FT1 DP
Fractional T1 Dataport For Nortel DE-4E Shelf
Installation and Maintenance

CONTENTS

FIGURES

TABLES

Figure 1. ADTRAN FT1 DP for Nortel DE-4E Shelf

1. GENERAL

This practice serves as an Installation and Maintenance guide for the ADTRAN Fractional T1 Dataport (FT1 DP). The ADTRAN FT1 DP (P/N 1245207L2) is the Central Office (CO) unit used to deploy a repeater-less FT1 circuit using 2-wire metallic facilities. The unit occupies one slot in a standard Nortel DE-4E (or equivalent) shelf. **Figure 1** is an illustration of the ADTRAN FT1 DP.

Revision History

This is the third release of this document. Clarifications were made to the SW1 Option Settings.

Description

Signals are provided to and from the channel bank or RT, while 2B1Q HDSL signals are provided to the local loop.

The FT1 Digital Subscriber Loop (DSL) local loop operates as an independent subsystem, over a single twisted pair. The FT1 DP communicates over this twisted pair to the Fractional Network Interface Device (FNID) and/or FT1 repeater listed below:

Part Number	Unit Description
1242041LX	T400 FNID Circuit Pack
1245201LX	T200 FNID Circuit Pack
1242042LX	T400 FNID Standalone
1242050L2	FT1 Repeater
1245211LX	FT1 Repeater

The payload between FT1 DP and FNID is programmable from the faceplate rotary switch as follows:

2 channels (minimum)	128 kbps
3 channels	192 kbps
4 channels	256 kbps
5 channels	320 kbps
6 channels	384 kbps
7 channels	448 kbps
8 channels	512 kbps
9 channels	576 kbps
10 channels	640 kbps
11 channels	704 kbps
12 channels (maximum)	768 kbps

The system carries a small amount of overhead used for maintenance and performance monitoring related functions.

NOTE

Changing the number of DS0s does not affect unit provisioning.

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2. INSTALLATION

CAUTION!
SUBJECT TO ELECTROSTATIC DAMAGE
OR DECREASE IN RELIABILITY.
HANDLING PRECAUTIONS REQUIRED.

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

The FT1 DP plugs directly into a Nortel DE-4E shelf. The unit occupies a single slot. No installation wiring is required.

Time Slot Allocation

The bandwidth may be taken by the FT1 DP in contiguous or alternating time slots. These slots must not have other channel cards plugged in the slots taken by the FT1 DP bandwidth. This will cause contention on the transmit side of the channel bank.

The FT1 will not wrap around the channels at the end of the channel bank. For example, if *n* is equal to 4 channels and the FT1 DP is plugged into slot 23 of the channel bank, then only channels 23 and 24 can be used, not channels 1 and 2.

Protected Loopback

Protected Loopback prevents false latching loopback occurrences when the latching loopback is embedded within the customer payload. This feature is enabled by setting SW1-8 to ON. See **Table 1** for the latching loopback sequence requirement when Protected Loopback is enabled.

Table 1. Protected Loopback Mode Requirement
T1E1.2/99-007R1 (Latching Loopback)

Function Sequence Bytes	Byte Code	# of Received
Clear existing loopbacks	Transition in progress (TIP) X0111010	Minimum of 35 TIP bytes
Identify device to be looped	Loopback select code (LSC) X1010101 - OCU X0110001 - CSU X1000001 - NI	Minimum of 35 LSC bytes
Prepare loop, send MAP code after 30 bytes	Loopback enabled (LBE) X1010110	Minimum of 100 LBE bytes
Activate loopback	Far-end voice (FEV) X1011010	Minimum of 35 FEV bytes
Note: Minimum of 35 TIP bytes required to disable established latching loopback. X = don't care bit.		

Three switch packs (SW1, SW2, SW3) are used to configure the mode of operation for the unit. A definition of each switch is shown in **Table 2** and **Table 3**. Configuration may be performed by manually selecting each option switch, or alternatively, set through the craft interface. Manual configuration must be performed before installing the unit into the channel bank.

Table 2. SW1 Option Settings
(Default settings are indicated in **bold** typeface.)

Switch	Function	Description
SW1-1	Code Select	SW1-1 *On* selects B8ZS line code. SW1-1 *Off* selects AMI.
		Off .... AMI
		On **B8ZS**
SW1-2	Framing	SW1-2 *Off* selects SF. SW1-2 *On* selects ESF.
		Off .... SF
		On .... **ESF**
SW1-3	Channel Select	Selects between Alternating and Contiguous DS0 channels.
		Off .... Alternate
		On .... **Contiguous**
SW1-4	Latching Loopback	Used to enable or disable latching loopbacks.
		Off .... **Disabled**
		On .... Enabled
SW1-5	Loopback Timeout	Used to enable or disable automatic loopback timeout.
		Off .... **Automatic loopback timeout is disabled**
		On .... Loopback timeout is enabled and set for 20 minutes.
SW1-6	Dumb/Smart Channel Bank Enable	Used to select dumb or smart channel bank operation
		Off .... Unit is provisioned for an NT1 bank with a Smart Transmit/Receive Unit (STRU) installed. Two-state signaling available (smart mode)
		On .... **Unit is provisioned for an NT1 bank with a Transmit/Receive Unit (TRU) installed. Four-state signaling available (dumb mode)**
SW1-8	Protected Loopback	Used to enable or disable protective loopback.
		Off .... Disabled.
		On .... ***Enabled.***

Table 3. SW2 and SW3 Option Settings
(Default settings are indicated in **bold** typeface)

Switch	Function	Description
SW3-4	A/B Signaling for Channel 1	Enables or Disables A/B Robbed Bit Signaling for Channel 1. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW3-3	A/B Signaling for Channel 2	Enables or Disables A/B Robbed Bit Signaling for Channel 2. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW3-2	A/B Signaling for Channel 3	Enables or Disables A/B Robbed Bit Signaling for Channel 3. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW3-1	A/B Signaling for Channel 4	Enables or Disables A/B Robbed Bit Signaling for Channel 4. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-8	A/B Signaling for Channel 5	Enables or Disables A/B Robbed Bit Signaling for Channel 5. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-7	A/B Signaling for Channel 6	Enables or Disables A/B Robbed Bit Signaling for Channel 6. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-6	A/B Signaling for Channel 7	Enables or Disables A/B Robbed Bit Signaling for Channel 7. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-5	A/B Signaling for Channel 8	Enables or Disables A/B Robbed Bit Signaling for Channel 8. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-4	A/B Signaling for Channel 9	Enables or Disables A/B Robbed Bit Signaling for Channel 9. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-3	A/B Signaling for Channel 10	Enables or Disables A/B Robbed Bit Signaling for Channel 10. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-2	A/B Signaling for Channel 11	Enables or Disables A/B Robbed Bit Signaling for Channel 11. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled
SW2-1	A/B Signaling for Channel 12	Enables or Disables A/B Robbed Bit Signaling for Channel 12. ***Off* A/B Signaling Disabled** *On* A/B Signaling Enabled

FT1 DP Option Selections

Configuration strap P1, illustrated in **Figure 2**, selects FT1 DP settings.
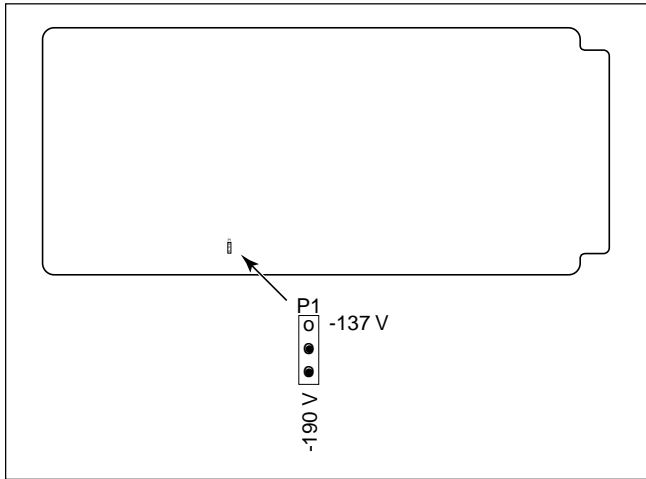
Figure 2. P1 Switch Location

By selecting -190 V, the FT1 DP can power up to two FT1 repeaters and a locally-powered FNID.
The settings on the FT1 DP are encoded and transmitted to the FNID once the circuit has achieved synchronization.

Faceplate Indicators

The FT1 DP has six faceplate LEDs which indicate operational status. **Table 4** defines these LEDs.

