

Sure Coat[®] Triggering Controller

For Sure Coat Individual Controller Systems

Customer Product Manual

Part 1019966F

Issued 10/03

**For parts and technical support, call the Industrial Coating
Systems Customer Support Center at (800) 433-9319 or
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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 all 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 (MSDS) 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.

- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Provide adequate ventilation to prevent dangerous concentrations of volatile materials or vapors. Refer to local codes or your material MSDS for guidance.
- Do not disconnect live electrical circuits while 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.
- 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.

All work conducted inside the spray booth or within 1 m (3 ft) of booth openings is considered within a Class 2, Division 1 or 2 Hazardous location and must comply with 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 electrical power. Close pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the equipment.

Disposal

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

Section 2

Description

Introduction

The Sure Coat triggering controller provides automatic part detection, tracking, and spray gun triggering for automatic powder spray guns. The triggering controller is designed for use with the Sure Coat individual controller systems equipped with the Sure Coat mini-master controller.

NOTE: The triggering controller is also available in Sure Coat modular gun control system and standalone configurations. Installation and parts for these two configurations are covered in separate manuals.

Trigger Outputs

The controller is configured for six trigger outputs (one output for each individual gun controller in the system).

Each output can be set to trigger one spray gun or a group of spray guns. In a typical system, spray guns are turned on and off in groups (banks), with each group arranged to cover a vertical or horizontal area (zone) of the booth.

Trigger Programming

Trigger programming is simple. Only three trigger points need to be calculated and entered into the trigger controller: pickoff, lead, and lag. Only the lead and lag values need to be adjusted if part sizes change. All values are entered in inches or centimeters.

See Figure 2-1.

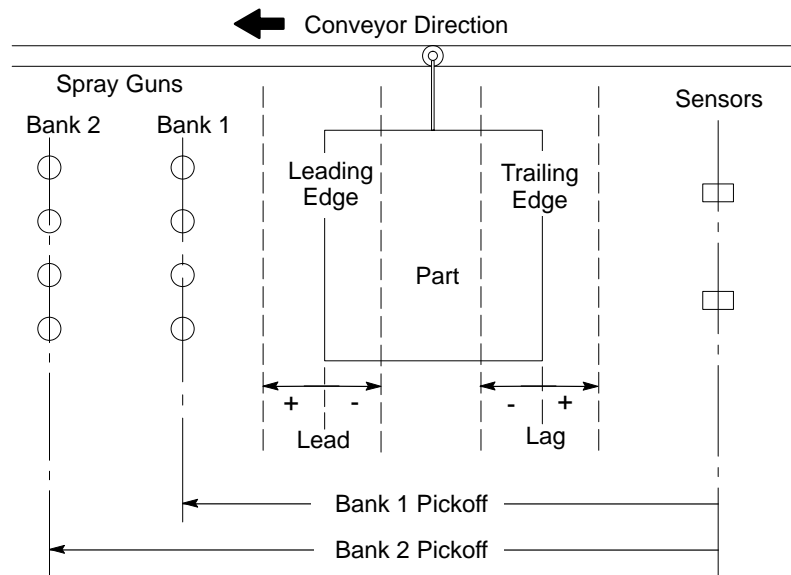
Pickoff: Distance from the sensors to the spray guns. Each bank of spray guns has its own pickoff point.

Lead: Distance from the spray guns to the leading edge of the part. Lead values can be positive or negative.

- A positive lead value turns on the spray guns before the leading edge reaches them.
- A negative lead value turns on the spray guns after the leading edge passes them.

Lag: Distance from the spray guns to the trailing edge of the part. Lag values can be positive or negative.

- A negative lag value turns off the spray guns before the trailing edge reaches them.
- A positive lag value turns off the spray guns after the trailing edge passes them.



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Figure 2-1 Pickoff, Lead, and Lag Points

Sensor Inputs

Four sensor inputs are provided. In a typical system, the sensors are photocells arranged to identify the presence of a part and the vertical or horizontal zone the part occupies. The triggering controller turns on and off the spray guns or groups of spray guns according to the sensor and encoder or timer inputs.

When you configure the controller, you assign sensors to outputs in a one-to-one relationship: sensor 1 to output 1, sensor 2 to output 2, and so on. You can also assign more than one output to one sensor.

When the sensors detect a part, a signal is sent to the controller that tells it which sensors detected the part. The signal is stored in memory and synchronized with the signal from the encoder or timer. The controller uses these signals to track the location of each part within the booth and trigger the spray guns according to the trigger programming.

Sensor filters and alarms are included. The filters delay or extend the sensor signal to prevent hanger detection or narrow part skipping and signal chattering. The sensor alarm alerts the operator if a sensor becomes misaligned or malfunctions.

Encoder Input

Encoder signals are used along with the sensor signals to track the position of parts within the booth.

One encoder input is provided. The controller's default resolution is 1:1 (one unit of movement=one pulse), and can be set to 1:2 (one unit of movement=two pulses). Unit scaling is in inches or centimeters. If no encoder is used, the controller can be configured to use an internal timer instead. The timer resolution is 1:1.

NOTE: If the internal timer is used, you must connect the conveyor interlock circuit. Refer to the *Installation* section for connection instructions.

The controller's shift register contains 2048 cells. At a resolution of one inch to one pulse (1:1), the effective distance parts can be tracked is approximately 170 feet ($2048 \div 12$). If the resolution is set to 1:2, the effective tracking distance is halved, to approximately 85 feet. Actual resolution is dependent on the encoder used and the encoder drive sprocket ratio.

Conveyor run and stop delays can also be set to compensate for conveyor response delays. For example, if the encoder is mounted some distance from the conveyor drive, it may take two seconds after the conveyor is started before all slack in the chain is taken up and the encoder starts to turn and send signals to the controller. Configuring a two second run delay compensates for the conveyor response delay and provides accurate triggering.

Conveyor Interlock

The triggering controller includes a conveyor interlock circuit which is typically wired to a relay that opens when the conveyor stops moving. The interlock circuit then turns off the spray guns.

The interlock can be enabled and disabled through the triggering controller software. If an encoder is used, there is no need to enable the interlock or connect the circuit to a relay since the encoder signals tell the controller the conveyor status.

If the controller is configured to use its internal timer, the interlock is automatically enabled, and the conveyor interlock circuit must be connected to a relay. If this is not done, the triggering controller will not shut off the spray guns if the conveyor stops. Refer to the *Installation* section for connection instructions.

Specifications

Main Input Voltage:	85-240 Vac, 50/60 Hz, 1Ø , 1 amp (30 VA)
Pollution Degree:	1
Installation (Overvoltage):	Category II
Trigger Outputs:	6 (sinking driver, 300 mA @24 Vdc maximum per channel)
Photoeye Inputs:	4 (10-80 mA per channel)
Encoder Inputs:	1 (10-80 mA per channel)
Sensor Voltage:	24 Vdc @ 1.0 amp

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.



WARNING: Disconnect and lock out system electrical power before installing the triggering controller and making electrical connections. Failure to observe this warning could result in personal injury and equipment damage.

Mounting

Mount the triggering controller between the mini-master controller and the individual controllers. The triggering controller uses the same mounting hardware as the mini-master controller.

Grounding



WARNING: Follow these guidelines to properly ground the triggering controller and other external system equipment. Improper grounding may result in damage to system electronics and personal injury.

Triggering Controller Cabinet



CAUTION: The green/yellow ground wire in the power harness will not protect a device from electrostatic discharge (ESD). This green/yellow ground wire is for shock protection of the equipment operator.

See Figure 3-1.

Use a braided strap to connect the triggering controller to an earth ground. This connection can be done in two ways:

Typical Installation: Cabinet to cabinet chain

Ideal Installation: Star pattern. Connect the triggering controller cabinets to the central grounding point in a star pattern with the grounding wires parallel. The star pattern insures that any electrostatic discharge (ESD) encountered by the controllers is routed directly to the earth ground.

