X9800 Flame Detector

Customer Product Manual

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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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1609500-02

Change Record

Revision	Date	Change
01	04/16	Release
02	08/23	Removed DC power panel data

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.

All phases of equipment installation must comply with all federal, state, and local codes.

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 any 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.
- Obtain and read Material Safety Data Sheets (SDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- 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.

Fire Safety

To avoid a fire or explosion, follow these instructions.

- Ground all conductive equipment. Use only grounded air and fluid hoses. Check equipment and workpiece grounding devices regularly. Resistance to ground must not exceed one megohm.
- Shut down all equipment immediately if you notice static sparking or arcing. Do not restart the equipment until the cause has been identified and corrected.
- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored. Do not heat materials to temperatures above those recommended by the manufacturer. Make sure heat monitoring and limiting devices are working properly.
- Provide adequate ventilation to prevent dangerous concentrations of volatile particles or vapors. Refer to local codes or your material SDS 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.

Grounding

WARNING: Operating faulty electrostatic equipment is hazardous and can cause electrocution, fire, or explosion. Make resistance checks part of your periodic maintenance program. If you receive even a slight electrical shock or notice static sparking or arcing, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

Grounding inside and around the booth openings must comply with NFPA requirements for Class II, Division 1 or 2 Hazardous Locations. Refer to NFPA 33, NFPA 70 (NEC articles 500, 502, and 516), and NFPA 77, latest conditions.

- All electrically conductive objects in the spray areas shall be electrically connected to ground with a resistance of not more than 1 megohm as measured with an instrument that applies at least 500 volts to the circuit being evaluated.
- Equipment to be grounded includes, but is not limited to, the floor of the spray area, operator platforms, hoppers, photoeye supports, and blow-off nozzles. Personnel working in the spray area must be grounded.
- There is a possible ignition potential from the charged human body. Personnel standing on a painted surface, such as an operator platform, or wearing non-conductive shoes, are not grounded. Personnel must wear shoes with conductive soles or use a ground strap to maintain a connection to ground when working with or around electrostatic equipment.
- Operators must maintain skin-to-handle contact between their hand and the gun handle to prevent shocks while operating manual electrostatic spray guns. If gloves must be worn, cut away the palm or fingers, wear electrically conductive gloves, or wear a grounding strap connected to the gun handle or other true earth ground.
- Shut off electrostatic power supplies and ground gun electrodes before making adjustments or cleaning powder spray guns.
- Connect all disconnected equipment, ground cables, and wires after servicing equipment.

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.

Description

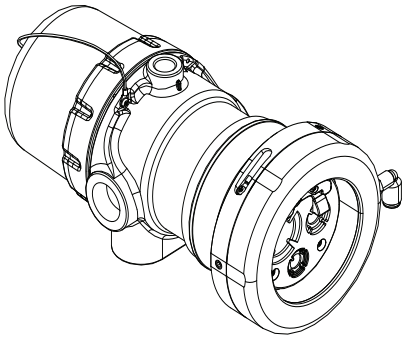
Flame Detection System Components

The flame detection system is installed in a coating system booth and interfaces with the booth and the application system controls. The flame detector shuts down the booth, application equipment, and the conveyor when it detects a flame in the booth.

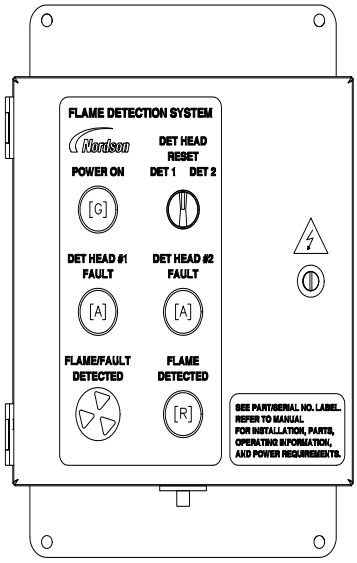
See Figure 1. The flame detection system consists of one or two detector heads and an indicator panel. The detector circuit is available as either a 120/230 Vac NEMA12 panel or as a control board and operator controls that can be integrated into a booth control panel.

NOTE: The field wiring connector adapter box connects to the AC control panel and is available as an option to primarily support XL-3000 legacy systems.

