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All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, be it electronically, mechanically, or by any other means such as photocopying, recording or otherwise, without the prior written permission of EXFO ElectroOptical Engineering Inc. EXFO. Information provided by EXFO is believed to be accurate and reliable. Page 5 CableSHARK P3 User Guide 7.10 7.11 7.12 7.13 7.14 7.15 7.16 7.17 7.18 7.19 7.20 7.21 7.22 RETURN LOSS. 61 SHDSL DATA RATE PREDICTION. 61 4 WIRE XTALK. 61 ISOLATION TEST OR STRESS LEAKAGE TEST. These measurements determine the capability of the cable to carry digitized xDSL technology. A Samsonite carrying case is also available as an optional accessory. It is a lightweight briefcase style unit. Be certain when unpacking the instrument that you identify all of the pieces that have been shipped with the unit. Also, inspect the instrument for damage during shipment. Page 15 CableSHARK P3 User Guide Section 2 Digital Subscriber Line DSL Overview The need for faster and cheaper Internet access, video on demand, simplex video, remote LAN access and interactive multimedia by residential and business customers alike has been a driving force in the creation of Digital Subscriber Line DSL technologies. High bitrate Digital Subscriber Line HDSL is a symmetric DSL similar to T1 or E1 in that it delivers a bit rate of 1.544 or 2.048 Mbps of bandwidth. Most systems use two copper twisted pairs, although some early 2.048 Mbps systems required three copper twisted pairs. ADSL signals are able to coexist on the same loop with POTS service because they occupy a higher frequency band than does POTS. ADSL typically will use the band of about 25 kHz to 1.104 MHz while POTS uses 300 Hz to 3400 Hz. For the most part, however, DMT implementations will use 218 bins for Downstream. Guard bands that separate the POTS signals from the ADSL signals use some of the possible carrier allocations. <http://www.pandawakaryacitra.co.id/fabercms/userfiles/991-7-speed-manual-review.xml>

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There is also a guard band between the upstream and downstream carriers. This lowers the power transmitted between modems and maximizes the reach of transmission without compromising potential data rates. SHDSL has been developed to be spectrally compatible with other technologies within bundles of local loops. SHDSL owes this to the Trellis Coded Pulse Amplitude Modulation TCPAM line coding. Page 21 CableSHARK P3 User Guide Section 3 Time Domain Reflectometry Overview Time Domain Reflectometry TDR is a cable testing technique that is used to detect faults along power transmission lines. Using this technique, voltage pulses are sent out over the line and voltage reflections caused by cable abnormalities are monitored. Reflection times are measured from the reflection location on the cable to the TDR device, which is attached to one end of the cable. TDR technology can be compared to sonar. Impedance is a major player. The TDR equipment looks for a change in impedance which could be caused by improper installation, cable damage caused by water, etc., end of cable, and a bridged tap. The magnitude of the impedance changes determines the amplitude of the reflection. Page 23 CableSHARK P3 User Guide Not all cables are the same, hence the variations in VOP. Conversely, not all local loops are the same. Some local loops are longer than others and susceptibility to noisy environments varies. All signals on these loops, regardless of cable length or environment, are subject to attenuation. Attenuation affects both transmitted and reflected signals and, if the signal to noise ratio is low enough, impairments may not be identifiable. The contrast required will depend on the lighting conditions of the environment. Battery life will be enhanced if the LCD Backlighting is turned off when not needed i.e. Page 29 CableSHARK P3 User Guide 4.1.2 The Rear Panel The illustration below shows the back panel

