

## T-BERD®/MTS-4000 Multiple Services Test Platform

### Triple-Play Services Software Option



#### Key Features

- **Video service (IPTV) testing**
  - **IP Multicast test (broadcast video service):** Generate IGMP Join and Leave requests to verify the functionality of stream flows, channel changes, and multi-cast communications
  - **IP Unicast test (video on demand [VoD] service):** Generate RTSP client requests for access to VoD media server to verify the functionality of program stream flows and uni-cast communications
  - **Decode and display I-Frame**
- **Voice service (VoIP) testing**
  - **Emulate a VoIP phone for service turn-up and troubleshooting**
  - **Supports Cisco SCCP, SIP, MGCP, H.323, and Nortel Unistim signaling protocols**
- **Data services testing**
  - **Provides a fully integrated Web browser**
  - **Offers Throughput testing (FTP, HTTP)**

#### Applications

- Tests IPTV video quality, including analysis of video streams and packet statistics on up to 10 streams in Monitor Mode and 6 streams in Terminate Mode, including video mean opinion score (VMOS)
- Assesses VoIP packet quality and voice quality rating using MOS and R-Factor
- Tests data services, including ping, trace route, and Web browser functions from a 10/100/1000 Ethernet port or optional xDSL modules
- Scans the virtual local area network (VLAN) for current configuration and activity

The JDSU T-BERD/MTS-4000 equipped with the Triple-Play Software option delivers comprehensive Internet Protocol (IP) service-level testing in a rugged, handheld, battery-operated platform that is ideal for Access and Home network turn-up, troubleshooting, and maintenance.

The growth of triple-play services has changed the landscape of the telecommunications industry through the creation of new opportunities, while also introducing significant challenges for service providers. To remain competitive, providers must efficiently deploy bundled voice, video, and data to the exacting demands of customers—delivering on both quality of service (QoS) and experience (QoE), while reducing operating expenses.

The T-BERD/MTS-4000 meets these challenges and more as the first multi-application platform with fully integrated copper and fiber functionality that addresses the complete set of requirements for triple-play, such as turn-up, troubleshooting, and maintenance. The T-BERD/MTS-4000 Triple-Play Services Software gives field service technicians who install and maintain triple-play service over leading-edge fiber- and copper-based digital subscriber line (DSL) Access networks a complete suite of essential testing tools in one unit.

Flexible connectivity, including universal serial bus (USB), high-speed 10/100/Gigabit Ethernet (GigE), Wireless Fidelity (WiFi), and Bluetooth, interfaces make downloading software and offloading captured test data easier, thus increasing productivity and baseline network performance.

## Architecture

The T-BERD/MTS-4000 is designed for skilled field technicians who install and maintain various next-generation fiber (FTTx) networks delivering triple-play services that often require advanced troubleshooting, including in-depth physical layer tests on copper or fiber—or increasingly both.

### Layered Graphical User Interface

The figure below shows the JDSU Quality Layer Model integrated into the T-BERD/MTS-4000 graphical user interface (GUI) to enhance root-cause analysis. Technicians can use it to locate IP service problems more easily and quickly.

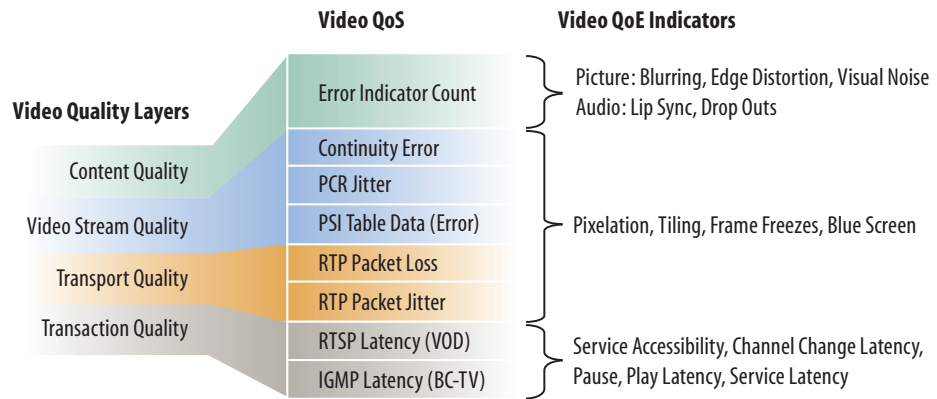


Figure 1: JDSU Quality Layer Model



Figure 2: Example of Video test results using the T-BERD/MTS-4000 GUI with the JDSU Quality Layer Model

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The Triple-Play Software Option for the T-BERD/MTS-4000 installed on the base unit can be used with the resident Ethernet (10/100/Gig E) port. It is compatible with field-swappable T-BERD/MTS-4000 xDSL interface modules.

