

## E220 HFAC HDSL / HDSL2 FUSE Alarm Control Unit Installation and Maintenance

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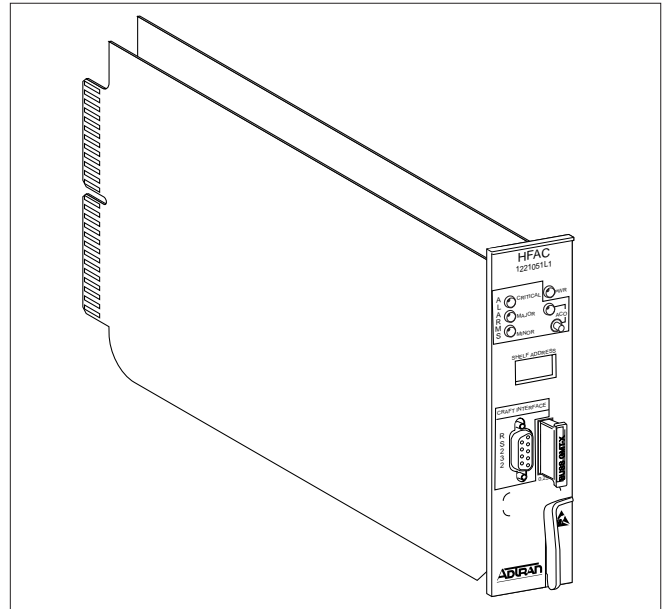


Figure 1. ADTRAN E220 HFAC

### 1. GENERAL

The ADTRAN E220 HDSL / HDSL2 Fuse/Alarm/Control (HFAC), P/N 61221051L1, unit is a shelf controller unit designed for operation in the ADTRAN E220 HDSL / HDSL2 Central Office (CO) shelf.

**Figure 1** is an illustration of the E220 HFAC.

### Revision History

Revisions to this practice will be summarized in this paragraph.

The E220 HFAC provides a common access point to performance and provisioning information related to each HDSL / HDSL2 transceiver unit for the central office (HTU-C and H2TU-C) deployed in the E220 shelf. By addressing the HTU-C or H2TU-C, the HFAC also provides support for the HDSL / HDSL2 range extender (HRE and H2R) and the HDSL / HDSL2 transceiver unit for the remote end (HTU-R and H2TU-R). The shelf supports one shelf controller (HFAC) and up to 13 HTU-C / H2TU-C cards for the 23-inch shelf or 11 HTU-C / H2TU-C cards for the 19-inch shelf. A faceplate-mounted DB9 connector provides a VT 100 compatible terminal interface for controlling the system.

The HFAC supports the HTU-Cs / H2TU-Cs listed below.

- 1242024L1
- 1242002L2
- 1242002L5
- 1242002L6
- 1245001L2
- 1245001L9
- 1245011L1
- 1242002L7
- 1242029L1
- 1242029L2
- 1244001L1
- 1246001L2
- 1221001L2

The differences in functionality when working with list-specific HTU-Cs / H2TU-Cs or HREs / H2Rs, if any, are called out in this practice. Also, the HFAC has necessary interface software for communications with the HCOT-CTL (ADTRAN p/n: 1240009L1, 1244051L1, 1221051L1). See appropriate HCOT practices for installation and maintenance information.

The HFAC collects and presents performance information for each circuit deployed in the shelf. It also allows control of all provisioning information for each circuit. The unit can also be configured to provide advanced alarm processing features.

## 2. INSTALLATION



After unpacking the unit, inspect it for damage. If damage is discovered, file a claim with the carrier, then contact ADTRAN. See Warranty and Customer Service.

## Electrical cable compliance

**Table 1** shows the Compliance Codes for HFAC. The HFAC complies with the requirements covered under UL 1950 third edition and is intended to be installed in an enclosure with an Installation Code (IC) of “B” or “E.”

### NOTE

**This product is intended for installation in Restricted Access Locations Only. Input current at maximum load is 1A at -48 VDC. Maximum output at overcurrent condition is 165 mA at -190 VDC.**

Table 1. Compliance Codes

Code	Input	Output
IC	A	-
TC	-	-
PC	F	C

## Configuration

Operation of the HFAC is influenced by three sets of configuration option switches (see **Figures 2 and 3**).

## Shelf Address

Two rotary switches (U38 and U39) are provided to program the shelf’s address. In a system where several shelves are under the common control of one ADTRAN E220 HCOT-CTL System Controller, each individual shelf must be programmed with a unique shelf address. Addresses range from 00 to 99. In a system that does not utilize the HCOT-CTL System Controller, the shelf address is not used. To program

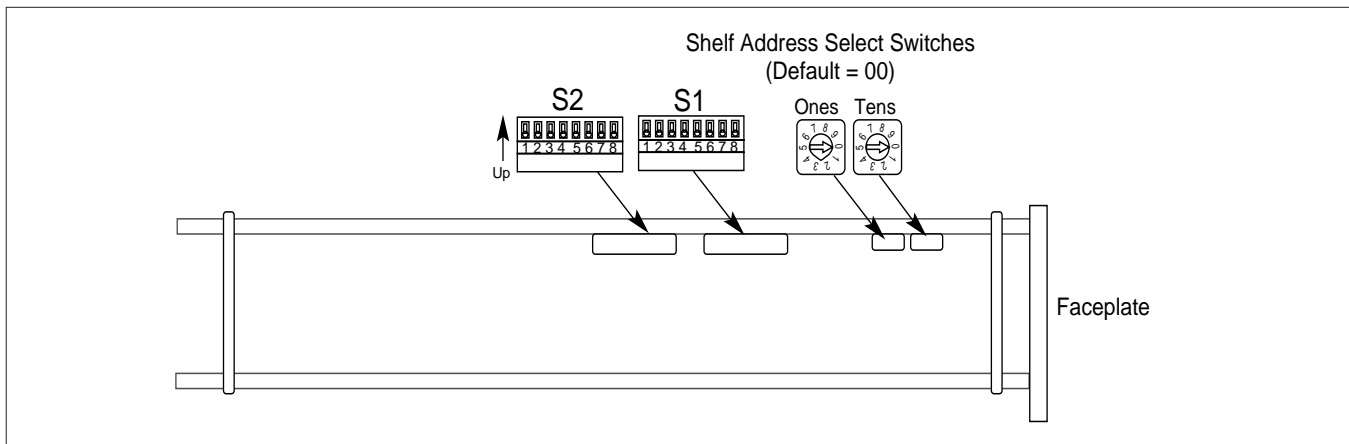


Figure 2. Configuration and Shelf Address Switches

the address, select the desired address in the Options Setup Screen (Figure 11), or set the rotary switches as indicated in Figure 2.

**Unit Options**

Two banks of configuration switches (S1, S2 and S3, see Figure 2 and 3) are used to select advanced alarm reporting features (see Tables 2, 3 and 4).

**Errored Seconds (ES) Alarm**

The locations shown in Figure 4 are monitored for errored seconds and counts are maintained for each location.

If any of these counts exceed the ES programmed threshold (see Tables 1 and 2) an alarm will be generated. This alarm threshold and the alarm type (minor or major) can be programmed by setting switches S1 and S2 (Figure 2) to the appropriate positions, according to Tables 1 and 2.

The alarm thresholds are for the 15-minute registers only, and the 15-minute ES counts are zeroed at each 15-minute boundary. The ES alarm threshold and alarm type can also be configured in the Craft interface Options Setup screen.

