SpecMetrix EXR In-line Coating Thickness Measurement System

Installation & Operation Manual

The Sensory Building
405 Pomona Drive
Greensboro, NC, 27407 USA
+1 (336) 315-6090

www.specmetrix.com

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System Description and Usage

The *SpecMetrix® EXR* In-line coating thickness measurement system is designed to measure the thickness or top/finish coats on metal coils and for measurement of opaque pigmented coatings although the same technology can be used for measurement of clear and transparent coatings as well. Each system is comprised of one or multiple probes connected by fiber optic cable to a controls enclosure mounted up to 9 feet (~ 2.75 meters) of cable length from the farthest probe on the coating line. The enclosure has a data connection to the *SpecMetrix®* Display Unit, which can be up to 300 feet (~100 meters) away.

SpecMetrix® systems use proprietary ruggedized optical interference technology to measure the absolute wet or dry coating thickness. This is a non-contact and non-destructive technology that only requires minimal prior knowledge of the refractive Index of the coating to evaluate the coating thickness measurement in microns. When measuring wet coatings, the dry coat weight in units such as MgSI, Mg4SI, lbs/ream or GSM is then calculated from the wet or dry thickness using data from the coating manufacturer such as wet density (lbs/gallon or gram/liter) and % solids by weight and %solids by volume.

Product Safety

Before using your *SpecMetrix®* System

Your *SpecMetrix®* System is very safe to use. However, like all electronic equipment you must follow these common-sense guidelines to ensure your personal safety and future integrity of the unit.

- **Please read and follow instructions**
  It will be helpful if you review this document completely before you attempt to install and use your *SpecMetrix®* System.
- **Retain this manual for future reference**
  Keep this manual handy for others to read and refer to when they operate the unit
- **Obey Warnings**
  Please follow all the precautions described in this manual. If you modify or use the *SpecMetrix®* System in a manner not intended, the built-in safety features may be impaired.
- **Protect from water and moisture**
  Do not use your *SpecMetrix®* System in an area where there is a potential hazard of electric shock from spilled water or other uncontrolled moisture.

Not intended for use in an explosive environment.

System Specifications

Performance Specifications

1.	Coating Thickness Range	*Transparent*: 0.7 to 350 microns. *Pigmented:* 0.7 to 75 microns
2.	Typical Accuracy	+/- 3%
3.	Non-contact measurement range	15-30mm

Environmental Specifications

1.	Electrical mains input	100-240 VAC, 50/60 Hz
2.	In-line Control Unit (ICU)	5/2.5 Amps 600 watts
3.	*SpecMetrix®* Display Unit	100-240 VAC, 1.5/0.75 Amps
4.	Operating Temperature	0^oC to 55^oC (ICU), 0^oC to 50^oC (Display Unit)
5.	Operating Humidity	10%-90% relative, non-condensing
6.	ICU enclosure protection	IP66, Type 12/4/4X
7.	*SpecMetrix®* display protection	IP66, Type 12/4/4X

Installation and Site Requirements

Utilities

The only utility required to run the *SpecMetrix®* In-line system is electrical. The customer must provide a dedicated single-phase 100-240VAC, 15 Amp grounded circuit. A dedicated circuit means a direct connection back to the breaker/fuse panel. The instrumentation should not be spurred off a thyristor-controlled heater or motor due the electrical interference this would cause. The Control Unit and Display Unit can be run on the same 15 Amp circuit. The Display Unit requires a standard 100-240VAC receptacle; the Control Unit can either be directly connected via conduit or use a standard 100-240VAC receptacle.

Figure 1 - Mounted Probe with hex bar

Electronics Mounting and Conduit Work

The customer is expected to provide a maintenance technician to work with SA personnel to mount the probe holder fixtures to the equipment frame. These attachments will vary depending on the type of system purchased, and machine configuration.

The control Unit will require six 3/8" holes on a 36" x 24" area to mount.

The *SpecMetrix®* Display Unit will require either a table top area or can be mounted with a swing arm assembly to any flat surface using four 3/8" holes.

Sensory Analytics will supply the flexible conduit to be installed between probes and control Unit, with appropriate clamps and mounts to properly route the fiber conduit.

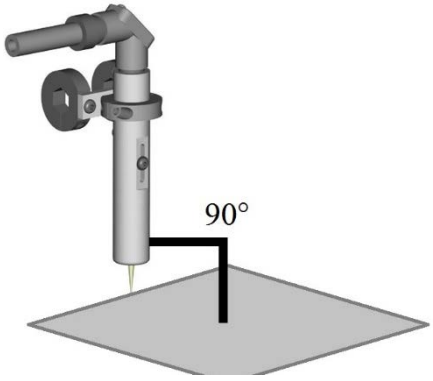
Note: It is important that the fiber maintains a bend radius of about 8 inches and extreme care should be taken to maintain the bend radius at every turn while routine the fiber optic probe

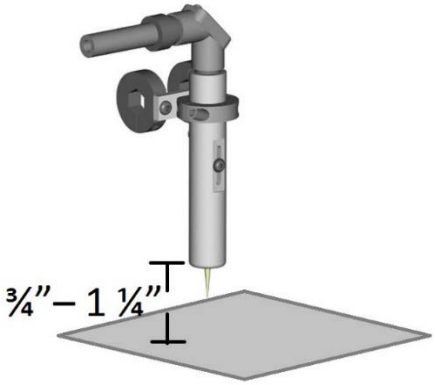
The customer is expected to supply and install conduit for an Ethernet connection between the Display Unit and the Control Unit, and from the Control Unit to the customer's network if external data storage is required.

SA will supply, install and terminate the Ethernet cable, unless agreed otherwise with plant personnel. The probes are optical devices with no electrical connections and so can be mounted in an explosive environment. The Control Unit, however, contains electrical components and is not designed for use in an explosive environment. The fiber optic cables are 30 feet long and so the Control Unit can be mounted up to 20 feet from the probes and production line. The Display Unit can be mounted up to 75 feet from the Control Unit.

Probe Installation

Typically, Sensory Analytics technicians will install the probes ¾" – 1 ¼" over the web at a 90° angle using a Hex bar and collar clamps. If a plant has constructed their own mechanism for probe mounting, the mechanism must allow for probe height adjustment from ½ inch to 2 inches from the web.





Network and Machine Communications

The SpecMetrix® Display Unit motherboards are designed with 2 or 3 Ethernet ports for various network & peripheral communication needs. The Ethernet ports are configured for communication by Sensory Analytics technicians or by plant IT engineers. When multiple devices need to communicate across different networks or subnets it is imperative to make sure the correct Ethernet cables are plugged into the appropriate Ethernet port.

Plant network engineers are permitted to change the login configuration to use plant network authentication. The requirement for any user account that will be given access to the SpecMetrix® Display Unit is to have local admin access as well as proper access to read/write to any network path that is defined as a file repository. It is permitted, and recommended, to use file mapping to network paths.

1. Make sure the ICU's internally mounted Ethernet hub has a connection to the SA Network port, the Ethernet NIR spectrometer, and the Ethernet MCC I/O board.
2. Connect the Display Unit to a dedicated 100-240VAC 50/60Hz power outlet. Run a properly terminated (Line, Neutral, and Ground) power cable into the bottom of the ICU to the internal disconnect (connections are labeled).
3. Connect the Display Unit to the ICU via a KVM Extender (included). USB keyboard and mouse, also included, will be connected to the KVM's REMOTE unit. Figure 2.
4. Refer to Diagram 1. for additional KVM setup.

Figure 2 – KVM Extender – Remote unit

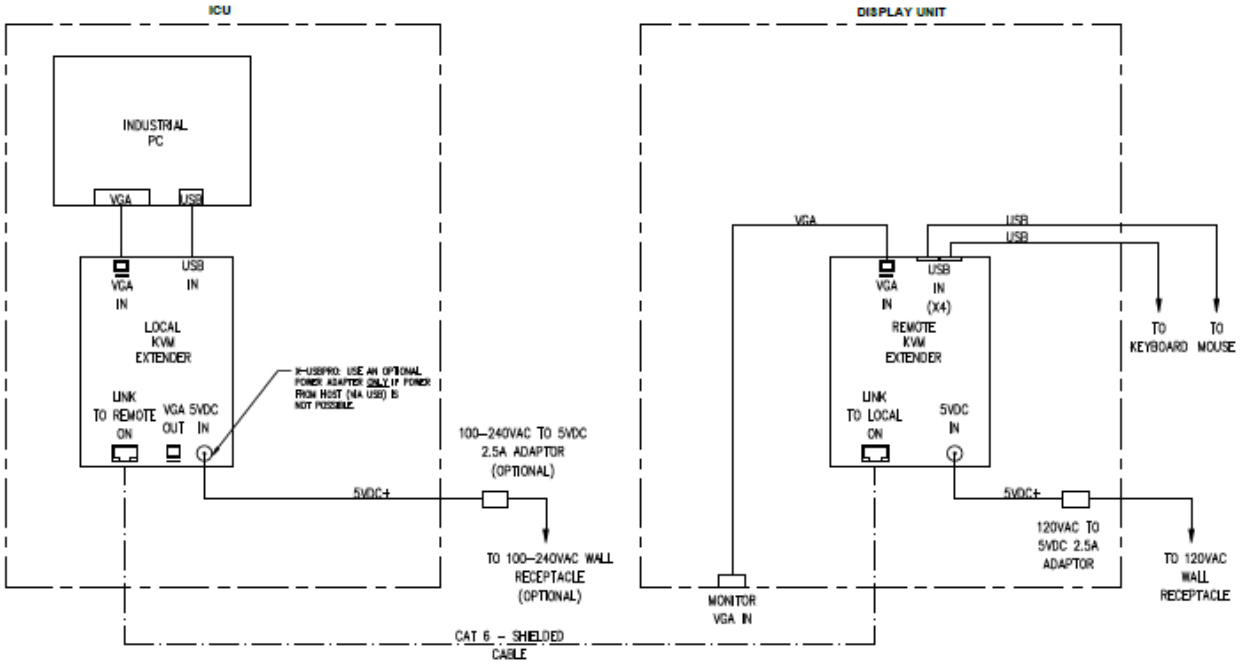


Diagram 1. KVM Extender – Setup

Initial Power-up Procedures

In-line Control Unit

Before powering on the *SpecMetrix®* Display Unit, the stainless-steel electronics cabinet, or In-line Control Unit (ICU), must first be powered on. To do so, turn the mains disconnect switch to the ON position. The disconnect switch is in front of the electronics cabinet. Figure 3.

Figure 3 - ICU main power disconnect switch

A green LED indicator light on the ICU door will illuminate, indicating the system is power up.

Power-down Procedures

1. Stop all measuring by pressing “STOP” or “STOP ALL” button
   NOTE: If all lines are not appropriately stopped the sensor could fail to initialize properly on next start up.
2. Close all running applications
3. Shut down Windows in one of two ways:
   a. Click on the “*Show Desktop*” button in the SA Menu to return to the desktop and shut down Windows from the Start Menu.
   b. Press the “*Windows Shutdown*” button to power off system immediately.

For “Power Cycle”, after closing applications:

1. Shut off power by switching the disconnect switch to the OFF position on the ICU unit. Figure 3.
2. Wait at least 10 seconds before turning on power.

The image in Figure 3 will allow users to minimize the SA Menu window and return to the Windows desktop environment without shutting down the SA software.

Figure 3 - Show Desktop icon

SpecMetrix® Display Unit

Using the Display Unit:

1. Connect the Display Unit, Figure 4, using a 100-240VAC power cord provided with the unit. Connect it to a receptacle that is on the designated single-phase power circuit for the *SpecMetrix*® system.

When Restarting or Cycling the unit, it is recommended to power down the *SpecMetrix*® Display Unit by closing all applications first including the SA software, then accessing the Start menu and choosing

Restart from the power options list, then turn the disconnect switch to OFF and back ON. Pressing the main power button on the unit will cut all power immediately but may cause errors.

Figure 4 - SpecMetrix Display Unit

Signing On

1. Double-click the Sensory Menu icon on the desktop. This will open SA Menu window and prompt the user for login credentials as shown below:

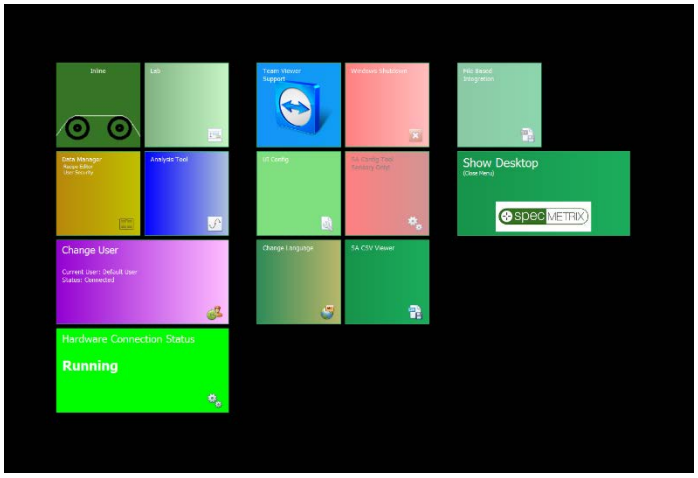


Figure 3 - SA Menu

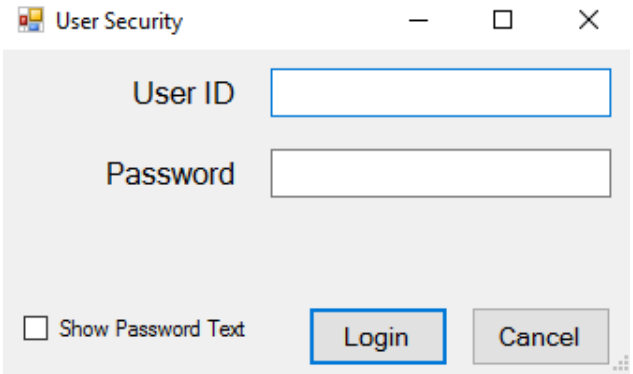


Figure 2 - SA Login Window

2. Make sure the Server Status is running (Indicated as a Green Color). If Server Status is Stopped (Red Color) click the Server Status Tile once.
3. With a single click, Click the "In-line" Tile, this will start the In-line UI.
4. Verify the correct Line by selecting the appropriate tab (for multi-line systems only).
5. Click the dropdown arrow in the "Recipe Name" selection box and select the correct recipe for the coating or film being measured.
6. Optional: Enter the Work Order number (Refer to your plants requirements for Work Order number)
7. Optional: If this is a traversing system, you may need to select the appropriate Lane Definition for physical web dimensions.
8. Click the "Start" button

The *SpecMetrix*® System should now be measuring.

SA Menu Buttons

Data Manager - integrates to a SQL database where all recipes are stored and tracked. Additionally, this interface supports a fresh new user-friendly interface for Adding/Editing not only recipes, but lane definitions for traversing systems, User security, and the all new Plant database.

Figure 4 - Data Manager button

Figure 5 - Analysis Tool button

Analysis Tool – used to analyze collected debug files during a measurement cycle by using optimized algorithms for faster analysis and validation of your In-line coatings & films. Collect debug files by clicking the "debug" check-box in the In-line UI. Export files to a location on C:\ to load them in the tool for analysis.

UI Configuration – grants users with local admin level credentials access to the In-line UI settings. Users can adjust graph settings, minimum and maximum measurement ranges, target specifications, as well as change aspects of the In-line system such as the color of the High/Low measurement on the display, or to apply alternative smoothing to a graph, and even if you wish to set your graphs to be tabbed or side-by-side in multi-line systems.

Figure 6 - UI Config button

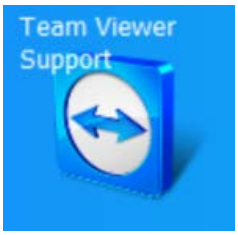


Figure 7 - Team Viewer button

Team Viewer Support – Team Viewer is a secure remote support tool that gives Sensory Analytics personnel remote access to our customers' *SpecMetrix*® Display Unit so we can offer immediate solutions to the more challenging issues. For Sensory Analytics to provide remote support you will need to provide the **9-digit Team Viewer ID** as well as the **Team Viewer password**. There is no way for Sensory (or anyone else) to access your SpecMetrix® unit without the plant providing this information. For specific information about Team Viewer visit them online at (www.teamviewer.com).

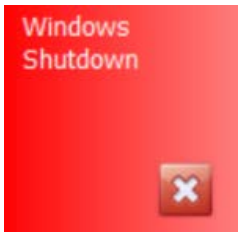


Figure 8 - Windows Shutdown button

Windows Shutdown – used to close the *SpecMetrix*® Server in a 'Friendly' way (so that all hardware is properly closed), you must first Stop the In-line service before shutting down or restarting Windows. If the service is running, you will receive an error prompt indicating this as well. Depending on how you requested the system be setup with the sensory technician, the system will either shutdown or restart.

User Configuration

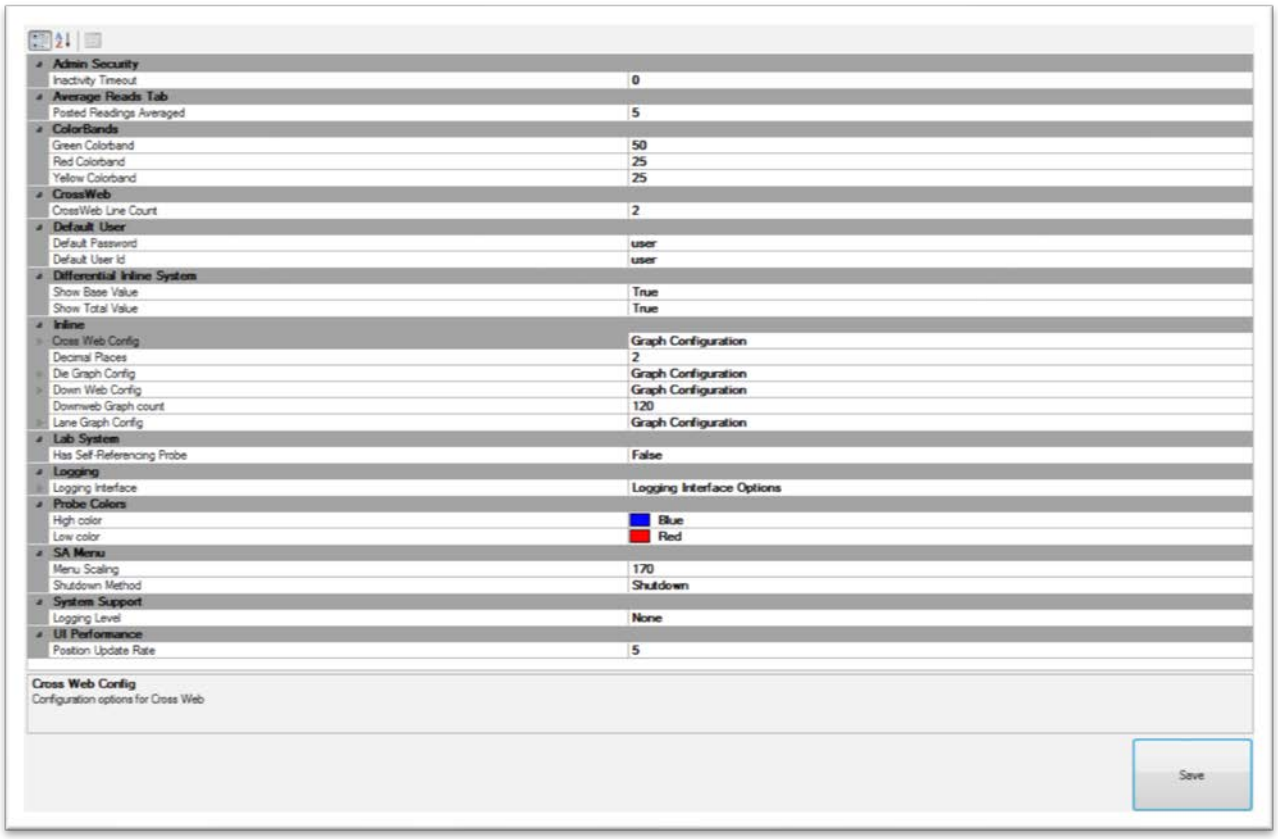


Figure 9 - User Configuration

Admin Security

Inactivity Timeout

The number of minutes of inactivity before Admin Timeout; Default is set to **0 (Never Timeout)**

Average Reads Tab

Posted Readings Averaged

Count of reading cycles to use for calculating held average. Only used for Average Reads Tab; Default is set to **5**.

ColorBands

Percentage of the graph that each band occupies. By default, **GREEN = 50, YELLOW = 25, RED = 25**

CrossWeb

CrossWeb Line Count

Number of Cross Lines to display

Default User

User account used when the application is initialized. Operators can press the Change User tab when Administrative privileges are needed; default is set to ***User***.

Differential Inline Systems

Note: Only applicable to not very common differential system configurations.

Show Base Value

Shows the Base Value in probe control

Show Total Value

Shows the Total Value in probe control.

