Broadband Test and Measurement Solutions

A Selection Guide for Access and In-Home Network Tools and Services

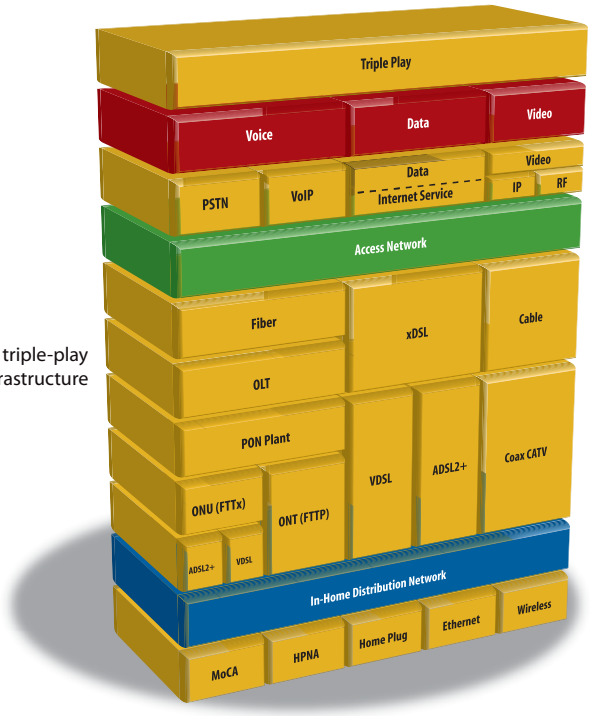
RUS requires providers to provide the following data during implementation

- Total and peak utilization of access links
- Total and peak utilization on interconnection links
- IP address utilization and IPv6 implementation
- Network management practices
- Total number of new subscribers
- Total number of subscribers
- The number of broadband customer premises equipment or end-user devices deployed
- Average increase in end-use and middle-mile speeds
- Availability of the broadband offering
- Total number of subscribers that receive improved access
- Average broadband speeds
- The speed of broadband to the public computer center

Broadband stimulus funding is creating an historic opportunity to bring the benefits of next generation communications networks to the one-third of Americans who currently do not have broadband access. The potential for rural service providers to grow business is huge, but success depends on having the right partners with the right knowledge to help bring this opportunity to reality.

Broadband delivery is complex—IP-based video and voice elements in the Multiprotocol Label Switching/Virtual Private LAN Service (MPLS/VPLS) Ethernet core network, evolving infrastructures that push optical fiber near or to the customer premises and myriad in-home distribution technologies. Each facet of infrastructure and application must interconnect seamlessly, from the headend through the home, to ensure the quality of experience (QoE) customers expect. Regardless of how these building blocks are stacked, solid network construction and reliable operation depends on comprehensive planning and a well-defined test and measurement strategy.

