ACT6000

Advanced Communication Tester

SINE SIGNAL & NOISE GENERATOR - SELECTIVE LEVEL METER
CROSS TALK METER - SPECTRUM & NETWORK ANALYZER
LONGITUDINAL BALANCE & RETURN LOSS METER
MICROINTERRUPTION & IMPULSIVE NOISE METER
VOLTAGE - RESISTANCE - CAPACITANCE METER
TDR & RESISTANCE FAULT LOCATOR
POTS DEVICE SIMULATOR

ALL ON THE PALM OF YOUR HAND!

This new instrument combining various kinds of transmission, metallic and special tests, may be considered up to today the most advanced Test Set for qualifying and maintenance of advanced transmission systems and copper pairs used for various telecommunication services:

•POTS •ISDN •T1 •E1 •HDSL 1/2P •SHDSL •ADSL •ADSL2+ •VDSL2 •VDSLp

ERGONOMIC CHARACTERISTICS

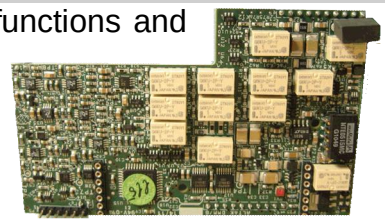
One of **ACT6000** most interesting features is the colour LCD high resolution graphic display, a real ñwindowò on the most advanced measurementsô world.
The keypad, the function keys, connections and interfaces on the upper panel grant to the instrument a high operating level.

DATA-COMMUNICATION CHANNELS & COPPER PAIRS QUALIFICATION / CERTIFICATION

One **ACT6000** can perform easy and quick ñSingle-End Line Testsò or specific ñEnd-to-End Line Testsò if coupled with another **ACT6000**. The wide kind of measurements of the **ACT6000** allows the qualification and certification on various communication carriers and copper pairs used for digital streams with a frequency occupancy up to 6 MHz (or 35 MHz optional); moreover, the instrument can automatically extrapolate the ADSL, ADSL2+, VDSL2 and VDSL Plus maximum expected data rate of the copper line under test.

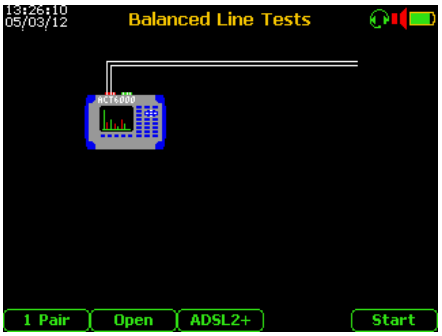
COPPER PAIRS DIAGNOSTIC & FAULTS FINDING / LOCATION

ACT6000 can be configured for high troubleshooting mission, by special functions and internal optional modules.
The complete adoption of these modules allows the simple and fast finding and localization of anomalies and/or faults on the copper line and communication systems.



