P-Wave Quick Start Guide

Introduction

The P-wave velocity gantry measures the speed at which ultrasonic sound waves pass through materials that are placed between its transducers; this includes section halves, discrete samples, and mini-cores.
The three orthogonal sets of piezoelectric transducers allow the velocity to be determined in the X-, Y-, and Z-directions on working-half split-core sections. The P-wave bayonets (PWBs) measure the velocity along the core (Z-direction) and across the split-core face (Y-direction), and a P-wave caliper (PWC) measures the velocity perpendicular to the split-core face (X-direction) (*Figure 1*).
For discrete sample cubes, the velocity is measured along each of the three axes separately using the PWC. Mini-cores are measured along the axis of the cylinder (X-direction).
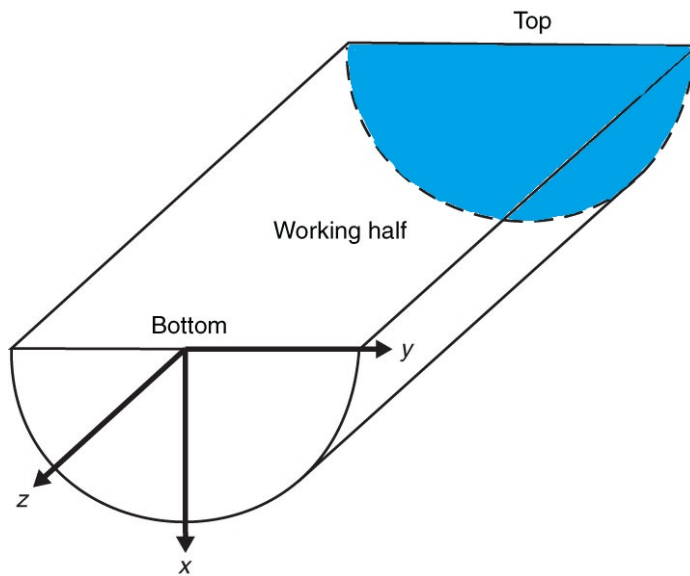

Figure 1. Core section-half liner showing top of section and relative orientations.

For further information see the User Manual or ask the Physical Properties Technician.

Procedures

• Preparing the Instrument

CAUTION: DO NOT place anything, including samples, on the track below the instruments before opening the program. The program will lower all transducers upon startup, and **CAN CAUSE SEVERE INJURY**.

1. Double-click the **MUT** icon on the desktop (Figure 2a) and login using ship credentials. For more information on data uploading see the "Uploading Data to LIMS" section below.

2. Double-click the **IMS** icon (Figure 2b). IMS initializes the instrument and checks the movement of the the three instruments. Once initialized, the logger is ready to measure the first sample.

(a) MegaUploadaTron (b) IMS

Figure 2. (a) MUT Icon. (b) IMS Icon.

• Preparing Samples

1. Make sure the sensors are clean.
2. For section halves, place the desired measurement location underneath the desired sensor. Make sure that the section is oriented with the blue end-cap towards the laser (*Figure 3*).
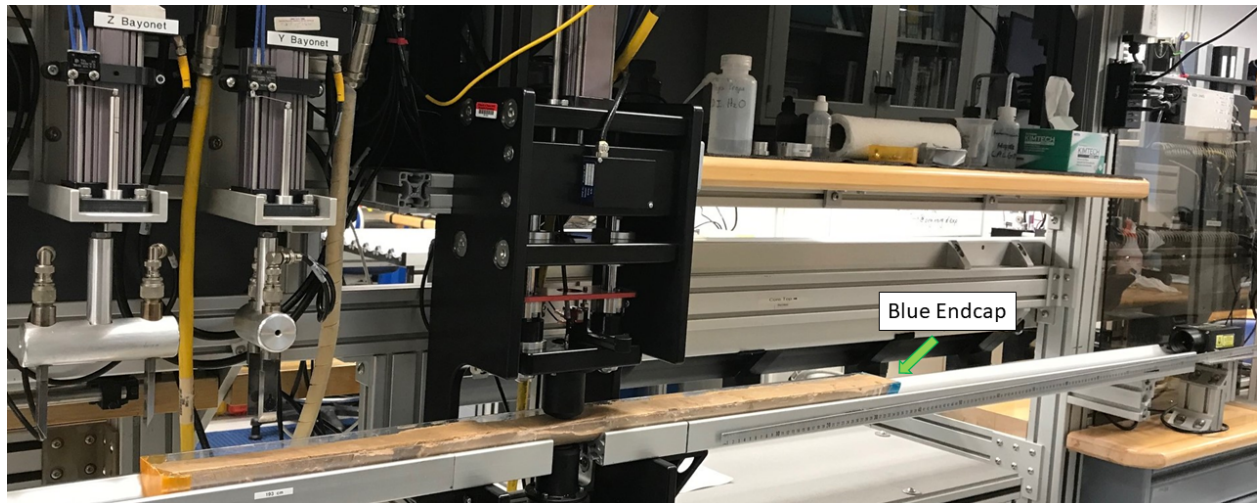