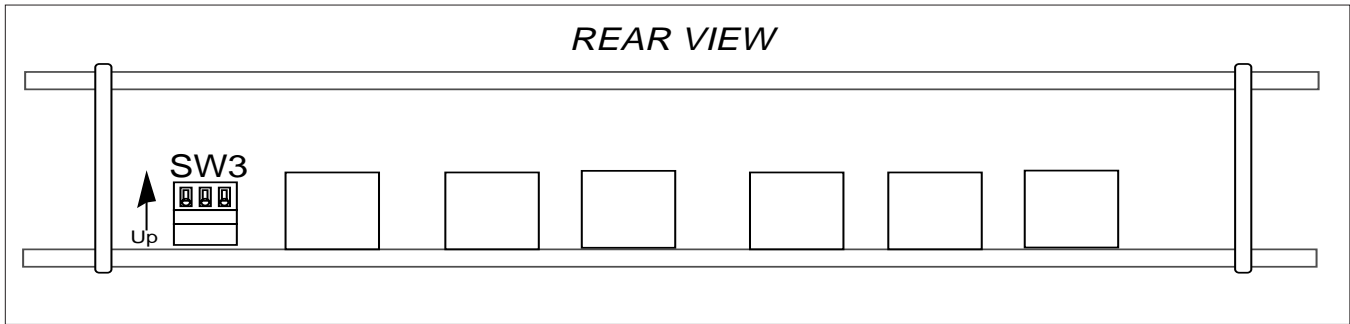


Figure 3. SW3 Location and Options

Table 2. S1 Switch Options (arrow indicates default setting)

Switch	Function	Description	
S1-1.....	Errored Seconds	Selects the type of alarm generated when the errored seconds (ES) counter exceeds the programmed threshold (see Table 2, S2-1, S2-2).	
►Down .....	Minor Alarm		
Up (open) .....	Major Alarm		
S1-2.....	Severely Errored Seconds	Selects the type of alarm generated when the severely errored seconds (SES) counter exceeds the programmed threshold (see Table 2, SW2-3, SW2-4).	
►Down .....	Minor Alarm		
Up (open) .....	Major Alarm		
S1-3.....	Unavailable Seconds	Selects the type of alarm generated when the unavailable seconds (UAS) counter exceeds the programmed threshold (see Table 2, SW2-5, SW2-6).	
►Down .....	Major Alarm		
Up (open) .....	Critical Alarm		
S1-4..... S1-5 .....	HFAC Fuse Alarm Type	Selects the type of alarm generated in response to an HFAC fuse failure. Switch SW3 must also be set correctly for this alarm to function properly (see Table 3). This option is hardware-selectable only.	
Down .....	No Alarm		
Up (open) .. Down .....	Minor Alarm		
►Down .....	Up (open) .. Major Alarm		
Up (open) .. Up (open) ..	Up (open) .. Critical Alarm		
S1-6..... S1-7 .....	HTU-C Fuse alarm Type	Selects the type of alarm generated in response to a specific number of HTU-C fuse failures.	
Down .....	Down .....		No Alarm
Up (open) .. Down .....	1 or more: Critical		
Down .....	Up .....		1: Major, 2-13: Critical
►Up (open) .. Up (open) ..	Up (open) ..		1-5: Major, 6-13: Critical
S1-8.....	HCOT-CTL Fuse Alarm Type	Selects the type of alarm generated in response to an HCOT-CTL system controller fuse failure. This option can only be selected by switch.	
►Down .....	Major Alarm		
Up (open) .....	Critical Alarm		

Table 3. S2 Switch Options (arrow indicates default setting)

Switch	Function	Description
S2-1 ..... S2-2 ..... Down ..... Down ..... Up (open) .. Down ..... Down ..... Up (open) ..... ➤ Up (open) .. Up (open) .....	ES Alarm Threshold No Alarm 15 30 150	Selects the threshold for generating an ES alarm. Once the number detected exceeds the threshold, an alarm is generated as programmed by S1-1. The alarm condition is cleared at the next 15-minute boundary.
S2-3 ..... S2-4 ..... Down ..... Down ..... Up (open) .. Down ..... Down ..... Up ..... ➤ Up (open) .. Up (open) .....	SES Alarm Threshold No Alarm 5 15 75	Selects the threshold monitored for generating an SES alarm. Once the number detected exceeds the threshold, an alarm is generated as programmed by S1-2. The alarm condition is cleared at the next 15-minute boundary.
S2-5 ..... S2-6 ..... Down ..... Down ..... Up (open) .. Down ..... Down ..... Up (open) ..... ➤ Up (open) .. Up (open) .....	UAS Alarm Threshold No Alarm 5 15 75	Selects the threshold monitored for generating an UAS alarm. Once the number detected exceeds the threshold, an alarm is generated as programmed by S1-3. The alarm condition is cleared at the next 15-minute boundary.
S2-7 ..... S2-8 ..... Down ..... Down ..... ➤ Up (open) .. Down ..... Down ..... Up ..... Up (open) .. Up (open) .....	COMM Link Loss Alarm No Alarm Minor Major Critical	Selects the type of alarm generated when a loss of communication between the HFAC controller and an HTU-C occurs. This option is switch-selectable only.

Table 4. S3 Switch Options (arrow indicates default setting)

NOTE: Only one of the S3 Switches should be in the down position.

Switch	Function	Description
S3-1 ..... Down ..... ➤ Up .....	HFAC Fuse Alarm Control Critical No Alarm	Selects Critical as the type alarm generated if the HFAC fuse is blown.
S3-2 ..... ➤ Down ..... Up .....	HFAC Fuse Alarm Control Major No Alarm	Selects Major as the type alarm generated if the HFAC fuse is blown.
S3-3 ..... Down ..... ➤ Up .....	HFAC Fuse Alarm Control Minor No Alarm	Selects Minor as the type alarm generated if the HFAC fuse is blown.

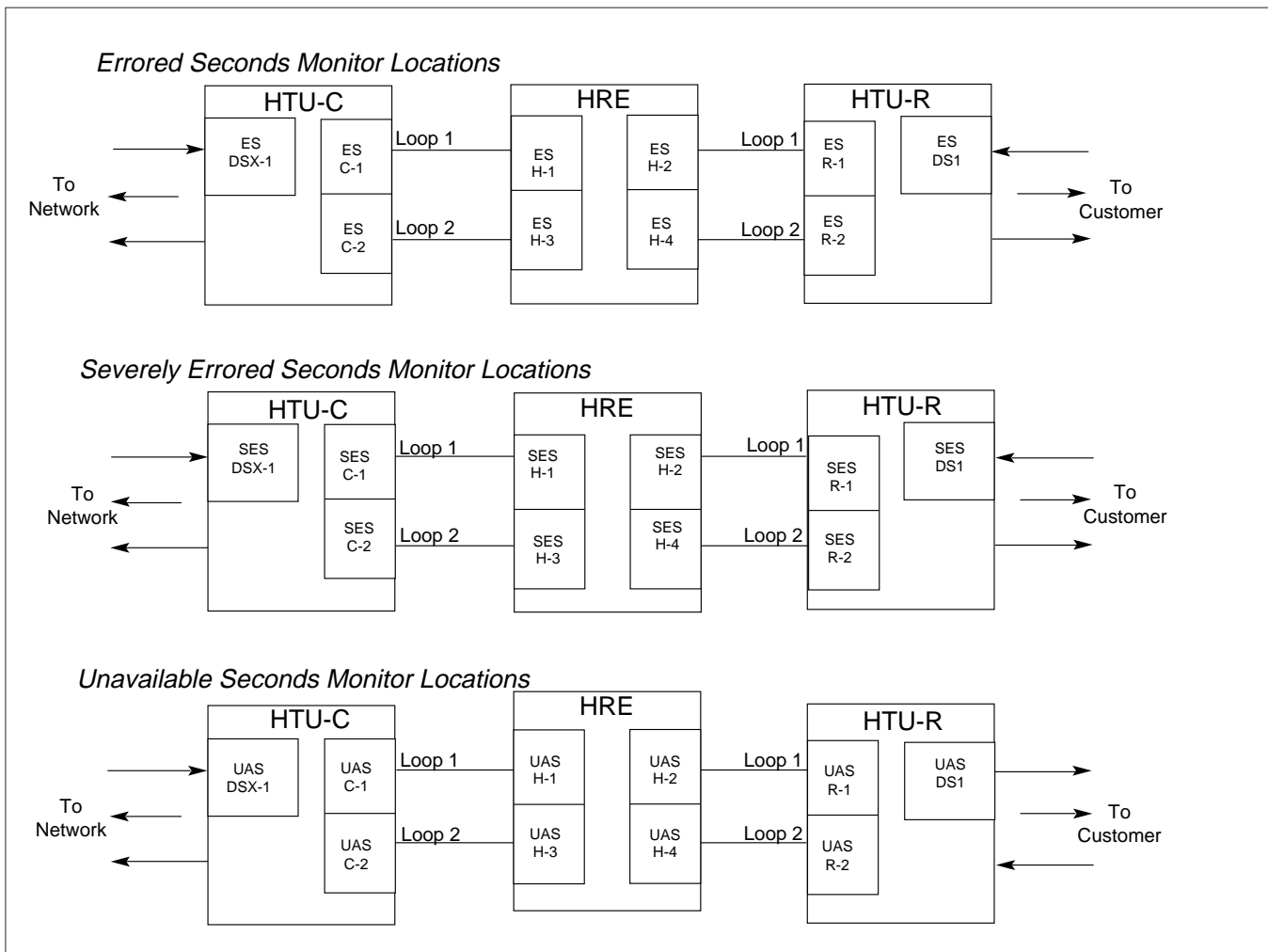


Figure 4. ES, SES, and UAS Monitor Locations

### Severely Errored Seconds (SES) Alarm

The locations shown in Figure 4 are monitored for Severely Errored Seconds and counts are maintained for each location. If any of these counts exceed the SES programmed threshold (see Tables 1 and 2) an alarm will be generated. This alarm threshold and the alarm type (minor or major) can be programmed by setting switches S1 and S2 (Figure 2) to the appropriate positions according to Tables 1 and 2. The alarm thresholds are for the 15-minute registers only, and the 15-minute SES counts are zeroed at each 15-minute boundary. The SES alarm threshold and alarm type can also be configured in the Craft interface Options Setup screen (see Figure 11).

