cScan+® Manual Unit MCS

Customer Product Manual
Part 1088963A02

Issued 08/09

For parts and technical support, call the
Finishing Customer Support Center at (800) 433-9319.

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Nordson

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Contact Us

Nordson Corporation welcomes requests for information, comments, and inquiries about its products. General information about Nordson can be found on the Internet using the following address: http://www.nordson.com.

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Change Record

Revision	Date	Change
A02	8/09	Updated software and procedures.
		Updated parts list.
		Added DOC.

cScan+® Manual Unit MCS

Safety

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to persons operating or servicing equipment.

Qualified Personnel

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

Intended Use

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

Regulations and Approvals

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed.

Personal Safety

To prevent injury follow these instructions.

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Relieve (bleed off) hydraulic and pneumatic pressure before adjusting or servicing pressurized systems or components. Disconnect, lock out, and tag switches before servicing electrical equipment.
- While operating manual spray guns, make sure you are grounded. Wear electrically conductive gloves or a grounding strap connected to the gun handle or other true earth ground. Do not wear or carry metallic objects such as jewelry or tools.
- If you receive even a slight electrical shock, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

Personal Safety *(contd)*

- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- Make sure the spray area is adequately ventilated.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.

High-Pressure Fluids

High-pressure fluids, unless they are safely contained, are extremely hazardous. Always relieve fluid pressure before adjusting or servicing high pressure equipment. A jet of high-pressure fluid can cut like a knife and cause serious bodily injury, amputation, or death. Fluids penetrating the skin can also cause toxic poisoning.

If you suffer a fluid injection injury, seek medical care immediately. If possible, provide a copy of the MSDS for the injected fluid to the health care provider.

The National Spray Equipment Manufacturers Association has created a wallet card that you should carry when you are operating high-pressure spray equipment. These cards are supplied with your equipment. The following is the text of this card:

WARNING: Any injury caused by high pressure liquid can be serious. If you are injured or even suspect an injury:

- Go to an emergency room immediately.
- Tell the doctor that you suspect an injection injury.
- Show him this card
- Tell him what kind of material you were spraying

Injection in the skin is a serious traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the bloodstream.

Consultation with a plastic surgeon or a reconstructive hand surgeon may be advisable.

The seriousness of the wound depends on where the injury is on the body, whether the substance hit something on its way in and deflected causing more damage, and many other variables including skin microflora residing in the paint or gun which are blasted into the wound. If the injected paint contains acrylic latex and titanium dioxide that damage the tissue's resistance to infection, bacterial growth will flourish. The treatment that doctors recommend for an injection injury to the hand includes immediate decompression of the closed vascular compartments of the hand to release the underlying tissue distended by the injected paint, judicious wound debridement, and immediate antibiotic treatment.

Fire Safety

To avoid a fire or explosion, follow these instructions.

- Ground all conductive equipment. Use only grounded air and fluid hoses. Check equipment and workpiece grounding devices regularly. Resistance to ground must not exceed one megohm.
- Shut down all equipment immediately if you notice static sparking or arcing. Do not restart the equipment until the cause has been identified and corrected.
- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Do not heat materials to temperatures above those recommended by the manufacturer. Make sure heat monitoring and limiting devices are working properly.
- Provide adequate ventilation to prevent dangerous concentrations of volatile particles or vapors. Refer to local codes or your material MSDS for guidance.
- Do not disconnect live electrical circuits when working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.

- Shut off electrostatic power and ground the charging system before adjusting, cleaning, or repairing electrostatic equipment.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

Halogenated Hydrocarbon Solvent Hazards

Do not use halogenated hydrocarbon solvents in a pressurized system that contains aluminum components. Under pressure, these solvents can react with aluminum and explode, causing injury, death, or property damage. Halogenated hydrocarbon solvents contain one or more of the following elements:

Element	Symbol	Prefix
Fluorine	F	“Fluoro-”
Chlorine	Cl	“Chloro-”
Bromine	Br	“Bromo-”
Iodine	I	“Iodo-”

Check your material MSDS or contact your material supplier for more information. If you must use halogenated hydrocarbon solvents, contact your Nordson representative for information about compatible Nordson components.

Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out system electrical power. Close hydraulic and pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the system.

Disposal

Dispose of equipment and materials used in operation and servicing according to local codes.

cScan+ Manual Unit MCS Software License Agreement

The MCS Software is furnished subject to the terms and conditions of this license.

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Manufactured under US Patent Number 6,674,533.

Description

Introduction

The MCS is a portable, bench-top measuring instrument for thickness coatings on product samples. The MCS consists of a computer with a touch screen monitor, a can stand, and a 12 VDC power supply.

Figure 1 cScan+ Manual Unit MCS

How Does it Work

The MCS uses an internal light source and spectrometer to apply and collect optical signals from the sample's surface. By using a patented algorithm, the MCS can evaluate the behavior of the light and accurately measure the sample's coating thickness.

See Figures 2 and 3. To measure the thickness, the spectrometer looks at the initial reflection off the coating surface, the rate of refraction (how the light bends as it penetrates through the coating and reflects off the substrate), and the interference wave between the first reflection and the second reflection.

Figure 2 Light Applied to Sample Can

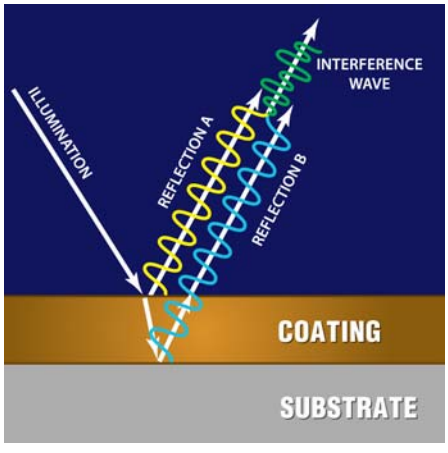


Figure 3 Interference Model

System Components

Component	Description
Computer	• Contains a touch screen monitor and an external keyboard with a touch pad mouse • Includes an internal spectrometer and light source • Proprietary software installed prior to delivery
Spectrometer	• An optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum • Installed prior to delivery
Light Source	• Based on a shine through principle, the light is focused through a small aperture providing a single optical path of penetrating light • Installed prior to delivery
Fiber Optic Cables	• SMA 905 connector • Selected fiber optic probe is used to couple light to and from the sample surface • Available as standard or self referencing
Manual Can Stand	• Holds the test sample perpendicular to the incident beam of light
Power Supply	• External, 12 VDC

Installation

Keyboard Connections

See Figure 4. The keyboard connects on the right side of the computer. Match the color coded PS/2 connectors or use the USB port if the keyboard has a USB connector.

Figure 4 MCS Computer Connections

Connecting the Hardware

NOTE: Use the tools provided with the MCS to assemble the hardware.

1. See Figure 5. Mount the probe to the can stand.

Figure 5 Manual Can Stand with Cable

2. Use the connections on the side of the computer (shown in Figure 6) to install the probes.
   a. The self referencing probe will have three connectors labelled *Light Source 1* (1), *Light Source 2* (2), and *Read Fiber* (3). Figure 6 shows where to plug in each cable.
   b. The standard probe only has two connectors and will only use the first 2 connections shown in Figure 6.

Figure 6 MCS Probe Connections

Connecting Power Source

See Figures 7 and 8 to connect the MCS computer to the 12 VDC power supply.

Figure 7 12 VDC Power Supply

Figure 8 MCS Power Supply Connection

Cold Start

1. See Figure 9. Turn the power on by using the power button on the side of the computer.
2. See Figure 10. Turn on the MCS computer by pressing the power button on front of the computer in the upper left corner. The LED will light green to show power is on.

Shutdown

NOTE: Nordson recommends closing all programs running on the MCS computer before shutting the system down.

1. The user can shut down the MCS computer like any other computer using the *Start* menu.

   NOTE: See Figure 10. If this option is not available, the user can press and hold the power button on the front of the computer until the green LED light turns off.
2. See Figure 9. Turn off the power button on the side of the computer.

Figure 9 Power Supply Switch on the MCS

Figure 10 MCS Power Switch

Operation

Software Startup

Once the MCS system is powered on using the *Cold Start* section on Page 8, the user can open the MCS software by double clicking the MCS software icon.

Using the Can Stand

Use the adjustment lever on the can stand to move the probe aside to make room for the can to be placed or removed from the measuring platform. Use the same lever to move the probe over the area to be measured. Position the probe approximately 1/8-in (3 mm) away from and perpendicular to the sample point on the substrate.

User Login

Security Levels

The MCS has three different security levels for operators. See Table 1.

Table 1 Operator Security Levels

Level	Description
Operator	• Lowest level of access • Access limited to *Results, Spectral Data, Thickness Data, and Contour Map* tabs • Will not have access to add or adjust part parameters or any other data
Manager	• Second highest level of access • Access to all tabs listed under Operator level • Access to *Part Info* tab
Administrator	• Highest level of access • Access to all tabs and screens • Ability to add and delete operators under the *Security* tab

Log In

NOTE: When logging in for the first time, the operator will have an opportunity to set an individual and unique password. The default Administrator password is *admin*.

1. Once the computer has been turned on, double click on the MCS icon on the desktop to execute the software.
2. A window for *Operator Entry* will appear on the screen to allow the user to log in. Use the drop down menu to select the correct user name, type in the password, and select *Login.*

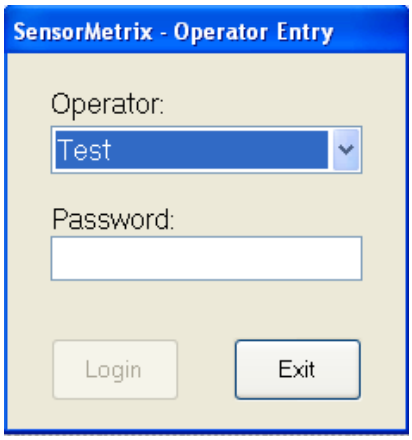


Figure 11 Login Window

Security Screen

Use Figure 12 and Table 2 to navigate through the options available through the *Security* tab.

NOTE: The user must have an administrative security level to access the *Security* tab.

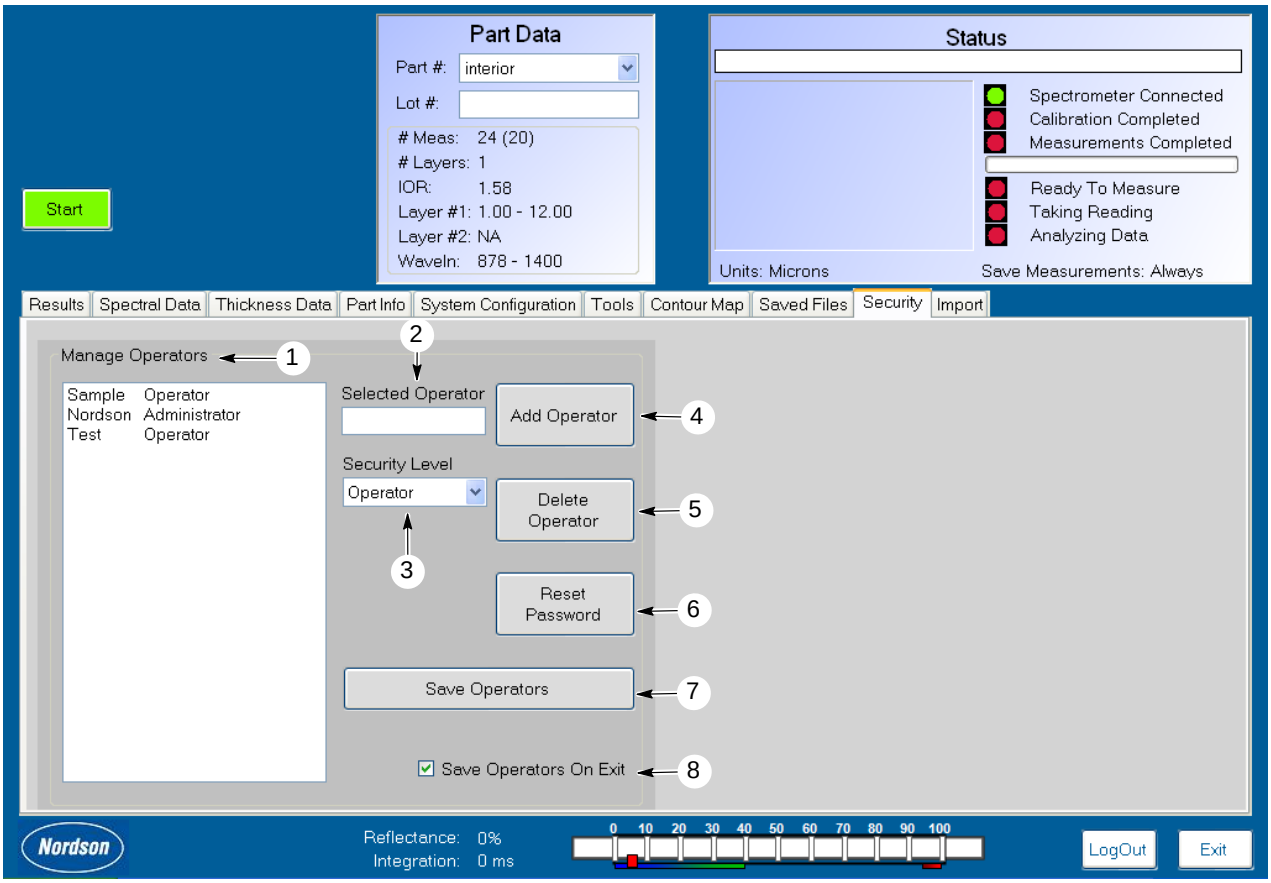


Figure 12 Security Screen

Table 2 Security Fields

Item	Field Name	Description
1	Manage Operators	Lists all the operators available for selection.
2	Selected Operator	Displays the operator selected for the current action.
3	Security Level	Assigns the appropriate security level for the selected user.
4	Add Operator	Adds the operator typed into the *Selected Operator* field.
5	Delete Operator	Deletes the operator typed into the *Selected Operator* field.
6	Reset Password	Resets the password of the selected operator.
7	Save Operators	Saves all changes made to operators.
8	Save Operators on Exit	Automatically saves changes made, in case the *Save Operators* command was not selected. If this box is unchecked, then any changes will be lost if the user does not select *Save Operators* after the action.

