cScan+® Automatic Unit ACS-1

Customer Product Manual
Part 1088984A02

Issued 05/09

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

This document is subject to change without notice.
Check http://emanuals.nordson.com/finishing for the latest version.

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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	06/09	Added information on loading cans, location of data points, computer battery repair, mounting feet, anti-vibration inserts, and transferring data to external source.
		Updated parts list.
		Added DOC.

cScan+ Automatic Unit ACS-1

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. Exposure to high-pressure fluid could result in serious bodily injury 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.

Robot Safety

CAUTION: The system and robot should only be serviced by qualified personnel.

Interfering with the movement or materials in use by a robot can lead to serious injury. Do not enter into a zone that has been designated to contain the robot.

Do not, at any time while the equipment is turned on, enter into the area designated for the operation of the robot. Interference with the movement of the robot, even if the robot is in an idle state or moving slowly, may still result in serious injury.

If the robot operates in any fashion other than as intended, shut off the system immediately.

cScan+ Manual Unit ACS-1 Software License Agreement

The ACS-1 Software is furnished subject to the terms and conditions of this license.

License

Under this license you may use the software only on the computer supplied with the ACS-1 system and only on this computer. You may not modify the software, lease the software, decompile the software or disassemble the software.

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Description

Introduction

The ACS-1 is an innovative real-time measurement platform for film thickness measurement.

The ACS-1 is a unique process information technology platform providing a non-contact, non-destructive real-time thickness measurement solution. It is a significant advancement over the current techniques which are tedious, invasive or requiring destructive analysis.

The measurement system was developed using state of the art optical and computer subsystems, combined with thickness proprietary ACS-1 software. The system collects optical signals from the part's surface to yield a precise coating measurement. The system uses a robot controlled by preset can dimensions and commands to allow for easy and accurate operator use.

Item	Component	Description
1	Light Tower	Alerts operator to faults.
2	Cell	The cell establishes a containment zone for the robot to operate in and adds an additional barrier for operator protection.
3	Computer and Monitor	Displays the software for operator commands and measurement values. The computer also has the capability to save measurement results. Powered by an internal battery.
4	Plastic Door	Allows operator to safely and accurately place the can tray into the unit.
5	Robot	5 Axis Robot provides a clean and quick transfer of the specimen can to the measurement probe.
6	Probes	Distributes the light from the light source and collects the reflection and refraction off the surface of the coating. Straight, 30 degree, and 90 degree probes are included with the ACS-1 system.
7	Vacuum Pump	24VDC vacuum pump and shock mounts.
8	Electrical Control Box	Vacuum pump power supply and switching valve.
9	Robot Controller Assembly	120VAC Robot Controller
10	Electrical Mount Plate	Contains the power supply for the computer, ethernet hub, AC power distribution, and vision system.
11	Bottom Front Panel	Can be propped up to display controls and acts as a table for the wireless keyboard.
NS	Spectrometer, 3 Channel Multiplexer	Collects the measurement data from probes and analyzes the interference spectrum.
		Multiplexer: Allows the use of three probes with one spectrometer.
		Light Source: Provides the light necessary to collect interference data.
NS	Wireless Keyboard	Can be placed on top of the bottom front panel when the panel is propped up.
NS: Not Shown		

Figure 1 ACS-1 System and Inner Components

Theory of Operation

An optical sensor uses optical interference combined with ACS-1's proprietary software and algorithms to measure coating thickness.

See Figure 2. By projecting a beam of light onto a coated specimen, part of the light is reflected back from the top surface, while another part of the light is refracted. The refracted beam of light is again reflected from the surface of the substrate. The resultant beam of light emits constructive and destructive interference with varying amounts of phase change from the light rays.

The resulting interference spectrum varies depending on the thickness of the specimen and optical properties of the coating material. Embedded in the ACS-1 software is a proprietary thickness calculation algorithm which evaluates the interference spectrum over a suitable interference range. This computation technique returns the specific thickness of film or coating applied to the substrate.

Figure 3 illustrates the interference model used in thickness evaluation. Part of the light incident on the surface of the layer (coating) is reflected and part of the light is transmitted. The transmitted light is in turn reflected from the surface of the substrate and these two reflected rays interfere constructively and destructively to generate an interference spectrum of periodic modulation. Surface roughness and the optical properties of the coating will limit the bandwidth where the analysis can occur.

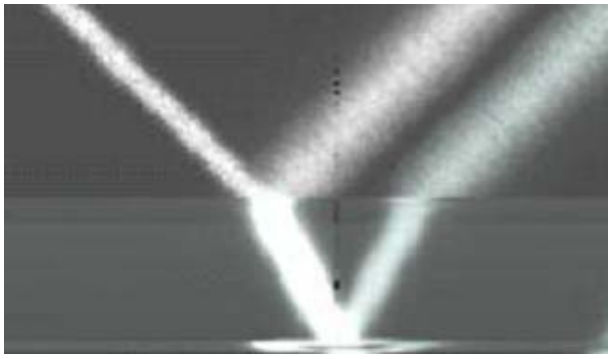


Figure 2 Light Rays Passing Through Different Layers of the Material

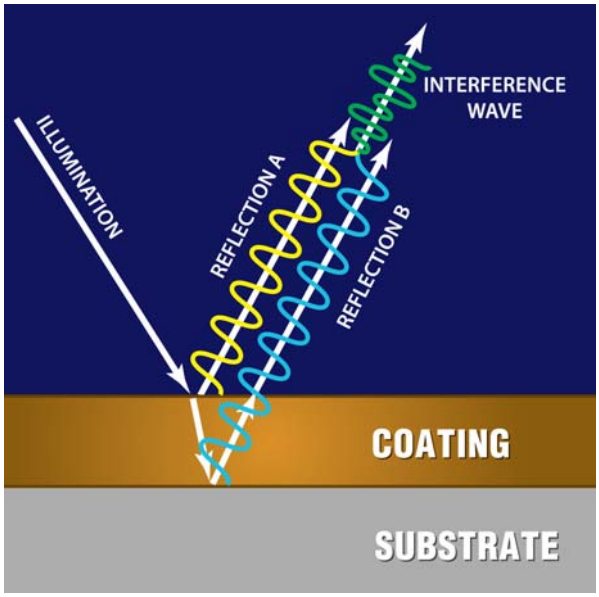


Figure 3 Interference Model

ACS-1 Software

ACS-1 software measures film thickness for transparent coatings. The results of the measurement, including operator information, part information, and thickness results, are populated into the report sheet and a spreadsheet is used as a report file for simplicity and flexibility. The ACS-1 operator interface is user friendly and effectively masks the complex spectral and mathematical analysis from the operator. Once the part parameters are set up for a specific type of part, any individual without any background in optics or spectroscopy can operate the instrument as the measurement procedure is straight forward.

See Figure 4.

Item	Description
1	Displays the currently selected pre-programmed can name and its tray position.
2	Operator and user login selections (if security system enabled).
3	Menu tabs allow the user to navigate through can details and data.
4	Displays details and data for its corresponding menu tab (shown as the *Can Info* menu).
5	Displays the strength of reflectance. The system will automatically adjust the reflectance as needed.
6	Displays hints that aid the user in operations.
7	Displays the current measurement taken from a sample.
8	Displays network messages and command guides.
9	Command actions for the robot and spectrometer.

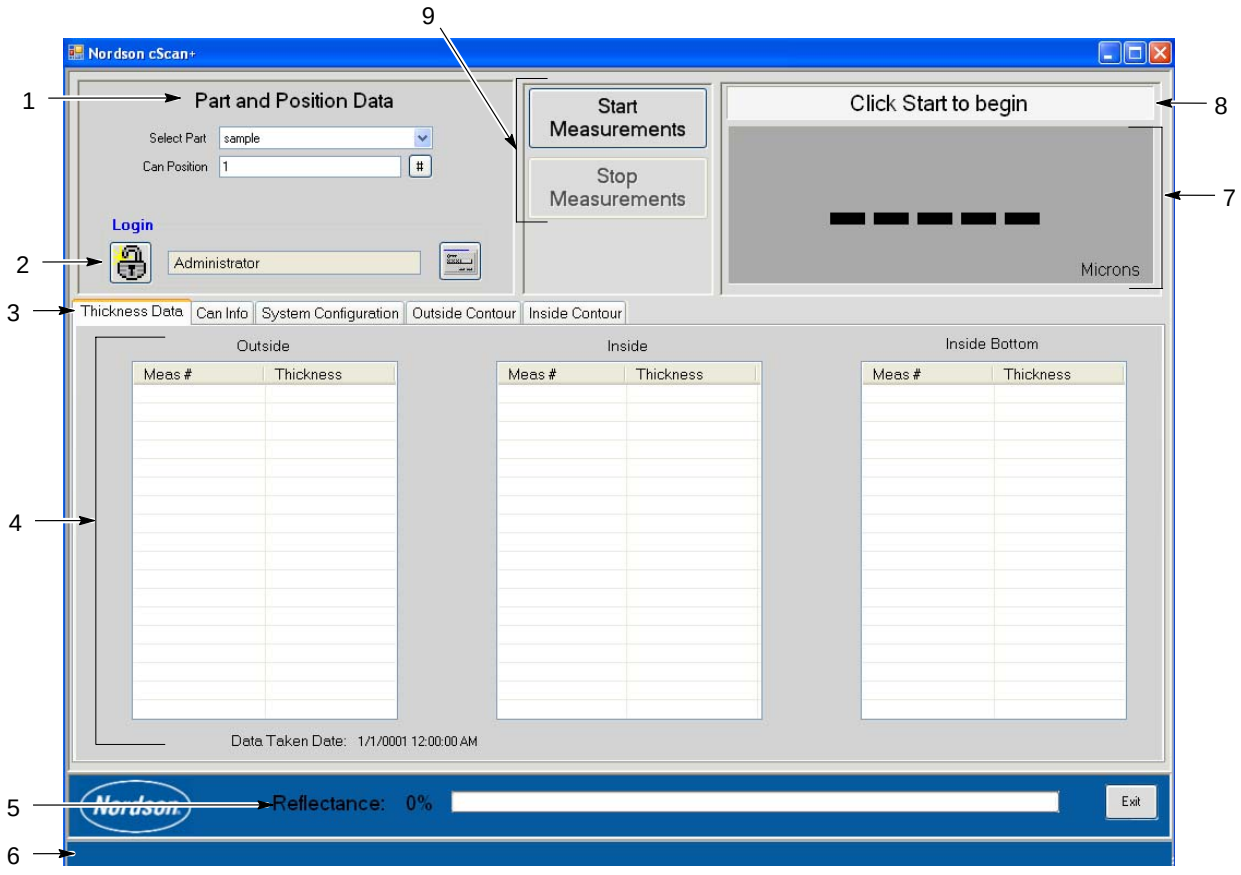


Figure 4 Main Screen for the ACS-1 Software

Installation

The ACS-1 system is shipped with most components already assembled for easy installation.

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

CAUTION: Before performing installation steps, always power the system down to avoid injury.

Mounting the Computer and Monitor

See Figure 5. Use the four screws to mount the computer to the mounting arm bracket.

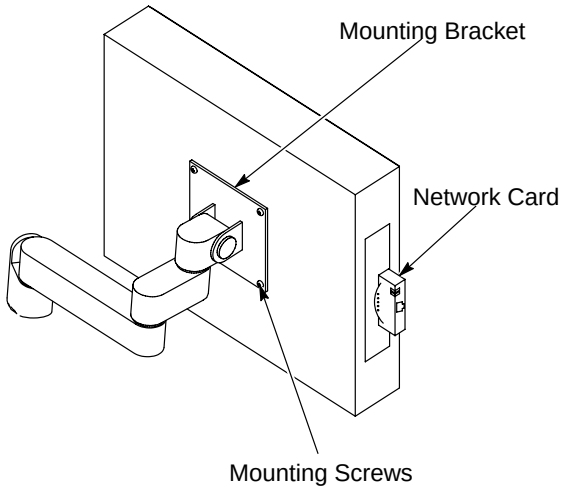


Figure 5 Mount and Network Card Connections for ACS-1 Computer

Port and Cable Connections

NOTE: For easy installation, the ACS-1 is shipped with the power, Ethernet, and USB spectrometer cable threaded through the mounting arm.

