WinCCS Version 8 Software Manual

This manual contains important operating and safety information. Carefully read and understand the contents of this manual prior to the operation of this equipment.

www.atspa.com

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Information in this document is subject to change without notice and does not represent a commitment on the part of:

Applied Test Systems

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For assistance with set-up or operation, contact the ATS service department. Please have this manual and product serial number available when you call.

**** This Manual is not in its completed state. If you have any questions or concerns regarding any information within this Instruction Manual, please contact ssiddall@atspa.com directly and he will answer any and all questions that need addressed.****

Manual Contents

Introduction

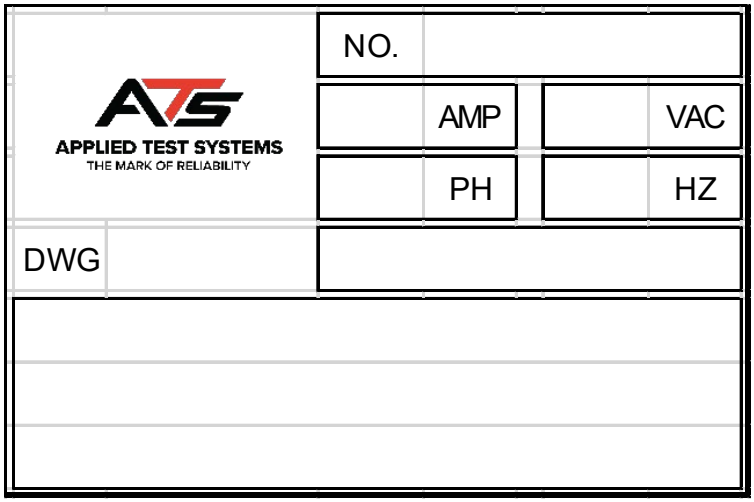
Warranty Information

All new ATS systems are shipped with a warranty. Units have a warranty against defective parts and workmanship for one full year from the date of shipment. Please see APPENDIX ? of this manual for complete details on the warranty.

After Sale Support

If there are any questions concerning the operation of the unit or software, contact the ATS Service Department at +1-724-283-1212.

Before calling, please obtain the software revision number from the View Screen and the serial number from the unit's data tag. A sample data tag is illustrated below, and can be completed with the unit's information for easy reference. Please be prepared to give a complete description of the problem to the ATS Service Department.



iFigure ?? - ATS Sample Data Tag

Safety

Blanket Statement about general safety for the machine.

System Overview

General Description

The Applied Test Systems (ATS) WinCCS system combines proprietary hardware and software with a direct load or lever arm tester to provide computer automation of the entire test process. Using archived test specifications, the system will:

- Control Furnace Temperature

- Apply the Appropriate Load
- Collect Creep, load, and temperature data
- Archive test results in a logical format

Constant stress and relaxation testing is accommodated on some models. The system is supplied with new ATS frames as well as retrofitted into existing frames made by ATS and other manufacturers.

Computer Specifications

Minimum computer specifications include the following:

- Processor: Core i3 or Better
- Operating System: Microsoft Windows 10 Professional
- Memory: 4GB or Better
- Hard Drive: SSD 256GB or Better
- Network Interface: Integrated 10/100 Ethernet

NOTE: Each RS422 port is capable of connecting up to 64 test frames (or 32 pairs of frames). A computer with a Dual Port RS422 card is capable of connecting up to 128 test frames (or 64 pairs of frames).

WinCCS System Overview

Test Specifications

The test specification contains all the details of the test. The system is designed to follow guidelines for several regulating agencies. Users can set specifications according to either these guidelines or their own configurations. A test specification is saved in the system each time that set of parameters is appropriate.

The WinCCS Test Specifications contains the test type (Creep, Stress Rupture, Stress Relaxation, etc.), specimen type instructions for running a test, pass / fail limits for various specimen parameters and data reporting and collection requirements. Each specification type has up to twenty conditions which are unique testing capabilities saved under one general test specification. This structure mimics real world specifications defined by the various standards groups, OEM manufacturers and materials suppliers.

As an example, a material supplier may have an alloy called Super10, this alloy has three different tests creep, stress rupture and notch rupture that need to be performed on it. The user might decide to create a test specification called “Super10”, with three conditions called creep, stress rupture and notch rupture. This makes it easy for the user creating the specimen to easily find the correct test specification to run the specimen under test with.

Test Specimens

The test specimen is specific to one item and therefore must have a unique specimen name for archival purposes. Associated with the specimen name is all data, including physical size, materials, etc. specific to that particular item.

Sequence of Events

The test specimen is performed in the following sequence of events:

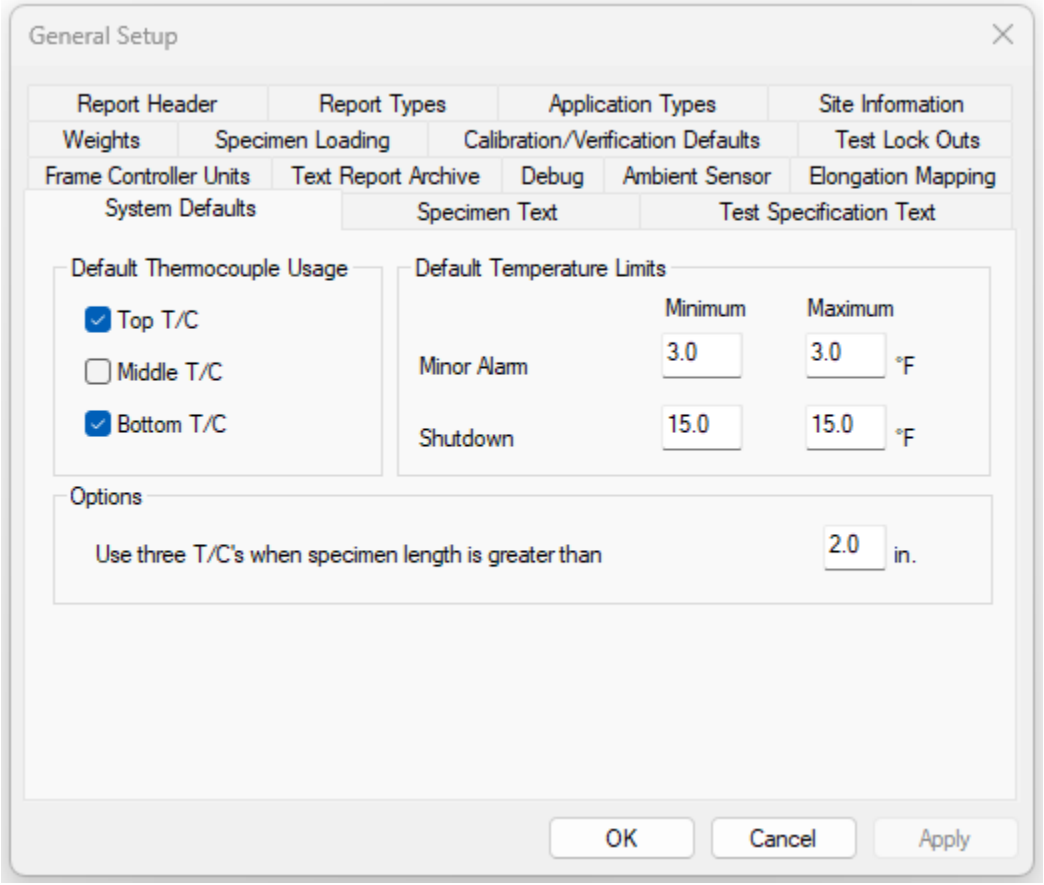
1. Select or create in the following sequence of events:
2. Create a specimen using the software process.
3. Select an Idle test frame and follow the Start a Test routine.
4. The Running Test state will change to the Post Test state when the test is complete or stopped manually.
    a. NOTE: The Post Test state allows the operator to restart the test or enter appropriate data, such as elongation information, onto the test comments. The test data is then automatically archived, and this test is now classified as a Previous Test.
5. Test results can be viewed either before or after the Post Test procedure.
    a. NOTE: All of the functions are described in detail in this manual.

Installation

Applied Test Systems will install all Software updates.

General Setup

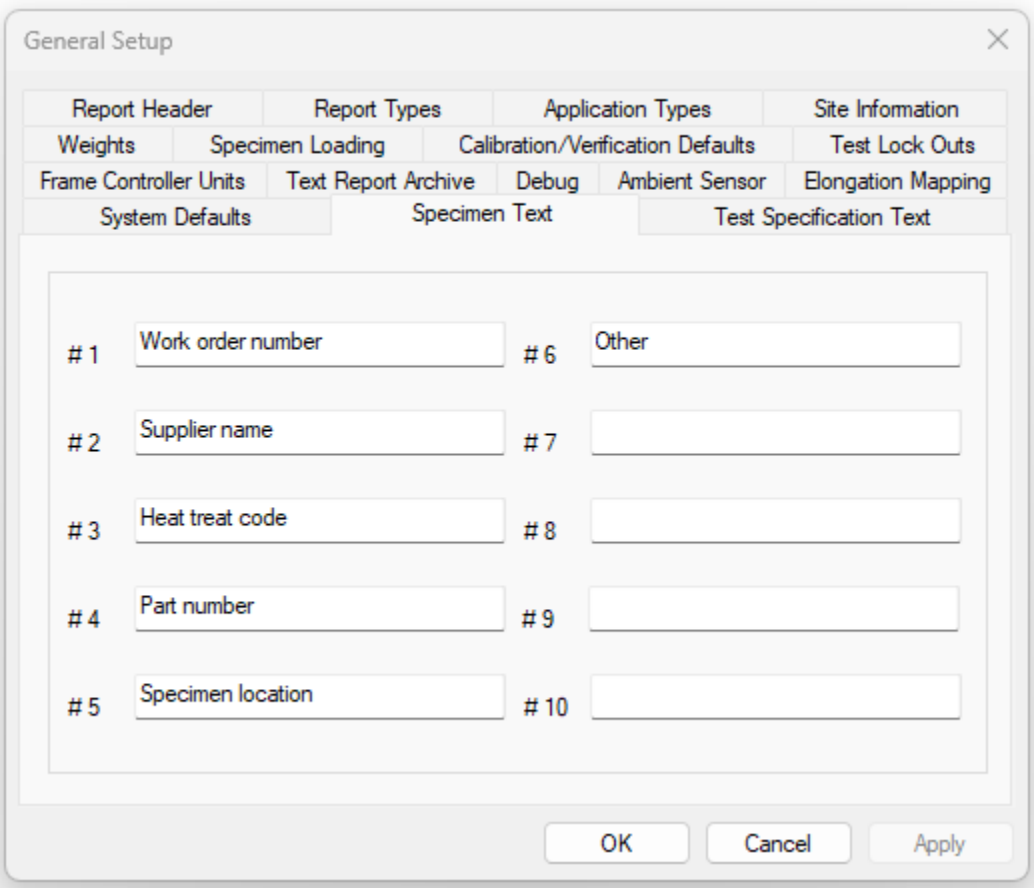
WinCCS General Setup contains all the general settings and information for the system. To enter General Setup select → General Setup from the main menu, which will open the General Setup Property Sheet as show below.



This Property Page sets what Thermocouples will be selected for use when a new specimen is created. Many users might select to only use a top and bottom thermocouple for smaller specimens and three thermocouples for Specimen greater than 2 inches as shown. NOTE: This is only the default setting used when creating Specimens and the user can easily override this.

There is also a section to default the minor and shutdown alarm temperature deviations allowed when creating Test Specifications. NOTE: This is only the default setting used when creating Test Specifications and the user can easily override this.

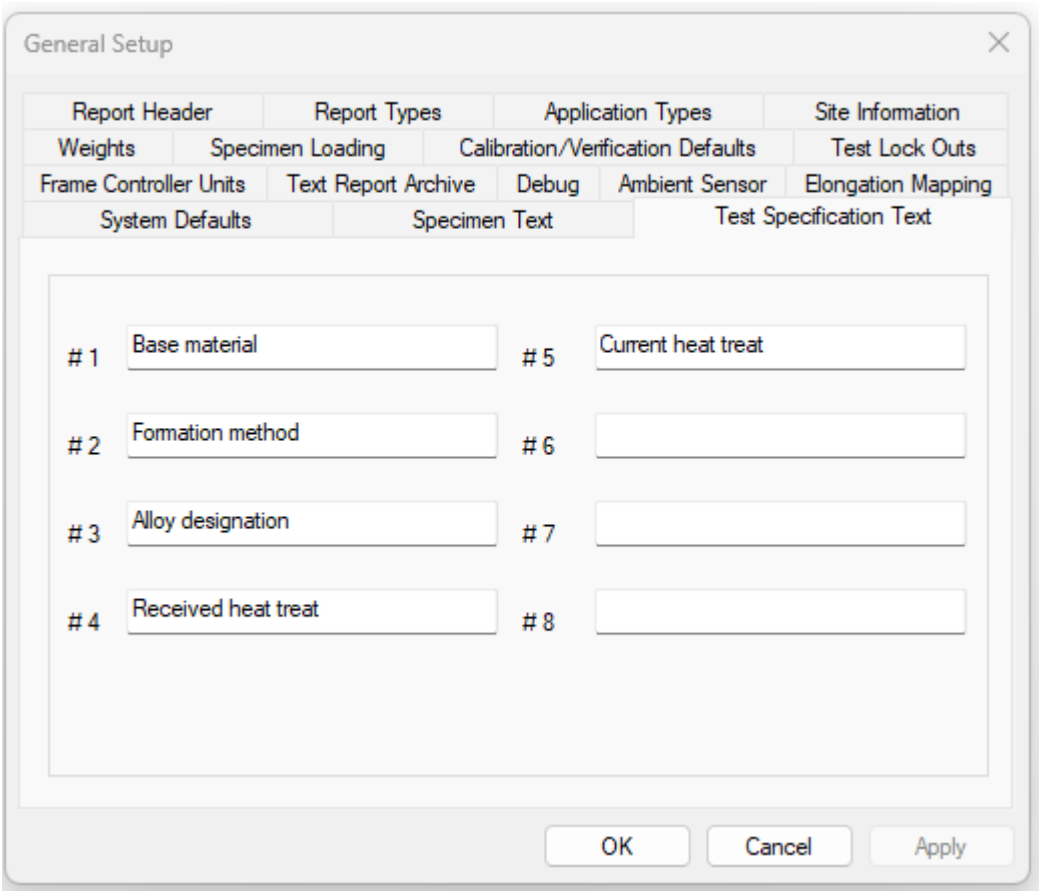
Proceed to the “Specimen Text” tab by clicking on the tab.



This Property Page configures the labels for user specific text fields to identify Specimens with when creating a Specimen, the user will be prompted to supply text for these fields.

NOTE: These fields may also be displayed in the “System Status” view, which could be helpful to allow operators to identify specimens by their Work Order Number.

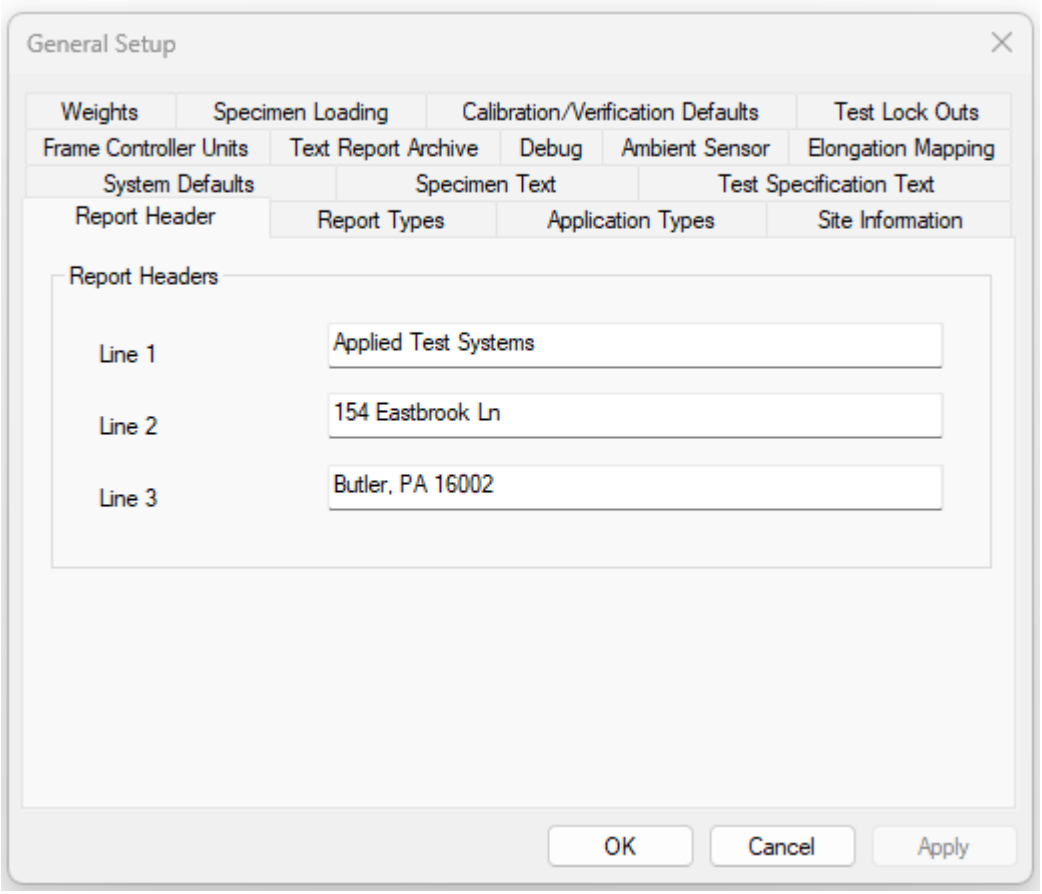
Proceed to the “Test Specification Text” tab by clicking on the tab.



This Property Page configures the labels for user specific text fields in the Test Specifications. They might be used to identify the material type or heat treatment

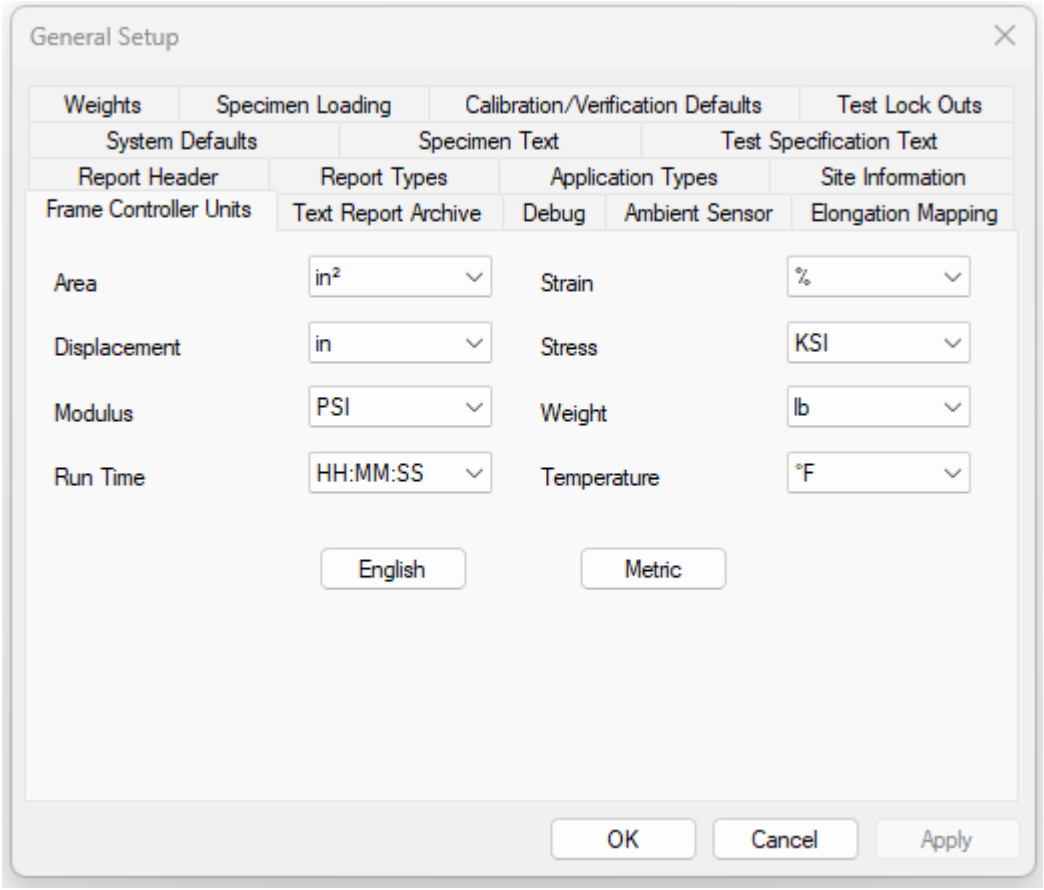
information. When creating a Test Specification, the user will be prompted to supply text for these fields.

Proceed to the “Report Header” tab by clicking on the tab.



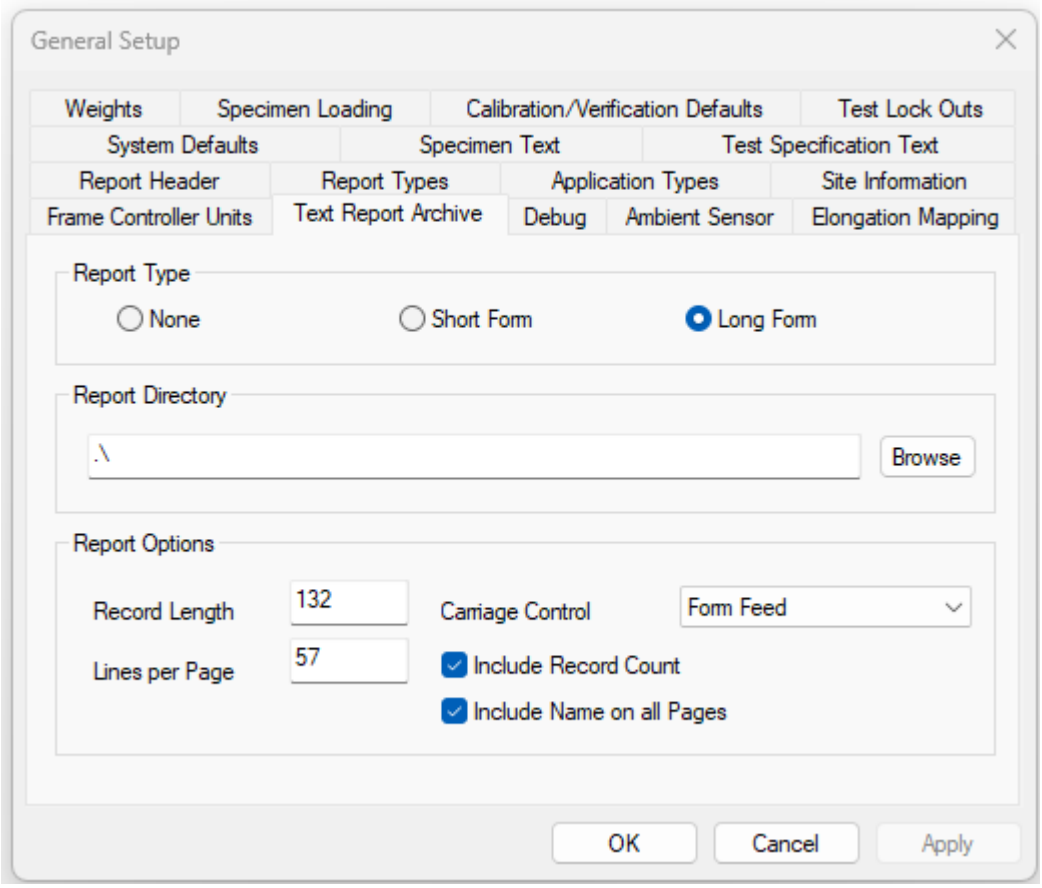
This Property Page sets the report header for all reports and graphs. This allows a clear header to be displayed and printed for all documents generated.

Proceed to the “Frame Controller Units” tab by clicking on the tab.



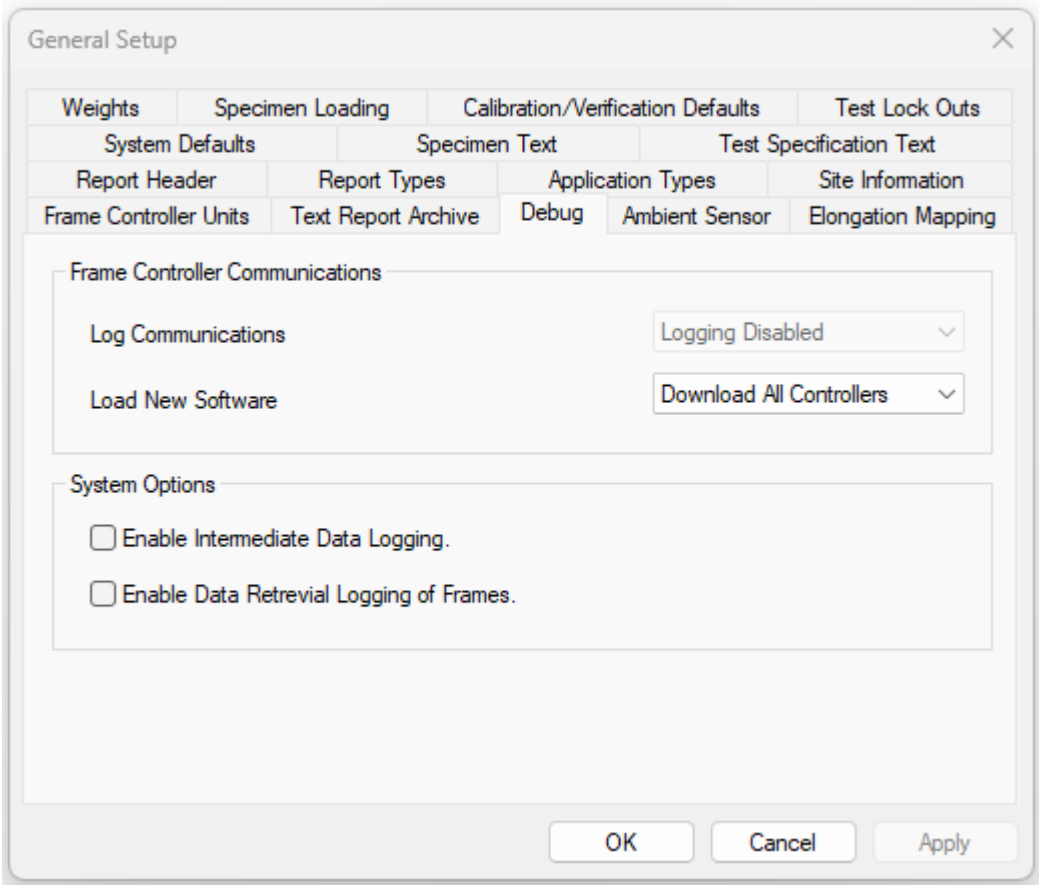
This Property Page sets the units that will be displayed on the SIGMA (GEN3) handheld terminals. This unit setting is for all frame controllers in the system and are not affected by the particular user's units.

Proceed to the "Text Report Archive" tab by clicking on the tab.



This Property Page configures the Text Report Archive. This is used to create text versions of either the short or long form report after the test is post tested. Typical usages of this are to generate text reports for fiche machines or other archival storage devices for hard copy. Though this can be useful, it is still probably better to archive the actual binary test files for retrieval at a later date.

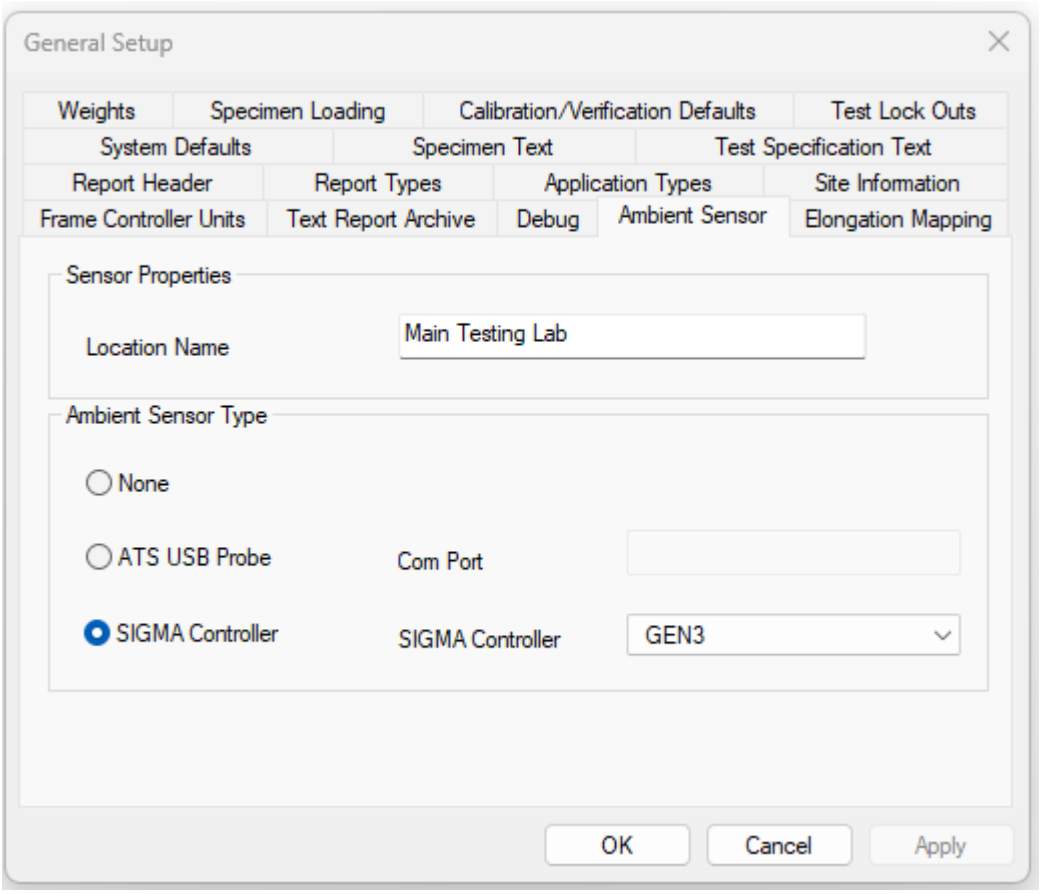
Proceed to the “Debug” tab by clicking on the tab.



This Property Page should only be used under the guidance of Applied Test Systems service personnel and under no circumstances should any of the logging features be used for more than a few minutes to collect data for Applied Test Systems service personnel, because these features gather a very large amount of data and could cause serious computer issues.

The one option that can be used by users is the “Load New Software”, which allows the user to direct the system to only download new firmware to a specific frame controller. Many users like to run new firmware on a particular controller to perform their internal verifications before releasing the firmware to the entire laboratory.

Proceed to the “Ambient Sensor” tab by clicking on the tab.

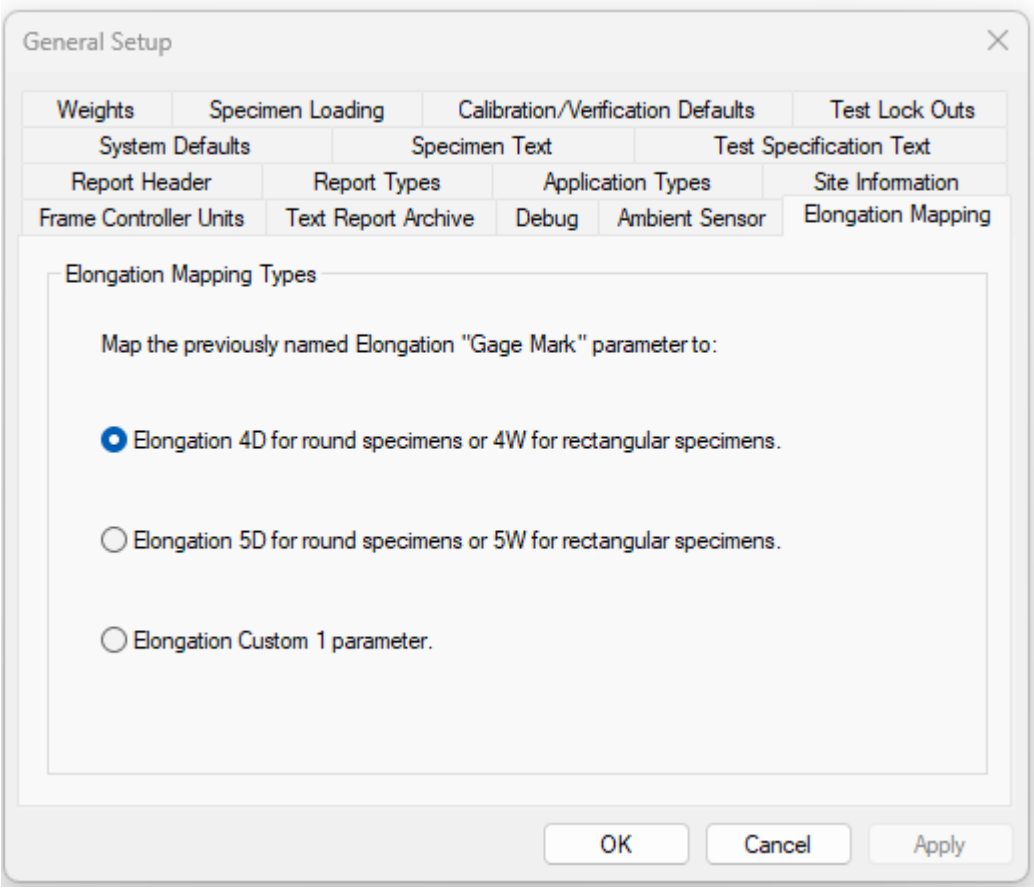


This Property Page configures the Laboratory Temperature and Ambient Sensor option for WinCCS. You can use either the ATS laboratory temperature and ambient sensor or any one of the SIGMA controllers in the laboratory.

NOTE: If all controllers in the laboratory or SIGMA, then this is not necessary because the SIGMA controllers use their own ambient temperature and ambient sensor.

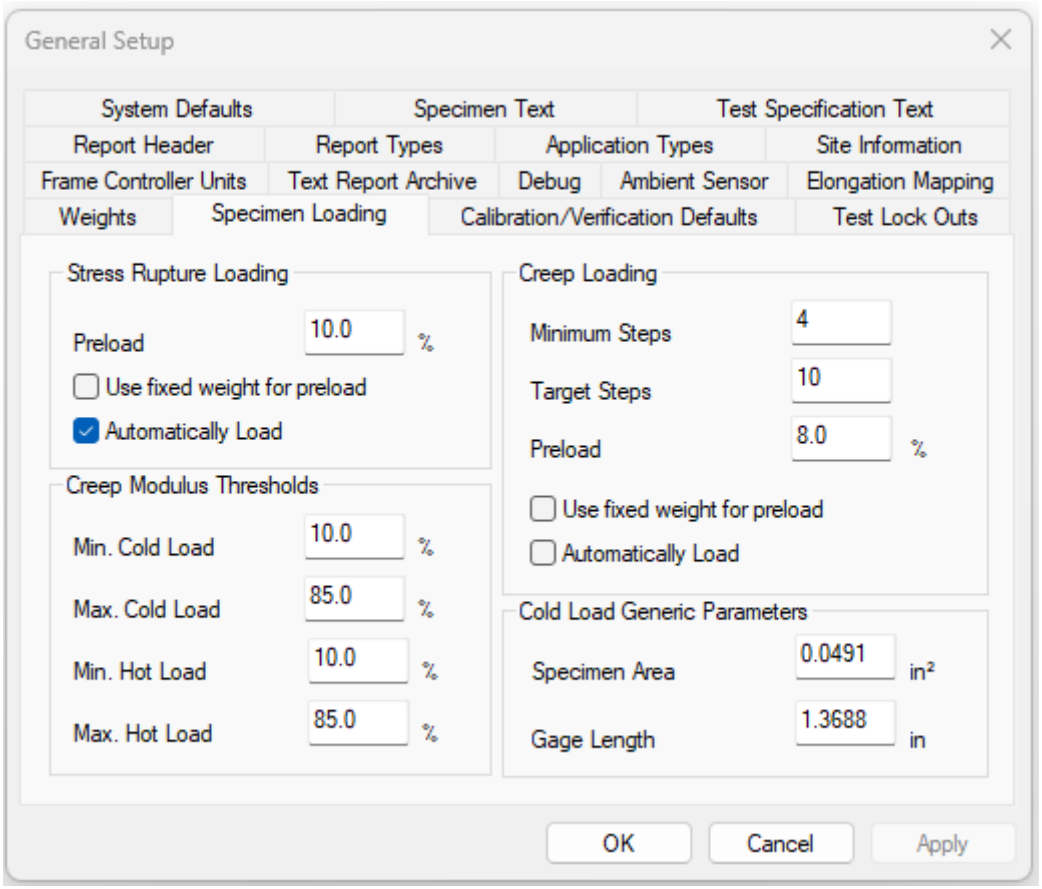
When installed it will monitor the laboratory temperature and ambient and add the measured values into the tests that are running in the laboratory using BLANK and BLANK controllers so that the ambient conditions are logged with the test data. These readings may be displayed on temperature graphs for a particular test.

Proceed to the “Elongation Mapping” tab by clicking on the tab.



This Property Page maps the “Gage Mark” value in Test Specifications created in previous versions of WinCCS to one of the new Elongation types automatically. This was required because previous versions only had one elongation computation and Version 8 and up have at least five different elongation computations.

Proceed to the “Specimen Loading” tab by clicking on the tab.



This Property Page controls the defaults for creep and stress rupture specimen loading.

Stress Rupture Loading Section

This allows the user to set the default stress rupture preload to a percentage value of the overall load or by checking the “Use fixed weight for preload” check box a fixed weight value can be specified.

By checking the “Automatically load” check box the user can setup stress ruptures to automatically load the specimen by default once the specimen has soaked.

NOTE: This feature requires a detached preload pan or a full load control machine to be used.

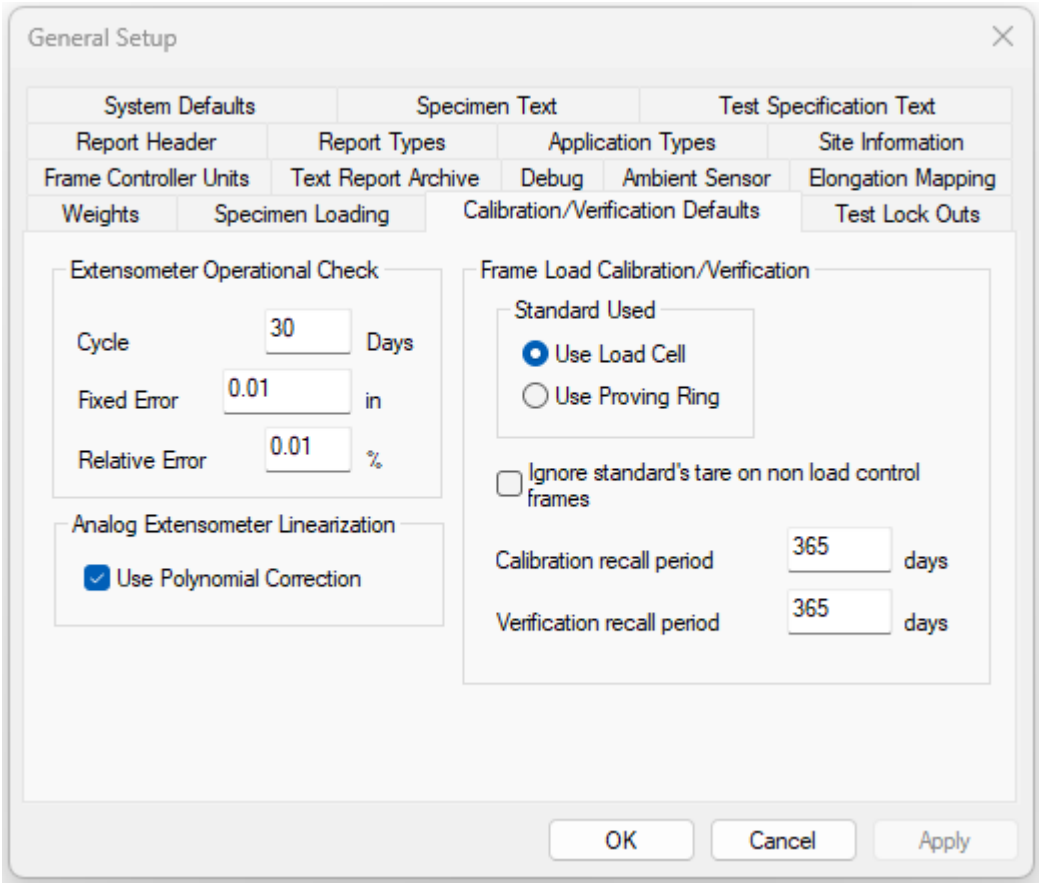
Creep Modulus Thresholds

The Creep Modulus Thresholds settings are the default percentage of the full load that should be used by creep step loading procedure to determine the specimen's modulus, and plastic deformation under load.

Creep Loading

The creep loading parameters set the minimum and desired target steps to be used. These values are used in weight-based machines to select the weights to be used for creep loading and the approximate steps to be used during full load control automatic loading. The preload value is used to determine the preload as a percentage of the full specimen load.

Proceed to the "Calibration / Verification Defaults" tab by clicking on the tab.



This Property Page configures the Calibration / Verification Defaults used by the system when performing calibration and verifications of some of the measurement devices.

Extensometer Operational Check

The extensometer operational check is a quick check to assure that the extensometer is performing properly. It is not intended to be a check that is accepted by any standards group and does not negate the need to perform at least yearly verifications on the extensometry. It walks the operator through XX points of the extensometer and

evaluates the error based on the Fixed Error and Relative Error to give the operator a pass or fail.

Analog Extensometer Linearization

Normally the linearization of an analog extensometer is performed using a least squares linear fit of the data. If you check the “Use Polynomial Correction” then the system will automatically use a seventh order polynomial curve fit to correct the extensometer if the linear fit cannot achieve a XXX or better calibration check. This is very helpful with many LVDT’s to achieve better calibrations than is possible with a straight line fit.

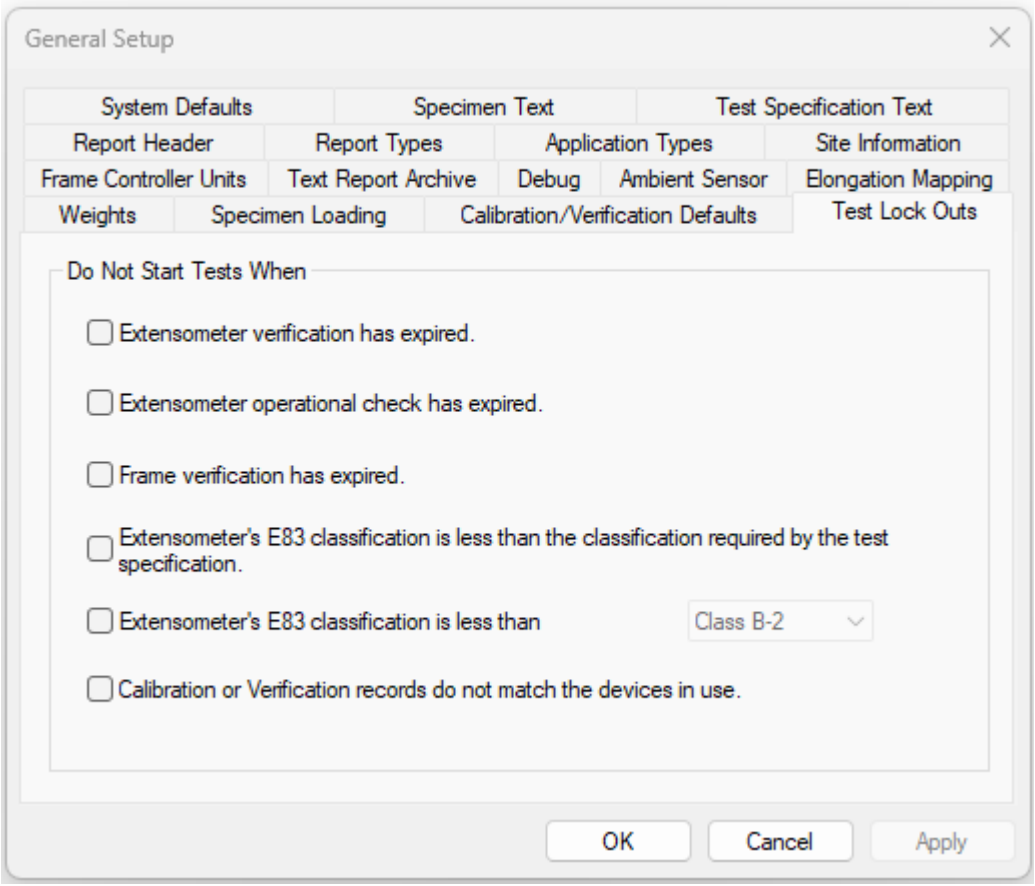
Frame Load Calibration / Verification

This is a global switch that informs the system what kind of force standards are used. Because proving rings need many extra steps the user should select this for proving rings, which will provide the prompts for all of the additional operations required for proving rings.

The “Ignore standard’s tare…” allows force calibration and verification technicians to use an offset weight on the weight pan to offset the weight of their calibration standard. Many technicians use an offset weight to account for their device and do not know the actual weight of it so they cannot supply the tare values.

The calibration and verification recall period will automatically inhibit usage of the testing machine if the calibration of verification has gone past the recall dates.

Proceed to the “Test Lock Outs” tab by clicking on the tab.



The Test Lock Outs Property Page controls whether tests can be started based on the Force and Extensometer verifications for a specific machine. WinCCS has verification procedures built in to verify the force and extensometry per ASTM methods. When the verifications are performed using the built-in functions it stores the verifications in the system and is made part of the testing record to assist in record keeping. The verifications have specific recall dates which are checked when starting a test and if they are expired the system will prevent startup unless the checks are disabled in this property page.

Extensometer verification has expired: If this is checked and the extensometer verification has expired then the machine will prevent a test requiring extensometers from being run on this frame until a new verification has been performed.

Extensometer operational check has expired: If this is checked and the extensometer operational check has expired then the machine will prevent a test requiring extensometers from being run on this frame until a new extensometer operational has been performed. If the laboratory does not perform extensometer operational checks then they should leave this unchecked so that tests can be started.

Frame verification has expired: If this is checked and the Frame force verification has expired then the machine will prevent a test from being run on this frame until a new force verification has been performed.

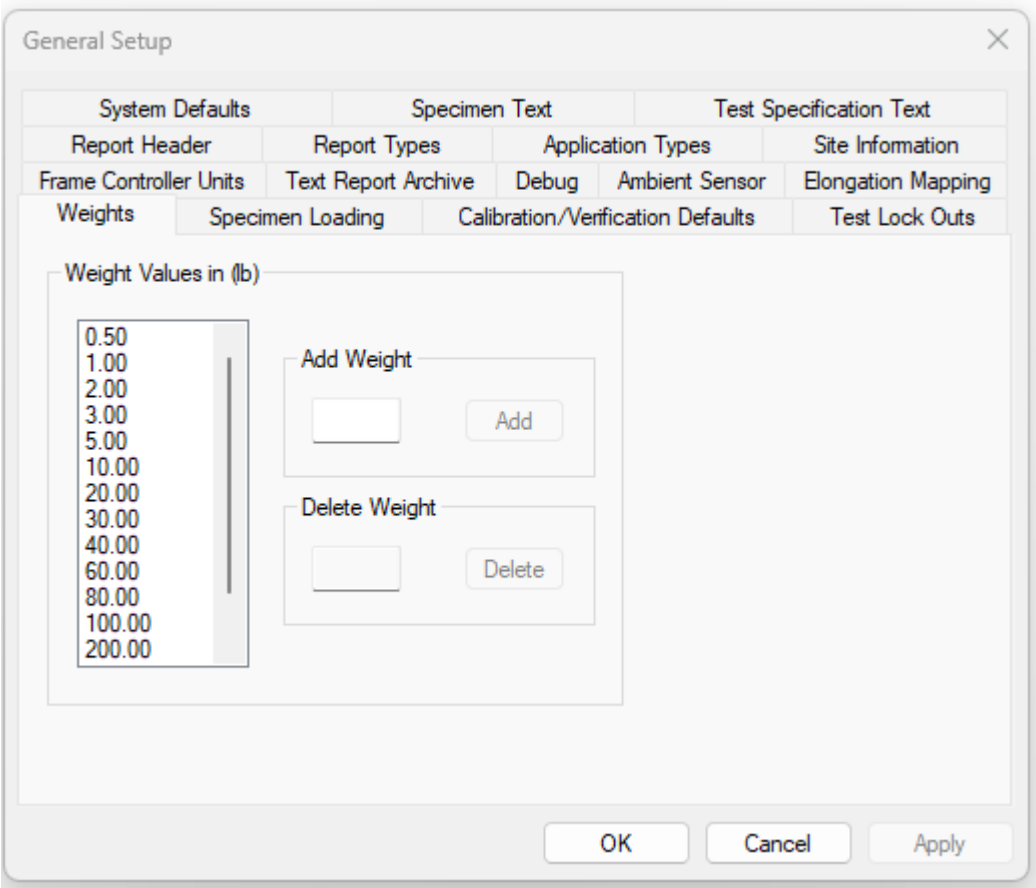
Extensometer’s E83 classification is less than the classification required by the test specification: If this is checked then the frames extensometer E83 classification is compared against the minimum classification specified in the test specification used for that test. If the frames classification does not meet the minimum, then the test cannot be run on the machine.

Extensometer’s E83 classification is less than X: If this is checked then the frames extensometer E83 classification is compared against the minimum classification specified in pull down window in this Property Page. If the frames classification does not meet the minimum, then the test cannot be run on the machine.

NOTE: Both E83 classification switches can be used at the same time to assure that all testing in the laboratory meets at least the classification value set in this Property Page. The test specification can always require a higher classification which would override this if both were checked.

Calibration or Verification records do not match the devices in use: If this is checked WinCCS will verify that the serial numbers of the extensometers and load cells match the serial number specified in the verifications. If they do not match the system will prevent a test from starting on this machine.

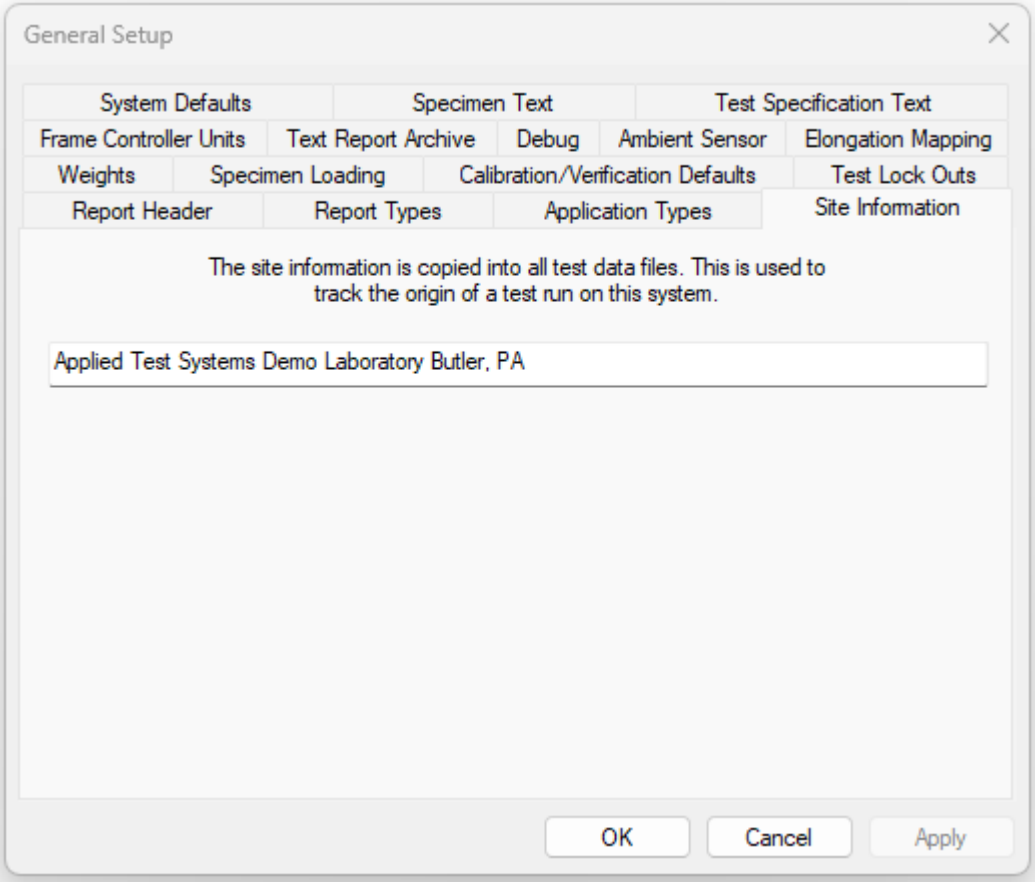
Proceed to the “Weights” tab by clicking on the tab.



The Weights Property Page provides a list of the weights that are available in the laboratory so that the WinCCS system can determine what weight combinations can be used for loading a specimen. The user can Add and Delete weights using the Add and Delete buttons.

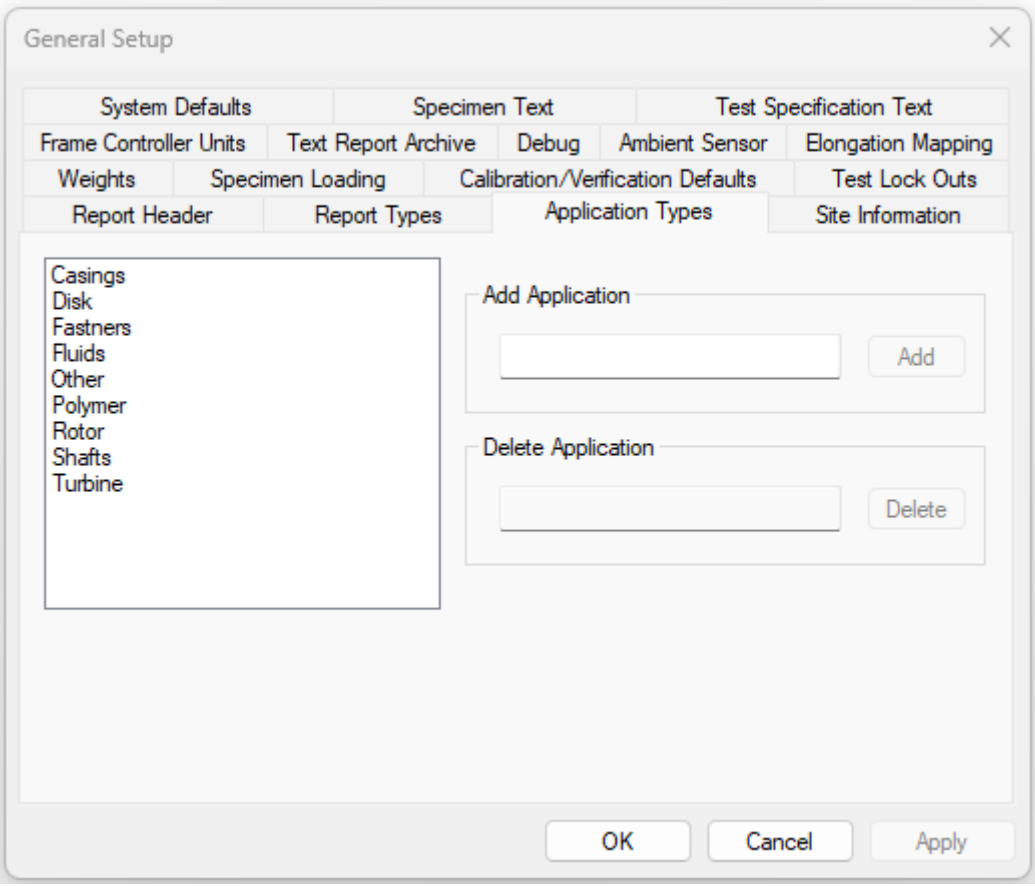
To make it easier for the operators it is suggested that you combine some weights. For instance if you have ten pound weights, you can say that you have twenty pound weights also. This will help the weight selection algorithm of WinCCS to determine the best way to load tests.

Proceed to the “Site Information” tab by clicking on the tab.



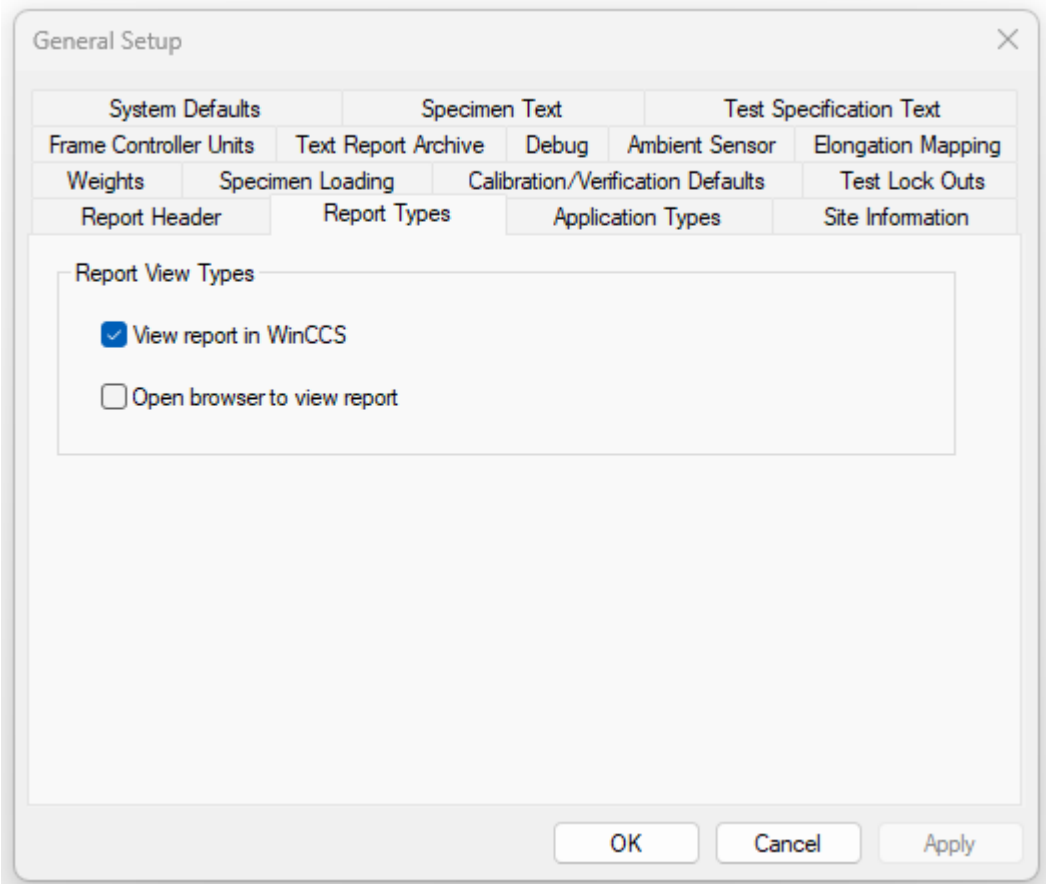
The Site Information Property Page allows the user to specify a laboratory or physical location for all of the systems tests and reports generated. The Site Information field is held in every internal system file so that if a test file is given to another location they will always know where it was tested.

Proceed to the “Application Types” tab by clicking on the tab.



The Application Types Property Page allows the user to create a list of applications that the material is used for in a test specification. The Application Types are for information only and have no bearing on the actual testing performed. Simply Add and Delete by clicking the buttons to generate a list.

Proceed to the “Report Types” tab by clicking on the tab.



The Report Types Property Page allows the user to select how they want reports to be presented in WinCCS. Starting in WinCCS Version 8, all text reports are created as HTML files, which means that they can be easily emailed or shared with other people. The user should select the way they want to view the reports.

View Report in WinCCS: If this is checked then the report will be opened in a window within WinCCS. This is the preferred method of opening reports because they are present within the program.

Open in browser to view: If this is checked then the report will be opened in the default browser in Windows. These reports will be separate windows from the WinCCS program.

When all selections have been made click “OK” to save the changes or Cancel to ignore them.

