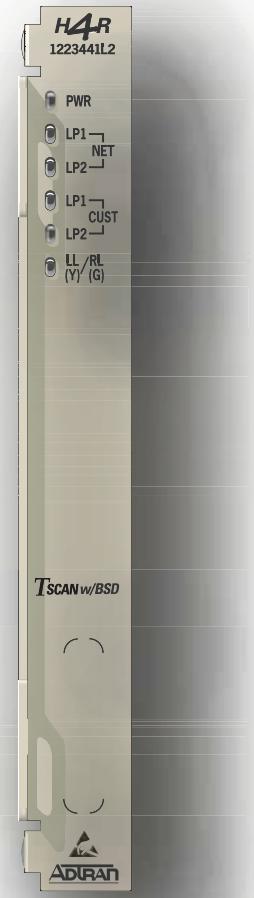

T200 HDSL4 H4R Repeater Installation and Maintenance Guide

Document Number: 61223441L2-5A
CLEI: T1RAAAAB_ _
May 2009

Trademarks

Any brand names and product names included in this document are trademarks, registered trademarks, or trade names of their respective holders.

To the Holder of this Document

The contents of this document are current as of the date of publication. ADTRAN® reserves the right to change the contents without prior notice.

In no event will ADTRAN be liable for any special, incidental, or consequential damages or for commercial losses even if ADTRAN has been advised thereof as a result of issue of this

About this Document

This document provides instructions for the installation and maintenance of the T200 HDSL4 H4R Repeater. The intended audience for this information is the craftperson responsible for the installation and maintenance of the equipment. These instructions assume familiarity with the intended use of the equipment, basic required installation skills, and knowledge of local and accepted safety practices.

Additionally, this document provides provisioning information specific to the User Interface of the T200 HDSL4 H4R Repeater. The intended audience for this information is system management personnel responsible for the configuration of the software applications. User Interface provisioning assumes familiarity with the intended use of the equipment, concepts peculiar to this product, and a computer operations skill set.

Related information can be obtained by referring to the applicable Job Aid and Compliance Notice documentation.

901 Explorer Boulevard
P.O. Box 140000
Huntsville, AL 35814-4000
United States
(256) 963-8000

Revision History

Revision	Date	Description
A	May 2009	Initial release

Conventions

The following typographical conventions are used in this document:

This font indicates a cross-reference link.

This font indicates screen menus, fields, and parameters.

THIS FONT indicates keyboard keys (ENTER, ESC, ALT). Keys that are to be pressed simultaneously are shown with a plus sign (ALT+X indicates that the ALT key and X key should be pressed at the same time).

This font indicates references to other documentation and is also used for emphasis.

`This font` indicates on-screen messages and prompts.

`This font` indicates text to be typed exactly as shown.

This font indicates silk-screen labels or other system label items.

This font is used for strong emphasis.

Hazard Classifications

The following hazard classifications are used in this document.

⚠ DANGER

DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. CAUTION can also be used to alert against unsafe practices associated with events that could lead to personal injury.

NOTICE

Notice call-outs indicate a potentially hazardous situation not related to personal injury, such as messages related to property damage only.

NOTE

Notes inform the user of additional, but essential, information or features.

Training

ADTRAN offers training courses on our products. These courses include overviews on product features and functions while covering applications of ADTRAN product lines. ADTRAN provides a variety of training options, including customized training and courses taught at our facilities or at customer sites.

For inquiries concerning training, contact ADTRAN:

Training Phone: 800-615-1176, ext. 6303

Training Fax: 256-963-6217

Training Email:training@adtran.com

Contents

Figures

Tables

T200 HDSL4 H4R Repeater

INTRODUCTION

HDSL4 technology provides extended range T1 (DS1) transport on the telecommunications network, and features spectral compatibility with ADSL and other transport technologies. The ADTRAN T200 HDSL4 H4R Repeater (T200 H4R, P/N 1223441L2) regenerates the HDSL4 signal, extending the range of the circuit.

Figure 1 illustrates the T200 H4R front panel.