1. See Figure 6. Connect the power, Ethernet, and USB spectrometer cables to the back of the computer.
2. Connect the USB Swivel Hub to the second USB port.
3. See Figure 5. Insert the network card on the side of the computer.

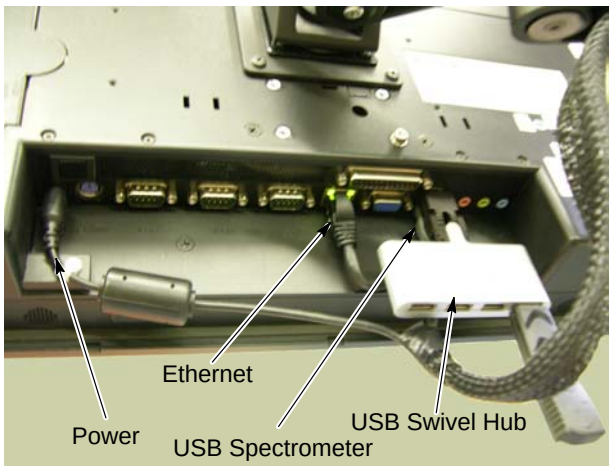


Figure 6 Port and USB Connection on Back of ACS-1 Computer

Mounting Feet and Anti-Vibration Inserts

See Figures 7 and 8.

1. Insert anti-vibration inserts into the opening underneath the mounting feet.
2. Use a carpenters level on the middle shelf to make sure unit is level both vertically and horizontally.
3. If the unit is not level, adjust the mounting feet, using the lock nut and threaded screw.

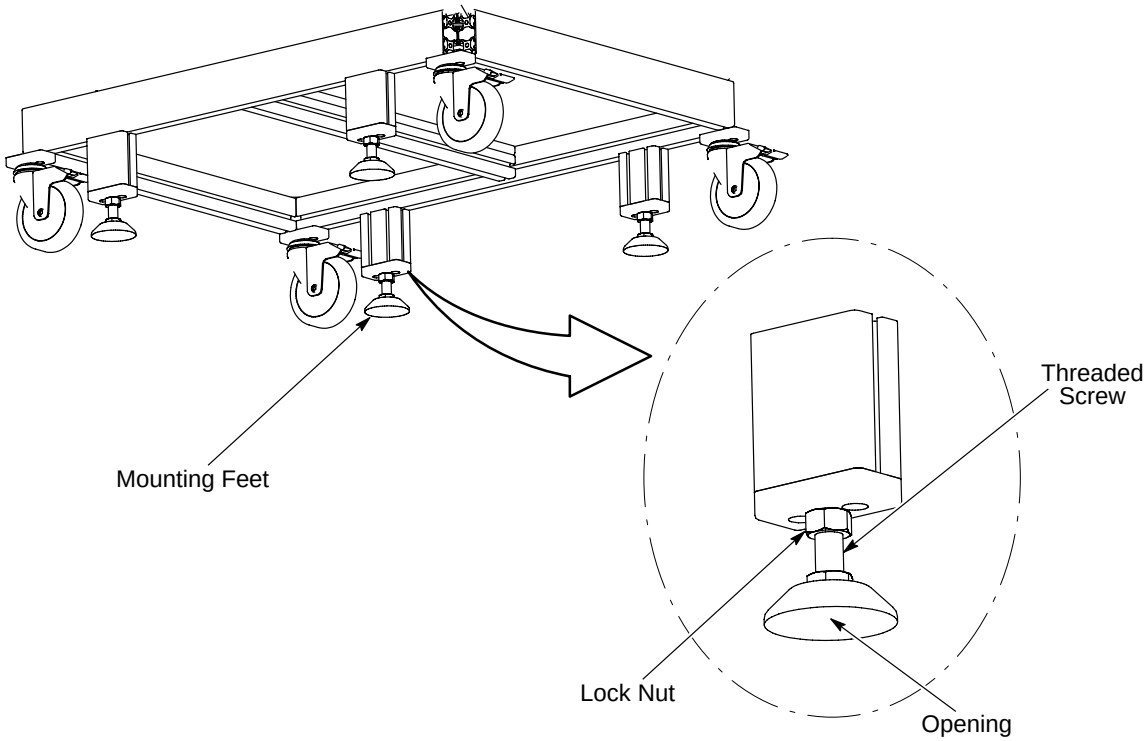


Figure 7 Mounting Feet

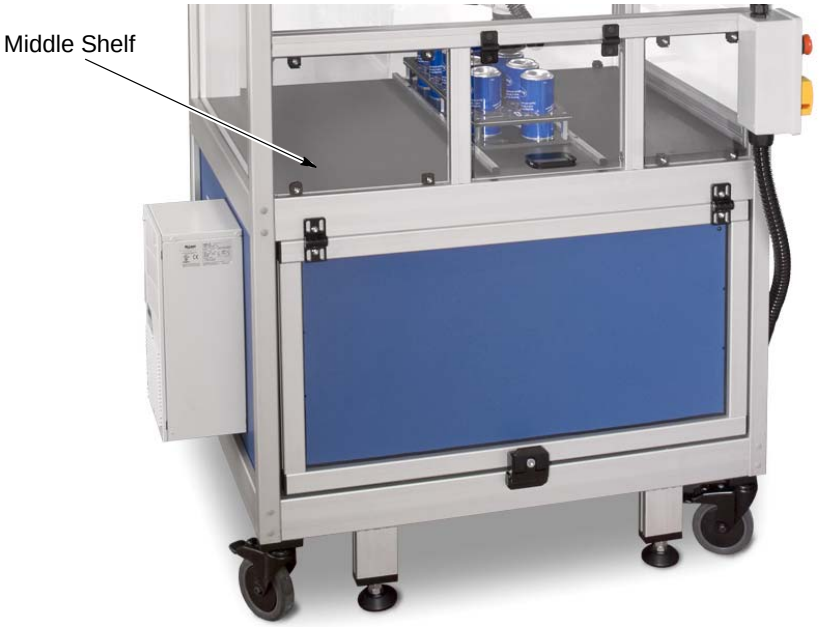


Figure 8 Level by Middle Shelf

Operation

NOTE: The ACS-1 software displays command hints at the bottom left portion of the screen.

Startup

NOTE: The ACS-1's computer has an internal battery, so it can be turned on without the main power being on. Nordson recommends operators to have the main power off when powering up the computer.

1. With the Main Power Switch in the OFF position, push the power button on the back of the computer boot up. The power button is located on the rear of display. The switch is on the back lower left hand corner of the unit. See Figure 9.
2. The Microsoft® Windows® XP operating system will boot up. There is no windows password required.
3. Verify that the *Emergency Stop* is pulled out. See Figure 10.
4. When the Windows XP Logo appears on the screen, turn the Main Power Switch mounted on the side of the cell to the ON position so that the arrow is facing up. See Figure 10.
5. Do Not try to start up the software. The computer automatically starts the cScan+ Application Software.
6. Once the cScan+ Application Software is up and running, and if the security system is enabled, then Click on the LOG IN button.
7. Log as required. If you are logging in as ADMINISTRATOR for the first time the temporary password is *admin*.
8. Click on the System Configuration Tab.
9. IMPORTANT. Wait for the green robot ready light (See Figure 11) located inside the cScan+ unit to come on. Once it lights green, click on the *Start Robot* button. See Figure 12.
10. Once the communication between the computer and robot is complete, *Network Connection Established* will appear in the upper right hand side message box.
11. If you wait more than 1 minute to click on the *Start Robot* button, the system will time out, and you will have to repeat the entire procedure.

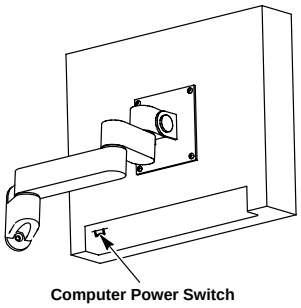
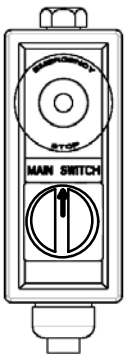


Figure 9 Location of Computer Switch



Note: Main Power Switch is shown in the ON position.

Figure 10 Main Power Switch and Emergency Stop

Note: Lights green when ready then goes off when communicating with the computer.

Figure 11 Robot Ready Light

Initial Setup

NOTE: Initial Setup should be performed by a qualified representative that has administrative rights under their login.

During the initial setup, the cans' dimensions, assigned part names, and operators will be added and saved into the program software to allow for easy and quick operator use. Once the specifications have been entered the initial setup will not need to be repeated for normal operation.

System Configuration Setup

See Figure 12.

1. Select the *System Configuration* tab.
2. In the field for *Select Data Path*, enter the desired path for where saved information will be stored. This can be typed in or the user can access the browser option next to the field.

   NOTE: Measurements taken during operation will be automatically saved according to the path created here.
3. The *Title Bar Text* fields allows the user to add a custom name in the top right hand side title bar.
4. The *Faults* option is defaulted to OFF. See the *Faults* section on Page 24 before turning the *Faults* option ON.
5. Select the measurement decimal places and retries per spot desired.

   NOTE: Decimal places is set at 2 and retries at 1 as a default.
6. Enable or disable the security and select a language.
7. Save the settings by selecting the disk icon.

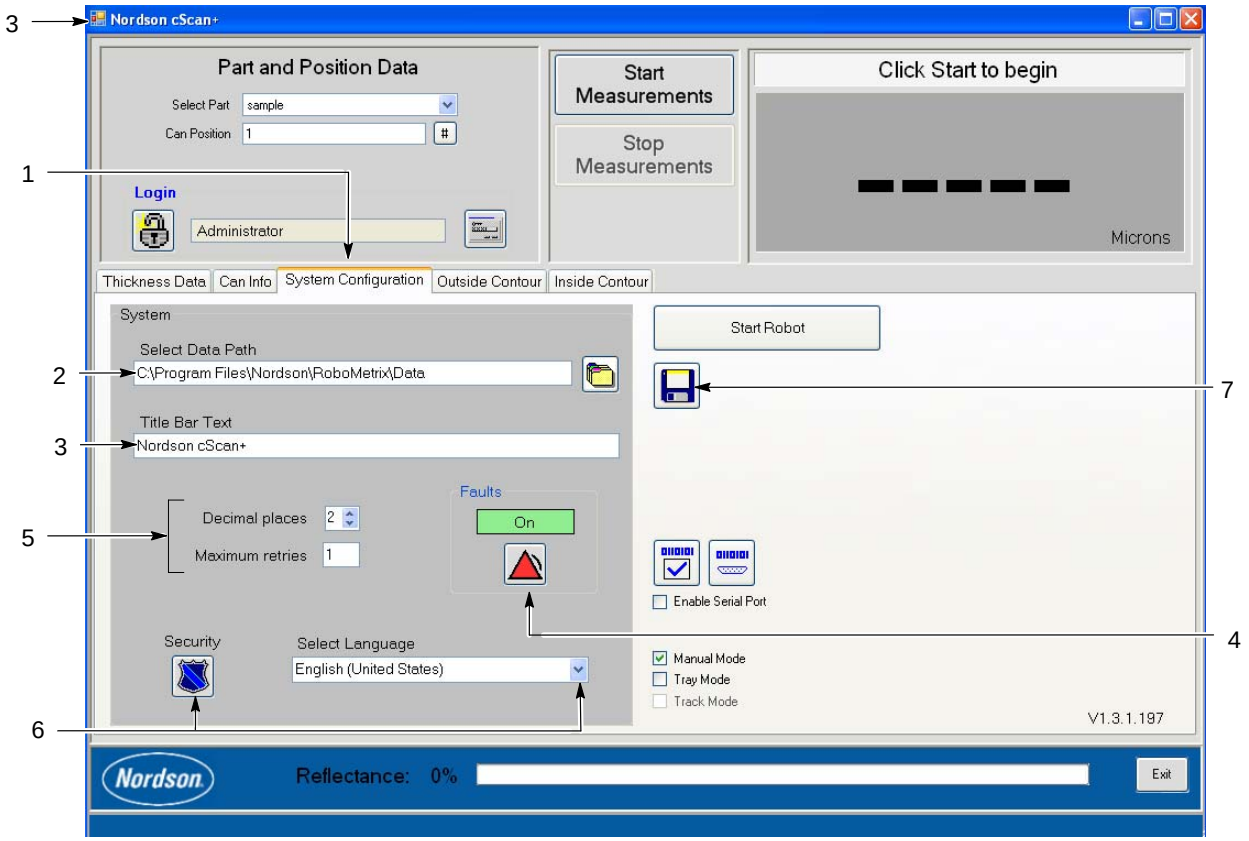


Figure 12 System Configuration Screen

Setting Can Recipes

1. On the computer, press the login button. Enter the username and password in the corresponding fields, and press the green checkmark to continue. See Figure 13.

