Tribomatic® II
Three-Gauge Control Unit

Customer Product Manual
Part 106812B
Issued 5/03

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

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.

Safety Labels

Table 1-1 contains the text of the safety label on this equipment. The safety label is provided to help you operate and maintain your equipment safely. See Figure 1-1 for the location of the safety label.

Table 1-1 Safety Labels

Item	Part	Description
1.	—	**WARNING:** Do not disconnect while circuit is live unless location is known to be non-hazardous.
2.	129597	**SAFETY INSTRUCTIONS** 1. To be installed in accordance with all local codes and ordinances, all pertinent statutes and regulations, and the safety provisions of the Nordson manual. 2. Ground all equipment and other metal objects within 10 ft (3 m) of spray area. Keep spray area clean. 3. Work pieces must be grounded. Keep conveyor and hangers clean. 4. Hold gun in bare hand. Wear shoes with conductive soles such as leather. (Rubber soles are not conductive.) 5. Turn off power and ground nozzle before doing any cleaning or other work on gun. 6. Do not store flammable materials in spraying area. 7. Caution: Shut off electrical power before breaking connections or opening enclosure.
	244644	**WARNING: Disconnect main power before servicing.** **WARNING:** The following procedures MUST be followed when working with this electrostatic spray equipment. Failure to follow these instructions may result in a fire and/or serious personal injury. Display this warning on the spray booth. 1. NO SMOKING. Keep open flames, hot surfaces, and sparks from torches or grinding away from booth. 2. Turn the electrostatic power unit off when the spray gun is not in use. 3. Shut down immediately in event of fire. 4. Maintain ground circuit on all conductive objects below 1 megohm to prevent sparking. (ANSI/NFPA 33, Chapter 9, or local codes) 5. Shut down operation and correct grounds if sparking occurs. 6. Install fixed fire suppression system in accordance with ANSI/NFPA 33, Chapter 7 (or local codes), before operating with combustible powder.

Item	Part	Description
		7. Install automatic flame detectors in accordance with ANSI/NFPA 33, Chapter 7 (or local codes), before operating automatic guns. 8. Examine all equipment at the beginning of each work period and repair or replace any damaged, loose, or missing parts. 9. Before cleaning or performing any maintenance on the electrostatic spray gun, turn off the power unit and ground the nozzle. Maintain electrostatic spray equipment in accordance with instruction manual. Do not deviate. Do not substitute parts from other manufacturers. 10. Operator must be grounded to prevent shocks from static electricity. Floor surface must be conductive. Footwear and gloves must be static dissipative in accordance with ANSI Z41-1991 (or local codes). 11. Air velocity through all booth openings must meet local requirements and contain powder within the booth. If powder escapes from the booth, shut down operation and correct the malfunction. 12. Powder may be toxic or be a nuisance dust hazard. Refer to supplier's MSDS. If exposed to dust during operation, maintenance, or clean up, operators must use appropriate personal protective equipment. 13. Do not use compressed air or organic solvents for removal of powder from skin or clothing. Do use soap and water. Wash hands before eating or smoking. 14. Guns, feeders, booths, etc., may be cleaned with clean dry air at 1.7 bar (25 psig). If you have any questions concerning this electrostatic spray equipment, call (440) 988-9411,and ask to speak with the Powder Systems Group Technical Service Department.

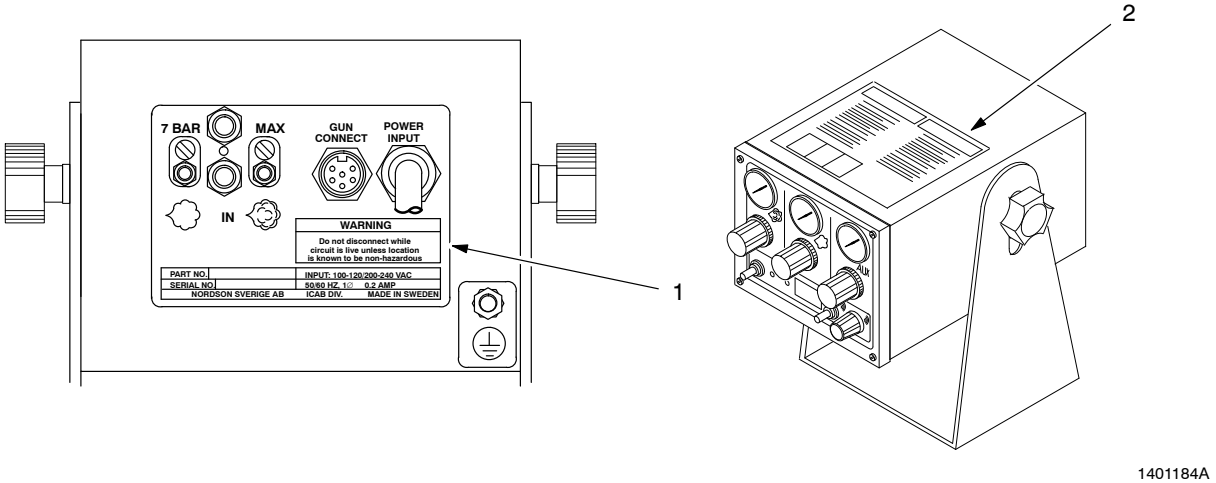

Figure 1-1 Safety Labels

Section 2
Description

Introduction

The Nordson Tribomatic II three-gauge control unit provides pneumatic and electrical controls for a Tribomatic II manual powder spray gun. The control unit consists of a control module installed in a cabinet.

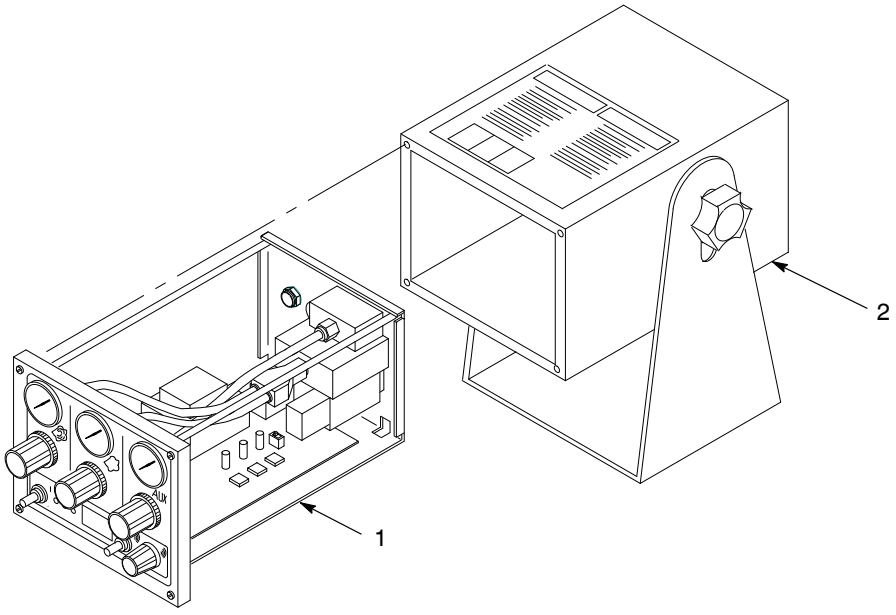

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Figure 2-1 Tribomatic Control Unit

1. Control module
2. Cabinet

The digital display normally shows the flow of current from the gun to ground, measured in microamperes (μA). The current flow to ground is equal to the current charge received by the powder as it flows through the gun. The μA reading is affected by powder flow rate and velocity (flow rate and diffuser air pressure settings). When the display function switch is held in the up position, the display shows the low-charge alarm setting.

Front Panel Controls

See Figure 2-2 and Refer to Table 2-1.

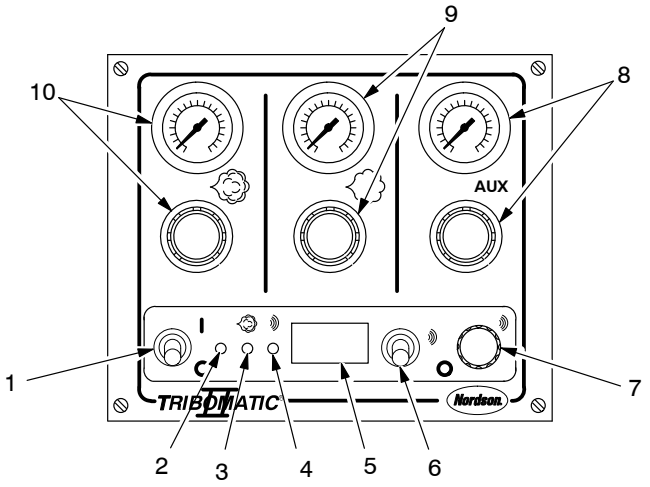

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Figure 2-2 Front Panel Controls

Table 2-1 Front Panel Controls

Item	Description	Function
1	Power switch	Activates the control unit. Will energize the flow rate and diffuser air solenoid valves if switch SW5 is in the standalone position.
2	Power LED (Green)	Lights when the control unit is turned on.
3	Powder LED (Green)	Lights when control unit trigger circuit is closed. Solenoid valves are energized, allowing flow rate and diffuser air to flow to pump and diffuser.
4	Low-charge alarm LED (Red)	Flashes to indicate that the powder is charging below the alarm setting.
5	Digital display	Displays microampere (μA) output or alarm setting, depending on the position of the display function switch. The plus (+) or minus (–) indicates whether powder is charging positively or negatively.
6	Display function switch (non-latching toggle switch)	Changes the digital display function. The display normally shows μA output. When the switch is held in the up position, the display shows the low-charge alarm setting.
7	Low-charge alarm potentiometer	Controls the low-charge alarm. Rotate the knob clockwise to turn the alarm on and increase the setting, counterclockwise to decrease the setting and turn off the alarm.
8	Auxiliary air regulator and gauge	Controls and indicates auxiliary air pressure. Air flows when regulator is set to pressure greater than zero. Usually used for feed hopper fluidizing air. Pull the regulator knob out to change the air pressure, push the knob in to lock the setting.
9	Diffuser air regulator and gauge	Controls and indicates diffuser air pressure. Air flows when unit is externally triggered (SW5 is set to external trigger) or when unit is powered up (SW5 set to standalone). Pull the regulator knob out to change the air pressure, push the knob in to lock the setting.
10	Flow rate air regulator and gauge	Controls and indicates powder pump flow rate (ejector) air pressure. Air flows when unit is externally triggered (SW5 is set to external trigger) or when unit is powered up (SW5 set to standalone). Pull the regulator knob out to change the air pressure, push the knob in to lock the setting.