Blue Endcap

Figure 3. Correct core position.

3. Place a small piece of Glad Wrap at the measurement location to keep the caliper sensor clean and the core free of contamination (including water).

4. Place one or two drops of deionized (DI) water at sample/sensor interface. It will improve the signal transmission.

5. For discrete samples, place them within the caliper transducers with the desired axis oriented vertically.

• Making a Measurement

1. Select the measurement type. Seven different measurement configurations are available (*Figure 4*). Currently measures to whole round sections are not available.
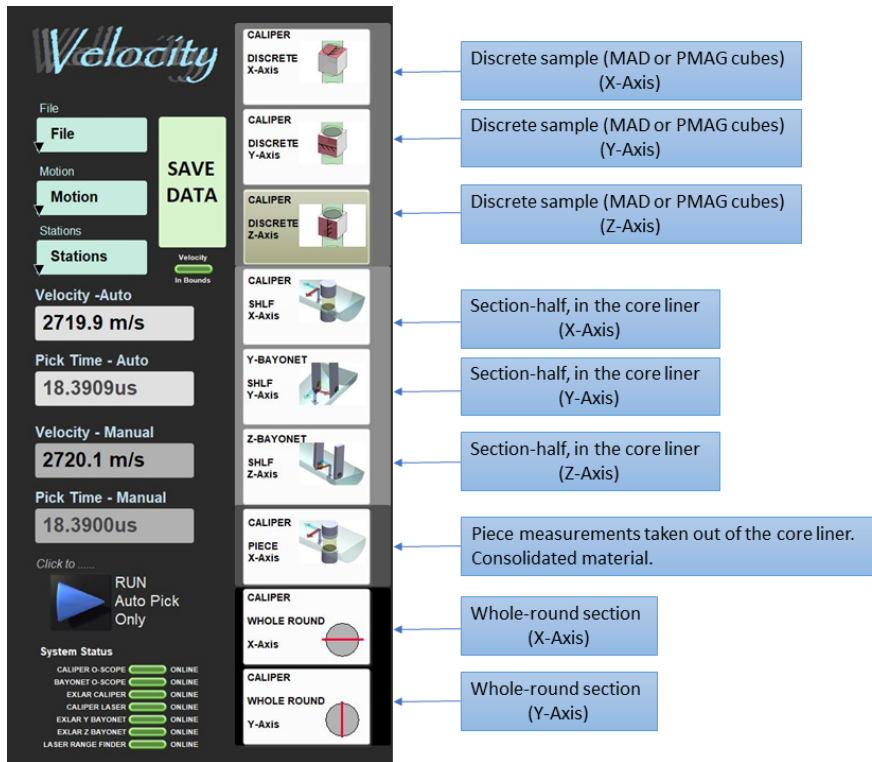
Figure 4. *Measurement Configuration Options*

