

## User's Guide



**ECHO Series Thickness Gages**



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### **Liability**

Ultrasonic testing is a function of using the proper equipment (electronics, transducer, cable and couplant combination) for the inspection and a qualified operator who knows how to use this manual, the instruments and all calibration procedures. The improper use of this equipment, along with the improper calibration can cause serious damage to components, factories, facilities, personal injury, and even death. ALL DANATRONICS ULTRASONIC THICKNESS GAGES ARE NOT INTRINSICALLY SAFE AND SHOULD NOT BE USED IN ANY HAZEDOUS OR EXPLOSIVE AREAS.

It is understood that the operator of this equipment is a well trained inspector qualified by either their own company or another outside agency to issue Ultrasonic Level I, 40 hour class room training in Ultrasonic Theory. Danatronics, Corp. and any of its employees or representatives shall not be held responsible for improper use of this equipment for its intended use. Proper training, a complete understanding of Ultrasonic wave propagation, thorough reading of this manual, proper transducer selection, correct zeroing of the transducer, correct sound velocity, proper test blocks, proper cable length, proper couplant selection all play a factor in successful ultrasonic thickness gaging. Special care should be taken when test pieces have rough or painted surfaces, particularly those applications where the test piece is thin to begin with as doubling of the echoes is possible even if the transducer is capable of measuring the desired thickness. As transducers wear or heat up, results can be either too thin due to a lack of sensitivity as a result of wear or too thick due to heating up of the transducer, referred to as "drift."

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## 1 Getting Started

### About the ECHO Series

The ECHO series are portable, digital, handheld ultrasonic thickness gages that are specifically designed to measure the remaining wall thickness of primarily steel structures.

- Vibralarm (vibrates gage below/above minimum/maximum thickness value)
- Illuminating keypad for easy to view go-no-go thickness values
- Unique, programmable left-hand/right-hand operation
- Up to 20 hour battery life with rechargeable Li-Ion high capacity battery
- Small, easy to hold, ergonomic, custom molded, durable case with rubber keypad designed for IP67 rating
- Multiple dual and single element transducer options including high temperature

The ECHO 9 is a base gage in the color family offering a simple user interface packaged in the same custom molded high-density plastic case with rubber keypad as the other more sophisticated models. This gage offers reliable, accurate thickness readings on mostly steel structures with access to only one side. The ECHO series can be easily upgraded in the field to the add ECHO-9DL, ECHO-9CW, or ECHO-9DLW the live color waveform (A-Scan). We can even add our precision gage mode to allow for 0.0001" resolution and higher frequency single element probes.

The ECHO-9W is a mid-range model consisting of the most commonly used features in a thickness gage not requiring a datalogger, but with a live color A-Scan. This model offers gain adjustment, vibrating alarm and illuminating keypad conditions, and automated transducer replacement notification feature. Like the ECHO 9, this model is field upgradeable to include a datalogger with color waveform.

Our top of the line model, ECHO-9DLCW, contains all the same features of the ECHO 9 and ECHO-9CW and ECHO-9DL plus:

- Live color waveform with gain, range, and rectify adjustments
- 1M thickness reading Datalogger using a 32GB micro SD card memory is essentially “unlimited”
- Three pre-set files for linear, grid (row advance), grid (column advance), linear plus custom point, 2D plus custom point, 3D, boiler, and sequential

- B-scan
- Custom rubber boot with built-in stand and 4-point chest harness
- Probe Zero

When turning on the ECHO 9 series, the gage does an automatic zeroing of the transducer thus eliminating the need for an on-block zero. (This manual is interchangeable when using the ECHO series basic operations and calibration steps, with the exception of the datalogger, B-scan, and Echo-to-Echo features.) The ECHO 9 will electronically zero the transducer upon power up and at a particular time during normal operation to ensure the transducer is working in accordance with electronic zeroing procedures. This feature is particularly important on high temperature materials and when the transducer becomes worn.

**Important Notice:** Please make sure the transducer is **NOT** coupled to the test piece when the gage is first turned on and that there is no couplant on the end of the transducer. The transducer should also be at room temperature and clean without any noticeable wear.

For a more accurate “span” of calibration, Danatronics recommends a zero calibration and sound velocity calibration as well.

When you press and hold the **F1** key, the gage will power on. Find the transducer part number (located on the back of the transducer) and match it to the same number on the gage display screen. Here is what the first screen will look like (see reset and backlight sections for additional details):

T R A N S D U C E R	
DC250	2.25MHZ
DK525	5.0MHZ
DC525	5.0MHZ
DK550	5.0MHZ
DC550	5.0MHZ
DK(S)537	5MHZ
DC537	5.0MHZ
DHT537	5.0MHZ
DK718	7.5MHZ
DK1025	10.0MHZ
DC1025	10.0MHZ
UP/DOWN TO SELECT	75%
MENU	RESET   BKLITE

Once you select the transducer number, press the **MENU/OK** key on the gage. Be sure to wipe off any couplant from the transducer face. At this point, the gage will preform an automatic probe zero.

**Note:** If you get an “insert transducer” message you can try swapping the connector or rotating the molded plug from where the cable plugs into the top of the gage. If this does not work, the transducer likely needs to be replaced.

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### Keypad Functions

The figure below shows the full keypad layout representative of each ECHO series thickness gage.



The following table refers to each key or symbol shown on the keypad. Note the F keys correspond to text above each key and prompts change depending on which screen you are adjusting.

Key	Function
	Up arrow key
	Down arrow key
	Left arrow key
	Right arrow key
	On/Off symbol (under the F1 key)
	MENU/OK key
F1	Varies
F2	Varies
F3	Varies
F4	Varies

### **Function Keys**

Function keys, or F keys (e.g., **F1**, **F2**, **F3**, **F4**), have various gage functions and may change depending on the display screen. View the bottom of the display screen for the function that corresponds with the appropriate F key. For example, **F1** may correspond with the Save function, **F2** with the Freeze function, or **F3** with the Directory function (Dir). Many times the left or right arrow keys can be used instead of the **MENU/OK** key to highlight a parameter or to see what is under the selected choice.

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### Display Screen

The gage has a graphic style color display with 320 x 240 (1/4 VGA) pixel density. Viewing the screen is best from straight above or slightly below the surface rather than from side to side. If external temperatures are below 32°F (0°C), the display may be slower to update information.



Color thickness reading only on ECHO 9



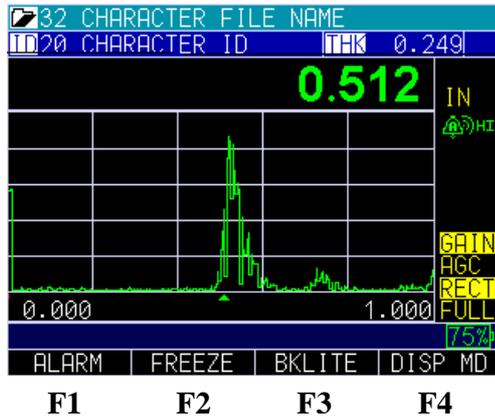
Color Waveform in Echo-to-Echo mode, filename, ID, thickness value, gain, rectification, battery life, alarm, freeze, backlight, and display mode.

T R A N S D U C E R	
DC250	2.25MHZ
DK525	5.0MHZ
DC525	5.0MHZ
DK550	5.0MHZ
DC550	5.0MHZ
DK(S)537	5MHZ
DC537	5.0MHZ
DHT537	5.0MHZ
DK718	7.5MHZ
DK1025	10.0MHZ
DC1025	10.0MHZ
UP/DOWN TO SELECT	
MENU	RESET
BKLITE	

**F1      F2      F3**

Transducer screen, menu, reset, backlight

The top part of the display screen shows the File Name, ID Number, AA, and 0001 for grid column and row. The lower part of the display acts as an interactive tool that allows you to decide how you want to proceed with the information that is displayed on the screen. The middle part of the screen shows the following: thickness value; In, mm or usec; Echo-to-Echo symbol; LOS (loss of signal); Freeze; Fast Min or Max; Alarm indicator; Differential mode; Low, Med or High gain; and percent remaining battery life.



### Battery Pack

To ensure the highest level of performance and protection, the battery compartment is separated from the electronic components of the gage.

### *Monitoring the Battery Charge from the Display Screen*

The ECHO series continuously displays the percentage of battery life remaining on the bottom right corner of the measurement display screen. When the battery life is below 10%, the battery indicator will turn from green to red. When the battery life is below 5%, the indicator will flash.

**Note:** Power off the ECHO series gage to ensure any saved data is stored internally.

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### **Re-charging the Battery**



To re-charge the battery, simply plug in the charger to an AC outlet (between 100-240V) and plug the other end into the USB connector on the top of ECHO series gage. The **F4** key will light up with a blue LED when charging, and the light will go out when fully charged. Allow several hours (up to 10 hours) to fully charge.

**Note:** There is a battery indication monitor on the bottom right of the screen showing the percent of battery life, as seen below at 75%.



You may also use a computer instead of the wall charger to charge the gage, but this will take significantly more time than using an AC outlet. If you decide to charge the gage using this method, make sure the gage is powered off before you connect the USB to the computer and to the gage itself.

When charging is complete, the **F4** key will appear translucent in color. Power off the gage, and unplug the charger from the USB connector on the top of the gage.

#### **Using Non-rechargeable AA Batteries**

A non-rechargeable alkaline AA pack is also available. This option requires a spare tray and 3 AA batteries. Follow these steps to insert non-rechargeable batteries:

1. Un-screw the battery door.
2. Disconnect the Li-Ion battery connector.
3. Plug in the AA tray connector.
4. Replace the battery door and tighten screws.



**Note:** When using the 3 AA battery tray, batteries cannot be re-charged.

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### **Boot, Bail, and Strap Features**

The custom rubber boot with built in bail and 4-point chest harness is an accessory for the ECHO series gages. Not only does the boot help to protect the gage from the elements, but the functional bail and strap also offers a variety of positioning options.

#### ***Placing the Boot on the Gage***

To insert the gage into the rubber boot, follow these steps:

1. Guide the gage strap through the hole at the top of the boot (either right or left side).
2. Slide the gage into the top of the boot.
3. Gently apply pressure to the bottom of the gage until it fully pops into the boot.

#### ***Removing the Boot from the Gage***

Be sure that the bail is set in the open position before attempting to remove the boot. Follow these steps:

1. Apply pressure to the bottom two corners of the boot until the gage pops out.
2. Wriggle the top section of the gage out of the boot.
3. Guide the gage strap through the hole at the top of the boot.

#### ***Using the Boot Strap and Bail***

The boot strap is attached to the bail on the back of the boot. It can be used as a right- or left-handed strap, or a finger strap. You can also connect the strap to a 4-point chest harness for hands-free use.

The bail, including the straps, can be removed from the boot. This is useful when adding accessories or locating the gage's serial number. Simply open the bail and apply gentle pressure to one side of the connector, which is located at the top of the bail. The piece will pop off exposing the accessory mount (see below) and gage serial number.

### **Other Gage Features**

#### ***Using the T/R 1 and T/R 2 Ports***

On the top of the ECHO series gages are two ports for transducer connectivity.

If you are using a dual element transducer, you may use either port—T/R 1 or T/R 2—interchangeably. However, if you are using a single element transducer, plug the connector into the T/R 1 port only.

#### ***Locating the USB Slot***

The ECHO series gages are furnished with a USB 2.0 slot on the top of the gage. Use the USB slot to connect AC chargers or to connect to a computer for cross-functionality.

#### ***Using the Accessory Mount***

On the back of the gage is a ¼ x 20 accessory mount. This connector point is compatible with a multitude of accessories including a magnetic pipe attachment and a Gorilla Pod.

***Locating the Altitude Change Release Regulator***

At the bottom of the gage is a circular outline with small holes. This feature regulates pressure due to altitude change. Any pressure built up inside the gage will be automatically released.

## 2 Using Basic Gage Operations

### Power on the Gage

To power on any of the ECHO series thickness gages, follow these steps:

1. Press and hold the **F1** key for more than 3 seconds. The power symbol, as shown below, is under the **F1** key printed on the keypad.



Power symbol  
under the F1 key

2. The following screen will appear on the gage display:

T R A N S D U C E R	
DC250	2.25MHZ
DK525	5.0MHZ
DC525	5.0MHZ
DK550	5.0MHZ
DC550	5.0MHZ
DK(S)537	5MHZ
DC537	5.0MHZ
DHT537	5.0MHZ
DK718	7.5MHZ
DK1025	10.0MHZ
DC1025	10.0MHZ
UP/DOWN TO SELECT	
MENU	RESET
BKLITE	75%

For the purposes of this manual, we will refer to this screen as the *Home* screen.

3. Use the up and down arrow keys to select a transducer and press the **MENU/OK** key. (Please note, the transducer selection will automatically display the last used transducer prior to shut off.)

From the *Home* screen the following F keys are available:

- F1 – Menu
- F2 – Reset
- F3 – Bklite

### Selecting the Menu Option

The gage offers several **Menu** options as shown below:



For a full description of all the **Menu** options, refer to Section 6.

### Performing a Reset

You can reset the gage parameters back to the default settings by performing a gage reset.

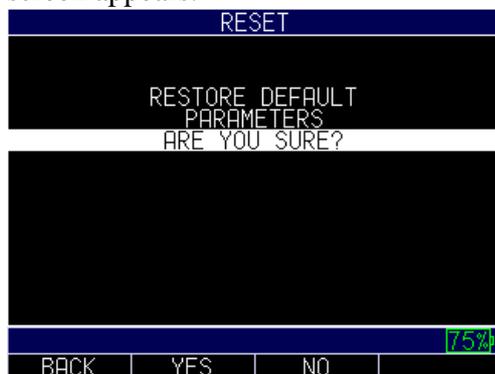
**Note:** Performing a reset permanently deletes all of the saved parameters from the gage and replaces the settings with default values.

To perform a reset, follow these steps:

1. From the *Home* screen, press the **F1 – Reset** key. The *Reset* screen appears:



2. Select the **Parameters** option, and press the **MENU/OK** key. The following screen appears:



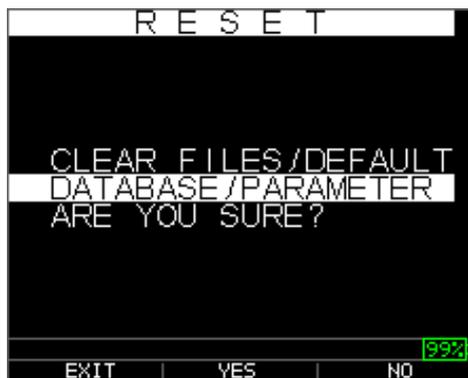
3. Press the **F2 – Yes** key to reset all parameters in the gage back to default settings, or press the **F3 – No** key to cancel a parameter reset.

### **Database Reset**

Performing a Database Reset clears all the files in the database and keeps the first three: Linear, Row Increment and Col Increment database files with cleared readings. All of the user created files in the database will be cleared and deleted. To perform a Database Reset, follow these steps:

1. From the *Home* screen, press the **F1 – Reset** key. The Reset screen appears.

Select the **Database** option and press the **MENU/OK** key. The following screen appears:



If you want to exit this screen, press the **F1 – Back** key to take no action and return to *Home* screen.

2. Press the **F2 – Yes** key to perform a Database reset.

After performing a Database Reset, the *Home* screen appears automatically.

### **Parameter Reset**

Performing a Parameter Reset restores default parameters to the factory settings. To perform a Parameter Reset, follow these steps:

1. From the *Home* screen, press the **F1 – Reset** key. The *Reset* screen appears.

Select the **Parameter** option and press the **MENU/OK** key. The following screen appears:



If you want to exit this screen press either the **F1 – Exit** key or **F3 – No** key to take no action and return to *Home* screen.

2. Press the **F2 – Yes** key to perform a **Parameter** reset.

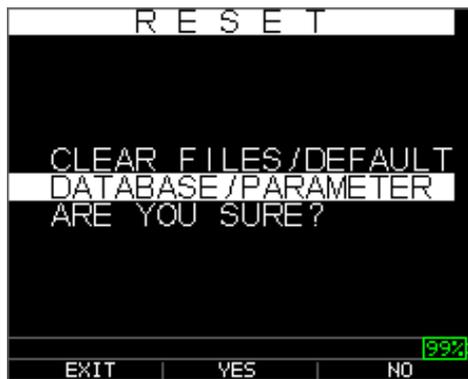
After performing a Parameter Reset, the *Home* screen appears automatically.

#### **Database/Parameter Reset**

Performing a Database/Parameter Reset clears all the files in the database and keeps the first three Linear, Row Increment and Col Increment database files with cleared readings. All of the user created files in the database will be deleted and the default parameters will be restored at the same time. This selection is the equivalent of performing MASTER RESET on the instrument, restoring original factory setting. To perform a Database/Parameter Reset, follow these steps:

1. From the *Home* screen, press the **F1 – Reset** key. The *Reset* screen appears.

Select the **Database** option and press the **OK** key. The following screen appears:



2. If you want to exit this screen press either the **F1 – Exit** key or **F3 – No** key to take no action and return to *Home* screen.
3. Press the **F2 – Yes** key to perform a **Database/Parameter** reset.

After performing a Database/Parameter Reset, the *Home* screen appears automatically.

#### **About Screen**

You can find out information about your ECHO series thickness gage, such as the model number, version number, and contact information from the gage's *About* screen. To go to the *About* Screen, follow these steps:

1. From the *Home* screen, press the **F2 – Reset** key. The *Reset* screen appears:

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2. Press the **F3 – About** key. The following *About* screen appears.



3. Press the **F1 – Back** key to return to *Home* screen.

### Backlight

The backlight is always on, but the contrast can be adjusted. To modify the contrast, see Section 4.

### 3 Calibrating the Gage

Calibrating is the process of adjusting the gage for a specific material and transducer before testing material to ensure that all of the measurements are accurate. You must always calibrate before measuring material for standard accuracy.

#### Velocity Calibration Only

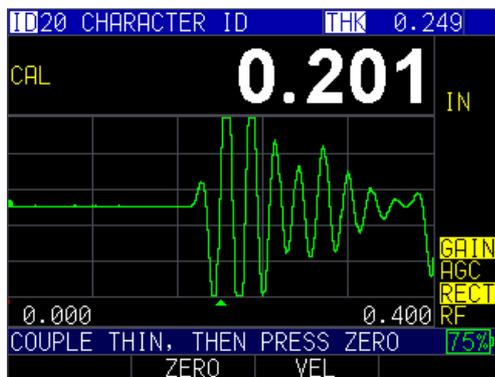
If you are working with a test piece of known thickness but unknown material, then you can calibrate velocity of the sound in the unknown material by measuring the time of flight from main-bang to the first back echo. By using the known thickness you can calculate velocity of the sound for the unknown material.

To preform a Velocity calibration only, follow these steps:

1. Power on the gage.
2. Use the up and down arrow keys to select your transducer.
3. Press **F1 – Menu** key.
4. Use the up and down arrow keys to select the **Calibration** option.
5. Press the **MENU/OK** key.
6. Verify your transducer selection and press the **MENU/OK** key.

To proceed with Velocity calibration, follow the instructions below:

1. Place couplant on the surface of a 5-step test block.
2. Couple the transducer to the material. A similar screen to the one shown below will appear:



Cal screen

3. While measuring the thickest step, select **F3 - VEL** key.
4. After pressing the **F3** key, you can take the transducer off the test block. If the displayed measurement is different than the known value of the step, use the up or down arrow key to adjust the displayed value to the known value of the step.
5. Press the **MENU/OK** key to perform the calibration.

The unit will briefly display the calibrated velocity value in the top of the screen and then return to **Measure** mode.

### Velocity and Zero Calibration

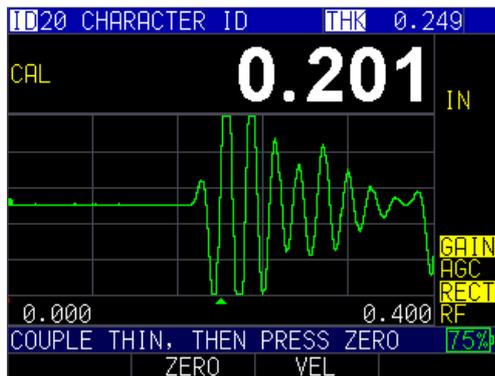
If you have a test step block of known thicknesses but unknown material, then you can calibrate the velocity and zero of the sound in the unknown material by measuring the time of flight from the main-bang to the first back echo for the thinner step and the thicker step.

To perform a Velocity and Zero calibration, follow these steps:

1. Power on the gage.
2. Use the up and down arrow keys to select your transducer, and then press the **Menu/OK** key.
3. Press **Menu/OK** key.
4. Use the up and down arrow keys to select the **Calibration** option.
5. Press the **MENU/OK** key.

To proceed with the calibration, follow the instructions below:

1. Place couplant on the surface of a 5-step test block.
2. Couple the transducer to the material. A similar screen to the one shown below will appear:



Cal screen

3. While measuring the thinnest step, press the **F2 – ZERO** key and then use the up or down arrow keys to scroll the thickness value number to the known thickness
4. Then press the **F1 - CAL** key
5. While measuring the thickest step, select **F3 - VEL** key.
6. After pressing the **F3** key, you can take the transducer off the test block. If the displayed measurement is different than the known value of the step, use the up or down arrow key to adjust the displayed value to the known value of the step.
7. Press the **MENU/OK** key to perform the calibration. For a few seconds in the top left hand corner, the calculated acoustic sound speed will be displayed.

**Note:** This process can be reversed by performing a velocity first and zero second as long as you enter the known thickness each time. This procedure is when the displayed user is set to left hand operation; see display settings; see section 4. The gage will briefly display the calibrated zero value and then return to Measure mode.

### Zero Calibration Only

If you have a test step block of known thickness and known velocity of sound in the material, then you can calibrate the zero by measuring the time of flight from main-bang to the first back echo for the thinner step. The calibrated zero is the calculated zero minus the measured zero.

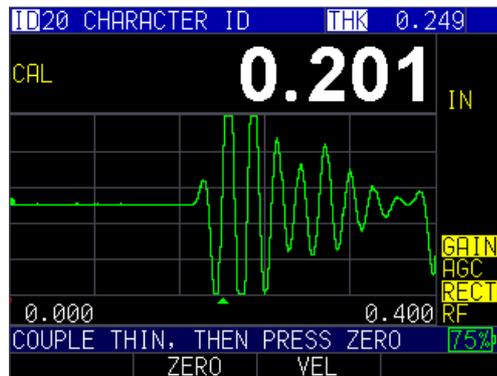
To accurately measure a thickness of unknown material you need to know the velocity of the sound in the unknown material and the errors introduced by the cable and electronics. This is called delay line and zero calibrated value for the transducer.

To perform a Zero calibration, follow these steps:

1. Power on the gage.
2. Use the up and down arrow keys to select your transducer.
3. Press **F1 – Menu** key.
4. Use the up and down arrow keys to select the **Calibration** option.
5. Press the **MENU/OK** key.
6. Verify your transducer selection and press the **MENU/OK** key.

To proceed with the Zero calibration, follow the instructions below:

1. Place couplant on the surface of a 5-step test block.
2. Couple the transducer to the material. A similar screen to the one shown below will appear:



Cal screen

3. Measure the thinner step and press the **F2 – Zero** key.
4. After selecting the **F2** key you can take the transducer off the test block. If measured value is different than the known value of the step, adjust the measured value by pressing up or down arrow key.
5. Press the **MENU/OK** key.

The gage will briefly display the calibrated zero value in the top of the screen and then return to **Measure** mode.

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### Delay Line Calibration

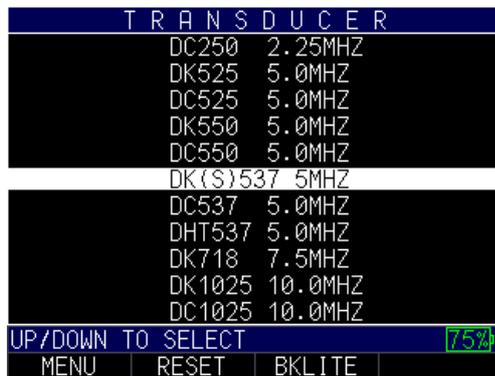
Delay Line calibration is done every time the thickness gage is powered on and a transducer is selected, or when a different transducer is selected during normal operation.

The gage automatically performs a Delay Line calibration by measuring the echo of the transducer itself when it is not placed on any material and there is no couplant on the transducer surface.

Under normal usage, the surface of the transducer wears out over time, which reduces sensitivity of the transducer.

### Automatic Zero

To perform an Automatic Zero or Auto Zero, you must first select a transducer option from the *Home* screen, and press the **MENU/OK** key.



To continue the Auto Zero, follow the instructions given on each display screen; the first of which will prompt you to wipe off any couplant from the transducer and wait three seconds. The waiting time is shown in the changing pie-clock graphic.



After three seconds, the gage automatically begins to zero the transducer.

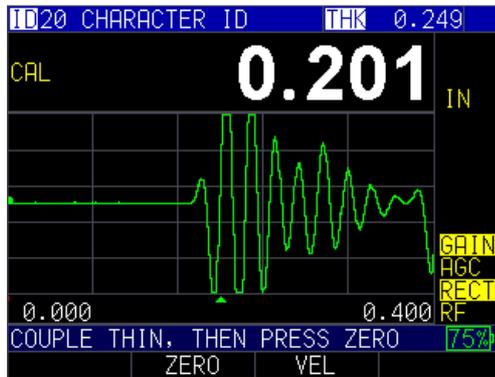
A warning message will appear on the display screen if the delay line is below the acceptable limit for accurate thickness measurements. You will need to replace the transducer or select the **F1** key to acknowledge the warning message and continue using the same transducer, which may have a worn surface. After three seconds or after acknowledging the warning message, the display shows the instrument parameters for three seconds before going to **Measurement** mode.



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### **Measurement Mode with a Datalogger**

If your ECHO 9 series thickness gage is equipped with a datalogger, then the display screen in **Measurement** mode will look like the screen below:



To continue in **Measurement** mode, follow these steps:

1. Press the **F1** key to select the **Save** option. (See: Save section for datalogger version.)
2. Press the **F2** key to select the **Freeze** option. (See: Freeze section.)
3. Press the **F3** key to select the **Dir** (Directory) option. (See: Directory section.)
4. Press the **Menu = OK** key to select the **Menu** option. (See: Menu section.)

**Note:** The available choices for F1, F2, F3, and F4 are different for the ECHO series thickness gages without a datalogger. Also, the file symbol, filename, ID: xx,xxxx are not displayed in the non-datalogger version of the ECHO series thickness gages.

#### 4 Customizing Display Options

The ECHO series gages have several display options that are customizable based on your preferences.



##### Backlight

The gage is readable in direct sunlight as well as indoors. The backlight is always on by default, and it's highly recommended to leave it on when using the gage indoors.

To use the backlight, follow these steps:

1. From the *Home* screen, press the **F1 – Menu** key. The *Menu* screen appears.
2. Use the up and down arrow keys to select the **Display** option, and press the **MENU/OK** key.
3. Select the **Bklight** option, and press the **MENU/OK** key.



4. Use the up and down arrow keys to choose any of the following parameters:
  - *Off*: Backlite remains off
  - *On*: Backlite remains on
5. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

##### Color

The ECHO series gages have a high-resolution color display with multiple color choices. By varying the colors, you can optimize visibility and improve contrast. You cannot choose two of the same colors, however, and the gage will prompt you to pick the next available color if a duplicate is selected.

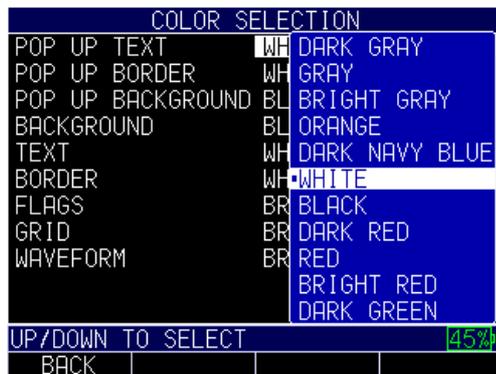
Some color changes are dynamic, meaning you will see the changes as you make the selection (e.g., Flags, Background). Others, such as Waveform and Pop Up Background, can only be seen once the change is made and you return to the *Home* screen.

To adjust the color settings, follow these steps:

1. From the *Home* screen, press the **F1 – Menu** key. The *Menu* screen appears.
2. Use the up and down arrow keys to select the **Display** option, and press the **MENU/OK** key.
3. Use the up and down arrow keys to select the **Color** option, and press the **MENU/OK** key.



4. The *Color Selection* screen will appear.



5. You may select any of the following items in the list for color modification:
  - Pop up text
  - Pop up border
  - Pop up background
  - Background
  - Text
  - Border
  - Flags
  - Grid
  - Waveform
6. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

## User

The ECHO series gage is compatible with both right-handed and left-handed users. To adjust your preference, follow the steps below:

1. From the *Home* screen, press the **F1 – Menu** key. The *Menu* screen appears.
2. Use the up and down arrow keys to select the **Display** option, and press the **MENU/OK** key.
3. Use the up and down arrow keys to select the **User** option, and press the **MENU/OK** key.



4. Select either option:
  - *Left hand*: Soft keys options appear on the left of the screen
  - *Right hand*: Soft keys options appear on the right of the screen
5. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

**Note:** For the purposes of this manual, all images shown are based on the left hand user setting.

## Waveform

The waveforms that appear on the screen when taking measurements can be viewed as either a solid waveform or an outline. Depending on the lighting conditions and your overall preference, follow the steps below to toggle between options:

1. From the *Home* screen, press the **F1 – Menu** key. The *Menu* screen appears.
2. Use the up and down arrow keys to select the **Display** option, and press the **MENU/OK** key.
3. Use the up and down arrow keys to select the **Waveform** option, and press the **MENU/OK** key.

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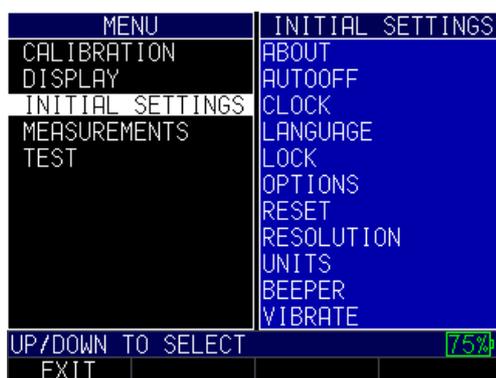
4. Select either option:
  - *Filled*: Waveform will be solid
  - *Outline*: Waveform will be outlined
5. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

## 5 Adjusting the Initial Settings

The ECHO series gages provide many usage settings that you can adjust depending on your location and preference.

To get to the *Initial Settings* screen, follow these steps first:

1. From the *Home* screen, press the **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Initial Settings** option.



3. Press the **MENU/OK** key.
4. Use the up and down arrow keys to select any of the settings you wish to change.
5. When finished, press the **F1 – Back** key to exit the screen.

### About

The **About** setting will display the gage's current software version. If you would like further information about Danatronics, including contact information, follow these steps:

1. Use the up and down arrow keys to select the **About** option and press the **MENU/OK** key. A similar image to the one shown below will appear:



2. When finished, press the **F1 – Back** key to exit the screen.

### Auto Off

The **Auto Off** setting shows the amount of time the gage will remain on during a period of inactivity. To change the parameters, follow these steps:

1. Use the up and down arrow keys to select the **Auto Off** option and press the **MENU/OK** key.

INITIAL SETTINGS	
ABOUT	V0.0.6
AUTOOFF	5 MIN
CLOCK	12:08 PM
LANGUAGE	ENGLISH
LOCK	OFF
OPTIONS	
RESET	
RESOLUTION	0.001 IN
UNITS	IN
BEEPER	OFF
VIBRATE	OFF
UP/DOWN TO SELECT 75%	
BACK	

2. Use the up and down arrow keys to scroll through the following settings.
  - *1–31 minutes*: The gage will turn off automatically between 1–31 minutes
  - *Never*: The gage will never turn off automatically
3. When finished, press the **F1 – Back** key to exit the screen.

### Clock

The gage has a real-time clock with several time and date formats in which to choose.

To change the clock parameters, follow these steps:

1. Use the up and down arrow keys to select the **Clock** option and press the **MENU/OK** key.

INITIAL SETTINGS	
ABOUT	V0.0.6
AUTOOFF	NEVER
CLOCK	CLOCK SETUP
LANGUAGE	TIME FORMAT
LOCK	DATE FORMAT
OPTIONS	MINUTE
RESET	HOUR
RESOLUTION	DAY
UNITS	MONTH
BEEPER	YEAR
VIBRATE	OFF
UP/DOWN TO SELECT 75%	
BACK	

2. Use the up and down arrow keys to change the settings in the *Clock Setup* screen shown below:

CLOCK SETUP	
TIME FORMAT	12 HR
DATE FORMAT	MM/DD
MINUTE	19
HOUR	10 PM
DAY	9
MONTH	JAN
YEAR	2014
<-CHANGE VALUE-> 75%	
BACK	

3. Use the left and right arrow keys to change any of the following settings:
  - *Time Format*: 12 hour or 24 hour
  - *Date Format*: Day/Month (DD/MM) or Month/Day (MM/DD)
  - *Minute*: Current minute (1–59)
  - *Hour*: Current hour (12 hour: 1–12 AM/PM; 24 hour: 1–23)
  - *Day*: Current day (1–31)
  - *Month*: Current month (Jan.–Dec.)
  - *Year*: Current year (2014–2025)
4. When finished, press the **F1 – Back** key to exit the screen.

### Language

There are multiple pre-loaded languages on the gage, such as: English, Italian, Spanish, French, German, Russian, Czech, Finnish, Chinese, Japanese, Hungarian, and Portuguese. Please contact Danatronics if you require a language other than the ones provided.

To select a language, follow these steps:

1. Use the up and down arrow keys to select the **Language** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to change the setting.
3. When finished, press the **F1 – Back** key to exit the screen.

### Lock

The **Lock** setting can be used to prevent unintentional key selection or calibration modification.

To select a parameter, follow these steps:

1. Use the up and down arrow keys to select the **Lock** option and press the **MENU/OK** key.



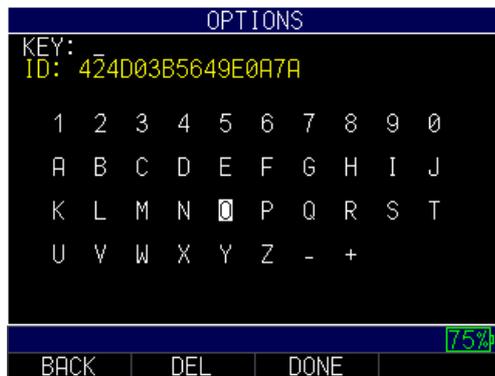
2. Use the up and down arrow keys to change any of the following settings:
  - *Off*: The gage lock is disabled.
  - *Key*: The keys on the gage are locked.
  - *Cal*: Calibration keys and values cannot be modified.
3. When finished, press the **F1 – Back** key to exit the screen.

### Options

The **Options** setting is used for the datalogger.

To enter a key, follow these steps:

1. Use the up and down arrow keys to select **Options** and press the **MENU/OK** key.



2. Use the arrow keys to enter the correct Key code. After each numerical or alphabetical selection, press the **MENU/OK** key. Note, your selection will appear in the Key field.
3. If you make an error during the Key code selection process, press the **F2 – Del** key to delete the last entered selection.
4. When finished, press the **F3 – Done** key to complete the selection process or press the **F1 – Back** key to exit the screen.

**Note:** The Key code must be at least six characters. An invalid message will appear if the Key code is incorrect.

### Reset

You can reset the gage parameters back to the default settings by performing a gage reset.

**Note:** Performing a reset permanently deletes all of the saved parameters from the gage and replaces the settings with default values.

To perform a reset, follow these steps:

1. Use the up and down arrow keys to select the **Reset** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to select the **Parameters** option and press the **MENU/OK** key. The following screen will appear:



3. Press the **F2 – Yes** key if you would like to reset the gage parameters back to the default settings. Pressing the **F2** key will bring you back to the *Home* screen.
4. Press the **F3 – No** key if you would like to cancel the reset function. Pressing the **F3** key, or the **F1** key, will bring you back to the *Initial Settings* screen.

### Resolution

The **Resolution** setting can be modified for corrosion or precision use. If your gage is equipped with the precision option, the user can select between 0.001" and 0.0001" or 0.01mm to 0.001mm using the same process described below.

To select a resolution parameter, follow these steps:

1. Use the up and down arrow keys to select the **Resolution** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to chose between the following options:
  - 0.01 IN/0.1 MM/0.1 US
  - 0.001 IN/0.01 MM/0.01 US
3. When finished, press the **F1 – Back** key to exit the screen.

### Units

There are three different **Units** settings available on the gage. To select one, follow these steps:

1. Use the up and down arrow keys to select the **Unit** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to chose between the following options:
  - *IN*: Inch
  - *MM*: Millimeter
  - *USEC*: Millisecond
3. When finished, press the **F1 – Back** key to exit the screen.

### Beeper

The **Beeper** setting is an audio feature that sounds when any key on the gage is pressed or if an alarm condition is triggered. (See Section 6 for more information about alarm settings.)

To turn on/off the **Beeper** feature, follow these steps:

1. Use the up and down arrow keys to select the **Beeper** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to chose between the following options:
  - *Off*: Disables the Beeper option
  - *On*: Enables the Beeper option
3. When finished, press the **F1 – Back** key to exit the screen.

### Vibrate

The gage will physically vibrate when this setting is enabled and an alarm condition is triggered. (See Section 6 for more information about alarm settings.)

To turn on/off the **Vibrate** feature, follow these steps:

1. Use the up and down arrow keys to select the **Vibrate** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to chose between the following options:
  - *Off*: Disables the Vibrate feature
  - *On*: Enables the Vibrate feature
4. When finished, press the **F1 – Back** key to exit the screen.

## 6 Changing Measurement Options

There are numerous options for taking measurements on the gage. All of the options can be made from the *Measurements* screen.

To get to the *Measurements* screen, follow these steps first:

1. From the *Home* screen, press the **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Measurements** option and press the **MENU/OK** key.

MENU	MEASUREMENTS
CALIBRATION	MEAS. TYPE
DISPLAY	RANGE
INITIAL SETTINGS	RECT
MEASUREMENTS	VEL
TEST	XDUCER
	ALARM
	BLANK
	BSCAN
	DIFF
	E-TO-E
	FAST
UP/DOWN TO SELECT	75%
EXIT	

3. Use the up and down arrow keys to select any of the settings you wish to change.
4. When finished, press the **F1 – Back** key.

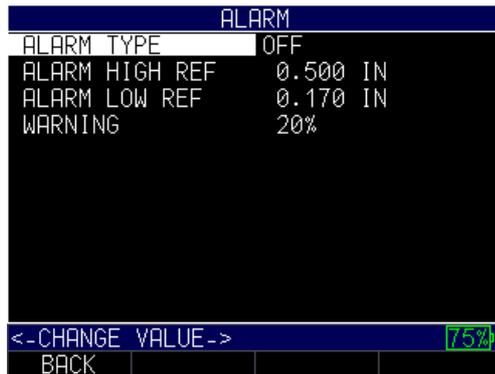
In addition to choosing various options from the *Measurements* screen, you can also change the settings once you are already engaged in taking thickness measurements. For instance, if you are taking a reading and decide to enable or disable an option or change the value of a setting, simply use the right or left arrow keys to highlight the option you wish to change. Next, use the up and down arrow keys to modify the setting. Once you are satisfied with your changes, press the **F1 – Done** key and begin taking measurements with the new parameters.

### Alarm

The gage offers various alarm settings to alert you of low or high thresholds via audible sounds and sensational vibrations (if settings are enabled), flashing display, and illuminating keypad.

To set alarm thresholds, follow these steps:

1. Use the up and down arrow keys to select the **Alarm** option and press the **MENU/OK** key.



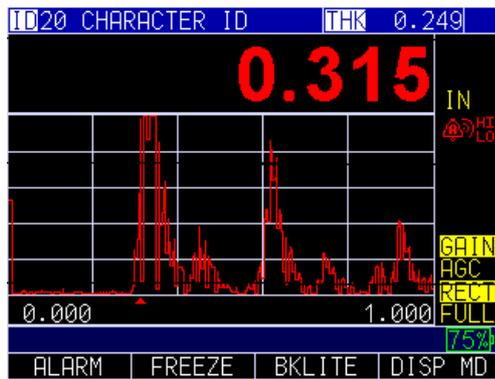
2. Use the up and down arrow keys, followed by the **MENU/OK** key, to select any of the following options:
  - Alarm Type
  - Alarm High ref
  - Alarm Low Ref
  - Warning
3. If you select the **Alarm Type** option, you can choose from the following settings by using the up and down arrow keys:
  - *Off*: Disables the audible and vibrating alarm feature
  - *High*: Alarm will occur when the displayed reading is higher than the high alarm reference value
  - *Low*: Alarm will occur when the displayed reading is lower than the low alarm reference value
  - *High-Low*: Alarm will occur when the displayed reading is less than the low alarm and/or greater than the High alarm reference value
4. If you select the **Alarm High Ref** option, you can change the high ref value. The waveform and the **F1** key will illuminate red when a reading rises above the set value.
5. If you select the **Alarm Low Ref** option, you can change the low ref value. The waveform and the **F1** key will illuminate red when a reading falls below the set value.
6. If you select the **Warning** option, you can change the percentage value between 0 and 100%. The percentage entered is based on the high and low set points. When a reading falls above or below this percentage, the waveform and the **F2** key will illuminate yellow.
7. When finished, press the **F1 – Back** key to exit the screen.

**Note:** The Alarm Low Ref limit will not go beyond the Alarm High Ref limit.

As noted above, the color of the A-Scan will dynamically change to red, yellow, or green depending on the reading and alarm value settings.

Red refers to a reading that is above or below the current low or high alarm value:

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Yellow indicates caution—the reading is nearing the Warning percentage set for a low or high alarm value:



Green shows that the reading is safe within the alarm value margins:



**Note:** The F4 key is not active in Alarm mode.

For example, when using the 5-step English test block with thicknesses of 0.100, 0.200, 0.300, 0.400 and 0.500 inches, if you enter alarm high-low you will first need to enter the high value. Enter 0.500 inches and press the **MENU/OK** key.

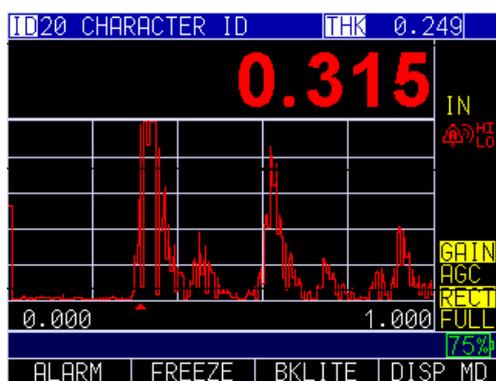
Next you will need to enter the low value of 0.100 inches. The display will ask you to enter the percent reading of the high-low. The gage will default to 20% (this can be changed with the up or down arrow keys), so any reading within 20% of the high value (approaching high, between 0.400" and 0.499" as 0.400" is within the 20% range of

0.500") will result in the yellow keypad illuminating. Also, any reading above the low value of 0.101" and 0.120" will result in the yellow **F2** key illuminating as you approach the minimum.

In **Alarm** mode, choosing a non-zero percent value provides a warning for readings that approach the selected percent value of the high or low limits. For example, if the alarm value is 0.100" and 20% is entered as the "percent value," reading from 0.101" to 0.120" will result in the **F2** "yellow" key being illuminated. Also, reading less than 0.100" will result in the **F1** "Red" key being illuminated and greater than 0.120" will result in the **F3** "Green" key being illuminated.

### **Vibrating Alarm Display**

The vibrating alarm, noted with a **bell icon** and two curved lines to the right of the gage display, can be enabled with varying alarms and alarm conditions as shown on the screens below:



Visual, Audible, and Vibrating alarm enabled.

)) symbol appears next to the alarm icon. **Hi** (High) **Lo** (Low) appears next to the symbol.

The image above shows that an alarm condition has occurred meaning the measured reading is greater than the High Alarm limit. The word **Hi** (High) appears next to the )) symbol. If a low threshold is set as well, the word **Lo** (Low) appears next to the )) symbol verifying the reading is lower than the Low Alarm limit.

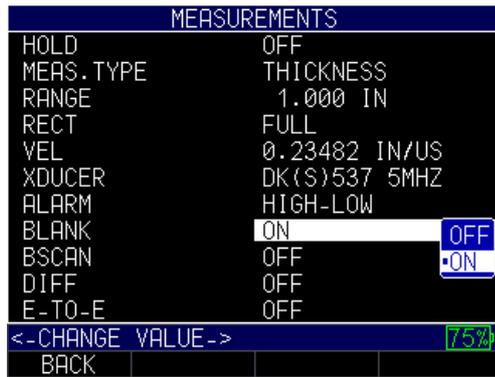
**Note:** In the NON-DATALOGGER version, the **F1**, **F2**, and **F3** key choices are different and the file symbol or the filename along with ID# are not shown.

### **Blank**

Use the **Blank** option when you do not want to read noise for a particular region. Using the **Blank** option is not recommended when using Echo-to-Echo.

To set the **Blank** option, follow these steps:

1. Using the up and down arrow keys select the **Blank** option and press the **MENU/OK** key.



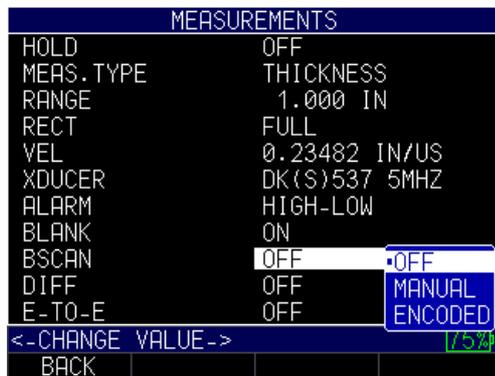
2. Use the up and down arrow keys to select the setting you wish to change.
  - *Off*: Disables the Blank feature
  - *On*: Enables the Blank feature
3. When finished, press the **F1 – Back** key to exit the screen.

### B-Scan

Use the **B-Scan** option to setup a manual or time encoded B-scan.

To set the **B-Scan** option, follow these steps:

1. Using the up and down arrow keys select the **B-Scan** option and press the **MENU/OK** key.



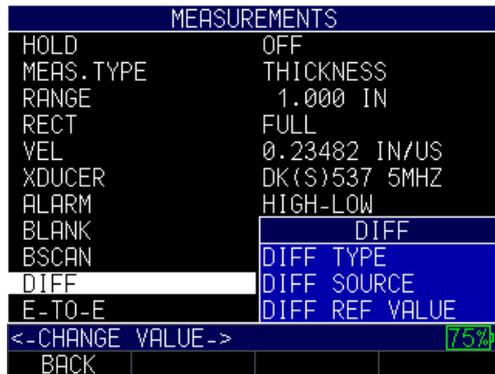
2. Use the up and down arrow keys to select any of the following options.
  - *Off*: Disables B-scan option
  - *Manual*: Enables manual B-scan
  - *Encoded*: Enables encoded B-scan
3. When finished, press the **F1 – Back** key to exit the screen.

### Differential (Diff)

There are three **Diff** options from which to choose.

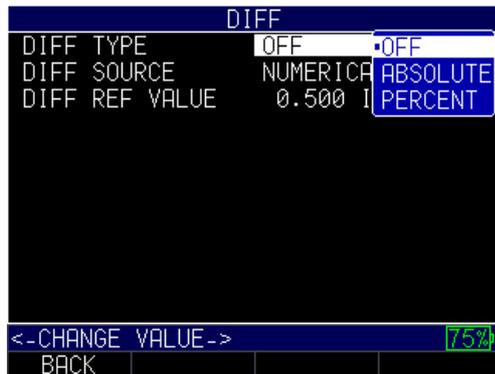
To set the **Diff** options, follow these steps:

1. Use the up and down arrow keys to select the **Diff** option and press the **MENU/OK** key.



2. Use the up and down arrow keys, followed by the **MENU/OK** key, to select any of the following options:

- Diff Type
- Diff Source
- Diff Ref Value



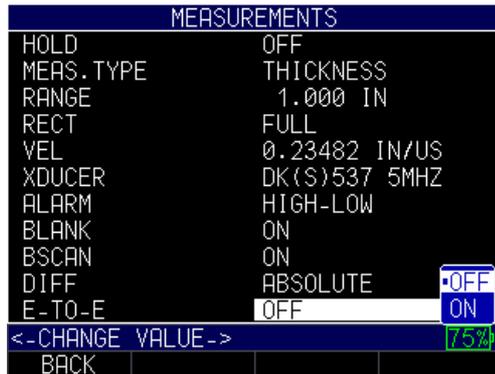
3. If you select the **Diff Type** option, you can choose from the following settings by using the up and down arrow keys:
- *Off*: Disables the Diff feature
  - *Absolute*: When this mode is enabled, the gage will display a thickness value as an absolute number of what has been entered. For example, diff abs = 0.500" and the real thickness is 1.000", the display will show diff abs 0.500". If the real value is 0.300", the gage will display, -0.200".
  - *Percent*: When this mode is enabled, the displayed value will be listed as a percentage of the value entered as the diff. For Example, if you set the diff to percentage at 0.500", a reading of 0.250" will result in 50%.
4. If you select the **Diff Source** option, you can choose from the following settings by using the up and down arrow keys:
- *Numerical Value*: The **Absolute** option displays reference values as IN, MM, or uSec
  - *File Compare*: The **Percent** option displays difference as a percentage of reference value
5. If you select the **Diff Ref Value**, you can set the value between 0.01–20.00 IN (or whatever metrics you have chosen in the **Initial Settings**).
6. When finished, press the **F1 – Back** key to exit the screen.

### Echo-to-Echo

The **Echo-to-Echo** option allows you to make measurements between two consecutive backwall echoes. Therefore, a good use of the **Echo-to-Echo** option is for measuring through coatings to measure only the true metal thickness.

To enable or disable the **Echo-to-Echo** option, follow these steps:

1. Use the up and down arrow keys to select the **E-to-E** option and press the **MENU/OK** key.

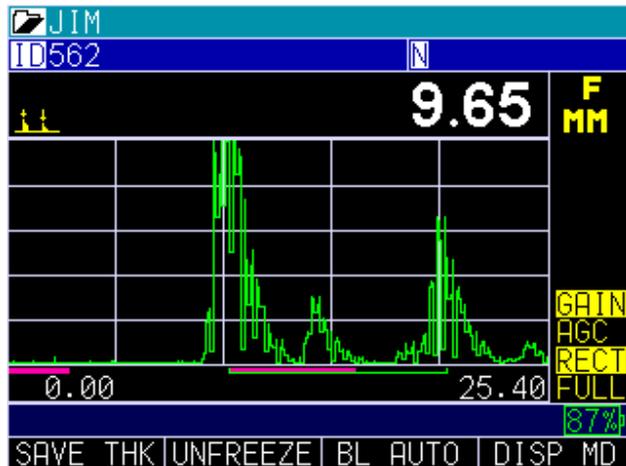


2. Use the up and down arrow keys to select the following settings:
  - *Off*: Disables the Echo-to-Echo feature
  - *On*: Enables the Echo-to-Echo feature
3. When finished, press the **F1 – Back** key to exit the screen.

Be mindful when making readings in Echo-to-Echo as the blank after the first receive echo may need to be adjusted to avoid “noise” or mode converted echoes. To adjust blanking on the first echo, it is important to recalibrate one time—either Cal Zero or Cal Velocity. (See Calibrating in Echo-to-Echo section below.)

**Note:** Pay attention in A-Scan mode to ensure you are in the appropriate mode. Echo-to-Echo or normal mode as thickness readings and associated calibrations are mode specific.

The first Pink line on the baseline is referred to as the Main Bang Blank while the second red line is referred to as the Interface Blank Or (IF Blank). The white line represents the measured time interval between the two correct echoes.



In Echo-to-Echo mode, sometimes gain will help to ensure you are reading on the correct echo.

#### Calibrating in Echo-to-Echo

When using Echo-to-Echo it is best to use the transducers designated with a –EE part number, such as DK 537EE and DK 718EE. These transducers have greater damping, which allow for more stable readings in **Echo-to-Echo** mode. For gages with a live waveform, using the DKS537 is also possible. Note, gain and the use of blanks may need to be adjusted depending on the shape and condition of the echoes.

Once the **Echo-to-Echo** option is enabled (see instructions in the section above), follow these steps to calibrate in **Echo-to-Echo** mode:



1. From the *Home* screen, press the **MENU/OK** key.
2. Use the left or right arrow and stop when you locate the symbol with two peaks in the upper left of the display, press the up arrow to turn on Echo to Echo. Denoting the **Echo-to-Echo** option is enabled.
3. Press **MENU/OK** key.
4. Use the up and down arrow keys to select the **Calibration** option and press the **MENU/OK** key.
5. Place couplant on the 5-step test block.
6. Perform CAL ZERO on the thick part of the test block with coating, following instructions on the gage display.

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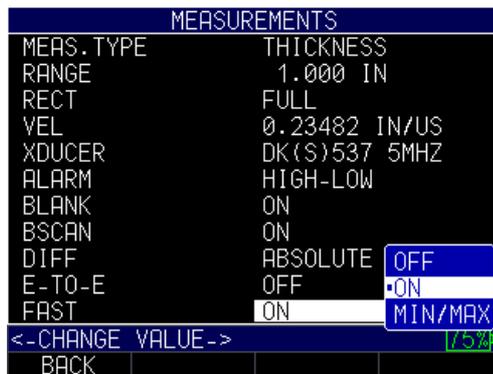
7. Perform CAL VEL on the thick part of the test block without the coating, following instructions on the gage display.
8. Press **MENU/OK**.

### Fast

The **Fast** option allows you to select fast updates of measurements at 25Hz compared to 4Hz in a normal reading.

To set the **Fast** option, follow these steps:

1. Use the up and down arrow keys to select the **Fast** option.



2. Use the up and down arrow keys to select any of the following settings:
  - *Off*: Disables the Fast feature
  - *On*: Enables the Fast feature. The LOS will work normally and not show the measured reading.
  - *Min/Max*: The LOS will display the LAST MAX measured value or the LAST MIN measured value. If you choose the **Min/Max** option, the gage will show the Max and Min value on the display as shown below:



3. When finished, press the **F1 – Back** key to exit the screen.

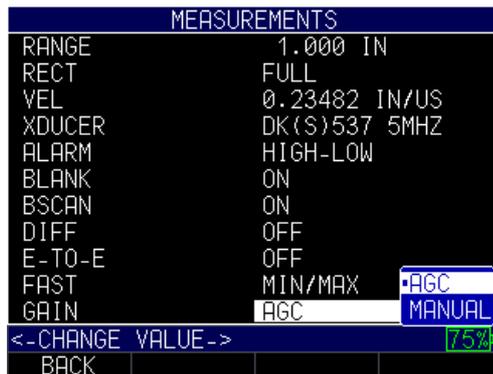
**Helpful Hint:** When using the **Min/Max** mode, if you press the **F2 – Freeze** key prior to LOS, the gage will display the last minimum prior to the LOS so that the actual couplant on the end of the transducer is not registered as a legitimate minimum reading. The LOS flag indicates the LAST MAX or the LAST MIN value and is shown based on the **Min/Max** setting.

## Gain

Gain refers to an increase in signal power (echo height) and is typically measured in decibels (dBs). The Gain feature is useful for setting a reference level where by making it easier to add or subtract gain.

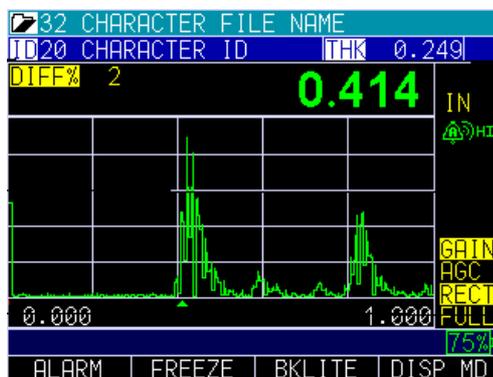
To set the **Gain** option, follow these steps:

1. Use the up and down arrow keys to select the **Gain** option.



2. Use the up and down arrow keys to toggle between the following two settings.
  - **AGC (Auto Gain Control)**: When in **AGC** mode, the gage will use its sophisticated algorithms to automatically set the gain to the desired height. If echoes are not being detected but are somewhat visible, try increasing or decreasing the gain as described above. Use the **F2** key to adjust from 20 dB or 94 dB.
  - **Manual**: When in **Manual** mode, gain adjustment can be set to low, std, and high representing a 3 dB change in each for the ECHO 9 (and the ECHO 9DL)
3. When finished, press the **F1 – Back** key to exit the screen.

You can also adjust the gain for waveform gages from the live A-Scan. To adjust gain during a live A-Scan, press the right or left arrow keys until the gain is highlighted, then use the up or down arrow, or the **F2** key, to return to AGC. Press the **F1** key when done. For the ECHO 9 or DL version, you can adjust the gain in the same manner or by using the *Measurement* screen.



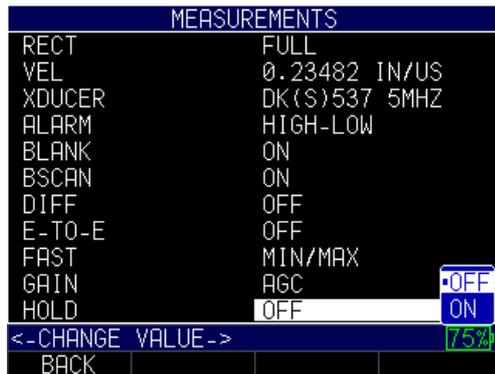
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### Hold

If a LOS occurs, the gage can continue to display the last measured thickness by “holding” the measurement.

To set the **Hold** option, follow these steps:

1. Use the up and down arrow keys to select the **Hold** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to toggle between the following settings:
  - *Off*: Disables the Hold feature, so the gage does not continue to display the last measured thickness
  - *On*: Enables the Hold feature, so the gage continues to display the last measured thickness
3. When finished, press the **F1 – Back** key to exit the screen.

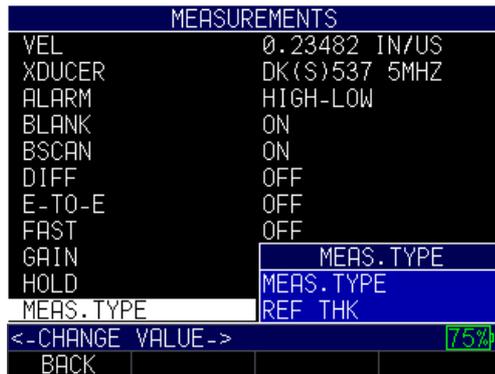
### Measure Type

The **Measure Type** option allows you to choose between a material thickness measurement or velocity measurement depending on your application.

**Note:** In order to use the **Measure Type** option, the **Fast** option must first be disabled.

To set the **Measure Type** option, follow these steps:

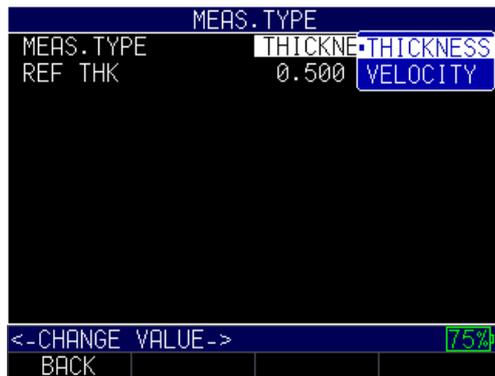
1. Use the up and down arrow keys to select the **Meas. Type** option and press the **MENU/OK** key.



- Use the up and down arrow keys to toggle between the following settings:

*Meas. Type:* Choose either the *Thickness* or *Velocity* setting. You must always enter a reference thickness before you chose to select the *Thickness* option. Likewise, you must always enter a velocity before your choose to select the *Velocity* option.

*Ref Thk:* Choose between 0.01 IN – 20.00 IN.



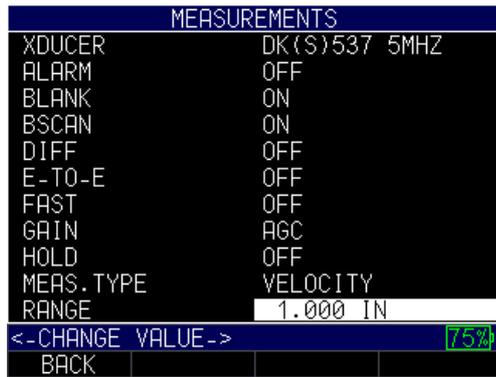
- When finished, press the **F1 – Back** key to exit the screen.

### Range

You can enter the range in which you are measuring when using the **Range** option.

To set the **Range** option, follow these steps:

- Use the up and down arrow keys to select the **Range** option and press the **MENU/OK** key.
- Use the up and down arrow keys to choose a desired setting between 0.200 IN – 20.000 IN, depending on the range found. You may also scroll to the **Zoom** option, which will put the echo in the middle of the screen.



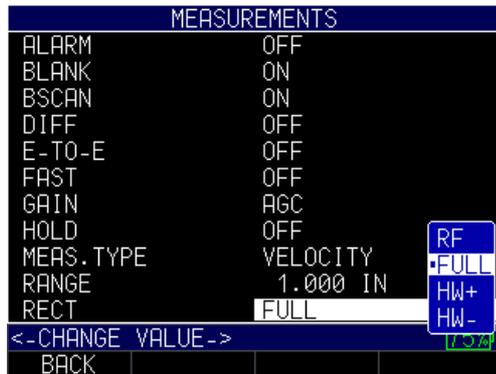
3. When finished, press the **F1 – Back** key to exit the screen.

### Rect (Rectification)

The **Rect** option will vary the way in which the echoes are shown on the waveform display. Rectification does not affect the thickness measurement in any way. There are four options available.

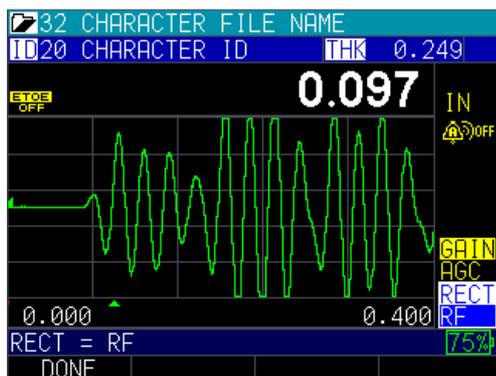
To set the **Rect** option, follow these steps:

1. Use the up and down arrow keys to select the **Rect** option and press the **MENU/OK** key.



2. Use the up and down arrow keys to select the settings you wish to change.

**RF:** Both positive and negative lobes are displayed in the RF waveform, which gives the greatest overall representation of position for more applications.



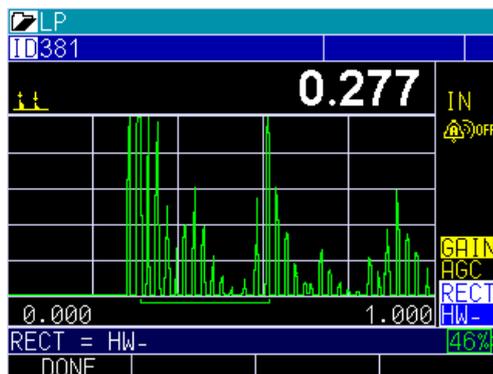
*Full*: Displays the negative section of the echo folded around the baseline so that both the positive and negative lobes are shown.



*HW+*: Displays the positive lobes, but not the negative lobes. An indicator is shown on the gage.



*HW-*: Displays the negative echo lobes as positive and does not show the positive lobes at all. An indicator is shown on the gage.



- When finished, press the **F1 – Back** key to exit the screen.

### Velocity

You can enter the range of velocity depending on your measurement needs and calibration by using the **Velocity** option.

To set the **Velocity** option, follow these steps:

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1. Use the up and down arrow keys to select the **Velocity** option and press **MENU/OK** key.

MEASUREMENTS	
BLANK	ON
BSCAN	ON
DIFF	OFF
E-TO-E	OFF
FAST	OFF
GAIN	AGC
HOLD	OFF
MEAS. TYPE	VELOCITY
RANGE	1.000 IN
RECT	FULL
VEL	0.23482 IN/US
<-CHANGE VALUE--> 75%	
BACK	

2. Use the up and down arrow keys to scroll through the options ranging between 0.04000 IN/US – 0.60000 IN/US.
3. When finished, press the **F1 – Back** key to exit the screen.

### Transducer

The **Transducer** option allows you to match a transducer from the list to the transducer you are using on the gage. The *Transducer* screen is the first screen that appears on the gage and acts as a *Home* screen as well. You can also change your transducer selection from the *Measurements* screen.

To select a new transducer from the *Measurements* screen, follow these steps:

1. Use the up and down arrow keys to select the **Xducer** option.

T R A N S D U C E R	
DC250	2.25MHZ
DK525	5.0MHZ
DC525	5.0MHZ
DK550	5.0MHZ
DC550	5.0MHZ
DK(S)537	5MHZ
DC537	5.0MHZ
DHT537	5.0MHZ
DK718	7.5MHZ
DK1025	10.0MHZ
DC1025	10.0MHZ
UP/DOWN TO SELECT 75%	
MENU	RESET
BKLITE	

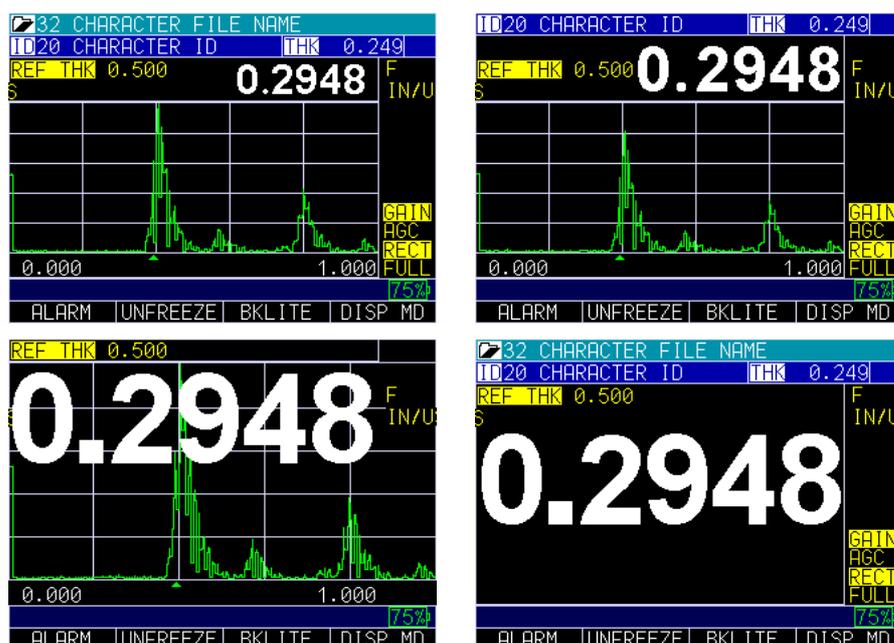
2. Use the up and down arrow keys to chose a transducer from the list that matches the one you are using.
3. When finished, press the **F1 – Back** key to exit the screen.

## 7 Special Gage Functions

The ECHO series thickness gages have many special functions that go beyond the basics. This section will discuss these special gage functions in detail.

### Display Size Options

The gage provides four different reading sizes on the display depending on your preference and operation environment. The images below show how each display will appear on your gage from smallest to largest display option.



To change the display size when making a thickness reading simply press the **F4- Disp MD** key until you are satisfied with the selection.

### Use of Blanks

The ECHO 9 with live waveform has 2 forms of blanking; MB BI and IF blank. These can be used to filter out any unwanted signals.

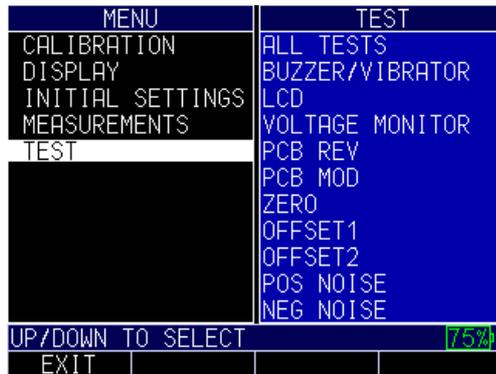
### Test

The **Test** option is designed to perform one or many internal tests on the gage to make sure it is running optimally. The **Test** option is found under the *Menu* settings.

To perform a **Test**, follow these steps:

1. From the *Home* screen, press the **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Test** option and press the **MENU/OK** key.

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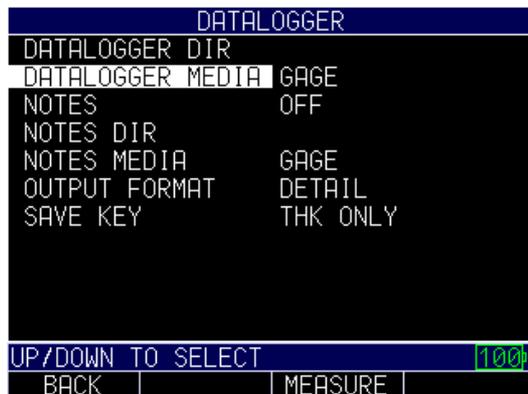
3. Use the up and down arrow keys to scroll through the tests in which you would like to select.
4. Press the **MENU/OK** key once you have selected the test you wish to perform.
5. When finished, press the **F1 – Back** key.

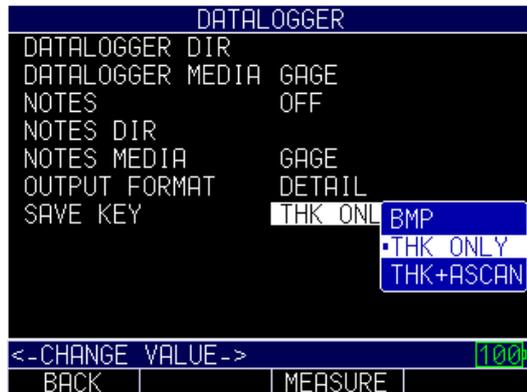
### Using the Save Option

If equipped with the Datalogger, the ECHO 9 series can save thousands of thickness readings and waveforms either internal onto a removable SD card.

To use the **Save Key**, follow these steps:

1. From the *Home* screen, press the **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Initial Settings** option and press the **MENU/OK** key.

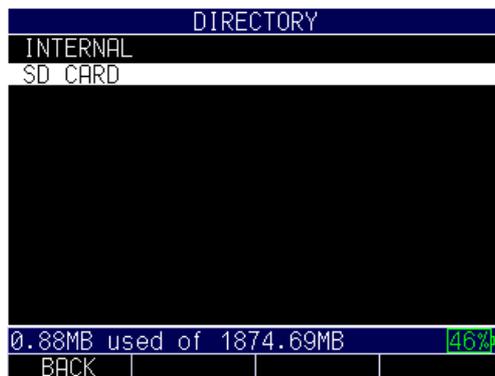




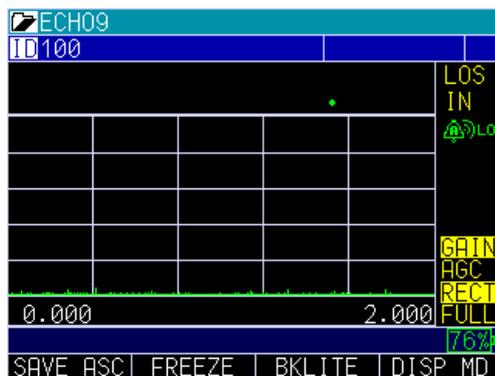
4. Use the up and down arrow keys to toggle between the following settings:
  - *BMP*: Bitmap or screen shot captures
  - *THK ONLY*: Thickness only
  - *THK+ASCAN*: Thickness and A-scan
5. After this selection is made, the **F1** key will display *BMP*, *SAVE THK*, or *SAVE ASC*. Data can later be sent to Microsoft Excel using a standard USB cable and *DATA XL* provided on the mini CD in your gage kit, or by removing the SD card to a card reader and also using *DATA XL*.

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### Choosing Where to Save the Readings

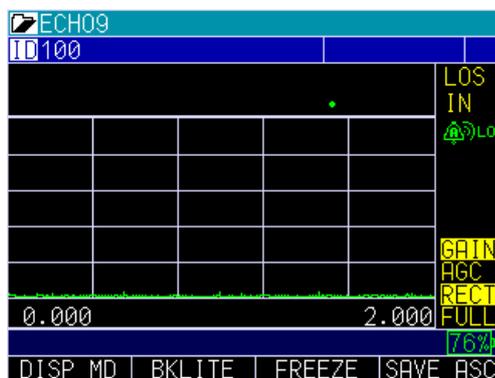


ECHO series has both internal and SD card memory. Be certain to select and note where your files are located, and always check for adequate memory before taking readings.



For the datalogger version only, you can save your data via the **Save** key, which is **F4** if right hand setting is enabled, or **F1** if left hand setting is enabled. (See Section 4 for right hand and left hand setting options.)

**Note:** Save is on the left.



**Note:** Save is on the right.

The data saved will depend on your setup parameters, which are selected from the *Setup* screen. For example, if the **Notes** option is set to **Off** then saved thickness

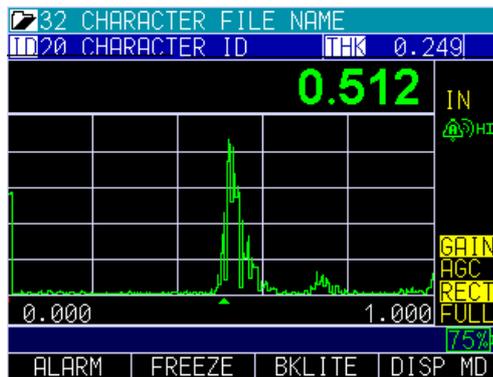
reading will be stored at the ID location [Linear], [Row], [Col] without notes.  
(See: Directory selection for file type details.)

### Using the Freeze Option

For the datalogger version and non-datalogger version thickness gages, you can freeze your data via the **Freeze** option.

To use the **Freeze** option, follow these steps:

1. From the thickness measurement screen, press the **F2 – Freeze** key.



The following screen is display whereby showing the “F” flag next to the thickness reading. You are now in **Freeze** mode. The **F2** selection changes from **Freeze** to **Unfreeze**. While in **Freeze** mode, the menu options are disabled.



2. Press the **F2 - Unfreeze** key to disable **Freeze** mode.

## 8 Using the Datalogger Directory Mode

The datalogger has a built-in file and data management system. Each thickness reading and/or waveform is stored and tagged with an alphanumeric identification number and file name with descriptive field. A complete description of the measurement type, gage calibration, and setup parameters are stored along with each reading.

To use the datalogger **Directory** mode, follow these steps:

1. Press **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Datalogger** option.
3. Press the **MENU/OK** key.
4. The following screen will appear:



5. Use the up and down arrow keys to toggle between the following settings:
  - *Directory*: Create and edit files
  - *Notes*: Customized comments/description per reading
  - *Output Format*: Choice of output format

To select the **Directory** option, press the **MENU/OK** key. The following screen will appear:



Use the up and down arrows to select a file, and press the **MENU/OK** key. The *File Create* screen will appear.

FILE CREATE			
FILE NAME:			
DIRECTORY		SD CARD	
1	2	3	4
5	6	7	8
9	0		
A	B	C	D
E	F	G	H
I	J		
K	L	M	N
O	P	Q	R
S	T		
U	V	W	X
Y	Z	-	+
72%			
BACK	DELETE	PREV	NEXT
SD CARD DIRECTORY			
CP			
2D+CP	64	54%	06/10/15
ICPITT			
LN	401	1%	01/17/14
LN+CP			
LN+CP	1604	0%	01/22/14
DC			
LN	501	0%	06/12/15
LP			
LN+CP	44	61%	06/15/15
48%			
BACK	OPEN	MEASURE	CREATE

Use the arrow keys to create a unique file name. Press the **F4 – Create** key when done.

FILE CREATE	
FILE NAME:	5
DIRECTORY	INTERNAL
DESCRIPTION:	
LOCATION:	
INSPECTOR ID:	
TYPE	LINEAR
49%	
BACK	NEXT

Use the up and down arrow keys to determine the file type and the amount of readings stored per file. The following file types include:

- Linear
- Linear + CPT (Custom point)
- 2D
- 2D + CPT
- 3D
- Boiler
- Sequential
- Bscan
- Configuration

**Note:** It is not necessary to enter data into such fields as: Description, Location, Inspector ID, or Prefix.

```
FILE CREATE
DIRECTORY      SD CARD
DESCRIPTION:
LOCATION:
INSPECTOR ID:
 1 2 3 4 5 6 7 8 9 0
 A B C D E F G H I J
 K L M N O P Q R S T
 U V W X Y Z - +
[49%]
BACK | DELETE | PREV | NEXT
```

Description

```
FILE CREATE
DESCRIPTION:
LOCATION:
INSPECTOR ID:
TYPE          LINEAR
 1 2 3 4 5 6 7 8 9 0
 A B C D E F G H I J
 K L M N O P Q R S T
 U V W X Y Z - +
[49%]
BACK | DELETE | PREV | NEXT
```

Location

```
FILE CREATE
LOCATION:
INSPECTOR ID:
TYPE          LINEAR
PREFIX:
 1 2 3 4 5 6 7 8 9 0
 A B C D E F G H I J
 K L M N O P Q R S T
 U V W X Y Z - +
[49%]
BACK | DELETE | PREV | NEXT
```

Inspector ID

FILE CREATE			
INSPECTOR ID:			
TYPE	CONFIGURATION		
PREFIX:			
STARTING ID:			
ENDING ID:			
			74%
BACK	PREV	NEXT	

Configuration

FILE CREATE			
INSPECTOR ID:			
TYPE	LINEAR		
PREFIX:			
START COL:			
END COL:			
COL STEP:			
			50%
BACK	PREV	NEXT	

Linear

FILE CREATE			
INSPECTOR ID:			
TYPE	LINEAR + CPT		
PREFIX:			
START COL:			
END COL:			
CUSTOM POINTS: DEGREE			
			50%
BACK	PREV	NEXT	

Linear + CPT

FILE CREATE			
INSPECTOR ID:			
TYPE	2D		
PREFIX:			
STARTING ID:			
ENDING ID:			
			74%
BACK	PREV	NEXT	

2D

FILE CREATE			
INSPECTOR ID:			
TYPE	2D + CPT		
PREFIX:			
STARTING ID:			
ENDING ID:			
			74%
BACK	PREV	NEXT	

2D + CPT

FILE CREATE			
INSPECTOR ID:			
TYPE	3D		
PREFIX:			
STARTING ID:			
ENDING ID:			
			74%
BACK	PREV	NEXT	

3D

FILE CREATE			
INSPECTOR ID:			
TYPE	BOILER		
PREFIX:			
STARTING ID:			
ENDING ID:			
			74%
BACK	PREV	NEXT	

Boiler

FILE CREATE			
INSPECTOR ID:			
TYPE	SEQUENTIAL		
PREFIX:			
STARTING ID:			
ENDING ID:			
			50%
BACK	PREV	NEXT	

Sequential

FILE CREATE				FILE CREATE			
INSPECTOR ID:				INSPECTOR ID:			
TYPE            BSCAN				TYPE            CONFIGURATION			
PREFIX:				PREFIX:			
STARTING ID:				STARTING ID:			
ENDING ID:				ENDING ID:			
74%				50%			
BACK		PREV	NEXT	BACK		PREV	NEXT

B-Scan

Configuration

After the file type is selected, press the **F3 – Next** key. Then use the arrow keys to select a number for the *Step* field, as shown below. Press the **F4 – Next** key when you are done.

FILE CREATE				FILE CREATE			
TYPE            BSCAN				PREFIX:			
PREFIX:				START COL:			
				100			
END COL:				END COL:			
				COL STEP:			
				1 2 3 4 5 6 7 8 9 0			
				A B C D E F G H I J			
				K L M N O P Q R S T			
				U V W X Y Z - +			
51%				51%			
BACK	DELETE	PREV	NEXT	BACK	DELETE	PREV	NEXT

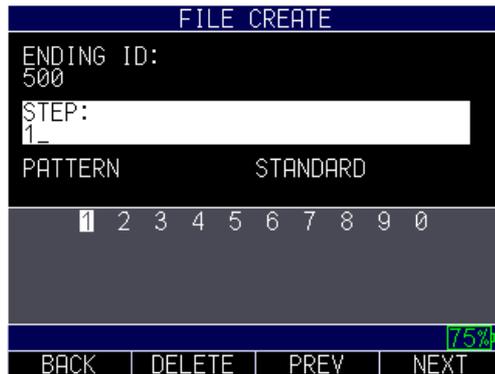
Prefix

Start Col

FILE CREATE			
START COL:			
100			
END COL:			
500			
COL STEP:			
1			
PATTERN		STANDARD	
1	2	3	4
A	B	C	D
K	L	M	N
U	V	W	X
Y	Z	-	+
52%			
BACK	DELETE	PREV	NEXT

End Col

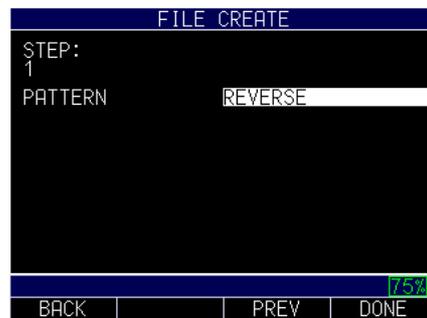
**Note:** It is imperative that the starting and ending ID always have the exact same number of digits.



Use the up and down arrow keys to select a pattern (standard or reverse). Press the **F4 - Done** key when you are finished.

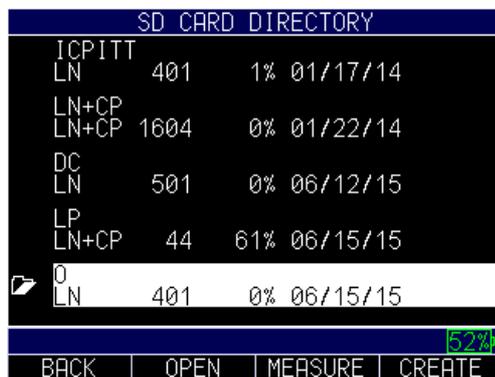


Standard



Reverse

The list of directories will appear. Simply highlight the file you want to open and press **F2** for open or **F3** to return to *Measure* screen



Use the arrow keys to select any letter or symbol on the screen to create a Starting ID.

Press the **F4 - Next** key when you are done.

Repeat instructions above for the Ending ID.

Use the arrow keys to select any letter or symbol on the screen to create a Prefix. Press the **F4 - Next** key when you are done.

Once you have created a file, you may open the file, edit information, or delete the file from the datalogger. After you find the file name (e.g., "ECH09" as shown below), press the **F4 - Next** key.

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FILE CREATE			
FILE NAME: ECH09			
DIRECTORY		SD CARD	
DESCRIPTION:			
LOCATION:			
INSPECTOR ID:			
72%			
BACK		PREV	NEXT

Find the file you would like to review.

SD CARD DIRECTORY			
LINEAR			
LN	5000	0%	04/24/15
SD FILE			
LN	10	0%	05/18/15
DAN			
LN	401	2%	05/19/15
ECH09			
LN	401	0%	01/14/14
75%			
BACK	OPEN	MEASURE	CREATE

Note, the F keys now display different options.

Use the arrow keys to select any letter or symbol on the screen to create a description.  
Press the **F4 – Next** key when you are done.

FILE CREATE			
DIRECTORY		SD CARD	
DESCRIPTION: _			
LOCATION:			
1	2	3	4
5	6	7	8
9	0		
A	B	C	D
E	F	G	H
I	J		
K	L	M	N
O	P	Q	R
S	T		
U	V	W	X
Y	Z	-	+
72%			
BACK	DELETE	PREV	NEXT

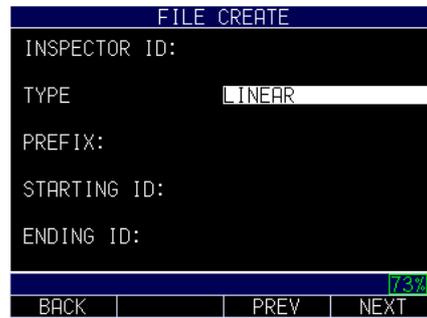
Use the arrow keys to select any letter or symbol on the screen to create an Inspector ID.  
Press the **F4 – Next** key when you are done.



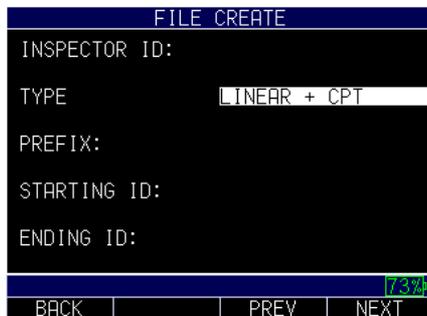
Use the arrow keys to choose the file type (sequential, linear, or linear + CPT). Press the **F4 – Next** key when you are done.



Sequential



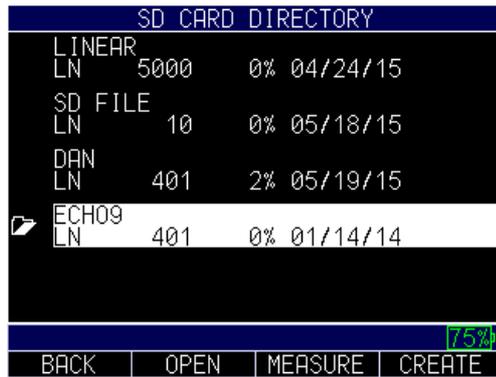
Linear



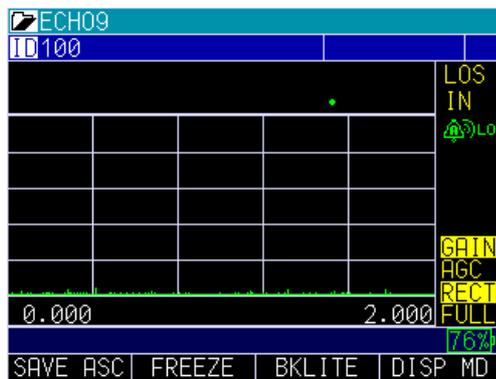
Linear + CPT

You will also need to decide, per file, if you want to save the thickness and an A-Scan. Find the file from the Directory and press the **F3 – Measure** key.

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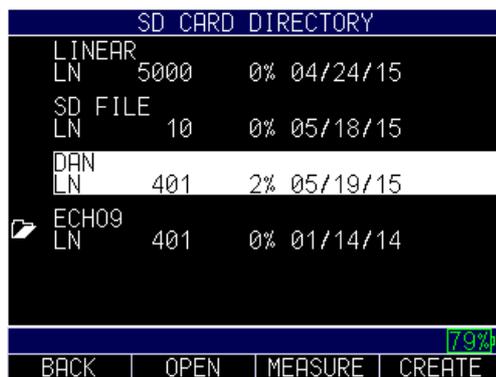
Press the **F1 – Save ASC** key to save the measurement as an A-Scan as show below:



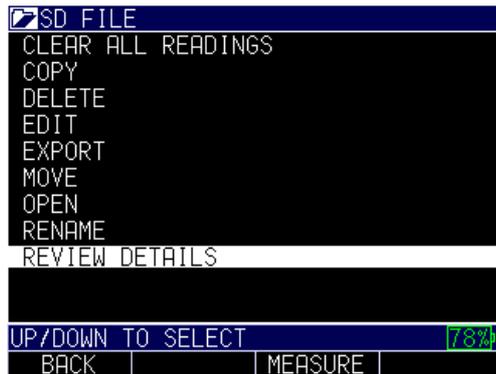
### Reviewing a File

To review a file from the **Measurement** mode screen in datalogger version only, follow these steps:

1. Press the **F3** key from the **Measurement** mode screen.
2. Use the up and down arrows to find the file, and press the **F2 – Open** key to open the file.



3. Use the up and down arrows to select a function, and press the **MENU/OK** key.



- Use the up and down arrows to review the file details.



If there is an A in the right of the file (as shown in the image above) that means A-Scan is saved, or if there is a T that means there is a Thickness. You can scroll down to any of them then press the **MENU/OK** key and the recalled reading in that location will appear on the screen. Use the left or right arrow to quickly scroll to the next stored value.

To clear a reading, highlight the reading to be cleared then press the **F3** key for clear. A prompt will appear: Are you sure. Press **F2** for yes and **F3** for no, or **F1** for Exit.

If you clear a reading, or a series of readings, press the **MENU/OK** key over the reading you would like to re-take and the ID will go back to the reading to be re-taken. The ID will then advance to any open (cleared) readings until it gets to the next available ID in the series to be taken. For example; if you clear readings 1 and 3 and the last reading in the file is ID number 10, the sequence upon clearing readings 3 and 1, **MENU/OK** will be reading 1 to re-take, skip over 2, and to 3 save, then ID number 11 as the next available id.

### B-Scan

The Datalogger version of ECHO 9 (ECHO 9DL or ECHO 9DLW) comes standard with the B-scan, which is a side view of the test piece being inspected. The B-scan is a great visual tool to quickly and easily show a representation of wall thinning. The standard B-scan is non-encoded, which means there is no correlation to the image relative to the test piece. Danatronics offers the EZ Scan 4 as a hardware option, which is a magnetic wheel, one axis encoder. When used with the ECHO 9DL or DLW, the image shows the

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Distance Traveled (DT) so you can correlate the image on the gage to a spot that was tested. Follow the images below to help set up the B-scan.



Image of a 5-step test block with both high and low alarms enabled

The image above shows the B-scan after it stops. The minimum thickness will be shown in the middle of the display. Use the left or right arrow to scroll the B-scan and see the thickness value at the vertical blue line. See the image below for a description of the various visual indicators for the B-scan display.



MEASUREMENTS	
ALARM TYPE	HIGH-LOW
ALARM HIGH REF	0.449 IN
ALARM LOW REF	0.149 IN
ALARM WARNING	20%
BLANK	OFF
BSCAN	MANUAL
BSCAN DIRECTION	LEFT TO RIGHT
BSCAN LOS	PAUSE
BSCAN MAX THICK	0.500 IN
BSCAN SAVE ASCAN	ALARM
DIFF TYPE	OFF
<-CHANGE VALUE--> 95%	
BACK	

MEASUREMENTS	
VEL	0.23589 IN/US
XDUCER	DK(S)537 5MHZ
ALARM TYPE	HIGH-LOW
ALARM HIGH REF	0.469 IN
ALARM LOW REF	0.169 IN
ALARM WARNING	20%
BLANK	OFF
BSCAN	MANUAL
BSCAN MAX THICK	0.519 IN
BSCAN DIRECTION	LEFT TO RIGHT
DIFF TYPE	OFF
<-CHANGE VALUE--> 5%	
BACK	

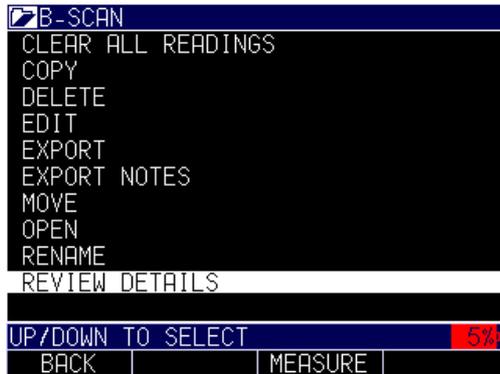
MEASUREMENTS	
ALARM TYPE	HIGH-LOW
ALARM HIGH REF	0.449 IN
ALARM LOW REF	0.149 IN
ALARM WARNING	20%
BLANK	OFF
BSCAN	MANUAL
BSCAN DIRECTION	LEFT TO RIGHT
BSCAN LOS	PAUSE
BSCAN MAX THICK	0.500 IN
BSCAN SAVE ASCAN	ALARM
DIFF TYPE	OFF
<-CHANGE VALUE--> 95%	
BACK	

MEASUREMENTS	
ALARM TYPE	HIGH-LOW
ALARM HIGH REF	0.449 IN
ALARM LOW REF	0.149 IN
ALARM WARNING	20%
BLANK	OFF
BSCAN	MANUAL
BSCAN DIRECTION	LEFT TO RIGHT
BSCAN LOS	PAUSE
BSCAN MAX THICK	0.500 IN
BSCAN SAVE ASCAN	NEVER
DIFF TYPE	OFF
<-CHANGE VALUE--> 94%	
BACK	

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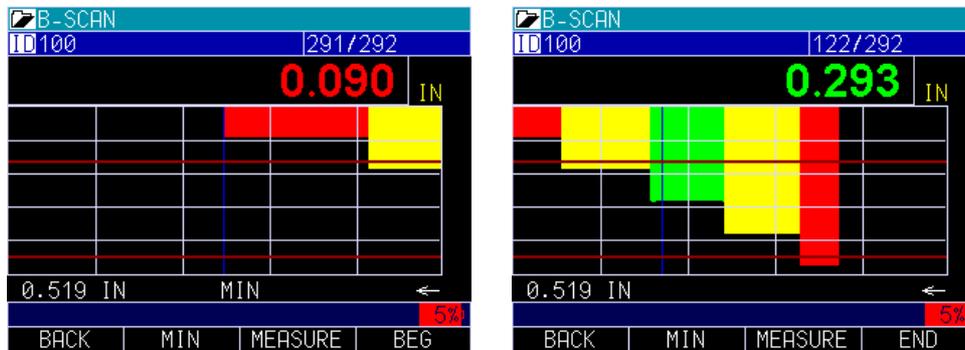
To Set up a B-scan, go to measurement and turn B-scan on. Once B-scan is set to manual or (optional encoder), you will have other screen choices to select maximum thickness you expect to encounter. The max thickness should be set just a little higher you're your maximum thickness so that the screen resolution on the vertical axis is maximized. The ECHO defaults to .500" or 12.7mm. You can also adjust direction left to right or right to left, B-scan LOS as pause (default) or continue and Save A-scan on Min, Max or Alarm. If you choose Min or Max, only 1 A-scan is saved. If you choose on alarm, a maiximum of You can save the B-scan by simply pressing the **F1 - Save** key. The B-scan will be saved to the Datalogger file. Next, go to **MENU/OK**, Dataloggger, Datlogger Dir, and highlight the file. Click the **Review Details** options as shown in the image below.



The image below shows the ID where the entire B-scan image is saved; it is indicated by the letter "B" to the right of the file. Press **MENU/OK** to review the image.



To review the image, use the left or right arrow key to scroll, or press the **F4 - BEG** key, for the Beginning of the image or the End of the image.

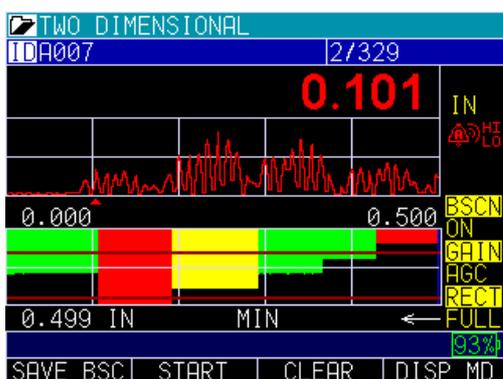


Split A and B-scan

When B-scan is enabled you can toggle between Full B-scan and Split Screen showing A-scan at the top and B-scan at the bottom by pressing the Display mode key (**F4**). By using the left or right arrows in this mode, you can scroll to various real time settings and adjust on the fly:

1. Echo to echo
2. ID
3. Alarm
4. B-scan off
5. Gain
6. Rectification
7. B-scan max range
8. A-scan range

**Note:** If blank is on under measurement, they would be adjustable as well.



### Saving A-scans with B-scan on

MEASUREMENTS	
ALARM TYPE	HIGH-LOW
ALARM HIGH REF	0.449 IN
ALARM LOW REF	0.149 IN
ALARM WARNING	20%
BLANK	OFF
BSCAN	MANUAL
BSCAN DIRECTION	LEFT TO RIGHT
BSCAN LOS	CONTINUE
BSCAN MAX THICK	0.500 IN
BSCAN SAVE ASCAN	NEVER
DIFF TYPE	OFF
<-CHANGE VALUE->	
BACK	

**CAUTION:** Saving A-scan on alarm is limited to 65 A-scan and 185 B-scans and can fill up the buffer memory quickly.

Below are descriptions of the different capacities in which the B-scan buffer can save thicknesses and A-scans.

#### Save A-scan on Alarm

Worst Case:

- 65 A-scans
- 185 thickness readings

Best Case:

- 10,000 thickness readings
- 0 A-scans

#### Save A-scan on Min or Max

- 10,000 thickness readings
- 1 A-scan for the min or max

#### Never

- 10,000 thickness readings

## 9 Technical Specifications

### Product Specifications for the ECHO 9 Series

**Size:** 7.25" (184 mm) (L) x 4.00" (101.5 mm) (W) x 2.00" (50.8 mm) (H)

**Weight:** 1.15 lbs (0.52 kg) with internal Li-Ion battery. 1.0 lb. (0.45 kg) with optional Alkaline tray including 3 AA batteries

**Display:** 3.5" high resolution color display, 320 x 240 pixels (1/4 VGA, sunlight readable, including multiple color choices

**Backlight:** Light Emitting Diode (LED) backlight, includes variable light intensity, indoor and outdoor modes

**Temperature:** (Gage Operating) -4° to 122°F (-20°C to 50°C)

**Package:** Designed for IP67 rating, custom, splash-proof, high impact plastic with illuminating rubber keypad for go/no-go testing

**Transducer connector type:** Lemo 00 (2qty)

**Bandwidth:** 0.5-30 MHz (-3dB)

**Measurement rate:** 4 Hz or 25 Hz

**Pulser:** 150V, Square Wave

**Range:** Thickness range depends on gage type, probe selection and material conditions. Typical range in corrosion mode, 0.020" – 23" (0.508 – 584 mm)

**Calibration:** Cal zero, Cal velocity, Two-point calibration or Auto Calibration performs a two-point calibration using a 5-step test block

**Material Velocity Range:** 0.0200 in/usec - 0.7362 in/uS (0.508 – 18.699 mm/uS)

**Batteries:** Standard 3.7V Li-Ion internally rechargeable battery (16 – 20 hours) or optional alkaline tray for 3 AA batteries (8 – 12 hours)

**Data XL:** Interface program to send and receive stored readings, latest firmware and application set up files as two way communication from ECHO to computer

**USB:** USB 2.0

**Stored setups:** Storage and recall of calibration and set up files

**Memory:** Internal memory standard on all models. For datalogger models 2GB micro SD card standard and expandable up to 32GB

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**Gain:** Low, Standard and High for gages without waveform, 20 – 94 db in 1 db increments

**Blanking:** Main Bang Blank and Blank After First Received Echo

**Zoom:** Automatically centers echos in the center of the display independent of material thickness

**Units:** English, Metric, Microseconds

**Temperature correction:** Software to correct for varying sound speed as a function of entered temperature

**Languages:** English, French, German, Spanish, Italian, Russian, Czech, Finnish, Chinese, Japanese, Hungarian

**Fast Min/Max:** Displays minimum, maximum or both simultaneously with actual thickness at 25 Hz

**Alarms:** Gage vibrates and beeps. Display changes color based on alarm condition

**Transducers:** Single, dual, delay lines, contact, immersion. Go to [www.danatronics.com/transducerchart.html](http://www.danatronics.com/transducerchart.html) for more information

**Measurement types:** Main bang to first backwall echo, Echo-to-Echo and velocity mode (displays acoustic sound speed based on entered thickness)

**Freeze mode:** Direct access to freeze display (ideal for high temperature applications)

**Hold mode:** Holds display to retain last thickness reading

**Warranty:** Limited 2 year warranty under normal use on parts and labor for gage. Optional Dan-A-Care to add up to 3 more years

**Shut off:** Selectable auto shut off 1 – 31 minutes or never shut off

**Differential mode:** Displays the difference from actual thickness measurement in absolute or percentage of a user entered reference value

**Resolution:** 0.001" or 0.010" as corrosion gage and 0.001" or 0.0001" in Precision mode

**Transport case:** Hard plastic with high density molded foam cut out for gage and most accessories

**Certifications:** CE certified, RHOS compliant, designed for IP67

**Accessory mount:** ECHO 9 includes a 1/4x20 standard connection point on the back of the unit to allow for a multitude of accessories including a magnetic pipe attachment and a Gorilla Pod

**Standard inclusions:** ECHO 9 series ultrasonic thickness gage, DKS-537, 5MHz, 0.375 inch diameter transducer with potted cable, 2oz bottle of couplant, operation manual, Data XL interface program, USB cable, Charger Adapter, Transport Case. \*A transducer is included with each model. Contact Danatronics for details.

**Available software options:** Datalogger with B-scan, Live waveform, Precision mode, Oxide scale, Coating thickness

**Hardware options:** EZ Scan B-scan Encoder, Bluetooth, Alkaline battery tray, rubber boot

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## 10 Software Options for the ECHO 9 Series

### Datalogger with B-Scan

The B-Scan represents a cross sectional view on the test piece. The simplest example is to show a 5-step test block. To turn on the option B-Scan for EHC-09 series press the **MENU/OK** key, go to **Measurement**, find B-scan and press the **MENU/OK** key. First enter the maximum thickness you expect to scan using the up, down, left and right keys, then turn on the B-Scan scrolling down and right arrow (left arrow for off). Press **F3** in lefty or **F1** in Righty mode when **done**. The bottom of the display will read **SAVE**, **START** or **STOP** and **CLEAR**. To Start a B-Scan, couple to the test block and press the **F2 – Start** key. If you uncouple the transducer, B-Scan will stop due to LOS. If you press the **F2 – Stop** key, the minimum thickness will be displayed in the center of the screen while a vertical cursor allows you to review readings. During review the thickness value is updated in the top right of the display. To save all the readings, press the **F1 – Save** key. The amount of saved readings up to the file size of 5,000 readings or what was pre-determined in the current file (See Datalogger) set up.

### Saving a B-Scan to Memory

When saving images to a B-Scan file, first set up a file name, save as a linear file and Thickness only...Thickness only is very important as one B-Scan screen represents approximately 200 data points and a thickness and waveform file would be full before one B-Scan full screen is complete. Press Done, press the **F2 – Start** key, and the **F1 – Save** key. You can now press the **MENU/OK** key, scroll to Datalogger, choose the B-Scan file to review, the **MENU/OK** key, Review, the **MENU/OK** key, scroll over where an id and reading are present, and press the **MENU/OK** key. The B-scan will appear. **F2** will center the minimum (min) in the middle of the screen. **F3** will show either Beg or End to go to the beginning or end of file. You can also use the left or right keys to move the cursor (triangle) to show the thickness in the top right above the triangle.

### Encoded B-Scan

The ECHO 9 can be equipped with a magnetic wheel linear axis encoder (EZ Scan 4). The EZ Scan 4 is an optional accessory that can be used with the B-Scan option. The EZ Scan 4 uses a 5 Mhz dual transducer.



Plug the lemo connectors into the connection on the gage for the transducer. The lemo connector, with a red dot on the end, is the encoder connector. Line up the 2 red dots to

plug in the encoder connector. (All ECHO 9DL gages need to be modified for this connector if the encoder is to be used. Contact Danatronics for details.)

To start on the encoder, press **MENU/OK**, Measurement, B-Scan, and **MENU/OK**. Then use the right arrow to select either off, manual, or encoder. Use the down arrow and highlight max thick and then left or right to change the value to change the maximum thickness (just larger than actual test piece). Use the down arrow to highlight encoder resolution between 0.031 – 2" by using left or right arrow once Resolution is highlighted:

### Transducers

Danatronics offers the use of a wide variety of primarily dual probes with the EHCO 9 series as well as a few delay line probes. See chart below for specifications on our available probes.



### ECHO 9 Transducers

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
<b>STANDARD DUAL TRANSDUCERS</b>						
DK-250	0.1"-20" (2.5mm-508mm)	0.200"-5" (5.08mm-127mm)	2.25 MHz	0.5"/12.7mm	32-392F/0-200C	Right Angle Potted - Lemo 00
DK-525	0.040"-20" (.76mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.25"/6.35mm	32-392F/0-200C	Right Angle Potted - Lemo 00
DK-537	0.040"-20" (1mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.375"/9.52mm	32-392F/0-200C	Right Angle Potted - Lemo 00
DKS-537	0.040"-20" (1mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.375"/9.52mm	32-100F/0-38C	Right Angle Potted - Lemo 00
DK-550	0.040"-20" (.76mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.5"/12.7mm	32-392F/0-200C	Right Angle Potted - Lemo 00
DK-718	0.030"-2.0" (.76mm-50mm)	0.060"-1" (1.55mm-25.4mm)	7.5 MHz	.187"/4.75mm	32-392F/0-200C	Right Angle Potted - Lemo 00
DK-1025	0.020"-2" (.5mm-48.2mm)	0.060"-1" (1.5mm-25.4mm)	10.0 MHz	0.25"/6.35mm	32-392F/0-200C	Right Angle Potted - Lemo 00

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
<b>COMPOSITE DUAL TRANSDUCERS</b>						
DC-110	0.200"-20" (5.08mm-508mm)	Not recommended for EtoE	1.0 MHz	1"/25.4mm	32-122F/0-50C	Right Angle Potted - Lemo 00
DC-175	0.150"-20" (3.81mm-508mm)	Not recommended for EtoE	1.0 MHz	.75"/19.05mm	32-122F/0-50C	Right Angle Potted - Lemo 00
DC-250	0.1"-20" (2.5mm-508mm)	0.200"-5" (5.08mm-127mm)	2.25 MHz	.5"/12.7mm	32-122F/0-50C	Right Angle Potted - Lemo 00
DC-525	0.030"-20" (.76mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.25"/6.35mm	32-122F/0-50C	Right Angle Potted - Lemo 00
DC-537	0.040"-20" (1mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.375"/9.52mm	32-122F/0-50C	Right Angle Potted - Lemo 00
DC-550	0.030"-20" (.76mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.5"/12.7mm	32-122F/0-50C	Right Angle Potted - Lemo 00

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
<b>DUAL ECHO TO ECHO TRANSDUCERS</b>						
DKS37EE	0.040"-20" (1mm-508mm)	0.080"-1.5" (2mm-38.1mm)	5.0 MHz	0.375"/9.52mm	31-392F/0-200C	Right Angle Potted - Lemo 00
DK-718EE	0.030"-1.5" (.76mm-38.1mm)	0.060"-1.0" (1.5mm-25.4mm)	7.5MHz	0.187"/4.75mm	31-392F/0-200C	Right Angle Potted - Lemo 00

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
<b>DUAL HIGH TEMP TRANSDUCERS</b>						
DHT-537	0.040"-20" (1mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.375"/9.52mm	-5 to 950F/-20 to 509C	Straight Microdot - requires detachable cable
DHT-537RM	0.040"-20" (1mm-508mm)	0.080"-2" (2mm-50.8mm)	5.0 MHz	0.375"/9.52mm	-5 to 950F/-20 to 509C	Right Angle Microdot - requires detachable cable

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
<b>DELAY LINE STANDARD TRANSDUCERS</b>						
DLK-525	.025-.500" (.63mm-12.7mm)	.025-.500" (.63mm - 12.7mm)	5.0 MHz	0.25"/6.35mm	32-122F/0-50C	Straight Microdot - requires detachable cable
DLK-1025	.020-.500" (.5mm-12.7mm)	.020-.500" (.5mm - 12.7mm)	5.0 MHz	0.25"/6.35mm	32-122F/0-50C	Straight Microdot - requires detachable cable

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
<b>DELAY LINE COMPOSITE TRANSDUCERS</b>						
DLC-525	.040-.500" (1mm-12.7mm)	.040-.500" (1mm - 12.7mm)	5.0 MHz	0.25"/6.35mm	32-122F/0-50C	Straight Microdot - requires detachable cable

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
<b>DELAY LINE PENCIL PROBE TRANSDUCERS</b>						
DLK-1225PP-SM	.020-.200" (.5mm-5.08mm)	.020-.200" (.5mm - 5.08mm)	12.0 MHz	0.1225"/3.11mm	32-122F/0-50C	Straight Microdot - requires detachable cable
DLK-1225PP-RM	.020-.200" (.5mm-5.08mm)	.020-.200" (.5mm - 5.08mm)	12.0 MHz	0.1225"/3.11mm	32-122F/0-50C	Straight Microdot - requires detachable cable

**QUICK CHANGE ANGLE BEAM TRANSDUCERS (ANGLE BEAM IS ON THE ECHO 9, EHC-09 COLOR AND THE FULL TRANSDUCERS LISTS)**  
 Available in: Diameter: 1/4", 3/8" & 1/2" Frequencies: 1.0, 2.25, 3.5, 5.0, 7.5 & 10.0 MHz

### Acoustic Sound Speed for Common Materials

The sound velocity table is a list of the speed of sound in various materials. This information is necessary to have when using the gage as the speed the ultrasound will move through the material in question need to be programmed into the gage to obtain an accurate thickness.

All velocities in this sound velocity table are approximations:

<b>Material</b>	<b>Sound Velocity Inch/<math>\mu</math>Second</b>	<b>Metres/second</b>
Air	0.013	330
Aluminium	0.250	6300
Alumina Oxide	0.390	9900
Beryllium	0.510	12900
Boron Carbide	0.430	11000
Brass	0.170	4300
Cadmium	0.110	2800
Copper	0.180	4700
Glass(crown)	0.210	5300
Glycerine	0.075	1900
Gold	0.130	3200
Ice	0.160	4000
Inconel	0.220	5700
Iron	0.230	5900
Iron (cast)	0.180	4600
Lead	0.085	2200
Magnesium	0.230	5800
Mercury	0.057	1400
Molybdenum	0.250	6300

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Monel	0.210	5400
Neoprene	0.063	1600
Nickel	0.220	5600
Nylon, 6.6	0.100	2600
Oil (SAE 30)	0.067	1700
Platinum	0.130	3300
Plexiglas	0.110	1700
Polyethylene	0.070	1900
Polystyrene	0.0930	2400
Polyurethane	0.0700	1900
Quartz	0.230	5800
Rubber, Butyl	0.070	1800
Silver	0.140	3600
Steel, Mild	0.230	5920
Steel, Stainless	0.230	5800
Teflon	0.060	1400
Tin	0.130	3300
Titanium	0.240	6100
Tungsten	0.200	5200
Uranium	0.130	3400
Water	0.0584	1480
Zinc	0.170	4200

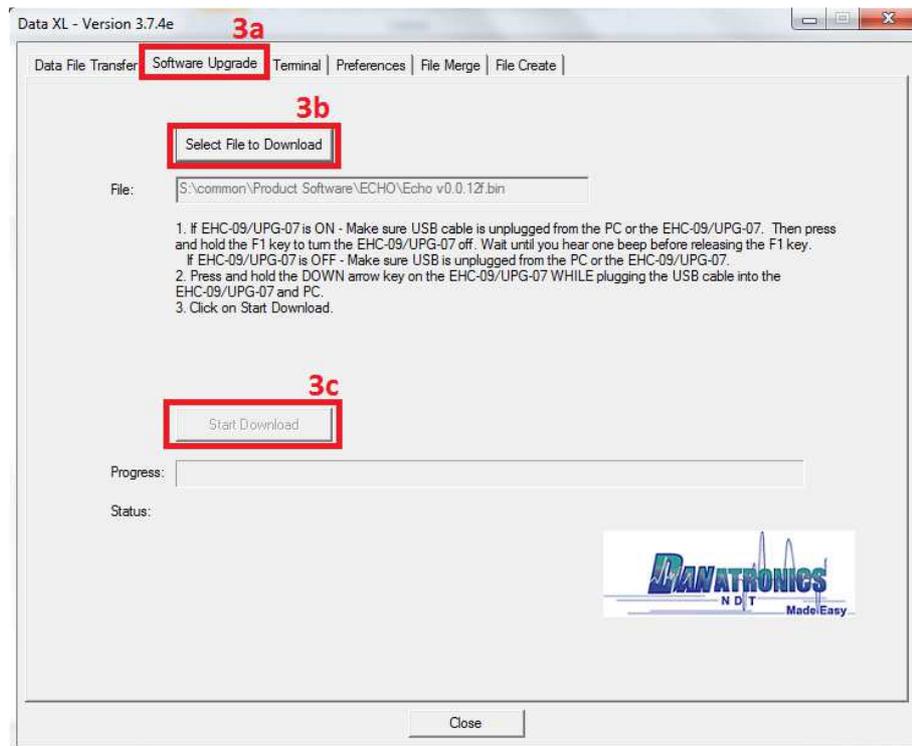


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### Updating the ECHO 9 Gage

To update an ECHO 9 gage, follow the below steps:

1. Power on the ECHO 9 gage by holding the **F1** key until the unit beeps and displays the splash screen.
2. Connect the ECHO 9 gage via a USB cable to a computer that already has Data XL software (v3.7.4 or higher) installed on it.
3. Launch Data XL software.
  - 3a. Click the **Software Upgrade** tab located in the upper portion of Data XL.
  - 3b. Click the **Select File To Download** button, which will launch an open file dialog box. Select the file to update the ECHO 9 gage. (In the example below, the file **Echo v.0.0.12f.bin** was chosen.)
  - 3c. Click the **Start Download** button, which will commence with the software update. The ECHO 9 gage should display the message “**Launching Update**” on the screen. Shortly after, the update program will proceed to update the gage. Once the update is complete, the screen will display a message to “**Unplug USB cable to turn off power**”. At this point, the software update process is completed.



**11 Technical Assistance**

Call Danatronics, Corp. at 978-777-0081 or email us at [sales@danatronics.com](mailto:sales@danatronics.com) for specific technical assistance or troubleshooting questions.