Table 4. Front Panel Indicators and Switches

Indicators	Description
DSL	Indicates four possible states of the quality of the DSL signal. (The signal quality has a provisionable threshold of 2, 4, 6, or 8 dB above a 10^{-7} BER.)
	Off .... No synchronization of FT1 DP and FNID
	Yellow .... Poor signal quality (below 2 dB above 10^{-7} BER)
	Green .... Good signal quality (above 2 dB above 10^{-7} BER)
	Blinking .... An error has been detected on the loop
DS1	Indicates four possible conditions:
	Green .... The customer-side DS1 signal is present and synchronized
	Yellow .... Yellow alarm at customer side DS1
	Off .... No customer-side DS1 signal present
	Blinking .... An error has been detected at FNID input
LB	Indicates three possible loopback states:
	Off .... No active loopbacks
	Blinking .... FNID or repeater is in loopback
	On (solid) .... Local (FT1 DP) loopback is active
SX	Sealing current is present
ALM	Indicate alarm condition
	On .... Alarm condition detected either locally (FT1 DP) or remotely (FNID)
	Off .... No alarm condition detected
AP	This LED will be *On* when Hardware Provisioning does not match software provisioning.
Rotary Switch	Selects number of DS0 channels. (See subsection 1 of this practice for a description of time slot allocation.)

3. CONNECTIONS

The FT1 DP occupies one card slot in a Nortel DE-4E shelf. Power signaling is provided to the card through the backplane of the channel bank. See **Figure 3** for FT1 DP edge connector wiring.

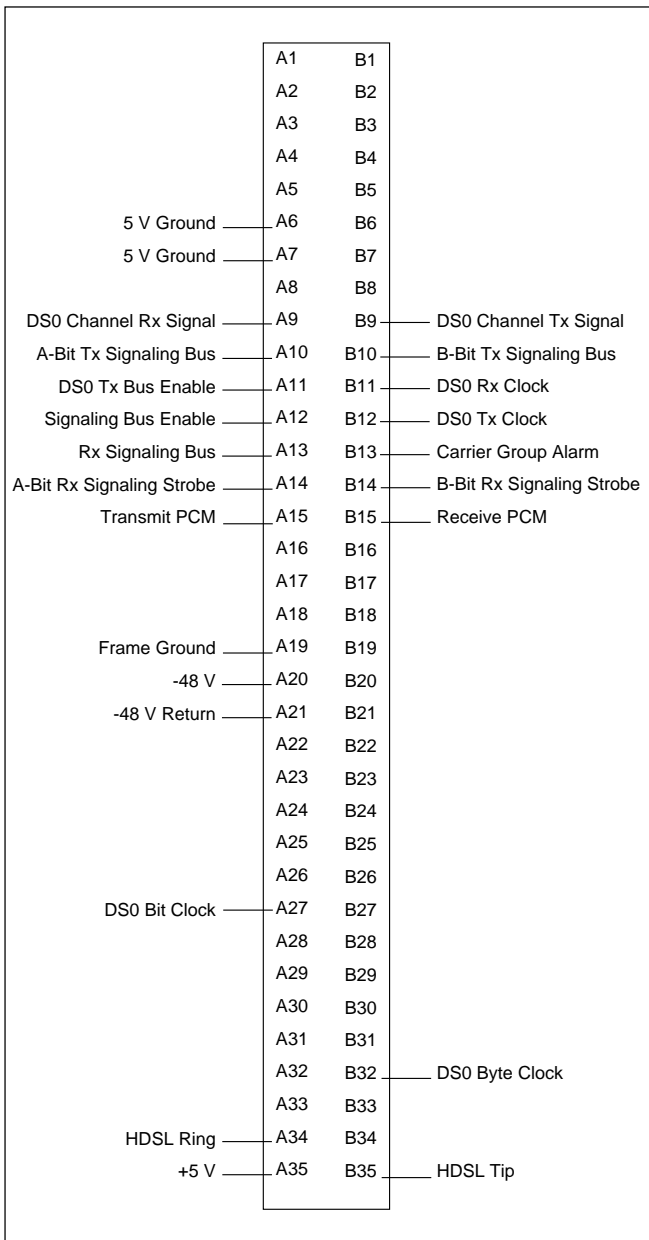|			
	A1	B1	
	A2	B2	
	A3	B3	
	A4	B4	
	A5	B5	
5 V Ground	A6	B6	
5 V Ground	A7	B7	
	A8	B8	
DS0 Channel Rx Signal	A9	B9	DS0 Channel Tx Signal
A-Bit Tx Signaling Bus	A10	B10	B-Bit Tx Signaling Bus
DS0 Tx Bus Enable	A11	B11	DS0 Rx Clock
Signaling Bus Enable	A12	B12	DS0 Tx Clock
Rx Signaling Bus	A13	B13	Carrier Group Alarm
A-Bit Rx Signaling Strobe	A14	B14	B-Bit Rx Signaling Strobe
Transmit PCM	A15	B15	Receive PCM
	A16	B16	
	A17	B17	
	A18	B18	
Frame Ground	A19	B19	
-48 V	A20	B20	
-48 V Return	A21	B21	
	A22	B22	
	A23	B23	
	A24	B24	
	A25	B25	
	A26	B26	
DS0 Bit Clock	A27	B27	
	A28	B28	
	A29	B29	
	A30	B30	
	A31	B31	
	A32	B32	DS0 Byte Clock
	A33	B33	
HDSL Ring	A34	B34	
+5 V	A35	B35	HDSL Tip

Figure 3. FT1 DP Edge Connector Wiring

4. DSL SYSTEM TESTING

The ADTRAN DSL system provides extensive ability to monitor the status and performance of the DS1 signals and DSL loop signals. These features are valuable in troubleshooting and isolating any system level problems that may occur at installation or during operation of the FT1 HDSL system. The following subsections describe additional testing features conducted with the front panel Bantam jacks as well as other faceplate features.

Bantam Jack Description

The front panel of the FT1 DP contains DS0 splitting Bantam jacks. The metallic splitting jacks provide an intrusive, signal interrupting access to the first DS0 channel. It is very important to know the direction of the access provided by a metallic splitting jack. Detailed descriptions of the FT1 DP Bantam jacks are given in the following subsection. **Figure 4** shows the Bantam jack arrangement and details for specific jacks.
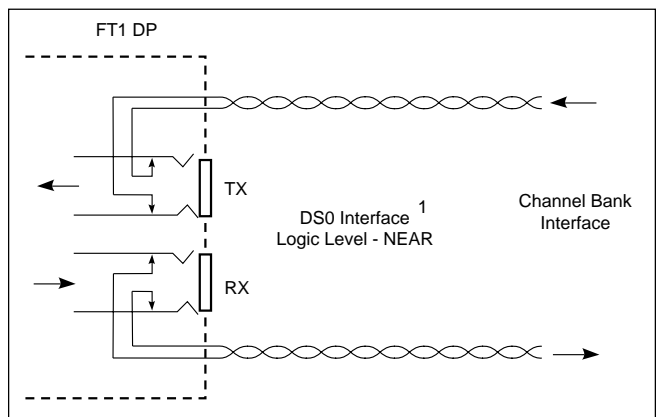
Figure 4. Bantam Jack Arrangement

FT1 DP Bantam Jacks

The FT1 DP provides a set of dual Bantam jacks on the front panel. These Bantam jacks allow connection of a Tele-Path Instruments 108/109 RT II (or equivalent) test set through one DS0 channel at 64 kbps for functions such as sending and receiving bit error rate signals.

NOTE
The DS0 access jacks are logic level interface.

FT1 DP Loopbacks

There are two loopbacks available to the FT1 DP. FT1 DP network loopback loops the FT1 signal back to the network. The FT1 DP CPE loopback loops the FT1 signal back to the customer. The FT1 system loopback capabilities are described in detail in Appendix A of this practice.

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[1]Logic level NEAR loopback on the DS0 interface is toward the outside cable pair. The FT1 DP will support logic level FAR loopback only in the presence of a BERT or loopback on the network end of the channel bank.

5. CONTROL PORT OPERATION

The FT1 DP provides a faceplate-mounted DB-9 connector that supplies an RS-232 interface for connection to a controlling terminal. The pinout of the DB-9 is illustrated in **Figure 5.**

The terminal interface operates at data rates from 2.4 kbps to 19.2 kbps. The asynchronous data format is fixed at 8 data bits, no parity, and 1 stop bit. The supported terminal type is VT-100 or compatible.

NOTE

If you are using a personal computer (PC) with terminal emulation capability, be sure to disable any power saving programs. Otherwise, communication between the PC and the HDSL unit may be disrupted, resulting in misplaced characters or screen timeouts.

Operation

Abbreviations used in the screen diagrams are detailed in **Table 5**.

A terminal session is initiated by entering multiple

Figure 5. RS-232 (DB-9) Pin Assignments

Table 5. Definition of Screen Abbreviations

Abbreviation	Definition
ES	Errored seconds
	DS1 (SF) .... Second in which a BPV or frame bit error occurs
	DS1 (ESF) .... Second in which a BPV or CRC error occurs
	DSL .... Second in which a CRC error occurs
SES	Severely errored seconds
	DS1 (SF) .... Second in which 1554 BPVs or 8 frame bit errors occur
	DS1 (ESF) .... Second in which 1544 BPVs or 320 CRC errors occur
	DSL .... Second in which 165 CRC errors occur
UAS	Unavailable seconds
	DS1 .... Second in which there is a loss of signal or sync
	DSL .... Second in which there is a loss of signal or sync
SF	Superframe format
ESF	Extended superframe format
B8ZS	Bipolar with 8-zero substitution
AMI	Alternate mark inversion
LBO	Line build-out
BPV	Bipolar violation
	DS1 .... Second in which a bipolar violation occurs
NIU	T1 network interface unit
S/N	Serial number
15M	Fifteen-minute period
24H	Twenty-four-hour period

space bar characters, which are used by the FT1 DP to determine the speed of the terminal. Once the speed has been determined, an Introductory Menu will appear, as illustrated in **Figure 6**.

