Total Access® 1500 FT1 DP
Total Access 1500 Fractional T1 Data Port
Installation and Maintenance

CONTENTS

FIGURES

TABLES

Figure 1. Total Access 1500 FT1 DP

1. GENERAL

This practice serves as an Installation and Maintenance guide for the ADTRAN Total Access 1500 Fractional T1 Data Port (Total Access 1500 FT1 DP). **Figure 1** is an illustration of the ADTRAN Total Access 1500 FT1 DP, (P/N 1180405L1).

Revision History

This is the initial release of this document. Future revisions to this document will be explained in this subsection.

Description

The Total Access 1500 FT1 DP is the Central Office unit used to deploy an FT1 circuit using 2-wire metallic facilities. The Total Access 1500 FT1 DP plugs directly into a standard Total Access 1500 channel bank. Signals are provided to and from the channel bank while 2B1Q HDSL signals are provided to the local loop.

The FT1 Digital Subscriber Loop local loop operates as an independent subsystem over a single twisted pair. The Total Access 1500 FT1 DP communicates over this twisted pair to the following Fractional Network Interface Devices:

Part Number	Description
1242041LX	Circuit Pack
1242042LX	Standalone
1245201LX	Circuit Pack
1242050L2	FT1 Repeater
1245211L1	FT1 Repeater

The payload between Total Access 1500 FT1 DP and FNID is programmable from the front panel 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.

To take advantage of all available features, the FT1 DP should be paired with the FT1 Repeater P/N 1245211L1 and the FNID P/N 1245201L2. The FTI DP is also compatible with other ADTRAN FNIDS.

2. INSTALLATION

C A U T I O N !
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 unit occupies two slots in a standard Total Access 1500 housing. No installation wiring is required.

The bandwidth is taken by the Total Access 1500 FT1 DP in contiguous time slots. These slots must not be previously assigned to other channel cards plugged into the Total Access 1500 shelf.

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.

If it is the first FT1 DP installed in the Total Access 1500 shelf, the FT1 DP will take approximately 20 seconds to communicate with the shelf common cards. This is indicated by the LEDs turning on one at a time in succession from bottom to top, then repeating.

How the Total Access 1500 shelf assigns time slots to the FT1 DP is determined by the type of LIU installed in the shelf. If it is a single T1 LIU, the normal assignment is one DS0 channel per physical slot. If it is a dual LIU, two DS0 channels per physical slot are assigned. If it is a quad LIU, four DS0 channels per physical slot are assigned. In order for the Total Access 1500 shelf to automatically assign time slots to the FT1 DP, one or more physical slots to the immediate right of the FT1 DP may need to be empty.

For example, assume a quad LIU is installed and the FT1 DP is set for 12 channels. If the FT1 DP is installed in slot 2 (occupying slots 2 and 3, then the next slot (4) should be empty so there will be no conflict. In this case, the FT1 DP will be assigned to T1-A slots 5-16.

Options

The FT1 DP is provisionable via the craft interface on the Total Access 1500 SCU or by circuit board DIP switches. **Table 1** and **Table 2** show the option settings and their defaults. Control Port Operation is described in Section 6 of this practice.

DIP Switch vs. Interface Options

Circuit board DIP switches SW1, SW2, and SW3 select option configurations identical to interface selected options. DIP switch options are set prior to card insertion and can be changed as often as necessary. However, once the card in a particular slot is provisioned via the interface, that configuration becomes the bank default for that slot. From that point on the interface is the only way to change options as card DIP switches will be ignored. Additionally, the bank default for that slot will automatically configure a replacement card regardless of DIP switch selections when inserted. If a card is inserted into a slot that has never been provisioned via the interface, the DIP switches can be used even if that card was removed from a bank default slot.

Table 1. Option Settings

Function	Description	SW1
Line Code		**SW1-1**
AMI	Selects AMI line code	OFF
B8ZS*	Selects B8ZS line code	ON
Framing		**SW1-2**
SF	Selects SF framing	OFF
ESF*	Selects ESF framing	ON
Latching Loopback		**SW1-3**
Enabled*	Enables latching loopbacks	ON
Disabled	Disables latching loopbacks	OFF
Latching Time Out		**SW1-4**
20 minutes*	Enables 20-minute loopback time out	ON
None	Disables loopback time out	OFF

*Default

Table 2. A/B Signalling Option Settings

Function	Description	DIP Switch
A/B Signalling for Channel 1:		**SW3-4**
A/B Signalling Disabled*	Disables A/B Signalling in channel 1	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 1	ON
A/B Signalling for Channel 2:		**SW3-3**
A/B Signalling Disabled*	Disables A/B Signalling in channel 2	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 2	ON
A/B Signalling for Channel 3:		**SW3-2**
A/B Signalling Disabled*	Disables A/B Signalling in channel 3	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 3	ON
A/B Signalling for Channel 4:		**SW3-1**
A/B Signalling Disabled*	Disables A/B Signalling in channel 4	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 4	ON
A/B Signalling for Channel 5:		**SW2-8**
A/B Signalling Disabled*	Disables A/B Signalling in channel 5	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 5	ON
A/B Signalling for Channel 6:		**SW2-7**
A/B Signalling Disabled*	Disables A/B Signalling in channel 6	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 6	ON
A/B Signalling for Channel 7:		**SW2-6**
A/B Signalling Disabled*	Disables A/B Signalling in channel 7	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 7	ON
A/B Signalling for Channel 8:		**SW2-5**
A/B Signalling Disabled*	Disables A/B Signalling in channel 8	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 8	ON
A/B Signalling for Channel 9:		**SW2-4**
A/B Signalling Disabled*	Disables A/B Signalling in channel 9	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 9	ON
A/B Signalling for Channel 10:		**SW2-3**
A/B Signalling Disabled*	Disables A/B Signalling in channel 10	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 10	ON
A/B Signalling for Channel 11:		**SW2-2**
A/B Signalling Disabled*	Disables A/B Signalling in channel 11	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 11	ON
A/B Signalling for Channel 12:		**SW2-1**
A/B Signalling Disabled*	Disables A/B Signalling in channel 12	OFF
A/B Signalling Enabled	Enables A/B Signalling in channel 12	ON