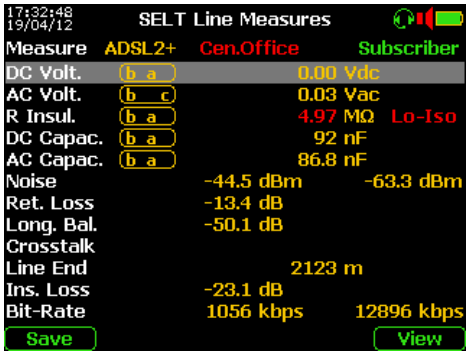
ACT6000 ï Typical Applications examples

AUTOMATIC SINGLE-END LINE QUALIFICATION

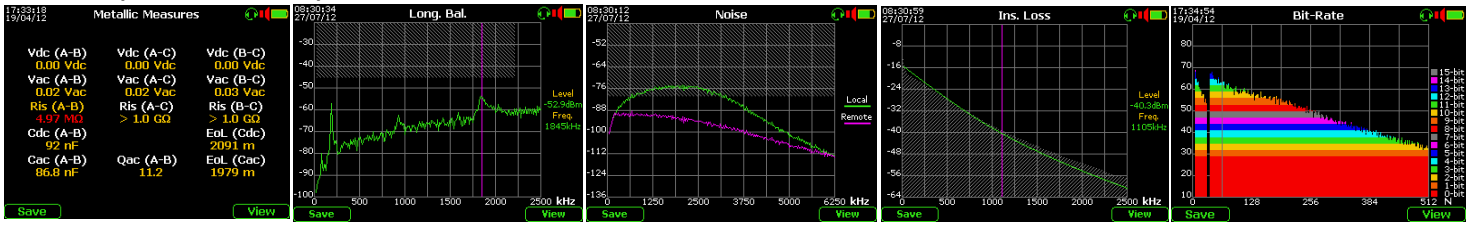


Adopting the optional ASW-1 software, after the quick cable selection among the many types included on the data base, it is possible to start an Automatic Sequence to perform a complete set of electrics and transmissive tests to qualify the line for a specific service.

For the ADSL, ADSL2+ and VDSL2 services, over the mentioned electrical and transmissive tests, the S/N Ratio and maximum Bit-Rate estimation are added.



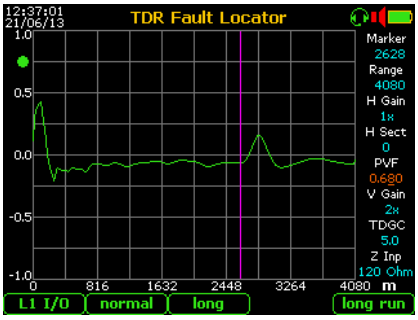
Finished the Sequence (about 100 seconds), a summary table appear on the screen with pass/fail indication (in red) for each result according to the international acceptability criteria and transmissive masks (ETSI or ANSI).



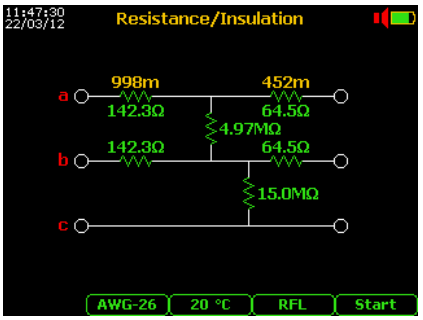
The results can be saved on the internal memory and then visualized or exported on the USB pen-drive or PC as .CSV file (Windows Excel compatible) or as .BMP photo of the screen.

FALUTS LOCATIONS

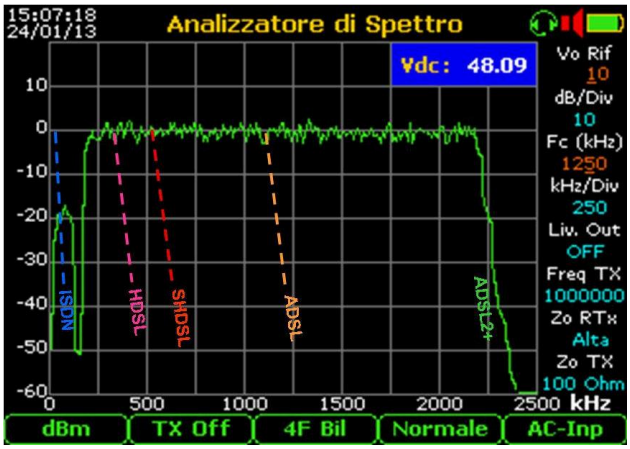
A powerful **TDR** allows the quick finding of the End-of-Line but also the location of possible faults or anomalies as: interruptions, short circuits, low insulation, bridge-taps, split-pairs, and also the possible micro-interruptions thanks to the ñSample & Holdò test modality.



Other important available function is the **Resistive Bridge - Fault Locator** that allows to localize various combinations of low insulations points.



