

## 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 softkey controls. For example, if you scanned in 2D mode, when you freeze the image, the softkeys 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:

- [Measurement Results Display Location](#) on page 107
- [Measurement Sets](#); see page 108
- [Measuring in the 2D Window](#); see page 110
- [Measuring in the M-Mode Window](#); see page 115
- [Measuring in Spectral Doppler Modes](#); see page 116
- [Deleting Measurements](#); see page 117
- [Restoring All Measurement Groups to Defaults](#); see page 117

You can also make measurements on both screens when using Split Screen mode. See [Split-Screen Measurements](#) on page 115.

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
- Press the Delete softkey
- Press the Clear All softkey

### 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, press the Results softkey. 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 108
- [Customizing Measurement Sets](#) on page 108
- [Setting Measurement Defaults](#) on page 168

### Default Measurement Sets

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

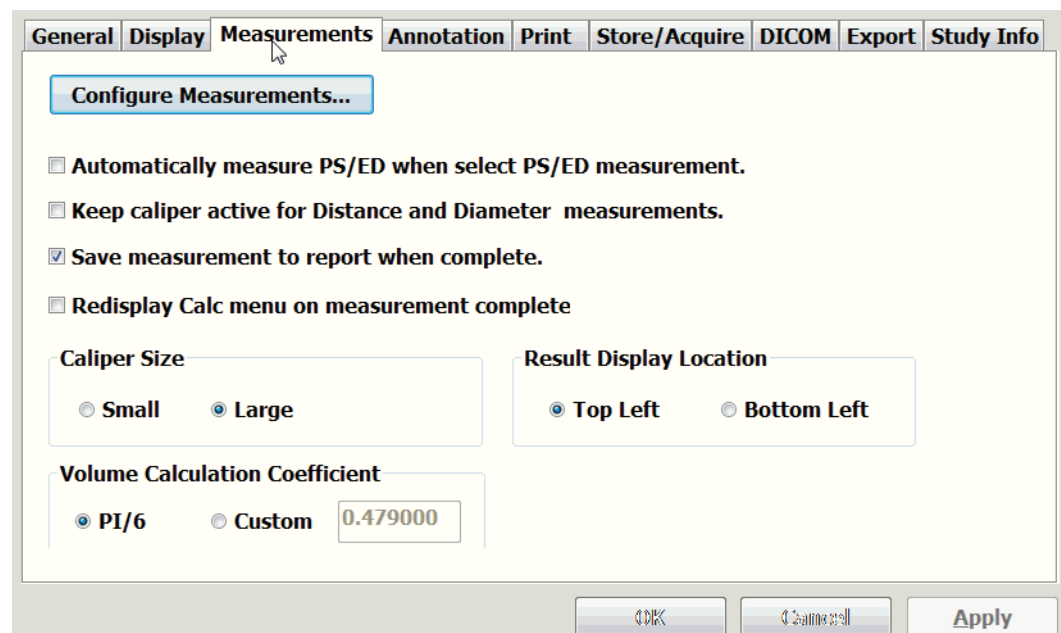
**To select a measurement type**, press the Calc softkey, and click the desired measurement.

### 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:

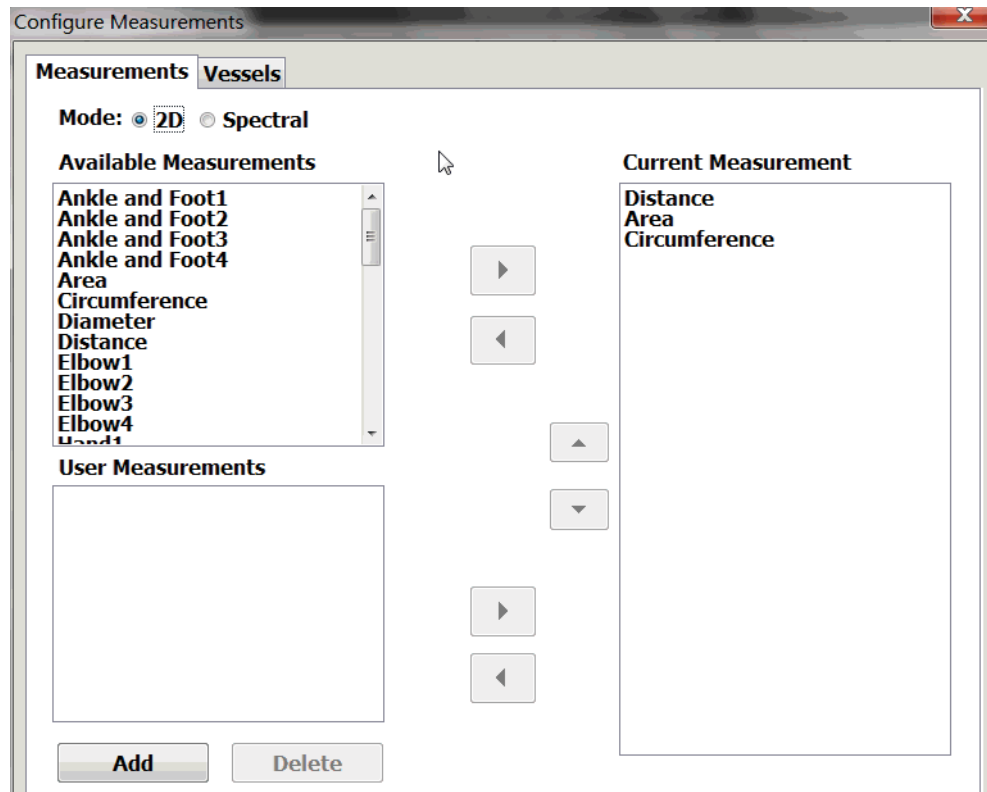
1. Click the **Setup** button.  
The Setup window opens.
2. Click the **Measurements** tab.  
The Setup/Measurements window opens.



