Scratch Operating Software

Table of Contents

1. Introduction

The Scratch 4 Operating Software 2.0 is the newest implementation of the operating software for your Scratch 4 Machine. This version is a ground-up rewrite, designed to address the major outstanding issues of the 1.x series Scratch Operating Software, as well as to reduce the complexity of using and maintaining the Scratch 4 Machine.

1.1. Features

Rising Load and Constant Load Tests – you can still perform rising, falling, and constant load tests.

Jogging and Positioning – the software allows you to jog or position the head above your samples. The Scratch 4 Machine sample stage is 24" (300 mm) wide—enough to allow for multiple samples to be arranged and tested without intervention. Positioning has been made relative, instead of conforming to the previous positive/negative standard for jogging.

Projects – the concept of a Project has been introduced, which allows you to save your Scratch settings for use and re-use at a later date.

Friendlier Data Acquisition – saving your Scratch data is now easier and friendlier, using recognizable data save behavior you are accustomed to in Windows.

Integrated Scratch Data Viewer – the operating software now includes an integrated Scratch Data Viewer, which allows you to view your data without resorting to third party tools. Additionally, the Scratch Data Viewer can automatically find the onset of Scratch, and display only the Scratch region of the Scratch Data. The Scratch Data Viewer can also be used to load old Scratch Data files, and is the mechanism by which new Scratch Data may be saved to disk.

Integrated Diagnostics – real-time machine sensory data and data capture are monitored. Watch you scratch data in real-time during a test. This screen can also be used to help diagnose common scratch issues, and hardware failures or problems.

NOTE: the options on this screen can be potentially hazardous to your Scratch Machine. Do not use the options unless directed to do so by a qualified technician.

Integrated Calibration – calibration has never been simpler or more powerful! The new calibration system allows for full-range table-based interpolation over the sensor range. The sensors have a more sophisticated

response profile than previous versions of the Scratch Operating Software were able to exploit. With the new calibration system, these profiles can be more accurately traced. Additionally, calibration has become much easier to do with the new Integrated Calibration screen. You can now take readings directly within the Operating Software, and these readings are translated into calibration profiles automatically. A special screen is available just for Depth calibration.

Scratch Machine Finder – now, when the machine is power cycled, you do not have to restart the Operating Software! New operating logic allows the Operating Software to recover when the machine is halted, and to discover the machine when attached. Additionally, the software includes options to clear emergency halts, and to perform first-boot operations to reset the Scratch 4 Machine without restarting the Scratch Operating Software.

Smaller, Easier Installation – the new Scratch 4 Operating Software is less than 1 MB in size, and includes a basic Windows Installer. This compares to the previous installations which were greater than 1 GB in size each (almost 2000 times as big!)

Extra Tools – the Scratch 4 Operating Software includes two new tools with the installation: a stand-alone Scratch Data Viewer, and a stand-alone Machine Discovery Tool. The first tool can be used to inspect and graph Scratch Data without resorting to third-party tools or having to keep the Scratch Operating Software running. The second tool allows you to determine if you Scratch Machine is appropriate connected and powered on without having to start the Scratch Operating Software.

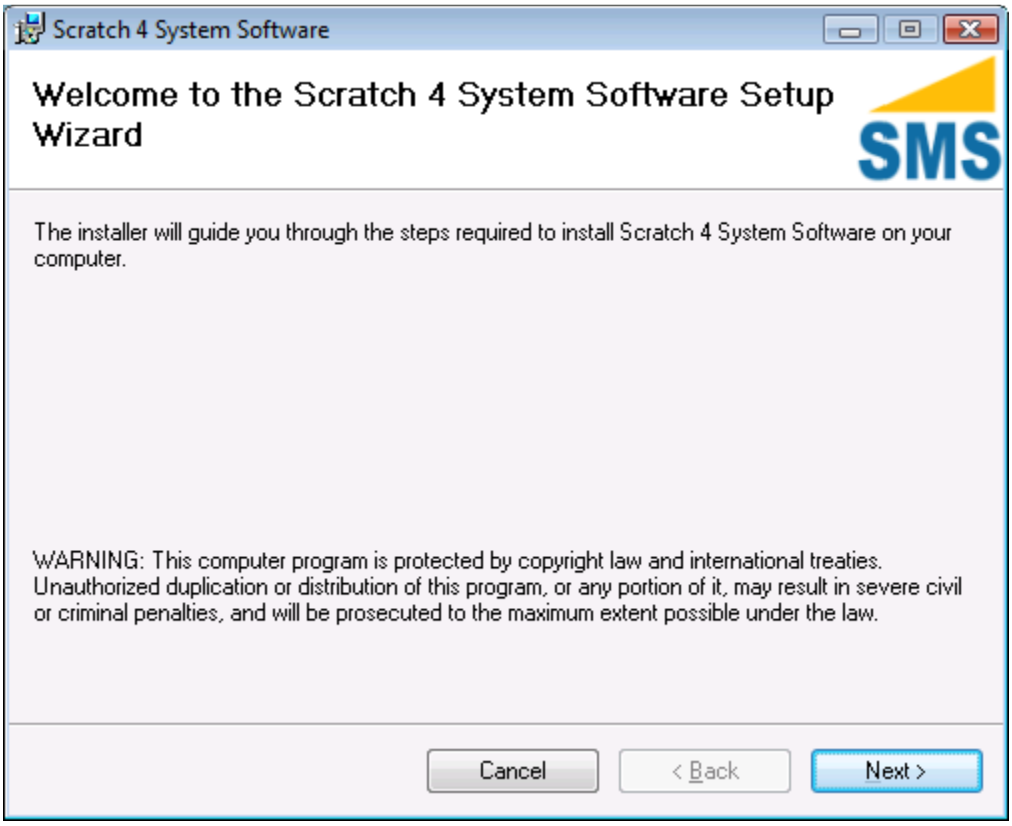
2. Installing the Scratch Operating Software

These instructions show you how to install the Scratch Operating Software and other Tools.

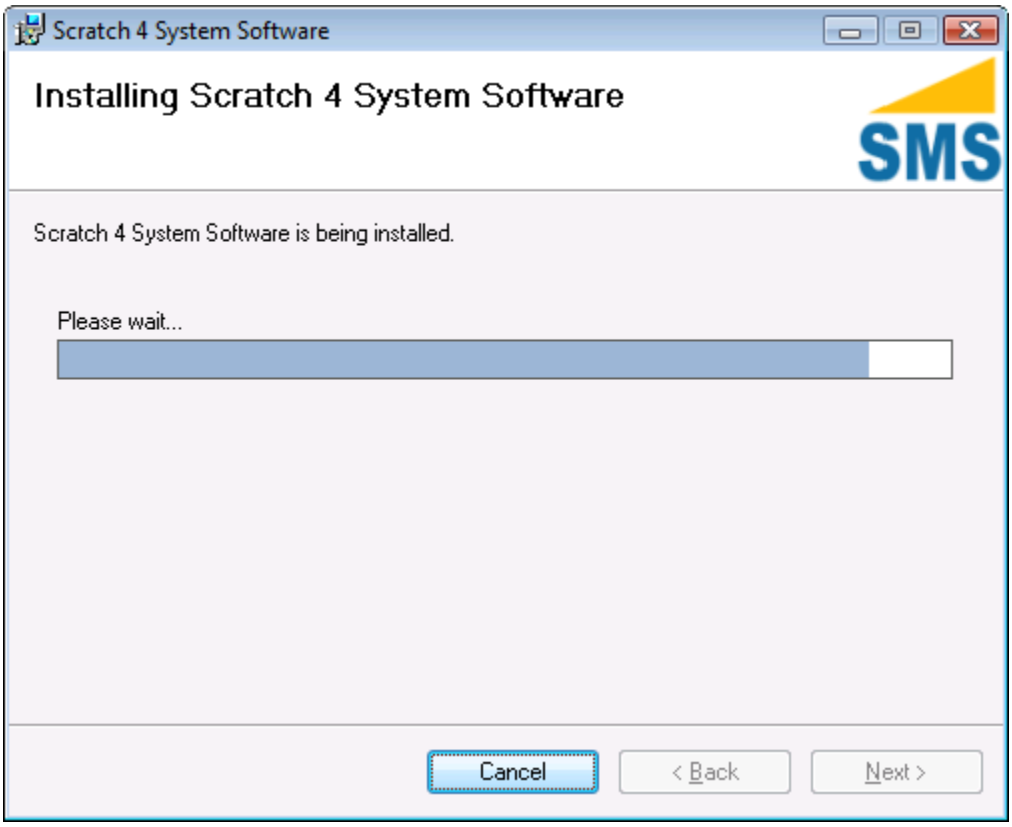
1. Download the file "Scratch4SystemSoftware.msi", or locate it on your Install Media (CD or DVD). The software can be acquired from:

    a. http://www.surfacemachines.com/swdist/sos/

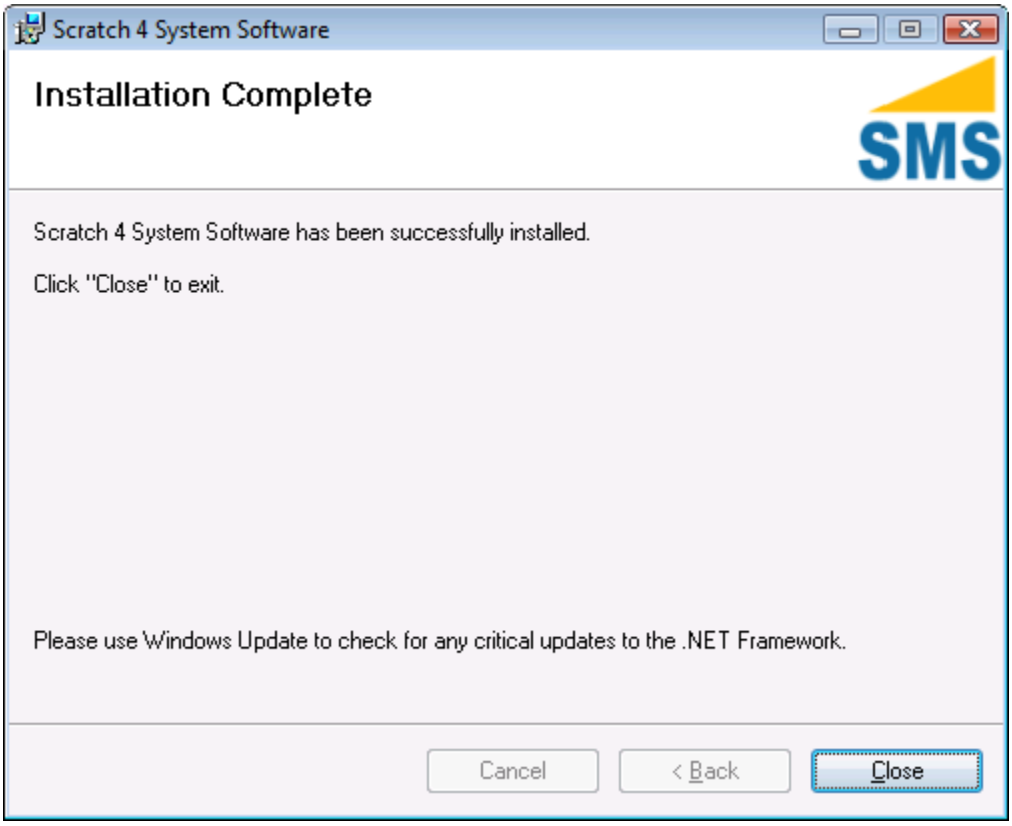
2. Double-click on the file "Scratch4SystemSoftware.msi".



