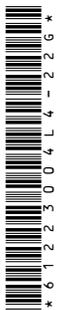
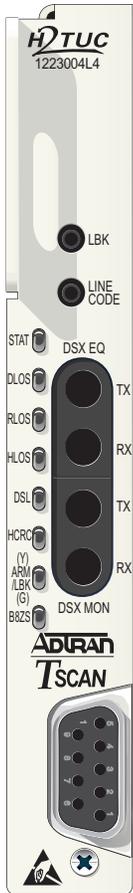


HDSL2 3192 H2TU-C

P/N: 1223004L4
CLEI: T113AEYE_



CAUTION!

SUBJECT TO ELECTROSTATIC DAMAGE
OR DECREASE IN RELIABILITY
HANDLING PRECAUTIONS REQUIRED

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LED STATUS

Label	Indications	Description
STAT	Off	Indicates a loss of power or blown fuse has occurred
	Green Flashing	Attempting to acquire HDSL2 synchronization with the H2TU-R
	Green	Normal operation; HDSL2 synchronization is achieved with the H2TU-R
DLOS	Off	DSX-1 signal is present and synchronized with no errors
	Red	No DSX-1 signal, or signal is present with errors
RLOS	Off	DS1 signal from CPE is present at H2TU-R with no errors
	Red	No DS1 signal from CPE at H2TU-R, or present with errors
HLOS	Off	Normal Operation; end-to-end HDSL2 synchronization good
	Red	Loss of end-to-end HDSL2 synchronization on the 2-wire Loop
	Red Flashing	GFI or overcurrent condition detected
	Flashing	If attenuation (LOSS on Current System Status Screen) is ≤ 30 dB the DSL LED remains solid. If attenuation is > 30 dB, the DSL LED flashes green, yellow, or red as determined by the signal quality
HCR	Off	Normal operation; No HDSL2 CRC errors detected by this unit within the last 30 minutes on the 2-wire Loop
	Yellow Flashing	One or more HDSL2 CRC errors are being detected by this unit on the 2-wire Loop
	Yellow	Four or more HDSL2 CRC errors have been detected on the 2-wire Loop within the last 30 minutes. The LED remains lit for 30 minutes. If no HDSL2 CRC errors occur within a rolling 30 minute interval, the LED extinguishes.
ARM/LBK	Off	Unit is not in the armed or loopback state
	Yellow	Unit is an armed state
	Green	A loopback is active on this specific unit
	Green Flashing	A loopback is active on the H2TU-R
B8ZS	Off	Unit is receiving AMI line code
	Green	Unit is receiving B8ZS line code

COMPLIANCE

This product is intended for installation in restricted access locations only.

WARNING: Up to -200 VDC may be present on telecommunications wiring.

CAUTION: The DSX-1 interface is intended for connection to intra-building wiring only. Ensure Chassis ground is properly connected.

Configuration Code	Input	Output
Power Code	F	C
Telecommunication Code (TC)	-	X
Installation Code (IC)	A	-

This product provides span powering voltage (negative only with respect to ground, -190 VDC nominal, GFI protection < 5 mA) and meets all requirements of Bellcore GR-1089-CORE (Class A2), ANSI T1.418-2002. This product is NRTL listed to the applicable UL standards.

HDSL2 LOOP GUIDELINES FOR OPTIMUM OPERATION

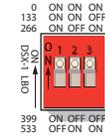
- ◆ Cable pairs *must* be non-loaded
- ◆ No single Bridged Tap > 2 kft.; Total Bridged Tap < 2.5 kft.
- ◆ Loop Resistance: 750Ω
- ◆ Attenuation: ≤ 30 dB
- ◆ Impulse noise < 52 dBmF (F filter)
- ◆ Wideband noise < 47 dBmF (F filter)
- ◆ Margin ≥ 6 dB
- ◆ Longitudinal Noise (Power Influence):
 - ◆ ≤ 80 dBmC: acceptable
 - ◆ 80-90 dBmC: marginal
 - ◆ > 90 dBmC: unacceptable

ON-BOARD OPTIONS

The following options can be accessed on the circuit board:

Line Build Out (LBO) Switches

Use the DIP switch **SW5** to select a distance of: 0-133 (default), 133-266, 266-399, or 399-533 feet.