Setup/Measurements Window

3. Click **Configure Measurements**.

The Configure Measurements window opens.



**Configure Measurements Window**

4. To configure the Spectral Doppler measurement sets, click **Spectral**. Otherwise, proceed to the next step.
  5. In the Available Measurements area, select the desired **measurements**.
    - **To select a sequence of measurements**, click the first measurement, press and hold the Shift key, then click the last measurement in the sequence. The first and last measurement and all the ones in between are selected.
    - **To select multiple measurements that are not in sequence**, press and hold the Control key, then click each of the desired measurements. The measurements you clicked when the Control key was down are selected.
  6. Click the **right-pointing arrow** button.
 

The selected measurements are added to the Current Measurement List.
  7. Click **OK**.
  8. On the Setup/Measurements window, click **OK** (or **Apply**, if you need to add custom measurements).
- To add a custom measurement to the Current Measurement List**, complete these steps:
1. Click the **Setup** button.
 

The Setup window opens.

2. Click the **Measurements** tab.

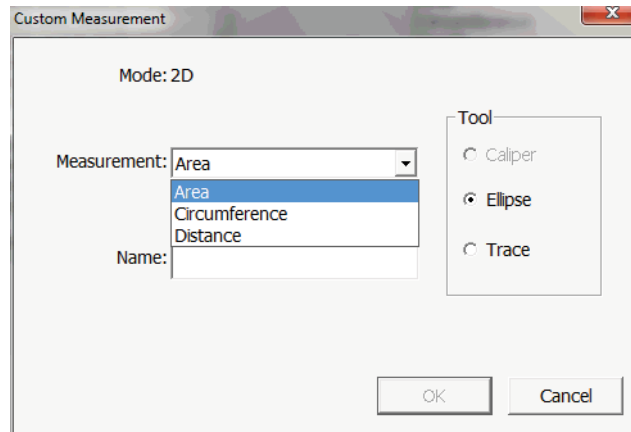
The Setup/Measurements window opens. (See [Setup/Measurements Window](#) on page 108.)

3. Click **Configure Measurements**.

The Configure Measurements window opens. (See [Configure Measurements Window](#) on page 109.)

4. Click **Add**.

The Custom Measurement window opens.

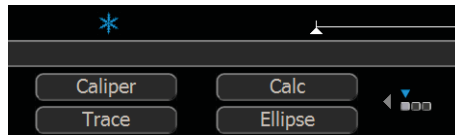


#### Custom Measurement Window

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

## Measuring in the 2D Window

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



### 2D Mode Measure Softkeys (When Scan is Frozen)


The Measure function in the 2D window allows:

- [Measuring Distances](#); see page 111
- [Measuring Elliptical Circumference and Area](#); see page 112
- [Tracing Areas on the Image](#); see page 113
- [Split-Screen Measurements](#); see page 115