3. Follow the installation instructions.

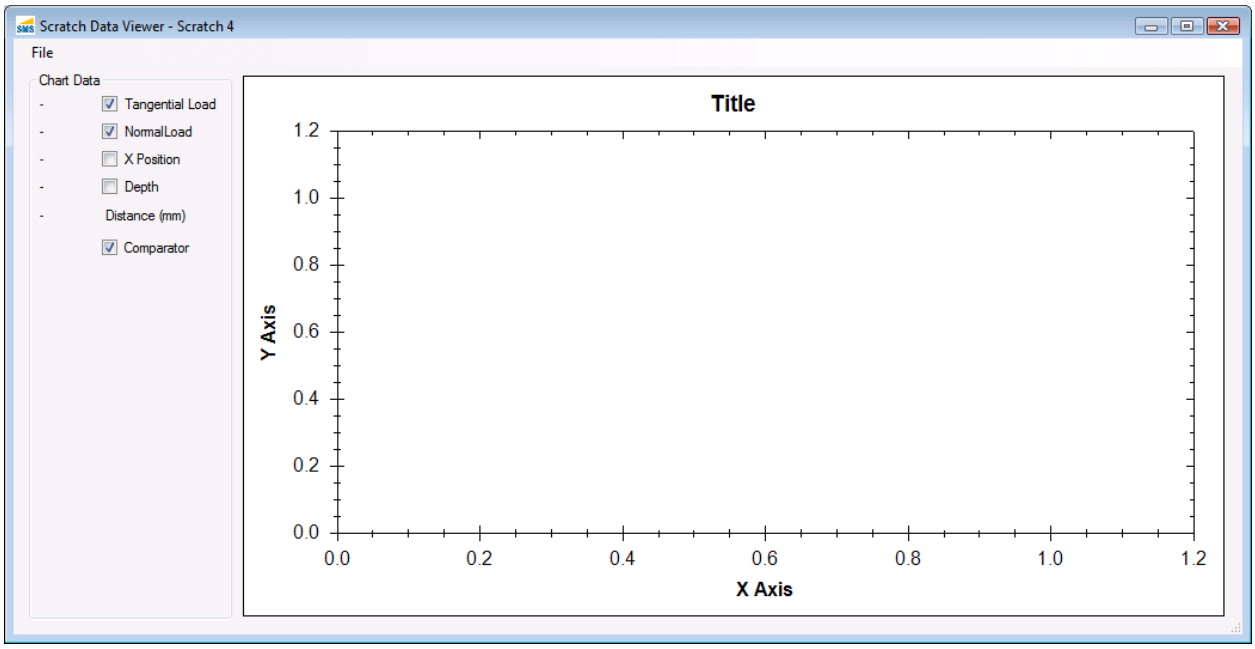


4. On a successful install, the following message will be displayed.

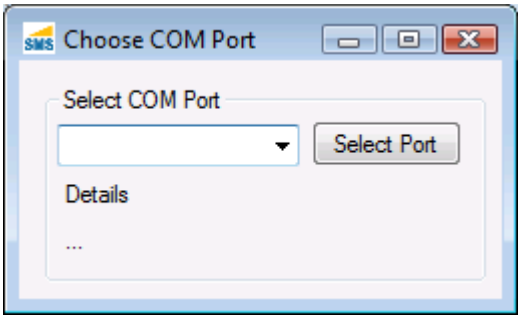


Testing the Scratch Operating Software Installation

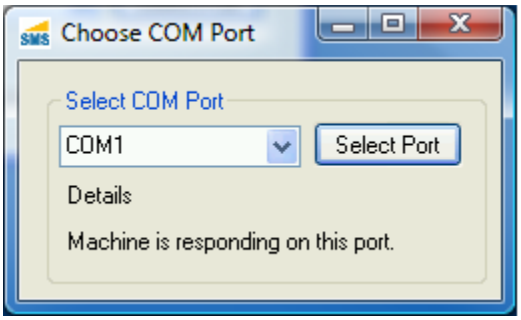
1. Click the Windows Start Button or Start Orb
2. Click "All Programs"
3. Click "Surface Machine Systems"
4. Click "Scratch Viewer". A window as follows opens.



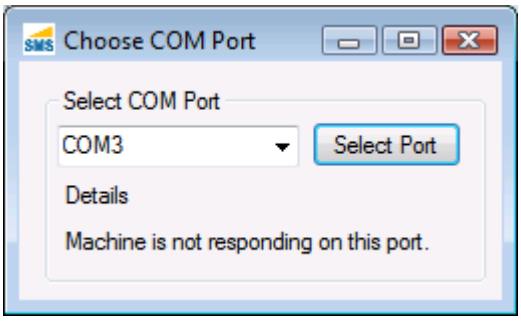
5. If you receive an error, Uninstall the software, and follow the steps outlined above.
6. Follow steps 1 through 3 of this section
7. Click "Machine Finder". A window as follows opens.



8. Select the first COM Port in the drop-down list.
9. Select the "Select Port" button.
10. The "Details" section should show the phrase "Machine is responding on this port". Make a note of which COM Port you selected.



11. If the phrase "Machine is not responding on this port." is shown, try selecting other Ports from the list. If no Ports find a machine, check the following:

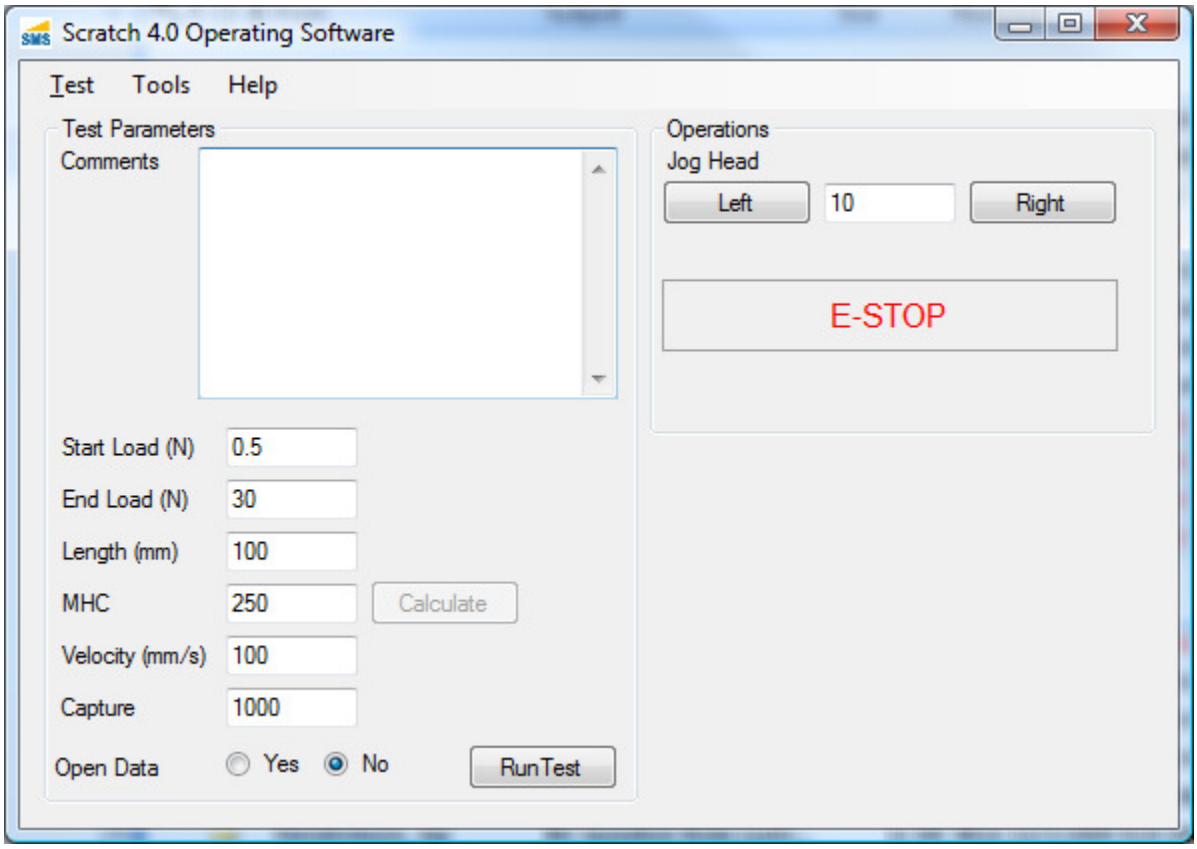


a. The machine serial cable and data cable are firmly connected to this computer.
b. The machine power cable is firmly connected, and the machine is powered on (green light)
c. If the machine does not power on, or does not respond, refer to your Scratch 4 Machine User Guide for troubleshooting information.

3. Using the Scratch Operator Software

3.1. The Main Interface

When you open the Scratch Operator, you will be presented with the following window.



This is the "Main Control Window", and all major functionality of the Scratch Machine can be accessed from this window.

