NETWORK TESTER

CableSHARK P3

NETWORK TESTING–COPPER ACCESS

Features

- Loop current measurement
- Stress/leakage testing with programmable soak time
- Single-Ended insertion loss measurement/frequency response to 6 MHz
- Single-Ended DMT rate prediction for full-rate ADSL, ADSL2, ADSL2+, & G.Lite
- ADSL auto-testing with pass/fail indication and user modifiable thresholds
- Single-Ended SHDSL rate prediction for G.SHDSL
- G.SHDSL auto-testing with pass/fail indication and user modifiable thresholds
- Power spectral density (PSD) noise with spectrum analysis to 6 MHz

The Fast Way to Locate & Repair Faults in the Local Loop

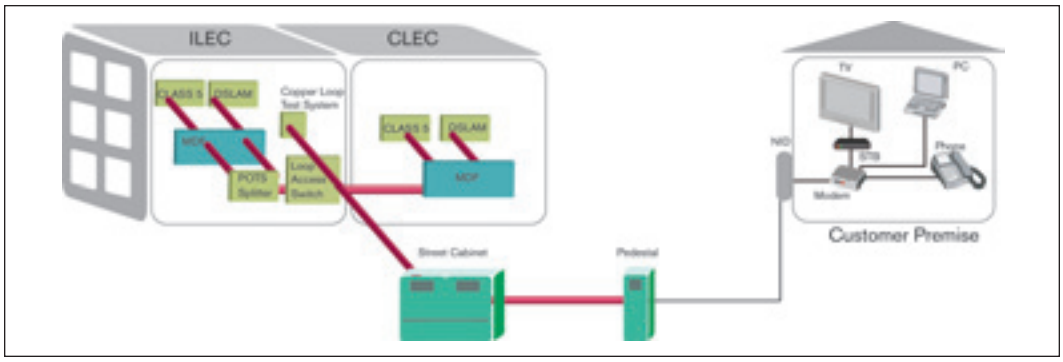
ALL LOCAL LOOP ACCESS TESTING

With the CableSHARK P3's 6 MHz bandwidth, it can test a local loop for just about any service it will carry. It's great for ADSL2+, ADSL2, ADSL, G.Lite, VDSL, G.SHDSL, HDSL, HDSL2, T1, DDS, PRI ISDN, and BRI ISDN. Service-specific auto-tests, reference cursors, specific noise filters and specialized loop evaluation algorithms make loop qualification simple.

CableSHARK P3

AN ESSENTIAL TOOL DSL SERVICE PROVIDERS (TELCOS) AND CONTRACTORS

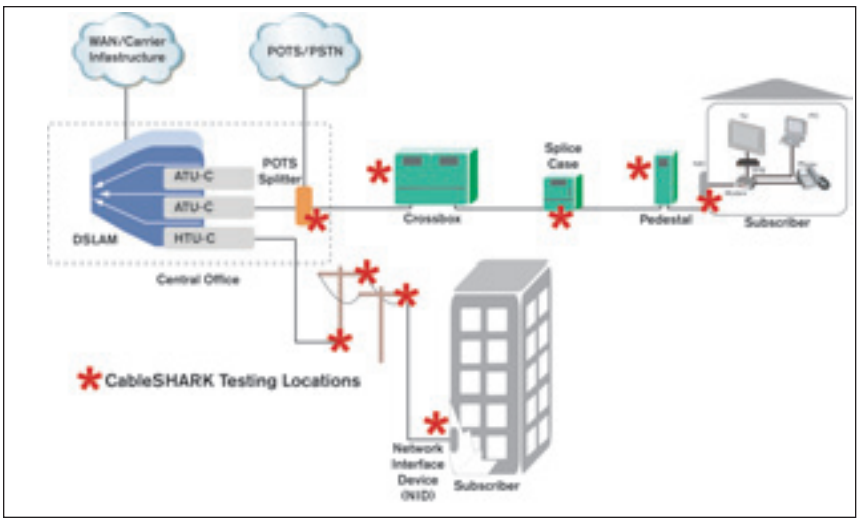
Cable maintenance technicians and cable splicers agree; the CableSHARK P3 is the ideal local loop troubleshooting tool. Telco and contractor personnel use them every day to identify the reason why a DSL and/or VF circuit didn't succeed. Cable repair crews use them to precisely locate and eliminate loop faults. Management loves them because they eliminate the guesswork in hunting down loop faults that might otherwise tie up valuable staff and company resources.



Test from CO to Subscriber

VIDEO OVER COPPER

For many telco's the roll out of ADSL has gone quite smoothly. Preparing the loop plant for video over copper services is another story. The CableSHARK P3 determines the DSL rates that a loop will support. If the rates are too low to support video services, the CableSHARK P3 will allow the technician to know if repairs can bring the loop up to spec. It even confirms the new DSL rates as repairs are made.



Verify Points Along Your Network with Ease

26 Measurements

A COMPLETE SUITE OF MEASUREMENTS

The CableSHARK P3 is a superb tool for technicians testing the field. This comprehensive testing tool combines these 26 measurements in one test set:

- A.C. voltage (T-R, T-G, R-G)
- D.C. voltage (T-R, T-G, R-G)
- Loop capacitance as well as T-G, R-G capacitance
- Shorts meter
- Loop resistance as well as T-G, R-G resistance
- Opens meter
- Loop current measurement
- Stress/leakage testing with programmable soak time
- Single-Ended insertion loss measurement/frequency response to 6 MHz
- Single-Ended DMT rate prediction for full-rate ADSL, ADSL2, ADSL2+, & G.Lite
- ADSL auto-testing with pass/fail indication and user modifiable thresholds
- Single-Ended SHDSL rate prediction for G.SHDSL
- G.SHDSL auto-testing with pass/fail indication and user modifiable thresholds
- Power spectral density (PSD) noise with spectrum analysis to 6 MHz
- Spectral Detective - live circuit spectrum analysis (with IEEE 743-1995 E, F & G filters)
- Noise - metallic (NM) and power influence (PI) measurements with various filters
- Impulse noise - voice frequency & high speed wideband
- Power influence – harmonic analysis (50 Hz / 60 Hz to 9th harmonic)
- Fully automatic graphical and numeric Time Domain Reflectometer (TDR)
- Manual mode graphical and numeric TDR
- 4-wire graphical and numeric TDR
- Graphical bridge tap detection and locating
- Load coil detection
- Swept frequency longitudinal balance measurement with graphic display
- VF Longitudinal balance
- 2-Wire “Live” crosstalk measurement with automatic disturber identification
- 4-Wire crosstalk measurement (pair to pair using a high power swept tone insertion)
- Ground resistance (station ground) for CO ground suitability
- Resistance fault location (RFL)
- K-Test
- End-to-End DMT rate prediction for full-rate ADSL and G.Lite
- End-to-End insertion loss/frequency response
- Full-Featured VF testing suite
- Voice frequency (VF) auto testing with pass/fail indication and user modifiable thresholds
- FDR