features of the latest

CableSHARK. <http://www.csrhrs.com/e-bussiness/fckimages/991-c4s-manual.xml>

This port is also used to upgrade the software version resident within the CableSHARK. 4. Ethernet 10BaseT Port The Ethernet connector provides highspeed communication with a computer. The AC mains adapter is automatic and requires no selection for different line voltages and frequencies. The CableSHARK also has an internal NiMH rechargeable battery. Replace only with same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacture's instructions. Page 35 CableSHARK P3 User Guide positioned to the inside of the battery compartment. In some CableSHARK's, this may require some maneuvering to position the connector in place. The excess battery wire should be carefully inserted into the side slot of the battery compartment. Install the battery in the compartment; replace the battery cover and tighten the two slotted screws in place. Return the old battery to EXFO for recycling. To begin operation, press the power button for 2 seconds to turn the unit on and the screen will display the "MAIN MENU" after a brief selftest sequence. The CableSHARK can be configured to perform SingleEnded one unit and EndtoEnd two units tests. Frequency Response SingleEnded selected, Time Domain Reflectometry, Digital MultiMeter, Power Spectral Density and Impulse Noise tests are examples of singleended tests with the CableSHARK. For singleended tests, ensure that the cable to be tested is not matchterminated at the far end. Press the function key on the Main Menu corresponding to RECALL RESULTS. The CableSHARK will display all results currently saved into the units memory as well as those stored on the optional USB Memory if it is installed. Note that the CableSHARK will display 16 results per page. Page 45 CableSHARK P3 User Guide 5.3.3 Renaming and Deleting Results The CableSHARK will allow a user to rename and delete results stored internally and on a USB memory device.

By pressing the DELETE button from the RECALL SETUP screen, users will be prompted to decide whether to delete the currently highlighted file, to delete ALL results in internal memory or to delete ALL results on the USB memory device. It is quite possible to have a real local loop, which is shorter distance than one of the various test loops see Appendix A Ideal Cable Results and not have error free transmission. This is usually caused by 1. 2. 3. 4. 5. Bridge taps, Load coils, Uneven pair twisting Bad splices, Water in cable, etc. Page 51 CableSHARK P3 User Guide Section 6 Main Menu Once the unit is powered on and the selftest sequence has been completed, the Main Menu will appear on the screen. At the bottom of the screen, various commands associated with the units' various function buttons are located. The command selection at the bottom of the screen consists of up to seven major options available to the user. See the illustration below. VF AUTO POTS Performs an automatic test on an active POTS circuit VF AUTO NO POTS Designed for testing a circuit for POTS capabilities but is not currently provisioned for POTS or there is no POTS service currently on the line. Page 53 CableSHARK P3 User Guide RECALL RESULTS The function button associated with RECALL RESULTS invokes the RECALL SETUP screen, allowing users to recall saved results found in nonvolatile RAM or on a PC Memory card. Selecting the function button displaying a wrench calls up the SYSTEM SETUP menu and it allows the user to set global system parameters such as Date, Time, Communication Parameters baud rate, data rate, parity, modem initialization string and Keyboard Backlight options. More parameters can be changed at this point, or press MAIN MENU to return to the Main Menu. For parameters that are preset in the CableSHARK i.e. Baud Rate, the user can press the function key related to SELECT NEXT to step forwards through the available options for a specific highlighted parameter.

Press ENTER when the value is correctly selected to save any changes. The TDR determines if the copper cable is suitable to carry DSL technologies by locating potential faults along the line such as a bridge tap or end of cable. Similar to FDR. FDR Frequency Domain Reflectometry Selecting FDR from the CABLE TESTS popup menu invokes the FDR SETUP menu. Page 57 CableSHARK P3 User

Guide RESISTANCE FAULT LOCATOR The function button associated with RESISTANCE FAULT LOCATOR invokes the RFL SETUP screen. This test allows users to determine the distance to a short, ground or battery cross by using a separate good pair to evaluate the faulty pair against. KTEST The function button associated with KTEST invokes the KTEST SETUP screen. This test allows users to determine the distance to a short, ground or battery cross by using a single pair of wires. MODE from the Main Menu invokes the REMOTE RESPONDER mode. This is used for EndtoEnd tests where the unit that has the RESPOND. MODE activated will only transmit signals to a Receiving unit. It is the Receiving unit that will display the test results. The illustration below shows the Responder Mode screen. E CABLE TESTS CHG F MAIN MENU Figure 6. Page 59 CableSHARK P3 User Guide 6.3 Recall Results Selecting RECALL RESULTS from the Main Menu invokes the RECALL SETUP screen. Users can recall saved results from nonvolatile memory or from USB memory. See Section 5.3.2 for more information. 6.4 The System Setup Menu Selecting the Wrench option from the MAIN MENU see Section 6 displays the SYSTEM SETUP menu and it enables the user to set global system parameters such as Date, Time, Baud Rate and Keyboard Backlight options. Time To change the Time setting, use the Arrow Keys to move the cursor so that the current Time value is highlighted. Use the Alphanumeric Keypad to enter the desired value. The format is hhmmss meaning 2 digit hour 24 hour clock followed by the 2 digit minute and then followed by seconds 2 digits.