* = Default (OFF)

LED Indication

The Total Access 1500 FT1 DP has five front panel LEDs that indicate operational status. **Table 3** defines these LEDs.

3. CONNECTIONS

The FT1 DP occupies two card slots in a Total Access 1500 shelf. Power and signaling are provided to the card through the backplane of the channel bank.

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 paragraphs describe additional testing features conducted with the front panel bantam jacks as well as other front panel features.

Table 3. Front Panel LEDs and Switches

Indicator	Description
STAT ....Indicates Status	
	Green .... Normal operating condition
	Yellow .... Local (FT1 DP) loopback is active
	Yellow (Flashing) ... FNID or repeater is in loopback
DS1 ....Indicates the quality of the DS1 signal	
	Green .... The customer-side DS1 signal is present and synchronized
	Yellow .... Yellow alarm at customer side DS1
	Red .... No customer DS1 input signal present (T1LOS) or excessive Frame Bits Error/Loss of frame synchronization
	Flashing .... Indicates an error has been detected at FNID input
DSL ....Indicates the quality of the DSL signal	
	Red .... No synchronization of FT1 DP and FNID
	Yellow .... Poor signal quality (> 10^{-7} BER)
	Green .... Good signal quality (> 2 dB margin above > 10^{-7} BER)
	Flashing .... An error detected on the loop will cause this LED to flash briefly
SX ....Sealing Current	
	OFF = No sealing current
	ON = Sealing current
REM ....Option Set Source	
	OFF .... Unit is operating from DIP switch settings
	ON .... Unit has been remotely provisioned
Rotary Switch ....Selects number of DS0 channels	
	Refer to *Installation* section for time slot allocation description.

Bantam Jack Description

The front panel of the FT1 DP has 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. A description of these jacks is provided below. **Figure 2** shows the bantam jack arrangement and details for specific jacks.
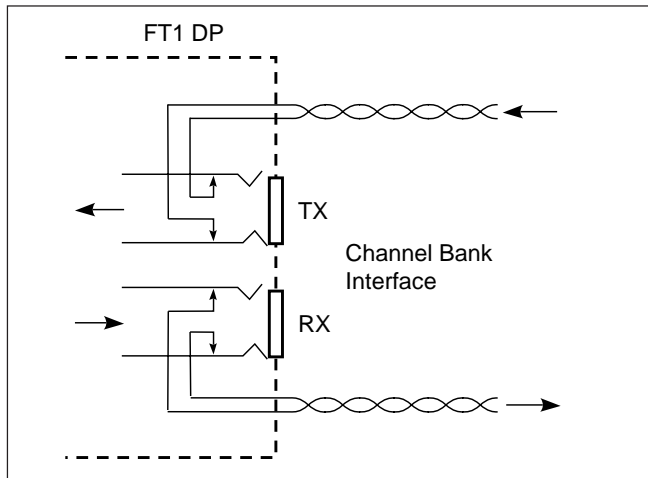
Figure 2. FT1 DP DS0 Bantam Jack Diagram

FT1 DP Bantam Jacks

A set of dual bantam jacks are on the front panel of the Total Access 1500 FT1 DP. The jacks allow for 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 BER signals.

NOTE

The DS0 access jacks are a logic level interface.

FT1 DP Loopbacks

Two loopbacks are available to the Total Access 1500 FT1 DP. The Total Access 1500 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 (see *Loopback Options Screen*). These loopback capabilities are described in detail in *Appendix A* of this practice.

5. OPERATION

For abbreviations used in the screen diagrams, see
Table 4.

Table 4. Definition of Screen Abbreviations

Abbreviation	Definition
ES	Errored Seconds: A count of the number of seconds in which at least one code violation was detected on a digital circuit
	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: A count of the number of seconds that a circuit or path is not available.
	DS1 .... Second in which there is a loss of signal or frame 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

The FT1 DP Main Menu is accessed via a craft port connection to the Total Access 1500 SCU. From the SCU Main Menu select the following options: Access Modules, Access Module Menus, and Fractional T1. See **Figure 3**.