Rear Panel Connections

See Figure 2-3 and Refer to Table 2-2.

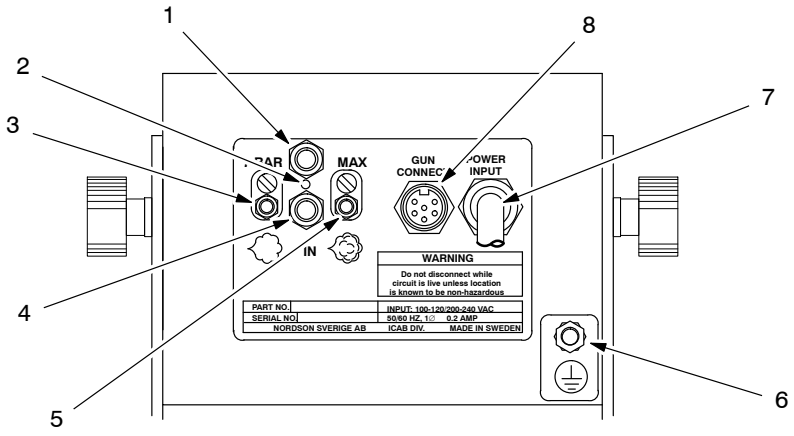

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Figure 2-3 Rear Panel Connections

Table 2-2 Rear Panel Connections

Item	Description	Function
1	10-mm straight tubing connector	Auxiliary air output. Pressure at regulator setting.
2	Exhaust air vent	Solenoid valve exhaust. Do not block.
3	6-mm straight tubing connector	Diffuser air output. Pressure at regulator setting.
4	10-mm straight tubing connector	Supply air input. 7 bar (100 psi) maximum air pressure.
5	6-mm straight tubing connector	Flow rate air output. Pressure at regulator setting.
6	Cabinet ground	Connects cabinet to ground. Module is grounded to cabinet internally.
7	Power cord	Input power connection. Three-lead unterminated cord. Customer must furnish three-prong plug.
8	6-pin receptacle	Connects manual gun cable to control unit. In addition to trigger circuit, grounds gun and operator through module and cabinet.

Specifications

Enclosure	The control unit enclosures meet IP54 and Class II, Division II requirements.
Electrical	
Input	100–120/200–240 Vac (±10%), 50/60 Hz, 1∅, 0.2 amps
Power Consumption	20 VA
Pneumatic	
Input Minimum	4.1 bar (60 psi)
Input Maximum	7.0 bar (100 psi)
Nominal Operating Pressures	
Flow rate air	1.8 bar (26 psi)
Diffuser air	2.5 bar (36 psi)
Auxiliary air	Normally used for fluidizing air; pressure depends on hopper type.
Air Supply Quality	Air must be clean and dry. Use a regenerative desiccant or refrigerated air dryer capable of producing a 3.4 °C (38 °F) or lower dewpoint at 7 bar (100 psi). Also, use a filter system with pre-filters and coalescent filters capable of removing oil, water, and dirt in the submicron range.

Symbols

Symbols used on this equipment are described in Figure 2-4.

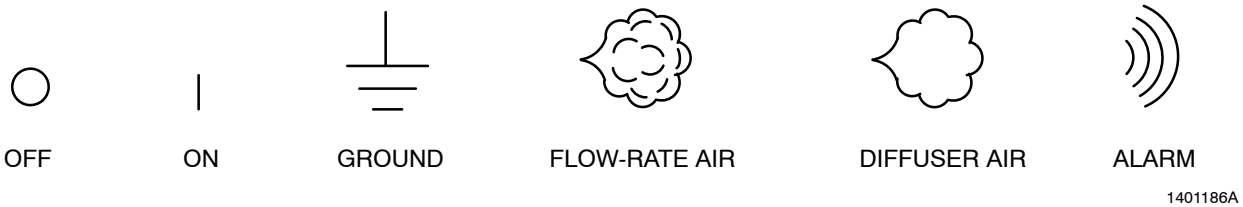


Figure 2-4 Symbols

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.

Circuit Board Setup

1. Loosen the captive screws (3) at the four corners of the front panel, and slide the control module (4) out of the cabinet (1). Disconnect the ground wire (5) from the module, if necessary.

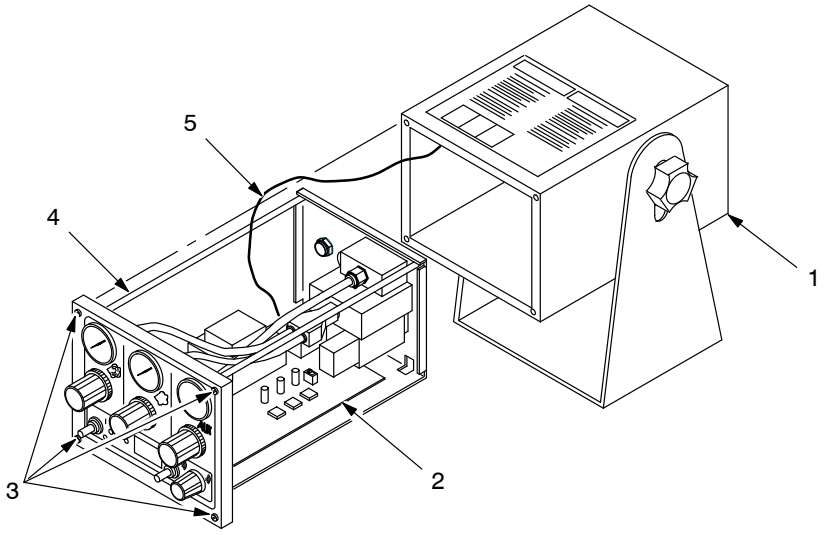


Figure 3-1 Removing the Control Module from the Cabinet

1. Cabinet
2. Circuit board
3. Captive screws
4. Control module
5. Ground wire

Circuit Board Setup *(contd)*

2. See Figure 3-2 and refer to Table 3-1 to set the switches.
3. Slide the electronic control module back into the cabinet and tighten the captive screws at the four corners of the front panel.
4. Slide the control module back into the cabinet, and tighten the captive screws at the four corners of the front panel.

NOTE: To maintain a dust-free environment inside the cabinet, make sure the front- and rear-panel gaskets are undamaged and in place before installing the control module in the cabinet.

Table 3-1 Jumper Block and Switch Settings

Switch SW3 — Set the switch to input voltage as follows:	
110	100–120 Vac nominal input power. Units are shipped set for 110 Vac or local voltage.
220	200–240 Vac nominal input power.
	NOTE: Input voltage must be 100–120 or 200–240 Vac (±10%), 50/60 Hz, 1∅≥
Switch SW5 — Set the switch to the correct position for your application:	
Stand Alone	Triggers the unit and starts air flowing when the power is turned on.
Ext. Trigger	If using a manual powder spray gun.
Switch SW6 — This switch is not present on revision A or B circuit boards.	
DELAY	When set to DELAY, flow-rate air is turned on before diffuser air. This switch is not present on revision A or B circuit boards.
DIRECT	Set to DIRECT for all guns except Tribomatic I automatic guns.

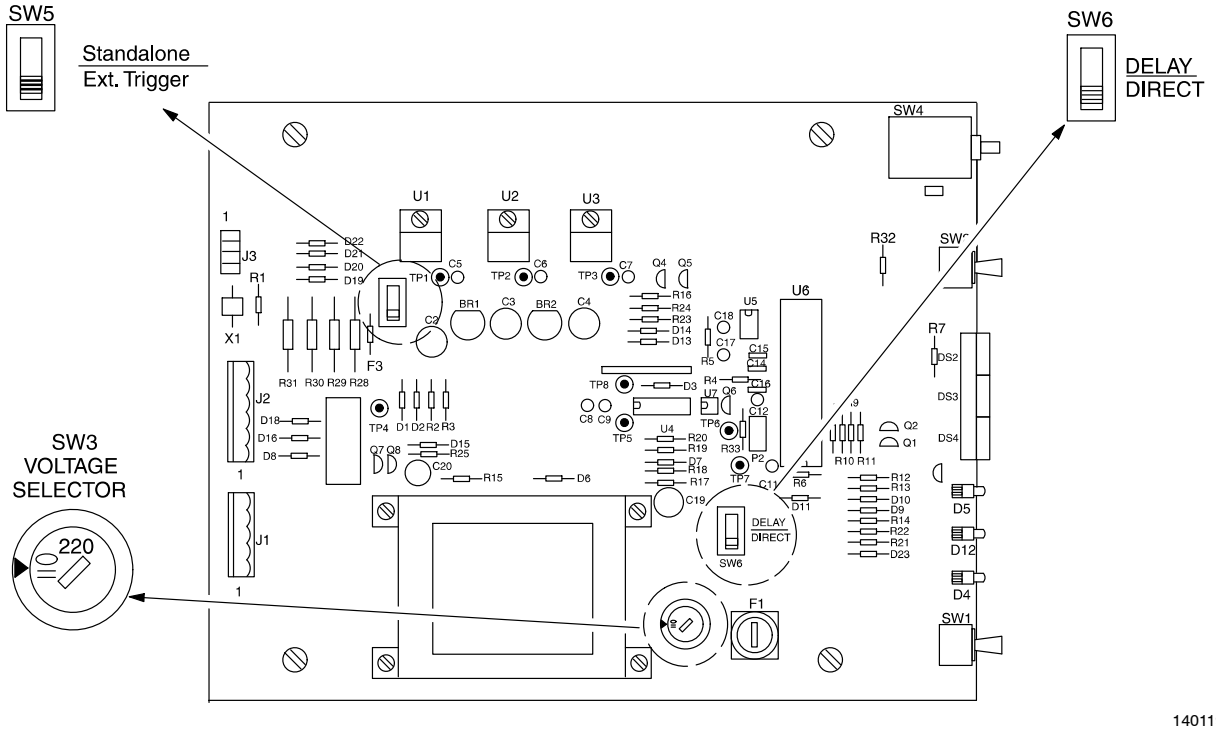


Figure 3-2 Circuit Board Setup

Mechanical Installation

Install the control unit in a location close to the manual spray gun operator's station. Mount the bracket to a wall or panel with screws and lockwashers inserted through the holes in the base of the bracket. Provide enough clearance at the rear of the unit for cables and air lines.

