

## User's Guide



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## Liability

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

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

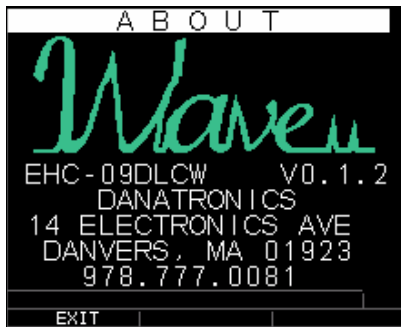
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## 1 Getting Started



### About the UPG-07 Wave series

The UPG-07C, UPG-07CW, and UPG-07DLCW are portable, digital, handheld thickness gages. The EHC series of ultrasonic thickness gages 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 (patent pending)
- Automatic transducer replacement intelligence built in (patent pending)
- Unique, programmable left-hand/right-hand operation (patent pending)
- Up to 50 hour battery life with 2 AA batteries
- Small, easy to hold, ergonomic, custom molded, durable case with rubber keypad
- Automatic zero capability
- Gain boost
- Multiple dual and single element transducer options including high temperature

The UPG-07C 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 UPG-07C can be easily upgraded in the field to the UPG-07CW or UPG-07DLCW models to add the live color waveform (A-Scan).

The UPG-07W 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 UPG-07C, this model is field upgradeable to a datalogger version with color waveform, the UPG-07DLCW.

Our top of the line model, UPG-07DLCW, contains all the same features of the UPG-07C and UPG-07CW plus:

- Live Color Waveform with gain, range, rectify adjustments
- 50,000 (expandable to 100,000) reading (5,000 waveform) datalogger capacity with complete setup tracking
- Three pre-set files for linear, grid (row advance) and grid (column advance)
- Echo-to-Echo
- B-scan
- Custom molded carrying pouch with belt clip and elastic strap

#### Probe Zero

When turning on the UPG-07C, UPG-07CW, and UPG-07DL CW (for the sake of this manual, with the exception of the datalogger, B-scan, and Echo-to-Echo features, the three model numbers are interchangeable for the basic operation and calibration), the gage does an automatic zeroing of the transducer thus eliminating the need for an on-block zero. The UPG-07C, UPG-07CW, and UPG-07DLCW will electronically zero the transducer upon power up and at a particular time during normal operation. This feature ensures 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, clean without any noticeable wear.

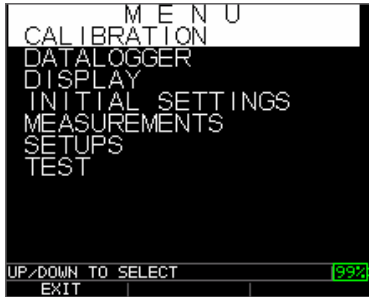
For a more accurate “span” of calibration, Danatronics recommends a zero calibration and sound velocity calibration as well.

Upon first turning on the gage, you can match the transducer part number on the back of the transducer to the screen, wipe couplant off face and press **MENU OK**. Here is what the first screen will look like, see reset and backlight sections for additional details.

#### Keypad Functions

The figure below shows the full keypad of the UPG Series thickness gages. Refer to the following table that lists the function of each key on the keypad.

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The above screen represents the very first power up screen, it will time out after 5 seconds or you can press F1 to Exit. Please note, this manual will refer to the gage set up to left hand operator when referring to the F1 Key. If the gage has been changed to a righthand operator via display, user, the F3 Key will display the values.



Key	Function
	Up arrow key
	Down arrow key
	Left arrow key
	Right arrow key
	On/Off symbol (under the F1 key)
	OK key
	F1 key





F2 key



F3 key

### Function Keys

Function keys, or F keys, such as F1, F2, and F3 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).

### Display Screen

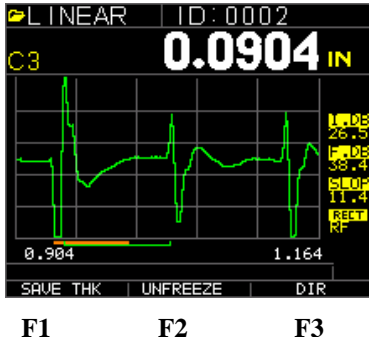
The gage has a graphic style color TFT with 270x220 pixel density. Viewing the screen is best from straight above or slightly below the surface rather than from side to side. If external temperatures are below 32°F (0°C), the display may be slower to update information.

At the top right corner of the display screen is the “available key mode”.

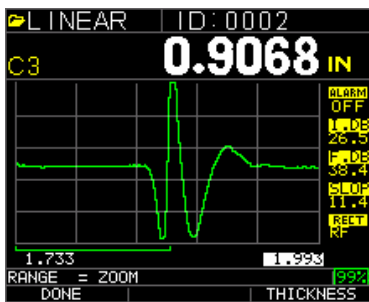


Color thickness of UPG-07C

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Color Waveform in class three (echo to echo) Display also shows main adjustments in Ascan including I.D.B for Initial Gain, F.D.B for Final Gain, Slope, rectification (RF shown), Range, filename in the top left (Linear), I.D. for datalogger (0002 shown). Above the F1, F2 and F3 keys are Save THK for Save thickness, Unfreeze (F2) and Dir for Directory (F3). The marker below the first 2 echoes shows the measured time interval with a C3 or fist detected blanking line shown in red.



RF in Zoom mode as displayed on the bottom of the screen

The top part of the display screen for UPG-07DLCW model shows the File name, ID number. 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 thickness value, In, mm or usec, Echo-to-Echo symbol, LOS for loss of signal, Freeze, Fast Min or Max, Alarm indicator, Differential mode, Low, Med or High gain and percent remaining battery life.

## Using the Battery Pack

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

The UPG-07 Wave series constantly displays the percent battery life on the bottom right hand corner of the measurement display screen. When the gage gets below 10 %, the indicator will turn from green to red and a 5% it will flash.

**Note:** You should power down the UPG-07 Wave to ensure any saved data is stored internally.

### *Replacing the Battery*

To replace the battery pack, unscrew the battery door on the bottom of the gage and slide out the two “AA” batteries. Replace with two new “AA” batteries paying attention that both positive ends should be facing towards the top of the gage.

## 2 Basic Gage Operations

### Power on the Gage

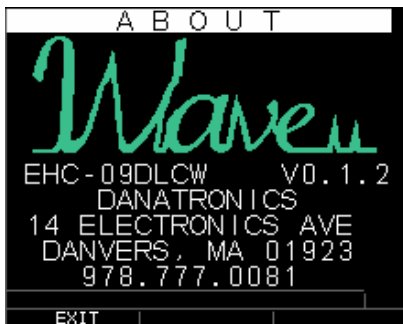
To power on any of the UPG series thickness gages follow these steps:

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



Power symbol  
under the F1 key

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



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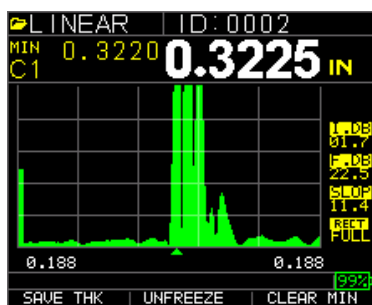
3. The next screen that appears is the main menu with the last set up used. The screen will look like this:



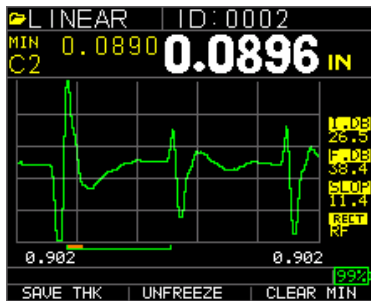
4. At this point you can choose the probe you want to use paying close attention to the Default settings, frequency diameter and part number. If you do not choose one the gage will time out after a few seconds based on the last probe used or you can press F1 or any other key. The screens can be interpreted as follows:

#### Transducer (Probe) Selection/Description of Classes of Measurements

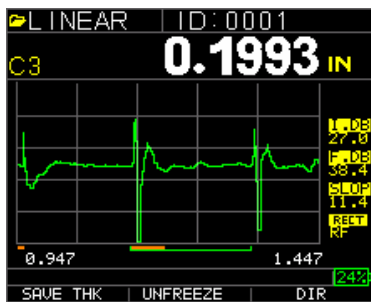
DEFP2-DLK1025 is a default class 2 set up for P for Plastics with a 10 Mhz, .25 inch probe. DEFS is for Steel and the classes of measurement are either 1, 2 or 3. Class one uses a contact transducer is the measurement time from the initial pulse or Main bang to first backwall echo. Class 2 is uses a delay or immersion probe and measures the time from the interface echo to first back wall echo. Class 3 also uses a delay line or immersion probe and measures the time between multiple echoes after an interface echo.



Class 1 with cursor on first backecho



Class 2 with interface echo at left and first detected backecho on right. Also shown in interface blank (dead zone) below the interface echo.



Class 3, marker shows measured time between echo 1 and echo 2 after an interface echo. Also shown is the blank after first

- USER 5.0MHz
- DCC110 1.0MHz
- DCC175 1.0MHz
- DCC250 2.0MHz
- DCC250 2.0MHz
- D525(s) 5.0MHz
- DC525 5.0MHz
- DCK550 5.0MHz
- DCK550 5.0MHz
- DCK537 5.0MHz
- DCK537 5.0MHz
- DLK525 5.0MHz

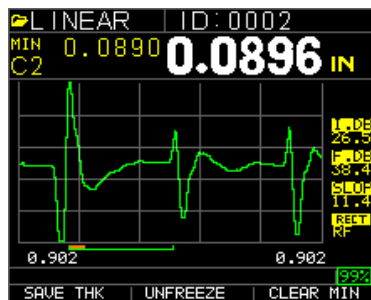
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DLK550 5.0MHz  
DLK1025 10.0MHz  
DLK1225PP 12.0 Mhz  
DLK1525 10.0MHz  
DLK20125 20 .0Mhz

5. Press **F1** to select the **Setup** option.
6. Press **F2** to select the **Reset** option.
7. Press **F3** to select the **Bk-lite** option.

## 1. Taking Measurements

Once an Auto-zero is performed on the selected transducer, the unit automatically goes to the Measure mode as shown below.



Measure mode

To take thickness readings, the user can simply apply the couplant to the surface and put the transducer to measure thickness. Depending on the parameter settings, the display may show other parameters. For more detailed information on Measure mode, please refer to the UPG-07 series User's Guide on the CD provided with the gage.

## 2. Changing the Parameter Settings from the Main A-Scan or Measurements Screen

The following is a list of available parameters:

I. DB for Initial Gain    26.5 dB  
F. DB for Final Gain    38.4DB  
SLOP for Slope...rate at which Initial gain and Final gain adjust  
RECTIFY    RF, Full, Halt+, Half - (RF is Default)  
RANGE    .5, 1, 2, 5, 10, 20 inch or Zoom

MB Blank for Main Bang Blank...see more detailed manual

IF Blank (C2 and C3 only)...see more detailed manual

C3 Blank (C3 only)...see more detailed manual  
Echo Window means end of measured time  
Echo 1 detect + or –  
Echo 2 detect + or –  
Pulsr Vol for Pulsar Voltage...30V, 60 V, 120V

## Getting Started ...Quick Reference Guide

### 1. Installing Batteries

In order to install batteries in any of UPG-07 series unit, open the battery door at the bottom left of the unit. Slide in two AA batteries with positive terminal of both batteries facing towards top of the unit. Close the battery door tight enough so that the batteries make contact with both the battery terminals.

### 2. Powering ON/OFF

To power ON the unit press and hold the F1 key for about three seconds. The LCD will display the company information briefly and then go to transducer selection screen. These two screens are as shown below. To power off the unit press and hold the F1 key for about three seconds. The LCD will briefly display the company information with a 'counting down' clock and then power off.

**NOTE:** If the gage is set up for right hand operation, the F1 and F3 display prompts will be reversed.



Company information screen

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Transducer selection screen

### 3. Selecting Transducer

Upon viewing the first screen, choose the transducer that matches the list above. Here is a Description of the above abbreviations:

DEF=Default

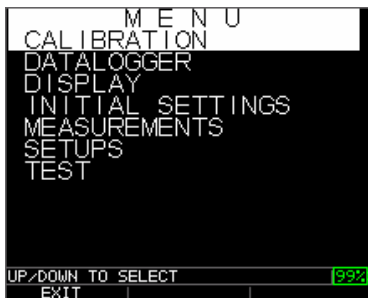
S= Steel

P= Plastics

1=Class one or the measured time from main bang to first backwall echo. C1 is the most common and easiest to use but are less accurate than class 3 and the minimum thickness is larger than class 2 or 3. C1 is good for most materials.

2=C2 or the measured time from the interface echo (echo off delay line or waterpath) to first back wall echo. C2 is ideal for thin materials, curved parts or high temperature with a high temp. delay line. Can also be used in immersion. C2 is ideal for plastics, composites and thin materials.

3= Class 3 or measured time between echoes following in interface. C3 is the most accurate because we measure the echoes within the material not affected by pressure used, amount of couplant or cable attenuation. C3 is also ideal for thin materials as well as materials such as steel, aluminum and ceramics where multiple echoes exists.

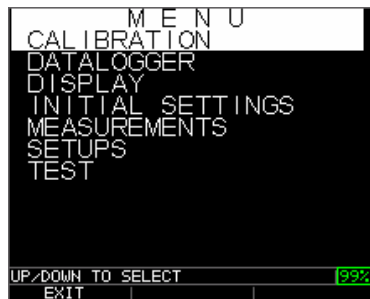




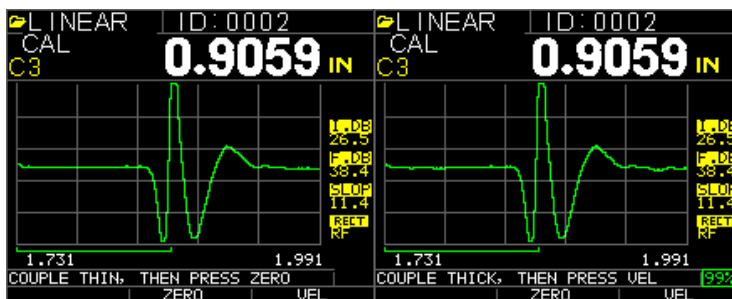
A new transducer can be selected from the Transducer selection screen, which appears after the device powers on. The transducer selection screen can also be accessed from the main menu and **Setup** as seen above.

While in the transducer selection screen, go to the transducer option that matches the part number on the actual transducer and material S or P and by pressing up or down arrow keys. The next screen will then be ready to make measurements. If gain, range, blankings and other parameters need to be adjusted, please refer the our more detailed product manual.

Example of Velocity and Zero values after Auto zero



Press Menu OK, scroll to Calibration, press menu O.K. for the following screens



Note the gage displays what to press, i.e. couple to thin, press Zero (F2), then press up/down to known thickness then Cal (F3). Couple to Thick, press Vel for Velocity (F3), up/down to known thickness then Menu O.K.

#### 4. Calibrating the Gage

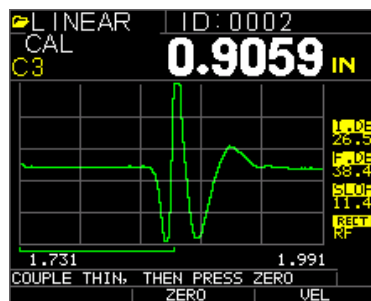
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Calibrating is the process of adjusting the gage for a specific material and transducer before testing the material to make sure that all measurements are accurate. You must always calibrate before measuring material for standard accuracy. The following steps show how to perform velocity cal, zero cal, velocity and zero cal and delay-line cal. You will need a test step block or a sample representing the thin and thick sections of a known thicknesses and same material to perform accurate calibration.

### Velocity Calibration Only

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To perform any calibration, first go to the Measure mode and press Menu/OK. Then go to the Cal option in the Menu screen and press OK. The following Cal mode screen should appear. To exit the Cal screen without performing any calibration, press OK. To proceed to velocity cal, follow the following instructions.



Cal screen for non-datalogger version

While measuring the thicker step, select VEL by pressing F3. After selecting VEL, 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. Press OK 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.

### Zero Calibration Only

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To perform a zero calibration, go to the Cal mode as shown in part a. While measuring the thinner step, select ZERO by pressing F2. After selecting ZERO, 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. Press OK to perform the calibration. The unit will briefly display the calibrated zero value in the top of the screen and then return to Measure mode.

### Velocity and Zero Calibration

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To calibrate both velocity and zero at the same time, first go to the Cal mode as shown in part a. While measuring the thicker step, select VEL by pressing F3. After selecting VEL you can take the transducer off the test block. If the displayed value is different than the known value of the step, adjust the value by pressing up or down arrow keys and press F1/CAL. While measuring the thinner step, select ZERO by pressing F2. After selecting ZERO 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

and then press MENU OK. The unit will briefly display the calibrated zero value and then return to Measure mode. Note that the order of Velocity and Zero calibration can be reversed. If Velocity calibration is performed after Zero calibration, the calibrated velocity value will be displayed at the end of the calibration process.

### Delay Line Calibration

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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. Please see section 3 above for instructions on Delay line calibration, which is the same as performing an Auto-zero.

**NOTE:** Once any of the above calibrations is performed, verify the accuracy of the readings using the test step block.

```

DEFS3-DLK1025 *
MEAS MODE CLASS 3
INIT GAIN 26.8 DB
FINL GAIN 37.9 DB
SLOPE 07.6 DB/US
VEL 0.23300 IN/
XDUCER DLK1025RM 1
XDCR FREQ 10.0 MHZ
MB BLANK 7.50 US
IF BLANK 0.40 US
C3 BLANK 0.03 US
ECHO WIND 7.50 US
<-CHANGE VALUE->
BACK SAVE AS DISCARD
    
```

### GENERAL KEYPAD OPERATION

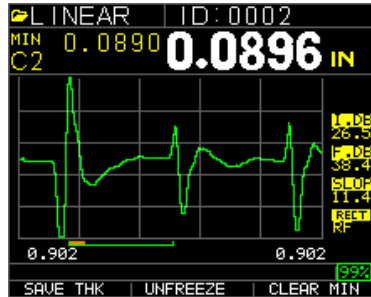
To change any parameter settings press Menu/OK and then go to the Setup option by pressing up or down arrow keys. Press OK to go to the Setup screen. The Setup screen lists the parameters as shown above. Go to the desired parameter from the list by pressing up or down arrow keys. You can change the settings for that parameter directly from the Setup screen by pressing the left and right arrow keys. Otherwise you can press OK to list all the settings for that parameter on a new screen and then go to the desired setting from the list and press OK. The display will return to the Setup screen with the new setting. For more detailed information on parameter settings, please refer to EHC-09 series User's Guide on the CD provided with the gage. Notice Vel for velocity is one of the settings, therefore, sound velocities can be entered manually by highlighting over Vel and using the left or right arrow to adjust then Menu OK to accept the new value.

### 3. Taking Measurements

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Once an Auto-zero is performed on the selected transducer, the unit automatically goes to the Measure mode as shown below.

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Measure mode

To take thickness readings, the user can simply apply the couplant to the surface and put the transducer to measure thickness. Depending on the parameter settings, the display may show other parameters. For more detailed information on Measure mode, please refer to the UPG-07 series User's Guide on the CD provided with the gage.

#### 4. Changing the Parameter Settings from the Main A-Scan or Measurements Screen

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The following is a list of available parameters:

- I. DB for Initial Gain 26.5 dB
- F. DB for Final Gain 38.4DB
- SLOP for Slope...rate at which Initial gain and Final gain adjust
- RECTIFY RF, Full, Halt+, Half - (RF is Default)
- RANGE .5, 1, 2, 5, 10, 20 inch or Zoom

- MB Blank for Main Bang Blank...see more detailed manual
- IF Blank (C2 and C3 only)...see more detailed manual
- C3 Blank (C3 only)...see more detailed manual
- Echo Window means end of measured time
- Echo 1 detect + or -
- Echo 2 detect + or -
- Pulsr Vol for Pulsar Voltage...30V, 60 V, 120V

#### 5. Changing the Parameter Settings from the Display Screen

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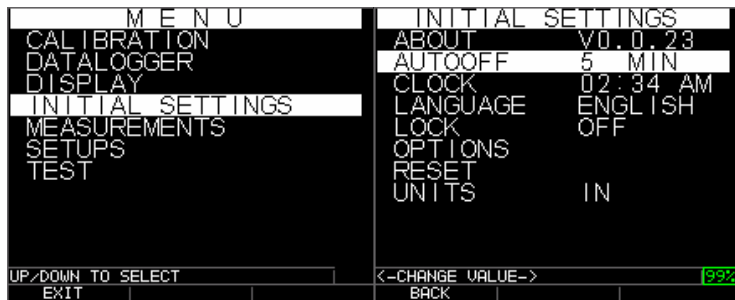


The following is a list of available parameters:

BACKLIGHT	OFF, ON, AUTO
COLOR	SELECTS COLORS FOR BACKGROUND, FLAGS, GRID, TEXT AND WAVEFORM
SHOW	Waveform or Thickness
USER	LEFT HAND, RIGHT HAND
WAVEFORM	Filled or Outline

### 6. Changing the Parameter Settings from the Initial Setup Screen

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The following is a list of available parameters:

ABOUT	SOFTWARE VERSION NUMBER
AUTOOFF	1-31 MINUTES, NEVER
CLOCK	SET TIME AND DATE FOR DATALOGGER STAMP
LOCK	LOCK CALIBRATION OR KEYBOARD
OPTIONS	USED TO ENABLE OPTIONAL SOFTWARE FEATURES
RESET	RESET PARAMETERS, DATABASE OR BOTH
UNITS	IN, MM, USEC

### 7. Changing the Parameter Settings from the DATALOGGER Screen

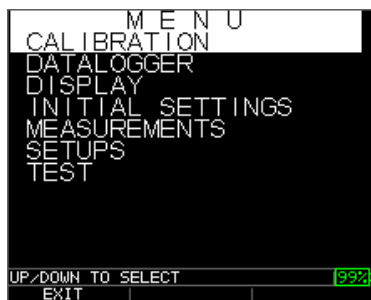
Formatted: Bullets and Numbering

The following is a list of available parameters:

Directory	Enables set up of all datalogger files..see long form manual
NOTES	OFF, On

To change any parameter settings press Menu/OK and then go to the Setup option by pressing up or down arrow keys. Press OK to go to the Setup screen. The Setup screen lists the parameters as shown above. Go to the desired parameter from the list by pressing up or down arrow keys. You can change the settings for that parameter directly from the Setup screen by pressing the left and right arrow keys. Otherwise, you can press OK to list all the settings for that parameter on a new screen and then go to the desired setting from the list and press OK. The display will return to the Setup screen with the new setting. For more detailed information on parameter settings, please refer to the EHC-09 series User's Guide on the CD provided with the gage.

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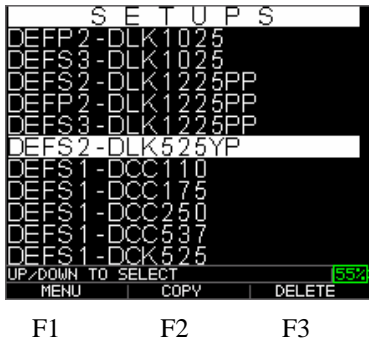


Screen shot above if initial screen times out.

### Performing a Reset

You can reset the gage settings 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 **F2 – Reset** key. The following Reset screen appears:



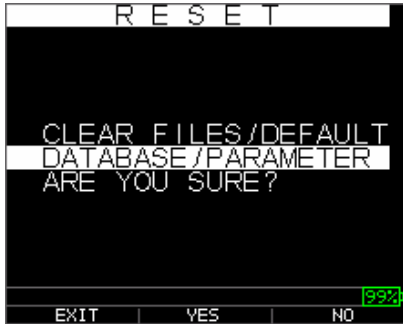
2. Select the **Database, Parameter, or Database/Parameter** option by using the up and down arrow keys and press the **Menu Ok** key to make a selection. See the following sections to perform each of these reset options.

#### 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 the user created files in the database will be cleared and deleted. To perform a Database Reset, follow these steps:

1. From the *Home* screen, press the **F2 – Reset** key. The Reset screen appears.
2. Select the **Database** option and press the **OK** key. The following screen appears:

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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 reset.

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

#### *Parameter Reset*

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

1. From the *Home* screen, press the **F2 – Reset** key. The *Reset* screen appears.
2. Select the **Parameter** option and press the **OK** key. The following screen appears:



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

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

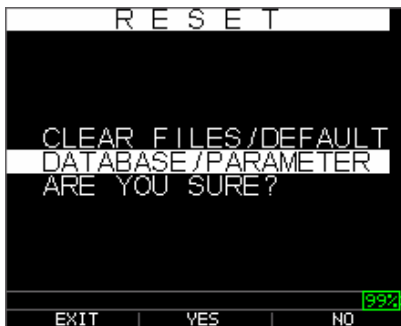
After performing a Parameter Reset, the *Home* screen appears automatically.



### 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 the user created files in the database will be deleted and the default parameters will be restored at the same time. This selection is the equivalent of performing MASTER RESET on the instrument, restoring original factory setting. To perform a Database/Parameter Reset, follow these steps:

1. From the *Home* screen, press the **F2 – Reset** key. The *Reset* screen appears.
2. Select the **Database** option and press the **OK** key. The following screen appears:



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

3. Press the **F2 – Yes** key to perform a **Database/Parameter** reset.

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

### Backlight

The backlight can be turned On or Off by pressing **F3 – Bklite**. Backlight can also be turned On, Off or set on Auto using the **Bklight** option in the Setup Menu/Display Menu. The Wave goes out with the Backlight automatically set to Auto to optimize viewing in various lighting while conserving battery life.

**Note:** Leaving the backlight on will reduce battery life.

If you set the backlight to Auto, the backlight will turn on during active readings and hold for 12 seconds or unless otherwise specified.

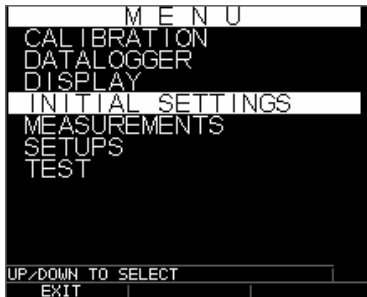
**Note:** If the backlight is set to Auto and you have the gage in Hold mode, the backlight will shut off after 12 seconds. If you would like the hold to remain lit, then you must enable the backlight on instead of using Auto.

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## About Screen

You can find information about any of the UPG-07 Wave series thickness gages 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 **Initial Settings** as highlighted below. The following *Reset* screen appears:



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



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

### 3 Calibrating the Gage and Making Measurements

#### 2 Point Calibration:

**To Get Started**, make sure the transducer you plan to use with the gage is the same from the pick list unless it is a custom setup, then press the F1 Back key to enter the main screen with A-Scan and thickness. Note the transducer pick list have default settings for common material velocities and ranges. See transducer chart at the end of this manual for more details. At this point you can apply some ultrasonic couplant (fluid provided with gage) to the material and place the transducer on top of it. **PLEASE NOTE: THE GAGE IS NOT CALIBRATED AT THIS POINT.**

#### Calibration

The UPG-07 Series has on-line help for 2 point calibration. Simply follow the on-screen instructions. Press Menu OK, choose calibration, press Menu OK, Couple to thin section, peress F2 Zero (you can remove the probe at this point), scroll up or down to the known thickness, press F1 Cal, couple to thick section, press F3 Vel, scroll to known thickness and press Menu OK.

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

To measure a thickness of unknown material you need to know the velocity of the sound in the unknown material. To find the velocity of the sound you can use one of the following methods:

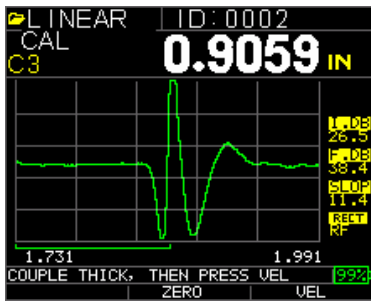
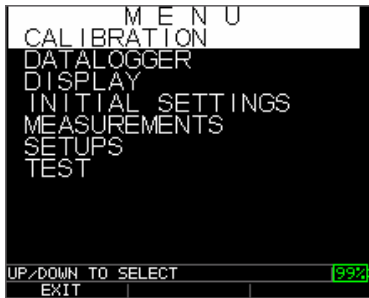
- Velocity calibration only
- Velocity and zero calibration...Most Accurate
- Zero calibration only

#### Velocity Calibration Only

If you are working with a test piece of known thickness but unknown material, then you can calibrate the 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. Subsequently you can enter the sound speed directly into the gage in the home screen and Setup under the transducer you are using, Velocity is one of many parameters which can be entered.

To perform any calibration, first go to the measure mode and press Menu/OK. Then go to the Cal option in the Menu screen and press OK. The following Cal mode screen should appear. To exit the cal screen without performing any calibration, press OK. To proceed to velocity cal, follow the following instructions.

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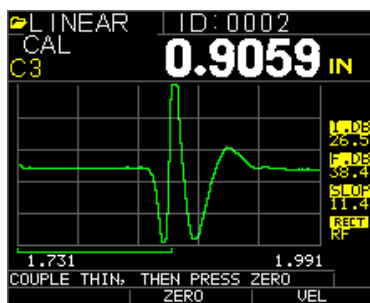
Cal screen for non-datalogger version

Once you have entered the Calibration screen by pressing Menu OK, you will see prompts on the second from the bottom line instructing what to do, i.e. “couple to thin, press zero, up down to known thickness then cal”. For Velocity only press menu OK skipping over the zero process. While measuring the thicker step, select VEL by pressing F3. After selecting VEL, 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. Press OK to perform the calibration. The unit will briefly display the calibrated velocity value in the top of the screen and then return to measure mode.

### Velocity and Zero Calibration

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

To calibrate both: velocity and zero at the same time, first go to the Cal mode as shown in Velocity Calibration Only section. While measuring the thinner step, select Zero by pressing F2. After selecting ZERO you can take the transducer off the test block. If the displayed value is different than the known value of the step, adjust the value by pressing up or down arrow keys and press F1/CAL. Then while measuring the thicker step select VEL by pressing F3. After selecting VEL 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 and then press OK. The unit will briefly display the calibrated sound velocity value and then return to Measure mode. Note that the order of Velocity and Zero calibration could be reversed. If Zero calibration is performed after Vel calibration, the calibrated zero value will be displayed at the end of the calibration process.



### 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.

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To perform a zero calibration, go to the Cal mode as shown in Velocity Calibration Only section. Then while measuring the thinner step, select ZERO by pressing F2. After selecting ZERO, 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. Press OK to perform the calibration. The unit will briefly display the calibrated zero value in the top of the screen and then return to measure mode.

### Delay Line Calibration

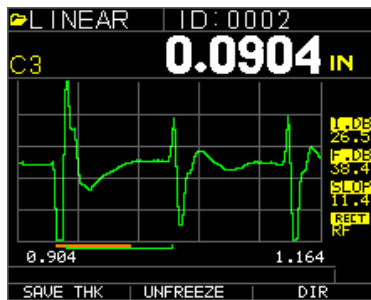
Delay line calibration is done every time the thickness gage is powered on and a transducer is selected, or when a different transducer is selected during normal operation.

Delay line calibration is performed 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. When you power on any of the EHC series thickness gages and select a transducer, the gage performs automatic calculations and warns you (patent pending) if the sensitivity of the transducer is too low and whether the transducer should be replaced.

### Measurement Mode with a Datalogger

If your UPG-07 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 are different for the EHC series thickness gages without a datalogger. Also, the file symbol, filename, ID: xx,xxxx are not displayed in the non-datalogger version of the EHC series thickness gages.

To continue in *Measurement* mode **without a datalogger**, follow these steps:

1. Press the **F1** key to select the **Alarm** option. (See: Alarm section.)
2. Press the **F2** key to select the **Freeze** option. (See: Freeze section.)
3. Press the **F3** key to select the **Gain** option. (See: Gain section.)
4. Press the **Menu = OK** key to select the Menu option. (See: Menu section.)

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#### 4 Adjusting parameters in A-Scan mode:

In addition to changing parameters via the Menu OK key, you can also adjust the following parameters while in A-Scan:

I DB or Initial Gain

FDB or Final Gain

Slope

Rectify (RF, Full Wave, Half + or Half -)

Range (.5,1,2,5,10 and 20 inch or 12.7, 25.5,50,127, 254, 508mm)

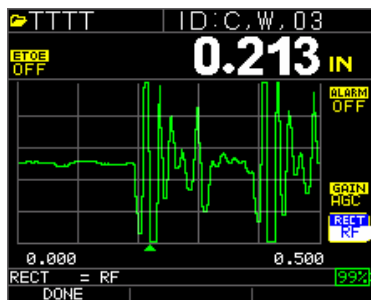
Blanking (MB for Main bang blank)

IF Blank (C2 and C3 only for interface echo)

C3 Blank, (C3 only)

To change a parameter use either the right or left arrow until the parameter to be adjusted is highlighted. Use the up or down arrow to adjust the parameter. You can also view the functions for each parameter by pressing the Menu OK key. When finished adjusting the parameter press the F1 done key (set up for left hand user), F3 for right hand user. For gain control, F2=AGC or Automatic Gain Control. When in AGC, 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.

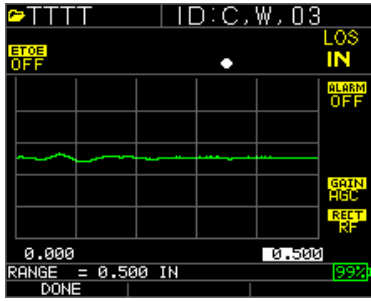
Here are screen shots examples highlighting the various parameters that can be adjusted:



Rectify Highlighted



UPG Series Ultrasonic Thickness Gages

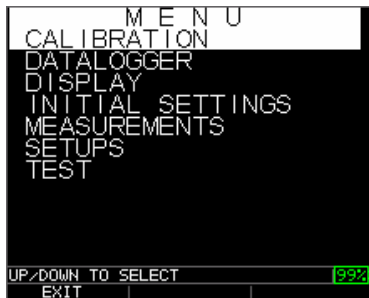


Range Highlighted

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## 5 Using Setup Mode on the Gage

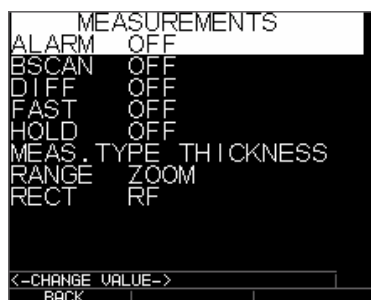
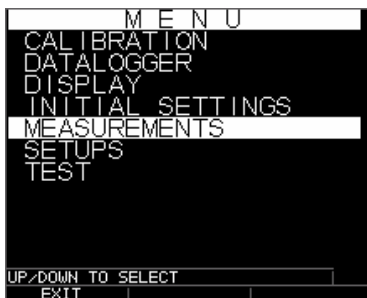
The following modes are available (please note that in the non-datalogger version of the UPG series, the **Directory** mode is not available.)



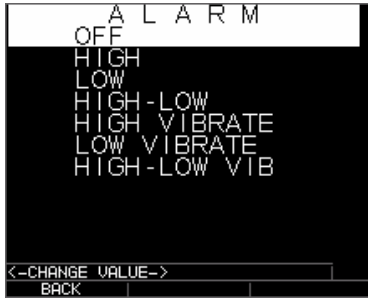
To select **Measurement** mode, follow these steps:

1. Press **Menu OK** to get to **Measurement** mode.
2. Use the up and down arrow keys to select the **Measurement** option and press the **OK** key.

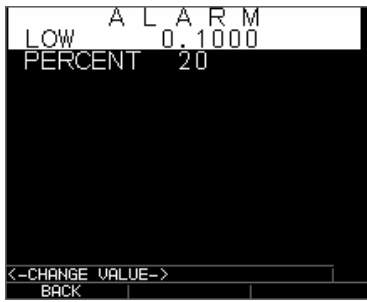
The following Setup choices are available:



UPG Series Ultrasonic Thickness Gages



As an example, if you want to set Low Vibrate, use the down arrow, scroll to Low Vibrate and press Menu OK, and the following will appear:



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Here is a list of what is under the **Display** screen:



- |           |  |
|-----------|--|
| Backlight | ON, Off or Auto  |
| Color     | Adjusts Background, Flags, Grid, Text and Waveform colors  |
| Demo      | Shows slide show of various screens  |
| Show      | Waveform or Large Thickness  |
| USER      | LEFT HAND or Right Hand to display parameters over the F1 or F3 Keys such as SAVE THK for Save Thickness |
| Waveform  | Outline or Filled in   |

Some color changes are dynamic, meaning you will see the changes as you make the change; examples include Flag, File, ID. Others, such as waveform and background, can only be seen once the change is made and you return to the screen.

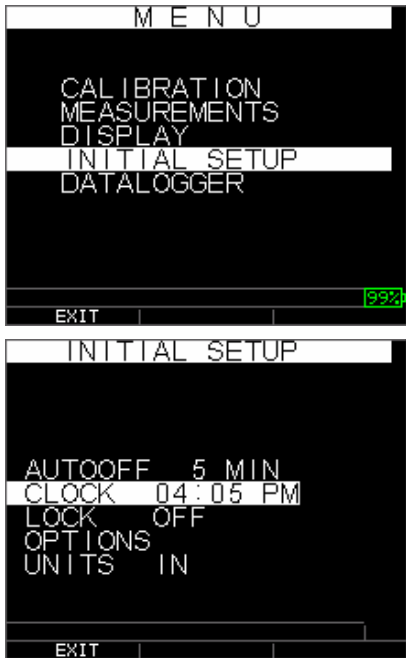
**Notes:** the Wave will not allow the superimpose of two simultaneous colors, outline not valid in RF, if Alarm is on, the waveform or thickness display will display in only Green, Yellow or Red.

To change a color, Press Menu/OK, scroll to Display, press Menu/OK, choose the item to change the color on using the up and down arrows, then use the left or right arrow to toggle through the color choices of:  
Red, green, blue, yellow, white, black, grey, light grey. By varying the colors, you can optimize ease of visibility and improve contrast. The Wave is readable in direct sunlight as well as in-doors. It is highly recommended to use the back light set to on or auto when using the wave indoors. You can not make two colors be the same and the Wave will prompt you with a message such as wave and background not allowed and the gage will move to the next available color.

### Using the Clock

The EHC Wave series thickness gages have an internal real-time clock that includes the year, month, day and time.

From the **Initial Setup** screen press menu/OK and scroll to clock and press Menu/OK.



The entire list of available clock setup options are as follows:

TIME FMT	12 HR
DATE FMT	MM/DD
MINUTE	21
HOUR	01 PM
DAY	01
MONTH	01
YEAR	2005

To set the time and date, follow these steps:

1. Select **Clock option** from the *Initial Setup* screen.



The following is an example of what the clock setup screen might look like depending on the previous setup.

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To change the **Time Format**, select TIME FMT using up/down arrow keys. Use the left/right arrow keys to select between 12 HR and 24 HR options.

2. To change the **Date Format**, select DATE FMT using up/down arrow keys. Use the left/right arrow keys to select between MM/DD and DD/MM options.
3. To set **Minute**, select the MINUTE option using up/down arrow keys. Use left/right arrow keys to decrease/increase the minute value. You can set the minute value from 00 to 59.
4. To set the **Hour**, select the HOUR option using up/down arrow keys. Use left/right arrow keys to decrease/increase the hour value. If time is set in 12 HR format, the available hour values are from 00 AM to 11 PM. If time is set in 24 HR format, the available hour values are 00 to 23.
5. To set **Day**, select the DAY option using up/down arrow keys. Use left/right arrow keys to decrease/increase the day value. You can set the day value from 01 to 31.
6. To set **Month**, select the MONTH option using up/down arrow keys. Use left/right arrow keys to select a Month from JAN to DEC.
7. To set **Year**, select the YEAR option using the up/down arrow keys. Use left/right arrow keys to select the year value from 2005 to 2025.

Press F1 – EXIT to exit the clock setup and return to the setup screen. The real-time clock will automatically update the date and time once the clock parameters are selected.

### Understanding a LOS Reading

LOS (Loss of Signal) occurs when the gage is not making a valid reading for a variety of reasons. This may be because there is not enough couplant, the surface is too rough or rusty, the transducer is low in sensitivity, the temperature is too high, there is a disbond between the coating and the steel or for a variety of other reasons. In the event you try to save a reading in LOS with the datalogger version, the *Notes* screen will automatically appear so that a reason is given for saving an LOS. You can scroll to the appropriate note and press the soft save key.

Using the Hold Option:

To turn on, from the main menu, scroll to Measurements, then Menu OK, scroll to Hold and press either the left or right key.

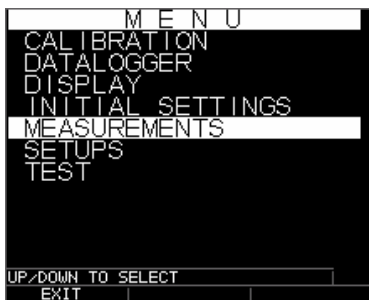
If a LOS occurs, the gage can continue to display the last measured thickness by “holding” the measurement. There are two Hold options, which include:

- **Hold On:** Continues to display the last measured thickness
- **Hold Off:** Does not continue to display the last measured thickness

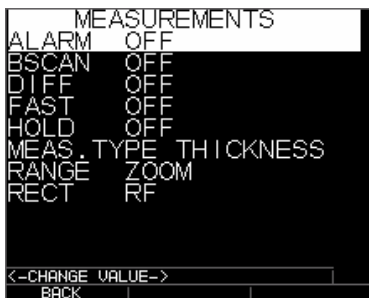
Using the Fast Option

From the **Measurement** Screen, the **Fast** option is available in the **Setup** mode in both the Datalogger and Non-datalogger versions of the gage.

To select the **Fast** option in **Measurements** mode, follow these steps:



1. Use the up and down arrow keys to highlight the **Fast** option and press the **OK** key. Or once **Fast** is highlighted, use Quick Access mode by pressing left or right arrow key as indicated in the top right corner of the display screen.



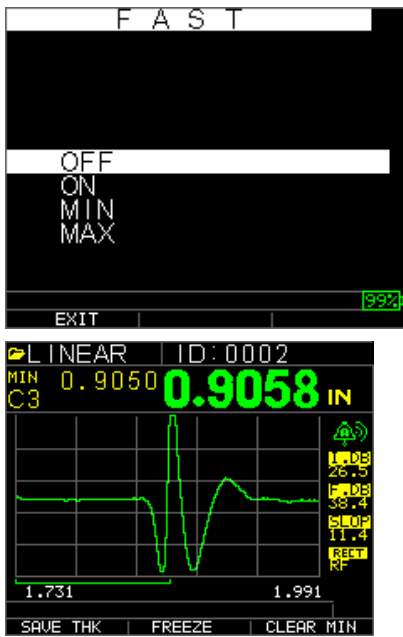
The following parameters are available:

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2. Use the up and down arrow keys to select the desired parameter and press the **OK** key.
3. Press **OK** key again to accept and return to **Measure** mode.

In the **Measure** mode in either the Datalogger or Non-datalogger version of the gage, the selected **Fast** option setting is displayed under the thickness reading as shown in the screens below:



**Helpful Hint:** Use the Fast Min or Fast Max to capture the minimum or maximum thickness while scanning, the gage is now measuring at 20 Hz. Vs. 4 Hz.

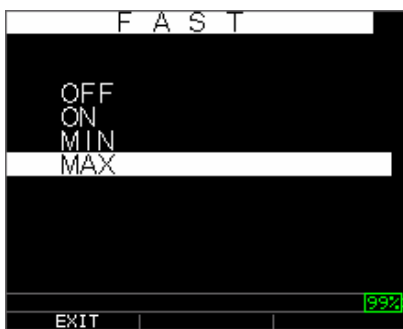


The parameters that you selected in the **Fast** option are shown as follows in **Measure** mode:

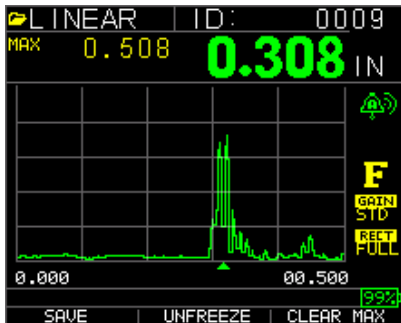
FAST	when <b>On</b> is selected
FASTMIN	when <b>Min</b> is selected
FASTMAX	when <b>Max</b> is selected
<BLANK>	when <b>Off</b> is selected

The **Fast** option allows you to select fast updates of measurements at 20 Hz compared to 4 Hz. If you selected the **FastMax** option, the LOS will display the LAST MAX measured value, or if you selected the **FastMin** parameter the LOS will display the LAST MIN measured value. If you select the **On** parameter from the **Fast** option, the LOS will work normally and not show the measured reading.

The screens below reflect different parameters selected from the Fast option. For example, the top screen shows the FASTMAX with LAST MAX measurement on LOS, and the bottom screen shows the FASTMIN with LAST MIN measurement on LOS.



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**Note:** The LOS flag indicates the LAST MAX or the LAST MIN value and is shown based on the *FastMax* or *FastMin* setting.

To reset the tracking of LAST MAX and LAST MIN measured value press the **OK** (Menu) key.

#### Using the Two Gains Initial Gain and Final Gain

From the **Measurement** Screen, gain refers to an increase in signal power (echo height) and is typically measured in decibels (dBs). The Gain function is useful for setting a reference level where by making it easier to add or subtract gain. There are two types of gain, one is Initial Gain and Final Gain adjustable in 1dB step for UPG-07CW or UPG-07DL CW.

The Gain selection is available from the **Measurement** screen to either IDB for initial gain or FDB for Final Gain. Adjusting these parameters requires looking at the echoes and adjusting them to achieve the desired echo pattern. For example, if the initial echoes look too noisy and the back echo looks to low, you would decrease IDB and increase FDB by using the right or left arrow unit either is highlighted and using the up or down key. The Slope is the final factor in making the echo presentation look good. The slope is the rate in which the gain changes between the IDB and FDB.

For gages without waveform, the IDB, FDB and Slope are adjustable parameters but it is not recommended they are adjusted unless you either upgrade to the waveform option or an authorized Danatronics Personnel has given you the values to help with a difficult applications. If you change it, it will never save over the default transducer settings but only can be saved in a custom set up.

For the datalogger version, use the up and down arrow keys in the **Measurement** screen to highlight the **Gain** option and press the **OK** key, or select the **F3** key if you are using the non-datalogger version.

### Using the Diff Option

From the **Measurement** screen, there are two Diff options, which include:

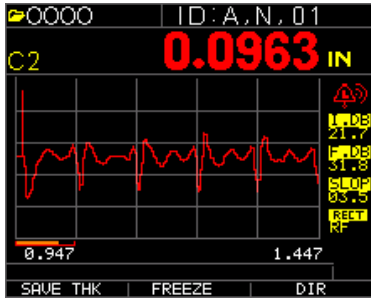
- **Diff ABS:** Absolute where the gage will display a thickness value as an absolute number of what has been entered. For example, diff abs = 0.500" and the real thickness is 1.000 inch, the display will show diff abs 0.500. If the real value is 0.300, the gage will display, -0.200"
- **Diff %:** When this mode is on, the displayed value will be listed as a percentage of the value entered into as the diff. For Example, if the operator set the diff to percentage at 0.500", a reading of 0.250" will result in 50%

### Using the Alarm Option

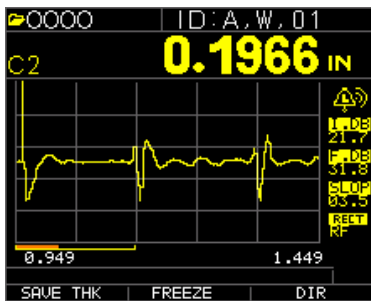
From the **Measurement** Screen, the UPG Series thickness gages offers various alarm settings to alert you of low or high thresholds via audible sounds, display flashes, sensational vibrations (if on) and illuminating keypad. There are several; different alarms options, which include:

- **Alarm Off:** Sets the audible alarm either off.
- **Low Alarm:** Audible alarm will occur and display will flash when the displayed reading is less than the low alarm reference value.
- **High Alarm:** Audible alarm will occur when the displayed reading is higher than the high alarm reference value.
- **High\_Low Alarm:** Audible alarm will occur and display will flash when the displayed reading is less than the low alarm or greater than the High alarm reference value.
- **Low Alarm/Vibra:** Vibration alarm will occur and display will flash when the displayed reading is less than the low alarm reference value.
- **High Alarm/Vibra:** Vibration alarm will occur and display will flash when the displayed reading is higher than the high alarm reference value.
- **High\_Low Alarm/Vibra:** Audible alarm will occur and display will flash as well as vibrate when the displayed reading is less than the low alarm or greater than the High alarm reference value.
- **High\_Low Alarm/Vibra with Dynamic Waveform Adjust:** Audible alarm will occur and display will flash as well as vibrate when the displayed reading is less than the low alarm or greater than the High alarm reference value. In addition, the color of the A-Scan will dynamically change to red, yellow (caution...within an operators preset value of high or low alarm, i.e. 20%) or green corresponding to bad, caution or good readings.

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Red echoes = tripped alarm

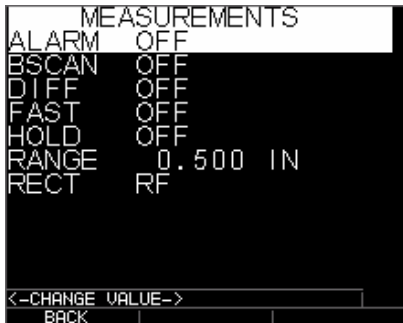


Yellow echoes = caution getting close to tripped alarm



Green echoes = good

The **Alarm** option is available from the **Measurement** screen.



1. Use the up and down arrow keys to highlight the **Alarm** option and press the **OK** key or you can use Quick Access mode by using the right or left keys once **Alarm** is highlighted from the **Setup** mode. If you are using the non-datalogger version you can also press the **F1** (Alarm) key to go directly to the **Alarm** option without having to go through the **Setup** Mode.

The following ALARM selections are available:

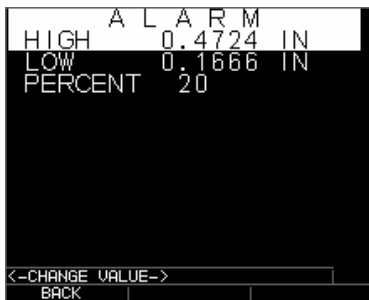


2. Use the up and down arrow keys to select the desired alarm parameters and press the **OK** key.

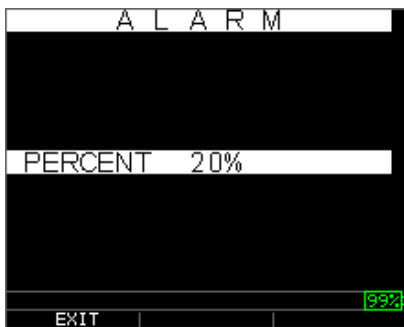
For example, when you select the **High-Low** option the following screen below appears. Use the up and down arrow keys to highlight what you want to change

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and use the right or left arrow to change the value. In this example we are adjusting the High Alarm. When finished you can press the F1 Back or Menu OK keys to continue.



3. Use the same steps from above to set the Alarm Low settings.
4. Setting the % for caution. In this mode, the % entered based on the high and low set points will cause the waveform and F2 to light up yellow:



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

5. When you are finished adjusting the setting, press the **OK** key to return to **Measure** mode.

#### *Setting the Visual and Audible Alarm*

The Visual Alarm conditions can be viewed from either a red, yellow or green LED that lights up under the **F1**, **F2**, or **F3** keys on the keypad.

As an 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 and press enter. Next you will need to enter the low value of 0.100 in. 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 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 lighting up. Also, any reading above the low value of 0.101 and 0.120 will result in the yellow F2 keypad lighting up as you are approaching the minimum

So, in **Alarm** mode, choosing a non-zero percent value provides the user with warning for readings approaching 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 key "Red" being illuminated and greater than 0.120" will result in the **F3** "Green" key being illuminated.

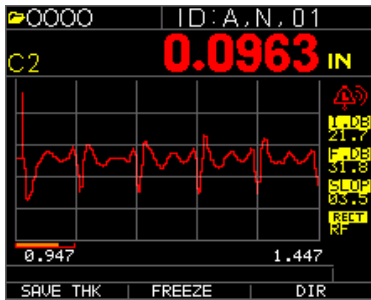
The Audible Alarm turns the beeper on the gage either on or off based on the same alarm conditions used for visual alarm stated above.

### *Setting the Vibra Alarm*

The gage will physically vibrate when the Vibrating Alarm is active based on the same alarm condition used for visual alarm. The Vibrating Alarm, noted as **vib** or vibrate on the gage display, can be enabled with varying alarms and alarm conditions as shown on the screens below:

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Visual and Audible Alarm is enabled.  
The letter A (Alarm) appears in the alarm icon



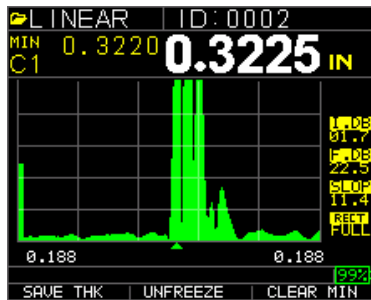
Visual, Audible, and Vibrating alarm enabled  
) symbol appears next to the alarm icon. The letter L (Low) appears in the alarm icon

Alarm condition has occurred meaning the measured reading is lower than the Low Alarm limit. The letter L (Low) appears in the alarm icon. The screen above has the Vibrating alarm enabled as the .) symbol appears next to the alarm icon.

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

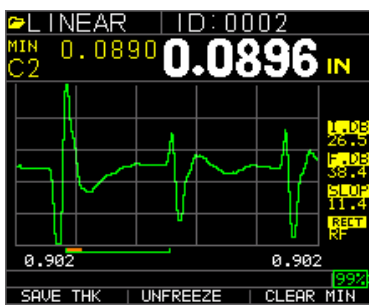
Using the Various Classes of Measurements, C1, C2 and C3

Class 1 is the measurement of the initial pulse or Main Bang to the first detected echo as such:



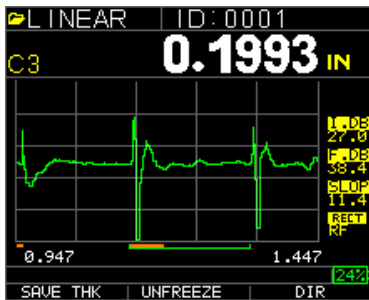
Class 2 is the measurement from the Delay line or water path to the first returned echo as below:





### Echo-to-Echo

**Echo-to-Echo, also called class 3** allows you to make measurements between two consecutive backwall echoes following an interface echo. Therefore, a good usage of the **Echo-to-Echo** option is for measuring very thin materials or through coatings to measure only the true metal thickness.



**Blanking in Echo to Echo:** close attention should be paid when making readings in echo to echo as the blank after first receive echo may need to be adjusted to avoid “noise” or mode converted echoes. To adjust blanking on the first echo, see section 4: Adjusting parameters in A-Scan mode.

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**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. For thinner materials it is good to use either the lowest range setting or zoom.

- **Manual Adjustment of Gain:** Again, sometimes gain will help to ensure you are reading on the correct echo. To adjust gain, see section 4: Adjusting parameters in A-Scan mode.
- **Rectification Mode Adjustments:** Lastly, in echo to echo, sometimes using various rectification modes can “clean up” the signals so you are reading the proper echoes.



## 6 Special Gage Functions

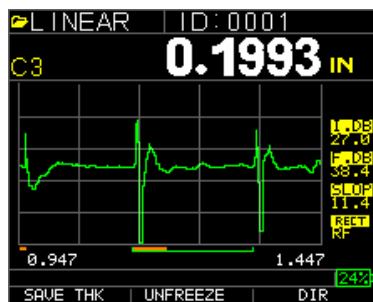
The UPG Wave series thickness gages have many special functions that go beyond the basics, mainly in the UPG-07CW and UPG-07DLCW models. This section will discuss these special gage functions in detail.

### Using the Save Option

For the datalogger version only, you are able to save your data via the **Save** option. Please note, the save key can appear over either the F1 or F3 keys depending on how the user prefers to the gage. See section...The datalogger initial file setup screen can either Save THK Only or THK + Ascan.

To use the **Save** option, follow this step:

1. From the **Measurement** mode screen, press **[F1] (Save THK) or (Save Ascan)** ...if selected. Please note, if the user has been set to rightly under the **Display Screen**, the Save will appear over the F3 key.



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



**Note:** Save ASCAN 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

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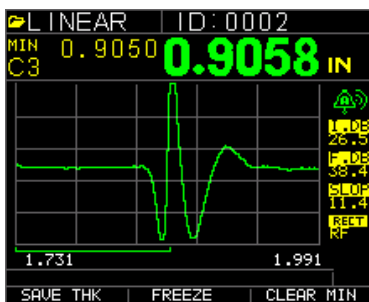
reading will be stored at the ID location [Linear], [Row], [Col] without notes.  
(See: Directory selection for file type details.)

### Using the Freeze Option

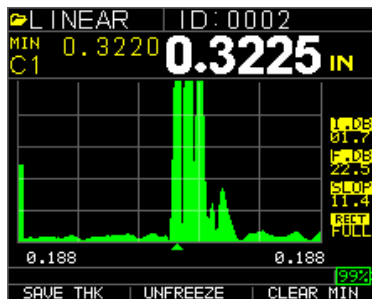
For the datalogger version and non-datalogger version thickness gages, you can freeze your data via the **Freeze** option.

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

1. From the **Measurement** mode screen, press [F2] (**Freeze**).

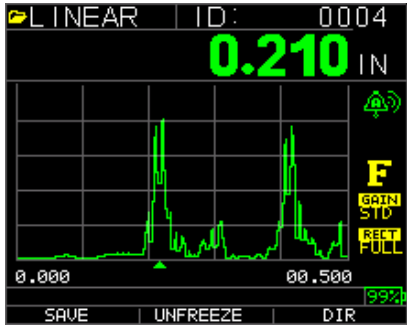


The following screen comes up after pressing [F2] (**Freeze**) whereby showing the flag “**Freeze**” under the thickness reading. You are now in **Freeze** mode. The [F2] selection also changes from **Freeze** to **Unfreeze**.



2. Press [F1] (**Save**) to save the reading. (See Using the Save Option for more information.)
3. Press [F2] (**Unfreeze**) to disable the **Freeze** mode
4. Press [F3] (**Dir**) to perform file operations. (See Using the Directory Option for more information.)
5. While in **Freeze** mode the menu options are disabled. The display will prompt you to unfreeze the gage.

UPG Series Ultrasonic Thickness Gages



Datalogger version

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## 7 Using the Datalogger Directory Mode

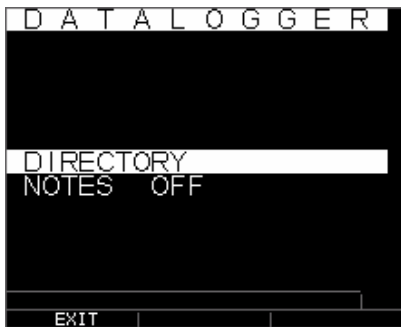
**Note:** This section applies only to the UPG-07DL Thickness Gage with a datalogger. If you do not have a datalogger, you may skip this section. Please note, the UPG-07B and UPG-07 gages are field upgradeable to the Datalogger version. Call the factory for installation instructions.

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

You can either press F3 if Min or Max clear is not present or press the Menu OK key and view this screen:



Then you will see this screen:



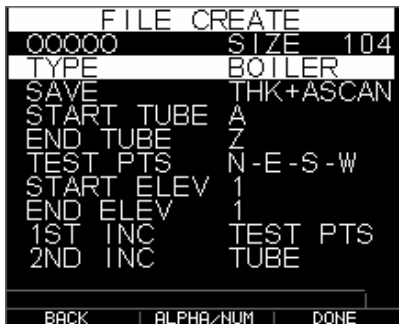
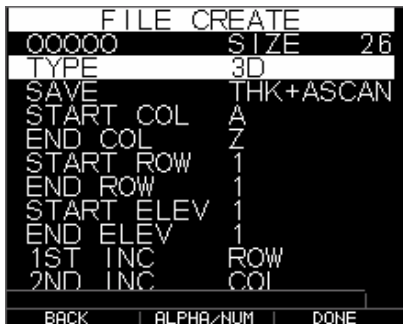
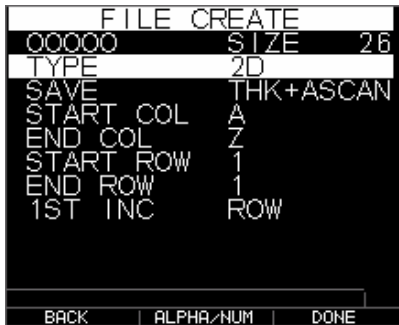
Choosing a file:

NAME	TYPE	SIZE	SV	%
LINEAR	LN	5000	T	00
TWOD	2D	4900	T	00
BOILER	BO	3120	T	00
TTTT	BO	36	A	F
EMPTY02				
EMPTY03				
EMPTY04				
EMPTY05				
EMPTY06				
EMPTY07				
EMPTY08				
BACK				99%

Naming a file: type in name, press F3 when done

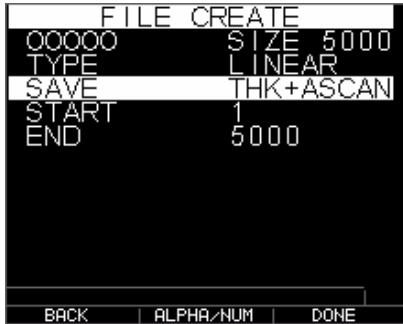


Next you will need to use the up and down keys to determine the file type and amount of readings stored per file. The many types are shown here:

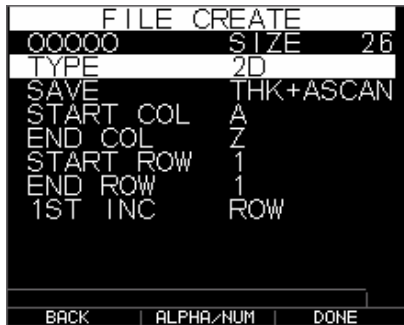


You will also need to decide per file if you want to save thickness and a-scan as per below screen:

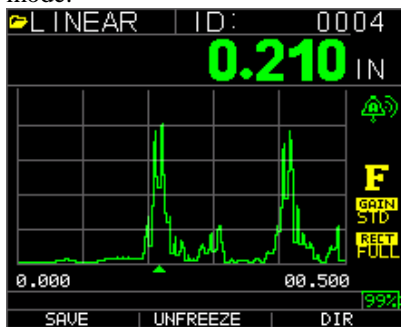
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Use the right arrow to change from linear to grid files, 2D, 3D and boiler files. Use the down arrow to select end row and/or end column. The Maximum number of readings per file is 5,000 and 160 A-Scan. The gage will dynamically re-calculate the size based on row end times column end. :



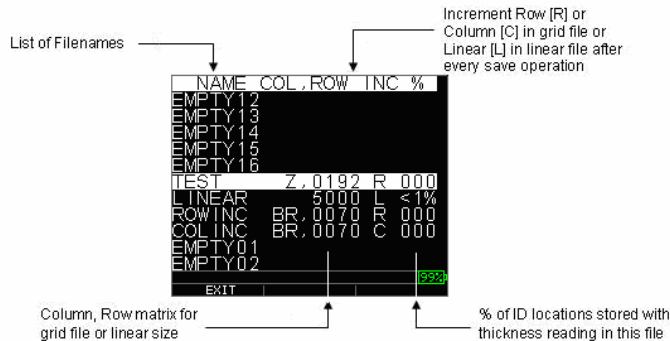
1. From the **Measurement** mode screen press **[F3] (Dir)** to select the **Directory** mode.



By pressing Menu/OK and choosing datalogger or **[F3] (Dir)** you will be able to review, create, delete, select, rename and clear stored thickness and copy.

2. Use the up and down arrow keys to view the list of files, and select which ever one is relevant.





3. Press the **OK** key to select a file in the directory view.
4. To create a custom file see *Creating Custom Files* section.
5. To review thickness readings, see *Reviewing a File* section.
6. To rename custom file, see *Renaming a File* section.
7. To clear an entire file, see *Clearing a File* section.
8. To clear selected readings from a file, see *Reviewing a File* section.
9. To create copy of the existing file structures, see *Copying a File* section.
10. To delete a custom file, see *Deleting a File* section.

The first three files [LINEAR], [ROW INCREMENT] and [COLUMN INCREMENT] cannot be deleted or renamed. These files are factory default files available for you to start storing thickness reading or make a quick copy of the file structure (Linear or Grid [Col, Row]) in order to start saving data in the new file. (See File System for more information.)

### Managing the Datalogger File System

The UPG-07DL supports the following two files types:

- **Linear file:** Consists of ID# from 0001 to 5000. The extended memory option consists of ID# from 1 to 500000.
- **Grid file:** Consists of ID# as COLUMN and ROW. The COLUMN is single or double digit capital alpha character from A to Z and AA to ZZ. The ROW is a four digit numbers based on the 5000 / COLUMN.

For example, when you create a new GRID file with END COLUMN = C, then the maximum ROW you can slew up to is limited to 1666 calculated by the instrument as follows:

- The total storage space per file is 5000 reading.

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- For Columns ending at C means 3 columns are required and the maximum Row allowed is limited to  $5000 / 3 = 1666$ .

If you create a new GRID file with END COLUMN = Z, then the maximum ROW you can slew up to is limited to  $5000/26 = 192$ .

If you create a new GRID file with END COLUMN = AF, then the maximum ROW you can slew up to is limited to  $5000/(26 \text{ for A to Z} + 6 \text{ for AA to AF}) = 156$  the grids are created as shown below:

```
A,1 to A,156 then
B,1 to B,156 then
:
Z,1 to Z,156 then
AA,1 to AA,156 then
AB,1 to AB,156 then
:
AF,1 to AF,156
```

If a new GRID file with END COLUMN = ZZ, then the maximum ROW you can slew up to is limited to  $5000/(26 \text{ for A to Z} + 26*26 \text{ for AA to ZZ}) = 7$ .

```
A,1 to A,7 then
B,1 to B,7 then
:
Z,1 to Z,7 then
AA,1 to AA,7 then
AB,1 to AB,7 then
:
AZ,1 to AZ,7 then
BA,1 to BA,7 then
BB,1 to BB,7 then
:
:
ZZ,1 to ZZ,7
```

**Note:** There are a few different types of Grid file: 2D, 3D and boiler. The above two examples show how the ID locations are incremented in ROWINC type file only. Here the Row value is incremented first, while updating ID location, whereas, in a COLINC type file, Column value is incremented first.

So for a COLINC file with END COLUMN value AF, the ID locations will increment as follows:

```
A,1 to AF,1 then
A,2 to AF,2 then
.
.
A,156 to AF,156
```

A COLINC file with END COLUMN value ZZ will have ID increments as follows:

A,1 to ZZ,1 then

A,2 to ZZ,2 then

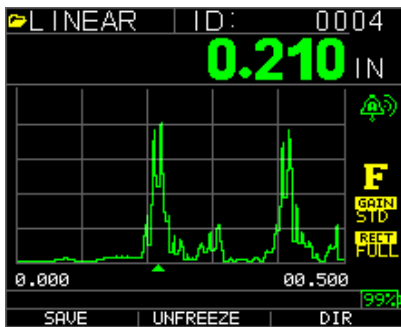
.

A,7 to ZZ,7

### Creating a new File

To create a custom file in the datalogger, follow these steps:

1. Press **[F3] (Dir)** from the **Measurement** mode screen.



The following screen appears:

NAME	TYPE	SIZE	SV	%
LINEAR	LN	5000	T	00
TWOD	2D	4900	T	00
BOILER	BO	3120	T	00
TTTT	BO	36	A	F
EMPTY02				
EMPTY03				
EMPTY04				
EMPTY05				
EMPTY06				
EMPTY07				
EMPTY08				

At the bottom of the screen, there is a 'BACK' button and a battery level indicator showing '99%'.

2. Use the up and down arrow keys to highlight the next **Empty** file in the list.

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NAME	TYPE	SIZE	SV	%
LINEAR	LN	5000	T	00
TWOD	2D	4900	T	00
BOILER	BO	3120	T	00
TTTT	BO	36	A	F
EMPTY02				
EMPTY03				
EMPTY04				
EMPTY05				
EMPTY06				
EMPTY07				
EMPTY08				

99%

BACK

3. Press the **OK** key and the following screen appears:

TEST _									
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	
U	V	W	X	Y	Z	-	,	+	

EXIT DEL DONE

4. Use the up, down, left, and right arrow keys to select the characters of the filename. Press the **OK** key to accept the selected characters. If you make an error, press **[F2] (Del)** to delete the last character of the entered filename.
5. Press **[F3] (Done)** when you are finished entering the filename. The following screen appears:

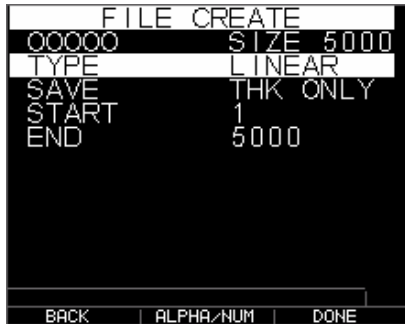
FILE CREATE	
00000	SIZE 5000
TYPE	LINEAR
SAVE	THK ONLY
START	1
END	5000

BACK ALPHA/NUM DONE

6. Use the left and right arrow keys to select a file type: LINEAR, ROWINC or COLINC. See the next two sections for more information on selecting file type for the new file.

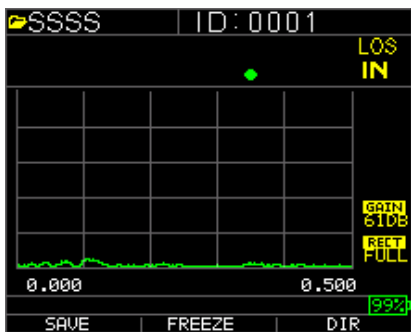
### Selecting a Custom Linear File

When you select a LINEAR file format the following screen appears displaying the maximum reading you can store in the LINEAR file.



With the extended memory, you can store up to 100,000 readings allowing you more total files.

Pressing the **F3 (Done)** key again will take you to the **Measure** mode displaying the new filename in the top left corner and the next ID location in the top right corner.



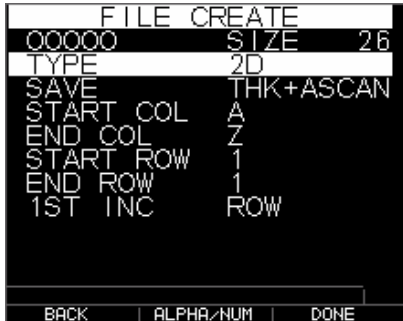
### Selecting a Custom Grid File

When you select 2D file type, the display changes as shown below.

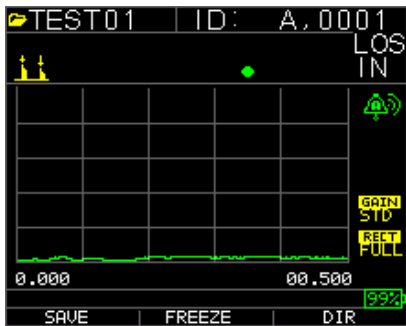
Select if you want to save THK only or THK + Ascan by highlighting SAVE and using left or right arrows.

Use the up and down arrow keys to highlight the Start Column . Now press left or right arrow key to change the value Note: the F2 key will toggle between alpha and numbers so if you want to change A to 1, press F2. Then press down arrow key to select END COL option. Press left or right arrow key to change the END COL value. Since the file size is limited to 5000, the END COL value is limited to 5000/END ROW. Note that the 'FILE SIZE' will change depending on the END ROW and END COL settings. You can select the number of rows and columns for your new file and if you want to first increment by row or column. In other words, what direction of your grid do you want to advance first (up or over).

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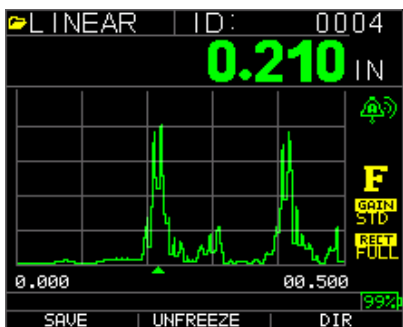
When you are finished selecting END ROW and END COL values, press F3 (Done). The display will go back to Measurement mode, showing the new filename and next ID location in the top row as shown below.



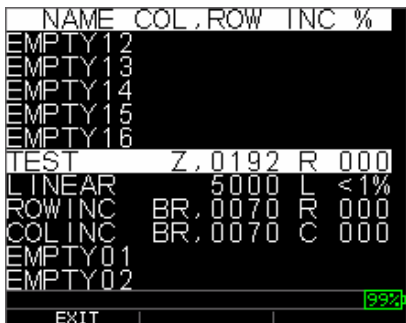
### Reviewing a File

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

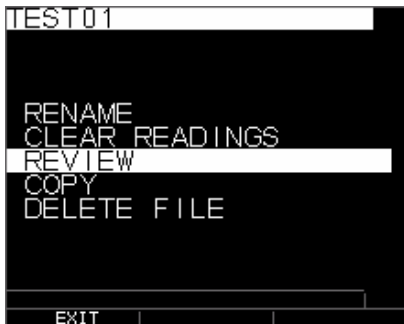
1. Press **[F3] (Dir)** from the **Measurement** mode screen.



The following screen appears:



2. Select the file you would like to review using the up and down arrow keys and press the **OK** key. Based on the type of file you select, one of the following screens will appear:



Factory default file Row Incremental (**Rename** and **Delete** options are not available)

The three factory default files have only 3 options: Clear File, Review and Copy. Custom files have 5 options: Rename, Clear File, Review, Copy, and Delete. Select the **Review** option and press the **OK** key to review the file.

#### *Reviewing a Linear File*

The linear file shows the ID# and the stored readings along with the units. You can browse the readings by pressing the up or down arrow key. You can also press **F3 (Beg/End)** to go to the beginning or end of the file. The left side is the i.d., the stored thickness reading, and units.

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TEST		
A,0011	0.498	IN
A,0012	0.498	IN
A,0013	0.498	IN
A,0014	0.496	IN
A,0015	0.498	IN
A,0016		
A,0017		
A,0018		
A,0019		
A,0020		
A,0021		

EXIT CLEAR BEG 99%

To clear a reading from the file, select the reading to be cleared by pressing up or down arrow key and then press **F2 (Clear)**. Note that once a reading is cleared, it cannot be restored. To store another reading in the file location that has been emptied by the **Clear** operation, highlight that location by pressing up or down arrow key. Then press **OK** to go to the measure mode. When you have the new reading to be stored in the emptied file location, press **F1 (Save)**. The new reading will be saved in that location and the display will show the next empty file location in the top right corner.

#### Reviewing a Grid File

The grid file shows the ID# as COL, ROW and the stored reading with the units.

TEST		
A,0011	0.498	IN
A,0012	0.498	IN
A,0013	0.498	IN
A,0014	0.496	IN
A,0015	0.498	IN
A,0016		
A,0017		
A,0018		
A,0019		
A,0020		
A,0021		

EXIT CLEAR BEG 99%

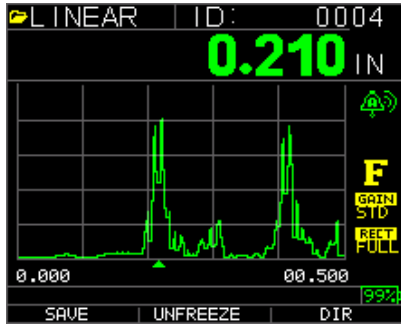
F2 and F3 function keys operate in the same way as discussed in *Reviewing a Linear File* section.

#### Renaming a File

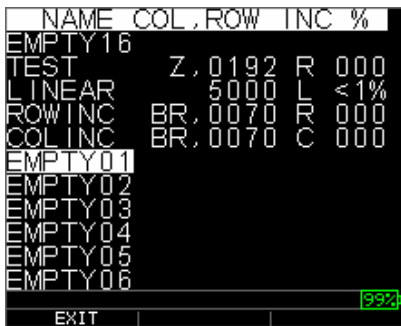
To rename a file from the **Measurement** mode screen in datalogger version only, follow these steps:

1. Press **[F3] (Dir)** for the **Directory** mode.





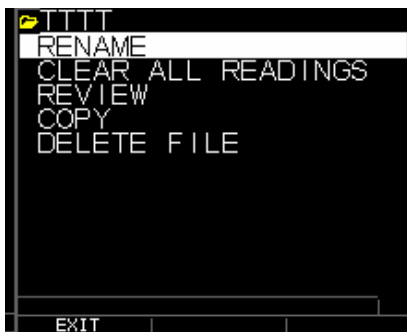
The following screen appears:



- Use the up and down arrow keys to select the file you would like to rename and press the **OK** key.

**Note:** The Rename option is not available for the first three factory default files.

The following screen appears:



- Use the up and down arrow keys to select the **Rename** option and press the **OK** key to rename the file.

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4. Use the up, down, left, and right arrow keys to select the characters of the filename. Press the **OK** key to accept the selected characters. If you make an error, press **[F2] (Del)** to delete the last character of the entered filename.
5. Press **[F3] (Done)** when you are finished entering the filename. The old filename will be updated with the new filename in the directory as shown in the example below.

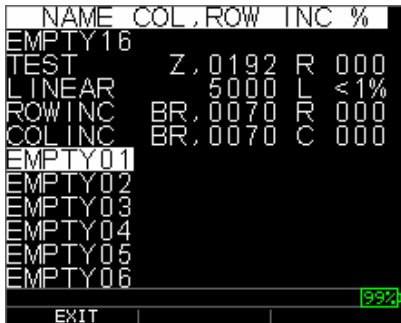
**Note:** Press **[F1] (Exit)** to exit the screen without renaming the file.

Example:

A user erases a file named ABCD by pressing **[F2] (Del)** and selects XYZ as the new filename and presses **[F3] (Done)** to accept the entered new filename.

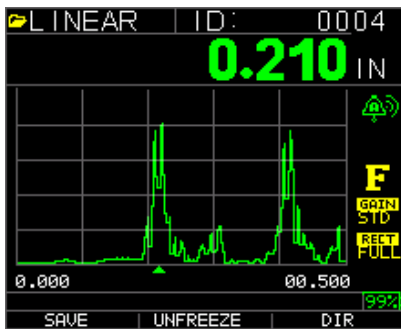


The old filename in the directory is updated with the new filename as shown.

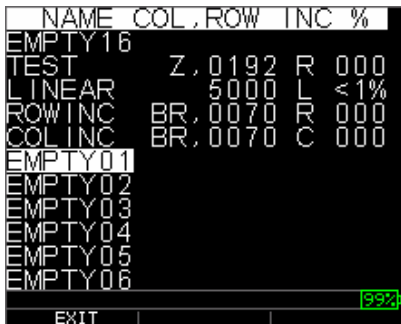


### Clearing all readings within a File

To clear (or delete) a single thickness reading at a time from a file, see *Reviewing a File* section. To clear all the readings from a file but keep the file structure with id still available, use the clear all readings. To do this, from measurement mode, press **[F3] (Dir)** for the **Directory** mode.

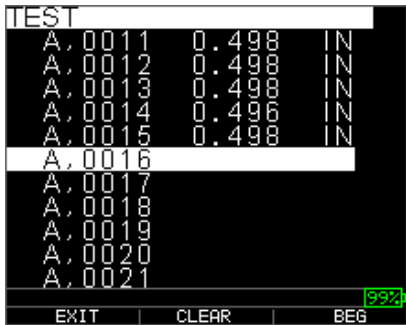


The following screen appears:

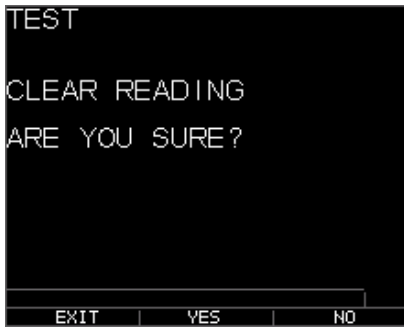


1. Use the up and down arrow keys to select the file you want to clear and press the **OK** key. The following screen appears:

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2. Use the up and down arrow keys to select the **Clear File** option and press the **OK** key to clear all the stored thickness readings in that file. The following confirmation prompt appears:



Press **[F1] (Exit)** to exit without clearing the thickness readings.

Press **[F2] (Yes)** to clear the stored thickness from the entire file.

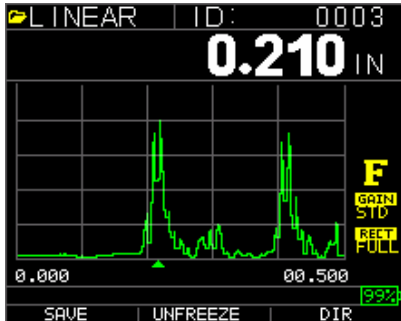
Press **[F3] (No)** to exit without clearing the thickness readings.

If the file is already clear, the unit will show 'NO READINGS TO CLEAR.' message.

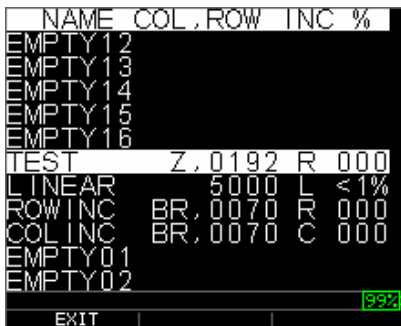
### Copying a File

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

1. Press **[F3] (Dir)** for the **Directory** mode.

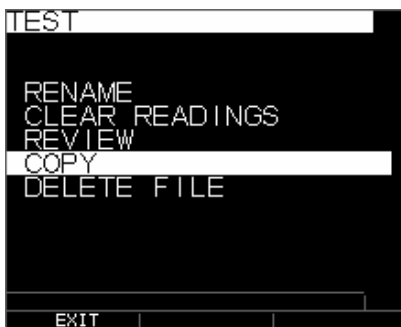


The following screen appears:



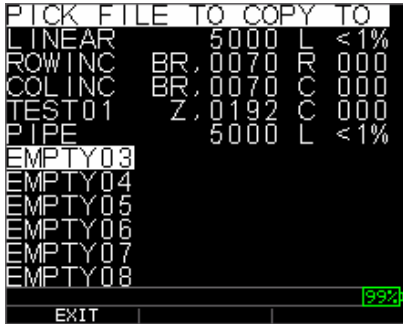
- Use the up and down arrow keys to select a file and press the **OK** key. Any file structure (factory default or custom) can be copied.

**Note:** When you copy a file only the structure of the file ID# is copied and not the associated file readings.



- Use the up and down arrow keys to select the **Copy** option and press the **OK** key. The following confirmation prompt appears with the next Empty file highlighted as the default choice.

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Press up or down to select an Empty file and press **OK** to assign it a new filename. The following screen appears.

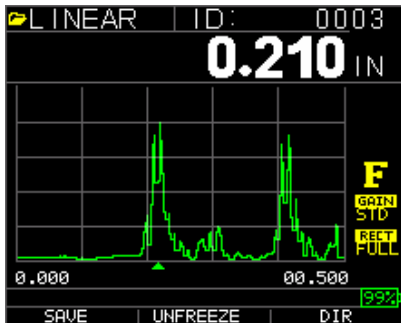


4. Use the up, down, left, right arrow keys to select the characters of the filename and press the **OK** key to accept the selected characters. If you make an error, press **[F2] (Del)** to erase last character before the cursor.
5. Press **[F1] (Exit)** to exit without copying the file.
6. Press **[F3] (Done)** when you are finished entering the filename. A new file with the selected name will be added in the directory with the file structure of the original file **ABCD**.

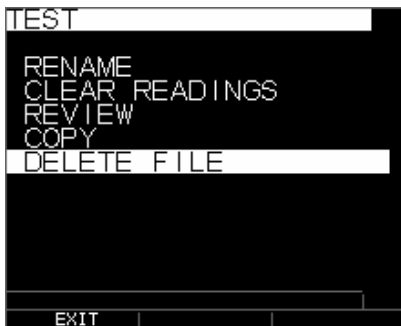
### Deleting a File

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

1. Press **[F3] (Dir)** for the **Directory** mode.

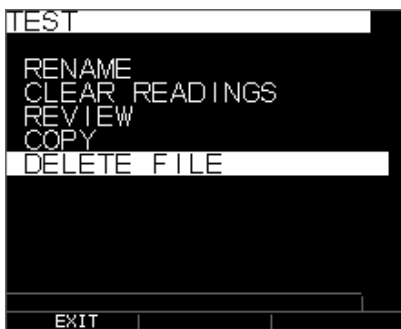


The following screen appears:



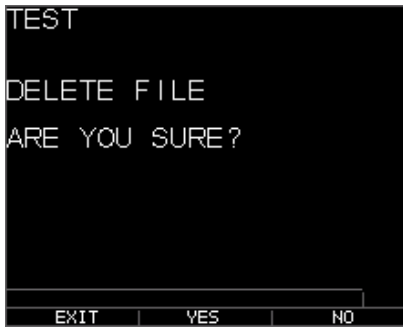
2. Use the up and down arrow keys to select the file to be deleted and press the **OK** key.

**Note:** Only custom files can be deleted. The factory default files cannot be deleted.



3. Use the up and down arrow keys to select the **Delete** option and press the **OK** key. The following confirmation prompt appears:

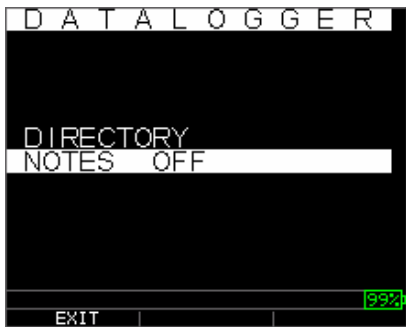
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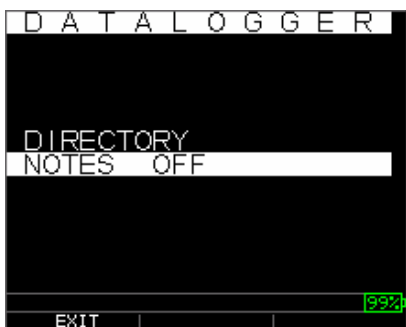
Press **[F1] (Exit)** to exit the screen without deleting the file.

Press **[F3] (No)** to exit the screen without deleting the file.

4. Press **[F2] (Yes)** to delete the file and remove the file from the directory.
5. If the **Notes** option is set to **On** from the datalogger screen, then the thickness reading is stored at the ID location [Linear], [Row], [Col] with notes. To change the Notes settings, select the Notes option from the *Datalogger* screen.



Now when you press **Save** to store a reading in measurement mode, the following *Notes* screen will appear.





6. Use the up and down arrow keys to select a note for the reading and press the **OK** key. The selected note will be stored at the ID location, and based on the file type, [Linear], [Row], or [Col] is incremented. (See: Directory selection for file type details.) When save is pressed with notes on, the gage will display the following pick list and save a note with the i.d. currently on the screen. After downloading the file to data xl interface program, the note will appear with a particular set up number at the end of a file.



The following notes are available:

0. NO COMMENTS
1. RUST
2. PITTING
3. TOO HOT
4. BROKEN INSULATION
5. POOR/NO ACCESS
6. NEEDS PAINTING
7. BROKEN/MISSED PLUG

### Waveform Adjustments

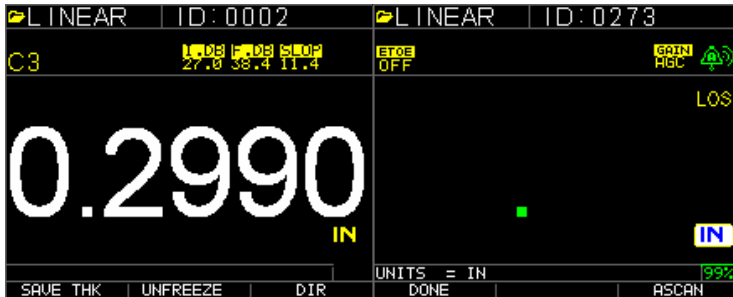
To adjust any of the above settings, from the main measurement screen, simply use the left, right, up or down arrow until the desired parameter is highlighted. In other words the arrow keys will act as a mouse or cursor to highlight the desired parameter. As an example, use the right arrow until Rectify is highlighted, then press Menu/OK to adjust the rectification mode by again using the right or left key to except, press F1=exit. You can follow the same procedure for Gain, Blanking and Range.

The UPG-07CW and UPG-07DLCW have a live Color Waveform with Adjustments. Only operators familiar with detailed Ultrasonic knowledge and training should adjust waveform related function, see liability statement in the beginning of this manual. Waveform adjustments are used in applications and industries requiring such. For example, echo to echo is very helpful when using echo to echo and RF. Below are examples of echo to echo with blanking and RF.

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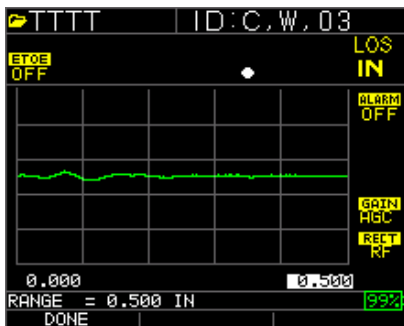
Caution, % of high or low detected

F3 will toggle between Thickness and ASCAN



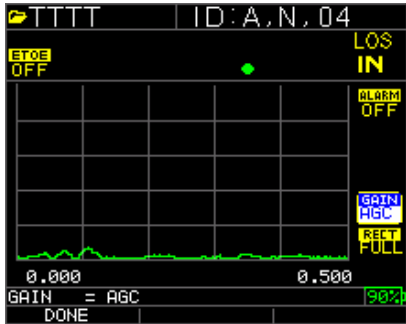
F3 will bring you back to A-Scan mode once the large thickness is displayed

Range-pre-set or Auto Zoom tracking to center echoes in the middle of the screen independent of test range thus allowing the operator not to fuss with the range control. Fixed ranges are Zoom, .5, 1, 2, 5, 10 and 20 inches or 12.7, 25.4, 125, 254 and 500 mm. To select the Auto Zoom tracking, use the left or right arrow key until range (bottom right is highlighted) and then the up and down arrow keys to select the desired range. You can also enable zoom from the Menu OK key, choose **Measurement**, range and adjust to zoom.

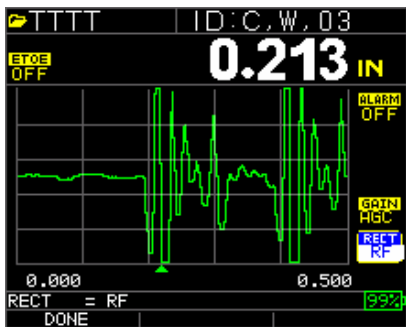


**Note:** if you are measuring a 2 inch part with a 1" range, no echoes will be visible. Please adjust range accordingly. The Wave is defaulted to a 2 inch range as a factory setting.

Gain-Manual or Automatic, Gain can be adjusted automatically where the gage will set the optimum range or manually, where the operator changes the range in 1dB steps. To select Auto, use the left or right arrow keys and highlight gain on the bottom right side of the display, use the up and down arrows to select Manual for desired setting or F2 for AGC. The Wave is defaulted to Auto gain where Automatic Gain Control (AGC) is on.



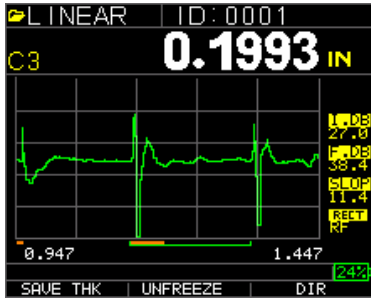
Rectify-RF, Full Wave, Half+ and Half – Use the left or right arrow keys to highlight RECT. for rectify the up or down arrows to select between RF, Full Wave, Half Wave + or Half Wave -. The default setting is Full Wave Rectified.



### Blanking

To adjust for main bang blank or blank after first received echo. From the live A-Scan mode, use the left or right arrow keys until you highlight over the desired blanking. There are 3 possible blankings: Main Bang Blanking, Interface Blanking and C3 Blanking.

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The above example is for C3 using IF blank to the far left in red. This will increase the dead zone after the interface echo (echo from the end of the delay line or water to material surface in immersion). The second red line is the C3 blanking which increases the dead zone after the first detected echo for C3 measurements. Please note, no echoes or readings can be detected in the red dead zones. green line represents the measured time interval between the two correct echoes.

To adjust any of the above settings, from the main A-Scan, simply use the left, right, up or down arrow until the desired parameter is highlighted. In other words the arrow keys will act as a mouse or cursor to highlight the desired parameter. As an example, use the right arrow until I.F. Blank is highlighted, then press the up or down arrows to increase or decrease the blanking accordingly.

## 8 Technical Specifications

Specifications for the UPG-07C/UPG-07CW/ECH-DLCW Ultrasonic Thickness Gage with Live Color Waveform

**Size:** 5" (127 mm) (L) x 3" (76.2 mm) (W) x 1.25" (31.75 mm) (H)

**Weight:** 8 OZ (.23 kg)

**Thickness range:** 0.008 - 20 inches (0.20 mm - 508 mm), depending on material, temperature and transducer selection

**Material velocity calibration range:** 0.200-0.7362 in/ $\mu$ S (0.508-18.699 mm/ $\mu$ S)

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

Surface temperature of material: Depending on probe used, from -5° F to 1000° F (-20° C to 537° C)

**Battery life:** Up to 40 hours (15 hours with backlight on)

**Battery type:** 2 "AA" Alkaline

**Display:** 220 X 170 Graphics Color TFT with Live Color Waveform

**Information displays:** LOS, min, max, large reading while displaying min at the same time, velocity, zero, calibration, units, freeze, unfreeze, % battery life remaining, gain - low, std, high, echo-to-echo symbol

**Resolution:** 0.0001" (0.001 mm), 0.001" (0.01mm)

**Probe recognition:** Via pick list from a menu

**Delay line zero measurement:** Auto at power up with listed numeric value. Ideal for correcting delay line wear/curvature and for transducer acoustic drift at elevated temperatures

**Package:** Custom, splash-proof, high-impact plastic with rubber, illuminating keypad for go/no-go testing

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

**Units:** English/Metric/Microseconds

**WaveForm:** Live Color Waveform with Dynamic color change on alarm, large thickness reading, super-impose thickness over top right of A-Scan.

**Rectify:** RF, Full Wave, Half Wave+, Half Wave -

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

**Gain:** Auto or Manual in 1 dB steps for varying test conditions

**Classes:** C1 (Main bang to first backwall), C2 (interface to first backwall), C3, echo to echo after first interface echo.

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**B-Scan:** Cross sectional representation of test piece

**Measurement rate:** 4/sec and 20/sec in fast mode

**Differential Mode:** Displays the difference from the actual thickness measurement and a user entered reference value

**Alarms:** Minimum/Maximum depth, vibralarm (vibration on alarm-patent pending), beeps and display flashes as well as keypad illumination and dynamic waveform color change

**Illuminating keypad:** F1 = Red, F2 = Yellow and F3 = Green for easy, go/no-go testing (Patent Pending)

**Automatic probe wear indicator** ( Transducer attendant): Automatically informs the operator to replace the transducer (Patent Pending)

**Ergonomics:** User selectable lefty or righty display changes via keypad (Patent Pending)

**Backlight:** Light Emitting Diode, On/Off or Auto On based on valid readings or last key press

**Shut off:** Auto, time out (after 1-31 minutes user programmable after no reading, loss or no key press or “never”)

**Scan mode:** Simultaneously Displays minimum or maximum thickness value at 20 measurements per second (ideal for high temperature thickness reading and tracking the minimum depth alarm). Press Freeze to capture last valid minimum thickness readings prior to Loss of Signal (LOS), without reading the couplant upon lifting probe off the test piece

**Carrying case:** Custom molded pouch with wrist strap for either left-handed or right-handed operators.

**Shipping case:** Hard plastic with high-density molded cut out for all accessories

**Freeze mode:** Freezes display (ideal for high temp. measurements)

**Hold mode:** Holds display to retain last thickness reading in reverse video display

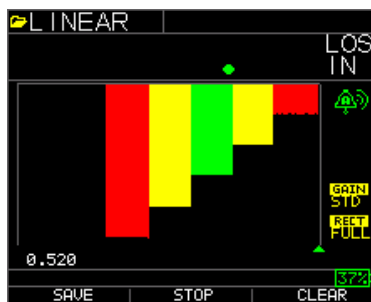
**Standard UPG-07 Wave series includes:** Ultrasonic thickness gage, DK-537potted, 5 MHz 0.375 inch diameter, operational manual, USB cable, couplant, protective pouch, transport case, data XL interface program. (Pouch not included with UPG-07C)

**Warranty:** Limited 2 year warranty on parts and labor

**MADE IN USA**

## 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 UPG-07 series press MENU/OK, go to **Measurement**, find B-scan and press MENU/OK. 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 F2 [START]. If you uncouple the transducer, B-Scan will stop due to LOS. If you press F2 [STOP] 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 F1 [SAVE]. The amount of saved readings up to the file size of 5,000 readings or what was pre-determined in the current file (See Datalogging) set up. Here is a picture of the B-Scan on a test block.



### 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 F2 start and F1 Save. You can now press menu OK, scroll to Datalogger, choose the B-Scan file to review, Menu OK, Review, Menu OK, scroll over where an id and reading are present and press Menu OK, 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.

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## **10 Technical Assistance**

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