BLACK BOX Catalogue Ltd
The Source for Connectivity

MTU3000-D3-T3
MTU3000-OM-T3
MTU3000-OS-T3
MTU3000-STM-T3
MTU3000-STS-T3
MTU3000-D3-E3
MTU3000-OM-E3
MTU3000-OS-E3
MTU3000-STM-E3
MTU3000-STS-E3

ATM Rate and Format Converter

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

Table of Figures

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules.

1.0 Introduction

This manual provides user-application information for the BLACK BOX' ATM Rate/Format Converter, hereafter referred to as the Converter. This manual gives a brief overview of the Converter, describes set-up and connection of the unit, and then discusses operation of the unit's hardware and software. Within the Converter, each Physical layer interface to the network consists of a BLACK BOX ATM line-interface module (). Appendix A lists the command and status register functions of the modules in a tabulated form. Detailed interface module specifications are provided in the -specific manuals that accompany the Converter.

The Converter is intended to convert from a public or private ATM interface to a public network compliant ATM interface. In the receive direction the interface modules terminate the facility interface, recover the clock, access the ATM cells in the payload, and present them to the UTOPIA interface. In the transmit direction the process is reversed. ATM cells are accepted from the UTOPIA interface, and mapped into the payload, which is then properly formatted and clocked out on a facility interface. In the nominal configuration each port transmits in accordance with the other port's recovered clock. In the event of a loss of signal condition that makes the recovered clock unavailable, an onboard oscillator with an accuracy of 20 PPM is switched in to clock out data on the transmit facility. The payload traffic at both interfaces is monitored to ensure that only correctly delineated ATM traffic is passed across the interface. The Converter has a 2,000-cell elastic buffer to absorb traffic bursts and facilitate end-to-end traffic management.

To support network diagnostics, the Converter provides two types of signal loop--backs on each interface in response to commands from a local RS-232 interface. The Converter can also provide information on network alarm status on each interface and on general equipment status through the RS-232 interface. Application software for this purpose is provided.

The unit can sit on a desktop, or on a shelf. With optional adapters, it can be wall-mounted or rack-mounted. The basic unit is powered from an external wide range AC power (universal input, 50 to 60 Hz, 115 to 230-V ac) supply intended for office environments. Optionally, it can be powered by a 48 V-dc power supply. The local management RS-232 interface connector is a DB-9. Front-panel LED indicators provide information on equipment failure, synchronization failure, near-end failure, and far-end failure status for each interface. A power-on indicator for the unit is also provided.

The Converter can be operated from -10°C to +70°C with 3-ft/s air flow and from -10°C to +50°C with no air flow. The Converter has extensive on-board self-diagnostics that operate upon power-up and continuously in a background mode.

ATM physical layer processing is performed according to the ATM Forum's User-Network Interface (UNI) Specification 3.1. All BLACK BOX modules have been rigorously tested for compliance to network specifications. Other specifications to which the modules comply are listed in the appropriate manuals supplied with the Converter.

Feature enhancements planned for future releases include SNMP management and automatic protection switching.

2.0 Setup

The basic model Converter consists of four items: the Converter unit, the universal ac power supply, a power cord, and the user's manual. Interconnection of the Converter to the network connections, the power supply/cord, and to the local configuration/management host is shown below in Figure 1. Installation procedure 180-1044 contains specific requirements for the 23" rack-mounting shelf with a 48-V dc power-supply option (180-1039-01).

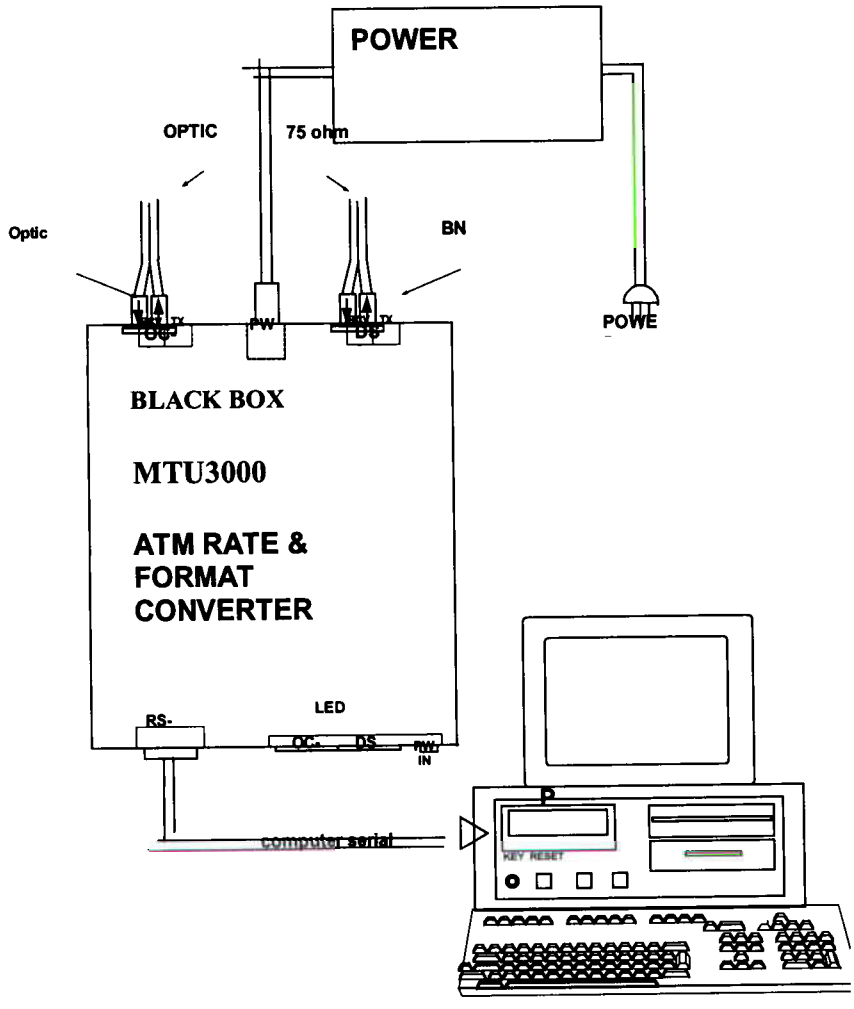


Figure 1: Setup

2.1 Description of User Interfaces

On the back of the Converter are the facility interface connectors of Port 1 and Port 2, the RS-232 serial-interface connector and the input-power connector. Each interface is clearly labeled. Between these two interfaces is the input-power connection. The RS-232 connector is a 9 pin female connector and the input power connector is a 6-pin MINI-DIN keyed connector. The RS-232 serial-interface connection is used for modifying the user's setup configuration or for troubleshooting. When the Converter is connected via this RS-232 interface to a DOS-based computer, the user has access to the contents of configuration and status registers for both interfaces. A 3.5-inch disk of application software is provided for this purpose. Use of the software is discussed at some length in Section 4. The front panel contains an on/off power switch with a related (green) power indicator LED. Also on the front panel of the unit are red LEDs whose functions are discussed in Section 3.2 of this manual.

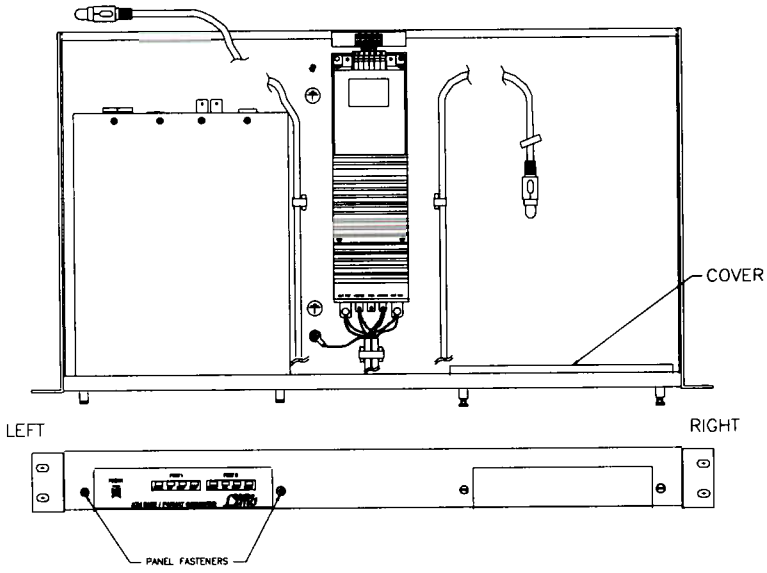
2.2 Installation on the 23" Rack-Mounting Shelf

If the 23" Rack-Mounting Shelf option is being utilized, mount the ATM Rate/Format Converter(s) in the following manner.

> **NOTE: In a single converter configuration the Converter is installed in the left-hand location when viewed from the front.**

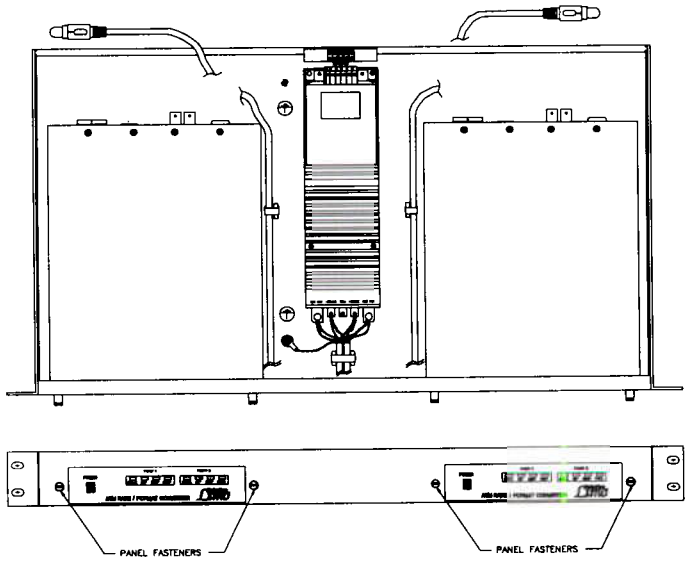
1. Remove the four rubber feet from the bottom of the ATM Rate/Format Converter.
2. Locate the Converter in the left-hand location of the shelf when viewed from the front and secure with 2 panel fasteners as shown in Figure 2.
3. If a second ATM Rate/Format Converter is to be installed, remove the cover from the right-hand location and repeat steps 1 and 2 to install the second Converter in the right-hand location as shown in Figure 3.
4. Remove the protective cap(s) from the power cable(s) and connect to the MINI-DIN connector(s) on the back of the ATM Rate/Format Converter(s) as shown in Figure 4.
5. Loosen the three "INPUT" screws on the terminal block of the 48-V dc power supply and attach the "+" potential lead to the "+" terminal, the "-" potential wire to the "-" terminal, and the chassis ground wire to the " " terminal. Tighten all three screws to secure the external power leads as shown in Figure 5.

