COFFEE LABORATORY

COLORTRACK™
GENESiS™
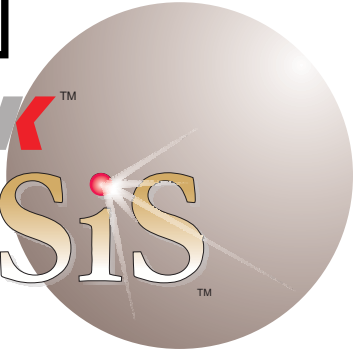
FRESH ROAST

User Reference Guide

COLORTRACK™

Introduction

The ColorTrack Genesis System

The ColorTrack Genesis Laser is a revolutionary portable reflectance meter for evaluating color/shade. This revolutionary technology is entirely unique employing a concentric laser optic system that overcomes many of the past obstacles to accurate, consistent and easy to use color analysis. What is so unique about the ColorTrack Genesis is this optics system which provides significant flexibility through tolerances to use such as distance and angle to target.

The Genesis theory is relatively simple. The illumination provided by the laser reflects off the sample material or target. The resulting reflectance is then calculated by a receptor in the device and converted to a voltage which determines how dark or light the sample is. In most systems, the resulting reflectance is significantly affected by distance and angles and the photon loss due to these variables can have dramatic effect on results. The Genesis laser eliminates this problem and basically experiences little or no photon loss within previously unattainable range and angle due to its geometry and method of illumination. This is what makes the Genesis device unique.

The simple hand held device can be held at virtually any distance, angle or position over a sample and results will not vary. In other words, operator error is reduced to virtually zero and sample preparation is virtually eliminated as a variable. "Hills and valleys" in samples are accurately and consistently eliminated making the reading of solid materials such as whole bean coffee, fruits and vegetables, nuts, etc., as accurate as if they were in liquid or powder form. The operator simply aims the device at the sample and gets a reading accurate to as little as one ten thousandth of a point regardless of the surface of the sample or the manner in which the operator uses the device.

Another important feature of the ColorTrack technology is its exclusive "dynamic sampling". As in all the ColorTrack products, the sample is not illuminated on a static basis. Because you move the illumination randomly over the sample and the laser takes readings the entire time at very high speed, the sample is scanned on a much more comprehensive basis than any other device of its type. While other devices take only a few static illumination readings, ColorTrack takes as many as 10,000 readings per second. All of this combined with a fully digital laser with on-board real-time processing is what makes ColorTrack so amazingly accurate and fast.

The Genesis device also is the only device that both records scans and/or displays real-time results. This allows for fast easy scanning without anything more than pointing the device at the sample and then watching the real time display.

The ColorTrack Genesis base unit is an extremely streamlined device. Its tough ABS case makes it durable and lightweight. Its design is so simple that virtually anyone can use it in a matter of minutes. In addition, the unit was designed to be flexible in its use allowing it to be used in a multitude of different applications including, but not limited to use with the optional ColorTrack bench unit and the exclusive ColorTrack inline R/T monitoring and logging system.

The device consists of a simple one button unit. The single button on the front of the device starts and stops recording of scans. Once pressed, the system will begin averaging and recording scans for any given sample. Just point and shoot. You can also use the manual software facilities to control everything from a single computer without any interaction with the device.

Applications

There are three separate applications for the Genesis device. Because it is entirely portable and hand held it can be used as easily as a flashlight. Entirely USB powered, the operator needs only a tablet or hand held computer to take readings anywhere, anytime.

Hand Held
As a hand held unit, the device can be carried from point to point, station to station just like any other portable device. Once powered, it's ready to use. Simply point and shoot.

Bench Unit and Turntable
The device can also be plugged into its custom companion bench unit with motorized automatic turntable creating a true laboratory device. The optional bench unit operates on all the same principles of hand held use. Once the sample dish is filled, placed in the turntable and inserted into the unit, it will begin to read the moving sample on a real time basis. When ready to record the results the operator simply pushed the record button. When it is released, the results will be displayed on the computer.

R/T and Inline
The Genesis device can also be used in conjunction with the ColorTrack R/T monitoring and logging system. This real time logging device can monitor any control device and store every one second of data for the given device(s). When the Genesis is added to the system, the patented real time color analysis is logged as well. An invaluable tool for process control and QC/QA, this patented process is available nowhere else in the world and is entirely exclusive to ColorTrack.

