



# ParaScope mPA

## *Triple Play Test Set*

The ideal tool for field engineers and technicians responsible for verifying and assuring successful delivery of triple play services on ADSL1/2/2+, VDSL2 and 10/100 Ethernet circuits.



## *Main Features*

- Large 7" bright touch-screen LCD and rugged enclosure.
- Unmatched ease of use with Pass/Fail results. Use at customer premises, remote location or the central office.
- Copper qualification to identify physical layer faults and qualify the local loop for handling triple play services. Suite of tools includes integrated digital multimeter (DMM), RFL meter, Longitudinal Balance meter, TDR etc.
- Complete service verification to determine the upstream and downstream rates, emulate the modem or STB, PING the ADSL or Ethernet and much more. Ethernet testing facilitates FTTx deployments.
- Triple Play analysis including IPTV and VoIP QoS measurements, streaming video, phone emulation and more over ADSL1/2/2+, VDSL2 and 10/100 Ethernet links.

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# ParaScope mPA Features / Functions

## Hardware

WAN Interfaces: xDSL and 5 banana jacks for copper testing.

Ethernet Interfaces: LAN 10/100 Base-T.

External Interfaces: USB Host and Slave 1.1 ports, RGB monitor DB15, SD Card, microphone and earphones.

User Memory Media: SD card, per SD Memory Card Specification Version 1.01 and SDIO Card Specification Version 1.

LED's:

Main Chassis indicates Power, WAN and LAN Ethernet Ports selected and activity, xDSL module indicates DSL Power and DSL Synchronized.

Rechargeable Battery Pack: Li Ion battery pack, 7.4V, 9600 mAH or 4800 mAH, field replaceable.

External Power: AC/DC power converter outputs 12VDC at 3A, 110-240 VAC, 50-60 Hz.

Enclosure: Ruggedized ABS with rubber shell.

Display: 7" TFT LCD superbright, 16:9 aspect ratio, with 800x480 resolution, white backlight.

Dimensions: 210mm wide, 146mm tall, 58mm deep.

Weight: 1.35kg(3 lbs) without battery.

Battery weight: 350g regular capacity, 680g double capacity.

## Copper Testing

Digital Multi-meter (DMM): Measures AC and DC voltage, DC current, resistance and leakage resistance, capacitance on pair 1 or pair 2.

DC voltage: 0-250V, 1% or +/-0.5V accuracy

AC voltage: 0-175V RMS, 1% or +/-0.5V accuracy

DC current: 0-90mA, 1% or +/-0.5mA accuracy

Resistance: 0-1M $\Omega$

Accuracy: 0-9999 $\Omega$ : 1% or +/-5  $\Omega$

10k $\Omega$ -99.9k $\Omega$ : +/-1%

100k $\Omega$ -999k $\Omega$ : +/-3%

Leakage resistance:

0-99M $\Omega$  at 110V test voltage

Capacitance:

0.2nF to 3000nF, +/-5% accuracy

TDR

Distance Range: 3m to 10000m

Pulse amplitude: 10V

Pulse type: square wave, step

Pulse Width:

Adjustable: 10ns- 40 $\mu$ s, 10ns resolution,

V.O.P: 120-299 m/ $\mu$ s

## RFL

Test type: separate good pair

Fault location: total resistance, near-end to fault resistance, fault to strap resistance, fault resistance, total length, distance from fault to strap, distance to fault.

Accuracy 0.1%

LB: frequency 18kHz to 2.3MHz

Range: 0 to -80 dB

Single Ended Loop Testing

1. Line attenuation: wideband line attenuation (attenuation versus frequency full vector) and attenuation for 300 kHz (single value). Range: ~4kHz to 17MHz. The maximum attenuation is 90 dB (limited by the noise floor).

2. Data rate reduction: it specifies the data rate reductions from different impairments (bridged taps, noise, faults). Measurements for: Actual Conditions (actual conditions of a line), Rate Expert (estimate data rates that can be roughly expected on a "clean" line), ADSL2+ Data Rate Estimation (estimate ADSL2+ data rates for the actual noise and loop conditions), VDSL2 (17a) Data Rate Estimation (estimate VDSL2 (17a) data rates for the actual noise and loop conditions).