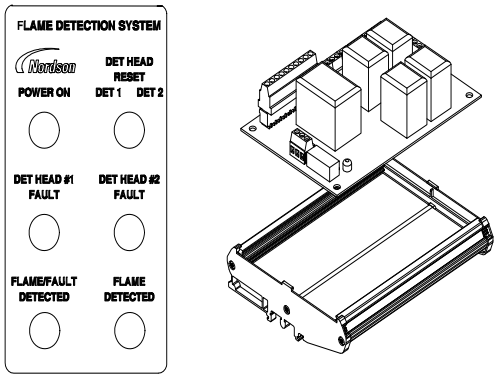
Flame Detector Head



Flame Detection AC-Power Control Panel



Flame Detector Integration Kit



Field Wiring Connector Adapter Kit

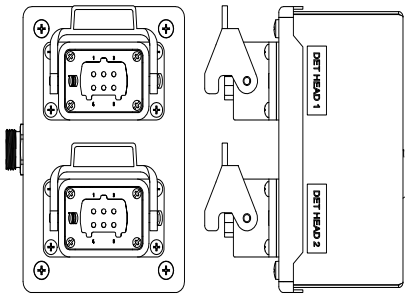


Figure 1 Flame Detection System Components

Flame Detector Heads

See Figure 2.

The detector heads simultaneously scan IR spectrum and the visible spectrum. They use intelligent, real-time signal processing to tell the difference between a real flame and false-alarm radiant energy sources.

Each detector head continuously monitors itself via a through-the-lens test. The detector head shines a light through the lens and looks for a reflection from the reflective plate. If the test fails, the detector head goes into fault mode and the amber fault indicator light is turned on.

Each detector head has a status LED, visible through the lens. The detector head lens is continuously cleaned by low-pressure air flowing from the air shield.

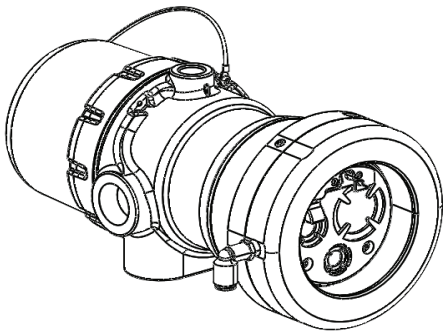


Figure 2 FX9800 Flame Detector

Theory of Operation

Flame Detection

If a flame is detected inside the booth, interlock relays in the indicator panel open and shut down the exhaust fan, application equipment, and conveyor. The red FLAME DETECTED indicator light is turned on and the flame alarm sounds.

Faults

The FAULT DETECTED indicator light and the fault alarm alert the operators of problems with the detector heads. There are two fault modes:

Fault: A fault occurs when one detector head loses power, fails a through-the-lens test, or has a microprocessor/sensor module malfunction. The fault indicator for that detector head lights and the fault alarm sounds. No interlocked equipment is shut down if two detector heads are used and only one is in fault. If only one detector head is used, any fault is treated as a major fault.

Major Fault: A major fault occurs when both detector heads lose power, fail a through-the-lens test, or have microprocessor/sensor malfunctions. Both fault indicators light and the fault alarm sounds. If only one detector head is connected, then any fault is a major fault. A major fault shuts down the booth and application equipment. The conveyor will continue to run. The conveyor is shut down only if a flame is detected.

Specifications

Detector Head Terminal Block Connections

X9800 Model Pin	Function
1	DC Common
2	+24 Vdc
3	Fault Relay (N.O.)
4	Fault Relay (COM)
6	Fire Relay (N.O.)
7	Fire Relay (COM)

Electrical Power and Temperature Rating

Item	Specification
Detector Head Input Voltage	24 Vdc, 120 mA
Temperature Rating	-40 °C to +75 °C (-40 °F to +167 °F)

Installation

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

Mounting Equipment

Excel Booth Vestibule Mount

See Figure 3.

1. Measure and mark the locations in the booth entrance and exit vestibules (2) for the detector heads (1).
2. Mount one detector head to the floor of each vestibule diagonally as shown below, using the included brackets and screws, washers, lock washers, and nuts.

   NOTE: Mounting brackets will need to be oriented differently depending on the detector head being used.

