FTB-635 Wideband Copper and DSL Test Module

WIDEBAND COPPER AND ADSL2+/VDSL2 ADVANCED MULTIPLAY TESTING

EXFO Connect Compatible

smartR™

PRODUCT SHEET

Powerful, total tool kit for troubleshooting high-value multiplay services over FTTN/ADSL2+/VDSL2 and Ethernet

KEY FEATURES AND BENEFITS

- Complete FTTN troubleshooting tool kit, with optical, copper, DSL and Ethernet test features—all in one
- SmartR™ features automatically analyze metallic test results using plain language and graphics to identify and locate faults
- ADSL2+ and VDSL2 bonding allows service providers to recover and grow wireline revenues
- Ethernet interfaces up to 1G for qualifying FTTN services at the customer premises
- IPTV test suite with live video preview
- Full Web browser for complete service qualification
- Large, colorful touchscreen for clear and intuitive testing

PART OF THE
FTB COPPER ACCESS SERIES

FTB-610
Wideband Copper
Test Module

EXFO | Assessing Next-Gen Networks

A NEXT-GENERATION TOOL FOR BROADBAND DEPLOYMENTS

EXFO's FTB-635 Wideband Copper and DSL Tester is the perfect tool for any service provider deploying multiplay services over FTTN and hybrid networks. The all-in-one FTB-635 tests optical power, wideband copper, ADSL2+/VDSL2, 1G Ethernet and multiplay services, including live video preview. The large display of the FTB-635 makes it even more user-friendly, clear and intuitive, and when it comes to capturing and uploading results, it provides technicians with many connectivity options for uploading tests and compiling reports.

SmartR™ TECHNOLOGY

Equipped with SmartR technology, the FTB-635 enables technicians and engineers alike to work smarter—not harder. It is the next generation of telco cable testing that automatically identifies and locates common circuit faults and presents results using intuitive graphical displays and plain language. The Pair Detective feature automatically runs the most common line tests and provides graphical, color-coded, plain language results and pass/fail indications to detect conditions, including shorts, grounds, opens, battery, splits and imbalances. FaultMapper uses time-domain reflectometry (TDR) technology to provide the additional capability of identifying the location of the service-affecting line faults, including bridged taps, shorts, grounds and opens. EXFO's unique SmartR draws an easy-to-understand graph of the wire pair, making copper troubleshooting easier than ever.

COMPLETE ADSL/VDSL2 SERVICE TESTING

Housed in EXFO's FTB-1 Platform, the FTB-635 is the most powerful DSL service troubleshooting tool for FTTN triple-play services. Whether for testing copper, ADSL2+, VDSL2, Ethernet or triple-play services, the FTB-635 is complete and provides technicians with many connectivity options for uploading tests and compiling reports. The FTB-635 combines multiple tools, ranging from a multimeter, wideband transmitter/receiver and noise meter, wideband impulse noise meter, balance, TDR, noise meter, RFL and SmartR technology, to allow effective troubleshooting of VDSL2 circuits. With an integrated modem supporting the newest capabilities, VDSL2 can be emulated up to 30 MHz, including improved performance with vectoring. DSL and Ethernet WAN (1G) and LAN interfaces enable testing on FTTH circuits and inside premises. Emulate a set-top box or VoIP calls inside or outside, to know where and when the service works. Test IPTV streams (multiple streams and live video preview) with the powerful test suite of the FTB-1 handheld modular platform.

ANNEX A AND B IN ONE CONFIGURATION

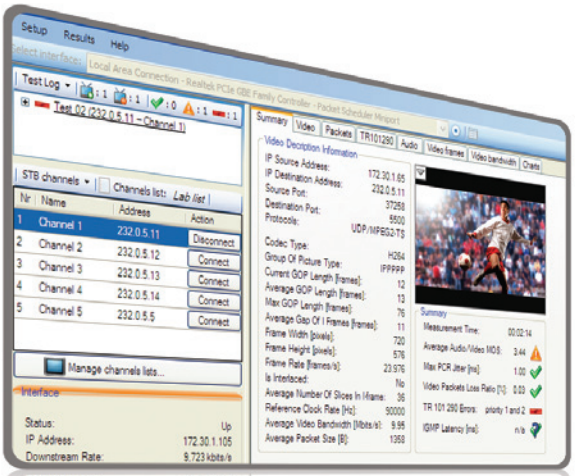
With a choice of modems, the FTB-635 supports testing services over Annex A up to profile 30a, as well as bonded circuits, or Annex A and Annex B up to profile 30a. Annex A and B together are convenient and economical for technicians troubleshooting both types of circuits, eliminating the need to swap modules or use a separate device.