Card Edge Pinouts

Pin #	Function	Pin #	Function
1	R TX DSX (In from DSX)	A	T TX DSX (In from DSX)
2	R1 RX DSX (Out to DSX)	B	T1 RX DSX (Out to DSX)
5	GND	H	DCV LOS (to Alarm Module)
8	-48 V	J	Frame Ground
9	R HDSL2 Loop*	K	T HDSL2 Loop*
10	Fuse Alarm (to Alarm Module)		

* The HDSL2 Loop is full duplex, capable of simultaneously sending and receiving data.

FRONT PANEL OPTIONS

The following options can be accessed on the front panel:

Pushbuttons

LBK To perform loopback functions, use the following methods:

To Loop Up:	Press and Hold LBK Button:	ARM/LBK LED Shows:
H2TU-C	Less than 3 seconds	Green
H2TU-R	More than 3 seconds	Flashing Green

To Loop Down:	Press and Hold LBK Button:	ARM/LBK LED Shows:
H2TU-C	Less than 3 seconds	Off
H2TU-R	Less than 3 seconds	Off

To release the active loopback, press the **LBK** pushbutton until the **ARM/LBK** LED extinguishes.

LINE CODE Press this button to provision for AMI or B8ZS (default) line coding. A Green **B8ZS** LED indicates B8ZS line code.

DSX EQ Splitting Jacks

- TX** DSX-1 transmit toward the local loop (intrusive)
- RX** DSX-1 receive from the local loop (intrusive)

DSX Monitor Jacks

- TX** DSX-1 transmit toward the local loop (nonintrusive)
- RX** DSX-1 receive from the local loop (nonintrusive)

RS-232 DB-9 Connector

Used to access performance monitoring data, perform loopbacks, and provision units via VT100 emulation applications, such as HyperTerminal. There are two terminal emulation modes: Manual Update and Real-Time Update. CTRL+T toggles between modes.

Manual Update Mode: Press the spacebar three times to manually update the screen. Print screen and log files commands are available in this mode.

Real-Time Update Mode: The default mode. Print screen and log file commands not available. Cursor placement and screen highlighting are enabled.

Provision terminal port for VT100: Data Rate = 1.2 to 19.2 kbps; Asynchronous Data Format = eight data bits; no parity (none); one stop bit. When using a PC with terminal emulation software, be sure to disable any power saving programs.



HDSL2 3192 H2TU-C

PRICING AND AVAILABILITY 800.827.0807
TECH SUPPORT 800.726.8663
RETURN FOR REPAIR 256.963.8722
www.adtran.com
61223004L4-22G

TROUBLESHOOTING HDSL2

This ADTRAN HDSL2 unit is equipped with troubleshooting-at-a-glance LEDs (identified on the reverse side of this document) that provide a simple means of identifying the location of certain faults. Additionally, screens available via the craft interface simplify the trouble isolation process. These screens and their associated benefits are described below.

Troubleshooting Screen

The Troubleshooting screen, available via the Main Menu, provides both current and 7-day historical view of performance. Errors and/or alarms detected at any of the monitored inputs (DSX-1, DS1 and HDSL) will be displayed in tabular format and highlighted in reverse video. This screen automatically escalates the error/alarm conditions using reverse video display. Faults detected and their associated meanings are as follows:

DSL:

LOS	Loss of HDSL sync
MARG	Margin has exceeded the alarm threshold
ATTEN	Attenuation has exceeded the alarm threshold
ERR	Errors recorded at the HDSL receiver

Facility:

GROUND	Ground Fault Interrupt on span voltage (facility pair grounded)
SHORT	Short circuit (or low impedance) between facility pairs
OPEN	Open circuit between facility pairs