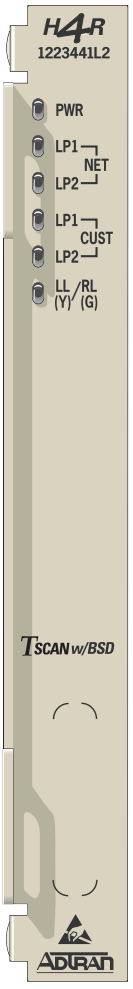

Figure 1. T200 H4R Front Panel

Description

Up to three T200 H4R units work in conjunction with an ADTRAN H4TU-C (Central Office Transceiver) and an ADTRAN H4TU-R (Remote) to provide DS1 service on the local loop.

- The HRTU-C receives DSX-1 input signals from the network through the chassis, transports them across the circuit, and terminates them through the H4TU-R. Additionally, the H4TU-C provides testing, provisioning, and performance monitoring capabilities that address circuit status.
- The H4TU-R provides a traditional DS1 to customer equipment.

Features

The basic features of the T200 H4R include the following:

- TC PAM line coding
- Lightning protection
- In-band loopback control
- Standard Type 200 or Type 400 form factor repeater, Outside Plant (OSP) apparatus case design
- Remote provisioning and pass-through performance monitoring
- Fault Bridging (refer to “Fault Bridging” on page 9)
- Bad Splice Detection (refer to “Bad Splice Detection” on page 9)
- Fast Retrain (refer to “Fast Retrain” on page 11)

Enhanced Features

Enhanced features of the T200 H4R include the following:

- Ground Fault Segment Identification
- Loop-to-Loop Detection
- Isolation Relays in the span-powering circuitry, between the network side and customer side of the repeater (refer to “Isolation Relays” on page 11)
- Ground Fault or Short Detection on the customer side of the repeater (refer to “Ground Fault or Short Detection” on page 12)

Electrical Characteristics

That following table lists the electrical characteristics of all four input ports of the T200 H4R in an unpowered state.

Table 1. T200 H4R Electrical Characteristics

Subscriber Loop Test Set				Ohmmeter			
	T/R	T-GND	R-GND		T/R	T-GND	R-GND
NET 1	5	365K	365K	NET 1	5.8	14.4M	15.6M
NET 2	5	218K	217K	NET 2	5.8	16.1M	16.5M
CUST 1	7	91.9K	91.9K	CUST 1	5.7	24.4M	24.3M
CUST 2	6	61.2K	61.1K	CUST 2	5.9	24.0M	23.8M

Compliance

NOTICE

Electrostatic Discharge (ESD) can damage electronic modules. When handling modules, wear an antistatic discharge wrist strap to prevent damage to electronic components. Place modules in antistatic packing material when transporting or storing. When working on modules, always place them on an approved antistatic mat that is electrically grounded.

⚠ WARNING

Voltages up to –200 VDC with respect to ground and between individual telecommunications conductors may be present.

The T200 HDSL4 H4R Repeater is NRTL Listed to the applicable UL standards. The T200 H4R meets or exceeds all the applicable requirements of NEBS, Telcordia GR-63-CORE, and GR-1089-CORE. The T200 H4R is intended for deployment in T200 form-factor outside plant (OSP) apparatus cases and cabinets.

Table 2 lists the compliance codes for the T200 H4R.

Table 2. T200 H4R Compliance Configuration Codes

Configuration Code	Input	Output
Power Code (PC)	C	C
Telecommunication Code (TC)	X	X
Installation Code (IC)	A	–

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by ADTRAN could void the user's authority to operate this equipment.

⚠ CAUTION

The Chassis frame ground terminal must be connected to an earth ground to ensure that the front panel of the T200 H4R is properly grounded via the backplane connector.

⚠ CAUTION

Per GR-1089-CORE, the T200 H4R is designed and intended for installation as part of a Common Bonding Network (CBN). The T200 H4R is not designed nor intended for installation as part of an Isolated Bonding Network (IBN).

NOTE

The HDSL4 input and output ports are classified as Type 3 and 5, as defined in Appendix B of GR-1089-CORE Issue 4, and meets the lightning and power fault criteria with primary protectors that meet any of the voltage limits of GR-974-CORE or GR-1361-CORE (i.e., carbon blocks, gas tubes, and solid state).