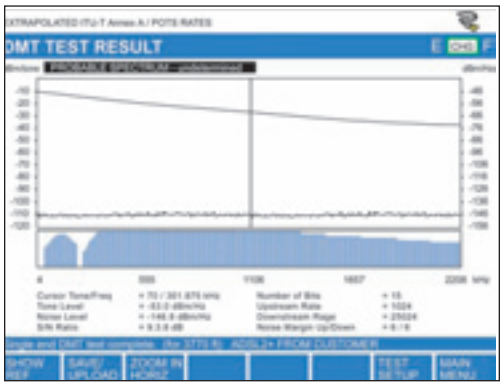
AN IMPRESSIVE LIST OF STANDARD FEATURES:

- Internal rechargeable NiMH battery
- High-Resolution graphic 640 x 480 (VGA) Pixel LCD Display with backlight (colour display optional)
- Additional storage of results to USB memory (optional accessory)
- Free of charge lifetime software updates using the RS232C serial interface, USB interface or Ethernet interface
- Easy to use graphical user interface (GUI) – simplifies testing remote control via RS232C or Ethernet using a PC

Qualify the Local Loop for DSL

FULL TESTING: SINGLE-ENDED WITH NO RESPONDER

The CableSHARK P3 can fully test a loop without a responder or second test set at the other end. All that is required is an open circuit at the far end. In just a few seconds, the CableSHARK P3 sends out hundreds of test tones to "probe" the loop. It then measures the noise and the crosstalk caused by disturbers in the bundle using its built-in FFT analyzer. The results of these tests and others are combined to determine the insertion loss of the loop and the upstream and downstream DSL rates that the loop can support. EXFO has a patent on double-ended "Discrete Multitone Modulation" (DMT) rate prediction and a patent pending for single-ended "Discrete Multitone Modulation" (DMT) rate prediction.



ADSL2+ Data Rate Prediction

ADSL2+/ADSL2/ADSL DATA RATE PREDICTION

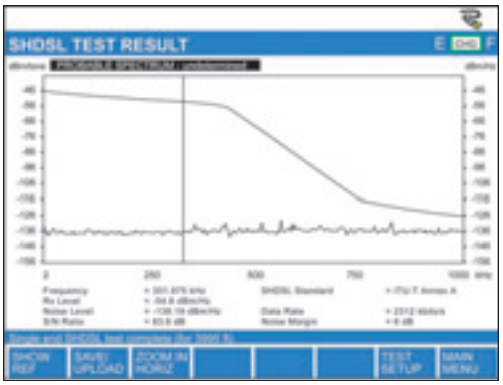
Service Providers that are rolling out ADSL2+ services will really enjoy the CableSHARK P3's DMT test for ADSL2+ data rate prediction. This "modemless" test uses the exact frequencies of DMT carriers to measure the insertion loss, noise, and the number of bits that can be carried per bin in order to determine the maximum achievable bit rates a local loop can support. The DMT test is modem independent and is offered in end-to-end (patented) and single-ended (patent pending) test configurations. The CableSHARK P3's DMT test can ensure that the cable plant is ready for ADSL2+ or just ADSL.

ADSL2+ AUTO-TEST WITH PASS/FAIL INDICATION

This convenient single-ended test quickly evaluates a cable to determine whether or not it is acceptable for ADSL2+ services based on predefined pass/fail criteria. The ADSL auto-test performs a DMM test, longitudinal balance, load coil test, capacitive imbalance, DMT test, and a TDR test.

AUTOMATIC DSLAM / MODEM DETECTION AND TEST

If the CableSHARK P3 detects a DSLAM or modem at the other end of the line, it informs the technician that they are present and uses the signals of these devices to make an end-to-end test. If there is no equipment at the other end, the CableSHARK P3 performs its automatic single ended test. The CableSHARK P3 gives an accurate prediction of the exact rates of the upstream and downstream channels, not just a rough "range" of rates.



SHDSL Data Rate Prediction

SHDSL DATA RATE PREDICTION

SHDSL is symmetrical – offering 2.3 Mb/s over 2 wires in both directions. The CableSHARK P3 offers an automatic single-ended test that predicts the SHDSL rate that can be supported on the loop being tested.

SHDSL AUTO-TEST WITH PASS/FAIL INDICATION

The SHDSL auto-test will perform a DMM test, longitudinal balance, load coil test, capacitive imbalance, SHDSL bit rate test, and a TDR test. In moments, the CableSHARK's SHDSL auto test evaluates a cable to determine if it is acceptable for SHDSL based on pre-defined pass/fail criteria.

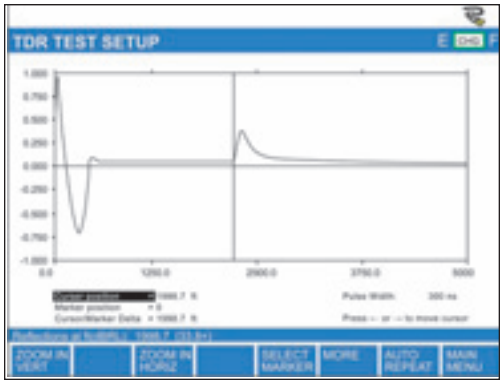
ELIMINATE OR REPLACE LOAD COILS

Load coils were applied to long loops in order to flatten the frequency response of cable in the voice band. Unfortunately, legacy load coils kill the high frequencies of DSL signals. From one end of the loop, the CableSHARK P3's load coil detection test not only identifies the presence of load coils, but also automatically indicates how many are in the local loop. Field tests have proven that the CableSHARK P3 can locate load coils that other test sets miss. Should the load coil detection test indicate the presence of load coil(s), the powerful TDR test can be used to locate the coil(s) with astounding accuracy. Once load coils are located they can be removed or replaced with modern coils that pass DSL frequencies. The CableSHARK P3 has a full-featured, automatic, high-resolution graphical TDR built-in that easily locates opens, shorts, bridge taps, splices, bridge taps and loop faults. The CableSHARK P3 has one of the leading TDRs on the market. It automatically determines the length of the loop being tested, automatically places a moveable curser at that point, and indicates the number of, and distance to each fault.