3.1.1. Primary Features

Test Parameters

This area is used to set Scratch Test Parameters during a Scratch Test. Pressing the "Run Test" button will cause the Scratch 4 Machine to run a scratch test using the currently visible parameters.

Warning: Running a test prior to calibration, or without a sample and styli in the machine may cause permanent damage to your Scratch 4 Machine.

Please see the section "Calibration" to calibrate the Scratch 4 Machine prior to running your first test. Please see the section "Running a Test" to see how to run a test.

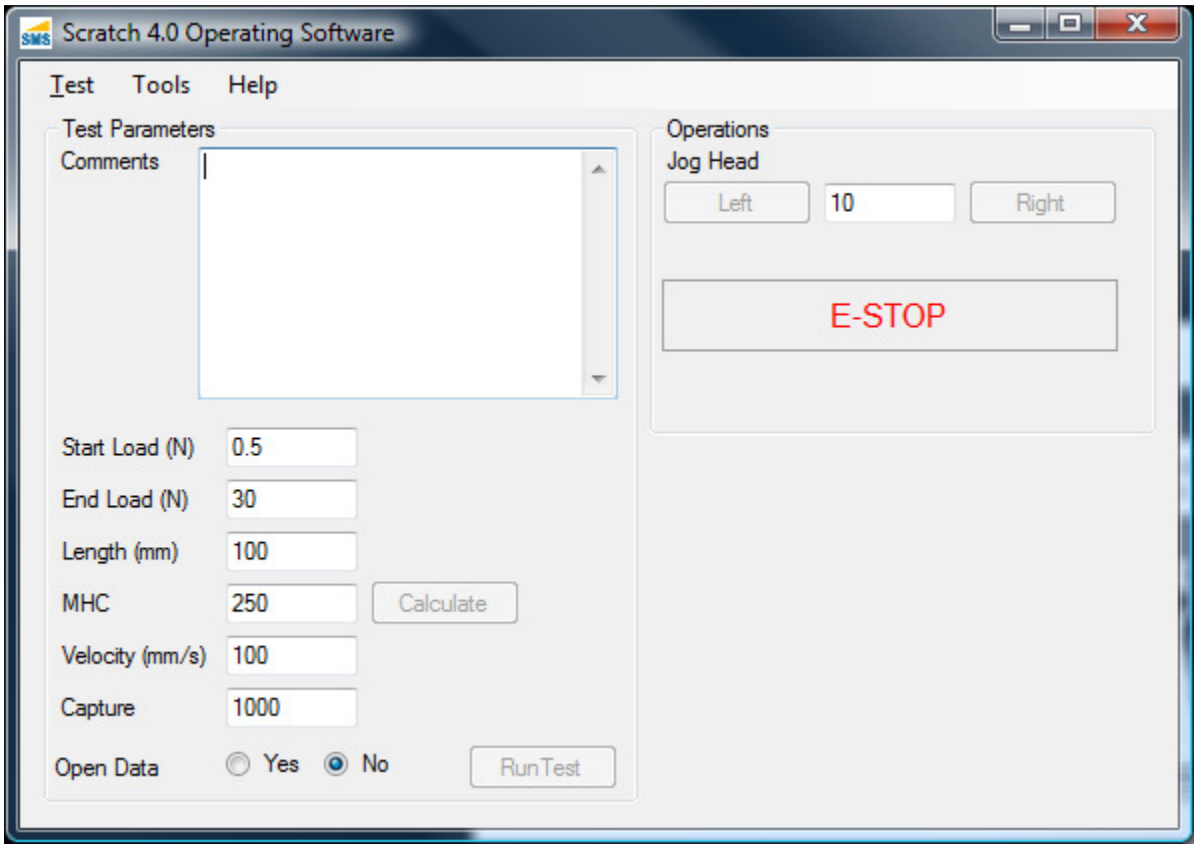
Operations

This section includes basic machine operations that are not part of a test. These operations are:

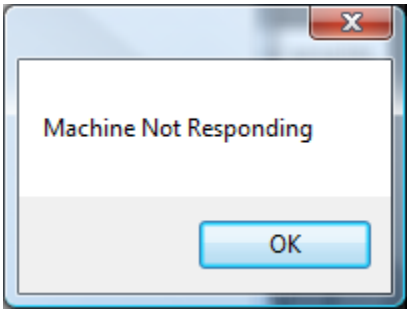
- Jog Head. Jogging the head means to move it left or right. The jog head operation works in millimeters. Pressing the "Left" button will move the head to the left. Pressing the "Right" button will move the head to the right. Use these operations to position the head over a sample.
- Emergency Stop. The emergency stop button can be used to halt all machine operations currently in progress. Once the Emergency Stop button is pressed, the machine will come to a complete halt. The machine will not respond to any further operation requests until the Emergency Halt is cleared. See "Clearing an Emergency Halt" below.

3.2. Finding the Scratch Machine

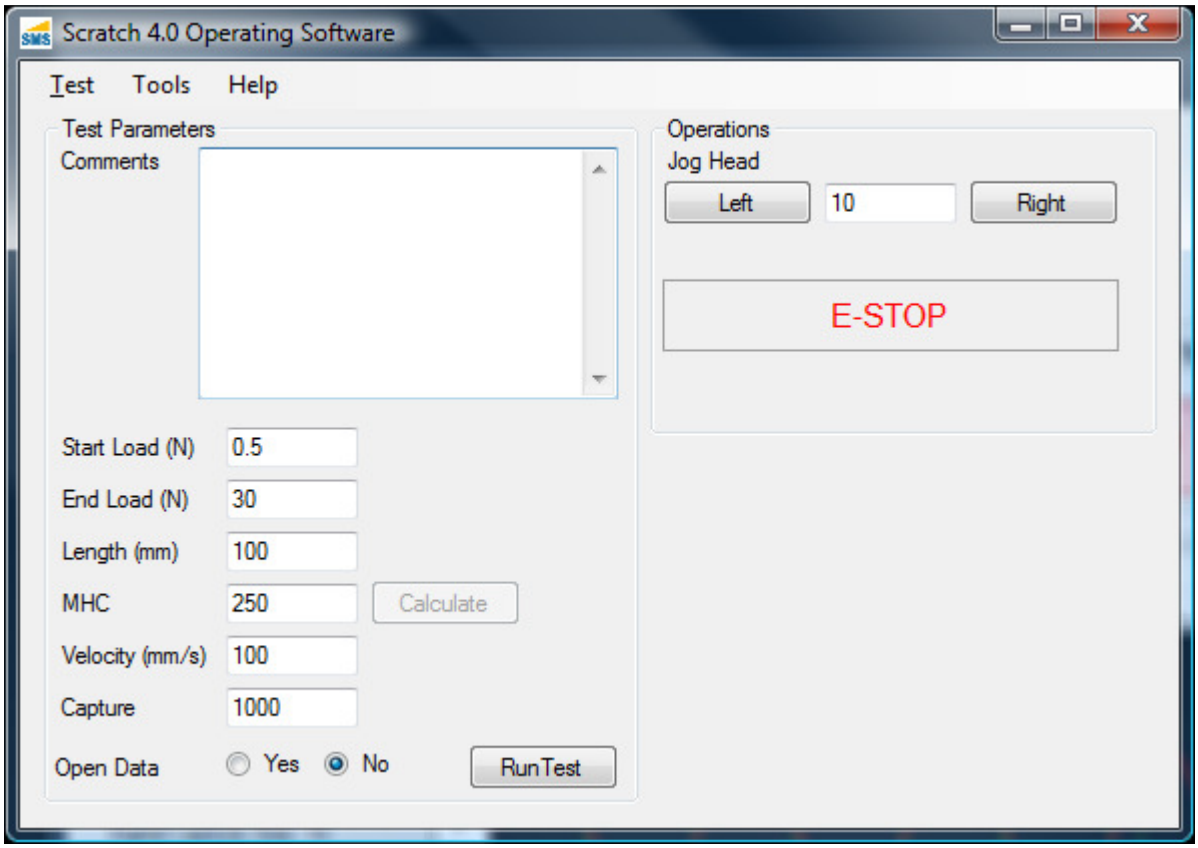
Your operating computer may have multiple communication ports with which to communicate with the Scratch Machine. These ports are labeled COM Port 1, COM Port 2, etc. By default, the Scratch Operator attempts to find the machine on "COM Port 1". If this is the wrong port, you will have to use the Find Scratch Machine functionality to find the Scratch 4 Machine. The machine will display a message, and the interface will be partially inaccessible.



If the Scratch Operating software is started prior to turning on the Scratch 4 Machine, you will need to follow these instructions to initialize the software for the machine. If the software displays the following message at startup, then this procedure will need to be followed in order to initialize the software after the machine is powered on.



1. Click "Tools", "Find Scratch Machine"
2. Follow the steps 7 through 11 in the section "Installing the Scratch Operating Software".
3. When the Scratch Machine is found, the interface will become accessible as follows.



3.3. Scratch Machine Initialization

When the software first starts, if the Scratch 4 Machine is found, the software will perform an automatic hardware initialization. If the software is started up before the Scratch 4 Machine is powered on, then a manual reboot must be performed to initialize the Scratch Machine.