POWER SPECTRUM DENSITY (HIGH IMPEDANCE)



The ACT6000ôs **Spectrum Analyzer** can operate on various frequency bands, readout mode and also with special Front/End configuration as the High Impedance.

Using the High Impedance configuration (not intrusive mode), it is possible to perform the PSD to verify the spectrum and energy of any digital stream (i.e. to extrapolate the ADSL, ADSL2+ and VDSL2 profile) connecting the input instrument in parallel to the active and powered line.

Other PSD application is to perform a quick signals map staying on the Main Distribution Frame or Street Cabinet.

ACT6000 ï TECHNICAL CHARACTERISTICS

General

Caseé é é é é é é é é : ABS shielded for EMI / EMC.
Connectionsé é é é é é : • "RTX" connectors IN/OUT and ñTXò OUT triple banana-jack;
• polarized connector for external supply;
• RJ-45/4 connector for headset;
• USB port for PC connector;
• USB for pen-drive connector.
Displayé é é é é é é é .: LCD color 320 x 240 pixel (¼ VGA) backlit.
Power supply (internal)é é .: • rechargeable battery pack (green) NiMh, with life of about 8 h. (typical), 5 h. (minimum).
• external: from 16,5 to 26,5 Vdc / max 2,5 Ah.
Dimensions and Weighté é : 150 x 210 x 50 mm / 1,5 Kg. (batteries included).
Temperature rangeé é é é : Operating: -5 ÷ +50° C. / Storage -20 ÷ +70° C.
Humidity rangeé é é é é ...: 5 ÷ 90% non-condensing.
Overvoltage Protectioné é .: In/Out RXT connectors up to 150 Vdc / 140 Vpp.
Reference Frequency accé : • ±1 ppm within the operating temperature ±2 ppm/year.
Reference Level accuracyé : • ±0.025% within the operating temp. ±0.025% / year.
CE mark - EMC é é é é é .: Directive 2004/108/CE, 89/336/EEC, Decree 2007/194 CISPR 11, ISO 14253 and CEI EN: 61326/A1/A2, 55011, 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-6, 61000-4-11.
Special Features and Setup : ð Results storage on internal flash memory;
ð Software update and Results Exportation on Pen Drive or PC;
ð PC Remote interface by USB port.

Level Generator

Sine output frequency range: • base band: from 20 Hz to 25 kHz
• med. band: from 20 kHz to 6 MHz
• high band*: from 20 kHz to 35 MHz
Reference Frequency acc. ..: • ±1 ppm within the operating temp. ±2 ppm/year.
Reference Level accuracy...: • ±0.025% within the operating temp. ±0.025% / year.
Frequency Resolution.....: 1 Hz up to 9.999999 MHz; 10 Hz over 10.0 MHz.
Frequency setup mode .....: manual on single frequency and step mode on programmable band / steps.
Balanced output impedances: • base band: 150, 200 and 600 Ý;
• medium band: 100, 110, 120, 135, 150 Ý;
• high band *: 100 Ý.
Unbalanced out. impedances: 50, 55, 60, 68 and 75 Ý by Banana/BNC optional adapt.
Output level ï Base Bandé .: • -70 ÷ +14 dBm @ 600 Ý balanced / 0.1 dB steps;
• -64 ÷ +17 dBm @ 75 Ý unbalanced / 0.1 dB steps.
Output level ï Medium Band: • -64 ÷ +20 dBm @ 100 ÷ 150 Ý balanced / 0.1 dB steps;
• -64 ÷ +17 dBm @ 50 ÷ 75 Ý unbalanced / 0.1 dB steps;
Output level ï High Band *...: • 0 dBm @ 100 Ý balanced;
Output level ï High Band *é : • 0 dBm @ 50 Ý unbalanced.
Output level accuracyé é é : • base band: ±0.2 dB from 50 Hz to 20 kHz @ 600 Ý ;
• medium band: ±0.2 dB up to 2 MHz ±0.3 dB up to 6 MHz @ 100 Ý;
• high band: ±0.5 dB up to 10 MHz ±1 dB up to 35 MHz @ 100 Ý.
White Noise Generator .....: 1 kHz ÷ 6 MHz / -74 ÷ -144 dBm/Hz / 0.1 dB steps. *(available on Network Analyzer)*

