SuperSystems
incorporated

CAT-100
ATMOSPHERIC CARBON POTENTIAL ANALYZER

OPERATIONS MANUAL

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Introduction

The Super Systems Inc. (SSi) CAT-100 is an Atmospheric Carbon Potential Analyzer that provides a measurement of Carbon Potential in a positive pressure atmosphere. This measurement is determined by measuring specific properties of a steel wire coil that has been inserted into an atmosphere with a carbon-bearing gas for a predefined amount of time. The CAT-100 system is designed to provide accurate results in a cost-effective manner.

Figure 1 - CAT-100 Carbon Potential Analyzer

The concept behind the CAT-100 is similar to the concept behind the SSi Shim Port with Shim Stock. The CAT-100 is designed to provide an on-site carbon measurement. More information on this process can be found in the
Testing Procedure section on page 8.

Note: The CAT 100 coils are not compatible with carbonitriding processes.

CAT-100 Specifications

Carbon Potential Measurement Specifications
Range: 0.1% to 1.3% Carbon Potential
Read Time: 30 to 45 seconds per coil

Accuracy
Accurate to within ±0.03% Carbon Potential

Operating Temperature
50°F to 100°F (10°C to 37.78°C)

Power
Input Power Range: Universal, 85 – 264 VAC
Input Frequencies Supported: 50 Hz, 60 Hz
Batteries: NiMH (up to 6 hours of continuous operation)

Dimensions
Length of front and rear plates: 12.5 inches
Length of sides: 10.5 inches
Height: 5.5 inches

Weight
9.5 lbs. (approx. 4.31 kg)

Touch Screen
Type: Resistive, TFT LCD
Size: 4.3”

Standard Insertion Rod
Maximum extension length: Approximately 41.4”. Requires 1” NPT connection on furnace access port. Visit www.supersystems.com for additional documentation on this procedure.

Figure 2 - Insertion rod

Extended Insertion Rod
Maximum extension length: Approximately 54.4”.

Replacement Parts

Contact SSi at (513) 772-0060 to order parts.

Part #	Item	Explanation
13569	CAT-100 Complete Unit	CAT-100 retail unit. Includes all components in an assembled unit.
13497	Standard Insertion Rod	The rod used to properly insert the steel wire coils into a carbon-containing atmosphere. Typically, the rod is inserted into the atmosphere through an access port on the furnace or other piece of equipment.
13694	Extended Insertion Rod	13" longer than the Standard Insertion Rod
20616	Cage Assembly for Insertion Rod	The piece that attaches to the insertion rod and surrounds the steel wire coil
20767	Calibration Bridge	The module used to perform a circuit calibration on the CAT-100. See Calibration section (page 27).
20753	Bag of 100 Coils	Steel wire coils that are inserted into a carbon-containing atmosphere for testing purposes **NOTE:** The % Carbon content of the untested coils will be imprinted on this bag. The Coil Factor will also be printed on the bag.
30058	Emery Cloth (Fine Grade, 150 Grit)	A cloth containing coarse material used with the steel wire coil prior to carbon analysis.
13564	Carrying Case Assembly	Carrying case used to transport and provide protection for the CAT-100 unit
34601	Hinged Standoff	The long, thin metal standoffs on the front of the unit that support it
34557	CAT-100 Handle	Handle attached to the top of the polycarbonate enclosure
32016	Battery	Replacement battery for CAT-100
33018	Power Cord	Power cord used with CAT-100
20759	Custom Foam Packaging	Specially designed packaging material used to protect the CAT-100 from damage during transport or storage
20756	Enclosure	The enclosure that covers the CAT-100

Table 1 - Replacement Parts List

Testing Procedure

Unpacking and Charging the CAT-100

Carefully remove the packing tape from the box in which the CAT-100 was shipped and remove the CAT-100, right side up. Using proper lifting technique, place the CAT-100 on a level surface.

If you are going to use the CAT-100 without electrical outlet power, allow the unit to charge overnight before use. Do this by simply plugging the unit into an AC electrical outlet and allowing it to charge. Make sure that the unit is charging with the power turned OFF.

Entering the Coil Factor

The **Coil Factor** for the wire coil is used in calculating Carbon Potential and is based on variations in coils in a batch. The recommended Coil Factor is printed on each bag of coils and is the same for all coils in a batch. Before using the coil in the testing process, follow this procedure for entering and verifying the Coil Factor. **It is essential that this procedure be followed correctly.**

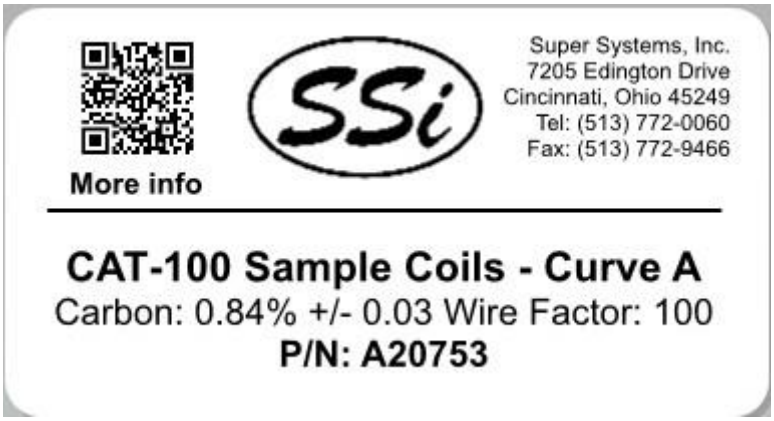


Figure 3 – Coil Label

First, note the recommended Coil Factor printed on the bag of coils that the coil you are using came from. If you do not have the bag, assume a Coil Factor of 100.

Next, log in with Configuration Mode on the CAT-100 by following these steps:

From the main status screen, push the menu button.

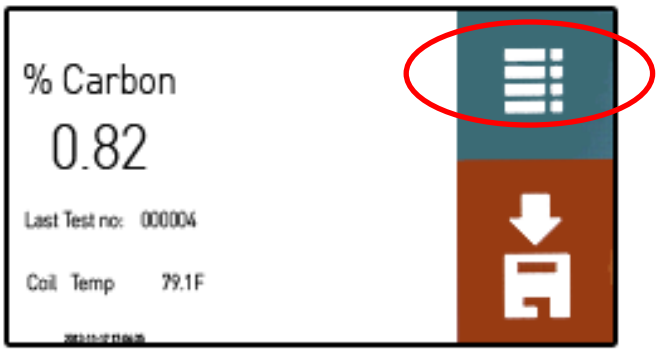


Figure 4 - Main Status Screen

Open the Detail menu from the main menu. The Detail screen will be shown, and the Coil Factor will be displayed in a box labeled "Factor". Tap on that box to continue.

Figure 5 - Logging into Configuration Mode

Figure 6 – Detail screen with Coil Factor box

A numeric entry screen will appear. Enter the Coil Factor that you noted earlier for the wire coil (or enter 100 if you do not have the Coil Factor available).

Figure 7 – Entering a new Coil Factor

The Detail screen will now show the Coil Factor that you entered.

Figure 8 – Detail screen with new Coil Factor shown

Return to the CAT-100 main status screen.

Attach the wire coil to the binding posts *using the small holes on the sides of the posts*, as illustrated in Figure and Figure 10. Make sure to tighten the binding posts by turning each screw clockwise; do not overtighten. Also, do not allow the coil to make contact with the external thermistor.

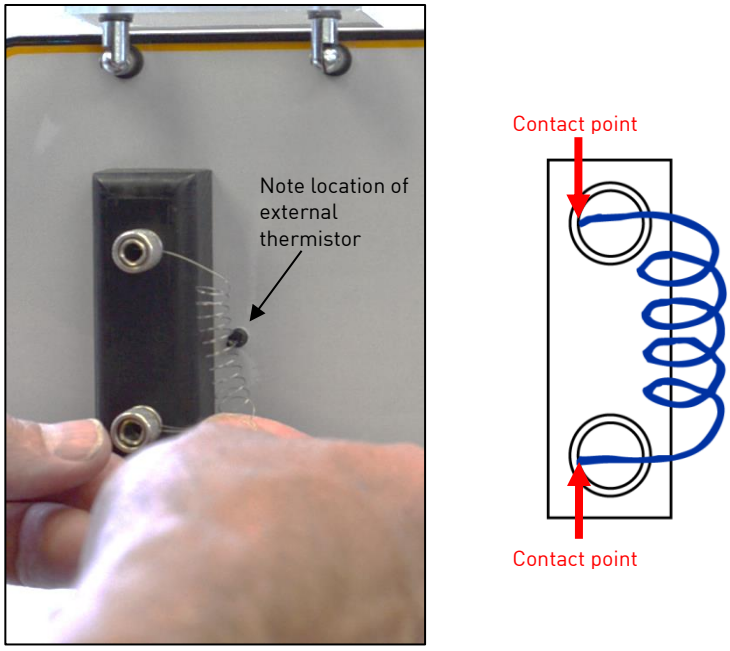


Figure 9 - Attaching wire coil to binding posts

Note: The CAT 100 coils are not compatible with carbonitriding processes.

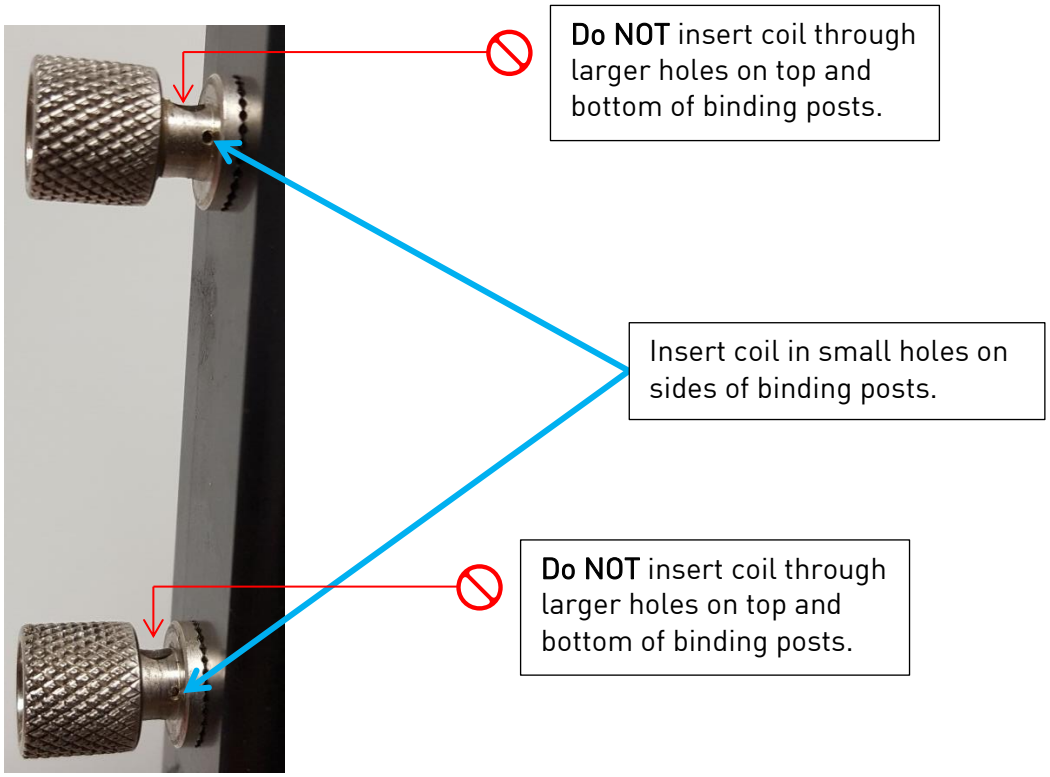


Figure 10 – Close up of binding posts

Once the coil is attached to the binding posts, note the %Carbon displayed on the CAT-100. The % Carbon should be as close as possible to the carbon potential listed on the bag. In order to increase the %C, increase the Coil Factor. In order to decrease the %C, decrease the Coil Factor.

Preparing the Insertion Rod with Steel Wire Coil

The wire coil is designed to be placed in the testing atmosphere with the use of a metal insertion rod that can be purchased from SSi. The parts of the insertion rod, shown in **Error! Reference source not found.**, are as follows:

- **Shaft**. A long metal shaft supports the working end of the insertion rod (where the wire coil is housed) and allows the rod to span the length of a typical furnace access conduit.
- **Threaded port connector**. The port connector is designed to attach to, and provide a tight connection with, the access port on a furnace. NOTE: The connector is designed for a 1" NPT connection.
- **Protective cage**. The protective cage provides housing for the wire coil when the coil is attached to the insertion rod.
- **Rod screw**. The rod screw, which screws into the shaft through the protective cage, helps keep the protective cage in place on the insertion rod.