1. Click "Tools", "Reset Scratch Machine"

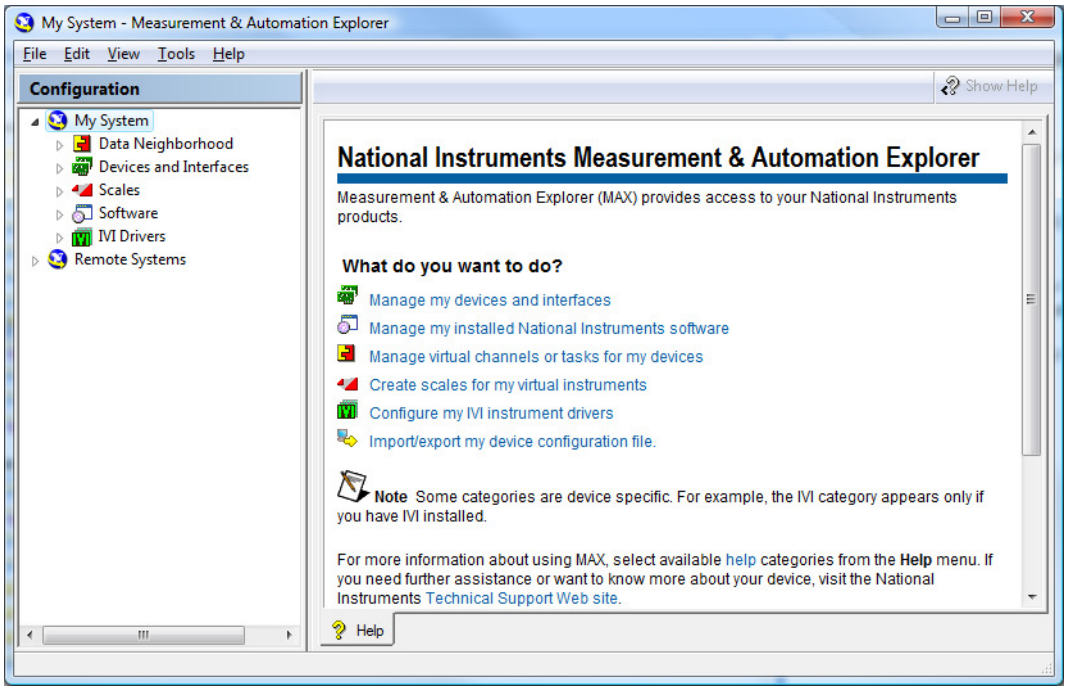
You will hear clicking noises, and a soft electronic sound. The interface will be inaccessible for a few seconds. When the operation is complete, the interface will become accessible again, and ready to perform scratch tests or other operations.

3.4. Calibration

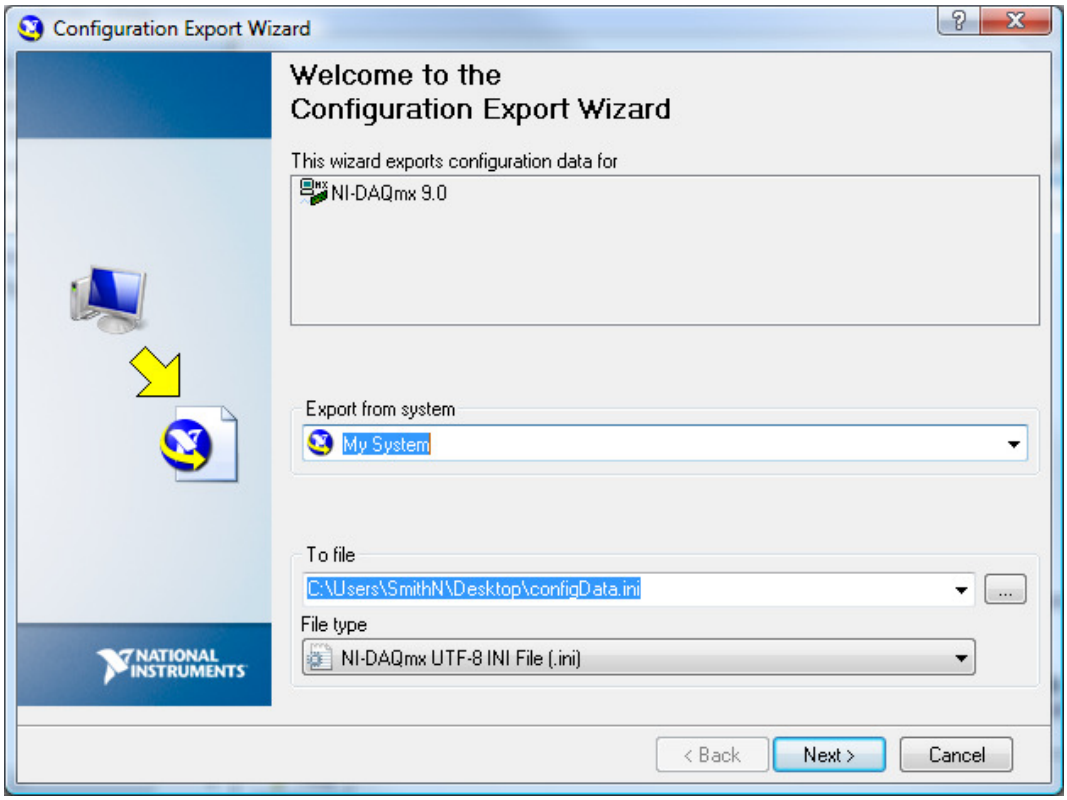
Calibration is now easier than ever. You can import and save your old Calibration Files from the 1.x series of Scratch Operating Software, or create new Calibration tables simply and easily.

3.4.1. Importing 1.x Calibration Files

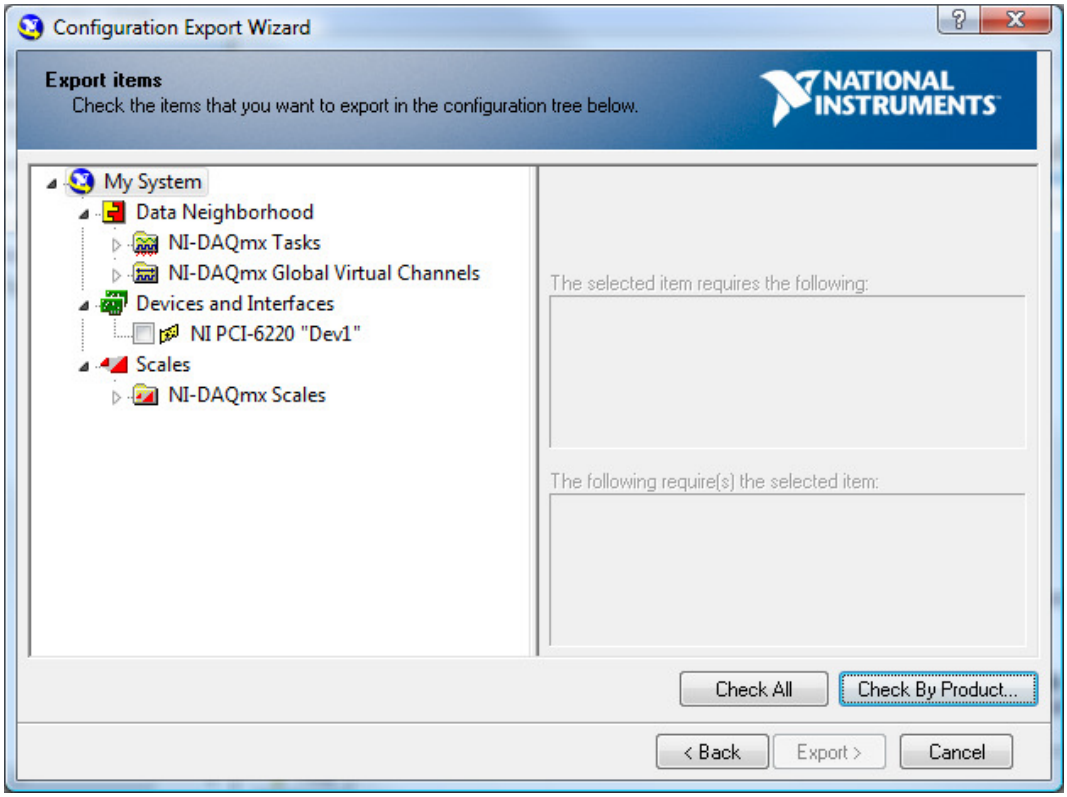
1. Close the Scratch Operating Software 2.x.
2. Open "Measure & Automation Explorer"



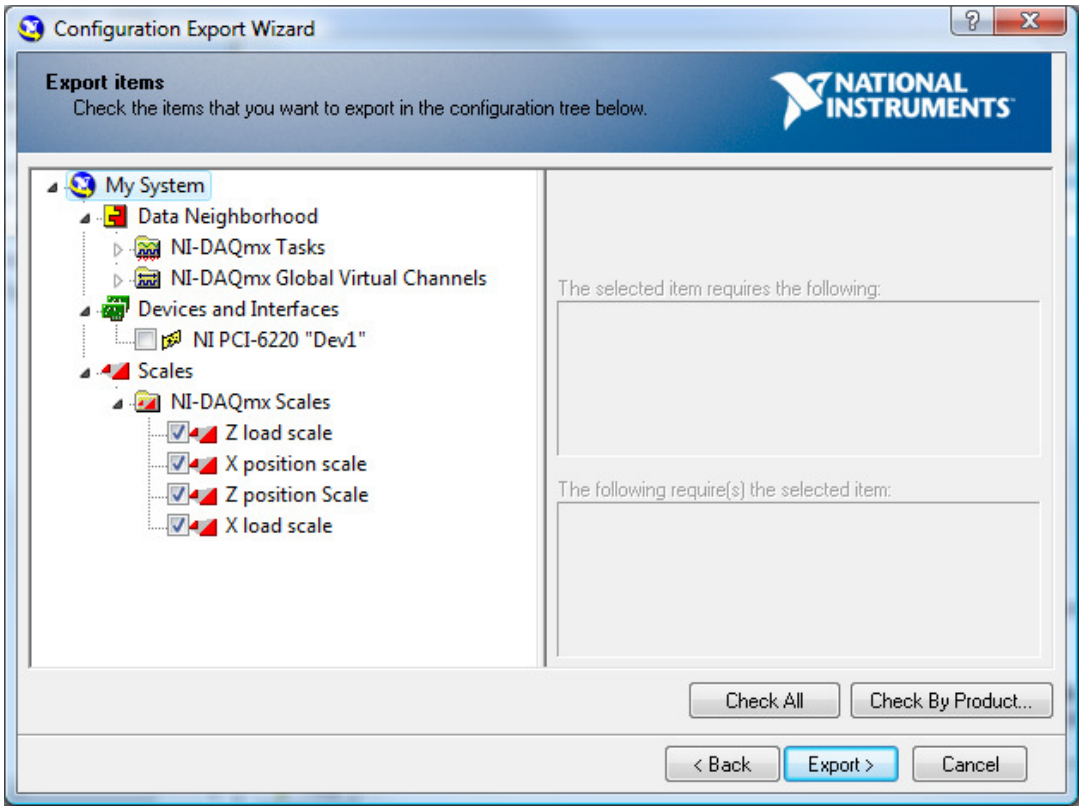
3. Click "File", "Export…"



