

CI-600 In-Situ Root Imager



Operation Manual

DECLARATION OF CONFORMITY

Manufacturer:

CID Bio-Science, Inc.
4901 NW Camas Meadows Drive
Camas, WA 98607

Declares that the CE-marked Product:

Product Models (s):

Model CI-600

Complies With:

89/336/EEC Electromagnetic Compatibility Directive
73/23/EEC Low Voltage Directive

Compliance Standards:

EN 55027	RF Emissions Information Technology Equipment
EN 50082-1	EMC Immunity Standard
EN 60950	Safety of Information Technology Equipment Including Electrical Business Equipment

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Leonard Felix
President

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This manual is written for CI-600 software version 4.

INTRODUCTION

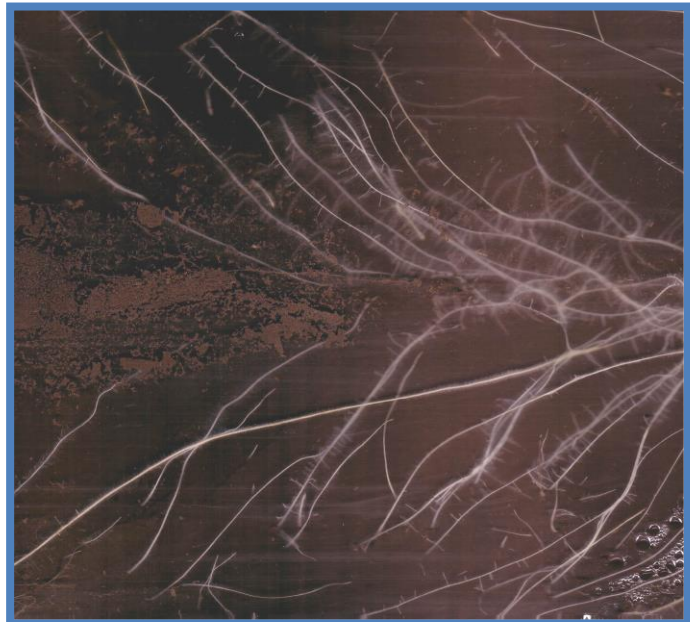
Root development and function are vitally important for plant adaptation to an environment. The CI-600 In-Situ Root Imager helps examine root activity and health, which are critical indicators of plant or crop performance. The CI-600 leads the fine root-imaging field by capturing non-destructive, high resolution, digital images to observe the development and function of a plant's root system. The images collected by the CI-600 can be imported and analyzed with -690 RootSnap! root image analysis software.



The CI-600 has the following features and specifications:

- ◆ Linear scanning with no distortion
- ◆ Very portable and quick operation
- ◆ USB interface for laptop computer image storage
- ◆ Super high-resolution image up to 23.5 million pixels
- ◆ Each scan provides a nearly 360-degree image (21.59 × 19.56cm)
- ◆ Allows observing root growth and behavior during an entire growing season or longer

The CI-600 provides an underground, high resolution, color image of the living roots in the soil. This enables the observation of root growth and behavior over time. It is easily operated using a laptop or tablet and CI-600 Software. The CI-600 is specifically designed for long-term root studies on living plants in the field. The root tubes should be installed in the field prior to the growing season. When the plant begins to build a network of roots, images of the structure and behavior of the roots can be recorded, such as in the root image to the right, courtesy of Dr. Dylan Fischer at The Evergreen State College, Washington, USA.



Unpacking

The CI-600 Root Growth Monitoring System includes the components listed below:

- ◆ **1 Scanner**
The CI-600 Root Scanner hardware.
- ◆ **1 Tablet Computer**
The tablet computer powers the root scanner, runs the software and saves root images.
- ◆ **3 Soil Tubes (105cm)**
You may receive different quantities and lengths based on your order.
- ◆ **1 Calibration Tube**
See the Calibration section of this document for information on using this tube.
- ◆ **1 USB Cable**
This cable is used to connect the CI-600 to the computer running the CI-600 software.
- ◆ **1 Collapsible Slider Rod**
This is used to lower, raise and hold the CI-600 in the root tube.
- ◆ **1 Allen Wrench**
This is used to secure the USB cable to the root scanner.
- ◆ **1 Software CD**
This contains the CI-600 Root Scanner software. See the Software/Driver Installation section of this document for information on using this software.
- ◆ **1 Carrying Case**

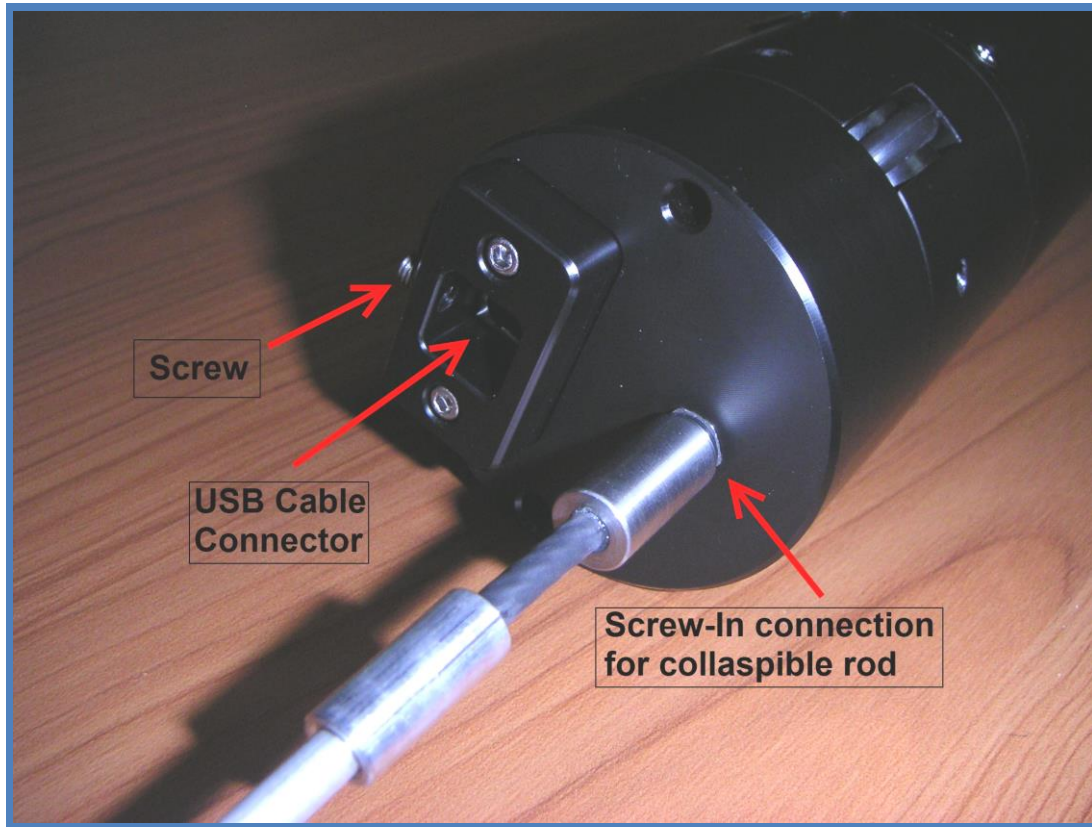
DURING UNPACKING IF ANY OF THESE ITEMS ARE NOT PRESENT PLEASE CONTACT CID IMMEDIATELY.

Note: Additional items, such as the CI-690 RootSnap! root image analysis software may be included based on your order.

HARDWARE ASSEMBLY

Please follow these important instructions on how to setup the CI-600 hardware.

1. Connect the USB cable to the CI-600's USB cable connector. Refer to the illustration below to locate the USB Cable connector.



2. Use the Allen wrench to tighten the screw to hold the USB cable in place securely. **Do not over-tighten this screw.** This can cause damage to the USB cable.



3. Connect the collapsible slider rod to the scanner by screwing in the end of the collapsible rod to the hole next to the USB cable connection.



4. Unscrew the black knob from the end of the collapsible slider rod.



5. Slide the Tube Cap down the USB cable and Collapsible Slider Rod, slide the scanner into a soil or calibration tube and then twist the Soil/Calibration tube to secure it in place.



6. Attach sections of the Collapsible Slider Rod by twisting or screwing each section into the others. The black knob is intended to be at the top of the collapsible slider rod to be used as a hand grip when inserting and removing the instrument from the root tube.



Notes:

- CI-600 imaging units manufactured before March 2010 will have a U-Joint style connector instead of the more durable threaded screw connectors. The measuring rod is now collapsible with several sections that screw into each other creating a long pole to lower the scanner to the bottom of the root tube. The rod breaks down into sections shorter than the calibration tube, making the measuring rod more transportable.
- It is recommended to **include overlap between scans** to ensure all roots are fully imaged. Overlap can easily be removed using the CI-690 RootSnap! analysis software.

Scanner Home Position

The CI-600 begins a scan by rotating the scanner body to the “Home” position and then initiating the scan. This is referred to as the scanner “returning to home.” If the instrument is already in the home position, it will not need to rotate before starting to scan. Ensuring that the instrument is in the Home position before scanning can eliminate scanning unintended areas and save time. When calibrating the CI-600 in the white calibration tube, the Home position location is of importance. Make sure to insert the scanner in the calibration tube properly.

Procedure to Return the CI-600 to Home

- ◆ Hold the scanner by the top and rotate the rest of the scanner clockwise until you meet resistance.
- ◆ Do not force or overturn the scanner body!
- ◆ The labels on the top part of the scanner indicate the actual Home position (when the bottom is rotated clockwise and the top is rotated counter-clockwise until resistance is met.)
- ◆ If the CI-600 is not returned to Home, the scanner will first rotate itself into this position before scanning or calibrating.
- ◆ Return the CI-600 to Home **prior to sliding the scanner in a root tube and beginning a scanning sequence** in order to have images start at the same point for each window. This will help when lining up root images to envision the entire root tube.
- ◆ It may be helpful to label a point on each root tube that is the “Home” or “Start” position for all scans done in that tube.

