



Bird Dog 3 System

Geophone Test Unit



User's Manual

Bird Dog 3 System User's Manual

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1 Introduction

1.1 System Description

The Bird Dog 3 system is an independent analog to digital acquisition system, especially designed for quality control testing and repair of seismic geophone units and geophone strings.

The Bird Dog 3 System consists of the following:

- Bird Dog 3 Unit – Digital to Analog converter unit with Ethernet interface. BD3 is a 32 bit acquisition unit, with each box containing 3 channels. The Bird Dog 3 uses a 16 bit D/A output for the Geophone Test signals
- Computer – The BD3 unit connects to a computer with Windows XP, Windows 7 or Windows 8 operating system and an Ethernet Network Interface Card (NIC).
- GeoTest software operates on the computer and communicates to the BD3 unit. The Software package allows viewing, analysis, and storage of the acquired signals.
- Connection cables are included to connect:
 - Power (11-18 VDC)
 - Geophone being tested
 - Ethernet cable to connect BD3 to computer

1.2 Bird Dog Software Installation and Setup

There are two different GeoTest programs. One is version 3 and the other is version 4.

The GeoTest ver3 software will only test one geophone at a time and requires a special cable with a 612 ohm resistor wired to pins C and D of the cable. The ver3 GeoTest cable will have only one input for the Geophone to be connected. This cable may not have been included in your shipment, I will have to check tomorrow to see what we shipped.

The GeoTest ver 4 software is designed to test 3 geophones simultaneously. The ver 4 Geophone test cable will have 3 separate inputs for the 3 separate geophones to be connected.

The ver 4 GeoTest cable will not work with the GeoTest ver 3 software.

The cable schematics are shown at the end of this manual

1.3 GeoTest version 3.27

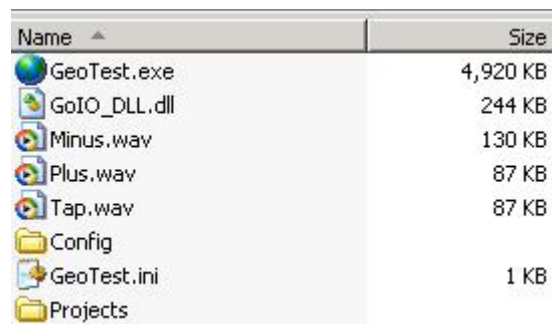
GeoTest version 3.27 or newer should be used with the BD3-3 unit

To operate the GeoTest program requires:

- GeoTest.exe – this main executable program
- GoIO_DLL.dll – is required for optional temperature sensor to operate correctly
- Minus.wav – wav files for Polarity TAP tests
- Plus.wav
- Tap.wav

The *.wav files can be changed to a different language or sound. These files must have the minus.wav, plus.wav, and tap.wav names to be used by the program.

After running GeoTest the program directory should look as follows:



Name	Size
GeoTest.exe	4,920 KB
GoIO_DLL.dll	244 KB
Minus.wav	130 KB
Plus.wav	87 KB
Tap.wav	87 KB
Config	
GeoTest.ini	1 KB
Projects	

1.4 WinPCap

WinPcap software needs to be installed

This software improves the Ethernet reliability and speed on most computers.

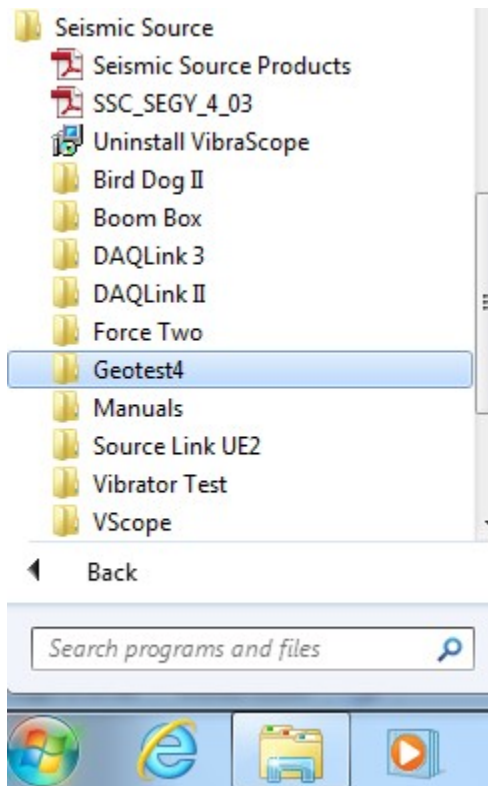
WinPcap is included on the GeoTest install disk

The latest winpcap can be downloaded from:

<http://www.winpcap.org/>

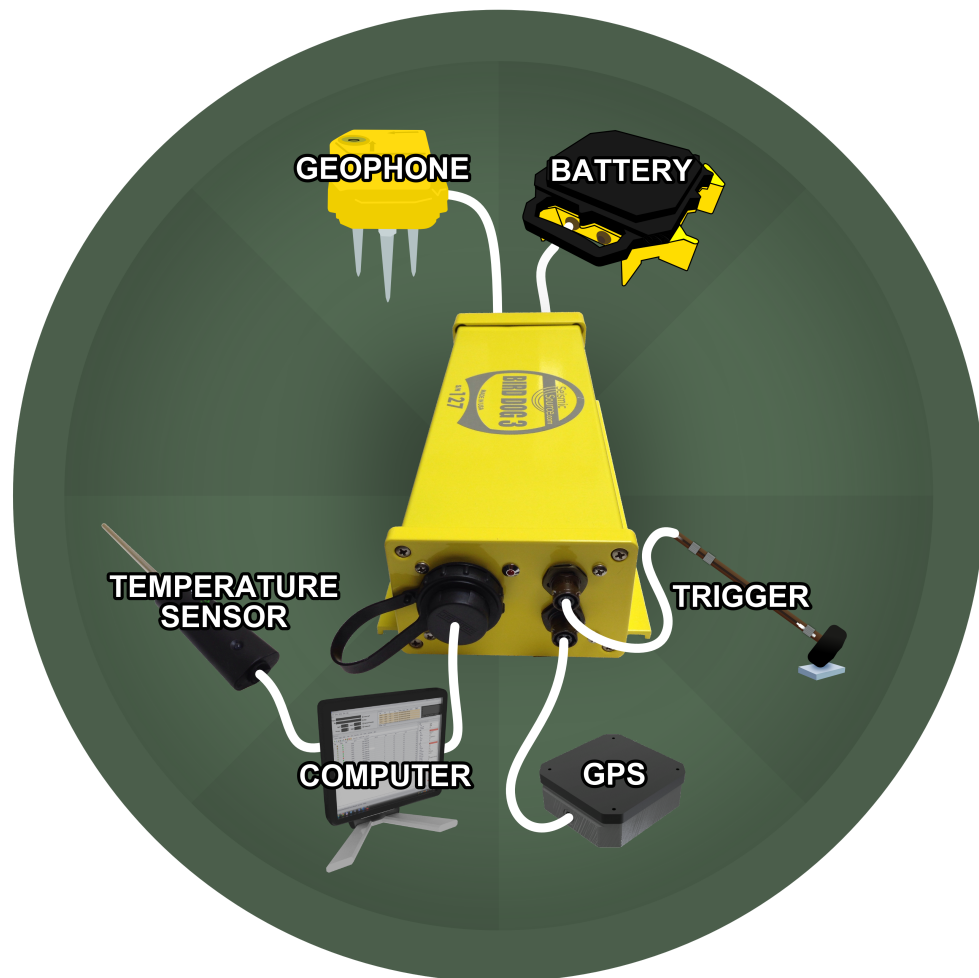
1.5 GeoTest ver 4 Software

The GeoTest ver 4 software can be installed on any Windows 8 or newer computer. The program will be installed in the Seismic Source program group under GeoTest4. A Desktop icon can also be generated.



2.1 Bird Dog Cable Connections

- Connect BD3 to computer with patch cable provided
- Connect 11-18 VDC supply to BD3 power cable (polarity does not matter). The power connects to the 2 pin connector on the BD3 unit. Make sure voltage to box is at least 11 volts. The power LED will operate with lower voltage but the unit will not perform properly.
- Connect the standard geophone test cable. Connect the 55 pin circular connector to the BD3 unit, connect the geophone test clips to the geophone under test.



3 Configuring The Program

3.0 Ethernet Setup

Set up computer with a fixed IP address of 10.0.0.101

The screenshot shows the 'Internet Protocol (TCP/IP) Properties' dialog box with the 'General' tab selected. The dialog box has a title bar with a question mark and a close button. Inside, there is a text box explaining that IP settings can be assigned automatically or manually. Two radio buttons are present: 'Obtain an IP address automatically' (unselected) and 'Use the following IP address:' (selected). Below the selected radio button, there are three input fields: 'IP address' (containing '10 . 0 . 0 . 101'), 'Subnet mask' (containing '255 . 0 . 0 . 0'), and 'Default gateway' (empty). Below these, there are two more radio buttons: 'Obtain DNS server address automatically' (unselected) and 'Use the following DNS server addresses:' (selected). Below the selected radio button, there are two input fields: 'Preferred DNS server' and 'Alternate DNS server', both empty. At the bottom right of the dialog box is an 'Advanced...' button. At the very bottom are 'OK' and 'Cancel' buttons.

Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 10 . 0 . 0 . 101

Subnet mask: 255 . 0 . 0 . 0

Default gateway: . . .

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

Advanced...

OK Cancel

See section 8 for more details on setting up the fixed IP address.

3.1 Hardware Configuration

Connect and power up BD3 unit. Start the GeoTest program by double clicking on GeoTest.exe file in Windows Explorer. Verify the correct BD3 unit is enabled by selecting menu **Settings->Device**.

If no unit serial numbers are displayed in the window click Auto Detect. It should find all BD3 units connected to computer.

Make sure the unit is enabled. A check mark by the serial number shows that the unit is enabled. Just left click the small box next to the serial number to enable it. This feature allows multiple units to be connected through the Ethernet link. All that is needed is an Ethernet hub.

Verify that Reference and Geophone1 are selected in the Channels selection.

Click OK. Settings will be stored in the device memory.

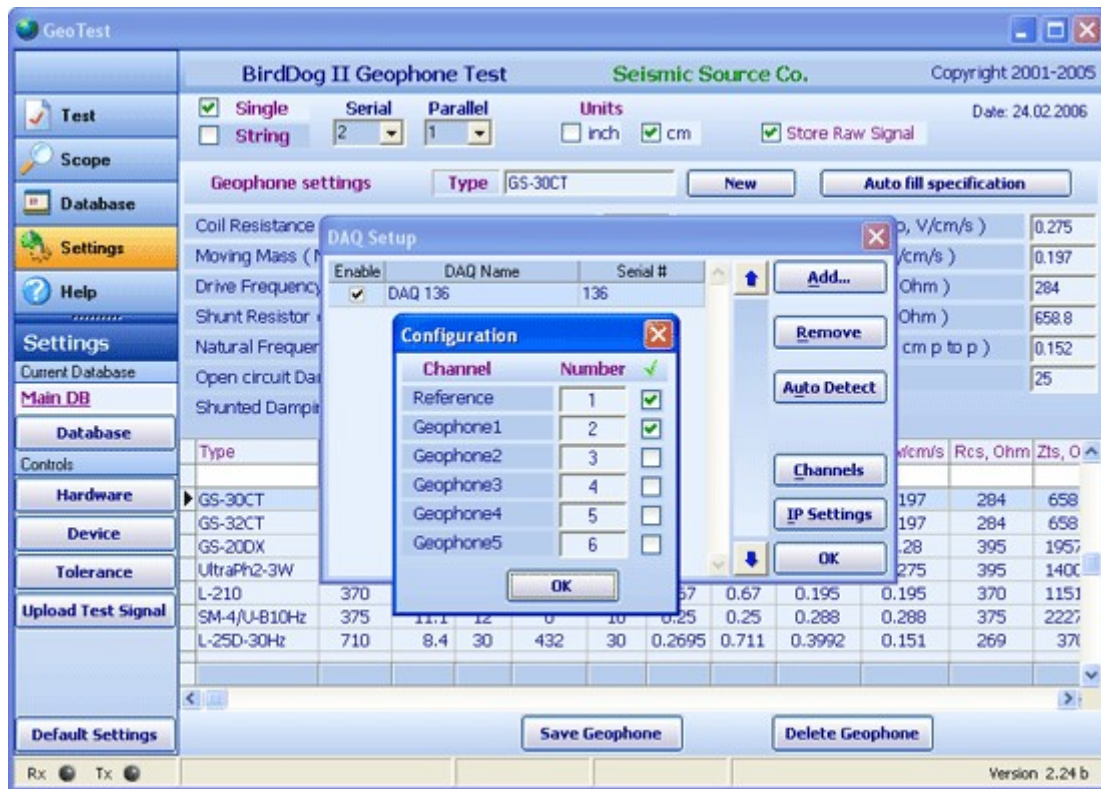
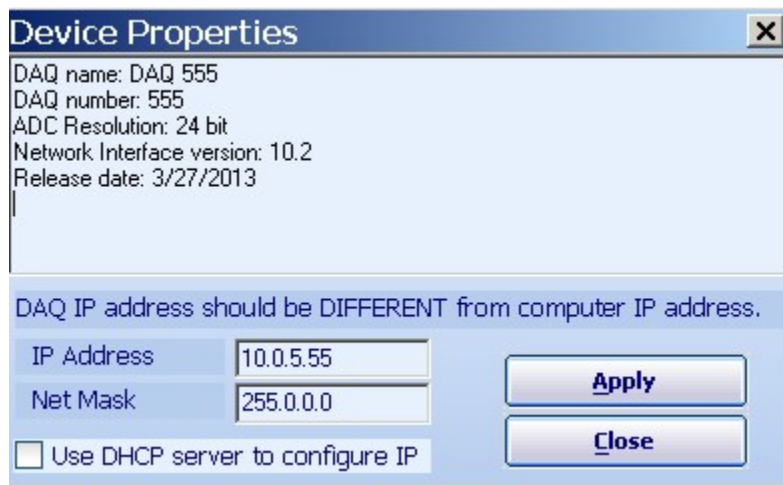


Figure 4.1 Device Configuration

To check that communication with the Bird dog 3 unit is working properly click the menu **Settings->Device**, then **IP Settings** button. The device information should appear. If the configuration window does not appear, it means that the Bird Dog 3 unit selected is not responding.



The screenshot shows a 'Device Properties' window with a blue title bar and a close button. The main area contains the following text: 'DAQ name: DAQ 555', 'DAQ number: 555', 'ADC Resolution: 24 bit', 'Network Interface version: 10.2', and 'Release date: 3/27/2013'. Below this is a blue bar with the text 'DAQ IP address should be DIFFERENT from computer IP address.'. Underneath are two input fields: 'IP Address' with the value '10.0.5.55' and 'Net Mask' with the value '255.0.0.0'. To the right of these fields are two buttons: 'Apply' and 'Close'. At the bottom left is a checkbox labeled 'Use DHCP server to configure IP' which is currently unchecked.

Figure 4.2 Device IP Settings

This is usually caused by improper TCP/IP settings, or Ethernet cable not plugged in properly. The computer or Bird Dog 3 unit may need to be reset if the TCP/IP configuration has changed.

The first number in IP Address of BD3 unit should match your computer IP Address (10.0.0.101). The IP address of the BD3 unit must be different than the computer. Devices with the same IP address will not communicate with each other.

Do not change BD3 IP Address unless you have some other device connected to network with the same address. Programming wrong IP Address to the BD3 may cause it to stop communicating with computer.

An additional check of communication can be performed by first removing all BD3 units from the table. Highlight the BD3 unit to be removed then press the Remove button. After all units have been removed, press the Auto Detect button and all units connected to the computer will be added.

Once the unit is setup, there is no reason to return to this menu unless you need to change BD3 unit or test the communication link.

3.2 Calibrating Bird Dog 3 unit – GeoTest ver 3 only

The Bird Dog 3 unit allows the end user to calibrate the unit to allow for tolerance of the internal components in the unit. First measure the resistance of the geophone under test with an accurate digital Ohm meter, then perform a resistance test with the GeoTest program. If the values are within 3% then no adjustment should be made. (Most Digital Ohm meters are not accurate to over 3 %). If you feel the Geo Test Program is reporting too high or too low resistance, then the Calibration Resistor (R25) can be adjusted to compensate for the inaccuracy. Go to the Hardware Setup menu in the GeoTest program. Select **Settings** → **Hardware**

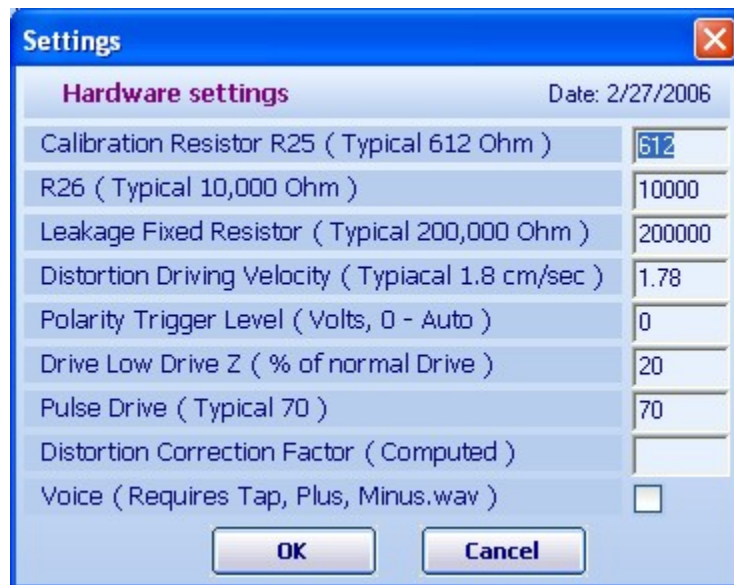


Figure 4.3 Hardware Setup

The Hardware setup allows fine-tuning of the Bird Dog 3 test results. The internal constant current source uses an internal (R25) 612 ohm resistor. To check if the entry for the internal resistor needs calibration, test the resistance of a known resistor. Adjust the entry for R25 to calibrate the resistor measurement to be exact.

3.3 Lock Feature

There is also a “lock” feature in the program. This allows the technician to “lock out” the critical entries of the program for unskilled operators.

Just click the “lock” button in the setting menus to “lock” the menus.

To “Unlock” the menus, enter the password “ssc”



4 BD3 Options

The standard BD3 is a 3 channel Geophone Test unit. Various options are available for testing of Servo Hydraulic Vibrators and Hydrophones

4.1.1 BD3 – VibQC Option -3 channel

The BD3-3 VibQC Option consists of the following:

- BD3 VibQC External Box
- VibQC cable kit
- Two external magnetic accelerometers



This kit enables testing of Servo hydraulic Vibrators. The independent accelerometers allow verification of correct polarity and operation of the system. The Weighted Sum or Ground Force signal can be recorded and compared against the True Reference Signal.

4.1.2 Portable Bird Dog 3 unit

The BD3-3 unit is also available in a portable version.

This version has a built in battery and display.

The portable BD3 Geophone tester can be used without a computer. Each string is tested and the results are shown on the Display. The results are also saved in the non-volatile memory in the device.

The saved Geophone results can be downloaded to computer and a summary report is available.

4.1.3 BD3 – Hydrophone Test Option

A Hydrophone Test Option is also available for the BD3-3 unit. The Hydrophone Test Option consist of the following:

- BD3 Hydrophone Test Sound Tube
- Hydrophone Test audio amplifier
- Hydrophone Test Cable kit

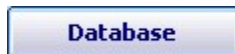
5 GeoTest ver 3 Operation

The main menu of the program is located at the left side of the program window. It allows you to navigate between various operation modes. They are Test Mode, Scope Mode, Database Mode and Settings Mode. There is an additional menu in the left bottom corner. It corresponds to current operation mode.

5.1 Settings



5.1.1 Database Menu



The **Settings -> Database Tools** menu allows the user to Create, Rename, Empty, or Delete the database. Bird Dog 3 can use different databases to store acquired data. The projects are like folders used to sort and store different data. The program remembers last project and loads it automatically on startup.

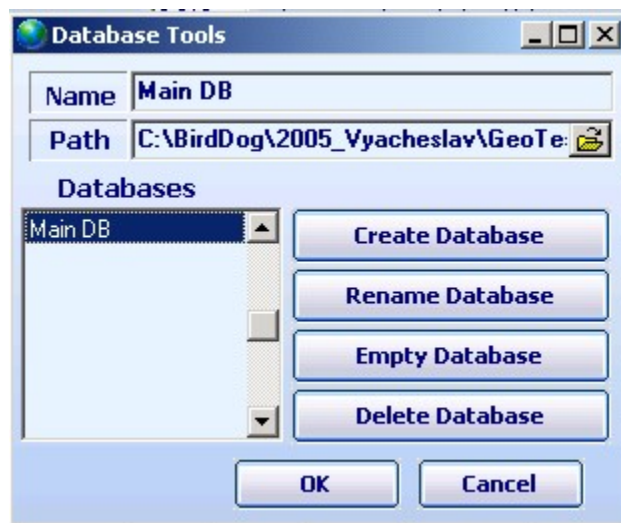
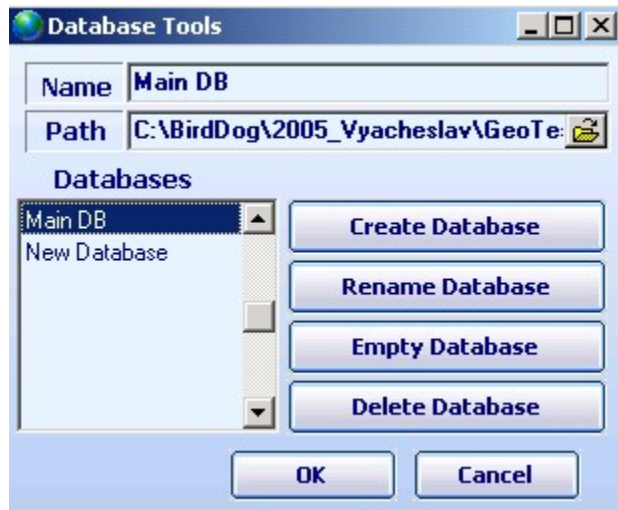


Figure 5.1 File Menu

To Create new Database, first enter new name in the name field, and then press the "Create database" button.

All of the different databases will be shown in the database list.



The above example shows two databases; Main DB, and New Database. Click the database to be used, and the program will switch to that database.

5.1.2 Hardware Setup



The Hardware Setup menu is accessed using the menu **Settings** → **Hardware**. The Hardware setup allows fine tuning of the Bird Dog 3 test results. The internal constant current source uses an internal (R25) 612 ohm resistor. To check if the entry for the internal resistor needs calibration, test the resistance of a known resistor. The 612 ohm resistor can be modified to calibrate the resistor measurement to be exact.

