2 x E1 ports – 75 ohm	MTU3802E-75
2 x E1 ports – 120 ohm	MTU3802E-120
4 x E1 ports – 75 ohm	MTU3800E-75
4 x E1 ports – 120 ohm	MTU3800E-120
6 x E1 ports – 75 ohm	MTU3806E-75
6 x E1 ports – 120 ohm	MTU3806E-120
8 x E1 ports – 75 ohm	MTU3808E-75
8 x E1 ports – 120 ohm	MTU3808E-120

E1 INVERSE MULTIPLEXOR WITH SNMP

TECHNICAL: (0118) 931 2233
SALES: (0118) 965 5100
FAX: (0118) 931 1727
ADDRESS: 15 Cradock Road, Reading, Berkshire RG2 0JT
WEB: www.blackbox.co.uk

MTU3800 Series Breakdown

Item	Code
2 x E1 ports – 75 ohm	MTU3802E-75
2 x E1 ports – 120 ohm	MTU3802E-120
4 x E1 ports – 75 ohm	MTU3800E-75
4 x E1 ports – 120 ohm	MTU3800E-120
6 x E1 ports – 75 ohm	MTU3806E-75
6 x E1 ports – 120 ohm	MTU3806E-120
8 x E1 ports – 75 ohm	MTU3808E-75
8 x E1 ports – 120 ohm	MTU3808E-120

1 Introduction

The E1 INVERSE MULTIPLEXOR Users Manual is divided into 8 sections. A brief description of each section is provided below to assist users of the E1 INVERSE MULTIPLEXOR with the use of this manual.

Chapter 1.0, INTRODUCTION, provides an introduction to the manual and a brief summary of each of the remaining 7 chapters.

Chapter 2.0, GENERAL SYSTEM DESCRIPTION, describes the E1 INVERSE MULTIPLEXOR system architecture, including signal flow, main circuit functions and system configurations, as well as the user interface. This chapter also provides the E1 INVERSE MULTIPLEXOR features and benefits as well as specifications.

Chapter 3, APPLICATIONS, describes the major application that the E1 INVERSE MULTIPLEXOR supports.

Chapter 4, ASCII INTERFACE, describes how the E1 INVERSE MULTIPLEXOR is controlled from an ASCII terminal. This section includes a detailed description of the ASCII terminal menu operation to configure, monitor status and alarm conditions, run tests and diagnostics, and generally operate the E1 INVERSE MULTIPLEXOR

Chapter 5, FRONT PANEL OPERATION, provides a summary of the various controls and indicators available on the front panel of the E1 INVERSE MULTIPLEXOR.

Chapter 6, INSTALLATION, describes the procedures for physically installing the E1 INVERSE MULTIPLEXOR. This section also describes the proper cable connections required for system operation and the "turn-up" procedure for the E1 INVERSE MULTIPLEXOR.

Chapter 7, MAINTENANCE AND USER DIAGNOSTICS describes how to perform various tests provided by the E1 INVERSE MULTIPLEXOR. It also describes how these tests and other E1 INVERSE MULTIPLEXOR diagnostics tools can be utilized to troubleshoot and isolate network and system problems. The return and repair procedure for the E1 INVERSE MULTIPLEXOR is also described in this section.

Chapter 8, APPENDIX, provides connector pin assignments and factory default settings.

2 General System Description

2.1 System Overview

The E1 INVERSE MULTIPLEXOR bridges the gap between E1 and E3 data services by providing E1 multiplexing of multimegabit (up to Nx1.976M bit/s, where N = 1 to 8) DTE data onto E1 circuits (any number of circuits between two and eight). The E1 INVERSE MULTIPLEXOR is an economical solution to bandwidth intensive applications as it provides multimegabit data transport without the need for E3 circuits. The E1 INVERSE MULTIPLEXOR is an ideal solution for applications such as LAN-to-LAN internetworking, bulk data transfer, video teleconferencing and disaster recovery.

The inverse multiplexing technique employed by the E1 INVERSE MULTIPLEXOR is completely transparent to the DTE application, as the multiple E1 circuits act as a single high-speed data link. The E1 INVERSE MULTIPLEXOR can accept up to a 31ms differential delay between individual E1 circuits, thus providing the capability to accommodate E1 circuits from divergent paths. This is often the case with circuits being utilized from different carriers.

The E1 INVERSE MULTIPLEXOR supports either High Speed Serial Interface (HSSI) or V.35/RS449/X.21 interfaces to the DTE. On the network side, it supports N x E1, compliant with ITU-T G.703 -and G.704.

The E1 INVERSE MULTIPLEXOR features an automatic rate fallback in the event of a failing E1 circuit. If the performance of an E1 circuit is detected to be falling below accepted levels, the E1 INVERSE MULTIPLEXOR automatically removes the E1 from service and throttles back the DTE to a data rate corresponding to the remaining E1s. When the alarm condition on the affected E1 has been cleared, the E1 INVERSE MULTIPLEXOR can automatically restore the E1 and data rate.

You can configure, control and monitor the E1 INVERSE MULTIPLEXOR through the front panel, an ASCII terminal (locally or remotely via a modem or remotely in-band) or a Simple Network Management Protocol (SNMP) management station. The remote E1 INVERSE MULTIPLEXOR can be managed in-band-using overhead in all active E1 connections as the communications path. The E1 INVERSE MULTIPLEXOR features an integrated SNMP agent that supports the RFC 1406 Management Information Base (MIB) in addition to a unit specific enterprise MIB.

A downloadable software feature of the E1 INVERSE MULTIPLEXOR allows new features and functionality to be added to the unit in the field, via the unit's communication port.

2.2 E1 INVERSE MULTIPLEXOR Functional Description

The base E1 INVERSE MULTIPLEXOR configuration consists of a mainboard with two (E1) network interface connectors and the DTE connectors (HSSI and V.35/RS449/X.21). Six additional E1 network ports can be added with the addition of from one to three daughterboards, each daughterboard supporting two additional E1 ports.

The general operation of the E1 INVERSE MULTIPLEXOR is explained in the following paragraphs that describe the signal flow and overhead functions.

Signal Flow:

You configure the E1 INVERSE MULTIPLEXOR for the number of E1 signals that you'll be using for transmission. The E1 INVERSE MULTIPLEXOR will provide a smooth clock to the DTE at the data rate required for the number of E1 outputs you have configured. For E1, this rate will be Nx1.976Mbps (payload), where N is the number of E1s to be used (from 1 to 8).

The transmit smooth clock PLL can use any of the incoming E1 clocks, and external clock or internal clock as reference. The receive smooth clock will use one of the receive clocks at its source. The smooth clock VCO will be divided down to 8khz to be phase compared to the 8khz reference. The receive buffers are large enough to accommodate variations between E1 receive clocks.

Data is sent from the DTE interface to an Inverse Multiplexor (IMUX) transmit framer. A 16-bit proprietary framing pattern is defined to satisfy the requirements of inverse multiplexing communications. This frame is constructed by using one payload bit in each E1 frame for 16 consecutive frames. The inverse multiplexing frame bit is the first bit after timeslot 0.

From the inverse MUX framer, the data is sent to all E1 framers, where the E1 framing is added, and then to the appropriate E1 network interface and out over the E1 network.

All incoming configured E1 lines, with their respective clocks, are received into a standard E1 framer. The output of the E1 framer is fed into the IMUX framer.
Data coming into the E1 INVERSE MULTIPLEXOR is stored in *N* independent buffers, where *N* is the number of configured input channels. From these buffers, the data will be read and IMUX framing removed.

When the incoming signal is framed on the inverse MUX frame, the framer will start loading its Dual Port RAM. The address to the Dual Port RAM is derived from the 16-bit inverse MUX frame. The software will ask all framers to latch their Dual Port RAM addresses at the same time, and by looking at the addresses, the software can determine which network has experienced the greatest delay.

From the receive IMUX framer, the data is sent to the receive multiplexor. The E1 network data that is last in time will be enabled to tell the receive multiplexor when to start unloading the Dual Port RAM to the DTE interface. To allow for jitter and wander specifications, the read address counter will be positioned approximately three frames behind the write address for the network last in time.

Figure 2.2 is a Functional Diagram of the E1 INVERSE MULTIPLEXOR showing a unit supporting four E1 lines.

E1 INVERSE MULTIPLEXOR FUNCTIONAL DESCRIPTION

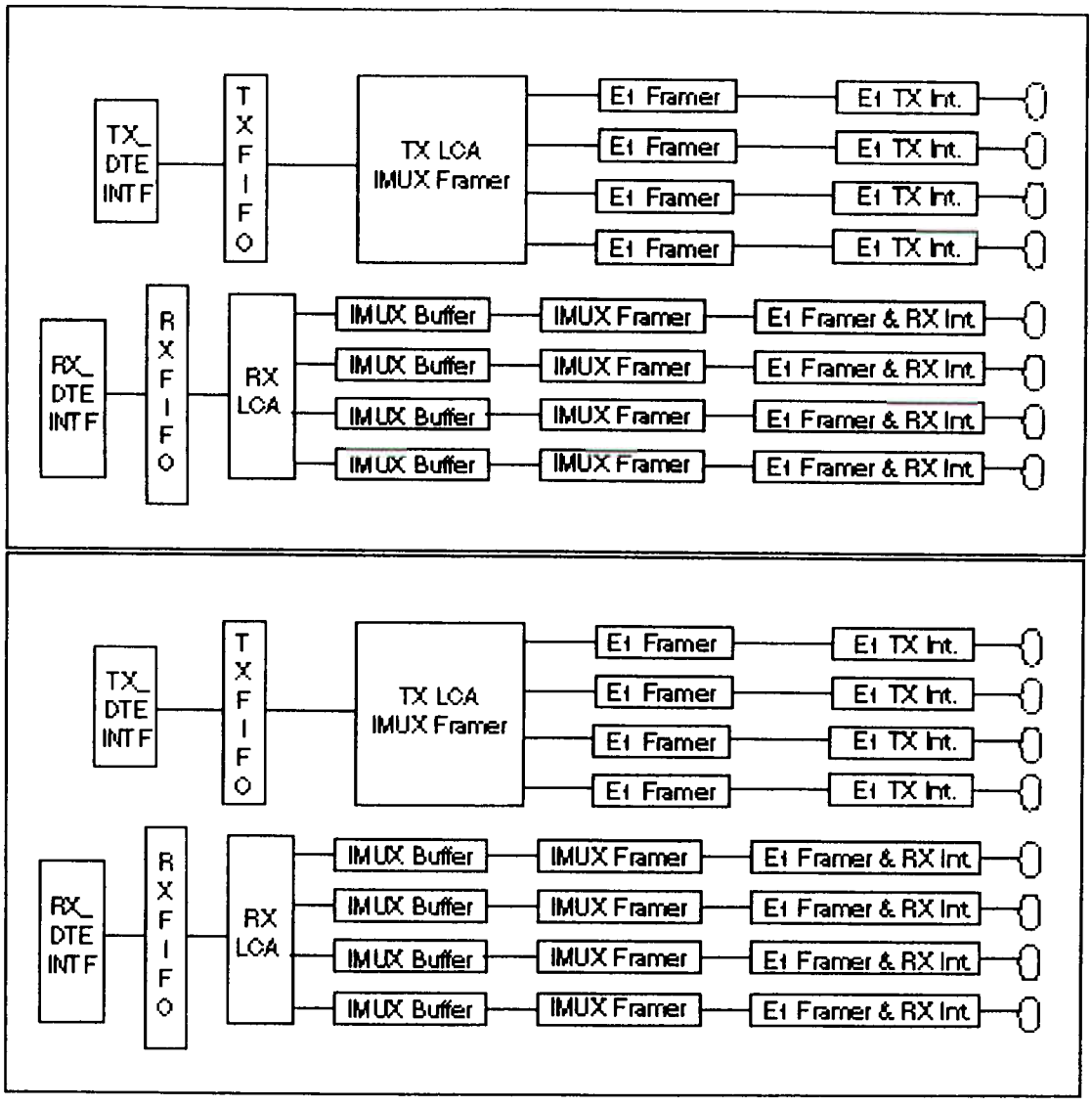


Figure 2.2

Overhead Functions:

The overhead functions consist of a controller, front panel, two RS232 communication interfaces (terminal and network management) and a power supply.

The controller function is performed by a microprocessor on the main board. The controller collects E1 statistics. It also processes E1 alarms and performance monitoring information as well as supporting unit configuration, test and maintenance activities. Finally the "Controller" block supports the front panel display, terminal port and SNMP port interfaces.

The front panel consists of a 16 character vacuum fluorescent display, 4-key keypad and LED's. This panel can be used to provision the unit, run diagnostic tests, or gain access to performance statistics.

The serial ports are RS-232C compatible ports with one port supporting a menu driven ASCII terminal interface and the other port providing access to the built-in SNMP agent functionality.

The built-in power supply has a range of 90V to 244V AC and -40V to -75V DC (optional).

2.3 E1 INVERSE MULTIPLEXOR System Features and Benefits

Feature	Benefit
High bandwidth transmission over 1 to 8 E1 links	Saves money compared to expensive E3 links. Allows high bandwidth transmission where E3 is not available
Automatic bandwidth response	Monitors network performance and increases reliability without any action required from the user
Local and remote unit management	Enables the user to monitor, configure, and troubleshoot the network from a central site
Integrated SNMP agent	Enables the user to monitor, configure, and troubleshoot the network through an SNMP-based management system
Extensive alarm reporting and diagnostics	Helps prevent network problems before they happen and reduces troubleshooting time if problems do occur
HSSI/V.35/RS-449/X.21 interfaces	Software selectable for easy configuration
Tolerates differential delay of up to 31 msec	Enables the user to choose different carriers for the E1 lines
Downloadable code capability	New features can be added later

2.4 E1 INVERSE MULTIPLEXOR Specifications.

E1 Network Interface

Transmit Bit Rate	2.048 Mbps ± 50 PPM
Receive Bit Rate	2.048 Mbps ± 75 PPM
Line code	HDB3 (G.703 Annex 1)
Framing	ITU G.704
Impedance	75 ohms (BNC) Unbalanced or 120 ohms Balanced (DB9)
Input signal	0 to -20dB
Output signal	ITU G.703
Electrical	ITU G.703
Physical Connector	BNC or DB15 2, 4, 6, 8 ports
Synchronisation	Internal, Loop-timed, External (BNC)

Data Terminal Equipment (DTE) Interface

Interface Type 1	V.35/RS449/X.21 (rates below 10 Mbps) Software selectable DB25 Female
Interface Type 2	HSSI (rates greater than 10 Mbps) 50 pin Female Amplimite
Number of ports	1
Maximum rate	15.8 Mbps (payload)

Diagnostics and Tests

Loopback	DTE/Network Payload Line DTE
Self Test	Unit circuitry (upon power up) Memory

Power

Input voltage	110 to 240 VAC, 50 to 60 Hz; -40 to -75 VDC
Power Consumption	18.4 W 3.4 A @ 5.00 V = 17 W 110mA @ 12.00 V = 1.32 W 10mA @ -5.2 V = 0.052 W 40 W Maximum
External Power Fuse	1A (located on the back panel)
Power supply	Internal fuse @ 2A Current Rating: +5V @ 5A +12V @ 2A -5.2 V @ 1A

Environmental

Dimensions	43.7cm (17.2") W x 7.1cm (2.8") H x 27.9 cm (11") D
Operating Temperature	0 to 50 degrees Celsius Ambient
Storage Temperature	-35 to 85 degrees Celsius
Humidity	0 to 95% non-condensing
Altitude	-6 cm (-20 ft.) to 3 km (10,000 ft.) Above Sea Level

Network Management System (NMS) Interface

Interface	Integrated SNMP agent (RFC 1406, enterprise MIB) through SLIP
Electrical	RS-232
Connector	DB-9

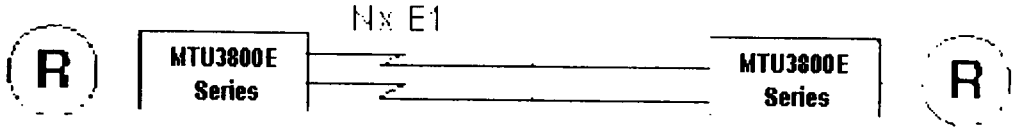
Communications Interface

Interface	ASCII Terminal, Modem
Electrical	RS-232
Connector	DB-9

3 Applications

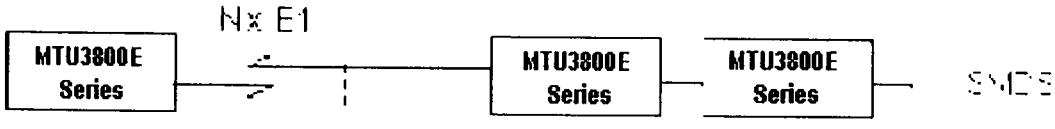
3.1 Point to Point Connection—Bandwidth on Demand

The E1 INVERSE MULTIPLEXOR can be used in a point to point E1 connections in lieu of E3 connection. As the need for bandwidth grows more E1 links can be utilized (up to 8).