From the Introductory Menu, the Main Menu may be selected. The Main Menu provides access to detailed performance and configuration information, as illustrated in **Figure 7**.

The following screens can be accessed from the Main Menu:

1. Current System Status
2. Performance History
3. ADTRAN Information
4. Loopback Options
5. Self-Test
6. Provisioning
7. Troubleshooting

```
                                ADTRAN
                         901 Explorer Boulevard
                        Huntsville, Alabama 35806-2807

                        For Information or Technical Support,

            Normal Support Hours ( 7am - 7pm CST ) or Emergency Support Hours ( 7x24 )
                    Voice Toll Free: 800.726.8663          Fax: 256.963.6217
                         Voice: 256.963.8100      Internet: www.adtran.com
            --------------------------------------------------------------------------
            FT1-DP INFORMATION    SIGNAL QUALITY    FNID INFORMATION    SIGNAL QUALITY
            -------------------      [ ]   9        -------------------      [ ]   9
            S/N :                    [ ]   8        S/N : DATA NOT AVAIL     [ ]   8
            CLEI:                    [ ]   7        CLEI:                    [ ]   7
            MANF:   /                [ ]   6        MANF:                    [ ]   6
                                     [ ]   5                                 [ ]   5
                                     [ ]   4                                 [ ]   4
                                     [ ]   3                                 [ ]   3
                                     [ ]   2                                 [ ]   2
                                     [ ]   1                                 [ ]   1
                                     [ ]   0                                 [ ]   0
                                   AT FT1-DP                               AT FNID

                        Press "M" to view Main Menu.
```

Figure 6. Introductory Menu Screen

```
                              ADTRAN FT1 MAIN MENU




                         1) CURRENT SYSTEM STATUS
                         2) PERFORMANCE HISTORY
                         3) ADTRAN INFORMATION
                         4) LOOPBACK OPTIONS
                         5) SELF-TEST
                         6) PROVISIONING
                         7) TROUBLESHOOTING



                Choose a screen by pressing the corresponding number.
```
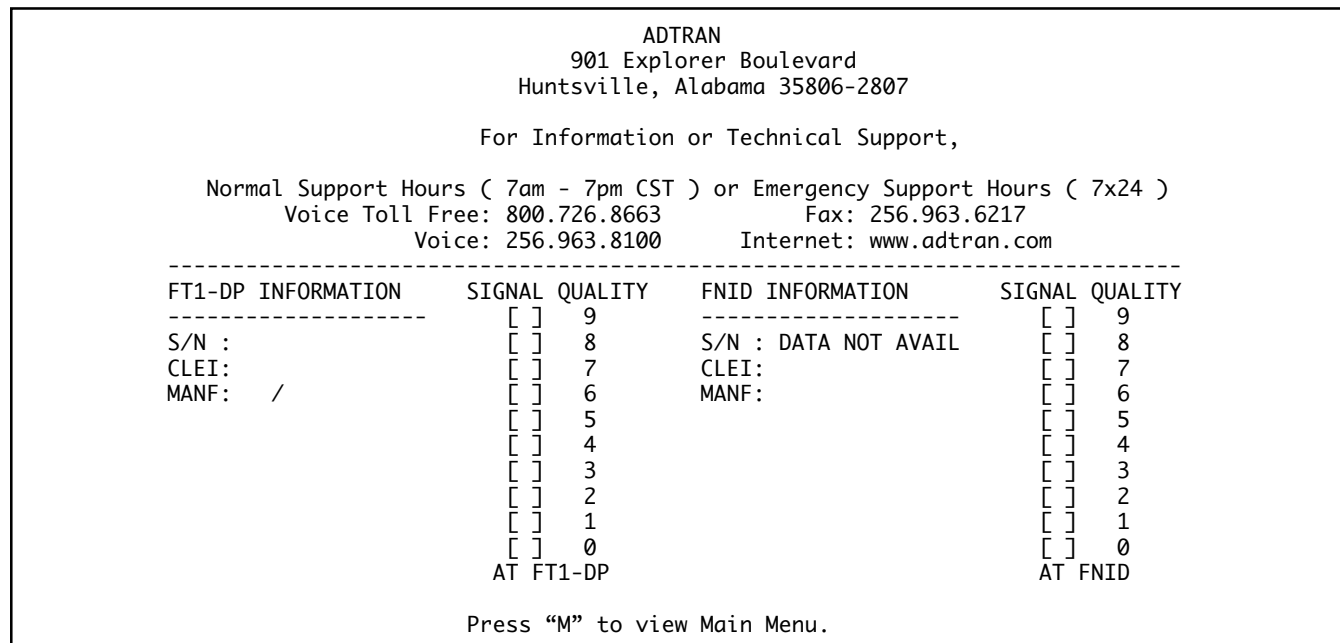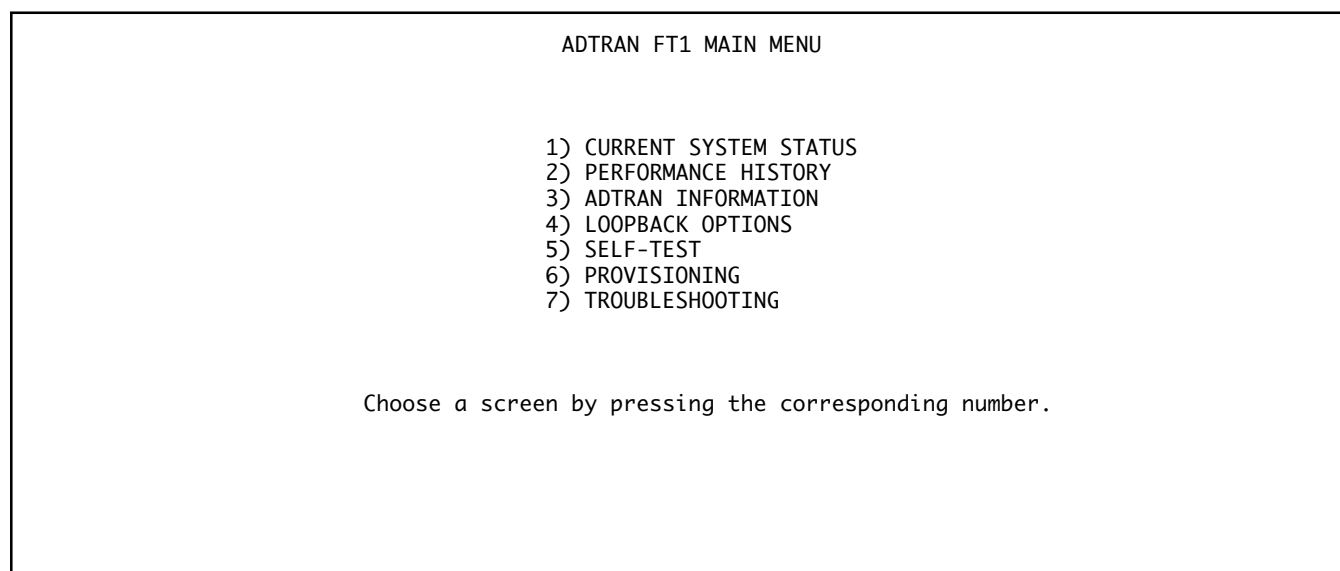
Figure 7. FT1 DP Main Menu Screen

The Current System Status Screen, illustrated in **Figure 8**, provides quick access to FT1 DP status information.

The Elapsed Time display indicates the period of time since the unit began collecting performance information. At each 15-minute interval, the performance information is transferred to the 15-minute performance data registers accessed from the Performance History screen. At each 24-hour interval, the performance data is transferred into the 24-hour performance data register also accessed using this screen.

Figure 8 consolidates current information for the DSL and DS1 interfaces. A key to the information provided is found in the center of the screen. Arrows indicate the key applies to the FT1 DP. The following defines terms used on this screen:

LOSS .... Pulse Attenuation Measurement
SYNC .... DSL Loop 1 Sync Status
ES 15M/24H .... Errored Seconds
SES 15M/24H .... Severely Errored Seconds
UAS 15M/24H .... Unavailable Seconds

A measure of signal quality for each DSL loop is graphically depicted on the bottom right and left of the screen. The measure is from 0 to 9 (poor to excellent signal quality). Guidelines for interpreting the indicators are:

0 .... Poor signal quality. Noise margin is ≤ 0 dB ($\approx 10^{-7}$ BER).
1-8 ...... Margin measurement above 10^{-7} BER in dB.
9 .... Excellent signal quality. Margin is ≥ 9 dB above 10^{-7} BER.