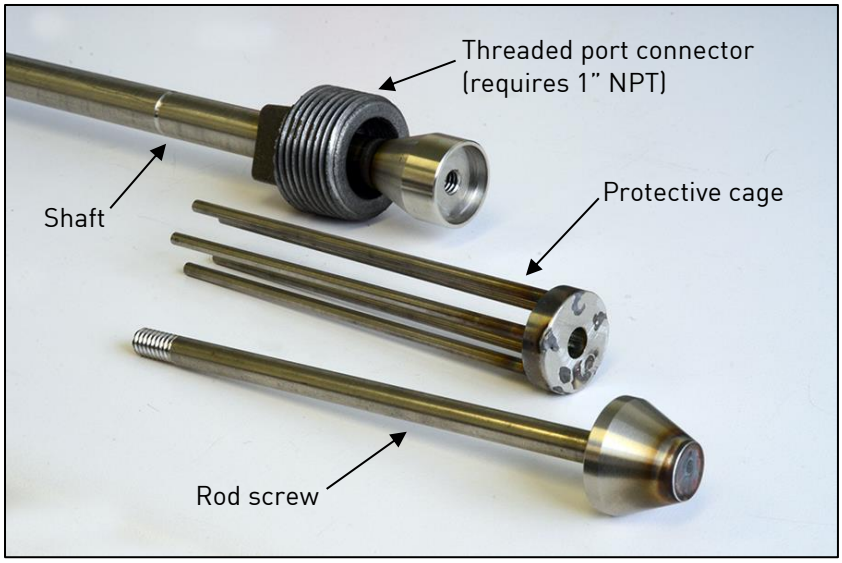


Figure 11 - Parts of metal insertion rod

NOTE: After repeated use, the insertion rod will gradually turn from its silver, "out of the box" color to a charcoal black color. This is due to the rod's placement in the furnace atmosphere and does not affect its function.

To prepare the insertion rod for placement in a testing atmosphere, first slide the "wound" portion of the wire coil(s) over the rod screw (**Error! Reference source not found.**). Up to 15 coils can be processed at one time if necessary.

Figure 4 - Wire coil placed on rod screw

IMPORTANT!

The wire coil must be placed on the rod screw, not on the protective cage.

Next, slide the rod screw through the opening in the protective cage (**Error! Reference source not found.**).

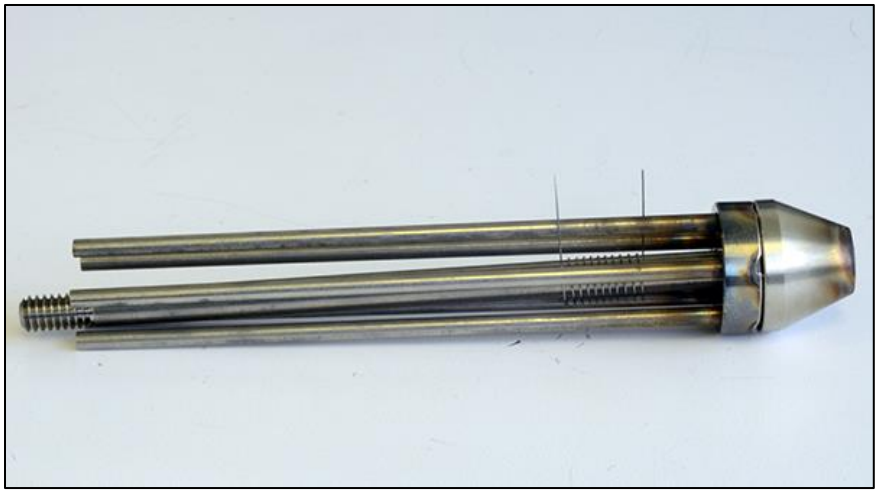


Figure 5 – Rod screw inserted through opening in protective cage

Finally, insert the protective cage and rod screw into the insertion rod (**Error! Reference source not found.**); hand tighten the rod screw until it screws into place tightly on the insertion rod. Ensure that the "legs" of the protective cage are inserted into the metal stopper on the insertion rod.

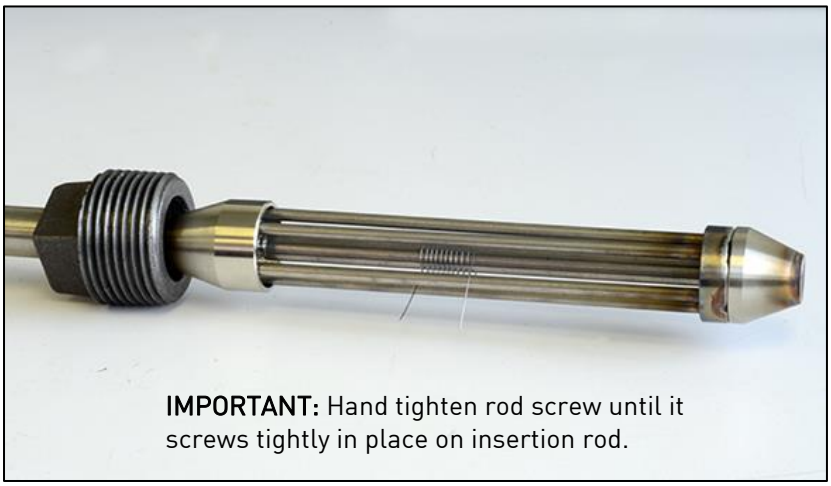


Figure 6- Protective cage and rod screw attached to insertion rod

Using the Insertion Rod in the Testing Environment

The insertion rod is now ready to be placed in the testing atmosphere. Since the testing atmosphere will be extremely hot, placement in the testing atmosphere is usually accomplished by extending the insertion rod through an access port in the furnace.

WARNING!

Use ANSI-approved eye protection at all times when working with the insertion rod in a plant or other testing environment. Take any additional precautions necessary to lower the risk of injury in the environment in which you are working.

With the wire coil in place on the insertion rod, place the insertion rod through an access port or other designated conduit. Begin hand-tightening the threaded port connector by turning the connector clockwise. See Figure 5.

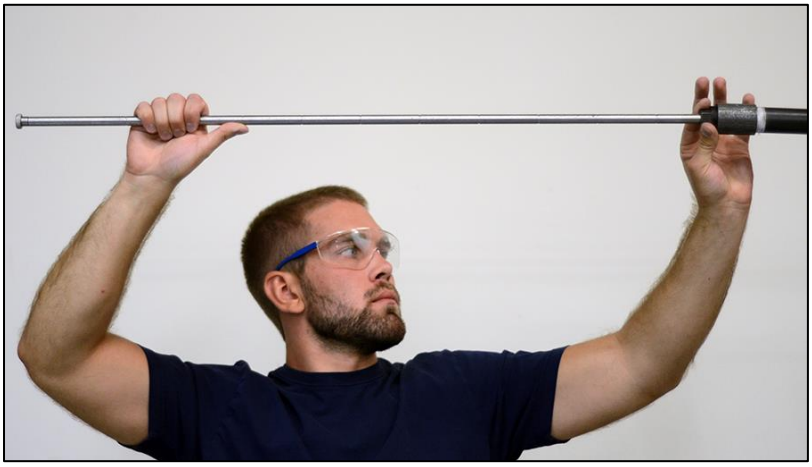


Figure 15 - Placing insertion rod in access port and tightening threaded port connector

Using a wrench, turn the port connector clockwise to finish tightening it (Figure). Take care not to overtighten the connector.

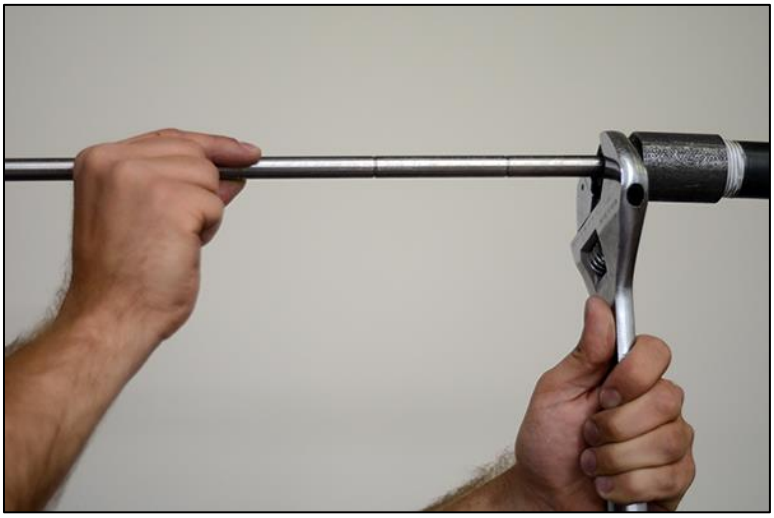


Figure 16 - Tightening port connector with wrench

Push the insertion rod until the wire coil is present in the testing atmosphere. The wire must now soak in the atmosphere; the amount of time to soak the wire is based on the temperature in the testing atmosphere. *120 minutes recommended for target carbon potential atmospheres of 0.40% and lower.

Table 2 shows the appropriate soak times.

Temperature in Testing Atmosphere	Minimum Soak Time
Above 1600°F	30 minutes
1550°F to 1599°F	60 minutes

Below 1549°F	90 minutes*

*120 minutes recommended for target carbon potential atmospheres of 0.40% and lower.

Table 2 - Soak times based on temperature in testing atmosphere

NOTE about soak times:

- Spring steels generally have a minimum carbon percentage of 0.50%C. SSi uses a carbon percentage that forms easily and maintains its shape with handling prior to being processed in a furnace.
- The CAT-100 %C-to-resistance relationship was developed based on one mill heat lot of spring steel, in order to ensure ease of use and traceability.
- Since the coil's base carbon percentage is above 0.50%C, a longer soak time is necessary for lower target carbon potentials to ensure that the coil is in equilibrium with the atmosphere.

NOTICE!

Soaking coils for less time than recommended in Table 2 may result in adverse effects on carbon potential readings when the wire coil is tested with the CAT-100.

Cooling Down and Removing the Insertion Rod

WARNING!

Use ANSI-approved eye protection at all times when working with the insertion rod in a plant or other testing environment. Use heat-resistant hand protection when removing the insertion rod from the testing environment. Take any additional precautions necessary to lower the risk of injury in the environment in which you are working.

NOTICE!

Do not immerse the insertion rod or wire coil in water or any other substance other than ambient air or test environment air at any time. Doing so could damage equipment and will invalidate the results of any carbon potential test.

Put on heat-resistant full hand protection (such as welding gloves) before proceeding.

Once the appropriate soak time has been achieved, the insertion rod is ready to be removed. Proper removal of the insertion rod is essential for achieving accurate carbon readings. Follow these steps for proper removal.

Recommended: Measuring tape; stopwatch or watch with seconds indication.

1. Retract the first 6" (six inches) of the insertion rod length from the access port.
2. Pause for one minute.
3. Retract another 3" (three inches) of the insertion rod length from the access port. Pause for another minute.

4. Repeat Step 3 as many times as needed until the protective cage makes contact with the ball valve (Figure 7).

Figure 17 - Removing insertion rod from access port

5. Once the insertion rod is fully retracted, leave it in place for a minimum of three minutes.
6. Close the access port valve.
7. Remove the insertion rod completely from the access port.

NOTICE!

Do NOT quench in water; air cool only. If a method of cooling other than air cooling is utilized, test results will be unreliable.

Using the Emery Cloth on the Steel Wire Coil

Before the wire coil is attached to the CAT-100 for analysis, the two ends of the wire should be cleaned. An emery cloth is provided for this purpose. It is recommended that each wire end be lightly cleaned with emery cloth, as pictured in Figure 18.

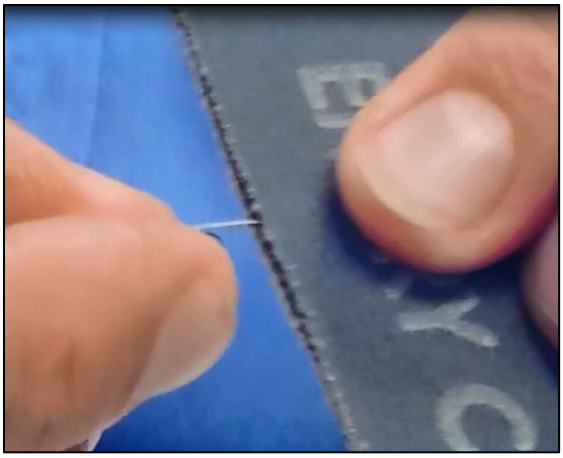


Figure 18 - Using emery cloth on wire coil

IMPORTANT!

The correct type of emery cloth must be used for acceptable results. SSi sells a fine grade, 150 grit emery cloth for use in this process. See the Replacement Parts list for more information.

Attaching the Steel Wire Coil to the Binding Posts

Attach one of two wire coil leads to the hole *on the right side* of one of the two binding posts, as shown in figures 19 and 20. Be sure to insert the coil lead until it touches the back of the post (note the contact points in Figure 19). Then tighten the post to secure the lead. Repeat this procedure for the second lead.

IMPORTANT!

Each lead must touch the back of the post to ensure the correct length of insertion.

Coil ends must be as horizontal as possible.

Note the red arrows in Figure 19.