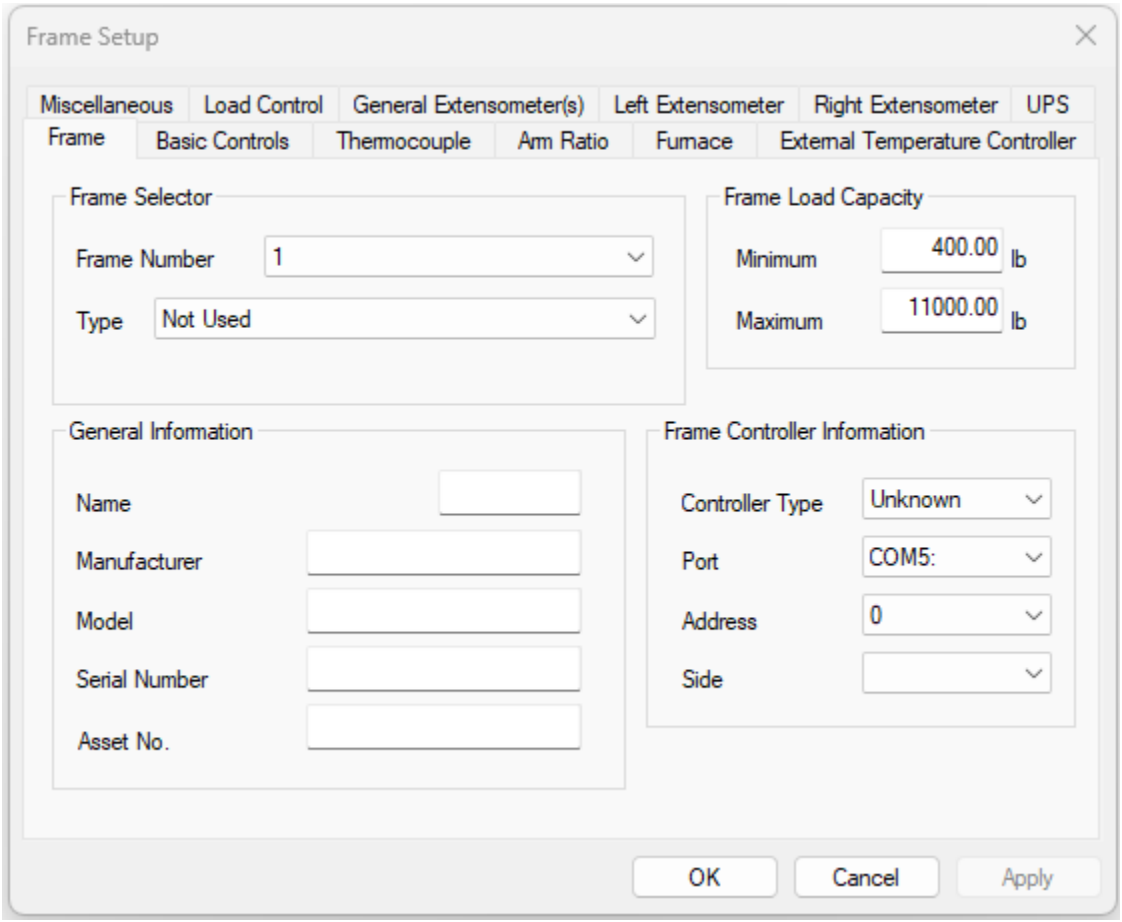
Frame Setup

Frame setup contains all the configuration information for a specific testing frame / machine in the laboratory. There are three ways to access Frame Setup:

1. From the main menu select System → Frame Setup.
2. Right click on white space in the “System Status” view and select “Setup”.
3. Right click on a previously setup frame in the “System Status” and select “Setup” to change its settings. If this option is used you can only change the settings for the frame selected, where options #1 and #2 allow you to select any frame that you want to modify the settings for.

IMPORTANT: WinCCS allows you to have user defined names for the frames / testing machine in the laboratory. It is a good idea to have a naming convention setup for your laboratory before starting the setup process. Many laboratories have some machines set up for creep and others for stress rupture only. In this case it’s a good idea to name them with prefixes so that the operators know the difference by their name.

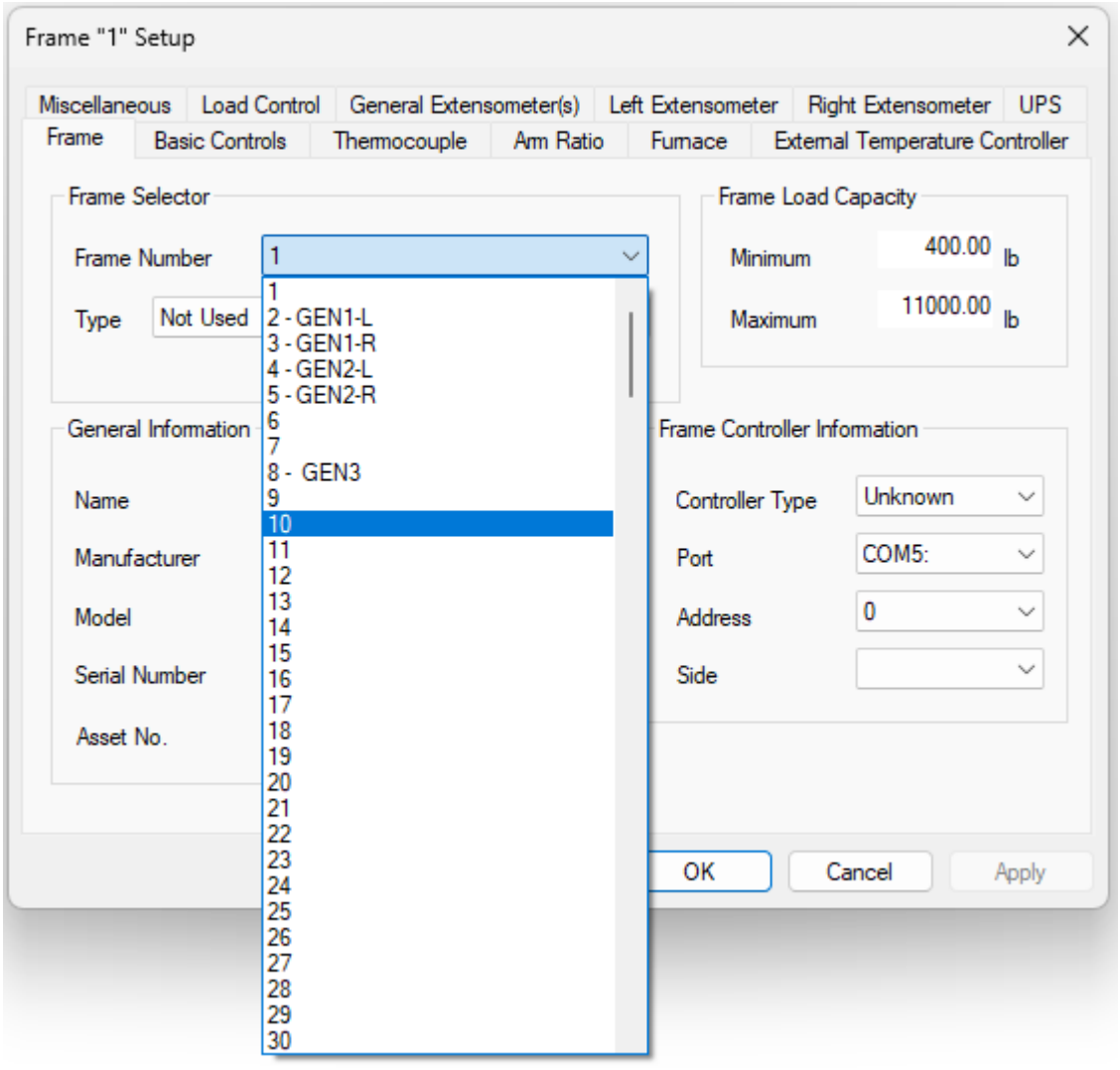
After selecting the System → Frame Setup from the main menu the following Property Sheet will be displayed.



The Frame Property Page has all of the general frame / testing machine information. First off you should select the setup index for the frame. The setup index can be any number from 1 to 250.

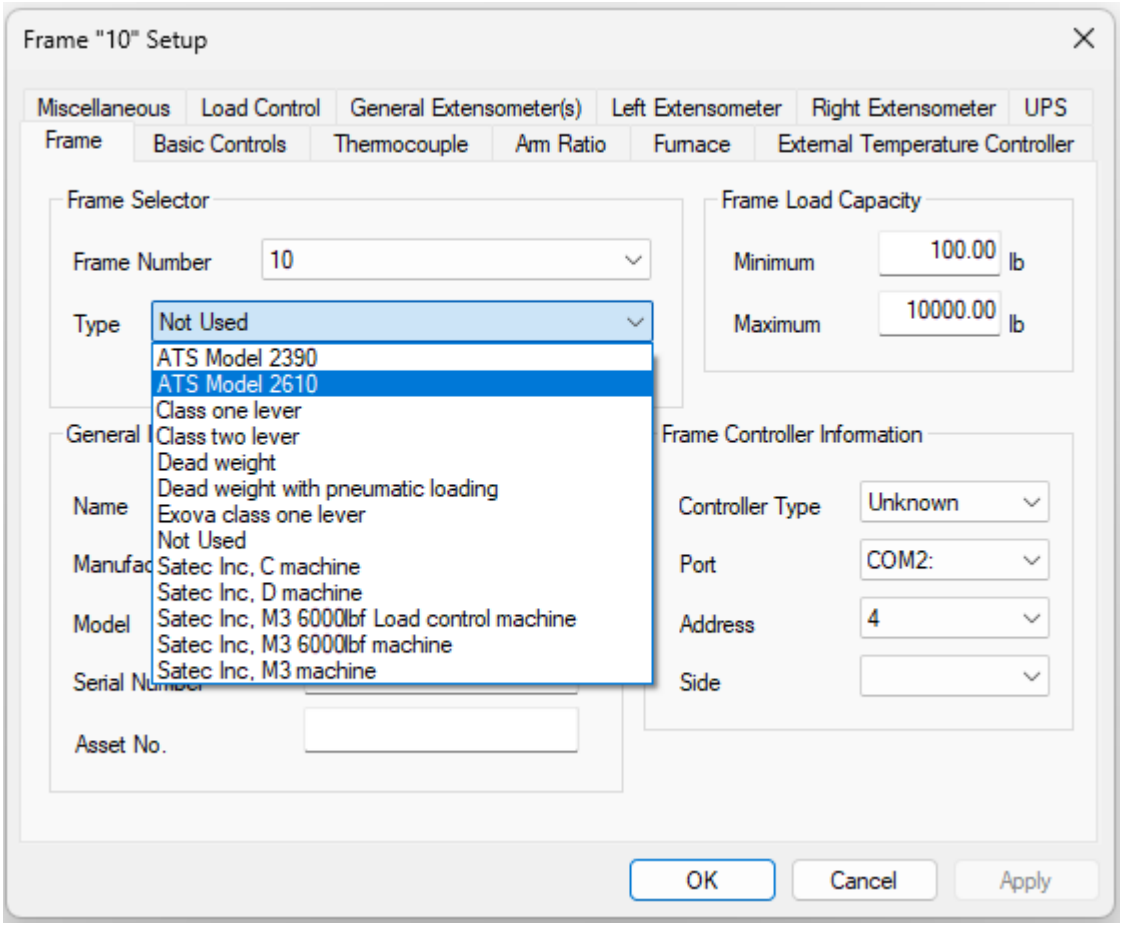
IMPORTANT: Please contact ATS if you have more than 250 frames connected to one WinCCS installation.

The index number has no significance to the actual operation except that in setup the index number is used to find the frame that you want, so again you may want to assign these in a logical order for your laboratory. You can also skip index numbers if you want to leave room to assign more frames of a particular type later.



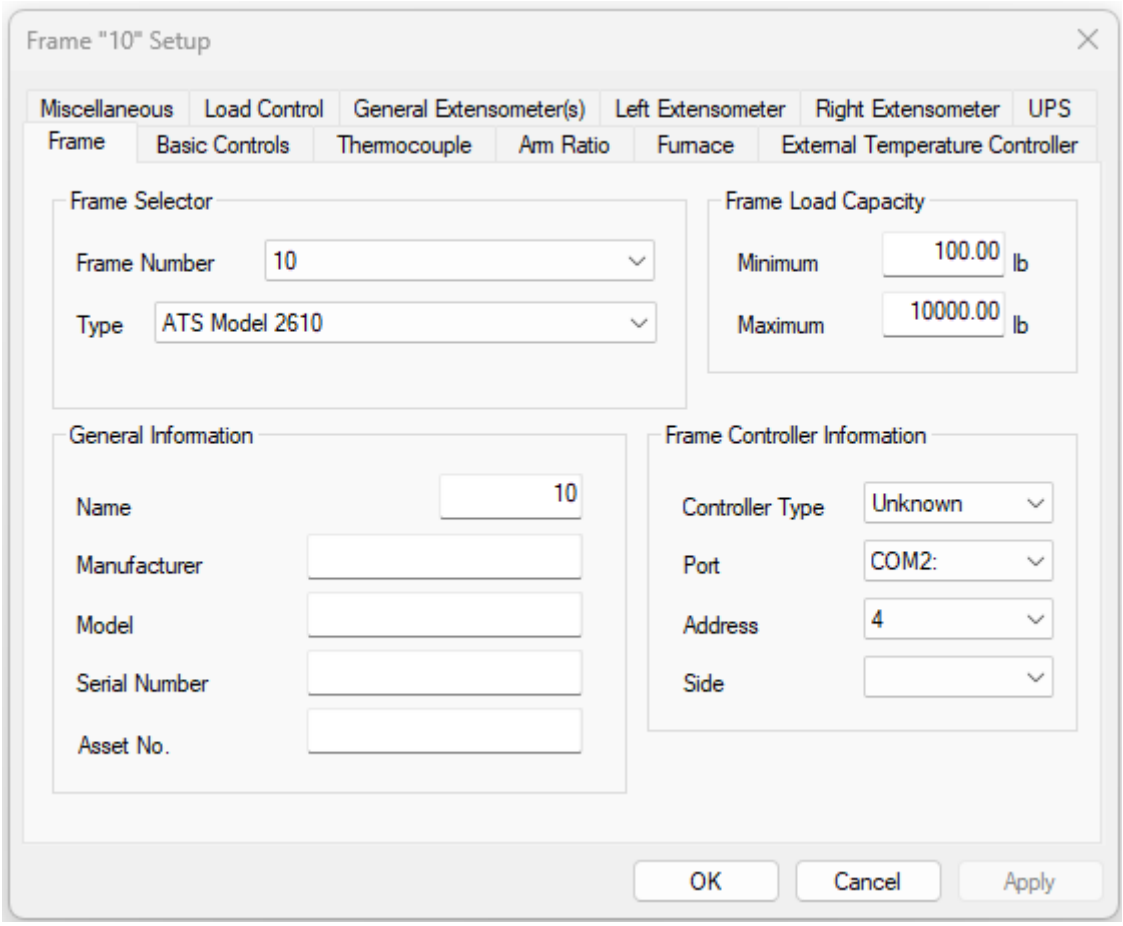
In this example I am selecting Index 10 from the list to setup a new frame. I could have selected one of the previous frames if I wanted to make changes to it.

After selecting the index to use you must select the frame type from the list as shown. In this example I will setup a 2610 Direct Load Tester with a SIGMA controller.



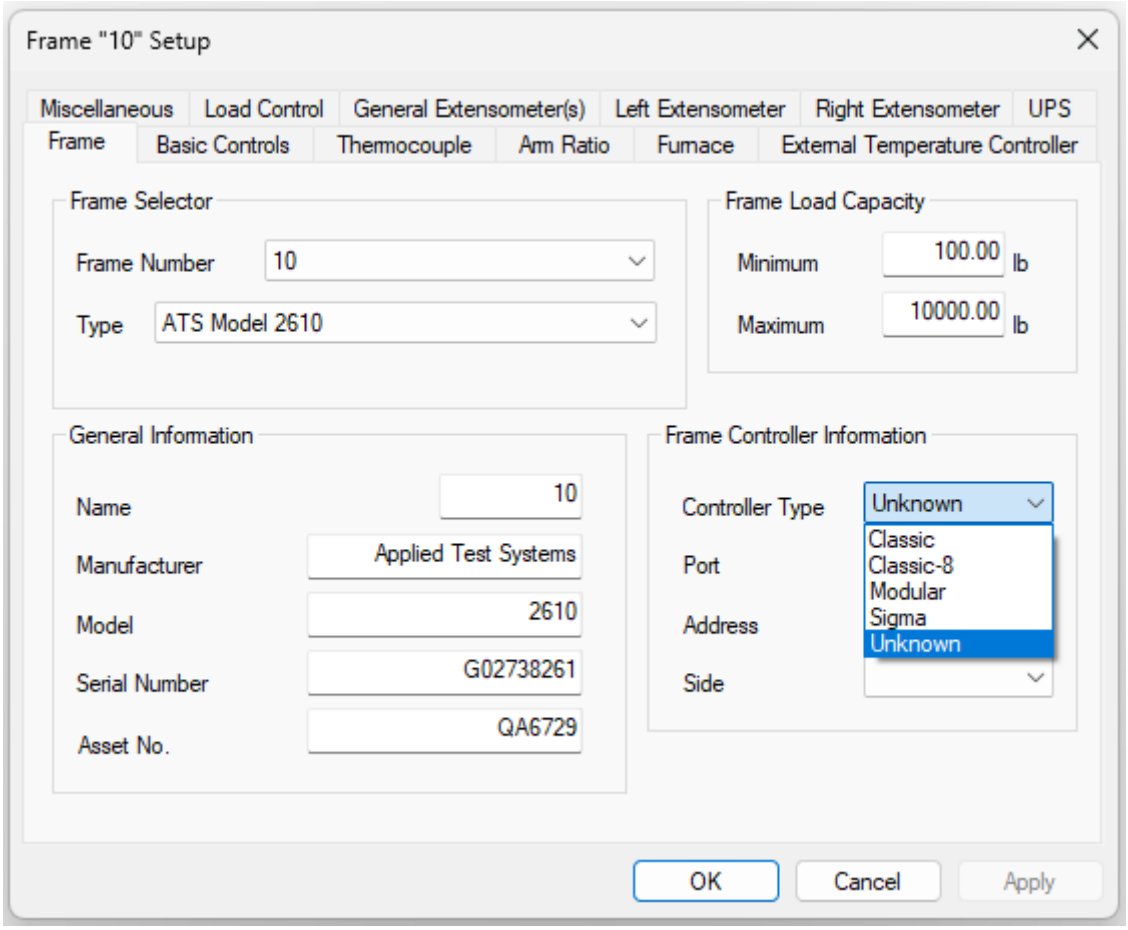
The Frame Type will control many different aspects of the machine and preselect some parameters depending on the type selected. If you are unsure of a machine type then always use “Class one lever”, “Class two lever”, or “Dead Weight” as your setup

depending on the basic machine type. See Appendix XXXXX Frame Types for further information.



Once the Frame Number and Type have been selected fill in the “General Information” text. The “Name” field is used throughout the system to identify the frame to the user and in reports. The other fields are for information only but will appear in reports.

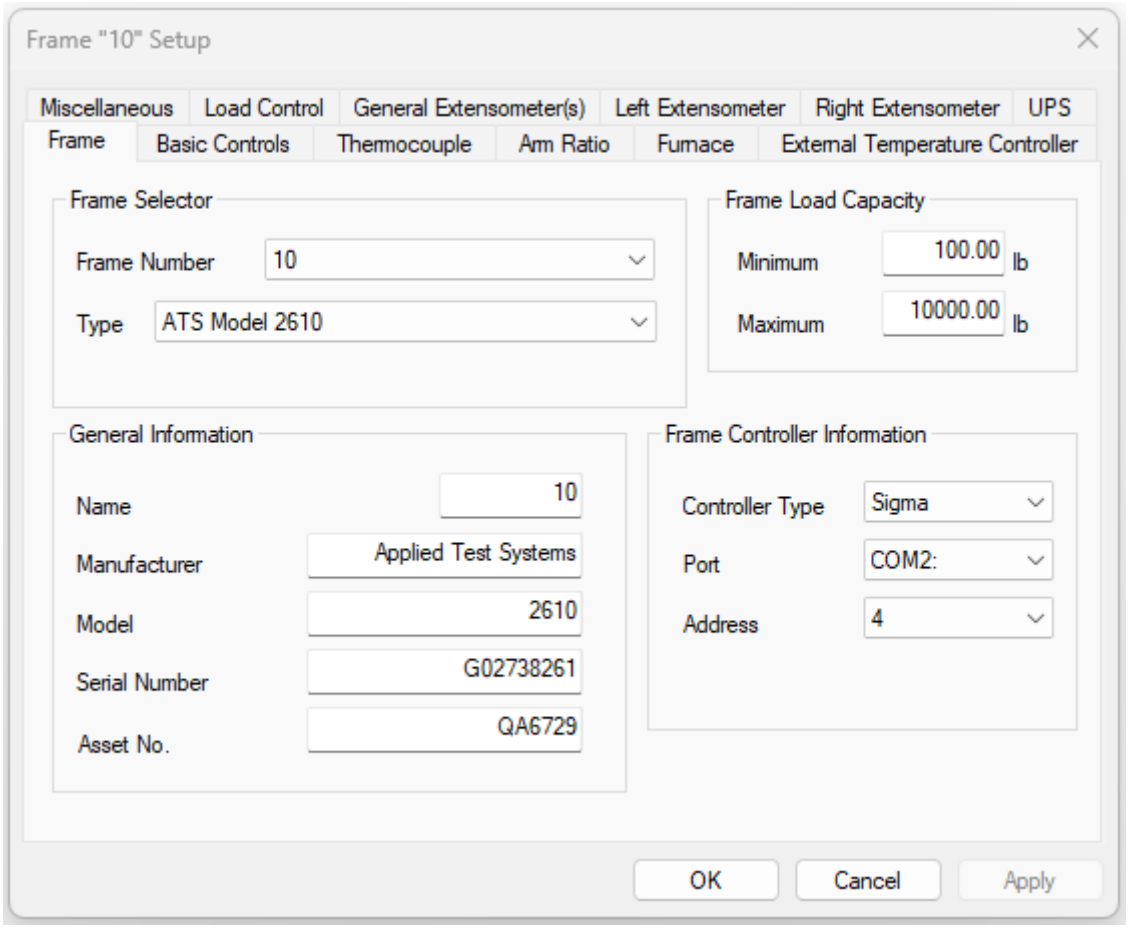
The “Frame Load Capacity” sets the manufacturers recommended load capacity and is used throughout the system to verify that the loads required by the specimen are within range. These are also used during the calibration and verification of force for the frame.



The “Frame Controller Information” sets the communication parameters for the computer to the frame controllers on the testing frames.

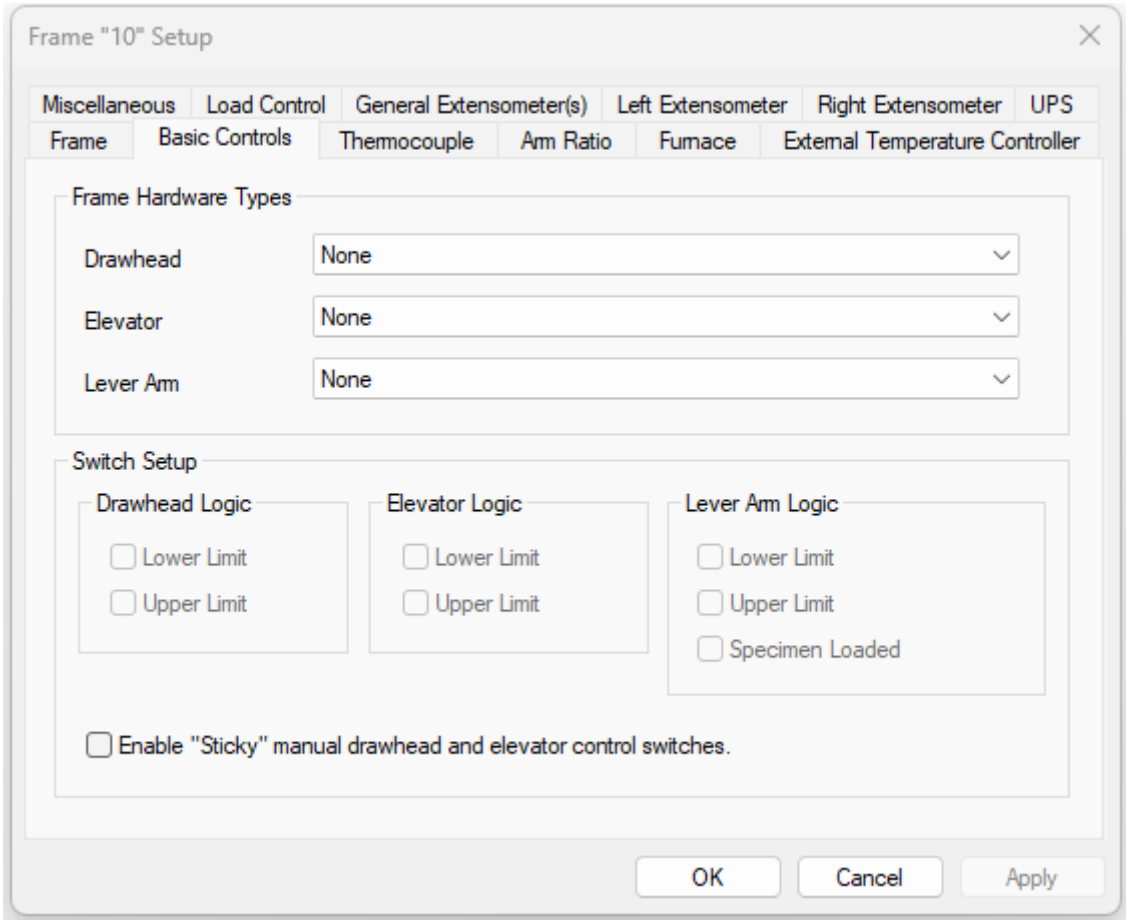
The “Controller Types” will affect the “Side” information pull down, so it is important that you set that correctly. Once communications are established the system will confirm the controller type and reset it if necessary. Please refer to appendix XXXXX Frame Controller types for a complete description of the various Controller Types.

Note: The Classic-8 controller is a controller designed to control an Applied Test Systems eight specimen direct load with single oven testing machine.

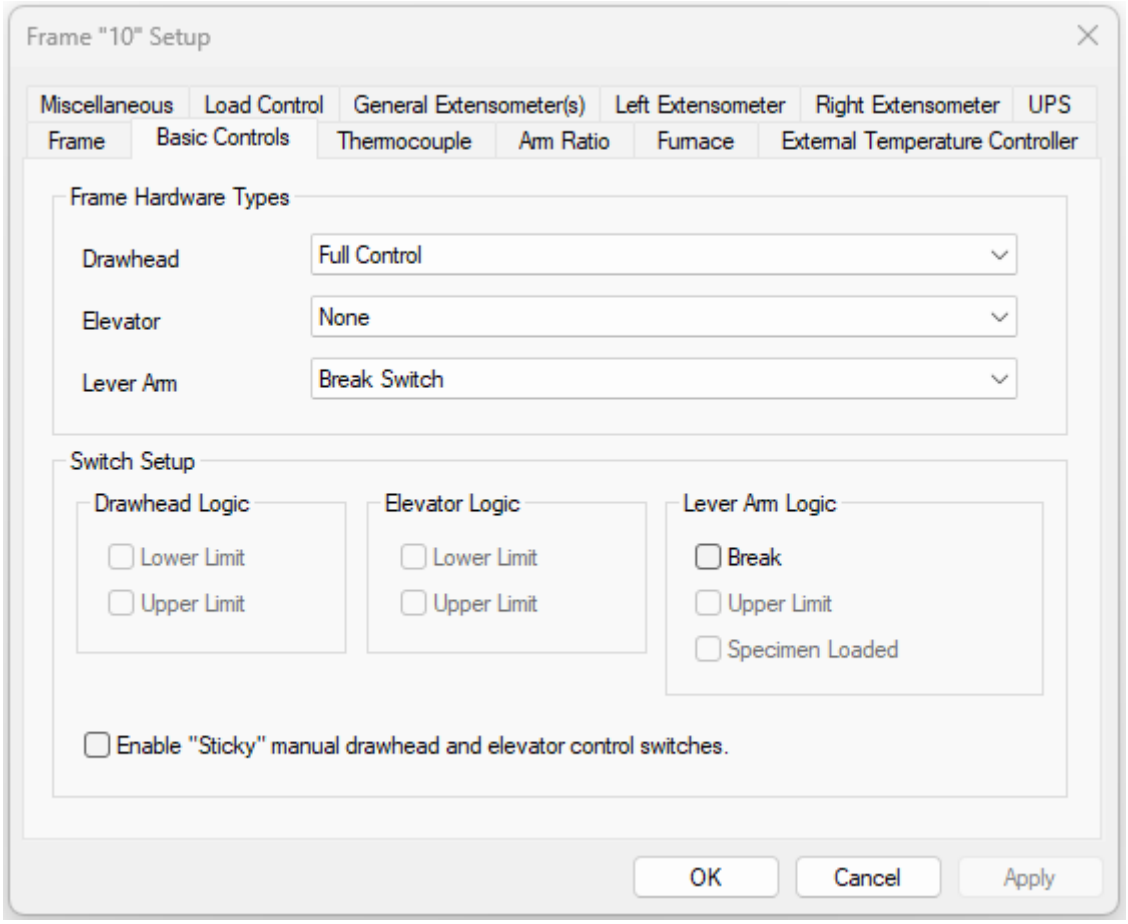


Once the SIGMA “Controller Type” was selected the “Slide” parameter is removed from the Property Page because the SIGMA controllers’ control one frame at a time.

Finally fill in the communication port that the SIGMA controller is connected to. Set the address number to agree with the Address Switches on the SIGMA controller. When ready proceed to the “Basic Controls” tab.



The “Basic Controls” Property Page controls the input switches used by the controller to level the draw head, control the elevator, and detect specimen breaks. Please refer to the Appendix XXXXX Lever Arm, Drawhead and Elevator Configuration.

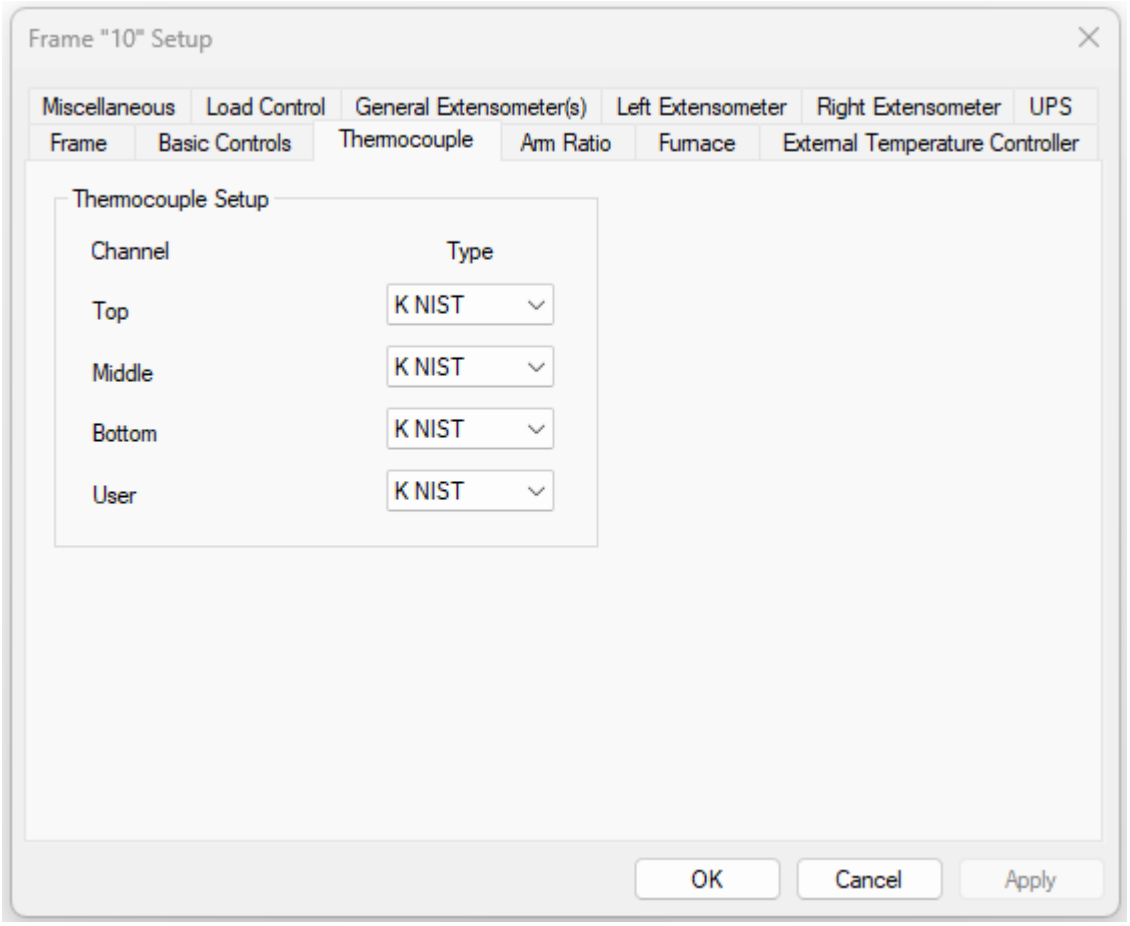


For Applied Test Systems 2610, the correct settings are shown above.

Note: If you are using a new style handheld (S Remote), then you can enable the sticky manual buttons which allow you to run the drawhead up or down without holding the

button. If you want to use this feature on this machine, check the “Enable “Sticky” manual…”.

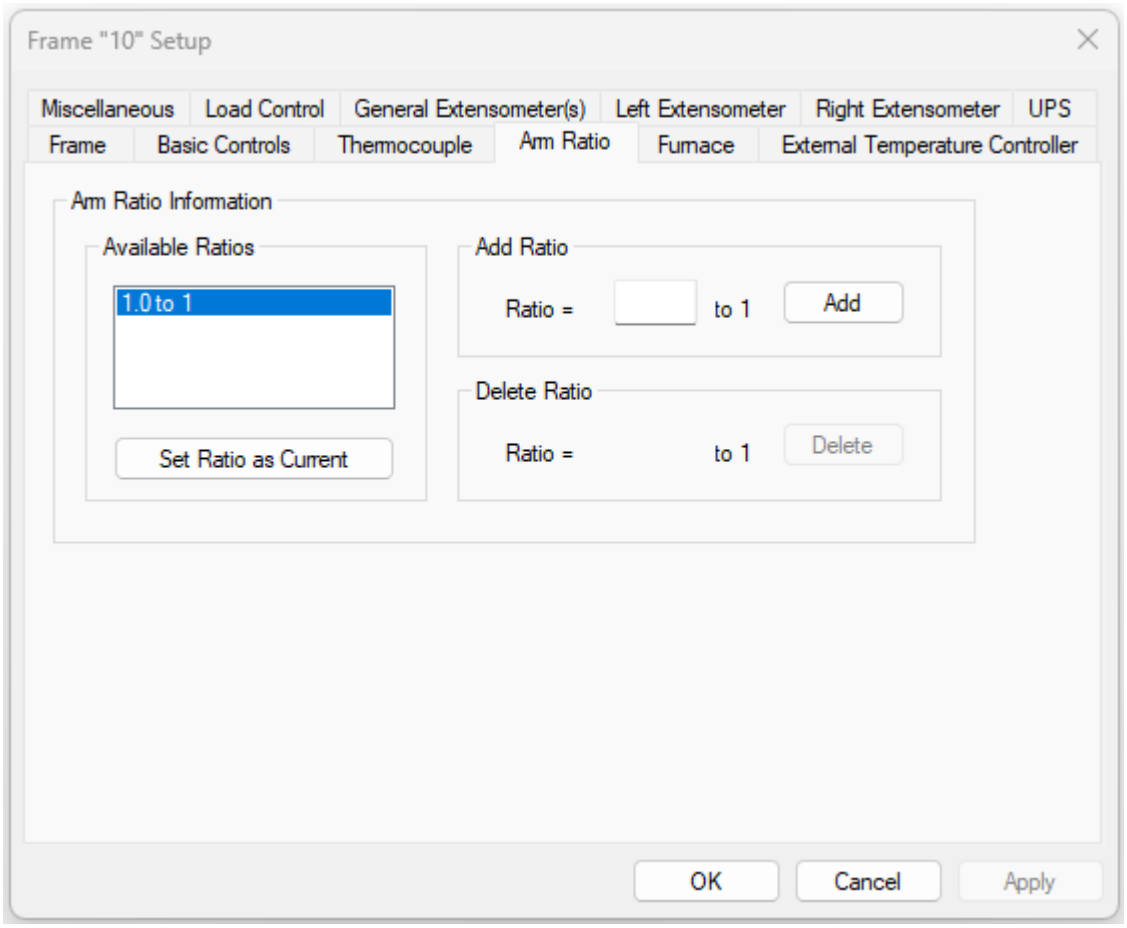
When ready proceed to the “Thermocouple” tab.



The “Thermocouple” Property Page sets the default thermocouple type used by the controller.

IMPORTANT: This thermocouple type MUST match the extension wire and thermocouple jacks used on the machine or the thermocouple inputs will not read the correct temperatures. Some machines may have dual wiring to accommodate the usage of two different types of thermocouples. In this instance, separate thermocouple input jacks and extension wires must be wired all the way back to the thermocouple measurement unit. Failure to do this will result in thermocouple measurement errors.

Once the thermocouple types have been selected, proceed to the “Arm Ratio” tab.

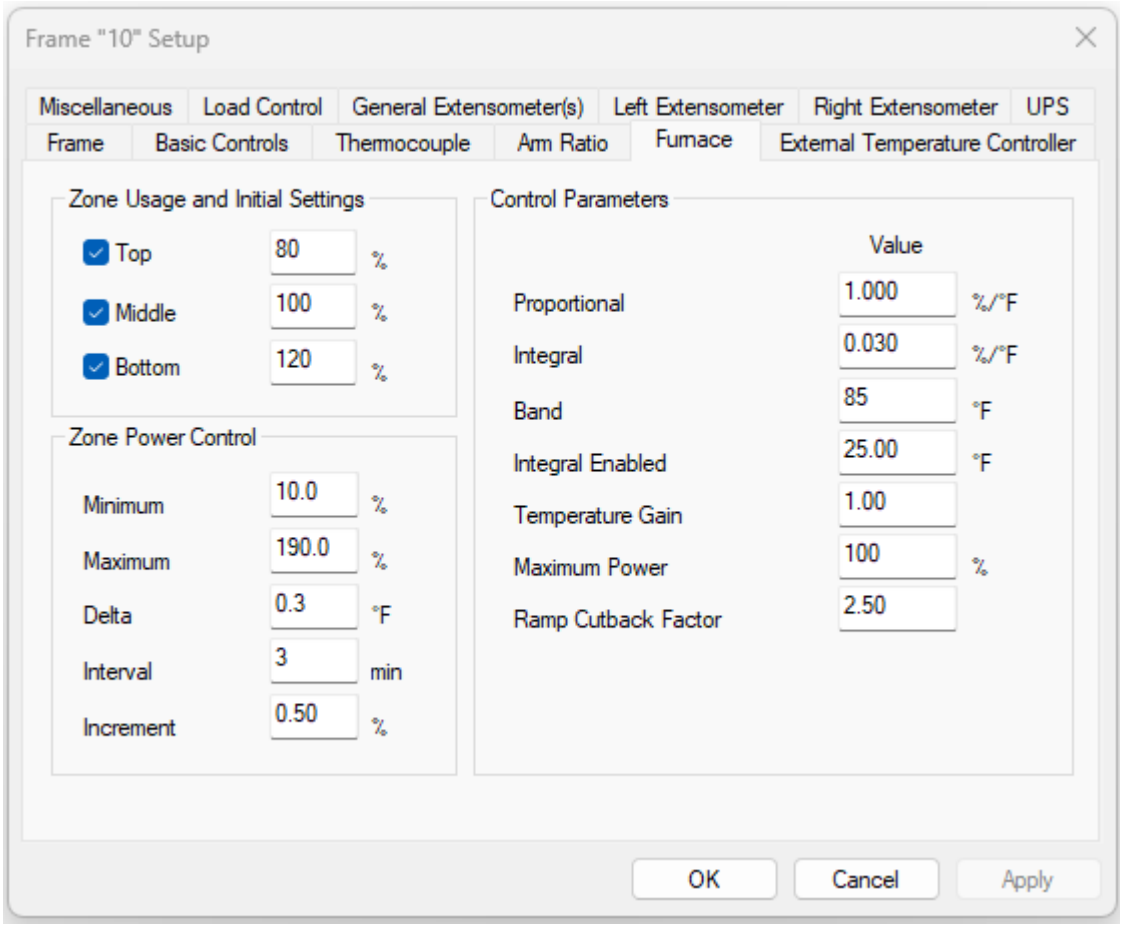


The “Arm Ratio” Property Page sets the arm ratio for lever arm testers. Since the 2610 is a direct load tester the arm ratio is always 1 to 1.

NOTE: WinCCS allows multiple arm ratios to accommodate the dual position lever arm option supplied by Applied Test Systems. Please consult with your Applied Test Systems sales engineer for further information.

If you have a multiple ratio lever arm you can enter the various arm ratios using the “Add” or “Delete” functions.

Once the arm ratios have been entered proceed to the “Furnace” tab.



The “Furnace” Property Page sets all the furnace control parameters for the system. If you are not familiar with the WinCCS control parameters, it is recommended that you read the Appendix – Furnace Control first or consult Applied Test Systems service personnel. There are three main sections of this setup Property Page.

Zone Usage and Initial Settings

The Zone Usage and Initial Settings selects which zones are used by the furnace and the initial power split settings. This must match the furnace zone usage as follows:

- Single Zone Furnace / Use the top zone.
- Two Zone Furnace / Use the Top and Bottom zones.
- Three Zone Furnace / Use all three zones – Top, Middle and Bottom.

NOTE: This setting must match the furnace wiring and zones and has nothing to do with the number of specimen thermocouples.

The initial splits initialize the Furnace Split Algorithm to the values selected. The values must add up to a total of 300. The Furnace Split Algorithm allocates power to the furnace zones to maintain the same temperature over the specimen. Typical furnaces will require less power on the top than the bottom zone, so many users will try and set the initial split power close to what their furnaces require. Applied Test Systems furnaces work best with initial splits of 80, 100 and 120 as shown above.

IMPORTANT: It is not necessary to change the Furnace Splits from the default of 100, 100, 100 because the system automatically adjusts them while running. However, if you set Furnace Splits closer to what is needed it will reduce the time to get the specimen into the soak state.

Zone Power Control

The Zone Power Control settings control the algorithm that allocates the power between zones (or furnace splits).

WARNING: It is highly recommended that you use the defaults. Using the wrong settings can cause temperature oscillations and excess temperature spread across the body of the specimen.

Below are the “Zone Power Control” parameters and their recommended defaults:

- Minimum: This sets the minimum percentage split that any zone can be given.
- Maximum: This sets maximum percentage split that any zone can be given.

IMPORTANT: If the Zone Power Control settings control algorithm adjusts a zone percentage so that it equals the Minimum or Maximum percentage specified then the system will continue to try and control the furnace, but it will flag a Furnace Split Alarm. Typical causes of this condition are as follows:

- A furnace zone element burned out or bad electrical connection
- Specimen thermocouples in the wrong position or loose on the specimen
- Specimen located too low or high in the furnace
- Improper furnace insulation allows too much airflow through the furnace
- Thermocouples placed too close to each other on a specimen

Delta: This sets the maximum temperature difference between any of the specimen thermocouples allowed in the furnace. If any specimens exceed the difference, then the furnace will modify the percentage power allocated to the zones to reduce the difference below the amount.

Interval: This sets the time between evaluations of the specimen thermocouple differences. Because the thermocouples and specimens are slow to respond to changes, any value shorted that 3 minutes will cause zone to zone oscillations.

Increment: This is the percentage increment that the algorithm will change the percentage power by each time it is evaluated. Similar to the interval, if a value above 0.5% is used, it will cause zone to zone oscillations.

Control Parameters

The Control Parameters control the actual temperature control algorithm that computes the output power required for the furnace. The settings shown are for a typical Applied Test System furnace and should be used for all testing.

Proportional: The proportional term is the current error multiplied times the proportional gain specified by the user. Typical values are from 0.1 to 1.8.

Integral: The integral term is the summation of the current error multiplied times the integral gain specified by the user. In practice the integral gain value is typically 10% or less of the proportional gain.

Band: The band is the proportional band of the routine. When the control input exceeds the set point by more than band degrees the output is set to zero and the integrator is set to zero. If the control is below the set point by more than band, then the output is set to 100% power and the integrator is set to zero. Typical band values are 75°F to 125°F.

Note: If the furnace is out of the band for more than fifteen minutes then the Furnace will shut down with the Out of Band Time Exceeded alarm. This is an important safety feature for shorted thermocouples, or thermocouples that have fallen out of the furnace or incorrect thermocouple types specified.

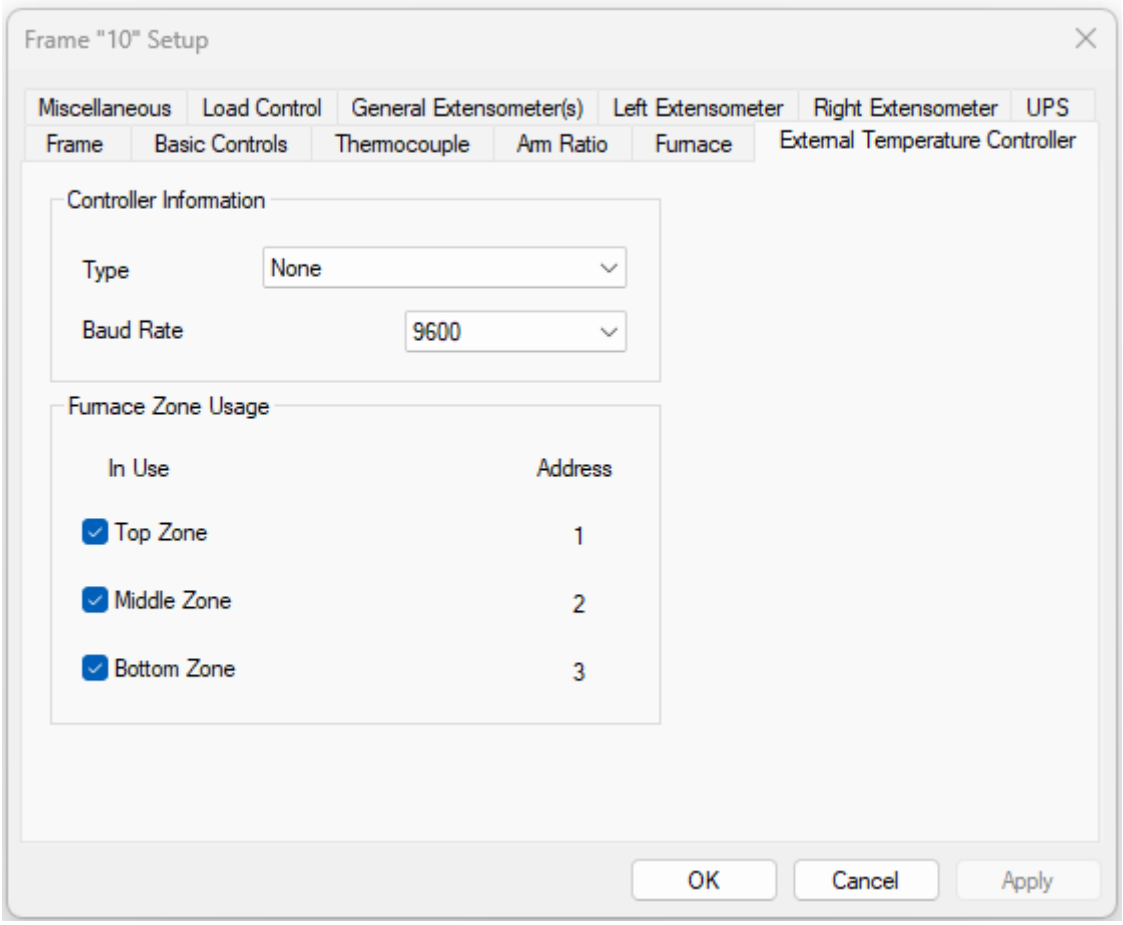
Integral Enabled: This sets the band from the target set point that the integrator is allowed to integrate. This prevents the integral wind-up problem. Typical values are 25 to 50 degrees F.

Temperature Gain: Changes the parameter adjustment due to temperature. Always leave this at 1.0 unless instructed to change this value.

Maximum Power: This limits the maximum output power that may be applied to a furnace zone. Typically, this is set to 100%.

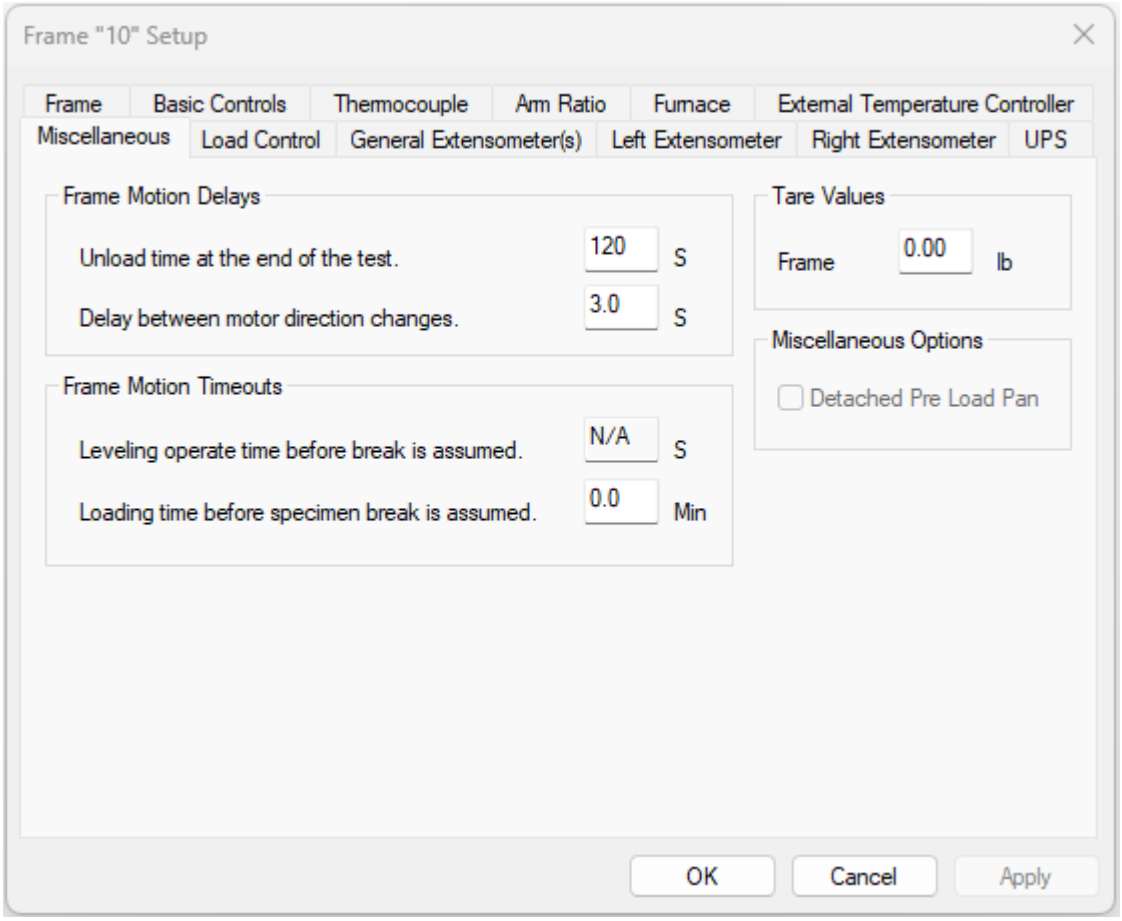
Ramp Cutback Factor: Is an automatic ramp decrease factor to prevent furnace overshoot. Typical values are from 1.0 to 3.5 and the nominal values is 2.5. Typically start this at 2.5 and adjust it down to decrease the ramp cut back as the target set point is reached.

Once the furnace parameters have been entered, proceed to the “external Temperature Controller” tab if present. Otherwise continue to the “Miscellaneous” tab.



The “External Temperature Controller” Property Page is optionally present on the system controllers present and options board. It is only available with a SIGMA controller with the XXXXX XXXXX XXXXX Option Board installed. Some high temperature furnaces are configured and shipped with individual temperature controllers and this option lets users run these directly as supplied from the manufacturer. Currently the only controller that this option is set up for is the Eurotherm 3016 controller using RS-485 Modbus communications. The user needs to check which zones are controlled by the controllers and the system will fully integrate the controllers into the system. Any zone marked as In Use will have the controller temperature and power displayed instead of the standard SIGMA controller’s thermocouples and power outputs.

Once the External Controller parameters have been entered proceed to the Miscellaneous tab.



The “Miscellaneous” Property Page sets various frame parameters that will depend on the actual frame type and drawhead / elevator settings. Please be aware that some settings can cause damage to the machine if improper values are used. Always consult with Applied Test Systems Service Department before making any changes.

Unload time at the end of test: This sets the amount of time that the drawhead or elevator will be operated to unload the specimen, on non-load control frames.

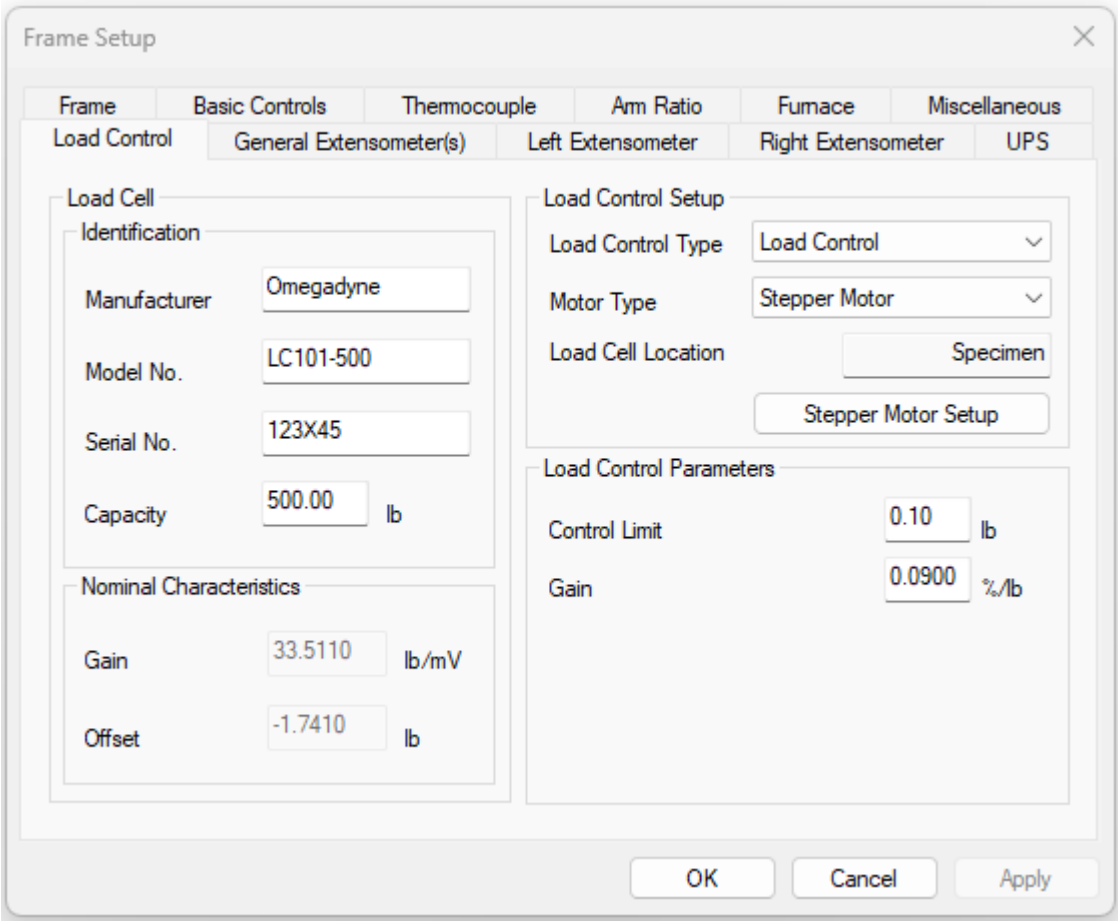
Delay between motor direction changes: On machines that use older AC line synchronous motors with reversing contractors this sets the delay between direction changes of the motor. On these styles of motors if the direction is changed to fast the moto may continue to run in the previous direction that it was running and cause serious damage to the machine. This should never be set below 3 seconds.

Leveling operate time before break is assumed: This setting is used for various switch settings that use the lever arm switches to determine when the specimen has broken. It can also be used as a general time threshold for the break switch. This makes the software delay calling the specimen broken until the break switch has been in the break condition for at least the specified amount of time.

Tare Value, Frame: This is the tare value for front loading and class two lever frames that have a tare value applied to the specimen regardless of the weights on the pan. The system will still ask the user for the lower pull rod weight on these machines because they could be using different pull rods.

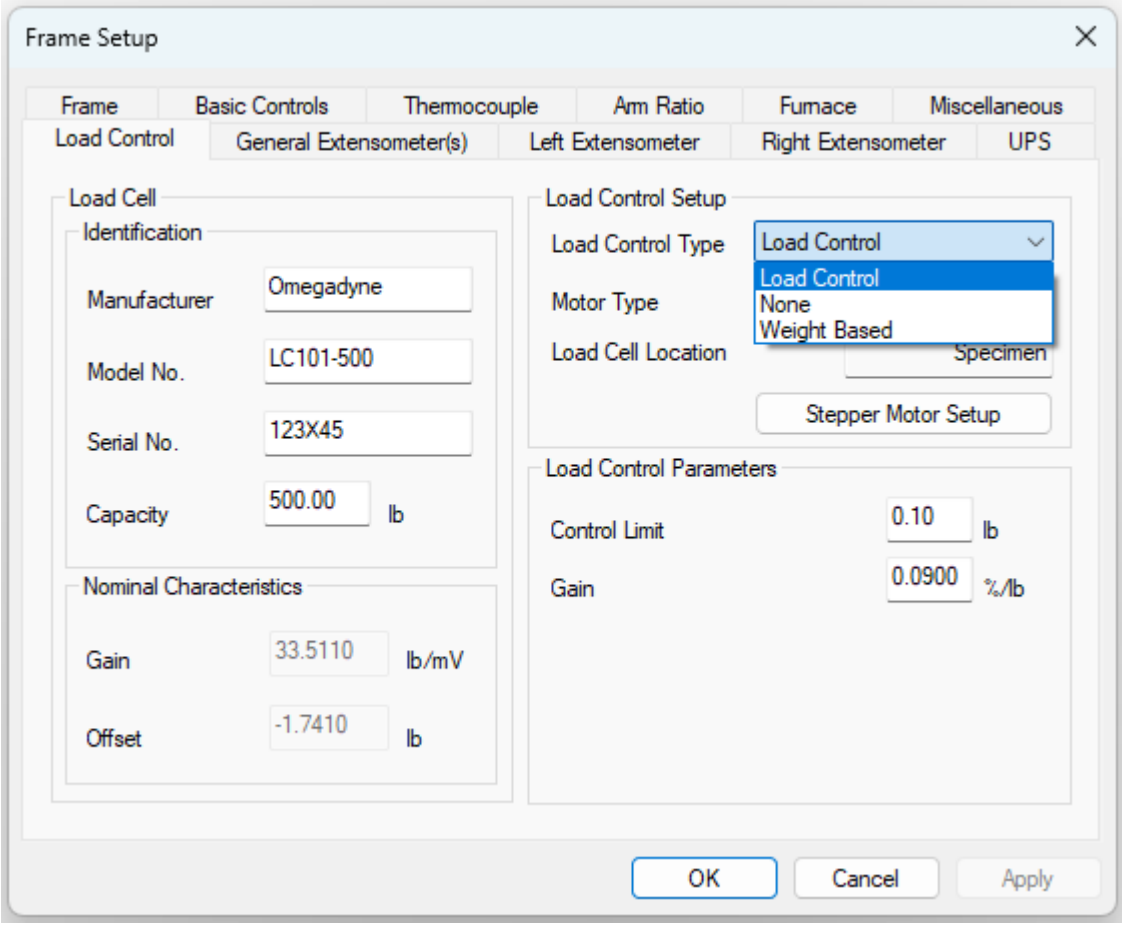
Detached Pre Load Pan: When this is checked it means that the machine has a separate weight pan above the primary weight pan with some chain separating them. This allows the machine to have a preload applied to the specimen with the full load placed on the pan at the start of the test, to allow the machine to apply full load once the specimen is ready to be loaded.

