



CI-600 Digital Root Imager

root growth monitoring system manual for software version 3.0



Document Overview

This document details the installation, usage and maintenance of the CI-600 root growth monitoring system.

PLEASE TAKE THE TIME TO READ THIS DOCUMENT BEFORE USING THE CI-600.

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Unpacking

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

- **1 Scanner**
The CI-600 Root Scanner hardware.
- **3 Soil Tubes (6ft)**
You may receive different quantities and lengths based on your order.
- **1 Calibration Tube**
See the Calibration area under the Usage section of this document for information on using this tube.
- **1 Software CD or USB Thumbdrive**
The CI-600 Root Scanner software. See the Software area under the Setup section of this document for information on using this software.
- **1 USB cable**
This cable is used to connect the CI-600 to the computer running the CI-600 software.
- **1 Carrying Case**

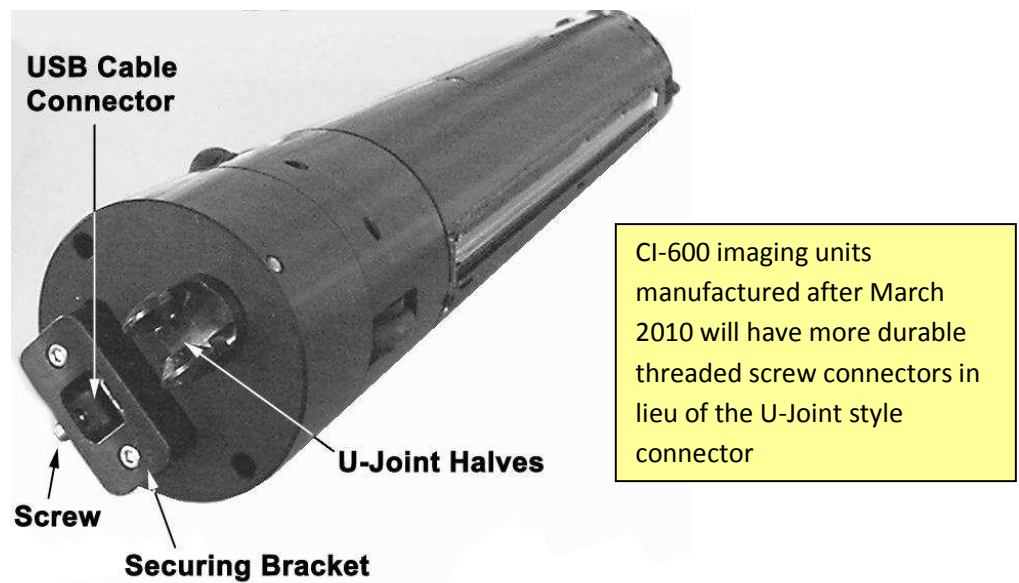
DURING UNPACKING IF ANY OF THESE ITEMS ARE NOT PRESENT PLEASE CONTACT CID IMMEDIATELY.

Note: Additional items, software (such as SigmaScan Pro) and hardware (such as a laptop) may be included based on your order.

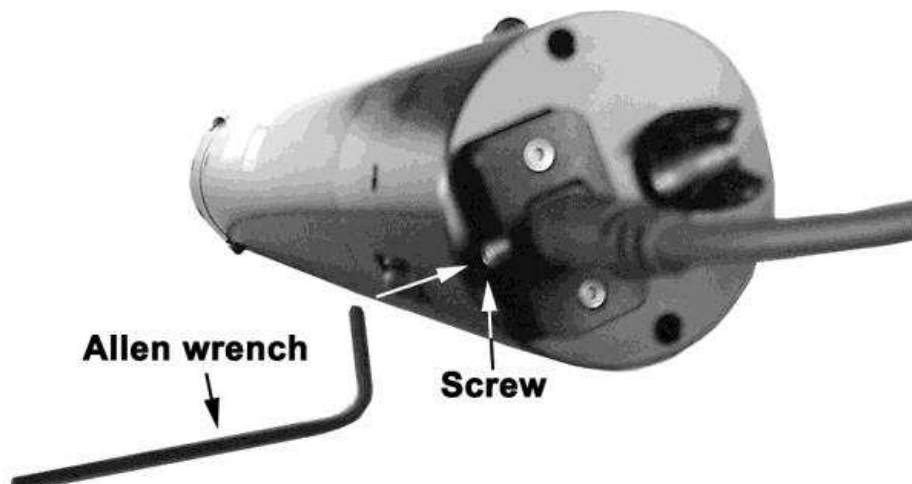
Hardware Assembly

Please follow these important instructions on how to connect your CI-600 to your computer.

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 screws on the securing bracket.



3. Connect the measuring rod (U-Joint End) to the scanner by placing the rod perpendicular and above the USB port as shown in the illustration below. Then lower the rod to engage the U-joint halves.



4. Swivel the measuring rod to the position shown below.



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



Software Installation

The following steps should be follows on each computer used with the CI-600 Root Scanner.

Windows Vista

Removing Previous Versions of CI-600 Software

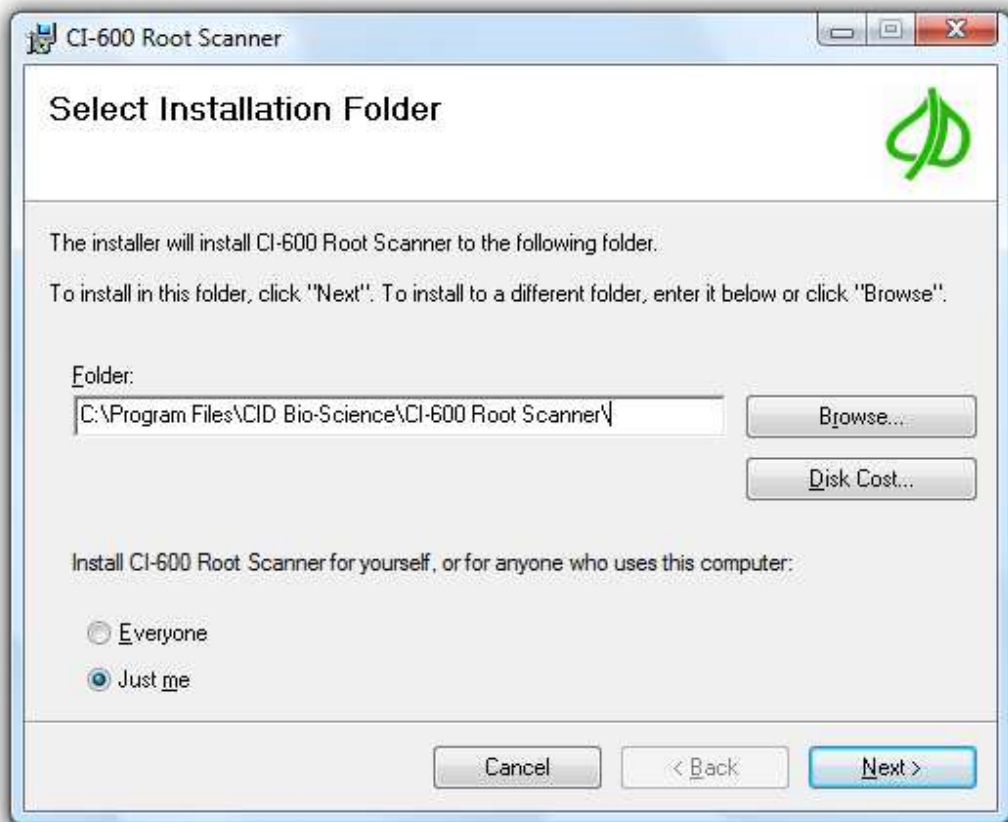
If this system already has a previous version of CI-600 software installed these steps must be followed before attempting to setup the new CI-600 software.