Initial Setup

The following procedures are to be used when configuring the MCS for the first time or when a new part and part parameters need to be added or edited.

The user must have an Administrative security level to perform these procedures.

Adding and Editing Parts and Parameters

See Figure 13 and Table 3. Complete the fields for each individual part under the *Part Info* tab. When all fields are complete for a part, select the *Update Part* button to save the settings.

To edit a previously entered part and its parameters, use the *Part Name* scroll box to select the correct part, edit the fields, and select the *Update Part* button.

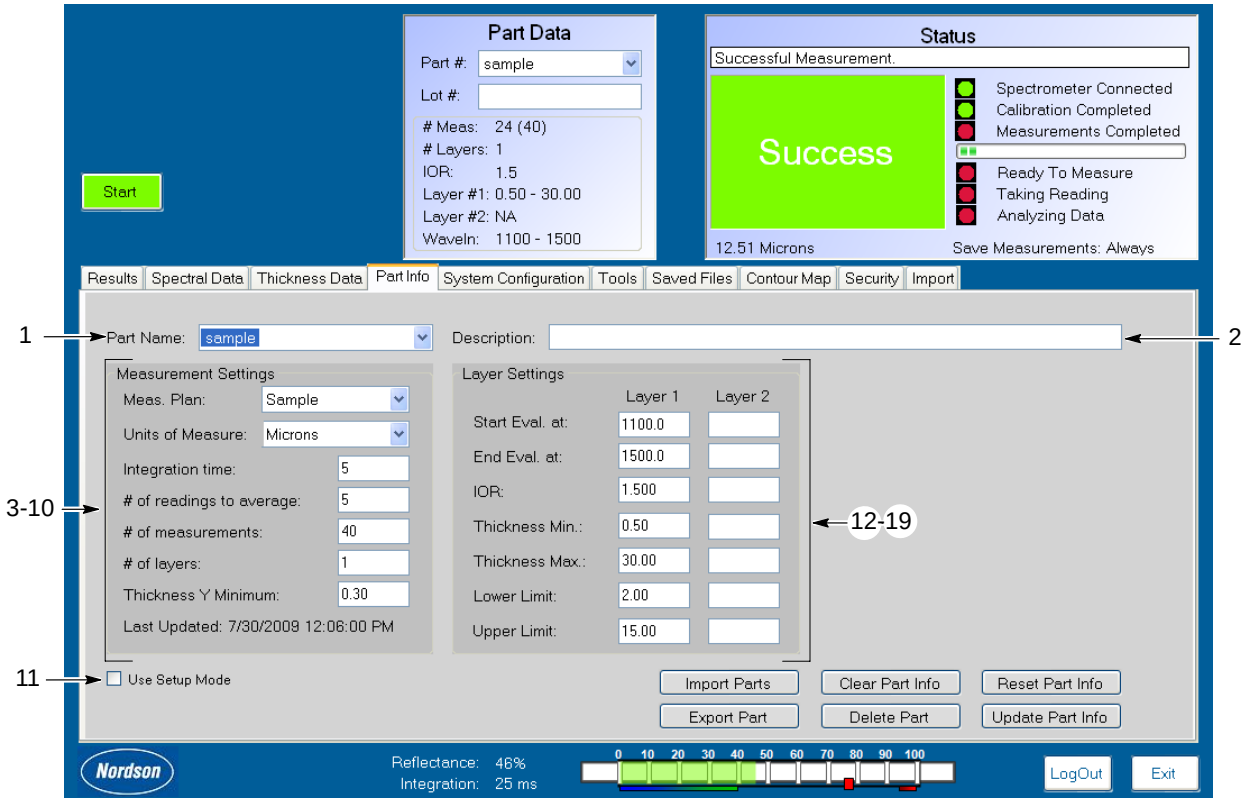


Figure 13 Part Info Tab

Table 3 Part Info Fields

Item	Field Name	Description
1	Part Name	The unique name for each part for both user and the computer to identify the part and all its preset part parameters.
2	Description	The user can use this field to add any additional information that will help operators to identify individual parts.
3	Measurement Settings	This group of fields contains info unique to the individual part.
4	Measurement Plan	Only to be used if the operator would like to see a contour map with results. The specific parameters for the contour map can be edited under the *Tools* tab.
5	Units of Measure	Selects the desired measuring units: mils, microns, nanometers, mg/in^2, mg/4 in^2, g/m^2, and mg/cm^2. Conversions listed below- 1 mil = 25.4 microns = 25400 nanometers 1 micron = 1000 nanometers = 0.0393 mils 1 nanometer = .001 microns = 0.000393 mils
NS	Thickness to Weight Conversion	Panel enabled if the selected *Units of Measure* is in square units. The user will need to fill this section out correctly for the computer to convert units accurately. Once the correct conversion factor is in place, the computer will automatically display measurements in the chosen units.
6	Integration Time	The time in milliseconds the spectrometer detectors will use to gather light data. For highly reflective surfaces, the integration time will be lower, so the detectors are not saturated by light. For lower reflective surfaces the integration time will be higher to ensure the detector can obtain a reading. Typical ranges for integration time are: 2 ms - 10 ms for MCS-1 5 ms - 100 ms for MCS-2 **Note:** The light intensity and the distance of the fiber optic cable to the part surface can also affect the detectors.
7	Number of Readings to Average	The number of readings the spectrometer will take to get an average before evaluation. This aids the computer with the signal to noise ratio or any ambient light interrupting the reading. Value is normally set to 5.
8	Number of Measurements	The number of measurements that will be taken by the operator on an individual part. No upper limit applies. **Note:** If using a contour map, this number should equal the number of rows multiplied by the number of columns.
9	Number of Layers	This is the number of coatings to be measured off the surface of the part. The MCS can measure up to two coatings, as long they each have a unique index of refraction. This number should be set to 1 if there is only one coating on the part's surface.
10	Thickness Y Minimum	This is the minimum signal strength of the *Thickness* peak that is needed to keep it from being considered a noisy peak. Suggested Value - 0.30
11	Use Setup Mode	Allows the user to take as many or as few readings as needed without being confined to the *Number of Measurements*. This allows the user to experiment without having to restart the measurement series. Any results and part parameter changes will not be saved in this mode.

Item	Field Name	Description
12	Layer Settings	This group of fields contains the information specific to each layer of coating on the part's surface. Two columns are provided if the part has a second layer of coating.
13	Start Evaluation at	The starting wavelength for the interference evaluation range. The value (λ_1-nm) should be as close to the beginning of the interference modulation as possible. See the *Identifying Interference Evaluation Range* section on Page 15 for more information on interference evaluation ranges.
14	End Evaluation at	The ending wavelength for the interference evaluation range. The value (λ_2-nm) should be as close to the end of the interference modulation as possible. See the *Identifying Interference Evaluation Range* section on Page 15 for more information on interference evaluation ranges.
15	IOR Index of Refraction	This value is unique to a coating material and aids the MCS in determining how light reacts to the coating. Most can coating materials are between 1.58 and 1.62. The index of refraction is published for common materials or can be obtained from the coating's manufacturer. A refractometer can also measure the index of refraction.
16	Thickness Minimum	This is not a quality control limit. This value determines the thinnest layer that can be considered for analysis. The value should be as close to or at least within 50% of the expected coating thickness. Example: Expected Thickness - 10 microns Thickness Minimum - 5 microns It is recommended to have a thickness minimum of at least 1 micron for samples that do not have an expected layer thickness in the nanometric range.
17	Thickness Maximum	This is not a quality control limit. This value determines the thickest layer that can be considered for analysis. The value should be around 1.5 times the upper control limit. Example: Upper Control Limit - 10 microns Thickness Maximum - 15 microns
18	Lower Limit	This is a quality control limit. Any measurement that falls below this point will trigger a failed reading, and will display the measurement in the color red under the results data.
19	Upper Limit	This is a quality control limit. Any measurement that falls above this point will trigger a failed reading, and will display the measurement in the color red under the results data.
NS: Not Shown		

Identifying Interference Evaluation Ranges

To correctly enter the *Start* and *End Evaluation* fields shown in Figure 13 and described in Table 3, the user will need to correctly identify and select the interference range as precisely as possible. The user can view the interference range under the *Spectral Data* tab after a measurement has been taken (see *Taking a Measurement* on Page 29).

The MCS's spectrometer can collect reflectance information over wavelengths from 250 nm to 1100 nm.

NOTE: The wavelength range for the MCS-2 is 877 nm to 1713 nm.

Figures 14 - 16 show a few examples of an interference evaluation range. An interference modulation wave usually appears in the form of a damped sine wave.

Please note that these examples are for the MCS-1 spectrometer, so the wavelength region will be different for a MCS-2 spectrometer (between 877 nm and 1713 nm).

NOTE: Although identifying an interference evaluation range is not a complex procedure, Nordson recommends that these part parameters be set by Nordson trained operators.

