Pro–Flo® II Controller

Customer Product Manual
Part 107012C

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NORDSON CORPORATION • AMHERST, OHIO • USA

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Notice

Trademarks

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Section 1
Safety

Introduction

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

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

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.

Fire Safety

To avoid a fire or explosion, follow these instructions.

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

Fire Safety *(contd)*

- 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 when working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Shut off electrostatic power and ground the charging system before adjusting, cleaning, or repairing electrostatic equipment.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

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:

Element	Symbol	Prefix
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.

Action in the Event of a Malfunction

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

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

Disposal

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

Section 2
Description

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.

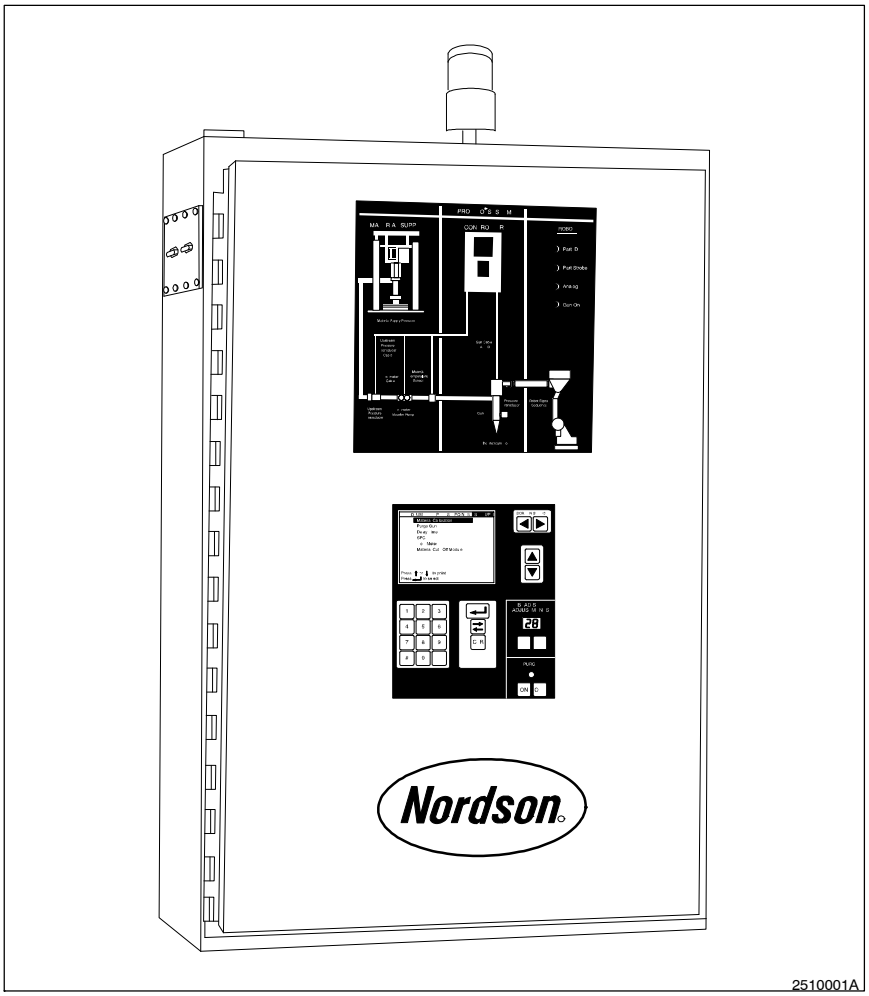


Figure 2-1 Pro-Flo Controller

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

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

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

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.

Location

Mounting dimensions and clearance requirements for the controller are shown in Figures 3–1 and 3–2. 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.

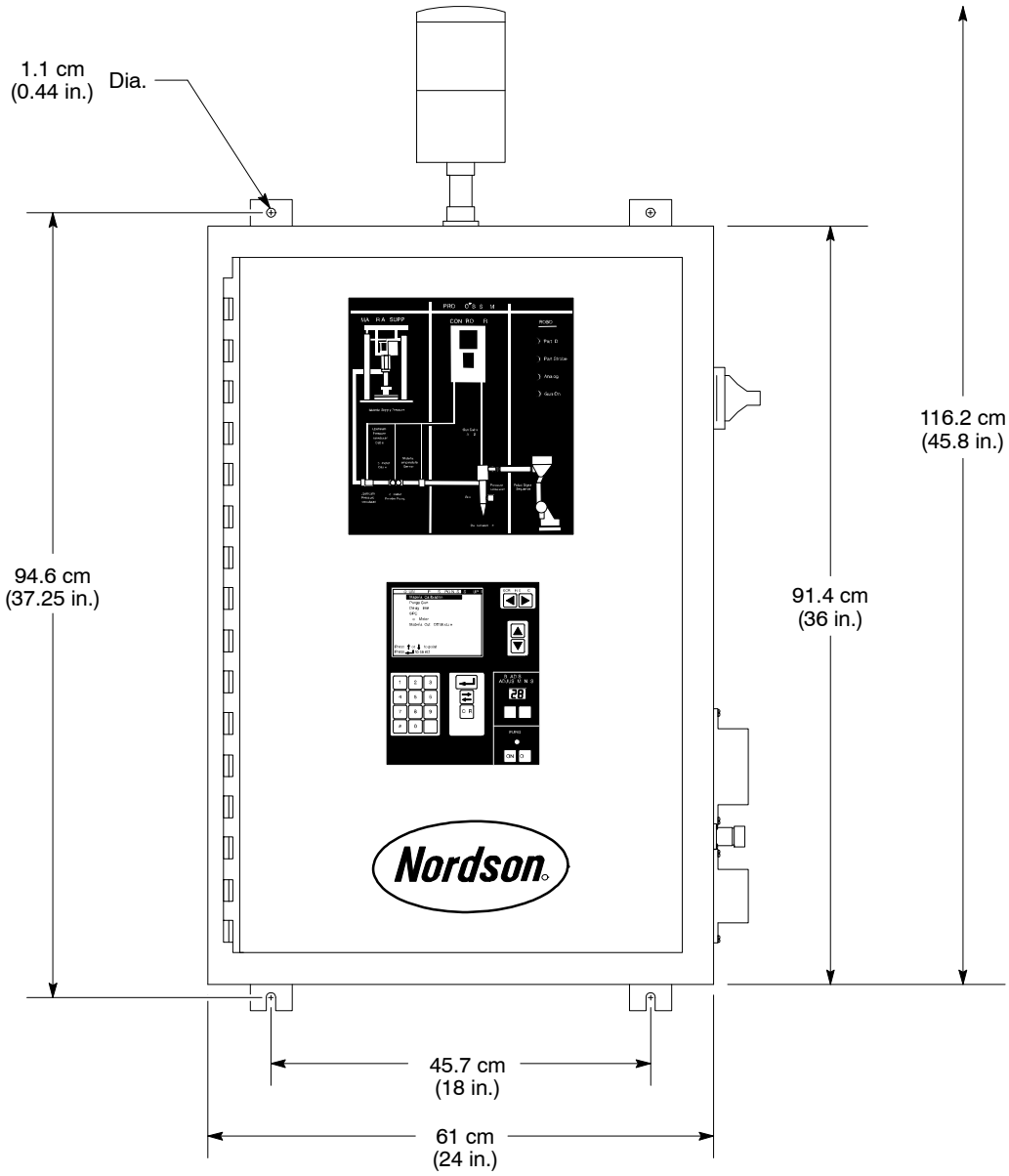


Figure 3-1 Mounting Dimensions and Clearance Requirements (Front View)

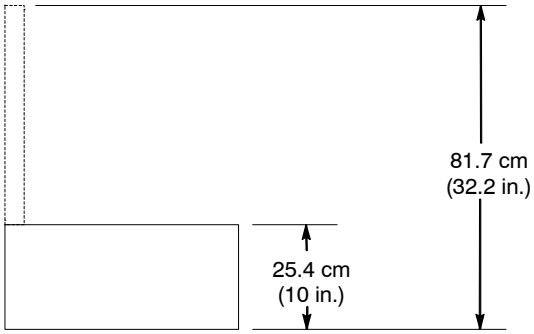


Figure 3-2 Mounting Dimensions and Clearance Requirements (Bottom View)

Electrical Cables

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.

When connecting cables between the gun (5) and controller (2), make sure there is enough slack to allow robot (8) and gun movement. Use an extension cable (4) if necessary.