QuickStart

Install the ColorTrack Software

If you purchased a ColorTrack system without a computer controller you will need to install the ColorTrack program on your computer. To do so, place the installation disk or USB drive into your computer and then access the drive. Select the install icon (setup.exe) and then follow the instructions as they appear on-screen. After you've installed the program, reboot your computer.
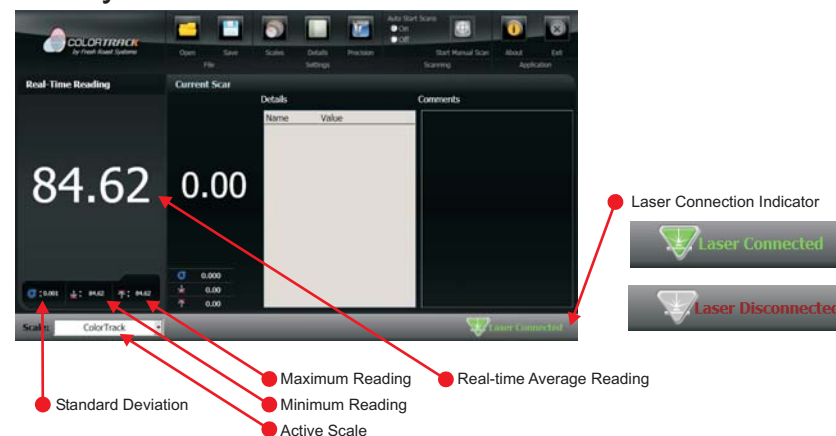
Connect the Device

Connect the supplied USB cord to the ColorTrack device and then connect the cord to any USB connection on your computer. Start the ColorTrack program from the icon on the desktop. The main screen will be displayed and assuming everything is installed correctly there will be an indicator in the lower right hand corner of the screen indicating that the laser is active and ready for use. In addition, if your laser is properly connected it will automatically start reading and displaying values.

Run/Record a Scan

With the USB cord securely connected, and ColorTrack software running point the laser at a sample. The ColorTrack program will automatically begin reading from the device in real-time displaying the results on screen. To record a final result press the red button on the front of the laser and hold it for a few seconds while waving it over the sample. Release it when you feel you have a good stabilized result. The value will be recorded and displayed in a separate window on your screen.

Ready Mode

Laser Connection Indicator
Laser Connected
Laser Disconnected
Maximum Reading
Real-time Average Reading
Standard Deviation
Minimum Reading
Active Scale

Recording Mode

Real-time Recorded Reading
Real-time Standard Deviation
Real-time Minimum Reading
Real-time Maximum Reading

Results Mode

Recorded Average Reading
Recorded Standard Deviation
Recorded Minimum Reading
Active Scale
Recorded Maximum Reading

Basic Operation

The ColorTrack Genesis can be used in a number of different ways. The three basic applications are as a hand held device, a bench or laboratory unit and with the ColorTrack R/T software as a real-time in line monitoring system. The hand held and bench unit use basically the same operation and software and are explained in detail in the next section. The R/T system incorporates a drastically different system and is documented in a separate manual included with purchase of the ColorTrack R/T system.

Hand Held and Bench Unit
As a hand held device the ColorTrack device offers extreme flexibility and portability to analyze anywhere and anytime. The device requires nothing more than a USB connection to a notebook or tablet computer and becomes a fully portable color analyzer. The method for connecting the hardware is identical for both the hand held and the bench unit. Once the software is started and the device is connected to your computer using the supplied USB cable, the unit is ready for operation. For the hand held simply point the device at your sample and the values will be displayed on your computer in real-time.

The bench unit operates virtually the same way as the hand held except that the laser is placed into a cradle in the top of the bench unit and samples are placed in a dish and inserted into a drawer with a turntable. Once the laser is in place and connected to your computer and a sample is placed in the drawer and the drawer is closed, the turntable will start rotating and the laser will begin to fire and start displaying real time values on your computer. All of the other

functions for scanning, recording, features, options and general use of the software are identical for both methods of operation and are covered jointly in detail next.

It should be noted that the reason for using the bench unit is to increase accuracy and eliminate variables. The bench unit provides a much more It should be noted that the reason for using the bench unit is to increase accuracy and eliminate variables. The bench unit provides a much more controlled environment as any laboratory device should. Elimination of any variable will almost always increase accuracy and repeatability. For instance, the bench unit positions the laser in a fixed position both at the given angle and distance. In addition, the bench unit allows you to prepare samples more carefully using methods such as leveling. Although this is not necessary for accurate results, it will increase accuracy for applications in which a significantly high level of precision is required.

Operation

Sample Preparation
The ColorTrack system does not require complex sample preparation but for best results, consistent preparation methods should be observed and employed. It is highly recommended that samples be prepared carefully to avoid contamination or inconsistencies that may skew results. When preparing your samples, try and prepare a level sample. Most importantly is to prepare samples in such a way as to insure that the bottom of the dish or container is not viewed or scanned by the laser as this will affect results.

