COLOR*TRACK* ™
REALTIME

REAL TIME DATA LOGGING CONTROLLER

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COLOR*TRACK* ™

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User Reference Guide
For Windows®

ColorTrack REALTIME

User Reference

Version 1.0.4

Introduction

ColorTrack REALTIME

Technology

The technology of the ColorTrack REALTIME system, also known as R/T is based on specific geometry of the laser and reflectivity. The laser is focused into the roasting chamber and gauges the color development in real- time. Operating at 785nM which is the optimum range for the actinic response of coffee, the ColorTrack family of lasers offer the most desirable and precise results for determining the true color and shade of roasted coffee and incredibly accurate and consistent results.

The Color Track R/T system is an exclusive patented system designed to monitor and record realtime data generated during a coffee roast. The system collects a virtually unlimited amount of information every one second. from various sensors and stores the data automatically allowing both real-time and post operation analysis. It is unique in the fact that it not only records and tracks time, temperature and any other sensor generated data as in normal data logging systems, but can also track color development of the roast on a real-time basis.

Laser Reflectometer

The ColorTrack Laser Reflectometer tracks color development during any given roast cycle. By focusing a laser through any point of sight into the roasting chamber, the laser monitors the color of the beans in real-time and displays the values in the R/T software so the operator can monitor and also terminate the cycle at the precise moment necessary to insure absolute consistency and perfect product. Most importantly, this allows any roaster to overcome the inherent margins for error in standard profile roasting due to environmental variables such as ambient

Getting Started

Hardware

Other than a computer with the ColorTrack R/T software installed on it, there are a number of different hardware options and requirements. What you will need is dependent on the features and options purchased with your system. The base system which simply logs time and temperature data requires only a thermocouple reader (see options below). For color monitoring with an R series laser or monitoring of any other sensors you will require a data acquisition module (see NI 6008 below). *NOTE: The HH series laser does not require any data acquisition module.* red for basic operation.

Computer/Monitor

There are a number of computer options for ColorTrack R/T. Fresh Roast offers as assortment of all-in-one models including a touch screen. If you purchased a computer with your package all of the software will be pre-installed. Please refer to the User Reference that came with the computer as it relates to operation of the computer. If you did not purchase a computer with your system you will need to install the ColorTrack R/T and drivers manually. (*See "Installing your Software and Drivers" section of this guide for more information*).

Thermocouple Monitoring Devices

There are currently two options for thermocouple monitoring.

Series is an entirely new digital laser technology also known as Genesis and incorporates slightly different features and operating procedures. All are covered in this reference guide.

Software and Drivers

There are a number of software programs and software drivers required for operation of the ColorTrack R/T system. If you purchased your computer as part of your package, the required software will be pre-installed for you. If you are using your own computer you may will have to install the software before you can start using the system. All of the required software is available via internet. All of the software can be downloaded and installed directly onto the target computer which is the recommended method. If you do not have an internet connection on the target computer, you can download the files to a different computer and then copy them to the target computer for installation.

thermocouples are connected firmly to the device. When completed, plug the USB cable into the National Instruments device and connect it to your computer. Your thermocouple reader should be ready for setup in the ColorTrack R/T software and if you have no other devices to install you can proceed to ColorTrack software installation.

Optional Hardware

There are a number of hardware options for the ColorTrack R/T system including full support of any and all analog devices and sensors other than thermocouples including any analog laser color support you may have purchased. There are two standard options available with the ColorTrack R/T system which are the analog color laser analyzer and the ambient humidity monitor. Both of these as well as any other analog devices you have are controlled by the National Instruments 6008 data acquisition device.

USB 6008

The National Instruments 6008 is a data acquisition unit that controls all analog devices and sensors other than thermocouples. If you are using an analog color laser or humidity sensor you will set it up with the NI 6008. All you need to do is make sure the device is connected to the NI 6008 and then enable it in the software. (See Software Setup). To set up the hardware, connect your devices to the NI 6008. If you purchased your system with color and/or humidity support, the device will be included in the package pre-wired. To connect your own devices and/or sensors please refer to the specific manufacturer and the NI 6008 documentation included in your package for the proper installation procedure.

Relative Humidity Meter

If you purchased the RH humidity meter option your package will include a Novus RH-100 relative humidity meter. The meter also includes a power transformer that will require a 110 VAC electrical outlet. The unit should be pre-wired and requires only that you

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information displayed in the panels.