The following screens can be accessed from the FT1 DP Main Menu:

1. FT1 DP and FNID Status
2. Performance History
3. Unit Information
4. Loopback Options
5. Provisioning

```
    Slot:  4                TOTAL ACCESS SYSTEM 1500           10/05/01 10:09



                      Fractional T1 Access Module

                        1.  FT1-DP and FNID Status
                        2.  Performance History
                        3.  Configuration
                        4.  Loopback Options
                        5.  Provisioning






                        Selection:


                    '?' - System Help Screen
```
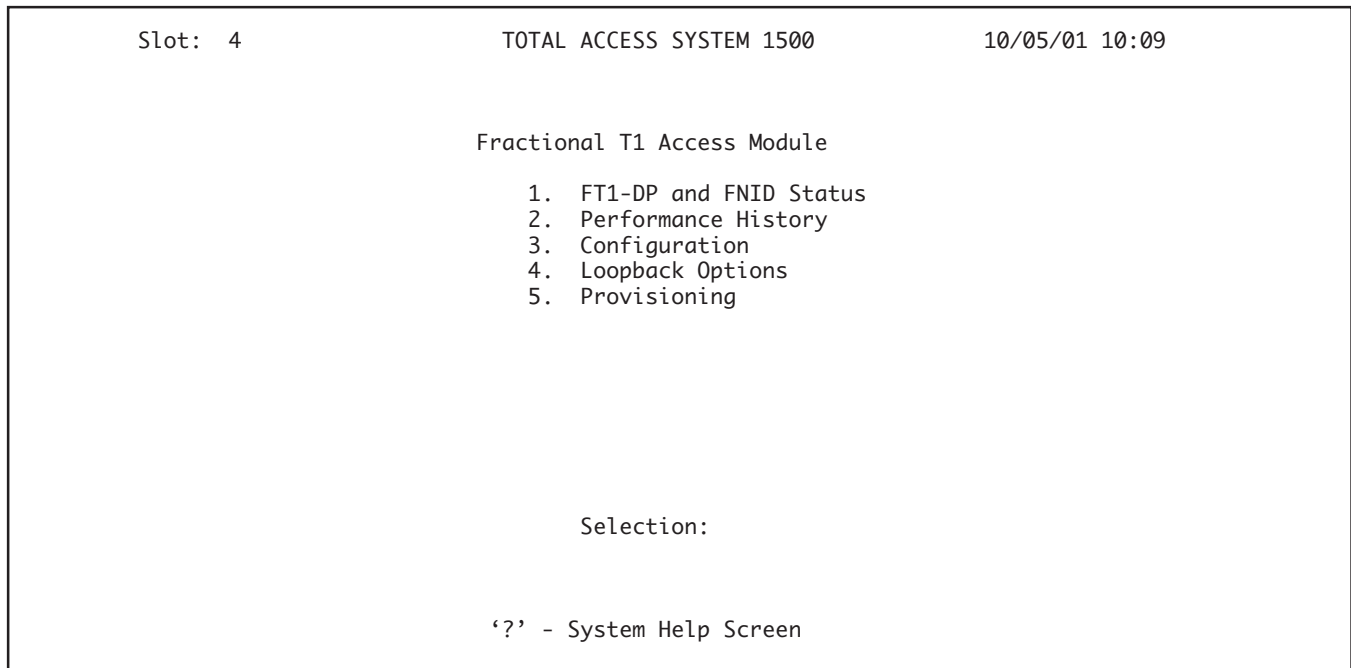
Figure 3. Main Menu Screen