Inline

Graphing options for CrossWeb Graph, Die Graph, DownWeb Graph, and Lane Graph

Inline	
Cross Web Config	Graph Configuration
Decimal Places	2
Die Graph Config	Graph Configuration
Down Web Config	Graph Configuration
Downweb Graph count	120
Lane Graph Config	Graph Configuration

Figure 10 - Inline Graph Configuration

Granularity

This will smooth the edges of the graph lines. By default, this is set to *Ultra,* but options include ***Course, Fine,*** and ***Ultrafine.***

Decimal Places

The number of decimal places measurement readings will display.

Invert CrossWeb Graph

This will flip the graph on its x-axis.; Options are **True** or **False**.

Multi-line Graph Display

How many graphs are drawn in relation to one another. Options include ***None, SidebySide,*** and ***Tabbed***.

Smooth?

Setting this to True will apply a smoothing algorithm to the averages. This may cause slight differences between numbers plotted on graph and the value displayed in the Probe Reading. Options are **True** or **False.**

Smoothing Count

Increasing this number will smooth the plot lines from point to point on graphing displays. Set to **3** by default.

Probe Colors

Drop-down menu to change the color of the Probe Readings where **by default high values are Blue** and **low values are Red**. Operators can use the drop-down menu to pick any color desired.

SA Menu

Menu Scaling

Changes the scale size, by percentage, of the SA Menu tiles. Default value is set to **150**.

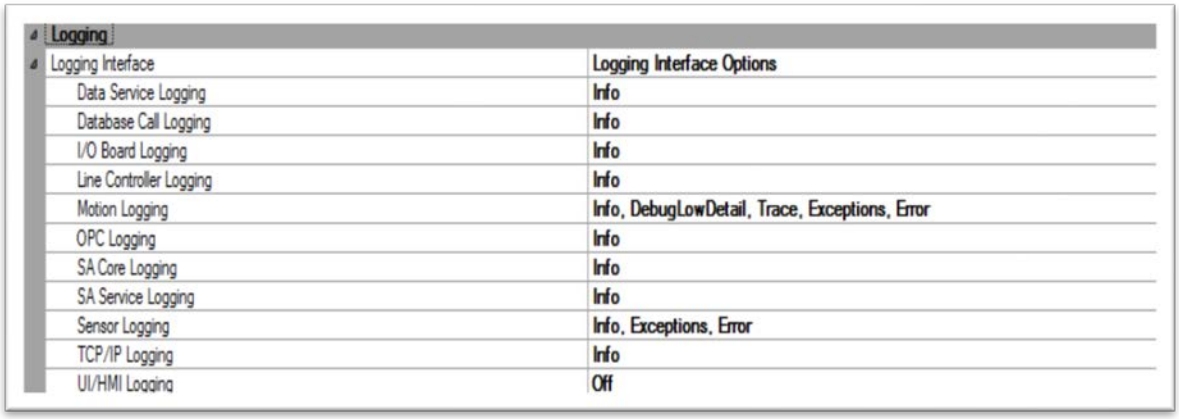
Shutdown Method

Shutdown method when the *System Shutdown* button is pressed from the SA Menu. Options include ***Shutdown*** and ***Restart*.**

System Support

Logging

Lowest Logging Level that will be saved in the “temps” logs. Drop-down options for each Logging Interface Option include ***Off, Info (*Default*), Warning, DebugLowDetail, DebugHighDetail,* Trace, Exceptions, and Error.**



Logging	
Logging Interface	Logging Interface Options
Data Service Logging	Info
Database Call Logging	Info
I/O Board Logging	Info
Line Controller Logging	Info
Motion Logging	Info, DebugLowDetail, Trace, Exceptions, Error
OPC Logging	Info
SA Core Logging	Info
SA Service Logging	Info
Sensor Logging	Info, Exceptions, Error
TCP/IP Logging	Info
UI/HMI Logging	Off

Figure 11 - Logging Interface Options

Logging Interface Options

1. **Data Service Logging**: Sets condition level for Data Service core functions.
2. **Database Call Logging**: Sets condition for Database operations.
3. **I/O Board Logging**: Sets conditions level for I/O Boards.
4. **Line Controller Logging**: Sets conditions level for line controllers.
5. **Motion Logging**: Sets the condition level for Motion Control.
6. **OPC Logging**: Sets the condition level for OPC/LPC Based Integration.
7. **SA Core Logging**: Sets the condition level for SA Core.
8. **SA Service Logging**: sets the condition level for SA Service.
9. **Sensor Logging**: Sets the condition level for the optical sensors.
10. **TCP/IP Logging**: Sets the condition level for TCP/IP Integration.
11. **UI/HMI Logging**: Sets the condition level for UI controls attached to the SA Service.

Logging Level

Lowest Logging Level that will be saved in the “temps” logs. Drop-down options include ***None, Debug, Info (*Default*), Warning, Error, Critical,*** and ***Success.***

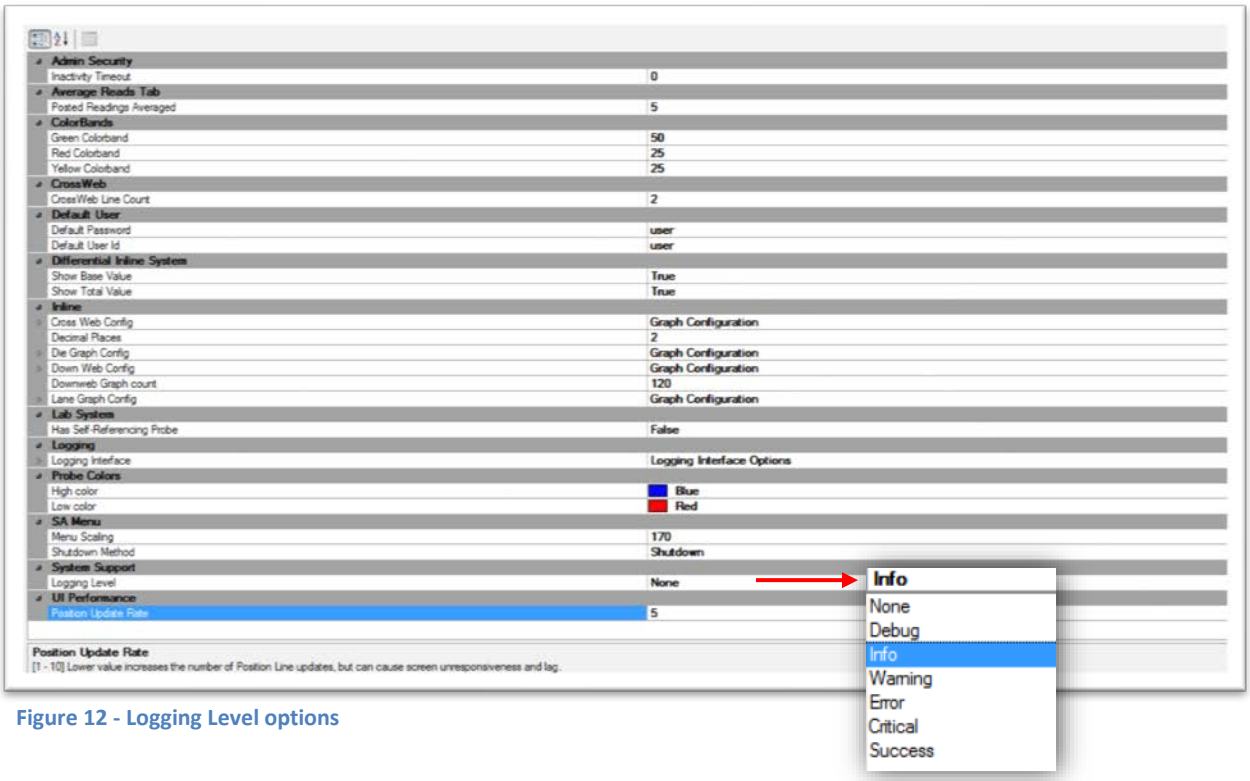


Figure 12 - Logging Level options

Taking Measurements

Main User Interface

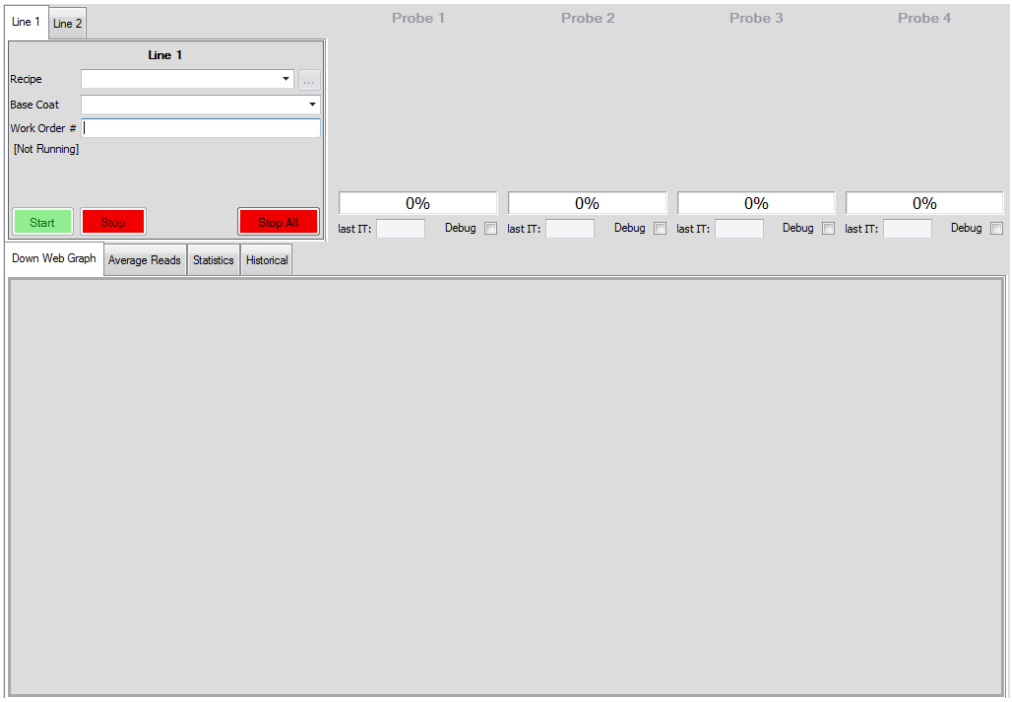


Figure 13 - User Interface Configuration

The image above is an example of what users see when the SA Inline application is initiated. The interface is largely dependent on settings chosen in the User Configuration tool. The image below offers a closer look at the drop-down menus for recipe selection in a 2-line system:

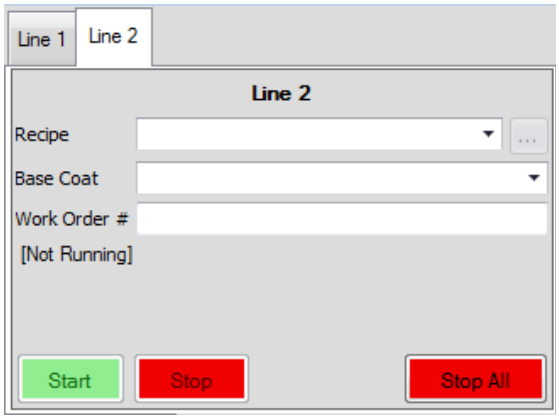


Figure 14 - Recipe drop-down menu

1. **Recipe**: This menu is a list of all recipes available to the user for the appropriate sensor. This means that each recipe is set up to work for a specific sensor. Recipes are created, edited, and deleted in the SA Data Manager (see previous section).
2. **Basecoat**: Drop-down items are generated when "*Also, used as dry Basecoat*?" option is checked on the Recipe Assistant's General Information page.

3. **Work Order#:** This field populates itself automatically when the measurement process starts unless the user specifies the Work Order # manually. The automatic WO# is in the format: WO_YYYY_MM_DD_HHMMSS (WO_YEAR_MONTH_DAY_TIME).
   Below is an example of what these fields look like when idol and when active:

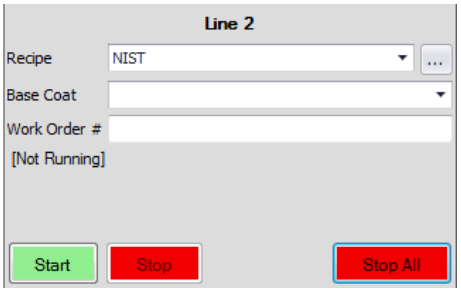


Figure 16 - Work Order field (unpopulated)

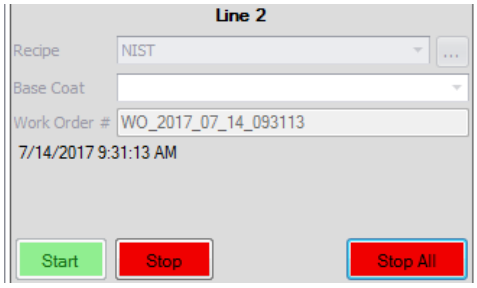


Figure 15 - Work Order field (populated)

4. **Line Tabs**: The top two tabs in the example represent each line running in the system and are determined by customers' specifications in the SA User Configuration. They can be named whatever the customer chooses and can be a single or multiple line configuration. The line setup will coincide with the orientation of the probes in the system.
5. **Start**: Begins taking measurements for the probe(s) on that line/tab. Separate lines must be started independently of each other in multi-line configurations.
6. **Stop**: Stops measuring of the active probe on that line/tab.
7. **Stop All**: Stops measuring on all active lines.

Note: During measuring, users can click on the probe name to deactivate that probe.

The image to the top right shows how measurement output is displayed (in real-time) when the probe, or probes in this case, are inactive.

The image to the bottom right takes a closer look and shows how measurement output is displayed (in real-time) when each probe is active.

Keep in mind that in both cases, probe names are arbitrary and will be chosen by the customer.

The bar underneath the thickness value may appear green or red. It represents the Reflectance percentage at that moment when a measurement is taken.

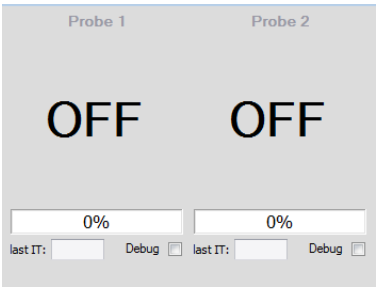
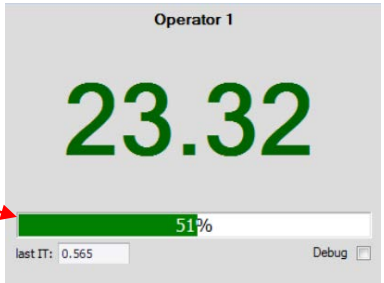


Figure 17 - Measurement output display



Reflectance bar

User Interface Tabs

Down Web Graph

Figure 18 - Reflectance bar

With each reading displayed in the probe reading region (above), this graph is a plot of thickness measured as a process. A reading is produced once every probe cycle (Default = 1.0 second).

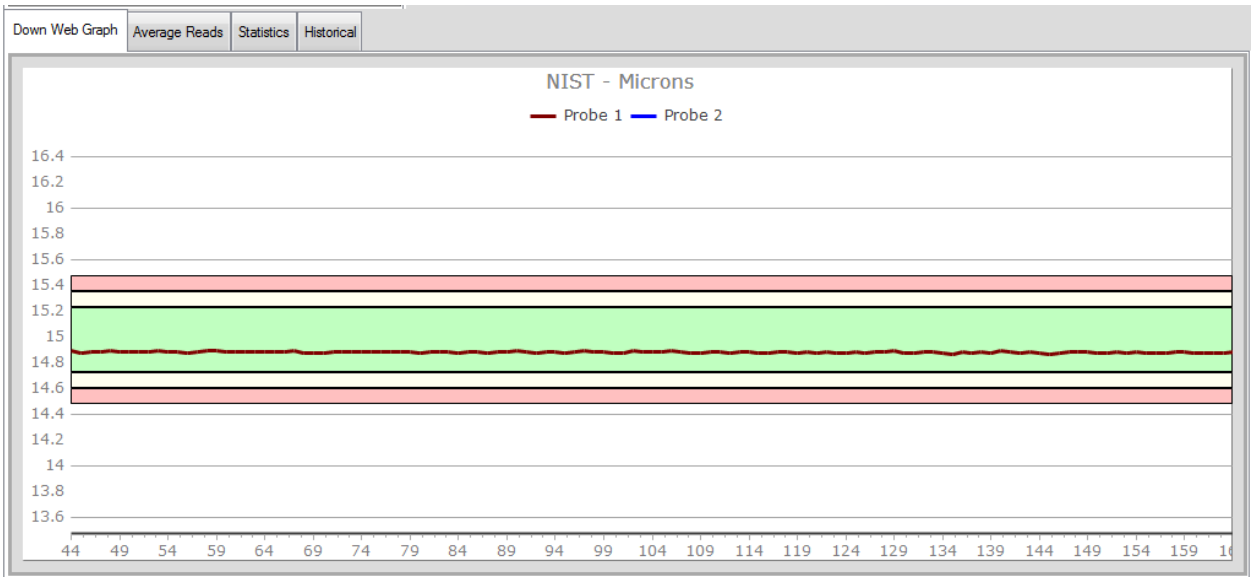


Figure 19 - Down Web Graph Tab

Average Reads

Displays the Moving Average, the average value for measurements taken over a certain period or the Full Run Average, the average value for measurements taken from the beginning of the probe cycle. This will hold an average of the last 5 probe cycle readings that had a yielded value greater than 0.0.

Figure 20 - Average Reads Tab

Statistics

Provides reading statistics. Traversing systems will yield statistics per lane. Non-traversing systems will yield statistics per probe cycle.

1. Min – The value of the lowest measurement taken during the probe cycle.
2. Max - The value of the highest measurement taken during the probe cycle.
3. Average – The average value of all measurements taken during the probe cycle.

4. Standard Deviation -A measure of the amount of variation from the Target Specification taken during the probe cycle.
5. Distance to Target – The distance (- or +) from the average to the Target Specification as defined in the recipe.

Historical

Quick reference to view general run occurrences, with ability to select run for manual CSV output, as well as selection for debug exporting.

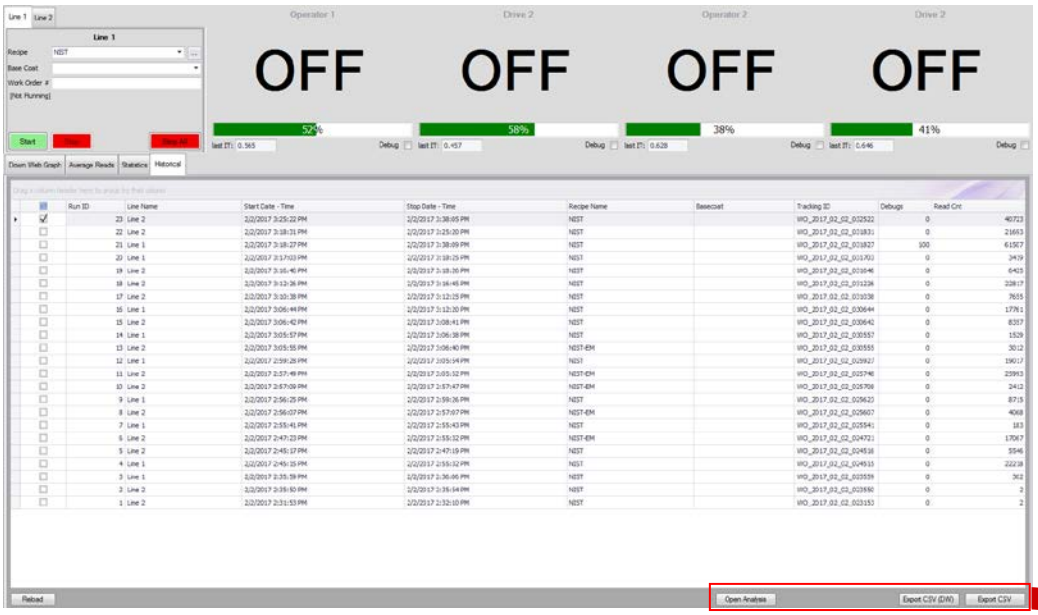
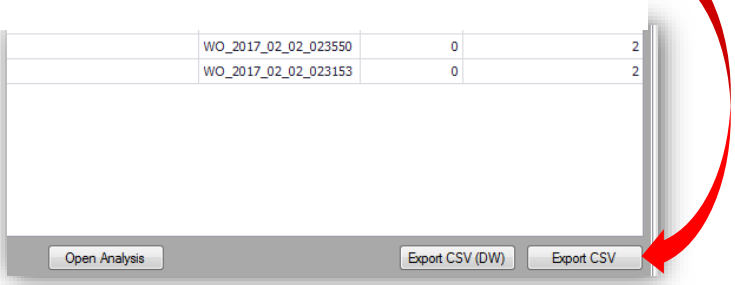


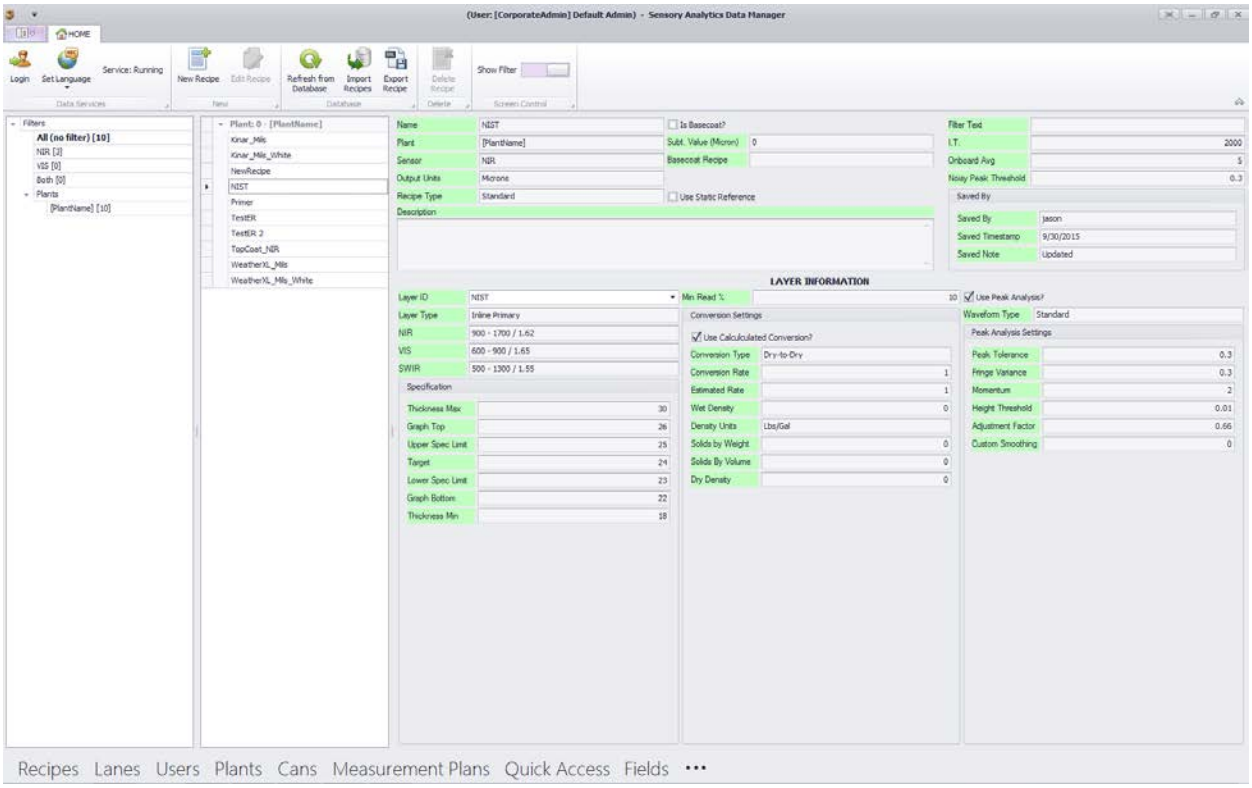
Figure 21 - Historical Tab and buttons

Notice in the example to the right, the buttons for Open Analysis, Export CSV, and Export CSV (DW) where DW is for Down Web.