Electrical Connections

WARNING: Install a locking disconnect switch or breaker in the service line ahead of the equipment so power can be shut off during installation or repair.

NOTE: Units are shipped set for 110 Vac or local voltage. Make sure switch SW3 is set correctly before connecting electrical power to the control unit.

CAUTION: Damage may occur if the equipment is connected to any line voltage other than that stated on the ID plate.

WARNING: If the control unit is within the spray area or any area defined as hazardous, disconnect electrical power at a breaker or disconnect in the service line ahead of the control unit before disconnecting the power cord from an outlet.

WARNING: The gun must always be connected to ground through the gun cable and control unit when spraying powder or cleaning the gun with compressed air. Without a ground connection the gun will become electrostatically charged. Personnel touching the gun could receive a shock.

See Figure 3-3.

<table>
<tr><th>Connection</th><th colspan="3">Description</th></tr>
<tr><td rowspan="5">Power Cord</td><td colspan="3">The control unit is shipped with a three-lead power cord (7) routed through a dust-tight, strain-relief bulkhead fitting in the rear panel and hard-wired to the J1 plug connector on the circuit board. The end of the power cord is unterminated.
Connect the brown, blue, and green/yellow wires to a three-pronged power plug.</td></tr>
<tr><td>J1 Connection</td><td>Function</td><td>Wire Color</td></tr>
<tr><td>J1-1</td><td>L (L1-Hot)</td><td>Brown</td></tr>
<tr><td>J1-2</td><td>N (L2-Neutral)</td><td>Blue</td></tr>
<tr><td>J1-3</td><td>PE (Ground)</td><td>Green/Yellow</td></tr>
<tr><td>Gun Trigger Cable</td><td colspan="3">Connect the gun cable to the GUN CONNECT receptacle (8) on the rear panel. Thread the cable nut onto the receptacle and tighten it securely.</td></tr>
<tr><td>Cabinet Ground</td><td colspan="3">Connect the ground strap furnished with the control unit to the ground stud (6) on the rear of the cabinet. Secure the clamp to an earth ground.</td></tr>
</table>

Electrical Connections *(contd)*

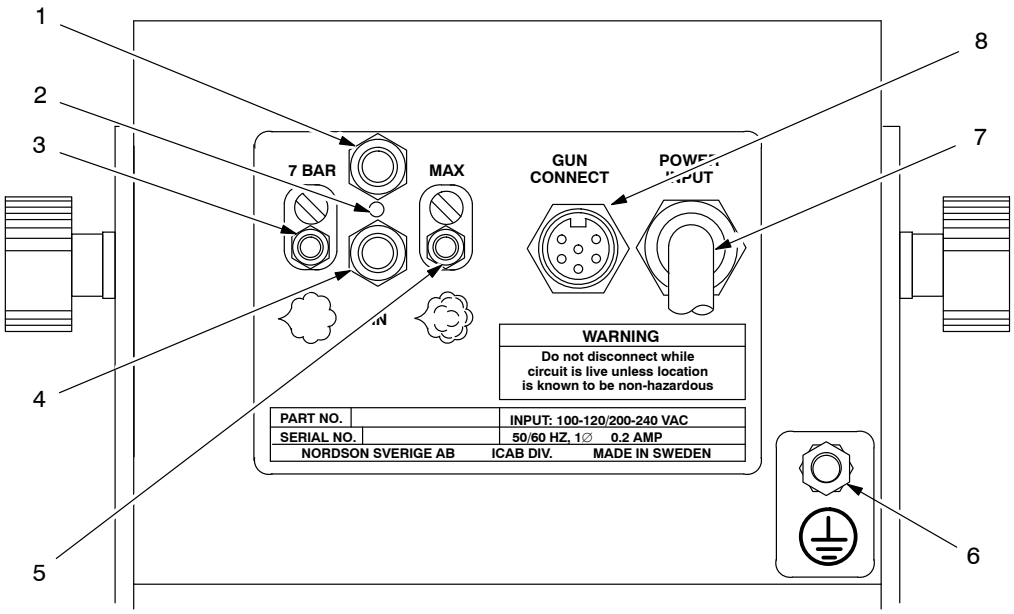


Figure 3-3 Electrical and Pneumatic Connections

1. Auxiliary air output (10-mm tubing)
2. Exhaust air vent
3. Diffuser air output (6-mm tubing)
4. Air input (10-mm tubing)
5. Flow rate air output (6-mm tubing)
6. Cabinet ground stud
7. Power cord
8. Gun cable receptacle

Pneumatic Connections

The maximum input air pressure is 7 bar (100 psi). Air must be clean and dry. Refer to the *Description* section for recommendations on air filtering and conditioning equipment.

Air Type	Tubing size	From	To
Input	10-mm	IN connector (3) on the rear panel	air supply
Output			
Flow rate	6-mm	Flow rate connection (5) on rear panel	"F" connection on powder pump
Diffuser	6-mm	Diffuser connection (3) on rear panel	Diffuser connection on spray gun
Auxiliary	10-mm	Auxiliary air fitting (1)	Fluidizing air fitting in the feed hopper plenum, to the vibrator motor on the box feeder, or to another pneumatic device.
NOTE: Install a manually operated, locking shut-off valve in the supply line in front of the control unit.			

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.

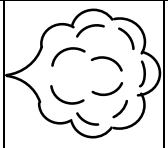
Read all system component manuals before operating your powder spray system. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.

The system must be connected to safety interlocks which will shut it down if a fire is detected, the booth fans shut down, or an arc is detected in the booth.

Flow Rate and Diffuser Air Pressure Settings

Flow rate and diffuser air pressures are two variables that affect system performance and coating quality. You will use powder more economically and obtain better quality coatings as you gain experience setting air pressures.

Table 4-1 Flow Rate and Diffuser Air Pressure Settings

Air Type	Symbol	Initial Setting	Function	Adjusting the Pressure
Flow Rate		1.8 bar (26 psi)	Controls the volume of the powder delivered to the spray gun.	**Increasing** will increase the amount of powder sprayed and the film build on the parts. If the pressure is too high: • powder will not wrap around part edges • too much powder will be sprayed • pump and spray gun parts will wear faster
Diffuser		2.5 bar (36 psi)	Controls the density (powder-to-air ratio) and velocity of the powder through the spray gun.	**Increasing** will decrease the density of the powder and increase the powder charge. If the pressure is too high the spray gun parts may wear faster. **Decreasing** will increase the density of the powder-and provide better coverage. If the pressure is too low the powder may clog the spray gun passages.

Startup

Before spraying powder, make sure the booth vent fans are on and the powder recovery system is operating.

WARNING: All electrically conductive equipment in the spray area must be grounded. Ungrounded or poorly grounded equipment can store an electrostatic charge which can give personnel a severe shock, or arc and cause a fire or explosion.

1. Turn on the system electrical power and air supply.
2. See Figure 4-1. Turn on the control unit power switch (1). The power LED (2) will light.
3. Fill the powder feed hopper to the recommended level with clean, dry powder and set the fluidizing air to the recommended pressure. The auxiliary air pressure regulator and gauge (8) are normally used for fluidizing air. Wait for the powder to become thoroughly fluidized.
4. Point the spray gun into the booth and pull the trigger. The powder LED (3) will light as the solenoids open and allow air to flow. Set the flow rate and diffuser air pressures with the appropriate regulators and gauges (9, 10).

   Diffuser air: 2.5 bar (36 psi)

   Flow rate air: 1.8 bar (26 psi)
5. Adjust these pressures for economical powder use and the desired coating thickness (film build), the type of powder used, the spray room humidity, and other operating variables.

NOTE: High air pressures will cause powder contact surfaces to wear faster. Operate the powder spray system at the lowest possible air pressures.

6. Spray powder on a part and observe the spray pattern and film build. Adjust the flow rate and diffuser air pressures until you obtain the spray pattern and film build desired.
7. Note the μA output. Press up on the switch (6) to display the low-charge alarm setting.
8. Rotate the low-charge alarm potentiometer (7) to set the low-charge alarm to 0.5 μA below the μA output. Release the switch to return to the μA output display.
9. Record the flow rate, diffuser, and fluidizing air pressures, the powder type, and the μA output on the chart furnished at the end of this section. Use these values to set air pressures the next time the same powder is used and to monitor the powder charge.