> **NOTE: To comply with UL requirements, external wires should be 16 AWG minimum, fused with a 1.5A 120V fuse. Terminal lugs are recommended.**



ONE RATE/FORMAT CONVERTER INSTALLED

Figure 2: Converter Power Connection



SECOND ATM RATE/FORMAT CONVERTER INSTALLED

Figure 3: Dual-Converter Installation

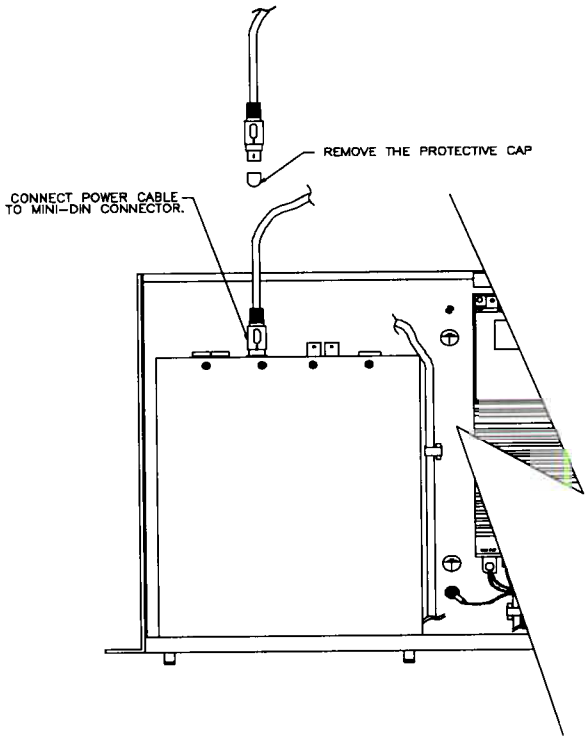


Figure 4: Converter Power Connection

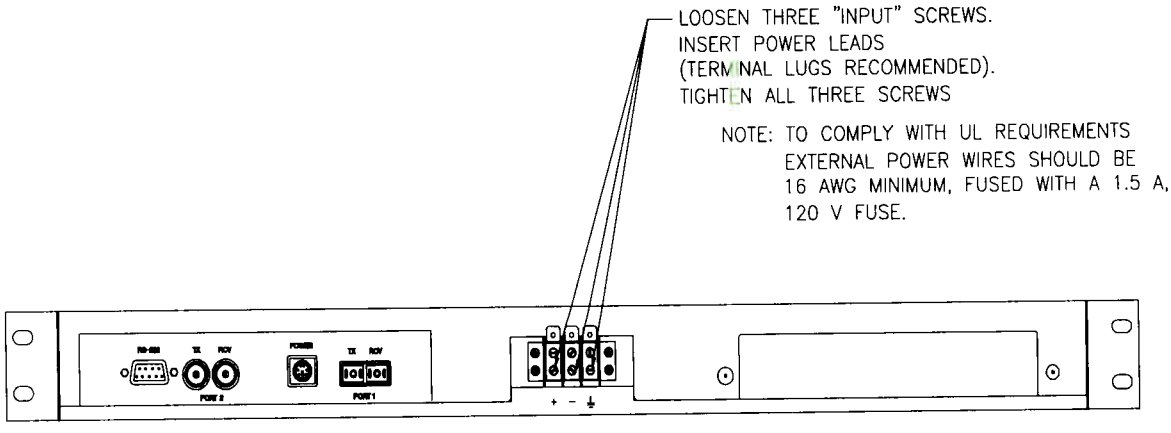


Figure 2: External Power Connection

2.3 *Initial Application of Power*

When power is first applied to the unit by interconnecting the power supply as shown in Figure 1, the Converter goes through a period of initialization lasting approximately four seconds. During this period, the front-panel LEDs illuminates in a sequential pattern while the Converter is going through self-test. Assuming the unit passes self-test, the unit will display current status. If either interface module fails self-test, then all the LEDs for that interface will flash continuously. If the Converter does not have facility signals connected, the normal status for each interface reflects a near-end failure, N.E.F. and if applicable a Synchronization Failure, S.F. As valid signals are connected to the facility interface, the N.E.F. and/or S.F. status clears and the appropriate LEDs are extinguished.

2.3.1 On/Off power switch.

After power has been applied to the Converter by interconnecting the power supply, power can be removed or applied to the interface modules using the power switch. Power is removed from the interface modules after the user depresses and holds the On/Off switch for approximately three seconds. This time period was chosen to ensure that power to the interface modules is not unintentionally interrupted. Power is applied to the interface after the user depresses the ON/Off switch for 0.3 seconds. When power is applied to the interface modules via the On/Off switch, the initialization period lasts approximately three seconds rather that the four seconds described previously because the self-test for the Converter motherboard is not performed.

3.0 Functional Description

This section describes the operation of the Converter and some of its features. The items discussed include the functional block diagram of the converter, the front panel LEDs, and the RS-232 interface. Detailed descriptions of the ATM physical-layer interfaces contained in the Converter are described in the specific manuals accompanying the Converter.

3.1 Functional Block Diagram

The Converter utilizes a simple design consisting of two standard BLACK BOX ATM line-interface-module cards plugged into a motherboard. The motherboard includes a control interface and house keeping microprocessor. A high-level functional block diagram of the Converter is shown in Figure 6.

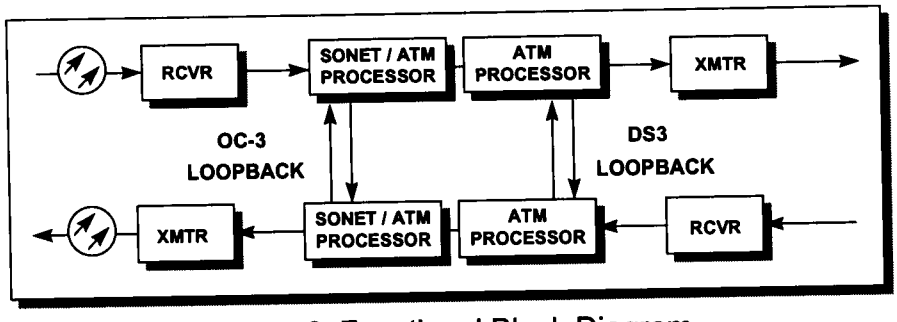


Figure 6: Functional Block Diagram

Upon receipt of a valid signal at the receiver of either interface, the Converter separates the clock and data, synchronizes to the frame, monitors and strips off the overhead, performs ATM cell delineation, and then forwards ATM cells to the transmit section at the full UNI rate. The Converter then maps the ATM cells into the transmit payload, generates the required overhead, and then transmits the signal over the facility interface.

The timing source for each facility interface is the recovered clock from the other interface. The interface automatically switches to an on-board 20-PPM crystal frequency source in the event of a loss of signal condition. The Converter will automatically return to facility timing upon receipt of a valid signal unless the user commands the Converter to operate with the crystal as the primary reference.

Two options for user commandable loopbacks are offered on each interface. One loops the recovered clock and data from the facility interface back to the transmit output of that same interface. The other option loops the data from the UTOPIA transmit interface back to the UTOPIA receive interface.

3.2 Front-Panel LEDs

In addition to the green LED which is illuminated when power is applied to the interfaces, there are four red failure indication LEDs for each interface module within the Converter. The front-panel failure indications (red when active) are driven according to the contents of the Failure Summary Status Registers. The interpretation of the front-panel mnemonics follows.

3.2.1 E.FLT. - Equipment Failure

This LED indicates the equipment failure status for the interface. This failure is activated if the power-up diagnostics detect a fatal error or an invalid software load on the module. Refer to the appendices to review the 37 possible diagnostic test descriptions.

3.2.2 S.F. - Synchronization Failure

This LED indicates the module is no longer synchronized to the configured timing source. The module declares the Synchronization Failure when a "Loss Of Synchronization" has been detected for a period in excess of the alarm integration period.

3.2.3 N.E.F. - Near-End Failure

This LED is illuminated if one or more of the following failures are present: Loss Of Signal, Loss Of Frame, STS Path Loss of Pointer, STS Path Signal Label mismatch, Line Alarm Indication Status, STS Path Alarm Indication Status, STS Path Trace mismatch, or Loss of cell delineation.

3.2.4 F.E.F. - Far-End Failure

This LED is illuminated if a Far-End Failure is detected on the facility due to a Line Remote Failure Indication and/or a STS Path Remote Failure indication.

3.3 RS-232 Interface Wiring Diagram

The wiring diagram for the RS-232 connection, on the back of the Converter, is shown in Figure 7 below. The connector is a DB-9 style. The diagram assumes connection to a PC and shows the connector configured as a DCE port. The Converter will sense when it is connected to a modem and automatically reconfigure the port to a DTE port.