Scanning
As already explained, once the device is connected to a computer it is ready to use. There are some basic concepts in taking samples that should be observed to insure accurate readings. The device is unique in that it does not require complex sample preparation. You can point it at any angle and virtually any distance within a foot or two and it will return consistent results. It should be noted that consistency in angle and distance will increase the accuracy of results. It is
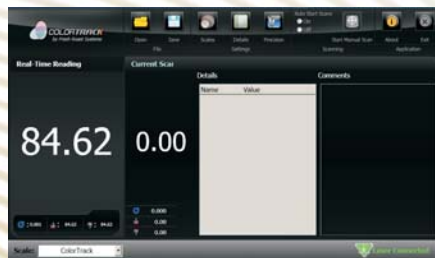
recommended that the device be pointed at the sample at a distance of roughly 2-3 inches and waved slightly over the sample. This allows the device to read more of the sample and give truer results.

When scanning in real-time, point the device at your sample as described above and watch the real-time display. As the program averages the readings it will narrow results to a point where it will not change or change very little. In other words, when you first start scanning a sample the resulting values will jump up and down from minimum readings to maximum readings. Over a few seconds the resulting value will stabilize through averaging. Once it stops moving up or down in value even as you move the device around over the sample, you have an accurate reading

Recording Results
Aside from the real-time readout you may also record a result. Follow the same procedure to start scanning and when you are ready to record, simply press and hold the red trigger on the front of the device. The device will continue to scan, average and record results as long as the trigger is depressed. When you have completed your scan, release the trigger and a static final result will be displayed including the average, minimum and maximum reading along with the standard deviation. *(See also: Manual Start/Stop)*

Note: Always make sure you release the trigger before moving the device away or off of the sample or target. Late release of the trigger can cause the system to read area outside of the sample area.

Saving Results
You can save any and/or all of your recorded results to a database on your computer that you may also customize (See "Details Settings") The system will save the results from your current scan for future
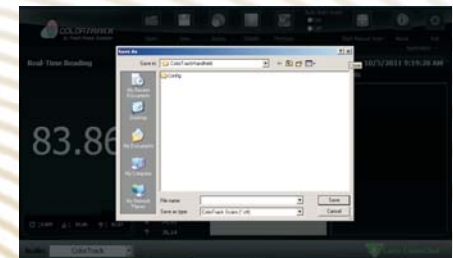
reference along with any other related information in the database template that you'd like to attach such as dates, times, comments, sample names, sample type, etc.

To save results simply press the Save button at the top of the screen after any newly recorded scan. This will bring up a standard Windows File Save dialog box. Save the file as you would any Windows file. All you need to do is enter a name. The format and file extension (.CTF) are automatically created for you. Once you have entered a name for the file press the Save File button and your file will be saved. Just remember that results files are saved, opened and stored the same way as any Windows file.

Opening Files

Again, opening saved results files is no different than opening files in any other Windows application. To open a previously saved results file, press the Open button at the top of the screen. A standard Windows Open File dialog will appear with all of your saved results files. Simply select the file you want to open and press the Open button on the dialog box. The results file will be loaded into the ColorTrack program with all of the values and data associated with the previously selected saved result.

Scales

By default the scale will be ColorTrack, however if you'd like to use a different scale you can change the current scale. To do this, drop down the Scale list and select the desired scale. The results will be recalculated to reflect results in the selected scale. You may toggle between any number of scales if for instance you want to record multiple values from different scales for the same sample. Once you click on a scale the system will default to the selected scale and will remain the default scale until manually changed in the same manner.

The Scales function in the ColorTrack software is unique and affords you a powerful tool. There are many scales for analyzing color such as

ColorTrack, Agtron, Collerette, LaB* as well as standard color models such as RGB and CYMK.

The Scales function basically allows you to add, create and/or edit a scales. In other words, you can have many different color models on your system not to mention creating custom scales of your own if so needed. Operation is straight forward and you simply correlate native values to any given scale. So, if you have known Agtron values for samples, you can create or edit the Agtron scale so that the ColorTrack reads identically. In essence, it allows you to calibrate the ColorTrack to any known reflectivity device.

You may also create entirely customized scales to fit your needs. For instance you may desire broader range. If you have a material or sample that falls into a very tight or limited range, you can create a scale that stretches the range to create greater differentiation for the scale. For example, if you have a series of samples that fall within ColorTrack values of only 50-60, you may want greater differentiation than 10 points. Simply create a new scale in which the 50 value equals 10 and the 60 value equals 100. This will in effect stretch the range. The ColorTrack will automatically insert the calculations to adjust the readings when scanning each time the alternate scale is selected.

If you'd like to adjust the way any of the scales work, or if you'd like to add a new scale you may do so by using the Scales section of the control panel. Select the Scales button and you will be presented with a list of your existing scales and those that come with your software. There are a number of fields: Scale Name, Actual Light Reading, Desired Light Reading, Actual Dark Reading, Desired Dark Reading, Maximum Value, and Minimum Value. These fields go into a formula that results in the converted value.

