Version 1.08
February 2015

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DTS Support

SLICE systems and SLICEWare are designed to be reliable and simple to operate. Should you need assistance, DTS has support engineers worldwide with extensive product knowledge and test experience to help via telephone, e-mail or on-site visits.

The best way to contact a DTS support engineer is to submit a request through the DTS Help Center web portal (support.dtsweb.com). You must be registered (support.dtsweb.com/registration) to submit a request (https://support.dtsweb.com/hc/en-us/requests/new). Registration also enables access to additional self-help resources and non-public support information.

This manual supports the following products:

10920-03002: SLICEWare Software for SLICE PRO/MICRO+/NANO+/G5 Systems
10920-03010: SLICEWare Software for SLICE PRO/SLICE 2 Systems (retired)

Introducing SLICEWare

The SLICEWare software application allows for easy:

- Test set-up,
- Sensor database management,
- Real-time sensor check-out,
- Test execution,
- Data download and viewing,
- Data export.

SLICE API (Application Programming Interface) and LabVIEW drivers are also available.

Please contact support.dtsweb.com for the latest update to your software.

1 Installation

This section covers software installation and use. *See Appendices A, B and C for additional information regarding file formats and how to update the SLICE Base firmware.*

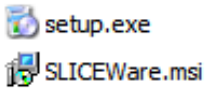
1.1 Basic Requirements

SLICEWare is a Windows®-based program. Minimum PC specifications are:

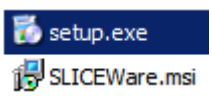
- Windows Vista, Windows 7 or Windows 8. 32- and 64-bit versions are supported.
- 1 GHz or faster processor
- 2 GB RAM minimum. More RAM is important for longer/higher sample rate data acquisition.
- 100 MB disk space for software plus storage for test data.
- 1024 x 768 minimum screen resolution.

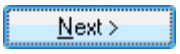
1.2 Software Installation

Locate the installation files on the CD or flash drive provided.



Double-click the "set-up.exe" file to begin installation.

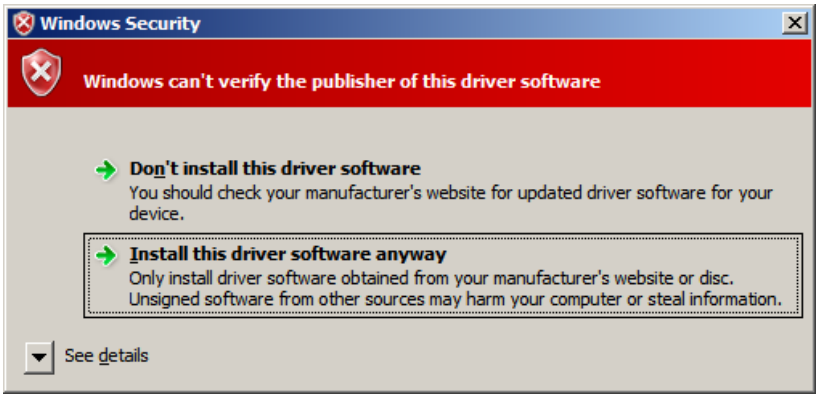


Click 

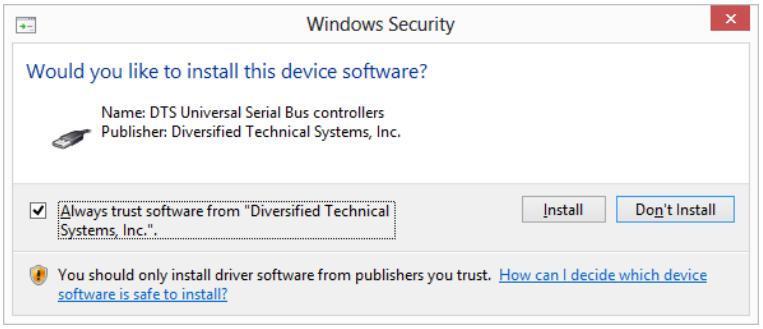
for each of the screens: set-up wizard, driver installation, installation folder and confirming installation.

You must allow the driver to be installed. You may see these screens:

For Windows Vista or Windows 7, click to "Install this driver software anyway."



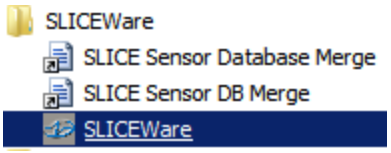
For Windows 8, check "Always trust software from "Diversified Technical Systems, Inc." and click "Install".



Note: Windows will ask you to reinstall the hardware driver each time you connect the SLICE Stack to a different USB port.

To start SLICEWare, either double-click the 

icon on the desktop or navigate to the SLICEWare folder in the Start menu:

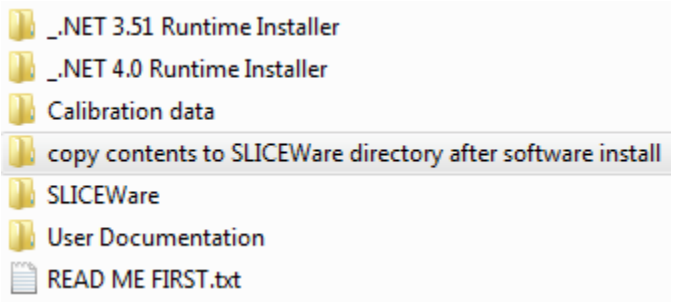


1.3 XML Files: Configuration and Sensor Information

Upon installation, SLICEWare will install a default configuration XML file with system operating parameters and other functional variables. This file is updated as you configure the software to your specific environment.

Sensor information is recorded in a separate XML file. This file is updated as you add your sensor database to the software.

In some cases, you may be provided one or more XML files that you will need to copy to your SLICEWare directory. These files will overwrite the existing files.



If you install SLICEWare on another PC, be sure to copy your revised XML files from the old PC to the new PC.

2 Data Collection Concepts

SLICE is a standalone data logger. Once it is armed, the PC can be disconnected if desired. (Power must remain connected, however.) After receiving a Start Record or trigger signal, the SLICE autonomously collects data, storing it to flash memory with no user interaction. After the test, the user can reconnect the PC to download the data.

SLICEWare also includes a real-time mode that allows the user to check channel inputs on an oscilloscope-style screen. Depending on hardware and firmware version, real-time data can be logged to Comma Separated Value (CSV) files.

2.1 Data Collection Modes

SLICE supports two data collection modes: Circular Buffer and Recorder. *Note: SLICEWare cannot simultaneously display the data while the system is recording.*

2.1.1 Circular Buffer Mode

In Circular Buffer mode, the user can program SLICE to record pre- and post-trigger data. Time Zero (T=0) is marked when the trigger signal is received.

2.1.2 Recorder Mode

Recorder mode starts when a Start Record signal is received and continues for the time specified in the test set-up. If a trigger signal is received some-time after the Start Record, this is marked as T=0.

2.1.3 Hybrid Recorder Mode

Hybrid Recorder mode starts when a Start Record signal is received and continues until the unit receives a trigger signal and then records for the post-trigger time specified by the host software. The trigger signal marks the T=0 point and all data recorded is available for download. *Note: This mode is not available in SLICE PRO Gen2 hardware.*

2.1.4 Continuous Recorder Mode

Continuous Recorder mode starts when a Start Record signal is received and continues until the Start Record signal is released. The unit will then re-arm for another event. The LEDs on the unit will flash blue slowly then rapidly, and then the STATUS LED will become solid blue, indicating the unit is fully armed. The unit will continue to record new events until it records the number of events specified by the host software. If a trigger signal is received after the unit has re-armed, the unit will disarm and no longer attempt to re-arm. *Note: This mode is not available in SLICE PRO Gen2 hardware.*

2.2 Multiple-Event Modes

Generally, SLICE data collection modes have an equivalent multi-event mode. A unit armed in a multiple-event mode will re-arm when an event completes. The

unit will stop re-arming when the number of events specified by the host software has been recorded.

NOTE:

A trigger or event signal applied anywhere in the DAS chain is distributed throughout the system. This is also true for level trigger.

2.3 Level Trigger

Level trigger will initiate data collection or mark T=0 when a predetermined sensor threshold is exceeded. The DAS will monitor the data values in real-time, simultaneously recording data and exporting a trigger or event signal when the value has exceeded the pre-set threshold. Level trigger is typically used with Circular Buffer mode.

CAUTION:

DTS does not recommend using level trigger for destructive testing.

Allow ample time for sensors to warm up before performing the calibration. Even after warm-up, sensors will drift from the zero level. Depending on the scaling, an accelerometer could drift anywhere from 2 to 100 g. Setting a level trigger value too close to zero will cause the DAS to trigger as the sensor drifts and before the operator intended. It is better to set a known, good trigger level of 30-50% of full-scale and set a pre-trigger time so data is collected from 0-30%. If a pre-trigger time is not set, data collection will begin only when the trigger signal is received.

2.4 Auto-Arm Data Collection

SLICE can be placed in an auto-arm mode that will cause the unit to arm automatically when the power is cycled. The unit can be placed into this mode and record with any data collection mode.

2.5 Sampling Rates

SLICE MICRO/NANO and SLICE PRO support different sampling rates. Regardless of hardware, SLICE systems will record all channels even if they are not programmed.

	Maximum Sampling Rate (per channel)		
Number of Channels*	**SLICE MICRO/ NANO Base**	**SLICE MICRO/ NANO Base+**	**SLICE PRO SIM (Gen2/Gen3)**
3	120,000 sps	500,000 sps	1,000,000 sps
6	60,000 sps	400,000 sps	1,000,000 sps
9	40,000 sps	300,000 sps	1,000,000 sps
12	30,000 sps	200,000 sps	500,000 sps
15	24,000 sps	200,000 sps	500,000 sps
18	20,000 sps	200,000 sps	500,000 sps
21	17,000 sps	200,000 sps	
24	15,000 sps	200,000 sps	

* All channels are recorded even if they are not programmed.

2.5.1 How to Calculate Maximum Recording Time

SLICE MICRO/NANO and SLICE PRO have different data storage capacities.

	SLICE MICRO/ NANO Base	**SLICE MICRO/ NANO Base+**	**SLICE PRO SIM (Gen2/Gen3)**
Data Capacity	6.48 GB	15 GB	15 GB
Samples Available*	3,240,000,000	7,500,000,000	7,500,000,000

* 1 sample = 2 bytes

To determine the recording time possible, use the equation below:

$$\frac{\text{Samples available}}{\text{Sampling rate (sps)} \times \text{number of channels}} = \text{number of seconds}$$

Example 1: 10,000 sps using a 9-channel SLICE NANO/MICRO stack

$$\frac{3{,}240{,}000{,}000}{10{,}000 \times 9} = 36{,}000 \text{ sec (10 hours)}$$

Example 2: 25,000 sps using an 18-channel SLICE PRO SIM

$$\frac{7{,}500{,}000{,}000}{25{,}000 \times 18} = 16{,}667 \text{ sec (4.63 hours)}$$

2.5.2 SLICE PRO Circular Buffer Limitations

Due to the nature of flash memory, the system cannot be armed in Circular Buffer mode indefinitely. To determine the maximum time available in Circular Buffer mode, use the equation below:

0.8 ∗ recording time = maximum time available in Circular Buffer mode

Example:

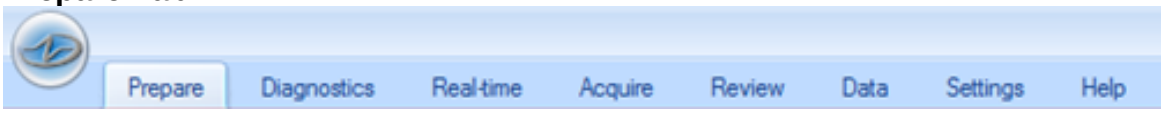
0.8 ∗ 8,333 sec = 6,666 sec (111 minutes)

In this example, the test must occur within 111 minutes, after which time the unit stops recording data.

3 Tab Menus

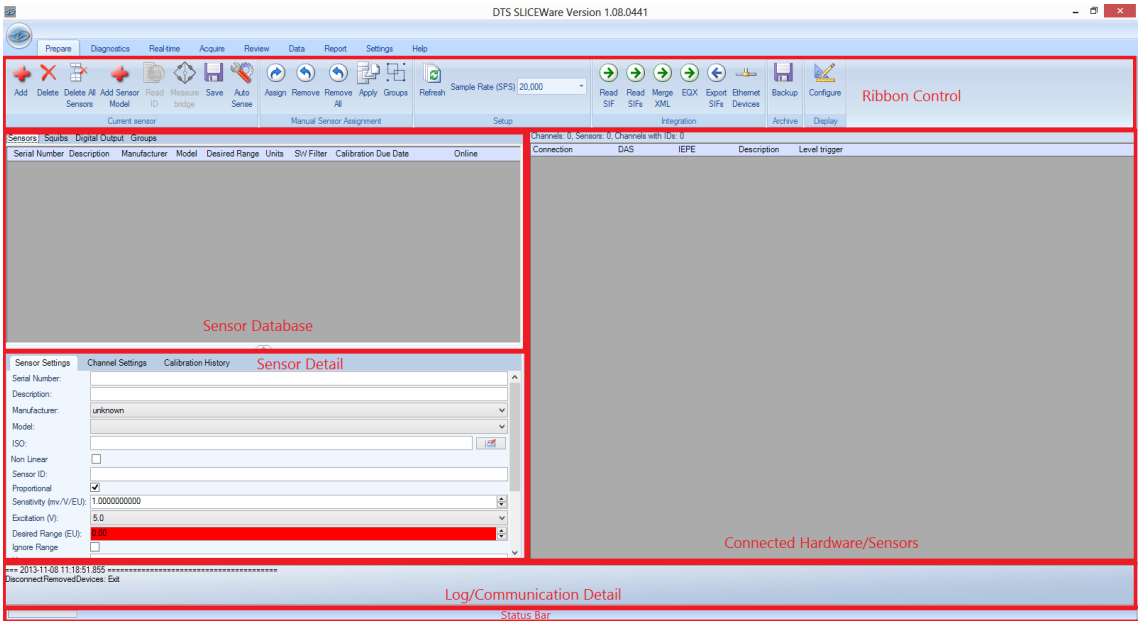
SLICEWare's user interface is organized into separate panels which can be selected by clicking on a tab in a ribbon at the top of the application. This section describes the functionality and use of each tab.