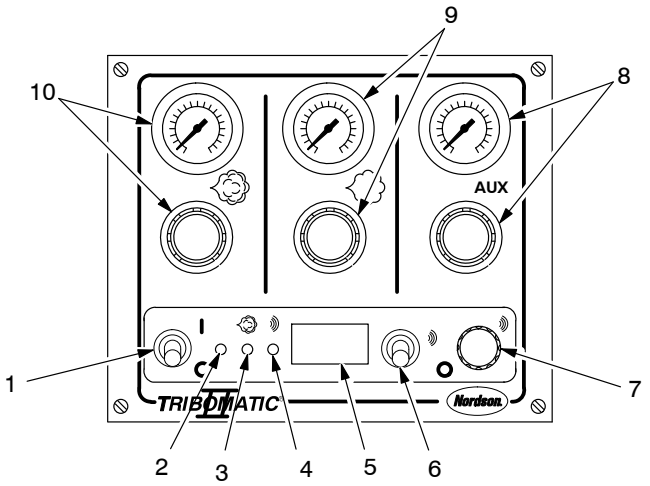


Figure 4-1 Front Panel Controls

1. Power switch
2. Power LED
3. Powder LED
4. Low-charge alarm LED
5. Digital display
6. Display function switch
7. Low-charge alarm potentiometer
8. Auxiliary air regulator and gauge
9. Diffuser air regulator and gauge
10. Flow rate air regulator and gauge

Shutdown

Turn off the control unit power switch. This will shut off flow rate and diffuser air. Set the auxiliary air pressure regulator to zero to stop the flow of fluidizing air.

Maintenance

Exercise good housekeeping practices with all components of a powder spray system. Dust and powder accumulations on electrostatic equipment can cause malfunctions and fire and shock hazards. Clean the entire system and surrounding area periodically. Make the following procedures part of a scheduled maintenance program.

WARNING: If the control unit is within the spray area or any area defined as hazardous, disconnect electrical power at a breaker or disconnect in the service line ahead of the control unit before disconnecting the power cord from an outlet.

Daily	• Open the supply line drain valve to check for water and oil in the air supply. • Drain the air filters. Refer to the air dryer manual for maintenance procedures. • Make sure all system safety interlocks and fire detection systems are connected and functioning properly.
Weekly	• Check all ground connections. Ungrounded parts will not attract charged powder and could result in poor quality surface finishes. Ungrounded equipment and parts may accumulate a charge which could arc and cause a fire or explosion. • Clean powder and dust off the control unit cabinet with a clean cloth or brush.

Control Unit Settings

Use this chart to record your control unit settings and μA output for different powders and parts. This chart can be copied and posted next to the control unit. Significant deviations from the recorded μA output could indicate problems with the powder, air, or gun.

Powder	Part	Air Pressures		μA Output
		Flow rate	Diffuser	

Section 5
Troubleshooting

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

WARNING: Electrical power must be on to check voltages. Perform these procedures carefully, with insulated tools. Touching energized electrical components could be fatal.

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

Designations such as SW1 and U3 given in the troubleshooting procedures refer to components on the circuit board. Refer to the following illustrations for help in troubleshooting.

Figure	Description
5-1	Circuit board test points, switches, and fuses
5-2	Control unit wiring diagram

Problem	Possible Cause	Corrective Action
1. All LEDs off, no display	No input power	Check for appropriate input power on J1-1 and J1-2.
	SW1 (power switch) off or open	Check SW1 for proper operation.
	Blown fuse F1	Correct overload problem and replace fuse F1.
	SW3 (voltage selector switch) not set properly	Make sure SW3 is set for input voltage.
2. Power LED off, powder LED on	LED D4 or regulator U3 failed	Replace circuit board.
3. Powder LED off, display on	LED D12, U7, or Q6 failed	Replace circuit board.
4. Display off, powder LED on	Q3 or U6 failed	Replace circuit board.
5. No air output, powder LED on	SW3 not set for correct voltage	Make sure SW3 setting matches input voltage.
6. No air output, powder LED on	Bad solenoid connection	Check for loose connection at J2 or broken solenoid wires.
	Solenoid coil open	Replace solenoid valve.

Continued...

Problem	Possible Cause	Corrective Action
7. No air output, powder LED off, all other LED's on	D8 or Q7 failed	Replace circuit board.
8. Powder LED off, display off, all other LED's on, air is flowing from output fittings	SW5 (trigger switch) in wrong position	Place SW5 in proper position.
	TP1 is less than -11.5 volts DC	Replace circuit board.
	TP2 is less than +11.5 volts DC	Replace circuit board.
	U4, U7, or Q6 failed	Replace circuit board.
9. No low-charge alarm	Alarm setting too low	Set alarm to 0.5 μA below normal μA output.
	SW4, U4, or Q4 failed	Replace circuit board.
10. Display reads zero μA, powder charging normally	Current feedback wire in gun cable shorted or open, or poor connection	Check current feedback wire continuity and connection at rear panel and at J3. Repair or replace as necessary.
	U6 failed	Replace circuit board.
11. Display reads zero μA, loss of wrap, transfer efficiency	Current feedback wire in gun cable shorted or open, or poor connection	Check current feedback wire continuity and connections. Repair or replace as necessary.
	Powder not suitable for tribo-charging	Consult your powder manufacturer.
12. Loss of wrap, poor transfer efficiency	Poorly grounded parts	Measure resistance between parts and ground with a megohmmeter. Resistance should not be greater than one megohm. Clean hangers and conveyor if necessary.
	Powder not suitable for tribocharging	Consult your powder manufacturer.
13. Gun not spraying powder when triggered. Powder LED off, display off	Trigger wire open	Check continuity of cable trigger wires. Replace cable if wires are open.
	Trigger switch failed	Check continuity through switch when activated. Replace cable if switch is broken (switch is part of cable).
	J3 plug connector loose or wired incorrectly	Check J3 plug connector and socket. Make sure plug connector is wired correctly.
14. Powder flows when power is turned on but gun trigger not pulled	SW5 in standalone position	Change SW5 to external-trigger position.
	Trigger switch stuck closed or shorted closed	Check switch continuity. Replace cable if unable to open switch (switch is part of cable).
	Cable trigger wires shorted to ground	Check continuity of cable trigger wires. Replace cable if shorted.
	J3 plug connector wired incorrectly	Check J3 plug connector and make sure plug connector is wired correctly.

Continued...

Problem	Possible Cause	Corrective Action
15. Powder continues to flow when power is turned off	Solenoid valve exhaust vent plugged	Make sure exhaust vent is not blocked. Remove manifold and clean passageways.
	Solenoid valve(s) dirty, stuck open	Replace valve, check air filters and dryer. Make sure air is clean and dry.
	Solenoid valve spring broken	Replace solenoid valve.