Setting a Baseline
Adsljh asdlk hjdal hls fa

and a portion or all of the sight glass remains relatively clean due to the scrubbing action of the green coffee. The "clean point" refers to the section of the sight glass that is clearest or the most scrubbed. This is where the laser should be pointed for best results. In most cases, simple bar stock steel attached to an outside bolt on the roaster will create a simple and effective mounting solution.

Once you have determined where the laser can be positioned you can decide on your mounting and bracket solution. **The laser needs to be roughly 2-4 inches from the sight glass (3.00" is optimal) to the front of the laser and must carry an angle (Preferably downward) of at least eight degrees.** You must create a bracket and mounting system that secures the laser at the desired distance and pointing at the correct portion of the sight glass or opening. You may also use a tripod or boom device if feasible but it must be sturdy enough to support the weight of the laser without moving. Once you have created your mounting system, simply attach the laser to your bracket.

Targeting The Laser
Once your laser is installed you should test and target the laser. Having attached all of the necessary cables you should be able to clearly see where it targets once power is applied. You will need a piece of white paper or simple white business card. The laser emits a beam in the form of a red dot that can be easily seen on any light colored surface. Connect your laser to power with the materials provided in your package. Once the power is on you can put your light colored paper or business card in front of the laser and you will see a red dot appear. Put the paper directly on the sight glass surface. You may find it easier to cut a piece of paper to the size of the sight glass and glue or tape it temporarily directly to the glass with an adhesive that can be easily removed from the glass afterwards such as rubber cement or common aerosol contact cement. Make sure your laser is properly targeted and then secure the laser in that position. Once you have targeted and tested your laser you are ready to install your software and test your entire monitor system.

roast. This information is optional and will not affect the system if they are not added. The user can click the "Add Air" and "Add Gas" buttons at the bottom of the screen to add these values. Once the button has been clicked a screen will popup showing the current time of the roast. If the user types in a value, then that value will be entered corresponding to the time that is displayed.

For example, if the user clicks the "Add Gas" button at time 5:30 of the roast a screen the popup screen will show 5:30 as the time. Once the user adds a value for the gas and hits enter that value will be reflected in the Chart showing the gas was added at time 5:30 at the value the user entered.

Changing previously added Gas/Air values during the roast can also be done. The user can choose to change the time value in the popup window and the system will go back and replace all the values which corresponded to a particular time and value.

For example, if the user had added 50 units of gas from time 1:00 to 2:00, then the user may type in 1:00 as the time and 60 units of gas. When the user hits the enter button the system will go back to 1:00 and change it's value to 60. It will do the same for 1:01, 1:02, 1:03, etc until it sees a change in gas value which happens at 2:00. Therefore, all the values of 50 between 1:00 and 2:00 will be changed to 60.

Changing Details
The user can change any of the details as shown in the screen shot above. The "Roast Name" will be used as the name of the file along with the current date/time.

(Example: Kenya2009-04 12:12:59.xml). The user may also click on the detail name and change the name of the detail itself. For example, the user can click on "Batch Number" and change the name to "My Batch" with the exception of any field who's background is gray.

Installation From Packaged Media
Installation of the National Instruments drivers must be completed before you can install the ColorTrack R/T application or any of the ColorTrack drivers. To do so use the following procedure EXACTLY. From the media included with your system access the proper drive and open the National Instruments Folder. Double-click on the setup file (NIDAQ911f0.exe). This compressed self extracting file will immediately start the setup program.

The program will start automatically and guide you through the steps for installation. The dialog boxes you need to respond to are illustrated here.

After the first dialog box appears press OK to start the installation.
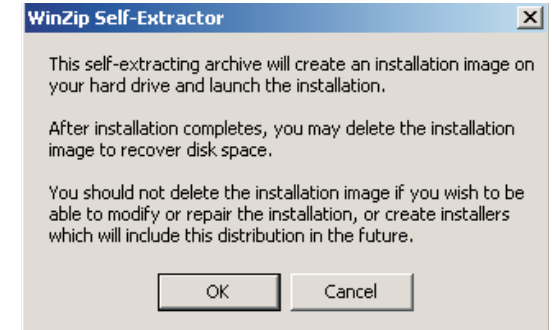
In the next dialog box you will be asked for a location to unzip and save the files to. It is recommended that you accept the default values and simply press UNZIP to start the installation. If you wish to change the target directory you may do so by pressing the Browse button and selecting an alternate location. A progress bar will appear displaying the progress of the unzipping procedure. Allow the program to finish unzipping the files as illustrated and when completed press OK.

