

HST-3000 Handheld Services Tester

Broadcom Bonded ADSL2+/VDSL2 SIM



Benefits

- Saves money and reduces repeat faults with Triple-Play services testing capability in one Universal xDSL module that covers ADSL1, ADSL2, ADSL2+, VDSL2, Bonded ADSL, and Bonded VDSL
- Provides critical ability to verify correct pair-bonding and provisioning
- Provides investment protection in both CPE and DSLAM equipment, featuring the latest Broadcom chipset and compatible with the widest range of chipset manufacturers (Broadcom, Infineon, Ikanos/Conexant, and Texas Instruments)
- Reduces troubleshooting time enabling users to segment single line performance issues of a bonded group and segment which pair requires further troubleshooting
- Provides Hlog, and QLN graphing, which are key for identifying bridged tap, noise, and pair balance problems

Service providers face significant challenges when ramping up their networks to provide advanced triple-play services with the same or better quality than cable/multiple switch operators (MSOs). A key success factor will be to cost-effectively increase bandwidth to subscribers for new IP video services over bonded asymmetric Digital Subscriber Line 2+/very high-speed Digital Subscriber Line 2 (ADSL2+/VDSL2) while continuing to provide single line ADSL2+ service to subscribers without triple-play services capability. It is tempting to believe that the bonded two pair ADSL2+/VDSL2 connection can be tested similarly to single line ADSL connection, however, testing one pair at a time is insufficient. Internet Protocol television (IPTV) services require pristine xDSL service Layer 1 performance. Factors such as noise, crosstalk, pair imbalance, bridged taps, and other copper plant anomalies can be easily hidden when testing one pair at a time. Dual-pair bonded group testing is critical to ensuring that the service will be delivered to the subscriber with the best possible quality of service (QoS). Designed for the outside plant, the HST-3000 meets those challenges head-on.

Featuring the latest Broadcom Corporation chipset, the new service interface module (SIM) tests bonded-pair ADSL2+/VDSL2 by terminating both pairs of a bonded group. The Broadcom SIM also supports legacy ADSL1, ADSL2, ADSL2+, and VDSL2 in the same module, making it easy for technicians to switch between testing bonded and non-bonded services without having to swap modules. Further, the same module features dual tip/ring/ground interfaces for basic and advanced copper testing to further isolate copper pair problems. The new SIM provides additional testing power for field technicians who install and maintain access networks and high-bit-rate triple-play services, including IP Video.

The lightweight, rugged, and battery-operated HST-3000 with the Broadcom SIM cost-effectively scales to provide an all-in-one solution for field installation, maintenance, and troubleshooting across a wide range of triple-play service test applications.

Applications

Why a Bonded Pair Test?

A relatively simple, single pair sync test that checks one xDSL pair at a time is simply insufficient for bonded pair DSL service. Testing one pair at a time will not establish actual line rates, because it does not include the impact of crosstalk. Rates may give a false positive, because they may show higher bit rates without the effects of crosstalk noise. Testing one line at a time will not exercise the pair bonding timer threshold settings nor will it validate that each line is wired to or configured for the same bonding group, because it will never exercise the group condition. This technique could be even more confusing when testing one line at a time where one line that reaches a different customer premises equipment (CPE) port and resets to a single-line mode automatically. A single pair test will not detect the connection to a different bonded group. The very nature of the bonded service technology must accomplish true dual loop evaluation by testing both pairs simultaneously with a dual modem designed test tool to emulate the real bonded CPE.

- Identifying when loops are **not in the same bonding group** *requires* dual modem testing.
- Proper provisioning and bonded group metrics analysis require **both** interfaces to be active.
- Crosstalk analysis is only possible when both pairs are active.