SUPPORTING THE LATEST DSL TECHNOLOGIES: G.INP AND VECTORING

VDSL2 is revitalizing the copper plant with new methods that help achieve high-quality multiplay and take noise mitigation to the next level through G.INP (impulse noise protection and physical layer retransmission as defined by ITU-T G.998.4) and vectoring (ITU-T G.993.5). These techniques are supported by the FTB-635 to validate and ensure maximum performance of DSL circuits.

POWERFUL ON-BOARD TRIPLE-PLAY TESTING

The on-board EXFO EXpert application options on the FTB-1 Platform provide the power to test and troubleshoot your triple-play services—whether via 1G Ethernet on the platform (for FTTH circuits and in-premises connections) or DSL on the test interfaces of the FTB-635 (for fiber-to-the-cab and other DSL circuits). The VoIP analysis includes call emulation for common codecs; in-depth IP analysis and tests to analyze data delivery and network connection issues, and in-depth IPTV testing to include a live video preview. Whether outside or inside, the FTB-635 is ready.



FULL COLOR WEB BROWSER AND THIRD-PARTY APPLICATIONS

The Windows-based FTB-1 Platform provides a fully functional Internet Explorer Web browser, enabling full access to the provider portals and clear, independent, visual proof to end customers of properly provisioned Internet services. What's more, selected third-party applications are also on board, such as Net Stumbler to check Wi-Fi signals in the premises, or Wireshark to capture and analyze IP packets to isolate service-delivery problems at the Ethernet/IP layer.

KEY DSL APPLICATIONS

- Ensures that customers have the required bandwidth (downstream and upstream rates) for delivering triple-play services over single-pair or bonded ADSL2+ and VDSL2
- Validates that the IPTV and data services can operate on the circuit with the required QoS
- Provides in-depth view of link quality at all layers
- Isolates service issues outside and inside on FTTC and FTTH networks

KEY COPPER APPLICATIONS

- Every tool needed for troubleshooting FTTN circuits from the cab to the set-top box: optical power measurement, VFL, fiber assessment, ADSL/VDSL2 testing and wideband copper testing
- Complete suite of manual and automated advanced metallic tests **for any service**, from multimeter to TDR to wideband impulse noise
- 30 MHz wideband spectrum analysis for analyzing any circuit cable service qualification, up to VDSL2 band plan (8, 12, 17, 30 MHz)
- High-power isolation for finding those highly resistive faults and insulation failures on long circuits
- Unmatched short- and long-range wireless connectivity to capture, upload, analyze and leverage captured measurements

ALL THE RIGHT FEATURES

IPTV Testing

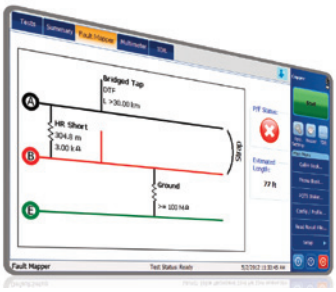
To boost their revenues, many service providers are using DSL to deliver new multiplay services on their existing networks. Among these services, video (IPTV) is one of the fastest growing and is getting a high level of focus and investment. Knowing that customers are very sensitive when it comes to IPTV QoS (i.e., picture quality due to packet loss, zap time, etc.), technicians must be sufficiently equipped to find and resolve complex IPTV issues, to restore service and meet customers' QoS expectations. With this in mind, the FTB-635 offers a powerful, optional Expert IPTV test suite to test the depth of IPTV services across multiple streams and types in an efficient yet in-depth manner. What's more, the FTB-635 can replace a set-top box and show a real-time video preview, enabling to validate to the customer that the service had been restored.

