SmartClass ADSL
ADSL and IPTV Service Installation Tester

Key Features

• All-in-one tool for broadband services installation including Copper, ADSL 1/2/2+, IP Data, and IP Video testing
• Fast and easy CableCheck Copper test for ADSL2+: DVOM, Capacitance, Longitudinal Balance, and Load coil counter
• Thorough ADSL analysis including graphical Bits-per-Tone and SNR-per-Tone
• Full suite to verify connectivity with ATM OAM F4 and F5, PPP, static and dynamic IP, DNS support, IP PING, TRACERT, HTTP, and FTP
• IPTV STB Emulation and Quality of Service (QoS) testing for Broadcast and VOD services
• Ethernet T.E. mode to quickly isolate CPE, Through-mode to replace customer modem

Applications

• Test and verify customer loop quality for ADSL 1/2/2+ and IPTV
• Installation and maintenance of ADSL2+ service and performance
• IPTV streaming for service availability and quality
• Through mode test for ATU-R replacement
• Service testing at customer’s broadband connection isolates PC as failure point

The JDSU SmartClass ADSL is the perfect tool for the technician installing and maintaining ADSL services. The tester enables the technician to test loop quality, verify ADSL signal and performance, and validate the customer’s Internet connection with unprecedented ease and speed. The SmartClass ADSL reduces finger pointing between customer and provider by testing from the customer’s broadband connection, quickly isolating PC troubles.

SmartClass ADSL provides a full set of copper tests that qualifies the customer loop for the delivery of newer services such as IPTV, including Longitudinal Balance, a key copper metric to ensure external noise and interference will not impact the quality of the the IPTV streams with intermittent pixelization and other disruptive effects. DVOM, Distance-to-Short, Leakage, Opens/Capacitance, and Loadcoil Counter tests guarantee the copper loop does not exhibit connection issues and that the quality of the copper pair is within allowed standards for ADSL2+ transmission in terms of loop length and isolation. The unique “CableCheck” sequence provides a very easy and fast method to qualify the copper loop for ADSL2+ services with a Pass/Fail indication and programmable thresholds. The full-featured ADSL tests quickly verify provisioned rates and quality, including up/down actual and max rates, margin, attenuation, capacity, TX power, errors, alarms, ATM OAM and stats, Ethernet stats, and BPT graphs. The suite of IP tests easily and quickly verifies ISP access and Internet connectivity: IP PING, TRACERT, HTTP, FTP upload and download. The built-in 10/100 Ethernet port tests the service from the customer’s broadband interface.

In addition, the SmartClass ADSL supports the storage and retrieval of pre-set configurations and allows technicians to transfer results to a PC using USB. The instrument’s features, including its rugged design and field-replaceable AA batteries, make it the essential ADSL installation tool for everyone.
ADSL and IPTV Overview

ADSL2+ has emerged as an IPTV-enabling technology of choice for Network Operators and Services Providers seeking new revenue streams and competitive positioning. At the same time consumers are signing up for multiple services in this very competitive environment expecting the best service quality, making it imperative that Operators quickly and cost-effectively install ADSL2+ lines with the confidence that their complex Triple Play services are working well.

Delivery of ADSL services requires a single copper pair configuration of a standard voice circuit with an ADSL modem at each end of the line, creating three information channels—a high-speed downstream channel, a medium-speed upstream channel, and a plain old telephone service (POTS) channel for voice. Data rates depend on several factors including the length of the copper wire, the wire gauge, presence of bridged taps, and cross-coupled interference. The line performance increases as the line length is reduced, wire gauge increases, bridge taps are eliminated and cross-coupled interference is reduced or is cancelled out by a good longitudinal balance characteristic of the copper wire. The modem located at the subscriber’s premises is called an ADSL transceiver unit-remote (ATU-R), and the modem at the central office is called an ADSL transceiver unit-central office (ATU-C). The ATU-Cs take the form of circuit cards mounted in the digital subscriber line access multiplexer (DSLAM), while a residential or business subscriber connects their PC and ATU-R modem to a telephone outlet on the wall.