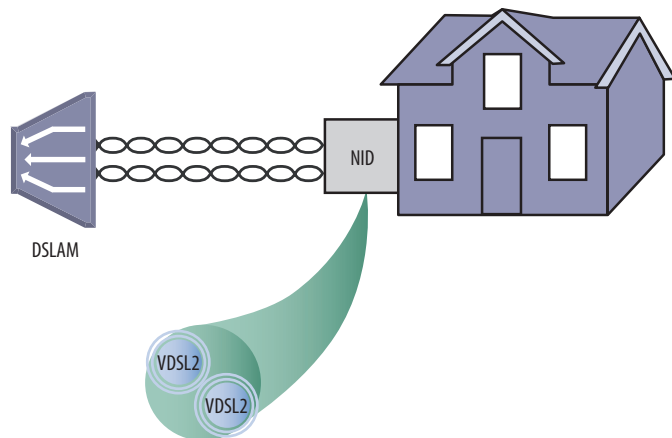


Figure 1: Bonded pair testing is mission-critical

Full Compatibility Range

The new Universal xDSL SIM for the HST-3000 tests ADSL1, ADSL2, ADSL2+, VDSL2, Bonded ADSL, and Bonded VDSL with just one module, making it compatible with a huge range of CPE and DSL Access Multiplexer (DSLAM) equipment. Service providers can minimize their investment cost in test equipment as well as in DSLAM ports, allowing them to continue to offer high-speed data service over single-pair ADSL2+, while turning up new IP video service tiers as they qualify new bonded service areas. JDSU also features additional modules utilizing the widest range of DSL chipsets available on the market: Infineon, Ikanos/Conexant, Texas Instruments, and more. A wide range of chipset compatibility allows providers to verify interoperability and to analyze real-world rate versus reach performance between DSLAMs and the CPE.

VDSL Summary - Group		
HOME->VDSL BOND->EMULATE		
Pair 1-Show Time, Pair 2-Show Time	12b,12b	
	UP	DOWN
Group Rate	9700 K	99999 K
Max Group Rate	9288 K	104988 K
Group Capacity	100.0 %	95.2 %
Lapse Time	18 sec	
Display ▲ SELT TERM Results ▲ DSL Stop		

Figure 2: Showtime for bonded pairs requires that both pairs of a bonded group are active

VDSL Summary - Both				
HOME->VDSL BOND->EMULATE				
Pair 1-Show Time, Pair 2-Show Time				12b,12b
Est.Len < 1kft/< 1kft	UP		DOWN	
	Pair 1	Pair 2	Pair 1	Pair 2
Actual Rate(K)	4453	5247	50000	49999
Max Rate(K)	4378	5080	52936	52052
Capacity(%)	100.0	100.0	94.5	96.1
Noise Margin(dB)	6.0	5.6	7.9	9.3
Line Atten(dB)	8.0	7.0	3.8	3.4
Signal Atten(dB)	7.5	6.3	3.8	3.4
Display ▲ SELT TERM Results ▲ DSL Stop				

Figure 3: View statistics simultaneously for both pairs of a bonded group

BPT, Hlog, and QLN Graphs

In the case of slow service, perhaps indicated by less than expected downstream bit rates, advanced technicians can view Bits-per-Tone (BPT), Hlog (Insertion Loss), and Quiet Line Noise (QLN) graphs accessible within the xDSL application. Significant “dips” or “notches” in the BPT and Hlog graph may indicate the presence of a bridged tap or a corroded splice, showing the absorption of DSL signal energy. The QLN graph provides an indication of external noise interference. Spikes may show a high noise floor revealing noise interference issues. All graphs offer users the ability to zoom in or out to isolate areas of interest, a key benefit for pinpointing possible sources of trouble. After identifying the trouble source, technicians can find and correct problems with the advanced copper measurement suite on the HST-3000, including the precision time domain reflectometer (TDR) or resistive fault locator (RFL) tools.

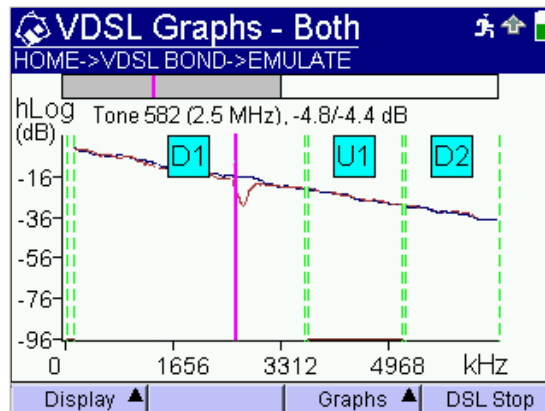


Figure 4: Dual pair Hlog Graph showing likely bridged tap on pair 1 at tone 582.