1. Click the **Start button**.
2. Click **Control Panel**.
3. Click **Uninstall a program**.
4. Locate the old CI-600 software in the list of installed programs.
5. Right click on the old software.
6. Click "**Uninstall**" and follow the onscreen prompts to remove the software.
7. Reboot the computer.

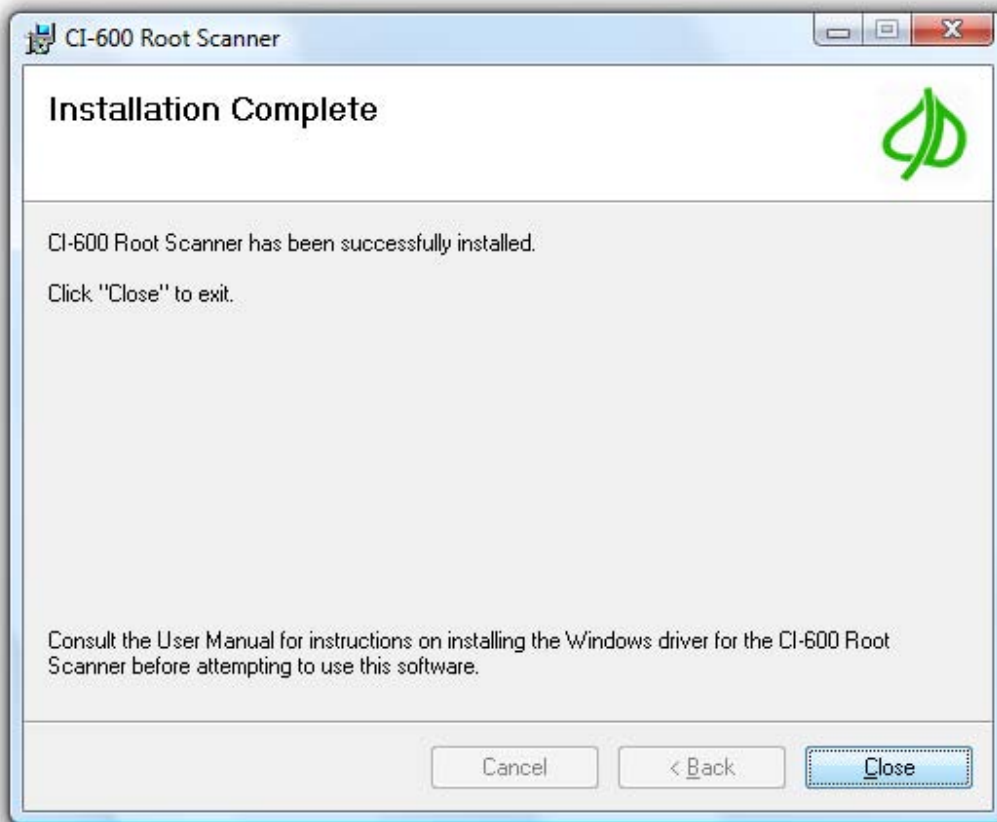
Installing the Scanning Software

This process should be completed before attempting to install the scanner's driver.

1. Insert the supplied CI-600 Root Scanner Software CD in your CD-ROM drive.
Note: This should automatically run the software setup program. If the setup program doesn't start browse to the CD and run Setup.exe
2. Specify the folder to install the CI-600 Root Scanner software in.



3. Click **Next** to continue and standby as the program is installed.
4. A dialog will appear that indicates the CI-600 Root Scanner software was installed successfully. Click **Close** and proceed to setup the Driver Software as prescribed in the next section of this document.



Replacing Previous Versions of the CI-600 Driver

If this system already has a previous version of CI-600 driver installed these steps must be followed.

1. Plug-in the CI-600 instrument.
2. Click the **Start** button.
3. Right click **Computer** and select **Properties**.
4. Click on the **Device Manager** link.
5. Expand the **Imaging Devices** and right click on **CanoScan LiDE 30/N1240U**.
6. Click on **Update Driver Software...**
7. Select "**Browse my computer for driver software**".

8. Select “**Let me pick from a list of device drivers on my computer**”.

9. Click the **Have Disk** button.

10. Type (or browse to select) the path of the CI-600 driver software.

By default the path is...

C:\Program Files\CID Bio-Science\CI-600 Root Scanner\Driver

11. Select **CI-600 Root Scanner** from the list of drivers.

12. Click **Next**.

13. If dialogs appear warning that this driver has not been signed by Microsoft, click **Continue** or **OK** to install the driver.

14. If dialogs appear asking if you want to replace any files, click **OK** , **Replace** or **Yes** to continue.

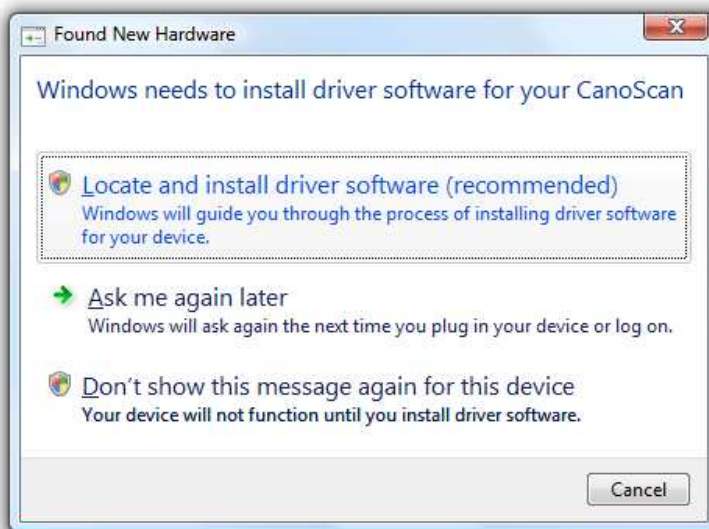
15. Reboot the computer.