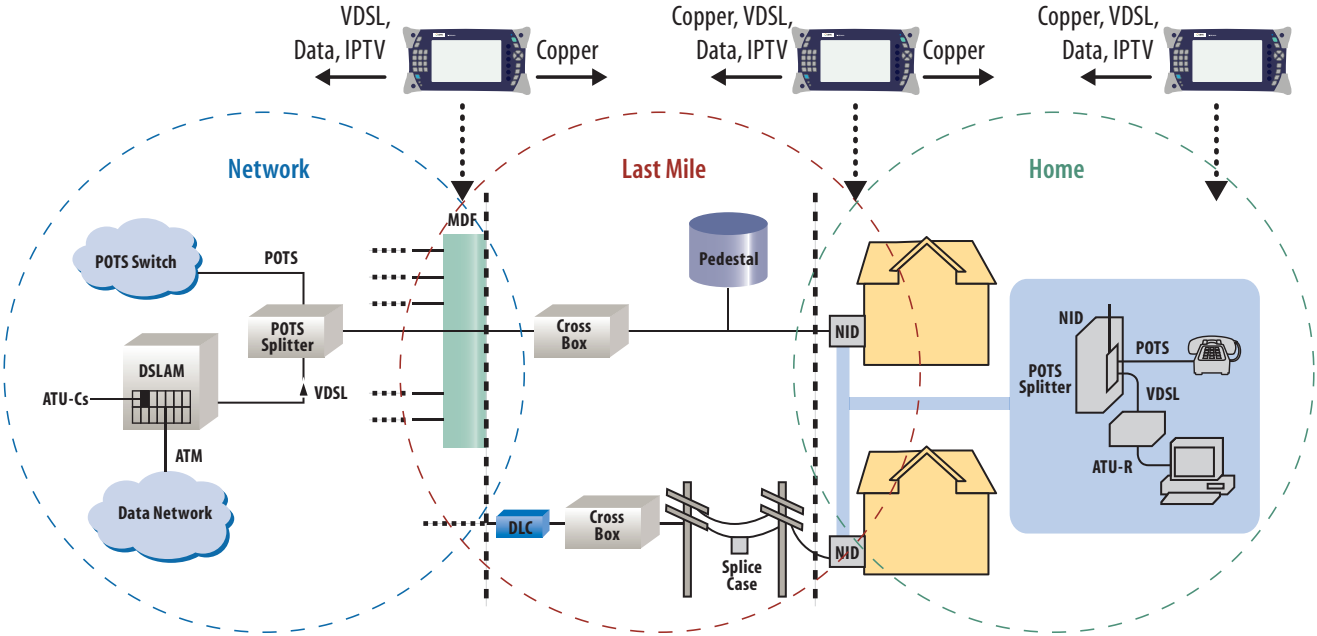


Figure 3: Example of a typical DSL architecture

## Applications

The T-BERD/MTS-4000 provides the full range of capabilities needed to test today's leading-edge FTTx and copper access networks plus the expandability needed to test next-generation networks. The wide range of testing technologies offered by the T-BERD/MTS-4000 provide all of the testing functions that technicians need at every stage of the network lifecycle, from the physical layer to the application layer, in a single handheld and rugged unit.

The T-BERD/MTS-4000 delivers an integrated approach to field testing with test support for specific application use cases. Field-swappable modules are available for multi-service testing and two modules can run simultaneously.

### IP Video Testing

The T-BERD/MTS-4000 enables analysis of the video service (IPTV) stream anywhere in the Access network using a DSL or Ethernet interface. With its advanced performance monitoring features, the T-BERD/MTS-4000 accurately measures video QoS and QoE using built-in tests for content, transport, transaction, and physical link quality.



Figure 4: Example of IPTV Video Stream test



Figure 5: Example of IPTV Summary test screen

### VoIP Testing

Technicians can use the T-BERD/MTS-4000 to turn up and troubleshoot voice service (voice over IP [VoIP]) connectivity, feature availability, and voice quality. They can also conduct IP ping, packet statistic, and trace route analysis to identify, diagnose, and sectionalize VoIP network and equipment problems.

