

6100-Gfast

HANDHELD SOLUTION FOR ULTRA-BROADBAND INSTALLATION AND MAINTENANCE



Efficient copper characterization to 35 MHz and DSL/G.fast analysis for the installation and maintenance of ultra-broadband deployments.

KEY FEATURES

- G.fast with backwards compatibility to VDSL2 and ADSL2+ with one test tool
- Compatible with cloud-based test asset management
- Spectrally compatible VDSL2 35b support and, VDSL2 and ADSL2+ bonding
- Adherence to existing methods and procedures is easy with single-ended testing or via testing to a far-end device (FED), including high-voltage stressed balance testing
- High resolution 6-inch touchscreen with dual 1 GigE ports and single test lead connection supporting both G.fast/DSL and copper testing to 35 MHz bandwidth
- Designed to face the challenges of the outside plant environment, with an IEC IP54 rating

APPLICATIONS

- FTTx / MDU, G.fast, VDSL2 35b and VDSL2 vectored installations
- Bonded-VDSL2 and ADSL2+ deployments
- Multiplay service assurance (Internet, IPTV, and VoIP), inclusive of Internet throughput validation using Speedtest™ by Ookla®)
- FTTdp deployments
- G.fast-based mobile backhaul, DAS or small cell deployments
- Validate bandwidth performance and speed, using Speedtest™ by Ookla®, HTTP, FTP, or iPerf

Multifunction TDR family



Copper Tester
Copper, VDSL2, Multiplay Test Solution

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G.FAST/DSL CHIPSET SPECIFICATIONS		
DSL chipset	Broadcom 63138	
Standards compliance	ADSL1/2/2+	ITU-T G.992.5 (ADSL2+ including Annexes A and M)
		ITU-T G.992.3 (ADSL2 including Annexes A and L)
	G.fast	ITU-T G.992.1 (G.DMT including Annex A)
		ITU-T G.994.1
		ATIS/ANSI T1A13 Issue 2
		IEEE 802.3ah (PTM)
		ITU-T G.998.1, 2 (ATM, Ethernet bonding)
		ITU-T G.998.4 (G.INP)
		ITU-T a992.5 (INP Amendment 3)
	VDSL2	ITU-T G.993.2 Annexes A, B, C1 and Y
		Profiles: 8a/b/c/d, 12a/b, 17a, 30a, 35b
		Band Plan: 997, 998, USO
		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)
	G.fast	ITU-T G.9700, G.9701
DSL parameters	Maximum attainable bit rates	Interleave depth
	Actual achieved bit rates	Interleave delay
	Actual bonded achieved rates	Trellis coding
	Latency mode: fast, interleaved	Bit swapping
	Data modes: ATM, PTM	INP value
	Capacity (%)	PhyR, G.INP state, performance counters
	SNR margin	Vectoring state, performance counters
	Output power	LOS, FEC, CRC, HEC, SES
	Attenuation	LATN per band
	Bits/tone	SATN per band
	Hlog/tone (attenuation/tone)	EWL
	OLN/tone	KLO
	SNR/tone	
	Vendor code, revision	

MULTIPLAY TESTING SPECIFICATIONS		
Test interfaces	G.fast	ADSL1/2/2+
	VDSL2	Ethernet 10/100/1000 BT
Encapsulation methods	RFC 2684/Bridged Ethernet/IPoE (IPv4 and IPv6)	PPPoE (RFC 2516)
	IPoA (RFC 1577)	PPPoA/LLC and PPPoA/VC-MUX (RFC 2364)
Operating modes	DSL Terminate	Ethernet Terminate
	DSL to Ethernet pass through	Ethernet to Ethernet bridged pass through
Login format	User name and password using PAP/CHAP	
Connectivity support	IPv4 and IPv6 LAN/WAN status	VLAN ID, VLAN tagging
	IPv4 and IPv6 DNS, gateway	VPI/VCI
	IPv4 DHCP client/server, DHCP vendor class	IP release
	IPv6 DHCP client	Multi-VLAN support
	NAT	
Throughput test	Methods supported: Speedtest by Ookla, iPerf3	
	Address: auto-configured for Speedtest, URL or IPv4 address for iPerf3	
	Direction: upload and/or download	
	Speedtest results displayed: download and upload speed in Mbit/s, ping in milliseconds (ms), host, location, country and sponsor	
	iPerf results displayed: download and upload speed in kbit/s	
Ping test	Ping destination: gateway, IPv4 or IPv6 address or URL	
	Number of pings: 1 to 99	
	Packet size: 32 to 1200 bytes (32 is default)	
	Timeout period: 1 to 10 s	
	Results displayed: packets sent/received and average round-trip delay (ms)	
Traceroute test	Traceroute destination: gateway, IPv4 address or URL	
	Timeout period: in seconds, default is 1 s, maximum is 10 s	
	Packet size: 32 bytes	
	Number of hops: 1 to 32 (default is 30)	
	Results displayed: indicates IPv4 address of hop and round-trip time in ms	
FTP test	Address: IPv4 address or URL	
	Direction: upload and/or download	
	Results displayed: time, kB transferred, bit rate in kbit/s	
HTTP test	Address: URL	
	Direction: download	
	Simultaneous download sessions: 1 to 4	
	Results displayed: kB transferred, bit rate in kbit/s	
Web browser (software option)	Address: IPv4 address or URL	
	Bookmarks: user-definable	