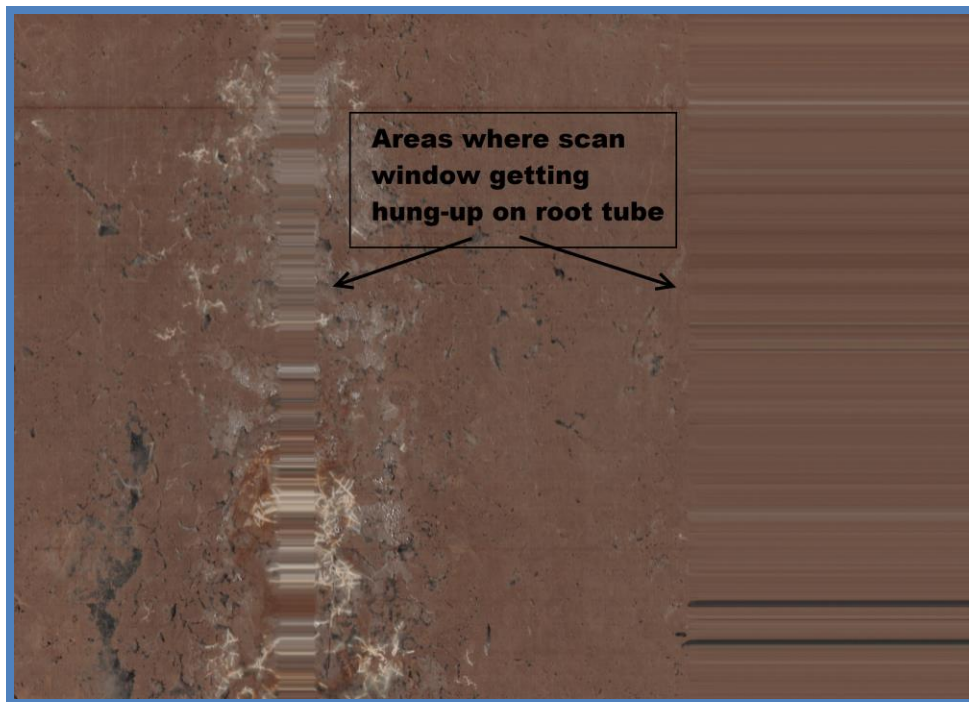


CI-600 Adjustable Scan Window

The CI-600 root scanner now has an adjustable scan window so that the user can change the focal length or focus of the image. The user should adjust to the maximum focal length that will not get caught-up on the tube when the scanner rotates. This could provide better clarity in different types of root images, but is intended to alleviate problems with imperfections in root tubes or areas where the scanner will not smoothly pass through a rotation.

DO NOT ADJUST THE SCAN WINDOW UNLESS THERE IS A PROBLEM WITH YOUR SCANNER GETTING STUCK OR HUNG UP.

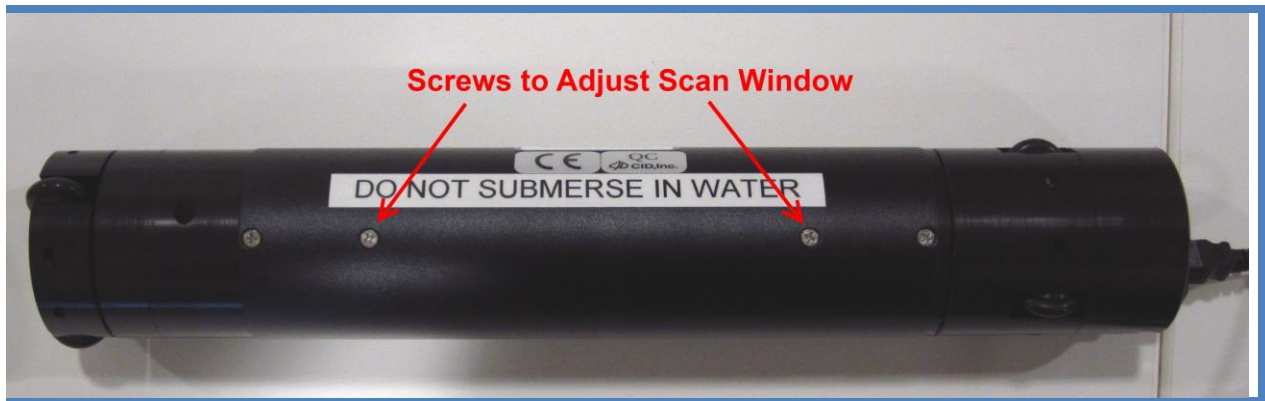
The CI-600 scan window is carefully set at the factory to provide the maximum focal length and best quality image, without having the scan window get caught on the inside of the root tube as it rotates. Below is an example of an image where you can see the scan window get caught twice during rotation. This scan window should be lowered slightly and re-tested to see if it passes.



To adjust the scan window:

1. Use the screw-driver to slowly turn the 2 inner screws on the opposite side of the CI-600 as the scan window. Each screw at each end will raise and lower that end of the scan window.
2. After you adjust the scan window, put the CI-600 in the calibration tube and take a test scan. Carefully watch the scan window during the rotation.
3. If the window appears to be catching on the calibration tube, remove the CI-600 and lower the scan window.
4. **Repeat the test scan in the calibration tube to ensure that the scan window will not get hung up on the wall of the root tube.**

There are four screws along the bottom of the CI-600 housing. The inner 2 screws adjust the scan window. The outer screws attach the upper and lower pieces to the scanner body. Use a screwdriver to raise or lower the scan head, one end at a time.



Please make sure the scan window is not catching on the tube when the scanner rotates. *This could cause damage to the scan window and gear assembly of the unit.*

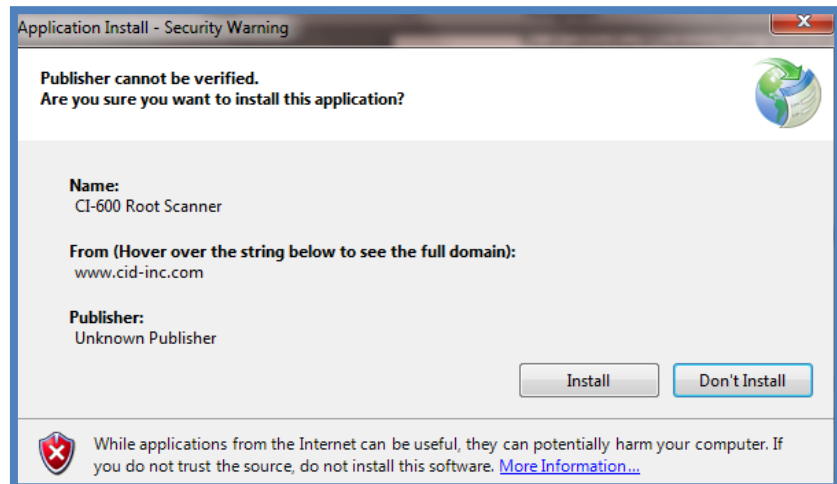
SOFTWARE/DRIVER INSTALLATION

The following steps to download and install the software and driver should be carried out on each computer used with the CI-600 Root Scanner. Version 4 software and driver are compatible with Windows 7 and Windows 8 (32 and 64 bit).

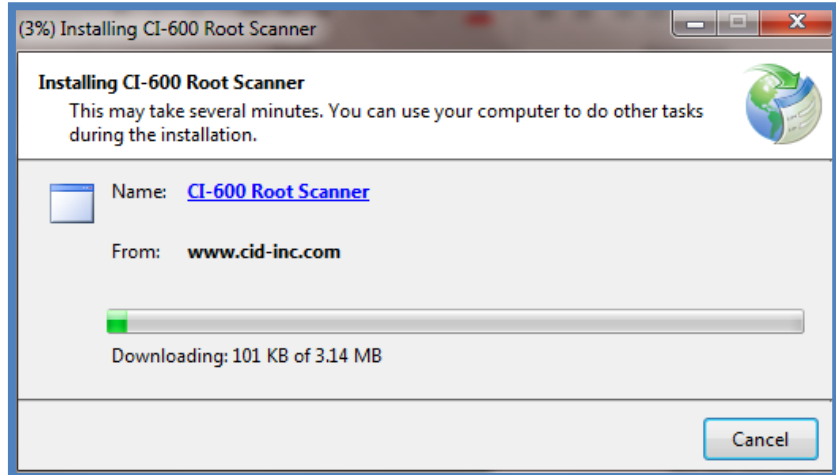
Version 3 software and driver is compatible with Windows Vista, Windows XP and Windows 7 (32 bit only). Please contact CID Bio-Science technical support (support@cid-inc.com) with any questions about software compatibility.

Software Installation

- This application requires the version 4.0 of the Microsoft .NET Framework. If this has not been installed on the computer, please download and install it.
- Insert the CD or navigate to <http://www.cid-inc.com/root-image/ci-600-software.php>
- Download or install the latest version by clicking setup.exe
- Choose to “run” or “install” the software anyways if a security warning appears indicating the publisher cannot be verified.



- When the application has finished installing, it will automatically open.
- A shortcut to the CI-600 software should be pinned to the taskbar or desktop.



Disabling UAC in Windows 7

User Access Control (UAC) is not compatible with the ClickOnce technology used by the CI-600 software and must be disabled. If you do not disable UAC the CI-600 software will not start, instead an error will appear. In the error details will be the message, “The requested operation requires elevation”

To disable the Windows User Account Control:

1. Press Start and type UAC in the search bar.
2. Select “Change User Access Control Settings” and move the slider bar to the bottom (Never Notify).
3. Re-start the computer for changes to take effect.

Remove the previous version of CI-600 Driver if necessary

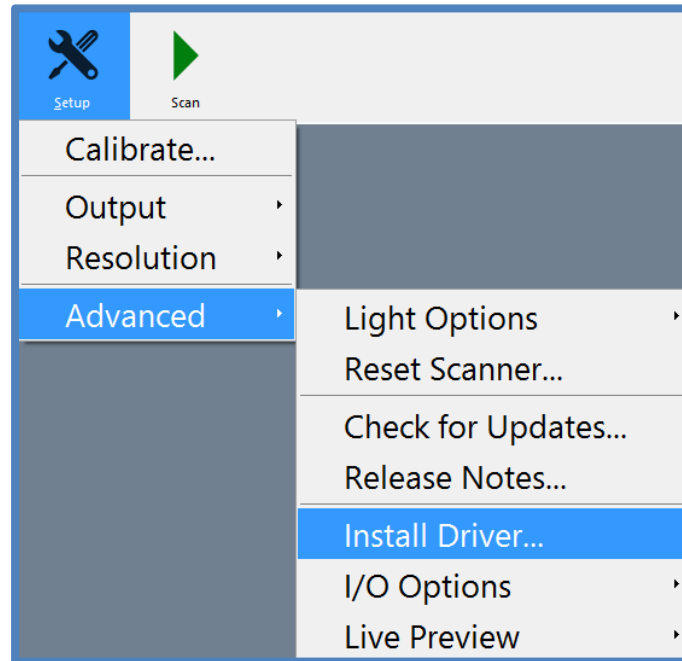
If a previous version of CI-600 driver was installed these steps must be followed before installing the latest driver.