Locate Load Coils, Bridge Taps and Faults with Our Best-in-Class TDR

LOCATE AND DETERMINE THE LOCATION, AND LENGTH OF BRIDGE TAPS

Bridge taps, laterals and end sections degrade DSL performance due to interference caused by reflections from the end of the tap. The reflected signals are both attenuated and delayed in time. In addition, bridge taps add capacitance to the loop. The shorter the bridge tap and the closer it is to either DSL Modem of DSLAM (CO or CPE), the more detrimental it is to the service. As the outside plant has evolved, cable splices and cable-pair swaps, combined with poor documentation, have made locating and removing bridge taps time-consuming and costly – until now. The CableSHARK P3 is an invaluable tool for determining the existence, location, and length of bridge taps. Your technicians will appreciate the flexibility of the manual-TDR test and the convenience of the Auto-TDRtest to locate bridge taps quickly.

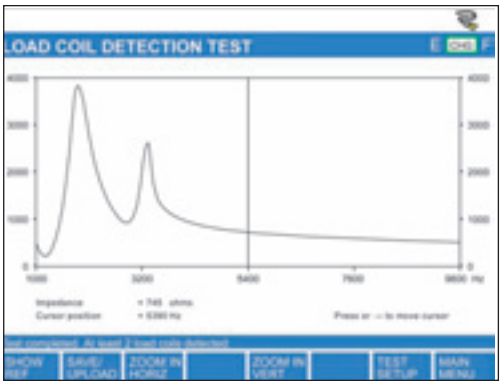


Best TDR in the Industry

FIND OPENS AND SHORTS

The CableSHARK P3 has an "opens" and "shorts" meter to locate these problematic faults. In addition, the CableSHARK P3's powerful TDR is even more accurate for pinpointing faults. A short arises when the sheath insolating two conductors is damaged, allowing the two wires to come into contact with each other. Sheath damage may occur from wear, improper splicing, or improper digging. When a TDR test is performed, the almost zero-impedance presented by the short does not dissipate the energy or the TDR pulse. The original pulse will be reflected back with the same amplitude, but with opposite polarity.

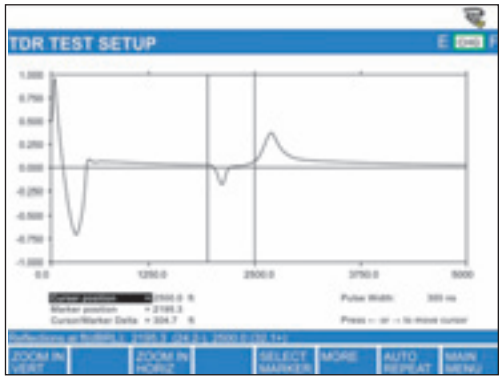
Opens, or breaks in the cable pair, are often caused by careless or unauthorized digging. The TDR pulse is not dissipated by a terminating impedance, as an open presents an almost infinite impedance. Therefore, the pulse is reflected back to the source. A reflected pulse having the same amplitude and polarity as the original pulse is indicative of an open.



Easilty Detect Number of Load Coils Deployed

UNCOVER ELUSIVE PAIR-TO-PAIR FAULTS WITH THE CABLESHARK P3'S 4-WIRE TDR

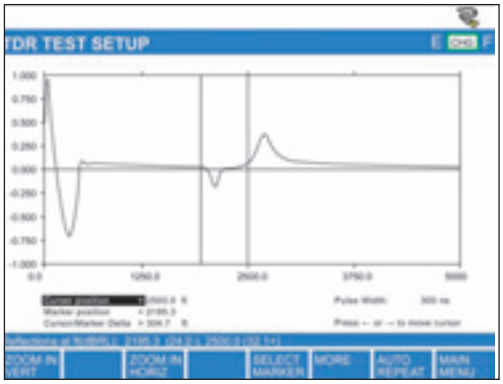
When cable bundles are damaged, often the problem is not a true break in the cable but is a short or partial short between pairs. Locating and repairing pair-to-pair faults is simplified with the new 4-Wire TDR functionality of the CableSHARK P3. A pulse is sent out on one pair while the reflection is sought on another. Like all TDR measurements, the distance to the fault(s) is clearly indicated both graphically and numerically.



Detect the Distance to the BT and the Length of the BT

AUTO-TDR TESTING MAKES IT EASY

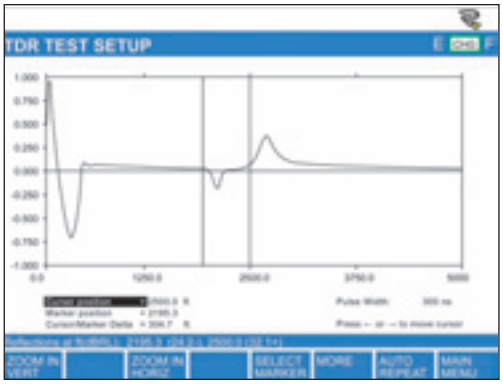
The CableSHARK P3's convenient Auto-TDR Test makes it easy to detect the cable end or bridge taps. CableSHARK P3 will automatically calculate the best pulse width and pulse shape to use, based on the line conditions. Once the Auto-TDR test finds any valid reflection, (up to four reflections), the CableSHARK P3 places the cursor at the reflection corresponding to the end of the cable. CableSHARK P3's TDR is the easiest, most powerful TDR available.



4 Wire TDR Test Result

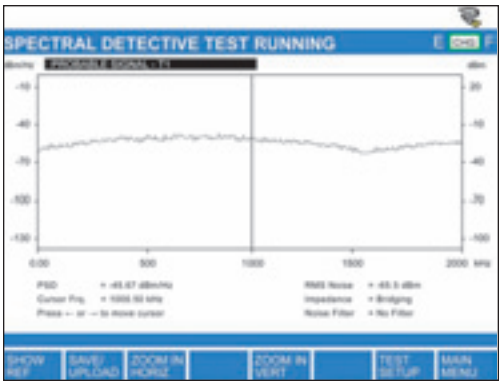
Manage Unbundled & Shared Local Loops

Easy to Use DMM



The CableSHARK P3 Finds Faults that Other TDR's Cannot

Determine the Effects of Other Distributors on the Line



Detect the Presence of T1 in the Bundle

SPECTRUM MANAGEMENT

You can rely on the CableSHARK P3's Spectral Detective feature to manage the spectrum in your cable bundle. In a non-intrusive way, it bridges onto live access loop circuits with high impedance so that the measured service is not interrupted. On the CableSHARK P3's graphic display, you can determine what service is deployed on the loop and at what power levels. This is an ideal way to find signals that are running too "hot" for the bundle. The Spectral Detective test may be run in continuous, snapshot (freezes the display upon command), or peak mode that is ideal for long term analysis of a circuit to help identify transients or intermittent crosstalk/noise.