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

Type "Z" at the Current System Status screen in order to reset performance registers to zero at both the Current System Status and Performance History screens.

```
        FT1-DP          CURRENT SYSTEM STATUS        FNID
      NETWORK (DSL)     ELAPSED TIME 00:08:18    CUSTOMER (DSL)
  -----------------------                       --------------------
        00 dB            <-     LOSS     ->          00 dB
         NO              <-     SYNC     ->           NO
       000/00000         <- ES   15M/24H ->        000/00000
       000/00000         <- SES  15M/24H ->        000/00000
       498/00498         <- UAS  15M/24H ->        498/00498
     LOOPBACKS INACTIVE                          LOOPBACKS INACTIVE

   FT1-DP SIGNAL QUALITY          FNID DS1       FNID  SIGNAL QUALITY
         [ ]   9           --------------------       [ ]   9
         [ ]   8           FRAME   -->    SF          [ ]   8
         [ ]   7           CODE    -->    AMI         [ ]   7
         [ ]   6           LBO     -->    0 dB        [ ]   6
         [ ]   5           BPV     -->    00000       [ ]   5
         [ ]   4           ES      -->    00000       [ ]   4
         [ ]   3           SES     -->    00000       [ ]   3
         [ ]   2           UAS     -->    00000       [ ]   2
         [ ]   1           ALARMS  -->    NONE        [ ]   1
         [ ]   0           NO SEALING CURRENT         [ ]   0
           Press "Z" to zero registers, "M" for Main Menu.
```
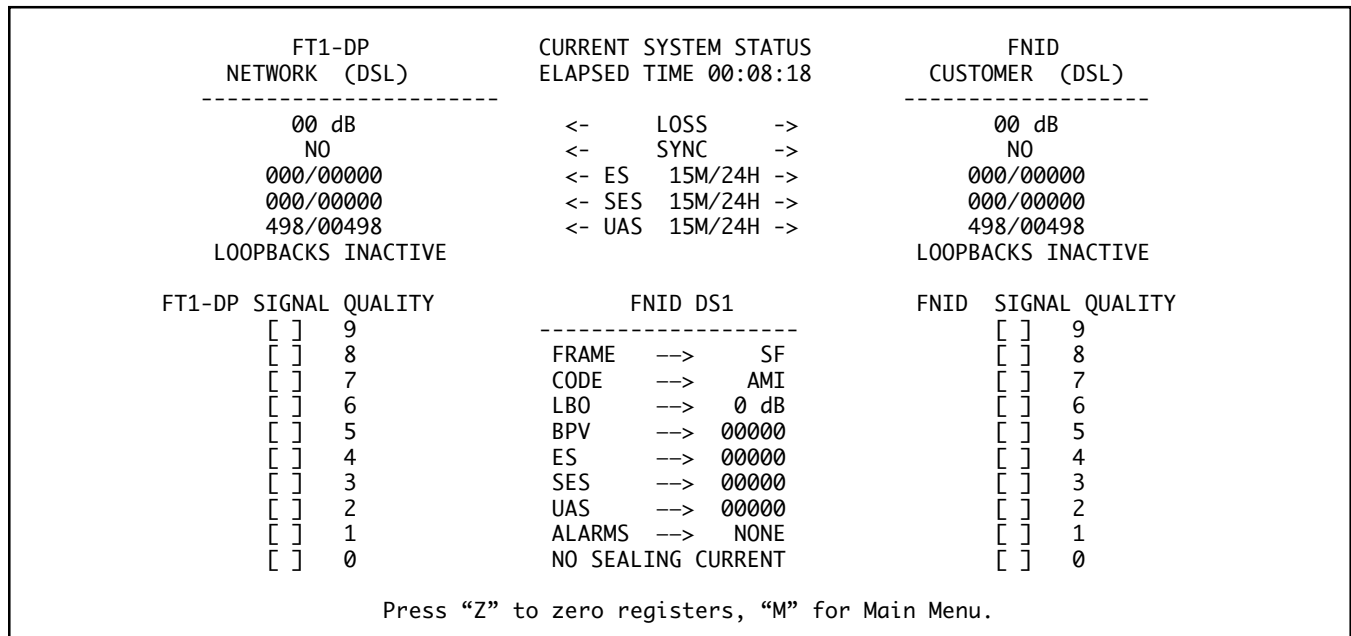
Figure 8. Current System Status Screen

The Performance History Screen displays 15-minute and 24-hour registers for several points in the circuit. **Figure 9** depicts the Performance History Screen.

Figure 10 depicts the FT1 DP Loopback Options Screen. Loopback may be initiated or terminated using this screen. A status of current loopback conditions also appear.
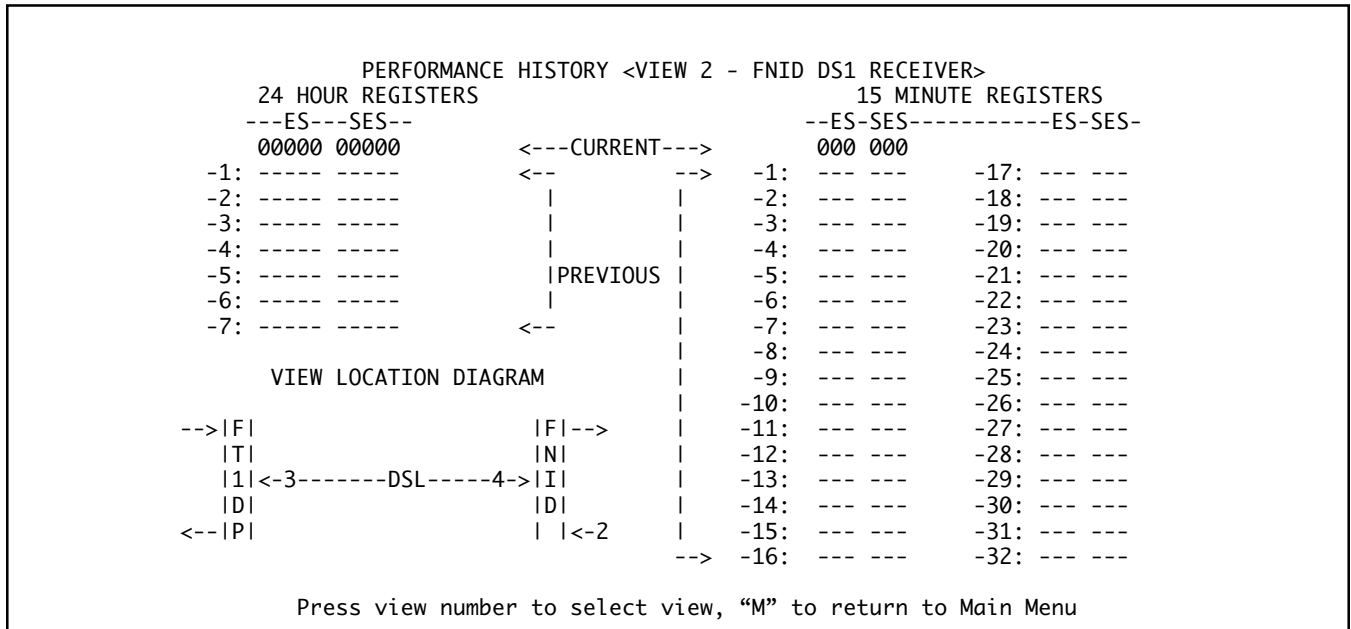
```
                    PERFORMANCE HISTORY <VIEW 2 - FNID DS1 RECEIVER>
                24 HOUR REGISTERS                        15 MINUTE REGISTERS
                ---ES---SES--                          --ES-SES-----------ES-SES-
                 00000 00000        <---CURRENT--->       000 000
            -1: ----- -----         <--         -->  -1:  --- ---     -17: --- ---
            -2: ----- -----          |           |   -2:  --- ---     -18: --- ---
            -3: ----- -----          |           |   -3:  --- ---     -19: --- ---
            -4: ----- -----          |           |   -4:  --- ---     -20: --- ---
            -5: ----- -----          |PREVIOUS |     -5:  --- ---     -21: --- ---
            -6: ----- -----          |           |   -6:  --- ---     -22: --- ---
            -7: ----- -----         <--          |   -7:  --- ---     -23: --- ---
                                                 |   -8:  --- ---     -24: --- ---
                 VIEW LOCATION DIAGRAM           |   -9:  --- ---     -25: --- ---
                                                 |  -10:  --- ---     -26: --- ---
          -->|F|                      |F|-->     |  -11:  --- ---     -27: --- ---
             |T|                      |N|        |  -12:  --- ---     -28: --- ---
             |1|<-3-------DSL-----4->|I|         |  -13:  --- ---     -29: --- ---
             |D|                      |D|        |  -14:  --- ---     -30: --- ---
          <--|P|                      | |<-2     |  -15:  --- ---     -31: --- ---
                                              -->   -16:  --- ---     -32: --- ---

              Press view number to select view, "M" to return to Main Menu
```

