# Prodigy® PLC Gateway Generation III

Customer Product Manual
Part 1102107A
Issued 07/10

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

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

---

CE

Nordson

NORDSON CORPORATION • AMHERST, OHIO • USA

# Table of Contents




**Contact Us**

Nordson Corporation welcomes requests for information, comments, and inquiries about its products. General information about Nordson can be found on the Internet using the following address: http://www.nordson.com.

Address all correspondence to:

Nordson Corporation
Attn: Customer Service
555 Jackson Street
Amherst, OH 44001

# Change Record

| Revision | Date | Change |
|---|---|---|
| 1102107A | 07/10 | Manual part number 1102107 replaces 1077102.<br>1101422 replaces 1076798 for Prodigy PLC Gateway.<br>1101454 replaces 1083689 for Prodigy PLC Gateway PCA Kit.<br>Added pattern air range, gun purge, and pump speed settings. |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

# Prodigy® PLC Gateway

## Safety

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to 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.

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 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.

# Description

The Prodigy PLC Gateway is the interface between an external controller and a Prodigy HDLV pump panel and MGI (Manual Gun Interface). The Prodigy MGI software must be version 2.2 or later. The software allows the MGI to control and trigger a Prodigy automatic powder spray gun and HDLV pump in response to commands from the external controller.

The Gateway is capable of interfacing with two Prodigy MGIs and two automatic guns, through the Prodigy Manual System pump panel or the Prodigy Manual Color-on-Demand® System pump panel. The Gateway converts digital or analog signals from an external controller into Prodigy CAN messages.

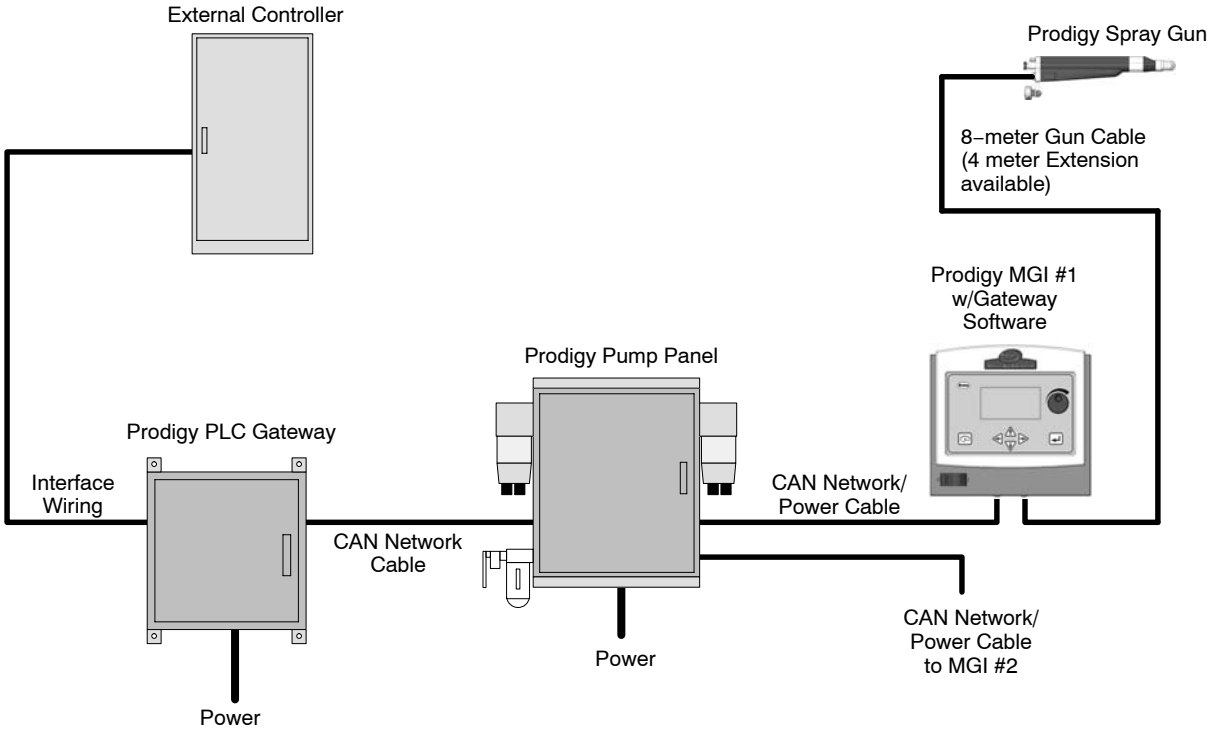


Figure 1 Typical System Diagram

# Operation Modes

## Preset Mode

Preset mode is used to switch between presets, which are sets of pre-programmed spray parameters. Up to 10 presets can be programmed and stored in the MGI.

Preset Mode operates as follows:

1. The external controller first sends a digital signal corresponding to the desired preset number (1–10) to the Gateway.
2. When it is time to switch to the new preset, the external controller sends the Gateway a gun strobe signal.
3. The Gateway reads the preset number signal, converts it into a CAN message and sends it to the Prodigy MGI.
4. The MGI now operates the spray gun and pump using the parameters of the new preset.

## Analog Mode

Analog mode is used for direct control of the spray parameters for Preset 1. In analog mode, the external controller sends signals to the Gateway to control:

- Powder flow (0–10 Vdc)
- Pattern air flow (0–10 Vdc)
- Assist air compensation (4–20 mA)
- Electrostatics (0–10 Vdc)

In analog mode, the MGI uses only Preset 1 to control the spray gun and pump. The spray parameters for Preset 1 are changed as needed by the external controller.

Analog mode operates as follows:

1. The external controller sends the desired analog signals to the Gateway.
2. When the signals are stable the external controller sends the Gateway a gun strobe signal.
3. The Gateway then reads the analog signals at its inputs, converts them into CAN messages, and sends them to the MGI.
4. The MGI changes the spray parameters for preset 1. The gun and pump now operate with the new parameters.

