CanWorks[®] SM-1 Spray Monitor

Customer Product Manual Part 106698B Issued 9/03

For parts and technical support, call the Industrial Coating Systems Customer Support Center at (800) 433-9319 or contact your local Nordson representative.

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Section 1 Safety

Introduction

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.
- 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

MEDICAL ALERT-AIRLESS SPRAY WOUNDS: NOTE TO PHYSICIAN

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.

Fire Safety (contd)

- 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:

<u>Element</u>	<u>Symbol</u>	<u>Prefix</u>
Fluorine	F	"Fluoro-"
Chlorine	CI	"Chloro-"
Bromine	Br	"Bromo-"
lodine	I	"lodo-"

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.

Section 2 Description

Introduction

The Nordson CanWorks SM-1 spray monitor detects problems in a spray system by monitoring the static base and firing pressures inside the spray gun. If there is a small change from the preset spray pressure level, the SM-1 issues a warning. When the pressures are significantly higher or lower than the preset level, the SM-1 issues an alarm. The SM-1 uses LEDs and relay closures to indicate warnings and alarms.

The SM-1 also provides on-line fault diagnostics to help troubleshoot the spray system. The CanWorks display module displays the FAULT and HELP screens. Refer to the *CanWorks Display Module* manual for display module information.



Figure 2-1 CanWorks SM-1 Spray Monitor

Component Description

Front Panel LEDs

See Figure 2-1.

LED Color	Function	Description
Green	POWER	The green POWER LED comes on when power is supplied the SM-1.
Amber	WARNING	The amber WARNING LED alerts the operator to these warning conditions:
		high nozzle flow
		low nozzle flow
		electrical and mechanical noise
		gun opening slow
		gun closing slow
		cycle rate too fast
		spray duration too short
		If the warning system is enabled and the SM-1 determines that any of the above conditions exists, the amber WARNING LED will come on. The WARNING LED turns off when the fault condition is corrected and reset on the CanWorks display module.
Red	ALARM	The red ALARM LED alerts the operator these alarm conditions:
		high base spray pressure
		low base spray pressure
		high nozzle flow
		low nozzle flow
		If the alarm system is enabled and the SM-1 determines that any of the above conditions exists, the red ALARM LED will come on. The ALARM LED turns off when the fault condition is corrected and reset on the CanWorks display module.

End Cap Assemblies

See Figure 2-3. The right and left end cap assemblies (3 and 5) provide connections for the signals listed in Table 2-1.

Left End Cap Assembly			
Terminal	Signal	Description	
PWR +24 [⊥]	Power Input	+24 Vdc, 200 mA—requires twisted-pair with shield	
COMM A B	Communications Path	CanWorks protocol, two-wire twisted-pair with shield connection	
	Right End Cap Assembly		
Terminal	Signal	Description	
PRESS +,-	Pressure Transducer Output	 41 bar (600 psi) pressure transducer signal 1-4 Vdc 	
		 103 bar (1500 psi) pressure transducer signal 0-5 Vdc 	
EXC +, -	Pressure Transducer Output	+24 Vdc excitation output	
TIMER +,-	Gun Timer Input	Input from the timing signal driving the gun 4 Vdc/min, 50 V peak max, and 24 Vdc max. continuous	
ALARM WARNING	Alarm and Warning Contacts	Normally open contacts: 5 A at 250 Vac, or 5 A at 30 Vdc	
NOTE: For the pressure transducer load requirements, see the transducer manual/data sheet which comes with the pressure transducer.			

Table 2-1	End Cap	Terminals
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Network Addressing Switches (SW1 and SW2)

See Figure 2-3. Each SM-1 on the CanWorks network must have a unique address. Use the network addressing switches SW1 and SW2 (1) to set a valid network address. Valid network addresses are 00 through 31. Figure 2-2 illustrates the addresses in a typical network.

NOTE: Refer to Table 2-1. The operator must set the number on SW2 before setting the number on SW1.

Table 2-2 Setting a Network Address

If the address is	Turn SW2 to	And turn SW1 to
31	3	1
07	0	7



Figure 2-2 CanWorks Network

- 1. Network addresses
- 2. Last module on the network terminator ON
- 3. First module on the network terminator ON
- 4. Address switches
- 5. CanWorks UI-1
- display module
- 6. CanWorks SM-1 spray monitor

Terminator Switch (SW3)

See Figure 2-3. Only the first and last module on the CanWorks network must have their terminator resistors connected to the network (ON). Use terminator switch SW3 (4) to connect (ON) or disconnect (OFF) the resistor from the network. Figure 2-2 illustrates the terminator switch setting in a typical network.

Fuse

See Figure 2-3. A 200 mA fuse (2) protects the power supply input. Refer to the *Parts* section for the fuse part number.

Mounting

See Figure 2-3. Mounting holes (6 and 7) are provided for installing the SM-1 on a DIN rail or flat surface.



Figure 2-3 Spray Monitor Components

- 1. Network addressing switches SW1 and SW2
- 2. Fuse
- 3. Right end cap assembly
- 4. Terminator switch SW3
- 5. Left end cap assembly
- 6. Surface mounting holes
- 7. DIN rail mounting hole

Theory of Operation

System Operation

See Figure 2-4. The spray station performs a critical process in producing a quality can. If problems occur, such as blocked or worn nozzles, restricted hydraulic lines, or malfunctioning pumps or spray guns, the quality of the cans will be affected. The CanWorks system provides a means of early detection to these problems. It gives the operator time to correct the problems before they affect quality.



A basic CanWorks system consists of a UI-1 display module (3), one or more CanWorks SM-1 spray monitors (4) and a pressure transducer (2) for each SM-1. In order for the CanWorks system to function correctly, a pressure control system is required. It consists of the pump, pressure regulator, fixed orifice, and plumbing sized according to the specific coating application.

The SM-1 is the heart of the CanWorks system. All data processing takes place in the SM-1 and is sent to the display module . The pressure transducer signal is digitized and compared to reference data obtained during calibration. The difference between the signal and the data is compared against fixed values to determine if an out-of-specification condition has occurred. If so, the SM-1 sends a Warning or Alarm message to the display module , and if selected, will activate a relay contact.

The display module acts as the messenger between the CanWorks system and the operator. The SM-1 sends system parameter and error data to the display module, enabling the operator to check system performance. The operator uses the display module to setup and calibrate the SM-1 module(s). The CanWorks system uses a single pressure transducer to determine direct pressure fault conditions and to infer flow and gun timing faults. Because the pressure transducer is the sole device used to monitor the performance of the coating process, its proper operation is critical to a well-running CanWorks system.

The pressure transducer is mounted between the CO-Plate (5) and nozzle (6) on the spray gun (1) and is connected to the SM-1 via a junction box. The transducer converts the pressure sensed in the gun body to an electrical signal, which is sent to the SM-1.