Once the Miscellaneous parameters have been entered proceed to the Load Control tab.



The “Load Control” Property Page sets frame parameters for frames that are load controlled. If the frame is strictly weight based, then proceed to the “General Extensometers” Property Page.

The first item that needs to be selected on this Property Page is the Load Control Type, because this affects the other parameters in the Property Page. There are three choices as shown below.



Load Control Type:

None: This means that the frame is a weight-based testing machine with no ability to control the load on the specimen except via loading and unloading. Selecting this will disable all selections in this Property Page.

Load Control: The load control selection means that there are no weights used on this frame and the specimen load is controlled via the machine and the load cell. Certain frames are only available in this mode, and the Applied Test Systems 2610 is one of them.

Weight Based: Weight based load control is a special machine setup that requires weights with the machine, but it supports automatic hot stepped loading of a creep specimen. This offers many benefits to the end user as follows:

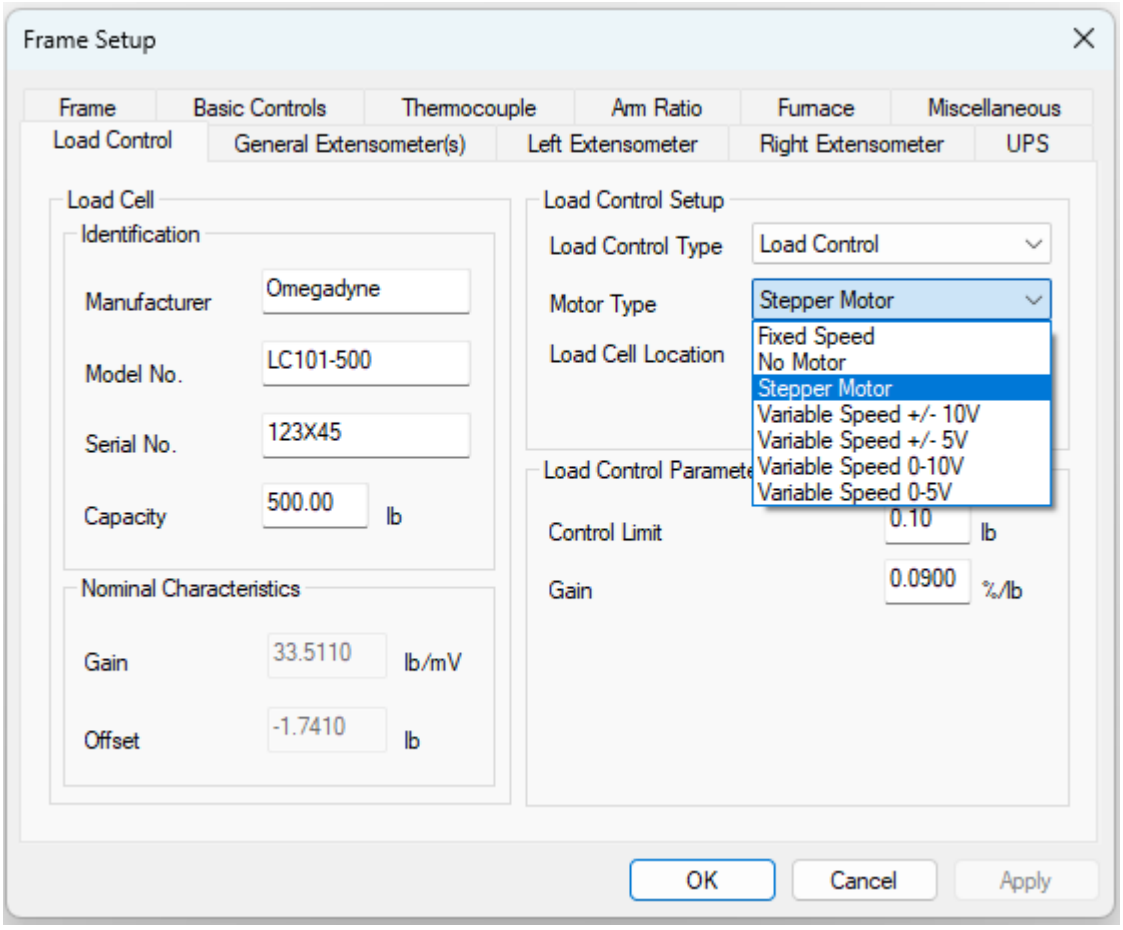
- Improved hot loading because load application is not subject to dropped weights.
- The creep test can be started at the end of shifts, and it will automatically load when heated.
- Less chance of extended times waiting to be loaded or between loading steps.
- A superior choice for very long-term creep tests where the end user specifies the use of weights for specimen loading.

Once the load control method has been selected the information on the load cell can be entered. The Manufacturer, Model No. and Serial No. fields are text only which are saved as part of the calibration and verification records. The load cell capacity must agree with the load cell nameplate capacity.

The load cell gain and offset can only be changed when there is no calibration file. The user can enter in approximate values to calibrate the load, but once it is calibrated, they cannot be changed.

The last item for the load cell setup is the load cell location. Load Control frames will have a Load Cell in the load train, which is identified which can be on the specimen side or weight pan side on lever arm machines and always on the specimen side for dead weight or class two lever machines.

Once the load cell setup is complete the user must select the motor type from the list as shown below:



The final selection is for the physical motor type used in the testing frame. There are three motor type supported as discussed below:

Fixed Speed: The fixed speed motor is an AC Line Synchronous motor, with a relay reverser. This is typically found in older testing frames and is not used on modern testing machines.

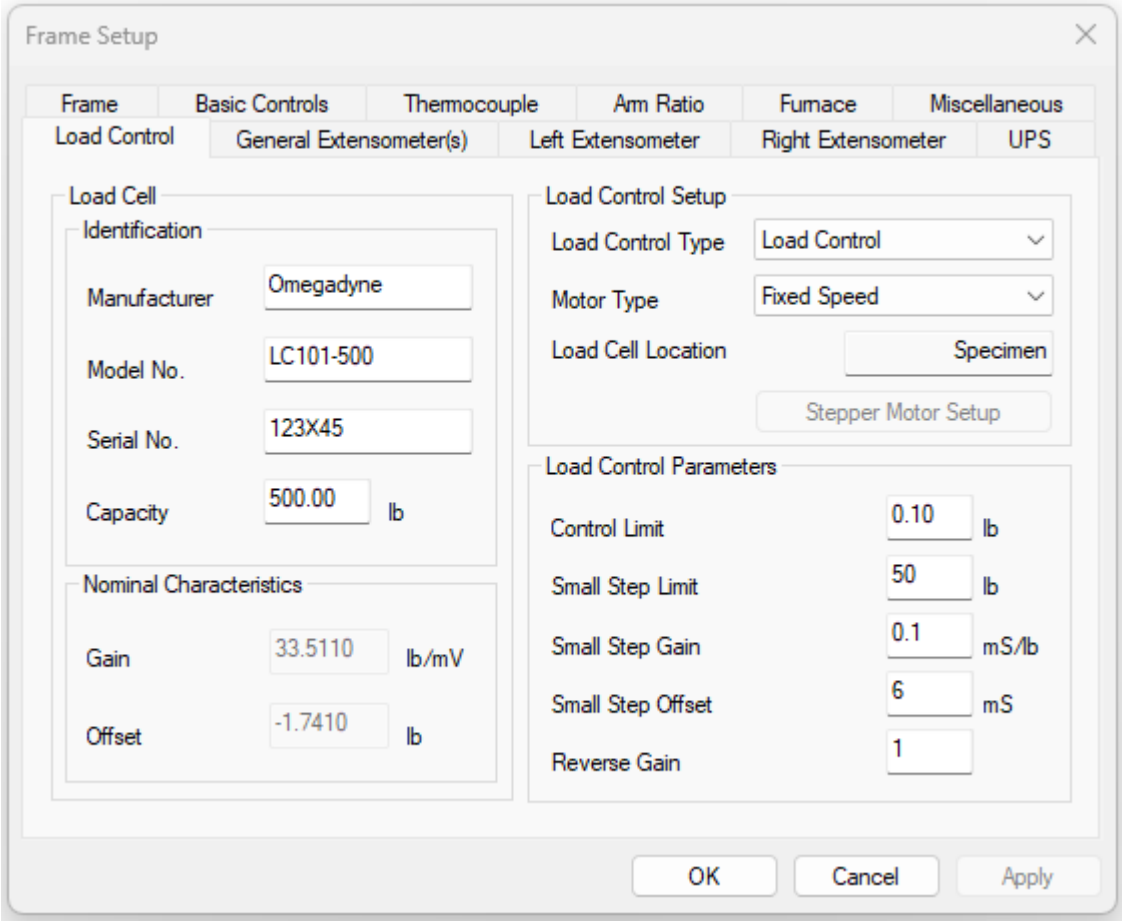
Stepper Motor: The stepper motor is a bidirectional stepping motor capable of making very small steps of rotation. These are used on all SIGMA Controller based testing frames supplied by Applied Test Systems. These allow very precise control of the drawhead and therefore excellent load control.

Variable Speed: Variable speed motors are typically servo motors with DC control systems. Some use bipolar control voltages to control the motor direction and others use a digital control input to control direction and a unipolar DC control voltage to set the speed.

When the motor type is selected the Load Control Parameters will be changed as shown below.

IMPORTANT: All Load Control Parameter values are based on the load cell values or location.

Fixed Speed Motor Type



Because the Fixed Speed motor is a fixed speed the WinCCS controller will generate very short pulses of power to the motor to make it make small movements. The Fixed Speed motor type has the following parameters:

Control Limit: This value sets the limits of the control error.

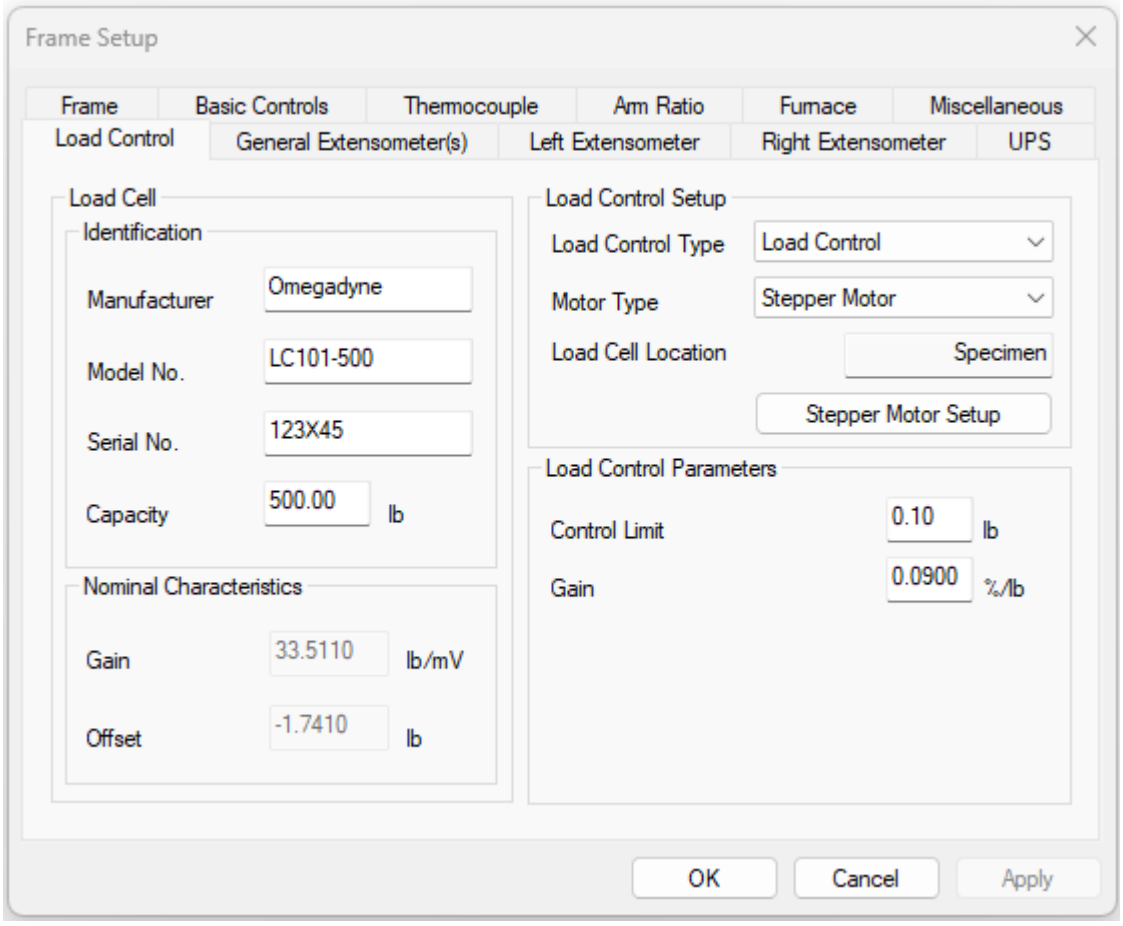
Small Step Limit: When the control error is above the Small Step Limit value it will operate continuously in the direction required to return the load value withing the Small Step Limit. Once the control error is below Small Step Limit value, the control will pulse the motor based on the Small Step Gain and Offset.

Small Step Gain: The Small Step Gain is multiplied times the control error to determine the pulse length applied to the motor.

Small Step Offset: This value is added to the computed step time of Control Error times Small Step Gain. The intention is that the motor will have a certain dead zone of operation that requires a fixed amount of pulse time to get it to move.

Reverse Gain: Some systems will exhibit easier motor operation unloading versus loading and this provides the ability to modify the gain when operating in the unload direction.

Stepper Motor Type

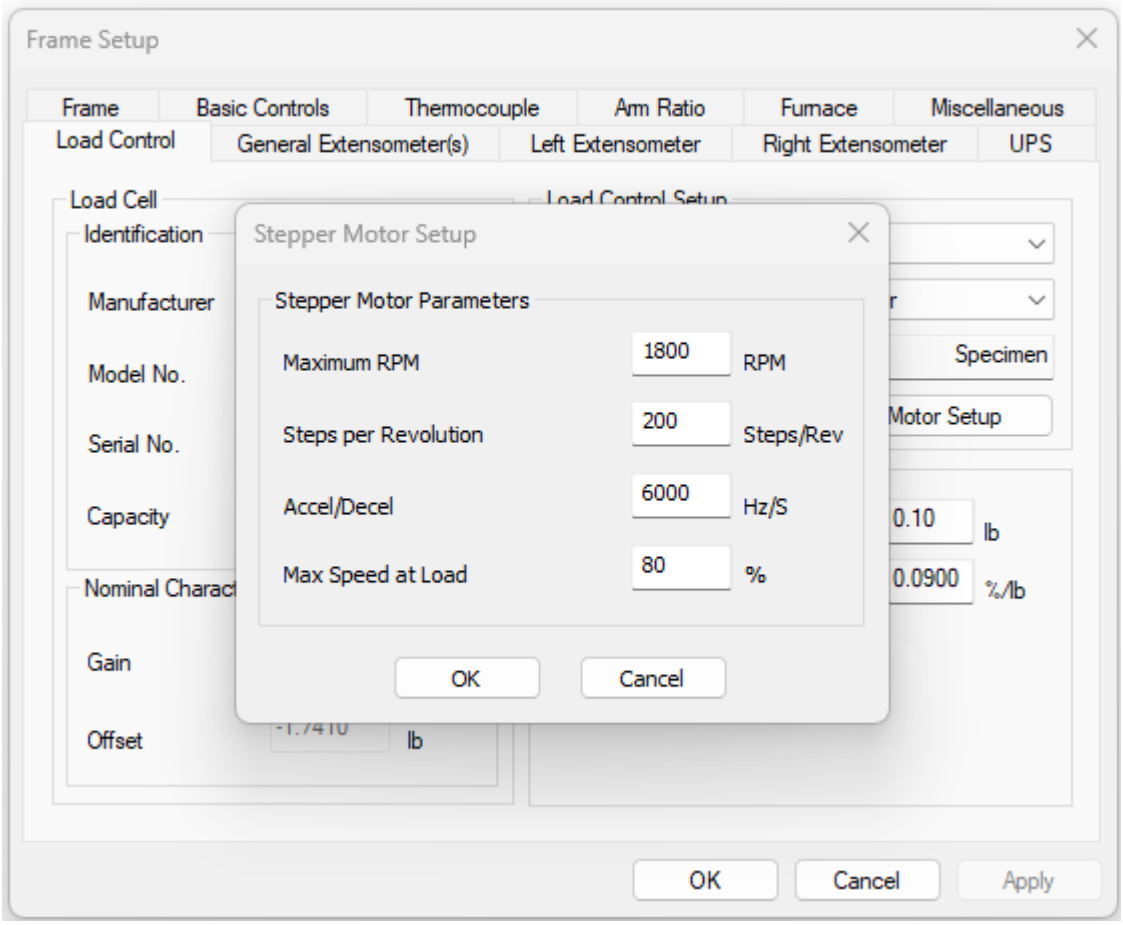


When the stepper motor type is selected there are two control parameters and a special dialog to set the actual stepper motor physical parameters.

Control Limit: This value sets the limits of the control error.

Gain: This sets the control loops gain which is multiplied times the control error to determine the percent speed to be sent to the stepper motor controller.

The Stepper Motor physical parameters are set by clicking on the “Stepper Motor Setup” button, which will open the following dialog as shown below:



The Stepper Motor Setup dialog allows the setting of the physical stepper motor parameters. These must agree with the actual stepper motor and controller used in the system.

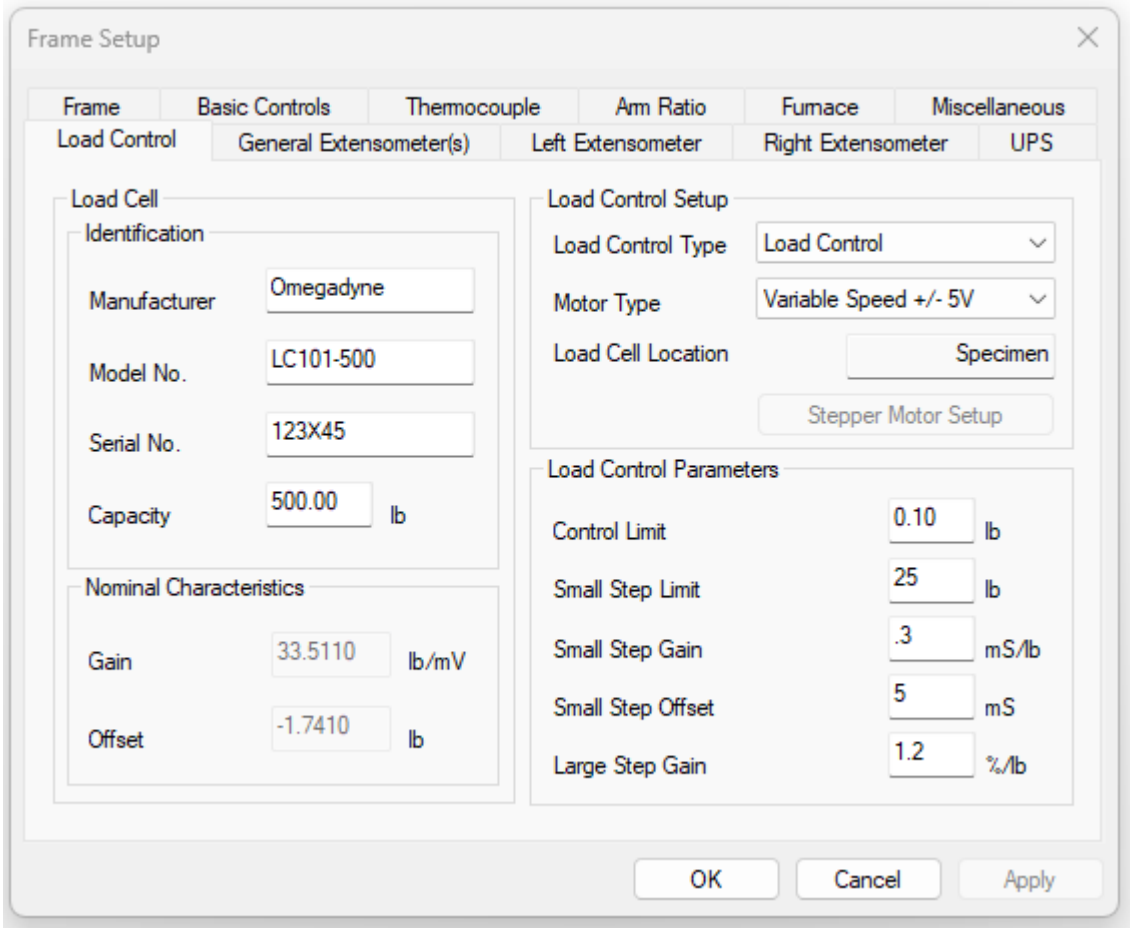
Maximum RPM: This is the maximum RPM that the stepper motor can run at.

Steps per Revolution: This sets the number of steps per revolution of the stepper motor.

Accel / Decel: Controls the acceleration and deceleration of the motor itself. It is dependent on the various aspects of the machine. Please consult with Applied Test Systems Service personnel before changing.

Max Speed at Load: This limits the maximum speed of the machine at full load. It is intended to provide smoother operation as higher machine loads. Please consult with Applied Test Systems Service personnel before changing.

Variable Speed Motor Type



The Variable Speed Motor is usually a servo-based motor with a DC voltage level to control the actual motor speed. The WinCCS controller will generate very short pulses of power to the motor to make it make small movements at minimal control voltage. This allows the system to micro step the motor for precise control of position. The Variable Speed Motor type has the following parameters:

Control Limit: This value sets the limits of the control error.

Small Step Limit: When the control error is above the Small Step Limit value it will operate continuously in the direction required to return the load value withing the Small Step Limit. The DC speed value is proportional to the control error and is computed by the control error times the Large Step gain. Once the control error is below Small Step Limit value the control will pulse the motor based on the Small Step Gain and Offset, using a small control voltage to micro step the motor.

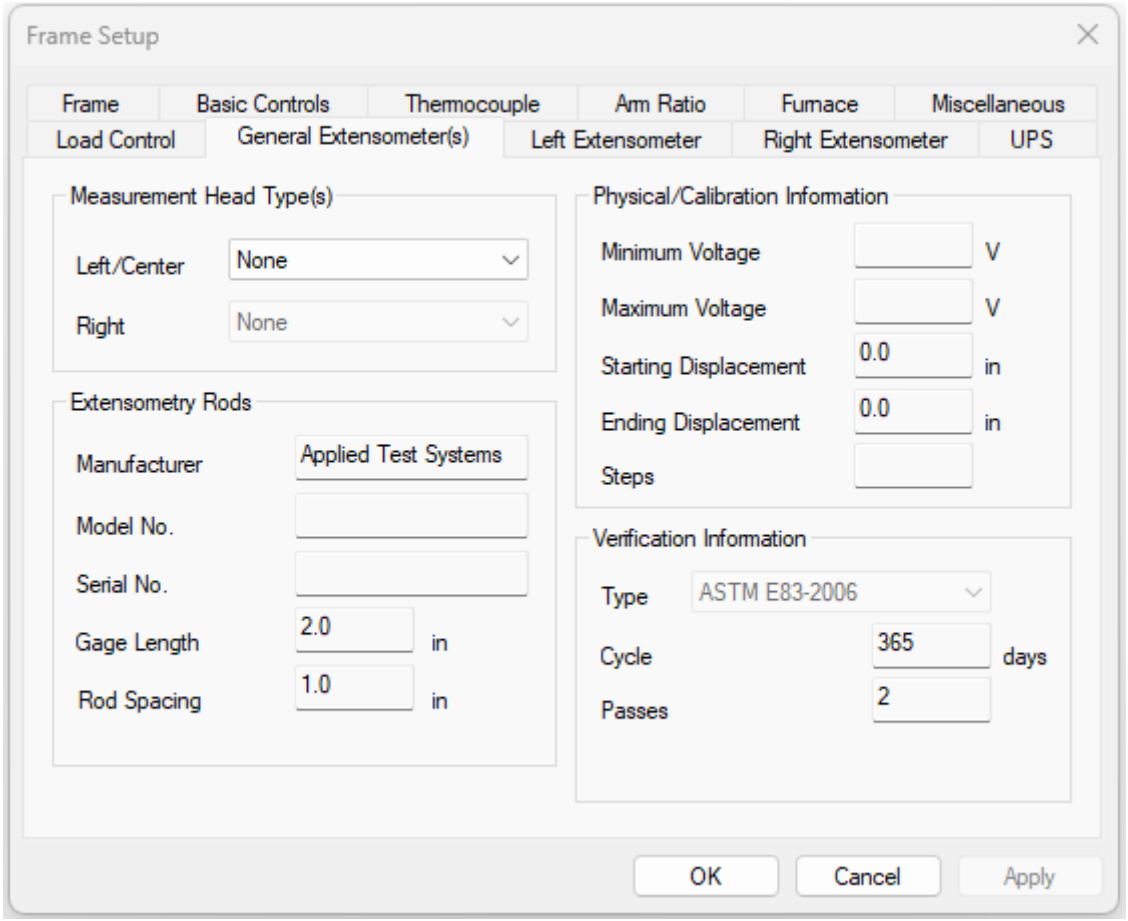
Small Step Gain: The Small Step Gain is multiplied times the control error to determine the pulse length applied to the motor.

Small Step Offset: This value is added to the computed step time of Control Error times Small Step Gain. The intention is that the motor will have a certain dead zone of operation that requires a fixed amount of pulse time to get it to move.

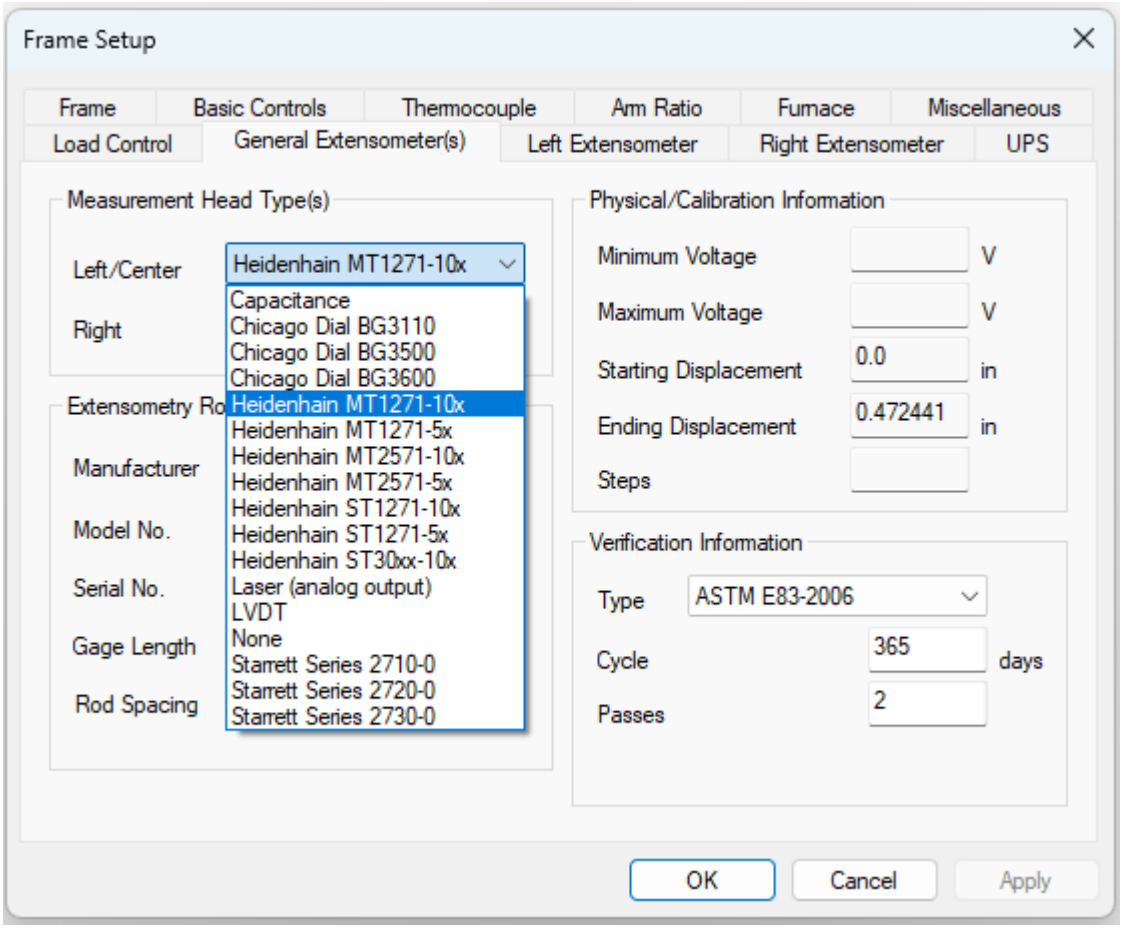
Large Step Gain: The Large Step Gain is multiplied times the control error to determine speed of the motor when the control limit is greater than the Small Step Limit.

Once the settings for the Load Control Property Page have been completed, you should select the next Property Page. If the machine does not have extensometers, then proceed to the UPS Property Page otherwise select the General Extensometer(s) Property Page as shown below.

Please refer to Appendix XXXXX Extensometer Types

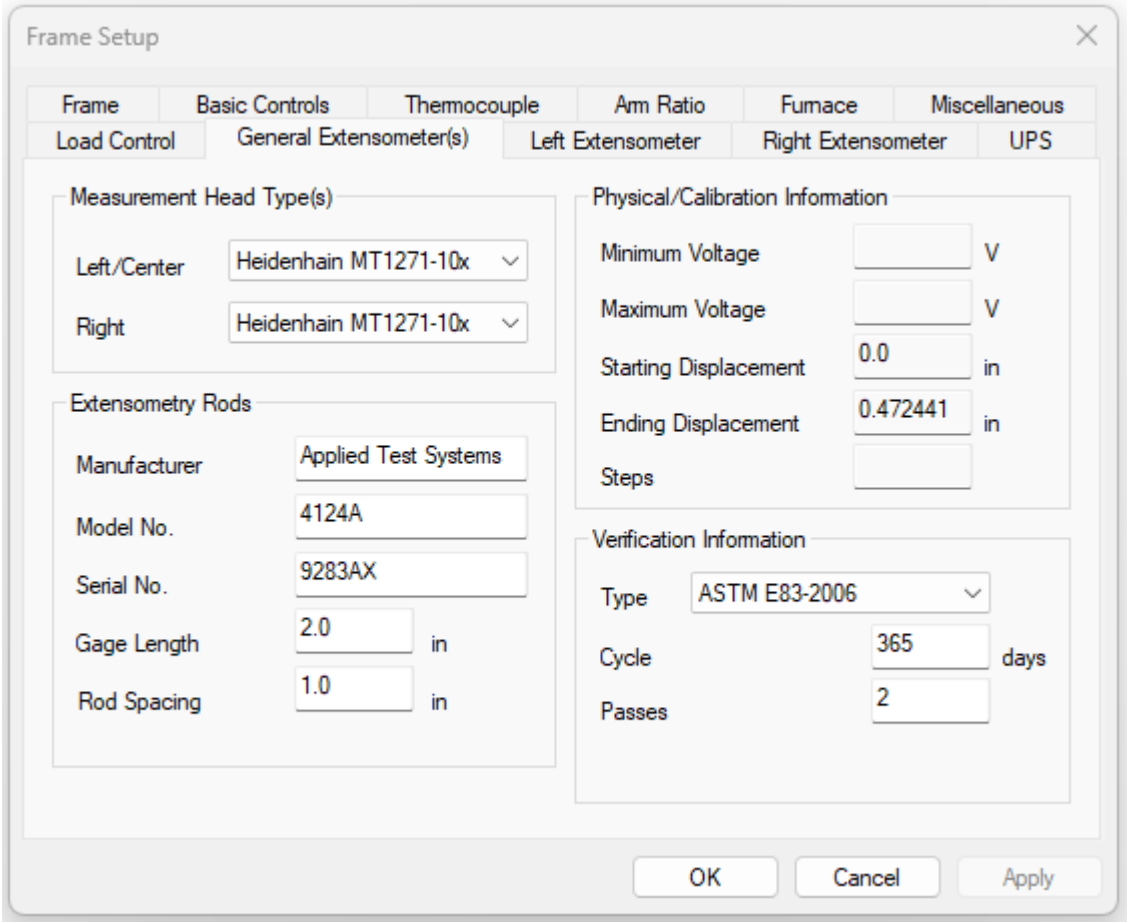


The first thing that the user should do is select the Left / Center extensometer from the pull-down list as shown below:



Once the extensometer type has been selected, then the user can select the Right extensometer.

Note: The Right extensometer choices will only by the type selected for Left / Center or None.



Fill in the information about the extensomerty rods. The fields Manufacturer, Model No. and Serial No. are text fields that are recorded when the extensometer is calibrated (if required) and verified. The Gage length parameter sets the Gage Length used for the E83 computations and the Rod Spacing is used for the for the percent bending calculations.

IMPORTANT: Most extensometer assemblies are not serialized because they are made up of many different parts that need to be replaced due to normal wear and tear. The laboratory should come up with their own practice for assigning serial numbers to the extensometer assembly and always keep it with the same testing frame to assure compliance with current testing standards and practices.

Fill in the Physical / Calibration information values as follows:

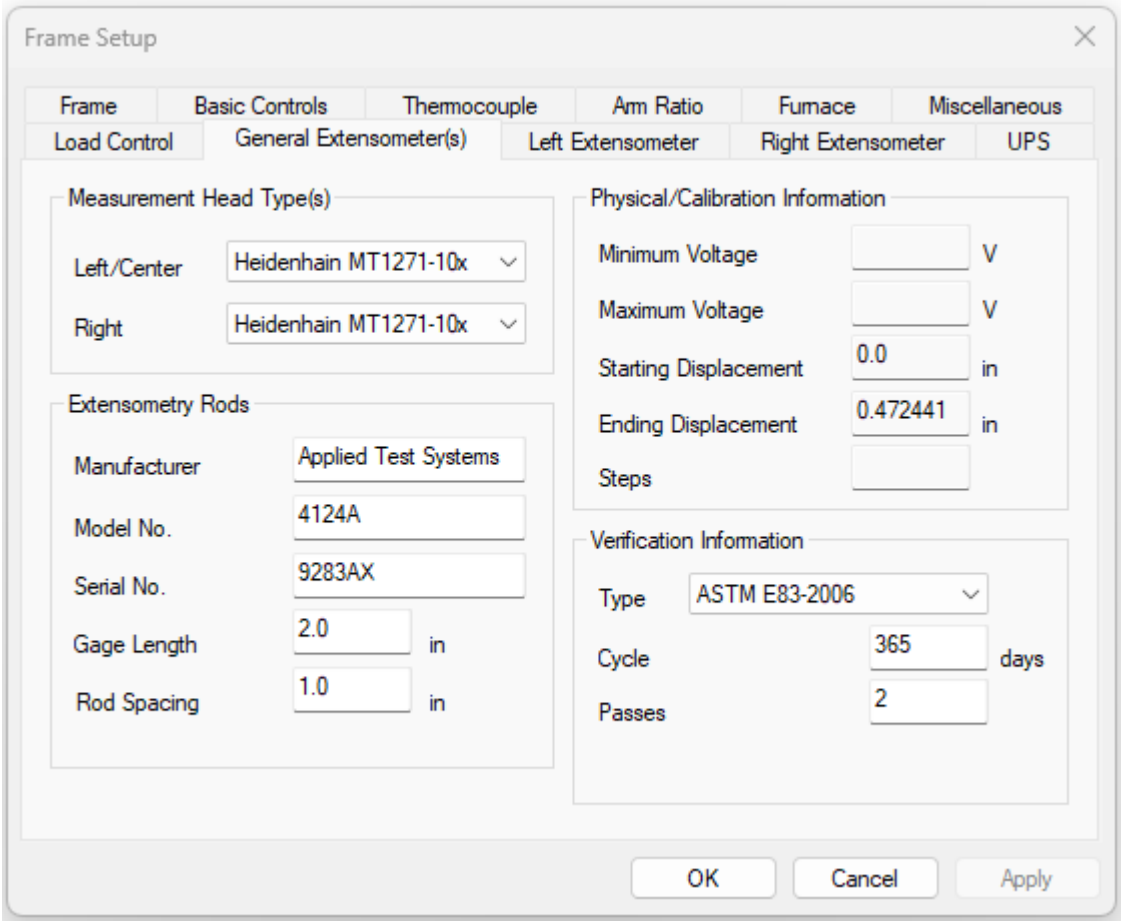
Minimum Voltage: This parameter is only used for analog extensometers, and it sets the minimum expected voltage at full scale. Typically, you should set this value 10% higher than expected to allow for drift in the device.

Maximum Voltage: This parameter is only used for analog extensometers, and it sets the maximum expected voltage at full scale. Typically, you should set this value 10% higher than expected to allow for drift in the device.

Starting Displacement: This should always be zero unless the extensometer is an analog device with a bipolar voltage output.

Ending Displacement: This sets the maximum extensometer displacement.

The next step is to select the Verification Type in the Verification Information box as shown below.



There are two types of extensometer verification Single Pass and ASTM E83. The Single Pass is retained only for legacy systems use because this was used before the ASTM E83 became accepted in creep testing.

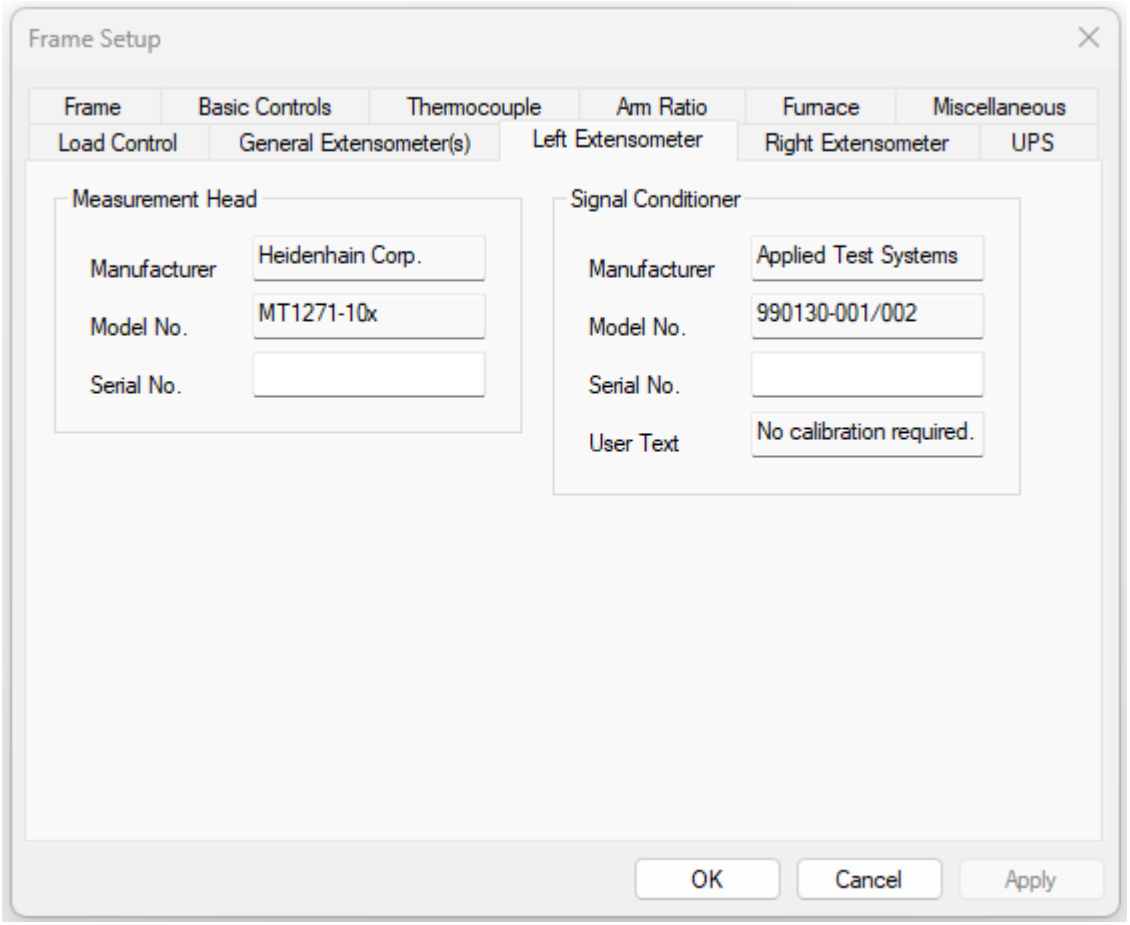
IMPORTANT: All current installations and testing should use the ASTM E83 verification type.

And fill in the Cycle and Passes as follows:

Cycle: This value is laboratory dependent, but typical values are between one half and a full year.

Passes: This sets the number of verification passes to be performed.

Once the settings for the General Extensometer(s) Property Page are complete, select the left Extensometer Property Page tab as shown below:



The following fields should be filled in. Some of the fields will be automatically filled in and disabled for editing depending on the extensometer type that was selected in the previous Property Page.

Measurement Head Box

Manufacturer: The name of the measurement head manufacturer.

Model Number: The model number of the measurement head.

Serial Number: The serial number of the measurement head.

Signal Conditioner Box

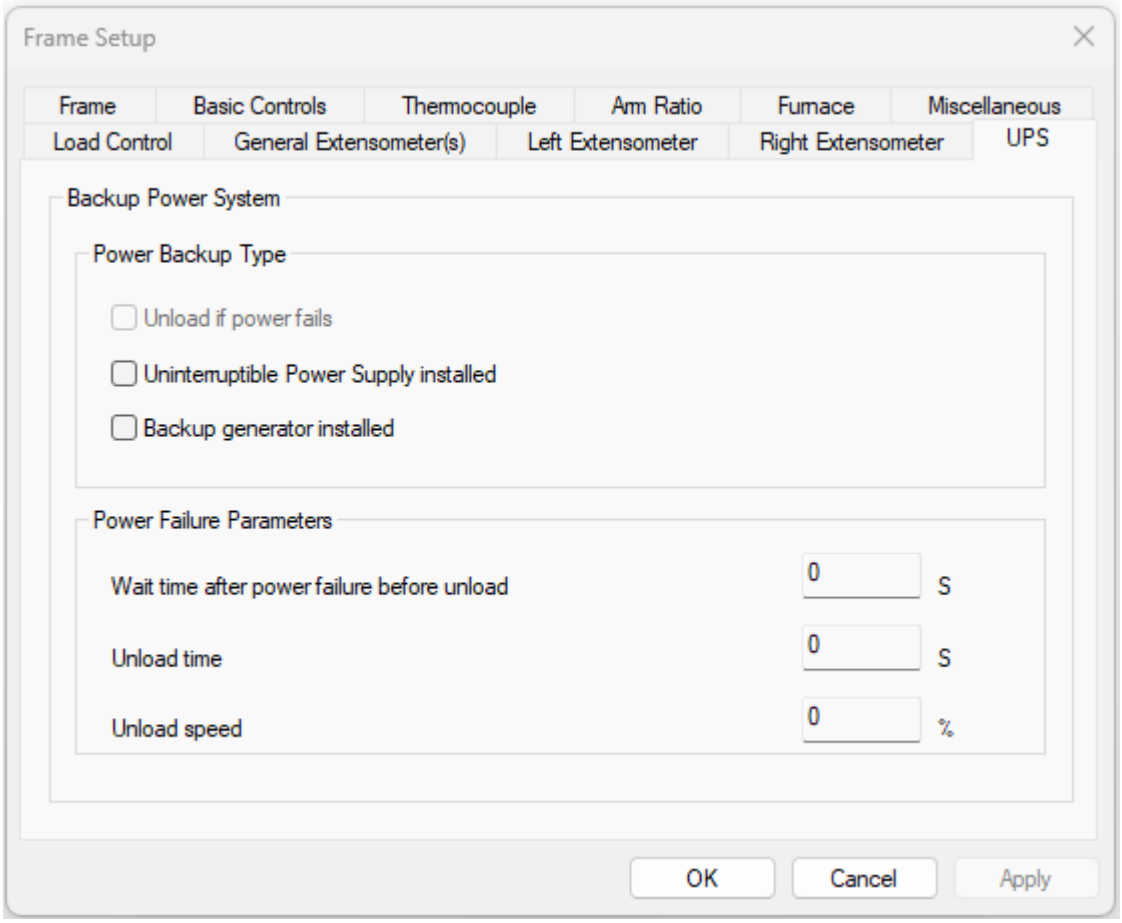
Manufacturer: The name of the signal conditioner manufacturer.

Model Number: The model number of the signal conditioner.

Serial Number: The serial number of the signal conditioner.

IMPORTANT: The digital encoder style extensometers cannot be physically calibrated and therefore do not require calibration. The text “No Calibration required.” is automatically filled in for those extensometer types.

Once the Left Extensometer Property Page is filled in, click on the Right Extensometer Property tab if the system uses a right extensometer, otherwise click on the UPS Property Page tab as shown below:



General Notes:

Specimens and Test Specification use PC filenames and therefore the names must comply with the current version of Windows that is being used.

Test Specifications

This section describes creating a Test Specification for a Combination or Combo Specimen as the first condition in the test specification and then editing the test specification to add a second condition to the test specification for a creep test. During the editing process you can always click around on the tabs to add or edit multiple conditions, but you can only add one condition when you first create the specification.

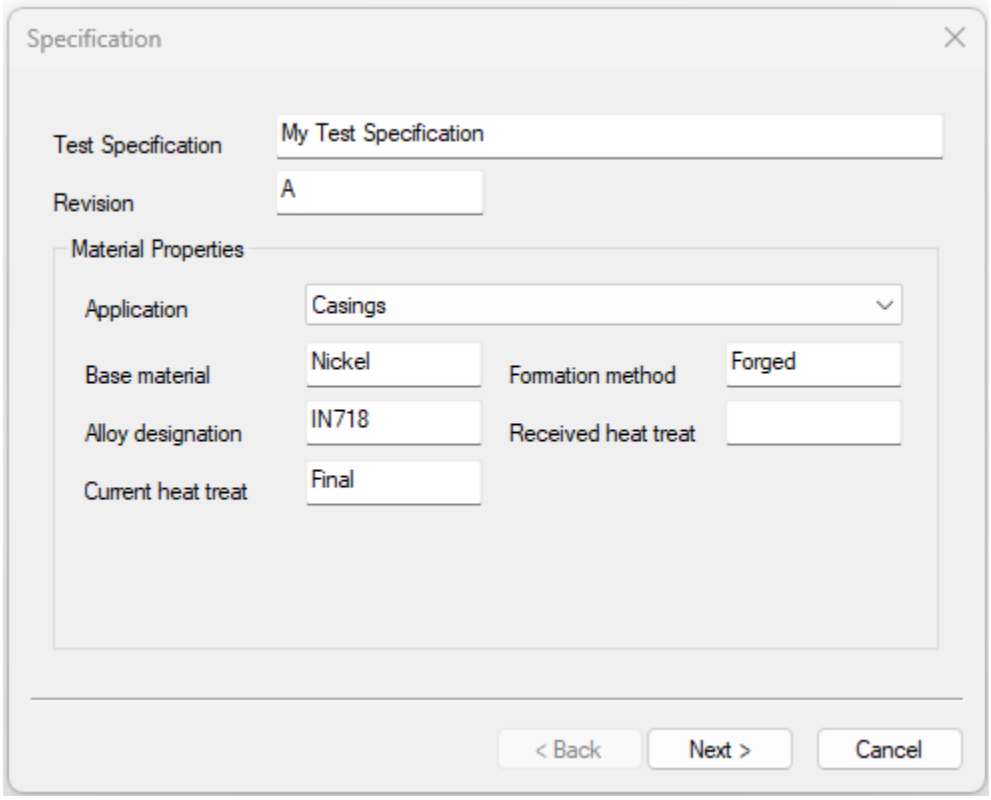
IMPORTANT: Once a test is started using a test specification the parameters for that test cannot be changed. Therefore, if you think that someone may decide to run a test beyond its specified life hours then do not specify that the sample should terminate on life hours. The operator can always terminate the test at any time if needed.

IMPORTANT: There are numerous test specification default values and text setup fields that are controlled by General Setup. The user should always make sure that they have configured General Setup BEFORE creating Test Specifications!

IMPORTANT: The test specification defines all the various capabilities that the WinCCS system has to offer. As a result, a test specification can be created that will not run on some or all of the test machines in a laboratory. The WinCCS system will notify the user if they are trying to start a test with a test specification feature that is not supported by the test machines hardware or software revision.

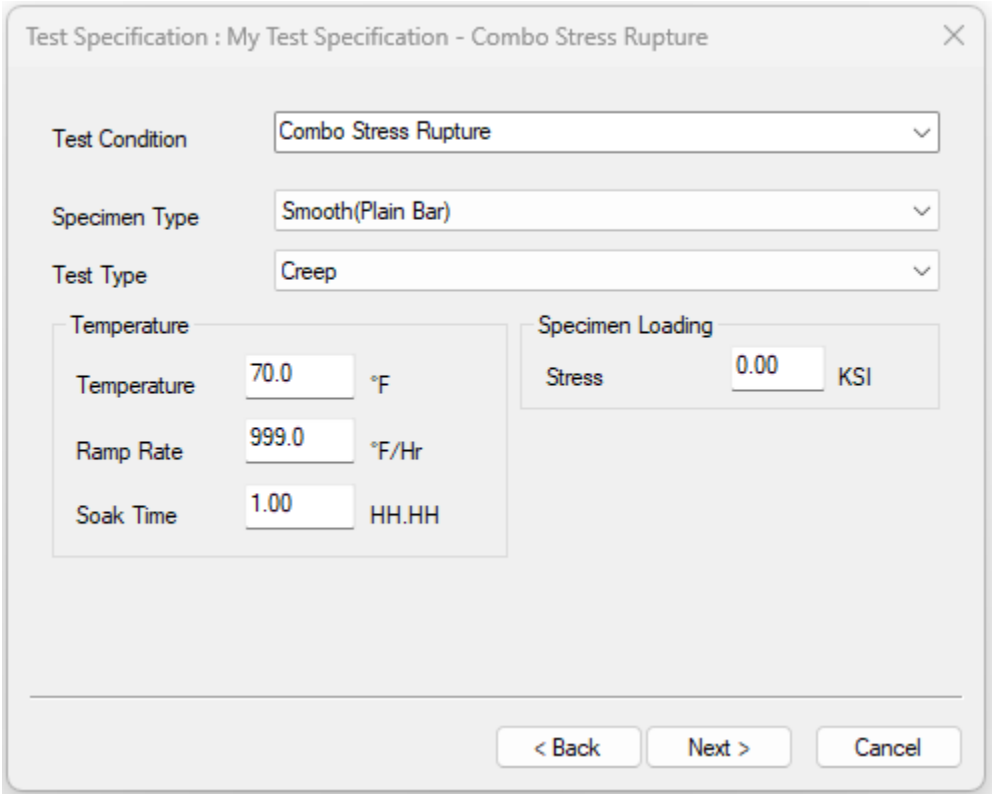
Create Test Specification

To create a test specification, select Specifications → Create from the Main Menu. This will open the test specification creation Property Page shown below.

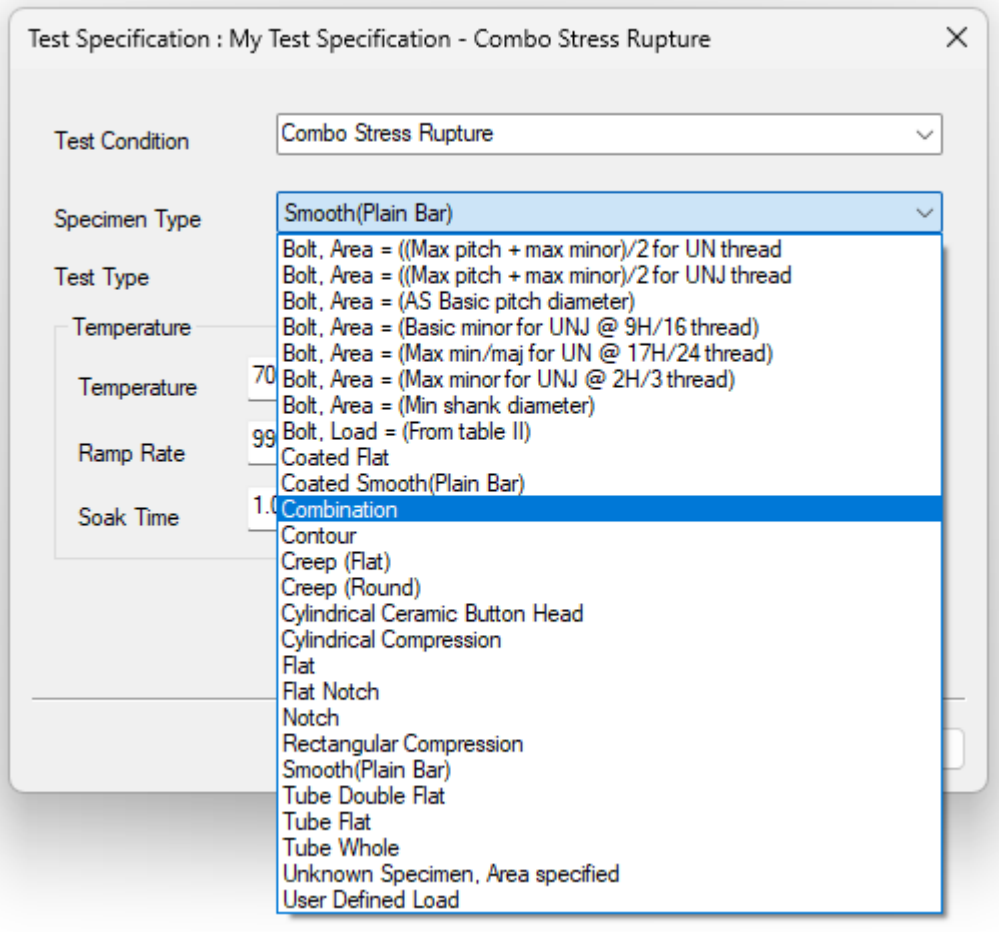


Enter the name of the Test Specification and enter a revision that matches the specification you are creating. This will allow the quality group to track what revision the specimen was tested to. The drop-down Application combo box and other text fields below it is user modifiable in General Setup and should be setup prior to Test Specification creation. Once these fields have been filled in click Next to continue.

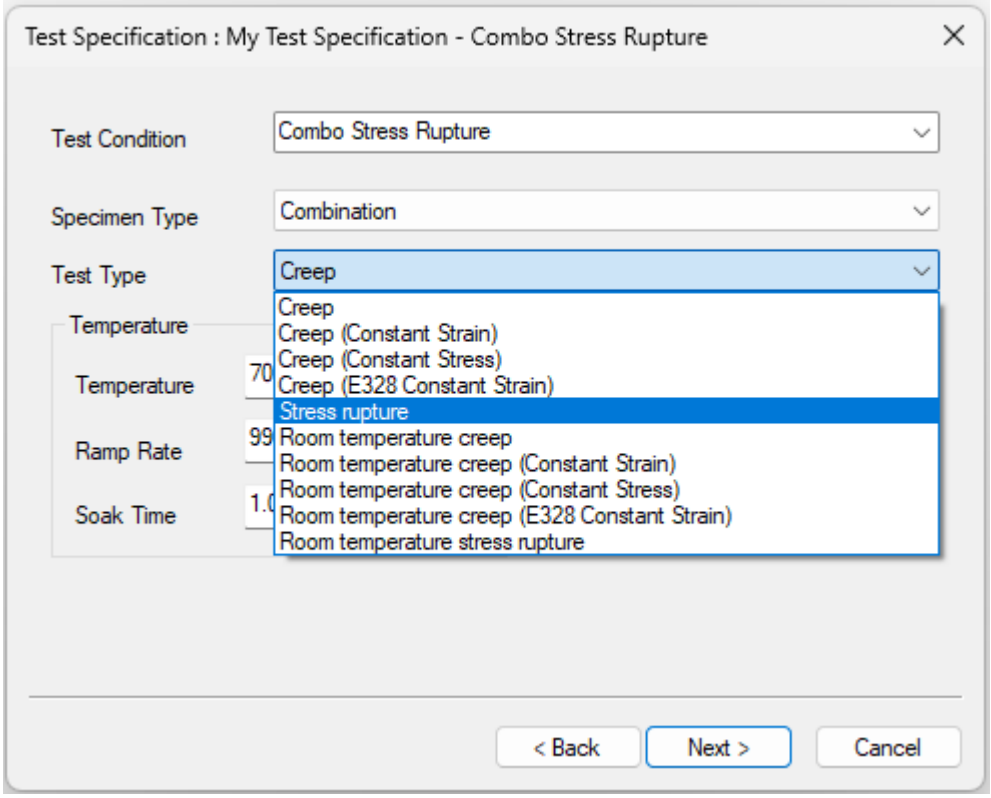
The Property Page shown below is the start of a unique test condition within the test specification. For the first condition use the name “Combo Stress Rupture”.



Next, select the specimen type. Please refer to appendix XXXXX for a description of specimen types and area calculations.

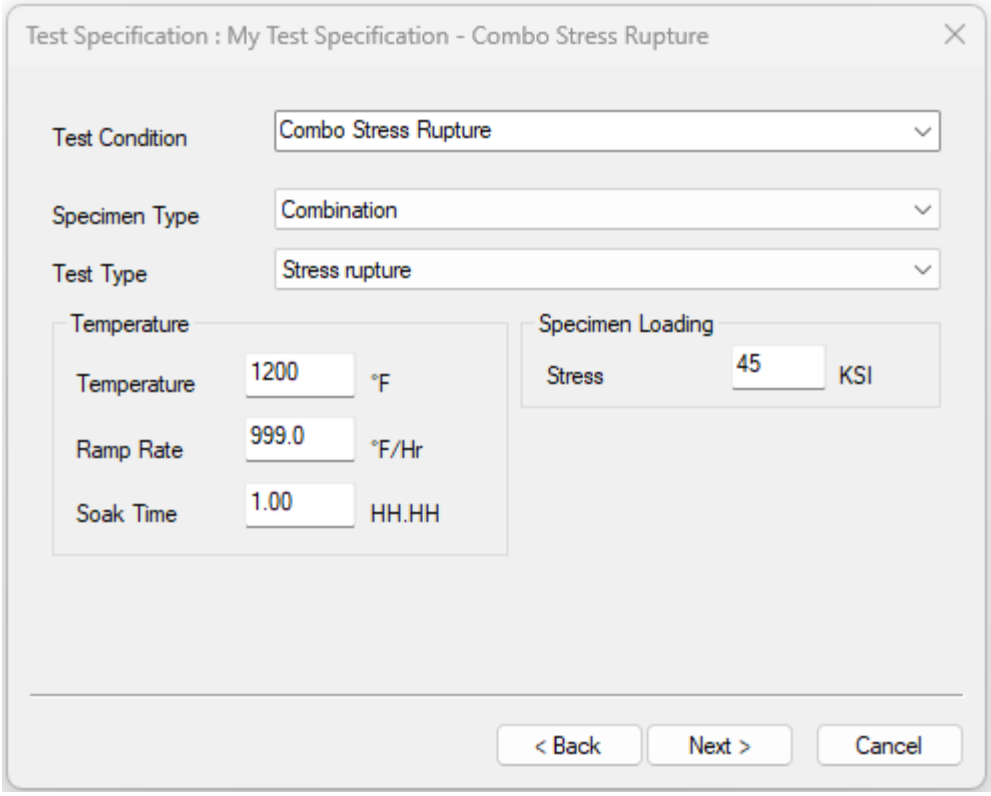


Then select the Test Type. The combination of Specimen and Test Type will enable and disable various Test Specification features.



Now fill in the rest of the test parameters shown below.

IMPORTANT: Specifying Ramp Rates above 1000°F or 550°C per hour are not achievable with most furnaces. High ramp rates are very detrimental to extensometry rods because of their proximity to the furnace walls which causes extremely high temperatures to be transferred to them during fast heat ups.