Triggering Controller Cabinet (contd)

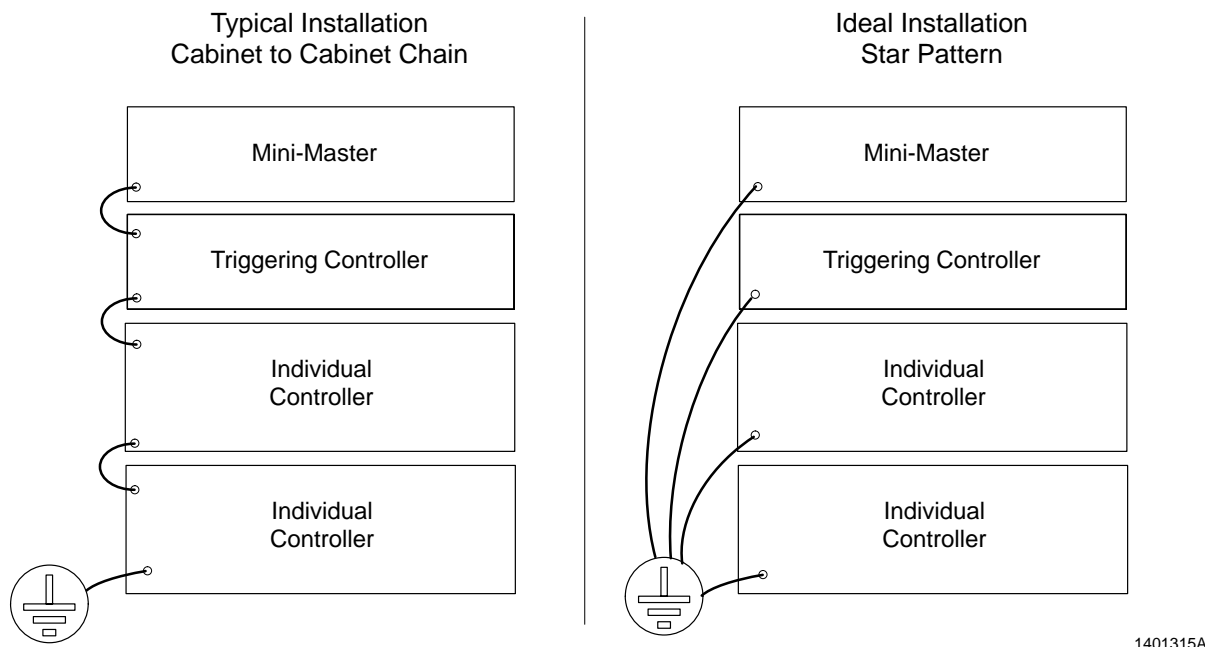


Figure 3-1 Grounding the Triggering Controller Cabinet

Photo eyes and Encoders

Connections



CAUTION: Use a shielded, extra-hard usage cable for photo eye and encoder connections to protect the the circuits from electrical noise. The electrical noise may be generated by motor circuits, powder hoses that tribo charge, or other electrical devices. The noise can interfere with the proper detection of photo eye and encoder signals causing erratic operation or lost data.

- Connect the shield or drain wire at one end only. Complete the connection at the triggering controller with the connectors for photo eye and encoder input. These connectors have a pin that is bonded directly to the chassis ground.
- When connecting multiple shielded, extra-hard usage cables in a series through a junction box, make sure to connect the drain wires from one cable to the next. Do not allow the drain wires to contact ground within the junction box.

Mounting Hardware

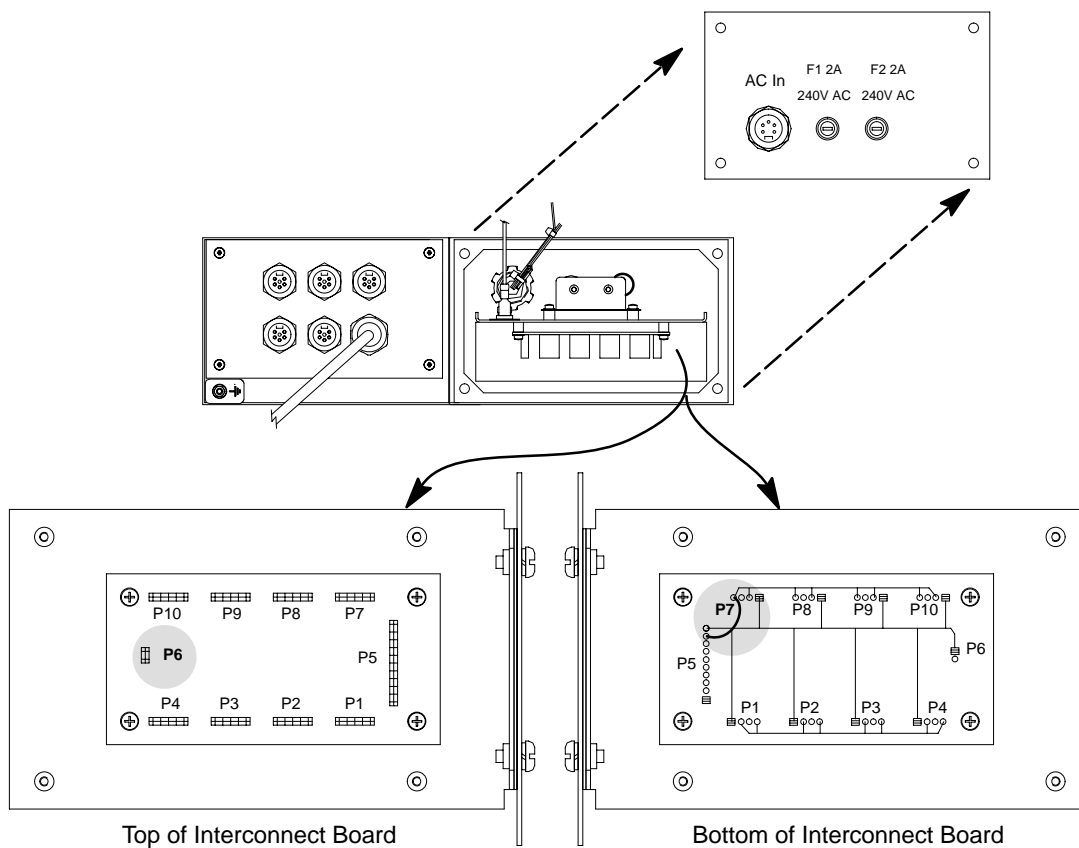
Make sure the photo eye and encoder brackets, as well as the Uni-Strut these items might be mounted to, are grounded to an earth ground. These items are susceptible to static charge buildup and need to be grounded before the ESD voltage reaches the circuitry inside the controller.

External Power Supplies

Follow these steps if your system uses an external power supply to provide enough voltage for the input devices.

See Figure 3-2.

1. Make sure power is disconnected and locked out.
2. Remove the triggering controller's right side (power supply side) of the rear panel.
3. Locate the interconnect board.
4. Remove the power connection (P6) from the board.
5. Make sure that at least one set of the red and black wires from the photo eye and encoder shielded hard usage cable is connected to the 24-volt supply. Refer to *Encoder Cable Connections* on page 3-7.
6. Make sure there is a 22-gauge wire jumper between pin 9 of connector P5 and pin 4 of connector P7. This jumper completes the grounding circuit to prevent noise from entering the controller.
7. Install the triggering controller's rear panel.



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Figure 3-2 Grounding for External Power Supplies

Power Cable Connections

The triggering controller must be connected to the same external power source as the mini-master controller.

1. Make sure system power is disconnected and locked out.
2. Plug the supplied 5.5-m (18-ft) power cable into the AC IN receptacle on the triggering controller's back panel.
3. Route the power cable to the same external power source that the mini-master controller is connected to. Connect the power cable to the power terminals as described in to Table 3-1.

Table 3-1 Power Cable Connections

Wire Color	Function
Brown	L1
Blue	L2
Green/Yellow	GND (Ground)

Interconnect Cable Connections

The interconnect cable contains leads for making the trigger and conveyor interlock connections.

Routing the Interconnect Cable

1. Install a dust-tight strain relief in the empty knockout under the AC IN receptacle on the back panel of the mini-master controller.
2. Pull the interconnect cable through the strain relief. Make sure that there is enough slack to make connections to the mini-master controller's main terminal block, then tighten the strain relief.