2. Depending on which measurement, insert the bayonets into or close the caliper onto the sample. Click the instrument motion buttons to slowly lower the transducers to the sample (*Figure 5*). Alternatively, use auto close. Auto close button functions for either the caliper or the bayonets.
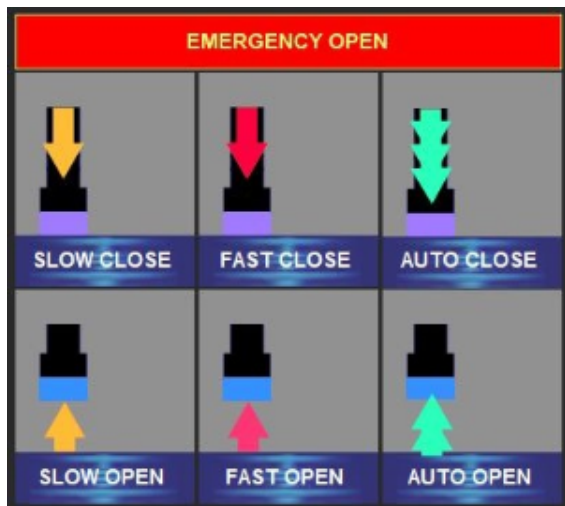

Figure 5. GANTRY motion buttons.

Note: Insert the bayonets until the entire sensor (black dot) is within the sample. Stop before the bayonets make contact with the liner.

3. The program continually updates the velocity calculation and displays the value (Average of stack set) in the **Velocity-Auto** box (*Figure 6*).
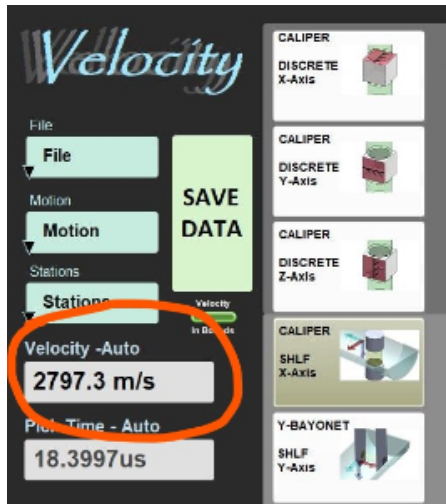
Figure 6. Data display on Velocity-Auto box.

Program also displays a signal graph with a red vertical auto-pick location line (*Figure 7*), where the program's algorithm has placed the first arrival wave.
Note: Typical slide bar settings are 100 for the stack bar and10mV for the threshold bar.
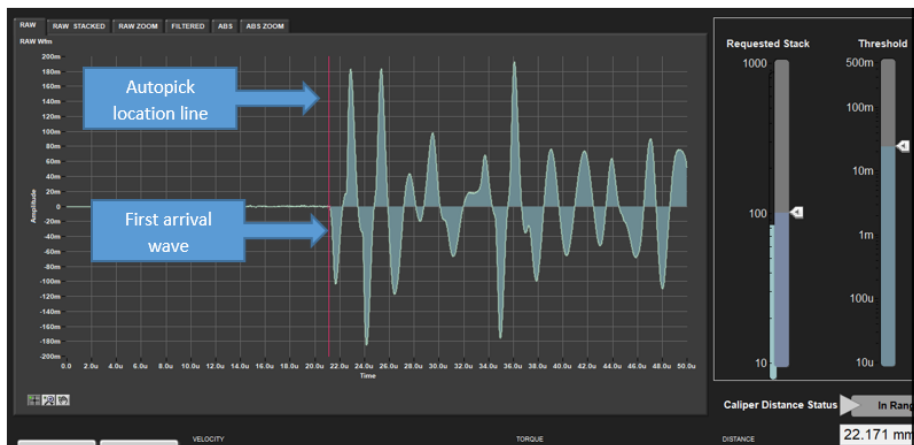

Figure 7. Clean waveform indicating a strong/good signal.

4. Click **Save Data**

Note: If the velocity is out of the expected range, or the pick location is not near to or at the first arrival wave, contact the PP technician.

5. The **Sample Information** screen is displayed.

6. Place the cursor in the **SCAN** field and scan the section label. **SAMPLE ID** and **LIMS ID** automatically fills. This ID tag contains sample information, site, hole, core, section number and length.

   Additional entry field options are the **LIMS** and **MANUAL** tabs.

7. Check that the test offset data is correct for section halves. If you are measuring a discrete sample, the offset is already in the database.