SA Data Manger

General Information

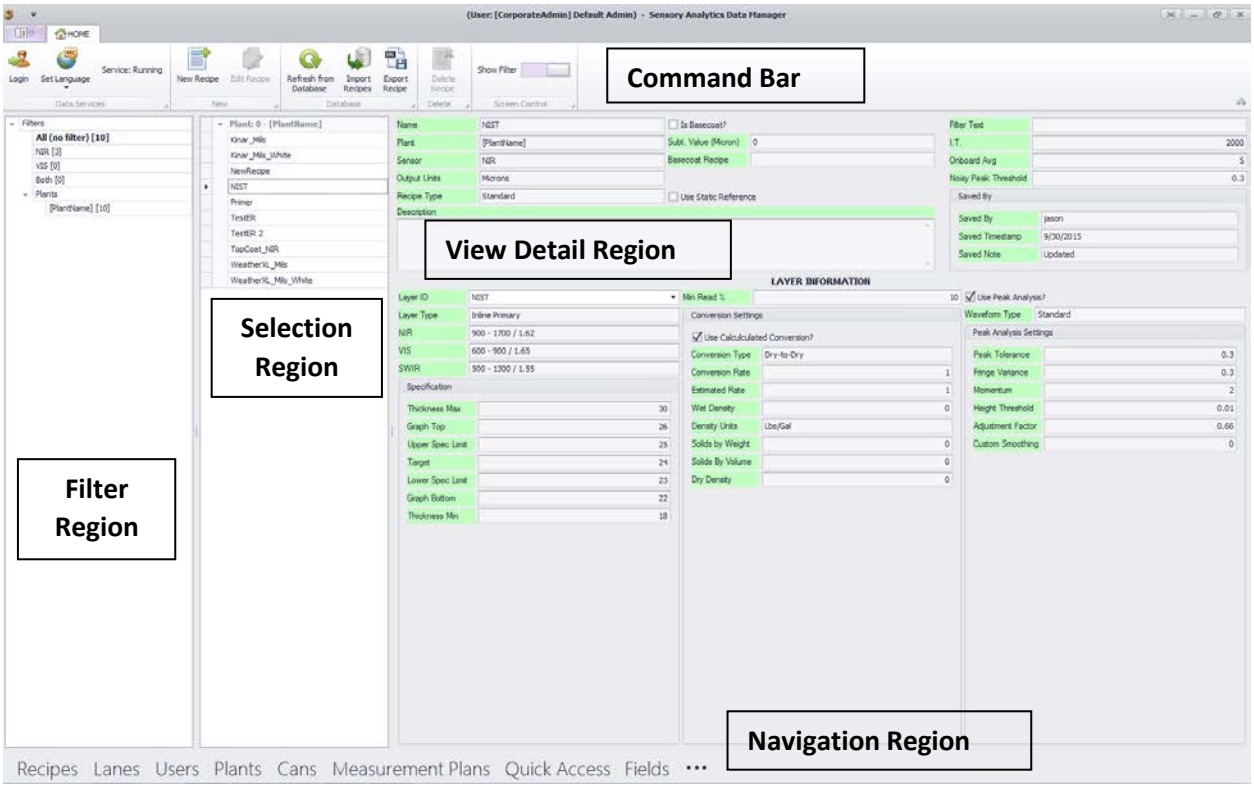


The SA Data Manager does more than edit recipes. This interface integrates to a SQL database where all recipes are stored and tracked. Additionally, this interface supports a user-friendly way of Adding/Editing not only recipes, but Lane definitions for traversing systems, User Security, and the Plant database.

User Interface

The Data Manager structure and flow functions very similarly to Microsoft Outlook in terms of navigation which is quite familiar to many users. The layout of the Data Manager is broken down into 5 main visible sections as shown below.

Region Layout



Command Bar (Ribbon Bar) Region

The Command Bar is itself divided into sub groups, and except for the “Data Services” section, will change depending on which module is being viewed by the user.

Data Services Group

Login – This will allow the user to use different login credentials, or if clicked and ‘cancelled’ then the system will automatically log out of the current user and into a [default user] which does not have any editing privileges.

Set Language – This is a real-time action that will allow you to change the currently displayed language on the screen. This will only affect the current instance of the Data Manager. Subsequent entries from

SA Menu will display in the language that is currently defined as the default language (This is changed in the SA Menu [Change Language] option.

Service: {Running/Stopped} – This indicates the current connection status to the Data Manager Service. The Data Manager UI cannot be accessed if the Service is in a 'Stopped' state. However, if the Service becomes unresponsive or is stopped while the Data Manager UI is currently active, the status will change from 'Running' to 'Stopped', and likewise will change from 'Stopped' to 'Running' once the service is restored. Database transactions (Save/Delete) cannot take place when the service is 'Stopped'.

New Group

Each Module can add a new item, or edit and existing item. These buttons are disabled if the user does not have sufficient security login credentials to perform the action. Clicking on either of the options, when enabled, will open the corresponding editor screen.

Database Group

If multiple people are working with the data, a user many need to periodically "Refresh from Database" to ensure that he/she is working with the most current data.

The '*Recipes*' and '*Lanes*' modules have an Import and Export feature. The '*Lanes*' feature is only applicable to *SpecMetrix*® In-line Traversing systems.

The import wizard (described in more detail later in this manual) will validate and make available, an XML transport/backup file, with recipes or lanes to add to the current plant database.

Highlighting one or more recipe or lane ID's in the Selection window and then clicking the Export button will allow the user to create a backup XML that can be used to import to another plant or transfer recipes to another *SpecMetrix* system.

Delete Group

The *Delete* button will remove the selected item from the "*Active*" item list, and will no longer display that item in the selection options. For *Recipes* and *Lanes*, it is recommended that these items are archived in the database and not permanently deleted.

Screen Control (Recipe Module Only)

The screen control has a toggle: "Show Filter" that by default is 'on' which displays the Filter region. When this is toggled off then the Filter region is hidden and the Selection region and recipe view region is scrolled to the left. This is not needed for English, or most languages, however some fields after translation end up have longer words/phrases in some languages to describe the field information. In those cases, the Recipe View is scrolled off the right-hand side of the screen. This toggle will provide enough room on the screen to allow for full visibility of all recipe data by hiding filter panel on the left.

Filter Region

Plants have asked for a filtering mechanism to see recipes in groups/filters and Sensory Analytics® listens to what our customers ask for, now here it is. Recipes have long had a 'Group' field, and now that group field is called "Filter Text", which allows a plant to enter a [string] in the filter text field, which in turn gets rendered as a selectable filter. Clicking on the filter will change the recipe Selection region to display only the associated recipes with that filter.

Next to each filter is a number inside of brackets (for example: [5]), in this case, that indicates that there are 5 items that match that filters criteria. Selecting that filter would display those items in the Selection Region.

Selection Region

The available recipe list is seen in the Selection Region. This list can/will change if the user selects a different filter. A filtered list is a subset of the full list which can be seen by choosing the filter labeled "All (no filter)".

A user can only edit one item at a time, therefore selecting multiple items and clicking the '*Edit*' button will not change all items at once. Multi-selection is only applicable to Exporting Recipes or Lanes.

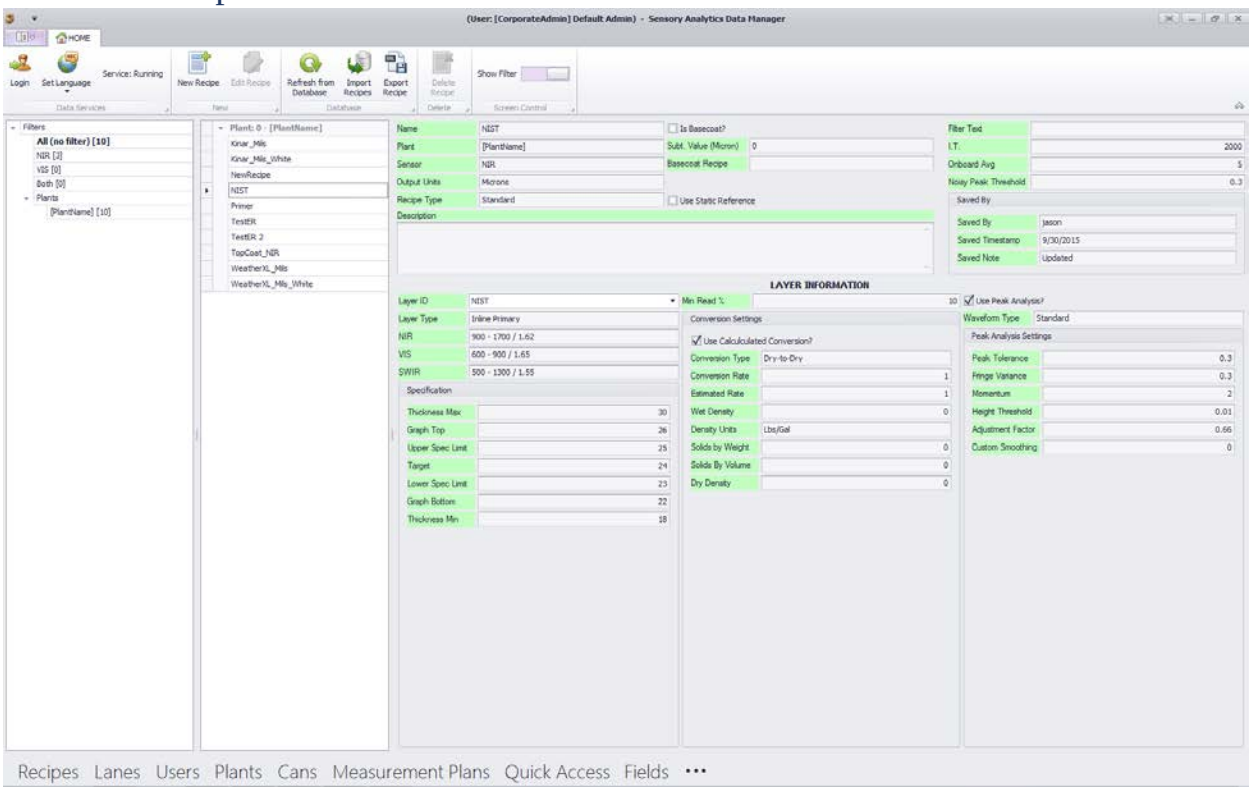
View Detail Region

The details of an item are visible in the larger section in the middle-right side. This is a Read-Only section and does not allow changes directly in this screen. In the Recipe Detail View, if a recipe has multiple layers defined, a user can review the layers by selecting the layer within the dropdown.

Navigation Region

To navigate and view different modules, simply mouse over and click on the module name. When you mouse over the module name will change color to indicate the selection. If the login is changed, the screen will automatically reset to the '*Recipes*' module.

Recipes



The most important part of the *SpecMetrix*® Measurement System is the coating recipe. This contains all the critical information about the coating/layer/film that is being measured. This user interface allows all the information about the recipe and its layer(s) to be viewed on a single screen.

There is a lot of information on this screen, and while all of it may be relevant, not all of it is "required". For fields that are required or that have dependency properties, this new enhanced solution has validation that takes place when an attempt is made to save the recipe. If not all of the required information is entered, an appropriate alert will be displayed as (Red circle with 'X') or (Yellow caution with "!"). Hovering over the icon will provide a description of what is required to fulfill the validation. If the required information is not available, the recipe cannot be finalized and saved.

The Recipe Wizard/Assistant button is the largest feature on the screen because it is critically important for setting up new baseline recipe (There is an entire chapter devoted to the Recipe Wizard in a subsequent section). Activating this function will start a simple dialog that will take the user through all the required prompts, and 'ask' some simple, but important, questions about the coating/film that is being measured. Once the user answers these questions and responses finalized, a baseline recipe will be automatically generated, and all the user needs to do next is "Save". While the recipe wizard will generate a very good baseline recipe and sufficient for most coating combinations, there will still be room for optimization depending on the application and a trained *SpecMetrix* user can edit and optimize the recipe parameters as necessary.

Editing/Creating a recipe

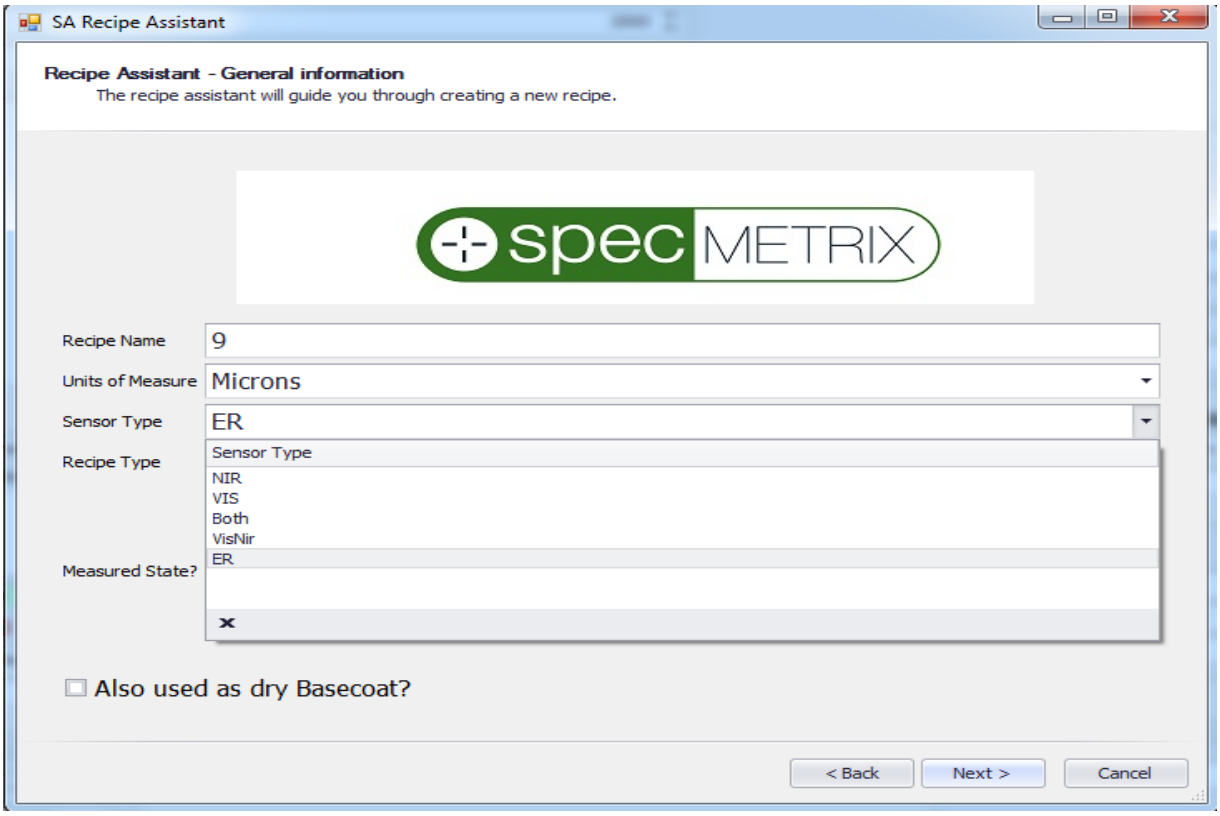
The fastest, easiest and best way to create a new recipe is to use the Recipe Wizard. This will guide the user through all the required information in a user friendly guided questionnaire, as well as calculate the optimal starting recipe parameters for getting measurements.

Recipe Wizard

Recipe Wizard is a user-friendly way to create new coating recipe for *SpecMetrix*® Measurement *S*ystems. Having a good recipe for a given coating is critical and it is a one-time setup that should only take a few minutes for a given coating. The task of creating new recipes has been simplified compared to earlier versions and by answering a few questions. Creating a recipe can be effectively achieved. As noted earlier, while a significant percentage of recipes created with the recipe wizard will get measurements right away, there is often the need to review some of the fine-tuning details of a recipe in the SA Analysis Tool to dial-in the recipe for the purposes of final optimization.

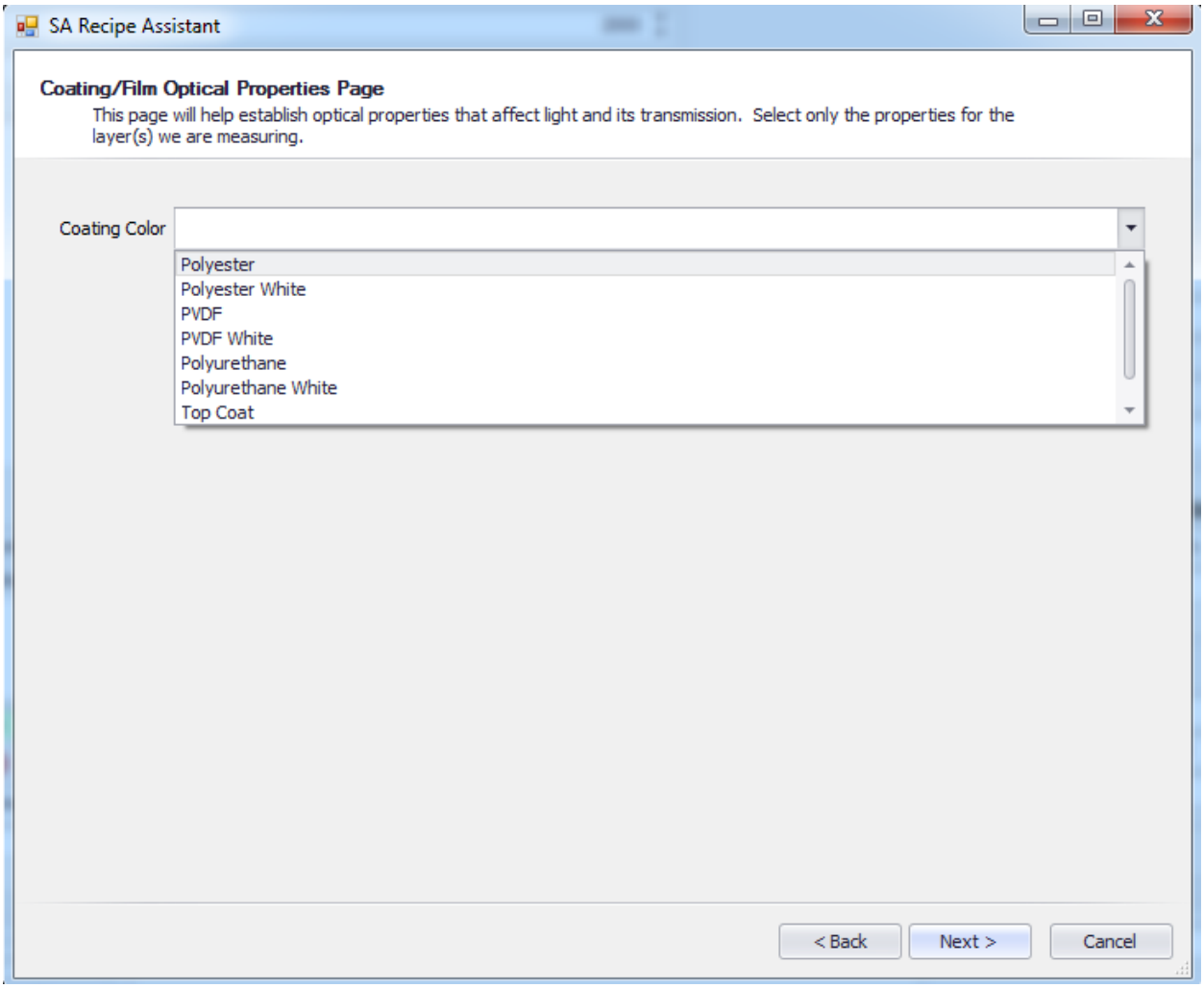
Getting Started with the Recipe Wizard

Once the user is in the editor the Recipe Wizard Button will be displayed in the upper-right side of the screen.