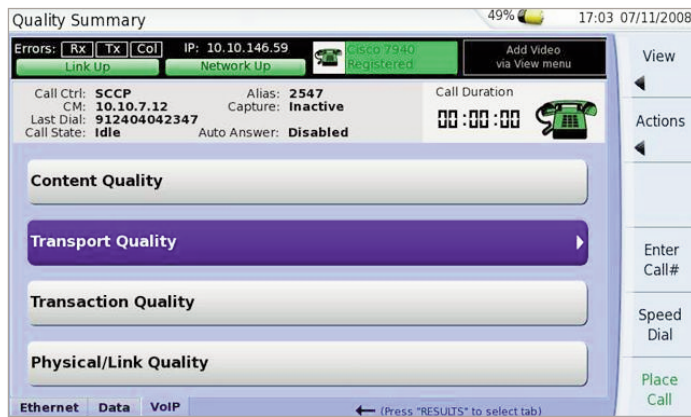


Figure 6: VoIP test interface

### IP Data Testing

The T-BERD/MTS-4000 enables Internet connectivity testing using an integrated Web browser and also performs required IP data tests (such as IP ping delay) to verify bandwidth requirements for real-time applications and services (such as online gaming and streaming video).



Figure 7: IP Ping test interface

### CoS Testing

With its advanced test capabilities that address each triple-play application QoS metric, the T-BERD/MTS-4000 let carriers focus on effective Class of Service (CoS) testing to ensure priority mapping for IP services. All three applications can be run at the same time simulating mixed traffic flows. Interactions that violate CoS rules can be identified quickly.

## The Right Tool for Today's Triple-Play Tests

The lightweight, rugged, and battery-operated T-BERD/MTS-4000 cost-effectively scales to provide an all-in-one solution for field installation, maintenance, and troubleshooting across a wide range of test applications for copper, fiber, and triple-play services. With automation features, such as auto tests, custom scripts, work flow ticket support, and flexible connectivity that improve workforce efficiency, the T-BERD/MTS-4000 is ideally suited to optimize even the most complex and advanced FTTx networks.



## Specifications

### Test Ports/Interface Support

10/100/1GigE (configurable—half/full duplex auto detect), RJ45  
Optional ADSL1/2/2+, VDSL1/2 (modem port 8-pin modular—line on center pins, Tip-Ring connections)

### Cable Test CAT 3/5

#### TDR Results

Fault type open/short  
Distance to fault

#### GigE Results

Polarity  
Skew

### Ethernet Data

#### Media Type

Auto, 10/100/1000 Mb/s full, half duplex

#### Data Modes

IPoE, PPOE, data off

#### IP Mode

DHCP, static

#### MAC Setting

Factory default, user-defined

#### VLAN

Tag on/off

ID selection 0–4095

Priority selection 0–7

#### Web Browser

On/Off

### Reported Results—Ethernet TE

#### Ethernet Statistics

Link status, link speed, link duplex detection  
TX collisions, TX/RX (bytes, frames, errors, dropped frames)

#### LAN/WAN Results

IP address, Net mask, gateway, DNS, MAC address

#### PING ICMP and UDP Statistics

Echoes sent/received, PING delay (Cur/Avg/Max/Min), lost count/percentage

Supports IP address or DNS name destination

#### Trace Route ICMP and UDP Statistics

Hop count, name lookup, and IP address of hops  
Supports IP address and DNS address destination

#### FTP/HTTP

Upload/download rate, transfer count, time

#### VLAN scan

VLAN, priority, frame count, last seen

### VoIP Specifications

#### Supported Signaling Protocols

H.323 ITU-T H.323 version 3 Fast Connect

H.323 ITU-T H.323 version 3 Full Connect

(MSD, CAPSET, OLC exchange)

Skinny Cisco Client Protocol (SCCP)

SIP RFC 3621

Nortel Unistim

MGCP

#### Supported Codec Configuration

ITU-T G.711 u-law/A-law (PCM/64 kb/s)

ITU-T G.723.1 (ACELP/5.3, 6.3 kb/s)

ITU-T G.726 (ADPCM/32 kb/s)

ITU-T G.729a (GS-ACELP/8 kb/s)

ITU-T G.722 64K

ITU-T H.261 video conferencing

ITU T H.263 video conferencing

User-selectable silence suppression, jitter buffer, and voice packet size

User-selectable transmit source (live voice conversation, tone transmit (200–5 kHz), pre-recorded wave file (up to 2 Mb)

#### LAN Settings

User-selectable calling alias

User-selectable IP address, static or DHCP

User-selectable subnet mask, gateway, and DNS server

User-selectable or default MAC address VLAN configurable—

IEEE.802.1p/q

Configurable IP TOS

#### Gatekeeper Settings

User-selectable static/auto discovery, or no gatekeeper direct connect mode

Supports inbound and outbound calls with or without gatekeeper support

### Reported Results—VoIP

#### Call Stats

Full incoming call statistics, including IP address, far-end alias, far-end name, RTPC availability/ports, codec and rate, call signaling support, silence suppression enabled, and call duration