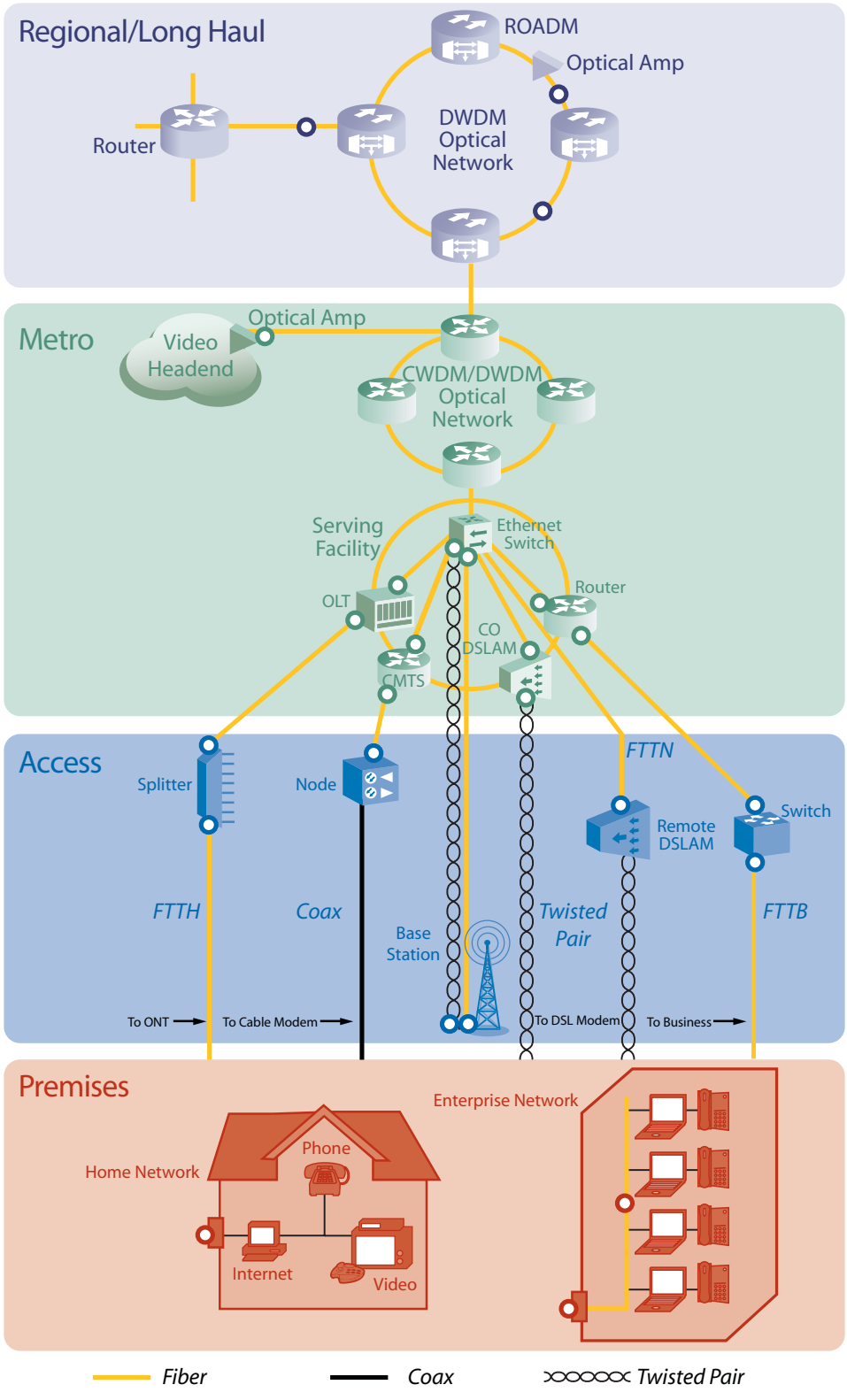
This planning and strategy is where JDSU can help you. As a leader in broadband network test and measurement solutions and optical components, JDSU has decades of experience working with large and small telecom service providers, cable operators, utilities, municipalities, and network equipment manufacturers. Whether you are deploying fiber-to-the-home (FTTH), digital subscriber line (DSL), wireless, or hybrid fiber-coaxial systems, you need the tools and expertise to install, test, and verify infrastructure and services efficiently and cost-effectively. With JDSU, you have a partner who can help you get broadband service delivery right the first time.