The formula is similar to the Fahrenheit to Celsius conversion. You may notice that maximum value and minimum value are not used in the formula. This is because the maximum and minimum values are only used to find the range of the chart's x axis.

Let's look at exactly how to create the scale in the previous example. Press the Scales button at the top of the screen. The Adjust Scales dialog box will be displayed. On the left are the existing scales and on the right are the values for correlation. Select the scale you want to edit by highlighting it or press the Add button to create an entirely new scale. To build your scale simply enter native values on the left and desired values on the right. In the previously mentioned example we wanted a scale that read between 50-60 to read from 10-100. To do this, enter 50 on the left under Native Reading and 10 on the right under Scale Reading. Go to the next line and enter 60 on the left under Native Reading and 100 on the right under Scale reading. The new or edited scale will be saved when you exit and will then appear in the Scales drop down selection box at the lower left hand portion of your screen. Anytime you want to use the new or edited scale, simply select it from the drop down box and results will adjust to the selected scale. You can also toggle back and forth and select different scales.

In the above example what will actually happen is that the software will still read a native 50 value internally, but when the alternate scale is selected, the program will display 10 as a value. When the system reads 60, the program will display 100. For any values in between, the system will make a calculation based on the range and increments in between on a straight line percentage basis and or formulae should you enter more than two values for scaling.

One note on scales is that the simple example above is merely representative of how the scaling function works. Ideally, you would have many more, or at least three values (light, medium and dark) to correlate to. The more values and points of correlation you have, the more accurate the scale will be.

Details Settings/ Creating Database Fields

As stated earlier, you can enter additional information for your results by attaching data fields which are filled out at the end of a recorded scan. To create fields select Details Setting from the menu. A list of the current fields available will be listed on the left. To edit or change the fields, simply type in the value or heading for the field. You may enter as many fields as you like. After you have finished the new fields will show up and you can then type in the actual value to the right of the heading on each recorded scan or when desired. Any data entered and then saved to a file will include all of the database criteria and values as well.

Precision

The precision is the decimal precision you require to be displayed. You can set the precision by going to menu and then adjusting the decimal places to be used for each scan for both the average and the standard deviation. You may add up to four decimal places of display.
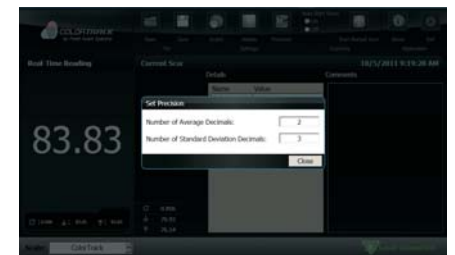
Manual Start/Stop

The Manual Start function allows you to start and stop recording scans from your computer as opposed to the device and trigger. In order to use this function you need to disable the Auto Start Scans function by selecting the radio button at the top of the screen. This will give control for recording scans to your computer controls versus the trigger on the device.

This is commonly used when the device is installed in a ColorTrack

bench unit or if the device is not being used by hand or is in someway mounted to perform scans, e.g., on a tripod.

Once you have disabled the auto scan feature all control is returned to the controls in your software. To start a scan simply press the start button at the top of the screen. It will continue to read until you press the stop button at which time it will display the final results just as if you had pressed the button on the device itself.

About

The About function will list your status and software version. You can use this function to check that you have the most up to date version of the ColorTrack software.

Exit

The Exit function will shut down the software.

Understanding and Interpreting the Results

There are a number of values and data displayed in the results window and graph which you may or may not find useful for your specific purposes. Understand the data will allow you to decide which results data serves your purposes best.

The basic data at the top of the graph window will display five important components of the scan in units based on the selected scale:

1. Average - The average is the average for the sample based on total number of scans at any given value. Total number of scans or "hits" can be calculated as time of scan multiplied by 10,000 as the laser is producing 10,000 reading per second. So, for a twenty second scan the average would be average of 200,000 readings.

2. Minimum and Maximum - Logically, these values represent the entire range of values found in the sample from lightest to darkest or darkest to lightest depending on which scale you are using.

3. Standard Deviation - In probability theory and statistics, the standard deviation of a statistical population, a data set, or a probability distribution is the square root of its variance. Standard deviation is a widely used measure of the variability or dispersion, being algebraically more tractable though practically less robust than the expected deviation or average absolute deviation. It shows how much variation there is from the "average" (mean).

A low standard deviation would indicate that the readings for the given sample tend to be very close to the mean, whereas a high standard deviation would indicate that the readings were spread out over a large range of values. In other words, this value will most likely indicate the level of consistency of a sample as it relates to color and reflectivity.