Trigger Connections

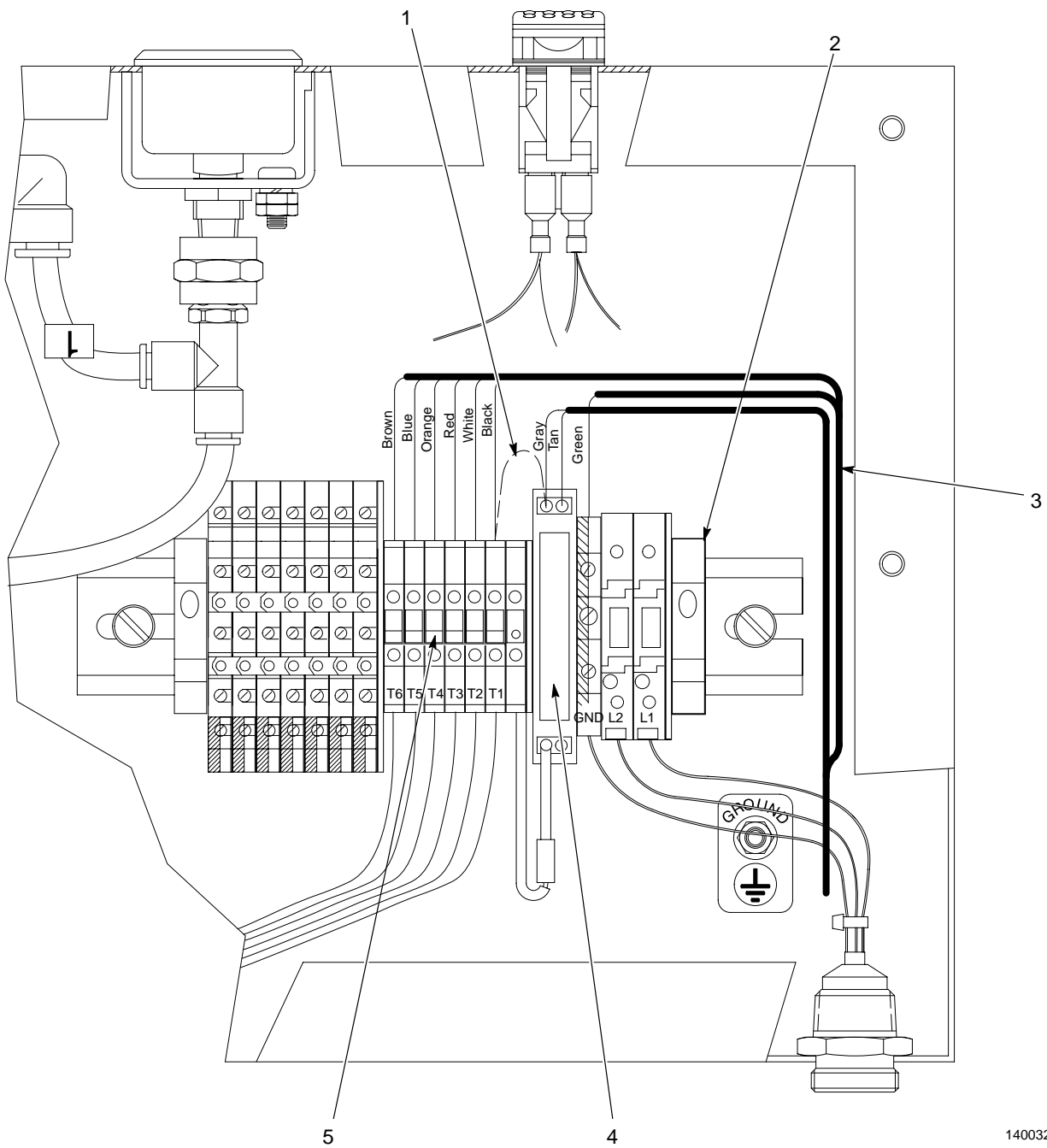
1. [See Figure 3-3](#). Remove the plastic jumpers (5) from terminals T1 through T6.
2. Remove the wire jumper (1) connecting the conveyor interlock relay to terminal T1.
3. Connect the interconnect cable trigger wires to the terminals as described in Table 3-2.

NOTE: If there is a jumper between the GND terminal and the interlock relay (4), remove the jumper before installing the interconnect cable's green wire.

Table 3-2 Trigger Connections

Wire Color	Terminal	Function
Black	T1	Group A1 Trigger
White	T2	Group B1 Trigger
Red	T3	Group C1 Trigger
Orange	T4	Group D1 Trigger
Blue	T5	Group A2 Trigger
Brown	T6	Group B2 Trigger
Green	GND	Ground

Trigger Connections (contd)



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Figure 3-3 Interconnect Cable Connections to the Mini-Master Controller

- | | | |
|------------------------|-----------------------|------------------------|
| 1. Wire jumper | 3. Interconnect cable | 5. T1-T6 Relay jumpers |
| 2. Main terminal block | 4. Interlock relay | |

Conveyor Interlock Connections

The conveyor interlock connection is optional if your system uses an encoder. If you use the triggering controller's internal timer instead of the encoder, you must connect the conveyor interlock.



CAUTION: You can connect the conveyor interlock to an external relay instead of the mini-master controller's interlock relay. If you do so, the external relay contacts must be voltage-free (dry). Applying external voltage to the interlock circuit will damage the triggering controller.

See Figure 3-3.

Connect the conveyor interlock wires to the interlock relay (4) as described in Table 3-3.

Table 3-3 Conveyor Interlock Connections

Wire Color	Terminal	Function
Gray	A	Interlock
Tan	B	Common

Encoder Cable Connections

NOTE: Disregard this procedure if your system does not have an encoder.

1. Remove the plastic cap from the ENCODER receptacle and discard the seal.
2. Plug the encoder cable into the ENCODER receptacle in the back of the triggering controller.
3. Route the encoder cable to the encoder. If the cable is not long enough, connect the cable to a junction box and complete the circuit with another four-wire cable to the encoder.
4. Connect the encoder cable to the encoder as described in the following table. Refer to your encoder documentation for connection information.

Table 3-4 Encoder Cable Connections

Wire Color	Function
White	Signal
Green	Signal Return (Common)
Red	+24V
Black	24V Return

Sensor Cable Connections

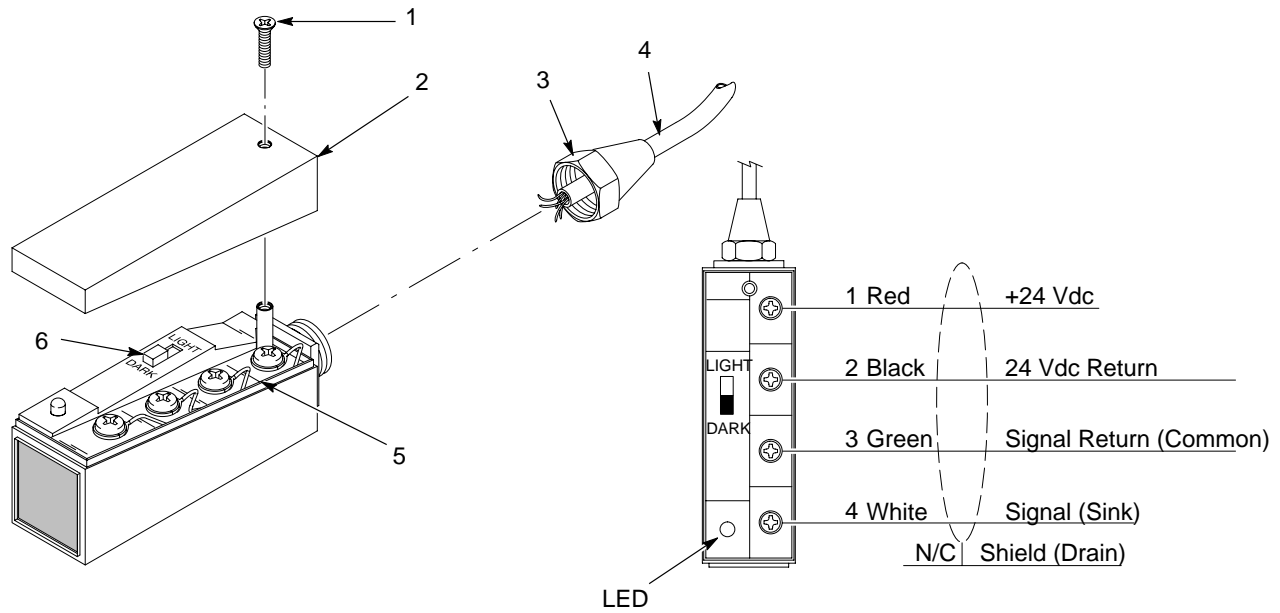
This procedure describes connecting the sensor cable to the two types of photo eyes that are typically used on Nordson systems (ATC: orange housing; SICK: blue housing). The differences in the procedures for the two types of photo eyes are identified but refer to your photo eye manufacturer's instructions for specific connection instructions.

1. Remove the bulkhead seal from the SENSOR 1 receptacle and discard the cap. Depending on how many photo eyes your system will use, remove as many of the bulkhead seals from the other SENSOR receptacles as appropriate.
2. Plug the sensor cables into the SENSOR receptacles in the back of the triggering controller.
3. Route the sensor cables to the photo eyes. If the cables are not long enough, connect the cables to a junction box and complete the circuits with additional four-wire cables to the photo eyes.
4. [See Figures 3-4 and 3-5](#). Remove the screw (1) and the photo eye cover (2).
5. Strip the cable (4) cover so that the wires are long enough to reach the photo eye terminals and the cable can be secured properly in the strain relief (3). Strip the wire insulation for connection to the terminals.
6. Route the cable through the strain relief. Tighten the strain relief.
7. Connect the cable wiring to the photo eye terminal block (5) as shown.
8. **ATC Photo Eye Only (orange housing):** Set the photo eye mode switch (6) to DARK.

The LED is off when it is aligned with the reflector and is not blocked.