AUTOMATIC DISTURBER IDENTIFICATION

A single B8ZS coded (T1) signal in a cable bundle halt service service to an entire neighborhood due to crosstalk effects. Some telcos are moving away from 2B1Q coded HDSL and HDSL2 for the same reason. The CableSHARK P3 displays the noise power spectral density (noise PSD) on unused loops showing the sum of all disturbers and automatically identifies the type of disturber by name. This arms telco techs, cable repair crews, and CLECs with the information they need to take action at the loop plant engineering level. Converting traditional T1 signals to more spectrally compatible signals such as G.SHDSL should be a priority. Much like the spectral detective feature, the noise PSD test may be run in continuous, snapshot (freezes the display upon command), or peak mode that is ideal for long-term analysis of a circuit to help identify transients or intermittent crosstalk/noise.

IDENTIFY SPLIT PAIRS

Technicians create split pairs by robbing the single conductor from two defective pairs to create a single working circuit. While a split pair circuit will certainly pass current and will most likely support a POTS (plain old telephone service) line, it will probably degrade or may even kill a DSL service. Telephone cable pairs are twisted to limit pair to pair crosstalk. Because a split pair no longer maintains the proper twisting, it is very prone to crosstalk. Split pairs are easy to find with a quick visual inspection provided the tech is at the proper pedestal. Determining if a loop has an unseen "section" of split pair requires the CableSHARK P3. A split pair will have abnormally high crosstalk, but relatively normal longitudinal balance.

Measuring and observing unusually high crosstalk on cable pairs (a telltale sign that the pair is split) has always been possible on the CableSHARK P3 so long as the bundle and the specific binder group was already loaded with DSL. The four-wire crosstalk measurement offered by the CableSHARK P3 (with swept tone insertion) comes into play either when DSL is being added to a bundle for the first time, or to prevent a split pair from becoming a transmitting source of crosstalk. The CableSHARK P3 generates a swept signal into one pair while measuring

FIND INTERMITTENT PROBLEMS

The CableSHARK P3 will help you isolate those elusive intermittent faults. As an example, the CableSHARK can perform long-term monitoring for wideband impulse noise. Results are displayed graphically in a histogram format.

LOCATE WATER IN THE BUNDLE

The ingress of water into a cable bundle can cause complications for DSL circuits. The CableSHARK P3 can identify and locate water in four ways. The CableSHARK P3's resistive fault location (RFL) test will accurately indicate the location of the damaged section. The precise resolution TDR displays the "ripples" in the reflected signal associated with water. The CableSHARK P3's stress/leakage measurement will show the repeatable charging effect associated with water, and the resistance-to-ground measurement will show the trickle of current conducted by the water. The CableSHARK P3 not only indicates that there is water in the bundle, but also locates it with a TDR pulse.

Stress/Leakage Test

METALLIC TESTING QUICKLY DETECT SHORTS, CROSSES, GROUNDS AND BATTERY CROSSES

The CableSHARK P3's resistance fault location (RFL) test effectively locates resistance faults (shorts, crosses, grounds and battery crosses) in aerial, direct buried or underground cable sections. The K-Test is a variation of the RFL Test.

PERFORM METALLIC TESTING WITH THE TELCOM-SPECIFIC DMM

A.C. voltage, D.C. voltage, tip-to-ring, tip-to-ground, ring-to-ground measurements are all automatically performed and documented without having to press a lot of buttons and without having to move the test leads. In addition, the CableSHARK P3 correctly measures tip-to-ring, tip-to-ground, ring-to-ground (and also loop) capacitance and resistance. It also measures loop current. The CableSHARK P3 automatically translates loop capacitance and resistance into distances.

IS YOUR STATION GROUND ADEQUATE?

The CableSHARK P3's Ground Resistance Test (also known as station ground test) enables your technicians to verify that correct grounding rules are being followed at the location under test (usually the CO). An adequate station ground and ground distribution system provides a common electrical reference point for all telecommunications equipment in the installation and minimizes the danger of electrical potential developing between various equipments and equipment ground.

Measure AC/DC Voltage, Resistance, and Capacitance

LOCATE INSULATION BREAKDOWNS

Over time, cable insulation breaks down due to the elements, age, ultra violet light and physical wear and tear. In addition, cables may be damaged during installation or maintenance. The CableSHARK P3 can generate the high voltages needed to locate hard to find compromises in cable insulation. The stress/leakage measurement includes programmable soak time, and the ability to find faults of up to 999 Mohms.

One-Person End-to-End Testing

Measure PI to the 9th Harmonic

The CableSHARK P3 performs a full evaluation from one end of a loop including the accurate prediction of upstream and downstream DSL rates. However, should end-to-end measurements need to be made, the application of two CableSHARK P3's have the ability to automatically communicate with each other in support of one person testing (command & respond).

USE THE CABLESHARK P3 WITH SMART NID'S

The CableSHARK P3 is compatible with Smart NID's. The CableSHARK P3 can command the smart NID to terminate the far end of the line with an open or short for unbiased testing of the loop. This capability enables many tests to be performed without another expensive test instrument (and in some cases, test instrument and test technician) at the far end of the line being tested. Both DSL and VF tests benefit from this ability.

EASILY QUALIFY THE LOCAL LOOP FOR POTS SERVICES

The CableSHARK P3 possesses a truly impressive array of measurements to qualify the copper loop for plain old telephone service (POTS). This is especially important where DSL and voice operate on the same loop. Service providers can ensure that the voice circuit has the proper quality using the CableSHARK P3.

