

General Motors Pro-Flo[®] II Controller

Customer Product Manual
Part 229 810D



NORDSON CORPORATION • AMHERST, OHIO • USA

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Section 1

Safety

Section 1

Safety

1. Introduction

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

Make sure all equipment documentation, including these instructions, is accessible to persons operating or servicing equipment.

2. 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.

3. 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

4. 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.

5. 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 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.
- While operating manual spray guns, make sure you are grounded. Wear electrically conductive gloves or a grounding strap connected to the gun handle or other true earth ground. Do not wear or carry metallic objects such as jewelry or tools.
- If you receive even a slight electrical shock, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.
- 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.
- Make sure the spray area is adequately ventilated.
- 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.

High-Pressure Fluids

High-pressure fluids, unless they are safely contained, are extremely hazardous. Always relieve fluid pressure before adjusting or servicing high pressure equipment. A jet of high-pressure fluid can cut like a knife and cause serious bodily injury, amputation, or death. Fluids penetrating the skin can also cause toxic poisoning.

If you suffer a fluid injection injury, seek medical care immediately. If possible, provide a copy of the MSDS for the injected fluid to the health care provider.

The National Spray Equipment Manufacturers Association has created a wallet card that you should carry when you are operating high-pressure spray equipment. These cards are supplied with your equipment. The following is the text of this card:



WARNING: Any injury caused by high pressure liquid can be serious. If you are injured or even suspect an injury:

- Go to an emergency room immediately.
- Tell the doctor that you suspect an injection injury.
- Show him this card.
- Tell him what kind of material you were spraying.

MEDICAL ALERT—AIRLESS SPRAY WOUNDS: NOTE TO PHYSICIAN

Injection in the skin is a serious traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the bloodstream.

Consultation with a plastic surgeon or a reconstructive hand surgeon may be advisable.

The seriousness of the wound depends on where the injury is on the body, whether the substance hit something on its way in and deflected causing more damage, and many other variables including skin microflora residing in the paint or gun which are blasted into the wound. If the injected paint contains acrylic latex and titanium dioxide that damage the tissue's resistance to infection, bacterial growth will flourish. The treatment that doctors recommend for an injection injury to the hand includes immediate decompression of the closed vascular compartments of the hand to release the underlying tissue distended by the injected paint, judicious wound debridement, and immediate antibiotic treatment.

6. Fire Safety

To avoid a fire or explosion, follow these instructions.

- Ground all conductive equipment in the spray area. Use only grounded air and fluid hoses. Check equipment and workpiece grounding devices regularly. Resistance to ground must not exceed one megohm.
- Shut down all equipment immediately if you notice static sparking or arcing. Do not restart the equipment until the cause has been identified and corrected.
- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Do not heat materials to temperatures above those recommended by the manufacturer. Make sure heat monitoring and limiting devices are working properly.
- Provide adequate ventilation to prevent dangerous concentrations of volatile particles or vapors. Refer to local codes or your material 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.
- Shut off electrostatic power and ground the charging system before adjusting, cleaning, or repairing electrostatic equipment.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

**Halogenated Hydrocarbon
Solvent Hazards**

Do not use halogenated hydrocarbon solvents in a pressurized system that contains aluminum components. Under pressure, these solvents can react with aluminum and explode, causing injury, death, or property damage. Halogenated hydrocarbon solvents contain one or more of the following elements:

<u>Element</u>	<u>Symbol</u>	<u>Prefix</u>
Fluorine	F	"Fluoro-"
Chlorine	Cl	"Chloro-"
Bromine	Br	"Bromo-"
Iodine	I	"Iodo-"

Check your material MSDS or contact your material supplier for more information. If you must use halogenated hydrocarbon solvents, contact your Nordson representative for information about compatible Nordson components.

**7. Action in the Event of a
Malfunction**

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out system electrical power. Close hydraulic and pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the system.

8. Disposal

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

Section 2

Description

Section 2

Description

1. Introduction

[See Figure 2-1.](#)

The Pro-Flo system automates the application of sealants and adhesives. It includes a Pro-Flo gun and controller that work in conjunction with a robot and robot controller.

The Pro-Flo controller uses signals from the robot controller and other sensors to control the gun dispensing rate. A constant bead size is maintained by adjusting the dispensing rate for changes in robot speed, material viscosity, and material delivery pressure.

The controller

- maintains a consistent dispensed volume even as the viscosity of the material varies
- learns the shear-thinning effects of the material and automatically adjusts the dispensing rate
- displays recovery procedures if operation faults are generated by the controller or gun
- communicates faults to the robot controller.

1. Introduction (contd)

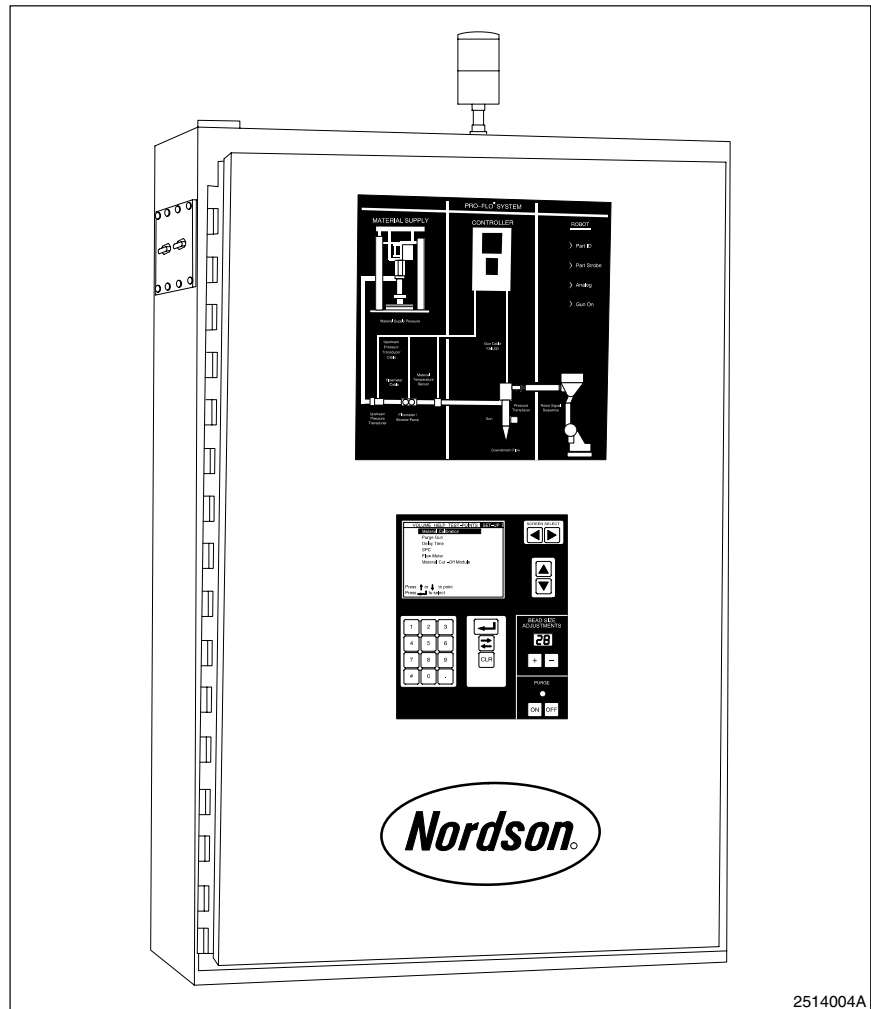


Fig. 2-1 Pro-Flo Controller

The controller includes

- a software program configured by Nordson for your application
- a flowmeter assembly, which includes a flowmeter, an upstream pressure transducer, and a resistance temperature detector (RTD)
- electrical cables for connecting the controller to the gun, robot controller, and optional equipment

In addition to controlling an air-spray (compact) or extrude (dispensing) gun, the controller can be used to monitor or control the following system components:

- material cut-off (MCO) module (extrude guns only)
- air-spray proportioning valve (air-spray guns only)
- flowmeter
- upstream pressure transducer
- material supply regulator

2. Theory of Operation

The robot controller outputs an analog (tool-speed) signal that is proportional to the robot speed. The controller uses this signal to adjust the dispensing rate of the gun. When the robot speeds up, the gun dispenses material faster, and when the robot slows down, it dispenses material slower.

The controller continuously monitors the volume of material dispensed and automatically adjusts the dispensing rate to maintain a constant bead size. The controller compensates for batch-to-batch variation in material and shear-thinning effects.

A second analog signal is output by some robot controllers and can be used to control the proportioning valve pressure in air-spray guns. More or less atomizing pressure is supplied from the proportioning valve when the robot speeds up and slows down, respectively. Precise bead-size control is achieved with independent control over the dispensing rate and delivery pressure.

The controller alerts the operator when a fault occurs by lighting the alarm tower and flashing a signal on the diagnostic panel. The software provides a description of the fault, the appropriate corrective action to take, or how to contact Nordson for assistance. The operator has the option of stopping the system to correct the fault, or running the system in backup mode and correcting the fault later.

An optional feature of the controller logs statistical process control (SPC) data. A serial port interface can be used to transfer SPC data to a personal computer or disk drive. Data can be received by a computer running the Nordson DataLink program, which is sold separately.

Section 3

Installation

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.

1. Introduction

Unpack the Pro-Flo controller and inspect it for dents, scratches, corrosion, or other physical damage. If there is any visible damage, call your Nordson Corporation representative immediately.

2. Location

See Figures 3-1 and 3-2 for mounting dimensions and clearance requirements for the controller.

Mount the controller as close to the robot controller as possible.

NOTE: Install a dedicated power supply for the controller to provide safe operation and to reduce interference from electrical noise.

NOTE: Install all electrical connections to local code.

NOTE: Install a locking disconnect switch or breaker in the service line ahead of any electrical equipment.

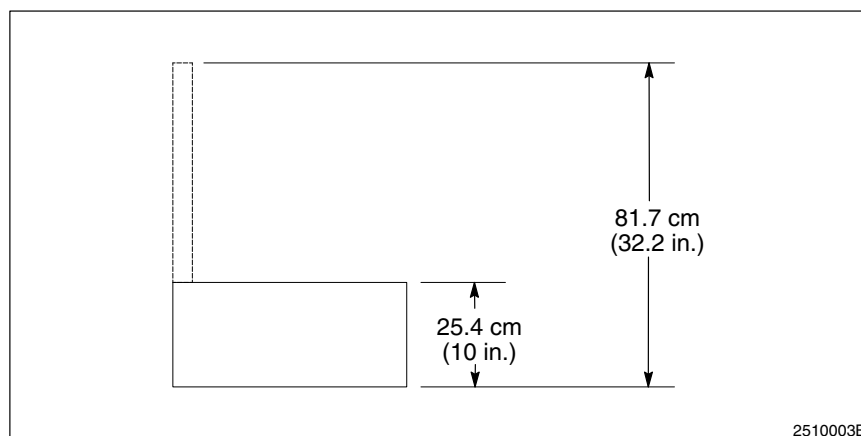


Fig. 3-1 Mounting Dimensions and Clearance Requirements (Bottom View)

2. Location (contd)

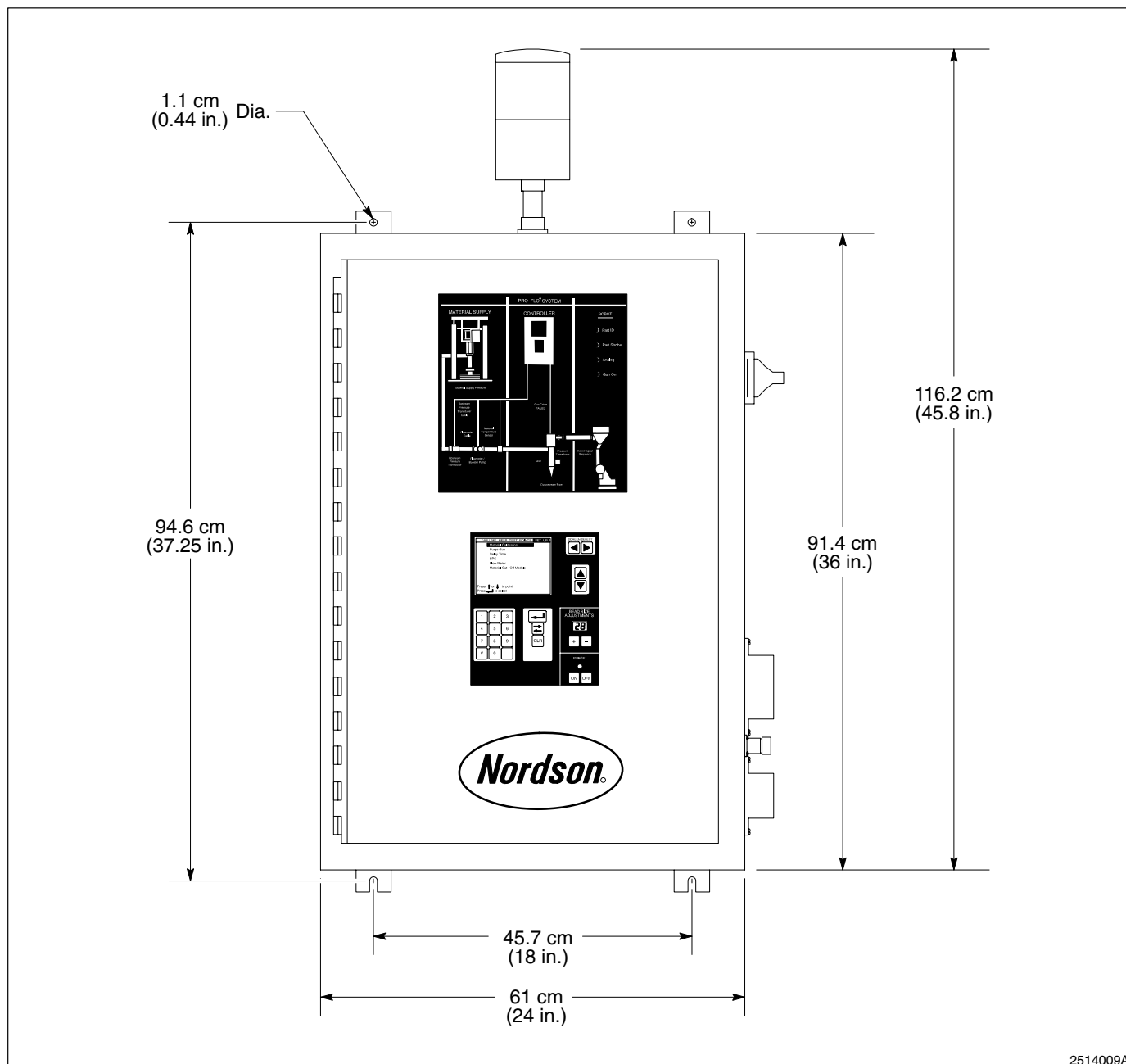


Fig. 3-2 Mounting Dimensions and Clearance Requirements (Front View)

3. Electrical Cables

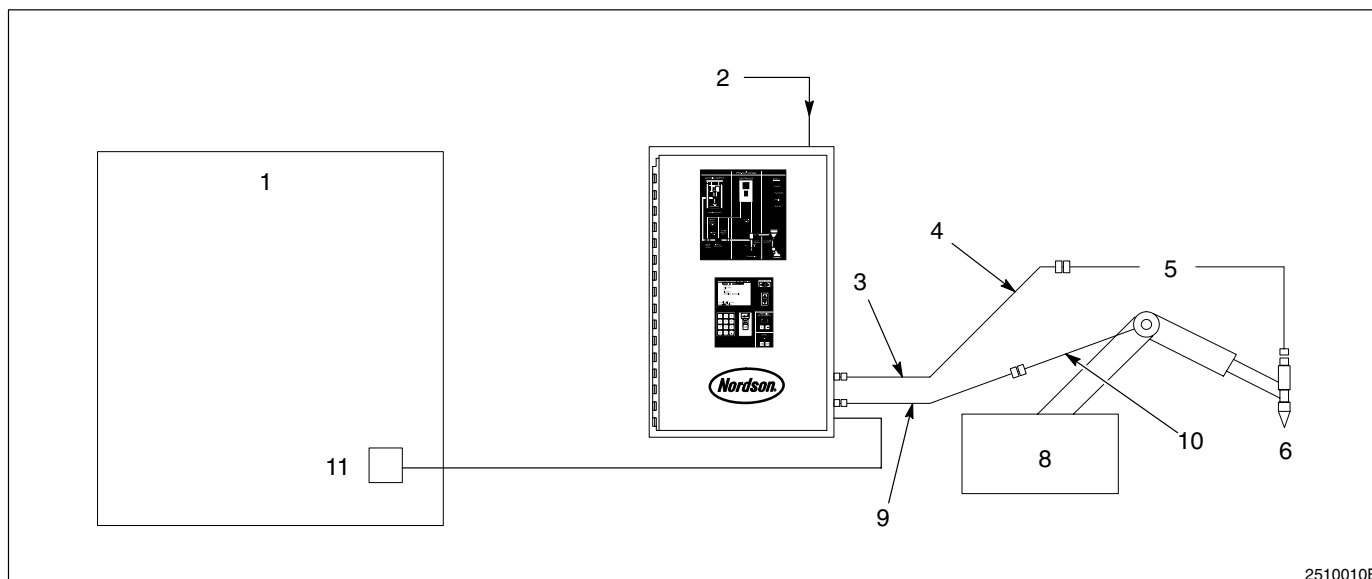
NOTE: See the system drawings included with the unit for Pro-Flo guns used in your application.

The controller is shipped with the cables necessary to connect to your gun and robot controller. Connect your controller by following the procedures for your standard controller interface.

See Figures 3-3 and 3-4.

When connecting cables between the gun (6) and controller (2), make sure there is enough slack to allow robot (8) and gun movement. Use an extension cable (5) if necessary.

The standard controller interface is supplied to customers installing new Pro-Flo systems. Use the cables supplied to connect the Pro-Flo controller to the robot controller, Pro-Flo gun, and flowmeter assembly.



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Fig. 3-3 Standard Cabling Connections

- | | | |
|-----------------------|------------------------|-----------------------------|
| 1. Robot controller | 5. Extension gun cable | 9. Flowmeter cable |
| 2. Pro-Flo controller | 6. Gun | 10. Extension cable |
| 3. Y-cable | 7. Flowmeter | 11. Input and output boards |
| 4. Gun control cable | 8. Robot | |

3. Electrical Cables (contd)

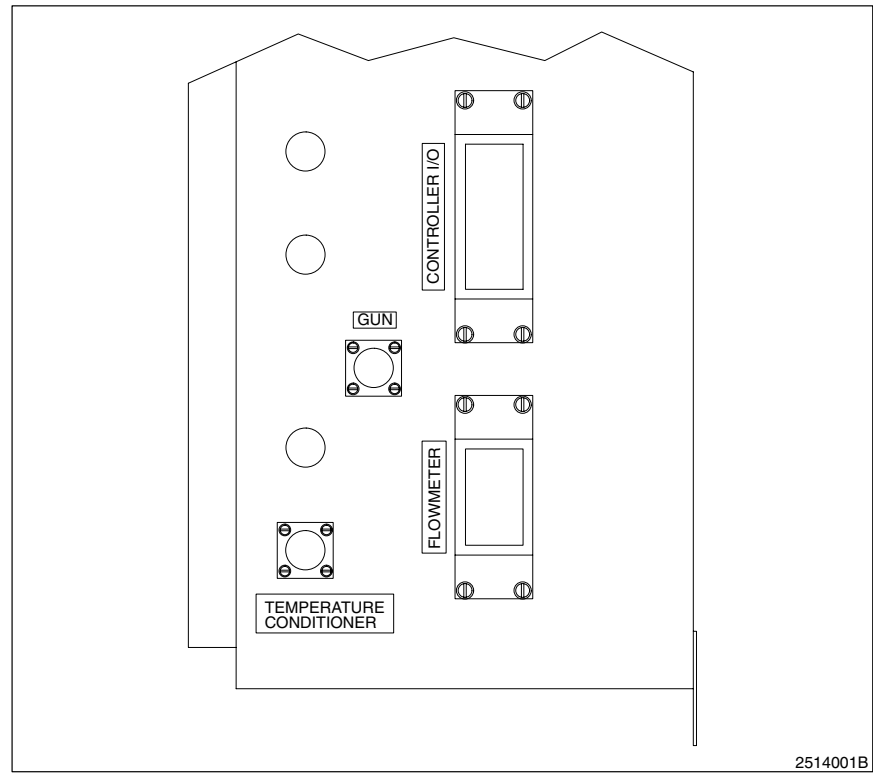


Fig. 3-4 Standard Cable Receptacles

Robot Connections

NOTE: Each cable plug has a key that matches a notch in the receptacle in the correct orientation.

1. Connect the robot interface cable to the ROBOT INTERFACE CABLE receptacle.



WARNING: Risk of electrical shock. The robot controller contains electrical potentials that can be fatal. Disconnect and lock out electrical power before opening the robot controller enclosure and making connections.

2. [Refer to Table 8-5.](#)

Make the necessary connections between the robot interface cable and the robot controller input and output boards.

Gun Connections

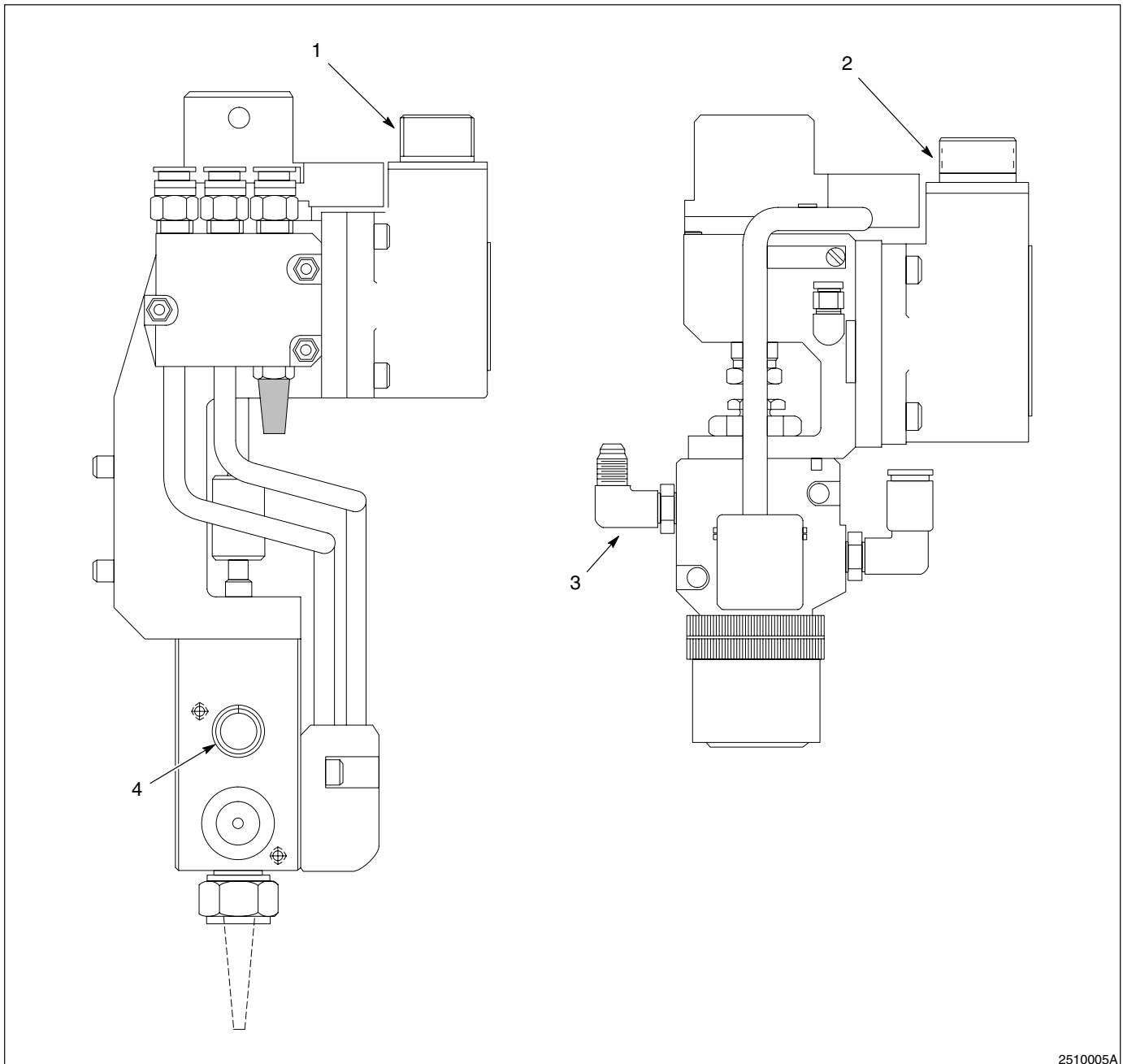
NOTE: See the system drawings included with the unit for Pro-Flo guns used in your application.

When connecting cables between the gun and controller, make sure there is enough slack to allow robot and gun movement. Use as many gun control cables as necessary.

1. Connect the gun control cable to the CONNECTOR 1 receptacle.
2. Connect together as many gun control cables as necessary to allow robot and gun movement.
3. [See Figure 3-5.](#)

Connect the free end of the gun control cable to the Pro-Flo dispensing gun receptacle (1) or to the compact gun receptacle (2).