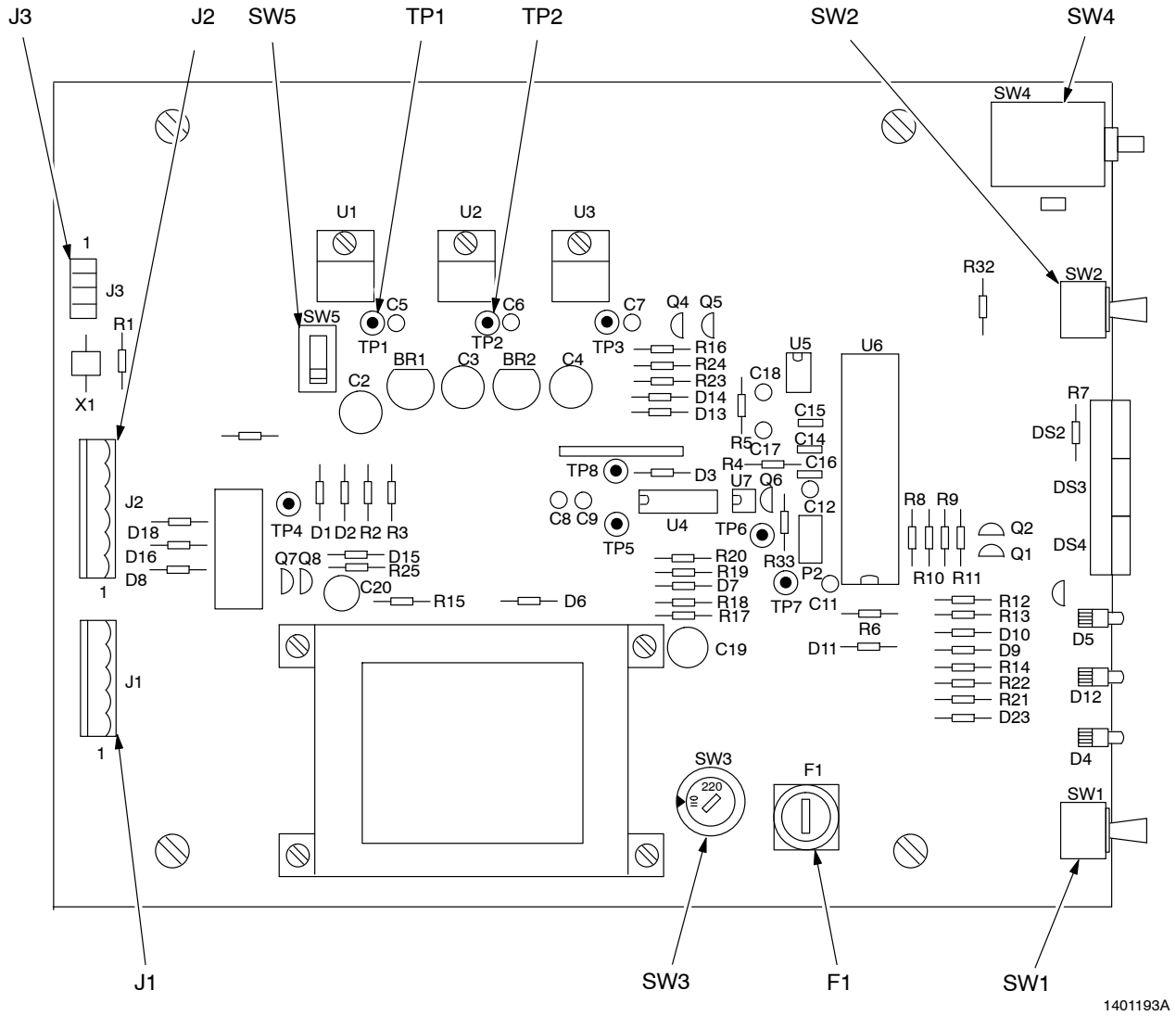


Figure 5-1 Circuit Board Test Points, Switches, and Fuses

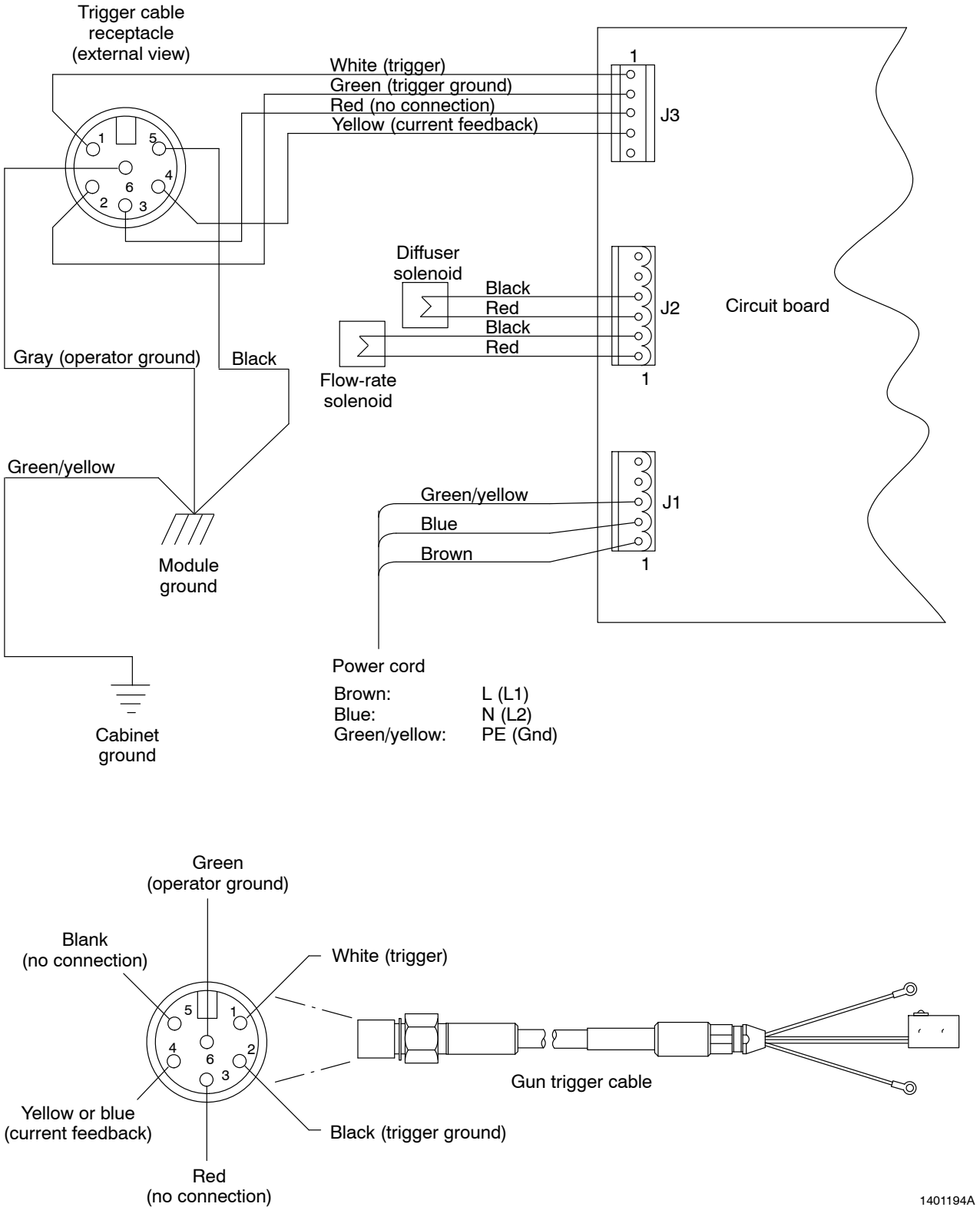


Figure 5-2 Control Unit Wiring Diagram

Section 6
Repair

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 electrical power and shut off and relieve air pressure before performing the following tasks. Failure to observe this warning could result in personal injury or death.

NOTE: A dust-free environment must be maintained inside the control unit cabinet. Make sure all gaskets (front and rear panels, gauges, regulators, switches, and manifold) are in good condition.

Control Module Removal

1. Disconnect the gun cable and all air tubing from the control unit. Unplug the power cord from the outlet.
2. See Figure 6-1. Loosen the four captive screws (3) securing the control module (4) to the cabinet (1).
3. Slide the control module out of the cabinet. Disconnect the cabinet ground wire (5) from the module, if necessary.

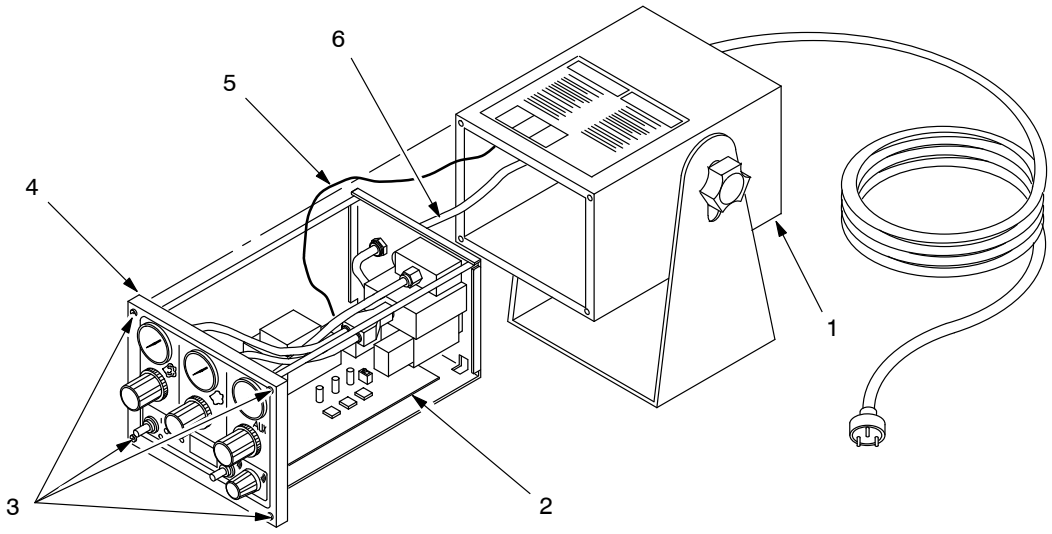


Figure 6-1 Removing Control Module from Cabinet

1. Cabinet
2. Circuit board
3. Captive screws
4. Control module
5. Ground wire
6. Power cord

Solenoid Valve Replacement

See Figure 6-2.

Remove the Solenoid Valves

1. Remove the control module from the cabinet as described in *Control Module Removal* on page 6-1.
2. Disconnect the air tubing (9) from the solenoid valve elbow fittings (10), the manifold elbow fitting (13), the Y-connector (14), and the 6-mm straight fitting (15).
3. Remove the 10- and 6-mm straight fittings (7, 8) from the manifolds. Save the fittings for reuse.
4. Disconnect the plug connector (11) from the J2 connector on the circuit board.
5. Remove the two screws and washers (6) securing the valve manifold (2) to the rear panel. Remove the manifold and panel gasket (1). Save the screws and washers for reuse.
6. Remove the screws and washers (5) securing the solenoid valves (4) to the manifold. Save the screws and washers for reuse.
7. Remove the solenoid valves, valve gaskets (3), and O-rings (12) from the manifold. Save the gaskets and O-rings for reuse, if they are undamaged.
8. Disconnect the solenoid valve leads from the plug connector (11).
9. Remove the elbow fittings (10) from the solenoid valves.

Install the Solenoid Valves

1. Wrap the elbow fitting threads with PTFE tape, and screw them into the new solenoid valves. Tighten the fittings securely.
2. Connect the new solenoid valve leads to the plug connector (11).
3. Install the O-rings (12) in the grooves in the valve manifold (2).
4. Place the valve gaskets (3) on the manifold. Line up the small holes in the gaskets with the small holes in the manifold.
5. Install the solenoid valves on top of the gaskets. Insert the screws and lock washers (5) through the solenoid valves and gaskets. Thread the screws into the valve manifold, and tighten them securely.
6. Install the panel gasket (1) and valve manifold on the rear panel with the screws and washers (6).
7. Wrap the straight fitting threads (7, 8) with PTFE tape, and thread them into the manifold.
8. Connect the plug connector to the J2 connector on the circuit board.
9. Connect the air tubing to the Y-connector and elbow fittings.
10. Install the control module in the cabinet.