   NOTE: Each detector head has a 90-degree cone-shaped field of view.
3. Align the detector head center lines (4) so they have an unobstructed view of the spray guns (3), conveyor (5), hangers, and workpieces (6).
4. Mount the indicator panel in an appropriate location, close to or on the booth electrical panel, or on an operator platform, using the mounting holes on the panel flanges.

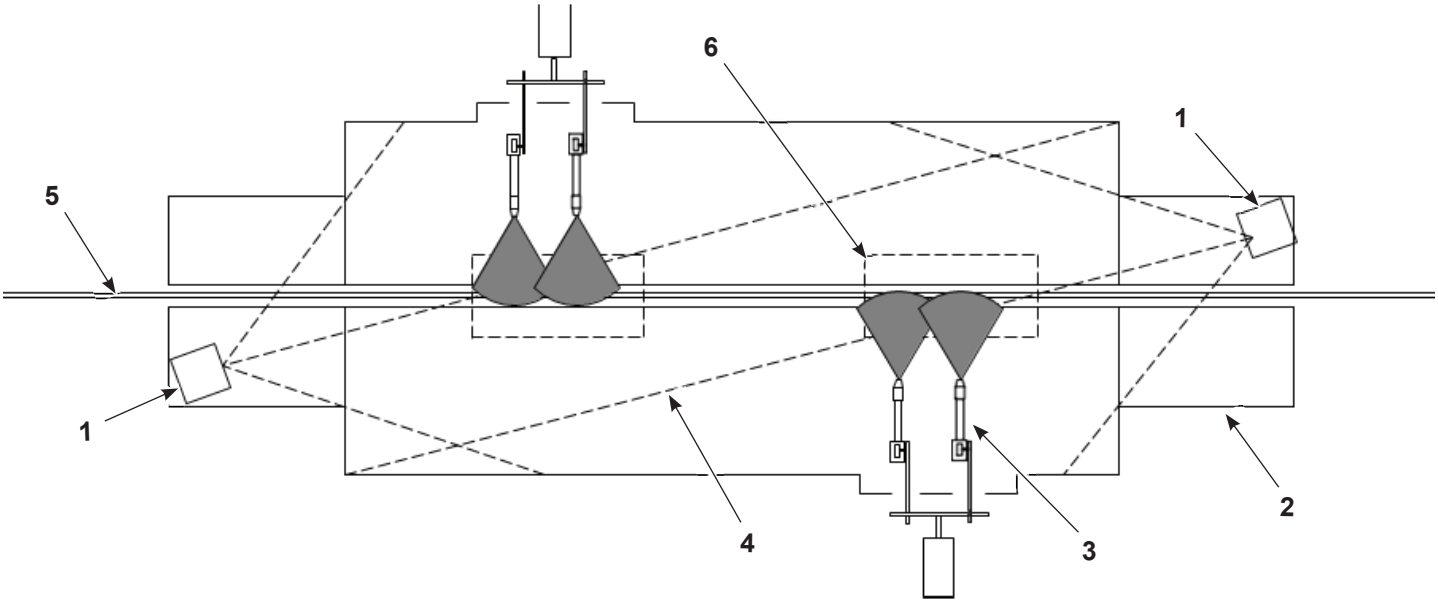


Figure 3 Excel Booth Flame Sensors and Light Test Source Installation (Top View)

1. Detector heads
2. Booth vestibules
3. Spray gun
4. Centerlines
5. Conveyor
6. Hangers and workpieces

Colormax Booth Mount

See Figure 4.

1. Measure and mark the locations at the top of the booth entrance (2) to mount the detector heads (1).
2. Mount the detector heads to the top corners of the booth entry wall as shown below. Orient the bracket appropriately using the included brackets and screws, washers, lock washers, and nuts.

   NOTE: Mounting brackets will need to be oriented differently depending on the detector head being used.

   NOTE: Each detector head has a 90-degree cone-shaped field of view.
3. Align the detector head center lines (4) so they have an unobstructed view of the spray guns (3), conveyor (5), hangers, and workpieces (6).
4. Mount the indicator panel in an appropriate location, close to or on the booth electrical panel, or on an operator platform, using the mounting holes on the panel flanges.