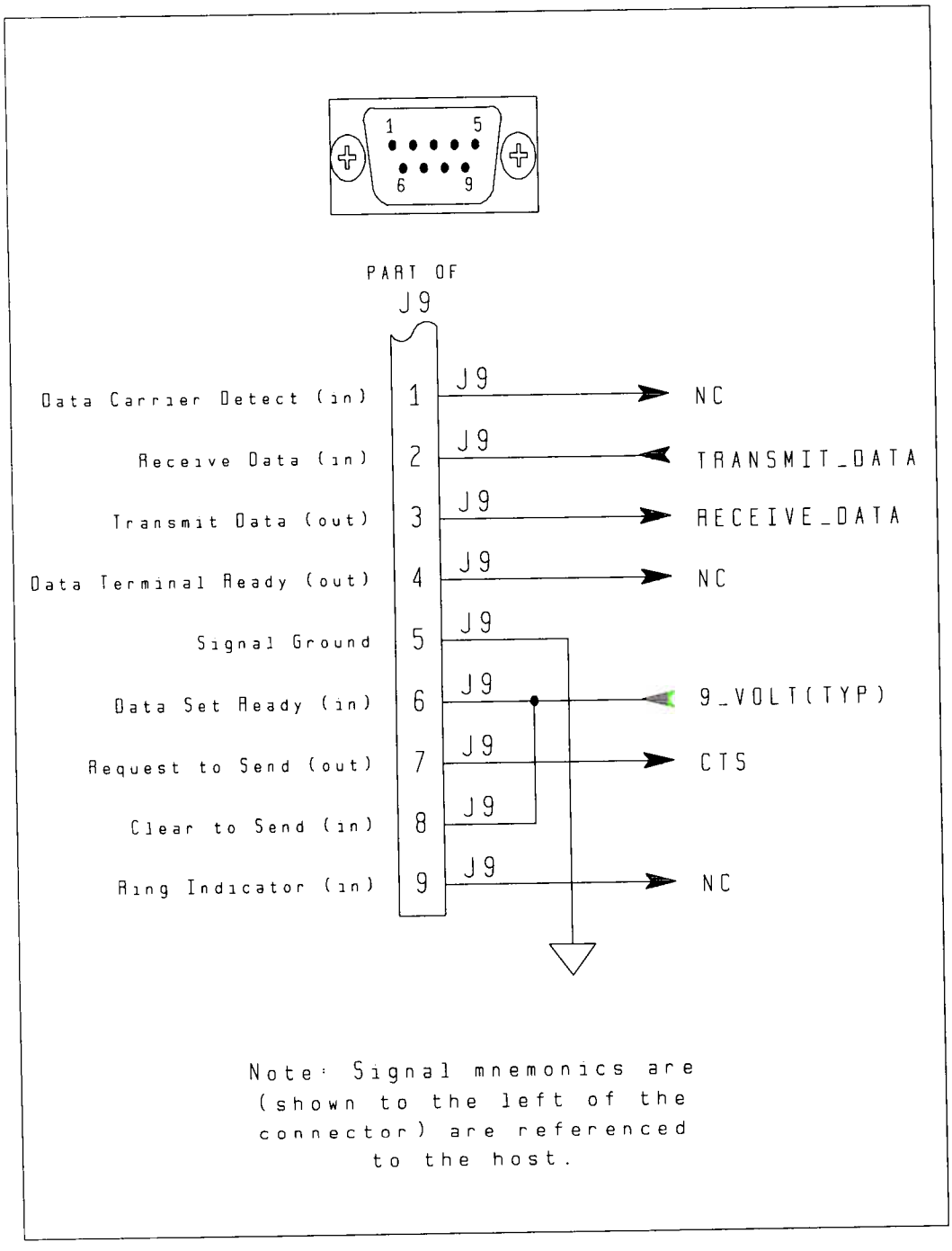


Figure 7: RS-232 Interface Wiring Diagram

4.0 Management Interface Software

The BLACK BOX Converter uses an application software that is DOS-based. This software provides two ways to obtain the status and communication information of the s inside of the Converter. This information can be obtained by using the menus provided, or by using discrete commands. Both of these methods will be discussed later.

The management interface software is written from DOS applications and is presented on the computer screen in a DOS format. By knowing DOS-based applications the registers can be accessed, configured, and a status of the Converter and its s can be obtained. This information can then be compared to the information presented in the specific manuals accompanying the Converter.

The specific manuals contain detailed information on the s including the following information:

- A description of each register and its default state.
- Whether the registers are read/write or read only.
- A description of onboard diagnostic tests.

The contents of all writable registers, except the Configuration Control Registers, are volatile and will be reset to their default values if the Converter is reset or restarted. Configuration Control Registers, once changed, will retain their value until such time as they are manually changed again. A single command can reset all of either 's default settings, including the Configuration Control Registers. See section 4.7.

4.1 Starting the Software

NOTE

A summary of the recommended procedure is as follows. More details are given later:

1. Interconnect the computer and the Converter as shown in Figure 1.
2. Apply power to the computer and the Converter.
3. Load the TEST software *.
4. Follow the menu.

***NOTE**

When loading the software the correct COM port must be specified. If the wrong COM port is specified, the software presents a message

"Obtaining Port Information..."

and the system waits for that COM port to be identified, which will never happen.

The computer will have to be re-booted to remove this hang-up.

NOTE
The following descriptions will use a DOS-based computer with the floppy drive designated as the A: drive. Other drive configurations will require the commands to be changed appropriately.

The software to test the Converter is on the TEST floppy disk that is supplied with the Converter and is called TEST.

To run the test program: boot-up the computer, place the TEST disk in drive A, and at the DOS prompt type:

A:TEST <COM port><ENTER>
where <COM port> is equal to 1, 2, 3, or 4 as designated by the computer setup.

After the computer has installed the software, the program's banner will appear as:

```
">>>>>>>>>>>>>>>>>>>>>  TESTER <<<<<<<<<<<<<<<<<<<<"
```

The TESTER MENU manager will then display a list of nine options, see Paragraph 4-2, "Menu Driven Status and Configuration Access." This menu provides a way to rapidly acquire information regarding functional areas of a 's operation. The manager software defaults to this command upon successfully connecting to a .
Discrete commands are supported and can be accessed by pressing <ENTER> at the

```
"Port:1 Type:OC-3 Enter Menu Option or Location to Change
[Exit Menu]:"
```

prompt. Interface type will vary depending on the type of modules installed in the Converter. The TESTER MENU can be re-accessed at any time by entering the command 'MENU' at the manager prompt ">>."

NOTE
The software can be run from the computer's hard drive. This will provide faster access to the information in the Converter.

To run the program from the computer's hard drive, the TEST MASTER disk's files must be loaded onto the hard drive in a new directory (which will be named CONV for this example). To make a new directory named CONV and to install the software: place the TEST disk in drive A, at the DOS prompt type:

```
C:MD CONV <ENTER>
C:CD CONV <ENTER>
C:CONV>COPY A:*.* <ENTER>
C:CONV>TEST <ENTER>
```

The program's banner and prompt will then appear.

4.2 *Menu Driven Status and Configuration Access*

One of the ways to access the operating information is by using the TESTER menu provided in the software. Nine options appear in the TESTER menu and these are discussed in this paragraph. The menu presentation is:

```
   Port    Type      Media      HW Lvl     SW Lvl
   ====    ====      =====      ======     ======
    1      OC-3       MMF         1        0.3.0.I
    2      DS3        COAX        2        0.4.0.J

***   (1)Failure   Status   (4)Diag   Status              (7)RSVD
***
***   (2)Configuration    (5)Overhead  Access  (8)Product  Info
***
***  (3)Diag Control    (6)Download          (9)Select Port 2
***
Port:1  Type:OC-3  Enter  Menu  Option  or  Location  to  Change
[Exit Menu]:
```

The currently selected Port and interface Type is included as part of the menu display. Interface information will vary depending on the type of module installed in the Converter. You can, when prompted, enter a menu option (1-9) or, through discrete commands discussed later, enter the address of a memory location that you want to modify. The various menu option choices will cause the Manager to interrogate the , and in options 2, 3, and 6 value changes can be made. To change a value, type the memory location number and press <ENTER> and a list of values and their meanings will appear. Type the value wanted and press <ENTER> and the new value will be displayed, after which the program will revert to the main menu. The menu option choices are defined in the following paragraphs.

NOTE
Menu option (9) will select the port that is not presently selected. If the currently selected port is port 2 the prompt for menu option (9) will read "Select Port 1."

If port two is selected, all memory locations will be preceded by a one giving a four-digit memory location number. For the examples that follow, port one was specified and the memory locations are in a three-digit format.

4.2.1 Menu Option 1, "Failure Status"

To obtain the failure status of the , type: 1 <ENTER>. The following is a typical Port 1 failure status display that shows the memory location, value, and the meaning of the failure status value:

```
Loc Val Meaning
=== === ================================================
460 00  Loss of Signal = Inactive
461 00  Loss of Frame = Inactive
462 00  (STS/AU4) Path LOP = Inactive
463 00  Equipment Failure = Inactive
464 00  Loss of Synch = Inactive
465 00  Signal Label Mismatch = Inactive
466 00  (Line/ms) AIS = Inactive
467 00  (STS/AU4/DS3) Path AIS = Inactive
468 00  (Line/ms) RFI = Inactive
469 00  (STS/VC4) Path RFI = Inactive
46A 01  Path Trace Mismatch = Inactive
46B 00  Loss of Cell Delineation = Inactive
480 04  Failure Summary
            Near End Failure = Inactive
            Far End Failure = Inactive
            Equipment Failure = Inactive
            Synchronization Failure = Inactive
```

4.2.2 Menu Option 2, "Configuration"

To obtain the configuration of the , type: 2 <ENTER>. The following is a typical Port 1 configuration display that shows the memory location, value, and the meaning of the configuration value. Each of these configuration values can be changed by typing the memory location number and pressing <ENTER>. A list of values and their meanings will appear. Type the value wanted and press <ENTER>. The new value will be displayed after which the program will revert to the main menu:

```
Loc Val Meaning
=== === ================================================
100 01  Power-up Diagnostics = Enabled
101 05  Failure Integration Time (seconds): 2.5
102 14  Failure Decay Time (seconds): 10
```

```
103 02  Timing Source = Facility Timing
104 01  Receive Cell Descrambling = Enabled
105 01  Receive Cell Error Correction = Enabled
106 01  Discard Receive Cells w/Uncorrectable Header Errors
= Enabled
107 01  Discard Idle Receive Cells = Enabled
108 01  Scramble Transmit Cells = Enabled
109 01  Generate HEC for Transmit Cells = Enabled
10A 01  Monitor Signal Label Mismatch Failures = Enabled
10B 01  Monitor Path Trace Mismatch Failures = Enabled
```

