



Communications Test Design, Inc.

TerraBoss & TerraUno User's Reference Manual

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Introducing TerraBoss and TerraUno

The TerraBoss and TerraUno T1/E1 DSUs make it easy to connect your network to a T1 or E1 line – and to manage the connection.

This chapter gives you a quick overview of the capabilities and features of TerraBoss and TerraUno. Subsequent chapters include all of the information you need to install, configure, and operate your TerraBoss or TerraUno.

If you just want to set up a TerraUno or TerraBoss and start using your network connection, the *Getting Started Guide* tells you all you need to know.

When you're ready to access the added features of your TerraUno or TerraBoss (including TerraBoss's management features), this manual has the information you need.

Support for E1 and T1

Unlike other DSUs which support only T1 or E1, or require you to specify T1 or E1 at the time of purchase, any TerraUno or TerraBoss can connect your network to either an E1 or T1 line. (T1 is used in North America and parts of the Asian Pacific Rim, while E1 is used pretty much everywhere else.) You use the same port to connect to either type of line, so you're not paying for redundant ports. Simply put, the TerraUno and TerraBoss line port is smart enough to handle whatever you give it.

***Note:** You don't have to know this, but T1 and E1 are the first-level signals in digital signal hierarchies used originally by telephone service providers to transmit digitized voice channels within their own networks. Each digitized voice channel (also called a DSO in the T1 world, or a time slot in the E1 world) uses 64 kbps. A T1 signal includes 24 channels, or 1.536 Mbps, of "payload" - plus extra bandwidth ("overhead") for organization, for a total bandwidth of 1.544 Mbps. An E1 signal includes 32 channels, for a total bandwidth of 2.048 Mbps; one or two channels are used for overhead (TS0 for framing, and sometimes TS16 for voice signaling).*

"Plug-and-Play" Setup

TerraUno and TerraBoss are the world's first true plug-and-play T1/E1 DSUs. You just press a couple of buttons, and LineLearn function configures the line interface for you.

LineLearn reads your T1 or E1 connection, and determines from the signal itself the type of line (T1 /E1), the particular line characteristics. (One T1 or E1 is not necessarily the same as the next T1 or E1)

You can even configure your TerraBoss or TerraUno to execute LineLearn at power-up - either each time the unit powers up, or just until it has successfully self-configured.

Bandwidth for Current and Future Needs

In most places, service providers will let you purchase less than the full T1 or E1 bandwidth—in other words, a certain subset of T1 or E1 channels. Such services are usually referred to as *fractional T1 or E1*. As part of the LineLearn function, your TerraUno or TerraBoss will automatically sense the number of active channels (DS0s or time slots) in fractional service offerings and configure itself for the exact fractional T1 or E1 service to which you are connected.

The great advantage to fractional T1 or E1 is that it lets you purchase only the bandwidth you need. Then, as your need for bandwidth grows, you can increase the bandwidth in stages up to the full T1 or E1. And each time you increase bandwidth, you just run LineLearn and your Terrauno or TerraBoss will reconfigure itself for the new bandwidth.

Flexible Data Interface

Routers and other data devices use a variety of interfaces, including V.35, RS449, and X.21. The EIA530-compatible data port used by TerraBoss and TerraUno supports *all* of these interface types; you just choose a cable with the right connectors at both ends. Then, if you're not using a V.35 interface, you press a couple of front-panel buttons to specify the interface you're using.

Choose the Management Power You Need

TerraUno includes two management interfaces: an RS232 Terminal Interface, and front-panel buttons and LEDs. The front-panel interface includes all of the functions you need to get TerraUno up and running. The Terminal Interface adds advanced configuration, monitoring, and diagnostic features. TerraBoss gives you the same Terminal Interface and front-panel interfaces as TerraUno, plus a lot more.

A New Standard for DSU Management

In addition to the RS232 port, TerraBoss includes a 10Base-T Ethernet port as well as the option of an inband IP management channel. These are the basis for a range of management options unmatched by any other T1/E1 DSU:

- ***Terminal Interface*** – TerraBoss includes the powerful menu-based Terminal Interface included in TerraUno, plus an added layer for managing up to nine TerraUno DSUs connected to TerraBoss.
- ***Web Interface*** – For that familiar Web “look-and-feel”, TerraBoss includes an HTML-based interface which can be opened using standard Web browsers. This interface gives users access to the full range of TerraBoss’s configuration, reporting, and diagnostic options accessible via the Terminal Interface.
- ***Telnet server*** – The Terminal Interface can also be accessed over a Telnet link through a 10Base-T Ethernet LAN connection.
- ***Inband IP Management*** – You can designate a DS0 as a dedicated IP management channel.
- ***TFTP server*** – Software upgrades can be downloaded from a central location through the TFTP server, making upgrades simple and inexpensive.
- ***Integral SNMP agent*** – SNMP has become an important standard for managing multi-element networks. TerraBoss features an integral SNMP agent which allows configuration and management from an SNMP element manager.
- ***Modem support*** – TerraBoss supports dial-in modem connections for remote management, as well as dialect connections for automatic event reporting.
- ***Email agent*** – TerraBoss is the first T1/E1 DSU that lets you use Email messages to report events and maintain trouble tickets.

With all of these management capabilities, TerraBoss is clearly ready to satisfy your management requirements.

Managing Multiple Units

Via Terra^{BOSS}, you can manage up to nine interconnected Terra^{UNO}s. That means that you need only one modem and phone line, or only one Ethernet connection and IP address, for up to ten DSUs at a site. You interconnect Terra^{BOSS} and Terra^{UNO}(s) by installing them in a chassis, or by means of a ribbon cable.

Interconnected units are referred to as a *stack*. Terra^{BOSS}'s management interfaces make it easy for you to look at the stack as a whole, or any individual unit in the stack.

E1 Unframed (Clear Channel) (Terra^{UNO} only)

Terra^{UNO} supports an E1 Unframed feature, which is supported by LineLearn. In this E1 Unframed mode, Terra^{UNO} will map the full bandwidth, unframed E1 signal (2048 kHz) to the **Data** port. The Format option on the **LINE SETUP** page displays the **E1 Unframed** parameter.

When the **E1 Unframed** option is selected, a new **LINE SETUP** page will be displayed that removes the E1 options that do not apply in unframed mode (i.e., "Framing", "Signaling", "Send Yellow Alarm", "Line Idle Code"). Also, the Terra^{UNO} will show all channels mapped to the **DATA** port and will not allow changes to this mapping.

DTE Timing

Terra^{UNO} and Terra^{BOSS} support master clock timing from the **Internal**, **Network**, or **Data** (*Terra^{UNO} only*) port. The Master Clock Source option on the **UNIT SETUP** page displays three parameters: **Internal**, **Network**, and **Data Port** (*Terra^{UNO} only*), any one of which, when selected as the clock source, allows the Terra^{UNO}/Terra^{BOSS} to synchronize the line clock to this source. If **Data Port** (*Terra^{UNO} only*) is selected, the frequency of the input clock is determined by the number of channels mapped to the **DATA** port and its rate (56k / 64k).

As a timing check, the TerraUno/TerraBoss provide status information about the accuracy of the input clock. If the input clock source is not proper, then a Loss Of Master Clock event is generated and the master clock source will automatically switch to **Internal**. TerraUno and TerraBoss continually monitor the input clock source status and automatically switches back to the **Port 1** clock when it has stabilized.

This feature is very effectively used with external time sources used for encryption, satellite, and other unique devices.

Event Reporting by Modem, Email, and SNMP

Each TerraUno or TerraBoss can log and report the events you choose. TerraUno reports events via modem dialout, while TerraBoss offers Email (using SMTP) and SNMP reporting as well as dialout. TerraBoss is the first T1 / E1 DSU to report events via Email. You can even set up the Email addresses so that TerraBoss automatically generates and updates trouble tickets.

In you use TerraBoss to manage a stack, you can configure it to report events for all DSUs in the stack, as well as stack-level and chassis events.

Built-in SNMP Agent

The standard protocol for managing diverse, multi-vendor networks is called the Simple Network Management Protocol (SNMP). Under SNMP, equipment being managed includes a software "SNMP agent" which supports relevant portions of the defined protocol, called MIBs (Management Information Bases). An SNMP "element manager" is a software package which communicates with and manages the agents.

TerraBoss includes a built-in SNMP agent supporting the standard management and DS1/E1 MIBs, plus our TerraBoss and TerraUno MIBs. Event reporting via SNMP traps is user-configurable.

Performance Monitoring To Help Identify Problems

TerraBoss and TerraUno offer a number of performance-monitoring features designed to help you identify and resolve problems. There are status reports to tell you what is going on right now. And there are event logs and statistical histories that let you view what has happened over time. You can see exactly what's happening where you access the WAN - and you can document what you see.

Graphical Test Set To Isolate Problems

You can use the Graphical Test Set built into the Terminal and Web Interfaces to isolate and diagnose problems associated with the T1 or E1 line, the connection to your local network, or the unit itself. The Graphical Test Set features a real-time display of line and data port status.

Via the Graphical Test Set, TerraBoss and TerraUno let you set up various signal "loopbacks", generate test patterns, and detect bit errors. You don't have to know how to employ the diagnostic features to install and use your TerraBoss or TerraUno -but they're there if you or your service provider need them.

Upgrade the Unit Yourself

Perhaps you've had a piece of equipment become outdated soon after you bought it. That won't happen with TerraUno or TerraBoss. If new options or capabilities are needed, or we come up with further enhancements, we'll make upgraded software available along with instructions for downloading the new software into your TerraUno or TerraBoss.

Installing TerraBoss and TerraUno

This chapter tells you how to install your TerraBoss or TerraUno. It's pretty simple: you mount the unit, connect cables to your local network and to the T1 or E1 line, and plug in power. You can also install a Terminal Interface and/or LAN management connection if you want.

You probably had it all figured out a couple of minutes after you took the unit out of the box. Or you followed the simple procedures in the *Getting Started Guide*. But if you want a little more detail, this chapter has it.

**As for setting up TerraBoss or TerraUno once you've powered it up, that's in the next chapter.
Installation Checklist**

After unpacking your TerraUno or TerraBoss and its accessories from the box, check the contents against the following list:

- TerraUno or TerraBoss DSU
- Universal mounting base
- Power supply (for 110-120 Vac, a single assembly; for 100-240 Vac, separate transformer and power cable - depends on model)
- E1 / T1 cable (14-foot RJ48, or 1-foot RJ48 plus 75-ohm balun adapter for BNC connections - depends on model)
- Small plastic bag containing: a) ferrite-core EMI suppressor, a plastic-covered metal cylinder which clamps onto the RJ48 cable; b) power cable clamp, a small strip of plastic with a hole at each end, plus a small Phillips-head screw
- Multi-connector ribbon cable (TerraBoss only)
- *Getting Started Guide and User's Reference Manual*

Be sure that you have the proper power supply and E1/T1 line cable before proceeding. If you have received the wrong model, or have not received all of the correct accessories, contact your distributor.

Note: There are numerous models of the TerraBoss and TerraUno DSUs to meet the needs of different countries worldwide. The models differ primarily in the power supplies and network cables supplied.

What You'll Need To Provide

There are many different ways to connect your TerraBoss or TerraUno to a router or other device. You'll need to determine and obtain the appropriate data cable for connecting to TerraBoss's **DATA** port. For cable requirements, contact your router manufacturer or distributor.

If you plan to use the Terminal and/or Web Interfaces, you'll need the appropriate serial and/or 10Base-T cable, as described later in this chapter. If you plan to mount the unit on a wall, you'll also need to supply appropriate mounting screws (and screw anchors).

Tools You'll Need

If you are not wall-mounting the unit, the only tool you're likely to need is a small screwdriver for tightening cable connectors. For wall mounting, you'll probably need a drill and other tools, depending on the particulars of your installation.

Mounting Your TerraUno or TerraBoss

You can mount your TerraUno or TerraBoss in several ways:

- Place the unit in its base and set it on a flat surface
- Interconnect multiple TerraBoss/TerraUno units using the “nesting” tabs and slots on the base
- Mount the base on a wall and insert the unit into the base
- Install one TerraBoss and up to nine TerraUno units in a rack-mountable chassis
- Install two units in a rack-mounting tray

CAUTION: *However a unit is mounted, be sure that its air vents are always clear to ensure adequate ventilation and prevent possible overheating.*

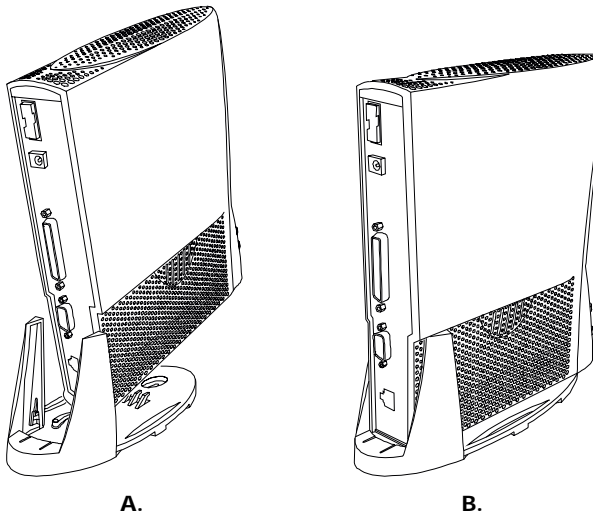


Figure 2-1. Inserting a TerraUno or TerraBoss into Its Base

Desktop Mounting

To mount a free-standing desktop unit:

1. Gently press the unit down on the base as shown in part A of *Figure 2-1*.
2. Slide the unit toward the back of the base until it locks into place as shown in part B of *Figure 2-1*.

Interlocking Multiple Units

If you have two or more units that you want to mount side by side, you can interlock their bases for optimum stability. Here's how:

1. Insert all units into their bases as described in the *Desktop Mounting* section above.
2. Set one unit next to another, with both facing the same direction.
3. Insert the semicircular tab on the base of one unit into the groove on the base of the other unit.
4. Repeat steps 2 and 3 until the bases of all units are interlocked.

Wall Mounting

To mount a TerraUno or TerraBoss on a wall, you use the same base as for desktop mounting, but oriented in a different direction.

To mount the base to the wall, you'll need two screws, and possibly two screw anchors—the type of each will depend on the type of wall.

CAUTION: *If you are mounting the unit on a sheet rock wall, be sure that the screws extend into studs, or use drywall anchors that will support a load in excess of 10 pounds. Take similar care to ensure the security of the mounting on other types of walls, such as masonry or plaster.*

To wall-mount your TerraUno or TerraBoss:

1. Orient the mounting base as shown in *Figure 2-2*, and hold it against the wall where you want to mount the unit. *Remember to locate the unit within reach of an ac outlet.*
2. If necessary, drill holes and/or install anchors to match the two circular mounting holes in the base.
3. Install two screws through the two circular holes in the base. Slide the base down so it rests on the screws, and tighten the screws so the base is held firmly to the wall.
4. Position the unit as shown in *Figure 2-2*, lining up the five prongs on the base with the five slots in the unit's side.
5. Place the unit against the side of the base, making sure the prongs on the base insert into the unit. Gently but firmly press down until the two nibs on the base's support arms snap into the two holes on the bottom of the unit.

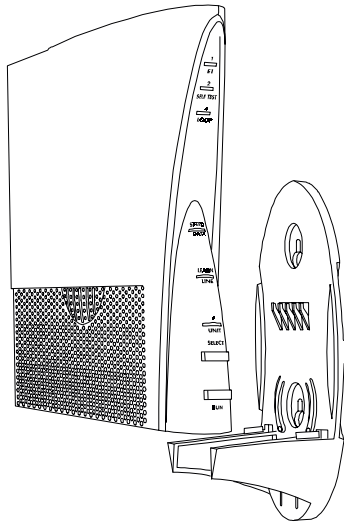


Figure 2-2. Wall-Mounting a TerraUno or TerraBoss

Installing Units in a Chassis or Tray

The chassis holds one TerraBoss and up to nine TerraUnos (or ten TerraUnos, if there is no TerraBoss providing unified management). All units in the chassis receive power from the chassis's single or dual power supply(s). In addition, all units are connected to a management bus that allows one TerraBoss to manage all units in the chassis.

The tray holds two units horizontally, side-by-side, and mounts in one rack unit (1.75 vertical inches). The two units are separately powered via their rear panels. A ribbon cable is provided for connecting a TerraBoss to a TerraUno for shared management.

For information about mounting a chassis or tray, and installing TerraBoss and TerraUno units in it, see the documentation provided with the chassis or tray.

Cable Connections

All cable connections are made to the TerraUno and TerraBoss rear panels. The rear panels are the same, except that the **10BASE-T** connector is not present on the TerraUno rear panel.

Connecting to Your Local Network

TerraBoss or TerraUno connects to your local network via the rear-panel EIA530 port (female DB25 connector) labeled **DATA**. You'll need a cable with an EIA530-compatible, male DB25 connector on one end. On the other end, you'll need one of the connectors shown in *Figure 2-3*, depending on your router (or other device you're connecting to).

To connect TerraBoss or TerraUno to your local network:

1. Obtain a cable to match the connector requirements of TerraBoss/TerraUno and your router. (If it's more convenient, you can use adapters to convert cable connectors.)

2. Mate the EIA530 connector to TerraBoss/TerraUno as shown in *Figure 2-4*, and secure it using the cable screws.
3. Mate the other connector to the router and secure it in the appropriate manner.

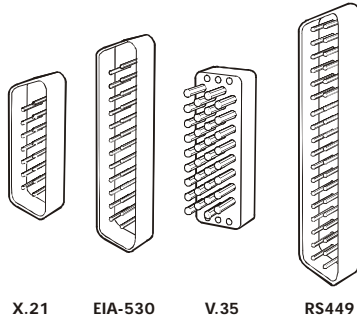


Figure 2-3. Router Connectors

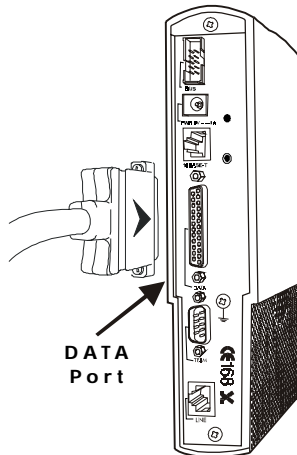


Figure 2-4. Connecting to the Data Port

Connecting to the E1 or T1 Line

The way you connect to the network depends on whether your connection is T1 or 120-ohm E1 (RJ48), or 75-ohm E1 (BNC).

T1 or 120-ohm E1 Line Connections

Usually, connecting TerraUno or TerraBoss to the E1 or T1 line is simply a matter of connecting a cable between the service provider's RJ48 jack and the RJ48 **LINE** jack on the TerraUno or TerraBoss.