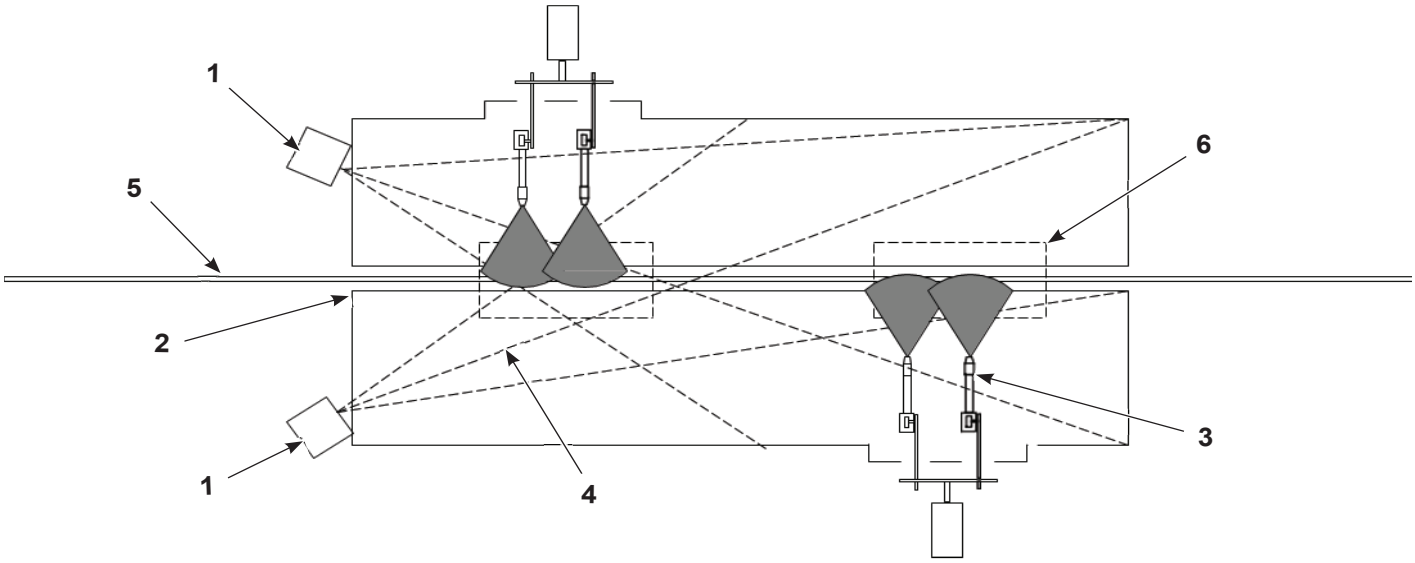


Figure 4 Colormax Booth Flame Sensors and Light Source Installation (Top View)

1. Detector heads
2. Booth entrance
3. Spray gun
4. Centerlines
5. Conveyor
6. Hangers and workpieces

Pneumatic Regulator Installation (if applicable)

See Figure 5.

Install a 1.0 bar (15 psi) fixed-pressure regulator for each detector head.

1. Install the regulator (4) on the booth as close as practical to the detector head (2).
2. Connect 6-mm air tubing (3) from the air supply to the regulator and from the regulator to the detector head air shield.

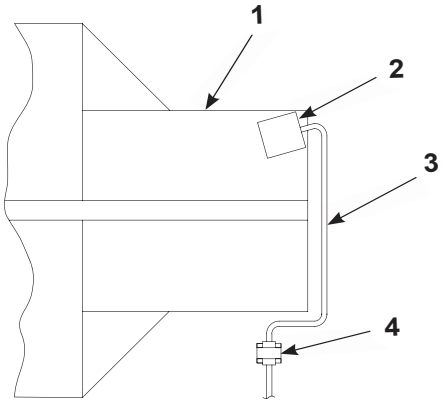


Figure 5 Flame Detector Head Pneumatic Connections

1. Vestibule
2. Detector head
3. 6 mm air tubing
4. Regulator

Flame Detector Head Connections

WARNING: All electrical connections must be made according to local or national electrical codes. Use properly sized wire and approved conduit and fittings. Failure to observe this warning could result in property damage or personal injury.

NOTE: Use copper conductors for all field wiring to the indicator panel. See Figure 6.