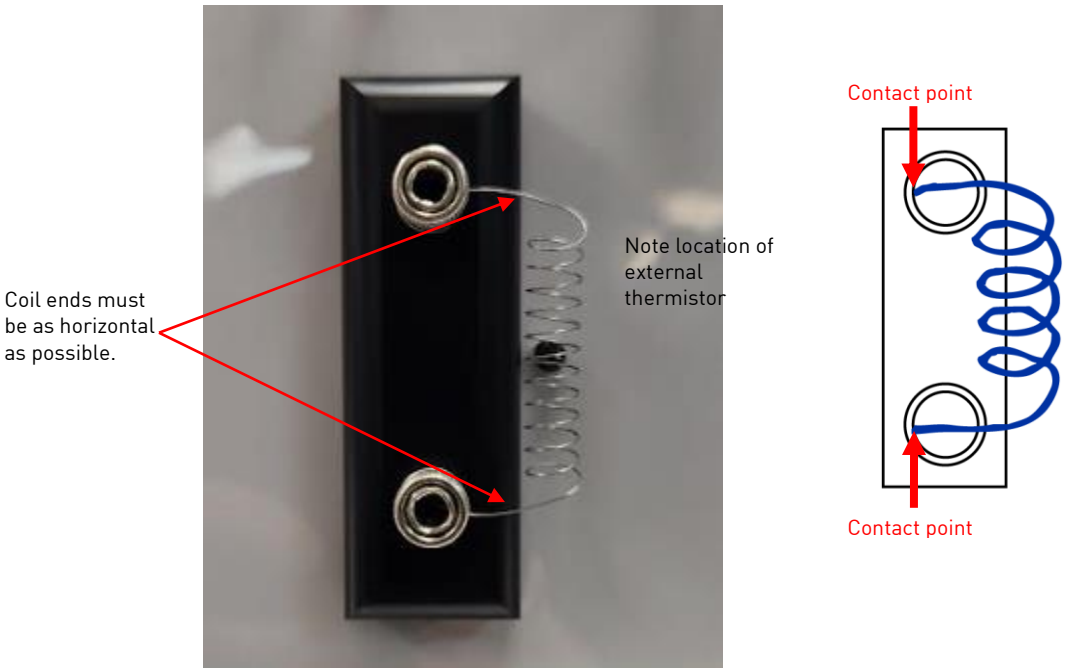


Figure 19 - Attaching wire coil to binding posts

Note: The CAT 100 coils are not compatible with carbonitriding processes.

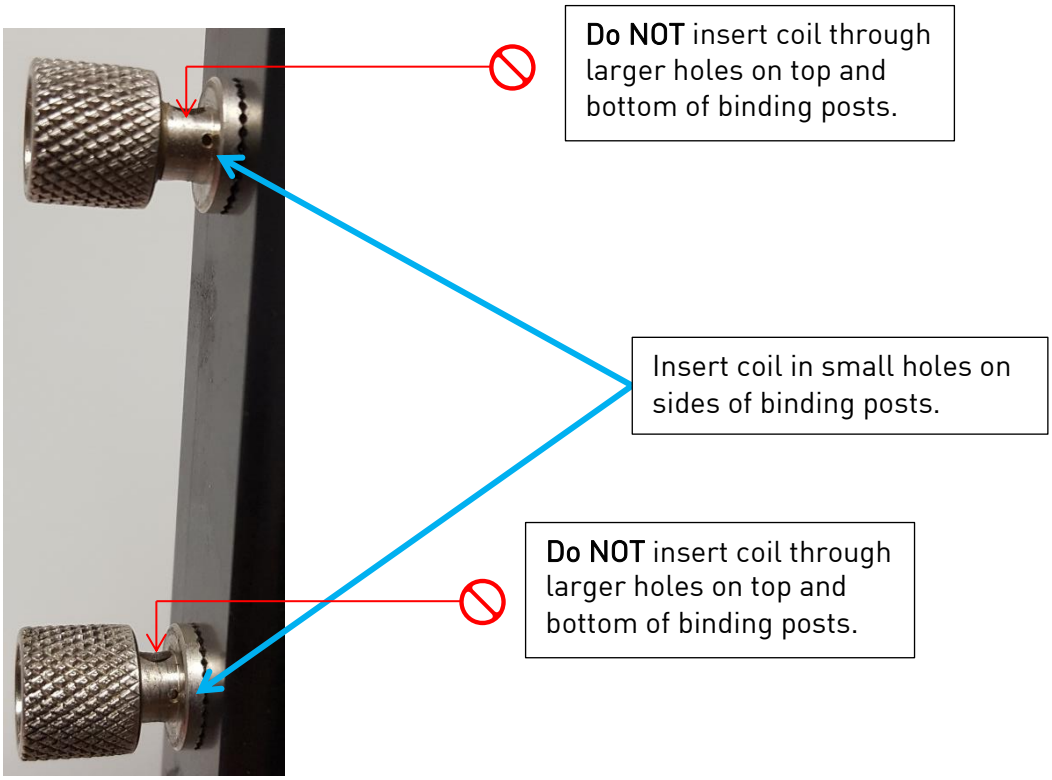


Figure 20 – Close up of binding posts

Once the wire coil is secured to the binding posts, close the protective cover on the CAT-100.

IMPORTANT!

Ensure that the wire coil does not make contact with the external thermistor once the wire is attached to the binding posts. The location of the external thermistor is noted in

Figure .

Storing Test Results

Leave the wire coil attached to the binding posts for 30 to 45 seconds. During this time, the % Carbon reading will likely fluctuate. This is expected and is not an error. After 30 to 45 seconds, press the  button to save the setting to the CAT-100's internal storage.

Depending on which options are enabled in the Test Enables menu (see page 35), a series of screens will appear. If one or more of these options are NOT enabled in the Test Enables menu, that screen(s) will NOT appear.

- **Test ID Entry** (Figure 7). This screen gives you the ability to enter an identification number for the test data that you are saving. When finished, press ↵ to continue.

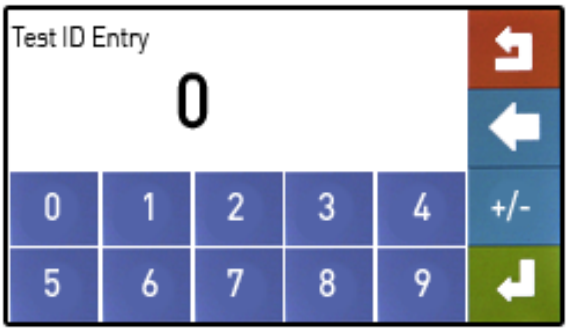


Figure 7 - Test ID Entry

- **Furnace # Selection** (Figure). With this screen, you may select a furnace number to associate with the saved test data. Furnace names may be edited in the CAT-100 PC software; see the **View Furnaces** section on page 46 for more details. The maximum number of furnace names is 16; the maximum number of characters for each name is 32.

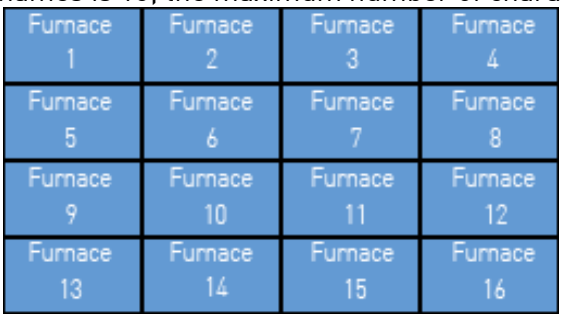


Figure 82 - Furnace # Selection

Operator # Selection With this screen, you may select an operator number to associate with the saved test data. Operator names may be edited in the CAT-100 PC software; see the **View Operators** section on page 46 for more details. The maximum number of operator names is 16; the maximum number of characters for each name is 32.

- **Enter probe data** (Figure 9). Using this screen, probe data may be saved with the test data: % Carbon ("%C"), millivolts ("MV"), thermocouple number ("TC"), and CO Factor ("COF"). Pressing each button associated with a field will bring up a numeric keypad that will allow you to enter the appropriate value for that field. When finished entering values, press ↵ to continue.

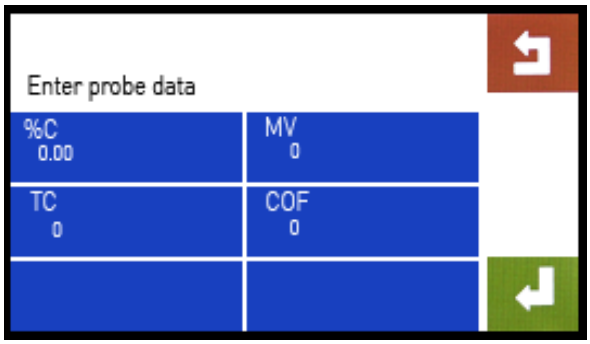


Figure 9 - Probe data entry

- **Enter date and time of test** (Figure 10). This screen contains buttons allowing you to enter the Year, Month, Day, Hour, and Minute of the test. You may also accept the default values shown. When finished entering values, press ↵ to continue.

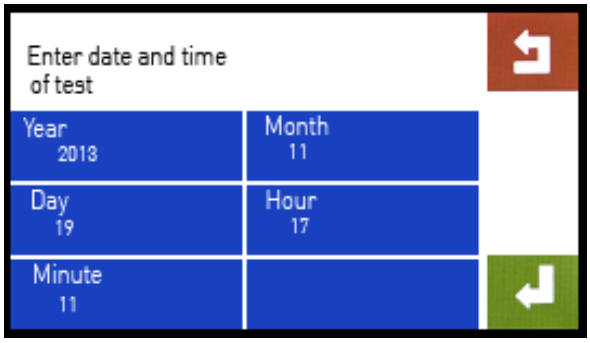


Figure 10 - Entry of date and time of test

The screen will read "Test Saved!" (see Figure 11) when the test data has been saved. A summary of the data saved will then be shown (Figure 12) before the main menu is again displayed.

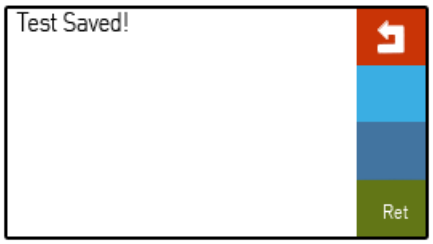


Figure 11 - "Test Saved!" initial screen

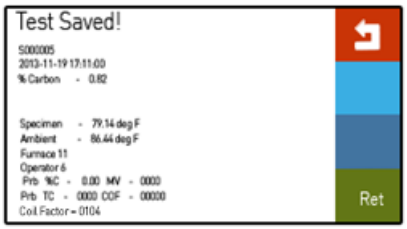


Figure 12 - "Test Saved!" summary screen

Once the data has been saved appropriately, remove the wire coil from the binding posts. Discard the wire coil in a proper manner. <u>To prevent errors in test results, it is important not to reuse a coil that has already been used.</u>

CAT-100 Menu Navigation

Most of the CAT-100's functional details and settings are accessed by using the CAT-100 menu.

To open the menu from the main screen, press the "Menu" ( ) button located in the upper right hand corner of the touch screen, as shown in Figure 13.

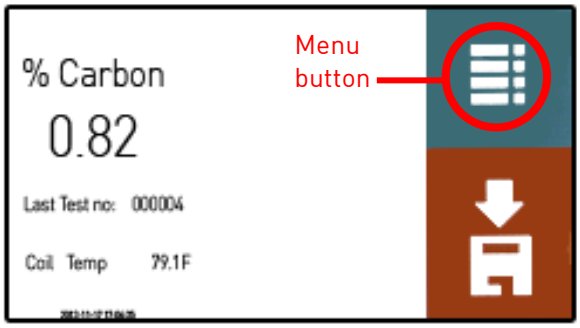


Figure 13 - Main Screen with Menu button

A number of menu items will be visible.

User Level

- Main
- Detail
- Review Tests
- About
- LOGIN

Supervisor Level (Default Code: 1)

All of the above options and these:

- Calibration
- Coil TC Calibration
- Comms Setup (Communications Setup)
- Ethernet Setup
- Update
- View Updates

Configuration Level (Default Code: 2)

All of the above options and these:

- General Setups
  - Temperature Mode
  - Date/Time Set
  - Display Theme
  - Factory Defaults
  - Clear Tests
- Test Enables
- Touch Cal (Touch Calibration)
- Pass Code Set
- Language

Figure 14 shows an example of a CAT-100 menu list. The menu items are described in more detail in the subsections below.

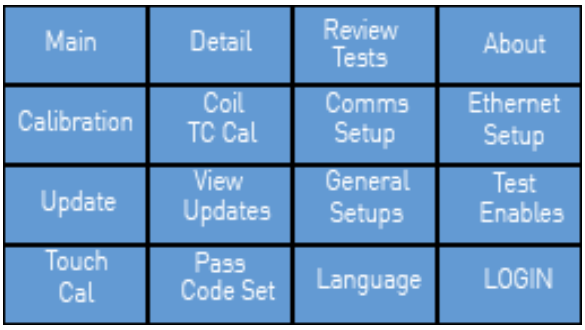


Figure 14 - CAT-100 Menu List

Note about Battery Level Indicator

The CAT-100 includes a battery level indicator which is displayed on the bottom of many screens. The battery level indication will change as the battery discharges. When the battery is nearly depleted of its charge, the indicator will change to a red color. Examples are shown in Figure 15.

Figure 15 - Example Battery Level Indicators

Main

The Main menu option will open the main status screen (pictured in Figure). From this screen, you can see Carbon Potential data and coil temperature for a properly attached wire coil.

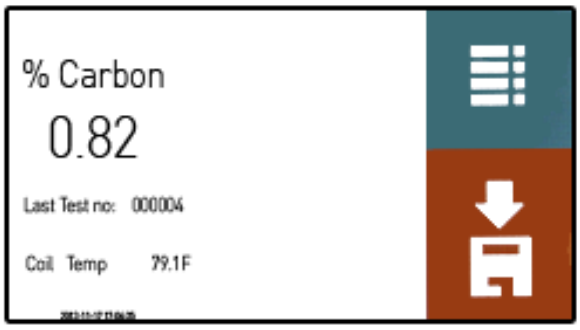


Figure 16 - Main Status Screen

If no coil is detected, or if the Carbon Potential cannot be calculated, the % Carbon will be displayed as "NS" ("No Sample").

The main status screen will be used during a typical coil testing procedure. Refer to the Testing Procedure section (page 8) for further details on this process.

Detail

The Detail menu will open the Detail screen (Figure), which displays current values for % Carbon, coil temperature (the temperature detected for the wire coil), and internal temperature (the temperature detected inside the CAT-100).