4.2.3 Menu Option 3, "Diag Control"

To obtain the diagnostic control of the , type: 3 <ENTER>. The following is a typical Port 1 diagnostic control display that shows the memory location, value, and the meaning of the diagnostic control values. Some of these values can be changed by typing the memory location number and pressing <ENTER>. A list of values and their meanings will appear. Type the value wanted and press <ENTER>. The new value will be displayed after which the program will revert to the main menu:

```
Loc Val Meaning
=== === ================================================
(070-07F) Diagnostic Pattern
070  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
080  00 Software Reset = Disabled
081  00 Diagnostic Status = Left Unchanged
082  00 Terminal Loopback = Disabled
083  00 Facility Loopback = Disabled
```

4.2.4 Menu Option 4, "Diag Status"

To obtain the diagnostic status of the , type: 4 <ENTER>. The following is a typical Port 1 diagnostic status display that shows the memory location, value, and the meaning of the diagnostic status value:

```
Loc Val Meaning
=== === ================================================
410 00  Diagnostics Passed
411 00  Number of Test that Failed: 0
412 00  00 00 00  Test Address (412-415)
416 00  00  Test EXP Data (416-417)
418 00  00  Test RCV Data (418-149)
41A 00  Test Suspect Part: Nothing
41B 00  A Control Interface Error has NOT Occurred
41C  00   00   Data Stored when Control Interface Error
Occurred (41C-41D)
```

4.2.3 Menu Option 3, "Diag Control"

To obtain the diagnostic control of the , type: 3 <ENTER>. The following is a typical Port 1 diagnostic control display that shows the memory location, value, and the meaning of the diagnostic control values. Some of these values can be changed by typing the memory location number and pressing <ENTER>. A list of values and their meanings will appear. Type the value wanted and press <ENTER>. The new value will be displayed after which the program will revert to the main menu:

```
Loc Val Meaning
=== === ================================================
          (070-07F) Diagnostic Pattern
070  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
080  00 Software Reset = Disabled
081  00 Diagnostic Status = Left Unchanged
082  00 Terminal Loopback = Disabled
083  00 Facility Loopback = Disabled
```

4.2.4 Menu Option 4, "Diag Status"

To obtain the diagnostic status of the , type: 4 <ENTER>. The following is a typical Port 1 diagnostic status display that shows the memory location, value, and the meaning of the diagnostic status value:

```
Loc Val Meaning
=== === ================================================
410 00  Diagnostics Passed
411 00  Number of Test that Failed: 0
412 00  00 00 00  Test Address (412-415)
416 00  00  Test EXP Data (416-417)
418 00  00  Test RCV Data (418-149)
41A 00  Test Suspect Part: Nothing
41B 00  A Control Interface Error has NOT Occurred
41C 00  00 Data Stored when Control Interface Error
Occurred (41C-41D)
41E 00  00  Address where Control Interface Error Occurred
(41E-41F)
420 00  Hardware Audit Failure: No Error
450 A5  Sequence Number: 42266
```

4.2.5 Menu Option 5, "Overhead Access"

To obtain the overhead access of the , type: 5 <ENTER>. The following is a typical Port 1 overhead access display that shows the memory location and the values of the overhead access:

```
Loc Val Meaning
=== === ================================================
          (10C-14B) Transmit Path Trace
10C   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
11C   00 00 00 00 00 00 00 00 C5 00 00 00 00 00 00 00
12C   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
13C   00 00 00 00 00 00 00 80 00 00 00 00 00 00 00 00
          (14C-18B) Expected Receive Path Trace
14C   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 80
15C   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
16C   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
17C   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
          (4B0-4EF) Receive Path Trace
4B0   00 00 00 80 00 00 00 00 00 00 00 00 00 00 00 00
4C0   00 00 00 00 00 00 C5 00 00 00 00 00 00 00 00 00
4D0   00 00 00 80 00 00 00 00 00 00 00 00 00 00 00 00
4E0   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
4F0   13 Signal label C2
```

4.2.6 Menu Option 6, "Download"

To obtain the download information of the , type: 6 <ENTER>. The following is a typical Port 1 download display that shows the memory location, value, and the meaning of the download values. Some of these values can be changed by entering the memory location number and pressing <ENTER>. A list of values and their meanings will appear. Type the value wanted and press <ENTER>. The new value will be displayed after which the program will revert to the main menu:

```
Loc Val Meaning
=== === ================================================
010 00  Downloading = Disabled
400 00  Download Count: 0
402 01  Download State: Disabled
```

4.2.7 Menu Option 7, "Performance"

To obtain the performance information of the , type: 7 <ENTER>. The following is a typical Port 1 performance display that shows the memory location and meaning of the registers, as well as the decoded value of the registers.

```
Loc  Val Meaning
==== === ================================================
1680  -- Current Interval  time.....: 561
1682  -- Current Interval  CV-S......: 16383
1684  -- Current Interval  ES-S......: 561
1686  -- Current Interval  SES-S.....: 561
1688  -- Current Interval  SEFS-S....: 0
168A  -- Current Interval  FC-L......: 0
```

```
168C  -- Current Interval  CV-L.....: 0
168E  -- Current Interval  ES-L.....: 0
1690  -- Current Interval  SES-L.....: 0
1692  -- Current Interval  UAS-L.....: 562
1694  -- Current Interval  FC-LFE.....: 0
1696  -- Current Interval  CV-LFE.....: 0
1698  -- Current Interval  ES-LFE.....: 0
169A  -- Current Interval  SES-LFE.....: 0
169C  -- Current Interval  UAS-LFE.....: 0
169E  -- Current Interval  FC-P.....: 0
16A0  -- Current Interval  CV-P.....: 0
16A2  -- Current Interval  ES-P.....: 0
16A4  -- Current Interval  SES-P.....: 0
16A6  -- Current Interval  UAS-P.....: 563

Loc  Val Meaning
==== === ================================================
16A8  -- Current Interval  FC-PFE.....: 0
16AA  -- Current Interval  CV-PFE.....: 0
16AC  -- Current Interval  ES-PFE.....: 0
16AE  -- Current Interval  SES-PFE.....: 0
16B0  -- Current Interval  UAS-PFE.....: 0
16B2  -- Current Interval  UHEC.....: 0
16B4  -- Current Interval  Receive Cells..: 0
16B8  -- Current Interval  Transmit Cells.: 0
16BC  -- Current Interval  IDF-LFE.....: 0
16BD  -- Current Interval  IDF-PFE.....: 0
16C0  -- Previous Interval time.....: 900
16C2  -- Previous Interval CV-S.....: 16383
16C4  -- Previous Interval ES-S.....: 900
16C6  -- Previous Interval SES-S.....: 900
16C8  -- Previous Interval SEFS-S.....: 0
16CA  -- Previous Interval FC-L.....: 1
16CC  -- Previous Interval CV-L.....: 0
16CE  -- Previous Interval ES-L.....: 0
16D0  -- Previous Interval SES-L.....: 0
16D2  -- Previous Interval UAS-L.....: 900

Loc  Val Meaning
==== === ================================================
16D4  -- Previous Interval FC-LFE.....: 0
16D6  -- Previous Interval CV-LFE.....: 0
16D8  -- Previous Interval ES-LFE.....: 0
16DA  -- Previous Interval SES-LFE.....: 0
16DC  -- Previous Interval UAS-LFE.....: 0
16DE  -- Previous Interval FC-P.....: 1
16E0  -- Previous Interval CV-P.....: 0
16E2  -- Previous Interval ES-P.....: 0
```

```
16E4  -- Previous Interval SES-P.........: 0
16E6  -- Previous Interval UAS-P.........: 900
16E8  -- Previous Interval FC-PFE........: 0
16EA  -- Previous Interval CV-PFE........: 0
16EC  -- Previous Interval ES-PFE........: 0
16EE  -- Previous Interval SES-PFE.......: 0
16F0  -- Previous Interval UAS-PFE.......: 0
16F2  -- Previous Interval UHEC..........: 0
16F4  -- Previous Interval Receive Cells..: 0
16F8  -- Previous Interval Transmit Cells.: 0
16FC  -- Previous Interval IDF-LFE.......: 1
16FD  -- Previous Interval IDF-PFE.......: 1
```

4.2.8 Menu Option 8, "Product Info"

To obtain the product information of the both s: type `8` and press <ENTER>. The following is a typical product information display:

```
Port   Type    Media   HW Lvl    SW Lvl
====   ====    =====   ======    ======
 1     OC-3    mmf        1      0.3.0.I
 2     DS3     coax       2      0.4.0.J
```

4.2.9 Menu Option 9, "Select Port 2"

Menu option (9) will select the port that is not currently selected. If the currently selected port is Port 2 the prompt for the menu option (9) will read "Select Port 1."

To select the port shown, type: `9` <ENTER>. The port shown on the display will be selected.

Refer to the specific manuals accompanying the Converter for a complete status listing. The status listing includes all registers from: Failure Status, Configuration, Diagnostics Control, Diagnostics Status, Overhead Access, and Download Groups.

4.3 Discrete Commands

The software has discrete commands that can be used to access, display, and modify the functions of a . When the memory address location is known (see applicable manual) the registers can be accessed through the discrete commands. The discrete commands also allow the combining of commands and functions to produce a DOS-type batch file.

4.3.1 List of Discrete Commands

The following list shows the commands that can be typed into the software and a description of the response to the command.

