Capturing the Sense of Touch!

CHAMELEON TVR SOFTWARE

For TactArray, DigiTacts & TacTile

OPERATOR'S GUIDE

PPS Advanced Real-Time Visualization & Acquisition

Last Modified on 10/4/2012

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This document provides basic instructions for using PPS's real-time visualization and acquisition software, Sapphire. It covers startup, shutdown, and basic operations such as recording data and comparing files.

TABLE OF CONTENTS

INSTALLATION/STARTUP PROCEDURE

Install Software and Drivers

Insert the provided CD into your computer and run the Chameleon installer executable program. The software and all necessary drivers will be installed automatically. A shortcut to the software will be created in your Start Menu under "Programs >> Pressure Profile Systems."

Notes: Microsoft .NET Framework 4.0 Client Profile or higher is needed to run the Chameleon software. The Chameleon installer will notify you if .NET 4 is not detected. The CD includes .NET Framework 4.0 installer in a separate file from the Chameleon installer file.

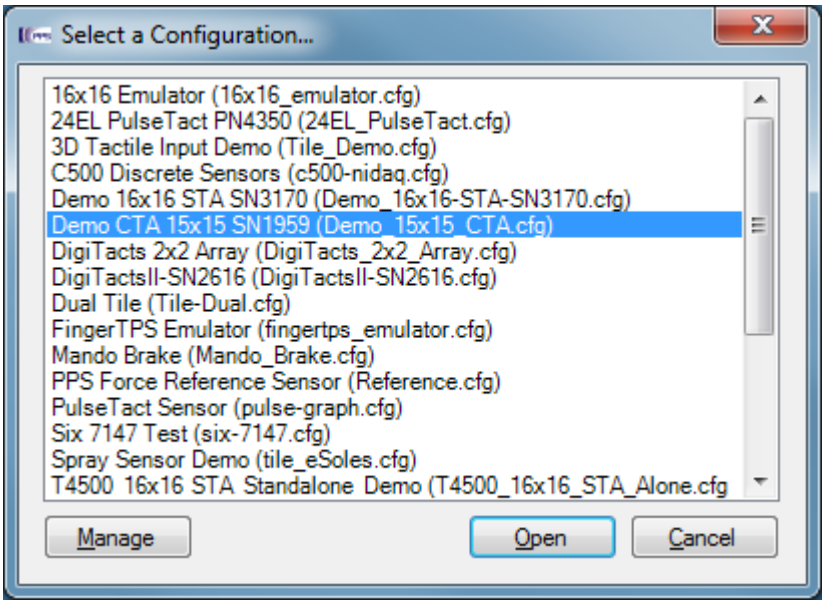
Connect Hardware

The electronics must be powered on and connected via USB to an open port on your computer before the software is started. Powering your system will vary according to the type of system you have as described below.

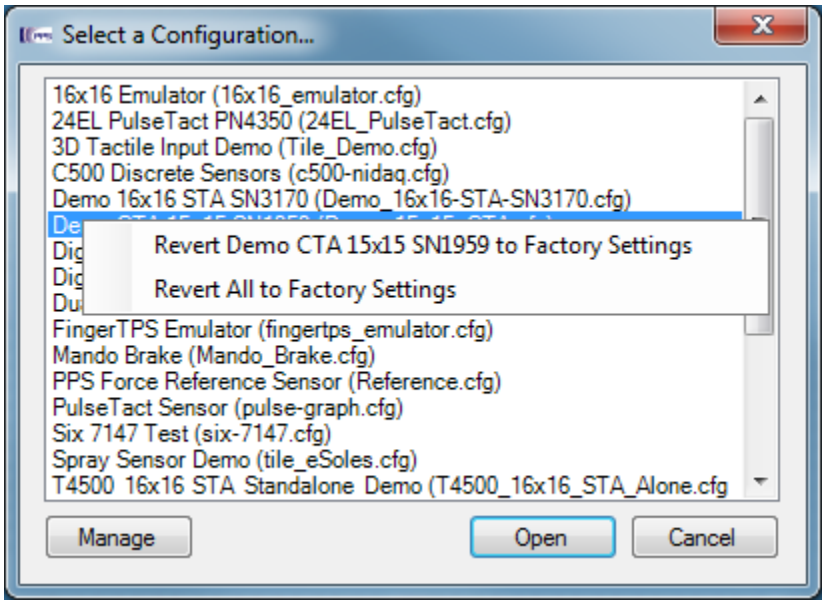
- **T3000:** Plug the electronics power cable into the provided 24VDC power supply.
- **D600/D700:** Turn on the switch located next to the USB port so that the LED on the electronics box is lit and connect the Bluetooth dongle to an open USB port prior to launching the software. The hardware recharges but does not communicate via USB connection.
- **T4000/T4500/TacTile:** Only USB connection is required.

Start Software

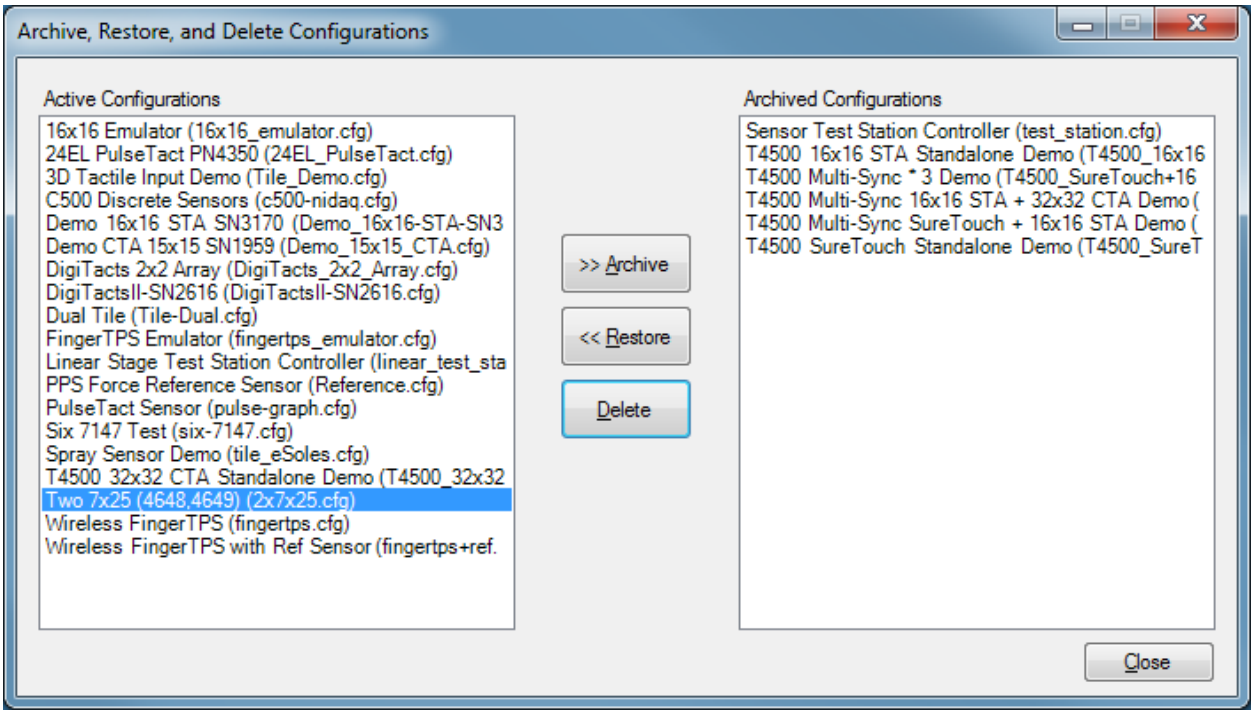
Launch the application by choosing "Chameleon TVR" from the Pressure Profile Systems program folder in your Start Menu. You will initially be prompted with a list of all configurations installed on your computer. Choose a configuration and click "Open" to connect to your hardware and begin viewing real-time data, or click "Cancel" to start Chameleon without connecting to hardware to review saved data files.



If a particular configuration is not operating correctly, it may be necessary to revert it to its factory-supplied defaults. To do this, right-click on a configuration and choose the option from the pop-up menu. You may also choose to reset Chameleon and all configurations to factory settings as well.