### Unavailable Seconds (UAS) Alarm

The locations shown in Figure 4 are monitored for unavailable seconds. Seconds and counts are maintained for each location. If any of these counts exceed the UAS programmed threshold (see Tables 1 and 2), an alarm will be generated. This alarm threshold and the alarm type (major or critical) can be programmed by setting switches S1 or S2 (Figure 2) to the appropriate positions according to Tables 1 and 2. The alarm thresholds are for the 15-minute

registers only, and the 15-minute UAS errored second counts are zeroed at each 15-minute boundary. The UAS alarm threshold and alarm type can also be configured in the Craft interface Options Setup screen (see Figure 11). Note that HDSL2 two wire units only have Loop 1.

### HFAC Alarm Outputs

If an HFAC is present in the shelf, alarm outputs are available on the backplane wirewrap pins corresponding to the HFAC slot (see **Figure 5**). These outputs are dry contact relay connections and provide normally open, normally closed and common connection points for alarm monitoring equipment. Alarm connection points corresponding to critical major, and minor alarms (both visible and audible) are provided. These alarms are generated by the HFAC as a result of processed data collected from the HTU-Cs / H2TU-Cs.

Alarm outputs presented on these pins are programmable and can be provisioned in the HFAC Options Setup screen (see Options Setup screen), or using the HFAC dip switch settings (see Tables 1, 2, and 3). Alarm severity can be provisioned for alarms

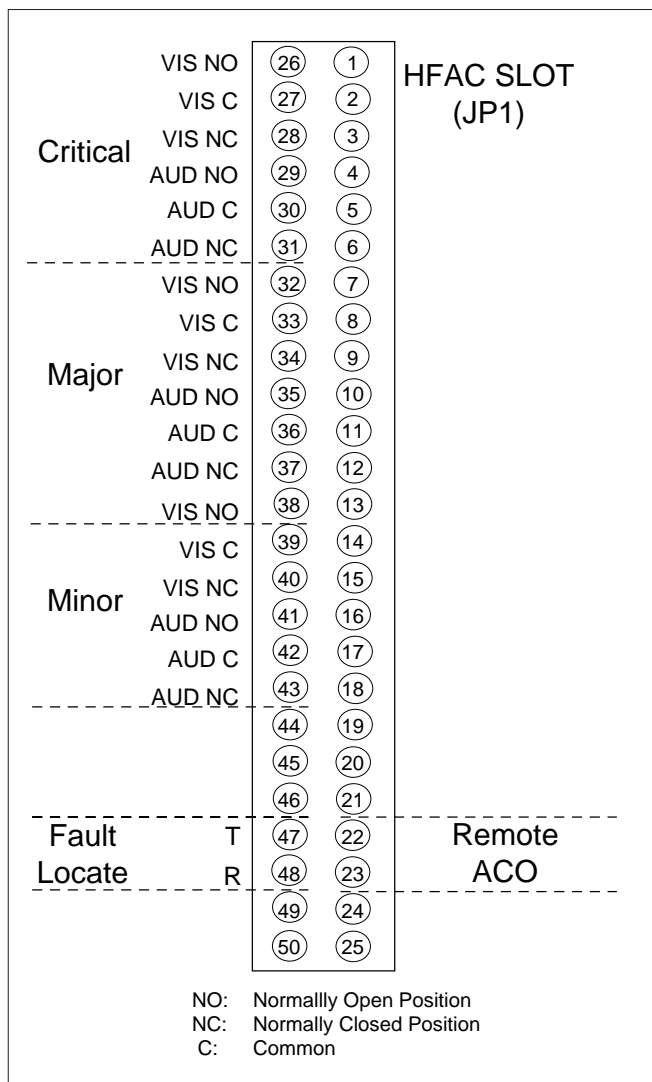


Figure 5. HFAC Wire-Wrap Pin-Out Design

resulting from blown fuses in the HFAC, HTU-C, or HCOT units, or from communications failure between any HTU-C and the HFAC. Alarm severity and threshold value can be provisioned for the errored second, severely errored second, and unavailable second parameters.

An option available on the HFAC Option Setup screen allows external DSX-1 or DS1 alarms to be enabled or disabled. This option can only be changed in the HFAC menu (no dip switch option) and the factory default is disabled (see **Table 5**).

### HFAC Fuse Alarm

An alarm may be generated as a result of an HFAC fuse failure. For alarm processing to work, two sets of switches (S1 and S3) must be programmed. See Table 1 and 4. Both switches must be set properly for the HFAC fuse alarm to operate correctly.

Table 5. External HTU-C/HTU-R Alarm Options (Software-Selectable Only) (arrow indicates default setting)

Options Screen		
Menu Item No.	Function	Description
5	EXT HTU-C/R	Alarms Disables and enables the alarms resulting from external DSX-1 or DS1
	▶ Disabled	
	Enabled	

### HTU-C Fuse Alarm

An alarm may be generated as a result of an HTU-C fuse failure. The HFAC controller will sense the failure and process this alarm event according to switch settings as defined in Table 2.

### 3. CONNECTIONS

The HFAC plugs into Slot 0 (labeled HFAC) of the ADTRAN E220 shelf. Push firmly to ensure the card seats properly. Connections to the HFAC are made by wire wrap connections to the backplane-mounted connector. JP1 is the primary interface connector for the HFAC. Figure 5 shows the wire-wrap connector terminal pin assignments.

### Alarms

A set of alarm contacts is provided through backplane wire-wrap connections (Figure 5). Wiring can be made to the appropriate pins on JP1 for normally open or normally closed connections for alarm conditions. Connection is made to the Common (C) pin and to the Normally Open (NO) or Normally Closed (NC) pin. Visible and audible alarm contact connections are provided for critical, major, and minor alarms. An audible alarm cutoff function can be initiated by pressing the ACO push-button on the HFAC, or by providing closure between the Remote ACO pins on the JP1 connector. The backplane is labeled with appropriate markings for the alarm and alarm cutoff connections.

### System Communications

If the HFAC is to be used as part of a larger system under the control of an ADTRAN E220 HCOT-CTL system controller, then shelf-to-shelf connections are required. Two RJ45S jacks, JP6 and JP7, located on the shelf backplane, provide shelf-to-shelf communications. A 4- or 8-wire cable with RJ45S type jacks should be used to supply these interconnections. The sequence of connections should be from the RS422 OUT port of the shelf containing the E220 HCOT-CTL system controller to the RS422 IN port of the next shelf. Follow this procedure to

interconnect subsequent shelves. Each shelf controller should be assigned unique sequential shelf addresses. No connection should be made to the RS422 in connector on the shelf containing the E220 HCOT-CTL.

#### 4. FACEPLATE FEATURES

**Table 6** defines the faceplate features of the HFAC.

#### 5. CONTROL PORT OPERATION

The HFAC provides a faceplate-mounted DB9 connector which supplies an RS232 interface for connecting to a controlling terminal. Pin assignments are shown in **Figure 6**.

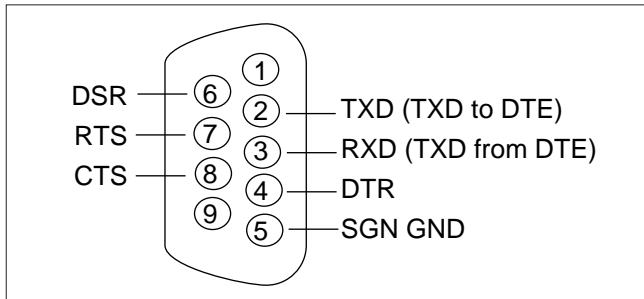


Figure 6. Control Port Pin Assignments (DCE Configuration)

The terminal interface operates at a data rate range of 4.8 kbps to 19.2 kbps. The asynchronous data format is fixed at eight data bits, no parity, one stop bit. The supported terminal type is VT 100, or compatible.