Level Meter

Frequency range .....: from 50 Hz to 6 MHz (two bands) base version; up to 35 MHz *
Manual tuning / resolution ...: 1 Hz up to 9.999999 MHz; 10 Hz over 10.0 MHz.
Level measurement modeé : absolute (dBm, dBV, dBu,Volt) and relative (dBr).
Reading resolutioné é é : 0.1 dB
Input rangeé é é é é é .: • base band: -110 ÷ +10 dBm @ 1 kHz / 600 Ω;
• medium band: - 120 ÷ +12 dBm @ 1 MHz / 120 Ω;
• high band *: -70 ÷ +5 dBm @ 10 MHz / 100 Ω;
Level meter accuracyé é é .: • ±0.2 dB from 100 Hz to 20 kHz @ 0 dBm / 600 Ω;
• ±0.2 dB up to 2 MHz, ±0.3 dB up to 6 MHz; @ 120 Ω;
• ±1 dB up to 10 MHz, ±1.5 dB up to 35 MHz * @ 100 Ω.
Noise floor (TX OFF)é é é : • ≤ -140 dBm/Hz up to 6 MHz;
: • ≤ -100 dBm/Hz up to 35 MHz *.
Frequency Meter sensitivity : ≤ -30 dBm - base and medium band
Input impedances balanced : • base band: 150, 200, 300, 415, 600 Ω and >10 kΩ;
• medium band: 100, 110, 120, 135 150 Ω and >10 kΩ;
• high band * 100 Ω and > 5 kΩ.
Input impedances unbalé ...: base and medium band: 50, 55, 68 75 Ω and >10 kΩ; high band *: by Banana/BNC: 50 Ω and > 2.5 kΩ.
Noise filtersé é é é é é .: • base band: wide band, Psophometric; C-Message; 300 ÷ 3400 Hz, 20 ÷ 3400 Hz, 300 Hz ÷ 6 kHz, 20 Hz ÷ 6 kHz, 300 Hz ÷ 15 kHz, 20 Hz ÷ 15 kHz, 300 Hz ÷ 20 kHz, 20 Hz ÷ 20 kHz and 20.0 kHz flat.
• medium / high band *: E, F, G / VDSL 2 and VDSL plus.
Selective filters / notché é ..: • base band: (200 Hz ÷ 20 kHz) pass band and notch for S/N+D (dB and %) test;
Selectivity: 10 Hz @ fo <200 Hz, 5% fo @ >200Hz fo <4 kHz, 200 Hz @ fo >4 kHz.
Selective for telegraph. channels: 120, 240, 360, 480 Hz.
• Medium / high band (20 kHz ÷ 6 or up to 35 MHz *): 25, 100, 200, 400 Hz and 1.74, 3.1, 4.0, 8.0 and 16.0 kHz.

Spectrum and Network Analyzer

Frequency rangeé é é é é : from 200 Hz to 6 MHz (two bands) base version; up to 35 MHz *
In / Out *1)* impedances bal.. : • base band: 150, 200, 300, 415, 600 Ω and >10 kΩ;
• medium band: 100, 110, 120, 135 150 Ω and >10 kΩ;
• high band * 100 Ω and > 5 kΩ.
In / Out *1)* impedances unbal: • base and medium band: 50, 55, 68, 75 Ω and >10 kΩ , high band *: by Banana/BNC adapter: 50 Ω and > 5 kΩ.
Level reading modeé é é : dBm, dBV, dBu,Volt and dBr.