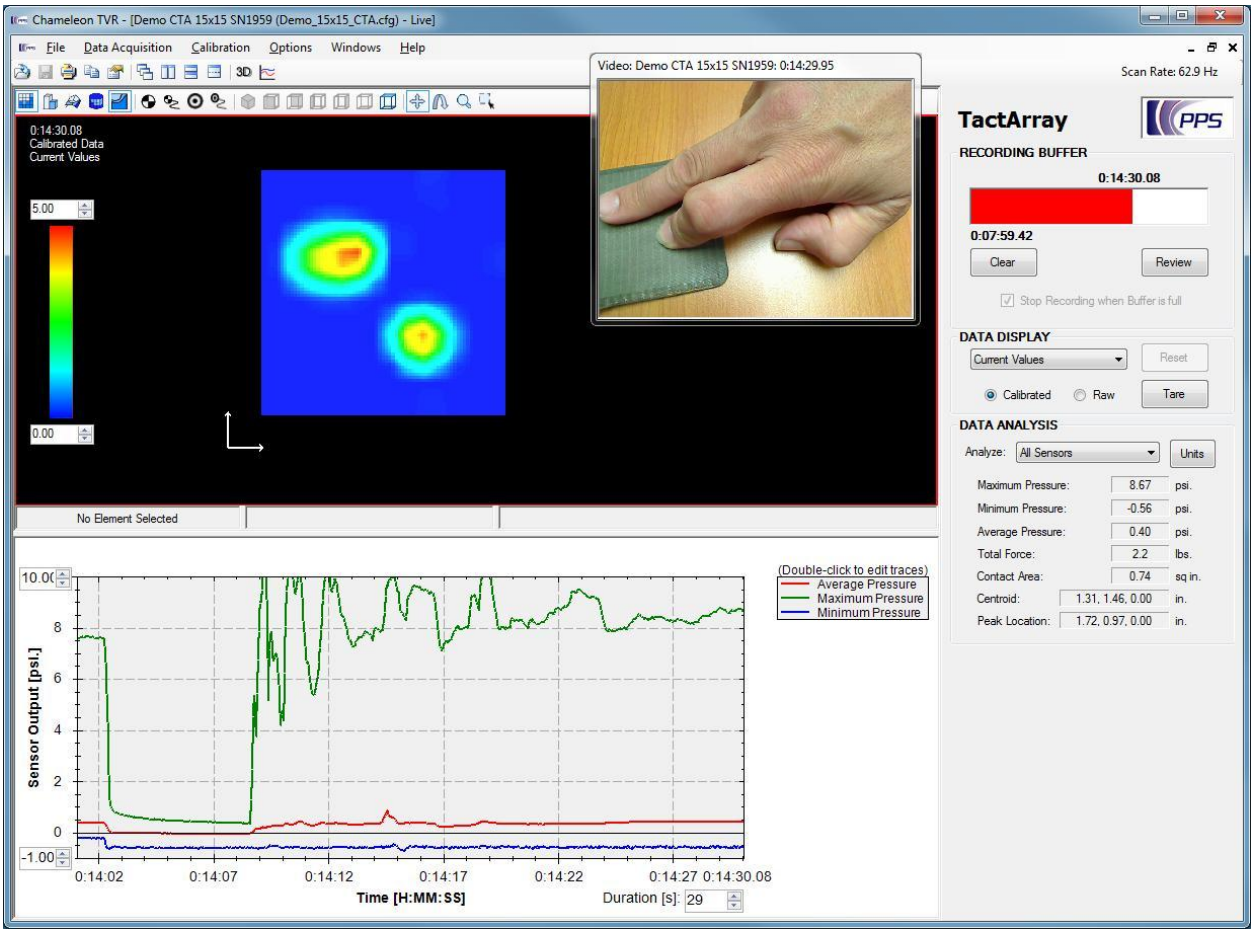
If you have a large number of configurations, you can manage them by clicking the “Manage” button:



From here you may Archive and Restore configurations or delete them entirely. Note that once a configuration is deleted it can only be restored from the original PPS installation materials.

MAIN PROGRAM SCREEN

The main program screen is divided into 6 areas:

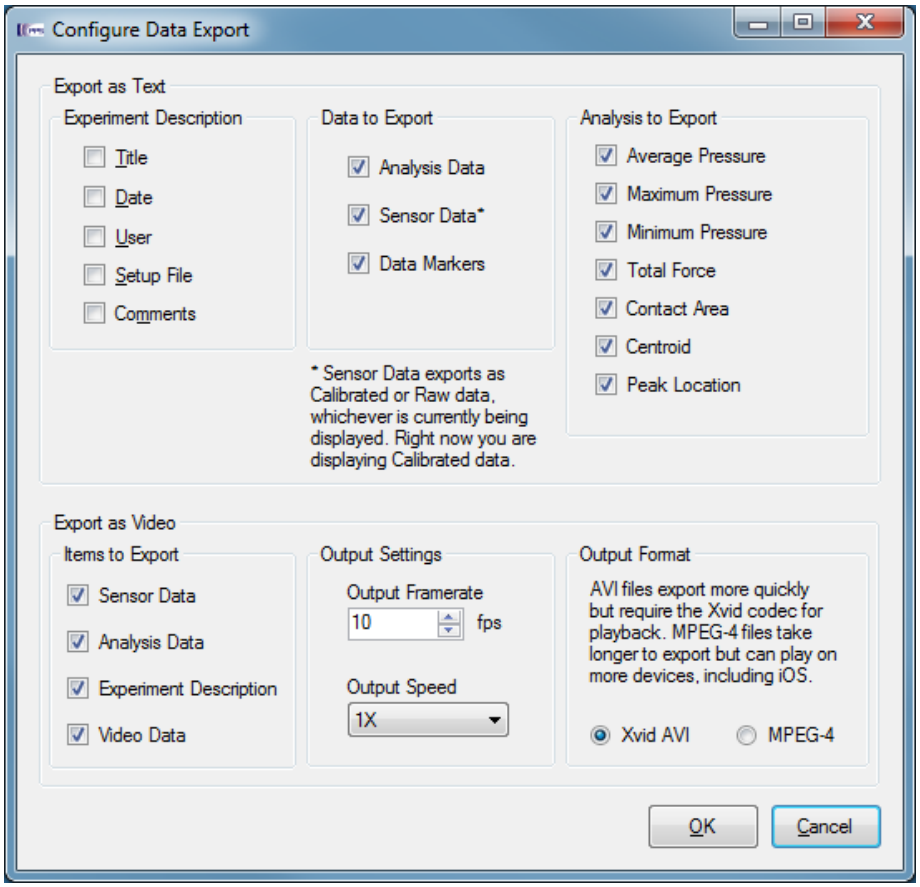


1. Menus and Toolbars
2. Sensor Display
3. Recording Buffer
4. Data Display
5. Data Analysis
6. Webcam Window (if enabled)

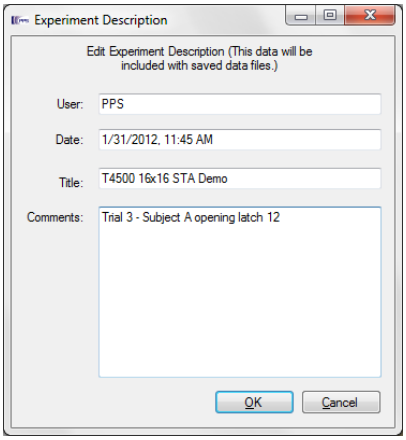
Menus and Toolbars

File Menu

- **Open… (Ctrl+O)**: Opens a saved data file for comparison and/or analysis.
- **Save As… (Ctrl+S)**: Saves the current data in the buffer while in Review Mode.
- **Export as Text…**: Exports the currently selected data in Review Mode to a file in ASCII-delimited format for import into Microsoft Excel, MATLAB, or other analysis packages. If selection mode is not active, the entire sensor array is saved. Export files can be saved as 1D or 2D files csv or txt files. 1D will save files to show a single frame of data in a row starting with a time stamp followed by individual sensor element outputs recorded at that point in time. 2D will show each data frame of sensor element outputs arranged in a 2-dimensional matrix similar to the 2D view on the Chameleon display.
- **Export as Video...**: Exports data in a video format that can be viewed on any computer. Sensor data, analysis data, video data, and experiment description may all be exported in either AVI or MP4 format. AVI files will export slightly faster, but require the Xvid codec for viewing. MP4 files can be viewed on most computers, including iOS devices.
- **Configure Export**: Allows the user to control the sensor data that will be exported as text. Any boxes that are checked will be data that is exported.



- **Print Screen… (Ctrl+P)**: An image of the entire Chameleon window with a snapshot of the accompanying webcam screen will be sent to the printer.
- **Export Screen to File…**: Allows an image of the entire Chameleon window with a snapshot of the accompanying webcam screen to be saved to a PNG, JPG,GIF or BMP file format.
- **Copy Screen to Clipboard (Ctrl+C)**: Allows an image of the entire Chameleon window with a snapshot of the accompanying webcam screen to be copied to a clipboard and be pasted into another document.
- **Experiment Description…**: Allows viewing and/or editing of the current file's properties and annotations. This information will be recorded with saved data files.