16. Consult the Usage section of this document for calibration and scanning instructions.

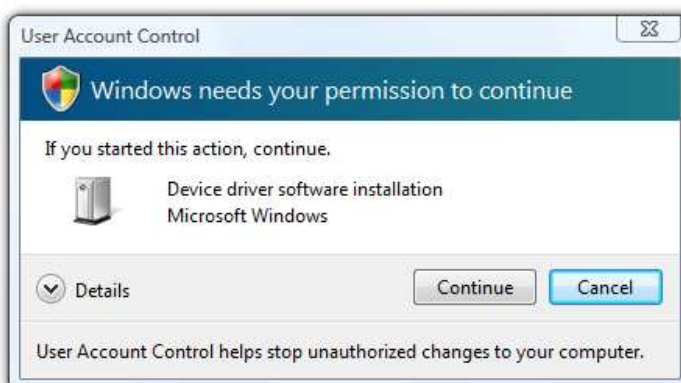
Installing the Driver Software

Follow the steps below to install the hardware driver which allows Windows to communicate with the CI-600 Root Scanner. If you have already completed the steps outlined under “*Replacing Previous Versions of the CI-600 Driver*” these instructions should be ignored.

1. Plug the supplied USB Cable into the host computer and CI-600 Root Scanner. The dialog below should display after a few moments.
2. Click **Don't show this message again for this device** when the **Found New Hardware** dialog appears



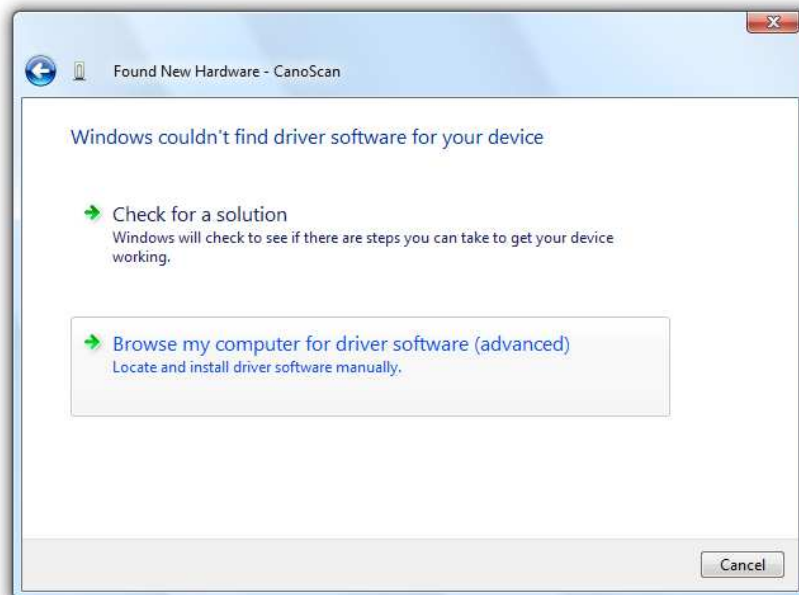
3. The dialog below will display. Click **Continue** to proceed.



4. Windows will now search for the driver software. Standby until the dialog below is displayed. Then click ***I don't have the disc. Show me other options*** to proceed.



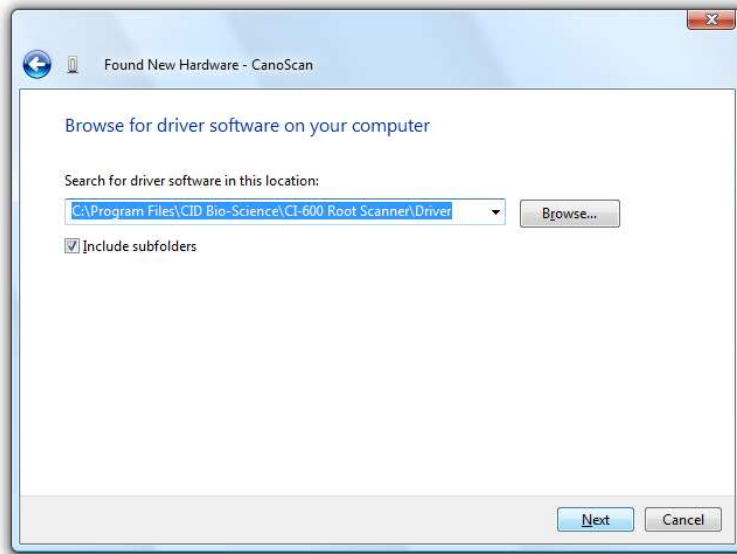
5. A dialog will display saying Windows could not find the driver. Click ***Browse my computer for driver software***.



6. A dialog will appear asking you to browse for the driver software. Type (or browse to select) the path of the CI-600 driver software.

By default the path is...