3.1 Prepare Tab

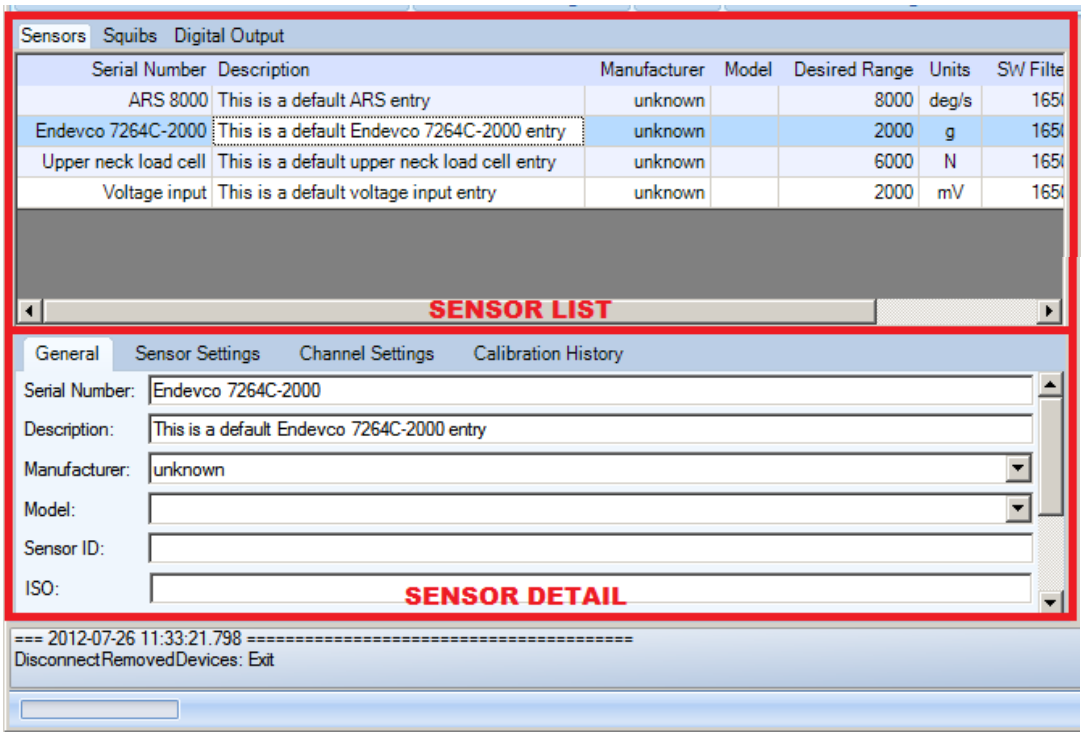


This tab identifies the relationship between available sensors and attached SLICE units. Sensor information can be added, removed, viewed, edited or assigned to channels on connected data acquisition hardware.

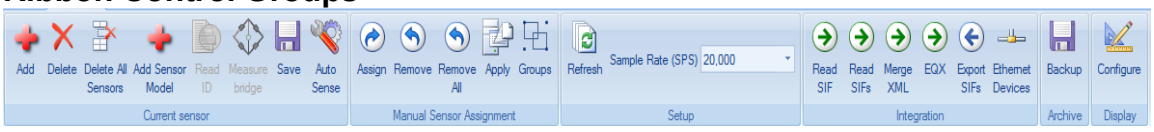
The image below highlights the different screen areas. The red boxes and text are used in this manual only (not visible in actual software).



Click anywhere on a line in the Sensor List to show the Sensor Details for that sensor.



Ribbon Control Groups



Current Sensor

- **Add:** Will add a blank Sensor Details field to all for creating a new sensor entry.
- **Delete:** Deletes the sensor that is highlighted in the sensor list.
- **Delete All Sensors:** Deletes all sensors from the database.
- **Add Sensor Model:** Adds a new sensor template.
- **Read ID:** Reads the EID from the channel selected in the Connected Sensor list. The returned ID value will be populated in the Sensor ID field for the sensor that is highlighted in the sensor list. Both a hardware channel and a sensor must be selected.
- **Measure Bridge:** Measures a sensors bridge resistance from the channel selected in the Connected Sensor list. The returned bridge resistance will be populated in the Bridge resistance (ohms) field for the sensor that is highlighted in the sensor list.
- **Save:** Saves edits made in the Sensor Detail area into the sensor database.

- **Auto Sense:** Allows hardware to automatically detect whether attached channels are IEPE or Analog bridge types. Currently only SLICE PRO hardware supports this command.

Manual Sensor Assignment

The user can manually assign and remove sensors that do not have an EID. The user cannot unassign or overwrite an auto-assigned channel.

- **Assign:** After highlighting a sensor in the list and highlighting an unassigned channel in the Connected Sensors area, use this to assign the sensor.
- **Remove:** Remove the highlighted channel in the Connected Sensors area.
- **Remove All:** Removes all sensors from Connected Sensors area.
- **Apply:** Commits the sensor set-up information to SLICE.
- **Groups:** Imports arrangements of sensors from Equipment Exchange (EQX) and allows assigning a block of sensors as a group.

Note: SLICEWare expects a sensor with an ID specified will only be used on a hardware channel with the same ID. If a sensor has an ID and the hardware does not or it has a different ID, the sensor settings will not be applied to the channel.

Set-up

- **Refresh:** The sensor IDs are read when the software is started or when a SLICE is rebooted. If sensor connections are switched, choosing refresh will read the connected IDs on the current channels.
- **Sample Rate (SPS):** Locks in a target sample rate for diagnostics and data collection.

Integration

- **Read SIF:** This button imports and merges a sensor information file (SIF) from an existing DTS TDAS Control installation into the current SLICEWare sensor database. IR-TRACC and non-linear sensor files are not currently supported.
- **Read SIFs:** This button imports and merges multiple SIFs from an existing DTS TDAS Control installation into the current SLICEWare sensor database.
- **Merge XML:** This button imports and merges a SLICEWare sensor database file into the current SLICEWare sensor database.
- **EQX:** This button imports sensors from an Equipment Exchange (EQX) file into the current SLICEWare sensor database.
- **Export SIFs:** This button exports the current SLICEWare sensor database to SIFs in a folder selected by the user. IR-TRACC, non-linear sensors, and IEPE sensors are not supported in SIF export.
- **Ethernet Devices:** This button allows the user to connect to a SLICE Distributor or TDAS hardware by entering the hardware's IP.

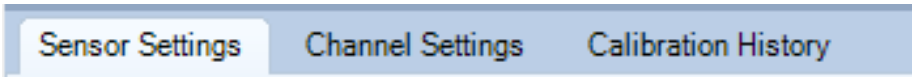
Archive

- **Backup:** This button will back up the current SLICEWare settings and database files to a location specified by the user.

Display

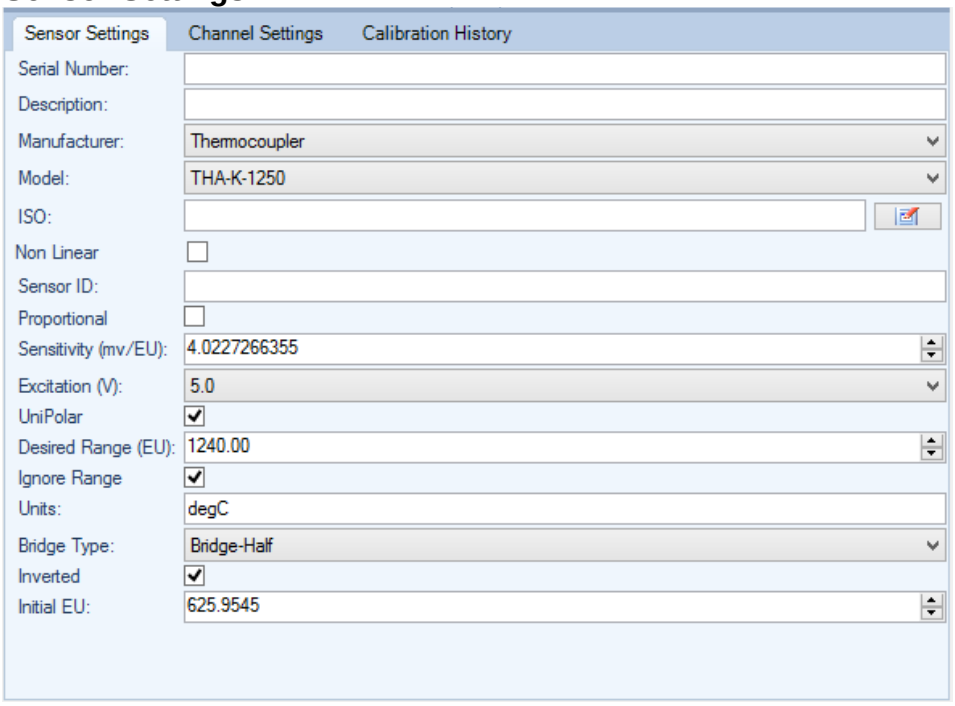
- **Configure:** This button allows the user to selectively change the layout of the Sensor Grid and Channel List.

3.1.1 Sensor Details



This section covers sensor settings, channel settings and calibration history in the Prepare tab.

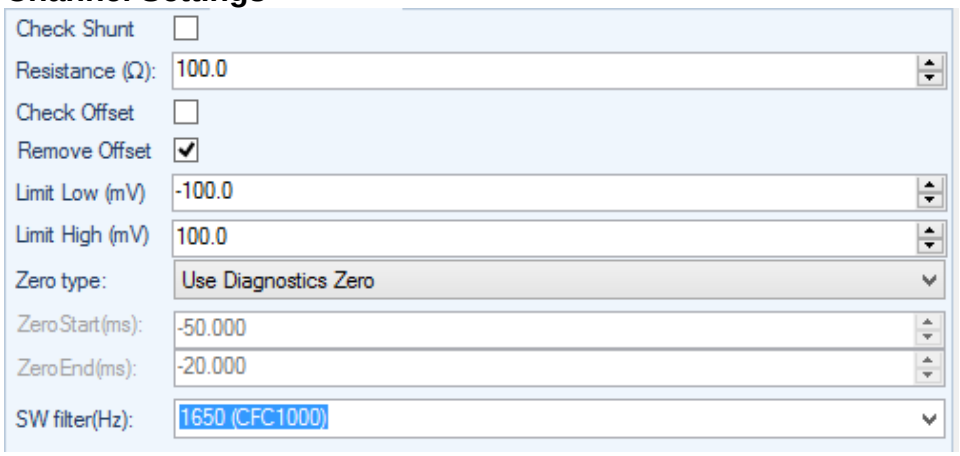
Sensor Settings



- **Serial Number:** Used to identify the sensor. Can be any unique identifier. The sensor list is sorted by default with the serial number.
- **Description:** Used as a secondary identifier of the sensor. The Description is displayed as the sensor identifier by default in the connected sensors section.
- **Manufacturer:** Use to select the sensor manufacturer. This list is populated by the Model.SensorDB.xml file.
- **Model:** Use to select the sensor model. This list is populated by the Model.SensorDB.xml file.
- **ISO:** Used to specify an ISO code for a sensor.
- **Non Linear:** Used to indicate a sensor is not linear and will use an IR-TRACC, thermocouple, or polynomial equation.

- **Sensor ID:** Enter or "READ ID" to populate.
- **Proportional:** Used to indicate sensor output is proportional to excitation.
- **Sensitivity:** Sets the calibrated sensitivity for linear sensors.
  - When Proportional to Excitation is checked, this value is the calibrated sensitivity in mV/V/EU.
  - When Proportional to Excitation is not checked, this value is the calibrated sensitivity in mV/EU.
- **Excitation:** Voltage applied to the bridge during measurements. Support for voltages other than 5 V are hardware and firmware dependent.
- **Unipolar:** Controls the behavior of range in diagnostics. When calculating "actual range" in diagnostics, unipolar sensors will double the calculated range since they are expected to range from 0 to y rather than –y to y.
- **Desired Range (EU):** Maximum expected value in engineering units the system needs to record for the sensor.
- **Ignore Range:** Allows SLICE PRO hardware to use the full input range of the channel. This may cause distortion (if more than 500 mV of input range is needed at 1M sps or 1200 mV at 500,000 sps) and is only recommended for sensors that can manage their own cut-off frequency.
- **Units:** Engineering units for the sensor.
- **Bridge Type:** Indicates the bridge completion type for the sensor. Also used to indicate a sensor is uses the "Integrated Electronics Piezoelectric" (IEPE) standard.
- **Inverted:** Indicates output from the sensor should be inverted before converting to engineering units.
- **Initial EU:** Used to indicate the engineering units that should be offset by a constant value to account for the starting point or value of the sensor.

Channel Settings



- **Shunt Check:** Perform a shunt check (verify sensor impedance and signal path from sensor to analog-to-digital converter). Requires that bridge resistance is specified to some degree of accuracy.
- **Bridge Resistance:** Specifies the expected amount of resistance measured when the sensor is properly connected.
- **Check Offset:** Measure the average output during diagnostics and compare against a low/high values for the expected offset.
- **Limit Low:** Minimum expected output for the sensor at idle in mV.
- **Limit High:** Maximum expected output for the sensor at idle in mV.

NOTE:

Sensor output (mV) is read during diagnostics. A very high reading can indicate a broken or unattached sensor. Additionally, sensor limits may need to be adjusted for specific sensors or test conditions.

- **Remove Offset:** Attempt to zero measured offsets during diagnostics. This option is not available to all types of sensors, notably non-linear sensors are not allowed to remove initial offsets.
- **Zero Type:** The type of post-download software zeroing to perform before displaying engineering units.
  - **Use Diagnostics Zero:** The Zero Measured Output (ZMO) of the sensor during Diagnostics will be used to set the EU zero of the downloaded data.
  - **Average Over Time:** Used in conjunction with ZeroStart and ZeroEnd, the average EU value during the Start and End window will be used to zero the collected data. The Zero Start/End window must be set to data that will be collected. If using a negative time, then the Acquire tab must include this window.
  - **Absolute Zero:** For SLICE hardware, the actual recorded input will not be adjusted or compensated for zero level. This setting can be used to show the actual mV offset. An example may be to record a logic level signal and see the actual on/off state. For TDAS hardware, a calibrated signal of 0 mV is directly injected and measured to be removed via software later.
- **Zero Start:** Used to indicate (relative to T=0 or event trigger) where averaging should begin (when using average over time).
- **Zero End:** Used to indicate (relative to T=0) where averaging should end (when using average over time).
- **SW Filter (Hz):** Choose the frequency of a software filter to be applied to the data when viewing. This only affects the viewed data as all data stored will be as collected with the hardware anti-alias filter.