Easily Recognizable Interference Spectrum

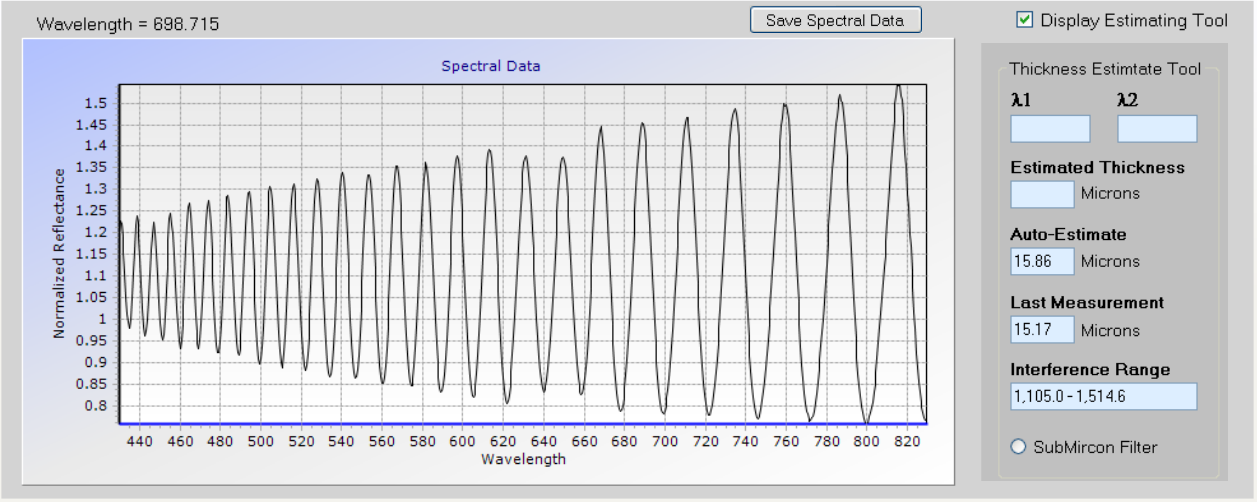


Figure 14 Interference between 430 nm and 830 nm

Slightly Complex Interference Spectrum

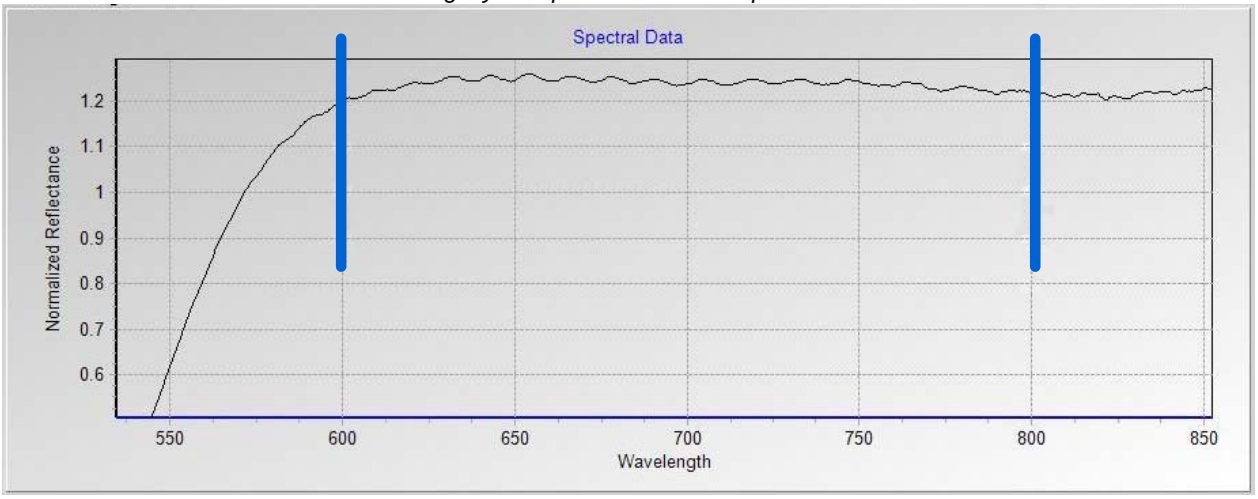


Figure 15 Interference between 600 nm and 800 nm

Identifying Interference Evaluation Ranges *(contd)*

More Complex Interference Spectrum

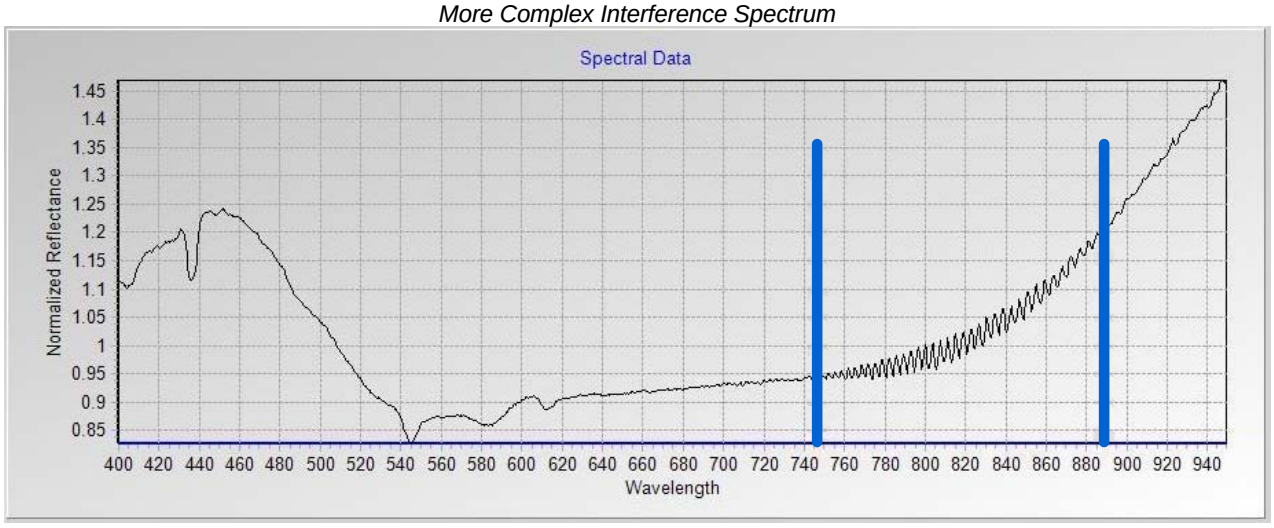


Figure 16 Interference between 745 nm and 890 nm approximately

Identifying the True Peak

Once the user has reviewed the interference evaluation range, then the thickness peak must be evaluated under the *Thickness Data* tab.

The thickness peak will be easy to identify when the *Thickness Minimum* (shown in Figure 13 and described in Table 3) is chosen correctly, there is good reflectance, and the coating material suits other optical properties. Figure 17 shows only one peak, making the true thickness peak very easy to identify.

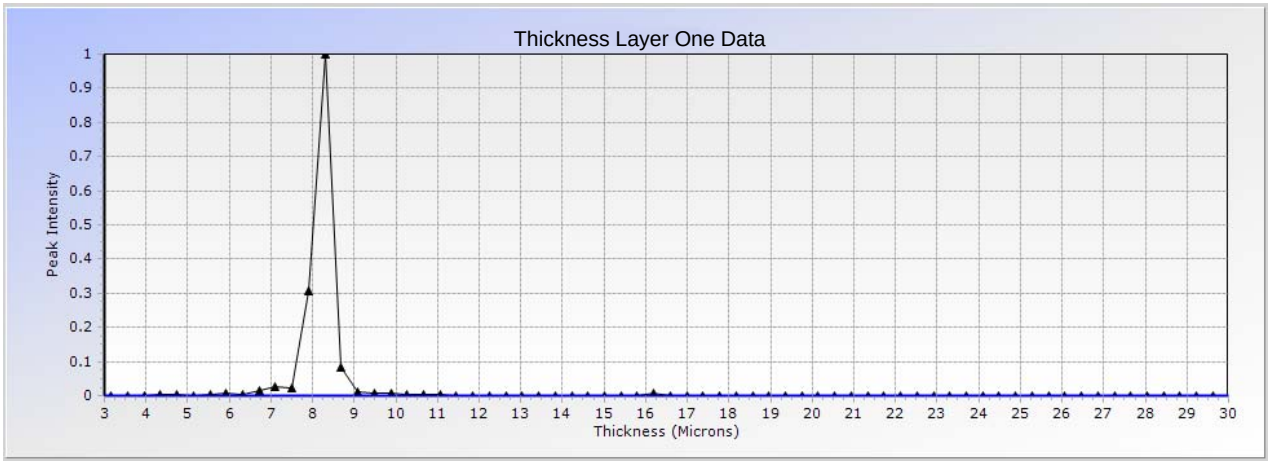


Figure 17 Easily Recognizable Thickness Peak Example

Identifying the True Peak *(contd)*

When coatings do not produce a well defined interference, the thickness peak is not as pronounced.

In Figure 18 the thickness spectrum is for a 9.25 microns sample. The *Thickness Minimum* was set at 1 micron which manages to include the false peak. In this instance, the false peak was the result of noise associated with taking the measurement in an unsuitable environment. The results yielded the thickness value as 1.25 microns (false peak) instead of 9.25 microns (true peak).

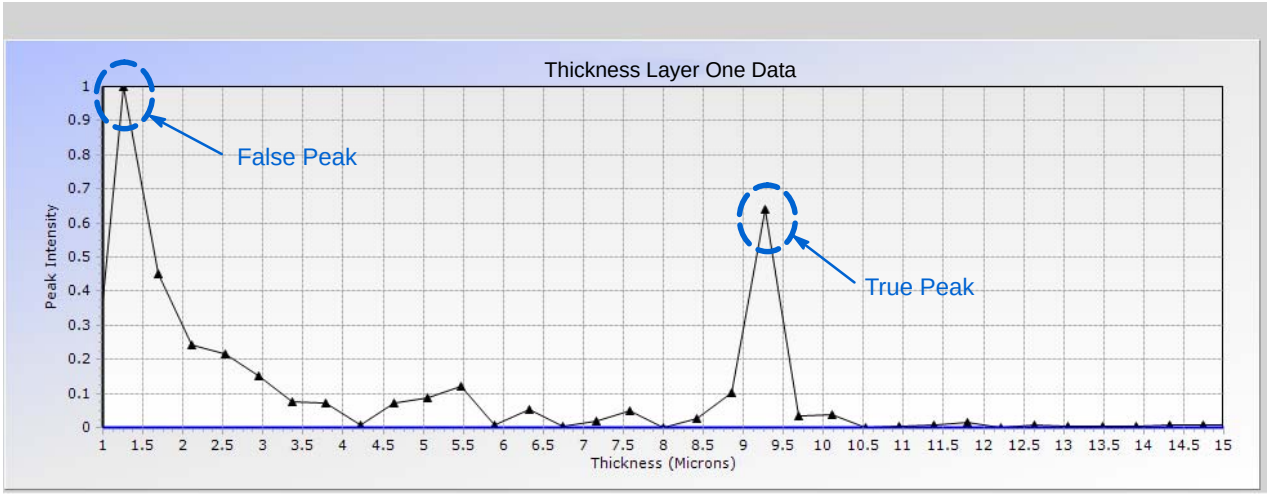


Figure 18 Thickness Data Spectrum with a False Peak and the True Peak

By going back and changing the *Thickness Minimum* from 1 micron to 5 microns the true peak becomes apparent as shown in Figure 19. Noisy frequencies usually appear at the beginning of the thickness spectrum, which makes correctly setting the *Thickness Minimum* more significant than the *Thickness Maximum.*

> **NOTE:** If the user is still uncertain what the *Thickness Minimum* should be set at, the *Thickness Estimate Tool* can assist the user further. See Page 18 for more information on the *Thickness Estimate Tool*.

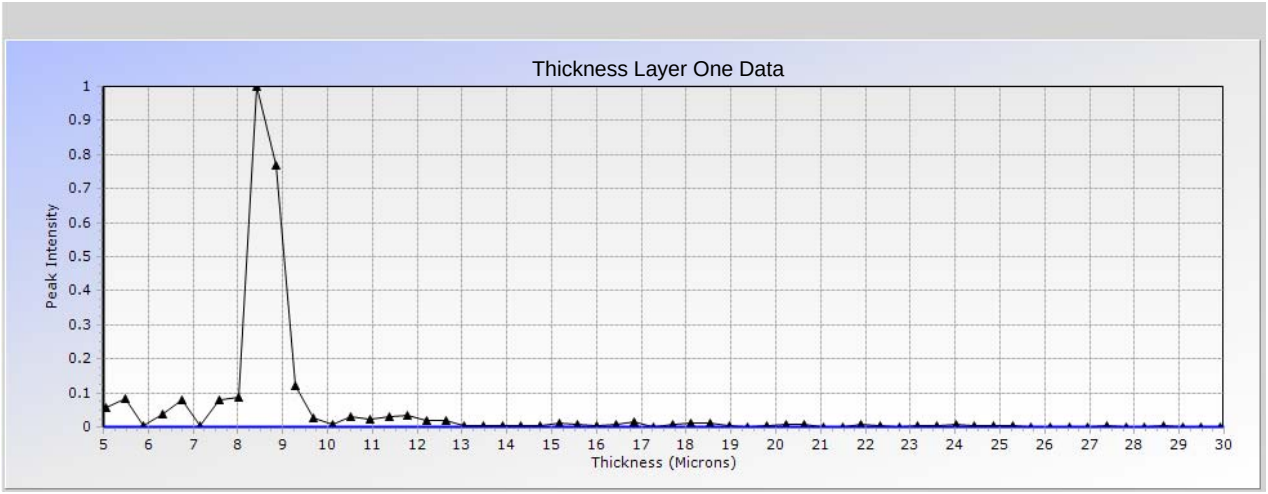


Figure 19 Clean Unambiguous Thickness Data Spectrum

Thickness Estimate Tool

If the user does not have a good estimate of the coating thickness, it may be harder to pick out the true peak in order to adjust the *Thickness Minimum*. The *Thickness Estimate Tool* can assist the user in finding the approximate thickness, which can prompt the user to correct part parameter settings as necessary.

Figure 20 shows an interference spectrum for a 28 microns thick coating, while Figure 21 shows the multiple peaks under the *Thickness Data* tab.