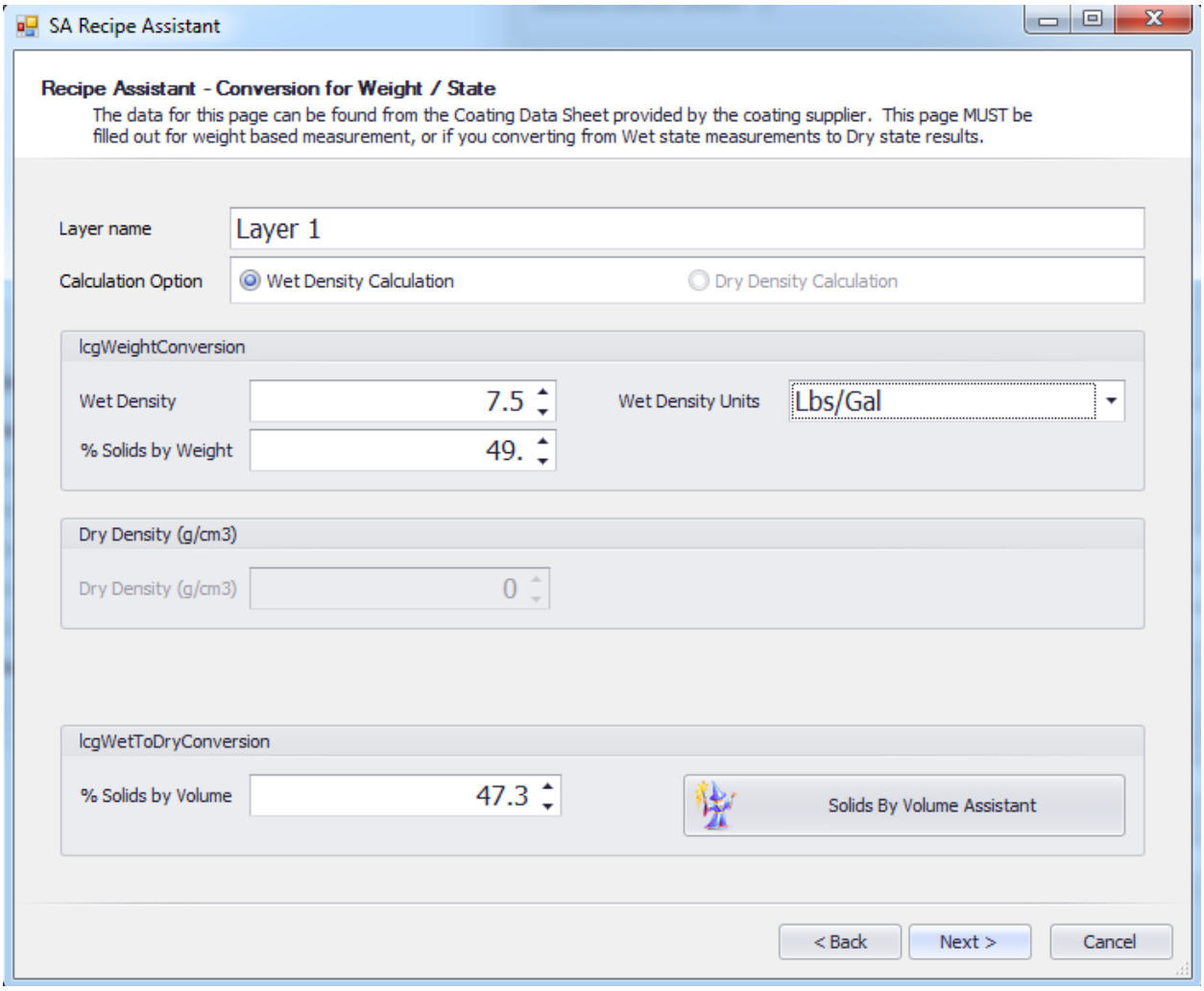
There are only 4 screens with entry questions. The first screen is gathering some general information such as:

- **Recipe Name** – This is the Recipe ID that is used for recipe selection and is unique identifier
- **Units of Measure** – (Default: Microns) this represents the desired output units. The units of measure could be thickness units such as microns or mils or coat weight units such as mg/in^2, mg/4in^2, g/m^2, lbs. /ream etc.
- **Sensor Type** – VIS, NIR or ER. The Recipe Wizard directs its results to one or the other detector/sensor.
- **Measurement State** – This determines whether the coating is being measured in the wet state or dry state.
- **Output State** – How does the user want the results converted for output? Wet or Dry
- **Also used as dry Basecoat?** – If this recipe will be used as a base coat for a 2nd pass coating where we will be subtracting a fixed result then check this box. This does not apply to differential or multi-layer subtractive coatings.



The optical properties page is asking about the opacity (color) of the coating, and if the coating is clear/gold and there is a base coat underneath, what is the opacity (color) of the base coat.

Coating Color – There are 5 choices Choose the most appropriate one for the coating being measured. If none of these are applicable for the specific coating, the closest option should be chosen.



A micron to weight conversion often requires coating specific properties which is generally found in the Coating Specification Sheet from the coating supplier. The most difficult piece of information that is typically missing from the Coating Specification Sheet is the [% of Solids by Volume]. A simple assistant screen is provided to help the estimation of the %solids by volume field, however this is only an *estimation* based on user entered values and it is highly recommended to obtain this value from the coating supplier. It is important to understand that % of solids by volume is required only for measuring dry coating in coating weight units and not coating thickness units. It is not required while measuring wet coatings or while measuring the coating in the units of thickness, such as microns.

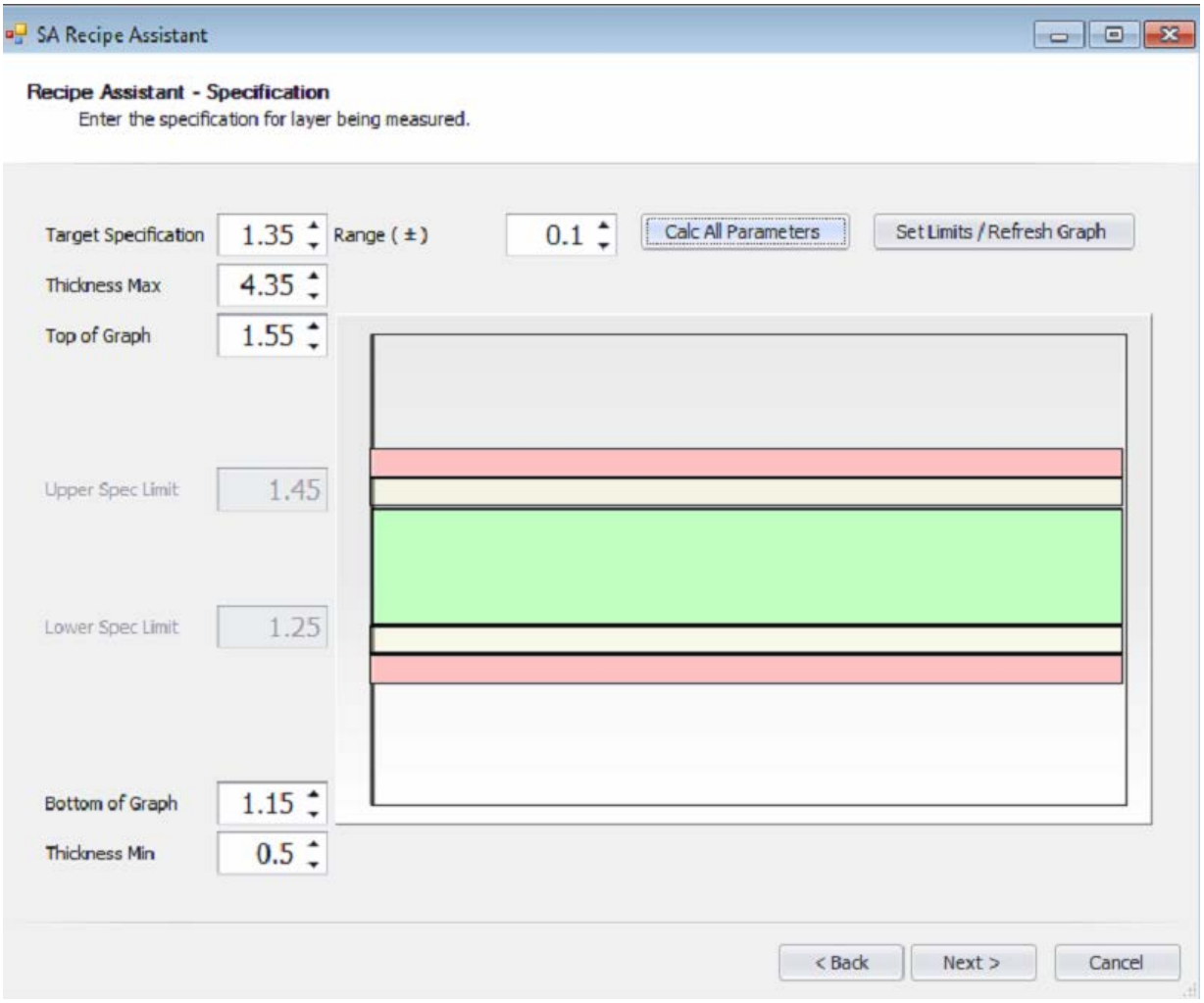
Note: For measurements in thickness units such as microns or mils, there is no necessity to enter data for wet density and solids.

Layer/Coating Name – this is a required field. This prints on reports, graphs and is part of the selection tool in the SA Analysis Tool.

Some conversions can apply a Dry Density Calculation in lieu of percent solids by volume.

For Wet-to-Dry conversions the user must enter the data in the Weight Conversion Group.

For Dry-to-Dry base coat conversion you must enter the appropriate conversion for Dry Density or percent solids by volume.



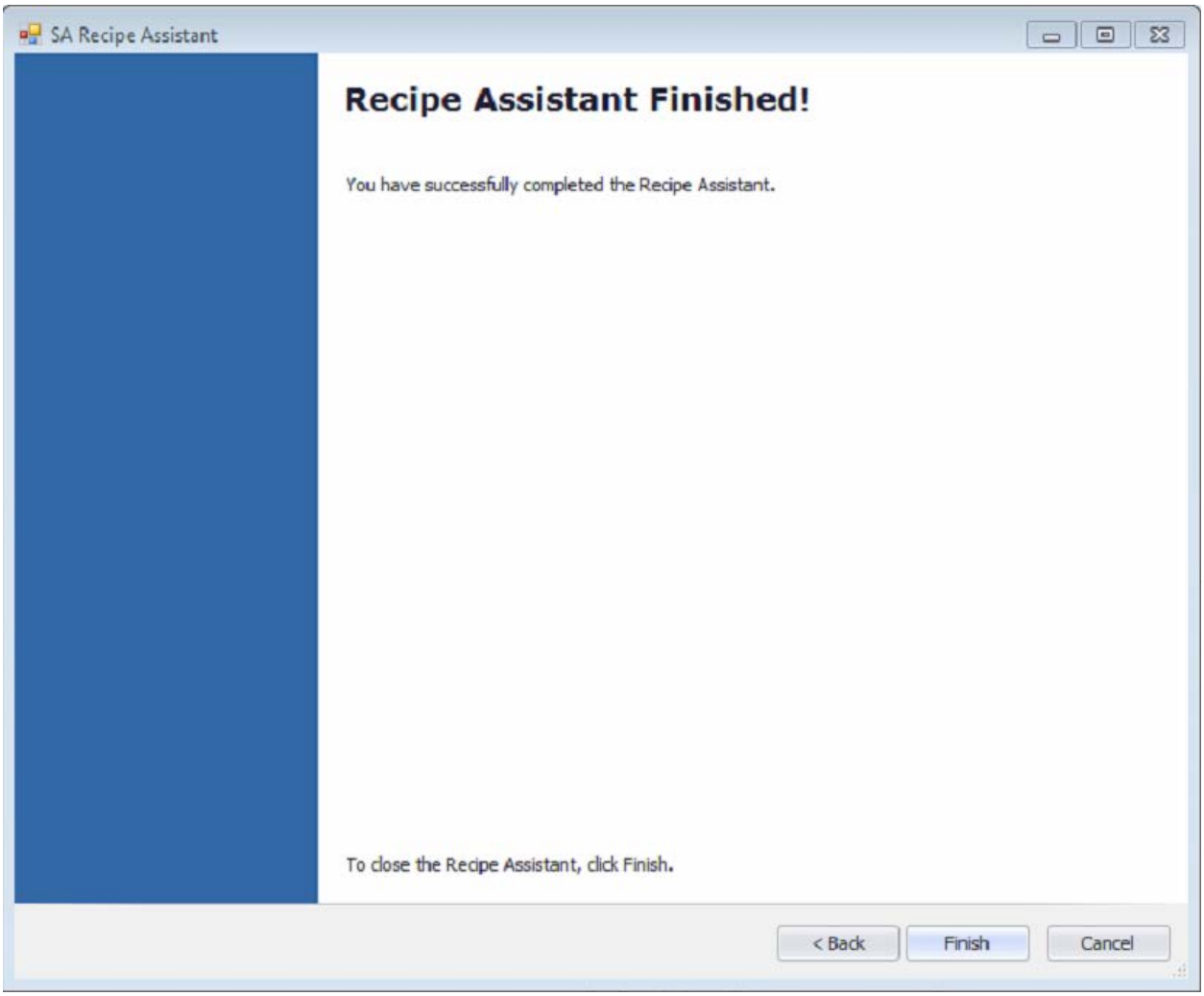
The easiest way to finish up the specification is to enter the desired target specification, select the appropriate range for the specification tolerance, then click the “Calc All Parameters” button. This will present the graph in the best logical layout with SPC (Statistical Process Control) banding, and based on the specification will attempt to isolate to an appropriate thickness min/max, graph bottom/top, and show the limit specs.

A user can adjust your target specification and range to reflect and “upper limit” and “lower limit” by entering the values in accordance with the formula:

Target Specification = (Upper Limit + Lower Limit) / 2

Range = (Upper Limit - Lower Limit) / 2

The Thickness Min/Max values may need to be adjusted when measuring multi-layer applications to prevent multiple thicknesses from invalidating each other.



The Recipe Wizard is now complete. The user can navigate [back] to review the questions or click on [Finish] to finalize and generate the new recipe.

Lanes (*SpecMetrix*® Traversing Only)

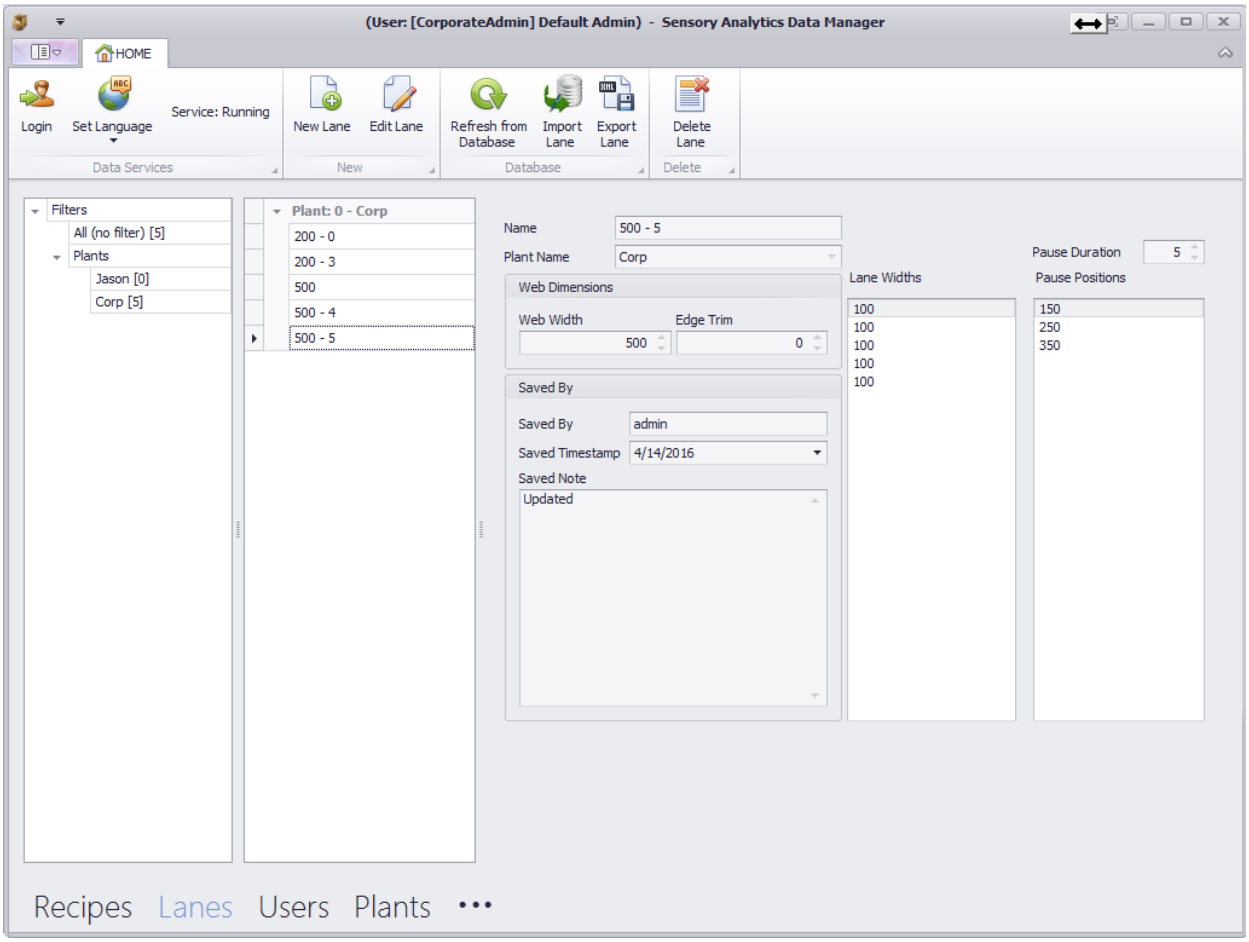


Figure 22 - Lane definition Viewer

Lane definitions are not new to the SA platform, as they were introduced in the SA 1.x version of software. However, the Lane Definition editor has changed in both looks and user friendliness.

As with the Recipe editor there is a filter section, however the filter only separates out based on plants as of the current release.

The Selection grid functions the same as the Recipe module.

The Detail view shows the pertinent information regarding the currently selected Lane Definition.

Adding / Editing a Lane Definition

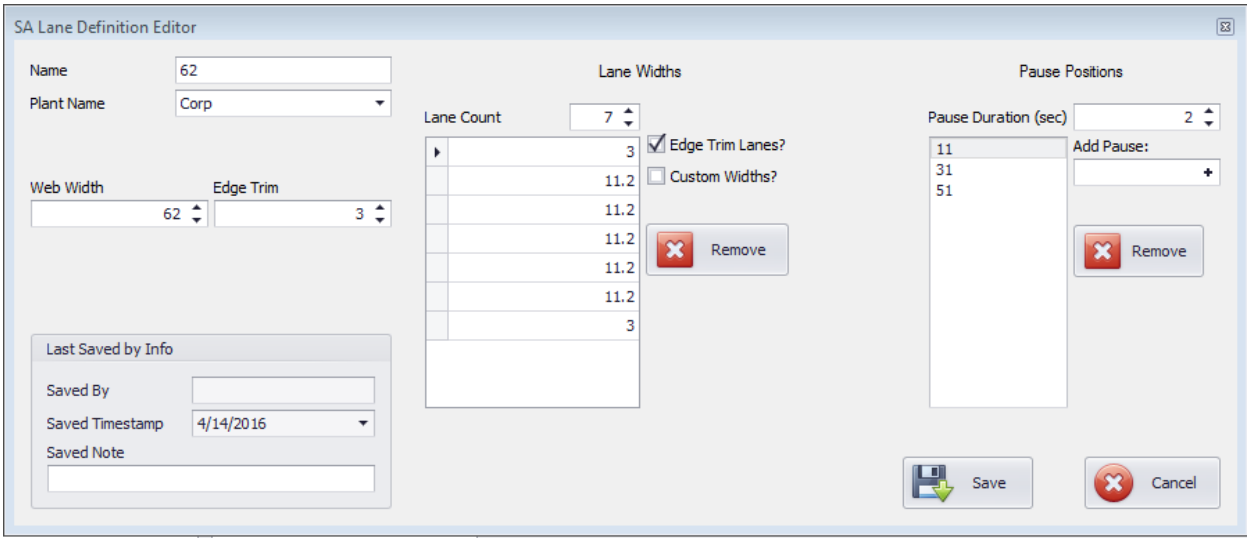


Figure 23 - Lane Definition Editor (Auto-calculate with Edge Trim)

Naming a lane is entirely up to how the 'user' (or the plant) decides to name the identifying Lane Definition. This is what will be displayed within the dropdown selection of the In-line system during production.