The level frequency test detects sources of attenuation distortion/3 tone slope on the loop. This distortion causes various symptoms such as muffled (high-frequency attenuation) or hissing (low frequency distortion) speech. Causes may include capacitive and inductive reactances, carrier filters, loaded cable effects, isolation transformers, and bridge taps. Technicians use the VF noise measurement to detect noise caused by low frequency interferers, crosstalk and other interfering processes. The included weighting filters weight the noise reading to correspond to the subjective effect of the noise on voice communications and can be used to aid in the identification the noise source as they can help estimate the predominant frequency component in the noise. In addition, a VF impulse noise measurement is also included, and it features three user-definable thresholds. Impulse noise is primarily caused by switching noise, loose pair connections, signalling equipment, and electrical storms. Bit error bursts in the digitized analog signal can also manifest themselves as impulse noise in the VF domain.

POWER INFLUENCE (PI)

Power Influence Measurements (Noise to Ground) are essential for detecting noise caused by AC signals (often centered at 60Hz), that is caused by nearby power lines. When present, this type of noise is common to both conductors of a 2 wire pair. The CableSHARK P3 also does an on-screen powerline harmonic analysis, showing a bar graph of the noise at 60 Hz and all harmonics up to the 9th. The single-ended VF auto test quickly evaluates a cable to see if it is acceptable for voice frequencies based on pre-defined pass/fail criteria. The VF auto test will perform a TDR test, DMM test, load coil test, a capacitive imbalance test and a longitudinal balance test. If a load coil is found, the distance to the load coil is given.

THE COMPREHENSIVE VF TESTING SUITE INCLUDES:

- VF noise measurement with the following weighting filters: C-Message, C-Notched, 3 KHz Flat, 15 KHz Flat, 50 Kbit, & IEEE 743-1995 D filter (psophometric, psophometric-notched, & SBDC filters are also available)
- VF auto-testing that includes TDR & pass/fail Indication
- VF impulse noise measurement with three threshold settings VF longitudinal balance testing VF tone generation (300 Hz to 4 kHz) with selectable level; variable frequency, spot frequency, sweep, 3-tone slope & tracing tone VF tone receive with level indicator
- VF level/frequency measurement (300 Hz to 20 kHz)
- Power influence test with analysis up to the 9th harmonic
- Dialling/loop holding
- Ringer detection test
- Drive capability remote test responders

Remote Control your CableSHARK P3™

GRAPHICAL REMOTE CONTROL WITH VISI-SHARK

Control of the CableSHARK P3 could not be easier than with the optional = PC-based software package Visi-SHARK. Visi- SHARK allows users to take "remote" control of the CableSHARK P3 via a direct connection to the unit, dial-up modem, or via the Internet. Visi-SHARK is a MS Windows® 95/98/ME/2000/XP software package that enables you to use your PC to control the CableSHARK. In addition to making remote control measurements, Visi-SHARK allows you to view, print or save to disk any information obtained from your local and/or remote CableSHARK P3(s). Results can be transferred to Microsoft® Excel® (98 or higher), or exported to JPEG format. This enables users to quickly e-mail results to colleagues for detailed analysis. To run a test using Visi-SHARK, you simply use your PC mouse to command a "virtual" CableSHARK P3. Visi-SHARK's intuitive controls will be instantly recognizable to any CableSHARK P3 user. Clicking the graphical buttons on the screen of your PC has exactly the same effect as pushing the buttons on the CableSHARK front panel. The information on the screen changes as you operate the unit. In a central office environment, the CableSHARK P3 can also be commanded by the industry recognized TL1 control commands.

Visi-SHARK with the CableSHARK P3 and Your PC

PROTECT YOUR INVESTMENT AND YOUR PEOPLE

The CableSHARK P3 can be connected to any local loop at any time without fear. It has full protection against damage from ringing voltage, line powering for HDSL modems, battery, and even minor faults that cross power line voltages onto the pair. If the CableSHARK P3 detects voltages that would be dangerous to technicians, a bold warning message comes on the screen.

REMOTE CONTROL OVER THE INTERNET

In addition to the convenient Visi-SHARK software, the CableSHARK P3 can also be controlled with nothing more than an Internet browser. The CableSHARK P3 offers a choice of serial (RS232C) and TCP/IP (Ethernet) connections. Service providers requiring direct access or dialup access to the CableSHARK P3 will benefit from the CableSHARK P3's high-speed serial port or the power and flexibility of controlling the CableSHARK P3 over a LAN or WAN.

MULTI-LANGUAGE SUPPORT

The CableSHARK P3 supports several international languages including:

English, Spanish, French and others.

CableSHARK P3

Store Your Test Results to Memory

THE CONVENIENCE OF INTERNAL NON-VOLATILE MEMORY OR PORTABLE USB MEMORY

The CableSHARK P3 offers the convenience of an internal non-volatile memory to save test results. In addition, using the built-in USB port, your techs can also save the results of their tests to a portable USB memory stick.

Compare Test Results to Expected Standards

COMPARE YOUR RESULTS OVER TIME WITH REFERENCE MASKS

Any graphical result saved to the CableSHARK P3's internal non-volatile memory or external USB Memory can be designated as a Reference Mask. Technicians can then designate any saved result as a reference for other similar tests so an on screen comparison can be made. This is useful in determining how a circuit may change from day to day or week to week. This feature is also beneficial in evaluating similar circuits with the same benchmark criteria.

Specifications

VF AUTO-TEST (EXPERT SYSTEM AUTOMATIC TEST)

- Automatic test providing pass / fail results in both text and graphic formats
- DMM-12 Auto-test (voltage, resistance, capacitance & capacitive imbalance), load coil test, TDR, VF balance, VF noise, power influence.
- Dialup test to a milliwatt source also measures loss, tone frequency and noise with quiet termination.
- Phone book allows up to 20 entries, where the name can be up to 32 characters long
- DTMF or pulse dialing of digits 0-9 and characters * and #, up to 32 digits
- DTMF dialing uses 200 ms / 100 ms make/break signal
- Pulse dialing uses 400 ms / 600 ms make/break signal

SHDSL AUTO-TEST (EXPERT SYSTEM AUTOMATIC TEST)

- Requires single end SHDSL data rate prediction option
- Automatic test providing pass / fail results in both text and graphic formats
- DMM-12 auto-test (voltage, resistance, capacitance & capacitive imbalance), load coil test, longitudinal and VF balance test, TDR, single-end SHDSL test evaluating rate prediction.

