Ethernet Service Interface Module (SIM)

Gigabit Ethernet Testing for the HST-3000

Key Benefits

- Single, compact module for testing next-generation carrier Ethernet

- Automated SAMComplete/ITU-T Y.1564 test accurately measures KPIs for structured voice, video, and data

- Flexible to support packet-based networks and optional legacy TDM testing

- Supports Gigabit or 100 Mbps optical as well as 10/100 Mbps twisted-pair Ethernet

- Offers fiber inspection and optical power meter to certify fiber connections and performance

- Speeds service delivery and ensures that all voice, video, and data services meet required bandwidth and performance requirements

Key Features

- Electrical and optical Ethernet testing in a single module

- SAMComplete provides Y.1564 service-activation testing methodology

- Layer 2, 3, and 4 traffic generation up to interface line rate

- Automated RFC 2544 tests at Layers 2 to 4 (Eth/IP/TCP/UDP)

- Supports Ethernet OAM, PBB/PBT, MPLS, VLAN, and Q-in-Q

- Options for VoIP and IP video/Microsoft TV testing

- Dual-port 'Thru mode' configuration enables live traffic analysis

- Optional USB-mounted P5000i offers unique pass/fail fiber inspection

The JDSU HST-3000 platform just got even better. Equipped with the Ethernet Service Interface Module (SIM) along with SAMComplete testing, fully compliant with ITU-T Y.1564, and fiber inspection and optical power measurement capability, the HST-3000 accelerates carrier Ethernet service provisioning and mean-time-to repair.

Accurately and simultaneously delivering IP video, voice, and data traffic over a structured Ethernet transport requires more than just a single Layer 2 or 3 pipe test. The HST-3000 puts the power of multi-layer access network and carrier Ethernet service provisioning and troubleshooting in the palm of your hand. With SAMComplete service activation testing, fully compliant with ITU-T Y.1564, the HST-3000 emulates traffic simultaneously carrying IP video, voice, and data content to accurately validate structured Ethernet service-level agreements (SLAs). SAMComplete guides users through simple test setup and operation with easy-to-interpret results that can be saved using an innovative user interface. The HST-3000's flexibility performs across various network infrastructures and tunneling technologies (VLAN, MAC-in-MAC, and MPLS) that provide common quality of service (QoS), traffic engineering, redundancy, and scalability across the service infrastructure.

For carrier Ethernet services deployed over optical fiber, up to 90 percent of performance faults are traceable to dirty or damaged fiber interfaces. The JDSU P5000i, the world's most versatile and reliable analysis microscope, mounts to the HST-3000 USB interface for unique, objective pass/fail fiber inspection that removes subjective guesswork. The included FiberChekPRO™ software certifies fiber end-face quality to industry standards (including IEC 61300-3-35) or customer specifications.

Carrier Ethernet Installation Testing

ITU-T Y.1564 SAMComplete™ Service-Activation Testing

SamComplete is an easy-to-use tool to quickly and easily measure service-level agreement (SLA) performance according to ITU-T Y.1564 service-activation methodology. The feature suite, available on HST-3000s with the multiple streams option, validates user-defined SLAs by first testing each service independently during service configuration test. If the service configuration test passes, all streams are tested simultaneously during the service-performance test. SAMComplete provides pass/fail results for key performance indicators (KPIs) including committed information rate (CIR), extended information rate (EIR), frame delay (FD), frame-delay variation (FDV) and frame-loss rate (FLR) independently for up to eight simultaneous services.
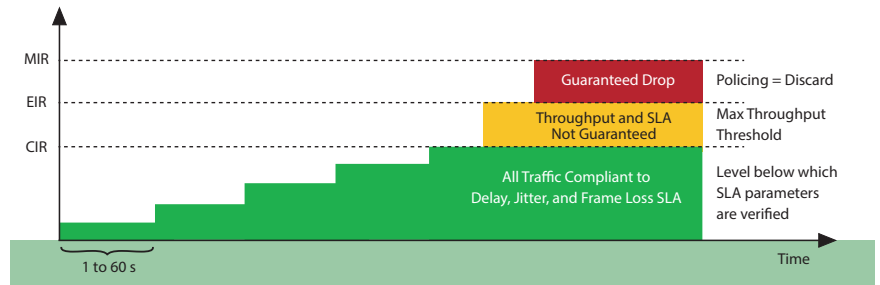