Calibration History

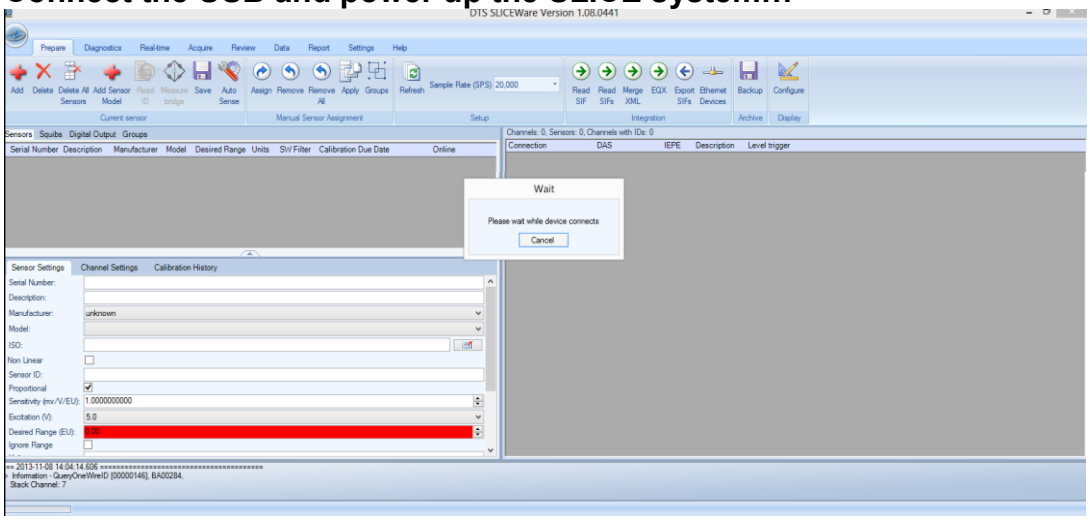
Date	Sensitivity	Offset

This table is automatically updated whenever a new sensitivity is applied to the sensor attributes.

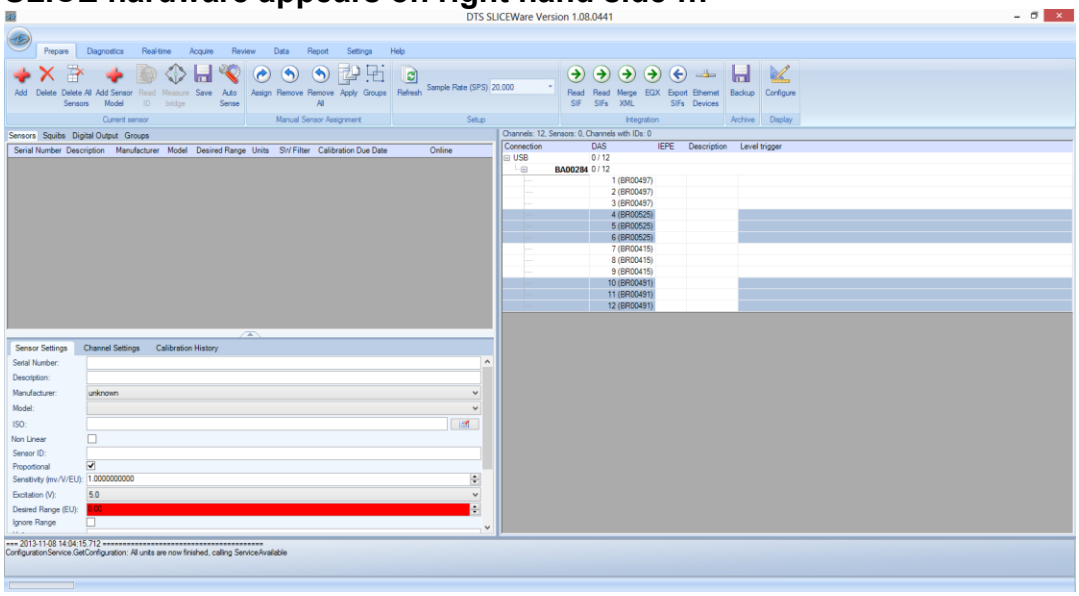
3.1.2 Hardware Channel List

The hardware channel list displays if a hardware channel has been set up for a sensor, and if there is a level trigger on the channel.

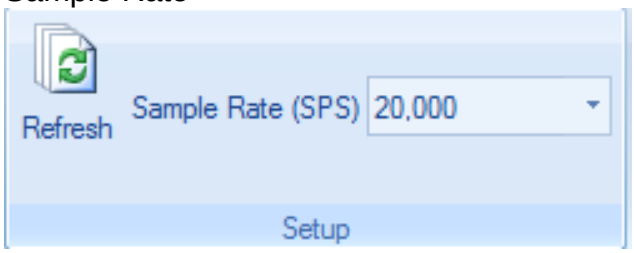
Connect SLICE …
Connect the USB and power up the SLICE system…



SLICE hardware appears on right hand side …



3.1.3 Sample Rate



- The sample rate dropdown selects a target sample rate in samples per second (sps) for data collection and diagnostics.
- The sample rate has implications on the maximum useable input voltage bandwidth and hardware anti-aliasing filtering, so the sample rate is set prior to diagnostics. Contact DTS Technical Support for more details on the trade-offs between gain and bandwidth.
- When the sample rate is set, SLICEWare will automatically configure the hardware for the maximum number of channels available at the sample rate. (See section 2.5 for information on sampling rates and recording times.)

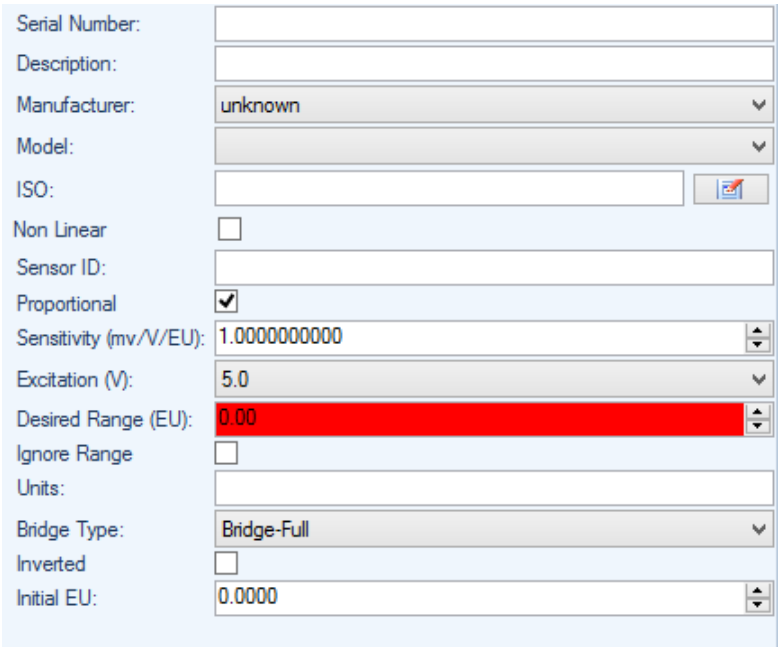
3.1.4 Ignore Range

SLICE hardware can restrict the bandwidth of data signals through the use of hardware anti-aliasing. Ordinarily this is handled automatically, however the Ignore Range setting in Sensor Settings can change this behavior.

- By default, the hardware anti-aliasing filter (AAF) is configured to 1/5 of the sample rate. For SLICE PRO Gen2 hardware, the hardware AAF has implications on the maximum usable input range. The table below details the AAF and input ranges for the SLICE PRO Gen2 SIM.

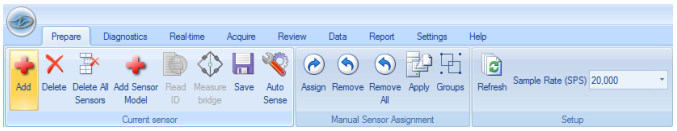
Sample Rate	Hardware AAF	Minimum Range	Maximum Range
≤500,000 sps	45,000 Hz	±1.95 mV	±2500 mV
1,000,000 sps	200,000 Hz	±15.6 mV	±500 mV

- Some sensors should be configured to ignore the input range available at the current hardware AAF. This lets the unit continue to use the full input range for data collection.

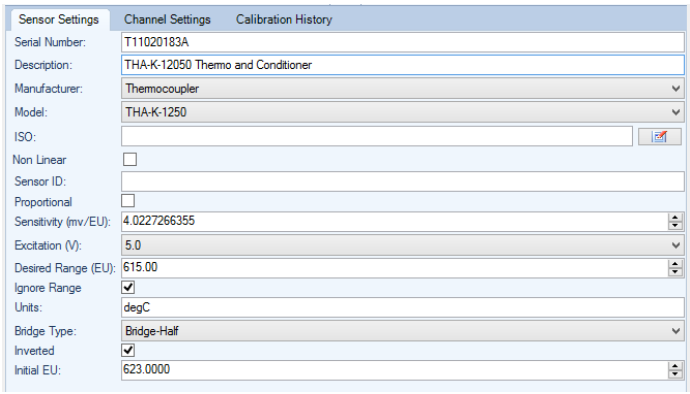


3.1.5 Adding a Texense THA-K-1250 Thermocouple Adapter

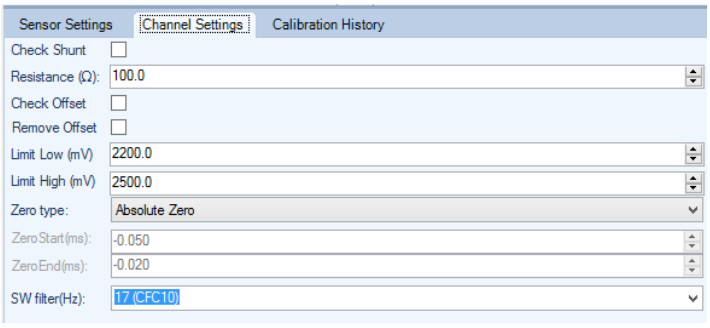
1. On the PREPARE tab, click the "Add" button in the "Current Sensor" button group.



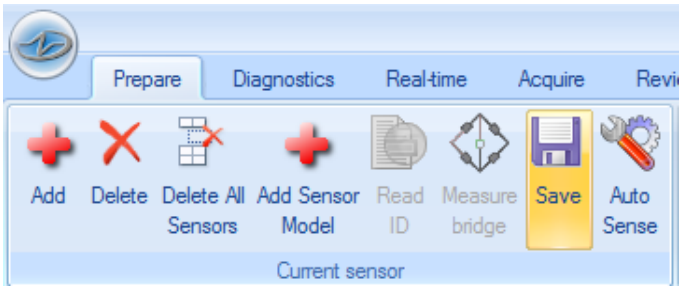
2. Select "Texense" as manufacturer and "THA-K-1250" as model.



3. Adjust sensor offset tolerances to account for your test conditions. (The information below will help in setting these values.)



4. Enter a serial number and description, then press "Save" in the "Current Sensor" button group.



THA-K-1250 Offset Tolerances

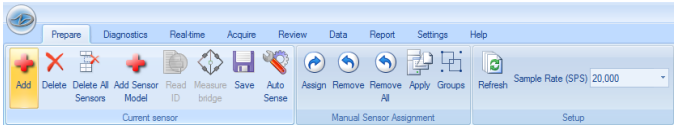
As a method of checking sensor status, SLICEWare performs some sensor output measurements during diagnostics (see Section 3.2.3 Initial Offset). The Limit Low (mV) and Limit High (mV) settings can be used check that sensor output values are in a valid and expected range. Expected electrical output can be calculated using temperatures in °C.

Initial EU = 625.9545 (can be found in Sensor Settings)
Sensitivity = 4.0227266355 (can be found in Sensor Settings)
mV = (Initial EU – °C) * Sensitivity
(625.9545 – 24) * 4.0227266355 = 2421.5 mV

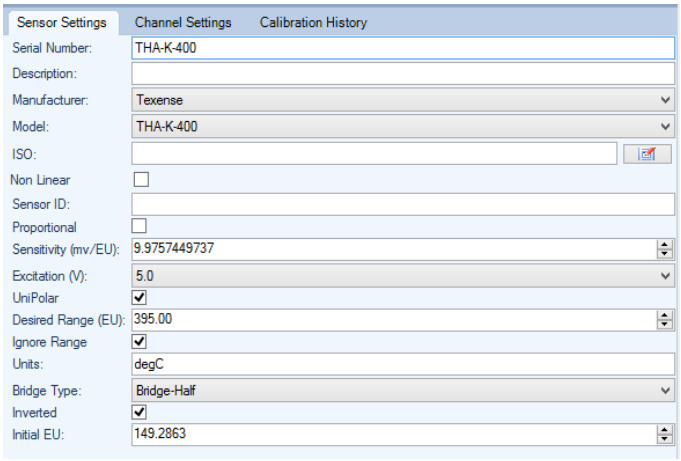
The default THA-K-1250 offset tolerance is set for between 4°C and 80°C.

3.1.6 Adding a Texense THA-K-400 Thermocouple Adapter

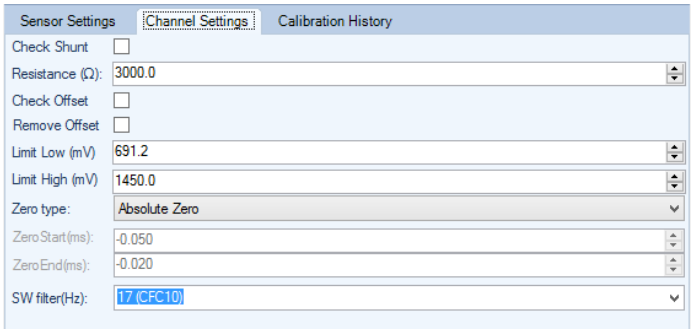
1. On the PREPARE tab, click the "Add" button in the "Current Sensor" button group.