- **Exit**: Closes the program and exits.

Data Acquisition Menu

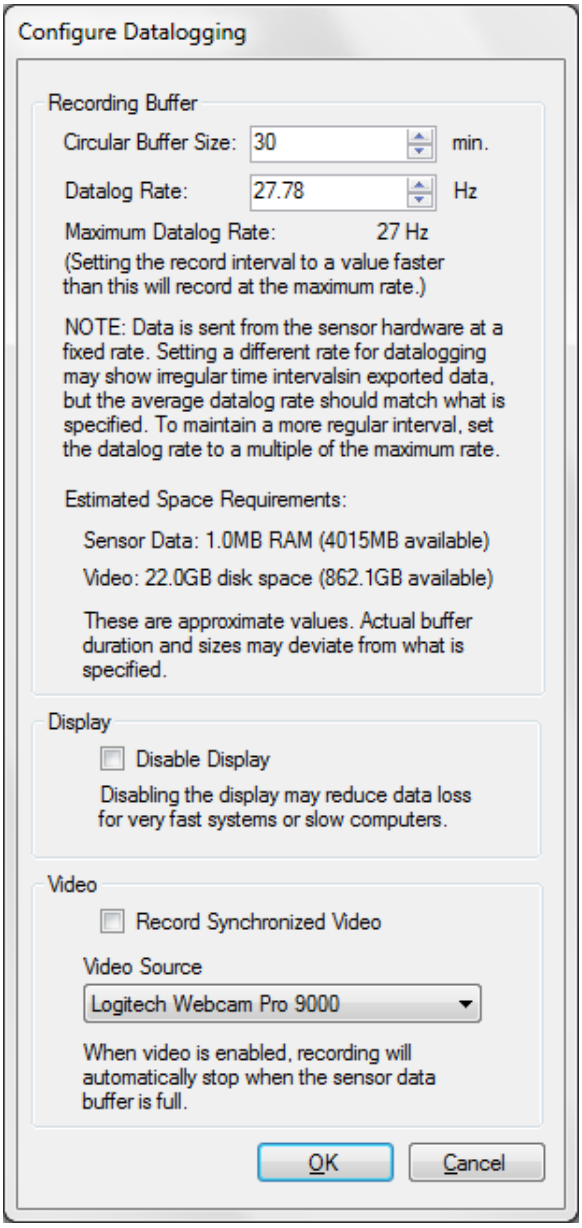
- **Connect to Hardware:** If the Live data window is not active, connection to the Live Data can be achieved by selecting the desired configuration file.

- **Disconnect Hardware:** Any hardware connected to the computer will be disconnected.

- **Configure Data Acquisition (see right)**:
  The **Circular Buffer Size** can be adjusted in the increment of minutes. An estimation of storage space required will be displayed below.
  The **Scan Rate** can be controlled by changing the frequency the software will wait before collecting sensor data. Please note that due to rate at which the hardware sends data to the computer, the scan rate may vary slightly from frame to frame from the specified value. Setting a scan rate below 1Hz will initially delay Chameleon in resetting the data buffer before it updates the screen with new data.
  The **Strip Chart Display** can be disabled if a computer does not have sufficient processing power to show real time data.
  Webcam feed can be enabled by checking the box next to "Record Synchronized Video." The default webcam will be set to "Logitech Webcam Pro 9000."
  *NOTE: Not all webcams will be compatible with Chameleon so it is recommended to use the provided Logitech Webcam Pro 9000 with the Chameleon software.

- **Change to Review Mode (Ctrl+M):** Enters review mode to allow saving of data files

- **Clear Live Buffer (Ctrl+R):** Clears the Live mode Data Buffer

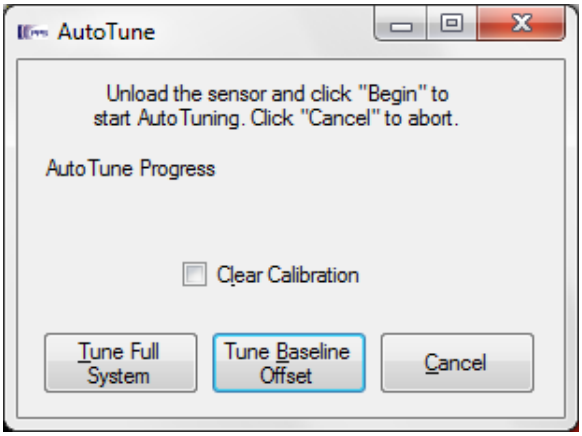


Calibration

- **Zero Sensor Output (Ctrl+T):** Zeroes the sensor offset using the current data (Only available with calibrated data).
- **Reset Sensor Baseline (Ctrl+Shift+T):** Removes any software offset applied to the sensor output. (Only available with calibrated data).
- **Show Raw Data/Calibrated Data:** Allows user to toggle the data display between raw sensor counts and calibrated sensor output.
- **Auto Calibration:** If an auto calibration system was purchased with a system, the auto calibration can be controlled and activated using this option.
- **Manual Calibration:** Allows user to perform a multi-point calibration on their system. Further details on how to perform a calibration are provided later in this document.

Options

- **Autotune TactArray:** Autotune will optimize the electronics for a TactArray system. It is generally not necessary to perform an Autotune procedure without a recommendation from PPS Technical Support.



- **Show Aux Data (optional):** Shows output from auxiliary data equipment that is synchronized with system.

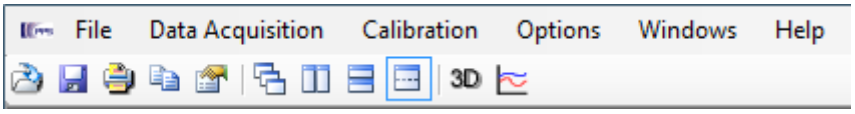
Windows Menu

- **Cascade Windows:** Shows all open document windows in an overlapping fashion.
- **Tile Horizontally:** Shows all open document windows with maximum width.
- **Tile Vertically:** Shows all open document windows with maximum height.
- **Arrange Icons:** Arrange all minimized window icons.
- **Minimize Windows:** Minimize all the windows.

Help

- **About Chameleon:** Displays information about Chameleon version.
- **Chameleon Manual Shortcut:** Click on any of the listed documents to launch the Chameleon manual pertaining to a system in use.

Toolbar



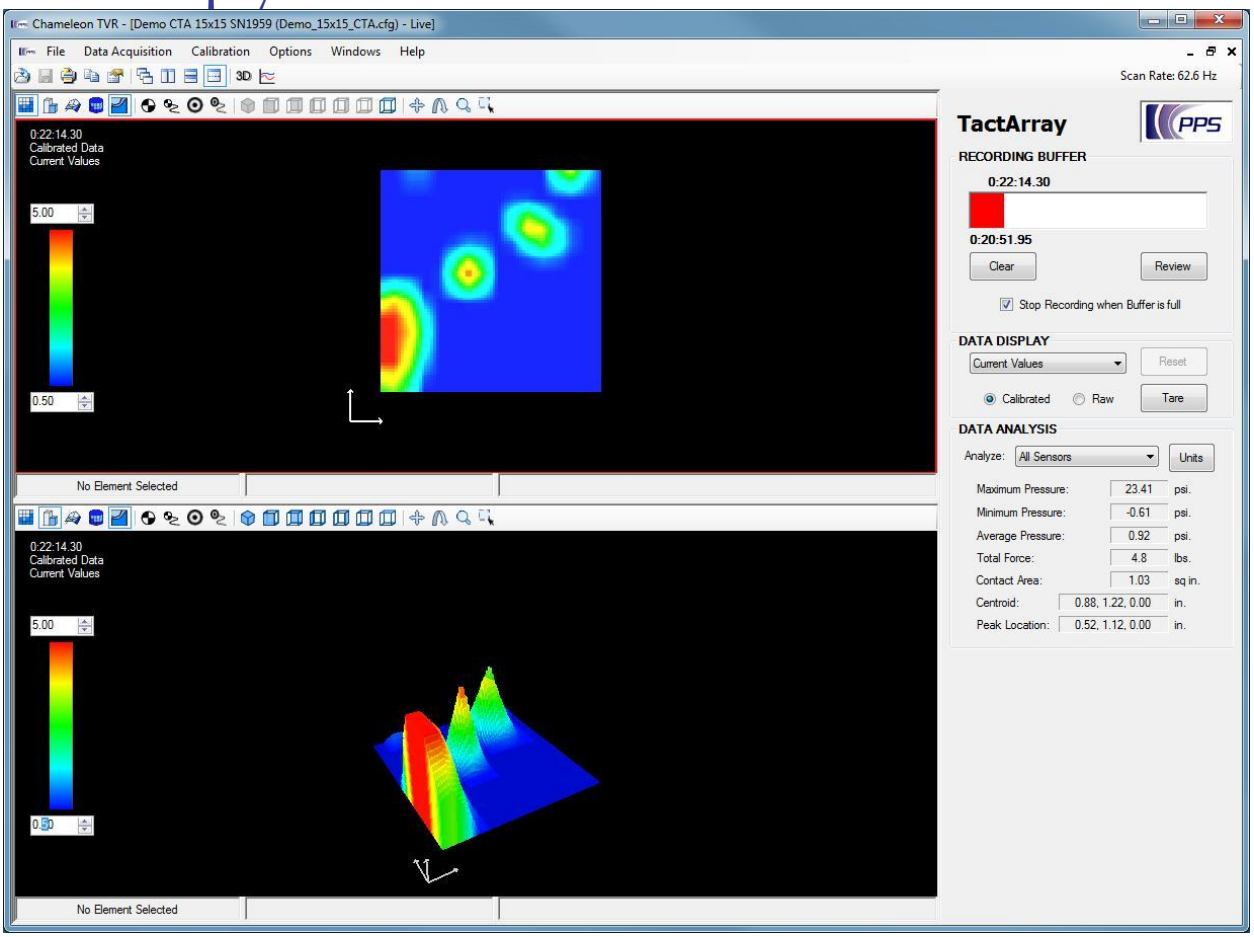
From left to right:

- **Open:** Opens a TVR data file
- **Save:** See "Save As…" under "File Menu" above
- **Print:** Sends snapshot of Chameleon Window to printer
- **Experiment Description:** See "Experiment Description" under "File Menu" above
- **Cascade Windows:** See "Cascade Windows" under "Windows Menu" above
- **Tile Vertically:** See "Tile Vertically" under "Windows Menu" above
- **Tile Horizontally:** See "Tile Horizontally" under "Windows Menu" above
- **Split View:** Splits the current view window into two display areas, both showing the same data, but which can each be display in different orientations or display types if available
- **3D Data Display:** Enables 3D data display mode
- **Strip Chart:** Enables Strip Chart display mode

Main Sensor Display

The main sensor display area can contain one or more windows showing live, recorded, saved, or video captured data. Generally all system types will both have the option of a 3D Data Display and Strip Chart display for the sensor output with the exception of the following which are Strip Chart display only: FingerTPS, Single Element DigiTacts, C500 with NiDAQ. Live data has a red border, while recorded (saved or unsaved) data has a green border, which matches the datalog buffer display (see below). Clicking in a particular window or view makes it active (signified by the red or green border).

3D Data Display



This display mode allows the user to view sensor data in the orientation that it is physically mapped on a sensor array. Each display window will have its own set of display controls as shown below:

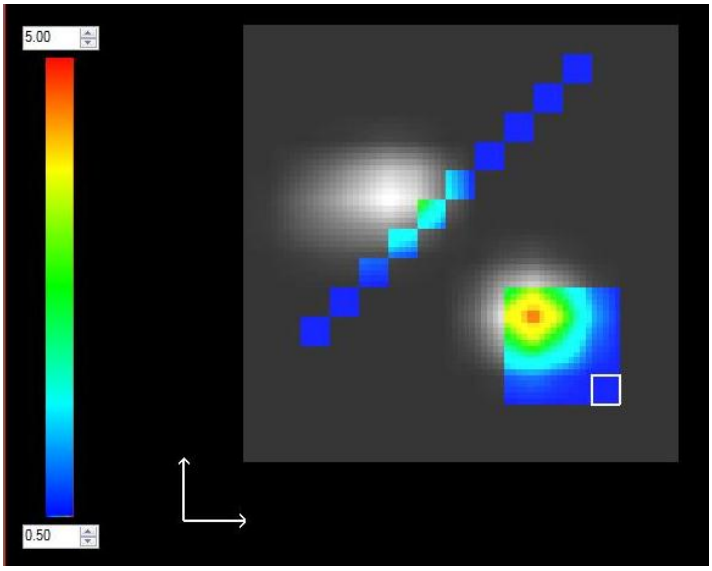
From left to right:

- **2D Display:** Shows the current sensor data in 2D format with no interpolation.
- **3D Column Frame Display:** Shows the current sensor data in the form of one vertical column per sensor, where height corresponds to pressure level.
- **3D Mesh Display:** Shows a mesh view of sensor data within a 3D space

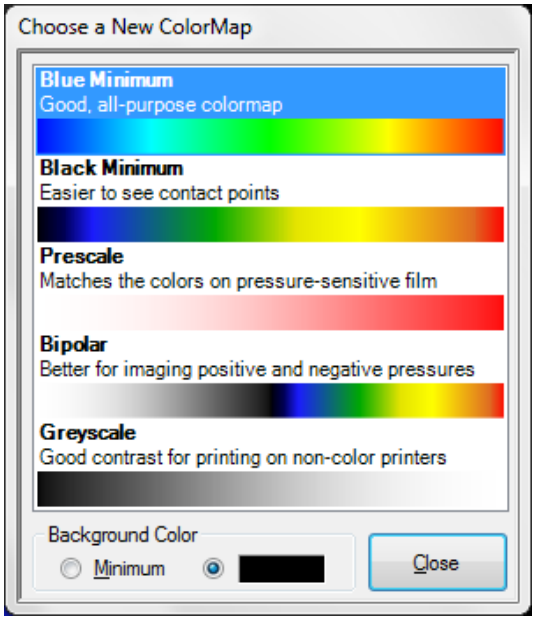
- **3D Shape Display (optional):** Shows sensor data as a 3D shape for customized sensors that are mounted on contoured surfaces.
- **Interpolated Display:** Shows the current sensor data with interpolation.
- **Show Center of Pressure Centroid:** Click to show a marker indicating the center-of-pressure for each sensor. Coordinates for the location of the COP Centroid are located in the Data Analysis section.
- **Show Center of Pressure Trajectory:** Check to show the trajectory/history of pressure centroid locations. Un-check to clear the history.
- **Show Max Pressure Location:** Click to show a marker indicating the location of the maximum pressure for each sensor. Coordinates for the location of the maximum pressure are shown in the Data Analysis section.
- **Show Max Pressure Trajectory:** Check to show the trajectory/history of the maximum pressure location. Un-check to clear the history.
- **Isometric View:** Set the camera to view the data from an isometric position for 3D displays.
- **Front View:** Set the camera to view the data from the front for 3D displays.
- **Back View:** Set the camera to view the data from the back for 3D displays.
- **Left View:** Set the camera to view the data from the left for 3D displays.
- **Right View:** Set the camera to view the data from the right for 3D displays.
- **Bottom View:** Set the camera to view the data from the bottom for 3D displays.
- **Top View:** Set the camera to view the data from the Top for 3D displays or to reset the 2D display to the default view settings.
- **Pan:** Click and drag to move the sensor data around the view area.
- **Rotate:** Click and drag to rotate the sensor data in the view area. Default 3D view angles are also available by clicking the buttons in the view control area.
- **Zoom:** Click and drag up or down to zoom in/out.
- **Show Selection Tools:** Click to show the selection tools (see below for more details on element selection)

Color Map Scale

The ColorMap scale is visible on the left-hand side of the 3D Display.