The Building Blocks of the triple-play services delivery infrastructure

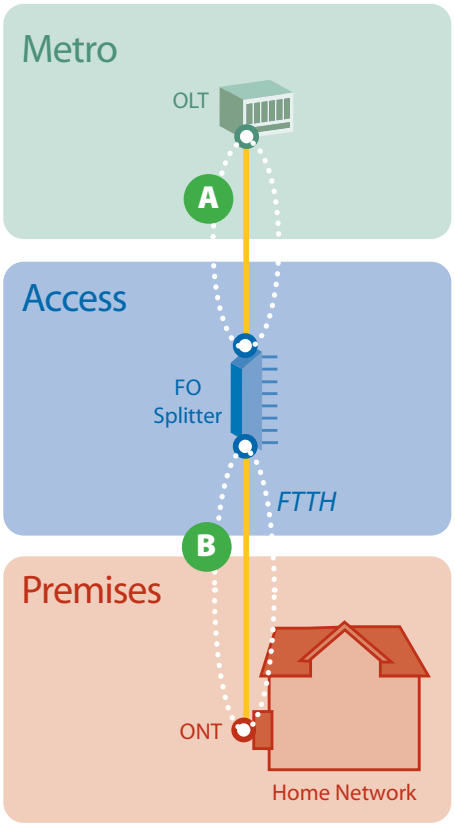
broadband@work ACROSS AMERICA™

Inside the Broadband Network



Ensuring quality for broadband services delivery requires a test strategy across all network segments. JDSU delivers the most comprehensive, reliable test and measurement products and services portfolio for all network applications and segments.

Fiber-to-the-Home (FTTH) using Passive Optical Networking (PON) Access Network Test Solutions



A Fiber Testing: OLT to FDH/Splitter (F1)

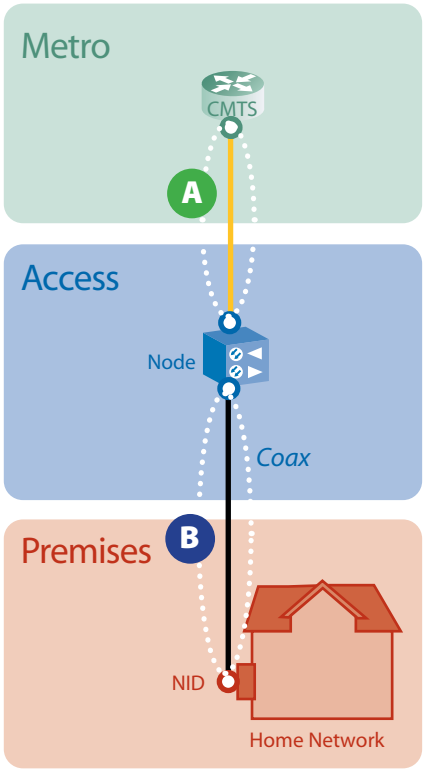
Tests to Perform	Tool Category	T-BERD-4000	SmartClass Meters	Fiber Inspection
Evaluate Connector End Face Quality	Inspection Scope	■		■
Verify Link Length	OTDR	■		
Evaluate Fiber, Connector, Splice Loss, Connector Reflectance	OTDR	■		
Measure Link Loss (Pre-Service Turn-up)	OTDR, Loss Test Set	■	■	■[1]
Measure Optical Return Loss (RF Video)	OTDR, ORL Meter	■	■	
Power Levels (at OLT, before splitter)	Broadband Power Meter	■	■	■[1]

B Fiber Testing: FDH/Splitter to Terminal/ONT (F2/F3)

Tests to Perform	Tool Category	T-BERD-4000	OLP-57 PON PowerMeter	SmartClass Meters	Fiber Inspection
Verify Link Length to each Termainal/Premise	OTDR	■			
Evaluate Fiber, Connector, Splice Loss, Connector Reflectance	OTDR	■			
Measure Link Loss (Pre- Service Turn-up)	OTDR, Loss Test Set	■		■	■[1]
Evaluate Connector End Face Quality	Connector Inspection	■			■
Measure Optical Return Loss (RF Video)	OTDR, ORL Meter	■		■	
Power Levels (after split for all down/up wavelengths)	Broadband Power Meter	■	■	■	■[1]