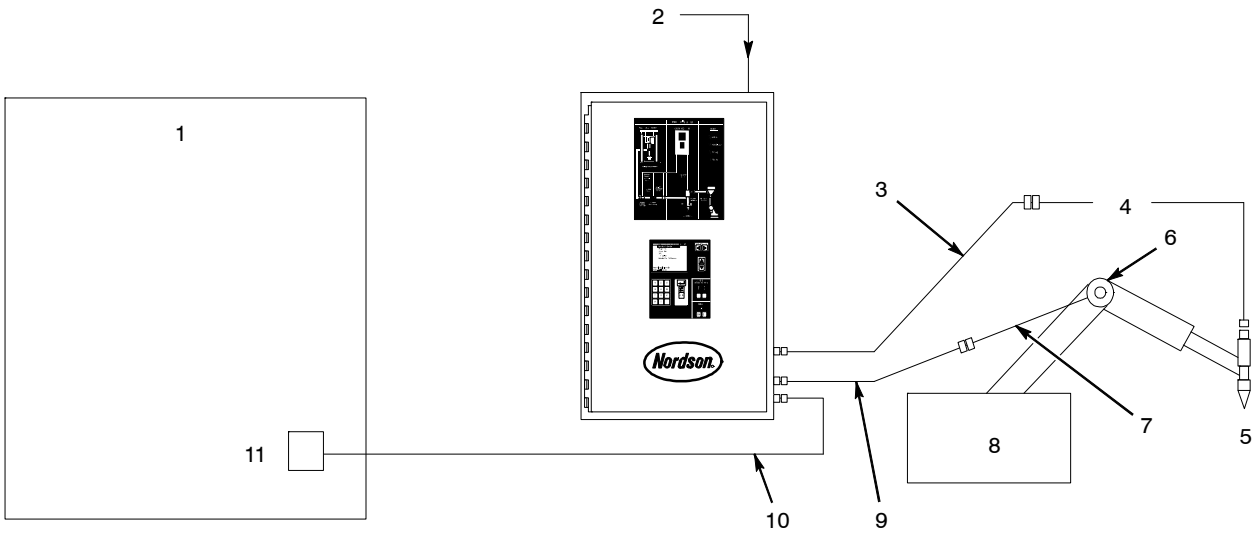


Figure 3-3 Standard Cabling Connections

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

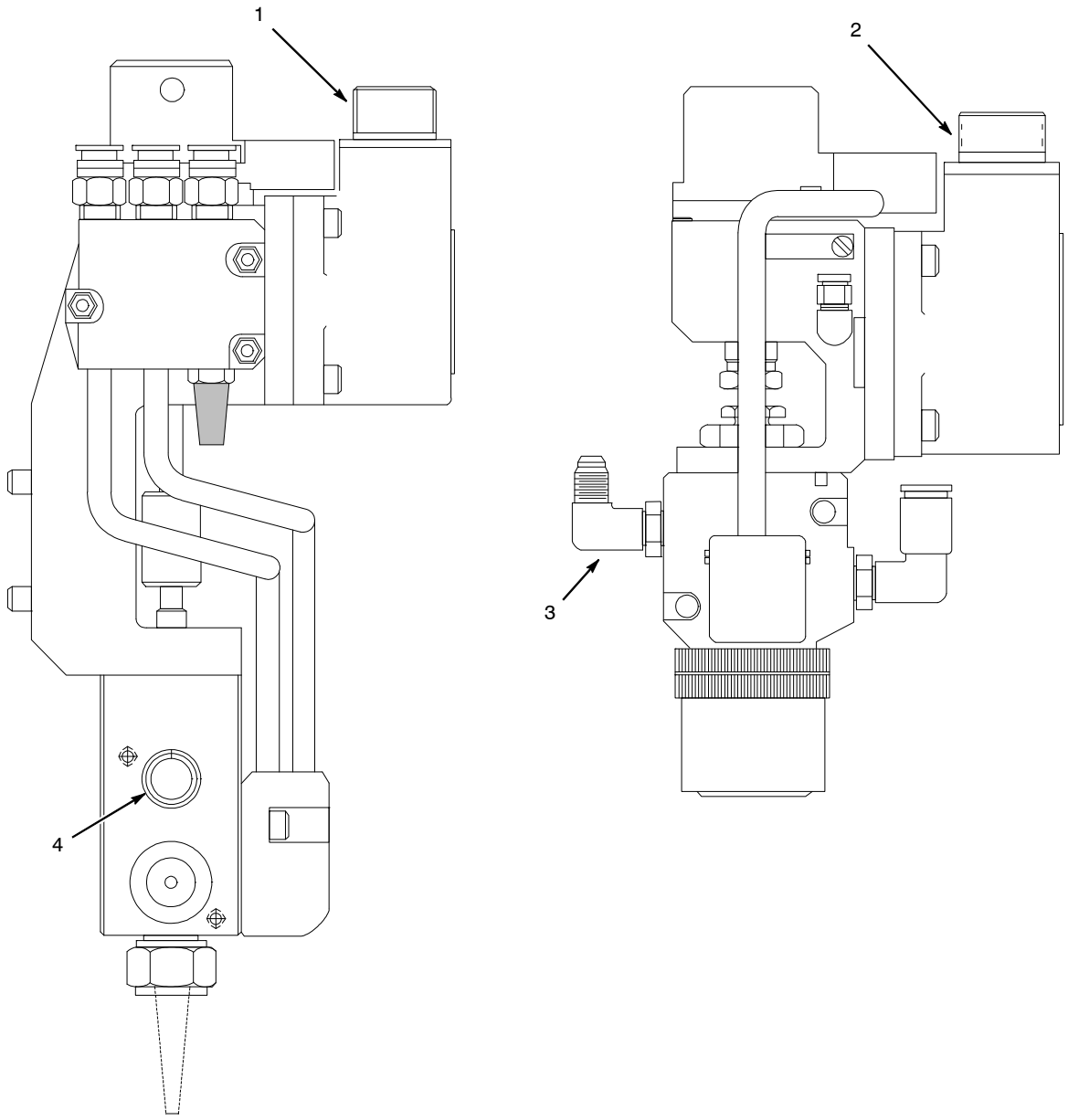


Figure 3-4 Pro-Flo Guns

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

Standard

The standard controller interface (Figure 3–3) 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.

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

1. See Figure 3–6. 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. See Table 8–7. Make the necessary connections between the robot interface cable and the robot controller input and output boards.

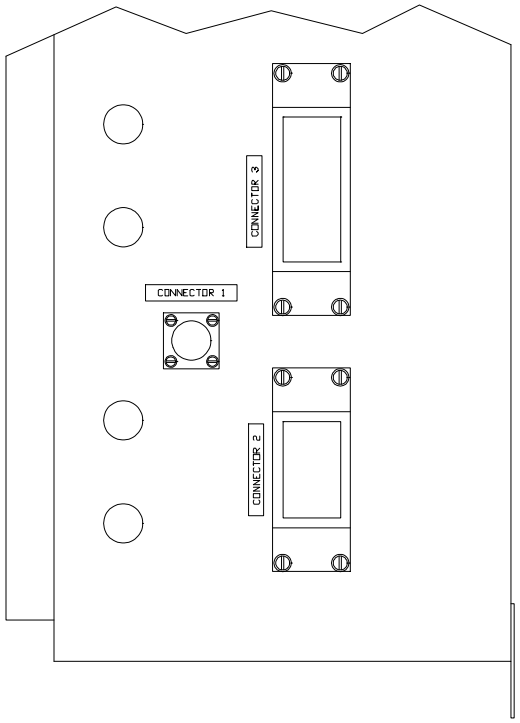


Figure 3-5 Standard Cable Receptacles

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.

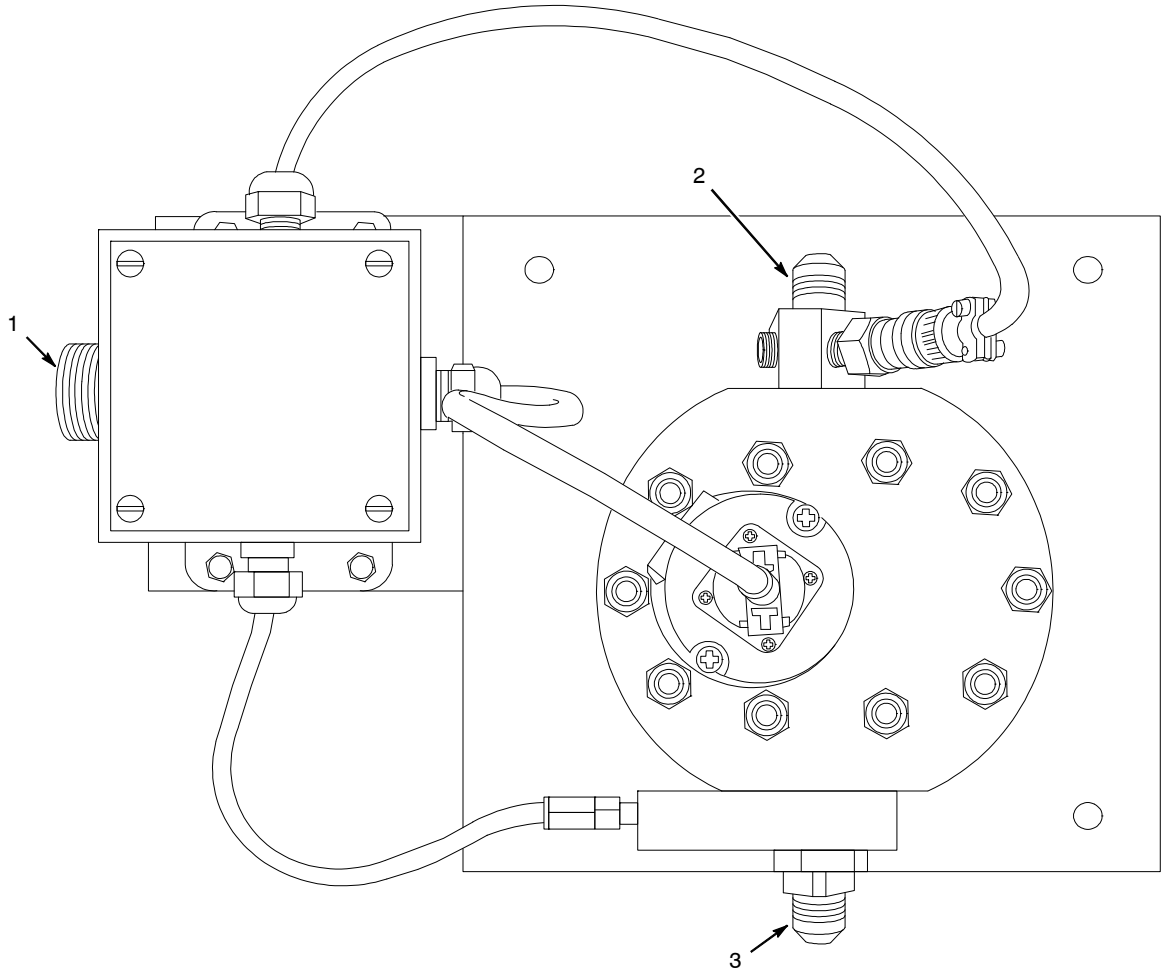


Figure 3-6 Flowmeter Assembly

1. Electrical receptacle
2. Material inlet
3. Material outlet

3. Connect the free end of the gun control cable to the Pro–Flo gun receptacle (dispensing (Figure 3–4, (1)) or compact (Figure 3–4, (2)).
4. Connect the flowmeter manifold cable to the FLOWMETER MANIFOLD CABLE receptacle.
5. See Figure 3–6. Connect the free end of the cable to the electrical receptacle (1) on the flowmeter assembly.