The Current System Status Screen, illustrated in **Figure 4**, provides quick access to FT1 DP status 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 4 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 Sync Status
ES 15M/24H ...... Errored Seconds
SES 15M/24H .... Severely Errored Seconds
UAS 15M/24H ... Unavailable Seconds

```
    Slot:  4              TOTAL ACCESS SYSTEM 1500          10/05/01 10:10

         FT1-DP DSL          FT1-DP and FNID STATUS          FNID DSL
    -----------------------    -----------------------    -----------------------
         2 db              <-      LOSS     ->              1 db
         Yes               <-      SYNC     ->              Yes
         0/   23           <- ES   15M/24H ->              0/   17
         0/    2           <- SES  15M/24H ->              0/    2
         0/    0           <- UAS  15M/24H ->              0/    0
        Inactive           <-    LOOPBACKS  ->             Inactive
   Sealing Current Present
   Locally Provisioned
                                    FNID DS1
    FT1-DP SIGNAL QUALITY    ----------------------    FNID SIGNAL QUALITY
    (9 = Best, 0 = Worst)    FRAME      -> ESF          (9 = Best, 0 = Worst)
    Signal Quality =  9      CODE       -> B8ZS          Signal Quality =  9
                             BPV 15M/24H ->   0/    0
                             ES  15M/24H ->   0/    2
                             SES 15M/24H ->   0/    5
                             UAS 15M/24H ->   0/    5
                             ALARMS      -> None
                             1.  CLEAR PM REGISTERS
                             Selection:
                             '?' - System Help Screen
```
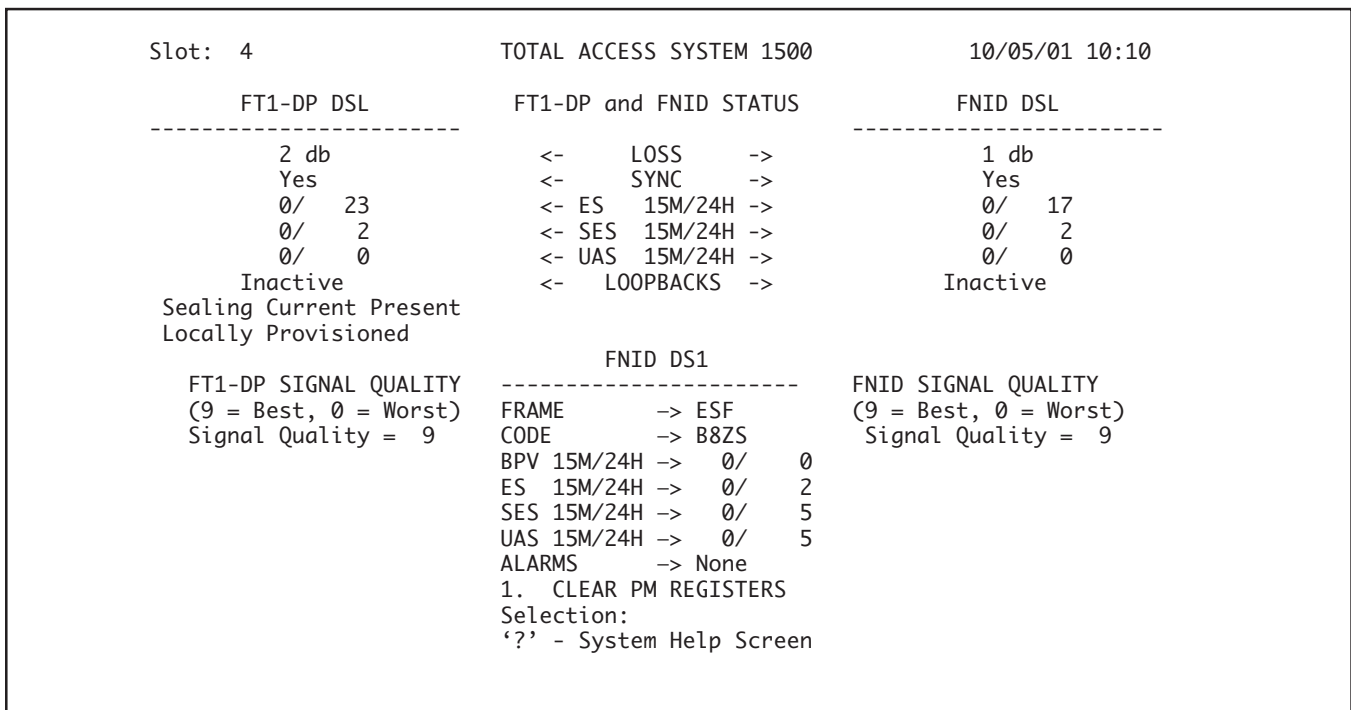
Figure 4. Current System Status Screen

The Performance History Screen is illustrated in **Figure 5**.