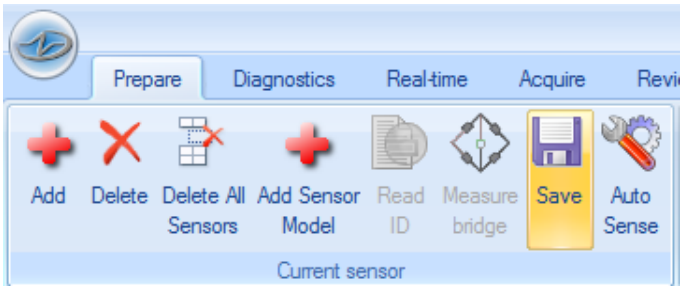
2. Select "Texense" as manufacturer and "THA-K-400" as model.



3. Adjust sensor offset tolerances to account for your test conditions. (The information below will help in setting these values.)



4. Enter a serial number and description, then press "Save" in the "Current Sensor" button group.



THA-K-400 Offset Tolerances

As a method of checking sensor status, SLICEWare performs some sensor output measurements during diagnostics (see section 3.2.3). The Limit Low (mV) and Limit High (mV) settings can be used check that sensor output values are in a valid and expected range. Expected electrical output can be calculated using temperatures in °C.

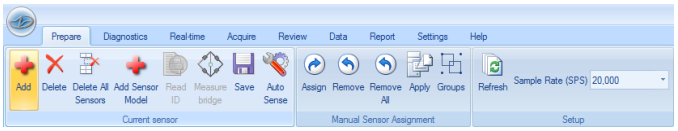
Initial EU = 149.2863 (can be found in Sensor Settings)
Sensitivity = 9.9757449737 (can be found in Sensor Settings)
mV = (Initial EU – °C) * Sensitivity
(149.2863 – 24) * 9.9757449737 = 1249.8 mV

The default THA-K-400 offset tolerance is set for between 4°C and 80°C.

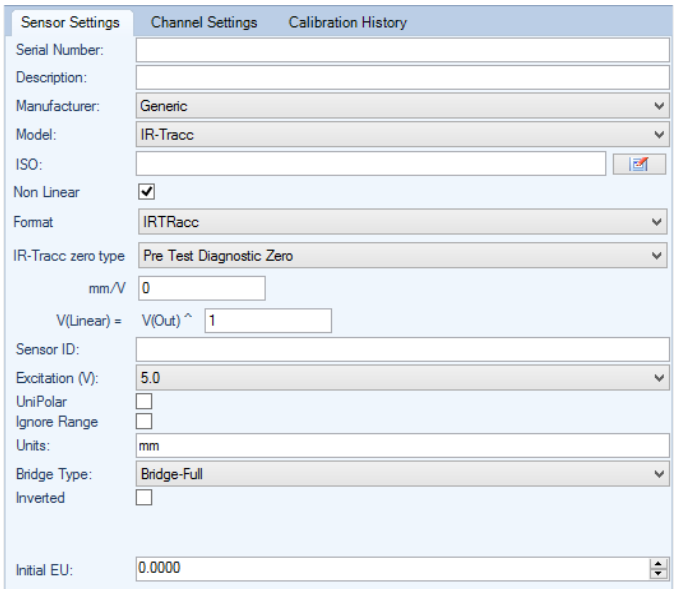
3.1.7 Adding an IR-TRACC

SLICEWare includes support for IR-TRACC devices. It collects readings in raw non-linear format. SLICEWare linearizes and scales the data using equations provided by the device manufacturer.

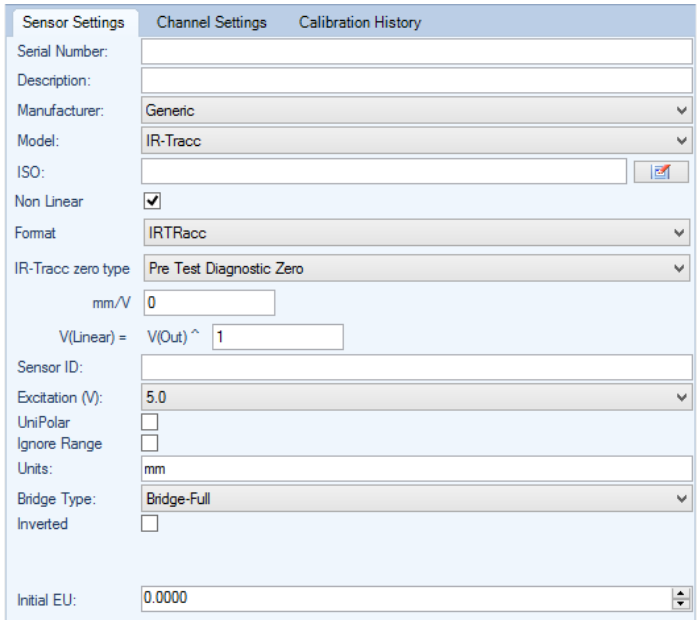
1. On the PREPARE tab, click the "Add" button in the "Current Sensor" button group.



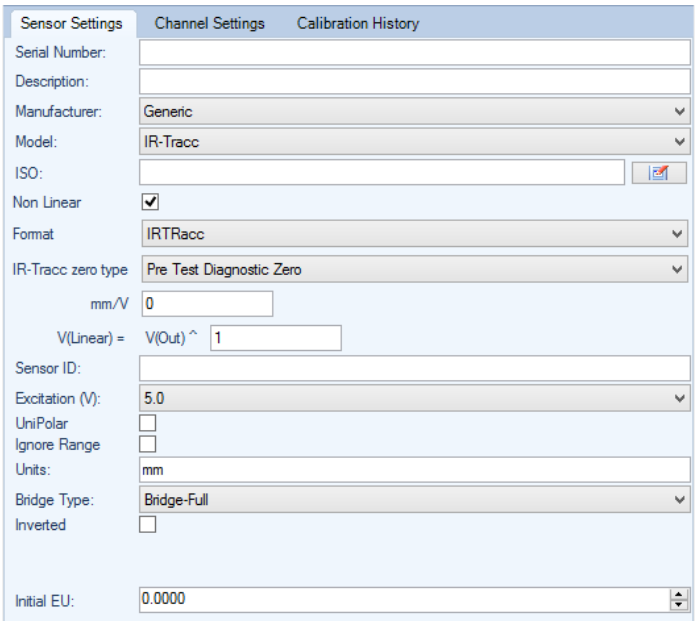
2. Select "Generic" as manufacturer and "IR-TRACC" as model.



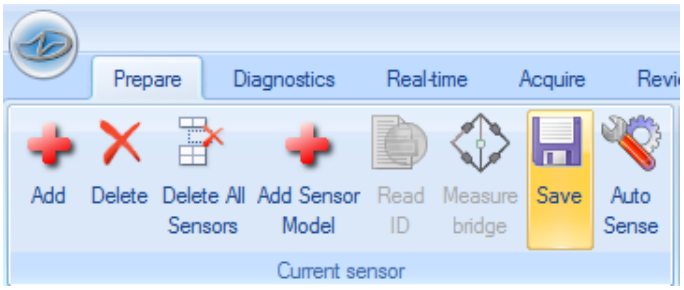
3. Select the IR-TRACC zero type. This setting controls the format the behavior of scaling of data. (The information below will help in setting these values.)



4. Enter mm/V and the linearization exponent as appropriate for the selected IR-TRACC zero type.



5. Enter in a serial number and description, then press "Save" in the "Current Sensor" button group.



IR-TRACC Zero Types: The IR-TRACC zero types are different ways that the IR-TRACC output can be specified and controlled.

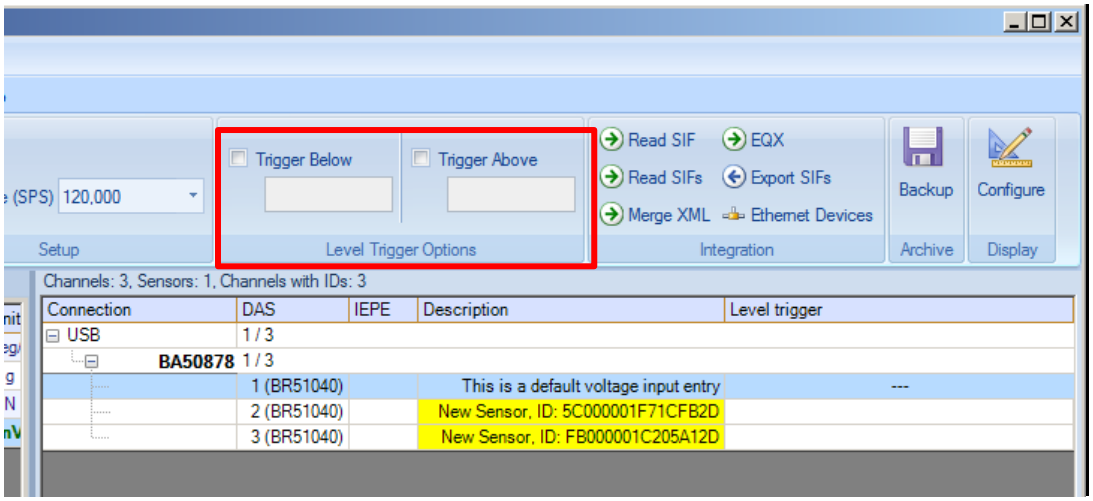
- **Manual:** This setting can be used to specify an equation in the form of y = mx + b where y is linearized voltage, x is units of measurement, and b is an offset. This setting can be used with any software zeroing method.
- **Pre-Test Diagnostic Zero:** This setting uses mm/V as provided from a cal sheet. Selecting this type will change the default software zeroing method to "Pre-Test Diagnostic", meaning that EU data will be zeroed using the output of the device during diagnostics.
- **mV for 0MM:** This setting allows the user to specify a specific mV value for the sensor at 0MM. This information is typically taken from a cal sheet table listing mV values for different MM measurements. This setting by default uses "absolute zero" software zeroing, meaning the output will be actual calculated EU.
- **Average Over Time Zero:** This setting uses mm/V scaling from a cal sheet. By default, this method sets the software zero method to average over time, and average over time should always be used

with this IR-TRACC zero type. EU data will be zeroed using the averaging window specified in the sensor channel settings.

3.1.8 Level Trigger Options

A hardware channel with an assigned sensor must be selected to enable level trigger functionality.

Level trigger conditions can be set on multiple channels for a single test. Threshold values can be an upper bound, a lower bound, or both. (The DAS monitors raw data; any post-processing may appear to alter the trigger value.)



Click on the check box next to "Trigger Above" and/or "Trigger Below" and enter the desired number. (Level trigger is specified in EU.) Click "Save" to record the changes.

CAUTION:

DTS does not recommend using level trigger for destructive testing.

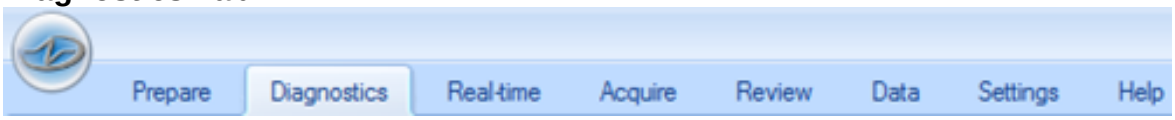
The SLICE MICRO/NANO Base has level trigger limitations as shown in the table below.

SLICE MICRO/NANO Base Level Trigger Limitations

Sample Rate (sps)	Maximum Number of Channels for Both Comparisons	Maximum Number of Channels for One Comparison	Number of Bridge SLICEs in Stack
120,000	0	1	1
100,000	2	3	1
60,000	3	6	2
50,000	6	6	2
40,000	6	9	3
20,000	15	18	6
15,000	15	24	8
12,500	24	24	8
10,000	24	24	8

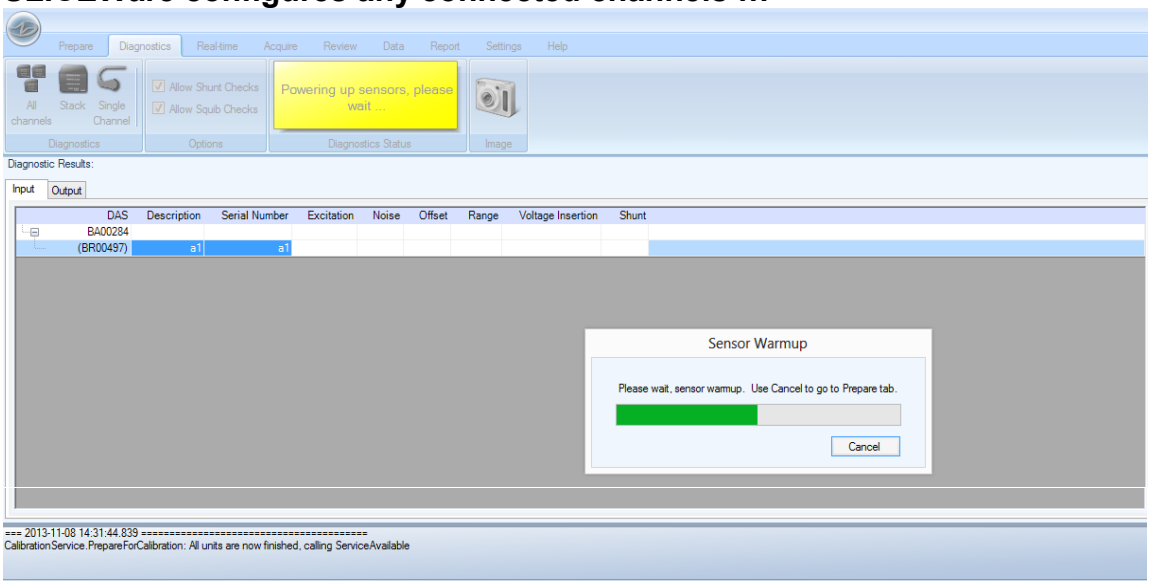
SLICE MICRO/NANO Base+ and SLICE PRO do not have these limitations.

