6 Working With Measurements

Measurements accompanying ultrasound images supplement other clinical procedures available to the attending physician. Accuracy of the measurements is determined by the Terason Ultrasound software and by proper use of medical protocols.

When you freeze a scan, the Terason software changes the set of available button controls. For example, if you scanned in 2D mode, when you freeze the image, the buttons include Trace, Ellipse, and Caliper.

When you save an image, all measurements are saved with the image.

You can create measurements on the currently acquired image (with frames stored temporarily).

To make measurements on scanned images, you must understand:

You can also make measurements on both screens when using Split Screen mode. See Split-Screen Measurements on page 110.

To obtain a complete set of measurements, you often have to acquire multiple scans. You can make as many scans and measurements as required for the study without losing any measurements. Measurements remain on the Imaging window until you:

- Select a different exam
- Select a different scan mode
- Load a different patient
- Tap the Delete button
- Tap the Clear All button

Measurement Results Display Location

The default location for the display of measurement results is the top left of the image. To move the results to the bottom of the image, tap the Results button. You can also change the default location to the bottom of the image using the Result Display Location radio buttons on the Setup/Measurements window.

Measurement Sets

When you choose an exam preset, the Terason software makes a default set of measurements available. The default set may vary from one supported probe to another. You can also add custom measurements to the available lists. See:

- Default Measurement Sets on page 103
- Customizing Measurement Sets on page 103
- Setting Measurement Defaults on page 138

Default Measurement Sets

The system loads a set of measurements tailored for the preset you've selected. The measurements are selected using the Calc button.

To select a measurement type, tap the Calc button, and tap the desired measurement.

Customizing Measurement Sets

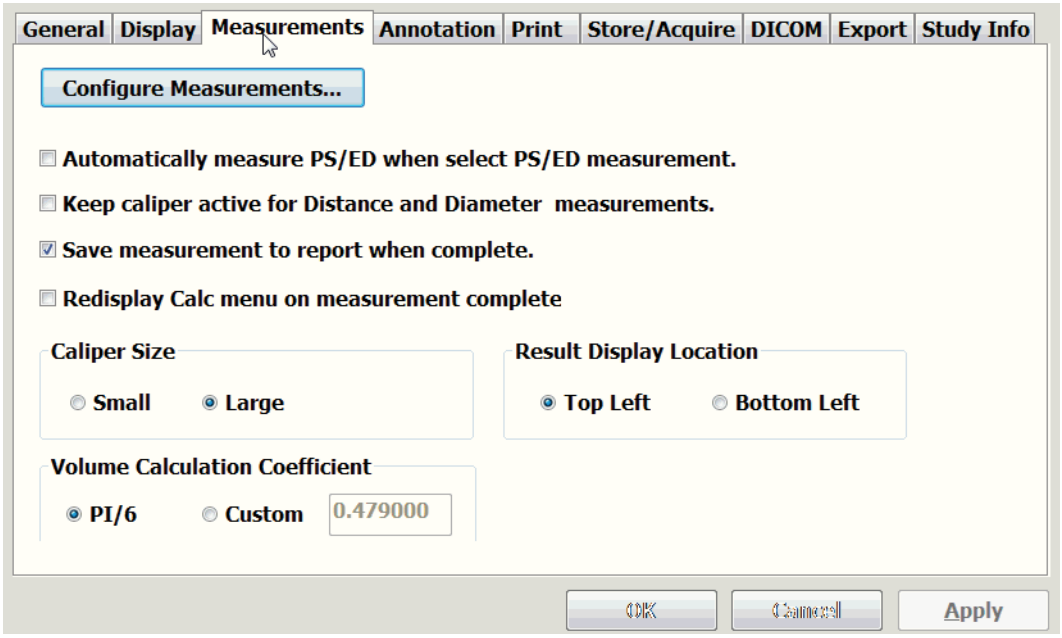
If the default measurement set does not include a measurement you need, you can customize the set.