NOTE

Current limiting protectors are not required.

NOTE

The T200 H4R is designed to be deployed in GR-3108-CORE environmental class 2 as defined in GR-3108-CORE issue 2.

Compatibility

The T200 H4R is used in conjunction with any T1.418-compliant, span-powering H4TU-C and H4TU-R. Table 3 list the compatible ADTRAN HDSL4 transceiver units.

Table 3. T200 H4R-Compatible ADTRAN HDSL4 Transceiver Units

Part Number	Unit Name
118141*x*L*y*	Total Access 3000 H4TU-C
122*x*401L*y*	220 H4TU-C
122*x*403L*y*	DDM+ H4TU-C
122*x*404L*y*	3192 H4TU-C
122*x*407L*y*	Soneplex H4TU-C
122*x*424L*y*	T200 H4TU-R, Local Power
122*x*426L*y*	T200 H4TU-R, Span Power

Note: x = any generic number; y = any list number

Due to span power limits, the number of T200 H4R units permitted in the circuit depends on the type of H4TU-C in use. A T200 H4R provides DS1 transport on all revised resistance design (RRD) 26 AWG loops, 24 AWG loops, or both. Three T200 H4R repeaters can be added to extend the range of a loop.

The following criteria determines Repeater placement:

- On single T200 H4R loops, consider the attenuation properties of the loop segment.
- For a circuit requiring two T200 H4R units, satisfy both segment attenuation and segment DC resistance requirements.
- For a circuit requiring three T200 H4R units, satisfy all H4TU-C and H4TU-R hardware requirements; segment attenuation; and segment DC resistance requirements.

Refer to the “HDSL4 Deployment Guidelines” on page 14 of this guide and the applicable installation and maintenance guide for the H4TU-C being deployed.

INSTALLATION

After unpacking the T200 H4R, inspect it for damage. If damage has occurred, file a claim with the carrier then contact ADTRAN Customer Service. Refer to "Appendix A, Warranty" for further information. If possible, keep the original shipping container for returning the T200 H4R for repair or for verification of shipping damage.

Shipping Contents

The contents include the following items:

- T200 HDSL4 H4R Repeater (P/N 1223441L2)
- *T200 HDSL4 H4R Repeater Job Aid* (P/N 61223441L2-22)
- *T200 HDSL4 H4R Repeater Compliance Notice* (P/N 61223441L2-17)

Installing the Module

The T200 H4R is designed for deployment in any Type 200 form-factor enclosure. When installing the T200 H4R, refer to the appropriate Installation and Maintenance Guide for the housing being used.

NOTE

Power to the T200 H4R comes from an H4TU-C, independent of line impedance or wire gauge. The operating power from the H4TU-C can also span-power the H4TU-R.

To install the T200 H4R, complete the following steps:

1. Hold the T200 H4R by the front panel while supporting the bottom edge of the module.
2. Align the module edges to fit in the lower and upper guide grooves for the enclosure slot.
3. Slide the module into the slot. Simultaneous thumb pressure at the top (above the **PWR** LED) and at the bottom (below the electrostatic caution symbol) of the module ensures that the module is firmly positioned against the backplane of the chassis.

Once the power up self-test is complete, the status LEDs reflect the true state of the hardware (see Table 4).

Front Panel LEDs

The T200 H4R provides front panel LEDs that display status information. Table 4 lists the T200 H4R LEDs and status descriptions.