3.2 SMDS (or ATM) Access via Multiple E1s

Another application is the Trans-Atlantic or Pacific communication of SMDS traffic, as illustrated below. With the MTU3802E, (SMDS DSU) functioning as a "DTE," the E1 INVERSE MULTIPLEXOR can be connected back to back with the MTU3802E to provide an SMDS access. A long-haul E1 links communication can be supported by the E1 INVERSE MULTIPLEXOR. This application demonstrates the transparency of the E1 INVERSE MULTIPLEXOR technology.



4 ASCII Terminal Interface

4.1 Log In/Log Off

Each E1 INVERSE MULTIPLEXOR is equipped with an integrated RS232 ASCII user interface that can be accessed through the "Terminal" port (DB-9 connector) located on the rear panel of the E1 INVERSE MULTIPLEXOR. Through this interface, you can perform various functions described in this section.

When operating in MULTIDROP MODE (multiple E1 INVERSE MULTIPLEXORs that are daisy-chained together for centralized network management), you must "log in" to establish communication with a single unit on the network. Only one unit may be logged onto at a time. All units continuously monitor the line, but only the unit that is logged on will respond to terminal commands. When no unit is logged on, the characters typed on the terminal will not show up on the display screen.

To log on and log off a particular unit, follow these procedures:

1. Typing five CTRL X commands in a row, followed by RETURN (or RETURN) will return a "roll call" of all Node Numbers on the communications network. This feature is useful when the Node Numbers of any units on the network are unknown.

2. Type CTRL X (hold control key down and press the X key) followed by # (the number sign), the NODE NUMBER and RETURN (or RETURN). These characters will not be displayed on the terminal screen but the units will receive them nonetheless.

3. Menu 1 of the Black Box Terminal Interface will appear. If not, check that the Node Number matches what is typed on the terminal. If it still does not appear, check that the E1 INVERSE MULTIPLEXOR port settings match the settings (baud rate, parity, data bits and stop bits) of the terminal. If so, a null modem adapter may be required to interchange pins 2 and 3 (transmit and receive) from the terminal.

4. To log on to another E1 INVERSE MULTIPLEXOR on the same daisy chain, simply type CTRL X, followed by a # and the Node Number and press RETURN (or RETURN). The previous unit is logged out and the new unit is logged on.

5. To log off all units without logging onto any new units, type CTRL X followed by RETURN or RETURN.

4.2 Terminal Operation Overview

4.2.1 General Menu Flow

The menu interface for the E1 INVERSE MULTIPLEXOR consists of the INVERSE MULTIPLEXER MAIN MENU and a series of Sub Menus.

From the MAIN MENU, the Sub Menu to be selected or function to be performed is selected by moving the highlight bar through the menu screen with the CURSOR ARROW keys until the desired function is highlighted.

To prevent any accidental data and/or status change, every proposed change requires a confirmation response. To confirm a proposed change, move the highlight bar to "CONFIRM" on the menu and press "RETURN." Type any other key and the change will not be made. This will cause the terminal to continue to prompt you to confirm the change(s). To abort the change, move the highlight bar to "EXIT" and press RETURN rather than confirming the change.

GENERAL TIPS: Striking the ESCAPE key brings the display back to SELECT LOCAL/REMOTE when in the MAIN MENUS and back to EXIT when in the EXECUTION MENUS.

4.2.2 Screen Description

The top four lines of each display screen contain information regarding the last two status or alarm conditions reported by the E1 INVERSE MULTIPLEXOR. This information includes: the severity of condition reported, the date and time it was reported, the Unit and NET (E1 port) reporting the alarm, a code for the type of condition, and a description of the condition.

The next two lines in the menu, which are always highlighted, represent the STATUS BAR. The first line of the Status Bar displays the product type , the software release number, node number, node name, date & time and current alarm status of the unit. The second line displays the selected device address and name.

INVERSE MULTIPLEXER MAIN MENU

```
Major  01/01/90 04:58:17  Unit: 0    NET : 2  (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major  01/01/90 04:58:17  Unit: 0    NET : 1  (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR   SR 2.00.00 NODE 7:
01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS:    7.00.000  NAME:

INVERSE MULTIPLEXER MAIN MENU
  Select Local/Remote
  Alarms & Status
  Statistics
  Event History
  Configuration
  System Utilities
  Tests
  Manual Network Restoration
  Logout
```

FIGURE 4.2.2

Figure 4.2.2 is an example of an INVERSE MULTIPLEXER MAIN MENU.

The product type is a E1 Digital Inverse Multiplexor.

The software revision is **2.00.00**. This number is useful to determine the features that are supported with this release.

The Node number, in this case **7**, is user defined. This can be used to further identify the node within your network. It is recommended that all nodes be given a unique node number. This is crucial in inter-node communications.

The Node name **(HOME)**, is user defined. You can use this field to uniquely describe the node within the network.

The date and time are given in **month/date/year** and **hour/minute/second.**

The alarm indicator, in this case **MJ** for major, is given on each screen to alert you of a local Node alarm.

The Selected Device address, in this example **7.00.000** is shown at the beginning of the second status line. A device is a generic term to indicate a NODE (unit).

4.3 Inverse Multiplexor Main Menu Commands

When a E1 INVERSE MULTIPLEXOR is first powered up, the Main Menu (Figure 4.2.2) appears on the terminal screen. This describes those functions that can be performed, parameters viewed, changed and/or deleted from this menu. The Inverse Multiplexor Main Menu items are:

SELECT LOCAL/REMOTE: allows you to move to the between the Main Menu of the Local and Remote units.

ALARMS AND STATUS: provides current alarm and status report of the common equipment, DTE and E1 lines.

STATISTICS: allows you to access the statistics menus of the various E1 lines.

EVENT HISTORY: allows user to view and clear alarms and event history of the E1 INVERSE MULTIPLEXOR.

CONFIGURATION: allows you access sub-menus to configure certain parameters of the E1 INVERSE MULTIPLEXOR, network and DTE.

SYSTEM UTILITIES: allows you to perform various system utility functions such as download software, configure SNMP, configure login and delete or save configuration.

TESTS: allows you to initiate diagnostic loopbacks.

MANUAL NETWORK RESTORATION: allows you to manually restore an E1 circuit instead of it being restored automatically upon the clearing of a problem.

LOGOUT: allows you to log out of the E1 INVERSE MULTIPLEXOR without having to wait for automatic logout.

These items are described in more detail in the following sections.

4.3.1 Select Local/Remote

When in the INVERSE MULTIPLEXER Main Menu, this option allows you to view and access the other items on either the local or remote E1 INVERSE MULTIPLEXOR. The Device Address and Name in the header portion of the display screen will identify the unit that the terminal is presently communicating with.

Note: While accessing the remote unit, all menus are available with the exception of Software Download.

To move to the Main Menu of the other E1 INVERSE MULTIPLEXOR, highlight SELECT LOCAL/REMOTE and hit RETURN. The Device Address and Name in the header should change to the new unit.

4.3.2 Alarms and Status

The ALARMS AND STATUS menu is a "view only" screen that allows you to review the current ALARMS AND STATUS items being reported by the E1 INVERSE MULTIPLEXOR. To access this screen, move the highlight bar in the Inverse Multiplexor Main Menu to ALARMS AND STATUS and press RETURN.

The ALARMS AND STATUS display (Figure 4.3.2) will appear on the screen describing the status of the common equipment and each of the E1 ports (lines) plus the status of the DTE leads and the current rate of the DTE port.

ALARMS & STATUS MENU

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7:  01/01/90 05:55:07 MJ
SELECTED DEVICE ADDRESS:   7.00.000  NAME:

CURRENT ALARMS AND STATUS ITEMS   Exit  Repeat

Common equipment status: No Ext Clk, Primary Clk, No Net Sync
Network ports:
  PORT 1:  LOS, RED, Active, OOF MN, UAS 15 MIN MJ Relative delay of 0.000 ms
  PORT 2:  LOS, RED, Active, OOF MN, UAS 15 MIN MJ Relative delay of 0.000 ms
  PORT 3:  BPV MN, OOF MN, BPVS 15 MIN MN
  PORT 4:  BPV MN, OOF MN, BPVS 15 MIN MN
```

PORT 5: LOS, RED, UAS 15 MIN MJ
PORT 6: LOS, RED, UAS 15 MIN MJ
PORT 7: LOS, RED, UAS 15 MIN MJ
PORT 8: LOS, RED, UAS 15 MIN MJ

RS449/X.21 port: DSR ON
Current **RS449/X.21** port rate = 3.952 Mbits/sec

Figure 4.3.2

Following are the Alarm and Status items (severity) that may appear. The Common Equipment alarms and status will appear first, followed by the Network and the DTE alarms and status.

NETWORK	COMMON EQUIP.	DTE
Not Present	External Alarm	HSSI Channel Lpbk
LOS	Proc Restart	User Lpbk
LOF	RAM Test Fail	V.35 LT Lpbk
AIS det	ROM Checksum Fail	DTE Loss
AIS	No Ext Clk	DTR On
RED	Primary Clk	RTS On
YEL det	Secondary Clk	RLB On
YEL	Internal Clk	LT On
Failed Signal	Sync-Net 1	TA On
Xmt Failed	Sync-Net 2	LA On
User Line Lpbk	Sync-Net 3	LB On
User Payload Lpbk	Sync-Net 4	DSR On
HW Line Lpbk	Sync-Net 5	CTS On
HW Payload Lpbk	Sync-Net 6	RLSD On
* Active	Sync-Net 7	TM On
Not Active	Sync-Net 7	CA On
Excessive Delay	Sync-Net 8	LC On
Set Code Detected	No Net Sync	
Reset Code Detected		
CRC Threshold		
SES Threshold		
UAS Threshold		
BPV MN/MJ		
OOF MN/MJ		
BPV 15 Min MN/MJ		
CRCs 15 Min MN/MJ		
ES 15 Min MN/MJ		
SES 15 Min MN/MJ		
UAS 15 Min MN/MJ		
BPVs 24 Hr MN/MJ		
CRCs 24 Hr MN/MJ		
ES 24 Hr MN/MJ		
SES 24 Hr MN/MJ		
UAS 24 Hr MN/MJ		

Notes:
1. If the E1 INVERSE MULTIPLEXOR is in Inverse Mux mode and receiving I-Framing on the E1 without Blue, Yellow or Red Alarms or Major Alarm Thresholds being exceeded, the Alarm & Status display will read ACTIVE.
2. If the E1 Network Config is set to NEVER USE, the Alarm & Status display will read NOT ACTIVE.
3. In Single DSU Mode, the E1 INVERSE MULTIPLEXOR is ACTIVE if it is receiving valid E1 pulses from the network without Blue, Yellow or Red Alarms or Major Alarm Thresholds being exceeded and 1) if in HSSI mode the TA must be asserted or 2) if in non-HSSI mode you must select DTR or RTS.
4. A Blue, Yellow or Red Alarm or the exceeding of Major Alarm Thresholds will cause the E1 to be taken out of service.

4.3.3 Statistics

This menu item allows you to access the performance STATISTICS sub-menu of any E1 port. Highlight STATISTICS in the Inverse Mux Main Menu and press RETURN. The STATISTICS Menu (Figure 4.3.3a) will appear on the screen.

STATISTICS

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7: 01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS:   7.00.000  NAME:

STATISTICS MENU      Exit

  NETWORK 1 STATISTICS
  NETWORK 2 STATISTICS
  NETWORK 3 STATISTICS
  NETWORK 4 STATISTICS
  NETWORK 5 STATISTICS
  NETWORK 6 STATISTICS
  NETWORK 7 STATISTICS
  NETWORK 8 STATISTICS
```

Figure 4.3.3a

To view the performance statistics of any one E1 port, highlight that port and press RETURN. The NET STATISTICS for that port (Figure 4.3.3b) will appear on the screen.

This screen displays the selected port's E1 performance statistics for the current 15-minute interval and for the past 48-hour interval. The performance statistics for the first 24 hours are in both accumulative form and in 15-minute intervals. The statistics for the second 24 hours are only in accumulative form. It also allows the user to clear the display and reset the counters. For the E1 INVERSE MULTIPLEXOR, the E1 statistics displayed are "BPV", "CV", "FE", "ES", "SES", "UAS", and "EFS". These statistics are kept according to Bellcore TR-TSV-000773 specifications.

STATISTICS MENU (PORT 1)

Major 01/01/90 04:58:17 Unit: 0 NET : 2 (114)
Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit: 0 NET : 1 (114)
Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX **E1 INVERSE MULTIPLEXOR SR 2.00.00** NODE 7: 01/01/90 05:55:07
MJ
SELECTED DEVICE ADDRESS: 7.00.000 NAME:

NET STATISTICS - PORT 1 Exit Next Repeat Clear Page 1

CURRENT SECONDS: 878 PAST INTERVALS: 3 ERROR-FREE SECONDS:
0.0%

	BPV	CV	FE	ES	SES	UAS
CURRENT	0	0	0	0	0	0
CUMULATIVE 1	0	0	0	0	0	0
CUMULATIVE 2	0	0	0	0	0	0
05:26-05:41	0	0	0	0	0	0
05:11-05:26	0	0	0	0	0	0
04:56-05:11	0	0	0	0	0	0

Figure 4.3.3b

To view additional pages with this set of performance data, press the CURSOR down arrow, or to view the previous page, the CURSOR up arrow.

Additional NET STATISTICS are presented in subsequent screens (Figures 4.3.3c). To view additional screens with this same set of performance data, press the TAB key or the CURSOR right and left arrow keys until the NEXT field is highlighted, then press RETURN. Continue to press RETURN with the NEXT field highlighted to view all the screens.

BPV	This display provides the number of Bipolar Violations (BPVs) that have occurred during the accumulation period. A total of 15430 BPVs in a 10-second sliding window (approximately 10-3) will create a Major Alarm and 916 BPVs in a 600-second sliding window (approximately 10-6) will create a Minor Alarm.
CV	A CODE VIOLATION (CV) is a count of frame synchronisation bit errors (FE) in the frame format, or a count of the CRC-4 errors in the frame format occurring during the accumulation period.
FE	A FRAME ERROR is declared when two out of four consecutive framing bits are in error. Typically, a FE indication will be accompanied by a significant number of payload data bit errors.
ES	An ERRORED SECOND (ES) is the count of one-second intervals containing one or more CRC-4 errors, or one or more CS events, or one or more SEF events. SEF is severely errored framing in a non-LOS and non-AIS condition.
SES	Severely Errored Seconds are defined as a count of one-second intervals with 320 or more CRC-6 errors, or an SEF defect.
UAS	This is a count of one-second intervals in which the E1 path has been unavailable. The E1 path is determined to be unavailable from the onset of 10 contiguous SESs, or the onset of the condition leading to a failure.

Table 4.3.3 (Continued)

4.3.4 Event History

This screen allows you to view and clear the alarm and status history of the unit.

To view the EVENT HISTORY, move the highlight bar to EVENT HISTORY in the Node Main Menu and press RETURN. Use the UP and DOWN CURSOR keys to move ahead to the next page or back to the previous page of the Event History Menu.
All messages contain the following:

ALARM LEVEL:	
Major	Service affecting
Minor	Needs attention, but not yet service affecting
Idled	Alarm condition has expired
Status	Non-service-affecting event
DATE & TIME:	Date and Time of the occurrence or expiration of the alarm/state.
ADDRESS:	The address is the physical location.
DEVICE:	The device reporting the status and alarm condition (Unit #), and the type of device (NET, DTE or NODE).
EVENT CODE:	Number designation for type of alarm or status condition. This number will be useful when contacting the factory.
DESCRIPTION:	Describes the event.

To clear the report of all History Events, move the highlight bar to CLEAR HISTORY and press RETURN. Figure 4.3.4 is an example of the EVENT HISTORY Menu.

EVENT HISTORY MENU

```
Major     01/01/90  17:56:47          Unit: 1  NET : 2 (33)
          Loss of Frame
Idled     01/01/90  17:56:58          Unit: 1  NET : 2 (13)
          Loss of Frame Idled

BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.000  NODE 7:HOME  01/01/90  03:14:54  MN
SELECTED DEVICE ADDRESS:  7.00.000     NAME:HOME

   EVENT HISTORY        Exit        Repeat        Clear History     Page 1

   Idled          01/01/90        09:02:10        Unit 1   NET 2   (29)
                  Yellow Signal Detected Idled
   Major          01/01/90        09:02:06        Unit 1   NET 2   (30)
                  Yellow Alarm
   Status         01/01/90        08:58:09        Unit 1   NET 2   (29)
                  Yellow Signal Detected
   Idled          01/01/90        08:58:01        Unit 2   NET 3   (29)
                  Yellow Signal Detected Idled
   Minor          01/01/90        08:56:24        Unit 1   Node    (36)
                  ROM Checksum Failed
```

Figure 4.3.4

4.3.5 Configuration

The CONFIGURATION menu item provides access to a series of sub-menus to configure various parameters of the unit, DTE and network.

Highlight CONFIGURATION in the INVERSE MULTIPLEXER main menu and press RETURN to access the CONFIGURATION Menu shown in Figure 4.3.5.