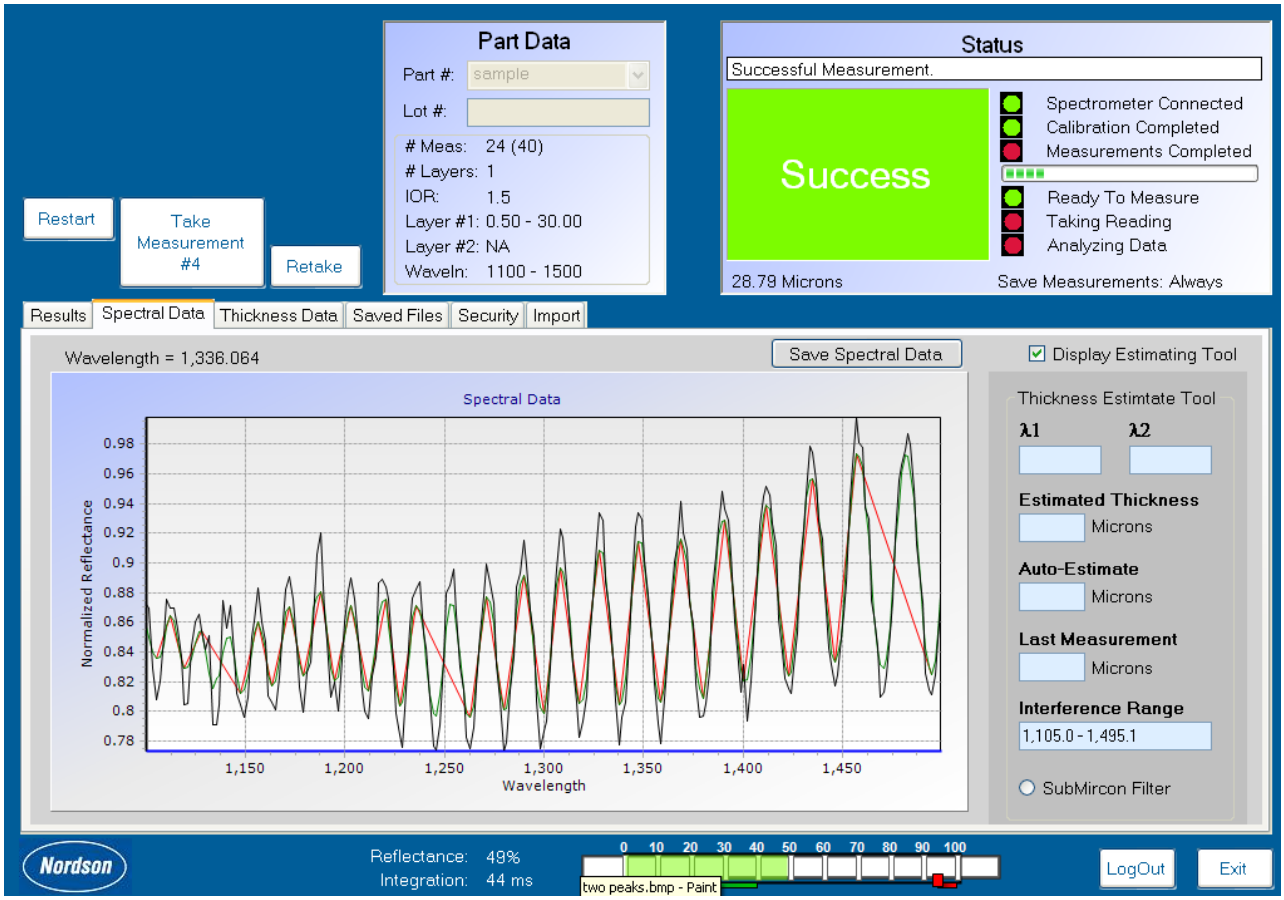


Figure 20 Interference Spectrum Displayed through Spectral Data Tab

Thickness Estimate Tool *(contd)*

The software automatically selects the strongest peak (peak with higher Y-value) as the desired peak and reports thickness which is not always from the true peak.

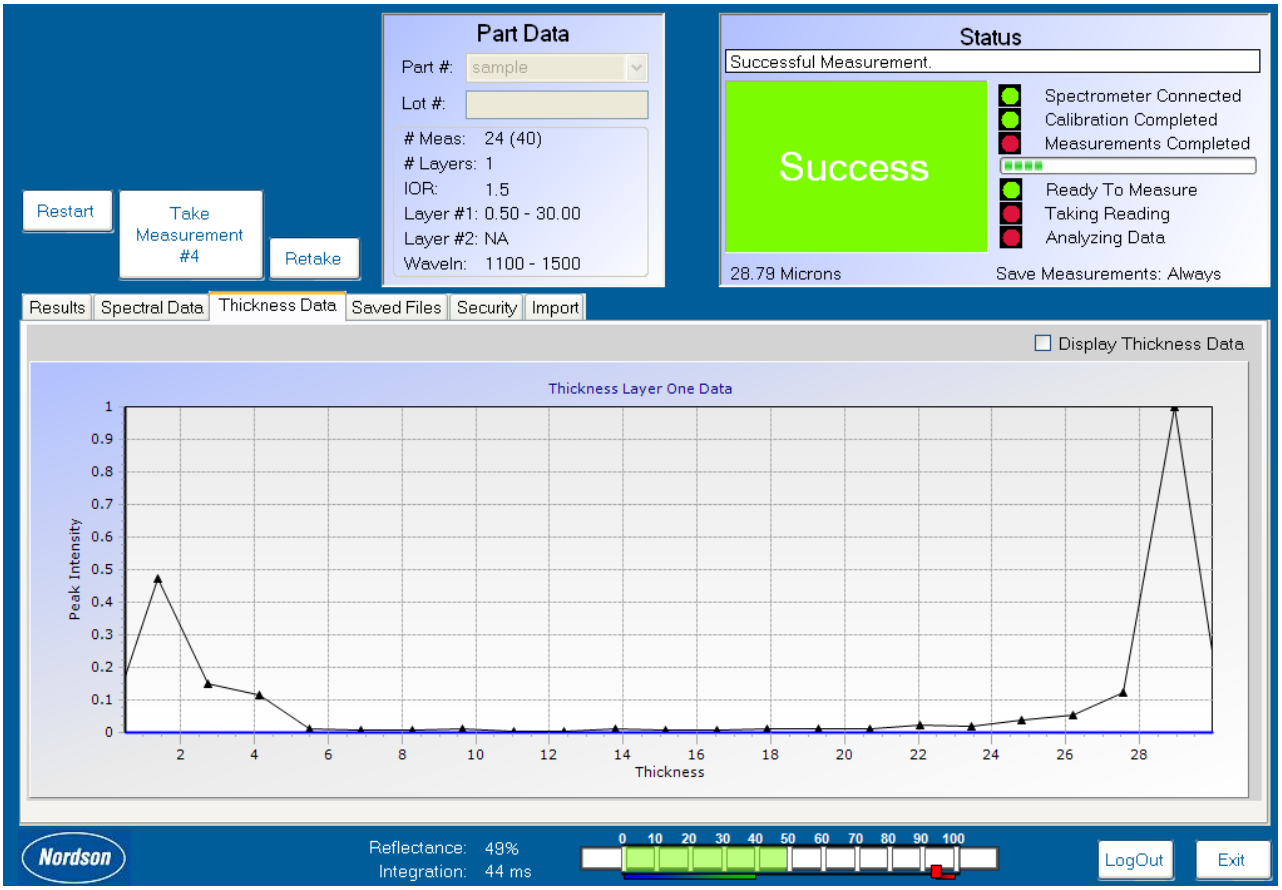


Figure 21 Thickness Data Tab Displayed

How to Use the Thickness Estimate Tool

See Figure 22.

1. Check the *Display Estimating Tool* box.
2. Choose any two adjacent cycles of the sine wave in the interference spectrum, then double click at the peak of the first cycle. The software will automatically populate λ_1 (1329.501 nm in Figure 22).

How to Use the Thickness Estimate Tool *(contd)*

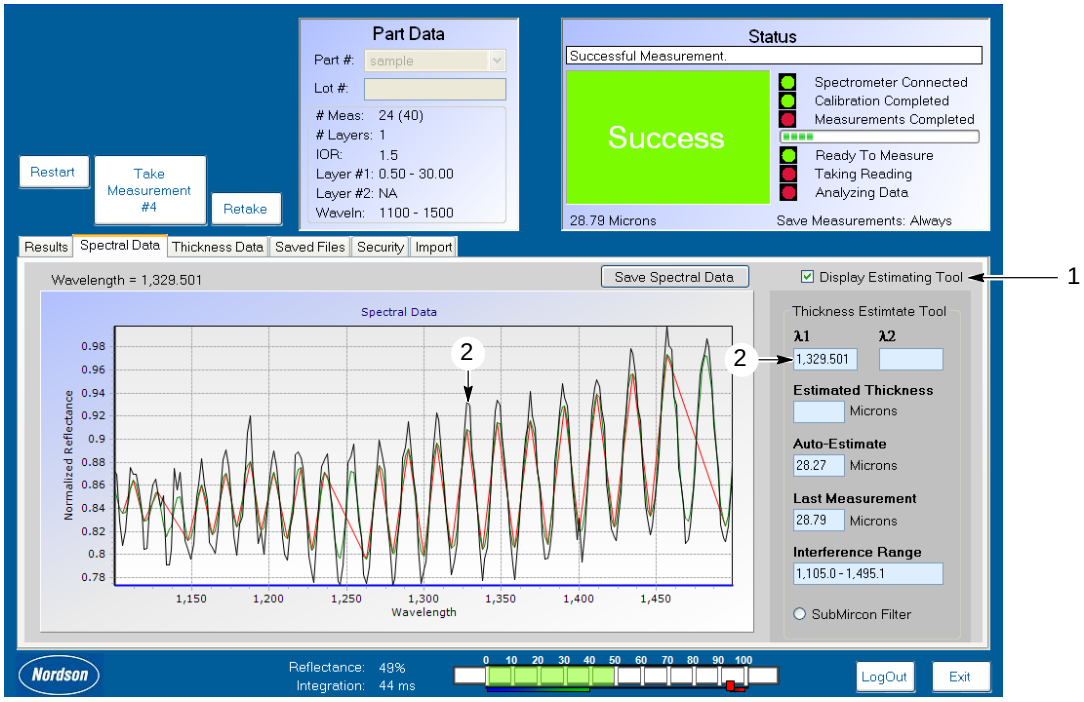


Figure 22 Sine Wave and λ_1 Displayed through Spectral Data Tab

3. Double click on the peak value of the second cycle and the software populates λ_2 (1349.132 nm in Figure 23).
4. Figure 23 shows the *Estimated Thickness* of 30.46 microns.

Figure 23 Sine Wave and λ_2 Displayed through Spectral Data Tab

5. By going back to the *Part Info* tab and changing the *Minimum Thickness* from 1 micron to 15 microns, the true peak is now apparent after the correction, as shown in Figure 24.

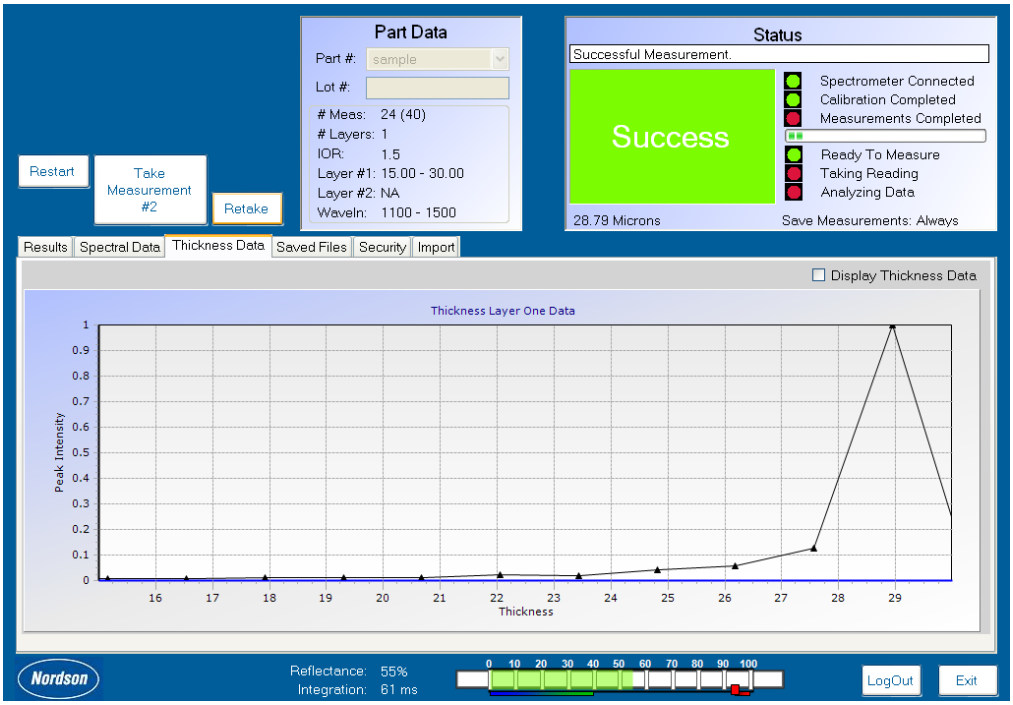


Figure 24 Thickness Data Tab Displayed with True Peak

System Configuration Settings

See Figure 25 and Table 4.