The FT1 DP Loopback Options Screen is illustrated in **Figure 6**. Loopbacks can be evoked or terminated using this Screen. A status of current loopback conditions is also provided.
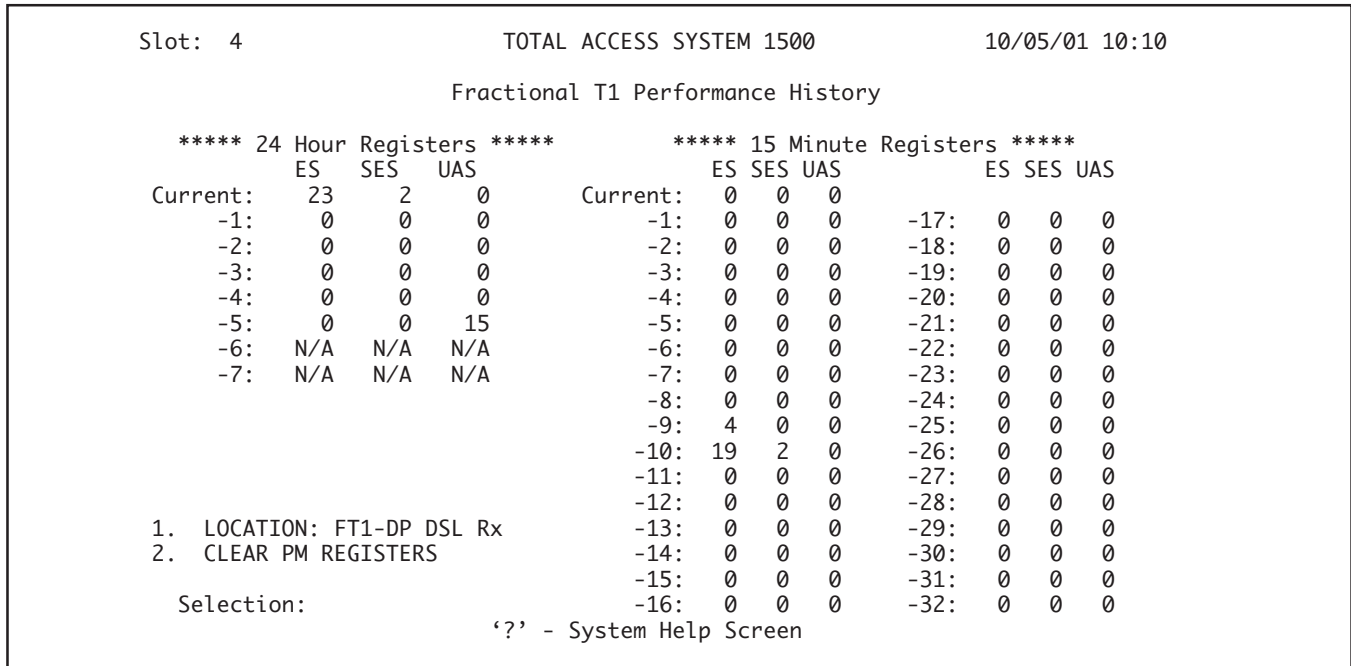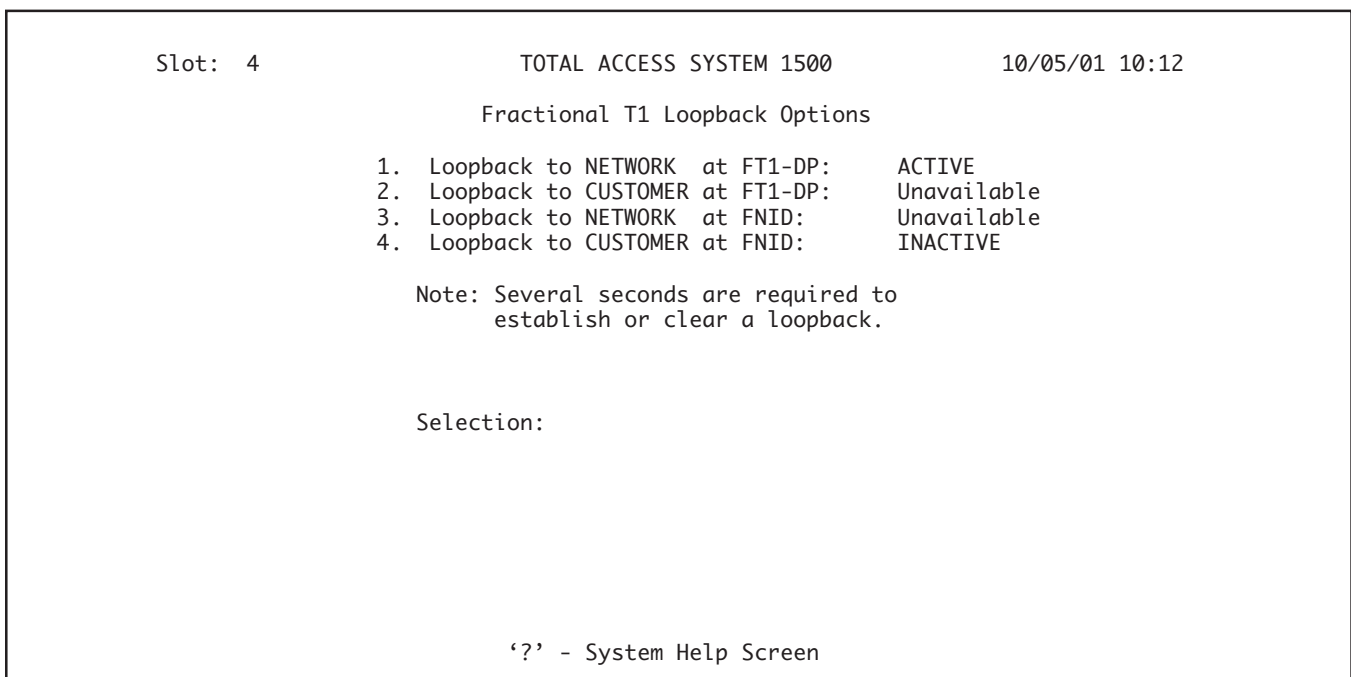
```
 Slot:  4                TOTAL ACCESS SYSTEM 1500          10/05/01 10:10

                       Fractional T1 Performance History

      ***** 24 Hour Registers *****        ***** 15 Minute Registers *****
            ES   SES   UAS                    ES SES UAS         ES SES UAS
   Current:  23    2     0       Current:   0   0   0
        -1:   0    0     0            -1:   0   0   0      -17:   0   0   0
        -2:   0    0     0            -2:   0   0   0      -18:   0   0   0
        -3:   0    0     0            -3:   0   0   0      -19:   0   0   0
        -4:   0    0     0            -4:   0   0   0      -20:   0   0   0
        -5:   0    0    15            -5:   0   0   0      -21:   0   0   0
        -6:  N/A  N/A   N/A           -6:   0   0   0      -22:   0   0   0
        -7:  N/A  N/A   N/A           -7:   0   0   0      -23:   0   0   0
                                      -8:   0   0   0      -24:   0   0   0
                                      -9:   4   0   0      -25:   0   0   0
                                     -10:  19   2   0      -26:   0   0   0
                                     -11:   0   0   0      -27:   0   0   0
                                     -12:   0   0   0      -28:   0   0   0
    1.  LOCATION: FT1-DP DSL Rx      -13:   0   0   0      -29:   0   0   0
    2.  CLEAR PM REGISTERS           -14:   0   0   0      -30:   0   0   0
                                     -15:   0   0   0      -31:   0   0   0
     Selection:                      -16:   0   0   0      -32:   0   0   0
                              '?' - System Help Screen
```