Table 4. T200 H4R Front Panel LEDs

Label	Status	Description
PWR	○ Off	No span power present
	● Green	Span power present
NET LP1/LP2	○ Off	No span power present
	● Green	Synchronized with an Signal-to-Noise Ratio (SNR) margin greater than the SNR Margin Alarm Threshold
	✹ Green (Fast Flashing)	Flashing three times per second indicates attempt to synchronize with the H4TU-C
	✹ Green (Slow Flashing)	Flashing once per second indicates synchronization with a SNR margin greater than the SNR Margin Alarm Threshold; attenuation is greater than the user-recommended Loop Attenuation Alarm Threshold
	● Yellow	Synchronized with a SNR margin greater than 0 dB, but less than the SNR Margin Alarm Threshold
	✹ Yellow Flashing	Synchronized with a SNR margin greater than 0 dB, but less than the SNR Margin Alarm Threshold; attenuation is greater than the Loop Attenuation Alarm Threshold
	● Red	Synchronized with a SNR margin of 0 dB
	✹ Red Flashing	Flashing once per second indicates synchronization with a SNR margin of 0 dB; attenuation is greater than the Loop Attenuation Alarm Threshold
CUST LP1/LP2	○ Off	No span power present
	● Green	Synchronized with an Signal-to-Noise Ratio (SNR) margin greater than the SNR Margin Alarm Threshold
	✹ Green Flashing (Fast)	Flashing three times per second indicates attempt to synchronize with the H4TU-R
	✹ Green Flashing (Slow)	Flashing once per second indicates synchronization with a SNR margin greater than the SNR Margin Alarm Threshold; attenuation is greater than the Loop Attenuation Alarm Threshold
	● Yellow	Synchronized with a SNR margin greater than 0 dB, but less than the SNR Margin Alarm Threshold
	✹ Yellow Flashing	Synchronized with a SNR margin greater than 0 dB, but less than the SNR Margin Alarm Threshold; attenuation is greater than the Loop Attenuation Alarm Threshold
	● Red	Synchronized with a SNR margin of 0 dB
	✹ Red Flashing	Flashing once per second indicates synchronization with a SNR margin of 0 dB; attenuation is greater than the Loop Attenuation Alarm Threshold
LL/RL	● Green	Loopback active at the H4R towards the H4TU-R
	● Yellow	Loopback active at the H4R towards the H4TU-C
	✹ Yellow, Flashing	H4R armed but not in loopback

OPERATIONAL FEATURE DETAILS

The T200 H4R has the following operational features:

- Fault Bridging
- Bad Splice Detection
- Fast Retrain
- Isolation Relays
- Ground Fault or Short Detection

Fault Bridging

The Fault Bridging feature minimizes downtime due to intermittent impairments that appear on the cable pair, for example, from a Ground Fault Interrupt (GFI), short, micro-interruption, bad splice, or noise burst. This feature allows the DSL transceivers to maintain synchronization during an interruption, thus avoiding a 25 to 30-second retrain. Depending on the type of impairment, interruptions up to 200 ms can be bridged.

Bad Splice Detection

This T200 H4R supports the Runtime TScan 2.0™ bad splice detection feature, an ADTRAN proprietary, non-intrusive algorithm for detection of anomalies (bad splices) in the copper plant. This feature monitors the cable pair during runtime for the presence of bad splices that can potentially impact service.

Poor cable splices are often undetected by normal testing methods. Often, these splices present no problem for the data transmission equipment until oxidation with the splice itself causes a rapid impedance change, which can cause errors, signal margin fluctuation, and retrain of the DSL transceivers. The splice detection feature is available from the Troubleshooting Screen through the craft access port.

Data transmission transceivers (especially echo-cancelled technologies) are subject to performance degradations and errors in the presence of bad splices. A splice may be benign for a time, allowing a circuit to behave appropriately for portions of the day. However, over time the splice oxidizes and incurs small, rapid changes in impedance. This inconsistency in behavior makes the problem difficult to locate. Additionally, an impedance change that is large enough to cause the transceiver trouble can still be small enough to be undetectable by test equipment used on the copper pairs. Therefore, a non-intrusive method of identifying these bad splices has been developed to aid the customer in troubleshooting the distribution plant.

NOTE

The Splice Detection Feature is a troubleshooting aide. Due to inconsistency in environmental conditions and their effect on telecommunications plant, ADTRAN cannot guarantee the accuracy of the measurements. Comparison to existing engineering drawings can provide exact locations of suspect splices indicated by ADTRAN algorithms.

Splices that are varying in impedance cause the HDSL data pump to see a reduced and/or fluctuating signal quality (margin). The HDSL data pump attempts to track these changes. When the changes become too severe, errors or loss of synchronization result.