3. Spectral Analysis: Power Spectral Density of the spectrum up to 30 MHz - range ~8kHz to 30MHz with a ~8k resolution or ~4kHz to 17kHz with a ~4kHz resolution. The minimum value for Spectral Analysis is: -150.5 dBm/Hz (limited by the noise floor).

4. Crosstalks (disturbers) detection: frequency and power for each disturber. Types of detectable disturbers: Wideband Disturbers (wideband disturbers primarily consist of crosstalk), Narrowband Disturbers (narrowband disturbers consist of AM, FM etc.), Harmonic Disturbers (Harmonic disturbers are caused by events such as switching power supplies and monitors (displays)). Sensitivity: ~4kHz to 30MHz

5. In-home analysis: detects missing or miss-installed microfilters or other devices that impact DSL training.

6. Impulse Noise Detection: it reports information on impulsive noise, which is defined as a relatively short burst of noise. The impulse can be defined by a magnitude, a duration, or both simultaneously.

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## ADSL1/2/2+ Service Verification

Standards Compliance

ADSL ITU-T G.992.1 Annex A , Annex B

ADSL ITU-T G.992.2 Annex A , Annex B

ADSL2 ITU-TG.992.3/4 Annex A , Annex B

ASDL2+ ITU-T G.992.5 Annex A , Annex B

ITU-T G.992.5 Annex M

ITU-T G.992.3/4 Annex M

Emulation: ATU-R or ATU-C

DSL Measurements: Bits per tone chart, SNR chart. Max attainable bit rate with speedometers and text, link rate, SNR margin, Attenuation, Output Power

Transport settings: ATM with multiple configurable PVCs, VC or LLC multiplexing; PPPoA and PPPoE with CHAP and/or PAP authentication, RFC2684 Bridge,

IP connectivity: static, DHCP with additional options (Vendor Class Identifier, User Class Information)

ATM: ATM F4, F5 OAM Loopback, AAL5 Tx,Rx statistics (Tx AAL5 Frames, Tx AAL5 Frame Errors, Rx AAL5 Frames, Rx AAL5 Frame Errors, Rx AAL5 Frame Drops, Rx AAL5 Length Errors, Rx AAL5 CRC Errors, Rx AAL5 Aborts), misinserted cells, CRC10 errors

ATM Data Path Performance ( TR:128): Header Error Code Violation, Total Cell Count, User Total Cell Count, IBE Count

Line Performance Monitoring: Forward Error Correction Second, Errored Second, Severely Errored Second, Loss of Sync Second, Unavailable Second Line

Channel Performance Monitoring ( TR:090): Code Violation, Forward Error Correction

Alarms:

Upstream and Downstream:

LOS:Loss of Signal, LOF: Loss of Frame, LPR:Loss of Power, LOM:Loss of margin, NCD:No Cell Delineation, LCD:Loss of Cell Delineation

Operation:

Terminate or Pass-Through

## VDSL2 Service Verification

Standards Compliance: VDSL2 per ITU-T G.993.2

Bandplans: 8,12,17,30mhz

Profiles: 8a,8b,8c,8d,12a,12b,17a,30a

Plan 997, Plan998

Emulation: ATU-R ( RT) or ATU-C (CO)

DSLAM Compatibility: DSL1 Standard Compliant,

VDSL1 Conexant ( Alcatel North America)

VDSL1 Conexant ( Motorola North America)

VDSL1 Ikeanos CO4 (Tellabs N.America)

VDSL2 Standard Compliant

VDSL2 over POTS Standard Compliant

VDSL2 over ISDN Standard Compliant

VDSL2 Conexant ( Alcatel N.America)

VDSL2 Ikeanos CO4 ( Lucent Stringer 9.10)

VDSL2 Ikeanos CO4 ( Lucent Stringer 9.10)

VDSL2 Ikeanos CO4 ( Lucent Stringer 9.11)

VDSL2 Ikeanos CO4 ( Alcatel Europe)