CONFIGURATION

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7:  01/01/90 05:55:07
MJ
SELECTED DEVICE ADDRESS:  7.00.000  NAME:

CONFIGURATION MENU      Exit

  Unit
  DTE
  Network
  Network Thresholds
  SAVE configuration
```

Figure 4.3.5

To access any of the configuration sub-menus, highlight the desired item and press RETURN. Following are samples and descriptions of the sub-menus that can be accessed from the CONFIGURATION menu.

4.3.5.1 Unit Configuration

Highlighting UNIT and pressing RETURN accesses the UNIT CONFIGURATION menu shown in Figure 4.3.5.1. The configurable items and options are described in Table 4.3.5.1.

The following parameters can be set or changed for the Node: DATE, TIME, ALARM ENABLE, AUTOMATIC BACKUP, FRONT PANEL, UNIT NUMBER, UNIT NAME and LOCAL TERMINAL BAUD RATE, BITS/PARITY, STOP BITS, X-ON/X-OFF and MULTIDROP MODE. HARDWARE, SOFTWARE and MIB REVISIONS are view only items and cannot be changed.

UNIT CONFIGURATION MENU

```
Major 01/01/90 04:58:17 Unit:  0  NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:  0  NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7:  01/01/90 05:55:07
MJ
SELECTED DEVICE ADDRESS:  7.00.000  NAME:

UNIT CONFIGURATION  Exit  Confirm
DATE: 01/01/90
TIME: 05:57:42
ALARM ENABLE: Disabled
AUTOMATIC BACKUP:  5 minutes after a database change.
FRONT PANEL: On
UNIT NUMBER:0
UNIT NAME:
HARDWARE REVISION:  E
SOFTWARE REVISION:  1.07.00  (DOWNLOADED)
MIB REVISION:  1.01 Aug. 24th 1993
TERMINAL BAUD RATE:  38400
TERMINAL #BITS AND PARITY:  8 bits, No parity
TERMINAL STOP BITS:  2 bits
TERMINAL XON/XOFF:  Enabled
TERMINAL MULTIDROP:  Enabled
```

Figure 4.3.5.1

NODE CONFIGURATION OPTIONS

1) DATE -Move the highlight bar to "DATE" and enter a valid date with the format 01/01/90 and press RETURN when finished.

MM	1-12	month
DD	1-31	date
YY	0-99	year

2) TIME - Move the highlight bar to "TIME" and enter a valid time with the format 03:14:54 and press RETURN when finished.

HH	0-23	hours
MM	0-59	minutes
SS	0-59	seconds

3) ALARM ENABLE - This option allows you to ENABLE or DISABLE the E1 INVERSE MULTIPLEXOR from reporting Network, DTE and common equipment alarms. Highlight ALARM ENABLE and, using the space bar, toggle between ENABLED and DISABLED until the desired choice appears.

Table 4.3.5.1

4) AUTOMATIC BACKUP - This feature allows you to backup the database to the EEPROM automatically at certain intervals or manually. To change the present backup mode, highlight AUTOMATIC BACKUP and use the space bar to toggle between the following choices: after every database change, 15 seconds, 30 seconds, 1 minute or five minutes after each change, or OFF (must change manually with SAVE CONFIGURATION).

5) FRONT PANEL - This feature enables (ON) or disables (OFF) your ability to make changes in the configuration or run tests from the front panel display and buttons. To change FRONT PANEL feature, highlight "FRONT PANEL" and use the space bar to toggle between OFF and ON

6) UNIT NUMBER - Move the highlight bar to UNIT NUMBER and enter a number between 1 and 9999. Press RETURN when finished. **Note:** Each unit must be set to a different number, to allow remote communication and daisy chaining of multiple units. For example, if the remote unit is set to the same number as the local unit you will not be able to access the remote unit.

7) UNIT NAME - Move the highlight bar to UNIT NAME and enter alphanumeric name of up to 20 digits. Press RETURN when finished.

8) TERMINAL BAUD RATE - This feature selects the terminal baud rate. To set or change the baud rate, move the highlight bar to TERMINAL BAUD RATE and hit the Space Bar to toggle between the options: 300, 600, 1200, 2400, 4800, 9600, 19,200 and 38,400.

9) TERMINAL PARITY & BITS - This feature selects the terminal parity. To set or change the local terminal parity, move the highlight bar to TERMINAL PARITY & BITS and hit the Space Bar to toggle between the options: NONE, ODD and EVEN.

10) TERMINAL STOP BITS - This feature selects the terminal stop bit requirement. To set or change the requirement, move the highlight bar to TERMINAL STOP BITS and hit the Space Bar to toggle between the options. The options are 1, 1.5 or 2.

11) TERMINAL XON/XOFF - This allows you to enable or disable the XON/XOFF Flow Control feature. With the Flow Control feature ON, the terminal can request that the DTE quit sending data when its buffers are full. To set or change this feature, move the highlight bar to TERMINAL XON/XOFF and use the space bar to select choice.

ALARM - This item allows you to enable (REPORT) or disable (MASK) the E1 INVERSE MULTIPLEXOR from reporting alarms or sending SNMP traps from any of the individual E1 network ports. To change the present ALARM mode, use the up and down arrow keys to highlight the ALARM item in the appropriate line for the desired port and use the space bar to toggle between REPORT and MASK. Highlight CONFIRM and press ENTER to confirm any change. (Default—Mask)

ACTIVE/RESTORE MODE - This option selects the ACTIVE/RESTORE MODE for each of the E1 network ports. To change the present mode, use the up and down arrow keys to highlight the ACTIVE/RESTORE MODE option for the desired port and use the space bar to toggle between the following selections until the desired choice appears: Use w/auto restore (failed line is restored automatically when problem is solved); Use w/manual restore (user must manually restore line); Never Use (never mux data onto this line); Always Use (always mux data onto this line, even when it is bad). (Default—Never Use)

CRC4- Allows CRC4 coding to be enabled or disabled.

TSLOT16- Allows you to select between DATA and FLAG. If "DATA" is selected, timeslot 16 will be used for payload data. If FLAG is selected, timeslot 16 will not be used for payload and will be stuffed with the value 7E hex.

NATIONAL BITS- Selections can be set to either 0 (zero) or 1.

PRIMARY CLOCK SOURCE - This allows you to select either the PRIMARY CLOCK SOURCE, transmit (xmt) and receive (rcv) for the individual E1 network ports. To change the present Primary Clock Source, use the up and down arrow keys to highlight either Xmt or Rcv on the Primary Clock Source line and use the space bar to toggle between the choices. For Xmt (transmit) the choices are Network (NET), External (EXT) and Internal (INT). For Rcv (receive) the choices are Net-1 through Net 8 (each of the individual E1 network ports) or Auto (the unit selects the best source).

The E1 INVERSE MULTIPLEXOR can use several sources to generate the transmit clock. The INTERNAL selection uses an oscillator within the E1 INVERSE MULTIPLEXOR, the NETWORK setting recovers the clock from the selected E1 line, and the EXTERNAL setting recovers the clock from the DB-9 Ext. Clock connector on the rear panel of the unit. Typically the clock source on one side of the link is set to INTERNAL and the other is set to NETWORK. (Default—Xmt: Int., Rcv: Net 1)

SECONDARY CLOCK SOURCE - This allows you to select either the SECONDARY CLOCK SOURCE, transmit (xmt) and receive (rcv) for the individual E1 network ports. To change the present SECONDARY CLOCK SOURCE, use the up and down arrow keys to highlight either Xmt or Rcv on the Secondary Clock Source line and use the space bar to toggle between the choices. For Xmt (transmit) the choices are Network (NET), External (EXT) and Internal (INT). For Rcv (receive) the choices are Net-1 through Net 8 (each of the individual E1 network ports) or Auto (the unit selects the best source) until the desired choice appears. (Default—Xmt: Int, Rcv: Net 2)

DSU MODE - This allows you to set the E1 INVERSE MULTIPLEXOR up as a DSU, with one DTE and one Network port. To change the present DSU MODE level, use the up and down arrow keys to highlight the DSU MODE item and use the space bar to toggle between the following selections until the desired choice appears: INVERSE MUX (standard operation) or SINGLE E1 DSU. Highlight CONFIRM and press ENTER to confirm the change. (Default—Inverse Mux)

SUPPRESS YELLOW DETECT - This item allows you to configure the unit to ignore or report yellow alarm conditions. To change the present SUPPRESS YELLOW DETECT, use the up and down arrow keys to highlight the item and use the space bar to toggle between ENABLED and DISABLED until the desired choice appears. Highlight CONFIRM and press ENTER to confirm the change. (Default—Disabled)

SECOND ERROR RESTORAL INTERVAL - This item selects the time that a failed E1 line must run without errors in order to be restored automatically. If a network alarm is exceeded for a second time within the selected window (15 minutes or 24 hours), the line will not be restored. To change the present Restoral Interval, use the up and down arrow keys to highlight the item and use the space bar to toggle between the following selections until the desired choice appears: Immediate, 5, 10, 15 or 30 seconds and 1, 5, 10 and 15 minutes. (Default: 15 minutes)

Table 4.3.5.3

4.3.5.4 Network Thresholds

This Menu allows you to enable/disable the automatic FALLBACK feature and set the various Network Alarm Thresholds that will cause the E1 lines to automatically be taken out of service.

Figure 4.3.5.4 is an example of the NETWORK ALARM THRESHOLDS configuration screen.

NETWORK THRESHOLDS CONFIGURATION

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7:  01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS:  7.00.000  NAME:
```

NETWORK ALARM THRESHOLDS Exit Confirm

CONSECUTIVE THRESHOLDS	FALLBACK	SECONDS
CRC Seconds	Disabled	10
SES	Disabled	10
UAS	Disabled	10

INTERVAL THRESHOLDS	15 MINUTES			24 HOURS		
	FALLBACK	MAJOR	MINOR	FALLBACK	MAJOR	MINOR
BPV Err Sec(10E-3)	Disabled	100	100	Disabled	10	10
CRC Seconds	Disabled	100	100	Disabled	10	10
ES	Disabled	100	100	Disabled	10	10
SES	Disabled	100	100	Disabled	10	10
UAS	Disabled	100	100	Disabled	10	10

Figure 4.3.5.2

Note: The defaults of the network threshold parameters are as shown in Figure 4.3.5.2.

Through the CONSECUTIVE THRESHOLDS section of this menu, you disable or enable the fallback condition relating to the number of consecutive seconds (from 1 to 100) in which a CRC, SES or UAS alarm threshold is exceeded. To Enable or Disable the FALLBACK feature, highlight the appropriate item and use the space bar to select your choice. To change the number of errored consecutive seconds that will cause that E1 line to go out of service, highlight the appropriate item and press RETURN. When the highlight bar is blank, type in the number of seconds desired.

The INTERVAL THRESHOLDS section of this menu allows you to enable or disable the FALLBACK feature. FALLBACK relates to the number of in-error seconds (from 1 to 900) occurring in a 15-minute period, or the number of in-error 15-minute intervals (from 1 to 96) occurring in a 24-hour period that will cause a MAJOR or MINOR alarm. To Enable or Disable the FALLBACK feature, highlight the appropriate item and use the space bar to select your choice. To change the number of in error seconds or 15-minute intervals that will cause a MAJOR or MINOR network alarm, highlight the appropriate item and press RETURN. When the highlight bar is blank, type in the number desired.

4.3.5.5 Save Configuration

This option allows you to manually backup the database to EEPROM at any time. To SAVE CONFIGURATION and backup the database to EEPROM, highlight the SAVE CONFIGURATION in the CONFIGURATION menu and press RETURN.

4.3.6 System Utilities

The SYSTEM UTILITIES MENU in the INVERSE MULTIPLEXER Main Menu is used to access sub-menus in the E1 INVERSE MULTIPLEXOR to configure various system utilities and perform certain functions with the E1 INVERSE MULTIPLEXOR. These SYSTEM UTILITIES include SOFTWARE DOWNLOAD, DELETE ENTIRE NODE CONFIGURATION, LOGIN CONFIGURATION, SNMP CONFIGURATION, AND SAVE CONFIGURATION.

To access the SYSTEM UTILITIES MENU, highlight SYSTEM UTILITIES in the INVERSE MULTIPLEXER MAIN MENU and press RETURN.

Figure 4.3.6 is an example of the SYSTEM UTILITIES MENU that will appear. To access any of the sub-menus or perform certain functions, highlight that line item and press RETURN.

SYSTEM UTILITIES MENU

```
Major 01/01/90 04:58:17 Unit:  0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:  0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7: 01/01/90 05:55:07
MJ
SELECTED DEVICE ADDRESS:  7.00.000  NAME:

SYSTEM UTILITIES MENU      Exit

SYSTEM UTILITIES MENU                Exit
   Software Download
   DELETE Entire Unit Configuration
   Login Configuration
   SNMP Configuration
   SAVE Configuration
```

Figure 4.3.6

4.3.6.1 Software Download

This selection allows you to choose the desired mode for upgrading the software revision level of the E1 INVERSE MULTIPLEXOR via download if this option is available.

Highlight SOFTWARE DOWNLOAD in the SYSTEM UTILITIES menu and hit RETURN. The SOFTWARE DOWNLOAD Menu (Figure 4.3.6.1) will appear on the screen.

SOFTWARE DOWNLOAD MENU

```
Major 01/01/90 04:58:17 Unit: 0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit: 0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7:  01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS:  7.00.000  NAME:

DOWNLOAD NEW SOFTWARE   Exit   Confirm

DOWNLOAD PROTOCOL:  None
```

Figure 4.3.6.1

To download new software to the E1 INVERSE MULTIPLEXOR, the following equipment is needed.

- An MS DOS-based PC with a hard disk drive and a 35-inch floppy disk drive is required. Black Box provides a 3.5 inch floppy formatted for 1.4 Mbytes for downloading software.
- A terminal emulation program such as Procomm, Mirror or Xtalk with VT100 or ANSI emulation that supports one or all of the following:
  - Motorola S-Records with ASCII Transfer
  - Binary Image with Xmodem
  - Binary Image with Kermit
- Make the proper RS232 connection between the PC and the E1 INVERSE MULTIPLEXOR. A DB9 (terminal) connector is pinned out on the E1 INVERSE MULTIPLEXOR such that the use of a null modem is not necessary. DB9 to DB25 adapters may be needed depending upon the PC used.

Perform the following steps to download software:

Note: The following steps are recommended before initiating the download process:

- Disable all control lead dependencies (RTS, CTS, DCD, etc.)
- Enable XON/XOFF flow control.
- Disable DCD (Data Carrier Detect) aborts (especially on Procomm.

1. Copy the files off the floppy onto the hard drive on the PC. The names of the files will vary in accordance with the current software revision. The file name should look similar to the following: V10xxx.RAM.

2. Execute the emulation program on the PC and set it up match the E1 INVERSE MULTIPLEXOR comm port configuration. Default configuration for the E1 INVERSE MULTIPLEXOR is 9600

Baud, 8 bits, No parity, 2 stop bits and connect the PC serial port to the E1 INVERSE MULTIPLEXOR.

3. If the E1 INVERSE MULTIPLEXOR is set up for "Direct Terminal" configuration, typing a "Ctrl-L" will refresh the screen (Procomm). If it is set up for multidrop mode, see Section 4.1 on how to Log in to a unit.

4. Select the "Software Download" option from the System Utilities menu. On the System Utilities menu, scroll down to where it says "None" and hit the space bar until the desired mode appears and hit RETURN. Select "Confirm" and hit RETURN again to save the change. The E1 INVERSE MULTIPLEXOR is now ready to receive a file.

5. Enter the file transfer mode on the terminal emulation program and transfer the appropriate file. The file transfer will take approximately 30 minutes at 9600 baud.

6. Once the file has downloaded, the E1 INVERSE MULTIPLEXOR will take up to 30 seconds to reboot. This will be done automatically. If any communications errors were encountered, it may be necessary to perform this operation again.

4.3.6.2 Delete Entire Unit Configuration (revert to factory config)

WARNING: THIS COMMAND MAY ADVERSELY AFFECT SERVICE

Deleting the unit database causes the unit, and any other device's database within that unit, to be reset to the factory default setting. All device names will be erased, and all connections will be removed. The time and date, however, will remain the same and the node number will be set to "0.00.00".

As the warning states above, if there are any valid connections in the node, execution of this command may interrupt service.

To delete the entire Unit configuration, select DELETE ENTIRE UNIT CONFIGURATION from the Software Utilities

menu and press RETURN. Use the arrow keys to highlight the Desired Action field. Press the space bar until RESET ENTIRE UNIT DATABASE TO FACTORY DEFAULTS appears in the field. The change must then be confirmed. Move the highlight bar to CONFIRM and press RETURN. Deleting the entire Unit configuration puts all parameters back to their Factory Default Settings.