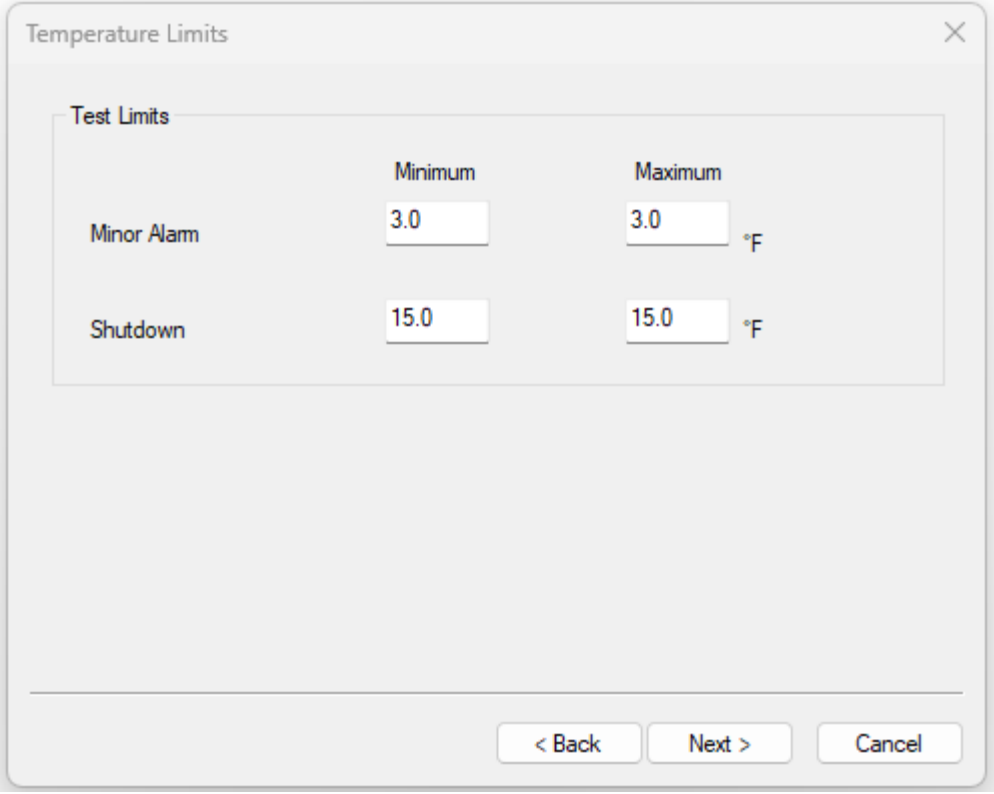
Once this is complete, click Next.

The minor limits are defined as the +/- temperature specification in the material test specification. These are typically +/- 3F, but they do vary so always refer to the actual specification that you are testing to. Deviations above the upper minor limit are reported regardless of the test state, but deviations below the minor limit are only reported during the actual test.

All specimen thermocouple values must be within minor limits before the test can enter the soak state. During the soak state the limits are also used as limits for the guaranteed soak, so if any thermocouple drops below the minor limit during the soak state the soak timer will be reset to its initial setting.

During a stress rupture test if any thermocouple drops below the minor limit the accumulation of test time is suspended until all thermocouples have returned within limits.

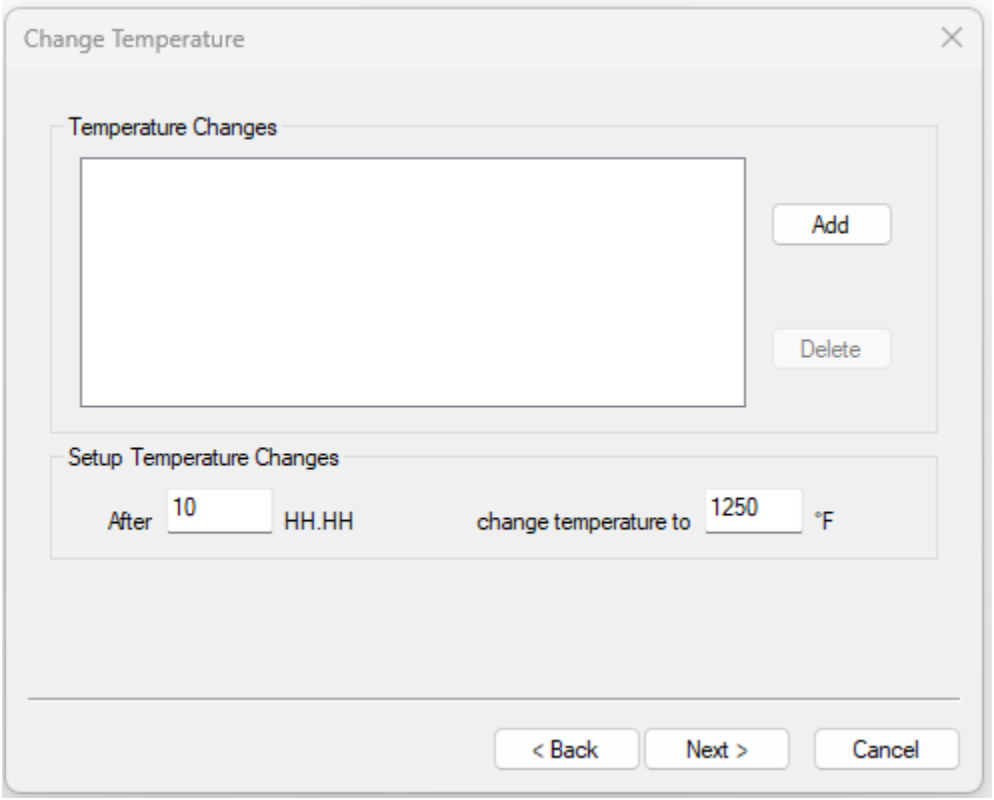
The shutdown test limits means whenever the temperature is +/- the entered threshold, the test will shutdown.



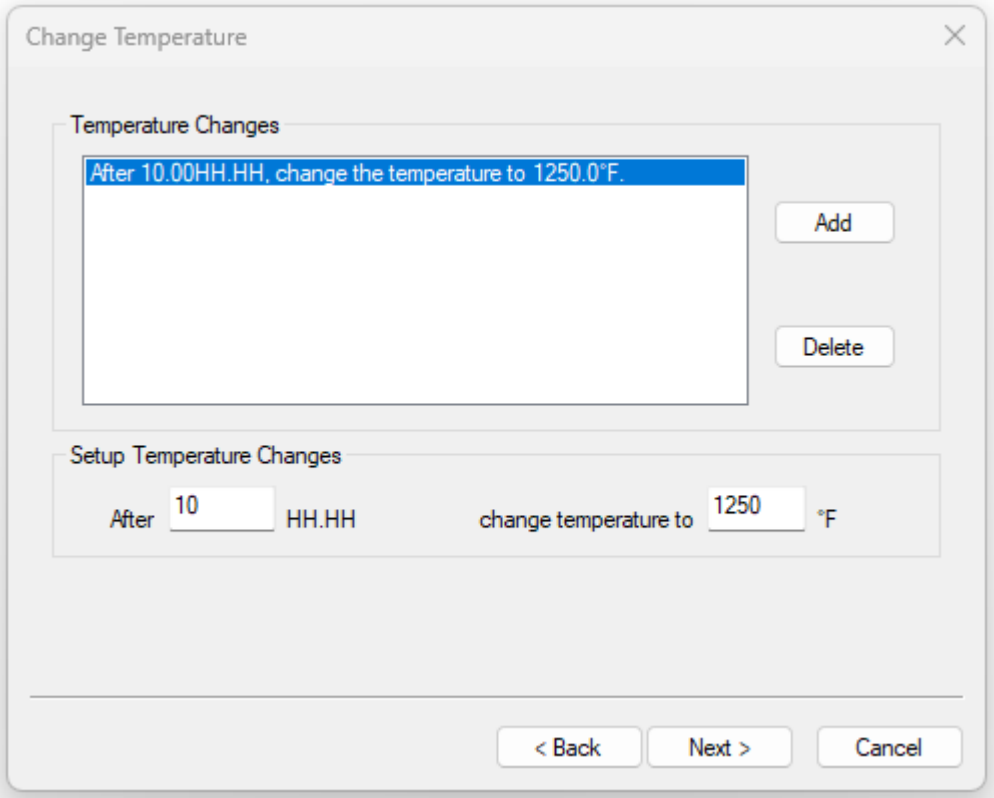
Once this is complete, click Next.

The next property page instructs the control system to change the setpoint temperature up or down at defined specimen run times. The system automatically determines an appropriate ramp rate between the current temperature and the new desired setpoint, and the alarm limits track the ramped setpoint preventing temperature alarms while the system is changing the temperature.

In the example below we are instructing the system to change the temperature to 1250°F after 10 hours. Enter the values in and then click the Add button.

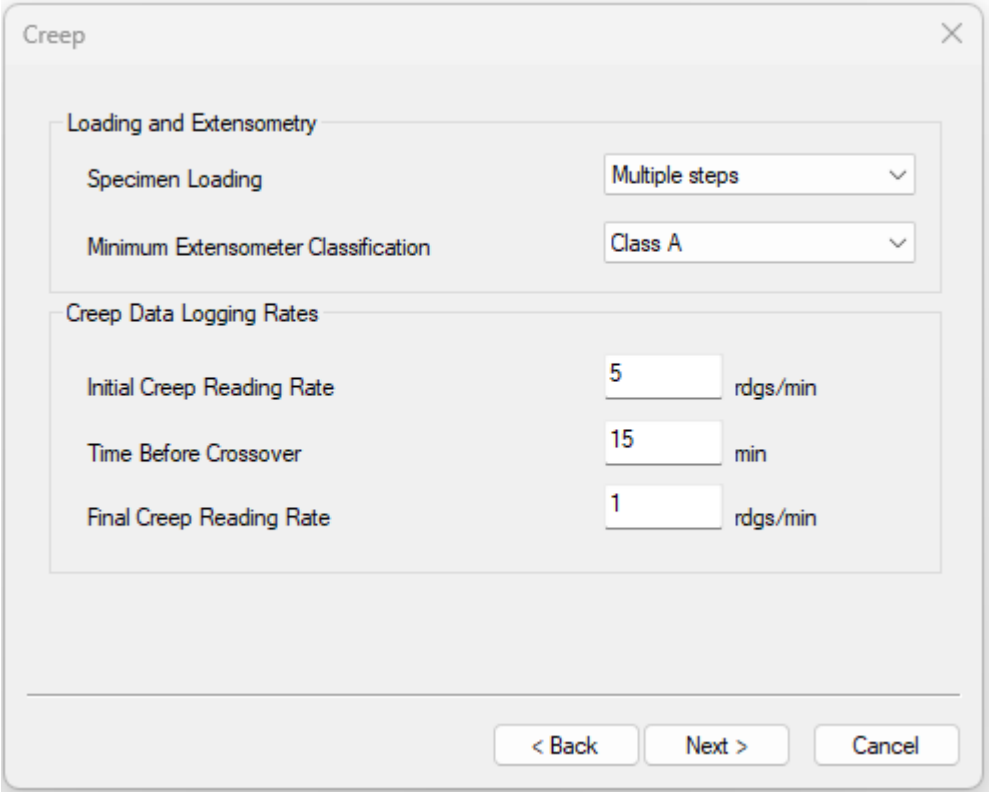


After clicking the Add button, the temperature change will be shown in the upper window. You can have up to six temperature changes specified for a test.



Once you are finished Adding or Deleting temperature changes click Next to continue.

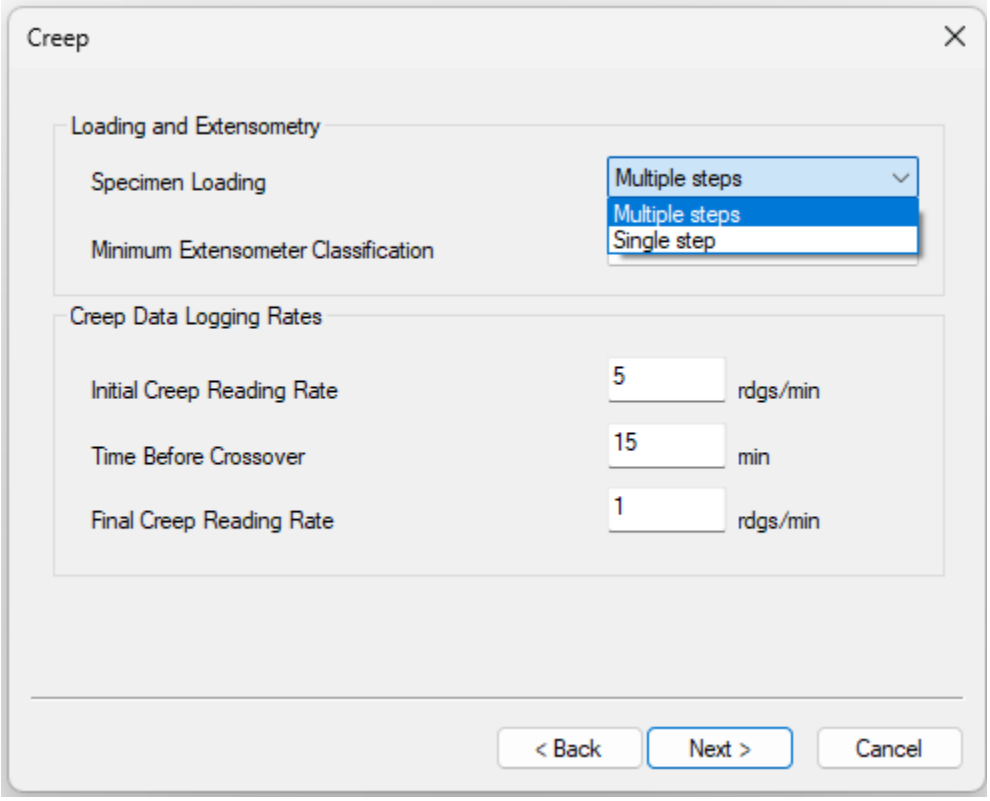
The next Property Page deals with Creep parameters and would not show up during creation of a test type that is not creep related.



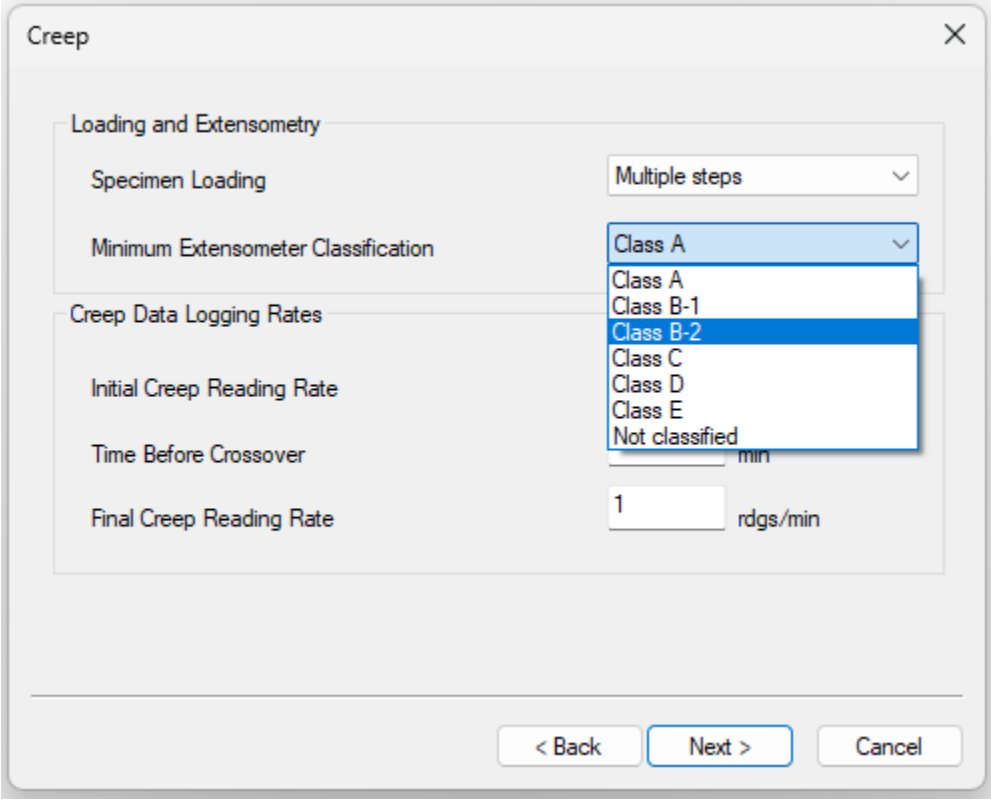
Creep tests are ramped to temperature and then soaked for an appropriate amount of time. Many different studies have shown that specimen soak times below one hour for creep tests will usually have issues due to extensometry rods not fully reaching temperature equilibrium. Once the specimen soak is complete the creep specimen needs to have the load applied and there are two different methods.

Single Step Loading is where the specimen is applied as one load step. It is typically used for very high-rate creep samples or samples that are loaded very close to their yield point. These situations mean that the specimen will start creeping and/or deforming as the load is applied. This loading will measure the extensometer value before the load is applied and immediately after. A creep value of zero is assigned to the extensometer value taken immediately after the load was applied.

Multiple Step Loading is the typical loading method for creep specimens. This method applies the load in discreet steps with the extensometer being measured and recorded before starting at each step and after the final load has been applied. The system will then mathematically determine the creep zero point and whether any plastic deformation has occurred during loading. These values are saved and become part of the test record. See Appendix Hot Stepped Loading for more information.



Once the Specimen Loading type has been selected the user needs to select the Minimum Extensometer Classification. This is laboratory driven as to what classification they want to use, and some specifications call out minimum extensometry classifications. The operator will be prevented from starting a test on a test machine whose extensometry does not meet the limits defined in the specification. This feature can be ignored by changing the “Test Lockouts”. See General Setup, Test Lockouts (NEED A LINK HERE)



Finally, the user should fill out the Creep Data Logging Rates section.

The Initial Creep Reading Rate value sets the creep acquisition rate to be used by the system after the final loading has occurred. It will continue at this rate until the **Time Before Crossover** is reached. Once the crossover time is reached the system will acquire data at the **Final Creep Reading Rate** until the end of the test.

The defaults for these values are shown in the example above. The system does not set limits on the initial reading and time before crossover, because it is hard to determine everyone's different system setup to know what the maximum data bandwidth is. That said running an initial rate of 10 readings per minute for ten or twenty minutes should not be an issue.

IMPORTANT: The WinCCS system has a maximum creep reading storage set to 1,000,000 readings or 16,666 hours of test time at a one reading per minute rate. Please see Appendix dfhdjfhdj for a complete discussion of reading storage.

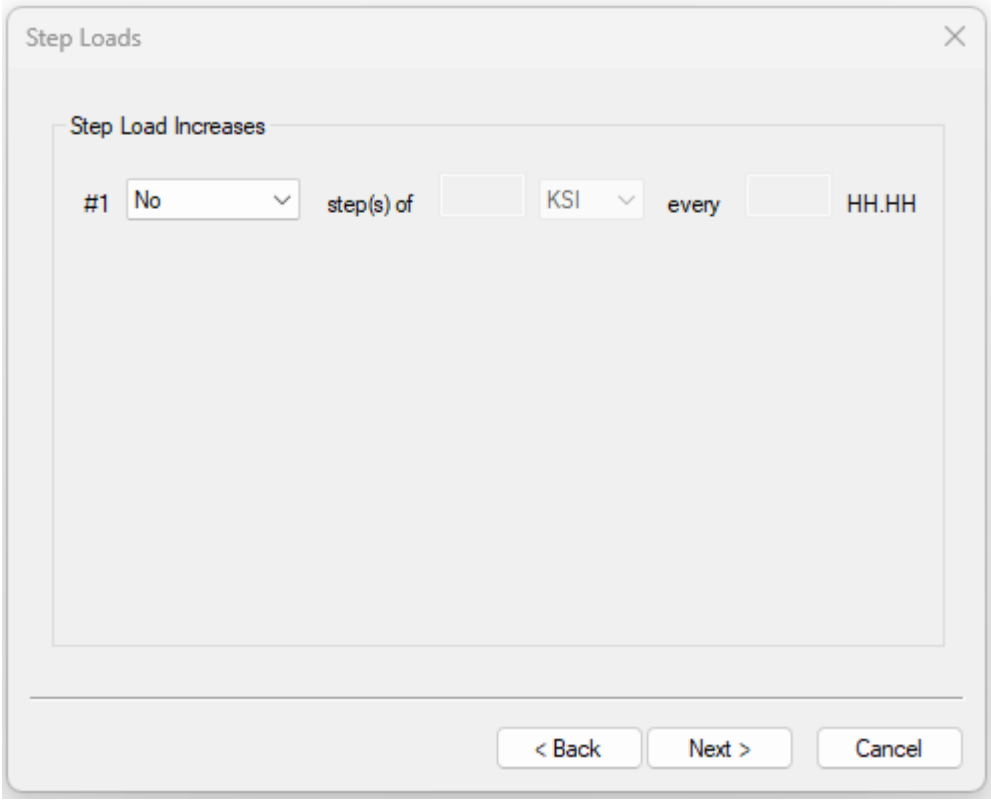
17. Min Extensometer Classification. I would not state that ATS systems typically meet B-1. Since extensometer measurements are supposed to be verified as a system, IE the measurement head mounted in a rod and tube and then verified. I have never seen this

type of arrangement that can meet B-1 or B-2. It is common practice in the industry to verify the measurement head and ignore the rod and tube, but we all know that the rod and tube are the primary source of all errors.

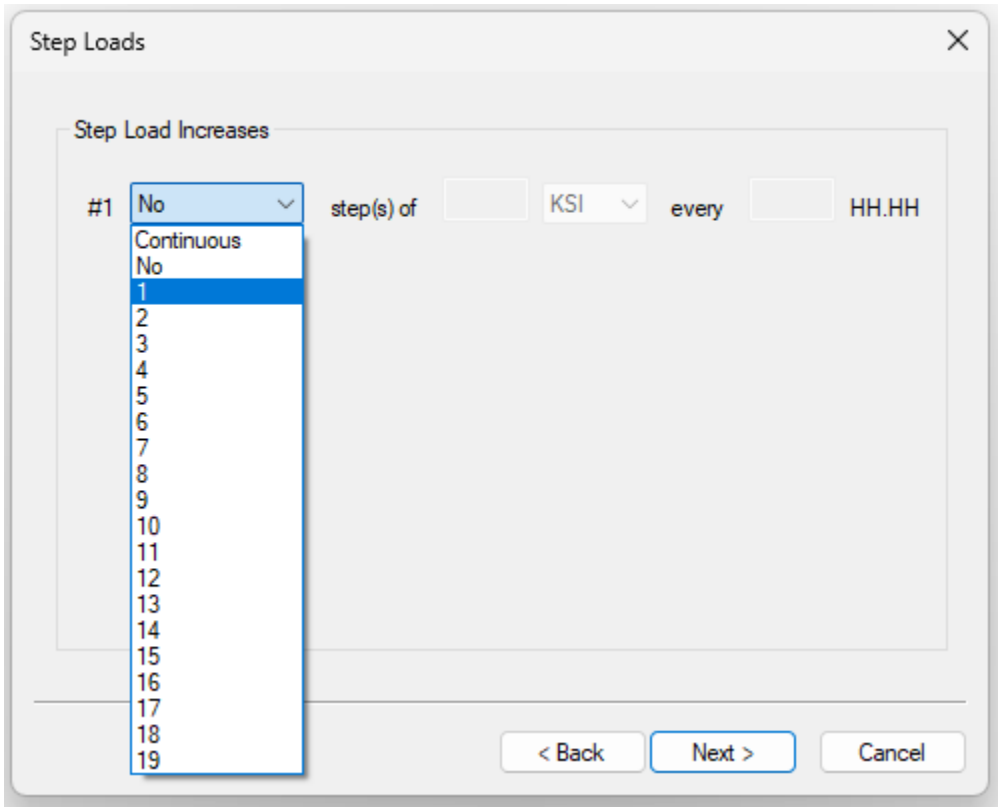
18. The default creep logging rates are way faster than the default ASTM E139 of once per hour.

The interval for strain readings should not be more than 24 h or 1% of the estimated duration of the test, whichever is longer. Laboratories with computerized data acquisition should record at shorter intervals (no longer than one point every 24 h) if possible so that the creep rupture curve can be more clearly defined. Omissions of readings are allowed when the absence of daily readings does not influence the test results or the time period does not occur at a specification requirement for reporting time or creep.

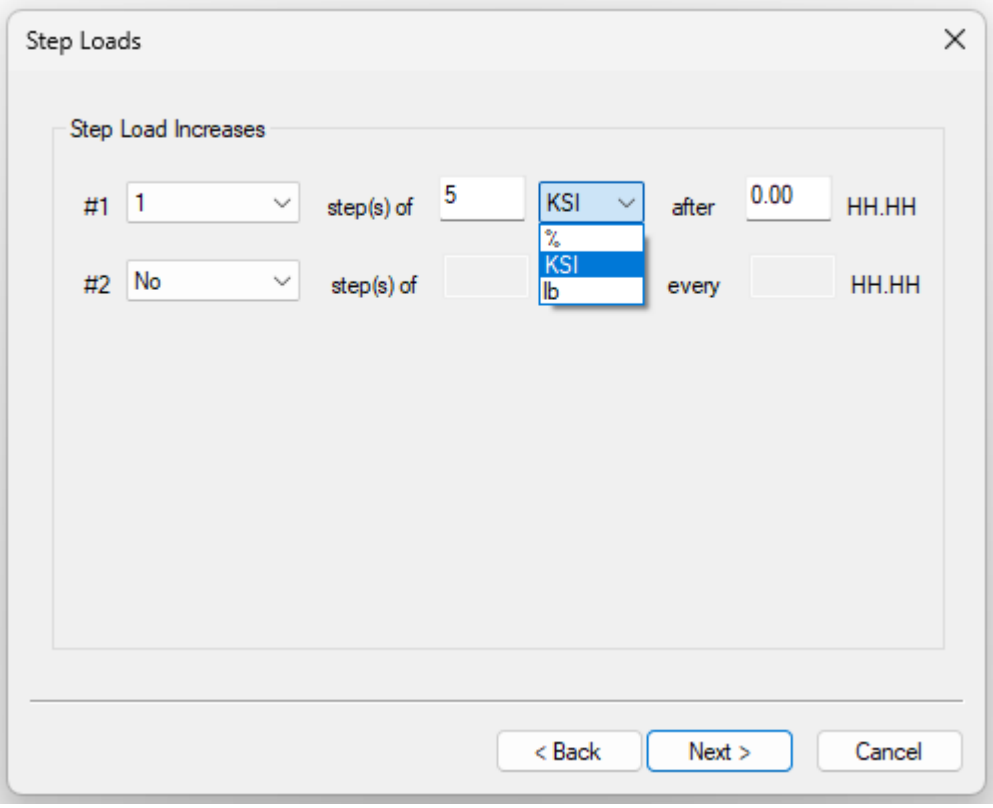
The Step Load Property Page allows the user to specify load increases on the specimen during the test. The user may specify up to five different load conditions in a test. If the test machine performing the Step Loads has full load control capability, then the machine will perform them automatically at the required time. If the test machine is weight based then the operator will be prompted on the status display screen, machine displays for Classic (GEN1) machine and on the handheld terminal if connected on a Modular (GEN2) or SIGMA (GEN3) controller. Once prompted the user can connect a handheld terminal on a Modular (GEN2) or SIGMA (GEN3) controller to perform the weight increases at the machine.



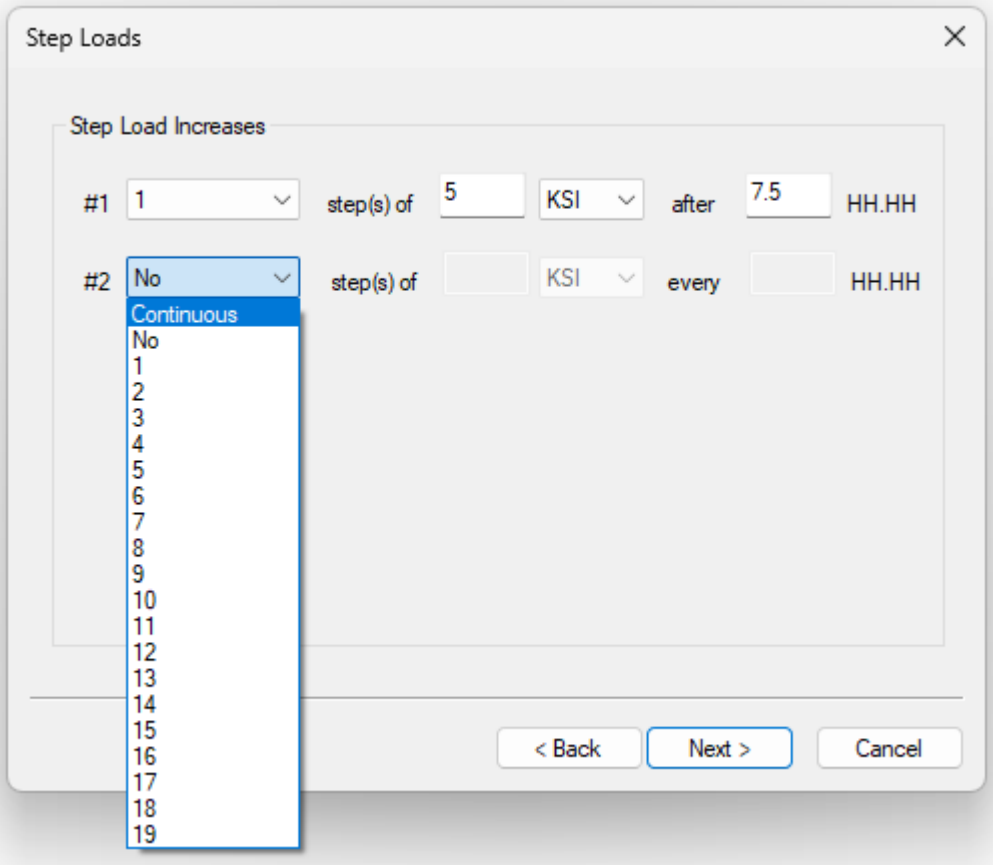
To specify a step load, select the number of step loads or “continuous” to have continuous steps loads until a specimen failure or test termination. For this example, we will choose one step load for the first condition.



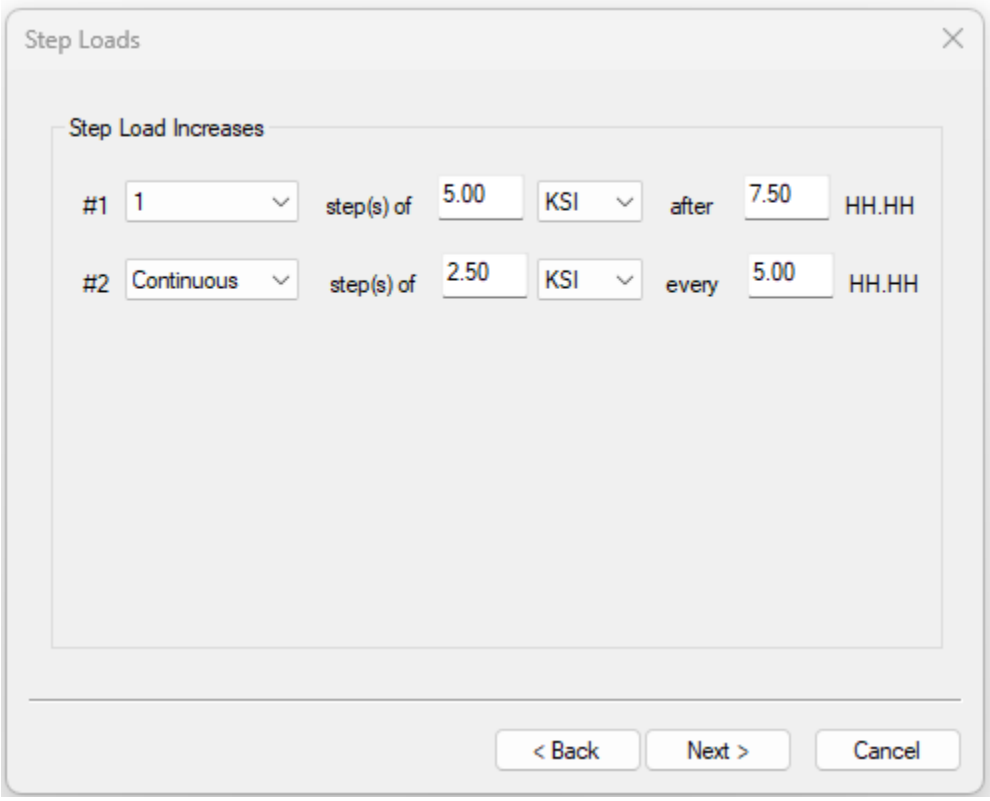
Once you have selected the number of step loads, the next condition will be shown below it unless it is condition #5 or “continuous” was specified. Fill in the load increase amount as KSI, Lbs or % of initial load. The load units will change depending on the units that the user has selected in their profile. Fill in the time increment to be used for the test. The time specified is from start or test for the first step load and then since the last step load for subsequent load increases.



After adding the information for Condition #1, for this example make the next step load be continuous. This will perform this step load for the remainder of the test.

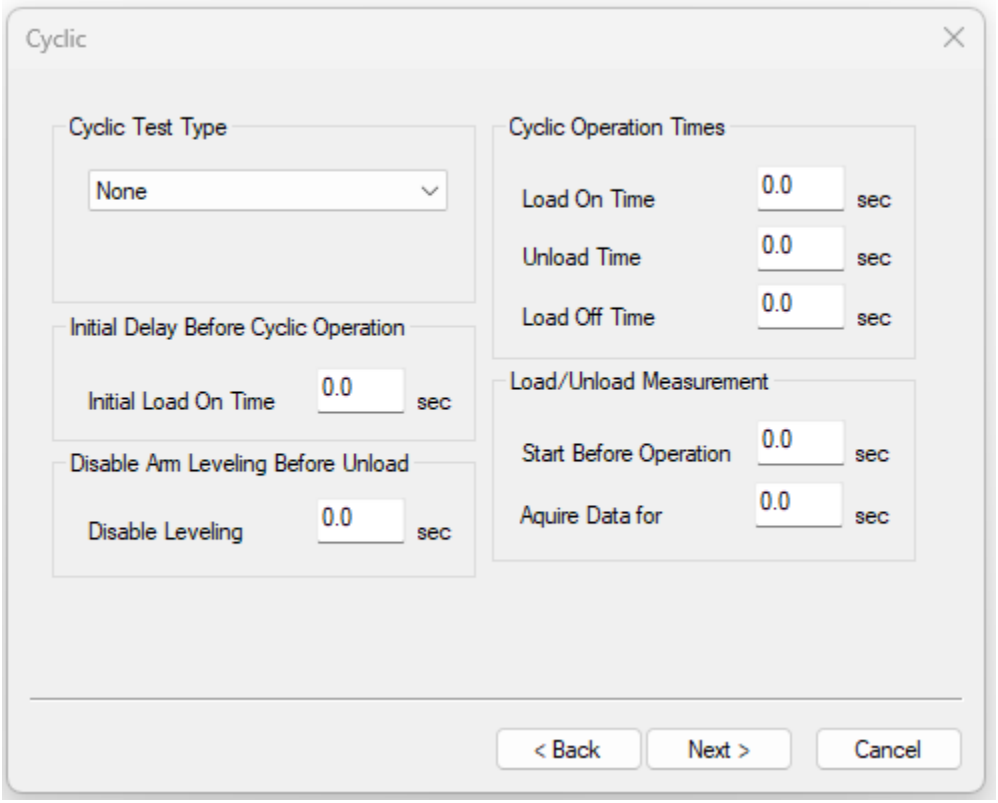


As in the last example, fill in the load value and time. Note that the next condition was not displayed because this condition is for the remainder of the test.

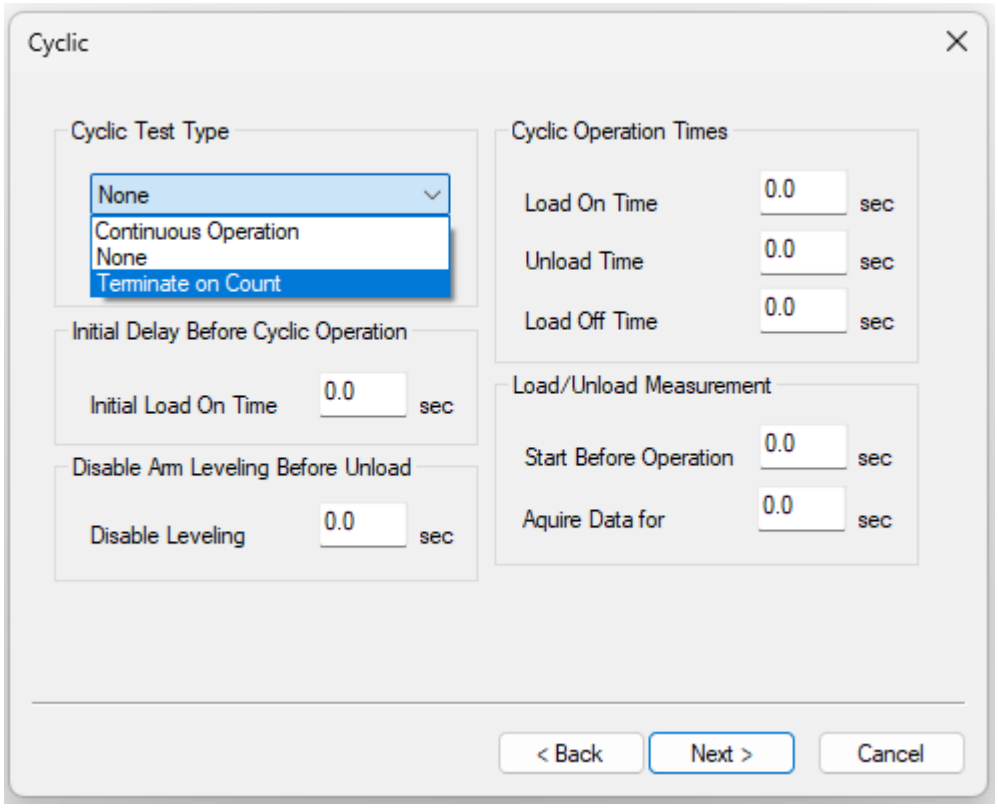


Click Next when finished.

The next screen shown allows cyclic loading and unloading of the test specimen. This is designed for Full Load control machines and Weight based machines that have specific hardware installed. Please consult with your Applied Test Systems sales consultant to verify what is needed for non-load control machines.



The first step to enabling this mode of operation is to select the Cyclic Test Type, which can be “Continuous Operation” or a defined “Terminate on Count”. If a fixed number of cycles is selected, then the “Termination Count” box will be displayed.



Fill in the termination count and then the rest of the parameters defined below.

NOTE: Parameters in RED are ignored by full load control machines. Since many laboratories have multiple machine types it is always recommended to create Test Specifications that will work with all machine and controller types in the laboratory.

Initial Load On Time: This sets the time from test start until the cyclic operations begin.

Disable Leveling: This parameter is used to halt auto leveling on the lever arm before the cyclic operation begins. On draw head machines the lever arms should remain static while the cyclic operation is performed.

Load On Time: Specifies the amount of load applied time per cycle.

Unload Time: This is the draw head or elevator up operate time on a weight-based machine.

Load Off Time: Specifies the amount of time the load is left off of the specimen during a cycle.

Start Before Operation: During Cyclic Loading operations the system will take higher speed readings of the load. These higher speed readings can be started before the load or unload operation to give the user a window of readings during the operation.

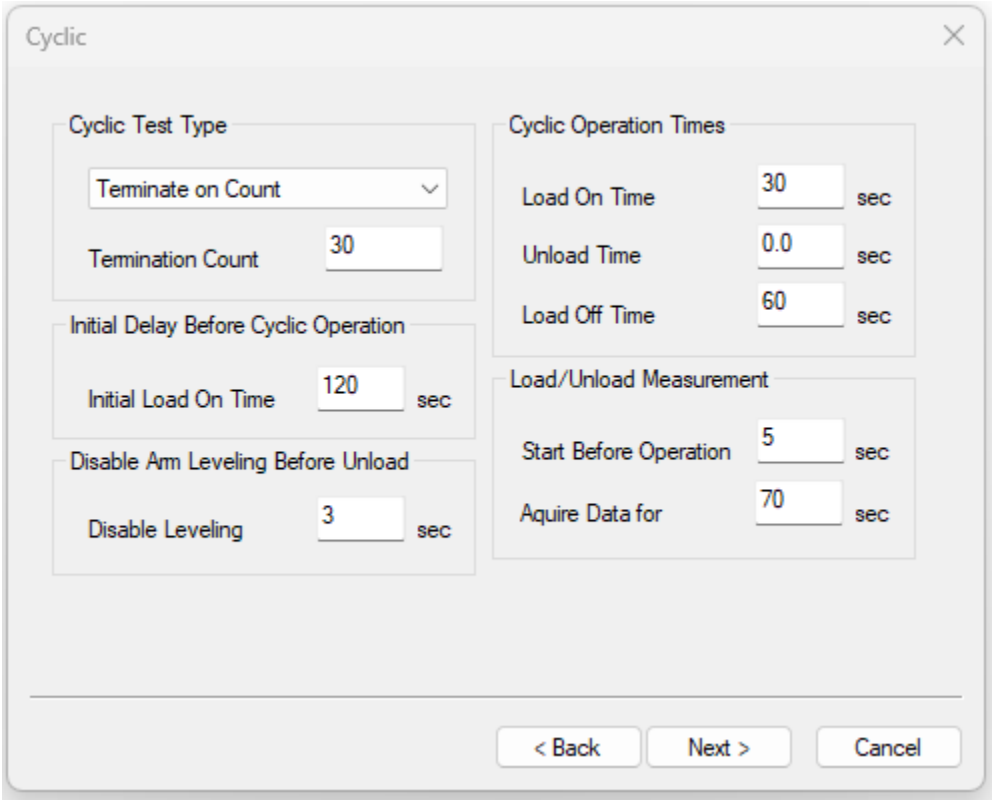
Acquire Data for: This sets how long to acquire data at the faster rate. See suggested times below:

Weight Based Machines >= “Start Before Operation” + “Unload Time” + 10 seconds.

Classic (GEN1) Full Load Control >= “Start Before Operation” + “Unload Time” + 10 seconds.

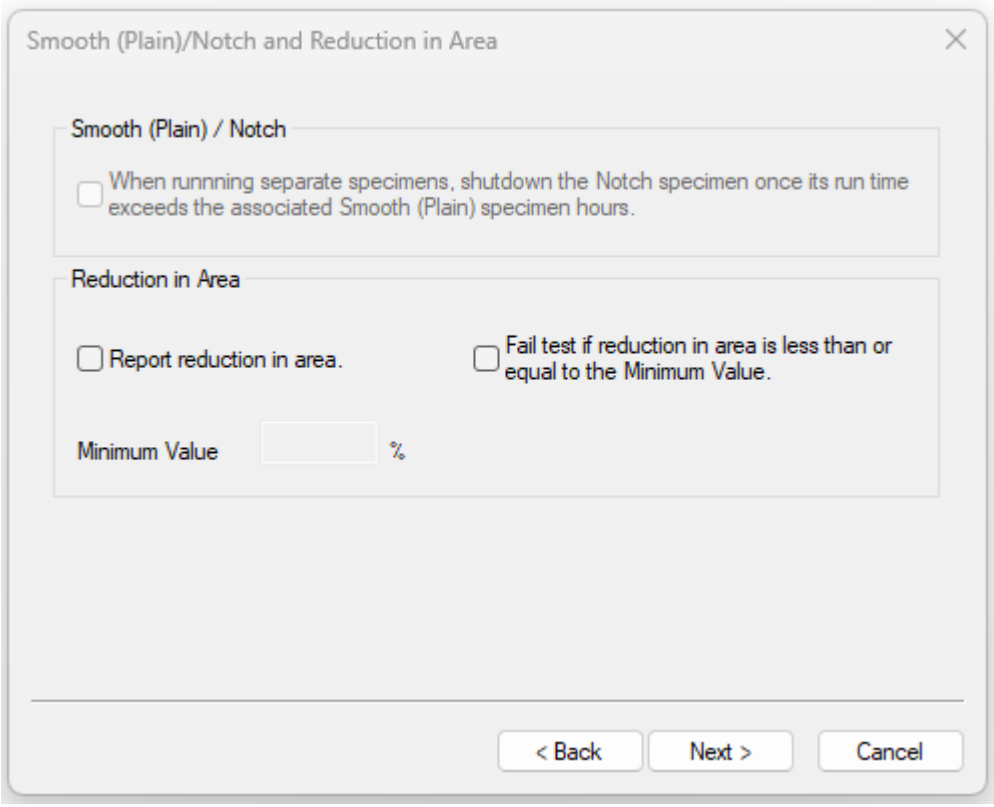
Modular (GEN2) >= “Start Before Operation” + “Unload Time” + 10 seconds.

SIGMA (GEN3) >= “Start Before Operation” + “Unload Time” + 5 seconds.



Once the values have been filled in, click Next to continue.

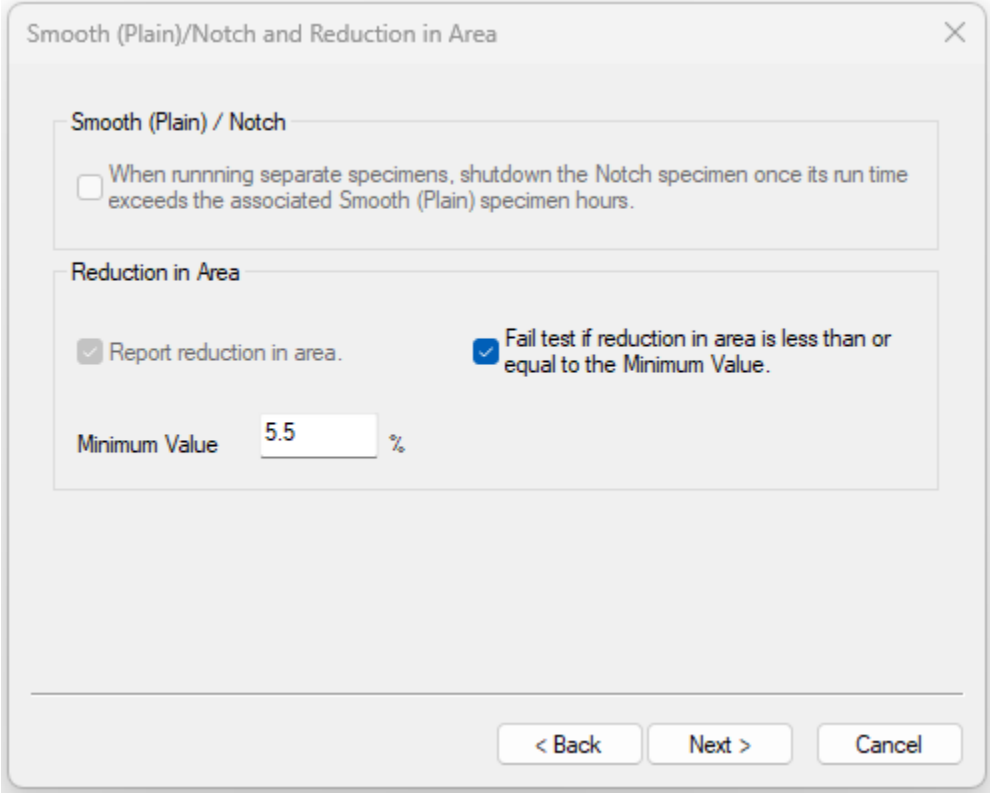
The next Property Page allows to determine how separate notch and plain / smooth specimen test are conducted along with the reporting of Reduction in Area.



The WinCCS system is designed to handle Notch and Smooth (Plain) specimen testing. Most of the specifications that require these two specimens to be tested require the Notch specimen to run longer than the Smooth (Plain) specimen. This switch sets up the system so that it will terminate the Notch specimen when its hours exceed the Smooth (Plain) specimen hours. This option is grayed out because the specimen type is a Combination, which has a Smooth (Plain) section and a Notched section in the same specimen.

See Appendix XXX – Notch Specimen Testing for further information

The reduction in area can be reported and marked as pass/fail for most specimens. We will check the “Fail test…” button, which will automatically request that the reduction in area is reported also. Then fill in the pass/fail limit value as shown below.

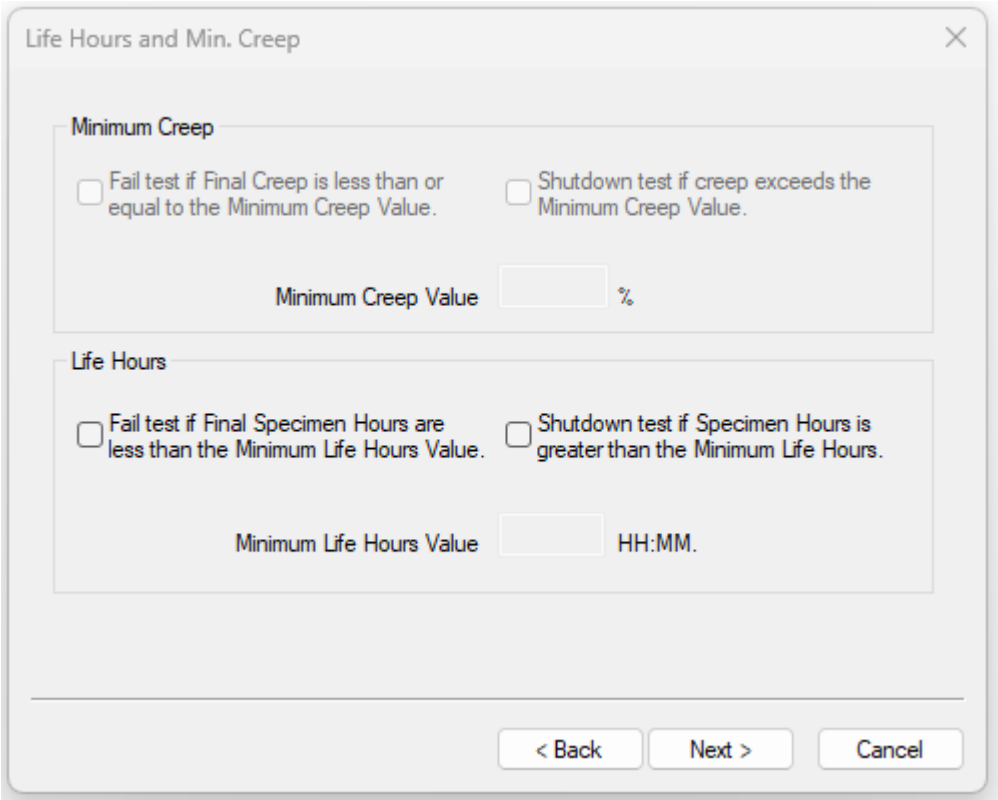


Once this is complete, press “Next” to continue.

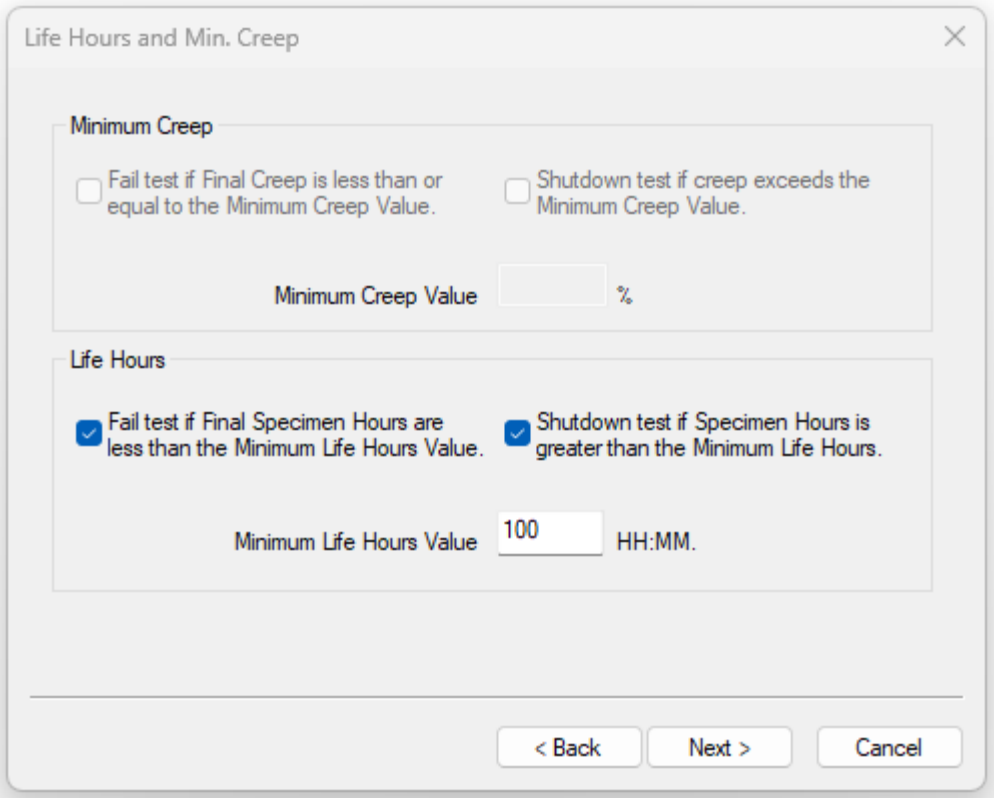
This will bring up the Life Hours and Min Creep Property Page. The “Minimum Creep” section is grayed out because this is not a creep test, so it does not apply.

The Life Hours applies to all specimens and the test can be setup to pass or fail based on the life hours or shut it down. In this case we will setup the test to pass or fail based on the life hours and to shut down the test when it reaches the life hours.

IMPORTANT: If a test is set to terminate based on life hours it cannot be changed once the test has been started. It is recommended that if the user suspects that someone will want to run the test longer once it has started then this option should not be used.

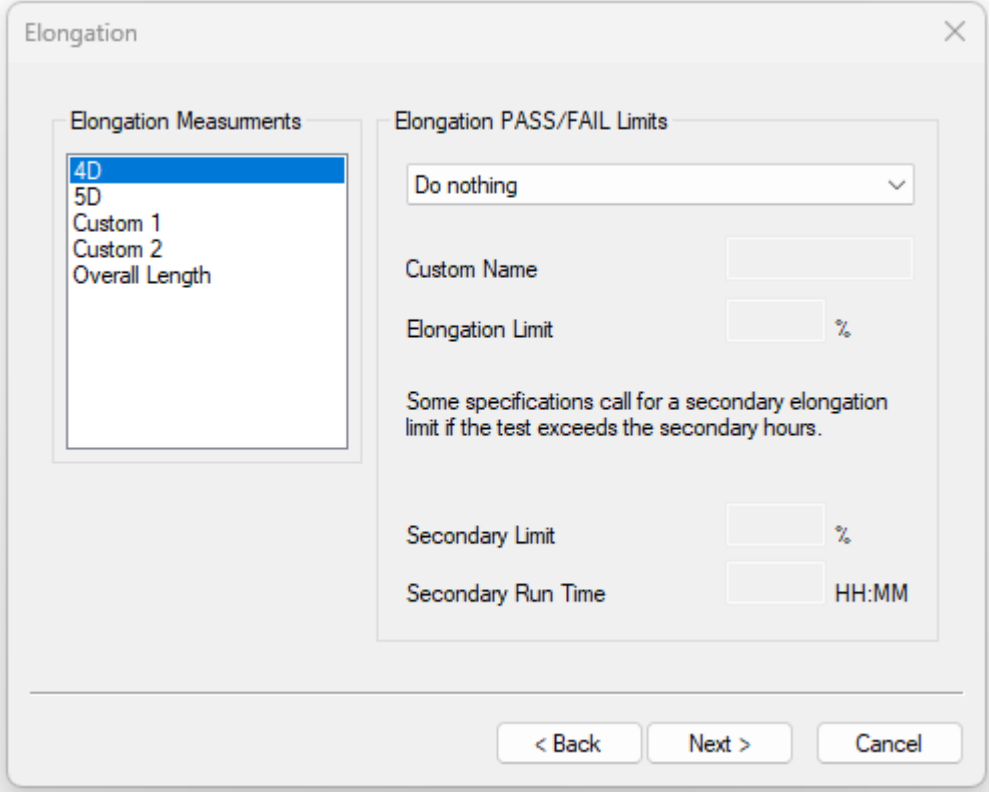


Once either check box is checked the Minimum Life hours Value will be enabled to allow the value to be entered. In this case we are setting the life hours to 100.



Once this is complete, press the “Next” button to continue.

The Property Page setups the reduction in area measurements. Depending on which options are selected the user may need to provide additional specimen measurements when creating the specimen using this Test Specification or provide measurements at the completion of the test.



There are five specimen elongation types that can be reported and used for pass / fail checking on the completed test. The five types are:

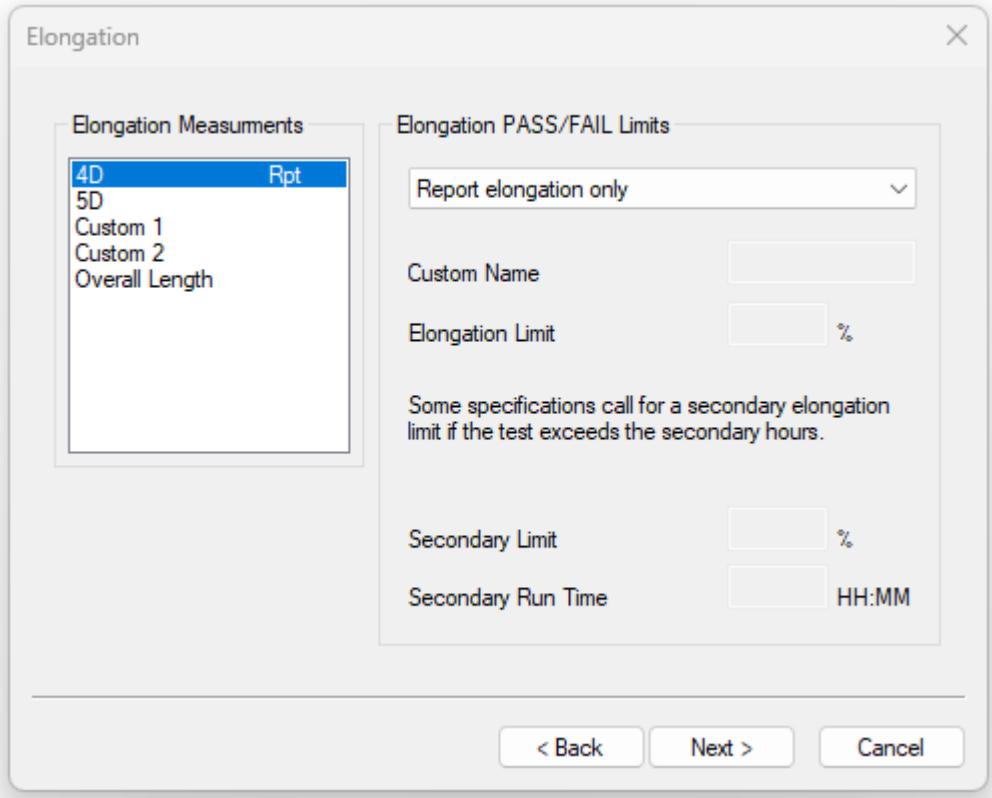
4D: This elongation is reported over the gage length of a specimen whose gage length is four times its diameter. See ASTM E8.

5D: This elongation is reported over the gage length of a specimen whose gage length is five times its diameter. See ASTM E8M.