Gun Connections (contd)



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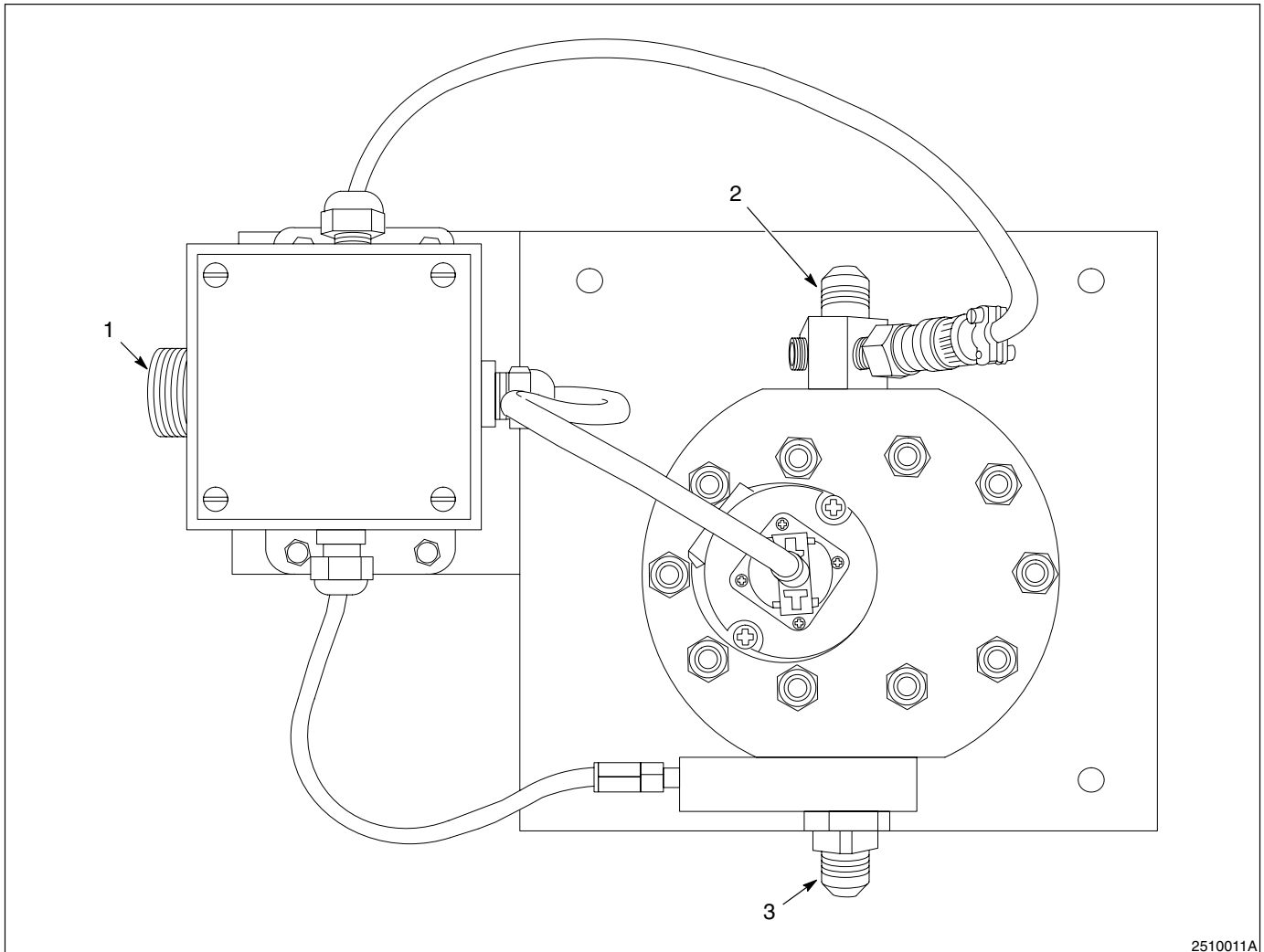
Fig. 3-5 Typical Pro-Flo Guns

- | | | |
|---|--------------------------------|---|
| 1. Gun control cable receptacle, full-size dispensing gun | 3. Material inlet, compact gun | 4. Material inlet, full-size dispensing gun |
| 2. Gun control cable receptacle, compact gun | | |

Flowmeter Connections

1. Connect the flowmeter manifold cable to the FLOWMETER MANIFOLD CABLE receptacle.
2. See Figure 3-6.

Connect the free end of the cable to the electrical receptacle (1) on the flowmeter assembly.



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Fig. 3-6 Typical Flowmeter Assembly

1. Electrical receptacle

2. Material inlet

3. Material outlet

Fluid Connections

Make the following fluid connections:

1. See Figure 3-6.

Connect the material supply hose from the drum unloader to the material inlet (2).

2. Connect a material supply hose from the material outlet (3) to the Pro-Flo dispensing gun inlet (See Figure 3-5, (4)) or compact gun inlet (See Figure 3-5, (3)).

4. Robot Interface Signals

Fault codes are documented in the *Specifications* section.

See Figure 3-7.

Configure your robot controller to vary the analog #1 (or tool speed) signal from 0 to 10 Vdc over the full range of robot speed.

1. Determine the highest and lowest robot speeds to be used in production.
2. Configure the robot controller to output an analog #1 signal of +10 Vdc when the robot is moving at, or slightly above maximum speed.
3. Configure the robot controller to output the analog #1 signal of 0 Vdc when the robot is stationary.

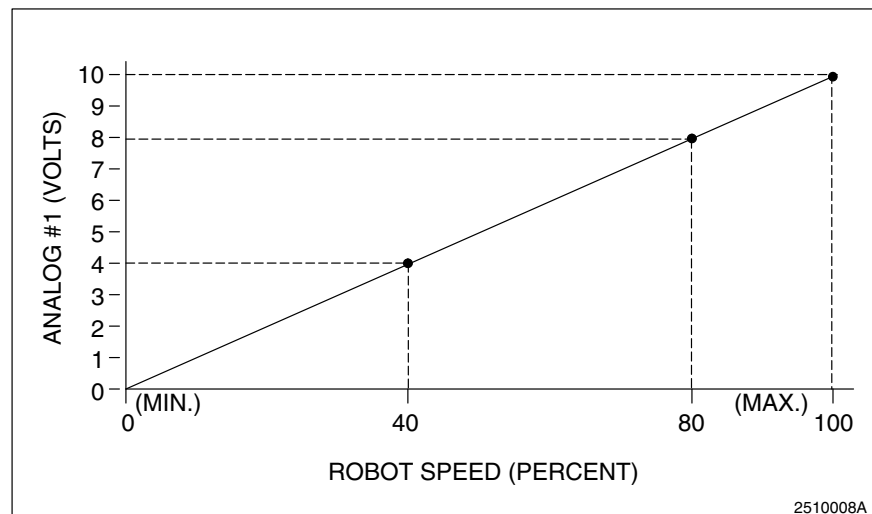


Fig. 3-7 Relationship Between Analog #1 Signal and Robot Speed

Note: Figure 3-7 presents an example of the approximate relationship between robot speed and analog #1 voltage as a guide for the operator. A robot speed of 80% corresponds to 8 Vdc. A robot speed of 40% corresponds to 4 Vdc.

4. Robot Interface Signals (contd)

If your robot supplies the optional analog #2 (or tool speed #2) signal and you are using an air-spray gun, more precise control over atomizing air pressure is possible. The controller controls the proportioning valve feeding air to the gun to adjust atomizing air pressure for robot speed. Establish the relationship between the signal and the pressure supplied to the proportioning valve.

Configure the robot controller to output an analog #2 signal of 2, 4, 6, and 8 Vdc when the pressure supplied to the proportioning valve is 20, 40, 60, and 80 bar (290, 580, 870, and 1160 psi), respectively.

5. Setting Timing Sequences

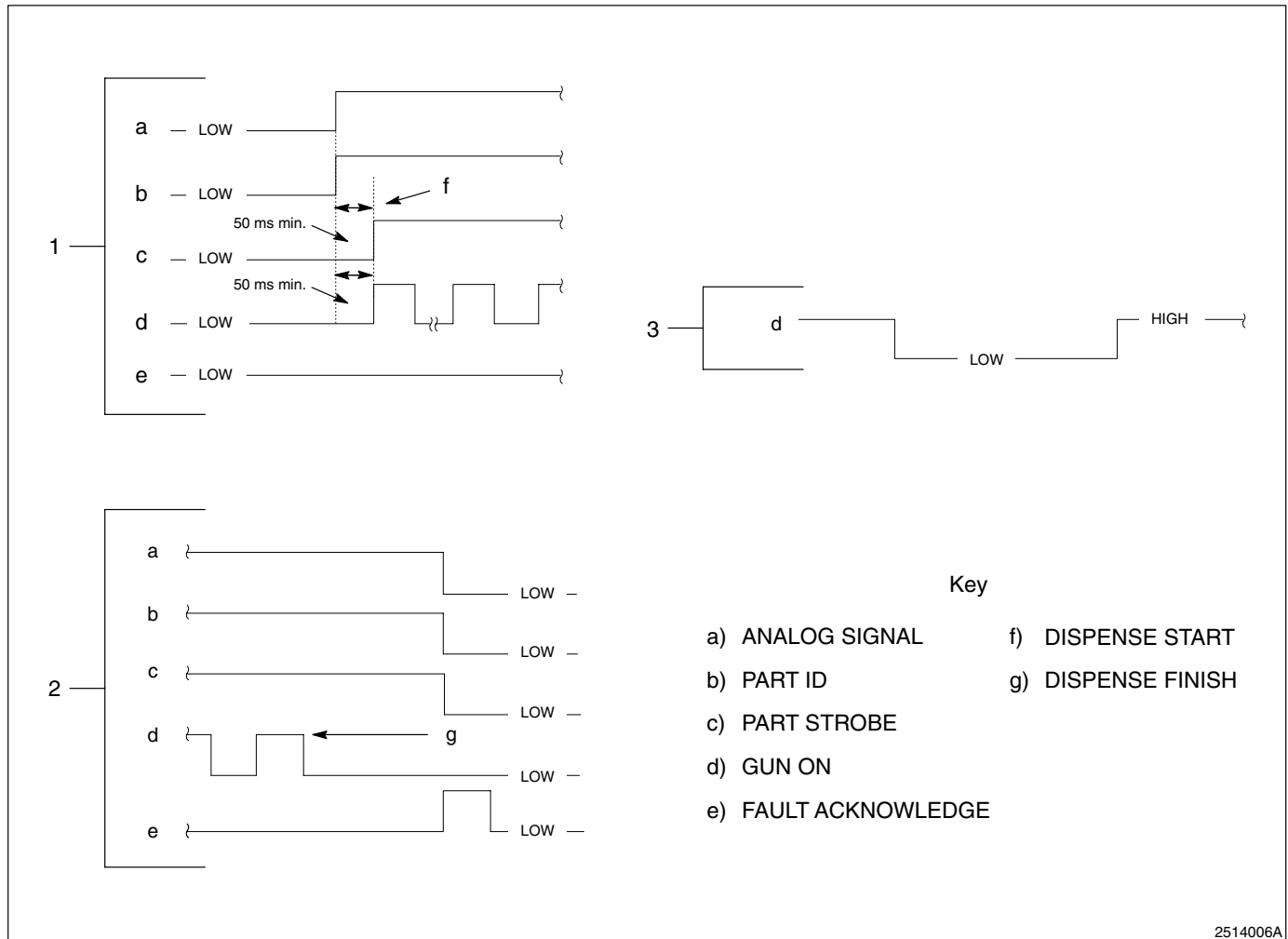
The timing sequence of output signals from the robot controller must be adjusted to suit the Pro-Flo controller. Refer to your robot controller manual for procedures to set the signal timing sequences.

[See Figure 3-8.](#)

Set the robot timing as illustrated for

- start of dispense cycle (1)
- end of dispense cycle (2)
- emergency stop (3)

5. Setting Timing Sequences (contd)



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Fig. 3-8 Timing of Robot Signals

1. Start of dispense cycle

2. End of dispense cycle

3. Emergency stop

Section 4

Operation

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.

1. Introduction

Follow the instructions given in this section to operate your Pro-Flo controller. The controller has been configured by your Nordson representative. If the configuration needs to be modified, use the Pro-Flo Configurator software.

NOTE: Before operating the controller, make sure the robot has been “taught” the proper tool path. Refer to procedures given in the robot manual.

Refer to Table 4-1 and [see Figure 4-2](#) for a description of the keys and indicators on the controller.

Table 4-1 Controls and Indicators on the Controller

Item	Function
Command keys	
Screen select (1)	highlights screen selection from top menu bar shown on display
Up and down arrow (2)	highlights prompt from screen
+/- (4)	adjusts bead size up or down
ON/OFF (6)	starts or stops gun from purging
CLR (7)	clears numeric values
Toggle (8)	toggles between on/off or yes/no
Enter (9)	activates screen selection or enters numeric value typed at prompt
Numeric (10)	types numeric values
Indicators	
Bead size (3)	displays bead size
Purge (5)	lights when gun is open for purging
Display (11)	displays top menu bar and currently selected screen
Screen selection menu (12)	displays available selections

2. User Interface (contd)

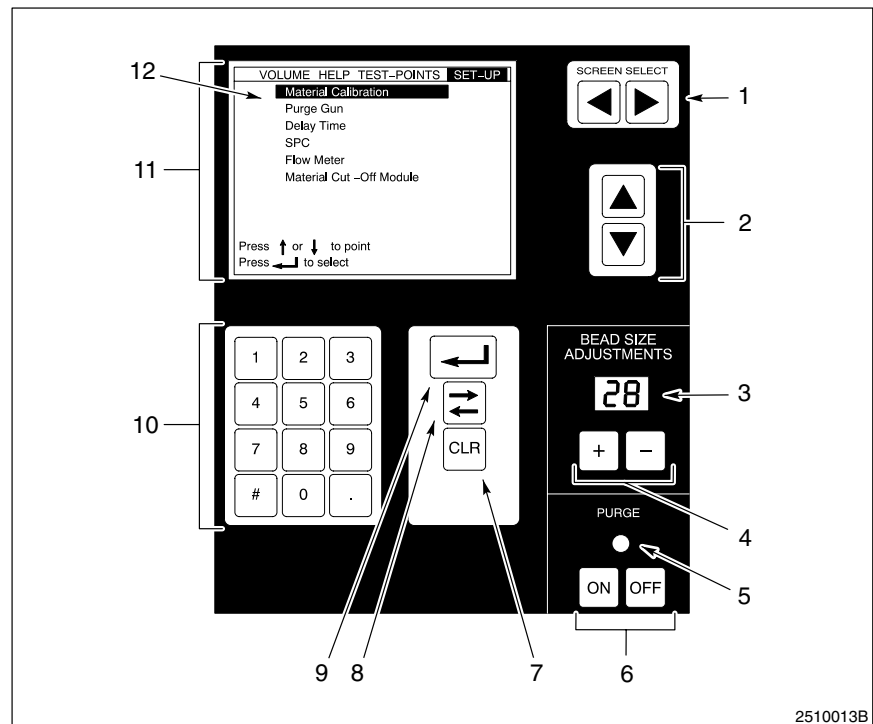


Fig. 4-2 Operator Keypad

- | | |
|------------------------------|---------------------------|
| 1. Screen select keys | 7. Clear key |
| 2. Up and down arrow keys | 8. Toggle key |
| 3. Bead size indicator | 9. Enter key |
| 4. Bead size adjustment keys | 10. Numeric keypad |
| 5. Purge indicator | 11. Display |
| 6. ON/OFF keys | 12. Screen selection menu |

3. Operator Keypad Controls

See Figure 4-2.

Bead Size Adjustment

Bead size is an arbitrary number between 1 and 99. The current bead size is displayed on the bead size indicator (3). Use the bead adjustment keys to increase or decrease the bead size.

Purging

Purge the gun before use to remove air from the material supply hose and nozzle. Press the ON key to begin purging. The purge indicator (3) lights while the gun is open. Purging will stop after the purge time has elapsed. Otherwise, press the OFF key to stop purging immediately.

4. Screen Menus

See Figure 4-2.

The screen selection menu (12) is displayed across the top line of the display (11). Use the left or right arrows (1) to highlight one of four screen choices: VOLUME, HELP, TEST-POINTS, or SET-UP. Use the up or down arrow to highlight the prompts from the screen.

VOLUME

See Figure 4-3.

View the VOLUME screen during production to monitor material dispensing characteristics. For each part run, the VOLUME screen displays the time, part identification, bead size, volume set point, actual volume dispensed, and whether the volume is within the customer-set range.

NOTE: If the volume is within the customer set range, the OK column is left blank. If the volume is not within the customer set range, NO is displayed in the OK column.

VOLUME (contd)

VOLUME					
HELP TEST-POINT SET-UP					
Time	Part ID	Bead	Setpoint	Actual	OK
11:59A	4	32	21.3	21.5	
11:59A	2	32	11.1	11.0	
11:59A	5	32	36.0	35.8	
11:58A	2	32	11.1	10.9	
11:58A	5	32	36.0	36.1	
11:58A	5	32	36.0	35.7	
11:58A	2	32	11.1	11.1	
11:57A	4	32	21.3	21.6	
11:57A	5	32	36.0	36.0	

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Fig. 4-3 Example of the VOLUME Screen

HELP

See Figure 4-1.

If a fault is detected during operation, the alarm tower (1) red light turns on and the type of fault is indicated on the diagnostic panel (5).

NOTE: Press the LAMP TEST key (4) occasionally to test the lights on the diagnostic panel.

See Figure 4-4.

Choose the HELP screen to display an explanation of the fault and the suggested corrective action.

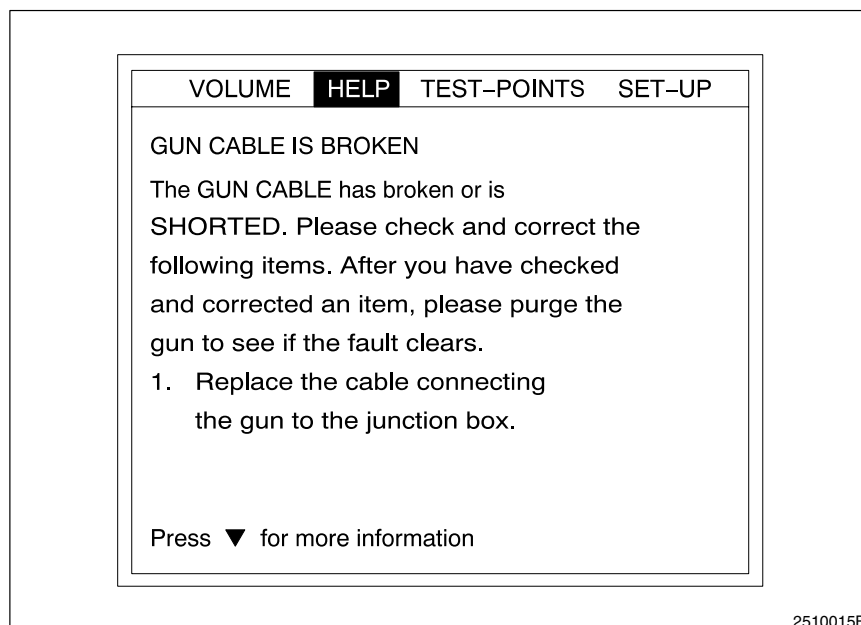


Fig. 4-4 Example of the HELP Screen

TEST-POINTS

The TEST-POINTS screen is reserved for use by Nordson field service engineers.

SET-UP

See Figure 4-5.

Set the parameters that affect Pro-Flo dispensing from the SET-UP screen.

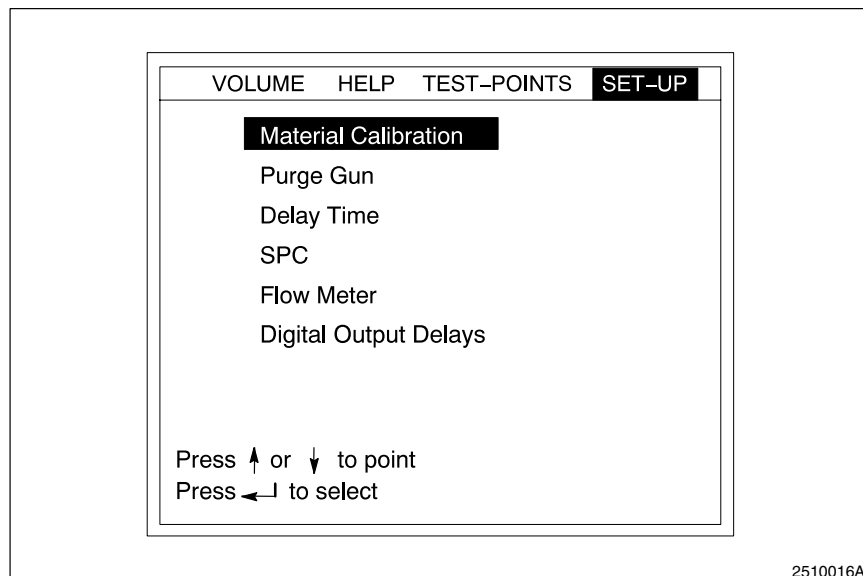


Fig. 4-5 SET-UP Screen

Highlight and select SET-UP, then select any of the following prompts:

Material Calibration

NOTE: Material is dispensed during this operation. Place a waste bucket under the gun. Do not allow the robot to move.

Run a material calibration after the controller is installed and whenever you change the type of dispensing material. Material calibration allows the controller to learn the material's shear thinning properties. When this prompt is selected, the controller runs an automatic routine for up to five minutes while dispensing material.

Purge Gun

The Dispense Time determines how long the gun stays open each time the Purge ON button is pressed. Enter a Dispense Time from 1 to 60 seconds.

Delay Time

The Tool Speed and gun delay times determine how fast the controller reacts to signals received from the robot controller. Sometimes delays are necessary to prevent the controller from reacting more quickly than the robot. These delays are in milliseconds (msec).

The Tool Speed parameter delays the controller's reaction to robot motion. Enter a Tool Speed delay from 0 to 500 msec.

The Gun On and Gun Off parameters delay the controller's reaction to the gun-on and gun-off signals from the robot controller. These parameters adjust the start and stop time of material dispensing. Enter Gun On and Gun Off delays from 0 to 500 msec.

Optional Statistical Process Control (SPC)

Use the SPC screen to clear data from the SPC queue or to download it to a PC using the Nordson DataLink program. Refer to the *Nordson DataLink User's Guide* for more information.

Flow Meter

When a new flowmeter is installed, enter its flow rate (or K-value) in counts/liter. The K-value is stamped on the side of the flowmeter body.

Digital Output Delays

If your system requires digital output delays, your local Nordson representative will configure it.

The on-screen prompts will alert you of any needed adjustments.

5. Initial Setup

Use this procedure to make one-time adjustments to the controller before beginning production for the first time.

When the controller is turned on, it performs a self-test routine to verify proper operation. After the routine is completed, begin this procedure to achieve the proper bead size and shape.

See Figure 4-2.

1. Use the screen select keys (1) to highlight SET-UP on the top menu bar of the display (11).
2. Enter the flow rate (or K-value) of the flowmeter in counts/liter. Use the up or down arrow key (2) to highlight the Flow Meter prompt. Enter the K-value stamped on the side of the flowmeter body.

NOTE: Material is dispensed during this operation. Place a waste bucket under the gun.

3. Run a material calibration. Use the up or down arrow key (2) to highlight the Material Calibration prompt. The controller runs an automatic routine for up to five minutes while dispensing material.
4. Use the bead size adjustment keys (4) to set the bead size, which is displayed on the bead size indicator (3).

NOTE: Bead size is a number between 1 and 99. Bead size has no units; it is simply a relative number.

5. Run a test part. Position the part under the gun and begin material dispensing from the robot controller.
6. If the bead is too small, adjust it to a higher number with the bead size adjustment keys (4). If the bead is too big, adjust it to a lower number.
7. If dispensing did not start or stop at the correct time, adjust the Gun On or Gun Off delay times. From the SET-UP screen, highlight the Delay Time prompt. Enter Gun On and Gun Off delays from 0 to 500 msec.

NOTE: Improper robot programming may be the cause of the incorrect dispensing start and stop times.

5. Initial Setup (contd)

8. Repeat steps 4 through 7 until you achieve a bead of the correct size and shape.
9. Record the bead size and the part ID. Return to this bead size every time this type of part is run.

NOTE: Once set correctly, the delay times should not need readjusting as other types of parts are run.

10. Repeat steps 4 through 9 to determine the desired bead size for every type of part to be run.

6. Setup Using Configurator

Use these procedures to install and operate the Configurator program.

Description

The Nordson Pro-Flo II Configuration Utility program (or Configurator) is used to create, read, and save configuration parameters of the Nordson Pro-Flo II Digital Controller. The program runs on IBM-compatible PCs.

Configurator is distributed with two batch files called SAVE and LOAD. These batch files are used to transfer files between the PC and controller. LOAD transfers files from the PC to the controller, and SAVE transfers files from the controller to the PC.

Refer to *Operation* in this section to set the desired configuration.

Requirements

To run the Configurator, you must have an IBM-compatible computer with at least:

- 386 microprocessor
- 640 kb of RAM
- DOS operating system, version 3.0 or later
- One floppy drive and one hard drive
- RS-232 serial communications port and cable

Installation

Follow the procedure in this section to install the Configurator program. All commands are typed at the DOS prompt.