To add an available measurement to the Current Measurement List, complete these steps:

1. Tap the **uSmart3200T** name at the top left of the screen.
2. Tap the **Setup** button.

   The Setup window opens.
3. Tap the **Measurements** tab.

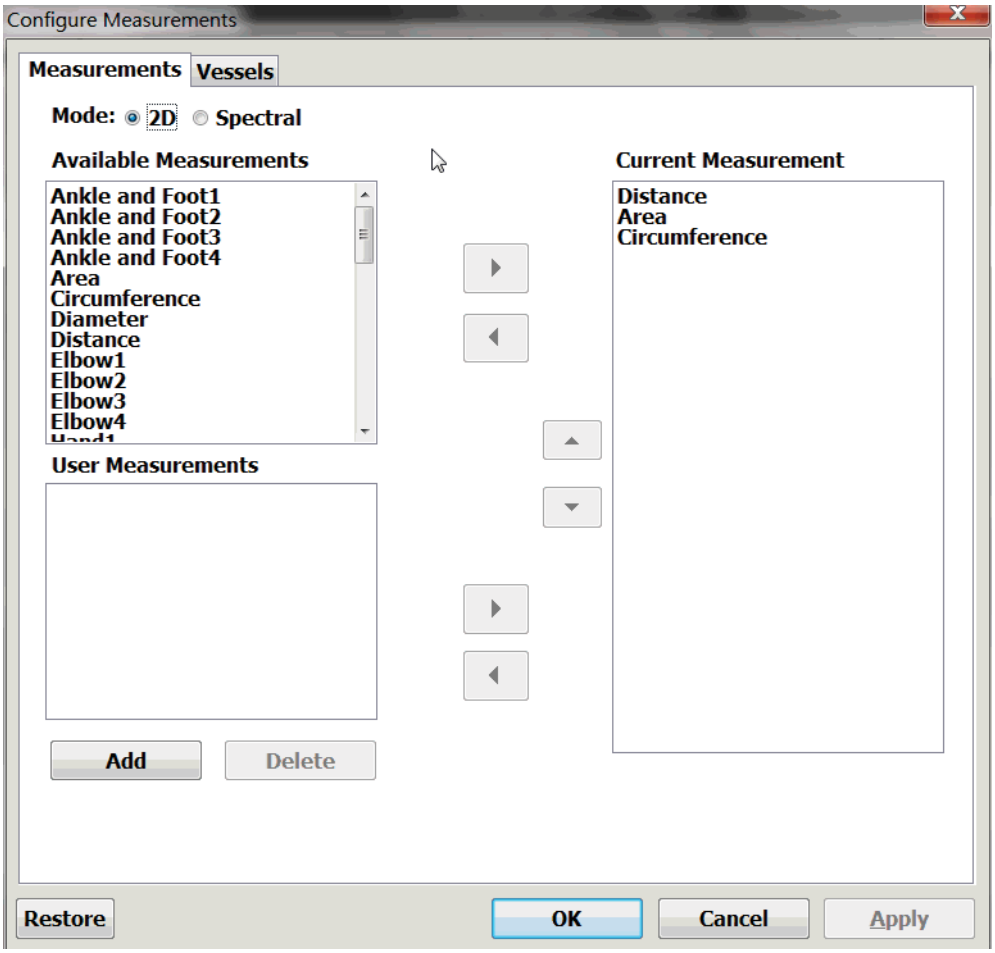
   The Setup/Measurements window opens.



Setup/Measurements Window

4. Tap **Configure Measurements**.

   The Configure Measurements window opens.



Configure Measurements Window

5. To configure the Spectral Doppler measurement sets, tap **Spectral**. Otherwise, proceed to the next step.
6. In the Available Measurements area, select the desired **measurements**.
   - **To select a sequence of measurements**, drag out the keyboard hidden at the left side of the screen and tap the Shift key, then tap the first and last measurements.
   - **To select multiple measurements that are not in sequence**, drag out the keyboard hidden at the left side of the screen and tap the Ctrl key, then tap the desired measurements.
7. Tap the **right-pointing arrow** button.