Optional terminal parameters should be set as follows:

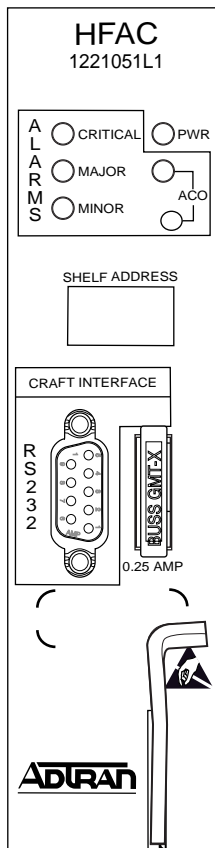
- XON/XOFF flow control      On
- TX carriage return            <CR> (not <CRLF>)
- Send ACK\*                      Off
- Linewrap                        Off
- Duplex setting                 Full
- Asynchronous format        8 data bits, no parity, 1 stop bit
- Cursor                         Off (if possible)
- Display Width                 80 columns
- Display Height                24 lines (minimum)

*\*or any other autonomously-sent character from terminal*

#### Screen Abbreviations

Screen diagram abbreviations used are defined in **Table 7**.

Table 6. HFAC Faceplate Features



Indicators and LEDs	Description
PWR	Indicates that power is present to the HFAC card.
ALARMS	Critical (red) ..... Indicates that a critical alarm condition is present. Major (red) ..... Indicates that a major alarm condition is present. Minor (yellow) ... Indicates that a minor alarm condition is present. ACO ..... Alarm cut off. Indicates that the audible portion of an alarm has been terminated.
SHELF ADDRESS	The shelf address is indicated using two 7-segment LED displays. The address is programmed using the switches described in subsection 2 and tables A and B; or using the Options Setup screen (see Figure 11).
Button ACO	A single momentary push-button provided to operate the alarm cut off function. When the button is present, the audible portion of an active alarm is silenced. The condition of the alarm itself is not affected.
Fuse	This 0.25 -amp fuse is provided to protect the card from power-related failures. The fuse is a BUSS BMT-0.25, or equivalent. If the fuse opens, a fuse alarm is generated as described in subsection 2. The fuse has a visual tripped indicators. When the metal tab (visible through the cover) flips up, the fuse has opened.
RS232	A faceplate-mounted DB9 connector which supplies an RS232 interface for connection to a controlling terminal. Refer to subsection 5.

Table 7. Screen Abbreviations

Abbreviations	Description
<b>DSX/DS1</b>	
BPV .....	Second in which a bipolar violation occurs.
ES .....	SF: Second in which a BPV or frame bit error occurs. ESF: Second in which a BPV or CRC error occurs.
SES .....	Second in which 1544 BPVs or 8 frame bit errors occur.
UAS .....	Second in which there is a loss of signal or loss of sync.
<b>HDSL Loops</b>	
ES .....	Second in which a CRC error occurs.
SES .....	Second in which 165 CRC errors occur.
UAS .....	Second in which there is a loss of signal or loss of sync.
<b>General</b>	
SF .....	Superframe format.
ESF .....	Extended superframe format.
B8ZS .....	Binary 8 zero substitution.
AMI .....	Alternate mark inversion.
LBO .....	Line build-out.
NIU .....	T1 network interface unit.
DOM .....	Date of manufacture.
S/N .....	Serial number.
15M .....	Fifteen-minute period.
24H .....	Twenty-four-hour period.

A terminal session is initiated by entering multiple space bar characters which are used by the HFAC to determine the speed of the terminal. Once the speed has been derived, an Introductory Menu is presented as illustrated in **Figure 7**. This screen includes ADTRAN

technical support phone numbers along with serial numbers, CLEI codes, date of manufacture information for each active HDSL / HDSL2 system element, and if the circuit has an installed HDSL / HDSL2 range extender (HRE / H2R).

---

**NOTE**

**The command keys valid for each screen are shown at the bottom of the display. Pressing keys other than these may cause the HFAC to adjust to a different speed. If this happens, the HFAC will not respond to keyboard commands and may display random characters. Press the space bar repeatedly until the screen is re-displayed.**

---

**Main Menu**

From the Introductory Screen, select Main Menu by typing **M**. **Figure 8** illustrates the Main Menu Screen.

From the Main Menu select:

1. Shelf Status Summary
2. Performance Data
3. Alarm Status
4. Loopback Control
5. ADTRAN Information
6. Troubleshooting
7. Self-Test Options
8. Provisioning
9. Protection Switching

Selection of 5, ADTRAN Information, presents the same screen as the Introductory Screen. Description of other screen selections available from the Main Menu follow.



```

08/08/70 17:55:57          A D T R A N          SHELF ADDRESS = 00
                        901 Explorer Boulevard, Huntsville, Alabama 35806-2807

***** Technical Support *****      HFAC Information [Version 3.00]
Voice (888) 873-HDSL or (800) 726-8663  Serial Number :
Fax ..... (256) 963-6217              CLEI Code :
Internet ..... www.adtran.com         Date of Manf. :

      HTU-C Serial#  CLEI Code  DOM  HRE?      HTU-R Serial#  CLEI Code  DOM
1 : -----
2 : -----
3 : -----
4 : -----
5 : -----
6 : -----
7 : A12344321      T1LIDPX2AA 01/97 - 7 : B805A5458      T1L2CRVBAA 02/98
8 : -----
9 : -----
10 : -----
11 : -----
12 : A11111111     T1LIDP02AA 01/97 - 12 : -----
13 : A12345678     T1L2BUCBAA 08/99 - 13 : -----

      PRESS : "M" - main menu, "R" - range extender info

```

Figure 7. Introductory Menu

```

08/08/70 17:57:06          SHELF ADDRESS = 00

                        HFAC MAIN MENU

1: SHELF STATUS SUMMARY
2: PERFORMANCE DATA
3: ALARM STATUS
4: LOOPBACK CONTROL
5: ADTRAN INFORMATION
6: TROUBLESHOOTING
7: SELF-TEST OPTIONS
8: PROVISIONING
9: PROTECTION SWITCHING

      CHOOSE 1-9 :

```

Figure 8. Main Menu Screen

### Shelf Status Summary Screen

The Shelf Status Summary Screen shown in **Figure 9** provides a top-level look at the alarm and provisioning of data for the shelf and each circuit within the shelf.

### HDSL / HDSL2 Status Screen

From the Shelf Status Summary Screen, detailed information related to a particular circuit may be accessed. The HDSL / HDSL2 Shelf Status Summary

screen related to a particular slot may be displayed by typing the desired slot number and **S**. For example, to access Slot 6 information, type **6S**. The HDSL / HDSL2 Status Summary Screen is shown in **Figure 10**. This screen gives both local and remote performance and provisioning information for the selected slot. If a supported HRE is present in the HDSL / HDSL2 circuit, screen 10A is available to view the performance of the HRE.

```

08/08/70 17:59:19 SHELF STATUS SUMMARY [ BYPASS = OFF ] SHELF ADDRESS = 00

ACTIVE SHELF ALARMS
-----
CRITICAL - YES
MAJOR - NO
MINOR - NO

FUSE ALARM SETTINGS
-----
HFAC : CRIT
HTU-C : 1-5 = MAJ,
        6-13 = CRIT

LEGEND
-----
NA = NOT ALARMED
* = DEFAULT
- = EMPTY SLOT

PRESS : "0" - change options, "D" - read HFAC switch defaults (all slots),
        nn"S" - slot select (HDSL STATUS), "M" - main menu :

-----
HFAC ALARM THRESHOLD OPTION SETTINGS
-----
              ES              SES              UAS
SLOT  TYPE THRSHL  TYPE THRSHL  TYPE THRSHL
-----
1:  ---  ---  ---  ---  ---  ---
2:  ---  ---  ---  ---  ---  ---
3:  ---  ---  ---  ---  ---  ---
4:  ---  ---  ---  ---  ---  ---
5:  ---  ---  ---  ---  ---  ---
6:  ---  ---  ---  ---  ---  ---
7:* MAJ  150  MAJ  075  CRIT  075
8:  ---  ---  ---  ---  ---  ---
9:  ---  ---  ---  ---  ---  ---
10: ---  ---  ---  ---  ---  ---
11: ---  ---  ---  ---  ---  ---
12:* MAJ  150  MAJ  075  CRIT  075
13:* MAJ  150  MAJ  075  CRIT  075
    
```