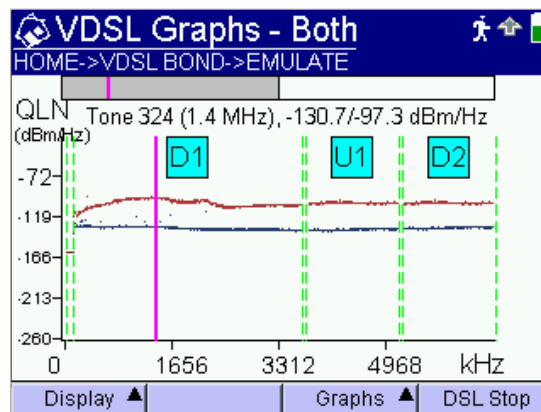


Figure 5: Dual pair QLN graph showing noise on pair 1.

Specifications

Bonded ADSL/VDSL Broadcom Module

Chipset Broadcom

Standard Compliance

ITU-T G.998.1, ITU-G.998.2, ITU-T G.994; ITU-T G.992.1 (G.DMT), Annex A,B, and C ; ITU-T G.992.2 (G.LITE) Annex A and C; ANSI T1.413; ITU-T G.992.3 (ADSL2) Annex A, C, L, and M; ITU-T G.992.5 (ADSL2+) Annex A, C, and M; ITU-T G.993.2 (VDSL2) Annex A, VDSL2 Profiles 8a,8b,8c,8d,12a,12b,17a

All Modes (Single, Bonded Pair ADSL/VDSL2)

Graphs

BPT

Combination BPT/SNR Tone

VDSL Band Statistics

Hlog

QLN

Miscellaneous results

Synchronization (Showtime)

Failed Synchronization

Number of Syncs

Training Time

Standard Used

Estimated Loop Length

Modem Firmware Version

Errors/Performance Local/Remote/Remote(total)

Loss of Signal

Forward Error Correction (FEC)

Cyclic Redundancy Check (CRC)

Loss of Frame

Loss of Margin

Far end Loss of Signal

Errored Seconds

Severely Errored Seconds

Unavailable Seconds

Measurements (Bonded Pair ADSL/VDSL2)

Measurements (Upstream/Downstream)

Modem State

Group Rate

Max Group Rate

Group Capacity

Lapse Time

Per Band Bonded VDSL2 Statistics

Loop Attenuation (LATN)

Signal Attenuation (SATN)

SNR Margin

Tx Power

Network

Network Modes

Terminate,Through

Network Types

ADSL1, ADSL2, ADSL2+, VDSL, Bonded ADSL2+, Bonded VDSL

IPoE, PPPoE, IPv6oE, Multiple VLANS, data off

ADSL/ADSL2+

IPoE, PPPoE, IPv6oE, MVC Video, IPoA, PPPoA, Multiple VLANS,

Network off

VPI/VCI

Transport Types

ATM, PTM

IP Mode

DHCP, static

MAC Setting

Factory default, user-defined

Vendor Id

Yes/No

User Class

Yes/No

VLAN

Tag on/off

ID selection 0–4095

Priority selection 0–7

Additional Features

Technology Auto Mode for single pair DSL Standard (Auto, ADSL, VDSL2)

Transport Auto Mode (ATM or PTM Bonding)

PhyR Settings Upstream/Downstream

NitroMode

Dual Latency paths (VDSL2)

Four latency paths (ADSL2/2+)

Modules

HST3000-BDCM ADSL/VDSL with Broadcom Chipset

HST3000-BDCM-WB2 ADSL/VDSL Bonded and Copper (up to 30 MHz) with Broadcom Chipset

Cables

CB-5CLIP-BON RJ to 5 clip lead cable

(Bonded Cable for Broadcom/Conexant/Capri SIMs)

CB-5CLIP-RTC RJ to 5 clip lead cable with regular telco clips

(Bonded Cable for Broadcom/Conexant/Capri SIMs)