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 gun inlet (dispensing (Figure 3–4, (4)) or compact (Figure 3–4, (3)).

Robot Interface Signals

Fault codes are documented in the *Specifications* section.

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. See Figure 3–7.

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.

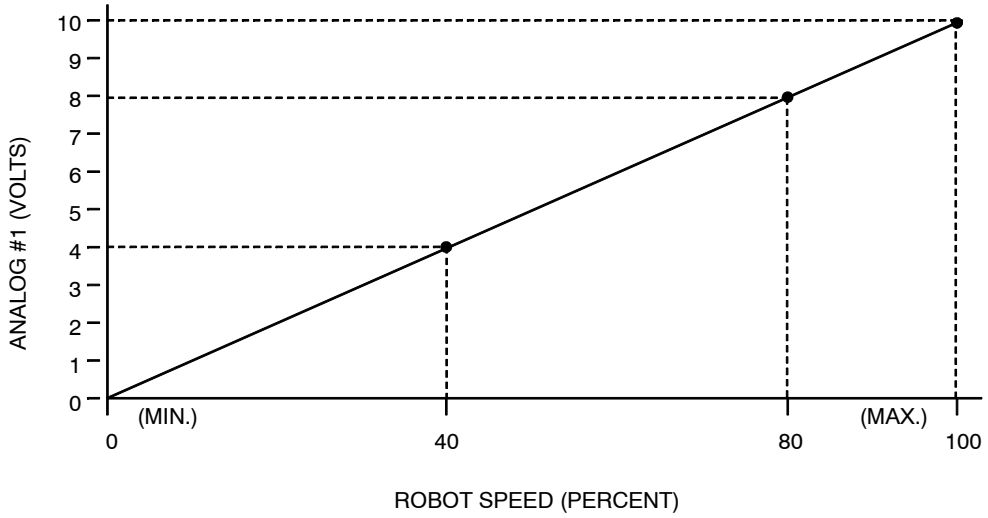


Figure 3-7 Relationship Between Analog #1 Signal and Robot Speed

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 8 VDC. A robot speed of 40% corresponds to 4 VDC.

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 1.38, 2.75, 4.14, and 5.52 bar (20, 40, 60, and 80 psi), respectively.

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)

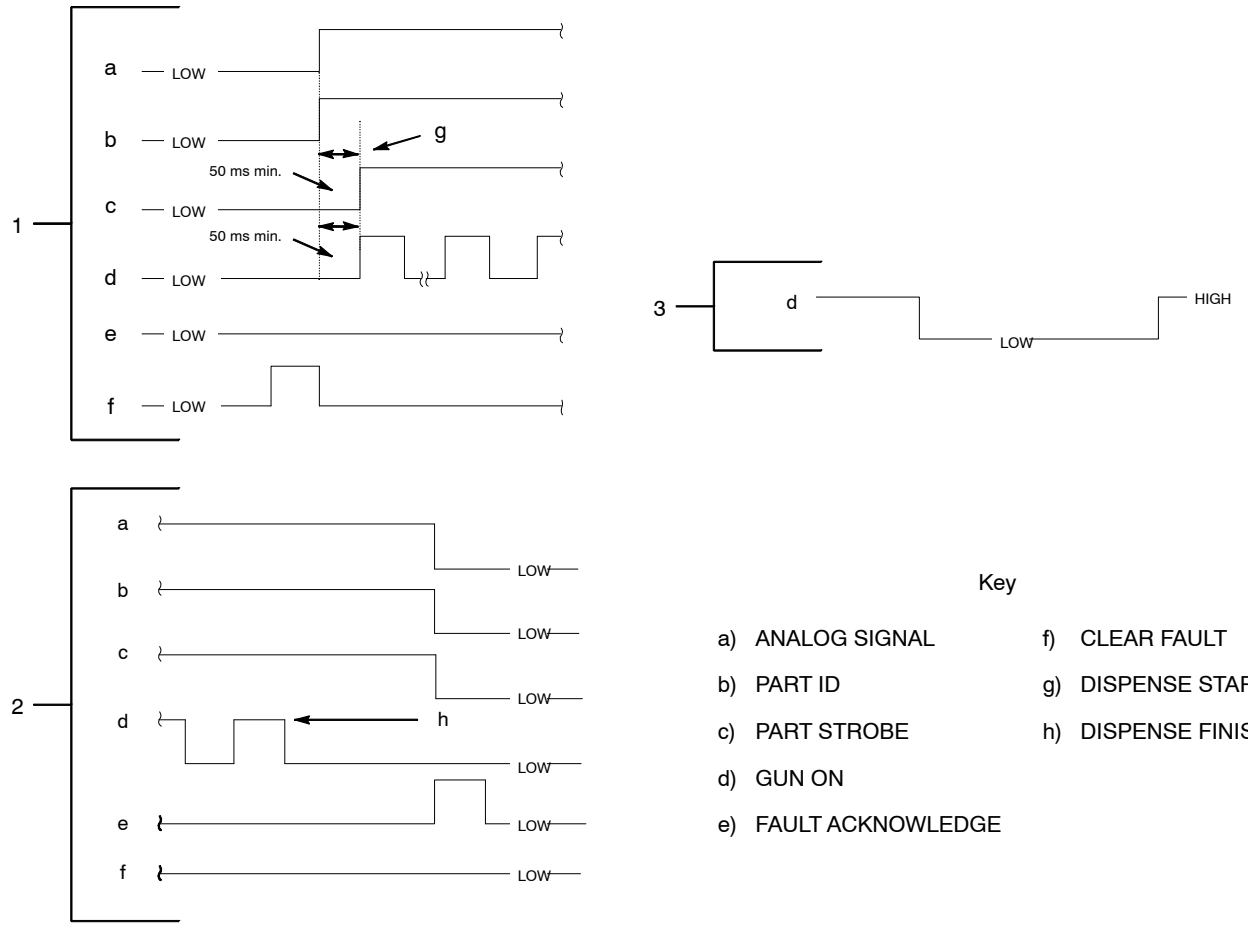


Figure 3-8 Timing of Robot Signals

1. Start of dispense cycle
2. End of dispense cycle
3. Emergency stop

Section 4
Operation

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

Introduction

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.

User Interface

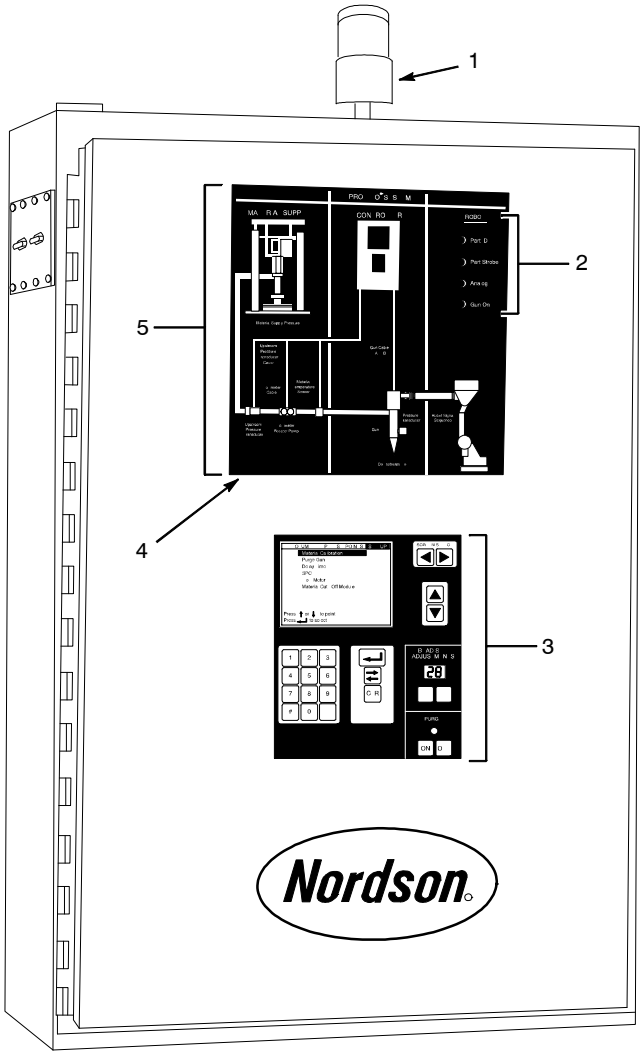


Figure 4-1 Pro-Flo Controller User Interface

1. Alarm tower
2. Robot signal indicators
3. Operator keypad
4. LAMP TEST key
5. Diagnostic panel

Use the operator keypad (3) to select and define production parameters. The keys and indicators on the user interface panel are described in Table 4–1.