The electric spray gun is the preferred coating application device for CanWorks systems. It has a quick response time, which is necessary to ensure repeatability in coating applications. The spray gun uses an internal CO-Plate, which is an orifice that produces a controlled pressure drop when the spray gun fires.

When properly selected, the CO-Plate and nozzle combination will develop the a 3 bar (50 psi) pressure drop within the gun body. A CO-Plate designator is assigned to the CO-Plate based on a 3 bar (50 psi) drop with the nozzle/CO-Plate combination using 34 bar (500 psi) water at ambient temperature.

The SM-1:

- uses an analog to digital converter to convert the pressure signals to digital format so the microprocessor can analyze the data.
- continually collects data every 6.25 usec and analyzes both static base and firing pressures about every 20 msec.
- produces a fault condition if the averaged base pressure goes above or below calibrated limits.

Calibration

Calibration of the CanWorks system is necessary for its proper operation. The operator must calibrate the system when all of the components are operating properly. When a calibration is performed, CanWorks finds the coating application's "signature." That is, the system assumes that the signature is the ideal pressure profile that occurs when the coating application is running well.

However, the operator must enter the CO-plate and nozzle values before the system can be put into operation. To calibrate the SM-1, the operator first enters values for these parameters. To calibrate an SM-1 module, press the Calibration button on the display module for the desired module.

When the calibration procedure is initiated, the SM-1:

- analyzes the next four cans that are sprayed. The rising edge of the trigger signal is the starting point for data collection and computations.
- compares the firing pressure drop to the expected pressure drop (calculated from the user entered nozzle flow rate and CO-Plate designator values).
- uses the actual values to calculate and set the warning and alarm bands, if the calibration is successful. In addition, the system stores the readings of the base and fire pressures taken at the time of calibration.

Alarms and Warnings

Refer to Table 2-3. The CanWorks display module displays the alarms and warnings. Refer to the *CanWorks Display Module* manual for more information.

Problem	Notification
Low flow	Warning and alarm
High flow	Warning and alarm
Low base pressure	Alarm only
High base pressure	Alarm only
Gun open slow	Warning only
Gun close slow	Warning only
Duration too short	Warning only
Cycle rate too fast	Warning only
Elec/mech noise	Warning only

Table 2-3 Alarms and Warnings

Section 3 Installation



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

Preinstallation

NOTE: Review the *Specifications* section before performing these procedures.

End Cap Removal

- 1. See Figure 3-1. Loosen the end cap screws (5) securing the end cap assemblies (2).
- 2. Carefully remove the end cap assemblies.

Terminator Switch Settings

The network must be terminated at each end. The CanWorks display module has a built-in terminator switch that is in the enabled position by default from the factory. Figure 3-1 illustrates the terminator switch settings for a typical setup.

NOTE: The last module on the network can be any CanWorks module.

- 1. See Figure 3-1. Set the terminator switch (1) of the last CanWorks module on the network to the ON position.
- 2. Set the terminator switch of all modules between the display module and the last spray monitor to the OFF position.

Network Address Settings

See Figure 3-1. Each CanWorks module must have a unique two-digit network address. Valid network addresses are 00 through 31.

NOTE: Refer to Table 3-1. The operator must set the number on SW2 before setting the number on SW1.

If the address is	Turn SW2 to	And turn SW1 to
07	0	7
15	1	5

NOTE: The display module must have an address that is different from the spray monitors.

- 1. Using an insulated screwdriver, turn the SW2 and SW1 network addressing switches (3) to select a network address.
- 2. Refer to *Gun Labels and Addresses* on page 7-2 to record the gun label and address. This information is necessary for configuring the CanWorks display module.

Fuse Installation

- 1. See Figure 3-1. Remove the fuse cap from the fuse holder (4).
- 2. Install the fuse supplied with the SM-1 into the fuse cap.
- 3. Insert the fuse cap into the fuse holder (4) and tighten it.

NOTE: When ordering additional fuses, refer to the *Parts* section for the part number.

End Cap Installation

1. See Figure 3-1. Carefully connect the end cap assemblies (2) to the SM-1.



CAUTION: To prevent damage to the SM-1 spray monitor, do not overtighten the end cap screws.

2. Tighten the end cap screws (5) finger-tight.



Figure 3-1 SM-1 Setup

- 1. Terminator switch (SW3)
- 2. End cap assemblies
- 3. Network addressing switches (SW1 and SW2)
- 4. Fuse holder
- 5. End cap screws

- 6. Display module
- 7. Last module on network

Mounting

Mount the SM-1 to a DIN rail or flat surface. Mount the SM-1 in an area that is free from excessive vibration, dust, moisture, and ambient temperatures above 60 $^{\circ}$ C (140 $^{\circ}$ F) or below 0 $^{\circ}$ C (32 $^{\circ}$ F).

DIN Rail Mounting

- 1. See Figure 3-2. Install the DIN rail clip (2) on the SM-1. Apply finger pressure to the DIN rail clip while turning the M4 screw (3).
- 2. Install the SM-1 by snapping the DIN rail clip on the DIN rail (1).



Figure 3-2 DIN Rail Mounting

- 1. DIN rail
- 2. DIN rail clip

3. M4 screw

Surface Mounting

- 1. See Figure 3-3. Drill two 6.35 mm (0.25 in.) holes into the mounting surface that are 95.25 mm (3.75 in.) apart on the centers.
- 2. To select the proper M4 screw length, calculate

Panel Thickness + 6.35 mm (0.25 in.) max. = Screw Length

3. Use the M4 screws to secure the SM-1 to the mounting surface.



1200401A

Figure 3-3 Surface Mounting

Electrical Connections

Figure 3-3 illustrates the electrical connections for a typical system.

NOTE: Use 22 AWG twisted-pair, shielded wire, such as Belden # 8723, for the network, power, and transducer connections.



CAUTION: The colors of the pressure transducer twisted-pair wires may not match the standard colors of twisted-pair wires. To prevent noise, keep the twisted-pair wires together.

1. See Figure 3-4. Connect twisted-pair wire leads to the SM-1 spray monitor's end caps as illustrated:

Left End Cap:

Power supply and display module

Right End Cap:

Pressure transducer, timer, and warning and alarm relays



Electrical Connections (contd)

Figure 3-4 Electrical Connections (Typical System)

2. When installing multiple SM-1 spray monitors, see Figure 3-5 and refer to Table 3-2 to connect the wire leads from one SM-1 to another.

From	То
PWR +24	PWR +24
PWR GROUND 🛓	PWR GROUND 🛓
GND	GND
COMM A	COMM A
СОММ В	СОММ В

Table 3-2 SM-1 Signal and Power Connections





Software Setup

Read the following instructions before setting up the SM-1 for the first time.