Service configuration test (ramp test) validates each service/stream

SAMComplete employed in the HST-3000, as well as in the JDSU T-BERD®/MTS-5800, -6000, -8000, and QT-600 offers the unique time-saving capability to stop the service configuration test in the event of a failure, saving technicians valuable time.
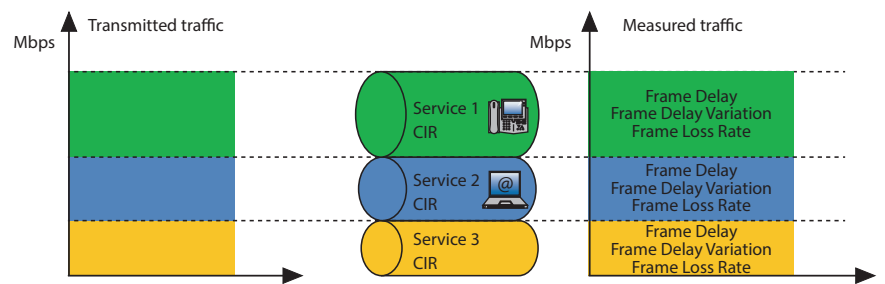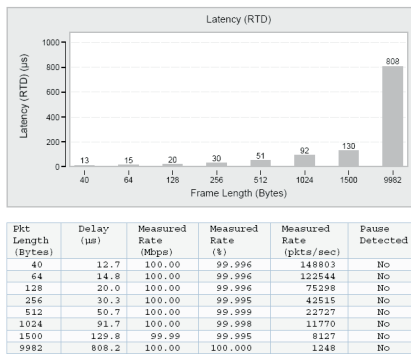

Service-performance test (multistream) tests all streams simultaneously

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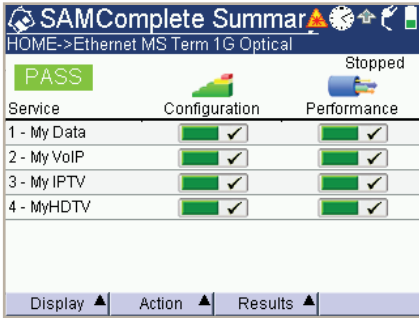
HST-3000 SAMComplete test summary

Latency (RTD) Test Results:

Pkt Length (Bytes)	Delay (µs)	Measured Rate (Mbps)	Measured Rate (%)	Measured Rate (pkts/sec)	Pause Detected
40	12.7	100.00	99.996	148803	No
64	14.8	100.00	99.996	122544	No
128	20.0	100.00	99.996	75298	No
256	30.3	100.00	99.995	42515	No
512	50.7	100.00	99.999	22727	No
1024	91.7	100.00	99.998	11770	No
1500	129.8	99.99	99.995	8127	No
9982	808.2	100.00	100.000	1248	No

RFC 2544 latency/round-trip delay (RTD) test results report

Enhanced RFC 2544 Testing

The HST-3000 delivers all the carrier Ethernet testing needed to qualify Ethernet-based transport networks. In addition to supporting Ethernet CIR, FD, FLR, and back-to-back burst testing required in the de facto industry standard RFC 2544, the HST-3000 also tests packet jitter or FDV to ensure circuit readiness for transporting time-sensitive services such as Internet TV (IPTV) and voice over IP (VoIP). JDSU-enhanced RFC testing measures CIR, FD, and FV concurrently to reduce test times by more than 60 percent and delivers a zeroing-in algorithm to more quickly establish maximum throughput on an Ethernet virtual circuit (EVC). Using a pair of test sets and asymmetric RFC testing, users can validate EVCs with different upstream and downstream CIRs or they can test sequentially in both directions to ensure any connection type meets the KPIs.