1 Integrated Inspection and Optical Power/Loss Measurement included with FIT-HP3 series products

Fiber-to-the-Node (FTTN) and Hybrid Fiber Copper (HFC) Network Test Solutions



A Fiber Testing: Headend to Node

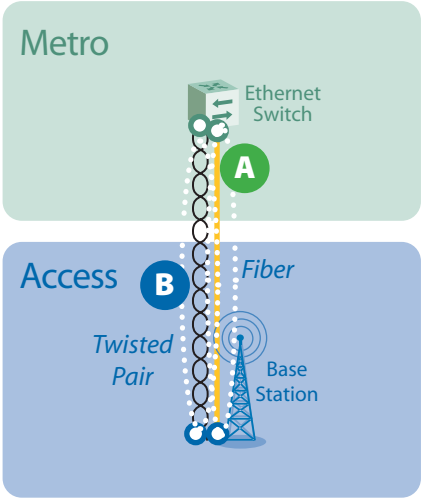
Tests to Perform	Tool Category	T-BERD-4000	SmartClass Meters	Fiber Inspection
Evaluate Connector End Face Quality	Inspection Scope	■		■
Verify Link Length	OTDR	■		
Evaluate Fiber, Connector, Splice Loss, Connector Reflectance	OTDR	■		
Measure Link Loss (Pre-Service Turn-up)	OTDR, Loss Test Set	■	■	■[1]
Measure Optical Return Loss (RF Video)	OTDR, ORL Meter	■	■	
Power Levels	Broadband Power Meter	■	■	■[1]

B Coax: Node to Home

Tests to Perform	Tool Category	DSAM-6000	DSAM-3xxx	MSQ-800/900
Amplifier RF-Sweep	Sweep	■		
Amplifer Alignment	Sweep	■		
Ingress/Noise Troubleshooting	SLM, Spectrum	■	■	
DOCSIS® Service Testing	SLM, DOCSIS	■	■	
QAM Digital Video	SLM	■	■	■
Analog Video	SLM	■	■	■

1 Integrated Inspection and Optical Power/Loss Measurement included with FIT-HP3 series products

Fiber and Copper Backhaul Test Solutions



A Fiber Backhaul for Wireless Network

Tests to Perform	Tool Category	T-BERD-4000	SmartClass Meters	Fiber Inspection
Evaluate Connector End Face Quality	Inspection Scope	■		■
Verify Link Length	OTDR	■		
Evaluate Fiber, Connector, Splice Loss, Connector Reflectance	OTDR	■		
Measure Link Loss (Pre- Service Turn-up)	OTDR, Loss Test Set	■	■	■[1]
Measure Optical Return Loss (RF Video)	OTDR, ORL Meter	■	■	
Power Levels	Broadband Power Meter	■	■	■[1]

B Copper Backhaul for Wireless Network

Tests to Perform	Tool Category	T-BERD 4000	HST-3000	SmartClass Triple Play
CU Testing[2]	Phys Plant / Repair	■	■	■[3]
30 MHz CU Testing[4]	Phys Plant / Repair	■	■	
Far End Device[5]	Phys Plant / Repair	■	■	
Customer Scripting	Uniform Test Routine	■	■	
BERT-LOOP	Service Turn-up		■	
VT100 Emulation	xDSL Card Status		■	

1 Integrated Inspection and Optical Power/Loss Measurement included with FIT-HP3 series products

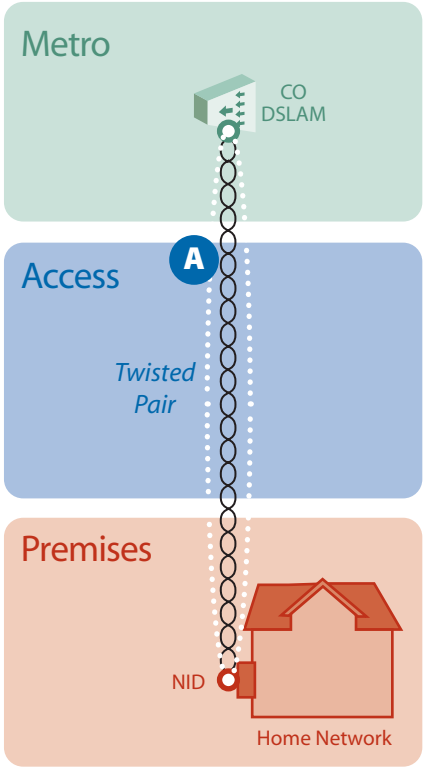
2 DVOM, Leakage Resistance, Narrowband Tone TX-RX Capacitance, Longitudinal Balance, Resistive Fault Locate, TDR, Butt Set, Load Coil Detect