Naming tips – It is best to name the lane definition after the width of the material. If there are multiple variations of web division for the same web width, then it is recommended naming the Lane Definition with something more distinguishable such as [WebWidth]. [LaneCount] (i.e. 62.10 based on* ***Error! Reference source not found.**).*

- **Web Width** – This is the full web width from edge to edge.
- **Edge Trim** – This is the distance from each side of the web which you wish the probe to remain inside while traversing.

**Note: Edges are static once initial edge is found, the system will not continually check to determine if the edge is moving.*

- **Lane Count** – This is how many divided lanes the user wishes to separate out the material into. It is required that 100% of the web width be accounted for, and therefore represented. Changing this value will automatically calculate divided lanes into equidistant lengths if Custom Widths is not checked. The traversing system will produce an *average* reading for every reading taken within each respective lane. If only specific lanes are intended be monitored by the plant, it is the plants responsibility to either establish the lanes in accordance with their desired output, or extract the data as they need for their reporting or review.
- **Edge Trim Lanes?** – Checking the box will automatically ensure that there are at least 3 lanes, where the first and last lanes are the width of the Edge trim. If this is checked then Custom Widths cannot be. This will automatically divide all remaining interior lanes evenly.

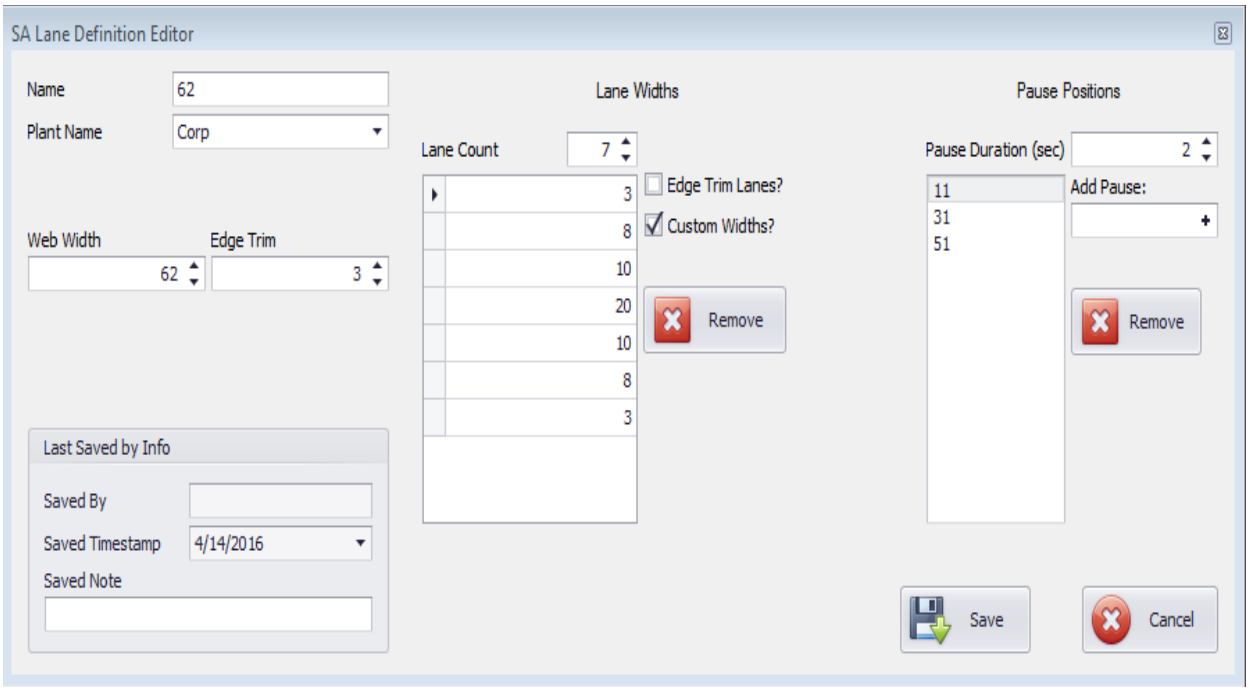


Figure 24 - Lane Definition (Custom Width)

- **Custom Widths?** – Checking this box will allow the user to enter variable widths for their desired lanes. The SUM of all the widths must exactly equal the full web width field. When editing values directly in the grid, the final value will change its value to balance the sum of the equation (add all values, except for last, and subtract from provided Web Width to give the new value of the last [Lane Width]). If the last [Lane Width] is a value less than 0.0, then the value will be set to 0.0. The width customization must be rectified so that none of the individual value are <= 0.0, and that ALL values sum up to equal the full Web Width.

Users

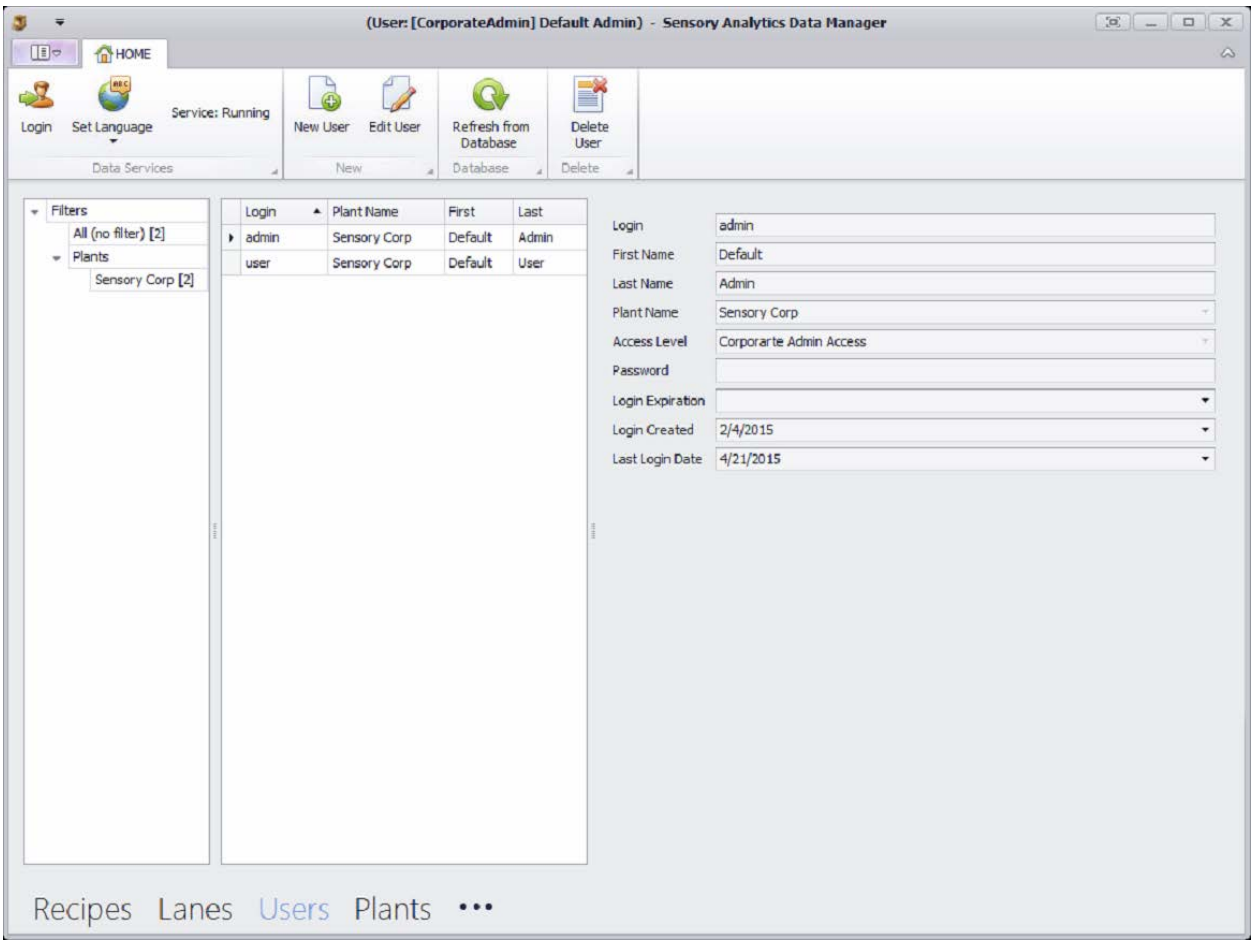


Figure 25 - User Security Viewer

User security is (or at least should be) at the forefront of thinking in any plant. Ensuring that the right people have access to make changes, or not, will ensure that the data remains secure and accurate.

User Permission levels and their privileges

- **User** – This is a base level user. They have access to "Read" but not update any element. In the Data Manager, this access level can only review [Recipes] and [Lanes]. A user can open and operate the In-line software, as well as the Analysis tool. However, recipe changes will not be available for this access level.
- **Supervisor** – This access level has permission to add new recipes & lanes. They can also edit recipes provided the minimum access level for the recipe is set to Supervisor. Supervisor level can add/remove user & supervisor level users to the User Security. These users have visibility to [Recipes], [Lanes] & [Users] modules.
- **Local Admin** – Previously this was the highest level of access. This remains the highest level of access for a defined [Plant]. This access level can add/edit recipes provided the minimum access level for the recipe is set to Local Admin. Local Admin level can add/remove user, supervisor &

local admin level users to the User Security. These users have visibility to [Recipes], [Lanes] & [Users] modules.

- **Corporate** – Corporate users are the equivalent of a Supervisor; however, they access to the currently established "Corporate" defined recipes and lanes (The corporate defined account is the account who's Plant ID = 0). This level of access does however possess the ability to add/modify/remove ANY user, regardless of assigned plant, whose credentials are 'Corporate' or less.
- **Corporate Admin** – This is the highest-level user on the system, but still has restrictions on some aspects of the recipe editor. First, this is the minimum level user that is required to add, modify or inactivate a [Plant]. Corporate Admin's can view all plant recipes but can only make modifications to the 'Corporate plant' recipes and lanes. This level of access does however possess the ability to add/modify/remove ANY user, regardless of assigned plant.
- **Support** – This level of access is strictly limited Sensory Analytics Technical personnel.

** **Note**: Login name is a unique field. If a login name already exists on the system (regardless of visibility in the editor) then you will need to select a different name as there cannot be 2 logins with the same.*

Plants

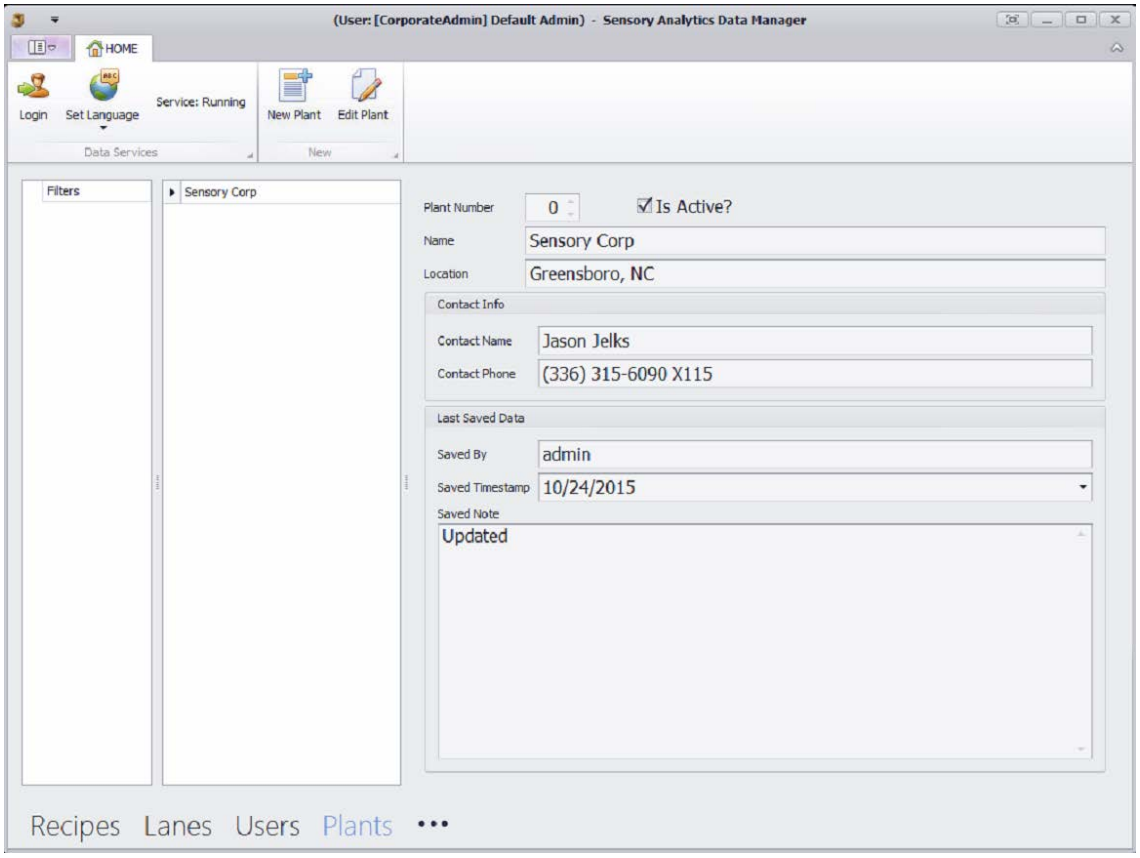


Figure 26 - Plant Viewer (Corporate)

For almost all systems installed in the field the recipe data base will reside locally on the *SpecMetrix*® unit. This is also the recommendation of Sensory Analytics. When this is the case, then there is only one plant and it will be the 'Corporate' plant. *** <u>The corporate plant cannot be deactivated</u>**.

For those corporate facilities who wish to host the Data Manager on their server, there are some requirements that need to be fully asserted. First, the server/pc MUST be a Windows 7 (or newer), or MS Server 2008 R2 (or newer). Secondly, you MUST allow the *SpecMetrix*® Data Service to be installed and run (automatically) on the server. Additionally, Sensory Analytics technical personnel may require access to the Database to perform scripts for updates or maintenance. Lastly, the plant/client must be able to maintain 100% up-time of the server for any *SpecMetrix*® unit that will be accessing it during production (this means using the In-line function). It is the responsibility of the plant to ensure that all connections and network settings are properly configured and accessible for all users who access and use a *SpecMetrix*® unit that connects to a remote Data Manager host. Sensory Analytics cannot manage or make changes to a plants network at any time.

For additional information regarding Data Manager hosting please contact Sensory Analytics.

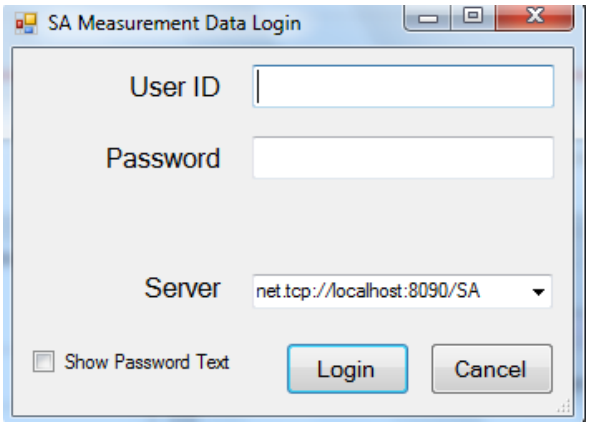
In-line Wave Analysis Tool

To get started you must first turn on and run the *SpecMetrix*® SA Offline software and collect "debug" records in a run. Once you have collected debug files and stopped the run, the data can be accessed via the SA Analysis Tool. If the run is less than 7 days old, you can access the debug directly in the database record. To review a run that is older than a week you must export the debug to its zip file prior to the data being purged. Because of database size restrictions Sensory Analytics® cannot guarantee data to remain in the system for longer than 7 days.

Logging In

Like all other SA utilities, Analysis Tool requires different credentials to accomplish certain things. In this case the only difference between a user level and administrative level is the ability to save changes to the recipe within Analysis Tool when logged in with administrative privileges.

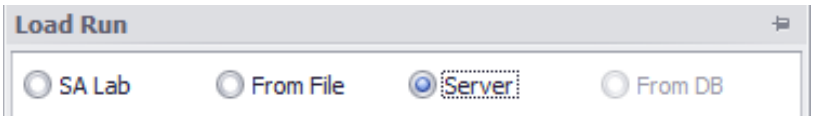
By default, the user will be logged into Analysis Tool with the current user's level of credentials, however, users can change credential levels within Analysis Tool.



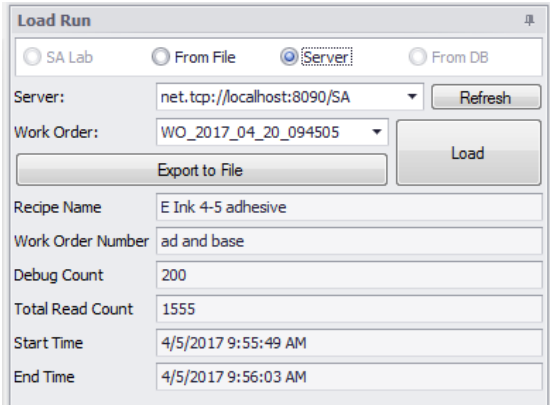
Log in with a user ID and password. Be sure to connect to the appropriate server.

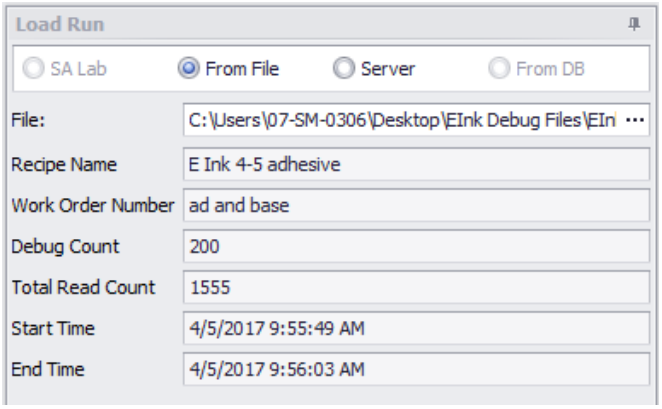
Loading Files

There are 3 ways to review a debug set:



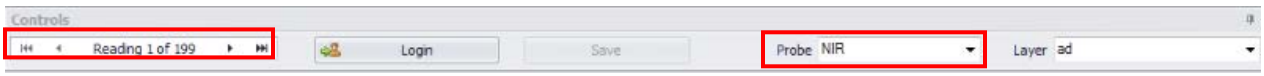
1. The primary, and best way to work with the data, is to access the server directly. Select "From Server" and use the drop down to select which SA server you wish to work with. For *SpecMetrix* system, there will only be 1 server: net.tcp://localhost:8090/SA
2. Select the option of "From File" if you are working with an exported debug zip file
    a. Click on the ellipse "…" button to open the file selection window
    b. Navigate to the folder and select the file to analyze
3. Select the option "From DB" if you wish to work with the SA Database
    a. DO NOT Use this option if you are working directly with the SA database. Only use if you have copied (NOT 'CUT') the database to a remote location from the original.
    b. Click "Change DB" if you have an archived database you wish to work with. Navigate to the folder and select the SA database (*.mdf) to work with.
    c. The drop-down window will display the list of Work Order numbers for each run
    d. When working with the DB, the details will be displayed below the "Load" button
    e. If Debug Readings = 0, then there are no debug records for the given run there will be no readings in which to analyze. Select a different Work order number.
4. SA Lab will be explained in the SA Lab Manual.





Regardless of which option, once you have selected a debug set, click the "Load" button. Within a few seconds the spectral data should be displayed in the graphs. If you do not see any graphs, then make sure you have selected the correct "Probe" and "Layer" (top of the screen).