# Installation

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

**WARNING:** Use dust-tight conduit connectors or strain reliefs to route cables into all electrical enclosures. Installation must be done according to code and care must be taken to maintain the dust-tight integrity of the enclosures.

## *Enclosure Mounting*

If mounting the enclosure on a Prodigy Manual System stand use the optional mounting kit listed on page 18, and drill holes in the stand for the mounting kit brackets and fasteners as shown in Figure 2.

If mounting on a wall or panel, use the dimensions shown for the enclosure feet. Use M8 fasteners as needed.

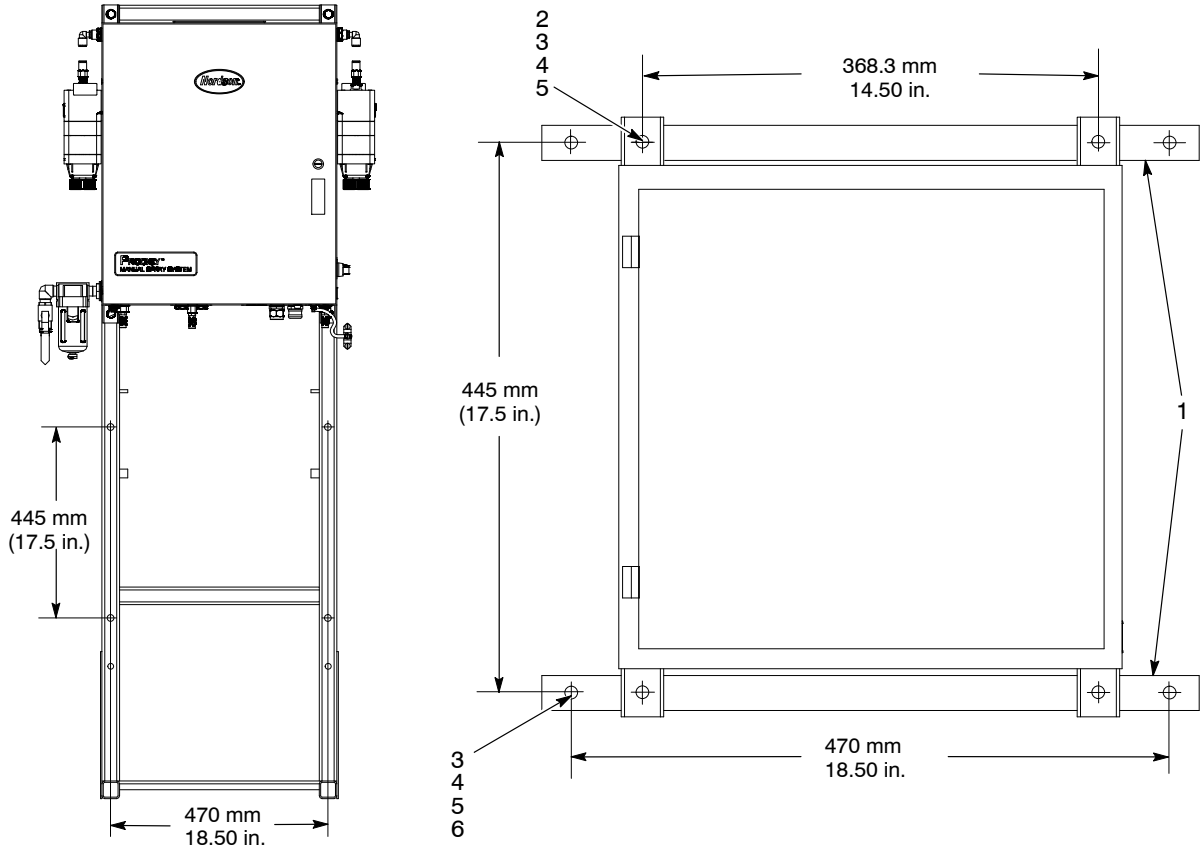


Figure 2 Gateway Circuit Board Jumper Settings

1. Mounting kit brackets
2. Screws, M8 x 16
3. Lock washers, M8
4. Flat washers, M8
5. Lock nuts, M8
6. Screws, M8 x 60

## Electrical Power and Fusing

Refer to the Gateway Enclosure Wiring Diagram on page 19.

The Gateway requires 85–230 Vac, 50–60 Hz, single phase, 21 Va input power.

Route the AC power leads through a knockout in the bottom of the enclosure and connect them to the L1, L2 and GND terminals on the terminal block as shown in the following wiring diagrams.

Use a liquid-tight cord grip or conduit connector in the knockout. The enclosure must be dust-tight.

## Gateway Circuit Board Jumper and Switch Settings

See Figure 3.

Open the Prodigy PLC Gateway enclosure, locate JP11, 12, and 13 on the right side of the circuit board and make the following jumper settings for your application:

**JP11 – Mode of Operation**

Preset Mode: Open (no jumper) (factory setting)
Analog Mode: Jump Pins 1 and 2

**JP12 – Number of Guns**

1 Gun: Open (no jumper) (factory setting)
2 Guns: Jump Pins 1 and 2

**JP13 – Type of System**

Standard Manual Gun System: Open (no jumper) (factory setting)
Color-on-Demand System: Jump Pins 1 and 2

**NOTE:** Replacement circuit boards are jumpered and programmed at the factory for the Prodigy PLC Gateway application. The following diagram shows the default jumper settings for the board. Only jumpers JP11, JP12, and JP13 should be changed to configure the board for the application.

**SW4-4 – Pattern Air Range**

Open: 0.20–2.0 SCFM (0.34–3.4 SCMH)
Closed: 0.20–4.0 SCFM (0.34–6.8 SCMH) (Requires 4.0 SCFM orifice.)