Once you press OK, the installation will start automatically installing the National Instruments drivers that were unzipped in the previous step.

When the installation program starts it will display the initial splash screen and begin initialization as illustrated. When it has completed initializing you will be asked to identify a target

Basic Operation

Start/Stop Configuration

Manual Start

Manual Stop

Auto Star/Stop

Configuring Start Settings

Roast Monitoring

Starting a Roast
The process to start a roast is as follows:

1. Click new Track to create a new track

2. Fill out information in the details section as described below

3. Click the Start button (it will turn red with a time of 0:00.0). The system will now be waiting for the beans to drop into the roaster. The system detects this by reading the color of the beans. Once the

After the Options window is displayed you will see all of the installation options. The first of your two required options will be under Application Development Support. Expand that category by clicking on the plus sign. All of the options for that category will be displayed. Go down the list to .NET Framework 3.5 Languages Support. Click on the button and make sure that this feature is already installed or going to be installed locally.

Next, go to the NI Measurement and Automation category and expand it by pressing the associated button. As in the previous step make sure that the option to install .NET Framework 3.5 Languages Support is installed already or selected to be installed locally.

Press Next when finished and the installation will proceed. In the next step the installation program will contact the National Instruments server via internet to check to see if there are any updates or notifications regarding the drivers and will download them and update your system or it will simply inform you that there are no updates or notifications available.

That should complete the installation of your National Instruments software and you can
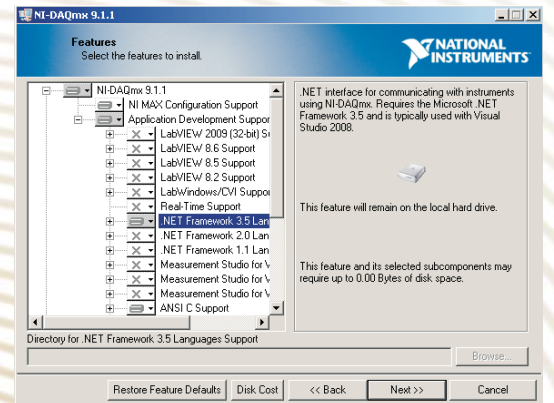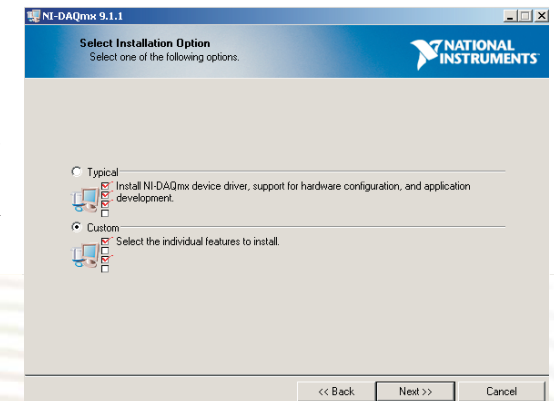
appear in the order, left to right, as they are entered in the configure dialog box.

Changing the Laser Settings
To change the laser scale calibration settings the user may choose to replace the default values. The Desired values will be used to change the actual readings that are taken by the Color Track laser.

The "Start/Stop Trigger" is the ColorTrack laser value at which the system will begin and end the roast.

Configuring Manual and Auto Start
The Configure Auto Start/Stop function allows you to set up how the system begins and ends logging data during a session. Automatic operation can only be used when a laser is attached as the function is based on color processing. For example, if you are roasting coffee you can set the system to start logging as soon as it sees uncooked coffee or a color value that would indicate such. Conversely you would set the stop value to a very dark value (color of the drum/black) so that the system would end logging upon completion of the process.

Testing the System
Having connected all of your devices and configured them you should be ready to test the system and all of the installed devices.

Once the program is started and running it should immediately begin reading data from the probes and devices which you previously configured and the data will be displayed in the main screen panels. These values are simply for display and will not be recorded until you begin a roast. Make sure that all of the values are being displayed and that all of the devices are working properly. Assuming you have not yet roasted all of the values should be relatively normal and within ambient conditions. For example, the temperature reading on your screen should be somewhere near or at room temperature as should relative humidity if you are using the RH-100 humidity meter. Likewise, as

package and access the drive. Once the contents are displayed, open the ColorTrack R/T file folder. The contents of the folder should be displayed and you can then select the installation program (Setup.exe) by double clicking on it. This will start the installation program and guide you through the process.