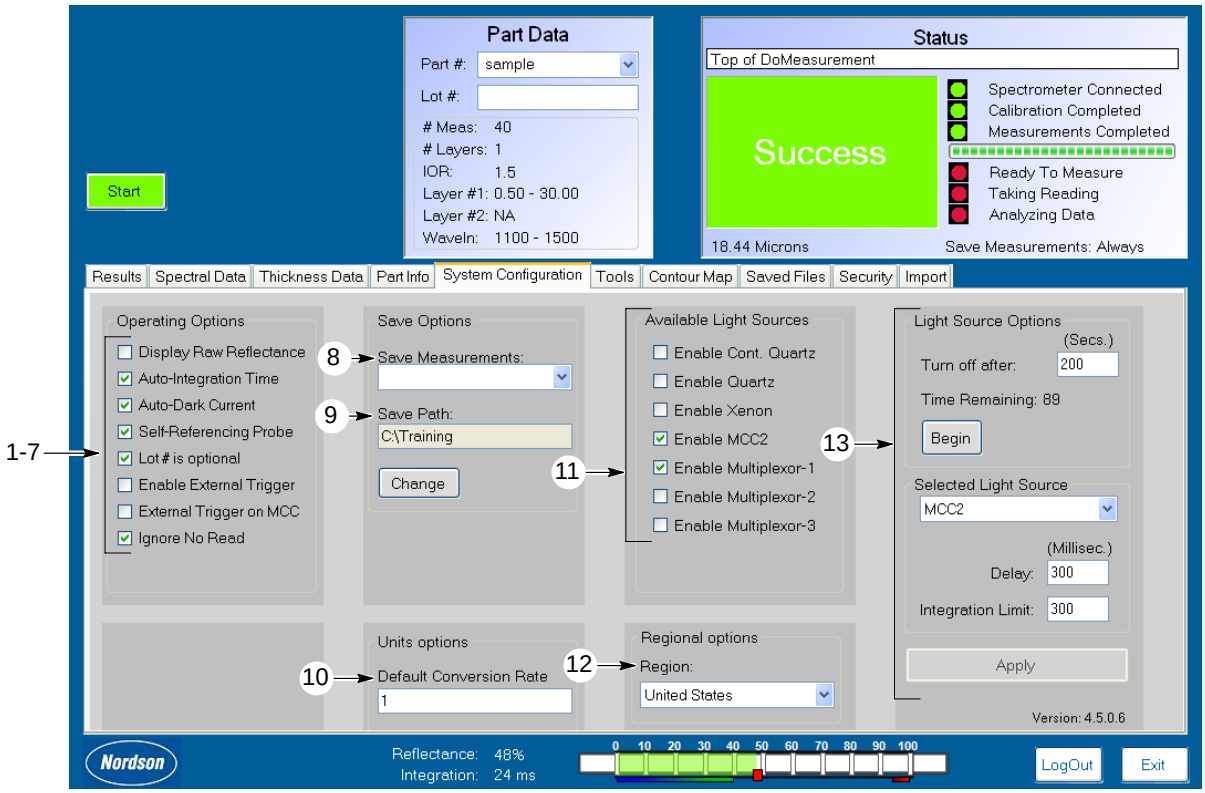


Figure 25 System Configuration Screen

Table 4 System Configuration Fields

Item	Field Name	Description
1	Display Raw Reflectance	Nordson recommends leaving this box unchecked as users will not typically need to view the raw reflectance.
2	Auto Integration Time	By checking this field, the system will automatically adjust the integration time if the reflectivity varies on different spots on the part's surface.
3	Auto Dark Current	This option will instruct the system to automatically take a dark current each time a reference measurement is taken. If this option is not selected, then the system holds the dark current taken when the software was first launched or the last time the *Calibrate* button was selected.
4	Self Referencing Probe	This option must be checked when using a self referencing probe. A self referencing probe has 3 fiber optic legs instead of 2, which eliminates the need for the *Reference Measurement* step.
5	Lot #	This option restricts a measurement series from being taken, unless the operator enters a lot number.
6	Enable External Trigger	This option is to be used if an external device is used to trigger a measurement instead of using the buttons on the computer screen.
7	Ignore No Read	The *No Read* message will not display when a measurement fails to be taken and the user will have to take the same measurement again.
8	Save Measurements	Choose whether measurements at the end of a run will automatically save, skip saving, or prompt the operator to choose to save or not to save.
9	Save Path	This is the path where saved data will be stored. Use the *Change* button to change the path.
10	Default Conversion	This factor is used to convert microns to msi. If the *Thickness to Weight Conversion* under the *Part Info* tab is left blank, then this default conversion number is used.
11	Available Light Source	This setting is configured before shipping and should not be changed. Figure 25 is shown with MCS-2 settings.
12	Region	If density is to be entered as *pounds/gallons*, then choose *United States*. If density is to be entered as *grams/litre*, then choose *Europe*.
13	Light Source Options	This is preset prior to delivery and should not be changed. Figure 25 is shown with MCS-2 settings.

Settings Under the Tools Tab

See Figure 26 and Table 5 for a description of the fields under the *Tool* tab screen.

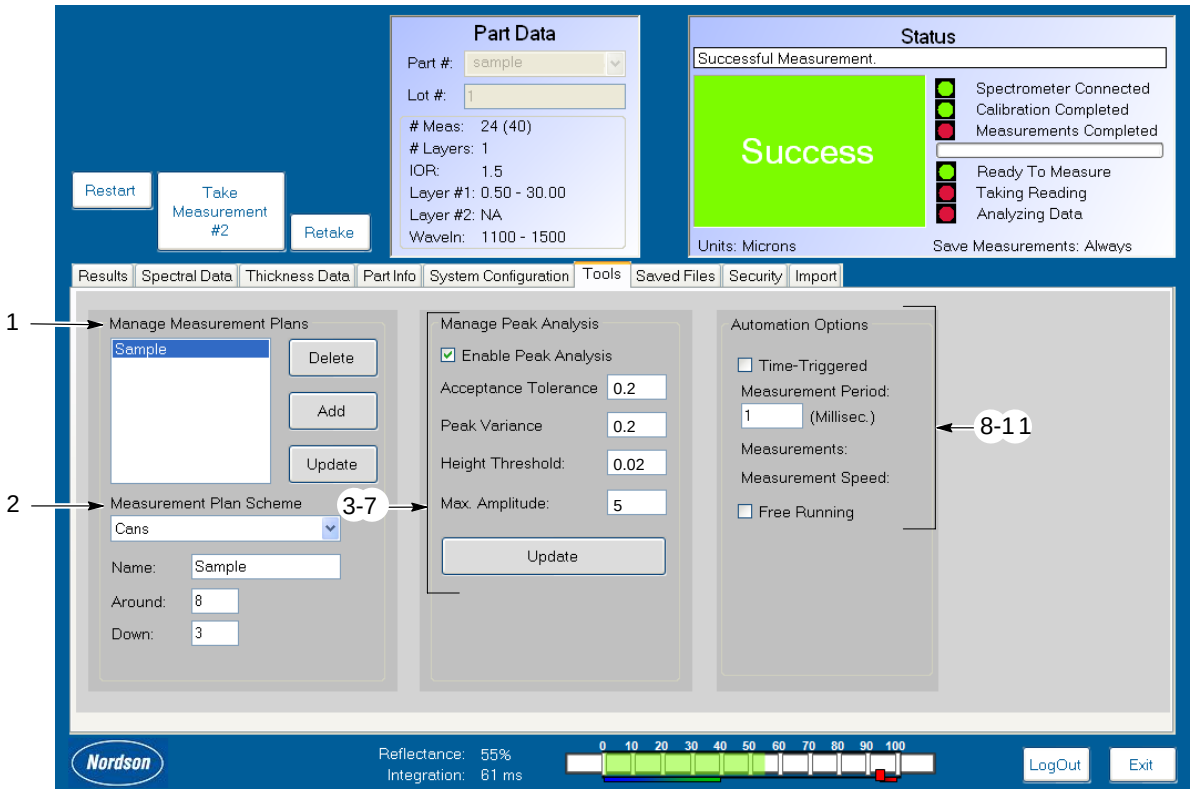


Figure 26 Tools Screen

Table 5 Tools Fields

Item	Field Name	Description
1	Manage Measurement Plans	This field is for setting up the specifications for the contour map. The number of columns will be entered in the *Around* field, and the number of rows will be entered in the *Down* field. Example: An entry of 2 *Around* and 3 *Down* will yield a contour grid with 6 readings of 2 columns and 3 rows. The software will not identify the location of the measurements on the sample, so users must note the locations on their own. See *Contour Maps* on Page 32 for more information on contour maps.
2	Measurement Plan Scheme	This field allows you to choose the basic shape of the part to be measured. The *Can* and *Sheet* option will still use *Around* and *Down* for the specifications, while the *Default* uses *Columns* and *Rows*.
3	Manage Peak Analysis	This determines how and when the software will automatically disregard noisy peaks and report a measurement value based on the most intense peak. If this option is disabled and there are multiple peaks, then the software will report a *No Read* warning and the user will need to adjust parameters accordingly.
4	Acceptance Tolerance	This number tells the software when to report a *No Read* warning when the *Peak Analysis* is enabled. Typical range is 0.2 - 0.6. By putting 0.5 in this field the software will report *No Read* only if there is a variation greater than 50% between the final estimated thickness according to the *Peak Analysis* and the thickness displayed by the software.
5	Peak Variance	The allowed difference from different peaks. Typical range is 0.2 - 0.6.
6	Height Threshold	This is the minimum height an interference wave must be to not be considered as noise. Height is the distance from the bottom point to the top point in an interference wave.
7	Maximum Amplitude	This is the figure that allows the software to determine unusually noisy peaks. The height from the lowest amplitude to the highest amplitude in an interference spectrum must fall below the set *Maximum Amplitude* number. If the height is above this set number, then the software identifies it as noise.
8	Automation Options	Not applicable with this system.
9	Time-Triggered	Not applicable with this system.
10	Measurement Period	Not applicable with this system.
11	Free Running	Not applicable with this system.

Saved Files Settings

To view previously saved spectral data, the user can browse through the directories under the *Saved Files* screen. For instructions on how to save spectral data from an individual measurement, see *Saved Data and Reports* on Page 34.

See Figure 27 and Table 6 to view the settings for saving spectral data.