Table 4-1 Controls and Indicators on the Controller. See Figure 4–1.

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

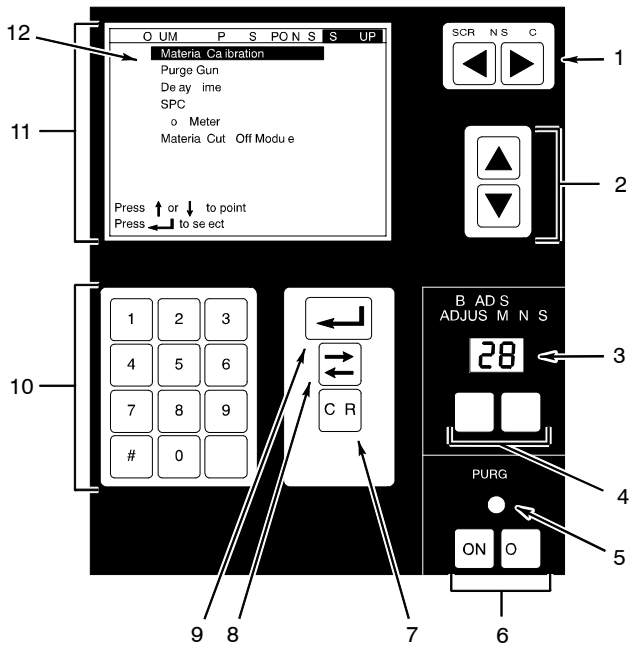


Figure 4-2 Operator Keypad

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

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. 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 lights while the gun is open. Purging will stop after the purge time has elapsed. Otherwise, press the OFF key to stop purging immediately.

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.

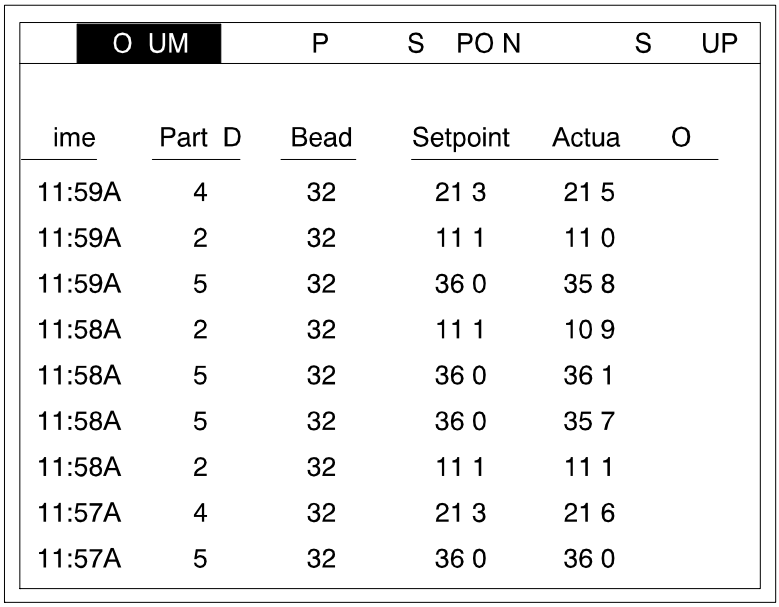


Figure 4-3 Example of VOLUME Screen

HELP

See Figure 4–1. If a fault is detected during operation, the alarm tower (1) turns on and the type of fault is indicated on the diagnostic panel (5). Choose the HELP screen to display an explanation of the fault and the suggested corrective action. One example of a HELP screen is shown in Figure 4–4.

NOTE: Press the LAMP TEST key (Figure 4–1, (4)) occasionally to test the lights on the diagnostic panel.

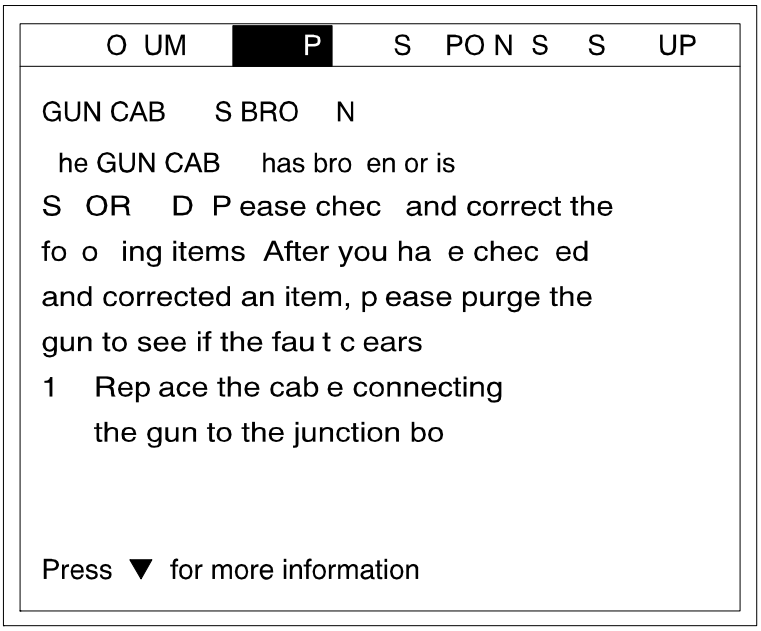


Figure 4-4 Example of HELP Screen

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.

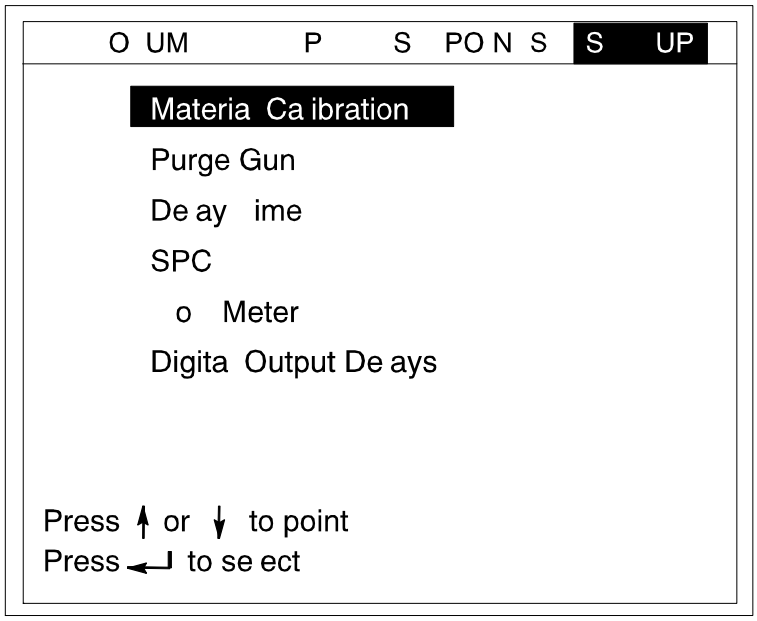


Figure 4-5 Example of SET-UP Screen

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 5 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.

Statistical Process Control (SPC) (Optional)

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.

Flowmeter

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.

Initial Set Up

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 5 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.

   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 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.

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.

Set-Up 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 personal computers.

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.

Follow the operating procedure in this manual 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. Make the Configurator program directory the active current directory; type:

   CD C:\CONF

2. Start the program; type:

   CONFIG

   The copyright screen is displayed. See Figure 4–6.

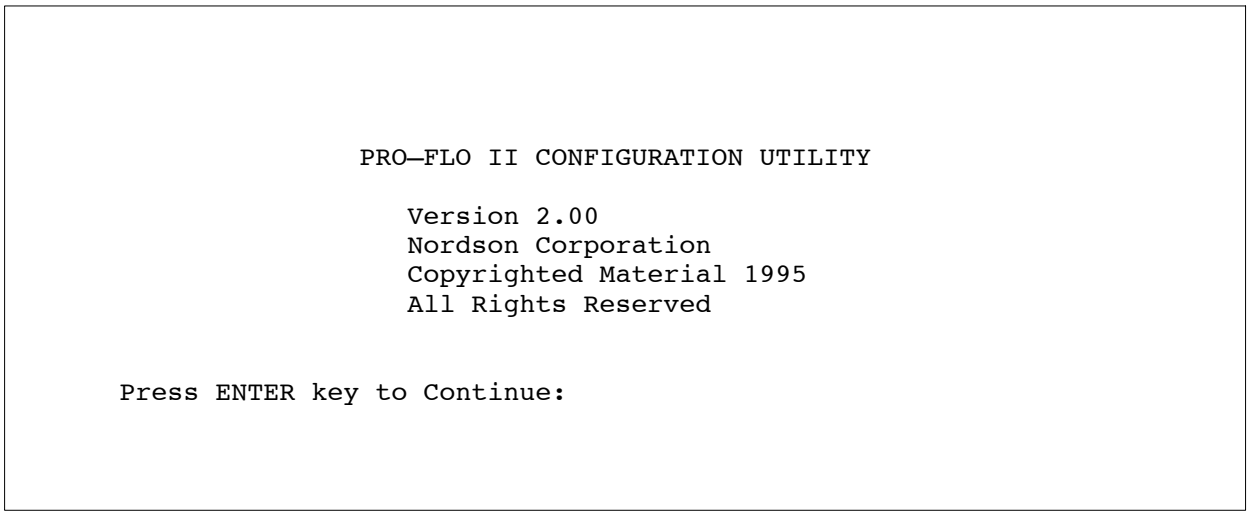


Figure 4-6 Copyright Screen

3. Press **ENTER** to continue to the file selection screen.
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: If you want to modify an existing file, it must be located in the currently active directory.