#### Throughput Audio/Video

Sent/received in bytes and packets, out-of-sequence packets, remote packets

#### Voice Stream Timeline

Packet delay, packet jitter, packet loss, overall QoS

#### Incoming Delay

Network, encoding, packetization, buffering, and total delay

### Content Quality

Call quality R-Factor	Current/Min/Max/Average
Line quality R-Factor	Current/Min/Max/Average
R-Factor G.107	Current/Min/Max/Average
R-Factor burst	Current/Min/Max/Average
R-Factor gap	Current/Min/Max/Average
CQ MOS	Current/Min/Max/Average
LQ MOS	Current/Min/Max/Average
PQ MOS	Current/Min/Max/Average

### Transport Quality

Audio jitter	Current/Min/Max/QoS History
Audio packets lost	Current/Min/Max/QoS History
Audio overall QoS	Current/Min/Max/QoS History

Voice and video quality rating based on packet metrics thresholds set by user MOS rating, R-Factor, and voice degradation factors support packet capture and filtering (save internally or to USB mass memory storage)

**Specifications**
**IP Video Specifications**
**Modes**

Terminate, Monitor, Through

**Set Top Box Emulation**

IGMPv2 and v3 emulation client

IGMP message status/decode status/error message

RTSP emulation client

**Service Selection**

Broadcast video-UDP

Broadcast video-RTP

VOD-RTSP-UDP

ISMA broadcast

ISMA VOD (RTSP-UDP)

ISMA VOD (TTSP-TCP)

Rolling stream-R-RTP/UDP

**Video Source Address Selection**

IP address and port number

IP address, port number, and VOD URL extension

RTSP port select

RTSP vendor select

**Multiple ATM VC Setup Selection**

Virtual channels with simultaneous usage

Selectable TX peak cell rate (PCR) for signaling channel

**Video Analysis is Per Video Stream**

Simultaneous stream support 6 Terminate, 10 Monitor

**IP Packet Analysis**

Total packets RX count

Jitter current/max

RTP packets lost, count

RTP OOS, count

RTP errors, count

**PID Analysis (each stream)**

PID number

PID type (video, audio, data, unknown)

PID description

**Summary Statistics**

Terminate active stream count 1-6

Monitor active stream count 1-10

Data rates combined Current/Ave/Min/Max

**QoS**

Error indicator count

Continuity error event count Current/Max

Continuity error event percentage Current/Max

PCR jitter

Current/Max ms

IGMP latency ms

RSTP latency ms

QoS score

(Pass/Fail threshold selections)

**Graphs**

Packet loss

QoS timeline

Jitter

**Content Quality**

PID, class, description

Error indicator count

Service name

Program name

Video MOS

R-Factor

Degradation (loss, discard, codec)

**Stream Quality**

Sync errors Count

Continuity errors Current/Average/Min/Max

Continuity errors % Current/Average/Min/Max

PCR jitter Count

PID timeouts Count

PAT errors Count

PMT errors Count

**Video Stream Data Rates**

Total Current/Average/Min/Max

IP Current/Average/Min/Max

Video Current/Average/Min/Max

Audio Current/Average/Min/Max

Data Current/Average/Min/Max

Unknown Current/Average/Min/Max

All streams Current/Average/Min/Max

**Transport Quality**

MDI delay factor Current/Average/Max

MDI MLR Current/Average/Max/Total

MDI buffer size Current/Average/Max

RTP jitter Current/Max

Lost packets Current/Average/Max

RTP packet loss Distance Errors Threshold/Current/Max/Total

Period Errors Threshold/Current/Max/Total

**Error Logging**

Timestamp for error events

QoS state changes Pass to Fail, Fail to Pass

**Signaling Protocol Message Decode:**

IGMP Messages

RTSP Messages

500 Message FIFO Buffer Storage—File Export

**Standards**

RFC2236, IGMP RFC2326, RTSP

ISO (IEC 13818), Video Transport ETSI TR 10-290 V2.1,

Steam and Analysis Video Measurements

TFC-1483; 2684, ATM AAL5 RFC2364, PPPoAAL5

RFC4445, Media Delivery Index (MDI)

**Ordering Information**
**Triple-Play Software Options**

C4000-VOIP Standard VOIP

C4000-VOIP-CISCO Cisco Call Manager

C4000-VOIP-UNISTIM Nortel Unistim Call Manager

C4000-IPTV Standard IPTV

C4000-CABLDIAG Cable Diagnostics