ADSL2 has been specifically designed to improve the rate and reach of ADSL largely by achieving better performance on long lines. ADSL2 accomplishes this by improving modulation efficiency, reducing framing overhead, achieving higher coding gain, improving the initialization state machine, and providing enhanced signal processing algorithms. ADSL2+ further improves on the ADSL2 standard by allocating additional spectrum for downstream data, dramatically improving the data rate over ADSL2 or ADSL.
With the improved downstream rates for ADSL2+, it is the preferred technology to deliver IPTV. The service requires the installation of a Set-top Box (STB) to decode the compressed video stream—either Broadcast or Video-on-Demand (VoD) services. ADSL2+ is a key differentiator from regular IP/TCP-based Data services that have retransmissions on lost packets, leading to intermittent problems with the Transport and Video Stream Quality. These problems affect real-time IPTV service in the form of pixelization, blurring, frame freezes, and blue screen—all visible to the subscriber and leading to possible customer churn.
Measuring ADSL and IPTV Performance

The SmartClass ADSL can be used to verify service delivery at the provisioned bit rates and quality levels through a quick sync check at various points along the customer circuit (ATU-R, NID, splice case, Cross Box, MDF, DSLAM). If the tester cannot synchronize with the DSLAM, the SmartClass ADSL provides the copper tests needed to check the wire pair for service affecting faults, or in the worst case helps find a new serviceable pair. In addition to DVOM, the included Capacitance (Opens), Longitudinal Balance, and load coil counter tests help identify unique ADSL problems in the convenient CableCheck test sequence. If the delivered service is slower than expected, the SmartClass ADSL provides Resistance and Opens tests to verify the presence of service-affecting bridged taps or the Balance test to assess noise immunity.

Separately, a poorly balanced copper wire will pick up Noise that contributes to video packet loss (Continuity Errors). The copper wire can be checked using the SmartClass ADSL load coil counter to count the number of service-choking load coils on the line, as well as monitor for very high noise levels. The bits-per-tone and SNR-per-tone graphs are handy to correlate dips in performance with specific frequencies and crosstalk.

SmartClass ADSL also enables technicians to verify end-to-end IP connectivity with IP PING and Trace Route. Other tests include the FTP Throughput test, to ensure the network supports the requested bandwidth, and the HTTP “Web Test”, that identifies problems related to dedicated websites.

<table>
<thead>
<tr>
<th>CABLE CHECK</th>
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</thead>
<tbody>
<tr>
<td>TEST</td>
</tr>
<tr>
<td>DVOM</td>
</tr>
<tr>
<td>CAPACITANCE</td>
</tr>
<tr>
<td>BALANCE</td>
</tr>
<tr>
<td>LOADCOIL</td>
</tr>
<tr>
<td>Y - Cancel</td>
</tr>
</tbody>
</table>
With the IPTV Software Option, technicians can quickly verify the availability of IPTV service and its required bandwidth. The Quality of Service (QoS) parameters, such as Continuity Error, PCR Jitter, and PID Map, help indicate Video Stream Quality problems. Content Quality issues are determined by the Error Indicator Count, Transport Quality metrics can be measured with the IP Packet Jitter and RTP Packet Loss features, and the "Zap-Time" presented by the IGMP or RTSP Latency judges the Transaction Quality. Users can also use the SmartClass ADSL back-up circuit and log-in configurations for easy future recalls.
Specifications

Configurations
ADSL Annex A
ADSL Annex B
Cu-ADSL Annex A
Cu-ADSL Annex B
ADSL Specifications
Standard Compliance, ADSL over POTS Modem
- ANSI T1.413-1998, Issue 2
- ITU-T G.992.1 Annex A (G.DMT)
- ITU-T G.992.2 Annex A (G.lite)
- ITU-T G.992.3 Annex A, L,M
- ITU-T G.992.5 Annex A (ADSL2+)
- ITU-T G.992.5 Annex L (RE-ADSL)
- ITU-T G992.5 Amendment 1
Standard Compliance, ADSL over ISDN Modem
- ITU-T G.992.1 Annex B (G.DMT)
- ITU-T G.992.3 Annex B (G.DMT.BIS)
- ITU-T G.992.5 Annex B (ADSL2+)
General Settings
- Auto Sync
- Auto or manual framing mode
Physical Layer Feature Support
- Actual and maximum bit rates capacity
- Noise margin
- Attenuation
- Modern state
- TX power
- Far vendor ID, revision
- Graphical display of BPT (bits-per-tone)
- Re-sync counter
- Graphical display of SNR (SNR-per-tone)
- Fast or interleaved
ADSL Errors
- LOS (loss of sync)
- LOF: (Loss of Frame)
- LOP: (Loss of Power)
- CRC (cyclic redundancy check)
- HEC (header error correction)
- FEC (Forward Error Correction)
- Modern errors
PPP/IP Connectivity
- BRAS: PAP/CHAP
- IPCP
- NAT
- PPPoA, PPPoE, IPoA, IPoE, Bridged
- RFCs 2364, 2516, 1483, 2684
Through Modes
- Bridged Ethernet
- IPoE
- IPoA
- PPPoE
- PPPoA
ATM
- VCC scan: up to five VPI/VCCs
- OAM F4/F5 near and far loopbacks
- IP
  - MAC address
  - WAN/LAN status screens
  - GATEWAY/DNS screen
  - DHCP client on WAN and LAN
  - IP release/renew
  - DNS support WAN & LAN
  - DCHP server on LAN
- IP PING
  - IP PING:TX/RX, received, delay
  - PING count, PING size
  - PING to URL (DNS)
  - Remote PING monitor
- TRACERT
  - IP, name, hops, delay
Web Test (HTTP)
- URL
  - download status
  - file size
  - time
  - rate
FTP
- URL/FILE
  - connection status
  - time
  - file size K bytes
  - rate Kbs
DNS
configure up to three manual addresses
Ethernet Statistics
- RX/TX bytes
- RX/TX frames
- RX/TX errors
- Collisions
ATM Statistics
- ATM OAM F4/S near and far loopback count
- UP/DN Good and idle cell count
- Bad HEC cell count
- Dropped Cell count
- TX/RX PDUs
- TX/RX AAL Bytes
- TX/RX Total error count

Copper Test Specifications

<table>
<thead>
<tr>
<th>Test</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Volts</td>
<td>0 – 300 Peak</td>
<td>1V</td>
<td>2% ± 1V</td>
</tr>
<tr>
<td>DC Volts</td>
<td>0 – 300 (VDC + Peak AC)</td>
<td>1V</td>
<td>2% ± 1V</td>
</tr>
<tr>
<td>Resistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 999 &amp;</td>
<td>1</td>
<td>2% ± 2.5 &amp;</td>
<td></td>
</tr>
<tr>
<td>1.0K - 9.9K</td>
<td>10</td>
<td>2% ± 2.5 &amp;</td>
<td></td>
</tr>
<tr>
<td>10K - 99.9K</td>
<td>100</td>
<td>2% ± 2.5 &amp;</td>
<td></td>
</tr>
<tr>
<td>100K – 999K</td>
<td>1K</td>
<td>2% ± 2.5 &amp;</td>
<td></td>
</tr>
<tr>
<td>1M – 9.9M</td>
<td>10K</td>
<td>6.5% ± 2.5 &amp;</td>
<td></td>
</tr>
<tr>
<td>10M – 100M</td>
<td>100K</td>
<td>6.5% ± 2.5 &amp;</td>
<td></td>
</tr>
</tbody>
</table>

Leakage
| 0 - 999 &  | 1             | 2% ± 2.5 & |               |
| 1.0K - 9.9K | 10            | 2% ± 2.5 & |               |
| 10K - 99.9K| 100           | 2% ± 2.5 & |               |
| 100K – 999K| 1K             | 2% ± 2.5 & |               |
| 1M – 9.9M  | 10K            | 6.5% ± 2.5 & |               |
| 10M – 100M | 100K           | 6.5% ± 2.5 & |               |

Distance to Short
| 0 – 30Kft/10Km | 1ft/1m |               |

Capacitance/Opens
| 0 – 2.999ft/999m | 1ft/0.1m | 2.5% ± 45pF    |
| 0 – 44.9ft     | 1m | ± 2% ±1mA     |

DC Current
| 1 – 110mA      | 1 mA | ± 2% ±1mA     |

Longitudinal Balance
| 35 - 85dB      | 1dB | 2dB            |

Load coil counter
| 0 – 27Kft/8230m | up to 5 | ±1            |
## General specifications

**Languages**
- English, Chinese, German, Italian, Spanish, Portuguese
- 4 AA field replaceable batteries (NiMH and or alkaline)
- Charging time 3 to 4 hours for fast charge, overnight for maximum charge and performance
- Nominal range of use -5°C (23°F) to +50°C (122°F)
- Storage and transport -30°C (-22°F) to +60°C (140°F)
- Operating humidity 10% to 80%

**Physical specifications**
- Size (H x W x D) 230 x 120 x 50 mm (9.05 x 4.72 x 1.97 in)
- Weight, including batteries ~1.1 KG (2.5 lbs)
- Weight without accessories 0.85 KG (1.5 lbs)
- Display 240x160 monochrome display

**Ordering Information**

<table>
<thead>
<tr>
<th>Order number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC-DSLSIL-P2</td>
<td>ADSL Silver package complete (Annex A)</td>
</tr>
<tr>
<td>CSC-DSLSIL-P2B</td>
<td>ADSL Silver package complete (Annex B)</td>
</tr>
<tr>
<td>CSC-DSLGLD-P3</td>
<td>Copper and ADSL Gold Package complete (Annex A)</td>
</tr>
<tr>
<td>CSC-DSLGLD-P3B</td>
<td>Copper and ADSL Gold Package complete (Annex B)</td>
</tr>
<tr>
<td>SCASWVIDEO</td>
<td>SmartClass ADSL IP Video Software Option</td>
</tr>
</tbody>
</table>

Packages include standard accessories, USB cable, and test leads.
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