Figure 9. Performance History Screen

```
                              LOOPBACK OPTIONS

              FT1-DP                           FNID
              _____                            _____
             |     |                          |     |
             |     |                          |     |
       --->| |     |                          |     | |<---
             |     |                          |     |
       NET |  |     |<===========================>| |  | CUST
             |     |                          |     |
       <---| |     |                          |     | |--->
             |     |                          |     |
             |     |                          |     |
             |_____|                          |_____|

              1) LOOPBACK TO NETWORK  AT FT1-DP =INACTIVE
              2) LOOPBACK TO CUSTOMER AT FT1-DP =INACTIVE
              3) LOOPBACK TO NETWORK  AT FNID   =INACTIVE
              4) LOOPBACK TO CUSTOMER AT FNID   =INACTIVE



              Press corresponding number to toggle loopback option.
                        Press "M" for Main Menu.
```
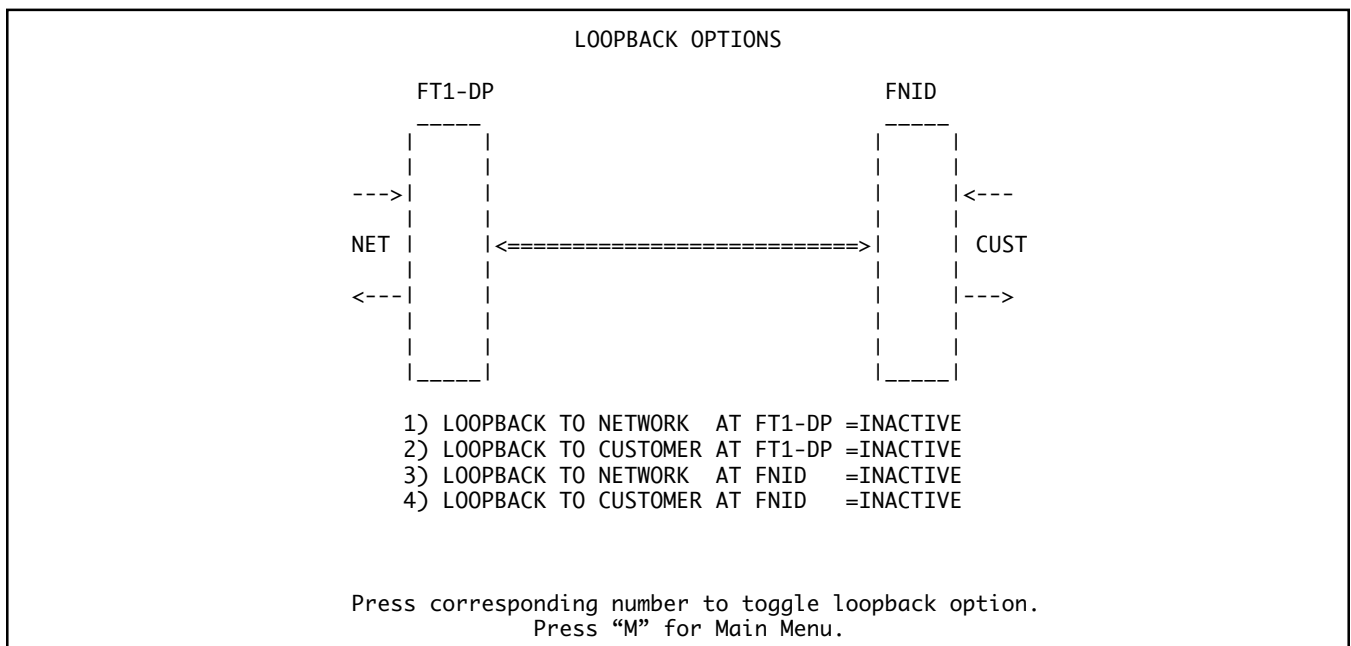
Figure 10. Loopback Options Screen

Figure 11 depicts the Self-Test Options Screen. A test of the FT1-DP and the FNID may be initiated from this screen.

Figure 12 shows the Provisioning Options screen. Settings for all provisioning options may be configured via the provisioning screen.
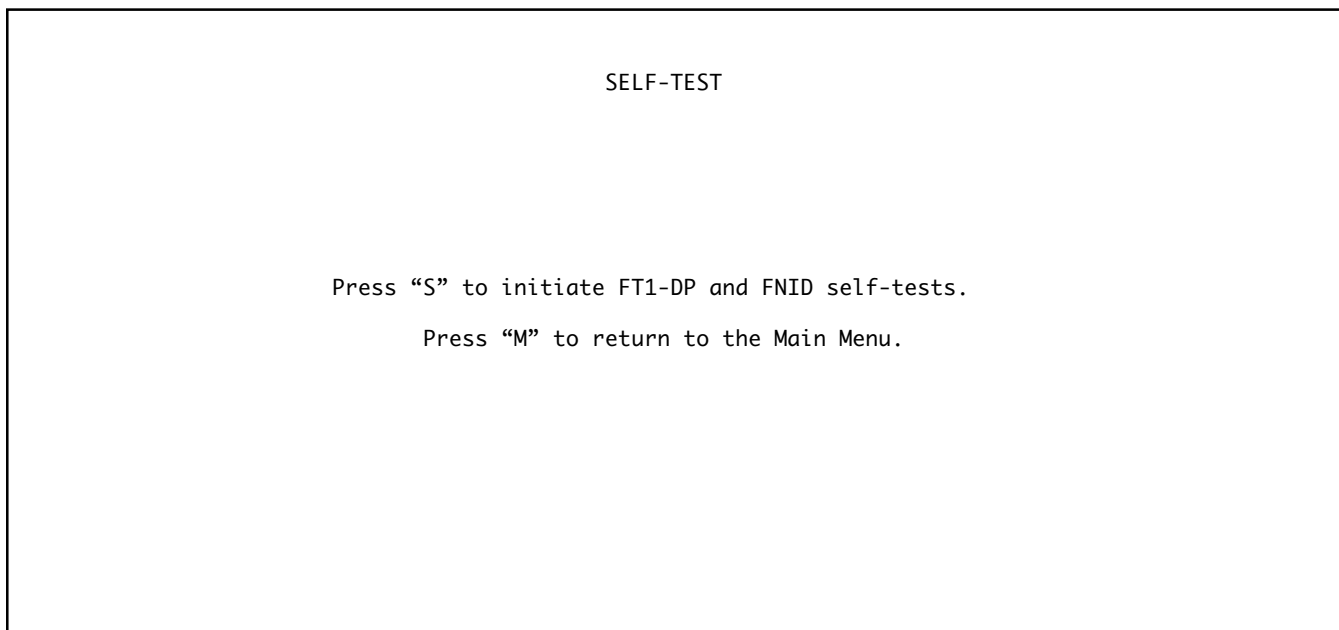
```
                              SELF-TEST




              Press "S" to initiate FT1-DP and FNID self-tests.

                  Press "M" to return to the Main Menu.
```
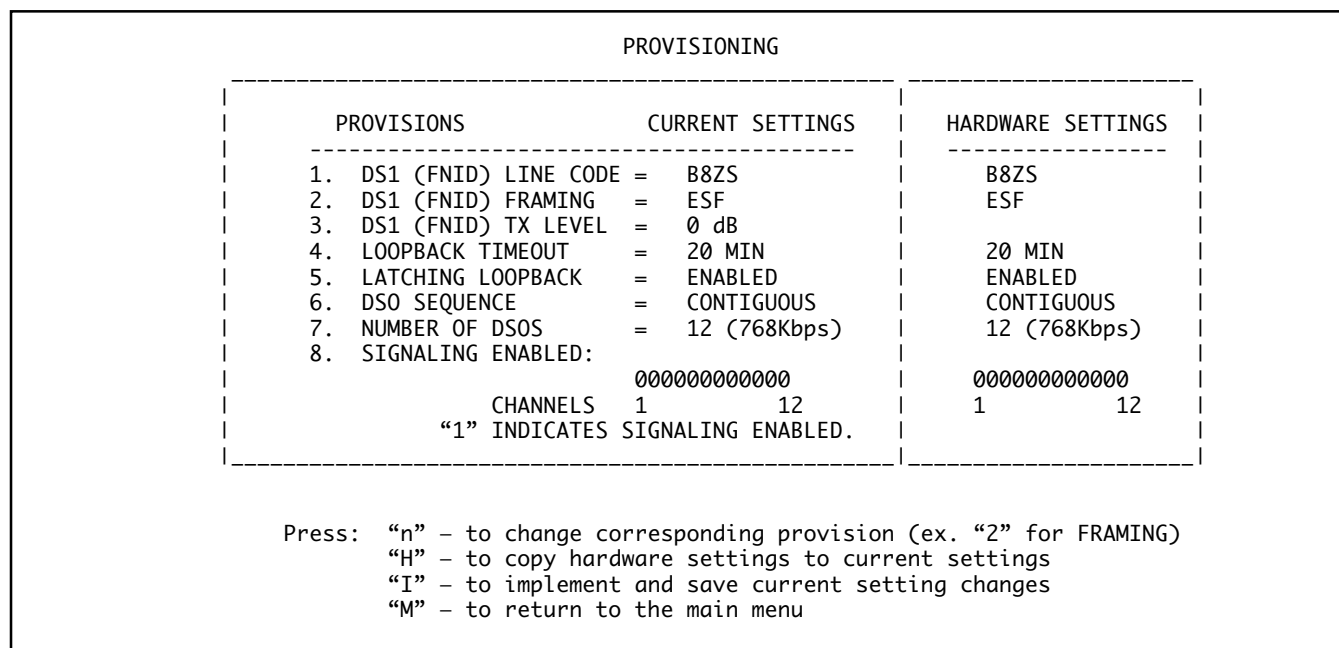
Figure 11. Self-Test Options Screen

```
                            PROVISIONING
        ----------------------------------------------  ---------------------
       |                                              | |                     |
       |      PROVISIONS            CURRENT SETTINGS  | | HARDWARE SETTINGS   |
       |    ----------------------------------------  | | ----------------    |
       |    1.  DS1 (FNID) LINE CODE =   B8ZS         | |    B8ZS             |
       |    2.  DS1 (FNID) FRAMING   =   ESF          | |    ESF              |
       |    3.  DS1 (FNID) TX LEVEL  =   0 dB         | |                     |
       |    4.  LOOPBACK TIMEOUT     =   20 MIN       | |    20 MIN           |
       |    5.  LATCHING LOOPBACK    =   ENABLED      | |    ENABLED          |
       |    6.  DSO SEQUENCE         =   CONTIGUOUS   | |    CONTIGUOUS       |
       |    7.  NUMBER OF DSOS       =   12 (768Kbps) | |    12 (768Kbps)     |
       |    8.  SIGNALING ENABLED:                    | |                     |
       |                            000000000000      | |    000000000000     |
       |              CHANNELS   1           12       | |    1           12   |
       |          "1" INDICATES SIGNALING ENABLED.    | |                     |
       |_____| |_____|


         Press:  "n" – to change corresponding provision (ex. "2" for FRAMING)
                 "H" – to copy hardware settings to current settings
                 "I" – to implement and save current setting changes
                 "M" – to return to the main menu
```