Controls



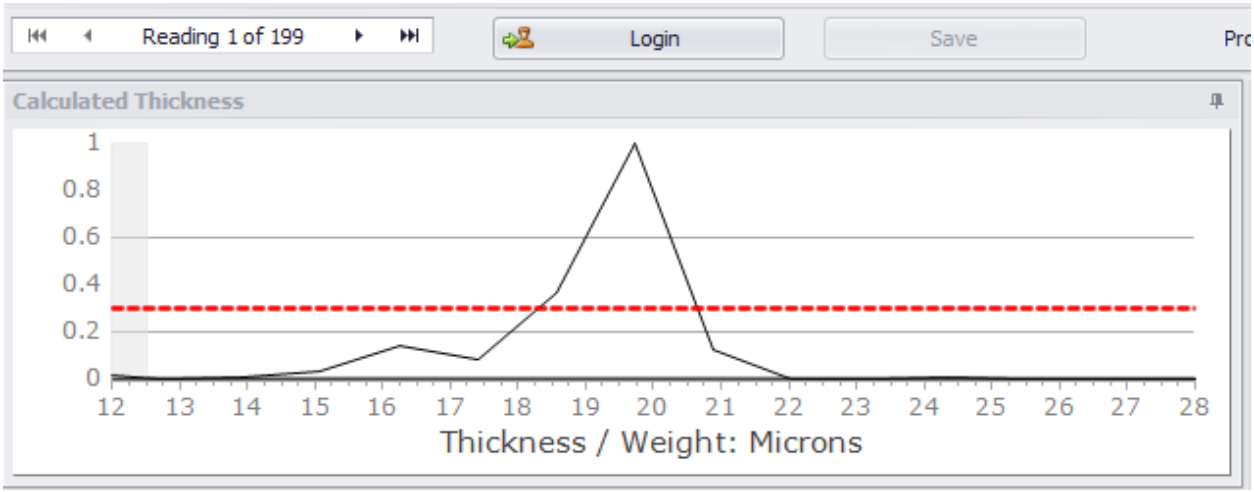
From left to right:

- **Reading Navigator:** Using the navigation arrows on each side of the reading navigator to see the different debug readings. You can go backwards and forwards or enter the number of the reading directly.
- **Language: Displays a selection window to change the language without having to exit**
- **Probe Drop-down menu:** Selector used to choose between probes.
- **Layer Drop-down menu:** Selector used to choose between layers.

If the run selected was defined as a 2-layer recipe at the time of the run, then you can select, analyze and modify each layer individually. SA Analysis Tool can analyze up to 2 layers at the same time with the *SpecMetrix* Measurement System.

If a defined line has more than 1 probe that has had analysis (Debug) readings taken, you can select which probe analysis data you wish to review.

Calculated Thickness



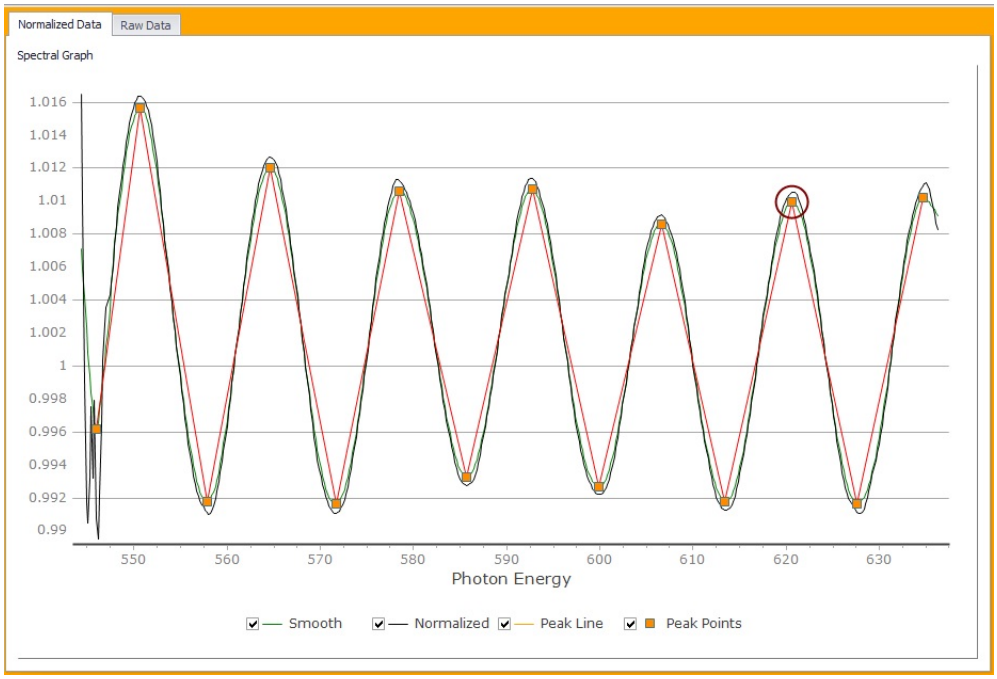
A Peak graph that shows the thickness or film-weight peaks within the Min/Max evaluation range.

On a scale of 0.0 to 1.0 (0 to 100%), the y-axis of this graph shows the normalized probability of the thickness/weight for the particular measurement. Unless measuring a multi-layer material, there should only be one obvious peak. Multiple peaks usually occur when there are multiple layers or when there is "noise" present in the light signal. This optical noise can be caused by the scattering of light hitting solid particles in the coating, when the light hits a material with a rough surface, or improperly focused probe.

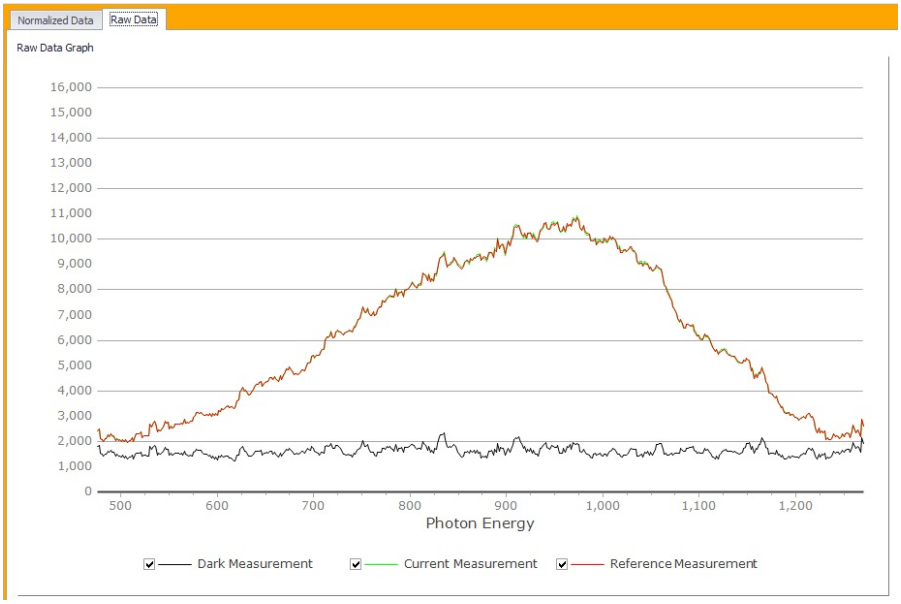
Changes to the PA Settings or Layer Settings section will have an impact on the peak graph.

Normalized Data

The Spectral graph displays the normalized reflectance used to calculate thickness of a coating/film across a wavelength range.



Raw Data Graph

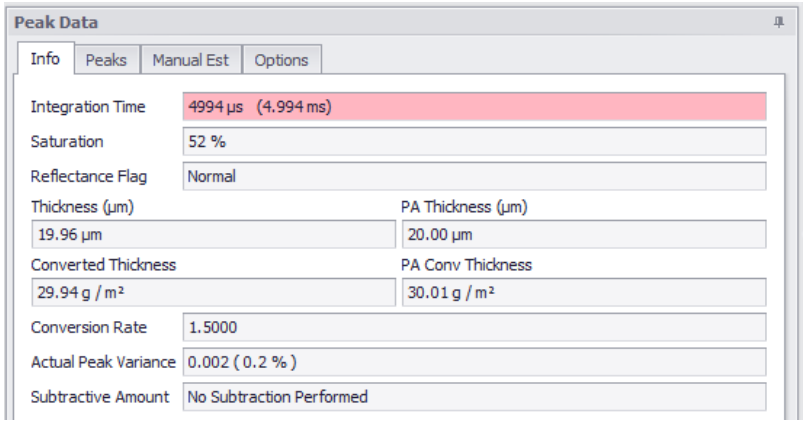


The y-axis shows the reflectance energy entering the probe at the respective integration time. The x-axis is the wavelength of light in nanometers (nm).

The checkboxes at the bottom are used to add/remove to each of their respective readings.

Peak Data

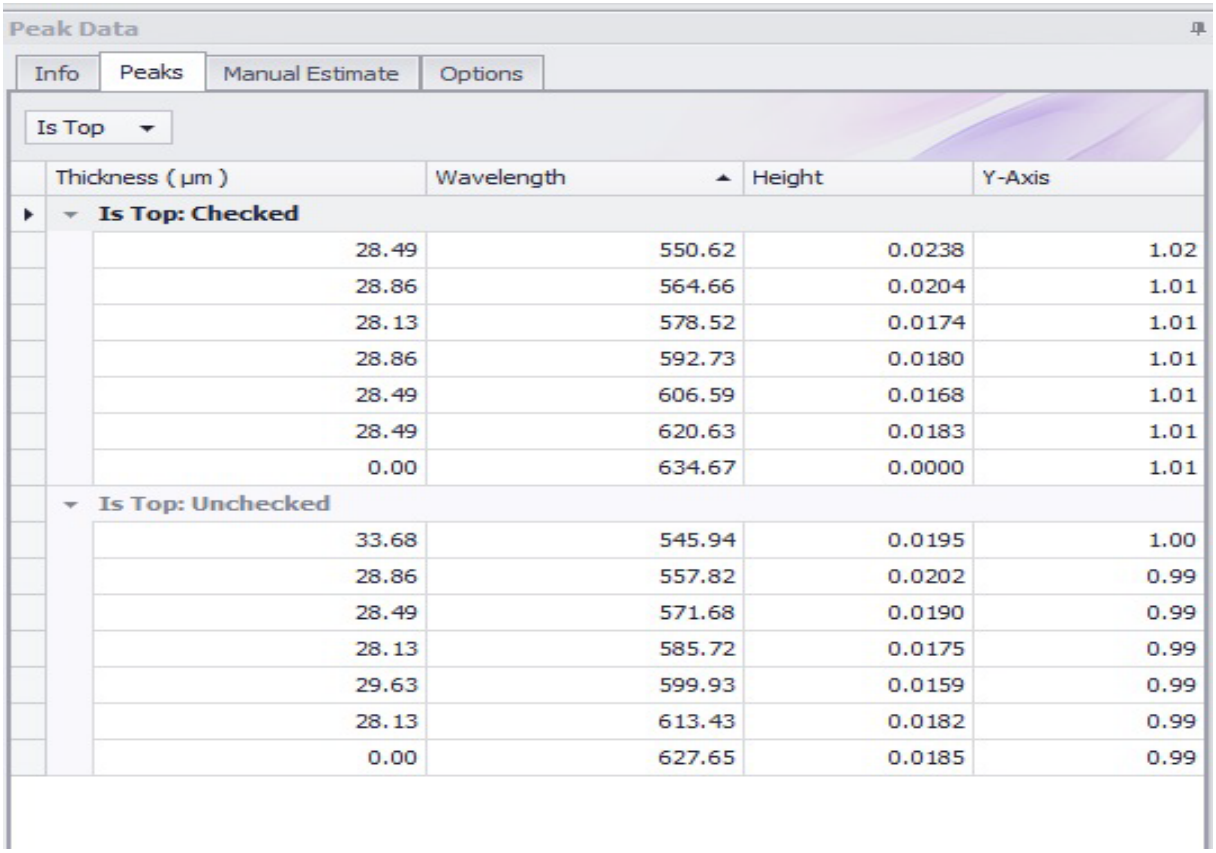
Accessed by clicking on the Peak Data Tab on the top right side of the Normalized Data Window.



- **Integration Time (IT):** time in milliseconds used to sample the optical package detector array once.
- **Saturation:** Percentage of reflectance
- **Reflectance Flag:** The percentage of saturation. It will either be Low, Normal, or High.
- **Thickness (µm):** The thickness of the material shown in microns.
- **Converted Thickness:** The thickness of the material converted into another unit of thickness or weight. This conversion can also be for a wet layer measurement converted into the projected dry thickness or film-weight.
- **PA Thickness (µm):** A secondary validation calculation to support the thickness calculation.
- **PA Conv. Thickness:** The PA thickness value converted into another unit of thickness or weight.
- **Conversion Rate:** From measurement thickness in microns, converted to desired units of measure
- **Actual Peak Variance:** Ratio of Thickness and PA Thickness estimate
- **Subtractive Amount:** Only shows information if a Differential configuration is being used. This will show the thickness of the applied coating.

The data for each of the peak points of the Normalized Graph separated by top points and bottom points. The following image contains data for wavelength, height (distance from one peak point to its

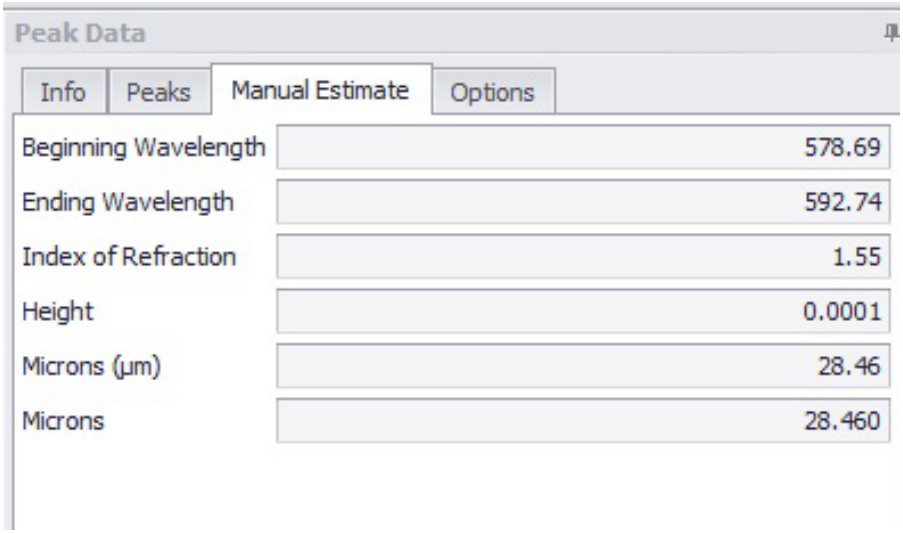
adjacent peak to the right), and thickness (in microns and converted units). Peaks must be in sequence. It also contains subtractive layer information based on the debug information used in this example.



Thickness (µm)	Wavelength	Height	Y-Axis
Is Top: Checked			
28.49	550.62	0.0238	1.02
28.86	564.66	0.0204	1.01
28.13	578.52	0.0174	1.01
28.86	592.73	0.0180	1.01
28.49	606.59	0.0168	1.01
28.49	620.63	0.0183	1.01
0.00	634.67	0.0000	1.01
Is Top: Unchecked			
33.68	545.94	0.0195	1.00
28.86	557.82	0.0202	0.99
28.49	571.68	0.0190	0.99
28.13	585.72	0.0175	0.99
29.63	599.93	0.0159	0.99
28.13	613.43	0.0182	0.99
0.00	627.65	0.0185	0.99

Manual Est.

Allows users to adjust the following values:



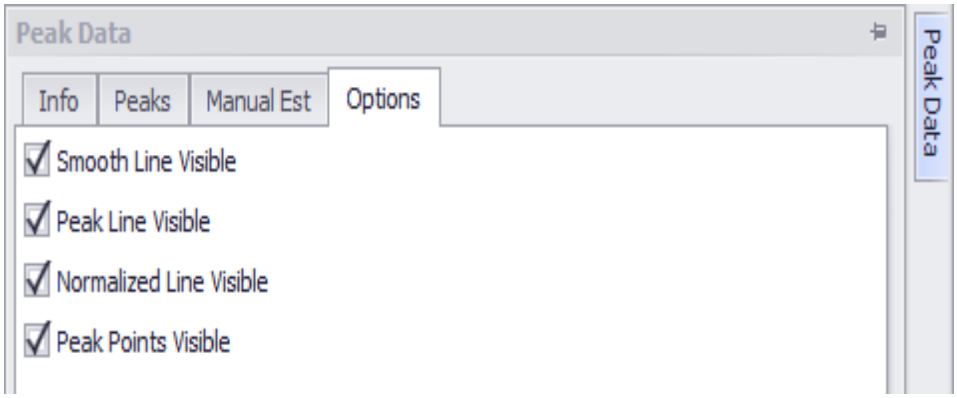
- **Starting/Ending Wavelength/Energy:** The wavelength/Energy range is the range of light spectrum that is being measured to produce a reading. SpecMetrix® software currently measures in 3
- different spectral ranges:
    a. Visible spectrum (VIS) which ranges from 400 nm – 1000 nm (can also detect in the 200-400nm wavelength region if a UV light source is included).
    b. Near-Infrared (NIR) which is from 900 nm – 1700 nm.
    c. Extended Range (ER) which operates in the 485-1300 photon energy range.

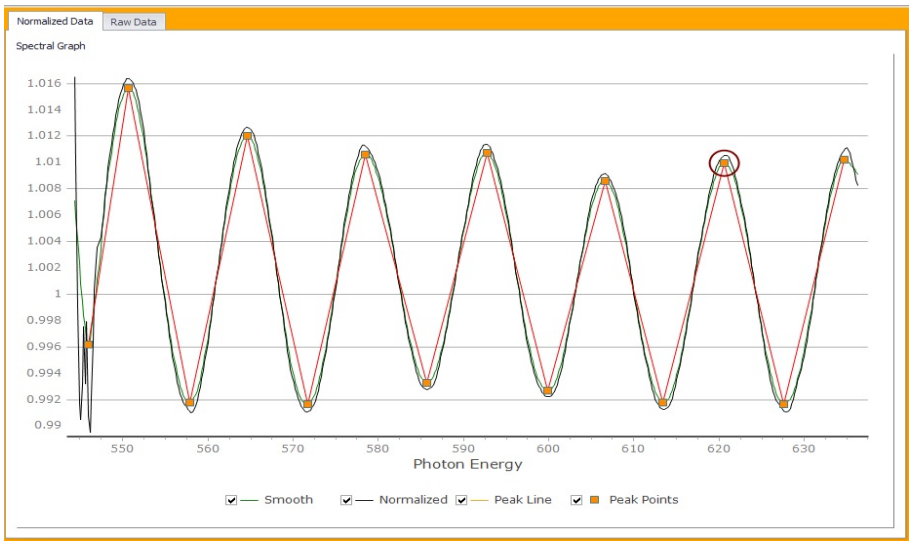
  When you adjust, the wavelength or *Energy* ranges you are narrowing the available spectrum in which is measured. This becomes apparent in the Spectral graph as you slide the Start or End wavelength indicator.

- **Index of Refraction (IOR):** Changing the IOR will not change the wavelength or wave graph but will have a direct impact on the peak graph and the resulting thickness.
- **Height (Height Threshold):** This is the minimum amount of height (distance from the bottom point to the top point for a given interference cycle) required to consider the interference wave as valid. If the peak to valley distance is less than the height threshold value, then that is not considered as a valid interference cycle. Typical value for this field is between 0.002 to 0.01.
- **Estimated Microns:** The estimated thickness of the material at a specific point on the graph
- **Estimated Conversion Factor:** The conversion rate to convert from microns to another unit of thickness or weight.

Options

Controls the visibility of the Normalized graph lines:



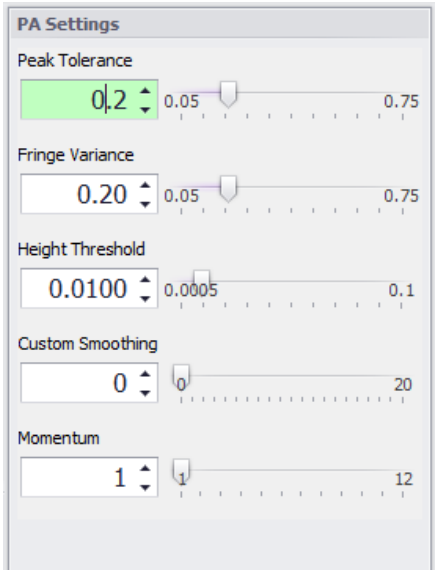


Checking or unchecking the line display boxes will hide or unhide the respective lines in the Wave Graph.

- **Normalized line** – (Black line) the normalized spectral array for the wavelength range.
- **Smoothing Line** – (Green line) smoothing line to improve 'readability' of the normalized spectral array.
- **Peak Line -** (Red line) line that graphs from peak to peak that identifies valid peak ranges.
- **Peak points –** (Red dots) points that identify each peak within a range.