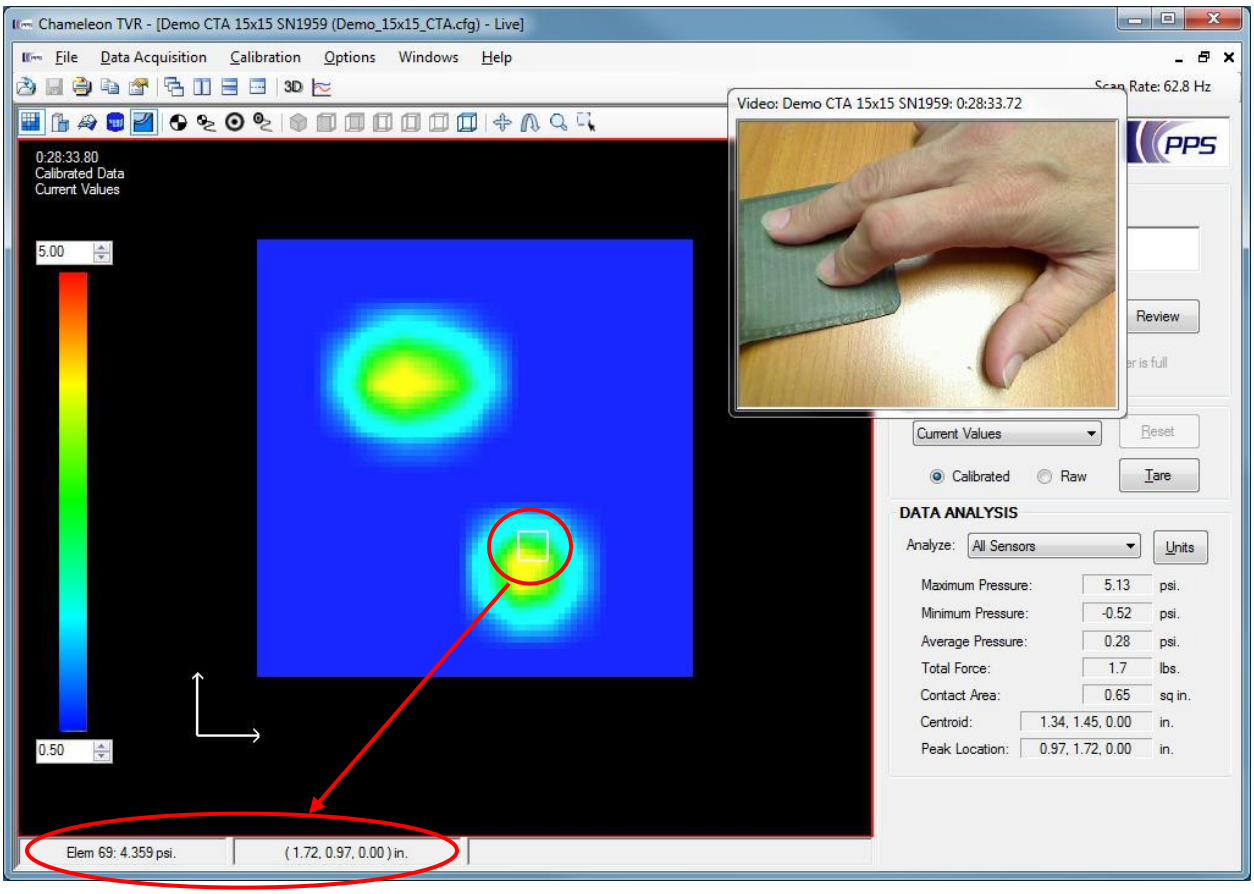


Enter values in the Max and Min inputs of the color map to set the sensitivity of the color map for the active 3D display window. Double clicking on the color map itself will launch a color scheme selection window with tips on when to use each color map type. The background of the 3D data display can also be altered by double clicking on the color field to the left of the "Close" button.

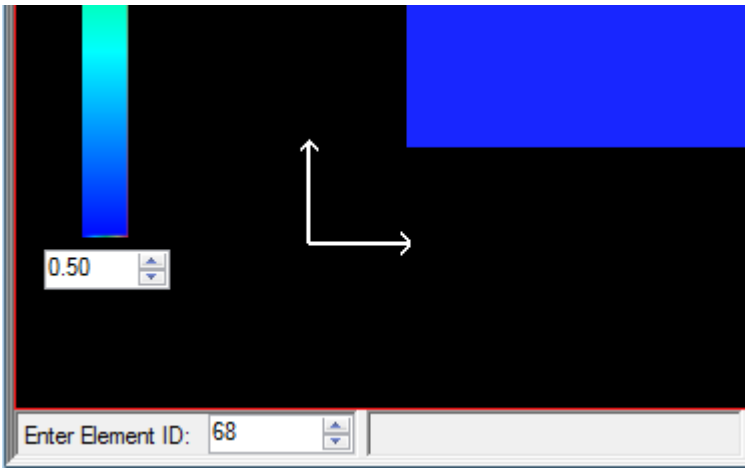


SmartMouse Display

When the mouse is over the active sensor display, the current element is highlighted. (If interpolated data is shown, all interpolated points within the actual sensor element are highlighted). Beneath the main sensor display, the current sensor element ID, pressure value, and coordinates are shown.

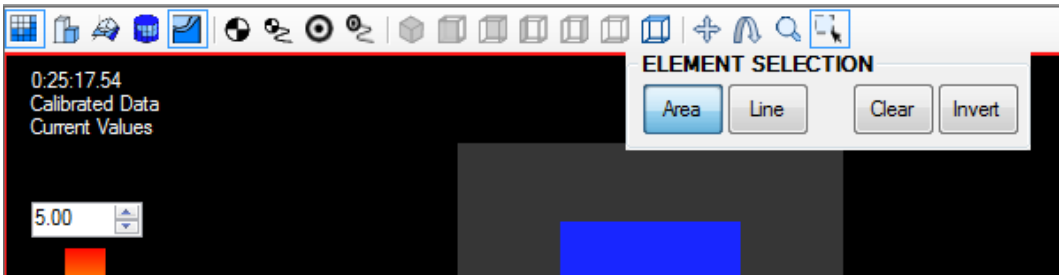


You may also double-click on the SmartMouse display to enter an element ID manually:

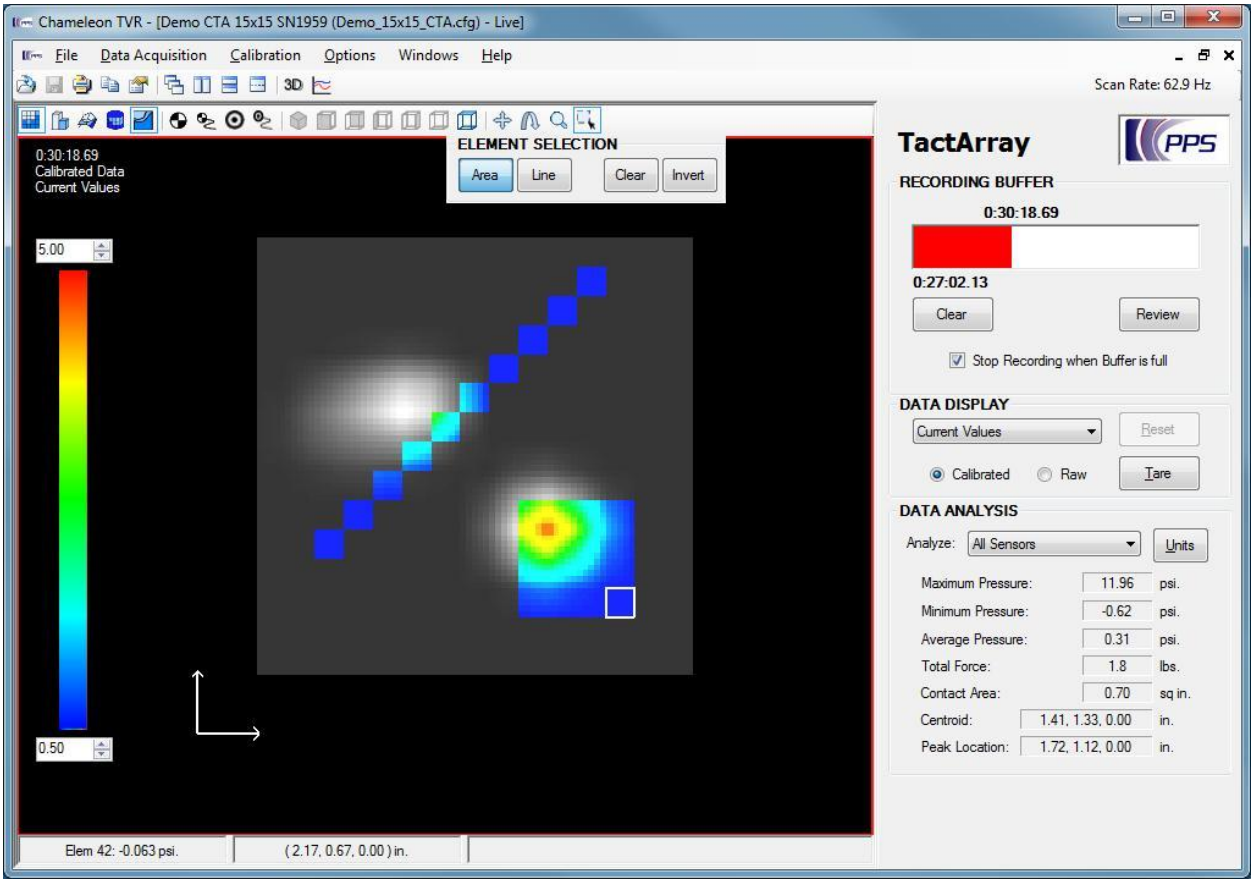


Element Selection Mode

Selection Mode allows analysis and export of only certain areas of the sensor array. It is a useful tool to focus only on areas of interest and filter out extraneous data. To view the element selection tools, click the "Show Element Selection" button on the 3D Display toolbar. Then click the "Area" or "Line" button to enter or exit selection mode. When in selection mode unselected elements are shown in grayscale.