SICK Photo Eye Only (blue housing):

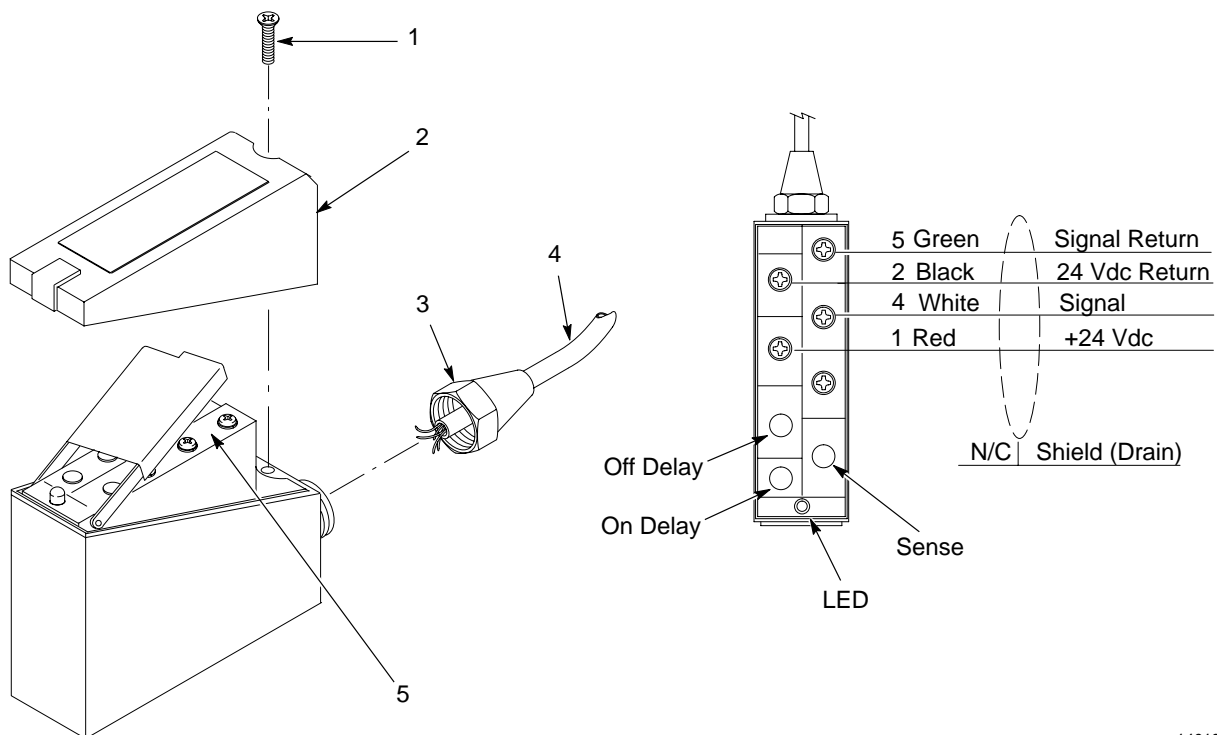
- a. Turn the On Delay and Off Delay adjustments fully counterclockwise.
 - b. Adjust the Sense dial for part detection.
 - c. The LED is on when it is aligned with the reflector and is not blocked.
9. Install the photo eye cover and tighten the screw.



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Figure 3-4 ATC Photo Eye Connection

- | | | |
|----------|------------------|-------------------|
| 1. Screw | 3. Strain relief | 5. Terminal block |
| 2. Cover | 4. Cable | 6. Mode switch |



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Figure 3-5 SICK Photo Eye Connection

- | | | |
|----------|------------------|-------------------|
| 1. Screw | 3. Strain relief | 5. Terminal block |
| 2. Cover | 4. Cable | |

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.

Introduction

Before you start using your triggering controller for production, perform the tasks in the following chart:

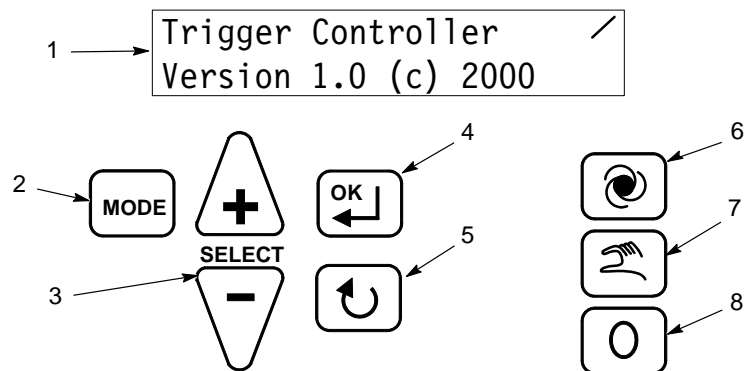
Task	Procedure	Page
Learn how to use the MODE , SELECT , and OK keys to navigate through the Configuration and Setpoint Adjustment menus to configure the controller and set trigger points.	<i>Using the Operator Interface</i>	4-2
Configure the controller.	<i>Configuration</i>	4-4
Calibrate the controller.	<i>Calibration</i>	4-6
Find starting pickoff points for each output.	<i>Finding Starting Pickoff Points</i>	4-7
Set trigger points for each output.	<i>Entering Trigger Points</i>	4-10
Learn how the operating mode keys work.	<i>Normal Operation</i>	4-11

Using the Operator Interface

See Figure 4-1.

The controller's operator interface consists of a tactile keypad and LCD (1). When the trigger controller is powered up, the LCD shows the version number and year. The following table describes the key functions.

Operator Interface Keys		
Item	Key	Press to:
2	MODE	toggle modes: run, language, setpoint adjustment, and configure
3	SELECT + and -	navigate through mode menus, in edit mode to increase or decrease values
4	OK (Enter)	to enter edit mode, again to set value and exit edit mode
5	Undo	cancel value change and exit the edit mode
6	Auto	put controller in automatic mode. Spray guns are triggered according to trigger settings and signals received from sensors and encoder.
7	Manual	put controller in manual mode. Spray guns are triggered continuously.
8	Off	turn off spray guns. Controller continues to monitor parts moving through booth.



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Figure 4-1 Operator Interface

Accessing and Changing Settings

Accessing Configure and Setpoint Menus

1. Press the **MODE** key until the desired mode appears.
2. Press the **OK** key to enter the mode.
3. Press the **SELECT+** or **SELECT-** keys to toggle through the mode menus.

Changing Menu Item Settings

1. Press the **OK** key to enter edit mode. **EDIT** appears next to the menu label. The value you are editing will flash while you are in the edit mode.
2. Press the **SELECT+** or **SELECT-** keys to change the value displayed below the menu label.
3. If you change a value but then decide to revert to the old value, press the **UNDO** key. This key only works while you are in edit mode.
4. Press the **OK** key to accept the value and exit edit mode.

Changing Interface Language

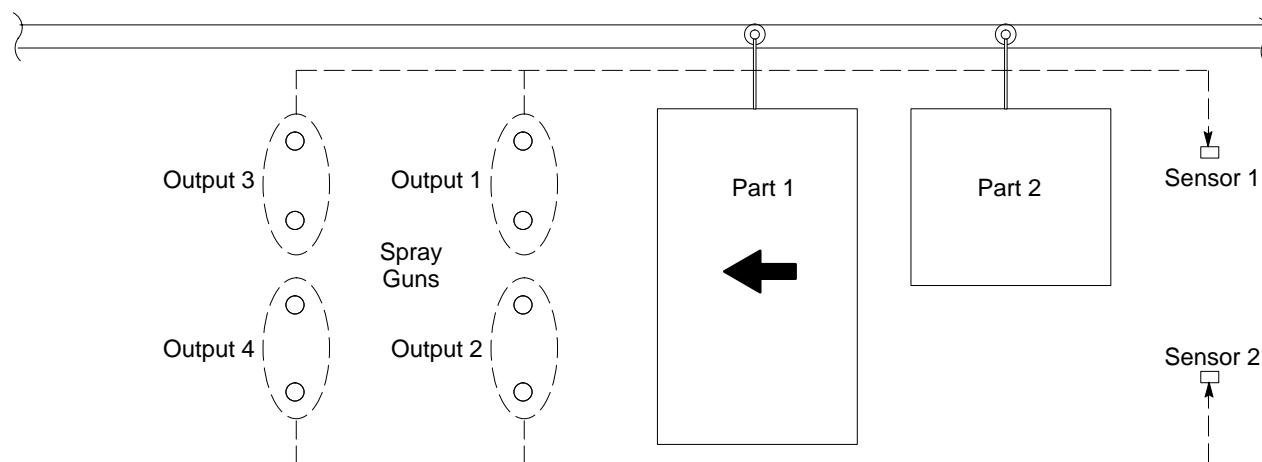
The default interface language is English. Perform these steps to change to another supported language.

1. Press the **MODE** key until **SELECT LANGUAGE** appears.
2. Press the **OK** key to enter edit mode. The currently selected language appears.
3. Press the **SELECT+** or **SELECT-** keys until the desired language appears.
4. Press the **OK** key to set the change and exit the edit mode.

Configuration

Before using the triggering controller for production, access the Configure menu and set each of the following menu items as appropriate.