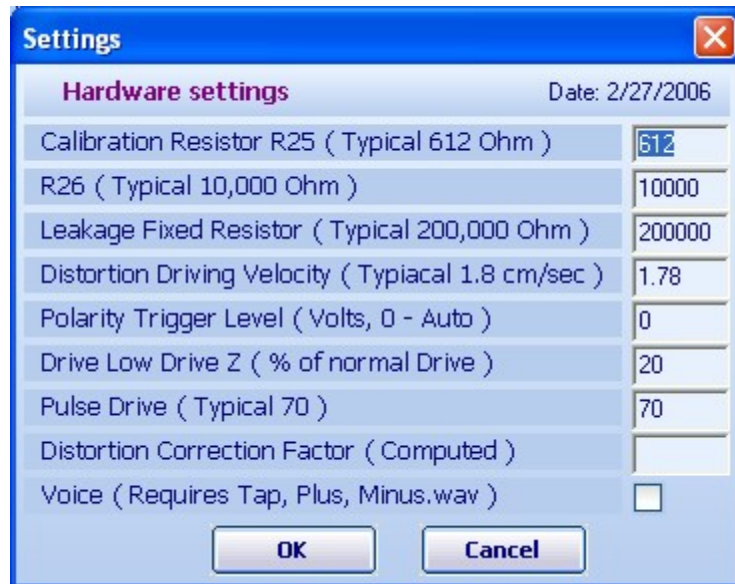


Figure 5.2 Hardware Setup

The Leakage test recommends using a 200 kOhm resistor. This resistor needs to be measured accurately for accurate Leakage measurements. Enter the exact value used for the parallel resistor in the leakage tests.

Most geophones have the distortion specified at 1.8 cm/sec (0.7 in/sec) velocity. Geotest allows this drive level to be changed. Enter the desired drive level for the distortion test. Normal entry is 1.800 cm/sec.

R26 entry works very similar to R25. For normal operation set this entry to 10000.

The polarity test uses either tones or a wave file. The wave file can be used by selecting Voice in this entry.

Drive for Low Drive Z – This entry is used to set the drive level for the Low Drive Impedance Test. Enter the % of normal drive for the low drive Z tests.

For test purposes only the Pulse Drive can be adjusted in this menu.

Distortion Correction Factor (computed) – This is the distortion correction factor computed by the software. When an external source is used to drive the geophone, a correction factor must be applied to the result to obtain the correct distortion reading of the geophone. The computed total distortion from the FFT is multiplied by this “Correction Factor” to compute the actual geophone distortion.

5.1.3 Device Setup



Device Setup window is used to detect and setup Bird Dog 3 units. Please, refer to section 8.1

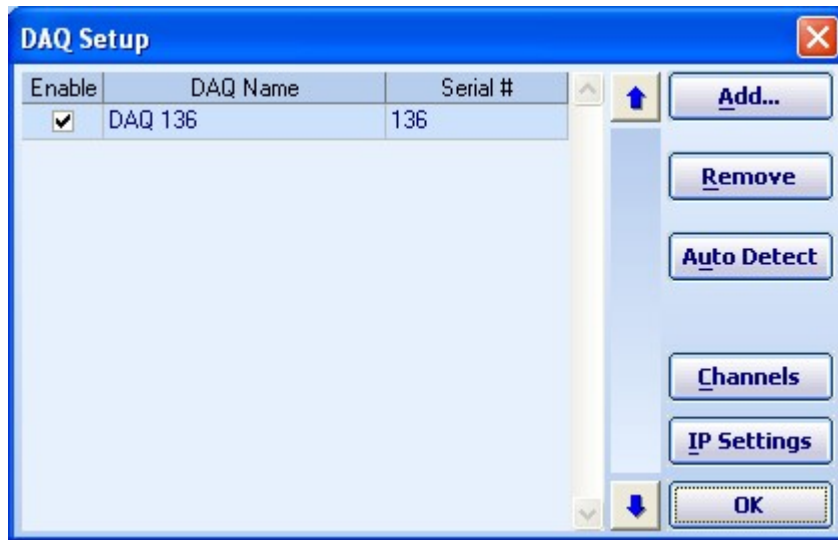


Figure 5.3 Device Setup

5.1.4 Tolerance Setup



Menu Tolerance Settings is used to setup the default tolerance settings for geophones. These settings are only used for geophones where tolerances are not entered or equal to 0.

A screenshot of a "Settings" dialog box with a blue title bar and a close button (X) in the top right corner. The dialog contains a section titled "Tolerance settings" in purple. Below this title are nine input fields, each with a label and a value. At the bottom are "OK" and "Cancel" buttons.

Tolerance settings	
Natural Frequency, %	5
Damping, %	5
Sensitivity, %	5
Resistance, %	5
Impedance, %	5
Distortion	0.5
Polarity +1/-1	1
LeakMax, Ohm	1000000

Figure 5.4 Default Tolerance Settings

Note: Normal Tolerance settings are set with the Geophone parameters

5.1.5 Geophone Selection and Specification

To obtain the correct test results the geophone parameters for the units under test must be entered and selected. All geophones are listed in Geophone Specification table. To select a geophone for the test just click on it with the left mouse button. You can also modify existing geophone specifications or add new geophones to the table.

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☒ Single ☐ String Serial: 3 Parallel: 2 Cable Resistance: Ohm/km Interval: 5.0 m Lead-in: 7.0 m ☒ Store Raw Signal Units: ☐ inch ☒ cm

Geophone settings Type: GS-30CT New Auto fill specification

Coil Resistance (Rc, Ohm)	395	Shunted Impedance (Zts, Ohm)	658.8
Moving Mass (M, Gram)	11.2	Case to Coil Motion (Disp, cm p to p)	0.152
Drive Frequency (Fd, Hz)	12	Temperature (deg C)	25
Shunt Resistor (Enter 0 for none) (Rd, Ohm)	1000	Tolerances settings	
Natural Frequency (Fn, Hz)	10	Frequency Tolerance (+ / -) %	2 2
Open circuit Damping (Bo)	0.316	Damping Tolerance (+ / -) %	2 2
Shunted Damping (Bt)	0.7	Sensitivity Tolerance (+ / -) %	2 2
Open circuit Sensitivity (Go, V/cm/s)	0.275	Resistance Tolerance (+ / -) %	2 2
Shunted Sensitivity (Gs, V/cm/s)	0.197	Impedance Tolerance (+ / -) %	5 5
Shunted Resistance (Rcs, Ohm)	284	Distortion Tolerance %	0.08

Type	Rc, Ohm	M, Gram	Fd, Hz	Rd, Ohm	Fn, Hz	Bo	Bt	Go, v/cm/s	Gs, v/cm/s	Rcs, Ohm	Zts, Ohm	Disp	Temp	FreqTol +
GS-30CT	395	11.2	12	1000	10	0.316	0.7	0.275	0.197	284	658.8	0.152	25	
GS-32CT	395	11.2	12	1000	10	0.316	0.7	0.275	0.197	284	658.8	0.152	25	
GS-20DX	395	11	12	0	10	0.3	0.3	0.28	0.28	395	1957.6	0.15	25	

Save Geophone Delete Geophone Export Geophone Import Geophone

Rx Tx Version 2.76

Figure 5.6 Geophone Specifications

To add a new Geophone press New button and type in parameters in the top section of the Geophone Settings screen.

The Auto Fill feature can be used to compute impedance, shunted sensitivity and damping. When possible the empty fields will be computed and filled when the Auto Fill button is pressed.

Example:

Enter: Rc, M, Fd, Rd, Fn, Bo, Go, Displacement

AutoFill computes: Bt, Gs, Rcs, Zts

Entries must be blank for auto fill to work. (Use delete key if you want to recalculate entered value)

After all entries in the top portion are correct, press Save Geophone button at the bottom of the screen to save the new geophone and its parameters.

Enter all parameters for a single geophone. The Geotest program will compute the specifications for the string using the single geophone specification.

- Type – This is a text entry that allows the user to identify the parameters when selecting the geophone type. This can be the detailed name or as simple as red ones and blue ones
- Rc-Coil Resistance – Coil Resistance of the geophone.
- M- Moving Mass – Moving Mass of the geophone is used to compute the sensitivity of the geophone
- Fd- Geophone Drive Frequency – determine the frequency that will be used for the distortion and impedance tests
- Rd- Damping Resistor – Enter the value of the damping resistor. A zero should be entered when there is no shunt resistor.
- Fn- Natural Frequency – Enter natural frequency of the geophone.
- Bo – Open circuit Damping – Enter the open circuit damping. This is the damping of the geophone with no damping resistor.
- Bt – Shunted damping – Enter the damping of the geophone with the damping resistor.
- Go – Open circuit Sensitivity – Enter the sensitivity of the geophone with no damping resistor.
- Gs – Shunted Sensitivity – Enter the shunted sensitivity of the geophone. This is the sensitivity of the geophone with the shunt resistor.
- Rcs- Shunted Resistance – Enter the DC resistance of the geophone with the shunt resistor.
- Zts- Impedance – Enter the shunted impedance of the geophone at the Fd (Drive Frequency).
- Disp – Displacement of the geophone – Enter the peak to peak displacement of the geophone. This entry is used to compute the Step drive level.
- @ Temp – Enter the temperature that the geophone is specified at. Most geophone manufacturers use 20 degrees C to specify the geophone. OYO/Geospace use 25 degrees C to specify their geophones.

5.1.6 Units



Units – Centimeters- Inches - use this selection to switch between English and metric units.
Note: Moving Mass is always entered in grams

5.1.7 String Selection

To perform test of geophone strings check String checkbox and choose enter number of series and parallel phones.

A control panel for string selection. It features two checkboxes on the left: 'Single' (unchecked) and 'String' (checked). To the right of these are two dropdown menus. The first dropdown is labeled 'Serial' and has the number '2' selected. The second dropdown is labeled 'Parallel' and has the number '1' selected.

<input type="checkbox"/> Single	Serial	Parallel
<input checked="" type="checkbox"/> String	2	1

Figure 5.7 String Selection

You can quickly switch between String or Single geophone in the Main Test Window checking appropriate checkbox

5.1.8 String Resistance

There are entries in the program to compensate for the resistance in the wire in a geophone string. The resistance of the cable should be entered as xx ohms per 1000 meters. This value is typically about 120 ohms per 1000 meters.

Also enter the lead in length of the cable used on the string, and the spacing between the geophones. All of the entries should be in meters.

The GeoTest program automatically computes the added resistance and impedance of the caused by the wire in the geophone string

BirdDog II Geophone Test Seismic Source Co. Copyright 2001-2006

☒ Single ☐ String Serial: 3 Parallel: 2 Cable Resistance: 120 Ohm/km Interval: 5.0 m Lead-in: 7.0 m ☒ Store Raw Signal Units: ☐ inch ☒ cm

Geophone settings Type: GS-30CT New Auto fill specification

Coil Resistance (Rc, Ohm)	395	Shunted Impedance (Zts, Ohm)	658.8
Moving Mass (M, Gram)	11.2	Case to Coil Motion (Disp, cm p to p)	0.152
Drive Frequency (Fd, Hz)	12	Temperature (deg C)	25
Shunt Resistor (Enter 0 for none) (Rd, Ohm)	1000	Tolerances settings	
Natural Frequency (Fn, Hz)	10	Frequency Tolerance (+ / -) %	2
Open circuit Damping (Bo)	0.316	Damping Tolerance (+ / -) %	2
Shunted Damping (Bt)	0.7	Sensitivity Tolerance (+ / -) %	2
Open circuit Sensitivity (Go, V/cm/s)	0.275	Resistance Tolerance (+ / -) %	2
Shunted Sensitivity (Gs, V/cm/s)	0.197	Impedance Tolerance (+ / -) %	5
Shunted Resistance (Rcs, Ohm)	284	Distortion Tolerance %	0.08

Type	Rc, Ohm	M, Gram	Fd, Hz	Rd, Ohm	Fn, Hz	Bo	Bt	Go, v/cm/s	Gs, v/cm/s	Rcs, Ohm	Zts, Ohm	Disp	Temp	FreqTol +
GS-30CT	395	11.2	12	1000	10	0.316	0.7	0.275	0.197	284	658.8	0.152	25	
GS-32CT	395	11.2	12	1000	10	0.316	0.7	0.275	0.197	284	658.8	0.152	25	
GS-20DX	395	11	12	0	10	0.3	0.3	0.28	0.28	395	1957.6	0.15	25	

Save Geophone Delete Geophone Export Geophone Import Geophone

Version 2.76

Typical String Resistance Entries

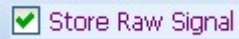
70 Break Wire: 35 ohms / 1,000ft or 114 ohms per 1 km

100 Break Wire: 24 ohms / 1,000ft or 78 ohms per 1 km

150 Break Wire: 14 ohms / 1,000ft or 45 ohms per 1 km

225 Break Wire: 4 ohms / 1,000ft or 13 ohms per 1 km

5.1.9 Store Raw Signal



You may save some space on your hard drive if only the results of the test are stored to the database.

Uncheck the Store Raw Signal checkbox to store only the results. The program will not save recorded geophone response signal in this case.

Check the Store Raw Signal checkbox to store the signal trace along with the digital test results. The program will save recorded geophone response signal in this case.

5.2 Test Mode



The main test window shows which test are currently selected, the geophone type selected, and the results of the previous test or results loaded from database. For the saved record serial number and date of the test will be shown.

In this window you can quickly switch between Single geophone or String.

The Frequency, Damping, Sensitivity, Resistance, Impedance, and Distortion test will all be performed as one test. Clicking any of these tests will enable all of them.

The Polarity test is performed separately.

The Leakage test is also performed separately and a special cable configuration must be used.

You can adjust Tolerance settings using menu **Settings->Tolerance** (Refer to section 5.1.4)



Figure 5.8 Test Mode Window

Auto Sequence button enables or disables the auto sequence feature

Auto Repeat button enables or disables the auto repeat function

Temperature Entry

At the top right of the screen, the temperature of the geophone should be entered.

The geophone parameters will change depending on temperature. The Geotest program will automatically adjust the test readings to show what the results would have been at 20 degrees C operation. Enter the temperature of the geophone under test. The results of the test will be modified depending on the temperature entry. The Geotest program uses the temperature entered in the Geophone Specification to compute the temperature offset. Most manufacturers specify the geophone at 20 degrees C. (OYO/Geospace specify their geophones at 25 degree C).

With Optional Temperature Probe, the temperature entry will automatically update

Temperature compensation

GeoTest ver 4.19

When the Geophone is tested at a temperature other than the manufacturer's specified temperature the results of the geophone test are not modified, however the specifications are changed.

BD 4.19 Test results at specified 20 C temperature

Geophone Type		Natural Frequency		Damping		Sensitivity	
Result	Error	Result	Error	Result	Error	Result	Error
4.39 Hz	-2.5%	0.553	-1.2%	354.81	2.7%		
Tolerance +5.0 % / -5.0 %		Tolerance +5.0 % / -5.0 %		Tolerance +5.0 % / -5.0 %		Tolerance +5.0 % / -5.0 %	
Resistance 4546.5 Ohm		Impedance 14953.2 Ohm		Distortion			
Result Error		Result Error		Result			
4546.5 Ohm 1.0%							
Tolerance +5.0 % / -5.0 %		Tolerance +5.0 % / -5.0 %		Tolerance 0.3 %			
Polarity Positive		Leakage		Low Drive Z		14953.2 Ohm	

BD 4.19 Test results at 100 C temperature setting. Notice the Test Results do not change, but the specifications do change

Geotest ver 4.19 - temp test C:\Seismic Source\Geotest4\Projects\temp test Copyright 2001 - 2015

Main Menu Geophone Test Project Settings

Geophone Test Current Project temp test Selected Device 146 Ver: 10.30

Clear Start Add / Repeat

Seismic Source Co

Geophone Type HG 4.5 B _375 Natural Frequency 4.5 Hz

Single String 12 X 1

Manual USB Sensor Portable Sensor Temperature 100

Frequency	Damping	Sensitivity
4.43 Hz	0.47	308.55 V/m/s
Result Error	Result Error	Result Error
4.4 Hz -0.6% Pass	0.558 18.7% Fail	356.96 15.7% Fail
Tolerance +5.0 % / -5.0 %	Tolerance +5.0 % / -5.0 %	Tolerance +5.0 % / -5.0 %
Resistance 5508.0 Ohm	Impedance 15934.1 Ohm	Distortion
Result Error	Result Error	Result
4543.9 Ohm -17.5% Fail		
Tolerance +5.0 % / -5.0 %	Tolerance +5.0 % / -5.0 %	Tolerance 0.3 %
Polarity Positive	Leakage	Low Drive Z 15934.1 Ohm

The amount that the temperature changes the results can be entered for each geophone. Typical entries are shown below. All geophones are not the same, so changing some of these tolerances may be required for some geophones

Hardware Dialog

Hardware Settings

Low Drive Level (% of normal drive)	20
Pulse Drive (Typical 60%)	60
Distortion Driving Velocity (Typical 1.8 cm/s)	1.8
Polarity Trigger Level (Volts, 0 - Auto)	0.1
Resistance Temperature Compensation	0.0028
Damping Temperature Compensation	-0.002
Frequency Temperature Compensation	-0.00019
Sensitivity Temperature Compensation	-0.00134
Impedance Temperature Compensation	0.00082

Send Settings to Unit Ok Cancel

GeoTest 3.20

Temperature compensation changes the Geophone Test Results and the specifications remain the same for all temperatures.

GeoTest ver 3.20 Test results at specified 20 C temperature

Geotest - C:\GeoTest\GeoTest_ver318\Projects\Project with all geophone specs\

BirdDog Geophone Test Seismic Source Co Copyright 2013

Geophone Type HG6_4.5B Natural frequency 4.5 Hz ☐ Single ☒ String Serial 12 x Parallel 1

Date: 5/23/2016 Temperature 20.0

Test	Result	Error	Test	Result	Error	Test	Result	Error	Test		
Frequency	4.52 Hz	0.4%	Pass	Damping	55.3%	-1.3%	Pass	Sensitivity	3.555	2.9%	Pass
Tolerance +6.0 % / -6.0 %			Tolerance +6.0 % / -6.0 %			Tolerance +6.0 % / -6.0 %					
Resistance	4603.6 Ohm	2.3%	Pass	Impedance	15501.7 Ohm	3.7%	Pass	Distortion	0.11%		Pass
Tolerance +6.0 % / -6.0 %			Tolerance +6.0 % / -6.0 %			Tolerance 0.3 %					

☐ Polarity Positive ☐ Low Drive Z 14953.2 Ohm

GeoTest ver 3.20 Test results at entered 100 C temperature. Notice Test results change. Specification are not changed

Geotest - C:\GeoTest\GeoTest_ver318\Projects\Project with all geophone specs\

BirdDog Geophone Test Seismic Source Co Copyright 2013

Geophone Type HG6_4.5B Natural frequency 4.5 Hz ☐ Single ☒ String Serial 12 x Parallel 1

Date: 5/23/2016 Temperature 100

Test	Result	Error	Test	Result	Error	Test	Result	Error	Test		
Frequency	4.52 Hz	0.5%	Pass	Damping	47.4%	-15.4%	Fail	Sensitivity	3.557	2.9%	Pass
Tolerance +6.0 % / -6.0 %			Tolerance +6.0 % / -6.0 %			Tolerance +6.0 % / -6.0 %					
Resistance	3482.4 Ohm	-22.6%	Fail	Impedance	15502.9 Ohm	3.7%	Pass	Distortion	0.09%		Pass
Tolerance +6.0 % / -6.0 %			Tolerance +6.0 % / -6.0 %			Tolerance 0.3 %					

☐ Total ☒ Harmonic

The Temperature Coefficients can be entered in the GeoTest ver 3 programs.
Press and Hold the Shift key and click the Hardware Settings



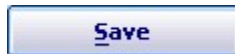
5.2.1 Start the Test



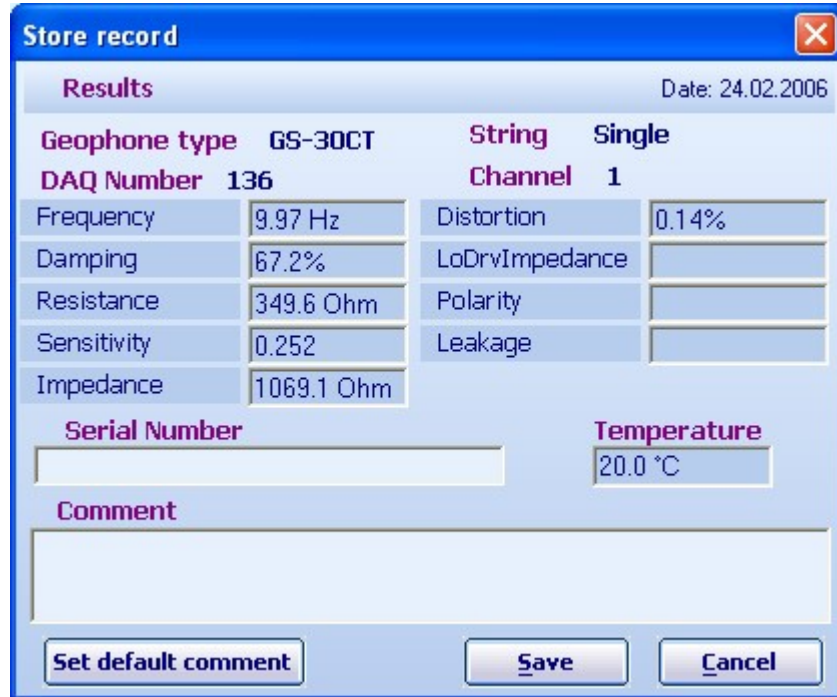
Press New Test button to clear the results stored in memory and shown on the screen.
Press Start button (or “A” key) at the bottom left of the Screen to acquire new test data.

After recording new data the results of the test will be shown on the screen. Depending on the result and tolerance settings the program will mark the results with Pass or Fail. If the tests results are within the user specified limits the tolerance box will be green, if the test result is outside the limits the tolerance box will be red.

5.2.2 Storing Data to Database



After acquisition is finished you can save new data to database. To do that click the Save button at the bottom of the main Screen or press "S" key. A window will appear where you can enter a **Serial Number** and a **Comment** for current record. By default this window displays a comment from the previous record.

A dialog box titled "Store record" with a blue header bar and a close button (X) in the top right corner. The dialog contains a "Results" section with a date "Date: 24.02.2006" in the top right. Below the title bar, there are two columns of data. The left column contains "Geophone type" (GS-30CT), "DAQ Number" (136), and a list of five parameters: Frequency (9.97 Hz), Damping (67.2%), Resistance (349.6 Ohm), Sensitivity (0.252), and Impedance (1069.1 Ohm). The right column contains "String" (Single) and "Channel" (1), followed by a list of three parameters: Distortion (0.14%), LoDrvImpedance, and Leakage. Below these columns are two input fields: "Serial Number" and "Temperature" (20.0 °C). At the bottom is a large text area for "Comment". At the very bottom are three buttons: "Set default comment", "Save", and "Cancel".

Results				Date: 24.02.2006
Geophone type	GS-30CT	String	Single	
DAQ Number	136	Channel	1	
Frequency	9.97 Hz	Distortion	0.14%	
Damping	67.2%	LoDrvImpedance		
Resistance	349.6 Ohm	Polarity		
Sensitivity	0.252	Leakage		
Impedance	1069.1 Ohm			
Serial Number		Temperature 20.0 °C		
Comment				
Set default comment		Save	Cancel	

Figure 5.9 Save Results to Database

5.2.3 Leakage Test - GeoTest ver 3

☒ Leakage

First enable the Leakage Test menu by selecting the Leakage Test in the System Messages Screen.