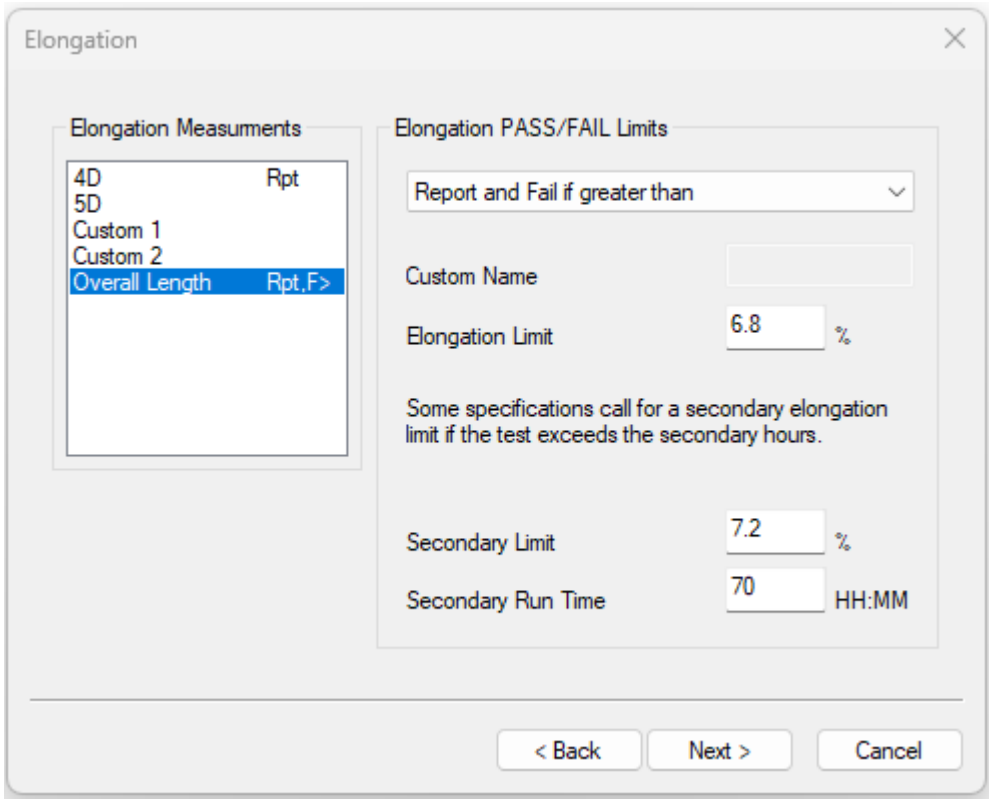
Custom 1 and 2: This elongation allows the user to have their own custom elongation reports.

Overall Length: This method still uses the specimens specified gage length to determine elongation, and it assumes that the only elongation occurs in the gage section. Typically, this is reported as a just in case because sometimes the gage marks may become unusable and so the overall length method must be used to determine elongation.

Below we have selected the “4D’ method and are reporting the elongation only. This will require the user to supply the 4D gage length when creating the specimen.

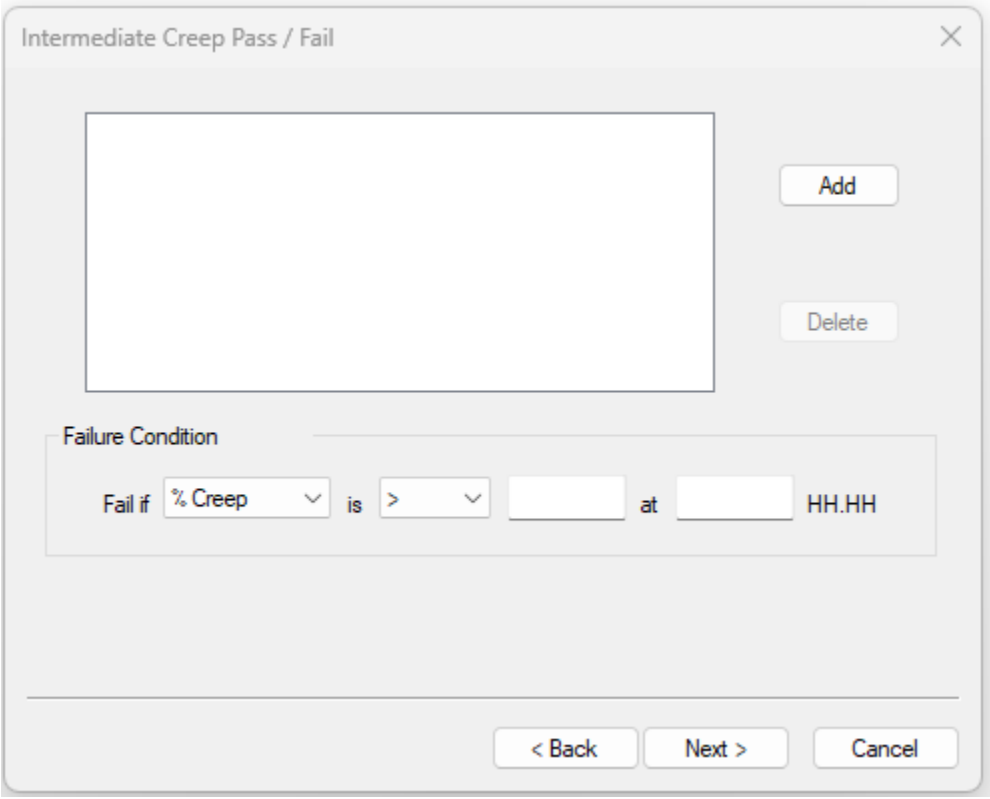


In this example, we are requesting that the elongation via the Overall Length method be reported and used as a pass / fail test including the secondary limits for elongation.

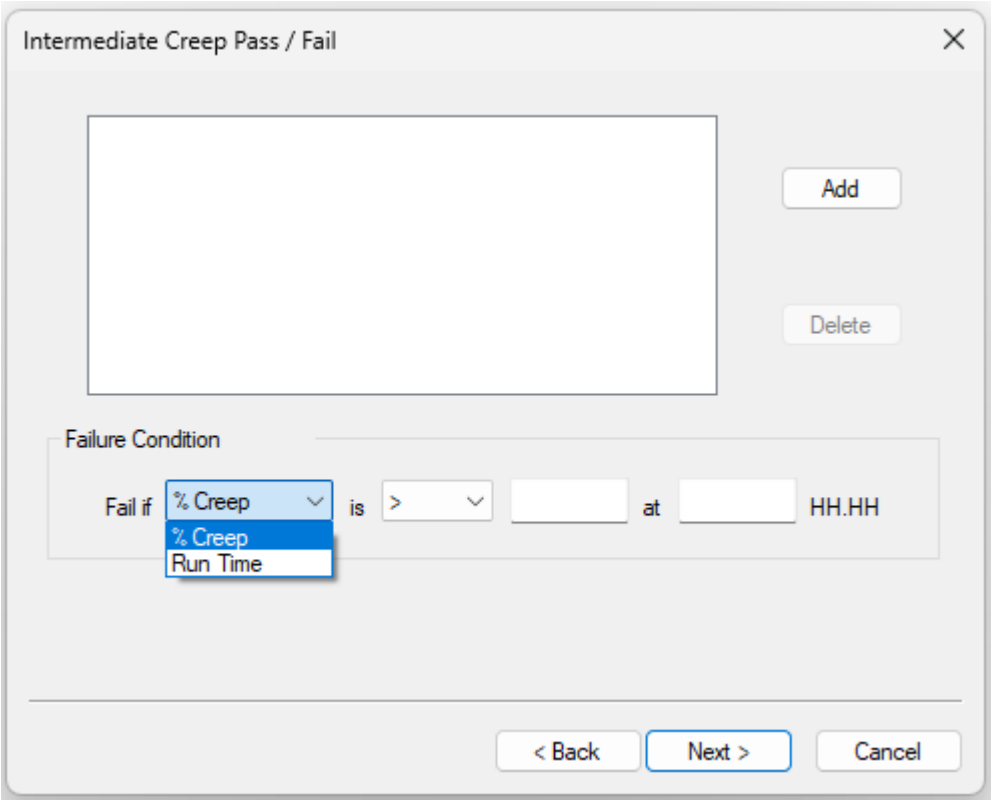


Once you have selected the various elongations that you want reported or pass / fail tested press the “Next” button to continue.

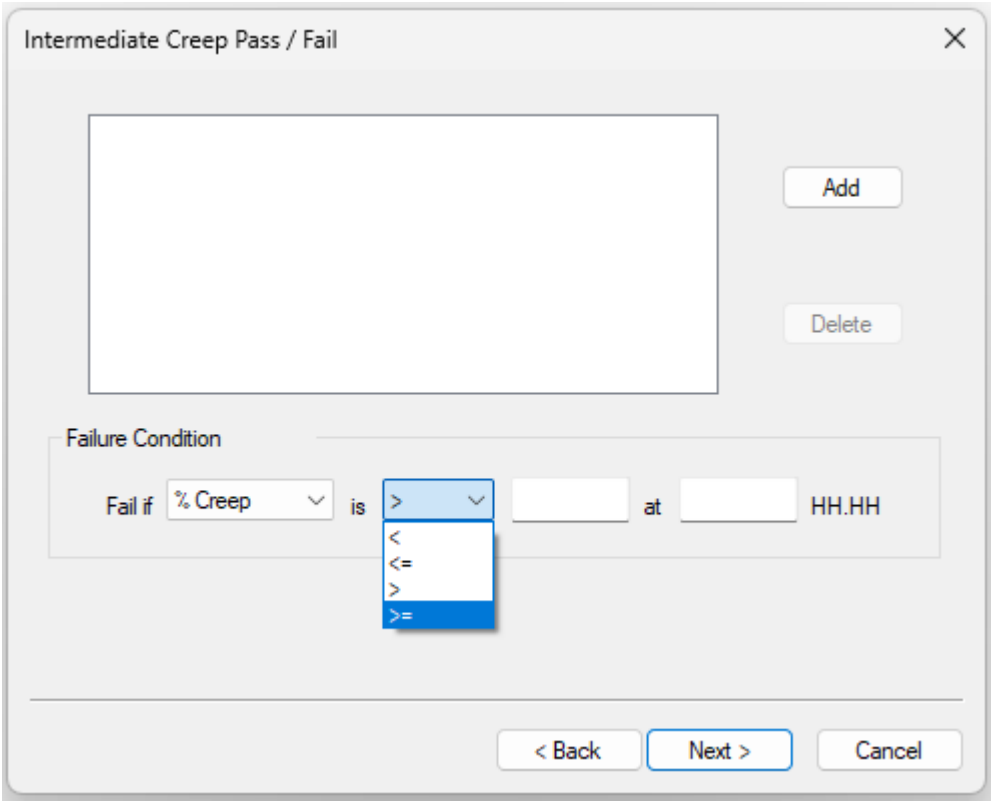
If the test type is a creep test, then the following Property Page would be displayed. This allows the user to set pass / fail criteria on creep vs time for the test. The user can specify up to XX entries for a Condition. This Property Page would not be displayed on this Condition because it is a stress rupture test.



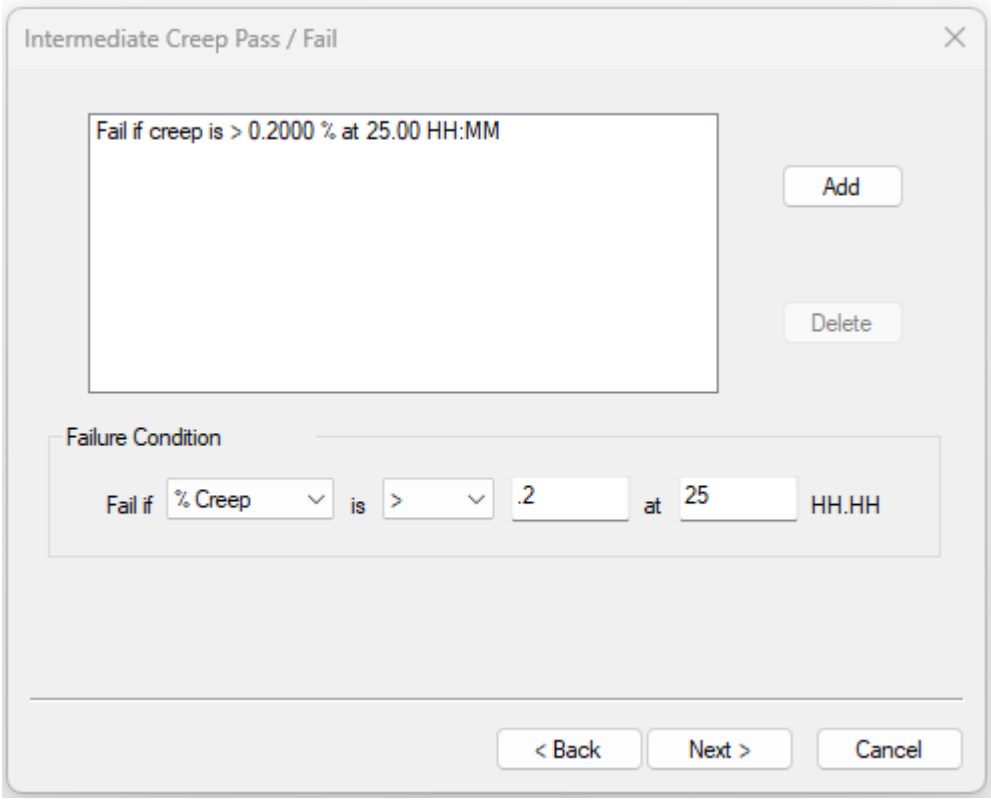
First select the failure condition based on % Creep of Run Time hours.



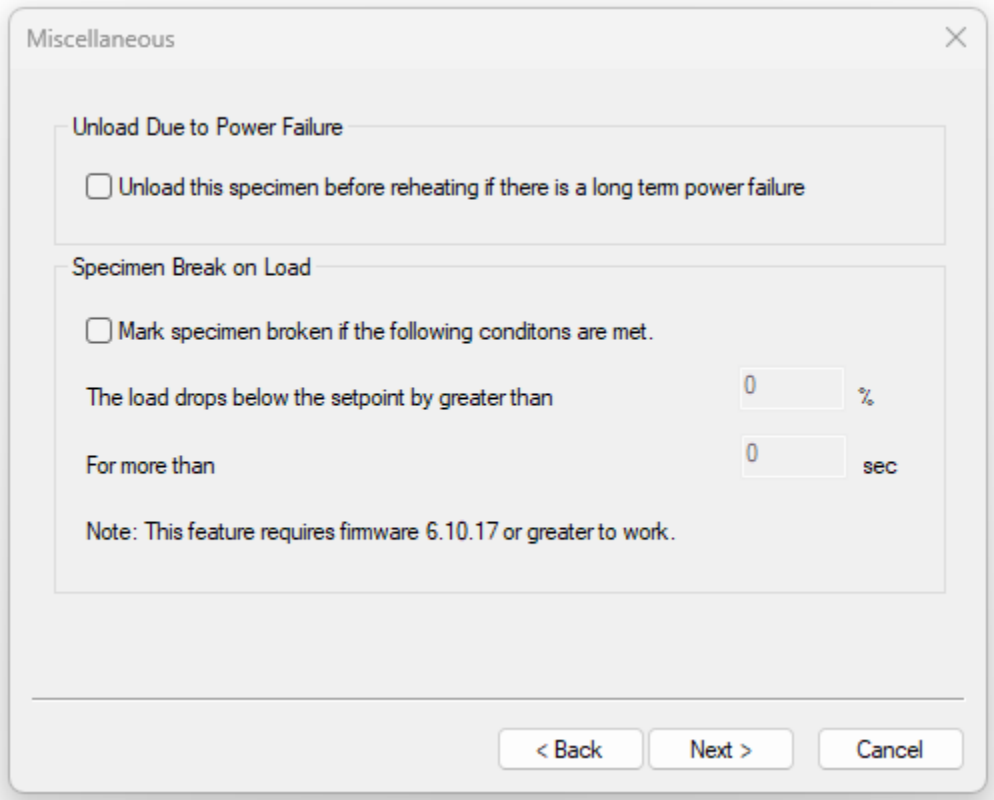
Then select test testing evaluation.



Finally, fill in the limits of creep and time, when done press the Add button to add it to the list of pass / fail criteria. The same procedure is used to add other test criteria. If you want to delete one, simply click on the criteria to be deleted and press the Delete button.



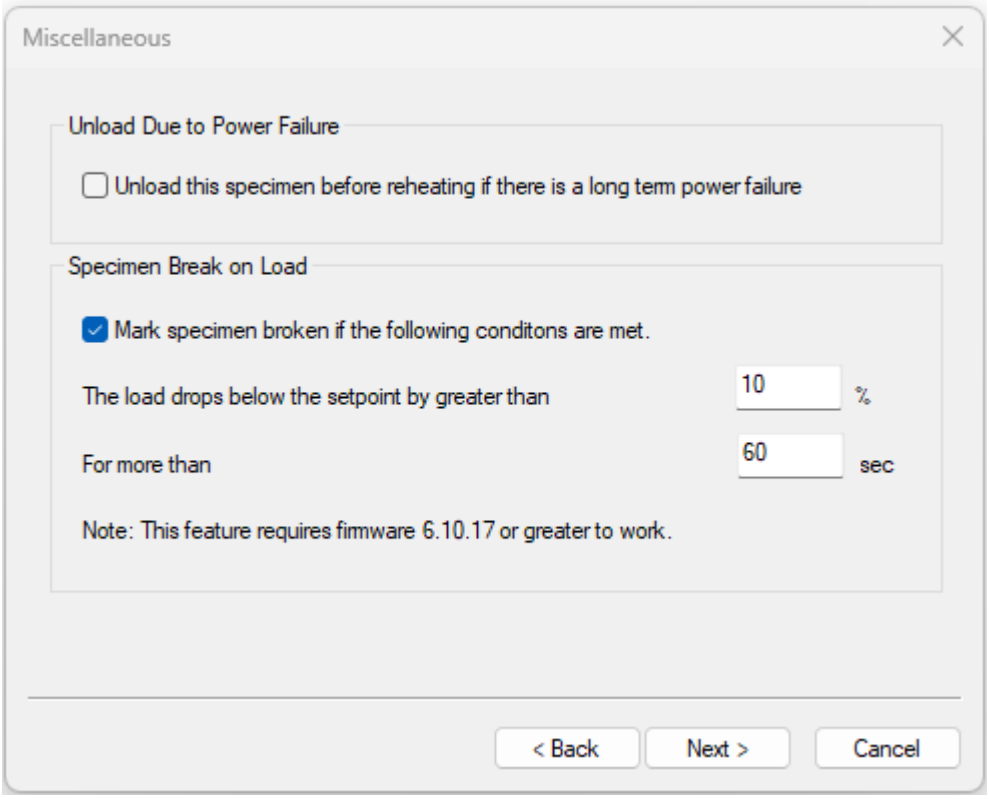
The Miscellaneous tab handles how specimen loading is handled during power failures and a special break detection based on load feature.



The first condition is whether the specimen should be unloaded during a long-term power failure. A power failure is long term when the specimen temperature drops below the shutdown limits for that test. When the “Unload this specimen…” box is checked the specimen will be unloaded before the specimen is reheated. This switch is ignored for stress rupture tests because they are always unloaded during reheat after a power failure.

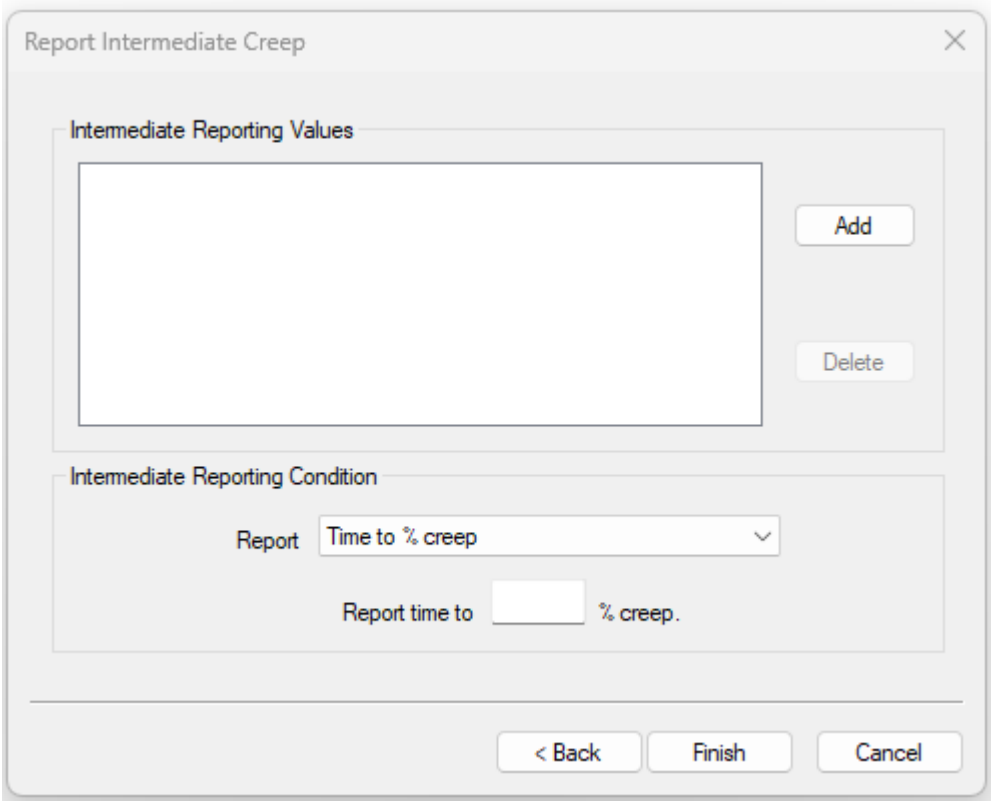
See Appendix XXXXX “Power Failures”

The Specimen Break on Load feature is for “Full Load Control” machines only. This special feature is used for specimens that have very high elongations, where the drawhead could bottom out before the specimen actually breaks. Another scenario is the specimen elongates faster than the drawhead can move. In either case the break can be detected by a low load on the specimen using this feature.

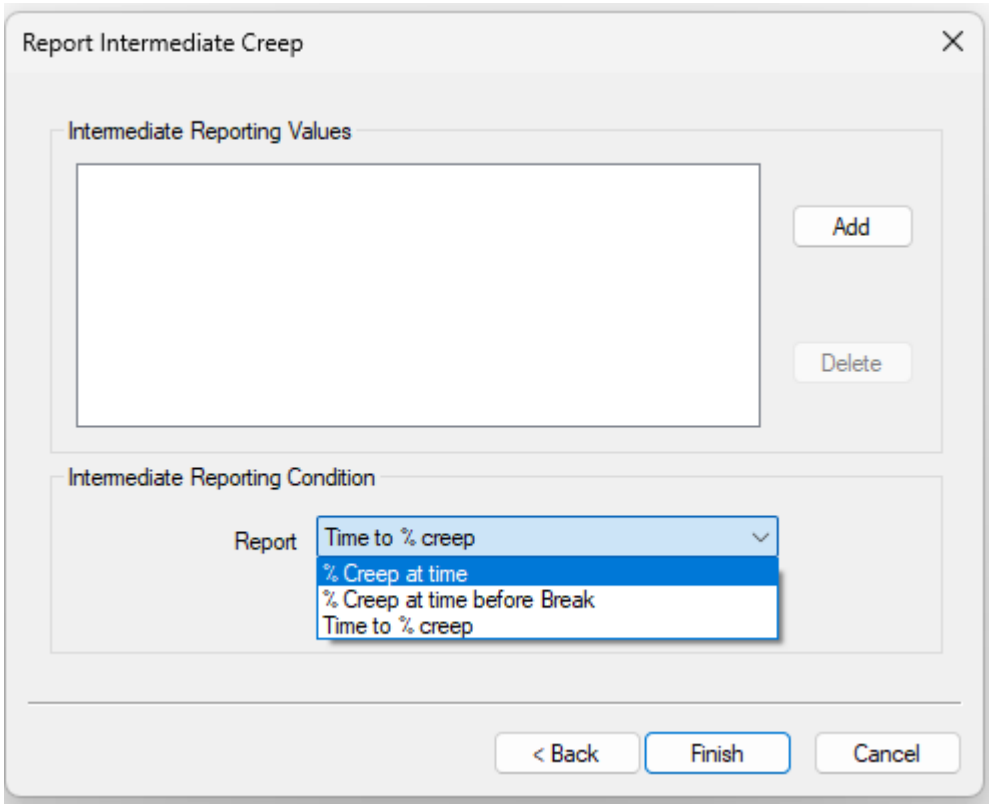


Check the “Mark specimen broken…” box and fill in the load and time values. Click the Next button when ready to proceed.

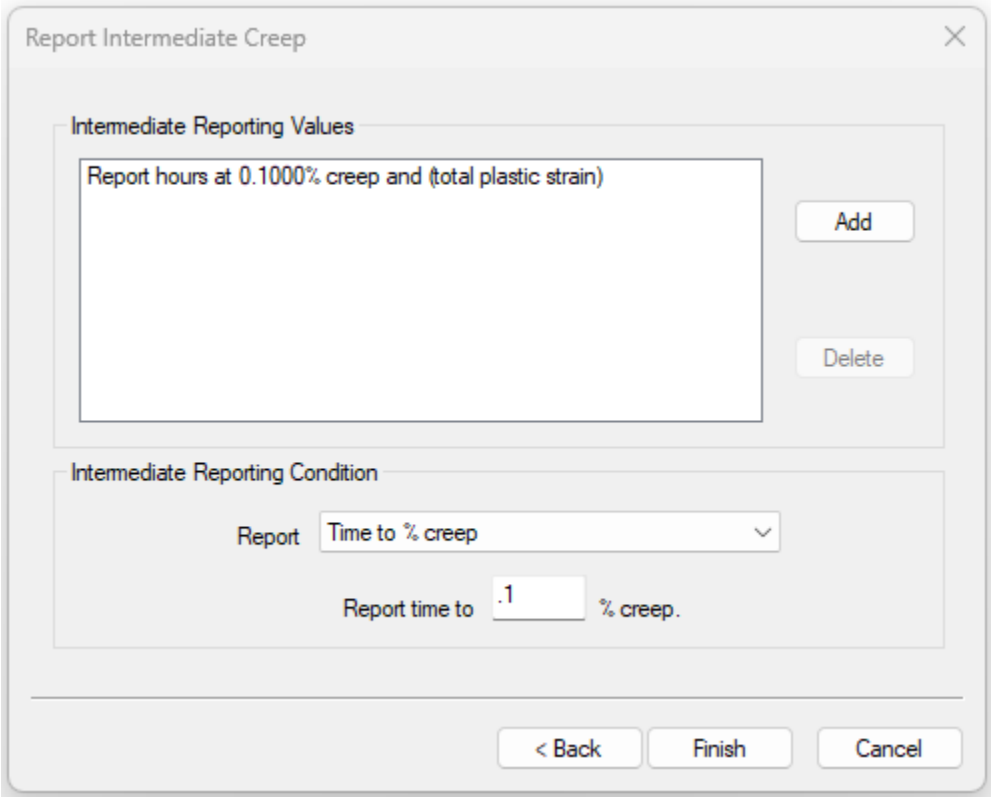
The next Property Page is for creep tests only and is used to report creep at a time or time at a creep. You can have up to twenty-five different reporting values.



First select the item to report by using the drop-down.



Once you have selected the item to report the time or creep to report at value will be displayed. Fill in the value and click the “Add” button to add the reporting amount. You can click on any item and press the “Delete” button to remove it.

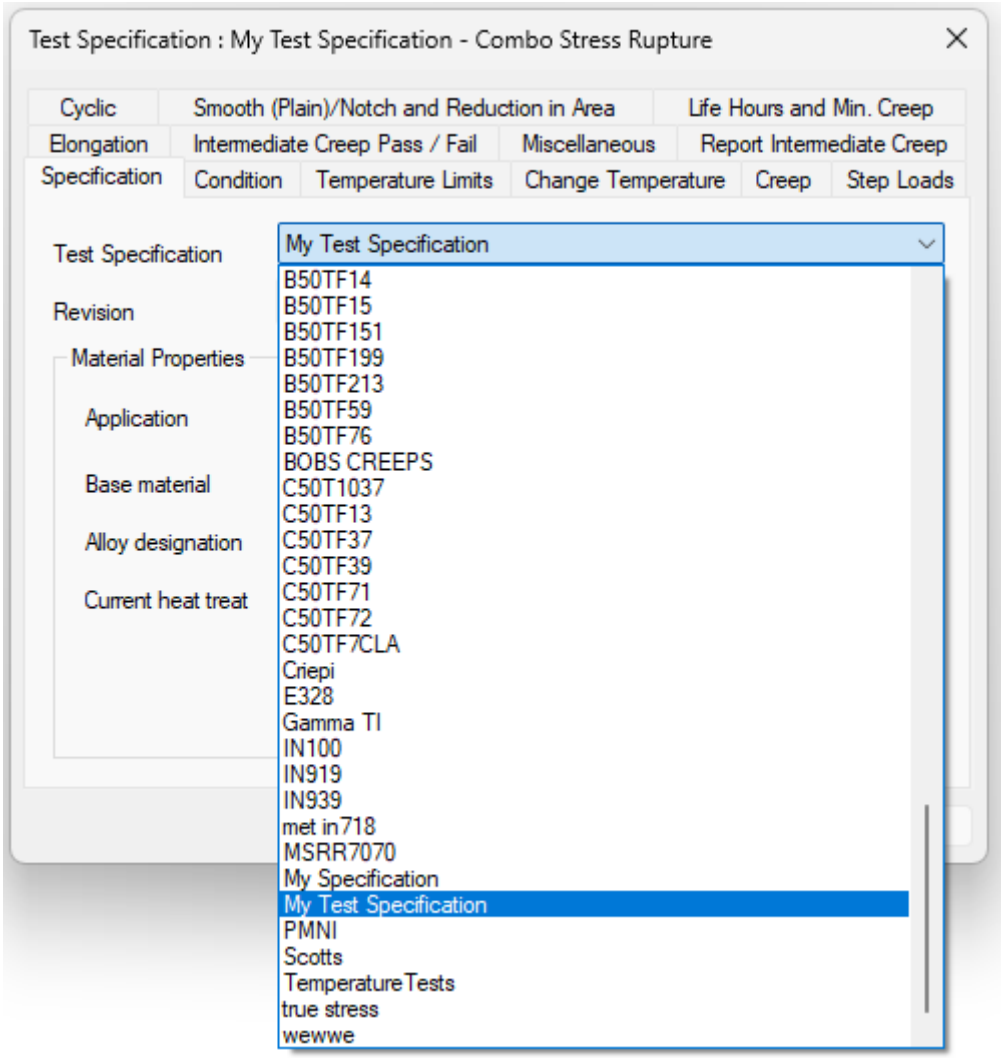


This is the last Property Page for the Test Specifications, click the “Finish” button when you are done adding items to report.

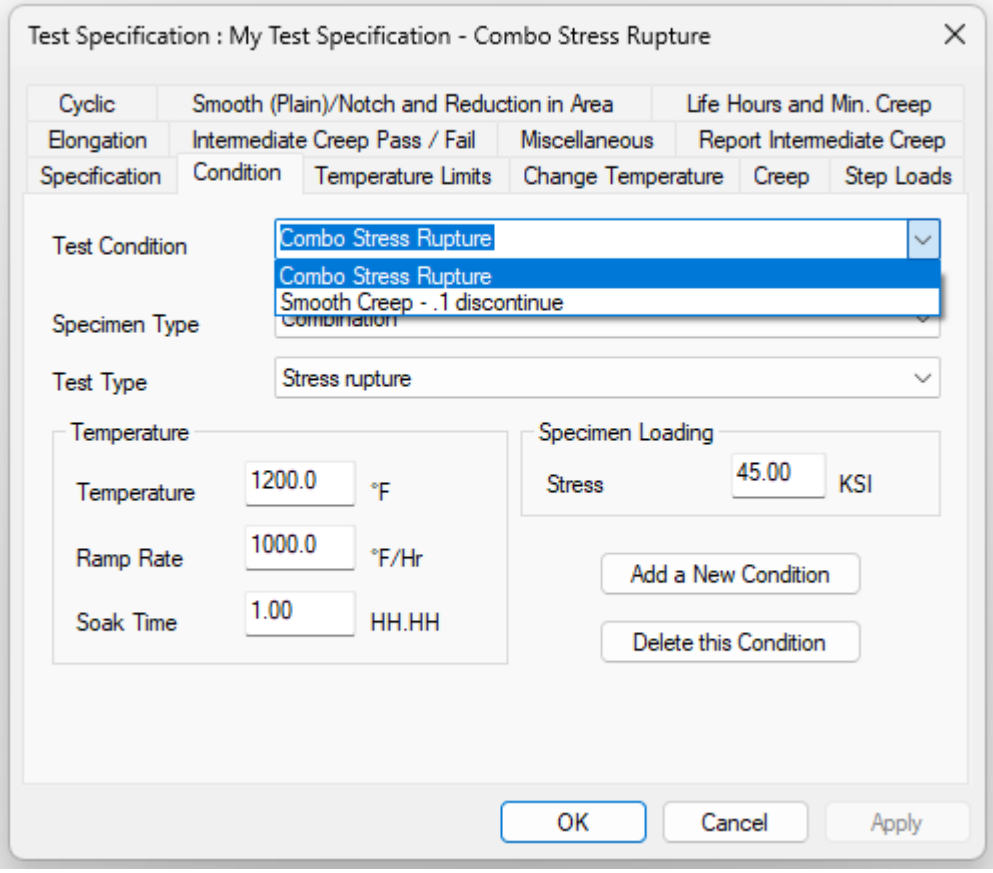
Edit Test Specifications

Editing a Test Specification is similar to creating a Test Specification except that the creation process walks the user through step-by-step. When editing a Test Specification, the entire Test Specification is displayed as tabs for each Property Page. This allows the user to select the Property Page that they wish to make changes on.

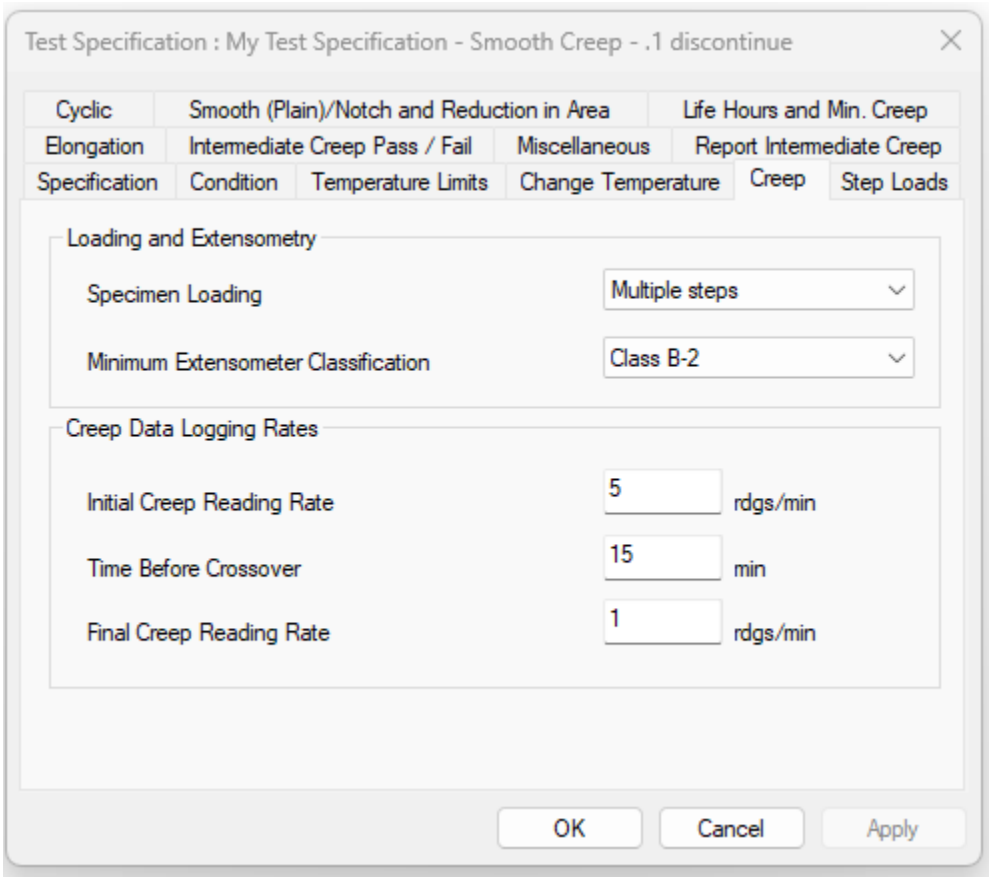
Select Specifications → Edit from the Main Menu to enter the Test Specifications editor and the Property Sheet will be displayed below.



First select the Test Specification name that you want to edit from the drop-down list as shown.

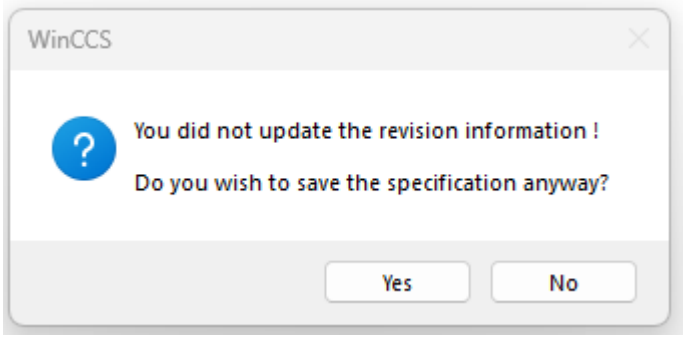


Then click the “Condition” tab and select the condition that you want to edit, or you could click the “Add a New Condition” button to enter a new condition in your Test Specification. Once you have selected the Test Specification and Condition to edit the name and condition will be displayed on the top bar of the Property Sheet. Always remember to go to the “Condition” tab and select the condition that you want to edit first before changing values on any other tabs.



You can then click on any of the tabs you want to edit the values within. Once you have made all of your changes you can click the “OK” button to save them.

IMPORTANT: If you did not change the “Revision” on the “Specification” tab, then WinCCS will display the message box shown below. This is a reminder to update the Revision of the Test Specification whenever you edit it. Your facility may not track specification changes, but it is a good idea to, for audit purposes. If you click “No” the changes that were made will not be saved.



Power Failure Handling

WinCCS Power Failure Procedures

Power failure in a Creep and / or Stress Rupture facility are never a welcome event. Some facilities have chronic power issues and have installed large generator backup systems and others do not. For this reason, we will separate this discussion into two main groups. Facilities with backup power and those without.

Facilities Without Backup Power

Facilities without backup power need special attention when power failures occur because of potential test machine damage and / or specimen damage. Because Creep and / or Stress Rupture testing is typically performed at high temperatures, the specimen and load train elongate significantly during the test due to thermal expansion and these machines may need operator intervention for power failures that last longer than a few minutes due to the shrinkage of the load train. Without power, the machines are not able to respond by unloading the specimen or releasing the load from the specimen while the specimen cools. For this reason, facilities without backup power that are not staffed 24/7 require some sort of power failure notification to call in operators to unload the machines. Additionally, it is not recommended that facilities use the load control type machines because there is no manual uploading provision, unless a separate per machine UPS option is installed on the machines.

So in these facilities short-term power failures (less than 10 minutes) will be handled by the system, but any longer power failures will require the testing machine to be manually unloaded, unless local UPS systems are supplied. Since these machines are not automated the machine controller will not know that the test has been unloaded. To facilitate this situation the operators should turn off the machine power and then manually upload the weights from the system.

When power is restored, the operators can go to each machine that was running a test and perform the test restart routine, which is part of the controller’s firmware. When the operator is ready to restart the test, they would connect a handheld terminal to the machine if it does not have displays and then reconnect the power to the machine. After the machine controller perform routine startup checks it will display the prompt:

“Test will restart”

“automatically in”

“xx.x seconds.”

“ABORT”

The xx.x seconds will be counting down to zero. The operator can allow the countdown to proceed, and the machine will continue its restart routine, or they can press the “ABORT” button to change the test to Post Test State (POSTT_STATE) See Frame Controller States. The Post Test State will allow the operator to decide if they want to restart the test later or resample the specimen. If they do not ABORT the test, then the display will question the operator as follows:

“Was the specimen”

“manually unloaded”

“YES NO”

The operator haw twenty seconds to answer the question YES or NO, otherwise the system will assume No, that the weights were not unloaded.

If the test was unloaded “YES”, then the machine will either reload immediately or wait until after the specimen is re soaked depending on the settings in the Test Specification and then enter the (STARTUP_STATE) See Frame Controller States.

If the test was not unloaded “NO”, and the Test Specification requires that the test be unloaded prior to heat up then the test will be unloaded automatically by the system by entering the (RESTART_UNLOAD_STATE) See Frame Controller States.

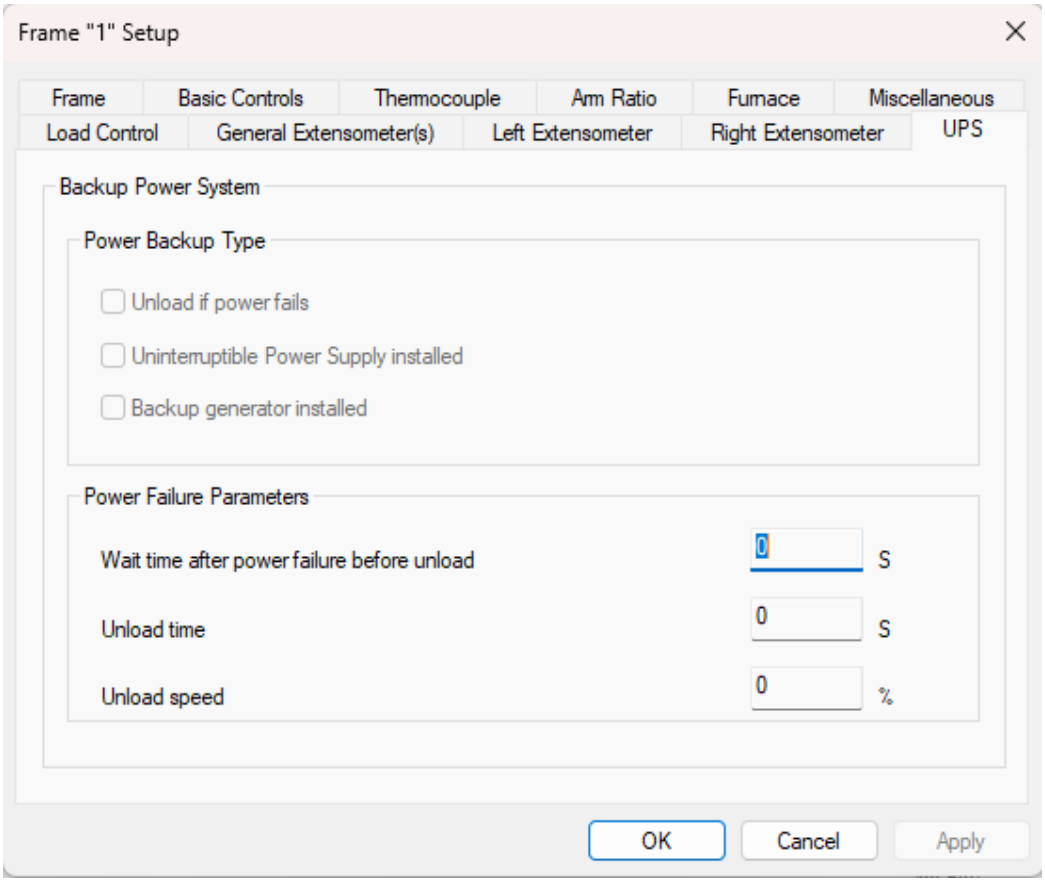
IMPORTANT: The above procedure is designed to automatically restart the test and continue testing if there is no operator involvement with the machine or display during the restart sequence.

IMPORTANT: If the facility has Applied Test Systems SIGMA controller equipped machines using Full Load Control, with the unload UPS option, then the machine will be automatically unloaded if the power failure duration lasts longer than XX (WE NEED THIS TIME FROM ENGINEERING!!!!!) minutes. Once power is restored, the machine will restart the test automatically.

Facilities With Backup Power

Facilities that are equipped with backup generators should typically require no operator intervention. The tests will automatically recover perform any unload / reload and reheating as per the test specification instructions.

UPS Setup (We need to figure out the settings for this tab on WinCCS then we can add a section on the setup)



Furnace Parameters

The WinCCS furnace control algorithm is a controlled ramp function that ramps the furnace temperature from the current temperature to the target set point by creating a ramped set point that is fed to the control algorithm. The algorithm uses only two simple gain parameters.

Proportional – The proportional term is the current error multiplied times the proportional gain specified by the user. Typical values are from 0.1 to 1.8.

Integral – The integral term is the summation of the current error multiplied times the integral gain specified by the user. In practice the integral gain value is typically 10% of less of the proportional gain.

Derivative – The Derivative term is no longer used, but it has been left in the software for compatibility with older frame controller software. Set this parameter to zero.

Band – The band is the proportional band of the routine. When the control input exceeds the set point by more than band degrees the output is set to zero and the integrator is set to zero. If the control input is below the set point by more than band, then the output is set to 100% power and the integrator is set to zero. Typical band values are 75° to 125° F or 23.9° to 51.7° C.

Note: If the furnace is out of the band for more than fifteen minutes then the Furnace will shutdown with the Out of Band Time Exceeded alarm. This is an important safety feature for shorted thermocouples, or thermocouples that have fallen out of the furnace or incorrect thermocouple types specified.

Integral Enabled – This sets the band from the target set point that the integrator is allowed to integrate. This prevents the integral wind-up problem. Typical values are 25° to 50° F (-3.9° to 10° C).

Temperature Gain – Changes the parameter adjustment due to temperature. Always leave this at 1.0 unless instructed to change this value.

Maximum Power – This limits the maximum output that may be applied to a furnace zone. Typically, this is set to 100%.

Ramp Cutback Factor – Is an automatic ramp decrease factor to prevent furnace overshoot. Typical values are from 1.0 to 3.5 and the nominal value is 2.5. Typically start this at 2.5 and adjust it down to decrease the ramp cut back as the target set point is reached.

Main Menu Options Part 1 of 2.

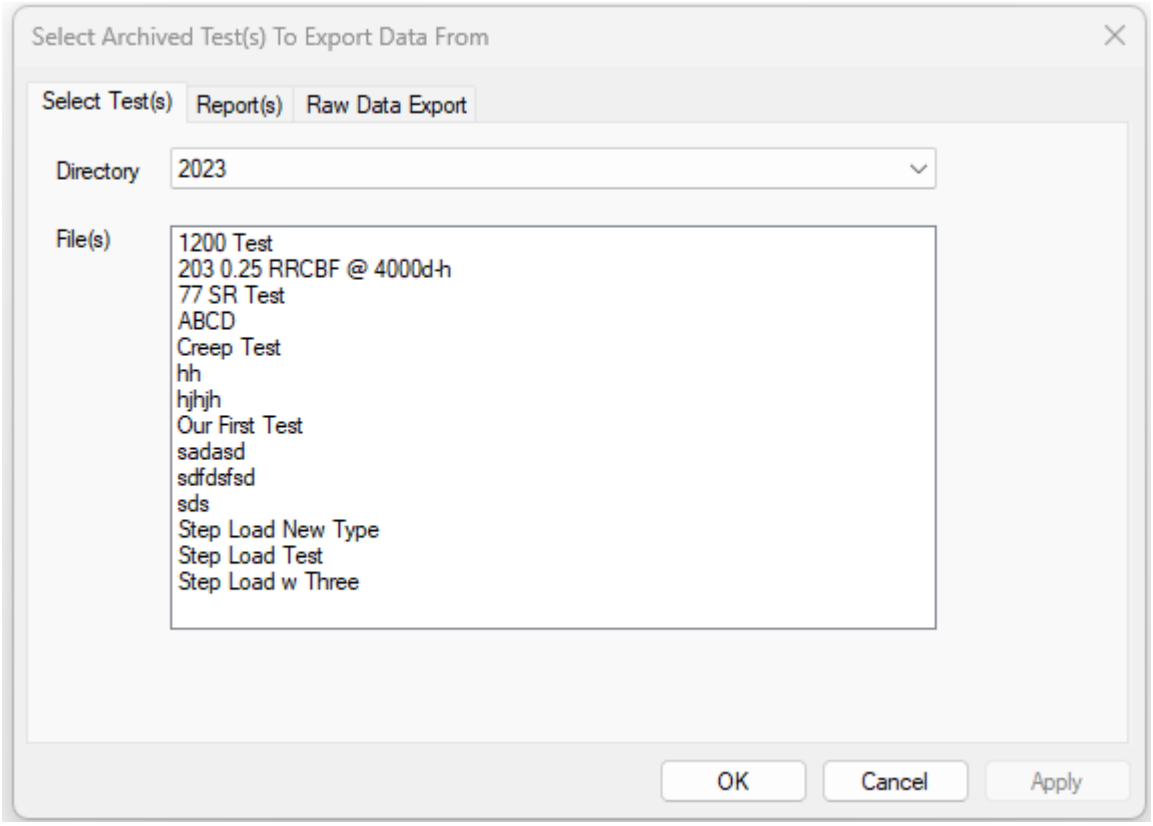
File → Export → Previous Test(s)

The Export Previous Test(s) menu item is used to export tests that have been previously completed. The user can select whether to export the Short Form Text Report, Long Form Text Report or Raw Data in a Comma Separated File.

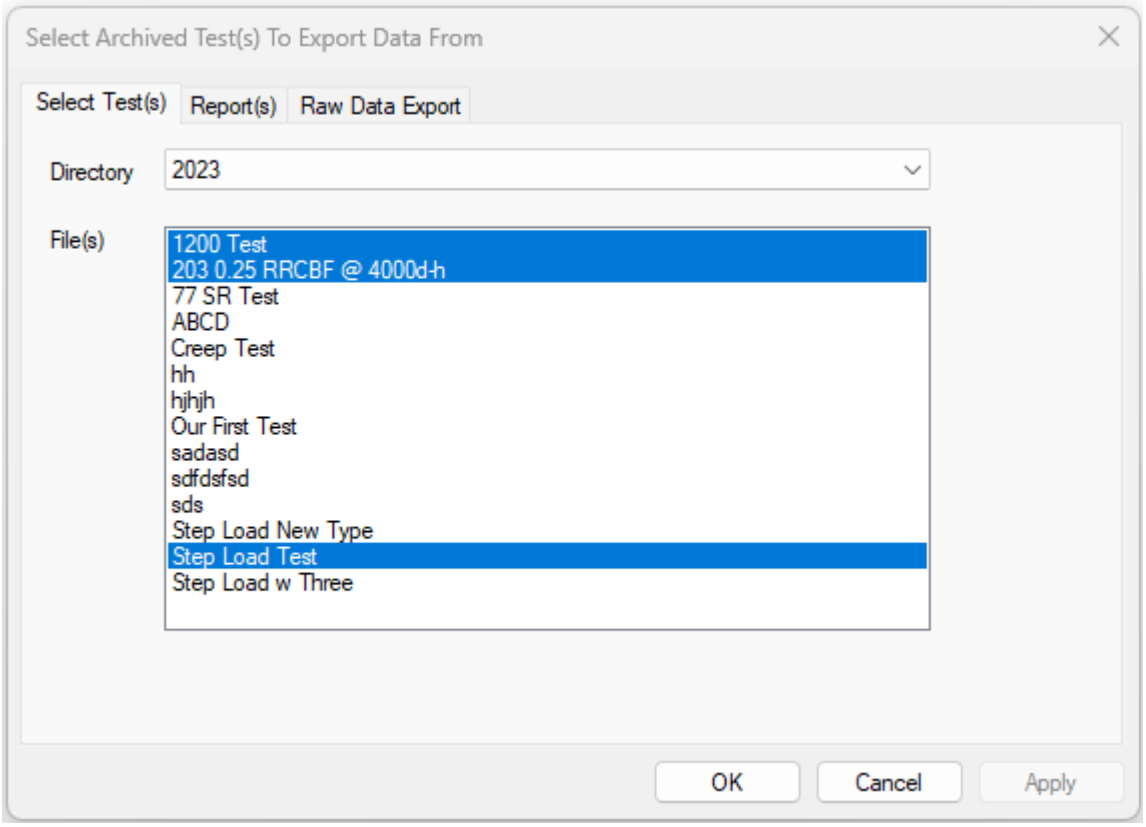
IMPORTANT: The Short Form Text Report and Long Form Text Report are flat file exports of the reports using the formatting parameters specified in the System → General Setup “Text Report Archive” tab. The Report Type and Report Directory are not used when exporting the reports using this menu option, instead the property sheet (shown below) will select the reports to export and the folder that they are written to.

WARNING: The Short Form and Long Form Text Reports are legacy options which only export brief versions of these reports. These have been superseded by the newer HTML reports which contain all of the test information.

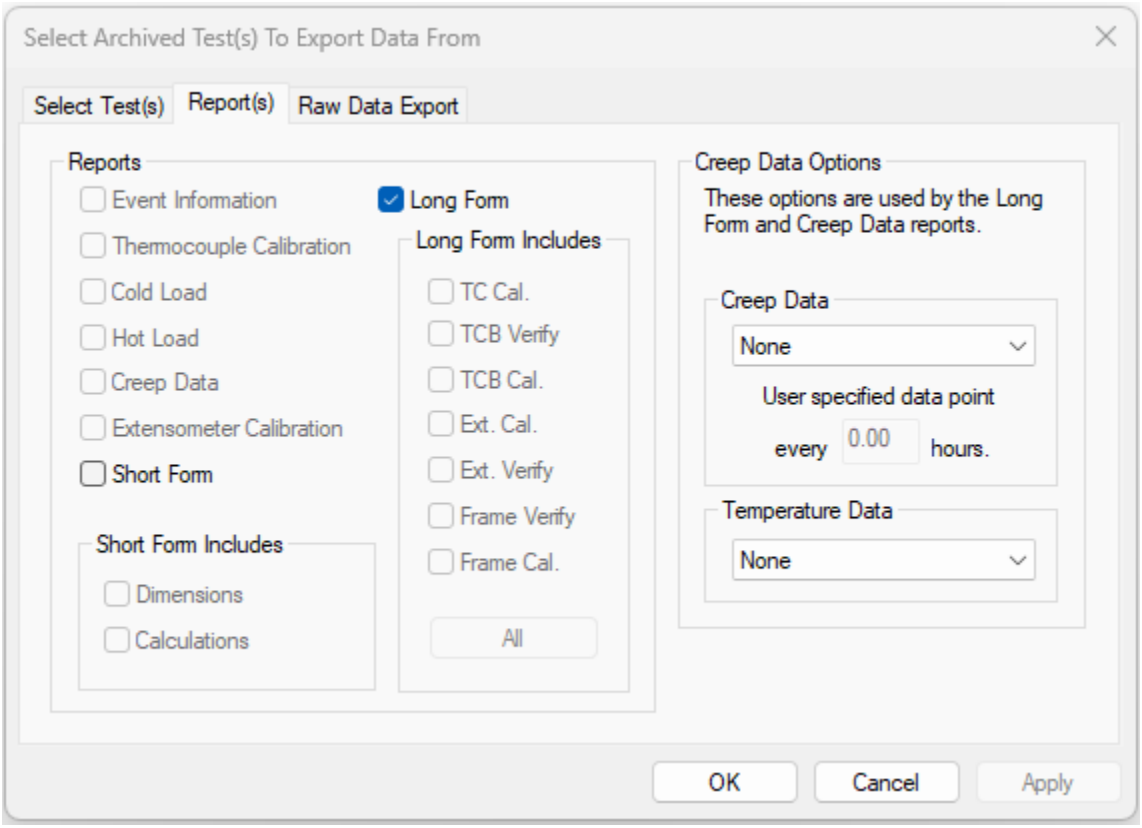
When the Export Previous Test(s) menu is selected it will display the following property sheet.



You can then select the Year from the Directory pull down and can select tests to export. To select a single file left click on it. If you want to select multiple files, hold the “Control” key while left clicking on the test names. In the example shown below three tests have been selected for export.

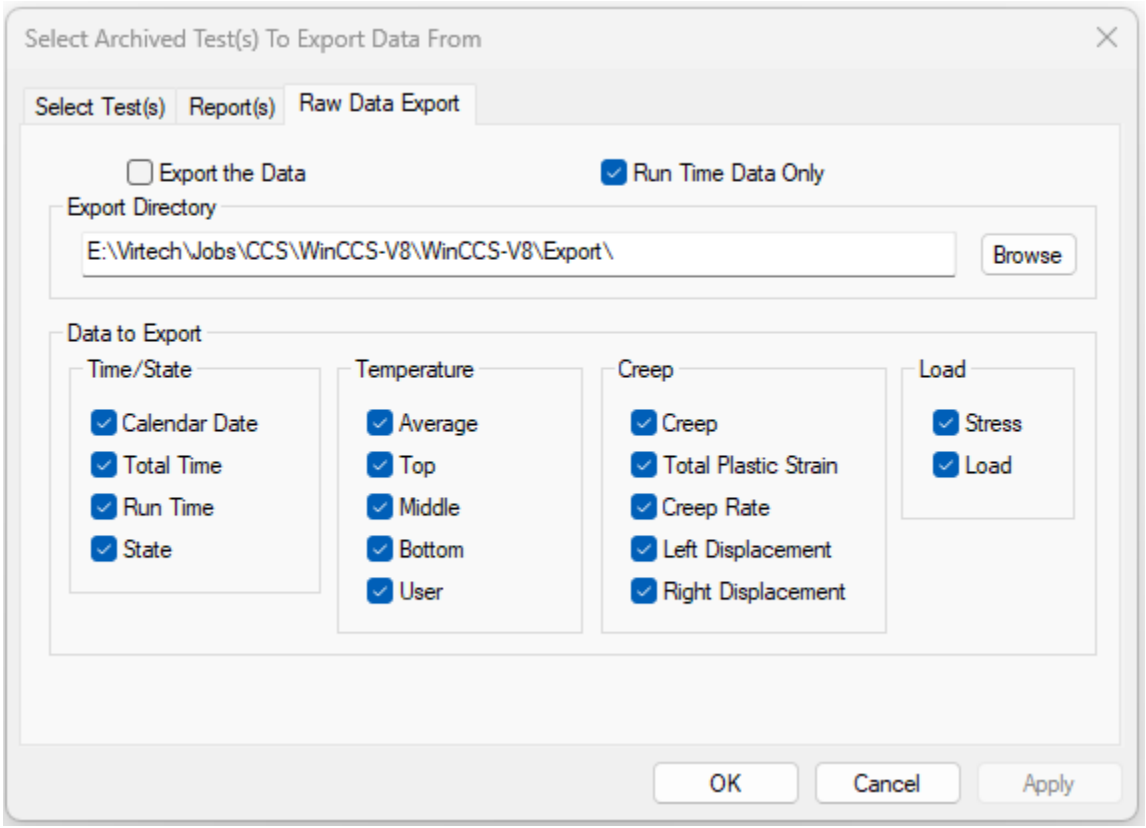


Once the test or tests to export have been selected, click the “Report(s)” Property Page tab to select the reports to export in flat file format.



There are only two choices with no options, the Short Form or Long Form. In this example the Long Form was selected. As previously mentioned, these reports are legacy software. Select which reports to export and then proceed to the Raw Data Export Property Page tab as shown below.

IMPORTANT: The Test Reports created by this operation will always be written to the WinCCS Export folder in the PC’s C:drive.



The Raw Data Export Property Page allows the user to export the raw data from the test file into a Comma Separated Variable or CSV flat file. This file type is easily imported into Microsoft Excel or other database programs.

To export the data, the user must check the “Export the Data” box. The “Run Time Data Only” check box controls whether the system will export data prior to the specimen being loaded. It is helpful sometimes to uncheck the box to see the temperature data during specimen heat up.

The export directory for the CSV data may be selected by clicking the browse button and selecting the folder to export the data to.

The check boxes under the data to export control which data items will be exported by the system.

When all selections have been made, click OK and the data export will take place.

By default, Text Reports will be written to the Export folder and the raw CSV data will be written to the folder specified.