Simply follow the on-screen instructions and the software will be installed. When completed, reboot your entire system.

Installing drivers for the Genesis Digital Laser
If you have a ColorTrack Genesis digital laser option you will need to install a separate set of software drivers for that device. Insert the CD-ROM or memory stick in your computer and access it. Open the Genesis Device folder. Once opened the contents will be displayed and you then need to start the installation program by clicking on it (dpinst.exe). Follow the on-screen instructions and the drivers for your Genesis will be installed. Once completed, reboot again and all of the required software should be installed to use your Genesis device with your ColorTrack R/T software.

NOTE: If you need to re-install the programs and/or drivers for any reason you must first uninstall any old or previous versions. To do this, use the Windows Control Panel and use the Uninstall feature for Software/Programs.

Setting Up The NI Devices
The last step is to make sure that your National Instrument devices are connected properly. If you are installing for the first time there should be no need to edit anything but it should be checked to make sure the devices are assigned correctly.

Once all of the software has been installed and the system has been rebooted, you are going to use the National Instruments Measurement and Automation software. There should be an icon on your desktop (or you can go to the Start menu in Windows and select National Instruments -> Measurement & Automation).

6008 setup where you simply enable them and designate units and scale.

Configuring Manual Inputs
Manual inputs are merely notes that you may enter during the logging process that are not automatically collected such as data for a device that is not controlled or monitored by the logging system. Any manually entered data will be attached and included in the final log file for the session.

Configure Scales
Configuring scales is a highly specialized function and should be used with caution. Basically, you can custom calibrate any of your devices by using a native or raw reading and correlating that to a desired value. This function is most often used in conjunction with the Acquire Hardware Readings function in order to attain raw readings.

To configure a scale you must create at least three values related to three raw readings. It is highly recommended that you create the greatest expected range in doing so. In other words, using the minimum of three native readings you would create a scale using the minimum native reading, a median and a maximum each with a corresponding scale reading.

You can also choose a method of scaling. Linear interpolation will create a straight line relationship in which the scaled value will be proportionally stepped from low to high, point to point for those points entered. The alternate option is Cubic Spline Interpolation in which all points in the scale are connected on a "smoothed curve" basis. The difference between the two is that the Spline is a "smarter" or more intelligent interpretation of the data but it also requires considerably more processing power so you need to make sure that your hardware will support it.

Configuring Panels
The ColorTrack R/T software allows you to create your own

start/stop settings, panel settings, plot settings, and chart settings.

ConfiguringThe System
Once you are sure that your devices and hardware are correctly installed you're ready to setup and configure each device to work with the ColorTrack R/T properly. From the Settings menu on the main screen select Configure Hardware. A dialog box will appear with tabs for each usable devices. You should see the two National instruments devices, Extech reader and the Digital Laser (HH-100). These are installed by default so all of them will appear even if you do not have all of them connected.

Refresh Files
The Refresh Files function updates any ColorTrack R/T data that may have been changed or edited. This is especially important if any changes are made outside the program such as an addition or deletion of files outside of the ColorTrack program through Windows.

Acquire Hardware Readings
The Acquire Hardware Readings function allows you to get raw data readings from any attached hardware devices such as thermocouples or a laser. To use the function you would select a device to monitor and select a time period over which the readings are to take place. With the system running the raw reading will be displayed along with the normal scaled reading.

Configuring Attributes
Your ColorTrack R/T software allows you to create a detailed database containing any and all information you need to track for any given session such as the name of the roast, the roaster, location, etc. You may enter as many data items as you need and each session will have the database attachment and will save all the information you enter for the given session.

To add a field simply click in the Name column on the left and type in the name or title of the entry field. You may also assign a

default value in the column on the right. Press the Save button when complete. For any new session, access to the Attributes in the main window will display a table with all of the fields created in which you can enter data for each individual session.

Configuring Hardware
This is a vital function of the ColorTrack R/T software and system and allows you to connect, enable and disable any given device. There are four categories of devices; USB 6008 which is the National Instrument Data Acquisition device, USB 9162, which the National Instruments thermocouple reader, EA 15 which is the alternate Extech thermocouple reader and Digital Laser for use with the ColorTrack HH-100 Digital Laser which unlike the analog laser which runs off of the USB 6008, has it's own port.

To configure your devices, select the appropriate tab for the given device. All of the devices connected to the given port or acquisition component should be displayed. Make sure the main Enabled button is on and each device associated with the component is also individually enabled.