CB-BONDED RJ to dual RJ cable

(Bonded Cable for testing at the NID/NIU)

Ordering Information
Base Unit

HST3000-NG	HST-3000 Mainframe without Copper (Color)
HST3000C-NG	HST-3000 Copper Mainframe (Color)

Available SIMS (Modules)

HST3000-CUCE	Copper only SIM, CE Marked
HST3000-AR2A-T1	ADSL2+ T1 (ATU-R, Annex A)
HST3000-AR2B-T1	ADSL2+ T1 (ATU-R, Annex B)
HST3000-CAP-VDSL	Capri bonded VDSL SIM
HST3000-CAP-VDSL-WB2	Capri bonded VDSL/WB2 SIM
HST3000-CAR2A-T1	Copper, ADSL2+ T1 (ATU-R, Annex A)
HST3000-CAR2B-T1	Copper, ADSL2+ T1 (ATU-R, Annex B)
HST3000-CSHHV	G.SHDSL, 380V SPAN, DVOM SIM
HST-3000-CU	Dual T/R/G Interface to Copper Test SIM
HST-3000-CUVDSL-CNXT	VDSL and Copper with Conexant Chipset SIM
HST3000-WB2	Wide Band 2 (up to 30 MHz) Copper Test
HST3000-VDSL-CNXT	VDSL with Conexant Chipset
HST-3000-VDSL-CNXT-WB2	VDSL and Copper (up to 30 MHz) with Conexant Chipset
HST3000-VDSL-IK	VDSL with Ikanos Chipset
HST-3000-VDSL-IK-WB2	VDSL and Copper (up to 30 MHz) with Ikanos Chipset
HST3000-INF-VDSL	VDSL with Infineon Aware Chipset
HST-3000-INF-VDSL-WB2	VDSL and Copper (up to 30 MHz) with Infineon Aware Chipset
HST3000-ETH	10/100/1000 Ethernet
HST3000-CT1	T1 and Copper
HST3000-DC	Datacom
HST3000-E1	E1
HST3000-E1-DC	E1/Datacom
HST3000-4WLL	4-Wire Local Loop
HST3000-T1	Dual TX/RX Bantam T1 Interface and T1
HST3000-T3	Dual TX/RX Bantam T1 Interface, and Dual RX/Single TX BNC DS3 Interface/and DS3
HST-BRA ETSI (Euro)	ISDN BRA
HST3000-BRI	ISDN BRI
HST3000-CSHCE	G.SHDSL and Copper
HST-GSH	G.SHDSL
HST3000-GSHCE	2-Wire G.SHDSL
HST3000-CSH4	Copper, 4-Wire G.SHDSL (STU-R/C, Annex A/B)
HST3000-BLK	Blank

Software Options

HST3000-BLUETOOTH	Bluetooth Wireless
HST3000-COS	Class of Service
HST3000-802.11	802.11 Wireless
HST3000S-WEB	Web Browser
HST3000-REMOP	Remote Operation
HST3000-SCRIPT	Scripted Test
HST3000-DSL2	ADSL2 and ADSL2+
HST3000S-IP	Advanced IP Suite—PING and Through Mode Support
HST3000S-IP-Video	IP Video Analysis
HST3000S-VMOS	Video MOS Analysis
HST3000-MSTV	Microsoft IPTV Video Analysis
HST3000-VT100	VT100 Emulation
HST3000S-VOIP	VoIP Software Analysis
HST3000S-H.323	H.323 VoIP Signaling
HST3000S-MGCP	SCCP MGCP VoIP Signaling
HST3000S-MOS	VoIP Mean Opinion Score
HST3000S-SCCP	SCCP VoIP Signaling
HST3000S-SIP SIP	VoIP Signaling
HST3000-UNISTIM	VoIP Signaling Call Controls for UNISTIM
HST3000-OPTETH	Optical Ethernet
HST3000-IPV6	IPv6 Option for Ethernet SIM
HST3000-MPLS	MPLS
HST3000-MSTR	Multiple Streams
HST3000-TCPUDP	TCP/UDP
HST3000-FTP	FTP
HST3000-WBTONES	WB TMS

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