3 DVOM, Leakage Resistance, Capacitance, Longitudinal Balance, Butt Set, Load Coil Detect

4 Wideband Tone TX-RX, Spectral Analysis (30 MHz), NEXT, Signal to Noise, Wideband Balance

5 Strap, TDR helper, Pair 1 to Pair 2 Short, Multi-Tone, TX-Tone (30 MHz), Tech Tone Sweep, Term 100, 135, 600 Ohm

Central-Office-to-Premises Test Solutions for Copper Twisted Pair



A CU TWP: CO to Premises

Tests to Perform	Tool Category	T-BERD 4000	HST-3000	SmartClass Triple Play
CU Testing[2]	Phys Plant / Repair	■	■	■[3]
30 MHz CU Testing[4]	Phys Plant / Repair	■	■	
Far End Device[5]	Phys Plant / Repair	■	■	
Customer Scripting	Uniform Test Routine	■	■	
ADSL 2+ Testing	Service Turn-up	■	■	■
VDSL 2 Testing	Service Turn-up	■	■	
ADSL 2+ Testing	Service Turn-up	■	■	■

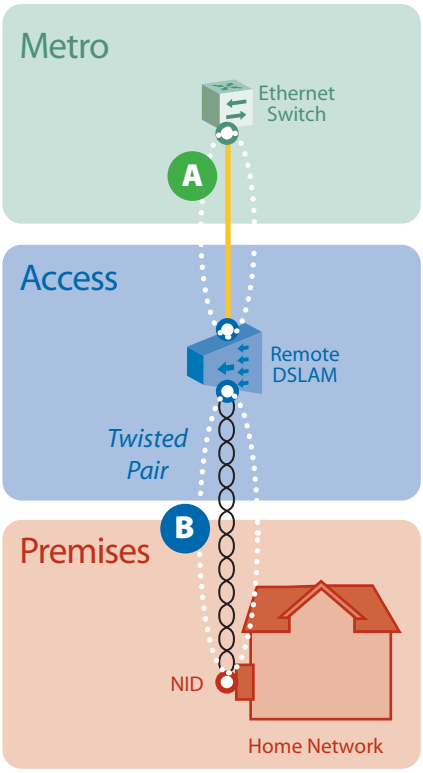
2 DVOM, Leakage Resistance, Narrowband Tone TX-RX Capacitance, Longitudinal Balance, Resistive Fault Locate, TDR, Butt Set, Load Coil Detect

3 DVOM, Leakage Resistance, Capacitance, Longitudinal Balance, Butt Set, Load Coil Detect

4 Wideband Tone TX-RX, Spectral Analysis (30 MHz), NEXT, Signal to Noise, Wideband Balance

5 Strap, TDR helper, Pair 1 to Pair 2 Short, Multi-Tone, TX-Tone (30 MHz), Tech Tone Sweep, Term 100, 135, 600 Ohm

Hybrid Fiber and Copper Network Test Solutions



A Fiber Testing: Serving Office (Eth Switch) to Remote IP-DSLAM

Tests to Perform	Tool Category	T-BERD-4000	SmartClass Meters	Fiber Inspection
Evaluate Connector End Face Quality	Inspection Scope	■		■
Verify Link Length	OTDR	■		
Evaluate Fiber, Connector, Splice Loss, Connector Reflectance	OTDR	■		
Measure Link Loss (Pre- Service Turn-up)	OTDR, Loss Test Set	■	■	■[1]
Measure Optical Return Loss (RF Video)	OTDR, ORL Meter	■	■	
Power Levels	Broadband Power Meter	■	■	■[1]
Wavelengths/ Channel Power Levels (CWDM Networks)	OSA/Channel Checker	■	■	

B CU TWP Testing: Remote IP DSLAM to Premises (NID)