** By EBM30 optional module (ACT-13)*
1) Referred to Tracking Level Generator

Measurements readout.....: normal, peak (max, mean or min. value),
Measurement modeé é é ..: base and medium bands: 2 Wires +/- (for Return-Loss measurement), 2 Wires +/+ (for Longitudinal Balancement measurement) and 4 Wires. High band *: 2 Wires for Return-loss measurement and 4 Wires.
Input range.....: from noise floor ÷ +12 dBm @ 100 Ý
Noise floor.....: Ò-140 dBm/Hz.
Resolution verticalé é é .. : 192 pixel / 8 div.: 1, 2, 3 ÷ 20 dB / division.
Resolution marker.....: 0.1 dB / as selected resolution (BW).
Tracking Level Generator....: in sweep or single frequency in 2/4 wires mode; Output Lev. & Resolution are the same of Level Generator.

- **Base band** rangeé é é .. : 200 ÷ 25000 Hz, by FFT analyzer (Kaiser window).
  Spané é é é é é é é ..: 6250 Hz (and zoom / 2), 12500 Hz and 25000 Hz.
  Resolution horizontalé é ..: 250 pixel / 10 div. : 625 + zoom, 1250, 2500 Hz / division.
  Resolution (BW)é é é é ..: 50, 100, 200 .. Hz (other resolutions are interpolated).

- **Medium band** range.....: 1 kHz to 6 MHz, by Digital SSB quad. conversion.
  Span .....: 30 ranges: from 10 to 8000 kHz, 10 per decade.
  Resolution hor. on display..: 250 pixel / 10 div: 1, 2, 4, 8, 16.. ÷ 800 kHz / division.
  Measurement hor. resol.....: 1000 points (available on saved and exported CSV file).
  Resolution (BW) .....: 0.2, 0.5, 1, 2, 5, 8 kHz (other resolutions are Interpolated)
  Max level freq. readout.....: up to 10 Hz resolution on 1 kHz / Div.

- **High band *** range.....: 20 kHz to 30 MHz, by double conversion receiver in four bands: 0.02 to 12, to 18, to 30 to 35 MHz.
  Resolution horizontal .....: 250 pixel / 10 div: 1.2, 1.8 3 and 3.6 MHz / division.

Mix measurements Generator/Meter and Network Analyzer

- **Cross-Talk (4 Wires)**
  by Generator & Meteré .. : NEXT (in Single-End mode) and FEXT (in End-to-End mode) on single frequency.
  Test by Network Analyzer : NEXT (in Single-End mode on single frequency or wide band by tracking generator) and FEXT (in End-to-End mode) on single frequency or wide band using the frequency Step Generator and sample & hold Spectrum Analyzer.
  Freq. range TX and RXé : 200 Hz ÷ 6 MHz, up to 35 MHz *
  Impedances TX and RXé : same of the Signal Generator & Level Meter, excluded the high impedances.
  Measurement accuracyé .: • up to 2 MHz: ±1 dB / 0 ÷ -90 dB;
  • up to 6 MHz: ±2 dB / 0 ÷ -86 dB;
  • up to 35 MHz *: ±3 dB / 0 ÷ -80 dB.
  Intrinsic crosstalké é é é : <- 90 dB (by precise termination).

- **Return Loss (2 wires)**
  Test by Network Analyzer : in Single-End mode on single frequency or wide band (spectral)
  Freq. range TX and RXé .: 200 Hz ÷ 6 MHz, up to 35 MHz *
  Impedances TX and RXé : same of the Signal Generator & Level Meter, excluded High Z.
  Measurement accuracyé .: • up to 2 MHz: ±1 dB / 0 ÷ -50 dB;
  • up to 6 MHz: ±2 dB / 0 ÷ -46 dB;
  • up to 35 MHz*: ±3 dB / 0 ÷ -40 dB.