SOFTWARE DOWNLOAD MENU

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7:  01/01/90 05:55:07 MJ
SELECTED DEVICE ADDRESS:   7.00.000  NAME:

DELETE ENTIRE UNIT CONFIGURATION   Exit

DESIRED ACTION:  None



      DO YOU REALLY WANT TO DO THIS?  PLEASE CONFIRM:

                 Confirm
```

Figure 4.3.6.2

From the DELETE ENTIRE UNIT CONFIGURATION screen you may also perform the following functions:

- Delete RAM code and Revert to ROM code
- Restart Node Software

4.3.6.2.1 Delete RAM Code and Revert to ROM Code

To delete RAM code and revert to ROM code, select DELETE ENTIRE UNIT CONFIGURATION from the Software Utilities menu and press RETURN. Use the arrow keys to highlight the Desired Action field. Press the space bar until DELETE RAM CODE AND REVERT TO ROM CODE appears in the field. The change must then be confirmed. Move the highlight bar to CONFIRM and press the RETURN key.

Note: Revert to ROM code only when the downloaded software does *not* perform better than the ROM software. Reverting to ROM software will reset the unit.

4.3.6.2.2 Restart Node Software

Restart Node Software allows you to reset the unit without powering down.

To Restart Node Software, select DELETE ENTIRE UNIT CONFIGURATION from the Software Utilities menu and press ENTER. Use the arrow keys to highlight the Desired Action field. Press the space bar until RESTART NODE SOFTWARE appears in the field. The change must then be confirmed. Move the highlight bar to CONFIRM and press ENTER.

4.3.6.3 Login Configuration

This screen allows you to designate a NAME, PASSWORD and ACCESS PRIVILEGE LEVEL for up to eight users.

When the unit is shipped, the factory default is "no name" and "no password." Striking RETURN bypasses both of these parameters until the first name and password are entered.

To access the LOGIN CONFIGURATION menu, move the highlight bar to LOGIN CONFIGURATION in the Node Main Menu and press RETURN. Figure 4.3.6.3 is an example of the LOGIN CONFIGURATION MENU.

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
  Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
  Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7:  01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS:   7.00.000  NAME:

LOGIN CONFIGURATION    Exit       Confirm

   USER IDENTIFICATION          PASSWORD      ACCESS TYPE(S)
1)      Cole Porter             12CP          Full access
2)      Arthur Fiedler          Arty1         Maintenance
3)      Louie Armstrong         Satchmo       Provision
4)      Billie Holiday          LadyDay       No access
5)                                            No access
6)                                            No access
7)                                            No access
8)                                            No access
AUTOMATIC LOGOUT:  Off.  (Must use Logout to return to login prompt).
```

Figure 4.3.6.3

Note: Name and Password are "case sensitive."

Only those users who are granted "Full Access" class can view or change this screen.

The name and password can be any alphanumeric designation up to 16 characters in length. To enter a name or password, move the highlight bar to the appropriate line and column and type in the alphanumeric designation. Move the highlight bar to CONFIRM and press RETURN to confirm the changes.

To designate the access privileges that a particular user is to be allowed, move the highlight bar to that column of the menu on the user line and, using the space bar, toggle between the following options: FULL ACCESS, MAINTENANCE, PROVISION, PROVISION+MAINTENANCE, NO ACCESS and DISPLAY ONLY.

FULL ACCESS CLASS allows you to view any menu and perform any function. It is the only access class where you are allowed to view the LOGIN CONFIGURATION menu and assign names, passwords and access levels to users. This user is also the only one who can change the SNMP Configuration, Download Software or Delete Entire Node Configuration.

Note: At least one user must have full access to the unit.

MAINTENANCE designation allows you to clear the event history Log, clear statistics and initiate tests.

PROVISION access level allows you to configure the E1 INVERSE MULTIPLEXOR.

PROVISION+MAINTENANCE allows you to perform all functions allowed PROVISION and MAINTENANCE access described above.

DISPLAY ONLY allows you access to view only screens. This user is not allowed to make any changes or initiate tests.

NO ACCESS allows no access to the Menu Screens.

Note: If a user tries to access a screen or perform a function beyond the particular access level allowed, the following message will appear on the screen: **"Access denied - your account does not have this PRIVILEGE."**

AUTOMATIC LOGOUT allows you to turn off the Automatic Logoff feature of the E1 INVERSE MULTIPLEXOR. Highlight the item and, using the space bar, toggle between OFF and ON until your selection appears. Move the highlight to CONFIRM and press RETURN to confirm the change.

4.3.6.4 SNMP Configuration

Through the SNMP CONFIGURATION menu, you configure the Network Manager (NMS) port on the rear panel of the E1 INVERSE MULTIPLEXOR, setting various addresses and configurable items required for operation with an SNMP Network Manager. The E1 INVERSE MULTIPLEXOR utilizes SLIP protocol over the RS232 port to communicate with the SNMP management station.

To access the SNMP CONFIGURATION menu, move the highlight bar to SNMP CONFIGURATION in the CONFIGURATION Menu and hit RETURN.

These parameters can be set or changed for SNMP operation: NODE IP ADDRESS, NODE IP SUBNET MASK, TRAP IP ADDRESS, READ COMMUNITY STRING, WRITE COMMUNITY STRING, TRAP COMMUNITY STRING, SNMP BAUD RATE, BITS/PARITY, and STOP BITS.

Figure 4.3.6.4 is an example of the SNMP CONFIGURATION MENU and Table 4.3.6.4 describes the SNMP parameters.

SNMP CONFIGURATION MENU

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR   SR 2.00.00 NODE 7:  01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS:   7.00.000  NAME:

SNMP CONFIGURATION   Exit  Confirm
NMS SERIAL PORT (SLIP)
   UNIT IP ADDRESS:  0.000.000.000 UNIT IP SUBNET MASK: 0.000.000.000
   TRAP IP ADDRESS:  0.000.000.000

READ COMMUNITY STRING:    public
WRITE COMMUNITY STRING:   public
TRAP COMMUNITY STRING:    public

SNMP BAUD RATE:      9600
SNMP #BITS AND PARITY: 8 bits, No parity
SNMP STOP BITS:      2 bits
```

Figure 4.3.6.4

SNMP CONFIGURATION OPTIONS

1) UNIT IP ADDRESS - The UNIT IP ADDRESS is a 32-bit quantity that uniquely identifies the node in the SNMP network. The SNMP manager to access information from the node uses this address. To set or change the UNIT IP ADDRESS, move the highlight bar to UNIT IP ADDRESS and enter a 32-bit quantity. Press RETURN.

2) UNIT IP SUBNET MASK - The UNIT IP SUBNET MASK is a 32-bit quantity that identifies which bits in the IP address identify the physical network. To set or change the UNIT SUBNET MASK, move the highlight bar to UNIT SUBNET MASK and enter a 32-bit quantity. Press RETURN when finished.

3) TRAP IP ADDRESS - The TRAP IP ADDRESS is a 32-bit quantity that identifies the SNMP manager, the address to which the node sends any event messages. To set or change the TRAP IP ADDRESS, move the highlight bar to TRAP IP ADDRESS and enter a 32-bit quantity. Press RETURN when finished.

4) READ COMMUNITY STRING - This alphanumerical identifier, up to 32 characters in length, identifies a portion of the SNMP network that is able to read messages from the node. To set or change the READ COMMUNITY STRING, move the highlight bar to READ COMMUNITY STRING and enter an alphanumerical identifier, up to 32 characters in length. Press RETURN when finished.

5) WRITE COMMUNITY STRING - This alphanumerical identifier, up to 32 characters in length, identifies a portion of the SNMP network that can write messages to the node. To set or change the WRITE COMMUNITY STRING, move the highlight bar to WRITE COMMUNITY STRING and enter an alphanumerical identifier, up to 32 characters in length. Press RETURN when finished.

6) TRAP COMMUNITY STRING - This alphanumerical identifier, up to 32 characters in length, identifies a portion of the SNMP network that is able to receive event messages from the node. To set or change the TRAP COMMUNITY STRING, move the highlight bar to TRAP COMMUNITY STRING and enter an alphanumerical identifier. Press RETURN when finished.

7) SNMP BAUD RATE - This feature selects the SNMP port's baud rate. To set or change the SNMP port baud rate, move the highlight bar to SNMP BAUD RATE and hit the Space Bar to toggle between the options until the desired speed appears. The options are: 300, 600, 1200, 2400, 4800, 9600, 19,200 and 38,400.

Table 4.3.6.4

8) SNMP BITS & PARITY- This feature selects the SNMP port's parity. To set or change the SNMP PARITY, move the highlight bar to SNMP BITS & PARITY and hit the Space Bar to toggle between the options until the desired parity appears. The options are: NONE, ODD and EVEN. BITS is always set at 8.

9) SNMP STOP BITS - This feature selects the SNMP manager stop bit requirement. Move the highlight bar to SNMP STOP BITS and hit the Space Bar to toggle between the options, 1, 1.5 or 2.

Table 4.3.6.4 (Continued)

To update the SNMP database with all the changes made, move the highlight bar to CONFIRM and press RETURN. Changes can be confirmed after each change, or, after all changes have been made.

Note: If the SNMP baud rate is changed, it is necessary to change the baud rate at the connection to the SNMP manager before continuing. The same is true for modifying the parity and/or number of stop bits.

4.3.6.5 Save Configuration

This option allows you to manually backup the database to EEPROM at any time To SAVE CONFIGURATION and backup the database to EEPROM, highlight the SAVE CONFIGURATION in the SYSTEM UTILITIES menu and press RETURN.

4.3.7 Tests

The TESTS Menu allows you to initiate or stop four types of loopbacks for each individual network port: DTE/NETWORK LOOPBACK for the DTE, PAYLOAD LOOPBACK, LINE LOOPBACK, and LOCAL LOOPBACK.

To access the TESTS menu, move the highlight bar to TESTS in the E1 INVERSE MULTIPLEXOR Main Menu and hit RETURN.

Figure 4.3.7 is an example of the TESTS menu. The individual loopbacks and operation of the menu are described below in the text following the menu

TESTS MENU

```
Major 01/01/90 04:58:17 Unit:   0   NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:   0   NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7: 01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS: 7.00.000  NAME:

DTE AND NETWORK TESTS   Exit  Confirm

DTE TESTS:
 DTE/NETWORK LOOPBACK:  Off

NETWORK TESTS:

 PORT#      PAYLOAD LOOPBACK   LINE LOOPBACK   LOCAL LOOPBACK
   1              Off              Off             Off
   2              Off              Off             Off
   3              Off              Off             Off
   4              Off              Off             Off
   5              Off              Off             Off
   6              Off              Off             Off
   7              Off              Off             Off
   8              Off              Off             Off
```

Figure 4.3.7

To initiate a test, use the CURSOR keys to move the highlight bar to DTE/Network Loopback or a Payload or Line Loopback on a selected port. Use the space bar to toggle between OFF and ON until ON appears in the display. When that selection appears in the display, move the highlight bar to CONFIRM and press RETURN. To cancel a test that is running, move the highlight bar to DTE/Network Loopback. Use the space bar to toggle between the options until OFF appears in the display. Move the highlight bar to CONFIRM and press RETURN.

DTE/NETWORK LOOPBACK

The DTE/NETWORK LOOPBACK is a bi-directional loopback that loops back at the DTE interface. The received DTE data is routed back towards the DTE, and the data from the network is routed back towards the network.

PAYLOAD LOOPBACK

The payload loopback is used to verify proper E1 network operation of the E1 INVERSE MULTIPLEXOR and the E1 network. The loopback takes place in front of a particular E1 Framer (1 through 8).

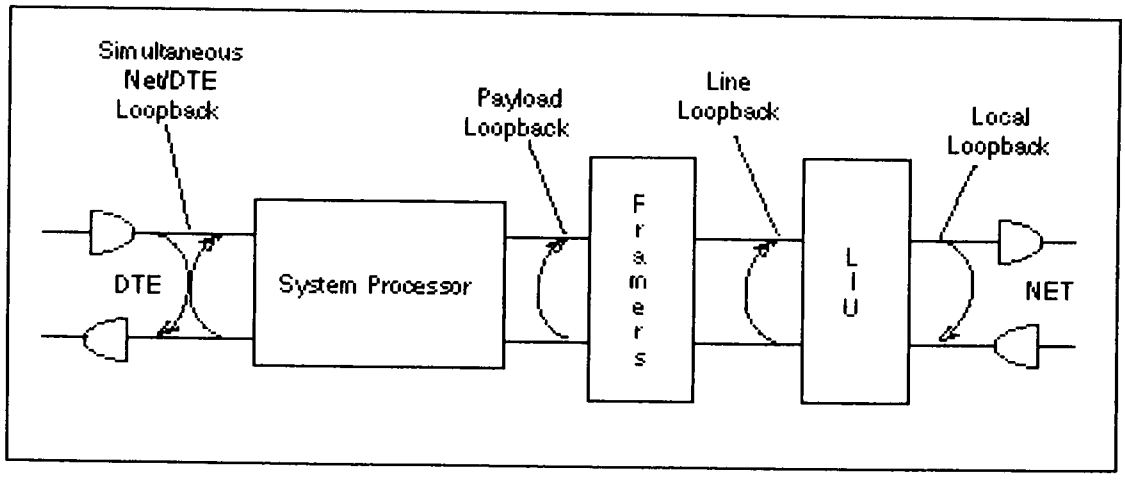
LINE LOOPBACK

The line loopback is used to verify the operation of the E1 Line Interface Unit (LIU (1 through 8)). The loopback takes place at the LIU.

LOCAL LOOPBACK

The local loopback is used to verify operation from the DTE to the network, with the exception of the E1 line interface. Data is looped from the DTE back towards the DTE at the LIU.

WARNING: THE LOOPBACK TESTS *WILL* INTERRUPT TRAFFIC TO THE E1 INVERSE MULTIPLEXOR.



4.3.8 Manual Network Restoration

The E1 INVERSE MULTIPLEXOR's E1 ports are normally set to auto restore. However, you may choose to individually restore E1 networks after they fail, through the Manual Network Restoration menu.

Note: Manual restore will only work under the following conditions:

1. If the port has previously been set to "Use w/manual restore," in the Network Configuration screen.

2. If the E1 is *not* in alarm. If the E1 is in alarm, you must first clear the alarm statistics in the Statistics menu. To learn how to clear alarm statistics, see Section 4.3.3.

3. The line has been removed due to excessive delay.

To access the MANUAL NETWORK RESTORATION menu (Figure 4.3.8), move the highlight bar to MANUAL NETWORK RESTORATION in the CONFIGURATION Menu and hit RETURN.

MANUAL NETWORK RESTORATION MENU

```
Major 01/01/90 04:58:17 Unit:  0  NET : 2 (114)
   Network 15 Minute UAS Major Threshold Exceeded
Major 01/01/90 04:58:17 Unit:  0  NET : 1 (114)
   Network 15 Minute UAS Major Threshold Exceeded
BLACK BOX E1 INVERSE MULTIPLEXOR  SR 2.00.00 NODE 7: 01/01/90 05:55:07  MJ
SELECTED DEVICE ADDRESS:  7.00.000  NAME:
You must confirm to save changes.
MANUAL NETWORK RESTORATION   Exit  Confirm