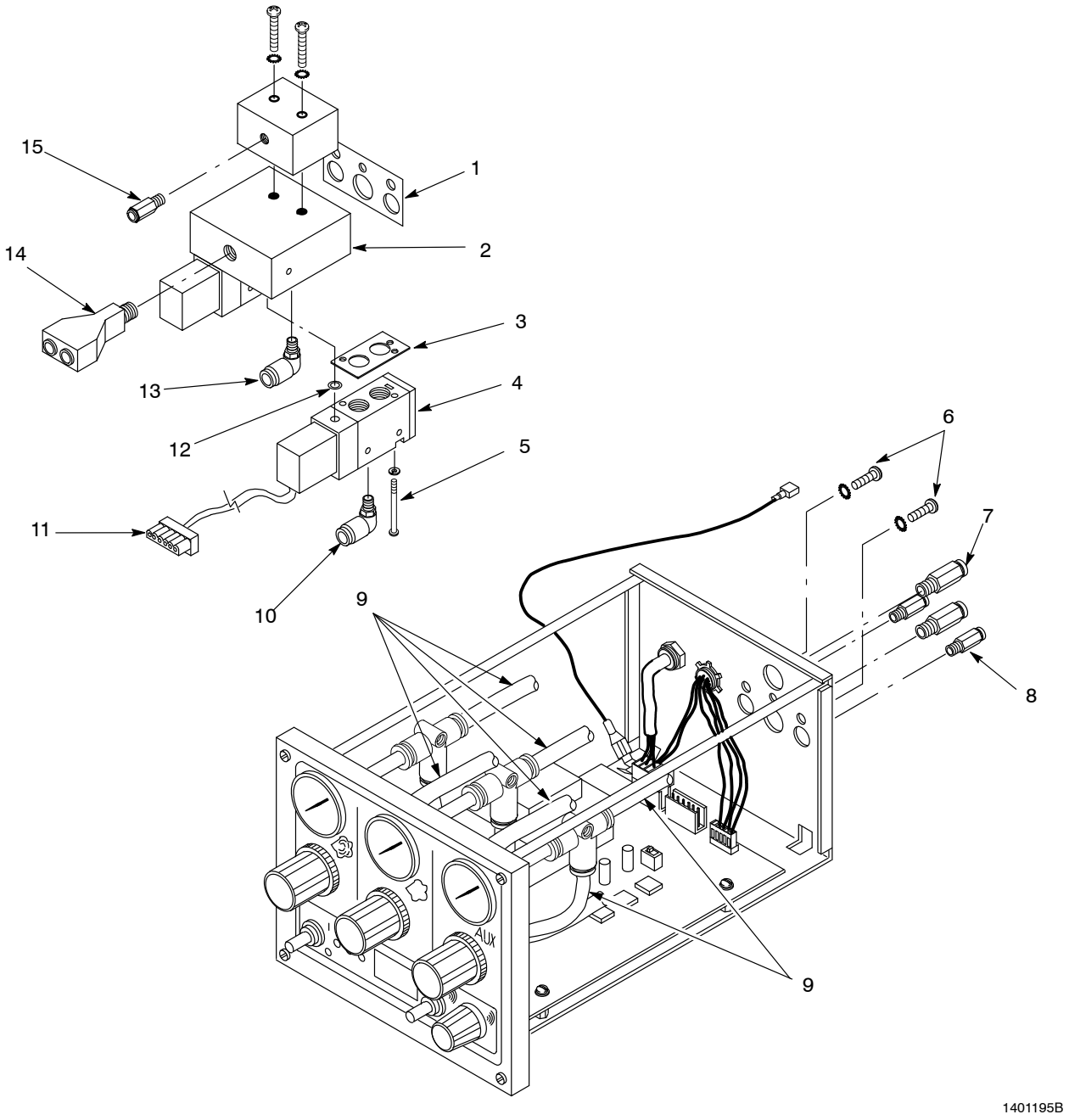


Figure 6-2 Solenoid Valve Replacement

1. Panel gasket
2. Valve manifold
3. Valve gasket
4. Solenoid valve
5. Screws and lock washers
6. Screws and lockwashers
7. 10-mm straight fittings
8. 6-mm straight fittings
9. Air tubing
10. Elbow fitting (valves)
11. Plug connector
12. O-ring
13. Elbow fitting (manifold)
14. Y-connector
15. 6-mm straight fitting

Air Gauge Replacement

NOTE: Replace the gauges one at a time to avoid crossing air tubing.

See Figure 6-3. Two types of air gauges are available for the control unit.

Air Gauge Part 631123 (Barbed Fitting)

Remove the Air Gauge

1. Remove the control module from the cabinet as described in *Control Module Removal* on page 61.
2. Disconnect the air tubing (3) from the tee (9).
3. Pull the 6-mm tubing (8) and tee from the air gauge (1).
4. Separate the 6-mm tubing and tee.
5. Remove the screws (4), lock washers (6), and nuts (7) from the gauge bracket (5).

   NOTE: The bracket, screws, lock washers and nuts hold the gauge against the front panel so hold onto the gauge as these parts are removed.

6. Remove the gauge and gasket (2) from the front panel. Save the gasket for reuse, if it is undamaged.

Install the Air Gauge

1. Install the gasket (2) behind the gauge bezel. Install the gauge (1) through the front panel.
2. Install the screws (4), lock washers (6), and nuts (7) onto the gauge bracket (5) then set this assembly in place onto the air gauge. Tighten the nuts to hold the gauge against the front panel. Use a wrench on the flats on the back side of the gauge to prevent it from turning while tightening the nuts.
3. Push the 6-mm tubing (8) onto the barbed fitting of the air gauge.
4. Push the opposite end of the 6-mm tubing into the tee (9).
5. Connect the air tubing (3) to the tee.
6. Check the resistance between the gauge body and the module ground (10) stud with an ohmmeter. The resistance should not exceed one ohm.

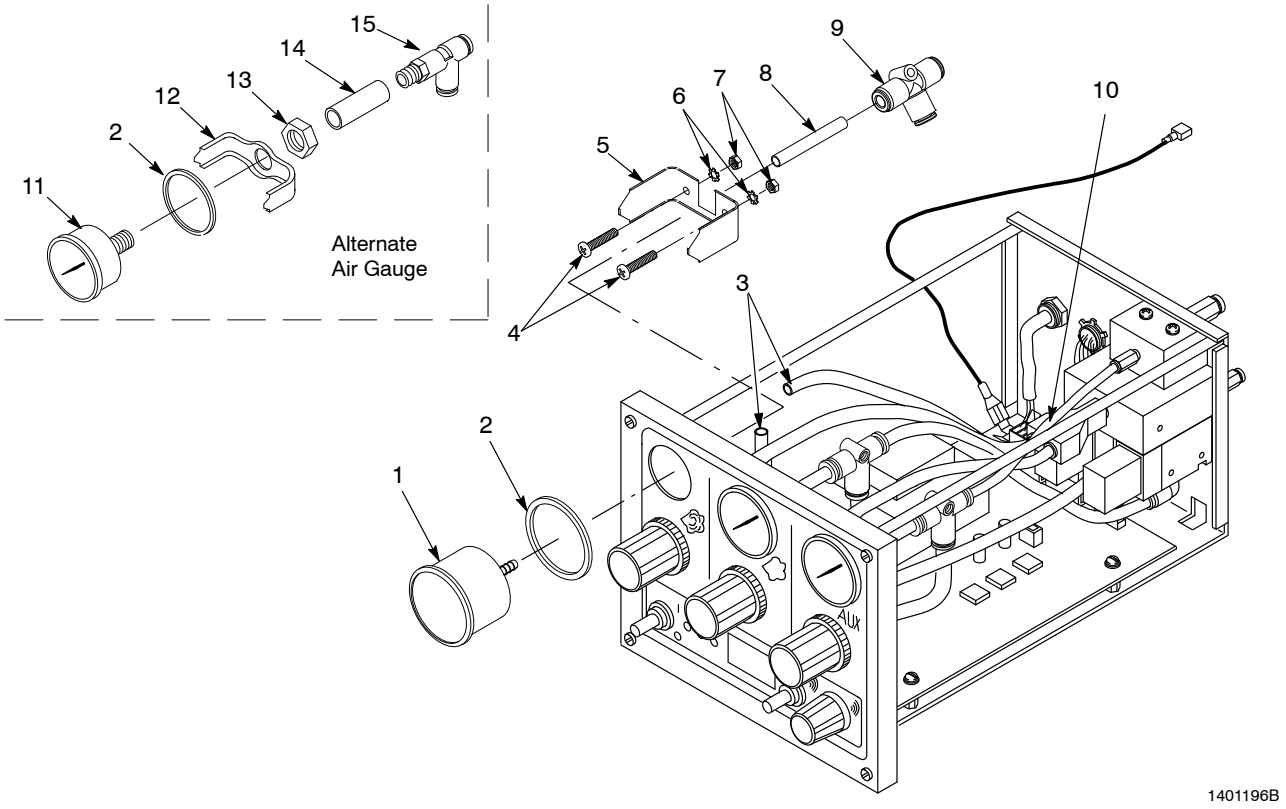


Figure 6-3 Air Gauge Replacement

1. Air gauge, part 631123
2. Gasket
3. Air tubing
4. Screws
5. Gauge bracket
6. Lock washers
7. Nuts
8. 6-mm tubing
9. Tee
10. Ground stud
11. Air gauge, part 901260
12. Gauge bracket
13. Nut
14. Coupling
15. Tee

Air Gauge Part 901260 (Threaded Fitting)

NOTE: Older models of the control unit use this air gauge with a threaded fitting.

Remove the Air Gauge

1. Remove the control module from the cabinet as described in *Control Module Removal* on page 6 1.
2. Disconnect the air tubing (3) from the tee (14).
3. Remove the tee and coupling (14) from the air gauge (11).
4. Remove the nut (13) and bracket (12) from the gauge.
5. Remove the gauge and gasket (2) from the front panel. Save the gasket for reuse, if it is undamaged.
6. Remove the nut and bracket from the new air gauge. Wrap the gauge threads with PTFE tape.

Install the Air Gauge

1. Install the gasket (2) behind the gauge bezel. Install the gauge (11) through the front panel.
2. Install the gauge bracket (12) and nut (13) on the gauge. Tighten the nut to hold the gauge against the front panel. Use a wrench on the flats on the back side of the gauge to prevent it from turning while tightening the nut.
3. Thread the coupling (14) onto the gauge and tighten securely.
4. Wrap the tee (15) threads with PTFE tape. Thread the tee into the end of the coupling and tighten securely.
5. Connect the air tubing (3) to the tee.
6. Check the resistance between the gauge body and the module ground (10) stud with an ohmmeter. The resistance should not exceed one ohm.

Air Regulator Replacement

1. Remove the control module from the cabinet as described in *Control Module Removal* on page 6-1.
2. See Figure 6-4. Disconnect the air tubing from the regulator elbow fitting (4).
3. Unscrew the knurled locking nut (1) from the regulator.
4. Remove the regulator (3) and gasket (2) from the front panel. Save the gasket for reuse, if they are undamaged.
5. Remove the elbow fittings from the regulator.
6. Wrap the elbow fitting threads with PTFE tape and install them in the new regulator.
7. Install the gasket on the new regulator.
8. Install the regulator in the front panel, and secure them with the knurled locking nut.