Connect the detector heads to the indicator panel with six-wire shielded cable, ground wire, flexible or rigid conduit, and liquid-tight conduit fittings (Type 12 minimum rating).

1. Unscrew the housing lid (7) from the housing (1).
2. If installed, remove one of the plugs (2) from the housing (1) ports.
3. Screw the bulkhead (4) on the liquid−tight conduit fitting (5) (Type 12 minimum) and install in the open port.
4. Pull the cable (8) and ground wire (3) through the conduit (6), then connect the conduit to the fitting (5).
5. Connect the cable wires (8) to the terminal block (9) on the bottom of the microprocessor/ sensor module. See Wiring Diagrams Figures 7, 8, 9, or 10 for connections.
6. Connect the ground wire (3) to the green ground stud in the housing (1).
7. Screw the housing lid (7) on the housing (1).
8. Install plugs (2) in the lower housing as required.
9. Refer to the appropriate system wiring diagram and connect the cable wires to the control panel as shown in Figures 7, 8, 9, or 10.

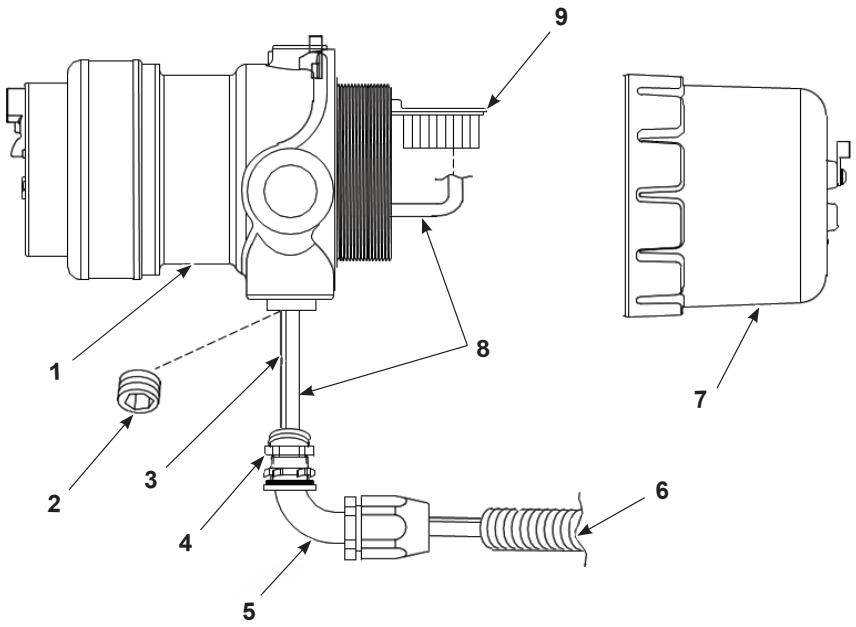


Figure 6 Flame Detector Electrical Connections

1. Housing
2. Plug
3. Ground wire
4. Bulkhead
5. Conduit fitting
6. Conduit
7. Housing lid
8. Cable
9. Terminal block

Wiring Diagrams

NOTE: Connections must be made so that power is supplied to the indicator panel as long as the booth electrical power is turned on. Supply service must be provided from a disconnect switched source.

AC-Powered Control Panel

Make connections according to Figure 7. Supply 120−240 Vac, 1 phase, 50/60 Hz, 2 amp electrical service with ground to the indicator panel from the booth electrical panel. Use three-wire cable, flexible or rigid conduit, and liquid-tight conduit fittings.

NOTE: If a field wiring connector box is added, refer to Figure 8.