MULTIPLAY TESTING SPECIFICATIONS (continued)		
VoIP testing (software option)	Protocol support: SIP (IPv4)	
	Codecs: G.711 u-Law, G.711 A-Law	
	Interface support: ADSL1/2/2+, VDSL2, G.fast, Ethernet	
	Parameter/functionality:	
	- Test duration timer	
	- MOS (current, average)	
	- R-Factor (current, average)	
	- Latency (current, average, maximum)	
	- Jitter (current, average, maximum)	
	- Packets (lost, total)	
IPTV testing (software option)	Supported video standards: MPEG2, MPEG4 part 2 and 10 (H.264/AVC), Mediroom/WM9/VC1	
	Operating modes: DSL Terminate and Ethernet Terminate	
	IPTV parameters/functionality:	
	- IGMP version 2 and 3 (IPv4) join/leave requests with STB emulation	
	- Automatic tests to join/leave and analyze up to 5 (five) simultaneous streams	
	- Programmable channel list for storage of commonly used channels	
	- Bandwidth usage per channel	
	- IGMP (IPv4) packet and rate information per line and channel	
	- Multicast RTP/UDP IP stream support	
	- Key IP video QoS parameters, packet loss, zap time, PID statistics	
	- Graphical results	
	- Transport	

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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 (dBm)	-20 to 10 at 600Ω		
	Level resolution	0.1 dB		
	Level uncertainty (accuracy)	±1 dB		
Frequency range 20 kHz to 2.2 MHz	Impedance (Ω)	600		
	Frequency resolution	1 kHz steps		
	Frequency uncertainty (accuracy)	±(50 ppm + 100 Hz)		
	Level range (dBm)	-20 to 10 at 100 Ω		
	Level resolution	0.1 dB		
Frequency range (2.2 MHz to 30 MHz)	Level uncertainty (accuracy)	±1 dB		
	Impedance (Ω)	100, 120, 135, 150		
	Frequency resolution	1 kHz steps		
	Frequency uncertainty (accuracy)	± (50 ppm + 100 Hz)		
	Level range (dBm)	-20 to 0 at 100		
Level resolution	Level uncertainty (accuracy)	±1 dB		
	Impedance (Ω)	100, 120, 135, 150		
	Receiver characteristics			
	Reception Frequency range	200 Hz to 20 kHz		
		20 kHz to 35 MHz		
Frequency uncertainty range (accuracy)	±(50 ppm + 1 digit) for 20 kHz to 30 MHz			
VF reception level range (dBm)	-90 to 15 at 600Ω			
VF level uncertainty (accuracy)	200 Hz to 20 kHz			
	-90 dBm to -50 dBm, uncertainty (accuracy) ±2 dB			
WB reception level range (dBm)	50 dBm to 15 dBm, uncertainty (accuracy) ±1 dB			
	-90 to 15 at 100Ω and 135Ω			
WB level uncertainty (accuracy)	20 kHz to 2.2 MHz			
	-90 dBm to -50 dBm, uncertainty (accuracy) ±2 dB -50 dBm to 15 dBm, uncertainty (accuracy) ±1 dB			
Impedance (Ω)	2.2 MHz to 30 MHz			
	-90 dBm to -50 dBm, uncertainty (accuracy) ±2 dB -50 dBm to 15 dBm, uncertainty (accuracy) ±1 dB			
POTS dialer				
DTMF	0 - 9, #, *			
Phonebook	25 entries			
Digital multimeter (DMM)				
Test type	Snapshot and continuous			
Impedance selection (for voltage measurement)	100 kΩ, 1 MΩ			
Notes	Measurement	Range	Resolution	Uncertainty (accuracy)
	DC voltage	0 to 400 V	0.1 V for 0 to 99.9 V	±(1% + 0.5 VDC)
			1 V for 100 V to 400 V	
	AC voltage	0 to 280 Vrms	0.1 V for 0 to 99.9 V	±(1% + 0.5 VAC)
			1 V for 100 V to 280 V	

