![ADTRAN]
PRACTICES

C A U T I O N !
SUBJECT TO ELECTROSTATIC DAMAGE
OR DECREASE IN RELIABILITY.
HANDLING PRECAUTIONS REQUIRED.

MODEL T400 DDST III LOCAL POWER
DIGITAL DATA STATION TERMINATION W/LOCAL POWER
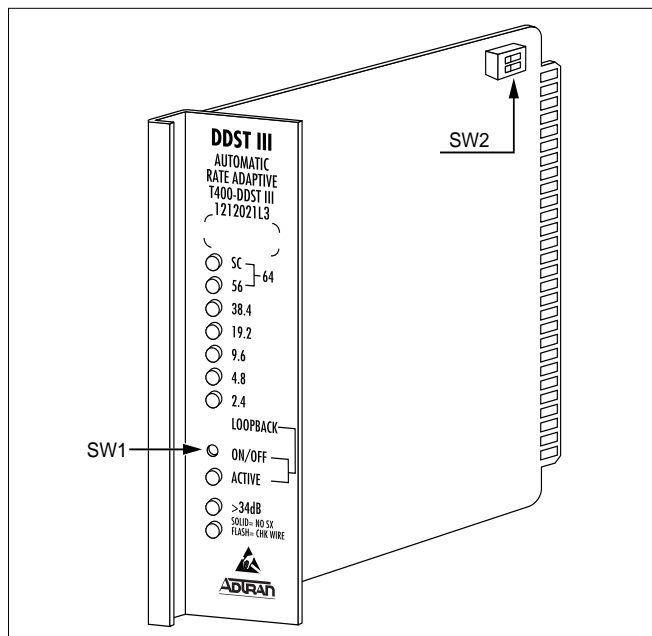# INSTALLATION AND MAINTENANCE

CONTENTS

Figure 1. T400 DDST III LOCAL POWER

1. GENERAL

This section provides installation and maintenance information for the ADTRAN® T400 Digital Data Station Termination (DDST III) with Local Power. The T400 DDST III is Type-400 mount compatible. A detailed description of the unit can be found in ADTRAN Practice, 61212021L3-2. **Figure 1** is a drawing of the T400 DDST III with Local Power**.**

Document Revision History
Revisions to this practice include SW2 factory setting for RPT option *OFF*.

Features
The basic features of the T400 DDST III, part number 1212021L3, include:

- All subrates, 19.2, 38.4, and 56 kbps loop rates, including Secondary Channel and 64 kbps Clear Channel capability
- Adapts automatically to loop rate
- Powered by -48 VDC supplied by mounting assembly (local power)
- Manual and remote latching loopback
- Optional CSU loopback response

- -10dB output toward customer (regen mode only)
- Extended loop option
- Front panel indicators for rate, loopback, >34 dB loop loss, reversed network wire pairs, and loss of sealing current
- Signal cut-through upon loss of power

The DDST III unit is an auto-rate adaptive digital network interface located at the customer premises point-of-demarcation. It primarily functions as a regenerative loopback device supporting telco-generated testing. A switch-selectable regeneration capability accommodates 45 dB loop-loss deployment to customer equipment designed to meet the -34 dB receiver sensitivity requirement of applicable industry standards. The DDST III interfaces with an OCU, OCU DP, or digital data service (DDS) repeater from the network interface, and a DSU/CSU from the customer interface of the unit.

The DDST III automatically adapts to the output signal of the central office OCU or OCU DP and supports all standard rates as well as 19.2, 38.4, and 64 kbps.

The DDST III can be optioned to pass the loop signal to the CPE without regeneration. In this mode, regeneration of an incoming signal will occur only in loopback, allowing loops of up to 45 dB loss to be tested. For loops with losses in excess of 34 dB, the regenerative mode of operation can be selected to accommodate customer equipment that requires a stronger signal to aid in lengthy wiring extensions beyond the demarcation point. The DDST III can receive signals that have been attenuated by 45 dB from an OCU or OCU DP. The RPT/RPT *OFF* option switch controls regeneration; in RPT mode the DDST will output a -10dB signal to the customer's DSU/CSU.

The DDST III is a single Type 400 mount circuit card operating from -48 VDC supplied by the mounting assembly. **Table A** provides applicable part numbers. If the signal loss from the CO exceeds 34 dB, the unit detects this condition and the >34 dB indicator on the faceplate turns *On*.

Table A. Part Numbers

Description	Part Number
T400 DDST III Circuit Pack	1212021L3
T400 DDST III Stand-alone	1212041L3
T400 Stand-alone Housing Only	1210007

When used in conjunction with ADTRAN high performance OCUs or OCU DPs, the unit can be optioned to provide extended range operation on loops with loss to 45 dB[1] at all rates.