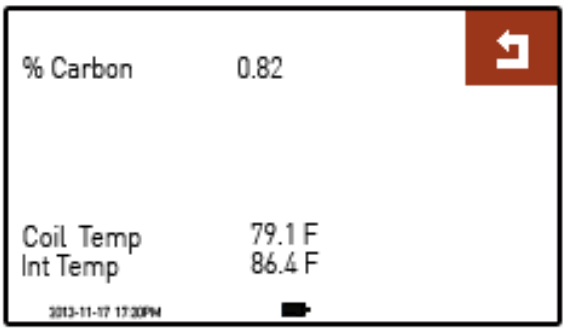


Figure 17 - Detail Screen

Press the ↰ button to return to the menu list.

Coil Factor and Advanced Detail Display (Configuration Mode)

By logging in with configuration mode (see LOGIN section on page 26), you can:

- View and set the **Coil Factor** (shown as "Factor") and
- View additional information on resistance, voltage, and current.

An example screen is shown in Figure 18.

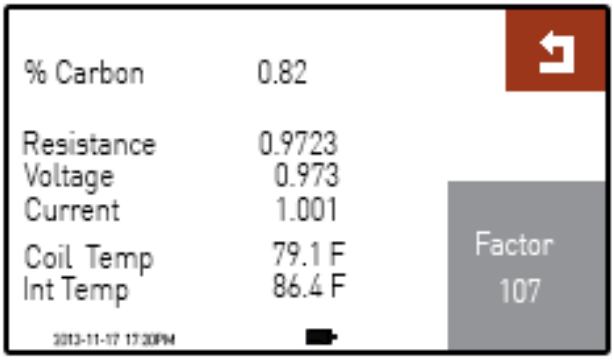


Figure 18 - Coil Factor and Advanced Display on Detail Screen (Configuration Mode Login Required)

Each wire coil has a Coil Factor associated with it. The Coil Factor is critical in accurate Carbon Potential calculations and can be found printed on each bag of wire coils. More information on how the Coil Factor is used and set can be found in the Entering the Coil Factor section on page 8.

Review Tests

The Review Tests menu contains a record of recorded test results. When opened, the menu will present a list of test results (Figure 19).

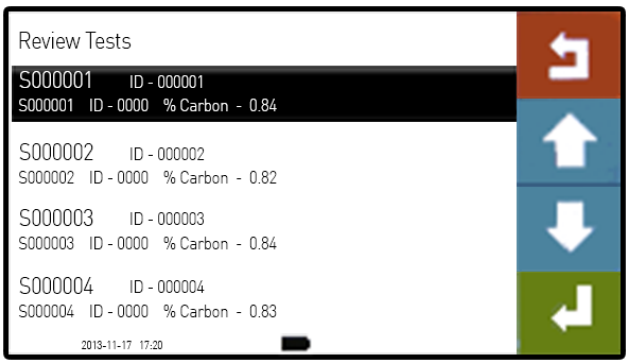


Figure 19 - Review Tests Screen

To view more detailed information on a specific test, use the ⇧ and ⇩ buttons to scroll to the desired test result, and then press the ↵ button. A screen similar to the one pictured in Figure 20 will be shown.

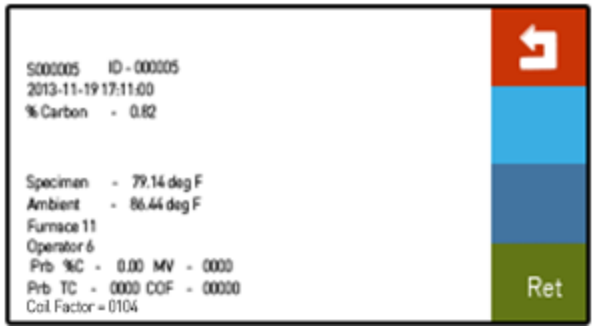


Figure 20 - Detailed Test Results

Press ↰ to return to the list of recorded test results.

Once you are finished reviewing test results, press the ↰ button to return to the menu list.

About

Selecting the About menu option will bring up the About screen (similar to the screen shown in Figure 21). This is the same screen that is shown when the CAT-100 first starts up.

Figure 21 - About Screen

LOGIN

The purpose of the LOGIN option (Figure 22) is to allow the user to access Supervisor and Configuration functions. Enter the Supervisor pass code (default is 1) to log in with the

Supervisor access level. Enter the Configuration pass code (default is 2) to log in with the Configuration pass code. Functions available with each access level are shown in the CAT-100 Menu Navigation section.

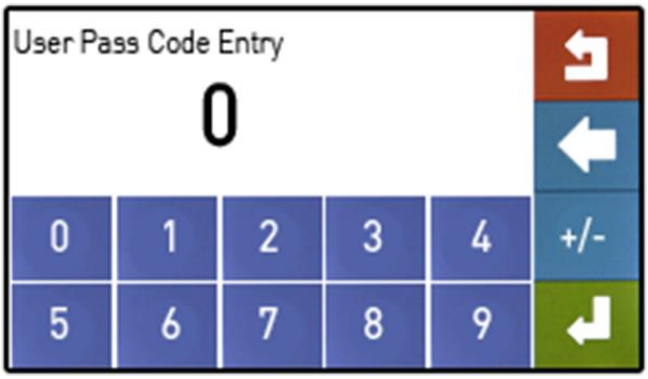


Figure 22 - LOGIN Option

Calibration

A circuit calibration is required once per year and recommended every four months. The required annual calibration is performed by SSi, and a certificate is issued for this calibration. A circuit calibration can be performed by the end-user by using the Calibration Bridge provided by SSi when the CAT-100 is first shipped.

An important guideline is as follows: **A circuit calibration should be performed at any time the "Error in %" found in this procedure is greater than 0.5 or less than -0.5.**

NOTE: Information on ordering a replacement Calibration Bridge can be found in the *Extended Insertion Rod*
Maximum extension length: Approximately 54.4".

Replacement Parts section.

The Calibration screen allows you to perform the circuit calibration. The procedure is as follows.

1. Open the Calibration menu option. Doing this will require a Configuration level access code.

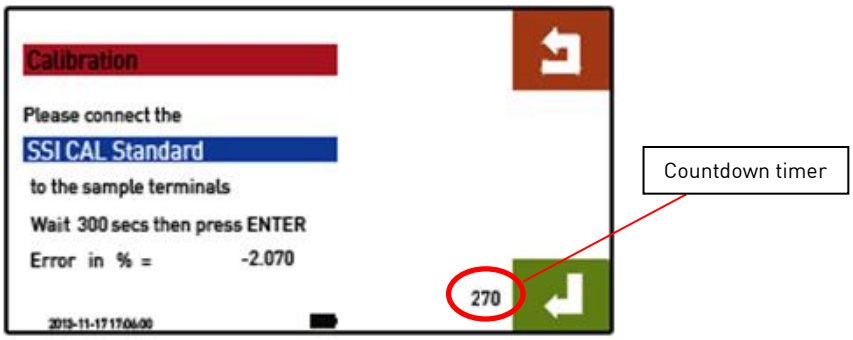


Figure 23 - Calibration menu screen

2. Connect the Calibration Bridge to the binding posts (It is *not* necessary to sand the calibration bridge). Do this by first inserting the **long end** of the Calibration Bridge into a binding post first, tightening that post, then inserting the **short end** of the Calibration Bridge in the other binding post, and tightening that post. See Figure 24.

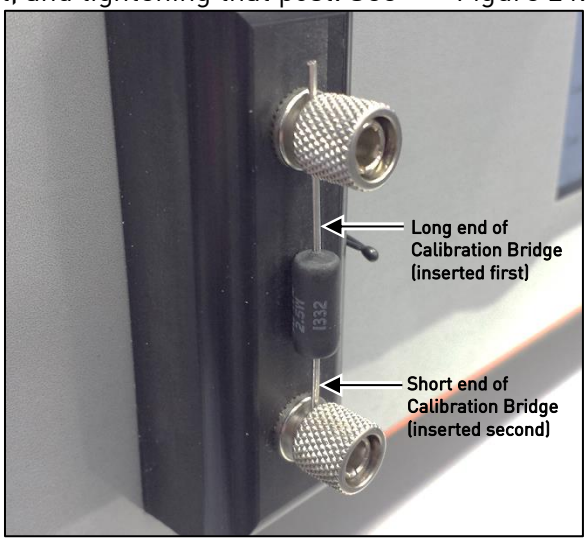


Figure 24 - Calibration Bridge in CAT-100 Binding Posts

3. Wait five (5) minutes. This will allow "Error in %" readings to stabilize. The screen will display a countdown during the calibration process (See Fig. 38 above).
4. Press the ↵ button to calculate and store the calibration value. The "Error in %" should now be equal to zero (0). If "Error in %" does not read zero (0) on the first attempt, press ↵ to recalculate and store the calibration value.

IMPORTANT!

The maximum allowable "Error in %" range is ±0.5. If the "Error in %" is greater than 0.5 or less than -0.5 after you have pressed the ↵ button more than twice, contact SSi at (513) 772-0060 for further assistance.

Press the ⮌ button to return to the menu list.

Coil TC Calibration

The CAT-100 contains a thermistor used to measure ambient temperature in the area near the binding posts to which the steel wire coil is attached for carbon analysis. This thermistor must be calibrated annually.

To calibrate, first press the Coil TC Calibration button. Using a digital thermometer with accuracy of ±0.1°C (±0.18°F), measure the ambient temperature within ¼" of the thermistor (see Figure 25). Enter this value in the Coil TC Calibration screen (Figure). The "Coil Temp" value will change to the value you entered.

Figure 25 - Location of external thermistor

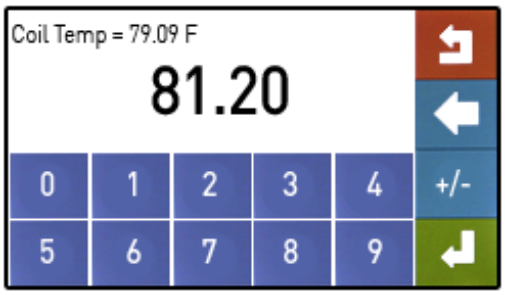


Figure 26 – Coil TC Calibration screen

Press the ⮌ button to return to the menu list.

Comms Setup (Communications Setup)

The Comms Setup screen allows you to change communications settings of the serial and USB connections for the CAT-100. Use the ⇧ and ⇩ buttons to change which setting is selected.

Press the ↵ button to change a setting. **In most cases, these settings will not need to be changed from their defaults.**

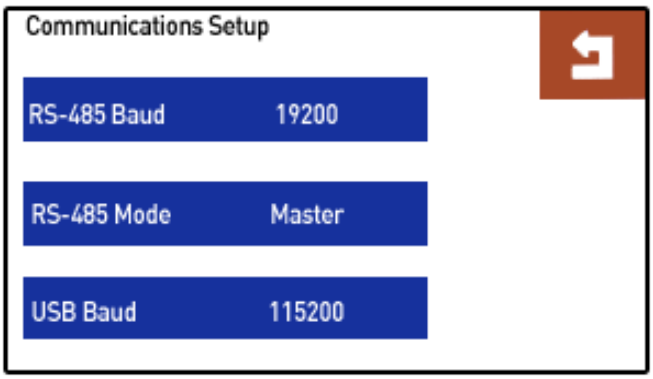


Figure 27 - Comms Setup Screen

The settings are as follows:

- RS-485 Baud: The baud rate (data transmission rate) of the RS-485 serial connection. 19200 is default.
- RS-485 Mode: The mode of the RS-485 serial connection. Master is default. Host may also be selected.
- USB Baud: The baud rate (data transmission rate) of the USB connection. 115200 is default.

To change the value for a selected setting, use the ⇧ and ⇩ buttons. When finished, press the ↵ button.

Press the ⮌ button to return to the menu list.

Ethernet Setup

The Ethernet Setup menu (Figure 28) allows you to change settings for the network adapter on the CAT-100. The following settings can be changed:

- Address (IP Address). The IP address of the CAT-100.
- Subnet Mask. The subnet mask for the CAT-100. If you intend to create an Ethernet connection between the CAT-100 and a computer, all of these values must match the subnet mask of the computer you are using to connect to the CAT-100.
- Gateway. The IP address of the router or network device that manages traffic on the network.

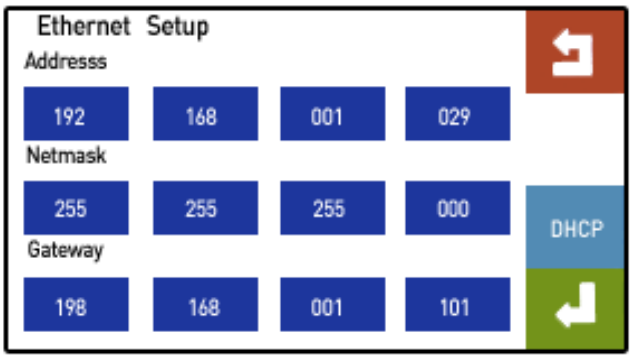


Figure 28 - Ethernet Setup Screen

Each of the numeric values may be changed by first tapping the numerical block and then using the numeric keypad to enter a new value.

IMPORTANT!

If you are uncertain of the correct network settings for the CAT-100, first consult your network administrator. Incorrect network settings may cause the CAT-100 to be unusable on the network and may even cause network problems for other devices on the network (such as computers and other connected instruments).

Press the ↰ button to return to the menu list.

DHCP Button

The **DHCP** button (Figure 29) turns on dynamic IP address assignment. When DHCP is on, the CAT-100 will request an IP address from the network server. This IP address may change over time.