3.2 Diagnostics Tab

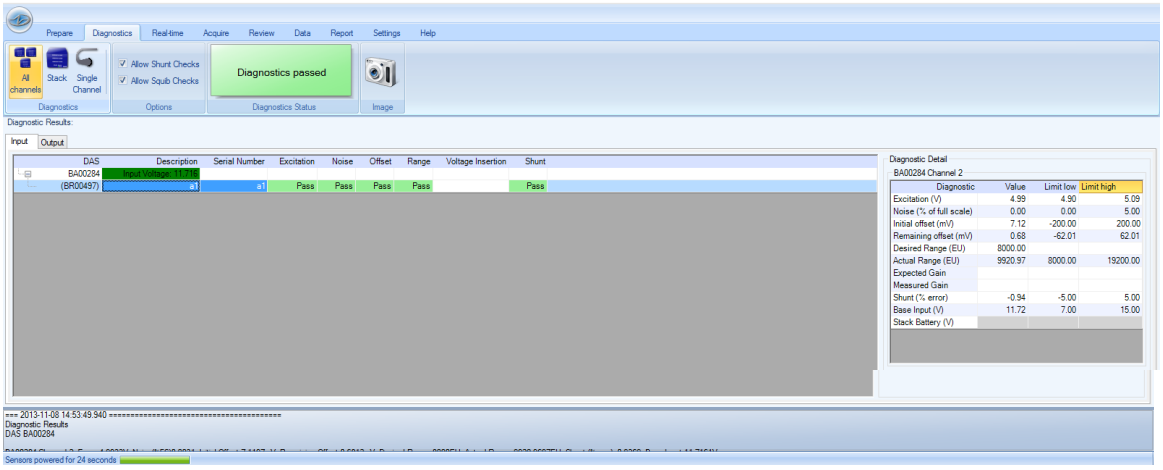


This tab ensures that the connected hardware is operating normally. Hardware diagnostics include checks for battery level, excitation voltage, noise and expected offset.

SLICEWare configures any connected channels …



Detailed calibration results for all channels …



3.2.1 Excitation

Displays expected and measured excitation. It is possible to change the low and high thresholds for excitation.

3.2.2 Noise (% of Full Scale)

Displays channel noise as a percentage of the available input range. In SLICE 1.0, a 100 sample data collection is performed at 20,000 sps and a gain of 1. The resulting standard deviation is then divided by analog data count (ADC) range available to record (16 bits for SLICE and SLICE PRO). SLICE PRO performs the same test at the set desired data collection rate for 400 samples.

3.2.3 Initial Offset

Displays the initial offset of a channel in mV. In SLICE 1.0 hardware, a 100 sample data collection is performed at 1000 sps and averaged. The value is compared against a high and low threshold for the channel which is obtained from the corresponding sensor setting on the channel. The same test is performed in SLICE PRO hardware at the desired data collection rate for 100 ms or 5000 samples (whichever comes first). The primary purpose of the initial offset test is identifying broken and incorrectly attached sensors.

If a sensor does not have "Check Offset" selected, an offset result will not be displayed in the broad diagnostic details table.

3.2.4 Remaining Offset

This fields displays the remaining offset after any offset removal has been performed by SLICE hardware. Offset removal is performed when "Remove Offset" is selected for a sensor. SLICE will adjust its digital-to-analog converter to try to minimize the analog data counts for the current input.

3.2.5 Desired Range (EU)

Displays the desired range in engineering units for the channel. This information comes from the sensor settings applied to the channel.

3.2.6 Actual Range

Displays the actual range in EU for the channel. This value is a combination of sensitivity, gain, and input range of the hardware. The high and low thresholds for the value can be adjusted using the config file, but are a percentage of the desired range.

3.2.7 Base Input

Displays voltage of the measured input of the DAS. The high and low thresholds for input voltage are contained in the config file, default values are 7 V and 15 V.

3.2.8 Stack Battery

Displays the measured voltage of any attached DAS batteries. The high and low thresholds for battery voltage are contained in the config file, with default values being 8 V and 9 V. Note that there are separate values for high and low during data collection.

3.2.9 Output

Displays the results from any squib channels, if present.

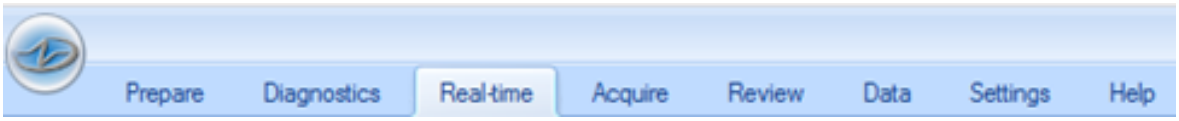
3.2.10 Diagnostics Ribbon Group

*** All Channels:** Runs data collection on all channels for all DAS.

*** Stack:** Runs data collection on all channels for the selected DAS.

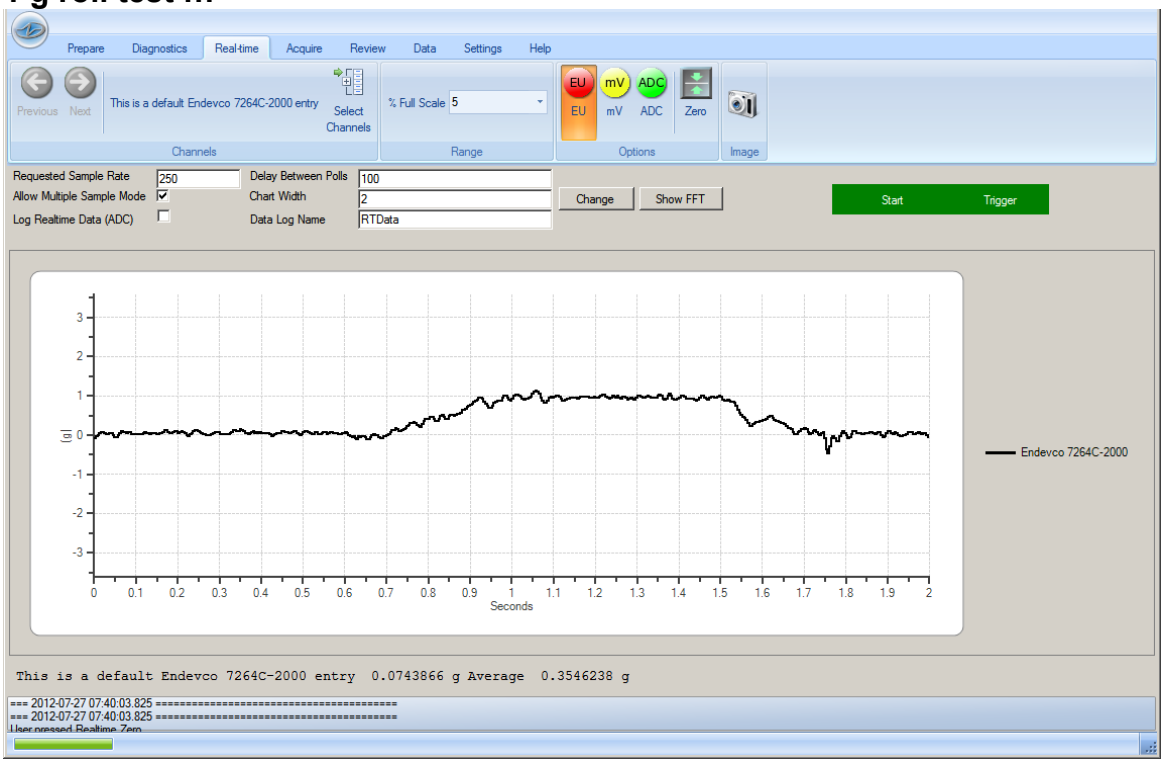
*** Single Channel:** Runs data collection for the currently selected channel.

3.3 Real-time Tab

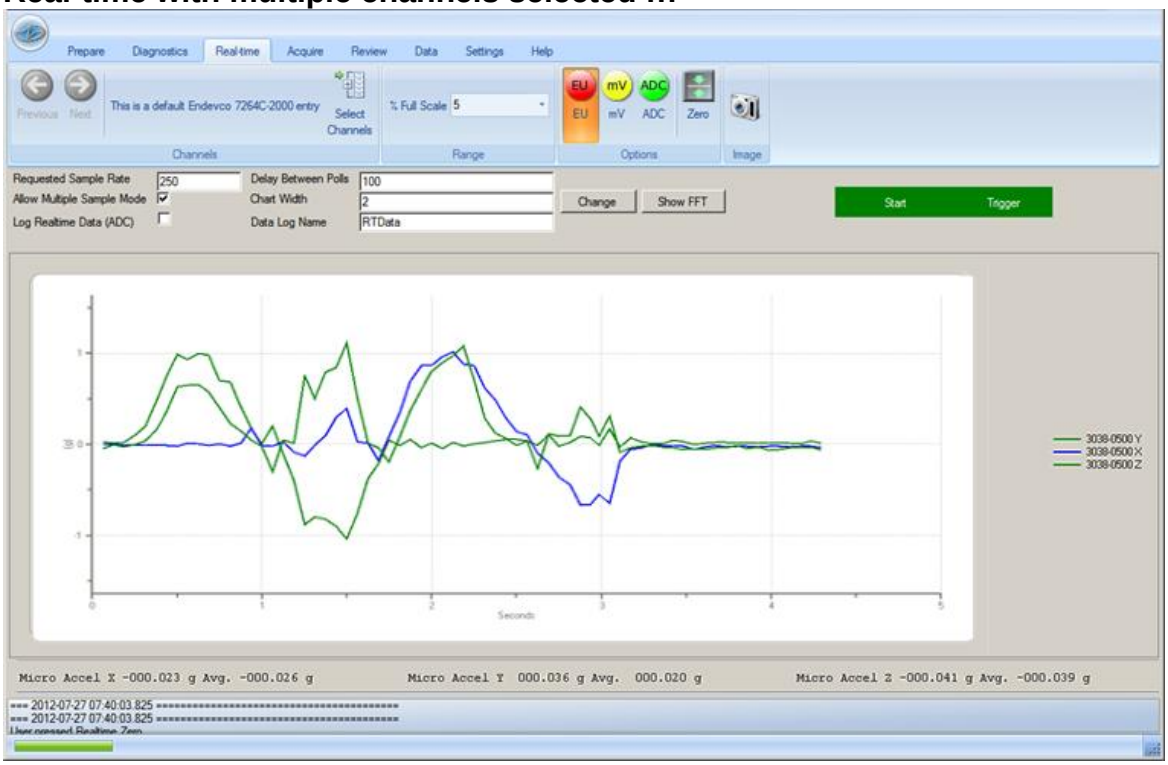


Real-time mode collects readings at a reduced sample rate so the data can be viewed simultaneously. This allows for checking polarity and scaling of channels interactively. It is possible to go directly from the Prepare tab to the Real-time tab, but offset removal, excitation warm-up, and some channel initialization may be skipped when bypassing diagnostics.

1 g roll test …



Real-time with multiple channels selected …



3.3.1 Requested Sample Rate

The default rate at which to collect data. This can sometimes be adjusted to provide for better real-time operation. The maximum and minimum possible sample rates are hardware and firmware dependent. You must press "Change" for any changes to be applied.

3.3.2 Delay between Polls

The delay in ms between calls to units for samples. Any attached devices collect data at an independent rate, however the data must be polled from the devices. This setting controls how frequently the units are polled. Increasing the value can make some systems more responsive, but also increases the chance of dropped data between the polls. You must press "Change" for any changes to be applied.

3.3.3 Smoothed

Controls the graphing mode. When selected, lines are drawn directly from one sample data point to the next. When unselected, the data is stepped from each data point to the next.

3.3.4 Allow Multiple Sample Mode

Controls whether the units will report multiple samples at once or not. Support for this option is hardware and firmware dependent. You must press "Change" for any changes to be applied.

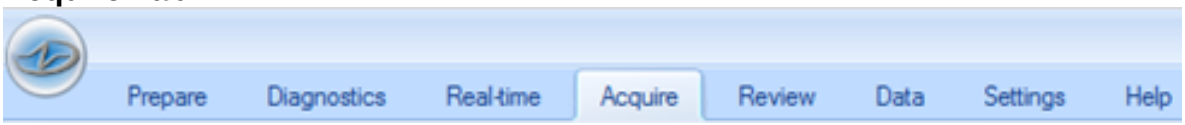
3.3.5 Chart Width
Controls the width of the chart in seconds. You must press "Change" for any changes to be applied.

3.3.6 Log Real-time Data
Controls whether samples are logged while in real-time mode. Data is appended to a CSV file in a real-time directory under the Data directory.

3.3.7 Fast Fourier Transformation (FFT)
Turns on a fast Fourier transformation to aid in signal noise or signal characteristics.

3.3.8 Start/Trigger
Displays start and trigger line status. This can be used to ensure the trigger and start lines are properly connected, however support for these checks are hardware and firmware dependent.