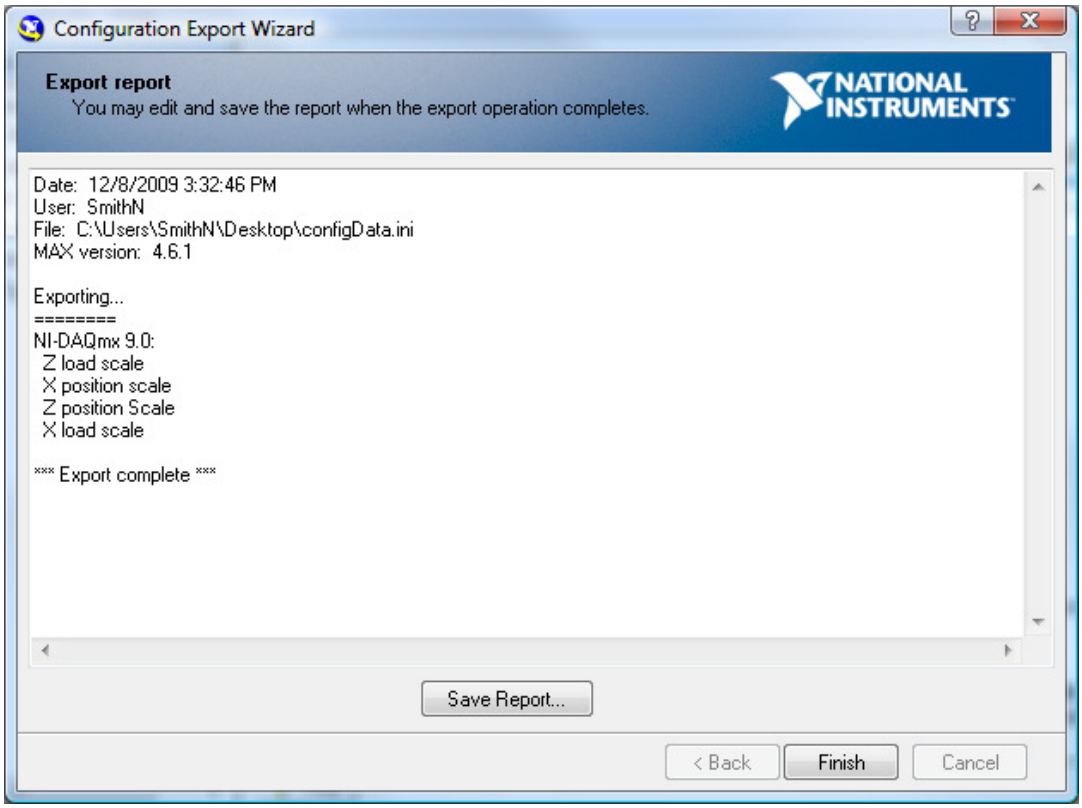
4. In the "To file" text box, enter the location on disk you would like to save the export file, or use the "…" button to select.
5. Click "Next >"



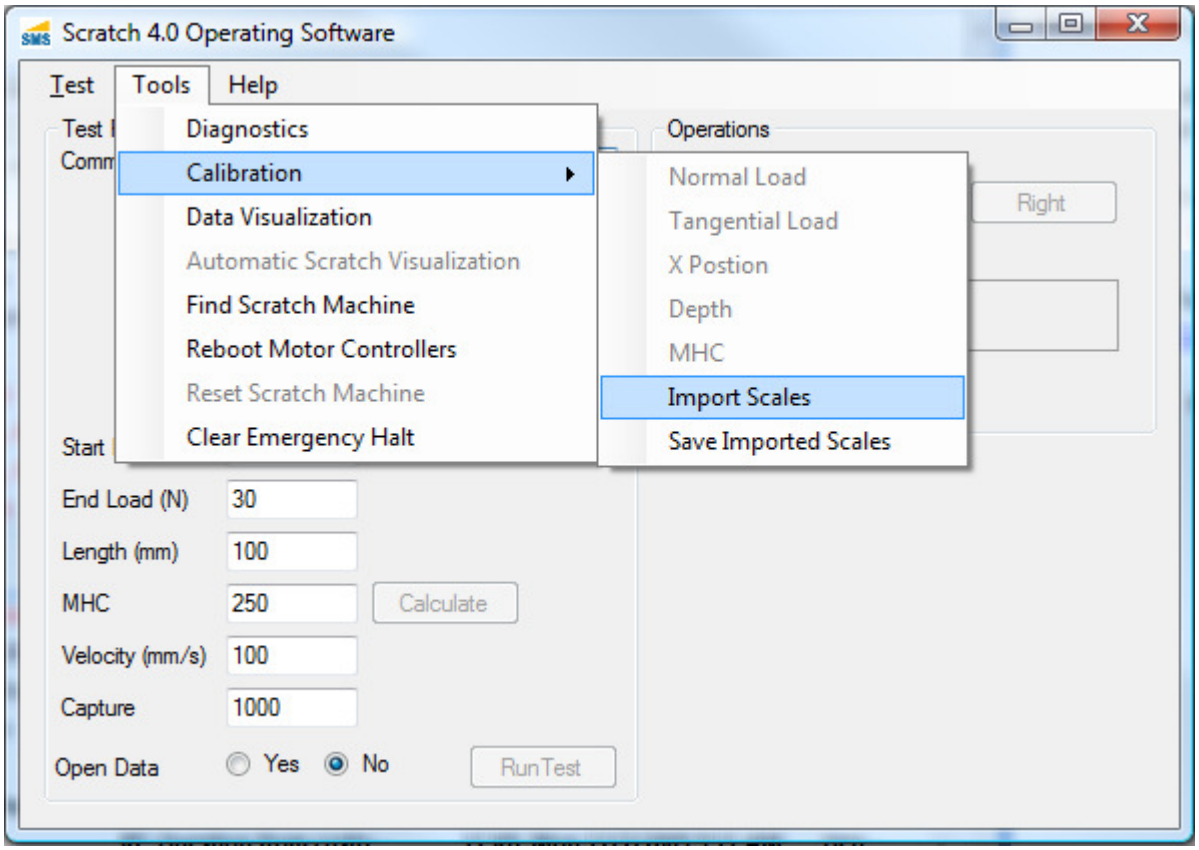
6. Open the "Scales" item, and check the four Scales shown: "Z Load scale", "X position scale", "Z position Scale", and "X load scale".



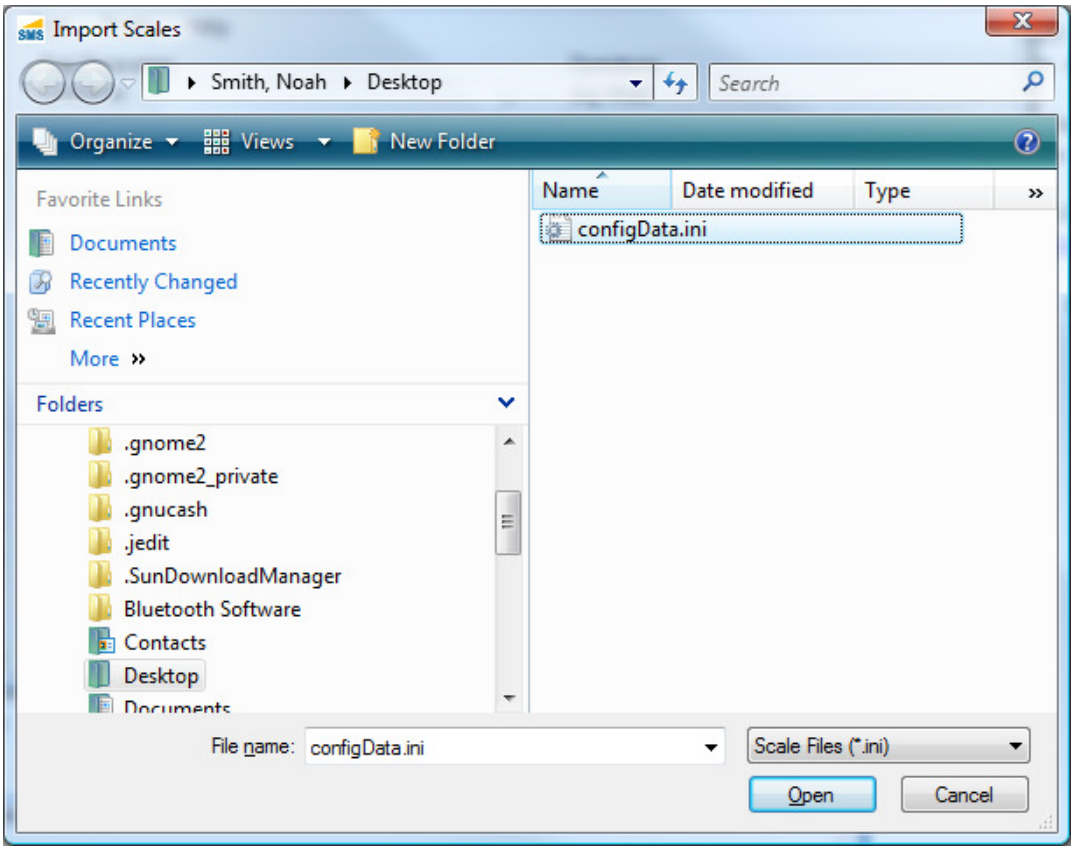
7. Click “Export >”



8. Click “Finish”
9. Close “Measure & Automation Explorer”
10. Open the Scratch Operator program.
11. Click “Tools”, “Calibration”, “Import Scales”