- 1) Download and run the file located at this URL
<http://www.cid-inc.com/Software/CI-600/DelDrv.exe>
- 2) Choose “LiDE 20/30” when prompted and click OK to remove the old driver.

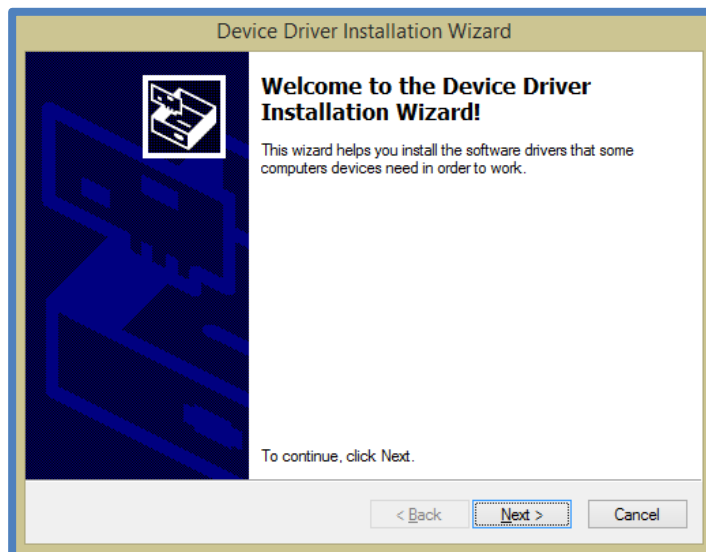
Driver Installation

The CI-600 driver is compatible with 32 and 64 bit versions of Windows 7 and Windows 8. To install the driver for the CI-600, first install the CI-600 In Situ Root Imager software version 4. Next,

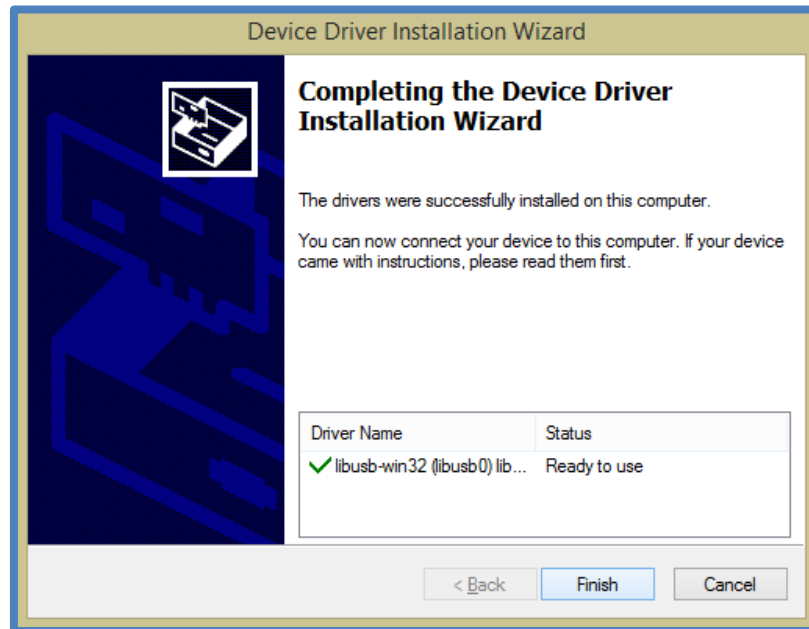
1. Open the software with the CI-600 connected to the PC via USB.
2. Click on Setup in the tool bar.
3. Click Advanced and Install Driver.



4. The **Device Driver Installation Wizard** tool (pictured below) will appear.



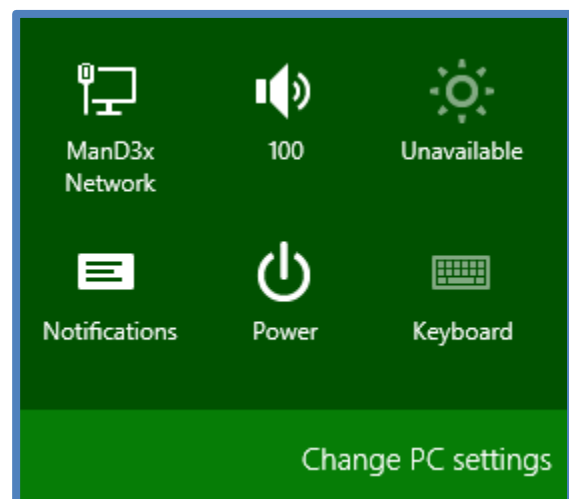
- Complete the CI-600 driver installation using the device driver installation wizard and click finish.



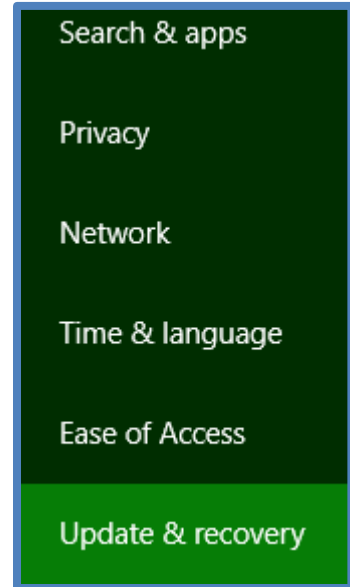
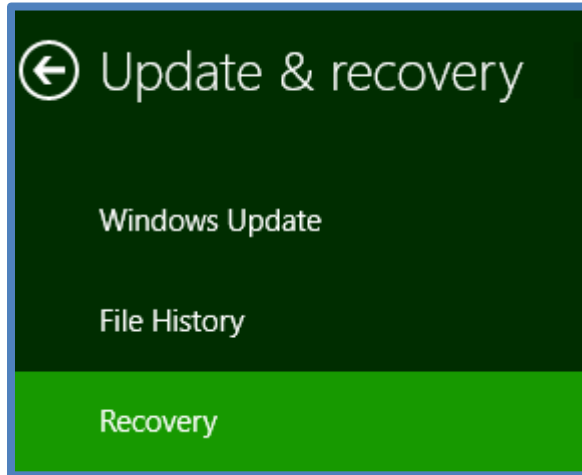
Windows Driver Signature Verification

For Windows 8 and all 64 bit Windows operating systems, the driver signature verification will need to be disabled before the CI-600 can be installed. This will allow an unsigned driver to be installed in Windows. A keyboard is required for this procedure (not a touchscreen keyboard on a tablet).

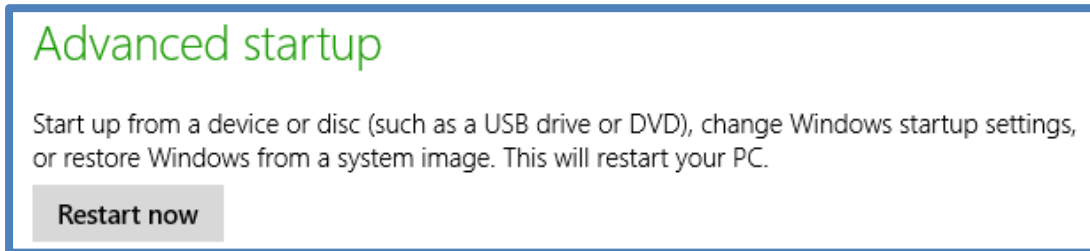
- Press the Win + C keyboard combination to bring up the Charms Bar, then click on the Settings Charm.
- Click on the Change PC settings link and access the Modern Control Panel.



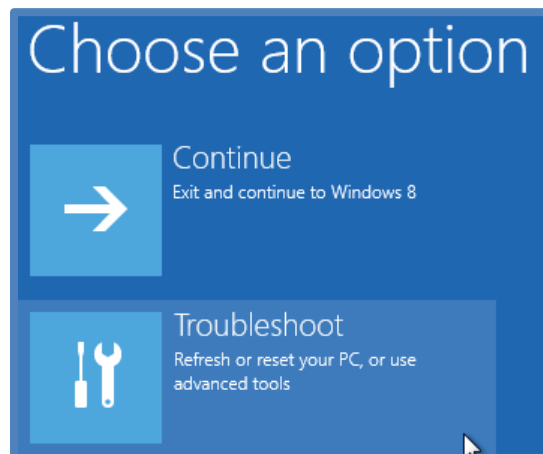
- When the Control Panel opens, select the "Update & recovery" section.
- Next, click on the Recovery option on the left hand side.



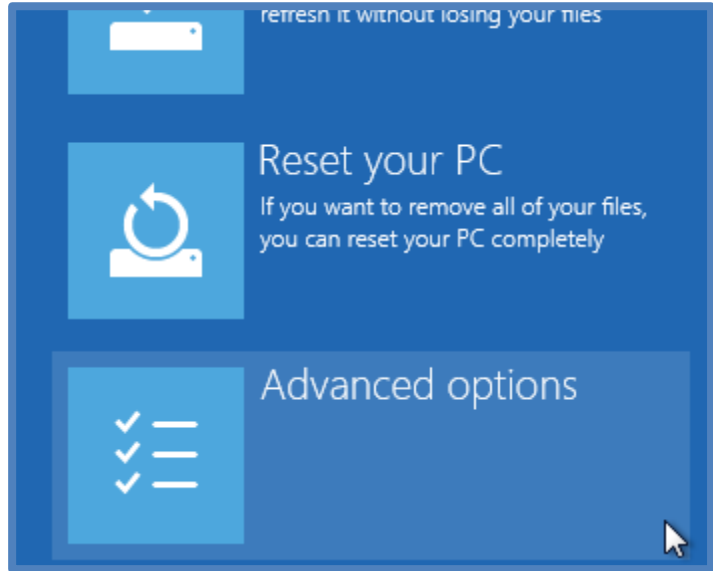
- Once selected, you will see an advanced startup section appear on the right hand side. You will need to click on the "Restart now" button.