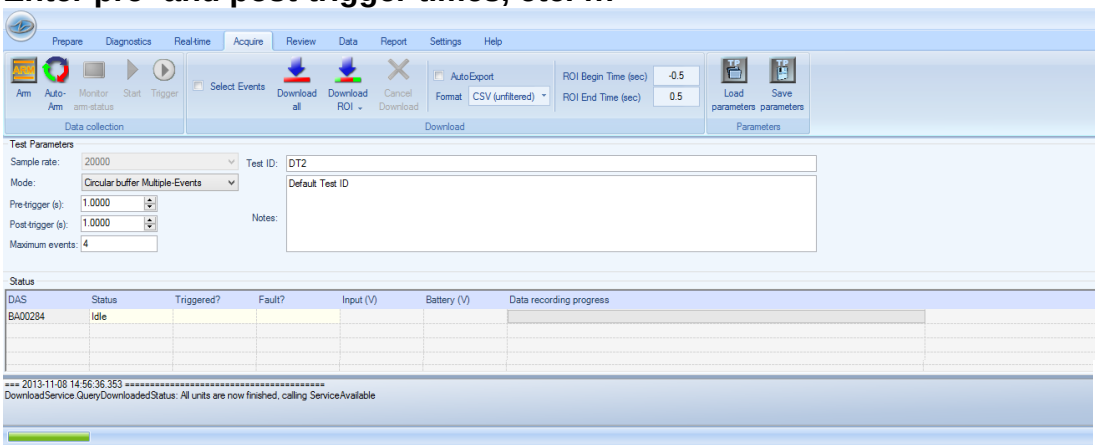
3.4 Acquire Tab



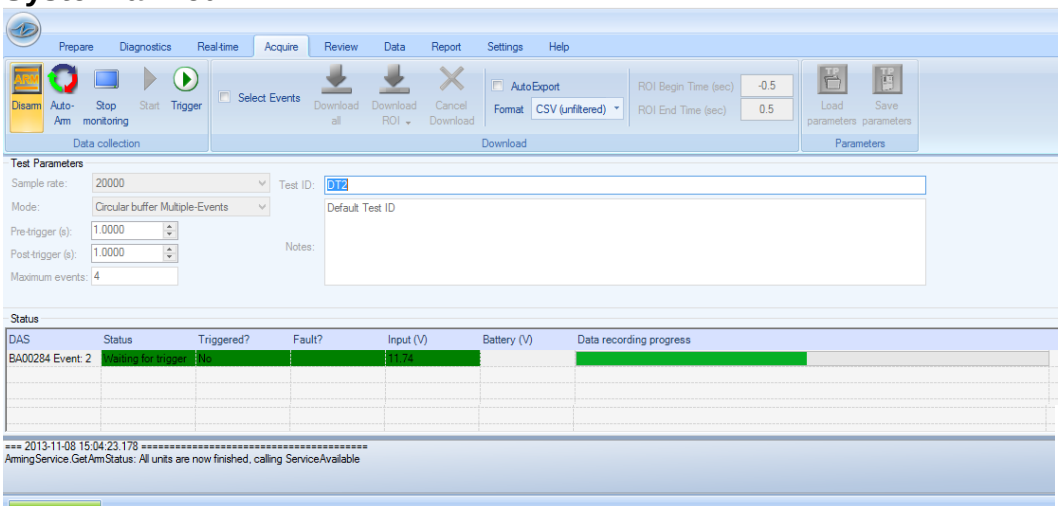
This tab configures and controls the data acquisition process. The user enters the test name, description, recording mode, pre- and post-trigger times and then prepares the system for data acquisition with the arm command. After the test is completed, the user can use the download command to view the data. *Note: Some recording modes are hardware and firmware dependent.*

It is possible to control some of the behavior of the Acquire tab in the Settings tab. Notably, it is possible to control whether data is automatically viewed after downloading, whether data is automatically downloaded after a test completes, and what download method to use.

Enter pre- and post-trigger times, etc. …

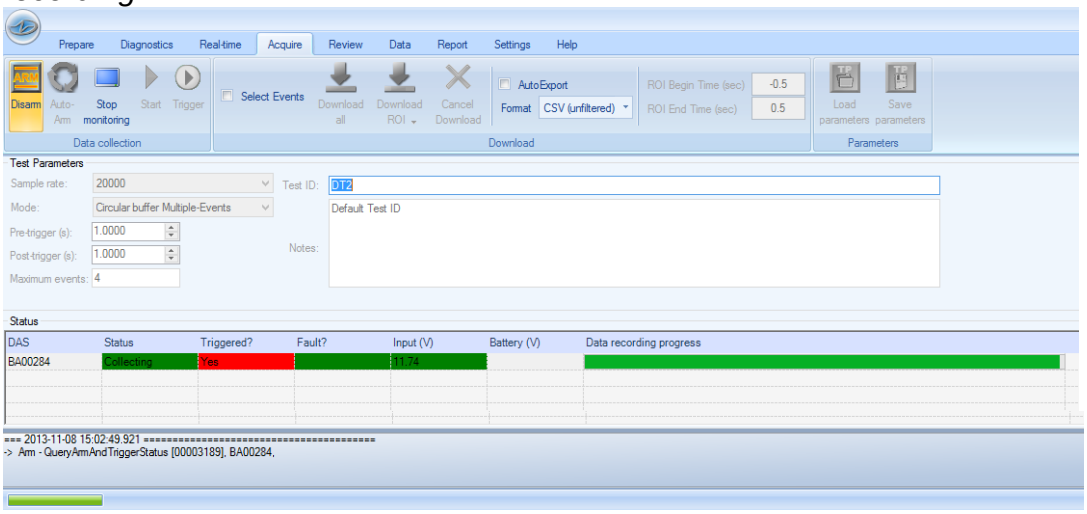


System armed …

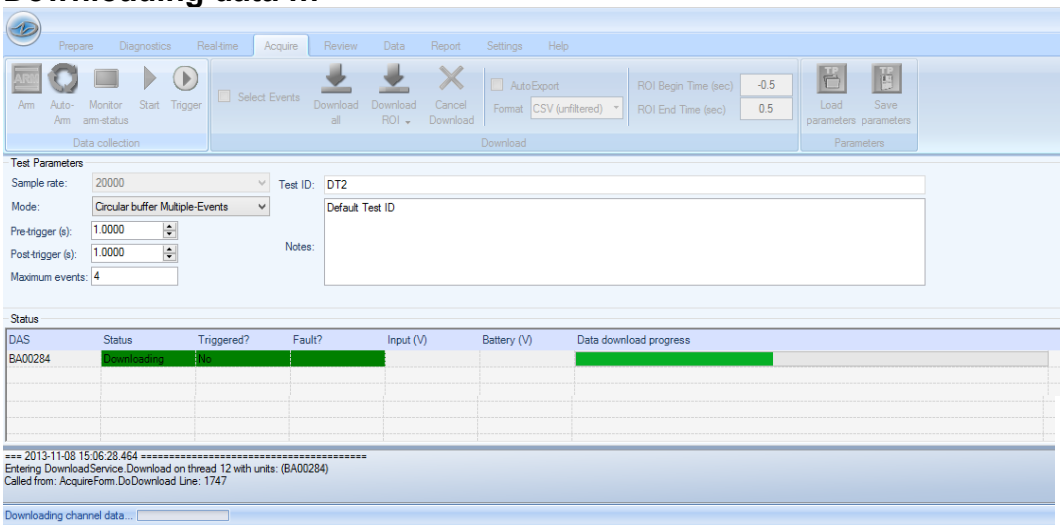


System triggered and acquiring data …

Note: SLICEWare cannot simultaneously display the data while the system is recording.



Downloading data …



3.4.1 Test ID

This field controls the test ID and will be stored in the test configuration. Note that it is possible to change the test ID at any time in order to download data to an alternate test directory without changing the test configuration on the hardware.

3.4.2 Notes

Any optional notes to store with the test.

3.4.3 Maximum Events

Controls the maximum number of events to collect when using multiple event collection modes.

3.4.4 Download All

Downloads the entire test from all attached units. In circular buffer mode, this means downloading from pre-trigger seconds to the trigger sample, and then to post-trigger seconds after the trigger. In recorder modes, this means downloading from 0 to post-trigger seconds.

3.4.5 Download Region of Interest

The Download Region of Interest (ROI) button allows selection of either user-specified or segmented modes.

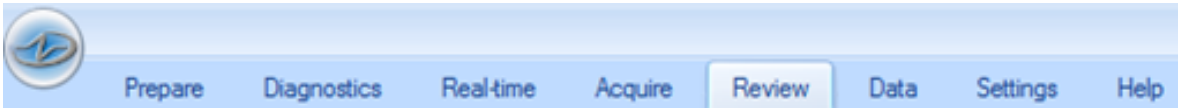
User-specified: SLICEWare will download from ROI Begin Time (sec) to ROI End Time (sec) (trigger sample is time 0). If the beginning and ending times are not in range, they will be automatically adjusted.

Segmented: This download method splits the test into a number of segments, each being a specific length in time. The ROI Segment Length (sec) is used to control the segment length.

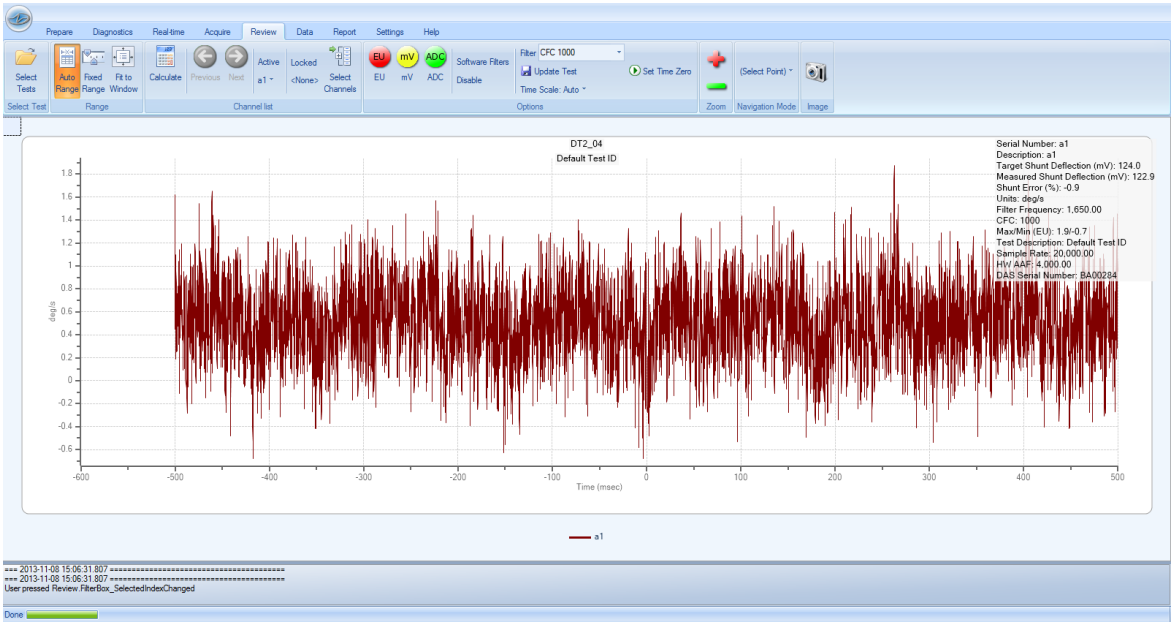
3.4.6 Auto-Export

Controls whether data is automatically exported (and the format) after downloading.

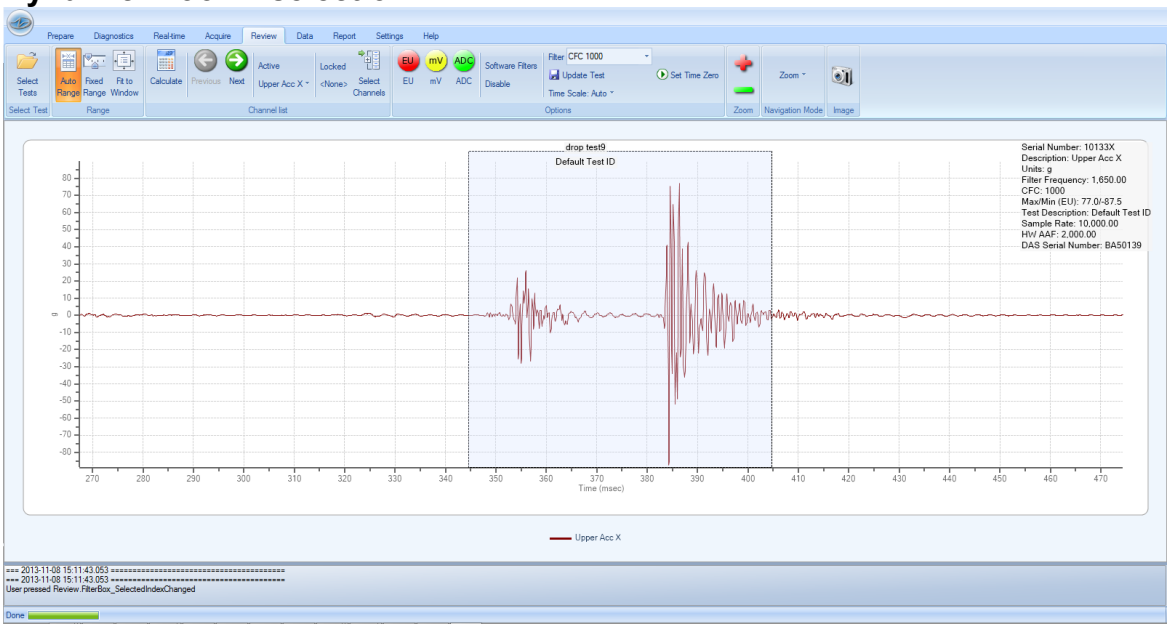
3.5 Review Tab



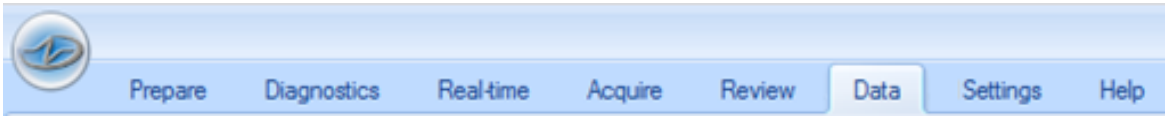
This tab displays collected data. Previously downloaded tests can be viewed and examined on a per-channel basis.



Dynamic "zoom" selection …



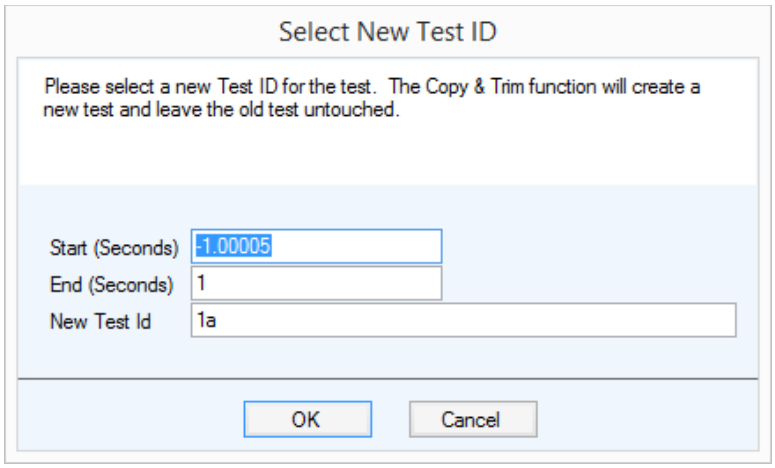
3.6 Data Tab



This tab provides export options for collected data. Export options include CSV, TDM, ISO MME, DIAdem (DAT), SoMat and TDAS formats.