   NOTE: The default *Administrator* password is *admin*. Nordson recommends changing the temporary password to a numeric password so the provided keyboard is not necessary.

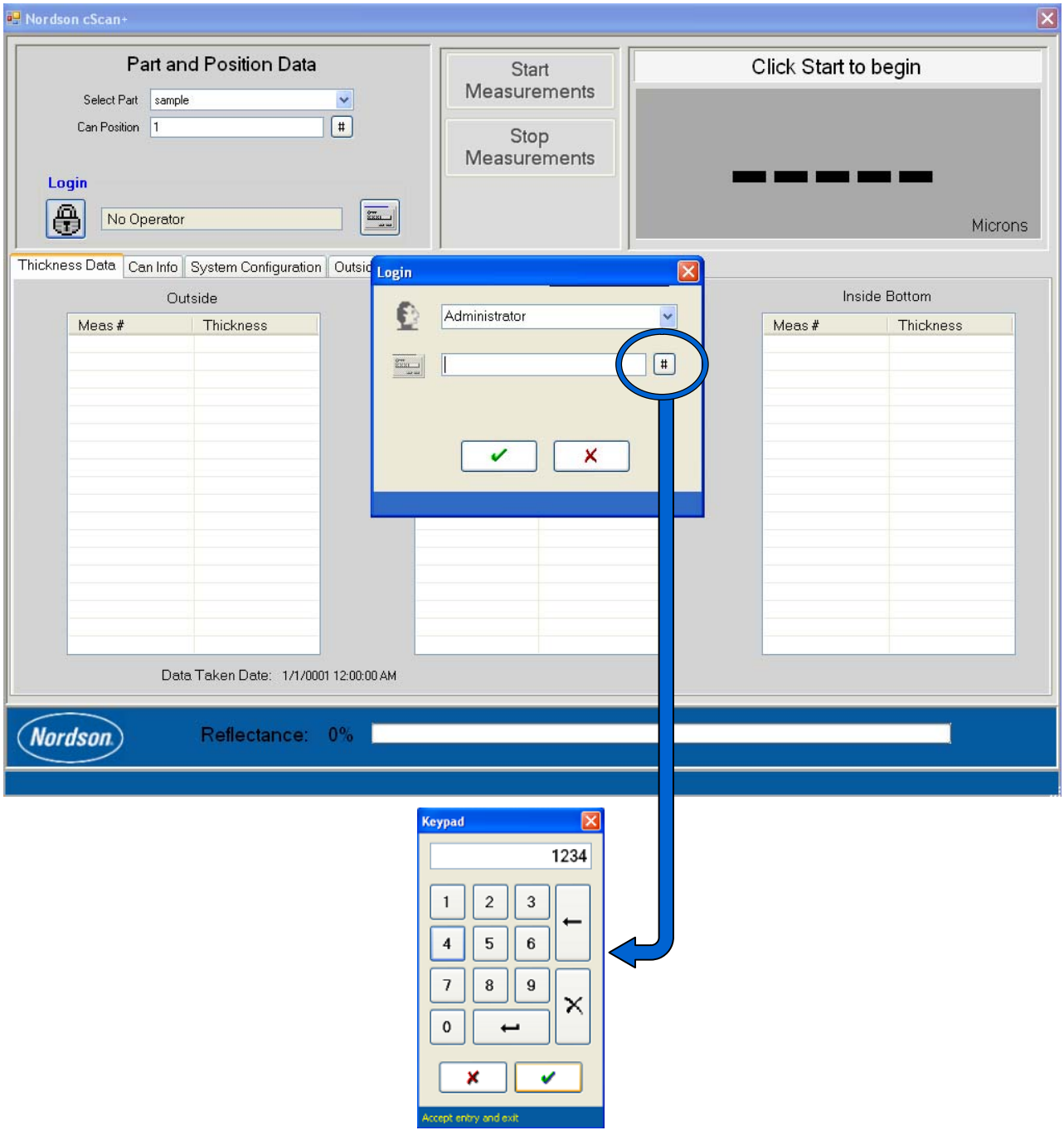


Figure 13 Login Screen and Keypad

Setting Can Recipes *(contd)*

2. See Figure 14. Select the *Can Info* tab.
3. Create a part name for an individual can by entering the name into the *Can New Name* field.
4. Continue to enter individual can specifications in the fields. See the *Glossary* section on page 36 for further explanation of field definitions.
5. Enter specifications for the particular coating surface by toggling the tabs *Outside, Inside,* and *Inside Bottom*. Complete the fields under the appropriate tabs and probes. See Figure 15 for a guide to can measurements.
6. Once all fields have been completed, press the *Save* button.
7. To add more cans, repeat steps 3-7 in this section.

NOTE: By pressing the information icon, the user can access a guide that aids in measuring can dimensions. See Figure 15 for can dimension guides.

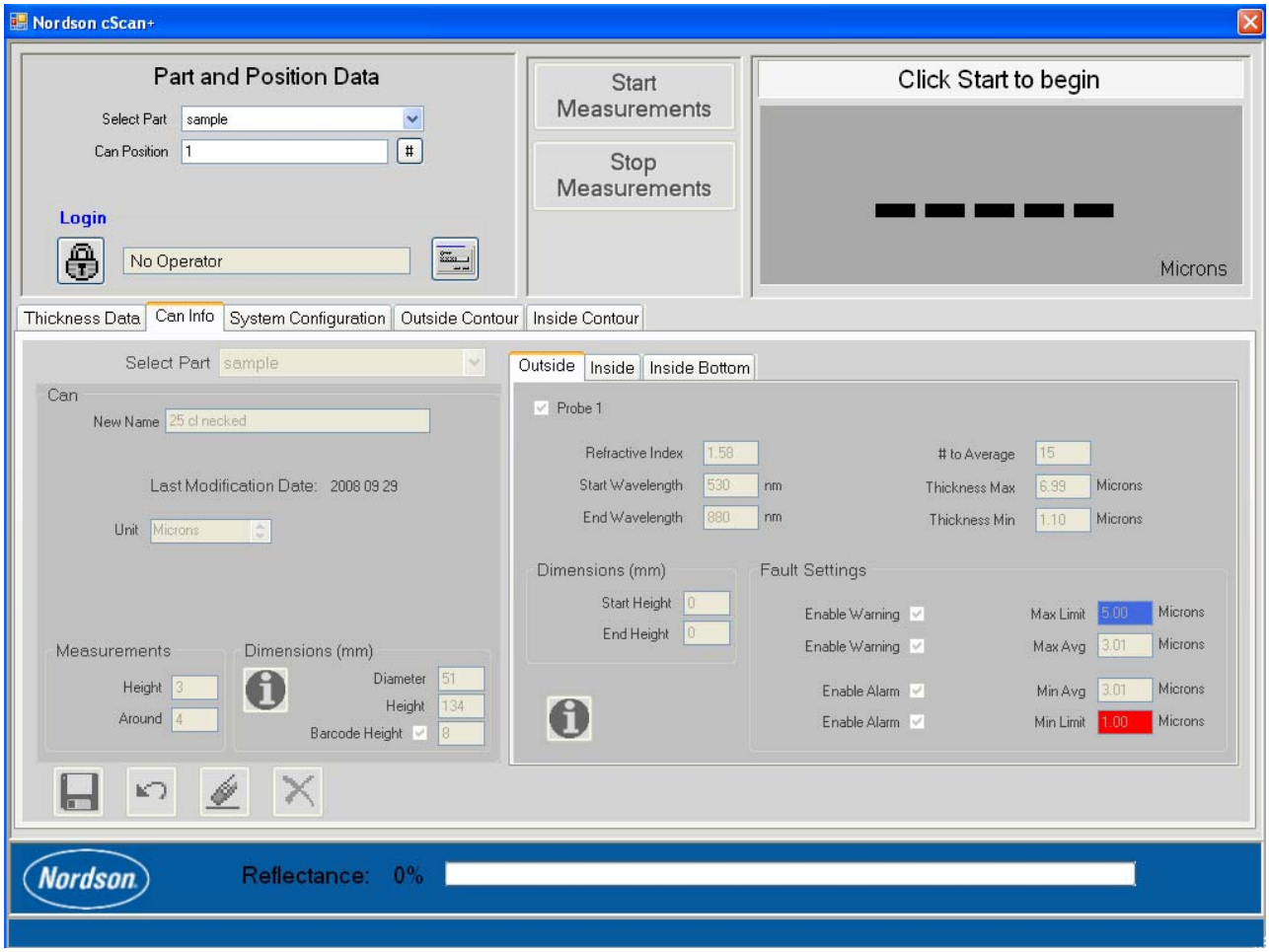


Figure 14 Can Info Screen

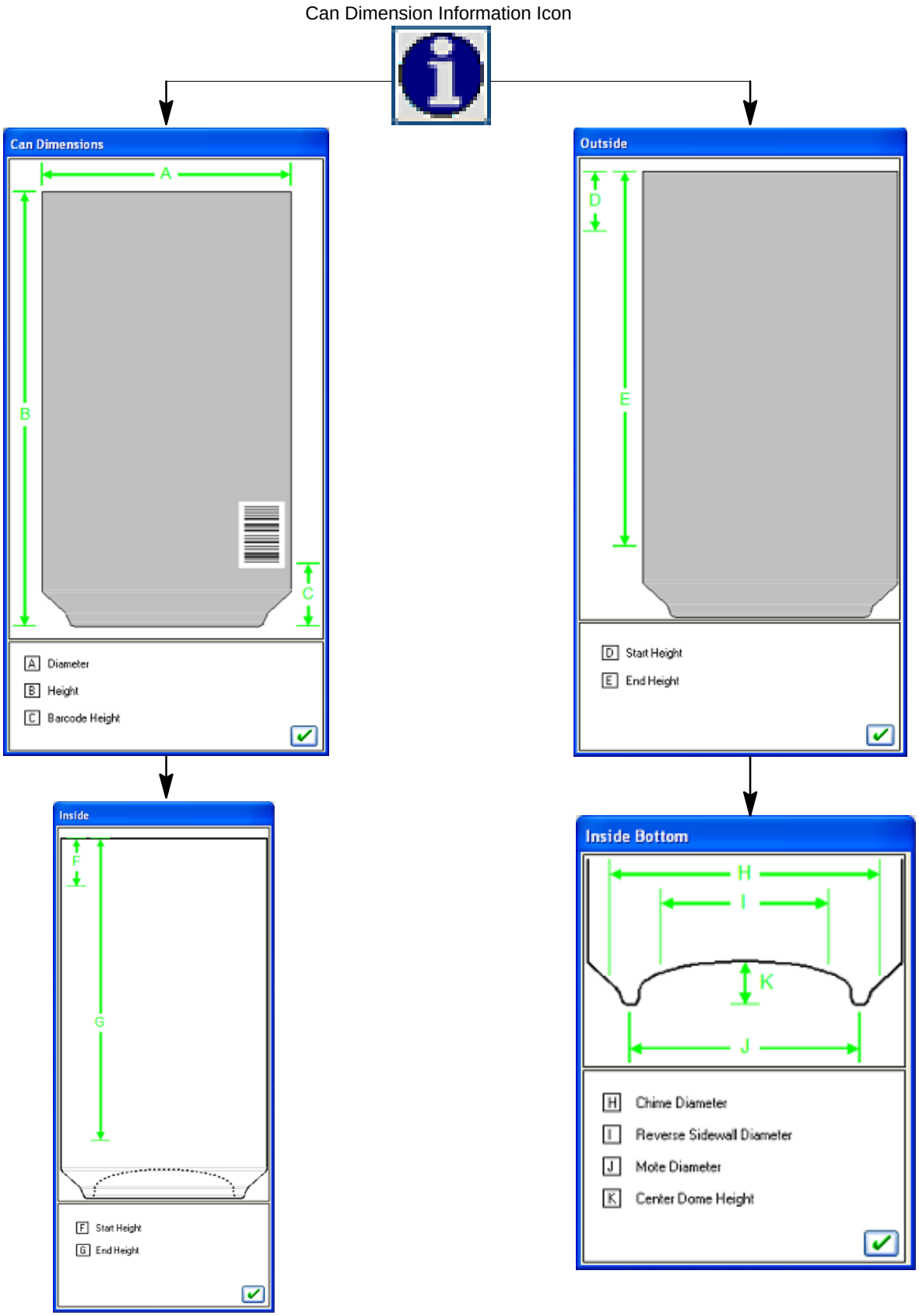


Figure 15 Can Dimension Guide

Adding Tray Configurations

After the individual can details have been added and saved, the user can begin creating tray configurations that include variations of the individual cans that have been added.