NI 9162
The National Instruments 9211A and DA 15 tabs are for your thermocouple readers. Select the device you plan to use. The process for setting it up is identical to your other NI device. Make sure the thermocouples you plan to use are connected to the device and then simply label the connections and enable them. Save your changes and the thermocouples will be enabled. You must also select the type of thermocouples you are using (i.e., "J", "K", etc.)

NI 6008
The National Instruments 6008 is the data acquisition unit that controls any and all analog devices and sensors other than thermocouples. If you are using an analog color laser or humidity sensor you will set it up with the NI 6008. All you need to do is make sure the device is connected to the NI 6008 and then enable it in the software. Enable all of the devices connected to the unit

and save your changes. This includes the optional ambient humidity meter. Just make sure that the analog input listings in the software match how you have installed the devices in the data acquisition unit.

R-100 Laser
If you have an R-100 analog laser it will be set up in the NI-6008 section. It should be connected to the Ai0 port of your NI-6008 and will appear in the setup screen. Enable the laser by clicking on the "Enabled" radio button.

HH-100 Laser
If you have an HH Series Genesis digital laser installed, there are some different steps to connect the device to your system. Assuming you have installed the Genesis drivers you still need to enable the device in your software. Go to the tab for Digital Laser in the Configure Hardware section and activate the device by pressing the Enable button. You may also select the scale you'd like to use by selecting it from the drop down menu. The menu will display the default scales included and any that you have or will add to the system. If you add a scale afterwards you can return to the configuration and select it as the default scale.

Humidity Meter
If you have the optional ambient humidity/temp sensor you will set it up with the NI-6008 to which it is connected. The device should be found by the software and displayed in the listings of analog port connections. Simply click on the enable button for each of the items to be used. You may also assign your unit preference. If you change from standard units for humidity or temperature you may have to create a separate scale for the device in order to properly convert to the selected scale units. (See "Changing Scales").

All Other Analog Devices
If you have installed additional analog devices to the NI-6008 you may enable them in the same manner as any of your other analog devices. Once they are connected they should appear in the NI-

Once started, a panel will be displayed with all of your setup options and components. In the left panel, expand the "My System -> Devices and Interfaces" triangle. You will see something that says "NI USB-9211A". Right click on it and select "Rename "in the menu that pops up. Rename the device to "Dev2".
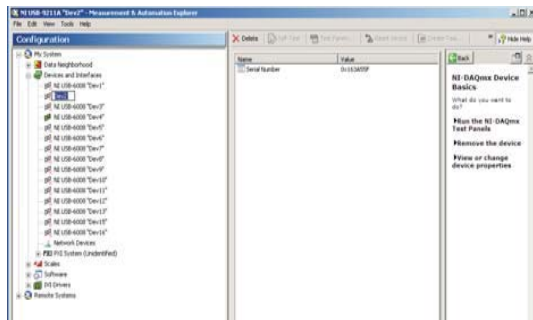
Once this is done, all of your devices should be enabled at the hardware level and you need only setup your application software covered next.

Settings and Devices

To setup your devices you will need to make sure they are identified in your ColorTrack application software. You will need to make sure that wll your devices and hardware is connected and plugged into your computer via USB. To start setting up and configuring your devices, start the ColorTrack R/T program and from the main menu go to the "Settings" category which will display all of your setup and configuration option. set up the hardware settings,
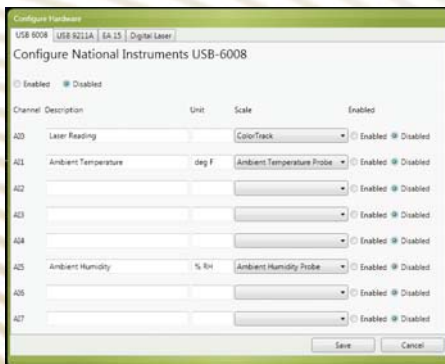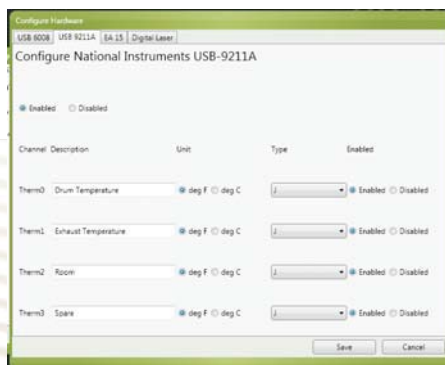
interface by configuring your data panels and how they are arranged and displayed. Once a device is installed it can be configured.