3.6.1 Copy & Trim

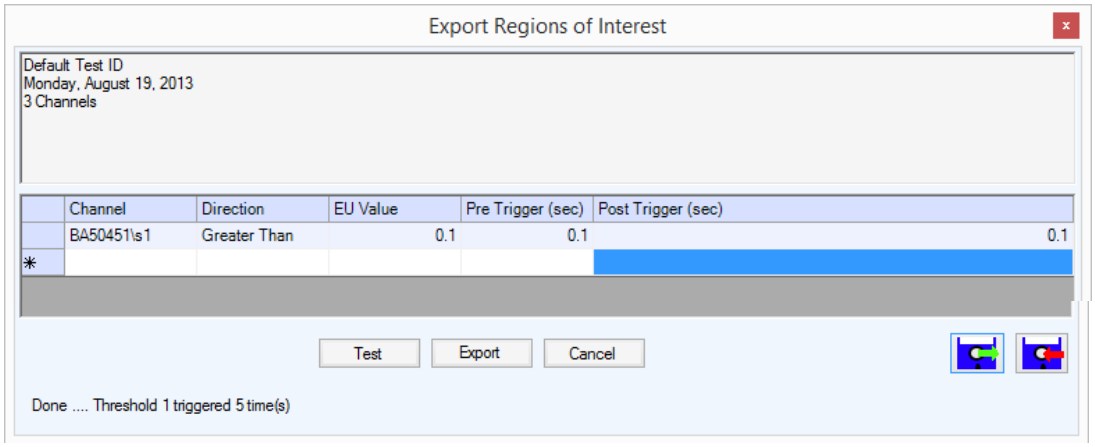
Creates a new test record by first copying another test's data and then trimming it to a user specified length. Time 0 is the trigger sample (if not present, then when data collection started).



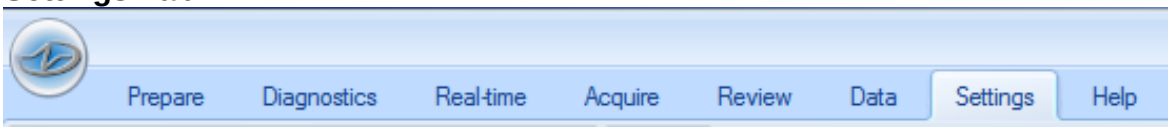
3.6.2 Threshold ROI

Allows the creation of a number of new data sets using existing test data and user specified threshold settings. For a trigger to be detected the values must cross from not trigger to triggered and stay triggered for at least 5 samples.

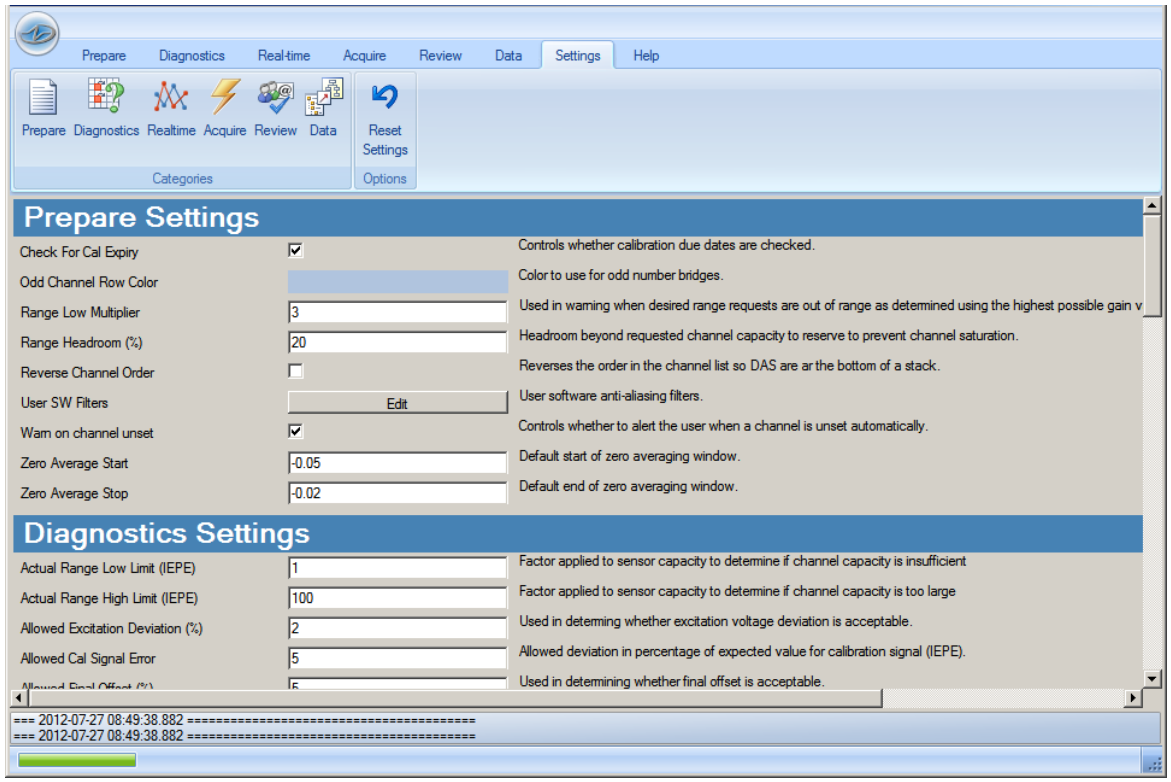
- Channel specifies the channel to examine.
- Pre-Trigger (sec) specifies the amount of time to carry over before the trigger when a new test is created for any triggers detected.
- Post-Trigger (sec) specifies the amount of time to carry over after the trigger when a new test is created for any triggers detected.
- Test will scan through the data looking for triggers.
- Export will export the new tests if any triggers are detected.


Export Regions of Interest
Default Test ID
Monday, August 19, 2013
3 Channels
Channel
Direction
EU Value
Pre Trigger (sec)
Post Trigger (sec)
BA50451\s1
Greater Than
0.1
0.1
0.1
Test
Export
Cancel
Done .... Threshold 1 triggered 5 time(s)

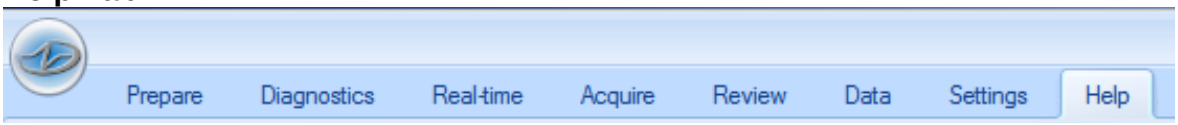
3.7 Settings Tab



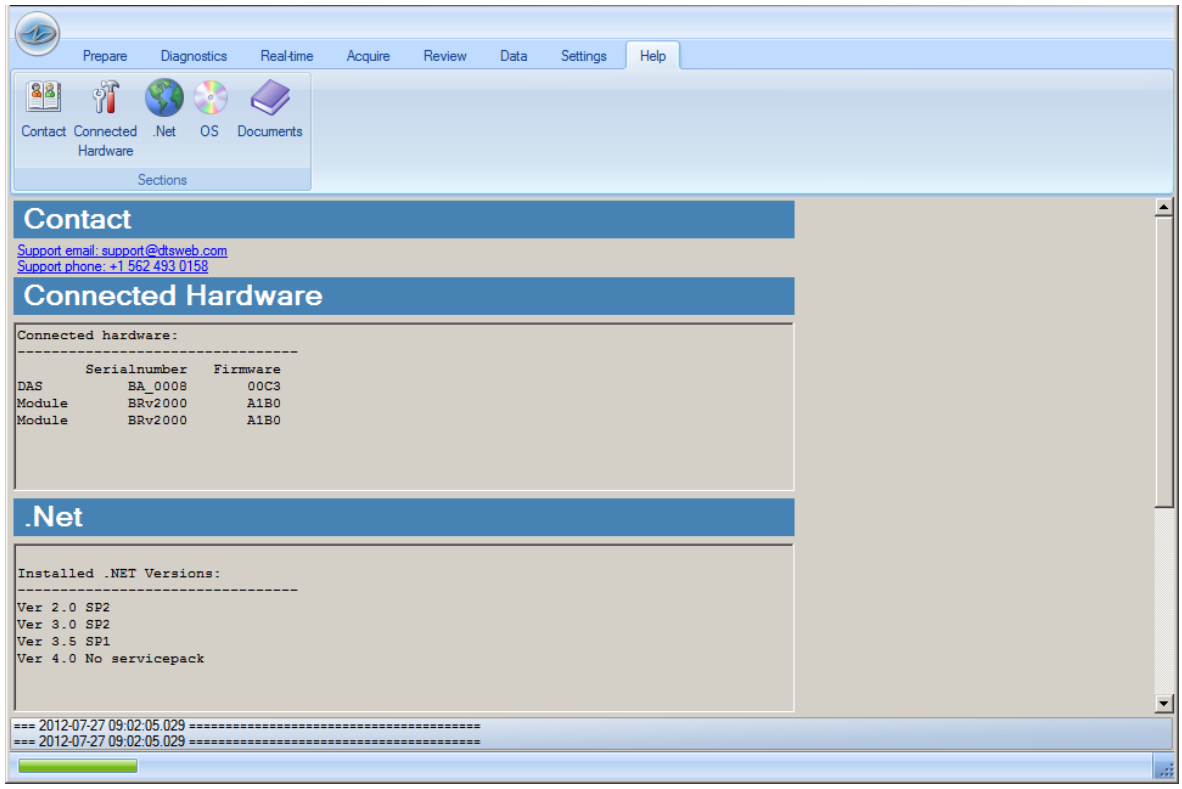
This tab provides an interface to modify basic settings related to each tab.



3.8 Help Tab



This tab provides information about contacting technical support, connected hardware, the computer operating system that SLICEWare is currently running on, and links DTS software and hardware manuals.



Appendix A: SLICEWare XML File Format

Overview

The .DTS file is an XML based file that contains information about the overall test and the individual channels. Some of the information may be redundant with information stored in the binary channel header.

The attributes and relationships of each XML node are described below.

XML Structure

<Test>

The Test tag is the outer most tag. It contains the following attributes and describes details common to the entire test.

Name	Data Type	Description
Id	String	The name of the test, typically the same as the .DTS file name
Description	String	The description of the test provided by the user
InlineSerializedData	Boolean	
Guid	Windows UUID string	A unique identifier assigned to each event
FaultFlags	Integer (UInt16)	16-bit bit array Bit 0: Incoming status line dropped Bit 1: ADC Buffer Overrun Bit 2: Flash CRC Error Bit 3: Trigger before start Bit 4: Input voltage low Bit 5: Input voltage high Bit 6: Back-up voltage low Bit 7: Back-up voltage high Bit 8-15: Unused

<Modules>

Within the Test node will be a list of modules contained within a <Modules></Modules> tag. A module corresponds to a data acquisition system—for example, an entire Stack. Each module will have its own <Module> tag with the following attributes:

Name	Data Type	Description
AaFilterRateHz	Integer	The name cut off frequency of the hardware anti-alias filter used during the test
Number	Integer	A sequential number assigned to each module within the test
SerialNumber	String	The factory assigned serial number of the Base
NumberOfSamples	Integer	The number of samples stored in each channel file. This will be fewer than the number of samples originally requested by the user if the data has been subsampled or if only a portion of the data was downloaded.
UnsubsampledNumberOfSamples	Integer	The total number of samples collected during data acquisition
PostTriggerSeconds	Double	The number of seconds of recorded data that the user requested after T=0
PreTriggerSeconds	Double	The number of seconds of recorded data that the user requested before T=0
RecordingMode	String	Either the value RecorderMode or CircularBuffer. Other values will be added in the future.
SampleRateHz	Integer	The rate at which sampling occurred during data collection
StartRecordSampleNumber	Integer	The sample number at which the start signal was first detected. The value will always be 0 when RecordingMode=CircularBuffer.
NumberOfChannels	Integer	The number of user configured channels within the module
InlineSerializedData	Boolean	

<TriggerSampleNumbers>

This is a list (possibly 0 length) of trigger sample numbers. In the Circular Buffer case, there will be one trigger sample number. In Recorder mode, the trigger is optional. In the case of multiple event mode, there may be more than one trigger sample number.

<Channels>

The Channels tag contains a list of channel elements. It should have the same number of entries as NumberOfChannels in the Module tag. The type of the child elements will depend on the type of signal conditioning SLICE used.