## *Gateway Circuit Board Jumper and Switch Settings* *(contd)*

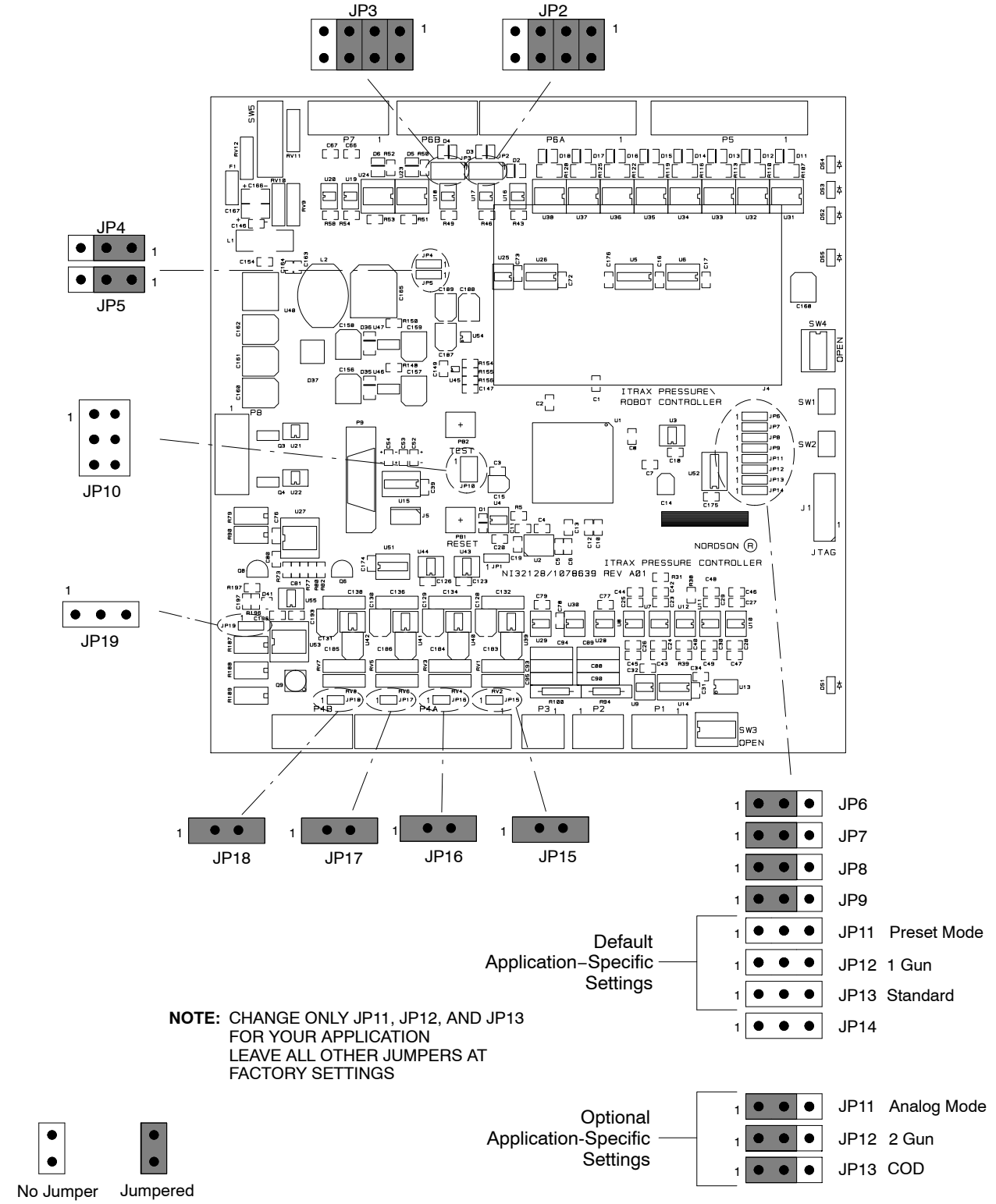


Figure 3 Gateway Circuit Board Jumper Settings

# *Preset Mode Connections and Settings*

## Gateway Connections and Settings

Refer to Table 1 and Figure 4 to make input and output connections to the Gateway circuit board. Gun 1 and 2 Alarm are optional connections.

Refer to Table 2 when programming the external controller to select preset numbers.

Table 1 Preset Mode External Interface Connections

| Signal | Conn. | Pins | Gateway | External | Signal Type |
|---|---|---|---|---|---|
| Trigger 1 | P6 | 1, 2 | Input | Output | Dry Contacts |
| Trigger 2 | P6 | 3, 4 | Input | Output | Dry Contacts |
| Preset Bit 1 | P5 | 1 | Input | Output | Dry Contacts |
| Preset Bit 2 | P5 | 2 | Input | Output | Dry Contacts |
| Preset Bit 3 | P5 | 3 | Input | Output | Dry Contacts |
| Preset Bit 4 | P5 | 4 | Input | Output | Dry Contacts |
| Gun 1 Strobe | P5 | 5 | Input | Output | Dry Contacts |
| Gun 2 Strobe | P5 | 6 | Input | Output | Dry Contacts |
| Gun 1 Purge | P6 | 9, 11 | Input | Output | Dry Contacts |
| Gun 2 Purge | P6 | 12, 14 | Input | Output | Dry Contacts |
| Gun 1 Alarm | P8 | 1, 2 | Output | Input | 24 Vdc 250 mA Sinking |
| Gun 2 Alarm | P8 | 4, 5 | Output | Input | 24 Vdc 250 mA Sinking |

Table 2 Preset Mode Preset Inputs

| Preset Number | P5–1 | P5–2 | P5–3 | P5–4 |
|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 |
| 2 | 0 | 1 | 0 | 0 |
| 3 | 1 | 1 | 0 | 0 |
| 4 | 0 | 0 | 1 | 0 |
| 5 | 1 | 0 | 1 | 0 |
| 6 | 0 | 1 | 1 | 0 |
| 7 | 1 | 1 | 1 | 0 |
| 8 | 0 | 0 | 0 | 1 |
| 9 | 1 | 0 | 0 | 1 |
| 10 | 0 | 1 | 0 | 1 |

1 = Shorted
0 = Open
All P5 references to common.