<http://www.efodis.com/images/canon-fax-machine-manual-l80.pdf>

Press ENTER when the value is correctly entered to save your changes. Page 61 CableSHARK P3 User Guide Auto Shut Off min Allows the user to specify the length of time after the last key press that the unit will automatically turn off to conserve the battery. Available options are 0 continuous operation up to 60 minutes in 1 minute increments. Contact your IT department for an IP address to use. External Cap. Detection If the External Capacitance Detection parameter is YES the cable length is estimated taking into account the external capacitance. If the External Capacitance Detection parameter is NO the cable length is estimated using the actual readings. If some capacitance is connected to the end of the cable i.e. telephone, modem, etc. An EDIT box will appear in which the user will need to input the key using the alphanumeric keypad. Press the CableSHARK alphanumeric keys to enter the Software KEY. To qualify a circuit for an xDSL application, or when a circuit has a problem with the cable impairments, CableSHARK allows the user to perform various tests for the cable qualification or troubleshooting purposes. Once the AUTO TDR finds any valid reflection, up to four reflections could be plotted on screen. The TDR test will automatically place the cursor at the initial rising slope leading edge of a major reflection. Page 67 CableSHARK P3 User Guide 7.3 Frequency Response Tests The Frequency Response test is used to indicate the frequency response of the twisted copper pair cable. Press the function button associated with Main Menu to exit out of the Remote Responder mode. Setting up the Receive Rx unit 1. 2. 3. From the Main Menu, select CABLE TESTS function button F1. Choose Frequency Response from the popup menu. Modify the Test Type parameter to EndToEnd Rx and set the other parameters as required. Page 69 CableSHARK P3 User Guide 7.4.

<http://eastbayscanning.com/images/canon-fax-machine-l170-manual.pdf>

1 SingleEnded DMT Test Optional Note This is a SingleEnded test The SingleEnded DMT Test is a predictive test where the results display are extrapolated from measured results obtain before graphing. 1. 2. 3. 4. From the Main Menu, select CABLE TESTS function button F1. Choose DMT Test from the popup menu. Once both units are synchronized, the test will be carried out. The whole process is automatic. When a test is completed, the CableSHARK's large graphical display will show the results of the DMT test. The user can then move the cursor to get all the information presented both graphically and numerically. Page 71 CableSHARK P3 User Guide 1. 2. 3. 4. From the Main Menu, select CABLE TESTS function button F1. Choose LONGITUDINAL BALANCE from the popup

menu. Test Type is Long Bal Near End, and set Term Impedance as required. When a test is completed, the CableSHARK will display the longitudinal balance characteristics of the cable. You can also change option settings if you wish by pressing the function button associated with TEST SETUP. 7.8 Spectral Detective Note This is an optional SingleEnded test. The CableSHARK's Spectral Detective is a PSD noise test that uses a high impedance bridge to measure an active circuits PSD to ensure it meets with spectral compatibility guidelines. 1. 2. 3. 4. From the Main Menu, select CABLE TESTS function button F1. Page 73 CableSHARK P3 User Guide 7.10 Return Loss Note This is a Singleended test. The Return Loss measurement is useful in determining the affect of impedance mismatches. 1. 2. 3. From the Main Menu, select CABLE TESTS function button F1 Choose RETURN LOSS from the popup menu. The results will be displayed on screen in an easy to understand format. Values between 50 to 60 dB are considered excellent. 30 to 50 dB is considered good. Users will be able to a plot of the effects of crosstalk. You can also change option settings if you wish by pressing the function button associated with TEST SETUP. 7.