- 1. Install the SM-1 on one of the ten CanWorks Display Module's runtime screens. Refer to the *CanWorks Display Module* manual.
- 2. Assign a LABEL to the SM-1. Refer to *Configuration Setup* on page 4-8 for detailed procedures.
- 3. Select either 41 or 103 bar (600 or 1500 psi) for the proper pressure transducer RANGE. Refer to *Configuration Setup* on page 4-8 for detailed procedures.

NOTE: The pressure range matches the range of the transducer amplifier. Compare the part number on the amplifier to the part number in the parts list based on the unit.

- 4. Perform a quick test to make sure that the SM-1 is properly installed. Use the TEST screens to check the base or firing pressures and verify the timer connections. Refer to *Testing the SM-1 Spray Monitor Hardware* on page 4-26 for detailed procedures.
- 5. Perform the CALIBRATION procedure. Refer to *Calibration* on page 4-12 for detailed procedures.
- 6. Enable the FAULT system. Refer to Table 3-3 for each function's options.

FAULT Function	Options
FAULT STATUS	• ON
	• OFF
	WARN ONLY
	ALARM ONLY
FAULT MODE	LED ONLY
	LED/RELAY
RESET MODE	• MANUAL
	• AUTO
FAILSAFE	• ON
	• OFF

Table 3-3 Fault Function Options

Refer to Fault Setup on page 4-19 for detailed procedures.

7. Enable the can COUNTER. Refer to *Counter Setup* on page 4-22 for detailed procedures.

Section 4 Operation



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

SM-1 Module Setup

These main parameters must be set before putting the SM-1 spray monitor into service:

- Configuration
- Calibration
- Fault
- Counter
- Copy To

Read the *Configuration Settings*, *Calibration Settings*, *Fault Settings*, *Counter Settings*, and *Copy To* paragraphs before performing any procedures in this section.

The *Configuration Setup* procedure on page 4-8 explains the procedures for setting up the SM-1. Use the SM-1 software tree at the end of this section as a guide for accessing setup screens.

Configuration Settings

CONFIGURATION consists of assigning a **LABEL** and selecting the pressure transducer **RANGE**.

Label

The user-defined **LABEL** can be up to five alphanumeric characters. It identifies a specific gun. The default label is **GUN XX**; where XX equals the Module address.

Range

Two pressure transducers are available for use with the SM-1. Toggle the **RANGE** to select the **41** or **103** bar (600 or **1500** psi) pressure transducer.

Calibration Settings

CALIBRATION consists of entering the flow rate and CO-Plate orifice designator. The system automatically measures the base pressure.

Flow Rate

The **FLOW RATE** is based on the size of the nozzle that the gun is using. The flow standard rate in gallons per minute is based on 34 bar (500 psi) water at ambient temperature.

Orifice Designator

The **ORIFICE DESIGNATOR** is a three-digit number that is assigned to a CO-Plate. The CO-Plate chart on page 4-15 lists the CO-Plate part numbers and designations.

Base Pressure

The **BASE PRESSURE** is the static pressure the SM-1 measures inside the gun when it is not firing. When calibrated, the system automatically measures and saves the base pressure.

Calibrating the SM-1

When the operator presses the $\ensuremath{\text{CALIBRATE}}$ button, the calibration procedure begins. The SM-1

- analyzes the next four cans that are sprayed.
- stores an averaged base pressure.
- compares the firing pressure drop to the expected pressure drop (calculated from the operator-entered nozzle flow rate and CO-Plate designator values).
- uses the actual values to calculate and set the warning and alarm thresholds within the fault bands, if the calibration is successful.

Fault Settings

The **FAULT** function is used to select the status, the type of fault and fault reset modes. The CanWorks Display Module can display the last 50 faults.

Status

These are the **STATUS** selections:

OFF—Alarms and warnings are disabled

ON—Alarms and warnings are enabled

ALARM ONLY-Alarms enabled and warnings disabled

WARN ONLY—Warnings enabled and alarms disabled

Modes

There are two fault **MODES**. **LED ONLY** turns on the appropriate front panel LED. **LED/RELAY** turns on lights and activates relay contacts when a fault occurs.

Reset

There are two **RESET** modes. **MANUAL** mode keeps the relay and light activated until the error condition is corrected. This is the default mode. **AUTO** mode will automatically reset the relay after a 10-msec close time. The light will remain on until the operator notices the error condition. This mode is useful to eject a bad can without stopping the operation.

When the alarm **AUTO Reset** mode is selected, the relay does not automatically reset when the base pressure is below setpoint. This mode prevents the relay from "chattering" for long periods of time when the CanWorks system is operating, and the base pressure is below the lower setpoint.

Refer to Table 4-1. The following activities occur, assuming that the CanWorks system is powered and operating.

lf	Then
The base pressure goes below setpoint,	The relay will not AUTO Reset , but rather will remain "latched" until the base pressure goes above the low base pressure setpoint.
The base pressure goes above the low base pressure setpoint,	The relay will reset automatically every 10 msec until the fault condition is corrected and alarm is manually cleared.
The system is not calibrated,	The system will not determine the low base pressure setpoint, and alarms will not be active.

Failsafe

There are two failsafe modes. **ON** mode makes the relays normally closed and will open on a fault. **OFF** mode is the default; it makes the relays normally open, and it will close on a fault.

NOTE: LEDs work in reverse when the failsafe ON mode is selected.

History

The **HISTORY** function retrieves the last 50 fault conditions saved by the SM-1. Each entry is stamped with the time, date, fault type, and actual fault pressures.

Counter Settings

The **COUNTER** function maintains a running count of gun signal trigger inputs. The maximum count for one gun is 50 million:

- The CanWorks display module Runtime screen displays up to 10 million counts. If the total count reaches 10 million, the SM-1 automatically resets the counter to 0, time-stamps the count and stores it in **HISTORY**.
- The **HISTORY** function can store four total counts. Each total count can be up to 10 million.
- Pushing **RESET COUNT** and **SAVE** stores the current count with a time-stamp and resets the counter to 0.

Сору То

The **COPY TO** function copies configuration settings from one SM-1 module to another. All configuration settings are copied with the exception of the **FAULT** status and **LABEL**. The **FAULT** status is set to the **OFF** position. The operator must assign a **LABEL** to the SM-1 module that coincides with the configuration settings.

Runtime Screen

See Figure 4-1. The CanWorks display module's Runtime screen displays data for up to four SM-1 modules. Figure 4-1 shows the Runtime screen data display for a system with two SM-1 modules.

The Runtime screen does not display **FAULT** when the fault system is disabled. If there is a warning or an alarm condition while the fault system is enabled, the Runtime screen displays **WARNING** or **ALARM** instead of the pressure and can count and **FAULT** will appear as flashing.