View Splice Results Screen

Access to the Bad Splice Detection feature is through the Troubleshooting screen, using the craft access terminal of the H4TU-C or H4TU-R. Selecting the View Splice Results option from the Troubleshooting screen menu displays the View Splice Results screen (see Figure 2). The Splice Detection Results column lists the reported results for each transceiver:

- NTF - Indicates that the unit is active and has not detected any problems, or, the number of detected anomalies have not yet reached the detection count threshold. This threshold facilitates the reporting of the result to this screen (eight is the present threshold).
- LOS - Indicates that the unit has not detected the remote unit.
- Number - Indicates if the number of times an anomaly was detected exceeds the detection count threshold of eight. The number in this column represents the number of feet from the transceiver (Reference Point) to the anomaly. This number also reflects the highest anomaly count the unit sees, as it is possible to have more than one bad splice per circuit. This screen reports the worst (most frequently detected) anomaly.

Example

In Figure 2, the View Splice Results screen example shows that a detection has occurred approximately 650 feet from an H4TU-C module on Loop 2 of the HDSL4 circuit.

```
Circuit ID:HTSVALHDSL4                                        MM/DD/YY hh:mm:ss
                      Press ESC to return to previous menu

* Note: Chronic Circuit Results are only valid after all other circuit    *
* qualification tests have been performed and failed to show a trouble !! *

Splice Detector Version 1 Result Definitions:
---------------------------------------------
NTF    - No Trouble Found yet.
LOS    - Unit not in sync.
Number - Distance from Reference point (in ft.) of suspect splice.

 Reference    Splice Detection Results        Version          Result Shown
   Point        Loop 1        Loop 2          Number             for date
 ---------    ----------    ----------        -------            MM/DD/YY
   H4TUC          NTF           650              01              --------
   H4TUR          NTF           NTF              01              06/17/04
   H4RU1 NET      NTF           NTF              01
   H4RU1 CST      NTF           NTF              01            (B)Back
```

Figure 2. View Splice Results Screen

Fast Retrain

Fast Retrain is an ADTRAN-proprietary feature that minimizes downtime when an intermittent, non-power related impairment (bad splice, noise burst, etc.) affects the HDSL loop and cannot be bridged.

When such an impairment occurs after achieving HDSL synchronization, Fast Retrain restores service within five to seven seconds. This short retrain time allows for reduced downtime compared to the traditional 25 to 30-second retrain duration.

NOTE

For proper functionality, install Fast Retrain capable units on both ends of the circuit. Failure of a Fast Retrain attempt initiates the traditional (25 to 30-second) retrain.

HDSL2 and HDSL4 transceivers normally train in approximately 25 to 30 seconds. For an initial circuit turnup, this is not a significant issue. However, once service has been established on the circuit, any large down-time will interrupt communications on the circuit. A loss of synchronization on the HDSL loop can cause excessive down times due not only to the 30-second HDSL retrain time, but also further delays due to the higher level protocols in the network going through re-synchronization. On the older generation HDSL2 and HDSL4 units, a one-second loss of HDSL frame synchronization would cause the data pumps to retrain. This retrain would take approximately 25 seconds, during which AIS would be sent to the terminating equipment. The reception of AIS by the terminating equipment could trigger higher level protocol re-synchronizations.

If an impairment (for example, a bad splice) causes the HDSL data pump to lose frame synchronization for 500 msec or longer, the system attempts a Fast Retrain (instead of retraining). This abbreviated train can achieve data mode in five to seven seconds. A successful fast retrain should be evident on the Span Status screen, and also by the reduced unavailable seconds (UAS) in the PM data for each LOS alarm recorded.

Isolation Relays

Isolation relays are normally open without span powering. Once span powering is detected on the network side, the T200 H4R monitors the customer-side to determine if a short or ground fault condition exists. If no short or ground fault is detected, the T200 H4R will close the relay, allowing span powering to pass from the network to the customer side.

Ground Fault or Short Detection

If a short or ground fault is detected, the T200 H4R will keep the relays open and continue to monitor the customer side interface until the fault condition clears. During the fault condition, the network-side of that repeater can function normally, allowing for synchronization and loopback/sectionalization testing up to that repeater.