See Figure 16.

1. Select the *Tray Info* tab to go to the tray configuration screen.

   NOTE: If the *Tray Info* and *Tray Data* tabs are not displayed, go to the *System Configuration* screen and select the *Tray Mode* option. Save the settings and the tray tabs should appear.

2. Choose the can recipes to be used for the individual tray by placing a check mark next to the can number. (In Figure 16 all ten cans are shown as being selected. See Figure 17 to determine the corresponding can number to the can cell.

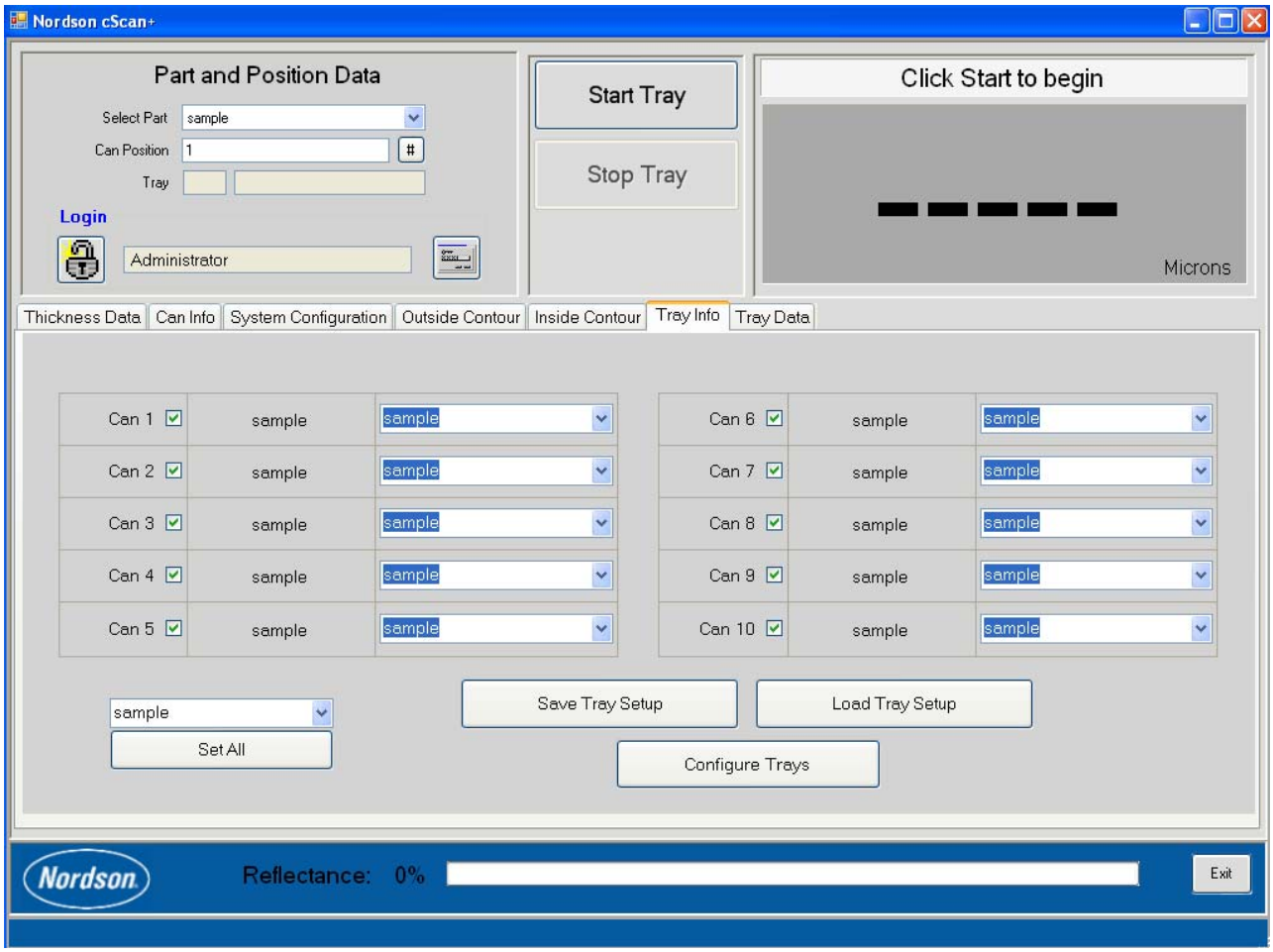


Figure 16 Tray Menu Screen

3. Use the drop down box next to the can number to select the desired can for that particular cell. Continue to select cans for the rest of the tray if they are different.

   NOTE: To quickly add the same can to all the can cells listed, use the drop down box above the *Set All* button to select the desired can. Then select the *Set All* button and the chosen can will populate in all the can cell fields.

4. Once all desired can recipes and can locations have been designated, select the *Save Tray Setup* option.

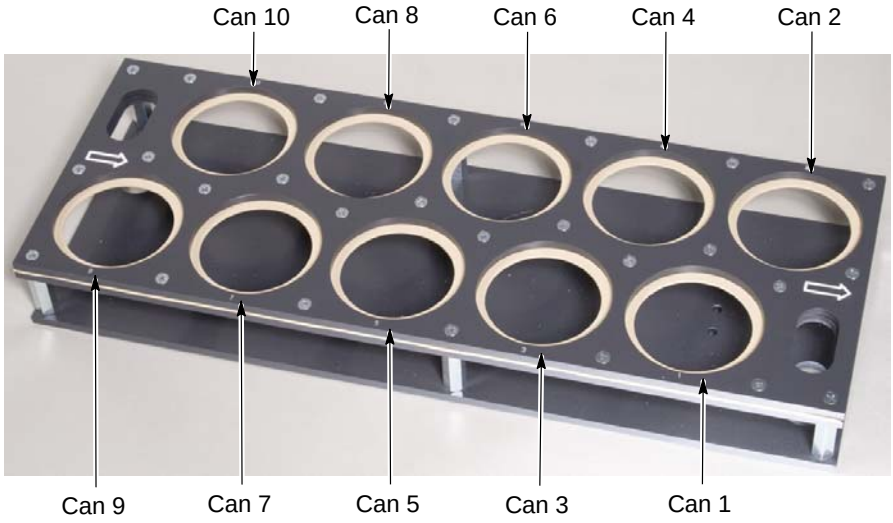


Figure 17 Can Cell Numbers

5. To add the newly saved tray configuration to a list that any standard operator can access for operation, select the *Configure Tray* option.
6. Select the order number in which you would like the tray to appear by double clicking in that row. See Figure 18.
7. Using the browser, choose the desired tray and assign it a name in the *Name* field and select the check mark.
8. Then, on the Tray Configuration Screen, select the disk image in the bottom left corner to save.
9. Exit the screen by choosing the X image at the bottom right.

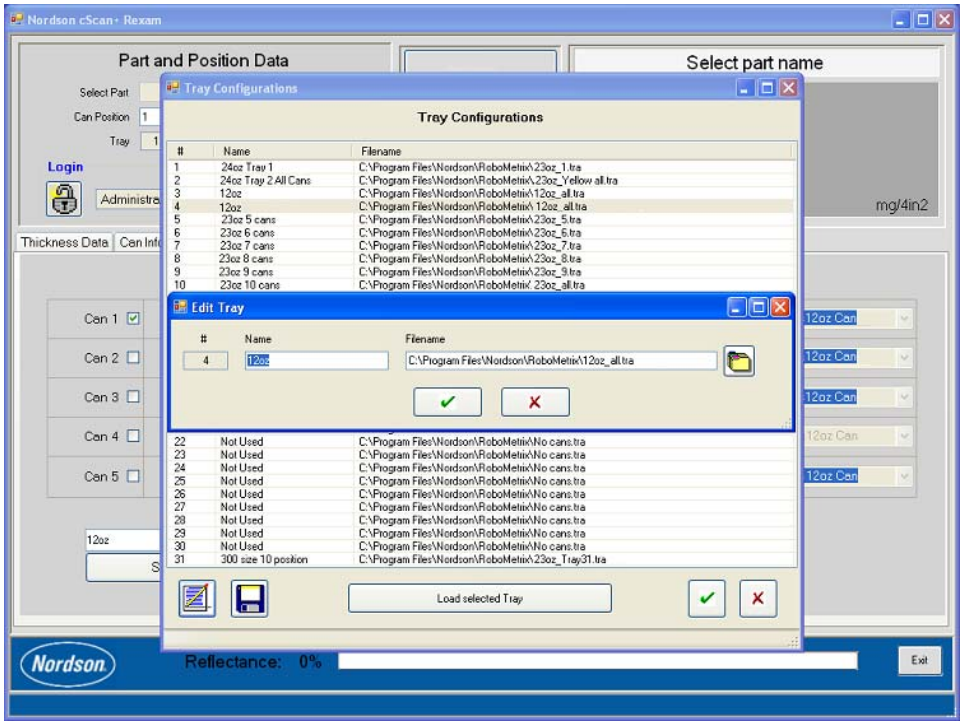


Figure 18 Tray Configuration Option Screen

Taking a Measurement

Measurement results will automatically according to the path assigned under the *Systems Configuration* menu. See page 13.

Loading the Specimen Cans

1. Login to the system as an operator using step 1 under the section for *Setting Can and Measurement Specifications.*
2. Load the can specimens into the can tray according to a saved preset tray configuration previously saved.
3. See Figure 19. Open the plastic door and use the track on the mid base of the robot cell to guide the can tray into place. Continue to gently push the can tray until the the can tray hits the back stop of the track guide.
4. Close the plastic door.

Figure 19 Loading Can Tray into Robot Cell

Start Measurement Reading for Tray

See Figure 20.

1. On the computer screen, select the *Tray Data* tab.

   NOTE: If the *Tray Info* and *Tray Data* tabs are not displayed, go to the *System Configuration* screen and select the *Tray Mode* option. Save the settings and the tray tabs should appear.

2. From the *Select Tray* drop down box, select the desired tray.
3. Select *Load Tray Setup*.
4. Verify the information from the selected tray configuration corresponds to the tray of specimen cans loaded on the tray platform in the robot cell.
5. Select the *Start Tray* button to allow the robot to begin to select the specimen cans for measurements.

   NOTE: If for any reason the operator would like to stop the measurements from being completed, simply select *Stop Tray.* The robot will finish any current operation and return to the start position.