   The selected measurements are added to the Current Measurement List.
8. Tap **OK**.
9. On the Setup/Measurements window, tap **OK** (or **Apply**, if you need to add custom measurements).

To add a custom measurement to the Current Measurement List, complete these steps:

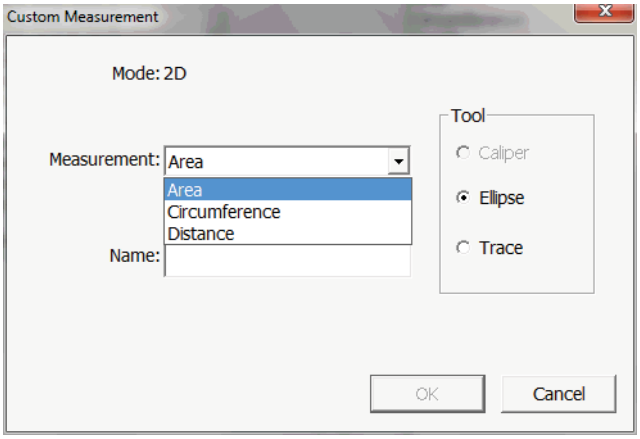
1. Tap the **uSmart3200T** name at the top left of the screen.
2. Tap the **Setup** button.

   The Setup window opens.
3. Tap the **Measurements** tab.

   The Setup/Measurements window opens. (See Setup/Measurements Window on page 103.)
4. Tap **Configure Measurements**.

   The Configure Measurements window opens. (See Configure Measurements Window on page 104.)
5. Tap **Add**.

   The Custom Measurement window opens.

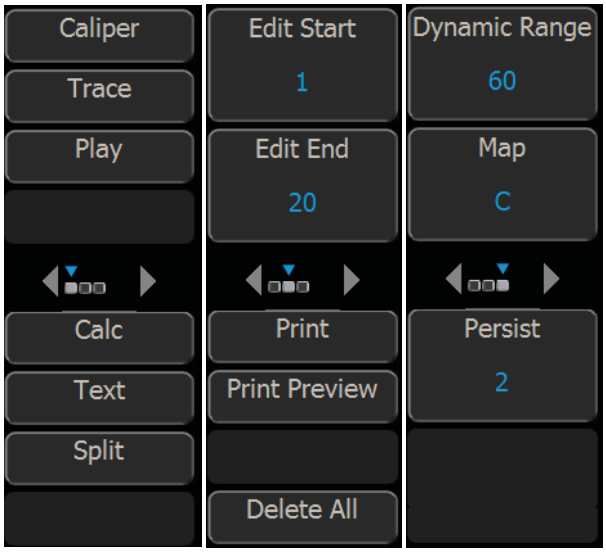


Custom Measurement Window

6. In the **Measurement:** menu, select a measurement type.
7. In the **Name:** field, enter a name for the custom measurement.
8. Select the **tool** used for the custom measurement by tapping the appropriate radio button.
9. Tap **OK**.
10. In the User Measurements area of the Configure Measurements window, tap the **new measurement** to select it.
11. Tap the **right-pointing arrow** button.
12. Tap **OK**.
13. On the Setup/Measurements window, tap **OK**.

Measuring in the 2D Window

When you freeze a 2D scan, the Terason software displays buttons for measuring, printing, and playing loops in 2D mode.



2D Mode Measure Buttons (When Scan is Frozen)

The Measure function in the 2D window allows:

- Measuring Distances; see page 106
- Measuring Elliptical Circumference and Area; see page 107
- Tracing Areas on the Image; see page 109
- Split-Screen Measurements; see page 110

In general, select what you want to measure from the menu of measurements. If you select a specific measurement, such as Area, only the buttons that work with that measurement are available.