Figure 9. Shelf Status Summary Screen

```

08/08/70 18:00:37 SUMMARY - [ SLOT 7 ] SHELF ADDRESS = 00
LOOP #1 <NETWORK> LOOP #2 ELAPSED TIME 00:09:56 LOOP #1 <CUSTOMER> LOOP #2
----- HTU-C -----
01 dB 01 dB  <- LOSS -> 01 dB 01 dB
YES YES  <- SYNC -> YES YES
000/00001 000/00001 <- ES 15M/24H -> 000/00001 000/00001
000/00000 000/00000 <- SES 15M/24H -> 000/00000 000/00001
000/00026 000/00025 <- UAS 15M/24H -> 000/00026 000/00025
LOOPBACKS INACTIVE LOOPBACKS INACTIVE

HTU-C SIGNAL QUALITY DSX-1 DS1 HTU-R SIGNAL QUALITY
[X] 9 [X] [X] 9 [X]
L[X] 8 L[X] SF <- FRAME -> SF L[X] 8 L[X]
0[X] 7 0[X] AMI <- CODE -> AMI 0[X] 7 0[X]
0[X] 6 0[X] EXT <- LBO -> 0 dB 0[X] 6 0[X]
P[X] 5 P[X] N/A <- NIU -> NO P[X] 5 P[X]
[X] 4 [X] 00000 <- BPV -> 00000 [X] 4 [X]
1[X] 3 2[X] 00000 <- ES -> 00000 1[X] 3 2[X]
[X] 2 [X] 00000 <- SES -> 00000 [X] 2 [X]
[X] 1 [X] 00324 <- UAS -> 00302 [X] 1 [X]
[X] 0 [X] RED <- ALARMS -> RED [X] 0 [X]

SEALING CURRENT PRESENT

"P" - prev scrn,
"M" - main menu, "Z" - clr current reg, nn"S" - slot:
    
```

Figure 10. Status Summary Screen

**Figures 10 and 10A** consolidate current information for the HDSL / HDSL2, DSX-1, and DS1 interfaces. A key to the information provided is found in the center of the screen. Arrows indicate the key applies to both the HTU-C and HTU-R.

LOSS Pulse Attenuation Measurement  
 SYNC HDSL Loop 1 and Loop 2 Sync Status  
 ES 15M/24H Errored Seconds\*  
 SES 15M/24H Severely Errored Seconds\*  
 UAS 15M/24H Unavailable Seconds\*

\* The first number is for the current 15-minute period and the second is the current 24-hour period (Loop 1 and Loop 2 numbers are displayed).

An indication of Pair Reversal (if present) is given at the bottom of the first key column. Loopback status for the HTU-C, HRE, and HTU-R is indicated on these screens. Status and configuration information for the DS1 and DSX-1 signals is located in the center of the screen near the bottom.

FRAME T1 Framing Format select  
 CODE T1 Line Code selected  
 LBO Line Build-Out selected (for DSX-1);  
 Customer signal of 0, -7.5, -15,  
 and -22.5 dB (for DS1)  
 NIU Network Interface Unit enabled?

BVP Bipolar Violations detected (DSX-1 and DS1)  
 ES Errored Seconds (DSX-1 and DS1)  
 SES Severely Errored Seconds (DSX-1 and DS1)  
 UAS Unavailable Seconds (DSX-1 and DS1)  
 Alarms Lists current alarm condition status

A measure of signal quality for each HDSL / HDSL2 loop is displayed in graphic form on the bottom right of the screen. The measure is from 0 (poor signal quality) to 9 (excellent signal quality). Guidelines for interpreting the indicators are given below.

0 Noise margin is  $\leq 0$  dB ( $\approx 10^{-7}$  BER)  
 1-8 Margin measurement above  $10^{-7}$  BER in dB  
 9 Margin is  $\geq 9$  dB above  $10^{-7}$  BER

Predicting performance based upon signal quality varies with each loop. Generally, a noise margin of 0 or higher will support a bit error rate of better than  $10^{-7}$ .

ADTRAN has defined the following as guidelines that correspond to the operation of the HTU-C and HTU-R faceplate LEDs labeled LP1 and LP2.

Margin < 0 Poor Loop Signal Quality  
 $0 \leq$  Margin  $\leq 2$  Marginal Loop Signal Quality  
 Margin > 2 Good Loop Signal Quality  
 (better than  $10^{-9}$  BER)

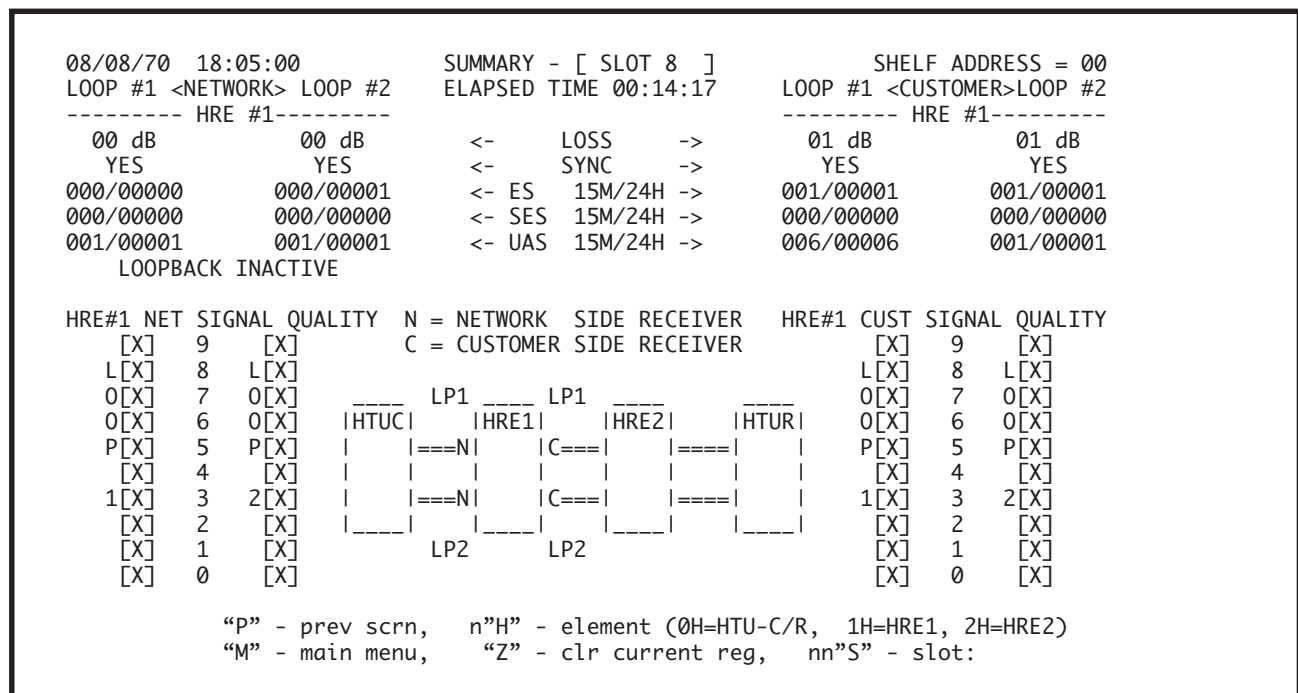


Figure 10A. HDSL Status Summary -HRE Screen

### Shelf Controller Options

From the Shelf Status Summary Screen, all shelf controller options may be reviewed. By typing O at the Shelf Status Summary Screen, the Shelf Options Setup Screen may be accessed. This screen is illustrated in **Figure 11**.

External DSX-1 or DS1 threshold alarms (ES, SES, UAS) can be enabled and disabled for a specific slot by selecting the desired setting from the menu. If disabled, these alarms will be suppressed, regardless of how the HTU-C and HTU-R units are provisioned.