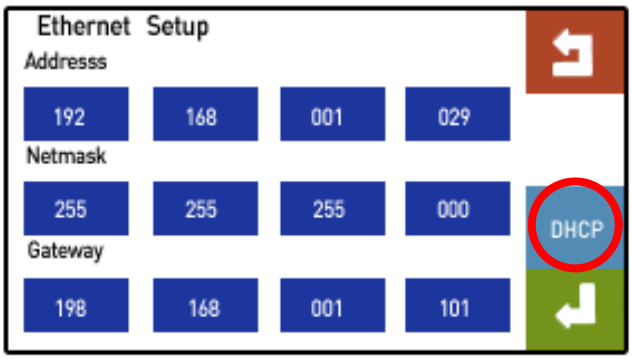


Figure 29 – DHCP Button

If dynamic IP addressing is turned ON, a message will appear to the right of the "Address" text. The message will read "DHCP ," followed by an IP address. This is the dynamically assigned IP address that the CAT-100 is using. When dynamic IP addressing is turned ON, the message "DHCP" will also appear on the main screen.

To turn dynamic IP addressing OFF, enter a static IP address. The CAT-100 will switch to manual Ethernet settings.

In order to leave dynamic IP addressing ON, press the ↰ to exit the Ethernet Setup menu.

Update

The Update menu (Figure) is used to perform an automatic update of operating parameters. In order for the update to work, the CAT-100 must be connected to an Ethernet network with Internet access. Press the "START" button to begin downloading the calculation update.

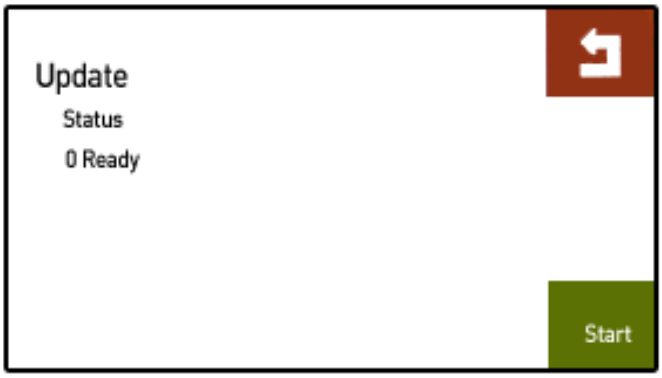


Figure 30 - Update Screen

NOTE: If the CAT-100 is connected to a network with Internet connectivity but fails to update properly using this menu, turn on dynamic IP assignment (following the procedure described in the DHCP Button section on page 31) and try the update again. If you continue to have problems after doing this, please call SSi at (513) 772-0060.

Press the ↰ button to return to the menu list.

View Updates

The View Updates screen (Figure) allows you to view a log of calculation method changes and when they were applied. Pressing ↵ will load the highlighted calculation method, and the CAT-100 will use that method to calculate % Carbon.

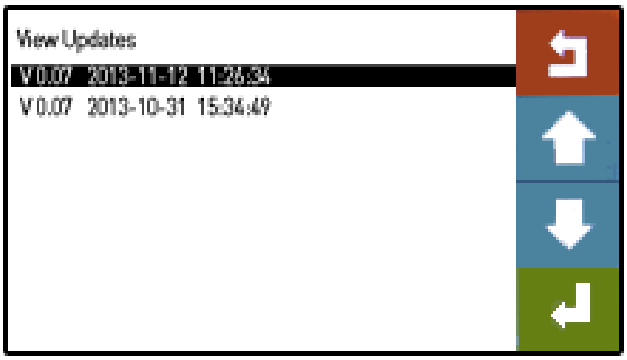


Figure 45 - View Updates Screen

Press the ↰ button to return to the menu list.

General Setups

The General Setups menu (Figure 31) contains five submenus used to control various settings, reset the CAT-100 to factory default settings, and reset test numbering.

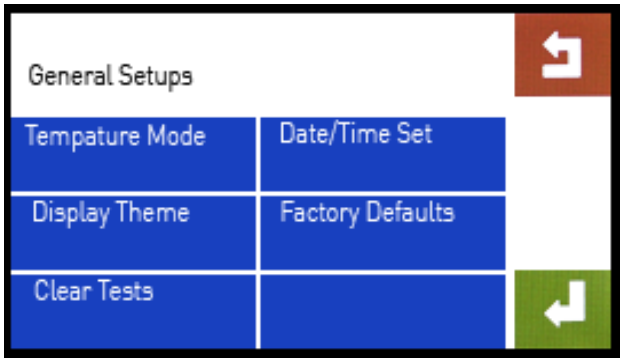


Figure 31 – General Setups screen

Temperature Mode

The Temperature Mode menu (Figure 32) allows you to select one of two temperature modes for displaying and recording data. These two modes are **Fahrenheit** and **Celsius**.

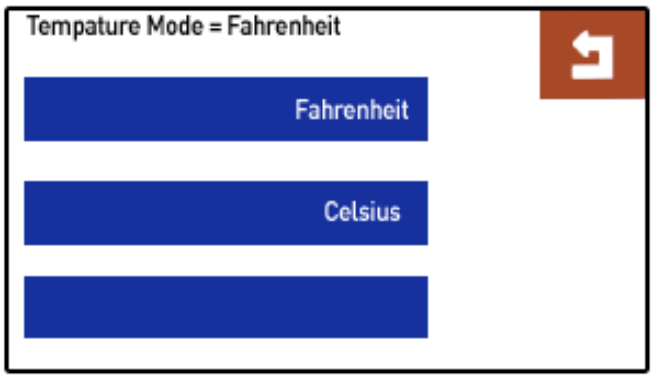


Figure 32 – Temperature Mode selection

Date/Time Set

The Date/Time Set menu (Figure) allows you to set the current date (Year, Month, and Day) and time (Hour, Minute, and Second) manually.

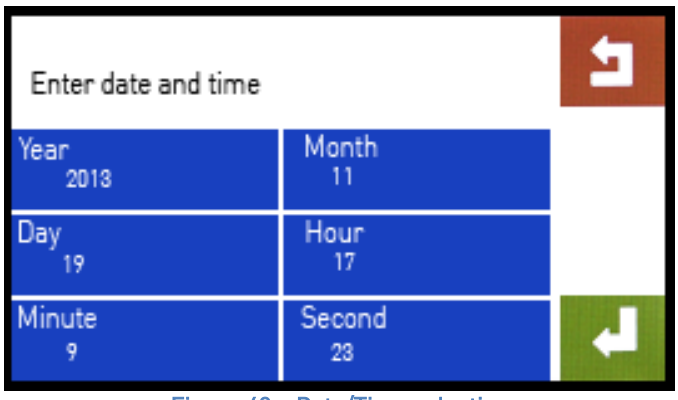


Figure 48 – Date/Time selection

Display Theme

Using the Display Theme menu, you may choose one of three display modes: white text on black background, black text on white background (default), or white text on gray background.

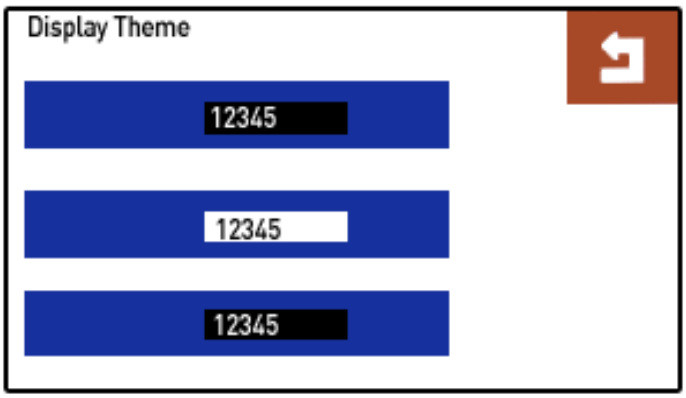


Figure 49 – Display Theme selection

Factory Defaults

Pressing this button will revert CAT-100 settings such as operating parameters, equipment (furnace) numbers, and operator numbers to factory defaults. The static IP address (if assigned) is not changed.

Use care when selecting this option, as any settings that were changed before factory defaults are reset cannot be recovered. Also note that if the device is reset, the coil curve will also need to be updated to match your current coils.

Clear Tests

Pressing this button will erase the first character of each stored test and restart test numbering at 0.

Test Enables

The Test Enables screen (Figure) allows you to toggle whether data for the following are enabled or disabled:

- Test ID
- Equipment
- Operator
- Date/Time
- Probe Data

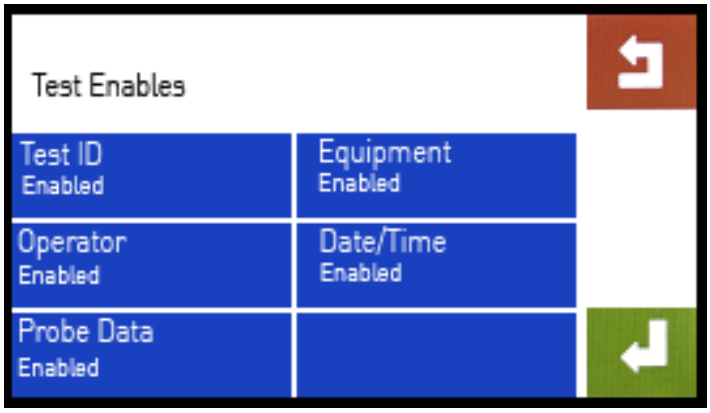


Figure 50 – Test Enables screen

Touch Cal (Touch Screen Calibration)

Using the Touch Screen Calibration option (Figure), you will be able to set up the CAT-100 touch screen for optimal touch response. Using a stylus, press and hold the center of each numerical block for a period of 10 seconds, as instructed on the screen. Once all of the blocks have turned green, press the DONE button.

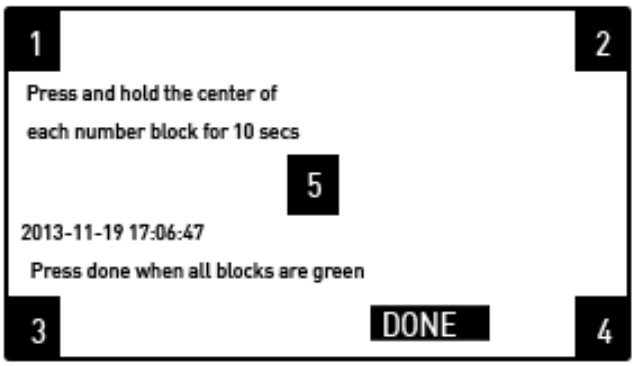


Figure 51 - Touch Calibration screen

Pass Code

Use the Pass Code screen (Figure) to change the default Supervisor and Configuration pass codes. Simply press the pass code type you would like to set, enter the new code on the numeric keypad, and then press ↵ to save the newly entered pass code.

Figure 52 - Pass Code Screen

Press the ⮌ button to return to the menu list.

Language

The CAT-100 provides several language options. Use the Language menu to change which language the CAT-100 uses for operation.

Press the Language Update button to update the language definition file. An Internet connection to the CAT-100 is required for this to work.

Press the ⮌ button to return to the menu list.

CAT-100 PC Software (CAT-100 View)

When purchased, the CAT-100 is provided with PC computer software, **CAT-100 View,** that can be used to download and store data on the PC as well as display data in grid form and in a line graph. CAT-100 View connects to the CAT-100 using a USB or Ethernet connection.

Installation

Installation files for CAT-100 View are provided on a USB Drive that is shipped with the CAT-100. Insert the drive to begin the installation process. The drive contents will look similar to what is shown in Figure . To install CAT-100 View, double click on the "setup" or "setup.exe" file.