Measuring Distances

To measure a distance in the 2D window, complete the following steps:

1. If the image is live, tap the **Freeze** button.

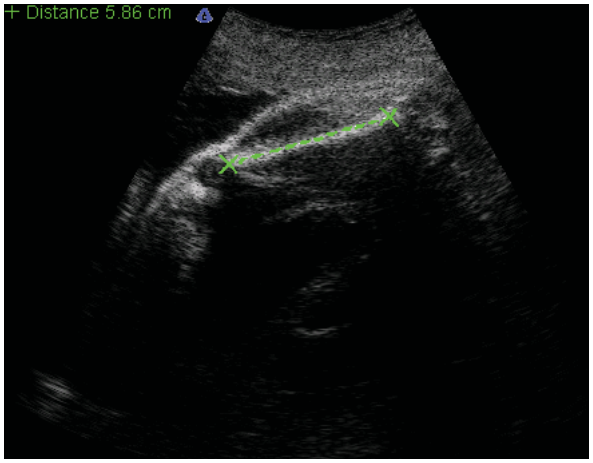
   The image freezes and the button controls change.

2. To measure a detailed area with precision, use the **Zoom** function (see Enlarging an Area of the Image on page 55) to enlarge an area of the 2D scan.

3. Tap the **Caliper** button.

4. Tap where you want to **start** measuring, move the target cursor, and tap where you want to **finish** measuring.

   The Terason software displays the results in the top left corner of the 2D window.



Distance Measurement on an Image

If you do not see the measurement value, select Setup > General > Measurement Value.

To make more than one measurement of the same type on an image, tap the appropriate button again, then make the additional measurement.

When making a series of 2D measurements using the Caliper button, you can keep the caliper active by checking the Keep caliper active box on the Setup/Measurements window (see Setup/Measurements Window on page 103). When the box is checked, a new caliper cursor appears when you set the end point of a caliper measurement. When you finish making measurements, save the image, then tap the Freeze button to turn off caliper measuring.

Measuring Elliptical Circumference and Area

You can use either the Ellipse button or the Trace button to measure a circumference on the image. To measure an oval area, use the Ellipse button. To measure the area of an irregular shape, use the Trace button. See Tracing Areas on the Image on page 109 for instructions on using the trace tool.

To measure a small area, use the Zoom function before you measure.

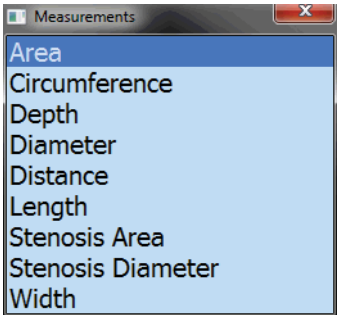
To use the ellipse tool to measure an elliptical area, complete the following steps:

1. If the image is live, tap the **Freeze** button.

   The image freezes and the button controls change.

2. Tap the **Calc** button.

   The Measurements menu opens.



Measurements Menu

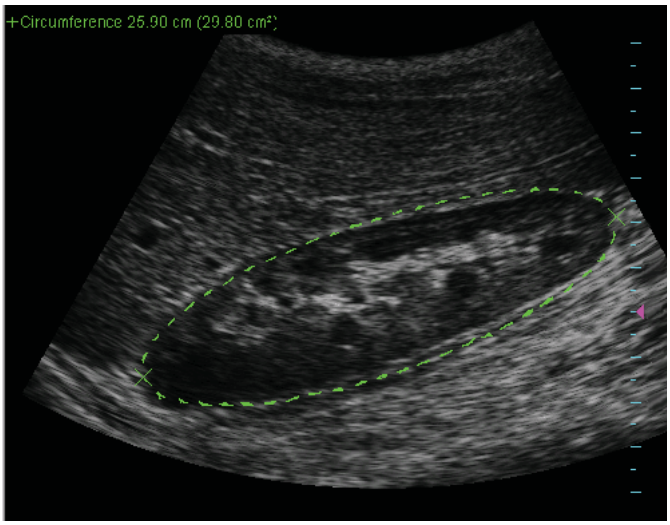
3. Select the **measurement type** by tapping it in the Measurements menu.