SLA Verification with Multiple Traffic Streams

Many service providers now realize the value of testing more than just a single Ethernet stream to the customer when providing multiple services over the same Ethernet transport. It is extremely critical to test different classes of service (CoS) to offer customers tiered services or to prioritize traffic and effectively manage triple-play networks. These deployments lead to new challenges where latency and loss may not affect regular traffic, but higher-priority traffic fails to meet its required SLA.
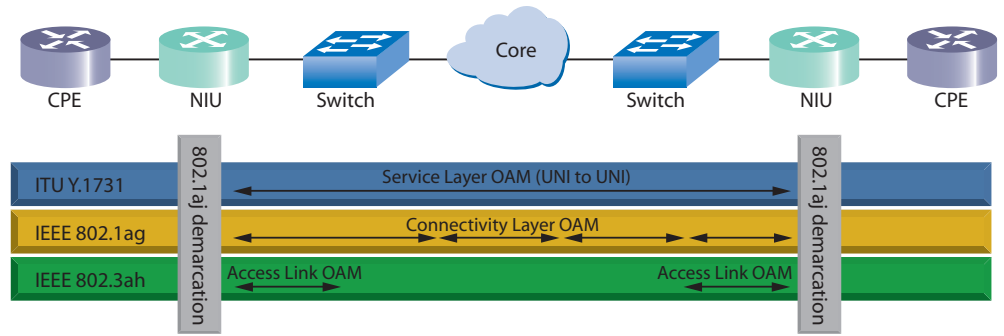
To ensure that delivery meets SLA requirements for structured voice, video, and data services, technicians can use the multiple streams option to measure Layer 2, 3, and 4 performance and oversubscribe the network elements to determine if the various SLAs are met. Technicians can generate up to eight simultaneous traffic streams, with differing encapsulation and priority schemes, locate performance bottlenecks and accurately establish SLA guidelines.

PBB-TE/PBT

Provider backbone bridging with traffic engineering/transport (PBB-TE/PBT) offers an enhancement to Ethernet (IEEE 802.1ah/802.1Qay) that was developed to meet the scalability requirements of metro/aggregation networks. By adding a backbone tag (B-TAG), operators can aggregate and maintain large numbers of links and services. The HST-3000 PBB/PBB-TE test suite lets users terminate or monitor a PBB/PBB-TE trunk or generate and analyze traffic with backbone MAC/VLAN ID (B-MAC/B-VID) and service ID (I-SID).

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Ethernet OAM

Ethernet operation, administration, and maintenance (OAM) gives service providers a critical tool for troubleshooting carrier Ethernet services. The HST-3000 Ethernet service-layer OAM test suite lets customers monitor the status of a link, automatically identify open links, and generate loopback and linktrace messages for path verification and discovery. The test suite complies with ITU Y.1731/IEEE 802.1ag Connectivity Check (CCM/ETH-CC), Loopback (LBM/ETH-LB), and Linktrace (LTM/ETH-LT) messages. With Link Layer OAM (IEEE 802.3ah Ethernet First Mile), users can discover peer devices, monitor alarms, and provide link-level loopback capability.

Ethernet OAM testing

VoIP call analysis

VoIP Testing

Successful VoIP service turn-up and troubleshooting requires proving connectivity to the signaling gateway, feature availability, and call quality. The HST-3000 can emulate an IP phone and place and receive VoIP calls via a huge range of VoIP signal gateways, including Cisco SCCP (Skinny), session initiation protocol (SIP), media gateway control protocol (MGCP), MEGACO, H.323, and Nortel Unified Networks IP Stimulus (UNIStim). The HST-3000 provides an objective packet-based measurement of VoIP provisioning by placing actual VoIP calls and measuring call quality of out-of-sequence packets by analyzing delay, jitter, and packet loss. The HST-3000 measures call quality based on Telchemy's patented single-ended live-call method of assessing subjective voice quality in terms of both mean opinion score (MOS) and R-factor in real time. The HST-3000 then compares objective and subjective measurements to accurately verify acceptable VoIP call quality. The HST-3000's unique VoIP inspector mode automatically detects network configurations/customer premises equipment (CPE) configurations/signaling type and attributes, to rapidly reduce configuration time. For unsupported gateway signaling, such as over a satellite link, the HST-3000's convenient "auto-answer" mode automatically answers and provides the required KPIs for analysis.