VDSL2 Ikeanos CO4 ( Alcatel&ZyxeL ONT)

DSL Measurements : Bits per tone chart, SNR chart. Max attainable bit rate with speedometers and text, link rate, SNR margin, Attenuation, Output Power

Transport settings: ATM with multiple configurable PVCs, VC or LLC multiplexing; PPPoA and PPPoE with CHAP and/or PAP authentication, RFC2684 Bridge; PTM PPPoE and PTM Bridge

IP connectivity: static, DHCP with additional options (Vendor Class Identifier, User Class Information)

ATM: ATM F4, F5 OAM Loopback, AAL5 Tx,Rx statistics, misinserted cells, CRC10 errors

Link Errors: FEC, CRC, HEC,ES, SES, Loss, UAS, CV

Alarms: Upstream and Downstream:

LOS: Loss of Signal, LOF: Loss of Frame, LPR: Loss of Power, LOM: Loss of margin, NCD:No Cell Delineation, LCD: Loss of Cell Delineation

Operation:

Terminate or Pass-Through

Dual Ended Loop Tests

1. Loop topology and Bridged taps detection: full loop topology, including length of up to two taps.

2. Line attenuation: wideband line attenuation (attenuation versus frequency full vector) and attenuation for 300 kHz (single value). The maximum attenuation is 90 dB (limited by the noise floor). ADSL2+ range: 138kHz-2.2 Mhz. VDSL2 range: ~4kHz to 17MHz

3. Data rate reduction: it specifies the data rate reductions from different impairments (bridged taps, noise, faults). Measurements for: Actual Conditions (actual conditions of a DELT data set), Rate Expert (estimate data rates that can be roughly expected on a "clean" line), ADSL2+ Data Rate Estimation (estimate ADSL2+ data rates for the actual modem combination, noise conditions, and loop), VDSL2 (17a) Data Rate Estimation (estimate VDSL2 (17a) data rates for the actual modem combination, noise conditions, and loop).

# ParaScope mPA Features / Functions

4. Spectral Analysis: Power Spectral Density of the spectrum.

5. Crosstalks (disturbers) detection: frequency and power for each disturber. Types of detectable disturbers: Wideband Disturbers (wideband disturbers primarily consist of crosstalk), Narrowband Disturbers (narrowband disturbers consist of AM, HAM etc.), Harmonic Disturbers (Harmonic disturbers are caused by things such as switching power supplies and monitors (displays)).  
Operation: Terminate or Pass:Through.

## IPTV Testing

Physical Layers Supported:

ADSL1/2/2+, VDSL2 and 10/100 Ethernet.

Recognized Video Compression Standards: MPEG2, MPEG4 part 2&10 (H.264).

Signaling Protocols: IGMPv2, RTSP

STB Emulation: joining/leaving multicast video streams and monitoring VoD streams, detecting program name, stream source/destination address and port, video codec, audio codec, IGMP latency, displaying MPEG:TS streams per PID with average and current bitrates, Video preview (live 1fps)

Perceptive Quality Metrics:

Video: MOS:V, VSPQ, Gap VSPQ, Burst VSPQ, VSTQ, EPSNR.

Degradation Factors due to: Loss, discard, delay, codec type, A:V sync, recency.

Video Stream Metrics: MPEG:TS packets carrying I, P, B statistics (loss, discarded due to jitter, total received);

Video Stream Description: codec type, GoP type, GoP length, image size, frame per seconds count

Transport Metrics:

MPEG:TS Packet Loss Metrics:

Video MPEG:TS packet loss metrics: packet counters (received, lost, discarded, out of sequence, duplicated), burst and gap loss rate, burst and gap average length video bit rate.

PCR Jitter Metrics: PCR jitter, max positive PCR jitter, max negative PCR jitter, positive jitter percentile, negative jitter percentile.

Media Delivery Index: MDI Delay factor, MDI Maximum Delay Factor, MDI Media Loss Rate, MDI Maximum Media Loss Rate

TR 101290 MPEG: TS sync loss, sync byte error, transport error, PCR repetition error, PCR discontinuity indicator error, PTS error.