DSX-1/DS1:

LOS	Loss of signal (Red Alarm) at the DSX-1/DS1 receiver
CLK	T1 receive clock is out of range
RAI	Remote Alarm Indication (Yellow Alarm) detected at DSX-1/DS1 receiver
AIS	Alarm Indication Signal (Blue Alarm) detected at DSX-1/DS1 receiver
ERR	Errors recorded at DSX-1/DS1 receiver

Troubleshooting Guidance Screens

The Troubleshooting Guidance screens, available via the Troubleshooting screen, provide guidance on the fault(s) detected. The screens also provide the possible cause(s) and suggested corrective actions that can be taken.

Along with the Troubleshooting screens, the Detailed Status screen and Performance History screen, available via the craft access terminal, provide both real-time and historical view of this circuit.

FEATURES

TScan 2.0

This module incorporates the TScan 2.0™ feature. TScan allows for remote retrieval of circuit diagnostics and performs advanced fault location. For more information about TScan refer to the Installation and Maintenance practice.

Bad Splice Detection

The Runtime TScan splice detection feature is an ADTRAN proprietary non-intrusive method for detection of anomalies (bad splices) in the copper plant.

Data transmission transceivers, especially echo-cancelled technologies, such as HDSL2 (or HDSL4) are subject to degraded performance in the presence of bad splices. Poor splices in the cable are often undetected by normal testing methods. Often, these splices present no problem for the data transmission equipment until the point at which oxidation with the splice itself causes a rapid impedance change. Such a change in impedance may cause errors, signal margin fluctuation, and/or a retrain of the DSL transceivers. To address the difficulty in identifying bad splices, ADTRAN has developed the splice detection feature. This feature non-intrusively monitors the cable pair during runtime for the presence of bad splices, which may potentially impact service.

Fault Bridging

Fault Bridging is a feature that minimizes downtime due to an intermittent impairment (GFI, short, micro-interruption, bad splice, noise burst, etc.) that appears on the cable pair.

The bridging feature allows the DSL transceivers to maintain synchronization during such an interruption, thus avoiding a 25 to 30 second retrain. Depending on the type of impairment, interruptions as long in duration as 200 ms can be bridged.

Fast Retrain

Fast Retrain is an ADTRAN proprietary feature that minimizes downtime due to an intermittent impairment (bad splice, noise burst, etc.) which due to its duration cannot be bridged.

When such impairments occur after HDSL synchronization has been achieved, the fast retrain feature will be invoked to restore service within 5 to 7 seconds. This short retrain time allows for reduced downtime compared to the traditional 25 to 30 second retrain duration.

NOTE: Fast-Retrain capable units must be installed on both ends of the HDSL2 circuit for this feature to function properly. Also, if there is a failure of a fast retrain attempt, for any reason, then the traditional (25-30 second) retrain will be initiated.