LEAKAGE TEST SCREEN will appear



The Leakage test recommends using a 200 Kohm resistor. This resistor needs to be measured accurately for accurate Leakage measurements. Enter the exact value used for the parallel resistor in the leakage tests in the hardware settings menu



A resistor, typically 200Kohm, is connected between the positive and negative geophone connectors on the Bird Dog 3 cable. The positive end of the cable should be connected to one end of the geophone string. The negative end of the cable needs to be connected to a ground point to measure leakage.

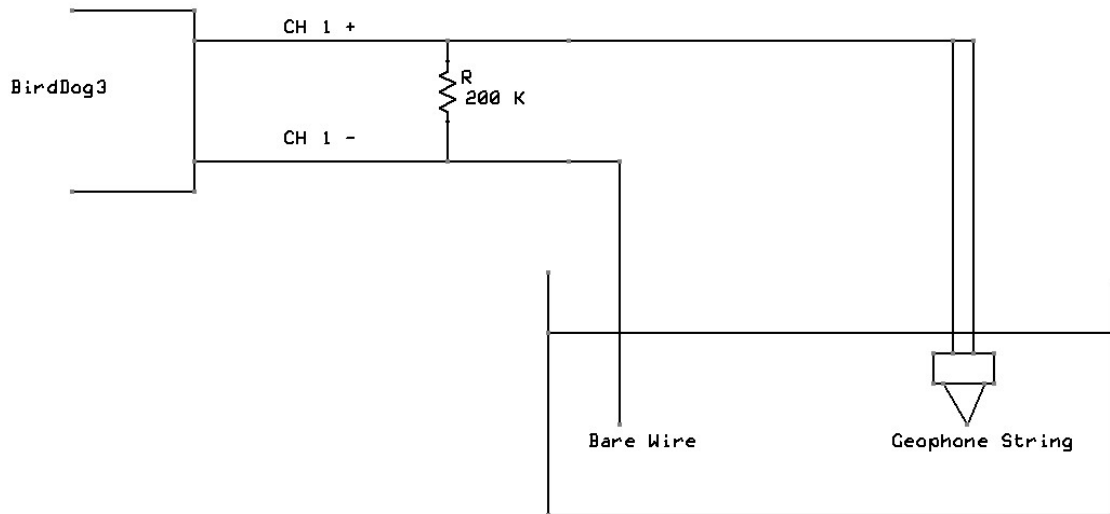
Typically, a large water container is used to test leakage. The positive end of the Geophone Test cable should be connected to one end of the geophone string. The negative end of the Geophone Test cable is terminated in the large water container.

The geophone string is submerged in this water container. The Leakage test will measure the resistance between the positive and negative leads of the cable ignoring the 200Kohm fixed resistor. The correct value of the resistor must be entered in the Options-Hardware Setup-Leakage Fixed resistor entry. This test is used to verify the electrical isolation of the geophone string is adequate.

Connect both Positive and Negative side of the Geophone under test to the + connector-
Ch1 + - Pin A
Aout – Pin CC
One side of 200 K resistor

Connect the – connector to a probe which is terminated in water container
Ch1 – Pin B
Aout FB – Pin GG
Other side of 200 K resistors

GeoTest ver 3 Leakage Test



5.2.4 Polarity Test



Select Polarity test in the main test window and press Start button. The program will switch to waiting mode. Slightly tap the geophone. If geophone signal exceeds Trigger level then the program will generate a beep and show results on the screen. The beep sound is different for positive or negative polarity. The beeps can be customized by using WAVE files. These files are located in the program folder.

You can change Polarity trigger level and enable WAVE files in the menu **Settings->Hardware**.

5.2.5 Hot Keys

Hot Keys are available to speed up the test operation. The following is a list of the keys for main operation:

Esc – Stops current test

F2 – or “S”- Saves data – Opens saves data screen – enter serial number and comment before saving data.

F3- Clears results

F5 – or “A” -Starts the main test (Frequency, Damping, Sensitivity, Resistance, Impedance, Distortion) for all of the Bird Dog 3 units.

F6- Starts polarity Test

F7 – Starts leakage test

F8 – Starts low drive impedance test

Example Production Test

1. Connect new string to be tested
 2. Press F3 – clears previous results
 3. Press F5 – performs Frequency, Damping, Sensitivity, Resistance, Impedance, and Distortion Tests
 4. Press F6 – starts polarity test
 5. Tap each geophone on the string to check polarity
 6. After test is completed Press F2 to save data
 7. Enter serial number or use optional barcode reader
 8. Press F2 or Alt S to save data
- Go to Step 1 to test next string

See Auto Sequence for enabling multiple tests with a single keystroke

5.2.6 Auto Operation Mode

There is also an “Auto Operation” mode. This mode is very useful in testing many strings quickly.

Typically the “Auto Operation” is setup as follows:



To operate in this mode:

First set up the Auto operation as shown above

Select the “Auto operation” in the main menu

Press the “New Test” button

1. Press the “F5” key to start acquisition
2. Wait for polarity test, and tap each geophone on the string. Make sure that each geophone passes the polarity Test.
3. Press “ESC” key to stop acquisition.
4. Press “ALT S” to save the data
5. Install new string
6. Go to step 1

5.2.6.1 String Troubleshooting Repeat Mode

If an error occurs during testing, then it is easy to stop the “Auto Sequence” Mode and retest the string.

To find a bad element in the general test, perform the following:

1. Press “ESC” to stop the “Auto Sequence” Mode
2. Click the “Auto Sequence” button on the main test screen to disable the “Auto Sequence mode
3. Click the “Frequency Test” to enable the “General Test”
4. Press the “Auto Repeat” key to enable the “Repeat” function
5. Turn all of the Geophones on their side.
6. Press Start
7. Turn one geophone upright one at a time
8. Look at results to determine bad geophone

The following screen shows the “Auto Operation” Enabled and the “Repeat” function disabled.

Geotest - July20

BirdDog II Geophone Test **Seismic Source Co.** Copyright 2001-2006

Date: 7/20/2007

Geophone Type GS-30CT ☐ Single ☒ String Serial 3 x Parallel 2 Temperature 20

Frequency 10 Hz **Damping** 70.0 % **Sensitivity** 0.591 V/cm/s

Result	Error	Test	Result	Error	Test	Result	Error	Test
9.94 Hz	-0.6%	✓ Pass	69.8%	-0.2%	✓ Pass	0.582	-1.5%	✓ Pass
Tolerance +2.0 % / -2.0 %			Tolerance +2.0 % / -2.0 %			Tolerance +2.0 % / -2.0 %		

Result	Error	Test	Result	Error	Test	Result	Error	Test
429.6 Ohm			991.8 Ohm					
434.7 Ohm	1.2%	✓ Pass	992.0 Ohm	0.0%	✓ Pass	0.09%		✓ Pass
Tolerance +2.0 % / -2.0 %			Tolerance +5.0 % / -5.0 %			Tolerance 0.2 %		

☒ **Polarity** Positive **System Messages** ☐ **Low Drive Z** 991.8 Ohm

Result Positive **Test** ✓ Pass **Polarity Test** Test Completed

☒ Test Status ☐ Leakage

Tolerance +5.0 % / -5.0 %

2:10:03 PM | DAQ 395 - triggered
 2:10:03 PM | DAQ 395 - receiving data
 2:10:03 PM | DAQ 395 - finished acquisition
 2:10:04 PM | DAQ 395 - finished data transmission

5.2.7 Test Status Menu –System Messages

There is a Test Status Menu in the Main program. Either the “Leakage Test” or the Test Status Menu can be selected. Selecting Test Status will show the results and status of the testing process. This is very useful in the “Auto Sequence” Mode.

Geotest - July20

BirdDog II Geophone Test **Seismic Source Co.** Copyright 2001-2006

Date: 7/20/2007

Geophone Type GS-30CT ☐ Single ☒ String **Serial** 3 **Parallel** 2 **Temperature** 20

Frequency 10 Hz **Damping** 70.0 % **Sensitivity** 0.591 V/cm/s

Result	Error	Test	Result	Error	Test	Result	Error	Test
9.94 Hz	-0.6%	✓ Pass	69.8%	-0.2%	✓ Pass	0.582	-1.5%	✓ Pass
Tolerance +2.0 % / -2.0 %			Tolerance +2.0 % / -2.0 %			Tolerance +2.0 % / -2.0 %		

Result	Error	Test	Result	Error	Test	Result	Error	Test
429.6 Ohm			991.8 Ohm					
434.7 Ohm	1.2%	✓ Pass	992.0 Ohm	0.0%	✓ Pass	0.09%		✓ Pass
Tolerance +2.0 % / -2.0 %			Tolerance +5.0 % / -5.0 %			Tolerance 0.2 %		

☐ **Resistance** 429.6 Ohm ☒ **Impedance** 991.8 Ohm ☒ **Distortion**

Polarity Positive **System Messages** ☐ **Low Drive Z** 991.8 Ohm

Result **Test** **General Test** **Test Completed**

☒ **Test Status** ☐ **Leakage** **Test Passed**

Auto Sequence **Auto Repeat** **Export**

(2:02:08 PM) DAQ 395 - finished data transmission
 (2:02:10 PM) DAQ 395 - loaded parameters
 (2:02:10 PM) DAQ 395 - START received
 (2:02:10 PM) DAQ 395 - triggered

When the polarity Test is operating the Screen shows the following. This screen shows that the program is waiting on a geophone Tap signal:

Geotest - July20

BirdDog II Geophone Test **Seismic Source Co.** Copyright 2001-2006

Date: 7/20/2007

Geophone Type GS-30CT ☐ Single ☒ String Serial 3 x Parallel 2 Temperature 20

Natural frequency 10 Hz

Frequency	Damping	Sensitivity
10 Hz	70.0 %	0.591 V/cm/s
Result: 9.94 Hz	Result: 69.8%	Result: 0.582
Error: -0.6%	Error: -0.2%	Error: -1.5%
Test: Pass	Test: Pass	Test: Pass
Tolerance: +2.0 % / -2.0 %	Tolerance: +2.0 % / -2.0 %	Tolerance: +2.0 % / -2.0 %

Resistance	Impedance	Distortion
429.6 Ohm	991.8 Ohm	
Result: 434.7 Ohm	Result: 992.0 Ohm	Result: 0.09%
Error: 1.2%	Error: 0.0%	
Test: Pass	Test: Pass	Test: Pass
Tolerance: +2.0 % / -2.0 %	Tolerance: +5.0 % / -5.0 %	Tolerance: 0.2 %

☒ **Polarity** Positive

Result: Positive Test: **Pass**

System Messages

Polarity Test

Waiting for Tap

☒ Test Status ☐ Leakage

Test Passed

☐ **Low Drive Z** 991.8 Ohm

Result: Test: Tolerance: +5.0 % / -5.0 %

Device List

DAQ Num	Channel
395	1

Controls

New Test Start Stop Save

Auto Sequence Auto Repeat Export

(2:10:03 PM) DAQ 395 - receiving data
 (2:10:03 PM) DAQ 395 - finished acquisition
 (2:10:03 PM) DAQ 395 - finished data transmission
 (2:10:03 PM) DAQ 395 - waiting for trigger

5.3 Database



GeoTest version 2.68 and newer programs use a new database. The program should update old databases to the new format. The older programs will not be able to read the new database after the conversion process.

The new database includes tolerance settings for each geophone setting. Different Geophones have different manufacturer specifications, and these specifications and tolerances are entered into the database:

Geophone settings		Type	GS-30CT		New	Auto fill specification	
Coil Resistance (Rc, Ohm)			395		Shunted Impedance (Zts, Ohm)		658.8
Moving Mass (M, Gram)			11.2		Case to Coil Motion (Disp, cm p to p)		0.152
Drive Frequency (Fd, Hz)			12		Temperature (deg C)		25
Shunt Resistor (Enter 0 for none) (Rd, Ohm)			1000		Tolerances settings		
Natural Frequency (Fn, Hz)			10		Frequency Tolerance (+ / -) %	2	2
Open circuit Damping (Bo)			0.316		Damping Tolerance (+ / -) %	2	2
Shunted Damping (Bt)			0.7		Sensitivity Tolerance (+ / -) %	2	2
Open circuit Sensitivity (Go, V/cm/s)			0.275		Resistance Tolerance (+ / -) %	2	2
Shunted Sensitivity (Gs, V/cm/s)			0.197		Impedance Tolerance (+ / -) %	5	5
Shunted Resistance (Rcs, Ohm)			284		Distortion Tolerance %		0.2

Type	Temp	FreqTol +	FreqTol -	DampTol +	DampTol -	SensTol +	SensTol -	ResTol +	ResTol -
► GS-30CT	25	2	2	2	2	2	2	2	2
GS-32CT	25	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
GS-20DX	25	5	5	10	10	10	10	5	5
SG-10	20	2.5	2.5	5	5	2.5	2.5	3.5	3.5
UltraPh2-3W	20	5	5	5	5	5	5	5	5
L-210	20	5	5	5	5	5	5	5	5
SM-4/U-B10Hz	20	5	5	5	5	5	5	2.5	2.5
L-25D-30Hz	20	5	5	5	5	5	5	5	5

All of the tests results can be stored to a single database or to multiple databases. Multiple databases are commonly used to keep track of different geophone strings, or to keep track of geophones on different crews.

The database is also used to sort and analyze the saved data. Various export and report features are available within the database.

Click the Database button to enter the main database

Data from the current open project will be shown.

Geotest - April_18

BirdDog II Geophone Test Seismic Source Co. Copyright 2001-2006

Test	SerialNum	DateTime	String	Frequency	Damping	Resistance	Sensitivity	Impedance	LoDrvImped	Distortion	Polarity	Leakage	GeoType	Com
Scope		4/18/2007	Single	9.89	0.259	387.1	0.282	2069.2	0	0.30	1	0	GS-30CT	
Database		4/18/2007	Single	9.89	0.261	379.4	0.281	2062.9	0	0.08	1	0	SM-4/U-B10H	
Settings		4/18/2007	Single	9.89	0.261	380.5	0.281	2063.9	0	0.12	-1	0	SM-4/U-B10H	
Help		4/18/2007	Single	9.88	0.261	380.8	0.281	2063.3	0	0.10	1	0	SM-4/U-B10H	
Database		4/18/2007	Single	9.89	0.261	380.9	0.281	2063.8	0	0.12	1	0	SM-4/U-B10H	
Project		4/18/2007	Single	9.9	0.261	380.6	0.281	2064.4	0	0.11	1	0	SM-4/U-B10H	
New Project		4/18/2007	Single	9.89	0.261	380.9	0.281	2062.2	0	0.12	1	0	SM-4/U-B10H	
Open Project		4/18/2007	Single	9.89	0.261	380.9	0.281	2062.0	0	0.13	1	0	SM-4/U-B10H	
1. April 18		4/18/2007	Single	9.89	0.261	380.8	0.281	2063.9	2060	0.11	1	0	SM-4/U-B10H	
2. Aug13		4/18/2007	Single	9.89	0.261	380.9	0.281	2063.9	2061	0.11	0	0	SM-4/U-B10H	
3. Open project		4/18/2007	Single	9.89	0.261	380.9	0.281	2064.2	2065	0.15	0	0	SM-4/U-B10H	
Recent Projects	1	4/18/2007	Single	9.89	0.261	381.0	0.281	2064.8	2060	0.09	0	0	SM-4/U-B10H	
Controls	2	4/18/2007	Single	218.06	0.343	4.0	0.025	5.4	5	11.15	0	0	SM-4/U-B10H	
Load Record	3	4/18/2007	Single	9.89	0.261	381.1	0.281	2063.9	2059	0.11	1	0	SM-4/U-B10H	
Delete Record	4	4/18/2007	Single	9.89	0.261	381.1	0.281	2064.8	2063	0.09	0	0	SM-4/U-B10H	
Report Preview	5	4/18/2007	Single	9.9	0.261	381.2	0.281	2064.4	2061	0.22	1	0	SM-4/U-B10H	
Print Specs	6	4/18/2007	Single	9.9	0.261	381.0	0.281	2066.7	2066	0.14	1	0	SM-4/U-B10H	
Print Label	1	8/13/2007	Single	9.99	0.699	288.4	0.20	682.2	0	0.06	0	0	GS-30CT	
Export to File	2	8/13/2007	Single	9.99	0.7	288.5	0.20	682.2	0	0.06	0	0	GS-30CT	
CSV Delimiter	3	8/13/2007	Single	10.0	0.7	288.4	0.201	682.1	0	0.07	0	0	GS-30CT	
	4	8/13/2007	Single	10.0	0.7	288.4	0.20	682.0	0	0.06	0	0	GS-30CT	
	5	8/13/2007	Single	10.01	0.701	288.4	0.201	682.1	0	0.06	0	0	GS-30CT	
	6	8/13/2007	Single	9.99	0.7	288.4	0.20	682.3	0	0.06	0	0	GS-30CT	
	7	8/13/2007	Single	10.01	0.7	288.4	0.201	682.3	0	0.07	0	0	GS-30CT	
	8	8/13/2007	Single	10.0	0.7	288.5	0.20	682.3	0	0.06	0	0	GS-30CT	
	9	8/13/2007	Single	10.0	0.7	288.4	0.20	682.3	0	0.06	0	0	GS-30CT	
	10	8/13/2007	Single	10.0	0.701	288.4	0.201	682.3	0	0.07	0	0	GS-30CT	
	11	8/13/2007	Single	10.0	0.701	288.5	0.201	682.3	0	0.06	0	0	GS-30CT	
	12	8/13/2007	Single	9.99	0.699	288.4	0.20	682.2	0	0.06	0	0	GS-30CT	
	13	8/13/2007	Single	10.02	0.701	288.4	0.201	681.9	0	0.06	0	0	GS-30CT	
	14	8/13/2007	Single	10.0	0.7	288.4	0.20	681.9	0	0.06	0	0	GS-30CT	
	15	8/13/2007	Single	9.99	0.7	288.4	0.20	681.8	0	0.07	0	0	GS-30CT	
	16	8/13/2007	Single	10.0	0.701	288.4	0.201	681.9	0	0.07	0	0	GS-30CT	

All Records Layout Settings Restore Layout Save Layout

Filters Geophone Type String Records Range Field Name Min Value Max Value

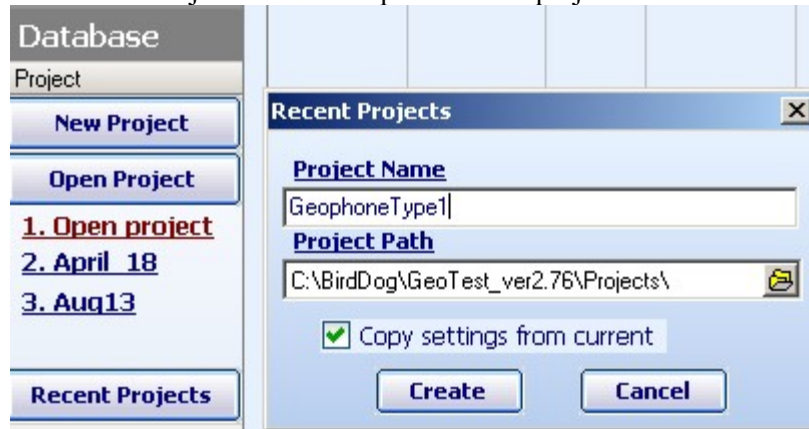
Apply <All types> <All> <All records> Apply <All records>

The following Projects operations can be performed:

- New Project – Select “New Project” to open a new project
- Open Project – Select “Open Project” to open an existing project which has been previously saved to the database
- Recent Projects – A list of “Recent Projects” are shown under the “Open Project” button. These “recent projects” can be quickly opened by clicking the project name.

5.3.1 New Project

Press the “New Project” button to open the New project menu



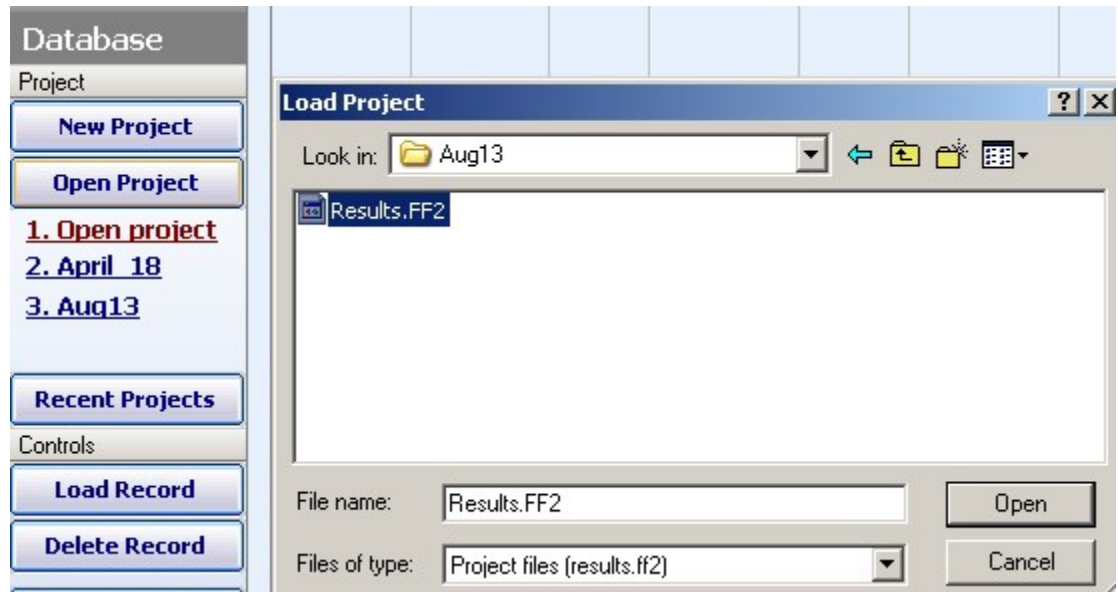
Enter the Name of the new project

Select “copy settings from current” to copy the settings from the current project to the new project.

Uncheck “copy settings from current” to select default settings for new project.

5.3.2 Open Project

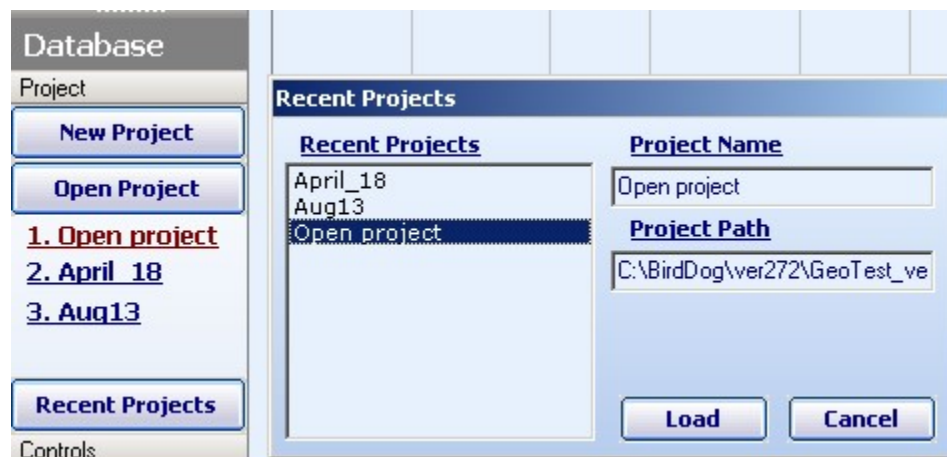
Press the “Open Project” button to open the Recent Project menu



Select the project to open

5.3.3 Recent Projects

Press the “Recent Project” button to open the Recent Project menu



The list of recent projects will be shown.

