ECHO Series Thickness Gages

Ver: 2.1A

Danatronics, Corp.

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."

Table of Contents

Danatronics, Corp.

Danatronics, Corp.

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, EHCO-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

Latest Software Updates

Danatronics periodically releases software updates with new and improved gage functionality and features. You can download the latest standard software at no charge by going to the ECHO section of www.danatronics.com and clicking on the support tab. Use

the most recent version of Data XL, which is also available on the website to download at no charge, and use the USB cable provided with the kit. Plug the cable into the USB port on the top left of the ECHO and use the "Software Upgrade" tab to begin.

The following enhancements are included with the latest software for the ECHO 9 Series (Version V1.15 or higher):

1. Coating Thickness
2. Temperature Correction
3. Stored Setups
4. Oxide Scale

Coating Thickness

For any ECHO 9 equipped with the live Waveform (A-scan), both the coating thickness and substrate thickness can be displayed at the same time. When the Coating option is enabled through the Menu options, the Measurements and the Calibration screen will be turned on. ECHO will prompt you to calibrate the thickness of the substrate first (without the coating), and preform your normal 2-point calibration (described later in this manual). Next, you must perform Cal Zero on the thin section and Cal Vel on the thick section followed by pressing the **OK** button. ECHO will then prompt you to put on a coating of the known thickness and press the **F3 Vel** key to adjust the coating thickness displayed in yellow in the top right hand corner of the screen (shown in the image below). ECHO calculates the sound speed of the coating and substrate independently. There is no need for special dual transducers.

Temperature Correction

The Temperature Correction feature allows you to enter the calibrated temperature, current temperature, and coefficient factor, which corrects for sound speed variations between the calibrated temperature and current temperature.

Danatronics, Corp.

```
              MEASUREMENTS
REF THK             0.500 IN
RANGE               1.000 IN
RECTIFICATION    FULL
TEMPERATURE COMP ON
TEMPERATURE CAL      70 F
TEMPERATURE COEF -0.00010
TEMPERATURE CURR    70 F
VEL              0.23300 IN/US
XDUCER           DK550  5.0MHZ
ALARM TYPE       OFF
BLANK            OFF
<-CHANGE VALUE->            96%
   BACK
```

Stored Setups

You can store and re-call up to 2,700 unique applications setups with this updated feature, allowing for easy parameter recall for a more efficient inspection. ECHO keeps track of various parameters, such as Gain, Range, Rectification, and Alarm Values. To get started, follow the steps below.

1. Choose the transducer you are using and perform your normal test.

```
         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
    F1        F2        F3
```

2. If you alter a setup parameter, such as Gain, Range, Blank, or Rectification, then you will see in the main *Menu* screen as shown below:

```
        MENU
CALIBRATION
DATALOGGER
DISPLAY
INITIAL SETTINGS
MEASUREMENTS
XDUCER SETUPS
TEST




UP/DOWN TO SELECT          62%
   EXIT
```

3. After scrolling to the **Xducer Setups** option, press the **MENU/OK** key. An asterisk next to the transducer file you started with.
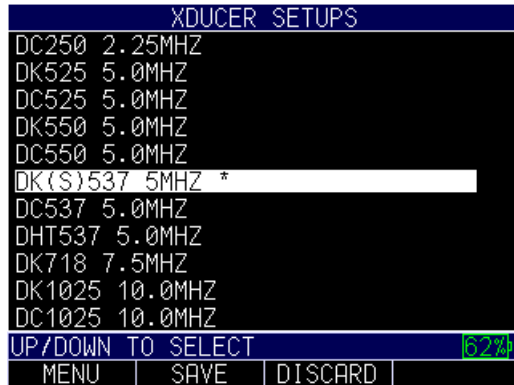
4. At this point, you can either **SAVE** the file by pressing the **F2** key or **DISCARD** it by pressing the **F3** key. If you press the **F2** key to save the file, then a screen will appear with an alphanumeric keypad so you can name the custom file.

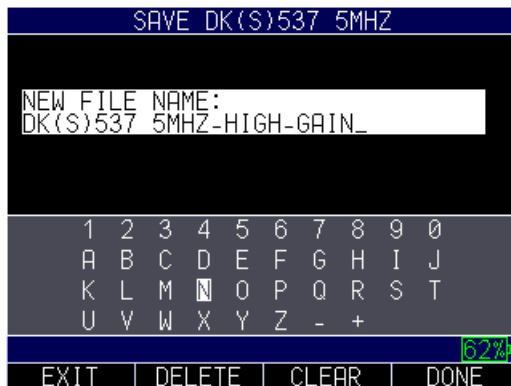5. After naming the file, press the **F4 – Done** key. The new custom setup file will populate at the end of the transducer list.

When the new file is highlighted in the transducer list, you can press the **MENU/OK** key to use the custom setup or press the **F3 – DELETE** key to the delete it. You can also press the **F4 – RENAME** key to modify the file name.
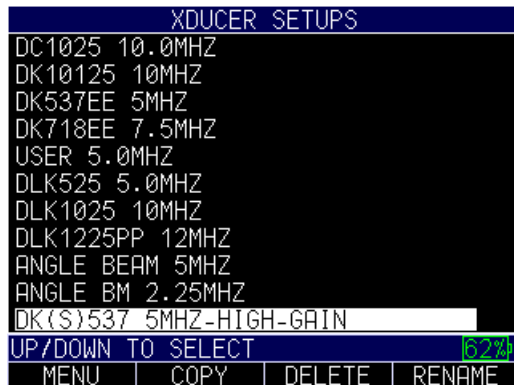
Note: Default transducers in the initial library cannot be deleted.

6. You may have more than one custom setup, as shown in the example below:

Danatronics, Corp.
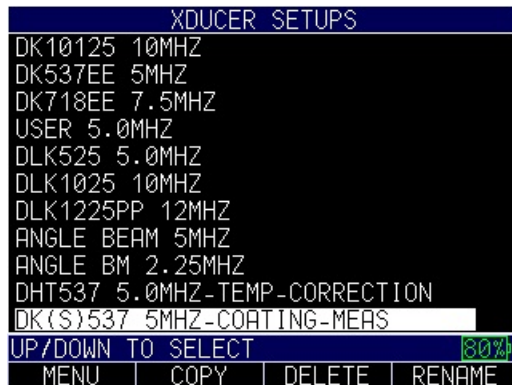
Oxide Scale

The Oxide Scale option comes standard on the ECHO-7W and ECHO-7DLW.

When equipped with the Oxide Scale option and a 20mhz delay line transducer, both ECHO 7 and ECHO 8 units with live waveform can measure the Oxide Scale (0.015" – 0.040") and tube thickness calibrated to their independent sound speeds.
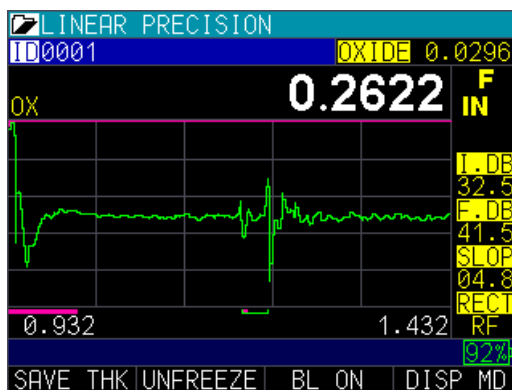
To use the Oxide Scale option, begin at the main Menu and go to the **Setups** option. Select DEF S3, DLK2025-OXIDE, or DLK20125. Use samples of known tube thickness and known oxide thickness to perform a calibration.

Press the **MENU/OK** key. Select the **Calibration** option followed by the **MENU/OK** key. The following prompt will appear:

Use screen above

Follow the prompts by pressing the **F2** key to calibrate the tube thickness first (Cal Zero on the thin section, and Cal Vel on the thick section). Press the **MENU/OK** key. Next, press the **F3 – VEL** key to calibrate while coupled to a sample with a known oxide scale thickness.

> **Note:** You may need to increase I.DB or F.DB to get an echo image similar to the one shown below.
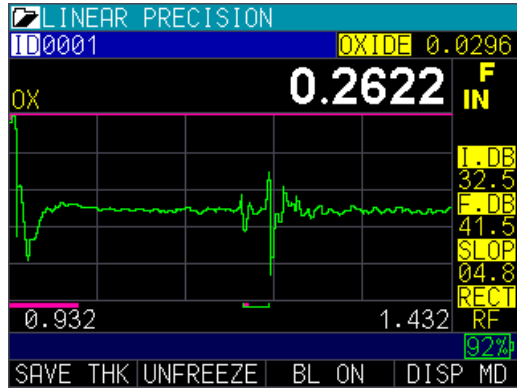
Setup Instructions

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):

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.

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)

OK	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.

Danatronics, Corp.

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.
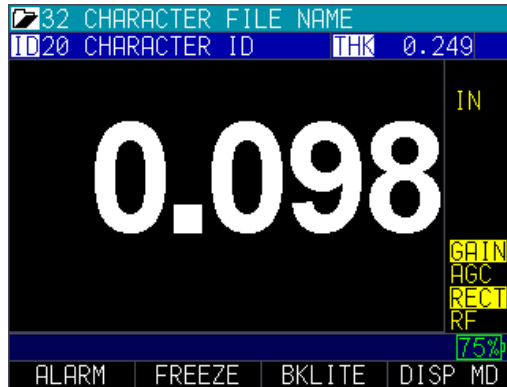
Color thickness reading only on ECHO 9

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

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.
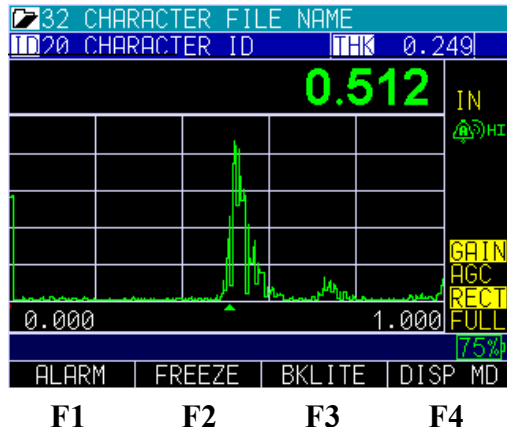
Battery Pack

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.

Danatronics, Corp.

Re-charging the Battery

USB port

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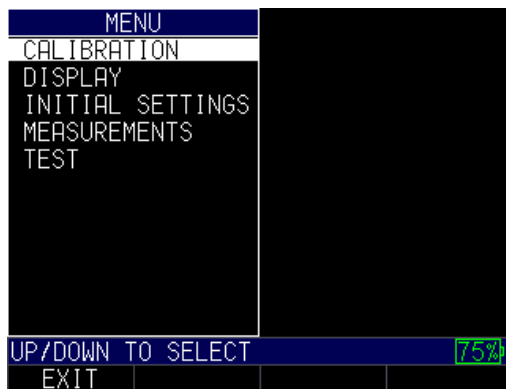
You may also use a computer instead of the wall charger to charge the gage, but this will take significantly more time than using an AC outlet. If you decide to charge the gage using this method, make sure the gage is powered off before you connect the USB to the computer and to the gage itself.

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.

Danatronics, Corp.

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.

Danatronics, Corp.

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:

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:

```
            MENU
 CALIBRATION
 DISPLAY
 INITIAL SETTINGS
 MEASUREMENTS
 TEST




 UP/DOWN TO SELECT        75%
      EXIT
```
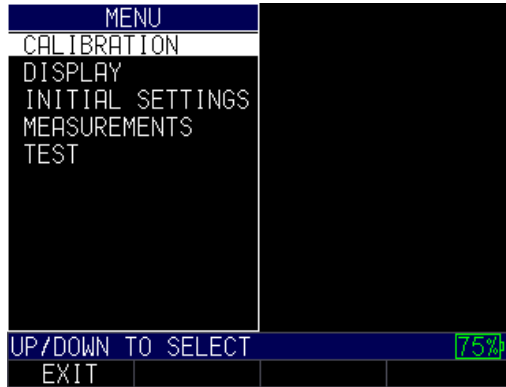
For a full description of all the **Menu** options, refer to Section 6.

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:

```
            RESET
         PARAMETERS






 UP/DOWN TO SELECT        75%
      BACK        ABOUT
```

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

```
            RESET

      RESTORE DEFAULT
        PARAMETERS
       ARE YOU SURE?




                         75%
      BACK      YES      NO
```
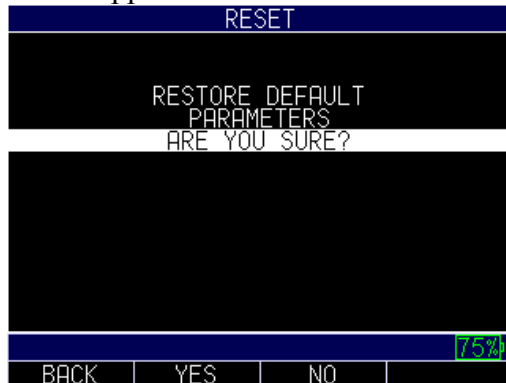
3. Press the **F2 – Yes** key to reset all parameters in the gage back to default settings, or press the **F3 – No** key to cancel a parameter reset.

Danatronics, Corp.

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 H*ome* screen, press the **F1 – Reset** key. The Reset screen appears.

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

```
         R  E  S  E  T



     CLEAR  FILES/DEFAULT
     DATABASE/PARAMETER
     ARE  YOU  SURE?


                          99%
     EXIT  |    YES    |    NO
```

   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 H*ome* screen, press the **F1 – Reset** key. The *Reset* screen appears.

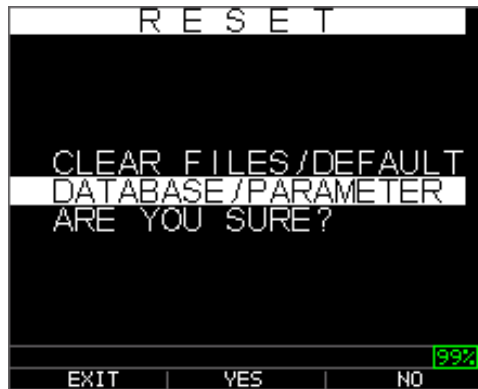   Select the **Parameter** option and press the **MENU/OK** key. The following screen appears:

```
         R  E  S  E  T



     DATABASE
     PARAMETER
     DATABASE/PARAMETER



     EXIT  |          |  ABOUT
```

22

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 H*ome* screen, press the **F1 – Reset** key. The *Reset* screen appears.

    Select the **Database** option and press the **OK** key. The following screen appears:
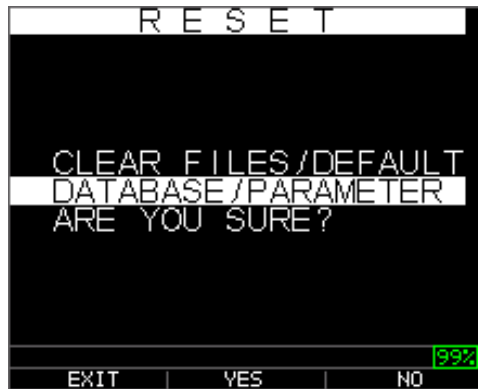
2. If you want to exit this screen press either the **F1 – Exit** key or **F3 – No** key to take no action and return to *Home* screen.

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:

Danatronics, Corp.

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.
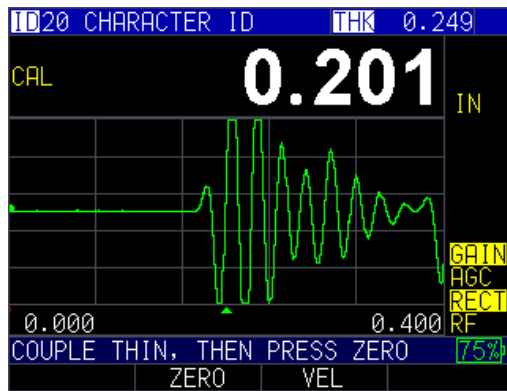
Velocity Calibration Only

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.

Danatronics, Corp.

**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:
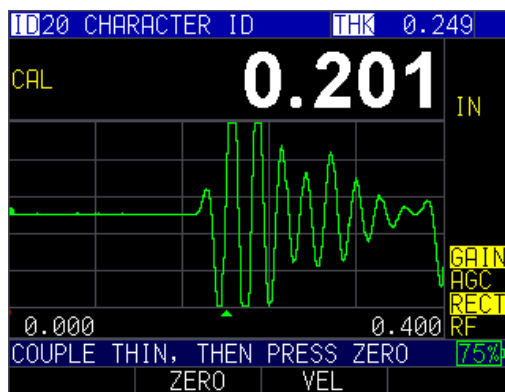
Cal screen

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:
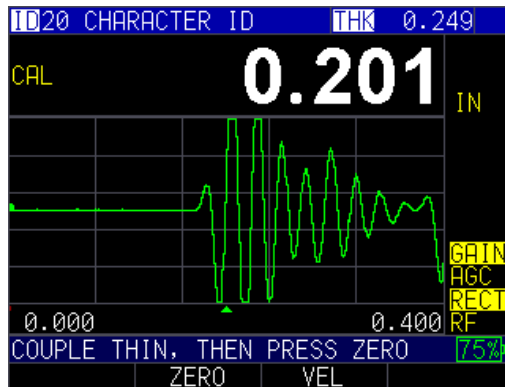
Cal screen

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.

Danatronics, Corp.

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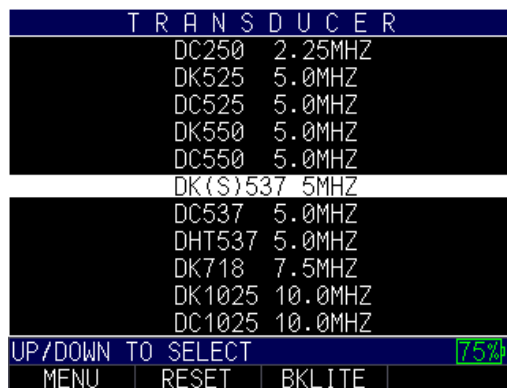
To continue the Auto Zero, follow the instructions given on each display screen; the first of which will prompt you to wipe off any couplant from the transducer and wait three seconds. The waiting time is shown in the changing pie-clock graphic.
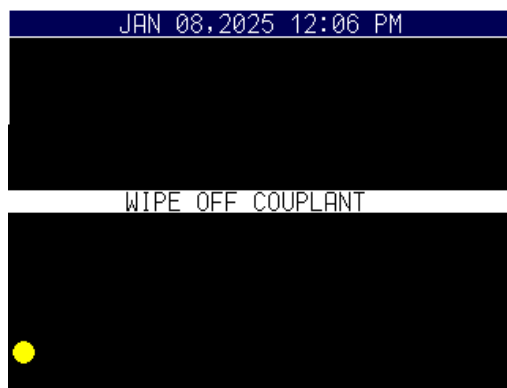
After three seconds, the gage automatically begins to zero the transducer.

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.

Measurement Mode with a Datalogger

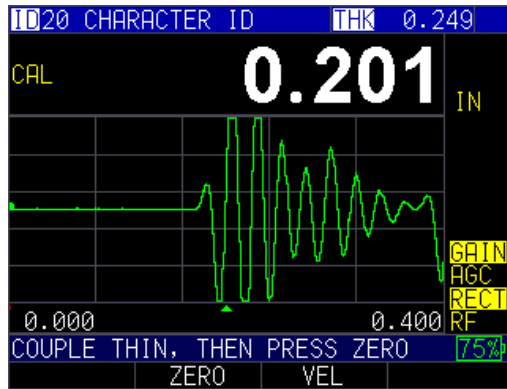If your ECHO 9 series thickness gage is equipped with a datalogger, then the display screen in *Measurement* mode will look like the screen below:

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.

Danatronics, Corp.

4 Customizing Display Options

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

```
            MENU
 CALIBRATION
 DISPLAY              DISPLAY
 INITIAL SETTINGS  BKLIGHT
 MEASUREMENTS      COLOR
 TEST              USER
                   WAVEFORM




 UP/DOWN TO SELECT          75%
     EXIT
```
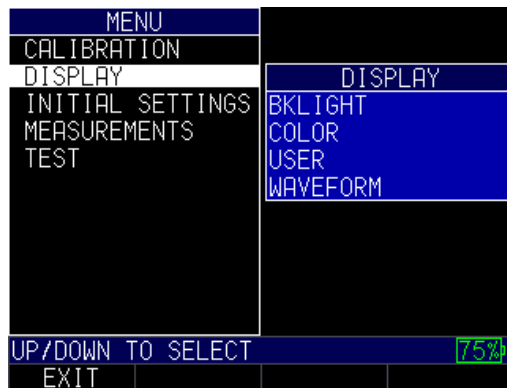
Backlight

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 H*ome* 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.

```
            DISPLAY
 BKLIGHT          AUTO
 COLOR
 USER             LEFT HAND
 WAVEFORM         OUTLINE






                           75%
     BACK
```

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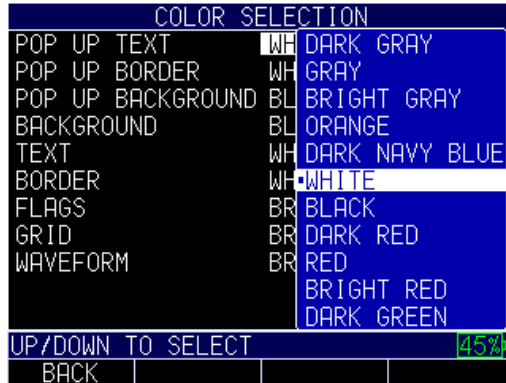5. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

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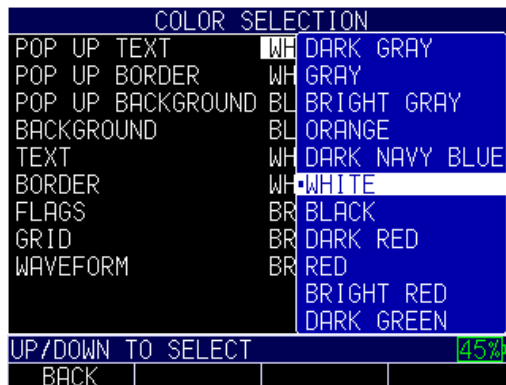
5. You may select any of the following items in the list for color modification:
   - Pop up text
   - Pop up border
   - Pop up background
   - Background
   - Text
   - Border
   - Flags
   - Grid
   - Waveform
6. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

User

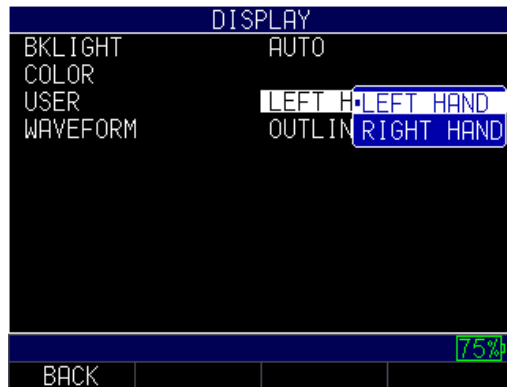The ECHO series gage is compatible with both right-handed and left-handed users. To adjust your preference, follow the steps below:

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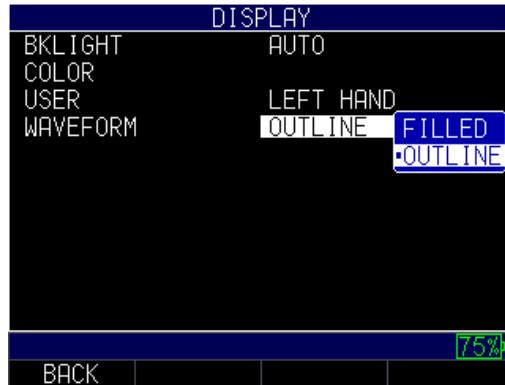
4. Select either option:
   - *Filled*: Waveform will be solid
   - *Outline*: Waveform will be outlined
5. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

Grid View

Grid view is a standard feature on any gage (version 2.07 or higher) equipped with the datalogger. This feature has two options to view the screen: (1) display the grid by itself or (2) display a split screen with the A-scan on the top and the grid on the bottom. One advantage of using the grid view is that you can see the datalogger populating as you make readings. Also, alarms—if activated—can even be color-coded. Below is an example of the split screen grid view in Corrosion mode:

To activate the grid view option, follow the steps below:

1. Press **MENU/OK**, scroll to display, and turn on the Grid View option. You can also choose small or large font parameters, which will affect how large the grid will appear.

Danatronics, Corp.

2. Use the up and down arrow keys to chose the any of the following parameters:
    - *Off*: Grid View remains off
    - *Small Font*: Determines how many rows and columns can be viewed simultaneously
    - *Left Hand*: Option for left hand users
    - *Outline*: Waveform will be outlined
3. Press the **MENU/OK** key or the **F1 – Back** key to exit the screen.

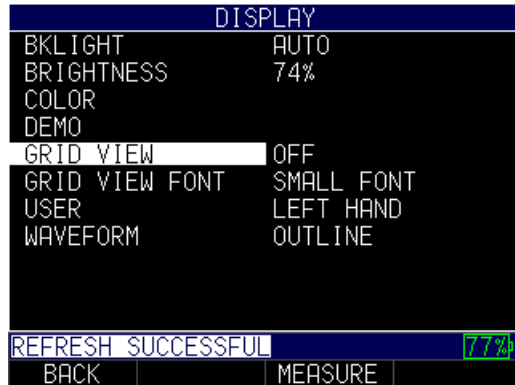With grid view turned on—while in the A-scan split screen mode—use the left or right keys (edit keys) to highlight the grid with a white box, and press **F2 – Grid Nav** key to use grid navigation.

From grid navigation you can select the following options:

- **F1 – Exit Nav:** Goes back to the previous screen
- **F3 – Sel ID:** Goes to the specific ID of a reading that you with to re-take.

If you have a suspect reading and would like to delete it from the system, follow the steps below:

1. Press **F3 – Clear** key.
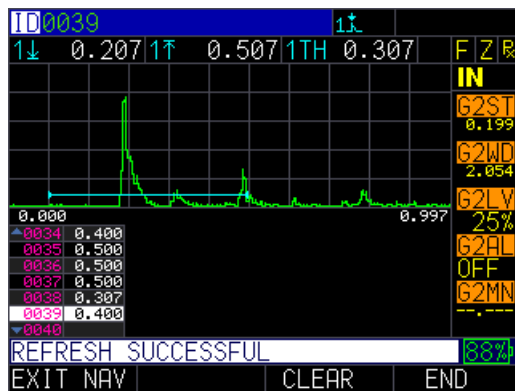
2. Verify that you wish to delete the reading by pressing **F2 – Yes** key. If you decide not to delete the reading, then press **F3 – No** key.

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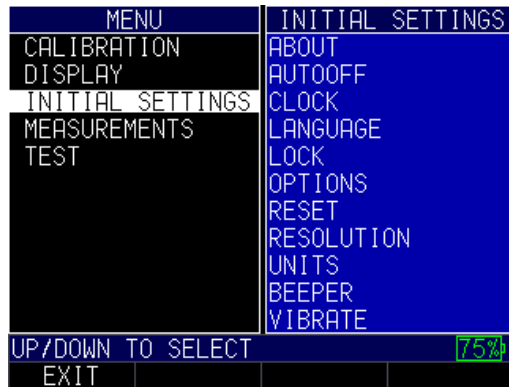
3. Press the **MENU/OK** key.
4. Use the up and down arrow keys to select any of the settings you wish to change.
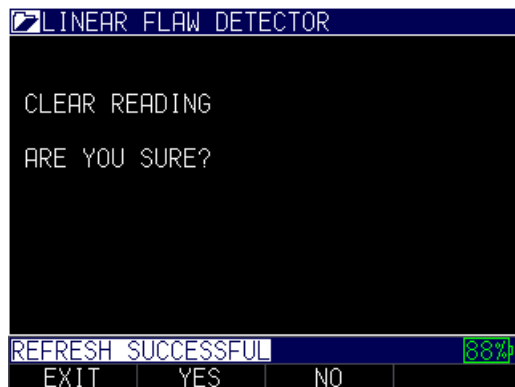5. When finished, press the **F1 – Back** key to exit the screen.

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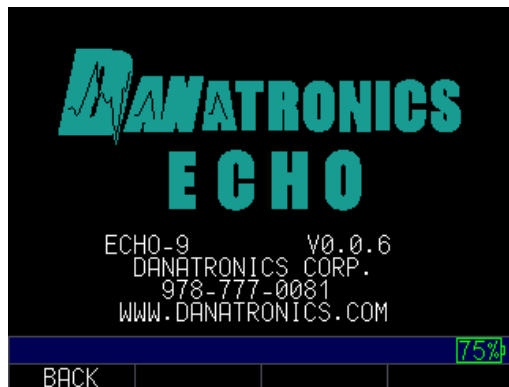
2. When finished, press the **F1 – Back** key to exit the screen.

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
                             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
```

Danatronics, Corp.

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.
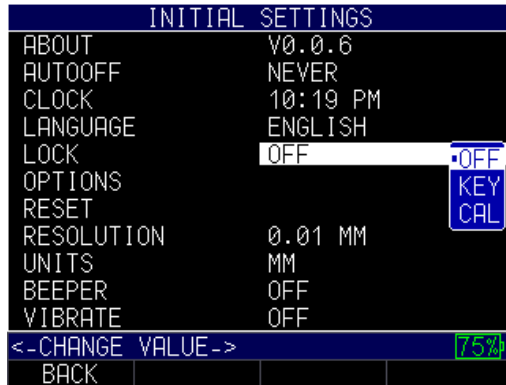

2. Use the up and down arrow keys to change the setting.
3. When finished, press the **F1 – Back** key to exit the screen.

General Lock

The general **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.
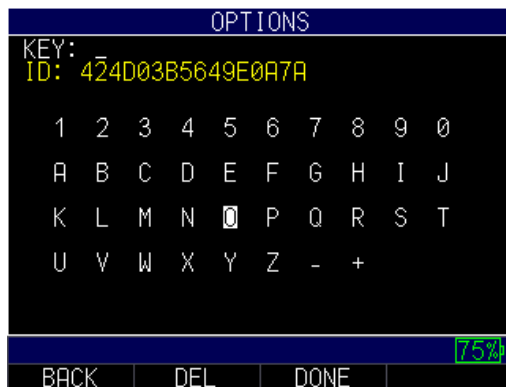
Advanced Locks

Please see Section 7: Special Features for more information.

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.
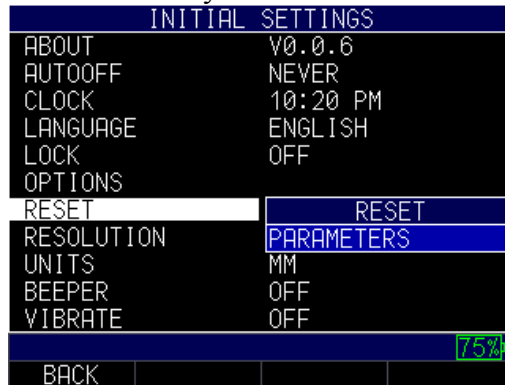
Danatronics, Corp.

Reset

You can reset the gage parameters back to the default settings by performing a gage reset.
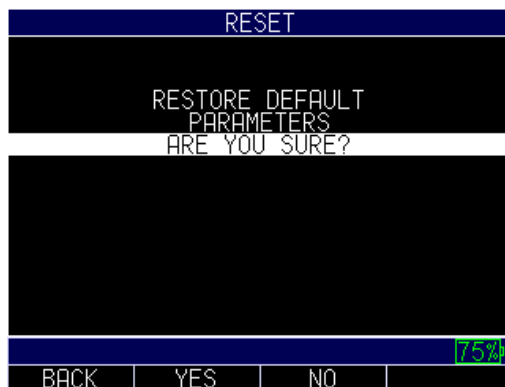
> **Note:** Performing a reset permanently deletes all of the saved parameters from the gage and replaces the settings with default values.

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.

```
            INITIAL SETTINGS
 ABOUT              V0.0.6
 AUTOOFF            NEVER
 CLOCK              10:20 PM
 LANGUAGE           ENGLISH
 LOCK               OFF
 OPTIONS
 RESET                      RESET
 RESOLUTION         PARAMETERS
 UNITS              MM
 BEEPER             OFF
 VIBRATE            OFF
                                    75%
    BACK
```

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

```
                  RESET


             RESTORE DEFAULT
                PARAMETERS
              ARE YOU SURE?




                                    75%
    BACK      YES       NO
```

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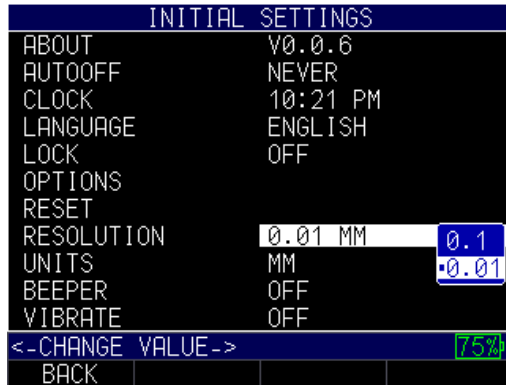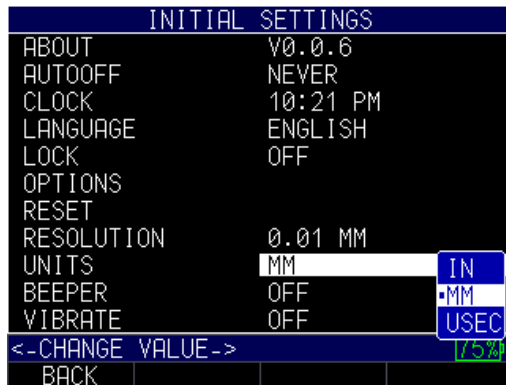
2. Use the up and down arrow keys to chose between the following options:
   - 0.01 IN/0.1 MM/0.1 US
   - 0.001 IN/0.01 MM/0.01 US
3. When finished, press the **F1 – Back** key to exit the screen.

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.

```
          INITIAL SETTINGS
 ABOUT              V0.0.6
 AUTOOFF            NEVER
 CLOCK              10:22 PM
 LANGUAGE           ENGLISH
 LOCK               OFF
 OPTIONS
 RESET
 RESOLUTION         0.01 MM
 UNITS              MM
 BEEPER            [OFF    ]    •OFF
 VIBRATE            OFF          ON
<-CHANGE VALUE->                 75%
    BACK
```
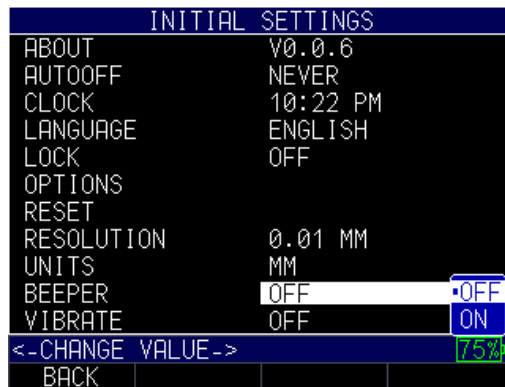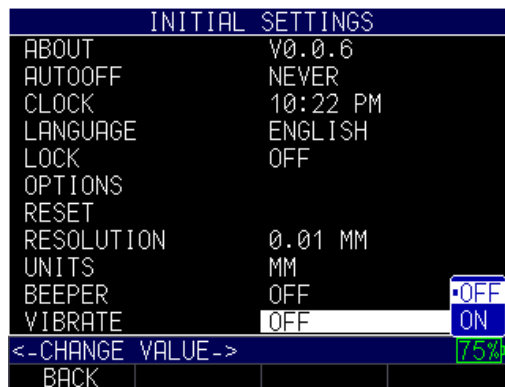
2. Use the up and down arrow keys to chose between the following options:
   - *Off*: Disables the Beeper option
   - *On*: Enables the Beeper option
3. When finished, press the **F1 – Back** key to exit the screen.

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.

```
          INITIAL SETTINGS
 ABOUT              V0.0.6
 AUTOOFF            NEVER
 CLOCK              10:22 PM
 LANGUAGE           ENGLISH
 LOCK               OFF
 OPTIONS
 RESET
 RESOLUTION         0.01 MM
 UNITS              MM
 BEEPER             OFF          •OFF
 VIBRATE           [OFF    ]     ON
<-CHANGE VALUE->                 75%
    BACK
```
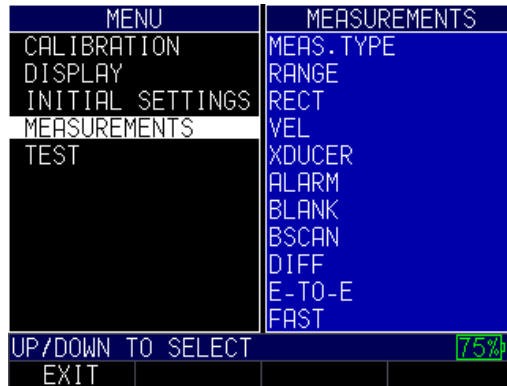
2. Use the up and down arrow keys to chose between the following options:
   - *Off*: Disables the Vibrate feature
   - *On*: Enables the Vibrate feature
4. When finished, press the **F1 – Back** key to exit the screen.

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.

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.
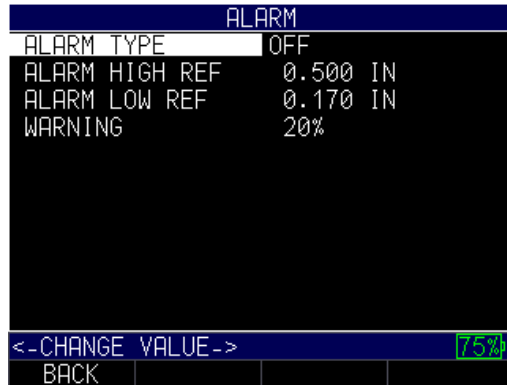
Danatronics, Corp.

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 chose 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.
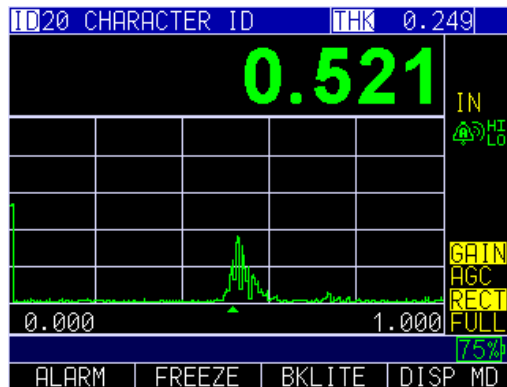
Red refers to a reading that is above or below the current low or high alarm value:
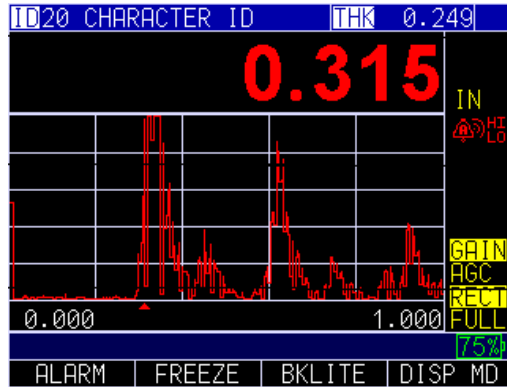
Yellow indicates caution—the reading is nearing the Warning percentage set for a low or high alarm value:
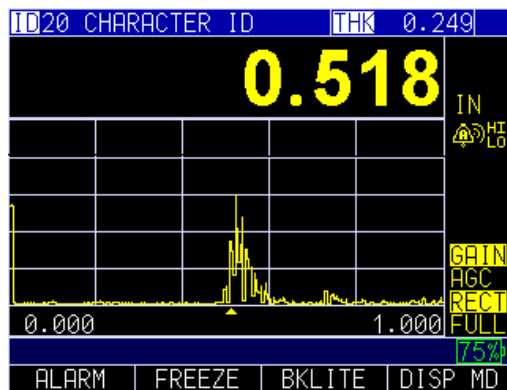
Green shows that the reading is safe within the alarm value margins:

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:
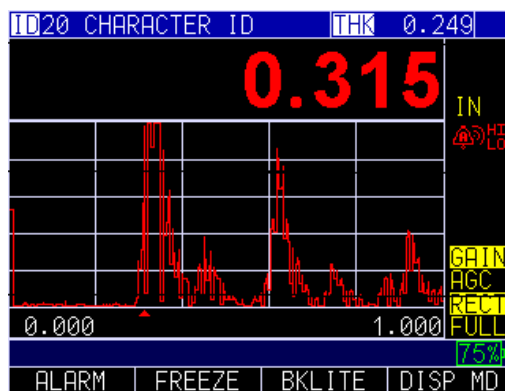
Visual, Audible, and Vibrating alarm enabled.
)) symbol appears next to the alarm icon. **Hi** (High) **Lo** (Low) appears next to the symbol.

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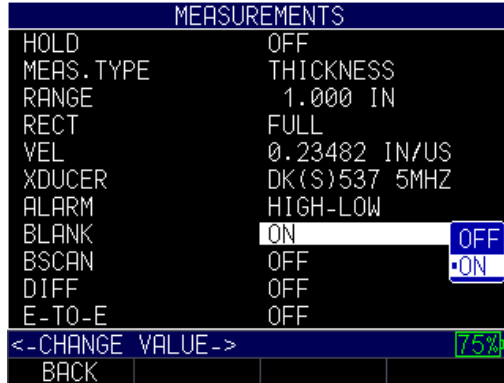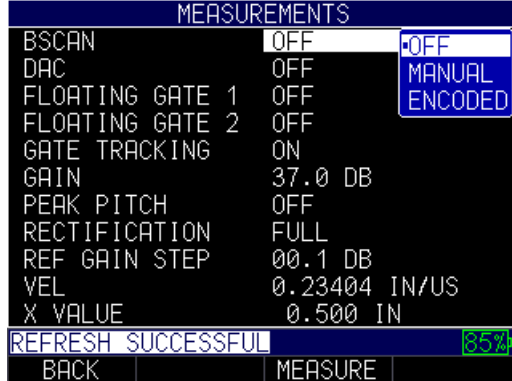
2. Use the up and down arrow keys to select the setting you wish to change.
    - *Off*: Disables the Blank feature
    - *On*: Enables the Blank feature
3. When finished, press the **F1 – Back** key to exit the screen.

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 and note that the screens may look different if you are using version 2.07 or lower:

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.

Changing B-scan Max Thickness

When changing the B-scan max thickness from the *Measurements* screen, it is important to enter a thickness slightly higher than the maximum you expect to encounter after you perform an A-scan calibration.

Danatronics, Corp.


Saving an A-scan while in B-scan

If you would like to save an A-scan, you may do so while **B-scan Save A-scan** parameters are set to Never, Minimum, or Alarm. Below is an example:

Note: We recommend using either Never or Min because the alarm will fill up the buffer quickly (61 events).

Once the B-scan stops (by pressing **F2**), the minimum thickness is centered in the middle of the screen. The left or right arrow keys can move the blue vertical cursor to show the thickness at the cross hair. Thickness is located on the top right, as shown below:
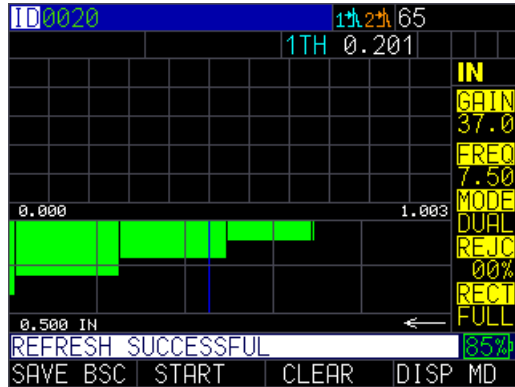
Note: While in B-scan mode, you can use the left and right arrows to edit parameters real time such as gain, range, gates, etc.

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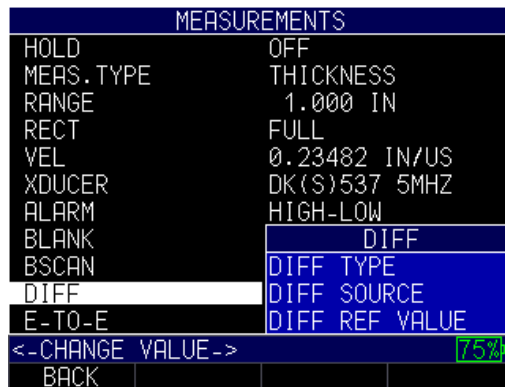
2. Use the up and down arrow keys, followed by the **MENU/OK** key, to select any of the following options:
   - Diff Type
   - Diff Source
   - Diff Ref Value

Danatronics, Corp.

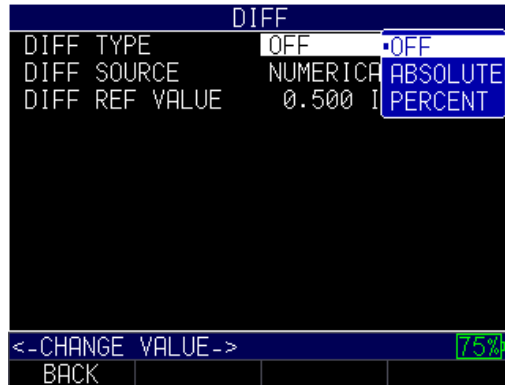3. If you select the **Diff Type** option, you can chose from the following settings by using the up and down arrow keys:
    *   *Off*: Disables the Diff feature
    *   *Absolute*: When this mode is enabled, the gage will display a thickness value as an absolute number of what has been entered. For 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 chose 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.
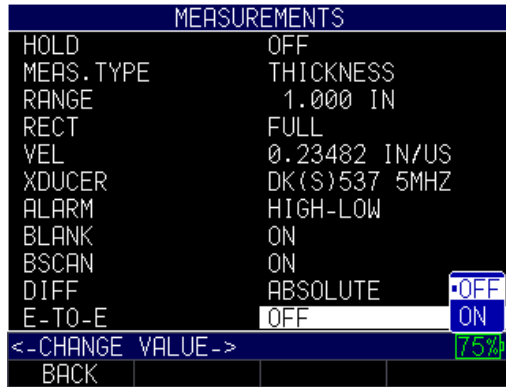
2. Use the up and down arrow keys to select the following settings:
    *   *Off*: Disables the Echo-to-Echo feature
    *   *On*: Enables the Echo-to-Echo feature
3. When finished, press the **F1 – Back** key to exit the screen.

    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.
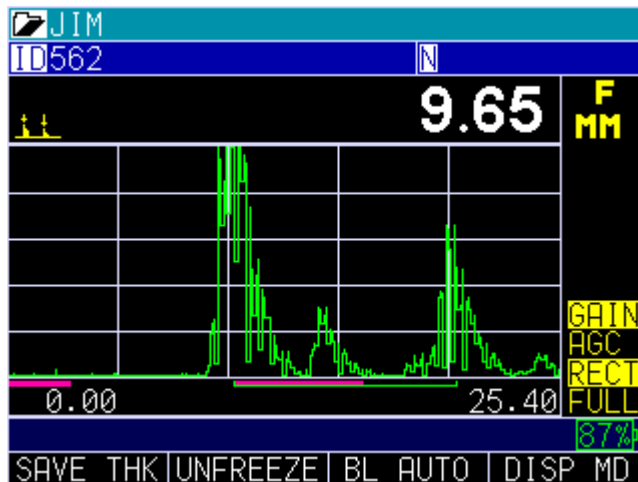

In Echo-to-Echo mode, sometimes gain will help to ensure you are reading on the correct echo.

Danatronics, Corp.

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:
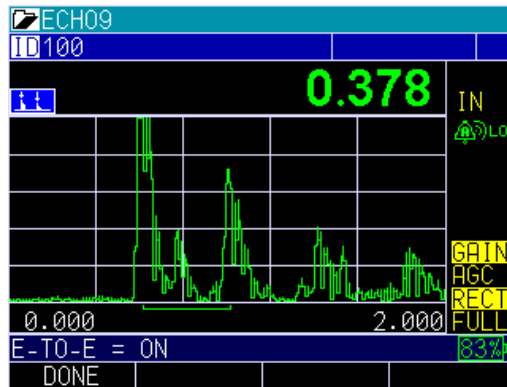

1. From the *Home* screen, press the **MENU/OK** key.
2. Use the left or right arrow and stop when you locate the symbol with two peaks in the upper left of the display, press the up arrow to turn on Echo to Echo. Denoting the **Echo-to-Echo** option is enabled.
3. Press **MENU/OK** key.
4. Use the up 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 think part of the test block with coating, following instructions on the gage display.
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.
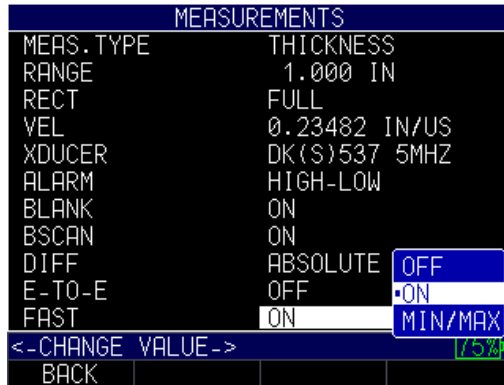
2. Use the up and down arrow keys to select any of the following settings:
    *   *Off*: Disables the Fast feature
    *   *On*: Enables the Fast feature. The LOS will work normally and not show the measured reading.
    *   *Min/Max*: The LOS will display the LAST MAX measured value or the LAST MIN measured value. If you choose the **Min/Max** option, the gage will show the Max and Min value on the display as shown below:
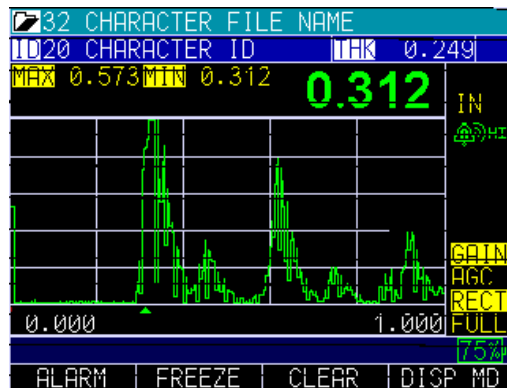
3. When finished, press the **F1 – Back** key to exit the screen.

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.
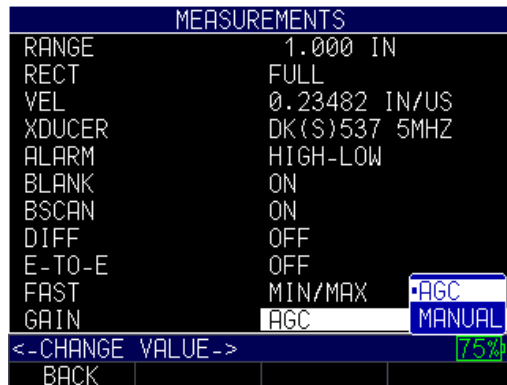
2. Use the up and down arrow keys to toggle between the following two settings.
    -   *AGC (Auto Gain Control)*: When in **AGC** mode, the gage will use its sophisticated algorithms to automatically set the gain to the desired height. If echoes are not being detected but are somewhat visible, try increasing 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.
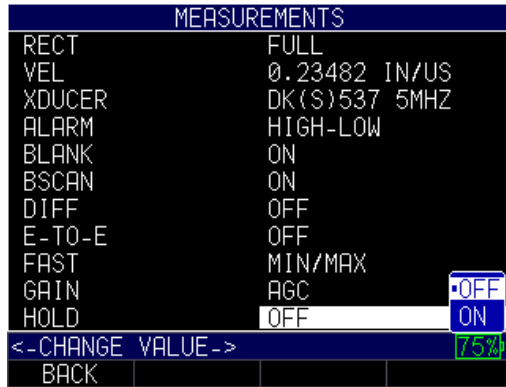

Hold

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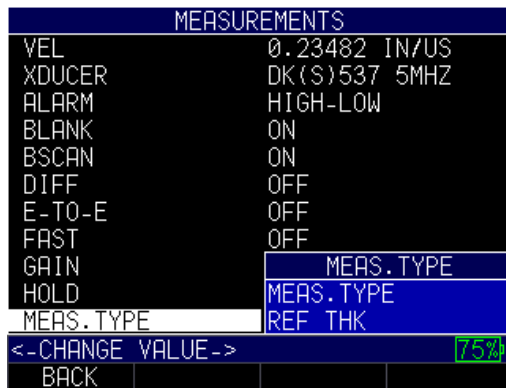
2. Use the up and down arrow keys to toggle between the following settings:

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.

3. 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:

1. Use the up and down arrow keys to select the **Range** option and press the **MENU/OK** key.
2. 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.

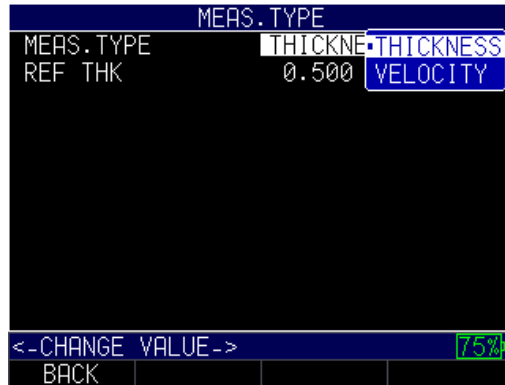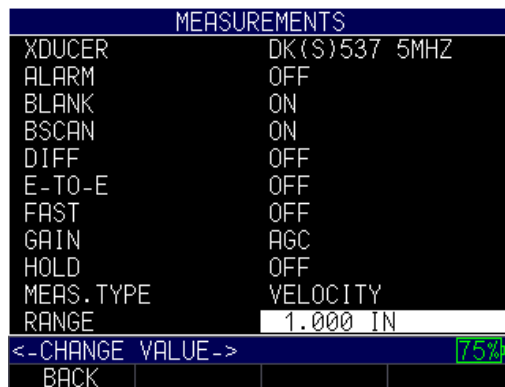3. When finished, press the **F1 – Back** key to exit the screen.

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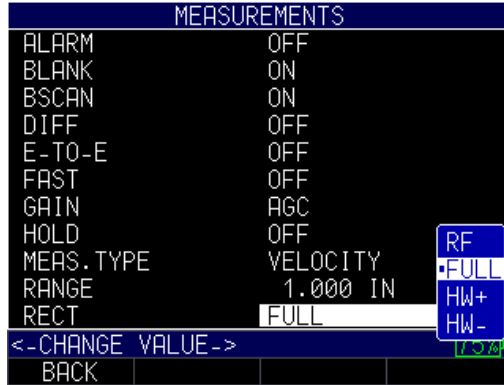
2. Use the up and down arrow keys to select the settings you wish to change.

RF: Both positive and negative lobes are displayed in the RF waveform, which the gives the greatest overall representation of position for more applications.
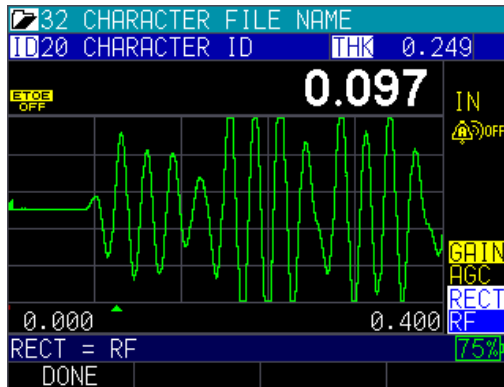
Full: Displays the negative section of the echo folded around the baseline so that both the positive and negative lobes are shown.

HW+: Displays the positive lobes, but not the negative lobes. An indicator is shown on the gage.
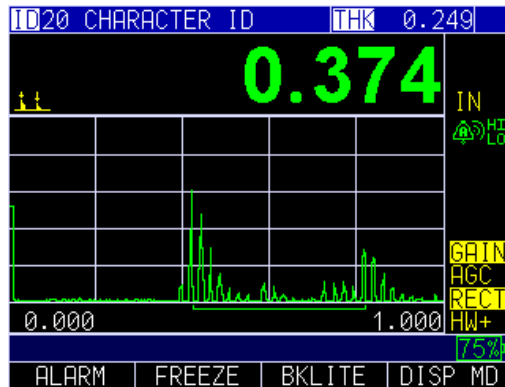
HW-: Displays the negative echo lobes as positive and does not show the positive lobes at all. An indicator is shown on the gage.
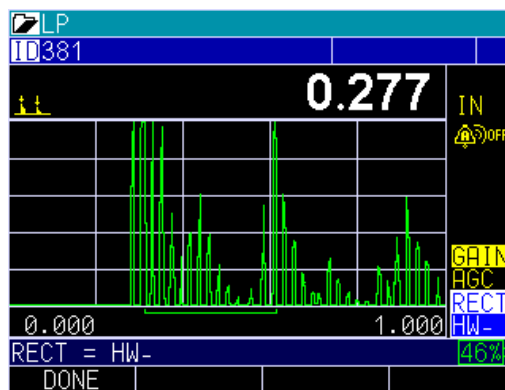
3. When finished, press the **F1 – Back** key to exit the screen.

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:

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

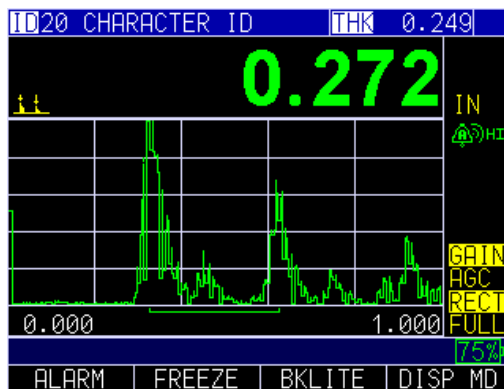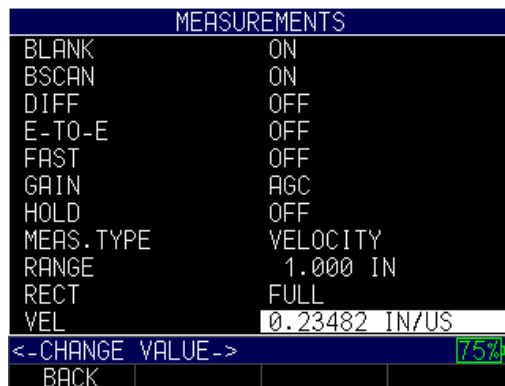2. Use the up and down arrow keys to scroll through the options ranging between 0.04000 IN/US – 0.60000 IN/US.

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.

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.

Danatronics, Corp.

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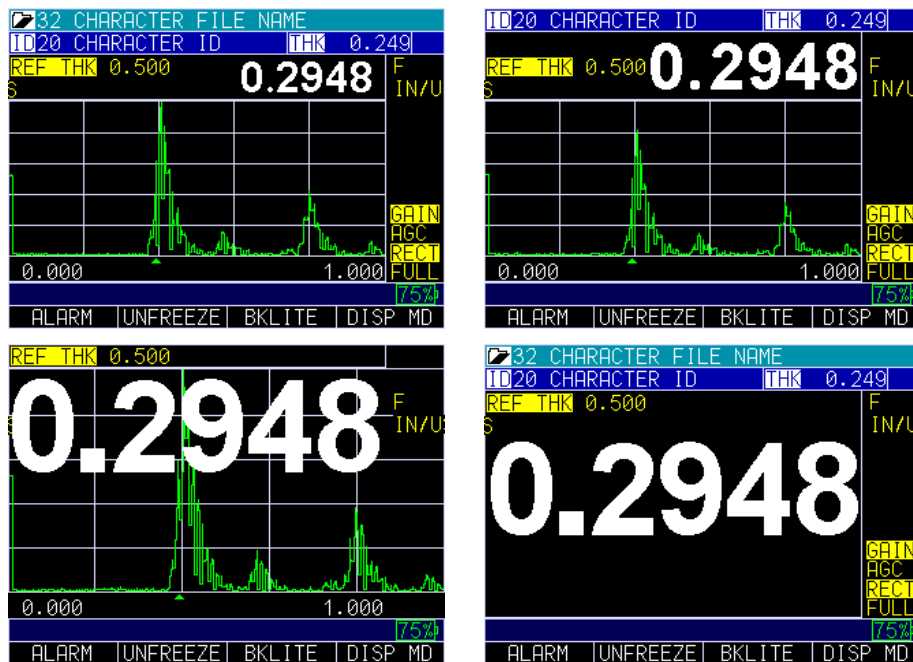
To change the display size when making a thickness reading simply press the **F4- Disp MD** key until you are satisfied with the selection.

Use of Blanks

The ECHO 9 with live waveform has 2 forms of blanking; MB Bl 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.
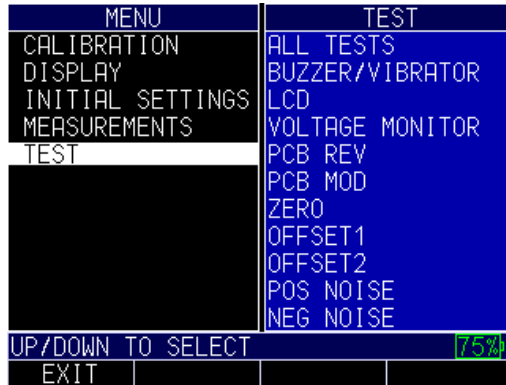
3. Use the up and down arrow keys to scroll through the tests in which you would like to select.
4. Press the **MENU/OK** key once you have selected the test you wish to perform.
5. When finished, press the **F1 – Back** key.

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.

Danatronics, Corp.
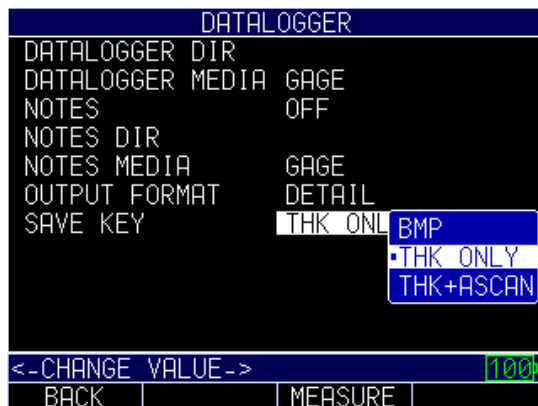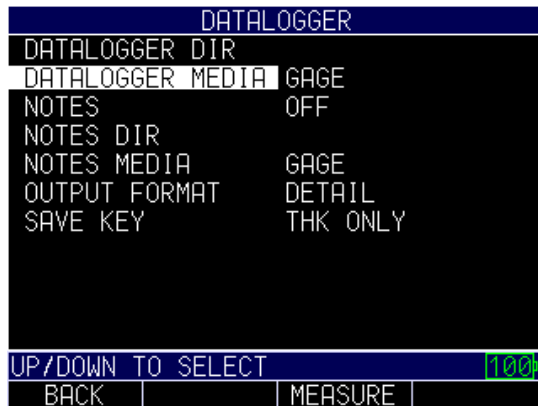
4. Use the up and down arrow keys to toggle between the following settings:
   - *BMP*: Bitmap or screen shot captures
   - *THK ONLY*: Thickness only
   - *THK+ASCAN*: Thickness and A-scan
5. After this selection is made, the **F1** key will display BMP, SAVE THK, or SAVE ASC. Data can later be sent 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.

Choosing Where to Save the Readings
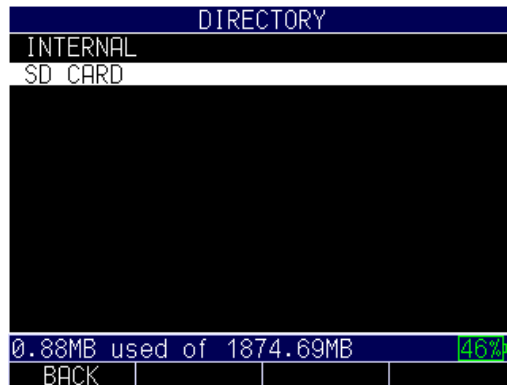
ECHO series has both internal and SD card memory. Be certain to select and note where your files are located, and always check for adequate memory before taking readings.
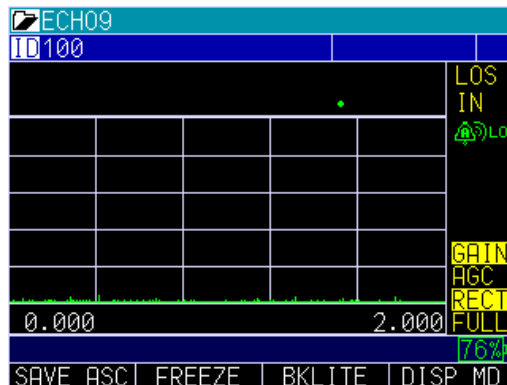
For the datalogger version only, you can save your data via the **Save** key, which is **F4** if right hand setting is enabled, or **F1** if left hand setting is enabled. (See Section 4 for right hand and left hand setting options.)

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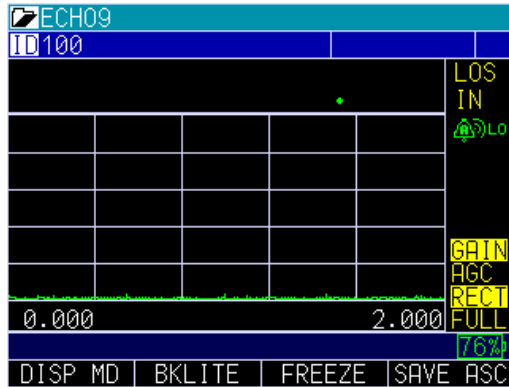
Note: Save is on the right.

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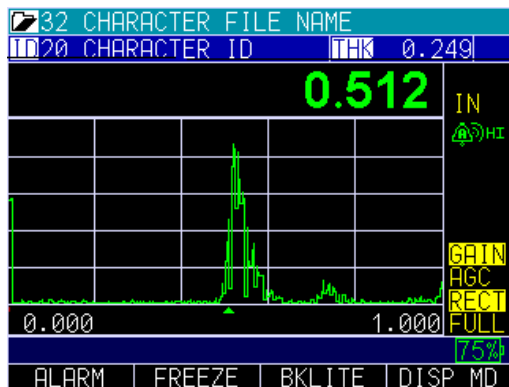
The following screen is display whereby showing the "F" flag next to the thickness reading. You are now in **Freeze** mode. The **F2** selection changes from **Freeze** to **Unfreeze**. While in **Freeze** mode, the menu options are disabled.
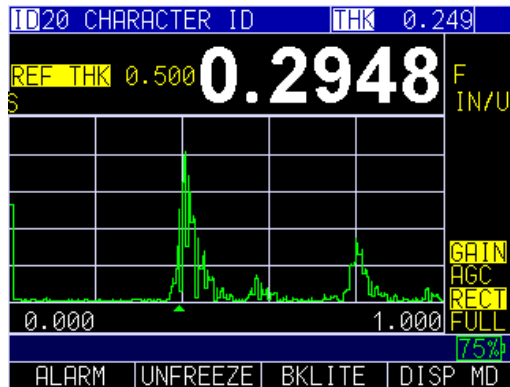
2. Press the **F2 - Unfreeze** key to disable **Freeze** mode.

Advanced Locks

There are several types of advanced locks from which to choose. The available options are ideal for supervisors or managers who need to protect settings from being changed by other users. These advanced lock options are located in the main menu.

To use advanced **Locks**, follow these steps:

1. From the H*ome* screen, press the **F1 − Menu** key. The *Menu* screen appears.
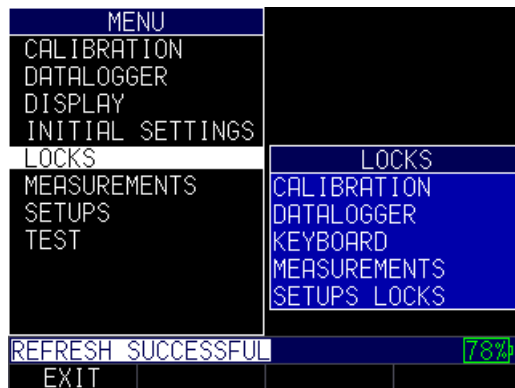
2. Use the up and down arrow keys to select the **Locks** option, and press the **MENU/OK** key.
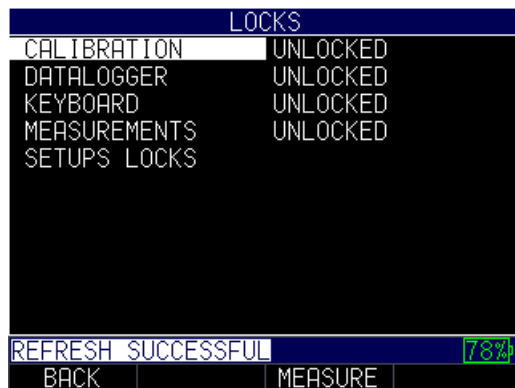
The following lock options are available:

- *Calibration*: Locks or unlocks calibration settings

- *Datalogger*: Locks or unlocks datalogger settings
- *Keyboard*: Locks or unlocks the keyboard
- *Measurements*: Locks or unlocks measurement settings
- *Setups Locks*: Locks or unlocks setups

When locked, a lock symbol will appear next to the locked feature or a stored setup, as shown below:
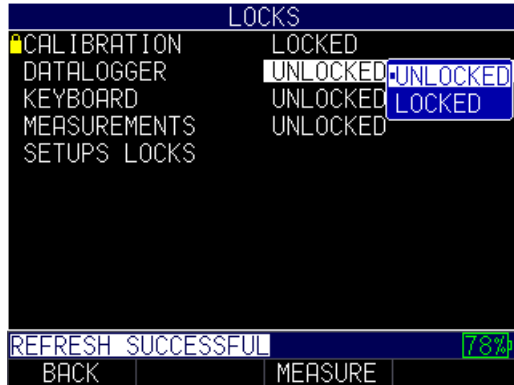
To set a password for the advanced **Locks** feature, you must first go to the *Initial Settings* screen by following these steps:

1. From the *Home* screen, press the **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Initial Settings** option.
3. Press the **MENU/OK** key.
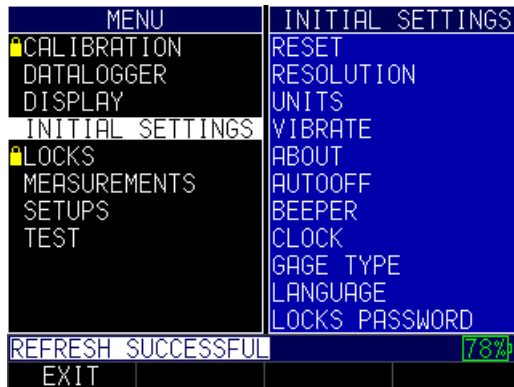
4. Use the up and down arrow keys to select **Locks Password**.
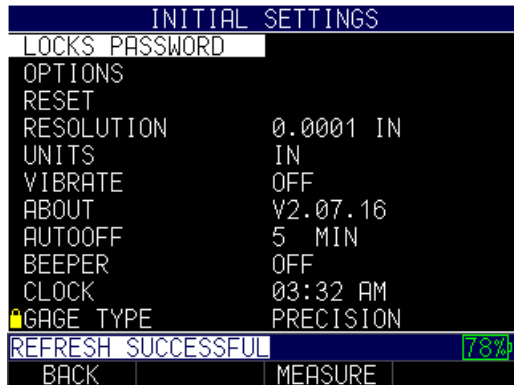
5. Press the **MENU/OK** key.
6. Enter your 4-digit password/code by scrolling over each character and pressing the **MENU/OK** key.

```
         ENTER NEW PASSWORD
 LOCKS PASSWORD: _


   1  2  3  4  5  6  7  8  9  0

   A  B  C  D  E  F  G  H  I  J

   K  L  M  N  0  P  Q  R  S  T

   U  V  W  X  Y  Z  -  +



 REFRESH SUCCESSFUL              78%
   BACK   | DELETE  |  SET
```
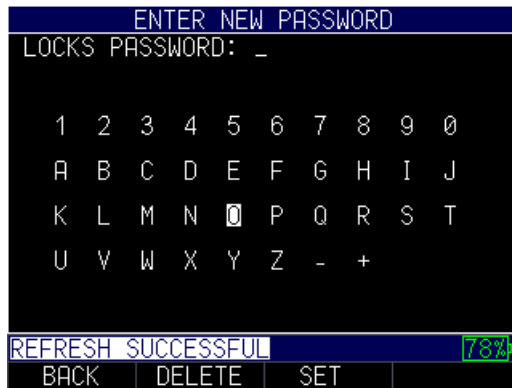
7. Press **F3 – Set** key to complete the password.

Note: If you forget or want to clear the password, enter 0081 to reset it. Once the code is activated, any locked function will require the password to unlock it.

To clear a password, you will first need to enter your 4-digit password. Next, **press F3 – Clear** key when done:

```
          CLEAR PASSWORD
 LOCKS PASSWORD: 1111


   1  2  3  4  5  6  7  8  9  0

   A  B  C  D  E  F  G  H  I  J

   K  L  M  N  0  P  Q  R  S  T

   U  V  W  X  Y  Z  -  +



 REFRESH SUCCESSFUL              84%
   BACK   | DELETE  | CLEAR
```
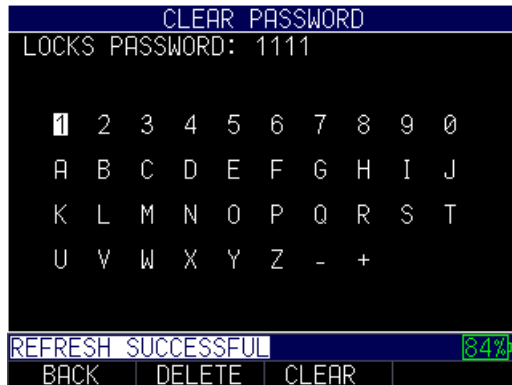
8 Using the Datalogger Directory Mode

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:

```
                DATALOGGER
 DIRECTORY
 NOTES            OFF
 OUTPUT FORMAT    DETAIL
 SAVE KEY         THK ONLY




 UP/DOWN TO SELECT           47%
    BACK     |     | MEASURE |
```

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:

```
                DATALOGGER
 DIRECTORY
 NOTES            OFF
 OUTPUT FORMAT    DETAIL
 SAVE KEY         THK ONLY




 UP/DOWN TO SELECT           47%
    BACK     |     | MEASURE |
```

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

Danatronics, Corp.

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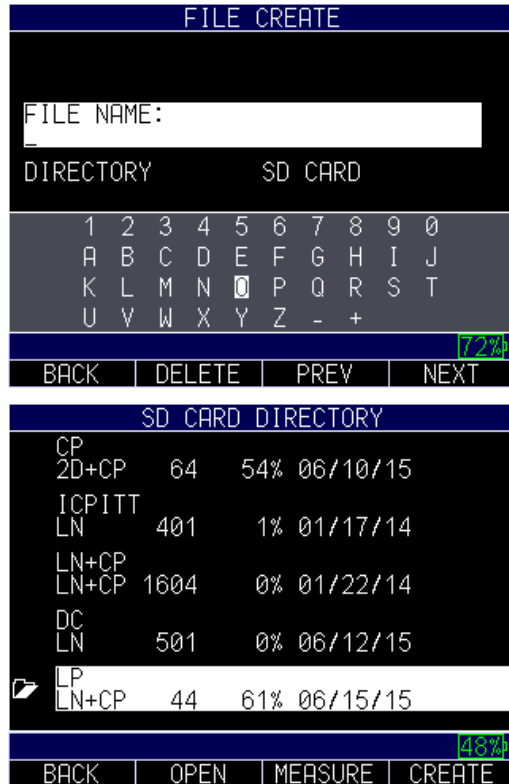
Use the arrow keys to create a unique file name. Press the **F4 – Create** key when done.

```
         FILE CREATE
FILE NAME:
5
DIRECTORY        INTERNAL

DESCRIPTION:

LOCATION:

INSPECTOR ID:

TYPE             LINEAR
                         49%
  BACK  |       | PREV | NEXT
```
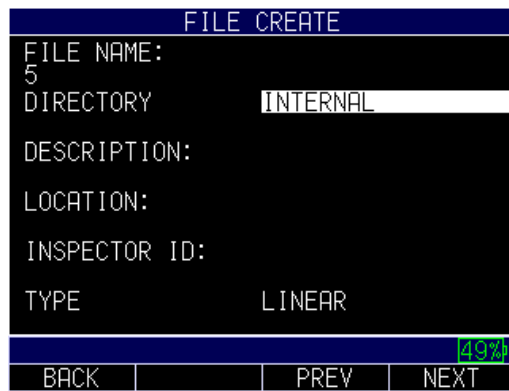
Use the up and down arrow keys to determine the file type and the amount of readings stored per file. The following file types include:

- 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.

Description

Location

Inspector ID

Danatronics, Corp.

```
       FILE CREATE                          FILE CREATE
INSPECTOR ID:                        INSPECTOR ID:

TYPE          CONFIGURATION          TYPE          LINEAR

PREFIX:                              PREFIX:

STARTING ID:                         START COL:

ENDING ID:                           END COL:

                                     COL STEP:
                          74%        1                      50%
   BACK    |     PREV  | NEXT           BACK    |     PREV  | NEXT
```
Configuration   Linear

```
       FILE CREATE                          FILE CREATE
INSPECTOR ID:                        INSPECTOR ID:

TYPE          LINEAR + CPT           TYPE          2D

PREFIX:                              PREFIX:

START COL:                           STARTING ID:

END COL:                             ENDING ID:

CUSTOM POINTS:DEGREE
           0              50%                               74%
   BACK    |     PREV  | NEXT           BACK    |     PREV  | NEXT
```
Linear + CPT   2D

```
       FILE CREATE                          FILE CREATE
INSPECTOR ID:                        INSPECTOR ID:

TYPE          2D + CPT               TYPE          3D

PREFIX:                              PREFIX:

STARTING ID:                         STARTING ID:

ENDING ID:                           ENDING ID:

                          74%                               74%
   BACK    |     PREV  | NEXT           BACK    |     PREV  | NEXT
```
2D + CPT   3D

```
       FILE CREATE                          FILE CREATE
INSPECTOR ID:                        INSPECTOR ID:

TYPE          BOILER                 TYPE          SEQUENTIAL

PREFIX:                              PREFIX:

STARTING ID:

ENDING ID:

                          74%                               50%
   BACK    |     PREV  | NEXT           BACK    |     PREV  | NEXT
```
Boiler   Sequential
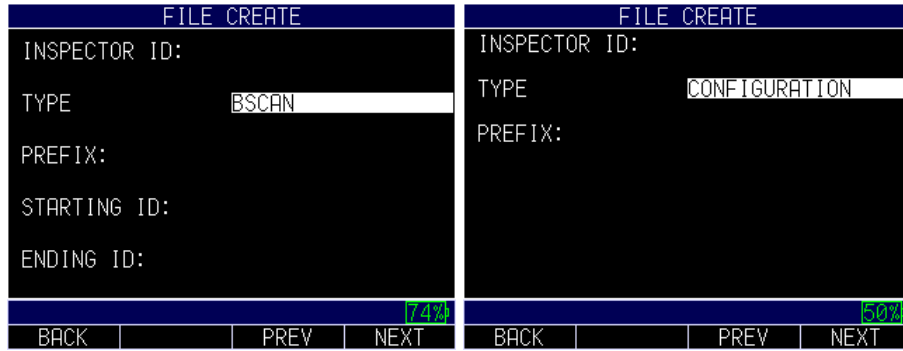
B-scan   Configuration

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.
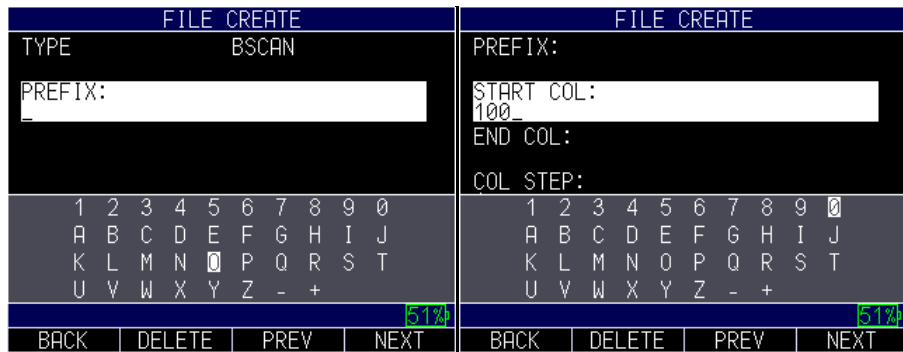
Prefix   Start Col
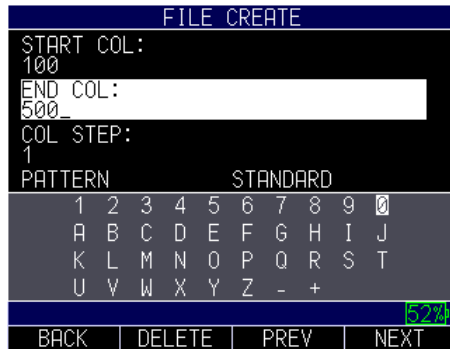
End Col

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

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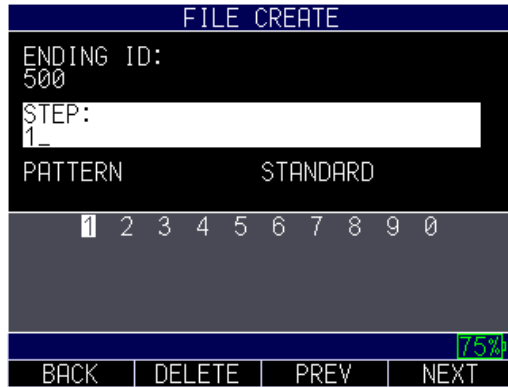
Use the up and down arrow keys to select a pattern (standard or reverse). Press the **F4 - Done** key when you are finished.
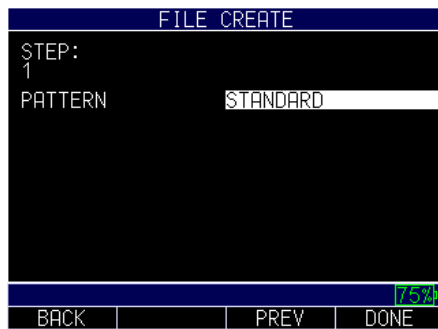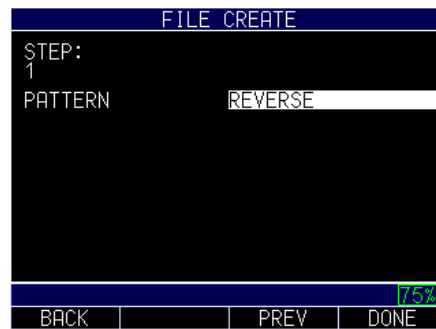
Standard   Reverse

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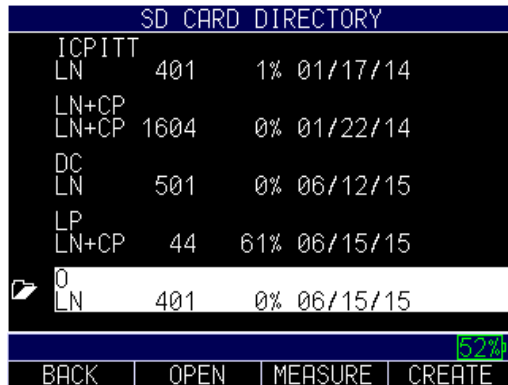
Use the arrow keys to select any letter or symbol on the screen to create a Starting ID.

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.

```
          FILE CREATE
FILE NAME:
ECHO9
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

ECHO9
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.

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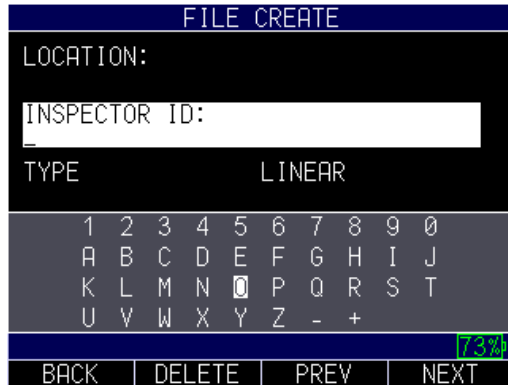
Use the arrow keys to chose the file type (sequential, linear, or linear + CPT). Press the **F4 – Next** key when you are done.
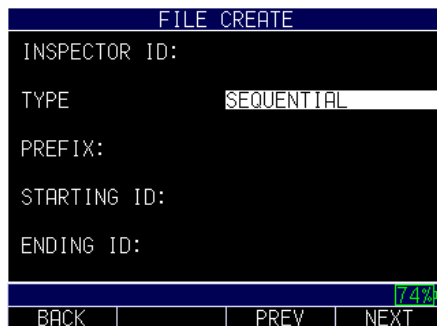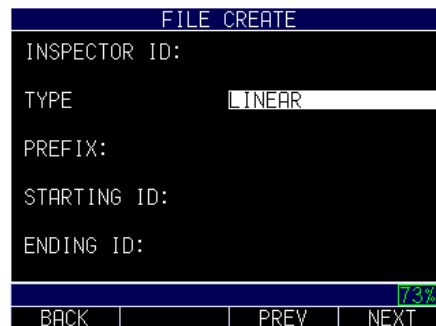
Sequential   Linear
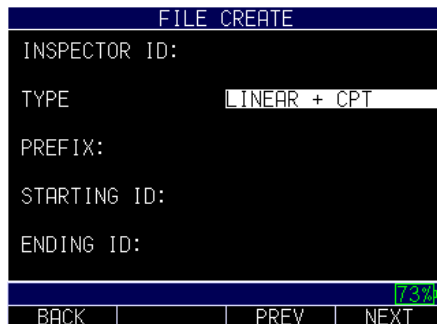
Linear + CPT

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.
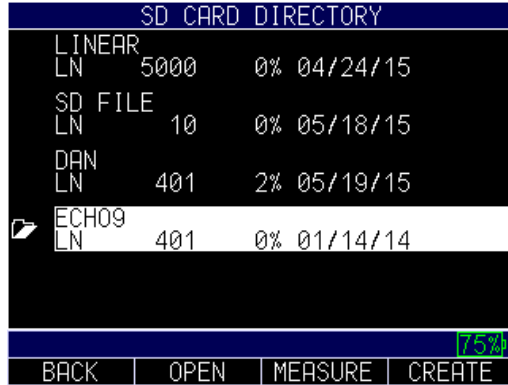
Press the **F1 – Save ASC** key to save the measurement as an A-scan as show below:
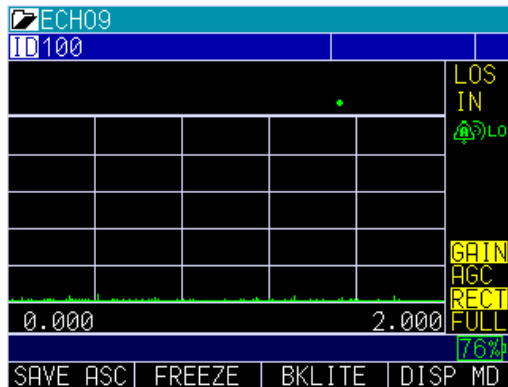
Reviewing a File

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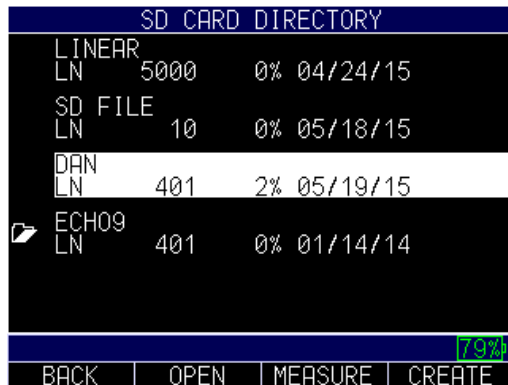
3. Use the up and down arrows to select a function, and press the **MENU/OK** key.

Danatronics, Corp.

```
SD FILE
CLEAR ALL READINGS
COPY
DELETE
EDIT
EXPORT
MOVE
OPEN
RENAME
REVIEW DETAILS


UP/DOWN TO SELECT        78%
   BACK    |     | MEASURE |
```
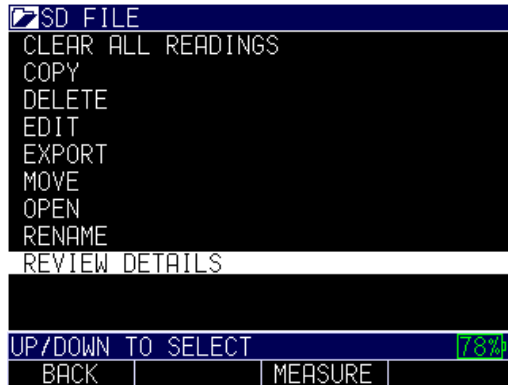
4. Use the up and down arrows to review the file details.

```
DAN
100              0.101 IN T
101              0.200 IN T
102              0.300 IN T
103              0.401 IN A
104              0.502 IN A
105              0.430 IN A
106              0.257 IN A
107              0.172 IN A
108              0.086 IN A
109
110
                         79%
   BACK  | RECALL | CLEAR |  BEG
```

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

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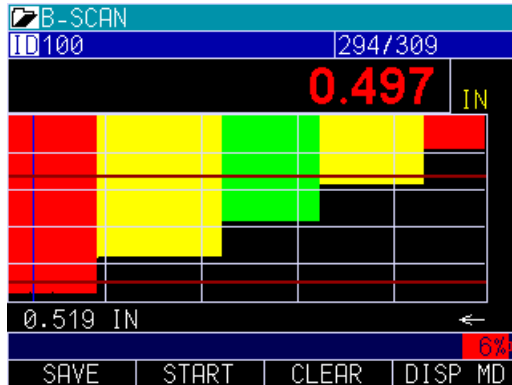
Image of a 5-step test block with both high and low alarms enabled

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.

Danatronics, Corp.

```
         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  LEF LEFT TO RIGHT
BSCAN LOS        PAU RIGHT TO LEFT
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    PAUSE
BSCAN MAX THICK  0.500 I  CONTINUE
BSCAN SAVE ASCAN NEVER
DIFF TYPE        OFF
<-CHANGE VALUE->           94%
  BACK
```

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 slightly higher than your maximum thickness so that the screen resolution on the vertical axis is maximized. The ECHO defaults to 0.500" 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 an alarm, 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 below.
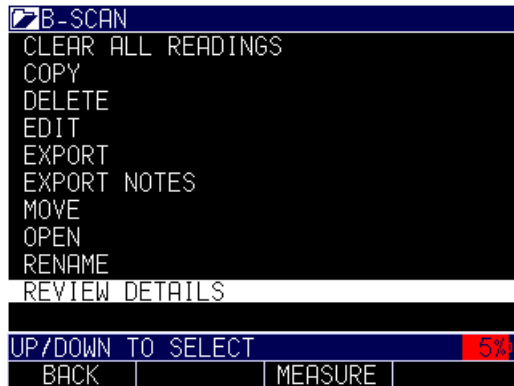
The image below shows the ID where the entire B-scan image is saved; it is indicated by the letter "B" to the right of the file. Press **MENU/OK** to review the image.

Danatronics, Corp.

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.
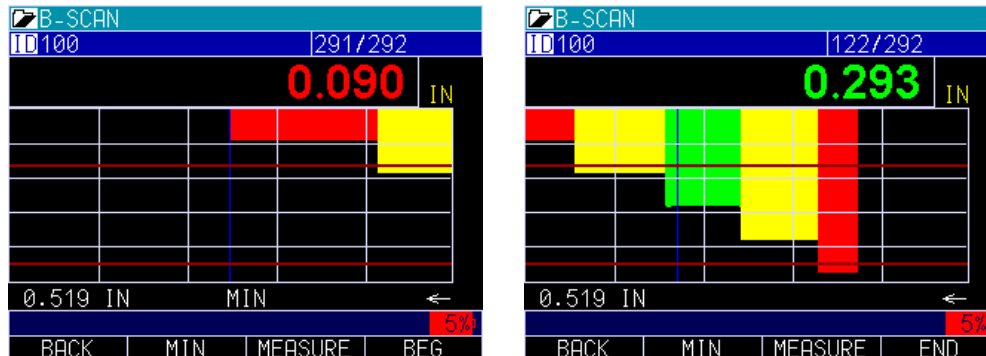
Split A and B-scan

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.
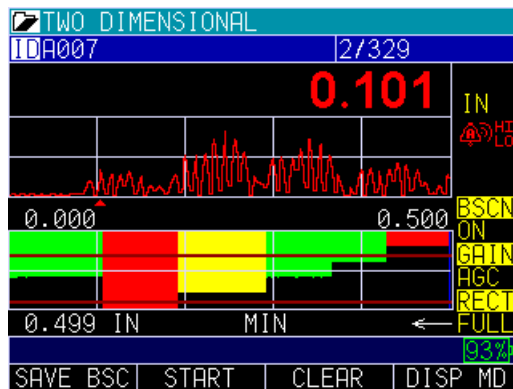
Saving A-scans with B-scan On

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

Danatronics, Corp.

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

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 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

Danatronics, Corp.

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

MADE IN USA

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 Series and the Flaw Detector can be equipped with the EZ Scan 6, which is a magnetic wheel linear axis encoder with high temperature and pole attachment options. The encoded B-scan is not available for the Precision Gage. (For more details on the EZ Scan 6, please refer to its separate manual.)

Note: Use of the encoded B-scan requires a new hardware jack, not initially supplied with your Echo unless otherwise ordered. Also, the extra connector is NOT IP67 rated.

Danatronics, Corp.

When the Encoder B-scan option is selected from the **Measurement** menu, select EZ Scan 6, as shown below.

```
          MEASUREMENTS
RECTIFICATION     FULL
REF GAIN STEP     00.1 DB
VEL               0.23404 IN/US
X VALUE            0.500 IN
BSCAN             ENCODED
BSCAN DIRECTION   LEFT TO RIGHT
BSCAN ENC. RES     0.003 IN
BSCAN ENC. MODEL  EZSCAN-6  EZSCAN-4
BSCAN REWRITE ON  LOWER VA  EZSCAN-5
BSCAN MAX THICK    0.500 I ·EZSCAN-6
BSCAN SAVE ASCAN  NEVER
REFRESH SUCCESSFUL              86%
    BACK          │  MEASURE │
```
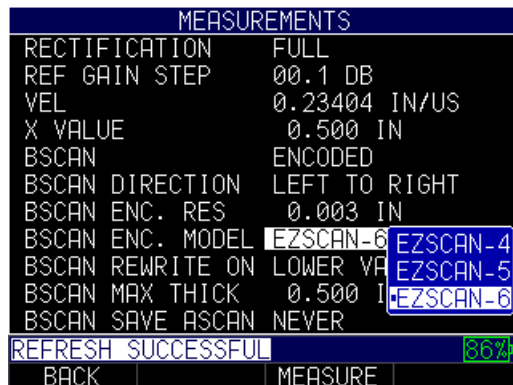
Floating Gate

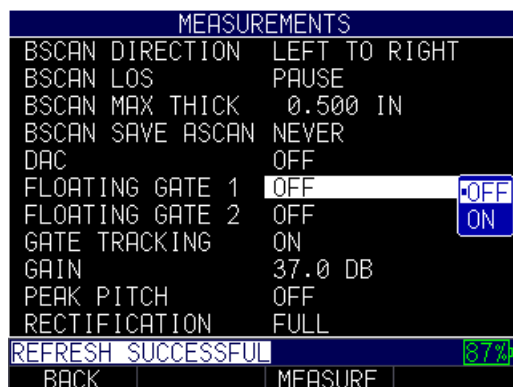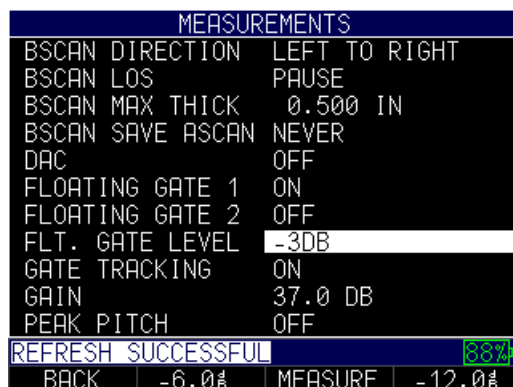The floating gate is a software option that can be enabled remotely by supplying Danatronics with your ECHO serial number and options code found under the **Menu** and *Initial Settings* parameters. Danatronics will provide you with a code to unlock the floating gate. Note, the floating gate also includes a tracking gate for use in the Echo-to-Echo thickness modes as well as some select dual probes with their unique V-path correction. The purpose for the floating gate option is to ensure consistent thickness readings in flaw detection mode at a 60Hz update rate.

```
          MEASUREMENTS
BSCAN DIRECTION   LEFT TO RIGHT
BSCAN LOS         PAUSE
BSCAN MAX THICK    0.500 IN
BSCAN SAVE ASCAN  NEVER
DAC               OFF
FLOATING GATE 1   OFF       ·OFF
FLOATING GATE 2   OFF        ON
GATE TRACKING     ON
GAIN              37.0 DB
PEAK PITCH        OFF
RECTIFICATION     FULL
REFRESH SUCCESSFUL              87%
    BACK          │  MEASURE │
```

Once the floating gate is enabled, select the -db point to measure the edge depth from 1-18db.

```
          MEASUREMENTS
BSCAN DIRECTION   LEFT TO RIGHT
BSCAN LOS         PAUSE
BSCAN MAX THICK    0.500 IN
BSCAN SAVE ASCAN  NEVER
DAC               OFF
FLOATING GATE 1   ON
FLOATING GATE 2   OFF
FLT. GATE LEVEL   -3DB
GATE TRACKING     ON
GAIN              37.0 DB
PEAK PITCH        OFF
REFRESH SUCCESSFUL              88%
    BACK   -6.0▒ │ MEASURE │ -12.0▒
```

There are also "hot" keys above **F2** for -6db, and **F4** for -12db.

Press **F3** to enter the *Measurement* screen. A gate floating at the -3db point of the peak amplitude with edge depth set with a thickness of 0.400" is shown below. Note, you cannot change to peak depth when the floating gate is activated, and the image below does not capture the flashing letter "F" that appears on the top of Gate 1.
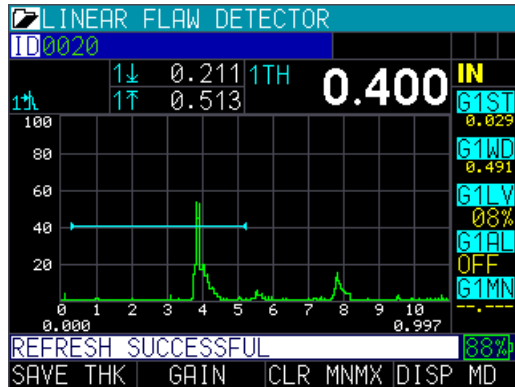

Tracking gate

The tracking gate is an optional feature is typically used in Echo-to-Echo thickness measurements to ignore coatings.

To activate the tracking gate feature, follow these steps:

1. From the *Home* screen, press the **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Measurements Settings** option.
3. Press the **MENU/OK** key.
4. Use the up and down arrow keys to select the **Gate Tracking** parameter.
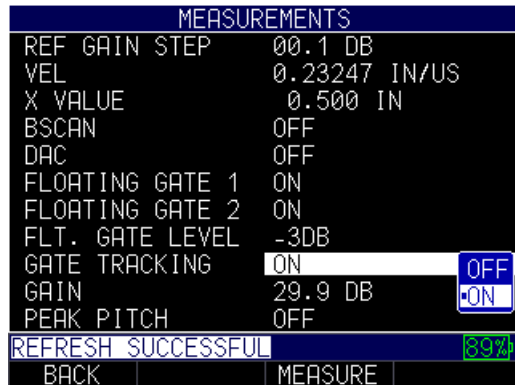
5. Press **F3 – Measure** key to begin taking measurements.

In the example below, gate 1 start and gate 2 start have been set to 0.100". Gate 2 will automatically track (shift left or right) 0.100" off the first detected echo within gate 1.

Danatronics, Corp.
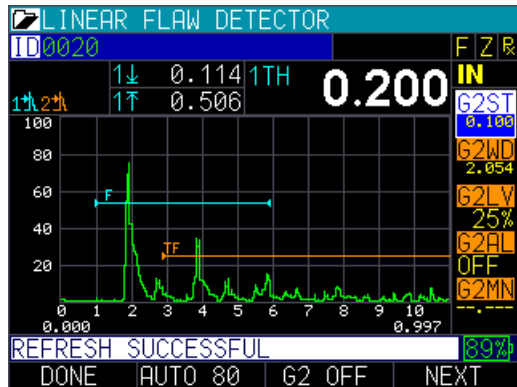
In the next image shown below, Gate 2 automatically moved to the right. It starts at the 5th graticule while the above image started at around the 3rd division without touching the range or gate positions.

When using tracking gate, normally the measurement box is set to Echo-to-Echo.

Note: All these setups can be saved as custom setups by going to the *Setups* screen and then pressing the **F2** key to save and give the setup a new name.

Peak Pitch Memory

This patent pending features is standard on ECHO FD with software version 2.08 or higher.

To activate the peak pitch memory, follow these steps:

1. From the *Home* screen, press the **F1 – Menu** key.
2. Use the up and down arrow keys to select the **Measurements Settings** option.
3. Press the **MENU/OK** key.
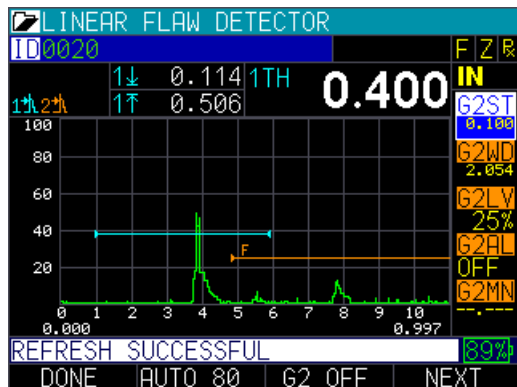4. Use the up and down arrow keys to select the **Peak Pitch** parameter.
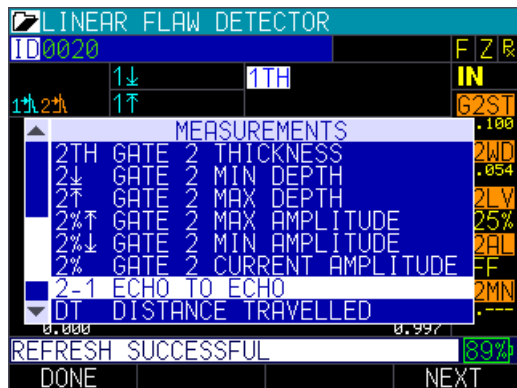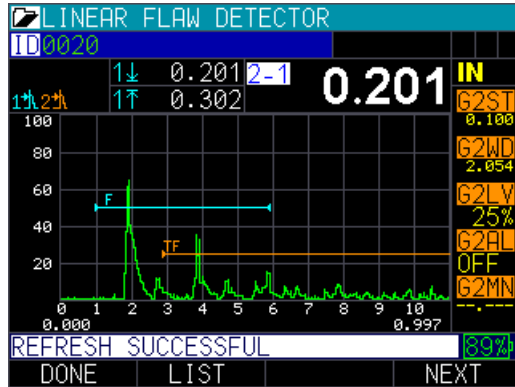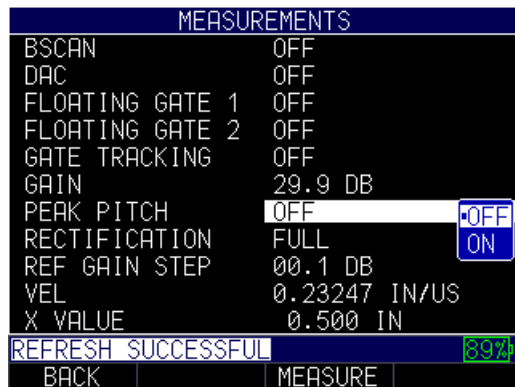

5. Press **F3 – Measure** key to enter A-scan mode.

The peak pitch feature is ideal for peaking an angle beam transducer. First gate a signal under 100% screen height. **Tip:** F2 gain/auto 80 is ideal as it will adjust the signal to 80 Full Screen Height (FSH). Press the left or right arrow keys until the "P" on the top right is highlighted. Move the probe to peak the envelope, and then use the up arrow again or press **F2 – Peak HLD** key and a P and a small H will appear on the top right indicating peak pitch is on. Any signal breaking the gate that is at least 65% of the peak height, as recorded by the Peak envelope, and you will hear a variable frequency audible chirp increase in frequency when the max echo height matches the peak envelope.
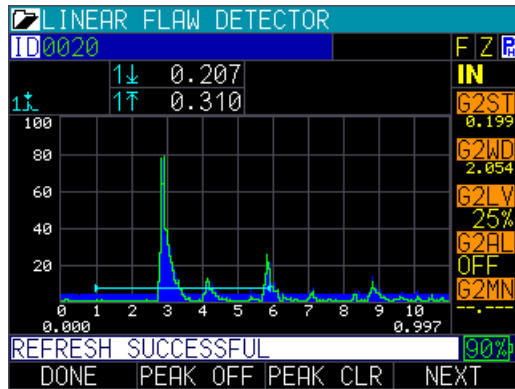
Danatronics, Corp.

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

STANDARD DUAL TRANSDUCERS

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
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

COMPOSITE DUAL TRANSDUCERS

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
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

DUAL ECHO TO ECHO TRANSDUCERS

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
DK537EE	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

DUAL HIGH TEMP TRANSDUCERS

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
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

DELAY LINE STANDARD TRANSDUCERS

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
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

DELAY LINE COMPOSITE TRANSDUCERS

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
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

DELAY LINE PENCIL PROBE TRANSDUCERS

Part Number	Range in Steel	Echo to Echo Range in Steel	Frequency	Diameter	Temperature Range	Connector Type
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

Danatronics, Corp.

Acoustic Sound Speed for Common Materials

The sound velocity table below shows a list of the speed of sound in various materials. This information is necessary to have when using the gage as the speed of the ultrasound moving through the material in question needs to be programmed into the gage to obtain an accurate thickness. All velocities in this sound velocity table are approximations:

Material	Sound Velocity Inch/µSecond	Metres/second
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

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

Danatronics, Corp.

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.
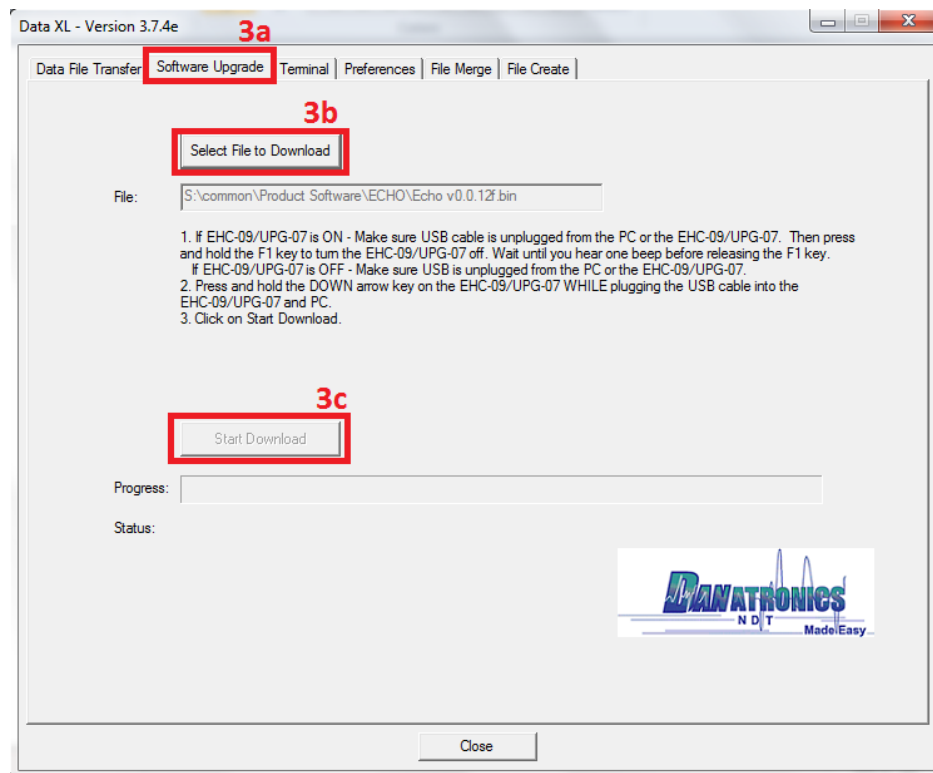
Updating a Thickness Gage to be Compatible with Windows 8 or Windows 10 USB

With Windows 8 and Windows 10 there can be USB enumeration problems between the host computer and a thickness gage. Windows can report a "USB device not recognized" error in the bottom right of the screen shortly after the thickness gage is plugged into the computer via USB. Below is a list of all the gages and the versions of software that have this issue:

- EHC-09 (color and mono) v3.26 and below
- UPG-07 (color and mono) v1.15 and below
- EHC-03 v1.0

If your thickness gage software version falls within one of the above versions, and you need to connect it via USB to a computer running Windows 8 or Windows 10, then the below sequence of steps will guide you through the update process so that the thickness gage can properly enumerate via USB with Windows 8 or Windows 10.

Below is a list of the required items to perform the update to the thickness gage:

- A computer running either Windows XP or Windows 7 which has Data XL installed on it. If Data XL is not installed on the computer, it can be downloaded at the following link:
  http://www.danatronics.com/ultrasoundsupport.html

  At the time of this document, the latest version of Data XL is v3.7.3.

- A version of software for the thickness gage that is compatible with the USB protocol used in Windows 8 and Windows 10. Below is a list of the different gages and software versions which are compatible with the USB protocol found in Windows 8 and Windows 10:
  o EHC-09 (color and mono) v3.27 and above
  o UPG-07 (color and mono) v1.16 and above
  o EHC-03 v1.1 and above

  The thickness gage software can be found at the following link:

 http://www.danatronics.com/ultrasoundsupport.html

- A USB A to mini b cable. This is used to connect the thickness gage to the computer via USB.

To upgrade your thickness gage, follow these steps:

1. The thickness gage first needs to be connected to the computer via USB in a special sequence. With the gage powered off and the down button on the gage being pressed, connect it to the computer via the USB cable. Holding the down button while being powered up puts the gage into upgrade mode.

2. Launch Data XL.

    2a. Click on the "Software Upgrade" tab located in the upper portion of Data XL.

    2b. Click on the "Select File To Download" button, which will launch an open file dialog box. Select the file to update the thickness gage with. In this example the file "color_ehc09_v3_27.bin" was chosen.

2c. Click the "Start Download" button which will commence with the software update. Shortly after, the update program will proceed to update the thickness gage. Once the update is completed the screen will display a message to "Unplug USB cable to turn off power". At this point the software update process is completed and the thickness gage will now successfully enumerate via USB with a computer running Windows 8 or Windows 10.
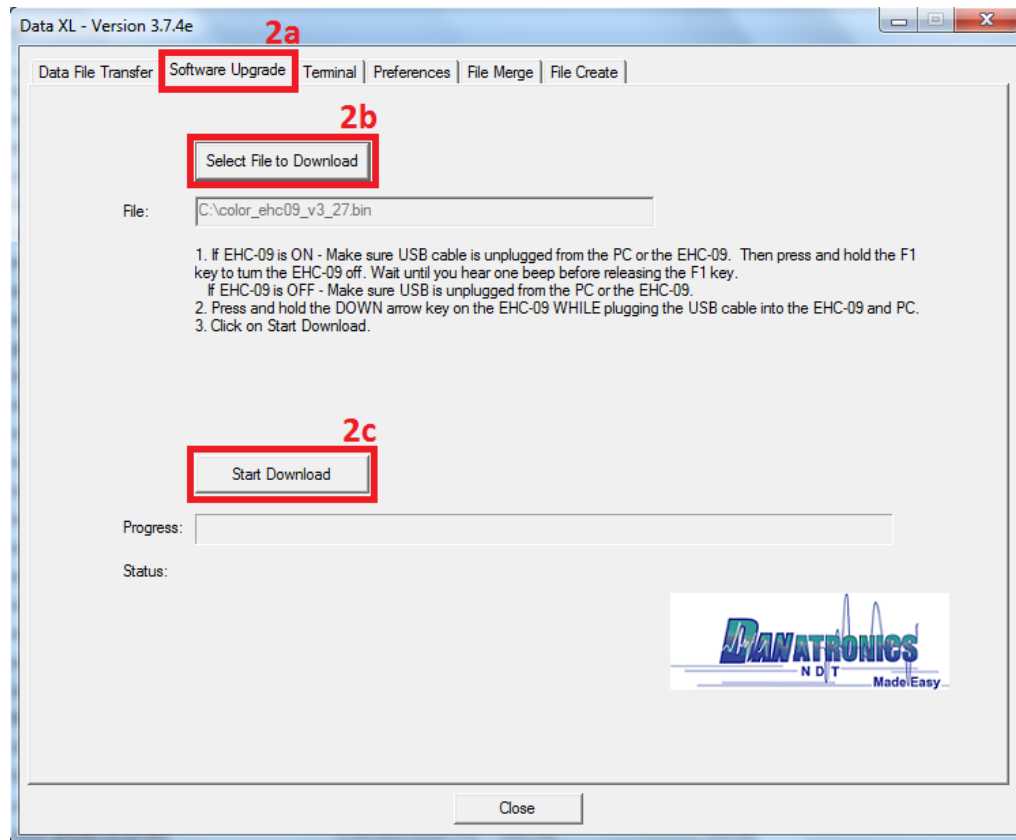

Exporting Files from a Gage

The steps in this section need to be performed to export a file from the gage to a computer via USB. You will need the following:

- An ultrasonic thickness gage (EHC-09, UPG-07, ECHO 7, ECHO 8, ECHO 9, or ECHO FD)
- Mini B USB cable
- A Computer with Windows XP, 7, 8 or 10 operating system
- Data XL (to download the latest version of Data XL click on the following link http://www.danatronics.com/ultrasoundsupport.html)

To export files from a gage, follow these steps:

1. Plug the USB cable into the gage and the host computer.
2. Turn the gage on by holding the **F1** key until the gage beeps.
3. Launch Data XL on the host computer.

4. Click the "Refresh Gage Button" button in Data XL to get the file list loaded into Data XL.
5. The files that are present in the gage will now appear in the left side file list in the "Gage" area. Select the file you wish to export to the computer by left clicking it once.
6. Click the ">> Transfer >>" button to export the file from the gage to the computer. The exported file will now appear on the right side file list in the "Host PC" area. To view the file, double click the filename located on the right side file list in the "Host PC" area.
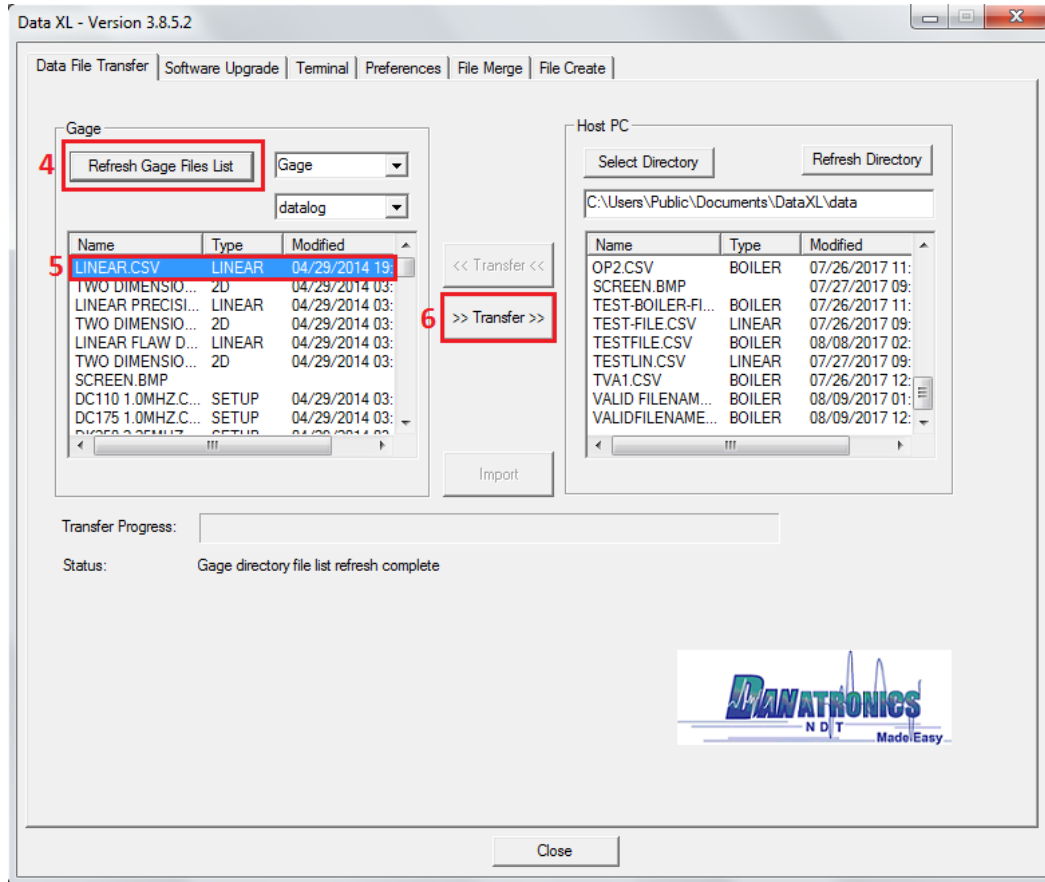
Danatronics, Corp.

11 Additional ECHO Series Gage Information

**ECHO 7 and ECHO 8 Series**

In addition to the ECHO 9 Thickness Gage, Danatronics also offers the ECHO 7 Precision Gage and the ECHO 8 Corrosion and Precision Gage.

Described below are some of the applications and uses for the ECHO 7 and the ECHO 8 when it is set in precision mode. Danatronics recommends that only personnel who are knowledgeable about ultrasonic sound propagation make instrument setups. Calibration standards of the thin and thick material sections, along with similar surface conditions and temperature, should always be used.

Note: ECHO 7 and 8 used as precision gages can measure many materials. We have conveniently set up generic default parameters as guidelines. There is no way to know if your exact materials and setup will produce desired results. ECHO units equipped with the live Waveform option can make many adjustments to produce steady and reliable readings, however **only qualified ultrasonic operators familiar with ultrasonic signals and adjustments should make changes to the instrument**. Contact Danatronics for more details.
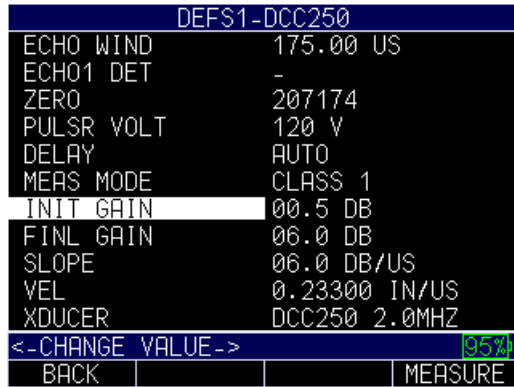

Overview to Get Started

1. Select the transducer you will use for testing from the **Setups** screen.
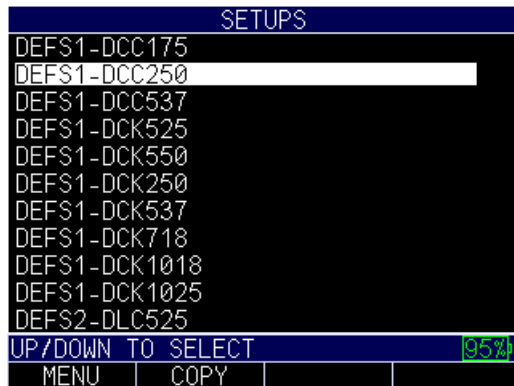
2. Press the **Menu OK** button, and then press the **F4 Measure** key.

    Note, the values listed are set to the default user as "lefty," so the **F4 Measure** key is for lefty. If the user setting is changed under the display menu to "righty," then the **F1** key would be the **Measure** option.

Gages equipped with the Live Waveform option will have a screen similar to the one shown below, which is a 1" test block with echoes displayed and un-calibrated at 0.9953". The calibration procedure for ECHO 7 and 8 is the same as described in this manual.
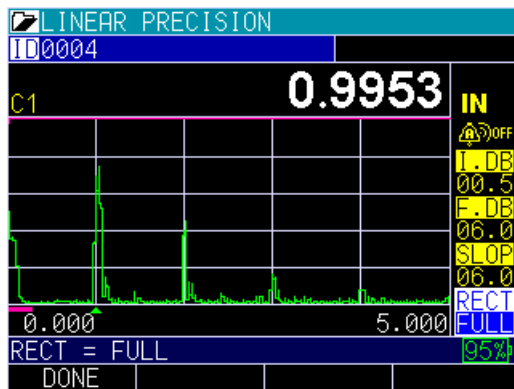
If you have a gage with thickness only, the screen will appear as shown below:
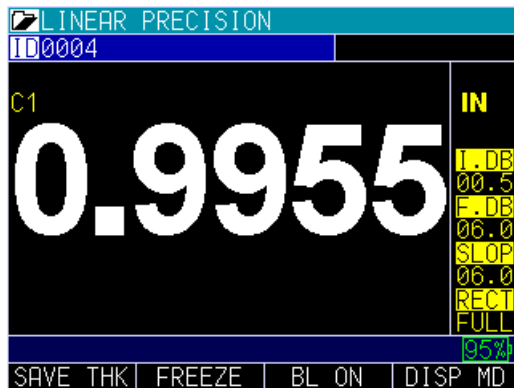
There are several adjustable parameters for ECHO 7 and ECHO 8 when equipped with a live waveform. The purpose of the live waveform is to view the detected echoes and verify that they are correct as they relate to the thickness being displayed. You can adjust the following parameters using the left or right arrow keys:

Initial gain I.DB.: How much the initial gain is set to
Final gain F.DB.: Final gain used to boost echoes
Slope SLOP: Slope between Initial gain and Final gain
Rectification RECT: Full wave, half +, half -, RF

> *Range*: Displays how much material range, e.g. 5.000"
> *Delay*: Delays start of signal
> *Main Bang Blank (MB blank)*: Used to eliminate main bang recover noise
> *ECHO Window*: End of maximum time (material) to be measured
> *ECHO 1 Detect*: + or −
> *Pulser Voltage*: Pulsr volt: 30, 60, 90, 120V
> *ID*: If datalogger equipped to change to another ID location
> *Alarm*: High, Low, High-Low, Off

If another type of probe is chosen (e.g., delay line), other fields such as IF blank, C3 blank, and echo 2 polarity will appear as additional setup parameters.

Note, if any parameter has been adjusted, then an asterisk will appear next to the probe setup file. You have a choice at this point to **Save** above **F2** and give it a file name or **Discard** above **F3**. You can save up to 2,700 unique application setups.

For all other gage setups such as alarm, hold, datalogger, etc. please refer to the ECHO 9 portion of this manual.

ECHO 8 allows you to choose between corrosion and precision gage functionality from the Menu list, under Initial Settings, followed by the Gage Type parameter:
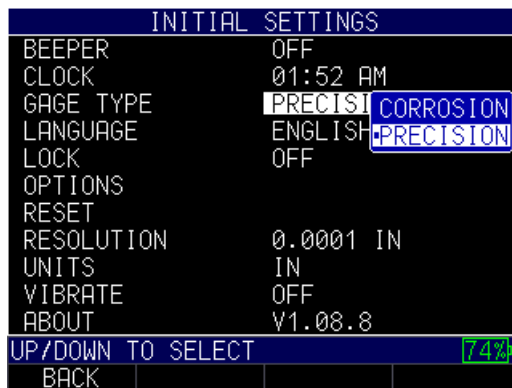
12 Technical Assistance

Call Danatronics, Corp. at 978-777-0081 or email us at sales@danatronics.com for specific technical assistance or troubleshooting questions.