Read	This command allows the user to read 'n' bytes of data starting at address 'adr'. The usage is `READ adr n`.
Write	This command allows the user to write 'x' at address 'adr'. The usage is `WRITE adr x`.
Check	This command allows the user to check (or read and verify) an array of values versus addresses. The usage is `CHECK 'adr' 'v1', 'v2' ... 'vn'`. The uncontested result of this command insures that v1 was read from adr, v2 was read from adr+1, and so on up to vn which was read from adr+n-1. The contested result reports the unexpected value at the first address in error. This command is most useful in a command file or script file.
Open	This command allows the user to open a log file. All dialogs shown on the monitor will be recorded in a file named `LOGxxx.LOG`. The file is opened when the user types `OPEN`. The value for 'xxx' in `LOGxxx.LOG` ranges from 000 to 999. The first log file is named `LOG000.LOG`, the second is `LOG001.LOG` ... the 1000th log file is `LOG999.LOG`. The Log file remains open until a "CLOSE" command is received. The usage is: `open`.
Close	This command allows the user close a log file. The usage is: `close`.
Execute	This command is used to start a file of commands or a script. A command file contains repetitive commands with their parameters. Command file names possess the suffix '.cf'. If you wanted to start the command file "any_name.cf" you would type: `'execute any_name'`.
Delay	This command allows the user the install a delay of 'n' seconds (usually used in command files). The usage is: `delay n`.

Pause	This command works like the DOS pause command. Pause is normally used in a command file to provide the test observer time to make an instrument measurement. The usage is: `pause`.
Time	This command queries the system for time and date information and is then presented to the user. It is most useful during a log file session when the need for a time stamp arises. The usage is: `time`.
Acknowledge	This command is normally used during command file execution and with an on-going log file to permit the user to submit test results (called for by the command file) in the form of a string. These results will then be made part of the log file. The usage of this command is: `Acknowledge`.
Log	This command, like Acknowledge, allows a string to be recorded in a log file much like a comment. The string can contain any printable keyboard character. The usage for this command is: `Log`
Loop	This command is not supported.
End	This command is not supported.
Flush	This command flushes the UART buffer. It is used when the displayed address contents appear to be skewed from their nominal or expected values. The usage of this command is: `flush`.
Quit	This command allows the user to bring the program to a normal termination. The usage for this command is: `quit`.

4.3.2 *Command Abbreviation/Ambiguity*

Using just the first letter in the command name can start most of the commands. For example, to read two values starting at address 100 could be commanded in the four following ways: `read 100 2`, `rea 100 2`, `re 100 2`, or `r 100 2`. There are four commands that require more then the first letter to remove ambiguity. These four commands are: Loop, Log, Execute, and End. The first two letters of Execute and End must be typed to remove the ambiguity between these commands and the first three letters of Loop and Log are required to remove their ambiguity. Although Loop and End are not supported as commands, a minimum of Ex and Log are required to exercise the Execute and Log commands.

4.4 *Accessing the Contents of Registers for the Port 1 Interface*

(using Discrete Commands).

4.4.1 *Reading the Port 1 interface register's contents*

The program's "READ" command is used to determine the contents of Configuration Control Registers & Status Registers (refer to Appendix B of the appropriate software manual) The format for this command is as follows:

`READ xxx y` <ENTER> where xxx is the last three digits of the number shown in the Address Offset column of Appendix A, and y is the number of bytes to be read.

For example, to determine the contents of the "power-up diagnostics" register whose Address Offset is 0x100, at the >> prompt type:

`READ 100 1` <ENTER>

The screen will show: `0100: 01`

This is a value at register 100 of 1, which is the pre-configured default value of Enabled.

To save time, a range of registers' contents can be displayed by using the format:

`READ xxx yy`<ENTER>

For example, to determine the contents of registers with Address Offset from 0x100 to 0x11f, at the >> prompt type:

`READ 100 20`<ENTER>

The screen will show:

```
 0100: 01 05 14 01 01 01 01 01 01 01 01 00 00 00 00 00
 0110: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
>>
```

Each row displays a set of 16 two-digit numbers, which corresponds to the values in the address starting with the address to the left of the colon (:).

4.4.2 Writing to the Port 1 interface register

Having read the value at register 100 as a 1, the default value of 1 can be changed by using a "WRITE" command. The program's "WRITE" command is used to change the contents of any writable register, but it can not change the content of the read only registers. To determine appropriate values for a specific register, refer to Appendix B of the appropriate software manual. The format for the "WRITE" command is as follows:

`WRITE xxx z` <ENTER> Where xxx is the last three digits of the number shown in the Address Offset column of Appendix B of the appropriate software manual, and z is the value to be written.

For example, to change the contents of the "power-up diagnostics" register to a value of "0", at the >> prompt type:

`WRITE 100 0` <ENTER> This changes register 100 to a 0 which disables "power-up diagnostics" for the Port 1 interface.

4.5 Accessing the Contents of Registers for the Port 2 Interface

(using discrete commands).

4.5.1 Reading the Port 2 interface register's contents

The program's "READ" command is also used to determine the contents of Configuration Control Registers and Status Registers for the Port 2 interface. The format for this command is as follows:

`READ 1xxx y` <ENTER> Where xxx is the last three digits of the number shown in the Address Offset column of Appendix B of the appropriate software manual, and y is the number of bytes to be read.

For example, to determine the contents of the "power-up diagnostics" register (for Port 2) whose Address Offset is 0x100, at the >> prompt type:

`READ 1100 1` <ENTER>

The screen will show: `1100: 01`

The reflects a value of 1 in register address 100 on the Port 2 interface.

4.5.2 Writing to the Port 2 interface register

Having read a value of 1 at address 100, the default value of 1 can be changed by using the "WRITE" command. The program's "WRITE" command is used to change the contents of any writable register for the Port 2 interface. The format for this instruction is as follows:

`WRITE 1xxx z` <ENTER> Where xxx is the last three digits of the number shown in the Address Offset column of Appendix B of the appropriate software manual, and z is the value to be written.

For example, to change the contents of the "power-up diagnostics" register to a value of "0", at the >> prompt type:

`WRITE 1100 0` <ENTER> This changes register 100 to a 0 which disables "power-up diagnostics" for the Port 2 interface.

In summary, the READ and WRITE commands apply to the Port 2 interface exactly as with the Port 1 interface except that there is a 1000 (hex) offset.

4.6 Log Files

A set of tests can be recorded allowing the results to be referenced and evaluated at a later time. The log file function provides a means to "snap-shot" the accessible registers whose values can then be put into a hard copy form. To start a log file, type "OPEN". All communication between the user and the Converter will be recorded in the log file. To end a log file session type "CLOSE". For example, if all control and status information were needed for both 's within the Converter, type the following:

"OPEN" <ENTER>
"READ 0 500" <ENTER>
"READ 1000 500" <ENTER>
"CLOSE" <ENTER>

These commands cause the following to occur:

1. "OPEN" creates a log file entitled LOGXXX.LOG (where XXX is a number ranging from 000 to 999). XXX is incremented each time a LOG file is created.
2. "READ 0 500" reads and displays the contents of addresses 0 to 4FF. This relates to all possible control and status registers of port #1.
3. "READ 1000 500" reads and displays the contents of addresses 1000 to 14FF. These addresses correspond to all possible control and status registers of port 2.
4. "CLOSE" causes the file to be closed and time stamped according to DOS conventions.

4.7 Establishing Default Values

Depending on the type of modules installed in a Converter, it can be used to accomplish the following rate conversions, media conversions, and protocol conversions.

Converter (Port 1 - Port 2)
OC-3 - DS3
OC-3 - E3
STM1 - DS3
STM1 - E3
DS3 - E3

Modules installed in Converters have their nonvolatile configuration settings in the Default State when shipped. The user can then modify these configuration settings if desired. The following is a list of commands that can be utilized to reset modules to their default values.

Writing "ff" to 2491 causes a preset of OC-3 (in port 1) ==>
WRITE 2491 FF
Writing "ff" to 2492 causes a preset of DS3 (in port 2) ==>
WRITE 2492 FF
Writing "ff" to 2493 causes a preset of STM (in port 1) ==>
WRITE 2493 FF
Writing "ff" to 2494 causes a preset of E3 (in port 2) ==>
WRITE 2494 FF
Writing "ff" to 24A2 causes a preset of DS3 (in port 1) ==>
WRITE 24A2 FF

4.8 Command Files

A command file can be written (much like a batch file or script) to automate a series of command executions. The syntax for the command list follows the same conventions as those shown for the discrete commands. Comments can be placed in the command file by preceding the commented line with a percent sign '%'.

4.8.1 Location of the Command file

The command file must be located in a sub-directory (called "cmd") to the directory that contains 'TEST.EXE'. Make the directory that contains TEST.EXE the 'current directory'. Then execute TEST. The command file is expected to reside in 'current directory\cmd'. For example: If TEST.EXE resides in D:\RATECONV\, then the command files must also reside in D:\RATECONV\\CMD.

4.8.2 Method of making a Command File

This is a two-step method which serves to guarantee the correct syntax and to provide the correct responses to each command.

1. Create a log file with the command 'OPEN'. Type the commands that are wanted in the command file. After all of the commands and the responses have been logged, close the log file with the 'CLOSE' command.
2. Edit the log file to:
    a. Remove any commands typed in error.
    b. Remove TEST.EXE responses and results.
    c. Insert comments, precede all comments with a '%'.
    d. Save the file with a name of choice and with the extension ".CF".

4.9 *Modem Link Capability*

To run the Tester program when connected to a remotely located Converter the following set-up procedure should be verified.