RECEIVER CHARACTERISTICS[a]

Receive frequency	300 Hz to 2.2 MHz, resolution 1 Hz (optionally to 6 MHz range)
Receive level	−90 to +24 dBm at 100 Ω or 135 Ω, resolution 0.1 dB
	−90 to +10 dBm at 600 Ω, resolution 0.1 dB
Level accuracy	−0.5 dB at 300 Hz at 0 dBm
	±0.2 dB for 1 kHz to 200 kHz at 0 dBm
	±0.5 dB for 200 kHz to 1 MHz at 0 dBm
	±1 dB for 1 MHz to 2.2 MHz at 0 dBm
	±3 dB at 6 MHz at 0 dBm
Frequency accuracy	±2 Hz from −40 dBm to +24 dBm
Impedance	100 Ω, 135 Ω, 600 Ω, bridging (100 kΩ)

NOTES

a. Characteristics are subject to instrument noise floor (approx −70 dBm). Levels below −70 dBm can be measured using the PSD noise test.

Cont'd

TRANSMITTER CHARACTERISTICS

Transmit frequency	300 Hz to 2.2 MHz, 1 Hz steps.
Frequency accuracy	±0.3 Hz
Transmit level	0 to 24 dBm at 100 Ω or 135 Ω −16 to +10 dBm at 600 Ω
Level accuracy	0.5 dB at 300 Hz, at 0 dBm ±0.2 dB at 1 kHz to 200 kHz at 0 dBm ±0.5 dB for 200 kHz to 1 MHz ±1 dB for 1 MHz to 2.2 MHz
Impedance	100 Ω, 135 Ω, 600 Ω

TRANSMITTER FUNCTIONS

Single tone	Any frequency within the transmit frequency range
Tracing tone	577 Hz
3-tone slope	ANSI: 404 Hz, 1004 Hz, 2804 Hz ITU: 420 Hz, 1020 Hz, 2820 Hz
VF sweep	300 Hz to 4k Hz, 100 Hz steps
Spot frequencies	Any 10 tones (user settable) within the transmit frequency range

RECEIVER FUNCTIONS

Single tone	Numeric display of any tone in the receiver range
Plot	300 Hz to 4 kHz or 300 Hz to 20 kHz
3-tone slope	ANSI: 404Hz, 1004 Hz, 2804 Hz ITU: 420Hz, 1020Hz, 2820 Hz,

VF NOISE MEASUREMENT

Range	0 to −90 dBm subject to instrument noise floor
Accuracy	±1 dB at 60 dBm ±2 dB at 80 dBm
Filters	None, 3 kHz flat, c-message psophometric, c-notched p-notched, 50 kbit, 15 kHz flat, d filter (d is defined by IEEE 743-1995)

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
Separation	1 to 6 dB in 1 dB steps
Filters	None, c-message psophometric, c-notched p-notched, d Filter (d is defined by IEEE 743-1995)
Counter	Maximum 999 for each threshold

POWER INFLUENCE (NOISE TO GROUND)[a]

Noise range	−90 to +40 dBm (0 to 130 dBrn), resolution 1.0 dB
Voltage range	0 to 30 V typically, resolution 0.1 V

RINGER DETECTION

Ringer range	0 to 5 REN (ringer equivalent number based on 0.47 µF / ringer) measured tip to ring, tip to ground and ring to ground

NOTES

a. Numeric display of the common mode C-message or psophometric and 3 kHz flat weighted noise and a plot of the fundamental as well as up to the 9th harmonic of the common mode interference voltage.

Cont'd

TIME DOMAIN REFLECTOMETRY (TDR)[a, d]

Mode	One shot, continuous (auto-repeat) with cursor and zoom
2 Wire single-end test type	Auto-Cable end, auto-bridge tap, manual mode
4 Wire single-end test type	Manual mode
Distance range[e]	30 m to 6000 m (100 ft up to 20,000 ft) Manual mode can test up to 13,500 m (45,000 ft) when using 330 µs pulse width
Auto-bridge tap detection range	10% to 50% of total cable length from measuring end
Auto-bridge tap length range	10% to 25% of total cable length
Pulse width	28 ns to 20 µs (auto-selected in auto TDR test) 330 µs in manual mode
Test signals	Sine wave, compensated sine wave, half-sine wave, square wave
Amplitude	10 V p-p on cable, 20 V p-p open circuit
V.O.P.	0.400 to 0.999 or 120 to 299 m/µS
Distance accuracy	± 3 m (± 9 ft) increments ± 1% of reading
Units	feet, metres, and nanoseconds
Horizontal scale	Automatic or 300 m (1000 ft), 600 m (2000 ft), 1500 m (5000 ft), 3000 m (10,000 ft) 6000 m (20,000 ft), 13,500 m (45,000 ft)

LOOP MAPPER[b]

Distance range	30 m to 3000 m (100 ft up to 10,000 ft).
V.O.P.	0.400 to 0.999 or 120 to 299 m/S
Distance accuracy	For measurements below 655 m (2000 ft): ± 4 m (± 12 ft) increments ± 1% of reading For measurements above 655 m (2000 ft): ± 19 m (± 58 ft) increments ± 1% of reading
Units	Feet and metres
Horizontal scale	Automatic
Type of fault to detect	Automatic
Display of result	Text, graphic and circuit drawing with distances (when applicable)

SINGLE END ADSL, ADSL2, ADSL2+ (DMT) TEST[c, d]

Distance range[e]	100 m to 5000 m (300 ft to 16000 ft)
ADSL test type	Test from CO and test from CPE
ADSL2 test type	Test from CO and test from CPE
ADSL2+ test type	Test from CO and test from CPE
ADSL evaluation	ANSI full rate/POTS, G.LITE/POTS, ITU-T Annex A / POTS, ETSI full rate / POTS, ITU-T Annex B / ISDN, ETSI full rate / ISDN
ADSL2/2+ evaluation	ITU-T Annex A/POTS, ITU-T Annex B/ISDN, ITU-T Annex I/POTS, ITU-T Annex J/ISDN, ITU-T Annex L/M/POTS
Bits/bin setting	8 to 15 bits per bin 14 is default for full rate ADSL 8 is default for G.Lite
Noise margin range	Auto or 0 to 32 dB in 1 dB steps
Frequency range	ADSL: 4.3 kHz to 1.104 MHz ADSL2: 4.3 kHz to 1.104 MHz ADSL2+: 4.3 kHz to 2.208 MHz
Horizontal scale	Depends on frequency range (see above)
Vertical scale	–36 dBm/Hz to –156 dBm/Hz or 0 to –120 dBm
CPE / DSLAM detection	ADSL Annex A, ADSL Annex B, ADSL2, ADSL2+

LOAD COIL DETECTION[d]

Test methodology	End-to-End, single-end (plot to 10 kHz)
Distance range[e]	up to 7,500 m (up to 24,000 ft)

NOTES

a. Plot and numeric display of reflection, reflection loss and distance with cursor and zoom.

b. Plot and numeric display of reflection with distance and phase angle. Includes cursor and zoom.

c. Extrapolated results – combined frequency response, PSD noise/crosstalk, signal-to-noise ratio, disturber identification, and data rate estimation test. The single ended DMT test used by the CableSHARK is patent pending. ADSL data rate prediction (single end). US Patent Pending # 10/133,408.