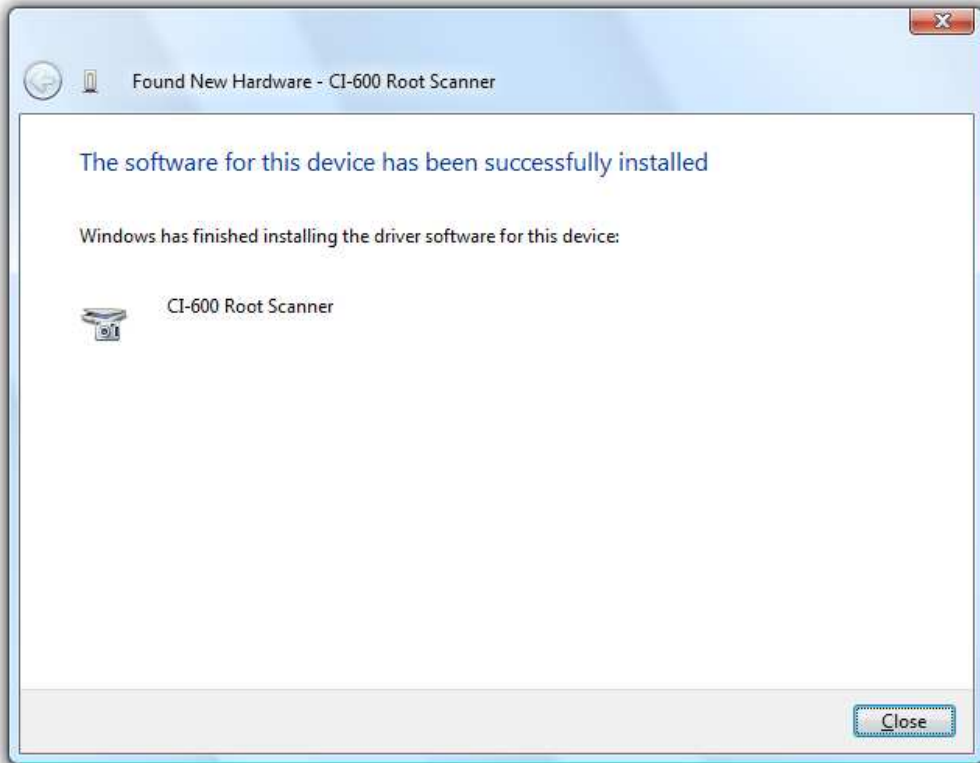
C:\Program Files\CID Bio-Science\CI-600 Root Scanner\Driver



7. Click **Next** to continue.
8. A security warning will appear because the CI-600 Root Scanner driver has not been signed by Microsoft. Click **Install this driver software anyway** to continue.



- Windows will display a dialog confirming that the driver was installed properly. Click **Close** to proceed.



- Reboot the computer.
- Consult the Usage section of this document for calibration and scanning instructions.

Windows XP

Removing Previous Versions of CI-600 Software

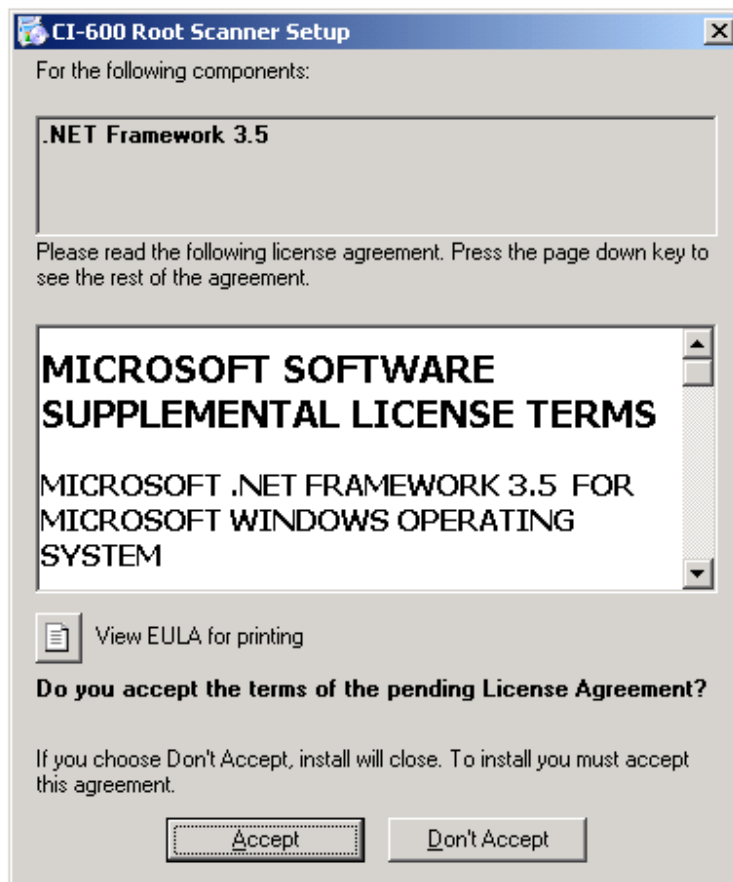
If this system already has a previous version of CI-600 software installed these steps must be followed before attempting to setup the new CI-600 software.

1. Click the **Start button**.
2. Click **Control Panel**.
3. Click **“Add or Remove Programs”**
4. Locate the old CI-600 software, select it and click **“Change / Remove”** and follow the onscreen prompts to remove the software.

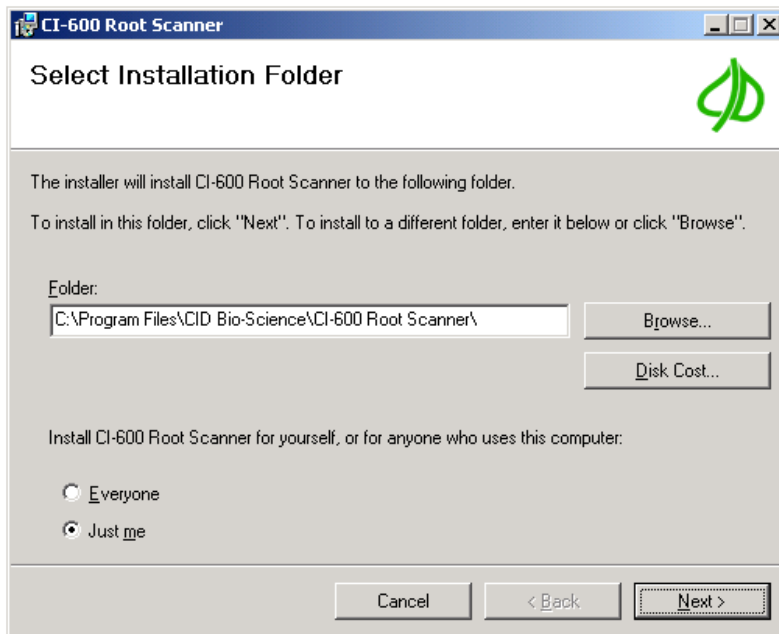
Installing the Scanning Software

This process should be completed before attempting to install the scanner's driver.