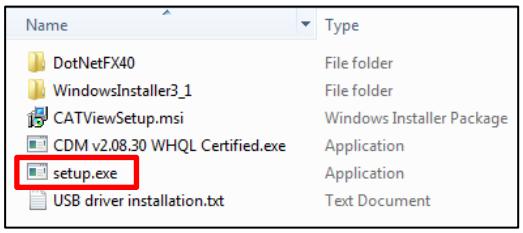
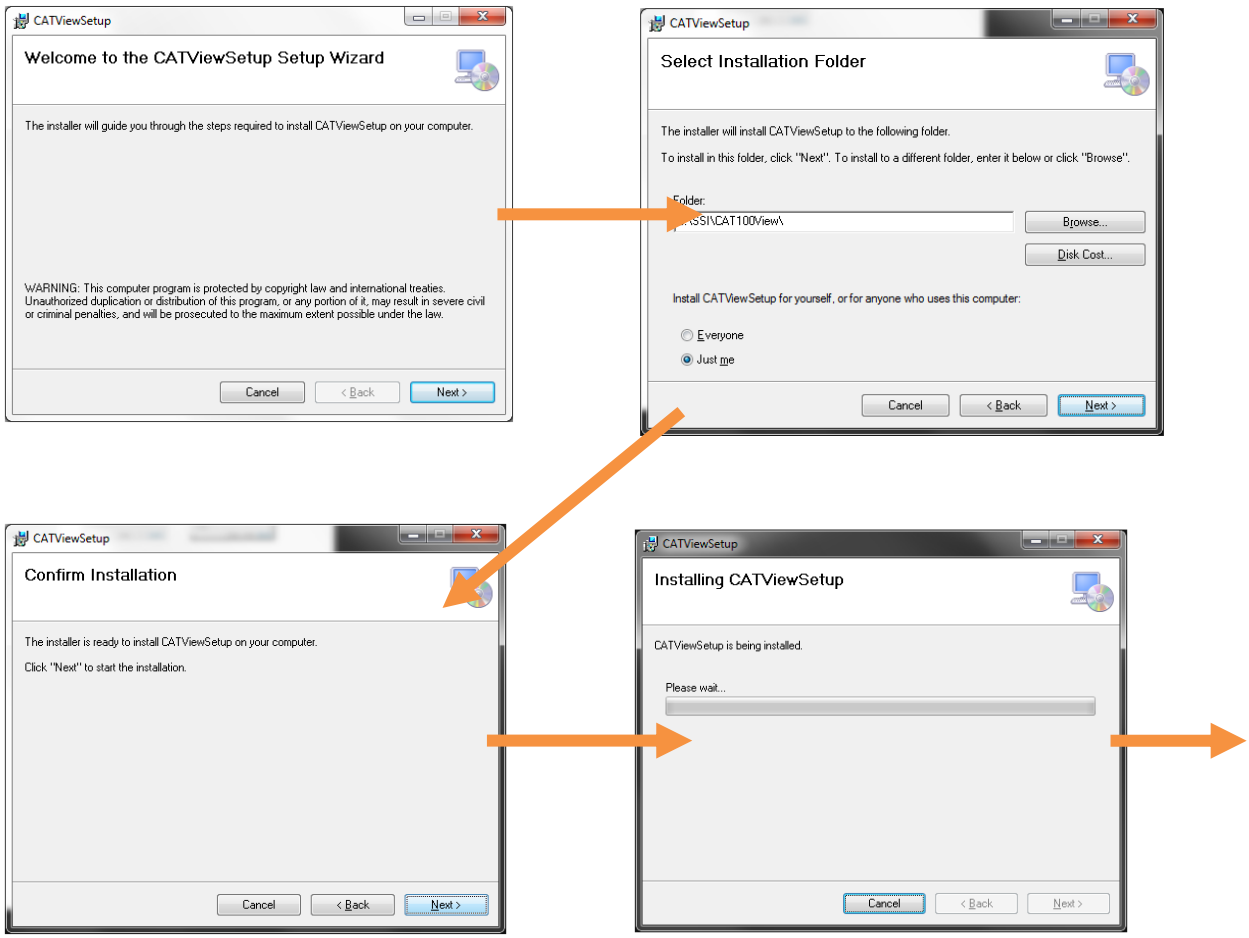


Figure 53 - Example contents of installation CD

CAT-100 View Setup will run. Figure shows an example of what the installation screens may look like. The Setup procedure will ensure that all prerequisites for using CAT-100 View are installed, in addition to the CAT-100 View software itself.



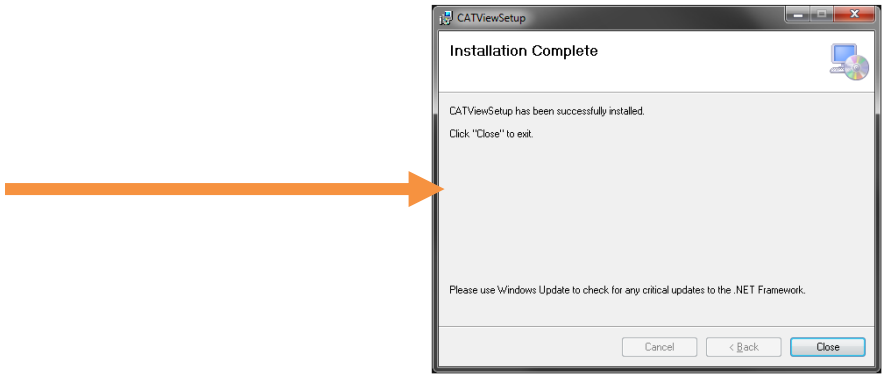


Figure 54 - CAT-100 View installation screens

Once installed, CAT-100 View can be opened from the Windows Start menu.

CAT-100 USB Driver

The CAT-100 can be connected to a PC using an Ethernet connection or USB. In **most** cases, Windows will detect the CAT-100 and install the USB driver that is needed for the computer to access CAT-100 data via USB. In some cases, Windows will not be able to successfully install the driver, in which case it will need to be installed manually. This can happen, for example, if the computer to which the CAT-100 is connected does not have Internet access.

To install the USB driver manually, follow these steps:

1. Ensure that the CAT-100 is not connected to the computer. Remove any USB cables and Ethernet cables from the CAT-100.
2. Insert the installation CD provided with the CAT-100 into the computer's disc reader.
3. Open the installation CD in Windows Explorer. Find the file named ***CDM v2.08.30 WHQL Certified.exe.*** This is the driver installation program.
4. If using Windows XP, double click on the driver installation program. If using Windows Vista, 7, or 8, right click on the driver installation program and select **Run as administrator** (you will need to confirm this action).
   NOTE: The program must be run with administrator privileges in order to work correctly.
5. Extract the driver installation files by clicking **Extract.** A driver installation window will appear once all files are extracted.
6. Click **Next** to install the drivers.

   Once the drivers are installed successfully, a window will appear showing the successful installation.

7. Restart the computer.

   If you encounter problems with this procedure, contact SSi by calling (513) 772-0060.

Main Screen

The main screen is what appears when CAT-100 View is first opened. In order to utilize most of this screen, data must first be downloaded from a CAT-100 unit. This is performed with the Manage CAT100s option described on page 45.

Figure shows the layout of the CAT-100 View main screen. Lettered labels in Figure correspond to descriptions in Table 3 - Main Screen options and Table 4 - Main Screen display fields.

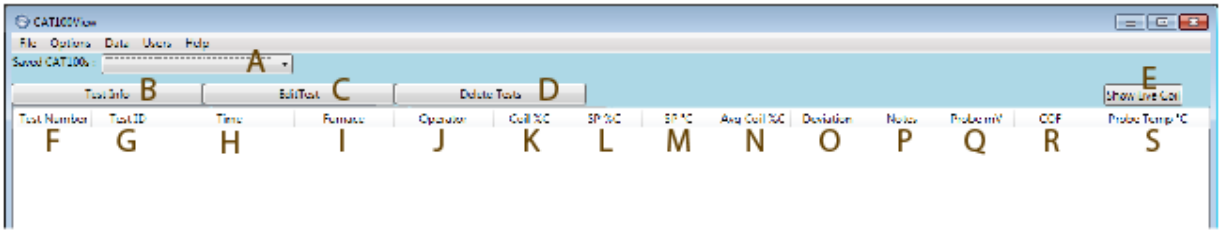


Figure 55- CAT-100 View main screen

Main Screen Options		
Label in Figure	**Name**	**Description**
A	**Saved CAT100s** drop-down list	Opens a list of CAT-100 units that have been accessed by the program previously. When a CAT-100 unit is selected, data that has been downloaded for that unit is displayed.
B	**Test Info** button	Opens a window containing information on a highlighted test
C	**Edit Test** button	Allows for the modification of highlighted test data (**NOTE:** This does NOT change the data on the CAT-100 itself)
D	**Delete Tests** button	Deletes highlighted test data
E	**Show Live Coil** button	Displays coil data from a connected CAT-100
NOTE: If no CAT-100 data is loaded, the buttons (B, C, D, & E) will be grayed out.		

Table 3 - Main Screen options

Main Screen Display Fields		
Label in Figure	**Name**	**Description**
F	Test Number	The saved test number
G	Test ID	The test ID *(user-provided)*
H	Time	The time of the test recorded by the CAT-100
I	Furnace	The saved furnace number *(user-provided)*
J	Operator	The saved operator identifier *(user-provided)*
K	Coil %C	The recorded carbon potential of the coil used in the selected test
L	SP %C	The carbon value of the process that is entered in the CAT-100 unit during the soak of the coil *(user-provided)*
M	SP °F	The temperature setpoint (may be displayed in °C or °F; *user-provided*)
N	Avg Coil %C	The average carbon potential for a particular Test ID
O	Deviation	The difference between the Coil %C and the SP %C
P	Notes	Test notes *(added in CAT-100 View)*
Q	Probe mV	The probe millivolts *(user-provided)*
R	COF	The CO factor *(user-provided)*
S	Probe Temp °F	The probe temperature (may be displayed in °C or °F; *user-provided)*
T	Coil Factor	The Coil Factor used in Carbon Potential calculation *(entered by user during testing procedure)*

Table 4 - Main Screen display fields

With the exception of the Test Number, all of the fields can be changed by the user. When a field is changed, it is changed in CAT-100 View, but not on the CAT-100 itself.

Sorting Data in the Main Screen View

The main screen provides a way to sort data based on one field by clicking on that field's column heading. For example, if you want to sort test results in order of time, simply click on the **Time** column heading. By default, sorting will be performed in ascending order. In the case of time, this means that the least recent time will be shown first. To change sorting order to descending, click on the column heading again. Again using the example of time, a descending order will display the most recent time first. This example is depicted in Figure .

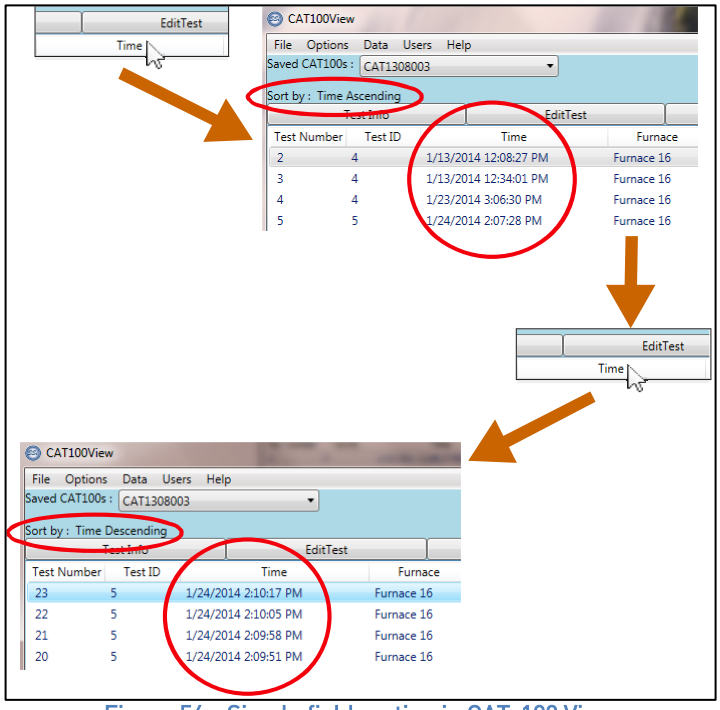


Figure 56 - Simple field sorting in CAT-100 View

For more advanced sorting options, see a description of the Sort menu on page 47.

File Menu

The **File** menu (Figure 57) contains three options: **Show Graph, Export Tests to CSV,** and **Print Selected Tests.**

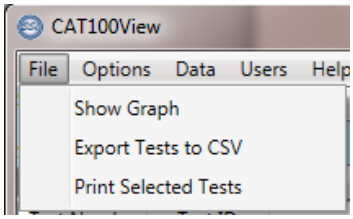


Figure 57- File Menu

Show Graph

The **Show Graph** option displays CAT-100 data in line graph form. This is derived from the data presented in the grid form displayed on the CAT-100 main screen. An example of a graph is shown in Figure .

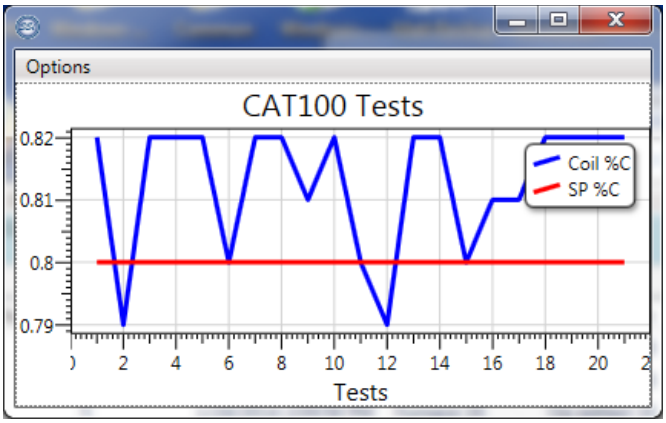


Figure 58 - Example of Line Graph in CAT-100 View

Export Tests to CSV

This option allows you to save downloaded CAT-100 data in a comma-separated value (CSV) file that can be opened with a program such as Microsoft Excel. To save a CSV file and use it in Excel, follow these steps.

1. Save the CAT-100 data to a CSV file using the **Export Tests to CSV** option in CAT-100 View (see example in Figure).

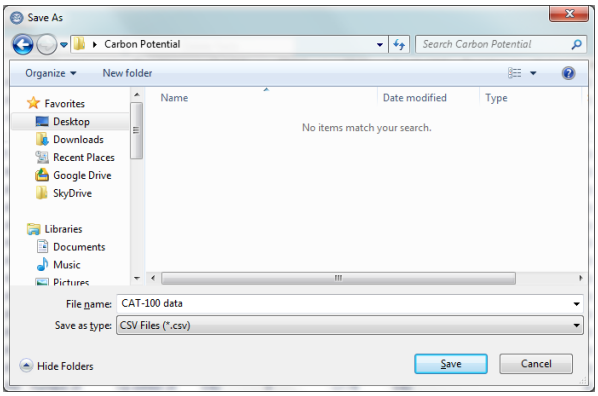


Figure 59 - Saving CSV file in CAT-100 View

2. Open Microsoft Excel (or a similar spreadsheet program). Open the **File -> Open** dialog box (Figure). Set the File Type to include .csv files. Select the CSV file you saved and click **Open**.