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

e. Range will depend on cable type and condition

END-TO-END DMT TEST[a]

Distance range[b]	100 m to 14000 m (300 ft to 45000 ft)
Test resolution	Coarse, fine
ADSL setups	ANSI full rate/POTS, ITU-T Annex A / POTS ETSI full rate / POTS, G.LITE/POTS ITU-T Annex B / ISDN, ETSI full rate / ISDN
Bits/bin setting	8 to 15 bits per bin 14 is default for full rate ADSL 8 is default for G.Lite
Noise margin range	AUTO-CPE, AUTO-CO/EXCH, 0 to 32 dB in 1 dB steps
Frequency range	4.3 kHz to 1.104 MHz
Frequency accuracy	± 50 ppm
DMT tone & noise accuracy	± 0.5 dB
Level resolution	0.1 dB
Horizontal scale	0 - 1.104 MHz
Vertical scale	–36 dBm/Hz to -156 dBm/Hz
Bits/bin vertical scale	0 to 15 bits
Noise filters	None or E, F, G (IEEE-743 / 1995)

SINGLE END FREQUENCY RESPONSE[a, c]

Distance range[b]	100 m to 5000 m (300 ft to 16000 ft)
Frequency range	Up to 2.2 MHz, optional 6 MHz support available
Frequency accuracy	± 50 ppm
Accuracy	± 1.0 dB typical
Resolution	0.1 dB
Horizontal scale	ISDN 500 kHz, HDSL 1 MHz, ADSL 2.2 MHz, optional VDSL 6 MHz
Vertical scale	0 to +90 dB

END-TO-END FREQUENCY RESPONSE[a, d]

Distance range[b]	100 m to 13,500 m (300 ft to 45000 ft)
Frequency range	4.3 kHz to 2.0 MHz (2.2 MHz or 6 MHz not supported)
Frequency accuracy	± 50 ppm
Accuracy	± 0.5 dB
Resolution	0.1 dB
Horizontal scale	ISDN 500 kHz, HDSL 1 MHz, ADSL 2.2 MHz
Vertical scale	0 to +90 dB

SHDSL DATA RATE TEST[a, e]

Distance range[b]	100 m to 5000 m (300 ft to 16000 ft)
SHDSL setups	ITU-T Annex A or ITU-T Annex B
Noise margin range	Auto, 0 to 20.0 dB in 1 dB steps
Frequency range	4.3 kHz to 1.104 MHz
Horizontal scale	0 to 1.104 MHz
Vertical scale	–36 dBm/Hz to –156 dBm/Hz Hz or 0 to –120 dBm

NOTES

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

b. Range will depend on cable type and condition

c. Extrapolated result plot with cursor and zoom.

d. Plot with cursor and zoom.

e. Extrapolated results – combined frequency response, PSD noise/crosstalk, signal-to-noise ratio, disturber identification, and data rate estimation test plot with cursor and zoom.

Cont'd

PSD NOISE MEASUREMENT[a]

Mode	Continuous or peak-hold display of (PSD)
Vertical scale	–10 to –153.3 dBm/Hz or +20 to –120 dBm
Horizontal scale	2.16 kHz to 2.2 MHz, in 2.16 kHz steps, optional 6 MHz support available (in 4.3125 KHz steps
Noise filters	None or E, F, G (IEEE-743 / 1995)

DSL IMPULSE NOISE MEASUREMENT

Threshold	–50 dBm (40 dBrn) to 0 dBm (90 dBrn) in 1 dB steps
Counter	Maximum 65000
Test duration	1 minute, 5 minutes, 10 minutes, 15 minutes, 60 minutes, 24 hours, or continuous (up to 360 hours) Histogram plot interval 1, 5, 10, 15 or 60 minutes
Accuracy	± 2 dB

SWEPT LONGITUDINAL BALANCE TEST

Single-end test	Near-End test plot with cursor & zoom
Frequency accuracy	± 50 ppm
Accuracy	± 2 dB
Vertical scale	0 to 80.0 dB
Horizontal scale	26 kHz to 2.2 MHz

DMM (DIGITAL MULTIMETER)[b]

Mode	DMM-12 autotest, DMM-14 autotest or individual measurements	
DC voltage		
	Range	0 to 400 V auto-ranging
	Resolution	3 significant digits
	Accuracy	±1 % of reading ±1 LSB
AC voltage		
	Range	0 to 250 VRMS auto-ranging
	Resolution	3 significant digits
	Accuracy	±1 % of reading ±1 LSB
Resistance		
	Range	0 to 999 MΩ auto-ranging (30 MΩ for auto-test)
	Resolution	3 significant digits
	Accuracy	0 to 999 Ω ±1 % or ±5 W 1 kΩ - 99 MΩ, ±1 % of reading ±1 LSB 100 MΩ to 999 MΩ, ± 5 % of reading ±1 LSB
	Distance	up to 30,000 m (100,000 ft)
Capacitance		
	Range	200 pF to 10 µF auto ranging, auto zeroing
	Resolution	3 significant digits
	Accuracy	±2 % of reading ±1 LSB
	Distance	up to 30,000 m (100,000 ft)
Current		
	DC Current	0 to 110 mA
	AC Current	0 to 77 mA
	Accuracy	±2 % of reading ±1 LSB

SPECTRAL DETECTIVE[c]

Mode	Continuous or Peak-hold plot with cursor and zoom
Bridging impedance	15 kΩ
Vertical scale	–10 to –153.3 dBm/Hz or +20 to –120 dBm
Horizontal scale	2.16 kHz to 2.2 MHz, in 2.16 kHz steps optional 6 MHz support available (in 4.3125 KHz steps
Noise filters	None or E, F, G (IEEE-743 / 1995)

NOTES

a. Single-end test plot of power spectral density/crosstalk noise spectrum with disturber identification, cursor and zoom.

b. For use on normal telephone network and broadband circuits.

c. Allows the CableSHARK to bridge (high-impedance) onto a live circuit to display a plot of transmitted levels and spectrum (PSD). The Spectral Detective Test can be referenced to any user-selected impedance. The Impedance reference setting is required to display proper readings in dBm/Hz or dBm.