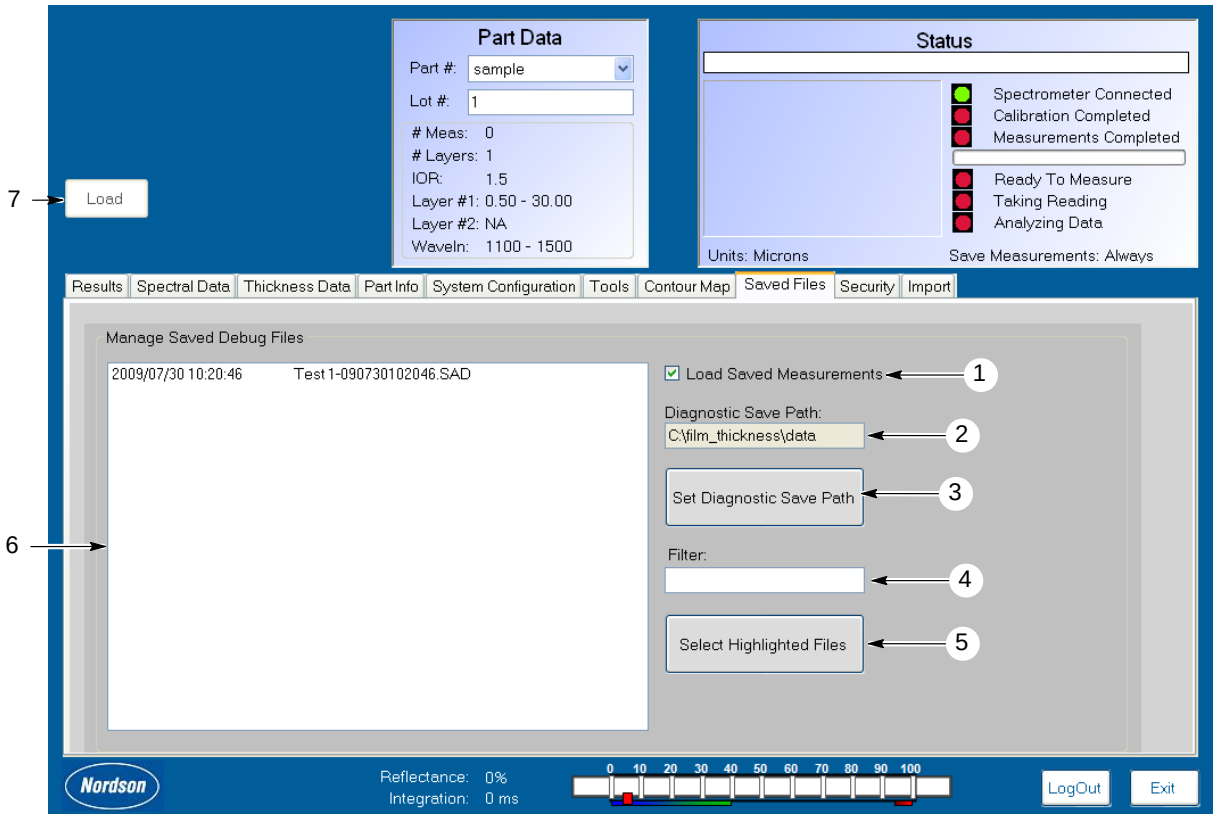


Figure 27 Saved Files Screen

Table 6 Saved Files Fields

Item	Field Name	Description
1	Load Saved Measurements	Checking this option changes the *Start* button to the *Load* button.
2	Diagnostic Save Path	Displays the directory of spectral data currently being viewed.
3	Set Diagnostic Save Path	Allows user to view all directories for spectral data files.
4	Filter	Helps navigate through files listed in the viewing window.
5	Select Highlighted Files	Readies the selected highlighted files from the viewing window for loading.
6	Viewing Window	Displays list of spectral data files from the *Diagnostic Save Path* location.
7	Load	After highlighting the desired files and clicking on the *Select Highlighted Files* button, the *Load* button will load the selected files for viewing.

Viewing Loaded Spectral Data

Spectral data is saved as a .SAD file by selecting the *Save Spectral Data* button under the *Spectral Data* tab after a measurement has been taken. Once the chosen files have been loaded through the *Saved Files* screen, the user can view the previously saved spectral data.

See Figure 28 for navigating through the selected files.

1. After loading the spectral files through the *Saved Files* screen, go to the *Spectral Data* tab and select *Load Measurement #1*.
2. The first file of spectral data will display. To view the next file, select *Load Measurement #2*.
3. Continue to select the *Load Measurement #* button to view all the selected spectral data files.

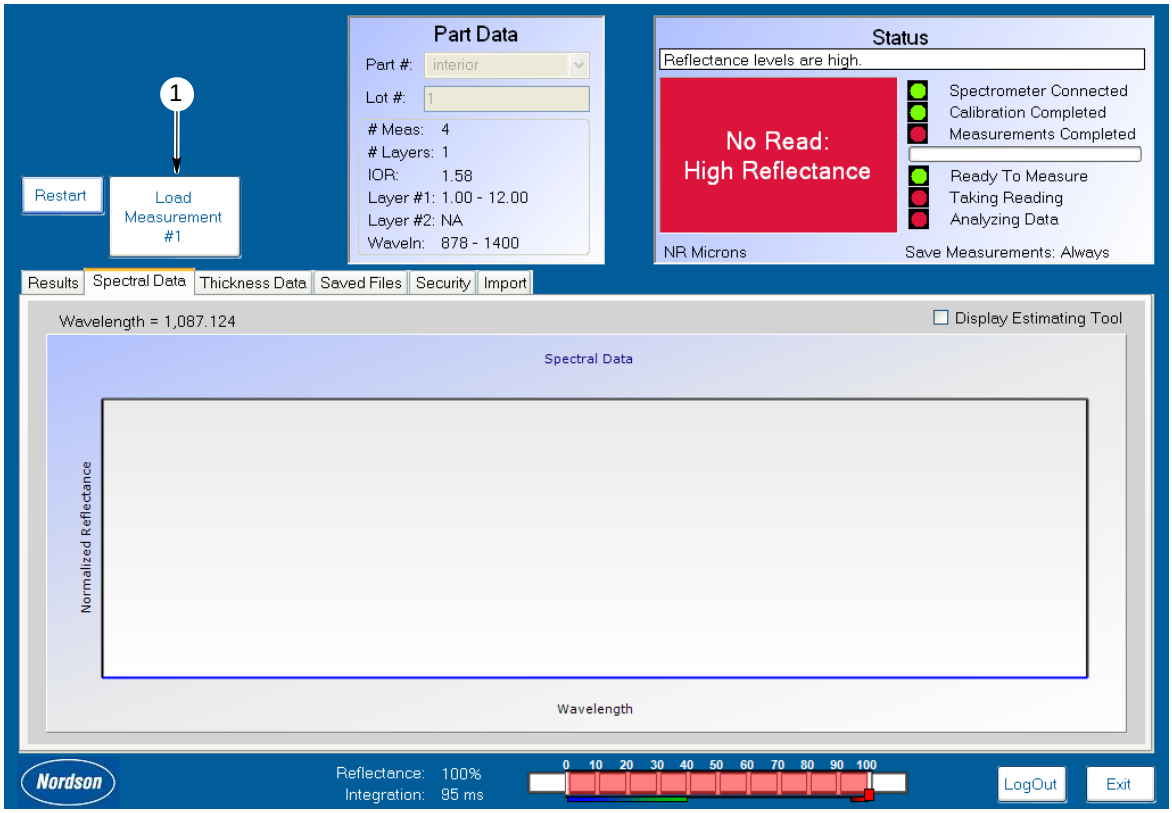


Figure 28 Load Measurement Screen

Settings Under the Import Tab

Under the *Import* screen, the user can import can recipes for a new part that has been previously saved into a directory. Can recipes are saved as .prt files.

Use Figure 29 and Table 7 to import recipes.

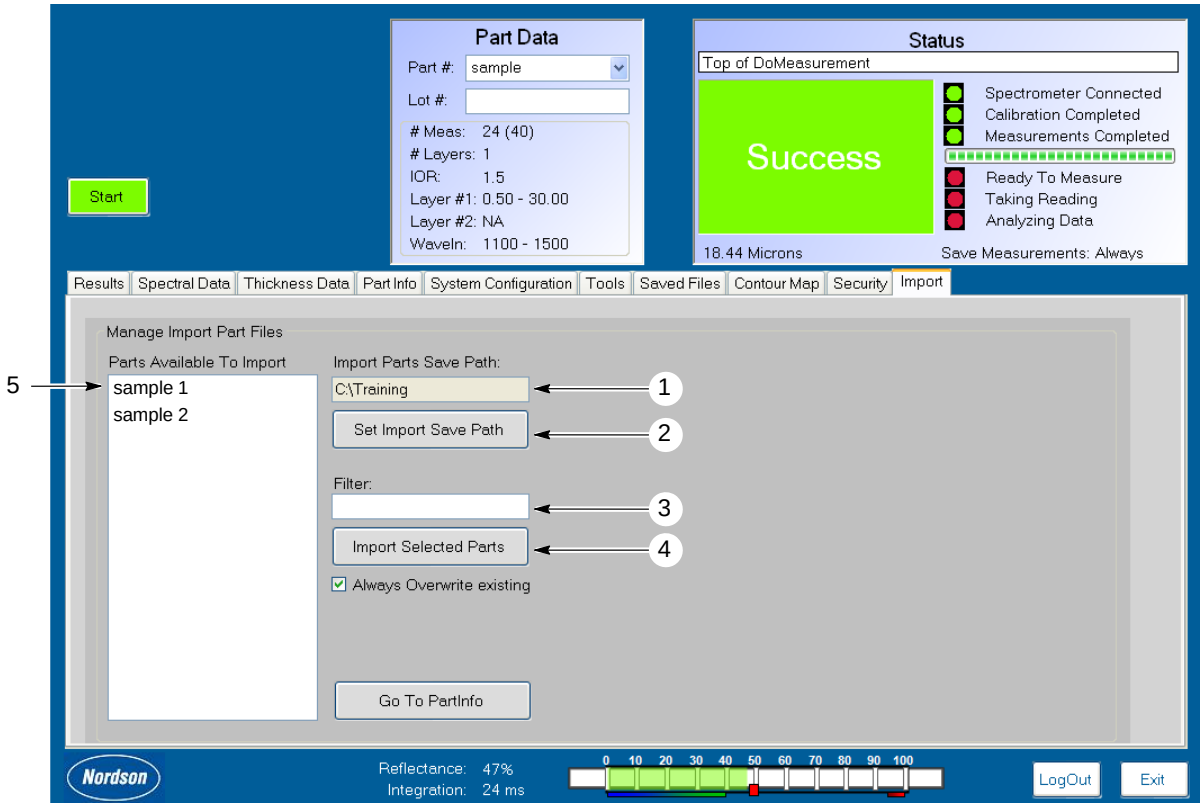


Figure 29 Import Screen

Table 7 Import Fields

Item	Field Name	Description
1	Import Parts Save Path	Displays the directory currently being viewed.
2	Set Import Save Path	Select this button to view a list of the available directories.
3	Filter	Helps navigate through files listed in the viewing window.
4	Import Selected Parts	Imports the selected can recipe highlighted in the *Parts Available to Import* viewing window.
5	Parts Available to Import	Displays the available can recipe .prt files in the selected directory.

Taking a Measurement

NOTE: Before an operator can take a measurement, all applicable parameters must have been previously set for the individual part. See the *Initial Setup* section on Page 12. The software contains some default part parameter settings which may not apply to the selected part.

NOTE: The operator name will be part of the file name used to store the report file.

Self Referencing Probe Procedure

1. Place the part to be measured on the can stand's measurement platform (see *Using the Can Stand* on Page 9).
2. See Figure 30. Select the part to be measured. Assigning a *Lot #* is optional.
3. Select the *Start* button to initiate the measurement process.

NOTE: Light should be coming out of the fiber optic probe as this time.

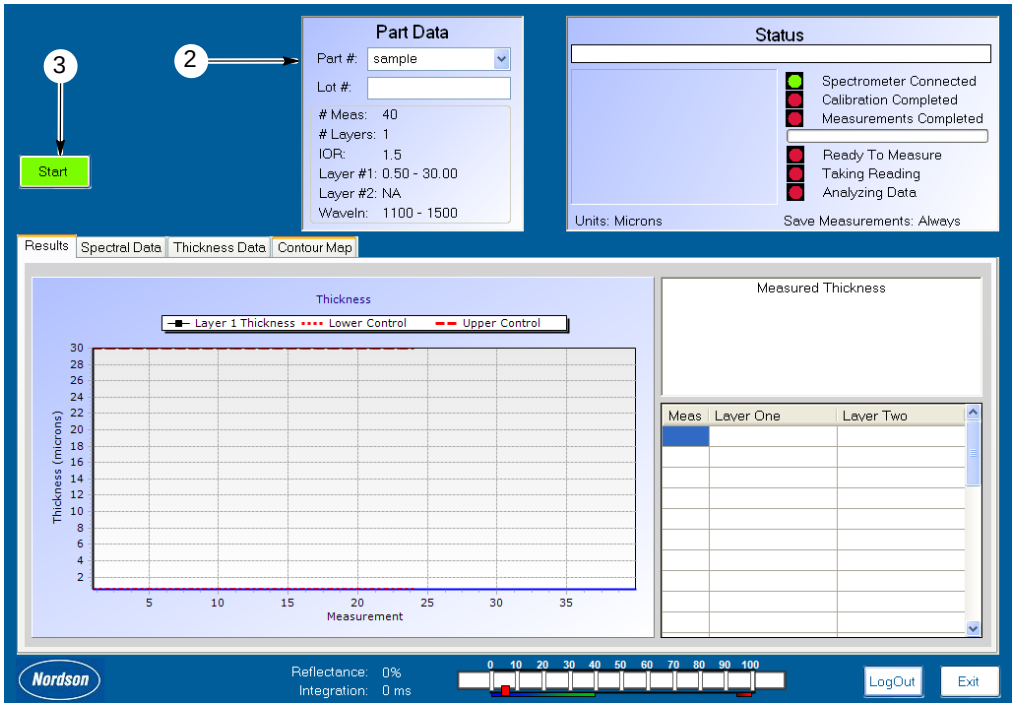


Figure 30 Part Number Selection Displayed

Self Referencing Probe Procedure *(contd)*

4. See Figure 31. Relocate the probe tip a small amount radially (no less than 0.1 mm or no more than 2 mm) and then click on *Take Measurement # 1* button. The software computes the thickness in seconds and displays the thickness.