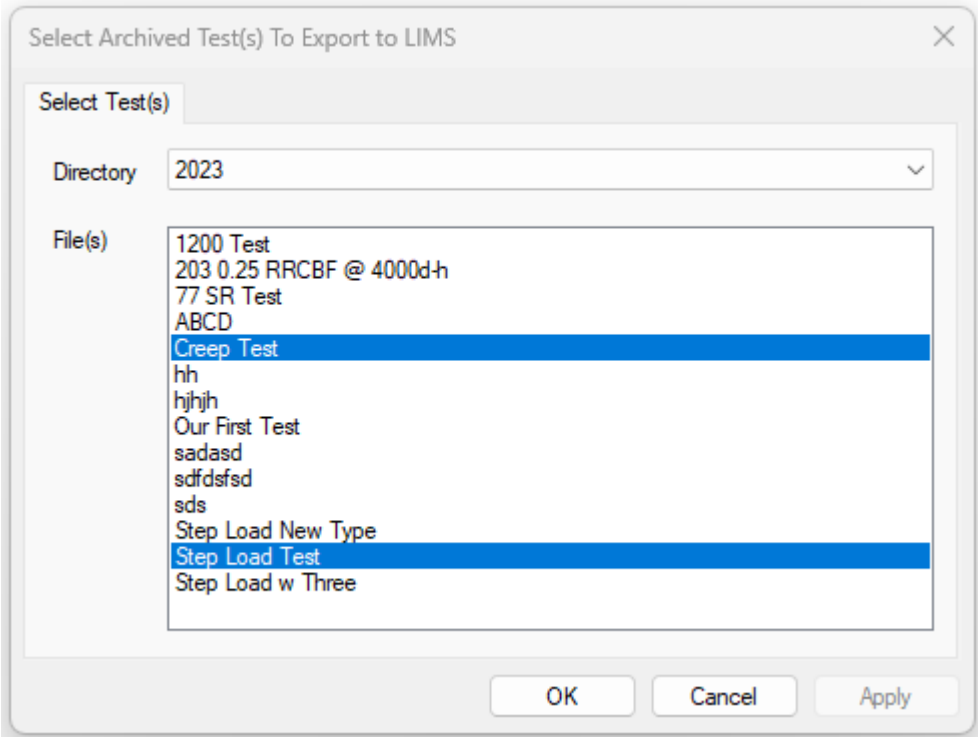
File → Export → Running Test(s)

The Export Running Test(s) menu item is the same procedure as the File → Export → Previous tests menu item, except that the user must select from a list of running tests instead of completed ones.

File → Export → Previous Test(s) to LIMS

The Export Previous Test(s) to LIMS (Laboratory Information Management System) menu allows the user to start a file export to the LIMS folder of the standard LIMS export package for a test. This is typically used for testing the LIMS export function because the system will automatically export test data for tests once they have been post tested.

When this menu item is selected the following dialog box will open allowing the user to select the Test or Test(s) to export to the LIMS system. Select one file by left clicking or multiple by holding the Control Key while left clicking on the files as shown below.



Once the files have been selected click OK and the files will be queued for export.

NOTE: The LIMS export is a background function and therefore will be occurring while the program continues to execute. Depending on the speed of the computer and the size of the test file, there could take a few minutes to export a very large test file.

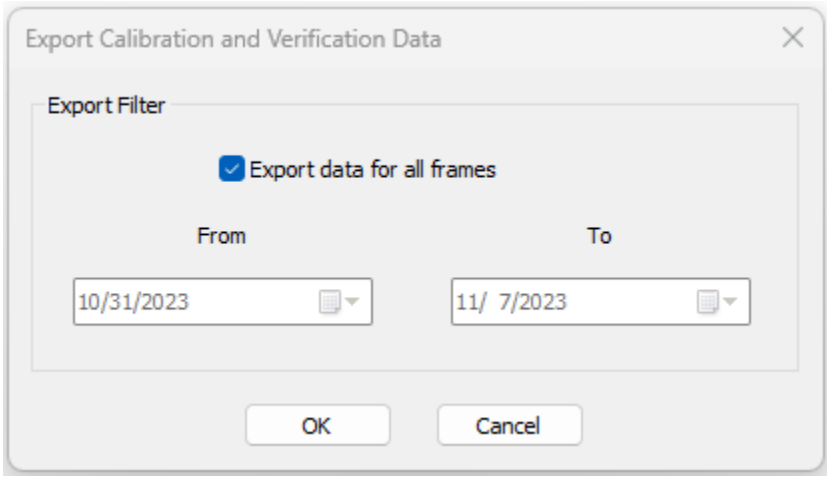
The files that are created by the LIMS Export are written to the LIMS Output folder in the WinCCS directory structure. Two files are written in the folder. The first is the Long Form report in a flat file text export names LF_>Specimen Name>.txt and the second file is in XML format named <Specimen Name>.xml.

File → Export → Running Test(s) to LIMS

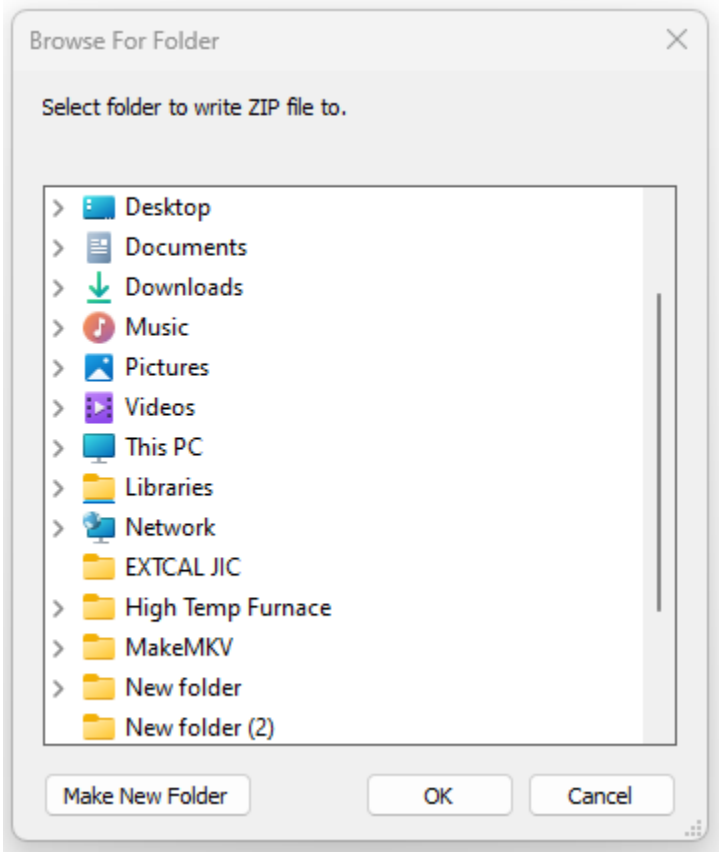
This works identically to the File → Export → Previous Test(s) to LIMS menu function except that it will list the active frames with their specimen names. Select one or more files to export.

File → Export → Verification Data to XML ZIP File

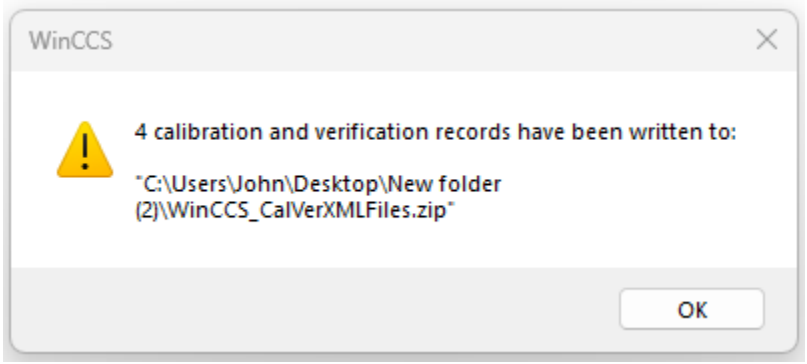
The export verification data to XML ZIP file can be used to capture all the verification data on the system to use for import into other reporting software. This feature is particularly useful for calibration / verification technicians to capture the system calibration and verification data into an easily useable format. When you select this the following dialog will open:



The default is to capture all of the system calibration and verification data. If you uncheck the “Export data for all frames” you can select a date range to export from instead. When ready to export click the OK button which will open a Browser Folder dialog as shown below:



Select the folder to write the files to and click OK, shortly afterwards the system will display the following dialog box confirming the file was created and where it is.



View → System → Calibration

The view system calibration will open a report that shows the status of the entire systems calibration and verification

INSERT: SystemCalibrationReport.html

View → System → Communication Statistics

The view system communication statistics will open a report that shows the status of the system's communications with the frame controllers.

INSERT: CommunicationsStatisticsReport.html

View → System → SIGMA POST and Error Codes

The view system SIGMA POST and Error Codes will display a document that contains all of the POST (Power On Self Test) codes and system hardware error codes displayed on the local SIGMA controllers two seven segment displays.

INSERT: SIGMA_FCPostAndErrorCodes.html

View → System → Hardware

The view system hardware report will open a document that has all of the controller communications setup information, firmware information and main board and thermocouple measurement unit serial numbers.

INSERT: SIGMA_FCPostAndErrorCodes.html

View → System → Log

The view system log will open a text file that contains all of the various parameters logged by WinCCS during startup and operation. Generally, this log can be ignored, but in the event of a WinCCS issue the Applied Test Service technician may want a copy of this text file.

INSERT: WinCCS.log

View → System → Setup

The view system setup report will open a document that lists the setup parameters for each testing machine in the system.

INSERT: SystemSetupReport.html

View → System → Status

The view system status will open the interactive System Status display. This view is automatically opened whenever the program is started and can be minimized or closed by the operator. If it has been closed, this will allow the user to reopen the System Status view.

View → System → Wiring

View → Isochronous Graph

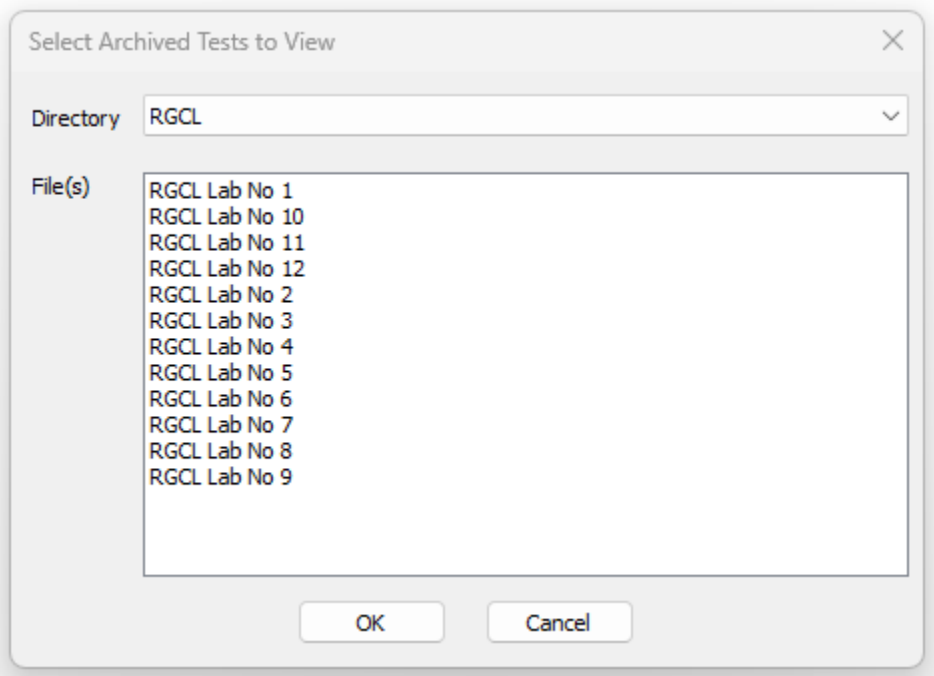
Waiting on Jeff and Rob for a decision.

View → Larson Miller Graph

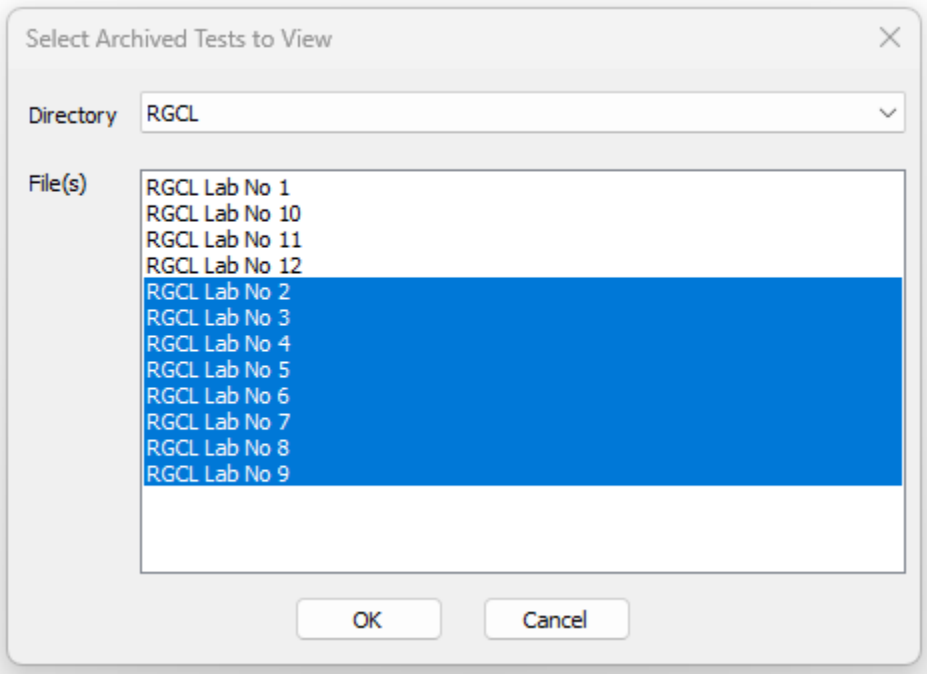
Waiting on Jeff and Rob for a decision.

View → Multiple Creep Graph

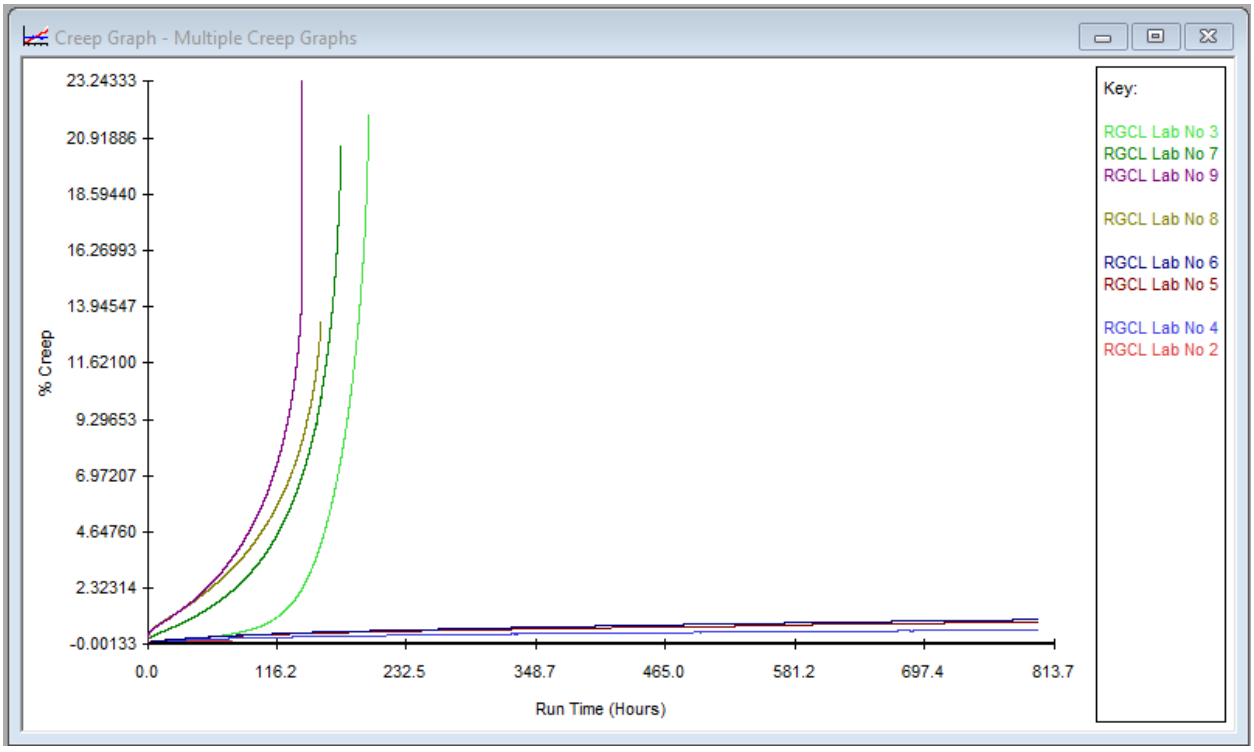
The view multiple creep graph menu allows the suer to select multiple tests that have been previously completed to view the creep graphs in a combined format. When you select the option, the following dialog will be shown:



You can select the directory from the pull down and the tests will be displayed in the lower area. Select one test by left clicking on the mouse or hold the SHIFT button down and select multiple tests as shown in the example below:

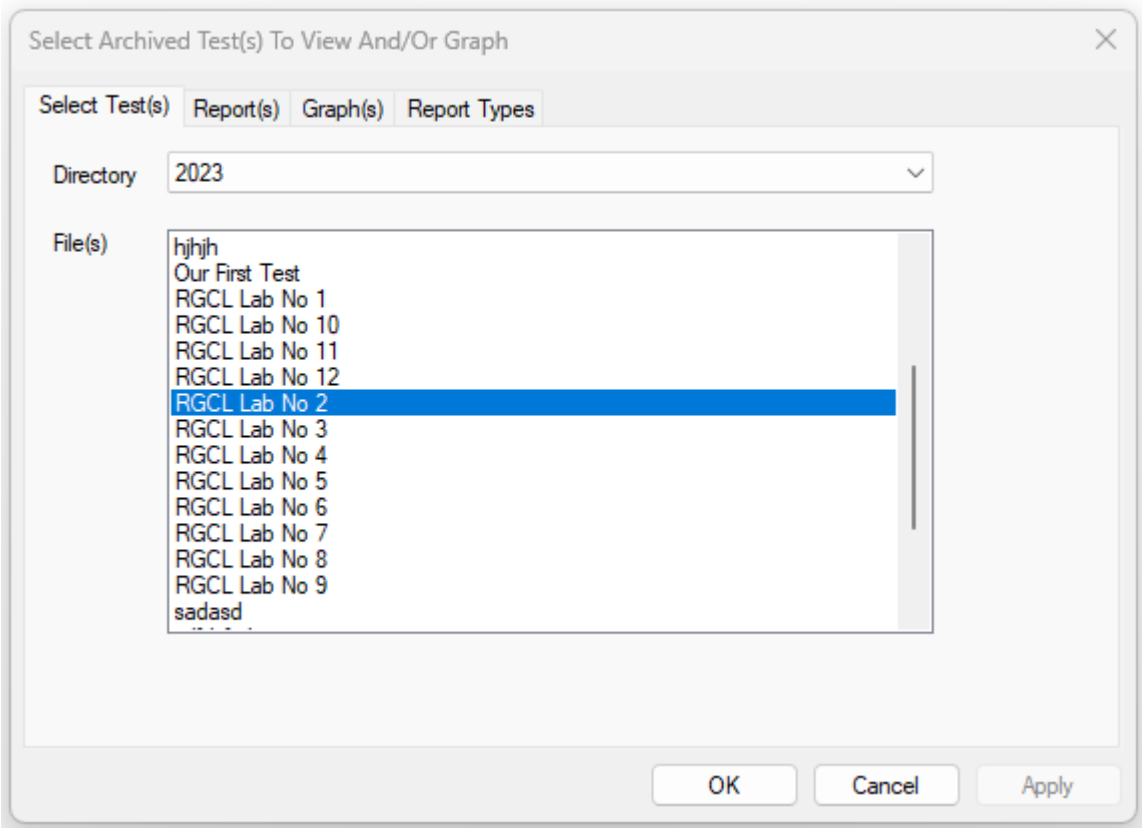


Then click Ok and the graph showing the creep tests will be displayed as shown below:



View → Previous Test(s)

The view previous test(s) allows the user to view reports and graph data from previous tests. When this option is selected the following Property Page will be displayed allowing the user to select the reports and graphs that they want.



Select the test to display data for by selecting the Directory first and then the test as shown above. Once that is done click on the “Reports” tab to select which reports if any you want to display.

The available reports are listed below:

Event Information: The event information report is a listing of every significant event and alarm that occurred during the test with the date and time of occurrence and the specimens running time when the event occurred.

Thermocouple Calibration: The thermocouple calibration report lists the thermocouple batch information for the thermocouple batches used for the test.

Cold Load: The cold load report is the loading report for a creep specimen that was performed prior to the heating of the specimen. This is not always available because only the SIGMA controller can perform cold loads and it is optional to be performed.

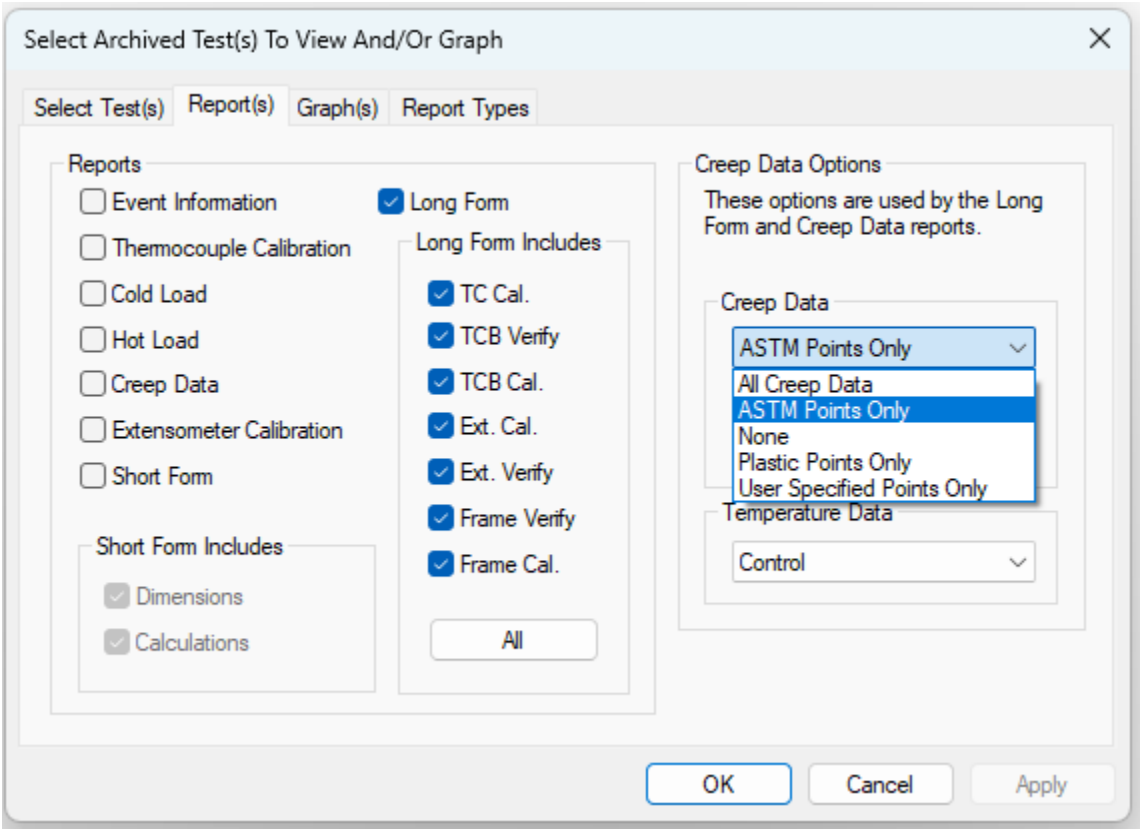
Hot Load: The hot load report is the loading report for a creep specimen. The loading report is an extremely important report to be reviewed for any creep test because it determines the actual staring point of the creep, and any associated plastic extension under load that occurred. It is also crucial to understanding the performance of the extensometery used during the test. Please see the Appendix Hot Stepped Loading and Hot Stepped Load Errors.

Creep Data: The creep data report is a tabular report of the creep data, bending (If multiple extensometers are used) and temperature data. The options for this report are controlled by the Creep Data Options section of the Property Page. These options also control the creep data that is displayed in the Long Form report.

Extensometer Calibration: This will display the extensometer calibration (if required) and the verifications (if performed) for the devices used in the test. These are the actual reports at the time the test was started.

Short Form: The short form report is a small, usually single page report with the pertinent test data listed for the specimen. There are two options for the short form to include either all dimensions and or calculations.

Long Form: The long form report is the full test that can include numerous reports within it, which are available separately. For convenience, there is a button called “All”, which will check all of the sub reports to allow a user to configure the reports quickly.



In this example we will generate a long form report.

Note: The Creep Data options pull down to the right. Select the data option, explained below, that you want to use for this report.

All Creep Data: This will export every data point that is in the test file. This may generate a very large report and is not the best possible way to really explore the actual data captured. To do that it is recommended that you use the File → Export → Previous Test(s) menu function to allow viewing the test data in a spreadsheet.

ASTM Points Only: This is the default option as it will report creep data every fifteen minutes for the first two hours and then one data point per hour thereafter. This is the E139 requirement for creep testing.

None: No raw data is reported.

Plastic Points Only: This is used for plastics testing. The first data point is reported at one minute and then every 100 minutes for the first 1000 minutes. From 1000 minutes to 10,000 minutes data is reported every 1,000 minutes. From 10,000 minutes to 100,000 minutes, it is reported every 10,000 minutes. Above 100,000 minutes it is reported every 100,000 minutes.

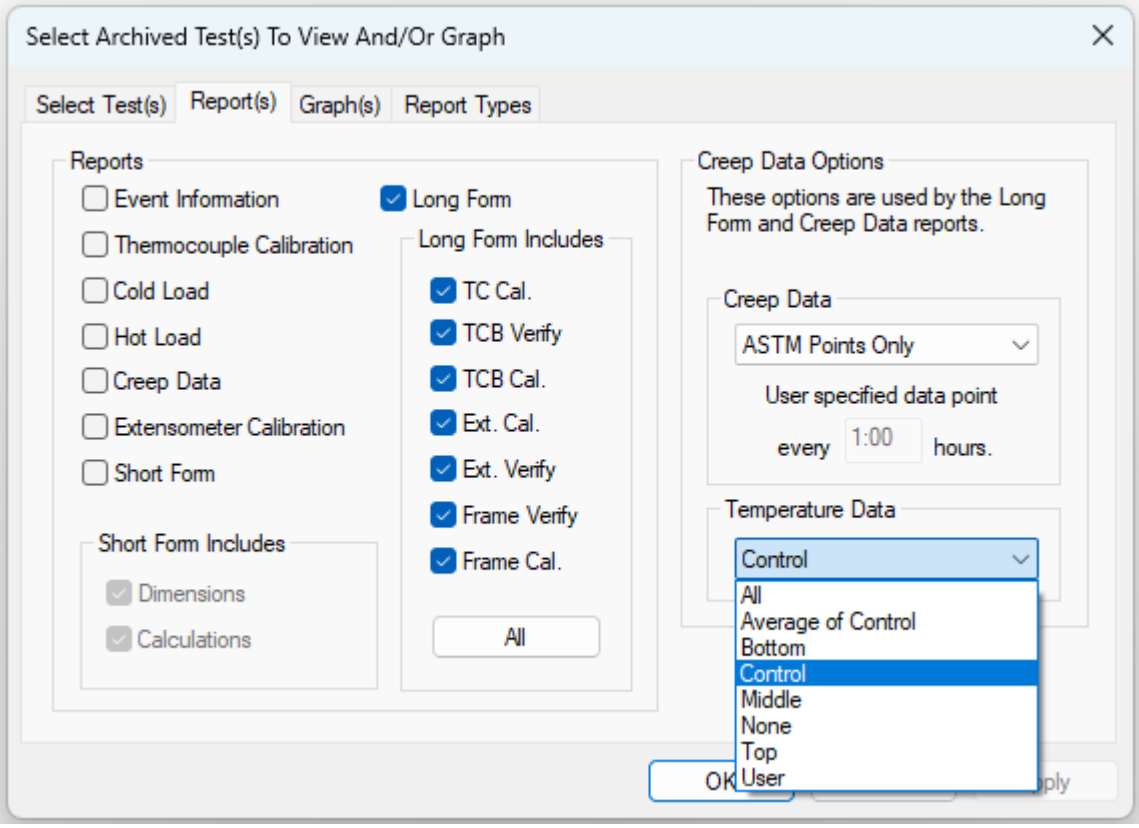
User Specified Points Only: This allows a user to select the time delta between reported readings.

After selecting the data points to display in the creep data, you can also control which specimen temperatures to display with the data points. The options are as follows:

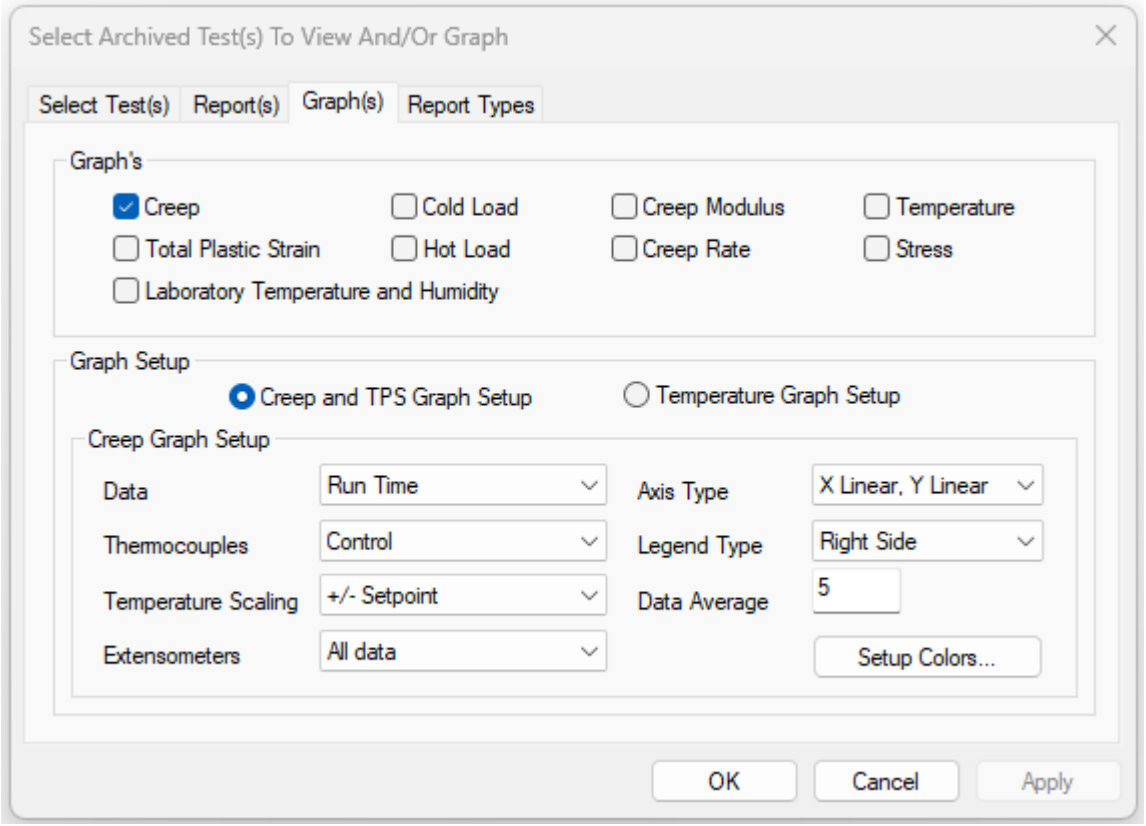
All: Will list all thermocouple values (Top, Middle, Bottom, and User).

Average of Control: Will only display the average temperature of the control thermocouples.

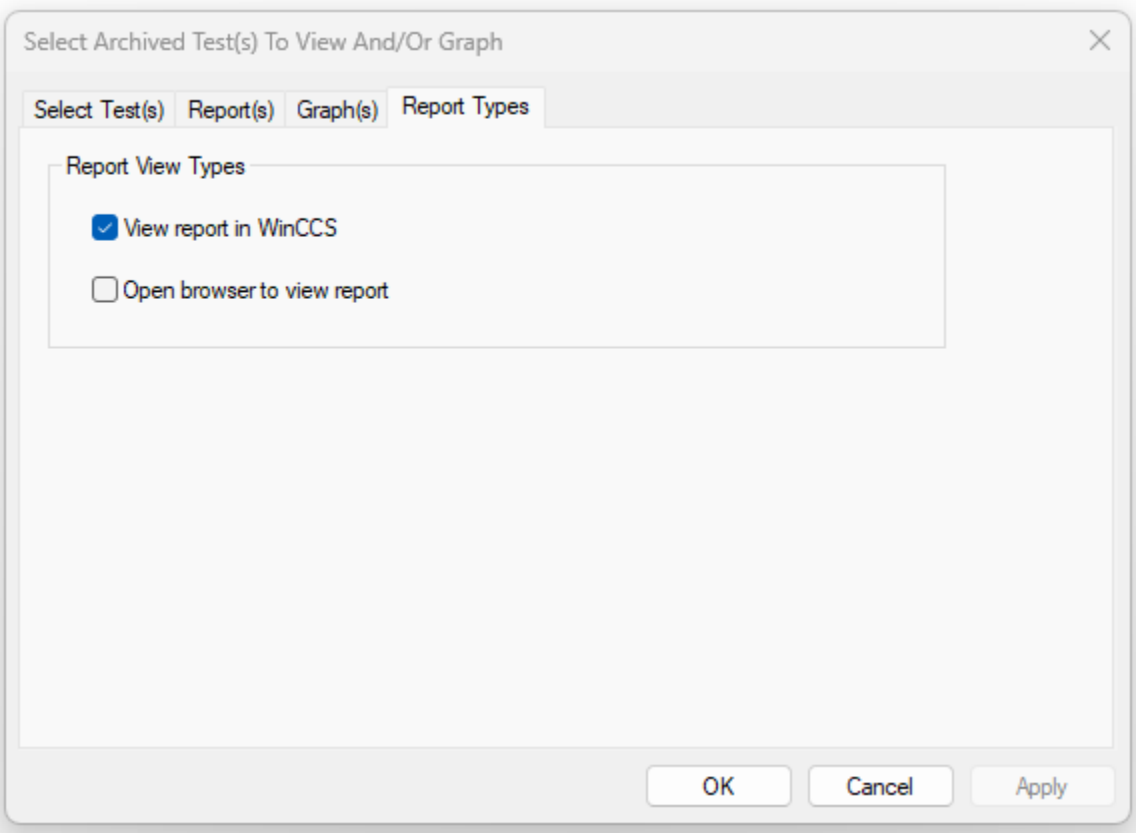
Bottom, Middle, Top or User: Will display only the thermocouple value selected regardless of its control status.



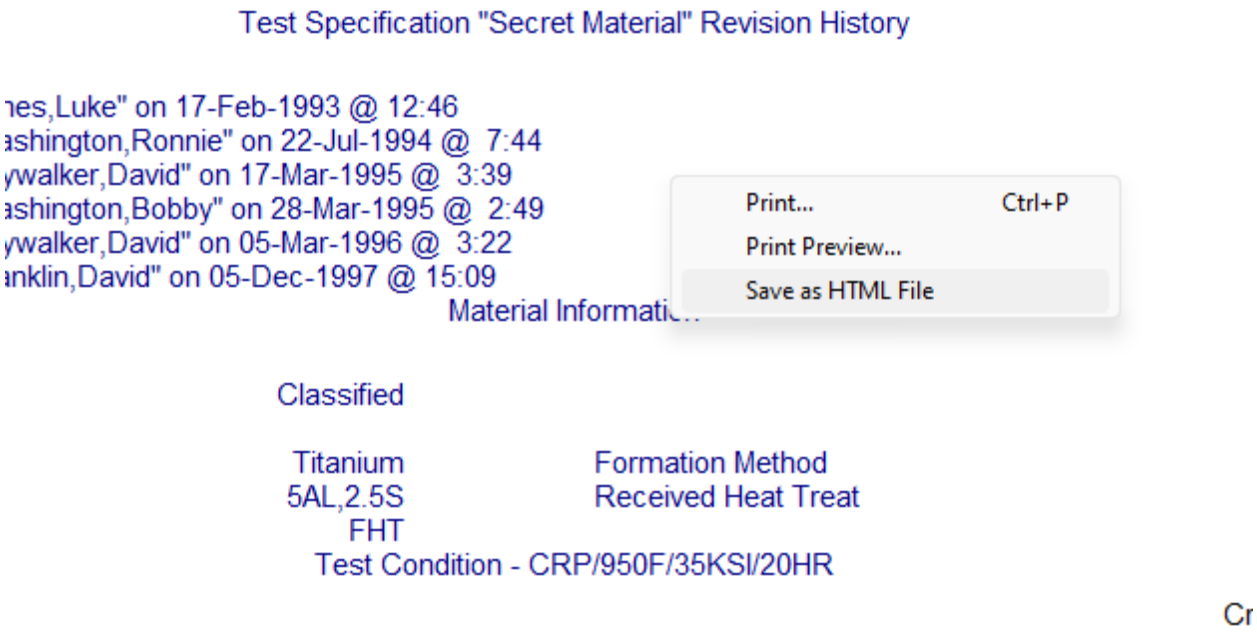
Once you have selected the reports and options click on the “Graphs” tab to select the graphs to display as shown below.



This Property Page allows you to select the graphs that you want created. In the lower half of the Property Page the various graph options are shown for the graph types. There are two basic setups for the graphs. One for Creep and Total Plastic Strain graphs and the other for Temperature graphs. You can select the options by clicking on the radio buttons or when you select a graph the setup will be automatically selected for that graph type. Once you have selected the Graphs to display select the “Report Types” tab to select the report type to use if you selected any reports.



The report types tab allows you to select the report type for the selected reports in the previous steps. When you select the “View report in WinCCS” a separate window for each report will be opened in WinCCS. This selection creates automatically sizing fonts in the reports for easier reading. Another feature of the WinCCS report type is that you can right clikc anywhere in the report to get a print and or save menu as shown below:

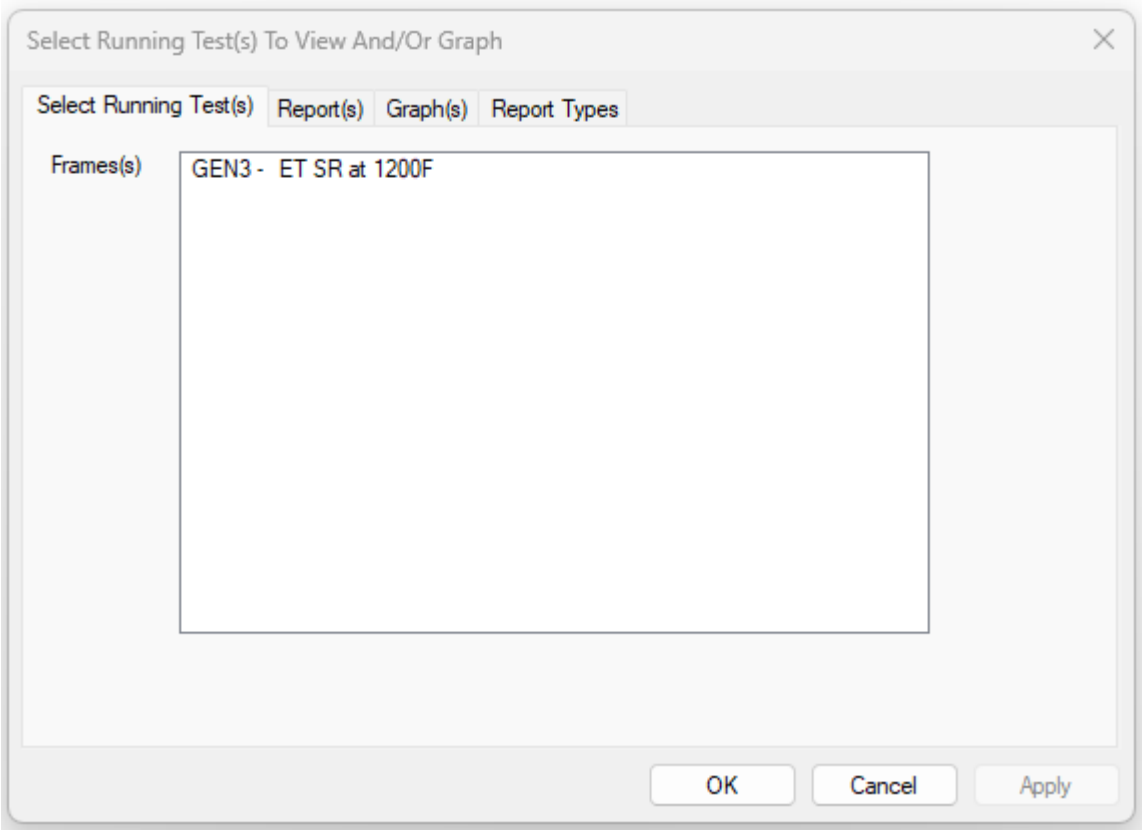


This allows you to easily print the report or you can save it as an HTML file. This is an important ability because you can email these files to anyone that requires the data.

Some people prefer to launch windows external to WinCCS to read the reports in and should select the “Open browser to view report”. This will have each report open in an individual browser external to WinCCS.

View → Running Test(s)

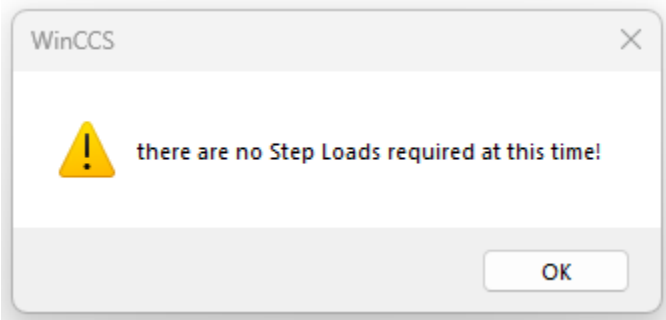
The view running test(s) works identically to the previous test(s) menu function except it uses running tests as the data source instead of previously run tests. When this option is selected the following property sheet will open.



Select the running test to view and then select the Reports(s), Graph(s) and Report Types from the tabs. Please reference View → Previous Test(s) menu function for a complete explanation of the functionality. Once you have made your selects click “OK” and the reports and graphs will open.

View → Required Step Loads

The view required step load report details what machines will need a step load and how long before it is required. If this report is requested and no tests require step loads then the system will display this message box.

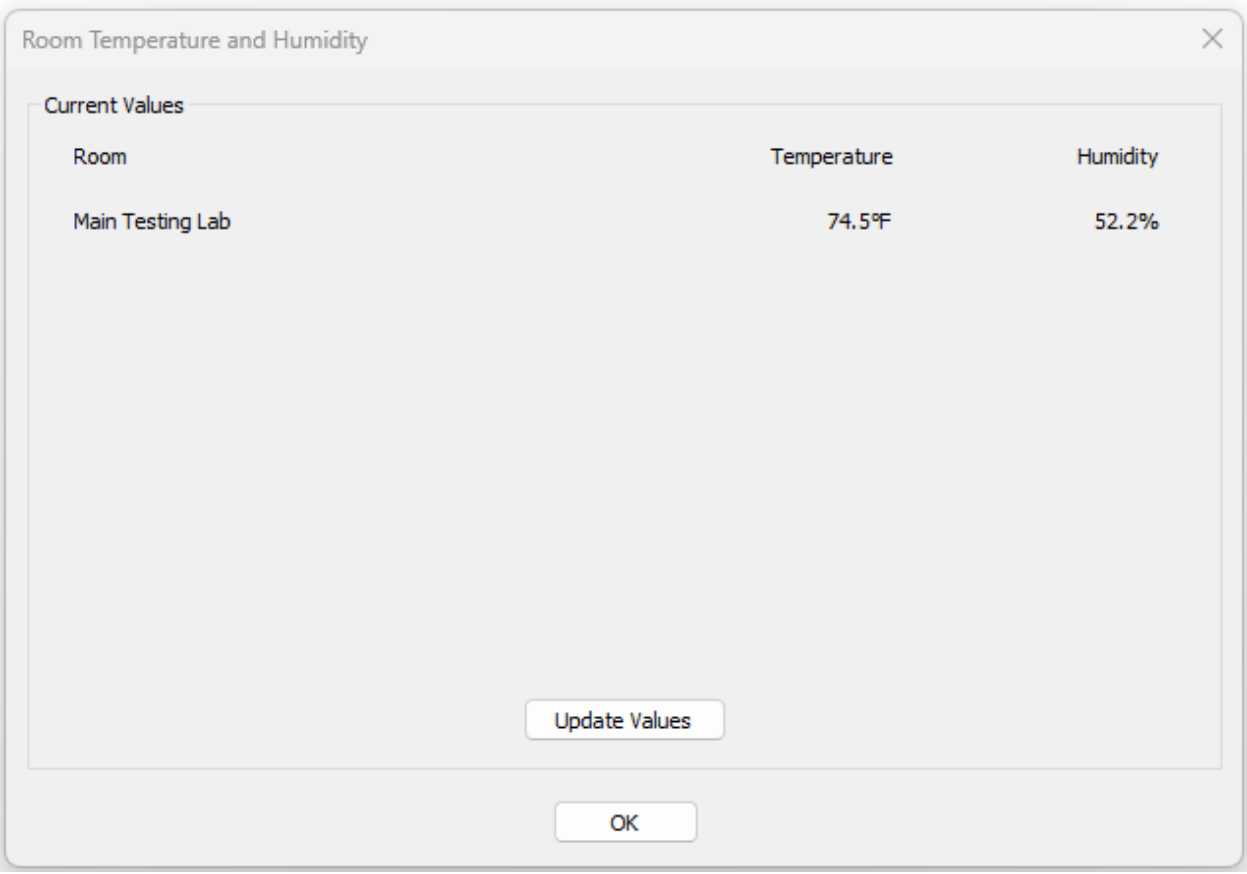


Otherwise, it will open a document that lists any tests that require uploads and how much longer before they do. This is used by operators to plan when technicians need to be in the lab to perform step loads on manually loaded machines.

INSERT: RequiredStepLoads.html

View → Room temperature and Humidity

This dialog displays the room temperature and humidity for the assigned ambient sensor in the System→ General Setup “Ambient Sensor” tab. The sensor values are used to update the room temperature and humidity on Classic (GEN1) and Modular (GEN2) controller-based frames.



When the dialog is entered the current sensor values are displayed. Click the “Update Values” button to update the readings, or “OK” to exit.

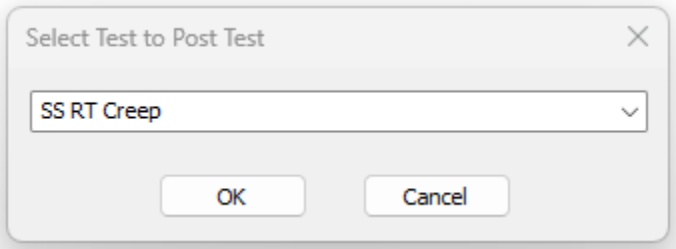
Tests → Post Test a Previously Removed Specimen

The Post Test a Previously Removed Specimen menu item allows the operator to post test previous specimens. In a production creep / stress rupture laboratory, there is a strong incentive to keep the machines full, so machine downtime is a very important factor. WinCCS has mechanisms in place to speed up workflow by allowing operators to remove specimens immediately after the test terminates,

load a new specimen into the machine and then post test the specimen later once it has cooled. If an operator wants to do this, then they have two options as listed below:

1) Select the option to remove the specimen and post test later that will be displayed on the test machines display or handheld.
2) Select the Remove Specimen Post Test Later menu item from the Frame Status context menu

Once either mode is selected the system will place the test in the post test queue and reset the test machine to idle making it ready to accept a new test. At some later time when the specimen is cooled the operator can post test the specimen by selecting the Post Test a Previously Removed Specimen menu and selecting the specimen to post test. When they do the system will display the following dialog box to allow the operator to select the test.



Select the test to post test and then click OK. Please refer to Frame Status context menu “Enter Post Test Information” for instructions on post testing specimens.

SPECIMENS – See “Specimen Section V0.docx”

SPECIFICATIONS – See ‘Test Specifications V0.docx”

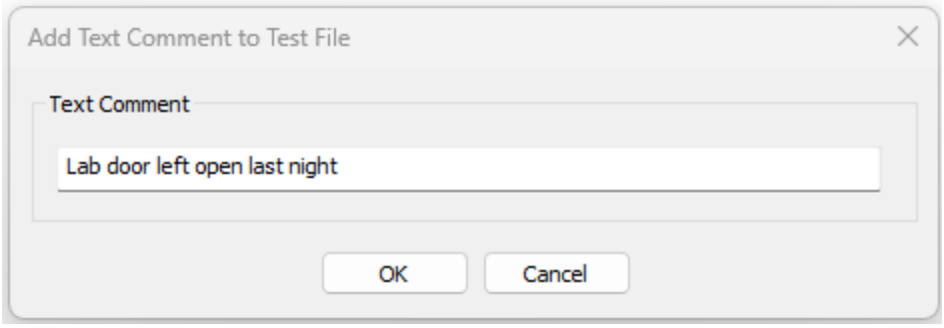
Frame Status Menu

The Frame Status View menu is accessed by right clicking on a Frame in the Status Display Screen. The menu is context sensitive, so it changes depending on the current Frame State, Test Type, User Privileges, and active Alarms. Some options are always present in the context menu, but the function may be Grayed Out due to the above-mentioned conditions. Those menus items and their sub menus are “Controller Status”, “Calibration and Verification”, “Maintenance:, “Setup” and “View”. The matrix below defines menu items that will be displayed based on the various conditions.

Scott INSERT Status Display Commands Matrix V2.xlsx here

Add Text Comment

The Add Text Comment menu is used to add a comment to the test file that will show up in the Event Log. This is useful to add a note to the test file indicating some external event that may have occurred during the test. Text comments are limited to 31 characters.

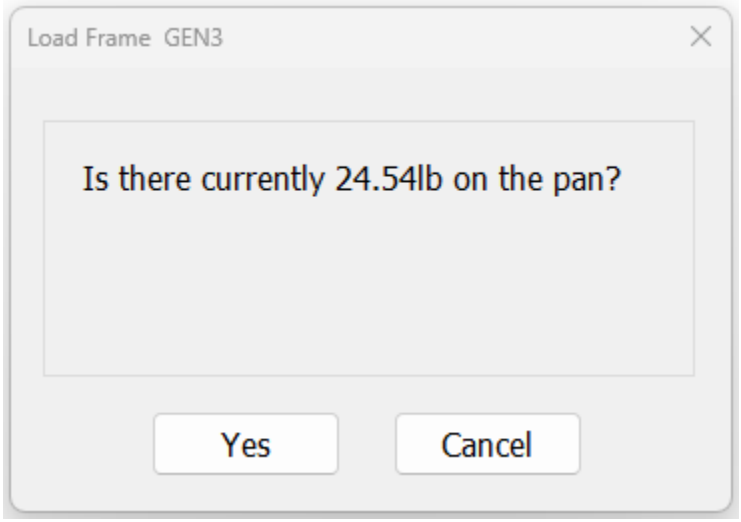


In the example above, the operator has noted that the laboratory door was left open, which could cause ambient temperature and humidity to deviate during that time. After entering the message click “OK”.

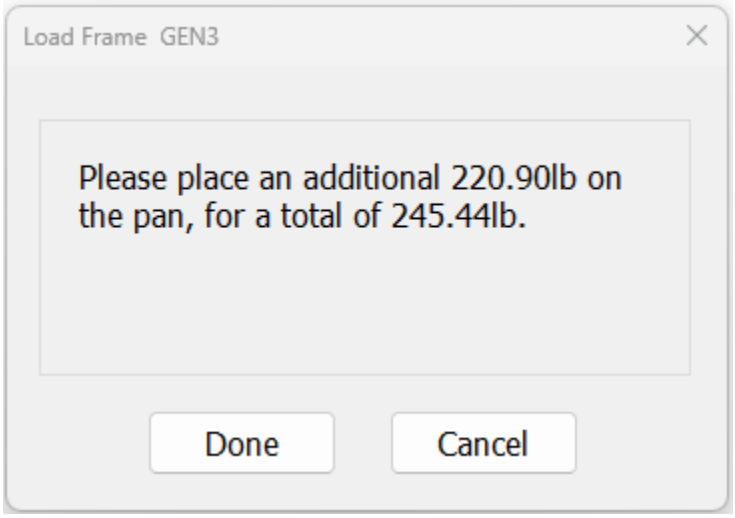
Apply Specimen Load

The Apply Specimen Load menu selection will only be available when the “Load” alarm is displayed in the status display screen. The user may either acknowledge the weight placement on the machine at the WinCCS computer, by using the remote displays (GEN1), or a handheld terminal for GEN2 and GEN3. Either method loads the frame, and typically using the machine displays or the handheld terminal is the easiest.

To perform the task on the WinCCS computer right click on the Frame and select the “Apply Specimen Load” menu item, which will display the following dialog box to confirm the current weights on the machine.



Visually confirm that the weights are loaded and then click “OK” to continue loading the machine, which will then display this dialog box.



Once the weights have been loaded click “Done”, which will register the operator that is logged into the system as the loading operator.

Notes:

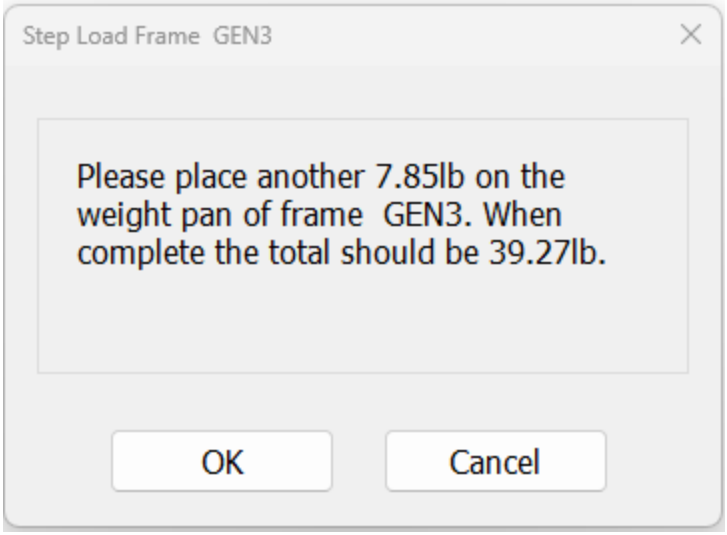
1) This option will not be available on test frames that have full load control, weight based load control or detached preload pans.
2) The above steps are very similar when using the handheld terminal at the testing machine.

It may be similar, but would we want to add pictures of the handheld going through these / which buttons to press for confirmation? D. Meals

Apply Step Load

The Apply Step Load menu selection will only be available when the “Sload” alarm is displayed in the status display screen. The user may either acknowledge the weight increase on the machine at the WinCCS computer or by using the remote displays (GEN1) or a handheld terminal for GEN2 and GEN3. Either method prompts the user to apply the step load and records the actual time. Typically using the machine displays or the handheld terminal is the easiest.

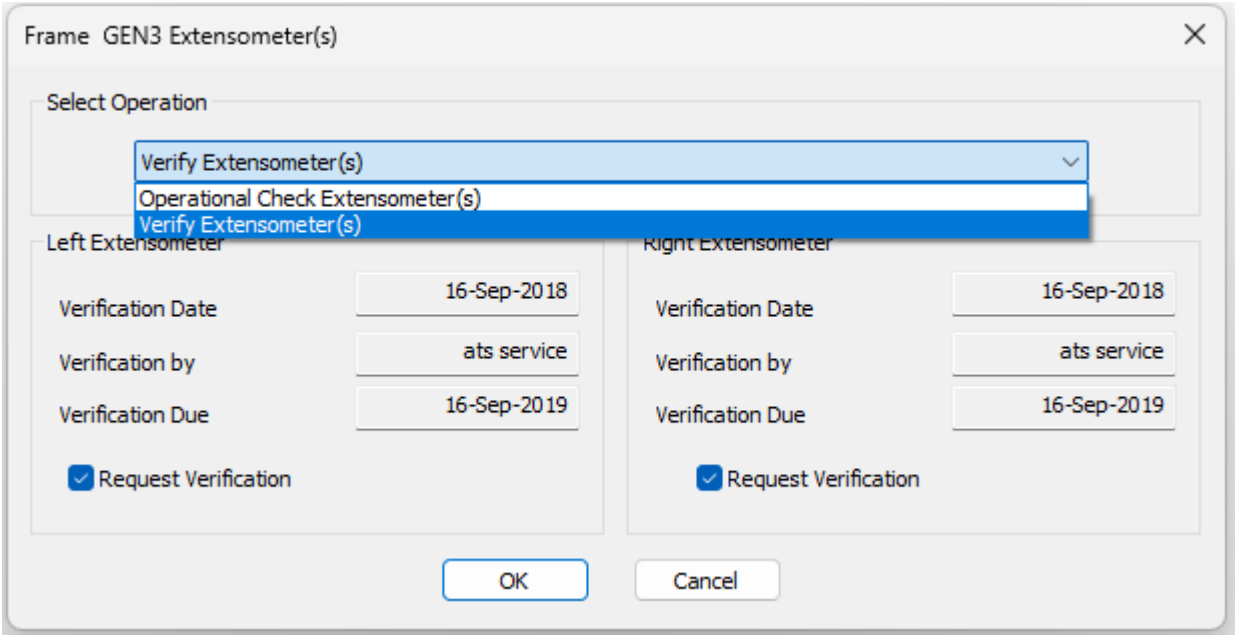
To perform the task on the WinCCS computer right click on the Frame and select the “Apply Specimen Load” menu item, which will display the following dialog box to confirm the current weights on the machine.



Once the step load has been applied, click the “OK”, which will register the operator that is logged into the system as the loading operator.

Calibration and Verification → Extensometer(s) → Calibrate / Verify

The Extensometer Calibrate / Verify menu item opens a dialog box to select the operation required for the extensometers as shown below.



The selections are “Calibrate Extensometer(s)”, “Verify Extensometer(s)”, or “Operational Check Extensometer(s)”. The option to calibrate will not be listed on test frames that are non-calibratable

devices such as glass scale encoders. Once the operation type has been selected, the dialog will display the last time the operation was performed and the operator that performed it. The due date is also shown. On dual extensometer test frames the system will allow either extensometer or both to be selected for the operation. Once the selections have been made click the “OK” button to initiate the procedure on the frame controller. All further prompting will be on the frame controllers displays.

IMPORTANT: Once the operator acknowledges the operation starting on the test frame the frame status will change to Cal / Caer and the alarm will display Ca / Ver for the duration of the operation. When the operation is complete, WinCCS will open the various reports for the operation automatically.

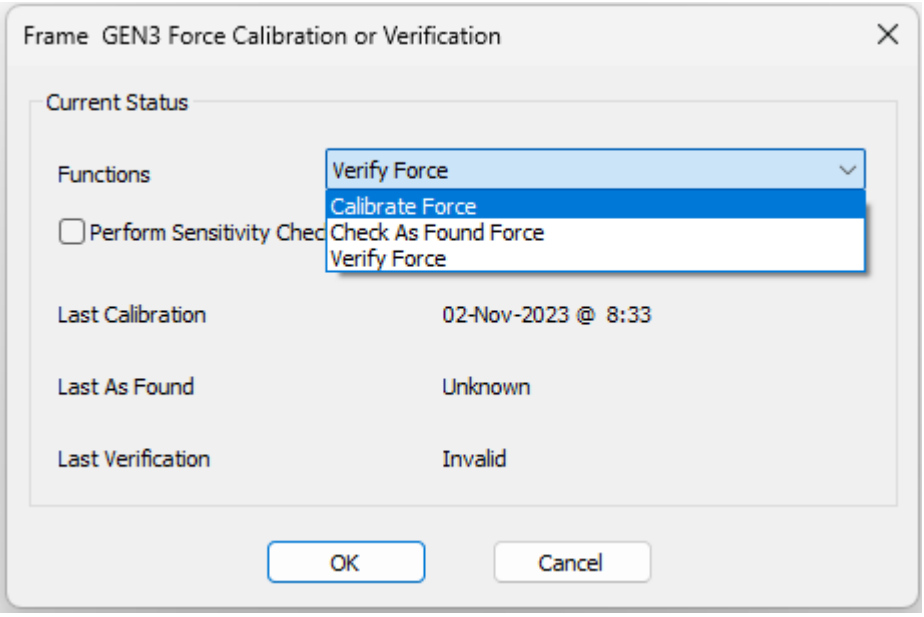
Calibration and Verification → Extensometer(s) → View → Calibration Report, Verification Report or Op Check Report

The Calibration and Verification → Extensometer(s) → View menu selection allows the user to View the reports for the operations selected. The report data is maintained by the system and copied into every test run on that test frame for archival purposes.

DO WE WANT TO INCLUDE EXAMPLE REPORTS? – D. Meals says yes.

Calibration and Verification → Force → Calibrate / Verify

The Force Calibrate / Verify menu item opens a dialog box to select the operation required for the test frames force as shown below.



The functions are allowed will not contain calibration if the test frame does not have “Load Control” enabled. The user should select the Function that they want to perform and then select whether they want a sensitivity check performed. Once the selections have been selected click the “OK” button to initiate the procedure on the frame controller. All further prompting will be on the frame controllers displays.