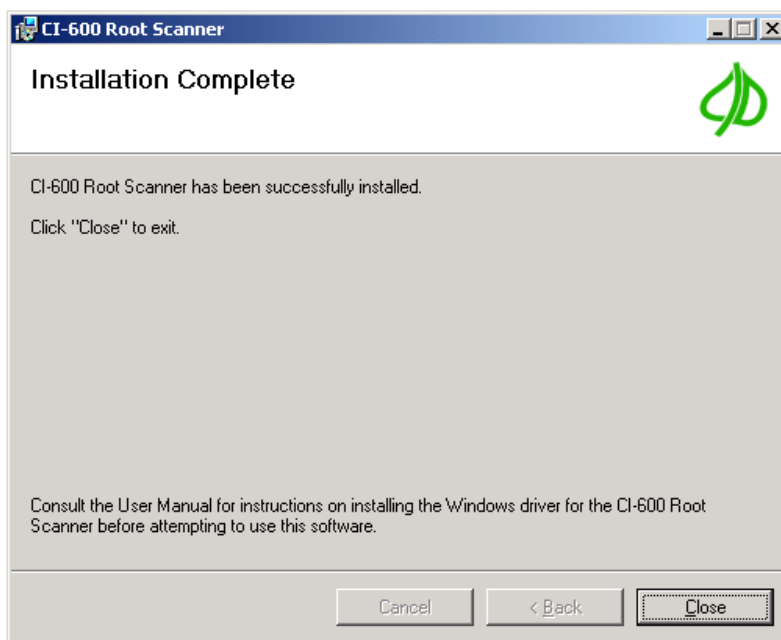
1. Insert the supplied CI-600 Root Scanner Software CD in your CD-ROM drive.
Note: This should automatically run the software setup program. However, if the setup program doesn't start browse to the CD and run Setup.exe
2. If version 3.5 of the Microsoft .NET is not installed you will be prompted to accept Microsoft's terms of use before continuing. Click **Accept** to continue.



3. The dialog below will appear. Specify the folder to install the CI-600 Root Scanner software in, and then click **Next** to continue.



4. The dialog below will appear which indicates the CI-600 Root Scanner software was installed successfully. Click **Close** and proceed to setup the Driver Software as prescribed in the next section of this document.



Replacing Previous Versions of the CI-600 Driver

If this system already has a previous version of CI-600 driver installed these steps must be followed.

1. Plug-in the CI-600 instrument.
2. Click the **Start** button.
3. Right click **Computer** and select **Properties**.
4. Click on the **Hardware** tab then the **Device Manager** button.
5. Expand the **Imaging Devices**.
6. Right click on **CanoScan LiDE 30/N1240U** and select **Update Driver...**
7. If you are prompted to connect to Windows Update select "**No, not at this time**" and click the **Next** button.
8. Select "**Install from a list or specific location (Advanced)**" and click the **Next** button.
9. Select "**Don't search. I will choose the driver to install**" and click the **Next** button.
10. Click the **Have Disk** button.
11. Type (or browse to select) the path of the CI-600 driver software.

By default the path is...
C:\Program Files\CID Bio-Science\CI-600 Root Scanner\Driver
12. Select **CI-600 Root Scanner** from the list of drivers and click **Next**.
13. If dialogs appear warning that this driver has not been signed by Microsoft, click **Continue** or **OK** to install the driver.
14. If dialogs appear asking if you want to replace any files, click **OK** , **Replace** or **Yes** to continue.
15. Reboot the computer.
16. Consult the Usage section of this document for calibration and scanning instructions.

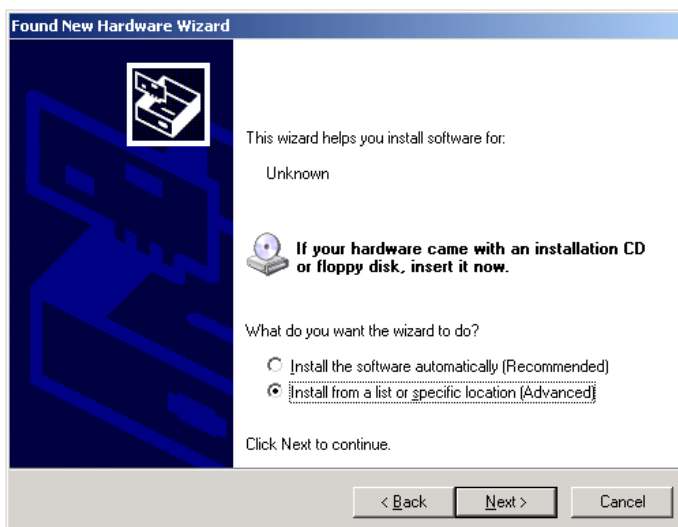
Installing the Driver Software

Follow the steps below to install the hardware driver which allows Windows to communicate with the CI-600 Root Scanner. If you have already completed the steps outlined under “*Replacing Previous Versions of the CI-600 Driver*” these instructions should be ignored.

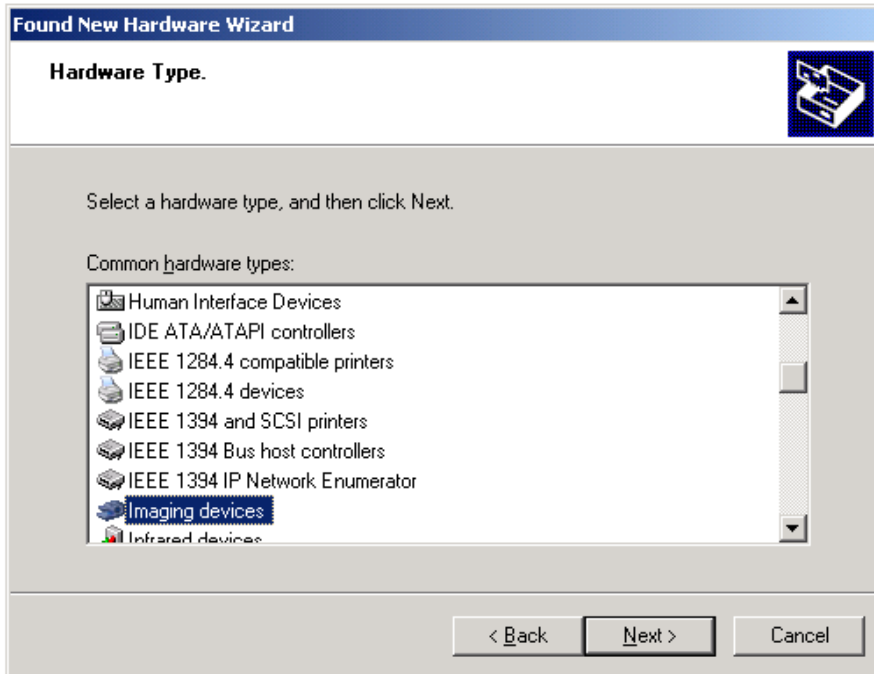
1. Insert the supplied CI-600 Root Scanner Software CD in your CD-ROM drive.
Note: This should automatically run the software setup program. If the setup program doesn't start browse to the CD and run Setup.exe
2. After a few moments the dialog below will appear. Select **No, not at this time** and click **Next** to proceed.