NOTE: Instead of using the touch screen or the mouse to select *Take Measurement*, the optional manual foot switch can also be used to trigger a measurement.

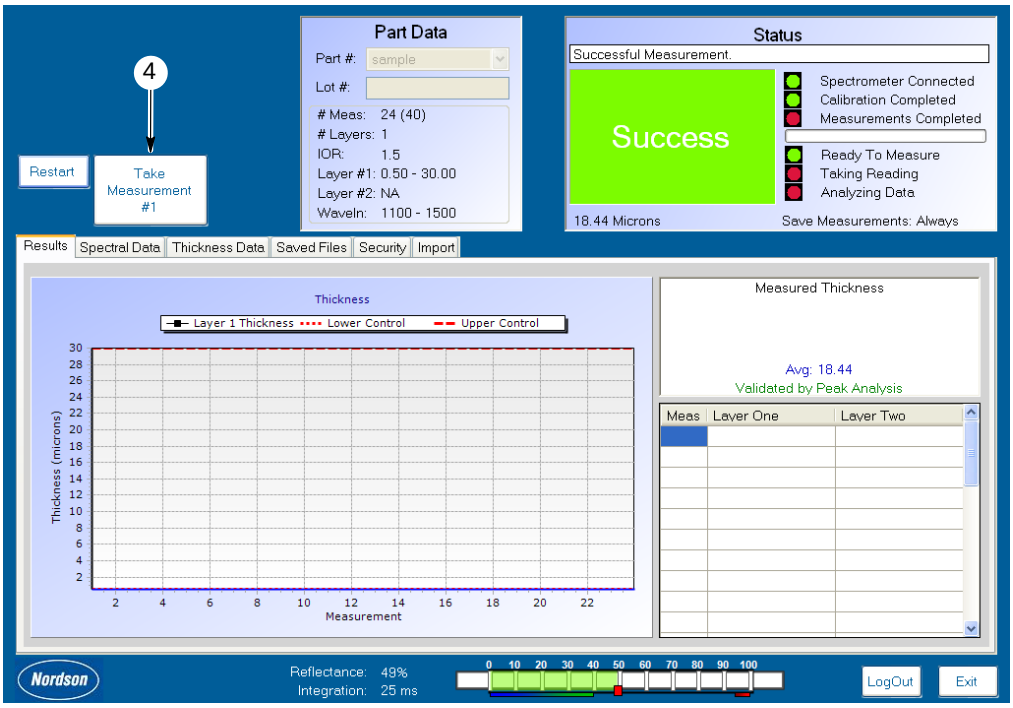


Figure 31 Take Measurement Button Displayed

5. Continue taking measurements, moving the probe tip before each new measurement, until the number of measurements for that specific part have been completed.

   NOTE: The number of measurements to be taken is determined by the *Number of Measurements* under the *Part Info* tab (see *Adding and Editing Parts and Parameters* on Page 12).

6. Spectral data (interference data) can be seen by clicking on the *Spectral Data* tab on the main screen. Similarly, the thickness graph can be observed under *Thickness Data* tab.

7. See Figure 32. After the measurement set has been completed, select the *End Measurement Run* button. to save the measurements. The MCS can save the data into a report file at the completion of the required measurement for a specific part.

   NOTE: Depending on how the *Save Options* are set under the *System Configuration* tab, the user may be asked if they would like to save the data results. The MCS can be setup to prompt the user to save, save all the time, or never save data. See *System Configuration Settings* on Page 22 for more information.

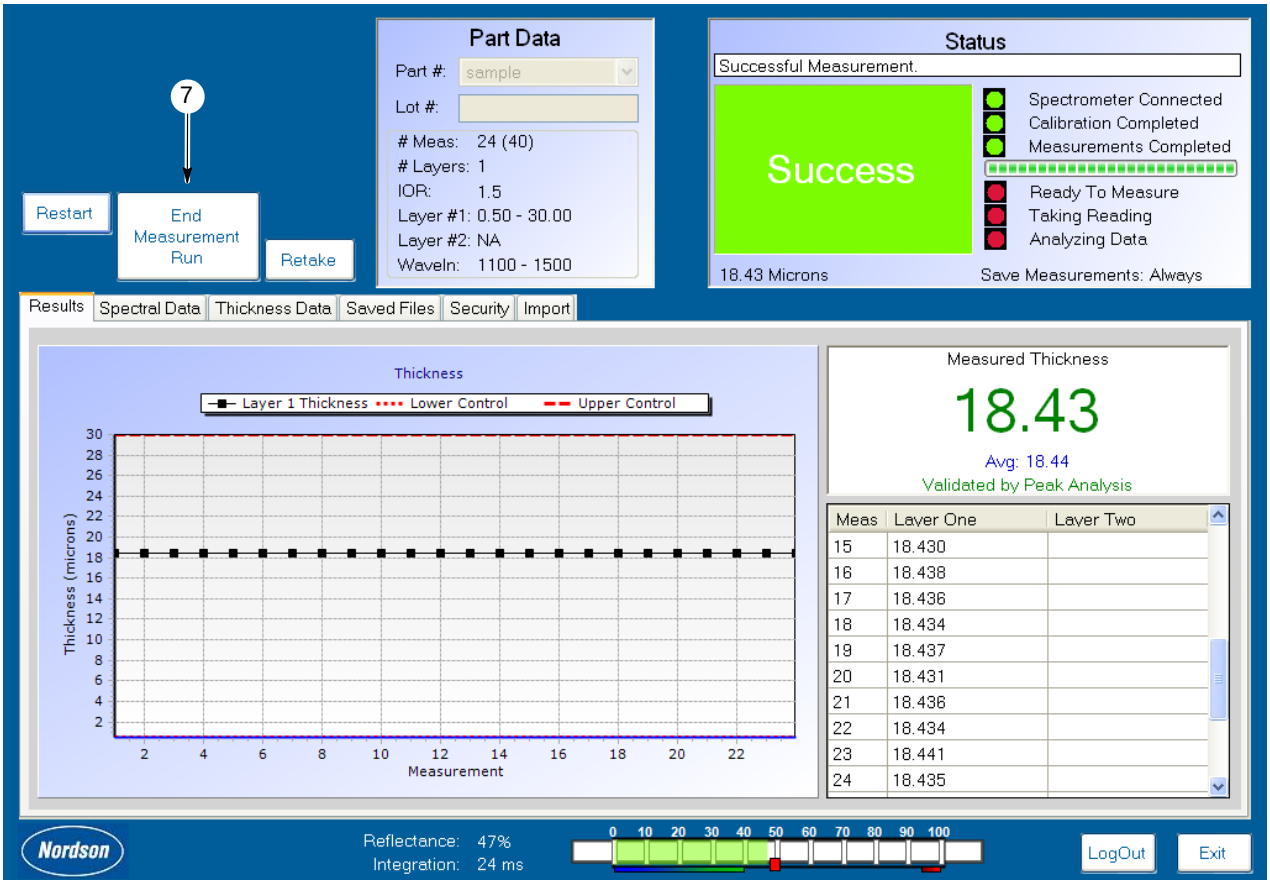


Figure 32 End Measure Run Displayed

Standard Probe Procedure

1. Follow steps 1-3 in the *Self Referencing Probe Procedure* on Page 29.
2. Click on the *Measure Dark* button to take a measurement of ambient light.

NOTE: The software automatically turns off the light source to take the measurement for ambient light.

After the ambient light measurement is taken, the light source shutter opens automatically. There will be a green bar at the bottom of the screen that will move from left to right showing the percentage of reflectance back from the surface of the sample for reference (whichever one is illuminated). The reference reflectance percentage should be between 30%-80%. If the percentage is out of this range see the *Troubleshooting* section to make necessary adjustments and then retake the reference measurement.

3. Click on the *Measure Reference* button.
4. Follow steps 4-7 in the *Self Referencing Probe Procedure* on Page 29.

Restart Button

The *Restart* button will void the measurements taken up to that point allowing the operator to start the measurement series from the beginning. The *Restart* button can be used in any (but not limited to) of the following scenarios.

- incorrect measurements resulting from a reference on a bad spot on the reference sample
- an out of focused beam
- evaluation range appears unsatisfactory

Retake Button

When there are a series of good measurements and there is a bad spot on the sample (a fingerprint for example) then the operator can use the *Retake* button to repeat the same measurement on a different spot.

Calibrate Button

The ambient light and reference data are stored inside the software and if there is a need to retake the ambient light and reference measurements, then clicking on the *Calibrate* button will enable the operator to retake ambient light and reference measurements. If the same type of coating is to be measured, then there is no need to re-calibrate the ambient light and reference for several hours.

Contour Maps

NOTE: The fields for *Measurement Plan* and *Number of Measurements* under the *Parts Info* tab must be filled out correctly to yield a contour map. See *Adding and Editing Parts and Parameters* on Page 12 for more information.

Contour maps use a color coded topographical map with a color key to graphically display the results of a measurement series.

Figure 33 shows a part with uneven coating and measurements that fall outside the upper and lower control limits. Figure 34 shows a part with even coating and measurements that fall inside the upper and lower control limits.