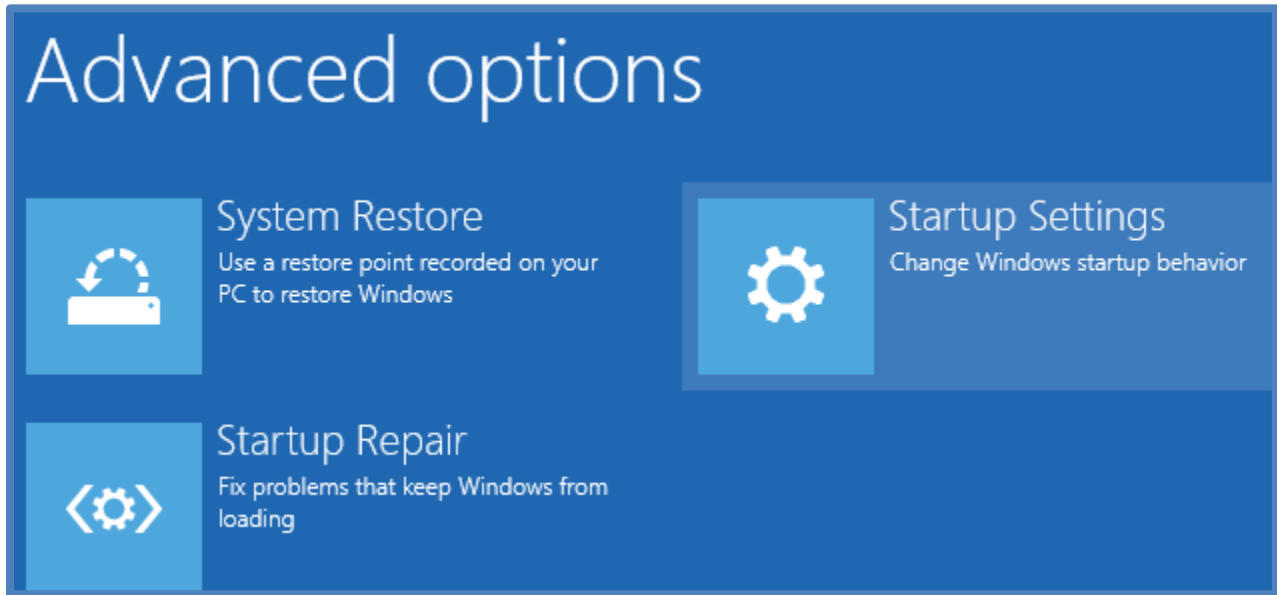
- Once your Computer has rebooted you will need to choose the Troubleshoot option.



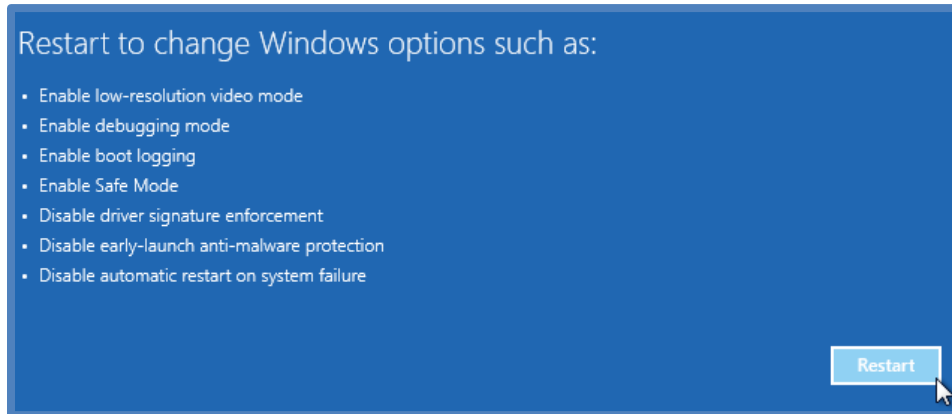
7. Then head into Advanced options.



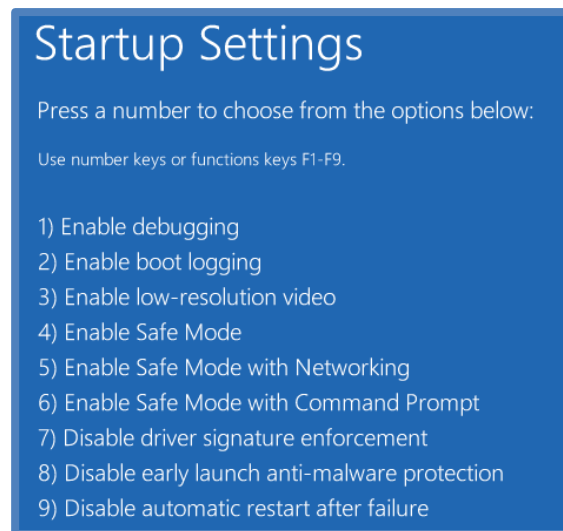
8. Then Startup Settings.



9. Since we are modifying boot time configuration settings, you will need to restart your Computer one last time.



10. Now you will be given a list of startup settings that you can change. The one we are looking for is "Disable driver signature enforcement". To choose the setting, **you will need to press the F7 key**. This will require a keyboard as the touchscreen keyboard cannot be accessed while in Windows Bios.



11. Finally, reboot the PC and install unsigned drivers.

OPERATING THE CI-600 SOFTWARE

To open the CI-600 software, click on the **Start** button, and select **CI-600 Root Scanner** from the **CID Bio-Science** folder. Or, click the icon on the desktop or taskbar. The dialog below will appear...



To begin using the CI-600 scanner:

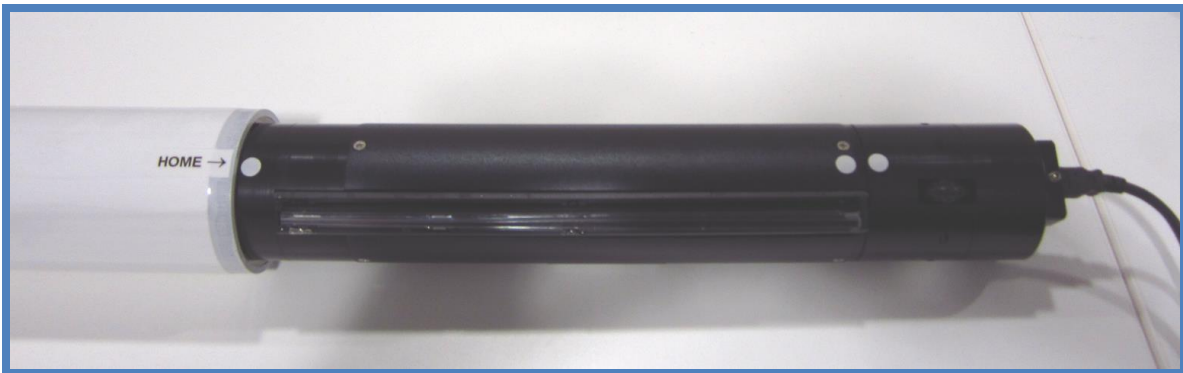
- ◆ Setup the hardware (See the Hardware Assembly section of this manual).
- ◆ Install the software and driver.
- ◆ Connect the CI-600 to the computer.
- ◆ Open the CI-600 software.
- ◆ Calibrate the instrument once at each resolution (100, 300 and 600 DPI) using the white calibration tube.
- ◆ Set the image parameters and scan.

Calibration

Calibrating the CI-600 root imager is required after the software and driver are initially installed. Calibration is necessary at each resolution (100, 300 and 600 DPI) using the white calibration tube. Prior to each scan, the CI-600 software will verify the calibration data, eliminating the need to re-calibrate the root imager frequently in the field.

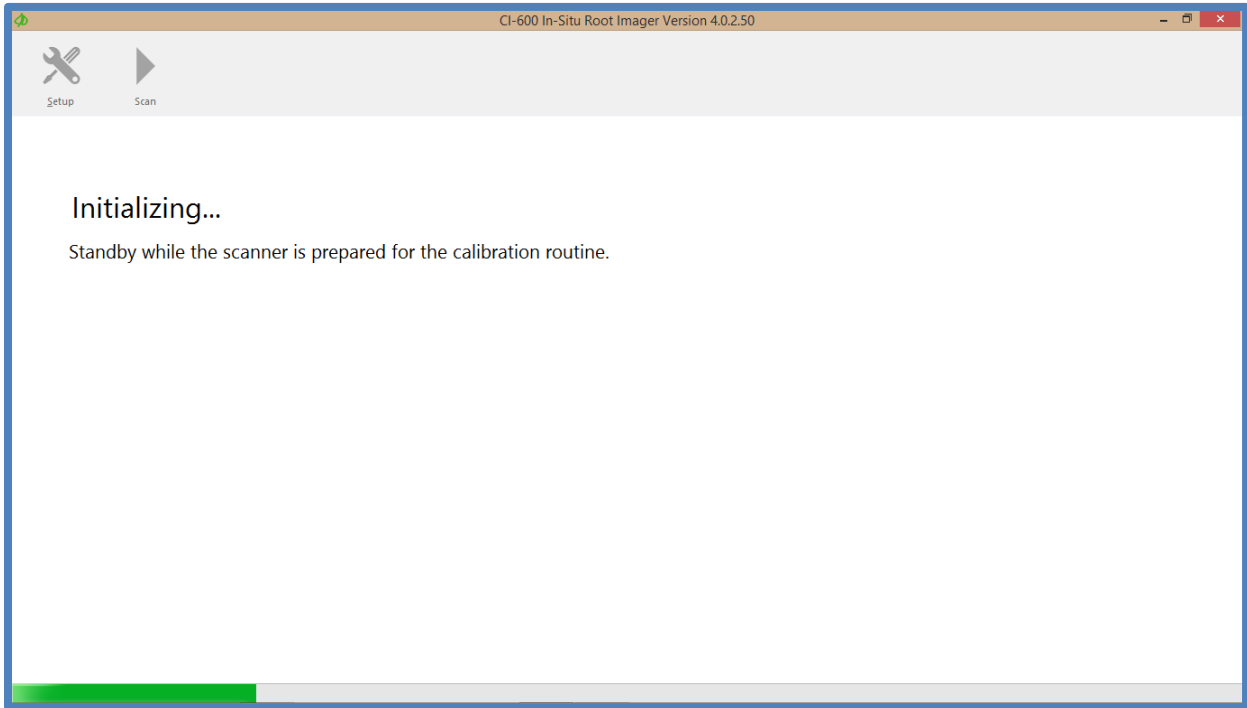
Calibration may also be necessary if the software prompts, asking you to insert the CI-600 in the white calibration tube and calibrate. All calibrations **MUST** be made in the CI-600 white calibration tube.