Advanced Noise Testing

IPTV and video services over VDSL2 are sensitive to noise levels and frequencies that were of no concern before. Conventional voice-band testers simply do not see higher frequency disturbers, which often lead to complaints and many repeats on newer, high-value services. The FTB-635 incorporates high-frequency wideband noise analysis to identify and understand the constant and impulse noise environment to include repetitive electrical impulse noise (REIN).

High-Voltage Testing

High-voltage isolation tests, from 50 V to 300 V (optionally) enable engineers to test insulation breakdown on lengthy and power span circuits.



Graphical Fault Location

The unique FaultMapper test automatically runs appropriate tests, including TDR to identify faults. Instead of presenting a simple signal return line, FaultMapper analyzes and locates faults. FaultMapper even names faults using plain language, thereby eliminating the guesswork, and making fault location easier than ever.

Easy to Use

The FTB-635's next-generation user interface is up-to-date, taking full advantage of the seven-inch color touchscreen to create a user experience that many will find familiar. The large display makes use of colored icons and graphics for easy configuration and operation, and is simple, intuitive and quick for experienced and novice users alike.

Results and Tester Management

Test results are simply too valuable to leave in the field: operators that collect and analyze (data mine) results can improve their processes, increase compliance and reduce OPEX. Through EXFO Connect, compatible with the FTB-1, collecting and uploading data is easy for post processing and analysis. EXFO Connect also makes it easy to manage the fleet of test equipment in the field, ensuring standardization of processes, firmware revision and tester profiles on a per-unit basis. With full visibility and accountability into each test set, leverage EXFO Connect on the FTB-600 series to maximize the effectiveness of technicians and test equipment in the field.

Floating Option Licenses

The FTB-635 supports the floating option licenses, so more users can access options that are less-frequently used, maximizing your investment. (EXFO Connect is required.)

EXFO Connect

EXFO Connect

AUTOMATE ASSET MANAGEMENT. PUSH TEST DATA IN THE CLOUD. GET CONNECTED.

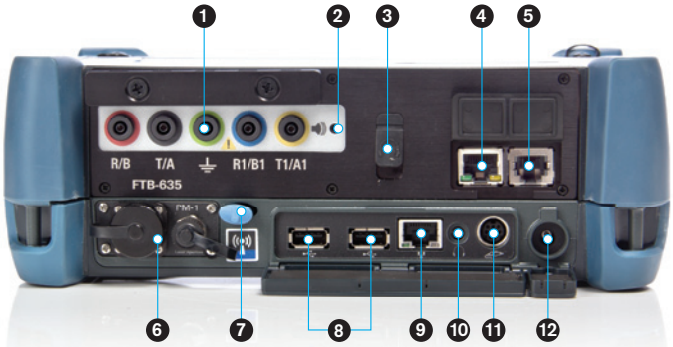
EXFO Connect stores and pushes test equipment and test data content automatically in the cloud, allowing you to streamline test operations from build-out to maintenance.

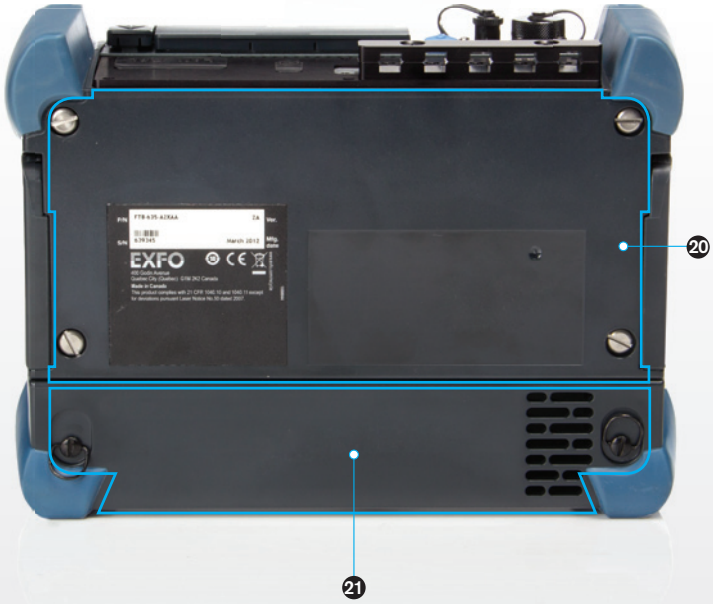
ADDITIONAL FEATURES

- Full multimeter, including series resistance detection
- Graphical power harmonics to 20 kHz
- Choice of Annex A modem supporting VDSL2 30a profile (and optionally bonding), or Annex A and B combined
- Vectoring and G.INP
- Timed and continuous DSL tests
- Profiles and results reporting and exporting
- Live video preview on the tester