PORT# RESTORE
1     No Change
2     No Change
3     No Change
4     No Change
5     No Change
6     No Change
7     No Change
8     No Change
```

Figure 4.3.8

To manually restore an E1 port (network), use the up and down arrow keys to highlight the line item of the corresponding network port number. To toggle from No Change to Restore, press the space bar. When Restore is highlighted across from the appropriate port, press RETURN. To toggle from No Change to Restore, press RETURN. Select Confirm and press RETURN to save the changes.

4.3.9 Logout

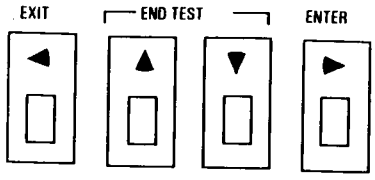
This allows you to manually logoff the unit, instead of waiting for the provisioned automatic logoff time for the unit to logoff automatically. Highlighting LOGOUT and pressing RETURN logs you off the system.

5.1.3 Front Panel LED's

Table 5.1.3 describes each of the LED's on the MTU3802E front panel.

INDICATION	DEFINITION
• **TEST (Test in Progress LED)**	
Off	No tests are in progress
Solid Red	A test condition exists
DATA PORT LED's	
• **TD (Data DTE Activity LED, represents pulses from DTE)**	
Green	Pulses are being detected
Off	No pulses are being detected
• **RD (Data DTE Activity LED, represents pulses to DTE)**	
Green	Pulses are being detected
Off	No Pulses are being detected
• **RTS (Request to send indicator, from DTE)**	
Yellow	RTS from DTE is active
Off	RTS has been removed
• **CTS (Clear to send indicator, to DTE)**	
Yellow	CTS to DTE is active
Off	CTS has been removed indicating that the MTU3802E Encore is not sending valid data
• **DTR (Data terminal ready indicator)**	
Yellow	DTR from DTE is active
Off	DTR from DTE is inactive
• **DATA/TEST (Indicates the port is in a normal or test mode)**	
The DATA/TEST LED is a bicolor LED. It is off only when the port is not allocated bandwidth. Otherwise it is RED (abnormal) or GREEN (normal). It is connected to the TEST lead going from the MTU3802E to the DTE, so both the LED and the lead carry the same data.	
NETWORK LED's (E1-1 through E1-8)	
Red	Network is in Red Alarm.
Green	Network is Active and running.
Flashing Green	The network is ready but there is no activity currently taking place.
Yellow	Network is in Loopback
Flashing Yellow	Receiving yellow/AIS alarm
Off	Network is inactive

Table 5.1.3



The front panel buttons are also used for Alarm Cutout. When an alarm condition occurs the External Alarm Output contacts close. This typically actuates external alarm indicators such as bells or alarm lights. Pressing any of the four front panel buttons clears the condition and turns off the external bell or light.

EXIT Button

The **EXIT** button is used to cancel operations or exit to a higher level menu loop from a sub-menu loop. This button doubles as a **LEFT ARROW** button in a few situations.

The **UP ARROW** button is used to move to the previous menu item or configuration option.

The **DOWN ARROW** button is used to move to the next menu item or configuration option.

Pressing both the **UP ARROW** and the **DOWN ARROW** keys simultaneously (the End Test combination), terminates all active tests on the local unit and brings the front panel menu to the Test Menu showing the test that has just been terminated. If no tests are active, pressing the End Test combination has no effect.

RETURN BUTTON

The **RETURN** button is used to select a sub-menu loop or configuration option. This button doubles as the **RIGHT ARROW** button in a few situations.

5.1.3 Front Panel LED's

Table 5.1.3 describes each of the LED's on the E1 INVERSE MULTIPLEXOR front panel.

INDICATION	DEFINITION
• **TEST (Test in Progress LED)**	
Off	No tests are in progress
Solid Red	A test condition exists
DATA PORT LED's	
• **TD (Data DTE Activity LED, represents pulses from DTE)**	
Green	Pulses are being detected
Off	No pulses are being detected
• **RD (Data DTE Activity LED, represents pulses to DTE)**	
Green	Pulses are being detected
Off	No Pulses are being detected
• **RTS (Request to send indicator, from DTE)**	
Yellow	RTS from DTE is active
Off	RTS has been removed
• **CTS (Clear to send indicator, to DTE)**	
Yellow	CTS to DTE is active
Off	CTS has been removed indicating that the E1 INVERSE Encore is not MULTIPLEXOR sending valid data
• **DTR (Data terminal ready indicator)**	
Yellow	DTR from DTE is active
Off	DTR from DTE is inactive
• **DATA/TEST (Indicates the port is in a normal or test mode)**	
The DATA/TEST LED is a bicolor LED. It is off only when the port is not allocated bandwidth. Otherwise it is RED (abnormal) or GREEN (normal). It is connected to the TEST lead going from the E1 INVERSE MULTIPLEXOR to the DTE, so both the LED and the lead carry the same data.	
NETWORK LED's (E1-1 through E1-8)	
Red	Network is in Red Alarm.
Green	Network is Active and running.
Flashing Green	The network is ready but there is no activity currently taking place.
Yellow	Network is in Loopback
Flashing Yellow	Receiving yellow/AIS alarm
Off	Network is inactive

Table 5.1.3

UNIT LED's

The following LED's display the status of the E1 INVERSE MULTIPLEXOR and indicate whether the condition is a Major or Minor alarm:

STATUS (Green)	Normal
MAJOR (Red)	Major alarm exists
MINOR (Yellow)	Minor alarm exists

Table 5.1.3 (Continued)

5.1.4 Access Levels and Protected Mode

Front panel access can be limited by placing the E1 INVERSE MULTIPLEXOR in the Protected Mode. In this mode, you can use the Front Panel User Interface only to monitor the status of the unit and its Error Counters and view its configuration. The following operations cannot be performed through the Front Panel User Interface when the unit is in Protect Mode:

- Clearing the Error Counters
- Changing the unit configuration
- Starting or terminating diagnostic tests

The unit can be put into and out of the Protected Mode through the Terminal User Interface but not from the Front Panel User Interface. To place the unit in protect mode, toggle the Front Panel field to Off, in the Unit Configuration menu. Refer to section 4.3.5.1.

When a user needs to take a unit out of Protected Mode but a terminal is not available, the following procedure can be used:

1. Turn off the power to the unit.
2. Turn the power to the unit back on.

Note: The unit automatically performs a self-test every time the unit is powered up.

This procedure takes the unit out of the Protected Mode (and clears any password that may have been programmed into the unit). To allow you to perform this procedure when the unit is in protected mode, the Protected Mode is ignored

in the first sixty seconds after powering the unit up. When in Protected Mode, the Test Menu does not appear in the Main Menu as a choice.

5.1.5 Power Up and Reset

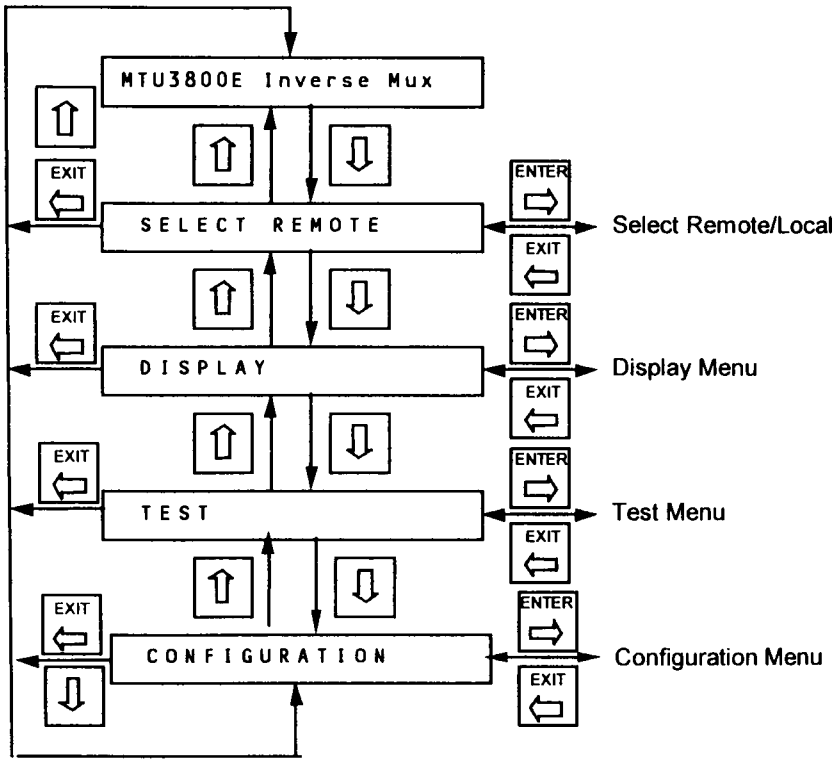
During power up initialisation, the unit performs self-test and displays a self-test message. Payload service resumes at the completion of Self-Test. When the Self-Test message is removed the default message **E1 INVERSE MULTIPLEXOR** appears on the display.

5.2 Top Menu

The menu system in the E1 INVERSE MULTIPLEXOR is consistent with other Black Box Products. Therefore a user familiar with an existing product can easily operate the E1 INVERSE MULTIPLEXOR. An example of a menu tree is shown below:

The Top Menu loop consists of five items: (1) E1 INVERSE MULTIPLEXOR designation, (2) Select Remote/Local, (3) Monitor Menu, (4) Test Menu, and (5) Configuration Menu.

E1 INVERSE MULTIPLEXOR TOP LEVEL MENU



This menu loop may also be entered at any time by pressing the **EXIT** button to go up the menu hierarchy until reaching the Top Menu. Continuing to press the **EXIT** button while in the Top Menu brings the unit to the default display **E1 INVERSE MULTIPLEXOR INVERSE MULTIPLEXER** scrolling across the screen. Pressing the up and down arrows get you into the menu loop. A menu is selected by pressing the **RETURN** button when the menu name appears on the display.

The Display Menu is used for displaying Node Status, DTE Status and Status of each installed E1 network. The 24 hour line data is only available with the terminal interface or through the Network Manager. The data in the Display menu is a subset of the parameters that are available on the Alarm and Status Menu through the terminal interface or the Network Manager.

The Test Menu is used for DTE and Network loopbacks. The E1 INVERSE MULTIPLEXOR does not allow performing tests on the remote unit through the front panel user interface. This feature is only available with the terminal interface.

The Configuration Menu is used to view and change the unit's configuration parameters, date and time, network interface parameters and DTE interface parameters.

Both the Monitor and Configuration Menus are also able to access the remote unit. Remote monitoring and configuration are only available when there is an Application Data Link (ADL) channel to the remote unit using the National Bits. When you request status or configuration information from the remote unit, the local unit sends a request to the remote unit over ADL and waits for a reply. While waiting for the reply, the local unit displays the message:
PLEASE WAIT...
On the front panel. If there is no reply from the remote unit within 10 seconds, the display of the local unit will show:
REMOTE NOT AVAILABLE
Otherwise, the information reported by the remote unit will be displayed.

5.2.1 Select Remote/Select Local

Striking the DOWN ARROW cursor key when the default message is in the display brings the message SELECT REMOTE or R, SELECT LOCAL to the display. This allows you to log onto either the local or remote E1 INVERSE MULTIPLEXOR.

When logged onto the local unit, the display will read SELECT REMOTE. When logged onto the remote unit, the display will read R,SELECT LOCAL. To change the E1 INVERSE MULTIPLEXOR being monitored and controlled, press RETURN. The message in the display will start "blinking." Press

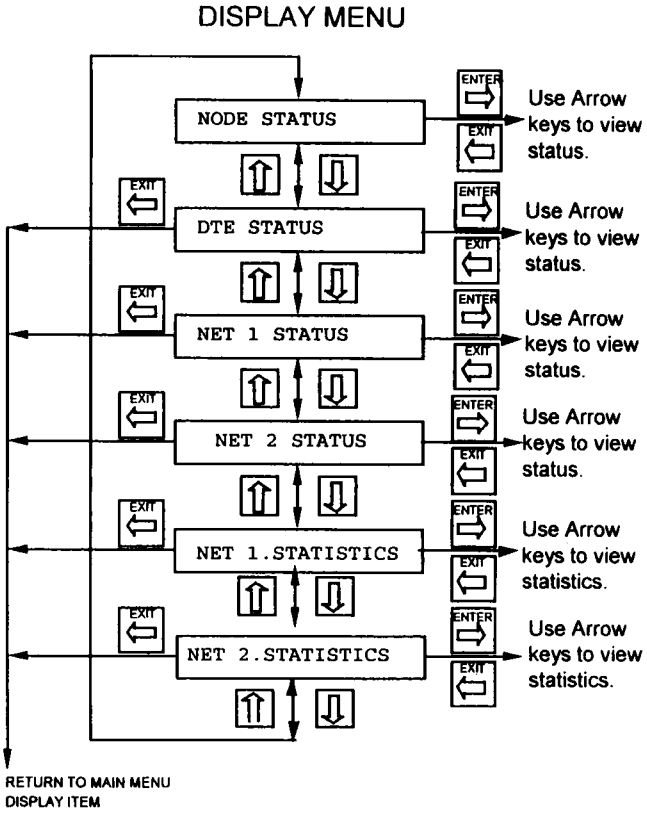
RETURN once again to change from SELECT REMOTE to R,SELECT LOCAL or visa versa.

Note: When logged onto the remote unit, an "R," will appear as the first two characters in the display. For example:

R,NEE1 STATISTICS

5.3 Display Menu

The DISPLAY Menu is used for displaying Node status, DTE status and the status of each installed E1 line. It is also used to clear the error counters (Clearing the error counters can only be done when the E1 INVERSE MULTIPLEXOR is not in the Protected Mode).



Note: Only those E1 circuits physically installed (from two to eight) will have status lines in this menu.

5.3.1 Node (Common Equipment) Status

This display shows the status of the unit. NODE STATUS is accessed from the DISPLAY Menu by pressing RETURN when NODE STATUS appears in the display.

If one or more errors are detected, one or more of the Common Equipment Alarm and Status messages will appear. Use the UP and DOWN arrows to view the list of error messages.

A list of the possible Common Equipment Alarm and Status messages is given on page 20.

5.3.2 DTE Status

The next display shows the status of the DTE data port. The Menu is accessed by pressing RETURN when DTE STATUS appears in the display.

If errors are detected, one or more of the following messages will appear. Use the DOWN and UP arrow buttons to view further messages.

See page 21 of this Users Manual for a list of those Common Equipment Alarm and Status items that could appear in this menu.

5.3.3 NET (1-8) Status

The next eight displays show the status of the E1 Networks (NET 1 STATUS through NET 8 STATUS if all are installed). Use the Up and Down arrows to select the E1 Network to be monitored and hit the RETURN button. Use the Up and Down arrow to view further status items relating to the same E1 circuit.

See page 21 of this Users Manual for a list of those Common Equipment Alarm and Status items that could appear.

5.3.4 NET (1 through 8) Statistics

The Menu provides you with the various performance statistics of the individual E1 circuits. These performance statistics are listed and defined in Table 5.3.3. To view the statistics of a particular E1 circuit, press RETURN when the display reads **NET N.STATISTICS**, where "N" is the number of the desired E1 network port.

The following table lists and explains the information that can be viewed from the NET Statistics menu, for each performance statistic:

Front Panel Display	Explanation
NET N XXX	XXX = the performance statistic N = the E1 network port (1 through 8)
SEC YYY VALID. Z	YYY = the number of seconds into the current interval Z = the number of valid 15 minute intervals since the error counters were reset (0 through 96)
CUR. X	X = the current interval
TOTL. X	X = the number of errors in the current interval

Pressing the down arrow from any of these displays will step you through the last 96 15-minute intervals while displaying the number of errors in each of the intervals.

The following paragraphs give an example of the Net Statistics menu hierarchy, using the Code Violation (CV) performance statistic.

From the Net Statistics menu press RETURN. When you see **NET N CV**, press RETURN again. The first display will read **SEC. 455 VALID.8,** showing the number of seconds in the current interval and the number of valid 15 minute intervals since the error counters were last reset.

