

# FTB-635 Wideband Copper and DSL Test Module

WIDEBAND COPPER AND ADSL2+/VDSL2  
ADVANCED MULTIPLAY TESTING



 EXFO Connect  
Compatible

 smartR™

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, including vectoring and G.INP, allows service providers to recover and grow wireline revenues

High-performance time and frequency scope for analysis of impulse noises, including a unique impulse duration distribution histogram with cumulative impulse disruption time

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**

## 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) and resistive fault location (RFL) 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

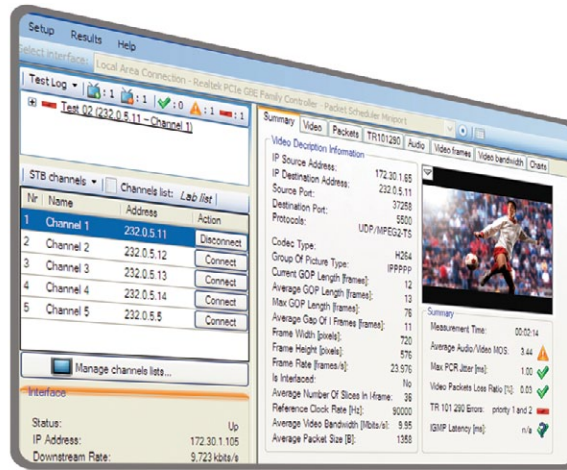
With a choice of modems, the FTB-635 supports testing services over Annex A up to profile 30a, as well as bonded circuits, or Annex A and Annex B up to profile 30a. Annex A and B together are convenient and economical for technicians troubleshooting both types of circuits, eliminating the need to swap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

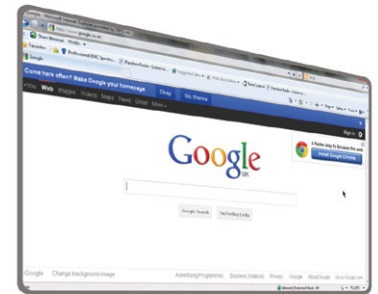
## POWERFUL ON-BOARD TRIPLE-PLAY TESTING

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 (as high as 500 V) 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

Advanced impulse noise (including REIN, PEIN and SHINE) time and frequency domain analysis

## 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 including power spectral density (PSD), near end crosstalk (NEXT), and impulse noise counter, histogram, and time and frequency domain impulse scope and capture functionality, to fully enable a technician or engineer to understand the impact of high frequency noise on high-value services. The FTB-635 also offers a unique impulse duration and disruption histogram, which is the first field tool capable of capturing, categorizing and reporting impulses in a histogram. This makes it possible to understand the distribution of impulses based on their duration occurring at different periods of time, including cumulative disruption time caused by impulse noises.

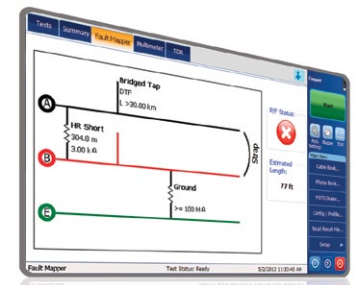
### High-Voltage Testing

High-voltage isolation tests, from 50 V to 500 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.

Fault location using the FTB-635 is also possible with the single, separate good pair method and the RFL K-Test method.



### 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.

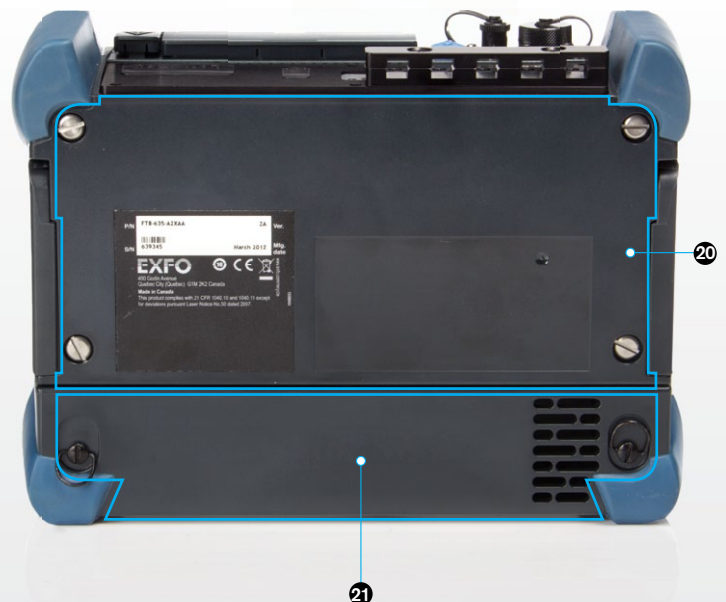
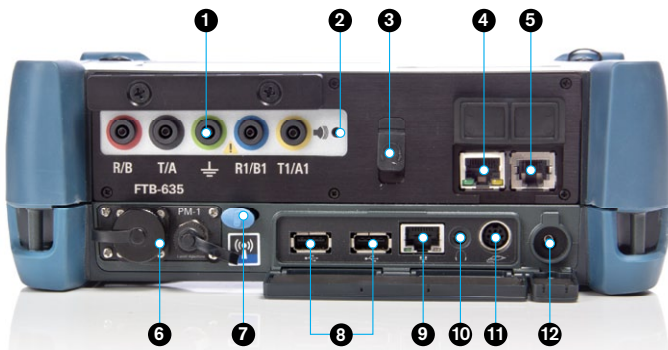
EXFO