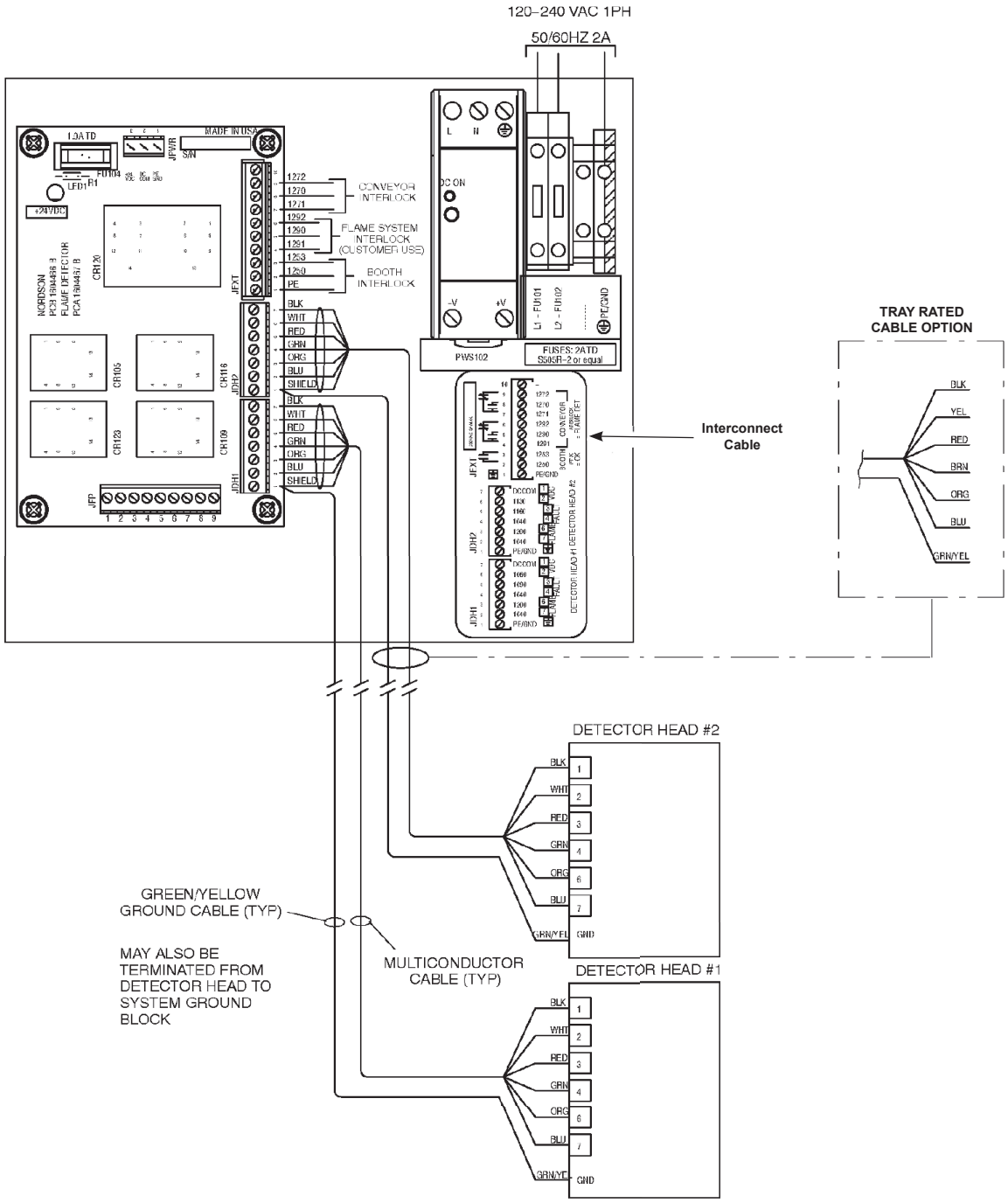


Figure 7 Wiring Diagram for AC-Powered Control Panel

AC-Powered Control Panel with Field Connector Box Wiring Diagram

Make connections according to Figure 8.