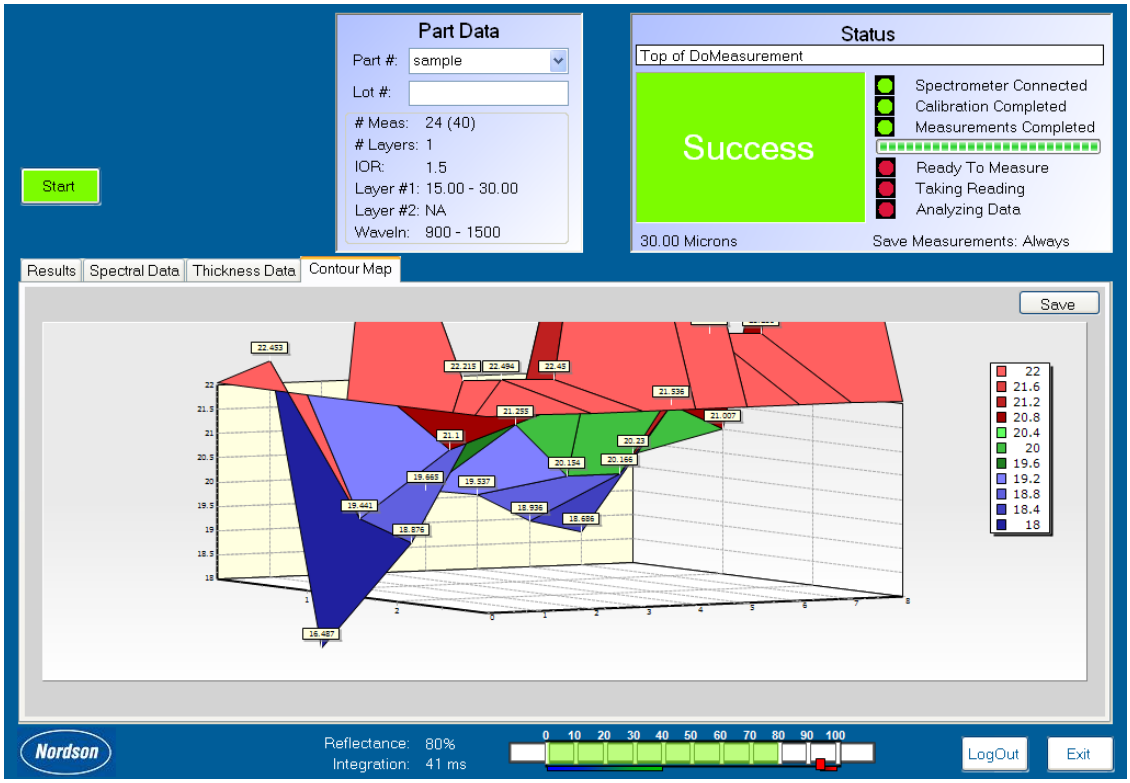


Figure 33 Contour Map 1

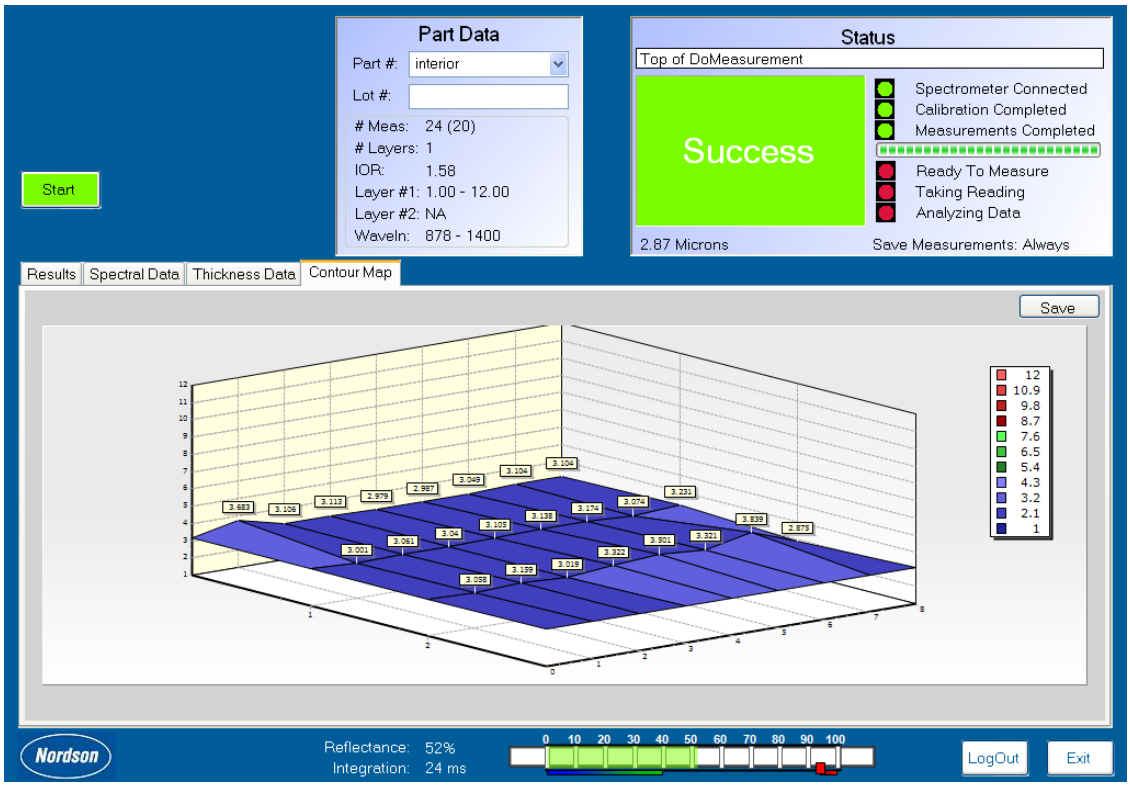


Figure 34 Contour Map 2

Saved Data and Reports

The MCS can save spectral data, measurement results, and can recipes. The default save path set under the *System Configuration* tab is C:\film_thickness\. See Table 8 for more information on the different kinds of saved files.

Table 8 Saved Data

Data Type	File Type	How the Data is Saved
Measurement Results	.xml	Save Options for measurement results are under the *System Configuration* tab. After a measure run is completed, the system can be set to always save the results, never save results, or offers the user a choice after each measurement run.
Spectral Data	.sad	Spectral data can be saved by choosing the *Save Spectral Data* button under the *Spectral Data* tab.
Can Recipes	.prt	Once a can recipe has been created and updated under the *Part Info* tab, the recipe can be exported to the designated directory.

Backup Data

The backup procedure applies to the measurement data, operator information, and part parameters for part recipes.

NOTE: The type of backup media device is up to the user.

1. On the desktop, click on *My Computer*.
2. Click on the *Local Disk C* drive.
3. Double click on the folder named *Film_Thickness*.

NOTE: This is the default save folder. If the user previously changed the save path for report files, then choose that file folder instead.

4. Copy all the report files (*PartInfolist.xml*, *operatorlist.xml*, *MeasurementPlans.xml*, and *UnitsofMeasure.xml*) and save to the backup media option of the user's choice.

Warning Messages

High Reflectance

The warning shown in Figure 35 is displayed if the reflectance coming back from the sample is greater than 94%. This will saturate the detectors, giving inaccurate results. Adjust the distance of the probe farther away from the substrate to decrease the reflectance off the sample.

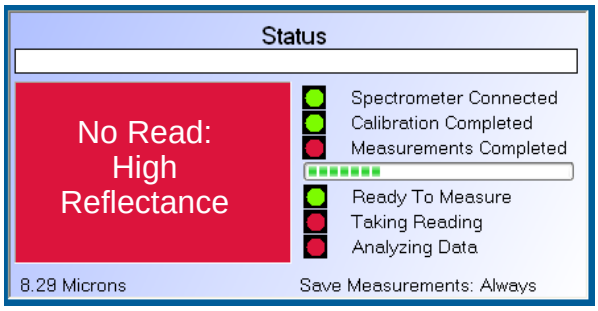


Figure 35 HIgh Reflectance Warning

No Read

The warning in Figure 36 is generated when the interference and thickness data is not strong enough to produce a good measurement. The user may need to adjust the interference evaluation range or refocus the beam of light. A part without any coating can also generate this warning.

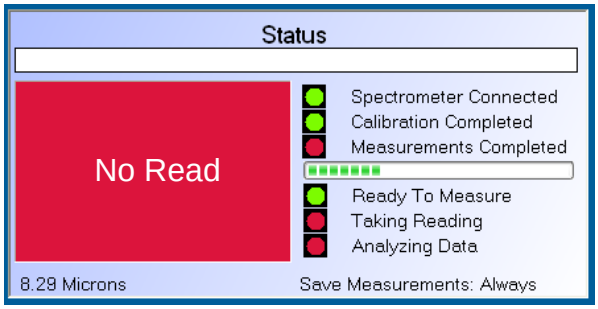


Figure 36 No Read Warning

No Read Low Reflectance Warning

The warning in Figure 37 is generated when the reflectance off the part's surface is not strong enough to take a measurement. Confirm that the light source is turned on and move the probe slightly closer to the part's surface. Increasing the integration time may be necessary, as well.

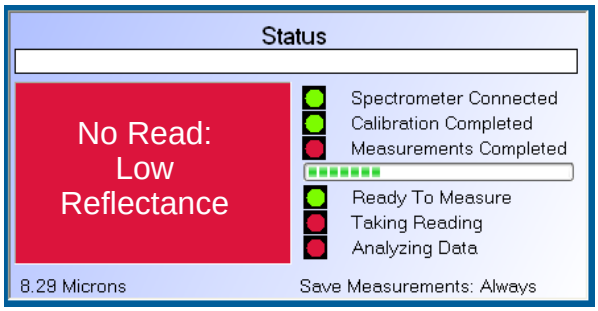


Figure 37 Low Reflectance Warning

Maintenance

Probe Tip

Always cap the probe tip when not in use.

If the probe tip becomes contaminated, it can be cleaned using a soft dry cloth.

Troubleshooting

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

These troubleshooting procedures cover only the most common problems. If you cannot solve a problem with the information given here, contact your local Nordson representative for help.

Problem	Possible Cause	Corrective Action
1. High reflectance warning	Detectors saturated due to reflectance from sample is greater than 94%	Adjust the distance of the probe to the sample. See *Warning Messages* section on Page 35.
2. Reflectance too low	Reflectance from sample is less than 10%	Adjust the distance of the probe so the light beam is more focused on the surface of the sample. Increase the integration time in the parts parameters table.
3. Reading shows several thickness peaks	Improper selection of interference range No interference on the sample Improper focus of the light beam	Tighten the interference evaluation range to an area where there is a good interference spectrum. Modify the thickness range if needed. Adjust the focus of the light beam.
4. Incorrect measurement of ambient light	Light emanating from fiber optic cable while ambient light measurement is being taken	Retake the ambient light measurement.
5. Proper interference range cannot be identified	Interference spectrum is not clearly distinguishable	Use a bare (uncoated) sample for a reference measurement and retake measurements to see if there is a well defined interference.

Conditions of Warranty

The MCS must be setup and used according to the specifications provided herein. Other than technical support provided under warranty for defective equipment, Nordson will not provide complimentary post-sale technical support if the setup does not comply with the requirements stated in this manual and local electrical codes. Furthermore, if post-sale technical services are performed and the setup is found to be non-compliant with these requirements, then the customer will be invoiced and will be responsible for payment of the charges associated with the service.

Parts

To order parts, call the Nordson Finishing Customer Support Center at (800) 433-9319 or contact your local Nordson representative.

Using the Illustrated Parts List

Numbers in the Item column correspond to numbers that identify parts in illustrations following each parts list. The code NS (not shown) indicates that a listed part is not illustrated. A dash (—) is used when the part number applies to all parts in the illustration.

The number in the Part column is the Nordson Corporation part number. A series of dashes in this column (- - - - - -) means the part cannot be ordered separately.

The Description column gives the part name, as well as its dimensions and other characteristics when appropriate. Indentions show the relationships between assemblies, subassemblies, and parts.

- If you order the assembly, items 1 and 2 will be included.
- If you order item 1, item 2 will be included.
- If you order item 2, you will receive item 2 only.

The number in the Quantity column is the quantity required per unit, assembly, or subassembly. The code AR (As Required) is used if the part number is a bulk item ordered in quantities or if the quantity per assembly depends on the product version or model.

Letters in the Note column refer to notes at the end of each parts list. Notes contain important information about usage and ordering. Special attention should be given to notes.

Item	Part	Description	Quantity	Note
—	0000000	Assembly	1	
1	000000	• Subassembly	2	A
2	000000	• • Part	1	

Continued...

MCS Unit Components

MCS Coating System

Part	Part	Description	Quantity
1095368	- - - - - -	SYSTEM, MCS-1, with probe, with can stand	1
- - - - - -	1095369	SYSTEM, MCS-2, with probe, with can stand	1
1087980	- - - - - -	• SYSTEM (PC), MCS-1, transparent coating	1
- - - - - -	1087984	• SYSTEM (PC), MCS-2, opaque coating	1
1095365	1095365	• STAND, manual, streamlined	1
1095362	1095362	• PROBE, straight, 10 in, self referencing	
1095364	1095364	• PROBE, 90 degree, mirror attachment	1

Optional

Part	Description	Quantity	Note
1087985	PROBE, straight, 10 in, standard	1	
1087986	PROBE, 30 degree, 10 in, standard	1	
1090364	PROBE, 90 degree, 10 in, standard	1	
1095367	SWITCH, foot, manual	1	
1087983	STAND, manual, 360 degree travel	1	
1095366	BOX, black hardshell, carrying case	1	A
NOTE A: The carrying case can accommodate the system PC and the streamlined can stand. It does not accommodate the 360 degree travel can stand.			

Specifications

MCS Computer

Item	Specification
Power Supply Input	100-250 VAC
	50/60 Hz
	4A max
Weight	9.1 kg (20.1 lb)
Height	336.6 mm (13.25 in)
Length	412.75 (16.25 in)
Width	158.75 mm (6.25 in)

Can Stand

Dimension	Specification
Weight	10.2 kg (22.5 lb)
Height	281 mm (15 in)
Length	298.5 mm (11.75 in)
Width	254 mm (10 in)

Can Sizes

Dimension	Specification
Diameter	25-73 mm
Height	250 mm (15 in) maximum

DECLARATION of CONFORMITY

PRODUCT: cScan+
Model: MCS-1 Manual Unit
Description: Non-Contact, Non-Destructive, thickness measurement system.

APPLICABLE DIRECTIVES:

2006/95/EC (Low Voltage Directive)
2004/108/EEC (Electromagnetic Compatibility Directive)

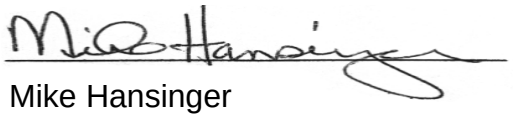
STANDARDS USED FOR COMPLIANCE:

EN61010-1 (2001) = Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use. General Requirements.

EN61326-1 (2006) = Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use. EMC requirements.

PRINCIPLES:

This product has been manufactured according to good engineering practice.
The product specified conforms to the directive and standards described above.



Date: 11 March 2009

Mike Hansinger
Manager Finishing Applications Engineering

Nordson

Nordson Corporation • Westlake, Ohio

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