While the short or ground fault condition is present on the customer side of the repeater, the T200 H4R places a nominal –37 VDC on the customer side, and every three seconds, will actively monitor the customer-side for the fault to clear. Once the T200 H4R detects that the condition is clear, the relays close, allowing span powering to pass to the customer side.

NOTICE

The isolation process is only possible if the apparatus case is properly grounded

Connections

All connections are through card edge connectors. Table 5 lists the card edge pin assignments.

NOTE

The T200 H4R dissipates a maximum of 5.4 watts.

⚠ CAUTION

Ensure that the chassis ground is securely connected to the apparatus case. Table 5 lists the ground pin designations.

Table 5. T200 H4R Card Edge Pin Assignments

Pin	Description	Loop
1	Chassis Ground	n/a
5	HDSL4 Loop Tip (Customer)	Loop 1
7	HDSL4 Loop Tip (Network)	Loop 1
11	Chassis Ground	n/a
13	HDSL4 Loop Ring (Network)	Loop 1
15	HDSL4 Loop Ring (Customer)	Loop 1
17	–48 VDC Return (Ground)	n/a
27	Chassis Ground	n/a
41	HDSL4 Loop Tip (Network)	Loop 2
47	HDSL4 Loop Ring (Network)	Loop 2
49	HDSL4 Loop Ring (Customer)	Loop 2
55	HDSL4 Loop Tip (Customer)	Loop 2

HDSL4 Deployment Guidelines

Refer to the applicable H4TU-C installation and maintenance guide, HDSL4 Deployment Guidelines section, for loop parameters, including attenuation and loop resistance considerations.

NOTE

The H4TU-C with part numbers 1221401L6, 1221403L6, and 1221404L6 support only one T200 H4R in the HDSL4 circuit.

Refer to the Detailed Status Screen by accessing the menus on the H4TU-C craft terminal interface for current Signal-to-Noise Ratio Margin and Attenuation status indications for the circuit.

Figure 3 illustrates a basic HDSL4 deployment.

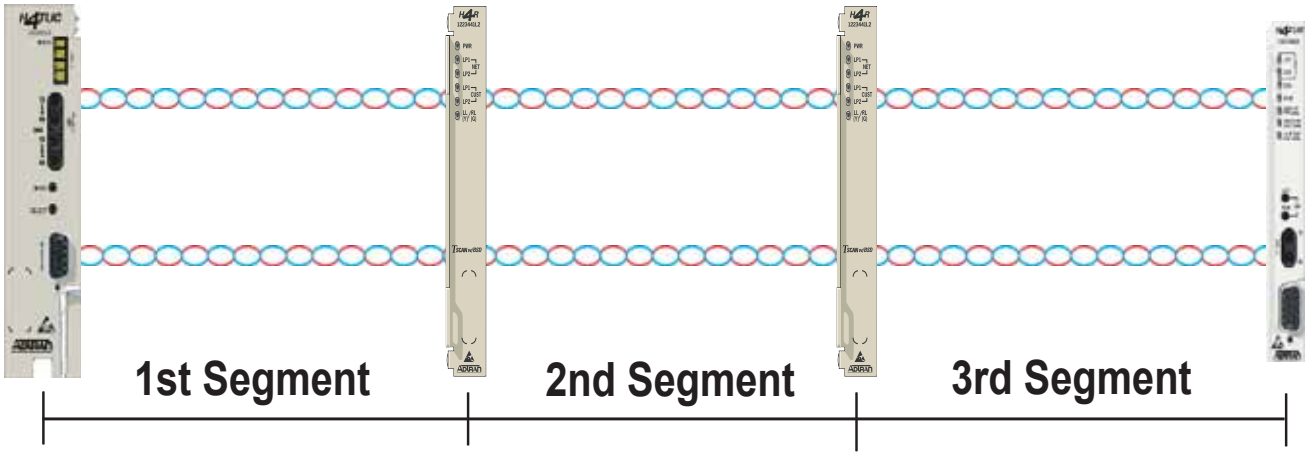

Figure 3. HDSL4 Deployment Guideline

T200 H4R Capacity Guidelines

The T200 H4R is designed for installation in a prewired Type 200 or Type 400 enclosure. Table 6 defines the capacity guidelines for deployment. The housing capacity numbers are based on test results.