1. Install the CI-600 software and driver.
2. Attach the CI-600 Root Scanner's USB cable to the USB slot.
3. Place the CI-600 Root Scanner in the white Calibration Tube with the scanner lined up at the Home Position.

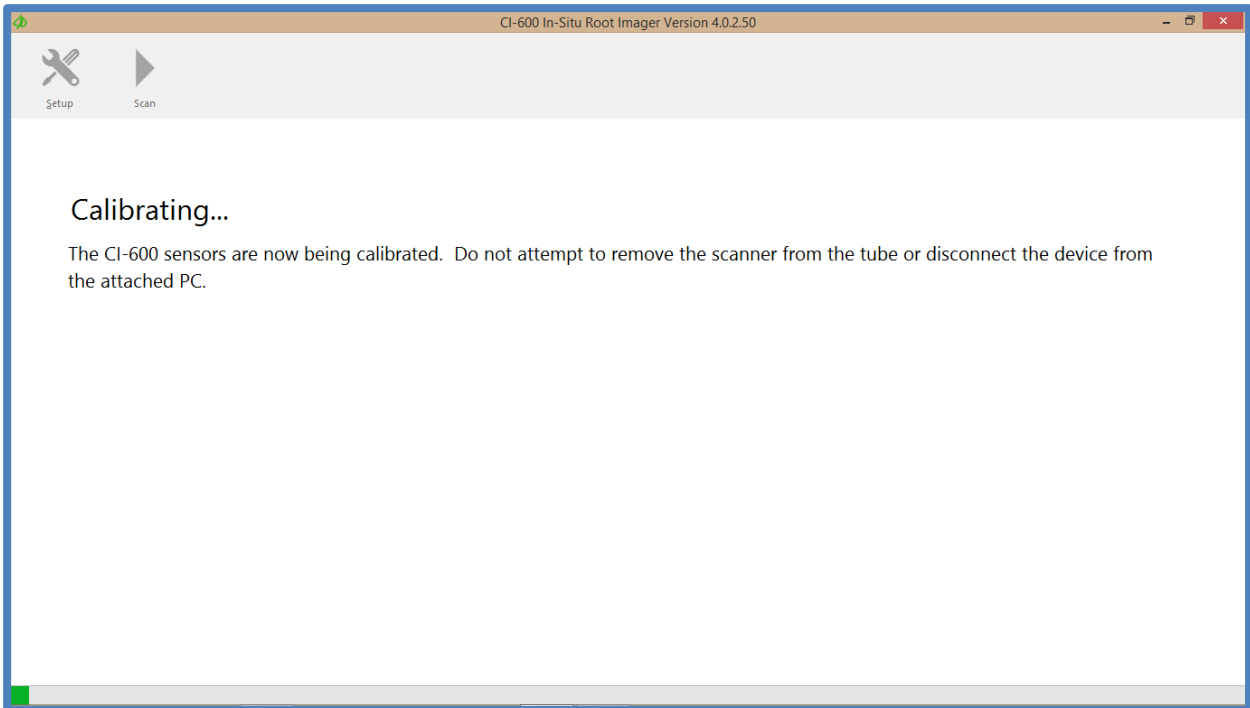


4. Open the CI-600 software.
5. Click on the Setup tool. Select the first resolution to calibrate at.

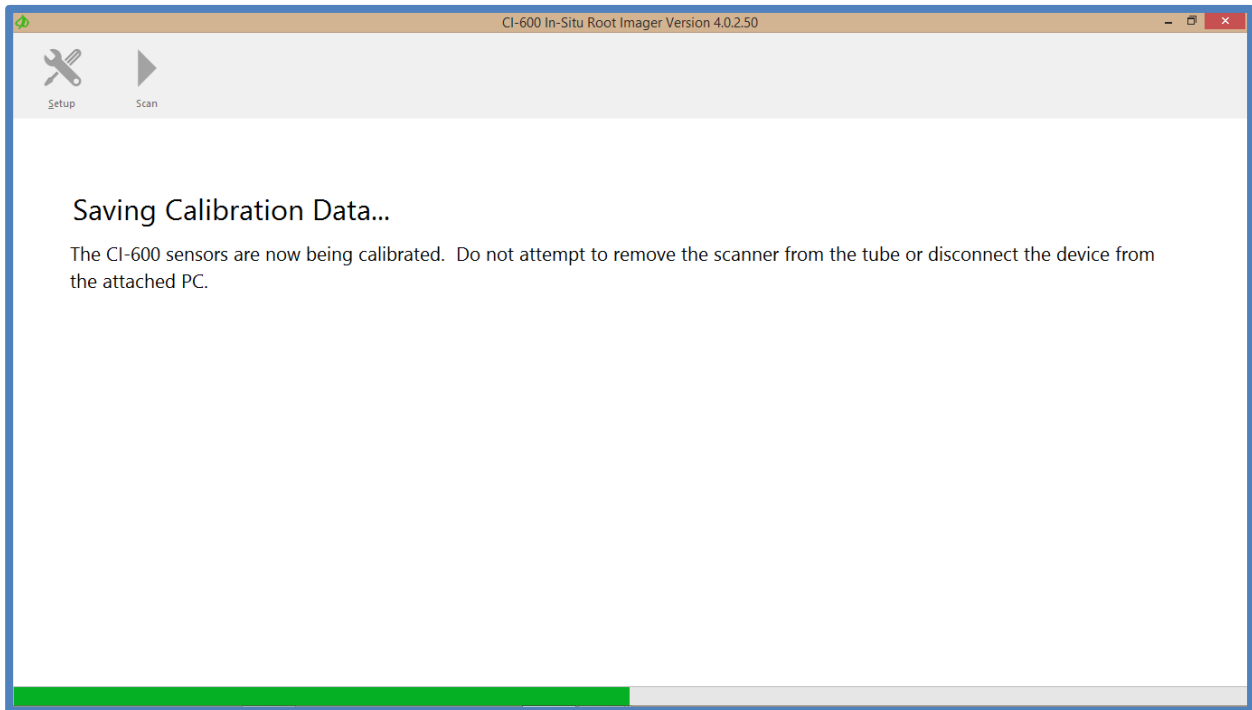
6. Select Setup>Calibrate. The software will indicate that the root imager is initializing.



7. Next, the software will indicate that the CI-600 root imager sensors are being calibrated.

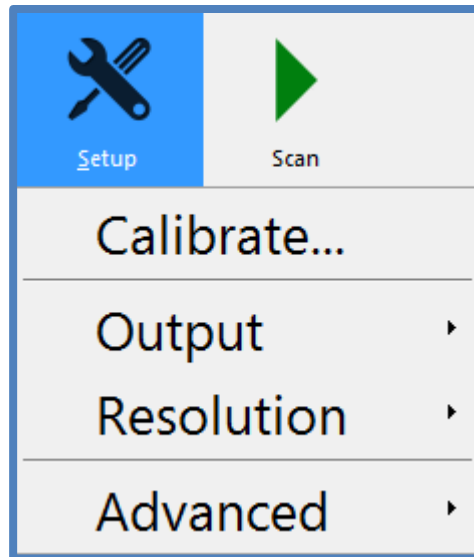


8. Finally, the calibration data will be saved and the software will exit to the opening screen.



Setup Menu

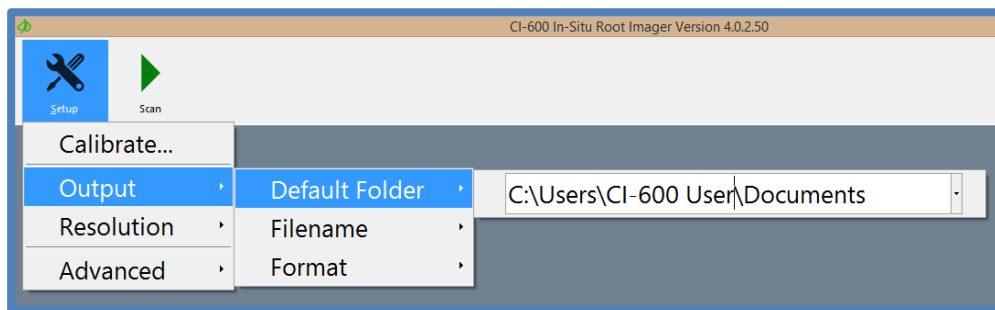
The CI-600 software is designed to be easy to operate with three buttons: Setup, Scan and Save (seen after an image is taken). The Setup Menu features user changeable parameters, such as where the image file is saved on the computer or the resolution of the scan.



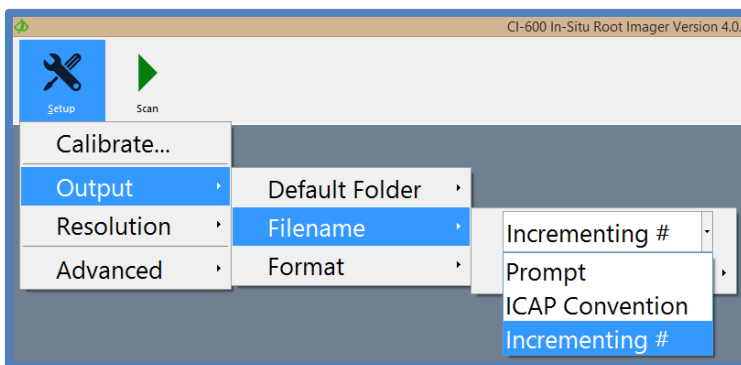
Setup>Output

The Setup>Output menu houses parameters that can be changed regarding the folder where images are saved (default folder), filename and file type.

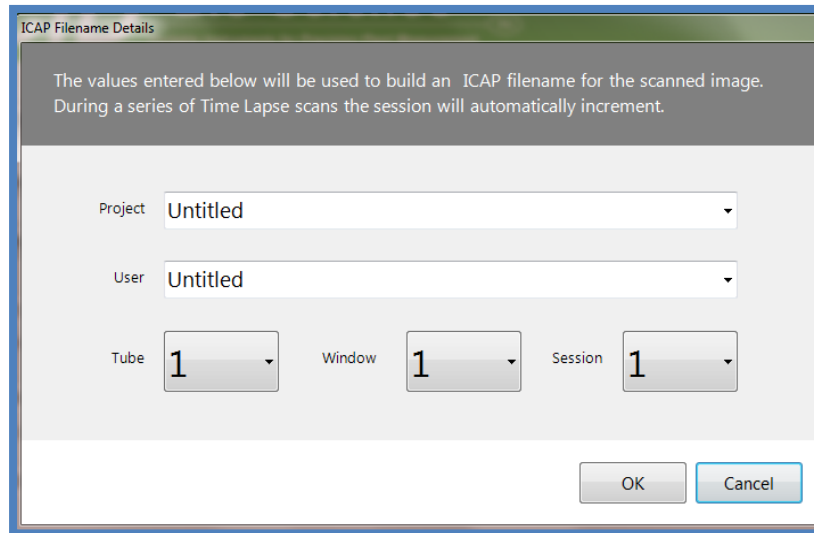
Setup>Output>Default Folder is where the folder on the hard drive to which images are saved can be designated. Type in the folder location or use browse to navigate to the folder on the PC.