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

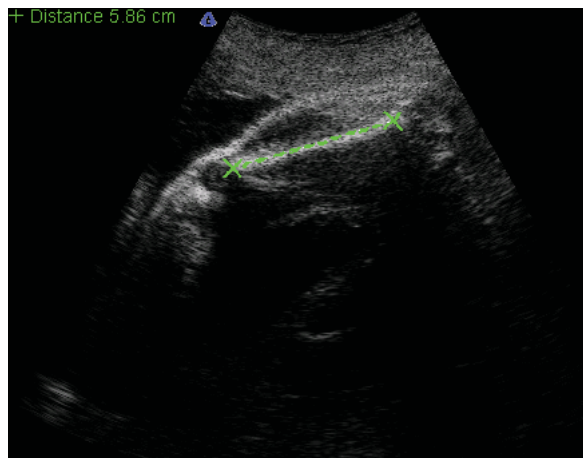
## Measuring Distances

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

1. If the image is live, press the **Live/Freeze** key .
 

The image freezes and the softkey controls change.
2. To measure a detailed area with precision, use the **Zoom** function (see [Enlarging an Area of the Image](#) on page 52) to enlarge an area of the 2D scan.
3. Press the **Caliper** softkey.
4. Click where you want to **start** measuring, move the target cursor, and click 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, press the appropriate softkey again, then make the additional measurement.


**When making a series of 2D measurements using the Caliper softkey**, you can keep the caliper active by checking the Keep caliper active box on the Setup/Measurements window (see [Setup/Measurements Window](#) on page 108). 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 press the Live/Freeze key to turn off caliper measuring.

## Measuring Elliptical Circumference and Area

You can use either the Ellipse softkey or the Trace softkey to measure a circumference on the image. To measure an oval area, use the Ellipse softkey. To measure the area of an irregular shape, use the Trace softkey. See [Tracing Areas on the Image](#) on page 113 for instructions on using the trace tool.

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

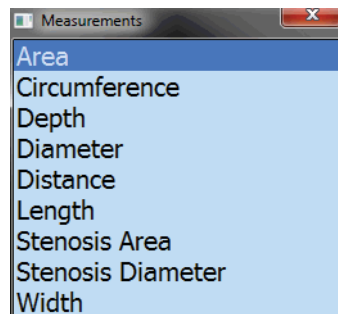
**To use the ellipse tool to measure an elliptical area**, complete the following steps:

1. If the image is live, press the **Live/Freeze** key .

The image freezes and the softkey controls change.

2. Press the **Calc** softkey.

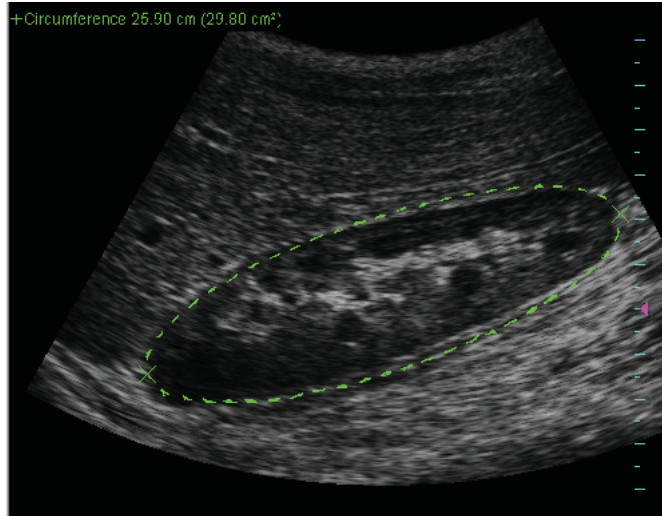
The Measurements menu opens.



### Measurements Menu



3. Select the **measurement type** by clicking 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 click.
5. Move the target cursor to the **other end** of the desired area, and click.

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. To adjust the other axis of an ellipse, press the **Trackball Arbitration key**  so that Axis is highlighted (above the softkey display), then use the trackball to adjust the width of the ellipse.
7. When the measurement is correct, press the **Left key** 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.
8. To save the measurements, press the **Save Image key** .

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 112 for instructions.)

You can use the trace tool to:

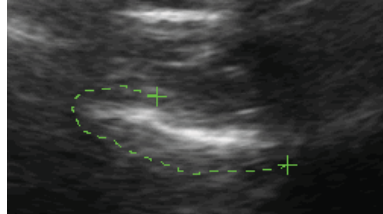
- Trace an irregular shape by sketching the outline
- Draw a polygon by clicking on corners of the shape

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

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

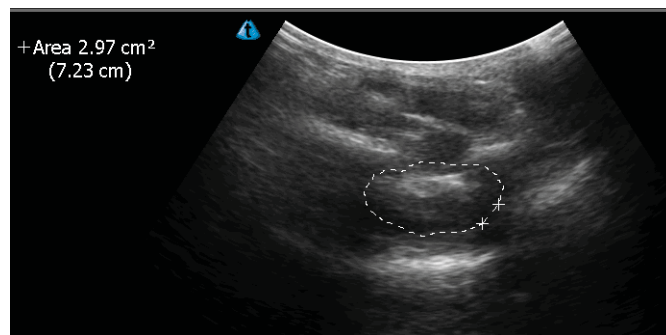
1. If the image is live, press the **Live/Freeze key** .  
The image freezes and the softkey controls change.
2. Use one of the following methods to select **the trace tool**:

- Press the **Trace** softkey.
  - Select **Area** from the Measurement menu.
3. To **trace an outline**:
    - a. Click where you want to **start** measuring.
    - b. Use the **trackball** to drag the tracing cursor around the object you want to trace.