Striking the Down Arrow button from this point in the menu will show the number of Code Violations in the current interval **(CUR 4)**. Striking the Down Arrow once again will display the total number of errors since the registers were last reset **(TOTL. 8)**

Using the Down Arrow from here will cycle through the last 96 15-minute intervals (or however many intervals exist since the counters were last reset) displaying the number of Code Violations in each interval, starting with the most recent, i.e., **1 = 0.**

Following, in the order they appear, are the NET STATISTICS items.

BPV	This display provides the number of Bipolar Violations (BPVs) that have occurred during the accumulation period. A total of 15430 BPVs in a 10 second sliding window (approximately 10-3) will create a Major Alarm and 916 BPVs in a 600 second sliding window (approximately 10-6) will create a Minor Alarm.
CV	A CODE VIOLATION (CV) is a count of frame synchronisation bit errors (FE) in the frame format, or a count of the CRC-4 errors in the frame format occurring during the accumulation period.
FE	A FRAME ERROR is declared when two out of four consecutive framing bits are in error. Typically, a FE indication will be accompanied by a significant number of payload data bit errors.
ES	An ERRORED SECOND (ES) is the count of one-second intervals containing one or more CRC-4 errors, or one or more CS events, or one or more SEF events. SEF is severely errored framing in a non-LOS and non-AIS condition.
SES	Severely Errored Seconds are defined as a count of one-second intervals with 320 or more CRC-6 errors, or an SEF defect.
UAS	This is a count of one-second intervals in which the E1 path has been unavailable. The E1 path is determined to be unavailable from the onset of 10 contiguous SESs, or the onset of the condition leading to a failure.

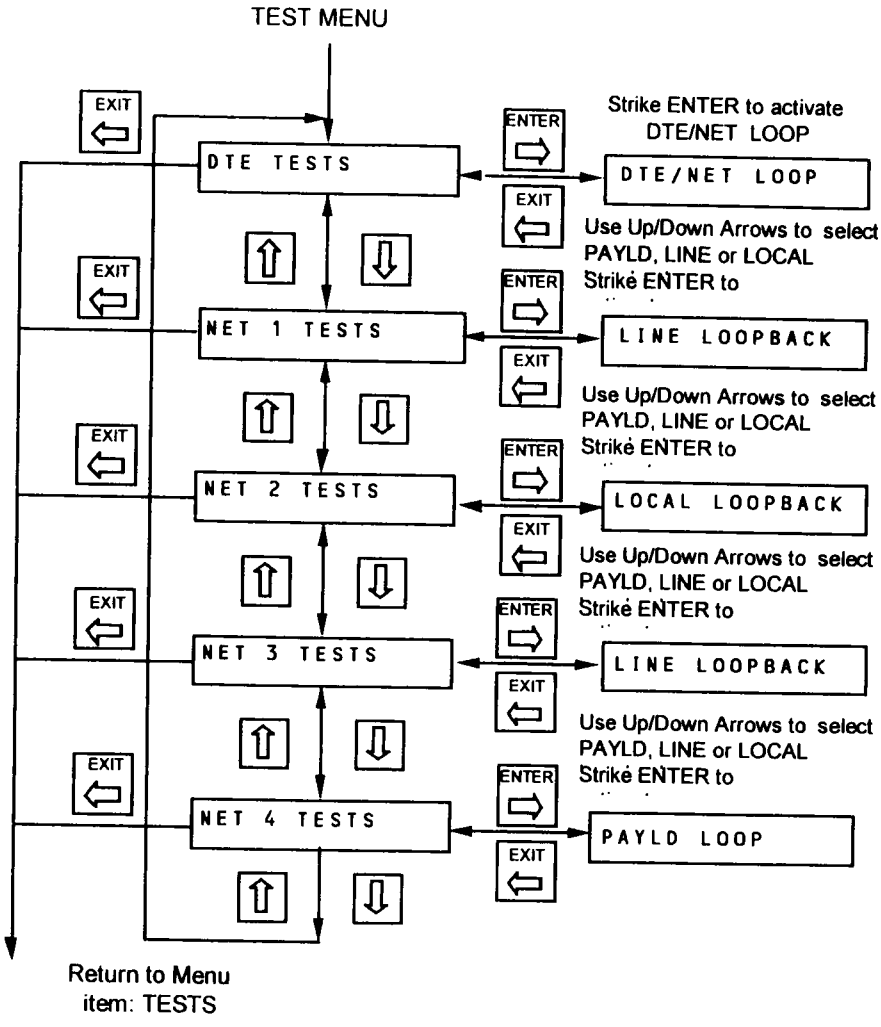
Table 5.3.3

5.4 Test Menu

The Test Menu is used to activate network loopbacks and DTE loopbacks. The Test Menu is only available when the unit is not in the Protected Mode. In Protected Mode, this menu is not included in the Top Menu loop. Tests are performed by selecting a test from the Test Menu or one of the Test sub-menus and pressing **RETURN**. To end all tests, press the **END TEST** key combination (UP and DOWN arrow simultaneously). When a test is selected that could apply to an E1 port, you are asked to specify to which fraction the test should apply. Only the local unit can be tested from the front panel. Testing the remote unit is limited to placing it in the Network Loopback Test.

The TEST Menu is broken down into two types of sub-menus: DTE TESTS (one menu) and NETWORK TESTS (one for each network interface installed). Through these submenus, you initiate and stop various tests and loopbacks.

The TEST Menu is accessed from the Main Menu by pressing RETURN when TEST appears in the display. Striking the DOWN or UP ARROW toggles through the three sub-menus. The submenus are accessed by pressing RETURN when the appropriate men appears in the display.



Note: A menu item will appear only for those E1 network interfaces installed.

5.4.1 DTE Tests

Only one loopback can be initiated through the DTE TESTS Menu, a bi-directional DTE/NET LOOPBACK.

To access the DTE TESTS Menu from the TEST Menu, press RETURN when DTE TESTS appears in the display.

When in the DTE TEST Menu, pressing the RETURN accesses the DTE/NET LOOPBACK.

5.4.1.1 DTE/NET Loopback

The DTE/NETWORK LOOPBACK is a bi-directional loopback that loops back at the DTE interface. The received DTE data is routed back towards the DTE, and the data from the network is routed back towards the network.

To initiate a DTE/NET LOOP from the E1 INVERSE MULTIPLEXOR front panel, press RETURN when DTE/NET LOOP appears in the display.

When a DTE/DTE LOOP is in operation, a "plus sign" will appear after the words DTE/NET LOOP in the display.

DTE/NET LOOP +

To end the loopback, press RETURN again while still in the DTE/NET LOOPBACK menu.

Note: To cancel a test or loopback from any place in the Menu by pressing the UP ARROW and DOWN ARROW at the same time. However, this will cancel all tests and loopbacks currently in progress.

Only one test can be performed at a time. To start a new test the previous test must first be terminated.

While a test is active and you are in the Test Menu, the **UP ARROW** and the **DOWN ARROW** keys are disabled and you can only view the name of the test that is currently active. You can use the **EXIT** key to go out of the Test Menu and then, using the other keys, go into the Monitor or the Configuration Menus to view the performance information or

view and change the configuration of the unit while the test is in progress.

While the test is active, the front panel TEST LED is on, reminding you that the unit is out of normal service condition. The test is terminated by pressing the END TEST key combination at any point in the menus. When this combination is pressed, the currently active test is cancelled and the front panel display returns to the Test Menu to the test that was just terminated.

5.4.2 Network Tests (1 through 8)

Three NETWORK TESTS can be performed through this Menu, a PAYLOAD (PAYLD) LOOPBACK, a LINE LOOPBACK and a LOCAL LOOPBACK. To access NETWORK TESTS Menu from the TEST Menu, press RETURN when NETWORK TESTS menu for a particular E1 circuit (NET 1 through NET 8) appears in the display.

When in the particular NETWORK TEST Menu, pressing the UP ARROW or DOWN ARROW toggles between the three options, PAYLD, LINE and LOCAL LOOPBACK.

5.4.2.1 Payload Loopback

The payload loopback is used to verify proper E1 network operation of the E1 INVERSE MULTIPLEXOR and the E1 network, per AT&T 54016. The loopback takes place in front of a particular E1 Framer (1 through 8).

To initiate a PAYLOAD LOOPBACK from the E1 INVERSE MULTIPLEXOR, press RETURN when PAYLD LOOPBACK appears in the display for the E1 (NET 1 through NET 8) line to be looped back.

When a PAYLOAD LOOPBACK is in operation, a "plus sign" will appear after the words PAYLD LOOPBACK in the display.

PAYLD LOOPBACK +

When the loopback is terminated, the "plus sign" disappears.

To end the loopback, press RETURN again while still in the PAYLD LOOPBACK menu.

5.4.2.2 Line Loopback

The line loopback is used to verify the operation of the E1 Line Interface Unit (LIU (1 through 8)). The loopback takes place at the LIU.

To initiate a LINE LOOPBACK from the E1 INVERSE MULTIPLEXOR, press RETURN when LINE LOOPBACK appears in the display.
When a LINE LOOPBACK is in operation, a "plus sign" will appear after the words LINE LOOPBACK in the display as shown below:

LINE LOOPBACK +

To end the loopback, press RETURN again while still in the LINE LOOPBACK menu. When the loopback is terminated, the "plus sign" disappears.

5.4.2.3 Local Loopback

The local loopback is used to verify operation from the DTE to the network, with the exception of the E1 line interface. Data is looped from the DTE back towards the DTE at the LIU.

To initiate a LOCAL LOOPBACK from the E1 INVERSE MULTIPLEXOR, press RETURN when LOCAL LOOPBACK appears in the display.
When a LOCAL LOOPBACK is in operation, a "plus sign" will appear after the words LOCAL LOOPBACK in the display as shown below:

LOCAL LOOPBACK +

To end the loopback, press RETURN again while still in the LOCAL LOOPBACK menu. When the loopback is terminated, the "plus sign" disappears.

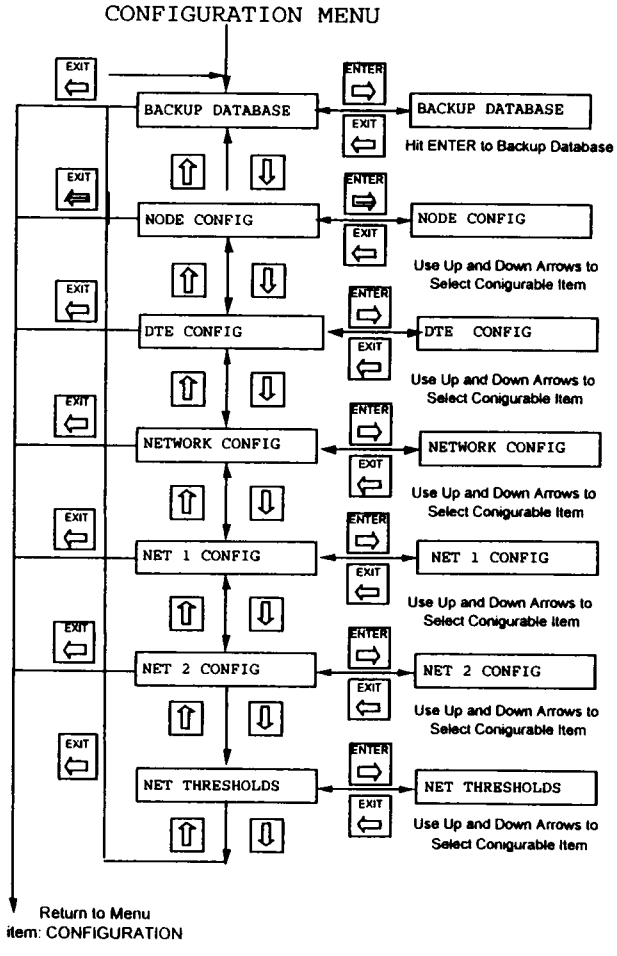
Note: You can cancel a test or loopback from any place in the Menu by pressing the UP ARROW and DOWN ARROW at the same time. However, this will cancel all tests and loopbacks currently in progress.

5.5 Configuration Menu

The Configuration Menu is used to Backup the database and to view and change the unit and comm port configuration parameters, network interface parameters and DTE interface parameters. The remote unit configuration may also be viewed and changed.

The E1 INVERSE MULTIPLEXOR configuration can only be changed when the unit is not in the Protected Mode. In Protected Mode the configuration can only be viewed but not changed.

To use the Configuration Menu, select the configuration submenu from a hierarchical list and press RETURN. Proceed through the hierarchical menu structure to view or change the chosen parameters. When you are done using the Configuration Menu, the **EXIT** key is used.



The **NODE CONFIG** menu is used to set the unit's ID, date,

The **NODE CONFIG** menu is used to set the unit's ID, date, time, and communications port. It also shows you the Hardware and Software versions.

The **BACKUP DATABASE** is used to manually backup the database to EEPROM.

The **DTE CONFIG** Menus is used to set the line mode for the DTE DATA port. It is also used to define whether the DTE signal is defined missing when the DTR line, the RTS line is not asserted or neither. Other options include V.35/RS449/X.21, HSSI and clocking options (SCTE/SCT NORMAL or SCT INVERT).

The **NETWORK CONFIG** menu is used to set the operating mode (Inverse Mux or Single Line DSU) and clocking options of that are common to all E1 Network Ports.

The **NET *N* CONFIG** menu is used to set various configurable items that are unique to each individual E1 Network Port, including FRAMING FORMAT, LINE CODE, ALARM REPORTING, AUTO-RESTORE and EQUALIZATION.

The **NET THRESHOLDS** Menu allows you to enable/disable and set the values of the various Network Alarm Thresholds which, when exceeded, will cause the E1 lines to automatically be taken out of service.

5.5.1 Node Configuration

The NODE CONFIG Menu allows you to configure the NODE ID, NODE NUMBER, DATE & TIME and *NODE COMM PORT (Terminal). It also displays the NODE HW REV and the SOFTWARE REV, which are set by the factory

Note: Only the terminal comm port can be set through the front panel. The network management port is set through the ASCII terminal.

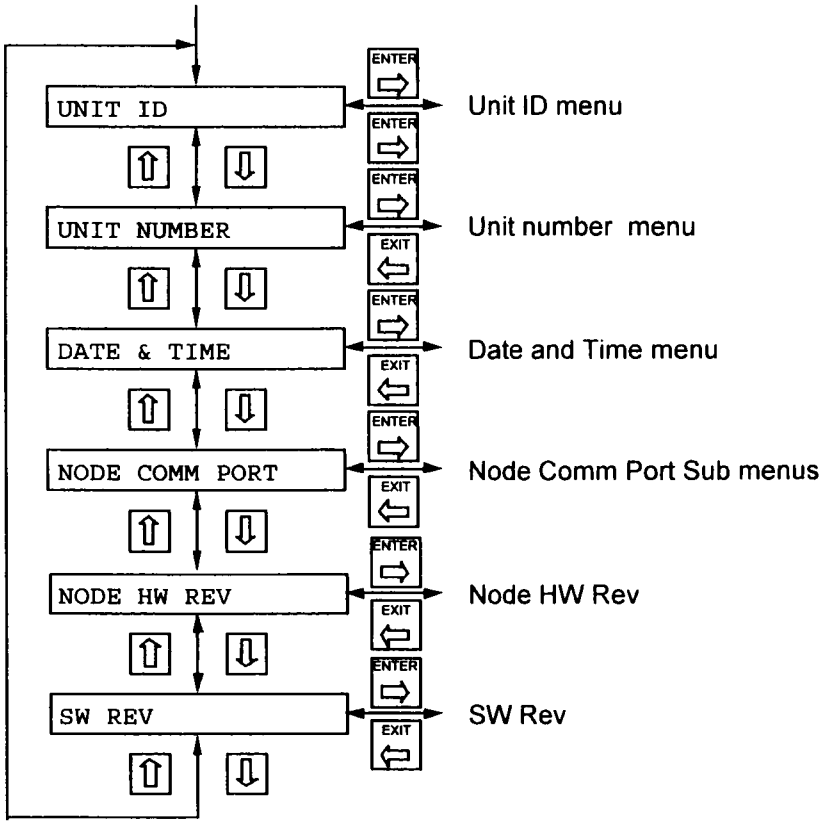
The NODE CONFIG menu is accessed through the CONFIGURATION Main Menu by pressing RETURN when NODE CONFIG appears on the display. Striking the DOWN ARROW or UP ARROW toggles through the sub-menus.

Striking RETURN when a selection is in the display allows you to view the present configuration. Striking RETURN again will cause the entry to start "blinking" and allows you to change the selection if desired.

To change the selection, use the DOWN ARROW and UP ARROW keys to toggle through the choices. Striking RETURN selects the option that's in the display as the configuration.

In the case of changing names and numbers, only one number or letter will "blink" at a time. Only that number or letter can be changed. After each letter or number is selected, press RETURN to confirm each change. The next letter or number space will then begin "blinking" and be available for change. To abort any change, hit EXIT before you press RETURN.

NODE CONFIGURATION Menu



The Node Configuration Menu is used to configure various parameters of the E1 INVERSE MULTIPLEXOR, including:

UNIT ID - The UNIT ID is an alpha-numeric designation up to 16 characters in length. The unit is shipped without a UNIT ID.

To access UNIT ID from the NODE CONFIGURATION Menu, press RETURN when UNIT ID appears in the display. Press RETURN again and the first space or letter will begin "blinking." Use the UP and DOWN ARROWS to select the desired letter or number. Press RETURN again to confirm the selection, and move on to the next letter or number.

UNIT NUMBER - The UNIT NUMBER is a four-digit number. The unit is shipped from the factory without a number. **Note:** Each unit must be set to a different number, to allow remote communication and daisy chaining of multiple units. For example, if the remote unit is set to the same number as the local unit you will not be able to access the remote unit.

To access UNIT NUMBER, press RETURN when UNIT NUMBER appears in the display. To enter or change the UNIT NUMBER, follow the same steps as in entering the UNIT ID (Section 6.4.6.1.1).

DATE & TIME - The DATE & TIME are set at the factory, on Pacific Region Time. They appear in the display as:
JUNE O7, 1995 09:44:49
The DATE & TIME can be changed in the same manner as described in Section 6.4.5.1.

NODE COMM PORT - The following communications port parameters can be set through this display: BAUD RATE, PARITY, DATA BITS, STOP BITS, FLOW CONTROL and MULTIDROP MODE.

BAUD RATE - The BAUD RATE menu is accessed through the NODE COMM PORT menu. When the menu is first displayed, it will show the present BAUD RATE: 38,400, 19,200, 9600, 4800, 2400, 1200, 600 or 300.

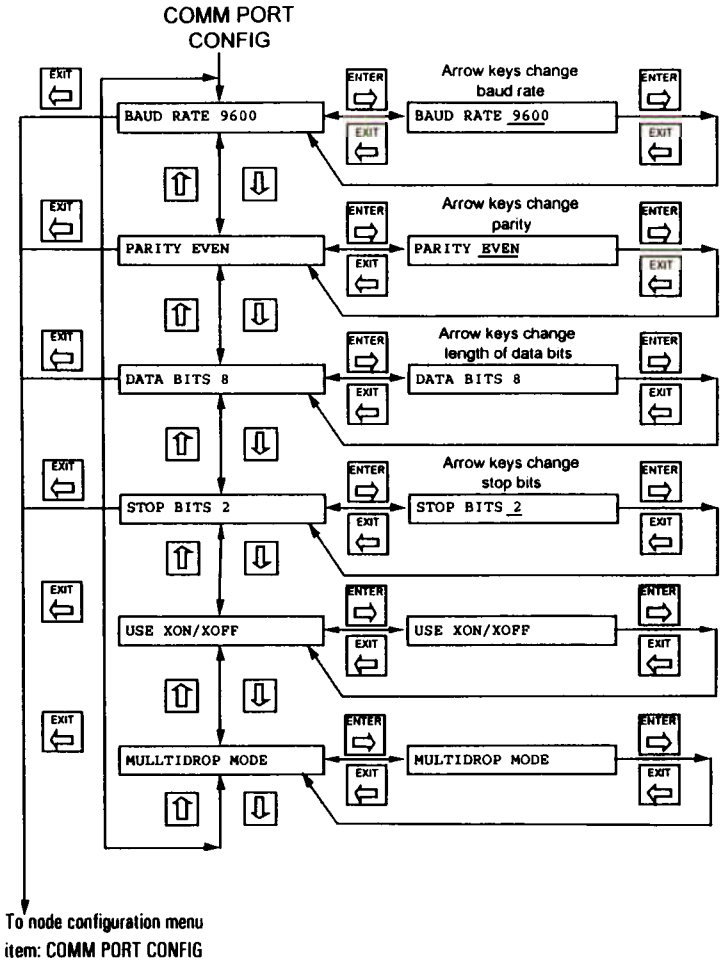
PARITY - The PARITY menu is accessed through the NODE COMM PORT menu. When the menu is first displayed, it will show the present PARITY; either NO, ODD or EVEN.

DATA BITS - The DATA BITS menu is accessed through the NODE COMM PORT menu. When the menu is first displayed, it will show the present DATA BITS configuration; either 7 or 8.

STOP BITS - The STOP BITS menu is accessed through the NODE COMM PORT menu. When the menu is first displayed, it will show the present STOP BITS configuration; either 1, 1.5 or 2.

LOCAL TERMINAL XON/XOFF - With the Flow Control feature ON, the terminal can request that the DT quit sending data when its buffers are full. The choices are USE or IGNORE XON/XOFF.

TERMINAL MULTIDROP - If the local terminal is connected to more than one E1 INVERSE MULTIPLEXOR, it must be in MULTIDROP MODE. If it is connected to only one unit, this feature can be disabled. When it is disabled, the system comes up directly, without you having to log in. The choices are MULTIDROP MODE and DIRECT TERMINAL.