Setup>Output>Filename is where the assigned filename of the image can be changed. **Prompt** will open up the computer library and prompt the user to manually enter a filename each time the "Save" button is pressed.

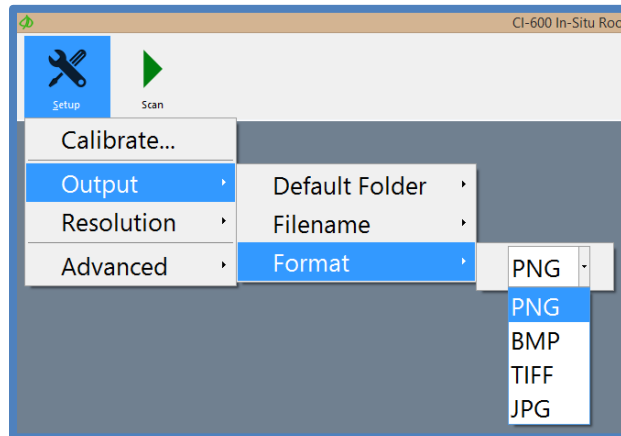


The **ICAP Convention** file name is used to designate the Root Tube number, Window height and Session number, as well as the project and user. Using this filename convention will make images easier to import into RootSnap! for later analysis.



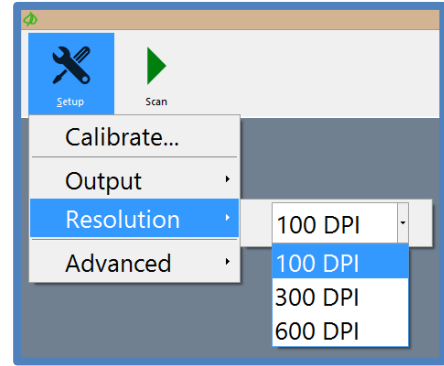
Selecting **Incrementing #** will assign each filename the Prefix designated, followed by incrementing numbers. For example, if the prefix entered is Pineapple Root, the first filename will be Pineapple Root01.png.

Setup>Output>Format is where the file type of the saved image can be set at .png (recommended), .bmp, .tiff or .jpg.



Setup>Resolution

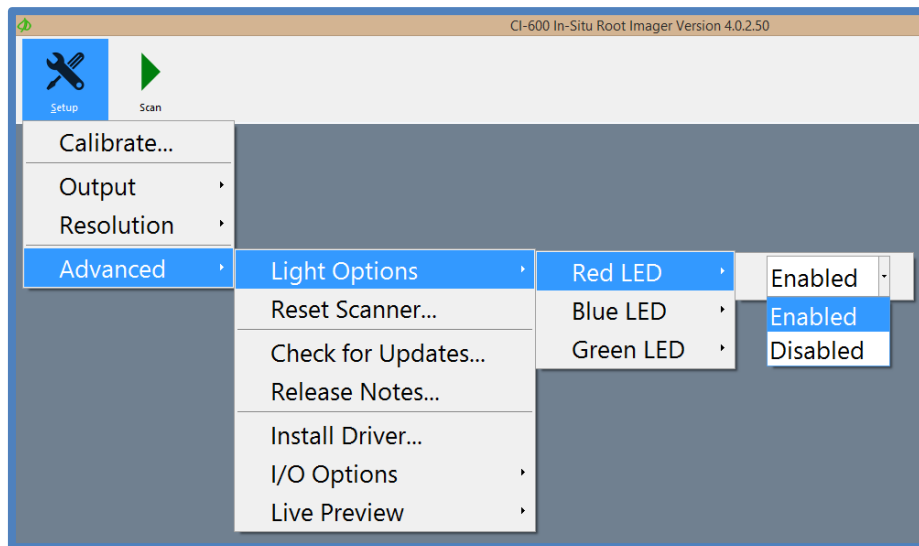
Select the resolution of the image. Available options are 100, 300, and 600 DPI (dots per inch). The higher the DPI, the longer the scan will take to complete. 100 DPI scans typically take 45 sec-1 min; 300 DPI scans are about 1.5-2 minutes; 600 DPI scans are at least 8 minutes.



Setup>Advanced

The Setup>Advanced menu houses the light options for the scanner, as well as the reset, update check, release notes, driver installation, I/O options and live preview feature.

Setup>Advanced>Light Options allows the user to enable/disable each of the LED colors independently (red, blue and green). By default, all three LEDs are enabled.



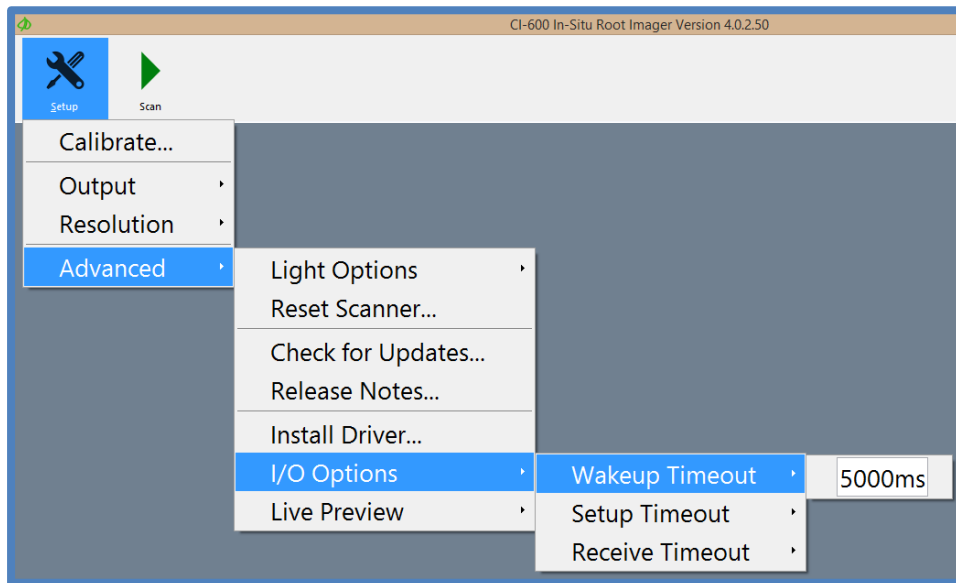
Setup>Advanced>Reset Scanner will restore the CI-600 software and hardware to the default settings.

Setup>Advanced>Check for updates will check the CI-600 webpage for any available software updates and prompt the user to download and install.

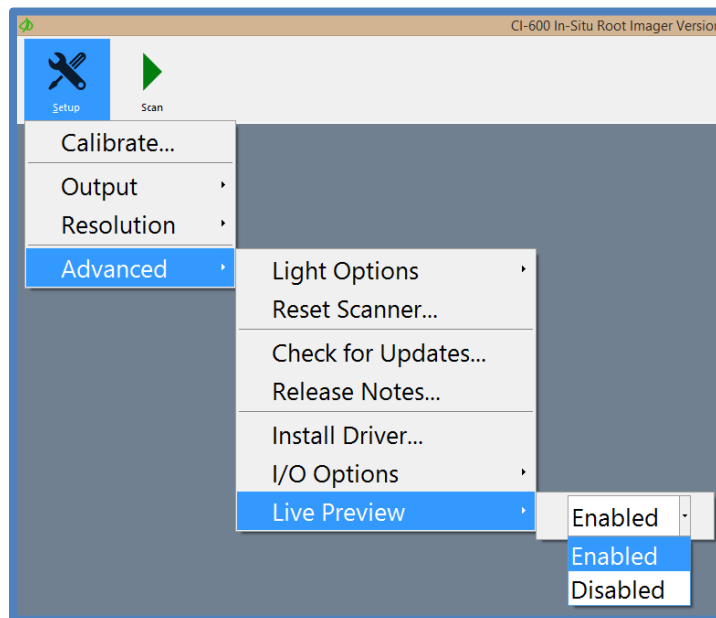
Setup>Advanced>Release Notes contains the notes from the programmers last update to the CI-600 software and any known software bugs.

Setup>Advanced>Install Driver will open the Device Driver Installation Wizard to install the CI-600 driver.

Setup>Advanced>I/O Options is where the timeouts can be adjusted for different PC's. The timeout controls how long the computer waits for a response through the USB port from the CI-600 root imager. The timeouts are optimized for the tablet computer included with the root scanner.



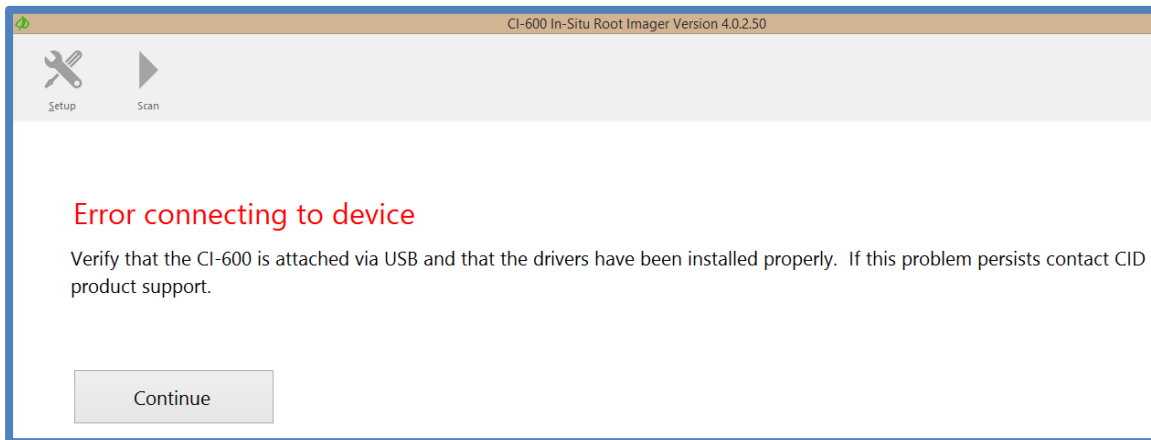
Setup>Advanced>Live Preview is where the live preview feature can be enabled/disabled to see the image as it is scanned or wait until the scan is complete to see the image.