13 Isolation Test or Stress Leakage Test Note This is a Singleended test. The SHDSL auto test will perform a DMM test, Longitudinal Balance, Load Coil test, Capacitive Imbalance, SHDSL bit rate test, and a TDR test. 1. From the Main Menu, select SHDSL AUTO function button F3. This test will take place automatically. The VF Auto test will perform a 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. 1. 64 From the Main Menu, select VF AUTO function button F4. The CableSHARK's Ground Resistance also known as Station Ground test allows technicians to verify that correct grounding rules are being followed at the location under test. These faults can be called shorts, grounds or crosses. The RFL measurement used by the CableSHARK is referred to as a "separate good pair" test. This means the user must have a good pair to compare against. 1. 2. 3. 4. 5. Page 79 CableSHARK P3 User Guide 7.20 Ringer Detection The CableSHARK Ringer Detection Test measures the Ringer Equivalency Number REN of a circuit. The REN is impacted most by telephones and modems connected to the circuit. Note telephone cables may have dangerous A.C. or D.C. voltages on them, therefore caution should be taken when connecting this test set. Page 83 CableSHARK P3 User Guide MAX. CAP. IMBALANCE % Allows the user to specify the maximum capacitive length imbalance between TG and RG. The default setting is 10%. Setting of Imbalance can be from 0.1% to 100% where 100% is the worst case scenario. If the imbalance is greater than the user defined setting the CableSHARK will not complete the test and will report "Measurement not possible. Tip and Ring wires are substantially different lengths. See Appendix B for more information on loop characteristics. A screen similar to Figure 8.1.2A will appear. The layout of the screen shows a graphic and numeric representation of the information received by the CableSHARK.

The graph's vertical scale depicts the relative Attenuation Level or Insertion Loss in dB and the horizontal scale depicts frequency kHz. Page 87 CableSHARK P3 User Guide command selection at the bottom of the Frequency Response Test screen consists of seven options available to the operator. The following are brief descriptions of each of the function button options SHOW REF Pressing the function button corresponding to SHOW REF allows a user to overlay a REFERENCE MASK over the test result on screen to compare the two. See Section 5.4 for more information about the REFERENCE MASK feature. Page 89 CableSHARK P3 User Guide 8.2 Time Domain Reflectometry Testing Time Domain Reflectometry TDR allows the user of the CableSHARK to easily identify faults if any along a given section of cable. Results can be displayed in feet, meters, or nanoseconds. This test is extremely useful in locating bridge taps multiple appearances and the end of the cable. The parameters can be modified to customize a TDR Test. Page 91 CableSHARK P3 User Guide HORIZONTAL UNITS The horizontal units on the graph once the test is run can be displayed in FEET, METERS, or in NANOSECONDS. The initial setting is reflective of the selected option under Measurement Units under System Setup. SMOOTHING An antialiasing filter that smoothes out the reflected and measured pulse to allow for easier interpretation of the results.

GRAPH SCALE The Graph Scale setting selects the horizontal scale for displaying the test result. A Square wave is useful for detecting impairments close to a user. A Sine Half wave and a Sine compensated 50% and 75% wave are useful for midrange faults. A Sine full wave pulse is excellent for locating impairments up to 20,000 ft away from the user. **VERTICAL GAIN** Allows the user to specify a vertical gain factor to apply to the TDR result. The default setting is 0 dB 1X. The available options are 0 dB, 12 dB, 24 dB, and 36 dB.

Press the function button corresponding ENTER to select the highlighted parameter. Another screen will appear indicating to the user that the TDR test has been started. If the CableSHARK has successfully found any reflections, it will place the cursor onto the first reflection and adjust the Graph Scale automatically if necessary so that the first reflection is within the display screen. Page 97 CableSHARK P3 User Guide options, press the function button associated with MORE. Enables continuous TDR pulses to be transmitted and reflections measured. Page 99 CableSHARK P3 User Guide 8.2.2.1 Testing Cables with the Manual TDR Figure 8.2.2.1A shows an example of a MANUAL TDR test result on a 2000ft cable with an open cable end, with the correct VOP setting and proper pulse width selected. The large pulse near 0 distance is the sent pulse, the reflected pulse near 2000 ft is the reflection coming from the open end of the cable. The CableSHARK will attempt to place the cursor at the bottom of the rising edge of the reflected pulse. Page 103 CableSHARK P3 User Guide 800ns and look for any impairments up to 5000ft 1520m, and so on, until the cable end is found or the test is completed. Wider pulse widths makes it easier to detect small faults on the cable or faults located at a farther distance. Starting from the shorter pulse width is useful for locating any fault that may otherwise be hidden in the blind spot see 8.2.4.1 Blind Spots of a sent pulse of wider width. This makes the EXFO CableSHARK ideally suited for use in qualifying any twisted copper pair lines in the local loop to carry DSL technologies. DMT is based on Frequency Division Multiplexing FDM. The remote control program VisiSHARK can be used to capture and analyze the results on a PC. Page 117 CableSHARK P3 User Guide 8.3.