2. INSTALLATION

After unpacking the unit, immediately inspect it for possible shipping damage. If damage is discovered, file a claim immediately with the carrier, and then contact ADTRAN Customer Service; see section 4, *Warranty and Customer Service*.

WARNING

- *Never install telephone wiring during a lightning storm.*

- *Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.*

- *Never touch uninsulated telephone wires of terminals unless the telephone line has been disconnected at the network interface.*

- *Use caution when installing or modifying telephone lines.*

[1] Covered under ADTRAN patent number 4,759,035.

Wiring

The DDST III can be used in a standard T400 shelf or housed in the ADTRAN T400 Stand-alone housing, part number 1210007. Connections are made using screwdown terminals of the barrier strip located in the rear of the housing.

Wires should be connected as shown in **Figure 2**. Connect the *From Network* pair to the terminals labeled RR and RT. Connect the *To Network* pair to the terminals labeled TT and TR. Connect the *To Customer* pair to the terminals labeled DRT and DRR. Connect the *From Customer* pair to the terminals labeled DTT and DTR.
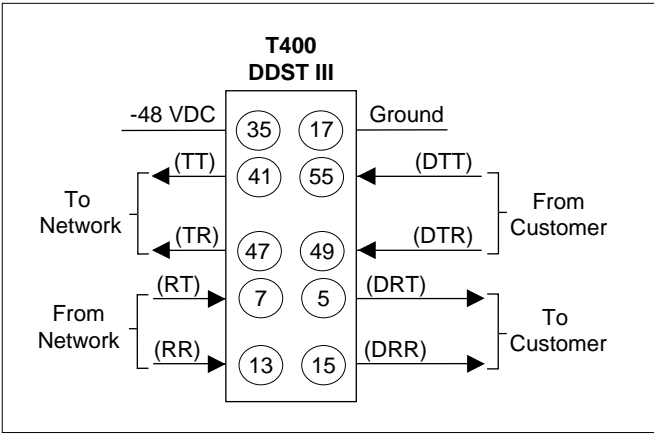

Figure 2. Circuit Card Pin Assignments

No rate selection is necessary for the DDST III. The unit automatically adapts to the operating rate of the OCU in the central office.

Optioning

The DDST III is equipped with one Dual In-Line Package (DIP) switch (SW2) that controls loopback capability and regeneration.
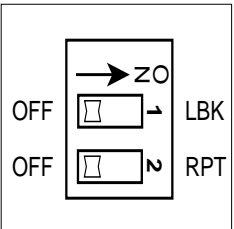

See **Figure 1**, **Figure 3**, and **Table B** for the location, labeling, and description of the option settings.

Figure 3. SW2 Option Labeling

The DDST III is sent from the factory with the option switches set to LBK *OFF* and RPT *OFF* .

All option switches are located on the DDST III circuit card.

Table B. SW2 Option Settings

Function	Switch/Description
Loopback Enable	SW2-1 (LBK) *On* - Responds to CSU loopback *Off* - Ignores CSU loopback
Repeat	SW2-2(RPT) *On* - Regenerates signals toward customer *Off* - Passes signal to customer without regeneration

Loopback Enable

The DDST III can be optioned to ignore or respond to CSU latching and non-latching loopback command sequences. CSU loopback sequences are processed by the OCU or OCU DP, which in turn reverses sealing current direction on the DDS loop. The DDST III detects sealing current reversal and responds with a regenerative loopback toward the network if LBK is selected. If LBK is disabled, the DDST III passes the reversed sealing current condition to the DSU/CSU. The DDST III always responds to the Network Interface Equipment (NIE) latching loopback sequence regardless of the position of the LBK option switch. Loopback command sequences are described in subsection *Testing*.

> **NOTE** *The LBK option does not disable Network Interface Equipment latching loopback response.*

Repeat

The DDST III can be optioned to regenerate the DDS loop signal in the network-to-customer direction only. Because DSU/CSU units are not required to operate on loops with loss beyond 34 dB, the RPT option can be enabled to extend the DDS loop to distances corresponding to 45 dB of loss. If RPT is disabled, loop signals pass transparently through the DDST III without regeneration. If the unit is commanded into network loopback, the incoming signal is regenerated toward the network at 0 dB, regardless of the RPT setting.

