

Bondascope 350 Operator's Manual



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1 INTRODUCTION

All of us at NDT Systems, Inc. would like to thank you for your purchase of the BondaScope 350, Ultrasonic Bond Tester, an instrument that not only provides the best value and feature set currently available but will also provide you with many years of dependable performance.

The BondaScope 350 features the following:

- Membrane-sealed TOUCH-COMMAND control to simplify its setup and use.
- 5.7", 240 x 320 Pixel, high contrast, graphic Liquid Crystal Display (LCD) allows for simple, plain text menus.
- Variable Frequency, and Cycle Tone Burst Oscillator.
- Resonance & Pitch-Catch Mode along with Pulsed Mode for Broader Banded Probe Response.
- Ultra-portability available in a hand-held instrument incorporating NDT Systems' "Easy Grip" Custom Extruded Aluminum Case.
- State-of-the-Art RISC based Microprocessor-based design offers unparalleled performance for Bonding applications.
- Exclusive ScanBars feature permits a simple, analog metered display of Amplitude and/or Phase for easy & rapid view of bond trend.
- Scrolling 'BPM' (Bond Profile Mode) Scan - Standard. - Industry First in a bond tester
- Auto Probe Recognition (patented)
- Fully Adjustable Range - Standard
- Waveform Storage for up to 250 Screen sets along with their associated setups.
- 3 Default User Modes / Probe - Standard
- Alarm Limits in high speed scan mode.
- Alarm LED on Instrument & Probes
- USB Data Transfer Port permits upload of user setups & download of User Setups and stored screen information.
- Operates on 6 "AA" NiMh Batteries for up to 8 hours of continuous use.
- 1.8 lbs with batteries.
- Variety of Probes available to suit a range of applications.

1.1 IMPORTANT:

The BondaScope 350's unique design makes it one of the most portable and simple to operate Bond Testers available. However, in order for the owner of this advanced technology instrument to fully benefit from the unique features of the BondaScope 350, the assigned operator(s) must be experienced and well-founded in the fundamentals of ultrasonic testing. Also, it is highly recommended the operator be familiar with this manual.

When using the Bondascope series instruments always be sure the cables are in good working order and be sure to use cables no longer than necessary. Reduced performance and higher signal to noise ratios can be expected with cables longer than necessary.

1.2 General Features:

The BondaScope 300 & 350 are designed as portable and robust instruments provided in an aluminum extruded case with high impact plastic cover plates. The handle assembly is operated by loosening the knobs and pulling outward on the handle arms to disengage them from the indexing pins and rotate to the desired position. Re-engage the indexing pins and tighten the handle knobs.

2 AREAS OF APPLICATION

The BondaScope 350 inspects a wide range of Bonded on metals, plastics, ceramics, glass or virtually any other material which will satisfactorily conduct ultrasound, and has fairly parallel (or concentric) surfaces. The actual range is material and application dependent.

The durable custom extruded, design allows the unit to withstand the rigors of heavier industrial environments.

The All New BondaScope Series defines a new standard in ease of use, performance, features and portability in a Portable, Handheld Bond Tester. The ALL NEW BondaScope 350 operates in Continuous Wave, Tone Burst or Pulsed mode (depending on user application & probe selected) as well as Pulsed Pitch-Catch mode with Pulse Rates up to 300 Hz. Display Updates of 40+Hz. With the introduction of NEW, industry leading features including SplitView and SplitScan the BondaScope 350 presents the best indication and presentation of potential bond problems available today. NDT Systems, Inc. is unique in offering, for the first time in industry, the ability to scan a surface and map a Bond Profile in real time! This mode can be significantly easier to interpret for users of all levels. Other, SIGNIFICANTLY more expensive units may offer to store a TOTAL of a mere 20 waveforms; the BondaScope can store over 250 full scan sets!!

The concept of Scanning and presenting historic information on screen, in real time, allows the operator to assess the pattern over distance and/or time, thereby developing a trend pattern. This information can provide the operator with a higher level of confidence.

Setup is as simple as setting a probe over a good area and pressing NULL, then go over a bad area, set gain and/or alarm level threshold.

The high speed (120Hz refresh rate), sunlight readable display offers a full Quarter VGA resolution. The resolution of the display will appear to approach analog! User interface is via simple plain text menus located at the bottom of the display.

Examples subjects of evaluation:

Airframes/Aircraft Skins

Bulkheads

Crushed Core

Fiberglass

Adhesive Joints

Cardboard

Skin to Honeycomb

Skin to Skin Composite to Aluminum Honeycomb

Multi-Layer Aluminum Laminates

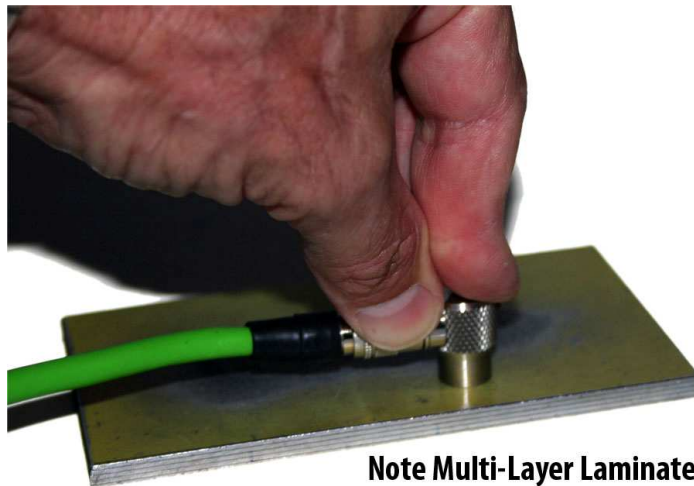
.... And More

3 PRINCIPLE OF OPERATION

The BondaScope 350 operates on a principle similar to sonar, operating in frequency ranges of 1 KHz to 1MHz

3.1 Resonance:

Resonance inspection is typically performed by inducing a continuous wave, fixed frequency to a very narrow banded probe or sensor head. When the probe is coupled to the sample under test, the acoustic impedance change within the material (due to unbounded or other conditions) loads the probe in a manner to affect its resonant frequency and amplitude.



Note Multi-Layer Laminate

3.2 Pitch-Catch:

The following figure explains the ultrasonic Pitch-Catch principle that the BondaScope 350 and its dual tip probe (transducer) employ. The probe's transmitter element (T) sends a short ultrasonic tone burst or pulse into the material. The burst or pulse traverses the surface of the material under test to the receiver tip. The frequency selected to provide the maximum flexural motion in the top layer thickness in the material under test. A variable time gate is used to select the position in the received echo envelope which has the greatest change in amplitude and or Phase when the probe is scanned from a bonded area to an un-bonded area.

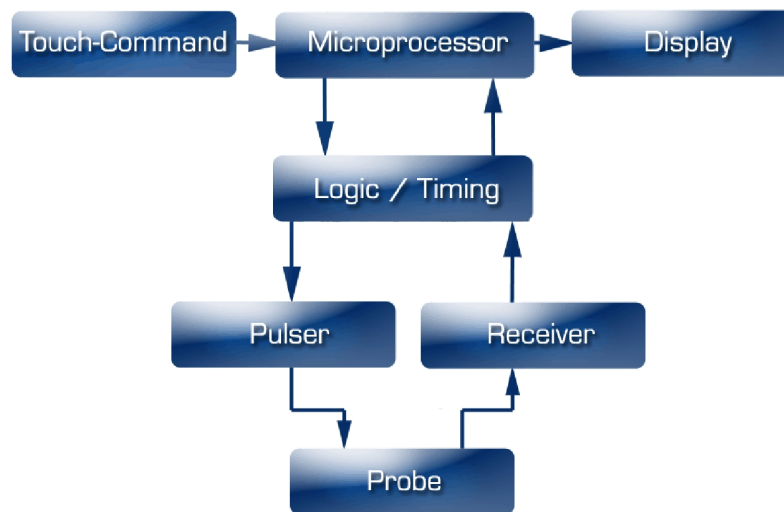
This round trip time is correlated to the material's thickness (i.e.. the thicker the material, the longer the round trip time). By precisely measuring the round trip time and compensating for the characteristic ultrasonic velocity of the material being gaged (sound velocity differs in various materials), an accurate thickness indication can be obtained.



4 4.0 BASIC DESIGN

The BondaScope 350 incorporates the latest technology available in microprocessor design. Through sophisticated on-chip programming, the RISC based microprocessor computes, transit time from one tip to the other, and directs numerous operations at high speeds. It also offers simplified setup and operation (gage calibration) via front panel TOUCH-COMMAND pushbuttons.

The Continuous Wave, Tone Burst or Pulsed transmitter, high-sensitivity receiver and informative digital display function in concert with the microprocessor to produce the unparalleled performance and ease of use in determining potential bond integrity.



Functional Diagram

5 Description of Connections

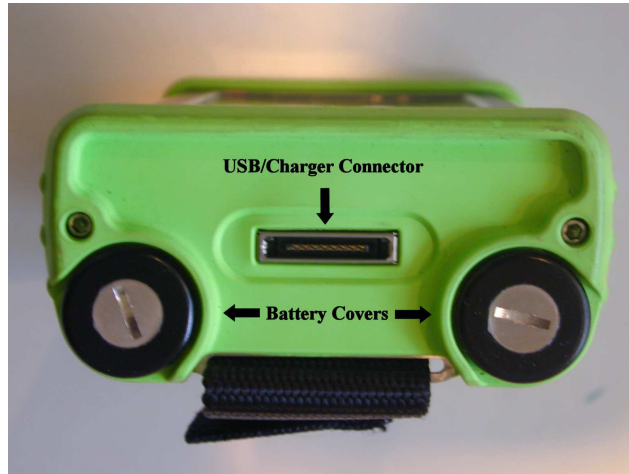
- 1) Probe Connection - 8 pin – Connector for BondaScope 300 & 350 Probes
- 2) USB/Charger connector on bottom panel. (BE SURE TO LOAD USB DRIVER PER INSTRUCTIONS BEFORE CONNECTING INSTRUMENT TO A PC)
- 3) Two battery covers (6 AA batteries 3 in each tube).



6 PREPARATION FOR USE

6.1 Batteries:

The BondaScope 350 comes with six “AA” NiMH batteries installed 3 in each battery tube. The batteries supplied with the unit are 2700 mAh Sanyo's, the 350 will run approx 8 hours with the backlight off.



When the batteries are within the instrument, check for satisfactory battery life by pressing the ON/OFF touch command to turn power on. A Battery Icon appears on the upper right side of the display indicating the current battery charge state. If the display readout fails to register more than 20% scale the batteries will need charging. When power becomes marginal, the Power-Guard Marginal Cutoff feature automatically turns the power off until the batteries are charged or replaced.

Battery Replacement:

Loosen (counterclockwise) the battery tube covers on the bottom plate of the instrument with a screwdriver or a coin. Remove the batteries and replace with another full set.

Often NiMH batteries that are not charging correctly in the instrument can be reconditioned in an external charger that is setup for reconditioning and be returned to service.

CAUTION:

Charging:

USE ONLY NDT Systems supplied charger. Plug the charger into wall and then into instrument. The “Charging” indicator will usually glow green for a second while the charge circuit determines the current state of charge and then turns RED to indicate a status of charging. When charge is complete, the indicator will return to GREEN.

While the 350 will run off of any AA batteries. ONLY USE THE CHARGER IF EITHER THERE ARE NO BATTERIES INSTALLED OR NIMH BATTERIES ARE INSTALLED. If Alkaline, NiCd, or any other chemistry batteries are installed and the charger plugged in damage may occur to the instrument.

NOTE: It is normal for the instrument to warm slightly while charging.

“An optional, conditioning external charger is also available for charging an extra pack while or conditioning/recalibrating a Li-Ion pack.”

Charge while operating is supported from any charge level.

6.2 Probe Selection :

Many probes are available supporting all test modes of the BondaScope 350 to optimize performance for the broad spectrum of inspection applications that may be encountered. The BondaScope 350 will automatically identify an attached NDT Systems, Inc. probe. Use of a particular probe for a given application is at the discretion of the user. Generally selecting a probe which permits the greatest amount of change on screen is an ideal candidate. Remember, NO couplant is required in the Pitch-Catch mode but is required in the resonance mode for the BondaScope to function.



6.3 Reference Samples - IMPORTANT!!

In order to use the BondaScope 350, or any other ultrasonic instrument for that matter, Reference Samples / Standards are essential. At the very least, when setting the BondaScope 350 for use, the user should have an idea of what is expected as a good area on the part under inspection and compare this area with an area suspected as bad. Bond testing is a comparative test method.

Reference Samples can be anything from specifically designed and manufactured "Standards" to samples acquired from known representative sources. Some of the samples in the picture below represent a cross section of various types.



7 KEYPAD AND OPERATION

7.1 ON/OFF COMMAND

Turn on the BondaScope 350 by momentarily pressing the ON/OFF key. Once the power is on and no buttons are depressed, the display will display NDT Systems, Inc Logo, Instrument type, & Software revision information. If no probe is attached the main screen will indicate so and go no further as shown in the image below on the left. Once a probe is connected a screen similar to the one on the right is displayed offering the user the option of selecting the default startup setting or recall a previously stored setup. The default setting is generally acceptable, as is, for a starting point in inspection. In the example the PCL series probe is selected and we have selected the default setting.



7.2 SETUP

The SETUP key provides a direct access method to the setup/recall menu for quick recall of user stored setups.

7.3 GAIN

The gain up and down keys are direct access keys to simplify setup as GAIN will likely be the most used key along with NULL.

7.4 MENU/ESC BUTTON

The MENU/ESC key is used to back out of a menu item below the main menu. For instance, ALRM menu item goes to another menu. When complete, press MENU/ESC to return to the main menu.

7.5 LEFT, RIGHT, UP, DOWN ARROW and ENTER Keys

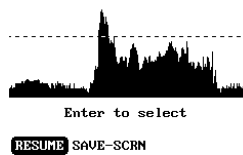
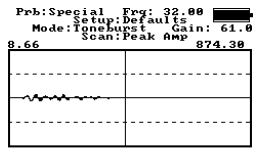
These keys help navigate the menu(s) as well as act on specific menu items. acts primarily as a shortcut key to the DISPLAY menu for rapid adjustment of the Scan Bar if desired. In several menus the LEFT ARROW acts to decrease associated menu values. To act on a menu item, highlight it and press ENTER. When finished, press MENU/ESC to return to the main menu.

7.6 NULL – Also acts as a BALANCING function where required

NULL sets a relative data value to the baseline or zero in both X & Y. Generally the NULL function is used in Phase mode to set a relative phase angle to zero. Example of use would be to place probe on a known good sample and press NULL. Any deviation from the NULL will appear as a positive deflection.

7.7 PROFILE

Bond Profile is a new and unique mode to assist the user in identifying potential delaminations. In the image to the right the BondaScope is set up to measure Phase and the surface of a composite to core is scanned for skin to core delamination. Any level which exceeds the threshold will trigger the alarm light on the instrument and probe.



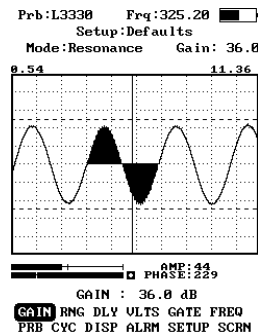
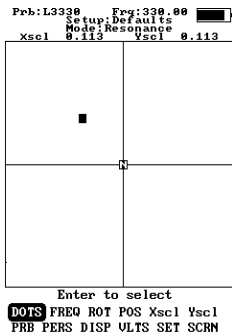
7.8 Alarm Key

The alarm key is a direct access to the alarm/ Beeper menu. It toggles the beeper on or off.

7.9 MODE Keys (RF/DOTS, SWEEP & GATES)

7.9.1 RF / DOTS Key

Toggles an impedance display or, when pressed a second time, an RF view of the currently attached probe. If a resonance probe is attached a Continuous Wave (CW) representation will be displayed. If a Pitch-Catch probe is attached, a Tone Burst will be displayed in the RF mode.



7.9.2 SWEEP Key

The SWEEP function provides a means to BALANCE the attached transducer/instrument combination as well as the setting the Start and Stop frequency range.

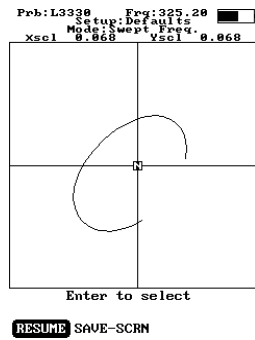
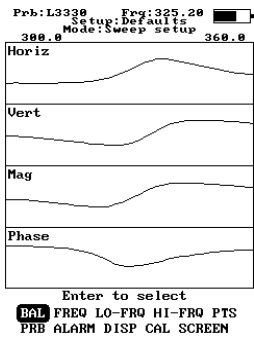
7.9.3 GATES Key

Mode dependant. Acts as a hot key to the appropriate gate menu.

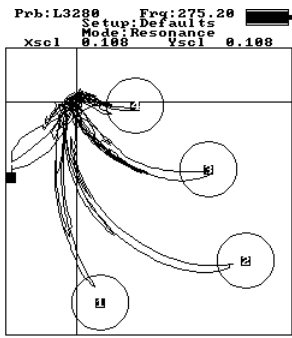
Balancing automatically sets optimal internal parameters to maximize amplification and scaling values to best match probe, instrument and material under test.

In resonance, when a probe attached and default parameters are selected the BondaScope 350 will auto Balance and bring the user to the sweep screen to accept or adjust otherwise.

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The image to the right is an example of a 330KHz probe running uncoupled in air from 300KHz to 360KHz. Though sweeping in a “resonant” mode seems counter intuitive, various samples tested exhibited a more dynamic screen presentation when presented with various defects which, generally alerts the user in a very visual manner. Generally, this mode of scanning is not very quantitative but rather, is useful for quickly locating areas of unbond to be further interrogated in a conventional impedance plane mode as shown here.



8 MAIN SCREEN & MENU Items

8.1 Main Menu Screen

From the main menu place the cursor over a desired icon and press the ENTER key.

Note: the MAIN menu may also be reached by pressing the MENU/ESC button on the front panel or by pressing and holding the knob depressed for 2 seconds.

The Menus in the BondaScope 350 are context or mode sensitive. For instance, if the unit is in the RF mode, (as with the pitch catch mode) the display will take on the characteristics of the mode. If in impedance, then the appropriate menus will be displayed.

When the unit is first turned on, the following is displayed if a probe is connected (This image shows an L3330 Resonance Probe is connected as an example):

The probe connected and frequency as well as battery charge indicator. If no battery were present and unit was running on charger, the battery icon will display AC in its icon

The next line identifies which mode and setup parameter (default or user setup) the BondaScope is currently operating in.

The third line identifies the BondaScope is operating in Resonance, Pitch-Catch or MIA

The two sets of numbers over the waveform display indicate the range start and stop or the X-Scale and Y-Scale values if in the impedance plane mode.

The waveform display may have the following features Vertical Gate Line, Dotted horizontal threshold limits - positive and negative and the waveform itself. Note one of the cycles on the waveform is filled in. This is the actual cycle the BondaScope is working with.

If the impedance plane mode is active, a cross hair will be displayed with an "N" at the cross points.

The next item below the waveform display are Level Bars (if in the RF mode), indicating the amplitude and phase level off the NULL position. The vertical lines in the bars are the individual amplitude and phase alarm threshold levels. If in the impedance mode, menu items will be displayed.

There will be a dot to the right of the scan bars as an indication that the specific phase or amplitude alarm is ON. If the threshold were not triggered it would be just a dot to indicate the alarm is active. The square around the dot indicates the amplitude alarm is in a triggered condition. The phase alarm is currently turned off in this example.

The following line is the active menu item selected. If RNG (range) were selected that line would indicate "Range : XXX" where XXX is the current value of range.



8.2 MAIN MENU ITEM DESCRIPTION

If in Pitch-Catch, RF or TONEBURST Mode

8.2.1 Gain

Gain can be changed via this menu item or the Direct Access Keys. As a matter of convenience, the GAIN Direct Access Key can be used while in any other menu item without re-scrolling through the menu to return to a previous position. The knob can also be used.

8.2.2 RNG – RANGE

Selects the value of the total screen range. Start and stop values are displayed over the waveform.

8.2.3 DLY – DELAY

This is the screen Delay or waveform position within the window

8.2.4 VLTS - VOLTS

Sets the desired drive voltage. Upper limit of voltage drive is determined by the probe attached.

8.2.5 GATE

Select GATE, Press ENTER to select & use the Up or Down Arrow Keys to select the cycle in the received signal envelope. This will be the position the Phase measurements are taken and NULL(ed) from.

8.2.6 FREQ – FREQUENCY

Frequency is available only when the Tone Burst probes are attached and is not available when the LOW Frequency (High Power) or broader banded probe is installed. To optimize the frequency to be used with a given material, place probe on a good surface of the material under test and adjust the frequency up or down to attain a maximum amplitude response. This will vary slightly for various materials, thicknesses and geometry. Generally speaking though, the default value may work just fine.

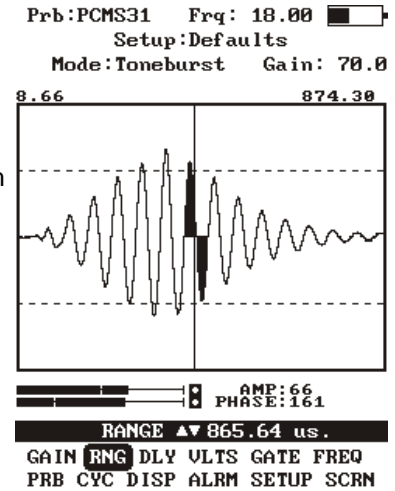
Next Menu line down

8.2.7 PRB – PROBE

Returns to the power on screen to select another probe or setup. If in the top most menu item "AUTO" simply plugging in a new (NDT Systems) probe will identify and select the attached probe. The selection options are then DEFAULT or LAST. The BondaScope 350 keeps track of the last probe type connected in association with that probe type. It does not keep track of the specific serial number attached to the probe. So, for instance, if a probe model number PCHS31 were connected, removed and another PCHS31 were attached, the setup could be selected but due to minor variances in the probe, slight adjustments may be required.

8.2.8 CYCLES

The number of cycles driving the probe in the Tone Burst Pulsar. Set Cycles to optimize received signal envelope symmetry and amplitude.



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Cycles is available only when tone burst style probes are connected. Pulsed Pitch-Catch probes will not offer this selection.

8.2.9 DISP

8.2.9 DISP

Display Menu. When selected, press enter which opens to a new menu and permits the adjustment of baseline OFFSet and the screen FREEZE and GRID feature.

8.2.9.1 FREEZE

The screen freeze feature allows the operator to press freeze which will allow the possibility to save the frozen screen to memory for later transfer (with optional transfer cable and software)

8.2.9.2 OFFS – Offset

Permits changing the vertical position of the baseline

8.2.9.3 – GRID

Turns the screen reference grid on and off

8.2.10 ALRM – ALARM

When highlighted, press ENTER to display Alarm Menu (as illustrate to the right). Functions in this menu are as follows:

8.2.10.1 - BUZZ - On or Off

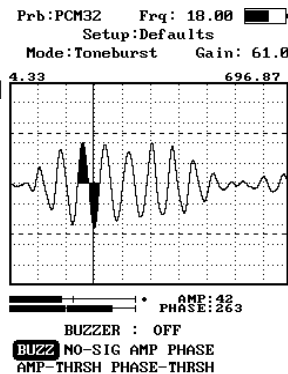
8.2.10.2 - NO-SIG - Alarms on loss of signal - Signal below threshold(s)

8.2.10.3 - AMP - Amplitude Alarm - On or Off

8.2.10.4 - Phase - Phase Alarm - On or Off

8.2.10.5 - AMP-THRESH - Sets the threshold level the amplitude alarm triggers

8.2.10.6 - PHASE-THRESH - Sets the Phase Degree change before alarm condition met. Default is 90 Degrees from NULL value.



Remember, Both amplitude and phase or any combination can be set. If material and unbond is particularly sensitive to amplitude there would be no reason to select Phase as well. The reverse may be true regarding Phase.

8.2.11 SET - SETUP

This is where the operator saves customized setups. One normally starts with one of the default setups and modifies it to suit a particular application. The user is offered up to 30 characters to name a file. In addition there are 8 lines of comments available each offering 30 characters. These memos are saved with the setup. In this regard, the inspection designer can name and comment the purpose of the inspection and or mention specific areas of interest during an inspection as an example. The following illustrates the SETUP saving options.

Prb: PCH32 Frq: 35.80
 Setup: Defaults
 Mode: Toneburst Gain: 54.0

Prb: PCH32 Frq: 35.80
 Setup: Defaults
 Mode: Toneburst Gain: 54.0

NAME:
 This is a SAMPLE setup

COMMENTS:
 1st of 8 lines of 32 chars

1	2	3	4	5	6	7	8	9	0	=	Bk
q	w	e	r	t	y	u	i	o	p	[]
Cap	a	s	d	f	g	h	j	k	l	:	Ent
Shf	z	x	c	v	b	n	m	.	/	Up	
Ins	Del	Space	Lft	Rt	Dn						

AMP: 1 PHASE: NoSig
 Enter to select
 Save New Setup #1
 RECALL **SAVE**

AMP: 1 PHASE: NoSig
 Enter to select
 Save New Setup #1
SAVE EDIT CLR-TXT

From the MAIN MENU Screen press ENTER on SETUP Menu Item. From this menu the user can SElect a previously saved setup or elect to SAVE a new one. If the user elects to load a previous setup, press SEL and select from the list of previous saved files. If the user elects to save a new setup select SAVE and move to the next menu (figure)

From the SAVE - EDIT menu the user can select to save their custom inspection parameter. You can save with the default name presented i.e. USER#3 alone or further edit the name. See the next illustration

When EDIT is selected from the previous screen, the user is presented with this menu to allow full QWERTY keyboard style text editing for both file name and additional comments. When complete, press MENU/ESC to return to the previous

screen above and press SAVE or CLR-TXT should you decide the default name is sufficient.

8.2.12 SCRN - SCREEN SAVE

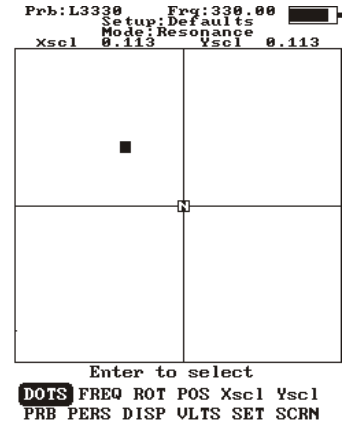
Screen Save follows the same convention and options as the SETUP save and recall feature. Please refer to section 8. 1.10

8.3 MAIN MENU ITEM OPERATION

If in Impedance Plane-Resonance Mode

8.3.1 DOTS

- Dots selects a sub menu where screen position is stored for up to 8 places. A ring, square or elliptical gate can then be set, sized and an alarm can be activated for that gate. The following are the sub gate functions
- DOT# - Activates a specific dot to work on when multiple dots have been set on screen.
- STORE – Sets the current flaw screen position when pressed and identifies it by applying a number to the location. Once set, the DOT# will auto increment to DOT#2 and so on.
- ERASE – Erases the selected DOT#. Renumbers any dot over the number selected if they exist.
- GATE – Selects gate type. Either RECT, ELIPSE or OFF
- WID – Gate Width. Makes the gate wider or narrower.
- HT – Gate Height. Increases or decreases gate height.

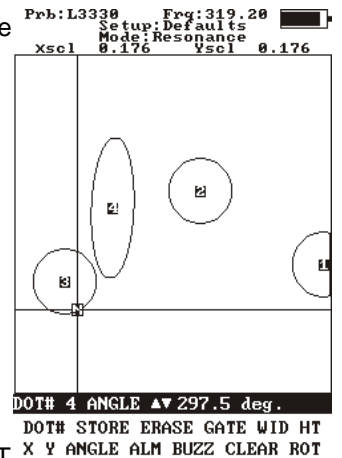


NOTE: A relative number is displayed in the status line below the active screen to aid is setup. A square gate would be had by selecting equal WID & HT

NEXT ROW

- X – Manually sets the X or horizontal position of the selected DOT#
- Y – Manually set the Y or vertical position of the selected DOT#
- ANGLE – Sets the DOT's angle
- ALM – Sets alarm trigger to either IN or OUT of the selected gate geometry
- BUZZ – Turns the Audible alarm ON or OFF
- CLEAR – Clears ALL Reference DOTS from the screen to start over.
- ROT – Rotates the screen with the DOTS following in tact to allow for optimal positioning of DOT geometry with reference to screen location

In this image example, the screen has the same stored dot positions as "Resonance 1 - Dot Screen" except the screen has been optimized to allow for increase in scale by repositioning the NULL cross hair to a more lower left position. The SCALE could then be increased and, one of the GATES was set to elliptical. These functions are generally not offered in competitive instruments.



8.3.2 FREQ - FREQUENCY

Permits manual adjustment of frequency. Nominal frequency is set when probe is attached. Balanced Frequency is set at any user selected balance interval.

8.3.3 ROT – ROTATE

Rotates the screen with the DOTS following in tact to allow for optimal positioning of DOT geometry with reference to screen location

8.3.4 POS - Position

Sets the crosshair Null point to any desired position on screen. This is useful if all impedance plane action is within one quadrant for instance. In this case the screen can be rescaled to maximize the separation between dots. 2Sample Setup Configuration

8.3.5 Xscl – X Scale Factor

Permits scaling of the X axis independent of the Y axis

8.3.6 Yscl – Y Scale Factor

Permits scaling of the Y axis independent of the X axis.

8.3.7 PRB – Probe

Returns to the power on screen to select another probe or setup. If in the top most menu item "AUTO" simply plugging in a new (NDT Systems) probe will identify and select the attached probe. The selection options are then DEFAULT or LAST. The BondaScope 350 keeps track of the last probe type connected in association with that probe type. It does not keep track of the specific serial number attached to the probe. So, for instance, if a probe model number PCHS31 were connected, removed and another PCHS31 were attached, the setup could be selected but due to minor variances in the probe, slight adjustments may be required.

8.3.8 PERS – Persistence

Sets a form of Digital Persistence to keep dot path illuminated for easier visual tracing of dot path. Options are LOW – Short duration, MED – Medium Duration, HI & CLEAR. When on HI the screen does not erase path lines until manually cleared

8.3.9 VLTS – Volts

Adjusts probe drive voltage

8.3.10 SET – Setup

Refer to 8.2.10 for detailed instruction

9 9.0 Front Panel Keys

Many of the front panel keys are also available from within the menu structure. A few are not.

9.1 PROFILE - Bond Profile Front Panel Key

Perhaps the most innovative, intriguing and productive feature of the BondaScope 350 is the unique scrolling Bond Profile Mode feature. This feature is actually a time encoded profile of the relative bond conditions within a material. To activate the feature press the BOND PROF key on the front panel. The user will be presented with a SplitScan view of the received signal envelope as well as a high speed moving graphic representation of the change in Amplitude or Phase on a trended, timed basis.

This mode can be far more intuitive than a flying dot or waveform movement alone in that it presents the user with a trend over time of the area inspected. Without this mode, data can be missed with the simple blink of an eye. NDT Systems, Inc is proud to offer this feature for the first time.

There are 3 profile modes accessed by sequentially pressing the PROFILE key. The BondaScope will clear the display and notify the user of the mode it is entering. The PROFILE mode of operation will then be displayed at the top of the screen thereafter.

MODE - Amplitude only - Plots received signal amplitude alone. Also known as a form of "Impulse" mode.

MODE - Phase Only - Plots the phase angle from 0-180 degrees.

MODE - Signature - A unique graphic representation of the surface under inspection whereby the operator can scan quickly for anomalies which come out of the baseline and further refine inspection beyond. This operates in a form of Phase sensitivity without the need to set a NULL value. It is primarily a method of quickly identifying areas as referenced to localized adjacent areas. Although you can set phase alarm on and null in this mode, its purpose is generally speed of scanning.

9.2 SETUP

Provides direct access to the SETUP recall menu

9.3 GAIN

Manual up and down front panel control.

9.4 ALARM

Toggles alarm Buzzer on and off

9.5 NULL

Nulls the probe selected in several ways. If in resonance and in the impedance plane mode, the Dot will be centered about the crosshairs of the display.

If in the Pitch-Catch mode, Null will set the Phase value to baseline for PROFILE mode.

10 INSPECTION TIPS & TECHNIQUES

10.1 Resonance Sample Setup Procedure

:

This is to provide a brief description for setting up and using a resonance probes on the Bondascope 350/350.

- \$ Select the proper resonance probe for the application
- \$ Select the BL8-S6 or BF11-S6 (350) Cable for use. Attach probe to Cable.
- \$ Plug Cable into appropriate connector socket located on the top panel of gage.
- \$ Turn gage on.

If AUTO-PROBE is on the screen will show that the probe part number (i.e. L3330, etc.) has automatically been selected. If the probe is not automatically selected, a probe list will appear on screen to perform the following step(s):

- \$ Use the up/down arrow keys or the encoder knob to highlight "AUTO-PROBE" on the display screen. Press "ENTER" on the keypad to turn on function. The screen display will show the probe part number of the probe selected.

OR

- \$ Use the up/down arrow keys or the encoder knob to highlight the probe part number from the list of probes. Press "ENTER" on the keypad to turn on function. The screen display will show the probe part number of the probe selected. (Note: You will not be in the AUTO-PROBE Mode)
- \$ Use the up/down arrow keys or the encoder knob to highlight "DEFAULT" for a first time setup or "LAST" for a previous non saved setup. Press "ENTER" (Stored setups can accessed in this matter.)
- \$ **If DEFAULT is selected**, the instrument will automatically go to, and perform a Probe BALANCING function. This sets the resonant frequency of the probe as well as internal "best fit" parameters for gain and Analog to Digital operational functions.

CALIBRATION

To set probe resonance frequency (balance):

1. Press "SWEEP" on the front panel.
 2. Highlight BAL in the menu and then press the ENTER key to balance the probe.
 3. Press ENTER key again to accomplish and Air-NULL for conventional Resonance inspection.
 4. Press RF/DOTS to return to the impedance display. (If the RF display is first apparent, press the RF/Dots button again. Recall that this key acts as a toggle function key, in this case toggling from RF to DOTS.
 5. Place probe on an area of the sample considered good
 6. Press NULL - this places the DOT in the center of the cross hairs. Any deviation from NULL will result in a planar movement across the display
 7. Enter the DOTS menu item to set and position any gating and alarming desired. Adjust gain and rotation as required to get the best liftoff to defect separation
- \$ Optional Method: Place probe on "Good" area of cal standard. Press "NULL" on the front panel. Next, place probe on defect area of cal standard. Press the "ENTER" key to accept.
 - \$ Press SWEEP key again to enter into Swept Frequency Inspection Mode.

10.2 PITCH-CATCH Sample Setup Procedure

This is to provide a brief description for setting up and using a Pitch/Catch probes on the Bondascope 350/350.

- \$ Select the proper Pitch/Catch probe for the application
- \$ Select the BL8-BL8 or BF11-L8 (350) Cable for use. Attach probe to Cable.
- \$ Plug Cable into appropriate connector socket located on the top panel of gage.
- \$ Turn gage on.

If AUTO-PROBE is on the screen will show that the probe part number (i.e. PCM32, etc.) has automatically been selected. If the probe is not automatically selected, a probe list will appear on screen to perform the following step(s):

- \$ Use the up/down arrow keys or the encoder knob to highlight "AUTO-PROBE" on the display screen. Press "ENTER" on the keypad to turn on function. The screen display will show the probe part number of the probe selected.
- OR
- \$ Use the up/down arrow keys or the encoder knob to highlight the probe part number from the list of probes. Press "ENTER" on the keypad to turn on function. The screen display will show the probe part number of the probe selected. (Note: You will not be in the AUTO-PROBE Mode)
 - \$ Use the up/down arrow keys or the encoder knob to highlight "Defaults" for a first time setup or "LAST" for a previous non saved setup. Press "ENTER" (Stored setups can accessed in this matter.)

CALIBRATION

To set probe Pitch/Catch frequency :

- \$ Press "SWEEP" on the front panel.
- \$ Press "NULL" on the front panel.
- \$ Place probe on "Good" area of cal standard. Press "ENTER" on the front panel. Next, place probe on defect area of cal standard. Press "ENTER".

Press "RF/DOTS" on front panel to display RF. Adjust Gain, Range ,Delay , Cycles to get best defect response.

10.3 Care and use of Pitch-Catch Probes

Pitch-Catch probes are sensitive measurement devices. Use care when handling them The tips are sensitive and if dropped, will likely, significantly damage the probe beyond use. Also, at the very least the tip may be broken within the Transmit or Receive tower if care is not used. This is not a user serviceable part and is not covered under warranty. The probe can be sent back to the factory for repair at prevailing rates.

To replace the tips when worn, simply pull them from their housings and replace with new tips. It may be helpful to moisten the tip prior to insertion to settle into the internal suspension rings. DO NOT FORCE the tip in or element damage WILL occur.

Probes offer several modes of use. There are 6 threaded holes on the bottom surface. To use the probe more within a spring loaded, constant pressure condition, we install 2 guide feet just behind the probe tips and a single foot at the rear (cable) end of the probe. This provides a relatively stable scanning position. On the other hand, if you prefer to scan with more control on probe pressure move the guide feet into desired position. For instance, a single foot in the rear will give a standard Tri-Point configuration providing a stable scanning condition.

10.4 Amplitude Inspection

When scanning in Amplitude, try setting the probe on a known unbonded surface and set the GAIN to an appropriate level such as 80 or 90%. Now, when you move to a good area, the amplitude will generally be much lower. Continue setting the Gain and or threshold as desired. This assumes the material under test is amplitude sensitive.

10.5 Phase Inspection

Set the probe on a surface and adjust the Frequency and Cycles as described earlier if using Medium Frequency Probes. Set the GATE to a gain stable single cycle. One which won't go through cycle nulling. Typically this is earlier in the signal envelope. Set the gain on a good or bad area to about 80% and then add 10-20dB gain. This assures the BondaScope can use its unique ability to track minute changes in phase. Set Phase Alarm and Beeper on if desired. When complete, NULL on a good part and enter the BPM if desired.

10.6 Signature Mode

Follow similar procedure as Phase. Alarms can be but are not recommended in this mode as this represents the highest scan speed. Also, the real benefit is the ability to move anywhere on similar layups without the need to null. In one demonstrated situation we have set the signature mode to scan and identify suspect areas on Aluminum skin to Al core, Nomex or paper all without the need to null. You likely won't have these extremes but it makes identification easy.

Clean Surface:

Prior to gaging, always remove performance hindering foreign substances from the material surface (e.g. dirt, loose scale, corrosion, particles, and flaking paint).

10.7 Excessive Surface Roughness:

Very rough surfaces can cause erratic, extremely noisy or irregular readouts. In such cases, consider scraping, sanding, grinding or smoothing the surface enough (if the situation allows) to obtain a proper response (provided such a procedure and the amount of metal removal are acceptable). Otherwise, try applying some Teflon tape to the tips of the probe.

10.8 Compound Contours:

Assure the probe remains in a similar position as relates to the part. Substantial changes in geometry can significantly effect the null point. This is an area to consider the Signature mode to start off.

10.9 Non-Parallel Surfaces:

These surfaces are generally not affected a great deal since the Pitch Catch mode is generally a surface oriented inspection. As the two surfaces approach each other there will likely be some interaction. Experimentation is the best path.

10.10 Material Temperature Effects:

The dimensions, ultrasonic velocity, and surface flexural properties of a material change with temperature, which, in turn affect the inspection. An area in the sun will likely exhibit a different NULL than that in the shade for instance. Again, Signature mode can help even out the appearance of NULL offsets.

The situation becomes more complex when the material temperature is considerably different than ambient. One solution is to calibrate on a reference sample at the same temperature as the material. Another solution is to calibrate on a reference sample at ambient temperature and then add an experimentally derived correction factor for the temperature of the material.

10.11 Excessively Attenuative Materials:

Some materials (fibrous, porous, large-grained, etc.) may absorb or scatter so much ultrasound that either a reading cannot be obtained or some abnormal reading (usually abnormally thin) occurs. These types of materials require the higher power capabilities of the Bondascope 3100 in conjunction with a Special Low Frequency, High Power Probe.

10.12 Honeycomb Cell Shape on Directionality Effects:

In structures where the cell of the honeycomb is not symmetrical it is advised to keep the probe in the same relative orientation as that when the probe was NULL(ed), particularly while in the phase or Mode 2. The transit time and flexural properties are different in either orientation. Once again, the shifts in phase are greatly reduced in appearance in the signature mode. Experimentation will demonstrate this anomaly.

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11 BondaScope Series - Features, Options, Probes and Accessories

MODEL	
BondaScope 3100	<p>ULTRASONIC BOND TESTER The BondaScope 3100 incorporates features including Pitch-Catch, Resonance Impedance Plane Mode, and an adjustable, Hi-Energy fixed frequency Mechanical Impedance Analysis Mode (MIA) as well as a Swept Frequency MIA (SweepMI) Mode bringing the MIA mode to a more useful and interpretive purpose.</p> <p>Included in the BondaScope 3100 package: Li-Ion Smart Battery, 110/220VAC Universal Charger, USB Cable and software, Operating Manual, Pelican Style Carry Case, and COC</p>
BondaScope 350	<p>ULTRASONIC BOND TESTER The BondaScope 350 incorporates features including a 3.9" LCD 240x320 Display, Tone Burst and High Energy Pitch-Catch Mode, both fixed and sweep frequency as well as Resonance Impedance Plane Mode. Gating features 8 user positioned reference points with the ability to individually size round, rectangular or ellipse alarm areas about each point. Other exclusive features include Bond Profile Mode (BPM) as well as a real time X, Y, Phase & Amplitude Reference Sweep Display</p> <p>Included in the BondaScope 350 package: 6ea NiMH 'AA' Batteries, 110/220VAC Universal Charger Adaptor, USB Cable, Operating Manual, Pelican Style Carry Case, and COC</p>
BondaScope 300	<p>All New BondaScope 300 Pulsed Pitch-Catch Miniature Bond Tester Incorporating Probe Auto Sense. Includes Pelican Style Carry Case. Includes 1 yr Warranty</p>
L3110	Resonance Probe – 110KHz – Laminated Structures - 6 Pin Connector – NDT Auto I.D. Bondmaster Series S-PR-3, S-PR-3L Type
L3165	Resonance Probe – 165KHz – Laminated Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 - L1 Type Bondmaster Series S-PR-4, S-PR-4L Type
L3200	Resonance Probe – 200KHz – Laminated Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 – L4 Type
L3250	Resonance Probe – 250KHz – Laminated Structures - 6 Pin Connector – NDT Auto I.D. Bondmaster Series S-PR-5, S-PR-5L Type
L3280	Resonance Probe – 280KHz – Laminated Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 – L2 Type
L3330	Resonance Probe – 330KHz – Laminated Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 – L3 Type Bondmaster Series S-PR-6, S-PR-6L Type
L3370	Resonance Probe – 370KHz – Laminated Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 – L6 Type
H318	Resonance Probe – 18KHz – Honeycomb Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 – H1 Type
H326	Resonance Probe – 26KHz – Honeycomb Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 – H2 Type
H353	Resonance Probe – 53KHz – Honeycomb Structures - 6 Pin Connector – NDT Auto I.D. BondaScope 2100 – H3 Type
PPCL-1RC	Pulsed Pitch-Catch, Low Frequency– Auto Sense Capable
PPCM-2RC	Pitch-Catch, Med Frequency– Auto Sense Capable
PPCH-3RC	Pitch-Catch, High Frequency Pitch-Catch – Auto Sense Capable
PCHS31	Pitch-Catch, High Frequency - SPRING LOADED

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PCMS31	Pitch-Catch, Medium Frequency - SPRING LOADED
PCLS31	Pitch-Catch, Low Frequency - SPRING LOADED
PCLHP32	Pitch-Catch, Low Frequency - HIGH POWER FIXED TIP
PCLHPS31	Pitch-Catch, Low Frequency - HIGH POWER SPRING LOADED
PCH32	Pitch-Catch, High Frequency - FIXED TIP
PCM32	Pitch-Catch, Medium Frequency - FIXED TIP
PCL32	Pitch-Catch, Low Frequency - FIXED TIP
PC-TIP	Replacement Tips for ACTIVE Part of Pitch-Catch Probes – AMBER in color Incorporates Snap-In design to prevent Foreign Object contamination Sold as pair
PC-FEET	Replacement Stabilizing Tips. Sold in sets of 3
M31	Mechanical Impedance Probe – MIA ¼" Tip
M32	Mechanical Impedance Probe – MIA 3/8" Tip
M33	Mechanical Impedance Probe – MIA 1/2" Tip
BPK-01	Bond Probe Kit incorporating: Resonance L3110 - 165 KHz L3250 - 250 KHz L3330 - 330KHz Pitch-Catch PCMS31 – Medium Frequency – Spring Loaded Tips PCB32 – Broad Banded High Voltage – Fixed Tip MIA M32 - Medium Tip Mia MIA-SL – MIA Spring Loaded Housing Cables & Accessories – (NDT Systems BondaScope 350 and Staveley/Olympus Bondmaster compatible) BF11-F11 – Fischer 11 Pin to Fischer 11 Pin (MIA & P-C) BF11-S6 – Fischer 11 pin to 6 Pin – (Resonance) Liquid Couplant (4oz) Hard Shell Carry Case
BONDDT-KIT	DATA TRANSFER CABLE & WINDOWS BASED BondaScope Data Transfer Software Connects BondaScope 350 Data Port to USB Port of PC for download of Stored Data in a BMP format for easy import to Word, PowerPoint or other software.
BF11-S6	PROBE CABLE – 350 to Resonance Probes Fischer 11 pin to 6 Pin Connector – 6 feet long
BF11-L8	PROBE CABLE – 350 to NDT Pitch Catch Fischer 11 pin to Lemo 10 Pin Female 6 inch long cable adaptor
BF11-F11	PROBE CABLE – 350 to Bondmaster Pitch-Catch and MIA Probes Fischer 11 pin to 11 Pin Fischer Connector – 6 feet long
BL8-BL8	PROBE CABLE – 300/350/350 to Pitch-Catch – Compatible with all BondaScopes Lemo 8 Pin to Lemo 8 Pin – 6 feet long
BF11-L10	PROBE ADAPTOR – BondaScope 350 to BondaScope 2100 Probes Fischer 11 pin to Lemo 10 Pin Female 6 inch long cable adaptor
BL8-L10	PROBE ADAPTOR – BondaScope 350 & 350 to BondaScope 2100 Probes Lemo 8 pin (available on both the 350 & 350) to Lemo 10 Pin Female (as used on the BondaScope 2100) 6 inch long cable adaptor
PPC-C6	PROBE CABLE , 6ft long – Adapts PPC-RC Probes to BondaScope 300
MIA-SL	Fixture - MIA Right Angle Spring Loaded Housing

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LC350	Leather Carry Case for BondaScope 350. Incorporates a removable neck strap.
LC300	Leather Carry Case for BondaScope 300/350. Incorporates a removable neck strap.
CC350	EQUIPMENT CARRYING CASE Black Pelican Style Case, with custom cutout foam padding & plastic couplant squeeze bottle.
BPL-104	Battery Pack for BondaScope 350
BCL-1	Conditioning, external rapid charger for BPL-104. Charge, conditions and recalibrates primary and/or additional battery packs.

12 SPECIFICATIONS:

Modes: Resonance (RF & Flying Dot); Pitch Catch (Tone Burst - Adjustable Frequency, Cycles and Amplitude) High Energy Pulsed Mode. Swept Frequency;

Display: 240 x 320 Pixels, Quarter-VGA, LCD

Probe Connector: 8 Pin Lemo

Frequency Range: 250Hz - 1.5MHz Probe and setup specific

Alarms: Box, Polar and up to 8 individual and individually-sizable "Ring Gates" centered at stored Reference Dot locations in Impedance Plane operation. Positive or negative operation. LED Front Panel, Buzzer and LED Probe mounted supported.

Storage: 100 Setups and 250 Screens with Real-Time Date and Time Stamp. Full 32 character Alpha-Numeric File naming with 8 lines of 32 characters for user comment or instruction.

Inputs & Outputs: TTL for Alarm - Positive or Negative, Latched or Momentary, 0-5VDC - Phase, Amplitude, X and Y Dot Location. Rate continuous in Resonance and Mechanical Impedance

USB I/O - External USB adaptor optionally available.

Analog Output - +/- 2.5 volts -Referenced to NULL

Signal Processing - Initially determined by probe connected. User can adjust beyond optimal parameters as necessary. Trace vector rotation, Screen NULL Crosshair Offset are user adjustable.

Printer not directly supported - Available via an optional NDT Systems, Inc. Windows based data transfer software utility.

Power: 6 AA NiMh batteries. Approximately 8 Full Hours of operation with backlight off.

Charging of the NiMh batteries and Operation are simultaneously supported for full time operation

Optional external Conditioning Fast Charger available: Helps provides extended battery life and charge condition calibration. 85-240VAC Auto Sensing

Dimensions: 9.25"H x 5.5"W x 2.9"D - (235x140x74mm)

Weight: 5.5 Pounds including battery

Operating Temperature: -10° to 140°F (-23° - 60°C)

Included in Standard Package:

Pelican Style transport case

Desktop charger module w/country specific plug (specified at time of order)

User's Manual

Probes and cables are extra as they are generally application specific.

Options:

Full Range of Resonance, Pitch-Catch and cables

Instrument Soft Pouch, Bond Profile Encoding Cart

USB interface cable

Software - Windows Based.

Bondascope 350 Operator's Manual

Contact Us regarding
Probes, fixtures and custom application requirements.

NDT Systems, Inc.
5542 Buckingham Drive
Huntington Beach, CA 92649

1.877.455.4NDT

Toll Free US, Canada, Mexico

1.714.899.4NDT

Local and International

Bondascope 350 Operator's Manual

13 PRODUCT WARRANTY

NDT Systems, Inc. (hereinafter NDT Systems) warrants that reasonable care was used in the choice of materials and the manufacture of this instrument, and that the instrument conforms to the published ratings and characteristics applicable to the instrument at the time the instrument is shipped to the Buyer. This warranty shall extend for a period of one year from the date of shipment of the instrument (FOB Seller's plant) and shall in no event extend beyond such term. The Buyer shall notify NDT Systems by registered or certified mail, return receipt requested, of any claim of discovery of such defect. Failure to notify NDT Systems within the time and in the manner specified herein shall constitute a waiver of any such claim of defect or breach of warranty. The final determination of the existence of a defect or breach of this warranty shall be made by NDT Systems. This warranty shall extend to the Buyer only, and shall not be assignable or transferable to any other person.

DISCLAIMER OF WARRANTIES

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANT ABILITY OR FITNESS FOR A PARTICULAR PURPOSE. OTHER THAN THOSE WARRANTIES SET FORTH IN THE PARAGRAPH ENTITLED "WARRANTY" ABOVE. The above warranty shall not apply to digital panel meters and items with a limited life, such as batteries, probes or cables, nor to any instruments which have been subjected to misuse, improper installation or repair, alteration, or use beyond the published maximum ratings of the instrument.

BUYER'S REMEDIES

The Buyer's sole and exclusive remedy for breach of the above warranty shall be the repair or replacement (at the discretion of NDT Systems) of the instrument by NDT Systems free of charge. The Buyer shall return the instrument to NDT Systems, transportation prepaid. NDT Systems shall promptly repair or replace the instrument and return same to Buyer, FOB Seller's Plant, collect. If, for any reason, NDT Systems is unable or unwilling to repair or replace the instrument or because of circumstances, the exclusive remedy provided herein fails of its essential purpose, or operates to deprive either party of the substantial value of its bargain then the Purchaser's exclusive remedy will be the return of the purchase price for the instrument. The liability of NDT Systems shall in no event be greater than the full amount of the purchase price for the instrument.

Any attempt by NDT Systems to repair or replace any instrument sold hereunder shall not constitute an admission that the instrument, or any part thereof, is defective within the meaning of the above warranty, nor that NDT Systems has any legal responsibility to make such repair or effect such replacement.

Any such attempts, if unsuccessful, shall not create any liability on the part of NDT Systems and the purchaser is limited to the remedy set forth herein.

LIMITATIONS ON LIABILITY

NDT Systems shall not, under any circumstances, be liable for direct, incidental or consequential damages for any breach of contract, breach of warranty or misrepresentations, including the negligence of NDT Systems, including, but not limited to damages resulting directly or indirectly from the use, or loss of use, of the instrument sold hereunder, or the business of the Buyer or third persons wherein the instrument is utilized.

The above warranty and the obligations of NDT Systems hereunder, are expressly in lieu of, and the Buyer expressly waives, any other liability of NDT Systems based upon warranty, express or implied, contract, or the negligence of NDT Systems including but not limited to, negligence in the design of the instrument or in the choice of the materials therefor, or negligence in the repair or replacement of the instrument, whether such repair or replacement is required by the terms hereof or is voluntary, upon the part of NDT Systems.

Except as provided herein, no person is authorized to assume on behalf of NDT Systems any other or additional liability or responsibility in connection with the instrument. These terms and warranty are applicable to and complete acceptance of such a binding legal agreement.

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May 2008
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