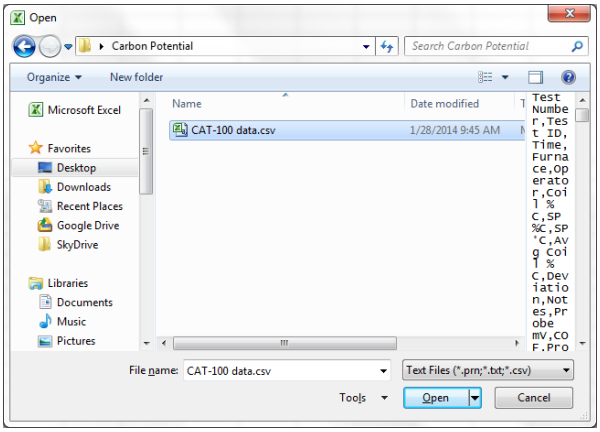


Figure 60 - Opening CSV file in Microsoft Excel

The rest of this section pertains to Microsoft Excel. However, other spreadsheet programs will likely have similar functionality.

3. Choose "Delimited" for the "Original data type" (Figure). Click **Next**.

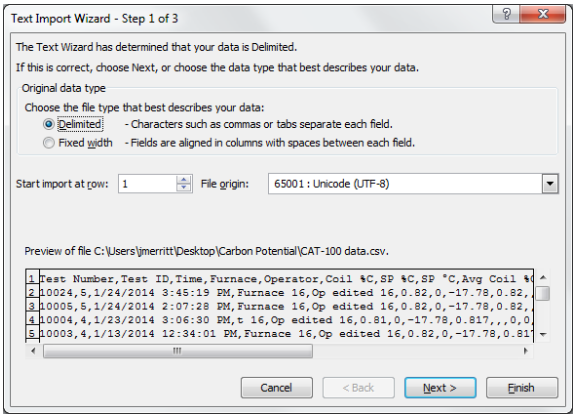


Figure 61 - Importing CSV file in Microsoft Excel (Step 1 of 3)

4. Set the Delimiter type to "Comma" (Figure). Then click **Next.**

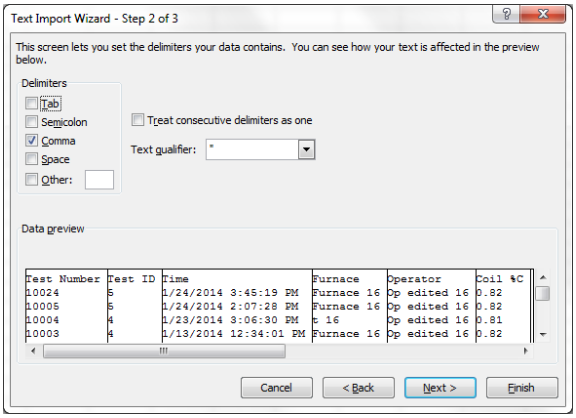


Figure 62 - Importing CSV file in Microsoft Excel (Step 2 of 3)

5. The "Column data format" can be configured for each column using the options in Excel (Figure). "General" format should work well in most cases. Click **Finish** when ready.

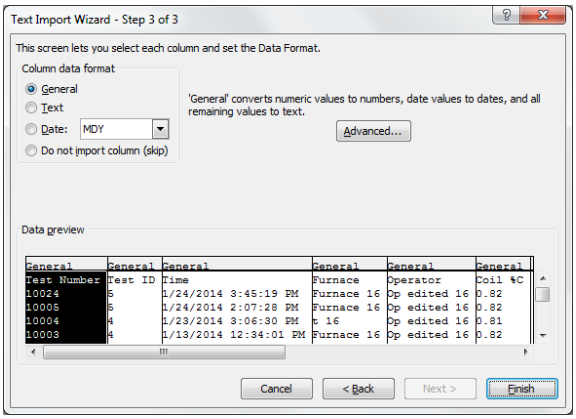


Figure 63 - Importing CSV file in Microsoft Excel (Step 3 of 3)

6. Observe how the data is organized in Excel (see an example in Figure). Make changes to the formatting as needed.

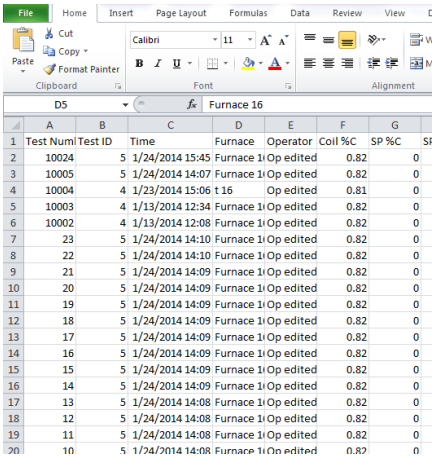


Figure 64 - Example of formatted CSV data in Microsoft Excel

Print Selected Tests

This option allows for the printing of selected CAT-100 data to a printer (see example Print Options window in Figure).

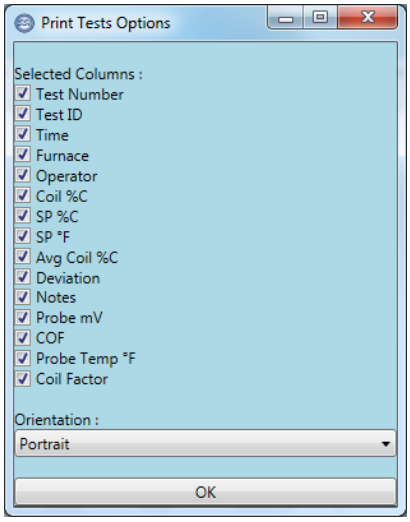


Figure 65 - Example Print Options window

Options Menu

The **Options** menu (Figure) provides the **Manage CAT100s** and **Temperature Scale** options.

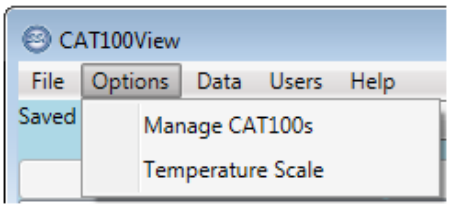


Figure 66 - Options Menu

Manage CAT100s

The **Manage CAT100s** menu is used to search for CAT-100 units via Ethernet or USB (see example in Figure). Once units are found, this option allows the PC to connect to a selected CAT-100, download data from it, and perform additional operations.

NOTE about USB connections: If you experience difficulty connecting the CAT-100 to the computer using USB, refer to the CAT-100 USB Driver section on page 39

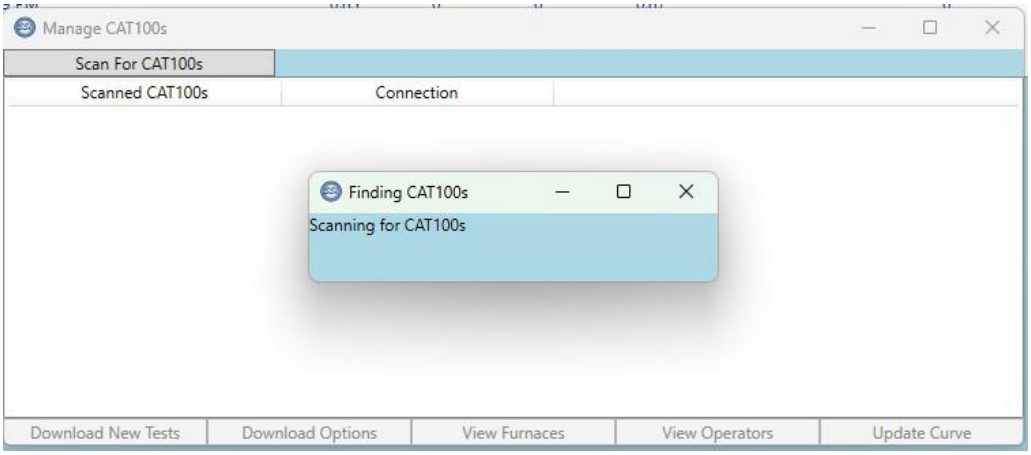


Figure 67 - Finding and selecting CAT-100s for management options

NOTE: Once CAT-100 View connects to a CAT-100 via USB or Ethernet, that CAT-100 can be connected to using the **Saved CAT100s** drop-down menu in the CAT-100 View main screen.

The following options are available:

Download New Tests. When this button is clicked, CAT-100 View downloads all new test values from the CAT-100 unit. New test values are those that have not been downloaded previously.

Download Options. This option (Figure) provides several parameters for downloading test results from the CAT-100 unit.

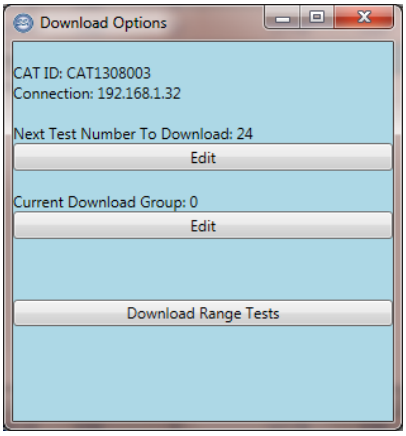


Figure 68 - Download Options

The first parameter is **Next Test Number To Download.** This specifies the test number at which CAT-100 View starts downloading test results. Any number less than that test number will not be downloaded. If the number specified for the Next Test Number does not exist, nothing will be downloaded.

The second parameter is **Current Download Group.** This allows you to assign a group number to the test data that will be downloaded when **Download New Tests** is clicked. In the main screen, the Test ID will display a value based on the following formula when a Group Number has been assigned to downloaded results: *(Group Number * 10000) + Test Number.*

The third parameter is **Download Range Tests** (Figure). This option allows you to set a range of tests that CAT-100 View will download from the CAT-100 unit. The test number in the "Start" field must exist in order for any values to be downloaded in this range.

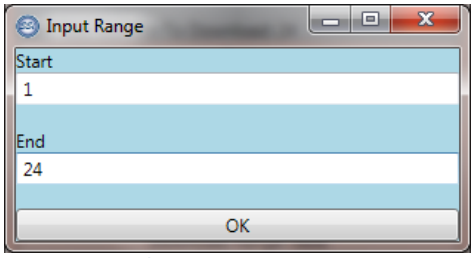


Figure 69 - Download Range Tests "Input Range" option

View Furnaces (Figure). Selecting this option will display the list of Furnace Names that can be applied to a test result when the test result is being saved on the CAT-100. The **Edit Furnace Names** option allows you to change a selected Furnace Name. There is a maximum of 16 furnace names, each with a maximum of 32 characters in the name.

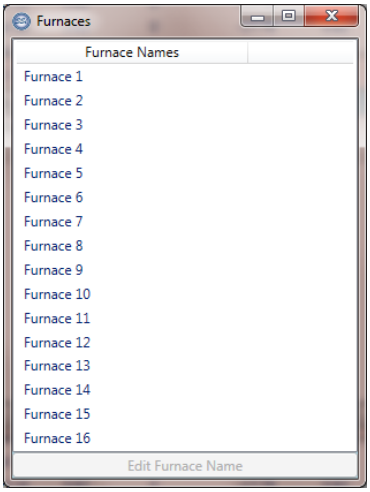


Figure 70 - View Furnaces option

View Operators (Figure). Similar to the View Furnaces option, this option, when selected, displays the list of Operator Names that can be applied to a test result when the test result is being saved on the CAT-100. The

Edit Operator Names option allows you to change a selected Operator Name. There is a maximum of 16 operator names, each with a maximum of 32 characters in the name.

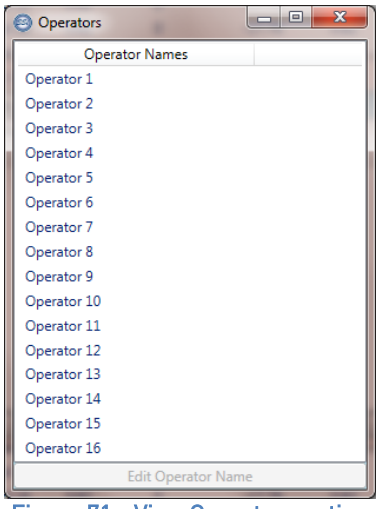


Figure 71 - View Operators option

Update Curve

The bag of coils that you purchased (SSI PN A20753) will specify a curve that is calibrated to the coil material. This option allows you to load the curve into your CAT100 analyzer and get an accurate reading from that material. The curve that is currently in you CAT100 is identified by a letter at the end of the serial number. Once the matching curve is entered, the CAT100 will save it and not need updating again unless a new curve is needed or if factory defaults are set.

Temperature Scale

Using this option (**Error! Reference source not found.**), you can toggle the temperature units between degrees Fahrenheit (°F) and degrees Celsius (°C).

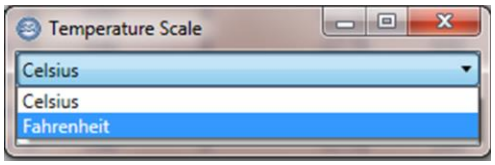


Figure 72 - Temperature Scale option window

Data Menu

The **Data** menu (Figure) contains the **Sort** and **Filter** options. These options are used to change how data is displayed in CAT-100 View.

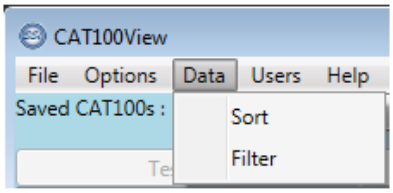


Figure 73 - Data Menu

Sort

The **Sort** window (Figure) contains advanced options for arranging data. As explained in the Sorting Data in the Main Screen View section on page 41, the main screen provides sorting options. The **Sort** menu provides additional functionality for sorting data, allowing for three "layers" of sorting.