Two DDST III units may be used in the bidirectional configuration to extend DDS loops beyond 45 dB loss. The loop loss from the central office may not exceed 45 dB, and the loop loss toward the customer may not exceed 34 dB. Wiring for this application is described in **Figure 4.**

> **NOTE** *LBK must be disabled on DDST III #2 and LBK must be enabled in DDST III #1 to accommodate telco testing.*

Display Indicators

The DDST III contains faceplate-mounted LED indicators which display the operating data rate and status. The indicators are described in **Table C**.
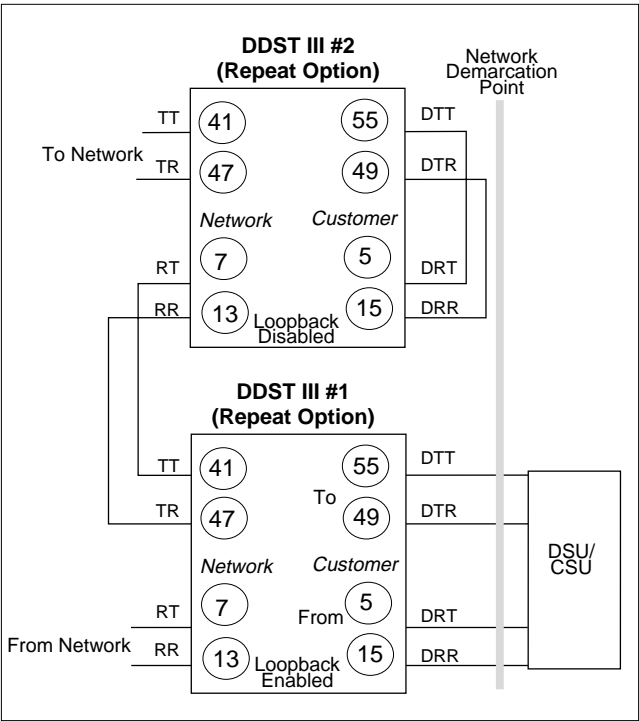

Figure 4. Bidirectional Connections for Loops Greater Than -45 dB

Table C. Faceplate Indicators and Controls

Indicator	Status	Explanation
SC	*On*	Secondary Channel enabled
56	*On*	56 kbps data rate enabled
SC and 56	Both *On*	64 kbps or 56 SC data rate enabled
38.4	*On*	38.4 kbps data rate enabled
19.2	*On*	19.2 kbps data rate enabled
9.6	*On*	9.6 kbps data rate
4.8	*On*	4.8 kbps data rate
2.4	*On*	2.4 kbps data rate
LOOPBACK ACTIVE	*On*	Loopback is activated
>34 dB	*On*	Loop loss exceeds 34 dB
CHK WIRE	*Flashing*	Loop pairs are reversed
NO SX	*On*	No sealing current detected

3. TESTING

Loopback Testing

Loopback tests can be performed from the CO to verify proper loop and DDST III operation. The DDST III provides a network loopback in response to sealing current reversal initiated from a CSU latching or non-latching loopback command. The DDST III also provides both Manual and NIE latching loopback capabilities at all rates. Repeater loopback operation functions in accordance with TR-TSY-000476.

Repeater Loopback (56 kbps)

A Repeater loopback code transmitted from a remote or local test system causes the OCU or OCU DP to reverse the sealing current direction on the loop. Upon detection of sealing current reversal, the DDST III operates relays that cause a loopback toward the network by connecting the customer-side transmit and receive pairs together. Circuit integrity can then be verified by transmitting Bit Error Rate (BER) data from the test system and examining the returning data for synchronization and errors.

While in loopback, the DDST III can detect the All-1s Repeater Release Code sequence, and upon recognition of this sequence, drops its loopback and allows the reversed sealing current condition to pass to the next downstream device. The All-1s Repeater Release Code may be transmitted in two separate iterations from a test system to release any looping devices that may exist on the loop between the CO and the customer DSU/CSU. The All-1s Repeater Release Code sequence is described in **Table D**.

Table D. All-1s Repeater Release Code Sequence

Function	Byte Code	Time Duration
. . . following CSU alternating or CSU latching loopback command sequences . . .		
CLEAR loopback on first repeater	CSU loopback code alternating with All-1s byte CSU/All-1s/CSU/All-1s . . .	1 to 2 seconds
WAIT	CSU loopback code alternating with data byte (i.e., 2047 test pattern) CSU/data/CSU/data . . .	1 second
CLEAR loopback on second repeater	CSU/All-1s/CSU/All-1s . . .	1 to 2 seconds
WAIT	CSU/data/CSU/data . . .	1 second
CLEAR loopback on Nth repeater		
	Repeat CLEAR and WAIT sequence N times.	