4 CPE Modem Detection and DSLAM Detection The CableSHARK's DMT test will automatically determine if there is a CPE modem or DSLAM connected to the far end of the circuit and will use the training frequency patterns as described by ANSI T1.413 to predict the expected data rate of the circuit. This is done by looking at the signal level and noise level at the ADSL modem synchronization frequencies. For example, a pair of ADSL modems compliant with the ANSI T1.413 standard employs some twelve tones ranging from 34.5kHz to 310.5kHz at a level of 1. Page 119 CableSHARK P3 User Guide 8.4.1 Setting up a Noise Test From the Main Menu, pressing Function button F1 CABLE TESTS will bring the user to the CABLE TESTS popup menu. Choose NOISE to invoke the NOISE TEST SETUP menu. The sections that follow will explain the operation as each of the control keys is pressed and their respective screens appear. Figure 8.4.1A below shows the Noise Test Setup Menu. The options are 100 ohms, 135 ohms, and AUTO older hardware will still show 120 and 150 ohms. For singleended tests, the AUTO impedance setting is recommended because it gives better accuracy by measuring the cable and selecting the most appropriate attenuation. **NOISE FILTER** The options are ISDN E Filter, HSDL F Filter, ADSL G Filter and No Filter. The function button command selection at the bottom of the Noise Test Setup menu consists of five options available to the operator. The last two options at the bottom of the screen are CABLE TESTS and MAIN MENU. From here, the test results can be saved to internal nonvolatile memory. See Section 5.3 for more information. From here, the test results can be saved to external USB memory. Page 131 CableSHARK P3 User Guide 8.5. Longitudinal Balance Test The longitudinal balance test ensures that the twisted pair is balanced. Longitudinal balance ratio is defined in ITUT Rec. O.9, which is important when it comes to reducing the effects of commonmode voltage to ground.

The CableSHARK can perform a longitudinal balance measurement to determine if the longitudinal

balance ratios are compliant with this standard. The CableSHARK displays results for ADSL applications respective of the ANSI T1. The parameters can be modified to customize a Longitudinal Balance test. The Longitudinal Balance test setup options are described as follows TEST TYPE LONG BAL NEAR END. This test is a single ended longitudinal balance test where the resultant is plotted from 26 kHz to 2208 kHz. SAVE TO USB The remainder of the buttons are as follows Use these function buttons to zoom in and out based on the vertical level scale. Please note after the completion of a test, the ZOOM OUT VERT option will be disabled as it is impossible to ZOOM OUT. When running a TDR test, a load coil on the line acts like an open circuit on the line. When running FR or DMT tests with a line, the test results will show the severe roll off in frequencies from 4 kHz to some 10 kHz should loading coils exist on the line. 8.6. Page 137 CableSHARK P3 User Guide TEST TYPE Select from either LOAD COIL RX receiver mode or LOAD COIL SINGLE END. LOAD COIL SINGLE END will plot a results graph up to 10 kHz. If a load coils is found, they will be represented graphically. LOAD COIL RX is an endtoend test. Load coil detection test complete. At least 2 load coils detected. Using this test allows technicians to identify whether a line is live voice line or not in use no voltage or current. The Resistance and Capacitance measurements will also provide the user with an estimated loop length after the completion of this test. Please ensure that the test set is connected in parallel with the load. Other connections may result in inaccurate readings. Note telephone cable may have dangerous A.C. or D.C. Voltages on them, therefore caution should be taken when connecting this test set. Page 145 CableSHARK P3 User Guide If the AUTO CABLE TYPE is NOT selected, the following settings are available.

These are necessary to provide the user with the most accurate results. The Capacitance Constant is used to calculate the length of the cable based on the Capacitance measurement. The following table lists the most common values. Please check with the cable manufacturer for specific details concerning the cables capacitance constant. The Resistance Constant is used to calculate the length of the cable based on the Resistance measurement. SELECT NEXT Pressing the function button corresponding to SELECT NEXT scrolls forward through each of the parameters that are available for the highlighted option. CABLE TESTS Pressing the function button corresponding to CABLE TESTS causes the CABLE TESTS popup window to appear. These manual selections are not available for AUTOTEST14, AUTOTEST12, or CURRENT I tests. UPLOAD RESULT Pressing the function button corresponding to UPLOAD RESULT sends the result that appears on the CableSHARK screen current test or recalled test to a PC via a NULL modem cable. Page 151 CableSHARK P3 User Guide 8.8. 4Wire Crosstalk Test The CableSHARK's 4 Wire Crosstalk test or 4 WIRE XTALK Test or Stressed Noise test allows users to measure and observe crosstalk on cable pairs that are currently in use or being provisioned for xDSL. One major impairment for which the 4wire crosstalk measurement is well suited for is for detecting and determining the severity of split pairs. Service Providers have often had to resort to using split pairs to add a subscriber. The measured resistance of the fault is displayed. The amount of current is low and controlled to protect the user. Page 157 CableSHARK P3 User Guide The Isolation Resistance test setup options are described as follows TEST TIME SEC The user can specify the "soak" time or the duration of the test in which 100 VDC is applied to the circuit. Allowable times are from 1 to 99 seconds. Values less than 25 Mohm means that the circuit may be unstable and therefore potentially unsuitable for xDSL.