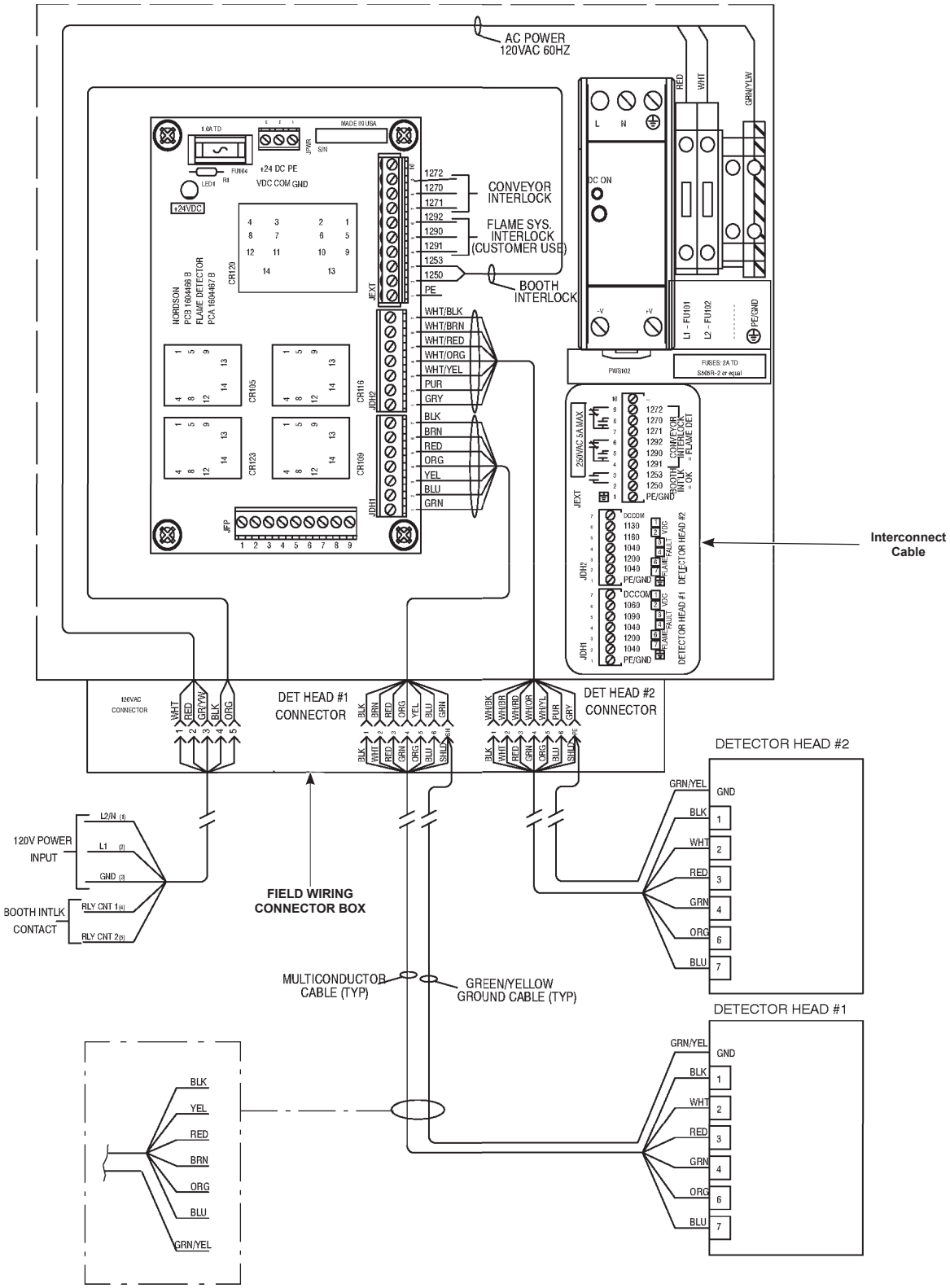


Figure 8 Wiring Diagram for AC-Powered Control Panel with Field Connection Box

Operation

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

Through-the-Lens Test

The detector heads automatically perform periodic through-the-lens tests to check their operation. If a test fails, the detector head goes into fault mode. Refer to Troubleshooting for diagnostic and correction procedures.

Detector Head Test Procedure

Automatic Optical Integrity Test

The X9800 includes the Automatic Optical Integrity (oi) feature which is a calibrated performance test that is automatically performed once per minute to verify complete detector operation capabilities. No testing with an external test lamp is required. The detector automatically performs the same test that a maintenance person with a test lamp would perform. However, a successful Automatic Optical Integrity test does not produce an alarm condition.

Magnet Optical Integrity Test

The Magnetic Optical Integrity test procedure is the approved external optical test method for the X9800 flame detector head to verify end-to-end function. This test replaces the need of a traditional external test lamp.

1. Place a magnet at the location marked “MAG OI” on the outside of the detector.
2. Hold magnet in place for 6 seconds. This will activate the IR emitter on the unit.
3. If the resulting signal meets the test criteria, the indicating LED will change to red. If the test criteria is not met, no alarm is produced and a fault is generated.