   If you select Circumference from the Measurement menu, the Ellipse tool is automatically activated.

4. Position the target cursor at **one end** of the area that you want to measure and tap.

5. Move the target cursor to the **other end** of the desired area, and tap.

   The Terason software displays a green line and shows the circumference or area values at the top of the image.



Ellipse Measurement on an Image

   If the measurement value does not show on your computer, select Setup > General > Measurement Value.

6. When the measurement is correct, tap the **measurement** to lock it in place.

   You cannot change a measurement after locking it in. You can now make another measurement without deleting the measurements you've locked in.

7. To save the measurements, tap the **Store button.**

   The image is saved with all measurements.

Tracing Areas on the Image

The Terason software lets you measure an area by tracing the contour of any shape on an image. You can also use the Ellipse tool to measure an area (see Measuring Elliptical Circumference and Area on page 107 for instructions.)

You can use the trace tool to:

- Trace an irregular shape by sketching the outline
- Draw a polygon by tapping on corners of the shape

You can also combine these methods to trace an area on the image.

To trace an area on an image, complete the following steps:

1. If the image is live, tap the **Freeze button**.

   The image freezes and the button controls change.

2. Use one of the following methods to select **the trace tool**:

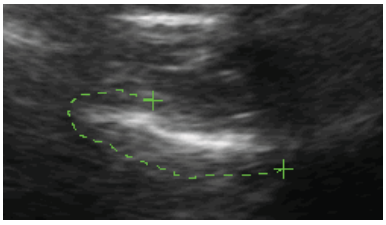
   • Tap the **Trace** button.

   • Select **Area** from the Measurement menu.

3. To **trace an outline**:

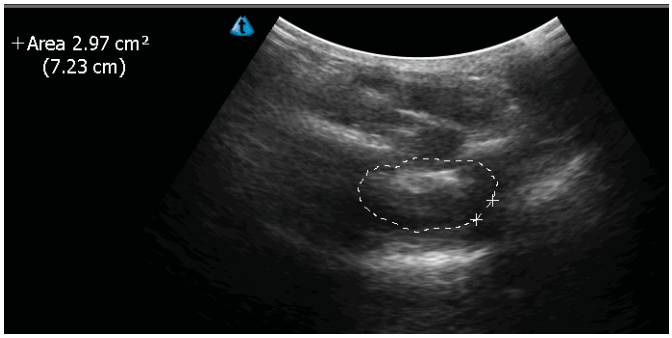
   a. Tap where you want to **start** measuring.

   b. Drag the tracing cursor around the object you want to trace.



Tracing an Outline

   c. When your trace is nearly complete, **lift the stylus**, and the software completes the loop by drawing a straight line from the current cursor position to the starting point.



Trace Measurement on an Image

   When you lift the stylus, the trace turns white, and can no longer be edited. Before you lift the stylus, you can reverse the track of the cursor to delete parts of the trace.

Split-Screen Measurements

When measuring in Split Screen mode (see Working With Split Screen Mode on page 57), all measurements are displayed in a single list, even if both screens contain measurements.

You can make a measurement on either screen or across both screens.

To make alternating measurements on split screens, you must Disable Return to live imaging:

1. Tap the **uSmart3200T** name at the top left of the screen.
2. Tap **Setup**.
3. Tap the **Display tab**.
4. Tap **Return to live imaging on toggle active screen**, so that the box is not checked.
5. Tap **OK**.