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Isolation resistance	0 to 1 GΩ, auto-ranging	Three digits	
(stress/leakage)	1 kΩ to 99 MΩ		±(2% + 1 digit)
	100 MΩ to 999 MΩ		±(5% + 1 digit)
Resistance	0 to 100 MΩ	Three digits	
	0 to 999 Ω		±(1% + 5 Ω)
	1 kΩ to 100 MΩ		±(2% + 1 digit)
Capacitance	0.1 nF to 2 uF	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)
Station ground	0 to 1 MΩ	Up to three digits	
	0 to 999 Ω		±(1% + 3 Ω)
	1 kΩ to 1 MΩ		±(2% + 1 digit)

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COPPER SPECIFICATIONS ^{a, b, c} (continued)		
Isolation resistance (stress/leakage) (continued)	Source	50 to 500 VDC (current safety limited to 2 mA)
	Soak timer (s)	1 to 60
VF noise measurement	Frequency range	200 Hz to 20 kHz
	Level range (dBm)	-90 to 20
	Resolution (dB)	0.1
	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 Q
VF impulse noise	Low threshold (dBm)	-40 to 0, in 1 dB steps
	Mid threshold	Low threshold plus separation
	High threshold	Mid threshold plus separation
	Separation (dB)	1 to 6, in 1 dB steps
	Dead time (ms)	125
	Filters	None, 3 kHz flat, C-message, psophometric, notched and D filter (IEEE 743-1995)
	Counter	Maximum 999 for each threshold
	Timer	Maximum 100 hours
Power influence (noise to ground)	Noise range (dBm)	-60 to 10
	Uncertainty (accuracy)	-60 dBm to -50 dBm ± 2 dB -50 dBm to 10 dBm ± 1 dB
VF longitudinal balance	Frequency (Hz)	1004
	Level range (dB)	0 to 100
	Level uncertainty (accuracy) (dB)	± 1
	Impedance	600 Q
Time-domain reflectometer (TDR)	Modes	Automatic, Manual, Peak, Xtalk (Crosstalk), Differential
	Distance range (m)	0 to 6700 (0 ft to 22 000 ft)
	Pulse width	15 ns to 20 us
	Amplitude	7.5 V p-p on cable, 9 V p-p open circuit
	Velocity of propagation (VOP)	0.400 to 0.999
	Distance uncertainty (accuracy) ^d (m)	$\pm(0.5 \text{ m} + 1 \% \times \text{distance})$
	Units	Meters and feet
Load coil detection	Count	Up to 5
	Plot (kHz)	Up to 10
	Distance range (m)	Up to 8000 (up to 27 000 ft)

Notes

- a. Subject to change without notice.
- b. Typical, at 23 °C \pm 3 °C, on batteries, with no type B 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

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COPPER SPECIFICATIONS ^{a, b, c} (continued)		
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: ±2.0 dB, from 0 to 90 dB
		8 MHz: ±2.0 dB, from 0 to 80 dB
		12 MHz: ±2.0 dB, from 0 to 75 dB
		17.6 MHz: ±3.0 dB, from 0 to 75 dB
30 MHz: ±3.0 dB, from 0 to 68 dB		
Terminations	100, 120, 135, 150 Q	
Return loss	Test type	Single, Sweep
	Frequency range	20 kHz to 2.2 MHz
	Dynamic range	0 dB to 40 dB
	Resolution	0.1 dB
	Uncertainty (accuracy)	±0.5 dB, for dynamic range 0 dB to 20 dB
	Horizontal scale	4.3125 kHz to 2.2 MHz, in 4.3125 kHz steps
	Vertical scale	0 dB to 50 dB
Power spectral density (PSD)	Test type	Continuous with peak-hold
	Termination	Bridging (Hi-Z), 100, 120, 135, 150 Q
	Vertical scale	15 dBm/Hz to -140 dBm/Hz or 20 dBm to -90 dBm
	Horizontal scale	4.3125 kHz to 17 MHz, in 4.3125 kHz steps or 8.625 kHz to 35 MHz, in 8.625 kHz steps
	Noise filters	None or E, F, G, ADSL2+, VDSL2-8, VDSL2-12, VDSL2-17, VDSL2-30 and VDSL2-35b
Wideband impulse noise	Threshold	-50 dBm (40 dBm) to 0 dBm (90 dBm) in 1 dB steps
	Termination	Bridging (Hi-Z), 100, 120, 135, 150 Q
	Counter maximum	65 000 000
	Test duration	Maximum 100 hours
	Uncertainty (accuracy) (dB)	±2
	Noise filters	None or E, F, G, ADSL2+, 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: ±2.0 dB, from 0 to 55 dB
		8 MHz: ±2.0 dB, from 0 to 45 dB
		12 MHz: ±3.0 dB, from 0 to 45 dB
		17.6 MHz: ±3.0 dB, from 0 to 40 dB
Level resolution	0.1 dB	
Frequency scale	ADSL2+: 8.6 kHz to 2.2 MHz, in 8.6 kHz steps VDSL2-8 : 17.25 kHz to 8 MHz, in 17.25 kHz steps VDSL2-12: 17.25 kHz to 12 MHz, in 17.25 kHz steps VDSL2-17: 34.5 kHz to 17.6 MHz, in 34.5 kHz steps	
Frequency uncertainty (accuracy)	±(50 ppm + 1 digit)	