DESIGNED FOR EFFICIENCY

1. Copper connectors
2. POTS speaker
3. Headphone jack
4. Ethernet port
5. DSL port
6. Power meter and VFL
7. Stylus
8. Two USB 2.0 ports
9. 1 GigE port
10. Head set
11. Fiber inspection probe video port
12. AC adapter
13. Back stand
14. Speaker out
15. Brightness
16. Keyboard/screen capture
17. Switch application
18. Power on/off
19. Battery LED
20. Module compartment
21. Battery





DSL SPECIFICATIONS — PRELIMINARY

DSL chipset	Broadcom	
Standards compliance	ADSL1/2/2+	ITU-T G.992.5 (ADSL2+ including Annex A, B, M) ITU-T G.992.3 (ADSL2 including Annex A, B, L) ITU-T G.992.1 (G.DMT including Annex A, B) ATIS/ANSI T1.413 Issue 2 IEEE 802.3ah (PTM) ITU-T G.998.x (ATM, Ethernet bonding)
	VDSL2	ITU-T G.993.2 Annex A,B Profiles: 8a/b/c/d, 12a/b, 17a, 30a Band Plan: 997, 998, US0 IEEE 802.3ah (PTM) ITU T G.998.2 (Ethernet bonding)
DSL parameters	Maximum attainable bit rates Actual achieved bit rates Actual bonded achieved rates Latency mode: fast, interleaved Data mode: ATM, PTM Capacity (%) Signal-to-noise ratio (SNR) margin Output power Attenuation Bits/bin Attenuation/bin (Hlog/bin) QLN/bin SNR/bin Vendor code, revision	Interleave depth Interleave delay Trellis coding Bit swapping INP Nitro PhyR, G.INP Vectoring (single pair) Modes: PTM, ATM, Nitro LOS, FEC, CRC, HEC LATN per band SATN per band EWL KL0
Test interfaces	VDSL2 ADSL1/2/2+ Ethernet 10/100BT	
Encapsulation methods	RFC 2684 supporting bridged Ethernet (IPoE) IPoA (RFC 1577)	PPPoE (RFC 2516) PPPoA/LLC and PPPoA/VC-MUX (RFC 2364)
Operating modes	DSL Terminate Modem Replacement (DSL to Ethernet) Pass Through	Ethernet Terminate
Login format	User name and password using PAP/CHAP	
Connectivity support	LAN/WAN status DNS, gateway DHCP client/server, DHCP vendor class NAT	VLAN ID, VLAN tagging VPI/VCI

COPPER SPECIFICATIONS [a, b, c]