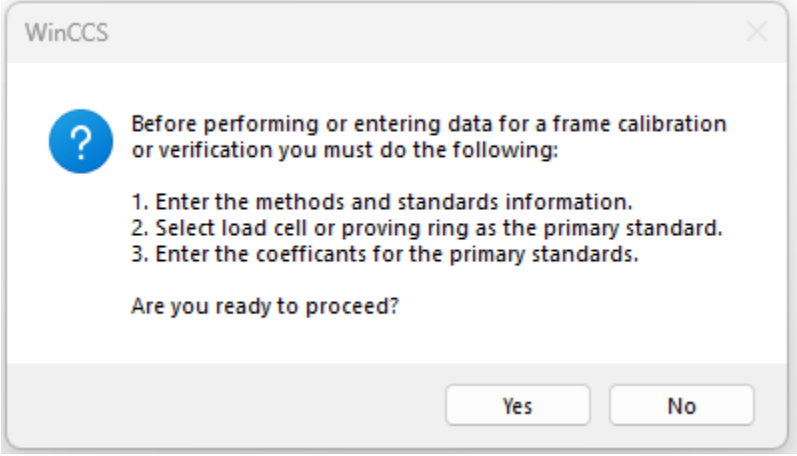
IMPORTANT: Once the operator acknowledges the operation starting on the test frame the frame status will change to Cal / Ver and the alarm will display Ca / Ver for the duration of the operation. When the operation is complete, WinCCS will open the various reports for the operation automatically.

Calibration and Verification → Force → View → (As Found or Current)

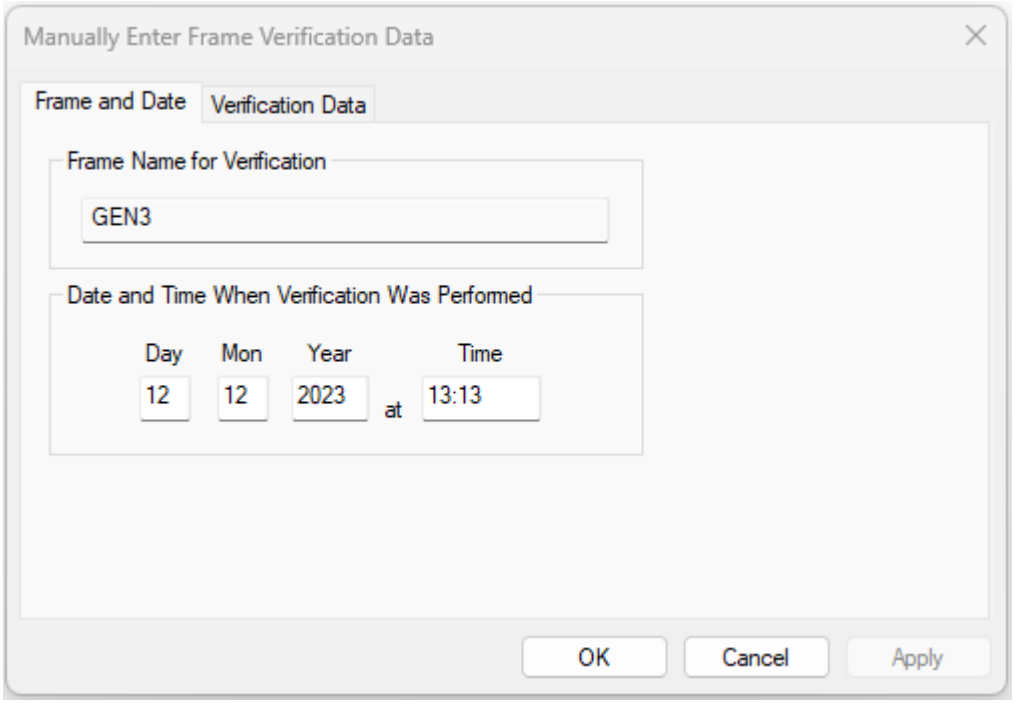
The Force View menu allows the user to view a report for the “As Found” or “Current” verification and calibration if the frame has Load Control enabled.

Calibration and Verification → Force → Manually Enter Verification Data

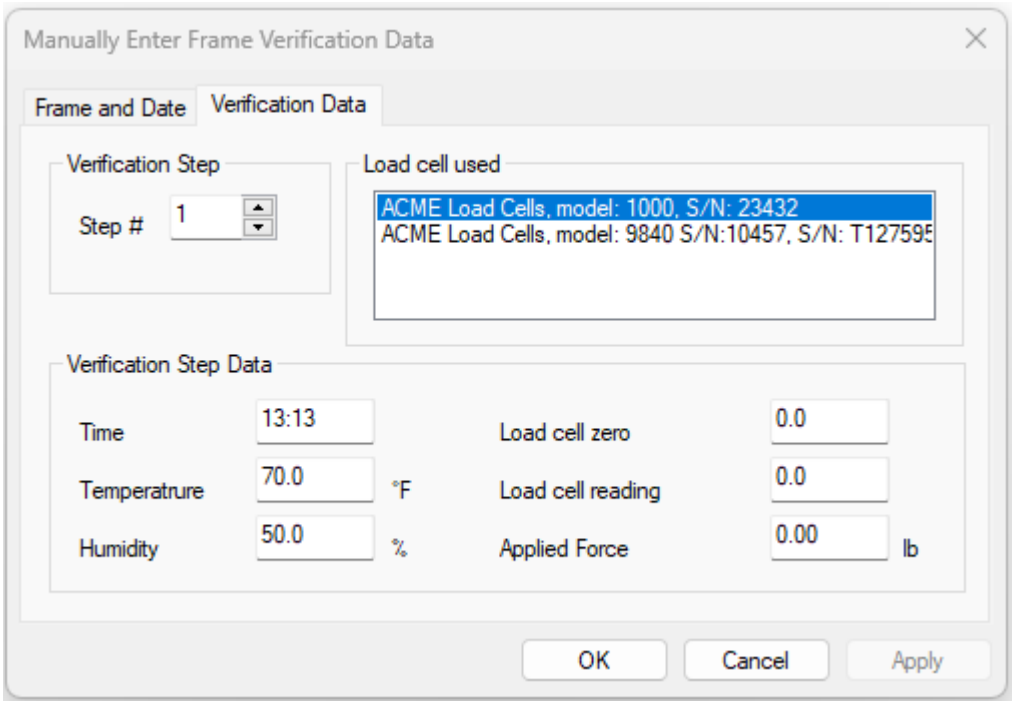
The Force manually Enter Verification Data is used by laboratories that do not use the verification routines built into the Frame Controllers. It allows a user to enter in verification performed by a third party, yet they want the verification data as part of the test record. When this item is selected the first dialog that is displayed is shown below. This reminds the user to fill in the various fields in the WinCCS system before proceeding with the verification data entry.



If the user has entered the required data, then click “Yes” to proceed and the following Property Sheet will open allowing the user to enter the verification data.



The “Frame and Date” Property Page displayed if for the user to enter the date and time that the actual verification was performed. Once that has been entered proceed to the “Verification Data” Property Page as shown below.



The “Verification Data” Property Page allows the user to enter each verification step that was performed into the system. After entering the data for a step, the user can select the next step and go back and review the previous step. When all the data has been entered and reviewed click the “OK” button to save the verification.

IMPORTANT: Once this data has been entered, it cannot be edited.

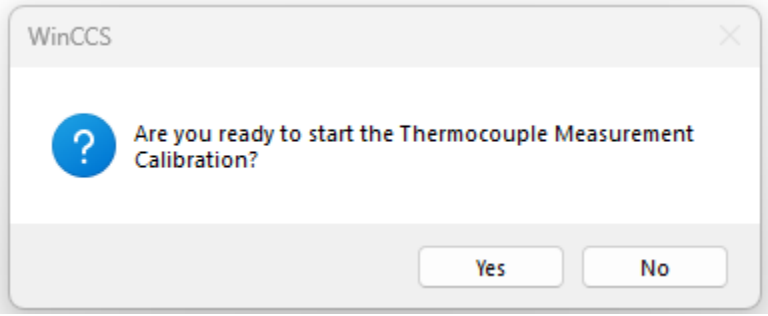
Calibration and Verification → Temperature Measurement → Calibrate

WARNING: The GEN1 and GEN2 systems require a Thermocouple Measurement Unit calibration. This calibration is performed at Applied Test Systems with a very sophisticated temperature sourcing device. Please do not attempt to calibrate a GEN1 or GEN2 Thermocouple Measurement Unit without first discussing with Applied Test Systems.

IMPORTANT: The GEN3 Thermocouple Measurement Unit is factory calibrated with it’s coefficients saved in the actual Thermocouple Measurement Unit silicon die and cannot be changed or updated.

The Calibrate function for the Thermocouple Measurement Unit is supplied for use by customers on GEN1 and GEN2 units, but before attempting any calibrations the customer should contact Applied Test Systems service department for guidance on proper technique. Generally, none of the Thermocouple Measurement Unit need calibration unless they have been damaged.

Once the menu item is selected the following dialog box will be displayed.

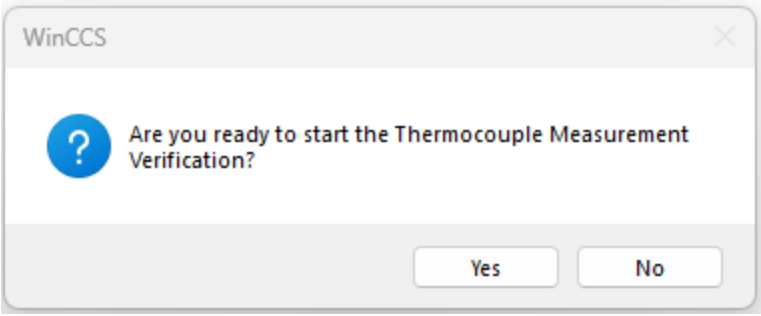


Select “Yes” to start a Thermocouple Measurement Unit calibration procedure and then follow the prompts on the frame controller.

Calibration and Verification → Temperature Measurement → Update Cal File

Calibration and Verification → Temperature Measurement → Verify

The Temperature measurement verification routine is only supported on GEN3 frame controllers. Users should verify the Thermocouple Measurement Unit based on their laboratories requirements. If the frame controller is a GEN3, then the Verify option can be selected. Before selecting this feature check the Systems → Methods and Standards tabs to make sure that the temperature information has been filled in. Once you select this option the following dialog will be displayed.



When you are ready to start the verification, press “Yes” and follow the prompts on the handheld of the GEN3 controller.

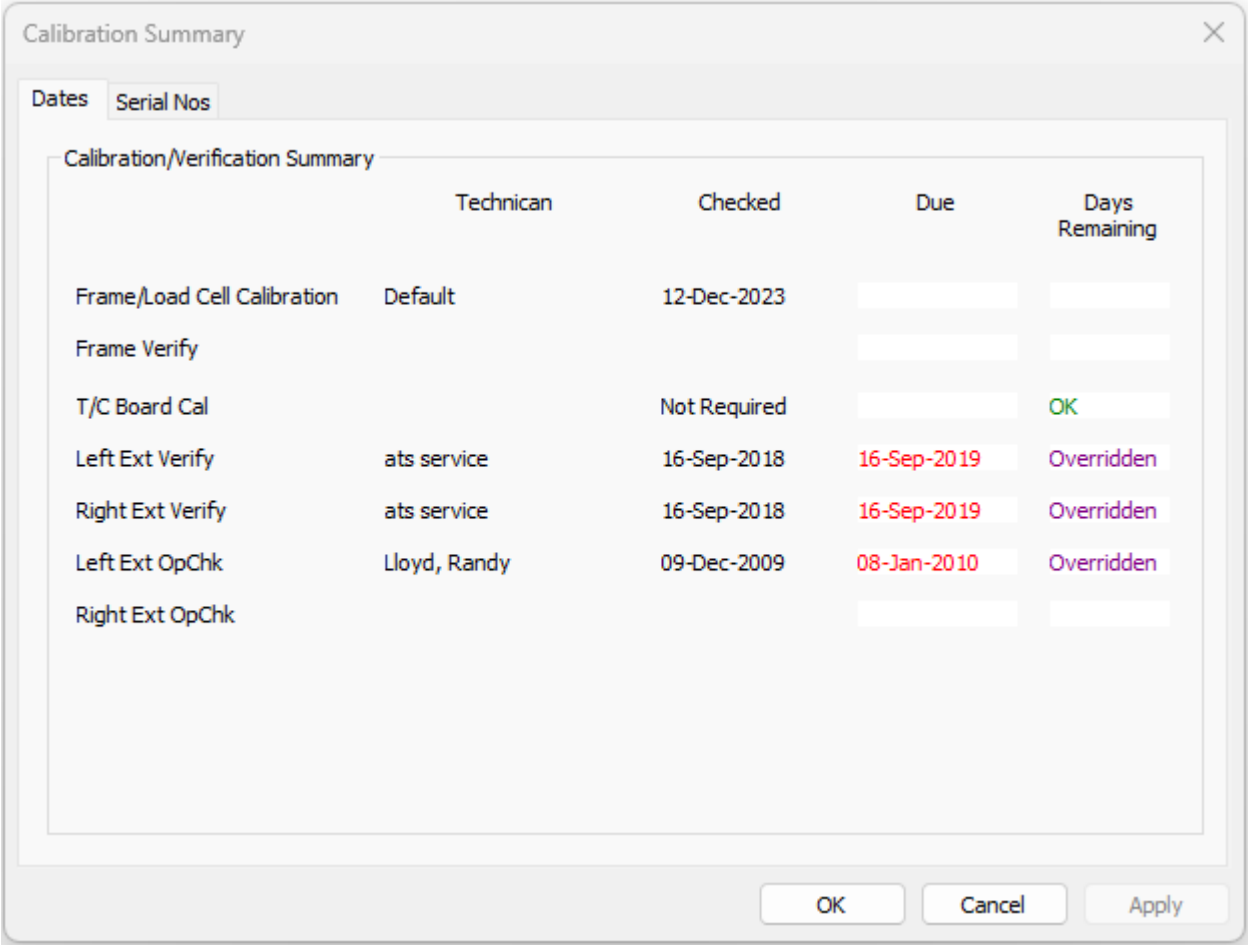
Calibration and Verification → Temperature Measurement → View

The Temperature Measurement View menu selection allows the user to View the temperature verification for the testing frame. The report data is maintained by the system and copied into every test run on that test frame for archival purposes.

Do we want to include example reports? – Yes – D. Meals

Calibration and Verification → View Calibration and Verification Summary

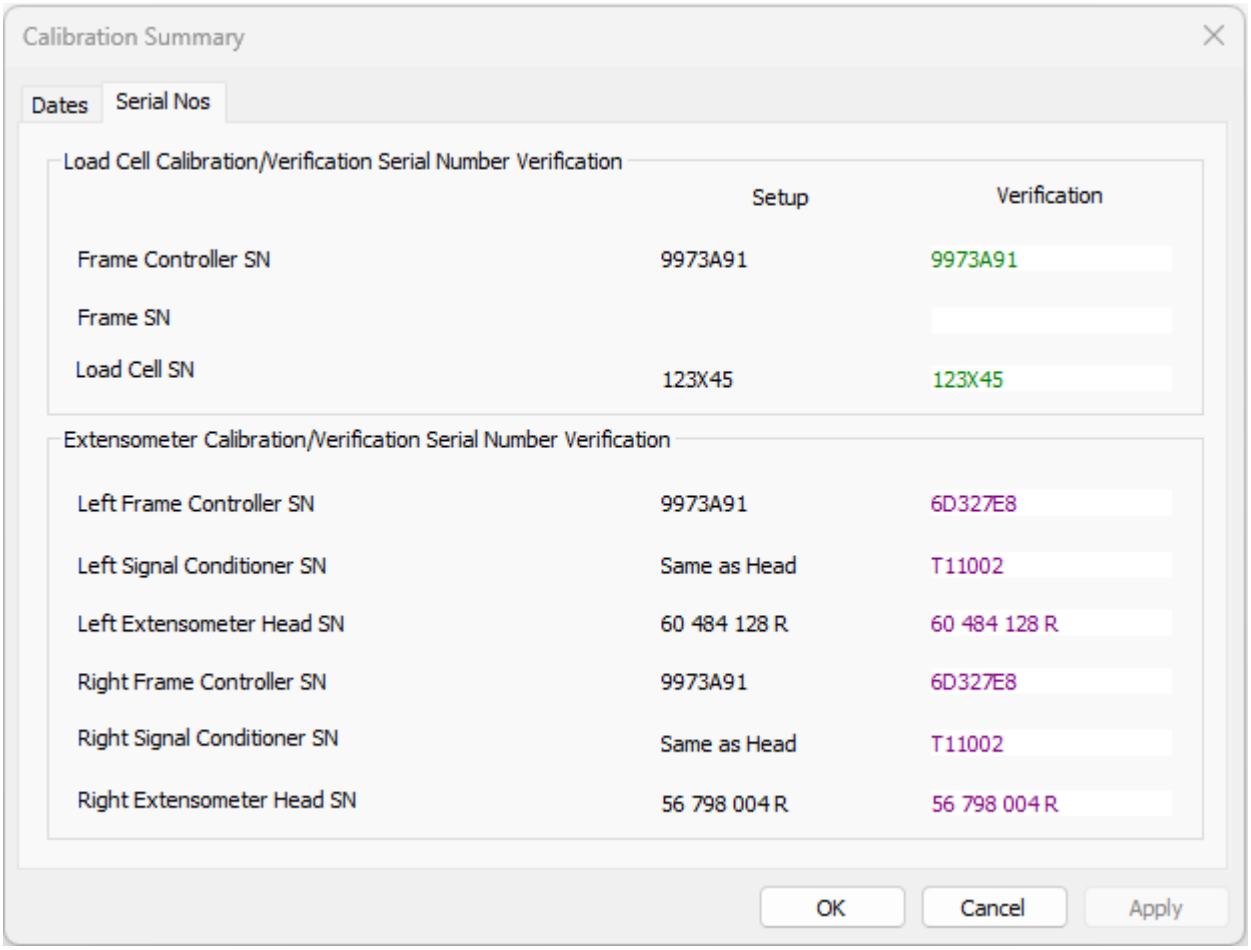
The Calibration and Verification Summary provides a quick look at the calibration and verification status of the test frame. When this option is selected, it will open up the following Property Sheet, with the Dates Property Page selected as shown below:



The “Dates” Property Page displays the status of the calibration and verification of various machine sensors. The color coding of the Due and Days remaining are as follows:

GREEN	The item is OK.
PURPLE	The test start checking is overridden for this device verification.
RED	The device required verification and tests cannot be started.

Clicking on the “Serial Nos” tab will display the serial number verification status as shown below:



The “Serial Nos” Property Page will display the comparison of the sensor serial number in setup to the serial number captured when the device was calibrated or verified. This makes sure that the calibration or verification record for the device is the correct device. Mismatches can be caused by sensors being moved from one machine to another or calibration technicians failing to put the correct serial numbers into the machine’s setup.

IMPORTANT: WinCCS allows the user to override the sensor serial numbers to start tests as shown in the above example, however Applied Test Systems strongly recommends that this feature is not used due to possible test invalidation.

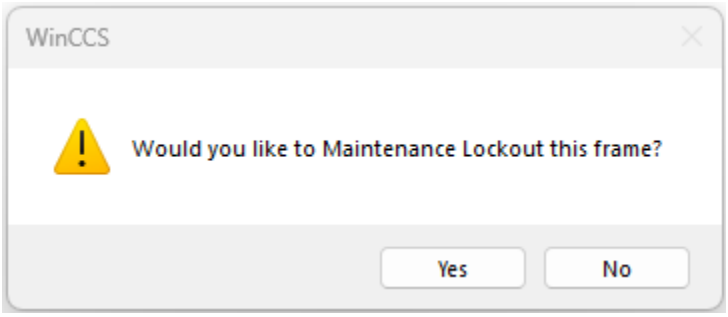
Maintenance → Enable Diagnostic Displays

The Enable Diagnostic Displays function is a toggled function that enables / disables the special diagnostic displays available on all Applied Test Systems frame controllers. Selecting the menu function toggles the display on or off. When the diagnostics have been enabled there will be a check mark to the left of the menu item.

NOTE: The diagnostic displays can be enabled at the controllers. Please see “Appendix 201 – Frame Controller Configuration Switches” for further information.

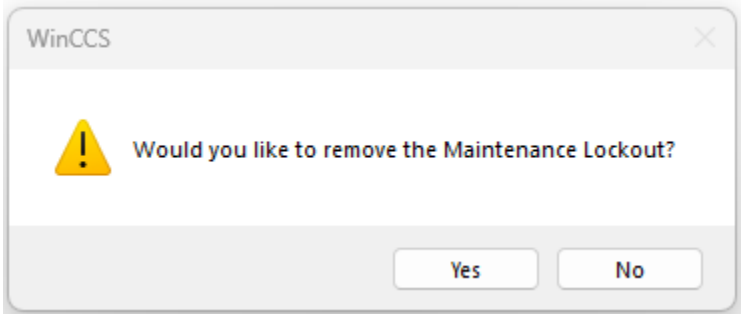
Maintenance → Lockout Frame

The maintenance lockout feature is used to prevent users from using a test frame due to an issue with the machine. When you select a frame that is not locked out the following dialog box will be displayed.



When you click “Yes” the frame will go into the Lockout mode, which will be evidenced by a check mark to the left of the Lock Out frame menu item and a “MLO” alarm for that frame in the frame status view.

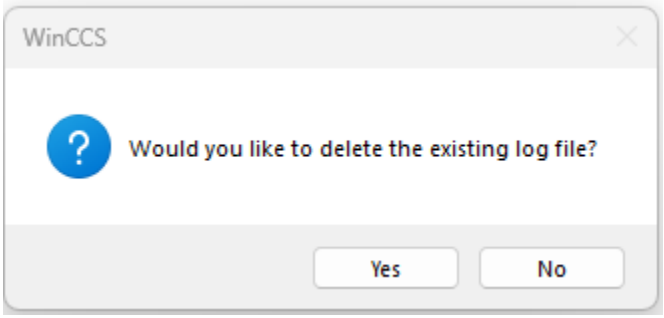
Once the issue has been corrected, select the Lockout Frame menu again and it will display the following dialog.



When “Yes” is clicked, it will clear the Maintenance Lockout on the frame.

Maintenance → Logging → Enable

The Logging feature of WinCCS can be used for many different purposes to collect data on a testing machine that has more data than a typical test. Logging can be used to observe furnace behavior better because it logs all the various furnace parameters at three second rate. To enable furnace logging to select the Logging menu and the following dialog box will be displayed.



This prompt lets you delete any previous log for the selected frame. If you select “Yes” a new log will be created, “No” will retain any previous information and append the data onto the existing data log.

Once the logging has been started the “Log” alarm will be displayed for the selected frame until you stop data logging. This will remind you that logging is enabled on that frame.

IMPORTANT: The frame data log can generate a very large amount of data in a short time and therefore impacts the performance of the PC running WinCCS.

You can cancel the logging operation by reselecting the logging menu.

The data log file is created in the “Logs” folder of the WinCCS folders tree. The filename is “DatLog_” plus the name of the frame with a “.CSV” extension. The “.CSV” will cause Microsoft Excel to open the file correctly.

The following data is logged:

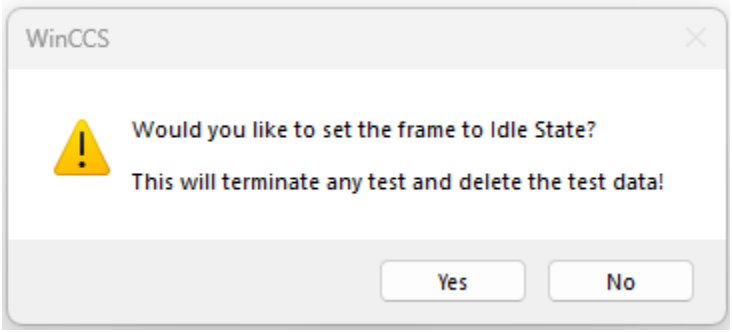
Date	Data point Date and Time string.
State	Current test state.
Avg Tmp	Average temperature of in use furnace thermocouples.
Ctrl T/C	Controlling T/C identifier. 0 = Top, 1 = Mid, and 2 = Bot.
S.P.	Actual furnace setpoint.
Rate	Current furnace rate in Deg/Min.
Err	Control error.
Pwr	Overall output power to the furnace.
P Term	Proportional term for the furnace control.
I Term	Integral term for the furnace control.
D Term	Not Used – Retained for legacy applications.
% Top	Actual percentage of power applied to the top zone.
% Mid	Actual percentage of power applied to the middle zone.
% Bot	Actual percentage of power applied to the bottom zone.
Top T/C	Actual temperature of the top thermocouple.
Mid T/C	Actual temperature of the middle thermocouple.
Bot T/C	Actual temperature of the bottom thermocouple.
User T/C	Actual temperature of the user thermocouple.
ACV	Current line voltage.
Iso Tmp	The isothermal junction temperature of the thermocouple measurement unit
Stress	Stress as measured or specified if no load control.
P. Load	Actual load cell reading.
LC Err	Load control error value.
LC It	Load control Integral term.
LC Pt	Load control Proportional term.
Output	Load control output value to the motor.
Ena Rly	Enable relay state.
Dir Rly	Direction relay state.

Maintenance → Logging → View

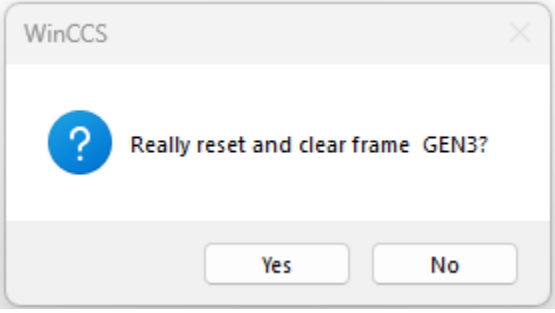
Select this menu item to open and view the data log for the selected frame.

Maintenance → Reset Frame to Idle

The Reset Frame to Idle menu is used to completely clear a test frame that is running and reset it's state back to idle. This can be used to terminate an errant test much faster than stopping the test. All data will be lost from the test. When you select this the following message box will be displayed.



Press “Yes” to reset the frame to idle and clear all test data.



The system will confirm that you want to clear all test data and reset the frame to idle state.

Maintenance → Test Load Control

This is only accessible by ATS.

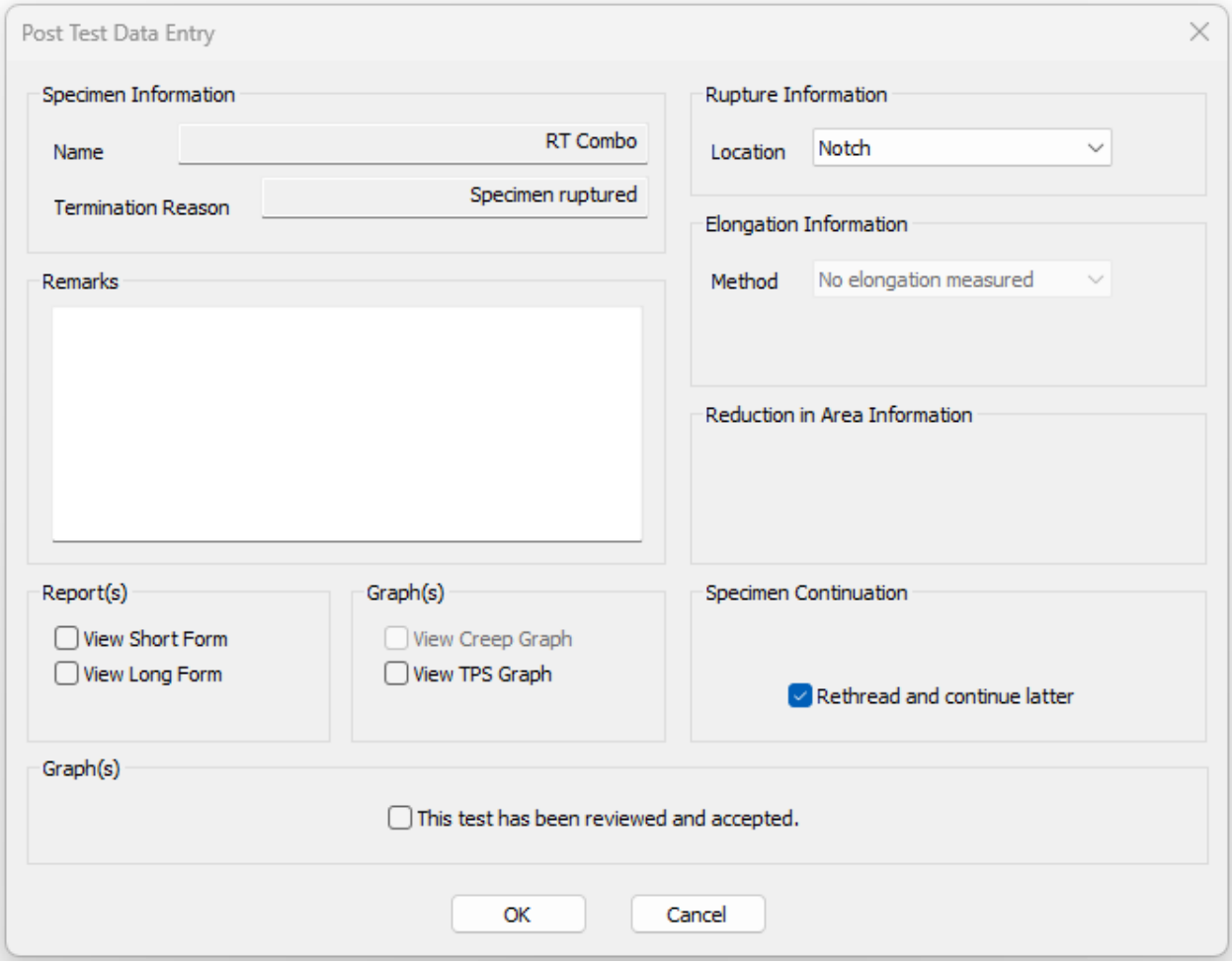
Clear Loading Error

The Clear Loading Error command is used to clear the “CLE” and “HLE” alarms that are set as a result of a Hot or Cold Creep Specimen Loading error. When a creep specimen is Hot Loaded the frame controller sends the data to the PC for validation. This validation consists of numerous checks to determine if there was a problem encountered during the loading operation. For more information on the Creep Loading process and the various checks performed see “Appendix Creep Loading”.

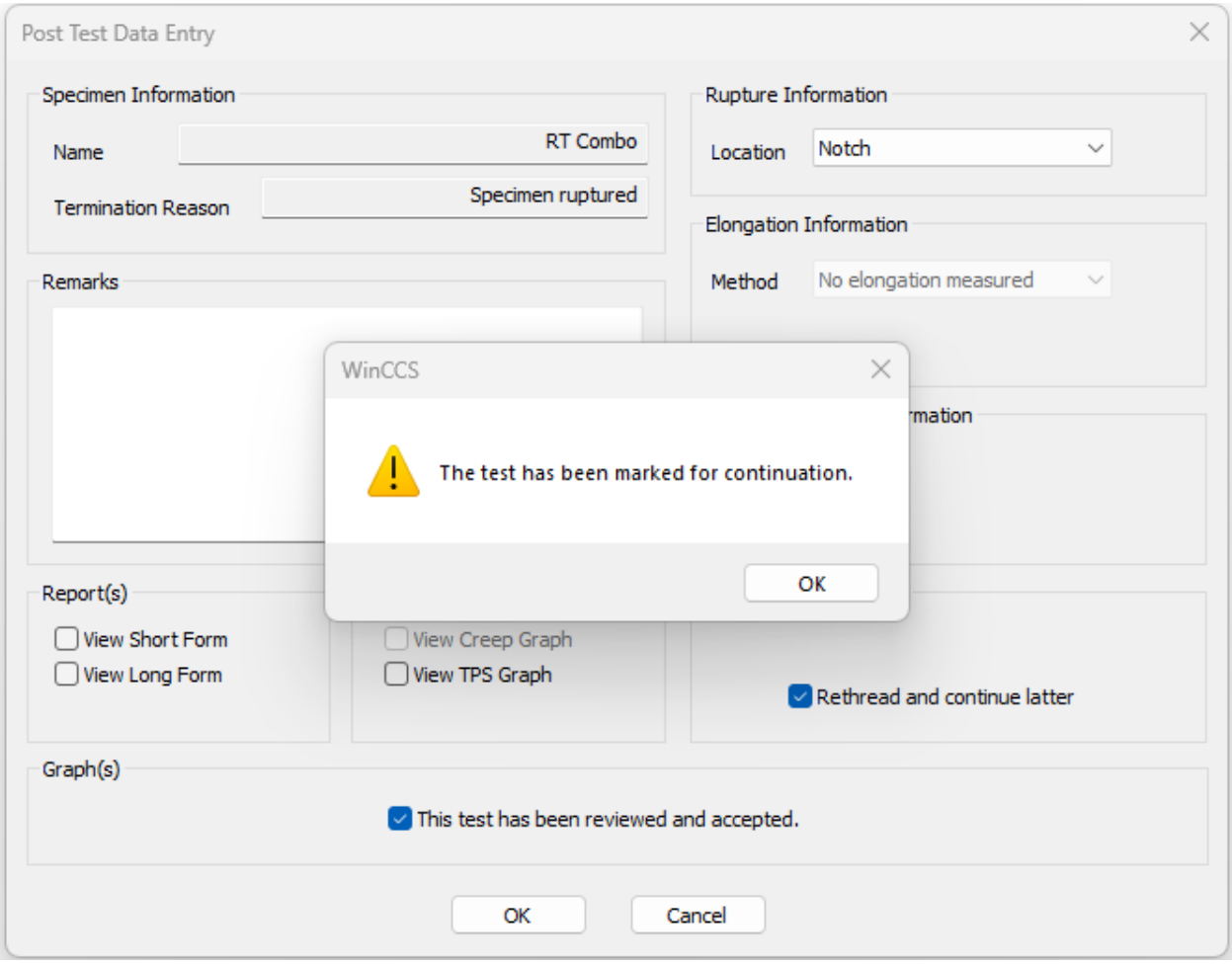
If a frame has the “CLE” or “HLE” icon on, then the user should first check the hot or cold loading report to determine if they should continue running the test or resample. If it is decided to continue running the test, the user can select the Clear Loading Error menu selection to clear the error. This will make an entry in the specimen event log using the operator’s name that was logged in at the time.

Continue a Combo Smooth (Plain) Test

The Continue a Combo Smooth (Plain) Test menu item will only appear when there is a continued Smooth (Plain) test in the system. A Smooth (Plain) test is saved by the system when a previous Combo Specimen test ruptures in the Smooth (Plain) section of the specimen, and the user selects the “Rethread and Continue Later.” Option during Post Testing. A Post Test example of this is shown below.

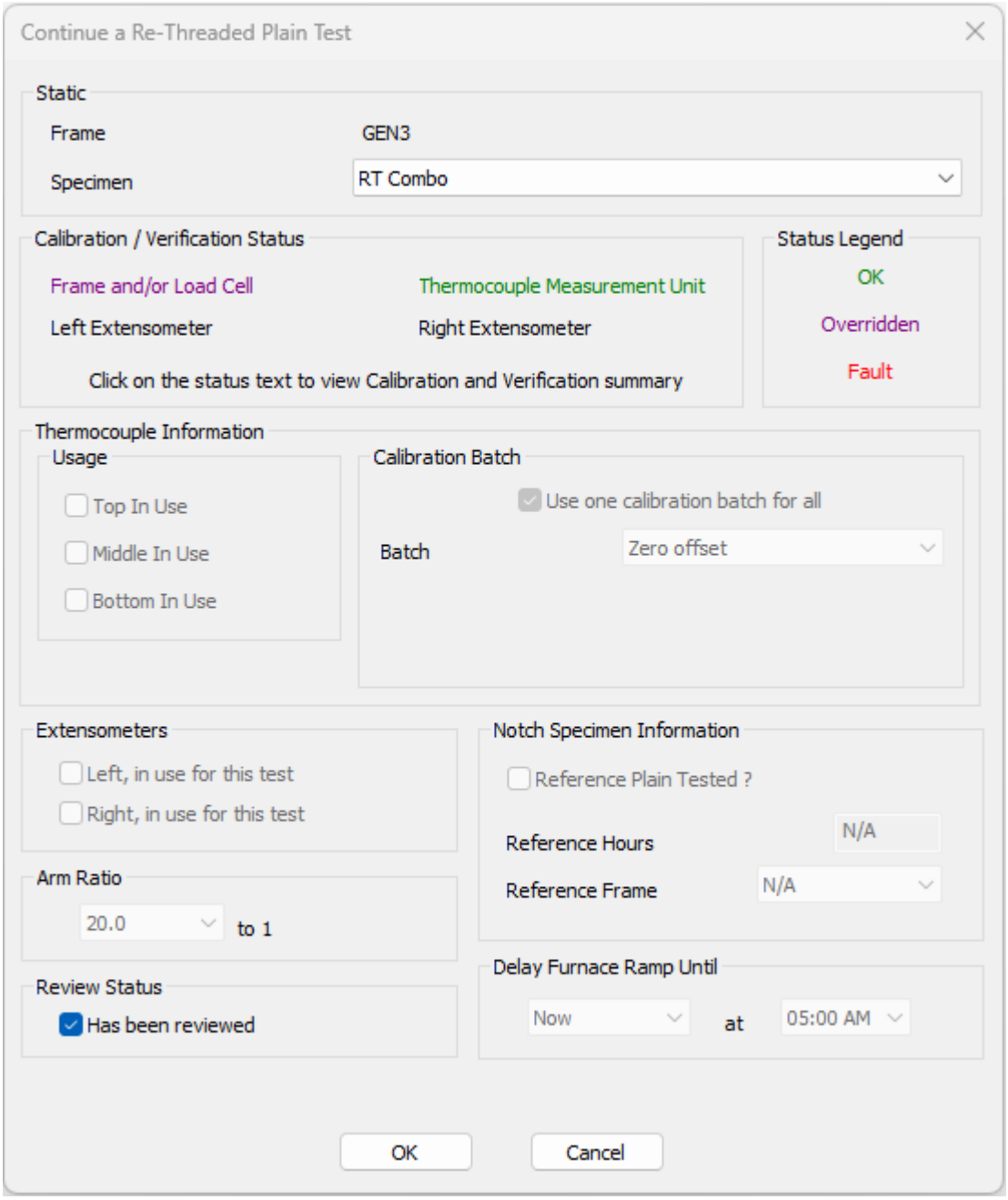


When the user selects the Rupture Location of “Notch”, the “Rethread and continue later.” Check box will be displayed. Checking the box instructs the system to move the specimen over to the ‘Continue Test Queue” so that the test can be restarted with the rethreaded Smooth (Plain) section. Once they finish post testing the specimen, the following dialog box will be displayed to confirm that the test is ready to be continued.



Click OK to proceed.

As stated previously, the Continue a Combo Smooth (Plain) Test menu item will only appear when there is a continued specimen in the “Continue Test Queue”. If the menu item is available and the user selects it the following Start Test dialog will be displayed.

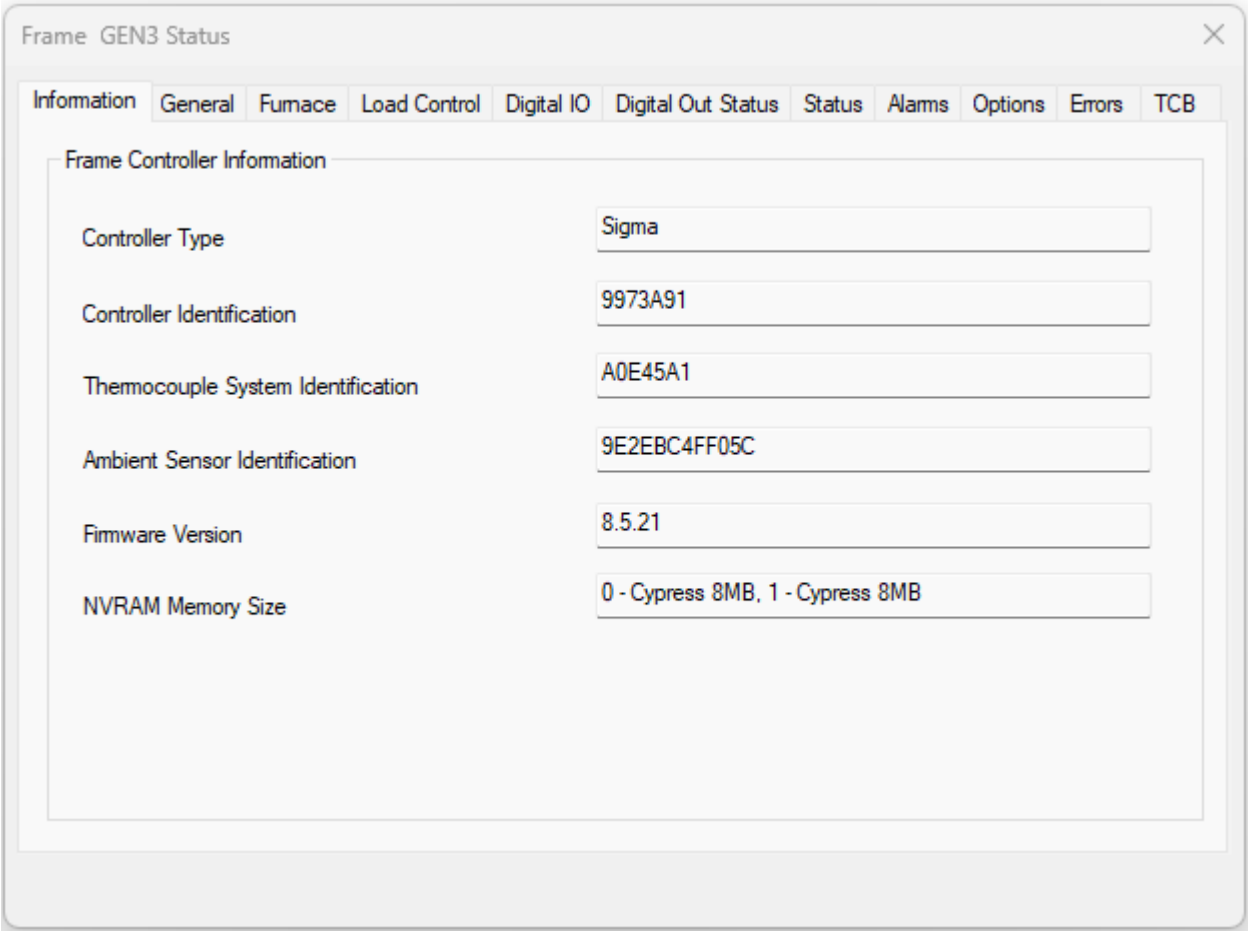


This Start Test dialog is the same as the normal Start Test dialog except the only tests shown are continued specimen. Please see “Start Test” menu item for correct usage.

Controller Status

The Controller Status menu item opens the Controller Status property sheet, which will be populated by several Property Pages depending on the actual Frame Controller type that is used in the test frame. The

Property Pages all update constantly allowing the user to see in real time the status of most of the controllers inputs and outputs.



Enter Post Test Information

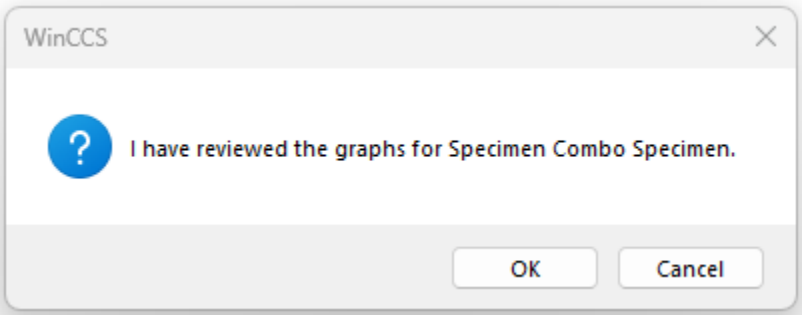
The Enter Post Test Information menu item starts the post testing process for a specimen. This process guides the user through entering the after (post) test information. The information required depends on the specimen type, and various testing requirements specified in the Test Specification.

IMPORTANT: The following example is for a Combination Specimen, which has requirements set in the test specification for reporting reduction in area and 4D and Overall Length method elongations.

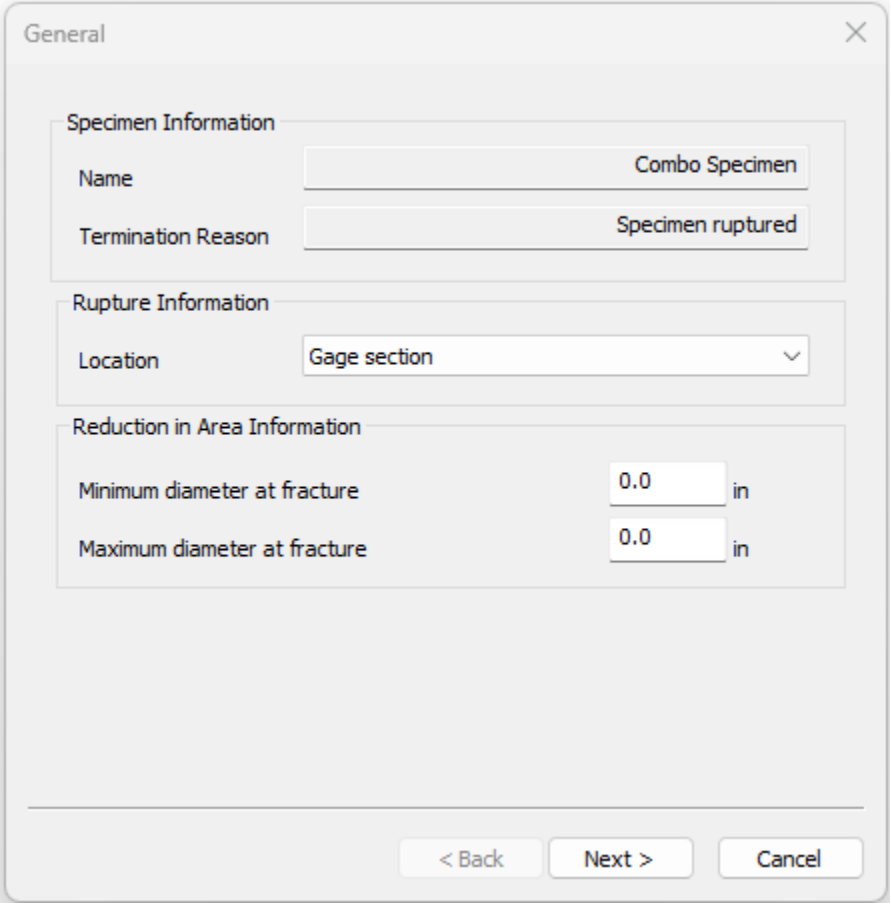
If the user has the “Test Review Option” enabled, then when the post testing process starts it will require the user to review the specimen graphs. The graphs that are presented depend on the test type as shown below and the settings for the “Test Review Option”.

- Creep Graph: Shown for Creep tests.
- Temperature: Shown for elevated temperature tests.
- Load: Shown for Load Control frames.
- Laboratory Ambient Graph: Shown for all tests, if the frame is equipped with an ambient sensor.

The graphs will be displayed to the user, and after each of the review graphs has been closed by the user the following dialog will be displayed.



Clicking the “OK” button continues the post testing process and opens the Post Test property sheet in wizard mode shown below:

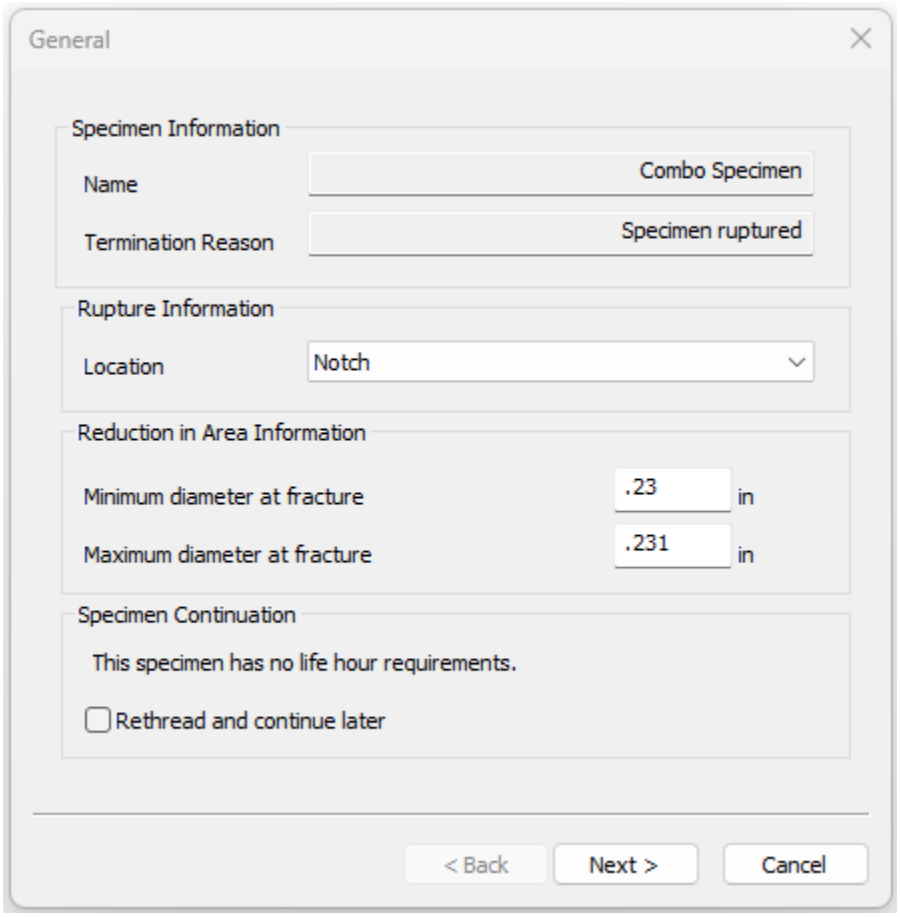


The post test “General” Property Page collects information that will change depending on the test and test specification.

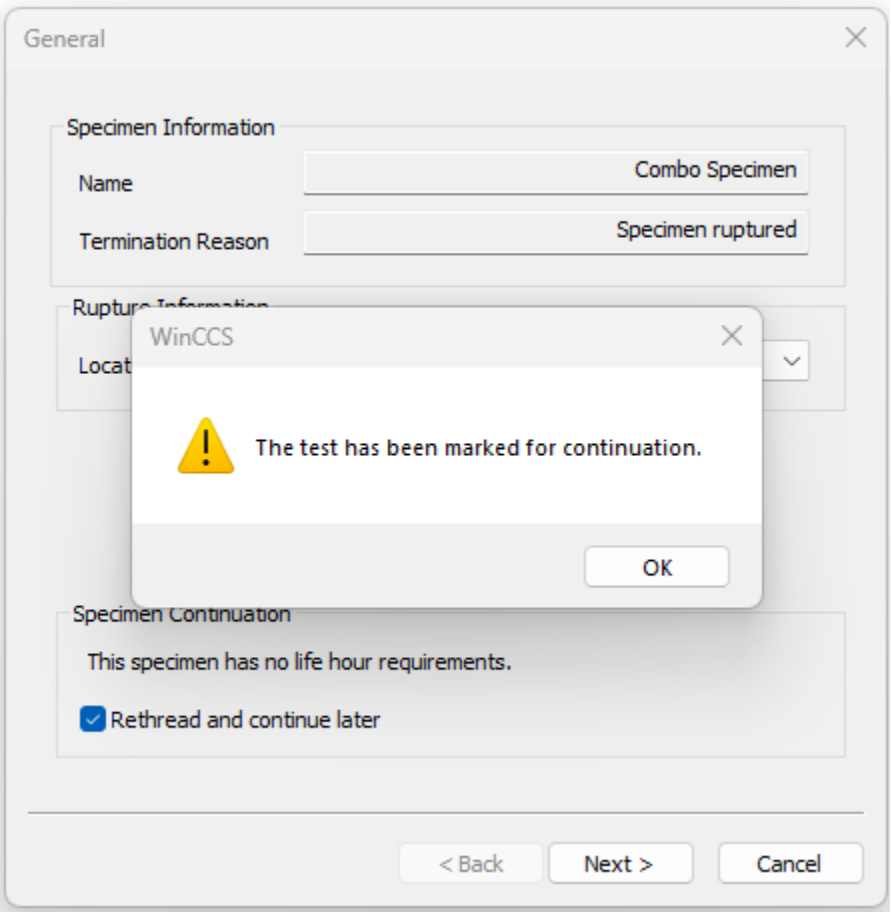
Rupture Information: The rupture location will only be enabled on tests that have broken during test. If the test was terminated for something other than a break, then this field will be grayed out.

Reduction in Area Information: These values will only be displayed when reduction in area is requested to be reported in the test specification.

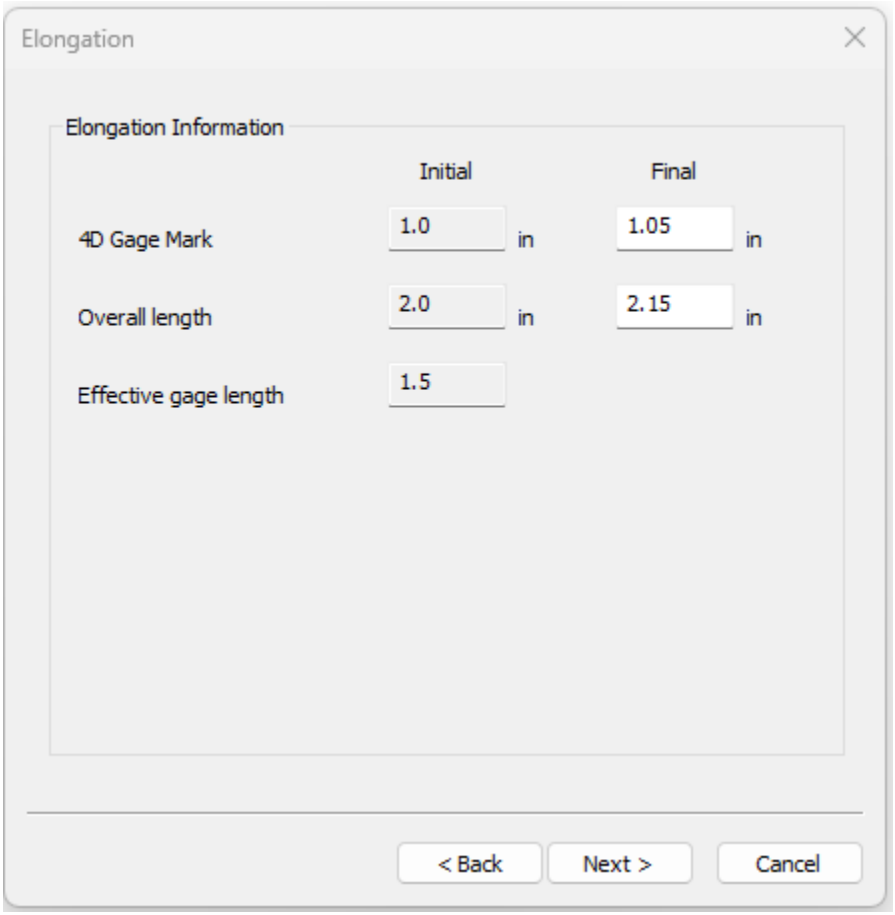
IMPORTANT: If this specimen is a combination specimen and the user selects a rupture of notch, then the Property Page will also show “Specimen Continuation” entry as illustrated below:



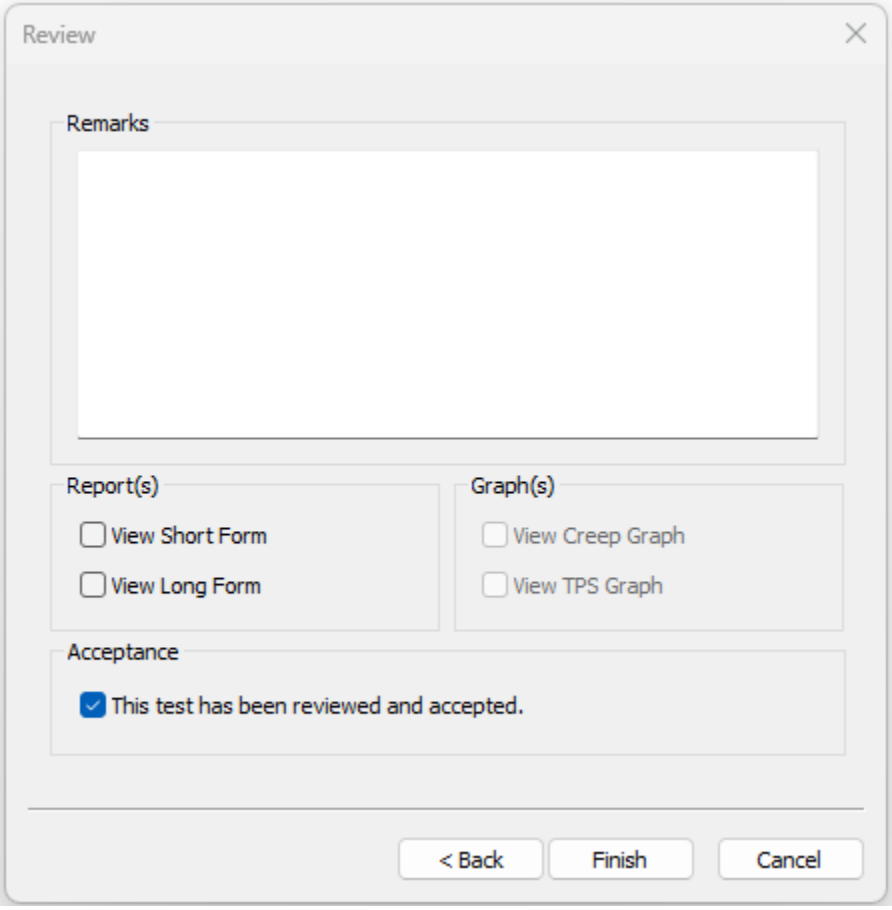
The above Property Page shows the Specimen Continuation information because the specimen is a Combination Specimen that broke on the Notch. If the user checks the Rethread and continue later than the specimen will automatically be entered into the retest queue, and the message will be shown below.



When the user acknowledges the rethread message or clicks the “Next” button the post test procedure will continue with the Elongation Property Page, if the test specification requires any elongation to be reported. If the test specification does not require elongation to be reported, then the “Review” Property Page will be displayed.



The Elongation Property Page is only displayed when elongation values are requested to be reported in the test specification. The system will display the required dimensions along with the initial values that were supplied when the specimen was created on the system. Once the final values have been entered, press next to proceed to the “Review” Property Page.



The final Property Page is the Review Property Page which allows the user to enter comments about the test, select which reports and graphs they want to view and has the “Review” check box.

IMPORTANT: The user must click on the “This test has been reviewed and accepted.” To complete the post testing process.

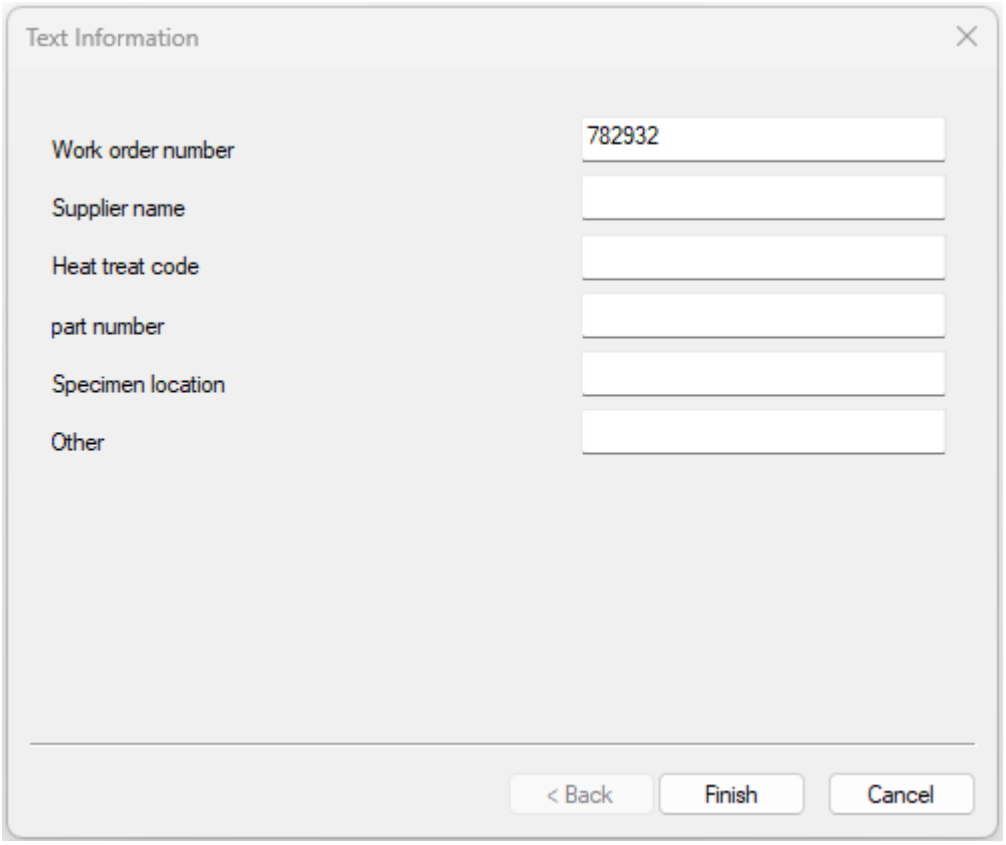
Manual Control

WARNING: The Manual Control dialog must be used with extreme caution and a complete understanding of the test frames controls, wiring and mechanical limitations. Always make sure that someone is at the machine and that adequate precautions have been taken to prevent injury to personal or the machine itself.