1. Connect the local modem to a serial COM port. Note which COM port (1, 2, 3, or 4) it is connected to.
2. Both the local and remote modem switch settings should be set so as to accomplish the following functionality:
   a. Data terminal ready should be set to the normal position as opposed to the override position.
   b. Verbal results should be enabled as opposed to numeric results.
   c. Display result codes should be enabled as opposed to suppressing result codes.
   d. Echo off-line commands should be enabled as opposed to no echo off-line commands.
   e. Auto answer on first ring, or higher, as specified in NVRAM, should be selected or enabled.
   f. Carrier detect should be set to normal as opposed to override.
   g. Load NVRAM defaults should be selected as opposed to load factory defaults.
   h. Smart mode should be selected as opposed to Dumb mode.
3. Create the equivalent to the following US Robotics Modem Settings:

   B0: ITU-T answer sequence.
   E1: Modem Displays keyboard commands.
   F1: Local echo off. Receiving system sends a remote echo of data it receives.
   M1: Speaker on until CONNECT.
   Q0: Displays results codes.
   V1: Verbal Codes.
   X1: Result Codes include 'OK', 'CONNECT, 'RING', 'NO CARRIER', 'ERROR', 'CONNECT 1200', 'CONNECT 2400', 'CONNECT 9600', 'CONNECT 4800', 'CONNECT 7200', 'CONNECT 12000', 'CONNECT 14400', 'CONNECT 19200', 'CONNECT 21600', 'CONNECT 24000', 'CONNECT 26400', and 'CONNECT 2880'.
   Y0: Default is profile 0 setting in NVRAM.

   BAUD=9600 PARITY=None WORDLEN=8 STOPBIT=1
   DIAL=PULSE ON HOOK

&A3: Protocol indicators added -- LAPM/MNP/NONE (error control and V42BIS/MNP5 (data compression).
&B1: Fixed serial port rate.
&C1: Normal Carrier Detect operation.
&D2: Normal DTR operations.
&G0: No guard tone, US and Canada.
&H1: Hardware flow control, Clear to Send (CTS).
&I0: Software flow control disabled.
&K1: Auto enable/disable of data compression.
&M4: Normal/ARQ error Control.
&N6: Sets forced connect speed of 9600 b/s. If connection cannot be established at this speed, the modem will hang up.
&P0: US/Canada ratio of 39%/61%; Set pulse dial make/break ratio.
&R2: Received Data to computer only on RTS.
&S0: DSR override; always on.
&T5: Prohibits Remote Digital Loopback.
&Y1: Destructive break handling expedited.

Each of the 'S' registers (for the US Robotics Sportster modem is set as follows:

S00=001 S01=000 S02=043 S03=013 S04=010 S05=008 S06=002
S07=060 S08=002 S09=006 S10=007 S11=070 S12=050 S13=000
S14=000 S15=000 S16=000 S17=000 S18=000 S19=000 S20=000
S21=010 S22=017 S23=019 S24=000 S25=005 S26=000 S27=000
S28=008 S29=020 S30=000 S31=000 S32=000 S33=000 S34=006
S35=000 S36=014 S37=000 S38=000 S44=000 S51=000

Legend: The numeric value to the left of the equal sign represents the register number while the value to the right of the equal sign shows the value stored in the register.

4. Start the TEST program as follows:
   TEST <COM port> <telephone number> <ENTER>. The interactive process with the Converter will appear and operate just as described in Paragraph 4.1.

4.10 Future Downloading and Self-test Additions

The software is still being enhanced and part of the features that will be added will give the software the ability to download and to self-test.

4.10.1 Downloading to modules

When the new version of the TEST.EXE software is completed it will include a downloading function. This function will enable the updating of the embedded software of either or both of the modules contained within the Converter unit. Each of the modules currently possess the ability of accepting and processing a download sequence as does the Converter mother board.

4.10.2 Downloading to the Converter

Downloading to the Converter is also a future function of the TEST.EXE software. This function will enable the updating of the embedded software for the Converter mother board.

4.10.3 Self-test

When completed, the self-test software will be in two parts. One part will test each module's ability to transmit and receive ATM cells, and the other part will test the elastic buffer within the Converter. The Converter possesses a user-programmable 16-bit pattern generator and a 32,767-bit pattern generator that will be selectively installed into the payload bytes of the ATM cells during the self-test mode. These ATM cells can be launched at any user-programmable rate in the range of 0 to 3.3 ms in increments of 50 ns. They can also be launched one at a time as commanded by the user. The cell delay from transmit to receive is constantly measured and is made available through the microprocessor interface with the mother board and is ultimately available to the user through the RS-232 interface. There is an error detector for each of the pattern generators that, upon detection of a data byte error, will increment an error counter. The value of the error counter is then made available to the user.

The first part of the self-test is to place each of the modules in an "internal loopback" configuration. ATM cells containing a 16 bit fixed pattern are steered to the Transmit input of the Port 2-interface module. The Port 2-interface module loops these cells back to the Receive output at the Utopia interface. These cells are then routed to the Port 1 interface module Transmit input (as is typical in the normal converter operations). The Port 1 module loops the cells back to the Utopia Receive output. These received (Port 1) cells are written to the 2048 cell elastic buffer and routed to the error detector. This process is continued until the elastic buffer is filled with known "good" ATM cells. As long as no errors are detected, the data path through the modules and FPGAs is good (for the selected pattern).

The second part of the self-test is to use the elastic buffer as the data source and repeat the same procedure outlined above. As long as no errors are detected, the memory devices that make up the elastic buffer are good (as is the address generation and the read/write functions between the FPGAs and buffer).
The above two parts are completed three times, first with a 16-bit (hex pattern of) "AAAA", then a (hex pattern of) "5555" and finally a pseudorandom pattern that is 32,767 bits long.

NOTE

The buffer contains 2,048 cells, each of which consists of 48 payload bytes plus five header bytes.

The total storage of the buffer is 786,432 bits. This allows 24.00073244 occurrences of the pseudorandom bit stream to be in the buffer at a time or 24 bits more than 24 occurrences. Successful completion of the 16 bit tests proves that every memory bit is operative when the data is a '0' or a '1'.

5.0 Specifications

Mounting	Desktop , optional rack mount
Size	(W,D,H) 7.26" x 9.31" x 1.424"
Weight	4 lb
Input Power	115 to 230-V ac/50 to 60 Hz, or 48-V dc
Power Consumption	20 W (max.)
Operating Temperature	0°C to 70°C
Connectors	OC-3/STM-1: Dual SC DS3/E3: BNC Control: DB-9 (RS-232)
LEDs on each interface	Equipment Failure Synchronization Failure Near-End Failure Far-End Failure Power
OC-3/STM-1 Options	Single Mode Multimode

Alarm Surveillance

	OC-3/STM-1	DS3/E3
Loss of Signal (LOS)	✓	✓
Loss of Frame (LOF)	✓	✓
Loss of Pointer (LOP)	✓	
Loss of Cell Delineation (LOC)	✓	✓
Signal Label Match Failure	✓	
Synchronization Failure	✓	✓
Hardware Failure	✓	✓
Line Alarm Indication Signal (AIS)	✓	✓
Path Alarm Indication Signal (PAIS)	✓	
Line RFI	✓	
STS Path RFI	✓	
DS3 Path RFI (C-bit)	✓	
FERF (M23)	✓	

Loopbacks, Facility and Terminal on OC-3/STM-1, locally controlled
Loopbacks, Facility and Terminal on DS3/E3, locally controlled and via FEAC

6.0 Ordering, Maintenance, and Repair Information

6.1 Converter Options

The Converter comes with an external power supply (universal input, 50 to 60 Hz, 115 to 230-V dc), and a power cord and a manual. Manuals for the specific types of modules installed in the Converter are also included. Two options are available for the Converter. The basic unit is table or shelf mounted. Available as an option is a 23″ Rack-Mounting Adapter Shelf with a 48-V dc power supply replacing the standard ac power supply. Also available as an option is a Wall-Mount Adapter Bracket.

Model and Product ID numbers for the options are listed in the Ordering Information paragraph below.

6.2 Ordering Information

The following items are currently available. Use both the description and its associated Product ID number when placing orders.

6.2.1 Model Numbers

Description	Product ID
Rate/Format Converter OC-3 MM/DS3	180-0101-01
Rate/Format Converter OC-3 SM/DS3	180-0101-02
Rate/Format Converter STM-1 MM/E3	180-0101-11
Rate/Format Converter STM-1 SM/E3	180-0101-12
Rate/Format Converter OC-3 MM/E3	180-0101-21
Rate/Format Converter OC-3 SM/E3	180-0101-22
Rate/Format Converter STM-1 MM/DS3	180-0101-31
Rate/Format Converter STM-1 SM/DS3	180-0101-32
Rate/Format Converter DS3/E3	180-0101-40

6.2.2 Options and Accessories

23″ Rack-Mount Shelf with 48-V dc supply	180-1039-01
Wall-Mount Adapter Bracket	180-1033
Power Supply, ac	180-8053-01
Power Cord, ac	0490065
User's Manual	7700002

6.2.3 Order Placement

To place orders, or to request information about converter products supporting interface types other than those specified above, contact: Black Box Catalogue Ltd.

6.3 Converter Maintenance

There are no moving parts in a Converter and there are no components that require periodic service.

6.4 Converter Provisioning

The FIT rate for a Converter is 17,350. This equates to an MTBF of 57,637 hours.

Appendix A

DS3 Status and Control Registers

Appendix A lists the status/configuration registers for the DS3 . The registers are listed by menu number as they appear in the TEST program user interface. For each register, the register's address and meaning is listed.