1. Create a directory on your PC's hard drive to store the Configurator program. For example, to create a new directory called CONF, type:

```
MKDIR C:\CONF
```

2. Copy all files distributed on the program disk to the hard drive directory. If the program disk is in floppy drive A, type:

```
COPY A: *.* C:\CONF
```

The installation is now complete.

3. After installing the Configurator program, remove the program disk from the floppy drive and store it in a safe place.

Operation

Follow the procedure in this section to use the Configurator program. All commands are typed at the DOS prompt.

1. To make the Configurator program directory the active current directory, type:

```
CD C:\CONF
```

2. [See Figure 4-6.](#)

Start the program; type:

```
CONFIG
```

The copyright screen is displayed.

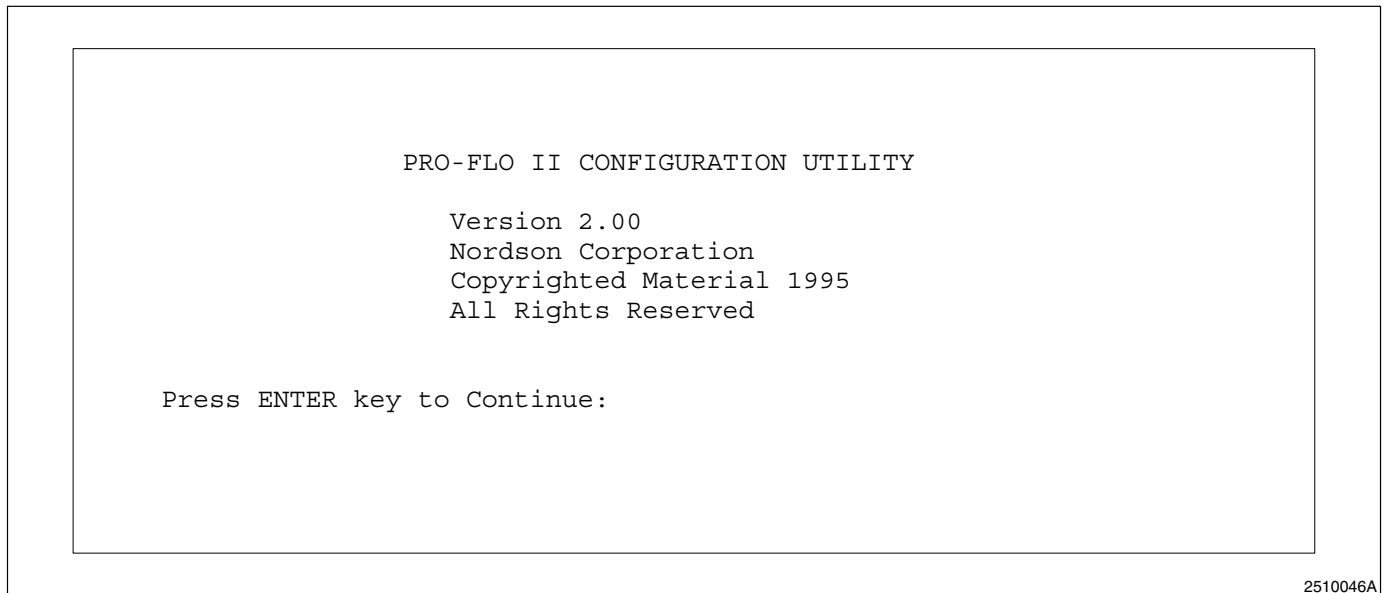


Fig. 4-6 Copyright Screen

3. Press the **ENTER** key to continue to the file selection screen.

NOTE: If you want to modify an existing file, it must be located in the currently active directory.

4. At the **file:** prompt, type the name of the file you want to create or modify. For example, to modify the default configuration file supplied by Nordson, type:

DEFAULT.CFG

NOTE: File names must have no more than eight characters, and should not contain periods, spaces, or an extension. The extension ".CFG" will be added automatically.

Operation (contd)

- 5. Press the **ENTER** key. The Configurator program reports the file across the bottom of the screen. This report includes the name of the file, the version of Configurator program used to create it, and the date and time the file was modified last.

File: DEFAULT.CFG Information

file is from Configurator version 2.00

date = 07/28/95 time= 09:39:44

Press ENTER key to Continue:

- 6. See Figure 4-7.

Press the **ENTER** key to display the top-level menu.

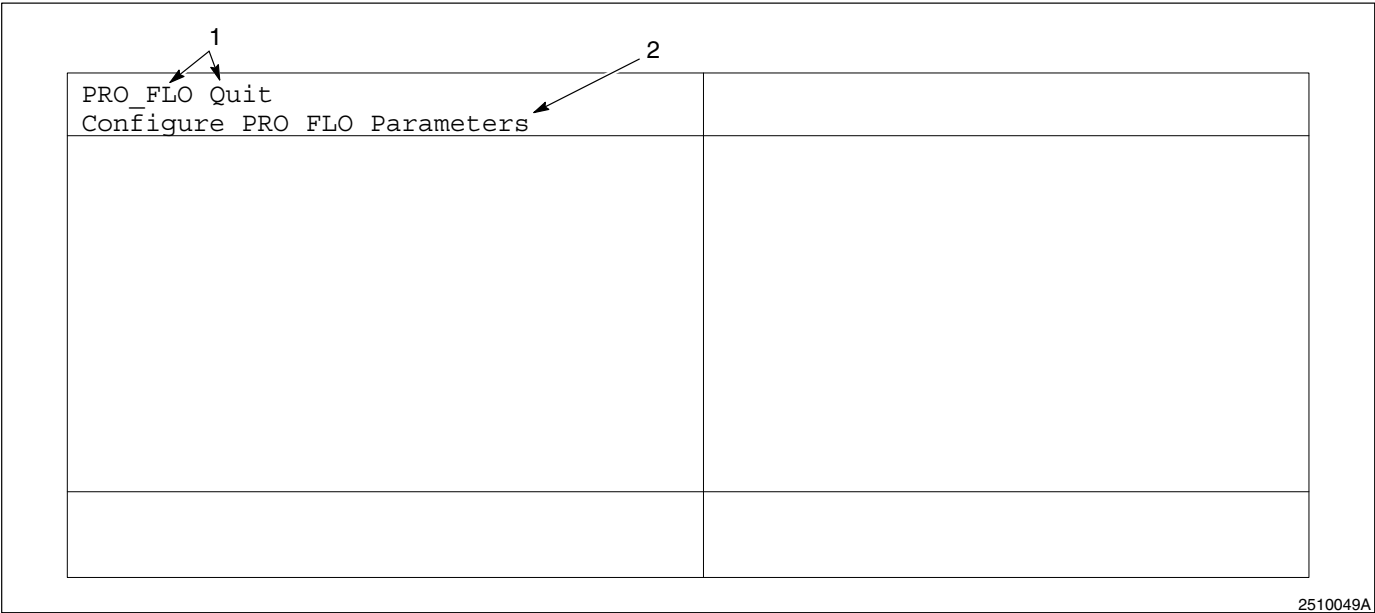


Fig. 4-7 Top-Level Menu

1. Screen selection menu
2. Screen description

The screen selection menu (1) is across the top line of the top-level screen. Use the arrow keys to highlight your selection. A blinking block cursor indicates that the screen is currently highlighted.

The screen description (2) gives a one-line explanation of the highlighted screen. To bring up the highlighted screen, press the **ENTER** key.

NOTE: A highlighted selection is indicated by a blinking block cursor positioned over the first character.

Quitting

To change an incorrect file name, or to quit the program:

1. See Figure 4-8.

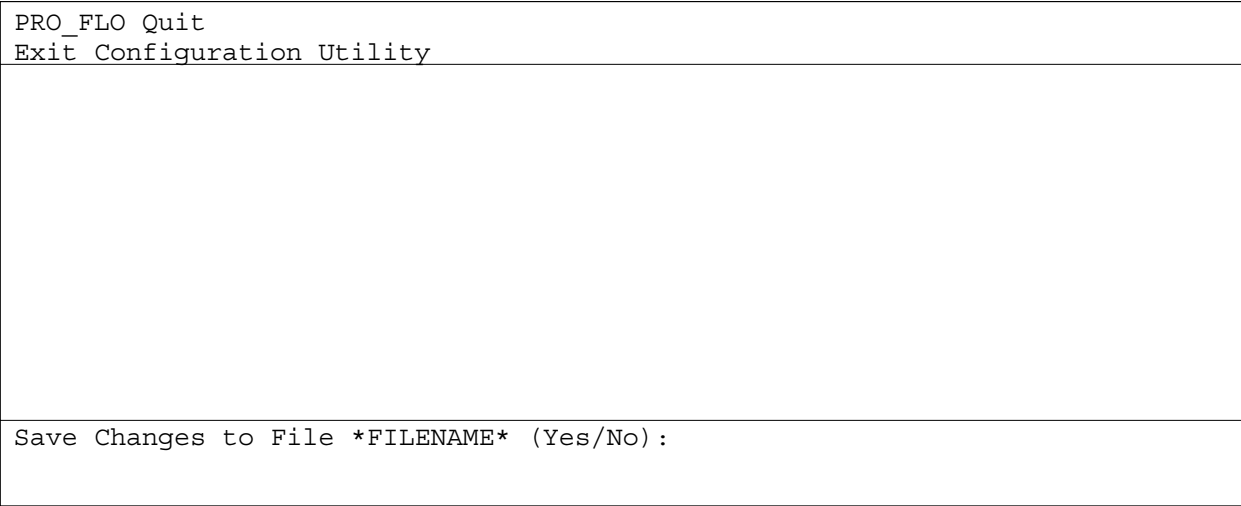
Highlight the Quit command and press the **ENTER** key. The program prompts you to save or discard any changes.

2. Type "Yes" or "Y" to save the changes,

OR

Type "No" or "N" to discard the changes.

NOTE: You can only save changes to the file that you opened.



The screenshot shows a terminal window with the following text:

```
PRO_FLO Quit
Exit Configuration Utility
```

Below this is a large empty rectangular area. At the bottom of the screen, there is a prompt:

```
Save Changes to File *FILENAME* (Yes/No) :
```

The text is in a monospaced font, typical of a terminal display.

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Fig. 4-8 Saving Changes

Creating a New Configuration File

New configuration files can be created using a previously saved configuration as a basis for the new file.

1. Make the Configurator program directory the active current directory; type:

CD C:\CONF

2. Create the new configuration file, type:

COPY DEFAULT.CFG NEWFILE.CFG

3. Change the parameters, as described in the next section, if desired.

Changing Parameters

This procedure describes how to change the setup parameters of an existing file.

1. Start Configurator and open the desired file. Refer to *Setup Using Configurator* in this section for instructions.

2. [See Figure 4-7.](#)

Highlight the PRO-FLO command in the screen selection menu (1).

NOTE: The help box at the bottom of the screen explains each parameter as it is highlighted.

3. Press the **ENTER** key. The Pro-Flo data entry screen is displayed.

NOTE: If your keyboard's arrow keys are located on the numerical keypad, make sure the NUM LOCK key is off before using the arrows.

4. [See Figure 4-9.](#)

Use the up or down arrow key to highlight the desired parameter.

PRO_FLO Parameters, Data Entry Table <ESCAPE = EXIT>	
Gun Delays: Analog Delay(1-500msec): 1 GunOn Delay(1-5,000msec): 1 GunOff Delay(1-5,000msec): 1 Digital Outputs: Output Number(0-3): 0 Output Name: On Delay(1-5,000msec): 1 Off Delay(1-5,000msec): 1 Flowmeter Counts per Liter: Counts(1-1,000,000): 1000 Volume Output: : Volume(1-1,000,000) : 1 Material Purge Parameters Purge Time(1-60sec): 1	Dispense Volume: HighVolume Alarm(%over): 20 LowVolume Alarm(%under): 20 System Parameters: Language(Eng, Ger, Fren): ENGLISH Volume Display(cc, oz): cc's Clock Format(24, 12hr): 24 Hours PressureUnits(psi, Bar): PSI Bead Options: Bead Size: 49 Bead Option: FULL Limited Range(1-50%): 25 Password(0-999): 123
Select Configuration Name (max 8 digits); ENTER KEY for DEFAULT:	

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Fig. 4-9 Data Entry Screen

- To change the value of a numerical parameter, highlight it and enter a number from the keyboard.

OR

If the prompt requires a text value, use the right and left arrow keys to scroll through the list of valid values. For example, the parameter *Language (Eng, Ger, Fren): ENGLISH* has three valid values: ENGLISH, GERMAN, and FRENCH.

- NOTE:** The range of valid values for each entry is shown as part of the prompt. If you enter a number that is too high, the highest valid number will be displayed. If you enter a number that is too low, the lowest valid number will be displayed.

- Once you make the correct entry, move to another parameter by pressing the up or down arrow key.

NOTE: You do not need to press the ENTER key after typing in a new value. The ENTER key has no effect on the data entry screen.

Saving Changes

After making all of your changes, press the **ESCAPE** key to the top level. Here, you may quit the program and save all changes made.

Transferring Files to and from the Pro-Flo Controller

This section describes how to transfer files between the PC and the controller using the LOAD and SAVE programs.

NOTE: LOAD and SAVE use the Nordson DataLink program to transfer files. Please make sure that DataLink is installed in the same directory as Configurator. Refer to the *Nordson DataLink User's Guide* for more information.

NOTE: Port2 is the only serial port on the Pro-Flo Controller that can be used to transfer files to and from the Configurator program.

1. Connect a serial cable from a serial port on the PC to port2 on the controller.
2. Change and save configuration options, as desired. Refer to *Changing Parameters* in this section for instructions.

NOTE: Most PCs come with two serial ports: COM1 and COM2. Either of these ports can be used.

3. To transfer a configuration file from the PC to the controller, type:

LOAD FILENAME COM1

FILENAME is the name of the file you want to transfer. The extension ".CFG" should not be typed as part of the filename; it will be appended automatically by Configurator.

Transferring Files to and from the Pro-Flo Controller *(contd)*

4. Press the **ENTER** key to execute the command.

The DataLink transfer screen is displayed on the PC as the file is transferred. Configurator records any warnings or errors generated by the transfer in a file named "trans.log". After the transfer is complete, the contents of this file are displayed.

5. To transfer a configuration file from the controller to the PC, type:

SAVE FILENAME COM1

FILENAME is the name you want to give the file on the PC. This can be either a new, or an existing filename. The extension ".CFG" will be appended automatically by Configurator. Press the return key to execute the command.

NOTE: If you type just LOAD or SAVE at the command prompt, instructions on how to use the commands will appear on the screen.

Maintaining Configuration Files

Keep a copy of the configuration file used on the PC as a backup. You may need to reload it on the controller if parameters are accidentally changed from the controller. You may find it useful to save several configuration files for example, one for each type of part run. Follow these tips to maintain your configuration files properly:

- Use the SAVE command to periodically save the configuration from the Pro-Flo controller to a file on the PC, and whenever an option has been changed from the controller. Before making the transfer, rename the old configuration file on the PC so that it may be used as a backup. Copy the new and old files to a floppy disk for backup.
- Before changing a configuration file with Configurator, copy the old configuration file to a different name, such as "OLD CFG". Make the changes to the original file, then transfer it to the controller using the LOAD command.
- Choose a name for the configuration file that indicates what controller it came from. Keep a log of the configuration file name, the date and time it was transferred, and the name of the controller from which it was transferred.
- Before upgrading to a new version of EPROM-based Pro-Flo controller software, use the SAVE command to transfer the old configuration file to the PC. Copy the file to a floppy disk for backup.
- After upgrading the EPROM-based software used by the Pro-Flo controller, use the newest version of the Configurator program.

On Board Configuration Backup

This feature allows the saving of up to three configurations on a portion of the SPC memory board. These configuration files are to be used in the event of CPU board failure.

If the CPU board fails and is replaced, using the Restore Configuration command in the Setup Screen will configure the new CPU board to work in the application.

This feature is a duplication of using a PC to reload a previously saved configuration and was added to the Pro-Flo controller for customers who do not have easy access to a portable PC on the shop floor.

NOTE: Exactly like the PC configuration files, the saved configuration will not be updated with the most recent A value for volume compensation nor will it be updated with any changes made to the controller without being saved.

In the case of the A value, this prevents a bad A value from a manual entry or from an improper dispense from being trapped into the configuration.

NOTE: The saving of the configuration should only be done by Nordson Corporation installers or service representatives.

Nordson strongly recommends that you do not save the configuration for trivial changes. Remember that the intent is to be able to replace the CPU board with its battery-backed RAM, restore the configuration, and get the Pro-Flo controller back up and operational.

Once the controller is up and dispensing, the volume compensation is self-correcting and any other changes that need to be done to optimize the application are done through the keypad.

Restore

The Restore function is located in the Set-Up screen, and is the last entry. This menu allows the selection of one of three previously saved configurations. The configurations are listed as A, B, and C. The display shows the time and date that the particular configuration was saved.

Save

The Save function is located in the hidden menu screen.

1. Select Next Page from the first screen.
2. Select Save Controller Configuration.

This Save screen also allows saving into one of three locations, A, B, or C.

NOTE: Loading a configuration file from a PC will not automatically save this new configuration in these menus.

If the configuration loaded from the PC is acceptable, the Nordson Corporation representative must manually save this as one of the three allowable configurations.

7. Startup

When the controller is turned on, it performs a self-test routine to verify proper operation. After the routine is completed, begin production.

[See Figure 4-2.](#)

1. Purge the gun to remove air from the material supply hose and nozzle. Press the ON key (6) to begin purging. The purge indicator (5) lights while the gun is open. Purging will stop after the purge time has elapsed. Otherwise, press the OFF key (6) to stop purging immediately.

NOTE: Material is dispensed during this operation. Place a waste bucket under the gun.

2. If you have changed the type of material since the last production run, perform a material calibration. Use the up or down arrow key (2) to highlight the Material Calibration prompt. Press the **ENTER** key (9). The controller runs an automatic routine for up to five minutes while dispensing material.

7. Startup (contd)

3. Check the correct bead size used for the type of part being run. Set the bead size using the bead size adjustment keys (4).
4. Display the VOLUME screen to monitor material dispensing characteristics. Use the screen select keys (1) to highlight VOLUME on the top menu bar of the display (11).
5. Position the part and begin dispensing from the robot controller.

NOTE: See Figure 4-1.

During dispensing, the robot signal indicators (2) illuminate when signals are received from the robot controller. Under normal operating conditions, these lights flash on and off in specific sequence.

8. Backup Mode

If a fault that affects system performance is generated during operation, you may stop production to correct the fault or continue operating in backup mode.

If one of the following faults is detected, you may continue production in backup mode with some sacrifice to bead dispensing characteristics:

- Gun cable
- Gun pressure transducer
- Flowmeter
- Flowmeter cable

If one of these faults is detected, the HELP screen will include a prompt to enter backup mode. When you enter backup mode, the BACKUP MODE indicator on the diagnostic panel lights and the alarm tower light shuts off. You can continue production dispensing without interruption.

Once the fault is corrected, the BACKUP MODE indicator light shuts off after the next part is run or the gun is purged.

Section 5

Troubleshooting

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.

1. Introduction

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.

Problem		Page
1.	Gun not dispensing material	5-2
2.	Gun not dispensing material, not opening	5-3
3.	Gun not dispensing material, opening fully	5-3
4.	Gun not changing dispensing rate to control bead size	5-3
5.	Gun not changing dispensing rate to control bead size, opening fully	5-3
6.	Gun dispensing early, before robot moves	5-4
7.	Gun dispensing after cycle ends, gun closed	5-4
8.	Dispensing delayed	5-4
9.	Bead deposition "wiggles"	5-4
10.	Unexpected bead-size change	5-4
11.	Material leaks from bonnet	5-4

2. Troubleshooting Chart

Follow the troubleshooting chart below.

Problem	Possible Cause	Corrective Action
1. Gun not dispensing material	Material supply pressure low	Increase the material supply pressure. Refer to the appropriate drum unloader manual.
	Nozzle blocked	Remove and clean the nozzle. Refer to the appropriate Pro-Flo gun manual.
	Material supply hose blocked	Check the material supply hose and unblock it. Refer to the appropriate Pro-Flo gun manual.
	Signals not received from robot in proper timing sequence	Set proper timing sequence. Refer to <i>Setting Timing Sequences</i> in the <i>Installation</i> section.
	Signals not received from robot controller or sent to gun	Check cable continuity and replace if necessary. Refer to the appropriate Pro-Flo gun manual.
	Spring closures are not retracted	Verify that power to the Pro-Flo controller and the robot controller is on. Verify that the solenoid supply air to the gun is on. Verify that air is present at the gun and that the air is at the correct pressure. Replace the spring closure assembly if it is defective.

Problem	Possible Cause	Corrective Action
2. Gun not dispensing material, not opening	<p>Absent or low control air pressure</p> <p>Stem binding</p> <p>Actuator malfunctioning</p> <p>Spring closures are not retracted</p>	<p>Check supply air pressure and increase if necessary.</p> <p>Remove the trimset valve and loosen the bonnet screw on a packing-type bonnet. Check and replace the stem and bonnet if necessary. Refer to the appropriate Pro-Flo gun manual.</p> <p>Replace the actuator. Refer to the appropriate Pro-Flo gun manual.</p> <p>Verify that power to the Pro-Flo controller and the robot controller is on.</p> <p>Verify that the solenoid supply air to the gun is on.</p> <p>Verify that air is present at the gun and that the air is at the correct pressure.</p> <p>Replace the spring closure assembly if it is defective.</p>
3. Gun not dispensing material, opening fully	Trimset valve blocked	Remove and clean the trimset valve. Refer to the appropriate Pro-Flo gun manual.
4. Gun not changing dispensing rate to control bead size	<p>Cordset damaged</p> <p>Gun control or extension cable damaged</p>	<p>Check the continuity of the cordset and replace if necessary. Refer to the appropriate Pro-Flo gun manual.</p> <p>Check the continuity and replace the cable if necessary. Refer to the appropriate Pro-Flo gun manual.</p>
5. Gun not changing dispensing rate to control bead size, opening fully	Pressure transducer in controller malfunctioning	Check the pressure output voltage of the controller board. Contact your Nordson Corporation representative.

2. Troubleshooting Chart

(contd)

Problem	Possible Cause	Corrective Action
6. Gun dispensing early, before robot moves	Signals from robot controller timed improperly	Set proper timing sequence. Refer to <i>Setting Timing Sequences</i> in the <i>Installation</i> section.
	Gun On or Tool Speed delay too short	Increase parameter settings. Refer to the <i>Operation</i> section.
7. Gun dispensing after cycle ends, gun closed	Control air pressure low	Check supply air pressure and increase if necessary.
	Needle not seating	Purge the gun. Refer to the appropriate Pro-Flo gun manual.
	Stem and trimset valve seat worn	Replace trimset valve. Refer to the appropriate Pro-Flo gun manual.
8. Dispensing delayed	Gun On signal from robot controller timed improperly	Set the proper timing sequence. Refer to <i>Setting Timing Sequences</i> in the <i>Installation</i> section.
	Gun On delay too long	Decrease the parameter setting. Refer to the <i>Operation</i> section.
	Stem binding (packing-type bonnet only)	Loosen the packing nut. Refer to the appropriate Pro-Flo gun manual.
9. Bead deposition "wiggles"	Nozzle too high above work piece	Lower the nozzle. Refer to the robot controller manual.
	Material speed through nozzle too high	Decrease the bead size. Refer to <i>User Interface</i> in the <i>Operation</i> section.
	Install a larger nozzle.	Contact your Nordson Corporation representative for part numbers.
10. Unexpected bead-size change	Nozzle partially blocked	Clean the nozzle. Refer to the appropriate Pro-Flo gun manual.
	Material exceeded shelf life	Use fresh material.
11. Material leaks from bonnet	Bonnet seals worn (lip seal-type only)	Replace the bonnet. Refer to the appropriate Pro-Flo gun manual.
	Bonnet screw loose (packing-type only)	Tighten the bonnet screw. Refer to the appropriate Pro-Flo gun manual.
	Bonnet packings worn (packing-type only)	Replace the bonnet. Refer to the appropriate Pro-Flo gun manual.

Section 6

Repair

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.

1. Introduction



WARNING: Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage.

2. Replacing the Controller

To replace the controller:

1. Turn off and lock out external electrical power to the controller.
2. Disconnect the cables and power leads.
3. Replace the controller with an identical unit.
4. Connect the cables and power leads.
5. Turn on electrical power to the controller.