### Performance Data Screen

From the Main Menu, a screen summarizing the 8-hour performance data for all slots may be selected. From the Main Menu, item 2 presents the Performance Data Screen shown in **Figure 12**. This screen graphically summarizes the performance information for each slot. A key for understanding the display is also presented.

```

              OPTIONS SETUP [SLOT = 8 ]
-----
      OPTION #       OPTION                               SETTING
-----
      ---> 1:  HTU-C FUSE ALARM TYPE             ---> 1-5 = MAJ, 6-13 = CRIT
SHELF | 2:  SHELF ADDRESS                         ---> 00
OPTIONS | 3:  SHELF BYPASS                       ---> OFF
      ---> 4:  SET DATE/TIME                     ---> 11/22/99 09:30:31
      ---> 5:  EXT HTU-C/HTU-R ALARMS          ---> DISABLED
      | 6:  ES ALARM TYPE                       ---> MAJOR
SLOT   | 7:  SES ALARM TYPE                     ---> MAJOR
OPTIONS | 8:  UAS ALARM TYPE                   ---> CRITICAL
      | 9:  ES ALARM THRESHOLD                ---> 150
      | 10: SES ALARM THRESHOLD                ---> 075
      ---> 11: UAS ALARM THRESHOLD            ---> 075

      PRESS: "P" - previous screen
             nn"X" - change option n (ex. 4X)
             nn"S" - select slot (ex. 11S)
             "D" - read HFAC switch defaults(this slot only)
             "M" - main menu

             -> <-

```

Figure 11. Shelf Options Setup Screen

```

11/23/99 00:15:21 [SLOT = 8 ] SHELF ADDRESS = 00
PERFORMANCE DATA <VIEW 1 - HTU-C DSX-1 RECEIVER>

24 HOUR REGISTERS                               15 MINUTE REGISTERS
-----ES-----SES-----CURRENT-----ES-----SES-----ES-----SES
-1 : 00000 00000 <--- | ---> -1 : 000 000 -17 : --- ---
-2 : ----- | -2 : 000 000 -18 : --- ---
-3 : ----- | -3 : 000 000 -19 : --- ---
-4 : ----- | --PREVIOUS-- | -4 : --- --- -20 : --- ---
-5 : ----- | | -5 : --- --- -21 : --- ---
-6 : ----- | | -6 : --- --- -22 : --- ---
-7 : ----- | <- | -7 : --- --- -23 : --- ---
| | -8 : --- --- -24 : --- ---
| | -9 : --- --- -25 : --- ---
| | -10 : --- --- -26 : --- ---
VIEW LOCATION DIAGRAM | | -11 : --- --- -27 : --- ---
1-->|H| -3---|H|-----|H|---4-|H|-> | | -12 : --- --- -28 : --- ---
ITI | IRI | IRI | ITI | | -13 : --- --- 29 : --- ---
IUI | IEI | IEI | IUI | | -14 : --- --- -30 : --- ---
<-- |C| -5---|I|-----|I|---6-|R|<-2 | | -15 : --- --- -31 : --- ---
| | -16 : --- --- -32 : --- ---
PRESS : n"V" - view (ex. 4V), "nH" - element (0H=HTU-C/R, 1H=HRE1, 2H=HRE2),
       nn"S" - slot (ex. 3S), "M" - main menu, "P" - prev. screen :

```

Figure 12. Performance Data Screen

### Performance History Screen

Detailed information concerning 15-minute performance history and 24-hour performance history for any given slot may be viewed by typing the slot number and S from the slot specific Performance Data Screen. The resulting screen is shown in **Figure 13**, Slot Specific Performance Data Screen. Performance

information for six different monitored locations is available. Also, for circuits with HREs, more detailed information is available by typing **1H** to view HRE points.

An on-screen view location diagram indicates the six monitored locations. Seven previous 24-hour periods and 32 previous 15-minute periods are maintained for each view location.

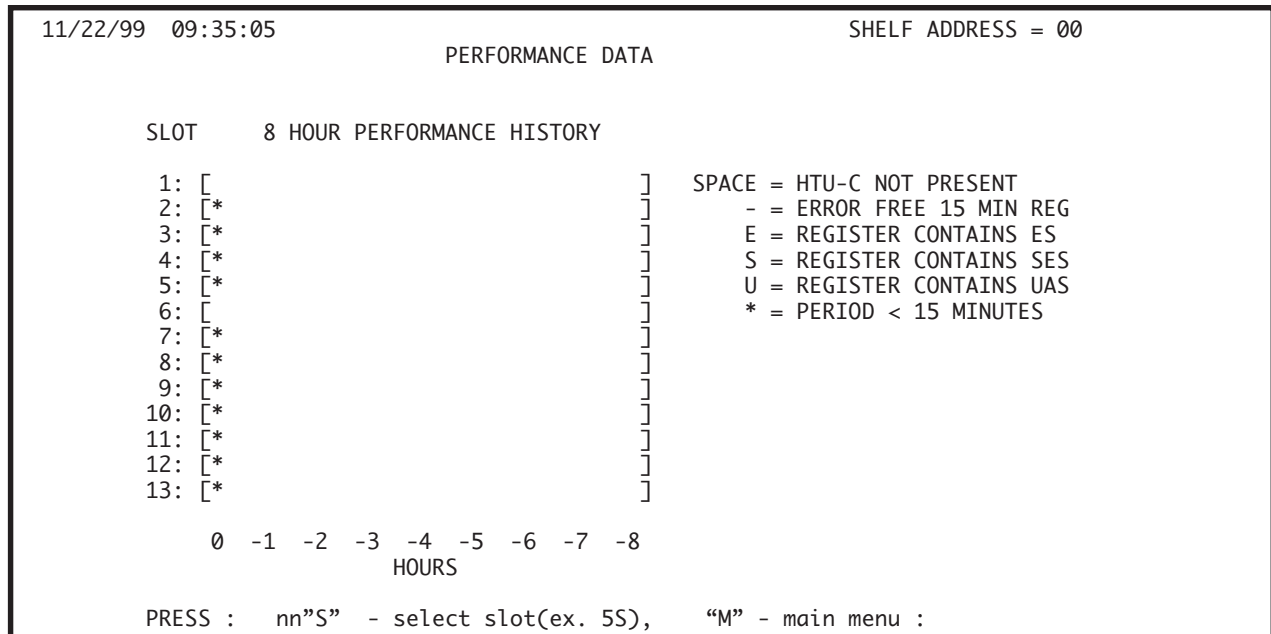


Figure 13. Slot Specific Performance Data Screen

## Alarm Status Screen

Selection of item 3 from the Main Menu presents the Alarm Status Screen, **Figure 14**. This screen is a composite display of all current alarms for each of the 13 slots. Alarm types are indicated by the number 1 for Critical, 2 for Major, and 3 for Minor alarms.

A capital **A** indicates the alarm is current while a trailing **\*** indicates the alarm cutoff has been exercised. **ES** or **SES** indicates the programmed threshold has been exceeded, resulting in an alarm. The position of the alarm indicator codes in the screen matrix indicates

both the alarm location and slot number.

## Alarm History Screen

The Alarm History Summary Screen (**Figure 15**) can be accessed from the Alarm Status Screen by pressing **H**. This screen provides a time and date stamp for up to 100 alarm events. These events include alarm initiation and alarm clear. For convenience, a user marker can be invoked by pressing **X**. This produces a highly visible marking point so that subsequent alarm events can be easily distinguished from older ones.

11/23/99 00:16:44		ALARM STATUS										SHELF ADDRESS = 00	
ACTIVE SHELF ALARMS		SLOT	UAS	FUS	COM	SIG	B/ HTUC	[ HTUC ]	[ HRE1 ]	[ HRE2 ]	HTUR		
							LP1	LP2	LP1	LP2	LP1	LP2	SIG
CRITICAL	- YES	1:	---	---	---	---	---	---	---	---	---	---	---
MAJOR	- NO	2:	---	---	---	---	---	---	---	---	---	---	---
MINOR	- NO	3:	---	---	---	---	---	---	---	---	---	---	---
		4:	---	---	---	---	---	---	---	---	---	---	---
DEFAULT ALARM TRIGGERS		5:	1A	---	---	---	---	---	---	---	---	---	---
		6:	---	---	---	---	---	---	---	---	---	---	---
CRIT: 6-13 HTU-C FUSES		7:	---	---	1C	---	---	---	---	---	---	---	---
UAS THRESHOLD		8:	---	---	---	---	---	---	---	---	---	---	---
HCOT-CTL FUSE		9:	1A	---	---	---	---	---	---	---	---	---	---
COMM LINK LOSS		10:	1A	---	---	---	---	---	---	---	---	---	---
HFAC FUSE		11:	---	---	---	---	---	---	---	---	---	---	---
MAJ: 1-5 HTU-C FUSES		12:	1A	---	---	---	---	---	---	---	---	---	---
ES THRESHOLD		13:	1A	---	---	---	---	---	---	---	---	---	---
SES THRESHOLD													
MIN: NONE													

1 = CRIT, 2 = MAJ, 3 = MIN, A = UAS OR FUSE ALARM,  
 B = BER ALARM ON PROTECTED CIRCUIT, C = COMM ALARM,  
 E/S = ES/SES THRESHOLD ALARM, \* = ALARM CUTOFF (ACO)