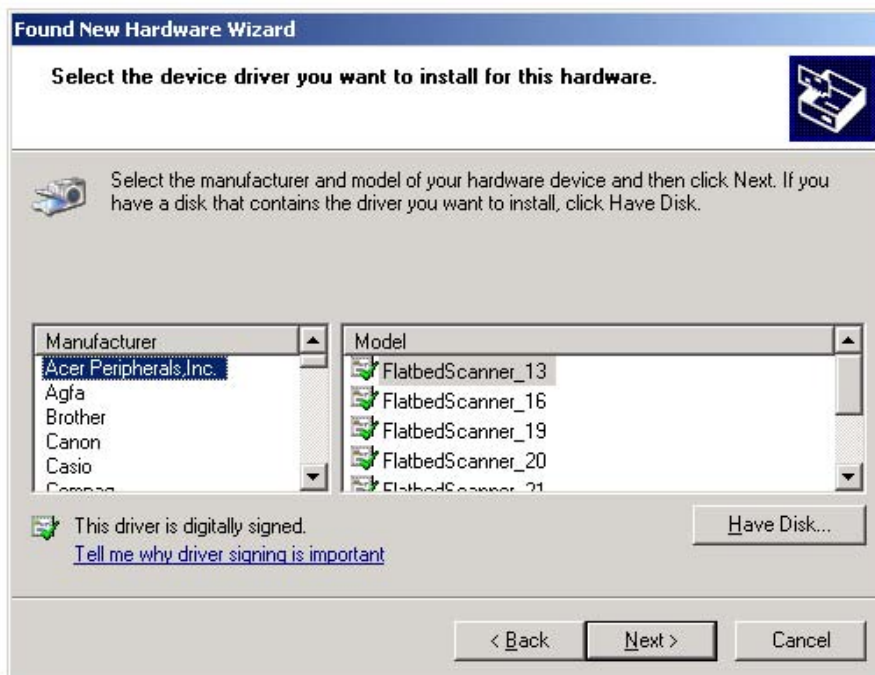
3. The dialog below will appear. Select **Install from a list or specific location** and click **Next** to proceed.



4. The dialog below will appear. Select Imaging **Devices** and then click **Next** to proceed.



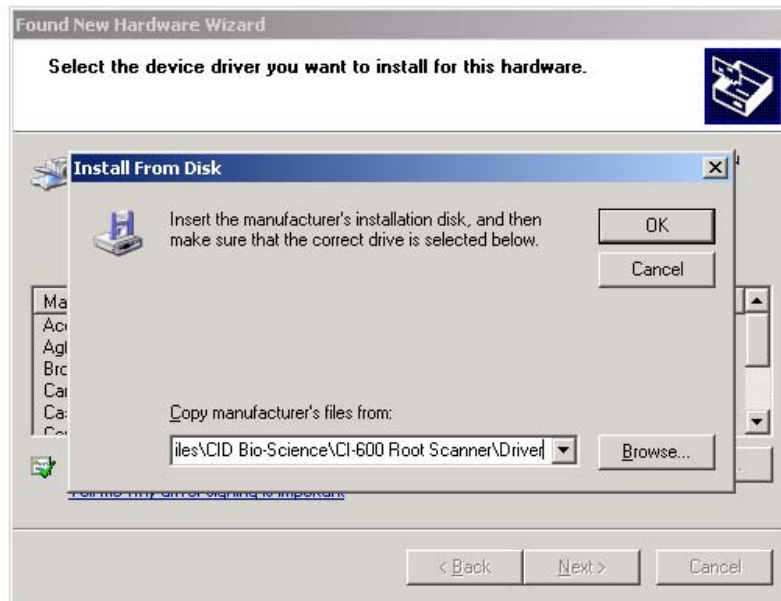
5. The dialog below will appear. Click **Have Disk** to proceed.



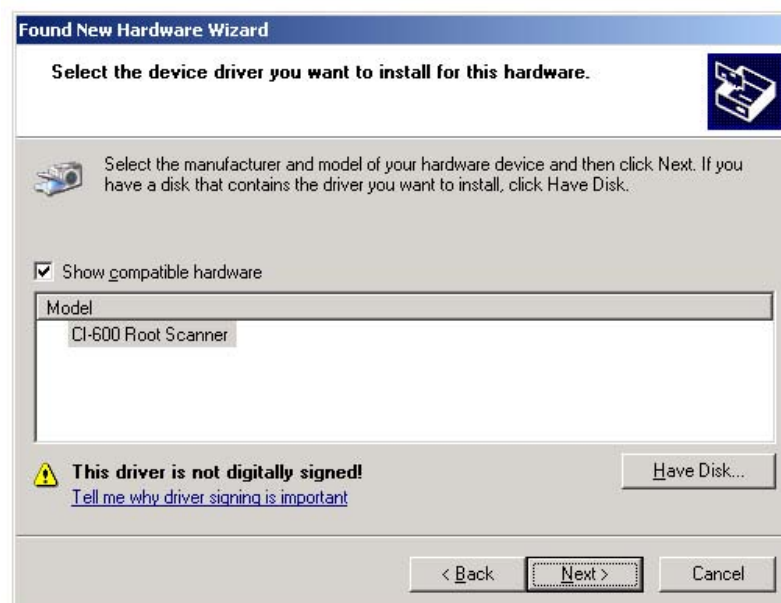
- The dialog below will appear. Type (or browse to select) the path of the CI-600 driver software, then click **OK** to continue.

By default the path is...