A 14-foot cable is provided with appropriate TerraUno and TerraBoss models, along with a ferrite-core EMI suppressor (a plastic-covered metal cylinder which clamps onto the RJ48 cable) for emissions control. *If you use an RJ48 cable other than the one supplied with your TerraBoss or TerraUno, take note of the following:*

CAUTION: *To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.*

ATTENTION: *Pour réduire le risque d'incendie, utiliser uniquement des conducteurs de télécommunications 26 AWG ou de section supérieure.*

To connect to the E1 or T1 line:

1. Connect one end of the RJ48 cable to the RJ48 jack that the service provider installed for the E1 or T1 line.
2. Connect the other end of the cable to the **LINE** jack on the rear panel of your TerraBoss or TerraUno, as shown in *Figure 2-5*.
3. Install the EMI suppressor on the RJ48 cable (about 1 inch or 2.5 cm from the connector on the TerraUno/TerraBoss end) by snapping it shut around the cable.

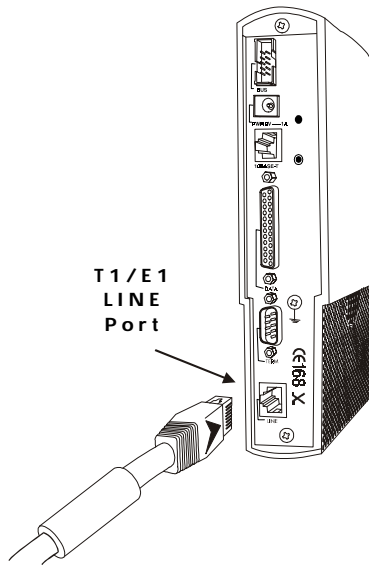


Figure 2-5. RJ48 T1 or E1 Connection

75-ohm E1 Line Connections

In the United Kingdom, Mexico, and other countries, you will need to connect your TerraUno or TerraBoss to the E1 line using two BNC connectors—in which case, your package will include the necessary 75-ohm “balun” adapter, a one-foot RJ48 cable, and a ferrite-core EMI suppressor (a plastic-covered metal cylinder which clamps onto the RJ48 cable) for emissions control.

To use the balun adapter to connect to the E1 line:

1. Plug one connector of the one-foot RJ48 cable into the RJ48 **LINE** jack on the TerraUno or TerraBoss rear panel.
2. Plug the other connector of the one-foot RJ48 cable into the RJ48 jack on the balun adapter.
3. Install the EMI suppressor on the RJ48 cable (about 1 inch or 2.5 cm from the connector on the TerraUno/TerraBoss end) by snapping it shut around the cable.
4. Obtain two coaxial cables of the necessary length, with BNC connectors on both ends.
5. Connect the cables between the service provider’s BNC connectors and the BNC connectors on the balun adapter.

***Note:** Be careful that you connect the **TX Out** BNC connectors together, and the **RX In** connectors together. (**TX Out** and **RX In** are clearly marked on the adapter, and should be similarly marked on your service provider’s BNC connectors.) Data will not be transmitted or received if you connect **TX Out** to **RX In**.*

Connecting to the Terminal Interface

You can connect to the TerraUno or TerraBoss Terminal Interface via the 9-pin RS232 port labeled **TERM** on the rear panel. You can connect directly (i.e., run a cable from your PC straight to the TerraUno or TerraBoss), or you can connect via modems (in which case the cable from the TerraUno or TerraBoss will connect to a modem).

***Note:** If you prefer, you can connect to an actual VT100 terminal rather than a PC running terminal emulation software. To support terminals which do not support the extended ASCII character set, TerraUno and TerraBoss allow you to disable the use of the extended character set by the Terminal Interface. See the discussion of the Terminal Setup frame in Chapter 5 for details.*

Instructions for configuring the terminal port are presented in *Chapter 5*. *Chapter 4* discusses the basic characteristics of the Terminal Interface, including logon and logoff procedures.

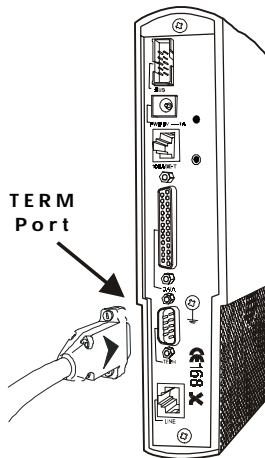


Figure 2-6. Connecting to the Terminal Port

Direct Connection

To connect a PC directly to the Terminal Interface:

1. Obtain a “null-modem” cable (also called a “crossover” cable) with a female 9-pin connector at one end and, on the other end, the appropriate connector for your PC’s **COM** port.
2. Install the cable between the TerraUno or TerraBoss **TERM** port and the PC’s **COM** port. *Figure 2-6* shows the TerraBoss end of the connection.
3. Secure the connectors at each end using the cable screws.

Connection via Modems

Before you connect to the Terminal Interface via modems, you’ll need to configure the terminal port for modem operation as described under the heading *Changing the Terminal Port Setup* in *Chapter 5*.

You also need to assure that the PC and modems are set for the same baud rate as the TerraUno or TerraBoss terminal port.

To connect a PC to the Terminal Interface via modems:

1. Obtain a “modem” cable (also called a “straight-through” cable) with a female 9-pin connector at one end and, on the other end, the appropriate connector for the modem at the TerraUno/TerraBoss location.
2. Install the cable between the TerraUno or TerraBoss **TERM** port and the modem’s data port. *Figure 2-6* shows the TerraUno/TerraBoss end of the connection.
3. Secure the connectors at each end using the cable screws.
4. Ensure that the modem is properly connected to a working telephone line.
5. Ensure that you have a modem installed in your PC, and that it is connected to a working telephone line.

Connecting TerraBoss to a LAN

The TerraBoss port labeled **10BASE-T** is a standard 10Base-T female RJ45 connector for connection to an Ethernet LAN. (*TerraUno does not provide this port.*)

To connect TerraBoss to an Ethernet LAN:

1. Obtain a UTP category 3 or better cable (category 5 is recommended) of at least three feet (one meter) in length. *Larscom does not supply this cable.*
2. Install the cable between the TerraBoss **10BASE-T** port and your LAN hub. *Figure 2-7* shows the connection to TerraBoss.

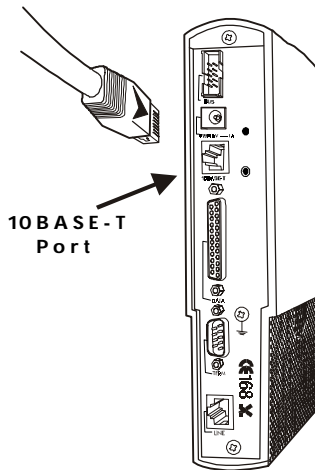


Figure 2-7. Connecting to TerraBoss's 10Base-T Ethernet Port

Connecting the Power Supply

If you are not installing TerraUno or TerraBoss in a chassis, you must connect it to an ac power source using the transformer and cable included with the unit.

***Note:** There is a green grounding screw, labeled **CHS GND**, on the rear panel next to the **TERM** connector. If you wish, you can connect **CHS GND** to earth ground in your building. However, you do not need to make any ground connection to this screw.*

IMPORTANT SAFETY INSTRUCTIONS:

When using your telecommunication equipment, always follow basic safety precautions to reduce the risk of fire, electrical shock, and injury.

Do not use this product near water.

Bei Benützung Ihres Fernmeldeapparates sollen immer die nötigen Sicherheitsvorkehrungen getroffen werden, um die Gefahr von Feuer, elektrischen Schlag, und Verletzung zu verringern.

Benützen Sie dieses Produkt nicht in der Nähe von Wasser.

Certaines mesures de sécurité doivent être prises pendant l'utilisation des telecommunication afin de réduire les risques d'incendie, de choc électrique et de blessures.

Ne pas utiliser l'appareil près de l'eau.

To plug in the power supply and secure the cable to the unit:

1. For 100-240 V ac supplies, connect the transformer and power cable sections together.
2. Plug the transformer cable's connector into the **POWER** socket on TerraUno or TerraBoss rear panel, as shown in *Figure 2-8*.

CAUTION: *Do not connect TerraUno or TerraBoss to a power supply which exceeds the provided power supply's rating of 1 amp at 9 V dc.*

3. Remove the plastic cable-clamp strip and metal screw from the accessory packet included with your TerraUno or TerraBoss.
4. Bend the plastic strip around the cable, lining up the holes at each end of the strip.
5. Insert the Phillips screw through the lined-up holes; then insert the screw in the rear-panel hole as shown in *Figure 2-8* and tighten.

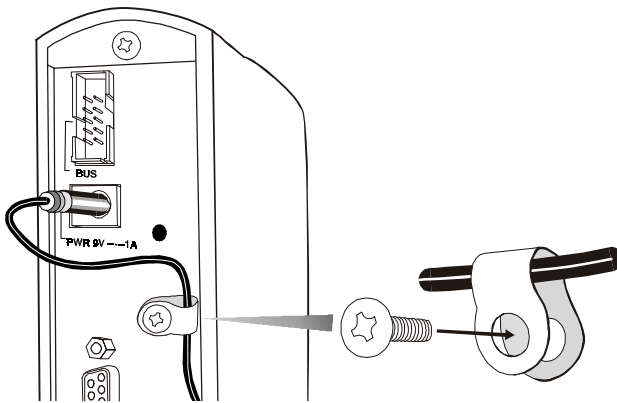


Figure 2-8. Connecting and Securing the Power Cable

6. Plug the power supply cable into a standard ac outlet. (If the power supply cable does not match the electrical outlet, you probably have the wrong power supply. See *Table 2-A*.)

CAUTION: *The power cable is the means for removing power from the TerraUno or TerraBoss. To insure that power can be disconnected rapidly and safely in an emergency, install your TerraBoss or TerraUno near an easily accessible mains socket outlet.*

When you plug in the power, the TerraUno or TerraBoss powers up. On power-up, the **UNIT LED** will be amber and then will turn green.

*Note: If the **UNIT LED** flashes red, the unit has not powered up properly. Try running the self-test. If the unit still fails to power up properly, contact your distributor or the CTDI Customer Support.*

If no LEDs light after you have connected power, check your power source by plugging something else into the outlet you used for the TerraUno or TerraBoss. If this other device doesn't work, the power outlet is probably out of service or defective. Try connecting the TerraUno or TerraBoss to an outlet that you know works correctly. If the LEDs remain unlit, contact your distributor to see about repair or replacement of the unit. For additional information about troubleshooting, repair, and replacement, contact your distributor or the CTDI Customer Support..

Interconnecting TerraBoss and TerraUno

The connector labeled **BUS** on the rear panel of each TerraUno and TerraBoss allows one to nine TerraUno units to be interconnected with a TerraBoss. Interconnection can take two forms:

- When a TerraBoss/TerraUno unit is installed in a chassis, the **BUS** connector mates with the chassis's midplane, allowing all units to receive power from the chassis and to be managed through a terminal or WAN connection to a single TerraBoss.
- Units which are not installed in a chassis can be interconnected using a ribbon cable which mates with the **BUS** connectors on TerraBoss/TerraUno rear panels. This cable allows interconnected units to be managed through a terminal or WAN connection to a single TerraBoss, but does not distribute power; all units must be independently powered.

If you choose to mount multiple units in a chassis, follow the instructions in the *Chassis Installation* manual, TCHS-5201-00x.

If you choose to interconnect units using the bus ribbon cable, obtain the cable from your distributor. Mate one connector on the cable with the **BUS** connector on each TerraBoss/TerraUno (shown in *Figure 2-9*). If you wish, you can trim off any unused portion of the cable.

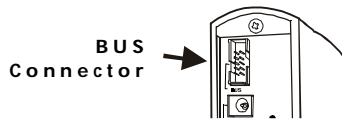


Figure 2-9. TerraUno/TerraBoss BUS Connector

Front-Panel Commands, Controls, and Indicators

This chapter identifies the LEDs and push-buttons on the TerraUno and TerraBoss front panels, and tells how they are used. It also gives instructions for the various procedures you can perform from the front panel—LineLearn, self-test, selection of the data interface and T1/E1 clock, loopbacks, etc.

You can perform the same functions, and more, using the Terminal and Web Interfaces. We'll discuss the Terminal and Web Interfaces in later chapters.

An Overview of the Front Panel

Figure 3-1 shows the TerraBoss front panel. (The TerraUno front panel is the same except for the product name at the bottom of the panel.) The front panel includes seven LEDs and two push-buttons.

During normal operation, the front panel is in status mode, and the LEDs indicate the operating status of the unit and its data and network interfaces as indicated in Table 3-A.

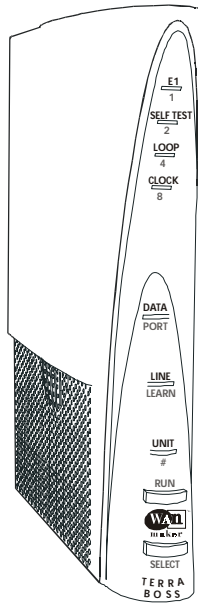


Figure 3-1. Front-Panel Buttons and LEDs

Table 3-A. Front-Panel LEDs (Status Mode)

LED	Color	Meaning
E1	Green Off	E1 mode T1 mode
SELF TEST	Green Amber Red Blink Red Off	Sending test pattern; receiver has pattern sync, no errors Sending test pattern; receiver has pattern sync, bit errors Sending test pattern; receiver has no pattern sync Unit failed self-test No test pattern being sent
LOOP	Amber	Loopback in effect within TerraBoss/TerraUno
CLOCK	Off	Always off except in front-panel mode
DATA (PORT) *	Green Red Off	Normal operation at data port Router or other device is not talking to data port All T1/E1 time slots configured as Idle
LINE (LEARN) *	Green Amber Red Off	Receiving a framed signal from the T1/E1 line Receiving Yellow Signal from the T1/E1 line No framing sync on signal from the T1/E1 line No signal (i.e., LOS) from the T1/E1 line
UNIT (#) *	Green Blink Amber Amber Red	Normal operation Software download in progress Start-up (boot) in progress Unit failure if this state persists

Front-Panel Mode

If you simultaneously press the two buttons, **SELECT** and **RUN**, you put the front panel into front-panel mode (unless front panel control has been disabled as described in *Chapter 5*). The LEDs cease to indicate operating status, and instead indicate things about the functions you can perform in front-panel mode. Front-panel mode continues until you simultaneously press **SELECT** and **RUN** again, or until five minutes have passed without either of the buttons being pushed.

There are several functions you can command from the front panel:

- LineLearn
- Data interface selection
- T1/E1 line clock selection
- Setting and clearing loopbacks
- Specifying the unit number
- Self-test

All commands are controlled using the two front-panel buttons:

- **SELECT+RUN** – *Simultaneously* pressing the two buttons turns front-panel mode on or off
- **SELECT** – Steps through the available functions; selects an option
- **RUN** – Initiates a function; cycles through options for a function

The LEDs indicate what function is currently selected, as identified in *Table 3-B*, or the options or status when a particular function is being performed.

The basic procedure for using front-panel mode is:

1. Press **SELECT+RUN** to begin front-panel mode.
2. Press **SELECT** until the a red LED indicates the desired function, as shown in *Table 3-B*.
3. Press **RUN** to initiate the function. Then follow the steps for the particular function as indicated in *Table 3-C*. (LEDs flash green to indicate options, and stay green to indicate selections.)
4. Press **SELECT** to go on to another function; or press **SELECT+RUN** to end front-panel mode.

Figure 3-2 summarizes front-panel mode in a flow-chart format.

Table 3-B. Front-Panel Functions and LED Indicators

LED	Color	Front-Panel Function
LINE	Red	LineLearn, the automatic process in which the DSU self-configures based on the characteristics of the T1 or E1 line to which it is connected
DATA	Red	Selecting the data interface type: V.35, RS449, or X.21
CLOCK	Red	Selecting an internal or network clock for the T1/E1 line
LOOP	Red	Setting and clearing various loopbacks of the data path within TerraBoss/TerraUno
UNIT (#)	Red	Specifying the unit number
SELF TEST	Red	Initiating a self-test

Command functions are listed in the order they occur. When you initiate front-panel mode, the LineLearn function is selected. Each time you press **SELECT**, you move to the next command in this table.

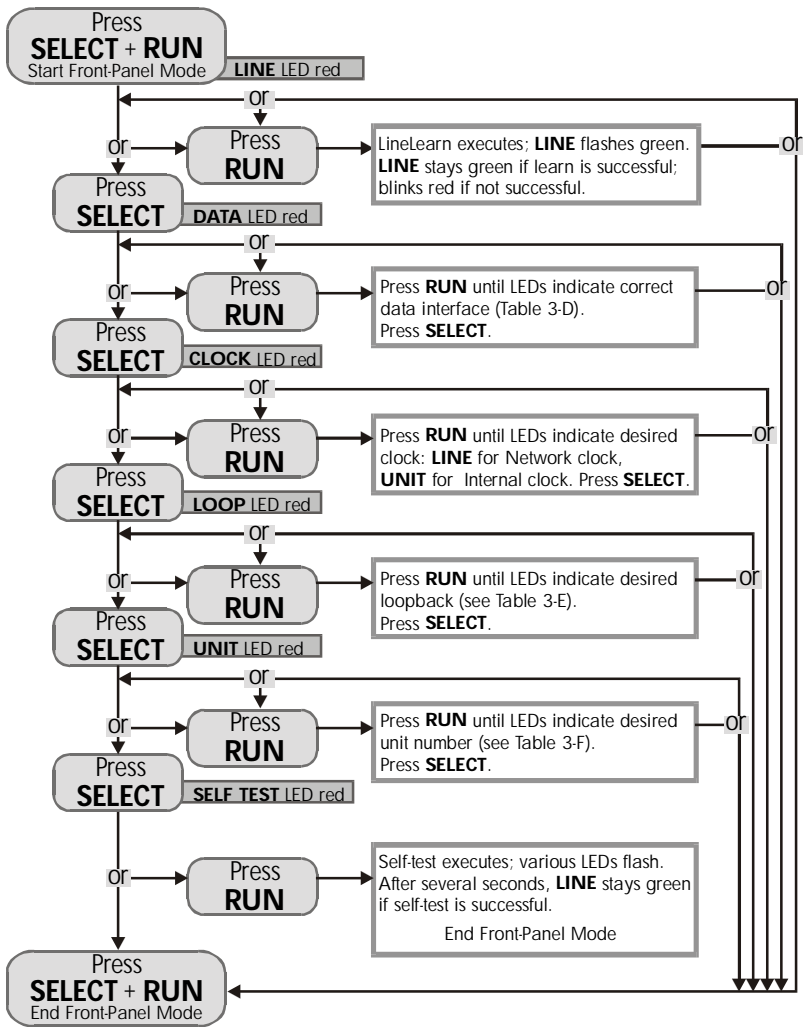


Figure 3-2. Front-Panel Mode Flow Chart

LineLearn

When you activate the LineLearn function, the TerraUno or TerraBoss detects and configures the following:

- Line format (T1 or E1)
- Number and placement of active channels (fractional or full bandwidth)
- Framing (ESF or D4 for T1; CRC4 On or CRC4 Off, with or without CAS for E1)
- Line encoding (B8ZS or AMI for T1; HDB3 for E1)
- Idle pattern
- Channel rate: 56 kbps or 64 kbps

Self-Test

If you think there may be a problem with your TerraUno or TerraBoss, you can run a diagnostic self-test from the front panel. When you perform a self-test, the TerraUno or TerraBoss interrupts the flow of data to test its line and data interfaces. It also clears performance data (events and statistics) in the process of testing internal memory.