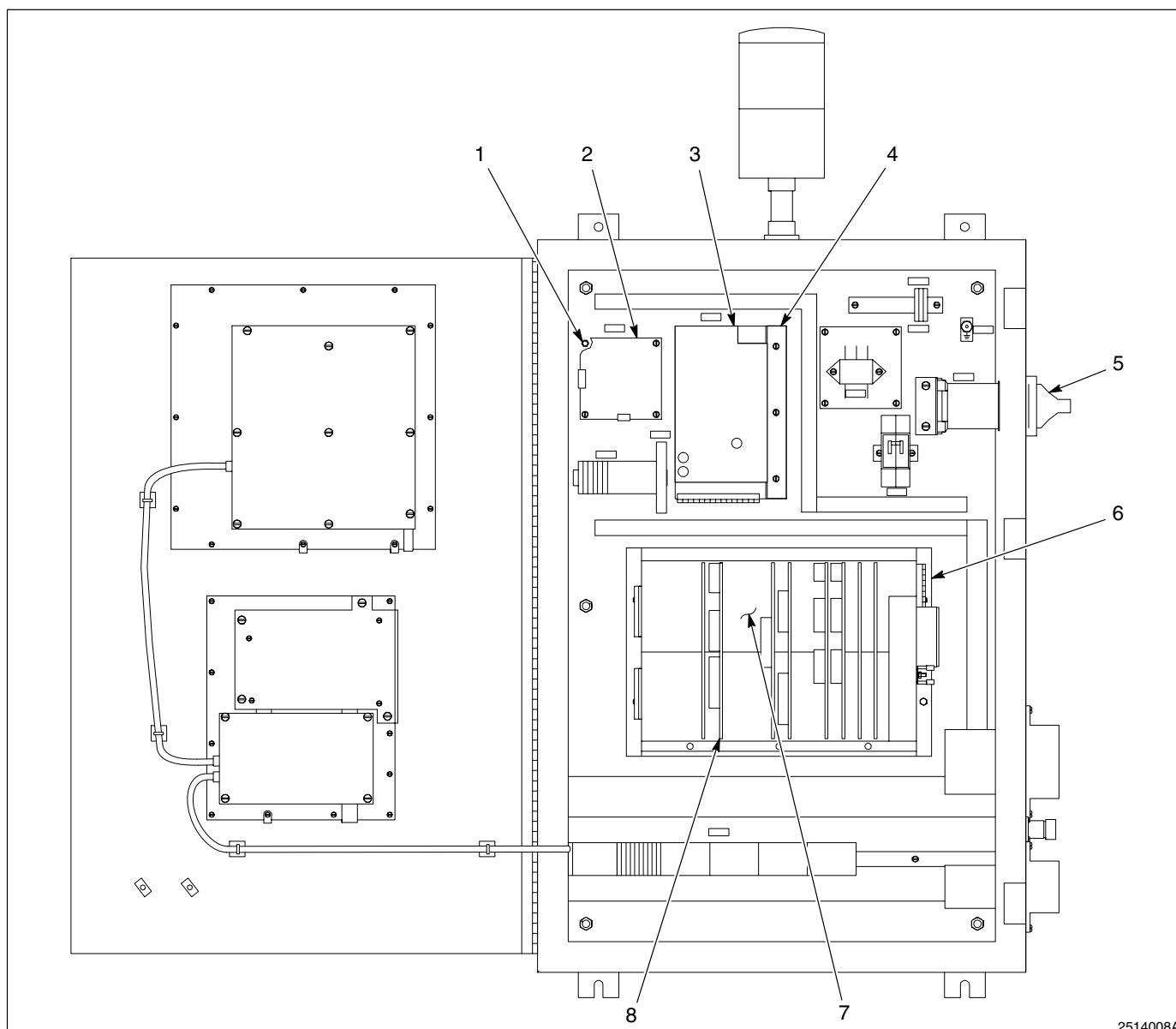
3. Replacing Components

The Pro-Flo System is modular in design, with components that are easily removed and replaced. Refer to the *Parts* section for part numbers of necessary components.

Power Supply

See Figure 6-1.

1. Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (5).
2. Open the enclosure door and disconnect and mark the cables from the power supply (3) and power monitor board (2).
3. Remove the three screws that hold the power supply support (4) to the enclosure. Remove the power supply support.
4. Remove the two screws securing the power supply to the power supply support.
5. Mount the new power supply to the power supply support.
6. Bolt the power supply to the enclosure.
7. Connect the cables to the power supply and power monitor board.
8. Adjust the power supply by following the instructions in the power supply manual.
9. Shut the enclosure door. Turn on the main rotary switch (5) and the electrical power to the system. If the controller does not operate properly, turn off the power, open the enclosure, and check the plug connections.



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Fig. 6-1 Controller Assembly Components

- | | | |
|------------------------|--------------------------|------------------|
| 1. Standoff | 4. Power supply support | 7. Backplane |
| 2. Power monitor board | 5. Main rotary switch | 8. Circuit board |
| 3. Power supply | 6. Card rack (installed) | |

Power Monitor Circuit Board

[See Figure 6-1.](#)

1. Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (5).
2. Open the enclosure door. Remove the plastic cover and the cables from the power monitor board (2).
3. Note the position of the circuit board (8) and remove it by taking out the standoffs (1).
4. Note the position of the voltage switch on the circuit board. Set the switch on the new circuit board to the same position.
5. Place the new power monitor board in position.
6. Connect the cables.
7. Shut the enclosure door. Turn on the main rotary switch. Turn on electrical power to the system.

Circuit Boards in Card Rack

1. Shut off and lock out external electrical power to the controller. Turn off the main rotary switch.
2. See Figure 6-1.

Open the enclosure door and remove the card rack (5).

3. See Figure 6-2.

Mark and disconnect the cables from their connections (4). Mark and disconnect any other cable plugs from the board (1).

4. Push the board ejector (2) to dislodge the circuit board from the backplane (See Figure 6-1, (7)). Slide the device from the slot in the card rack.

NOTE: Circuit boards can be mounted in any position in the card rack. Addresses are determined by the board circuitry and rotary switch positions.

5. Note the position of the rotary switch (3). Set the switch on the new circuit board to the same position.

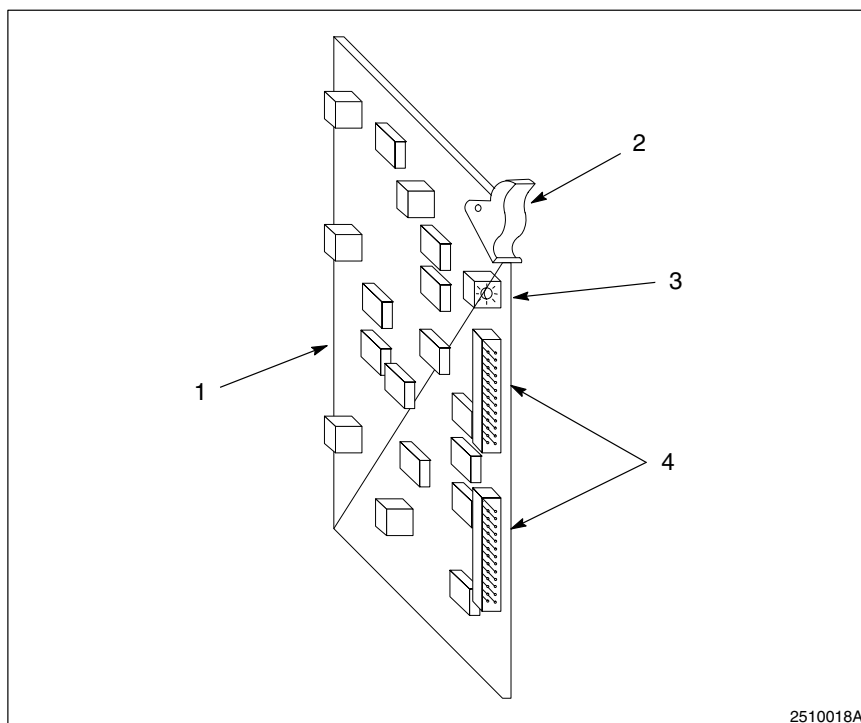


Fig. 6-2 Rotary Switch Setting (Board Address)

- | | |
|------------------|----------------------|
| 1. Circuit board | 3. Rotary switch |
| 2. Board ejector | 4. Cable connections |

Circuit Boards in Card Rack

(contd)

NOTE: When replacing a memory board, set the rotary switch to 14. When power is restored, make sure the following message is displayed: "SPC RAM 0 CONTROL INTERFACE INSTALLED."

NOTE: For two I/O boards, set the rotary switch on the first to 0, and on the second to 1.

6. Slide the new circuit board (1) in the slot until it locks in place.
7. Connect the cables.
8. Shut the enclosure door. Turn on the main rotary switch. Turn on power to the controller.

NOTE: If the controller does not recognize the board and does not display a message during start up, turn off the controller and lock out power. Make sure the board is seated and the rotary switch is set properly.

Diagnostic Panel

1. [See Figure 6-1.](#)

Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (5).

2. [See Figure 6-3.](#)

Open the enclosure door and disconnect the cable from the diagnostic panel (1).

3. Remove the nine screws that hold the diagnostic panel (1) to the enclosure door. Remove the diagnostic panel.
4. Bolt the new diagnostic panel (1) to the enclosure door.
5. Connect the cable to the diagnostic panel.
6. [See Figure 6-1.](#)

Shut the enclosure door. Turn on the main rotary switch (5) and the electrical power to the system. If the controller does not operate properly, turn off the power, open the enclosure, and check the plug connections.

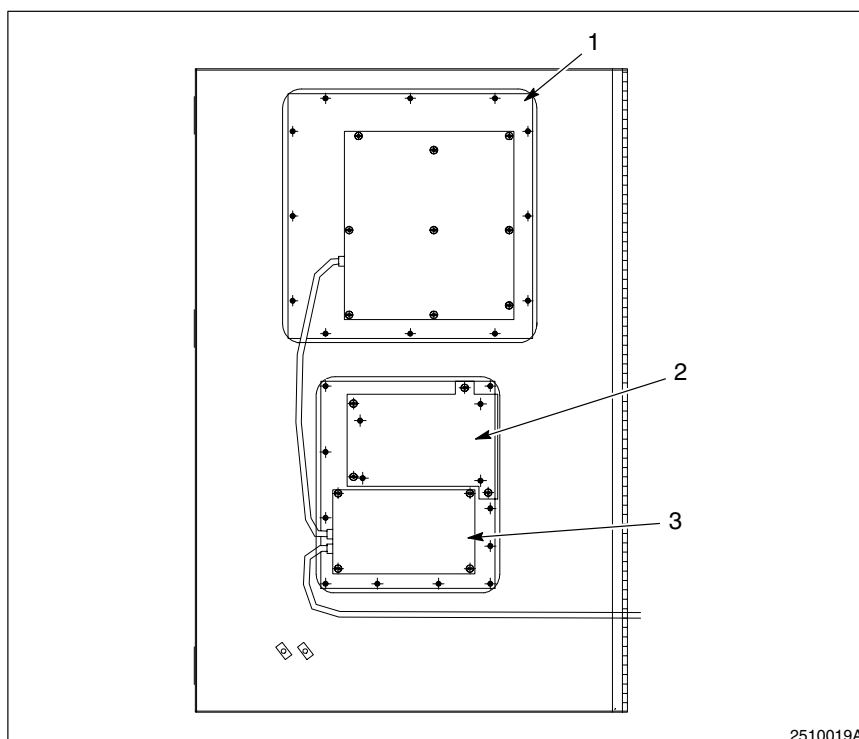


Fig. 6-3 Components Inside the Front Enclosure Door

- | | |
|---------------------|-----------|
| 1. Diagnostic panel | 3. Keypad |
| 2. VGA display | |

VGA Display

1. [See Figure 6-1.](#)

Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (5).

2. Open the enclosure door.
3. Remove the four screws that hold the VGA support plate to the enclosure door. Pull the support plate out slightly and disconnect the cable underneath. Remove the VGA support plate.
4. See Figure 6-3.
Remove the screws securing the VGA display (2) to the support plate.
5. Mount the new VGA display to the support plate.
6. Hold the support plate near its final position and connect the bottom cable. Bolt the support plate to the enclosure door.

VGA Display *(contd)*

7. [See Figure 6-1.](#)

Shut the enclosure door. Turn on the main rotary switch (5) and the electrical power to the system. If the controller does not operate properly, turn off the power, open the enclosure, and check the plug connections.

Keypad

1. [See Figure 6-1.](#)

Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (5).

2. [See Figure 6-3.](#)

Open the enclosure door and disconnect the two cables from the keypad (3).

3. Remove the six screws that hold the keypad to the enclosure door. Pull the keypad out slightly and disconnect the cable underneath. Remove the keypad.
4. Hold the new keypad near its final position and connect the bottom cable. Bolt the keypad to the enclosure door.
5. Connect the two cables to the keypad.
6. [See Figure 6-1.](#)

Shut the enclosure door. Turn on the main rotary switch (5) and the electrical power to the system. If the controller does not operate properly, turn off the power, open the enclosure, and check the plug connections.

4. Cable Continuity

Cables should be checked periodically and replaced when worn or frayed. If a working system malfunctions, check that the cable connections are tight. Check the cables for continuity with an ohmmeter. Refer to the cable wiring tables given in the *Specifications* section.

Section 7

Parts

Section 7

Parts

1. Introduction

To order parts, call the Nordson Customer Service Center or your local Nordson representative. Use the 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.

Item	Part	Description	Quantity	Note
—	000 0000	Assembly	1	A
1	000 000	• Subassembly	2	
2	000 000	• • Part	1	

- 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.

2. General Motors Pro-Flo Controller

See Figure 7-1.

Item	Part	Description	Quantity	Note
1	-----	Enclosure	1	
2	100 8045	Switch, rotary, 3 pst	1	
3	282 864	Circuit breaker	1	
4	117 188	Fan assembly	1	
5	107 499	Back plane	1	
6	105 987	Board, circuit, I/O	2	
7	227 119	Board, circuit, serial	1	
8	135 117	Board, circuit, memory	1	A
9	320 907	Board, circuit, CPU	1	
10	322 876	Board, circuit, gun	1	
11	282 960	Interconnect cable diagnostic, panel to keypad, 2 ft	1	
12	160 4380	PCA keypad panel, Pro-Flo	1	B, D
13	185 670	Keyboard assembly, English	1	
14	1604375	Display, QVGA	1	C, D
15	282 959	Interconnect cable diagnostic, keypad to console module, 2.5 ft	1	
16	185 669	Diagnostic panel, English	1	
17	185 681	PCA, diagnostic display	1	
18	109 302	Board, circuit, power monitor	1	
19	233 612	Board, circuit, power supply	1	
20	230 727	Light, tower, red & yellow	1	
NS	185 670	Board, PC, display configurator	1	
NS	160 4376	Service kit, Pro-Flo display replacement	1	E

NOTE A: Memory board included with the Pro-Flo Controller (SPC) option only.

B: 1604380 PCA replaces obsolete part number 185657.

C: 1604375 display replaces obsolete part numbers 221699 and 1034019

D: An obsolete keypad board (185657) will not work with a new display (1604375).

E: Service kit includes one 1604375 display and one 1604380 keypad panel.

NS: Not Shown

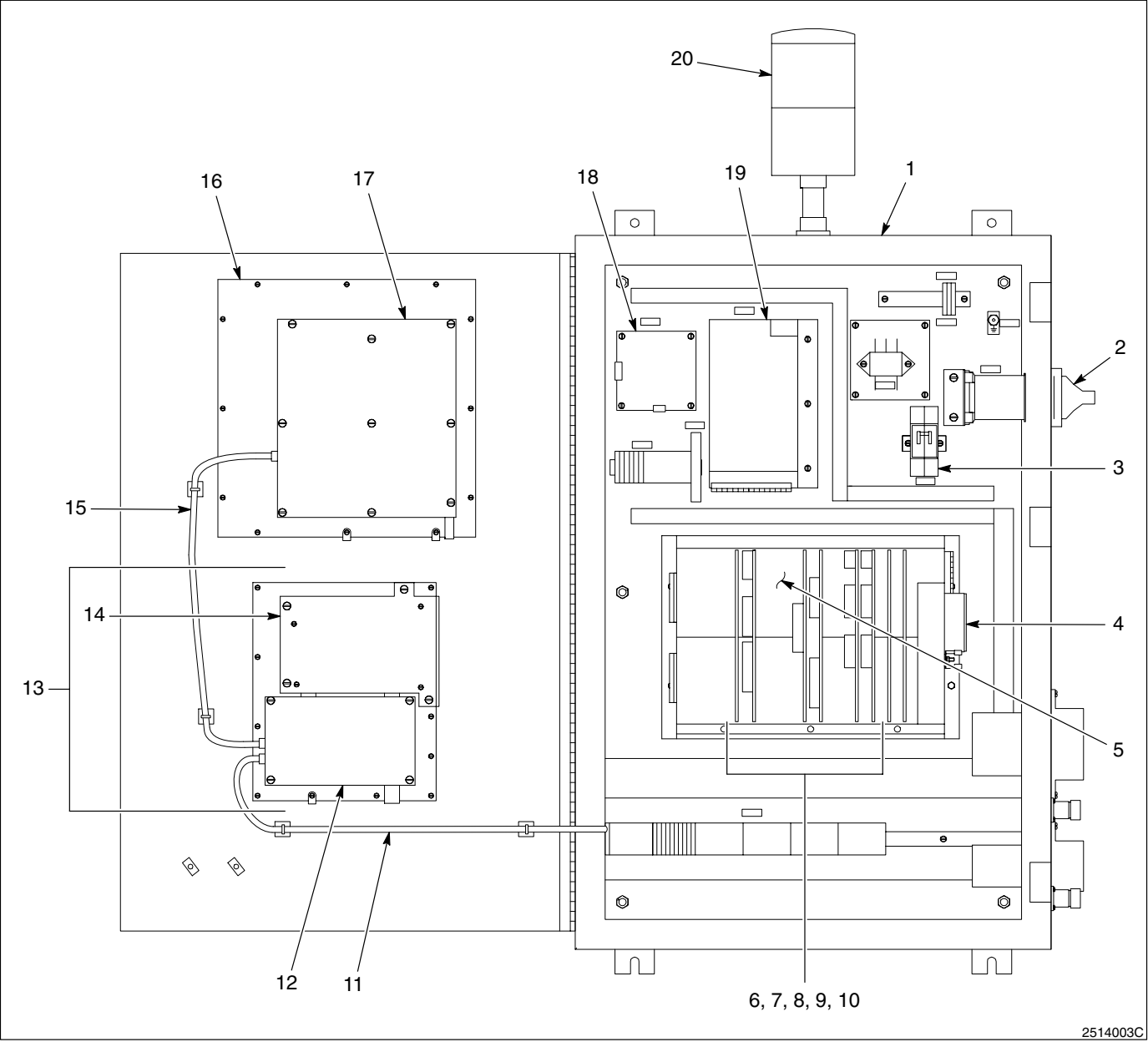


Fig. 7-1 General Motors Pro-Flo Controller

3. Accessories and Kits

These accessories may be purchased separately.

Part	Description
281 132	Kit, proportioning valve (for air spray)
154 376	Kit, material cut-off module
144 259	Software program, DataLink, 3.5-in. disk
155 450	Battery backup service kit

4. Cable

Use this list to order replacement cables of the correct type and length.

Part	Description
228 622	Cable, communication, 2 ft
233 524	Cable, robot, interface, 4 ft
221 821	Cable, flowmeter assembly, 70 ft
235 876	Cable, control, Pro-Flo gun, 70 ft
235 872	Cable, control, Pro-Flo gun, sacrificial, 16 ft
235 882	Sacrificial, flowmeter, cable, 16 ft

Section 8

Specifications

Section 8 Specifications



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

1. *Electrical*

The controller may be purchased for either 120 or 240 V line voltages. Each configuration requires 2A of current. Hard wire the controller into a dedicated power supply to provide safe operation and to reduce interference from electrical noise.

2. *Cables*



WARNING: Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage.

The following charts will help you determine the continuity of Nordson Pro-Flo system cables. Make sure power is disconnected before removing cables and testing them.

2. Cables (contd)

Table 8-1 Robot Interface Cable

Pin Number	After 8/96 Reference Signal 24 Volt I/O
Ground1	Ground
1	24V (Supply Voltage)
2	Ground
3	Ground
4	Part ID (BIT 3)
5	Part ID (BIT 2)
6	Part ID (BIT 1)
7	Part ID (BIT 0)
8	Part OK
9	Part Strobe
10	Clear Fault Queue
11	Fault Ack
12	Gun On
13	Purge
14	Dispenser Ready
15	Fault (MSB 3)
16	Fault (BIT 2)
17	Fault (BIT 1)
18	Fault (LSB 0)
19	Fault Strobe
20	Analog Signal #1 (+)
21	Analog Signal #1 (-)
22	Analog Signal #2 (+)
23	Analog Signal #2 (-) (NOTE A)
24	Spare (NOTE A)
NOTE A: There is no second analog signal from the robot for these pins. These pins may be reassigned for other functions.	

Table 8-2 Gun Control Cable — Standard Interface

Controller end of standard cable (pin designator)	Function
U	Servo current (+)
T	Servo current (–)
S	Servo current (+)
R	Servo current (–)
P	Velocity/position transducer (–)
N	Velocity/position transducer (+)
M	Signal (+)
L	Signal (–)
K	Excitation (+5 V)
J	Excitation common (+5 V)
H	—
G	—
F	Shield/ground
U	Jumper (+)
T	Jumper (–)

2. Cables (contd)

Table 8-3 Flowmeter Manifold Cable — Standard Interface

Controller end of standard cable (pin designator)	Wire color	Function
2-1	Red	Excitation (+)
2-2	Black	Out (–)
2-3	White	Out (+)
2-4	Green	Excitation (–)
2-5	Shield	Drain
2-6	Blue	+15 V
2-7	Brown	Signal
2-8	Gray	Signal common
2-9	Shield	Drain
2-10	Purple	RTD (+)
2-11	Yellow	RTD (–)
2-12		Not used
2-13		Not used
2-14		Not used
2-15		Not used
2-16		Ground

3. Robot Programming

Specification of the digital controller input and output signals and the fault codes generated are given to facilitate robot controller programming. Please refer to your robot controller manual for programming instructions.

Digital Controller I/O

Table 8-4 Card 0 I/O List

Card 0 inputs			
Terminal number	LED number	Input number	Function
Conn2-1	1	7	Air switch
Conn2-2	2	6	Part strobe
Conn2-3	3	5	—
Conn2-4	4	4	—
Conn2-5	5	3	—
Conn2-6	6	2	Fault acknowledge
Conn2-7	7	1	Gun
Conn2-8	8	0	Purge
Conn2-9	—	—	Common

Card 0 outputs			
Terminal number	LED number	Output number	Function
Conn3-1&2	9	7	Dispenser ready
Conn3-3&4	10	6	Fault bit #3 MSB
Conn3-5&6	11	5	Fault bit #2
Conn4-1&2	12	4	Fault bit #1
Conn4-3&4	13	3	Fault bit #0 LSB
Conn4-5&6	14	2	Fault strobe
Conn4-7&8	15	1	Light tower
Conn4-9&10	16	0	—

Digital Controller I/O (contd)

Table 8-5 Card 1 I/O List

Card 1 inputs			
Terminal number	LED number	Input number	Function
Conn2-1	1	7	—
Conn2-2	2	6	—
Conn2-3	3	5	Part ID MSB #5
Conn2-4	4	4	Part ID #4
Conn2-5	5	3	Part ID #3
Conn2-6	6	2	Part ID #2
Conn2-7	7	1	Part ID #1
Conn2-8	8	0	Part ID #0 LSB
Conn2-9	—	—	Common

Card 1 outputs			
Terminal number	LED number	Output number	Function
Conn3-1&2	9	7	Part OK
Conn3-3&4	10	6	System in backup
Conn3-5&6	11	5	—
Conn4-1&2	12	4	User assigned output 1
Conn4-3&4	13	3	User assigned output 2
Conn4-5&6	14	2	User assigned output 3
Conn4-7&8	15	1	User assigned output 4
Conn4-9&10	16	0	—

Table 8-6 Robot Fault Codes

Number	Binary	Description
1	0001	High dispensed volume
2	0010	Low dispensed volume
3	0011	High material supply pressure
4	0100	Low material supply pressure
5	0101	No material supply pressure
6	0110	Nozzle clog or down stream blockage
7	0111	Gun cable failure
8	1000	Flowmeter/booster pump failure
9	1001	Nozzle pressure transducer failure
10	1010	Flowmeter cable failure
11	1011	Upstream pressure transducer failed
12	1100	Upstream pressure transducer cable failure
13	1101	Robot signals out of sequence
14	1110	Gun failure
15	1111	Bead defect detected

Statistical Process Control (SPC) Data

Digital controllers equipped with an optional serial port interface may transfer SPC data logged by the controller to a personal computer. Data can be received by a computer running the Nordson DataLink program, which is sold separately.

The SPC data is presented in ASCII format, as comma-delimited text.

Statistical Process Control (SPC) Data (contd)

Table 8-7 Format of SPC Data

Column	Parameter	Units ^a
1	Date	—
2	Time	—
3	Part ID	—
4	Bead size	—
5	Volume set point	cc, oz
6	Current volume	cc, oz
7	Material temperature	°C or °F
8	Upstream pressure	bar or psi
9	SPC fault code I ^b	—
10	System status	—
11	SPC fault code II ^c	—

^aUnits may be changed using the Nordson Configurator program.

^bThis SPC code contains the primary fault, which is also reported on the Pro-Flo controller help screens.

^cThis SPC code contains all faults generated: both primary and secondary.

Decoding SPC Error Listings

The SPC error code listing of errors that occurred during the running of a part. Follow these steps to decode an SPC error listing:

1. Subtract the largest number from the **Code** column that yields a remainder greater than or equal to zero. This is the value of the first decoded error code.
2. If the remainder is greater than zero, subtract the largest number from the **Code** column that yields a remainder greater than or equal to zero. This value is the second decoded error code.
3. Continue subtracting the largest possible value until a remainder of zero is obtained.