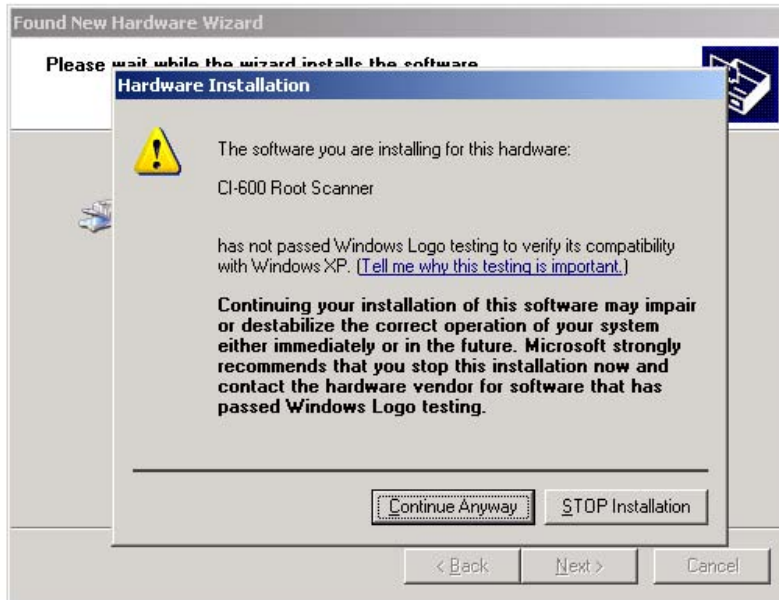
C:\Program Files\CID Bio-Science\CI-600 Root Scanner\Driver



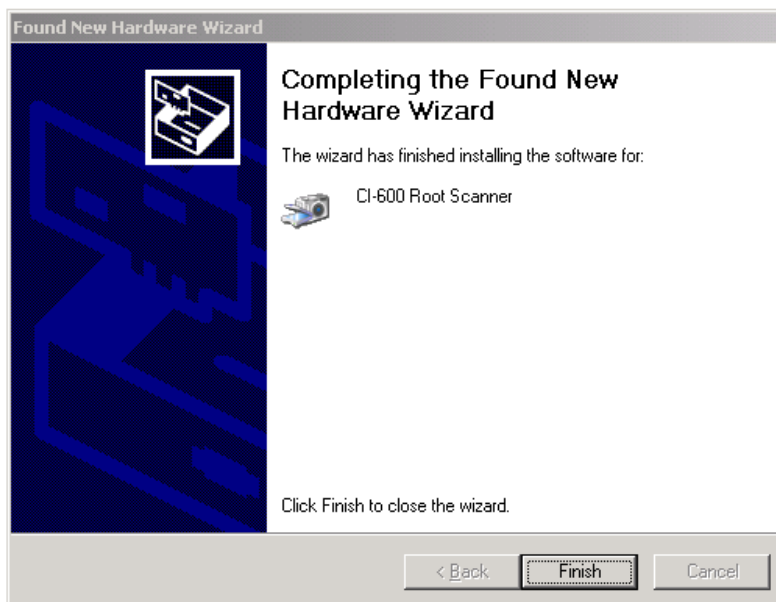
- The dialog below will appear. Click **Next** to continue.



8. The dialog below will appear. Click **Continue Anyway** to proceed.



9. The dialog below will display confirming that the driver was installed properly. Click **Close** to proceed.



10. Reboot the computer.

11. Consult the Usage section of this document for calibration and scanning instructions.

Setup Notes for Regent Instruments WinRHIZO Tron users

These steps should be followed only after the WinRHIZON Tron and the CI-600 software has been installed.

WARNING: IGNORING THESE INSTRUCTIONS MAY RESULT IN DAMAGE TO THE CI-600 ROOT SCANNER.

1. Open the Regent Instruments Protection Key's Driver.
Note: This should have been installed from the WinRHIZO Tron CD.
2. Attach the USB "Protection Key".
3. Connect CI-600 to the computer.
4. Open the WinRHIZO Tron software.
5. Click **Select Source** and choose **CI600 Root Scanner**.
6. Click **Images** and select **Acquisition Settings**.
7. Unselect **Use TWAIN Interface**.
8. Unselect **Regent Positioning System**.
9. Set the **Vertical** and **Horizontal Image Offsets** to **0.00cm**

Calibration

These instructions should be followed each time the CI-600 Root Scanner is used before scanning to ensure image quality and color accuracy.

WARNING: FAILING TO CALIBRATE THE SCANNER REGULARLY WILL RESULT IN POOR IMAGE QUALITY.

1. Place the CI-600 Root Scanner in the Calibration Tube.
2. Attach the CI-600 Root Scanner's USB cable to the USB slot.
3. Click on the **Start** button, go to **Programs** and select **CI-600 Root Scanner** from the CID **Bio-Science** folder.
4. Click the **Calibration** button.
5. Place the CI-600 Root Scanner in the white Calibration Tube.
6. Click **OK** to proceed with calibration.
7. Presuming calibration completed successfully, continue and scan as desired. Otherwise repeat step 4.

Calibration Notes for Regent Instruments WinRHIZO Tron users

The Regent Instruments calibration process is different than the CID Calibration process. Refer to the WinRHIZO Tron manual's section 4.7 "The Calibration Menu" for instructions to calibrate the scanner for the WinRHIZO Tron software.

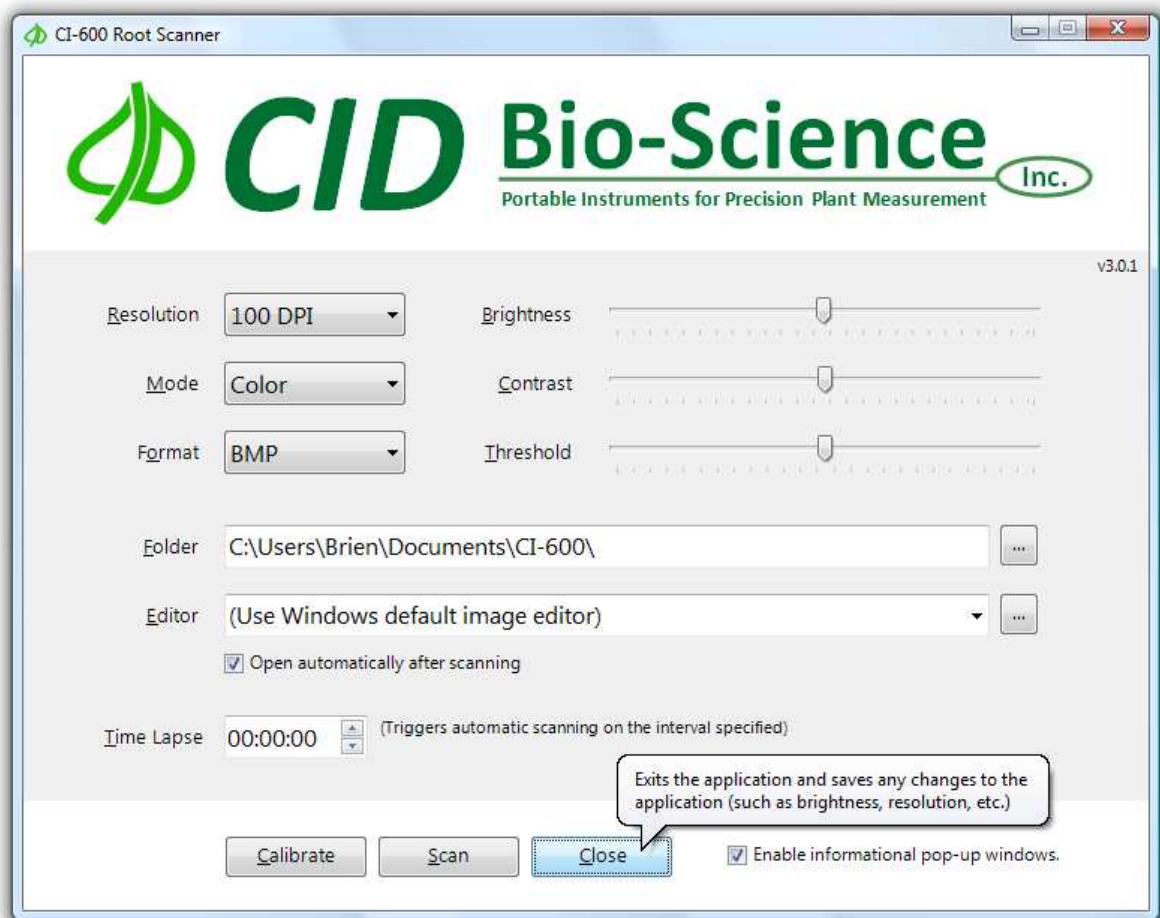
Always execute Calibration from the CI-600 Root Scanner software before conducting WinRHIZO Tron Calibration.

