

## QT-200 DSL Test Solution

### NetComplete™ Service Assurance Solutions Portfolio



#### Key Features

- Eliminates costly dual-ended testing requirements with patented, single-ended, wideband copper test technology
- Wideband copper test works through splitters without interrupting POTS service
- Minimizes required rack space with 1 RU high probe and in-band management over asymmetric digital subscriber line (ADSL)
- Web-based user interface eliminates the need to install and manage end-user software



#### Applications

- Robustly tests copper and xDSL service level, including IPTV, VoIP analysis, and integrated test access control
- Simplifies installation and management with TAM control through the QT-200

The NetComplete Service Assurance Solution Portfolio combines the QT-200 xDSL & Triple-Play Probe and NetAnalyst™ Test Management Software, providing an unsurpassed ability to pre-qualify, provision, maintain, monitor, and troubleshoot Digital Subscriber Line (DSL) triple-play services as well as copper loop and plain old telephone service (POTS) lines. Delivering DSL service testing, copper prequalification, and non-intrusive monitoring in one probe lets service providers gain the visibility and remote testing capabilities needed to accurately sectionalize faults and properly dispatch technicians, resulting in drastically reduced maintenance costs, improved customer satisfaction, reduced customer churn, and improved service profitability.

### **Making DSL Service Profitable**

The QT-200 xDSL & Triple-Play Probe, provides service providers with the ability to troubleshoot customer or network problems and pre-qualify copper loops, increasing the number of potential subscribers. Furthermore, the QT-200 provides higher layer service testing, which enables the deployment of new services while reducing overall maintenance costs.

Deploying the QT-200 probe near the Digital Subscriber Line Access Multiplexer (DSLAM) or Multi-Service Access Node (MSAN) lets technicians perform testing toward the customer premises and toward the IP network and the ISP to rapidly sectionalize problems and reduce mean time to repair (MTTR). Furthermore, many of these tests, including line qualification, can be performed without causing a POTS service outage, which eliminates potential customer complaints as well as the need to delay testing until the next maintenance window. In addition, technicians can perform non-intrusive DSL and/or POTS testing. All of these capabilities, plus features that include a small, 1 RU high footprint and a Web-based user interface, help to ensure profitability for DSL services.

### JDSU DSL Test Solution Overview

The JDSU QT-200 xDSL & Triple-Play Probe is installed at the DSLAM or MSAN and utilizes a test access matrix (TAM) switch—internal (ITAM), external (ETAM), or frame-based (FTAM)—to gain access to the copper loop. This arrangement allows for testing out to the end user to verify the quality of the copper loop and the remote xDSL modem. In addition, testing into the network to verify DSL, asynchronous transfer mode (ATM), IP connectivity, and video and voice over Internet Protocol (VoIP) is also possible. Graphical representations of the network and the locations of faults, along with a pass or fail test result, provide for rapid and very accurate trouble ticketing for resolution. Remote connectivity to individual QT-200 probes is via Ethernet (10BaseT or 100BaseT).

The JDSU NetAnalyst QT-EMS is utilized to perform software maintenance and probe provisioning. Testing is performed using the robust JDSU NetAnalyst test operation support system (OSS). If another test OSS is already in use, the open systems interfaces (SNMP, CORBA, and XML) provide straightforward integration into existing systems. The completely Web-based user interface supports up to 300 simultaneous users with various user privileges and requires no software installation on the users' PCs, thus eliminating the overhead costs associated with maintaining a PC-based application. In addition, concurrent multi-language support provides access to the user interface in the user's native language.

**Testing Out to the Customer Premises Equipment (CPE)**

The QT-200 xDSL & Tripe-Play Probe incorporates a number of unique patents that provide an unparalleled ability to test from the DSLAM or MSAN out to the customer network (Figure 1). A complete list of tests is available in Table 1. Key among these tests is patented use of frequency domain reflectometry (FDR) to perform single-ended loop qualification (SELQ). This test, as well as a host of others, can be performed remotely without causing a POTS service outage. The SELQ test provides key information, such as noise interference spectrum, attenuation, line length, and distance to a line fault (open or short). The single-ended nature of this test eliminates the need to send a technician to the customer premises to qualify the copper loop, saving both time and money. Other CPE-focused tests include a full suite of narrowband and wideband tests as well as power spectral density (PSD) measurements and inline monitoring. The JDSU QT-200 probe can also emulate the service provider’s network and provide service-level testing, including DSL modem synchronization and verification of end-user IP connectivity.