8. Click **Save Data.**

9. All instrument data (density, magnetic susceptibility, Pwave velocity) are stored in **C:\DATA\IN**.

10. **MUT** is used to upload data to the **LIMS** database. See section "Uploading Data to LIMS" for more information on data upload.

11. Once uploaded, data is available to view on **LORE** and **LIVE**. If data is not instantly visible, please contact the PP technician.

- ## Evaluating Your Measurement

The program will automatically calculate the velocity from its auto-picked first arrival wave, display the value (*Figure 6*) and the auto-pick location line (*Figure 8*). If either of these are not expected results, follow steps A, B and C.
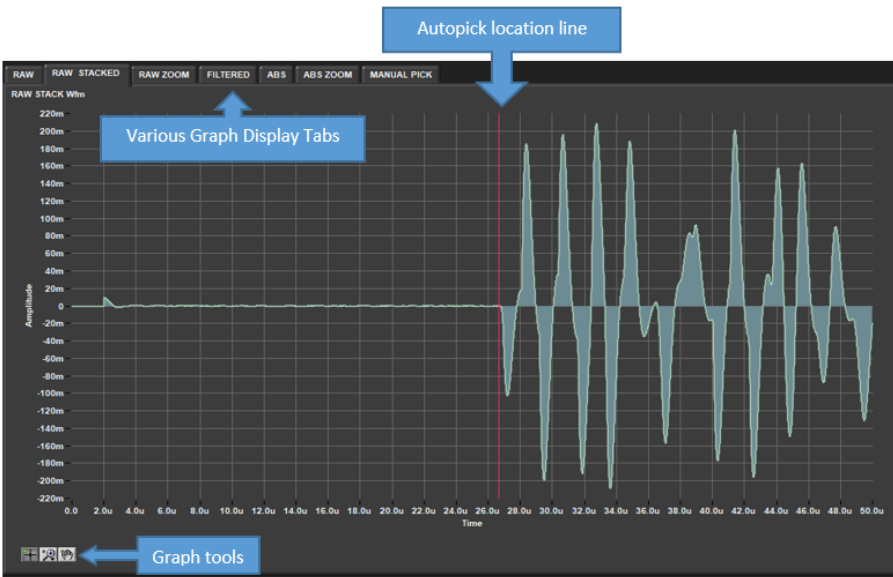

Figure 8. Raw Stacked signal display with red line indicating auto-pick location.

A) First Arrival Picking

The signal graph has several display options, all accessible by clicking on different tabs at the top. To zoom on a graph, pause the program and click on the magnifying glass in the "Graph Tools" box, *Figure 8*.

To evaluate the 'auto-pick velocity', you need to check the 'Autopick location line' (red line):

1. Go to **RAW STACKED** tab (*Figure 8*): Here you see the stacked measurements display. If the red line appears near the first significant deviation from 0 on the Y-Axis, then the value is likely reliable. However, if the 'auto-pick location' is off, or the velocities don't seem right, you may need to adjust the **Threshold**, which corresponds to amplitude on the Y-Axis. It will move the 'auto-pick' location.

2. Go to **ABS ZOOM** tab (*Figure 9*): Here you see a zoomed window of the absolute (ABS) signal value. Verify that the 'auto-pick location' is at the zero crossing after the first significant wave above noise levels (not at the first arrival peak), use the **Threshold** slide bar to adjust its location. By changing the threshold value the 'auto-pick' location will change in steps and the velocity will be recalculated.

3. Check on **RAW STACKED** or other raw displays to verify the position of the red line at the first arrival wave. If satisfied, save your data. If not, you can manually pick the first arrival.