Note: Performance data can be very useful for diagnosing problems. Do not perform a self-test unless you have already examined the performance data, or are sure you do not need to examine it.

If a TerraUno or TerraBoss fails the self-test, contact your distributor for assistance, or consult the CTDI Product support.

Table 3-C. Front-Panel Procedures

Function	Procedure
LineLearn	<ol style="list-style-type: none"> 1. With LINE LED red, press RUN; LINE LED will blink green. 2. LineLearn has successfully completed when LINE LED stays green. (If LINE LED flashes red, LineLearn was not successful. Try again, or finish configuration via the Terminal Interface.) 3. Press RUN to repeat, SELECT to go to next function, or SELECT+RUN to end front-panel mode.
Selecting the data interface	<ol style="list-style-type: none"> 1. With DATA LED red, press RUN until LEDs 1 and 2 blink green to indicate the correct data interface, as shown in <i>Table 3-D</i>. 2. Press SELECT to implement selection. LEDs stop blinking. 3. Press RUN to repeat, SELECT to go to next function, or SELECT+RUN to end front-panel mode.
Selecting the T1/E1 line clock	<ol style="list-style-type: none"> 1. With CLOCK LED red, press RUN until the desired clock is indicated: LINE LED blinking green for network clock, or UNIT LED blinking green for internal clock. 2. Press SELECT to implement selection. LEDs stop blinking. 3. Press RUN to repeat, SELECT to go to next function, or SELECT+RUN to end front-panel mode.
Setting and clearing loopbacks (See <i>Chapter 8</i> for details)	<ol style="list-style-type: none"> 1. With LOOP LED red, press RUN until the desired loop is indicated, as shown in <i>Table 3-E</i>. 2. Press SELECT to implement selection. LEDs stop blinking, turn amber. 3. Press RUN to end the loopback, SELECT to go to next function, or SELECT+RUN to end front-panel mode.
Specifying a unit number	<ol style="list-style-type: none"> 1. With UNIT LED red, press RUN repeatedly until the desired unit number is represented in binary form by blinking green LEDs 1, 2, 4, and 8 (as shown in <i>Table 3-F</i>). 2. Press SELECT to implement selection. LEDs stop blinking, turn green. 3. Press RUN to repeat, SELECT to go to next function, or SELECT+RUN to end front-panel mode.
Running a self-test *	<ol style="list-style-type: none"> 1. With SELF TEST LED red, press RUN to start the self-test (and end front-panel mode). LEDs will begin to flash, and continue flashing for several seconds. 2. When the test has completed successfully, the UNIT LED glows green and the other LEDs operate in status mode. If the TerraUno or Terra-Boss fails the test, the UNIT LED glows red or the SELF TEST LED blinks red.

* Running a self-test clears all of the performance data accumulated, so do not run the self-test if you want to retain the performance data.

Front panel mode will end if no button is pressed for approximately five minutes.

Table 3-D. LEDs and Data Port Types

LED(s) Green	Data Port Interface
#1	X.21
#2	V.35
#1 and #2	RS449

Table 3-E. LEDs and Loopback Selection

LINE, DATA, and/or UNIT LED(s) Green	Loopback
LINE	Network Loopback
LINE and DATA	Payload Loopback
DATA	Data Loopback

Table 3-F. LEDs and Unit Numbers

LED(s) Green	Unit Number
#1	1
#2	2
#1 and #2	3
#4	4
#1 and #4	5
#2 and #4	6
#1, #2, and #4	7
#8	8
#1 and #8	9
#2 and #8	10

Terminal and Web Interfaces

The front-panel controls make it simple to get your TerraUno or TerraBoss up and running. But both products have numerous advanced features that can be supported only by a more sophisticated interface.

For advanced configuration, alarm setup, and diagnostics, TerraUno provides a Terminal Interface accessible through a standard RS232 port. TerraBoss provides the same Terminal Interface, with an additional management layer, accessible via an RS232 serial connection and a 10Base-T Telnet connection. In addition, it includes a Web Interface with the same structure and functions as the Terminal Interface, a built-in SNMP agent, and SMTP Email capability for event notification and trouble ticketing.

The Terminal Interface

To ensure the simplest possible access, the TerraBoss and TerraUno Terminal Interface is based on the VT100-form terminal, a common text-based communication interface.

The TerraBoss/TerraUno Terminal Interface employs the “extended ASCII character set”, which includes some basic line-drawing elements. This allows the Terminal Interface to include a graphical component, in addition to text-based menus and reports. However, you can disable use of the extended character set if your terminal or PC does not support it.

The TerraBoss Terminal Interface consists of a manager level and a DSU level, while the TerraUno consists of the DSU level only. The DSU level supports configuration, monitoring, and testing of a particular unit. The manager level supports the Ethernet, SNMP, and Email interfaces, and provides for the management of multiple TerraUno DSUs interconnected to a TerraBoss.

Information in this manual about the manager level of the Terminal Interface does not apply to TerraUno.

The Web Interface

With TerraBoss, the functionality of the Terminal Interface is also available in an HTML-based Web Interface, which can be accessed over an IP link using a standard browser such as *Netscape*[®] or *Internet Explorer*[®]. The Web Interface uses the same basic components and structure as the Terminal Interface, but the presentation is somewhat different, reflecting the differences between the VT100 and HTML interfaces. Like the TerraBoss Terminal Interface, the Web Interface includes manager and DSU levels.

Information in this manual about the Web Interface does not apply to TerraUno.

Password-Protected Access

Logging on is required only when password protection is enabled. As described in *Chapter 5*, TerraBoss and TerraUno support two password levels—one that allows complete access, including configuration, and one that allows only viewing. The same passwords apply to both the Terminal and Web Interfaces.

If password protection is disabled or no passwords are defined, all functions will be available when an interface is accessed.

If password protection is enabled and passwords are defined, you will be prompted to enter a password when you access an interface. When access is via modems, Telnet, or the Web, you will not be able to view the **Manager Home Page** until you enter a valid password. When access to the Terminal Interface is direct, you will not be able to move from the **Manager Home Page** or perform any operations until you enter a valid password.

Logging On

When the password prompt appears, type the appropriate password exactly as it was defined; then press **[Enter]**.

***Note:** The Web Interface prompt will include a field for user name; enter nothing (or anything) in this field.*

Password checking is case-sensitive, meaning it distinguishes between capital and lower-case letters. For example, “Muskrat” is not the same password as “muskrat”.

***Note:** If you enter an incorrect password, the password will be rejected and you will be prompted again to enter the password. You are allowed an unlimited number of attempts to enter the correct password. However, if you are accessing the Terminal Interface via Telnet or a modem, you will be disconnected after three consecutive incorrect passwords, and will have to reconnect before trying again.*

Logging Off

To log off the Terminal Interface, press **[Ctrl-O]**. This has the following effects:

- **Direct Serial Connection:** The Terminal Interface will return to the **Home Screen**.
- **Modem Connection:** The modem connection will be terminated.
- **Telnet:** The Telnet connection will be terminated.

If password protection is enabled, logging on will be required after logout, as described in the previous section. If password protection is not enabled, no logon will be required after logout. However, any modem or telnet connection will have to be re-established.

To log off the Web Interface, close all TerraBoss windows open in the browser.

How the Terminal Interface Works

Within the constraints of the basic VT100 interface, the TerraUno and TerraBoss Terminal Interfaces incorporate a number of browser-like characteristics:

- Separate frames or windows which operate independently
- A “hyperlinked” structure that lets you move from frame to frame
- On-screen menus so you don’t have to memorize commands
- Graphical presentation of some information

Accessing the Terminal Interface

Both TerraBoss and TerraUno let you access the Terminal Interface through the RS232 **TERM** port, using a VT100 terminal or a computer's "terminal emulation" software. Just about any PC will include terminal emulation software that lets it act like a VT100 terminal. For example, Windows® 95 includes a terminal emulation program called HyperTerminal that includes VT100 emulation.

TerraBoss also lets you access the Terminal Interface over an IP link to the 10Base-T Ethernet port using Telnet, the standard terminal emulation program for IP networks.

Note: The Terminal Interface uses the extended ASCII character set. However, use of the extended ASCII character set can be disabled for terminals which do not support it.

Connecting through the RS232 (TERM) Port

Though specific procedures depend on the PC, emulation software, and/or modems you employ, the following guidelines should make accessing the Terminal Interface straightforward.

1. Make a direct physical connection as described in *Chapter 2*. (Whether or not you plan to connect to the Terminal Interface via modems, you'll need to make a direct connection first, then enable modem operations as described in *Chapter 5*.)
2. If you are using HyperTerminal, the terminal emulation program included with Windows 95, configure it as specified in *Table 4-A*. If you are using a different terminal emulation program, configure the program for corresponding options.
3. Activate the connection to TerraBoss. If you don't see the Terminal Interface display, press **[Esc]** a couple of times until it appears. (If you still don't see the display, you'll need to go over the connection and configuration to see where the problem lies.)

Table 4-A. HyperTerminal Settings

Configuration Option	Setting You Should Select
Bits per second	19200
Data bits	8
Parity	None
Stop bits	1
Function, arrow, and ctrl keys act as . . .	Terminal keys
Emulation	Auto detect or ANSI
Font	Terminal or MS LineDraw
Flow Control	None

Access Using Telnet and the TerraBoss Ethernet Port

For Telnet access to the Terminal Interface:

1. Make a 10Base-T connection as described in *Chapter 2*.
2. Define the Ethernet or inband IP connection, including assigning an IP address to TerraBoss, as described in *Chapter 8*.
3. Telnet to the IP address.

Note: You can also Telnet to Terraboss via an inband IP channel. See *Chapter 8* for details.

The Terminal Interface Display

Figure 4-1 shows the TerraBoss Terminal Interface's **Manager and DSU Home Screens**, and how each is divided into frames. These **Home Screens** provide access to the manager and DSU levels of the Terminal Interface, which provide the following functions:

- **Manager Level**— Manager and stack configuration and status; stack alarm and performance management; stack-related utility features; configuration of SNMP, Ethernet, and E-mail management features; software downloading; and access to the DSU level for any TerraBoss or TerraUno in the stack.

- **DSU Level**—DSU configuration and status; DSU alarm and performance management; and diagnostic testing.

Moving between the manager and DSU levels of the Terminal Interface is a simple matter:

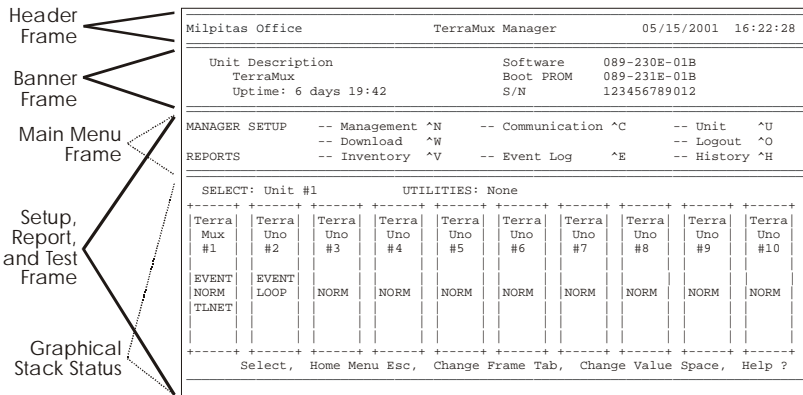
- To go *from the manager level to the DSU level*, move the cursor to the **SELECT** field of the **Manager Home Screen**; press **[Space Bar]** until the desired unit number appears; then press **[Enter]**. The **DSU Home Screen** will appear.
- To go *from the DSU level to the manager level*, return to the **DSU Home Screen** and press **[Esc]**. The **Manager Home Screen** will appear.

The following paragraphs describe operation of the Terminal Interface at the DSU level. Operation at the manager level is described in *Chapter 8*.

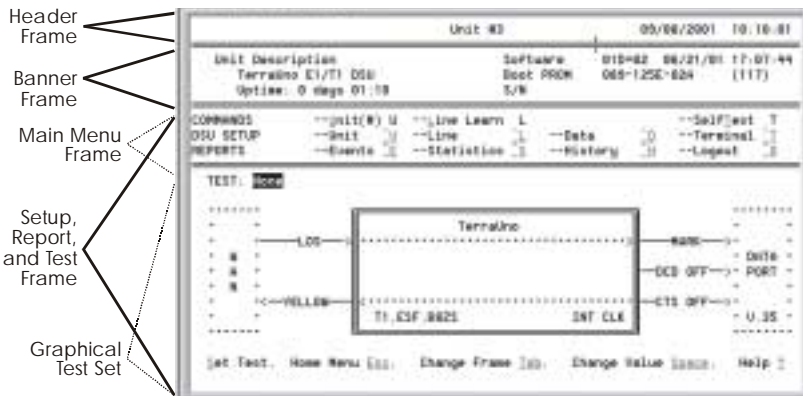
The DSU Home Screen

The **Header Frame**, at the very top of the display, shows the unit's user-defined name and number, and the current date and time. The **Banner Frame** is the portion of the screen just below the **Header Frame**. You control its contents using the **[Tab]** key. We'll give details a little further on.

The **Setup, Report, and Test Frame** is where most of the work gets done. In this area, you can call up and alter various **Setup** (configuration) frames, display performance reports, or display and use the **Graphical Test Set** included on the **Home Screen**. Again, details will come later.



TerraMux Manager-Level Home Screen



DSU Setup Home Screen

Figure 4-1. Elements of the Terminal Interface Display

Keyboard Control of the Terminal Interface

Because the VT100 terminal does not support a mouse, you'll be operating the Terminal Interface from your keyboard. Keyboard options in a particular situation are identified in the **Main Menu Frame** and/or at the bottom of the **Setup, Report, and Test** frame.

*Note: In some of the reports which can be displayed in the **Setup, Report, and Test Frame**, there are underlined characters. Entering the underlined character takes you to that particular field of the frame.*

Displaying Different Banners

By pressing the **[Tab]** key, you can cycle through different **Banners** on the Terminal Interface display. See *Chapters 6 and 8* for details on the DSU-level and manager-level banners, respectively.

Displaying Different Setup, Report, and Test Frames

When you are at the **DSU Home Screen**, the **Main Menu Frame** contains the Graphical Test Set. You can use the Graphical Test Set on the **DSU Home Screen** to view current status and perform diagnostic tests, as described in *Chapter 7*.

By pressing the "control characters" indicated in the **Main Menu Frame** on the **DSU Home Screen**, you can alter the contents of the **Setup, Report, and Test Frame**:

- You can examine and change configurations, including event reporting, as described in *Chapter 5*.
- You can display various reports, as described in *Chapter 6*.

How the Web Interface Works

TerraBoss's Web Interface lets you access the same functions as the Terminal Interface using a standard Web browser, such as *Netscape* or *Internet Explorer*.

Accessing the Web Interface

Before you can access TerraBoss's Web Interface:

Your TerraBoss must be connected to an Ethernet LAN via the rear-panel **10BASE-T** Ethernet port, as described in *Chapter 2*

The LAN should have Internet connectivity, unless you plan to limit access to an intranet

The Ethernet port must be appropriately configured (including IP address assignment), as described in *Chapter 8*

When the Ethernet port is connected and configured, open your chosen Web browser and point it to:

http://<TerraBoss IP address>/

When the password prompt appears, enter a valid password. (There will be no password prompt if password protection is disabled).

If you have problems connecting to the Web Interface:

1. See if you can Ping the TerraBoss.
2. Make sure the address is formatted correctly:
http://n1.n2.n3.n4/
3. Check you browser settings.
4. If you are using a proxy server to access the Internet, consult your MIS department regarding any special configuration requirements.

Web Interface Displays

Figures 4-2 and 4-3 show the Web Interface's **Manager** and **DSU Home Pages**, and how each is divided into frames. These **Home Pages** provide access to the same basic manager and DSU levels as the Terminal Interface.

The basic Web Interface display is divided vertically into two frames, with an additional frame at the top of the **DSU Home Page**. The frame to the left contains a menu tree, allowing you to select the contents of the frame to the right - which may be a setup screen, report, diagnostic display, etc. The contents of the right frame are basically analogous to the contents of the Terminal Interface **Setup, Report, and Test Frame**.

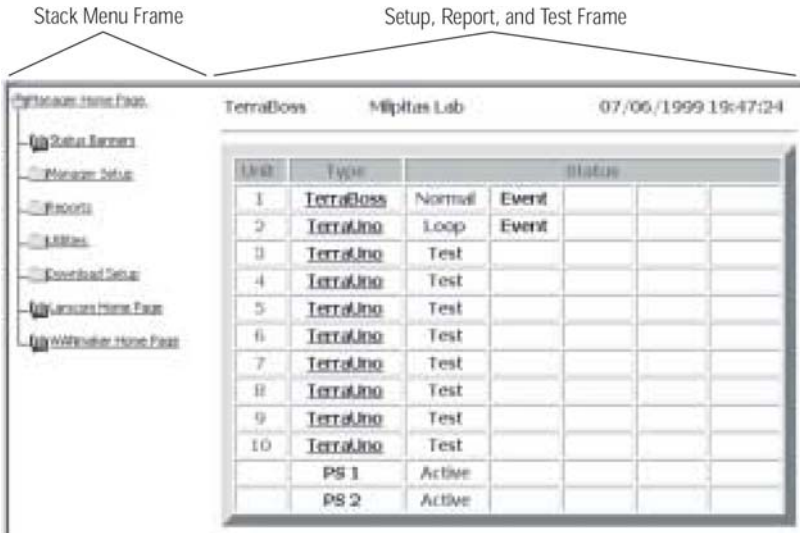


Figure 4-2. Manager Home Page: Web Interface

Taking advantage of one of the characteristics of Web browsers, the Web Interface opens additional windows when the display of information in the right frame of the **DSU Home Page** would necessitate excessive scrolling.

The **Header/Banner** frame at the top of the **DSU Home Page** is analogous to the Terminal Interface **Header Frame** and **Banner Frame**.