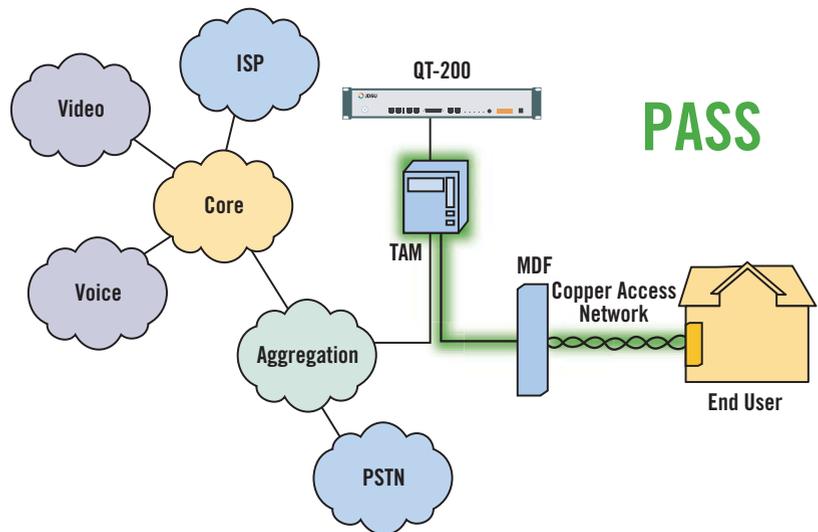


Figure 1 Testing from the central office out to the customer network using the QT-200

**Testing into the Network**

JDSU is acutely aware of the service provider’s need to rapidly sectionalize and identify problems. By taking advantage of the location of the QT-200 probe at the edge of the network, technicians can test into the network and verify connectivity through the service provider’s network out to the Internet service provider (ISP) (Figure 2). This testing includes verifying proper ATM transport, Point-to-Point Protocol (PPP) negotiation, and IP connectivity out to the public Internet. In addition, the QT-200 probe provides IPTV test capabilities to ensure the availability and quality of the video transport stream. These tests provide definitive information regarding the location of the reported problem and allow for rapid and correct trouble ticket routing and technician dispatching. The result is reduced MTTR and improved customer satisfaction. The QT-200 probe also provides VoIP and analog POTS voice testing to ensure the transition from legacy POTS switches to a full IP network.

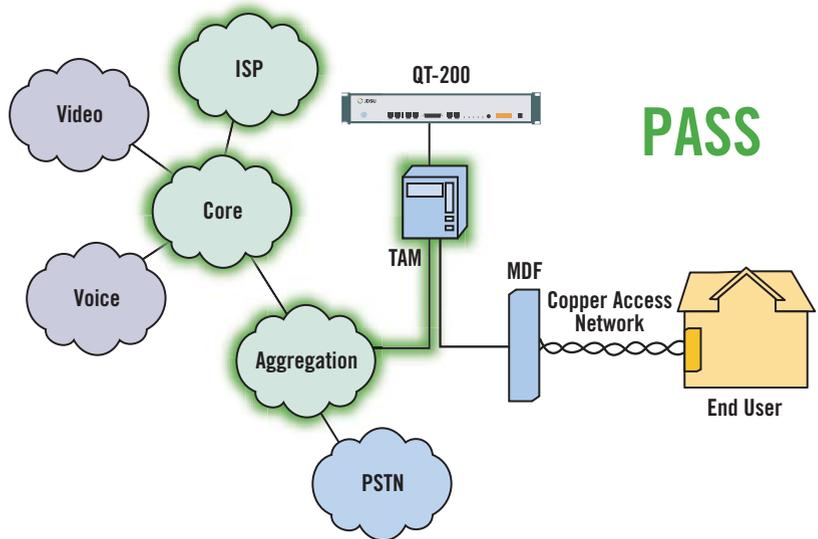


Figure 2 Testing through the service provider’s network out to the ISP using the QT-200

The JDSU NetComplete portfolio provides a comprehensive Service Assurance Solution—including industry-leading test probes, software, and systems—that support worldwide communications providers delivering next-generation network and fixed mobile convergence (FMC) services. NetComplete provides best-in-class business solutions, so service providers can effectively manage the entire life cycle for quality voice, video, data, and wireless services.

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Test	In-Service Monitoring	Out-of-Service Testing Toward the CPE	Out-of-Service Testing Toward the Network/ISP
Phone continuity	✓	✓	✓
Automatic line ID authentication			✓
On/off hook check	✓		
Dial tone check	✓		
AC/DC voltage		✓	
2-way resistance		✓	
2-way capacitance		✓	
3-way resistance		✓	
3-way capacitance		✓	
CPE signature		✓	
Fault and statement		✓	
Longitudinal balance		✓	
Load coil detection		✓	
TDR		✓	
Wideband noise	✓ (*)	✓ (*)	✓ (*)
Disturber identification	✓ (*)	✓ (*)	
HTU-R modem detection	✓ (*)	✓ (*)	
Noise spectrum analysis	✓ (*)	✓ (*)	
Carrier sets detection (ITU-T G.994) and analysis	✓ (*)	✓ (*)	
PSD measurement and mask comparison	✓ (*)	✓ (*)	
FDR (loop length, attenuation versus frequency)		✓ (*)	
ADSL and ADSL2+ bit rate prediction		✓ (*)	
HTU-C emulation		✓ (*)	
HTU-R emulation			✓ (*)
Modem training		✓ (*)	✓ (*)
Report modem activation and training failure status		✓ (*)	✓ (*)
Report upstream and downstream parameters		✓ (*)	✓ (*)
Report errors from the physical transmission		✓ (*)	✓ (*)
Check DSL bit rates and noise margin		✓ (*)	✓ (*)
Check ATM layer		✓ (*)	✓ (*)
Check PPP negotiation		✓ (*)	✓ (*)
Check IP ping connectivity		✓ (*)	✓ (*)
Check IP HTTP connectivity			✓ (*)
Display the IP traceroute			✓ (*)
IPTV and VoD check			✓ (*)
Voice testing (PESQ and Echo)			✓
Analog voice POTS tests			✓
VoIP (E-model MOSs)			✓