Notes

- a. Subject to change without notice.
- b. Typical, at 23 °C ± 3 °C, on batteries, with no type B USB connection.
- c. Specifications based on 24 AWG (PE 0.5 mm) cabling.
- d. Specification based on 1 kft 24 AWG cabling. Range depends on cable type and condition.
- e. For double faults only.

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COPPER SPECIFICATIONS ^{a,b,c} (continued)		
Single-ended frequency response (attenuation) ^d	Distance range (m)	100 m to 5000 m (300 ft to 16 000 ft)
	Frequency range (Hz)	4.3 kHz to 35 MHz
	Frequency uncertainty (accuracy)	±(50 ppm + 1 digit) for 20 kHz to 30 MHz
	Level uncertainty (accuracy) (dB)	±2.0 dB typical for 2.2 MHz and 8 MHz ranges ±3.0 dB for VDSL2-12 and VDSL2-17 ±4.0 dB for VDSL2-30 ranges
	Resolution (dB)	0.1
	Horizontal scale (MHz)	ADSL2+ = 2.208, VDSL2-8, VDSL2-12 = 12, VDSL2-17 = 17.66, VDSL2-30 = 30, VDSL2-35 = 35
Resistive fault location (RFL)	Vertical scale (dB)	0 to +100
	Test type	Single pair (two wire), separate good pair (four wire) and Kùpfmuller (K-test)
	Fault detection (MQ)	0 to 20 for single faults; up to a total fault resistance of 30 for K-test double faults only
	Resolution	Three digits
	Loop resistance (kQ)	10 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 Q) Total length, distance to fault, distance from fault to strap (three significant digits, least significant digit 1 m)
	Single fault uncertainty (accuracy)	±(0.1 Q + 1% RTS)
Stressed Balance	K-test uncertainty (accuracy) ^e	±(1 Q + 1% RTS)
	Level range	0 to 82 dB _{BrnC}
	Resolution	0.1 dB _{BrnC}
	Longitudinal excitation	135 VDC (0 dBm, ±1 dB reproducibility)

Notes

- a. Subject to change without notice.
- b. Typical, at 23 °C ± 3 °C, on batteries, with no type B USB connection.
- c. Specifications based on 24 AWG (PE 0.5 mm) cabling.
- d. Specification based on 1 kft 24 AWG cabling. Range depends on cable type and condition.
- e. For double faults only.

GENERAL SPECIFICATIONS

Display	Touchscreen TFT LCD with backlight
	152 mm (6 in) diagonal
	800 x 480 resolution, WVGA
Test connections	Five-color banana connector for T/A, RIB, G, T1/A1, R1/B1
Results management	> 2 GB internal memory
	Single and bulk file export to USB memory devices
Temperature operating	0 °C to 40 °C (32 °F to 104 °F)
storage	-20 °C to 60 °C (-4 °F to 140 °F)
Humidity	5 % to 95 % relative, non-condensing
Shock	1 m (39 in) drop per GR-196-CORE
Altitude	3000 m (9842 ft)
Input power	9-24 VDC, 2A, 18 W via 90-220 VAC adapter or 12 V vehicle adapter
Battery	Internal rechargeable lithium polymer, with battery-state and level indications, adjustable auto-power down
Safety	CE and CSA marked
Size (H x W x D)	254 mm x 124 mm x 62 mm (10 in x 4 7/8 in x 2 7/16 in)
Weight (with battery)	1.5 kg (3.3 lb)
Water/dust ingress	Designed to comply with IP54
Differential voltage protection	354 Vrms or 1000 VDC max
Common mode voltage protection	354 Vrms or 1000 VDC
Voltage detection	>20 V will trigger alarm message
Self-test	Routine on power-up
Connectivity	Two USB 2.0 client ports
	One USB Type B host port
	Optional WiFi support
Languages	English, French, Italian, Polish and Spanish

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