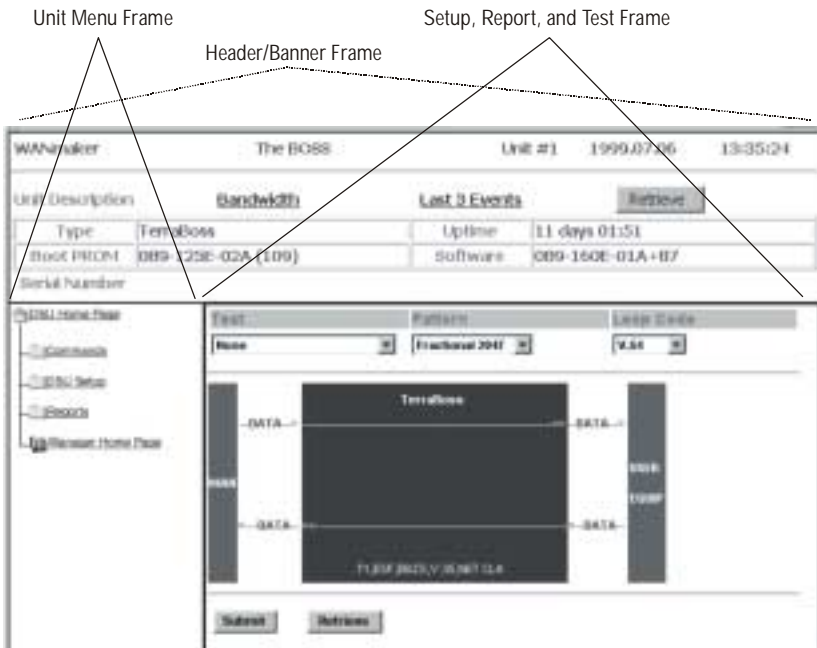


Figure 4-3. DSU Home Page: Web Interface

Navigating and Selecting in the Web Interface

Moving about the Web Interface is different from moving about the Terminal Interface:

- To go *from the manager level to the DSU level*, select **Manager Home Page** in the **Menu Frame**; then click on the desired unit in the **Setup, Report, and Test Frame**. A new window will be opened, displaying the **DSU Home Page**. You can also go to any open DSU-level window by clicking on it.
- To go *from the DSU level to the manager level*, click on any open manager-level window, or select **Manager Home Page** from the DSU-level **Menu Frame**.

To control the contents of the **Setup, Report, and Test Frame** (or the opening of new windows), click on the desired menu items in the **Menu Frame**. (The **Menu Frame** uses a folder structure like a standard disk directory.) Selecting a report or log will cause a new window to be opened. This has the advantage of allowing you to view multiple reports simultaneously. However, if you open a lot of reports, your screen can get pretty cluttered and performance can become slow, so it is a good idea to close any windows you no longer need to view. Closing a TerraBoss window has no effect on other TerraBoss windows currently open.

To select or specify options via the Web Interface, you simply click on an option field in an open window. If the field ends with a box containing a down-pointing triangle, you select the option from a drop-down menu. Otherwise, you click in the option field and then type your choice (a name or password, for example). When you're ready to activate the configuration change(s) that you have entered, click on the **Submit** button or press **[Enter]**.

To update a particular Web Interface page with the current status from TerraBoss, click on the **Retrieve** button.

Browser Considerations

An in-depth discussion of browser operation is beyond the scope of this manual. If you are not familiar with the operation of your browser, use the browser's **Help** option or consult vendor or third-party documentation for the browser. Generally, you will have no problems using default browser setups. If you custom-configure your browser, however, there are some things to watch out for.

One thing you need to consider is how your browser is configured to use "cached" web pages rather than pages updated from the source server. If your browser is configured (via **Preferences** in *Netscape* or **Internet Options** in *Internet Explorer*) to *never* update a page by going to the source server, you may not be displaying real-time status. Therefore, you should not have your browser configured to "never update pages" or "never compare document in cache to document on network" while you are accessing TerraBoss.

*Note: To be sure you have the latest information on a particular page of the TerraBoss Web Interface, click the **Retrieve** button.*

Also, be sure that JavaScript is enabled.

Configuring TerraBoss and TerraUno

This chapter describes the configuration procedures and options relating to the TerraBoss and TerraUno DSU functions. Configuration of TerraBoss's manager functions is discussed in Chapter 8.

Some of the options may seem arcane unless you have a lot of experience with T1 or E1—or even if you do. Don't worry about that. Default and LineLearn configurations will be correct for almost all installations.

DSU configuration includes specifying what events will be reported, and what severity they will have. So this chapter includes a discussion of the TerraBoss and TerraUno event-reporting functions.

Commands

The Terminal and Web Interfaces include commands which duplicate some of the front-panel operations described in *Chapter 3*. *Table 5-A* tells how to implement these functions via the Terminal and Web Interfaces.

CAUTION: *Remember that running the self-test will interrupt data flow through the DSU and erase all of the unit's performance data.*

Table 5-A. Terminal and Web Interface Commands

Function	Terminal Interface	Web Interface
LineLearn * <i>Initiates learning of T1/E1 line characteristics.</i>	Press [L] . Respond [Y] to prompt.	In the DSU Menu Frame , open the Commands folder and click on LineLearn . Click Yes to confirm.
Self-Test * <i>Initiates the TerraBoss/TerraUno self-test.</i>	Press [T] . Respond [Y] to prompt.	In the Unit Menu Frame , open the Commands folder and click on Self Test . Click Yes to confirm.
Data Port <i>Selects the Data Port type</i>	Press [D] . Press [Space bar] until correct data port type is displayed (X.21, V.35, or RS449). Press [S] to save or [Esc] to exit.	In the Unit Menu Frame , open the Commands folder and click on Data Port . Select from pull-down menu and click on Submit .
Unit <i>Specifies the unit number</i>	Press [U] . Press [Space bar] until desired number is displayed. Press [S] to save or [Esc] to exit.	<i>Not available via the Web Interface</i>

* Progress and completion of the **LineLearn** and **Self-Test** functions will be indicated in the lower left corner of the TerraBoss/TerraUno diagram on the Terminal Interface **DSU Home Screen**. These functions briefly interrupt data traffic, so use them carefully. See *Chapter 3* for discussions of these functions.

DSU Setup Frames

The DSU-level **Setup** frames identified in *Table 5-B* let you configure the TerraBoss and TerraUno DSU options – the line, data, and RS232 terminal interfaces, plus a few general unit parameters such as name, date format, date and time, etc.

The various DSU-level events that can be reported are also configured in the **Setup** frames.

Note: A TerraBoss or TerraUno retains all of the configuration you have specified, even if it loses power.

Table 5-B. DSU Setup Frames

Setup Frame	What You Can Configure
Unit Setup	Unit name and number; date and time; date format; front panel operation; master clock source; extended (graphic) character set for Terminal Interface * Unit events
Terminal Setup	Baud rate; modem operation; password protection
Line Setup	T1 or E1; framing format; line coding; line build-out/equalization; remote loopback modes; idle code; and other line interface parameters T1/E1 line events
Data Setup	Interface type; data loss (flow) control; data rate; clock and data polarities; terminal timing mode Data and idle channels Data loss event
*Unit number date and time, date format, and extended character set are not configurable via the Web Interface Unit Setup frame	

DSU Event Reporting

For each type of event it monitors, a TerraBoss or TerraUno DSU can report two states: **In Alarm** and **Normal**. An event is reported on either state transition: from **Normal** to **In Alarm** or from **In Alarm** to **Normal**.

When a TerraBoss and one or more TerraUnos are interconnected in a stack, the TerraBoss gathers event information from the TerraUnos by continually polling them. Thus, the event data base maintained by TerraBoss includes the events detected by interconnected TerraUnos as well as TerraBoss events.

Event Severity

TerraBoss and TerraUno let you assign a severity to each DSU event type. A change from **Normal** to **In Alarm** may have a severity of **Status**, **Critical**, **Major**, or **Minor**. A change from **In Alarm** to **Normal** always has a severity of **Clear**, indicating that an alarm state has been cleared.

In a stack, event severities are assigned independently for each DSU. For example, a Yellow Signal event may be defined as **Critical** for one DSU, **Major** for another, and **Minor** for a third. Events of all severities are logged, and can be viewed in the DSU and Manager Event Logs, as described in *Chapters 6* and *8*, respectively.

Remote Event Reporting

TerraBoss can report events to remote locations in three ways:

- Email — *requires an Ethernet connection to the **10BASE-T** port as described in Chapter 2, configured as described in Chapter 8*
- Modem dialout — *requires a modem connection to the **TERM** port as described in Chapter 2, configured as described in this chapter*
- SNMP traps — *requires an Ethernet connection to the **10BASE-T** port as described in Chapter 2, configured as described in Chapter 8*

Dialout is the only reporting method directly supported by TerraUno, and is thus the only method which can be enabled at the DSU level (via the **Terminal Setup** screen). Email and SNMP traps are enabled at the manager level, as described in *Chapter 8*.

Basic Configuration Procedure

With the exception of a small number of items which are not relevant to the Web Interface, all configuration options can be controlled via the Terminal and Web Interfaces.

*Note: When an attempt is made to configure a TerraUno in a stack and the TerraUno does not support the specified configuration (because it is running a earlier revision of software), an “Unsupported Feature” event is declared. Severity of the event is defined in the manager-level **Unit Setup** frame.*

Terminal Interface

To configure your TerraBoss or TerraUno via the Terminal Interface:

1. From the **DSU Home Screen**, select the **Setup** frame you want.
2. Use the arrow keys to move the selection cursor (usually reverse highlighting) among the configuration items in the **Setup** frame.
3. Make changes to the setup options as desired. Usually you'll do this by pressing **[Space Bar]** to cycle through the options. In some cases, you'll start by pressing **[Space Bar]**; then you'll type in text, finishing by pressing **[Enter]**.
4. If at any point you decide you want to exit from the **Setup** frame without implementing the changes you've specified, press **[Esc]** and respond to the prompt with **[N]**. You will be returned to the **Home Screen**.
5. When you want to implement the changes you have entered in the **Setup** frame, press the **[S]** key (or press **[Esc]** and respond to the prompt with **[Y]**). The new configuration will be implemented and saved.

Web Interface

The Web Interface offers the same DSU-level **Setup** frames as the Terminal Interface, but for manager-level configuration employs separate **Time**, **Password**, **Email**, **SNMP**, and **Ethernet Setup** frames.

To configure DSU options via the Web Interface:

1. Call up the desired Setup frame in one of these two ways:
 - From **DSU Menu Frame**, open the **DSU Setup** folder and click on the desired setup option: **Unit**, **Terminal**, **Line**, or **Data**.
 - From **Manager Menu Frame**, open the **Manager Setup** folder and click on the desired setup option: **Unit**, **Time**, **Email**, **Password**, **Terminal**, **SNMP**, or **Ethernet**.
2. Use the mouse to select among the various configuration parameters in the **Setup** frame.
3. Make changes to the setup options by selecting from pull-down menus and/or typing text, as appropriate.
4. If at any point you decide you want to exit from the **Setup** frame without implementing the changes you've specified, click on the **Cancel** button.
5. When you want to implement the changes you have entered in the **Setup** frame, click on the **Submit** button and confirm as prompted. The new configuration will be implemented and saved.

Coordinating Configuration Changes

TerraBoss can accept configuration requests from different interfaces virtually simultaneously. There is no way that TerraBoss can sensibly prioritize the incoming configuration requests, so they are handled in the order in which they are received. When multiple users may be configuring a unit, it is their responsibility to coordinate the configuration changes so that the desired configurations result.

Unit Setup

The DSU-level **Unit Setup** frame, illustrated in *Figure 5-1*, lets you change various items pertaining to a particular unit:

- Name and number
- Date and time
- Source of the line signal clock
- Whether the front-panel buttons will function
- Use of the extended ASCII character set for Terminal Interface graphics
- Event-reporting options

On the Web Interface, only the name, clock source, and front-panel operation are configurable.

Tables 5-C and 5-D describe the items in the DSU-level **Unit Setup** frame.

UNIT SETUP			
Name			
Unit #	3	EVENTS	SEVERITY
Time	10:27:00	Cold Start	Major
Date Format	MM/DD/YYYY	Warm Start	Major
Date	09/08/2001	Loss Of Master Clock	Major
Front Panel Control	Enable	Password Violation	Major
Master Clock Source	Data Port	Local Loop	Major
Terminal Graphics	Enable	Remote Loop	Major
EVENT PROCESSING			
Dial/Report Severity	Major or Greater		
Logging Severity	Major or Greater		
OTHER SETUPS:			
LINE	☐	DATA PORT	☐
Home Menu Esc.	Change Frame	Tab.	Change Value Space

Figure 5-1. Unit Setup Frame

Table 5-C. Unit Setup

Item	Description	Options (Defaults in Bold)
Name	Name identifying this unit in Web and Terminal Interface displays	Up to 32 characters (letters, numbers, punctuation marks, spaces)
Unit # *	Number identifying this unit in Web and Terminal Interface displays	1 to 10
Time *	The current time, in standard 24-hour format	hh:mm:ss (hh= <i>hour</i> ; mm= <i>minute</i> ; ss= <i>second</i>) <i>Note: Time and date are not reset when TerraBoss loses power</i>
Date Format *	The format in which the date will be displayed in Web and Terminal Interface displays	North America (MM/DD/YYYY); International (DD/MM/YYYY); ANSI X3.30 (YYYY.MM.DD)
Date *	The current date	Any date in the selected format
Front Panel Control	Whether control via the front panel (command mode) will be allowed	Enable or Disable
Master Clock Source	The source of the signal used in normal situations for clocking T1 or E1 data in and out *	Network (clock derived from T1 or E1 signal) or Internal (clock generated by TerraBoss/TerraUno)
Terminal Graphics *	Whether the Terminal Interface will support the extended ASCII character set, which enhances the look of the Graphical Test Set and other Terminal Interface elements	Enable or Disable
*Not included in the Web Interface's Unit Setup frame		

Table 5-D. Unit Event Severity

Event	Description	Options
Cold Start	The unit has powered up.	Critical, Major , Minor, Status
Warm Start	The unit has performed a self-test, has completed a software download, or has rebooted.	
Loss of Master Clock	The unit has lost its master clock signal. (In most cases, the unit receives its master clock from the E1 or T1 line. If the unit loses the E1 or T1 signal, it also loses the clock, and switches to its internal clock.)	
Password Violation	Someone trying to log in has entered an incorrect password three times, or failed to enter a password within 30 seconds of the prompt.	
Local Loop	A loopback within TerraBoss/TerraUno has been initiated via the Graphical Test Set.	
Remote Loop	A loopback within TerraBoss/TerraUno has been initiated from the network or the data device.	
Dial/Report Severity	The event severity which will result in dialout, Email, and/or SNMP traps	All, Critical only, Major or Greater , Minor or Greater, None
Logging Severity	The event severity which will result in an event being logged	

Unit Numbers

The unit number can be an important identifier when you have more than one TerraBoss and/or TerraUno at a site or in a location. You can assign any number to any unit you want, except that a TerraBoss will not let you assign duplicate unit numbers within a stack.

When units are installed in a chassis, whether connected in a stack or not, the slot in which a unit is installed has no effect on its unit number. However, it is generally a good idea to match unit numbers with slot numbers so that the Terminal and Web Interfaces logically and visually reflect the physical installation.

Changing the Master Clock Source

The master clock source, selected from Master Clock Source option on the **UNIT SETUP** page can be **Internal**, **Network**, or **Data Port** (TerraUno only) and must ensure that the timing between one end of the T1 or E1 line is in sync, or data transmission will not be reliable.

When connecting to a public T1 or E1 network, or to a private network that generates its own clock, you should always keep **Network** (the default) as the master clock source. In cases where the network itself does not supply a clock, one end of the T1 or E1 line should be configured for **Internal** clock, and one for **Network** clock.

When **Network** is selected, the DSU derives its signal clock from the T1 or E1 signal. If the DSU loses the clock from the network, it automatically switches to its internal clock and an “event” is generated. When the network clock is restored, the DSU reverts back to the network clock.

During Payload Loopback, if the **Internal** clock is selected, the DSU temporarily switches from the **Internal** to **Network** clock. When the loopback is removed, the DSU switches back to the **Internal** clock. (See *Chapter 7* for information about Payload Loopback.)

If **Data Port** (TerraUno only) is selected, the frequency of the input clock is determined by the number of channels mapped to the **DATA** port and its rate (56k / 64k).

The clock source *currently in use* (not necessarily the clock source selected in the **Unit Setup** frame, for the reasons described in the previous two paragraphs), is identified in the Graphical Test Set on the **Home Screen** (as **Int Clk** or **Net Clk** or **DTE Clk**).

Terminal Port Setup

You can use the **Terminal Setup** frame, illustrated in *Figure 5-2*, to redefine the communication parameters for the terminal port. *Table 5-E* details the **Terminal Setup** items and options.

Note: On the Terminal Interface, the same terminal port configuration can be performed at the stack level, using the **Communications Setup** frame.

Unit Description	Software	01D+02	06/21/01	17:07:44
TerraUno E1/T1 DSU	Boot PROM	009-125E-02A	(117)	
Uptime: 0 days 01:31	S/N			
TERMINAL SETUP				
Baud Rate		19200		
Data Bits		8		
Stop Bits		1		
Parity		None		
Modem		Disable		
Dialout Number				
Wait For Connect (sec)		30		
Inactivity Timeout (min)		5		
Dial Backoff Timer (min)		30		
Password		Disable		
Configure & View		XXXXXXXX		
View		XXXXXXXX		
OTHER SETUPS: UNIT CU LINE CL DATA PORT CD				
Home Menu Esc. Change Frame Tab. Change Value Space				

Figure 5-2. Terminal Setup Frame

Changing the Baud Rate

If the baud rates of the PC's terminal emulation software and the TerraBoss or TerraUno (and any modems in between) do not match, you'll most likely see "garbage" on the Terminal Interface. If this occurs, adjust baud rate settings in your terminal emulation software (and/or modems) until the Terminal Interface responds properly.

Table 5-E. Terminal Setup

Setup Item	Description	Options (Defaults in Bold)
Baud Rate	The speed at which the RS232 port operates	2400, 4800, 9600, 19.2 kbps, and 38.4 kbps
Data Bits, Stop Bits, Parity	The format of the serial bit stream	8 , 1 , and None , respectively (<i>cannot be altered</i>)
Modem	Whether the Terminal Interface will support a modem	Disable (if you are not using modems) or Enable (if you are)
Dialout Number	The dial string the Terminal Interface uses when dialing out to report events	Up to 40 characters; usually a phone number; see your modem manual for details
Wait for Connect	The number of seconds the Terminal Interface waits for connection after dialing	30 to 120 seconds
Inactivity Timeout	The number of minutes without sending a character that the Terminal Interface waits before hanging up and/or logging out	0 to 20 minutes (default is 5)
Dial Backoff Timer	The number of minutes the Terminal Interface waits, after failing to make a connection, before redialing	15 to 60 minutes (default is 30)
Password	Whether a password is required for access to the Terminal and Web Interfaces	Enable (to require passwords) or Disable
Set Password	The password required to log on (if Password = Enable)	Up to 8 characters (<i>letters, numerals, punctuation marks, and/or spaces</i>)

Passwords

To enhance management flexibility and security, TerraBoss and TerraUno provide two login levels, each with its own password.

A user entering the password for the **View Only** level will be able to view configurations and reports, but not change configuration or clear performance data. A user entering the password for the **Configure and View** level will be able to perform all Terminal and Web Interface functions.

To password-protect a TerraBoss or TerraUno, you must enable *and* define passwords. If you don't do both, users will not be prompted to enter a password.