The current configuration of installed devices will be displayed in the left column with each panel created and the device(s) that will be displayed in that panel. The middle column contains all of the available devices whether configured yet or not and the right panel displays any new or edited configuration.

To configure a panel select it from the left column or press the Add button below the list to add a new panel and then select it. Next select the device(s) you want displayed in that panel from the middle column and then press the arrow button to move it to the Added Hardware Readings column on the right. You may also adjust the decimal places displayed for the given reading(s). Press the Save button and the new panel will be added and displayed in the main window.

You may add, delete and modify the panels at any time as well as move the panels around. The format for display will arrange the panels from left to right at the top of the main screen starting with "Panel 1".

Configuring Plots
The Configure Plots function allows you set up how your plot graph is displayed during operation and logging. Simply select the devices and/or aspects of the process you want to be displayed and then how you would like them to appear on the screen on either the X or Y axis.

ConfiguringTables
The Configure Tables function allows you to set up how your tables view is displayed. Select the categories you want to be displayed and they will appear whenever you select the tables view during processing with the titles at the top and the value for each one second interval in the associated columns. The titles will

proceed to installing your ColorTrack application software and any required ColorTrack software drivers depending on your hardware options.

Installing the National Instruments Software From the Internet
You may also install the National Instruments software directly from the internet. To do so go to the following address:

Http://joule.ni.com/nidu/cds/view/p/id/2034/lang/en

This will bring you to the National Instruments download site. You will have two options. You can download the downloader and files and save them to be installed later or you can install directly from the site. It is recommended that you use the downloader option. If you choose to install directly be advised that the procedure could take a number of hours depending on your internet speed. Once you have selected an option follow the same procedures covered in the previous section to install the drivers and select options.

Installing the ColorTrack R/T Software
Once you have installed your National Instruments software drivers you can install all of your other application software.You will be installing the ColorTrack software much in the same way as the National Instruments software. NOTE: The ColorTrack software and associated drivers can only be installed from the media included in your package and cannot be downloaded via internet.

To install the ColorTrack R/T software, use the media included with your
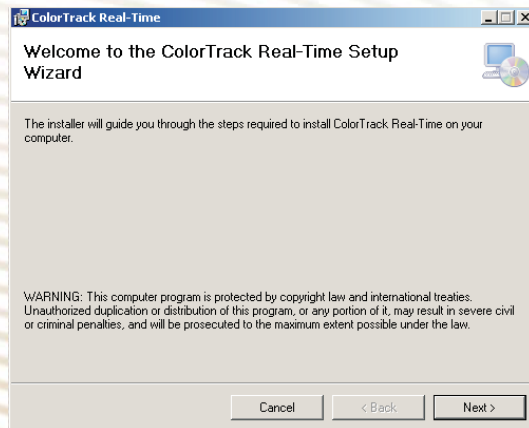
there is no coffee in the roster the laser should be displaying what it sees as the color of the drum. This should be very dark with a value of around 85-95 (with 100 being pure black). It is also recommended that you start the drum moving if possible to make absolutely sure the laser is reading. You should see the value displayed fluctuate slightly once the drum starts to turn as the laser is seeing different parts of the drum. If the drum color is not reading 85-95 you may have to adjust the position of the laser or make an adjustment to the laser power.

location for the drivers. It is highly recommended that you accept the default location displayed when the dialog box appears. Press the Next button to continue. If you need to change the target location you may do so by pressing the Browse button and selecting an alternate directory.

Once you have pressed the Next button you will be asked to select the type of installation you want. If it is the first time installing the drivers or if you had previously performed an uninstall of the drivers (not a repair or update) you will need to select Custom by clicking on the radio button for Custom installation. Once the Custom button is checked press the Next button to select your Custom installation options.