   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.

5. Press **ENTER**. 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 **ENTER** to display the top–level menu.

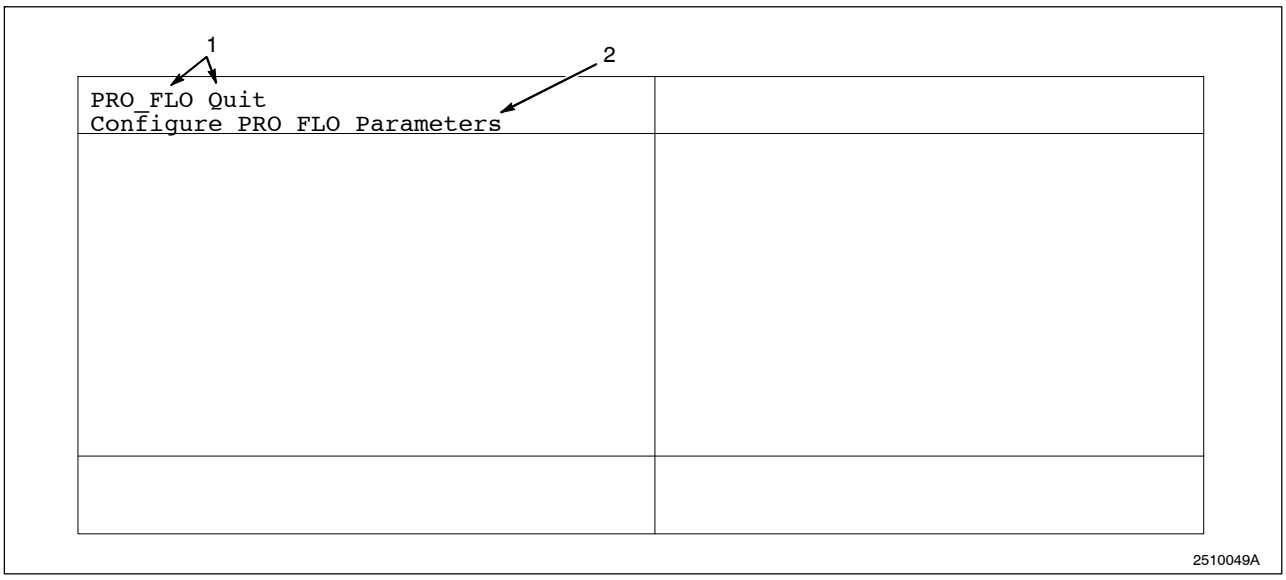


Figure 4-7 Top-Level Menu

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 **ENTER**.

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. Highlight the Quit command and press **ENTER**.

   See Figure 4–8. 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.

```
PRO_FLO Quit
Exit Configuration Utility

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

Figure 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* for instructions on how to do this.
2. Highlight the PRO–FLO command (Figure 4–7, (1)).
3. Press **ENTER**. The Pro–Flo data entry screen is displayed.