<AnalogInputChanel>

The AnalogInputChanel tag corresponds to a Bridge SLICE channel. (Note: There is a typo in the tag name and "Chanel" is misspelled. It has been retained for backward

compatibility.) Many of the attributes indicate how the channel was configured during the test. The AnalogInputChanel element has the following properties:

Name	Data Type	Description
ChannelType	String	This identifies the representation of the data contained in the .BIN file. Currently this value is always expected to be DTS.Serialization.Test+Module+AnalogInputChannel.
Number	Integer	The channel number within the signal conditioning unit. In a Bridge SLICE, channels are numbered 0–2.
Start	Date	Currently unused
Bridge	String	Either FullBridge or HalfBridge
BridgeResistanceOhms	Integer	The specified bridge resistance used during the shunt check
ChannelDescriptionString	String	The user provided description for the channel
Description	String	The user provided description for the sensor; currently the same as ChannelDescriptionString
DesiredRange	Integer	The user requested full scale
Sensitivity	Double	The sensitivity of the sensor in either mv/V/EU or mv/EU depending on ProportionalToExcitation
SoftwareFilter	String	The requested filtering to apply to this channel. Stored data is unfiltered, and this value must be used to apply proper filtering. Typical values are "1650hz" for CFC1000.
ProportionalToExcitation	Boolean	Indicates if the output of this sensor is proportional to excitation. Used in conjunction with Sensitivity.
IsInverted	Boolean	*(Optional)* Indicates if the data should be inverted before presenting to the user. If missing, this attribute is considered 'false'.
IsSubsampled	Boolean	*(Optional)* Indicates if the data stored on disk is at a lower sample rate than the original data collection. If missing, this attribute is considered 'false'.
Eu	String	The user provided Engineering Units (EU) (e.g., mm, g, or msec2)
SerialNumber	String	The serial number of the sensor used with this channel
CalSignalEnabled	Boolean	Applies to IEPE SLICE only.
ShuntEnabled	Boolean	For Bridge SLICE only. Indicates if the user requested the channel be shunted during diagnostics.
RemoveOffset	Boolean	Indicates if the user requested hardware offset compensation be used during diagnostics

Name	Data Type	Description
ZeroMethod	String	Identifies the type of software offset compensation that should be used. If the value is "UsePreCalZero," then the Pre-Calibration zero value stored in the channel file should be used. If the value is "AverageOverTime," then an average value computed from the channel data should be used.
ZeroAverageWindowBegin	Double	If ZeroMethod=AverageOverTime, this is the beginning of the window to be used for computing the average
ZeroAverageWindowEnd	Double	If ZeroMethod=AverageOverTime, this is the end of the window to be used for computing the average
InitialEu	Double	A value provided by the user that should be subtracted from all scaled data in addition to the selected ZeroMethod
UnsubsampledSampleRateHz	Integer	The sampling rate used during data collection. Valid only if IsSubsampled=true.
MeasuredShuntDeflectionMv	Double	*(Optional)* If a shunt test was performed, the actual deflection of the shunt
TargetShuntDeflectionMv	Double	*(Optional)* If a shunt test was performed, the expected shunt deflection
MeasuredExcitationVoltage	Double	*(Optional)* The measured excitation voltage, if available. Used by SLICEWare for scaling proportional-to-excitation sensor data if "factory" excitation voltage is not available.
FactoryExcitationVoltage	Double	*(Optional)* The factory excitation voltage, if available. Used by SLICEWare for scaling proportional-to-excitation sensor data.
TimeOfFirstSample	Double	The time relative to T=0 of the first sample

Appendix B: SLICEWare Binary File Format

Bin File Header Version 4 (SLICEWare versions 1.06 and higher)

Offset	# of bytes	Data Type	Description
0	4	UInt32	Magic key to identify file: 0x2C36351F
4	4	UInt32	Version number of this file header (currently 4)
8	8	UInt64	Offset (in bytes) from start of file to where data samples start
16	8	UInt64	Number of samples in this file
24	4	UInt32	Number of bits per sample
28	4	UInt32	0 = Unsigned samples, 1 = signed samples
32	8	Double	Sample rate
40	2	UInt16	Number of triggers. May be 0
42	N = Number of triggers * 8	UInt64	Trigger sample number
N + 42	4	Int32	Pre-Test zero level (in counts)
N + 46	4	Int32	Removed ADC (in counts)
N + 50	4	Int32	Pre-Test Diagnostics Level (in counts)
N + 54	8	Double	Pre-Test Noise (Percentage of Full Scale)
N + 62	4	Int32	Post-Test Zero Level (in counts)
N + 66	4	Int32	Post-Test Diagnostics Level (in counts)
N + 70	4	Int32	Data Zero Level (in counts)
N + 74	8	Double	Scale Factor mV (mV/Count)
N + 82	8	Double	Scale factor EU (mV/EU or mV/V/EU)
N + 90	2	Int16	EU field length (with terminator)
N + 92	X = Length of EU field	Char	Engineering units (without NULL termination)
N + 92 + X	8	Double	Excitation
N + 100 + X	4	Int32	Trigger Adjustment Samples (reserved)
N + 104 + X	4	Int32	Zero mV (in counts)

Offset	# of bytes	Data Type	Description
N + 108 + X	4	Int32	Window Average (in counts)
N + 112 + X	4	Int32	Original offset (in counts)
N + 116 + X	16	Char []	ISO Code
N + 132 + X	4	Int32	CRC32
N + X + 136 64bit (ulong) offset found in 3rd file field	Size of Sample Data	16-, 24-, or 32-bit depending on "Number of bits per sample"	DATA SAMPLES START HERE

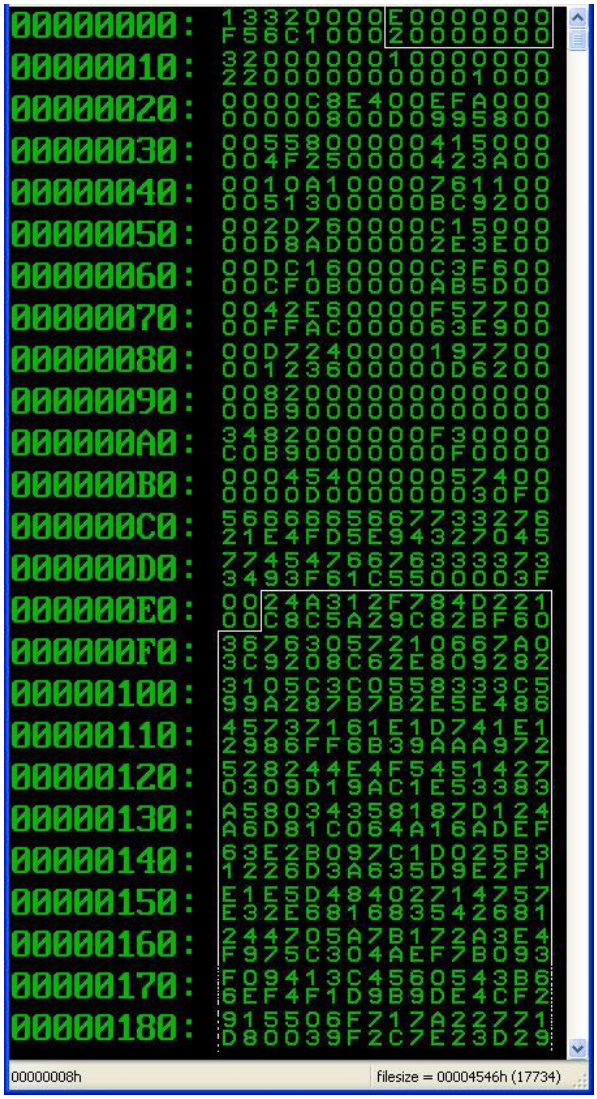
Bin File Header Version 1 (SLICEWare versions prior to 1.06)

Offset	# of bytes	Data Type	Description
0	4	UInt32	Magic key to identify file: 0x2C36351F
4	4	UInt32	Version number of this file header (currently 1)
8	8	UInt64	Offset (in bytes) from start of file to where data samples begin
16	8	UInt64	Number of samples in this file
24	4	UInt32	Number of bits per sample
28	4	UInt32	0 = Unsigned samples, 1 = signed samples
32	8	Double	Sample rate
40	2	UInt16	Number of triggers. May be 0.
42	N = Number of triggers * 8	UInt64	Trigger sample number
N + 42	4	Int32	Pre-test zero level (in counts)
N + 46	4	Int32	Pre-test Cal level (in counts)
N + 50	8	Double	Pre-test noise as a percent of FS
N + 58	4	Int32	Post-test zero level (in counts)
N + 62	4	Int32	Post-test cal level (in counts)
N + 66	4	Int32	Data-Zero level (in counts)
N + 70	8	Double	Scale factor MV (mV/Count)
N + 78	8	Double	Scale factor EU mV/EU (non-proportional); mV/V/EU (proportional)
N + 86	2	UInt16	Number of bytes in engineering unit field + 1
N + 88	X = Length of EU field	Array/string	Engineering unit (without NULL termination)

Offset	# of bytes	Data Type	Description
N + X + 88	16	Char	16 character ISO code
N + X + 104	4	UInt32	CRC32 for entire file
N + X + 108 64bit (ulong) offset found in 3rd file field	Size of Sample Data	16-, 24-, or 32-bit depending on "Number of bits per sample"	DATA SAMPLES START HERE

Example File

Shown below is an example view of a .CHN file in HEXADECIMAL notation. The byte numbers are along the left side of the viewer. Boxed in white is first the DATA start offset and it can be seen that starting at the byte specified in this offset is the actual sample data. Note that it is prefaced by trailing "00" from the previous value and from then on, all sample data is consistently non-zero.



Additional Information

Note that the file is 'little-endian'—that is the values are serialized into the file LSB first. This is not important but should be considered if changes are to be made to the serialization procedure. It must only be consistent between read and write operations. The .NET serialization utilities currently used in SLICEWare have defaulted to this because the x86 processor architecture is 'little-endian'.

Take the data offset for example. The 8 bytes read E2 00 00 00 00 00 00 00, but this does not mean the data starts at byte #1.62850163 × 10e19. E2 is the LSB, so the offset is 00 00 00 00 00 00 00 E2, or byte #226d.

SLICE Base Firmware Update Procedure

To update the SLICE MICRO™ or SLICE NANO™ Base firmware, you need:

1. ***Hardware:*** SLICE USB cable or SLICE SSI Cable Kit.

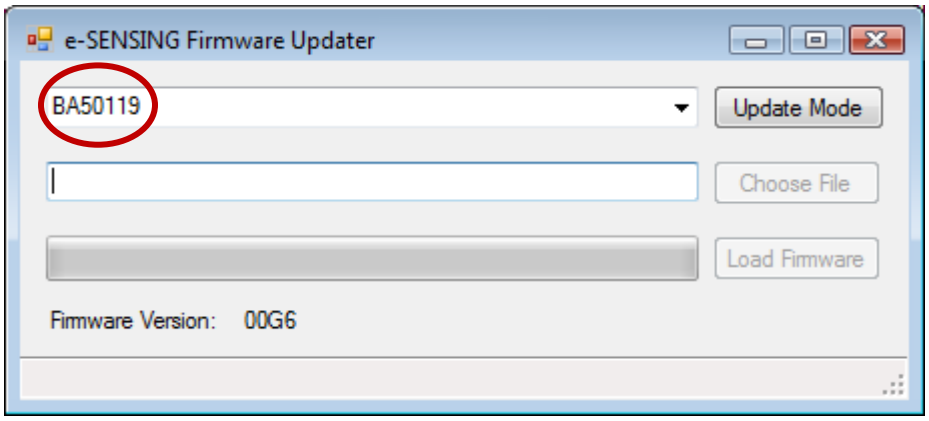
2. ***Software:*** ZIP file extracted on your PC. (This is typically provided by Technical Support via an attachment or web link.) The ZIP file contains the SLICE Firmware Updater program (eSENSING_FirmwareUpdater.exe) and required support files.

3. ***Firmware:*** Firmware version (*.sfw) you want to install.

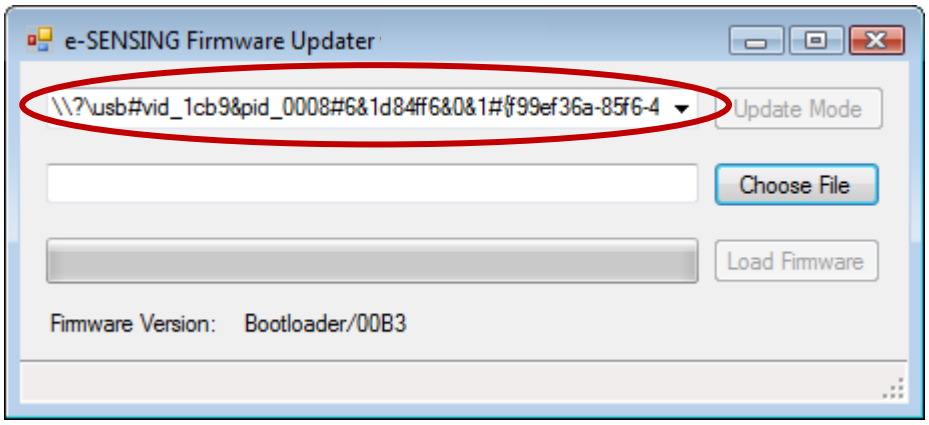
4. ***Procedure:***

   1. With PC on, connect the SLICE Base to the PC via USB. Power-up the SLICE Base.

   2. Start the SLICE Firmware Updater (eSENSING_FirmwareUpdater.exe). The screen will show the serial number of the connected Base:



3. Press Update Mode. The SLICE LEDs will flash. SLICE will disconnect, then reconnect. The internal ID of the SLICE Base will be shown:

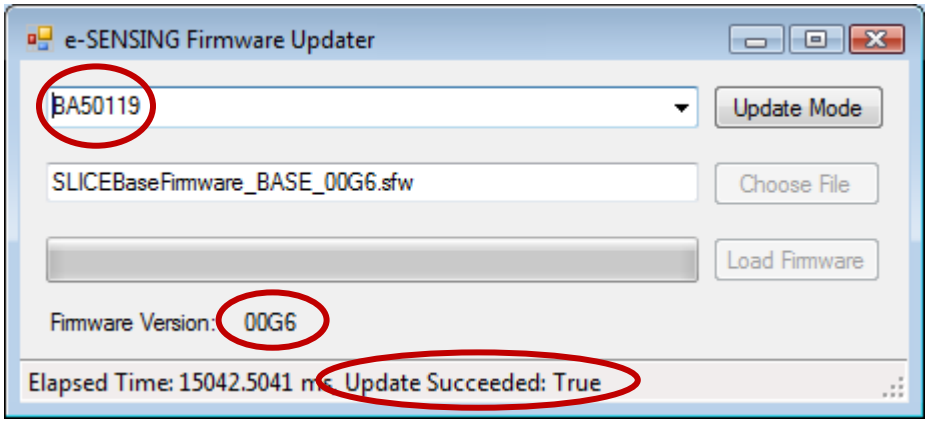


If this does not happen after 30 seconds, close then reopen the Firmware Updater program.

4. Press Choose File. Select the file (*.sfw) you want to use for update.

5. Press Load Firmware. The progress bar will show the progress of the firmware update. When the update is complete, the SLICE Base will reboot.

6. After reboot, the serial number and new firmware version will be shown. The status bar will indicate that the firmware update was successful.



Revision History

Date	By	Description
5 Feb 2015	EK	Removed support for Windows XP. (Rev 3)
2 Feb 2015	EK	Added sections on XML files (1.3), Level Trigger (2.3 and 3.1.8) and Sampling Rates (2.5). Revised sections 2.1.3, 2.1.4, 2.2 and 2.4 (supported hardware). Revised boilerplate material. (Rev 2)
26 Mar 2014	DM/EK	Expanded section 1.2. Section 2 extensively revised. (Rev 1)
8 April 2013	EK	Copied 10920-03002-MAN rev 5 as initial release. (Rev 0)