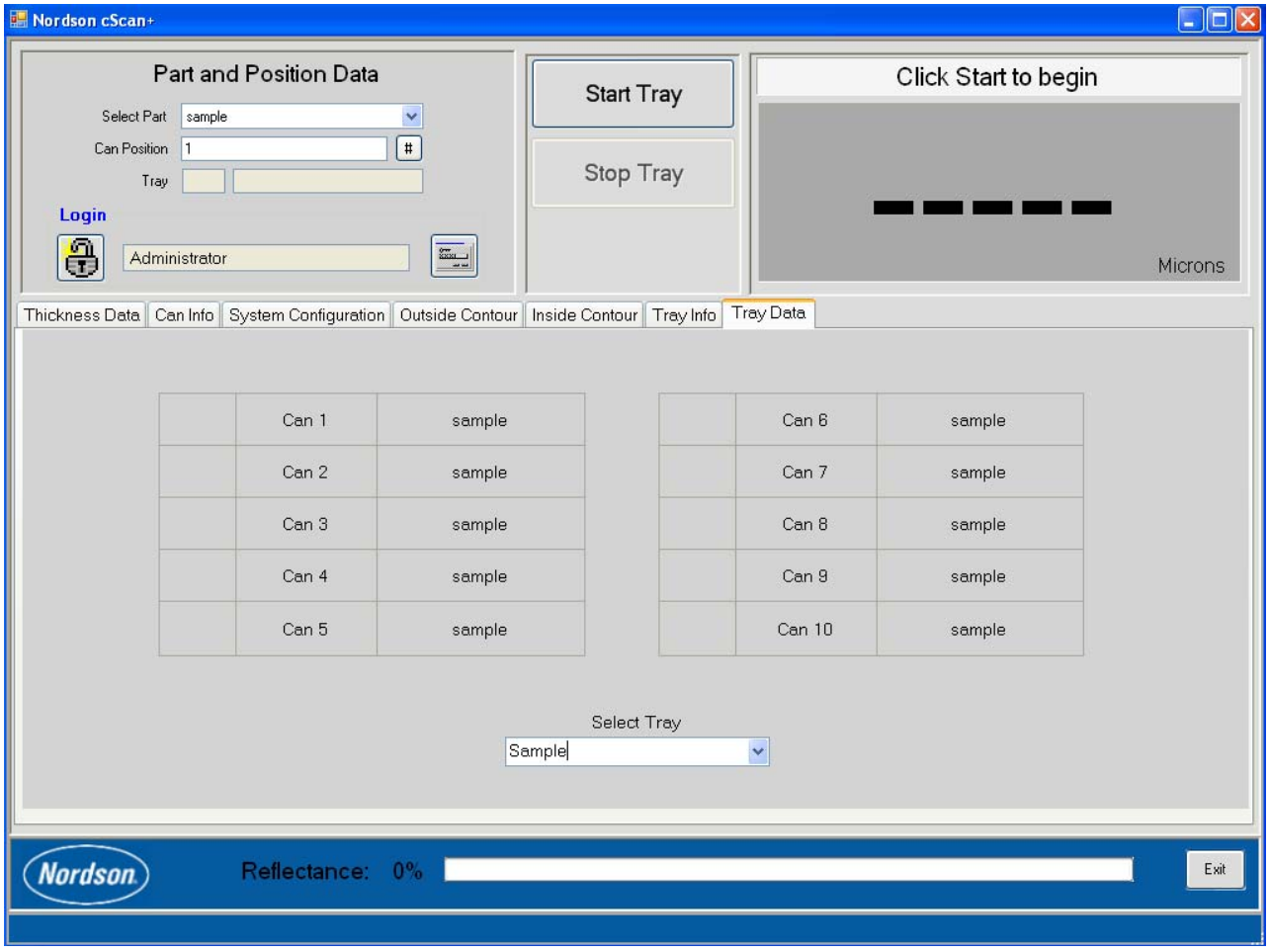


Figure 20 Tray Data Screen

Start Measurement for a Single Can

1. On the *System Configuration* screen, select the *Manual Mode* option, and save the settings using the disk icon.
2. Load the desired can into the can tray following the same steps described in the *Loading the Sample Cans* section on page 19.
3. In the *Part and Position Data* cell on the screen, use the drop down box next to *Select Part* to choose the desired can.
4. Enter the can position number next to the field for *Can Position.*
5. Verify the correct can is in the correct position in the can tray in the robot cell.
6. Select the *Start Measurements* button.

   NOTE: If for any reason the operator would like to stop the measurements from being completed, simply select *Stop Tray.* The robot will finish any current operation and return to the start position.

Evaluating the Results

The ACS-1 software allows the operator to view results using two kinds of evaluation tools. The user can view the data in a table format under the *Thickness Data* tab, or view a colored graph under the *Outside Contour Graph* tab for the outside of the can, or the *Inside Contour* tab for the inside of the can. See Figures 21 and 22.

Thickness Data Table

The thickness data table will show each individual measurement taken by the spectrometer.

If faults are enabled and any measurements fall outside of the range specified in the can recipe under the *Fault Setting* limits, a fault symbol will appear in the *Part and Position Data* cell. To view which specific can the fault occurred on, go to the *Tray Data* screen, where the fault symbol will appear next to the can it affects. See Page 24 for fault descriptions.

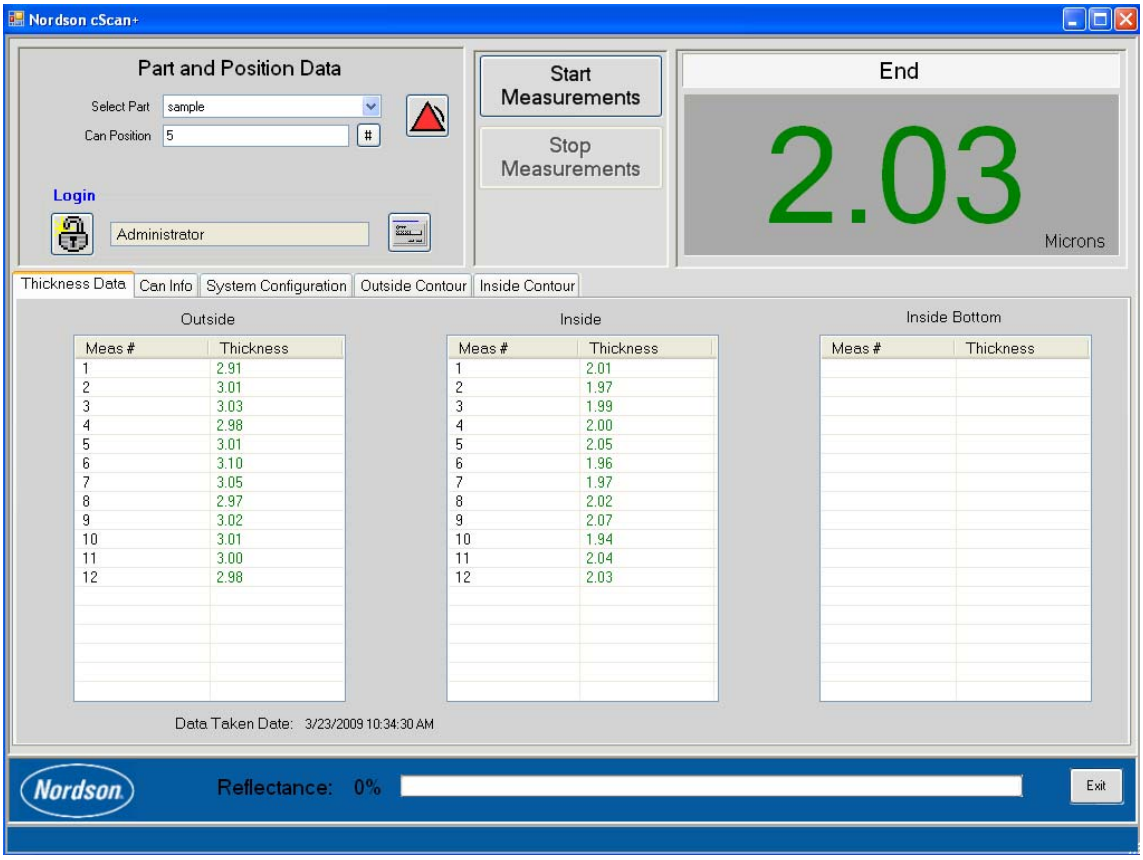


Figure 21 Thickness Data Menu Screen

Contour Graphs

The contour graphs allows the operator to easily view comparisons in different measurements on the can.

The colored graph can be viewed from various angles on the screen. Point the cursor to an area on the graph. While holding down the left mouse button, drag the cursor to rotate the graph.

Figure 22 shows the *Inside Contour* screen with the *Color Map* option selected.

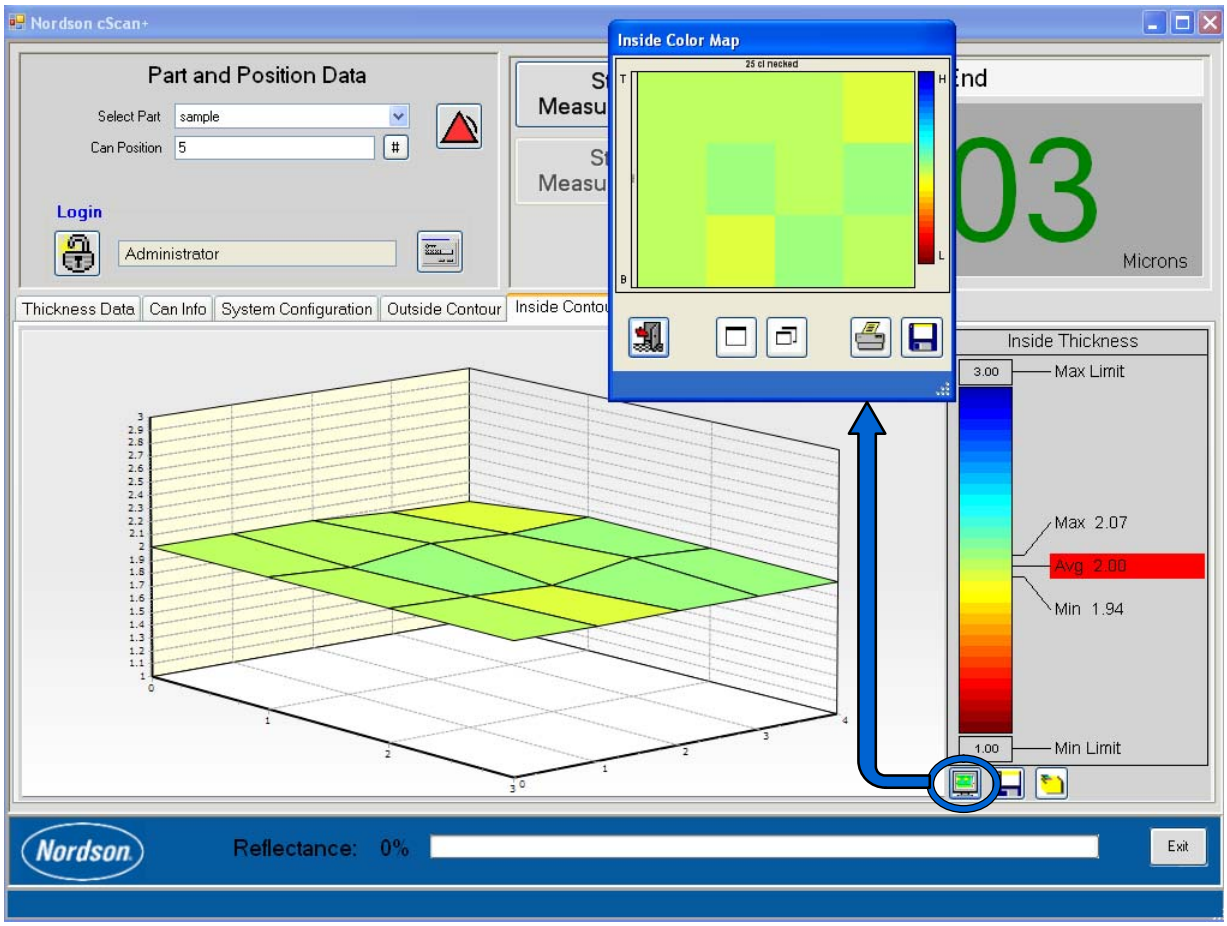


Figure 22 Inside Contour Screen

Points of Measurements

The individual data points are placed on the the contour graphs in Figure 23 to demonstrate the order and the location of the measurements. Note that the measurement data points for the inside measurements go from left to right and top to bottom, while the outside measurements go from right to left and top to bottom.