Triggering Controller Configuration Steps		
Menu Item	Default	Parameters and Functions
English/Metric	English	Choose English or Metric units.
Encoder Scale	1:1	Choose 1:1 or 1:2 encoder scale. Determines unit of movement per encoder pulse. If set to 1:2, encoder signal is split so that one unit of movement is equal to two encoder pulses, allowing finer resolution and more precise triggering.
Clocking Method	Encoder	Choose Encoder or Timer. Timer is an internal clock. If you choose Timer, the conveyor interlock is automatically enabled and cannot be disabled. The conveyor interlock circuit must be connected when the timer is used.
User Conveyor Speed	0.0 ft/min or m/min	Enter speed of conveyor, in feet or meters per minute. Used for Timer operation only, do not set if encoder is used.
Encoder Alarm	Time 5.0	<p>The Encoder Alarm can function in either of two ways, depending on how the External Interlock menu item is set:</p> <p>External Interlock Enabled: The encoder alarm is a delay (in seconds) between the time the encoder stops pulsing and when an alarm message appears on the display. Do not set this value to zero; doing so will cause the trigger controller to malfunction. To disable the alarm set this value to a large number.</p> <p>External Interlock Disabled: The encoder alarm function is an encoder pulsing stopped monitor. Refer to <i>Encoder Pulsing Stopped Monitor</i> for setup instructions.</p>
Sensor Alarm	Time 90.0	Enter number of seconds after last sensor signal is received before alarm message appears. Indicates sensor fault, or photo eye-to-reflector misalignment.
Sensor 1-4 Filters	0.0 dly/ext	Enter positive number to extend sensor signal, negative number to delay signal. Extend signal to eliminate signal chatter when coating wire goods, delay signal to skip hangers.
Outputs	4	Choose 4, 6, or 8 trigger outputs. Use 4 or 8 for Sure Coat Modular Gun Control System, 6 for Sure Coat Mini Stack System, and 4, 6, or 8 for Versa-Spray systems.
Trigger 1-8<-> Sensor 1-4	-	<p>See Figure 4-2. Connect trigger outputs to sensors. Any combination can be set. In the example shown, each output triggers two spray guns. Outputs 1 and 2 spray one side of part, and outputs 3 and 4 spray other side. Part 1 triggers all four outputs, but part 2 only triggers outputs 1 and 3.</p> <p>NOTE: On the run menu, outputs 1-4 are shown as A-D in normal type, and outputs 5-8 are shown as A-D in reverse type.</p>
Conveyor Run Delay	0.0	Enter number of seconds it takes for parts ahead of sensors to start moving after conveyor is started.
Conveyor Stop Delay	0.0	Enter number of seconds it takes for parts in booth to stop moving after conveyor is stopped.
External Interlock	Disable	Choose Disable or Enable. Can be disabled if encoder is used. If clocking method is set to Timer, then external interlock is automatically enabled and cannot be disabled.
Pickoff Setpoints	Show	Choose Show or Hide. When hidden, only Lead and Lag Setpoints are displayed in Setpoint Adjustment menus.



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Figure 4-2 Tying Outputs to Sensors

Encoder Pulsing Stopped Monitor

If your system does not have an external conveyor interlock, the triggering controller must monitor encoder pulses to indicate when the conveyor has stopped.

NOTE: This function only works if during the *Configuration* procedure you set the external interlock to Disabled.

To configure the monitor, set the encoder alarm value to a value that is slightly greater than the elapsed time between encoder pulses:

NOTE: If the conveyor speed changes as part of the daily operation, perform this procedure at the conveyor's slowest operating speed.

1. Set the Conveyor Run and Conveyor Stop delays to 0.0.
2. Start the conveyor. The encoder should be pulsing.
3. Press the Manual key to turn on the spray guns.
4. Decrease the Encoder Alarm delay value until the spray guns start to turn on and off repeatedly.

NOTE: If the Encoder Alarm delay value is less than the time elapsed between encoder pulses, the spray guns will turn on and off repeatedly.

5. Increase the Encoder Alarm delay value (0.1 second at a time) until the spray guns spray continuously.
6. Add 0.2-0.4 to the Encoder Alarm delay value to make sure that the spray guns will not turn off if the conveyor speed varies slightly.

NOTE: The spray guns will turn off if the time between encoder pulses exceeds the Encoder Alarm delay value. The next time that an encoder pulse is received, the spray guns will turn on again.

Calibration

Use the following steps to calibrate the triggering controller after you have configured it.

1. Choose a test part. It can be a production part or a piece of cardboard. It will not be coated.
2. Measure the part length as it is hung on the conveyor. The measurement must be in real world units, so if you are scaling to inches measure in inches.
3. Enter **Configure controller** mode.
4. Make sure **Encoder scale** is set correctly.
5. Go to the **RESET Enc Counts** menu.
6. Press the **OK** key to enter edit mode.
7. Press the **Select+** or **Select-** key to reset the counts to zero.
8. Press the **OK** key to exit edit mode.
9. Hang the test part on the conveyor, ahead of the photo eyes.
10. Start the conveyor.

As the part moves past the photo eyes the controller measures it in counts. When the part passes by the photo eyes the scaling adjustment is set in the controller. This scale appears on the **RESET Enc Counts** menu.

11. Go to the **Encoder CAL** menu.
12. Press the **OK** key to enter edit mode.
13. Use the **Select+** and **Select-** keys to enter the length of the part you measured in step 2. The more accurate the measurement is, the more accurate the triggering will be.
14. Press the **OK** key to exit edit mode. The trigger controller is now scaled to real world units of inches or centimeters.

Setting Trigger Points

Triggering setup consists of determining and setting three values for each output: pickoff, lead, and lag. All values are entered in real-world units of inches or centimeters.

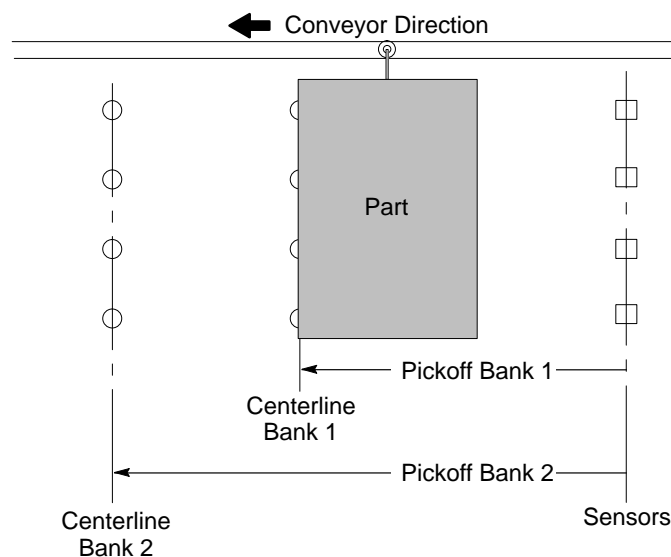
Finding Starting Pickoff Points

The pickoff point is the distance from the sensors to the spray guns, measured in real-world units (inches or centimeters). Use this procedure to obtain a starting value for each bank of spray guns (outputs), then adjust it as necessary to obtain the desired accuracy.

NOTE: Once you have the pickoff points adjusted properly, you do not need to change them unless you move the sensors or spray guns. Pickoff points can be hidden once they are set, as described in *Configuration*.

See Figure 4-3.

1. Enter **Configure Controller** mode.
2. Go to the **RESET Enc Measure** menu.
3. Press the **OK** key to enter edit mode.
4. Press the **Select+** key to reset the values.
5. Hang a test part on the conveyor, ahead of the photo eyes. Have another person stand behind the first bank of spray guns to tell you when the part reaches them, while you watch the **Measure** value.
6. Start the conveyor and note the **Measure** value when the leading edge of the part reaches the spray guns.
7. To determine the pickoff point for a second vertical bank, either repeat this procedure, or measure from the first bank to the second and add the distance to the pickoff point for the first bank.



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Figure 4-3 Finding Starting Pickoff Points

Calculating Lead and Lag Values

Lead and lag values determine how your parts are coated. Use the following information to calculate lead and lag values for the parts you are coating.

See Figure 4-4.

Lead

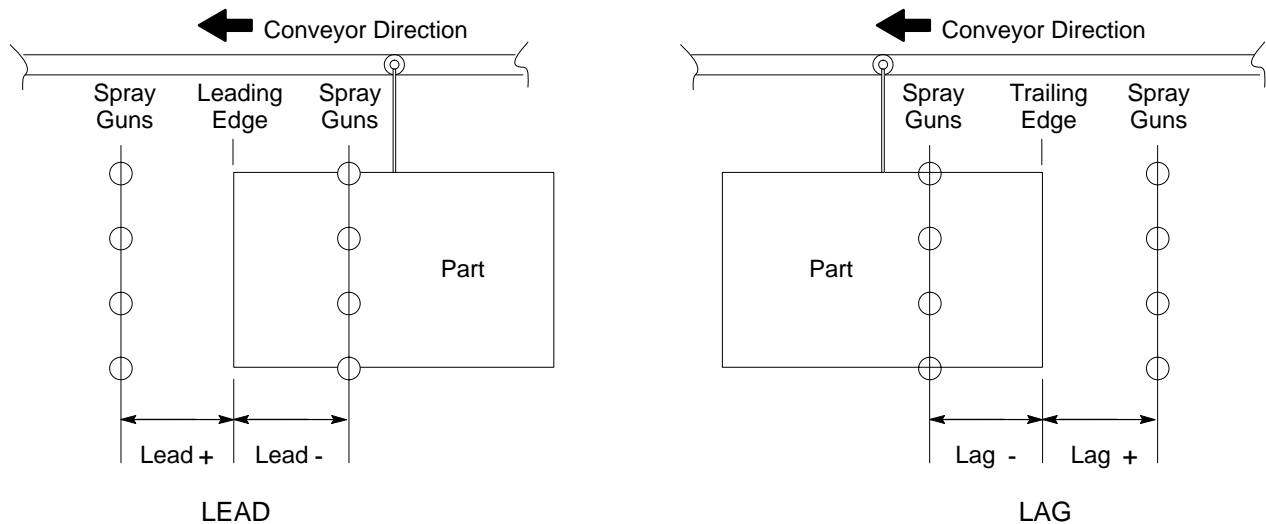
Lead is the distance from the spray guns to the leading edge of the part. Lead values can be positive or negative.