# *Analog Mode Connections and Settings*

## Gateway Connections and Settings

Refer to Table 3 and Figure 5 to make input and output connections to the Gateway circuit board. Gun 1 and 2 Alarm are optional connections.

Refer to Tables 4 and 5 when programming the external controller to set spray parameters.

Table 3 Analog Mode Inputs and Outputs

| Signal | Conn. | Pins | Gateway | Robot | Signal Type |
|---|---|---|---|---|---|
| Trigger 1 | P6 | 1, 2 | Input | Output | Dry Contacts |
| Trigger 2 | P6 | 3, 4 | Input | Output | Dry Contacts |
| AFC Mode | P6 | 6, 7 | Input | Output | Dry Contacts |
| Select Charge Bit 1 | P5 | 1 | Input | Output | Dry Contacts |
| Select Charge Bit 2 | P5 | 2 | Input | Output | Dry Contacts |
| Select Charge Bit 3 | P5 | 3 | Input | Output | Dry Contacts |
| Gun 1 Strobe | P5 | 5 | Input | Output | Dry Contacts |
| Gun 2 Strobe | P5 | 6 | Input | Output | Dry Contacts |
| Gun 1 Purge | P6 | 9, 11 | Input | Output | Dry Contacts |
| Gun 2 Purge | P6 | 12, 14 | Input | Output | Dry Contacts |
| Gun 1 Alarm | P8 | 1, 2 | Output | Input | 24 Vdc 250 mA Sinking |
| Gun 2 Alarm | P8 | 4, 5 | Output | Input | 24 Vdc 250 mA Sinking |
| Pump 1 Speed | P5 | 7 | Input | Output | Dry Contacts |
| Pump 2 Speed | P5 | 8 | Input | Output | Dry Contacts |

Table 4 Analog Mode Spray Parameter Signals

| Parameter | Conn. | Pins | Low | Scale |
|---|---|---|---|---|
| kV | P4 | 9, 10 (common) | 0–1 V = 0 kV | 1–10 V = 25–95 kV |
| µA (AFC) | P4 | 11, 12 (common) | 0–1 V = 10 µA | 1–10 V = 10–100 µA |
| Powder Flow | P4 | 13, 14 (common) | – | 0–10 V = 0–100% |
| Pattern Air Flow | P4 | 15, 16 (common) | 0–1 V = 0.2 SCFM | 1–10V = 0.2–2.0 SCFM |
| Assist Air Compensation | P4 | 8, 7 (common) | 0–3.9mA = 0% | 4–20 mA = –50% to +50% |

**SW4-4 – Pattern Air Range**

Open: 0.20–2.0 SCFM (0.34–3.4 SCMH)
Closed: 0.20–4.0 SCFM (0.34–6.8 SCMH) (Requires 4.0 SCFM orifice.)

## Electrostatics

Only one electrostatic charging mode can be used at a time: kV mode, µA mode (AFC mode), or pre-programmed Select Charge mode.

Refer to the Prodigy Manual Gun Controller manual (P/N1054580) for information on electrostatic settings.

**kV Mode:** This mode is the default mode. kV output is controlled by applying 1–10 Vdc to connector P4 pins 9 and 10.

**AFC Mode:** This mode controls current draw (µA) instead of kV output. To place the MGI in AFC mode, connector P6 pins 6 and 7 must be shorted. Applying 1–10 Vdc to connector P4 pins 11 and 12 then sets the current draw limit.

**Select Charge Mode:** This mode consists of 4 pre-programmed electrostatic settings. To set a Select Charge mode, place the MGI in AFC mode, then send signals to select the mode according to Table 5.

Table 5 Select Charge Mode Signals

| Coating Mode | P5–1 | P5–2 | P5–3 |
|---|---|---|---|
| 1 – Recoat | 1 | 0 | 0 |
| 2 – Special | 0 | 1 | 0 |
| 3 – Deep Cavity | 1 | 1 | 0 |
| 4 – User Programmable | 0 | 0 | 1 |
| 1 = Shorted<br>0 = Open<br>All P5 references to common (P5 pins 9 to 12). | | | |