PRESS : "C" - alarm cutoff, "H" - alarm history, "M" - main menu

Figure 14. Alarm Status Summary Screen

08/08/70 17:51:59	-UAS THRESHOLD CROSSING AT HTU-R LP1, SLOT 10.
08/08/70 17:51:59	-UAS THRESHOLD CROSSING AT HTU-R LP2, SLOT 10.
08/08/70 17:52:09 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP1, SLOT 5.
08/08/70 17:52:09 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP2, SLOT 5.
08/08/70 17:52:34 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP1, SLOT 9.
08/08/70 17:52:34 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP2, SLOT 9.
08/08/70 17:52:36 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP1, SLOT 10.
08/08/70 17:52:36 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP2, SLOT 10.
08/08/70 17:52:36 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-R LP1, SLOT 10.
08/08/70 17:52:36 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-R LP2, SLOT 10.
08/08/70 17:52:41 *CLEARED*	-LOSS OF COMMUNICATION WITH SLOT 12.
08/08/70 17:52:42	-LOSS OF COMMUNICATION WITH SLOT 12.
08/08/70 17:52:43 *CLEARED*	-LOSS OF COMMUNICATION WITH SLOT 12.
08/08/70 17:54:00	-UAS THRESHOLD CROSSING AT HTU-C LP1, SLOT 12.
08/08/70 17:54:00	-UAS THRESHOLD CROSSING AT HTU-C LP2, SLOT 12.
08/08/70 17:55:04 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP1, SLOT 7.
08/08/70 17:55:04 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP2, SLOT 7.
08/08/70 17:55:05	-UAS THRESHOLD CROSSING AT HTU-C LP2, SLOT 7.
08/08/70 17:55:07	-LOSS OF COMMUNICATION WITH SLOT 7.
08/08/70 17:55:07 *CLEARED*	-UAS THRESHOLD CROSSING AT HTU-C LP2, SLOT 7.

-----

PRESS: | ALARM HISTORY PAGE 3 OF 5  
 1 TO 5 - Select Page, "X" - Set Marker | 11/23/99 00:18:37  
 "p" - Prev Screen, "M" - Main Menu | SHELF ADDRESS = 00

Figure 15. Alarm History Screen

## Loopback Status Summary Screen

Item selection 4, Loopback Control, from the Main Menu displays the loopback status information for all of the HTU-C, HRE, and HTU-R units monitored by the HFAC. Loopback Status (On, Off, or Not available) is presented for loopbacks to both the network and the customer at both the HTU-C, HRE, and HTU-R. **Figure 16** illustrates the Loopback Status Summary Screen.

## Loopback Options

By pressing a slot number followed by an S from the

Loopback Status Summary Screen, you will be presented with a slot-specific Loopback Options Screen (**Figure 17**). Multiple loopbacks can be initiated for each circuit. This screen graphically depicts the loopback activated by showing through reverse video, the path of the loopback and the locations it loops to. Also, the status indication changes from inactive to active. The initiation of a loopback is accomplished by pressing the corresponding number of the loopback desired, followed by an L.

```

11/23/99  00:19:57          LOOPBACK STATUS          SHELF ADDRESS = 00
          HTU-C          HRE1  HRE2          HTU-R
          <--  -->      <--  <--  <--  -->
          SLOT# NET    CUST NET    NET    NET    CUST
          -----
          1 : ---    ---    ---    ---    ---    ---
          2 : OFF   OFF   xxxx  xxxx  OFF   OFF
          3 : OFF   OFF   xxxx  xxxx  OFF   OFF
          4 : OFF   OFF   OFF   xxxx  OFF   OFF
          5 : OFF   OFF   xxxx  xxxx  OFF   OFF
          6 : ---    ---    ---    ---    ---    ---
          7 : OFF   OFF   xxxx  xxxx  OFF   OFF
          8 : OFF   OFF   OFF   OFF   OFF   OFF
          9 : OFF   OFF   xxxx  xxxx  OFF   OFF
          10 : OFF  OFF   xxxx  xxxx  OFF   OFF
          11 : OFF  OFF   xxxx  xxxx  OFF   OFF
          12 : OFF  OFF   xxxx  xxxx  OFF   OFF
          13 : OFF  OFF   xxxx  xxxx  OFF   OFF

          ON    = LOOPBACK ON
          OFF   = LOOPBACK OFF
          xxxx  = NOT AVAILABLE
          ----  = EMPTY SLOT

          PRESS "nnS" - Slot Select,
                "M"  - Main Menu :
    
```

Figure 16. Loopback Status Summary Screen

```

11/23/99  00:21:48          LOOPBACK OPTIONS [ SLOT = 8 ]          SHELF ADDRESS = 00
          |HTU-C| |HRE 1| |HRE 2| |HTU-R|
          |-----| |-----| |-----| |-----|
          |   | LP1 | | LP1 | | LP1 | |<-- , <--
          ->| |<====>| |<====>| |<====>| |<-- , <--
          |   |   | |   | |   | |   | |
          NET |   |   | |   | |   | |   | | CUST
          |   | LP2 | | LP2 | | LP2 | |   | |
          <-| |<====>| |<====>| |<====>| |<-- , ->
          |   |   | |   | |   | |   | |
          |-----| |-----| |-----| |-----|

          1) LOOPBACK TO NETWORK AT HTU-C = UNAVAILABLE
          2) LOOPBACK TO CUSTOMER AT HTU-C = UNAVAILABLE
          3) LOOPBACK TO NETWORK AT HTU-R = ACTIVE
          4) LOOPBACK TO CUSTOMER AT HTU-R = UNAVAILABLE
          5) LOOPBACK TO NETWORK AT HRE1 = UNAVAILABLE
          6) LOOPBACK TO NETWORK AT HRE2 = UNAVAILABLE

          Press "nL" - Toggle Loopback(ex. 3L), "nnS" - Select Slot,
                "p"  - Previous Screen, "M" - Main Menu :
    
```

Figure 17. Loopback Options Screen

## Troubleshooting Screen

The Troubleshooting Screen (Main Menu, Item 6) provides a graphical presentation of trouble areas. Different parts of the diagram will be highlighted (on terminals that support reverse video) to indicate the trouble locations. In addition, in-band alarms and indicated problem areas are presented in text under the troubleshooting diagram. Use of this screen in conjunction with performance data and alarm status screens provides a reliable method of quickly locating system faults. **Figure 18** shows the Troubleshooting Display.

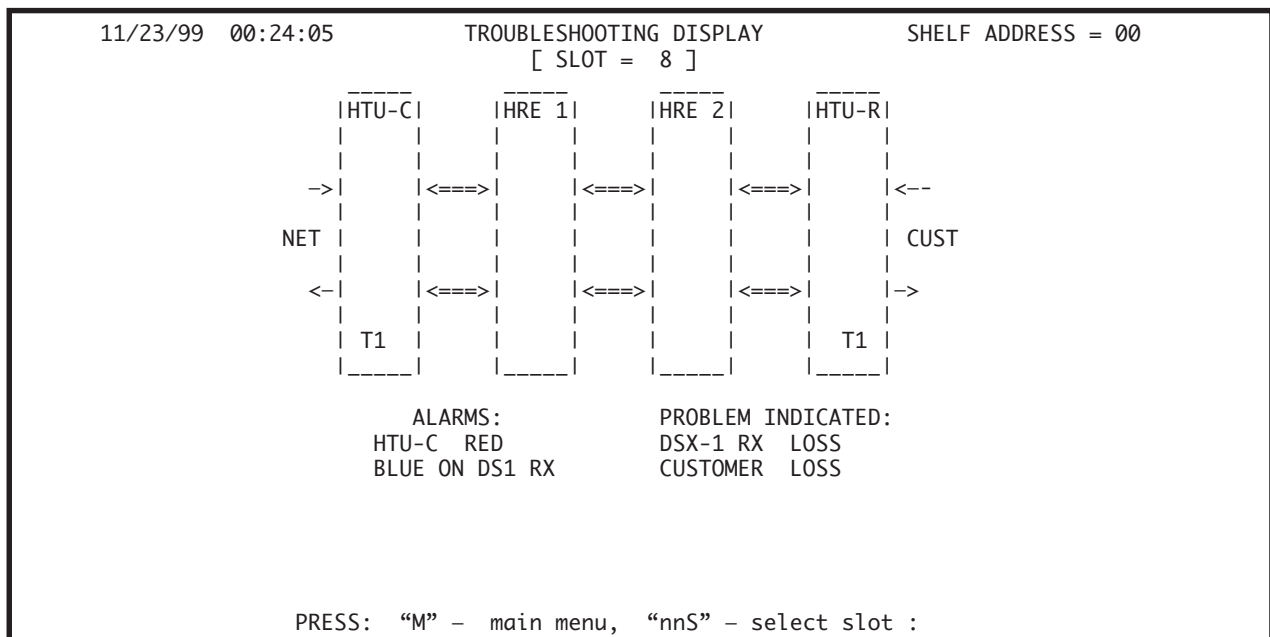


Figure 18. Troubleshooting Display Screen



## Self-Test Options Screen

By selecting item 7 from the Main Menu, the Self-Test Options Screen (**Figure 19**) is presented. From this screen, a self-test for the HTU-C, HTU-R, and HFAC controller can be initiated. To initiate a self-test, press the desired test number followed by a **T**. Upon completion of the test, results will be presented. These tests are useful in diagnosing suspect hardware and circuits.