NOTE: Refer to the *CanWorks Display Module* manual for more information about the Runtime screen.



Figure 4-1 Runtime Screen

- 1. User-defined gun label
- 2. Module type

- 3. Current base pressure inside gun 5. Fault system disabled
- 4. Current count

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Selecting a Module for Setup

1. Turn the CanWorks system power supply **ON**. The power-up screen appears.

See Figure 4-1. After a successful self-test, the Runtime screen appears.

 To access the SM-1 SETUP screen for one of the modules displayed on the Runtime screen, press the button to the left of the desired GUN# SM1 label.

See Figure 4-2. If the module is not displayed, perform these steps:

- a. Press the SETUP button. The SYSTEM SETUP screen appears.
- b. See Figure 4-3. Press the **MODULE SETUP** button. The **MODULE SETUP** screen appears.
- c. Use the ↑, ↓, **PGUP**, or **PGDN** buttons to select the module to be configured. The module flashes when it is selected.
- d. Press the CONFIG button. The SM-1 SETUP screen appears.

NOTE: If the module does not appear, press **DISPLAY** on the **SM-1 SETUP** screen. Refer to the *Display Module* manual for selecting a new module.



Figure 4-2 Accessing the SM-1 SETUP Screen (Module Displayed)



Figure 4-3 Accessing the SM-1 SETUP Screen (Module Not Displayed)

Configuration Setup

CONFIGURATION setup consists of assigning a label and selecting the pressure transducer range.

See Figure 4-4. Press the **CONFIG** button to access the **CONFIGURATION** screen.



Figure 4-4 Configuration Setup Display

Label

The user-defined **LABEL** can be up to five alphanumeric characters, and is used to identify the gun that is being monitored. The default label is **GUN XX**; where **XX** equals the module address.

- 1. See Figure 4-5. Press the **LABEL** button. The **LABEL SETUP** screen appears.
- 2. Enter a label. Use the \leftarrow and \rightarrow buttons to move the cursor. Use the \uparrow and \downarrow buttons to change the characters. Pressing the A/ /0 button resets the character to A, space, or 0.
- 3. Press either the SAVE or EXIT button:
 - **SAVE:** The changes are saved and the **CONFIGURATION** screen appears.
 - **EXIT:** The **SAVE?** prompt appears. Select either **YES** to save or **NO** to cancel the changes made. The **CONFIGURATION** screen appears.



Figure 4-5 Label Setup Display

Range

Two pressure transducers are available for use with the SM-1. Select either the **41** or **103** bar (600 or **1500** psi) pressure transducer.

NOTE: The pressure range selected must match the range of the transducer used. Compare the part number on the amplifier to the part number in the parts list to determine which range to select.

- 1. See Figure 4-6. Press the **RANGE** button until the desired range appears.
- 2. Press either the SAVE or EXIT button:
 - SAVE: The changes are saved and the SM-1 SETUP screen appears.
 - **EXIT:** The **SAVE?** prompt appears. Select either **YES** to save or **NO** to cancel the changes made. The **SM-1 SETUP** screen appears.



Figure 4-6 RANGE Selection

Fault Bands

See Figure 4-7. The SM-1 contains user-selectable ranges for the following four fault conditions. The difference between the base and fire pressure is defined as 100%.

For example, for the standard 3 bar (50 psi) drop, a default high flow warning would be 4 bar (70 psi) below the calibrated base pressure. Likewise a low flow warning would be 2 bar (30 psi) below the calibrated base pressure. Refer to Table 4-2 for more information about fault bands.

If the notification is a	Then the default is
Low Flow Alarm,	30%
Low Flow Warning,	60%
High Flow Warning,	140%
High Flow Alarm,	170%

Table 4-2 Fault Bands

To change the range of a fault condition, press the button next to the applicable condition. Use the (\leftarrow , \rightarrow , \uparrow , \downarrow) arrow keys to change the numerical range.

Press the **Default** button to return the settings to the factory-default range.



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Figure 4-7 FAULT BANDS Screen

Calibration

The calibration procedure creates a profile to which the spray machine can use to compare successive cans. The system records the base and fire pressures and determines valid warning and alarm conditions. Perform the calibration procedure when you

- change the nozzle size.
- change the CO-Plate size.
- change the base pressure.
- clean or modifying the plumbing.
- replace a gun.

Accessing the Calibration Setup Menu

Before calibrating, make sure the spray machine is coating the cans properly.

- 1. From the Runtime screen, select the desired module. The **SM-1 SETUP** screen appears.
- 2. Press the **CALIBRATION** button. See Figure 4-8. The **CALIBRATION** screen appears.
- 3. Perform the necessary calibration setup procedures that follow.



Figure 4-8 CALIBRATION Screen
Flow Rate

Enter the correct flow rate. The flow rate depends on the nozzle size that is used with the gun. This number is specified as the flow rate of water through the nozzle in gallons per minute at 34 bar (500 psi).

Refer to the Nordson Corporation nozzle catalog for flow rates. It is the operator's responsibility to determine the correct flow rate for each application.

- 1. See Figure 4-9. Press the **FLOW RATE** button. The **SET FLOW RATE** screen appears.
- Enter the nozzle flow rate. Use the ← and → push buttons to move the cursor. Use the ↑ and ↓ buttons to change the characters.
- 3. Press either the SAVE or EXIT button:
 - SAVE: The changes are saved and the CALIBRATION screen appears.
 - **EXIT:** The **SAVE?** prompt appears. Select either **YES** to save or **NO** to cancel the changes made. The **CALIBRATION** screen appears.



Figure 4-9 SET FLOW RATE Screen

Orifice Designator

Enter the orifice designator. The orifice designator is a three-digit number assigned to the CO-Plate. Refer to the CO-plate selection chart for the CO-plate designator.

1. See Figure 4-10. Press the **ORIFICE DESIGNATOR** button. The **SET CONTROLLED ORIFICE** screen appears.

NOTE: The orifice designator is the CO-plate number.

- 2. Enter the orifice designator. Use the ← and → buttons to move the cursor. Refer to Table 4-3 for the CO-plate numbers.
- 3. Press either the SAVE or EXIT button:
 - SAVE: The changes are saved and the CALIBRATION screen appears.
 - **EXIT:** The **SAVE?** prompt appears. Select either **YES** to save or **NO** to cancel the changes made. The **CALIBRATION** screen appears.



Figure 4-10 SET CONTROLLED ORIFICE Screen

NOTE: This chart selection for CO-Plates is based on a water temperature of 22 $^{\circ}$ C (72 $^{\circ}$ F) at 34 bar (500 psi).

	Spray Pressures							
Nozzle Size	27 bar (400 psi)	34 bar (500 psi)	41 bar (600 psi)	48 bar (700 psi)	55 bar (800 psi)	62 bar (900 psi)	69 bar (1000 psi)	76 bar (1100 psi)
0.015	247707	247707	247708	247708	247708	247709	247709	247709
	(015)	(015)	(020)	(020)	(020)	(025)	(025)	(025)
0.03	247709	247710	247710	247711	247711	247711	247712	247712
	(025)	(030)	(030)	(040)	(040)	(040)	(045)	(045)
0.04	247710	247711	247711	247712	247713	247713	247713	247714
	(030)	(040)	(040)	(050)	(060)	(060)	(060)	(075)
0.06	247712	247713	247713	247714	247714	247715	247716	247716
	(050)	(060)	(060)	(075)	(075)	(090)	(105)	(105)
0.075	247713	247714	247714	247715	247716	247717	247718	247718
	(060)	(075)	(075)	(090)	(105)	(120)	(140)	(140)
0.09	247714	247715	247716	247717	247717	247718	247718	247719
	(075)	(090)	(105)	(120)	(120)	(140)	(140)	(160)
0.12	247716	247717	247718	247719	247719	247720	247720	247720
	(105)	(120)	(140)	(160)	(160)	(200)	(200)	(200)
0.14	247717	247718	247719	247719	247720	247720	247721	247721
	(120)	(140)	(160)	(160)	(200)	(200)	(250)	(250)
0.20	247719 (160)	247720 (200)	247721 (250)	247721 (250)	247722 (300)	247722 (300)		
0.30	247721	247722	CO-Plate Part Number → 247720					
	(250)	(300)	(200) ← CO-Plate Designator					
NOTE: The CO-Plate designator is on the front of the CO-Plate.								

Table 4-3 CO-Plate Selection Chart

Calibrate

 After entering the flow rate and orifice designator, initiate a calibration from the SM-1 SETUP screen. See Figure 4-11. Press the CALIBRATE button to start. The module waits for four cans to be coated.

If the calibration is successful, the display returns to the Runtime screen. If the calibration is not successful,

- **CALIBRATION INCOMPLETE** is displayed when the calibration procedure cannot be performed. The screen displays the problem. See Figure 4-12. **EXIT** the **CALIBRATION** screen and perform the appropriate corrective action.
- After solving the problem, perform the **CALIBRATION** procedure again. If the problem still exists, refer to the *Troubleshooting* section.
- 2. If necessary, check the **HISTORY** screen to verify the calibration data. Refer to *Calibration History* on page 4-18.



Figure 4-11 CALIBRATE Display



Figure 4-12 CALIBRATION Display Screens (Successful and Incomplete)

Calibration History

The **HISTORY** screen displays the last four calibration times, dates and settings. This information is useful in monitoring changes to the spraying process. Use the most current calibration data to compare fault pressures.

- 1. See Figure 4-13. Press the **HISTORY** button. The **CALIBRATION HISTORY** screen appears.
- 2. Press the button to the left of the desired data line to switch between the calibration setup data and actual calibration base/fire pressure.
- 3. Press the EXIT button. The CALIBRATION screen appears.



Figure 4-13 CALIBRATION HISTORY Screen

Fault Setup

- 1. From the SM-1 SETUP screen, press the FAULT button to access the FAULT SETUP screen.
- 2. See Figure 4-14 and refer to Table 4-4 for a description of the functions available on the **FAULT SETUP** screen. Adjust the settings as appropriate.
- 3. Press either the SAVE or EXIT button:
 - SAVE: The changes are saved and the SM-1 SETUP screen appears.
 - **EXIT:** The **SAVE?** prompt appears. Select either **YES** to save or **NO** to cancel the changes made. The **SM-1 SETUP** screen appears.

Table 4-4	FAULT	SETUP	Screen	Functions
	IAULI		OCIECII	i unctions

Button/Setting	Description
STATUS	Press the STATUS button and select one of the following:
	OFF—Alarms and warnings are disabled ON—Alarms and warnings are enabled ALARM ONLY—Alarms enabled and warnings disabled WARN ONLY—Warnings enabled and alarms disabled
MODE	Press the MODE button and select one of the following:
	LED ONLY —Illuminates the front panel lights in response to a fault. LED/RELAY —Illuminates the front panel lights and closes the normally open relay in response to a fault.
RESET	Press the RESET button and select one of the following:
	MANUAL—Keeps the relay and light activated until the error condition is noticed. This is the default mode. AUTO—automatically resets the relay after a 10 msec close time. The light remains on until the error condition is noticed.
	NOTE: Refer to <i>Auto Reset State</i> on page 4-20 for more information about how the SM-1 functions when the RESET is set to AUTO .
HISTORY	Perform these steps to access the FAULT HISTORY screen:
	 See Figure 4-15. Press the HISTORY button. The FAULT HISTORY screen appears.
	2. Use PGUP or PGDN to page through the time, date, pressures, and the last 50 fault conditions. Up to 25 pages of fault history may exist.
	3. If needed, press the button to the left of the fault to access the CanWorks HELP screen.
	4. Press EXIT to return to the FAULT HISTORY screen.
FAIL SAFE	NOTE: By changing the failsafe mode from OFF to ON , and pressing SAVE , the LEDs on the SM-1 will work in reverse.
	Press the FAILSAFE button and select one of the following:
	ON —Relay contacts are normally closed and will open on a fault condition. OFF —Relay contacts are normally open and will close on a fault condition. OFF is the default state.

Fault Setup (contd)



Figure 4-14 FAULT SETUP Screen

Auto Reset State

When **AUTO** reset is selected, the relay does not automatically reset when the base pressure is below setpoint. This mode prevents the relay from "chattering" for long periods of time when the CanWorks system is operating, and the pressure control system is "off" or not at base pressure.

Refer to Table 4-5. The following activities occur, assuming that the CanWorks system is powered and operating.

lf	Then
The base pressure goes below setpoint,	The relay will not AUTO Reset , but rather will remain "latched" until the base pressure goes above the low base pressure setpoint.
The base pressure goes above the low base pressure setpoint,	The relay will reset automatically every 10 msec until the fault condition is corrected and alarm is manually cleared.
The system is not calibrated,	The system will not determine the low base pressure setpoint, and alarms will not be active.

Table 4-5 Reset Mode Activities



Figure 4-15 FAULT HISTORY Screen

Counter Setup

The **COUNTER** function maintains a running count of gun trigger signals. The maximum count for one gun is 50 million.

- The CanWorks display module **Runtime** screen can display up to 10 million counts. If the total count reaches 10 million, the SM-1 automatically resets the counter to 0, time-stamps the count and stores it in **HISTORY**.
- The **HISTORY** function can store four total counts. Each total count can be up to 10 million.
- Pushing **RESET COUNT** and **SAVE** stores the current count with a time-stamp and resets the counter to 0.
- 1. See Figure 4-16. From the **SM-1 SETUP** screen, press the **COUNTER** button to access the **COUNTER SETUP** screen.

Button/Setting	Function
STATUS	Press the STATUS button to turn the counter ON or OFF .
RESET COUNT	Press the RESET COUNT and SAVE buttons to store the current count and reset the counter to zero. The SM-1 SETUP screen will appear after performing this step.
HISTORY	Press the HISTORY button to display the last four time-stamped can counts.

2. Push the buttons to change the appropriate settings:

- 3. Press either the SAVE or EXIT button:
 - SAVE: The changes are saved and the CALIBRATION screen appears.
 - **EXIT:** The **SAVE?** prompt appears. Select either **YES** to save or **NO** to cancel the changes made. The **CALIBRATION** screen appears.



Figure 4-16 COUNTER SETUP and COUNTER HISTORY Screens

Copy SM-1 Settings

If necessary, perform this procedure to copy settings from one SM-1 module to another.

NOTE: Do not perform this procedure until at least one module has been configured.

- 1. See Figure 4-17. From the **MODULE SETUP** screen, use the ↑, ↓, **PGUP**, or **PGDN** buttons to select the module to be copied.
- 2. Press the **COPY TO** button. The **CONFIGURATION COPY TO** screen appears.
- 3. Use the ↑, ↓, **PGUP**, or **PGDN** buttons to select the module to copy the configuration settings to.
- Press the COPY button. All configuration settings are copied except SET LABEL and FAULT STATUS. FAULT STATUS is set to the OFF position. COPY SUCCESSFUL appears.
- 5. Press the **EXIT** button.
- 6. Perform the **SET LABEL** , **FAULT STATUS**, and **CALIBRATION** functions.



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Figure 4-17 COPY TO Display

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Testing the SM-1 Spray Monitor Hardware

See Figure 4-18. From the **SM-1 SETUP** screen press the **TEST** button to access the **HARDWARE TEST** screen. Perform the following tests:

Test	Description		
PRESSURE INPUT	Press the PRESSURE INPUT button to display the pressure being read at the SM-1 PRESS input. The first number displayed is the base pressure. The second number displayed is the fire pressure.		
	If – – – – PSI is displayed instead of the fire pressure, the gun is not firing.		
TIMER INPUT	Press the TIMER INPUT button to verify that the TIMER input is connected to a timing signal. The first number displayed is the timer duration. The accuracy of the timer duration is ± 2 msec. The second number displayed is cans per second. If $ MS$ and $/SEC$ are displayed, the timer is not connected to		
	a timing signal or the gun is not firing.		
FAULT LEDS	Press the FAULT LEDS button to turn the front panel LEDs on or off.		
FAULT RELAYS	Press the FAULT RELAYS button to open or close the relays		



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Figure 4-18 HARDWARE TEST Display

1. Module firmware version numbers

SM-1 Software Tree

The SM-1 spray monitor software tree is shown in Figure 4-19. This is a map of the **SM-1 SETUP** screens.



Figure 4-19 SM-1 Spray Monitor Software Tree

Section 5 Troubleshooting



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

This section contains troubleshooting procedures. These procedures cover only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local Nordson representative for help.

How to Troubleshoot Fault Conditions



WARNING: Before removing any component from the system, disconnect and lock out power to the system. Relieve fluid and system pressure.

These procedures will help you troubleshoot the coating system based on the warning and alarm messages that may be displayed during operation. Any fault message may have an electrical, hydraulic, or mechanical reason for occurring.

The CanWorks Help Screen

See Figure 5-1. Use the **CanWorks HELP** screen as a starting point when troubleshooting faults. Check the possible causes for a fault in the order displayed on the **CanWorks HELP** screen. To use the **HELP** screen, perform these steps:

1. From the Runtime screen, press the **FAULT** button. The **FAULT FINDER** screen appears.

NOTE: The bottom of the screen displays the last fault.

- 2. Use the ↑, ↓, **PGUP**, or **PGDN** buttons to select a module. The module flashes when it is selected.
- 3. Press the **HELP** button. The **CanWorks HELP** screen appears. Read the possible causes for the fault.
- 4. After taking the corrective action, press the **EXIT** button. The **FAULT FINDER** screen appears.
- 5. Press the RESET button. The ALARM or WARNING condition is reset.
- 6. Press the EXIT button. The RUNTIME screen appears.

The CanWorks Help Screen (contd)



Figure 5-1 Using the CanWorks HELP Screen

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Alarm Messages

The following tables provide troubleshooting procedures for the **ALARM** messages. The figures illustrated throughout this section are only examples.

Problem	Possible Cause	Corrective Action
1. LOW FLOW	Nozzle—partially or completely blocked	Remove and clean the nozzle or replace it. If the nozzle is replaced, recalibrate the system.
See Figure 5-2. Fire spray pressure is higher than the alarm pressure threshold	Defective spray gun	Disassemble and clean the spray gun. Inspect the parts for wear. Replace parts as necessary.
determined by calibration signal.		Make sure that the spray gun is receiving the proper input signal and the coil is in proper operating condition.
	Worn CO-plate or CO-plate O-ring	Make sure that the CO-plate is installed correctly.
		Inspect the CO-plate O-ring for any wear or damage. Replace the O-ring, if necessary.
		Replace the CO-plate.
		Continued





Alarm Messages (contd)

Problem	Possible Cause	Corrective Action
2. HIGH FLOW	Nozzle—missing, loose, worn, or wrong size	Install the appropriate nozzle or tighten the nozzle nut.
		Replace the nozzle and calibrate the system.
See Figure 5-3. Fire spray	Blocked supply system	Clean or replace the filter screens.
pressure is lower than the		Clean the heater.
determined by calibration signal.		Flush or replace the fluid lines.
	Pump output	Increase the pump output capacity.
		Check the supply to the pump.
	Blocked CO-plate	Clean or replace the CO-plate.
	Defective spray gun	Disassemble and clean the spray gun. Inspect the parts for wear. Replace parts as necessary.



Figure 5-3 HIGH FLOW Alarm

Problem	Possible Cause	Corrective Action
3. LOW PRESSURE	Change in regulated pressure	Reset the pressure to the calibrated value, or calibrate to new value. If calibrating, make sure that product quality is acceptable.
See Figure 5-4. Static base pressure is lower than the minimum base	Blocked supply system upstream	Check the supply pressure gauge and the pressure shown on the display module.
pressure determined by		Clean or replace the filter screens.
		Clean the heater.
		Flush or replace the fluid lines.
	Air in the system	Purge the air from the system.
	Fixed orifice worn or missing	Replace or install the proper fixed orifice.
	Leak in supply system	Replace or repair the leaking component.
	Low pump output	Increase the pump output capacity.



Figure 5-4 LOW PRESSURE Alarm

Alarm Messages (contd)

Problem	Possible Cause	Corrective Action
4. HIGH PRESSURE	Regulated pressure too high	Reset the pressure to the calibrated value or calibrate. If calibrating, make sure that the product quality is acceptable.
See Figure 5-5. Static base pressure is higher than the minimum base pressure determined by calibration.	Blocked fixed orifice assembly or filter	Clean or replace the fixed orifice assembly or the filter.
	Blocked supply system downstream from the spray gun	Check for a closed ball valve or other possible restrictions/blockages in the return line. Repair as necessary.



Figure 5-5 HIGH PRESSURE Alarm

Warning Messages

The following tables provide troubleshooting procedures for the **WARNING** messages. The figures illustrated throughout this section are only examples.

Problem	Possible Cause	Corrective Action
1. LOW FLOW	Nozzle—partially blocked or wrong	Remove and clean the nozzle.
	size	Replace the nozzle and calibrate the system.
See Figure 5-6. The difference between the base and fire pressure is too small compared to the warning fire pressure threshold determined by calibration signal and band setting.	Regulated pressure too low	Check the input pressure to the spray gun. Make sure that the input pressure matches the originally calibrated pressure for the system.
	Defective spray gun	Disassemble and clean the spray gun. Inspect the parts for wear. Replace parts as necessary.
	Blocked return system	Check the fixed orifice, return filter, and back pressure regulator. Make sure the parts are not blocked.
		The back pressure regulator may be set too low. Repair as necessary.
		Check to see if a ball valve has been closed downstream from the spray gun.
		Flush the lines or replace the lines.
	Worn CO-plate or CO-plate O-ring	Make sure that the CO-plate is installed correctly.
		Inspect the CO-plate O-ring for any wear or damage. Replace the O-ring, if necessary.
		Replace the CO-plate.



Figure 5-6 LOW FLOW Warning

Problem	Possible Cause	Corrective Action
2. HIGH FLOW	Nozzle—missing, loose, worn, or wrong size	Install the appropriate nozzle or tighten the nozzle nut.
		Replace the nozzle and calibrate the system.
See Figure 5-7. The difference between the base and fire pressure is too large when compared to the warning pressure threshold determined by calibration signal and band setting.	Regulated base pressure too high	Check the input pressure to the spray gun. Make sure that the input pressure matches the originally calibrated pressure for the system.
	Blocked supply system	Clean or replace the filter screens. Clean the heater.
		Flush or replace the fluid lines.
	Air in fluid system	Purge the air from the fluid system.
	CO-plate partially blocked or wrong size	Clean or replace the CO-plate.





Problem	Possible Cause	Corrective Action
3. DURATION TOO SHORT	Electrical connections	Check the electrical connections for a possible short or a break in the timer signal.
See Figure 5-8. Timer turns off before spray gun can execute a minimum spray cycle. This warning typically occurs during installation, if the spray gun spray duration is less than 45 msec.	Timer settings	Increase the set spray time above the minimum level.
	Spray gun opening slow	Make sure that the proper spray gun driver/timer is used.
		Disassemble and clean the spray gun. Inspect the parts for wear. Replace parts as necessary.



Figure 5-8 DURATION TOO SHORT Warning

Problem	Possible Cause	Corrective Action
4. CYCLE RATE TOO FAST	Spray duration too long	Reduce the spray duration. Use a higher flow rate nozzle or increase the spray pressure to achieve the required coating weight/thickness.
See Figure 5-9. Timer turns on before spray gun can execute a minimum delay cycle. GUN OFF time is less than the minimum spray time requirement.	Electrical connections	Check for short circuits or incorrect electrical connections.



Figure 5-9 CYCLE RATE TOO FAST Warning

Problem	Possible Cause	Corrective Action
5. GUN OPEN SLOW	Nozzle—partially blocked or wrong size	Remove and clean the nozzle.
		Replace the nozzle and calibrate the system.
See Figure 5-10. Spray pressure does not reach GUN ON minimum pressure before GUN time out. Opening spray gun takes longer than the GUN ON time setting.	CO-plate—missing, worn, or leaking	Install or replace the CO-plate. If the spray gun does not have a CO-plate, the pressure drop will typically be less than the calibrated value. This pressure drop could be interpreted as either GUN OPEN SLOW or LOW FLOW .
		Make sure that the CO-plate is installed correctly.
		Inspect the CO-plate O-ring for any wear or damage. Replace the O-ring, if necessary.
		Replace the CO-plate.
	Defective spray gun	Disassemble and clean the spray gun. Inspect the parts for wear. Replace parts as necessary.
	Inadequate timer/driver	Make sure the spray gun input voltage and amperage meets the spray gun's specifications.



Figure 5-10 GUN OPEN SLOW Warning

Problem	Possible Cause	Corrective Action
6. GUN CLOSE SLOW See Figure 5-11. Base	Defective spray gun/solenoid	Disassemble and clean the spray gun. Inspect the parts for wear. Replace parts as necessary.
GUN OFF minimum pressure before GUN OFF time-out. Spray gun is closing slowly. Time exceeds the GUN OFF time setting.		For an air-operated spray gun, make sure that the exhaust port on the solenoid valve is not restricted.
	Defective timer/driver	Make sure that the spray gun input voltage and amperage meet the spray gun's specifications.



Figure 5-11 GUN CLOSE SLOW Warning

Problem	Possible Cause	Corrective Action
7. ELEC/MECH NOISE	Pressure transducer	Check the pressure transducer. Refer to <i>Troubleshooting the SM-1</i> <i>Spray Monitor</i> , problem 3.
		Replace the pressure transducer
Either an electrical or mechanical noise in the spray system is affecting	Electrical connection	Check for loose or incorrect electrical connections. Check for any short circuits.
the SM-1 spray monitor.		Check for possible electrical noise sources within the area of the SM-1 spray monitor and display module such as,
		power cables.
		 high-voltage signals routed near the modules.
	Supply system	Make sure that the pressure supply to the spray gun is well-dampened and has a minimum pressure fluctuation.

Troubleshooting the SM-1 Spray Monitor

	Problem	Possible Cause	Corrective Action
1.	POWER light off	Loose or broken ground wire	Check the wires for damage. Make sure that the +24 Vdc and ground wires are securely fastened to the end cap assembly terminal block.
		Loose end cap assembly	Tighten the end cap assembly finger-tight.
		No voltage	Check for +24 Vdc at the connector.
		Bad fuse	Check the fuse and replace it if necessary.
2.	Module cannot be found on network (off-line)	Loose or broken A and B communication wires	Check the wires for damage. Make sure that the A and B wires are securely fastened.
		Loose end cap assembly	Tighten the end cap assembly finger-tight.
		Network wiring	Check the network wiring for any loose twisted-pairs.
		Module not selected for display	Use the display module to setup the spray monitor.
		Module address	Set the module address to an unused address.
		Module not setup for display	Use the display setup and Module selection procedures.
3.	Incorrect or no pressure displayed	Wrong pressure transducer setting	Check the RANGE setting from the CONFIGURATION menu.
		Loose pressure transducer wires or incorrect twisted-pairs	Check these pressure transducer connections:
			 Twisted-pair: +PRESS—white wire -PRESS—black wire
			 Twisted-pair: +EXC—red wire -EXC—green
		No voltage	Check for +24 Vdc (\pm 0.5 Vdc) across \pm EXC pins on the SM-1 connector.
			Continued

Troubleshooting the SM-1 Spray Monitor (contd)

	Problem	Possible Cause	Corrective Action
3.	Incorrect or no pressure displayed (contd.)	No pressure transducer output voltage	Check for the transducer output voltage on the PRESS pins on the SM-1 connector:
			 41 bar (600 psi) transducer– dc volts = (gauge pressure/200) +1
			 103 bar (1500 psi) transducer– dc volts = (gauge pressure/ 300)
			If voltage is not present, replace the SM-1 spray monitor or pressure transducer.
4.	Counter does not work	Counter not enabled	Check the COUNTER status from the SM-1 SETUP menu.
		Loose timer connections	Make sure all of the timer connections are securely fastened.
		Loose end cap assembly	Tighten the end cap assembly finger-tight.
		Bad timer signal	Make sure that the timer is running. Check the timer signal voltage and polarity on the TIMER pins of the SM-1 connector. Replace the SM-1 spray monitor if voltage and polarity are not present.
		Spray monitor not calibrated	Calibrate the spray monitor and set the counter to ON.
5.	Module will not calibrate	Wrong nozzle or CO-plate	Make sure that the correct nozzle and CO-plate are installed.
		Wrong FLOW RATE or ORIFICE DESIGNATOR, entered in the calibration menu	Enter the correct data from the CALIBRATION screen.
		Insufficient number of timing pulses	Complete four successive spray cycles while calibrating.
		Bad transducer	Refer to problem 3.
		Bad TIMER signal connection	Refer to problem 4.
		Bad gun or driver	Refer to problem 4.
6.	Warning, alarm lights, and relays do not work	Bad LEDs	Use the TEST function to test the LEDs. Replace the SM-1 spray monitor if the test fails.
		Bad relays	Use the TEST function to test the relays. Replace the SM-1 spray monitor if the test fails.

Section 6 Parts

Introduction

To order parts, call the Nordson Customer Service Center or your local Nordson representative. Use this five-column parts list, and the accompanying illustration, to describe and locate parts correctly.

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.

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

SM-1 Spray Monitor Parts

ltem	Part	Description	Quantity	Note
	159716	MODULE, SM-1 Spray Monitor, CanWorks	1	
1		HOUSING	1	A
2		PCA, configured, SM-1	1	A
3	933606	 CONNECTOR, board edge/screw terminal, 12-position 	1	
4	168549	 PLATE, Spray Monitor, end cap, 12-position 	1	
5	981599	 SCREW, pan head, #4-40 x 0.750, zinc-plated steel 	4	
6	983101	 WASHER, lock, E, internal, #4, zinc-plated steel 	4	
7	984104	HEX NUT, machined, #4-40, zinc-plated steel	4	
8	981637	 SCREW, flat head, #6-32 x 0.437, zinc-plated steel 	1	A
9	933605	 CONNECTOR, board edge/screw terminal, 6-position 	1	
10	168550	 PLATE, network/power, end cap, 4-position 	1	
11	326947	MOUNTING CLIP, DIN, 35-mm rail	1	
12	982164	 SCREW, pan head, slotted, M4 x 6, zinc 	3	
NOTE A: Th	ese parts are ir	ncluded in the spray monitor replacement kit, part 16854	47.	

See Figure 6-1.

Recommended Spare Parts

Keep these parts on hand to reduce downtime. Order the parts necessary for your system.

NOTE: There are three transducers available. Refer to the part number on your unit for replacement.

Part	Description	Note
333055	1500-psi TRANSDUCER, with amplifier	
771220	600-psi TRANSDUCER, with amplifier	
332768	600-psi TRANSDUCER, high temperature, (400 °F), with amplifier	
168547	KIT, monitor, spray, replacement	
939908	FUSE, 0.200 A, Slo-Blo, 250 V, 5 x 20	
166943	SWIVEL ASSEMBLY for 1500 psi transducer	
168549	KIT, spray monitor end cap	
168550	KIT, network/power end cap	



Figure 6-1 SM-1 Spray Monitor Parts

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Section 7 Specifications

Physical Specifications

Front Panel LEDs	Green:	Power			
	Amber:	Warning			
	Red:	Alarm			
Input/Output	Input voltage:	24 Vdc, 200 mA			
	Alarm/warning relays:	5 A, 250 Vac 5 A, 30 Vdc			
	Timer input:	4 Vdc minimum, 50 Vdc peak, maximum pulsed signal			
		24 Vdc continuous, high true signal, optically isolated			
	Communications:	RS-485, CanWorks protocol			
Environmental	Operating temperature:	0–60 °C (32–140 °F)			
	Operating humidity, (non-condensing):	5–95%			
	Storage temperature:	-20–60 °C (-4–140 °F)			
Mechanical	Mounting:	Panel or DIN rail			
	Screws:	M4, 6.35-mm (0.25-in.) maximum depth into SM-1 spray monitor module			
Dimensions	Height:	3.81 cm (1.5 in.)			
	Length:	14.6 cm (5.75 in.)			
	Width:	10.16 cm (4 in.)			
Weight	0.607 kg (21.4 oz.)				
Pressure Transducer	For pressure transducer specifications, refer to the <i>Pressure Transducer</i> manual.				

Gun Labels and Addresses

Use this table to record the gun labels and addresses. This information is necessary for configuring the CanWorks display module.

Gun Label	Address	Gun Label	Address	Gun Label	Address

DECLARATION of CONFORMITY

PRODUCT:

CanWorks Spray Control System

APPLICABLE DIRECTIVES:

89/392/EEC (Machinery)

STANDARDS USED TO VERIFY COMPLIANCE:

EN292 EN60204

PRINCIPLES:

This product has been manufactured according to good engineering practice.

The product specified conforms to the directive and standards described above.

Kark Jacka

Mark Gacka Vice President, Container Business Group

Date: 29 November 95

Nordson

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