Menu 1: Failure Status Registers

460	Loss of Signal
461	Loss of Frame
462	DS3 AIS
463	DS3 RAI
464	Equipment Failure
465	Loss of Synch
466	PLCP Loss of Frame
467	PLCP RAI
468	Loss of Cell Delineation
469	Idle Signal
480	Failure Summary

Menu 2: Configuration Control Registers

100	Power Up Diagnostics Control
101	Failure Integration Time
102	Failure Decay Time
103	Timing Source
104	Descrambling Receive Cells Control
105	Correct Receive Cells Control
106	Discard Errored Cells Control
107	Discard Idle Cells Control
108	Scramble Transmit Cells Control
109	Generate Transmit HEC Control
10A	Coset Polynomial Control
10B	DS3 Format
10C	DS3 Line Build Out
10D	PLCP Framing Control
10E	PLCP Timing Source
10F	Transmit Z Bytes
110	Failure Interrupt Control
112 - 113	Performance Monitoring Period

Menu 3: Diagnostic Control Registers

70 - 7F	Diagnostic Pattern
80	Software Reset
81	Clear Diagnostic Status
82	Terminal Loopback Control
83	Facility Loopback Control
8B	Far End Loopback
8C	Clear Interrupt
8D	Start Performance Monitoring Period
8E	Reset Performance Monitoring Period

Menu 4: Diagnostic Status Registers

410	Equipment Test Results
411	Test Number
412 - 415	Test Address
416 - 417	Expected Data Pattern
418 - 419	Received Data Pattern
41A	Suspect Part
41B	Control Interface Error
41C - 41D	Control Interface Data
41E - 41F	Control Interface Address
420 - 421	Hardware Audit Item
450 - 451	Status Update Sequence Number

Menu 5: Overhead Status Registers

4B0	Far End Alarm and Control
4B1	Receive DS3 Format Control

Menu 6: Download Registers

10 - 11	Download Control
400 - 401	S Record Count
402	Download State

Menu 7: Performance Monitoring Status Registers

680 - 681	Current Interval Time
682 - 683	Current Interval CV-L
684 - 685	Current Interval ES-L
686 - 687	Current Interval SES-L
688 - 689	Current Interval LOSS-L
68A - 68B	Current Interval FC-P
68C - 68D	Current Interval CV-P
68E - 68F	Current Interval ES-P
690 - 691	Current Interval SES-P
692 - 693	Current Interval SAS-P
694 - 695	Current Interval UAS-P
696 - 697	Current Interval FC-PFE
698 - 699	Current Interval CV-PFE
69A - 69B	Current Interval ES-PFE
69C - 69D	Current Interval SES-PFE
69E - 69F	Current Interval SAS-PFE
6A0 - 6A1	Current Interval UAS-PFE
6A2 - 6A3	Current Interval FC-PP
6A4 - 6A5	Current Interval CV-PP
6A6 - 6A7	Current Interval ES-PP
6A8 - 6A9	Current Interval SES-PP
6AA - 6AB	Current Interval UAS-PP
6AC - 6AD	Current Interval FC-PPFE
6AE - 6AF	Current Interval CV-PPFE
6B0 - 6B1	Current Interval ES-PPFE
6B2 - 6B3	Current Interval SES-PPFE
6B4 - 6B5	Current Interval UAS-PPFE
6B6 - 6B7	Current Interval UHEC
6B8 - 6BB	Current Interval Receive Cells
6BC - 6BF	Current Interval Transmit Cells

6C0 - 6C1	Previous Interval Time
6C2 - 6C3	Previous Interval CV-L
6C4 - 6C5	Previous Interval ES-L
6C6 - 6C7	Previous Interval SES-L
6C8 - 6C9	Previous Interval LOSS-L
6CA - 6CB	Previous Interval FC-P
6CC - 6CD	Previous Interval CV-P
6CE - 6CF	Previous Interval ES-P
6D0 - 6D1	Previous Interval SES-P
6D2 - 6D3	Previous Interval SAS-P
6D4 - 6D5	Previous Interval UAS-P

6D6 - 6D7	Previous Interval FC-PFE
6D8 - 6D9	Previous Interval CV-PFE
6DA - 6DB	Previous Interval ES-PFE
6DC - 6DD	Previous Interval SES-PFE
6DE - 6DF	Previous Interval SAS-PFE
6E0 - 6E1	Previous Interval UAS-PFE
6E2 - 6E3	Previous Interval FC-PP
6E4 - 6E5	Previous Interval CV-PP
6E6 - 6E7	Previous Interval ES-PP
6E8 - 6E9	Previous Interval SES-PP
6EA - 6EB	Previous Interval UAS-PP
6EC - 6ED	Previous Interval FC-PPFE
6EE - 6EF	Previous Interval CV-PPFE
6F0 - 6F1	Previous Interval ES-PPFE
6F2 - 6F3	Previous Interval SES-PPFE
6F4 - 6F5	Previous Interval UAS-PPFE
6F6 - 6F7	Previous Interval UHEC
6F8 - 6FB	Previous Interval Receive Cells
6FC - 6FF	Previous Interval Transmit Cells

Menu 8: Product Information Registers

440	Primary Software Version Number
441	Secondary Software Version Number
442	Tertiary Software Version Number
443	Boot Software Version Letter
490 - 4AF	Manufacturing Information

Appendix B

E3 Status and Control Registers

Appendix B lists the status/configuration registers for the E3 . The registers are listed by menu number as they appear in the TEST program user interface. For each register, the register's address and meaning is listed.

Menu 1: Failure Status Registers

460	Loss of Signal
461	Loss of Frame
462	E3 AIS
463	E3 RFI
464	Equipment Failure
465	Loss of Synch
466	Loss of Cell Delineation
467	Payload Type Mismatch
468	Trail Trace Mismatch
480	Failure Summary

Menu 2: Configuration Control Registers

100	Power Up Diagnostics Control
101	Failure Integration Time
102	Failure Decay Time
103	Timing Source
104	Descrambling Receive Cells Control
105	Correct Receive Cells Control
106	Discard Errored Cells Control
107	Discard Idle Cells Control
108	Scramble Transmit Cells Control
109	Generate Transmit HEC Control
10A	Coset Polynomial Control
10B	E3 Format
10C	Transmit Timing Marker
10D	Payload Type Monitor Control
10E	Trail Trace Monitor Control
10F	Trail Trace Format
130	LOCD Causes RDI Control
131	Failure Interrupt Control
132 - 133	Performance Monitoring Period

Menu 3: Diagnostic Control Registers

70 - 7F	Diagnostic Pattern
80	Software Reset
81	Clear Diagnostic Status
82	Terminal Loopback Control
83	Facility Loopback Control
8B	Clear Interrupt
8C	Start Performance Monitoring Period
8D	Reset Performance Monitoring Period

Menu 4: Diagnostic Status Registers

410	Equipment Test Results
411	Test Number
412 - 415	Test Address
416 - 417	Expected Data Pattern
418 - 419	Received Data Pattern
41A	Suspect Part
41B	Control Interface Error
41C - 41D	Control Interface Data
41E - 41F	Control Interface Address
420 - 421	Hardware Audit Item
450 - 451	Status Update Sequence Number

Menu 5: Overhead Status Registers

110 - 11F	Transmit Trail Trace
120 - 12F	Expected Receive Trail Trace
4B0 - 4BF	Receive Trail Trace
4C0	Receive Timing Marker

Menu 6: Download Registers

10 - 11	Download Control
400 - 401	S Record Count
402	Download State

Menu 7: Performance Monitoring Status Registers

680 - 681	Current Interval Time
682 - 685	Current Interval EB
686 - 687	Current Interval ES
688 - 689	Current Interval SES
68A - 68B	Current Interval UAS
68C - 68F	Current Interval BBE
690 - 693	Current Interval TB
694 - 697	Current Interval EB-FE
698 - 699	Current Interval ES-FE
69A - 69B	Current Interval SES-FE
69C - 69D	Current Interval UAS-FE
69E - 6A1	Current Interval BBE-FE
6A2 - 6A5	Current Interval TB-FE
6A6 - 6A7	Current Interval UHEC
6A8 - 6AB	Current Interval Receive Cells
6AC - 6AF	Current Interval Transmit Cells

6C0 - 6C1	Previous Interval Time
6C2 - 6C5	Previous Interval EB
6C6 - 6C7	Previous Interval ES
6C8 - 6C9	Previous Interval SES
6CA - 6CB	Previous Interval UAS
6CC - 6CF	Previous Interval BBE
6D0 - 6D3	Previous Interval TB
6D4 - 6D7	Previous Interval EB-FE
6D8 - 6D9	Previous Interval ES-FE
6DA - 6DB	Previous Interval SES-FE
6DC - 6DD	Previous Interval UAS-FE
6DE - 6E1	Previous Interval BBE-FE
6E2 - 6E5	Previous Interval TB-FE
6E6 - 6E7	Previous Interval UHEC
6E8 - 6EB	Previous Interval Receive Cells
6EC - 6EF	Previous Interval Transmit Cells

Menu 8: Product Information

440	Primary Software Version Number
441	Secondary Software Version Number
442	Tertiary Software Version Number
443	Boot Software Version Letter

490 - 4AF	*Manufacturing Information*

Appendix C

OC-3 Status and Control Registers

Appendix C lists the status/configuration registers for the OC-3 . The registers are listed by menu number as they appear in the TEST program user interface. For each register, the register's address and meaning is listed.

Menu 1: Failure Status Registers

460	Loss of Signal
461	Loss of Frame
462	STS Path LOP
463	Equipment Failure
464	Loss of Synch
465	Signal Label Mismatch
466	Line AIS
467	STS Path AIS
468	Line RFI
469	STS Path RFI
46A	Path Trace Mismatch
46B	Loss of Cell Delineation
480	Failure Summary

Menu 2: Configuration Control Registers

100	Power Up Diagnostics Control
101	Failure Integration Time
102	Failure Decay Time
103	Timing Source
104	Descrambling Receive Cells Control
105	Correct Receive Cells Control
106	Discard Errored Cells Control
107	Discard Idle Cells Control
108	Scramble Transmit Cells Control
109	Generate Transmit HEC Control
10A	Monitor Signal Label Control
10B	Monitor Path Trace Control
18C	Failure Interrupt Control
18E - 18F	Performance Monitoring Period

Menu 3: Diagnostic Control Registers

70 - 7F	Diagnostic Pattern
80	Software Reset
81	Clear Diagnostic Status
82	Terminal Loopback Control
83	Facility Loopback Control
8D	Clear Interrupt
8E	Start Performance Monitoring Period
8F	Reset Performance Monitoring Period

Menu 4: Diagnostic Status Registers

410	Equipment Test Results
411	Test Number
412 - 415	Test Address
416 - 417	Expected Data Pattern
418 - 419	Received Data Pattern
41A	Suspect Part
41B	Control Interface Error
41C - 41D	Control Interface Data
41E - 41F	Control Interface Address
420 - 421	Hardware Audit Item
450 - 451	Status Update Sequence Number

Menu 5: SONET Overhead Status Registers

10C - 14B	Transmit Path Trace
14C - 18B	Expected Receive Path Trace
4B0 - 4EF	Receive Path Trace
4F0	Received Signal Label (C2 Byte)