Figure 5. Performance History Screen

```
  Slot:  4                TOTAL ACCESS SYSTEM 1500          10/05/01 10:12

                       Fractional T1 Loopback Options

          1.  Loopback to NETWORK  at FT1-DP:     ACTIVE
          2.  Loopback to CUSTOMER at FT1-DP:     Unavailable
          3.  Loopback to NETWORK  at FNID:       Unavailable
          4.  Loopback to CUSTOMER at FNID:       INACTIVE

             Note: Several seconds are required to
                   establish or clear a loopback.




             Selection:






                         '?' - System Help Screen
```

Figure 6. Loopback Options Screen

Figure 7 shows the Provisioning Options Screen. Provisioning changes can only be implemented through the FT1 DP.

```
     Slot:  4                TOTAL ACCESS SYSTEM 1500              10/05/01 10:07



                            Fractional T1 Provisioning


             1.  Number of DS0s:                  6 (384kbps)
             2.  Line Code:                        B8ZS
             3.  Framing:                          ESF
             4.  Latching Loopback:                Disabled
             5.  Latching Loopback Timeout:        20 minutes

             6.  Hardware A/B Signaling:
                  1   2   3   4   5   6
                 Off Off Off Off Off Off



                         Selection:



                     '?' - System Help Screen
```

Figure 7. Provisioning Options 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 8**.
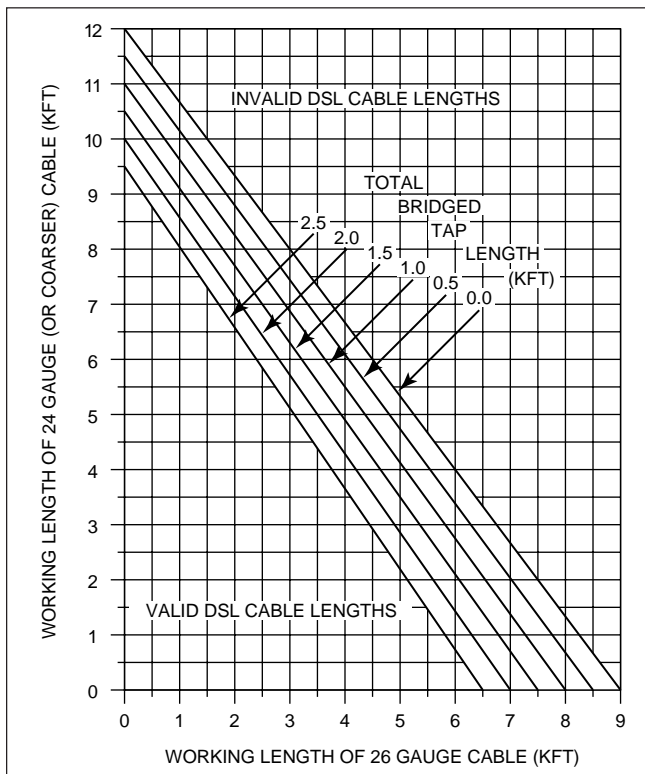
Figure 8. DSL Deployment Guidelines

Recommended maximum local loop loss information for PIC cable at 70°F, 135 Ω resistive termination, is provided in **Table 5**.

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.

Table 5. 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

7. MAINTENANCE

The ADTRAN FT1 DP does not require routine maintenance for normal operation. 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 ADTRAN Customer and Product Support (CAPS).

8. TROUBLESHOOTING PROCEDURES

Use **Table 6** to troubleshoot the FT1 DP.

9. PRODUCT SPECIFICATIONS

Specifications for the FT1 DP are provided in **Table 7**.

10. WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within ten (10) years from the date of shipment if it does not meet its published specifications or fails while in service. Refer to ADTRAN *U.S. and Canada Carrier Networks Equipment Warranty,* document 60000087-10.

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

Pre-sales Applications/Post-sales 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 6. Troubleshooting Guide

Condition	Solution
All front panel indicators are OFF.	1. Verify that the FT1 DP is properly seated in the shelf. 2. Make sure power supply feeding the FT1 DP is good. 3. If 1 and 2 pass, replace the FT1 DP.
Power OK but does not achieve Loop Sync (DSL LED is Red).	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 - 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 7. FT1 DP Unit 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 .... 135 Ω
Return Loss .... 20 dB (40 kHz to 200 kHz)

DS1 Facility Interface

Fully compatible with D4 channel bank equipment

Power

Total Power .... -48 VDC @ 125 mA with FNID
                                                    -48 VDC @ 215 mA with FNID and FT1 Repeater
                                                    -48 VDC @ 300 mA with a locally-powered FNID and two FT1 Repeaters
FT1 DP Power Dissipation .... 3.7 W with FNID
                                                    5.2 W with FNID and FT1 Repeater
                                                    6.1 W with a locally-powered FNID and two FT1 Repeaters
Span Power .... -190 VDC nominal for voltage and current limit at 125 mA ±5%
                                                    (internally generated)

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 .... 3.0 in. High, 1.25 in. Wide, 9.5 in. Deep, nominal
                                                    Plugs into Total Access 1500

Environment

Temperature .... Operating (Standard).... -40°C to +70°C
                                                    Storage .... -40°C to +85°C
Relative Humidity .... Up to 95 percent noncondensing