* *by internal optional module EBM30 (ACT-13)*

- **Longitudinal Balance Loss (2 Wires + Gnd)**
  Test by Network Analyzer : in Single-End mode on single frequency or wide band ï spectral readout, by tracking generator.
  Impedances TX and RX...: same of the Signal Generator & Level Meter, excluded high Z.
  Frequency range .....: 200 Hz ÷ 6 MHz.
  Impedances TX and RX...: same of the Signal Generator & Level Meter, excluded High Z.
  Measurement accuracy....: • up to 2 MHz: ±1 dB / 0 ÷ -60 dB;
  • up to 6 MHz: ±2 dB / 0 ÷ -56 dB.

- **Single-End Insertion Loss** (available on the automatic SELTest sequence) *by Advanced Software ASW-1/II;*
  Measuring Mode / readout: by wide band FDR technology with Spectral readout.
  Operating limits.....: • minimum line length: 50 meters;
  • max. line length: 4.5 km with wires diameter of 0.4 mm.
  Graphic Extrapolation .....: 1 kHz ÷ 6 MHz or up to 30 MHz *.
  Accuracy .....: ±1 dB up to 2.2 MHz;
  ±2 dB up to 30 MHz *.
  Operating Impedance .....: 120 Ω balanced line.

Event Tests

- **Micro-Interruptions - O.62 (base band)** and on **medium band**
  Threshold levelé é é é ...: -3 ÷ -20 dB - 2 kHz Test Tone (default) or on programmable input frequency up to 6 MHz.
  Monitoring timeé é é é .. : 4 min. ÷ 24 ours.
  Events indicatorsé é é é : 5 Counters (0.3ms ÷ >1min); Event/Time ; Secs. with Events.
  Readouté é é é é é é .. : Tabular and Time Domain histogram representation.
  Measure facilitiesé é é é : 2 kHz reference tone output from TX connector for loopback tests.

- **Impulsive Noise O.71 (base band)** or **medium** or **high band**
  - Threshold levelé é é é : 0 ÷ -60 dBm.
  - Base band BW filtersé .. : 200 ÷ 12000 Hz Flat, 600 ÷ 3000 Hz 300 ÷ 500 Hz.
  - Monitoring timeé é é é .: 4 min. ÷ 24 hours.
  - Events indicatorsé é é .: 1 Event Counter; Event/Time Ratio; Secs. with Events.
  - Readouté é é é é é é .:Tabular and Time Domain Histogram representation.

Special Measurements

- **Line Immunity by White Noise injection** (available on Network Analyzer)
  - Bandwidthé é é é .... : 1 kHz ÷ 6 MHz.
  - Output level rangeé é ...: -70 ÷ -144 dBm/Hz @ Zref 100 Ω 0.1 dB Resolution.
  - Output impedanceé é ...: 100, 120, 135, 150 and 1350 Ω (balanced).

- **TDR Fault locator**
  Distance rangesé é é é .: 90, 180, 450, 900, 1800, 3600, 7200 m. @ 0.600 PVF.
  Zoomé é é é é é é é .. : - vertical: -8 ÷ +77 dB;
  - horizontal : 1x, 2x, 4x.
  Distance res. (by marker)é .: • minimum range: about 0.4 meters
  • maximum range: about 40 meters
  Operative modeé é é é é : single line, Crosstalk (4 Wires), Differential by comparison of other test saved on internal memory; Monitoring to events localization by Peak mode (Sample & Hold).
  Pulse output levelé é é é ..: short / long: 2.2 Vpp; Boost: 5.5 Vpp.
  Pulse lengthé é é é é é é : automatic on range selection, from 10 to 5000 ns.;
  IN/OUT impedanceé ..é é : 100, 110, 120, 135, 150 Ω (bal.)
  TGC (autom. gain control)...: 0 ÷ 6 dB/km.
  Propagation velocityé é é ..: PVF: 0,300 to 0,999 or PV (90 to 300 m/µs)