- Setting the lead to a positive value turns on the spray guns before the leading edge of the part reaches them.
- Setting the lead to a negative value turns on the spray guns after the leading edge of the part passes them.

Lag

Lag is the distance from the spray guns to the trailing edge of the part. Lag values can be positive or negative.

- Setting the lag to a positive value turns off the spray guns after the trailing edge of the part passes them.
- Setting the lag to a negative value turns off the spray guns before the trailing edge of the part reaches them.



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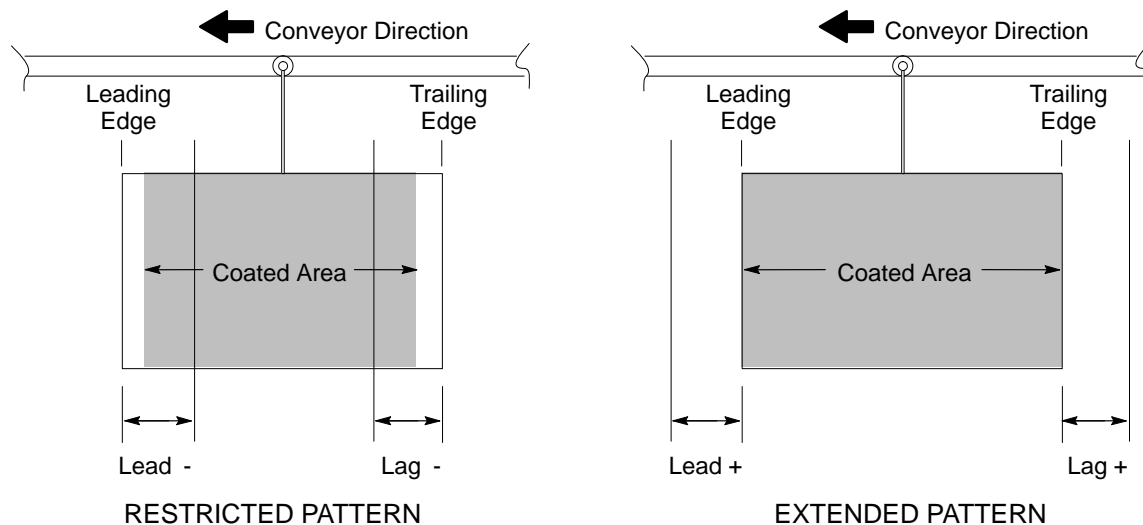
Figure 4-4 Calculating Lead and Lag Values

Spray Patterns

See Figure 4-5.

Restricted Spray Patterns are patterns where both the lead and lag values are negative. The spray guns turn on after the leading edge of the part passes them and turn off before the trailing edge passes them. This pattern prevents or limits powder wrap around the edge of the part.

Extended Spray Patterns are patterns where both the lead and lag values are positive. The spray guns turn on before the leading edge of the part passes them and turn off after the trailing edge passes them. This pattern allows powder to wrap around the edges of the part.



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Figure 4-5 Restricted and Extended Spray Patterns

Error Factor Effect on Spray Patterns

The triggering controller has an error factor of one real-world unit. For example, if the controller scale is inches, the error factor is one inch.

The lead and lag values you set apply to all parts entering the booth. The error factor can affect coverage if lead and lag values are not calculated properly.

For example, if both lead and lag are set to -2 inches, and parts five inches long or less are placed on the conveyor, they will not be coated. The lead and lag values subtract four inches from the length of part and the error factor subtracts the remaining inch, leaving a zero length to coat.

Entering Trigger Points




Use the following steps to enter pickoff, lead, and lag values for each trigger output.

1. Press the **MODE** key until **Setpoint Adjustment** appears.
2. Press the **OK** key to enter **Setpoint Adjustment** mode. The **Pickoff Output 1** menu appears. If it does not press one of the **Select** keys until it does.
3. Press the **OK** key to enter edit mode. Enter the **Measure** value from the *Finding Starting Pickoff Point* procedure. Press the **OK** key to accept the value and exit edit mode.
4. Press the **SELECT+** key to go to the **Lead Output 1** menu.
5. Press the **OK** key to enter edit mode. Use the **Select** keys to enter the desired lead value. Press the **OK** key to accept the value you entered and exit edit mode.
6. Press the **SELECT+** key to go to the **Lag Output 1** menu.
7. Press the **OK** key to enter edit mode. Use the **Select** keys to enter the desired lag value. Press the **OK** key to accept the value you entered and exit edit mode.
8. Press the **SELECT+** key to go to the **Pickoff Output 2** menu.
9. Repeat steps 3 through 8 to enter pickoff, lead, and lag values for the rest of the outputs.

Normal Operation

Operate the controller with the **Auto**, **Manual**, and **Off** keys and the Run mode display.

Operation Keys

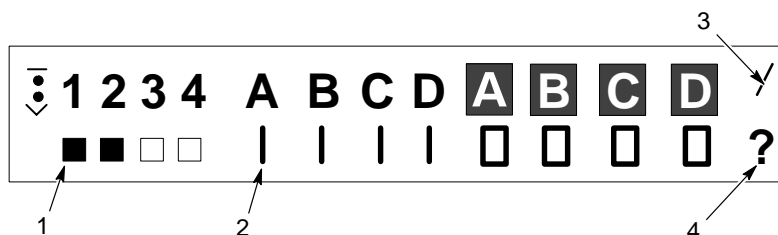
Key	Function	Description
	Auto	Press the Auto key to put the triggering controller in Auto mode. The spray guns are triggered automatically according to the current trigger settings and the sensor and encoder inputs.
	Manual	Press the Manual key to put the triggering controller in Manual mode. The spray guns turn on and spray continuously as long as the conveyor runs.
	Off	Press the Off key to shut off the spray guns. The triggering controller continues to receive encoder and sensor signals and track parts.

Run Mode Display

See Figure 4-6. While the system is running, indicators on the display show sensor, output, and conveyor status.

Press the **MODE** key until the run mode appears on the display.

Item	Indicator	Description
1	Sensor Status	Sensors 1-4 status is shown by the squares below the sensor number: ■ (Filled) = Part detected □ (Hollow) = No part detected
2	Output Status	On the run menu, outputs 1-4 are shown as A-D in normal type, and outputs 5-8 are shown as A-D in reverse type. Below each output letter is the output status indicator: I=On 0=Off
3	Conveyor Status	When the bar is rotating, the conveyor is moving. When the bar stops, either the signal from the encoder has stopped or the conveyor interlock circuit has signaled a conveyor stop.
4	Warning	Appears when one of the following conditions exist: <ul style="list-style-type: none"> • Conveyor interlock open • Encoder not pulsing • Photo eye blocked too long Press the Nordson oval to find out which condition exists.