The average value is shown by the left edge of the contour graph.

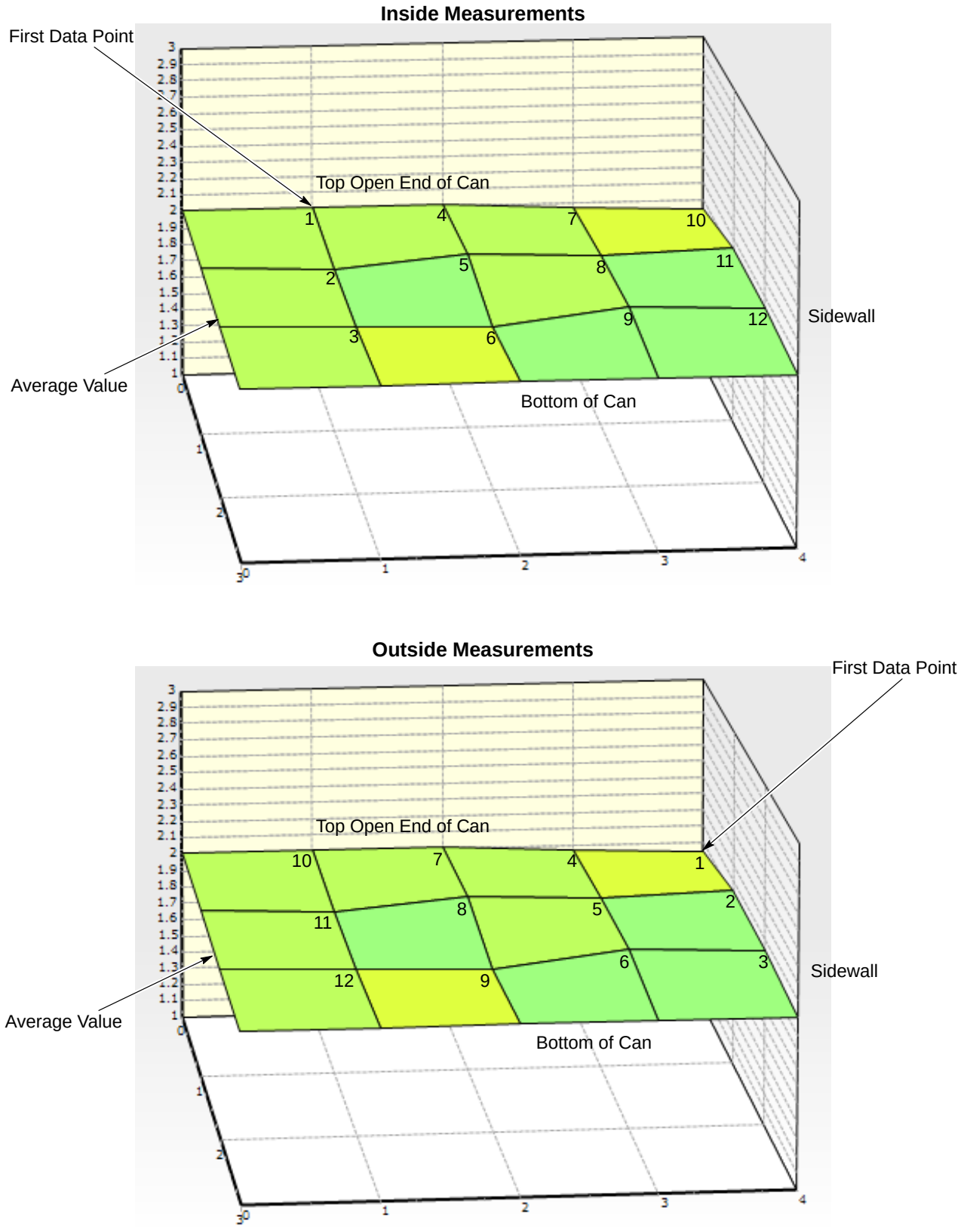


Figure 23 Data Points on Contour Map

Faults

The *Fault* option (enabled through the *System Configuration* tab) alerts the operator that a measurement has fallen outside of a predetermined limit. These limits are determined by the customer after initial testing. Limits can be adjusted through the *Fault Settings* under the *Can Info* tab.

See Figures 24 and 25. When a measurement falls outside of a limit a fault symbol will appear on the computer screen and the light tower will flash yellow or red.

To clear the fault, click on the fault symbol and select *Yes* when prompted to *Reset Fault(s)*.

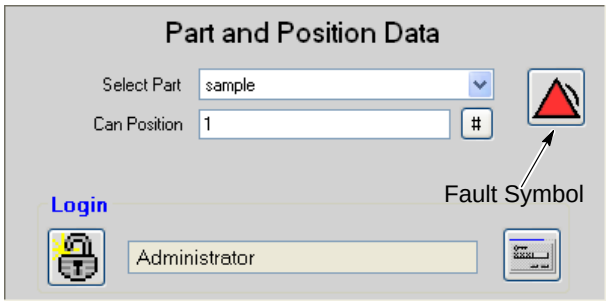


Figure 24 Fault Symbol

Red = Too much coating

Yellow = Too little coating

Figure 25 Light Tower Alerts

Altering Can and Measurement Specifications

Pre-set can and tray recipes can only be changed at the administrator level. Any changes or additions that need to be made must be made by a qualified administrator under their secured login.

Additional Software Tools

Network Connection

When the computer is first turned on, the message *Network Connection Established* should appear in the upper right corner of the screen and the *Start Robot* button is pressed.

Saving and Retrieving Contour Maps

NOTE: The following operations are only accessible under the administrator login.

See Figure 22.

When is Manual Mode and measurements are complete, the administrator can save the last resulting contour map image by going to either of the *Contour* tabs and then selecting *Save Map*. The file saves as a JPEG file.

To retrieve a previously saved contour map, the administrator should go to the appropriate *Contour* tab and then select *Load Map*. The user will be able to browse for the desired data file and reload it for display and save as a JPEG file.

Maintenance

Contact Nordson Service if a problem is found.

Check Every 6 Months:	Controller Power	How to Check	Criterion
Robot connections and their mating parts	OFF	Visually	No looseness, disengagement or dirt
Cables and robot's external cables	OFF	Visually	Free of damage or gouges
LCD on the teaching pendant	ON	Visually	Properly displayed
Pilot lamps on the robot controller	ON	Visually	Should light
Cooling fan in the robot controller	ON	Visually	Should have airflow. Clean filters if not.
EMERGENCY STOP button on the teaching pendant	ON	Press the EMERGENCY STOP button	The robot should come to a quick emergency stop
Safety door	ON	Operates the safety door switch and open the switch- wiring door	The robot should come to a quick emergency stop

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. The robot does not move.	Communication between the robot and the computer not made.	Press the *Start Robot* button on the computer screen. Check that the E-stop button is not engaged.
2. The robot does not pick up the can.	Lack of vacuum.	Check the vacuum line and pump operation.

Repair

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

CAUTION: Before performing repairs, power down the system and computer.

Computer Battery Replacement

CAUTION: Failure to correctly replace the battery could result in serious injury and damage equipment. Follow local guidelines for the disposal of batteries.

The ACS-1 computer battery is located on the back of the computer.

NOTE: As you perform the steps to replace the battery, support the battery cover when loosening or tightening it to prevent the cover and battery from falling to the floor.

1. See Figure 26. Remove the screw from the battery cover and set the cover aside.
2. See Figure 27. Slide the old battery out and disconnect it from the cable plant.
3. See Figure 28. Connect the new battery to the cable plant and slide the new battery into place.
4. Replace the battery cover and the battery cover screw.

Figure 26 Removing Battery Cover

Figure 27 Remove Battery

Figure 28 Battery Connected and in Place

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	

ACS-1 Unit

Part	Description	Note
------	SYSTEM ASSEMBLY, film measuring, ACS-1	
1089299	• CHUCK ASSEMBLY, suction	A
1095875	• BATTERY, rechargeable, Li-ion, 4000mAh, 11.1V	
1094499	• KEYBOARD, wireless	
1094498	• HUB, swivel, USB port	
1094497	• CARD, network, 10/100 32-bit PCMCIA	
NOTE A: See the *Optional Parts* section for specific chuck sizes for this assembly.		

Optional Parts

Part	Description	Note
1090761	TRAY ASSEMBLY, 10 can, 211 diameter	
1090825	AIR CONDITIONER ASSEMBLY, structure, ACS-1	
1095873	TRANSFORMER ASSEMBLY	
1089343	CHUCK, can, 300/211/204	
1095941	CHUCK, can 211/204	
1095955	CHUCK, can, 211	
1096053	CHUCK, can, 211	

Options

Tray Feed

Holds ten 211 x 411 size cans.

Other tray sizes available upon request.

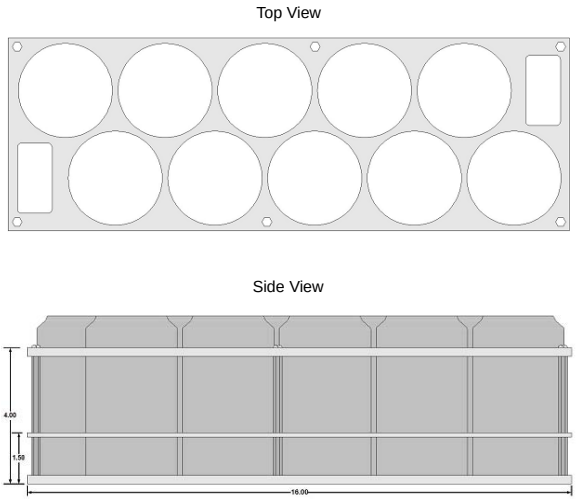


Figure 29 Manual Feed Can Tray

Specifications

ACS-1 System Unit

Item	Specification
Power	120 VAC
	50/60 Hz
	10A max
Power with Optional Transformer	240 VAC
	50/60 Hz
	5A max
Weight	225 kg (495 lb)
Height	218.4 cm (86 in)
Length	122 cm (48 in)
Width	86.5 cm (34 in)
Ambient Temperature Maximum	50°C (122°F)

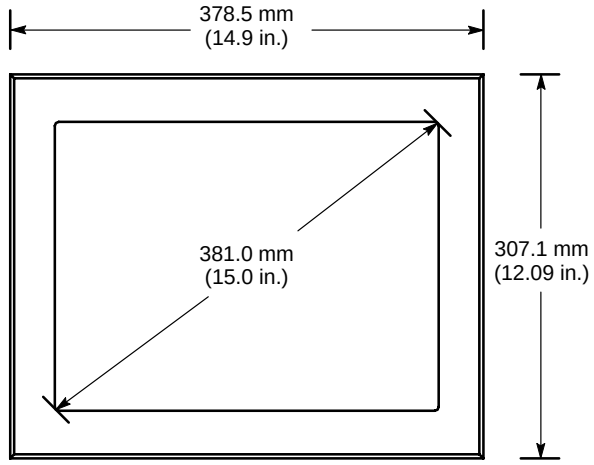


Figure 30 Computer and Monitor Dimensions

Accessories

Transferring Data to External Source

NOTE: Required cables will need to be provided by the customer.

The ACS-1 provides two options to transfer data to host computer:

- Serial Port as a Data Stream
- Ethernet as a CSV file

Option 1 - Serial Port Connection

For correct installation and configuration, the following are required:

- RS-232 Cable
  - 50 ft of cable or less
  - DB-9 connector on both ends
  - Null type
- Serial communication software (for example, Microsoft® Hyperterminal) to display incoming data.
- Text editor software (for example, Microsoft Notepad) to display exported data.
- A person knowledgeable in computer serial communication

Installation

Use the RS-232 cable to connect the host computer to the ACS-1 computer using the ports labelled *COM1*, *COM2*, or *COM3* on the back of the ACS-1 computer.