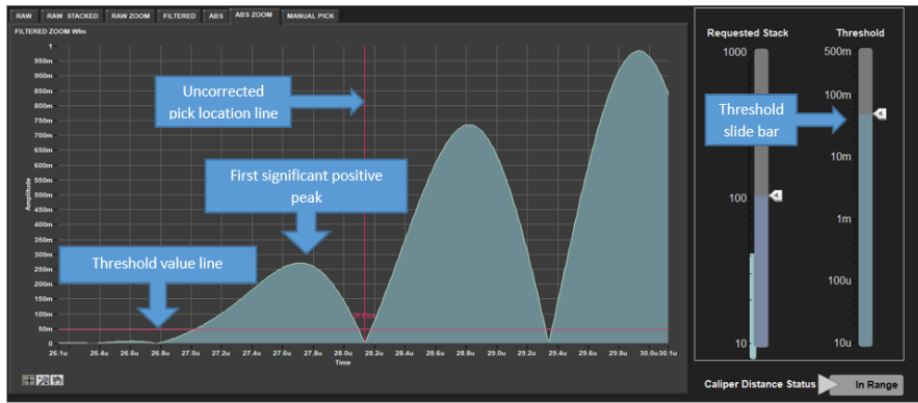Note: The program must be running for changes to apply.

Figure 9. ABS Zoom display with threshold slide bar and uncorrected auto-pick location.

B) Manual pick

1. Pause the program.
2. Select **MANUAL PICK** tab (*Figure 10*).
3. Click on the crosshair tool on the far left side of the toolbox bar. Hover over the dotted yellow-green vertical pink line. When the icon changes, click and drag the pick line to the desired location and release. The **Velocity –Manual** box will be updated with the manually picked velocity. Both the 'auto-pick' and 'manual pick velocities' are saved simultaneously to the database upload.

Figure 10. Manual Pick display with pink manual pick location.

C) Running a Standard as a QAQC Check

You can run a standard to verify if the instrument is measuring correctly. There are three materials available as a standard: Aluminum and acrylic are used on the caliper, and a core liner with D.I. water on the bayonets.

Expected velocities for each standard:
Aluminum 6295 m/s (+/- 63 m/s)
Acrylic 2730 m/s (+/- 27 m/s)
Water 1480 m/s (+/- 7 m/s)

Typical allowable deviation is 1% for the caliper and 0.5% for the bayonets. There will also be differences based on temperature, especially for water and aluminum. If the standard values are out of this range, ask a technician to help calibrate the instrument.

Uploading Data to LIMS

1. Click the **MUT** Icon. Log in using database credentials.

2. Once activated, the list of files from the **C:\DATA\IN** directory is displayed. Files are marked ready for upload by a green check mark (Figure 11).
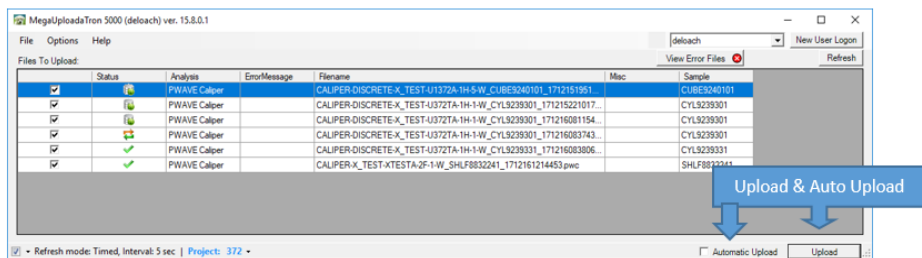

Figure 11. Main MUT screen

3. To manually upload files, check each file individually and clip **upload**. To automatically upload files, click on the **Automatic Upload** checkbox.

4. If files are marked by a purple question mark or red and white X icons, please contact a technician.
   Purple question mark: Cannot identify the file.

   Red and white X icons: Contains file errors.

5. Upon upload, data is moved to **C:\DATA\Archive**. If upload is unsuccessful, data is automatically moved to **C:\DATA\Error**. Please contact the PP technician is this occurs.

Credits

This document originated from Word document Gantry Velocity: Quick Start Guide *Version 1.0; Version 372 written by A. de Loach (2017-12-16).* Credits for subsequent changes to this document are given in the page history.

All improvements to the Quick Start Guides and User Guides are a communal effort, with honorable mention to the group of LOs, ALOs, and technicians who have helped.

Archived Versions

LMUG-P-WaveQuickStartGuide: An exported PDF version of this wiki page as of 2020-10-28.

P-Wave Quick Start Guide v2020
PWV_QSG_372.docx: A Word document of the Gantry Velocity: Quick Start Guide