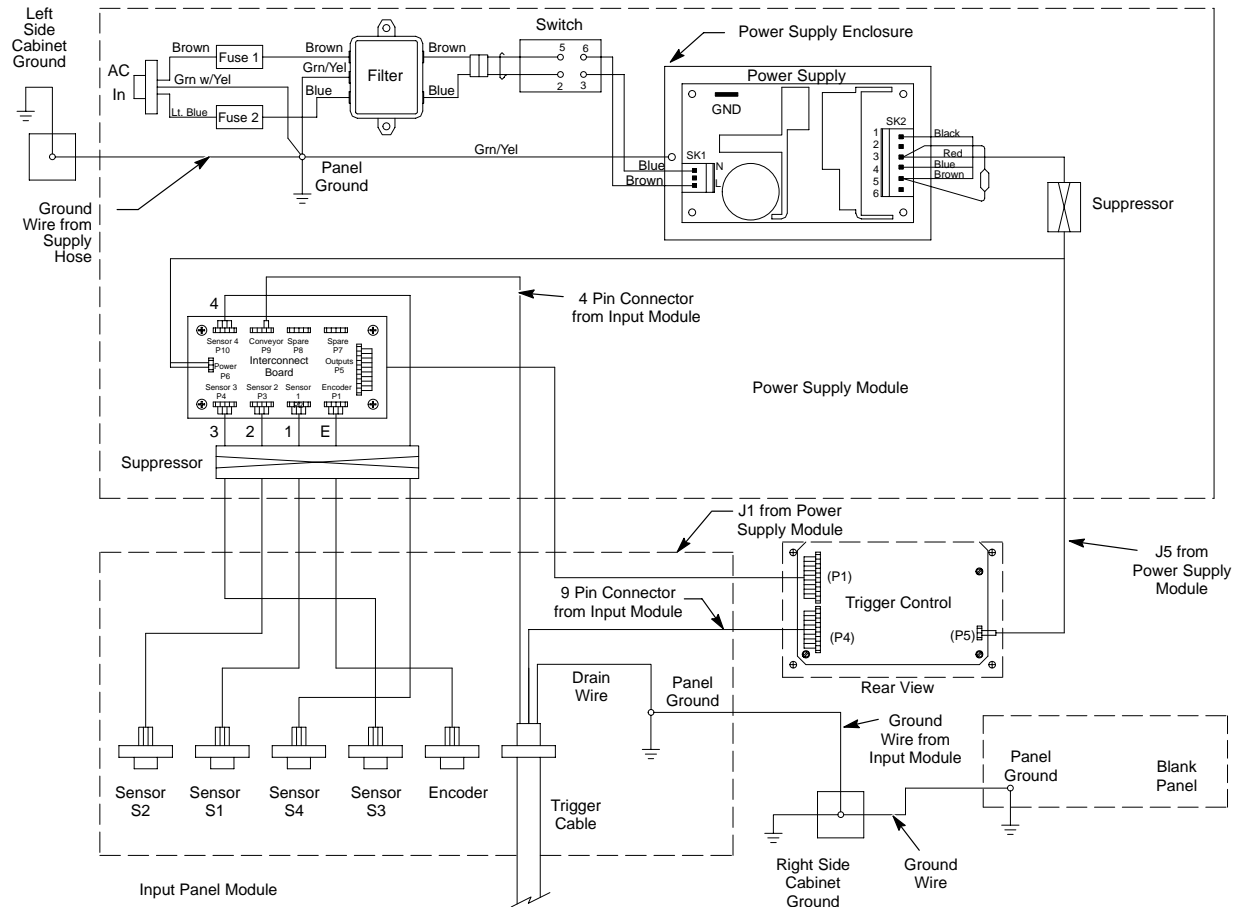


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Figure 4-6 Run Mode Display

Wiring Diagram

Use this wiring diagram to correctly reconnect any disconnected wiring or plugs. Use the *Parts* section to order replacement parts for the controller.



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Figure 4-7 Wiring Diagram

Section 5

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.

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

Controller Parts List

See Figure 5-1.

Item	Part	Description	Quantity	Note
—	1020008	TRIGGERING CONTROLLER, mini stack configuration	1	
1	1020006	• MODULE, power supply, triggering controller, mini	1	A
2	982825	• SCREW, pan, recessed, M4 x 12, with internal lock washer bezel	16	
3	-----	• ENCLOSURE, single, Sure Coat	1	
4	100775	• MOUNT, cable tie, screw down, medium	1	
5	982327	• SCREW, cheese head, slotted, M4 x 12, zinc	1	
6	240674	• TAG, ground	4	
7	983021	• WASHER, flat, e, 0.203 x 0.406 x 0.040 in., brass	4	
8	983401	• WASHER, lock, m, split, M5, steel, zinc	4	
9	984702	• NUT, hex, M5, brass	4	
10	1020004	• MODULE, input, triggering controller, mini	1	B
11	185068	• SUPPRESSOR, ferrite, 13.4-mm dia	1	
12	-----	• CAP/PLUG, tapered, 0.911-in. thread	1	
13	1023695	• SEAL, bulkhead, 7/8-16 thread	4	
14	185067	• SUPPRESSOR, ferrite, 7-mm dia	1	
15	302189	• WIRE, ground, assembly, 10.5 in.	1	
16	322404	• SWITCH, rocker, DPST, dust-tight	1	
17	-----	• MARKERS, wire, 1-99, A-Z	1	
18	1017125	• PANEL, blank, front, Sure Coat mini	1	
19	303372	• GASKET, front panel	1	
20	1015129	• KIT, keypad assembly, triggering controller	1	
21	288814	• BEZEL, manual controller, Sure Coat	1	
NS	173086	• CABLE, power, 3 wire, 18 ft	1	
NS	335456	• PLATE, mounting, long	2	C
NS	982094	• SCREW, pan, slotted, M5 x 6, zinc	6	C
NS	933260	• CONNECTOR, conduit, 1/2-in. NPT x 0.56 in. grip	1	D
NS	939122	• SEAL, conduit fitting, 1/2 in.	1	D
NS	984526	• NUT, lock, 1/2-in. conduit	1	D

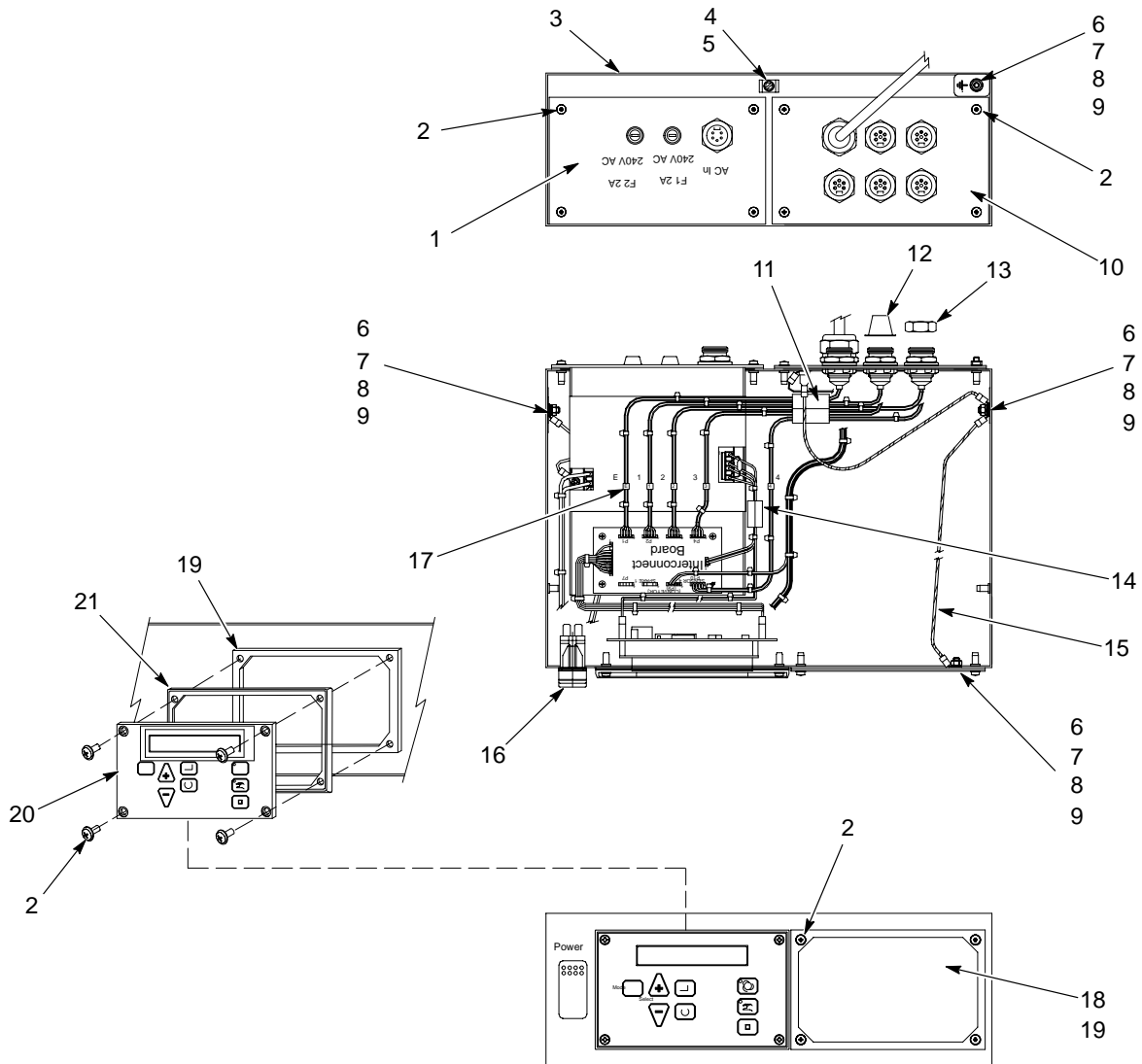
NOTE A: Refer to *Power Supply Module* on page 5-4 for a breakdown of the parts in this assembly.

B: Refer to *Input Module* on page 5-6 for a breakdown of the parts in this assembly.

C: Use these parts to mount the triggering controller between the top gun controller and the top of the mini-master controller.

D: Use these parts to route the TRIGGER cable into the mini-master controller.