This allows you to make a measurement on one screen, switch to the other screen and make a measurement there, then return to the first screen and make additional measurements. If the box in the Setup/Display window is checked, returning to the first screen makes it live and erases all measurements on it.

To make a measurement across both screens:

1. Disable Return to live imaging, as described above.
2. **Freeze a scan** on one screen.
3. Tap the **Toggle Screen** button.
4. **Freeze a scan** on the other screen.
5. Tap the **measuring tool button** for the tool you need.
6. Tap the **start point** of the measurement.
7. Tap the **end point** of the measurement.
8. **Lift the stylus**.

Measuring in the M-Mode Window

When you freeze an M-mode scan, the Terason software displays buttons for measuring, printing, and playing loops in M-mode.

M-Mode Measure Buttons (When Scan is Frozen)

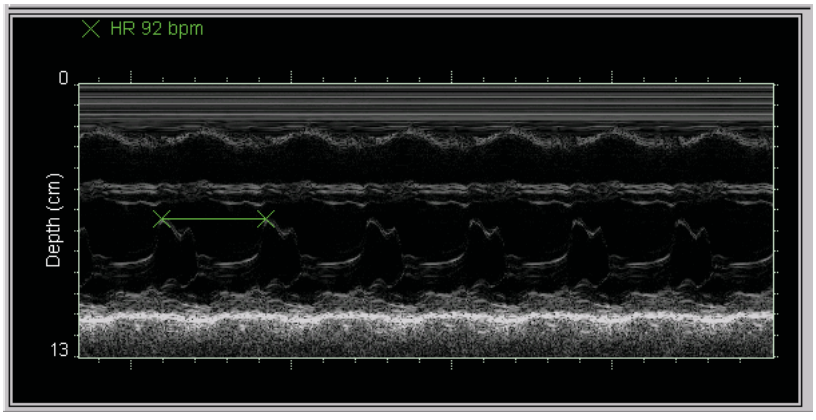
Making M-Mode Measurements

In the Time Series window of an M-Mode scan, you can measure:

- Heart rate (HR)
- Distance (includes time over distance [TD] and Slope values)

To measure in the M-Mode Time Series window, complete the following steps:

1. Tap the **Freeze button**.
2. Use the buttons to select a **measurement type**.
3. Tap the target cursor where you want to **start** measuring.
4. Move the target cursor and tap at the desired **end** location. The measurement displays at the top left of the Time Series window.



M-Mode Measurement

5. **Print and save** the image, if required.

Measuring in Spectral Doppler Modes

When you freeze a Pulsed-Wave Doppler or Triplex scan, the Terason software changes the buttons to allow measurement, printing, and other functions.

PWD Measurement Buttons

The Measurement section of the panel controls the following measurement operations:

- Velocity
- Time
- Slope
- Calc

You can use the CA (correction angle) button and the 0/+-60 button to adjust the angle on the frozen scan. This function works the same as the Correction Angle on the PWD tab as described in Adjusting the Correction Angle on page 78.

If you have added 2D measurements to the Spectral measurement set (see Customizing Measurement Sets on page 103), you can perform 2D measurements in Spectral Doppler imaging screens.

To make 2D measurements on Spectral Doppler imaging screens, tap the Calc button. Any 2D measurements you have added to the Spectral measurement set appear in a Measurements menu at the top right corner of the imaging screen. See Measuring in the 2D Window on page 106 for instructions in making 2D measurements.

Deleting Measurements

You can delete the most-recent measurement, or you can delete all measurements on the current image.

To delete the most recent measurement, tap the Delete button.

To delete all measurements, tap the Clear All button.

Restoring All Measurement Groups to Defaults

To restore all measurement groups to the defaults:

1. Tap the **uSmart3200T** name at the top left of the screen.
2. Tap **Setup**.
3. Tap the **Measurements** tab.
4. Tap the **Configure Measurements...** button.
5. Tap the **Restore** button.
6. Tap **OK**.