A password may consist of any combination of up to eight letters, numerals, punctuation marks, and/or spaces. The password is case sensitive, so it must be entered *exactly* as defined.

When you define passwords, make sure you write them down and keep them in a safe place.

Inactivity Timeout

In most cases, you shouldn't specify an **Inactivity Timeout** of **0**. If you do, a TerraBoss or TerraUno will stay connected until the caller disconnects. Also, check your modem's documentation to make sure the TerraBoss/TerraUno inactivity timeout is consistent with any timeout enforced by your modem.

Dial Backoff Timer

If the Terminal Interface is unsuccessful in reporting events after five attempts, it will wait (back off) the number of minutes specified in the **Dial Backoff Timer** field before it dials out again. This prevents the Terminal Interface from continuous re-dialing when a line is busy or unavailable.

T1, E1, or E1 Unframed (TerraUno Only) Line Setup

While the **LineLearn** function automates E1/T1 line configuration, you can use the **Line Setup** frame to fine-tune line interface settings if you want or need to do so. The **Line Setup** frame has three formats, one for T1, one for E1, and one for E1 Unframed (*TerraUno only*); these are illustrated in *Figures 5-3, 5-4, and 5-5*.

The frame that appears will match the current line format setting.

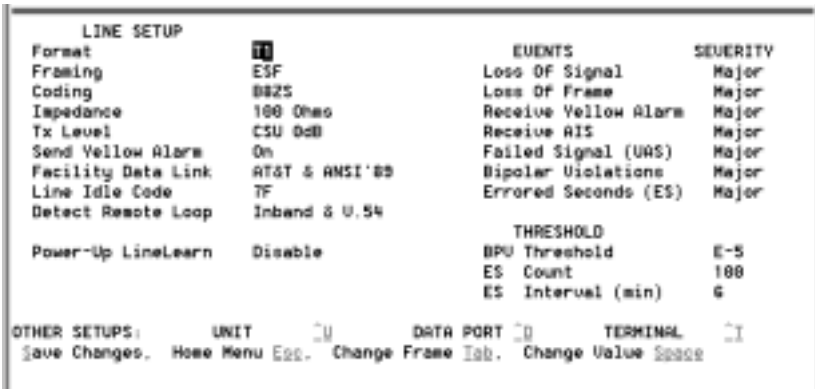


Figure 5-3. T1 Line Setup Frame

LINE SETUP		EVENTS		SEVERITY
Format	E1	Loss Of Signal		Major
Framing	CRC4 ON	Loss Of Frame		Major
Signaling	CAS	Receive Yellow Alarm		Major
Coding	HDB3	Receive AIS		Major
Impedance	120 Ohms	Failed Signal (URS)		Major
Tx Level	G.703	Bipolar Violations		Major
Send Yellow Alarm	OFF	Errored Seconds		Major
Line Idle Code	TF			
Detect Remote Loop	Channel (U.S4)			
		THRESHOLD		
Power-Up LineLearn	Disable	BPU Threshold		E-5
		ES Count		100
		ES Interval (min)		6
OTHER SETUPS: UNIT <input type="checkbox"/> DATA PORT <input type="checkbox"/> TERMINAL <input type="checkbox"/>				
Save Changes. Home Menu Esc. Change Frame Tab. Change Value Space				

Figure 5-4. E1 Line Setup Frame

LINE SETUP		EVENTS		SEVERITY
Format	E1 Unframed	Loss Of Signal		Major
Framing	None	Loss Of Frame		Major
Signaling	None	Receive Yellow Alarm		Major
Coding	HDB3	Receive AIS		Major
Impedance	120 Ohms	Failed Signal (URS)		Major
Tx Level	G.703	Bipolar Violations		Major
Detect Remote Loop	Channel (U.S4)	Errored Seconds		Major
Power-Up LineLearn	Disable	THRESHOLD		
		BPU Threshold		E-5
		ES Count		100
		ES Interval (min)		6
OTHER SETUPS: UNIT <input type="checkbox"/> DATA PORT <input type="checkbox"/> TERMINAL <input type="checkbox"/>				
Save Changes. Home Menu Esc. Change Frame Tab. Change Value Space				

Figure 5-5. E1 Unframed Line Setup Frame (TerraUno only)

Table 5-F defines the T1 line setup items and options, Table 5-G defines the E1 line setup items and options, and Table 5-H defines the E1 Unframed (TerraUno only) line setup items and options. Table 5-I describes the **EVENTS - SEVERITY** and **THRESHOLD** sections of the **Line Setup** frames used to configure event reporting.

Table 5-F. T1 Line Setup

Setup Item	Description	Options (Defaults in Bold)
Format	E1 or T1 line	T1
Framing	Framing format of T1 signal	ESF or D4
Coding	Coding of T1 signal	B8ZS , AMI, AMI Enforce (also referred to as "bit 7 stuffing")
Impedance	T1 line interface impedance	100 ohms or JATE (for Japan)
Tx Level	Impedance compensation for cable length and other conditions between the DSU and the service provider's first T1 repeater *	CSU 0 dB , CSU -7.5 dB, CSU -15 dB, CSU -22.5 dB; DSX 0-133 ft, DSX 134-266 ft, DSX 267-399 ft, DSX 400-533 ft, DSX 534-655 ft
Send Yellow Alarm	DSU sends Yellow Signal when receiving Loss of Signal or Frame	On or Off
Facility Data Link	Standard(s) used for the T1 FDL (ESF framing only)	AT&T, ANSI '89, ANSI '95, AT&T & ANSI '89 , AT&T & ANSI '95, or None
Line Idle Code	Code sent in unused T1 channels	7F , FF, or D5 (hexadecimal)
Detect Remote Loop	The type(s) of remote loopback commands the DSU responds to	Disable, Inband, Channel (V.54), or Inband and V.54
Send Remote Loop	The type of code the DSU sends when remote loop is commanded via data port leads or front panel	Disable, Inband, Channel (V.54)
<p>* Always use one of the CSU (line build-out) settings when connecting to a T1 network. DSX settings are for connecting to another T1 device (a multiplexer or channel bank).</p>		

Table 5-G. E1 Line Setup

Setup Item	Description	Options (Defaults in Bold)
Format	E1 or T1 line	E1
Framing	Whether or not CRC4 (Cyclic Redundancy Check) is used	CRC4 On , CRC4 Off
Signaling	Whether the E1 line uses Channel Associated Signaling (CAS), which signals on/off hook in channel 16	CAS , None
Coding	E1 signal coding	HDB3 (cannot be changed)
Impedance	E1 line interface impedance	120 ohms (cannot be changed; 75 ohms provided by adapter)
Tx Level	Defines type of equipment and distance it can transmit	G.703 (ANSI standard for E1; cannot be changed)
Send Yellow Alarm	DSU sends Yellow Signal when receiving Loss of Signal or Frame	On or Off
Line Idle Code	Code sent in unused E1 channels	7F or FF (hexadecimal)
Detect Remote Loop	The type of remote loopback commands the DSU responds to	Disable Channel (V.54)
Send Remote Loop	The type of code the DSU sends when remote loop is commanded via data port leads or front panel	Disable, Channel (V.54)
Thresholds	<i>See the section headed Line Event Thresholds.</i>	

Table 5-H. E1 Unframed Line Setup (TerraUno only)

Setup Item	Description	Options (Defaults in Bold)
Format	E1 or T1 line	E1 Unframed
Framing	Whether or not CRC4 (Cyclic Redundancy Check) is used	None
Signaling	Whether the E1 line uses Channel Associated Signaling (CAS), which signals on/off hook in channel 16	None
Coding	E1 signal coding	HDB3 (cannot be changed)
Impedance	E1 line interface impedance	120 ohms (cannot be changed; 75 ohms provided by adapter)
Tx Level	Defines type of equipment and distance it can transmit	G.703 (ANSI standard for E1; cannot be changed)
Detect Remote Loop	The type of remote loopback commands the DSU responds to	Disable Channel (V.54)
Send Remote Loop	The type of code the DSU sends when remote loop is commanded via data port leads or front panel	Disable, Channel (V.54)
Thresholds	<i>See the section headed Line Event Thresholds.</i>	

Table 5-I. Line Event Severity

Event	Description	Options
Loss of Signal	DSU is not receiving a T1 or E1 line signal	Critical, Major , Minor, Status
Loss of Frame	DSU has lost synchronization on the T1 or E1 frame	
Receive Yellow Alarm	DSU is receiving Yellow Signal from the T1 or E1 line	
Receive AIS Signal	DSU is receiving Alarm Indication Signal	
Failed Signal (UAS)	DSU is currently declaring Unavailable Signal on the incoming T1 or E1	
Bipolar Violations	Bipolar Violations exceed the user-set threshold	
Errored Seconds	Errored Seconds exceed the user-set threshold	

For details about these events, see *Appendix B*. For E1 with CAS, Multi-Frame Yellow will be shown by the Graphical Test Set, but will not generate an event.

LineLearn Power-Up Options

TerraBoss and TerraUno let you choose how LineLearn will respond to power-up of the unit. In the **Line Setup** frame, the **Power-Up LineLearn** field has three options:

- **Disable** — The LineLearn function is initiated only on user command (via front panel, Terminal and Web Interfaces); it is unaffected by a power-up of the unit. *This is the default LineLearn mode.*
- **Once** — The LineLearn function is initiated the first time the unit powers up, and continues until the line parameters have been successfully read. After that occurs, **Power-Up LineLearn** is set to **Disable** and LineLearn is unaffected by any subsequent power-up of the unit.
- **On Every Power-Up** — The LineLearn function is initiated every time the unit powers up.

Users who would like units to automatically learn T1/E1 line parameters (including bandwidth) when they are installed and powered up should set the **Power-Up LineLearn** option to **Once** or **On Every Power-Up**, as desired, before deploying the units. Use of the **Once** option is recommended unless repeated reinstallations or T1/E1 service changes are anticipated.

Line Event Thresholds

Threshold events let you monitor error rates over a period of time, rather than single error events. They can be particularly useful for identifying periods in which line performance falls below acceptable or contracted levels.

BPV Threshold

The **BPV Threshold** field lets you specify a bipolar violation (BPV) rate (measured over a 15-minute interval) which will be defined as an alarm. For BPV rates of 10^5 through 10^9 , specify **E-5** through **E-9**. (A BPV rate of 10^n means 1 BPV per 10^n bits.)

TerraBoss and TerraUno will declare a BPV alarm when the BPV rate for a 15-minute interval matches or exceeds the selected threshold rate, and will clear a BPV alarm when the BPV rate for a 15-minute interval is one level better than the selected threshold rate. (For example, a rate of 10^6 or better is required for clearing a BPV alarm if the threshold is 10^5 .)

Errored Seconds Threshold

The ES Threshold event indicates when Errored Seconds exceed a specified quantity within a specified number of minutes. In the **ES Count** field, type the number of Errored Seconds (from 1 to 399). In the **ES Interval (min)** field, type the number of minutes (from 1 to 15) over which the Errored Seconds count applies.

Table 5-J. Data Port Setup

Setup Item	Description	Options (Defaults in Bold)
Interface	Type of data interface employed	V.35 , RS449, or X.21
Data Loss Control	How the flow of data between the DSU and your router is controlled	RTS, DTR, or Force (V.35/RS449); C or Force (X.21) — Force means there is no flow control
Rate	The data bandwidth per channel allowed by your T1 or E1 service	N x 64k or N x 56k
Clock	Polarity of the data clock signal	Normal or Inverted
Data	How data will be encoded	Normal (pulse=1) or Inverted (pulse=0)
TTM (Terminal Timing Mode)	Whether special clocking will be employed to prevent data corruption over long cables	Off or On

Table 5-K. Data Port Event Severity

Event	Description	Options
Data Loss	The unit has lost the required flow control signal from the Data port, and thus cannot send data	Critical, Major , Minor, Status

Data Loss Control: Force

The **Force** setting turns off flow control, allowing the router to send data whenever it wishes. Try selecting **Force** if your network is receiving data but not sending data to the DSU.

Clock Polarity

Sometimes an inverted clock will compensate for errors resulting from long cables between the DSU and your router. You might want to try this before enabling Terminal Timing Mode.

TTM (Terminal Timing Mode)

If you are using a long data cable (generally, more than 30 feet) and are encountering a high rate of errors, try setting the **Terminal Timing Mode** option to **On**. Make sure you also turn Terminal Timing on for your router (i.e., configure it to transmit data in phase with an External Clock and receive data in phase with a Receive Clock).

***Note:** If the cable between TerraBoss or TerraUno and your router is too long, the resulting delay may cause the data received by the DSU to be out of sync with the clock that the DSU is using for that data. When Terminal Timing Mode is on, the clock and data travel the same distance in the cable, eliminating differential delay problems.*

Specifying Data Channels for Fractional T1 or E1

In some cases, you may want or need to identify active (data) and idle time slots using the **T1 BANDWIDTH** or **E1 BANDWIDTH** portion of the **Data Setup** frame. If so, you need to match the number of time slots used for data with the amount of available bandwidth on the T1 or E1 line. For example, if your service provider supports 64 kbps data rates and you purchased 256 kbps of T1 bandwidth, specify four active time slots ($64 \times 4 = 256$). (You should always select consecutive time slots for data unless your service provider has told you to do otherwise.)

To specify bandwidth via the **Data Setup** frame:

1. In the Data Setup frame, go to the section headed **T1** (or **E1**) **BANDWIDTH**.
2. Move the cursor to a time slot you want to change.
3. Select **D** (Data) or **I** (Idle) as desired. (The **Data Bandwidth** field will automatically update to show the new bandwidth total.)
4. Repeat steps 2 and 3 to configure additional time slots as desired.
5. Save your changes.

Displaying Status and Performance Reports

TerraBoss and TerraUno offer a number of ways to view information about the unit's status and performance. Various banners provide basic summaries, while setup and report frames provide complete and detailed information.

If something goes wrong in your WAN connection, these reports are just what experienced users and technicians need to solve problems quickly and effectively.

Detailed 24-hour performance reports give you an excellent way of verifying—and documenting—the level of service you're receiving from your service provider.

Banners

As mentioned in *Chapter 4*, a banner is always displayed when the Terminal or Web interface is at the DSU level. You can cause any of three banners to be displayed at the DSU level:

- The **Unit Description** banner displays information about the unit's hardware and software. You should note this information if you ever need to contact your distributor or CTDI Product Support
- The **T1 or E1 Bandwidth** banner shows the total bandwidth available on the T1 or E1 line, and identifies which specific channels are being used for data. (**D** represents a data channel, while **I** represents an idle channel. For E1, **F** and **S** indicate framing and CAS channels, respectively.)
- The **Last Three Events** banner shows the last three events added to the Event Log. The banner is automatically updated as new events are logged.

Figure 6-1 shows the formats of the three Terminal Interface banners. Formats of the Web Interface banners are analogous. For information about manager-level Terminal Interface banners and their Web Interface equivalents, see *Chapter 8*.

To display a particular banner:

- *Terminal* - Press [**Tab**] key until the desired banner is displayed
- *Web* - Click on the appropriate button in the **Header/Banner Frame: Unit Description, Bandwidth, or Last 3 Events**.

DSU-Level Report Frames

DSU-level reports are displayed in the **Setup, Report, and Test Frame** as described in *Chapter 4*, and present information about the current or historical status or performance of a TerraBoss or TerraUno. Manager-level reports are discussed in *Chapter 8*.

Unit Description	Software	089-122E-01A
TerraBoss	Boot PROM	089-125E-02A
Uptime: 6 days 19: 42	S/N	123456789012

DSU Unit Description Banner

E1 Bandwidth:	Data Bandwidth 1920 Kbps	Idle = I, Data = D
F D D D D D D D D D D D D D D D S D D D D D D D D D D D D D D D D		

Bandwidth Banner (E1 Version)

1999.04.20	08:44:27	Unit #2	Failed Signal State (UAS)	Clear
1999.04.20	08:44:19	Unit #2	Loss Of Frame	Clear
1999.04.20	08:44:19	Unit #2	Loss Of Master Clock	Clear

Last 3 Events Banner

Figure 6-1. The Three Terminal Interface Banners

Reporting the Current Setup

The **Setup** frames used to configure TerraBoss and TerraUno also serve as reports of the current setup:

- **Unit Setup** frame (DSU level)
- **Terminal Setup** frame (DSU level)
- **Line Setup** frames (DSU level)
- **Data Setup** frame (DSU level)
- **Management Setup** frame (TerraBoss manager level, Terminal Interface)

- **Communication Setup** frame (TerraBoss manager level, Terminal Interface)
- **Email Setup** frame (TerraBoss manager level, Web Interface)
- **SNMP Setup** frame (TerraBoss manager level, Web Interface)
- **Ethernet Setup** frame (TerraBoss manager level, Web Interface)

See *Chapters 5* and *8* for descriptions of the DSU-level and manager-level configuration items and options, respectively.

The Event Log Frame

The **Event Log** shows the last 100 events logged by the TerraBoss or TerraUno. Figure 6-2 shows the Terminal Interface version of the Event Log; the Web Interface version is analogous. Events are listed in chronological order, most recent first. An event listing includes the date and time of the event, the type of event, and the event's severity.

View Event By: ALL		EVENT LOG	
		Action: View	
1998.01.01	03:43:15	Errored Seconds (ES)	Major
1998.01.01	03:41:46	Failed Signal State (UAS)	Major
1998.01.01	03:41:38	Loss Of Frame	Major
1998.01.01	03:41:36	Loss Of Master Clock	Major
1998.01.01	03:41:36	Loss Of Master Clock	Clear
1998.01.01	03:41:36	Failed Signal State (UAS)	Clear
1998.01.01	03:39:30	Failed Signal State (UAS)	Major
1998.01.01	03:39:29	Loss Of Master Clock	Major
1998.01.01	03:39:29	Loss Of Signal	Major
1998.01.01	03:39:29	Loss Of Master Clock	Clear
1998.01.01	03:39:29	Failed Signal State (UAS)	Clear
1998.01.01	03:39:29	Loss Of Signal	Clear
1998.01.01	03:39:29	Errored Seconds (ES)	Clear

Home Menu Esc. Change Frame Tab. Change Value Space

Figure 6-2. Event Log Frame

To display and use the **Event Log**:

1. Call up the **Event Log**.
 - **Terminal** – Press **[Ctrl-E]**.
 - **Web** – In the **Unit Menu Frame**, open the **Reports/Log** folder and click on **Event Log**. (A separate window will be opened for the **Event Log**.)
2. Select the **View Events By:** field and specify the type of events you want to list:
 - **All:** The last 100 events of all types.
 - **Unit:** All unit-related events included in the last 100 events (i.e., events shown in the **Unit Setup** frame)
 - **Line:** All events related to the T1 or E1 line included in the last 100 events (i.e., events shown in the **Line Setup** frame)
 - **Data:** All data-port-related events included in the last 100 events (i.e., events shown in the **Data Setup** frame)
3. Page through the report using the up and down arrows (Terminal Interface) or the scroll bar (Web Interface).