---

### NOTE

**Momentary communications loss between the HFAC and HTU-C units will occur when the HFAC is first plugged in, or when HFAC self-test is executed. If HFAC communications alarms are not disabled, a momentary alarm may also be generated.**

---

```
11/23/99 00:26:44                                SHELF ADDRESS = 00

                SELF-TEST  [ SLOT = 8  ]

1.  INITIATE HTU-C AND HTU-R SELF-TESTS
2.  INITIATE HFAC CONTROLLER SELF-TEST

Press :  "nnS"  to select slot
          "nT"  to select desired test
          "M"  to return to Main Menu :
```

Figure 19. Self-Test Options Screen

## Provisioning Summary Screen

Selection of item 8 from the Main Menu supplies provisioning information on individual circuits being accessed by the HFAC. **Figure 20** is a slot-specific provisioning screen showing the provision option item, current settings, and hardware settings for that particular circuit. A key at the bottom of the screen describes the options associated with this screen.

Menu item 7 provides a means of provisioning specific HTU-C units, from the HFAC, to enable or disable various HTU-C alarms. This option is different from the Disable Alarms option on the HFAC Options Setup screen. This option sets the selected HTU-C to enable or disable the alarms presented on the HTU-C edge connector pins 20 and 21 (closure between pins) and edge connector pin 1 (closure to ground).

The *Enable All* selection permits alarms to be presented on the aforementioned edge connector pins

due to faults at any of the HDSL / HDSL2 loop, DSX-1, or DS1 locations. The *Disable All* disables all alarms due to external faults or faults within the HDSL / HDSL2 equipment or loops.

The *Disable EXT* selection allows only alarms caused by faults in the HDSL / HDSL2 equipment or HDSL / HDSL2 loops and suppresses alarms caused by external DSX-1 or DS1 faults.

### NOTE

**ADTRAN 220/E220 H2TU-Cs support an EXTERNAL LBO option for use in legacy 220 ORB shelves. The ADTRAN E220 shelf does not require the EXTERNAL LBO option. The E220 HFAC will not allow the selection of the EXTERNAL LBO setting when initiated through the HFAC terminal screen. It should be noted that the HFAC will not automatically override an EXTERNAL LBO setting.**

```

11/23/99 00:28:34      PROVISIONING  [ SLOT = 8 ]      SHELF ADDRESS = 00
-----
      PROVISIONS              CURRENT SETTINGS      HARDWARE SETTINGS
-----
1. DSX-1 LINE BUILDOUT = 399-533 FEET      399-533 FEET
2. DSX-1/DS1 LINE CODE = B8ZS              B8ZS
3. DSX-1/DS1 FRAMING   = ESF                ESF
4. LOOPBACK TIMEOUT    = NONE              NONE
5. DS1 OUTPUT LEVEL    = -15 dB             -15 dB
6. NIU LOOPBACK        = DISABLED           DISABLED
7. DS0 BLOCKING
                                00000000 00000000 00000000
CHANNELS 1                      24
          "X" BLOCKS THE CHANNEL.
-----

Press : "nP" - to change corresponding provision (ex. 5P)
        "H"  - to copy hardware settings to current settings
        "I"  - to implement and save current setting changes
        "nnS" - select slot, "M" - main menu
          -> <-
  
```

Figure 20. Provisioning Screen

### Protection Configuration Screen

The protection configuration screens (Figure 21 and 22) provides status and control details for fault protected circuits.

### NOTE

The screens provided below are typical and may vary slightly depending on the hardware installed. For Instance, if HDSL2 H2TU-C equipment is installed, certain screens will change to indicate only 1 loop present.

```

11/23/99 00:32:51          PROTECTION CONFIGURATION          SHELF ADDRESS = 00
                           [ SLOT 2 ]

-----
|      PROTECTION OPTIONS      |      CURRENT SETTINGS      |
|-----|-----|
| 1. BER THRESHOLD            | = 1E-7                      |
| 2. BER INTERVAL             | = 15 MINS                   |
|-----|-----|
|
| MAIN CARD CAN ONLY SET THE BER OPTIONS.
|
|-----|-----|
|                                SHELF STATUS                                |
|-----|-----|
| SLOT -> 01 02 03 04 05 06 07 08 09 10 11 12 13 |
| STATUS ->      ^^---- ** **      ** ** ** ** |
|-----|-----|
|^-- = MAIN ACTIVE      --^^ = AUX ACTIVE      ** = STANDARD HTU-C

Press: "nnS" - select slot, "nP" - select option,
       "M" - main menu, "I" - implement and save current changes :

```

Figure 21. Protection Screen (Main)

```

11/23/99 00:29:33          PROTECTION CONFIGURATION          SHELF ADDRESS = 00
                           [ SLOT 3 ]

-----
|      PROTECTION OPTIONS      |      CURRENT SETTINGS      |      SWITCHOVER HISTORY      |
|-----|-----|-----|
| 1. PROTECTION MODE          | = AUTO                      | SWITCHOVERS -> 00          |
| 2. MINIMUM HOLDIN TIME      | = 01 MIN(S)                 | REVERSIONS -> 00          |
| 3. BER THRESHOLD            | = 1E-7                      | FAILURES -> 00           |
| 4. BER INTERVAL             | = 15 MINS                   | LOCKOUTS -> 00           |
| 5. LOCKIN HOURS             | = 12 HR(S)                 |                          |
| 6. SWITCH TO AUX LIMIT      | = 09 (1-9)                 |                          |
| 7. LOCKIN CHECK INTERVAL    | = 20 MIN(S)                |                          |
|-----|-----|-----|
| LOCKIN OPTIONS: IF 09 SWITCHOVERS OCCUR IN 20 MINUTES, LOCKIN FOR 12 HOURS. |
| SYSTEM CURRENT STATUS : NORMAL OPERATION
|
|-----|-----|-----|
|                                SHELF STATUS                                |
|-----|-----|-----|
| SLOT -> 01 02 03 04 05 06 07 08 09 10 11 12 13 |
| STATUS ->      ^^---- ** **      ** ** ** * * * * * |
|-----|-----|-----|
|^-- = MAIN ACTIVE      --^^ = AUX ACTIVE      ** = STANDARD HTU-C

Press: "nnS" - select slot, "nP" - select option,
       "M" - main menu, "I" - implement and save current changes :

```

Figure 22. Protection Screen (Aux)

## 6. MAINTENANCE

The ADTRAN E220 HFAC requires no routine maintenance to operate properly.

ADTRAN recommends that major repairs on the shelf not be performed in the field. Repair services may be obtained by returning defective units to ADTRAN.

## 7. SPECIFICATIONS

**Table 8** lists E220 HFAC specifications.

Table 8. E220 HFAC Specifications

<b>Power</b>
-48 VDC @ 60 mA (maximum)
<b>Physical</b>
Dimensions: ..... 5.6" high x 1.25" wide x 10.1" deep Weight: ..... < 1 pound
<b>Temperature</b>
Operating: ..... -40° C to +70° C Storage: ..... -40° C to +85° C
<b>Part Number</b>
ADTRAN E220 Shelf Plug in, Single slot ..... 1221051L1

## 8. WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within 10 years from the date of shipment if it does not meet its published specifications or fails while in service (see ADTRAN *Carrier Network Equipment Warranty, Repair, and Return Policy and Procedure*, document 60000087-10A).

Contact Customer and Product Service (CAPS) prior to returning equipment to ADTRAN.

For service, CAPS requests, or further information, contact one of the following numbers:

### Part Number

1221051L1

### ADTRAN Sales

Pricing/Availability  
(800) 827-0807

### ADTRAN Technical Support

Presales Applications/Postsales Technical Assistance  
(888) 4-ADTRAN

Standard hours: Monday-Friday, 7 a.m. - 7 p.m. CST  
Emergency hours: 7 days/week, 24 hours/day

### ADTRAN Repair/CAPS

Return for Repair/Upgrade  
(256) 963-8722

### Repair and Return Address

ADTRAN, Inc.  
CAPS  
901 Explorer Boulevard  
Huntsville, Alabama 35806-2807