IMPORTANT: Always make sure that you have read and understand the Appendix – Motor Control Types before attempting to control the test frames motor!

Modify Specimen Text

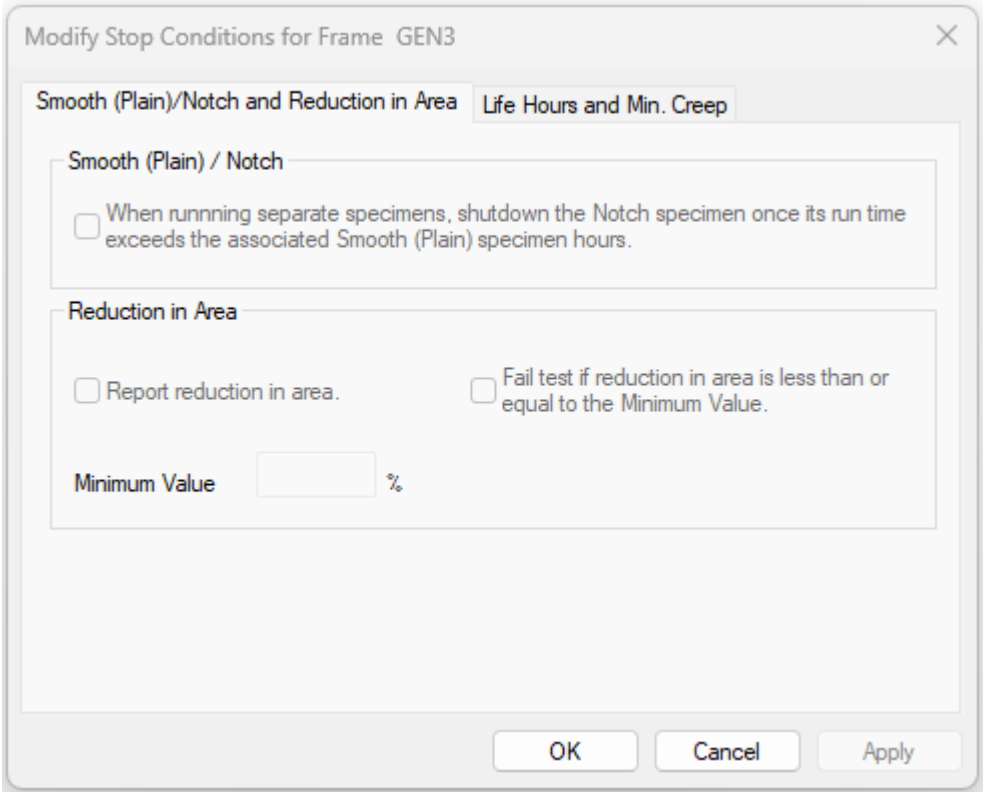
The Modify Specimen Text menu will open the following dialog box to allow the user to edit the current specimen text information on the running test.



Change or enter the text that you want for the current specimen running on the frame and click Finish to save it.

Modify Stop Conditions

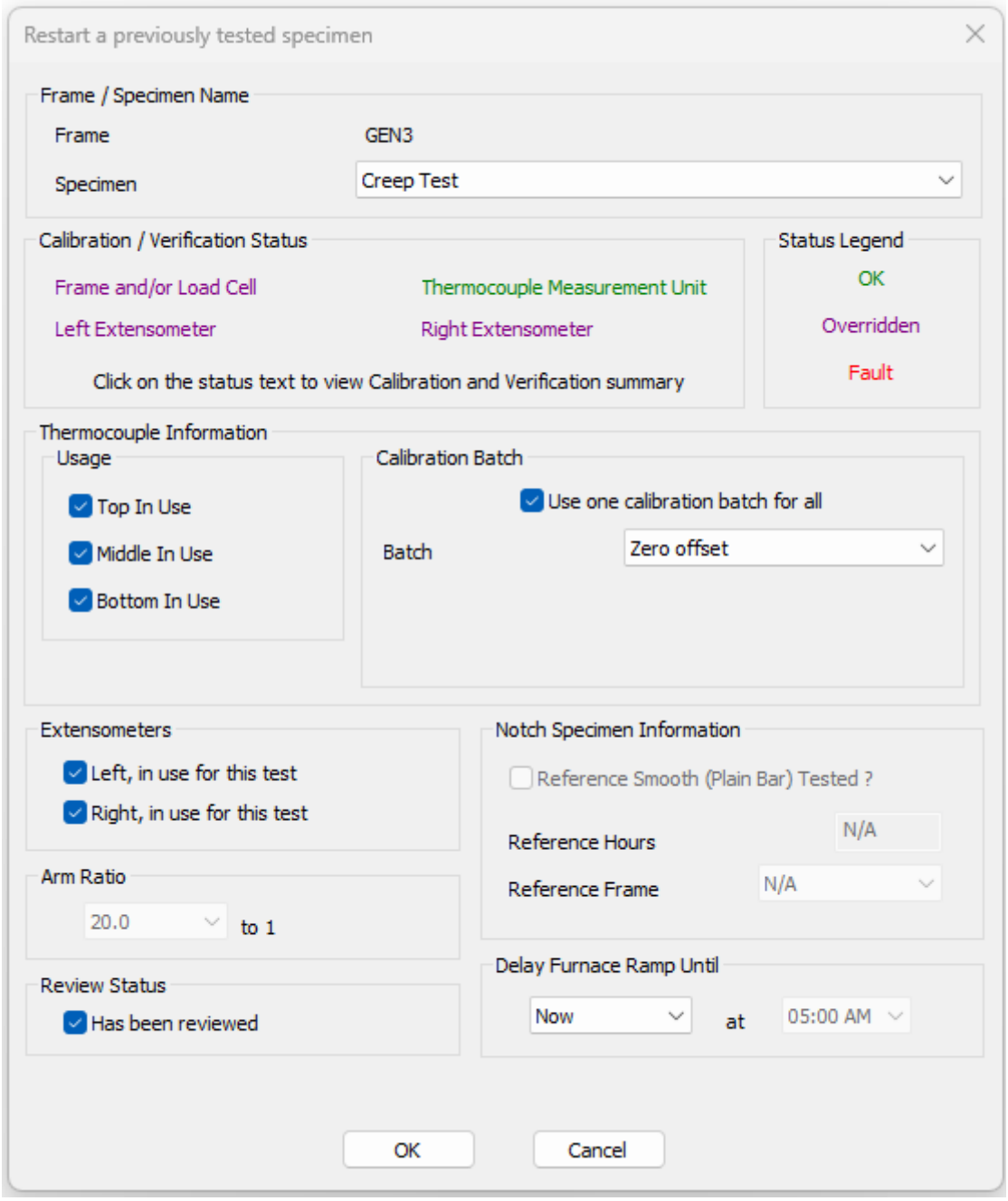
The Modify Stop Conditions when selected will open the following property sheet with two tabs to allow the user to modify the stop conditions that were specified for the test.



Once you have made your changes, click OK to save them. These changes will be transmitted to the frame controller.

Reload a Previously Run Test

The Reload a Previously Run Test will open the start test dialog, with tests selections of the current years previously run tests as shown below.



This dialog is the same as the start test dialog except that the available tests are selected from the current year's archived tests. Select the test to restart and press OK. Please refer to the Menus item "Start a Test" for complete instructions.

Remove Specimen and Post Test Later

This menu item will be available when the test is in the Post Test state. It allows the operator to remove the specimen and get another test started while waiting for the specimen to cool down for post test

measurements. Once this menu is selected the test will be moved from the machine to the Post Test Queue for post testing later. See the Main Menu Function Tests → Post Test a Previously Removed Specimen for details.

Reset and Cleat the Test

The Reset and Clear the Test menu function performs the same functions as the **Maintenance → Reset Frame to Idle** function. The only difference is that the Reset and Clear the Test menu function is only available when a test is in Post Test State.

Restart the Test

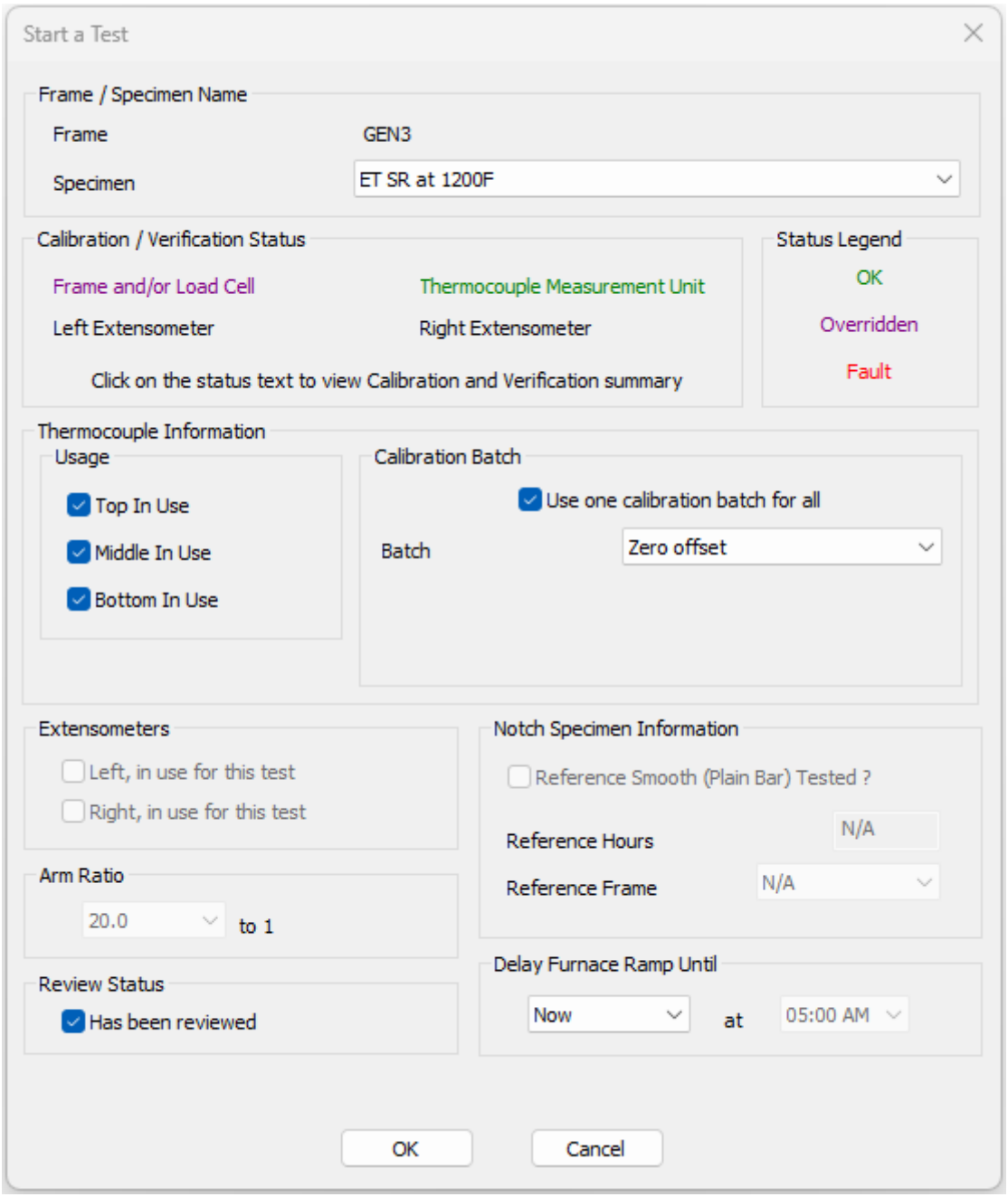
The Restart the Test function allows a user to restart a test that is in Post Test State. Sometimes a user inadvertently shuts down a test, has thermocouple issues or other problems that force them to restart the same test after it was shut down for various reasons.

Resume Creep Readings

The Resume Creep Readings menu item will only be shown when creep readings have been suspended by a user. When this is selected the extensometers are measured and the readings are set to the creep value that they were at when the readings were disabled.

Start Test

The Start Test menu item allows the user to start a previously queued specimen on the test frame. When the menu item is selected, the following dialog box will be displayed.



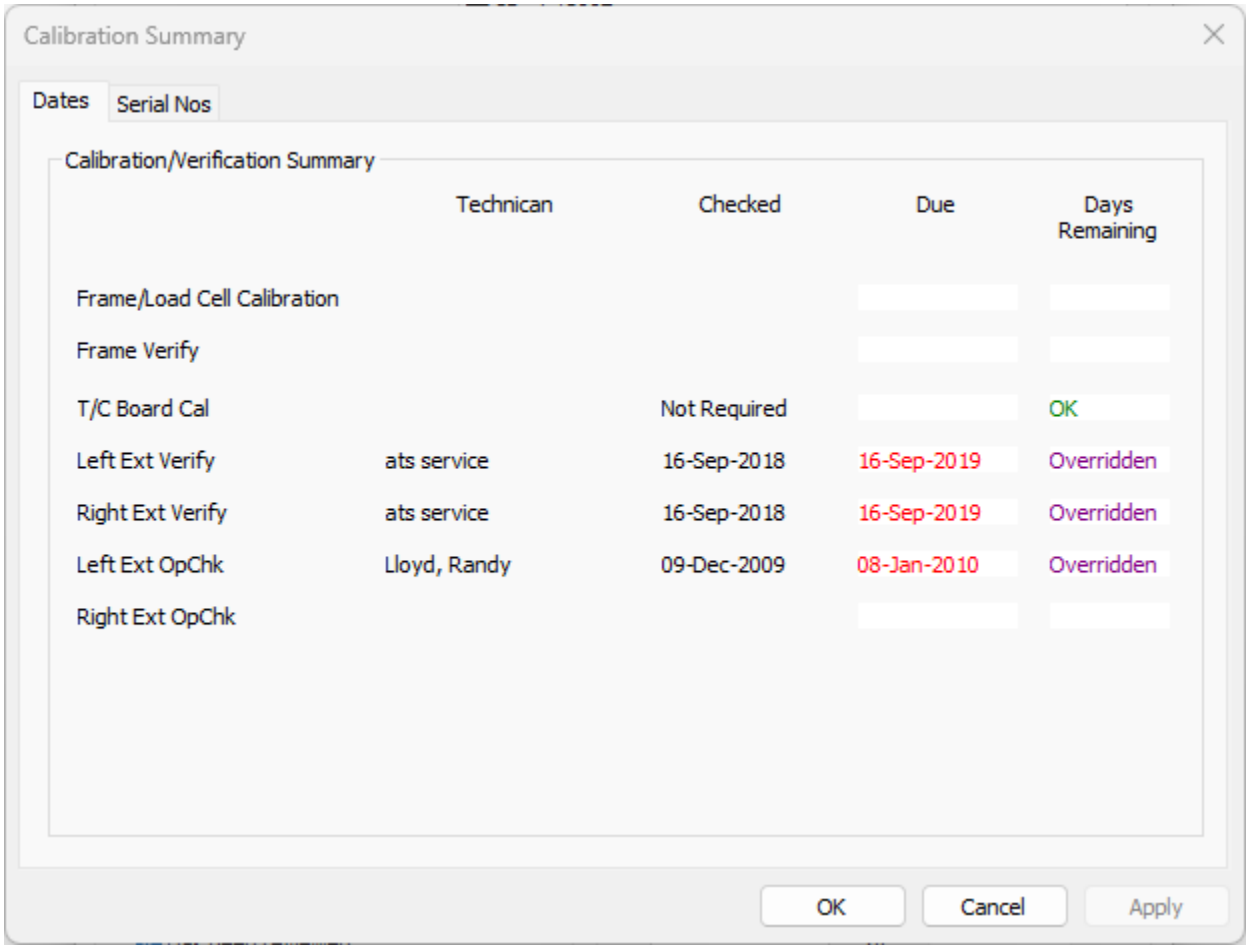
The start test dialog controls how the test will be started. Please see the description below for the explanations of the various sections of the dialog:

Frame / Specimen Name: The pull-down window allows the user to select the specimen from a list of previously created / queued specimens.

Calibration / Verification Status: The calibration / verification status shows the status of the testing frames measurement devices calibration and / or verification status. The “Legend” to the right indicates the color code used and the table below gives further explanation.

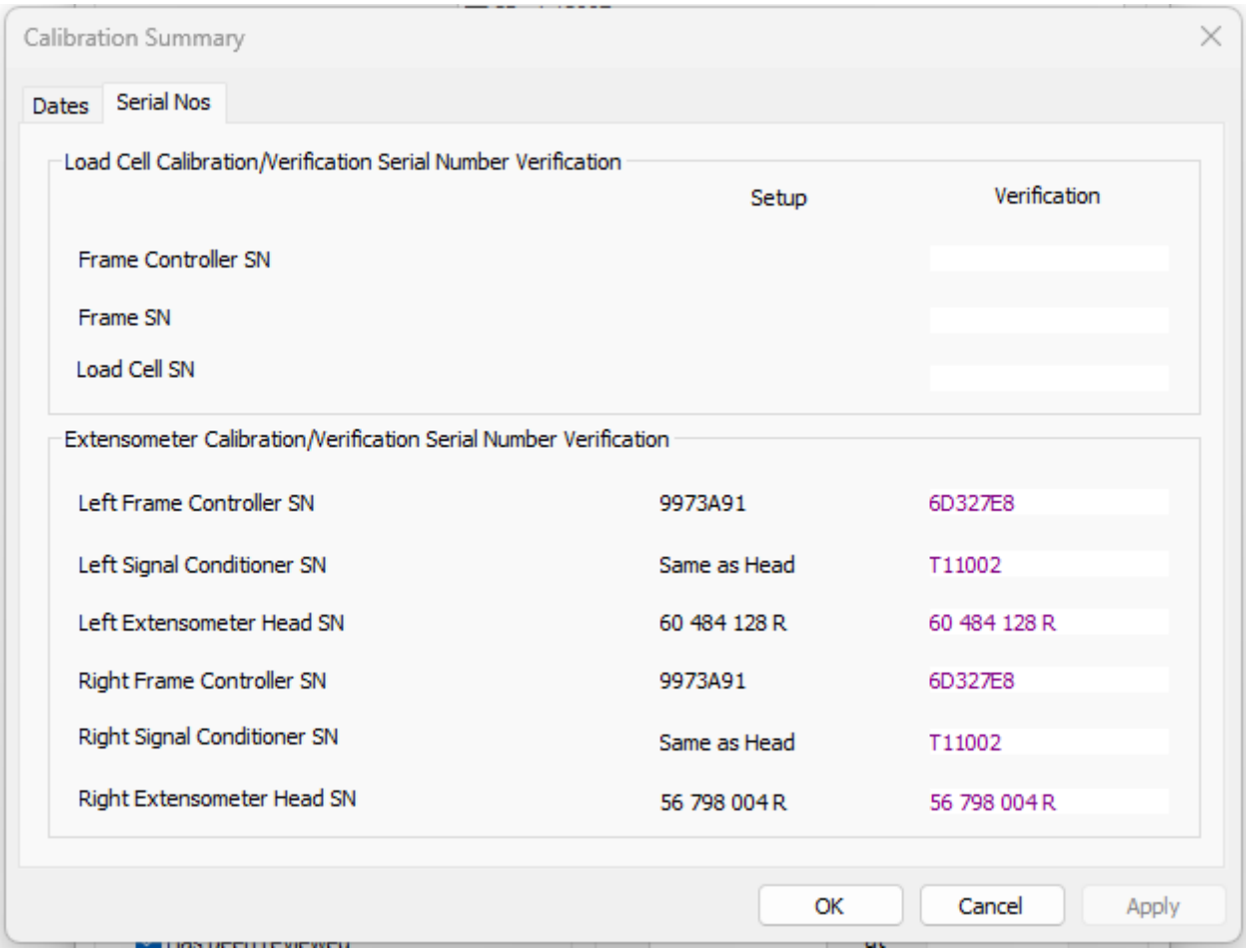
OK	The device has calibrations and verifications performed and they are current.
Overridden	The device has calibrations and verifications checking overridden, and therefore the current status is ignored.
Fault	The device’s calibration or verification has expired, and the test cannot be started.

To get specific calibration and verification status the user can left click on any one of the devices listed in the Calibration / Verification Status box and the Calibration Summary Property Sheet will be displayed as shown below.



The Dates Property Page lists the devices required calibration or verification and the technician and dates that they were performed. The Days Remaining column will show the days remaining or “Overridden” if it has been overridden in the system setup.

Clicking on the “Serial Nos” Property Page tab will display the serial number status as shown below.



The Serial Nos Property Page displays the devices current serial number along with the serial number in the verification file. This check can be overridden, but it is advised not to because it is a good way to check that they match. A typical problem can occur when an extensometer is replaced and reverified, but the calibration technician forgets to update the serial number in the machine setup. This will cause audit issues at a later date! Click “OK” to exit.

Thermocouple Information: This allows the selection of the active thermocouples and the calibration batches used for them. If the test is a room temperature test, then the selections will be grayed out.

Usage: The thermocouple usage box is where the user selects which thermocouples to use on the specimen for the test.

Calibration Batch: The calibration batch selects which thermocouple calibration batch should be used for the thermocouples. In the United States, most laboratories use a type J or K thermocouple made from large spools of calibrated wire. In this case they are using the same wire batch for all of the thermocouples on the specimen. European laboratories typically use type R or S individual thermocouples for testing, so the “Use one calibration batch for all” should be unchecked and each thermocouple’s serial number batch would be selected.

Extensometers: This allows the user to select which extensometers should be used for the test. If the test is a stress rupture test, then this will be grayed out.

Arm Ratio: Usually, this selection is set and grayed out, but if the frame is a multiple ratio frame, then the user must select the current arm ratio for the testing machine.

Review Status: This shows the status of the specimen review. If the specimen has not been reviewed, then this box will not be checked, and the test will not be allowed to start.

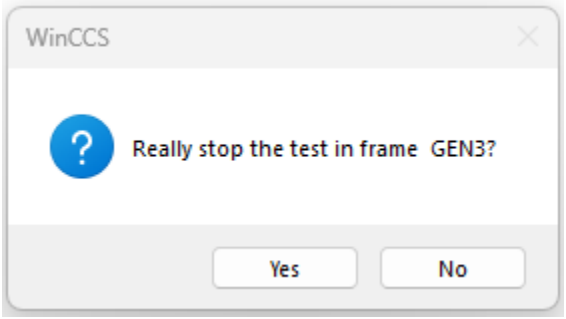
Notch Specimen Information: The items in this box will only be enabled when the specimen type for the selected test is a Notch. Since the Notch hours relies on being compared to the Smooth (Plain Bar) hours of an associated specimen the system requires the user to start the Smooth (Plain Bar) specimen first or run it to completion before the Notch is tested.

Therefore, when starting a Notch always have the Smooth (Plain Bar) testing already in the system or tested. If the Smooth (Plain Bar) is already tested, then click the "Reference Smooth (Plain Bar) Tested?" check box and enter the "Reference Hours". If the Smooth (Plain Bar) is already testing in a frame, leave the test files together and allow the Notch specimen to automatically terminate when the Smooth (Plain Bar) ruptures.

Delay Furnace Ramp Until: This allows the user to delay startup of a test to a later time. Laboratories that are staffed by a single shift, using manually loaded machines find this useful to start several tests with a delayed start time of an hour or two before the start of the next day. That way when they come in the next day, the specimens are soaked and ready to load but were not soaking all night.

Stop Test

The Stop Test menu is used to terminate a test before it breaks, or other termination conditions would have normally stopped the test.



Click "OK" to terminate the test. An entry will be made in the test events to indicate that the test was terminated by the user logged in at the time.

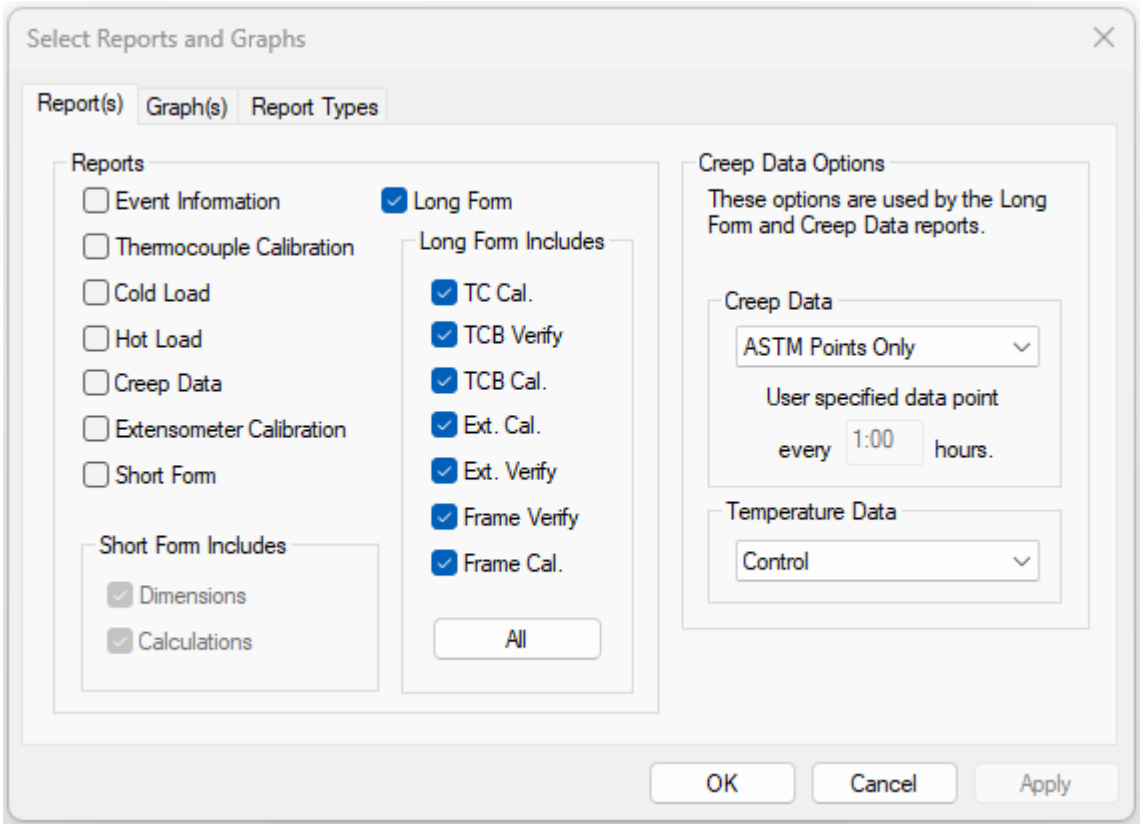
Suspend Creep Readings

The Suspend Creep Readings menu function is used to stop creep readings for a short period during the test to adjust the extensometry, re-zero the extensometers or sometimes to adjust the lever arm on elevator-based machines. When this option is selected the current extensometer readings are saved and then further logging is suspended until the user selects the Resume Creep Readings menu function, which will only appear when the readings have been suspended.

Click “OK” to suspend the creep reading to make frame / specimen extensometry adjustments. Select the Resume Creep Readings when done.

View Data

The View Data menu item allows the user to select data items they want to view. When this is selected the following Property Sheet will open:



The user can select the various reports that they want to view. Note that the Short Form and Long Form allow the reports to be tailored by the sub check boxes. The Creep Data Options allows the user to select the creep data to be reported on the report as described below:

All Creep Data: This will display every creep data point in the test record.

ASTM Points: Creep points will be displayed every fifteen minutes for the first two hours and then every hour thereafter.

None: Does not display the creep data points.

Plastic Points Only: Creep data points will be displayed according to the table shown below:

Runtime	Display Creep Data Every
Runtime < 99 minutes	10 minutes
99 < Runtime < 999	100 minutes
999 < Runtime < 9999	1,000 minutes
9999 < Runtime < 99999	10,000 minutes
Runtime < 99999	100,000 minutes

User Specified Points Only: Displays the data points at the rate specified by the user.

Temperature Data: The temperature data selection allows the user to select which thermocouples to report from the options below.

All: This will display the top, middle, bottom, and user thermocouple values.

Average of Control: This will display the average temperature of the selected control thermocouples.

Bottom: This will display the control thermocouple, which is the hottest thermocouple or the top thermocouple.

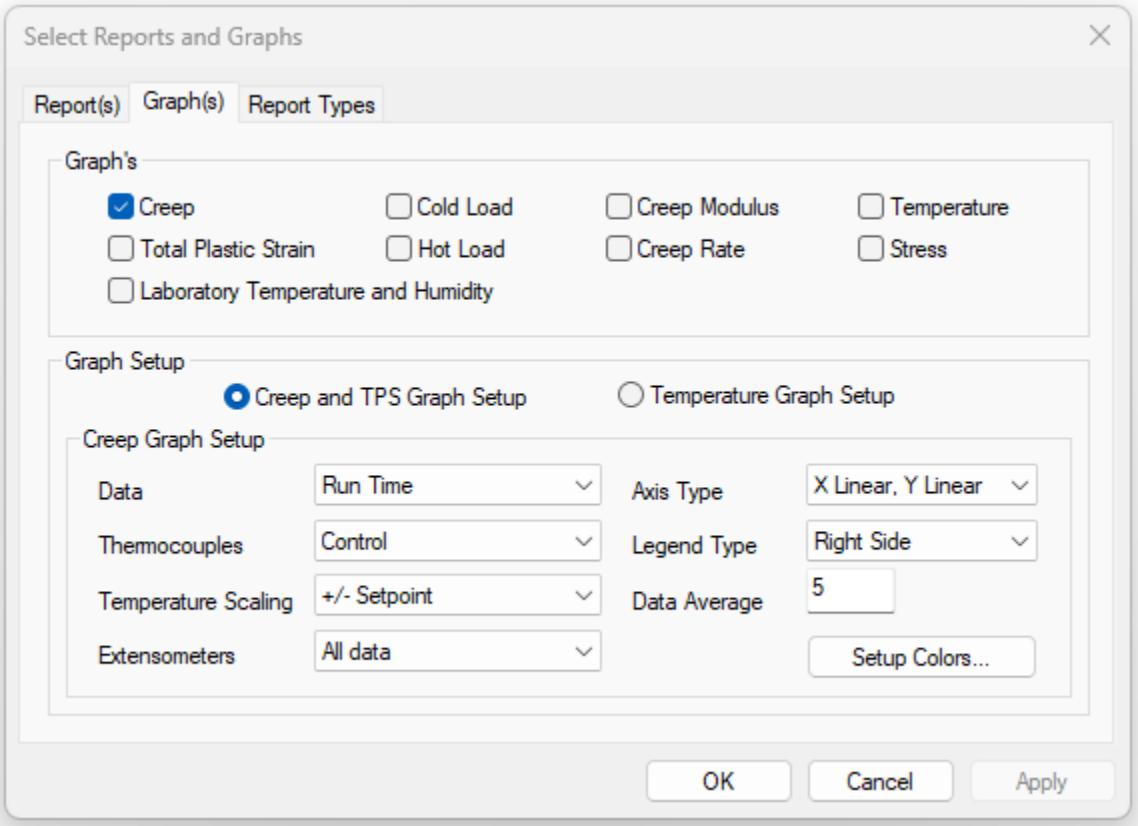
Middle: This will display the Middle thermocouple only.

Non: Does not display any temperature data.

Top: This will display the Top thermocouple only.

User: This will display the User thermocouple only.

Once the user has selected the reports to display and the parameters for them, click on the “Graph(s)” tab to select the graphs to display.



The Graph(s) Property Page allows the user to select the graphs to be displayed. There are various modifiers for the graphs as described below:

By clicking on the “Creep and TPS Graph Setup” or “temperature Graph Setup” selects the modifiers for the graphs that have been selected to display.

Creep and TPS Graph Setup

Data: This selects whether to display the entire data set or only the data during specimen run time.

Thermocouples: The creep graph can display thermocouples and creep data on the same graph. This allows the selection of which thermocouple to display on the graph. The user can select from all the control, average of control or individual thermocouples.

Temperature Scaling: This is only available if one or more thermocouples has been selected to graph. The options are + / - Setpoint, which will scale the graph as a deviation from setpoint, or Entire Test Range.

Extensometers: This selects the Left, Right, Average or All Data of the extensometers to graph.

Axis Type: Selects whether the graphs should use linear or logarithmic scaling on the X and Y axis.

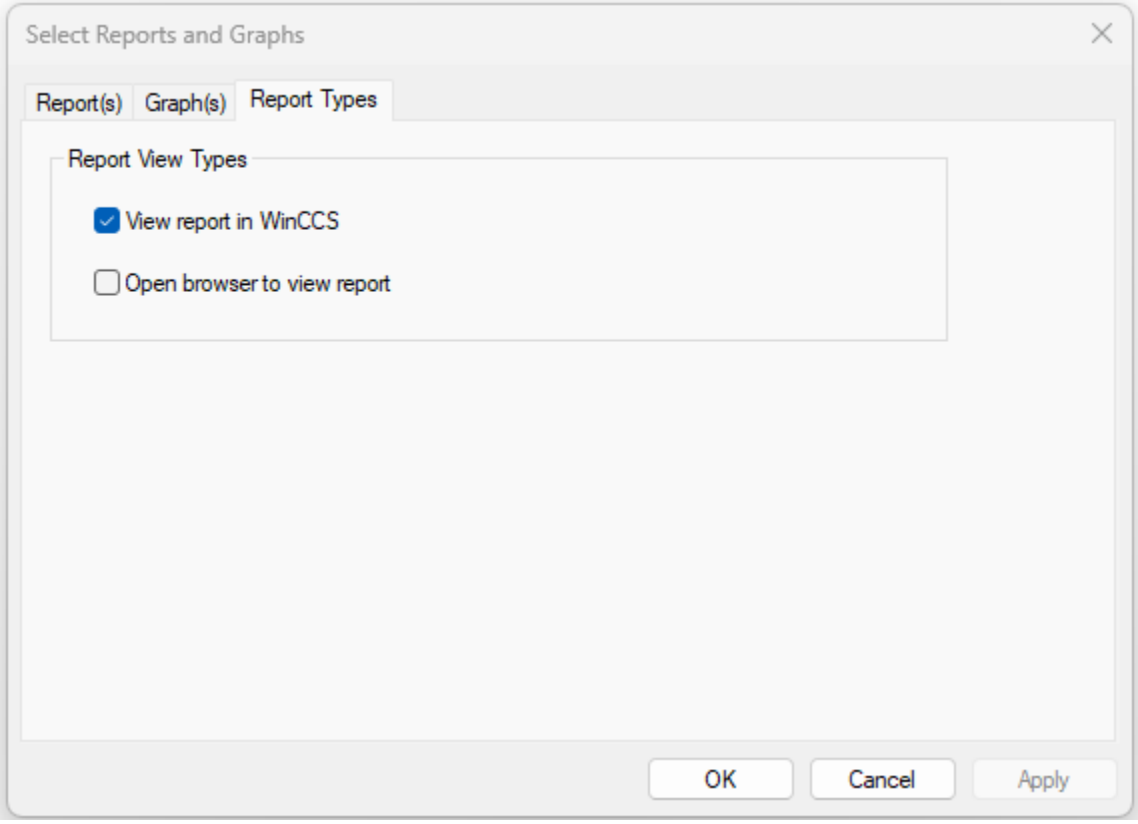
Legend Type: Selects whether the legend for the graphs should be displayed on the right side of the graph or down on the lower right corner of the graph.

Data Average: This will use a simple average of the number of points on the creep graph only. This is typically only used on system using LVDT's or Strain Gage extensometers to reduce the noise in the graph. Digital extensometers do not require any averaging.

Temperature Graph Setup

The temperature graph setup uses the same setup parameters as the Creep and TPS Graphs, please refer to the previous section for explanations.

Once the graphs have been selected, click on the final tab to select the 'Report Types" as show below.



This Property Page allows the user to select how to display reports. It defaults to the setting that is selected in the System → General Setup "Report Types" tab. "View report in WinCCS" is the typical setting because it used the built-in report features of WinCCS and provides faster, more uniform display of the reports. A second option is the "Open browser to view report" which will use the users default browser to open the report in a separate window on the PC. This is useful for PC with dual or very large monitors.

Once all selections are made, click the "OK" button and the reports and graphs will open.

View User Data

This menu item will display the reports and graphs that the user selected in their user account. See User→ Privileges "Status Display Report(s)" and "Status Display Graph(s)" tabs to setup the reports and graphs.

Force Firmware Download

The Force Frame Download menu item is used to force a download of the current firmware file located on the PC to the frame controller even if the version is the same or an earlier one. When selected the download will start a few seconds later.

NOTE: This should only be used when requested to by an Applied Test Systems service technician.

Hot and Cold Loading Errors

A new analysis feature was added to the Hot and Cold Stepped Loading data to attempt to flag potential issues when the specimen is loaded. Once the loading process is complete the data is transmitted to the WinCCS program, which processes the Loading Data. If any anomalies are detected, then the system will raise a "HLE" (Hot Loading Error) or "CLE" (Cold Loading Error) on the system status screen signaling the operator to check the Loading Report to determine if action needs to be taken. Please note that getting one of these errors does not mean that the test is a failure, but it should be reviewed by the laboratories Quality Control group to determine if the test is OK to continue.

Below is a list of error conditions that can occur during a hot or cold stepped load for a creep specimen.

Correlation Coefficient

When the system performs the data reduction for a Hot or Cold Load it computes the loading between the minimum and maximum stress points set in the specimen's test specification. This loading slope is computed by using a Least Square Fit algorithm. This algorithm generates a slope and intercept of the data which is used to determine the actual zero point of the load and the loading slope or material modulus. A byproduct of the Least Squares Fit algorithm is a unitless number called the Correlation Coefficient, whose values is between one and zero. A value of close to one means that there is good correlation between the data and a straight line, whereas a number closer to zero means that the data is scattered and does not closely fit a straight line. WinCCS will flag a Correlation Coefficient when the value is less than 0.9 and will display the message - "(Left or Right) extensometer correlation coefficient below x.xx", where x.xx is the actual value.

Least Squares Fit Computation Error

There are various checks during the Least Square Fit computations that validate that the computation is valid. If any of those tests fail, then the following message will be displayed – "(Left or Right) extensometer has unknown error computing the least squares fit.".

Inconsistent Extension Data Fault

The inconsistent extension data fault is caused when the next extension data point in the loading operation is less than the previous one. This is a clear indication of binding and release of the extensometer device. If this occurs the following message will be displayed – “(Left or Right) extensometer data is inconsistent.”.

Different Extension Fault

If the Loading Data is perfect, then the Left and the Right extensometer’s extension should be very close to one another. If there is binding in the extensometry or alignment issues due to the machine or threads, then the extension measured can vary significantly. The system will check the Loading Data and if the two sides differ from one another by more than 85% then the following message will be displayed – “Left extensometer extension is less than 85% of the Right extensometer.”.

Different Slope Fault

This is a similar issue to the “Different Extension Fault”, where the ratio of the Left to Right extensometer slope is compared to 0.9. If the ratio if less than 0.9 then there is potential binding, and the following message will be displayed – “Left extensometer slope is less than 90% of the Right extensometer.”.

Negative Slope Fault

In certain circumstances an extensometer will generate a negative slope. This is typically caused by very poor alignment or an issue with the specimen or pull bar threads causing an alignment issue. If an extensometers loading slope is negative than the following message will be displayed – “(Left or Right) extensometer has a negative slope.”.

Unknown Error Computing Least Squares Fit

While computing the Least Squares Fit there are various checks on the intermediate values that are computed. When this occurs, the data is usually so errant that the data has to be considered faulty. If any of these values are out of bounds for the computation than the following message will be displayed – “(Left or Right) extensometer has unknown error computing the least squares fit.”

Extension Ratio Fault

The Extension Ratio is a ratio between the predicted and actual extension. When this ratio is less that 0.9 it indicates that the modulus curve differs considerably from the actual data. If this occurs than the following message will be displayed – “The ratio between predicted and actual extension is less than 0.9.”.

Negative Extension Fault

In certain circumstances an extensometer will generate a negative extension. This is typically caused by very poor alignment or an issue with the specimen or pull bar threads causing an alignment issue. If an extensometers extension is negative than the following message will be displayed – “Measured extension is negative.”.

Average Correlation Coefficient

If the loading is performed with a dual extensometer device than the Left and Right extensometer Correlation Coefficient will be averaged and if the resultant value is less than 0.9 then the following message will be displayed - “Average extensometer correlation coefficient below 0.9.”.

Average Extension Slope

If the loading is performed with a dual extensometer device than the Left and Right extension slope is averaged and if the resultant value is less than zero, then the following message will be displayed - “Average extension slope is negative.”.

Inconsistent Load Data Fault

The inconsistent load data fault is caused when the next load data point in the loading operation is less than the previous one. This should never happen and can indicate many different types of machine failures or specimen issues. If this occurs the following message will be displayed – “Load data is inconsistent.”.

Appendix #1 (Furnace Control Appendix)

Furnace Control

All WinCCS controllers use the same furnace power control technology to achieve stabile accurate temperature control of the specimen during the test. They key feature of the WinCCS temperature controls are as follows:

- Control via specimen thermocouples.
- Ability to have thermocouples fail during the test.
- AC Line sensing with automatic power correction to the furnace.
- Automated functions to keep specimen temperature uniform.
- High precision temperature measurement subsystem.

These features are made possible by the multi control loop technology standard in all WinCCS controllers.

Main Temperature Loop

The first control loop is a special proportional and integral control loop that uses the highest temperature thermocouple during a controller ramp to the required temperature. As the temperature approaches the setpoint, a proprietary algorithm is used to reduce the ramp rate to allow for smooth temperature transition from ramping to steady temperature. Buried in this routine are safety checks that look for high furnace power for too long, which would indicate shorted thermocouples, thermocouples that detached from the specimen or incorrect thermocouple types. The output of this routine is a 0 to 100% power output for the overall furnace.

Furnace Split Algorithm

The power from the main temperature loop is then fed into the Furnace Split Algorithm. This algorithm allocates power to the active furnace zones based on the differential between the thermocouples on the specimen. This prevents one thermocouple from overdriving the rest of the furnace if it is below setpoint. Another feature of this is that if a thermocouple fails during the test, the routine locks the power allocation to that zone and continues to adjust the other zones allocation. This prevents test shutdown from the loss of a specimen thermocouple. The output of this routine is a percent power for each active zone.

Digital Power Controller

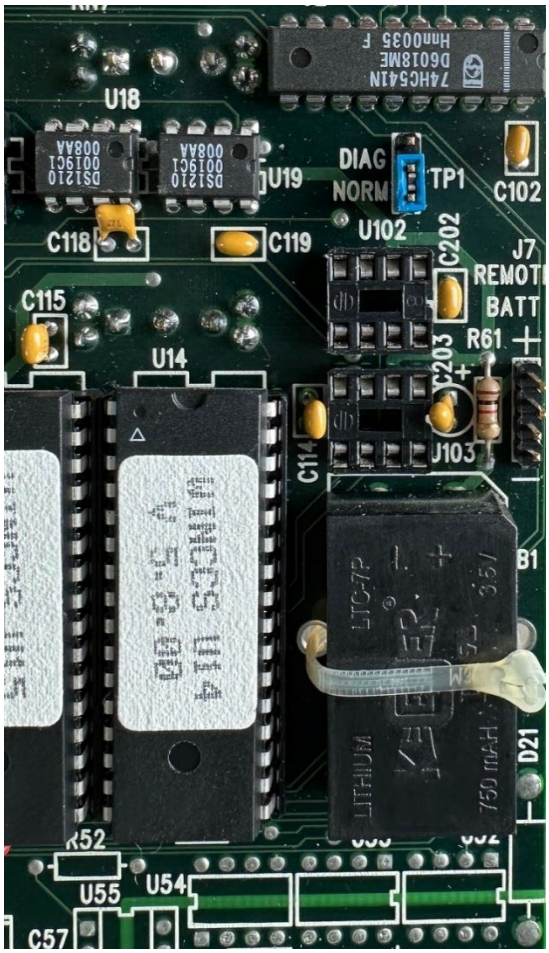
The digital power controller performs power control by syncing to the AC line and turning on and offline cycles to each furnace zone. The controller also phases the on / off cycles for each zone so that it minimizes the peak amperage drawn by the furnace. This is very important in a large facility because their electrical bill is typically based on peak demand. Another novel aspect of this controller is that it monitors the RMS value of the AC line and performs a squared correction for each zone. This causes the actual power delivered to the furnace at a setting to remain constant as the AC line fluctuates. Thereby further promoting temperature stability in the furnace.

Appendix #2 – Frame Controller Configuration Switches (Appendix 201)

Frame Controller Hardware Configuration

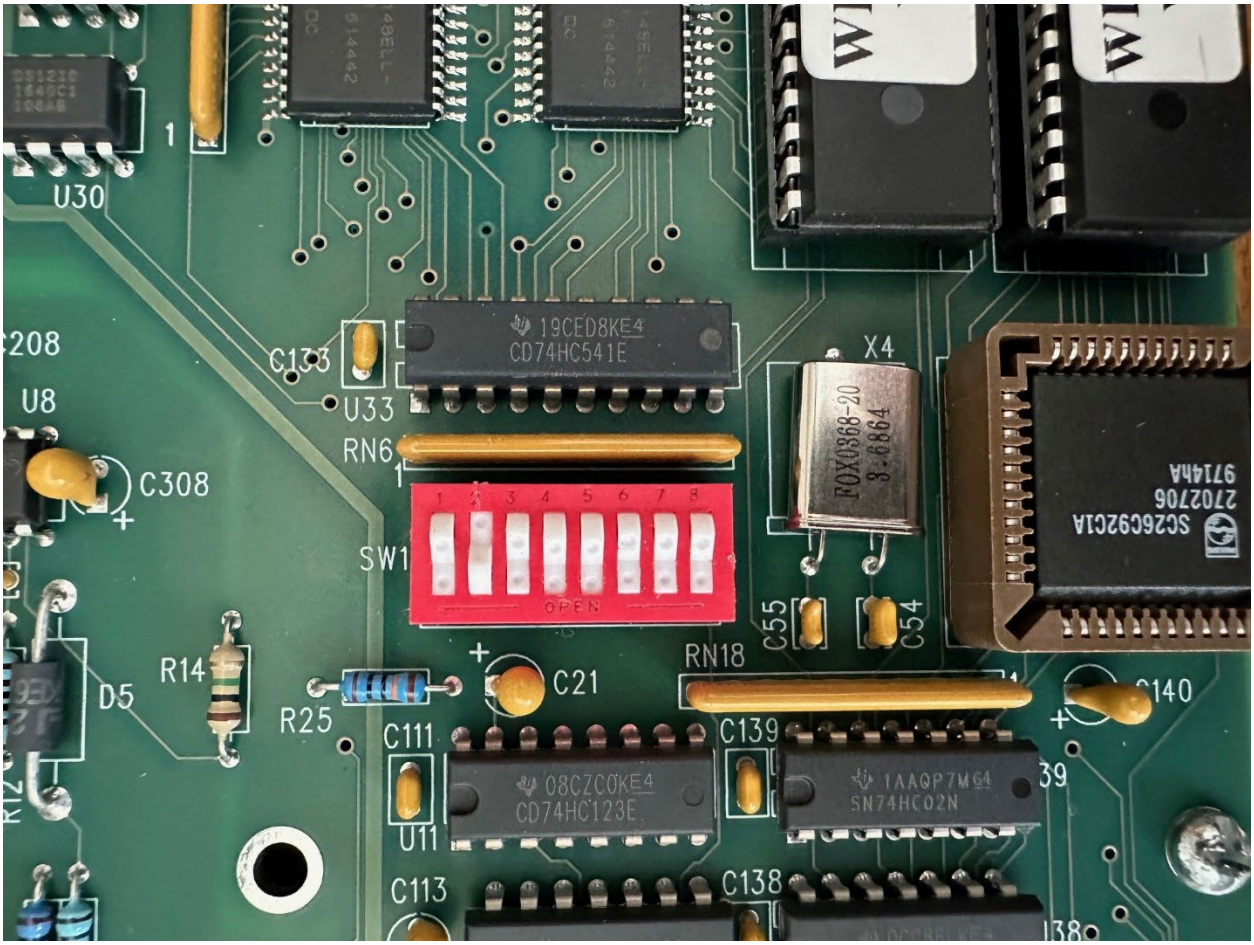
Classic / GEN1

The Classic / GEN1 controller uses the on board displays and user defined switches to set the controller's address and reset the device to factory settings. The only user configurable option is a jumper labeled TP1, which enables special diagnostics displays that are viewed on the on-board displays. Below is a picture showing the special diagnostics display jumper TP1.



Modular / GEN2

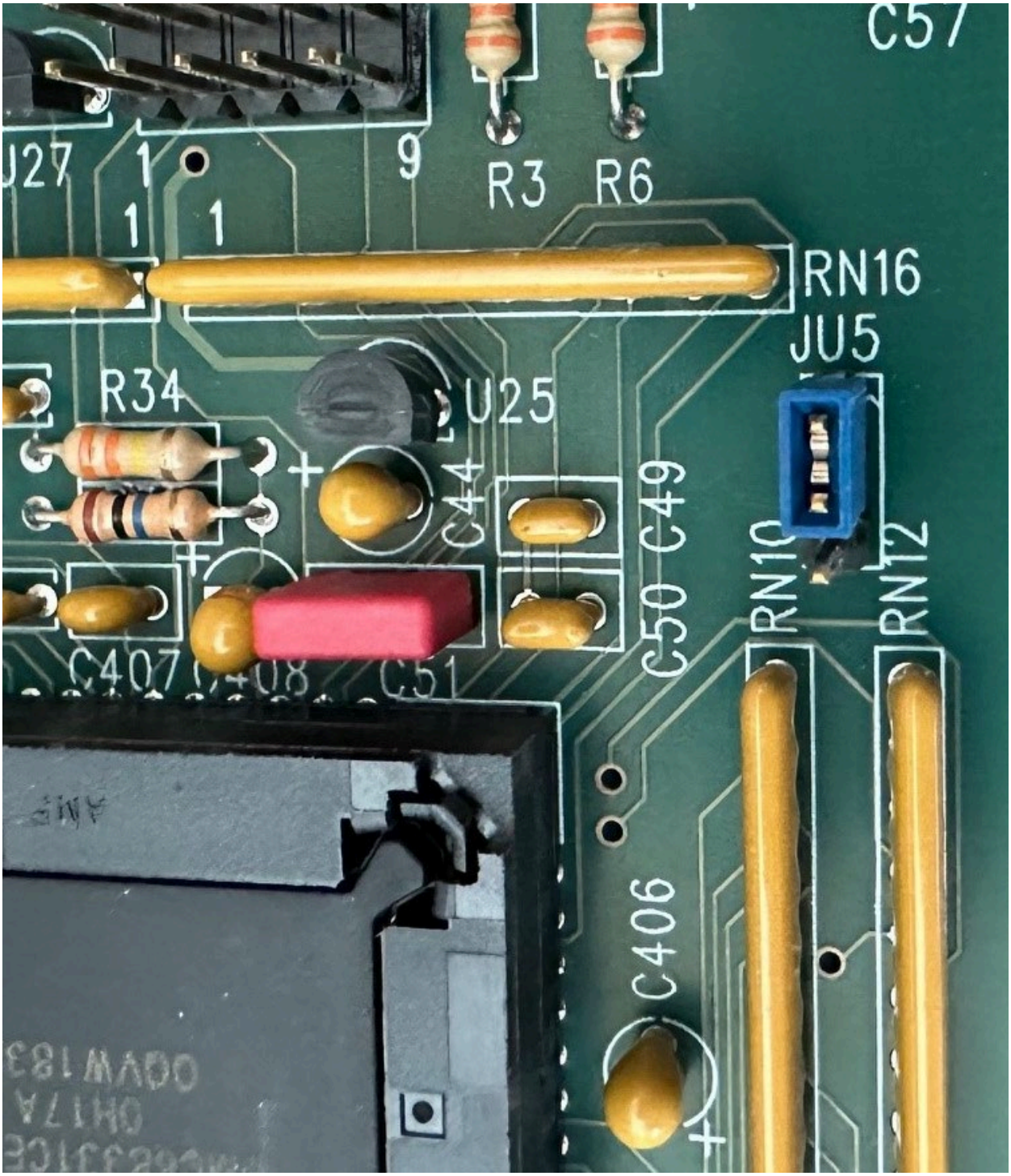
The Modular / GEN2 controller uses physical switches to set the boards address, factory reset firmware, and control factory setup. There is a jumper labeled JU5, which enables special diagnostics displays that are viewed on the on-board displays. Below is a picture of the multiple function switch.



In the above picture switch position 2 is closed, which sets the frame controller's address to 2.

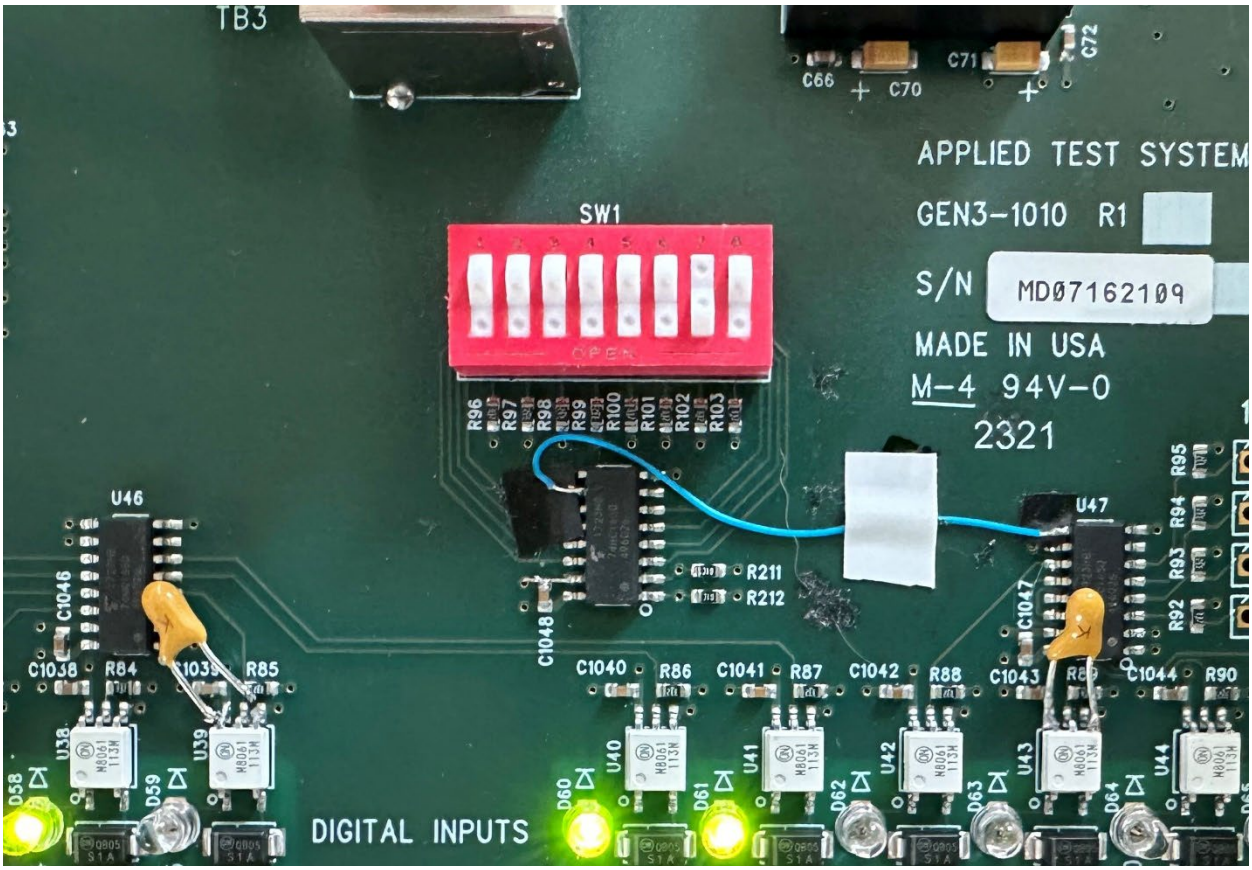
Position	Usage
1	Address bit #0 Value 1 - Open = 0, Closed = 1
2	Address bit #1 Value 2 - Open = 0, Closed = 1
3	Address bit #2 Value 4 - Open = 0, Closed = 1
4	Address bit #3 Value 8 - Open = 0, Closed = 1
5	Address bit #4 Value 16 - Open = 0, Closed = 1
6	Not Used, reserved for factory ALWAYS LEAVE OPEN
7	Factory Reset – Open = Normal Operation, Closed = Reset
8	Factory Diagnostics – Open = Normal Operation, Closed = Factory Mode

The jumper labeled JU5, which enables special diagnostics displays that are viewed on the on-board terminal is shown below. The jumper position shown has the special diagnostics displays disabled.


C57
U27
1
1
1
9
R3
R6
RN16
JU5
R34
U25
C44
C50
C49
RN10
RN12
C407
C408
C51
C406

SIGMA / GEN3

The SIGMA / GEN3 controller uses physical switches to set the boards address, NVRAM Reset, and enabled the special diagnostics displays. Below is a picture of the multiple function switch.



In the above picture no switches are closed, which sets the frame controller's address to 0.

Position	Usage
1	Address bit #0 Value 1 - Open = 0, Closed = 1
2	Address bit #1 Value 2 - Open = 0, Closed = 1
3	Address bit #2 Value 4 - Open = 0, Closed = 1
4	Address bit #3 Value 8 - Open = 0, Closed = 1
5	Address bit #4 Value 16 - Open = 0, Closed = 1
6	Not Used, reserved for factory ALWAYS LEAVE OPEN
7	Enable Diagnostic Displays - Open = Normal Operation, Closed = Diagnostic Displays
8	NVRAM Reset – Open = Normal Operation, Closed = Reset

Appendix # 3 – Motor Control Types

There are three distinct motor control types that the WinCCS frame controller's support.

Fixed Speed Control: Fixed speed control is the simplest motor controls used on testing frames. The frame controller has two digital outputs for controlling the motor. The first output is a motor power output that is active to run the motor. The second output is used to control the reversing contactor to change the motor direction. The software has appropriate timeouts to prevent improper operation of the motor when changing direction. This control method can be used with test frames that do not have load control.

Pulsed Motor Control: Pulsed motor control can be used on fixed or variable speed motors. The frame controller has two digital outputs for controlling the motor. The first output is motor power for fixed speed motors, or a motor enable for variable speed motors. The second digital output is to control a reversing contactor to change the motor direction. Variable speed motor frames using the Classic (GEN1) or Modular (GEN2) controllers have a frame mounted potentiometer to set the analog speed input for the motor that is connected directly to the motor. SIGMA (GEN3) controllers have a frame mounted potentiometer to set the analog speed input for the motor that is connected to the SIGMA (EN#) controller and a dedicated analog output from the SIGMA (GEN3) directly to the motor. This control method is used on load control testing frames. The pulsed output is used to generate very fine motor motions to control the actual motor position.

Stepper Motor Control: Stepper motor control is only available with the SIGMA (GEN3) controller. The SIGMA (GEN3) Frame Controller has three outputs to control the stepper motor controller. The first is an enable, which the motor controller and performs a brake on motor motion. The second and third are step and direction for the stepper motor control.