The most common error message that appears after hitting the scan button is that the instrument cannot be detected by the computer.

To fix this error message:

- i. Disconnect and reconnect the CI-600.
- ii. If the error appears again, re-start the computer.
- iii. Check the USB cable and connection of the instrument. Try a different USB port of the computer. **Try a new USB cable.**
- iv. Check that the software and driver are up-to-date and properly installed.



DEPLOYING ROOT TUBES

- ◆ Make sure the inside of the tube is clean (see the Cleaning & Maintenance section).
- ◆ The slider rod connected to the scanner, can be used as a measuring rod, with each section of the collapsible scanner being the equivalent of the scan window length. Using these marks, lower the scanner to the desired depth.
- ◆ The soil tube is typically installed at an angle (45-60°) to maximize root contact with the outer surface of the tube. The soil tubes may be installed in an upright vertical position as well as horizontal and/or various angular positions. To prevent water from getting inside of the tube, install the tube at an angle if there is a chance of standing water collecting around the tubes.
- ◆ Make sure the tubes are water tight at the bottom, which have plug on the bottom made by the manufacturer. Some amount of condensation is common on the tubes and will fluctuate. The condensation on the outside of the tube is much less of an issue if the tube is almost completely underground (only about 1-cm above the ground surface) and if the tube is filled with some sort of insulating material between measurements (e.g. pipe insulator). Also, if noticeable condensation is forming on the inside of the root tube, consider putting a desiccant pack in the root tube.
- ◆ In colder weather, freezing of condensation in the tubes can be avoided by putting good insulation in the tubes and leaving only a few centimeters above the ground surface. A similar problem can arise in the summer months where warm air gets into the tube and warms colder soil at depth. Insulating the tubes works well in this case, as well.
- ◆ The soil tube is made with Plexiglas clear material with two end caps. The end of the tube with the plug should be inserted into the soil. The other end, with a removable cap, should be about 5 to 8 cm. above the ground. The removable cap should be on at all times when you are not taking samples to avoid dirt, water/precipitation and other objects from getting into the tube. The tube(s) inner surface should be kept clean to protect the scanner head and for optimum image capturing.
- ◆ The soil tube should be inserted into the soil before crops are planted if you want to study root growth. More tubes should be used in different locations of your experimental plot, depending on the purpose of your research.
- ◆ In order to capture root images, the outer surface of the tube should be no greater than 8.0mm from the desired object being scanned. If the desired object is greater than 8.0mm from the outer surface of the tube, the image will be blurred or there will be a black image. This is the result of the image being beyond the scanner's focal range. In the case of the black image, the light from the scanner is not properly being reflected back to the scanner.

WARNING: ALWAYS PLACE THE CI-600 BACK INTO THE CARRYING CASE AFTER USE. DO NOT LEAVE THE UNIT IN TUBES, AS THIS WILL FLATTEN THE ROLLERS ON THE UNIT, CAUSING POSSIBLE MALFUNCTION.

Note: You may want to take extra precautions to make sure the tubes are water tight if your special applications require this, such as by using the water-tight bottom tube plug. Temperature fluctuations may cause a normal amount of expansion and contraction in the tubes and caps.

Auger Usage

To create the hole for inserting the soil tube into the ground, use a gasoline powered auger, such as the EarthQuake Auger sourced by CID Bio-Science, Inc. Use the auger to remove just enough soil to slide the CI-600 root tube into the ground. Minimizing the soil disturbance directly around the root tube will decrease the length of time necessary to wait for soil and roots to grow around the tube.

Upon request, CID Bio-Science, Inc. can provide you with the source for purchasing an auger, or information about additional soil tubes.

CLEANING AND MAINTENANCE

To keep your CI-600 Root Scanner and computer clean, wipe the exterior with a slightly damp cloth. A mild detergent may be used if necessary. Do not use solvents of any kind. Clean the lens with a soft, non-abrasive cloth, using a small amount of commercial lens cleaning fluid if necessary.

WARNING: KEEP LIQUID, INCLUDING CLEANING FLUID, OUT OF THE LAPTOP COMPUTER'S KEYBOARD, SPEAKER GRILL, AND OTHER OPENINGS. NEVER SPRAY CLEANER DIRECTLY ONTO THE CI-600. NEVER USE HARSH OR CAUSTIC CHEMICAL PRODUCTS TO CLEAN THE CI-600.

PROTECT THE CI-600 BY AVOIDING THE FOLLOWING ENVIRONMENTAL HAZARDS...

- ◆ Dust and moisture.
- ◆ Liquids and corrosive chemicals.
- ◆ Equipment that generates a strong electromagnetic field, such as stereo speakers (other than speakers you have connected to the computer) or speakerphones.
- ◆ Rapid changes in temperature or humidity and sources of temperature changes such as air conditioner vents or heaters.
- ◆ Extreme heat, cold or humidity.

Root Tube Cleaning and Drying Accessory

The root tube should be dried of any condensation or moisture before the CI-600 root scanner is lowered into the tube. Clean and dry the tube using a microfiber cloth and the accessory attachment for the collapsible rod.

1. Twist the swab holder to the end of the collapsible slider rod.
2. Insert the cloth into the slot of the swab holder.
3. Lower the rod and cloth into the tube, ensuring that all sides of the tube are clean and dry.
4. Use as many sections of the rod as necessary to prevent any moisture from coming into contact with the CI-600.



USING THE CI-600 FOR CI-690 ROOTSNAP!

RootSnap!, is a separate software program created at CID Bio-Science for root image analysis. It includes a revolutionary user interface that employs a combination of advanced image analysis and a multi-touch LCD screen, which allows users to more quickly and easily trace roots using their fingers. Root tracing enhancements, such as the “Snap-to-Root” feature that “snaps” root tracing points to the center of the root automatically, removes hours of tedious point-by-point outlining of roots.

When the CI-600 is used to acquire images being analyzed with CI-690 RootSnap!, there are several features that, if used, make the importing and analysis process easier and faster. First, always use the ICAP file-naming feature to save images. The ICAP naming system allows the user to scan, save and name images in any order and be organized for future analysis. Designating the root tube, window and session only takes a few seconds and automatically increased the session number when using the time lapse feature.

It is often asked whether to start taking root images at the top or the bottom of a root tube. It is recommended to start at the top of the root tube when taking images. First of all, this will allow the user to make the fewest possible scans while imaging to the lowest depth of the roots. Also, when images are imported into RootSnap, Window 1 is along the top layer of soil.

Make sure to always check the bottom of root tubes for standing water that could damage the CI-600 if lowered into it.

It is recommended to include overlap between scans to ensure all roots are fully imaged. Overlap can easily be removed using the CI-690 RootSnap! analysis software. If using the collapsible indexing handle and tube cap to position the scanner depth, overlap will be included in images.

TROUBLESHOOTING

Technical Support

If you have a question about the CI-600 features or functions, first look in the CI-600 Operation Manual. There is also online support available for the CI-600 at <http://www.cid-inc.com/root-image/ci-600-support.php>. If you cannot find the answer, you can contact a Technical Support Representative located in your country. CID Bio-Science, Inc. is committed to provide customers with high quality, timely technical support. Technical support representatives are to answer your technical questions by phone or by e-mail at support@cid-inc.com.

CID Bio-Science, Inc.'s contact information:

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Camas, WA 98607 USA

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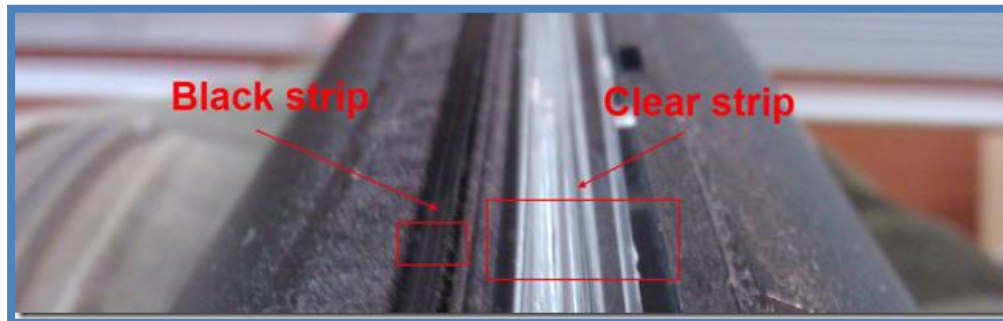
Customer Service

Customer Service Representatives answer questions about specifications and pricing, and sell all of the CID Bio-Science, Inc. products. Customers sometimes find that they need CID Bio-Science, Inc. to upgrade, recalibrate or repair their system. In order for CID Bio-Science, Inc. to offer these services, the customer must first contact us and obtain a Return Merchandise Authorization (RMA) number. Please contact a customer service representative for specific instructions when returning a product.

Frequently Asked Questions

If there are any questions about the CI-600, please check the Frequently Asked Questions below, as well as the CID Bio-Science support webpage at <http://cid-inc.com/support/ci-600-support>.

1. Where do I download the most current version of CI-600 software?
 - a. The latest version of software and the driver can be downloaded at <http://cid-inc.com/support/ci-600-support/600software>. Click the “Install” button to start the download. If prompted that the publisher is not verified, click Run or Install to continue the setup. Next, connect the CI-600 to the computer and install the driver in Setup>Advanced>Install Drivers.
 - b. Make sure to completely erase the old version of software and the driver before downloading version 4.
2. Where do I find a CI-600 64 bit driver?
 - a. The CI-600 driver is part of the software download for version 4.
3. Should the root tubes be installed vertically, horizontally or at an angle?
 - a. The angle the root tubes are installed will depend on the species, type of study (i.e. agriculture, forestry). Often, root tubes are installed at a 45° angle, especially when looking at fine root growth. However, a study by Villordon et al. (2011), found vertically installed root tubes gave the best estimate of root growth and storage roots development in sweet potato, *Ipomoea batatas*.
4. What are the blurry lines in the root image?
 - a. Consistent image artifacts, such as blur lines, which do not disappear after calibration, are caused by physical artifacts. The scan head, including the black strip, should be carefully cleaned using a cloth and can of air.