Tracing an Outline

- c. When your trace is nearly complete, press the **Left button**, 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 press the Left key, the trace turns white, and can no longer be edited. Before you click the Left key, you can reverse the track of the cursor to delete parts of the trace.

4. To **edit the uncompleted trace**:
  - a. Press the **Trackball Arbitration key** , so that Erase is highlighted above the Softkey display.
  - b. Use the **trackball** to erase the unwanted part of the trace, from most recent back toward the beginning.
  - c. When all the unwanted parts of the trace are erased, press the **Trackball Arbitration key** again that Draw is highlighted above the Softkey display.
  - d. Use the **trackball** to finish the trace.
  - e. Press the **Left key** to complete the trace.

## Split-Screen Measurements

When measuring in Split Screen mode (see [Working With Split Screen Mode](#) on page 54), 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. Click **Setup**.
2. Click the **Display** tab.
3. Click **Return to live imaging on toggle active screen**, so that the box is not checked.
4. Click **OK**.

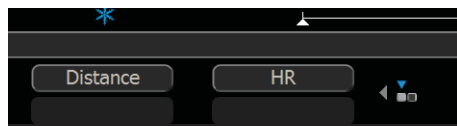
This allows you to make a measurement on one screen, switch to the other screen and make a measurement there, then return to the first screen and make additional measurements. If the box in the Setup/Display window is checked, returning to the first screen makes it live and erases all measurements on 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. Press the **Toggle Screen** softkey.
4. **Freeze a scan** on the other screen.
5. Press the **measuring tool softkey** for the tool you need.
6. Click the **start point** of the measurement.
7. Click the **end point** of the measurement.
8. Press the **Left key**.

## Measuring in the M-Mode Window

When you freeze an M-mode scan, the Terason software displays softkeys and a Gain Knob menu for measuring, printing, and playing loops in M-mode.




M-Mode Measure Softkeys (When Scan is Frozen)

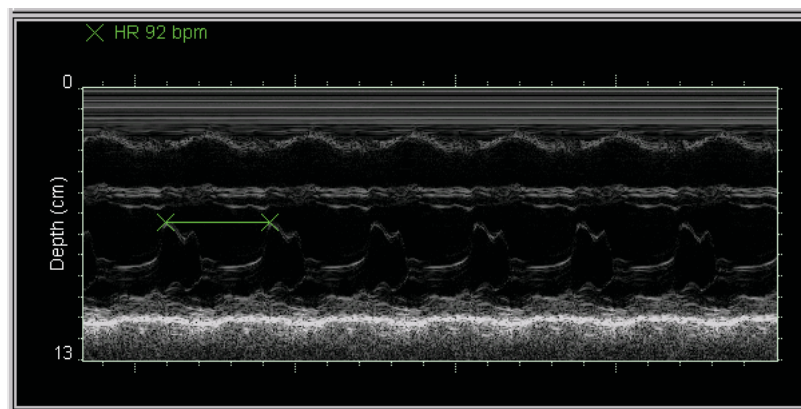
## Making M-Mode Measurements

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. Press the **Live/Freeze key** .
2. Use the softkeys to select a **measurement type**.
3. Click the target cursor where you want to **start** measuring.
4. Move the target cursor and click at the desired **end** location. The measurement displays at the top left of the Time Series window.

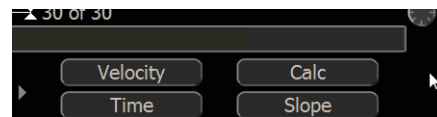


**M-Mode Measurement**

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 softkeys to allow measurement, printing, and other functions.



**PWD Measurement Softkeys**

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

- Velocity
- Time
- Slope
- Calc

You can use the CA (correction angle) softkey and the 0/+60 softkey 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 108), you can perform 2D measurements in Spectral Doppler imaging screens.

**To make 2D measurements on Spectral Doppler imaging screens**, press the Calc softkey. 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 110 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**, press the Delete softkey.

**To delete all measurements**, press the Clear All softkey.

## Restoring All Measurement Groups to Defaults

**To restore all measurement groups to the defaults:**

1. Click **Setup**.
2. Click the **Measurements** tab.
3. Click the **Configure Measurements...** button.
4. Click the **Restore** button.
5. Click **OK**.