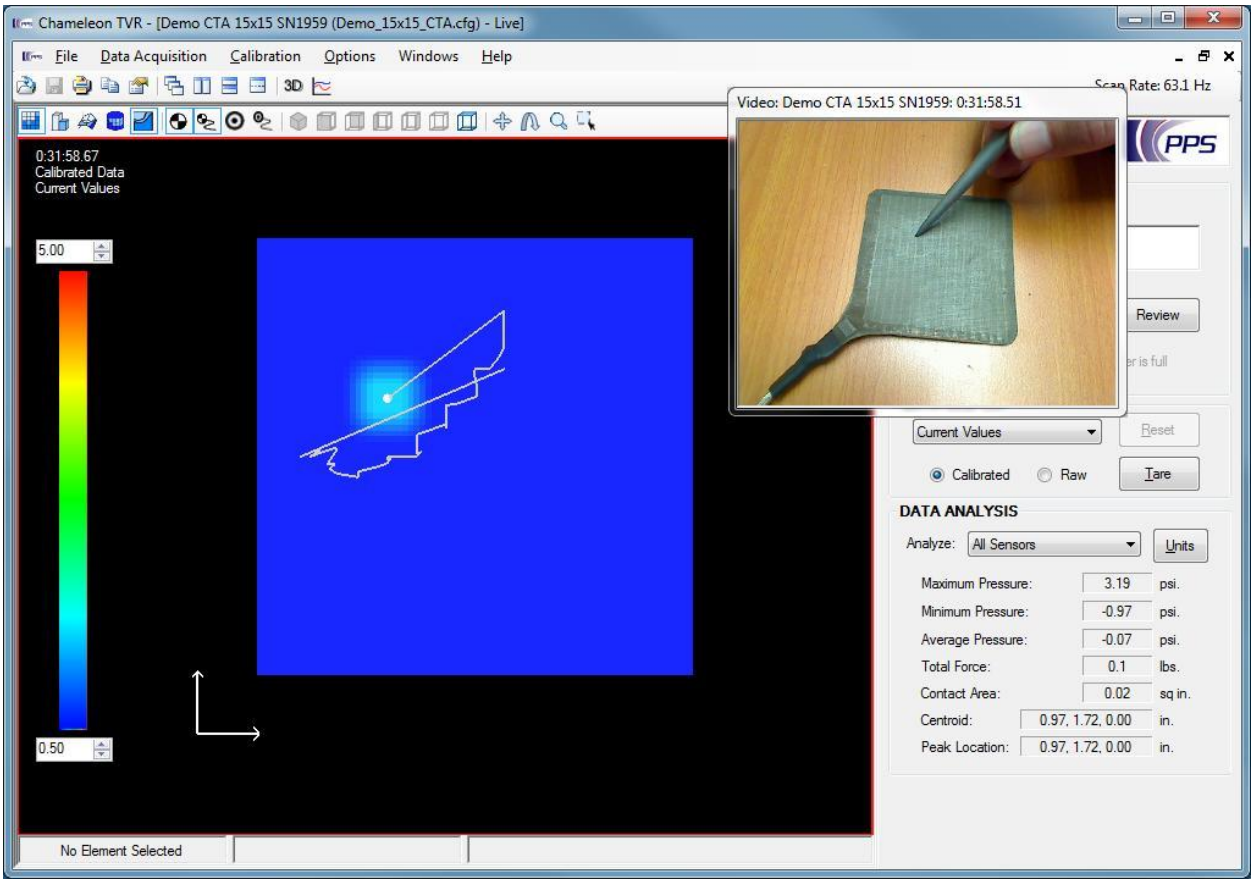
In Area select mode, use the mouse to click and drag to select rectangular areas.
In Line select mode, use the mouse to click and drag to select linear regions. It is possible to switch between Line and Area select modes to combine selected areas. Ctrl + Click and drag to select additional regions. Shift + Click and drag to unselect areas. Use "Clear" to unselect all elements, and "Invert" to toggle the selected state of all elements.



When elements are selected, the analysis displays will only reflect the selected elements. In addition, choosing "Export" from the file menu will only export the selected elements, allowing for more detailed post-processing analysis of selected areas using 3rd-party software. Selected elements will also generate a separate set of computations for maximum, minimum and average pressures. If strip chart is enabled and less than 12 elements are selected, individual element strips can be turned on to view in the strip chart by double clicking on the edit traces of the strip chart and checking the boxes for elements of interest.

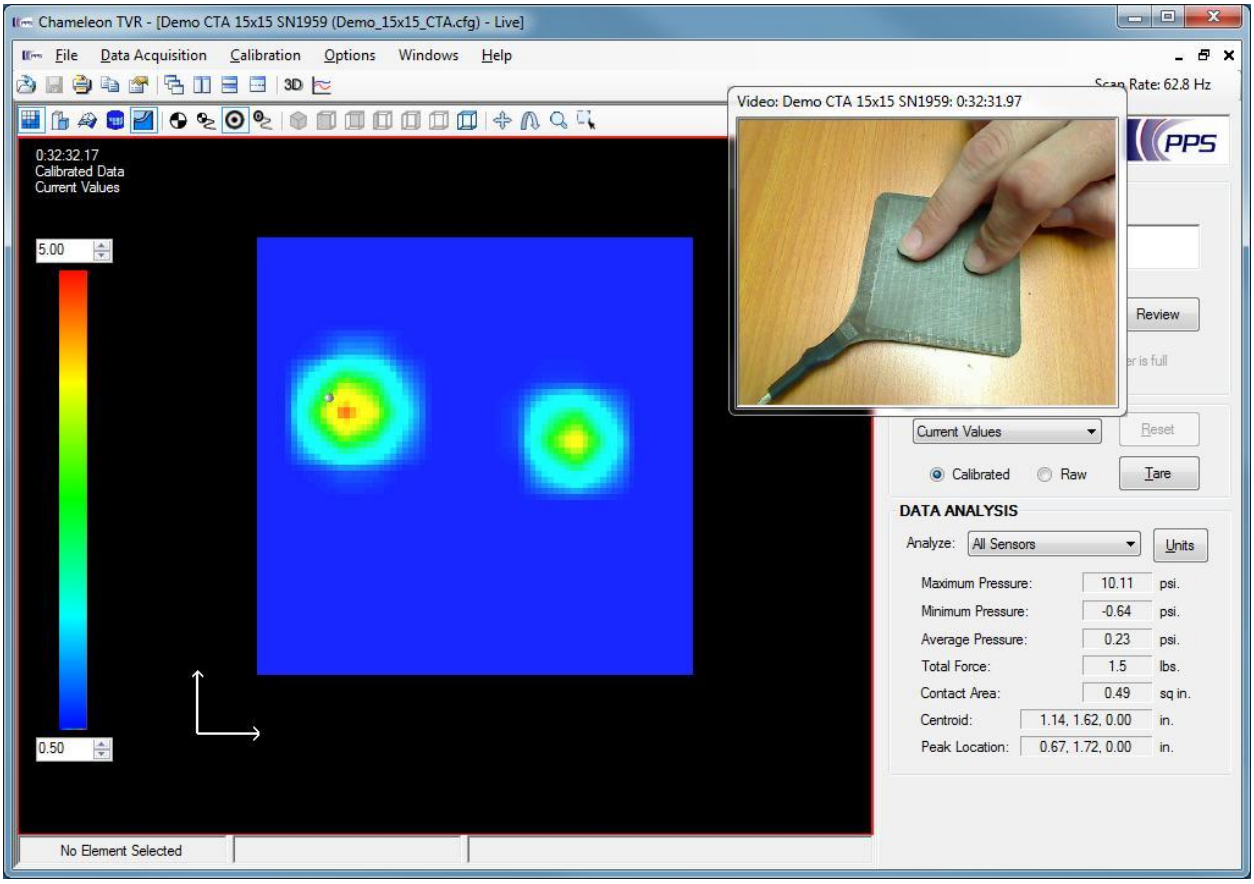
Center of Pressure Tracking

The center of pressure can be followed during data acquisition by enabling the pressure centroid ( ) and/or the centroid trajectory ( ). The coordinates for the centroid location on the sensor are shown in the "Data Analysis" field labeled as "Centroid:".