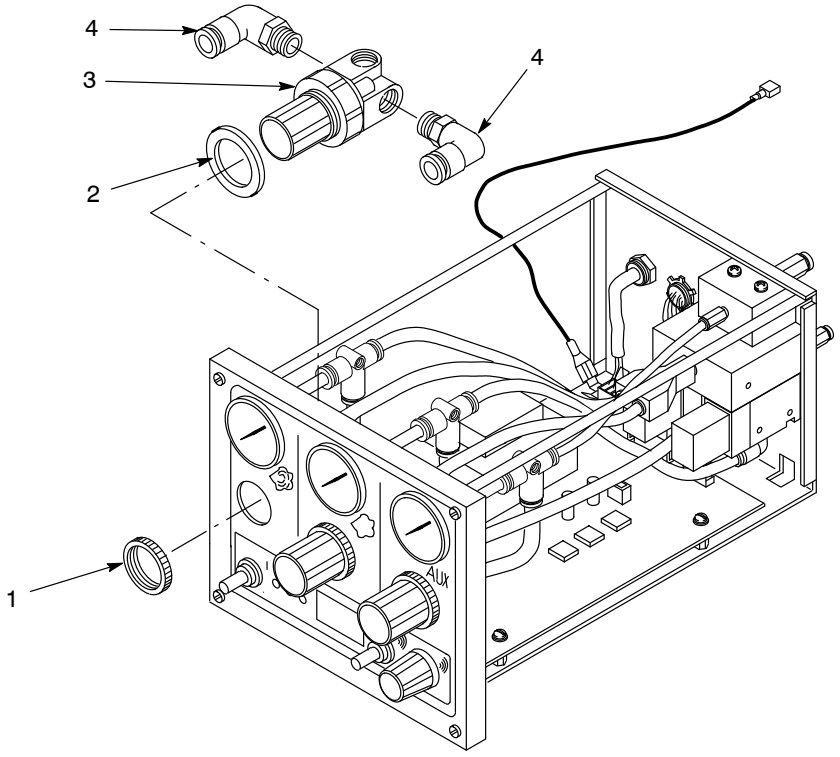


Figure 6-4 Air Regulator Replacement

1. Knurled locking nuts
2. Gaskets
3. Regulators
4. Elbow fittings

Circuit Board Replacement

1. Remove the control module from the cabinet as described in *Control Module Removal* on page 6-1.
2. See Figure 6-5. Disconnect the plug connectors from the J1, J2, and J3 connectors on the circuit board (1).
3. Remove the dust-cover nuts (8) from the toggle switches. Save the nuts for reuse.
4. Remove the cap, screw, washer, and knob (4, 5, 6, 7) from the low-charge alarm potentiometer. Save them for reuse.
5. Remove the four screws and washers (2, 3), and carefully remove the circuit board from the module. Save the screws and washers for reuse.
6. Position the new circuit board on the module standoffs, and secure it with the screws and washers removed in step 5. Do not overtighten the screws or you will damage the circuit board.
7. Connect the plug connectors to the J1, J2, and J3 connectors on the circuit board.
8. Install the dust-cover nuts on the toggle switches.
9. Secure the knob to the low-charge alarm potentiometer with the screw and washer. Install the cap on the knob.
10. Install the control module in the cabinet.

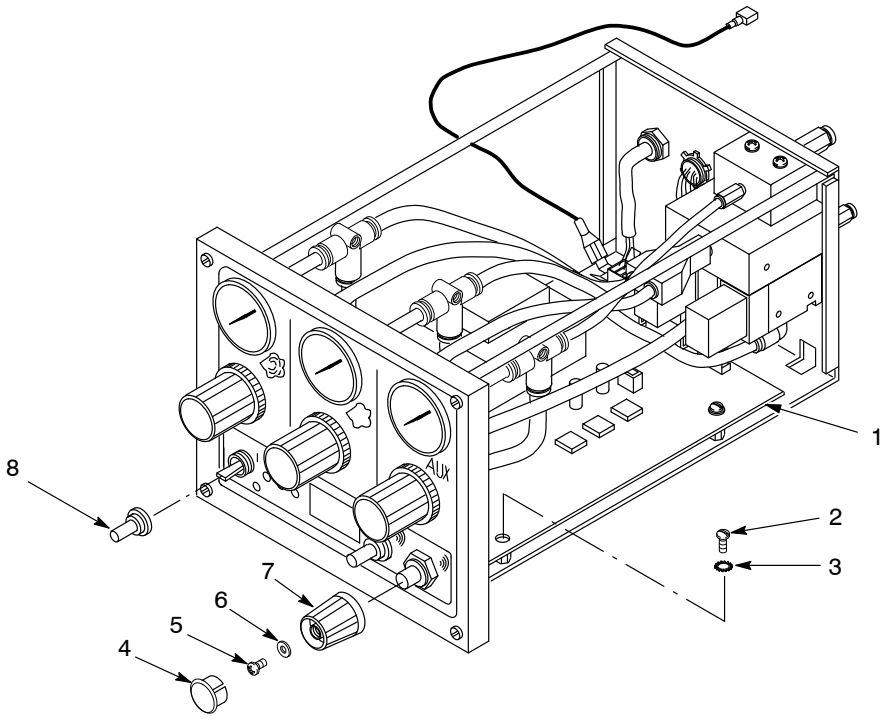


Figure 6-5 Circuit Board Replacement

1. Circuit board
2. Screws (4)
3. Washers (4)
4. Cap
5. Screw
6. Washer
7. Knob
8. Dust-cover nuts

Section 7
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	

Tribomatic II Control Unit

See Figure 7-1.

Item	Part	Description	Quantity	Note
–	631156	CONTROL UNIT, Tribomatic II, 3 gauge, manual, packaged	1	
1	240674	• TAG, ground	2	
2	983021	• WASHER, flat, external, 0.203 x 0.406 in., brass	2	
3	983401	• LOCK WASHER, split, M5	2	
4	984702	• NUT, hex, M5, brass	2	
5	631102	• MODULE, control, electronic, Tribomatic II, 3 gauge, manual	1	A
6	140165	• GASKET, filler, panel, front	1	
7	129595	• BRACKET, cabinet	1	
8	129590	• SPACER, cabinet, friction	2	
9	983410	• WASHER, flat, M6	2	
10	129592	• KNOB, clamping, M6 x 12 mm	2	
NS	971177	• CONNECTOR, male, $^{3}/_{8}$-in. OD tubing x $^{1}/_{4}$-in. NPT	1	B
NS	240976	• CLAMP, ground wire	1	B

NOTE A: For parts breakdown, see module parts list and accompanying illustration on the following pages.

B: Noted parts are shipped loose.

NS: Not Shown

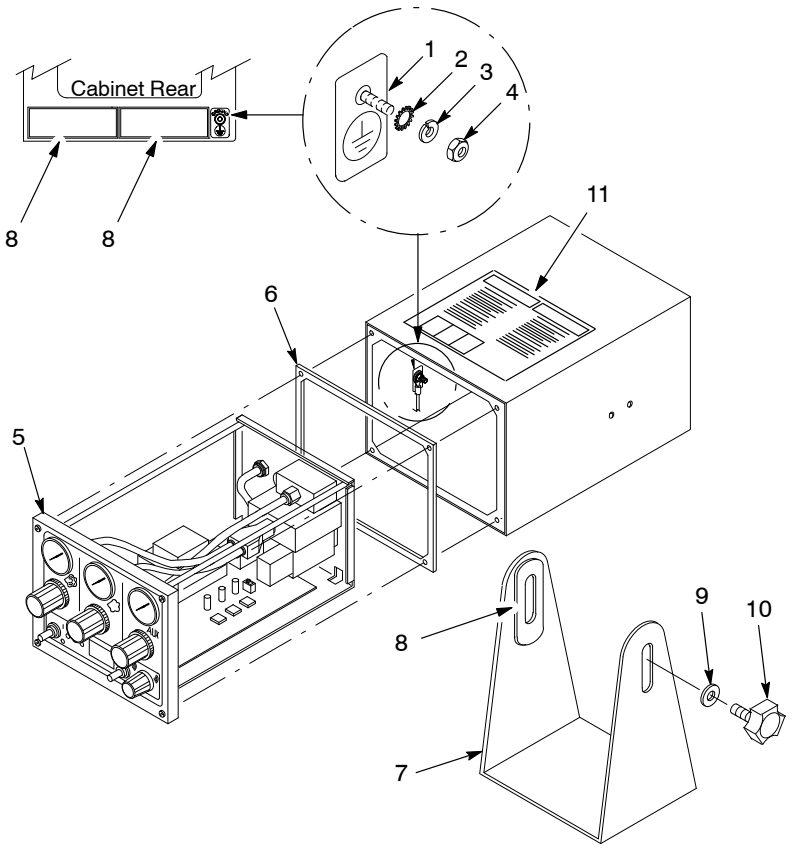


Figure 7-1 Tribomatic II Control Unit

Control Module

See Figure 7-2.