## *Gateway Wiring and Setting Diagram – Preset Mode*

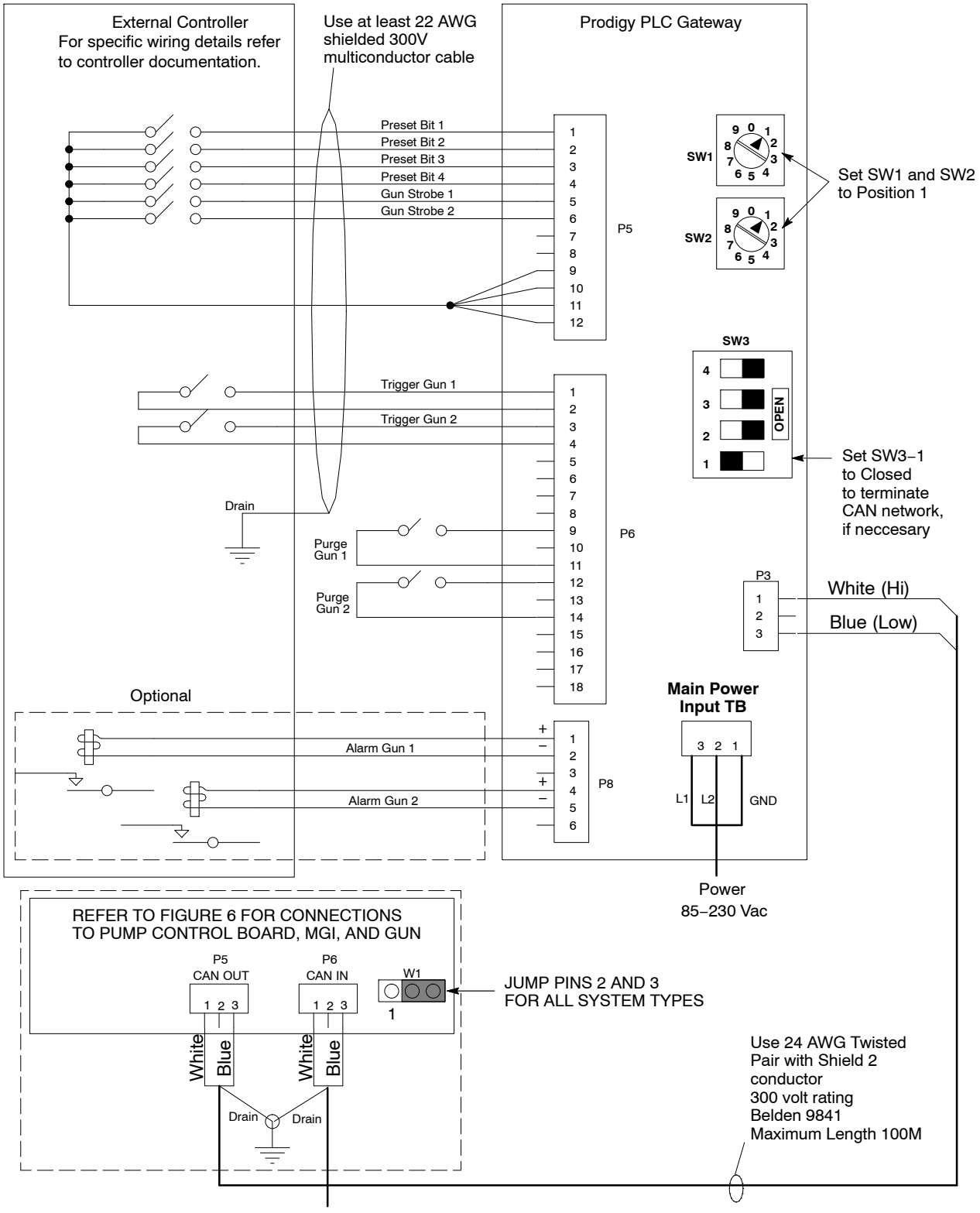


Figure 4 Gateway Wiring and Setting Diagram – Preset Mode

# *Gateway Wiring and Setting Diagram – Analog Mode*

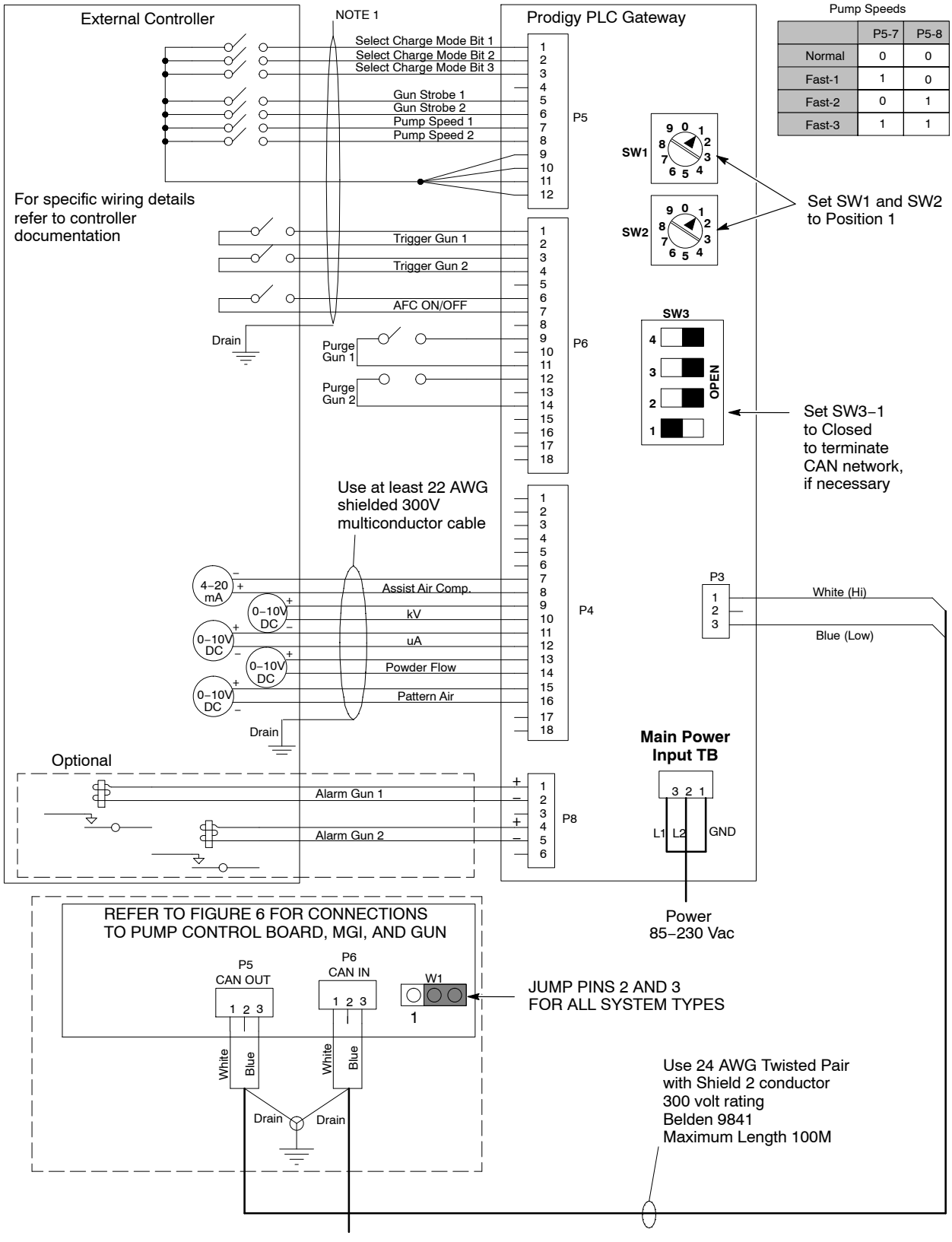


Figure 5 Gateway Wiring and Setting Diagram – Analog Mode

# *Pump Control Board Connections and Settings*

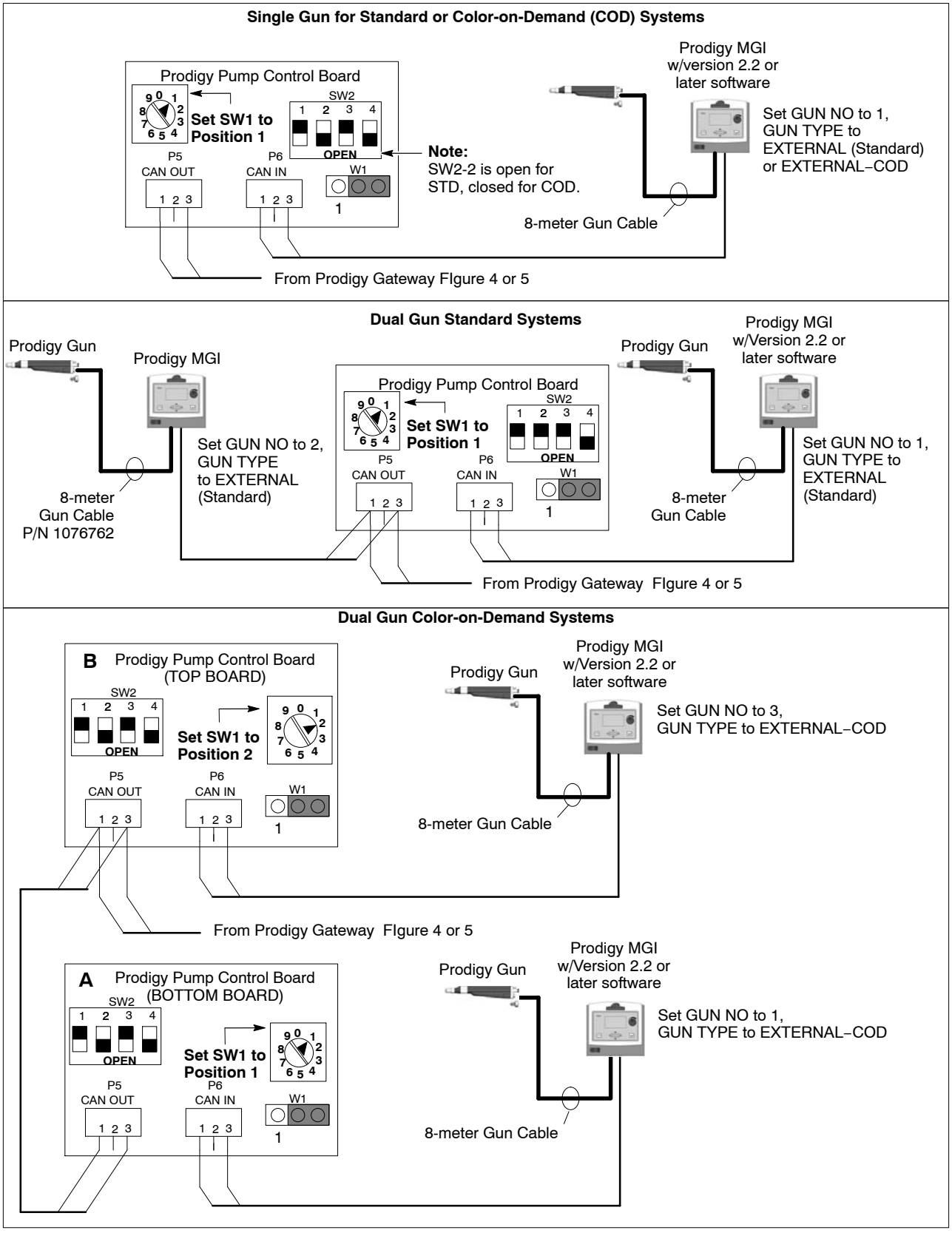


Figure 6 Pump Control Board Connections and Settings

## Gun Cables

For this application, you cannot use the standard automatic gun cables listed in the Prodigy Automatic Gun manual. Use the gun cables listed on page 17.

## Prodigy MGI Settings

Refer to the Prodigy Manual Gun Controller manual (P/N 1054580) for information on preset and configuration settings.

1. If you are using Preset Mode, turn on the MGI and program each of the presets with the desired values.
2. For both Preset Mode and Analog mode, cycle power while pressing the Nordson key. The Configuration menu appears after the MGI boots up.
3. Select SETUP and set the GUN NO (gun number).
   - For Standard Systems, set the gun number to 1 or 2, depending on the number of guns and the gun connected to the MGI.
   - For Color-on-Demand Single Gun Systems, set the GUN NO to 1.
   - For Color-on-Demand Dual Gun Systems, set the MGI connected to pump control board A (bottom board) to GUN NO 1, and the MGI connected to pump control board B (top board) to GUN NO 3.
4. Set the GUN TYPE:
   - For standard systems set to EXTERNAL
     For Color-on-Demand systems set to EXTERNAL−COD

   Setting the gun type to EXTERNAL or EXTERNAL−COD locks the MGI operator interface so no changes can be made while the external controller is in control. Errors can still be viewed and cleared.