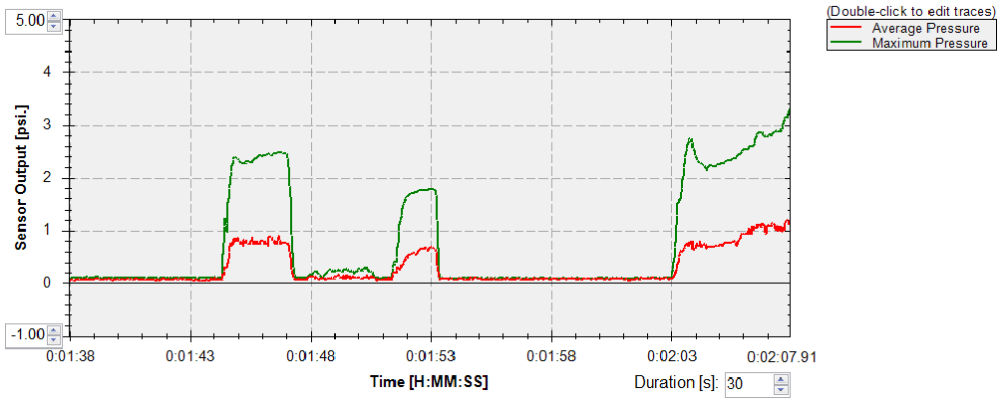


Maximum Pressure Location Tracking

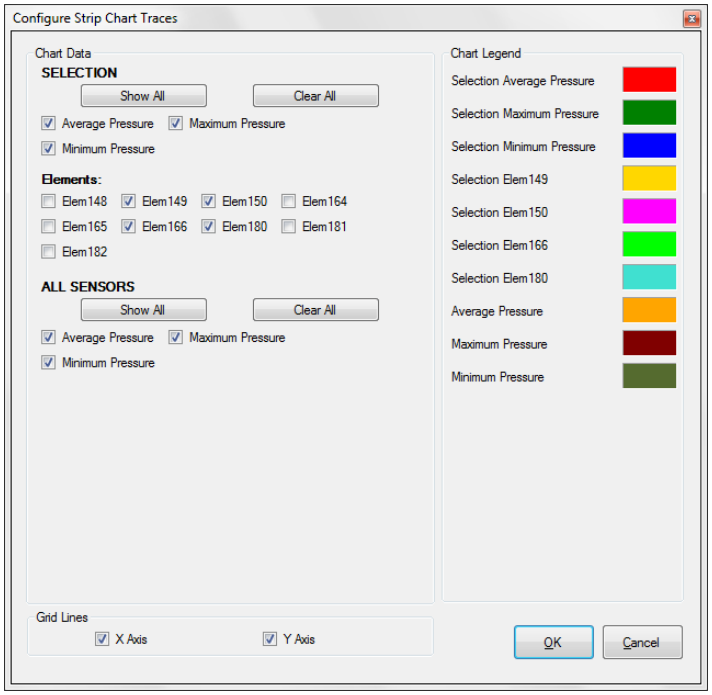
The location of the maximum pressure can be followed during data acquisition by enabling the max pressure location ( ) and/or the max pressure trajectory ( ). The marker for the maximum pressure is a darker color than the marker for the pressure centroid. The coordinates for the maximum pressure location on the sensor are shown in the "Data Analysis" field labeled as "Peak Location:".



Strip Chart



This display type will allow for the user to view up to 16 outputs in strip form and can be enabled by clicking on the Strip Chart Data Display button. The strip display is customizable by opening the strip trace configuration menu. For strip chart only systems (ie FingerTPS, C500, etc) clicking on the button for "Chart" in the Complete System Data section of the software. For systems with 3D visualization, double click on the strip chart legend to launch the configuration window. If selection mode is enabled and less than 12 elements are selected, those elements will be available for view in the strip chart.



Desired outputs can be added to the strip chart by checking the box next to the item of interest. Strip colors can also customized by doubling clicking on the color box located next to trace a trace name.
Values for the strip chart max and min can be changed by adjusting the values in the increment boxes.
The time scale on the strip chart can be changed by adjusting the values in the box next to the time scale.
Event markers can be added to the strip chart by double clicking on the display and entering information

into the dialog box. The information in the event markers will be visible for review by double clicking again on the marker in review mode and in an exported data file.

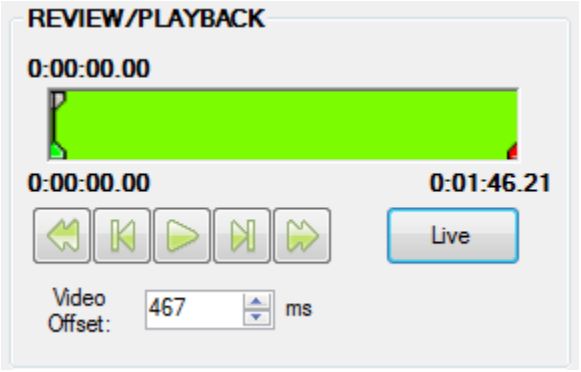
Recording Buffer

The Chameleon Software is constantly recording data whenever live data is being viewed. At any point, you can review the most recent data and choose which portions, if any, to save.

In Live Mode, the datalog indicator uses a red bar to indicate how full the datalog buffer is. When the bar is completely red, it means the buffer is full and the oldest data is being discarded. The live mode will automatically switch to review mode if the check box next to "Stop Recording when Buffer is Full" is enabled. Chameleon will also provide a warning if the buffer is nearly full if the user chooses to have the software notify them. Clicking "Clear" will empty the data buffer and "Review" will switch Chameleon to review mode for saving data.

Review/Playback

In Review Mode, the datalog indicator uses a green bar to show which data is selected for saving or exporting.

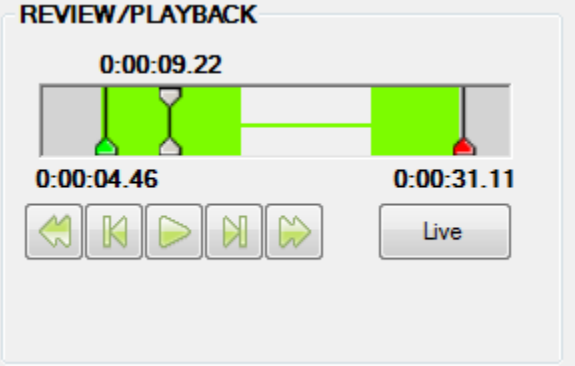


If video mode was enabled before entering review mode, a video offset feature to compensate for any time delay between the sensor data and recorded video will appear. Increase/decrease values in milliseconds to help synchronize video

- **Display Slider (Grey):** Shows which data is currently being displayed in the main display window. Drag the grey slider or use the arrow keys to find a particular location in the data buffer.
- **Start Slider (Green):** Indicates the start point for the subset of data that will be saved or exported. Drag the green slider to adjust the start point. If the slider is double clicked, it will snap to the position of the grey slider.
- **End Slider (Red):** Indicates the end point for the subset of data that will be saved or exported. Drag the red slider to adjust the end point. If the slider is double clicked, it will snap to the position of the grey slider.

Once you are in Review Mode and the green and red sliders are positioned where you want, you can Save or Export data. (See above)

Playback and Review Controls

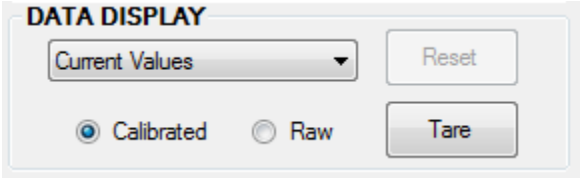


Bottom row from left to right:

- **Rewind:** Click to play data in reverse. Multiple clicks will speed up the display at a rate indicated at the far right of the playback buttons. Shift +click will play back below normal 1x speed.
- **Step Back:** Advances the current position one frame backward
- **Play / Pause:** Click to stop or halt playback on the current frame. Shift + Click to play in reverse.
- **Step Forward:** Advances the current position one frame forward
- **Forward:** Click to speed up the playback speed. Multiple clicks will increase speed. Shift +click will play back below normal 1x speed.
- **Live:** Click to reconnect to the hardware and show live data. If video is not enabled, you will have the option of appending new data to your existing data. The resulting gap in data will show as a thin line in the review display, as shown above.