• **Digital Multimeter DC / AC** (by DMM ï ACT-12 optional module)
Measuring mode.....: between a-b; a-c (Gnd); b-c (Gnd) and reverse.
- DC Voltage Rangeé é é ..: 0 ÷ 140 Vdc
- DC Voltage Accuracy.....: ≤2% of reading ±1 digit.
- AC Voltage Range.....: 0 ÷ 100 Vrms
- AC Voltage Accuracy.....: ≤2% of read. ±1 digit / 15÷3300 Hz

DC LOOP RESISTANCE / INSULATION
- Test Voltage.....: ≤ 100 Vdc (with current limit 1mA)
- Range / Accuracy .....: 2 Ω ÷ 1 GΩ / ≤2% of reading ± digit;

LINE LENGTH BY LOOP RESISTANCE
- Line length evaluation.....: as function of measured resistance
- Line Gauges setting.....: from 0.2 to 2.5 mm or from AWG 26 to AWG 11.
- Multi-section setup.....: up to 5 different cables type.
- Line Resistance correction: from 1.01 to 1.60 x standard copper resistance.
- Line Temperature setting ..: set from -20° ÷ +60° C.
- Range / Resolution.....: 0 to 99.999 Units (meters or feet) / 1 units.
- Accuracy.....: derived from measured resistance.

RESISTANCE METER (real time) (by optional module ACT-18 installed on DMM module)
Range / Resolutioné é é é : 0.1 Ω to 50 kΩ / 0.1 Ω to 999.9 Ω
Accuracyé é é é é é é : ±2% ±1 digit.

RESISTANCE balancement: for unbalance >5 Ω, shorting a-b-c.

RFL (Resistance Fault Locator)
- Loop resistanceé é é é ..: 1Ω to 5 kΩ maximum.
- Multi-section facilityé é é : as the setup for Loop Resistance.
- Fault resistanceé é é é . : from 5 Ω to 20 MΩ max.
- Accur. of RTF @ 1 MΩé . : ±0.5% of Loop resistance.

DC CAPACITANCE (time of DC discharge method)
- Test Voltageé é é é é é : ≤ 100 Vdc
- Rangeé é é é é é é é é : > 10 nF ÷ 10 µF.
- Accuracyé é é é é é é .. : ≤ 5% of reading ± 1 digit.

AC CAPACITANCE and Q factor (by capacitive bridge)
- Measuring modeé é é é . : by 1 kHz tone ï 1.1 Vpp.
- Range / Resolutioné é é . : 0.1 to 3000 nF / 0.1 nF.
- Accuracyé é é é é é é . : • ±1% of read. ± 1 nF @ C <500 nF;
  • ±5% of reading ± 1 digit @ C >500 nF and < 3000 nF.

LINE LENGTH BY CAPACITANCE
- Line length estimationé é : function of measured capacitance:
- Line Capacitance setupé . : 10.0 to 300.0 pF / Length Unit.
- Range / Resolutioné é é . : 1 to 99999 Units (m. or ft.)
- Accuracyé é é é é é é .. : as from capacitance meas.

LINE IMPEDANCE RESPONSE
- Measuring rangeé é é é . : from 30 to 3200 Ohm in five steps.
- Frequency Rangeé é é é : from 5 kHz to 5 MHz in four steps.
- Accuracyé é é é é é é .. : ±5 % ±5 Ý.

• **POTS Subscriber Simulator** (by optional module ACT-11 installed on DMM module)
Dial Encoderé é é é é é .. : • Pulse, progr. duration/ratio 100ms / 40/60%);
• DTMF std. tones, progr. Level, Duration, Inter-tone.
Ring Detect. Range & Meas : Level: 10 ÷ 90 Vrms; Frequency: 15 ÷ 70 Hz.
Ring Detector AC Loadé é .: R 7310 Ý ± 2% in series + 940nF ±10% capacitor.
Ring current self limitation.. : Ò15 mA peak ; safety fold-back limited.
On Hook / Break & Makeé . : R = 120 Ý ±2% @ I = 100 mA; Voffset = 4 Vdc.