# Operation

## *Power On*

When the Gateway is powered on, it reads the JP11, JP12, and JP13 positions for mode of operation, number of guns, and type of system. It then sends WHO messages to find the nodes (MGIs) connected to the network. The Green Power LED on the Gateway card blinks at 1 second intervals.

## *Triggering*

When a Trigger 1 or Trigger 2 signal is received, the Gateway immediately sends a trigger command to the MGI. No Gun Strobe signal is required. The MGI turns on the HDLV powder pump and the spray gun. The spray gun and pump will remain triggered on as long as the signal is present at the Trigger inputs.

## *Gun Strobe*

The Gun Strobe signal tells the Gateway that the data on its inputs is stable and ready to be read. If Gun 1 Strobe is activated the Gateway reads the inputs, converts them to CAN messages and addresses them for gun 1. Gun 2 Strobe works in the same way.

**NOTE:** Preset values are not retained when the power to either the PLC Gateway or to the MGI is cycled in EXTERNAL (gateway) mode. This means that whenever power is cycled to the MGI or the PLC Gateway, the robot or PLC must send the desired preset bits (or analog values) and strobe them in before triggering the gun.

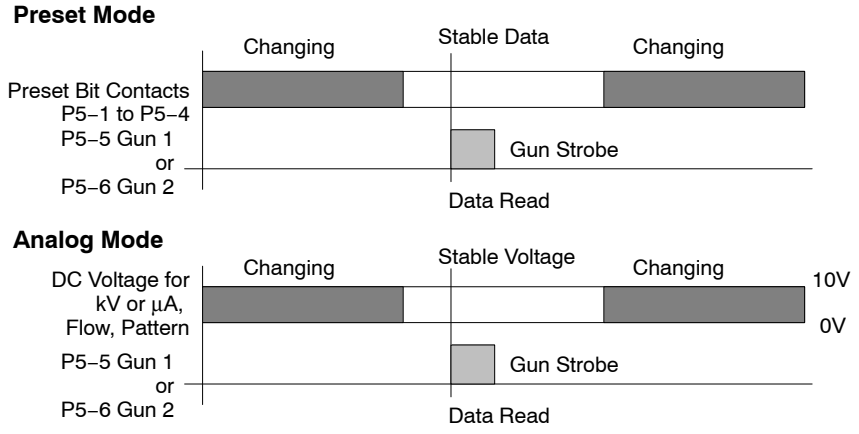


Figure 7 Gun Strobe

## *Faults*

Every 2 seconds the Gateway sends a heartbeat message to the MGI nodes over the CAN network. If the MGI does not receive a heartbeat message from the Gateway for 15 seconds the MGI will display an E31 error code (Gateway heartbeat missing). The MGI nodes also send out heartbeat messages. If the Gateway does not receive a heartbeat message from the MGI nodes for 15 seconds, then a communication fault occurs and the Red Fault LED is turned on. Refer to Troubleshooting in the Prodigy Manual Gun Controller manual for fault codes and suggested corrections.

# Parts

To order parts, call the Nordson Finishing Customer Support Center at (800) 433-9319 or contact your local Nordson representative. For more information, go to http://www.nordson.com on the Internet.

## *Gateway Replacement Parts*

| Item | Part | Description | Quantity | Note |
|---|---|---|---|---|
| – | 1101422 | GATEWAY, PLC, Prodigy, Generation III | 1 | |
| 1 | 1101454 | • KIT, PCA, Prodigy PLC gateway, Generation III | 1 | |
| 2 | 288807 | • FILTER, line, RFI power | 1 | |
| 3 | 131477 | • FUSE, 2.00, fast-acting, 250 V, 5 x 2 | 2 | |
| 4 | 288803 | • POWER SUPPLY, 24, 5, 12 Vdc, 40 W | 1 | |

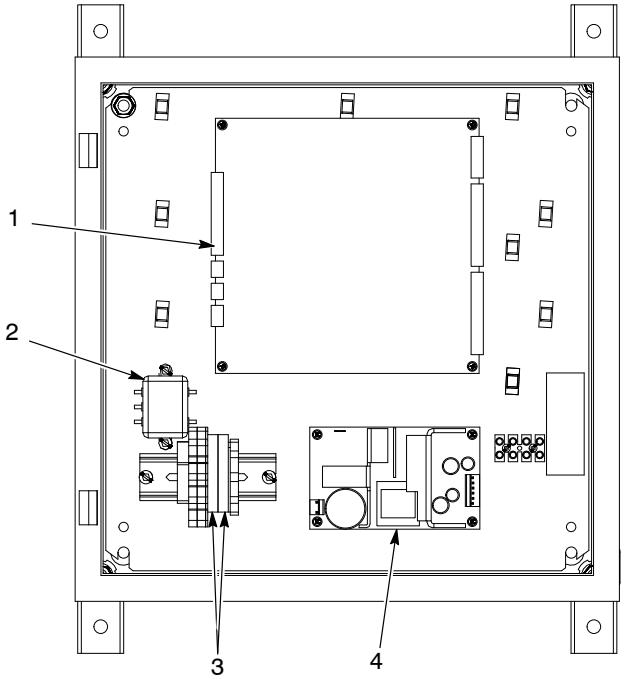


Figure 8 Prodigy PLC Gateway Parts

## *Gun Cables*

| Part | Description | Note |
|---|---|---|
| 1076762 | CABLE, Prodigy bar mount gun, 8 meter | A |
| 1073027 | CABLE, handgun, 4 meter extension | A |
| 1083912 | CABLE, handgun, 6 meter extension | A |
| NOTE A: The 8-meter cable is a special cable used only for connecting Prodigy automatic guns to Prodigy MGI controllers. If using the 4 meter extension, install it in between the 8 meter cable and the MGI. | | |