*Note: The **Event Log** is not automatically updated as new events occur. To see new events, press **[Enter]** (Terminal Interface) or click on the **Update View** button (Web Interface).*

4. If you are using the Terminal Interface and want to clear all events in the **Event Log**, move the cursor to **Action:**. Press the **[Space Bar]** to display **Clear All**; then press **[Enter]**. All events listed in the **Event Log** will be removed.

To perform the same function via the Web Interface, click on the **Clear All Events** button at the top of the frame.

The History Log

The **History Log** contains a historical summary of certain significant performance events occurring since the unit last powered up or executed a self-test or since the **History** frame was last cleared. *Figure 6-3* shows the history frame in Terminal Interface format. *Table 6-A* describes the types of events included, while *Table 6-B* defines the information presented for each type of event.

To display and use the **History Log**:

1. Call up the **History Log**.
 - **Terminal** – Press [Ctrl-H].
 - **Web** – In the **Unit Menu Frame**, open the **Reports/Log** folder and click on **History Log**. (A separate window will be opened for the **History Log**.)
2. If you want to clear the Terminal Interface **History Log**, press the [Space Bar] so that the **Action:** field displays **Clear All**; then press [Enter]. The **First**, **Last**, and **Count** columns will be reset to zero, and the **Initial** and **Current** columns will be updated.

To perform the same function via the Web Interface, click on the **Clear All Events** button at the top of the frame.

HISTORY						
Event	First	Last	Action: File	Initial	Current	Count
Loss Of Signal	01/01/1998 00:00	01/01/1998 03:39		Normal	Alarm	3
Loss Of Frame	01/01/1998 00:00	01/01/1998 03:41		Normal	Alarm	3
Loss Of Master Clock	01/01/1998 03:18	01/01/1998 03:41		Normal	Alarm	5
Data Loss	00/00/0000 00:00	00/00/0000 00:00		Normal	Normal	0
Receive Yellow Alarm	00/00/0000 00:00	00/00/0000 00:00		Normal	Normal	0
Receive AIS	00/00/0000 00:00	00/00/0000 00:00		Normal	Normal	0
Fail Signal State URS	01/01/1998 00:00	01/01/1998 03:41		Normal	Alarm	5
Bipolar Violations	00/00/0000 00:00	00/00/0000 00:00		Normal	Normal	0
Errored Seconds (ES)	01/01/1998 00:01	01/01/1998 03:43		Normal	Alarm	3
Password Violation	00/00/0000 00:00	00/00/0000 00:00		Normal	Normal	0
Local Loop	00/00/0000 00:00	00/00/0000 00:00		Normal	Normal	0
Remote Loop	00/00/0000 00:00	00/00/0000 00:00		Normal	Normal	0

Home Menu Esc. Change Frame Tab. Change Value Space

Figure 6-3. History Frame

Table 6-A. Events in the History Frame

Event Type	General Description
Loss of Signal	The DSU is not receiving a signal from the T1 or E1 network.
Loss of Frame	The DSU cannot synchronize on a framing pattern in the signal from the T1 or E1 network.
Loss of Master Clock	The master clock source chosen for the DSU has failed.
Data Loss	The DSU is not receiving the required Data Port flow control signal.
Receive Yellow Alarm	The DSU is receiving Yellow Alarm signal from the T1 or E1 network.
Receive AIS Signal	The DSU is receiving Alarm Indication Signal from the T1 or E1 network.
Failed Signal State UAS	Errors on the signal from the T1 or E1 network have resulted in a Failed Signal State (also called Unavailable Signal).
BPV Threshold	Bipolar violations have exceeded the user-set threshold. (See <i>Chapter 5</i> .)
ES Threshold	Errored Seconds have exceeded the user-set threshold. (See <i>Chapter 5</i> .)
Password Violation	A logon attempt has been denied by TerraBoss/TerraUno because three consecutive invalid passwords were entered or the unit timed out while waiting for a password to be entered.
Local Loop	A loopback within the DSU has been set or cleared via the Graphical Test Set. (See <i>Chapter 7</i> .)
Remote Loop	A loopback within the DSU has been set or cleared on command from the router or T1 line. (See <i>Chapter 7</i> .)
E1 MultiFrame Sync *	The DSU has lost synchronization on the E1 multiframe.
E1 MultiFrame Yellow *	The DSU is receiving MultiFrame Yellow Signal, indicating that the far end has lost synchronization on the E1 multiframe.
* These appear in the report only when the line interface is E1.	

Table 6-B. Event History Format

Column	What It Means
Event	The type of event being monitored. (See Table 6-A.)
First	Date and time when the first event occurred.
Last	Date and time when the most recent event occurred.
Initial	Whether the initial event status, when compilation of the History report began, was Normal or In Alarm .
Current	Whether the current event status, when the History report is displayed, is Normal or In Alarm .
Count	The number of status changes that have occurred for this event since compilation of the History report began.

The Statistics Frame

The **Statistics** frame shows T1 or E1 line performance in a variety of reports. These reports can be very useful for verifying and documenting levels of service, as well as for diagnosing problems in the WAN connection.

The **Statistics** frame can show performance data in two basic formats:

- **1-hour** summary for all error types, as shown in *Figure 6-4*
- **24-hour** summary for one error type, as shown in *Figure 6-5*

There are also three classes of statistics which can be displayed:

- **User** (T1 or E1): These statistics belong to the TerraBoss or TerraUno user, and can be cleared only by the user
- **Telco** (T1 only): These statistics belong to the service provider, and can be cleared only from the network; they follow the AT&T PUB 54016 standard (*Telco statistics are available only when T1 format and ESF framing are selected*)
- **RFC** (T1 or E1): These statistics belong to the service provider, and can be cleared only from the network; they follow the RFC 1406 standard

STATISTICS REPORT										
Register Set:	User	1 Hour		Error Type: None				Action: View		
Current Interval:	312	sec		Valid Intervals:				96		
	UAS	ES	BES	SES	EEV	LOFC	LCV	FE	CRC	OOF
24 Hours	0	0	0	0	0	0	0	0	0	0
Current	0	0	0	0	0	0	0	0	0	0
Last 4 Intervals										
	UAS	ES	BES	SES	EEV	LOFC	LCV	FE	CRC	OOF
Int. 1	0	0	0	0	0	0	0	0	0	0
Int. 2	0	0	0	0	0	0	0	0	0	0
Int. 3	0	0	0	0	0	0	0	0	0	0
Int. 4	0	0	0	0	0	0	0	0	0	0
Home Menu Esc, Change Frame Tab, Change Value Space										

Figure 6-4. Statistics Frame, 1-Hour T1 Performance Data (Terminal Interface Format)

STATISTICS REPORT												
Register Set:	RFC 24 Hours		Error Type: UAS				Action: View					
Current Interval:	122	sec		Valid Intervals:				13				
	UAS	ES	BES	SES	SEFS	LES	DM	LCV	FE	CRC	FAS	
24 Hours	0	0	0	0	0	0	0	0	0	0	0	
Current	0	0	0	0	0	0	0	0	0	0	0	
Last 96 Intervals												
01	0	0	0	0	0	0	0	0	0	0	0	
13	0	-	-	-	-	-	-	-	-	-	-	
25	-	-	-	-	-	-	-	-	-	-	-	
37	-	-	-	-	-	-	-	-	-	-	-	
49	-	-	-	-	-	-	-	-	-	-	-	
61	-	-	-	-	-	-	-	-	-	-	-	
73	-	-	-	-	-	-	-	-	-	-	-	
85	-	-	-	-	-	-	-	-	-	-	-	
Home Menu Esc, Change Frame Tab, Change Value Space												

Figure 6-5. Statistics Frame, 24-Hour E1 Performance Data (Terminal Interface Format)

When you display a **Statistics** report, you specify the following by selecting options in the second line of the frame, which is the frame's command line:

- 1-hour or 24-hour format; plus User, Telco, or RFC class (**Register Set**)
- For 24-hour format only, the particular T1 or E1 performance parameter (**Error Type**)

Note: Appendix B gives specific definitions of the T1 and E1 performance parameters monitored by TerraBoss and TerraUno.

You can also clear the **User** statistics from the **Statistics** report's command line. The **Clear All** command affects only the **User** statistics, resetting counts to zero and starting the first 15-minute interval.

To display and use the **Statistics** frame:

1. Call up the **Statistics** frame.
 - *Terminal* – Press **[Ctrl-S]**.
 - *Web* – In the **Unit Menu Frame**, open the **Reports/Log** folder and click on **Statistics**. (A separate window will be opened.)
2. Select **Register Set** and specify the desired option: **User 1-Hour**, **Telco 1-Hour**, **RFC 1-Hour**, **User 24-Hour**, **Telco 24-Hour**, or **RFC 24-Hour**.
3. For 24-hour statistics, select **Error Type** and specify the desired T1/E1 performance parameter.
4. If you want to clear all User statistics via the Terminal Interface, move the cursor to **Action**. Press the **[Space Bar]** to display **Clear All**; then press **[Enter]**. All User counts will be zeroed, and the first 15-minute interval will begin.

To perform the same function via the Web Interface, click on the **Clear All** button at the top of the frame.

Using the Graphical Test Set

TerraBoss and TerraUno include a powerful Graphical Test Set as an integral element of the Terminal and Web Interfaces. The Graphical Test Set allows you to perform sophisticated monitoring and diagnostics without having to hook up an expensive external test set.

The Graphical Test Set provides a real-time illustration of how the DSU is configured, and the signals being transmitted and received by the DSU.

You can also perform diagnostic tests with the Graphical Test Set, using loopbacks and test patterns to troubleshoot connections to the WAN and your local network. Even if you know very little about the technical aspects of WAN access, the Graphical Test Set can help you respond appropriately should a problem occur.

Advantages of the Built-In Graphical Test Set

There are several ways in which the Graphical Test Set built into TerraBoss and TerraUno is superior to external test equipment:

- The Graphical Test Set is always ready and in place when you want it. You'll never have to search for it as you might for a separate piece of test equipment.
- The Graphical Test Set is included in the price of TerraBoss or TerraUno. Separate test equipment is usually quite expensive.
- The Graphical Test Set is easy to learn and use. Separate test equipment is generally intended for experienced technicians, and is complex to learn and use.
- Most test equipment requires you to break the existing connection and install it on the line to be tested. The Graphical Test Set in TerraBoss and TerraUno lets you run tests without breaking the connection. It also lets you look at both the transmit and the receive sides of the connection without having to change test connections.
- The Graphical Test Set lets you see the status of the network line and the data port at the same time.

The Graphical Test Set is an integral part of the **DSU Home Screen** for both the Terminal and the Web Interfaces. If you're not yet familiar with the basics of the Terminal and Web Interfaces, see *Chapter 4*.

The Graphical Test Set Frame

Figure 7-1 shows the **Graphical Test Set** frame as it appears on the Terminal Interface. (The Web Interface version differs in format, but contains the same elements.) Notice the WAN at the left of the diagram, the local network (user) equipment at the right, and the Terra-Boss or TerraUno DSU in between. Notice also the data paths linking them. Within the basic network diagram are various status and setup indications which give you a real-time picture of the operation of your WAN connection.

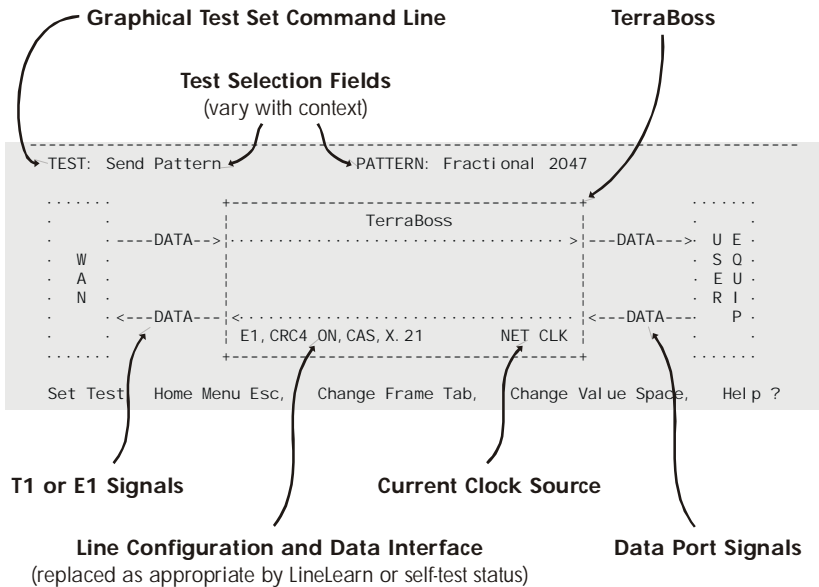


Figure 7-1. The Graphical Test Set and Its Components

Test Selection

The Graphical Test Set also includes selection fields at the top which let you run sophisticated diagnostic tests. The test selection fields let you set local and remote loopbacks and transmit test patterns. The **TEST** field controls the basic function: setting or clearing one of the local loopbacks, sending a command to set or clear a remote loopback, or transmitting a test pattern.

If you select a remote loopback function, a **LOOP CODE** field lets you select **Inband** or **V.54** code. If you select the **Send Pattern** function, a **PATTERN** field lets you select the particular test pattern to send.

On the Terminal Interface, the **LOOP CODE** and **PATTERN** fields only appear when the relevant **TEST** function is selected; on the Web Interface all three fields appear at all times, as shown in *Figure 7-2*.

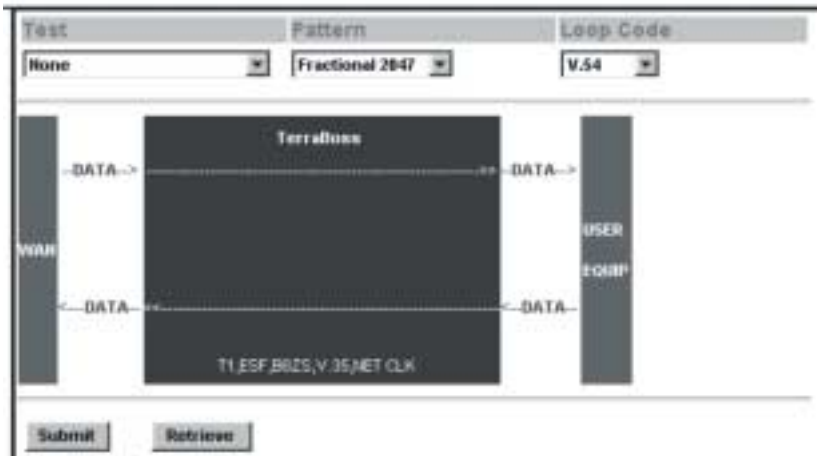


Figure 7-2. The Graphical Test Set on the Web Interface

Loopbacks

A “loopback” is a standard technique for testing communication circuits. It involves interrupting a data path at a certain point and returning (“looping”) the received data back to the sender. The Graphical Test Set in *Figure 7-3* shows data from the WAN being looped back to the WAN.

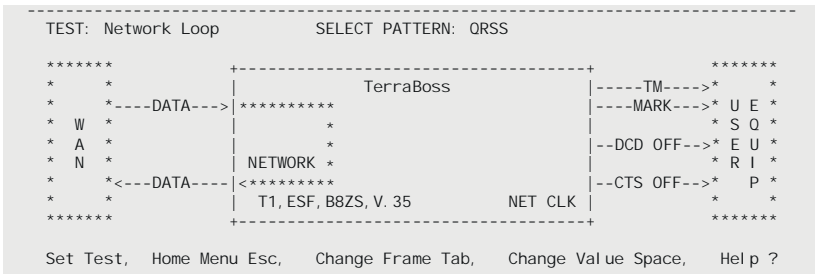


Figure 7-3. Graphical Test Set Showing Network Loop

There are three classes of loopbacks involving TerraBoss/TerraUno:

- Loopbacks within the TerraBoss/TerraUno which are controlled *locally* via the management interfaces
- Loopbacks within the TerraBoss/TerraUno which are controlled by codes received *remotely* (i.e., from the line or the data port)
- Loopbacks in *remote* devices which are controlled by codes transmitted by the TerraBoss/TerraUno on command from the management interfaces

Operation of the local and remote loopback options is described in the following two sections.

Setting and Clearing Local Loopbacks

You can set and clear three types of local loopbacks within the DSU:

- **Network Loop** — The DSU transmits the received signal back to the network. Network Loopback is useful for testing end-to-end communications, excluding the DSU.
- **Payload Loop** — The DSU reframes the payload (the actual data) and transmits it back to the network using the network's clock. Payload Loopback is useful for testing end-to-end communications, including the DSU.

Note: During Network or Payload Loop, the DSU sends All 1s to your local network and indicates it is unready to receive data.

- **Data Loop** — At the data port interface, the DSU loops the signal from your router (or other data device) back to the router. Data Loopback is useful for confirming the data connection to your router.

Note: During Data Loop, the DSU transmits All 1s to the WAN.

To set or clear a loopback:

1. Display the **DSU Home Screen**.
2. Select the **TEST** field and specify the loopback you want to set, or **None** if you want to clear an existing loopback.
3. Activate your choice.
 - *Terminal* — Press **[S]** or **[Enter]**
 - *Web* — Click on the **Submit** button at the bottom of the frame

The diagram will change to show the new data path.

Setting and Clearing Remote Loopbacks

Using standard loopback control codes, TerraBoss and TerraUno can initiate and clear loopbacks at the remote DSU (or other compatible device on the T1/E1 path). TerraBoss and TerraUno support two kinds of remote loopbacks:

- **Inband** — The remote device performs a Network Loopback, looping the received T1 signal back to the network. *Inband remote loopbacks are not available for E1 lines.*
- **Channel (V.54)** — The remote device loops the received data channel back to the network. *Only time slots carrying data are looped; idle and signaling channels are unaffected.*

To set or clear a remote loopback:

1. Display the **DSU Home Screen**.
2. Select the **TEST** field and select **Send Remote Loop Up** (to initiate loopback) or **Send Remote Loop Down** (to clear loopback).

Note: Only one of the options will be presented, depending on the previous remote loop code sent.

3. Select the **LOOP CODE** field, and specify the type of code to send (**Inband** or **V.54**).
4. Activate your choice.
 - *Terminal* — Press **[S]** or **[Enter]**
 - *Web* — Click on the **Submit** button at the bottom of the frame

The diagram will show the temporary transmission of the loop up or loop down code.

Test Patterns

Sometimes you can tell just by setting a loopback that a portion of the circuit is not operating properly. At other times, the problem won't be revealed until a test pattern is transmitted and monitored. Bit error monitoring of test patterns is especially useful when problems are intermittent or subtle.

TerraBoss and TerraUno let you select from various test patterns designed to simulate live data:

- **QRSS** (Quasi-Random Signal Source, an industry standard)
- A pseudo-random sequence of $2^{23}-1$ bits
- A pseudo-random sequence of $2^{20}-1$ bits
- A pseudo-random sequence of $2^{15}-1$ bits
- A pseudo-random sequence of **2047** ($2^{11}-1$) bits transmitted in all time slots
- A pseudo-random sequence of 2047 ($2^{11}-1$) bits transmitted in data time slots only (**fractional 2047**)

Except for the fractional 2047 pattern, the test pattern you select is transmitted toward the network in the entire bandwidth, including idle channels.