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IP video QoS analysis

Fiber inspection with a USB-mounted P5000i Digital Analysis Microscope

Optical power measurement with the MP-60

IP Video Testing

IP-based video services are helping traditional telecommunications service providers grow revenues by offering new and differentiated services. However, delivering good quality of experience (QoE) cost-effectively is complex and demanding. The HST-3000 can help accomplish this task with a suite of video test options that can be fined-tuned to the needs of various networks and field crews. It supports both video on demand (VoD) and broadcast service analysis, new service installation and troubleshooting, root-cause analysis that quickly separates source issues from distribution network ones, and matches specific quality of service (QoS) metrics to thresholds tuned to a given network design. These advanced test suites include: true CoS testing that analyzes mixed voice, data, and video traffic in the access network; MOS analysis with detailed audio, video, and a combined audio-visual (AV) view; and detailed packet analysis supporting error correction mechanisms operating at the packet level using Pro-MPEG Forum or Microsoft MediaRoom techniques, as well as packet-loss distribution analysis. The MediaRoom analysis further analyzes R-UDP error-recovery mechanisms as well as instant channel change (ICC) actions. The HST's copper, DSL, and Ethernet test interfaces and operating modes, including terminate, monitor, and through, coupled with the advanced test suites simplifies multilayer analysis, expanding possible depths for problem-solving and root-cause analysis. Simple pass/fail indicators for critical KPIs make the HST easy to use.

Fiber Testing

Fiber Inspection with the P5000i Digital Analysis Microscope

For years, the JDSU HST-3000 Handheld Services Tester has been the one instrument technicians have trusted for everything from copper testing to service verification. Yet today's carrier Ethernet networks also require fiber inspection to assure error-free performance given that the primary cause for poor performance in optical networks is contaminated fiber connectors. Adding the JDSU P5000i Digital Fiber Inspection probe to the HST-3000 gives technicians an essential tool that bridges the gap between copper and fiber testing as they expand into verifying Carrier Ethernet networks or various fiber (FTTx) connections terminated in a fiber-fed digital subscriber line access multiplexer (DSLAM). The USB-mounted P5000i with FiberChekPRO™ provides unique, reliable pass/fail analysis to quickly and easily certify that every connection in the network is optimized for a lifetime of performance.

Miniature USB 2.0 Power Meters with FiberChek2™ Integration

The miniature JDSU MP-Series Power Meter measures optical power via a USB 2.0 connected to the HST-3000. This unique device enables digital processing of optical power measurements and integrates directly with JDSU FiberChek2 software, the industry-leading automated fiber inspection and analysis program. The HST-3000 supports two MP power meter models: the MP-60 for 850, 1300, 1310, 1490, and 1550 nm connections, and the MP-80 for 980, 1310, 1480, and 1550 nm connections. The size, functionality, and ease-of-use of these tools make them extremely useful and practical for testing optical power levels.

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Specifications

Physical

Size (h x w x d)	241 x 114 x 70 mm (9.5 x 4.5 x 2.75 in)
Weight (with battery)	1.23 kg (2.7 lb)
Operating temperature	−5.5 to 50℃ (22 to 122°F)
Storage temperature	−40 to 65.5℃ (−40 to 150°F)
Battery life	10 hrs. typical usage
Charging time	7 hrs. from full discharge to full charge
Operating humidity	10 to 80% relative humidity
Storage humidity	10 to 95% relative humidity
Display	3.8″ diagonal, 1/4 VGA, Color Active Matrix with backlight (readable in direct sunlight)

Test Interfaces

Optical Ethernet/IP
100/1000 Mbps Dual SFP ports

Electrical Ethernet/IP
10/100/1000 Mbps Dual RJ45 ports

Test Modes

Terminate	
Monitor/Thru (bidirectional monitor)	

Ethernet (Layer 2)

Duplex modes	Full, half
Flow control	Supported
Traffic generation	Constant, ramp, bursty
Payload	ATP, BERT
Frame length	64-1526 bytes, user-defined, undersized, jumbo, random
MAC addressing	Configurable source and destination MAC addresses
Frame format	802.3 or DIX
ARP mode	Enable, disable
VLAN settings	ID, priority
QinQ settings	TPID, customer VLAN ID, customer VLAN priority, service provider VLAN ID, service provider priority, and service provider, DEI bits
MPLS settings	Label, priority, TTL, MPLS Ethertype (Unicast or Multicast), # MPLS Labels (1 or 2)
J-Proof (Layer 2 Transparency Settings)	Frames 1 through 20
Protocol	STP, RSTP, MSTP, LLDP, GMRP, GVRP, CDP, VTP or user-defined
Number of Frames Transmitted	1 to 100
MAC-in-MAC Settings	Backbone Source MAC Address Type, Backbone Destination Address, Backbone Tag, VLAN ID, Priority, DEI Bit, I-Tag, I-Tag Priority, I-Tag DEI Bit, I-Tag UCA Bit, I-Tag Service ID
MAC-in-MAC Filters	B-Tag VLAN ID, B-Tag DEI Bit, I-Tag Priority, I-Tag DEI Bit, I-Tag UCA Bit, I-Tag Service ID, Customer Frame Filter