Menu 6: Download Registers

10 - 11	Download Control
400 - 401	S Record Count
402	Download State

Menu 7: Performance Monitoring Status Registers

680 - 681	Current Interval Time
682 - 683	Current Interval CV-S
684 - 685	Current Interval ES-S
686 - 687	Current Interval SES-S
688 - 689	Current Interval SEFS-S
68A - 68B	Current Interval FC-L
68C - 68D	Current Interval CV-L
68E - 68F	Current Interval ES-L
690 - 691	Current Interval SES-L
692 - 693	Current Interval UAS-L
694 - 695	Current Interval FC-LFE
696 - 697	Current Interval CV-LFE
698 - 699	Current Interval ES-LFE
69A - 69B	Current Interval SES-LFE
69C - 69D	Current Interval UAS-LFE
69E - 69F	Current Interval FC-P
6A0 - 6A1	Current Interval CV-P
6A2 - 6A3	Current Interval ES-P
6A4 - 6A5	Current Interval SES-P
6A6 - 6A7	Current Interval UAS-P
6A8 - 6A9	Current Interval FC-PFE
6AA - 6AB	Current Interval CV-PFE
6AC - 6AD	Current Interval ES-PFE
6AE - 6AF	Current Interval SES-PFE
6B0 - 6B1	Current Interval UAS-PFE
6B2 - 6B3	Current Interval UHEC
6B4 - 6B7	Current Interval Receive Cells
6B8 - 6BB	Current Interval Transmit Cells
6BC	Current Interval IDF-LFE
6BD	Current Interval IDF-PFE
6C0 - 6C1	Previous Interval Time
6C2 - 6C3	Previous Interval CV-S
6C4 - 6C5	Previous Interval ES-S
6C6 - 6C7	Previous Interval SES-S
6C8 - 6C9	Previous Interval SEFS-S
6CA - 6CB	Previous Interval FC-L
6CC - 6CD	Previous Interval CV-L
6CE - 6CF	Previous Interval ES-L
6D0 - 6D1	Previous Interval SES-L
6D2 - 6D3	Previous Interval UAS-L
6D4 - 6D5	Previous Interval FC-LFE

6D6 - 6D7	Previous Interval CV-LFE
6D8 - 6D9	Previous Interval ES-LFE
6DA - 6DB	Previous Interval SES-LFE
6DC - 6DD	Previous Interval UAS-LFE
6DE - 6DF	Previous Interval FC-P
6E0 - 6E1	Previous Interval CV-P
6E2 - 6E3	Previous Interval ES-P
6E4 - 6E5	Previous Interval SES-P
6E6 - 6E7	Previous Interval UAS-P
6E8 - 6E9	Previous Interval FC-PFE
6EA - 6EB	Previous Interval CV-PFE
6EC - 6ED	Previous Interval ES-PFE
6EE - 6EF	Previous Interval SES-PFE
6F0 - 6F1	Previous Interval UAS-PFE
6F2 - 6F3	Previous Interval UHEC
6F4 - 6F7	Previous Interval Receive Cells
6F8 - 6FB	Previous Interval Transmit Cells
6FC	Previous Interval IDF-LFE
6FD	Previous Interval IDF-PFE

Menu 8: Product Information

440	Primary Software Version Number
441	Secondary Software Version Number
442	Tertiary Software Version Number
443	Boot Software Version Letter

490 - 4AF	*Manufacturing Information*

Appendix D

STM-1 Status and Control Registers

Appendix D lists the status/configuration registers for the STM-1 . The registers are listed by menu number as they appear in the TEST program user interface. For each register, the register's address and meaning is listed.

Menu 1: Failure Status Registers

460	Loss of Signal
461	Loss of Frame
462	AU4 Path LOP
463	Equipment Failure
464	Loss of Synch
465	Signal Label Mismatch
466	MS AIS
467	AU4 Path AIS
468	MS RFI
469	VC4 Path RFI
46A	Path Trace Mismatch
46B	Loss of Cell Delineation
480	Failure Summary

Menu 2: Configuration Control Registers

100	Power Up Diagnostics Control
101	Failure Integration Time
102	Failure Decay Time
103	Timing Source
104	Descrambling Receive Cells Control
105	Correct Receive Cells Control
106	Discard Errored Cells Control
107	Discard Idle Cells Control
108	Scramble Transmit Cells Control
109	Generate Transmit HEC Control
10A	Monitor Signal Label Control
10B	Monitor Path Trace Control
18C	Coset Polynomial Control
18D	Path Trace Format
18E	Failure Interrupt Control
190 - 191	Performance Monitoring Period

Menu 3: Diagnostic Control Registers

70 - 7F	Diagnostic Pattern
80	Software Reset
81	Clear Diagnostic Status
82	Terminal Loopback Control
83	Facility Loopback Control
8D	Clear Interrupt
8E	Start Performance Monitoring Period
8F	Reset Performance Monitoring Period

Menu 4: Diagnostic Status Registers

410	Equipment Test Results
411	Test Number
412 - 415	Test Address
416 - 417	Expected Data Pattern
418 - 419	Received Data Pattern
41A	Suspect Part
41B	Control Interface Error
41C - 41D	Control Interface Data
41E - 41F	Control Interface Address
420 - 421	Hardware Audit Item
450 - 451	Status Update Sequence Number

Menu 5: SONET Overhead Status Registers

10C - 14B	Transmit Path Trace
14C - 18B	Expected Receive Path Trace
4B0 - 4EF	Receive Path Trace
4F0	Received Signal Label (C2 Byte)

Menu 6: Download Registers

10 - 11	Download Control
400 - 401	S Record Count
402	*Download State*

Menu 7: Performance Monitoring Status Registers

680 - 681	Current Interval Time
682 - 683	Current Interval CV-S
684 - 685	Current Interval ES-S
686 - 687	Current Interval SES-S
688 - 689	Current Interval SEFS-S
68A - 68B	Current Interval FC-L
68C - 68D	Current Interval CV-L
68E - 68F	Current Interval ES-L
690 - 691	Current Interval SES-L
692 - 693	Current Interval UAS-L
694 - 695	Current Interval FC-LFE
696 - 697	Current Interval CV-LFE
698 - 699	Current Interval ES-LFE
69A - 69B	Current Interval SES-LFE
69C - 69D	Current Interval UAS-LFE
69E - 69F	Current Interval FC-P
6A0 - 6A1	Current Interval CV-P
6A2 - 6A3	Current Interval ES-P
6A4 - 6A5	Current Interval SES-P
6A6 - 6A7	Current Interval UAS-P
6A8 - 6A9	Current Interval FC-PFE
6AA - 6AB	Current Interval CV-PFE
6AC - 6AD	Current Interval ES-PFE
6AE - 6AF	Current Interval SES-PFE
6B0 - 6B1	Current Interval UAS-PFE
6B2 - 6B3	Current Interval UHEC
6B4 - 6B7	Current Interval Receive Cells
6B8 - 6BB	Current Interval Transmit Cells
6BC	Current Interval IDF-LFE
6BD	Current Interval IDF-PFE
6C0 - 6C1	Previous Interval Time
6C2 - 6C3	Previous Interval CV-S
6C4 - 6C5	Previous Interval ES-S
6C6 - 6C7	Previous Interval SES-S
6C8 - 6C9	Previous Interval SEFS-S
6CA - 6CB	Previous Interval FC-L
6CC - 6CD	Previous Interval CV-L
6CE - 6CF	Previous Interval ES-L
6D0 - 6D1	Previous Interval SES-L
6D2 - 6D3	Previous Interval UAS-L
6D4 - 6D5	Previous Interval FC-LFE

6D6 - 6D7	Previous Interval CV-LFE
6D8 - 6D9	Previous Interval ES-LFE
6DA - 6DB	Previous Interval SES-LFE
6DC - 6DD	Previous Interval UAS-LFE
6DE - 6DF	Previous Interval FC-P
6E0 - 6E1	Previous Interval CV-P
6E2 - 6E3	Previous Interval ES-P
6E4 - 6E5	Previous Interval SES-P
6E6 - 6E7	Previous Interval UAS-P
6E8 - 6E9	Previous Interval FC-PFE
6EA - 6EB	Previous Interval CV-PFE
6EC - 6ED	Previous Interval ES-PFE
6EE - 6EF	Previous Interval SES-PFE
6F0 - 6F1	Previous Interval UAS-PFE
6F2 - 6F3	Previous Interval UHEC
6F4 - 6F7	Previous Interval Receive Cells
6F8 - 6FB	Previous Interval Transmit Cells
6FC	Previous Interval IDF-LFE
6FD	Previous Interval IDF-PFE

Menu 8: Product Information

440	Primary Software Version Number
441	Secondary Software Version Number
442	Tertiary Software Version Number
443	Boot Software Version Letter
490 - 4AF	Manufacturing Information
6D6 - 6D7	Previous Interval CV-LFE
6D8 - 6D9	Previous Interval ES-LFE
6DA - 6DB	Previous Interval SES-LFE
6DC - 6DD	Previous Interval UAS-LFE
6DE - 6DF	Previous Interval FC-P
6E0 - 6E1	Previous Interval CV-P
6E2 - 6E3	Previous Interval ES-P
6E4 - 6E5	Previous Interval SES-P
6E6 - 6E7	Previous Interval UAS-P
6E8 - 6E9	Previous Interval FC-PFE
6EA - 6EB	Previous Interval CV-PFE
6EC - 6ED	Previous Interval ES-PFE
6EE - 6EF	Previous Interval SES-PFE
6F0 - 6F1	Previous Interval UAS-PFE
6F2 - 6F3	Previous Interval UHEC
6F4 - 6F7	Previous Interval Receive Cells
6F8 - 6FB	Previous Interval Transmit Cells
6FC	Previous Interval IDF-LFE
6FD	Previous Interval IDF-PFE

Menu 8: Product Information

440	Primary Software Version Number
441	Secondary Software Version Number
442	Tertiary Software Version Number
443	Boot Software Version Letter
490 - 4AF	Manufacturing Information