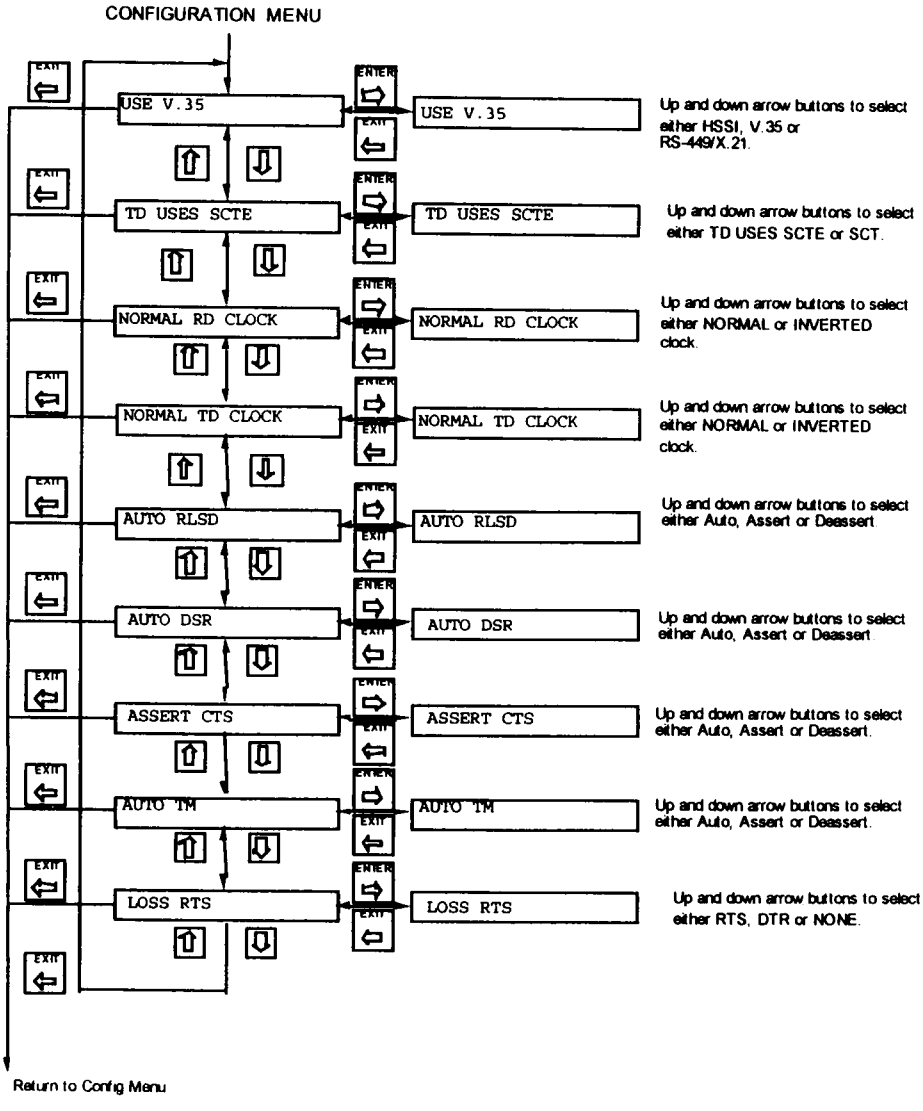
NODE HW REV - The NODE HW (HARDWARE) REV is set by the factory and cannot be changed.

SW REV - The NODE SW (SOFTWARE) REV is set at the factory and cannot be changed.

5.5.2 DTE Configuration Menu

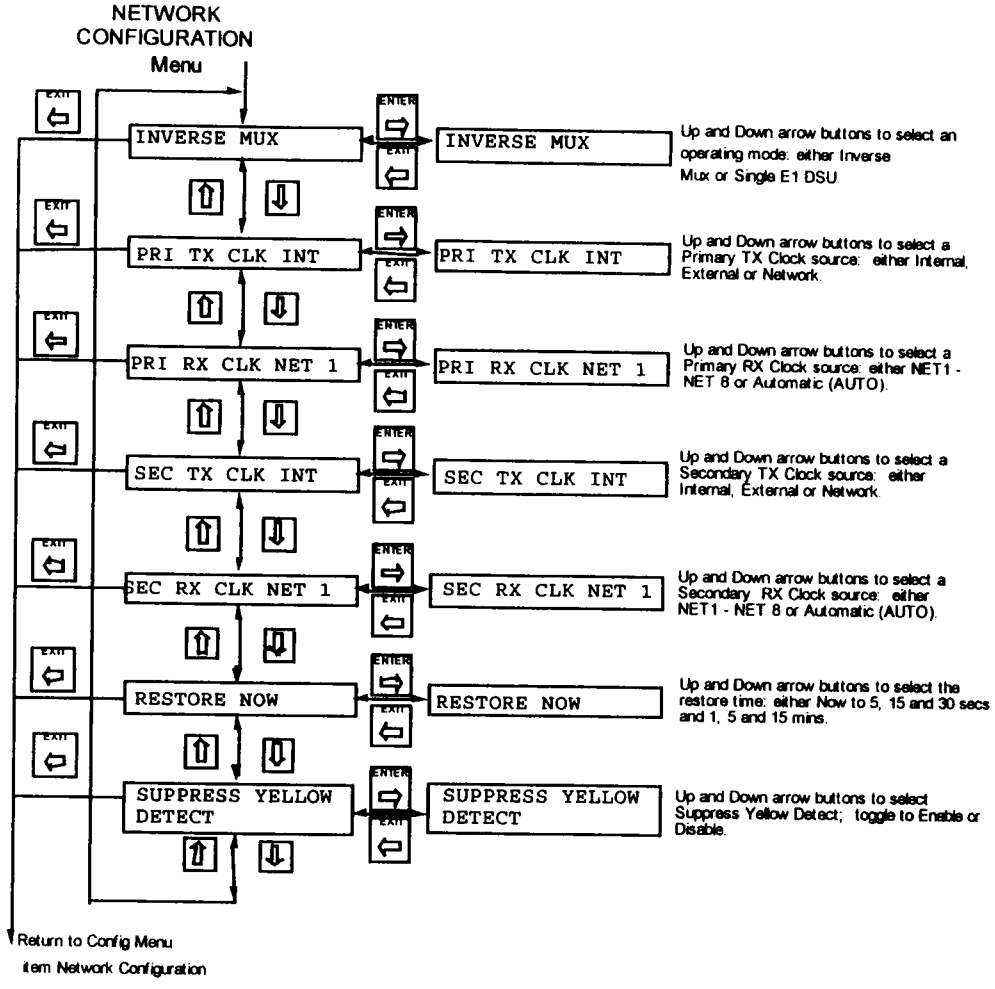
This menu allows you to set various configurable items for the DTE port.

For each item on this menu, pressing RETURN causes the configurable item to start flashing. Pressing the **UP ARROW** and **DOWN ARROW** keys changes the value of the flashing item. Pressing RETURN again terminates the configuration of that item. Pressing the **EXIT** key aborts the operation without making the change. Each of the Configurable items is described in detail in section 4.3.5.4 of this Users Manual.



5.5.3 Network Config

The NETWORK CONFIG menu allows you to change various configurable items common to all E1 network ports. For each item on this menu, pressing RETURN causes the configurable item to start flashing. Pressing the **UP ARROW** and **DOWN ARROW** keys changes the value of the flashing item. Pressing RETURN again terminates the configuration of that item. Pressing the **EXIT** key aborts the operation without making the change. Each of the Configurable items is described, along with the various options, in detail in section 4.3.5.3 of this Users Manual.



5.5.5 Network Thresholds

This Menu allows you to enable or disable the automatic FALLBACK feature and set the various Network Alarm Thresholds that will cause the E1 lines to automatically be taken out of service.

Three levels of thresholds can be turned ON or OFF and values set through this menu: CON (CONSECUTIVE), 15-minute and 24-hour. Thresholds can be set for the number of Consecutive seconds (1-100) containing errors, for the number of seconds containing errors in a 15-minute interval (1-900) and for the number of 15-minute intervals containing errors in a 24-hour period (1-96).

You can set the threshold value for Minor (MI) and Major (MJ) alarms, where exceeding the Minor alarm threshold will generate an alarm report and the exceeding a Major alarm threshold will actually cause a E1 line to be automatically taken out of service.

Striking RETURN when NET THRESHOLDS appears in the display screen will start the menu and allow you to scroll, using the Down or Up Arrow buttons, through the following options:

CON CRCS	010
CON CRCS	OFF
CON SES	010
CONSES	ON
CON UAS	015
CON UAS	OFF
15.MIN.MI.BPV	100
15.MIN.MJ.BPV	100
15.MIN.MJ.BPV	OFF
15.MIN.MI.CRCS	100
15.MIN.MJ.CRCS	100
15.MIN.MJ.CRCS	OFF
15.MIN.MI.ES	100
15.MIN.MJ.ES	100
15.MIN.MJ.ES	OFF
15.MIN.MI.SES	100
15.MIN.MJ.SES	100
15.MIN.MJ.SES	OFF
15.MIN.MI.UAS	100
15.MIN.MJ.UAS	100
15.MIN.MJ.UAS	OFF
24.HR.MI.BPV	10
24.HR.MJ.BPV	10
24.HR.MJ.BPV	OFF
24.HR.MI.CRCS	10
24.HR.MJ.CRCS	10
24.HR.MJ.CRCS	OFF
24.HR.MI.ES	10
24.HR.MJ.ES	10
24.HR.MJ.ES	OFF
24.HR.MI.SES	10
24.HR.MJ.SES	10
24.HR.MJ.SES	OFF
24.HR.MI.UAS	10
24.HR.MJ.UAS	10
24.HR.MJ.UAS	OFF

To turn a Major Alarm ON or OFF, use the Up and Down arrows to get the particular alarm in the display window and hit RETURN. Using the arrow keys, select ON or OFF. To change the value of an alarm threshold, use the Up and Down arrow keys to get that particular alarm in the display window and press RETURN. Use the Up and Down arrow keys to raise or lower the present value.

6 Installation

6.1 Installation Procedure

Notes: Before beginning the installation process, inspect the E1 INVERSE MULTIPLEXOR for damage that may have occurred during shipment. If damage has occurred, notify Black Box and your package carrier immediately.

To maintain EMC Class B (CE Label) compliance, only shielded cables should be used. This applies to alarm and DC power input cables

STEP REFERENCE

1. Unpack and inspect the E1 INVERSE MULTIPLEXOR for damage that might have occurred during shipment. If necessary, wipe off the exterior with a soft cloth. Save all packing slips and papers that come with the unit. Save the shipping cartons and packing materials until installation is complete and proper operation is verified.

2. Verify that all items ordered are included in the shipment. The shipment should consist of the following:

   - E1 Digital Inverse Multiplexor
   - E1 INVERSE MULTIPLEXOR Users Manual.
   - Appropriate data and network interface cables and connectors (if ordered).
   - Power cord

STEP		REFERENCE
3.	Mount the E1 INVERSE MULTIPLEXOR	See section 6.2
4.	Connect Power Cables and Connections	See section 6.3.1
5.	Network/DTE Cables & Connections	See section 6.3.2
Connect network cables		See section 6.3.2
Connect DTE cable to E1 INVERSE MULTIPLEXOR		See section 6.3.3
6.	ASCII Terminal and SNMP Connection	See section 6.3.4
7.	Configure Unit	See section 4.3.5.1 (ASCII terminal)
8.	Configure Comm Ports	
	Terminal Port	See Section 4.3.5.1 (ASCII terminal)
	Network Management Port	See Section 4.3.5.1 (ASCII terminal)
9.	Configure Network	See section 4.3.5.3 (ASCII terminal)
10.	Configure DTE	See section 4.3.5.2 (ASCII terminal)

6.2 Mounting The E1 INVERSE MULTIPLEXOR

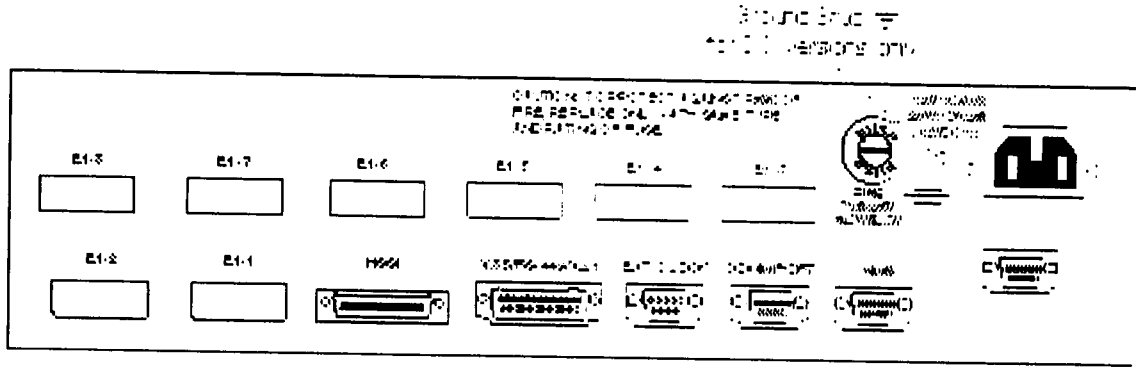
6.2.1 Rack Mounting

A 19-inch rack mounting kit is available from Black Box. Attach the appropriate rack mounting ears to the E1 INVERSE MULTIPLEXOR using the hardware included in the kit.

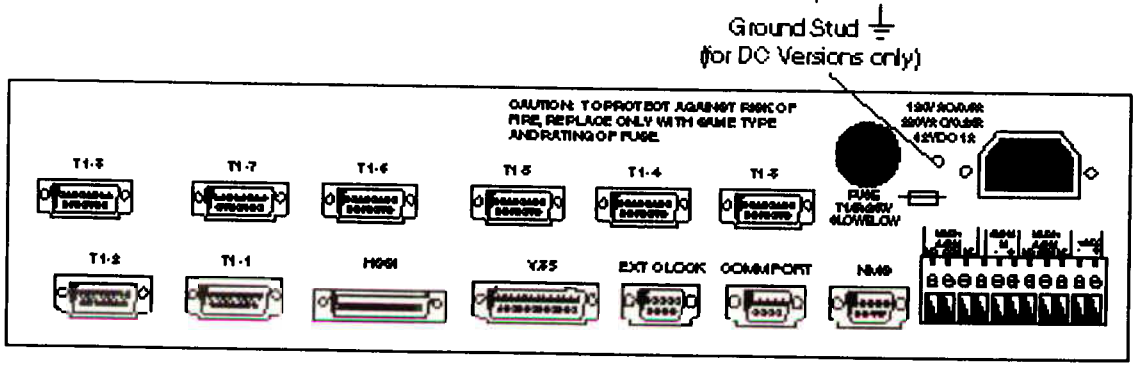
6.2.2 Desk Operation And Stacking

Four stick-on rubber feet are supplied with each E1 INVERSE MULTIPLEXOR. When desktop operation is to be used, remove the covering from each rubber foot and stick them onto the bottom of the E1 INVERSE MULTIPLEXOR. The E1 INVERSE MULTIPLEXOR units may now be stacked as required.

6.3 Cabling and Connectors



MTU3802E – Back Panel



Note: On DC versions of the E1 INVERSE MULTIPLEXOR, the AC receptacle will be covered with a blank face-plate.

6.3.1 Power Cables And Connections

6.3.1.1 AC Power Connection

An AC power cord is supplied with the E1 INVERSE MULTIPLEXOR to provide 120 VAC to 240 VAC power. The power cord receptacle is located on the rear panel of the E1 INVERSE MULTIPLEXOR. For AC power, connect the AC power cord to the E1 INVERSE MULTIPLEXOR and plug into the nearest AC outlet.

6.3.1.2 DC Power Connection

The Black Box E1 INVERSE MULTIPLEXOR can be optionally powered by -48 VDC power source. The DC power connection on the E1 INVERSE MULTIPLEXOR is located on the backpanel. There are eight screw terminals located on the rear panel The two screw terminals on the far right (looking at the rear panel) are for DC powering.

Connect the -48V wire to the screw terminal labeled "-". Attach the 48V Return (+) wire to the screw terminal to the immediate right, labeled "+". Connect Earth Ground to the ground stud.

The E1 INVERSE MULTIPLEXOR is designed to operate with NEGATIVE SUPPLY. This means the POSITIVE TERMINAL is connected to the ground.

WARNINGS:

1) **Damage to the E1 INVERSE MULTIPLEXOR may result if power is connected improperly.**

2) **Do not operate the E1 INVERSE MULTIPLEXOR without an Earth ground connection to the ground stud.**

6.3.2 E1 Network Connection

Eight female DB-9 or BNC connectors are located on the E1 INVERSE MULTIPLEXOR back panel for connecting to the E1 networks.

Connect the E1 INVERSE MULTIPLEXOR to each E1 Network using the appropriate cable and connectors, available from Black Box.

6.3.3 DTE Cable And Connection

The DTE interface connectors are provided on the back of the E1 INVERSE MULTIPLEXOR, a 50-pin SCSI female receptacle for HSSI compatible DTE and a DB25-pin female connector for V.35 or RS-449 compatible DTE.

If using a HSSI interface, the cable connecting the E1 INVERSE MULTIPLEXOR to the DTE consists of 25 twisted pairs with an overall foil/braid shield. The E1 INVERSE MULTIPLEXOR end of the cable should have a male connector.

One 50-pin SCSI female receptacle is provided on the rear of the E1 INVERSE MULTIPLEXOR to connect the E1 INVERSE MULTIPLEXOR to HSSI-based networks/systems. Cables and connectors are available from Black Box.

Using the appropriate cable and connectors, connect the E1 INVERSE MULTIPLEXOR HSSI connector to the HSSI DTE.

If using a V.35/RS-449 interface, use a shielded cable supplied by Black Box to connect the E1 INVERSE MULTIPLEXOR to the DTE.

One DB25-pin female connector is provided on the back of the E1 INVERSE MULTIPLEXOR to connect the E1 INVERSE MULTIPLEXOR to the V.35/RS-449 or X.21 compatible DTE.

Using the appropriate cable and connectors, connect the V.35/RS-449 or X.21 DTE device to the E1 INVERSE MULTIPLEXOR.

Note: When using X.21 mode, special cables are required (refer to the table of Black Box cable part numbers.

6.3.4 ASCII Terminal and SNMP Connection

The E1 INVERSE MULTIPLEXOR is accessed by an ASCII terminal or SNMP Management System workstation through direct, daisy-chained or dial-up modem connection.

On the rear panel of the E1 INVERSE MULTIPLEXOR, two female 9-pin receptacles labeled NMS and Comm Port are provided for connection to the ASCII terminal or SNMP workstation. An RS-232 straight ribbon cable with DB 9 male connectors is used to link the E1 INVERSE MULTIPLEXOR with the terminal, modem or workstation.

Direct Connection: For direct connection, using the appropriate DB-9 ribbon-type cable, connect the ASCII terminal or SNMP workstation to the E1 INVERSE MULTIPLEXOR through the Terminal or SNMP connector on the back of the rear panel. The baud rate, parity bit and stop bit settings must match those of the terminal: **baud rate=9600, eight bits, no parity and two stop bits.**

Modem Connection: When using a modem, the baud rate, parity bit and stop bit settings of the modem must match the terminal or workstation port default settings: **baud rate=9600, eight bits, no parity, and two stop bits** If these parameters are not the same, reconfigure the Unit default settings using the front panel controls.

When the parameters of the modem and the terminal or workstation port coincide, using the RS-232 straight ribbon cable, connect the ` modem to the appropriate RS-232 comm port (Terminal or SNMP) on the rear panel of the E1 INVERSE MULTIPLEXOR. Then, connect the modem to the phone line and the ASCII terminal or SNMP workstation. Nine-pin to 25-pin adapters and null-modem adapters, are available from Black Box. Specify a male or female terminal connection when ordering.

For direct connection, the terminal, workstation or modem may be placed up to 50 feet away from the comm port when operating at 9600 baud. Distances may be increased if the baud rate is reduced.

Daisy Chaining: Multiple E1 INVERSE MULTIPLEXORs can be daisy-chained together through the Terminal Port to provide centralized network monitoring and management capabilities.

A ribbon-type cable with DB-9 connectors is available from Black Box for daisy-chaining E1 INVERSE MULTIPLEXORs. The cable can be ordered to daisy- chain four units (part # 154-00051-01), eight units (part # 154- 00052-01) or twelve units (part # 154-00053-01).

If using a cable other than the above, see Terminal Port pin assignments, Section 8.1. With this cable, CTS (pin 8) must be connected between E1 INVERSE MULTIPLEXORs, but must not be connected to terminal.

The one female connector on the ribbon is to be connected to the terminal or modem (if a remote site). The remaining male DB-9 connectors are connected to the Terminal Port. Each unit must be assigned an unique node number.

When units are daisy-chained together, the local terminal must be operating in Multidrop Mode (see section 4.3.4). Each unit should be given an unique Node Number.

Note: For detailed instructions on installing SNMP systems, refer to the separate installation guides for these products.

7 Maintenance and Diagnostics

7.1 Equipment Return And Repair

If faulty equipment is suspected, perform the tests in this section. If, after performing these tests, the E1 INVERSE MULTIPLEXOR or any associated module is suspected to be faulty, call Black Box Technical Support at: 01189312233.

7.2 Running Diagnostic Tests

You should test the E1 INVERSE MULTIPLEXOR before you use it. If it, or an associated module, does not operate properly during or after testing, call Black Box Technical Support at: 01189312233

This chapter contains procedures for testing the E1 INVERSE MULTIPLEXOR followed by suggestions for troubleshooting problems.

You use the DTE AND NETWORK TESTS menu to initiate and terminate one DTE test and three network tests. The four tests are

- DTE/NETWORK Loopback
- Payload Loopback
- LINE Loopback
- LOCAL Loopback

Note: You do not need to inform the telephone company that you're running the tests. However, if the tests reveal a problem with the carrier's service or with the E1 INVERSE MULTIPLEXOR, you should inform the carrier that the DTE equipment or the E1 INVERSE MULTIPLEXOR must be removed from service.

To initiate a loopback test in the DTE AND NETWORK TESTS menu, select TESTS from the INVERSE MULTIPLEXER MAIN MENU and press RETURN to open the menu.

Select a test on a specific network port, set to ON, select CONFIRM and press RETURN.

To terminate or cancel the test, select it, set to OFF, select CONFIRM and press RETURN.

The example in Figure 7.4.1 shows the PAYLOAD LOOPBACK test selected on network port 5.

TESTS MENU