```
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:
```

Figure 4-9 Data Entry Screen

See Figure 4–9.

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

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.

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

5. 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.

6. 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.

1. Connect a serial cable from a serial port on the PC to port2 on the controller.

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.

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

2. Change and save configuration options, as desired. See the *Changing Parameters* section for instructions on how to do this.
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.

4. Press **ENTER** 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 “OLDCFG”. 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 it was transferred from.
- 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.

Start Up

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 5 minutes while dispensing material.
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: During dispensing, the robot signal indicators (Figure 4–1, (2)) illuminate when signals are received from the robot controller. Under normal operating conditions, these lights flash on and off in specific sequence.

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

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

Introduction

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

Troubleshooting the Pro-Flo Controller

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 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 *Setting Timing Sequences* in the *Installation* 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.
2. Gun not dispensing material, not opening	Absent or low control air pressure	Check supply air pressure and increase if necessary.
	Stem binding	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.
	Actuator malfunctioning	Replace the actuator. Refer to the appropriate Pro–Flo gun manual.
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	Cordset damaged	Check the continuity of cordset and replace if necessary. Refer to the appropriate Pro–Flo gun manual.
	Gun control or extension cable damaged	Check the continuity and replace cable if necessary. Refer to the appropriate Pro–Flo gun manual.
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.

Problem	Possible Cause	Corrective Action
6. Gun dispensing early, before robot moves	Signals from robot controller timed improperly	Set proper timing sequence. Refer to *Setting Timing Sequences* in the *Installation* section.
	Gun On or Tool Speed delay too short	Increase parameter settings. Refer to the *Operation* section.
7. Gun dispensing after cycle, 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 *Setting Timing Sequences* in the *Installation* section.
	Gun On delay too long	Decrease the parameter setting. Refer to the *Operation* section.
	Stem binding (packing–type bonnet only)	Loosen 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 *User Interface* in the *Operation* 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

Introduction

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

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

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.

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 (3) to the enclosure.
7. Connect the cables to the power supply (3) and power monitor board (2).
8. Adjust the power supply (3) 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.

Power Supply *(contd.)*

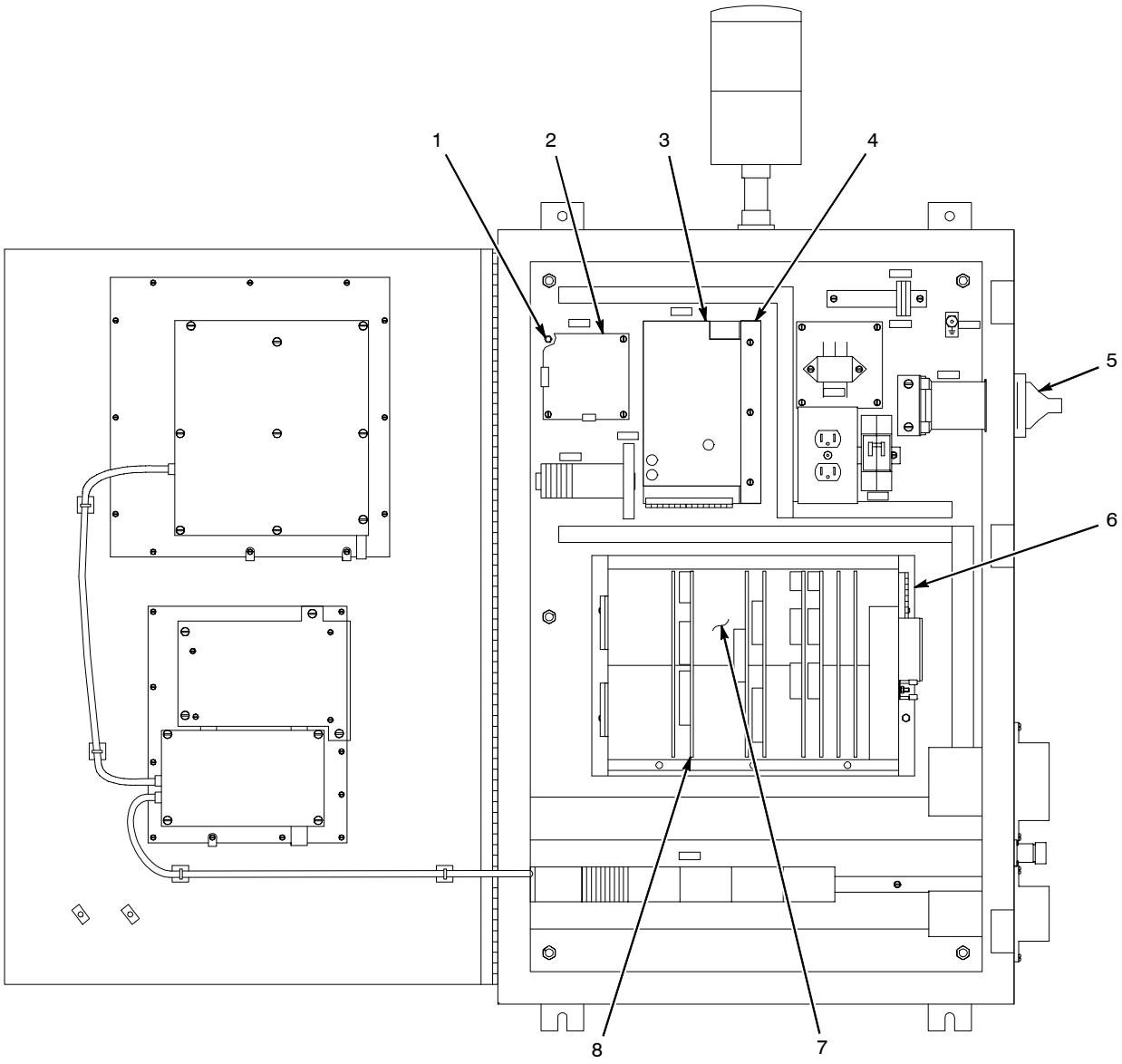


Figure 6-1 Controller Assembly Components

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

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 (8) to the same position.
5. Place the new power monitor board (2) in position.
6. Connect the cables.
7. Shut the enclosure door. Turn on the main rotary switch (5). Turn on electrical power to the system.

Circuit Boards in Card Rack

1. See Figure 6–2. Shut off and lock out external electrical power to the controller. Turn off the main rotary switch.
2. Open the enclosure door and remove the card rack (Figure 6–1, (5)).
3. 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 (1) from the backplane (Figure 6–1, (7)). Slide the device from the slot in the card rack.
5. Note the position of the rotary switch (3). Set the switch on the new circuit board (1) to the same position.

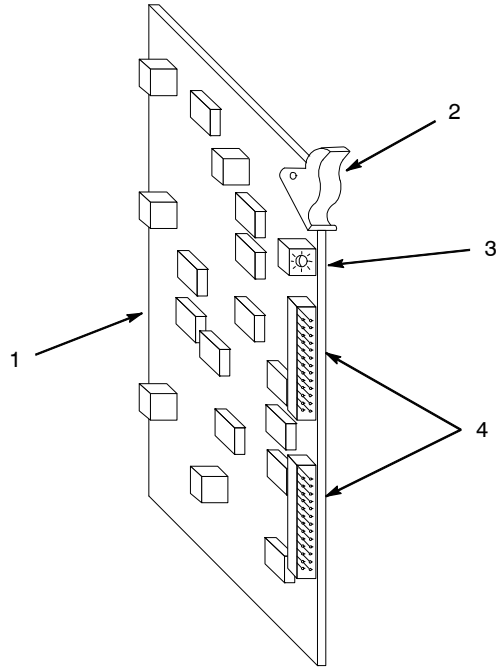


Figure 6-2 Rotary Switch Setting (Board Address)

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

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