***Note:** During test pattern transmission, the DSU sends All 1s to your local network.*

Generating and Monitoring Test Patterns

To generate a test pattern, inject single bit errors (via the Terminal Interface only), and then turn off a test pattern:

1. Display the **DSU Home Screen**.
2. Select the **TEST** field and specify **Send Pattern**.
3. Select the **Select Pattern** field and choose a test pattern. (*For E1 with CAS, only the 2047-bit patterns are supported.*)
4. Activate your choice.
 - *Terminal* – Press **[S]** or **[Enter]**
 - *Web* – Click on the **Submit** button at the bottom of the frame

The display will show the pattern being sent, whether the DSU synchronized on the pattern or not, and the number of errors detected. A properly functioning looped circuit should show pattern synchronization and no errors.

Note: Initiating test pattern transmission will clear any local loop-back in the TerraBoss/TerraUno.

5. To inject a single bit error via the Terminal Interface, press **[E]**. *The Error Counter should immediately increase by one if the test pattern is being looped back to the DSU.*

To clear the **Error Counter**, press **[Enter]**.

Note: Error injection is not available via the Web Interface.

6. To turn off the test pattern, select **TEST** and choose **None**; then activate your selection.
 - *Terminal* – Press **[S]** or **[Enter]**
 - *Web* – Click on the **Submit** button at the bottom of the frame

TerraBoss Manager and Stack Functions

This chapter describes the manager-level portions of the TerraBoss Terminal and Web Interfaces. It includes information about configuring the manager interfaces and modes, and about monitoring stack status and performance.

A stack is defined as a group of up to ten interconnected units: one TerraBoss and up to nine TerraUnos. The TerraBoss provides management access and control for all units in the stack. Units in a stack can be interconnected (via their BUS connectors) in a chassis or by a ribbon cable.

TerraBoss's "Manager" Functionality

The manager level is what distinguishes TerraBoss from TerraUno. Both include the same DSU functions, and TerraUno's Terminal Interface is identical to the DSU level of TerraBoss's Terminal Interface. TerraBoss's manager functionality includes:

- An Ethernet port supporting Telnet, Web, SNMP, and Email interfaces
- An inband (DS0) IP management channel
- The ability to manage a stack including up to nine TerraUnos
- Gathering and reporting performance data (events) from all DSUs in a stack

How a Stack Works

All units in a stack share a communication bus which runs on a physical connection between the **BUS** connectors of all units. Units in a chassis also share a common power source, but this is not a necessary feature of a stack.

***Note:** Early versions of TerraUno running software 089-120E-01x require a software upgrade before they can be managed by TerraBoss. The first TerraUno software which is compatible with TerraBoss management is 089-122E-01A.*

The stack manager, which must be a TerraBoss, continuously polls all of the DSUs in the stack. From the data it gathers by polling, the manager organizes and maintains status and performance information. The manager also ensures that DSU clocks are all synchronized to its clock.

***CAUTION:** Do not include more than one TerraBoss in a stack. Any TerraBoss connected to the stack bus will attempt to manage the stack, resulting in conflicts if there are multiple TerraBoss units.*

The Manager Level of the User Interfaces

As described in *Chapter 4*, the TerraBoss Terminal and Web Interfaces are each divided into a manager level and a DSU level. The manager level includes configuration, status, and reports relating to a stack of TerraBoss/TerraUno units, as well as to the unique management capabilities of TerraBoss. The DSU level includes configuration, status, and reports relating to a single TerraBoss or TerraUno in the stack.

Table 8-A summarizes the methods for moving between the manager and DSU levels.

Table 8-A. Moving between Manager and DSU Levels

	Terminal Interface	Web Interface
Down to DSU Level	On the Manager Home Screen , move the cursor to SELECT , press [Space bar] until the desired unit number is shown, and then press [Enter]	Click on a unit in the Manager Home Page 's stack table; <i>Or click on an already-open DSU-level window</i>
Up to Manager Level	From the DSU Home Screen , press [Esc]	Click on Larscom Management Page at the end of the Stack Menu Frame ; <i>Or click on an already-open manager-level window</i>

The Manager Home Screens

Figures 8-1 and *8-2* show the Terminal and Web Interface **Manager Home Screens**, respectively. In addition to the manager-level menus, each includes a view of the stack (graphical on the Terminal Interface, tabular on the Web Interface).

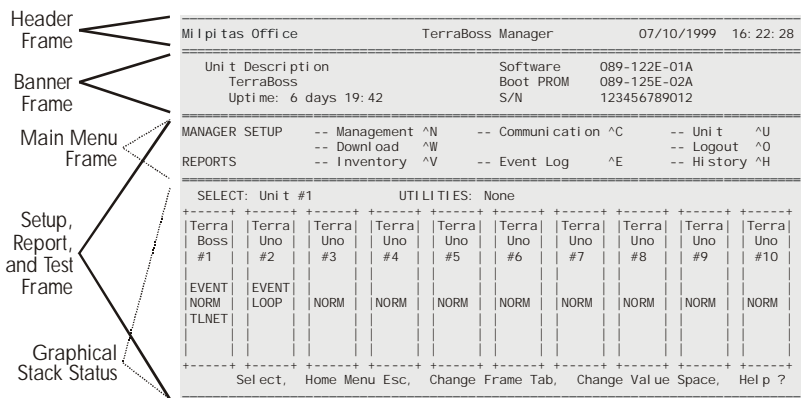


Figure 8-1. Terminal Interface, Manager Home Screen

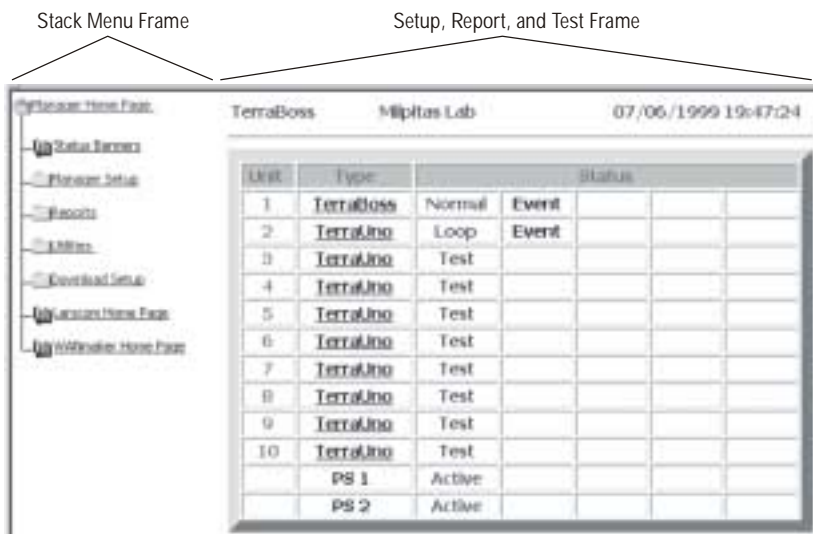


Figure 8-2. Web Interface, Manager Home Screen

The stack view on the **Manager Home Screen** identifies each unit in the stack by number, and gives basic status information about it. This status is updated in real time on the Terminal Interface, and once per minute on the Web Interface.

Possible status indications are defined in *Table 8-B*. The status labels are from the Terminal Interface; Web Interface versions are essentially the same but generally are not abbreviated.

Table 8-B. Unit Status on the Manager Home Screen

Status	Meaning
NORM	DSU data flow is normal
ALERT	DSU data flow is <i>not</i> normal
LOOP	Unit currently has an active loopback
TEST	Unit is currently transmitting a test pattern
EVENT	There is at least one event for this unit in the stack's Event Log
TLNET *	The unit has an active Telnet session
TRMNL	The unit has an active local terminal connection
MODEM	The unit has an active modem connection
NORSP	The unit had been responding to the manager, but is no longer responding
DWNLD	Unit is designated to be downloaded, or is being downloaded
BOOT	Unit's flash code is corrupted
REVSW	The unit is running an old revision of software
*Applies to TerraBoss only; all others apply to TerraBoss or TerraUno.	

Event Reporting

TerraBoss gathers and logs information of various types, including:

- DSU events for itself and any TerraUnos it is managing
- Changes in status of TerraUnos in the stack
- Status of chassis power supplies

Reporting these events is primarily a stack function, though severity for DSU events is defined at the DSU level, as described in *Chapter 5*.

Reporting Methods

TerraBoss lets you use any of three methods to report events to remote operators and technicians, as discussed in the following sections.

Dialout

When dialout is enabled, TerraBoss dials out to report designated events as specified in the **Terminal Setup**. Once a connection is established, TerraBoss sends a one-line header, followed by a list of the individual events (in the format of the Terminal Interface Header Frame and the **Last 3 Events** banner, respectively; see *Chapter 6* for details).

Note: TerraBoss reports up to 50 events per dialout, earliest at the top. If there are more than 50 events, TerraBoss ends the report with an overflow message, then redials to report the balance.

Email

When event reporting via Email is enabled, an event of the designated severity level (or higher) causes an Email message to be sent to the address(es) specified in the **Email Setup**.

The Email event report has the same multi-event format described above for dialout.

SNMP Traps

When SNMP traps are enabled, TerraBoss generates a trap for each designated event in accordance with the Simple Network Management Protocol (SNMP).

Specifying How Events Are Reported

For each reporting method – dialout, Email, SNMP traps – you specify the minimum severity for an event to be reported by that method.

DSUs in a stack may have different reporting methods and criteria. The managing TerraBoss in a stack can be configured to abide by or override the reporting methods and criteria of the individual DSUs.

You specify severity levels for event reporting in the **Setup** frames identified in *Table 8-C*. For each of the fields, specify **Disabled** if you don't want to use that particular reporting method, or specify the severity of events that will be reported: **All**, **Minor and above**, **Major and above**, or **Critical only**.

Table 8-C. Configuration for Event Reporting Modes

	Terminal Interface	Web Interface
Email	Management Setup frame (manager level)	Manager Setup / Email frame (manager level)
Dialout	Management Setup frame (manager level) or Terminal Setup frame (DSU level)	Manager Setup / Email frame (manager level) or Terminal Setup frame (DSU level)
SNMP	Management Setup frame (manager level)	Manager Setup / SNMP frame (manager level)

Setting Event Reporting for the Stack

The **Unit Setup** frame includes a section headed **System Event Reporting Filters**. This is where you tell TerraBoss whether it is to use the reporting criteria defined for the DSU(s), or to override them with reporting criteria that apply to all DSUs in the stack.

To set the filters:

1. Call up the **Unit Setup** frame:
 - *Terminal* – At the manager level, press [**^U**].
 - *Web* – In the **Manager Menu Frame**, open the **Manager Setup** folder and select **Unit**.
2. For each of the three reporting methods, select **DSU Defined** if you want to use the DSU reporting criteria; or select one of the other options (**All**, **Minor and above**, **Major and above**, or **Critical only**) if you want to specify an overriding reporting criteria to be applied to all DSUs in the stack.

Configuring Stack and Manager Functions

At the manager level, you configure the stack itself as well as the various management interfaces and modes. The Terminal and Web Interfaces present the same configuration options, but organize the options somewhat differently, as shown in *Table 8-D*.

Note: *Where the same items can be configured at both the manager and DSU levels, they are not separate configurations, but two ways to access the same configuration. The most recent input will prevail, independent of whether the input came via the manager or DSU level.*

Table 8-D. Manager-Level Setup Frames

Terminal Interface	Web Interface Menu Path	What You Configure
Unit Setup [^U]	Manager Setup → Unit	Unit name and number; front panel operation; master clock source
	Manager Setup → Time	Date and time; date/time format
Management Setup [^N]	Manager Setup → Email	Email parameters, including IP addresses and enable/disable
	Manager Setup → SNMP	SNMP parameters, including IP addresses and enable/disable
Communication Setup [^C]	Manager Setup → Ethernet	10Base-T port parameters including addresses and timeout DSO management channel parameters (Terminal Interface only)
	Manager Setup → Ethernet	Baud rate; modem operation
	Manager Setup → Password	Password protection (Configure/view and view-only levels)

Unit Setup

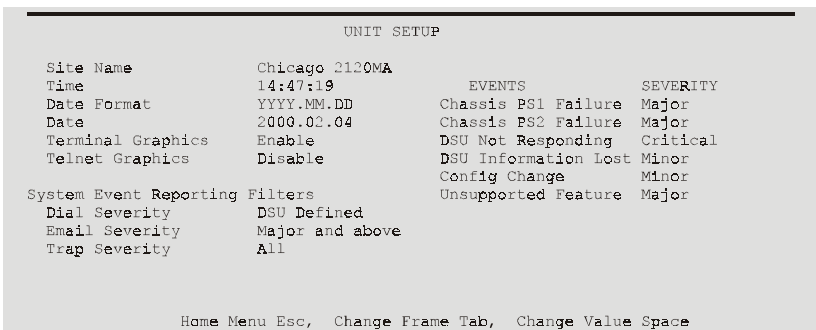
Manager-level unit setup involves naming the stack, configuring the manager-level events (such as power supply failures), and specifying whether event reporting will follow DSU configurations or will be determined by the manager for the stack as a whole.

Table 8-E identifies the stack configuration options in the manager-level **Unit Setup** frame (and the Web Interface **Time Setup** frame). Figure 8-3 illustrates the Terminal Interface **Unit Setup** frame.

Time Setup

Setting the time and date is done in the manager-level **Unit Setup** frame on the Terminal Interface; on the Web Interface, it is handled in a separate **Time Setup** frame. In addition, the Terminal Interface lets you set the time and date in the DSU-level **Unit Setup** frame.

In a stack, the TerraBoss keeps TerraUno clocks synchronized to its own, so changing the time and/or date of a TerraUno in a stack will have no effect.



UNIT SETUP			
Site Name	Chicago 2120MA		
Time	14:47:19	EVENTS	SEVERITY
Date Format	YYYY.MM.DD	Chassis PS1 Failure	Major
Date	2000.02.04	Chassis PS2 Failure	Major
Terminal Graphics	Enable	DSU Not Responding	Critical
Telnet Graphics	Disable	DSU Information Lost	Minor
		Config Change	Minor
System Event Reporting Filters		Unsupported Feature	Major
Dial Severity	DSU Defined		
Email Severity	Major and above		
Trap Severity	All		

Home Menu Esc, Change Frame Tab, Change Value Space

Figure 8-3. Management Unit Setup Frame

Table 8-E. Manager-Level Unit Setup

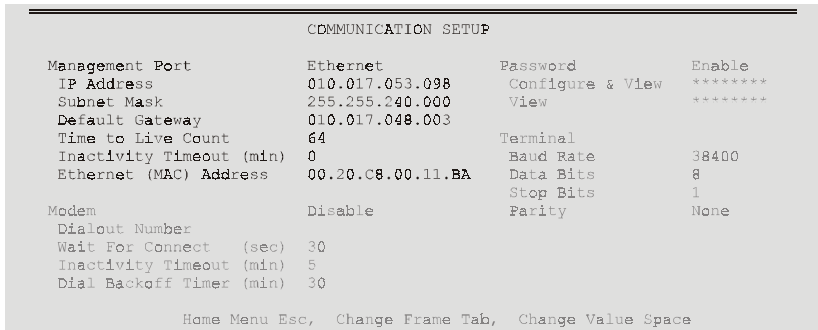
Setup Item	Description	Options (Defaults in Bold)
Site Name	Lets you assign a name to the stack	Text string (up to 64 characters)
Chassis PS1 Failure	Lets you set severity of event reported when chassis power supply 1 is not within specified operating parameters	Critical, Major , Minor, Status
Chassis PS2 Failure	Lets you set severity of event reported when chassis power supply 2 is not within specified operating parameters	
DSU Not Responding	Lets you set severity of event reported when a DSU which had previously been responding to polls from the managing TerraBoss is no longer responding	
DSU Information Lost	Lets you set severity of event reported when events reported by a DSU in the stack have overrun the managing TerraBoss's buffer	
Configuration Changed	Lets you set severity of event reported when the configuration of a DSU in the stack has been changed	
Dial Severity	Lets you specify a stack-wide severity required for reporting events via modem dialout, or defer to DSU settings	DSU Defined , All, Minor or Greater, Major or Greater, Critical Only
Email Severity	Lets you specify a stack-wide severity required for reporting events via Email, or defer to DSU settings	
Traps Severity	Lets you specify a stack-wide severity required for reporting events via SNMP traps, or defer to DSU settings	

Ethernet Setup

Setup of the 10Base-T Ethernet port is performed via the Terminal Interface's manager-level **Communication Setup** frame or the Web Interface's manager-level **Ethernet Setup** frame, and includes the parameters and options detailed in *Table 8-F*. *Figure 8-4* illustrates the Terminal Interface **Communication Setup** frame.

To configure the Ethernet port, you must select **Ethernet** in the **Management Port** field.

*Note: Changes to the Ethernet setup do not take effect until TerraBoss is rebooted. The Terminal Interface will prompt you to reboot when you save an altered Ethernet setup. On the Web Interface, click on the **Reset the TerraBoss** button to reboot. Via SNMP, execute a self-test to reboot the TerraBoss.*



The screenshot displays the 'COMMUNICATION SETUP' frame with the following configuration:

COMMUNICATION SETUP			
Management Port	Ethernet	Password	Enable
IP Address	010.017.053.098	Configure & View	*****
Subnet Mask	255.255.240.000	View	*****
Default Gateway	010.017.048.003		
Time to Live Count	64	Terminal	
Inactivity Timeout (min)	0	Baud Rate	38400
Ethernet (MAC) Address	00.20.08.00.11.BA	Data Bits	8
		Stop Bits	1
Modem	Disable	Parity	None
Dialout Number			
Wait For Connect (sec)	30		
Inactivity Timeout (min)	5		
Dial Backoff Timer (min)	30		

Home Menu Esc, Change Frame Tab, Change Value Space

Figure 8-4. Communication Setup Frame: Ethernet Port

Table 8-F. Ethernet Setup

Setup Item	Description	Options (Defaults in Bold)
IP Address	TerraBoss's 32-bit Internet address You will need to set this field via the Terminal Interface before you can use the 10Base-T port	xxx.xxx.xxx.xxx format 192.0.0.100
Subnet Mask	An IP address mask which allows TerraBoss to identify other addresses on the same subnet-work	xxx.xxx.xxx.xxx format 0.0.0.0
Default Gateway	IP address of the designated gateway for TerraBoss's network	xxx.xxx.xxx.xxx format 0.0.0.0
Time to Live Count	Number of routers a packet may encounter before it is automatically discarded; used in best-effort delivery systems	0 to 64 ; 0 disables discarding (unlimited routers)
Inactivity Timeout	The number of minutes without receiving a character after which a Telnet session will be disconnected	0 to 20 minutes (default is 5) <i>0 disables timeout</i>
Ethernet (MAC) Address	Read-only address defined during manufacture	xx.xx.xx.xx.xx.xx format

Inband Management Channel

To enhance management flexibility, TerraBoss now supports an inband management channel in any DS0 (time slot) you specify. The management channel uses IP (Internet Protocol) for accessing the Terminal, Web, and SNMP Interfaces.