## *Optional Enclosure Mounting Kit*

See Figure 2 for kit components. Use this kit to mount the Gateway enclosure on a Prodigy Manual System stand.

| Item | Part | Description | Quantity | Note |
|---|---|---|---|---|
| – | 1077918 | KIT, mounting, Prodigy PLC Gateway | 1 | |
| 1 | - - - - - - | • BRACKET, PLC gateway | 2 | |
| 2 | - - - - - - | • SCREW, hex, cap, M8x 16, black | 4 | |
| 3 | - - - - - - | • WASHER, lock, M8, steel, zinc | 8 | |
| 4 | - - - - - - | • WASHER, flat, M8, steel, zinc | 8 | |
| 5 | - - - - - - | • NUT, hex, lock, torque, M8 | 8 | |
| 6 | - - - - - - | • SCREW, hex, cap, M8 x 60, black | 4 | |

# Enclosure Wiring Diagram

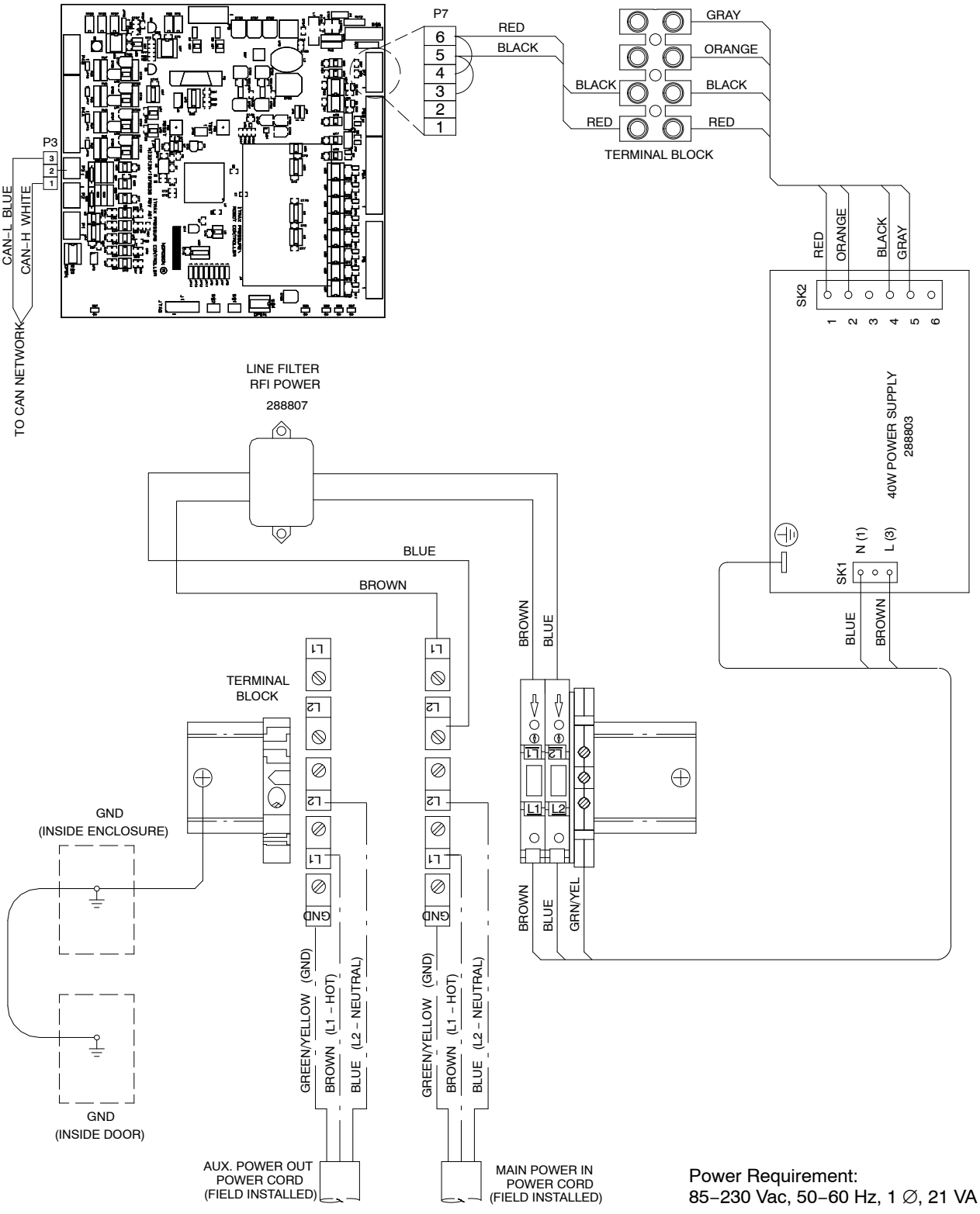


Figure 9 Enclosure Wiring Diagram

# DECLARATION of CONFORMITY

**Product:**

**Model: Prodigy PLC Gateway Controller**

**Description:** This unit is an interface between the manual gun controller and an automatic robot applicator.

**Applicable Directives:**

2006/42/EC – Machinery Directive
2006/95/EC – Low Voltage Directive
2004/108/EEC – Electromagnetic Compatibility Directive

**Standards Used for Compliance:**

EN/ISO12100 (2011)
EN60204 (2006)
EN61000–6–3 (2007)
EN55011 (2009)
EN61000–6–2 (2005)

**Principles:**

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

Date: 18 June 2012

Mike Hansinger
Manager Engineering Development
Industrial Coating Systems

**Nordson Authorized Representative in the EU**
**Contact:** Operations Manager
Industrial Coating Systems
Nordson Deutschland GmbH
Heinrich–Hertz–StraBe 42–44
D–40699 Erkrath

Nordson Corporation • Westlake, Ohio

DOC14024A02