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

See Figure 6–3.

1. Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (Figure 6–1, (5)).
2. 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. Shut the enclosure door. Turn on the main rotary switch (Figure 6–1, (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.

VGA Display

1. See Figure 6–3. Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (Figure 6–1, (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. Remove the screws securing the VGA display (2) to the support plate.
5. Mount the new VGA display to the support plate.

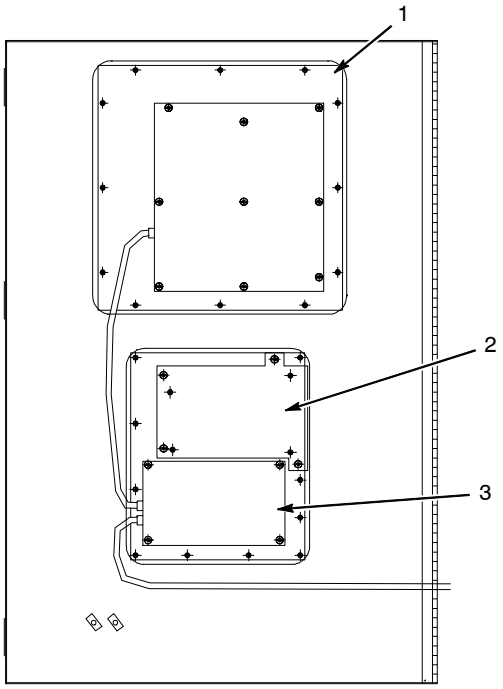


Figure 6-3 Components Inside the Front Enclosure Door

1. Diagnostic panel
2. VGA display
3. Keypad

6. Hold the support plate near its final position and connect the bottom cable. Bolt the support plate to the enclosure door.
7. Shut the enclosure door. Turn on the main rotary switch (Figure 6–1, (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

See Figure 6–3.

1. Turn off and lock out external electrical power to the controller. Turn off the main rotary switch (Figure 6–1, (5)).
2. Open the enclosure door and disconnect the two cables from the keypad (3).
3. Remove the six screws that hold the keypad (3) to the enclosure door. Pull the keypad out slightly and disconnect the cable underneath. Remove the keypad.
4. Hold the new keypad (3) 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. Shut the enclosure door. Turn on the main rotary switch (Figure 6–1, (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.

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

Introduction

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

Using the Illustrated Parts List

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

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

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

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

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

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

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

Pro-Flo Controller Parts List

See Figure 7–1.

Item	Part	Description	Quantity	Note
1	– – – – – –	Enclosure	1	
2	281714	Switch, rotary, 3 pst	1	
3	282864	Circuit breaker	1	
4	117188	Fan assembly	1	
5	107499	Backplane	1	
6	105987	Board, circuit, I/O	2	
7	115 877	Board, circuit, serial	1	
8	135117	Board, circuit, memory	1	A
9	123951	Board, circuit, CPU	1	
10	168433	Board, circuit, gun	1	
11	282960	Interconnect cable diagnostic, panel to keypad, 2 ft	1	
12	1604380	PCA keypad panel, Pro-Flo	1	B,D
13	185670	Keyboard assembly, English	1	
14	1604375	Display QVGA	1	C,D
15	282959	Interconnect cable diagnostic, keypad to console module, $2^1/_2$ ft	1	
16	185669	Diagnostic panel, English	1	
17	185681	Board, PC, diagnostic display	1	
18	109302	Board, circuit, power monitor	1	
19	233612	Board, circuit, power supply	1	
NS	233569	• Adapter, power supply	1	
NS	185682	Board, PC, display configurator	1	
NS	1604376	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

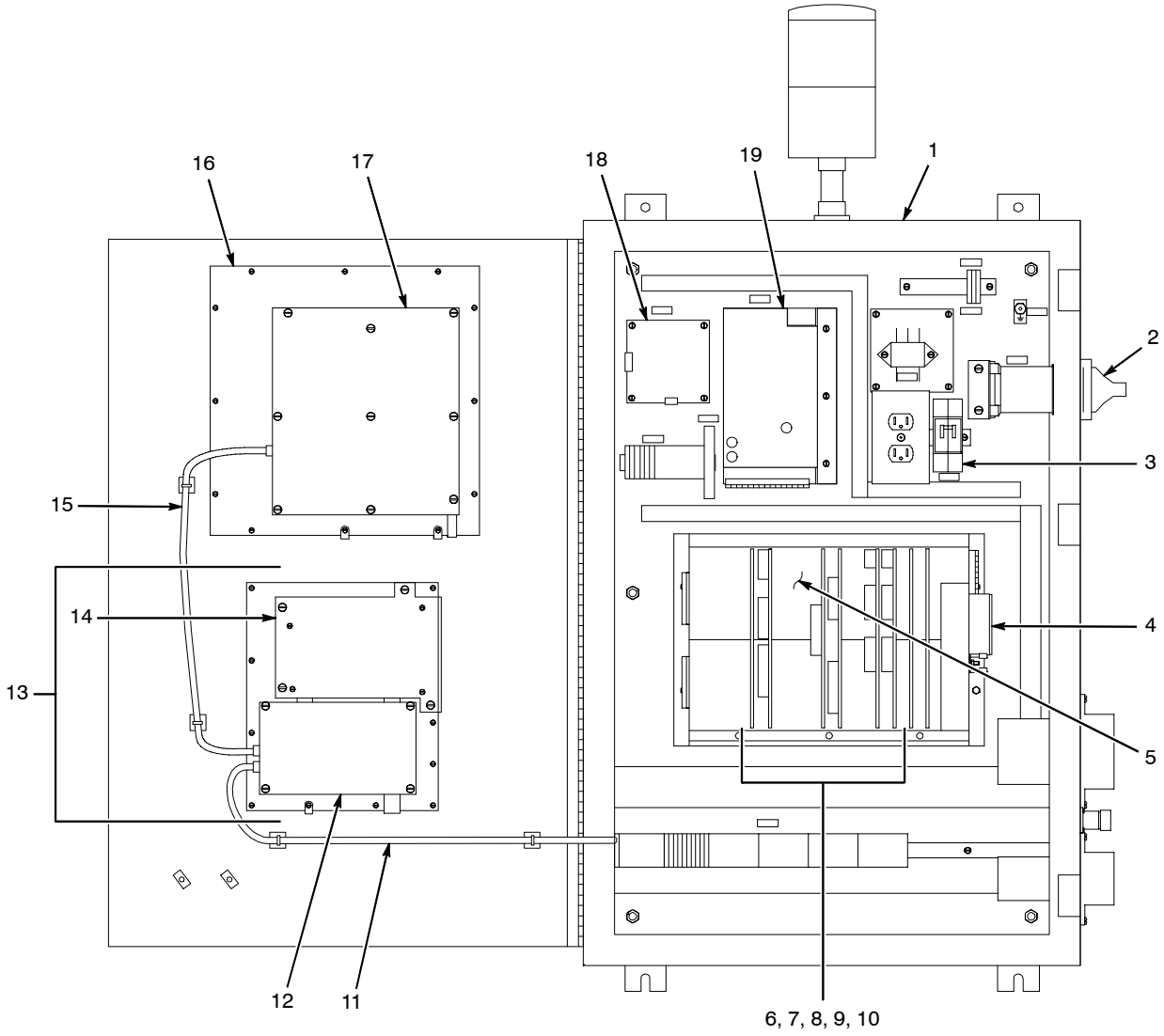


Figure 7-1 Pro-Flo Controller

Pro-Flo Controller Parts List – Additional Languages

Use this list to order language versions other than English.

Part	Description
186467	Diagnostic panel, German
186468	Key pad assembly, German
186469	Diagnostic panel, French
186470	Key pad assembly, French
221924	Diagnostic panel, Italian
221925	Key pad assembly, Italian
221922	Diagnostic panel, Dutch
221923	Key pad assembly, Dutch
221920	Diagnostic panel, Swedish
221921	Key pad assembly, Swedish
186460	Diagnostic panel, Spanish
186461	Key pad assembly, Spanish

Accessories and Kits Parts List

These accessories may be purchased separately.

Part	Description
281132	Kit, proportioning valve (for air spray)
154376	Kit, material cut–off module
144259	Software program, DataLink, $3^1/_2$–in. disk
144260	Software program, DataLink, $5^1/_4$–in. disk
155450	Battery backup service kit

Cable Parts List

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

Part	Description	Note
228622	Cable, communication, 2 ft	
221817	Cable, robot interface, standard, 25 ft	A
221816	Cable, robot interface, standard, 40 ft	A
221815	Cable, robot interface, standard, 70 ft	A
233524	Cable, robot interface, standard, 4 ft	B
230569	Cable, robot interface, standard, 25 ft	B
230568	Cable, robot interface, standard, 40 ft	B
230567	Cable, robot interface, standard, 70 ft	B
221823	Cable, RTD, flowmeter, upstream pressure transducer, standard, 25 ft	
221822	Cable, RTD, flowmeter, upstream pressure transducer, standard, 40 ft	
221821	Cable, RTD, flowmeter, upstream pressure transducer, standard, 70 ft	
235876	Cable, control, Pro–Flo gun, 70 ft	