WARNING: IGNORING THESE INSTRUCTIONS MAY RESULT IN DAMAGE TO THE CI-600 ROOT SCANNER.

Scanning

Calibration should be performed before scanning to ensure image quality and color accuracy.

1. Click on the **Start** button, go to **Programs** and select **CI-600 Root Scanner** from the **CID Bio-Science** folder. The dialog below will appear...



*Note: Descriptions for each user interface element will appear on-screen when hovering over user interface elements (as illustrated above) when **Enable informational pop-up windows** is checked.*

2. Select the resolution, mode, format, brightness, contrast and threshold settings as desired.
3. Specify the folder to store scanned images in.

4. If you wish to automatically load an image editor after each scan...
 - a. Chose the image editor to use in the **Editor** input box or click ... to browse and select the image editor desired.
 - b. Check **Open automatically after scanning**
5. If you wish to automatically re-scan after a specific time period...
 - a. Specify the interval between each scan in the **Time Lapse** input box.
6. Click the **Scan** button to start scanning.

Scanning Notes for Regent Instruments WinRHIZO Tron users

When acquiring images using the WinRHIZO Tron software you must always set the **Length** to **19.55 cm (7.7 in)** and the **Width** to **21.59 cm (8.5 in)**.

WARNING: IGNORING THESE INSTRUCTIONS MAY RESULT IN DAMAGE TO THE CI-600 ROOT SCANNER.

Deploying Tubes

- Make sure the inside of the tube is clean. You can make a mop with a clean soft cloth.
- On the slider rod connected to the scanner, there are black rubber marks marking every 20cm. (8 inches). Using these marks, lower the scanner to the desired depth.
- 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.
- Water condensation on the tubes: Make sure the tubes are water tight at the bottom, which have an end cap glued on the bottom 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). Obviously, you can't have the calibration portion of the tube in the ground if only 1 cm is showing above ground, so you can carry around a small section of calibration tube with you to take images. For condensation on the INSIDE of the tube, you can clean the tube with a paint roll sponge before each measurement, or make a thin mop with a very soft cloth. You may use a soft cloth similar to the ones used for cleaning car exteriors.
- 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 a glued and sealed cap 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. Temperature fluctuations may cause a normal amount of expansion and contraction in the tubes and caps.

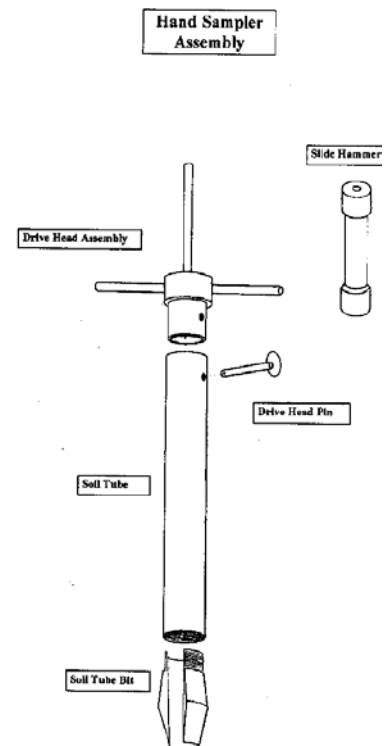
Auger Set Usage

To create the holes for inserting the soil tubes into the ground, use an auger set assembly (illustrated on the right).

Stand assembly vertical and slide the hammer up and down on slide rod until sample tube is driven to the depth required. Then pull complete assembly back out of the ground, remove pin from the top side of the tube, remove drive head assembly, turn the tube upside down and the soil will slide out of the tube.

Do not remove the soil tube bit from the sampling tube until it is to be replaced due to damage or to install a different style bit. Removing the soil tube bit from the sampling tube and then trying to thread it back on, could damage the threads. The sample is removed through the top of the soil tube, not through the cutting bit end.

Upon request, CID can provide you with the source for purchasing an Auger Set and/or additional soil tubes.



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 HOST COMPUTER'S KEYBOARD, SPEAKER GRILL, AND OTHER OPENINGS. NEVER SPRAY CLEANER DIRECTLY ONTO THE HOST COMPUTER. NEVER USE HARSH OR CAUSTIC CHEMICAL PRODUCTS TO CLEAN THE CI-600 OR THE HOST COMPUTER.

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 OF HEATS.**
- **EXTREME HEAT, COLD OR HUMIDITY.**

Support

CID Bio-Science, Inc. is committed to providing customers with high quality timely technical support.

Questions and issues not addressed by this document should be directed to a Technical Support representative in your own country, or CID Bio-Science, Inc. directly.

PLEASE REFER TO THE DETAILS IN THIS DOCUMENT BEFORE CONTACTING CID TECHNICAL SUPPORT.

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Fax

360-833-1914

<http://www.cid-inc.com>

support@cid-inc.com

sales@cid-inc.com

Warranty

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, 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, 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, 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, Inc., in Camas, Washington, USA, within 30 days after CID, 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, 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 Verification Date:	Verified By:
Final Test Date:	Tested By:

Comments