The ColorTrack R/T software requires .net 3.5 support and you must make sure that these options are selected for installation. There are two options that you must select in order to make sure you have the correct drivers installed.
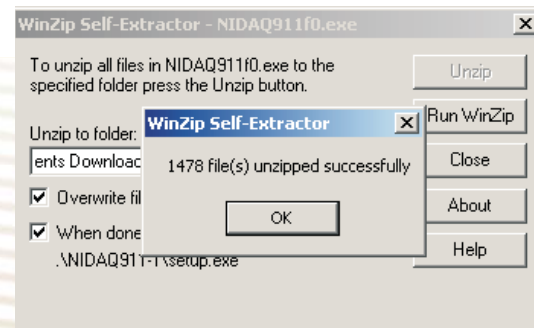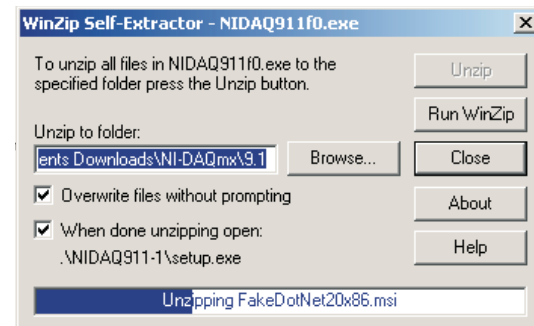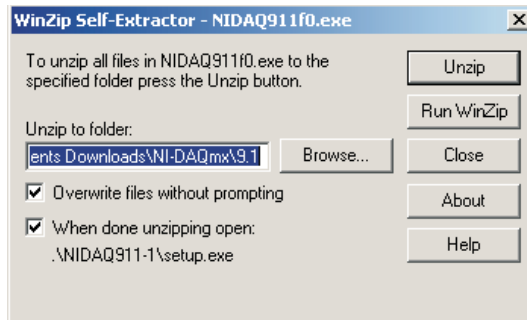
color of the beans drops below a preset value (default ColorTrack reading of 80).

4. Drop the beans into the roaster. This will start the clock as the roasting process initiates.

5. When the beans are finished roasting and have been dropped from the roaster the system will detect the corresponding change in color and stop recording the roast. The system will then automatically save the roast with the name of the roast from the details section and also the current date/time information.

6. (Optional) The user may choose to click the timer on the right side which the customer may choose to time the crack length. Clicking on the button again stops the timer. Right-clicking resets the timer.

Manual Start/Stop
The process to start a roast is as follows:

1. Click new Track to create a new

Track Configuration

Track Explorer

Set Baseline

Clear Baseline

Secondary Stopwatch

Manual Inputs
The user may choose to add gas and air values to be recorded during a roast. If the user has a manual gas or manual airflow controls, the user may also choose to record these values into the

HH Series Digital Laser

If you have purchased an HH-100 Genesis Series Laser it does not require set up as it does not use the NI-6008 data acquisition unit but an independent USB connection. It does require the installation of special software drivers which is covered in the Software section that follows later in this guide.

Software

If you purchased a computer with your system you are not required to install any software as it has been pre-installed for you. If you purchased an integrated computer system with your ColorTrack product you may skip this step.

Installing the Software

It is recommended that you start your system while connected to the internet from time to time as it will automatically check for any updates. If you are installing the software on your own computer or any computer not provided with your purchase you must install a number of different software programs and device drivers.

To install the program on your own computer you must install the software drivers for your all of your connected devices as well as the ColorTrack R/T application software. In your package you will find either a memory stick or CD-ROM which contains all of the programs and drivers you will need or you may install from the internet by downloading the same files. There are a number of installations you must perform depending on your hardware configuration. The installation of the National Instrument Windows drivers for support of your thermocouple reader (NI-9162) and/or your data acquisition device (NI-6008) is mandatory. The drivers you install will support both devices. If you are using the Extech thermocouple reader and no other devices you need only install the ColorTrack R/T software and can skip to installation of the application software.

Also, the user may choose to add new rows to the details section if the currently set details are not sufficient for recording all the information required by the user. By clicking the "Add" button the user can add new rows and populate them with new information. The user may also choose to remove rows by clicking the "Remove" button.

The Table View

When the user clicks on the Table tab, the user will be able to see the graph in tabular format. If the user chooses to add a baseline roast, the system will display the standard recording columns on the left of the table but it will also display the baseline columns on the right side of the table.

File Operations

Saving a File

To save a file simply use the File menu as you would with any other Widows application. Choose your location name the file and press the save button.

Opening a File

To open a file double-click on the panel with the small graph icon in the Tracks panel. That file will then be highlighted. It will quickly load the file and all its details into the system. The "Start" button will turn red and show the roast time of the roast.

To navigate through the systems directory structure the user can click the "Up One Level" button to change the directory up one level. Also the user can choose to click a directory in order to open a specific directory. We recommend organizing your roasts into a directory structure to improve the performance of the system.

Search

The user may also type a few characters into the search field and the system will attempt to match that text from the roast

have a 110 Volt A/C outlet for the transformer that powers the unit.