The DS0 management channel is configured via the Terminal Interface's **Communication Setup Frame** illustrated in *Figure 8-5*. (It cannot be configured via the Web Interface or SNMP.)

The **Management Port** field lets you select either the rear-panel Ethernet port or a DS0 channel for IP access; when you choose **DS0**, the subsequent fields appear as shown in *Figure 8-5*. Select the DS0/

time slot to be used as the management channel. Then specify the other parameters (**IP Address** through **Inactivity Timeout**) as indicated in *Table 8-F*.

Identifying of the Management Channel in Bandwidth Maps

Bandwidth maps for the T1 or E1 are included in the **T1** and **E1 Bandwidth** banners, and in the **Data Setup** frame. The character **M** indicates a DS0/time slot designated as a management channel. Unlike the data (**D**) and idle (**I**) channels, however, the management (**M**) channel cannot be modified from the **Data Setup** frame.

***Note:** If bandwidth is copied from a TerraBoss with a DS0 management channel enabled, the management (**M**) time slot will be converted to an idle (**I**) time slot in the destination unit.*

```

COMMUNICATION SETUP
Management Port      DS0      Password      Disable
DS0 Management Channel 24      Configure & View *****
IP Address           010.017.054.110 View          *****
Subnet Mask          255.255.240.000
Default Gateway      010.017.048.003 Terminal
Time to Live Count   64      Baud Rate     38400
Inactivity Timeout (min) 5      Data Bits     8
Modem                Disable  Stop Bits     1
Dialout Number       Terminal Parity         None
Wait For Connect (sec) 30
Inactivity Timeout (min) 5
Dial Backoff Timer (min) 30
Home Menu Esc, Change Frame Tab, Change Value Space

```

Figure 8-5. Communication Setup Frame: DS0 Channel

Protection of the DS0 Management Channel

When a DS0 management channel is enabled, TerraBoss disallows any activities which will disrupt the channel. Specifically, the following are disallowed when a DS0 management channel is defined:

- Network and Payload Loops
- Send Remote Loop Up and Down
- All test patterns except Fractional 2047
- SNMP Set requests for any of the above

Terminal Setup

As part of the **Communication Setup** frame, the Terminal Interface lets you configure the same terminal connection (**TERM** port) options that you can configure via the DSU-level **Terminal Setup** frame, as illustrated in *Figure 8-6*. On the Web Interface, you can configure the terminal connection via the **Terminal Setup** frame at the manager or DSU level.

Terminal setup is described in *Chapter 5*.

COMMUNICATION SETUP			
Management Port	Ethernet	Password	Enable
IP Address	010.017.053.098	Configure & View	*****
Subnet Mask	255.255.240.000	View	*****
Default Gateway	010.017.048.003		
Time to Live Count	64	Terminal	
Inactivity Timeout (min)	0	Baud Rate	38400
Ethernet (MAC) Address	00.20.C8.00.11.BA	Data Bits	8
		Stop Bits	1
Modem	Disable	Parity	None
Dialout Number			
Wait For Connect (sec)	30		
Inactivity Timeout (min)	5		
Dial Backoff Timer (min)	30		

Home Menu Esc, Change Frame Tab, Change Value Space

Figure 8-6. Communication Setup Frame: Terminal and Modem

Email Setup

One of the advanced features of TerraBoss is its ability to send Email messages announcing alarm events. Email setup is done via the Terminal Interface's manager-level **Management Setup** frame (illustrated in *Figure 8-7*) or the Web Interface's manager-level **Email Setup** frame, and includes the parameters and options detailed in *Table 8-G*.

```

MANAGEMENT SETUP

SNMP                               Enable
Get Community Name                  public
Set Community Name                  public
Traps                                Enable
  IP Address Where Traps Are Sent    010.017.052.087
Sets                                 Enable
  IP Address Allowed To Issue Sets  000.000.000.000
Authentication Trap                 Enable
Email Event Reporting               Disable
SMTP Server IP Address              010.017.049.018
Domain Name larscom.com
Reply To operations-rtp@larscom.com
Send To operations-alert@larscom.com
Send To

Home Menu Esc, Change Frame Tab, Change Value Space

```

Figure 8-7. Management Setup Frame: Email

Table 8-G. Email Setup

Setup Item	Description	Options (Defaults in Bold)
Email Event Reporting	Whether or not Email messages will be sent to report events	Enable or Disable
SMTP Server IP Address	The IP address of the SMTP server responsible for managing Email on the TerraBoss's network	xxx.xxx.xxx.xxx
Domain Name	The Email domain name.	Text string (up to 64 characters)
Reply To	Email address to which replies to Email event messages will be sent	Text string (up to 64 characters)
Send To	Email addresses to which event announcements will be sent	Two text strings (up to 64 characters each)

SNMP Setup

SNMP setup is performed via the Terminal Interface's manager-level **Management Setup** frame (illustrated in *Figure 8-8*) or the Web Interface's manager-level SNMP Setup frame. SNMP setup includes the parameters and options detailed in *Table 8-H*.

Contact CTDI Product Support to get details about the MIBs supported by TerraBoss.

```

MANAGEMENT SETUP

SNMP                               Enable
Get Community Name                 public
Set Community Name                 public
Traps                               Enable
  IP Address Where Traps Are Sent   010.017.052.087
Sets                                Enable
  IP Address Allowed To Issue Sets  000.000.000.000
Authentication Trap                 Enable
Email Event Reporting               Disable
SMTP Server IP Address              010.017.049.018
Domain Name                         larscom.com
Reply To                            operations-rtp@larscom.com
Send To                             operations-alert@larscom.com
Send To

Home Menu Esc, Change Frame Tab, Change Value Space

```

Figure 8-8. Management Setup Frame: SNMP

Table 8-H. SNMP Setup

Setup Item	Description	Options (Defaults in Bold)
SNMP	Whether SNMP will be enabled	Enable or Disable
Get Community Name	The community from which TerraBoss will accept <i>get</i> commands	text string (public)
Set Community Name	The community from which TerraBoss will accept <i>set</i> commands	text string (public)
Traps	Whether traps (event notifications) will be generated by TerraBoss	Enable or Disable
IP Address Where Traps Are Sent	The IP address to which TerraBoss will direct traps	xxx.xxx.xxx.xxx
Sets	Whether TerraBoss will accept <i>set</i> commands	Enable or Disable
IP Address Allowed To Issue Sets	The IP address from which TerraBoss will accept <i>set</i> commands	xxx.xxx.xxx.xxx If 0.0.0.0 , then <i>set</i> commands will be accepted from any address
Authentication Trap	TerraBoss will generate a standard Authentication Trap if Sets=Enable and TerraBoss receives a <i>set</i> command with a community name other than the one specified in the Set Community Name field	Enable or Disable

Manager-Level Banners/Status Displays

The Terminal Interface includes a banner area at the top, as shown in *Figure 8-1*. Pressing the **[Tab]** key cycles through three banners:

- *Unit Description*—Software and firmware revision levels, plus the elapsed time since the unit was last restarted
- *Management Status*—Information about current and historical activity of management interfaces
- *Last 3 Events*—The three most recent events in the stack event log

Formats of these banners are illustrated in *Figure 8-9*.

The information presented in the Terminal Interface's **Management Status** and **Last 3 Events** banners can also be displayed on the Web Interface. Simply open the **Status Banners** folder in the **Stack Menu Frame**; both banners will be displayed.

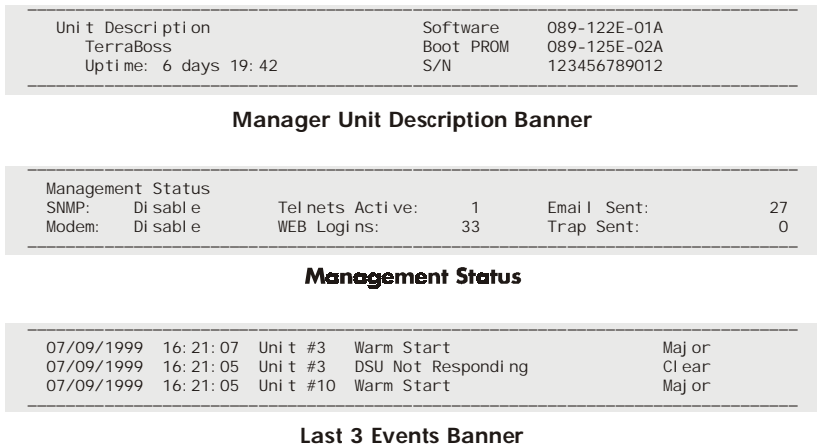


Figure 8-9. Manager-Level Banners, Terminal Interface

Manager/Stack Reports

There are three manager-level reports:

- *Inventory*— A list of all DSUs in the stack, identifying their unit numbers, types (TerraBoss or TerraUno), names, and software levels; a writable field allows you to indicate the location of each unit in the stack
- *Event Log*— A list of the 250 most recent events logged for the stack
- *History*— A statistical summary of logged events for the stack

The **Event Log** and **History** reports have exactly the same formats as the corresponding DSU-level reports described in *Chapter 6*, except that the event log also includes the unit number for each event.

To display a manager-level report via the Terminal Interface, enter one of the control-characters indicated in the manager-level Main Menu.

To display a manager-level report via the Web Interface, open the **Reports** folder in the **Stack Menu** frame and select the desired report.

Manager Utilities

The Terminal and Web Interfaces include several “utilities” which can help you configure and manage a stack. These utilities are described in *Table 8-1*. To access a particular utility:

- *Terminal*— Move cursor to the **UTILITIES** field on the **Manager Home Page**. Press [**Space bar**] until the desired utility is displayed.
- *Web*— In the **Stack Menu Frame**, open the **Utilities** folder and click on the desired utility.

Table 8-1. Manager Utilities

Function	Terminal Interface	Web Interface
<p>Update Inventory</p> <p>Gets current status for the Terminal Interface Manager Home Screen and Inventory frame</p>	<p>Use [Space bar] to select Update Inventory in UTILITIES field.</p> <p>Press [S] or [Enter].</p>	<p>(Use browser Reload/Refresh option.)</p>
<p>Copy Configuration</p> <p>Copies complete DSU configuration (Line, Data, Unit, and Terminal Setup frames) except unit name and number, password settings.</p> <p><i>Does not copy any manager configuration.</i></p>	<p>Use [Space bar] to select Copy From . . . in UTILITIES field.</p> <p>Arrow keys to select From Unit field; use [Space bar] to specify desired unit number. Repeat for To Unit field.</p> <p>Press [S] or [Enter].</p> <p>Respond to prompt with [Y].</p>	<p>Click on Copy DSU Configuration menu item.</p> <p>Select Copy From and To units from drop-down menus; then click on Submit button.</p>
<p>Ping</p> <p>Pings a specified address multiple times; then displays results (Reply/ No Reply).</p>	<p>Use [Space bar] to select Ping in UTILITIES field.</p> <p>Verify or edit IP address to ping.</p> <p>Press [S] or [Enter]. Wait for result.</p>	<p>Click on Ping menu item.</p> <p>Type in address to ping (xxx.xxx.xxx.xxx format); then click on Submit button.</p> <p>Wait for result. Click on Return to Ping when done.</p>
<p>Trap Test</p> <p>Sends an SNMP trap as specified in the SNMP configuration.</p>	<p>Use [Space bar] to select Trap Test in UTILITIES field.</p> <p>Press [S] or [Enter]. Wait for result.</p>	<p>Click on Trap Test menu item.</p> <p>Verify SNMP setup; then click on Send Test Trap.</p> <p>Wait for result.</p>
<p>Email Test</p> <p>Sends a test Email as specified in the Email configuration.</p>	<p>Use [Space bar] to select Email Test in UTILITIES field.</p> <p>Press [S] or [Enter]. Wait for result.</p>	<p>Click on Email Test menu item.</p> <p>Verify Email setup; then click on Send Test Email.</p> <p>Wait for result.</p>
<p>Clear Status/History Counters</p> <p>Clears the management status and event history counts.</p>	<p>Use [Space bar] to display Clear History and Banner Counters in UTILITIES field.</p> <p>Press [S] or [Enter]. Counters are immediately cleared.</p>	<p>Click on Clear Status/History Counters menu item. Counters are immediately cleared.</p>

Specifications

Network Interface

Type — Full or Fractional T1 or E1

Line Rate — T1: 1.544 Mbps \pm 50 ppm;
E1: 2.048 Mbps \pm 50 ppm)

Framing — T1: D4 or ESF per AT&T 62411;
E1: per G.703 and G.704, with or without CRC-4

Line Coding — T1: AMI, AMI Enforce, or B8ZS; E1: HDB3

Connector — RJ48 (BNC with 75-ohm cable adapter)

Impedance — T1: 100 ohms balanced; E1: 120 ohms
balanced / 75 ohms unbalanced (with adapter)

Clocking — Network, Internal, or Data Port

Data Interface

Data Rates — Nx56 or Nx64 kbps
(N=1 to 24 for T1, 1 to 31 for E1)

Interface Types — V.35, X.21, RS422/449

Hardware Interface — EIA 530, DB25 connector

Management Access

Front Panel — 2 buttons and 7 LEDs; functions accessible via the front panel include LineLearn™, data port interface selection, unit number selection, T1/E1 clock selection, loopback control, and self-test

Terminal Port — RS232; 2,400 to 38,400 baud (19,200 default); DB9 connector; direct or modem connection to Terminal Interface; event dialout

Ethernet Port (TerraBoss only) – 10Base-T port, supports Telnet to Terminal Interface, Internet to Web Interface, IP to SNMP, event reporting via Email

Terminal Interface - VT100-form; browser-like features including links, frames, and Graphical Test Set; password-protectable for access security

Web Interface (TerraBoss only) -Compatible with standard browsers such as *Netscape Navigator* and *Microsoft Internet Explorer*; same functionality as Terminal Interface; password-protectable

Performance Monitoring- T1: per AT&T Pub 54016, ANSI T1.403, RFC 1406;
E1: RFC 1406

Event Reporting - User-specified events and thresholds; dialout, Email (TerraBoss only), and/or SNMP traps (TerraBoss only)

Loopbacks - Line, Payload, Data, and Channel (V.54); controllable via front panel, via Terminal and Web Interfaces, and via data port leads

Test Patterns - Framed QRSS, 2047 bits (full or fractional), 2^{15} -1, 2^{20} -1, 2^{23} -1 (only 2047-bit patterns are supported for E1 with CAS); bit error detection and single bit error injection

Mechanical/Environmental

Power - 9 V dc, 1 amp; AC converter provided to country specifications:

120 V ac \pm 16%, 60 Hz; or
100 V ac to 240 V ac, 50/60 Hz

Dimensions - (H x W x D, without mounting base)
20.3 x 4.5 x 19.1 cm;
8 x 1.75 x 7.5 inches

Environment - 0 to 50°C (32 to 122° F) ambient;
up to 95% relative humidity, non-condensing

T1 and E1 Performance Parameters

As mentioned in Chapter 7, some of the performance data reported via the Terminal Interface is quite technical. Precise definitions of parameters vary depending on the line and framing formats.

For those highly technical users who want to know all of the details, this Appendix gives general (and occasionally slightly simplified) definitions of the performance parameters monitored by TerraBoss in its various configurations.

Further information can be obtained from the relevant specifications, RFC 1406 and AT&T PUB 54016.

Table B-1. T1 Performance Parameters

Parameter	T1, ESF per RFC 1406	T1, ESF per AT&T 54016	T1, D4 per RFC 1406
Alarm Indication Signal (AIS)	Unframed All 1s		
Loss of Signal (LOS)	No pulses (all 0s) for 175 ±75 bits		
Line Code Violation (LCV)	BPV or EXZ		
Path Code Violation (PCV)	CRC error	N/A	Framing Error (FE)
Excessive Zeros (EXZ)	N/A	8 consecutive 0s	16 consecutive 0s
Framing Error (FE)	Incorrect framing bit		
Errored Second (ES)	PCV, OOF, or AIS	OOF or CRC	PCV, OOF, BPV or AIS
Bursty Errored Second (BES)	AIS, SEF (Severely Errored Framing), or 2-319 PCVs	2-319 CRC errors	AIS, SEF (Severely Errored Framing), or 2-319 PCVs
Severely Errored Second (SES)	OOF, AIS, or 320 or more PCVs	OOF, or 320 or more CRC errors	FE, OOF, or 1544 or more LCV
Unavailable Second (UAS)	Counting begins at first of 10 consecutive SES; end at first of 10 consecutive non-SES *		
ESF Error Event (EEV)	N/A	OOF or CRC error	N/A
Out of Frame (OOF)	2 or more framing errors in 3 ms	2 of 4 consecutive framing bits in error	2 or more framing errors in 0.75 ms
CRC	CRC6 error		N/A
Severely Errored Framing Second (SEFS)	OOF or AIS	N/A	OOF or AIS
Line Errored Second (LES)	1 or more LCVs	N/A	1 or more LCVs
Degraded Minute (DM)	LCV rate between 10 ⁻⁶ and 10 ⁻³	N/A	LCV rate between 10 ⁻⁶ and 10 ⁻³
* For RFC 1406, this description is a simplification of the actual UAS determination. See RFC 1406 for details			

Table B-2. E1 Performance Parameters

Parameter	E1 with CRC4 per RFC 1406	E1 without CRC4 per RFC 1406
Alarm Indication Signal (AIS)	Unframed All 1s for 1100 bits (CAS) or 1450 bits (No CAS)	Unframed All 1s for 1050 bits (CAS) or 1375 bits (No CAS)
Loss of Signal (LOS)	26 consecutive 0s	
Line Code Violation (LCV)	BPV or EXZ	
Path Code Violation (PCV)	CRC error	Framing Error (FE)
Excessive Zeros (EXZ)	10 or more consecutive 0s	
Framing Error (FE)	Incorrect framing bit	
Errored Second (ES)	PCV, OOF, or AIS	PCV, OOF, BPV, or AIS
Bursty Errored Second (BES)	From 2 to 319 PCVs	
Severely Errored Second (SES)	OOF, or 832 or more PCVs	2048 or more LCVs
Unavailable Second (UAS)	Counting begins at first of 10 consecutive SES; ends at first of 10 consecutive non-SES *	
CRC	CRC4 error	N/A
Out of Frame (OOF)	3 consecutive framing bits in error	
Severely Errored Framing Second (SEFS)	OOF or AIS	
Line Errored Second (LES)	1 or more LCVs	
Frame Alignment Signal (FAS)	3 consecutive framing bits in error (OOF)	
FEBE	CRC error at far end	N/A
Degraded Minute (DM)	LCV rate between 10^6 and 10^3	LCV rate between 10^6 and 10^3
* For RFC 1406, this description is a simplification of the actual UAS determination. See RFC 1406 for details.		

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