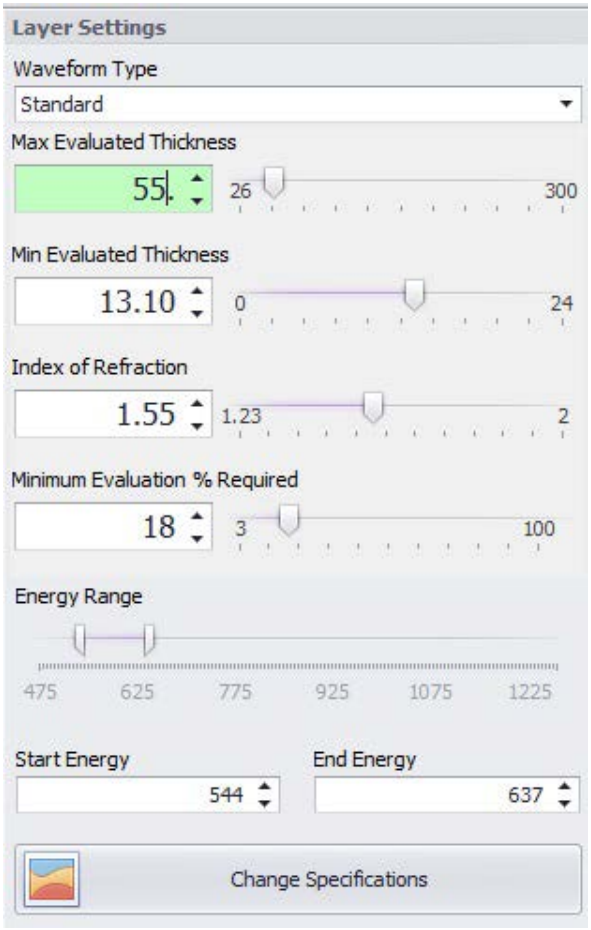
PA Settings

Peak Analysis values can be changed as follows:



- **Peak Tolerance:** This is the amount of acceptable variation in percentage between the final estimated thickness by the peak analysis algorithm and the thickness displayed by the software. If a value of 0.2 is used in this field, then a 20% variation is acceptable between the calculated thickness by the software and the estimated thickness by the peak analysis. If the variation is more than what is acceptable as defined by the acceptance tolerance value, then the software will flag the measurement as a "No Read". Typical range for this parameter is 0.1 to 0.5.
- **Fringe Variance:** This is the amount of variation allowed in thickness between the calculated thickness and individual peak estimates. (See Section 9 for an example of estimating thickness using peak estimate tool. The default value is 0.3. Depending on the nature of the samples and the quality of interference, this parameter might have to be modified.
- **Height Threshold:** This is the minimum amount of height (distance from the bottom point to the top point for a given interference wave) that is required in order to consider the interference wave as valid.
- **Custom Smoothing:** Attempts to "smooth" the spectral data curve as the value increases to fit the original interference curve better.

Layer Settings

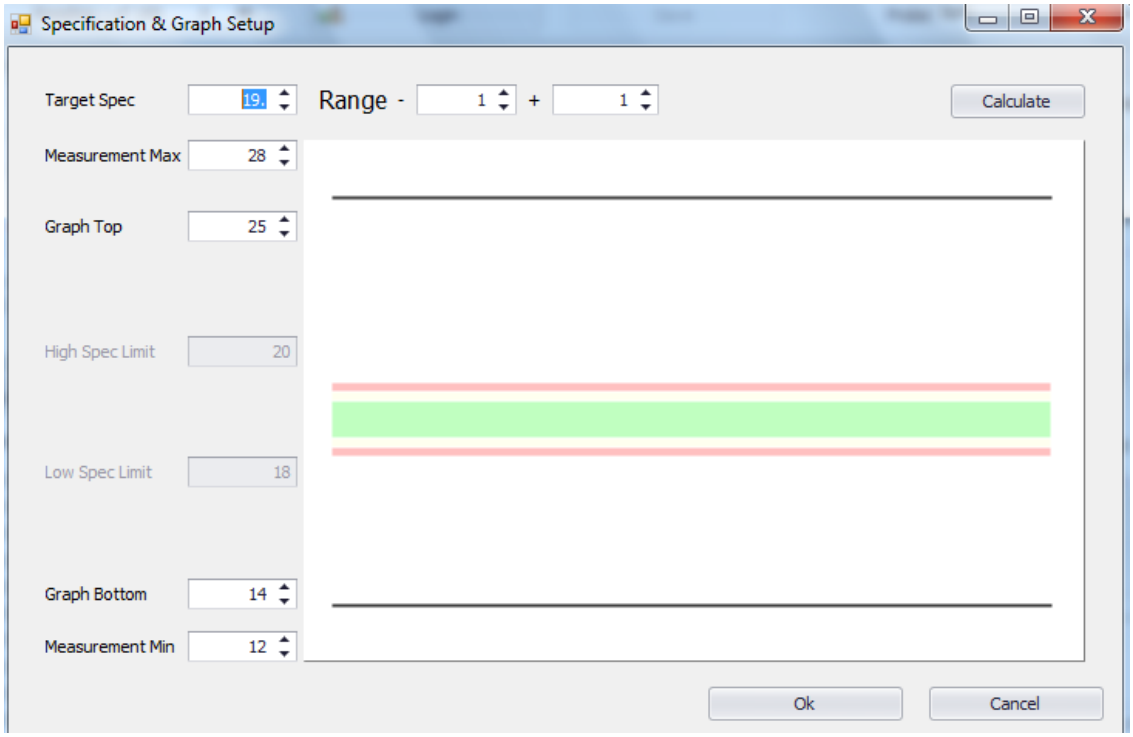


- **Waveform Type: *Standard*** is typically used and allows the peak analysis to track the major waveform pattern. ***Amplitude Modulated*** may be used in certain instances if there is a thin layer being measured with interference from a film substrate also present. Amplitude Modulated will attempt to track "over" the thicker wave curves, as the thinner layer waveform may be superimposed over the thicker curves. Amplitude Modulated would create the peak analysis curve to match the thin coating waveform.
- **Maximum/Minimum Evaluated Thickness:** The minimum and maximum range of thickness that are evaluated during measurement.
- **Index of Refraction:** Changing the IOR will not change the wavelength or wave graph but will have a direct impact on the peak graph and the resulting thickness.
- **Minimum Evaluated Percent:** The required minimum percentage of readings that are successfully evaluated in order for a reading to be displayed.
- **Wavelength Range**: Increase or decrease the wavelength range by using the slide bars.
- **Beginning/Ending Wavelength**: Change the wavelength range by either typing in the values or by using the arrow up/down buttons.

- **Change Specifications:** Opens the Specifications & Graph setup window allowing users to change the following parameters such as Target Spec, Measurement Max/Min, Graph Top/Bottom, High Spec/Low Spec limit.

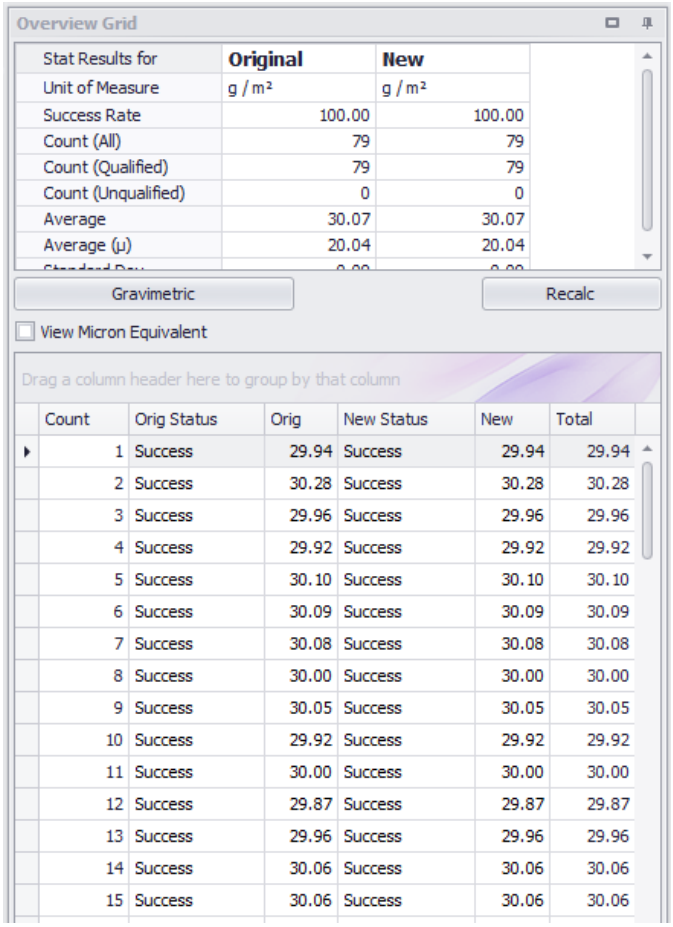
Specification & Graph Setup

To provide continuity and accurate graphical representation we have moved the specification editors into its own editor. This editor functions the same whether you see it embedded in the Recipe Assistant or as a popup window for Recipe Editor. The Specification & Graph Setup window is pictured below:



Additionally, the Range has been split out from a single +/- value, to a (-) range and a (+) range. The range allowance is dependent on the Target Spec. For any Target Spec whose calculated conversion is greater than 7 µm the allowable range is 50% of the target spec in either direction. If the conversion is less than or equal to 7 µm, then the Low range allows a value which will set the Low Spec Limit at the sensor minimum, and a High range value which will allow the High spec limit to be no greater than 12 µm (or equivalent).

Overview Grid



Once a recipe has been changed, you can see the impact across all the analysis readings to determine if the change has improved the reading success or decreased the success rate. You can see the reading success rate for the original result set as it was performed during the measurement run, and next to it you can see the new results (New Status). You can still select which Probe or Layer you wish to analyze, keeping in mind that only the probes with analysis data will reflect results.

You can also click and drag column headers to group by those columns as indicated in the figure above. This helps to group together bad readings to better investigate them.

NOTE: the value with (µ) next to it is the micron thickness that is calculated. If a conversion has been applied, then the conversion value will be displayed in the adjacent column.

Above the results grid you will see what the determined success rates are, along with Average microns for this set of data and the average of the calculated units (displayed under “Average”).

WSW Assistant

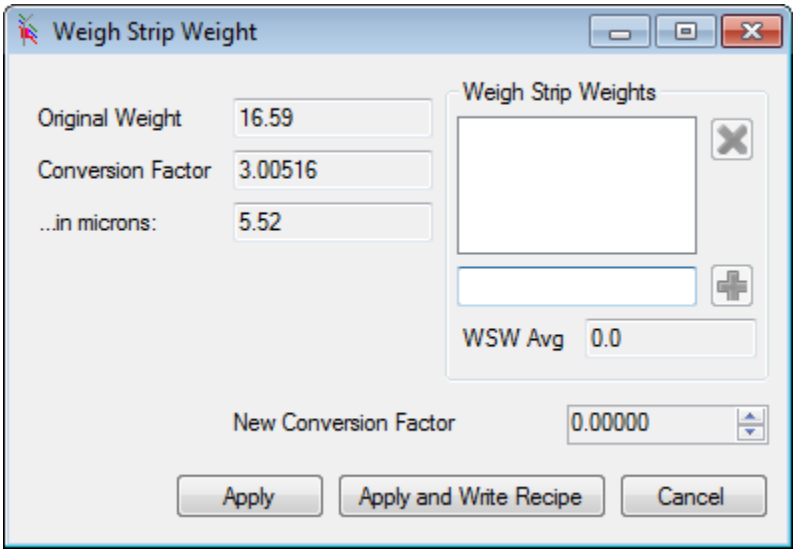


Figure 27 - Weigh Strip Weight Assistant

When the WSW assistant is invoked from the Analysis tool, the values for measuring are already added in provided the "Debug" checkbox was checked during the run. Otherwise, you will need to use the WSW tool from within the Recipe Editor and enter the Average Microns measured by the SpecMetrix® system for the WSW sample.

When used here the "…in microns" value is provided from the Original Average Microns calculation and cannot be altered from this function.

You will enter all the weights, one at a time, in the text field next to the symbol. You will click the symbol to add a WSW sample reading. The system will insert the value in the list box above and then average the values and calculate a new conversion factor based on the series. You have 3 options on how you wish to proceed with the calculation.

- **Apply** – This will make the temporary change to the recipe for analytical purposes, but will not save the change to the recipe database.
- **Apply and Write Recipe** – This will update the recipe database with the current recipe along with this new conversion value.
- **Cancel** – will abort anything performed in this window and return you to the previous screen.

Adjustable Target Spec

In the image below, the […] (ellipsis) button to the right of the Recipe gets enabled when the selected recipe qualifies as an Adjustable Target Recipe. When the ellipsis button is clicked, a popup window is displayed showing the recipe defined Upper Limit and Lower Limit (These are not adjustable), as well the current Target Spec is displayed and is adjustable within the range of "Greater than" but not equal to Lower Limit, and "Less than" but not equal to Upper Limit. When you click the "OK" button, the graph will recalculate the SPC bars as seen below. Original graph on Right side (small image), new graph on left (shown in In-line).

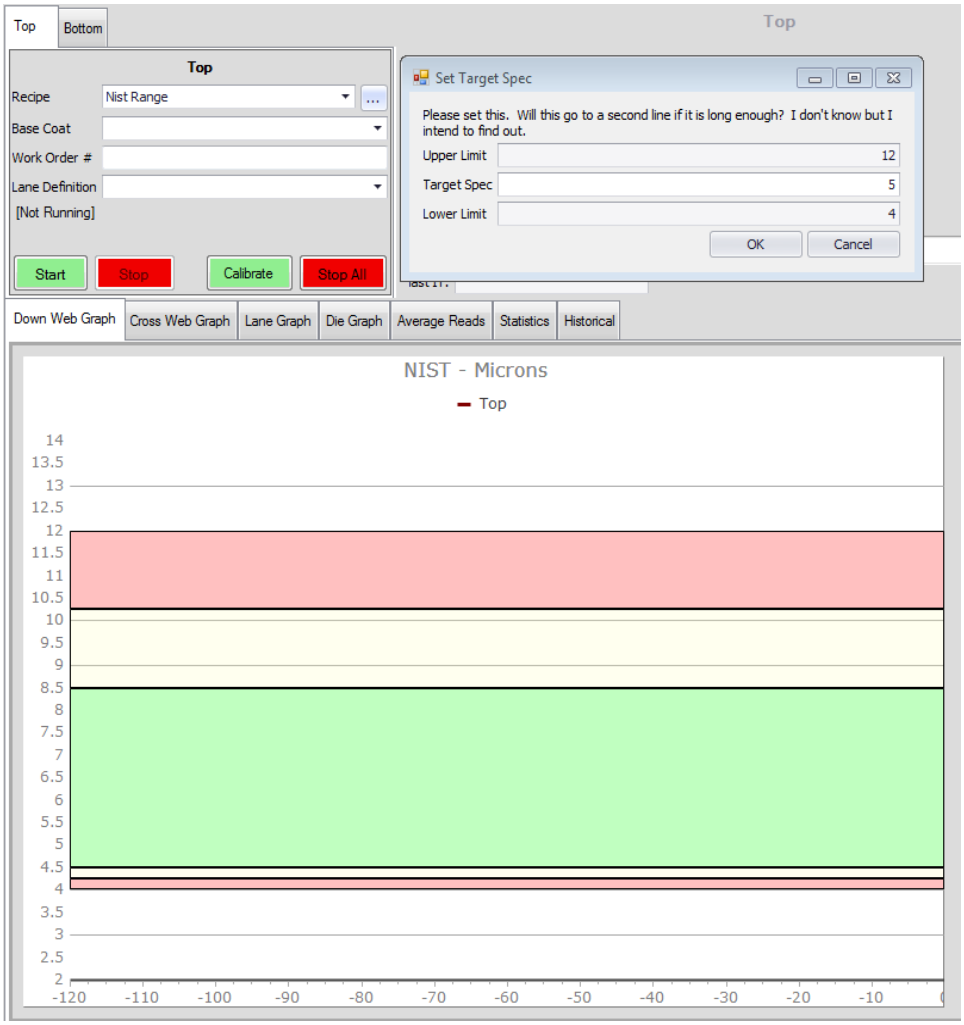
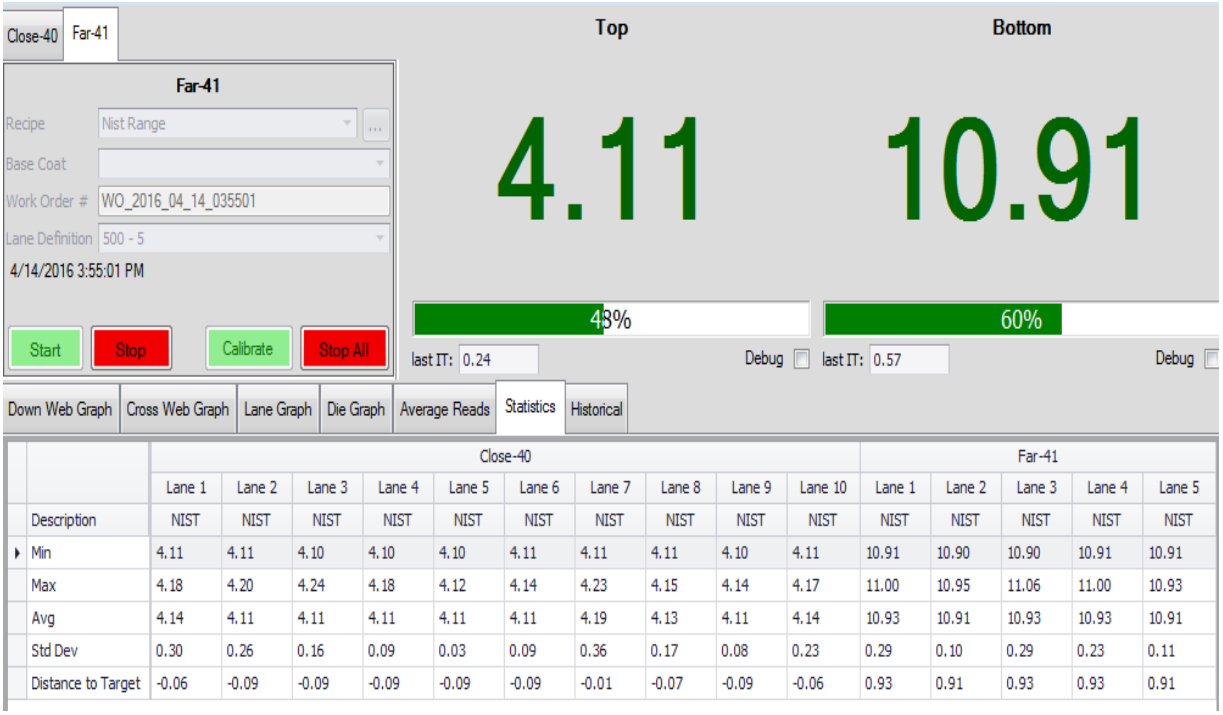


Figure 28 - Adjustable Target Spec

Not all recipes qualify as Adjustable Target Spec recipes. The recipe must be a 'simple' single layer recipe, not defined as basecoat or subtractive, and cannot be set if used in a differential system.

Statistics Tab

The Statistics tab is dynamic and if the system uses fixed probes, then each probe will be displayed with the Probe Name listed instead of Lane # for the respective "Line". For traversing, each Lane will have its own column of data. Likewise, if there is a lane definition selected the Line will adjust its Lane count accordingly. As seen below the "Top" line is defaulted with 10 lanes, and the "Bottom" line has a lane definition selected which overrides the default 10 (with a lesser number of lanes), in this case to 5 lanes.



		Close-40										Far-41				
		Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7	Lane 8	Lane 9	Lane 10	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5
	Description	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST	NIST
▸	Min	4.11	4.11	4.10	4.10	4.10	4.11	4.11	4.11	4.10	4.11	10.91	10.90	10.90	10.91	10.91
	Max	4.18	4.20	4.24	4.18	4.12	4.14	4.23	4.15	4.14	4.17	11.00	10.95	11.06	11.00	10.93
	Avg	4.14	4.11	4.11	4.11	4.11	4.11	4.19	4.13	4.11	4.14	10.93	10.91	10.93	10.93	10.91
	Std Dev	0.30	0.26	0.16	0.09	0.03	0.09	0.36	0.17	0.08	0.23	0.29	0.10	0.29	0.23	0.11
	Distance to Target	-0.06	-0.09	-0.09	-0.09	-0.09	-0.09	-0.01	-0.07	-0.09	-0.06	0.93	0.91	0.93	0.93	0.91

Figure 29 - Statistics Tab (Distance to Target)

Distance to Target

The Distance to Target value takes the "Target Spec" from the recipe, or adjusted target spec if overridden, and provides a relative thickness (or weight) to target. In the case of (**Error! Reference source not found.**) above the Top line had an overridden target spec at 4.2, and the Bottom line had an overridden spec at 10.0.