**Operation:** STB emulation in termination mode (Ethernet or Modem) or in pass:through mode (Ethernet or Modem)

Auto Test: automatic scan of channel list with all

channel summary report, including major perceptive metrics

## VoIP Testing

Physical Layers Supported: 10/100 Ethernet, ADSL1/2/2+, VDSL2,

Signaling Protocols: Session Initiation Protocol (SIP).

Operation: SIP phone termination and Pass:through mode.

Technical Specifications:

Call quality analysis using optimized ITU-T G.107

Measures perceptual effects of burst packet loss and recency using ETSI TS 101 329-5 Annex E Extensions

Supports Japanese TTC JJ201.01 VoIP monitoring requirements

Produces and interprets RTCP XR (RFC611) VoIP metrics payloads

Call Emulation (Soft Phone): Originate and receive VoIP SIP calls. Settings include NAT traversal options, SIP addresses, codec and ring tone selection.

Call Monitoring: Monitors multiple SIP calls present, registers them in the call log and performs QoS analysis

Call Analysis: SIP flow.

Call Log: Start/End time of call, IP address, Alias Name, SIP status, presence of audio RTP received and sent, QoS/QoE status, SIP protocol flow diagram

Call Quality Metrics:

Listening and conversational quality MOS scores with ACR, ITU and TTC scaling MOS- LQ and MOS- CQ

Estimated PESQ scores: MOS- PQ

Listening and conversational quality R factors: R- LQ and R- CQ

Audio codec type and bit rate

Degradation Factors: Percentage degradation due to loss, jitter, codec, delay, signal level, noise level, echo, latency.

RTP Metrics:

Packets: received, lost, discarded, late, out-of-order, duplicated, average loss rate, average net loss rate, average discard rate

Burst count, average R Burst, average Burst loss rate, average Burst length in milliseconds and in packets

Average R:Gap, average Gap Loss rate, average Gap length in milliseconds and in packets

Jitter buffer metrics: average and maximum packet delay variations.

# *ParaScope mPA Features / Functions*

## **IP Testing**

Physical Layers Supported: ADSL1/2/2+ ,  
VDSL2 .

IP Ping: Check the connectivity of the network.

Trace Route: Trace the IP addresses of all the gateways or routers from the ParaScope mPA. Results indicate number of hops, round trip time, and more.

Web Browser: navigate

Link Status: Receive and transmit IP bit rate, number of bytes, packets, errors, drops, fifo's, compressed, frames, collisions, multicasts , carriers

## **Operational**

File Handling: Save, export, view and delete test data. Text and histograms formats

Exporting: Test data can be exported with the USB disk.

Software Update: via USB from a PC

Online Help: Provides operational prompting and instructions.

## **Maintenance Plans**

One or two year Maintenance packages are available and include:

One or two year hardware warranty

One or two year software subscription updates

Unlimited technical support

## *ParaScope mPA Specifications*

Item	Description
WAN Ports	One RJ-45 for xDSL, Five banana jacks for copper testing
Ethernet Ports	Two 10/100 Fast Ethernet
External Interfaces	Two USB (Host and Slave) 1.1 ports, one RGB Monitor DB15, one SD Card, Headset, Microphone and earphone.
Display	7" TFT Touch screen LCD. Resolution: 800x480 with 16.9 aspect ratio, white backlight
Rechargeable Battery Pack	Li Ion, 7.4V, 9600mAH, field replaceable battery pack, 8 hrs of operation.
External Power	AC/DC power converter, 100-240VAC, 50-60 Hz, Output 12V@3A
Memory	SD Card
Operating Temperature	0 to 45 degrees C, 32 to 113 degrees F
Humidity	10% to 90% non-condensing
Storage Temperature	-20 to 60 degrees C, -6 to 140 degrees F
Dimensions	210mm (L) x 146mm (W) x 58mm (H)
Weight	1.36 Kg or 3.0 lbs. Add 350g or .77lbs for regular capacity battery pack and 680g or 1.501lbs for double capacity battery pack.

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