NS: Not Shown



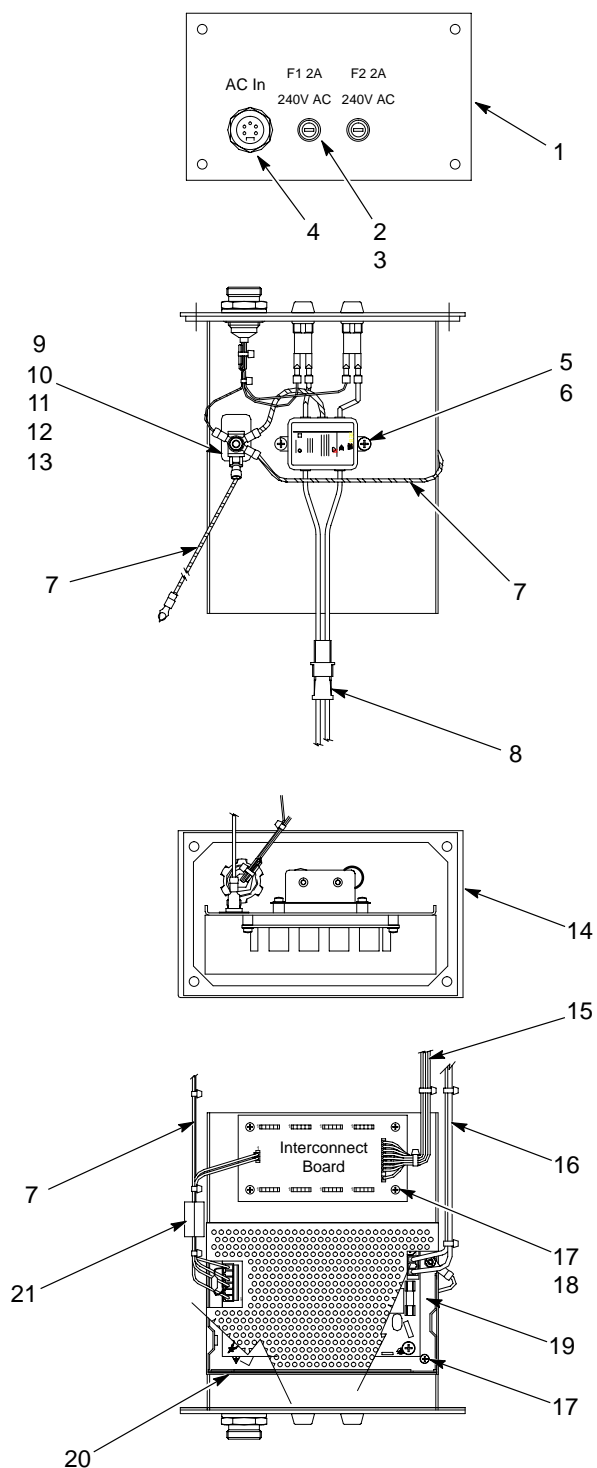
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Figure 5-1 Controller Parts

Power Supply Module

See Figure 5-2.

Item	Part	Description	Quantity	Note
—	1020006	MODULE, power supply, triggering controller, mini	1	
1	1016160	• PANEL, input, triggering controller	1	
2	288804	• FUSE HOLDER, panel mount, 5 x 20	2	
3	131477	• FUSE, 2.00, fast acting, 250 V, 5 x 20	2	
4	288842	• RECEPTACLE, power, Sure Coat	1	
5	335441	• FILTER, line, with connector	1	
6	982847	• SCREW, pan, recessed, M4 x 10, with lock washer	2	
7	1020171	• HARNESS, power supply, triggering controller, mini	1	
8	-----	• HARNESS, power, female	1	
9	240674	• TAG, ground	1	
10	271221	• LUG, 45, double, 0.250 x 0.438 in.	1	
11	983021	• WASHER, flat, e, 0.203 x 0.406 x 0.040 in., brass	1	
12	983401	• WASHER, lock, m, split, M5, steel, zinc	1	
13	984702	• NUT, hex, M5, brass	1	
14	302195	• GASKET, back panel, electrical, Sure Coat	1	
15	-----	• HARNESS, input, bank triggering	1	
16	-----	• HARNESS, power, male	1	
17	982824	• SCREW, pan, recessed, M3 x 8, with internal lock washer bezel	8	
18	-----	• PCA, triggering controller, interconnect	1	
19	288803	• POWER SUPPLY, 24, 5, 12 Vdc, 40 W	1	
20	-----	• COVER, enclosure, power supply	1	
21	185068	• SUPPRESSOR, ferrite, 7-mm dia	1	



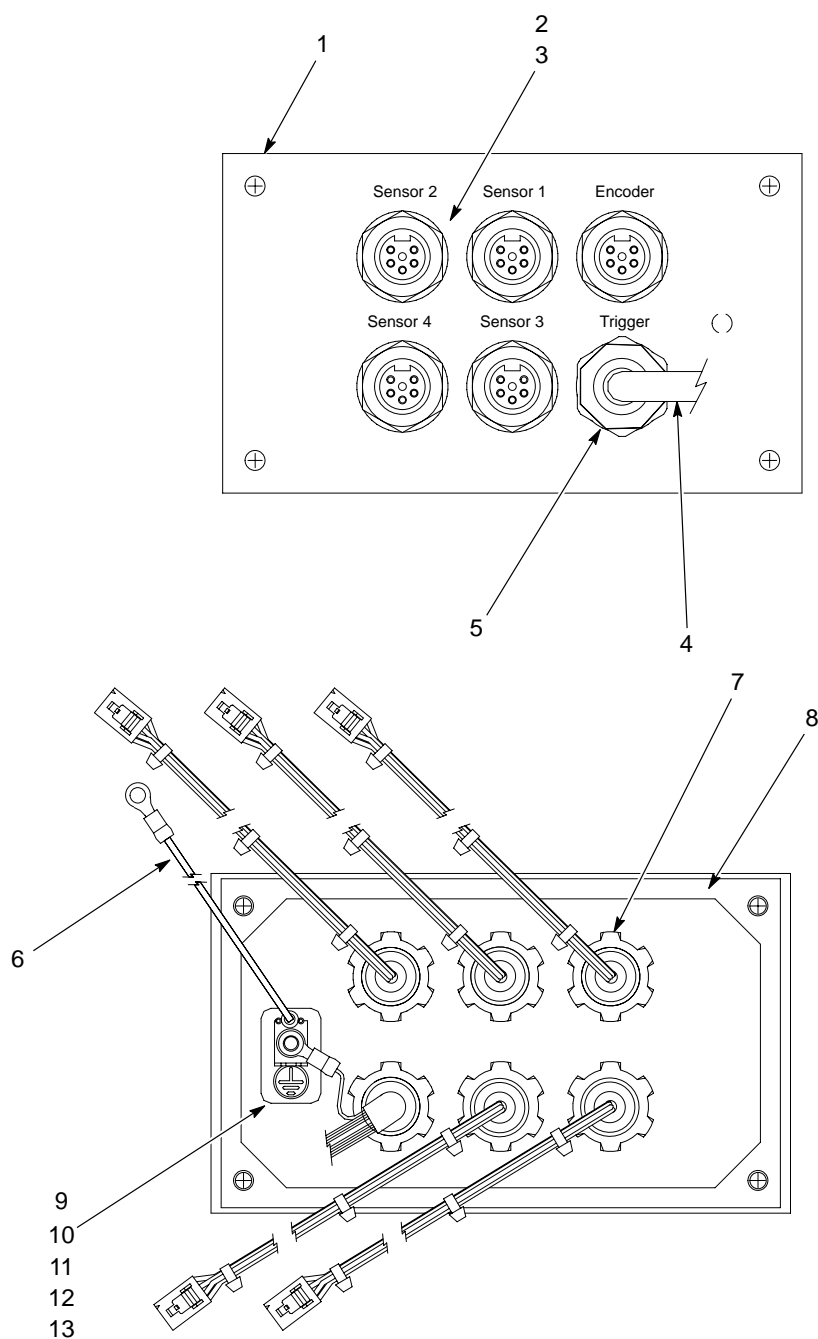
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Figure 5-2 Power Supply Module Parts

Input Module

See Figure 5-3.

Item	Part	Description	Quantity	Note
—	1020004	MODULE, input, triggering controller, mini	1	
1	1016160	• PANEL, input, triggering controller	1	
2	-----	• RECEPTACLE, sensor, 5 wire, female	5	
3	939122	• SEAL, conduit fitting, 1/2 in.	5	
4	-----	• HARNESS, interconnect, bank triggering	1	
5	335049	• STRAIN RELIEF, cable, 12 mm	1	
6	302189	• WIRE, ground assembly, 10.50 in.	1	
7	984526	• NUT, lock, 1/2-in. conduit	5	
8	302195	• GASKET, back panel, electrical, Sure Coat	1	
9	240674	• TAG, ground	1	
10	271221	• LUG, 45, double, 0.250 x 0.438 in.	1	
11	983021	• WASHER, flat, e, 0.203 x 0.406 x 0.040 in., brass	1	
12	983401	• WASHER, lock, m, split, M5, steel, zinc	1	
13	984702	• NUT, hex, M5, brass	1	



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Figure 5-3 Input Module Parts

Accessories

The following parts are not included with the controller and must be ordered separately.

Part	Description	Quantity	Note
347230	CABLE, input, 5 wire, 6 meters long, shielded	1	A
170730	PHOTOCELL, retroreflective	1	
183764	ENCODER, 24 PPR, with cable and connector	1	
145091	CABLE, shielded, 4-conductor, 22 gauge	AR	B
NOTE A: Use with photocell and encoder. Wire colors are black, red, white, green, with drain. B: Use to extend encoder or photocell. Wire colors are black, red, white, and green. Bulk item, order in increments of one foot. AR: As Required			