```
Major    01/01/90  17:56:47    Unit: 1    NET : 2    (33)
         Loss of Frame
Idled    01/01/90  17:56:58    Unit: 1    NET : 2    (13)
         Loss of Frame Idled

BLACK BOX E1 INVERSE MULTIPLEXOR  SR 1.XX  NODE  1:HOME  01/01/90
03:14:54  MN SELECTED DEVICE ADDRESS:  1.00.000 NAME:HOME


   DTE AND NETWORK TESTS          Exit        Confirm

   DTE TESTS:
         DTE/NETWORK LOOPBACK:    Off

   NETWORK TESTS:
PORT#  PAYLOAD LOOPBACK  LINE LOOPBACK  LOCAL LOOPBACK
   1          Off             Off             Off
   2          Off             Off             Off
   3          Off             Off             Off
   4          Off             Off             Off
   5          Off             Off             Off
   6          Off             Off             Off
   7          Off             Off             Off
   8          Off             Off             Off
```

Figure 7.2.1

7.2.1 DTE/NETWORK Loopback Test

Use the DTE/NETWORK Loopback test to verify the data port and associated cabling. This bi-directional loopback loops the received data port signal back to the data port and the received E1 processor signal back to the E1 network. It can test a problem whose source is the E1 line.

7.2.2 LOCAL Loopback Test

Use the LOCAL Loopback test to verify the operation of the E1 INVERSE MULTIPLEXOR data port and its connections.

To receive valid test data at the DTE device, run LOCAL Loopback on all active E1 ports.

Note: This test interrupts payload traffic to the unit.

7.2.3 PAYLOAD Loopback and LINE Loopback Tests

Use the PAYLOAD Loopback and LINE Loopback tests to verify the proper operation of the E1 INVERSE MULTIPLEXOR and selected E1 networks.

Both tests loop the payload data received from the E1 network back to the network.

With the PAYLOAD Loopback, the E1 INVERSE MULTIPLEXOR regenerates the data and inserts a new framing pattern before it loops back the data. This verifies the unit's E1 framing and the E1 network.

With the LINE Loopback, the E1 INVERSE MULTIPLEXOR does not do any additional processing of the data before it regenerates it and loops it back. This minimises the involvement of the E1 INVERSE MULTIPLEXOR during this test so that problems can be isolated to the network.

7.2.4 Possible Sources of Problems

The PAYLOAD Loopback can test a problem whose source may be the E1 INVERSE MULTIPLEXOR.

The LINE Loopback can test a problem whose source may be the Telco E1 line, wiring between the Telco demarcation points, the E1 INVERSE MULTIPLEXOR at one or both ends, or the cable between the E1 line reporting errors and the E1 INVERSE MULTIPLEXOR.

The TEST LED on the E1 INVERSE MULTIPLEXOR turns red during the tests and the E1 port LED turns yellow.

7.3 Troubleshooting the E1 INVERSE MULTIPLEXOR

This section describes problems you may encounter on the E1 INVERSE MULTIPLEXOR and suggests ways you can troubleshoot them.

The troubleshooting procedure is designed to isolate the faulty or malfunctioning item to the E1 network, the DTE equipment, the cable from the DTE to the E1 INVERSE MULTIPLEXOR or the E1 INVERSE MULTIPLEXOR itself. The built-in diagnostic features of the E1 INVERSE MULTIPLEXOR aid you in quickly identifying and isolating faults.

Using the front panel buttons and display, the ASCII terminal or SNMP workstation, you can run a series of loopback tests. Verification of the proper functioning of the DTE equipment and the E1 INVERSE MULTIPLEXOR is accomplished through DTE loopback and a self test. Testing for the proper functioning of the remote E1 INVERSE MULTIPLEXOR is accomplished by a Line loopback.

It is also possible to verify the path from the DTE through the E1 line to the remote-end E1 INVERSE MULTIPLEXOR, provided the DTE equipment can generate and detect looped back bit streams.

These suggestions can help determine which portion of the network might be at fault. When discovering a failure, check the simple solutions first. Is the power turned on? Is the equipment set up and configured properly? Will swapping cable pairs solve the problem?

The E1 INVERSE MULTIPLEXOR is equipped with alarms that alert you to the existence of possible problems with the unit, and received signals from the DTE or network. LED's on the Module provide a quick indication of the status of that module: green light indicates everything is functioning normally; **yellow** light means the module is powered, configured and ready to be put into service.

Problem 1

The E1 INVERSE MULTIPLEXOR does not power up.

Solutions

- If the E1 INVERSE MULTIPLEXOR is AC powered, make sure it is plugged into a live AC outlet. It is DC powered, make sure the respective DC leads are not crossed.
- Check all fuses for opens, replace as needed. If the E1 INVERSE MULTIPLEXOR blows fuses continuously, call Black Box Technical Support.

Problem 2

You cannot communicate with the remote E1 INVERSE MULTIPLEXOR.

Solutions

- Make sure both units are in Inverse Mux mode, not Single E1 DSU.
- Verify that the local and remote units have unique IDs.
- If a DTE device is not connected at either end, set DTE LOSS to None.
- For HSSI operation, a DTE device must be connected at each end. If you must communicate with the remote unit before the DTE devices are connected, switch to V.35 operation and set DTE LOSS to None.
- Make sure your E1 port LED's are solid green indicating that the circuits are up and running.

Problem 3

The TEST LED on the E1 INVERSE MULTIPLEXOR is constantly on.

Solutions

- Make sure no tests are being initiated and check the TEST display from a terminal.

  If a test is running, end it by selecting the test and setting it to OFF in the DTE AND NETWORK TESTS menu.

- Make sure the DTE device or the E1 carrier is not sending loop up and loop down codes.

Problem 4

The NETWORK E1 port LED's on the E1 INVERSE MULTIPLEXOR never illuminate.

Solutions

- Make sure the E1 cable from your service provider is connected to the E1 INVERSE MULTIPLEXOR.
- Remove the E1 cable from the affected E1 port and hardloop the interface by connecting pins 1-3 and 9-11 of the DB-15 port. If the E1 LED lights up, check your E1 cabling and contact your service provider.

Problem 5

The NETWORK E1 LED's on the E1 INVERSE MULTIPLEXOR are constantly red.

Solutions

- Check each E1 port configuration to make sure the framing and line code are what the carrier is providing.
- Check each E1 INVERSE MULTIPLEXOR for excessive errors.
- Check the E1 cabling or inside wiring for possible problems.
- Verify with the service provider that the local Smart Jack is not looped up.
- Perform the hardloop procedure on the affected E1 port to verify that the E1 port is functioning on the unit.

Problem 6

The NETWORK E1 LED's are constantly yellow.

Solutions

- Make sure no tests are being initiated on the affected E1 ports.

  Individual E1 port tests cause the E1 LED to turn Yellow.

  If a test is running, end it by selecting the test and setting it to OFF in the DTE AND NETWORK TESTS menu.
- Verify the DTE device or the E1 carrier is not sending loop up and loop down codes.

Problem 7

The NETWORK E1 LED's are flashing yellow.

Solutions

- Check the CURRENT ALARMS AND STATUS ITEMS menu to see if the unit is receiving an E1 Yellow alarm or transmitting an Alarm Indication Signal (AIS).
- Make sure the remote unit is receiving a valid E1.

  If it is not, it will transmit a Yellow alarm.
- Make sure a valid DTE device is connected to the E1 INVERSE MULTIPLEXOR and is powered on. If a DTE device is not connected and DTE LOSS is set to DTR or RTS, the E1 INVERSE MULTIPLEXOR transmits an AIS to the remote unit.

Problem 8

The NETWORK E1 LED's on an E1 INVERSE MULTIPLEXOR are flashing green.

Solutions

- Make sure a valid DTE device is connected to the E1 INVERSE MULTIPLEXOR and is powered on.

  If no DTE device is connected and the unit is configured for V.35 or RS-449, make sure that DTE LOSS is set to None. If the unit is configured for HSSI, check for a valid HSSI signal (TA and DTR).

  If a DTE device is connected, make sure all DTE port LED's are on.

- Check the CURRENT ALARMS AND STATUS ITEMS menu to make sure no alarm thresholds have been exceeded.

  An E1 circuit is taken out of service for a configured amount of time if FALLBACKS (in NETWORK ALARM THRESHOLDS) or Second Error restoral interval (in NETWORK CONFIGURATION) is enabled and a threshold has been exceeded.

- . Make sure that the correct E1 cable is connected to the correct E1 port.

- You must restore the E1 line manually if it is configured for USE W/MANUAL RESTORE (in NETWORK CONFIGURATION) and a threshold or alarm condition has been exceeded.

Problem 9

The DTE port LED's on the E1 INVERSE MULTIPLEXOR do not illuminate.

Solutions

- Make sure the correct DTE cable is securely attached to both units and the connected DTE device is actually passing traffic.
- If the connected DTE device does not support the RTS or DTR leads, configure the DTE LOSS for None. This asserts the CTS lead from the E1 INVERSE MULTIPLEXOR.
- Make sure the E1 INVERSE MULTIPLEXOR is configured for the correct electrical signalling from the DTE device: V.35, X.21, RS449, or HSSI.

Problem 10

The UNIT Major and Minor Alarm LED's on the E1 INVERSE MULTIPLEXOR do not clear.

Solutions

Alarm thresholds may have been exceeded for the 15 minute or 24 hour periods. If other thresholds have not been exceeded, the E1 INVERSE MULTIPLEXOR automatically clears these alarms after the period has passed.

Problem 11

The connected DTE device shows intermittent errors.

Solutions

- Run a DTE/NET Loopback to verify the physical connection between the local DTE device and the E1 INVERSE MULTIPLEXOR.

  If errors are reported during this loopback, check the DTE cable.

- Make sure the DTE device supports the DTE port clocking option.
- Use SCTE clocking for the DTE device if the application is using V.35 and the E1 INVERSE MULTIPLEXOR has more than 4 connected E1 circuits.
- Make sure the DTE device can handle the set DTE clocking speed.

Problem 12

The DTE/NETWORK Loopback does not work towards the locally connected DTE device.

Solutions

- Make sure the DTE device can run to a DCE in loopback.
- If configured for SCTE, the DTE device must be able to recognise an inverted clock. If it does not, set the clocking to SCT.
- Make sure the DTE device does not need to see RLSD (RECEIVE LINE SIGNAL DETECTED) during this loopback.

  If it does, set RLSD in the DTE CONFIGURATION menu to ASSERT this lead.

8.1.4 E1 Network Pin Assignments

The network connector is a DB15 connector. The assignments for the DB15 Network connector are given below.

PIN	SIGNAL
1	Send towards Network Tip (T1)
9	Send towards Network Ring (R1)
3	Receive from Network Tip (T)
11	Receive from Network Ring (R)

8.2 Factory Default Settings

Unit

ALARM ENABLE:	Disabled
AUTOMATIC BACKUP:	5 minutes after each database change
FRONT PANEL:	On
UNIT NUMBER:	0
TERMINAL BAUD RATE:	9600
TERMINAL PARITY & BITS:	8 bits, No parity
TERMINAL STOP BITS:	2
XON/XOFF	Enabled
MULTIDROP:	Enabled

DTE

DTE INTERFACE:	V.35
CLOCK:	SCTE
TX CLOCK:	Normal
RX CLOCK:	Normal
RLSD MODE:	Automatic
DSR MODE:	Automatic
CTS MODE:	Automatic
TM MODE:	Automatic
DTE LOSS DETECTION:	RTS