## ADDITIONAL FEATURES

- > Full multimeter, including series resistance detection
- > Graphical power harmonics to 20 kHz
- > TDR including dual/multiple trace TDR and XTALK TDR, RFL K-Test, WB longitudinal balance and station ground tests
- > 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

- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li>❶ Copper connectors</li> <li>❷ POTS speaker</li> <li>❸ Headphone jack</li> <li>❹ Ethernet port</li> <li>❺ DSL port</li> <li>❻ Power meter and VFL</li> <li>❼ Stylus</li> </ul> | <ul style="list-style-type: none"> <li>❽ Two USB 2.0 ports</li> <li>❾ 1 GigE port</li> <li>❿ Head set</li> <li>⓫ Fiber inspection probe video port</li> <li>⓬ AC adapter</li> <li>⓭ Back stand</li> <li>⓮ Speaker out</li> </ul> | <ul style="list-style-type: none"> <li>⓯ Brightness</li> <li>⓰ Keyboard/screen capture</li> <li>⓱ Switch application</li> <li>⓲ Power on/off</li> <li>⓳ Battery LED</li> <li>⓴ Module compartment</li> <li>⓵ Battery</li> </ul> |
|---|--|---|



DSL SPECIFICATIONS — PRELIMINARY		
<b>DSL chipset</b>	Broadcom	
<b>Standards compliance</b>	ADSL1/2/2+	ITU-T G.992.5 (ADSL2+ including Annex A, B, J, M) ITU-T G.992.3 (ADSL2 including Annex A, B, J, L) ITU-T G.992.1 (G.DMT including Annex A, B) ITU-T G.994.1 ATIS/ANSI T1.413 Issue 2 IEEE 802.3ah (PTM) ITU-T G.998.1, 2 (ATM, Ethernet bonding) ITU-T G.998.4 (G.INP) DT 1 TR 112 U-R2
	VDSL2	ITU-T G.993.2 Annex A, B, Y 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) ITU-T G.998.4 (G.INP) ITU-T G.993.5 (G.Vector) DT 1 TR 112 U-R2 (U-RV2)
<b>DSL parameters</b>	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 state, performance counters Vectoring state, performance counters Modes: PTM, ATM, Nitro LOS, FEC, CRC, HEC LATN per band SATN per band EWL KLO
<b>Test interfaces</b>	VDSL2 ADSL1/2/2+ Ethernet 10/100BT	
<b>Encapsulation methods</b>	RFC 2684 supporting bridged Ethernet (IPoE) IPoA (RFC 1577)	PPPoE (RFC 2516) PPPoA/LLC and PPPoA/VC-MUX (RFC 2364)
<b>Operating modes</b>	DSL Terminate Modem Replacement (DSL to Ethernet) Pass Through	Ethernet Terminate
<b>Login format</b>	User name and password using PAP/CHAP	
<b>Connectivity support</b>	LAN/WAN status DNS, gateway DHCP client/server, DHCP vendor class NAT	VLAN ID, VLAN tagging VPI/VCI