Configuration

See Figure 31.

1. Using the Administrator login, go to the *System Configuration* tab and select the *Enable Serial Port* option (see Figure 12).
2. Select the *Setup Serial Output Port*.
3. Configure the setup up options as needed. The host computer should share the same configuration.
4. Select the *Serial Output Command*.
5. Choose the type and order of data to be transferred and save the commands.

   NOTE: For the ACS-1 to default to these commands at the beginning of every startup, select the *Load at Startup* option.

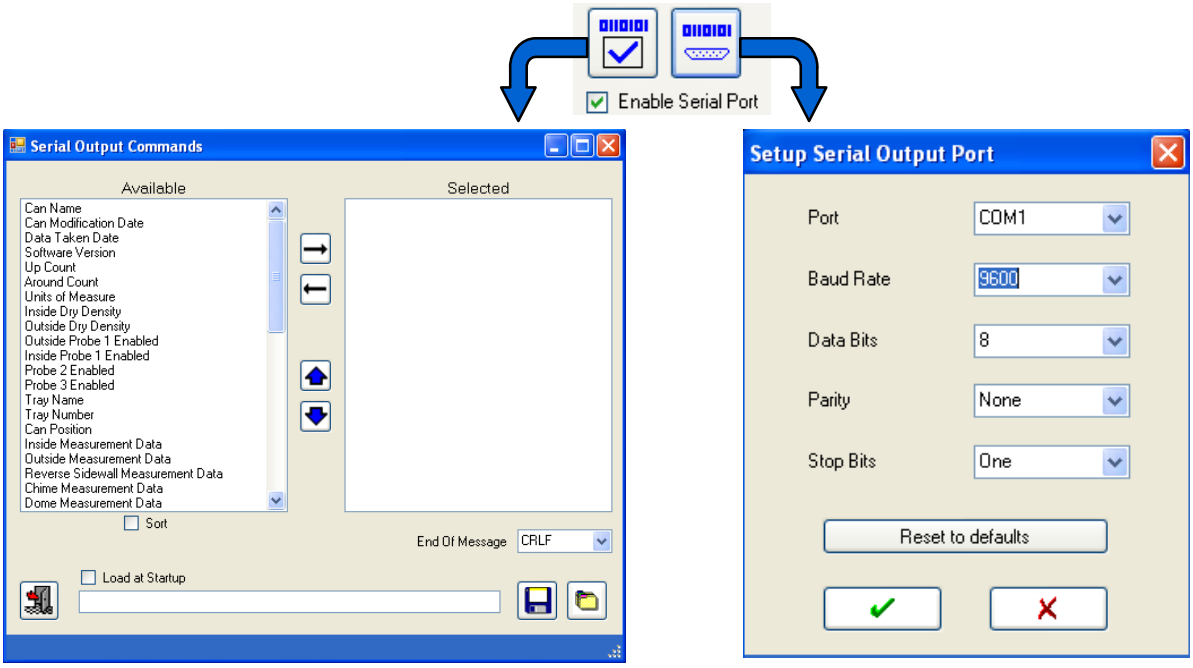


Figure 31 Serial Port Setup

Transferred Data

Data is sent in the ASCII format and can be displayed by a terminal program.

Figure 32 shows transferred data read by a Notepad program using CRLF for end of message. See Tables 1 and 2 for command structure and command name definitions.

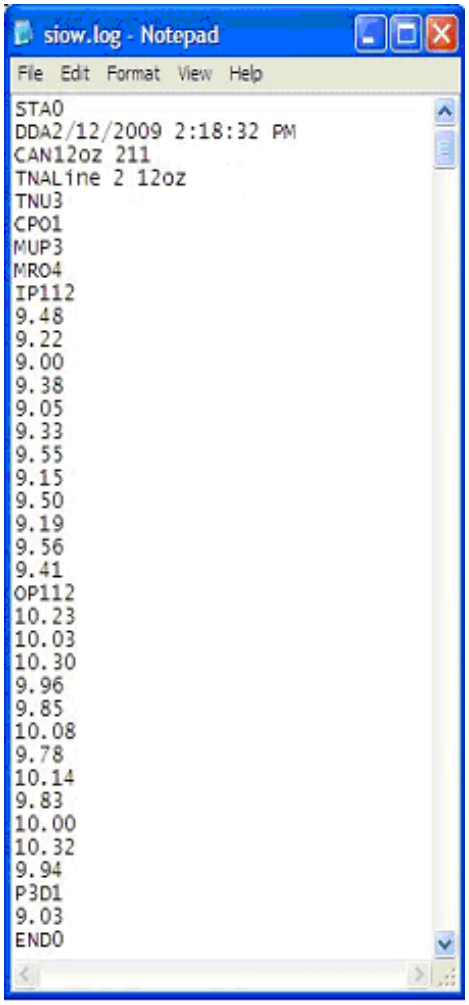


Figure 32 Notepad Display

Table 1 Message Command Structure

1	*2*	*3*	*4..N N*	*End*
C	*M*	*D*	*Value in ASCII*	*EOM*
C = Command Byte 1 M = Command Byte 2 D = Command Byte 3 EOM = End of Message Byte(s)				
Example: OUL5.00 means Outside Upper Limit = 5.00				

Table 2 Command Name Definitions

Data Element	Command	Notes
Can Name	CAN	Can recipe name
Can Modification	CDA	Can recipe modification date
Data Taken Date	DDA	Date data was taken (CSV)
Version	VER	Software version
Measurements UP	MUP	Up count
Measurements Round	MRO	Around count
Units of Measure	UOM	Microns, mg/in^2, g/m^2 and so on.
Inside Dry Density	IDD	Inside coating dry density
Outside Dry Density	ODD	Outside coating dry density
Probe 1	P1O	Is enabled
Probe 1 Inside	P1I	Is enabled
Probe 2	P2I	Is enabled
Probe 3	P3I	Is enabled
Tray Name	TNA	Name for tray
Tray Number	TNU	Number of tray (magnet)
Can Position	CPO	Position of can in tray
Probe 1 Inside Data	IP1	Inside measurement data
Probe 1 Outside Data	OP1	Outside measurement data
Probe 2 Reverse Sidewall Data	P2R	Reverse sidewall data
Probe 2 Chime Data	P2C	Chime data
Probe 3 Dome Data	P3D	Dome data
Probe 3 Mote Data	P3M	Mote data
Start Sending	STA	Start sending data
Stop Sending	END	Data sending is over
End of Message	EOM	Data block is complete
MaxLimit Enable	OXL	Is enabled
MaxAvgEnabled	OXA	Is enabled
MinAvgEnable	ONA	Is enabled
MinLimitEnabled	ONL	Is enabled
UpperLimit	OUL	Outside fault maximum
RangeMax	ORX	Outside fault maximum average
RangeMin	ORN	Outside fault minimum average
LowerLimit	OLL	Outside fault minimum
TMax	OTX	Outside analysis upper limit
TMin	OTN	Outside analysis lower limit
Refractive Index	ORI	Outside Index of Refraction
Start Wavelength	OSW	Outside starting point
End Wavelength	OEW	Outside ending point
Number of Average	OMA	Outside number of samples

Data Element	Command	Notes
MaxLimitEnable	IXL	Is enabled
MaxAvgEnable	IXA	Is enabled
MinAvgEnable	INA	Is enabled
MinLimitEnable	INL	Is enabled
UpperLimit	IUL	Inside fault maximum
RangeMax	IRX	Inside fault maximum average
RangeMin	IRN	Inside fault minimum average
LowerLimit	ILL	Inside fault minimum
TMax	ITX	Inside analysis upper limit
TMin	ITN	Inside analysis lower limit
Refractive Index	IRI	Inside index of refraction
Start Wavelength	ISW	Inside starting point
End Wavelength	IEW	Inside ending point
Number of Average	IMA	Inside number of samples

Option 2 - Ethernet Port Connection

For correct installation and configuration, the following are required:

- Ethernet Cable
- Text editor software (for example, Microsoft Notepad or Excel) for host computer to display exported CSV files.

Installation and Configuration

Use the Ethernet cable to connect the host computer to the ACS-1 computer using the Ethernet port located on the left side of the ACS-1 computer.

Using the Administrator login, go to the *System Configuration* tab and confirm the *Enable Serial Port* option is not selected.

Transferred Files

Data saves as a CSV file upon the completing a measurement set. These files can be read by a text editor and imported into an Excel sheet.

The naming convention of the CSV files comes directly from the can name and the date and time of the measurement. See Figure 33.

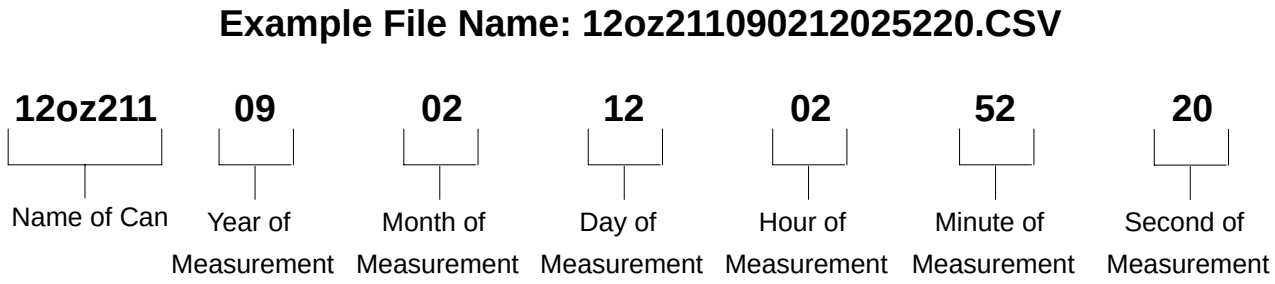


Figure 33 Definition of CSV File Name

Figure 34 shows the data as presented on the ACS-1 unit's computer screen for a single can, while Figure 35 shows the same can data imported into Excel.

When in Tray Mode, all can data is stored in a single CSV file.