(\*) Test performed without interrupting the POTS service (depends on TAM capabilities)

Table 1 JDSU DSL Test Solution Measurements

**Specifications**

**QT-200 xDSL & Triple-Play Probe**

**Mechanical Dimensions**

Width	440 mm (17.32 in) ETSI and ANSI compatible rack (515 mm [20.28 in] between fixing screws)
Height	44.5 mm (1.75 in)
Depth	235 mm (9.25 in)
Weight	5 kg (11 lbs)

**Power Supply Specifications**

The QT-200 is powered from one or two -48 VDC supply input ports that operate from a nominal supply voltage of -48 V DC

Range	35 to 60 V DC
Power consumption	<20 W

**Regulatory Compliance**

CE certified	(ETS 300 386 v1.3.1 and EN 60950)
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**DSL Standards**

ADSL over POTS	ITU-T G.992.1 (Annex A)
G.SHDSL	ITU-T G.991.2 (G.SHDSL)
ADSL2+ over POTS	ITU-T G.992.5 (Annex A)
ADSL2+ over ISDN	ITU-T G.992.5 (Annex B)
Encapsulation	LLC-SNAP or VC-MUX
PPP/IP connectivity	PPPoA, PPPoE, IPoE, IPoA

**ADSL, ADSL2+ Layer**

Up/down connect rate	
Max up/down rate	
Up/down noise margin	
Up/down transmitter power	
Remote equipment vendor/model	
Training time	
Up/down attenuation	
Up/down CRC errors	
Impulse Noise Protection (INP) support (depends on modem revision)	

**G.SHDSL Layer**

Minimum connect rate	192 to 2320 kbps
SNR	
Transmitter power	
Remote equipment vendor/model	
Training time	
Local/remote CRC errors	
Receiver gain	
Local/remote errored seconds	

**ATM Layer**

VPI/VCI	
AAL1, AALS	
Encapsulation	LLC-SNAP or VC-MUX
PPP encapsulation	PPPoA, PPPoE
Cell count TX/RX	
ATM loopback (depends on modem revision)	F4/F5 segment and ETE

**Number of cells TX and RX**

Number of F4/F5 segment and ETE cells TX and RX (depends on modem revision)	
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**PPP Layer**

User login	
Password	
Chap authentication	
Pap authentication	
Local IP address, IP Netmask, DNS address, remote IP address	

**IP Layer**

Protocol to be tested	
Message count TX/RX	
Response time	
Min/avg/max in ms	
IP-ICMP	
IP-HTTP IPERF throughput	

**Non-intrusive Monitoring**

Bandwidth	-25 kHz to 4.4 MHz
RMS noise level	
Up/down PSD levels	
E, F, and G IEEE standard 743 filters	
Main disturber levels and frequencies	
<b>Wideband Copper Check</b>	
Frequency domain reflectometry (FDR)	
Attenuation measurement at center frequency	
Length/distance to fault/end of line	
Echo plot	
Cable loss plot	
ADSL, ADSL2+ bit rate prediction	

**Narrowband Copper Check**

AC and DC voltages	
Resistance	
Capacitance	
CPE Signature	
Fault and dispatch statement	
Longitudinal balance	
Power influence and balance	
POTS test capabilities	
Time domain reflectometry (TDR)	
Wiring check	

**Video Service**

MPEG-2 Transport Stream analysis over UDP/RTP/UTStarcom's RollingStream™ protocol	
Set top box (STB) emulation	
IGMP V2/V3 and RTSP protocols	

**Voice Service**

PESQ MOS score (MOS LQ0) and echo on digital or analog POTS interface	
MOS score (MOS LQ0)	
RTP/ RTCP protocol	
SIP 2.0 signalization (RFC 3268, RFC4028)	
G.711 μ-law and A-law	
Analog POTS test (round trip delay/latency, dial tone/post dialing delay, noise, attenuation, SNR)	

**Ordering Information**

Please contact your local JDSU sales office for more information about JDSU NetComplete Service Assurance Solutions.

**Test & Measurement Regional Sales**

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