Figure 12. Provisioning Options Screen

The Troubleshooting Display, shown in **Figure 13**, graphically depicts a DSL circuit. The unit monitors red, yellow, and blue alarm conditions in the circuit. Once a fault location is suspected, the corresponding portion of the circuit on the screen is highlighted and a message describing the failure will appear.

```
                    TROUBLESHOOTING DISPLAY

          FT1-DP                              FNID
          _____                              _____
         |     |                            |     |
         |     |                            |     |
 --->|     |                            |     |<---
         |     |                            |     |
 NET |     |<===========================>|     | CUST
         |     |                            |     |
 <---|     |                            |     |--->
         |     |                            |     |
         |     |                            |     |
         |_____|                            |_____|

          ALARMS:          PROBLEM INDICATED:
          FT1-DP           CHANNEL BANK ALARM
          FT1-DP  RED      DSL       LOSS




             Press "M" for Main Menu.
```
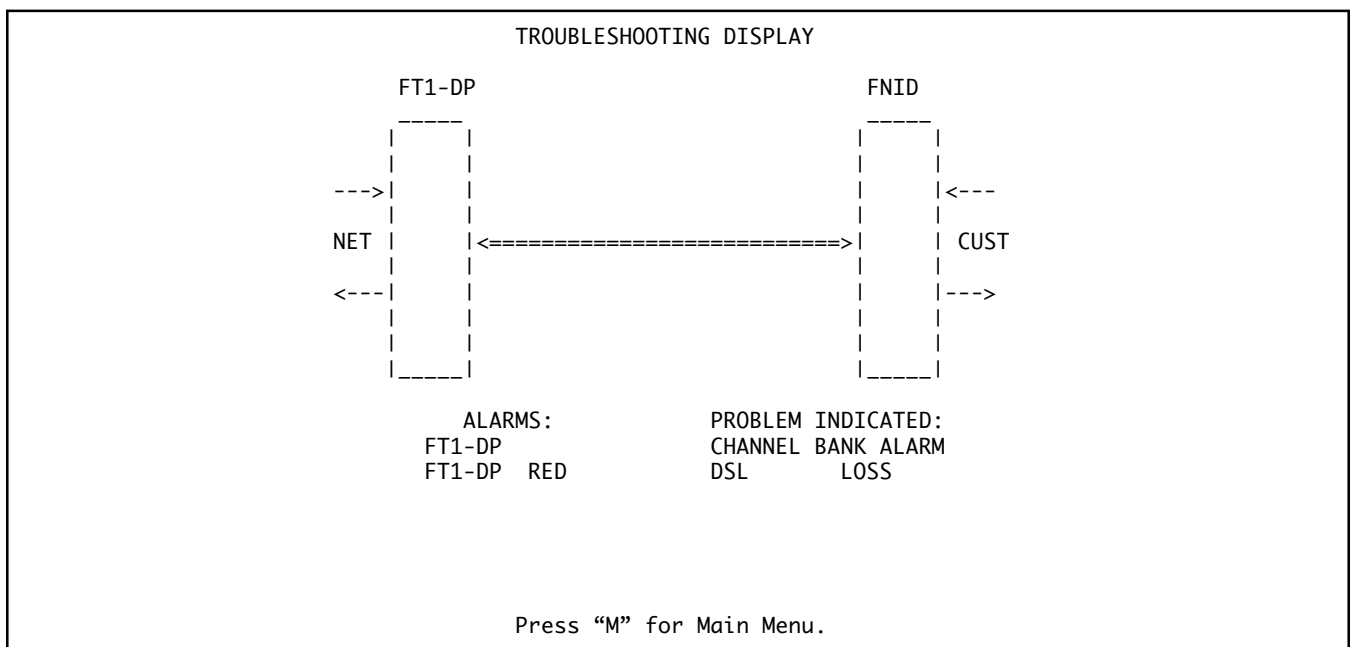
Figure 13. Troubleshooting Screen

6. DSL DEPLOYMENT GUIDELINES

The ADTRAN FT1 DSL system is designed to provide Fractional DS1 based services over loops designed to comply with Carrier Service Area (CSA) guidelines. CSA deployment guidelines are given below.

1. All loops are non-loaded only.
2. For loops with 26-AWG cable, the maximum loop length including bridged tap lengths is 9 kft.
3. For loops with 24-AWG cable, the maximum loop length including bridged tap lengths is 12 kft.
4. Any single bridged tap is limited to 2 kft.
5. Total bridged tap length is limited to 2.5 kft.
6. The total length of multi-gauge cable containing 26-AWG cable must not exceed
   $12 - \{(3*L^{26})/9\} - L^{BTAP}$ (in kft)

L^{26}	=	Total length of 26-AWG cable excluding bridged taps (in kft)
L^{BTAP}	=	Total length of all bridged taps (in kft)

This deployment criteria is summarized in the chart shown in **Figure 14**.
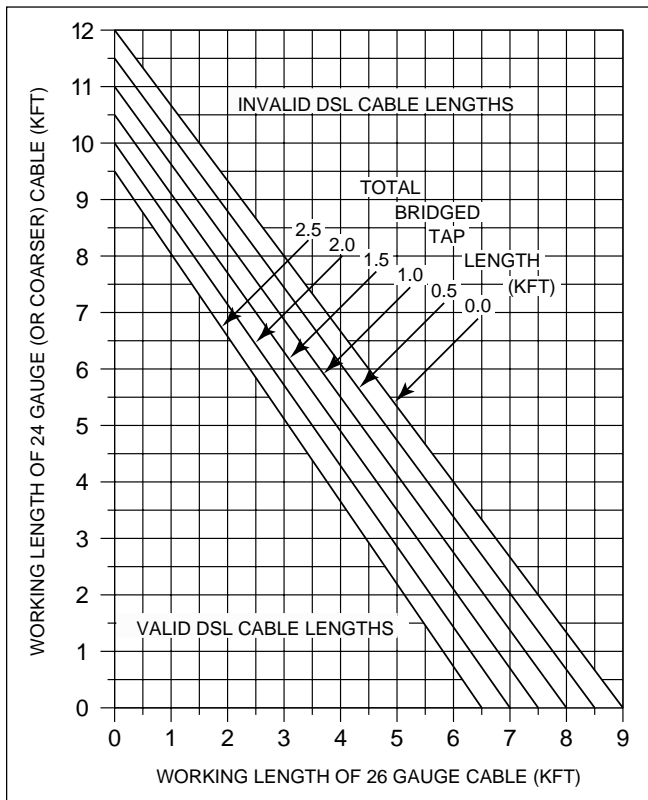
Figure 14. DSL Deployment Guidelines

Recommended maximum local loop loss information for PIC cable at 70°F, 135Ω resistive termination, is provided in **Table 6**.

Table 6. Loop Insertion Loss Data

Frequency (Hz)	Maximum Loss (dB)
3000	12.0
10,000	15.0
50,000	25.5
100,000	30.0
150,000	32.75
200,000	35.25

An approximation for the maximum amount of wideband noise on a DSL local loop as measured by a 50 kbps filter is ≤ 31 dBrn.