Part Number 1180405L1

Appendix A
FT1 Loopbacks

1. GENERAL

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

2. FT1 LOOPBACKS

Figure A-1 shows the application from the central office (CO) to customer premises. The FT1 Repeater is shown for convenience and not as a necessary part 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 #1 customer loopback
- E. FT1 Repeater #2 network loopback
- F. FT1 Repeater #2 customer loopback
- G. FNID network loopback
- H. FNID CPE loopback

There are two loopbacks available to the FT1 DP:

- FT1 DP network loopback loops the FT1 signal back to the network.
- 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 DP latching loopback command (N1010101) or by the Total Access 1500 craft interface. The OCU DP 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. AIS will be sent 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 Total Access 1500 craft interface. When the FT1 circuit is looped, all DS0s in use will be looped back toward the customer. All DS0s will be transmitted on to the network.
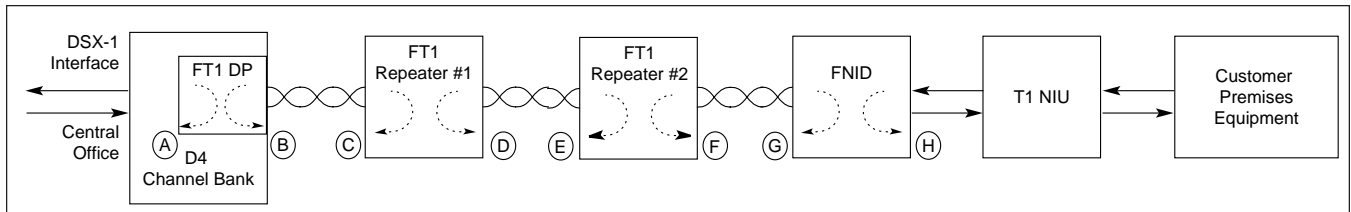
Figure A-1. FT1 Loopbacks
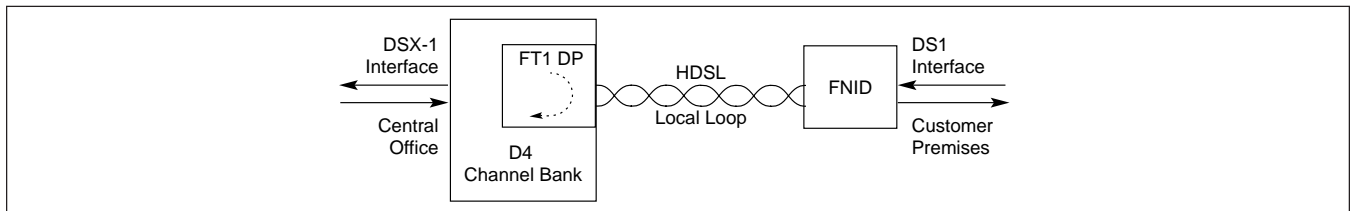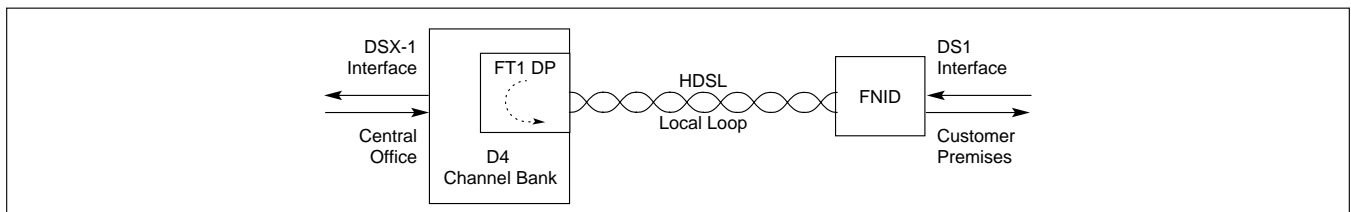

Figure A-2. FT1 DP Network Loopback

Figure A-3. FT1 DP CPE Loopback

There are two loopbacks available to the FT1 Repeater:

- FT1 Repeater network loopback loops the FT1 signal back toward the network.
- FT1 Repeater CPE loopback loops the FT1 signal back toward the customer.

The FT1 Repeater Network loopback is a digital loopback toward the CO as shown in **Figure A-4**. The loopback is initiated by the DDS latching loopback code NEI Loopback 1 for repeater #1 or NEI Loopback 2 for repeater #2 (N1000001). The NEI #1 or NEI #2 latching loopbacks are 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 back toward the network. AIS will be sent to the customer.

The FT1 Repeater CPE loopback is a digital loopback toward customer premises as shown in Figure A-4. This loopback is initiated by the Total Access 1500 craft interface, when available. When the FT1 circuit is looped, all DS0s in use will be looped back toward the customer. The DS0s will be transmitted toward the network.