Highlighting a project and clicking the right mouse button allows the selected “Recent Project” to be deleted

5.3.4 Main Database Menu

The main database menu allows the user to view and analyze the stored test results. To see a record from database in the main test window press Load Record button.

SerialNum	DateTime	String	Frequency	Damping	Resistance	Sensitivity	Impedance	LoDrvImped	Distortion	Polarity	Leakage	GeoType	Com
1	4/18/2007	Single	9.89	0.259	387.1	0.282	2069.2	0	0.30	1	0	GS-30CT	
2	4/18/2007	Single	9.89	0.261	379.4	0.281	2062.9	0	0.08	1	0	SM-4/U-B10H	
3	4/18/2007	Single	9.89	0.261	380.5	0.281	2063.9	0	0.12	-1	0	SM-4/U-B10H	
4	4/18/2007	Single	9.88	0.261	380.8	0.281	2063.3	0	0.10	1	0	SM-4/U-B10H	
5	4/18/2007	Single	9.89	0.261	380.9	0.281	2063.8	0	0.12	1	0	SM-4/U-B10H	
6	4/18/2007	Single	9.9	0.261	380.6	0.281	2064.4	0	0.11	1	0	SM-4/U-B10H	
7	4/18/2007	Single	9.89	0.261	380.9	0.281	2062.2	0	0.12	1	0	SM-4/U-B10H	
8	4/18/2007	Single	9.89	0.261	380.9	0.281	2062.0	0	0.13	1	0	SM-4/U-B10H	
9	4/18/2007	Single	9.89	0.261	380.8	0.281	2063.9	2060	0.11	1	0	SM-4/U-B10H	
10	4/18/2007	Single	9.89	0.261	380.9	0.281	2063.9	2061	0.11	0	0	SM-4/U-B10H	
11	4/18/2007	Single	9.89	0.261	380.9	0.281	2064.2	2065	0.15	0	0	SM-4/U-B10H	
12	4/18/2007	Single	9.89	0.261	381.0	0.281	2064.8	2060	0.09	0	0	SM-4/U-B10H	
13	4/18/2007	Single	218.06	0.343	4.0	0.025	5.4	5	11.15	0	0	SM-4/U-B10H	
14	4/18/2007	Single	9.89	0.261	381.1	0.281	2063.9	2059	0.11	1	0	SM-4/U-B10H	
15	4/18/2007	Single	9.89	0.261	381.1	0.281	2064.8	2063	0.09	0	0	SM-4/U-B10H	
16	4/18/2007	Single	9.9	0.261	381.2	0.281	2064.4	2061	0.22	1	0	SM-4/U-B10H	
17	4/18/2007	Single	9.9	0.261	381.0	0.281	2066.7	2066	0.14	1	0	SM-4/U-B10H	
18	8/13/2007	Single	9.99	0.699	288.4	0.20	682.2	0	0.06	0	0	GS-30CT	
19	8/13/2007	Single	9.99	0.7	288.5	0.20	682.2	0	0.06	0	0	GS-30CT	
20	8/13/2007	Single	10.0	0.7	288.4	0.201	682.1	0	0.07	0	0	GS-30CT	
21	8/13/2007	Single	10.0	0.7	288.4	0.20	682.0	0	0.06	0	0	GS-30CT	
22	8/13/2007	Single	10.01	0.701	288.4	0.201	682.1	0	0.06	0	0	GS-30CT	
23	8/13/2007	Single	9.99	0.7	288.4	0.20	682.3	0	0.06	0	0	GS-30CT	
24	8/13/2007	Single	10.01	0.7	288.4	0.201	682.3	0	0.07	0	0	GS-30CT	
25	8/13/2007	Single	10.0	0.7	288.5	0.20	682.3	0	0.06	0	0	GS-30CT	
26	8/13/2007	Single	10.0	0.7	288.4	0.20	682.3	0	0.06	0	0	GS-30CT	
27	8/13/2007	Single	10.0	0.701	288.4	0.201	682.3	0	0.07	0	0	GS-30CT	
28	8/13/2007	Single	10.0	0.701	288.5	0.201	682.3	0	0.06	0	0	GS-30CT	
29	8/13/2007	Single	9.99	0.699	288.4	0.20	682.2	0	0.06	0	0	GS-30CT	
30	8/13/2007	Single	10.02	0.701	288.4	0.201	681.9	0	0.06	0	0	GS-30CT	
31	8/13/2007	Single	10.0	0.7	288.4	0.20	681.9	0	0.06	0	0	GS-30CT	
32	8/13/2007	Single	9.99	0.7	288.4	0.20	681.8	0	0.07	0	0	GS-30CT	
33	8/13/2007	Single	10.0	0.701	288.4	0.201	681.9	0	0.07	0	0	GS-30CT	

Figure 5.10 Database Window

The database menu allows the user to look at the data in many different formats. To display limited set of records according to some criteria use Filters and Range panels. Filters let you select geophones of a certain type, one of the string configurations or records that passed or failed the test. Using Range panel you can show records that fall between Min and Max value of a certain parameter. To cancel Filter or Range press All Records button.

5.3.5 Database Layout Menu

Layout Settings

The database layout menu allows the user to select which parameter to view in the database and on the reports. The column titles can also be changed.

A check mark enables the field to be displayed in the database.

Settings Date: 24.02.2006

Layout settings

Column	Title	✓	Column	Title	✓
DAQNum	DaqN	<input type="checkbox"/>	SpecFrequency	SpecFreq	<input type="checkbox"/>
ChanNum	ChN	<input type="checkbox"/>	SpecDamping	SpecDamp	<input type="checkbox"/>
SerialNum	SerialN	<input checked="" type="checkbox"/>	SpecSensitivity	SpecSens	<input type="checkbox"/>
DateTime	DateTime	<input checked="" type="checkbox"/>	SpecResistance	SpecRes	<input type="checkbox"/>
String	String	<input checked="" type="checkbox"/>	SpecImpedance	SpecImp	<input type="checkbox"/>
Temperature	Temp	<input type="checkbox"/>	CoilResistance	CoilRes	<input type="checkbox"/>
Data	Data	<input checked="" type="checkbox"/>	MovingMass	Mass	<input type="checkbox"/>
Frequency	Freq	<input checked="" type="checkbox"/>	TestFrequency	TestF	<input type="checkbox"/>
Damping	Damp	<input checked="" type="checkbox"/>	ShuntResistor	ShuntR	<input type="checkbox"/>
Resistance	Res	<input checked="" type="checkbox"/>	CalibrationResistor	CalibrR	<input type="checkbox"/>
Sensitivity	Sens	<input checked="" type="checkbox"/>	GeoType	GeoType	<input checked="" type="checkbox"/>
Impedance	Imp	<input checked="" type="checkbox"/>	SpecTemperature	SpecTemp	<input type="checkbox"/>
LoDrvImpedance	LoDrvImp	<input checked="" type="checkbox"/>	Comment	Comment	<input checked="" type="checkbox"/>
Distortion	Dist	<input checked="" type="checkbox"/>			
Polarity	Pol	<input checked="" type="checkbox"/>			
Leakage	Leak	<input type="checkbox"/>			

Figure 5.11 Layout Settings

Using the cursor and the left mouse button, the order of the fields can be selected by tagging and dragging the fields in the main database menu.

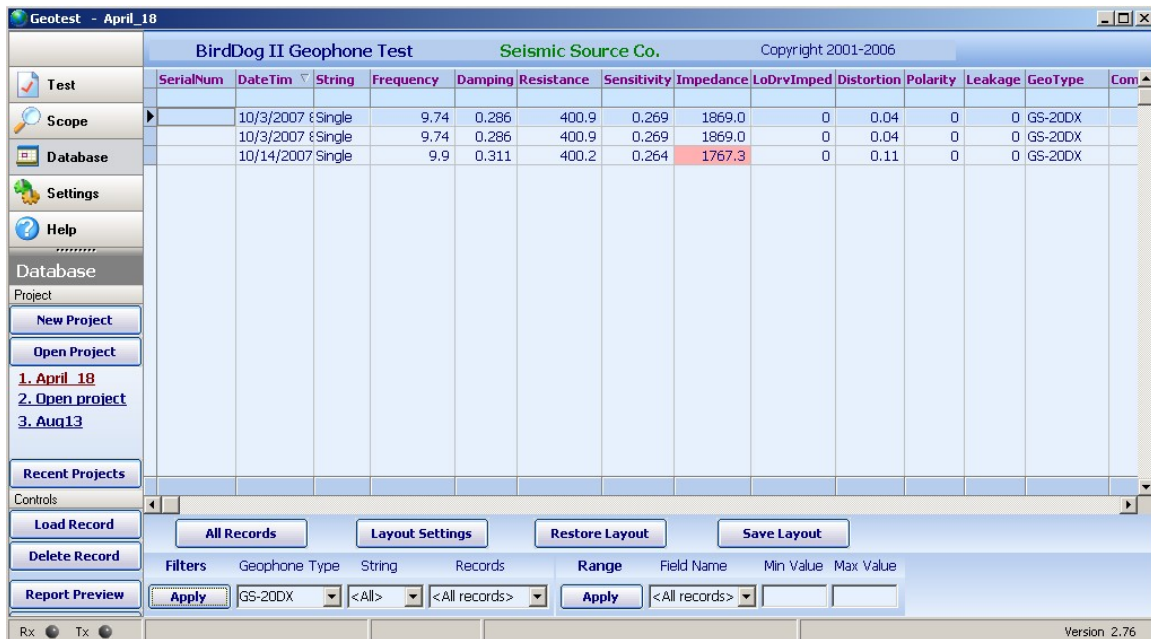


Figure 5.12 Sorting Records

Left clicking the title bar can change the order of the data in the database.

Example:

Left clicking time and date will sort the fields by time and date.

Left clicking serial numbers will sort by serial number

The Filters, and Ranges at the bottom of the screen can be changed. The affect on the database can be seen immediately by pressing the Apply buttons.

5.3.6 Reports

The Geotest program has a powerful and flexible function of creating reports. Report is generated using information currently visible in Database Window. Using Layout Settings, Filters, Range and Tolerance you can display only information that you need. Information from the screen will go to the report.

Report Preview

Press Report Preview button to see report on the screen. You can select a printer or adjust printer settings in this window.

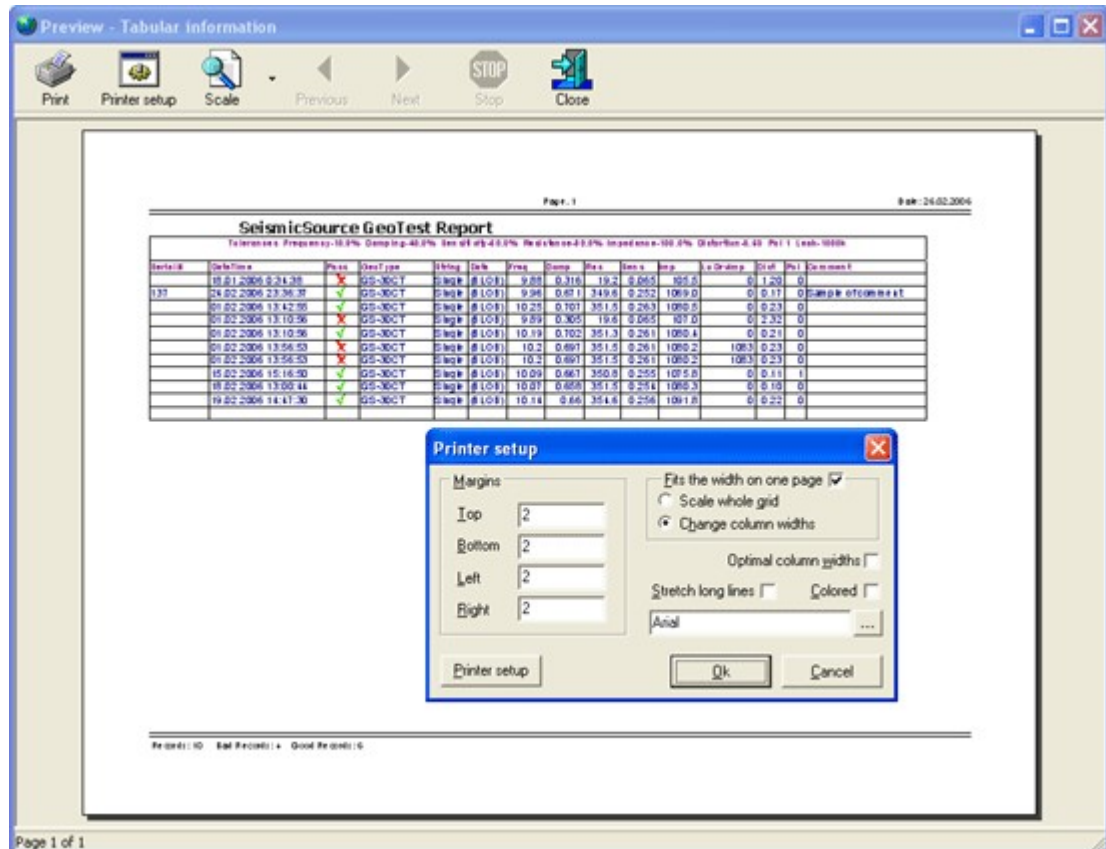


Figure 5.13 Report Preview

To print geophone specifications that were used in the report press Print Specs button.

Print Specs

To save report to file using various formats press Export to File button.

Export to File

5.4 Scope Mode



In this mode you can view data that were acquired from geophone. Buttons **Start**, **Stop** and **Save** had same functions as and same buttons in the Main Window.



Figure 5.14 Scope Window

The red (Out) trace is the actual geophone signal. The blue (In) trace is the drive signal used to create the geophone response.

Figure shows the test performed by the Geotest program. The Red plot is the actual output of the geophone and the blue plot shows the driving reference signal.

The two step pulses (positive and negative) are used to compute resistance, frequency, sensitivity, and damping.

The sine wave is used to compute impedance and distortion.

5.4.1 Setting Zoom Level

Buttons **Axis** , **Full View** and **Reference Off** help to adjust a view of a selected plot. These functions are also available in pop up menu if you click on the plot with right mouse button.



Allows changing of the X and Y axis of the plot.



Zooms out completely to show all of plot.



Reference signal can be turned off

To adjust zoom with the mouse press the left mouse button and make a box to zoom in on an area of the plot.

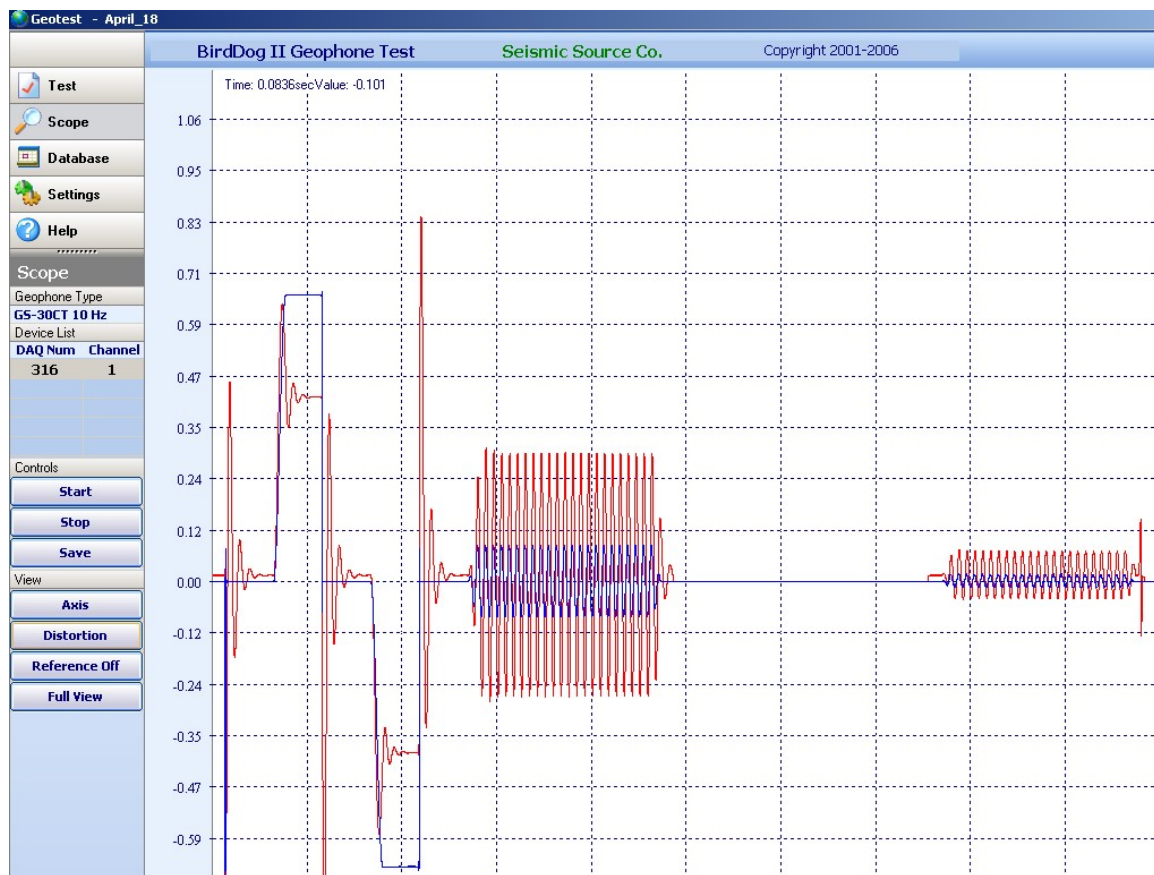
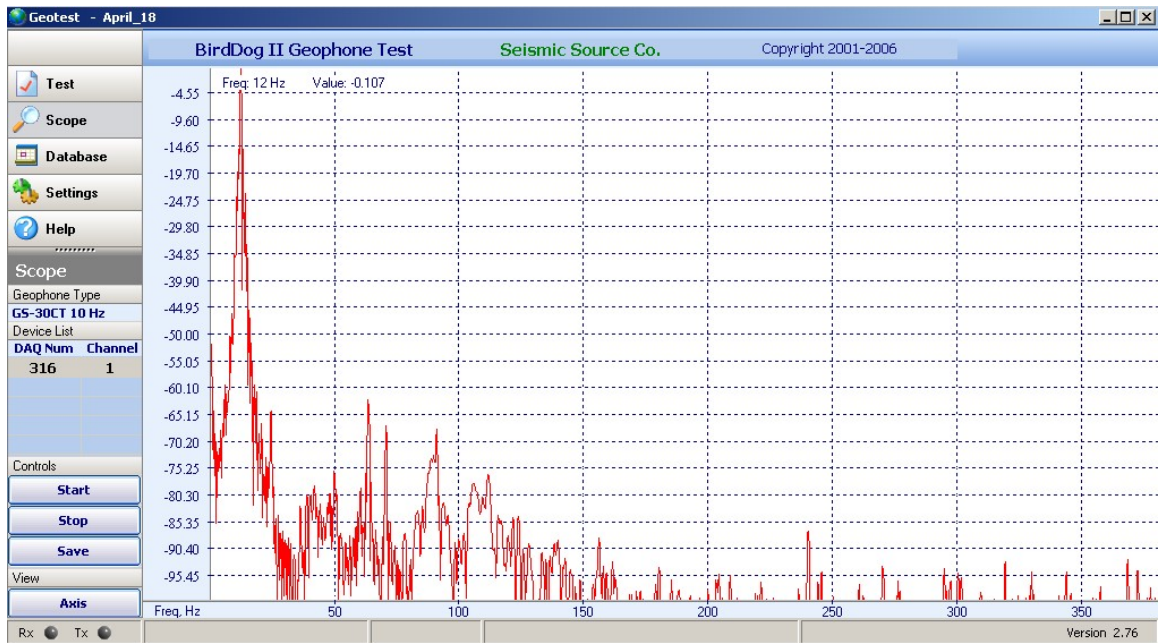


Figure 5.15 Zooming in with the mouse

5.4.2 Distortion Window Setting Zoom Level

The Distortion Button is used to view the sine wave test in the frequency domain



The % Total Distortion measurement compares the Fundamental Energy (Energy at the Drive Frequency) to the Noise Energy (All Energy not at the Drive Frequency)

5.4.3 Vscope Program

After setting up the box with the Geotest program, the Vscope program can be used for more detailed analysis.

The Vscope program allows general seismic processing capabilities. The Vscope program can be used for detailed research on the geophone parameters. The following is just a short list of the Vscope program's capabilities:

- Overlays of different geophone tests can be made
- Time Variant Spectral Analysis can be done
- Exporting data to Seg-Y or Ascii file
- Loading special analog drive signal

6 GeoTest ver 4 Program Operation

The GeoTest program is compatible with Windows XP and newer operating systems. This software program allows complete testing of geophones and geophone strings when connected to the Bird Dog 3 units. After installing the software, click on the GeoTest icon and start the program.

The main menu of the program is located at the left side of the program window. It allows you to navigate between three main selections.



They are Geophone Test, Project and Setting.

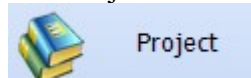
- Geophone Test is used to perform the Geophone Test.
- Project is used to view the saved data.
- Setting is used to setup the GeoTest parameters

The projects and settings must be setup prior to performing any Geophone Testing.

6.1 Setup

6.1.1 Create Project

Press the Project button to view the Project Menu



A new project should be created before starting the test.

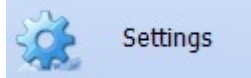


Type the name of the Project and press “Create Project” to create a new project.

Existing projects can also be loaded by pressing the “Load Project” button

6.1.2 Settings

Press the setting Menu to enter the GeoTest setting Menu



6.1.2.1 Hardware Settings

Hardware Settings	
LowDrive Level	20%
Pulse Level	60%
Trigger Level	0.05
Dist Velocity	0.8
Temperature Compensation	
Resistance	0.004
Damping	-0.002
Setup	
Send Settings to Unit	

The Drive levels for the various test are setup with the Hardware settings menu.

Also the temperature compensation correction values can be entered.

The values shown are the standard values.

To change settings press the “SETUP” button and edit the values.

Press “SEND SETTINGS to UNIT” to send the Hardware settings to the Portable BD3 unit.

Most geophones have the distortion specified at 1.8 cm/sec (0.7 in/sec) velocity. Geotest allows this drive level to be changed. Enter the desired drive level for the distortion test. Normal entry is 1.800 cm/sec.

Drive for Low Drive Z – This entry is used to set the drive level for the Low Drive Impedance Test. Enter the % of normal drive for the low drive Z tests.

For test purposes only the Pulse Drive can be adjusted in this menu.

6.1.2.2 Geophone Selection and Settings

To obtain the correct tests results the geophone parameters for the units under test must be entered and selected. All geophones are listed in Geophone Specification table. To select a geophone for the test just click on it with the left mouse button. You can also modify existing geophone specifications or add new geophones to the table.