Some test systems and test sets support both a CSU (Channel loopback) and a 56 kbps Repeater loopback. If Repeater loopback is available, it *only* loops the repeater. When CSU or Channel loopback is selected, some test systems automatically send the All-1s Repeater Release Code to release loopbacks from any repeaters on the loop. If the test system or test set does not support a 56 kbps Repeater loopback, a CSU or Channel loopback should be selected and the All-1s Repeater Release Code data injected for approximately two seconds to release any repeater loopbacks prior to looping the CSU. The repeater is transparent to all other test commands.

CSU Latching Loopback

Some test systems embed All-1s Repeater Release Codes within the CSU Latching Loopback command to bypass loop repeaters and directly access the DSU/CSU. If a latching loopback at the DDST III is desired, see subsection *Network Interface Equipment Latching Loopback*.

For test systems or test sets that do not support automatic release of CSU latching loopback from the repeaters or network interface devices, use the following procedures.

Initiating CSU Latching Loopback to Loop DDST III (SW2-1 LBK enabled)

- From a test system or set, send a CSU latching loopback sequence. This instructs the OCU DP to reverse sealing current and loop the DDST III.

- Send a selected test pattern and test for error-free operation.

- Upon completion of this test, advance to *Terminating CSU Latching Loopback to DDST III or CSU* for latching loopback termination.

Initiating CSU Latching Loopback to Loop a DSU/CSU (SW2-1 LBK enabled)

- From a test system or set, send a CSU latching loopback sequence. This instructs the OCU DP to reverse sealing current and causes the DDST III to loop.

- To release the DDST III from latching loopback and pass reversed sealing current to the DSU/CSU, send the non-latching CSU loopback code alternating with an all-1s data pattern for approximately two seconds. The DSU/CSU should loop when reversed sealing current is detected.

- Send a selected test pattern and test for error-free operation.

- Upon completion of this test, advance to *Terminating CSU Latching Loopback to DDST III or CSU* for latching loopback termination.

Terminating CSU Latching Loopback to DDST III or DSU/CSU

- From a test system or set, send a CSU Latching Loopback Disable command (35 TIP bytes); see subsection *Network Interface Equipment Latching Loopback*.

Manual Loopback

Manual loopback is activated from the faceplate of the DDST III by pressing the LOOPBACK ON/OFF (SW1) button. Manual loopback will automatically terminate after 20 minutes unless otherwise terminated by pressing the button again or by receiving a Latching Loopback Disable command from the CO.

To activate Manual Loopback

- Press the LOOPBACK ON/OFF button; the ACTIVE LED turns *On*.

To deactivate Manual Loopback

- Press the LOOPBACK ON/OFF button; the ACTIVE LED turns *Off*, or

- Wait for the 20-minute time out, or

- Receive a Latching Loopback Disable command from the CO.

Network Interface Equipment Latching Loopback

Because some remote test systems do not support a Repeater loopback for rates other than 56 kbps, the NIE latching loopback method can be used to loop the DDST III at all other rates. This loopback test may require programming of the loopback select code or the complete sequence into the test system.

Alternating and latching loopback sequences are described in **Tables E** and **Table F**. The All-1s Repeater Release code is described in **Table D**.

Table E. Alternating Loopback Activation Sequence

Function	Received Bytes
Activate loopback	Four consecutive bytes of specified loopback code *0101010 - OCU *0101000 - CSU *0101100 - DSU
Maintain loopback and test for bit errors	Data byte alternating with loopback code example: *DDDDDD1/*0101010
Clear loopback	Four consecutive data bytes without CSU loopback code
* - *Don't Care* bit D - data bit	

Table F. Latching Loopback Activation Sequence

Function	Byte Code	# of Received Bytes
Clear existing loopbacks	Transition in progress (TIP) *0111010	Minimum of 35 TIP bytes
Identify device to be looped	Loopback select code (LSC) *1010101 - OCU *0110001 - CSU *1000001 - NIE	Minimum of 35 LSC bytes
Prepare to loop; send MAP code after 30 bytes	Loopback Enable (LBE) *1010110	Minimum of 100 LBE bytes
Activate loopback	Far-End Voice (FEV) *1011010	Minimum of 32 FEV bytes
Minimum of 35 TIP bytes required to disable established latching loopback.		
* - *Don't Care* bit		

4. WARRANTY AND CUSTOMER SERVICE

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

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

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

ADTRAN Technical Support............. (800) 726-8663
Standard support hours, Monday-Friday, 7am-7pm CST
Emergency Support:, 7 days/week, 24 hours/day

ADTRAN Sales.................................. (800) 827-0807

ADTRAN Repair/RMA........................ (205) 963-8722

Repair and Return Address
  ADTRAN, Inc.
  Customer Service Department
  901 Explorer Boulevard
  Huntsville, Alabama 35806-2807

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio frequencies. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference