EVIDENT

72DL Plus Software

User Interface Guide

Software Version 1.2

10-014358-01EN — Rev. 2
October 2023

This instruction manual contains essential information on how to use this product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

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This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

Software version 1.2
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Important Information — Please Read Before Use

Instruction Manual

This instruction manual contains essential information on how to use this Evident product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

IMPORTANT

Some of the details of software images in this manual may differ from your software display. However, the principles remain the same.

Note Signal Words

The following note signal words could appear in the documentation of the software:

IMPORTANT

The IMPORTANT signal word calls attention to a note that provides information that is important or essential to the completion of a task.

NOTE

The NOTE signal word calls attention to an operating procedure, practice, or the like, that requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The TIP signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or that provides hints on how to effectively use the capabilities of the product.

Introduction

This manual contains instructions for software upgrade, configuration, calibration, inspection, and analysis.

The manual is divided into task-oriented sections that logically follow the required work flow to configure and use the software on the 72DL Plus.

The following sections give you detailed instructions to get the software for the 72DL Plus configured and the device ready for inspections.

About the Options

Choose between the standard frequency and high frequency models based on the application.

Standard Frequency

The standard frequency model supports single element transducer frequency between 0.2 and 30 MHz to provide reliable thickness measurements at high speed of up to 2KHz and a display update rate of 60 Hz. The 72DL PLUS allows you to perform calibration, gain, and blank controls on frozen waveforms.

NOTE

The standard frequency model can be upgraded to a high-frequency model, but the upgrade requires a hardware installation. The upgrade can be performed only at an authorized Evident repair facility.

High Frequency

The high frequency model supports all the features of the standard frequency model, but also supports high frequency transducers up to 125 MHz to measure very thin material. Users can select either the standard frequency range (0.5-26 MHz) or high-frequency range (20-125 MHz), whichever is required at the time, with the high-frequency model.

Multilayer Measurement Software

The multilayer measurement software, available in both standard and high frequency models, simultaneously measures and displays thickness of up to 6 layers.

1. Setting Up the Gauge

This chapter describes how to configure the software for the gauge.

1.1 Configuring Device Date, Time, and Units

The initial configuration of the 72DL Plus requires you to specify the date, time, and the units being used on the gauge. When you first power-up the 72DL Plus you will be presented with the My Applications screen (see Figure 1-1 on page 9). You configure the Date, Time, and Units values in the System Settings screen (See Figure 1-2 on page 10).

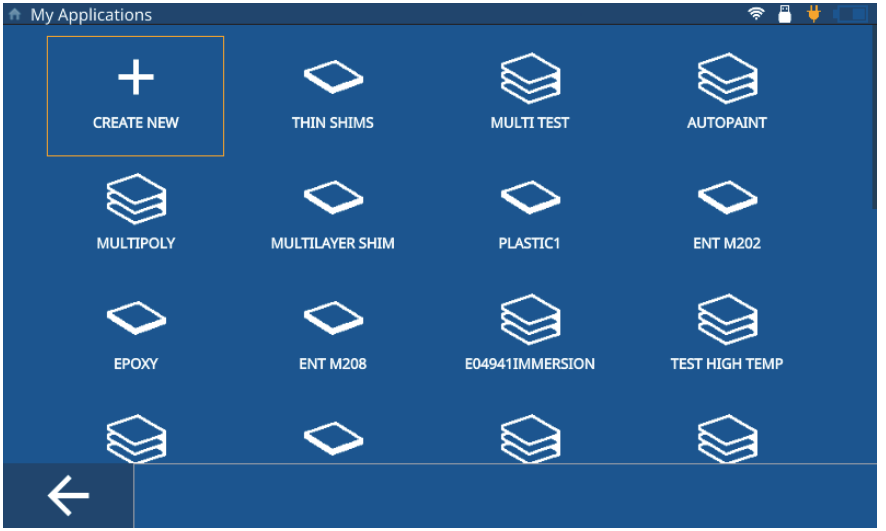

Figure 1-1 My Applications screen

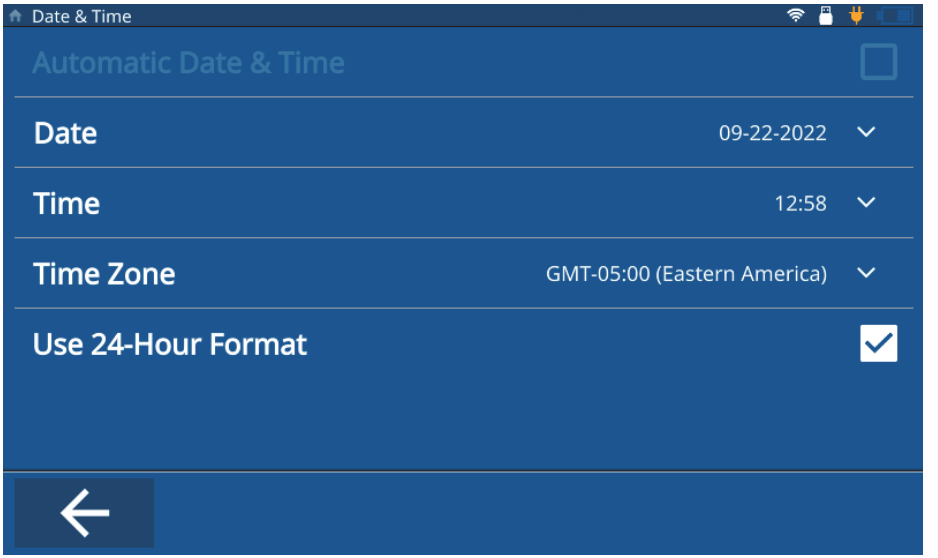

Figure 1-2 Date & Time screen

1.1.1 Configuring Device Date and Time

To configure the date and time on the gauge, complete the following steps:

1. Turn on the gauge.
2. Press the **Home** key. The gauge loads the Inspection screen recalling the previous application, or **Untitled** if no applications have been defined.
3. Tap the main menu icon in the top-left of the screen and select **Settings**.
4. Tap the **System** tab in the left navigation menu and select **Date & Time**.
5. Tap **Date** and enter the current date, then tap **OK**.
6. Tap **Time** and enter the current time, then tap **OK**.
7. Tap **Time Zone** and select the current time zone from the pop-up window.
8. Check or clear the **Use 24-Hour Format** check-box to toggle between 12-hour and 24-hour formats.
9. Press the **Home** key to exit the **Date & Time** configuration screen.

1.1.2 Configuring Device Units

To configure the units on the gauge, complete the following steps:

1. Turn on the gauge.
2. Press the **Home** key. The gauge loads the Inspection screen recalling the previous application, or **Untitled** if no applications have been defined.
3. Tap the main menu icon in the top-left of the screen and select **Settings**.
4. Tap the **Meas** tab in the left navigation menu and select **Measurement**.
5. Tap **Unit Type** and select the desired units from the pop-up window.
6. Press the **Home** key to exit the **Measurement Settings** screen.

1.2 Configuring Language

To configure the language on the gauge, complete the following steps:

1. Turn on the gauge.
2. Press the **Home** key. The gauge loads the Inspection screen recalling the previous application, or **Untitled** if no applications have been defined.
3. Tap the main menu icon in the top-left of the screen and select **Settings**.
4. Tap the **Systems** tab in the left navigation menu and select **User Preferences**.
5. Tap **Language** and select the desired language from the drop-down list.

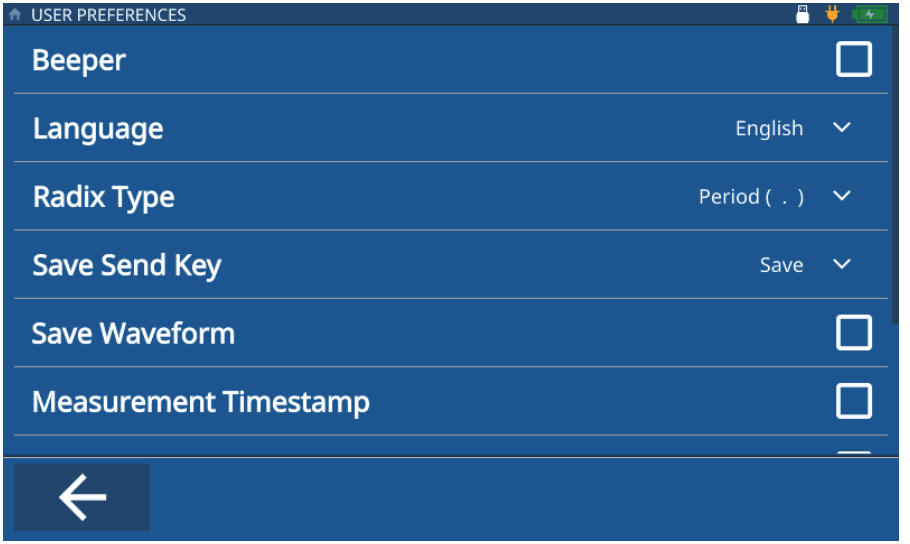

Figure 1-3 User Preferences screen

6. Press the **Home** key to exit the **User Preferences** screen.

NOTE

In the **Systems** tab, you can also configure the values for **Display Settings**, **Communication Settings**, and other **User Preferences** (**Radix Type**, **Save Send Key Function**, **Measurement Timestamp**, **ID Overwrite Protection**, etc.).

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2. Creating an Application

An application file is a pre-defined setup for the 72DL Plus that you create to quickly access and perform an inspection (see Figure 2-1 on page 13). When the device is powered on, it displays the **My Applications** page and all user-created applications.

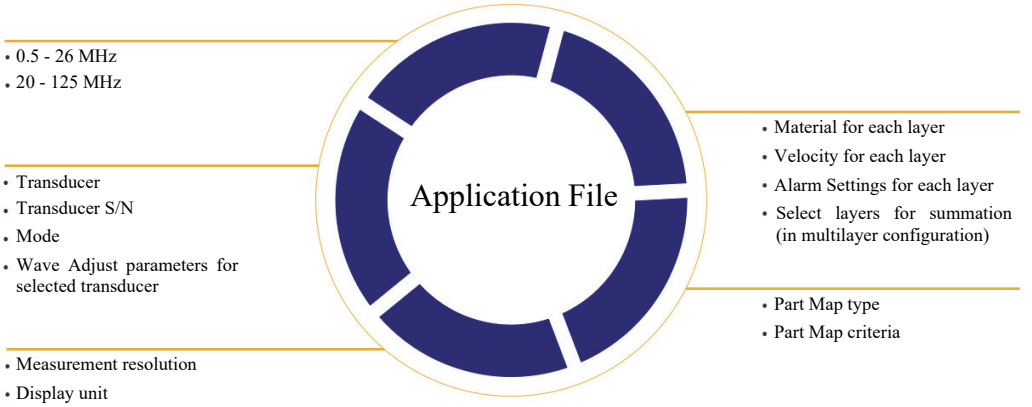

Figure 2-1 Application File Definition

2.1 Creating Single Layer Applications

Single Layer applications are the most basic applications to create for the device. To create a new Single Layer application, complete the following steps:

1. From the **My Applications** screen, click the **Create New** tile to enter the **New Application** workflow (See Figure 2-2 on page 14).

TIP

If the **My Applications** screen is not being displayed, tap the main menu icon and select **My Application**.

2. Enter a name (required) for your application in the **Name** field.
3. Enter a description for your application in the **Description** field (optional). This is not a mandatory field, and can be bypassed and updated later if desired.

Figure 2-2 New Application Workflow

4. Click the forward arrow to access the next screen.
5. Select a frequency range from the drop-down list. Select from 0.5-26 MHz for standard frequency applications, or 20-125 MHz for high frequency transducers and applications. Some pre-built configurations are displayed based on the frequency range selected.

6. Select the **Single Layer Thickness** tile. The gauge loads the configuration for the Single Layer Thickness configuration. The configuration consists of three tabs: **Transducer Select**, **Material**, and **Unit/Resolution**.
7. Select your transducer from the drop-down list. The default transducer for standard frequency is M112, and the default is M2104 for high frequency.
8. Click the **Material** tab (See Figure 2-3 on page 15), and then select your material from the drop-down list. The gauge automatically updates the velocity based on the material selected.

Figure 2-3 Single Layer Material Tab

9. Use the **Alarm** drop-down list to configure an alarm (**Off**, **High**, **Low**, or **Both Alarms**). This is optional, and the default is Off. For states other than Off you may enter a thickness value as an alarm threshold.
10. Click the **Unit/Resolution** tab (See Figure 2-4 on page 16).

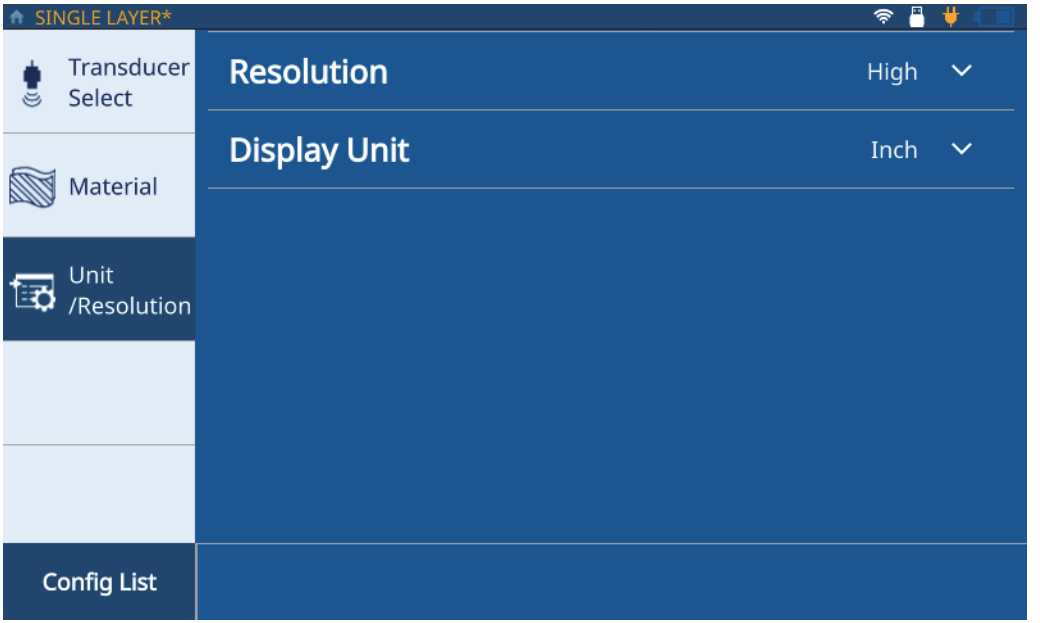

Figure 2-4 Unit/Resolution Tab

11. Select the **Resolution** from the drop-down list (**Low**, **Standard**, or **High**).
12. Select the **Display Unit** from the drop-down list.
13. Press the **Home** button. The gauge saves the new application to the **My Applications** screen with an icon representing the selected configuration of the new application.

2.2 Creating Multilayer Applications

Multilayer applications allow you to measure up to 6 different layers in a material. To create a new Multilayer application, complete the following steps:

1. From the **My Applications** screen, click the **Create New** tile to enter the **New Application** workflow (See Figure 2-2 on page 14).

TIP

If the **My Applications** screen is not being displayed, tap the main menu icon and select **My Application**.

2. Enter a name for your application in the **Name** field.
3. Enter a description for your application in the **Description** field. This is not a mandatory field, and can be bypassed and updated later if desired.
4. Click the forward arrow to access the next screen.
5. Select a frequency range from the drop-down list. Some pre-built configurations are displayed based on the frequency range selected.
6. Select the **Multilayer Thickness** tile. The gauge loads the configuration for the Multilayer Thickness configuration. The configuration consists of three tabs: **Transducer Select**, **Material**, and **Unit/Resolution**.
7. Select your transducer from the drop-down list. The default transducer for standard frequency is M112, and the default is M2104 for high frequency.
8. Click the **Material** tab (See Figure 2-5 on page 18 where L1 represents the first layer), and then select your material from the drop-down list. The gauge automatically updates the velocity based on the material.

Figure 2-5 Multilayer Material Tab

9. Enter the maximum thickness for the first layer in the **Max Thickness** field.
10. Use the **Alarm** drop-down list to configure an alarm (**Off**, **High**, **Low**, or **Both Alarms**) for layer 1. This is optional, and the default is Off. For states other than Off you may enter a thickness value as an alarm threshold.
11. Check the **Include Layer for Summation** check-box to add the layer thickness to the total thickness calculation.
12. To add another layer, click the plus (**+**) sign button. The gauge adds a new layer, represented by a new numbered tile at the base of the screen, and populates it with the values from the previous layer.

NOTE

To delete a layer, click the minus (**-**) sign button.

13. Edit the pre-populated values as required.

14. Repeat steps 12 and 13 until all layers (up to a maximum of 6 layers) have been defined, then click the **Unit/Resolution** tab (See Figure 2-4 on page 16).
15. Select the **Resolution** from the drop-down list (**Low**, **Standard**, or **High**).
16. Select the **Display Unit** from the drop-down list.
17. Apply the differential thickness or ratio to a layer, if required.

NOTE

Differential thickness or ratio can only be applied to one layer.

18. Configure the summation of total thickness of layers by selecting the desired layers from the **Summation** drop-down list.
19. Click **OK**.
20. Press the **Home** button. The gauge saves the new application to the **My Applications** screen with an icon representing the selected configuration of the new application.

On the **Inspection** screen, the gauge displays individual layer thickness as well as the summation value at the bottom of the screen.

2.3 Creating Reduction Rate Applications

Reduction Rate applications show the actual thickness as well as the percent difference between the actual thickness and the former value. The former value is the thickness of the metal prior to the bending process. Use this mode for metal bending or other applications in which you need to track the percentage of wall thinning. You can also configure alarms to identify deviations from the former thickness.

NOTE

Reduction rate is only available for standard frequency inspections.

To create a new Reduction Rate application, complete the following steps:

1. From the **My Applications** screen, click the **Create New** tile to enter the **New Application** workflow (See Figure 2-2 on page 14).

TIP

If the **My Applications** screen is not being displayed, tap the main menu icon and select **My Application**.

2. Enter a name for your application in the **Name** field.
3. Enter a description for your application in the **Description** field. This is not a mandatory field, and can be bypassed and updated later if desired.
4. Click the forward arrow to access the next screen.
5. Select the **.5 - 26 MHz** frequency range from the drop-down list for reduction rate configuration.
6. Select the **Reduction Rate** tile. The gauge loads the Reduction Rate configuration. The configuration consists of three tabs: **Transducer Select**, **Material**, and **Unit/Resolution**.
7. Select your transducer from the drop-down list. The default transducer for standard frequency is M112.
8. Click the **Material** tab (See Figure 2-6 on page 21), and then select your material from the drop-down list. The gauge automatically updates the velocity based on the material selected.

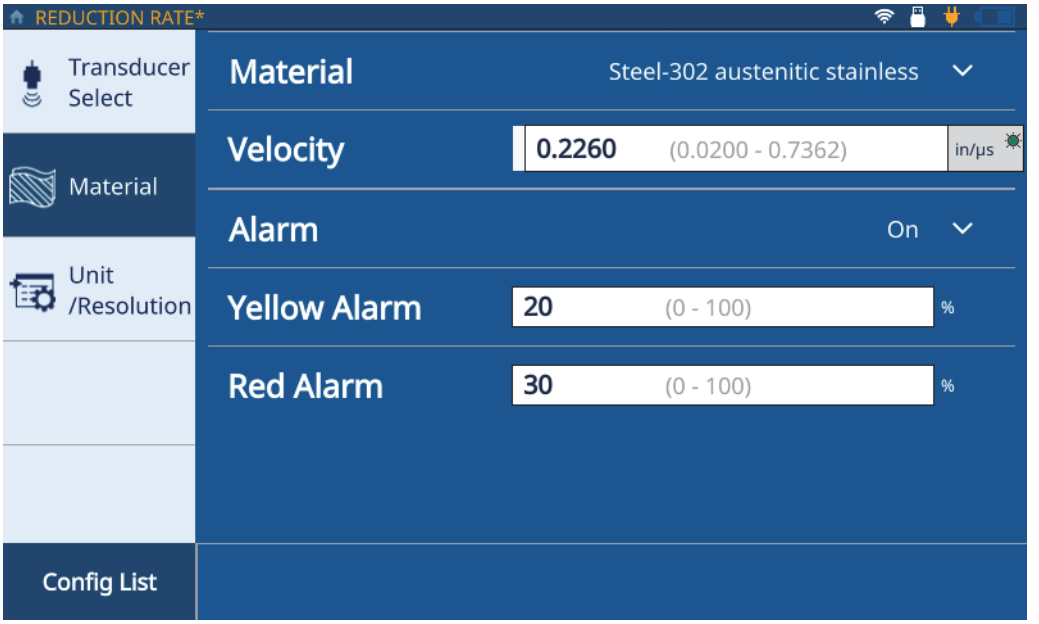

Figure 2-6 Reduction Rate Material Tab

9. Tap the **Alarm** icon to turn on the alarm function.
10. Enter the value for the **Yellow Alarm** in the associated field. The default value for the yellow alarm threshold is 20% differential from the former thickness.
11. Enter the value for the **Red Alarm** in the associated field. The default value for the red alarm threshold is 30% differential from the former thickness.

NOTE

For variances in thickness below the yellow alarm threshold, the alarm remains green.

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12. Click the **Unit/Resolution** tab (See Figure 2-4 on page 16).
13. Select the **Resolution** from the drop-down list (**Low**, **Standard**, or **High**).
14. Select the **Display Unit** from the drop-down list.

NOTE

Display Units are only available when using 15-20MHz transducers.

15. Review the **Former Thickness** value in the associated field. If the value needs updating, you must enter the value using the **Former Thickness** box in the waveform on the standard measurement screen.
16. Select the value to appear in **Large Font** in the inspection screen (**Thickness** or **Reduction Rate**). The secondary value will be displayed in a smaller font.
17. Press the **Home** button. The gauge saves the new application to the **My Applications** screen with an icon representing the selected configuration of the new application.

3. Setting Up a Part Map

A part map defines the type of file created by the 72DL Plus, and used for the storage of measurement data. Possible file types are incremental, sequential, and 2D Grid. A part map can also serve as a template, with thickness measurement locations, for the Inspection Data Files (IDFs) for a given part. When you select a file type for the part map, the gauge creates an IDF based on the file type and defined criteria.

NOTE

You can create an incremental, sequential, or 2D Grid part map on the device or the PC Interface Application.

You can convert an incremental, sequential or 2D Grid part to a template part on the PC Interface Application.

Once you select **Start a New Inspection** and the device creates an IDF, you cannot change the part map and criteria for the application.

3.1 Incremental File Type

The Incremental file type allows you to set a Start ID, and then increments each measurement taken with the gauge by 1 (see Figure 3-1 on page 24). The gauge makes an assumption for the value of the End ID based on the number of digits entered for the Start ID.

For example, if you enter the Start ID as 01, the gauge will assume the End ID must be 99, and will save all measurements taken up to 99.

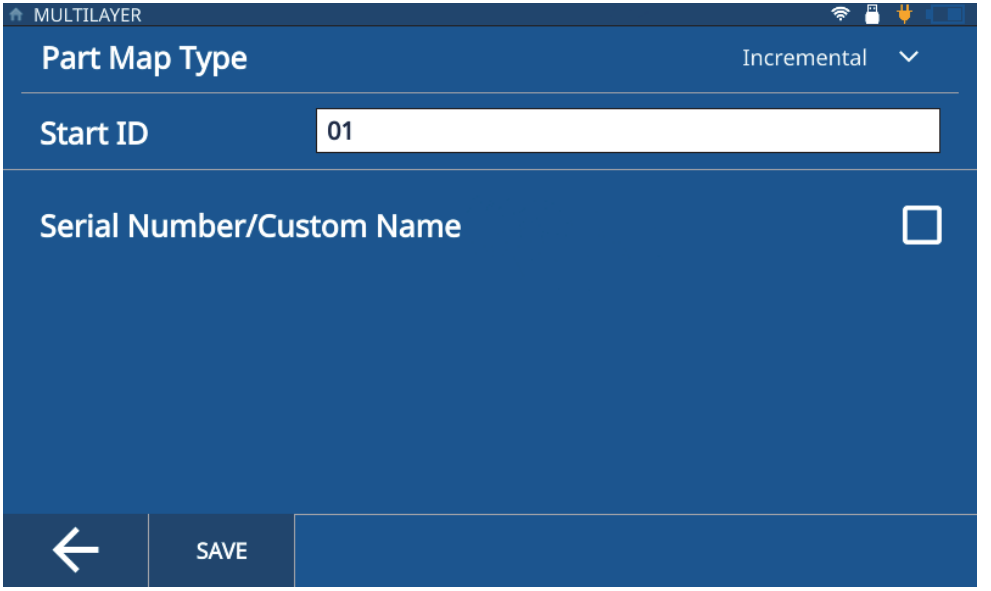

Figure 3-1 Incremental File Type

NOTE

The default part map type for applications created on the gauge is incremental with a **Start ID** = 01.

To select the Incremental part map for an application, complete the following steps:

1. From the **Home** screen, select **Setup** and then tap **My Applications** (see Figure 1-1 on page 9).
2. Tap the application of interest from the **My Applications** screen.
3. Tap **IDF** at the top of the inspection screen.
4. Select **Edit Part Map** from the drop-down menu.
5. Ensure **Incremental** is selected in the **Part Map Type** drop-down list.
6. Enter the **Start ID**.
7. Optional: Check the **Serial Number/Custom Name** check-box.

NOTE

Enabling the serial number/custom name option allows you to enter a serial number or unique ID for the part, which is displayed in the IDF field on the inspection screen. The gauge still generates an IDF, and you can view that from the **File Manager -> Application -> IDF List**.

8. Tap **Save**.

3.2 Sequential File Type

The Sequential file type allows you to define a **Start ID**, **End ID**, and **Increment Step** to use for each new ID (see Figure 3-2 on page 25). Each measurement taken with the gauge is assigned an ID within the bounds of the Start ID and End ID, and based on the defined Increment Step. Sequencing can be numeric or alphabetical, incrementing forward or backward, depending on the configuration of Start ID and End ID values.

For example, if the Start ID is 5, the End ID is 15, and the Increment Step is defined as 2, the gauge would assign IDs of 5, 7, 9, 11, 13, and 15 to the measurements taken.

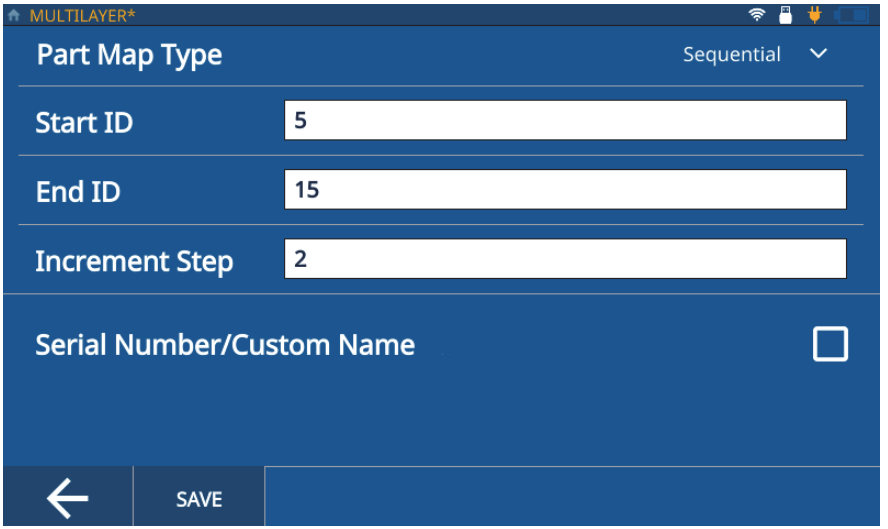

Figure 3-2 Sequential File Type

To select the Sequential part map file type for an application, complete the following steps:

1. From the **Home** screen, select **Setup** and then tap **My Applications** (see Figure 1-1 on page 9).
2. Tap the application of interest from the **My Applications** screen.
3. Tap **IDF** at the top of the inspection screen.
4. Select **Edit Part Map** from the drop-down menu.
5. Select **Sequential** from the **Part Map Type** drop-down list.
6. Enter the **Start ID**, **End ID**, and **Increment Step** values.
7. Optional: Check the **Serial Number/Custom Name** check-box.

NOTE

Enabling the serial number/custom name option allows you to enter a serial number or unique ID for the part, which is displayed in the IDF field on the inspection screen. The gauge still generates an IDF, and you can view that from the **File Manager -> Application -> IDF List**.

8. Tap **Save**.

3.3 2D Grid File Type

The 2D Grid file type allows you to define a grid of rows and columns that combine to provide an ID for each new measurement (see Figure 3-3 on page 27). When you define the grid, you also define the method of moving across the grid (by row or by column, with or without a zigzag). The increment is always one step through the grid in the direction and method defined.

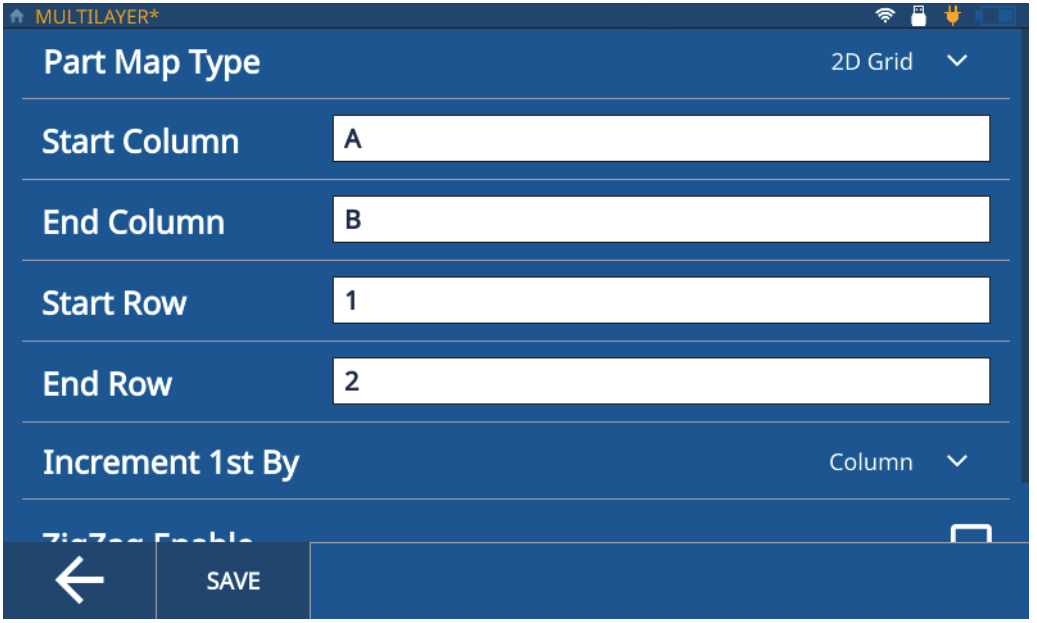

Figure 3-3 2D Grid File Type

For example, if you define Start Column A and End Column B, with Start Row 1 and End Row 2, you can opt to traverse the grid:

- First by column, which would assign IDs A1, B1, A2, and B2.
- First by row, which would assign IDs A1, A2, B1, and B2.
- First by column with zigzag enabled, which would assign IDs A1, B1, B2, and A2.
- First by row with zigzag enabled, which would assign IDs A1, A2, B2, and B1.

To select the 2D part map file type for an application, complete the following steps:

1. Load an application and open the inspection screen.
2. Tap **IDF** at the top of the inspection screen.
3. Select **Edit Part Map** from the drop-down menu.
4. Select **2D Grid** from the **Part Map Type** drop-down list.
5. Enter the **Start Column**, **End Column**, **Start Row**, and **End Row** values.
6. Select the **Increment 1st** method from the drop-down list.

7. Optional: Check the **ZigZag Enable** check-box.
8. Optional: Check the **Serial Number/Custom Name** check-box.

NOTE

Enabling the serial number/custom name option allows you to enter a serial number or unique ID for the part, which is displayed in the IDF field on the inspection screen. The gauge still generates an IDF, and you can view that from the **File Manager -> Application -> IDF List**.

9. Tap **Save**.

3.4 Using Templates

With a template, you can view the thickness measurement locations marked on the image of the part (see Figure 3-4 on page 29). Templates are used to give a visual reference on a part of each measurement location. You can only create templates using the **PC Interface Application**.

NOTE

If you convert a Template file to incremental, sequential, or 2D Grid, you cannot use the gauge to revert the file type to Template. You must use the **PC Interface Application** to convert any incremental, sequential, or 2D Grid file types to a Template file type.

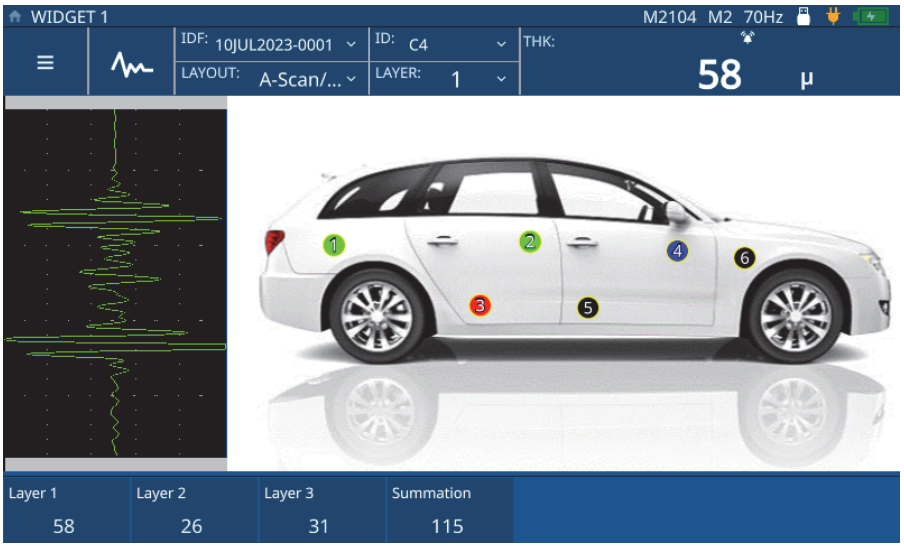

Figure 3-4 Interactive Template Image

3.5 Template File Type

The Template file type (see Figure 3-4 on page 29) is based on the part template created on the PC Interface Application, and then transferred to the instrument. It is stored under **My Applications** with all other applications. To setup and load the application, complete the following steps.

1. Open the **My Applications** screen (See Figure 1-1 on page 9) from the main menu.
2. Tap the **Template** application to load the application.
3. Tap **Layout** and select Template from the drop-down list. The gauge displays the part map with thickness measurement locations (TMLs) marked on it. Each location is color-coded to indicate whether a measurement has been taken at that point yet.
4. Tap **IDF** at the top of the **Inspection** screen, and select **Start New Inspection**.

NOTE

The gauge creates an IDF and the current/active TML turns to the color selected for the Active TML color on the PC Interface Application.

If a custom name was provided for the TMLs on the PC Interface Application, the gauge displays the custom name in place of the ID on the **Inspection** screen.

5. Couple the probe on the position shown on the image and press **Save**. The gauge saves the measurement and changes the color of the TML to indicate the point has been measured. The gauge also increments and displays the next TML in the color assigned for active TMLs.

NOTE

You can also tap on any TML displayed on the image to save/retake measurements for the TML. When you tap a TML the gauge displays the TML in the color assigned for active TMLs.This allows you to review and retake measurements for TMLs with alarms or loss of signal (LOS).

6. Once all the measurements have been taken, the gauge prompts you to start a new inspection. If you tap **Yes**, the gauge creates a new IDF and displays the TMLs in the color indicating the points have not yet been measured.

4. Adjusting the Waveform

Adjusting your waveform is an important part of the process to ensure the 72DL Plus produces the most accurate and easily read data. The wave adjust parameters and advanced user setups influence the measurement range and accuracy of the 72DL Plus.

NOTE

These adjustments must be made by someone who is trained in ultrasound testing.

4.1 Wave Adjust Parameters

When a user first creates an application, the instrument loads the default settings for the transducer selected. Often, these parameters will need to be adjusted to the part or a sample to make sure the measurement is accurate and repeatable. Please note that all parameter adjustments can be saved to the application file and can be quickly recalled from the **My Applications** screen.

Main Bang Blank – The MB Blank is effectively a blank zone that protects the receiver from false readings generated by the main bang. This blank or dead zone prevents the detection of the trailing edge echoes of the excitation pulse as if they were back-wall or interface echoes.

Init Gain – The initial gain sets an upper limit on receiver gain in the vicinity of the excitation pulse (mode 1) or of the interface echo (modes 2 and 3).

Gain Slope – The gain slope controls the rate at which the receiver gain slopes up from the initial gain level to the maximum gain level. The gain slope starts at the position of the **MB BLANK** parameter in mode 1, at the end of the **IF BLANK** parameter in mode 2, and at the end of the **M3 Blank** in mode 3.

Max Gain – The maximum gain indicates the maximum (time-dependent) receiver gain possible. The maximum gain is used to amplify echoes that are further out in time.

Echo Window – The echo window is the time interval after each main bang during which the instrument is enabled to detect echoes. The echo window interval begins at the end of the main bang blank.

Echo Polarity – You can select the detection polarity (positive or negative) for the first and second echoes. Depending on the measurement mode and type of test material, the maximum amplitude in an echo can either be a positive or negative peak.

Interface Blank – This represents a blank zone that follows the interface echo. The interface echo is only available in Mode 2 and Mode 3 Measurements.

M3 Blank – The echo blank in mode 3 (M3 BLANK) is like the interface blank in mode 2 or to the main bang blank in mode 1. This function creates a blank or dead zone following the first detected back-wall echo, to prevent detection of trailing lobes or cycles of that echo and the resulting gauge hang-up.

Detection Modes – There are 3 detection Modes (Mode 1, Mode 2, and Mode 3).

- **Mode 1** - Measures the time of flight between the main bang and the first back-wall echo using a direct contact transducer.
- **Mode 2** - Measures the time of flight between the interface (or delay line) echo and the first back-wall echo using a delay line or an immersion transducer.
- **Mode 3** - Measures the time of flight between one back-wall echo to the next back-wall echo using a delay line or an immersion transducer.

4.1.1 Modifying Wave Adjust Parameters

You can access and modify the Wave Adjust parameters (such as **MB Blank**, **IF Blank**, **Init Gain**, **Gain Slope**, **Max Gain**, **Echo Window**, and **Echo Detect**) by completing the following steps.

1. Tap the Wave Adjust button  on the Inspection Screen, and select the parameter needing adjustment from the bottom panel (see Figure 4-1 on page 33 and Figure 4-2 on page 34 for an example of increasing the Init Gain).

TIP

Tap once to perform a fine adjustment or tap twice to perform a coarse adjustment.

Figure 4-1 Example of Increasing the Init Gain (Before)

Figure 4-2 Example of Increasing the Init Gain (After)

2. Increase the value of the selected parameter by turning the adjustment knob clockwise, or decrease the value by turning the adjustment knob counter-clockwise.

NOTE

Touch the parameter once to enter fine adjustment mode, touch it again to toggle to coarse adjustment mode. Touching the parameter toggles between fine and coarse adjustment.

4.2 Advanced User Setup

You can access Advanced User Setup to modify additional settings, such as **Averaging**, **Pulser Power**, **Frequency**, **Time Out**, **Measurement Type**, **Filter**, and **Transmission Mode**.

Averaging – (High frequency only) To perform a running averaging, select between 2x, 4x, 8x, 16x, 32x, and 64x. You can also turn off averaging.

Frequency – Sets the pulse width. The best performance is achieved by setting the frequency as close as possible to the center frequency of the transducer being used.

STD Time Out – Sets the period of time in which the gauge will search past the first detected backwall echo to see if a greater peak exists.

IF Time Out – Sets the period of time in which the gauge will search past the first detected interface echo to see if a greater peak exists.

Measurement Type – Sets the desired measurement type between **Standard**, **First Peak**, and **Greatest Peak**.

- **Standard** – For normal Mode 1, 2, and 3 positive or negative peak measurement.
- **First Peak** - This is a special algorithm to measure the first peak of a group of several peaks on either the positive or negative side of the waveform.
- **Greatest Peak** – This is a special algorithm to measure the greatest peak of a group of several peaks of the waveform.
- **Measurement Type by Layer** – (For multi-layer only) This allows you to set the measurement type for each layer individually. When you select this type, the gauge displays the control to set the measurement type in the wave adjust menu.

Transmission Mode – The 72DL Plus can be used to operate in 2 modes.

- **Pulse Echo** – In this mode a single element transducer sends and receives the ultrasonic signal. You must use the red T/R transducer connector in pulse/echo mode.
- **Through** – (Standard frequency only) In this mode two separate transducers are typically located on opposite sides of the test piece. One transducer transmits the ultrasonic signal, the other receives. Use the transducer connection labeled T/R as the transmit connector.

Pulser Power – The 72DL Plus can adjust the pulse energy.

- In high frequency mode, the 72DL Plus can adjust the pulse energy to **Low**, **Medium**, or **High**. Set the pulse power to Low to extend the battery life, or set it to High for the most difficult materials.
- In standard frequency mode, the 72DL Plus can adjust the pulse energy between 60 v, 110 v, 150 v, and 200 v.

Filter - The filters help to improve the instrument's signal to noise ratio by filtering out unwanted high and/or low frequency noise outside of the test frequency spectrum.

4.2.1 Modifying Advanced User Parameters

To access the Advanced User Setup screen, and modify the parameters, complete the following steps.

1. Tap the main menu from the Inspection screen.
2. Tap the **Advanced User Setup** option from the main menu.
3. Tap the parameter to be modified.

The gauge opens a pop-up menu allowing you to scroll through the options and select a new value using the adjustment knob (see Figure 4-3 on page 37 and Figure 4-4 on page 38).

Figure 4-3 Navigating to Advanced User Setup menu

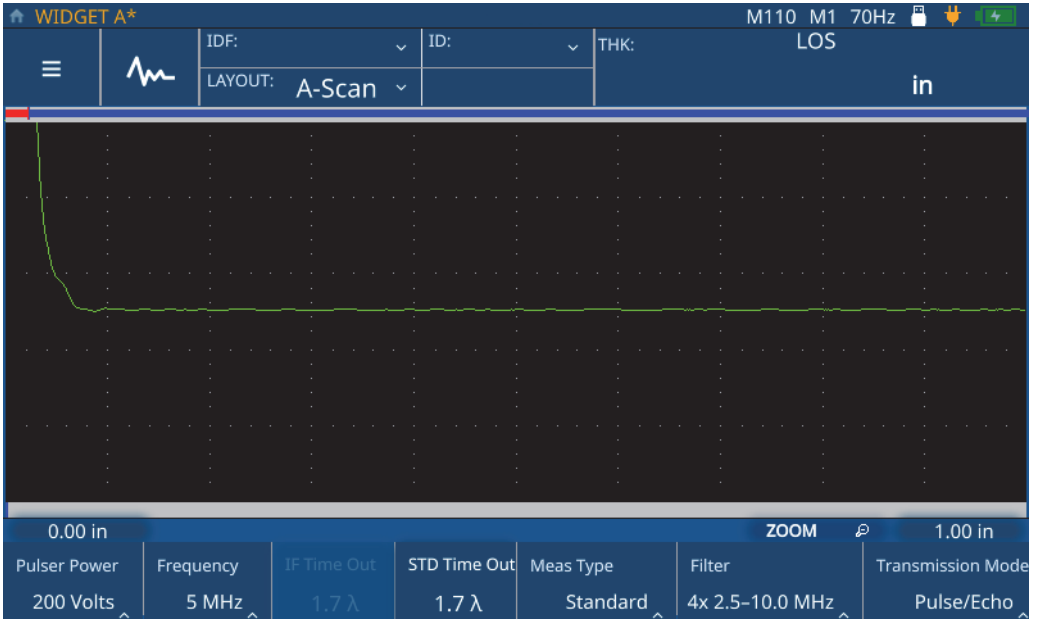

Figure 4-4 Parameters in Advanced User Setup menu

5. Calibrating the 72DL Plus

There are multiple calibration types available for the gauge. You can calibrate the gauge for the material sound velocity, zero calibration, or both sound velocity and zero calibration on both live and frozen waveforms.

5.1 Velocity Calibration

Velocity calibration allows you to calibrate the gauge for the speed of sound traveling through the material being tested. To conduct this calibration you must use a sample with a known thickness. Velocity calibration is typically done on a sample representing the maximum thickness to be encountered during live testing. To conduct a velocity calibration, complete the following steps:

1. Ensure the transducer is connected to the gauge.
2. Press the **CAL** button to open the Calibration menu (see Figure 5-1 on page 40).

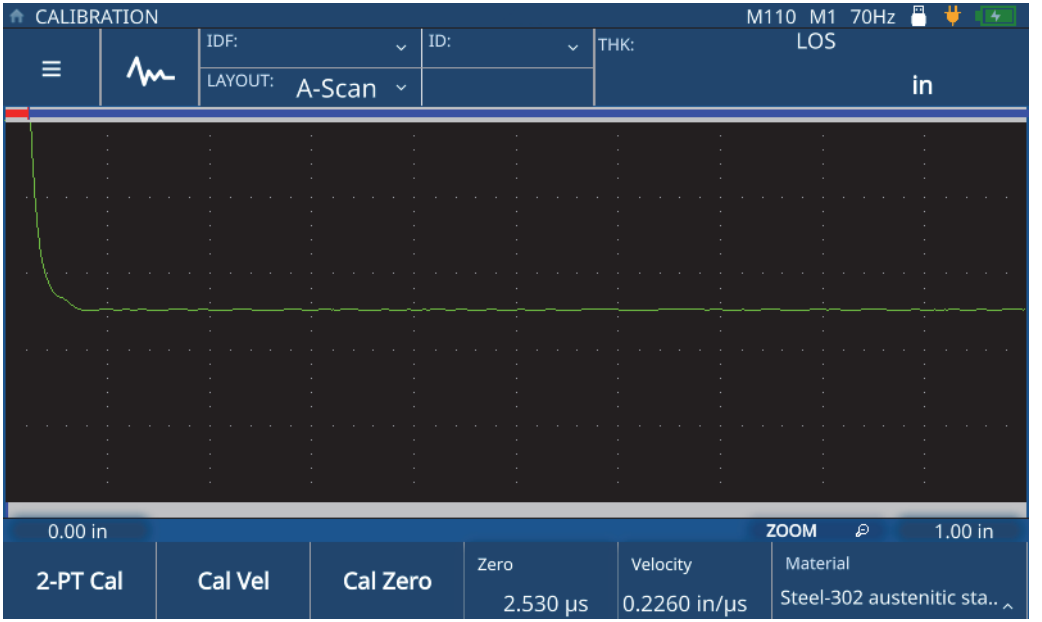

Figure 5-1 Calibration Menu

3. Tap the **Cal Vel** button.
4. Follow the screen prompts providing calibration instructions, and couple the transducer to the sample with a known maximum thickness (see Figure 5-2 on page 41).

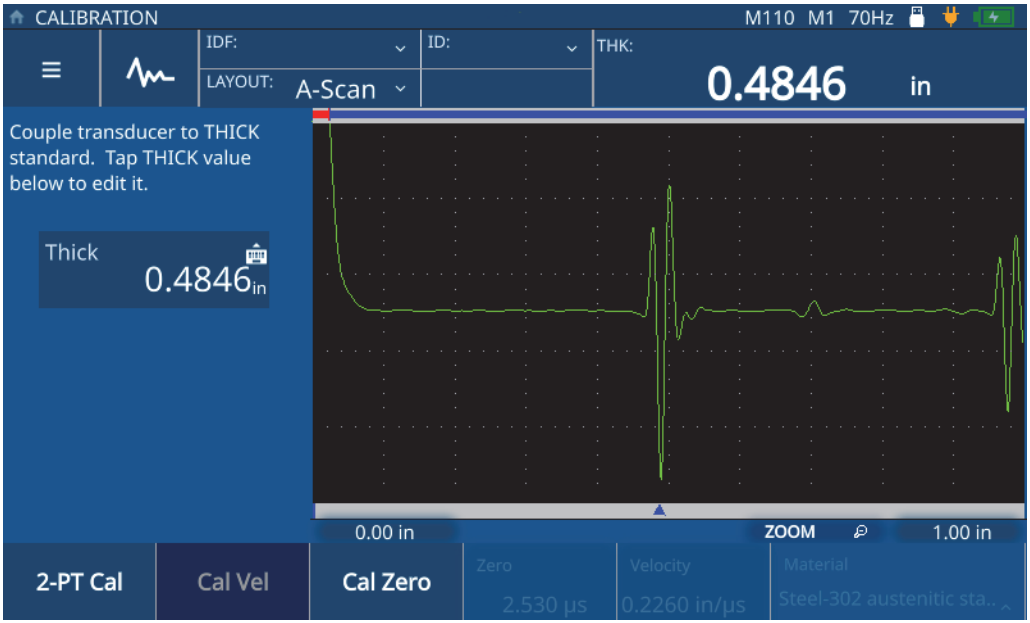

Figure 5-2 Velocity Calibration

5. Tap the **Thick** value to enter **Edit** mode, and enter the thickness of the sample (see Figure 5-3 on page 42).

Figure 5-3 Entering Sample Thickness

6. Tap the **Check-mark** icon to save the value and complete the calibration (see Figure 5-4 on page 43).

Figure 5-4 Completing Velocity Calibration

5.2 Zero Calibration

Zero calibration allows you to compensate for the time delay of the signal as it travels through the transducer cable and the couplant layer. To conduct this calibration you must use a sample with a known thickness. You must use a sample representing the minimum thickness to be encountered during live testing. To conduct a zero calibration, complete the following steps:

1. Ensure the transducer is connected to the gauge.
2. Press the **CAL** button to open the Calibration menu (See Figure 5-1 on page 40).
3. Tap the **Cal Zero** button.
4. Follow the screen prompts providing calibration instructions, and couple the transducer to the sample with a known minimum thickness (see Figure 5-5 on page 44).

Figure 5-5 Zero Calibration

5. Tap the **Thin** value to enter **Edit** mode, and enter the thickness of the sample (see Figure 5-6 on page 45).

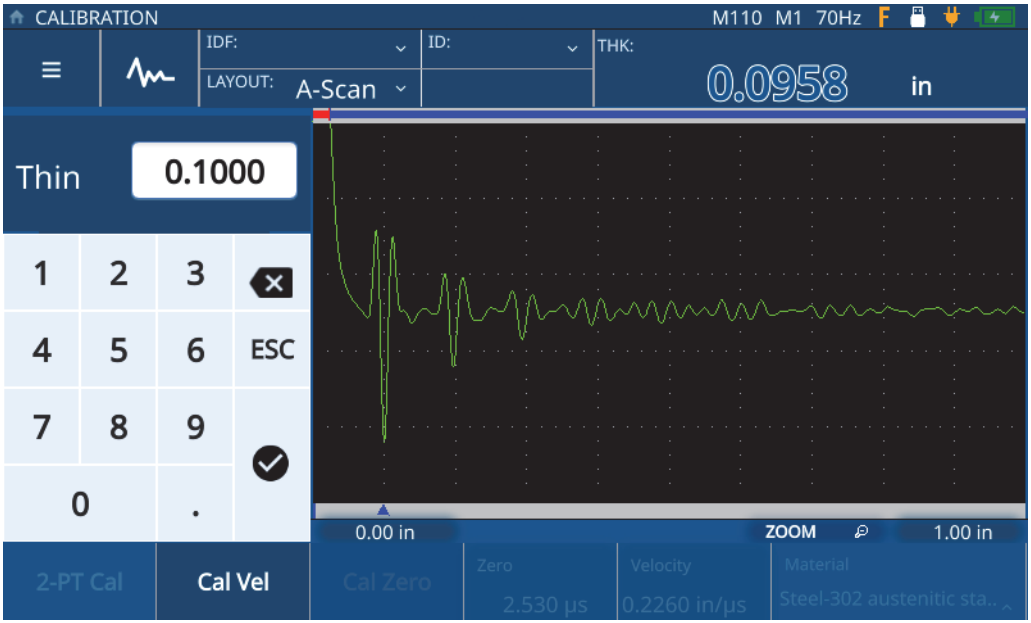

Figure 5-6 Entering Sample Thickness

6. Tap the **Check-mark** icon to save the value and complete the calibration (see Figure 5-7 on page 46).

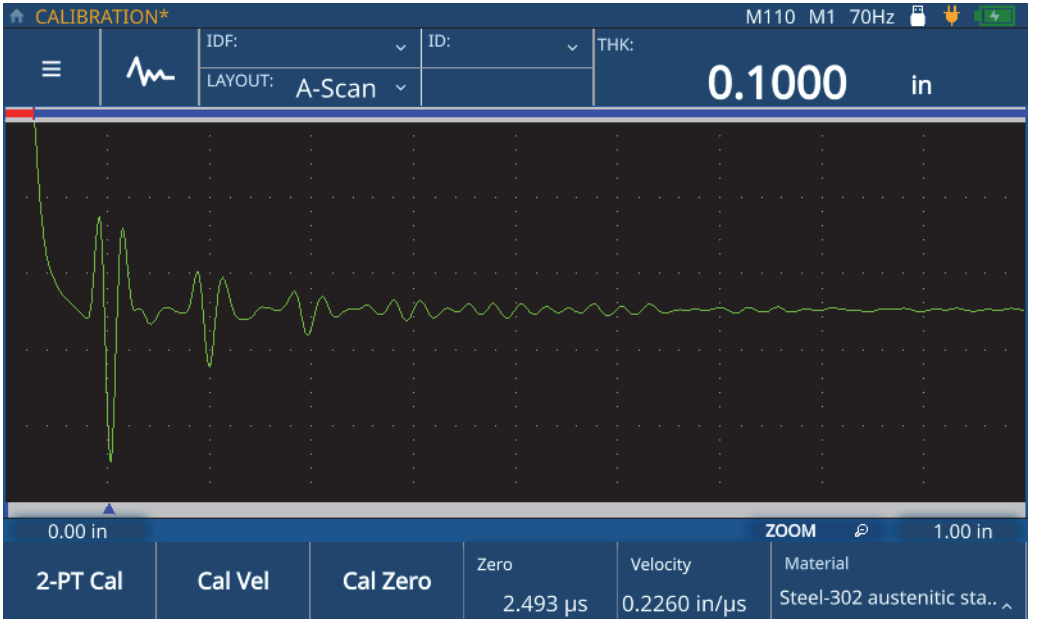

Figure 5-7 Completing Zero Calibration

5.3 2-Point Calibration

Two point (2-PT) calibration incorporates both the zero calibration and the velocity calibration. To conduct this calibration you must use a sample with a known maximum thickness, as well as a sample with a known minimum thickness. To conduct a 2-point calibration, complete the following steps:

1. Ensure the transducer is connected to the gauge.
2. Press the **CAL** button to open the Calibration menu (See Figure 5-1 on page 40).
3. Tap the **2-PT Cal** button.
4. Follow the screen prompts providing calibration instructions, and couple the transducer to the sample with a known maximum thickness (see Figure 5-8 on page 47).

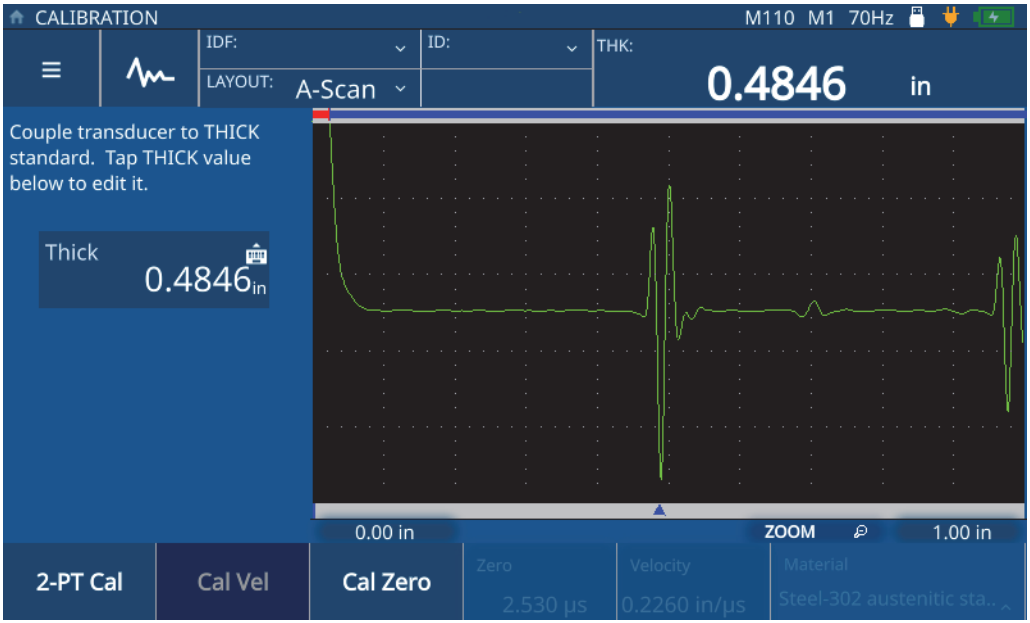

Figure 5-8 Velocity Calibration (2-PT Calibration)

5. Tap the **Thick** value to enter **Edit** mode, and enter the thickness of the sample (see Figure 5-9 on page 48).

Figure 5-9 Entering Sample Thickness

6. Tap the **Check-mark** icon to save the value.
7. Follow the screen prompts providing calibration instructions, and couple the transducer to the sample with a known minimum thickness (see Figure 5-10 on page 49).

Figure 5-10 Zero Calibration (2-PT Calibration)

8. Tap the **Thin** value to enter **Edit** mode, and enter the thickness of the sample (see Figure 5-11 on page 50).

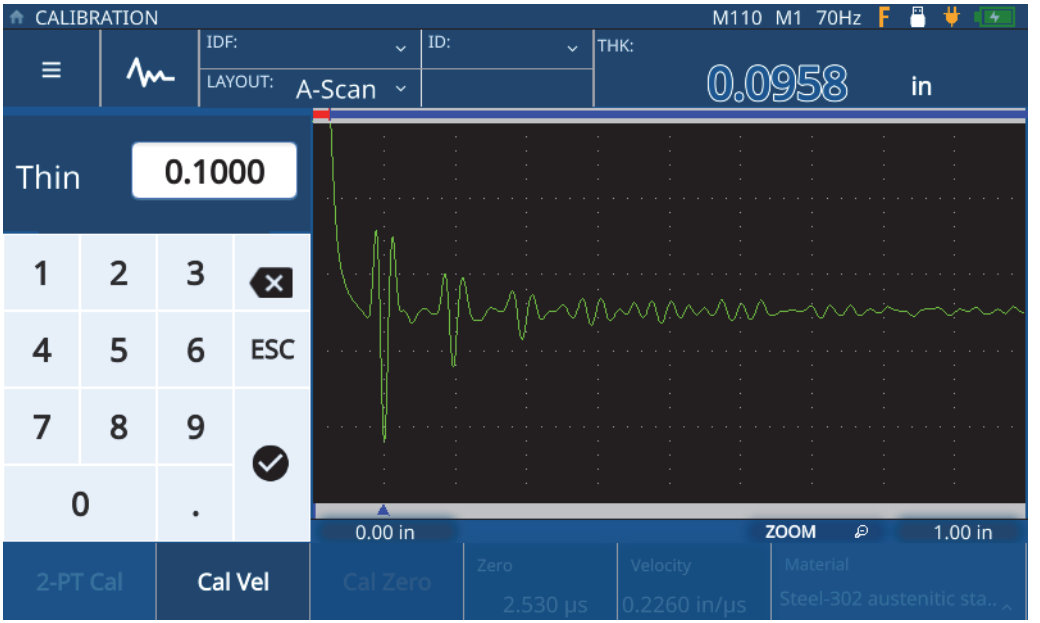

Figure 5-11 Entering Sample Thickness

9. Tap the **Check-mark** icon to save the value and exit **Edit** mode (see Figure 5-12 on page 51).

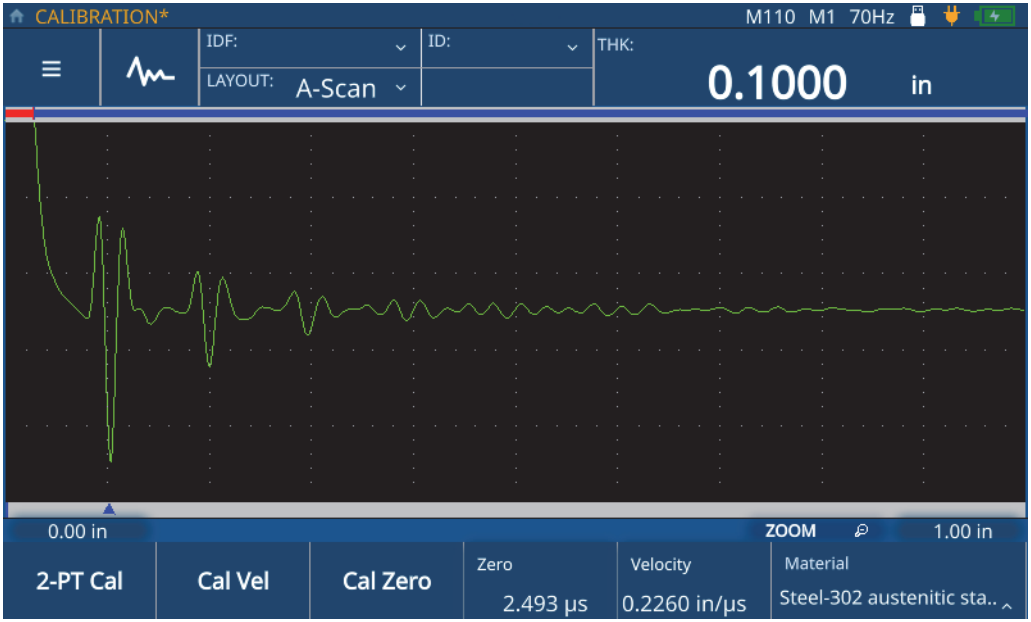

Figure 5-12 Completing 2-Point Calibration

6. Conducting Inspections

This chapter provides the information you require to conduct inspections once you have configured and calibrated the gauge.

6.1 Understanding the Inspection Screen

Pressing the Home key will always bring you directly to the inspection screen of the gauge and display the currently selected application. The default view displays the A-Scan layout. The inspection screen is comprised of the main waveform graph and 3 other sections (See Figure 6-1 on page 54).

Figure 6-1 Inspection Screen

6.1.1 Main Menu and File Data

The Main Menu and File Data sections of the Inspection screen, located in the top left corner (See Figure 6-2 on page 55), allow you to:

- Access the Main Menu.
- Adjust the waveform.
- View the inspection data file and ID.
- Access the inspection drop-down menu.
- View and select the layout.

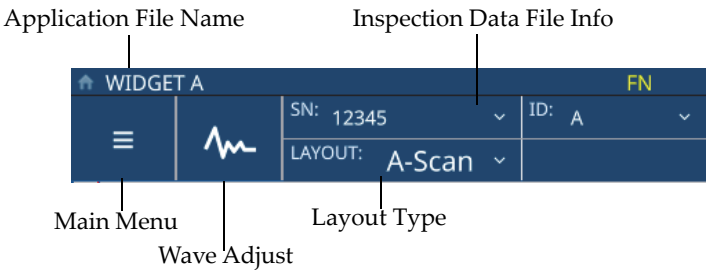

Figure 6-2 Main Menu and File Data Section

6.1.2 Status Bar Section

The measurement section of the Inspection screen, located in the top right corner (See Figure 6-3 on page 55), allows you to:

- View status of connections and battery life.
- View the transducer details.

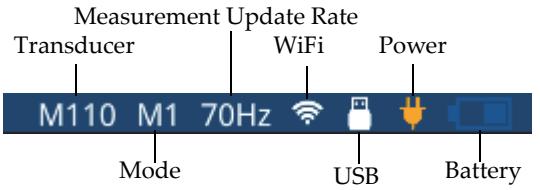

Figure 6-3 Status Bar Section

6.1.3 Measurement Section

The measurement section of the Inspection screen, located below the status bar in the top right corner (See Figure 6-4 on page 56), allows you to:

- View the thickness value and alarm status.
- View the minimum and maximum values.
- View the differential thickness value.

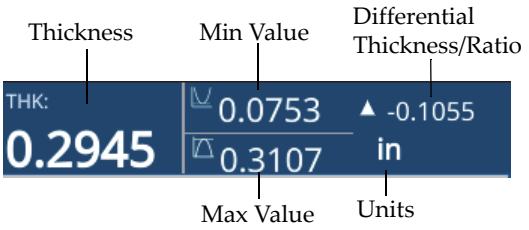

Figure 6-4 Measurement Section

6.1.4 Delay and Range

The Delay and Range section of the Inspection screen, located along the bottom (See Figure 6-5 on page 56), allows you to:

- View and adjust the delay value that modifies the beginning of the waveform.
- View the measurement marker.
- View and modify the horizontal zoom setting.
- View and adjust the range of the displayed waveform.

Figure 6-5 Delay and Range Section

NOTE

To adjust the delay or range, tap on the **Delay** or **Range** region and use the adjustment knob to change the parameter. Single and double touches on the regions toggle between fine and course adjustment modes, where a single tap enters fine adjustment mode, and a second tap enters course adjustment mode. Course adjustment mode is indicated by the parameter value being underlined.

6.2 Conducting an Inspection

To start a new inspection, and begin saving thickness readings, complete the following steps:

1. Tap the **IDF** location on the Inspection screen and select **Start New Inspection** from the drop-down menu.
2. Select **Yes** from the **Start New Inspection** pop-up window (see Figure 6-6 on page 57).

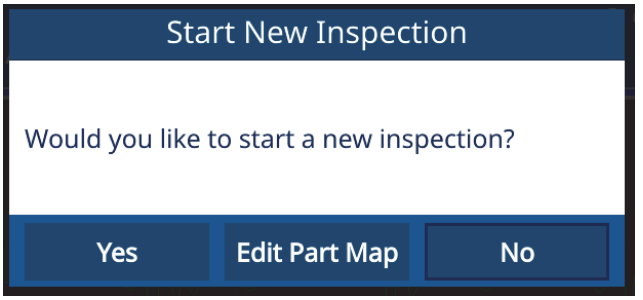

Figure 6-6 Starting New Inspection

NOTE

For the first-time inspection from a new application, the gauge will offer the chance to edit the part map. To edit the part map prior to inspection, select **Edit Part Map**. The gauge will open the Part Map screen and allow editing of the information. Once you have conducted an inspection using a new application you cannot further edit the part map.

3. **Optional:** Enter a serial number and click **Done** in the pop-up window if you have enabled serial number functionality for the application (see Figure).

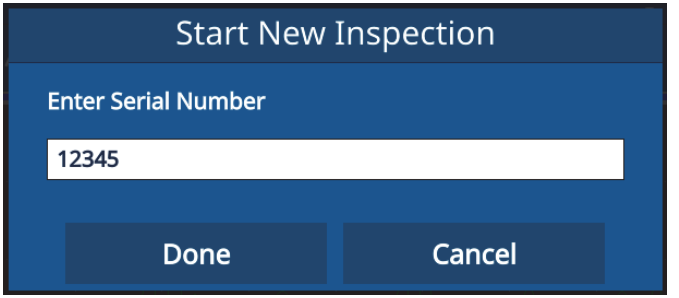

Figure 6-7 Entering a Serial Number

4. The gauge creates an inspection data file based on the part map type and criteria configured for the application, and displays the IDF and ID information. The default part map type is incremental with a Start ID of 01.

NOTE

If serial number is enabled, the gauge displays the serial number instead of the IDF.

---

5. Take a measurement and press the **Save/Send** key on the gauge. The gauge saves each measurement when the Save/Send key is pressed, and increments the ID for the next measurement. Once the last measurement for the IDF has been saved, the gauge notifies you that the inspection is complete.
6. Select **Yes** from the **Start New Inspection** pop-up window to conduct another inspection, or **No** to disregard.

7. Managing Files

File management is achieved via the File Manager built into the gauge. To access the File Manager, tap the **IDF** line of the **File** section of the screen, and select **File Manager** from the drop-down menu.

7.1 Understanding the File Manager

All user-created applications are displayed in the File Manager (See Figure 7-1 on page 60). For every user-defined application, the File Manager also displays the number of Inspection Data Files (IDFs) and the date and time of the last modification. You can sort the display by Name, Number of IDFs, or Modified Date/Time.

Figure 7-1 File Manager

7.2 Reviewing the Inspection Data File (IDF) List

The File Manager displays the number of IDFs saved to the gauge for every user-defined application. IDFs are files that the gauge creates based on the part map type and criteria defined by the user to save measurements. The file name is date stamped for the date of creation, for example 01Dec2021-0001 (unless you have configured the 72DL Plus to use the Serial Number/Custom Name in the **Edit Part Map** settings).

To view the IDF list for any application, complete the following steps:

1. Select the application from the **File Manager** list.
2. Click the **IDF LIST** icon at the bottom of the screen.

The gauge displays the list of IDFs for the selected application (See Figure 7-2 on page 61).

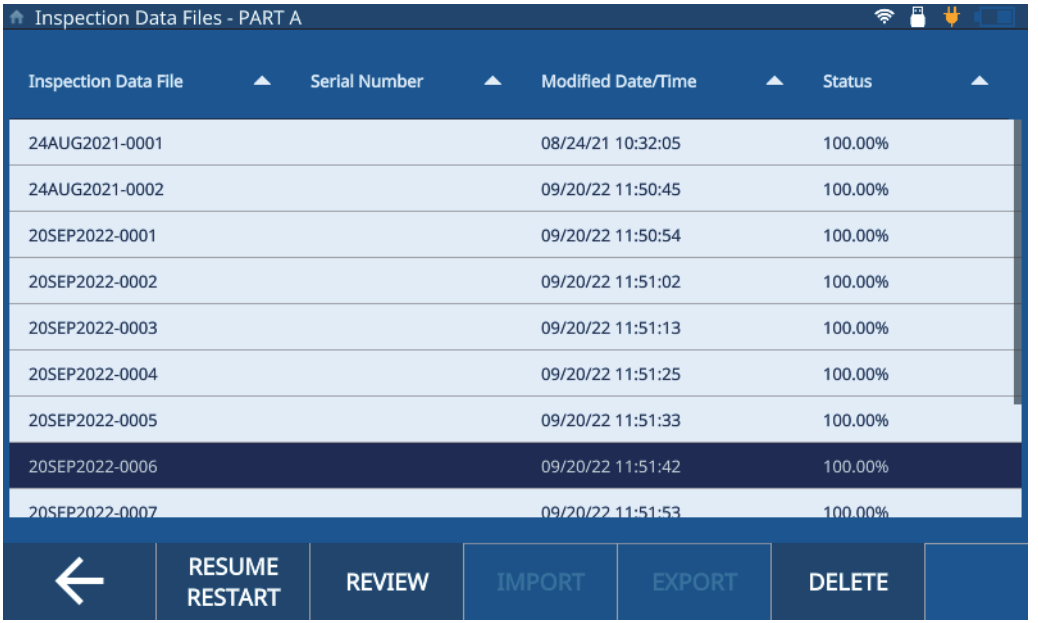

Figure 7-2 IDF list

The IDF list displays:

- The IDF number.
- The associated Serial Number, if assigned.
- The last Modified Date/Time stamp.
- The Status of the IDF, which is a percentage of completion based on the Part Map definition.
- The measurement timestamp for each ID (if enabled).

You can sort the list by any of the attributes, ascending or descending in value. The default display sorts the IDF numbers in ascending order. When you select an IDF from the list you can use the buttons at the bottom of the screen to **Delete** the IDF, **Review** the details, or **Resume/Restart** the inspection for an incomplete/complete IDF. Reviewing the IDF details opens the IDF Review screen, which has two views (Table and Waveform).

7.2.1 IDF Review Screen - Table View

The IDF Review screen Table view (See Figure 7-3 on page 62) is the default for the application. The Table view displays the measurements for each ID for the selected IDF. For a multilayer application, the gauge displays the thickness measurement of up to 6 layers along with a summation (total thickness) for all the IDs. If the measurement timestamp is enabled, the gauge also displays the timestamp for each ID in the table view.

Figure 7-3 IDF Review Screen - Table View

From the Table view, you are able to review all measurements and IDs, and even overwrite individual measurements as needed. To overwrite a measurement for an IDF, complete the following steps.

1. Select the ID.
2. Press the **Home** key.
3. Inspect the material and press the **Save** key to overwrite the ID measurement value.

Table 1 on page 63 displays the buttons and their functions.

Table 1 IDF Review Screen Buttons

Button	Function
	Search for an ID.
	Change ID: First ID in the current IDF.
	Change ID: Previous ID in the current IDF.
	Change ID: Next ID in the current IDF.
	Change ID: Last ID in the current IDF.
	Access Waveform view (available on Table view only).
	Return to the Table view (available in the Waveform view only).

7.2.2 IDF Review Screen - Waveform View

The IDF Review screen Waveform view (See Figure 7-4 on page 64) displays the waveform for the selected IDF, with the thickness measurement, differential thickness/ratio (if selected), and the minimum and maximum values (if enabled). Each ID in the Waveform view displays a snapshot of the inspection screen as it was when the **Save** button was pressed.

Figure 7-4 IDF Review Screen - Waveform View

Table 1 on page 63 displays the buttons and their functions.

7.3 Reviewing Application Files

The File Manager allows you to review the settings assigned at creation to all application files on the gauge (See Figure 7-5 on page 65). To review the settings for any application, complete the following steps:

1. Select the application from the **File Manager** list.
2. Click the **REVIEW** button at the bottom of the screen.

The gauge displays the settings for the selected application. Expand any list item (**Transducer**, **Material**, **Unit/Resolution**, or **Part Map**) to view the details about the settings.

Figure 7-5 Application Review Screen

7.4 Editing Application Files

The File Manager allows you to edit the name, description, or completely delete an application from the gauge (See Figure 7-6 on page 66). To edit or delete any application, complete the following steps:

1. Select the application from the **File Manager** list.
2. Click the **EDIT** icon at the bottom of the screen.
3. Edit the Name or Description and press **Save**.

NOTE

Pressing **Delete** will delete the entire application and all associated inspection data files.

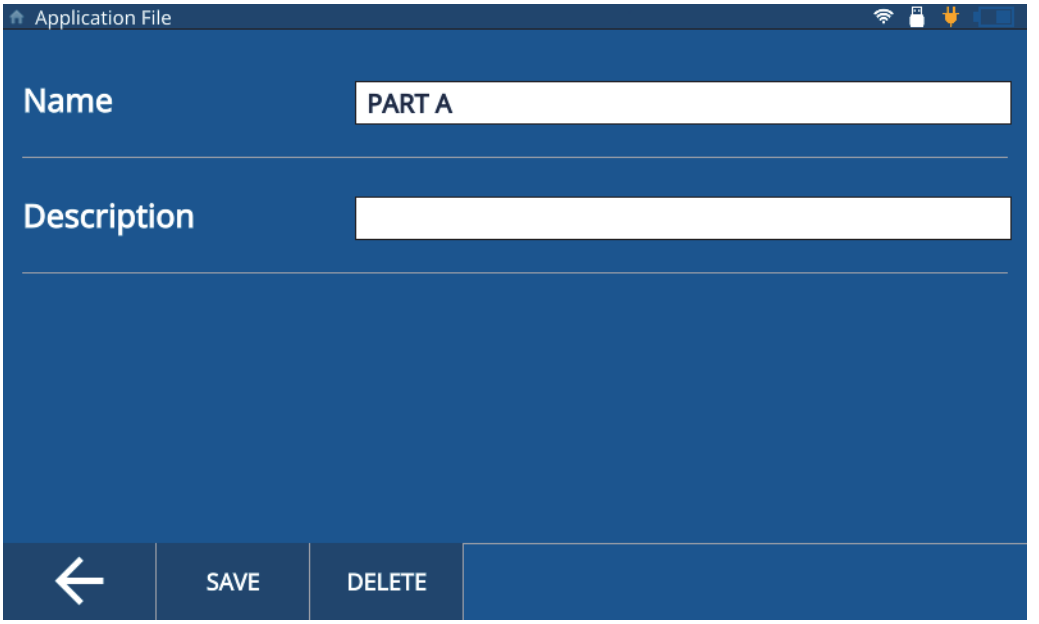

Figure 7-6 Application Edit Screen

7.5 Exporting Application Files

You can export an application file (in CSV format) from one gauge and import it into another. To export an application file, complete the following steps:

1. Connect a USB thumb drive to one of the USB A connectors on the gauge and confirm that the USB icon displays in the status bar (see Figure 6-3 on page 55).
2. Select the application from the **File Manager** list.
3. Tap the **Export** icon at the bottom of the screen.
4. Tap **OK** on the export confirmation window (see Figure 7-7 on page 67).

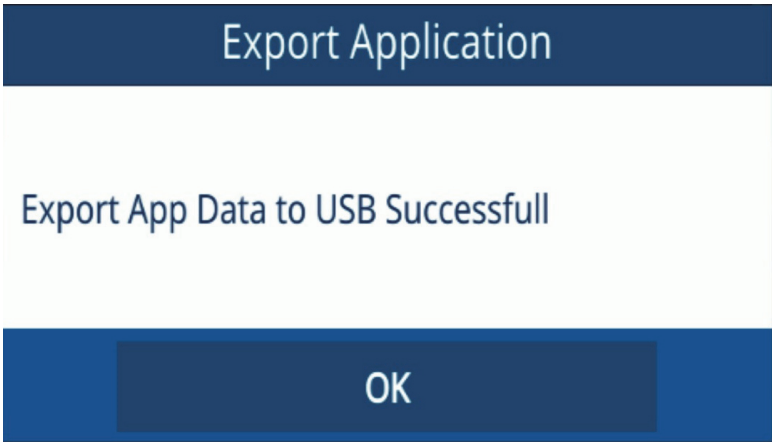

Figure 7-7 Export Confirmation Window

7.6 Importing Application Files

You can import an application file (in CSV format) to your gauge that has been exported from a different gauge. To import an application file, complete the following steps:

1. Connect a USB thumb drive containing the application file to one of the USB A connectors on the gauge and confirm that the USB icon displays in the status bar (see Figure 6-3 on page 55).
2. Tap the **Import** icon at the bottom of the screen.
3. Select the application from the pop-up window and tap **OK** (see Figure 7-8 on page 68).

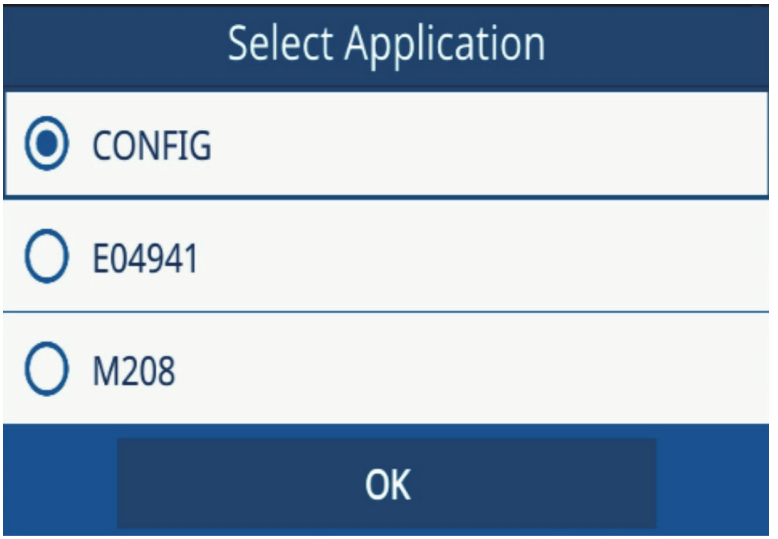

Figure 7-8 Select Application Window

7.7 Exporting IDFs

You can export an IDF from the device to a USB thumb drive in CSV or CSV Grid formats. To export an IDF, complete the following steps:

1. Connect a USB thumb drive to one of the USB A connectors on the gauge and confirm that the USB icon displays in the status bar (see Figure 6-3 on page 55).
2. Select the application from the **File Manager** list.
3. Tap the **IDF** to select it for export.
4. Tap the **Export** icon at the bottom of the screen.
5. Select the preferred file format (CSV or CSV Grid) from the pop-up window and tap **OK** (see Figure 7-9 on page 69).

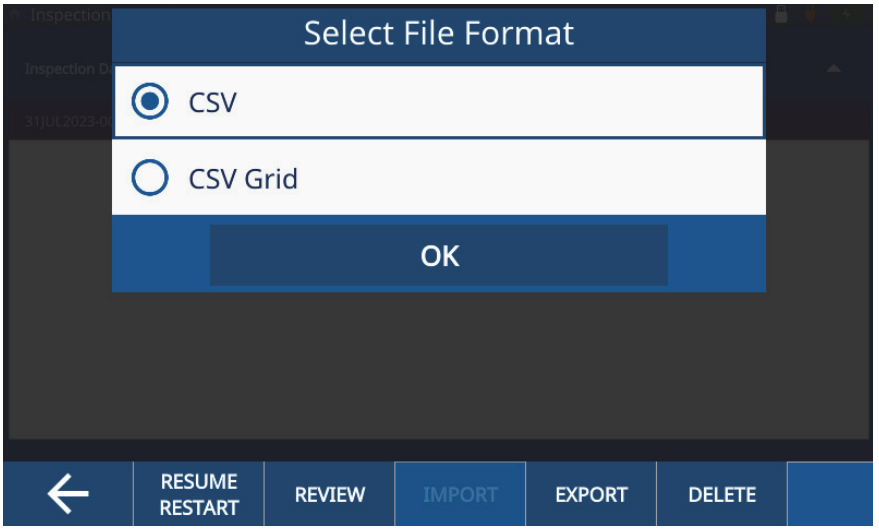

Figure 7-9 Select File Format Window

8. Instrument Lock

The Instrument Lock feature enables you to lock certain functionalities while performing an inspection. This provides better control over human error and improves retention of data integrity. You can enable the instrument locks with or without passwords.

8.1 Locking Functions

The Password Lock screen (see Figure 8-1 on page 72) allows you to lock the following features:

- **Calibration** — Checking this check-box locks the calibration function for the end user.
- **System** — Checking this check-box locks the System and Hardware screens for the end user. Locking these screens prevents the user from making any changes to the date and time, communication type, and user preferences. It also prevents the user from performing a device reset, or running diagnostic tests on the instrument.
- **File Manager** — Checking this check-box locks the File Manager and Edit Part Map screens. When locked, the user is prevented from changing or reviewing any applications or inspections.
- **Application** — Checking this check-box blocks the user from accessing any application other than the currently selected one. This also prevents the user from modifying the current application. A user only has access to perform inspections and review IDFs within the current application.

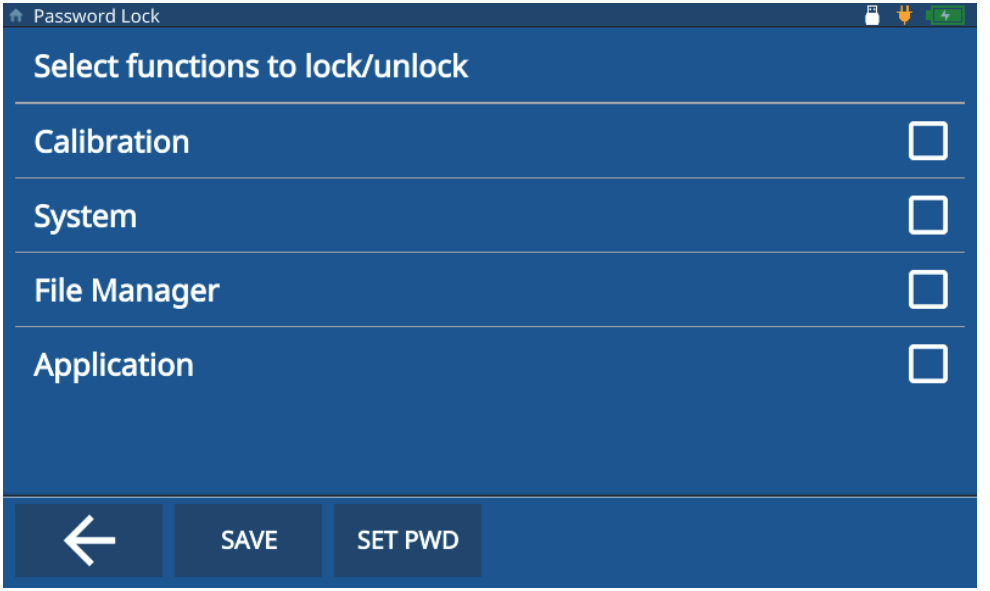

Figure 8-1 Instrument Lock screen

8.2 Enabling Instrument Lock

To enable instrument lock, complete the following steps.

1. Tap **Settings** from the main menu.
2. Tap **About**.
3. Tap **Password Lock**.
4. Select the functions to lock by checking the appropriate check-boxes (see Figure 8-1 on page 72).
5. (Optional step) Tap **Set PWD**, enter a password, and tap **Save** (see Figure 8-2 on page 73).

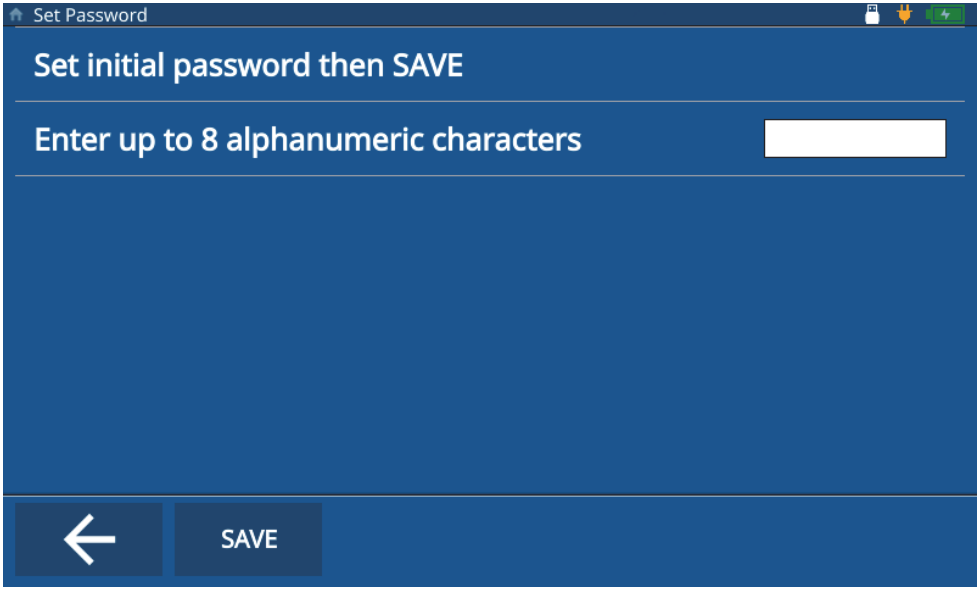

Figure 8-2 Set Password screen

6. Tap **Save**, and press the **Home** key.

8.3 Disabling Instrument Lock

To disable instrument lock, complete the following steps.

1. Tap **Settings** from the main menu.
2. Tap **About**.
3. Tap **Password Lock**.
4. Enter the password (if one is configured).
5. Select the functions to unlock by clearing the appropriate check-boxes (see Figure 8-3 on page 74).

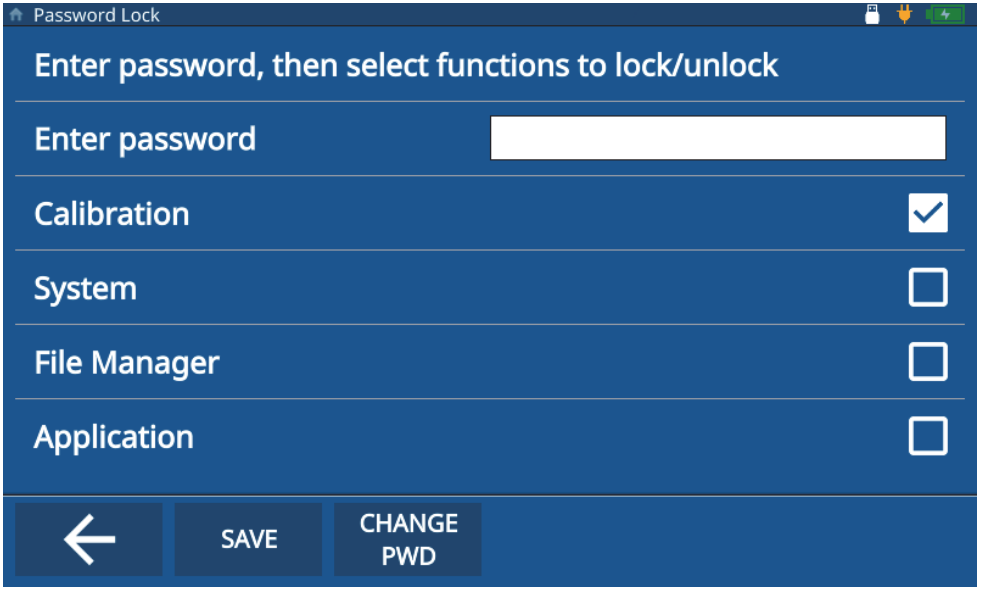

Figure 8-3 Disable Instrument Lock screen

6. Tap **Save**, and press the **Home** key.

8.4 Changing the Instrument Lock Password

To change instrument lock password, complete the following steps.

1. Tap **Settings** from the main menu.
2. Tap **About**.
3. Tap **Password Lock**.
4. Tap **Change PWD**.
5. Enter the current password and the new password. If none is desired, leave **New Password** blank and the password will be removed (see Figure 8-4 on page 75)).

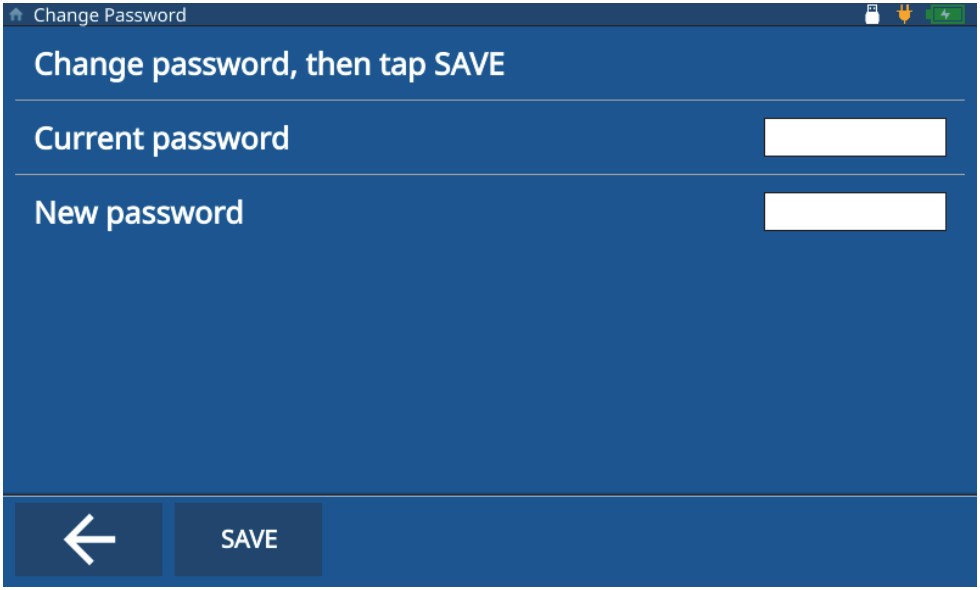

Figure 8-4 Change Instrument Lock password

6. Tap **Save**, and press the **Home** key.

NOTE

If you forget your password, use the master password (E72DLP) to reset the password.

9. Software Updates

The 72DL Plus has the ability to update the embedded system software from a USB thumb drive.

9.1 Updating the System Software

To update the system software, complete the following steps.

NOTE

The 72DL Plus must be connected to AC power, and powered on, before proceeding.

1. Copy the software update folder (`72DLP_upgrade`) to the root directory on a USB thumb drive.

IMPORTANT

Do not change the name of the folder.

2. Connect the USB thumb drive to the USB port on the instrument.
3. Access the main menu in the inspection screen and tap **Settings**.
4. Tap **About**.
5. Tap **Versions/Updates**.
6. The instrument displays the current software version on the screen. Tap **Check Updates** (see Figure 9-1 on page 78).

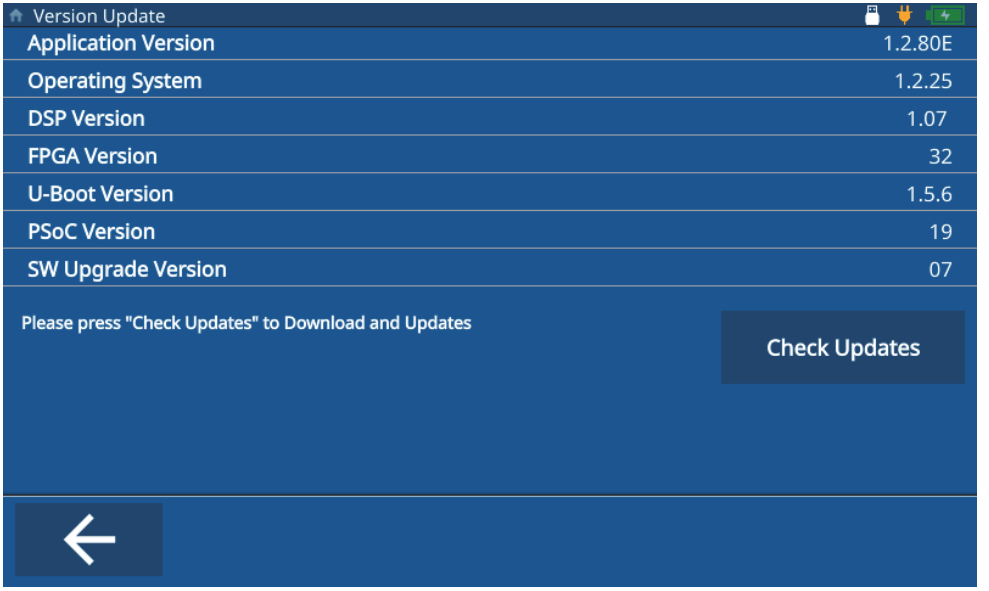

Figure 9-1 Software Update screen

NOTE

The 72DL Plus performs the system software update in the background, and once completed the new version will be reflected on the **Application Version** line of the **Version Update** screen.

List of Figures

List of Tables