Tests to Perform	Tool Category	T-BERD 4000	HST-3000	SmartClass Triple Play
CU Testing[2]	Phys Plant / Repair	■	■	■[3]
30 MHz CU Testing[4]	Phys Plant / Repair	■	■	
Far End Device[5]	Phys Plant / Repair	■	■	
Customer Scripting	Uniform Test Routine	■	■	
ADSL 2+ Testing	Service Turn-up	■	■	■
VDSL 2 Testing	Service Turn-up	■	■	
Triple-Play Service Testing	Service Turn-up	■	■	■

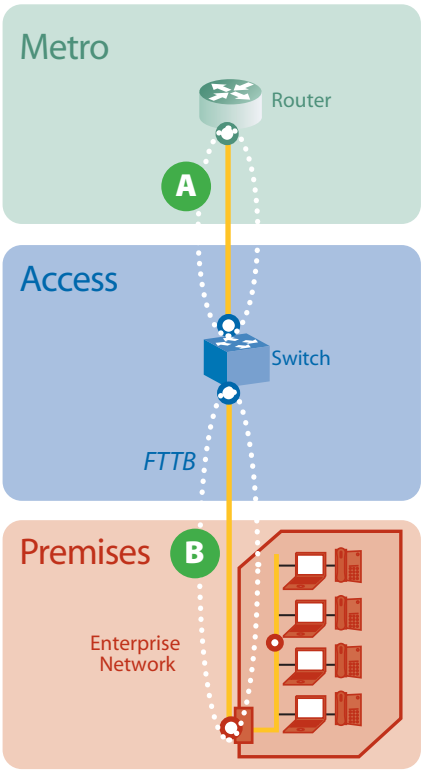
2 DVOM, Leakage Resistance, Narrowband Tone TX-RX Capacitance, Longitudinal Balance, Resistive Fault Locate, TDR, Butt Set, Load Coil Detect

3 DVOM, Leakage Resistance, Capacitance, Longitudinal Balance, Butt Set, Load Coil Detect

4 Wideband Tone TX-RX, Spectral Analysis (30 MHz), NEXT, Signal to Noise, Wideband Balance

5 Strap, TDR helper, Pair 1 to Pair 2 Short, Multi-Tone, TX-Tone (30 MHz), Tech Tone Sweep, Term 100, 135, 600 Ohm

Fiber-to-the-Business (FTTB) Access Network Test Solutions



A Fiber Testing: Serving Office Router to Remote Switch

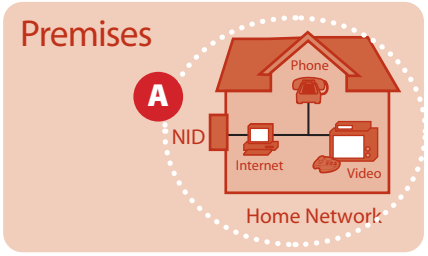
Tests to Perform	Tool Category	T-BERD-4000	SmartClass Meters	Fiber Inspection
Evaluate Connector End Face Quality	Inspection Scope	■		■
Verify Link Length	OTDR	■		
Evaluate Fiber, Connector, Splice Loss, Connector Reflectance	OTDR	■		
Measure Link Loss (Pre- Service Turn-up)	OTDR, Loss Test Set	■	■	■[1]
Measure Optical Return Loss (RF Video)	OTDR, ORL Meter	■	■	
Power Levels	Broadband Power Meter	■	■	■[1]
Wavelengths/ Channel Power Levels (CWDM Networks)	OSA/Channel Checker	■	■	

B Fiber Testing: Remote Switch to Business

Tests to Perform	Tool Category	T-BERD-4000	SmartClass Meters	Fiber Inspection
Evaluate Connector End Face Quality	Inspection Scope	■		■
Verify Link Length to each Terminal/Premise	OTDR	■		
Evaluate Fiber, Connector, Splice Loss, Connector Reflectance	OTDR	■		
Measure Link Loss (Pre- Service Turn-up)	OTDR, Loss Test Set	■	■	■[1]
Measure Link Return Loss (RF Video)	OTDR, ORL Meter	■	■	
Power Levels	Broadband Power Meter	■	■	■[1]
Wavelengths/ Channel Power Levels (CWDM Networks)	OSA/Channel Checker	■	■	