Seismic Source Co
Date : 25 Aug 2014
Copyright 2001 - 2014

☒ Single
 ☐ String
 Serial:
 Parallel:
 Cable Resistance: Ohm/km
 Interval: m
 Lead-in: m
 Units: ☒ US ☐ Metric ☐ cm

Geophone Settings
 Type:

Coil Resistance (Rc, Ohm)	395	Shunted Impedance (Zts, Ohm)	658.8
Moving Mass (M, gram)	11.2	Case to Coil Motion (Disp, mm p-p)	1.52
Drive Frequency (Fd, Hz)	12	Temperature (deg C)	25
Shunt Resistor (Enter 0 for none)(Rd, Ohm)	1000	Tolerance Settings	
Natural Frequency (Fn, Hz)	10	Frequency Tolerance (+ / -) %	3 3
Open circuit Damping (Bo)	0.316	Damping Tolerance (+ / -) %	3 3
Shunted Damping (Bt)	0.7012	Sensitivity Tolerance (+ / -) %	3 3
Open circuit Sensitivity (Go, V/m/s)	27.5	Resistance Tolerance (+ / -) %	3 3
Shunted Sensitivity (Gs, V/m/s)	19.71	Impedance Tolerance (+ / -) %	6 6
Shunted Resistance (Rcs, Ohm)	283.2	Distortion Tolerance %	0.1

Type	Rc,Ohm	M,gram	Fd,HZ	Rd,Ohm	Fn,HZ	Bo	Bt	Go,V/m/s	Gs,V/m/s	Rcs,Ohm	Zts,Ohm
GS-30CT	395	11.2	12	1000	10	0.316	0.7	27.5	19.7	284	658.8
GS-20DX	395	11	12	0	10	0.3	0.3	28.0	28.0	395	1957.6
SG-10	350	8.4	12	0	10	0.68	0.68	22.8	22.8	350	1040
UltraPh2-3W	395	8.4	12	0	10	0.68	0.68	27.5	27.5	395	1400.5
L-210	370	5.5	12	0	10	0.67	0.67	19.5	19.5	370	1151.7
SM-4/U-B10Hz	375	11.1	12	0	10	0.25	0.25	28.8	28.8	375	2227.2
L-25D-30Hz	710	8.4	30	432	30	0.2695	0.711	39.92	15.1	269	370
GS-32CT	395	11.2	12	1000	10	0.316	0.7	27.5	19.7	283.2	658.8
Sm7_10hz	375	11	12	1000	10	0.25	0.7	28.8	20.95	272.7	713.7
PS-1	3400	770	12	8750	1	0.36	0.7002	200.0	144.03	2448.6	2515.4
PS-1 undamped	3400	770	12	0	1	0.36	0.36	200.0	200.0	3400	3498.5
L22	5470	72.8	12	0	2	0.46	0.46	112.0	112.0	5470	6230.2
L22 damped	5470	72.8	12	20000	2	0.46	0.7292	112.0	87.95	4295.2	4832.8
Blue Geophone	395	11.2	12	1000	10	0.316	0.7012	27.5	19.71	283.2	658.8

Figure 6.6 Geophone Specifications

To add a new Geophone press New button and type in parameters in the top section of the Geophone Settings screen.

The Auto Fill feature can be used to compute impedance, shunted sensitivity and damping. When possible the empty fields will be computed and filled when the Auto Fill button is pressed.

Example:

Enter: Rc ,M, Fd, Rd, Fn, Bo, Go, Displacement

AutoFill computes: Bt, Gs, Rcs, Zts

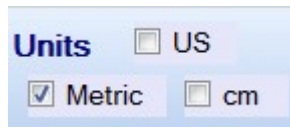
Entries must be blank for auto fill to work. (Use delete key if you want to recalculate entered value)

After all entries in the top portion are correct, press Save Geophone button at the bottom of the screen to save the new geophone and its parameters.

Enter all parameters for a single geophone. The Geotest program will compute the specifications for the string using the single geophone specification.

- Type – This is a text entry that allows the user to identify the parameters when selecting the geophone type. This can be the detailed name or as simple as red ones and blue ones
- Rc-Coil Resistance – Coil Resistance of the geophone.
- M- Moving Mass – Moving Mass of the geophone is used to compute the sensitivity of the geophone
- Fd- Geophone Drive Frequency – determine the frequency that will be used for the distortion and impedance tests
- Rd- Damping Resistor – Enter the value of the damping resistor. A zero should be entered when there is no shunt resistor.
- Fn- Natural Frequency – Enter natural frequency of the geophone.
- Bo – Open circuit Damping – Enter the open circuit damping. This is the damping of the geophone with no damping resistor.
- Bt – Shunted damping – Enter the damping of the geophone with the damping resistor.
- Go – Open circuit Sensitivity – Enter the sensitivity of the geophone with no damping resistor.
- Gs – Shunted Sensitivity – Enter the shunted sensitivity of the geophone. This is the sensitivity of the geophone with the shunt resistor.
- Rcs- Shunted Resistance – Enter the DC resistance of the geophone with the shunt resistor.
- Zts- Impedance – Enter the shunted impedance of the geophone at the Fd (Drive Frequency).
- Disp – Displacement of the geophone – Enter the peak to peak displacement of the geophone. This entry is used to compute the Step drive level.
- @ Temp – Enter the temperature that the geophone is specified at. Most geophone manufacturers use 20 degrees C to specify the geophone. OYO/Geospace use 25 degrees C to specify their geophones.

6.1.2.3 Units



Units – Metric, Centimeters, and Inches - use this selection to switch between English and metric units. Note: Moving Mass is always entered in grams

6.1.2.4 Units


To perform test of geophone strings check String checkbox and choose enter number of series and parallel phones.



Figure 5.7 String Selection

You can quickly switch between String or Single geophone in the Main Test Window checking appropriate checkbox

6.1.2.4 String Resistance



	<input checked="" type="checkbox"/> Single	Serial	Parallel	Cable Resistance	Interval	Lead-in
	<input type="checkbox"/> String	6	X 1	10.0 Ohm/km	1.0 m	1.0 m

There are entries in the program to compensate for the resistance in the in the wire in a geophone string. The resistance of the cable should be entered as xx ohms per 1000 meters. This value is typically about 120 ohms per 1000 meters.

Also enter the lead in length of the cable used on the string, and the spacing between the geophones. All of the entries should be in meters.

The GeoTest program automatically computes the added resistance and impedance of the caused by the wire in the geophone string

Typical String Resistance Entries

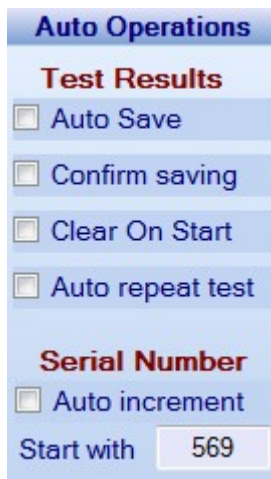
70 Break Wire: 35 ohms / 1,000ft or 114 ohms per 1 km

100 Break Wire: 24 ohms / 1,000ft or 78 ohms per 1 km

150 Break Wire: 14 ohms / 1,000ft or 45 ohms per 1 km

225 Break Wire: 4 ohms / 1,000ft or 13 ohms per 1 km

6.1.2.4 Auto Operations



Auto Operations	
Test Results	
<input type="checkbox"/>	Auto Save
<input type="checkbox"/>	Confirm saving
<input type="checkbox"/>	Clear On Start
<input type="checkbox"/>	Auto repeat test
Serial Number	
<input type="checkbox"/>	Auto increment
Start with	569

Auto Operation can be enabled to improve the efficiency of the test.

6.2 Test Mode



The main Geophone Test window shows which test are currently selected, the geophone type selected, and the results of the previous test or results loaded from database

In this window you can quickly switch between Single geophone or String.

The Frequency, Damping, Sensitivity, and Resistance test will all be performed as one test. Also the Impedance, and Distortion will be performed as one test. Clicking any of these tests will enable all of them.

The Polarity test is performed separately.

The Leakage test is also performed separately and a special cable configuration must be used.

Geotest ver 4.11 - Project1 C:\Seismic Source\Geotest4\Projects\Project1

Date : 25 Aug 2014 Copyright 2001 - 2014

Seismic Source Co

Geophone Type Sm7_10hz ☒ Single ☐ String **Serial** 6 **Parallel** X 1

Natural Frequency 10 Hz ☐ Manual ☐ USB Sensor ☐ Internal Sensor **Temperature** 20

<input checked="" type="checkbox"/> Frequency 10 Hz			<input checked="" type="checkbox"/> Damping 0.686			<input checked="" type="checkbox"/> Sensitivity 20.95 V/m/s		
Result	Error		Result	Error		Result	Error	
10.16 Hz	1.6%	Pass	0.699	1.8%	Pass	20.97	0.1%	Pass
Tolerance +5.0 % / -5.0 %			Tolerance +5.0 % / -5.0 %			Tolerance +5.0 % / -5.0 %		
<input checked="" type="checkbox"/> Resistance 272.7 Ohm			<input checked="" type="checkbox"/> Impedance 713.7 Ohm			<input checked="" type="checkbox"/> Distortion		
Result	Error		Result	Error		Result	Error	
276.2 Ohm	1.3%	Pass	703.5 Ohm	1.4%	Pass	0.06 %		Pass
Tolerance +2.5 % / -2.5 %			Tolerance +5.0 % / -5.0 %			Tolerance 0.2 %		
<input type="checkbox"/> Polarity Positive			<input type="checkbox"/> Leakage			<input type="checkbox"/> Low Drive Z 713.7 Ohm		
Pos	Neg	Result				Result	Error	
---	---	---						
			Tolerance 1000 kOhm			Tolerance +5.0 % / -5.0 %		

New Test - Press Start

Left Panel:

- Main Menu
 - Geophone Test
 - Project
 - Settings
- Geophone Test
 - Current Project
 - Project1
 - Device List
 - 107 IP: 10.0.1.7
 - Selected Device
 - DAQ Num: 107
 - DAQ Ver: 12.9
 - New Test
 - Start
 - Stop
 - Save Test Result
 - Selected Chans
 - ☒ Channel 1
 - ☐ Channel 2
 - ☐ Channel 3

Figure 6.8 Test Mode Window

Temperature Entry

At the top right of the screen, the temperature of the geophone should be entered.

The geophone parameters will change depending on temperature. The Geotest program will automatically adjust the test readings to show what the results would have been at 20 degrees C operation. Enter the temperature of the geophone under test. The results of the test will be modified depending on the temperature entry. The Geotest program uses the temperature entered in the Geophone Specification to compute the temperature offset. Most manufacturers specify the geophone at 20 degrees C. (OYO/Geospace specify their geophones at 25 degree C).

With Optional Temperature Probe, the temperature entry will automatically update

6.2.1 Start the Test



Press Clear button to clear the results stored in memory and shown on the screen.

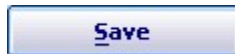
Press Start button to acquire new test data.

Press the Add/Repeat button to add new data to the Test Result. This button is used to add the Polarity Test information to existing test data.

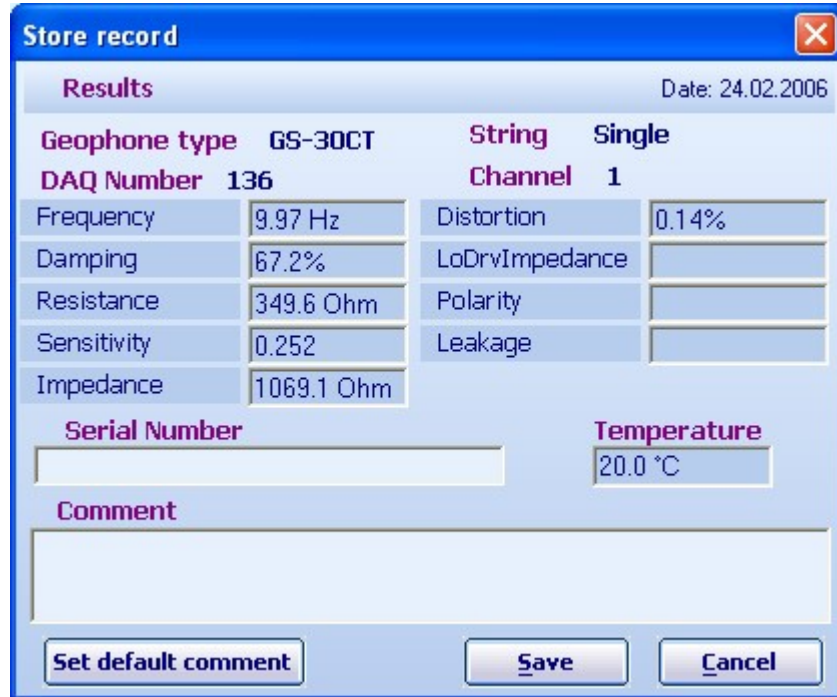
Press the “Stop” button or escape button (Esc) to stop the Polarity test

After recording new data the results of the test will be shown on the screen. Depending on the result and tolerance settings the program will mark the results with Pass or Fail. If the test results are within the user specified limits the tolerance box will be green, if the test result is outside the limits the tolerance box will be red.

6.2.2 Storing Data to Database



After acquisition is finished you can save new data to database. To do that click the Save button at the bottom of the main Screen or press “S” key. A window will appear where you can enter a **Serial Number** and a **Comment** for current record. By default this window displays a comment from the previous record.

A dialog box titled "Store record" with a blue header bar and a close button (X) in the top right corner. The dialog contains a "Results" section with a date "Date: 24.02.2006" in the top right. Below this, there are two columns of data. The left column contains "Geophone type" (GS-30CT), "DAQ Number" (136), and a list of five parameters: Frequency (9.97 Hz), Damping (67.2%), Resistance (349.6 Ohm), Sensitivity (0.252), and Impedance (1069.1 Ohm). The right column contains "String" (Single) and "Channel" (1), followed by a list of three parameters: Distortion (0.14%), LoDrvImpedance, and Leakage. Below the results, there are two input fields: "Serial Number" and "Temperature" (20.0 °C). A large text area for "Comment" is at the bottom. At the very bottom, there are three buttons: "Set default comment", "Save", and "Cancel".

Results		Date: 24.02.2006	
Geophone type	GS-30CT	String	Single
DAQ Number	136	Channel	1
Frequency	9.97 Hz	Distortion	0.14%
Damping	67.2%	LoDrvImpedance	
Resistance	349.6 Ohm	Polarity	
Sensitivity	0.252	Leakage	
Impedance	1069.1 Ohm		
Serial Number		Temperature	
<input type="text"/>		<input type="text" value="20.0 °C"/>	
Comment			
<input type="text"/>			
Set default comment		Save	Cancel

Figure 6.9 Save Results to Database

6.2.3 Polarity Test



Select Polarity test in the main test window and press Start button. The program will switch to waiting mode. Slightly tap the geophone. If geophone signal exceeds Trigger level then the program will show results on the screen.

You can change Polarity trigger level in the menu **Settings->Hardware Setting**.

Press the “Stop” button or escape button (Esc) to stop the Polarity test

6.3 Project Database



GeoTest database includes tolerance settings for each geophone setting. Different Geophones have different manufacturer specifications, and these specifications and tolerances are entered into the database:

Geotest ver 4.11 - Project1

C:\Seismic Source\Geotest4\Projects\Project1

Main Menu

Geophone Test

Project

Settings

Database

Project Settings

Project Name

Project1

Create project

Load project

Show Record

Delete Records

Print Settings

Seismic Source Co

Records

Show All

Filters

Apply

Geophone Type

< All Types >

Records

All

From

To

1/ 1/2000

8/20/2014

Field Name

< None >

Min

Max

Reset to default

Record	Date/Time	String	Temp	Comment	Lead	Interv	Freq	Damp	Res	Sens	Imp	Dist	Polarity	SpecFr	SpecD	SpecR	SpecS	CoilRe	Movin	TestFr	DistTo	LowDrv
8/5/2014 2:05:03 PM	Single	20	All three at	0	0	10.16	0.699	276.2	20.97	703.1	0.05	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:05:03 PM	Single	20	All three at	0	0	9.79	0.711	278	20.68	687.6	0.08	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:05:03 PM	Single	20	All three at	0	0	9.68	0.717	277	20.55	667.6	0.08	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:09:26 PM	Single	20		0	0	10.16	0.699	276.2	20.97	703.3	0.05		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:09:26 PM	Single	20		0	0	9.79	0.711	278	20.65	690.5	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:09:26 PM	Single	20		0	0	9.72	0.721	277	20.66	673.9	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:11:29 PM	Single	20		0	0	10.16	0.699	276.2	20.97	703.5	0.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:11:29 PM	Single	20		0	0	9.76	0.707	277.9	20.57	693.8	0.05		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:11:29 PM	Single	20		0	0	9.73	0.731	276.8	20.71	681.2	0.05		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:20:44 PM	Single	20		0	0	10.15	0.698	276.2	20.95	703.5	0.04	Negative	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:20:44 PM	Single	20		0	0	9.8	0.708	278	20.66	690.6	0.08	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:20:44 PM	Single	20		0	0	9.64	0.713	276.9	20.45	663.9	0.11	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:22:31 PM	Single	20		0	0	10.16	0.698	276.2	20.96	703.4	0.05	Negative	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:22:31 PM	Single	20		0	0	9.79	0.711	278	20.7	691.9	0.07	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:22:31 PM	Single	20		0	0	9.68	0.714	277.1	20.55	672.1	0.1	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:38:32 PM	Single	20		0	0	10.16	0.698	276.2	20.96	703.6	0.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:38:32 PM	Single	20		0	0	9.81	0.716	278	20.72	695.2	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:38:32 PM	Single	20		0	0	9.76	0.727	277	20.78	681.1	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		

All of the columns can be moved, so the most important columns are shown.

The data can be filtered and sorted.

The database is also used to sort and analyze the saved data. Various export and report features are available within the database.

GeoTest ver 4.11 - Project1

Seismic Source Co

Geophone Test

Project

Settings

Database

Project Settings

Project Name

Project1

Create project

Load project

Show Record

Delete Records

Print Settings

Page Setup

Print Preview

Print...

Download...

Save To PDF File

Records

Filters

Geophone Type

Records

From

1/ 1/2000

Field Name

Min

Max

Reset to default

Show All

Apply

<All Types>

All

To

8/20/2014

<None>

Date: 25 Aug 2014

Copyright 2001 - 2014

Record	Date/Time	String	Temp	Comment	Lead	Interv	Freq	Damp	Res	Sens	Imp	Dist	Polarity	SpecFr	SpecD	SpecR	SpecS	CoilRe	Movin	TestFr	DistTo	LowDrv
8/5/2014 2:05:03 PM	Single	20	All three at	0	0	10.16	0.699	276.2	20.97	703.1	0.05	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:05:03 PM	Single	20	All three at	0	0	9.79	0.711	278	20.68	687.6	0.08	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:05:03 PM	Single	20	All three at	0	0	9.68	0.717	277	20.55	667.6	0.08	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:09:26 PM	Single	20		0	0	10.16	0.699	276.2	20.97	703.3	0.05		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:09:26 PM	Single	20		0	0	9.79	0.711	278	20.65	680.5	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:09:26 PM	Single	20		0	0	9.72	0.721	277	20.66	673.9	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:11:29 PM	Single	20		0	0	10.16	0.699	276.2	20.97	703.5	0.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:11:29 PM	Single	20		0	0	9.76	0.707	277.9	20.57	693.8	0.05		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:11:29 PM	Single	20		0	0	9.73	0.731	276.8	20.71	681.2	0.05		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:20:44 PM	Single	20		0	0	10.15	0.698	276.2	20.95	703.5	0.04	Negative	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:20:44 PM	Single	20		0	0	9.8	0.708	278	20.66	690.6	0.08	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:20:44 PM	Single	20		0	0	9.64	0.713	276.9	20.45	663.9	0.11	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:22:31 PM	Single	20		0	0	10.16	0.698	276.2	20.96	703.4	0.05	Negative	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:22:31 PM	Single	20		0	0	9.79	0.711	278	20.7	691.9	0.07	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:22:31 PM	Single	20		0	0	9.68	0.714	277.1	20.55	672.1	0.1	Positive	10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:38:32 PM	Single	20		0	0	10.16	0.698	276.2	20.96	703.6	0.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:38:32 PM	Single	20		0	0	9.81	0.716	278	20.72	695.2	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:38:32 PM	Single	20		0	0	9.76	0.727	277	20.78	681.1	0.07		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:45:21 PM	Single	20	bad BD03-3	0	0	10.14	0.689	4121.5	12.88	10534	15.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:45:21 PM	Single	20	bad BD03-3	0	0	9.77	0.706	276.9	20.71	694.1	0.05		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 2:45:21 PM	Single	20	bad BD03-3	0	0	9.73	0.729	276.6	20.89	685	0.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 3:43:42 PM	Single	20		0	0	10.28	0.712	4119.6	13.13	10523	14.89		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 3:43:42 PM	Single	20		0	0	9.73	0.709	276.9	20.63	693.1	0.18		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 3:43:42 PM	Single	20		0	0	9.73	0.72	278.2	20.86	708.3	0.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 3:47:32 PM	Single	20	new BD03-3	0	0	10.22	0.708	271	21.33	687.5	0.06		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 3:47:32 PM	Single	20	new BD03-3	0	0	9.9	0.723	270.8	21.01	662	0.17		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/5/2014 3:47:32 PM	Single	20	new BD03-3	0	0	9.88	0.735	270	21.1	701.6	0.04		10.0	0.686	272.7	20.95	375	11	12	0.2		
8/6/2014 10:58:49 AM	6 x 1	20		0	0	10.07	0.711	1698.2	118.22	3933.6	0.08		10.0	0.707	279.0	19.7	395	11.2	12	0.1		
8/6/2014 10:59:16 AM	6 x 1	100		0	0	10.05	0.708	1698.1	118.09	3933.5	0.08		10.0	0.595	339.2	19.7	395	11.2	12	0.1		
8/7/2014 9:17:35 AM	Single	25	box 118	1	1	10.35	0.695	277.4	20.91	706.6	0.06		10.0	0.68	276.6	20.95	375	11	12	0.2		
8/7/2014 9:17:35 AM	Single	25	box 118	1	1	9.8	0.714	277.1	20.77	694.1	0.04		10.0	0.68	276.6	20.95	375	11	12	0.2		
8/7/2014 9:17:35 AM	Single	25	box 118	1	1	9.69	0.724	278.1	20.76	689.7	0.05		10.0	0.68	276.6	20.95	375	11	12	0.2		
8/7/2014 9:20:32 AM	Single	25	box 101	1	1	10.35	0.695	275.9	20.77	703.4	0.05		10.0	0.68	276.6	20.95	375	11	12	0.2		
8/7/2014 9:20:32 AM	Single	25	box 101	1	1	9.77	0.711	277.4	20.62	695.3	0.04		10.0	0.68	276.6	20.95	375	11	12	0.2		
8/7/2014 9:20:32 AM	Single	25	box 101	1	1	9.67	0.723	276.3	20.55	687.5	0.05		10.0	0.68	276.6	20.95	375	11	12	0.2		

Save Layout

Restore Layout

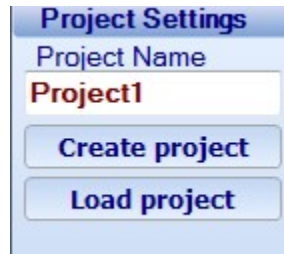
Layout Settings

The following Projects operations can be performed:

- Create Project – Select “Create Project” to open a new project
- Load Project – Select “Load Project” to open an existing project which has been previously saved to the database

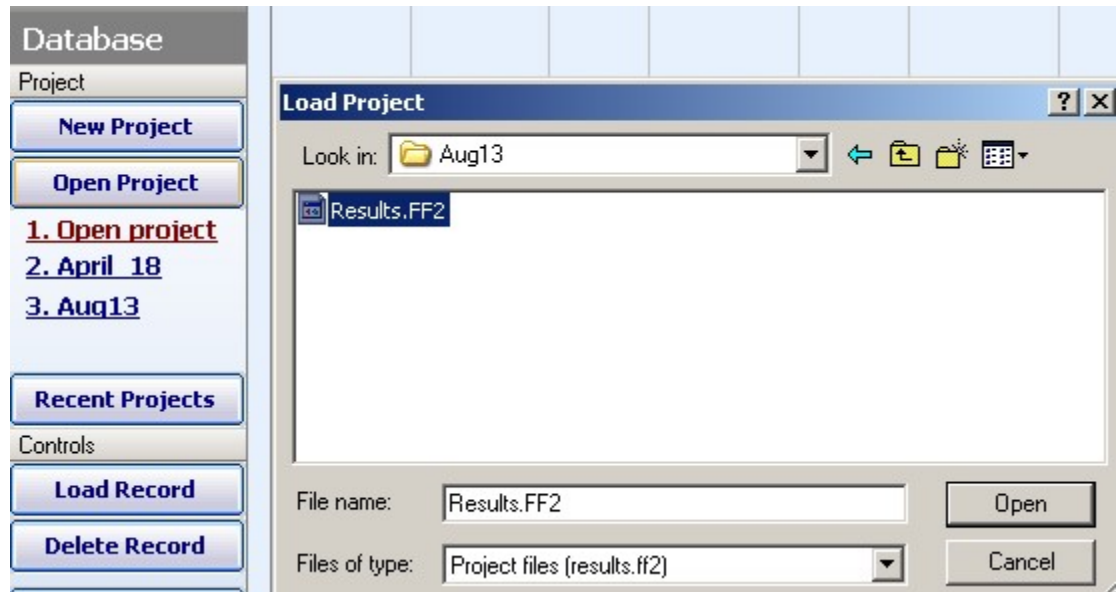
6.3.1 Create Project

Enter a new project name and press the “Create Project” button to create a New project menu

A screenshot of a 'Project Settings' dialog box. It has a blue header with the text 'Project Settings'. Below the header is a text input field labeled 'Project Name' containing the text 'Project1'. At the bottom of the dialog are two buttons: 'Create project' and 'Load project', both with blue text on a light blue background.

6.3.2 Load Project

Press the “Load Project” button to open the Load Project menu



Select the project to open

6.3.5 Database Layout Menu

Layout Settings

The database layout menu allows the user to select which parameter to view in the database and on the reports. The column titles can also be changed.

A check mark enables the field to be displayed in the database.

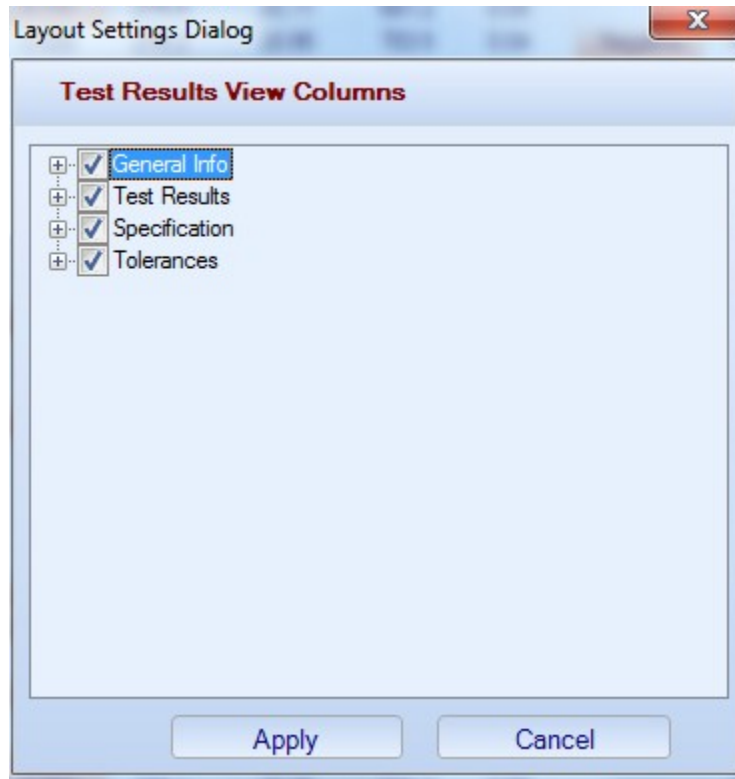


Figure 6.11 Layout Settings

6.3.6 Reports

The Geotest program has a powerful and flexible function of creating reports. Report is generated using information currently visible in Database Window. Using Layout Settings, Filters, Range and Tolerance you can display only information that you need. Information from the screen will go to the report.



Select Save to CSV file to export data to and CSV text file

7 SrcSig Operation

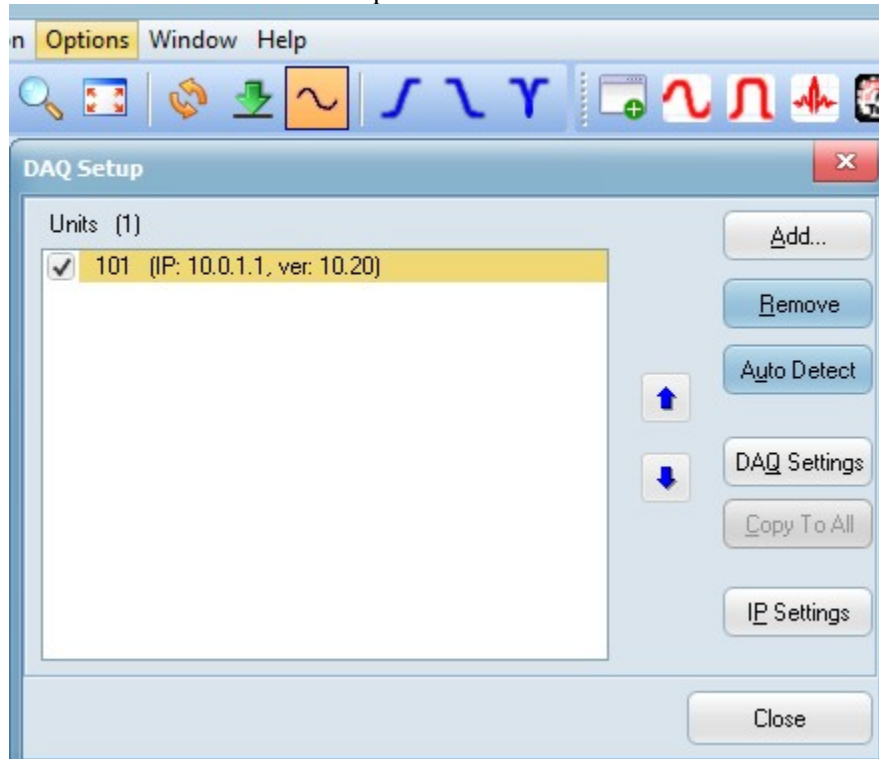
SrcSig software can be used to view the actual test response of the Geophone. This software allows viewing of the geophone tests voltage and response.

After starting the GeoTest software, start the SrcSig software.

Go to the Options-Device-DAQ Setup. Remove all Devices and then do an “Auto Detect”. The BD3 units that are connected to the computer should appear in the list.

Click the box to show a “check mark” to enable the unit

Press “Close” to close this setup window.

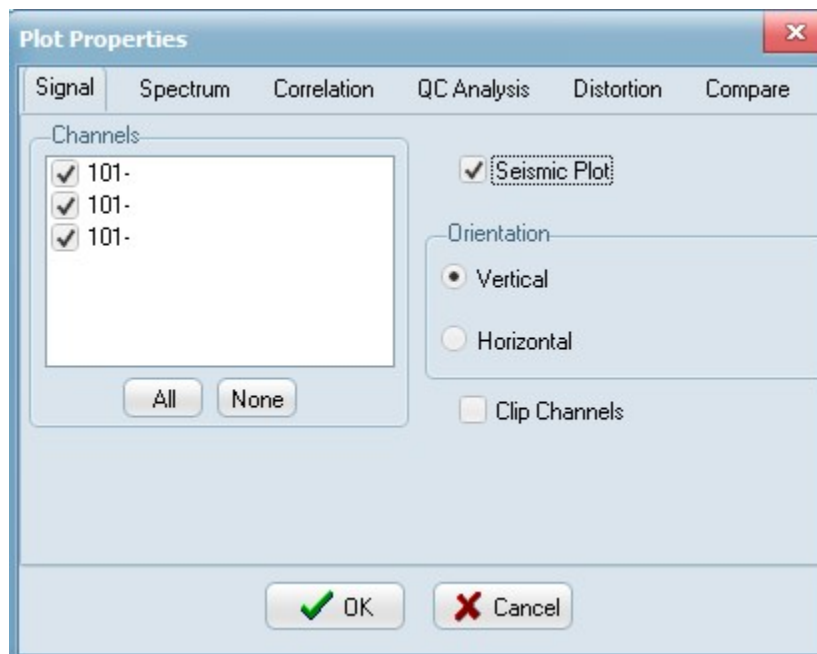


Run a test with the GeoTest software. The SrcSig should automatically receive the data. The status bar at the bottom of the screen will show the Status of the BD3 unit. After the test is completed a “finish acquisition” message should appear in the status window.



New Plot

Press the “new plot” button and select the graph that you would like to view. Normally Signal Trace is selected.



The BD3 GeoTest program normally performs multiple tests. The waveform is different depending on what test is run.

- Resistance, Frequency Damping and Sensitivity Test – These results are from the Step Function.
- Impedance, Distortion Test – These results are from the Sine wave
- Low Drive Impedance – System uses a low amplitude sine wave
- Polarity Test – system records the signal from the geophone and looks for the polarity of the first break

The multiple test will be shown on the screen, but will be immediately erased by the next test.

To view the Step Function. Select only the Resistance, Frequency, Damping and Sensitivity tests. Disable all other tests

The Step Function is used to test

- Frequency
- Damping
- Sensitivity
- Resistance

The sine Wave is used to Test

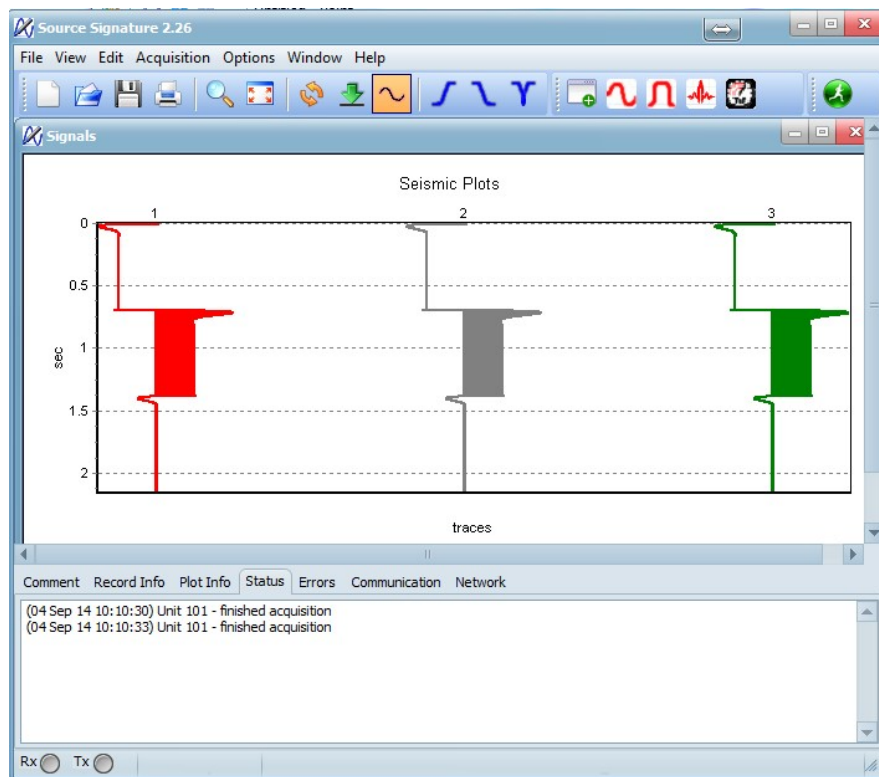
- Impedance
- Distortion

Low Drive Z is also a sine wave. It is a separate test with a lower sine wave voltage.

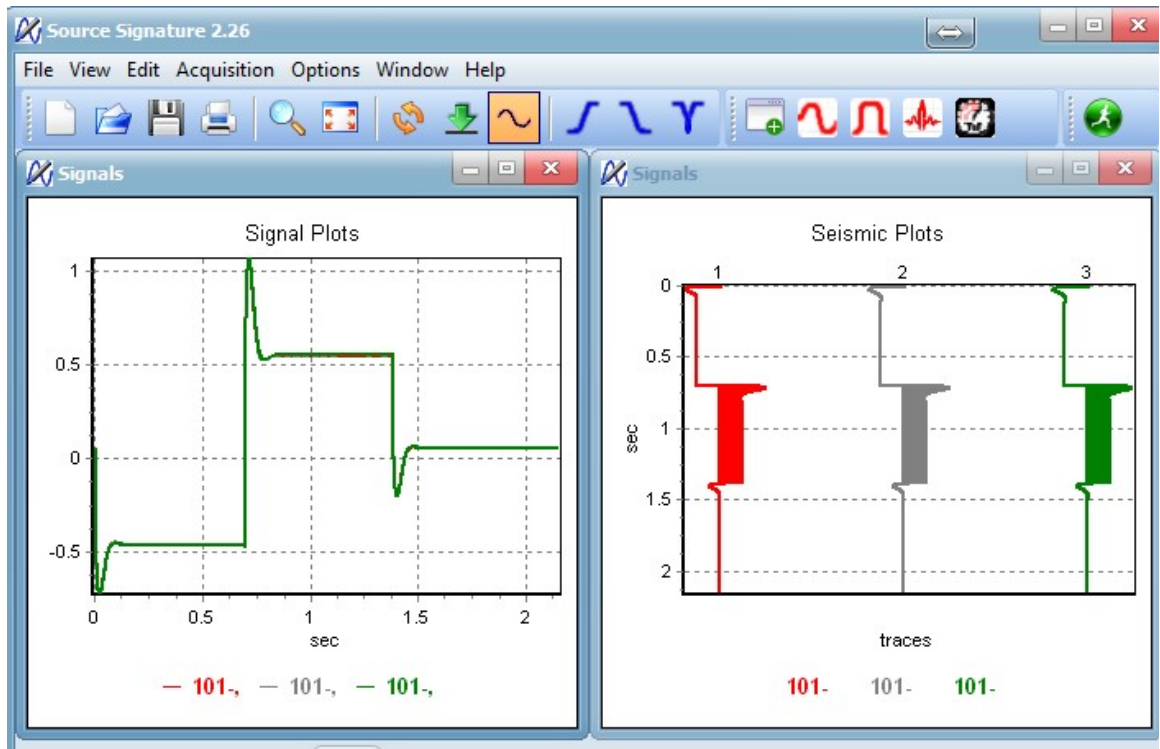
The Polarity Test is the final Test that can be viewed with the SrcSig software.

Select these tests one at a time in GeoTest to view them in SrcSig.

Seismic Plot allows viewing of all three channels at the same time



Viewing the signal traces in “non” seismic mode allows viewing of the actual voltages applied to the Geophone.



Pulse Test Example

Select only the Frequency Damping and Resistance Tests in GeoTest

Seismic Source Co. Copyright 2001 - 2022

Geophone Type PS2 Natural Frequency 2 Hz

☒ Single ☐ String Serial 1 X 1 Parallel 1 X 1

☒ Manual ☐ USB Sensor ☐ Portable Sensor Temperature 20

☒ Frequency 2.0 Hz ☒ Damping 0.50 ☒ Sensitivity 22.0 V/m/s

Tolerance +10.0 % / -10.0 % Tolerance +10.0 % / -10.0 % Tolerance +10.0 % / -10.0 %

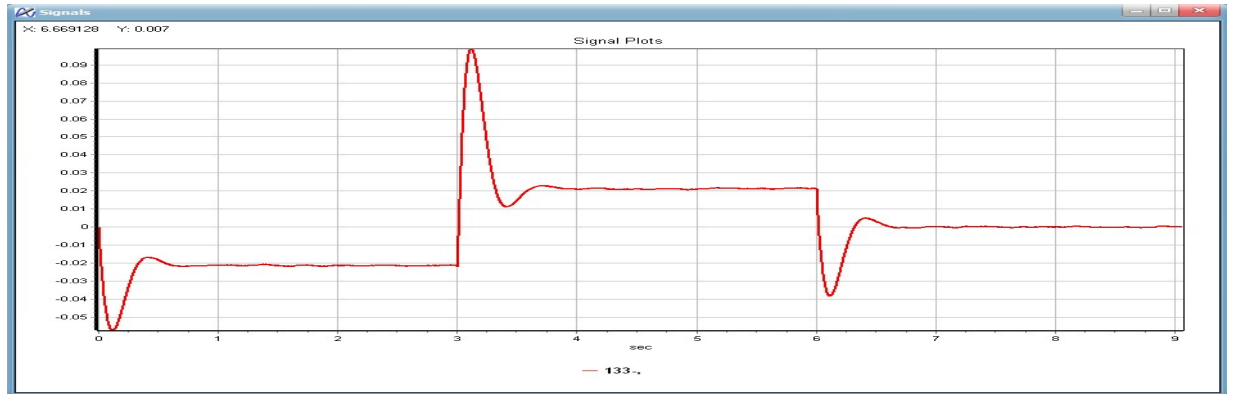
☒ Resistance 3600.0 Ohm ☐ Impedance 2850.0 Ohm ☐ Distortion

Tolerance +10.0 % / -10.0 % Tolerance +10.0 % / -10.0 % Tolerance 0.6 %

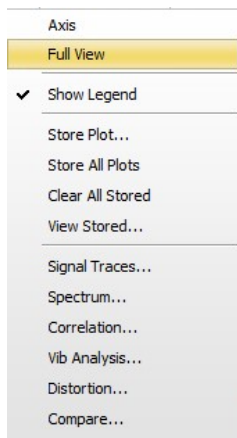
☐ Polarity Positive ☐ Leakage ☐ Low Drive Z 2850.0 Ohm

Tolerance 1000 kOhm Tolerance +10.0 % / -10.0 %

Press Start Test on the Geotest program
SrcSig should show the pulse Test

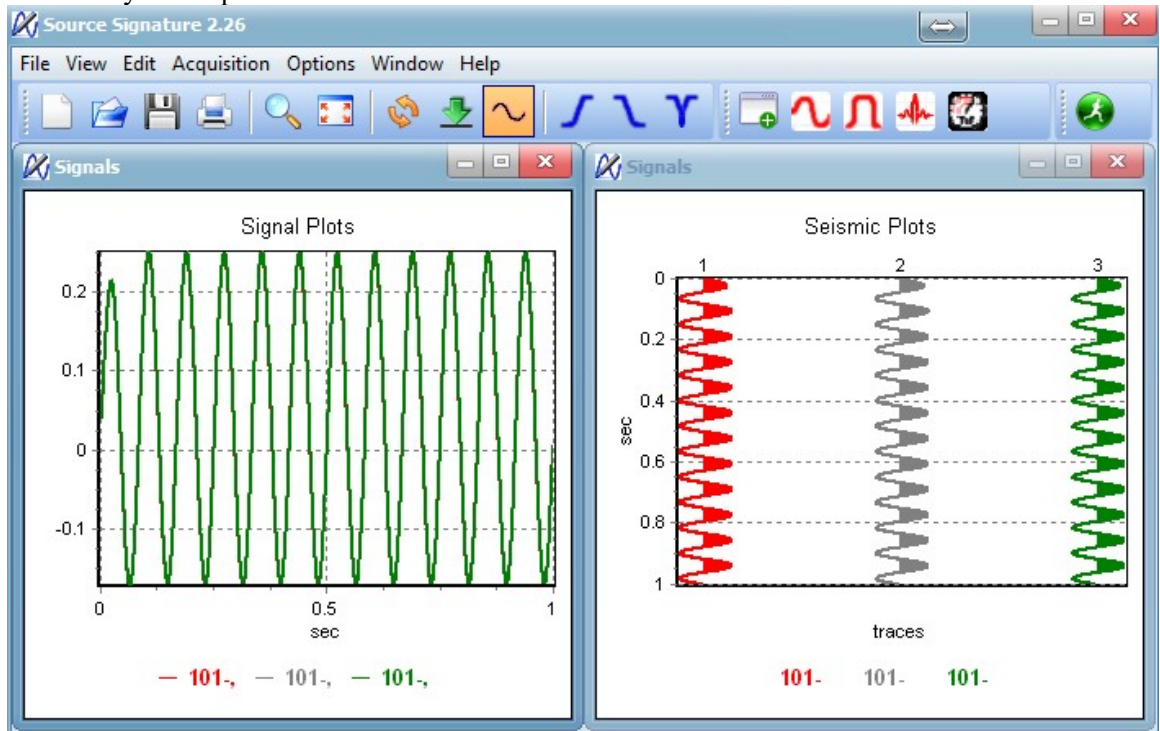


test Right click on the Graph to show the Graph menus. Select Full View to show the entire

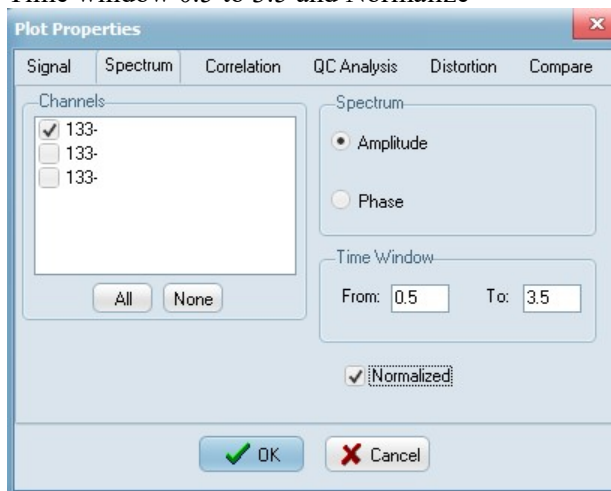


Sine Wave Test Example

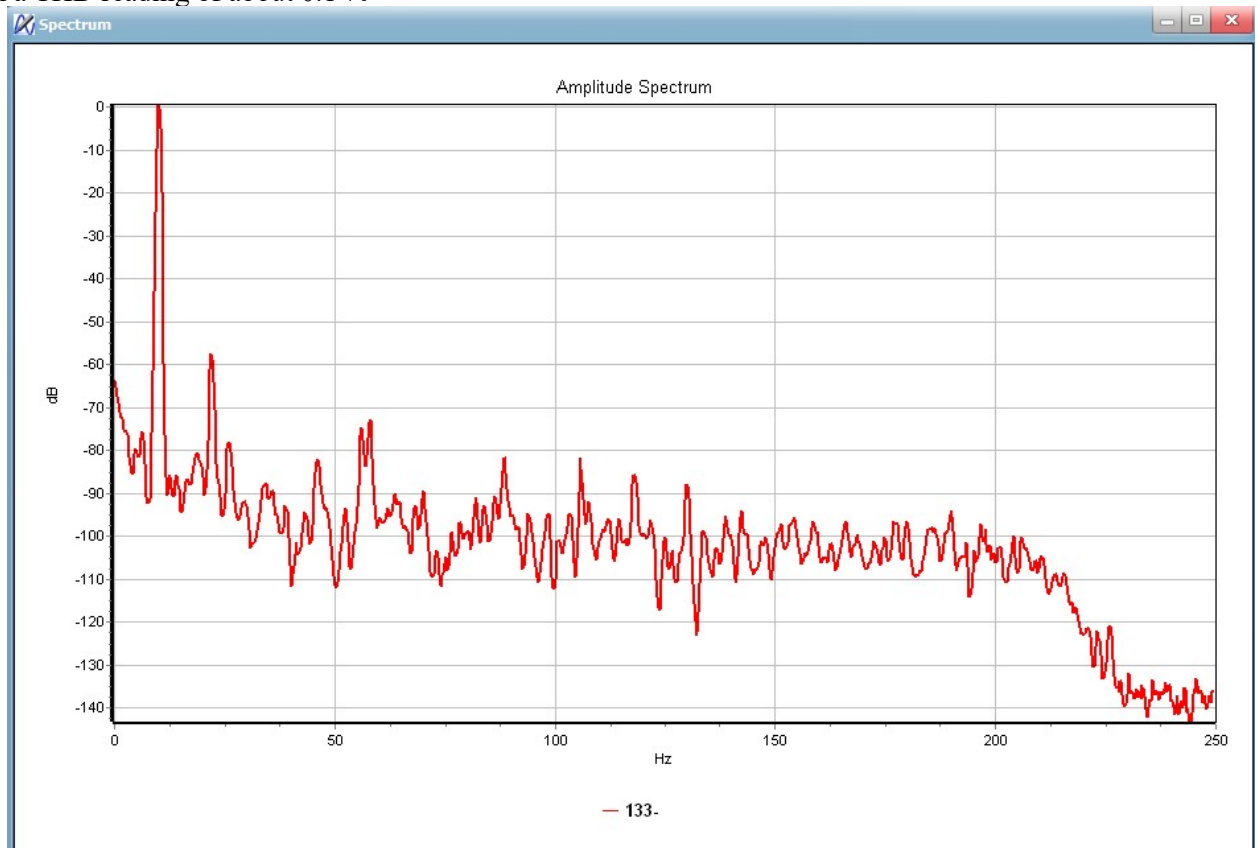
Select only the Impedance and Distortion Test to show the Sine Wave Test



Right Click the Graph and select spectrum
Time window 0.5 to 3.5 and Normalize



In this example the Spectrum shows about -60dB for the third harmonic. This would result in a THD reading of about 0.1 %



BD3 file storage

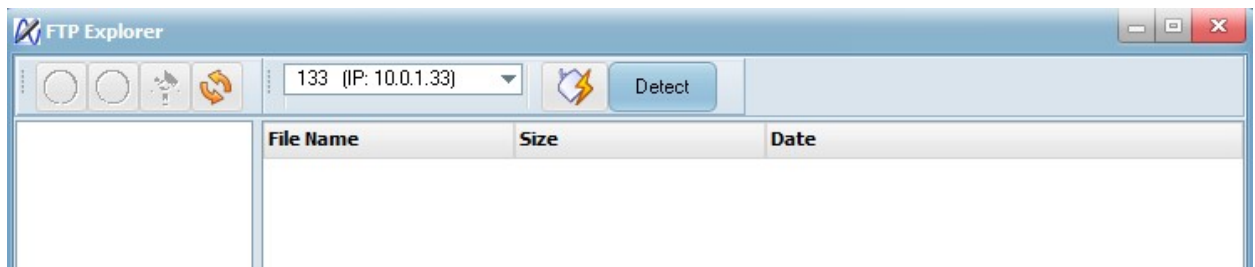
All the tests are saved on the internal CF card of the BD3.

The Tests can be viewed with SrcSig.

Go to the File menu and select “Load From Unit”



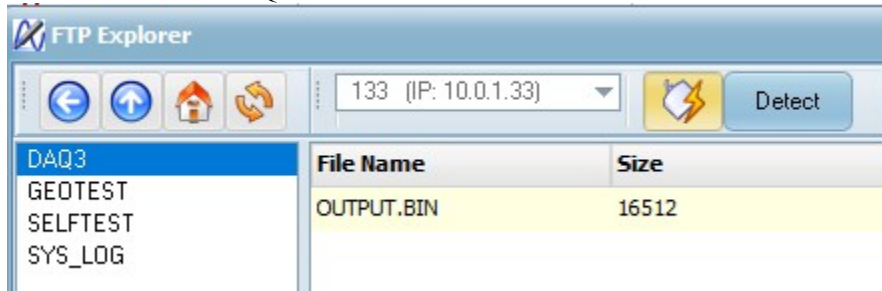
Then Detect the Unit



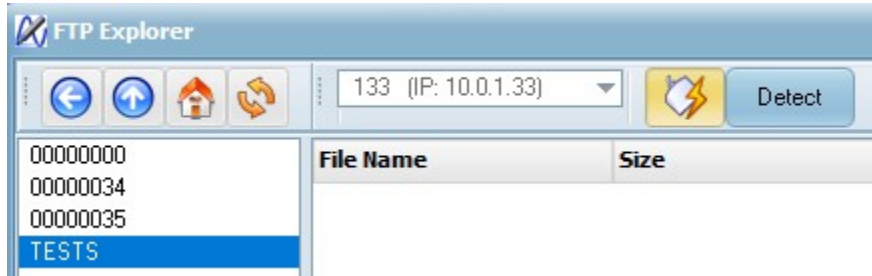
After Detecting the Unit Press the Connect icon



Double Click the DAQ3 Folder



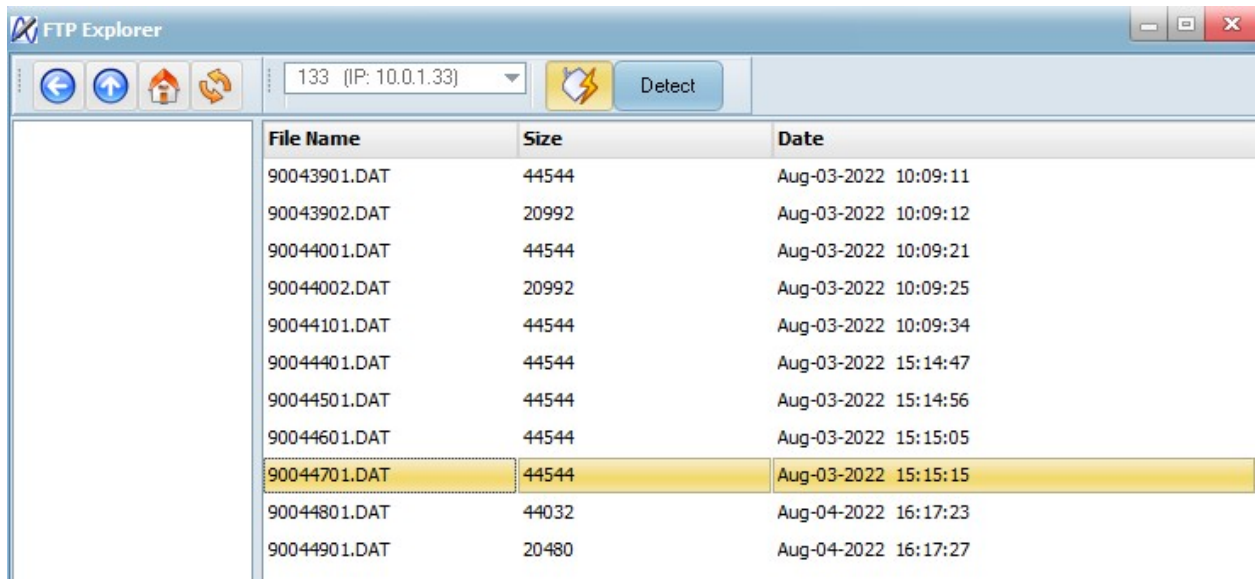
Then double click the Tests Folder



The Tests records should appear in the list.

The tests can be sorted by date

Click on any of the Test Records to view them



8 Geophone Tests

Natural Frequency – The Bird Dog 3 unit performs a step response to determine the frequency of the geophone. The zero crossings are used to determine the period of the response. The computed damping and the period are then used to determine the natural frequency of the geophone element.

Damping – The Bird Dog 3 unit performs a step response test to determine the damping of the geophone. The peak amplitude of the oscillations occurring after the step response is used to determine the damping of the geophone. The quicker the amplitudes decrease the larger the damping will be.

Sensitivity - The Bird Dog 3 unit performs a step response test to determine the sensitivity of the geophone. During the step the element is raised using a constant current source. The amplitude response after the step, the moving mass of the element, the computed natural frequency, and the computed damping are all used to compute the sensitivity of the geophone element.

Resistance – The Bird Dog 3 unit applies a constant current to the geophone and measures the voltage across the element. The resistance is then computed by dividing the Voltage by the current.

Impedance – The Bird Dog 3 applies an AC signal at the frequency selected in the geophone specification. The impedance is then measured similar to the way the resistance was measured. When different frequencies are selected the impedance will change.

Distortion – The Bird Dog 3 computes the distortion with the same signal used for impedance. A FFT is performed to convert the signal to the frequency domain. The driven frequency (Fundamental) Energy is then compared to the energy of the higher frequencies (noise). The ratio of the Noise/Fundamental is used to compute the % total harmonic distortion.

Polarity – The Bird Dog 3 records the data from the geophone and looks for the first break. A tap on the top of the element producing a positive voltage is considered “Positive” polarity. A negative first break pulse is considered “Negative” polarity. This is consistent with the SEG recommended polarity standard (Downward Motion (Tap on top) = Positive Voltage). The polarity test can be set to “**repeat**”. When “repeat” is selected the test will repeat until it is stopped. Two different audible tones are made by the computer, one for positive polarity and one for negative polarity. The result of the last test will be saved to the database when the data is stored.

Leakage – A resistor typically 200Kohm is connected between the positive and negative geophone connectors on the Bird Dog 3 cable. The positive end of the cable should be connected to one end of the geophone string. The negative end of the cable needs to be connected to a wire that is terminated in a large water container. The geophone string is submerged in this water container. The Leakage test will measure the resistance between the positive and negative leads of the cable ignoring the 200Kohm fixed resistor. The correct value of the resistor must be entered in the Options-Hardware Setup-Leakage Fixed resistor entry. This test is used to verify the electrical isolation of the geophone string is adequate.

9 Hardware Setup

9.1 Geophone Mounting and Isolation

For proper test results, it is important that the geophone or the geophone string under test be isolated from normal ground movement. This is especially important when working in a trailer or other portable building.

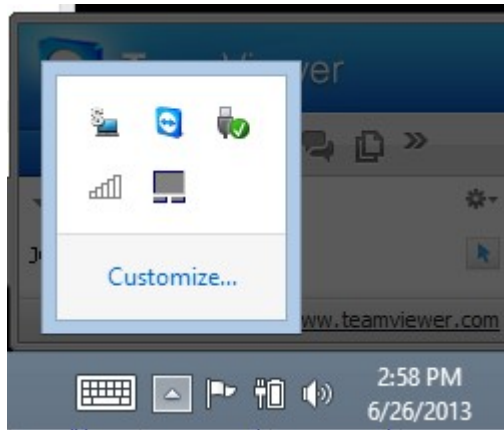
A simple isolation box can be made by filling a box with sand, and placing the box on a piece of foam rubber. Planting the geophones under test in the “sand box” will greatly improve the reliability of the tests.

10 Windows Ethernet Setup

10.1 Windows 7 and Windows 8

With Windows 7 and Windows 8 there is normally a quick access to the IP settings

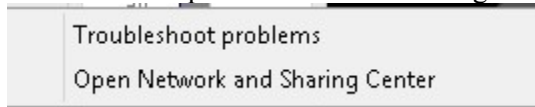
In the lower left hand corner, there are multiple icons.



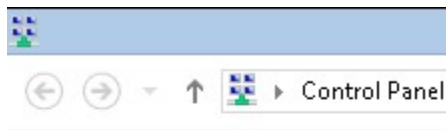
Right Click on the WiFi Icon



Then Select “Open Network and Sharing Center”



Then select “Change adapter Settings”



Control Panel Home

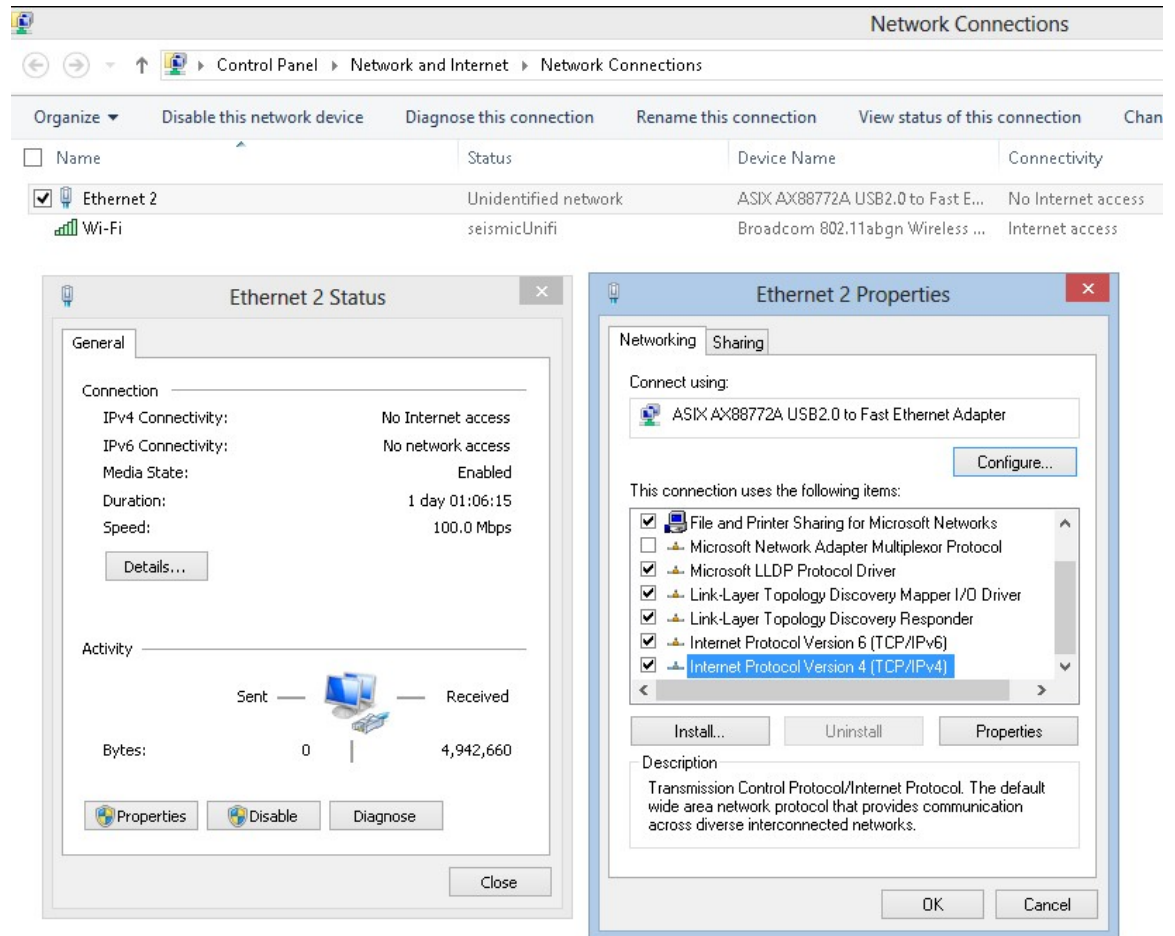
Change adapter settings

Change advanced sharing settings

Double Click the Wired Ethernet used by the Bird Dog 3 unit

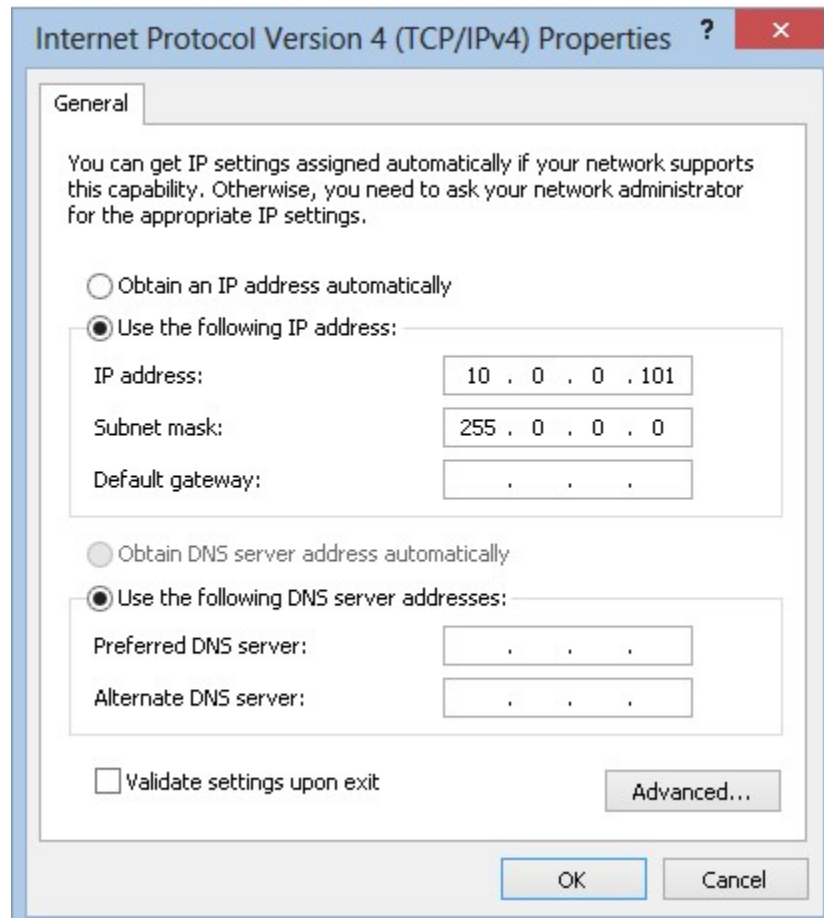
On the Ethernet status screen – click the “Properties” button at the bottom.

On the Ethernet Properties screen select the “Internet Protocol Version 4 (TCP/IPv4)”

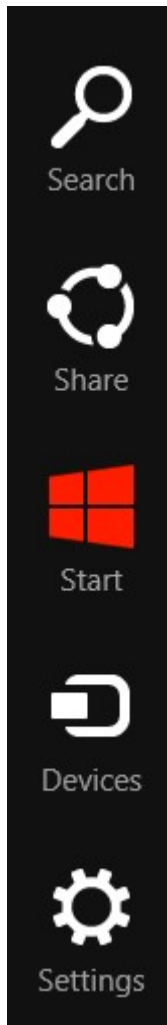


Then set the IP address to a fixed IP

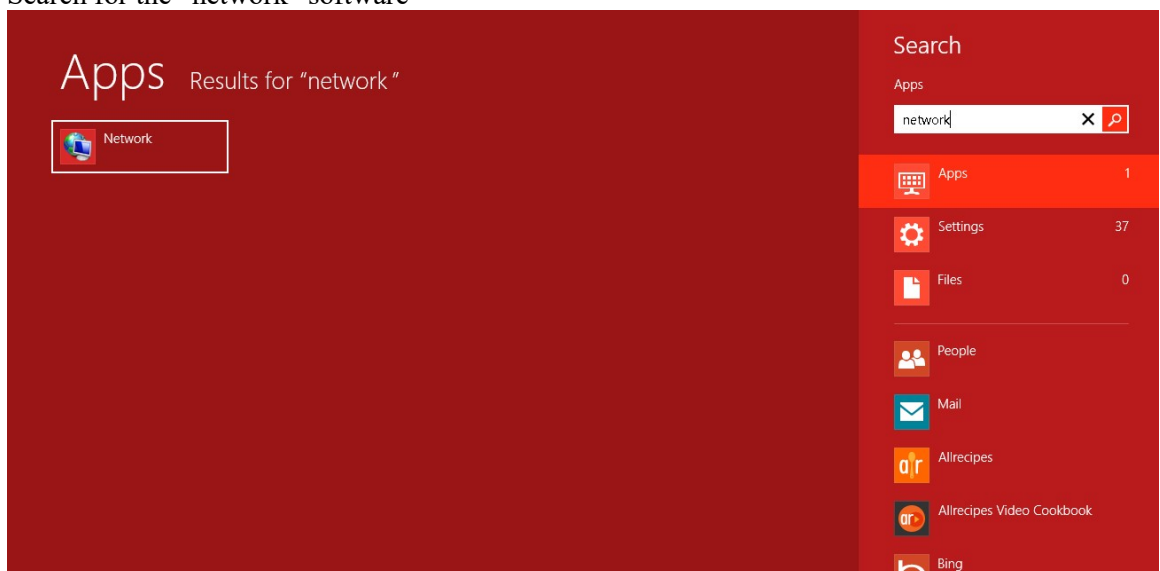
We suggest using 10.0.0.101 for the computer, with the 255.0.0.0 Subnet mask



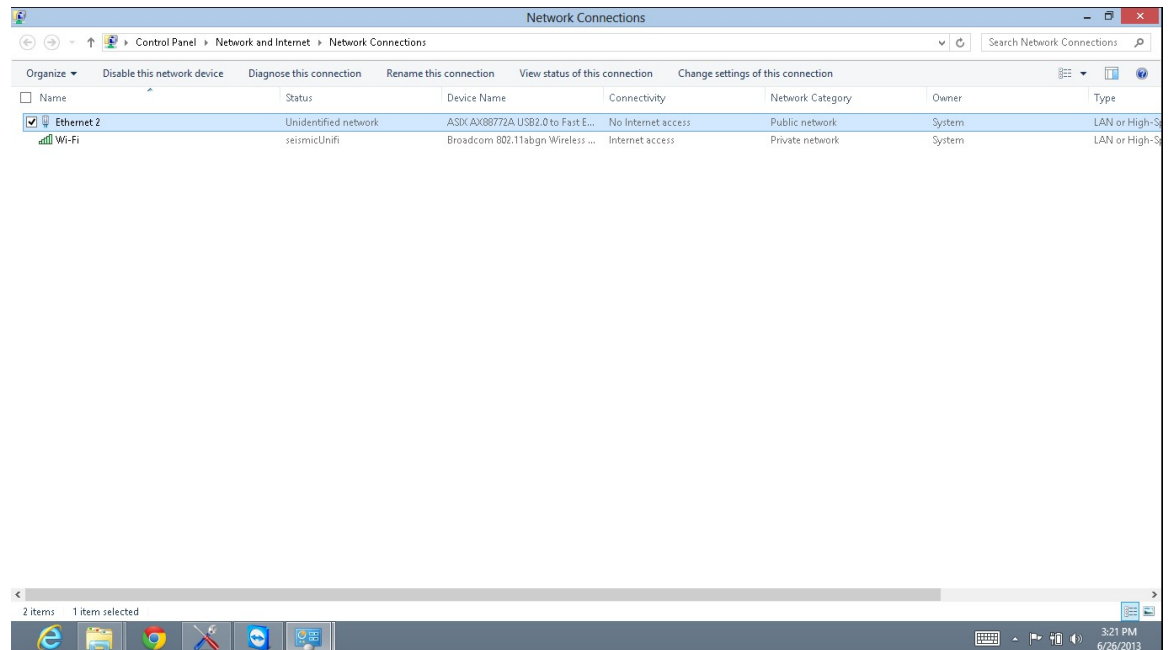
The Network selections can also be access via the windows 8 start menu.



Search for the “network” software



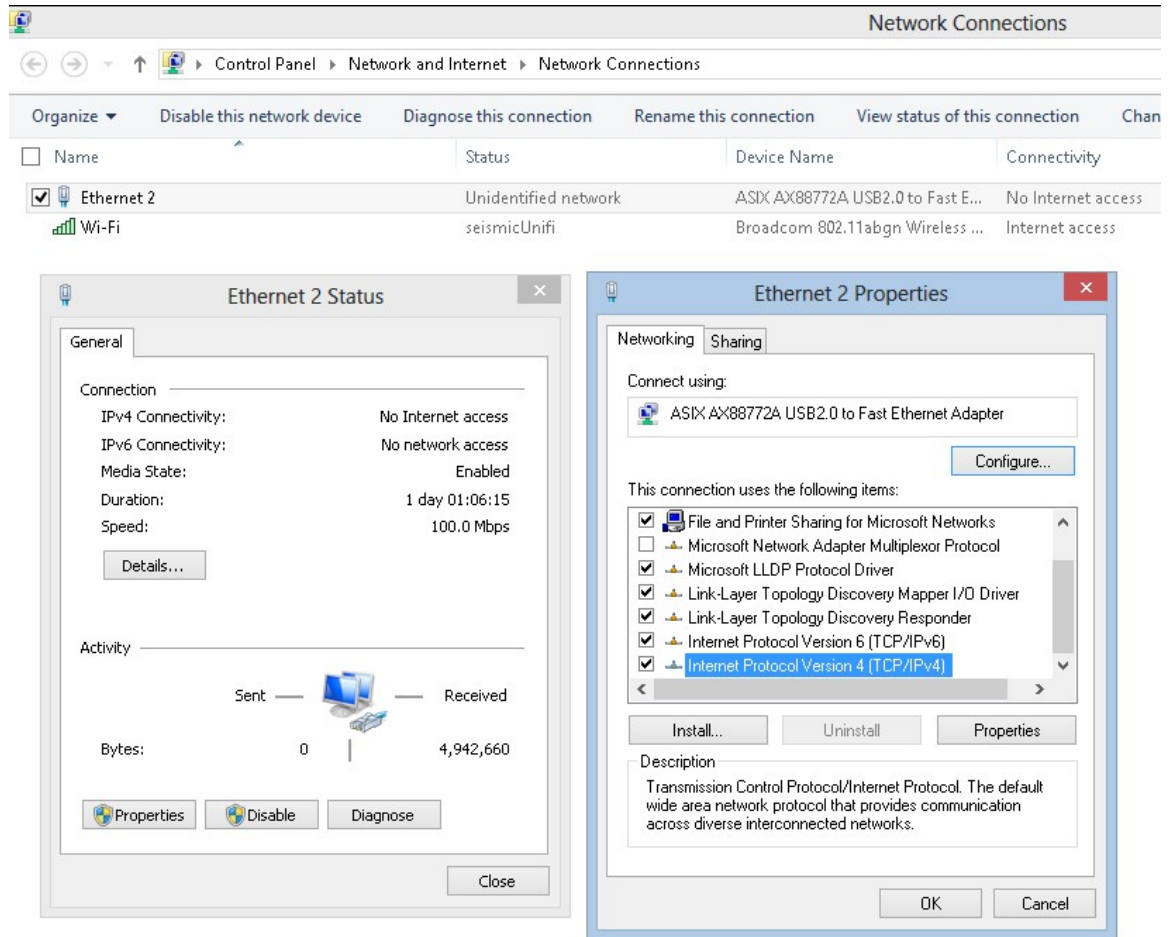
Click on the Network application



Double Click the Wired Ethernet used by the Bird Dog 3 unit

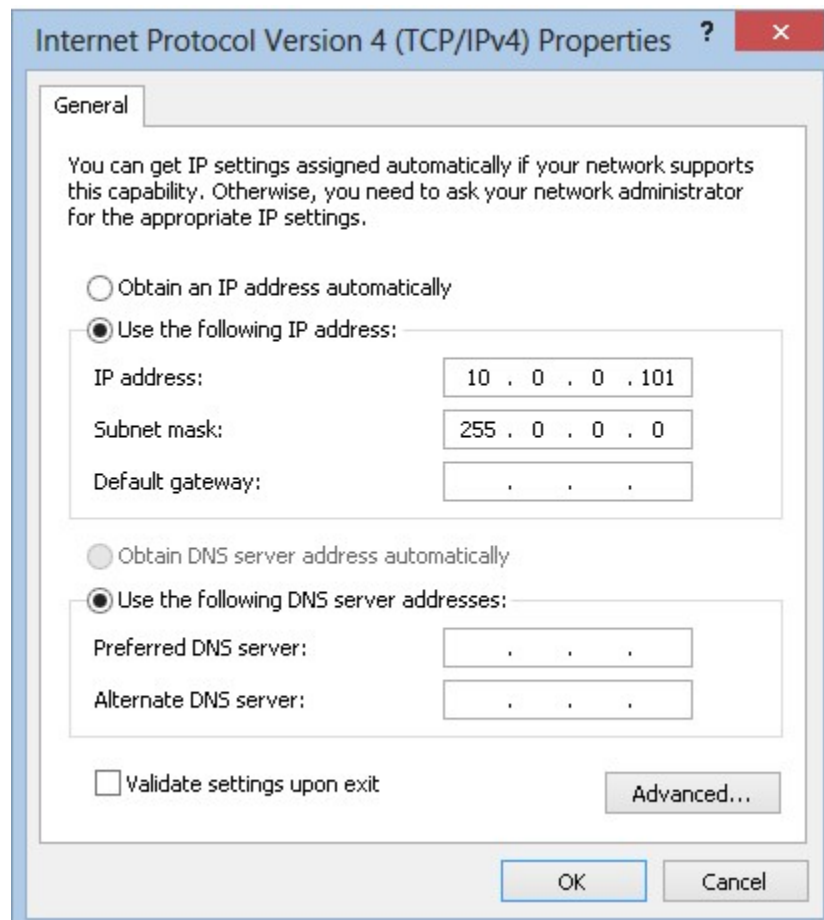
On the Ethernet status screen – click the “Properties” button at the bottom.

On the Ethernet Properties screen select the “Internet Protocol Version 4 (TCP/IPv4)



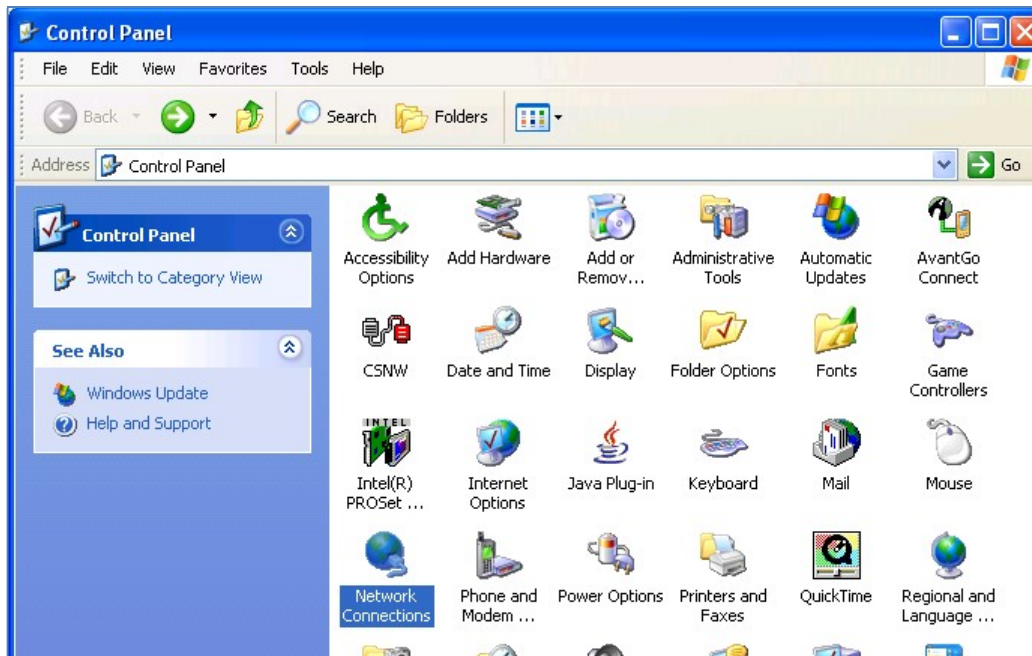
Then set the IP address to a fixed IP

We suggest using 10.0.0.101 for the computer, with the 255.0.0.0 Subnet mask

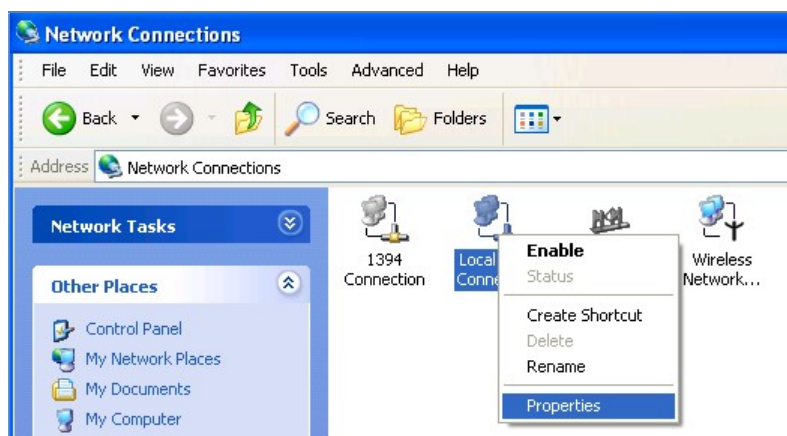


10.2 XP setup

With Windows XP computer setup in classic mode, the Ethernet setup is done by the following procedure:



Go to the Control Panel and open the Network Connections.



Right Click on the Local Area Connection Icon and select properties.

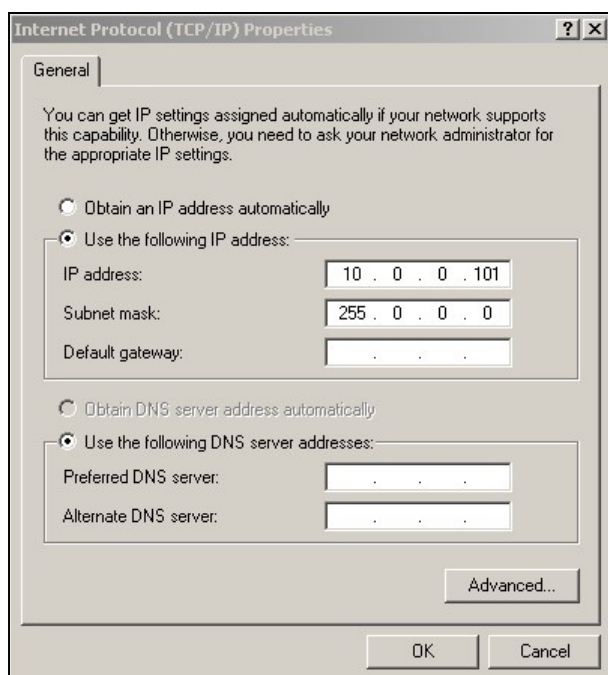
Scroll Down to the Internet Protocol TCP/IP selection and click on this icon.

Click on Properties button.

Use following IP address:

IP address 10.0.0.101

Subnet Mask 255.0.0.0



Press OK to accept entries.

It is sometimes necessary to reboot the computer to have the new address take effect.

If the BD3 Recording system unit was previously communicating with a computer with a different address, then the BD3 Recording system unit must be reset (power off then on) for the unit to communicate to the new address.

With Windows XP there is an additional Authentication Tab. The Authentication must be disabled to operate with the Sigma Recording system unit.

10.3 Windows 2000 Ethernet Setup

With Windows 2000 computer this can be done by the following procedure:

Right Click on My Network Places and select Properties.



Figure 2.1 Network Properties

Right Click on an icon that corresponds to your network card and select Properties.

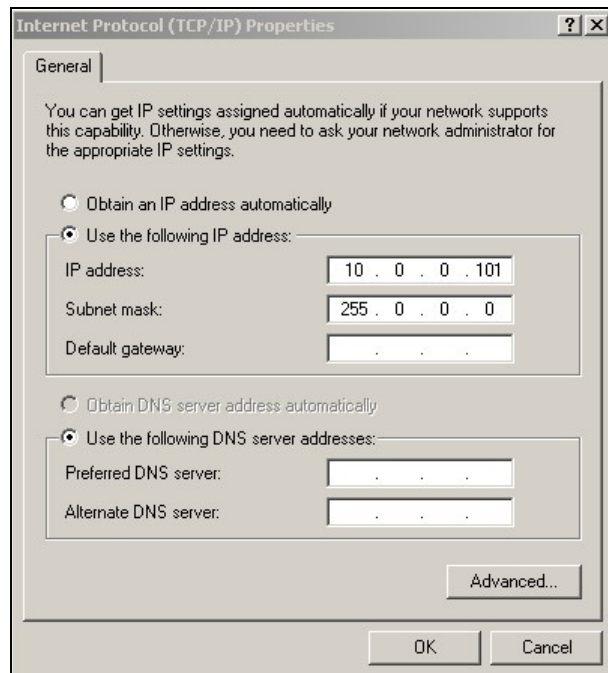


Figure 2.2 IP configuration

Select Internet Protocol (TCP/IP) and click on Properties button.

Use following IP address:

IP address 10.0.0.101

Subnet Mask 255.0.0.0

Press OK to accept entries.

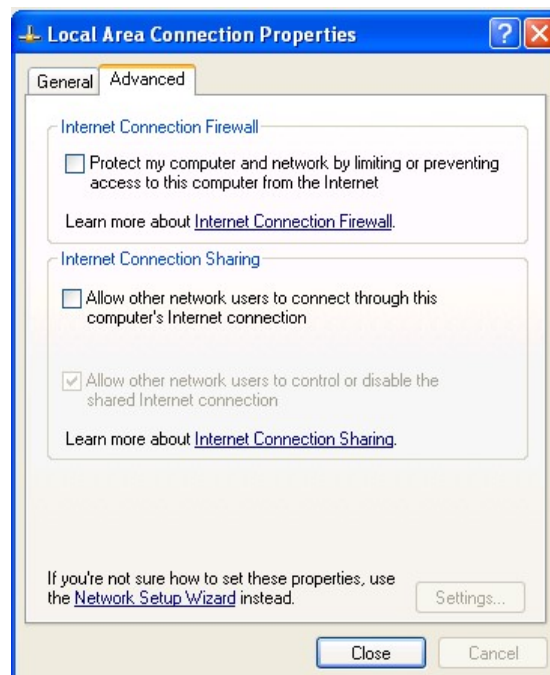
It is sometimes necessary to reboot the computer to have the new address take effect.

If the Sigma Recording system unit was previously communicating with a computer with a different address, then the Sigma Recording system unit must be reset (power off then on) for the unit to communicate to the new address.

10.4 Firewall

It is important to disable all Firewalls on the computer. Third party firewall from Norton, McAfee or other companies can completely disable the operation of the BD3 Recording system unit. Typically the Firewall will allow the “ping” command to operate, but will block all other commands and messages.

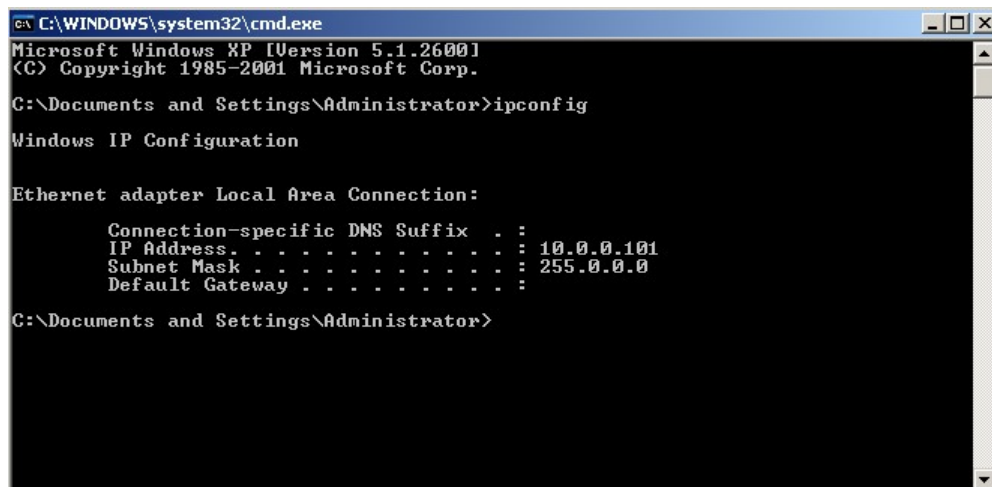
There is a built in Firewall with Windows XP. This should be disabled. Go to the Advanced Menu of the Local Area Properties and disable the Firewall.



Typical Firewalls will ask if the program should be “blocked”, always select “Unblock this program” if asked.

10.5 TCP/IP Verification

To verify that the IP address is correct, select “Start”, then “Run”, then type in “CMD”. This starts the command prompt in Windows (This is similar to the old DOS command prompt). Type the command “ipconfig”. The current ip address 192.168.0.101 should be shown.



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Administrator>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 10.0.0.101
    Subnet Mask . . . . . : 255.0.0.0
    Default Gateway . . . . . : 

C:\Documents and Settings\Administrator>
```

Viewing the Network Tab at the bottom of the Vscope program can also check the IP address.

Comment	Record Info	Plot Info	Status	Errors	Communication	Network
Adapter Desc: Intel(R) 82567LM Gigabit Network Connection - Packet Scheduler Miniport						
IP Address: 10.0.0.101						
IP Mask: 255.0.0.0						
DHCP Enabled: No						

The Network Tab shows the current IP address detected by the Vscope program.

Also if the Bird Dog 3 unit was previously communicating with a computer with a different address, then the Bird dog 3 unit must be reset (power off then on) for the unit to communicate to the new address.

With some of the Windows versions there is an additional Authentication Tab. The Authentication must be disabled to operate with the Bird Dog 3 unit.

11 Wiring Documentaion

11.1 Bird Dog 3 Connector Wiring

11.1.1 Power LED –

Illuminates when power is applied to box.

Caution if Battery voltage drops below 11 volts, LED will light but Bird Dog 3 will not perform properly

11.1.2 Three pin trigger Connector –

A– TB active – A

B– TB return – B

Not Used with BD3 unit

11.1.3 Power – 2 pin MS to X9 connector

A - +battery – A

B – negative battery - B

The Bird Dog 3 unit has a bridge rectifier built into the power circuit, so the unit will power with either polarity on the battery connection. There are two internal fuses on the board to prevent damage to the unit. However, we still recommend using an external fast blow fuse of 2 amps.

The unit can be powered from any DC source supplying a minimum of 11 VDC to a maximum of 37 VDC.

11.1.4 Ethernet – 10 base T

Standard Patch cable to Computer

11.1.5 4-pin GPS Connector

- A.....Battery +12 volts (supplies power to GPS receiver)
- B.....GPS RX (receives GPS data from GPS receiver)
- C.....GPS PPS
- D.....Ground

An external GPS receiver can be connected to the 19 pin GPS connector using a PT06A-14-19P. The GPS receiver must be setup for

- 19200 baud
- \$GPGGA and \$GPRMC messages only

11.1.5 PT 22-55 connector

Pin.....Signal	Pin.....Signal
A.....Ch 1 pos	b.....Ch 13 pos
B.....Ch 1 neg	c.....Ch 13 neg
C.....Ch 2 pos	d.....Ch 14 pos
D.....Ch 2 neg	e.....Ch 14 neg
E.....Ch 3 pos	f.....Ch 15 pos
F.....Ch 3 neg	g.....Ch 15 neg
G.....Ch 4 pos	h.....Ch 16 pos
H.....Ch 4 neg	i.....Ch 16 neg
J.....Ch 5 pos	j.....Ch 17 pos
K.....Ch 5 neg	k.....Ch 17 neg
L.....Ch 6 pos	m.....Ch 18 pos
M.....Ch 6 neg	n.....Ch 18 neg
N.....Ch 7 pos	p.....Ch 19 pos
P.....Ch 7 neg	q.....Ch 19 neg
R.....Ch 8 pos	r.....Ch 20 pos
S.....Ch 8 neg	s.....Ch 20 neg
T.....Ch 9 pos	t.....Ch 21 pos
U.....Ch 9 neg	u.....Ch 21 neg
V.....Ch 10 pos	v.....Ch 22 pos
W.....Ch 10 neg	w.....Ch 22 neg
X.....Ch 11 pos	x.....Ch 23 pos
Y.....Ch 11 neg	y.....Ch 23 neg
Z.....Ch 12 pos	z.....Ch 24 pos
a.....Ch 12 neg	AA.....Ch 24 neg

11.2 Bird Dog 3 – GeoTest ver 3 Cable –

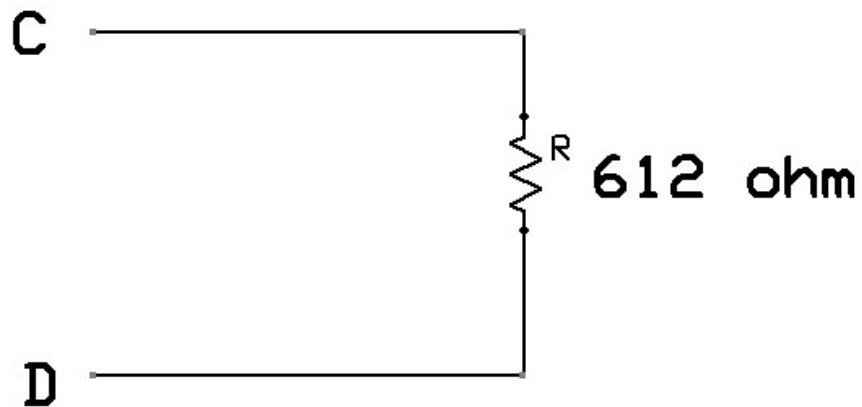
Geophone Plus -
(Ch1 +) - Pin A

Geophone Minus
(Ch1-) – Pin B

Pin C - Ref connected to 611 ohm resistor connected to Pin D

A ————— **Geophone +**

B ————— **Geophone -**



11.3 Bird Dog 3 – GeoTest ver 4 Cable –

Geophone1 Plus - (Ch1 +) - Pin A

Geophone1 Minus - (Ch1-) – Pin B

Geophone1 Plus - (Ch2 +) - Pin C

Geophone1 Minus - (Ch2-) – Pin D

Geophone1 Plus - (Ch3 +) - Pin E

Geophone1 Minus - (Ch3-) – Pin F