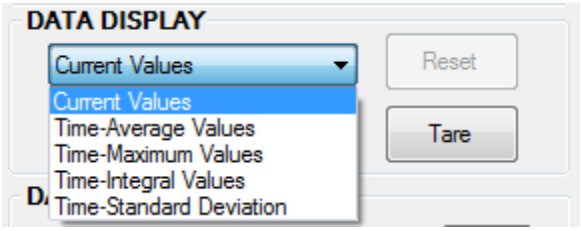
Data Display

The Data Display controls allow you to control what information is shown on the graphical and analysis displays.



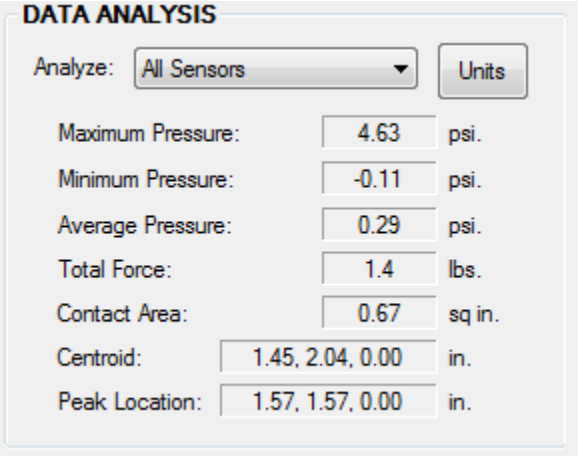
Click “Calibrated” or “Raw” to toggle between calibrated and uncalibrated output. Click “Tare” to set a new sensor baseline using the current values, or Shift+Click “Tare” to reset the sensor baseline.

The Data Display menu allows different time-based analysis to be applied to the data instead of viewing the data for the current time. Time-based values are calculated from when the selection was made from the menu or when you last clicked the “Reset” button.

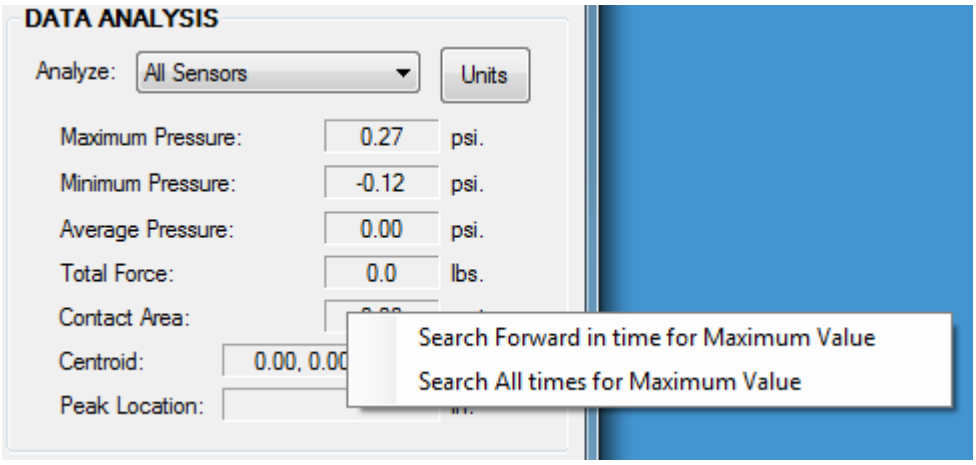


Analysis Data

The system data field shows the values of basic computations performed in software for the elements whose values are above the baseline. The Centroid field provides the coordinates of the center of pressure relative to the sensor surface. When the view mode is in "All Sensors", the data fields will reflect computations performed across all sensors. "Selection" will show the computations only of the elements that have been selected through Element Selection.



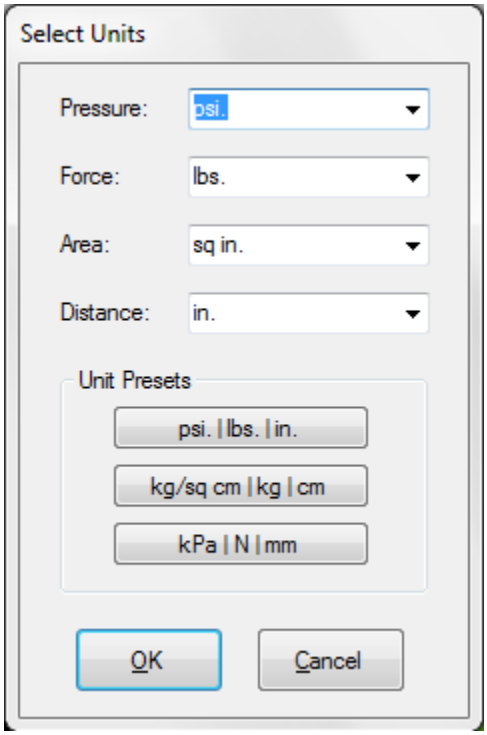
When in review mode, Chameleon can search through the collected data to find the maximum value for a particular analysis field. To do this, right-click on the field to bring up the search menu.



You may choose whether to search beginning from the current time or search all times for the maximum value.

Units

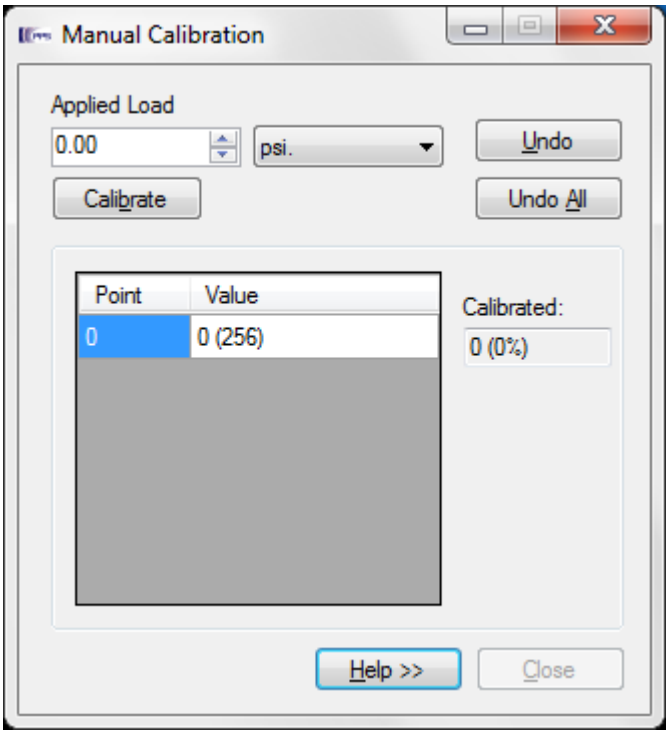
For calibrated data only, the units for the Analysis data can be changed as desired by selecting from the various units available in the drop down menus. Unit Presets can be selected for the most common units used.



MANUAL CALIBRATION

NOTE: Calibrating a tactile array system requires specialized hardware and carefully controlled loading conditions. Do not attempt to calibrate your system without first contacting PPS.

To calibrate the sensor array, choose "Calibrate System" from the Data Acquisition Menu and proceed with the following procedure:



1. Make sure the array is unloaded and click "Zero" to record the baseline output. Initially the array will be displayed in grayscale to indicate uncalibrated elements.
2. Apply a reference pressure, enter the applied value into the "Reference Value" input, and click "Calibrate." Only sufficiently loaded elements will actually be calibrated. As elements are calibrated, they will be displayed in color, while uncalibrated elements will continue to be shown in grayscale.
3. Repeat Step 2 for as many calibration points as desired. As calibration points are taken, the reference values are recorded in the calibration table display. When applying a uniform load over the entire sensor is not practical, it is possible to perform a "piecewise" calibration by applying the same smaller load to multiple areas of the sensor and clicking "Calibrate" for each.
4. If an erroneous calibration point is taken, click "Undo" to remove the most recent calibration point.
5. When finished, click "Apply" to use the new calibration. The color map scale will automatically be updated to reflect the maximum calibrated pressure. You must have at least one calibration point in addition to the zero point before the "Apply" button becomes active.
6. Clicking "Undo All" will discard all new calibration points and allow you to start over.
7. Clicking "Cancel" will discard all new calibration points and close the Calibration window while restoring the previous calibration.

SHUTDOWN

To shutdown the software, simply click the “Close” box in the upper right or select “Exit” from the File Menu.

QUESTIONS AND SUPPORT

For questions and technical support regarding Chameleon TVR software, contact PPS via email at support@pressureprofile.com or via phone at 310-641-8100.