EXAMPLE: An error code of 1060 is listed. The largest code that can be subtracted is 1024. The remainder is 36. The largest code that can be subtracted from the remainder is 32. Subtracting 32 from 36 yields 4. The largest code that can be subtracted from 4 is 4. The remainder is 0 and decoding is complete. The following errors were detected:

- 1024 — High dispensed volume
- 32 — Low nozzle pressure, sensor failed
- 4 — Gun full open > set time

Table 8-8 SPC Error Codes

Code	Description	Robot code
1	High dispensed volume	1
2	Low dispensed volume	2
4	High material supply pressure	3
8	Low material supply pressure	4
16	No material supply pressure	5
32	Nozzle clog or down stream blockage	6
64	Gun cable failure	7
128	Flowmeter/booster pump failure	8
256	Nozzle pressure transducer failure	9
512	Flowmeter cable failure	10
1024	Upstream pressure transducer failed	11
2048	Upstream pressure transducer cable failure	12
4096	Robot signals out of sequence	13
8192	Gun failure	14
16384	Bead defect detected	15

Decoding SPC Error Listing

(contd)

Table 8-9 SPC System Status Codes

Code	Description
1	In Back-up
2	Deferred Back-up
4	Material Calibration has been run
8	New pressure transducer offsets have been measured
16	“a” or “n” value has been changed through the keypad
32	The “a” value changed due to a purge
64	Cold Start Timer timed out
128	New Configuration file or defaults have been loaded
256	SPC data has been down loaded
512	Blank
1024	Blank
2048	Blank
4096	Blank
8192	Blank
16384	Blank
32768	Dispense cycle done in simulation mode

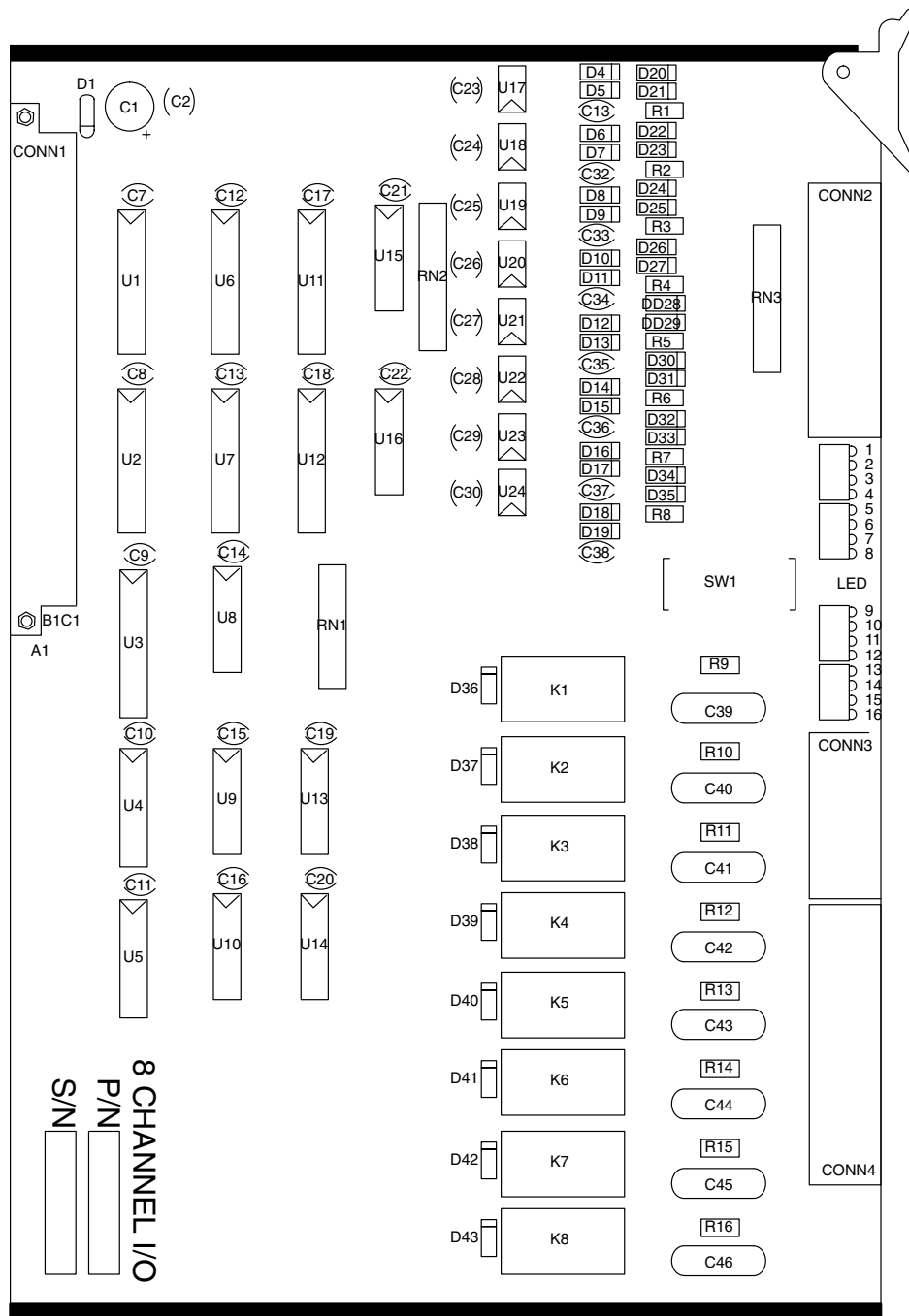
Pro-Flo II Gun Test Points

Refer to [Figure 8-3](#) to identify the described test points.

Table 8-10 Pro-Flo II Gun Test Points

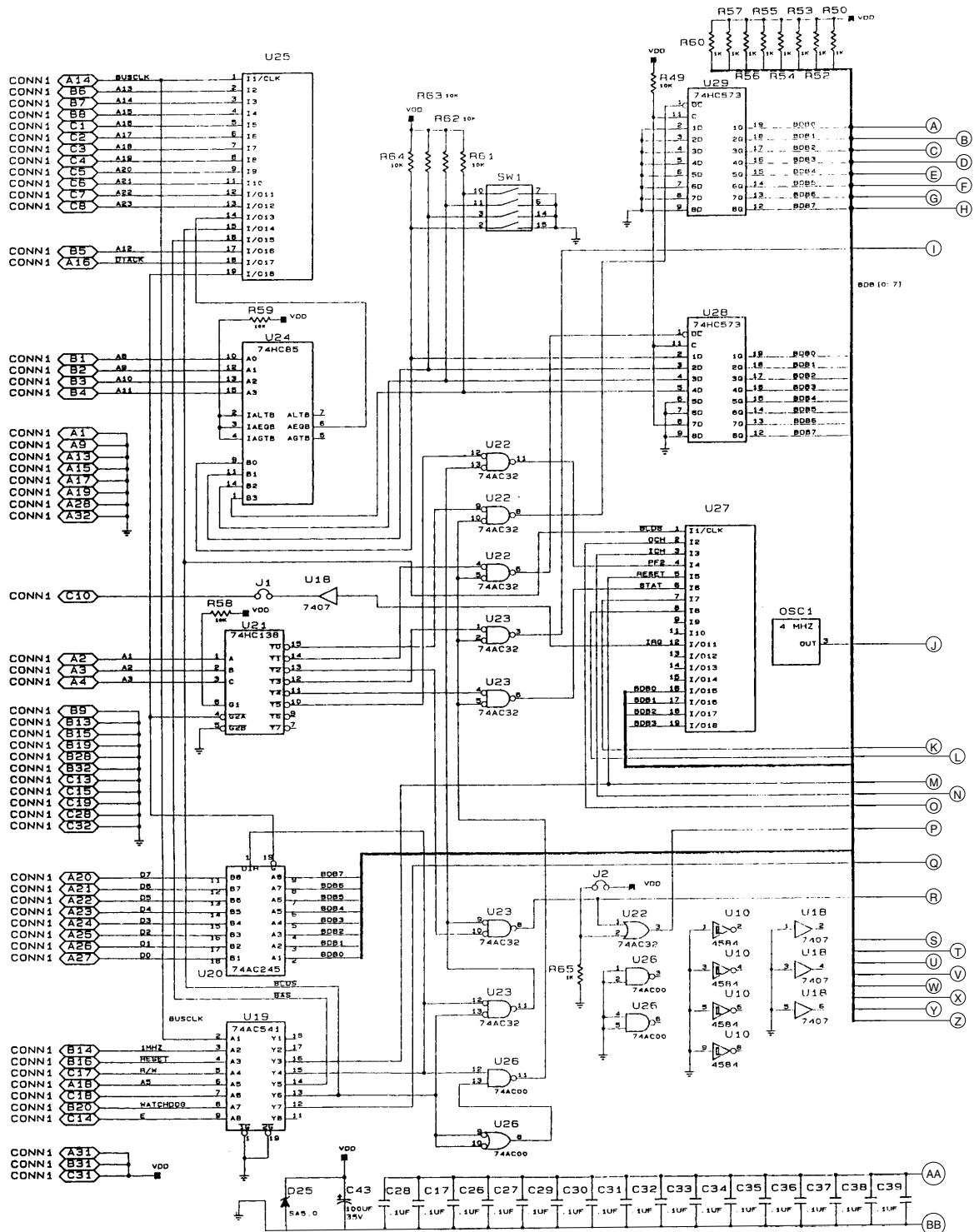
Test Point	Description
1	Ground
2	Analog Signal 1 (0–5V)
3	Analog Signal 2 (0–5V)
4	Upstream Pressure (0–5V)
5	Nozzle Pressure (0–5V)
6	Velocity Transducer (0–5V)
7	Servo Current (-10±10V)
8	Servo D/A (0–5V)
9	Air D/A (0–5V)
10	Aux D/A (0–5V)
11	Gun Temperature
12	5V Reference
13	Aux D/A (0–5V)
14	Position Transducer (0–5V)
15	Flow Meter (0–5V Square Waves)

4. Circuit Board Layouts and Schematics



2510044A

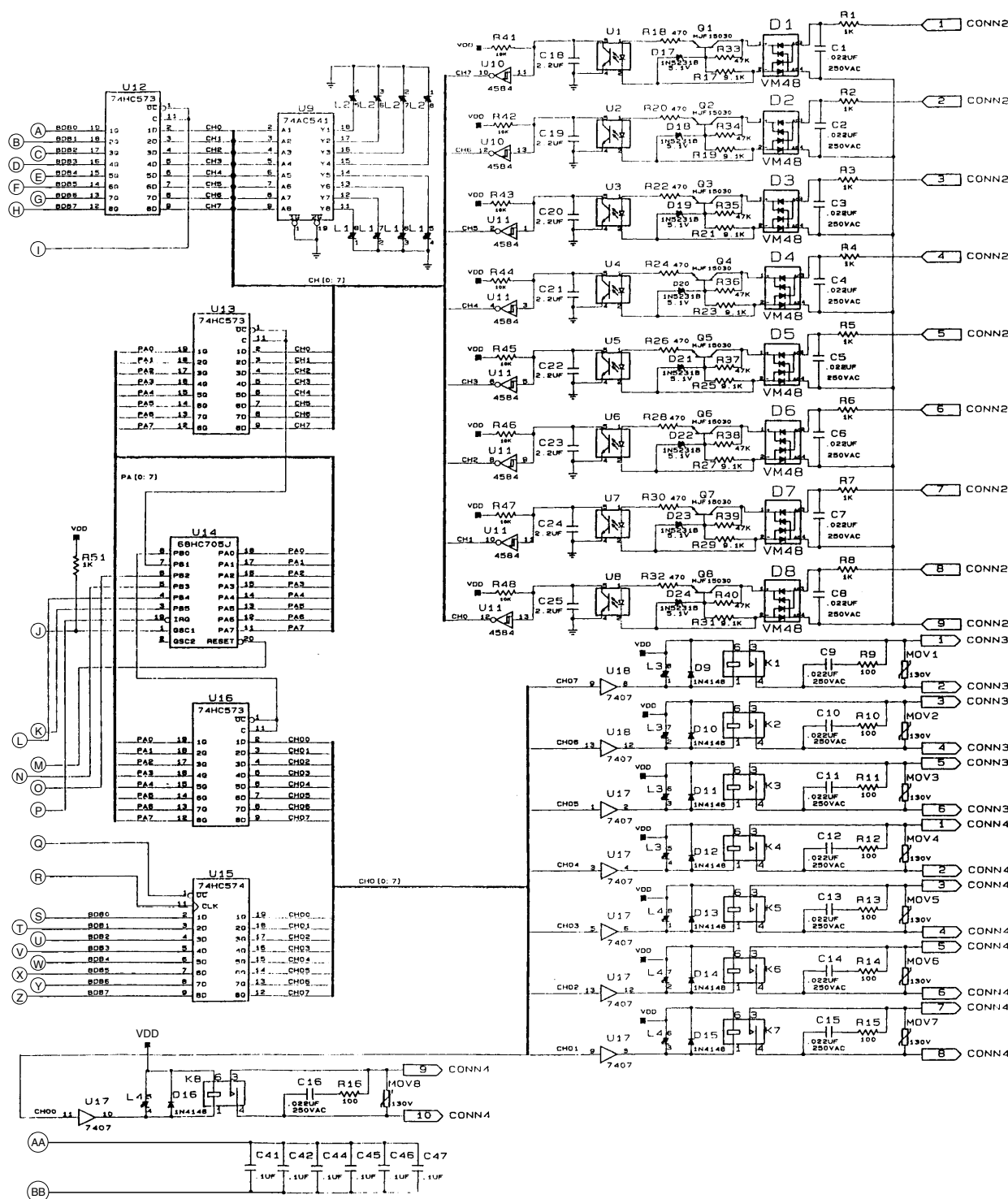
Fig. 8-1 Eight-Channel I/O Board Layout



2510051A

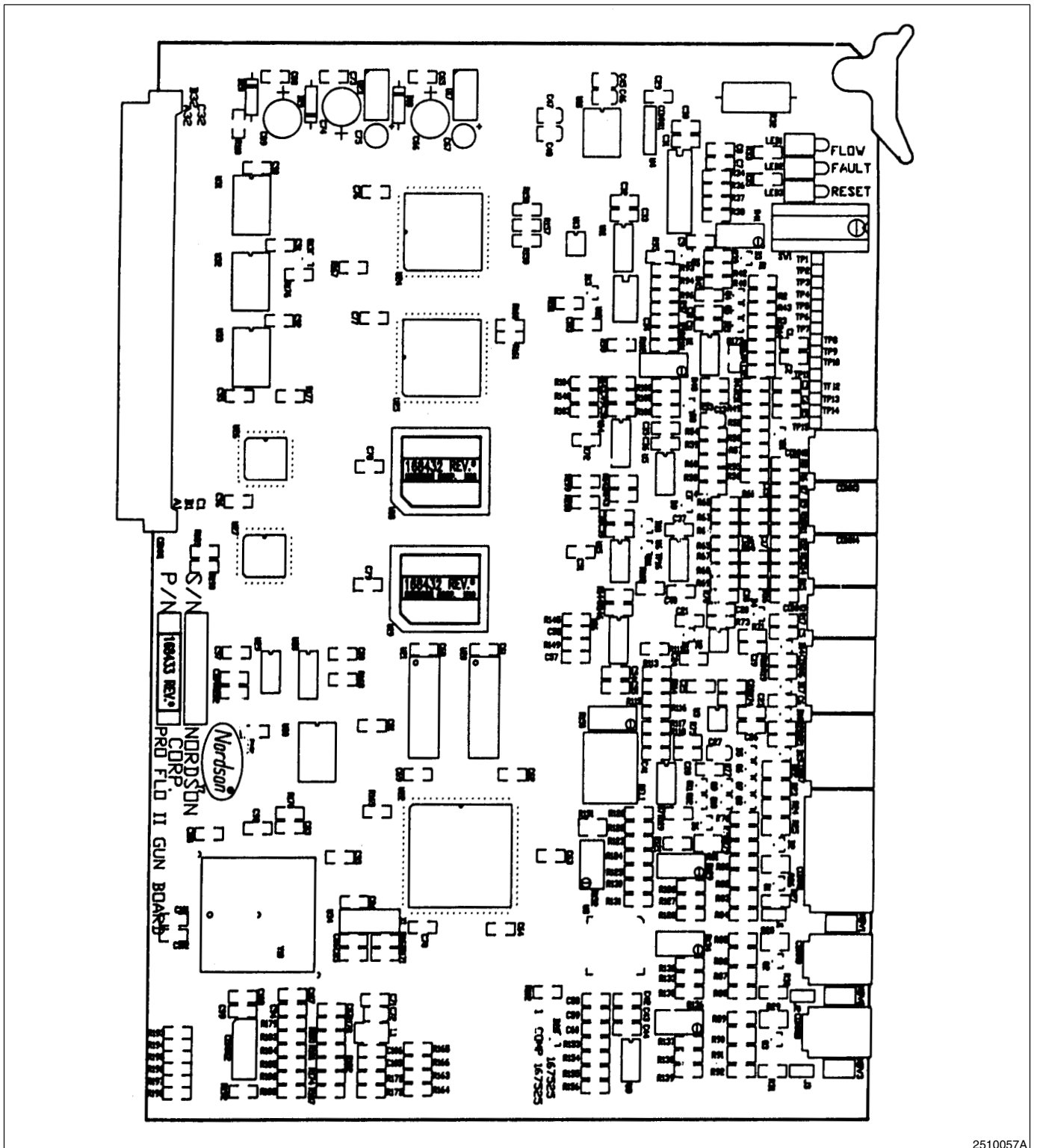
Fig. 8-2 Eight-Channel I/O Board Schematic (1 of 2)

4. Circuit Board Layouts and Schematics (contd)



2510052A

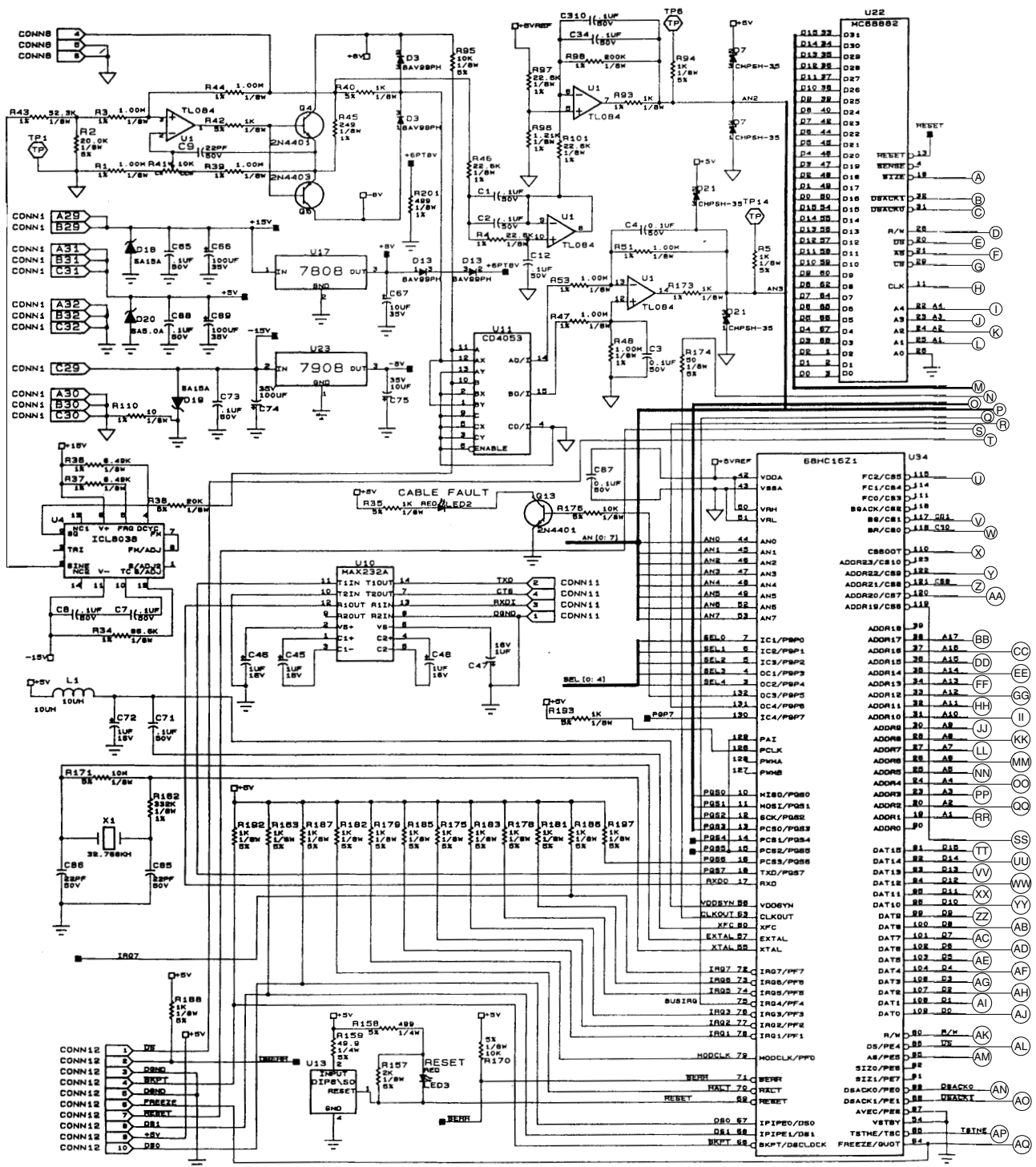
Fig. 8-2 Eight-Channel I/O Board Schematic (2 of 2)



2510057A

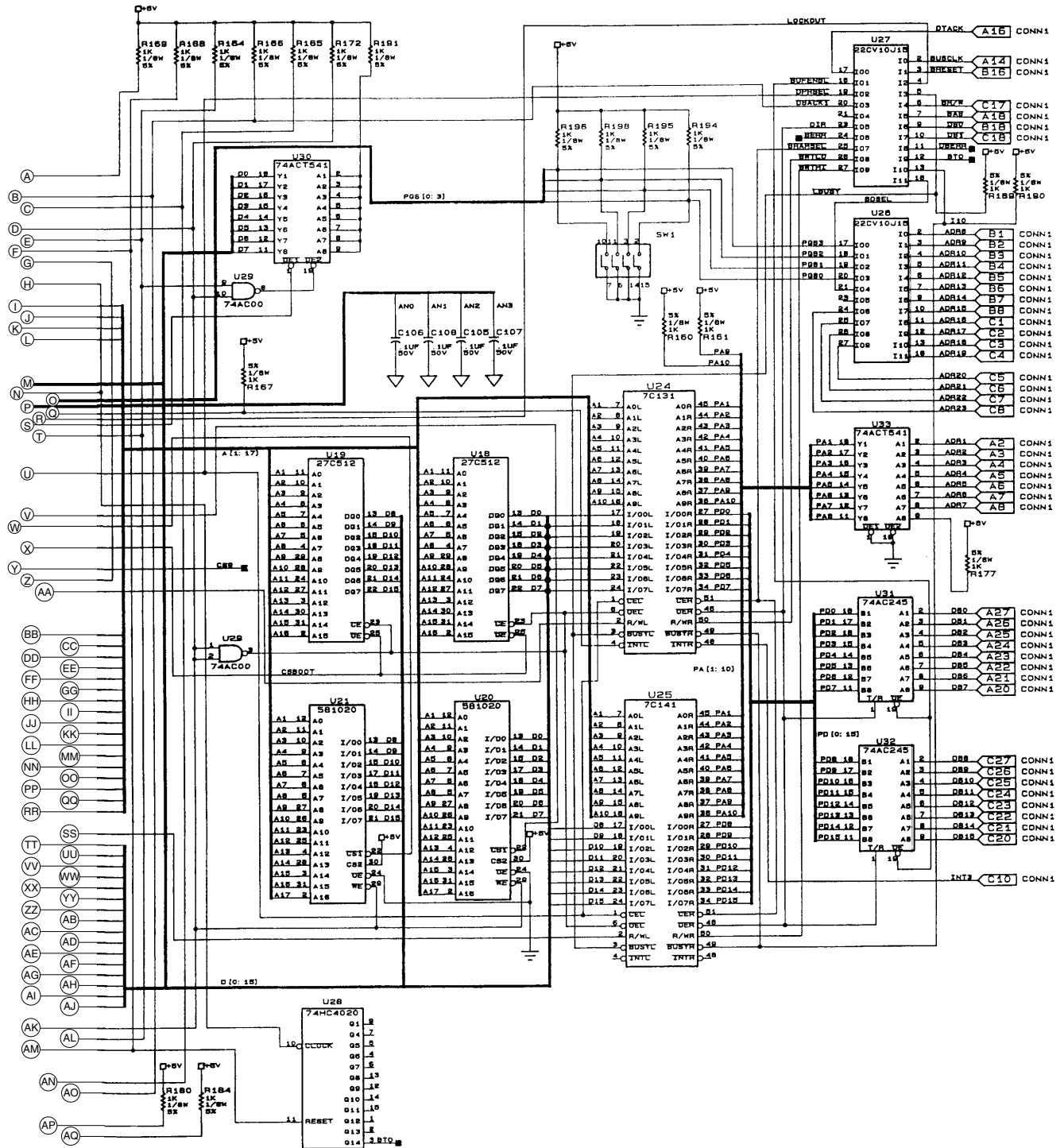
Fig. 8-3 Gun Board Layout

4. Circuit Board Layouts and Schematics (contd)



2510053A

Fig. 8-4 Gun Board Schematic (1 of 4)



2510054A

Fig. 8-4 Gun Board Schematic (2 of 4)