There are two loopbacks available to the FNID:

- FNID network loopback loops the FT1 signal back toward the network:
- 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 Loopback 1 (N1000001) for a non-repeatered loop and for a repeatered loop or by the craft interface.
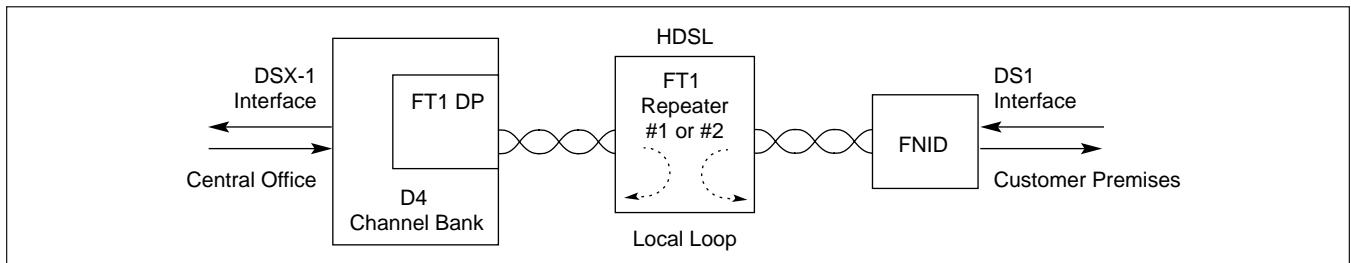

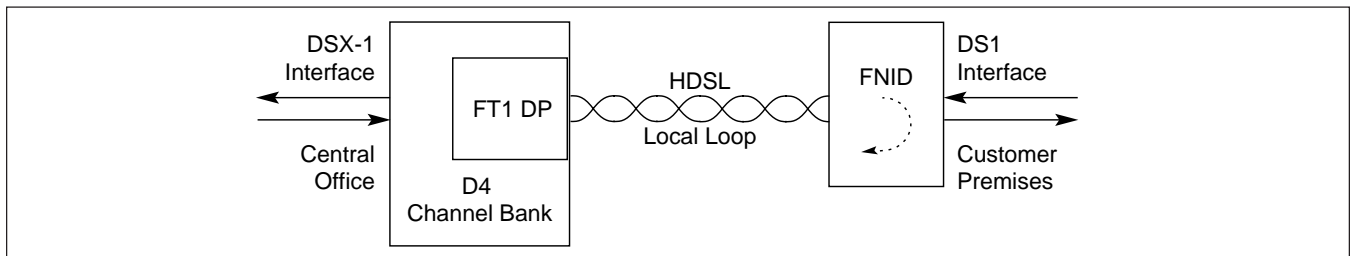**Figure A-4. FT1 Repeater Network and CPE Loopbacks**

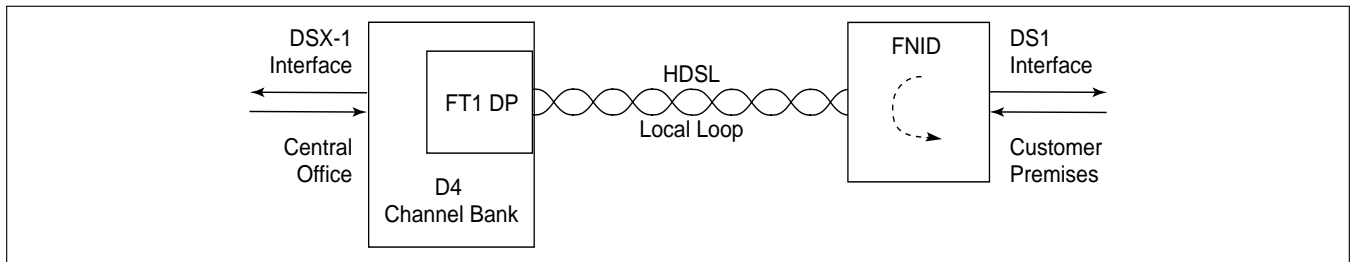**Figure A-5. FNID Network Loopback**

Figure A-6. FNID CPE Loopback

The NEI latching loopback is detected in the primary DS0 of the FT1 circuit to control the looping of the FT1 circuit. When the FT1 circuit is looped, all DS0s in use will be looped back toward the network. AIS will be sent to 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 Total Access 1500 craft interface, when available. When the FT1 circuit is looped, all DS0s in use will be looped back toward the customer. The DS0s will be transmitted toward the network.

3. 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 pushbutton located on the front panel, through craft interface, or latching loopback codes.

The FNID front panel REM LBK pushbutton controls remote loopback activation. Pressing REM LBK activates FT1 DP CPE loopback. Remote loopback is deactivated by again pressing the REM LBK or waiting for the 20-minute loopback time out, if enabled.

The FNID has a craft interface located on the front panel of the device. The FT1 DP is controlled by the craft interface on the Total Access 1500. The craft interface allows access to the FT1 device through an RS-232-type interface. All loopbacks for the FT1 DP and FNID can be controlled from the craft interface. The Total Access 1500 craft interface can activate and deactivate the FT1 DP network loopback and the FT1 DP CPE loopback in the FT1 DP. The Total Access 1500 craft interface can also remotely activate and deactivate the FNID network loopback, FNID CPE loopback, and the repeater loopbacks.

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 and the FT1 DP CPE loopback and the repeat 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 A-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).

Table A-1. FT1 Loopback Select Codes

FT1 Device	Loopback Select Code Name	Loopback Select Code Byte
FT1 DP	DDS OCU DP	N1010101
FT1 Repeater #1	NEI Loopback 1	N1000001
FT1 Repeater #2	NEI Loopback 2	N1000001
FNID without Repeater	NEI Loopback 1	N1000001
FNID with one Repeater	NEI Loopback 2	N1000001

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).

4. LOOP UP STATE

In the loop up 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 time out is checked. If the loopback time out is enabled, any loopback that is in the loop up state for 20 minutes will be deactivated.