12. Choose the export file from disk.

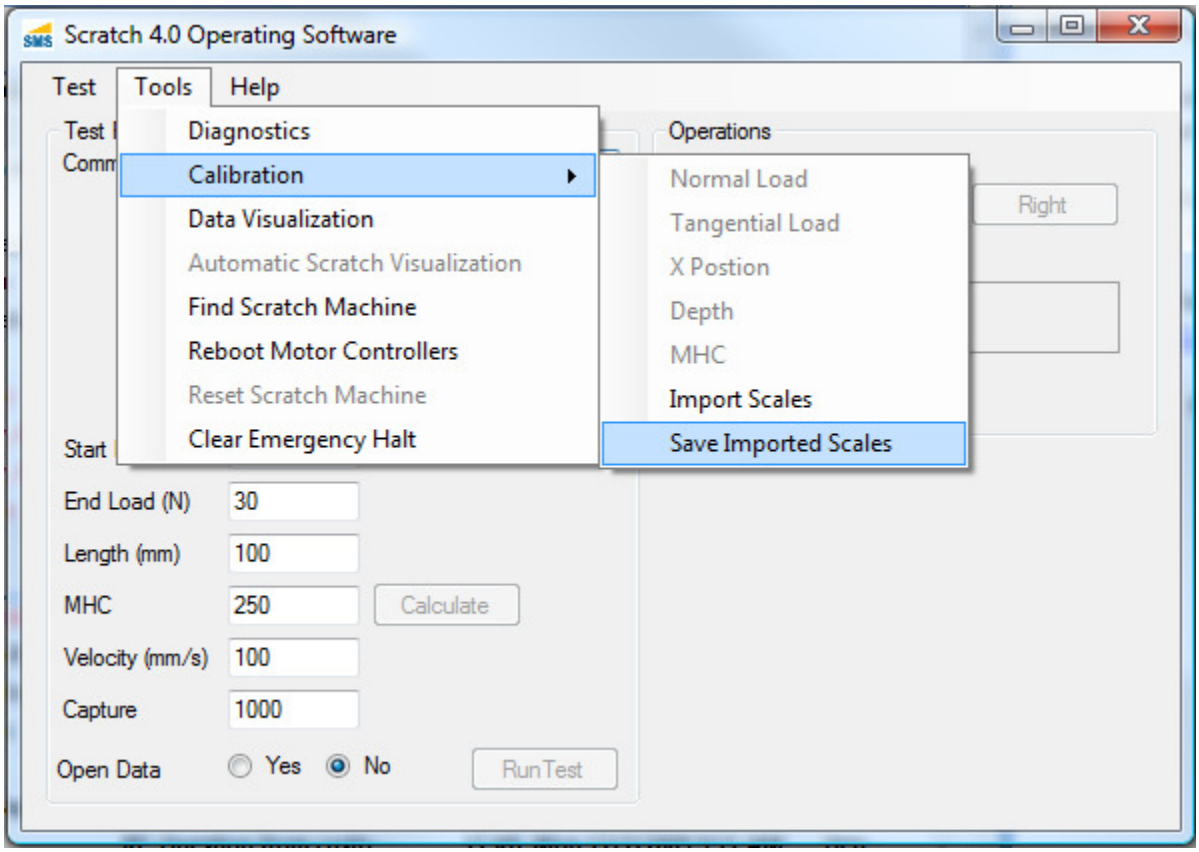


13. Click "Open"

3.4.2. Saving Calibration Scales

To Save Calibration Scales:

1. Click "Tools", "Calibration", "Save Imported Scales"



Calibration Scales will be saved and automatically loaded in the future.

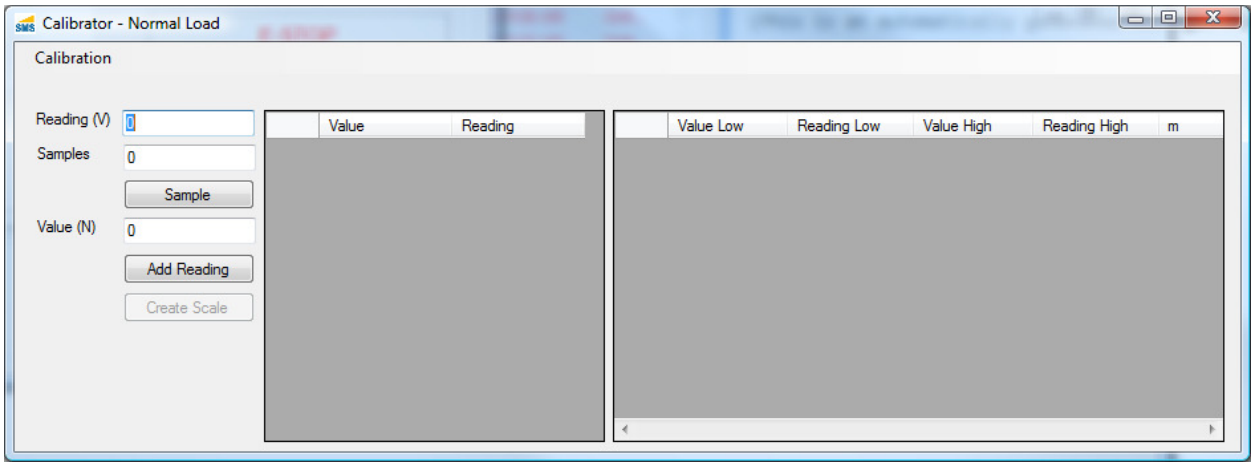
3.4.3. Creating New Calibration Scales

The general process for creating new calibration scales is as follows:

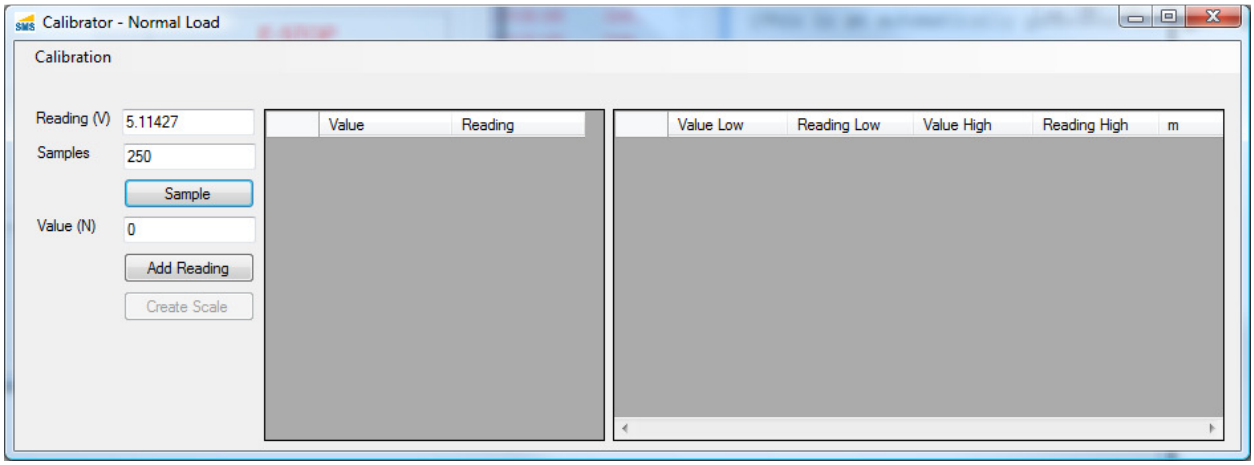
1. Select the Scale you would like to create (Normal Load, Tangential Load, X Position, Depth).
2. Apply a known load or position to the sensor
3. Take a measurement using the built-in measurement reading tool
4. Record the known load or position
5. Use the automatic calibration processing tool

Calibrating the Normal Load Sensor

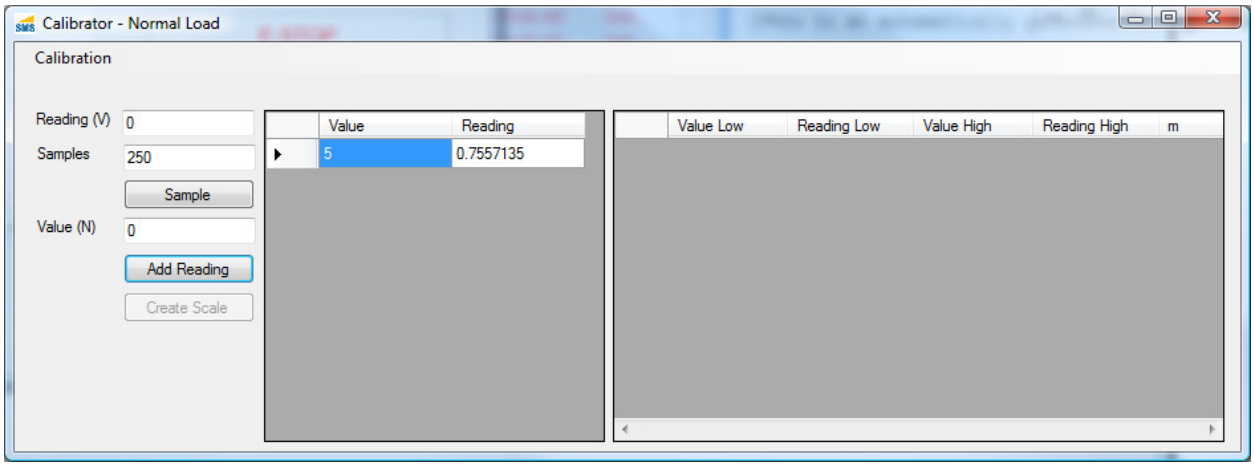
1. Place the calibration jig into the Scratch Head as shown in the User's Manual.
2. Place a known load on the jig.
3. Click "Tools", "Calibration", "Normal Load"



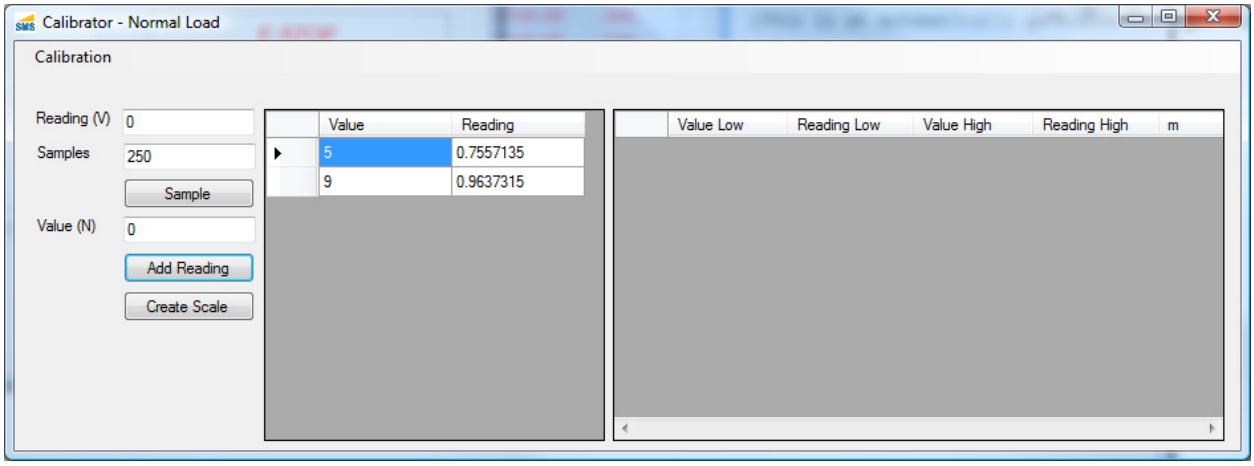
4. Enter a number of samples to Read. 50, 100, or 250 is reasonable. Press the "Sample" button. The system will automatically take and average voltage samples from the sensor.