1 Integrated Inspection and Optical Power/Loss Measurement included with FIT-HP3 series products

In-home Network Test Solutions



A In-Home Testing

Tests to Perform	Tool Category	T-BERD-4000	SmartClass Home	IW-1000	Tri-Porter	TestifierPRO	Wi-Net Window	DSAM	MSQ-800/900
HPNA	Physical Media		■						
WiFi	Physical Media	■	■				■		
Active ID	Physical Media		■						
Noise Immunity	Physical Media		■	■				■	
Splitter Detection w/ Noise & dB Loss (SECM)	Physical Media		■	■					
Splitter Detection	Physical Media		■	■	■				
Cable ID	Physical Media		■	■	■				
Wire Mapping, Length, Tone Gen, Cable ID (Coax, CAT 3/5/6)	Physical Media		■	■	■				
Ping, Port Discovery	Service	■	■	■	■				
Hub Flash	Service		■	■	■	■			
Butt Set	Service	■	■	■	■				
Dial Tone Simulator	Service				■				
QAM Digital Video	Service							■	■
Analog Video	Service							■	■
DOCSIS®	Service							■	
VDSL2	Service	■	■[6]						
VoIP	Service	■				■			
MPEG 2 Stream Analysis	Service	■							

6 VDSL2 available in SmartClass Home Full version only

Services

Tasks of Broadband Network Life Cycle

	Operational Process and Re-Engineering	Network Planning & Optimization	Broadband & IPTV Network Assessment	Optical Network Qualification	Fiber Characterization	Training & Knowledge Transfer	Product Support
Services							
Planning and Design for New Services	■						
Networks							
Planning and Design for Networks	■					■	
Verification of Metro Core Fibers					■	■	
Assessment of Existing Network Infrastructure			■	■	■	■	
Staging and FOA Testing			■	■	■	■	
Deployment of Network Infrastructure			■	■	■	■	■
Network and Service Quality Optimization		■	■			■	■
Operations							
Design and Optimization of OSS Infrastructure	■						
Development of Operational Models and Processes and Procedures	■						
Development and Implementation of SLAs and SLOs	■						
Deployment of OSS Infrastructure and Operations Tools	■						

Products and Services At-A-Glance

Connector Inspection Tools

Range of products enabling connector inspection, including handheld probes and video displays, integrated inspection and test solutions, and automated connector inspection and analysis tools.

DSAM Digital Services Activation Meter

Handheld field meter for DOCSIS®/EuroDOCSIS cable modem installation; enables cable installers to increase the speed and efficiency in deploying high-speed data and video services.

HST-3000 Handheld Services Tester

Modular, access network tester for voice over Internet Protocol (VoIP), IPTV, and the installation and maintenance of next-generation FTTx and PON-based triple-play services.

MSQ-800 Handheld QAM Signal Level Meter

Compact, handheld field signal-level meter with quadrature amplitude modulation (QAM) analysis; allows field and installation technicians to ensure the quality of RF analog and digital cable services.

OLP-57 PON Meter

Selective PON Power Meter—Measures optical power levels for both downstream (1490 nm data, 1550 nm RF video) from optical line termination (OLT) and upstream bursts (1310 nm) from optical network termination (ONT).

Smart Optical Meters

SMART Optical Power Meters are designed for installing, testing, and maintaining single-mode and multimode networks and cables.

SmartClass Triple-Play Services Meter

All-in-one tool for broadband services installation, including copper, ADSL 1/2/2+, IP data, VoIP, and IP video testing.

SmartClass™ Home

Enables verification of very high speed DSL (VDSL) and Home Phoneline Networking Alliance (HPNA) networks as well as the internal wiring at the customer premises for proper operation of voice, video, and data services; tests VDSL to the side of the premises, HPNA inside the premises, as well as the coax and twisted pair wiring inside the subscriber's location.