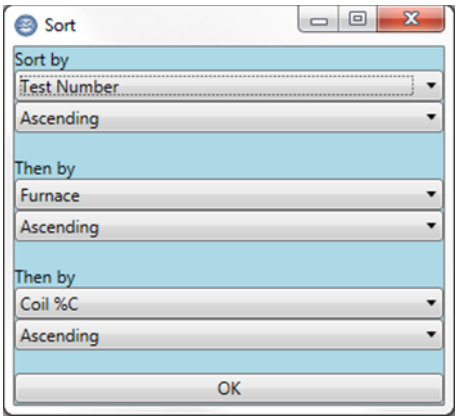


Figure 74 - Sort options window

As an example, if the settings in Figure are applied, data will be sorted first by Test Number in ascending order, second by Furnace Name also in ascending order, and third by Coil %C also in ascending order.

Filter

The **Filter** window (Figure) is used to set conditions for determining what data is displayed on the main screen and what data is not displayed.

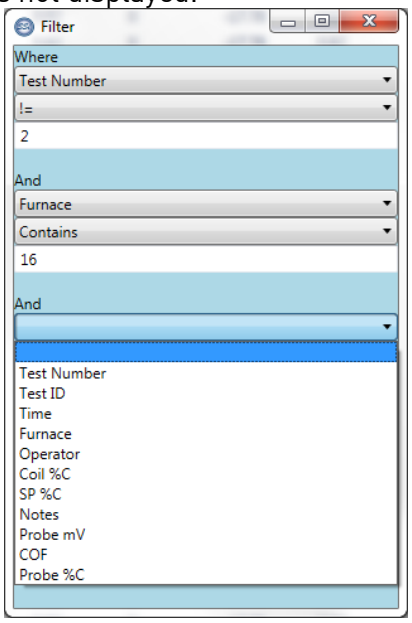


Figure 75 - Filter options window

The following operators are used in evaluating conditions:

Operator	Meaning
==	Is equal to
!=	Is NOT equal to
<	Is less than
>	Is greater than
<=	Is less than or equal to
>=	Is greater than or equal to

Table 5 - Operators used in Filter window and their meanings

Users Menu

The **Users** menu (Figure) contains options for adding, removing, and modifying registered users of CAT-100 View. It also provides the ability to log in and log out users. The available options in this menu are **Log In, Log Out,** and **Manage Users.**

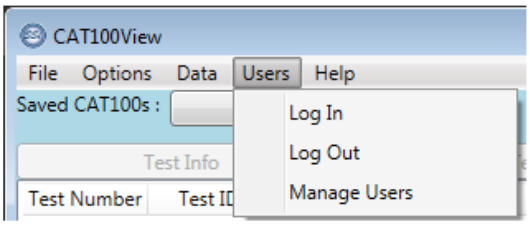


Figure 76 - Users Menu

Log In

Use this option (Figure) to log in with a registered user's credentials. (**NOTE:** To set up a user, use the Manage Users option.)

NOTE: If you have forgotten your login info, contact SSi for a login override code.

Once you've logged in a user successfully, that user and the user's type will be displayed in the upper left hand corner of the CAT-100 View main screen (example in Figure).

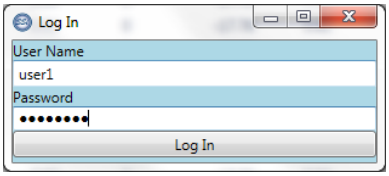


Figure 77 - Log In window

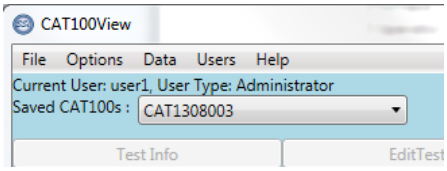


Figure 78 - Message indicating logged in user and access level

Log Out

Use this option to log out the currently logged in user.

Manage Users

This option allows you to add, remove, and modify registered users. The access levels possible are Operator, Supervisor, and Administrator. Operator and Supervisor access levels allow for the deletion of test results from CAT-100 View. Administrator access is required to add, remove, and modify users. The exceptions to the Administrator access requirement are in two cases:

1. **No users have been added.** If no users have been added, one user may be added for the first time. **It is recommended to add at least one user with Administrator access before adding any others.**
2. **Users have been added, but no Administrator level users have been added.** If users have been added, but none of the users have Administrator access privileges, then the existing users have Administrator level access by default. Once an Administrator level user has been added, only users with Administrator access privileges will be able to add, remove, or modify other users.

Figure illustrates an example of adding a user to CAT-100 View.

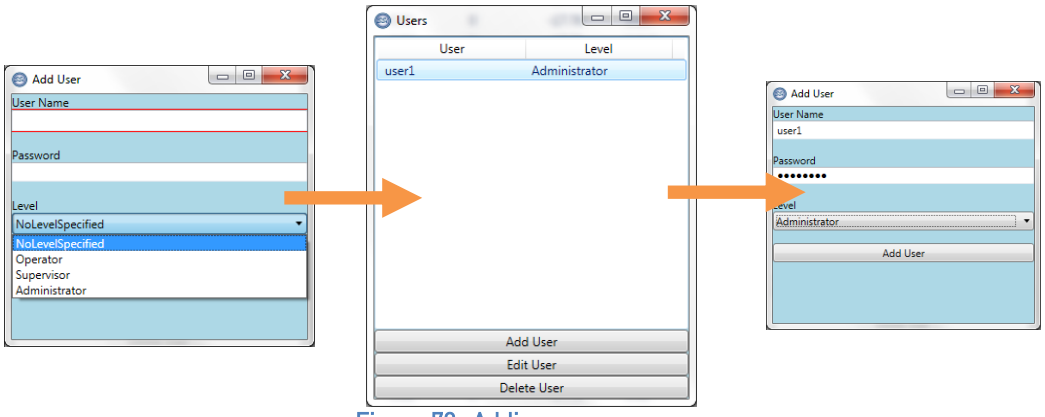


Figure 79- Adding a user

Help Menu

The **Help** menu (Figure) provides the ability to check for (and, if available, download) updates to the CAT-100 View software; it also provides information on the currently installed CAT-100 View version and software update history.

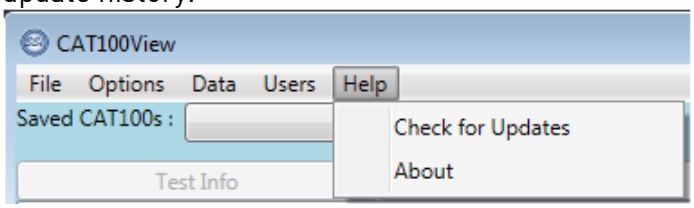


Figure 80 - Help Menu

Check for Updates

This option will check the Internet for updates to the software and, if an update is found, give you the option to download and install it. **It is recommended that you keep your software up-to-date and download updates when they are available.**

About

The **About** screen provides information on the specific software version as well as a revision history for the software.

Troubleshooting

The CAT-100 is designed to provide accurate results testing procedures and conditions are consistent with the product's design. When problems or discrepancies are encountered, they can often be corrected. The table below provides a list of potential problems that may be encountered, possible causes, and corrective actions that may rectify the problem.

WARNING!

When troubleshooting, follow all proper safety precautions. Use proper eye protection and hand protection at all times.

Problem	Possible Causes	Possible Corrective Actions
Wire breaks at any point in the procedure	Coil cooled too quickly	When removing insertion rod, follow procedure exactly as shown in Cooling Down and Removing the Insertion Rod section on page 16
	Wire stretched beyond design limitations	Avoid stretching wire excessively
% Carbon indicated by CAT-100 differs by more than 0.03% from Process Variable shown by instrumentation at the time wire was exposed to testing atmosphere	Wire soaked too early in soak cycle	Insert wire coil into testing atmosphere during final one-third of soak cycle.
	Emery cloth not applied to wire after soaking	Perform a test of a new wire, closely following the instructions in Using the Emery Cloth on the Steel Wire Coil page on 17
	Variability in % Carbon levels in testing atmosphere	Ensure that testing atmosphere remains consistent during test. Temperatures, % Carbon, and other parameters should not change significantly while wire is exposed to testing environment. Furnace should be in a soak state for a minimum of one hour.
	Testing procedure not followed correctly	Calibrate CAT-100 and re-test using an unused wire, following instructions exactly as indicated in manual
	Instrumentation error	Contact equipment manufacturer or distributor
% Carbon indicated by CAT-100 differs by more than 0.03% from Process Variable shown by instrumentation at the time wire was exposed to testing atmosphere *(Continued)*	Incorrect Coil Factor entered	Ensure that the correct Coil Factor is entered during the testing procedure; see Entering the Coil Factor section on page 8.
Carbon Potential is not within the effective range of 0.1% to 1.3%	Actual Carbon Potential is not within the effective range of the unit	% Carbon shown must be within the effective range in order to be reliable. A different method of measuring Carbon Potential may be needed in such a case.
	Soak time too long or too short	Re-test using an unused wire. Ensure that soak times shown in *120 minutes recommended

Problem	Possible Causes	Possible Corrective Actions
		for target carbon potential atmospheres of 0.40% and lower. Table 2 are applied as indicated.
Wire becomes detached from insertion rod during soak in testing atmosphere	Unsecured attachment	Before inserting rod into testing atmosphere, verify that wire coil is in place securely for testing, that rod screw is securely tightened, and that protective cage is securely in place on the rod
Reading is not stored when "Store" is pressed on CAT-100 touch screen	Pressure on screen not hard enough	Increase pressure of contact with screen. Take care not to cause damage to screen or protective film.
	Interference from protective film over screen	Verify that spacing between protective film and touch screen allows for contact with touch screen
	No reading to store	Verify that a test result was generated when wire coil was connected to binding posts on CAT-100. If not, reconnect wire to binding posts and observe reading again.
	Internal storage error	Call SSi Technical Support at (513) 772-0060
Test results not displaying correctly in Test Results screen	Internal storage error	Call SSi Technical Support at (513) 772-0060
Can't log in to CAT-100 View software.	Forgot login information for CAT-100 View software.	Contact SSi for Login Override Code.

Problem	Possible Causes	Possible Corrective Actions
CAT-100 View software cannot connect or access data from CAT-100 unit	*(If connecting through Ethernet)* Ethernet connection issue	Ensure that the PC and the CAT-100 are connected to the same computer network and that the needed computer network settings (such as subnet mask and gateway) are correct. Ensure that both the PC and the CAT-100 have network connectivity. Consult with your IT/network administrator if needed.
	(If connecting through USB) USB connection issue	Ensure that the USB port on both the PC and CAT-100 are working properly and that the USB driver needed for use with the CAT-100 is installed properly. If needed, contact your IT administrator for assistance, or call SSi at (513) 772-0060.

Table 6 - Troubleshooting

If you experience problems and cannot find the solution after troubleshooting, please call SSi Technical Support at (513) 772-0060.

Warranty

Limited Warranty for Super Systems Products:

The Limited Warranty applies to new Super Systems Inc. (SSI) products purchased direct from SSI or from an authorized SSI dealer by the original purchaser for normal use. SSI warrants that a covered product is free from defects in materials and workmanship, with the exceptions stated below.

The limited warranty does not cover damage resulting from commercial use, misuse, accident, modification or alteration to hardware or software, tampering, unsuitable physical or operating environment beyond product specifications, improper maintenance, or failure caused by a product for which SSI is not responsible. There is no warranty of uninterrupted or error-free operation. There is no warranty for loss of data—you must regularly back up the data stored on your product to a separate storage product. There is no warranty for product with removed or altered identification labels. SSI DOES NOT PROVIDE ANY OTHER WARRANTIES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU. SSI is not responsible for returning to you product which is not covered by this limited warranty.

If you are having trouble with a product, before seeking limited warranty service, first follow the troubleshooting procedures that SSI or your authorized SSI dealer provides.

SSI will replace the PRODUCT with a functionally equivalent replacement product, transportation prepaid after PRODUCT has been returned to SSI for testing and evaluation. SSI may replace your product with a product that was previously used, repaired and tested to meet SSI specifications. You receive title to the replaced product at delivery to carrier at SSI shipping point. You are responsible for importation of the replaced product, if applicable. SSI will not return the original product to you; therefore, you are responsible for moving data to another media before returning to SSI, if applicable. Data Recovery is not covered under this warranty and is not part of the warranty returns process. SSI warrants that the replaced products are covered for the remainder of the original product warranty or 90 days, whichever is greater.

Revision History

Rev.	Description	Date	MCO #
-	Initial Release	11/25/2013	2131
A	Added PC software section; updated Calibration section; updated specs and Parts List	3/7/2014	2136
B	Added Coil Factor and relevant procedures	4/4/2014	2139
C	Updated manual for redesigned insertion rod	5/21/2014	2149
D	Added extended insertion rod, removed extension information, changed calibration screen info to reflect 5 min wait time and countdown timer, fixed error percentage decimal place	10/20/2016	2198
E	Added close up of binding posts and clarifying text for coil insertion	2/26/2018	2230
F	Added connector information for insertion rod	3/8/2018	2231
G	Added login override info	9/7/2018	2239
H	Added note about carbonitriding	10/20/2022	2329
I	Updated Figures, Added statement about Coil Quantity, Updated soak time table, added Update Curve button, other minor changes	9/16/2025	2373