Transmitter characteristics		
Frequency range (200 Hz to 20 kHz)	Frequency resolution	1 Hz steps
	Frequency uncertainty (accuracy)	±(50 ppm + 1 Hz)
	Level range	–20 dBm to 20 dBm at 600 Ω
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	±1 dB
Frequency range (20 kHz to 2.2 MHz)	Frequency resolution	1 kHz steps
	Frequency uncertainty (accuracy)	±(50 ppm + 100 Hz)
	Level range	–20 dBm to 10 dBm at 100 Ω
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	±1 dB
Frequency range (2.2 MHz to 17 MHz)	Frequency resolution	1 kHz steps
	Frequency uncertainty (accuracy)	±(50 ppm + 100 Hz)
	Level range	–20 dBm to 0 dBm at 100 Ω
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	±1 dB
Frequency range (17 MHz to 30 MHz)	Frequency resolution	1 kHz steps
	Frequency uncertainty (accuracy)	±(50 ppm + 100 Hz)
	Level range	–20 dBm to 0 dBm at 100 Ω
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	±1 dB
	Impedance	100 Ω, 120 Ω, 135 Ω, 150 Ω, 600 Ω
Receiver characteristics	Reception frequency range	200 Hz to 20 kHz 20 kHz to 30 MHz
	Frequency uncertainty (accuracy)	±(50 ppm + 1 digit)
	VF reception level range	–90 dBm to 20 dBm at 600 Ω
	VF level uncertainty (accuracy)	200 Hz to 20 kHz –90 dBm to –50 dBm, uncertainty (accuracy) ±2 dB –50 dBm to 20 dBm, uncertainty (accuracy) ±1 dB
	WB reception level range	–80 dBm to 20 dBm at 100 Ω, 120 Ω, 135 Ω, 150 Ω
	WB level uncertainty (accuracy)	20 kHz to 2.2 MHz –80 dBm to –50 dBm, uncertainty (accuracy) ±2 dB –50 dBm to 20 dBm, uncertainty (accuracy) ±1 dB 2.2 MHz to 30 MHz –80 dBm to –50 dBm, uncertainty (accuracy) ±2 dB –50 dBm to 20 dBm, uncertainty (accuracy) ±1 dB
	Impedance	100 Ω, 120 Ω, 135 Ω, 150 Ω, 600 Ω
POTS dialer	DTMF	0 – 9, #, *
	Phonebook	25 entries

NOTES

a. Subject to change without notice.

b. Typical, at 23 °C ± 3 °C, on batteries, with no USB connection.

c. Specifications based on 24 AWG (PE 0.5 mm) cabling.

COPPER SPECIFICATIONS [a, b, c] (continued)

Digital multimeter (DMM)	Test type		Snapshot and continuous	
	Impedance selection (for voltage measurement)		100 kΩ, 1 MΩ	
	Measurement	**Range**	**Resolution**	**Uncertainty (accuracy)**
	DC voltage	0 to 400 V	0.1 V for 0 to 99.9 V 1 V for 100 to 400 V	±(|1 %| + 0.5 VDC)
	AC voltage	0 to 280 Vrms	0.1 VAC for 0 to 99.9 VAC 1 VAC for 100 to 280 VAC	±(1 % + 0.5 VAC)
	Isolation resistance (stress/leakage)	0 to 1 GΩ, auto-ranging 1 kΩ to 99 MΩ 100 MΩ to 999 MΩ	Three digits	 ±(2 % + 1 digit) ±(5 % + 1 digit)
	Resistance	0 to 100 MΩ 0 to 999 Ω 1 kΩ to 100 MΩ	Three digits	 ±(1 % + 5 Ω) ±(2 % + 1 digit)
	Capacitance	0 nF to 2 µF	Four digits	±(2 % + 50 pF)
	DC current	0 to 110 mA	0.1 mA	±(|2 %| + 1 mA)
	AC current	0 to 110 mA	0.1 mA	±(|2 %|+ 1 mA) [d]
Isolation resistance (stress/leakage) (continued)	Source		50 V to 300 V (current safely limited to 0.5 mA)	
	Soak timer		1 s to 59.9 min	
VF noise measurement	Frequency range		200 Hz to 20 kHz	
	Level range		–90 dBm to 20 dBm	
	Resolution		0.1 dB	
	Uncertainty (accuracy)		–90 dBm to –50 dBm, uncertainty (accuracy) ±2 dB –50 dBm to 20 dBm, uncertainty (accuracy) ±1 dB	
	Filters		ITU: none, psophometric, P-notched, 3.4 kHz, D-filter, 15 kHz ANSI: none, C-message, C-notched, 3.4 kHz, D-filter, 15 kHz	
	Impedance		600 Ω	
VF impulse noise	Low threshold		–40 dBm to 0 dBm, in 1 dB steps	
	Mid threshold		Low threshold plus separation	
	High threshold		Mid threshold plus separation	
	Test duration		Minutes: 1, 5, 10, 15, 30, 60 Hours: 4, 8, 12, 24, 100	
	Separation		1 dB to 6 dB, in 1 dB steps	
	Dead time		125 ms	
	Filters		None, 3 kHz flat, C-message, psophometric, notched and D-filter (IEEE 743-1995)	
	Counter		Maximum 999 for each threshold	
	Timer		1 min to 24 h, default is 15 min	
Power influence (noise to ground)	Noise range		–60 dBm to 10 dBm	
	Uncertainty (accuracy)		–60 dBm to –50 dBm ± 2 dB –50 dBm to 10 dBm ± 1 dB	
	Graphical display		Third triplet harmonics to 20 kHz	
VF longitudinal balance	Frequency		1004 Hz	
	Level range		0 dB to 100 dB	
	Level uncertainty (accuracy)		±1 dB	
	Impedance		600 Ω	