4. Circuit Board Layouts and Schematics (contd)

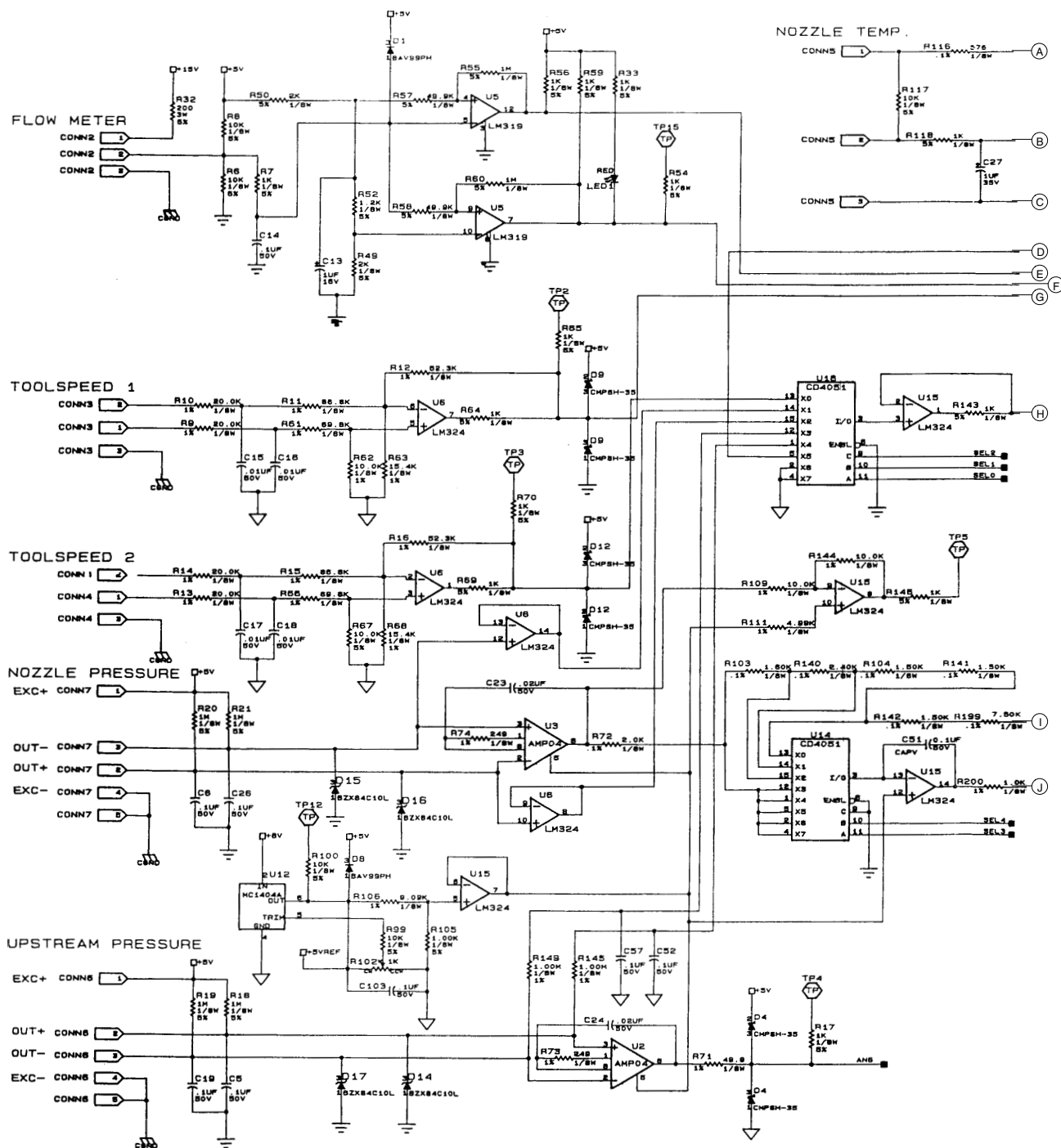
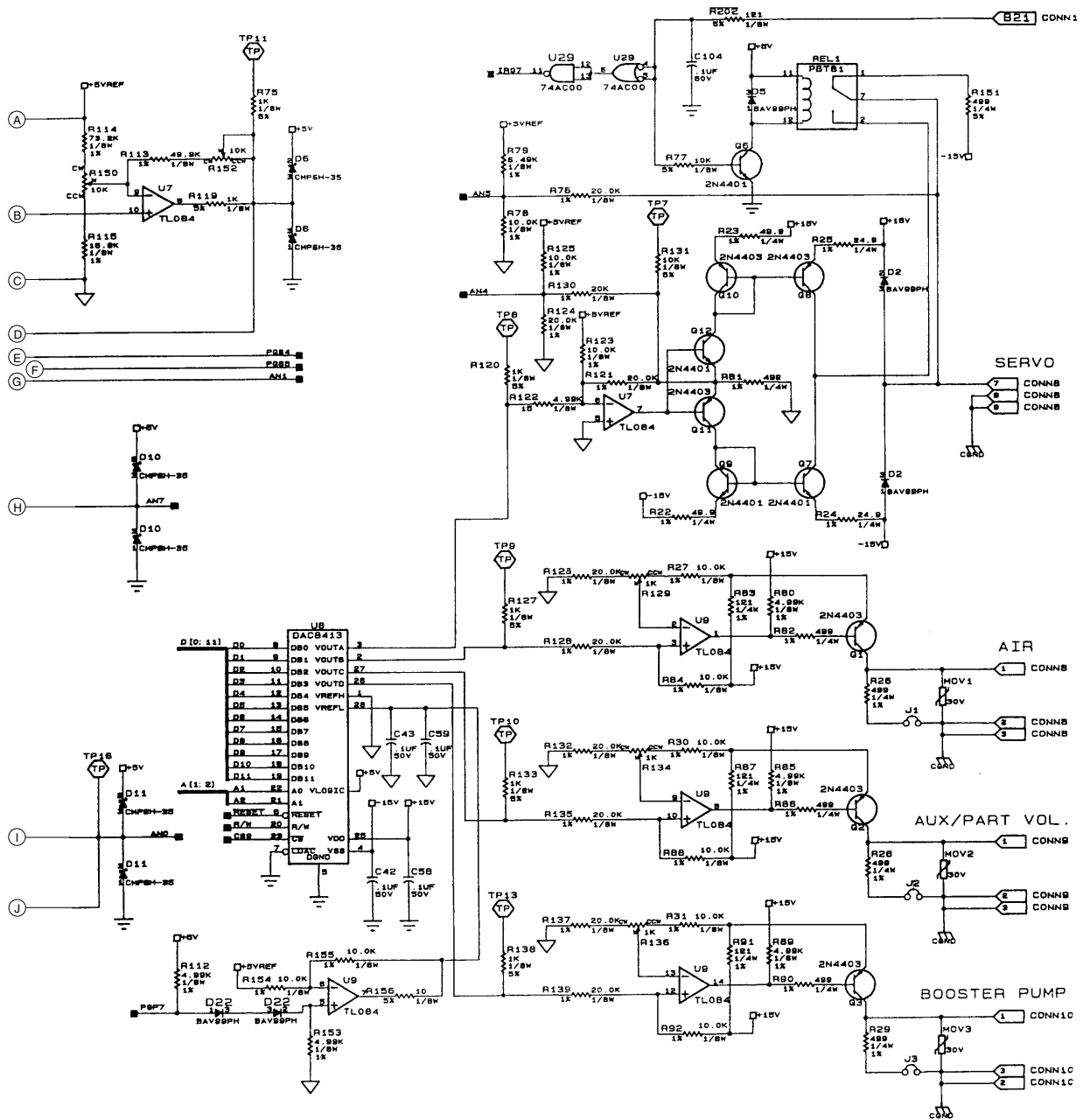


Fig. 8-4 Gun Board Schematic (3 of 4)



2510056A

Fig. 8-4 Gun Board Schematic (4 of 4)

4. Circuit Board Layouts
and Schematics (contd)

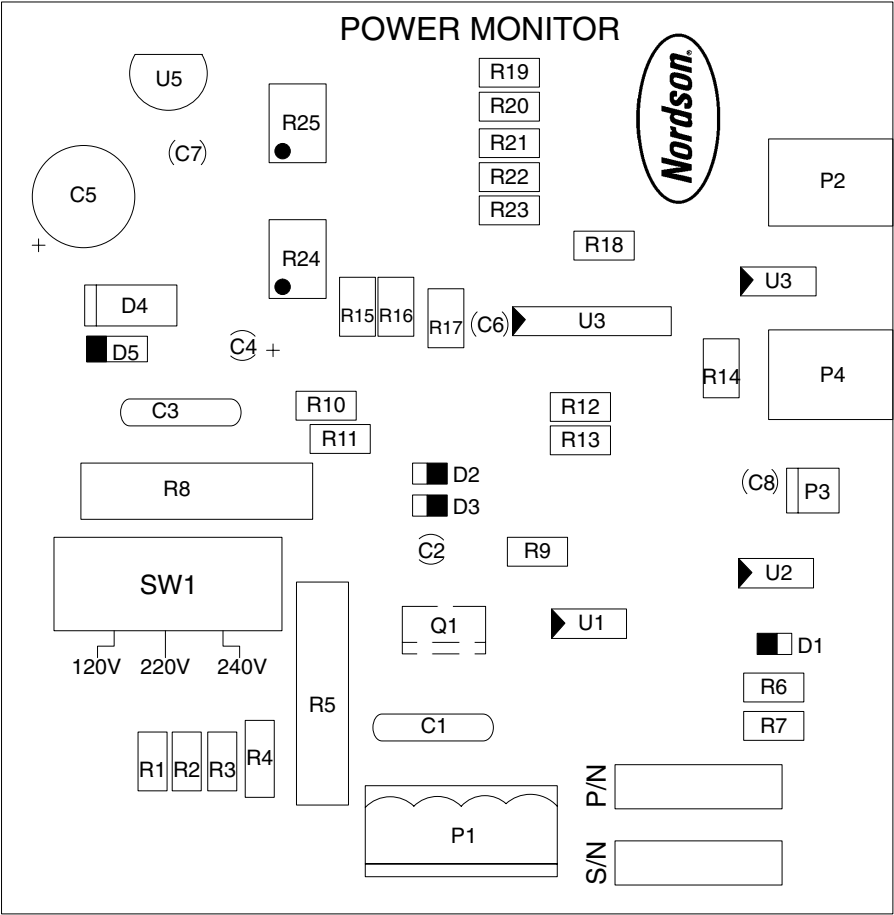
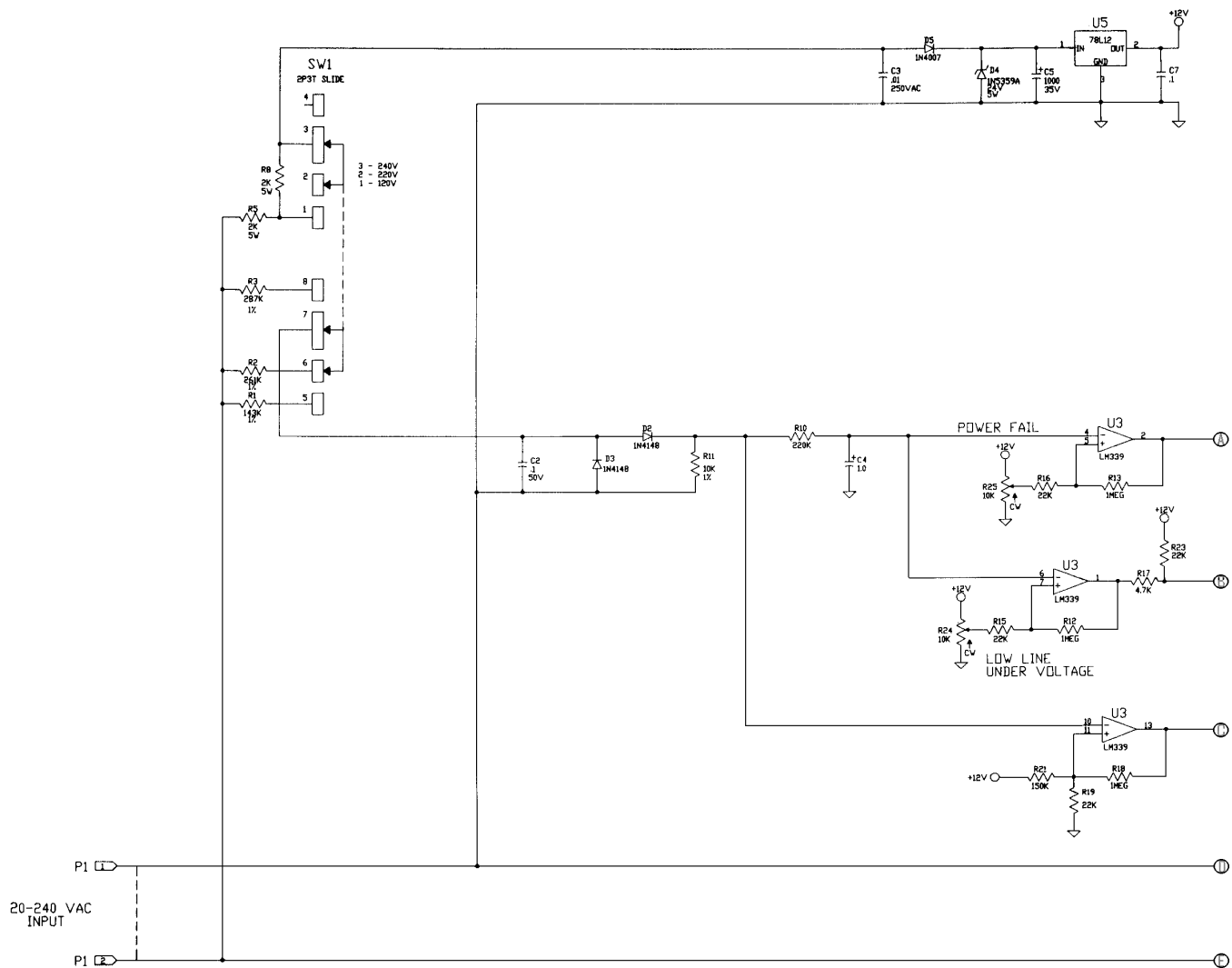


Fig. 8-5 Power Monitor Board Layout

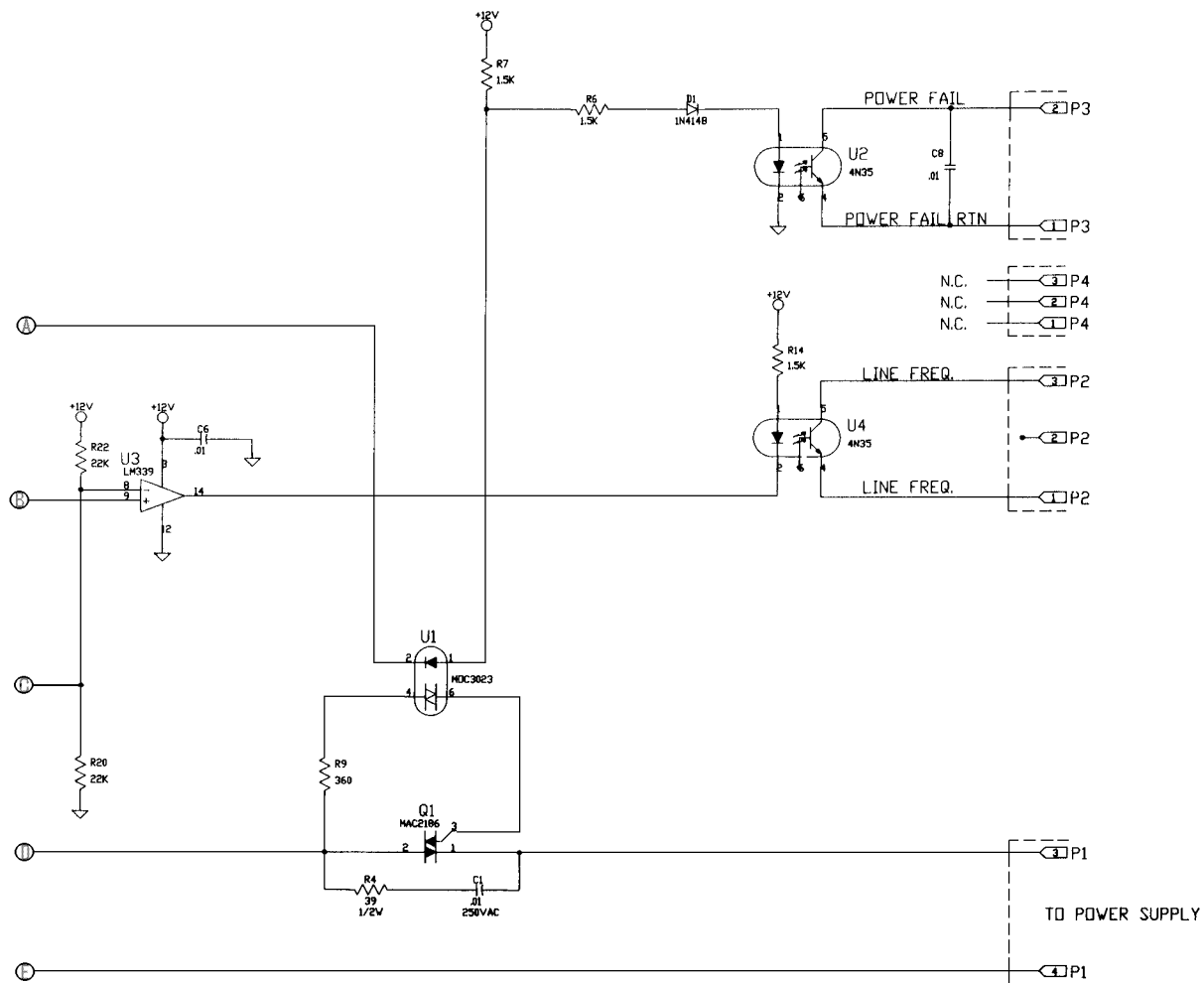
2510021A



2510022A

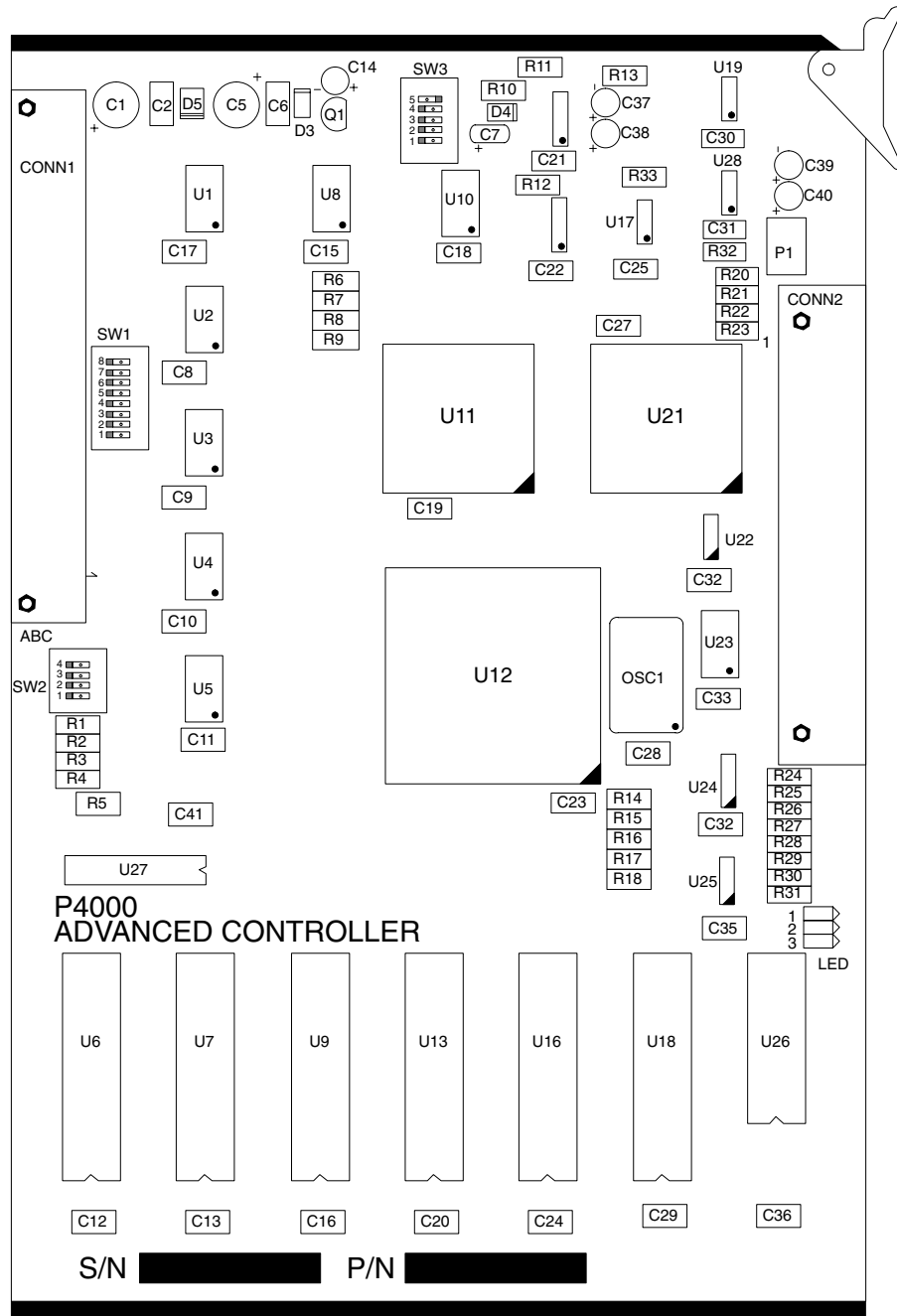
Fig. 8-6 Power Monitor Board Schematic (1 of 2)

4. Circuit Board Layouts and Schematics (contd)



2510023A

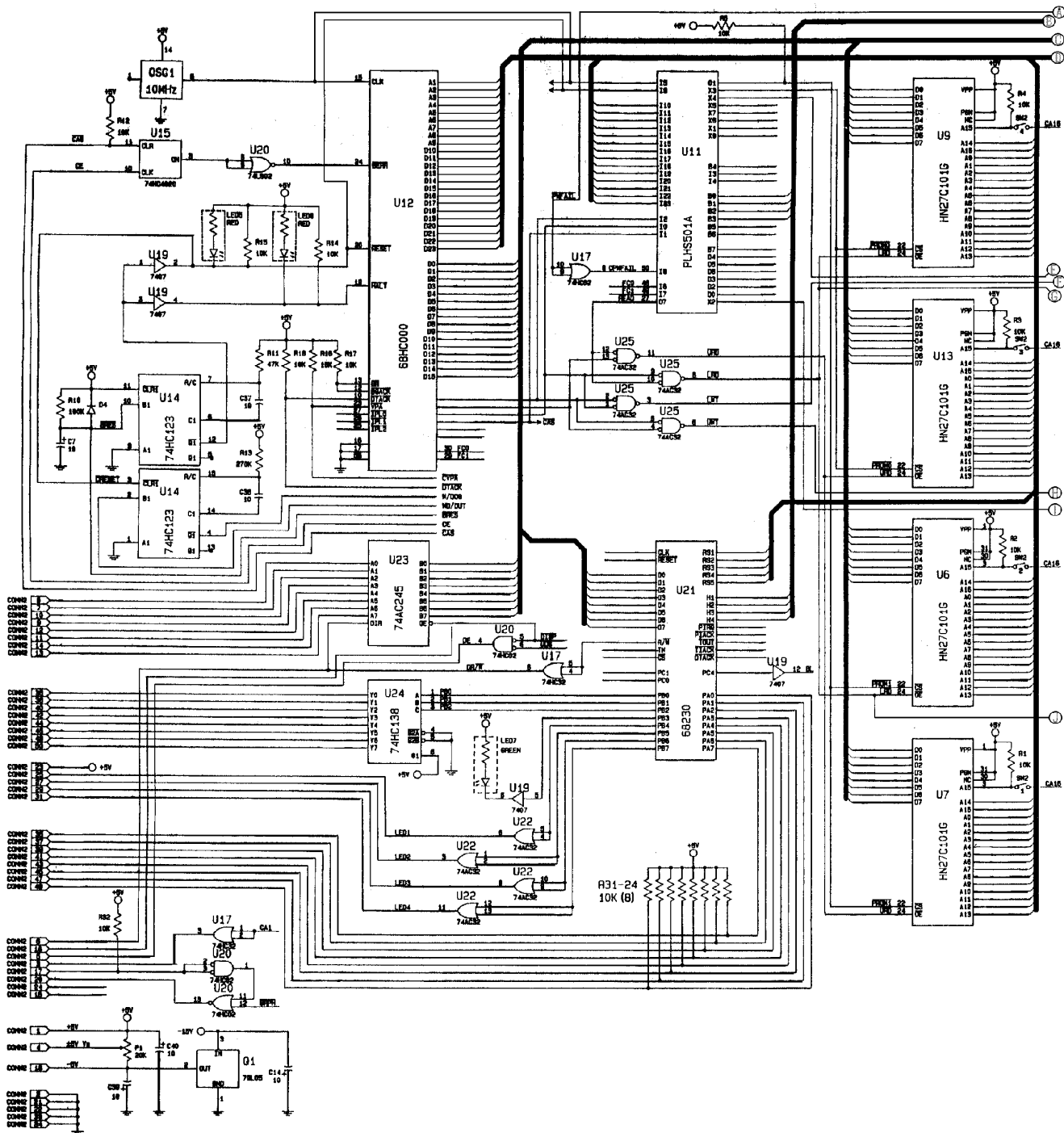
Fig. 8-6 Power Monitor Board Schematic (2 of 2)