SmartClass™ IW-1000

Enables verification of internal wiring at the customer premises for proper operation of voice, video, and data services; tests coax and twisted pair wiring inside the premises to support installing or troubleshooting triple-play services over existing or new networks.

T-BERD® 4000 Multiple Services Test Platform

Modular, handheld test platform designed for all phases of installation and maintenance of Access/FTTx networks and triple-play services; offers field service technicians the highest performance and superior levels of scalability and upgradeability.

TestifierPro™ Cable Tester

Performs essential physical cabling tests and wiring verification for telco, network, and coax cable; includes tone generator and LCD display.

Tri-Porter™ Premises Wiring Tester for Voice, Data & Video

Triple-play tester that performs the work of multiple tools: DSL-safe butt set, network tester, tone generator, cable tester, tone detector, and coax mapper.

Wi-Net Window™ Wireless Tester

Identifies, clarifies, and configures all wireless transmission equipment on a site; provides a clear picture of the range and availability of each wireless access point.

Broadband & IPTV Network Assessment

Using a unique three-phase program, this JDSU service assesses the broadband and IP video delivery capability of existing network infrastructure and provides cost-effective recommendations to achieve the desired network performance. The areas being assessed may cover metro transport, last mile access, and end-to-end service experience while the evaluation metrics often include items such as service quality, capacity, scalability, and service resiliency.

Fiber Characterization

This service helps network operators determine if a fiber is suitable for high data rate and wavelength division multiplexing (WDM) applications without costly compensation or additional equipment. JDSU provides the most trusted service by combining comprehensive project management and expert test results analysis with the use of the award-winning T-BERD 8000 platform. The testing typically includes optical insertion loss, optical return loss, optical time domain reflectometry (OTDR), chromatic dispersion, and polarization mode dispersion.

Network Planning & Optimization

JDSU works with network operators to design, plan, and optimize their next-generation network infrastructure to support broadband service launches and expansion. Our teams apply industry-leading expertise in agile and high-speed optical networking, access technologies, network and service modeling, and cost-performance trade-offs to help operators reduce time to market; smoothly roll out new converged networks; and provide high-quality, reliable services at an optimal cost.

Operational Process and Re-Engineering

JDSU works with operators to plan and design new services including high-speed data services, video services delivered over HFC or via IPTV technologies, and commercial metro Ethernet and mobile backhaul services. JDSU also assists in the design, optimization, and deployment of OSS infrastructure and of operational models and methods and procedures supporting the operations environment including development and implementation of service level agreements (SLAs) and internal service level objectives (SLOs).

Optical Network Qualification

With deep expertise in optical networking, test, and measurement, JDSU helps operators qualify and test the design and implementation of next-generation optical networks. This service helps operators during staging, trial, and field rollout.

Product Support

As one of the world's largest providers of test equipment, we support and extend the life of JDSU and third-party communications test equipment. Our services include repair, calibration, extended warranty and upgrades, both on-site and at JDSU service centers. We offer fast, quality repairs and can help keep equipment calibrated and maintained to the highest levels of accuracy, to ensure maximum useful life and return on investment (ROI).

Training and Knowledge Transfer

Training on the latest technologies and JDSU products is available as online and face-to-face training in a variety of formats from low-cost, self-paced training to complex custom-built classes. Our training helps telecom operators address recognized skills gaps for new service or technology introductions. We can also help develop and migrate an existing technician base from supporting legacy telecom services to supporting and deploying advanced broadband networks and IP-based services.

broadband@work ACROSS AMERICA™

Test & Measurement Regional Sales

NORTH AMERICA	LATIN AMERICA	ASIA PACIFIC	EMEA	WEBSITE: www.jdsu.com/test
TEL: 1 866 228 3762 FAX: +1 301 353 9216	TEL: +1 954 688 5660 FAX: +1 954 345 4668	TEL: +852 2892 0990 FAX: +852 2892 0770	TEL: +49 7121 86 2222 FAX: +49 7121 86 1222	

 30162904 000 1109 BROADBANDTM.SG.TFS.TM.AE November 2009