5. Enter the actual load presented on the sensor in the field "Value (N)". Press "Add Reading"



6. Take other readings as necessary. A minimum of 2 is required.



7. When you have completed at least 2 readings, you may create a scale. Do so by pressing "Create Scale".
8. This scale will be used for processing sensor data.

Creating an X Position Calibration Scale

Creating a Tangential Load Calibration Scale

Creating a Depth Calibration Scale

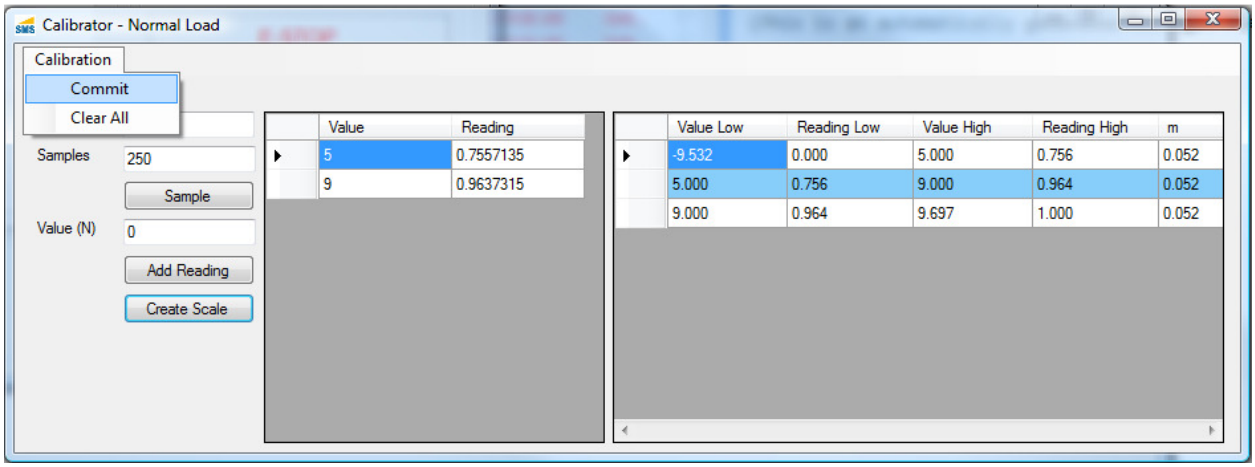
Creating a Depth Calibration Scale follows a slightly different procedure than other Scales. The Depth Calibration Scale requires a single absolute point of reference, and exactly 2 relative points of reference.

1. Open the Depth Calibrator Window by clicking "Tools", "Calibration", "Depth"

2. Set the Depth Calibrator to Zero following the instructions in the Depth Calibration Manual.
3. Enter 250 into the Samples text box, and click "Sample".
4. Enter 0 into the Value (in) text box, and click "Add Reading"
5. Using a feeler gage delimited in inches, for instance a 0.030" feeler gage, set the head to the top of the gage referenced to the work surface.
6. Enter 250 into the Samples text box, and click "Sample".
7. Enter 0.030 in the Value (in) text box, and click "Add Reading".
8. Using a feeler gage delimited in inches which is different than that used in step 5, for instance a 0.005" feeler gage, set the head to the top of the gage referenced to the work surface.
9. Enter 250 into the Samples text box, and click "Sample".
10. Enter 0.005 in the Value (in) text box, and click "Add Reading".
11. Click the "Create Scale" button.
12. Save the Calibration as in the section "Saving a New Calibration Scale"

3.4.4. Saving a New Calibration Scale

1. In the Calibrator Window, click "Calibration", "Commit"



3.4.5. Clearing a Calibration Scale

1. In the Calibrator Window, click "Calibration", "Clear All"
2. To permanently remove this calibration, follow the steps in "Saving a New Calibration Scale"

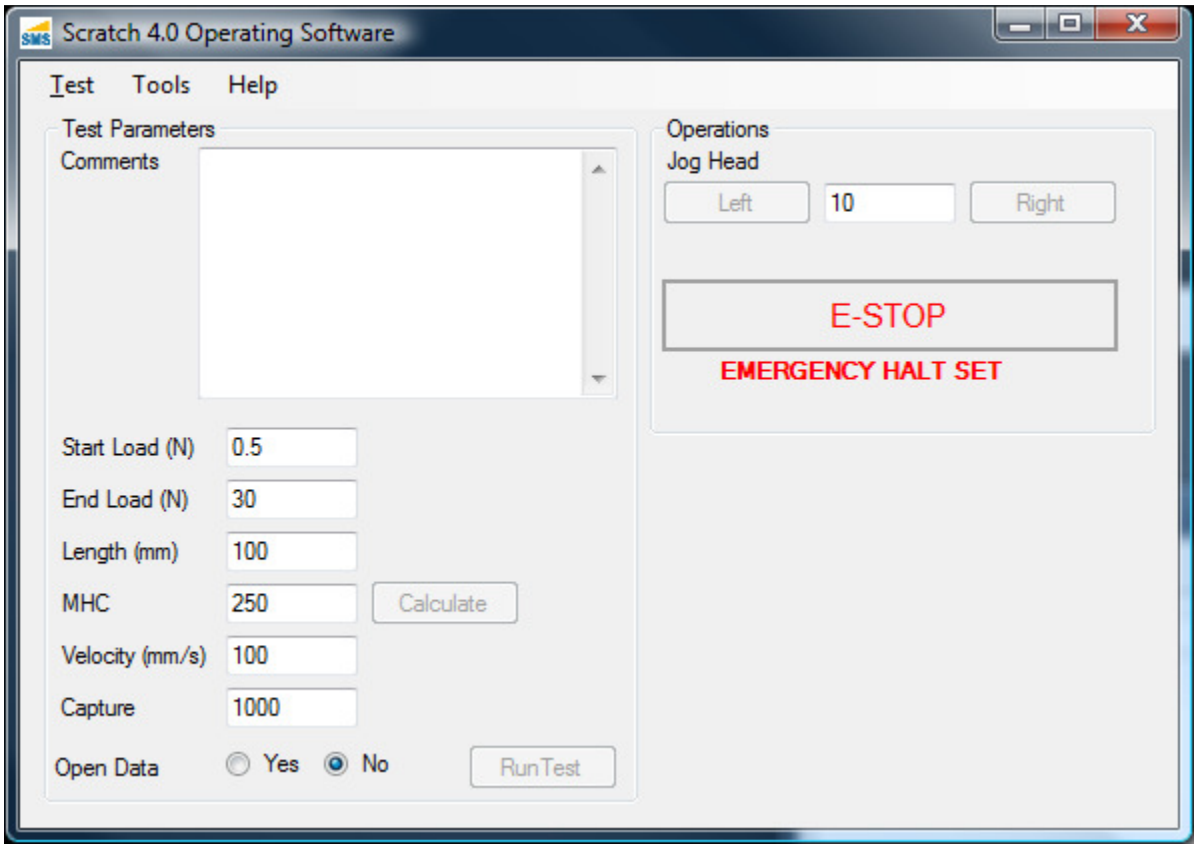
3.5. Jogging the Scratch Head

The head jogging functionality allows you to position the Scratch Head over the test piece for performing a test, or to move the head to a more convenient location. Additionally, jogging the Scratch head can be used as a basic diagnostic tool for determining if the Scratch Operating software is correctly communicating with the Scratch 4 Machine.

1. Enter the number of millimeters of translation desired in the "Jog Head" form in the "Operations" panel.
2. Press the "Right" or "Left" buttons to move the Scratch Head.

3.6. Clearing an Emergency Halt

If the E-STOP button is pressed at any time, the Scratch Operating software will immediately send halt commands to the Scratch 4 Machine, and quit all active operations. When this occurs, the Emergency Halt state is set. When the Scratch Operating software is in the Emergency Halt state, it will indicate the state with bright red lettering as below. While in this state, no operations will be allowed until the state is cleared.



To clear the emergency halt state, follow these steps:

1. Click "Tools", "Clear Emergency Halt"

3.7. Running a Scratch Test

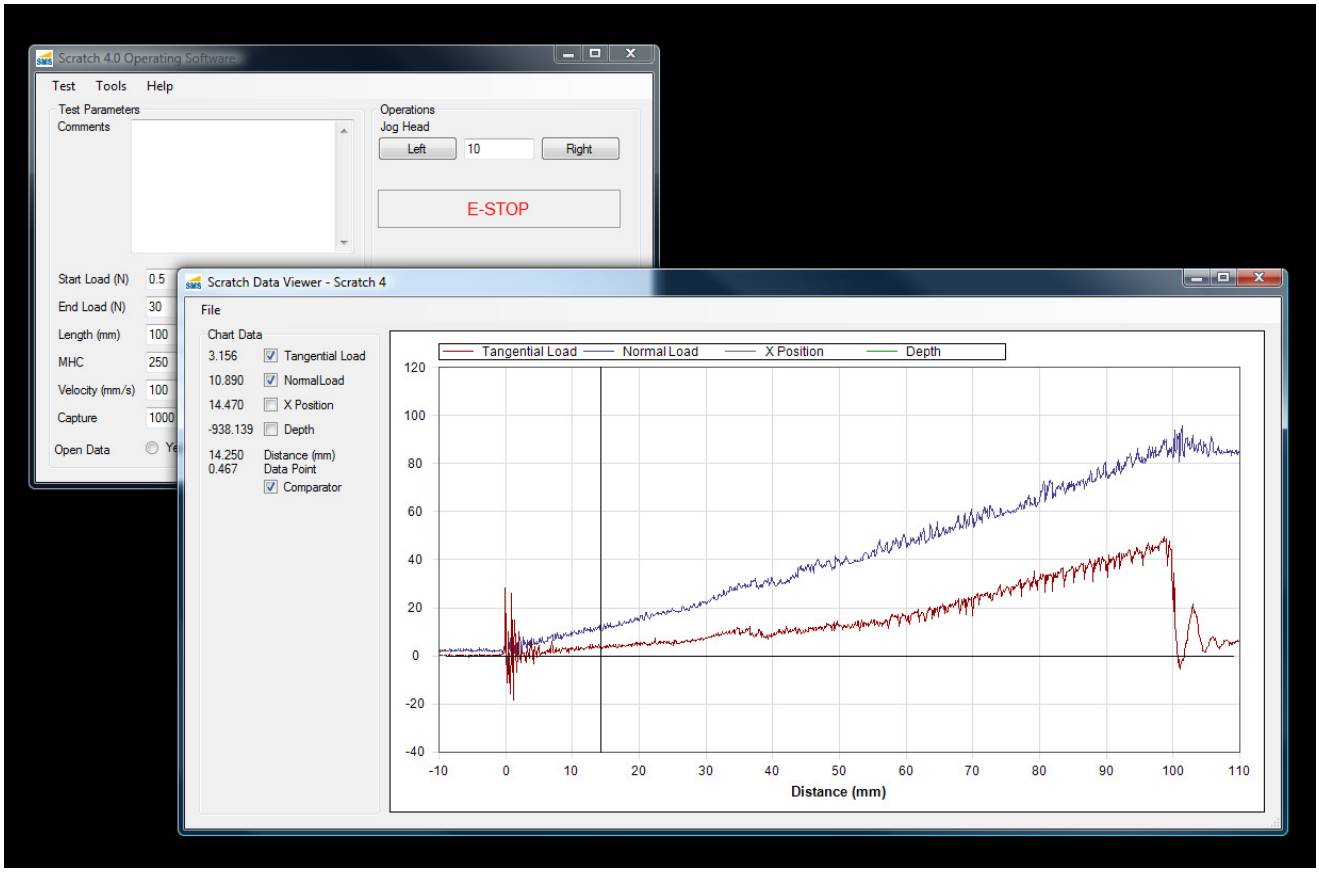
To run a Scratch Test, follow these steps:

1. Secure the system under test beneath the scratch styli as described in the Scratch 4 Machine User Manual.
2. Enter the Scratch test parameters in the "Test Parameters" section.

    a. Start Load should be at least 0.5 N
    b. End Load should be no more than 150 N
    c. The length should be no more than 1200 mm
    d. The Velocity should be no more than 400 mm/s
    e. The Capture rate should be no more than 2000 (1000 is recommended for optimal performance).

f. Select the "Open Data" option as either "Yes" or "No". If you select "Yes", the software will automatically open the Scratch Data Viewer to show the output from the test after the test has run.

3. Click the "Run Test" button.



3.8. Saving Scratch Test Data

If you ran the test with the "Open Data" option set to "Yes", the Scratch Data Viewer will be open as above. Otherwise click "Tools", "Data Visualization". The Scratch Data Viewer will open, displaying the data from the last scratch.

1. Click "File", "Save"
2. Choose the name and location of the file you would like to save.

The scratch information from the Test Parameters will be saved in the file.

3.9. Viewing Scratch Data

The Scratch Operator includes a copy of the Scratch Data Viewer. You can view Scratch Data Files (text files or comma-delimited files—*.txt, *.csv) by using this tool.

1. Click "Tools", "Data Visualization"
2. In the Scratch Data Viewer, click "File", "Open", and select a file.

The Scratch Data Viewer can only read files created by the Scratch Operating Software versions 1.x and 2.x.

3.10. Saving and Loading Scratch Test Parameters

The Scratch Operating software allows you to save and load the Scratch test parameters of your current project. To save your current settings, follow these steps:

1. Click "Test", "Save Parameters"
2. Choose a file name and location.
3. Click "Save"

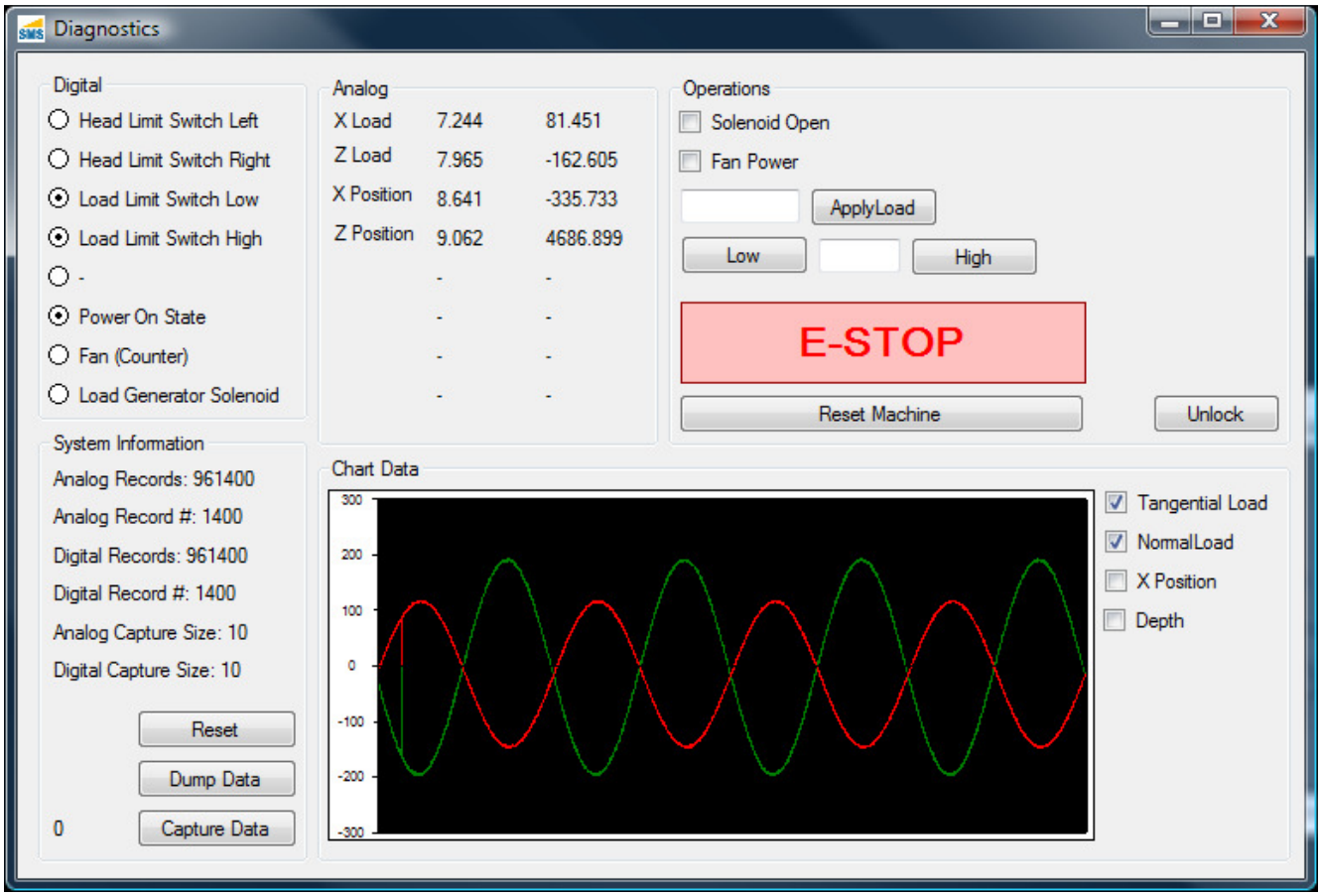
To load the test settings of your project, follow these steps:

1. Click "Test", "Load Parameters"
2. Choose the parameters project file.
3. Click "Open"

3.11. Accessing Diagnostics

To access the diagnostics window, click the "Tools" menu and select "Diagnostics". The Diagnostics window can be used to acquire real-time information on the status of the Scratch 4 Machine.

NOTE: Parts of the Diagnostic interface allow you to operate the machine without safety checks. Use of the Diagnostics interface may cause permanent damage to the machine, or leave it in an unusable state. Please only use the Diagnostics window at the direction of a qualified technician.



3.11.1. Components

Digital

These components relay on-off states of the machine.

- Head Limit Switch Left – a filled circle indicates that this switch is depressed (normally by the Scratch Head).
- Head Limit Switch Right – a filled circle indicates that this switch is depressed (normally by the Scratch Head).
- Load Limit Switch Low – a filled circle indicates that the load generator is in the lowest position.
- Load Limit Switch High – a filled circle indicates that the load generator is in the highest position.
- Power On State – indicates that the machine is powered on.
- Fan – indicates that the machine fan is turned on.
- Load Generator Solenoid – indicates the status of the Load Generator Solenoid.

Analog

Displays the real-time raw and scaled voltages from the sensors. The column on the left indicates the real-time raw voltage measured. The column on the right indicates the real-time scaled values (using the Calibration Scales for each sensor).

System Information

Indicates some status about the real-time internal system state.

- Reset – will reset the capture set.
- Dump Data – will dump the current set of records to disk as indicated by the "Analog Record #" count.
- Capture Data – will begin to capture data for display in the Scratch Data Viewer. The number to the left indicates the number of records captured. Using this function will overwrite the previous in-memory Scratch data. Do not use this function if you have not saved the last set of Scratch data from a Scratch test.

Operations

This section is used to exercise portions of the Scratch 4 Machine which are not typically available during normal operation. Using these options without the direction of a technician can severely damage the Scratch 4 Machine.

- Solenoid Open – opens the solenoid valve on the air spring cylinder, immediately releasing pressure.
- Fan Power – turns the fan on and off.
- Apply Load – will attempt to apply the target load.
- Low/High – will move the load generator by load units (approximately 150 in a full cylinder stroke).
- E-STOP – sets the Emergency Halt State.
- Reset Machine – sends reboot and reset signals to the Scratch 4 Machine.
- Unlock – unlocks the interface (even if the Scratch 4 Machine is not available).

Chart Data

This area shows a real-time chart display of the current sensor states. You can choose to view one or more sensors by selecting the check box next to each sensor.