2510024A

Fig. 8-7 Advanced Controller Board Layout

4. Circuit Board Layouts and Schematics (contd)



2510025A

Fig. 8-8 Advanced Controller Board Schematic (1 of 2)

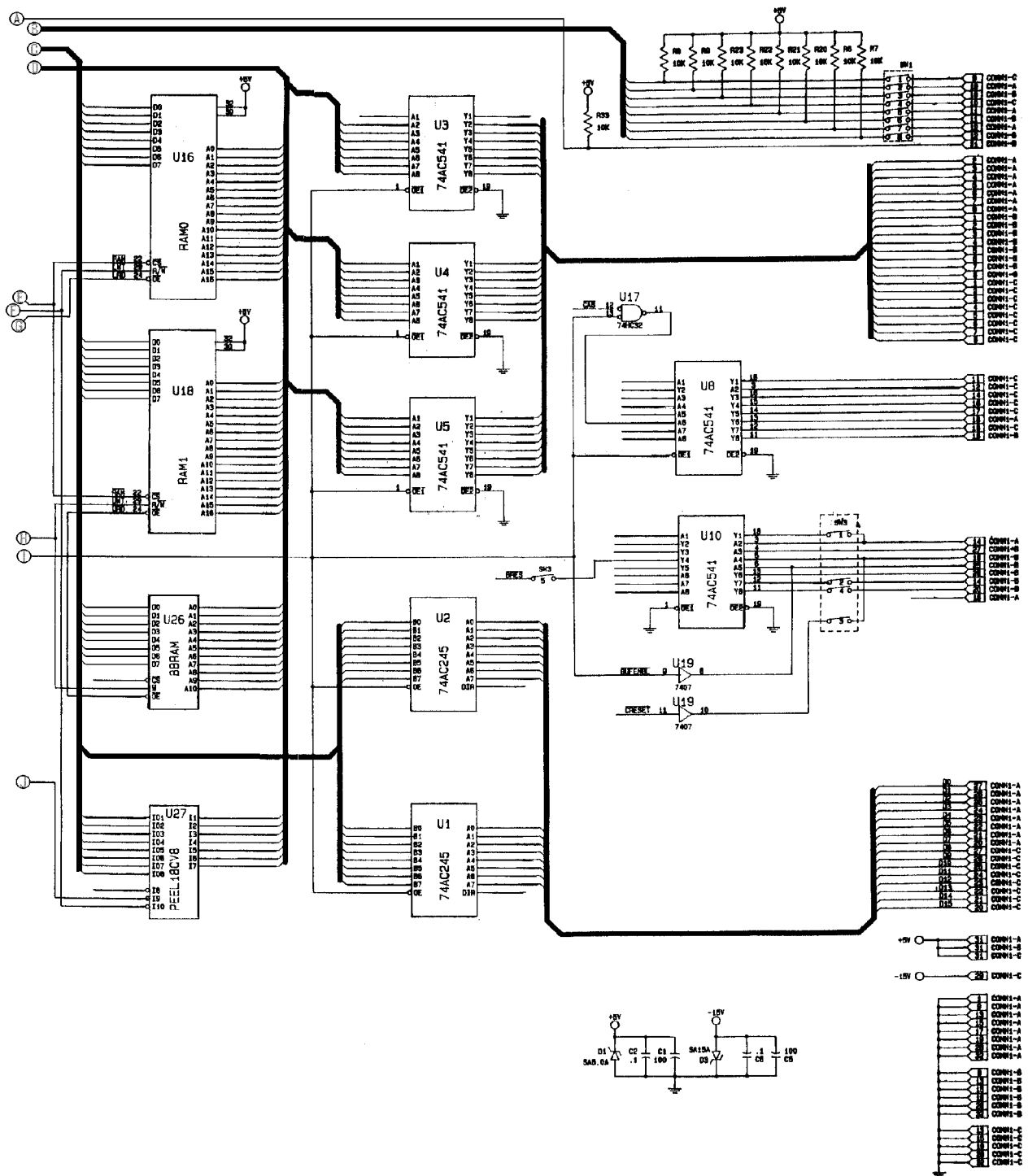
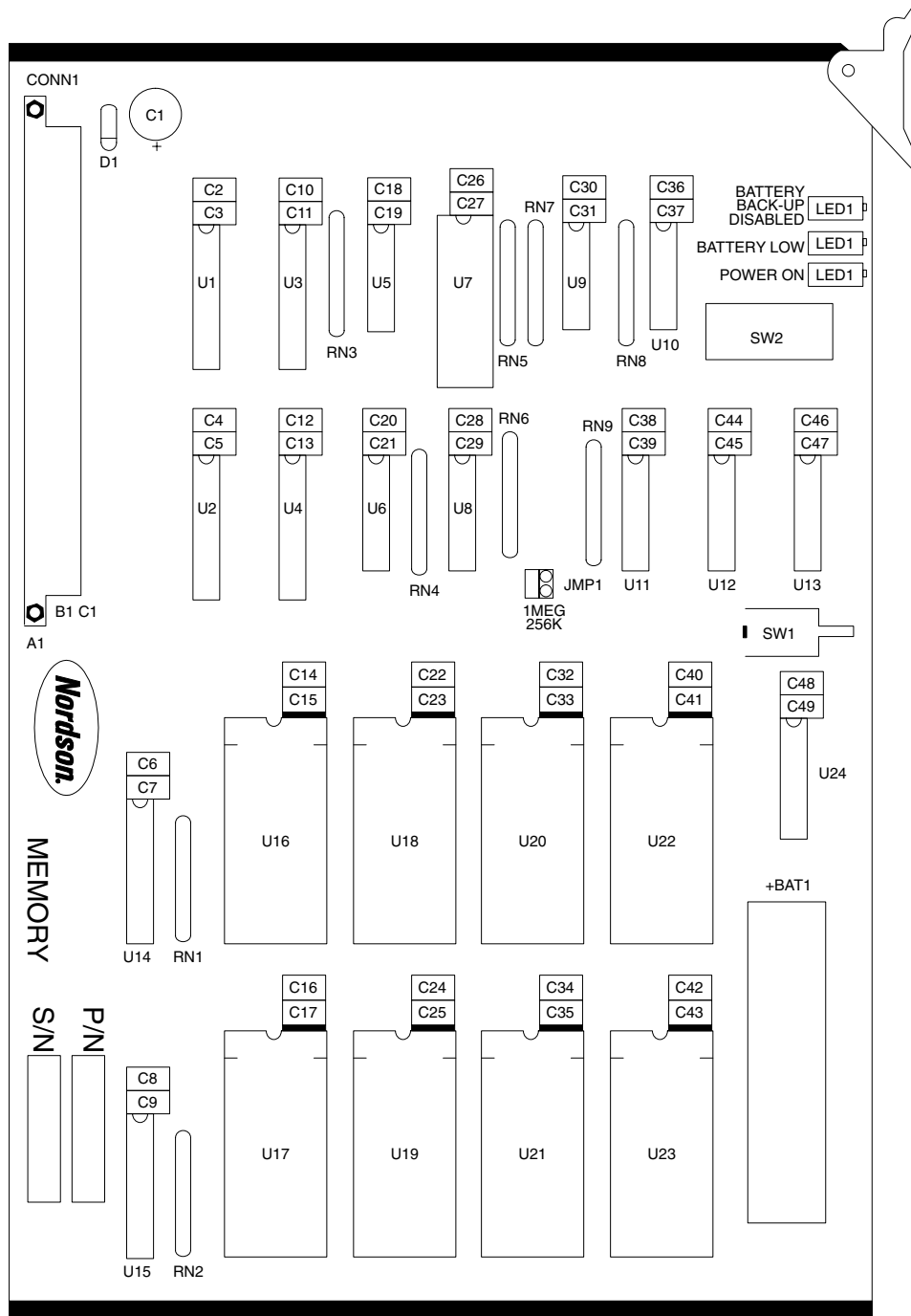


Fig. 8-8 Advanced Controller Board Schematic (2 of 2)

4. Circuit Board Layouts and Schematics (contd)



2510027A

Fig. 8-9 Memory Board Layout (1 meg)

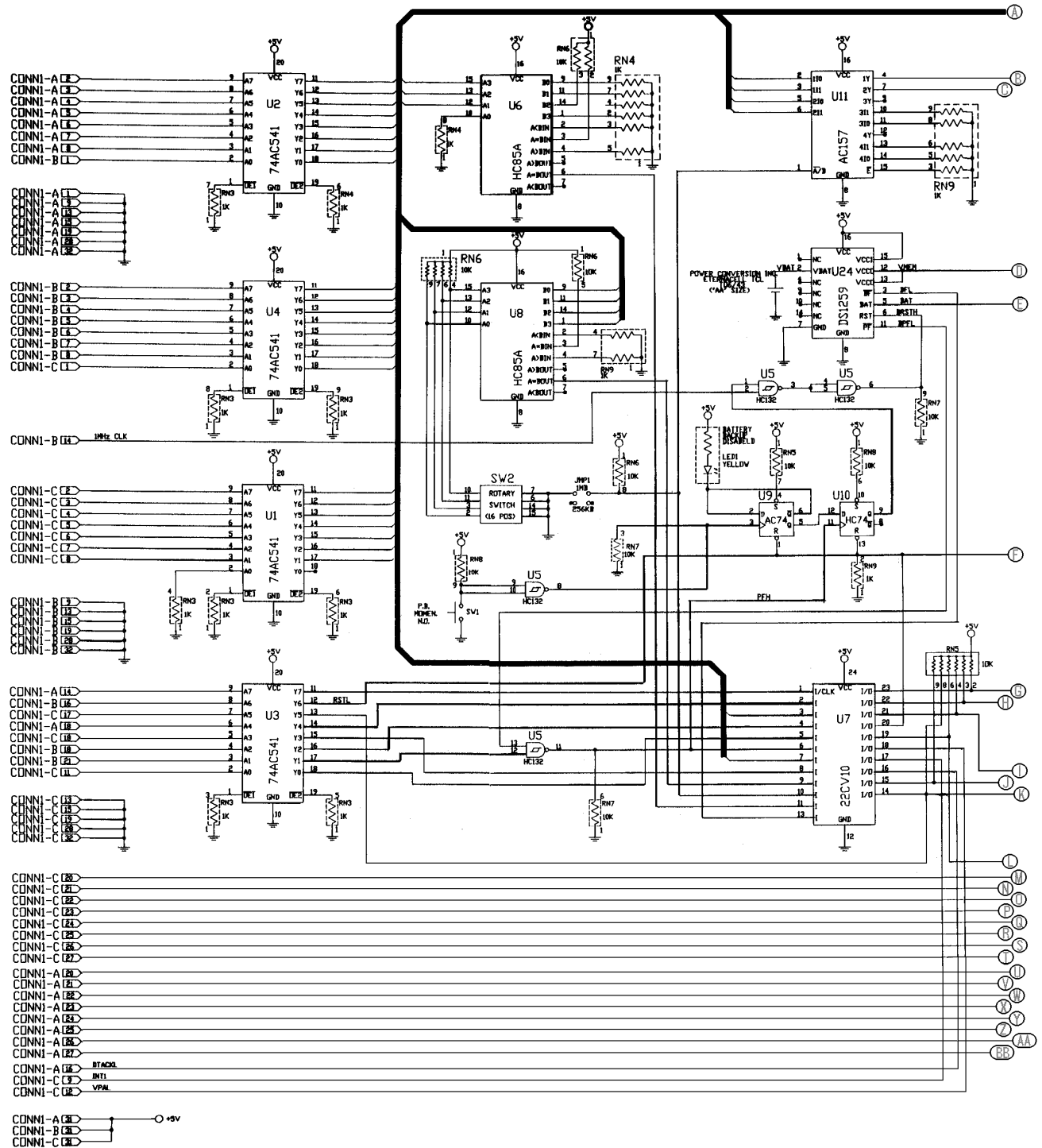
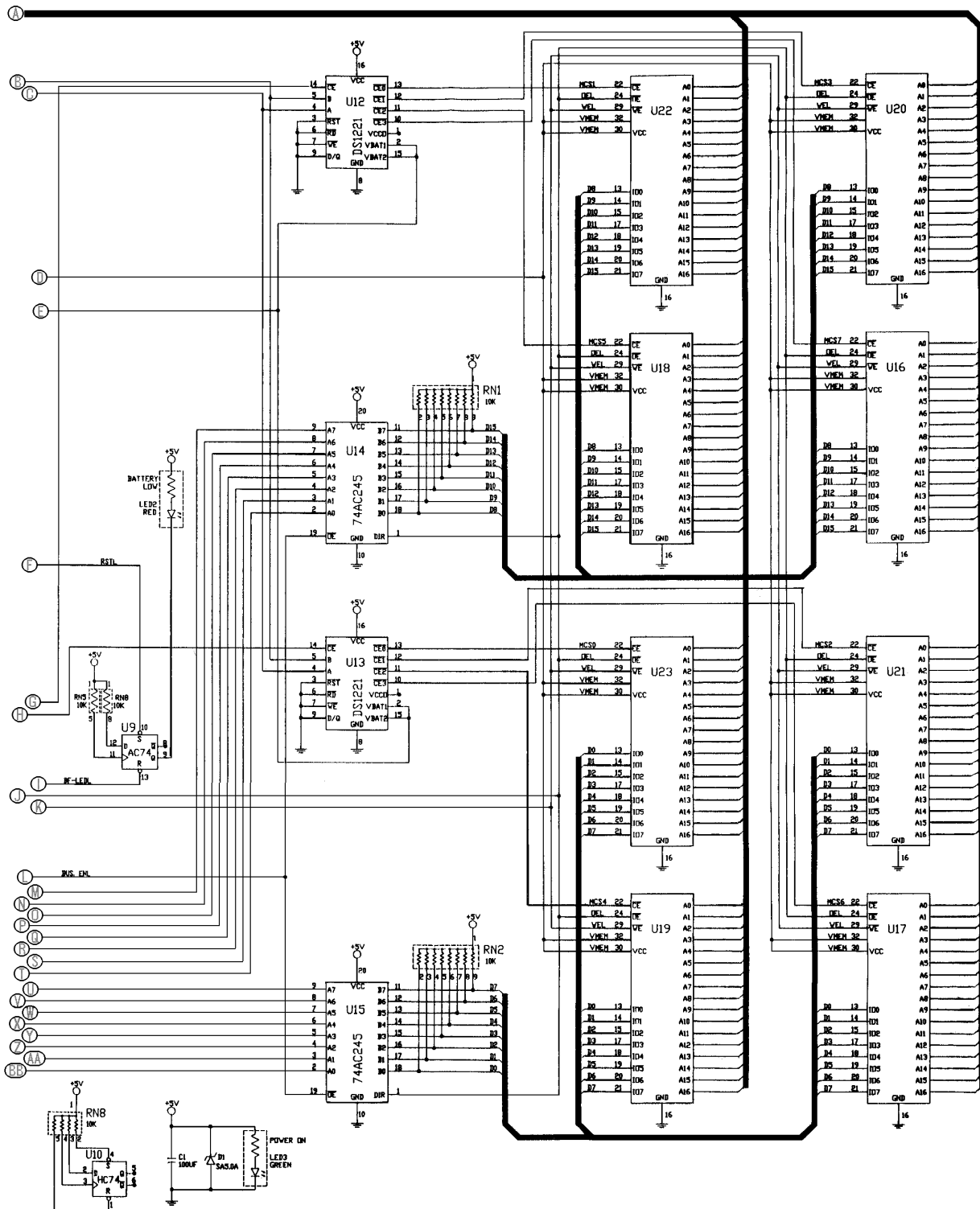


Fig. 8-10 Memory Board Schematic (1 meg) (1 of 2)

2510028A

4. Circuit Board Layouts and Schematics (contd)



2510029A

Fig. 8-10 Memory Board Schematic (1 meg) (2 of 2)

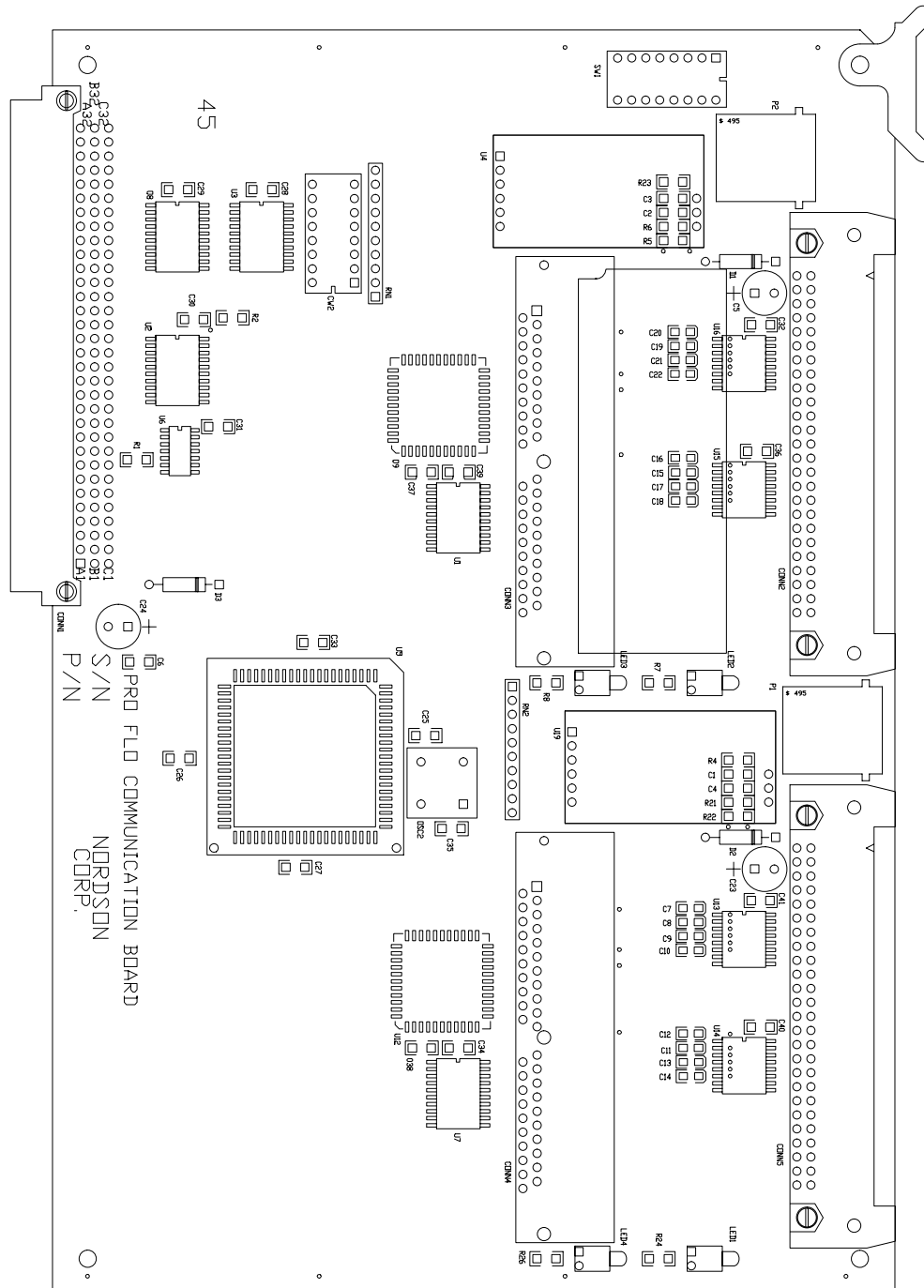
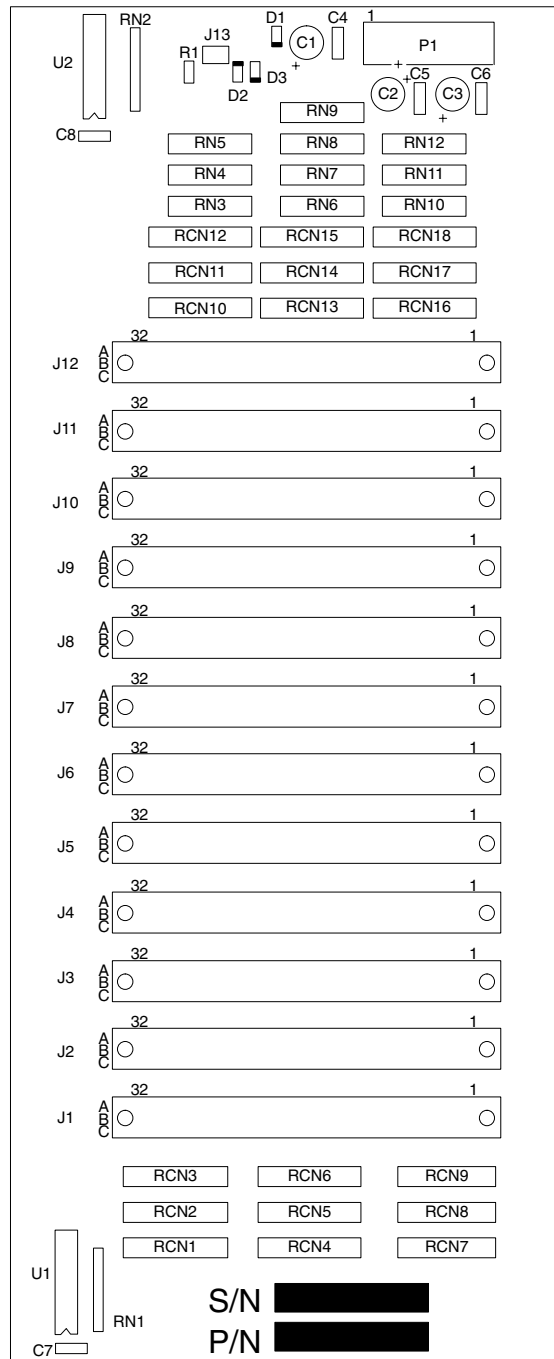


Fig. 8-11 Serial Interface Board Layout

Note: Use this board if SLTA is included with your unit. See Figure 8-12 if SLTA is not included.