An approximation for the maximum level of impulse noise as measured using a 50 kbps filter on a DSL loop is ≤ 50 dBrn.

NOTE

These approximations are to be used as guidelines only and may vary slightly on different loops. Adhering to the guidelines should produce performance in excess of 10^{-7} BER.

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7. MAINTENANCE

The ADTRAN FT1 DP requires no routine maintenance. In case of equipment malfunction, use the features supplied with the FT1 DP to help locate the source of the problem.

ADTRAN does not recommend that repairs be performed in the field. Repair services may be obtained by returning the defective unit to the ADTRAN Customer Service RMA Department.

8. TROUBLESHOOTING PROCEDURES

Use **Table 7** to troubleshoot the FT1 DP.

9. PRODUCT SPECIFICATIONS

Specifications for the FT1 DP are provided in **Table 8**.

10. 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 Networks 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:

ADTRAN Sales
Pricing/Availability
(800) 827-0807

ADTRAN Technical Support
Presales Applications/Postsales Technical Assistance
(800) 726-8663

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 Department
901 Explorer Boulevard
Huntsville, Alabama 35806-2807

Table 7. Troubleshooting Guide

Condition	Solution
All front panel indicators are *off*.	1. Verify that the FT1 DP is properly seated in the housing. 2. Make sure power supply feeding the FT1 DP is good. 3. If Steps 1 and 2 pass, replace the FT1 DP.
Power OK but does not achieve Loop Sync (DSL LED is *off*).	1. Verify that the loop conforms with CSA guidelines (not too long, etc.). 2. Verify that the Loop Loss at 200 kHz is not greater than 36 dB. 3. Verify that noise on the DSL Loop is within acceptable limits. 4. If Steps 1 through 3 pass and Loop Sync is still not available, replace the unit with an FT1 DP unit known to be in good working condition.

Table 8. FT1 DP Product Specifications

Loop Interface
Modulation Type 2B1Q
Mode .... Full Duplex, Echo Cancelling
Number of Pairs .... One
Bit Rate .... 784 kbps
Baud Rate .... 392K baud
Service Range .... Defined by Carrier Service Area Guidelines
Loop Loss .... 36 dB maximum @ 200 kHz
Bridged Taps .... Single taps < 2 kft, total taps < 2.5 kft
Performance .... Compliant with Bellcore TA-NWT-001210
Return Loss .... 20 dB (40 kHz to 200 kHz)
DSL Tx Signal Level .... 13.5 dBm
Input Impedance 135Ω
Return Loss .... 20 dB (40 kHz to 200 kHz)

DS1 Facility Interface
Fully compatible with Nortel DE-4E shelf

Power
Tested with the ADTRAN FT1 Repeater (P/N 1245211L1) and the ADTRAN FNID (P/N 1245201L1)
Total Power .... -48 VDC @ 125 mA with FNID
                                                                       -48 VDC @ 215 mA with FNID and FT1 Repeater
                                                                       -48 VDC @ 300 mA with Local Power FNID and two FT1 Repeaters
FT1 DP Power Dissipation .... 3.7 watts with FNID
                                                                       5.2 watts with FNID and FT1 Repeater
                                                                       6.1 watts with Local Power FNID and two FT1 Repeaters
Span Power .... 137 V or -190 VDC (nominal)
                                                                       Fusing 1.00 A (not field-replaceable)

Clock Sources
Clock Sources .... Internal, DS1 Derived
Internal Clock Accuracy .... ± 25 ppm, (exceeds Stratum 4). Meets T1.101 timing requirements.

Tests
Diagnostics .... Self-Test, Local Loopback (FT1 DP), Remote Loopback (FNID)

Mechanical
Dimensions .... 6.2" High, 1.1" Wide, 10.2" Deep, 16 ounces, nominal
                                                                       Plugs into Nortel DE-4E (or equivalent) shelf

Environment
Temperature .... Operating (Standard): -40° to +70°C; Storage: -40° to +85°C
Relative Humidity .... Up to 95%, non-condensing

Part Number 1245207L2

Section 61245207L2-5, Issue 3

Appendix A
FT1 Loopbacks

GENERAL

This Appendix is an overall reference to the loopback capabilities of the ADTRAN Fractional T1 system. Included in this Appendix is a description of the FT1 loopbacks and the methods for activating the FT1 loopbacks.

FT1 LOOPBACKS

Figure A-1 shows the application from the central office (CO) to customer premises. The FT1 Repeaters are shown for convenience and are not necessary parts of the FT1 network. The loopbacks shown are as follows:

A. FT1 DP network loopback
B. FT1 DP CPE loopback
C. FT1 Repeater # 1 network loopback
D. FT1 Repeater # 2 network loopback
E. FNID network loopback
F. FNID CPE loopback

There are two loopbacks available to the FT1 DP. The FT1 DP network loopback loops the FT1 signal back to the network. The FT1 DP CPE loopback loops the FT1 signal back to the customer.

The FT1 DP network loopback is a digital loopback toward the CO (see **Figure A-2**). This loopback is initiated by the OCU latching loopback command (N1010101), or by the craft interface, when available. The OCU latching loopback code is detected in the primary DS0 of the FT1 circuit (the channel where the FT1 DP is physically installed) to control the FT1 circuit looping. When the FT1 circuit is looped, all DS0s in use will be looped back toward the network. The DS0s will be transmitted on to the customer.

The FT1 DP CPE loopback is a digital loopback toward customer premises as shown in **Figure A-3**. This loopback is initiated by the REM LBK button on the FNID, or by the craft interface when available. When the FT1 circuit is looped, all DS0s in use will be looped back toward the customer. All DS0s in use will be filled with all 1s and sent toward the network.
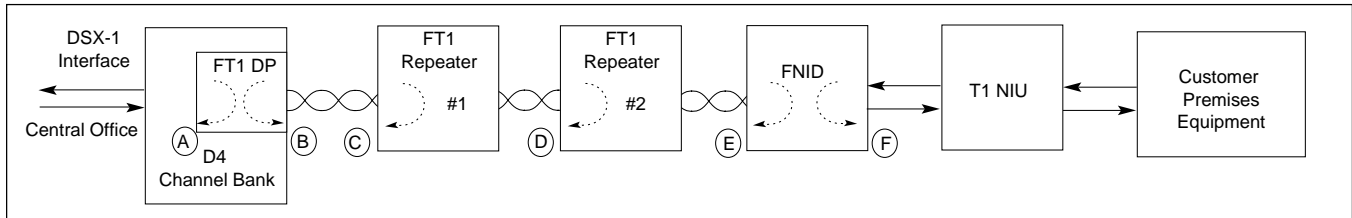
Figure A-1. FT1 Loopbacks
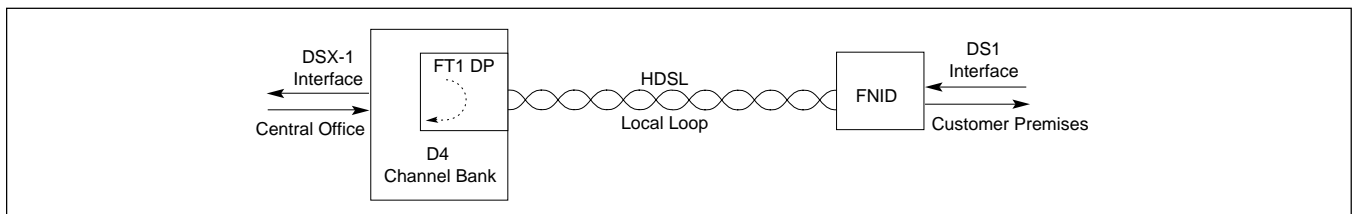
Figure A-2. FT1 DP Network Loopback
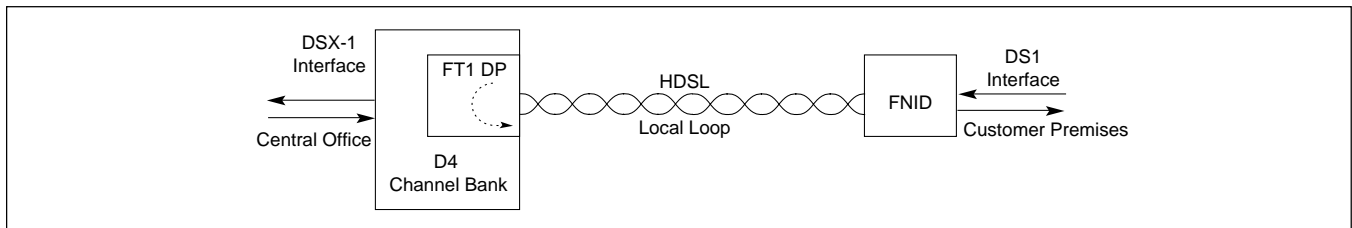
Figure A-3. FT1 DP CPE Loopback

There is one loopback available to the FT1 Repeaters. The FT1 Repeater Network loopback is a digital loopback toward the CO as shown in **Figure A-4**. The loopbacks are initiated by the DDS latching loopback codes for NEI Position 1 (N1000001) for FT1 #1 or NEI Position 2 (N100001) for FT1 Repeater # 2. The NEI latching loopback is detected in the primary DS0 of the FT1 circuit, the channel where the FT1 DP is physically installed, to control the looping of the FT1 circuit. When the FT1 circuit is looped, all DS0s in use will be looped. The DS0s in use will also be transmitted on to the customer.