Maintenance

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

WARNING: Keep the detector head lenses clean. Dirty lenses can prevent the detector heads from detecting a flame in the booth. Failure to observe this warning could result in property damage or personal injury.

NOTE: Keeping the lenses clean will prevent nuisance fault alarms or shutdowns. A dirty lens can cause a through-the-lens test to fail, triggering a fault. If only one detector head is installed, a fault will shut down the coating system during production.

Daily

Check the detector head lenses daily. If they are dirty, clean them with an approved low-pressure air gun or an oil- and silicone-free cloth. If necessary, dampen the cloth with ethyl alcohol. Do not use a silicone-based product such as commercial window cleaner to clean the detector head lenses.

NOTE: If the detector head lenses are covered with powder overspray, check the air supply to the air shields. Air should be supplied at 1.0 bar (15 psi). Make sure the air shield orifices are not clogged.

Periodically

Check all electrical connections periodically. Tighten any loose terminals. Replace any wiring that has worn or damaged insulation. Make sure conduit fittings are tight.

Troubleshooting

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

WARNING: Hazardous voltages are present inside the indicator panel when booth power is on. Do not touch exposed terminals or wiring when checking voltages. Use insulated tools. Failure to observe could result in severe shock and personal injury.

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

Problem	Possible Cause	Corrective Action
1. Detector Fault	Through-the-lens test failed	If the status LED on the detector head is yellow, the detector lens is obstructed. Make sure the detector lens is clean and clear of powder. If powder is accumulating on the lenses, check the air supply to the air shields. Reset the detector head to clear the fault.
	Detector head lost power	Check the status LED on the detector head. When operating normally, the LED should be green. If the LED is off, check the wiring between the indicator panel and the detector. There should be 24 Vdc between pins 1 and 2 at the detector. • If 24 Vdc is present, call a technical service representative. Detector head may need to be replaced. • If 24 Vdc is not present, make sure green POWER ON indicator on the indicator panel is lit. If the indicator panel has power, repair or replace the wiring between controller and detector.
	Microprocessor/sensor module failed	No LED indication on the detector head and 24 Vdc power present at pins 1 and 2. Replace the detector head or contact your technical service representative.

Parts

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

Using the Illustrated Parts List

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

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

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

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

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

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

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

X9800 Flame Detector Head

See Figure 9 and the following parts list.

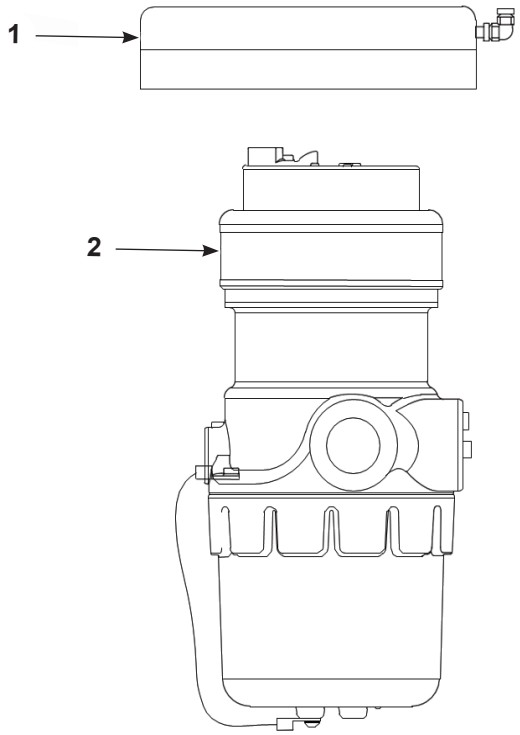


Figure 9 Flame Detector Parts

Item	Part	Description	Quantity	Note
1	1623642	KIT, air shroud, detector flame, X9800	1	
2	1609504	DETECTOR, flame, X9800	1	

Universal Mounting Kit

Part	Descriptioin	Quantity	Note
1609232	KIT, mounting brackets, fire detector, UNI	1	

Optional Air Supply Parts

Refer to the following parts list.

Part	Description	Note
249467	REGULATOR, in-line air	
900730	TUBING, polyurethane, 0.250 x 0.040 in.	A
900742	TUBING, polyurethane, 6/4 mm, blue	A
NOTE: A. Order tubing in 1-foot increments		