5. How often should I calibrate the CI-600?
 - a. The CI-600 requires calibration at least every 500 scans. However, it is recommended to calibrate the CI-600 using the white calibration tube between root tubes or if there is a noticeable change in image quality. The CI-600 should always be calibrated in the white calibration tube after installing the software on a computer.

6. How do I check the calibration?
 - a. After calibrating the scanner in the white calibration tube, take a scan of the calibration tube. The image should be solid white and not have any blurred sections or lines.
7. Is it alright to move the CI-600 while it is scanning or calibrating?
 - a. It is NOT recommended to move the scanner ever when it is scanning, calibrating or when the motor is making noise. Always wait until the scanner is settled or completely done with the scan and has rotated to its original Home position before moving the CI-600.
8. How do I prevent root tube cracks or condensation?
 - a. A suggestion to protect the CI-600 tubes from cracking is to insulate them between scans. This will decrease the temperature difference between the soil and the air trapped inside the tube, which will decrease condensation build-up and cracks. Insulation should slide easily into the tube, especially the first foot if it exposed above ground level. Make sure that the insulation material does not scratch the root tube.
9. Could I use the CI-600 to image root nodules?
 - a. The ability to quantify nodulation rate would depend on the size of the nodules. As long as they are at least the size of fine roots, 1-2 mm, there shouldn't be a problem with using the CI-600. Since the CI-600 images roots in direct contact with the root tube, the same would be true for nodules. The color contrast between roots, nodules and background soil will also affect the quality of images.
10. Could I cut the root tubes to my own custom length?
 - a. Be aware that to create a proper cut, you will need to have the tube cut using an electric miter saw. Hand cutting is not recommended, it results in cracks in the tubes. Cracks can allow moisture into the tube which can harm the 600 and cracks will also affect your picture quality. Further, after proper cutting, at CID we use hand tools to clean up the ends of the tubes, to smooth out the edges and allow for a proper seating of the end caps.
11. How do I access the log files for the CI-600 software?
 - a. To access the Log Files:
 - 1) Start the CI-600 software.
 - 2) Press Control + Escape at the same time (this launches the Task Manager).
 - 3) From the Task Manager, click on the Processes tab.
 - 4) Right click on CID.CI600.exe and select Open File Location (this launches the file browser)
 - 5) You should see several ApplicationLog and ErrorLog files.

12. How do I get my scans to line up in the tube?

- a. Make sure your scanner is rotated to the "HOME" position before inserting it in the root tube. The scanner will rotate back to the home position after each scan (see the .section in this manual). The CI-600 begins a scan by rotating the scanner body to the "Home" position and then initiating the scan. This is referred to as the scanner "returning to home." If the instrument is already in the home position, it will not need to rotate before starting to scan. Ensuring that the instrument is in the Home position before scanning can eliminate scanning unintended areas and save time. When calibrating the CI-600 in the white calibration tube, the Home position location is of importance. Make sure to insert the scanner in the calibration tube properly.

13. What does it mean when I get an error with the error summary message in the .txt file: "The requested operation requires elevation"?

- a. Any errors with "The requested operation requires elevation" message in them means the user needs to turn off UAC. This is a work-around for a bug in the way the ClickOnce technology handles the requirement for administrator privileges. To do this:
 1. Press Start and type UAC in the search bar.
 2. Select "Change User Access Control Settings" and move the slider bar to the bottom (Never Notify).
 3. Re-start the computer.

14. Where can I find the CI-600 driver?

The CI-600 driver is part of the software download for version 4. If you have a Canon Driver installed, you will need to remove it with using the CanoScan utility at <http://www.cid-inc.com/Software/CI-600/DelDrv.exe>. You should choose Run and LiDE 20/30 when prompted.

15. Does the CI-600 take 1200 DPI images?

- a. The CI-600 always scans at 1200 DPI because that is the native format of the image sensor in the scanner. You will probably only see a marginal benefit from scanning at 1200 DPI using the CID software. By default, that option is disabled since PCs with limited memory cannot handle the task.
- b. Please be aware that you need to have enough memory on the computer or else the software will crash the computer. A single scan at 1200 DPI can take 30 minutes or longer to complete. Make sure the computer's power settings allow for it to sit idle this long without turning off. The following instructions are for software version 3. Software version 4 does not allow for 1200 DPI scans.

- i. To enable 1200 DPI follow these steps:
 - 1) Start the CI-600 software.
 - 2) Start the Task Manager (right-click on the clock in the lower right of the Task Bar to find this option)
 - 3) Click on the Processes tab of the Task Manager.
 - 4) Right click on the CID.CI600.exe entry and select Open File Location.
 - 5) Find CID.CI600.exe.config and open the file with Notepad (you could start Notepad and drag the file into Notepad, you may be able to simply double-click the file it just depends on how the system is setup)
 - 6) Find the MaximumResolution entry and change the value from 600 to 1200.
 - 7) Save the file and re-start the CI-600 software.

16. What is the Windows 7 Run as Admin Fix for Software Version 3.1.21.1086?

- a. This issue has been fixed with version 3.1.22. Please upgrade your software.
- b. There is a known problem with our automatic upgrade solution for the CI-600 for version 3.1.21. Due to changes in Windows our CI-600 app requires admin access. Without administrator access the calibration files cannot be written properly. Administrator privileges must be set manually on the CI-600 app's executable file. This can be done (on Windows 7) by following these instructions..
 - 1) Start the CI-600 app.
 - 2) Press Control+Shift+Escape at the same time to start the Task Manager.
 - 3) Click on the Processes tab.
 - 4) Right click on CID.CI600.exe in the list of Processes.
 - 5) Select Open File Location
 - 6) Right click on CID.CI600.exe and select Properties.
 - 7) Click on the Compatibility tab and check "Run this program as an administrator"
 - 8) Click OK.

17. My instrument keeps asking to be calibrated...

- a. If you instrument repeatedly asks to be calibrated or you notice a decrease in the number of scans taken between calibrations, first check the software version. Are you running the most current version (4) of software? If not, it is recommended to download and install the latest version of software and update the driver. Remember to uninstall the old software and driver first.

- b. Disconnect and reconnect the instrument. Re-start the computer. Calibrate the scanner.
 - c. If there is not an improvement, check the USB cable connection and cord. USB cables typically last only a few years, so replacement of an old cable can have an effect on how the scanner is functioning. Is the USB cable connection on the instrument bent or crushed? Has it been exposed to moisture or condensation? Can you see any corrosion?
18. What does the “release the lock switch” error indicate?
- a. If you receive an error asking you to release the lock switch, you should update the software and driver of the CI-600. This error does not exist in new software and with new driver and calibration, the unit should function properly.
19. Where can I find a list of published articles referencing the CI-600?
- a. <http://cid-inc.com/publications/ci-600-publications>
20. If my CI-600 breaks, does CID Bio-Science provide loaner units during repair?
- a. If you are located within the United States, CID Bio-Science would be happy to provide a loaner CI-600 for use during any necessary repair. Please contact support@cid-inc.com for repair and loaner unit information. International loaner units will be provided on a case by case basis, depending on shipping costs and customs regulations.

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HARDWARE WARRANTY

Important: Please Read

Seller's Warranty and Liability: Seller warrants new equipment of its own manufacturing against defective workmanship and materials for a period of one year, of a single shift operation, from date of receipt of equipment - ***the results of ordinary wear and tear, neglect, misuse, accident and excessive deterioration due to corrosion from any cause is not to be considered a defect.*** Any defect must be called to the attention of CID Bio-Science, Inc., Camas, Washington, USA, in writing, within 90 days after receipt of the unit.

Seller's liability for defective parts is limited to the repair or replacement of any part of the instrument without charge, if CID Bio-Science, Inc.'s examination discloses that part to have been defective in material or workmanship, and in no event shall exceed the furnishing of replacement parts F.O.B. the factory where originally manufactured. No equipment may be repaired or altered by anyone not authorized by CID Bio-Science, Inc.

Material and equipment covered hereby, which is not manufactured by Seller, is to be covered only by the warranty of its manufacturer. Seller shall not be liable to the Buyer for loss, damage, or injury to persons (including death), or to property or things, whatsoever, including, but without limitation, products processed by the use of the equipment; or for damages of any kind or nature (including, but without limitation, loss of anticipated profits), occasioned by or arising out of installation, operation, use, misuse, nonuse, repair, or replacement of said material and equipment, or out of the use of any method or process for which the same may be employed. The purchaser is to pack, ship, or deliver the instrument to CID Bio-Science, Inc., in Camas, Washington, USA, within 30 days after CID Bio-Science, Inc. has received written notice of the defect at the customer's expense. No other arrangements may be made unless otherwise approved in writing by CID Bio-Science, Inc.

The use of this equipment constitutes Buyer's acceptance of the terms set forth in this warranty. There are no understandings, representations, or warranties of any kind, express, implied, statutory, or otherwise (***including, but without limitation, the implied warranties of merchantability and fitness for a particular purpose***), not expressly set forth herein.

PRODUCT TEST CHECK SHEET

CI-600 Serial Number:
RMA #
Computer Serial Number:
Computer Model No:
Windows Version:

Testing Function	Final
Clear Image Scanned	
Image Size Set: 8.5 x 7.7	
USB Cable Tested	
Scan Window Clean	

CI-600 Scanner Software Version:	Verified By:
Final Test Date:	Tested By:

Comments

WARRANTY REGISTRATION CARD



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Phone: (360) 833-8835 Fax: (360) 833-1914 e-mail: sales@cid-inc.com Web: www.cid-inc.com

PRODUCT REGISTRATION CARD

Please complete and return this form to CID within 30 days to validate your Warranty on Parts and Labor.

Registration Information:

Your Name: _____ Title: _____
 Company/University: _____
 Address: _____
 City: _____ State: _____ Zip: _____
 Country: _____ Email: _____
 Phone: _____ Fax: _____
 CID Serial Number(s): _____
 Purchase Date: _____ Purchase Price: _____

FOLD ON DOTTED LINE

Your opinions will help improve our service. Please answer the following questions.

1. What was the basis of your product selection?

- Representative Recommendation
- Product Features
- Technical Specifications
- Warranty
- Other _____
- Price
- Product Design
- Brand Name
- Service

2. What other competing brands did you consider? _____

3. Where did you first learn of this product?

- Advertisement in _____
- Friend/Colleague
- Other _____
- Representative
- Exhibit

4. Who selected this product?

- I did
- University Department
- Other _____
- Research Group
- Purchasing

5. Comments/Suggestions:

