Sapphire Applicator

with Hyper Dispense Technology

Customer Product Manual
Part 1125439_02
Issued 01/2018

This document contains important safety information Be sure to read and follow all safety information in this document and any other related documentation.

NORDSON CORPORATION • DULUTH, GEORGIA • USA
www.nordson.com

For CE Declaration, refer to equipment documentation.

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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Notice

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Table of Contents

Sapphire Applicator

Safety

Read this section before using the equipment. This section contains recommendations and practices applicable to the safe installation, operation, and maintenance (hereafter referred to as “use”) of the product described in this document (hereafter referred to as “equipment”). Additional safety information, in the form of task-specific safety alert messages, appears as appropriate throughout this document.

WARNING! Failure to follow the safety messages, recommendations, and hazard avoidance procedures provided in this document can result in personal injury, including death, or damage to equipment or property.

Safety Alert Symbols

The following safety alert symbol and signal words are used throughout this document to alert the reader to personal safety hazards or to identify conditions that may result in damage to equipment or property. Comply with all safety information that follows the signal word.

WARNING! Indicates a potentially hazardous situation that, if not avoided, can result in serious personal injury, including death.

CAUTION! Indicates a potentially hazardous situation that, if not avoided, can result in minor or moderate personal injury.

CAUTION! (Used without the safety alert symbol) Indicates a potentially hazardous situation that, if not avoided, can result in damage to equipment or property.

Responsibilities of the Equipment Owner

Equipment owners are responsible for managing safety information, ensuring that all instructions and regulatory requirements for use of the equipment are met, and for qualifying all potential users.

Safety Information

- Research and evaluate safety information from all applicable sources, including the owner-specific safety policy, best industry practices, governing regulations, material manufacturer's product information, and this document.
- Make safety information available to equipment users in accordance with governing regulations. Contact the authority having jurisdiction for information.
- Maintain safety information, including the safety labels affixed to the equipment, in readable condition.

Instructions, Requirements, and Standards

- Ensure that the equipment is used in accordance with the information provided in this document, governing codes and regulations, and best industry practices.
- If applicable, receive approval from your facility's engineering or safety department, or other similar function within your organization, before installing or operating the equipment for the first time.
- Provide appropriate emergency and first aid equipment.
- Conduct safety inspections to ensure required practices are being followed.
- Re-evaluate safety practices and procedures whenever changes are made to the process or equipment.

User Qualifications

Equipment owners are responsible for ensuring that users:

- Receive safety training appropriate to their job function as directed by governing regulations and best industry practices
- Are familiar with the equipment owner's safety and accident prevention policies and procedures
- Receive equipment- and task-specific training from another qualified individual

  NOTE: Nordson can provide equipment-specific installation, operation, and maintenance training. Contact your Nordson representative for information
- Possess industry- and trade-specific skills and a level of experience appropriate to their job function
- Are physically capable of performing their job function and are not under the influence of any substance that degrades their mental capacity or physical capabilities

Applicable Industry Safety Practices

The following safety practices apply to the use of the equipment in the manner described in this document. The information provided here is not meant to include all possible safety practices, but represents the best safety practices for equipment of similar hazard potential used in similar industries.

Intended Use of the Equipment

- Use the equipment only for the purposes described and within the limits specified in this document.
- Do not modify the equipment.
- Do not use incompatible materials or unapproved auxiliary devices. Contact your Nordson representative if you have any questions on material compatibility or the use of non-standard auxiliary devices.

Instructions and Safety Messages

- Read and follow the instructions provided in this document and other referenced documents.
- Familiarize yourself with the location and meaning of the safety warning labels and tags affixed to the equipment. Refer to *Safety Labels and Tags* at the end of this section.
- If you are unsure of how to use the equipment, contact your Nordson representative for assistance.

Installation Practices

- Install the equipment in accordance with the instructions provided in this document and in the documentation provided with auxiliary devices.
- This equipment has not been certified for compliance with the ATEX directive nor as incendive and should not be installed in potentially explosive environments.
- Ensure that the equipment is rated for the environment in which it will be used and that the processing characteristics of the material will not create a hazardous environment. Refer to the Safety Data Sheet (SDS) for the material.
- If the required installation configuration does not match the installation instructions, contact your Nordson representative for assistance.
- Position the equipment for safe operation. Observe the requirements for clearance between the equipment and other objects.
- Install lockable power disconnects to isolate the equipment and all independently powered auxiliary devices from their power sources.
- Properly ground all equipment. Contact your local building code enforcement agency for specific requirements.
- Ensure that fuses of the correct type and rating are installed in fused equipment.
- Contact the authority having jurisdiction to determine the requirement for installation permits or inspections.

Operating Practices

- Familiarize yourself with the location and operation of all safety devices and indicators.
- Confirm that the equipment, including all safety devices (guards, interlocks, etc.), is in good working order and that the required environmental conditions exist.
- Use the personal protective equipment (PPE) specified for each task. Refer to *Equipment Safety Information* or the material manufacturer's instructions and SDS for PPE requirements.
- Do not use equipment that is malfunctioning or shows signs of a potential malfunction.

Maintenance and Repair Practices

- Perform scheduled maintenance activities at the intervals described in this document.
- Relieve system hydraulic and pneumatic pressure before servicing the equipment.
- De-energize the equipment and all auxiliary devices before servicing the equipment.
- Use only new Nordson-authorized refurbished or replacement parts.
- Read and comply with the manufacturer's instructions and the SDS supplied with equipment cleaning compounds.

  NOTE: SDSs for cleaning compounds that are sold by Nordson are available at www.nordson.com or by calling your Nordson representative.
- Confirm the correct operation of all safety devices before placing the equipment back into operation.
- Dispose of waste cleaning compounds and residual process materials according to governing regulations. Refer to the applicable SDS or contact the authority having jurisdiction for information.
- Keep equipment safety warning labels clean. Replace worn or damaged labels.

Equipment Safety Information

This equipment safety information is applicable to the following types of Nordson equipment:

- hot melt and cold adhesive application equipment and all related accessories
- pattern controllers, timers, detection and verification systems, and all other optional process control devices

Equipment Shutdown

To safely complete many of the procedures described in this document, the equipment must first be shut down. The level of shut down required varies by the type of equipment in use and the procedure being completed.
If required, shut down instructions are specified at the start of the procedure. The levels of shut down are:

Relieving System Hydraulic Pressure

Completely relieve system hydraulic pressure before breaking any hydraulic connection or seal. Refer to the melter-specific product manual for instructions on relieving system hydraulic pressure.

De-energizing the System

Isolate the system (melter, hoses, applicators, and optional devices) from all power sources before accessing any unprotected high-voltage wiring or connection point.

1. Turn off the equipment and all auxiliary devices connected to the equipment (system).
2. To prevent the equipment from being accidentally energized, lock and tag the disconnect switch(es) or circuit breaker(s) that provide input electrical power to the equipment and optional devices.

   NOTE: Government regulations and industry standards dictate specific requirements for the isolation of hazardous energy sources. Refer to the appropriate regulation or standard.

Disabling the Applicators

NOTE: Adhesive dispensing applicators are referred to as “guns” in some previous publications.

All electrical or mechanical devices that provide an activation signal to the applicators or the melter pump must be disabled before work can be performed on or around an applicator that is connected to a pressurized system.

1. Turn off or disconnect the applicator triggering device (pattern controller, timer, PLC, etc.).
2. Disconnect the input signal wiring to the applicator.

General Safety Warnings and Cautions

Table 1 contains the general safety warnings and cautions that apply to Nordson hot melt and cold adhesive equipment. Review the table and carefully read all of the warnings or cautions that apply to the type of equipment described in this manual.

Equipment types are designated in Table 1 as follows:

HM = Hot melt (melters, hoses, applicators, etc.)

PC = Process control

CA = Cold adhesive (dispensing pumps, pressurized container, and applicators)

Table 1 General Safety Warnings and Cautions

Equipment Type	Warnings and Cautions
HM	 **WARNING!** Hazardous vapors! Before processing any polyurethane reactive (PUR) hot melt or solvent-based material through a compatible Nordson melter, read and comply with the material's SDS. Ensure that the material's processing temperature and flashpoints will not be exceeded and that all requirements for safe handling, ventilation, first aid, and personal protective equipment are met. Failure to comply with SDS requirements can cause personal injury, including death.
HM	 **WARNING!** Reactive material! Never clean any aluminum component or flush Nordson equipment with halogenated hydrocarbon fluids. Nordson melters and applicators contain aluminum components that may react violently with halogenated hydrocarbons. The use of halogenated hydrocarbon compounds in Nordson equipment can cause personal injury, including death.

Equipment Type	Warnings and Cautions
HM, CA	 **WARNING!** System pressurized! Relieve system hydraulic pressure before breaking any hydraulic connection or seal. Failure to relieve the system hydraulic pressure can result in the uncontrolled release of hot melt or cold adhesive, causing personal injury.
HM	 **WARNING!** Molten material! Wear eye or face protection, clothing that protects exposed skin, and heat-protective gloves when servicing equipment that contains molten hot melt. Even when solidified, hot melt can still cause burns. Failure to wear appropriate personal protective equipment can result in personal injury.
HM, PC	 **WARNING!** Equipment starts automatically! Remote triggering devices are used to control automatic hot melt applicators. Before working on or near an operating applicator, disable the applicator's triggering device and remove the air supply to the applicator's solenoid valve(s). Failure to disable the applicator's triggering device and remove the supply of air to the solenoid valve(s) can result in personal injury.
HM, CA, PC	 **WARNING!** Risk of electrocution! Even when switched off and electrically isolated at the disconnect switch or circuit breaker, the equipment may still be connected to energized auxiliary devices. De-energize and electrically isolate all auxiliary devices before servicing the equipment. Failure to properly isolate electrical power to auxiliary equipment before servicing the equipment can result in personal injury, including death.

Continued...

General Safety Warnings and Cautions (contd)

Table 1 General Safety Warnings and Cautions *(contd)*

Equipment Type	Warnings and Cautions
HM, CA, PC	**WARNING!** Risk of fire or explosion! Nordson adhesive equipment is not rated for use in explosive environments and has not been certified for the ATEX directive or as nonincendive. In addition, this equipment should not be used with solvent-based adhesives that can create an explosive atmosphere when processed. Refer to the SDS for the adhesive to determine its processing characteristics and limitations. The use of incompatible solvent-based adhesives or the improper processing of solvent-based adhesives can result in personal injury, including death.
HM, CA, PC	**WARNING!** Allow only personnel with appropriate training and experience to operate or service the equipment. The use of untrained or inexperienced personnel to operate or service the equipment can result in injury, including death, to themselves and others and can damage to the equipment.
HM	**CAUTION!** Hot surfaces! Avoid contact with the hot metal surfaces of applicators, hoses, and certain components of the melter. If contact can not be avoided, wear heat-protective gloves and clothing when working around heated equipment. Failure to avoid contact with hot metal surfaces can result in personal injury.

Equipment Type	Warnings and Cautions
HM	**CAUTION!** Some Nordson melters are specifically designed to process polyurethane reactive (PUR) hot melt. Attempting to process PUR in equipment not specifically designed for this purpose can damage the equipment and cause premature reaction of the hot melt. If you are unsure of the equipment's ability to process PUR, contact your Nordson representative for assistance.
HM, CA	**CAUTION!** Before using any cleaning or flushing compound on or in the equipment, read and comply with the manufacturer's instructions and the SDS supplied with the compound. Some cleaning compounds can react unpredictably with hot melt or cold adhesive, resulting in damage to the equipment.
HM	**CAUTION!** Nordson hot melt equipment is factory tested with Nordson Type R fluid that contains polyester adipate plasticizer. Certain hot melt materials can react with Type R fluid and form a solid gum that can clog the equipment. Before using the equipment, confirm that the hot melt is compatible with Type R fluid.

Other Safety Precautions

- Do not use an open flame to heat hot melt system components.
- Check high pressure hoses daily for signs of excessive wear, damage, or leaks.
- Never point a dispensing handgun at yourself or others.
- Suspend dispensing handguns by their proper suspension point.

First Aid

If molten hot melt comes in contact with your skin:

1. Do NOT attempt to remove the molten hot melt from your skin.
2. Immediately soak the affected area in clean, cold water until the hot melt has cooled.
3. Do NOT attempt to remove the solidified hot melt from your skin.
4. In case of severe burns, treat for shock.
5. Seek expert medical attention immediately. Give the SDS for the hot melt to the medical personnel providing treatment.

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WARNING! Failure to follow the safety messages, recommendations, and hazard avoidance procedures provided in this document can result in personal injury, including death, or damage to equipment or property.

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Safety Labels and Tags

Figure 1 illustrates the location of the product safety labels and tags affixed to the equipment. Table 2 provides an illustration of the hazard identification symbols that appear on each safety label and tag, the meaning of the symbol, or the exact wording of any safety message.

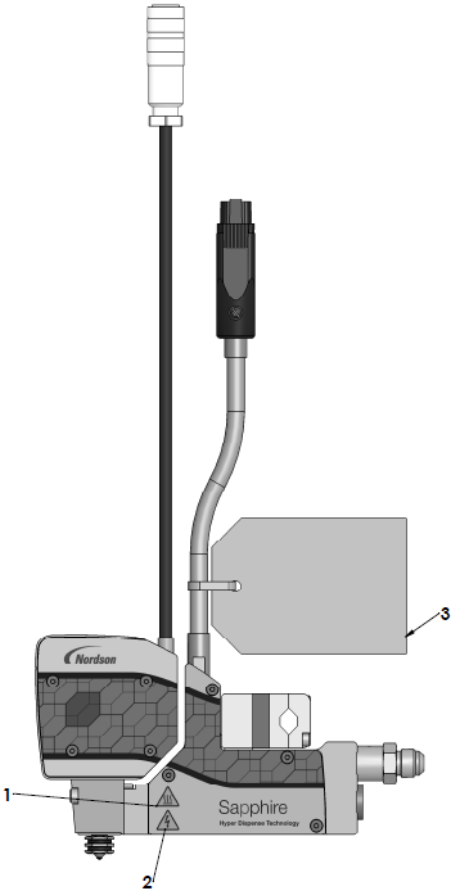


Figure 1: Sapphire applicator

Table 2 Responsibilities of the Equipment Owner

Item	Part Number	Image	Description
1.	N/A		**WARNING**: Hot Surface! Before touching the applicator body, allow the applicator to cool, or wear heat-protective gloves. Failure to allow the applicator body to cool or to wear heat-protective gloves may cause personal injury.
2.	N/A		**WARNING**: Disconnect power and remove system pressure before disassembly or maintenance. Failure to follow these instructions may result in serious personal injury.
3.	600137		**WARNING**: Disconnect power and remove system pressure before disassembly or maintenance. Failure to follow these instructions may result in serious personal injury.
	243352		**WARNING:** Fire, injury, or equipment damage can result if cleanout materials do not meet the following requirements: a. Minimum flashpoint to be 550°F (288°C) b. Liquid and vapor to be non-toxic at use temperature in equipment. c. Chemical reactions with adhesive and equipment materials must not be violently heat producing. d. Cleanout material must not corrode or otherwise weaken equipment materials.
	600103		**CAUTION:** This applicator is RTD (resistance temperature detector) controlled. Prior to operation and before changing adhesive, consult instruction manual for changing operating temperature. Failure to follow instructions may result in personal injury or property damage.
	243352		**CAUTION:** This equipment is factory tested with Nordson type R fluid containing Polyester Adipate plasticizer. Certain adhesives may react with the type R fluid residue to form solid gum, which can be difficult to remove. To avoid equipment damage, check with adhesive supplier regarding compatibility and cleanout procedure before putting adhesive into the system.

Description

The Sapphire dispensing system includes an applicator, driver, and interconnection cables intended for use in conjunction with a Nordson melter, hose, and pattern controller.

The Sapphire applicator is a compact, ultra high-speed, precision dispense hot melt adhesive applicator. The applicator module is electro-mechanically actuated and designed specifically to deliver hot melt adhesive beads in very high-speed situations. With the ability to deliver a distinct bead up to 1600 times per second*, it is intended for customers who need to place adhesive with exceptional precision at high-line speeds. The applicator can deliver beads or dots of packaging adhesives up to 2000 cPs** and up to 400°F (205°C).

NOTE: *1600 Hz is a burst speed. Continuous operation may be limited by several factors. High setpoint temperature or environmental temperatures may require reduced cycle rates.

Refer to the *Operation* section for full operational envelope.

NOTE: **Best results are typically seen between 900 and 1500 cPs.

The Sapphire driver converts a 24 VDC input signal into the appropriate output signal for the module. The driver is available with one- or two-channel capability. Each channel must only drive a single module.

The Sapphire dispensing system requires the use of the following components to form a complete application system:

- Nordson Sapphire applicator
- Nordson Sapphire driver
- 24VDC output, 10A power source (with a peak output current of 17 amps), Nordson part number 1126583.
- Interconnect cable – Sapphire driver to module
- Trigger cable – Pattern controller to Sapphire driver to connect
- Nordson BlueSeries or PureFlow hose with 9/16 fittings and t-style connector
- Spectra 30 or other pattern controller
- Nordson melter with Ni120 controls

Figure 2 shows a typical Sapphire applicator.

NOTE: The illustrations in this manual depict a typical Sapphire applicator. Your applicator may differ in appearance.

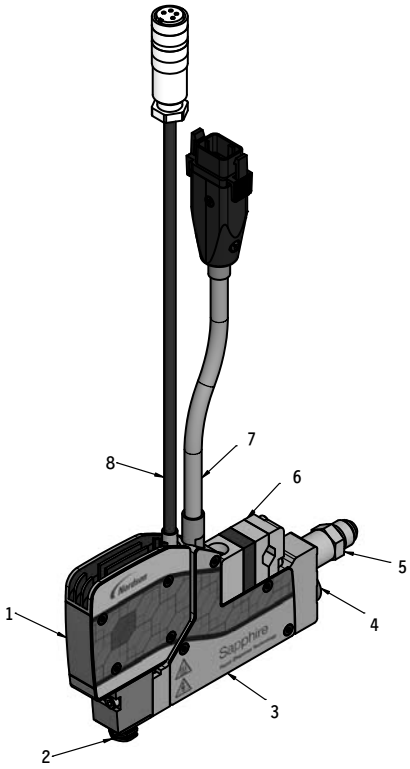


Figure 2: Typical Sapphire applicator

1. Module
2. Nozzle (sold separately)
3. Manifold
4. Integrated filter
5. Hose connector
6. Mounting bracket
7. Manifold cordset
8. Module cordset

Description *(contd)*

Figure 3 shows the front view of a typical Sapphire driver.

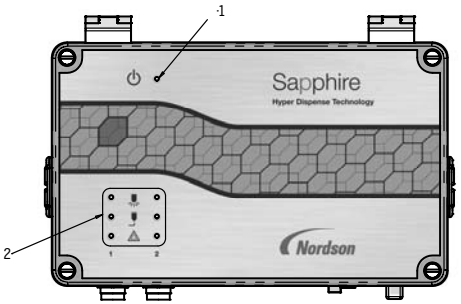


Figure 3: Sapphire driver - Front view

1. Power LED
2. Status LEDs

Figure 4 shows the bottom view of a typical Sapphire driver.

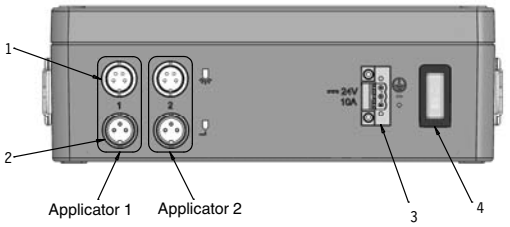


Figure 4: Sapphire driver - Bottom view

1. Trigger ports
2. Output ports
3. Power input
4. Power switch

Information on the Sapphire Applicator

Refer to Figure 5 for the locations of the following information:

- Serial Numbers
- Part Numbers
- Power Information

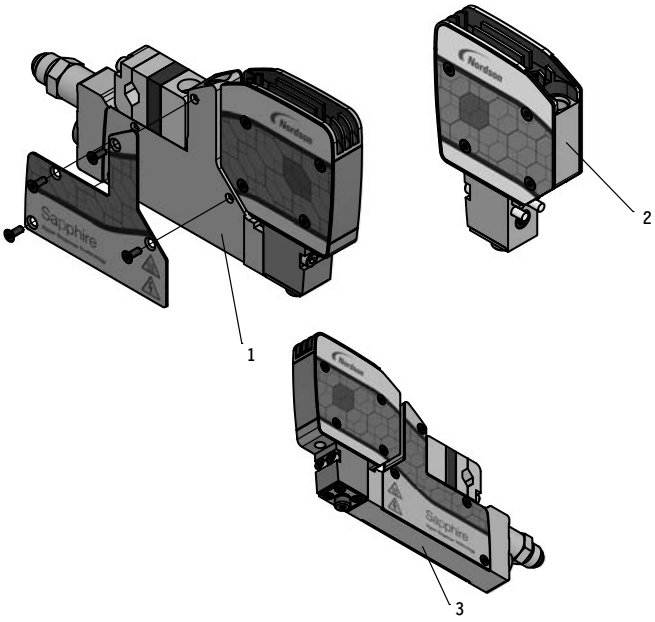


Figure 5: Information locations

1. Power information
2. Module part number/serial number
3. Applicator part number/ serial number

Cordset

Refer to Figure 6. Manifold cordsets are available in T-style versions and are replaceable. Module cordsets include a M16 type connector and are not replaceable.

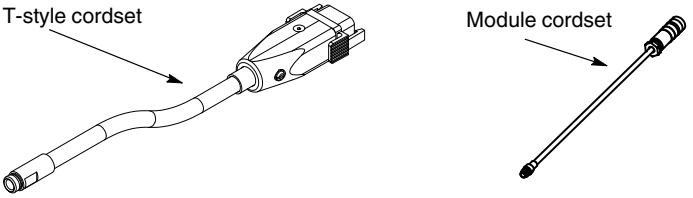


Figure 6: Cordset types

Temperature Control

All Sapphire applicators use 120-ohm nickel resistance temperature detectors (RTDs) for precise temperature sensing and for applicator temperature control to within +0.5 °C (1.0 °F) of a setpoint temperature.

Intended Use

Sapphire applicators are specifically designed for industrial applications that require the deposition of a precisely controlled bead of hot melt material onto a moving substrate. The applicators are designed to be rigidly mounted. Sapphire applicators are designed for use with Nordson melters and hoses.

Auxiliary Devices and Spare Parts

Sapphire applicators should only be connected to approved auxiliary devices. Use only new Nordson replacement parts or approved factory refurbished parts.

Installation

Applicators are installed using the following process:

- Unpack and inspect
- Mount
- Connect the hose
- Flush
- Install nozzles

NOTE: Applicators ordered with special options may require additional installation steps that are not described here.

NOTE: Nozzles must be ordered separately. Refer to *Using the Illustrated Parts Lists* for nozzle part numbers.

Items Needed

To ensure a smooth installation, have the following items on hand:

- Personal protective equipment for working with hot adhesive
- Product manuals for associated equipment (melter, hose, etc.)
- Mounting equipment, such as a mounting rod, appropriate for the parent machine
- Automatic applicator hose
- Flat-blade and Phillips-head screwdrivers
- Drain pans and waste containers suitable for waste adhesive
- 13 mm open-end wrench
- 11/16" open-end wrench (x2)
- M3 hex wrench
- M4 hex wrench
- M5 hex wrench

Applicator Installation Guidelines

Use the following installation guidelines for optimum applicator performance.

Unpacking and Inspecting the Applicator

1. Carefully unpack the applicator.
2. Inspect the applicator. Applicators are shipped fully assembled except for the nozzle. The nozzle is sold separately.

   Refer to *Using the Illustrated Parts Lists* for the nozzle parts list.
3. Inventory the contents of the ship-with kit. It includes the following components:
   - 90° hose connector
   - 45° hose connector

Mounting the Applicator

The configuration of your equipment and production line may require a variation in the mounting options described in this section. Regardless of the mounting method used, please follow these guidelines:

- Mount the applicator such that the nozzle will be as close as possible to the substrate, but at a distance that works best for your application. Typically, the minimum distance is two times the diameter of the nozzle orifice.
- Ensure that the mounting location provides sufficient clearance around the rear or sides of the applicator to allow for removal of the manifold covers.
- Mount the applicator on a rigid support that is isolated from external vibrations and that prevents the applicator from rotating.
- Insulate the applicator from the support using the insulator provided with the applicator.

1. Refer to Figure 7. Remove the clamp assembly from the applicator using a M5 hex wrench.

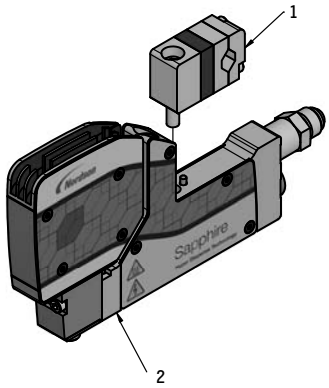


Figure 7: Removing the clamp assembly

1. Clamp assembly
2. Sapphire applicator

2. Attach the clamp assembly to the mounting bar. Tighten using a M3 hex wrench.
3. Connect the applicator to the clamp. Tighten using a M5 hex wrench.
4. Position the applicator by loosening the top screw with a M3 hex wrench, moving it into the desired position, and then re-tightening the screw.

Hydraulic Connections

- Use only one fitting to connect a hose-to-a-hose connector on the applicator.
- Insulate hose-to-applicator joints. Insulating cuffs may be ordered separately. Refer to *Using the Illustrated Parts Lists* for more information.

Connecting the Hose

NOTE: Refer to the user's guide shipped with the hose for detailed hose installation guidelines.

1. Refer to Figure 8. Connect the hydraulic hose to the applicator using two 11/16" wrenches.

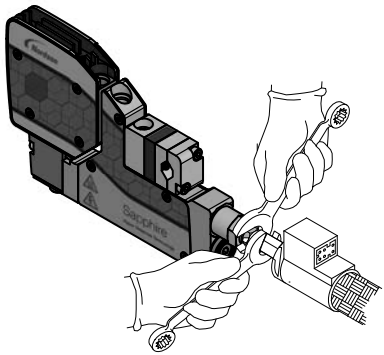


Figure 8: Connecting the hose

2. Connect the applicator cordset to the hose or extension cable.

Driver Installation Guidelines

Use the following installation guidelines for optimum applicator performance.

Unpacking and Inspecting the Driver

1. Carefully unpack the driver.
2. Inspect the driver. Drivers are shipped fully assembled.
3. Inventory the contents of the ship-with kit. It includes the following components:
   - Power connection terminal block
   - DIN rail clip and screws
   - M16 field wireable trigger signal connector(s)

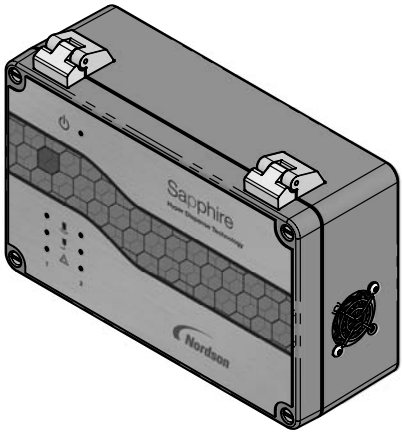


Figure 9: Sapphire driver

Mounting the Driver

There are two ways to mount the Sapphire driver:

- On a DIN rail strip
- Using a Through Hole mount

Mounting the Driver on a DIN Rail Strip

1. Refer to Figure 10. Turn the driver upside down on a clean flat surface.
2. Attach the DIN rail clip to the back of the driver with the screws using a M3 hex wrench.

NOTE: Ensure the spring on the DIN rail clip is oriented in the same direction as the connectors on the driver.

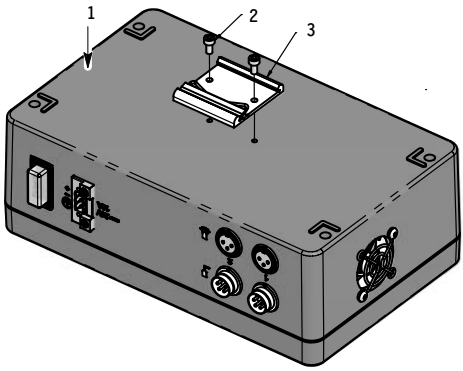


Figure 10: Sapphire driver - Bottom view

1. Sapphire driver
2. M4 screws (x2)
3. DIN rail mount

3. Refer to Figure 11. Position the lower edge of the DIN rail clip onto the DIN rail strip. Rotate the top of the driver and apply pressure until if fully engages the DIN rail strip.

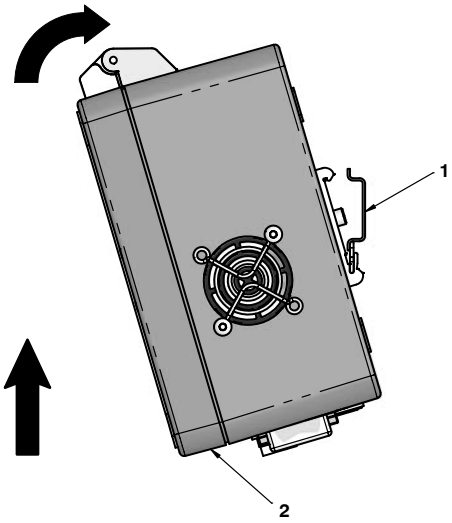


Figure 11: Driver mounting

1. DIN rail mount
2. Sapphire driver

Mounting the Driver using a Through Hole Mount

1. Refer to Figure 12. Mount the driver using the mounting hole pattern shown below.

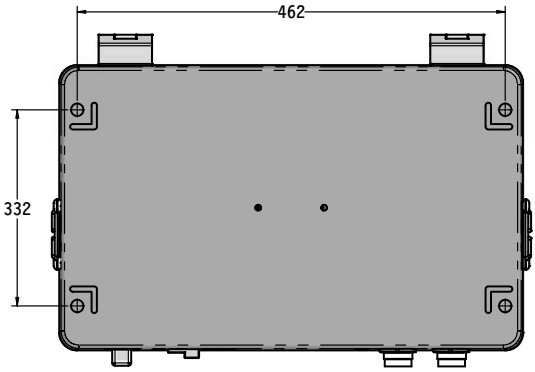


Figure 12: Mounting bolt pattern dimensions

2. Open the lid on the driver box to access the through holes, and then install the screws.

   NOTE: Use M6 or ¼¨ socket head screws (not included). The length of the screws must be longer than 20mm or .8 inches.

Connect the Field Wiring to the Sapphire Driver

The steps to wiring the Sapphire driver are as follows:

- Connecting the power supply
- Connecting the trigger signal
- Connecting the applicator

Connecting the Power Supply

NOTE: The driver requires a dedicated 10 amp/24VDC power supply with a peak output current of 17 amps. It is recommended to use Nordson part number 1126583.

1. Refer to Figure 13. Wire the three-pin terminal block connector using a 12-18 AWG wire and a small flat head screwdriver.

   NOTE: Wiring length should not exceed 1 m. For more information, see *Using the Illustrated Parts Lists*.

2. Connect the three-pin terminal box connector to the driver.

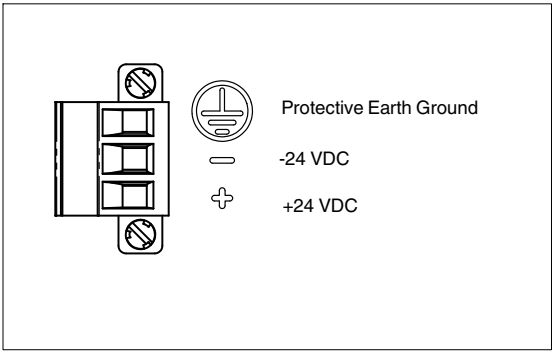


Figure 13: Power supply connection

NOTE: The power connection is polarity sensitive. The power supply to the driver wiring should not exceed 1 meter in length.

3. Secure with two screws using the flat head screwdriver.

Connecting the Trigger Signal

1. Refer to Figure 14. Wire the M16 signal trigger connector by disassembling the back shell from the connector and wiring it as shown below.

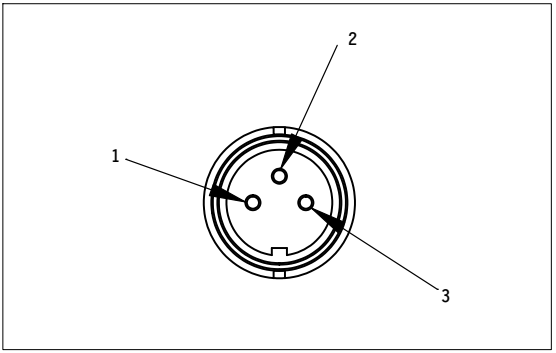


Figure 14: Trigger connection

1. Trigger signal
2. Not used
3. Trigger signal return

NOTE: The trigger signal is not polarity sensitive, and the voltage range is 5-30 volts VDC. The trigger is considered inactive at 0-2 volts and active at 5-30 volts.

2. Remove the back shell.
3. Loosen the clamp.
4. Insert the cable connector wire.
5. Reassemble the connector.

Connecting to the Applicator

1. Connect the female end of the interconnection cable to the M16 circular DIN connector on the Sapphire driver.
2. Route the cable to the driver.
3. Connect the interconnection cable to the module cordset on the applicator.

Flushing the Applicator

The applicator must be flushed of foreign material before it is placed into operation.

> **CAUTION!** This equipment is factory tested with Nordson Type R fluid containing polyester adipate plasticizer. Certain adhesives may react with the Type R fluid residue to form a solid gum that can be difficult to remove. Consult your adhesive supplier to determine the compatibility of your adhesive with Type R fluid.

1. Start the melter and heat the system to the operating temperature and pressure required for the adhesive being used. Refer to the melter product manual and the instructions provided with the adhesive as needed.
2. Place a drain pan under the applicator.
3. Remove the nozzle(s) from the applicator. Refer to the nozzle removal procedures under *Cleaning Nozzles* later in this manual as needed.
4. Purge the applicator by manually triggering the Purge feature on the pattern controller.
5. Stop dispensing when the adhesive flow is clear and free of foreign material.
6. Check for leaks between the applicator, hose, and melter.
7. Install the applicator nozzle by threading it onto the module by hand and then using a torque wrench to tighten the nozzle to no more than 4.5 N•m (40 in.-lb).
   Do not over-tighten.

Refer to the nozzle installation procedures under *Cleaning Nozzles* later in this manual as needed.

Operation

Refer to the melter product manual for heating instructions.

Operational Theory

The Sapphire applicator dispenses adhesive when the module receives a signal from the Sapphire driver. This signal is initiated by a 5-30 VDC input trigger signal to the driver.

When the driver receives a 5-30 VDC input trigger signal, it generates a specific waveform output that is sent to the applicator. The applicator then converts the signal into electromechanical movement to lift the needle and begin dispensing. When the trigger signal is removed from the driver, the driver ramps the output signal down according to a specific waveform, resulting in closure of the module and the end of the dispense cycle.

The output signal of the driver can range from 0.6 ms to infinitely open.

Refer to Figure 15 for a graphical representation.

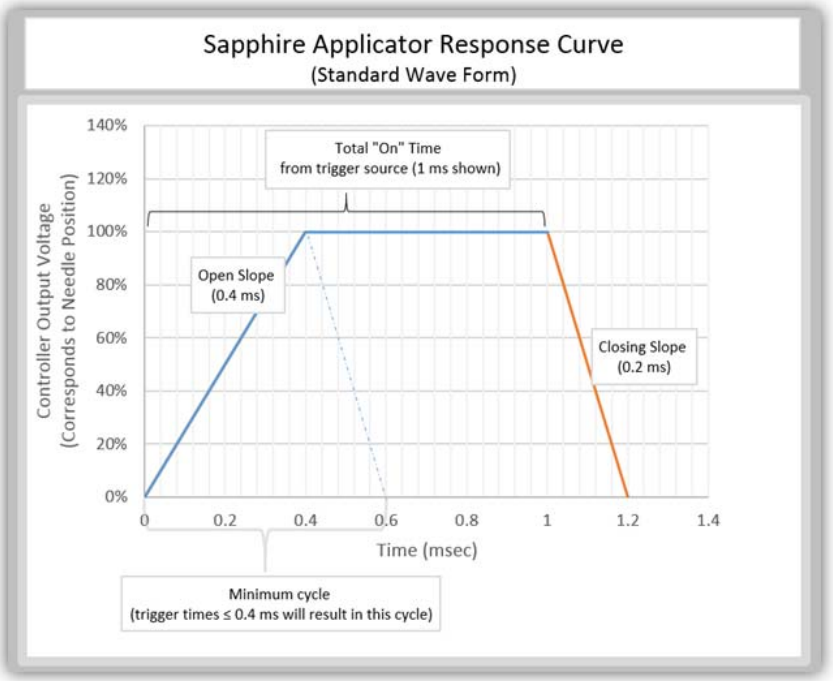


Figure 15: Sapphire applicator response curve

Operational Envelope

The Sapphire applicator is capable of cycle speeds up to approximately 1600 Hz (0.4ms open/0.2ms close). This capability and the maximum average number of dots per second are influenced by setpoint and environmental temperatures.

Refer to the chart below.

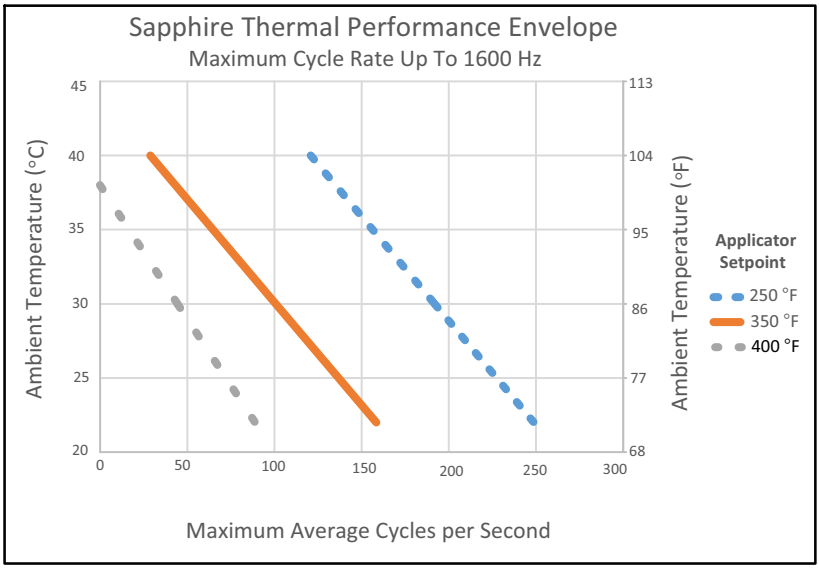


Figure 16: Sapphire thermal performance envelope

Sapphire Controller LEDs Operation

The Sapphire applicator driver has seven LEDs that indicate product status. The LED in the upper-left corner indicates the power status. The six LEDs in the lower-left corner are channel pairs: the three left LEDs are for applicator 1 and the three right LEDs are for applicator 2.

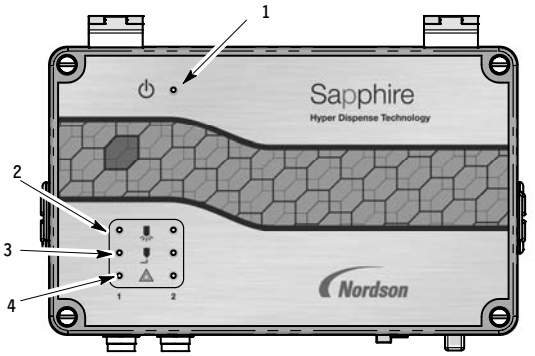


Figure 17: Sapphire driver - Front view

1. Power LED
2. Trigger LEDs
3. Applicator LEDs
4. Fault LEDs

LED Sequence Test

The LEDs automatically perform a sequence test when the Sapphire driver is turned on to indicate whether each LED is functioning properly. All the LEDs go off, and then each LED comes back on one at a time. After the test, the LEDs resume normal operation.

Power LED

The LED in the top-left corner of the Sapphire driver is the power LED. It is on whenever the software is running properly.

Trigger LEDs

The top two LEDs in the lower-left corner are the trigger LEDs. They indicate when a trigger input has been detected. These LEDs come on when a trigger is active and go off when the trigger is inactive. The trigger is considered inactive at 0-2 volts and active at 5-30 volts.

Applicator LEDs

The middle two LEDs are the applicator LEDs. They indicate when a driver signal has been sent to the Sapphire driver board and a signal is sent to the applicator. These LEDs come on when an applicator is active and go off then the applicator is inactive.

Fault LEDs

The fault LED are the bottom two LEDS in the bottom-left corner of the Sapphire driver. Whenever there is a problem, they send out a specific number of flashes followed by a period of no flashes to indicate a specific error code.

Refer to *Troubleshooting Table for Sapphire Drivers* for more information.

Maintenance

Table 3 provides the recommended schedule for applicator maintenance. Detailed procedures for weekly and semi-annual maintenance tasks are provided in the remainder of this section.

Table 3 Applicator Maintenance Schedule

Frequency	Task	Notes
Daily	Remove hot melt and char from the exterior of the applicator assembly.	
Weekly	Clean the applicator nozzles. Refer to *Cleaning Nozzles*.	A, B
Semi-annually	Inspect the applicator wiring.	
As needed	Replace the filter. Refer to the instructions supplied with the replacement filter.	

NOTE A: Nordson recommends the use of nozzle cleaning kit PN 901915.
B: Process-specific nozzle performance history may indicated the need for more or less frequent nozzle cleaning.

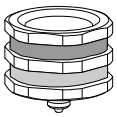
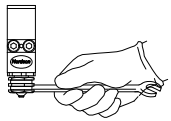
Cleaning Nozzles

Applicator nozzles may become clogged when char, a by-product of overheating the hot melt, becomes lodged in the nozzle.

To clean the nozzle, follow these steps:

1. Heat the applicator to operating temperature.
2. Disable the applicator. Refer to *Safety*.
3. Remove the nozzle. Refer to Table 4.

Table 4 Nozzle removal procedures

Nozzle Type	Nozzle Removal Procedure
Saturn 	With proper personal protection equipment (PPE), use a wrench to loosen and remove the nozzle. 

WARNING! Risk of fire. Do not heat Nordson Type R fluid above 245 °C (475 °F). Use only an industrial grade, regulated, electrical heating device that is designed to heat industrial fluids. Personal injury or property damage can result if Type R cleaning fluid is heated with an open flame or in an unregulated heating device.

4. Soak the nozzle in Nordson Type R cleaning fluid that has been heated above the melting point of the adhesive, to a maximum of 177 °C (350 °F).
5. Remove the nozzle from the cleaning fluid.

Cleaning Nozzles (contd)

6. Refer to Figure 18. At the outlet of each nozzle, insert a correctly sized cleaning probe.

   CAUTION! Use the correct size precision pin probe to clean Nordson nozzles. The use of non-precision or incorrectly sized probes may damage the nozzle. The Nordson nozzle cleaning kit (PN 901915) contains a variety of probe sizes.

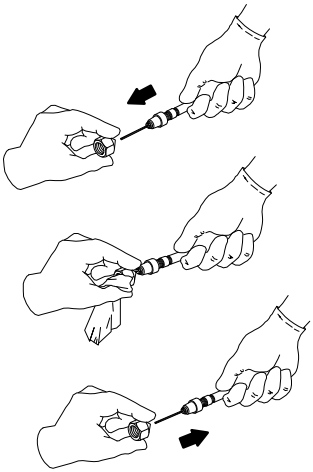
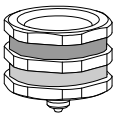


Figure 18: Cleaning the nozzle

7. With a clean cloth, firmly grip the cleaning probe and then pull the probe out of the nozzle, wiping the probe clean.

8. Refer to Table 5. Reinstall the nozzle.

Table 5 Nozzle installation procedures

Nozzle Type	Nozzle Installation Procedure
Saturn 	Thread the nozzle onto the module threads by hand, and then use a torque wrench to tighten the nozzle to 4.5 N●m (40 in.-lb).

9. Restore the system to normal operation.

Replacing the Filter

To replace the filter, follow these steps:

1. Relieve system pressure. Refer to *Safety*.
2. Trigger the applicator momentarily.
3. Disconnect and lock out power.
4. Refer to Figure 19. Unscrew the Saturn integrated applicator filter with a M4 hex wrench, and then remove the filter.

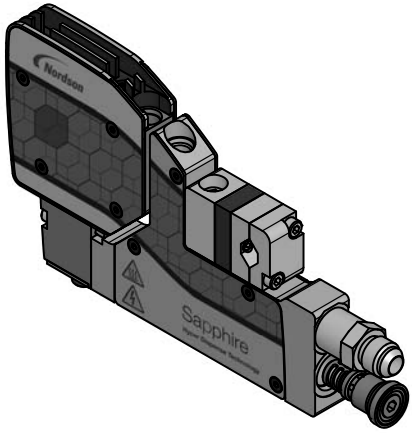


Figure 19: Replacing the filter

5. Insert a new Saturn integrated applicator filter, and then tighten it using a M4 hex wrench.
6. Restore the system to normal operation.

Troubleshooting

WARNING! Allow only personnel with appropriate training and experience to operate or service the equipment. The use of untrained or inexperienced personnel to operate or service the equipment can result in injury, including death, to themselves and others, and damage to the equipment.

Troubleshooting Table for Sapphire Applicators

The following table lists the applicator problems that are most likely to occur, the possible causes of each problem, and steps for corrective action. Where applicable, cross-references are made to expanded diagnostic procedures (DPs) provided later in this section or to other sections of this manual.

Problem	Possible Cause	Corrective Action
1. No adhesive flow	Adhesive level low	Add adhesive.
	No input power to driver	Verify that the power indicator light (green LED) is on. Connect power to the melter and auxiliary devices. Ensure that all disconnect switches or circuit breakers are on.
	No trigger signal	Verify that the Trigger indicator light is on: • If no light, check the connection. • If the connection is good, refer to *Troubleshooting Table for Sapphire LEDs*.
	No output for driver	Verify that the Output driver light is on. If no light, refer to *Troubleshooting Table for Sapphire LEDs*.
	Broken, loose, or damaged cables	Replace or reconnect cables.
	Melter, hose, or applicator temperature setting too low	Adjust the setting. Refer to the melter product manual.
	System not at operating temperature	Verify that the system ready light is on and that the adhesive is molten.
	Hose clogged	Replace the hose.

Problem	Possible Cause	Corrective Action
1. No adhesive flow (contd)	Nozzle clogged	Check the nozzle. Refer to *DP1. Check for a Clogged Nozzle or Module*.
	Module failed	Replace the module. Refer to the instructions provided with the module.
	Insufficient air pressure to melter piston pump (piston pump melters)	Adjust the pump air pressure.
	Melter motor not operating (gear pump melters)	Check the motor operation. Refer to the melter product manual.
	Dirty or faulty triggering device	Clean or replace the triggering device.
	Faulty encoder	Test the encoder and replace if defective.
	Faulty driver	Refer to *Troubleshooting Table for Sapphire LEDs.*
2. Uncontrolled adhesive flow from module	Hydraulic pressure too high	Decrease the system hydraulic pressure.
	Module failed to close	Replace the module. Refer to the instructions provided with the module.
3. Adhesive from bleed hole	Adhesive seals failed	Replace the module. Refer to the instructions provided with the module.
4. Applicator fails to heat or underheats	No power	Check that the melter is on. Refer to the melter product manual.
	Applicator temperature setpoint too low	Adjust the temperature setpoint. Refer to the melter product manual.
	Applicator heater failed (open or short)	Check for an open heater circuit. Refer to *DP2. Check a Heater*.
	Applicator RTD failed (open or short)	Check the RTD resistance. Refer to *DP3. Check an RTD.*

Troubleshooting Table for Sapphire Applicators (contd)

Problem	Possible Cause	Corrective Action
5. Applicator overheats	Tank, hose, or applicator temperature setpoint too high	Adjust the setpoint. Refer to the melter product manual.
	Applicator RTD shorted (melter should shut down)	Check the RTD resistance. Refer to *DP3. Check an RTD*.
	Short in heater control circuit	Troubleshoot the melter. Refer to the melter product manual.

Troubleshooting Table for Sapphire Drivers

Refer to *Sapphire Controller LEDs Operation* for more information.

Problem	Possible Cause	Corrective Action
1. LEDs do not turn on in sequence	Faulty interface board	Replace the interface board
2. Fault LEDs flash an error code before the LED sequence test	**# Flashes** — **Cause** 1 — Application upgrade file error 2 — Application software checksum error 3 — Application upgrade file checksum error 4 — Application software copy error	Replace the interface board
3. Fault LEDs flash an error code after the LED sequence test	**# Flashes** — **Cause** 1 — High voltage power supply over voltage 2 — High voltage power supply overload 3 — Isolated 15 volt power supply 4 — Low voltage power supply fault 5 — Maximum recommended temperature exceeded 6 — High voltage power supply below minimum voltage 7 — Driver board signals other error	Check all cable connections inside the driver Replace the faulty driver board Replace the interface board
4. Power LED flashes four times	Unit not operating properly, which might result in the unit being inoperable when turned off and then on again	Replace the interface board
5. Trigger LED does not turn on when trigger applied	Trigger not detected	Check trigger cables Replace the interface board

Troubleshooting Table for Sapphire Drivers (contd)

6. Applicator LED does not come on when trigger is activated	Applicator not detected	Check all external and internal cable connections to the driver Replace the applicator Replace the driver board
	Driver not detected	Check all internal cable connections to the driver Replace the driver board Replace the interface board
7. Fault LEDs flash alternately	Neither driver board can be detected	Check all cable connections inside the driver Replace the driver boards Replace the interface board
8. Fault LEDs stay on	Driver is present, but applicator is not	Replace the module
9. Fault LEDs flash rapidly	Damaged applicator cable Driver output voltages out of tolerance	Replace applicator cable Replace the applicator Replace the driver

Diagnostic Procedures (DPs)

The following diagnostic procedures (DPs) are referenced in the *Troubleshooting Table for Sapphire Applicators*.

DP1. Check for a Clogged Nozzle or Module

1. Disable the applicator. Refer to *Safety*.
2. Remove the nozzle. Refer to *Cleaning Nozzles* for the nozzle-removal procedure.
3. Place the applicator back into operation.
4. Trigger the applicator:
   - Adhesive flows—normal indication. Clean the nozzle. Refer to *Maintenance*.
   - No adhesive flow—the module is clogged. Replace the module. Refer to *Repair*.

DP2. Check a Heater

1. Disable the applicator. Refer to *Safety*.
2. Unplug the applicator cordset from the hose.
3. Refer to Figure 20. Test for continuity across the heater circuit (pins 1 and 2):
   - Continuity okay—normal indication. Return to the *Troubleshooting Table.*
   - No continuity—the heater is defective. Replace the heater. Refer to *Repair*.

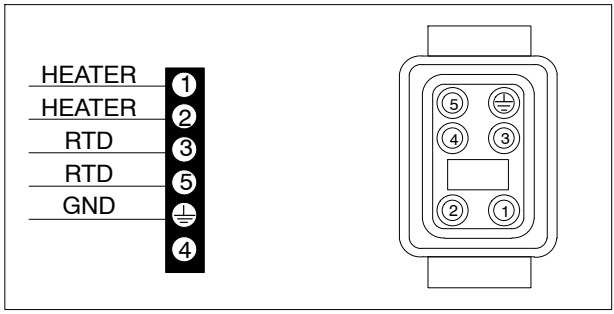


Figure 20: Applicator cordset pin positions

DP3. Check an RTD

1. Disable the applicator. Refer to *Safety*.
2. Unplug the applicator cordset from the hose.
3. Allow the applicator to reach room temperature or use a pyrometer to determine the temperature of the applicator.
4. Refer to Figure 20. When the applicator temperature is known, measure the resistance across the RTD circuit (pins 3 and 5).
5. Refer to Figure 21 to determine the expected resistance of the RTD at the known temperature. Compare the expected and measured resistance values.

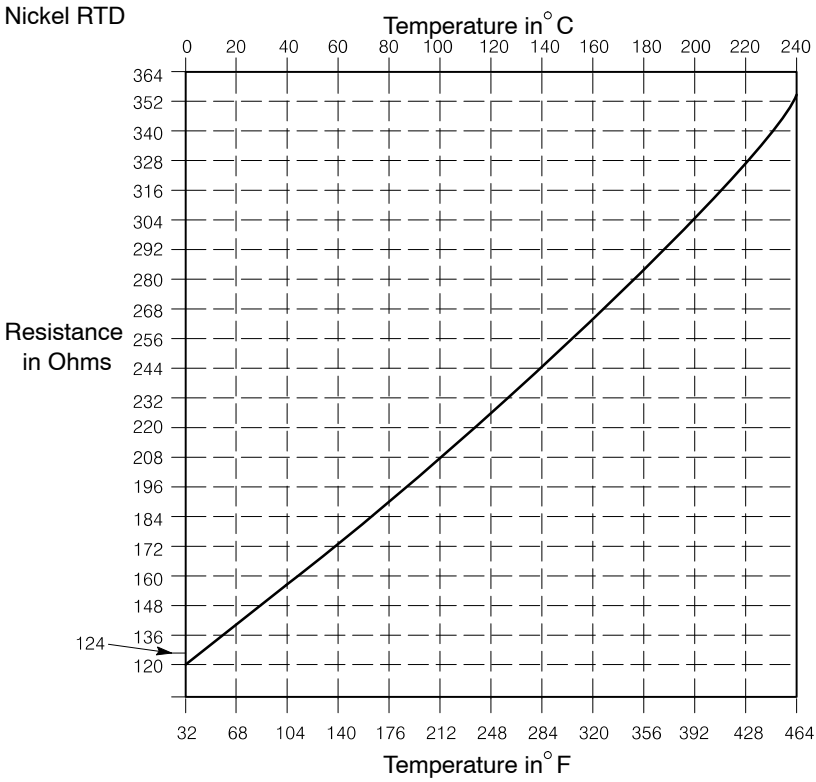


Figure 21: RTD resistance vs. temperature

- Measured resistance is within the expected range—normal indication. Return to the *Troubleshooting Table for Sapphire Applicators*.
- Measured resistance is not within the expected range—the RTD is defective. Replace the RTD. Refer to *Repair*.

Repair

Refer to these repair procedures as needed. For repair procedures not included in this section, refer to the instructions supplied with the replacement part.

WARNING! Disconnect power and remove system pressure before disassembly or maintenance. Failure to follow these instructions may result in serious personal injury.

Replacing the Complete Cordset

The following procedure describes the replacement of the entire cordset.

Refer to Figure 22.

1. Remove the cover from the applicator manifold using a M2.5 hex wrench.
2. Remove the RTD and heater from their bores.
3. Disconnect the ground lead from the manifold using a M2.5 hex wrench.
4. Unscrew the cordset from the body using a 10 mm open-end wrench.
5. Remove the ground lug, RTD, and heater by pulling them one-at-a-time through the cordset mounting hole.
6. Reverse steps 1. through 5. to install the new cordset and then proceed to step 7.
7. Use two wrenches to connect the hose to the applicator if the hose were removed earlier.
8. Plug the applicator cordset into the hose.
9. Restore the system to normal operation.

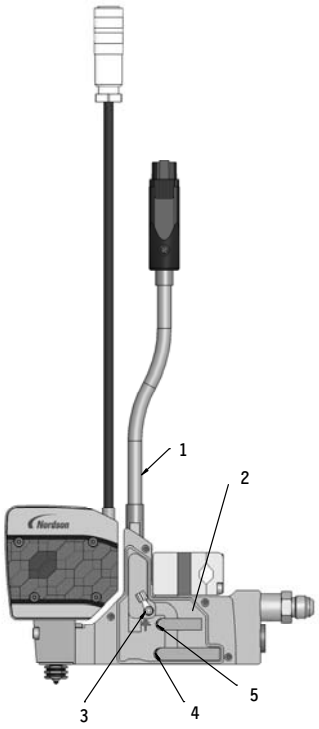


Figure 22: Replacing the cordset

1. Cordset
2. Manifold cover (not shown)
3. Ground screw
4. Heater
5. RTD

Replacing the Module

1. Relieve system pressure, and then purge the applicator and hose. Refer to the melter and applicator product manuals for additional information.
2. Disable the applicator driver.
3. Remove the M4 X 25 module retaining screws, and then remove the module.
4. Using a non-abrasive cloth, remove adhesive residue from the face of the applicator body.

CAUTION! Risk of Burns! Applicator body may be hot! Use caution when cleaning it.

5. Ensure the O-ring is on the module.
6. Apply an anti-seize compound (Nordson Corporation PN 900344) to the module retaining screws, and then install the new module. Tighten the screws to 1.7-2.2 Nm (15-20 in.-lb).

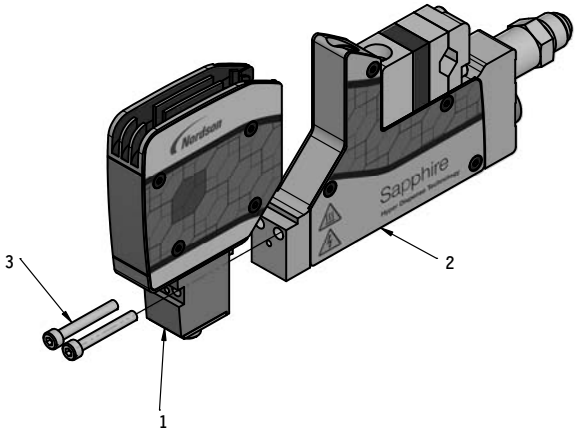


Figure 23: Replacing the Sapphire applicator module

1. Module
2. Applicator manifold
3. Module mounting bolts

Using the Illustrated Parts Lists

To order parts, call the Nordson Customer Service Center or your local Nordson representative. Use these five-column parts lists, and the accompanying illustrations, to describe and locate parts correctly. The following chart provides guidance for reading the parts lists.

The number in the *Part* column is the Nordson part number you can use to order the part. A series of dashes indicates that the part is not saleable. In this case, you must order either the assembly in which the part is used or a service kit that includes the part.

The *Description* column describes the part and sometimes includes dimensions or specifications.

The *Note* column contains letters that refer to notes at the bottom of the parts list. These notes provide important information about the part.

Part	Description	Note
	•	
	• •	

NOTE A:
B:
NS: Not Shown

Sapphire Applicator Assembly

Refer to Figure 24.

Item	Part	Description	Qty.	Note
1	1126010	MODULE,REPLACEMENT,SAPPHIRE	1	
2	- - - - - -	HEATER	1	A
3	- - - - - -	RTD	1	A
4	1125704	SEAL,CORD,VITON,1MM DIAMETER	1	
5	1125573	COVER, ELECTRICAL, RIGHT, SAPPHIRE	1	
6	1125579	COVER, ELECTRICAL, LEFT, SAPPHIRE	1	
7	1125561	SCR,FLT,SKT,M3X8,ZN	8	
8	- - - - - -	MANIFOLD	1	
9	1123663	KIT, FILTER, 200 MESH, SATURN, M14, 5 PACK	1	
10	- - - - - -	HOSE CONNECTOR	1	B
11	1126011	MOUNT,REPLACEMENT,SAPPHIRE	1	
12	1610605	SCR,SKT,M6X30,ZN	1	
13	1125667	CORDSET,MANIFORD,SAPPHIRE,240V	1	
	1126012	CORDSET,MANIFOLD,SAPPHIRE, 200V	1	
14	308586	SCR,SKT,M3 X 6,BL	1	
15	105815	SCREW,SK,HEAD,M4X.7X30LG.ZN.PL	2	

NOTE A: Included with cordsets.
B: Refer to *Applicator-to-Hose Connectors* for ordering information.

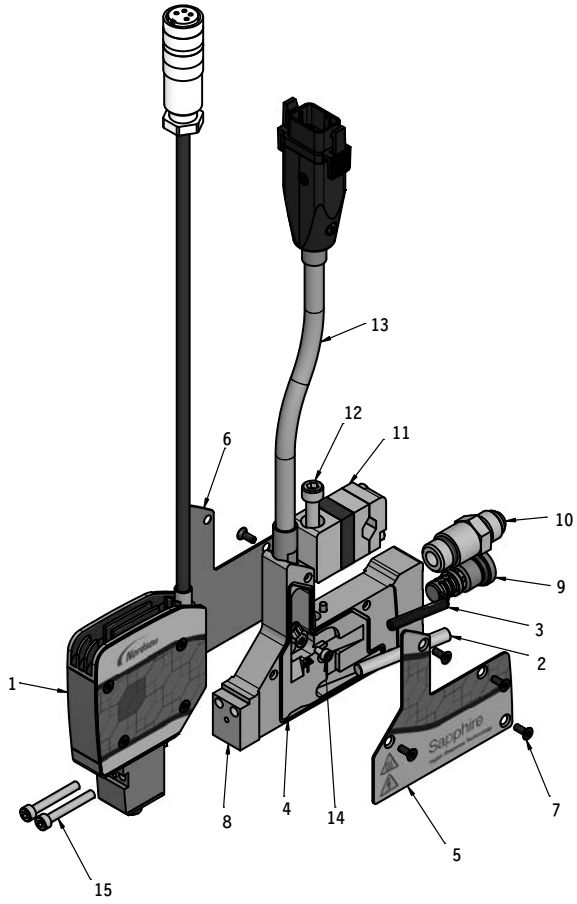


Figure 24: Sapphire applicator

Sapphire Driver Assembly

Refer to Figure 25.

Item	Part	Description	Qty.	Note
1	- - - - - -	DRIVER ENCLOSURE	1	
2	1126154	INTERFACE BOARD	1	
3	1104459	SCR,SKT,M3X0.5X6,ZN	12 (9)	
4	- - - - - -	FAN	1	
5	1126007	STANDOFF,M-F,M3,15MM	8 (4)	
6	1126152	DRIVER BOARD	2 (1)	A
7	1126008	STANDOFF, FEMALE-MALE, M3, 6MM	8 (4)	
8	1125899	GUARD,TOUCH,SAPPHIRE	2 (1)	
9	1125902	HARNESS,OUTPUT,SAPPHIRE	2 (1)	
10	1125901	HARNESS,TRIGGER,SAPPHIRE	2 (1)	
11	1064223	TBCONN,3POS,1ROW,5MM,STR8, PLUG	1	
12	1126021	PLUG,3 PIN,MALE,SCREW,SHIELDED	2 (1)	
13	7360629	CABLE RIBBON 16-POS F/F LOCKING	2 (1)	
14	1125905	HARNESS,ANALOG SIGNAL,SAPPHIRE	2 (1)	
15	1125893	HARNESS,POWER BOARD,SAPPHIRE	2 (1)	
16	1125903	HARNESS,DRIVER POWER,SAPPHIRE	2 (1)	
NOTE A: To upgrade a single driver to a dual driver, order PN1126153.				

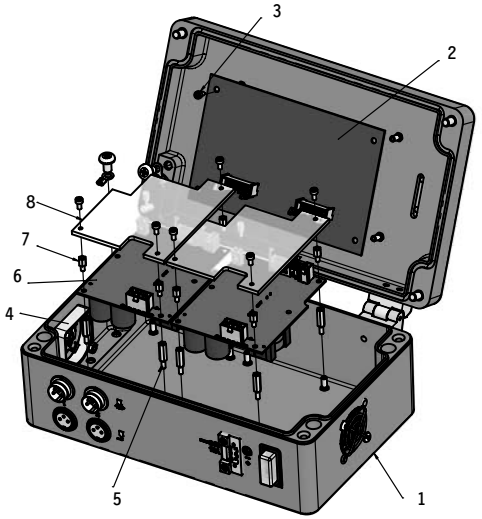


Figure 25: Sapphire driver assembly

Applicator-to-Hose Connectors

Refer to Figure 26. Applicator-to-hose connectors are installed between the applicator and hose to ease hose routing and to help prevent bending or pinching of the hose.

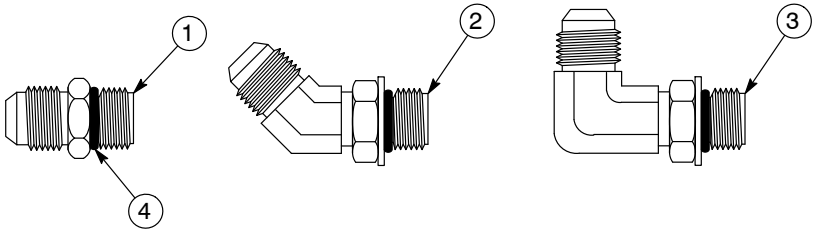


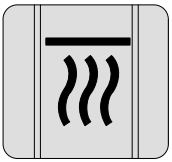
Figure 26: Applicator-to-hose fittings

Item	Part	Description	Note
1	972657	Connector, hose, with O-ring, straight	A
2	274179	Connector, hose, with O-ring, 45°	
3	274180	Connector, hose, with O-ring, 90°	
4	945032	• O-ring, Viton, $^3/_8$ in. tube	B

NOTE A: All applicators are shipped with this straight hose connector pre-installed on the applicator.

B: This is the replacement O-ring for all hose connectors.

Insulating Cuffs



Insulating cuffs are used to insulate hose-to-applicator joints.

Part	Description
273634	Cuff, insulating, 64 mm (2.5 in.)
273635	Cuff, insulating, 50 mm (2.0 in.)
274429	Cuff, insulating, 44 mm (1.75 in.)

Complete Assemblies, Recommended Spare Parts, and Supplies

The tables below provide part numbers for the replacement parts and miscellaneous supplies that are most commonly needed to service an applicator. Your decision about stocking spare parts and supplies depends on your approach to maintenance. The quantity of each item you stock will vary depending on the the number of hours you operate per day and the number of applicators you have. Base your spare parts stocking decisions on the specific needs of your operating environment.

Complete Assemblies

Part	Description
1125710	SAPPHIRE APPLICATOR (240V)
1126015	SAPPHIRE APPLICATOR (200V)
1125713	SAPPHIRE DRIVER (SINGLE CHANNEL)
1125712	SAPPHIRE DRIVER (DUAL CHANNEL)
1126010	SAPPHIRE REPLACEMENT MODULE
1125668	CABLE, EXT, SAPPHIRE ,3M, DRIVE TO MODULE
1126153	SAPPHIRE DRIVER UPGRADE KIT (UPGRADE A SINGLE DRIVER TO A DUAL DRIVER)
1126583	POWER SUPPLY, 24VDC, 240W, DIN

Recommended Spare Parts

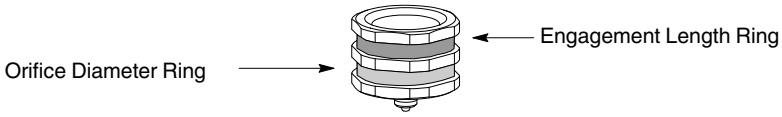
Part	Description
1126010	SAPPHIRE REPLACEMENT MODULE
1125667	CORDSET,MANIFOLD,SAPPHIRE,240V
1126012	CORDSET,MANIFOLD,SAPPHIRE,200V
1126011	MOUNT,REPLACEMENT,SAPPHIRE
1123663	KIT,FILTER,200 MESH,SATURN,M14,5 PACK
1126154	KIT,INTERFACE,REPL,SAPPHIRE
1126152	KIT,DRIVER,REPL,SAPPHIRE

Supplies

Part	Description
900344	LUBRICANT,NEVER SEEZ,8 OZ CAN (FOR LUBRICATING THREADS)
900223	LUBRICANT,O RING,PARKER,4 OZ (FOR LUBRICATING O-RINGS)
165415	LUBRICANT,HEATER (FOR LUBRICATING HEATERS)
100586	REMOVAL TOOL,PIN,SOCKET (T-STYLE CORDSET PIN REMOVAL TOOL)
901915	NOZZLE CLEANING KIT
270755	FLUID,TYPE R,1.0 GAL

Standard Saturn Nozzles

Saturn precision nozzles have patented color-coded rings that provide easy identification of nozzle orifice size. Refer to the *Adhesives and Sealants Equipment Guide* for a full listing of available Saturn nozzles.



Orifice Diameter and Bottom Ring Color mm (in.)	Engagement Length and Top Ring Color mm (in.)				
	1.3 (.050) Purple	1.9 (.075) Brown	2.5 (.100) Blue	3.8 (.150) Green	7.6 (.300) Black
.20 (.008) Purple	322008				
.25 (.010) Blue	322010				
.31 (.012) Green	322012	322112	322212	322312	322412
.36 (.014) Yellow	322014	322114		322314	322414
.41 (.016) Orange	322016	322116	322216		322416
.46 (.018) Red	322018	322118		332318	322418
.51 (.020) Beige	322020	322120			
.53 (.021) Brown					322421
.61 (.024) Gray					322424
.71 (.028) Black					322428

Specifications

Parameter	Specification
Operating temperature	204 °C (400 °F) maximum
Working hydraulic pressure	103 bar (1500 psi) maximum
Nozzles	Saturn, single orifice (controlled engagements)
Electrical service	240 VAC, 50/60 Hz; 200 VAC, 50/60 Hz optional
Cyclic rate(1)	1600 Hz maximum
Operating viscosity(1)	500-2000 cPs

(1) Best results are typically seen between 900 and 1500 cPs. Operation above this viscosity range may result in less than ideal cutoff, but is still possible. Operation below this range may result in splatter with factory settings, but can typically be corrected via special programing. 1600 Hz is a burst speed. Continuous operation may be limited by several factors. High setpoint or environmental temperatures may require reduced duty cycles.

Dimensions

Applicator Envelope

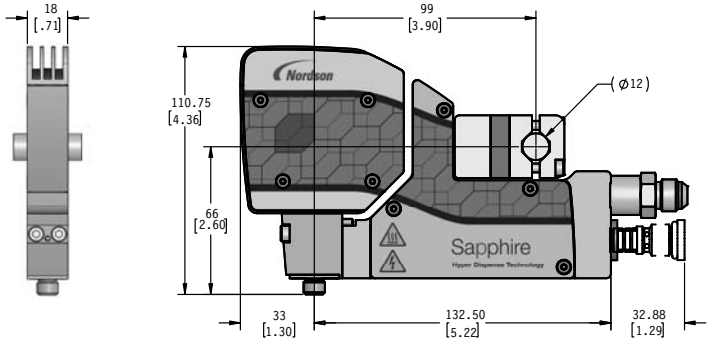


Figure 27: Applicator envelope

Driver Envelope

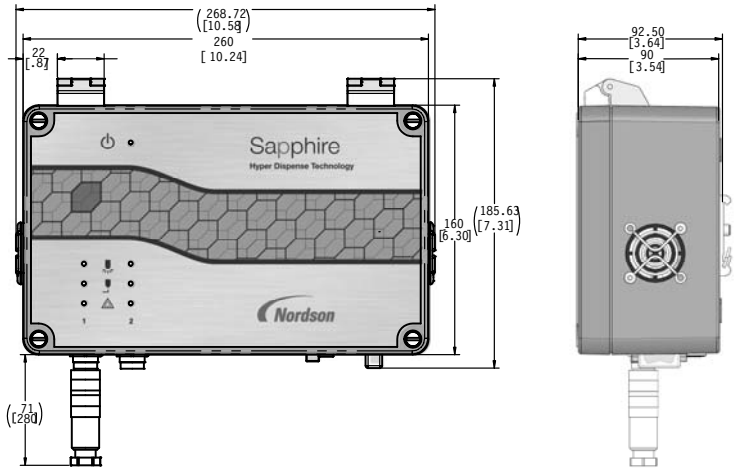


Figure 28: Driver envelope