NOTES

a. Subject to change without notice.

b. Typical, at 23 °C ± 3 °C, on batteries, with no USB connection.

c. Specifications based on 24 AWG (PE 0.5 mm) cabling.

d. From 10 mA to 110 mA.

COPPER SPECIFICATIONS [a, b, c] (continued)

Time-domain reflectometer (TDR)	Modes	Fully automatic operation with location of most significant event(s)
	Distance range	0 m to 6700 m (0 ft up to 22 000 ft)
	Pulse width	15 ns to 20 µs (automatic control)
	Amplitude	7.5 V p-p on cable, 9 V p-p open circuit
	Velocity of propagation (VOP)	0.40 to 0.99
	Distance uncertainty (accuracy) [d]	±(0.5 m + 1 % x distance)
	Units	Meters and feet
Load coil detection	Count	Up to 5
	Plot	Up to 10 kHz
	Distance range	Up to 8000 m (up to 27 000 ft)
Power spectral density (PSD)	Test type	Continuous with peak-hold
	Vertical scale	15 dBm/Hz to −140 dBm/Hz or 20 dBm to −100 dBm
	Horizontal scale	4.3125 kHz to 17 MHz, in 4.3125 kHz steps or 8.625 kHz to 30 MHz, in 8.625 kHz steps
	Noise filters	None or E, F, G, ADSL, ADSL2+, VDSL, VDSL2-8, VDSL2-12, VDSL2-17 and VDSL2-30
Wideband impulse noise	Threshold	−50 dBm (40 dBm) to 0 dBm (90 dBm) in 1 dB steps
	Counter maximum	65 000 000
	Test duration	Minutes: 1, 5, 10, 15, 30 and 60 Hours: 4, 8, 12, 24 and 100
	Uncertainty (accuracy)	±2 dB
	Noise filters	None or E, F, G, VDSL2-8, VDSL2-12, VDSL2-17 and VDSL2-30
Wideband longitudinal balance	Level range	0 dB to 55 dB up to 2.2 MHz 0 dB to 45 dB up to 12 MHz
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	±2 dB (up to 2.2 MHz)
	Frequency uncertainty (accuracy)	±(50 ppm + 1 digit)
	Frequency scale	ADSL/2+: 20 kHz to 2.2 MHz VDSL/VDSL2-12: 20 kHz to 12 MHz
Single-ended frequency response (attenuation) [e]	Distance range	100 m to 5000 m (300 ft to 16000 ft)
	Frequency range	4.3 kHz to 30 MHz
	Frequency uncertainty (accuracy)	±(50 ppm + 1 digit)
	Level uncertainty (accuracy)	±2 dB typical for 2.2 MHz and 8 MHz ranges ±3 dB for VDSL2-12 and VDSL2-17 ±4 dB for VDSL2-30 ranges
	Resolution	0.1 dB
	Horizontal scale	ADSL2+ = 2.208 MHz, VDSL2-8 = 8 MHz, VDSL2-12 = 12 MHz, VDSL2-17 = 17.66 MHz, VDSL2-30 = 30 MHz
	Vertical scale	0 dB to 100 dB
Resistive fault location (RFL)	Test type	Single pair (two wire) and separate good pair (four wire)
	Fault detection	0 to 20 MΩ
	Resolution	Three digits
	Loop resistance	10 kΩ maximum
	Multiple cable sections	Five (includes gauge and temperature setting)
	Fault location	Total resistance, near-end to fault resistance, fault to strap resistance (three significant digits, least significant digit 0.1 Ω). Total length, distance to fault, distance from fault to strap (three significant digits, least significant digit 1 m)
	Uncertainty (accuracy)	±(0.1 Ω + 1 % x RTS)

NOTES

a. Subject to change without notice.
b. Typical, at 23 °C ± 3 °C, on batteries, with no USB connection.
c. Specifications based on 24 AWG (PE 0.5 mm) cabling.
d. Qualified up to 300 m (1000 ft) and does not include the uncertainty due to VOP.
e. Specification based on 1 kft 24 AWG cabling. Range depends on cable type and condition.