STRESS/LEAKAGE (ISOLATION RESISTANCE)

Source	100VDC
Current	safely limited to < 0.5 mA
Range	0 to 999 MΩ auto-ranging
Resolution	3 significant digits
Accuracy	0 to 999 Ω, ±1 % or ±5 Ω 1 kΩ to 99 MΩ, ±1 % of reading ±1 LSD 100 MΩ to 999 MΩ, ±5 % of reading ±1 LSD
Soak timer	1 to 99 sec
Range	0 to 500 Ω
Resolution	1 Ω
Accuracy	±3 Ω ±1% of reading

GROUND RESISTANCE[a]

Mode	Continuous or Peak-hold plot with cursor and zoom
Bridging impedance	15 kΩ
Vertical scale	−10 to −153.3 dBm/Hz or +20 to −120 dBm
Horizontal scale	2.16 kHz to 2.2 MHz, in 2.16 kHz steps optional 6 MHz support available (in 4.3125 KHz steps)
Noise filters	None or E, F, G (IEEE-743 / 1995)

RFL[b]

Fault detection	0 to 20 MΩ, resolution 3 significant digits
Loop resistance	7 kΩ maximum
Wire gauges	0.4, 0.5, 0.6 or 0.8 mm (19, 22, 24, 26 AWG)
Cable temperature range	−40 °C to +60 °C (−40 °F to +140 °F)
Multiple cable sections	5 (includes gauge and temperature setting)
Fault location	Total resistance, near-end to fault resistance, fault to strap resistance (4 significant digits) Total length, distance to fault, distance from fault to strap (3 m (1 ft) resolution
Accuracy	0.1 % ±1 LSB for loop resistance of 0 to 99.99Ω 0.2 % ±1 LSB for loop resistance of 100Ω to 999.99Ω 1 % ± 1LSB for loop resistance of 1kΩ to 7kΩ

VISI-SHARK

- A graphic user interface between the CableSHARK and a PC.
- Full graphic remote control of the CableSHARK from a PC.
- Allows downloading of results or showing results saved in USB memory into Microsoft Excel® format.
- Enables graphic screen captures and recall of test results from computer memory.
- Allows a graphic printout of any CableSHARK display screen on any graphic printer used with the PC*.

*This option consists of an option key for the CableSHARK and software for an IBM PC or compatible running Windows 98, Windows 2000 or XP. Certain functions are available even if the option is not enabled in the CableSHARK (Result printing, etc.)

4 WIRE CROSSTALK[c]

Single Frequency mode		
	Horizontal scale	17 KHz to 2 MHz
	Vertical scale	0 to −90 dB
	Accuracy	±2 dB
Plot mode		
	Frequency setting	17 kHz to 2.2 MHz.
	Crosstalk result	0 to −90 dB
	Accuracy	±2 dB

NOTES

1. Detects CO voice switch line cards with constant voltage source, constant current source or grounded balanced source.
2. Resistive fault location. Detects faults such as shorts, grounds, and battery crosses. Displays total loop resistance, resistance to fault & resistance from fault to strap and equivalent distances.
3. Single frequency measurement or plot of crosstalk with cursor and zoom. Crosstalk levels below 60 dB may be affected by internal crosstalk of the unit itself.

Cont'd

RETURN LOSS TEST[a]

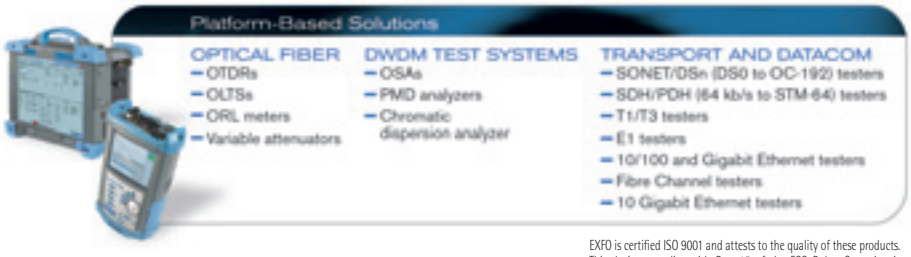
Range	0 to 60 DB
Resolution	0.1 dB
Accuracy	+/- 1 dB from 0 to 40 dB
Horizontal scale	17 kHz to 2.2 MHz
Vertical scale	0 to 60 dB

NOTES

a. Plot with cursor and zoom

GENERAL SPECIFICATIONS

Dimensions	175 mm x 235 mm x 65 mm (6.9 in x 9.25 in x 2.6 in)
Weight	2.2 kg (4.8 lbs) (including power adapter)
Operating temperature	Monochrome VGA: 0 °C to +50 °C (32 °F to 120 °F)
Colour VGA (optional)	0 °C to +43 °C (32 °F to 110 °F)
Storage temperature	–10 °C to +60 °C (14 °F to 140 °F)
Humidity	Up to 95 % relative, non-condensing
Power supply	16-18VDC input via external AC mains adapter (95 - 250 volts, 43 - 63 Hz, 2.5 A)
Battery	Internal rechargeable nickel metal hydride (NiMH) battery, with battery state indication
Display	640 x 480 pixels. 175 mm x 120 mm (6.9 in x 4.7 in) with backlight
Test connections	Main TX/RX 3 pin CF (Siemens) RJ-45, RJ-11 Auxiliary RX 3 pin CF (Siemens); also used for RFL Differential voltage protection 125 VRMS or 400 VDC max Common mode voltage protection 1000 VRMS
Serial port	RS232 9-pin D-type with flow control (XON/XOFF, or none) For upgrading software / downloading results / remote control
USB port	Series A receptacle; host USB port for upgrading software / saving results
Ethernet port	10BaseT port for upgrading software / downloading results / remote control
Self-test	Routine on power-up
Voltage detection	20V will trigger alarm message
Result storage	Up to 128 in non-volatile internal memory, 1000 for each 32 MB of optional USB memory
Languages	Up to 8 user selectable languages
Phone Book	Stores up to 20 records
Dial/Loop Holding	Approximately 30 mA (Tx or Rx), supports DTMF and pulse dialing



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