** by Advanced Software ASW-1/II;*
*** by adoption of EBM 30 (ACT-13) optional module;*

Automatic pre-configured SELTest sequence for line pre-qualification *
With **single ACT6000** - **Single-End Tests on open line,** 2 or [4] Wire mode:
Metallics: AC / DC Voltage, DC Insulation, AC / DC Capacitance, End-of-Line (TDR).
Transmissive (wide band / spectral): Noise (local), Return-Loss, Longitudinal Balance-Loss, ñFDRò Insertion-loss & frequency response estimation, Noise (far-end estimation), [NEXT], and SNR prediction, Bit-Rate prediction for ADSL - ADSL2+ - VDSL2 and VDSL Plus ****** masks.

Manual pre-configured SELTest **
Transmissive (wide band / spectral readout) measurements: Noise, Return-Loss, Longitudinal Balance-Loss, NEXT and PSD in high impedance (sniffer mode).

Automatic pre-configured DELTest sequence for line qualification & certification *
With two **ACT6000** (Master/Slave mode) for **End-to-End Tests,** 2 or [4] Wire mode:
Only Transmissive (wide band / spectral): Noise (bilateral), Return-Loss (bilateral), Longitudinal Balance-Loss (bilateral ñLCTLò), Insertion-Loss, [NEXT and FEXT] and Bit-Rate evaluation (Up & Down stream) and SNR for ADSL - ADSL2+ VDSL2 and VDSL plus****** masks.

Automatic DELTest for two unidirectional channels qualification / certification *
With **two ACT6000** (Master/Slave mode) for **End-to-End Tests,** in Base Band (Voice or Modem 56K) according to **EIA-464 4W E&M** tests. *Only bilateral Noise and Insertion-Loss measurements*.

Automatic POTS Telephone DELTest sequence * (by optional module ACT-11 installed on DMM module).
With **two ACT6000** (Master/Slave mode) for **End-to-End Tests**, to perform a complete qualification on POTS links, included Signalling and Transmissive tests according to M.1040 mask.

Pre-configured masks for manual SELT or SELT / DELT line tests sequences
• Wide band: **VOICE, MODEM 56k, ISDN, HDSL 1p** and **2p, E1, T1, SHDSL, ADSL, ADSL2+**, and **VDSL2-12a, VDSL2-17a, VDSL2-30a, VDSL Plus ****.

DBPO Masks - Automatic generation of the Threshold Mask for VDSL2****** related to the primary line parameters included the ñESELòmeasured by ADSL2+ SELT Sequence *****

Supplied Accessories (base kit):
ACT6000 Base Instrument, included:
- Nylon Carrying Case with pocket for accessories;
- User Guide (English or Italian language, as requested);
- AC Power Supply and Battery Charger (Line Input: 100-220 Vac; Output: 20 Vdc);
- Banana-Banana + Crocodiles cables (2.30m total length);
- Ground Cable unipolar Banana-Crocodile cable;

Extra cost Accessories and Optional HW/SW Modules
- **ASW-1/II - Advanced Software 1** (see the above description).
- **ACT-11** POTS Module (Subscriber Simulator for POTS for signalling tests);
- **ACT-12** DMM Module (Digital Multimeter for metallic tests);
- **ACT-13** EBM30 Module (Extension Band for 35 MHz operation);
- **ACT-14** USB Pen-Drive 8 GB;
- **ACT-15** Probes to perform Medium & High Band PSD measurement on fed lines;
- **ACT-16** Plug/Probes to perform Medium & High Band PSD measurements on fed lines.
- **ACT-17-B** 50 dB Bal. Attenuator, High Z input / 150 Ohm out.
- **ACT-17-U** 50 dB Unbal. Attenuator High Z input / 75 Ohm out.
- **ACT-18** Real Time Resistance Meter module;
- **ALT-05** Headset with 2m cable and RJ-45/4 connector;
- **ALT-09** Resistive Termination Set (100, 120, 150 and 600 Ω);
- **ALT-16** Triple Banana to BNC Adapter.