Recipe Editor & Assistant Specification Editor

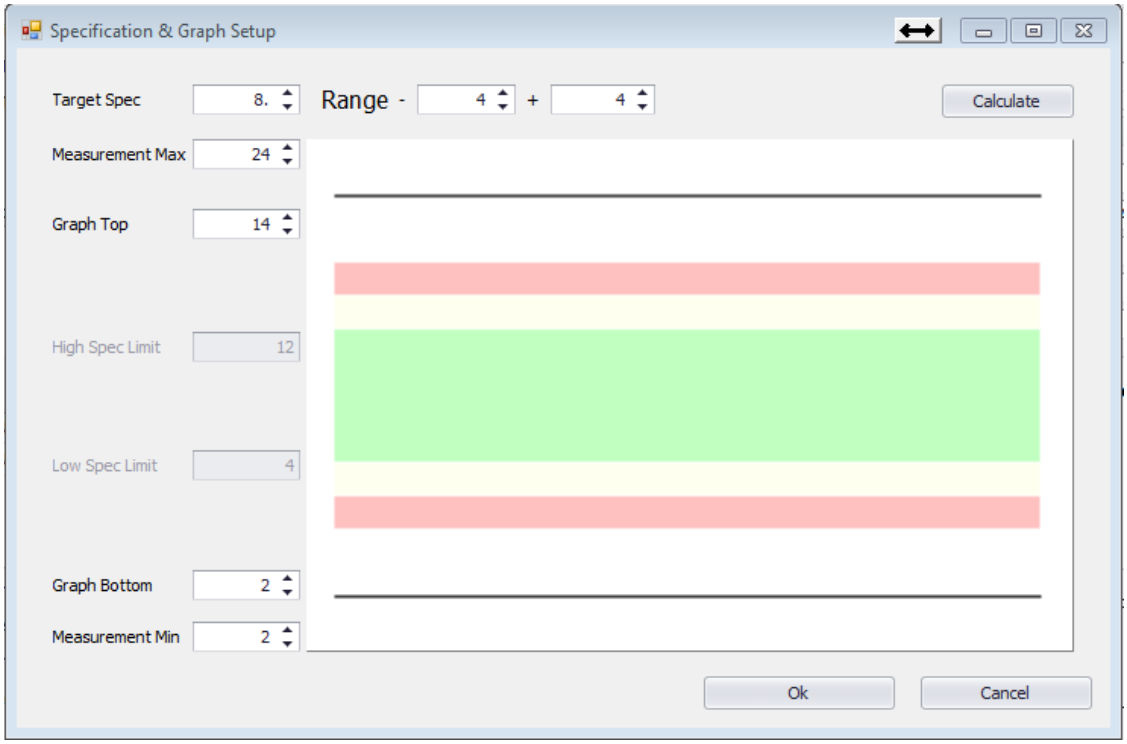


Figure 30 - Recipe Editor & Assistant Specification Editor

To provide continuity and accurate graphical representation we have moved the specification editors into its own editor. This editor functions the same whether you see it embedded in the Recipe Assistant, or as a popup window for Recipe Editor.

Additionally, the Range has been split out from a single +/- value, to a (-) range and a (+) range. The range allowance is dependent on the target spec. For any Target Spec whose calculated conversion is greater than 7 µm the allowable range is 50% of the target spec in either direction. If the conversion is less than or equal to 7 µm, then the Low range allows a value which will set the Low Spec Limit at the sensor minimum, and a High range value which will allow the High spec limit to be no greater than 12 µm (or equivalent).

SA Incrémental Motion (Pause Positions) – Traversing System

What is SA Incremental motion and how does it affect traversing?

Incremental motion stops the probe head at specific points across the web, relative to detected web edge, that are defined as Pause Positions in the Lane Definition of the Data Manager.

The pause position does exactly what you would think… It forces the probe head to pause at specific points on the web, relative to the detected web edge.

How to set Pause Positions

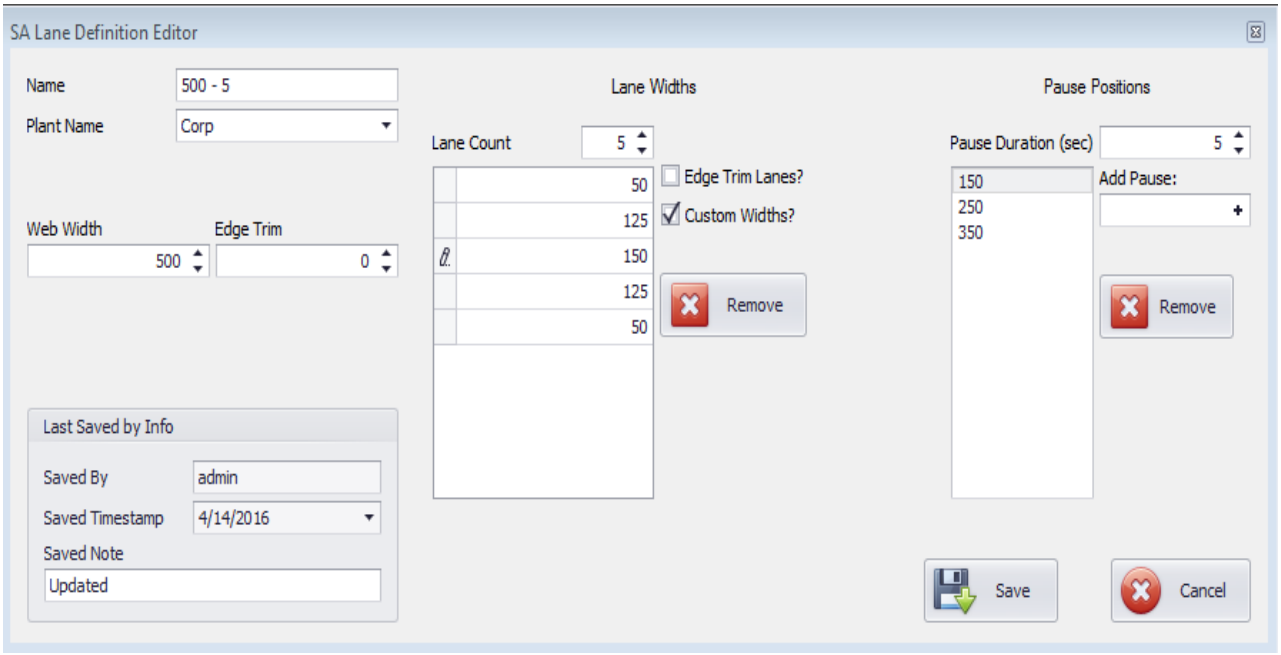


Figure 31 - Setting Pause Positions in Lane Definition

You must have sufficient privileges to change a Lane Definition. Users cannot make changes to any Lanes or Recipes. Pause positions are relative to detected web edge and are not influenced by Lane Widths or changes to Lanes.

To add a pause position, type in the distance from the edge of the web (specifically the edge that is closest to the SpecMetrix® Traversing Home position) in the [Add Pause] field and click the "+" symbol at the end of the editor. If the value entered is within the defined traverse area (**Traverse area** is from the [(Detected Web Edge) + (Edge Trim)] to [(Web Width) – (Edge Trim)]), then the value will be displayed in the "Pause List". The In-line software will automatically set the outer Traverse Area positions as a pause position when the web edge is detected and will not allow you to enter a pause value for that location.

If you adjust the (Web Width) field or (Edge Trim) field, the Data Manager will automatically remove any pause positions that fall outside of the newly defined traverse area.

System Maintenance

Suggested Cleaning Interval

The cleaning intervals are based upon general factory condition. If the box is placed in areas where significant dust or particle density is high, or should you notice performance or temperature issues and you may need to shorten the suggested interval cleaning cycle.

Equipment	Environment	Maintenance Interval
In-Line System	Clean Room	Quarterly
In-Line System	Factory Environment	Monthly
In-Line System	Harsh Factory Environment	2-4 weeks
Lab System	Office / Lab environment	Quarterly
Lab System	Factory Environment	Monthly
Lab System	Harsh Factory Environment	2 weeks

Maintenance Procedures for Lab and In-line systems

We suggest using compressed canned air for dust/particle removal. Never use water or liquids to clean electronic components.

***** WARNING: Make sure power is turned off to electronics before performing any maintenance. *****

1) Clean fan ports with compressed air (blow outward).
2) Check particle filter, replace if necessary.
3) Using Compressed air, blow off all circuit boards and electronics. Make sure dust is evacuated from the box.
4) Visually check wires for damage/fray and bad or loose connections.

Lamp Replacement for In-line Systems

There is one illumination lamp in the system for each optical probe. These lamps can be found in the aluminum blocks identified by the yellow circles in the following picture (Figure 62).

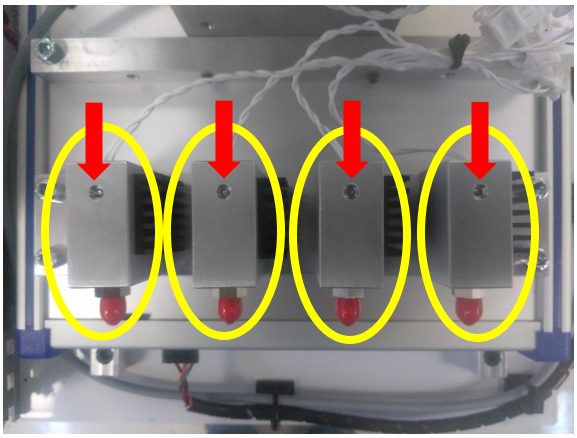


Figure 33 - Optical switch with light sources

Figure 32 - Halogen Lamp

To remove a lamp:

1. Use a 3/32 Allen key to loosen the set screw identified with the red arrows.

2. After pulling the lamp out of the aluminum housing, it should look like Figure 63 Above.

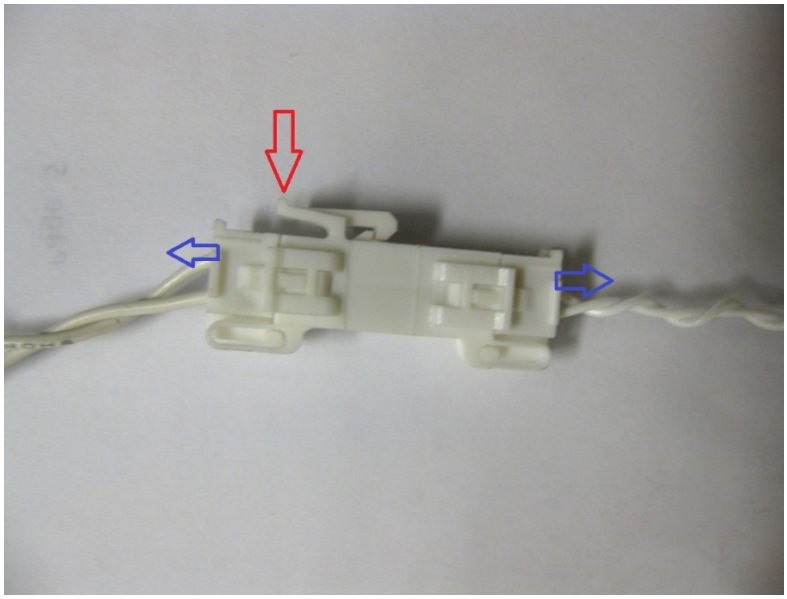


Figure 34 - Lamp extender connection

3. To disconnect the lamp from the system, press the tab indicated by the red arrow while pulling the two ends of the quick-connect away from each other in Figure 64 above.

4. To install a new lamp, reverse the last three steps, **being careful not to tighten the set screw in the aluminum housing so hard that it damages the lamp**. The set screw should just be snug with very little torque.

Probe Cleaning

The probe needs to be cleaned from time to time, as it will collect coating and other particulates.

To clean the probe:

1. First move the probe out to the end of the arm to rotate it upward. See the following examples.

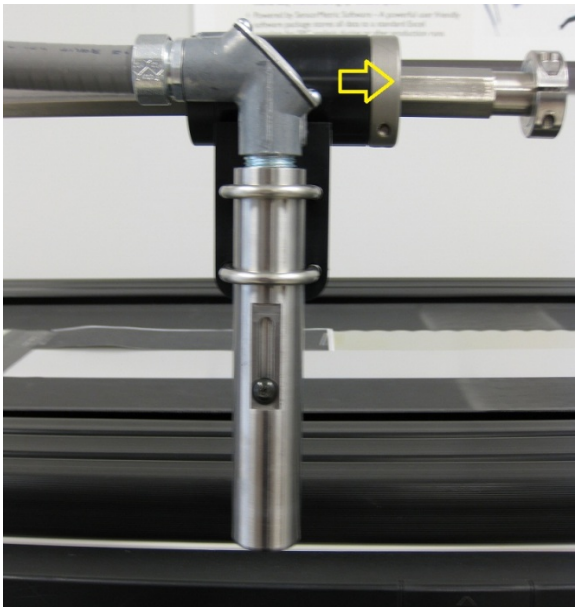


Figure 35 - Probe adjustment 2

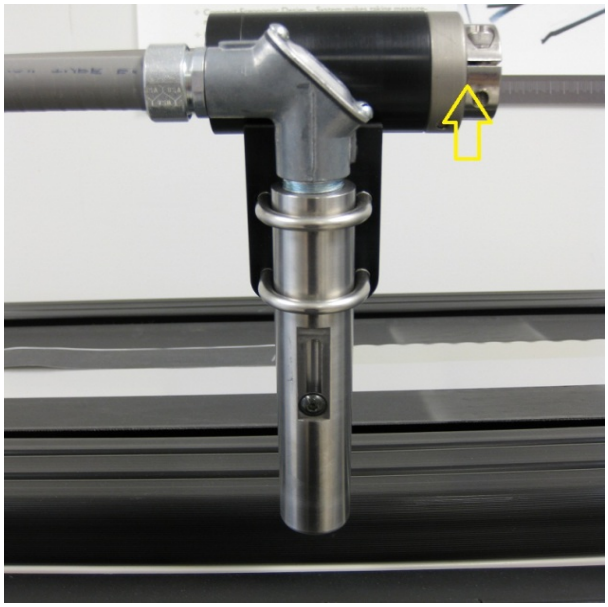


Figure 36 - Probe adjustment 2

2. Now rotate the probe up and move it back to keep it in that position.

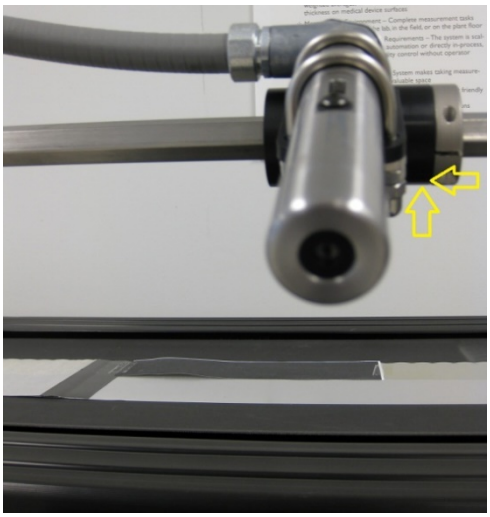


Figure 37 - Rotated probe

3. After the probe is in a position that the end can be viewed, the glass lens can be cleaned.

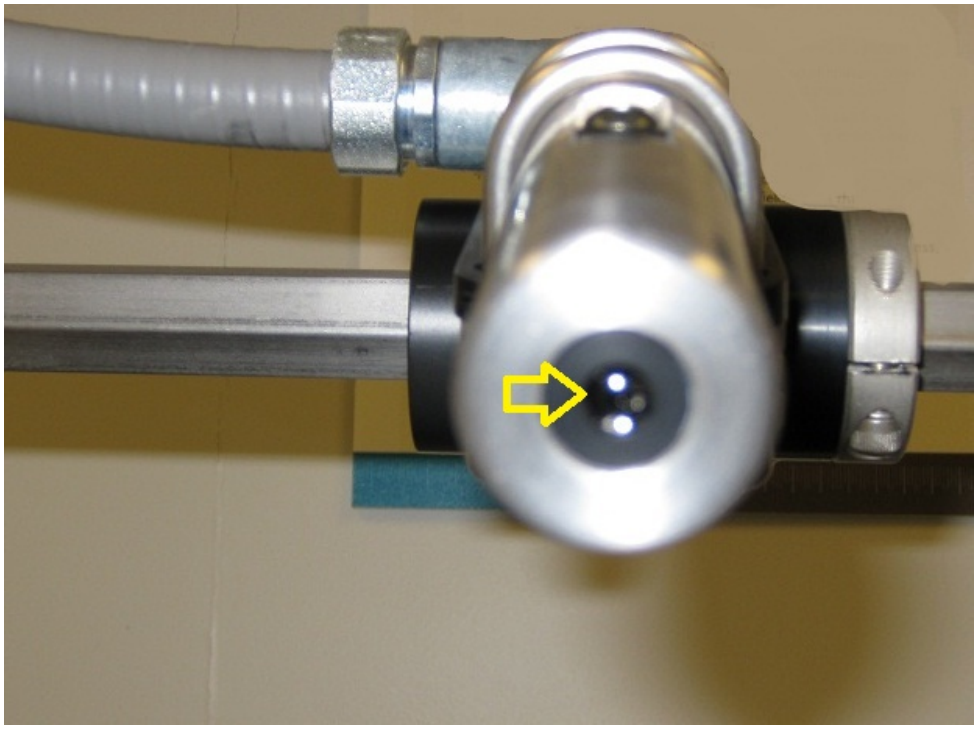


Figure 38 - Probe lens

4. To clean the lens, use a cotton swab or other soft cloth that has been dipped in a cleaning solution such as Acetone or MEK.

Figure 40 - Cotton swabs for probe cleaning

Figure 39 - Acetone

General Maintenance Checklist

1. Check all electrical connectors to ensure proper connectivity
2. Ensure all power buttons/switches are functional
3. Check keyboard is functional and that all keys are in place
4. Check touch screen is operational
5. Verify the Window operating system starts correctly
6. Start each software package and verify correct functionality of lamps and measurements
7. Visually inspect system for damage
8. Check all probes, Lab or In-line for damage
9. Clean probes if necessary
10. Clean filters
11. Check for any visual damage to cable conduit that is protecting fiber optical cables
12. Check for any heat related damage due to equipment placement near any ovens

Calibration

There is no requirement for calibration on individual coating standards on daily basis. A NIST traceable measurement coupon is provided to check the gauge's accuracy. A thickness verifier unit (TVU) can be supplied by Sensory Analytics and can be used to verify the calibration of the optics inside the unit.

Figure 41 - TVU

The calibration process is used to verify the calibration of optics inside the *SpecMetrix®* unit. The standard recommendation is to perform calibration at least once every 6 months, but the frequency can be higher depending on the internal quality requirements of specific plants. To verify calibration of the *SpecMetrix®* optical package and probe:

1. Take a Thickness Verification Unit (TVU) (*See Image at Right*) and place the probe head inside the TVU until it stops. Insert a battery into the location as shown in the image – this will turn on a rotating piece of film inside the TVU.
2. Turn on the *SpecMetrix®* software.
3. Select the appropriate NIST Recipe for the TVU.
4. Run the NIST recipe to make sure the values being read are within an acceptable tolerance range to the NIST traceable value shown on the TVU.

SpecMetrix® On-Line Support

To facilitate with any technical support needs that may arise, the *SpecMetrix®* unit includes provisions to connect remotely with support personnel at Sensory Analytics via the "TeamViewer" program. If the unit has an internet connection, establishing a remote connection with Sensory Analytics can be achieved by double clicking on the Team Viewer Support icon located on the desktop as shown below:

Figure 42 - Team Viewer icon

Clicking this icon will result in a pop-up window opening as shown below:

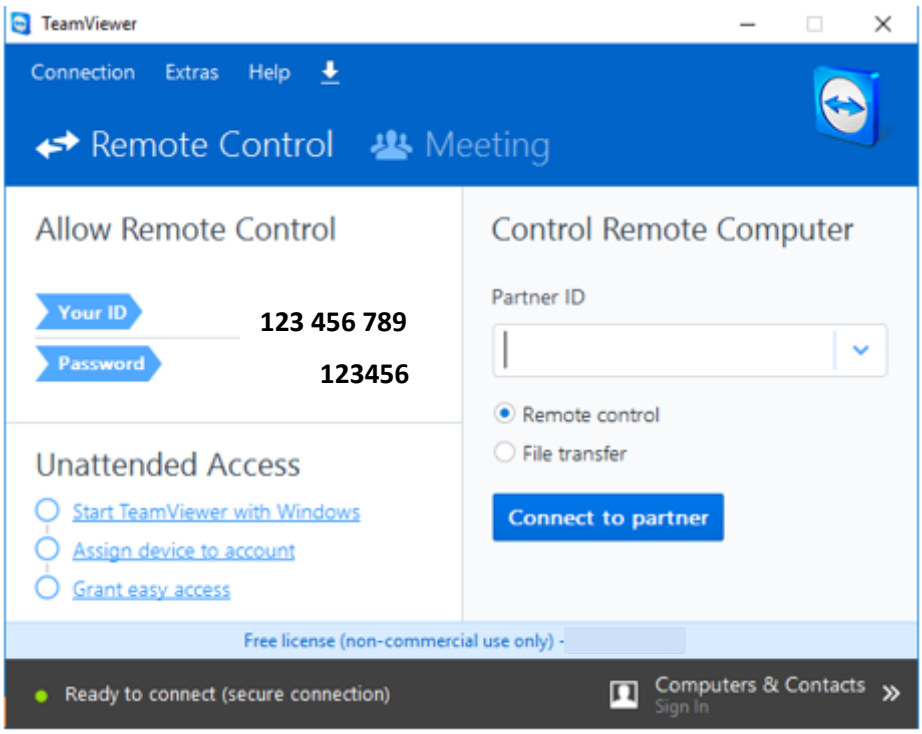


Figure 43 - Team Viewer Support Window

It is then necessary to contact Sensory Analytics with the 9-digit ID # as it appears in the Team Viewer Support window. This will allow the technical staff to remotely access the unit to assist with any operational needs.

We trust that the above information will be sufficient to meet your training and troubleshooting needs. However, in the unlikely case of any difficulties encountered in the operation of the SpecMetrix® software package, please contact your area representative for immediate service, or contact SpecMetrix® Technical Support at:

(336) 315-6090 or support@specmetrix.com