**COPPER SPECIFICATIONS** <sup>a, b, c</sup>

Transmitter characteristics		
<b>Frequency range (200 Hz to 20 kHz)</b>	Frequency resolution	1 Hz steps
	Frequency uncertainty (accuracy)	$\pm(50 \text{ ppm} + 1 \text{ Hz})$
	Level range	-20 dBm to 0 dBm at 600 $\Omega$
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	$\pm 1 \text{ dB}$
<b>Frequency range (20 kHz to 2.2 MHz)</b>	Frequency resolution	1 kHz steps
	Frequency uncertainty (accuracy)	$\pm(50 \text{ ppm} + 100 \text{ Hz})$
	Level range	-20 dBm to 0 dBm at 100 $\Omega$
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	$\pm 1 \text{ dB}$
<b>Frequency range (2.2 MHz to 17 MHz)</b>	Frequency resolution	1 kHz steps
	Frequency uncertainty (accuracy)	$\pm(50 \text{ ppm} + 100 \text{ Hz})$
	Level range	-20 dBm to 0 dBm at 100 $\Omega$
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	$\pm 1 \text{ dB}$
<b>Frequency range (17 MHz to 30 MHz)</b>	Frequency resolution	1 kHz steps
	Frequency uncertainty (accuracy)	$\pm(50 \text{ ppm} + 100 \text{ Hz})$
	Level range	-20 dBm to 0 dBm at 100 $\Omega$
	Level resolution	0.1 dB
	Level uncertainty (accuracy)	$\pm 1 \text{ dB}$
	Impedance	100 $\Omega$ , 120 $\Omega$ , 135 $\Omega$ , 150 $\Omega$ , 600 $\Omega$
Receiver characteristics		
	Reception frequency range	200 Hz to 20 kHz 20 kHz to 30 MHz
	Frequency uncertainty (accuracy)	$\pm(50 \text{ ppm} + 1 \text{ digit})$
	VF reception level range	-90 dBm to 15 dBm at 600 $\Omega$
	VF level uncertainty (accuracy)	200 Hz to 20 kHz -90 dBm to -50 dBm, uncertainty (accuracy) $\pm 2 \text{ dB}$ -50 dBm to 15 dBm, uncertainty (accuracy) $\pm 1 \text{ dB}$
	WB reception level range	-80 dBm to 15 dBm at 100 $\Omega$ , 120 $\Omega$ , 135 $\Omega$ , 150 $\Omega$
	WB level uncertainty (accuracy)	20 kHz to 2.2 MHz -80 dBm to -50 dBm, uncertainty (accuracy) $\pm 2 \text{ dB}$ -50 dBm to 15 dBm, uncertainty (accuracy) $\pm 1 \text{ dB}$
		2.2 MHz to 30 MHz -80 dBm to -50 dBm, uncertainty (accuracy) $\pm 2 \text{ dB}$ -50 dBm to 15 dBm, uncertainty (accuracy) $\pm 1 \text{ dB}$
	Impedance	100 $\Omega$ , 120 $\Omega$ , 135 $\Omega$ , 150 $\Omega$ , 600 $\Omega$
POTS dialer	DTMF	0 – 9, #, *
	Phonebook	25 entries
Digital multimeter (DMM)	Test type	Snapshot and continuous
	Impedance selection (for voltage measurement)	100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$

**NOTES**

- Subject to change without notice.
- Typical, at 23 °C  $\pm$  3 °C, on batteries, with no USB connection.
- Specifications based on 24 AWG (PE 0.5 mm) cabling.

COPPER SPECIFICATIONS <sup>a,b,c</sup> (continued)				
	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	$\pm( 1\%  + 0.5 \text{ VDC})$
	AC voltage	0 to 280 Vrms	0.1 VAC for 0 to 99.9 VAC 1 VAC for 100 to 280 VAC	$\pm(1\% + 0.5 \text{ VAC})$
	Isolation resistance (stress/leakage)	0 to 1 G $\Omega$ , auto-ranging 1 k $\Omega$ to 99 M $\Omega$ 100 M $\Omega$ to 999 M $\Omega$	Three digits	$\pm(2\% + 1 \text{ digit})$ $\pm(5\% + 1 \text{ digit})$
	Resistance	0 to 100 M $\Omega$ 0 to 999 $\Omega$ 1 k $\Omega$ to 100 M $\Omega$	Three digits	$\pm(1\% + 5 \Omega)$ $\pm(2\% + 1 \text{ digit})$
	Capacitance	0 nF to 2 $\mu$ F	Four digits	$\pm(2\% + 50 \text{ pF})$
	DC current	0 to 110 mA	0.1 mA	$\pm( 2\%  + 1 \text{ mA})$
	AC current	0 to 110 mA	0.1 mA	$\pm( 2\%  + 1 \text{ mA})^d$
	Station Ground	0 to 1 M $\Omega$ 0 to 999 $\Omega$ 1 k $\Omega$ to 1 M $\Omega$	Up to three digits	$\pm(1\% + 3 \Omega)$ $\pm(2\% + 1 \text{ digit})$
Isolation resistance (stress/leakage) (continued)	Source	50 V to 500 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) $\pm 2$ dB -50 dBm to 20 dBm, uncertainty (accuracy) $\pm 1$ 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 $\Omega$		
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 $\pm 2$ dB -50 dBm to 10 dBm $\pm 1$ 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)	$\pm 1$ dB		
	Impedance	600 $\Omega$		
Time-domain reflectometer (TDR)	Modes	Automatic, Manual, and Crosstalk (Xtalk) operation with location of most significant event(s)		
	Distance range	0 m to 6700 m (0 ft up to 22 000 ft) on 24 AWG (0.5 mm) cable		
	Pulse width	15 ns to 20 $\mu$ s (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) <sup>e</sup>	$\pm(0.5 \text{ m} + 1\% \times \text{distance})$		
	Units	Meters and feet		

**NOTES**

- Subject to change without notice.
- Typical, at 23 °C  $\pm$  3 °C, on batteries, with no USB connection.
- Specifications based on 24 AWG (PE 0.5 mm) cabling.
- From 10 mA to 110 mA.
- Qualified up to 300 m (1000 ft) and does not include the uncertainty due to VOP.



**COPPER SPECIFICATIONS<sup>a,b,c</sup> (continued)**

Load coil detection	Count	Up to 5
	Plot	Up to 10 kHz
	Distance range	Up to 8000 m (up to 27 000 ft)
Near End Crosstalk (NEXT)	Frequency Range	10 kHz to 30 MHz
	Level Range	0 to 90 dB
	Level Resolution	0.1 dB
	Level uncertainty (accuracy)	2.2 MHz: $\pm 2.0$ dB, from 0 to 90 dB 8 MHz: $\pm 2.0$ dB, from 0 to 85 dB 12 MHz: $\pm 2.0$ dB, from 0 to 80 dB 17.6 MHz: $\pm 3.0$ dB, from 0 to 80 dB 30 MHz: $\pm 3.0$ dB, from 0 to 80 dB
	Terminations	100, 120, 135, 150 $\Omega$
Power spectral density (PSD)	Test type	Continuous with peak-hold, disturber identification, spectral mask overlay, and bridging impedance features
	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	Test type	Counter, count histogram, time and frequency scope, duration and disruption histogram (IDD)
	Counter, count histogram threshold	-60 dBm (30 dB <sub>r</sub> n) to 0 dBm (90 dB <sub>r</sub> n) in 1 dB steps
	Scope (time) threshold	0.000 V to 7.000 V in 0.001 increments (0 V provides continuous triggering)
	IDD threshold	-60 dBm to 15 dBm
	Total impulse hit count	65 000 000
	Total impulse disruption time	65 000 000 ms
	Range	Scope: 10 $\mu$ s to 10 ms IDD: 1 $\mu$ s to 20 ms
	Test duration	Counter, histogram – minutes: 1, 5, 10, 15, 30 and 60 Counter, histogram – hours: 4, 8, 12, 24 and 100 Scope: continuous and capture/trigger modes
	Impulse separation time (IST)	1 $\mu$ s to 999 $\mu$ s
	Noise filters	None or E, F, G, ADSL, ADSL2+, VDSL, VDSL2-8, VDSL2-12, VDSL2-17 and VDSL2-30
Wideband longitudinal balance	Level scale	0 to 100 dB
	Level range uncertainty (accuracy)	2.2 MHz: $\pm 2.0$ dB, from 0 to 55 dB 8 MHz: $\pm 2.0$ dB, from 0 to 45 dB 12 MHz: $\pm 3.0$ dB, from 0 to 45 dB 17.6 MHz: $\pm 3.0$ dB, from 0 to 40 dB 30 MHz: $\pm 4.0$ dB, from 0 to 40 dB
	Level resolution	0.1 dB
	Frequency resolution	1 kHz
	Frequency uncertainty (accuracy)	$\pm(50 \text{ ppm} + 1 \text{ digit})$
	Frequency scale	ADSL/2+: 10 kHz to 2.2 MHz VDSL2-8 : 20 kHz to 8 MHz VDSL2-12: 20 kHz to 12 MHz VDSL2-17: 35 kHz to 17.6 MHz VDSL2-30: 35 kHz to 30 MHz

**NOTES**

- a. Subject to change without notice.  
b. Typical, at 23 °C  $\pm$  3 °C, on batteries, with no USB connection.  
c. Specifications based on 24 AWG (PE 0.5 mm) cabling.

**COPPER SPECIFICATIONS<sup>a,b,c</sup> (continued)**

Single-ended frequency response (attenuation) <sup>d</sup>	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) and Küpfmüller (K-Test)
	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)
	K-Test uncertainty (accuracy)	± (1.0 Ω + 1 % RTS + (Rf1 + Rf2)/10 MΩ) - double fault ± (1.0 Ω + 1% RTS) - single fault

**NOTES**

- Subject to change without notice.
- Typical, at 23 °C ± 3 °C, on batteries, with no USB connection.
- Specifications based on 24 AWG (PE 0.5 mm) cabling.
- 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 — 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	1.2 kg (2.6 lb)
Temperature operating storage	0 °C to 40 °C (32 °F to 104 °F) <sup>a</sup> -40 °C to 70 °C (-40 °F to 158 °F)

## PM-1 BUILT-IN POWER METER SPECIFICATIONS<sup>b</sup>

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 (%) <sup>c</sup>	±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 <sup>d</sup>	Max power to -63 dBm for InGaAs Max power to -40 dBm for GeX
Tone detection (Hz)	270/1000/2000

### Notes

- DC voltage, resistance, isolation resistance, VF and WB receiver and modem = 0 °C to 45 °C. (32 °F to 113 °F).
- At 23 °C ± 1 °C, 1550 nm and FC connector. With modules in Idle mode. Battery-operated.
- Up to 5 dBm.
- 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**

V2XAA = ADSL2+ Annex A

V2XAB = ADSL2+ Annex A and B

**DSL Software Options**

00 = Without software upgrade

BOND = ADSL2+ and VDSL2 bonding support <sup>a, b</sup>

VDSL2MOD = VDSL2 modem emulation

**Copper Software Options**

00 = Without software options

HIVOLT = Extended isolation resistance testing output from 125 VDC to 500 V

RFL = RFL

SMARTR = Pair Detective and FaultMapper (includes TDR)

TDR = TDR

WBAND = Extends frequency testing to 30 MHz; includes impulse scope

NEXT = Near End Crosstalk <sup>c</sup>IDD = Impulse Duration and Disruption <sup>c</sup>

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

**Notes**

- a. VDSL2 bonding requires VDSL2MOD option.  
 b. ADSL2+ bonding or ATM bonding not available with V2XAB.  
 c. Requires the WBAND option.

## EXFO CONNECT FLOATING OPTIONS (REQUIRES EXFO CONNECT SUBSCRIPTION)

Copper	HIVOLT-FLT = Enables floating license for extended isolation resistance testing output from 125 VDC to 500 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
	NEXT-FLT = Enables floating license to add Near End Crosstalk (NEXT). Requires WBAND-FLT
	IDD-FLT = Enables floating license to add impulse duration and disruption (IDD) measurement. Requires WBAND-FLT
DSL	BOND-FLT = Enables floating license for DSL bonding
	VDSL2MOD-FLT = Enables floating license for VDSL2 CPE modem emulation

EXFO Headquarters > Tel.: +1 418 683-0211 | Toll-free: +1 800 663-3936 (USA and Canada) | Fax: +1 418 683-2170 | info@EXFO.com | [www.EXFO.com](http://www.EXFO.com)

EXFO serves over 2000 customers in more than 100 countries. To find your local office contact details, please go to [www.EXFO.com/contact](http://www.EXFO.com/contact).

EXFO is certified ISO 9001 and attests to the quality of these products. EXFO has made every effort to ensure that the information contained in this specification sheet is accurate. However, we accept no responsibility for any errors or omissions, and we reserve the right to modify design, characteristics and products at any time without obligation. Units of measurement in this document conform to SI standards and practices. In addition, all of EXFO's manufactured products are compliant with the European Union's WEEE directive. For more information, please visit [www.EXFO.com/recycle](http://www.EXFO.com/recycle). **Contact EXFO for prices and availability or to obtain the phone number of your local EXFO distributor.**

For the most recent version of this spec sheet, please go to the EXFO website at [www.EXFO.com/specs](http://www.EXFO.com/specs).

In case of discrepancy, the Web version takes precedence over any printed literature.