Table 6. T200 H4R Capacity Guidelines for ADTRAN Housings

Part Number	Description	CLEI Code	Slots	Stub	H4R Capacity		Recommended Slot Assignments		Material
					Above Ground	Below Ground	Above Ground	Below Ground	
1150043L1	Universal Housing	DDMOAD01MA	4	Air	4	4	All	All	Stainless Steel
1150043L2	Universal Housing	DDMOBD01MA	4	Gel	4	4	All	All	Stainless Steel
1150087L1	Universal Housing	DDMOJHD1_ _	1	n/a	1	n/a	1	n/a	Hardened Plastic

MAINTENANCE

The T200 H4R requires no routine maintenance for normal operation. Do not attempt repairs in the field. Repair services may be obtained by returning the defective unit to ADTRAN. Refer to the “Appendix A, Warranty” for further information.

In case of equipment malfunction, perform an in-band loopback from the Central Office. If a malfunction is confirmed, replace the unit.

The T200 H4R has looping capability through the channel allowing digital loopback in fault isolation. The loopback is activated remotely. The type of loopbacks the T200 H4R supports are dependent on the loopback capabilities of the transceiver units in use on the circuit. Refer to the applicable installation and maintenance guide of the specific H4TU-C or H4TU-R for a list of loopback codes.

Performance monitoring, diagnostics, and loopbacks are also available from the craft interface at the H4TU-C or H4TU-R.

SPECIFICATIONS

Table 7 lists the specifications for the T200 H4R.

Table 7. T200 H4R Specifications

Specification	Description
Environmental	
Operating Temperature:	–40°C to 70°C
Storage Temperature:	–40°C to 85°C
Relative Humidity:	95 percent maximum at 50°C, noncondensing
Maximum Current Draw:	0.025 A maximum at –48VDC
Maximum Heat Dissipation:	1.21 watts
Physical	
Dimensions:	Height: 3.125 inches Width: 1.14 inches Depth: 10.1 inches
Weight:	< 1.0 pounds
Power	
T200 H4R Input Power	5.0 watts (span powered by H4TU-C)
Loop Interface	
Modulation Type:	16 TC PAM
Mode:	Full Duplex, Partially overlapped echo canceling
Number of Pairs:	2
Line Rate:	1.552 Mbps
Baud Rate:	261.333 k baud
Loop Loss:	Refer to “HDSL4 Deployment Guidelines” on page 14.
Bridged Taps:	Single Taps < 2000 ft., Total Taps < 2500 ft.
Performance:	Compliant with T1.418-2000 (HDSL4 Standard, Issue 2)
H4TU-C Transmit Power (Data) Level:	14.1 ±0.5 dBm (0 to 400 kHz)
H4TU-C Transmit Power (Activation) Level:	14.1 ±0.5 dBm (0 to 307 kHz)
Input Impedance:	135 ohms
Maximum Loop Resistance:	Refer to “HDSL4 Deployment Guidelines” on page 14.
Return Loss:	12 dB (50 kHz to 200 kHz)
Clock	
Clock Sources:	DSX-1 Derived (with HDSL4 frame bit stuffing)
Internal Clock Accuracy:	±25 ppm (Exceeds Stratum 4), Meets T1.101 Timing Requirements

Table 7. T200 H4R Specifications (Continued)

Specification	Description
Tests	
Diagnostics:	Loopback initiated with in-band codes or from H4TU-C or H4TU-R craft interface
Compliance	
UL 60950 NEBS Level 3 (SR-3580) FCC 47CFR Part 15, Class A	
Part Number	
T200 HDSL4 H4R Repeater:	1223441L2

Appendix A
Warranty

WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within the warranty period if it does not meet its published specifications or fails while in service. Warranty information can be found at www.adtran.com/warranty.

Refer to the following subsections for sales, support, Customer and Product Service (CAPS) requests, or further information.

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

Contact CAPS prior to returning equipment to ADTRAN.

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

Carrier Networks Division
901 Explorer Blvd.
Huntsville, AL 35806
USA