Color Monitoring

Installing the hardware for color monitoring involves a number of steps. The first step involves mounting your laser. Because each roaster is different there is no universal mounting solution and you are responsible for mounting your own laser and/or creating a bracket system to do so. There are two different series of lasers and the procedure for installation is roughly the same. The only difference is in software support which is covered later in this guide.

R Series Analog Laser

Installing the hardware involves a number of steps. The first step involves mounting your laser. Because each roaster is different there is no universal mounting solution and you are responsible for mounting your own laser and/or creating a bracket system to do so.

In creating your mounting system you need to take into account the ability of the laser to "look" into the drum and see the beans. Most commonly this is done by mounting the laser in such a way that it points into the sight glass at its "clean point." Virtually all roasters have a sight glass through which you can view the beans as they roast

Sample Installation

System Setup

Basic Hardware

After you have installed you're the software you can start to connect your devices and hardware. If you have already connected all of your devices you can skip the next step and go directly to software installation.

For basic installation (time and temperature logging only) the only hardware you will need is a thermocouple reader. There are two options, the Exetech DA-15 (not recommended) and the National Instruments 9162 series.

Extech DA-15

The Extech DA-15 reader is basically an inexpensive simple multimeter with thermocouple capabilities. It requires no additional software of system drivers. It is limited to two thermocouple inputs. To install this device simply plug your thermocouples into the device and then use the cable to connect to your computer.

USB 9211A/EA 15

The National Instruments 9211A thermocouple reader is capable of monitoring up to four different thermocouple devices. To connect the device to your system, you need to first connect your thermocouples. There are two connections required for each thermocouple, a negative and a positive lead. Connect your thermocouples to the plugs on the reader as labeled. Your first thermocouple is "TC0" and you should connect your positive and negative thermocouple leads respectively to the corresponding "TC0+" and "TC0-" insertion points. Repeat the procedure for any other thermocouples you will be monitoring using the existing contact points, i.e., TC1 + and -, TC2 + and -, etc. Make sure the

Depending on the package you purchased your package will include either an Extech DA-15 or a National Instruments NI-9162. The Extech DA-15 requires a 9 Volt battery which is included in the package. The NI-9162 is USB powered and requires only a computer USB connection to your computer. You will also find a USB cable that will connect your reader to your computer.

Data Acquisition Unit

For all R Series systems, included will be a data acquisition unit that allows the laser and other devices to capture, send and record data to your computer. This communication is handled by a National Instruments 6008 which is included with your laser package. Like the NI thermocouple reader, the unit is USB powered. the optional humidity meter and power via the NI 6008. You will also find a USB cable that will connect your NI 6008 to your computer. If you do not have the color monitoring option you can still use the data acquisition unit to track any other devices and/or sensors (see advanced setup).

Relative Humidity Meter

If you purchased the RH humidity meter option your package will include a Novus RH-100 relative humidity meter. The meter also includes a power transformer that will require a 110 VAC electrical outlet.
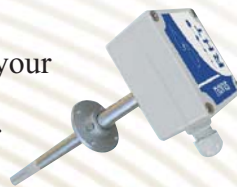
Laser Reflectometer

There are three ColorTrack laser models. The R10, R100 and HH100. The R Series are analog lasers identical in operation and features. The HH
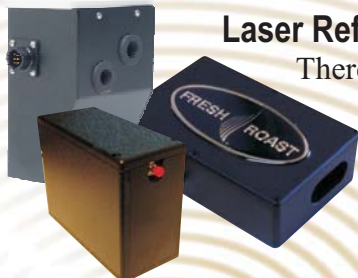
temperature and humidity and charge sizes.

The R/T Logging Software and Interface
All of the information collected is displayed in easy to read form using both graph and table views and allows you extensive options in exactly how you display the information including integrated graphing and overlay views. You can correlate all of the different variables in any given roast and store a historical record. Each roast's data is saved in an individual file for future analysis and comparison including creating baseline models which can be easily accessed through the Tracks panel. The system provides a very user friendly interface for quick and easy navigation.

The ColorTrack system is an invaluable tool in understanding your roasting operation. By providing automated real-time tracking and storage of all of your roasting variables you have the advantage of analyzing the effects of environmental variables and get the ability to make each and every roast both more consistent and develop profiles and procedures that guarantee the best consistency and quality in your product.

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COLORTRACK™
REALTIME
REAL TIME DATA LOGGING CONTROLLER

FRESH ROAST