Ethernet OAM Settings

OAM Type	802.1.ag/Y.1731
Service Layer OAM Continuity Check Messages (CCM)	Loss of Continuity Threshold, CCM Rate, CCM Type, MEG ID, Peer MEG End ID, MD Level, Peer MEG End ID
Service Layer OAM Alarm Indication Signal (AIS)	MD Level, AIS Rate
Service Layer OAM Loopback Message (PING)	MD Level, LBM Type
Service Layer OAM LTM/LTR (Trace route)	MD Level
Link Layer OAM Local Config	Active/passive, Vendor OUI, Vendor-specific info., Max PDU size, Link Events, Remote Loopback, Variable Retrieval
Link Layer OAM Defects	Link Fault, Dying Gasp, Critical Event
Link Layer OAM Events	Symbol Period Window, Symbol Period Threshold, Frame Window, Frame Threshold, Frame Period Window, Frame Period Threshold, Frame Second Summary Window, Frame Second Summary Threshold
Bit error testing patterns	PRBS (223^{-1}, 231^{-1}, and inverted selections), all Ones, all Zeros, user-defined
Framed pattern test per NCITS TR-25:1999	CRPAT, CJPAT, CSPAT
Traffic filtering	MAC source address, MAC destination address, Frame type/length, VLAN ID, VLAN Priority, SVLAN ID, SVLAN Priority, MPLS Label, MPLS Priority

IP Version 4 (Layer 3) Specifications

Traffic generation	Constant, ramp, bursty
Data mode (electrical only)	IPoE, PPPoE
IP addressing	Configurable source and destination IP addresses, TOS/DSCP
Traffic filtering	Source IP address, destination IP address, TOS/DSCP, VLAN ID, VLAN Priority, SVLAN ID, SVLAN Priority, MPLS Label, MPLS Priority

IP Version 6 (Layer 3)

Traffic generation	Constant, ramp, bursty
IP addressing	Stateless autoconfiguration, Stateful autoconfiguration, Manual
Traffic filtering	Source IP address, Source prefix, Destination IP, Destination Prefix Traffic Class Type, VLAN ID, VLAN Priority, SVLAN ID, SVLAN Priority

TCP/UDP (Layer 4)

Traffic mode	TCP, UDP
Port addressing	Source, Destination

Multiple Streams

Number of streams	8
Stream modes	Layer 2, Layer 3, Layer 4
Encapsulations	VLAN ID, VLAN Priority, SVLAN ID, SVLAN Priority

SAMComplete (ITU-T Y.1564)

Test modes	Disable, symmetric
Layers	2, 3
Streams	Eight
Loop type	Broadcast, Unicast
Frame formats	DIX, 802.11
Service type	Data, voice, HDTV, SDTV
Length types	Frame, packet
Frame lengths	64, 128, 256, 512, 1024, 1280, 1580, random, user-defined
Packet lengths	40, 64, 128, 256, 512, 1024, 1500, random, user-defined
Encapsulation	None, VLAN, QinQ
Thresholds	CIR, EIR, policing, FL, M value, FD, and FDV

RFC 2544

Test modes	Disable, symmetric, asymmetric upstream, asymmetric downstream, asymmetric combined
Layers	2, 3, and 4
Length type	Frame, packet
Frame lengths	64, 128, 256, 512, 1024, 1280, 1518, 9600, user-defined, disable
Packet lengths	40, 64, 128, 256, 512, 1024, 1500, 9582, user-defined, disable
Test selections	Throughput, latency (RTD), packet jitter, system recovery, frame loss, back-to-back frames, maximum bandwidth
Frame lengths	64, 128, 256, 512, 1024, 1280, 1518, 9600, user-defined, disable

Cable Testing

Optical	Power measurement, SFP Vendor Name
CAT V cable	Link speed, link status, crossover/straight, distance to fault, pin mapping, pair length, polarity, skew
Power over Ethernet	Indicates if the power supply responds to Class 1 power requests

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Ordering Information

Base units

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

Available SIMS (Modules)

Part Number	Description
HST3000-4WLL	4-wire Local Loop
HST3000-AR2A	ADSL1/2/2+ (ATU-R, Annex A)
HST3000-AR2B	ADSL1/2/2+ (ATU-R, Annex B)
HST3000-BLK	Blank
HST3000-BRA	ETSI (Euro) ISDN BRA
HST3000-BRI	ISDN BRI
HST3000-CAR2A	ADSL1/2/2+ with Copper (ATU-R, Annex A)
HST3000-CAR2A-TI	Copper, ADSL2+ TI (ATU-R, Annex A)
HST3000-CAR2B-TI	Copper, ADSL2+ TI (ATU-R, Annex B)
HST3000-CSH4	Copper, 4-wire G.SHDSL (STU-R/C, Annex A/B)
HST3000-CT1	T1 and Copper
HST-3000-CU	Dual T/R/G Interface to Copper Test SIM
HST3000-CUCE	Copper only SIM, CE Marked
HST3000-DC	Datacom
HST3000-E1	E1
HST3000-E1-DC	E1/Datacom
HST3000-ETH	10/100/1000 Ethernet
HST3000-GSH	G.SHDSL
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
HST3000-WB2	Wideband 2 (up to 30 MHz) Copper Test

Software Options

Part Number	Description
HST3000-802.11	802.11 Wireless
HST3000-BLUETOOTH	Bluetooth Wireless
HST3000-COS	Class of Service
HST3000-DSL2	ADSL2 and ADSL2+
HST3000-FR	Frame Relay
HST3000-FTP	FTP
HST3000-IPV6	IPv6
HST3000-MPLS	MPLS
HST3000-MSTR	Multiple Streams
HST3000-MSTV	Microsoft IPTV Video Analysis
HST3000-OPTETH	Optical Ethernet
HST3000-PCMSIG	Signaling (PCM)
HST3000-PCMTIMS	TIMS (PCM)
HST3000-PRI	ISDN PRI (NC Standard)
HST3000-PS	Pulse Shape
HST3000-REMOP	Remote Operation
HST3000-RFL	RFL
HST3000-SCRIPT	Scripted Test
HST3000-SPE	Spectral Noise
HST3000-ST	Basic Rate ISDN S/T (ANSI)
HST3000-T1DDS	DDS-T1
HST3000-TCPUDP	TCP/UDP
HST3000-TDR	TDR
HST3000-TxIMP	Transmission Impairments
HST3000-UNISTIM	VoIP Signaling Call Controls for UNISTIM
HST3000-VT100	VT100 Emulation
HST3000-WBTONES	WB TIMS

Part Number	Description
HST3000S-H.323	H.323 VoIP Signaling
HST3000S-IP	Advanced IP Suite—PING and Through Mode Support
HST3000S-IP-Video	IP Video Analysis
HST3000S-MGCP	SCCP MGCP VoIP Signaling
HST3000S-MOS	VoIP Mean Opinion Score
HST3000S-SCCP	SCCP VoIP Signaling
HST3000S-SIP	SIP VoIP Signaling
HST3000S-VMOS	Video MOS Analysis
HST3000S-VOIP	VoIP Software Analysis
HST3000S-WEB	Web Browser
FIT-SD103-C	Kit: P5000i, MP-60, FiberChekPRO software, case, tips, adapters, and cleaning materials
FIT-SD103	Kit: P5000i, MP-60, FiberChekPRO software, case, tips, and adapters
FBP-SD101	Kit: P5000i Digital Analysis Microscope, FiberChekPRO software, case, and 4 tips
MP-60	USB Optical Power Meter (850, 1300, 1310, 1490, and 1550 nm)
MP-80	USB Optical Power Meter (980, 1310, 1480, and 1550 nm)

Test & Measurement Regional Sales