TECHNICAL SPECIFICATIONS

Display	Color touchscreen, 800 x 480 TFT, 178 mm (7 in)
Interfaces	Two USB 2.0 ports RJ45 LAN 10/100/1000 Mbit/s Fiber inspection probe connector port (video) Built-in Bluetooth and Wi-Fi (hardware option) Five-color coded 2 mm analog safety shrouded line interfaces
Storage	8 GB internal memory (flash) 16 GB internal memory (flash), optional
Batteries	Rechargeable lithium-ion batteries Operating time: - CQ app = 4.75 h (typical with extended battery) - DSL app = 4.6 h (typical with extended battery)

GENERAL SPECIFICATIONS — PRELIMINARY (MODULE ONLY)

Size (H x W x D)	130 mm x 252 mm x 56 mm (5 1/8 in x 9 15/16 in x 2 3/16 in)
Weight	
V2XAA module	1.0 kg (2.2 lb)
A2XAB module	1.1 kg (2.4 lb)
Temperature	
operating	0 °C to 40 °C (32 °F to 104 °F) [a]
storage	–40 °C to 70 °C (–40 °F to 158 °F)

PM-1 BUILT-IN POWER METER SPECIFICATIONS [b]

Calibrated wavelengths (nm)	850, 1300, 1310, 1490, 1550, 1625, 1650
Optional CWDM calibrated wavelengths (nm)	1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610, 1383, 1625
Power range (dBm)	10 to –86 (InGaAs) 26 to –64 (GeX)
Uncertainty (%) [c]	±5 % ± 3 pW (InGaAs) ±5 % ± 0.4 nW (GeX)
Display resolution (dB)	
InGaAs	0.01 = max to –76 dBm 0.1 = –76 dBm to –86 dBm 1 = –86 dBm to min
GeX	0.01 = max to –54 dBm 0.1 = –50 dBm to –60 dBm 1 = –60 dBm to min
Automatic offset nulling range [d]	Max power to –63 dBm for InGaAs Max power to –40 dBm for GeX
Tone detection (Hz)	270/1000/2000

Notes

a. DC voltage, resistance, isolation resistance, VF and WB receiver and modem = 0 °C to 45 °C. (32 °F to 113 °F).

b. At 23 °C ± 1 °C, 1550 nm and FC connector. With modules in Idle mode. Battery-operated.

c. Up to 5 dBm.

d. For ±0.05 dB, from 18 °C to 28 °C.

ORDERING INFORMATION

FTB-635-XX-XX-XX

Model
FTB-635 = Wideband Copper and DSL Test Module

DSL Module
A2XAB = ADSL2+ Annex A and B
V2XAA = ADSL2+ Annex A

Example: FTB-635-V2XAA-SmartR-BOND-VDSL2MOD

DSL Software Options
00 = Without software upgrade
BOND = ADSL2+ and VDSL2 bonding support [a]
VDSL2MOD = VDSL2 modem emulation [b]

Copper Software Options
00 = Without software options
HIVOLT = Extended isolation resistance testing output from 125 VDC to 300 V
RFL = RFL
SmartR = Pair Detective and FaultMapper (includes TDR)
TDR = TDR
WBAND = 30 MHz wideband testing

Notes

a. Bonding available on V2XAA model only.

b. VDSL2 bonding requires VDSL2MOD option.

ADDITIONAL FLOATING OPTIONS

Copper	HIVOLT-FLT = Enables floating license for extended isolation resistance testing output from 125 VDC to 300 V
	RFL-FLT = Enables floating license for RFL
	SmartR-FLT = Enables floating license for Pair Detective and FaultMapper (includes TDR)
	TDR-FLT = Enables floating license for TDR
	WBAND-FLT = Enables floating license to add 30 MHz wideband testing
DSL	BOND-FLT = Enables floating license for DSL bonding
	VDSL2MOD-FLT = Enables floating license for VDSL2 CPE modem emulation

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