There are two loopbacks available to the FNID. The FNID network loopback loops the FT1 signal back toward the network. The FNID CPE loopback loops the FT1 signal back toward the customer.

The FNID network loopback is a digital loopback toward the CO as illustrated in **Figure A-5**. This

loopback is initiated by the DDS latching loopback code for NEI Position 1 (N1000001) for a non-repeatered loop, or NEI Position 2 (N1000001) for a single repeater loop or by NEI Position 3 (N1000001) for a two repeater loop; by the craft interface when available, or by the REM LBK button at the FT1 DP. The NEI Position 1 latching loopback is detected in the primary DS0 of the FT1 circuit (the channel in which the FT1 DP is physically installed), to control the looping of the FT1 circuit. When the FT1 circuit is looped, all DS0s in use will be looped. The DS0s in use will be filled with all 1s and transmitted toward the customer.

The FNID CPE loopback is a digital loopback toward customer premises as shown in **Figure A-6**. This loopback is initiated by the craft interface, when available. When the FT1 circuit is looped, all DS0s in use will be looped. The data in the DS0s in use will be transmitted toward the network.
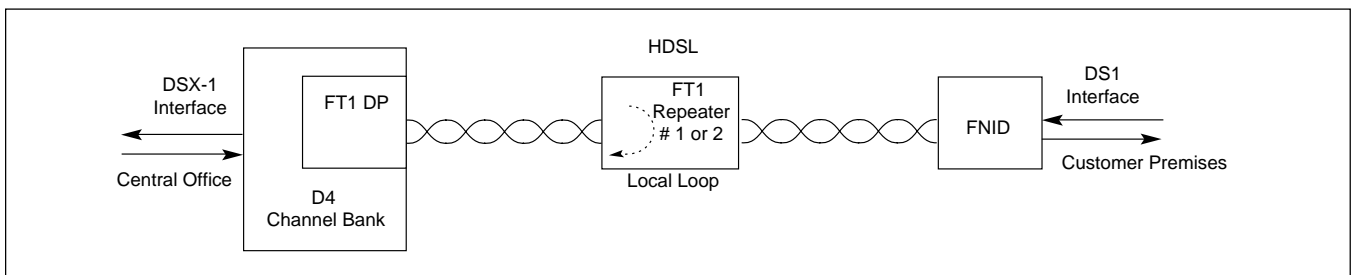

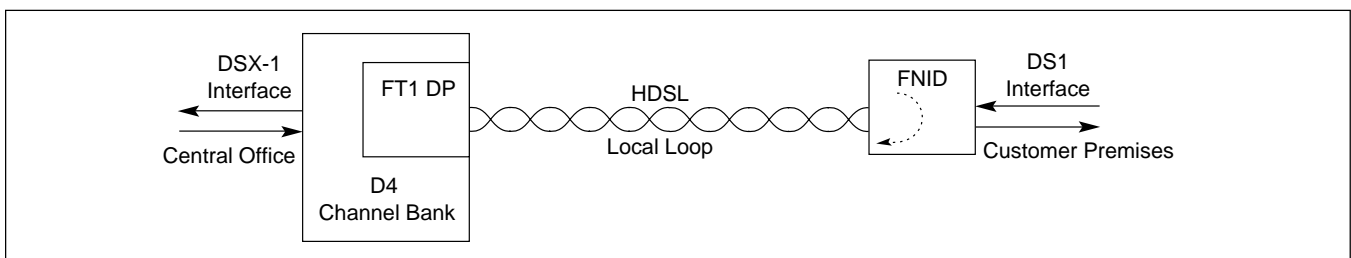Figure A-4. FT1 Repeater # 1 or 2 Network Loopback
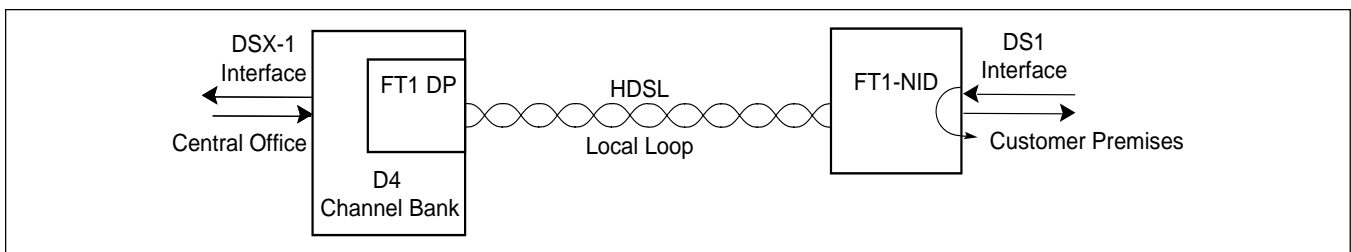

Figure A-5. FNID Network Loopback

Figure A-6. FNID CPE Loopback

LOOPBACK ACTIVATION/DEACTIVATION

This section describes loopback activation and deactivation methods for the ADTRAN Fractional T1 system. Loopback activation and deactivation is controlled with the push-button located on the front panel, through craft interface, or latching loopback codes.

Both the FNID and the FT1 DP have a push-button located on the front panel labeled REM LBK or RLB which controls the activation of remote loopback. Pressing REM LBK or RLB on the FNID activates FT1 DP CPE loopback. Pressing REM LBK or RLB on the FT1 DP activates FNID network loopback or repeater loopback when a repeater is present. Remote loopback is deactivated by pressing the REM LBK or RLB or waiting for the 20-minute loopback timeout, if enabled.

The FNID and FT1 DP (when available) have a craft interface located on the front panel of the device. The craft interface allows access to the FT1 device through an RS-232-type interface. All loopbacks for the FNID and FT1 DP can be controlled from the craft interface. The craft interface on the FNID can activate and deactivate the FNID network loopback and the FNID CPE loopback. The FNID craft interface can also remotely activate and deactivate the FT1 DP network loopback, FT1 DP CPE loopback, and the repeater network loopback. The craft interface on the FT1 DP can activate and deactivate the FT1 DP network loopback and the FT1 DP CPE loopback. The FT1 DP craft interface can also remotely activate and deactivate the FNID network loopback and the FNID CPE loopback and the repeater network loopback.

FT1 DP, FT1 Repeater, and FNID network loopbacks can be activated by the DDS latching loopback sequence. The latching loopback sequence is detected in the primary DS0 of the FT1 system. When the loopback is activated on the device, the whole FT1 bandwidth is looped. The FT1 DP, FT1 Repeater, and FNID each respond to a different loopback select code allowing for sectionalization of the network during testing. **Table A-1** is a list of FT1 devices and their loopback select codes.

Latching loopbacks for the FT1 system are activated by transmitting the following latching loopback sequence in the primary DS0 of the FT1 system:

A. Minimum of 35 transition in progress (TIP) bytes (N0111010).
B. Minimum of 35 loopback select code (LSC) bytes as defined in Table 1.
C. Minimum of 100 loopback enable (LBE) bytes (N1010110).
D. Minimum of 35 all 1s bytes (S1111111), plus a minimum of 100 LBE bytes. (N-1) iterations, where N is the number of channel units of the same type (i.e., same LSC) that lie between the test center and the loopback to be operated. This step is only used when there are identical channel units in tandem.
E. Minimum of 32 far end voice (FEV) bytes (N1011010).

A 25-second watchdog timer is activated between the 35 TIP bytes and 35 LSC bytes, between the 35 LSC bytes and 100 LBE bytes, and between the 100 LBE bytes and 32 FEV bytes. The timer requires the correct receipt of the latter sequences less than 25 seconds after receipt of the prior sequence. This prevents inadvertent setting of the latching loopbacks.

Latching loopbacks for the FT1 system are deactivated by transmitting the following latching loopback sequence in the primary DS0 of the FT1 system:

Minimum of 35 TIP bytes (N0111010).

LOOPUP STATE

In the loopup state, the active FT1 loopback will provide a continuous loop for the FT1 bandwidth. The data flow is continuously monitored for the loop deactivation commands to deactivate the loopbacks. Also, a 20-minute loopback timeout is checked. If the loopback timeout is enabled, any loopback that is in the loopup state for 20 minutes will be deactivated.

Table A-1. FT1 Loopback Select Codes

FT1 Device	Loopback Select Code Name	Loopback Select Code Byte
FT1 DP .... OCU loopback	....	N1010101
FT1 Repeater #1 .... NEI Position 1 loopback	...	N1000001
FT1 Repeater #2 .... NEI Position 2 loopback	...	N1000001
FNID without repeater ...... NEI Position 1 loopback	...	N1000001
FNID with one repeater .... NEI Position 2 loopback	...	N1000001
FNID with two repeaters .. NEI Position 3 loopback	...	N1000001