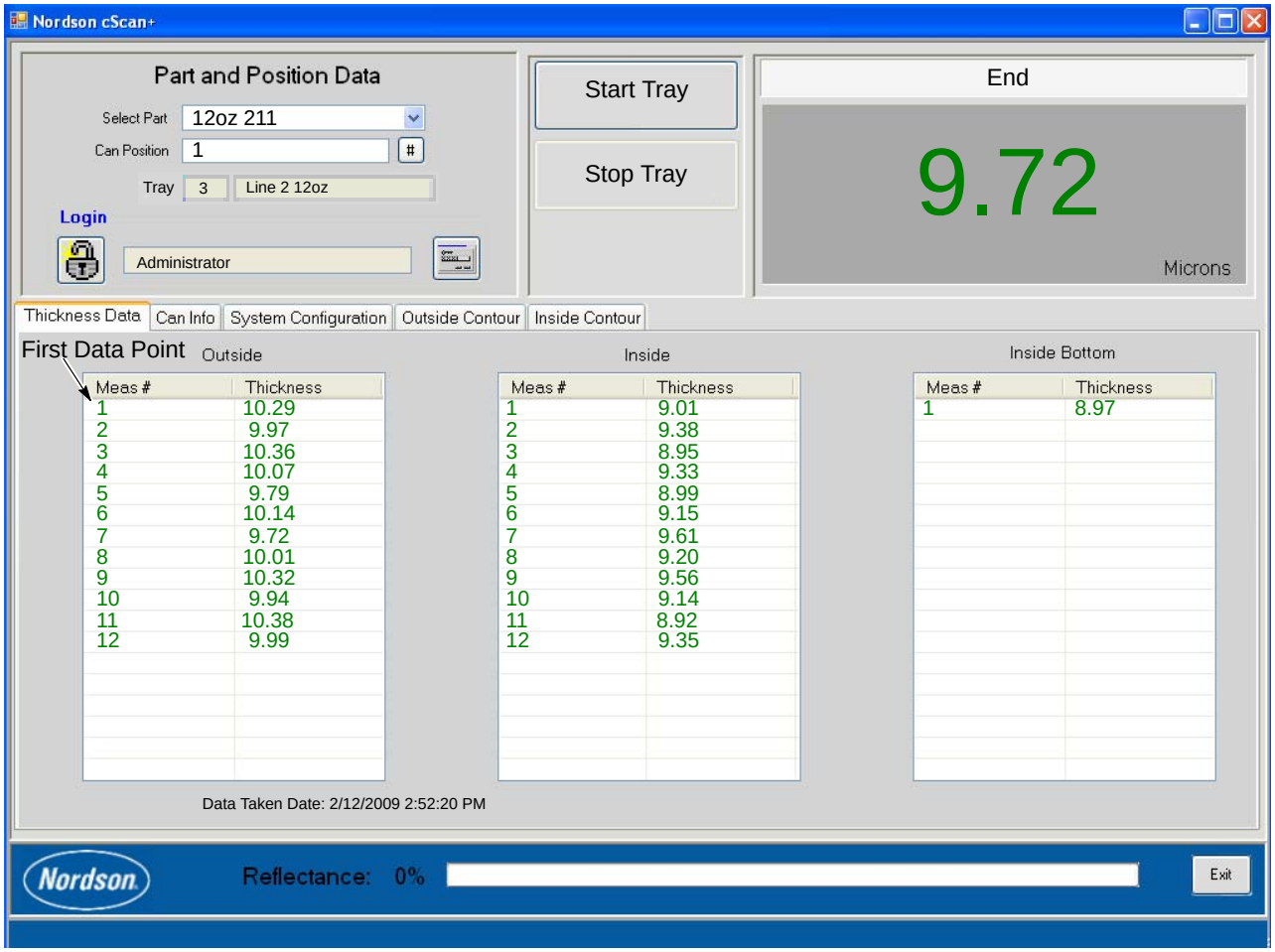
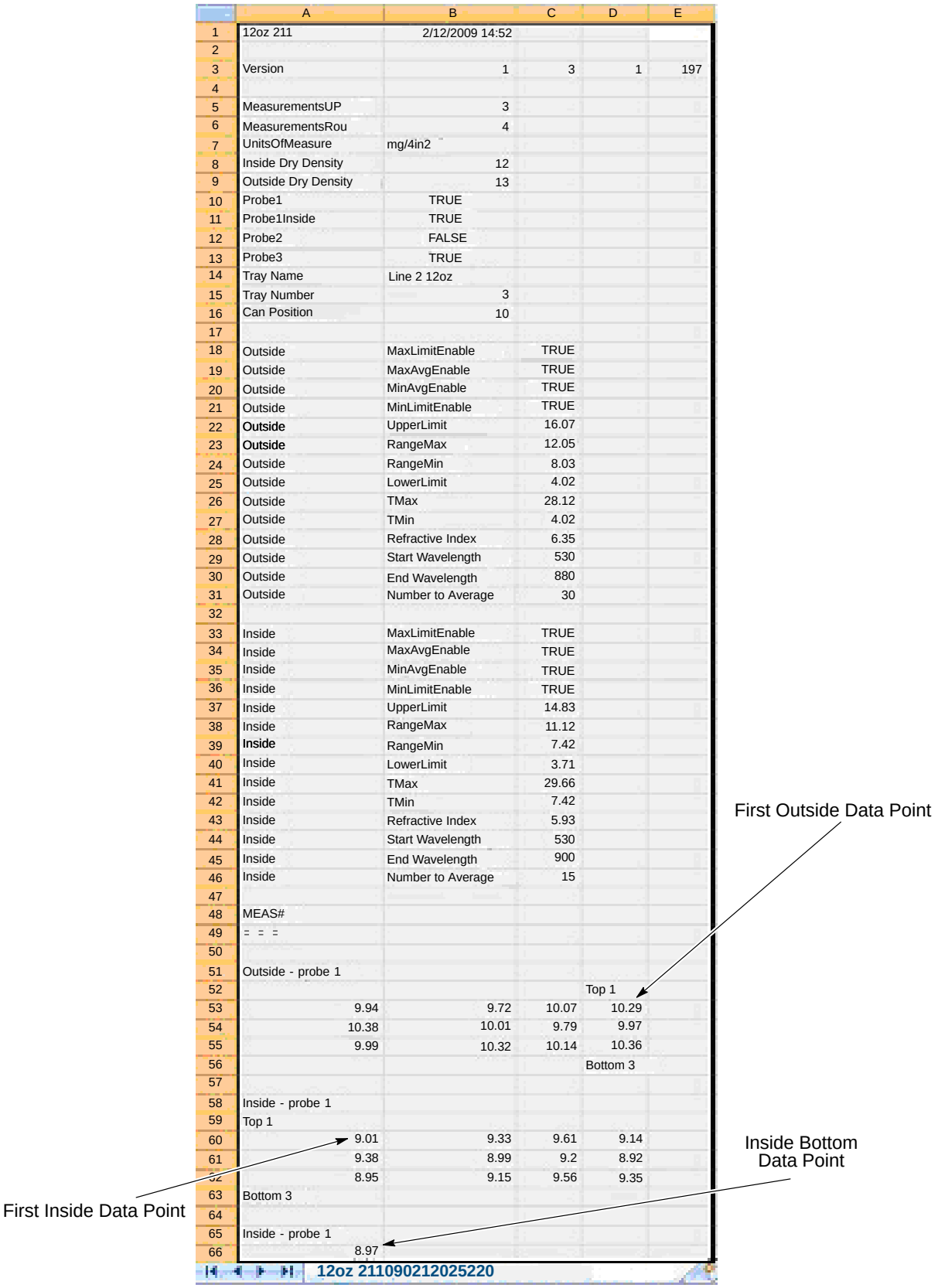


Figure 34 Measurements from Thickness Data Screen



	A	B	C	D	E
1	12oz 211	2/12/2009 14:52			
2					
3	Version	1	3	1	197
4					
5	MeasurementsUP	3			
6	MeasurementsRou	4			
7	UnitsOfMeasure	mg/4in2			
8	Inside Dry Density	12			
9	Outside Dry Density	13			
10	Probe1	TRUE			
11	Probe1Inside	TRUE			
12	Probe2	FALSE			
13	Probe3	TRUE			
14	Tray Name	Line 2 12oz			
15	Tray Number	3			
16	Can Position	10			
17					
18	Outside	MaxLimitEnable	TRUE		
19	Outside	MaxAvgEnable	TRUE		
20	Outside	MinAvgEnable	TRUE		
21	Outside	MinLimitEnable	TRUE		
22	Outside	UpperLimit	16.07		
23	Outside	RangeMax	12.05		
24	Outside	RangeMin	8.03		
25	Outside	LowerLimit	4.02		
26	Outside	TMax	28.12		
27	Outside	TMin	4.02		
28	Outside	Refractive Index	6.35		
29	Outside	Start Wavelength	530		
30	Outside	End Wavelength	880		
31	Outside	Number to Average	30		
32					
33	Inside	MaxLimitEnable	TRUE		
34	Inside	MaxAvgEnable	TRUE		
35	Inside	MinAvgEnable	TRUE		
36	Inside	MinLimitEnable	TRUE		
37	Inside	UpperLimit	14.83		
38	Inside	RangeMax	11.12		
39	Inside	RangeMin	7.42		
40	Inside	LowerLimit	3.71		
41	Inside	TMax	29.66		
42	Inside	TMin	7.42		
43	Inside	Refractive Index	5.93		
44	Inside	Start Wavelength	530		
45	Inside	End Wavelength	900		
46	Inside	Number to Average	15		
47					
48	MEAS#				
49	= = =				
50					
51	Outside - probe 1				
52				Top 1	
53	9.94	9.72	10.07	10.29	
54	10.38	10.01	9.79	9.97	
55	9.99	10.32	10.14	10.36	
56				Bottom 3	
57					
58	Inside - probe 1				
59	Top 1				
60	9.01	9.33	9.61	9.14	
61	9.38	8.99	9.2	8.92	
62	8.95	9.15	9.56	9.35	
63	Bottom 3				
64					
65	Inside - probe 1				
66	8.97				

12oz 211090212025220

Figure 35 Measurements Imported to Excel Sheet

Glossary

ASCII Format

American Standard Code for Information Interchange (ASCII) is a code that can be transmitted and displayed between computers through a terminal program. This allows computers to share information and data without the need to save data.

Can Measurements

To ensure the can is handled correctly during the measurement process, the can height and diameter must be entered. All can measurement units are in mm. See Figure 15 on page 16 for a can dimension guide.

End Wave Length

This is the end of the interference evaluation range of wavelengths that the spectrometer is capable of capturing. The minimum parameter that can be set for the start wavelength is 1100 nm.

For optimal results, the interference evaluation range has to be selected as precisely as possible.

Index of Refraction

See *Refraction Index*.

Integration Time

This is the time in milliseconds used to sample the spectrometer detector array upon initial setup of a new part. Sensitivity of the instrument is directly proportional to the integration time. For a highly reflective sample, integration time should usually be low to avoid saturating the detectors, whereas for a sample which is not quite as reflective the integration time must be higher. A typical range for integration time would be between 2 ms and 10 ms, although some lower reflective samples would be set higher than 10 ms.

> **NOTE:** Signal intensity also depends on factors like intensity of the light source and the distance of the fiber optic cable from the sample apart from the selected integration time.

Interference Evaluation Range

The spectrometer module inside the thickness measurement system is capable of collecting reflectance information over a wide range of wavelengths from 250 nm to 1100 nm.

Measurement Plan

This should be populated only if the operator is measuring a beverage can and if the contour graph is required. This is mainly used for can dimensions and can be changed under the *Tools* tab.

Number of Measurements

This field has the information about the number of measurements to be taken by the operator for the specified part number. Up to 10 x 10 contour maps can be taken.

Number to Average

This feature allows the system to take a variable number of spectra and average the spectra before it is evaluated. This helps in reducing the signal to noise ratio and reduce the effect of stray light. The time required to acquire a measurement will be increased by a factor of the number of readings to average. This is typically set to 15.

Part Name or Can Recipe

This is a unique identification name given to the part that needs to be measured. This also acts as an identifier for the rest of the parameters specific to that part. The parameters for a given part number are called upon the start of each measurement run, so once the part parameters for a specific part have been properly identified and populated, it will only be a one time setup procedure.

Reflectance Percentage

This is the amount of the light that the spectrometer is able to capture off the reflective surfaces of the can.

Refractive Index

This is the ratio of the speed of light in the can coating material to the speed of light in a vacuum. This value is always greater than 1. This data can be obtained from the manufacturer of the coating material.

The standard recipes use a value of 1.58, which is typical for most can coating materials.

Start Wavelength

This is the beginning of the interference evaluation range of wavelengths that the spectrometer is capable of capturing. The minimum parameter that can be set for the start wavelength is 250 nm.

For optimal results, the interference evaluation range has to be selected as precisely as possible.

Thickness Maximum

The parameter that determines the thickest layer that can be considered for analysis. Typically, this is set at 15 microns.

Thickness Minimum

The parameter that determines the thinnest layer that can be considered for analysis. Typically, this is set at 1 micron.

DECLARATION of CONFORMITY

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

APPLICABLE DIRECTIVES:

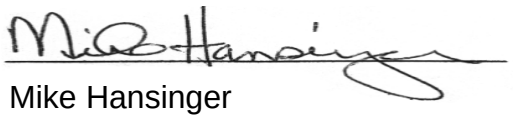
2006/95/EC (Low Voltage Directive)
2004/108/EEC (Electromagnetic Compatibility Directive)
98/37/EC (Machinery Directive)

STANDARDS USED TO VERIFY COMPLIANCE:

EN12100	EN55011
EN60204	EN61000-6-2
EN14121	

PRINCIPLES:

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



Date: 20 March 2009

Mike Hansinger
Manager Finishing Applications Engineering

Nordson Corporation • Westlake, Ohio

DOC12014A