2510030B

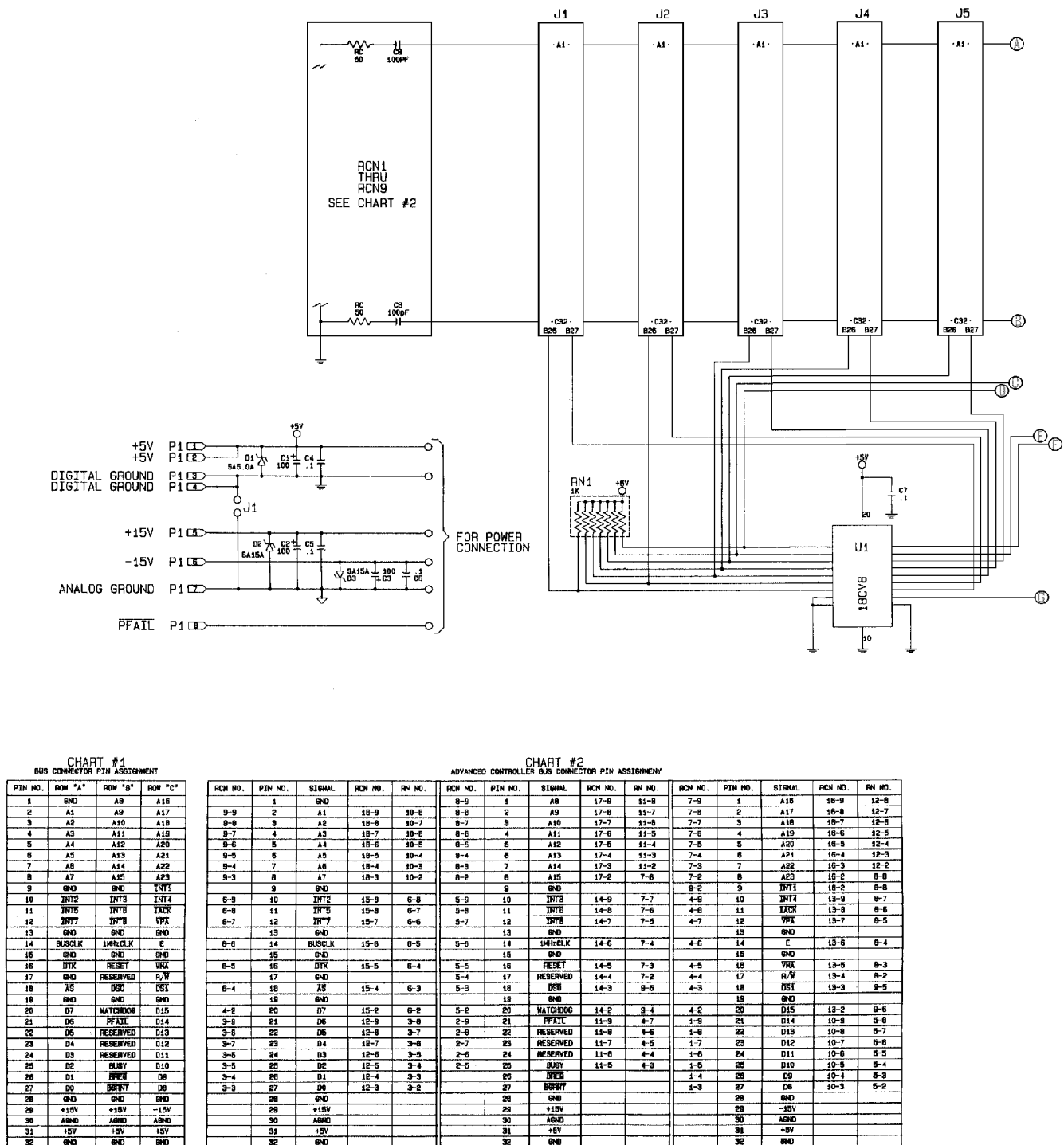
4. Circuit Board Layouts and Schematics (contd)



2510033A

Fig. 8-12 Backplane Board Layout

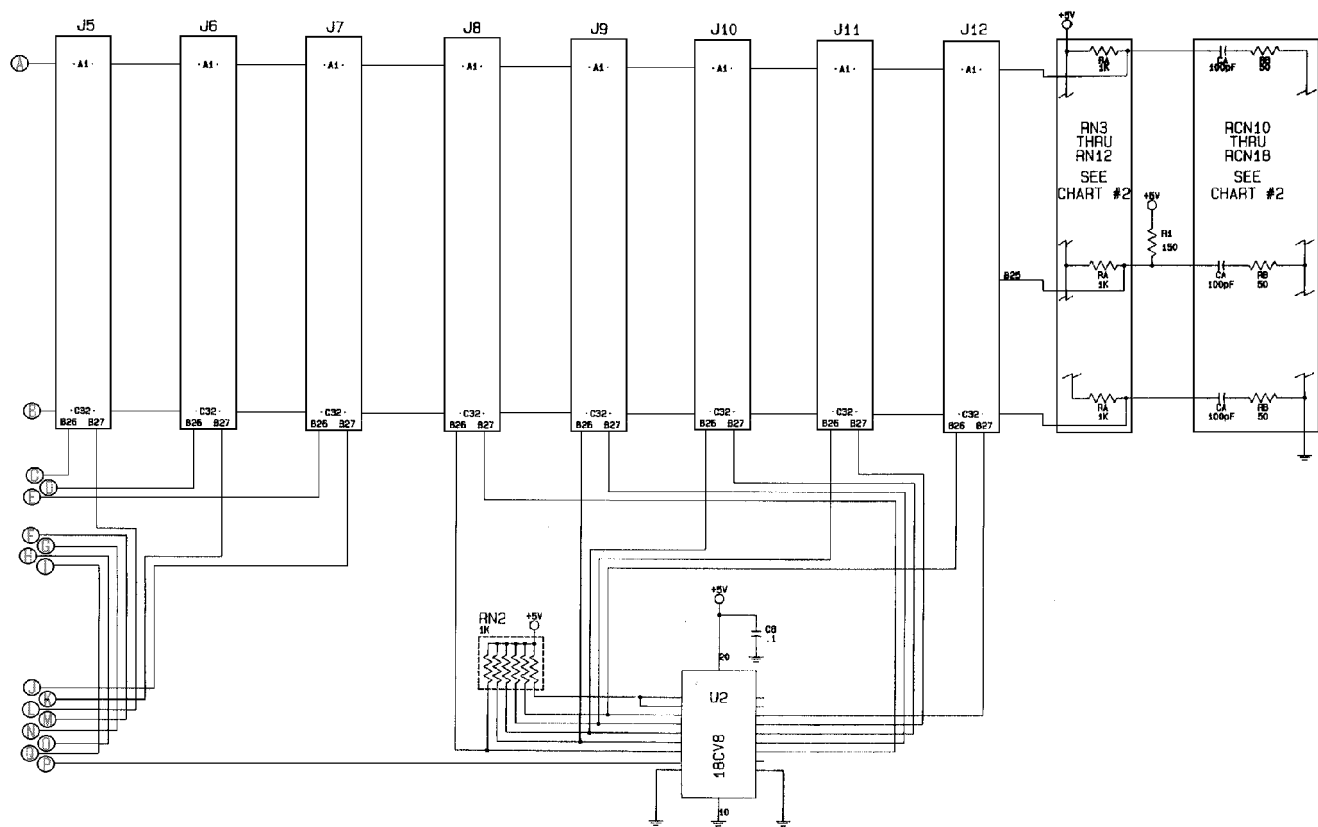
Note: Use this board if SLTA is not included with your unit. See Figure 8-11 if SLTA is included.



2510034A

Fig. 8-13 Backplane Board Schematic (1 of 2)

4. Circuit Board Layouts and Schematics (contd)



NOTES

- 1) RCN1 THRU RCN18 PINS 1 & 10 ARE TO GROUND.
- 2) RN1 THRU RN12 PIN 1 IS TO +5V.
- 3) ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.
- 4) ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED.

2510035A

Fig. 8-13 Backplane Board Schematic (2 of 2)

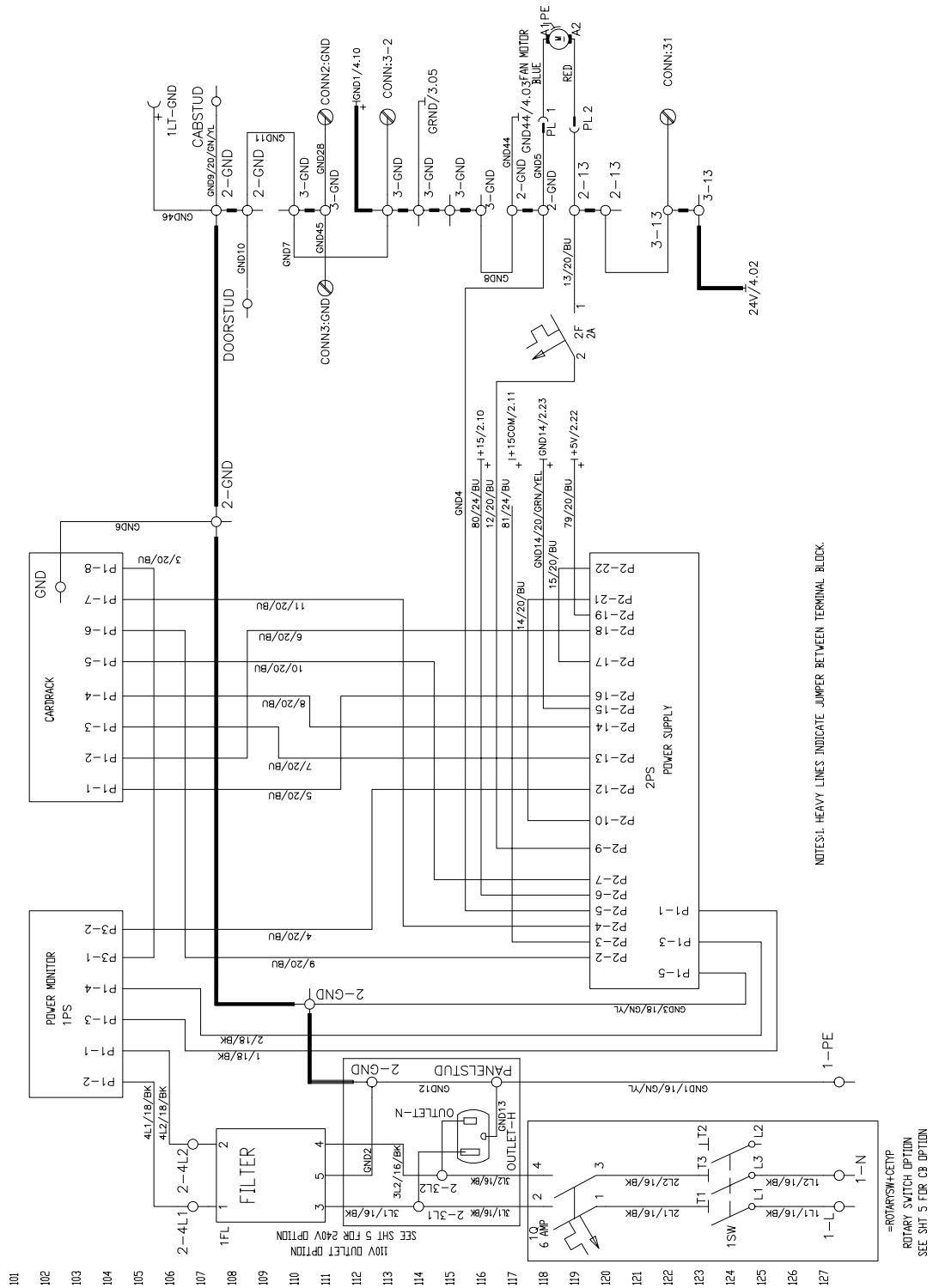
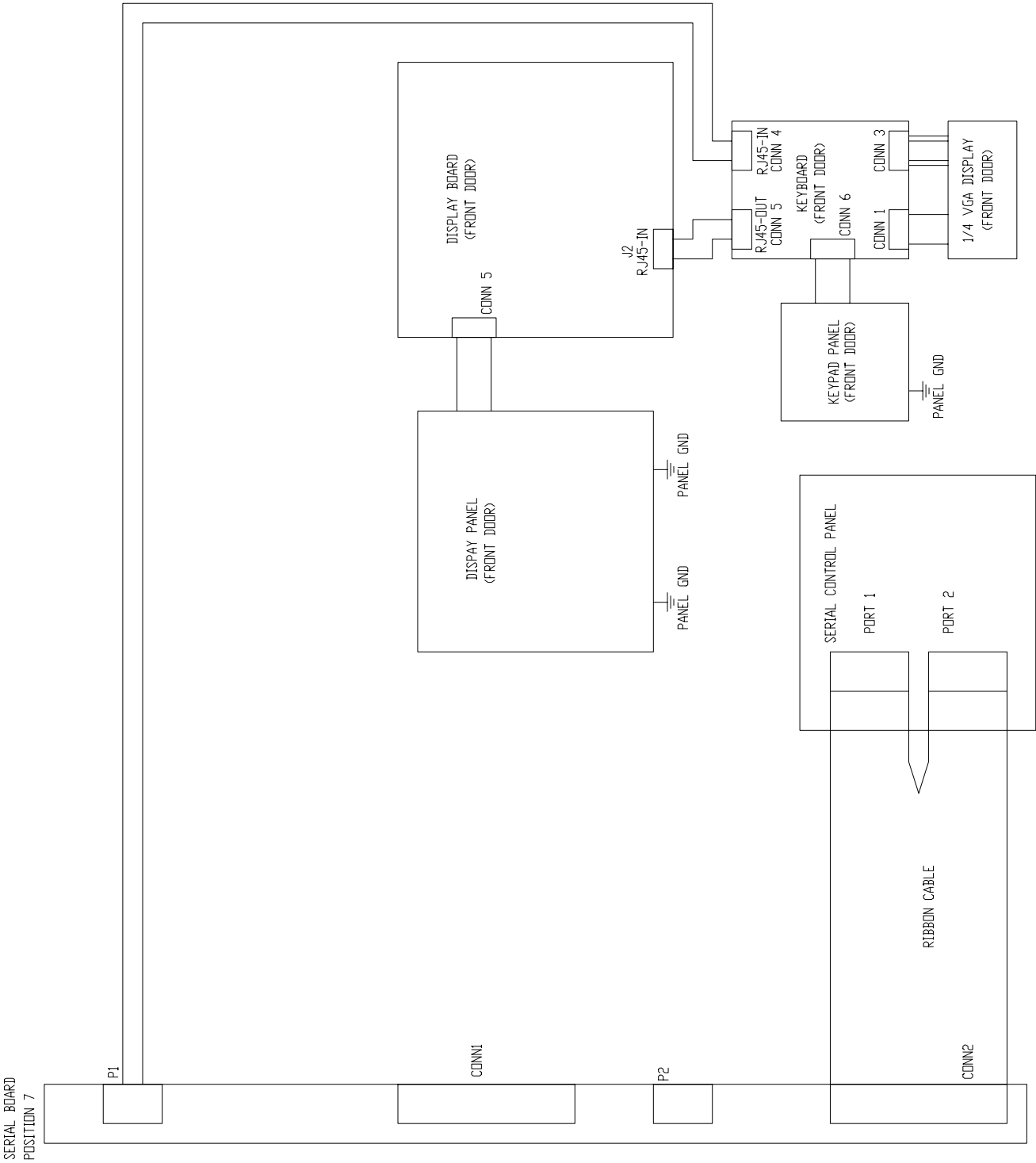


Fig. 8-14 Controller Wiring Diagram (1 of 5)

2510040B

4. Circuit Board Layouts
and Schematics (contd)



2510050A

Fig. 8-14 Controller Wiring Diagram without SLTA (2 of 5)

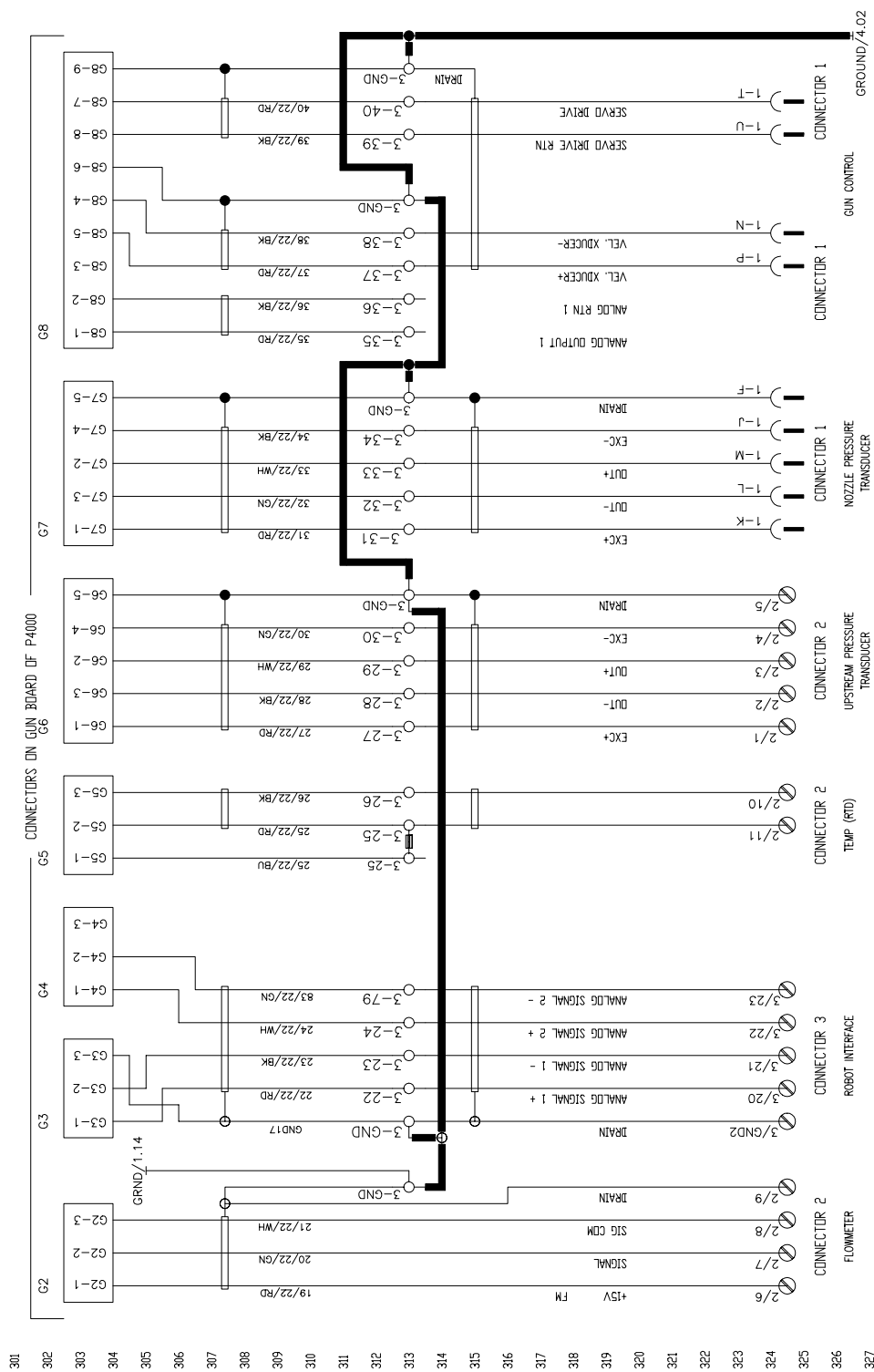


Fig. 8-14 Controller Wiring Diagram without SLTA (3 of 5)

4. Circuit Board Layouts and Schematics (contd)

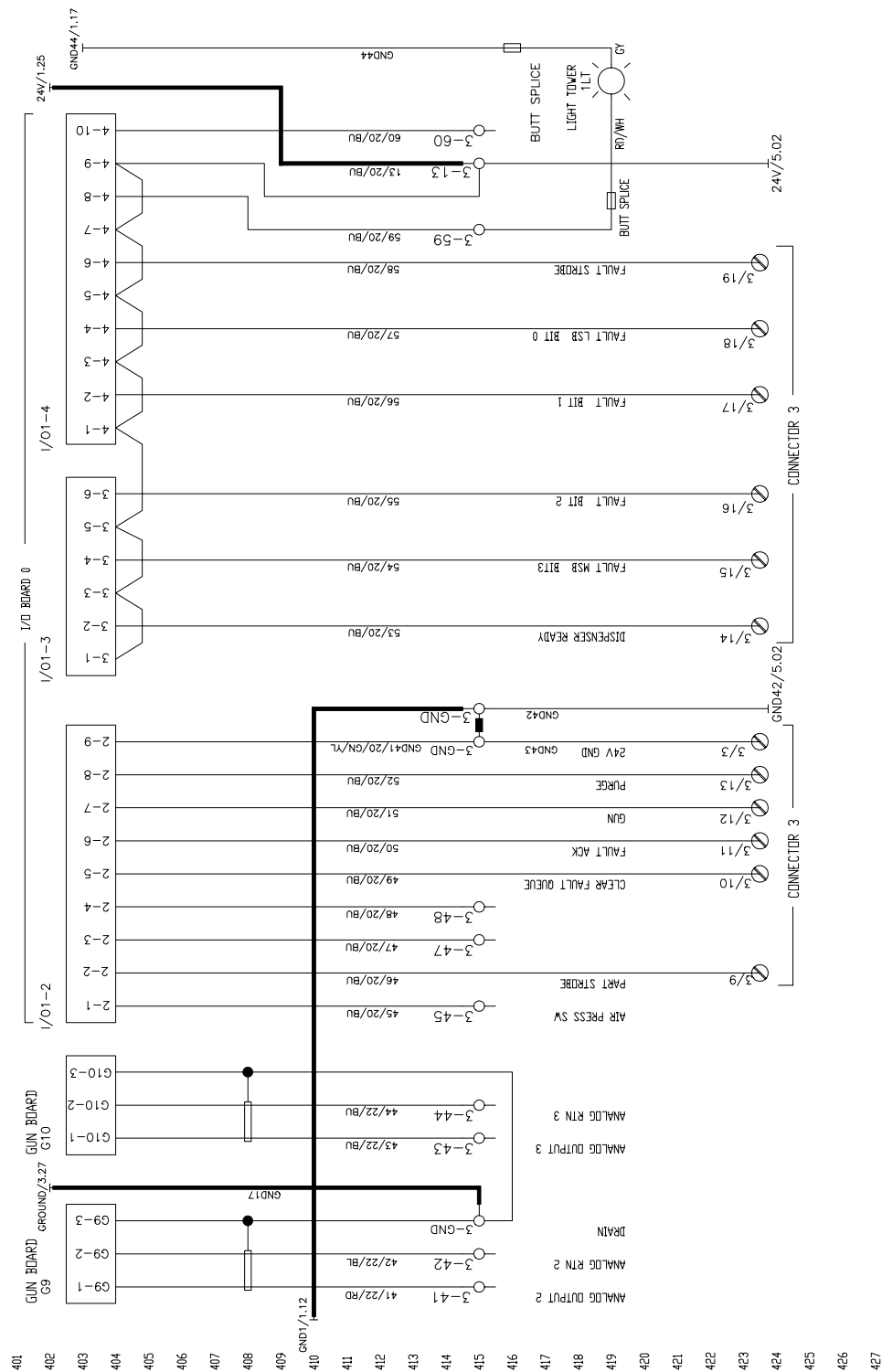
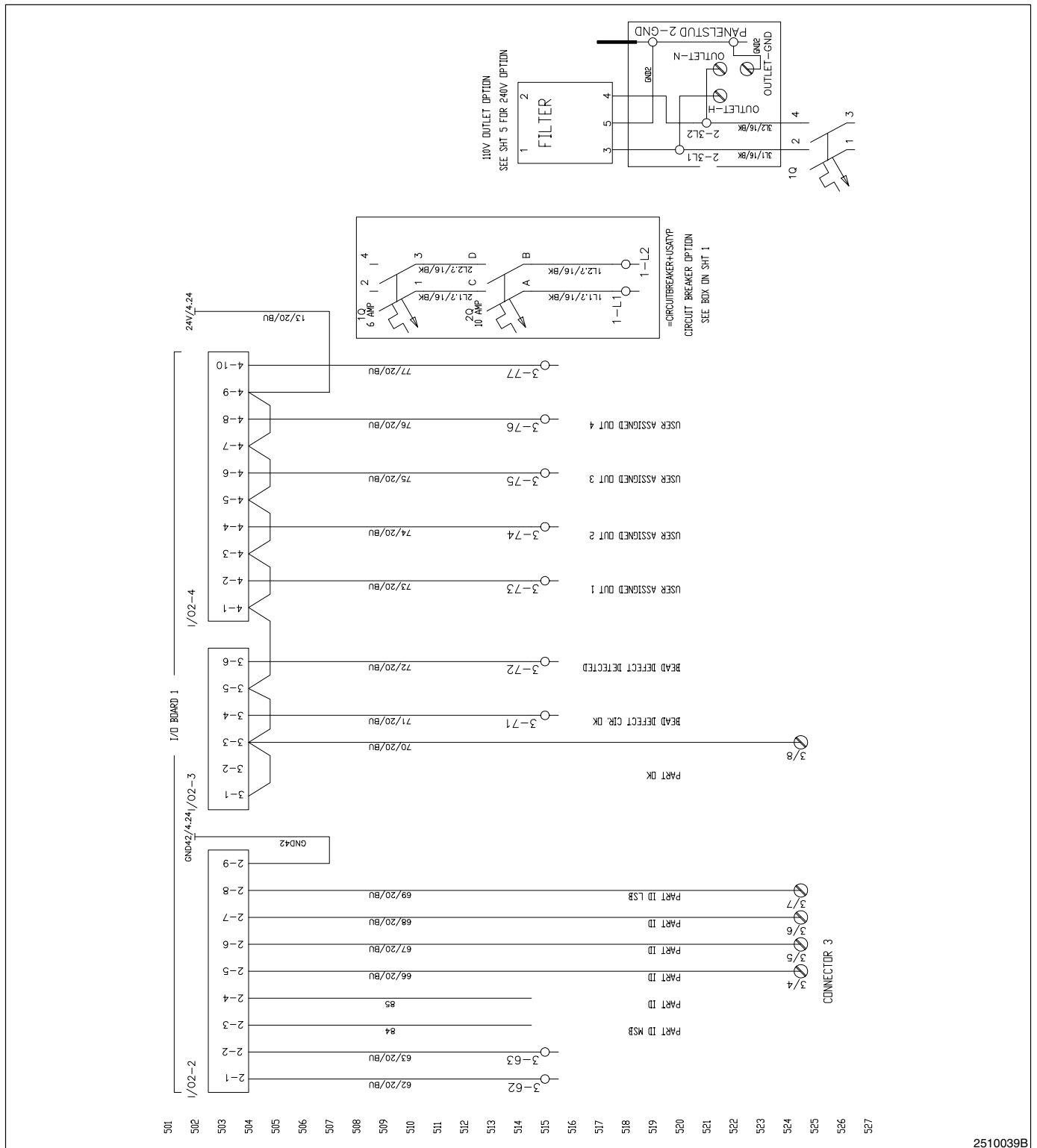


Fig. 8-14 Controller Wiring Diagram (4 of 5)



DECLARATION of CONFORMITY

PRODUCT:

Pro-Flo Controller

APPLICABLE DIRECTIVES:

89/336/EEC EMC Directive

73/23/EEC Low Voltage Directive

STANDARDS USED TO VERIFY COMPLIANCE:

EN292 Safety of Machinery

EN60204 Safety of Machinery–Electrical

EN50081 General EMC Requirements

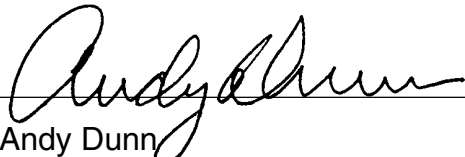
EN50082 General EMC Requirements

EN55011 EMC Radiated Emissions

PRINCIPLES:

This product has been manufactured according to good engineering practice.

The product specified conforms to the directive and standards described above.



Andy Dunn
Vice President, Automotive Systems Group

Date: 25 July 1996

European Contact: Dr. Joerg Sasse
Automotive Systems Group
Luneburg, Germany
Phone: 011-49-4131-8940



Nordson Corporation • Westlake, Ohio