At the completion of a test, the Function button command selection at the bottom of the ISOLATION TEST SETUP screen consists of a minimum of five options available to the operator. The parameters can be modified to customize a LoopMapper Test. The following describes the LoopMapper test setup options VOP Velocity of Propagation sets at what velocity the pulse travels along the wire. It is entered as a ratio of the speed of light. The table near the end of this section provides more information about VOP. The horizontal scale shows the location of the fault or end of cable in either feet or meters. At the completion of a test, the function button command selection at the bottom of the LoopMapper Test Result screen consists of several options available to the operator. The

remainder of the buttons are as follows PREVIOUS MENU The function button corresponding to PREVIOUS MENU takes the user to the command selections listed previously. To exit this menu level, press the function button associated with PREVIOUS MENU or TEST SETUP. Page 165 CableSHARK P3 User Guide FIGURE 8.10.2.1A RUNNING A LOOPMAPPER TEST WITH THE CABLE END OPEN Figure 8.10.2.1B shows a LoopMapper test result on the same cable of Figure 8.10.2.1A with the cable end shorted. The Bridge Tap condition is automatically detected and presented by the CableSHARK at the bottom of the screen. Page 167 CableSHARK P3 User Guide FIGURE 8.10.2.1C RUNNING A LOOPMAPPER TEST WITH A CABLE AND BRIDGE TAP BRANCH Note When using the LoopMapper test, be sure to use the CableSHARK's zoom function to amplify the result. The results are provided in both textual and graphical formats. Page 171 CableSHARK P3 User Guide 8.11.1.2 SHDSL Auto Test Setup From the Auto Test Setup screen, pressing the F6 button will activate the SHDSL Auto Test Setup screen. E SHDSL Evaluation SHDSL Noise Margin dB Min. AC Voltage TR V Max. AC Voltage TG V Max. AC Voltage RG V Max. DC Voltage TR V Max.

DEFAULT VALUES Sets the ADSL AUTO TEST parameters to their factory defaults. ADSL SETUP Allows the user to setup the ADSL Auto Test VF SETUP Allows the user to setup the VF Auto Test. TEST SETUP Pressing the function button associated with TEST SETUP activates the AUTO Test Setup menu. Test parameters can be modified and the test can be run once again from this screen. Otherwise, the CableSHARK will report FAILED. MAIN MENU Select MAIN MENU to return to the Main Menu. A special alphanumeric software key will be sent to the purchaser based upon each CableSHARK's unique serial number. To determine the options currently installed in the CableSHARK or to view the units unique serial number, go to SYSTEM SETUP and select the OPTIONS function key see Section 6.4. Once the key is properly entered, the user can exit to the MAIN MENU, select CABLE TESTS, and then select SPECTRAL DETECTIVE from the popup menu. Page 187 CableSHARK P3 User Guide NOISE FILTER The options are ISDN E Filter, HSDL F Filter, ADSL G Filter and NONE. NONE is the most ideal selection since it gives the user an unbiased analysis of the results. If the E, F, or G filters are enabled, the Disturber Identification is turned off as the analysis of the available bandwidth is limited. To determine if a circuit has a specific technology riding over it, ensure that the NOISE FILTER is set to NONE. Please note after the completion of a test, the ZOOM OUT VERT option will be disabled as it is impossible to ZOOM OUT. Discontinuities and impedance mismatches occur at connections where cable is improperly terminated, changing from one wire gauge to another of greater or lesser diameter, or from cable splices. When a transmitted signal pulse hits one of these discontinuities, part or all of a signal is reflected back and return loss occurs. The Return Loss result is expressed in dB.