Item	Part	Description	Quantity	Note
—	631102	CONTROL MODULE, electronic, Tribomatic II, manual	1	
1	631142	• GASKET, manifold	1	
2	972837	• ELBOW, male, 6-mm tube x $^1/_8$-in. BSPT	2	
3	130627	• RECEPTACLE, input, 6-wire, female	1	
4	984526	• NUT, lock, $^1/_2$-in. conduit	1	
5	939122	• SEAL, conduit fitting, $^1/_2$-in.	1	
6	983038	• WASHER, flat, nylon, 0.2 x 0.3 x 0.04 in.	4	
7	983422	• LOCK WASHER, internal, M5	4	
8	144662	• POWER CABLE, Versa-Spray, manual	1	
9	144356	• FITTING, straight, $^1/_2$-in. NPT	1	
10	984192	• NUT, lock, $^1/_2$-in. NPT, nylon	1	
11	982200	• SCREW, pan head, M5 x 10	2	
12	971196	• CONNECTOR, male, 10-mm tube x $^1/_4$-in. BSPT	2	
13	971230	• CONNECTOR, male, 6-mm tube x $^1/_8$-in. BSPT	2	
14	129600	• GASKET, rear panel	1	
15	933343	• CONNECTOR, plug, 5 pin	1	
16	631111	• CIRCUIT BOARD	1	
NS	939915	• • FUSE, 200 mA, slow-blow	1	
17	982164	• SCREW, pan head, M4 x 6	4	
18	983416	• LOCK WASHER, M4	4	
19	248741	• SEAL, shaft, rotary	1	
20	129593	• KNOB, collet, 21 mm, $^1/_4$-in. shaft	1	
21	129585	• CAP, flat, 21 mm, w/curved arrow	1	
22	631146	• COVER, dust, switch	2	
23	981387	• SCREW, captive, M5 x 21	4	
24	940073	• O-RING, Viton, .156 x .281 in.	4	
25	129583	• GASKET, bezel	1	
26	129591	• ROD, support	2	
27	630597	• TUBING, blue, 6 mm	AR	
28	130630	• JUMPER, ground, cabinet	1	
29	240674	• TAG, ground	1	
30	983021	• WASHER, flat, .203 x .406 in., brass	1	

AR: As Required

NS: Not Shown

Continued...

Control Module *(contd)*

Item	Part	Description	Quantity	Note
31	983401	• LOCK WASHER, M5	1	
32	984702	• NUT, hex, M5, brass	1	
33	933156	• LUG, terminal	2	
34	982127	• SCREW, flat head, M4 x 8	2	
35	972838	• ELBOW, male, 6-mm tube x $^1/_4$-in. BSPT	6	
36	630082	• VALVE, air regulator	3	
37	631139	• GASKET, regulator	3	
38	631123	• GAUGE, 0-7 bar	3	A
39	631138	• GASKET, gauge	3	
40	982069	• SCREW, pan head, M4 x 16	4	
41	984715	• NUT, hex, M4	4	
42	971114	• UNION TEE, 6-mm tube x 6-mm tube	2	
43	972839	• CONNECTOR, Y-branch, 6-mm tube x $^1/_4$-in. BSPT	1	
NS	- - - - - -	• CONNECTOR, male, 6-mm tube x $^1/_4$-in. BSPT	1	
44	631132	• SOLENOID ASSEMBLY, Tribomatic II, 3-gauge	1	B

NOTE A: Older modules of the control unit use air gauge, part 901260, with a threaded fitting. Refer to *Alternate Air Gauge* for part numbers and quantities for this air gauge.

B: Refer to solenoid assembly parts list and accompanying illustration on the following pages.

NS: Not Shown

Alternate Air Gauge

See Figure 7-2.

Item	Part	Description	Quantity	Note
39	631138	• GASKET, gauge	2	
45	901260	• GAUGE, 0-7 bar	2	
46	973572	• COUPLING, pipe, hydraulic, $^1/_8$-in.	3	
47	972840	• TEE, male run, 6-mm tube x $^1/_8$-in. BSPT	3	

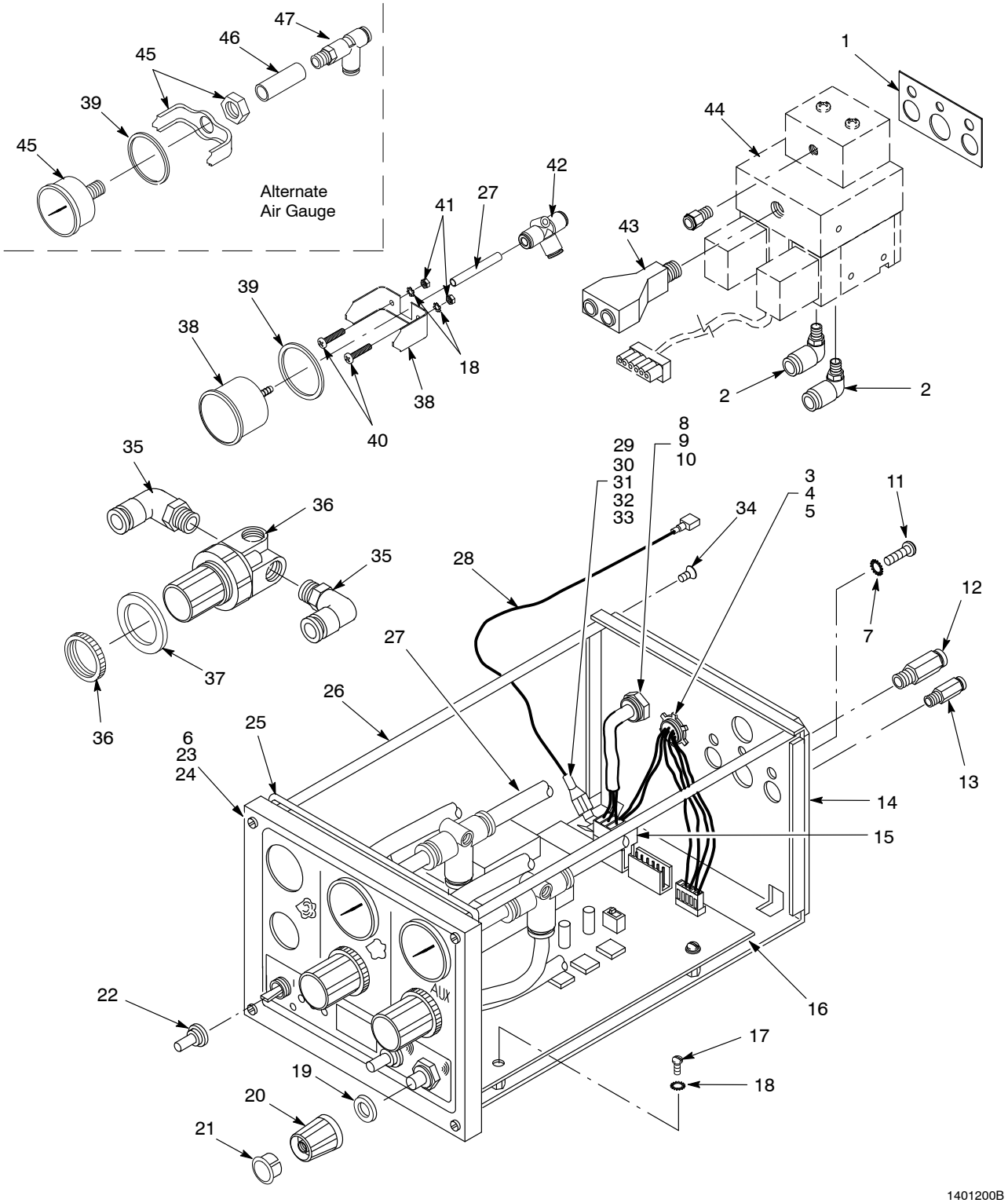


Figure 7-2 Control Module

Solenoid Assembly

See Figure 7-3.

Item	Part	Description	Quantity	Note
—	631132	SOLENOID ASSEMBLY, Tribomatic II, 3-gauge	1	
1	982300	• SCREW, pan head, M4 x 30	2	
2	983416	• LOCK WASHER, M4	2	
3	631133	• MANIFOLD, T2, 3-gauge	1	
4	630853	• GASKET, valve/base	2	
5	631144	• VALVE, solenoid	2	
6	983400	• LOCK WASHER, M3	4	
7	982192	• SCREW, pan head, M3 x 30	4	
8	933343	• CONNECTOR, plug, 6 pole	1	
9	945062	• O-RING, Viton, 7.1 x 1.6 mm	2	

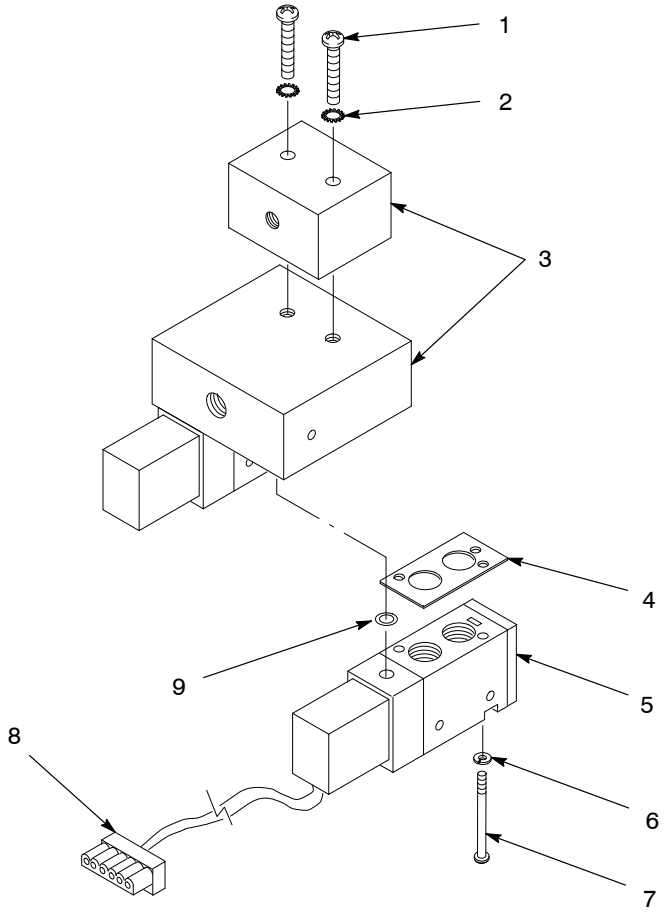


Figure 7-3 Solenoid Assembly