LOOPBACK AND CONTROL CODES

Function	Code (Hex / Bin)	Response
ARM (in-band) a.k.a. 2-in-5 pattern	11000	When sent from the network, the units arm and the H2TU-R loops up, if NIU Loopback is enabled. When sent from the customer, the units arm.
ARM (ESF Data Link)	FF48 or 1111 1111 0100 1000 sent via Facility Data Link (FDL)	When sent from the network, the units arm and the H2TU-R loops up, if NIU Loopback is enabled. When sent from the customer, the units arm.
Disarm (in-band) a.k.a. 3-in-5 pattern	11100	When sent from the network or customer, all units are removed from the armed state and loopbacks are released
Disarm (ESF Data Link)	FF24 or 1111 1111 0010 0100 (FDL)	When sent from the network or customer, all units are removed from the armed state and loopbacks are released.
H2TU-C Network Loopback ¹	D3D3 or 1101 0011 1101 0011	If armed, the H2TU-C loops toward the network, 2 seconds of AIS (all 1s) is transmitted, the looped data is sent for 5 seconds, and a burst of 231 logic errors is injected. The burst of 231 logic errors continues every 20 seconds as long as the D3D3 pattern is detected. When the pattern is removed, the unit remains in loopback. If the pattern is re-instated, the injection of 231 logic errors continues every 20 seconds. If the pattern is sent from the network, the loop up and error injection is toward the network. If the pattern is sent from the customer, the loopback and error injection will be toward the customer
H2TU-R Customer Loopback ¹	3F02 or 0011 1111 0000 0010	When sent from the network, if the units are armed, the H2TU-R loops up data from the customer toward the customer
Loopdown w/o disarm	9393 or 1001 0011 1001 0011	When sent from the network or customer, all units currently in loopback loop down. Armed units do not disarm. In order to behave like a smartjack, the H2TU-R does not loop down from a network loopback in response to the 9393 pattern if NIU Loopback is enabled. In order to behave like an NIU, the H2TU-R will not loop down from the network side with 9393h.
Loopback Query ¹	D5D5 or 1101 0101 1101 0101	This pattern allows a query of the devices to determine whether any units are in loopback. If D5D5 hex is received while in a loopback state, the unit in question transmits a logic error count. When sent from the network, logic errors are injected towards the network to indicate a loopback is present toward the network as follows: 231 bit errors every 20 seconds if an H2TU-C; 200 bit errors every 10 seconds if an H2TU-R. When sent from the customer, 200 bit errors will be injected toward the customer every 20 seconds if an H2TU-R is in customer loopback.
Loopback Time Out Override ^{1,2}	D5D6 or 1101 0101 1101 0110	When sent from the network or customer, if the units are armed or a unit is currently in loopback, the loopback timeout override is disabled, and loopbacks do not time out (regardless of the current loopback timeout setting). As long as the units remain armed, the timeout remains disabled. When the units are disarmed, the loopback timeout reverts to the previous setting.
Span Power Disable ^{1,2}	6767 or 0110 0111 0110 0111	When sent from the network or customer, if the units are armed, span power is disabled. When sent from the network, the span power is disabled as long as the pattern is detected. Once the pattern is no longer being received, the H2TU-C reactivates span power. All units then re-train and return to the disarmed and unlooped state. When sent from the customer, span power is only disabled momentarily.
Query Loop Parameters ¹	DBDB or 1101 1011 1101 1011	If the H2TU-C is in network loopback, errors are injected into the DSX-1 signal, and repeated every 20 seconds. The number of errors injected each time depends on the current status of signal margin and pulse attenuation parameters on each loop. 111 errors are injected if all HDSL2 receiver points (H2TU-C, H2R, NET LP, H2R CST, and H2TU-R LP) indicate pulse attenuation is ≤ 30 and signal margin is ≥ 6 dB. 11 errors at a time are injected if any of the receiver points indicate pulse attenuation is > 30 dB and/or signal margin is < 6 dB.
H2TU-R Address 20 for extended demarc.	C754 or 1100 0111 0101 0100	If armed the H2TU-R loops up, 2 seconds of AIS (all 1s) is transmitted, the looped data is sent for 5 seconds, and then a burst of 200 logic errors is injected. The burst of 200 logic errors continues every 10 seconds as long as the C754 pattern is detected from network (20 seconds if from customer). When the pattern is removed, the unit remains in loopback. If the pattern is re-instated, the injection of 200 logic errors continues. If the pattern is sent from the network, the loopup and error injection is toward the network. If the pattern is sent from the customer, the loopback and error injection is toward the customer.

¹ Units must be armed with 11000b or FF48h before this code can work.

² This code will be detected only if the units are armed and there are no loopbacks active.

NOTE: All codes listed above must be sent for a minimum of five seconds in order to be detected and acted upon.

NOTE: If NIU is enabled, then the H2TU-R can be in network loopback when the H2TU-C loop-up codes are sent.

Warranty: 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 online at www.adtran.com/warranty.