235872	Cable, control, Pro–Flo gun, sacrificial, 16 ft	
223229	Cable, air–management, package, 70 ft	
223231	Cable, control, solenoid, 70 ft	

NOTE A: Use these cables if your controller was built before August 1996.

B: Use these cables if your controller was built after August 1996.

Section 8
Specifications

Electrical

The controller may be purchased for either 120 or 240 V line voltages. Controllers for 120 V require 6A of current and controllers for 240 V require 3A of current. Hard wire the controller into a dedicated power supply to provide safe operation and to reduce interference from electrical noise.

Cables

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.

Table 8–1 Robot Interface Cable

Pin Number	Before8/96 Reference Signal	After 8/96 Reference Signal 24 volt I/O	After 8/96 Reference Signal 110 volt I/O
Ground1	Not Used	Ground	Ground
1	Part ID (MSB 5)	24V (Supply Voltage)	L1 (110V)
2	Part ID (BIT 4)	Ground	L1 (110V Neutral))
3	Part ID (BIT 3)	Ground	Ground
4	Part ID (BIT 2)	Part ID (BIT 3)	Part ID (BIT 3)
5	Part ID (BIT 1)	Part ID (BIT 2)	Part ID (BIT 2)
6	Part ID (BIT 0)	Part ID (BIT 1)	Part ID (BIT 1)
7	Part OK	Part ID (BIT 0)	Part ID (BIT 0)
8	Part Strobe	Part OK	Part OK
9	Clear Fault Queue	Part Stobe	Part Strobe
10	Fault Ack	Clear Fault Queqe	Clear Fault Queue
11	Gun On	Fault Ack	Fault Ack
12	Purge	Gun On	Gun On
13	24V (Supply Voltage)	Purge	Purge
14	Dispenser	Dispenser Ready	Dispenser Ready
15	Fault (MSB 3)	Fault (MSB 3)	Fault (MSB 3)
16	Fault (BIT 2)	Fault (BIT 2)	Fault (BIT 2)
17	Fault (BIT 1)	Fault (BIT 1)	Fault (BIT 1)
18	Fault (LSB 0)	Fault (LSB 0)	Fault (LSB 0)
19	Fault Strobe	Fault Strobe	Fault Strobe
20	Analog Signal #1 (+)	Analog Signal #1 (+)	Analog Signal #1 (+)
21	Analog Signal #1 (–)	Analog Signal #1 (–)	Analog Signal #1 (–)
22	Sheild	Analog Signal #2 (+)	Analog Signal #2 (+)
23	Analog Signal #2 (+)	Analog Signal #2 (–) (NOTE A)	Analog Signal #2 (–) (NOTE A)
24	Analog Signal #2 (–)	Spare (NOTE A)	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 (–)

Table 8–3 Solenoid Cable

Cable connection	Wire color	From connector (gun cable end) pin letter	Function	Cable connection (at MCO solenoid)
Connector at Pro–Flo controller	Drain	A	Drain	Drain
	Brown	B	MCO Solenoid +24 VDC	Wire at MCO solenoid
	White	C	Common 24 VDC	Wire at MCO solenoid

Table 8–4 Proportioning Valve Cable (Air Spray)

Cable connection	Wire color	From connector (gun cable end) pin letter	Function	Cable connection (at valve)
Connector at Pro–Flo controller	Drain	A	Drain	Drain
	Black	B	Proportional signal	Wire at valve
	Red	C	+24 VDC	Wire at valve
	Green	D	Common +24 VDC	Wire at valve

Table 8–5 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		Not used

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

NOTE: The terms defined below are used in the specifications presented:

- MSB — most significant bit
- LSB — least significant bit

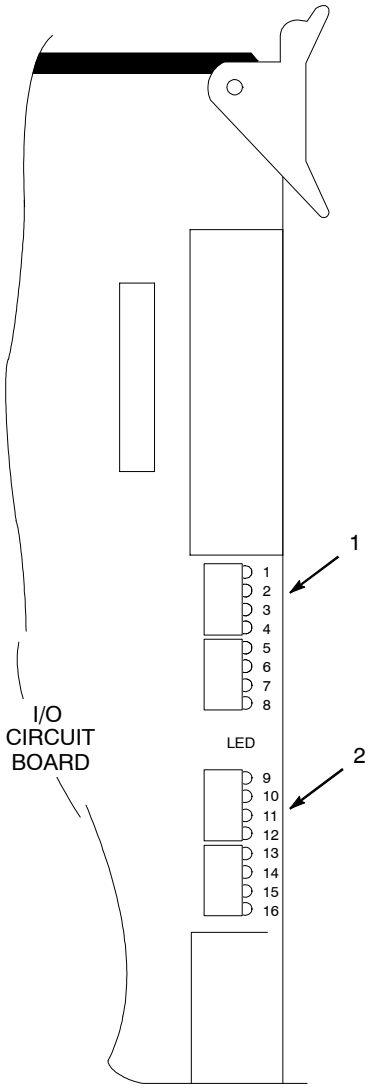


Figure 8-1 Partial View of I/O Board and all LEDs

1. LED inputs
2. LED outputs

Digital Controller I/O (contd.)

Table 8–6 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	Clear fault queue
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 8–7 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
Conn2–4	4	4	Part ID
Conn2–5	5	3	Part ID
Conn2–6	6	2	Part ID
Conn2–7	7	1	Part ID
Conn2–8	8	0	Part ID
Conn2–9	—	—	Part ID LSB

Card 1 outputs			
Terminal number	**LED number**	**Output number**	**Function**
Conn3–1&2	9	7	Part OK
Conn3–3&4	10	6	Bead defect circuit OK
Conn3–5&6	11	5	Bead defect detected
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	Read volume

***Digital Controller I/O** (contd.)*

Table 8–8 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 8–9 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	_F or _C
8	Upstream pressure	psi or bar
9	SPC fault code I[b]	—
10	System status	—
11	SPC fault code II[c]	—

[a]Units may be changed using the Nordson Configurator program.

[b]This SPC code contains the primary fault, which is also reported on the Pro–Flo controller help screens.

[c]This 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

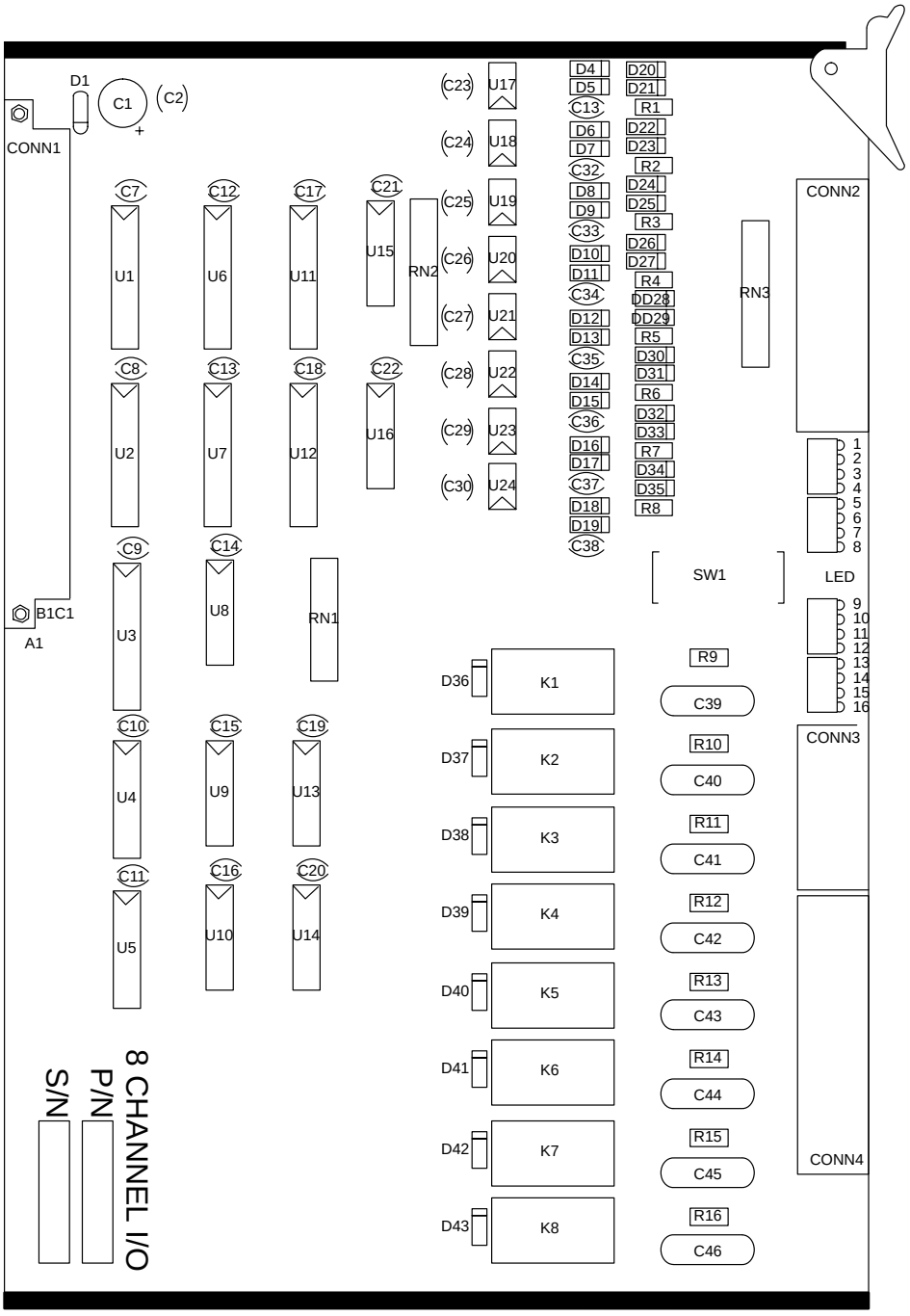
Table 8–10 SPC Error Codes

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

Table 8–11 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	Blank

4. Circuit Board Layouts and Schematics



2510044A

Fig. 8-2 Eight-channel I/O board layout

4. Circuit Board Layouts and Schematics (contd.)

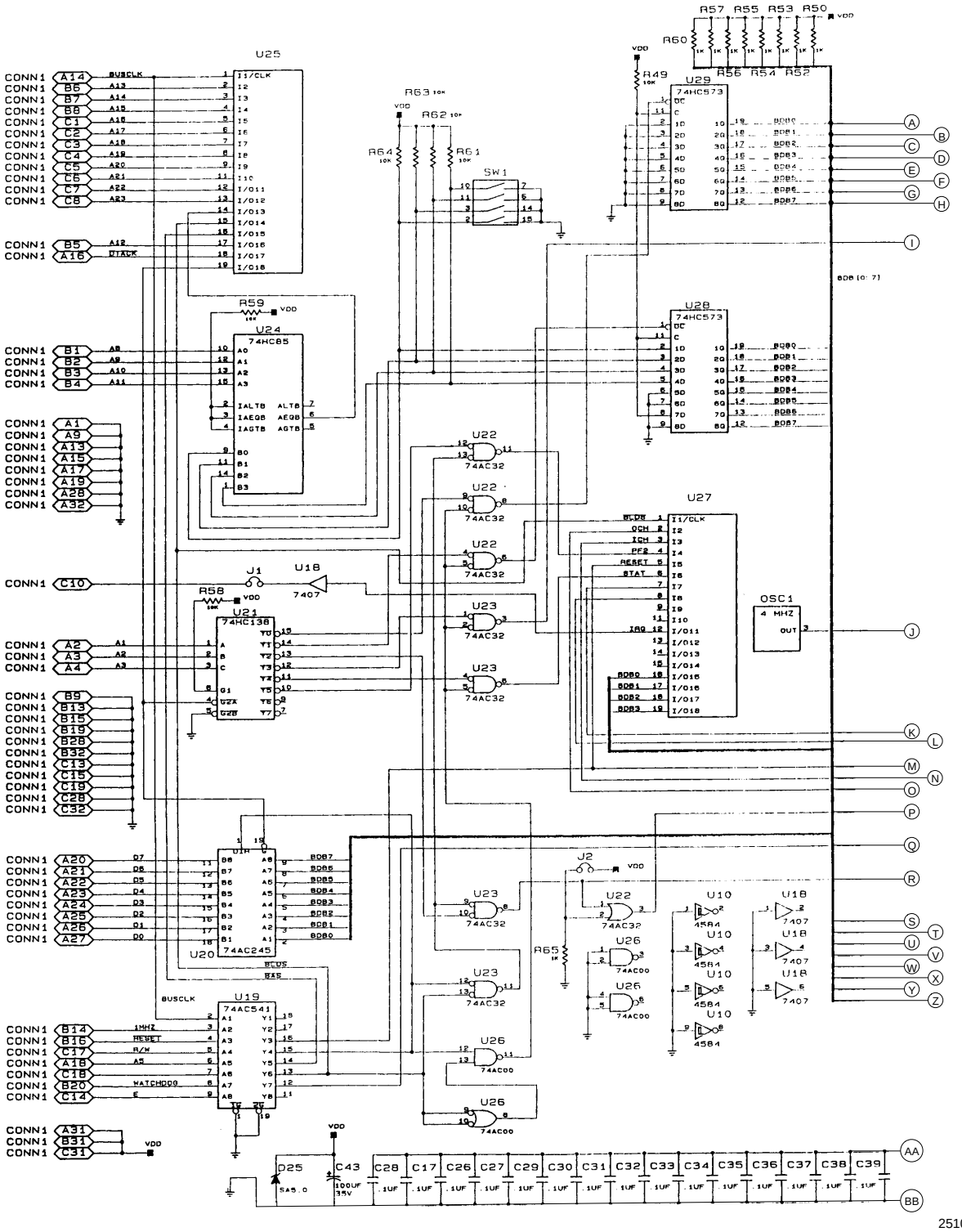


Fig. 8-3 Eight-channel I/O board schematic (1 of 2)

4. Circuit Board Layouts and Schematics (contd.)

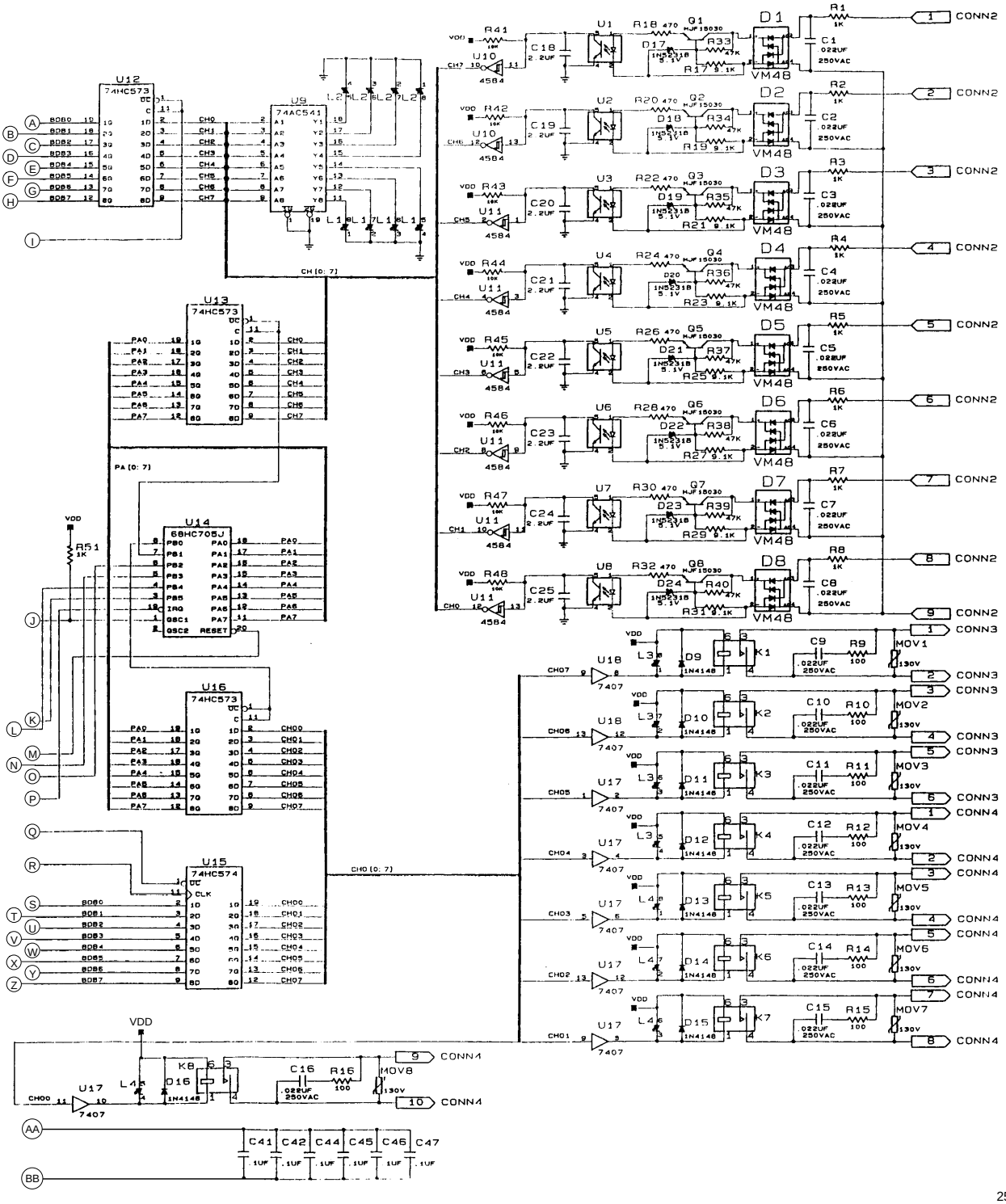


Fig. 8-4 Eight-channel I/O board schematic (2 of 2)

4. Circuit Board Layouts and Schematics (contd.)

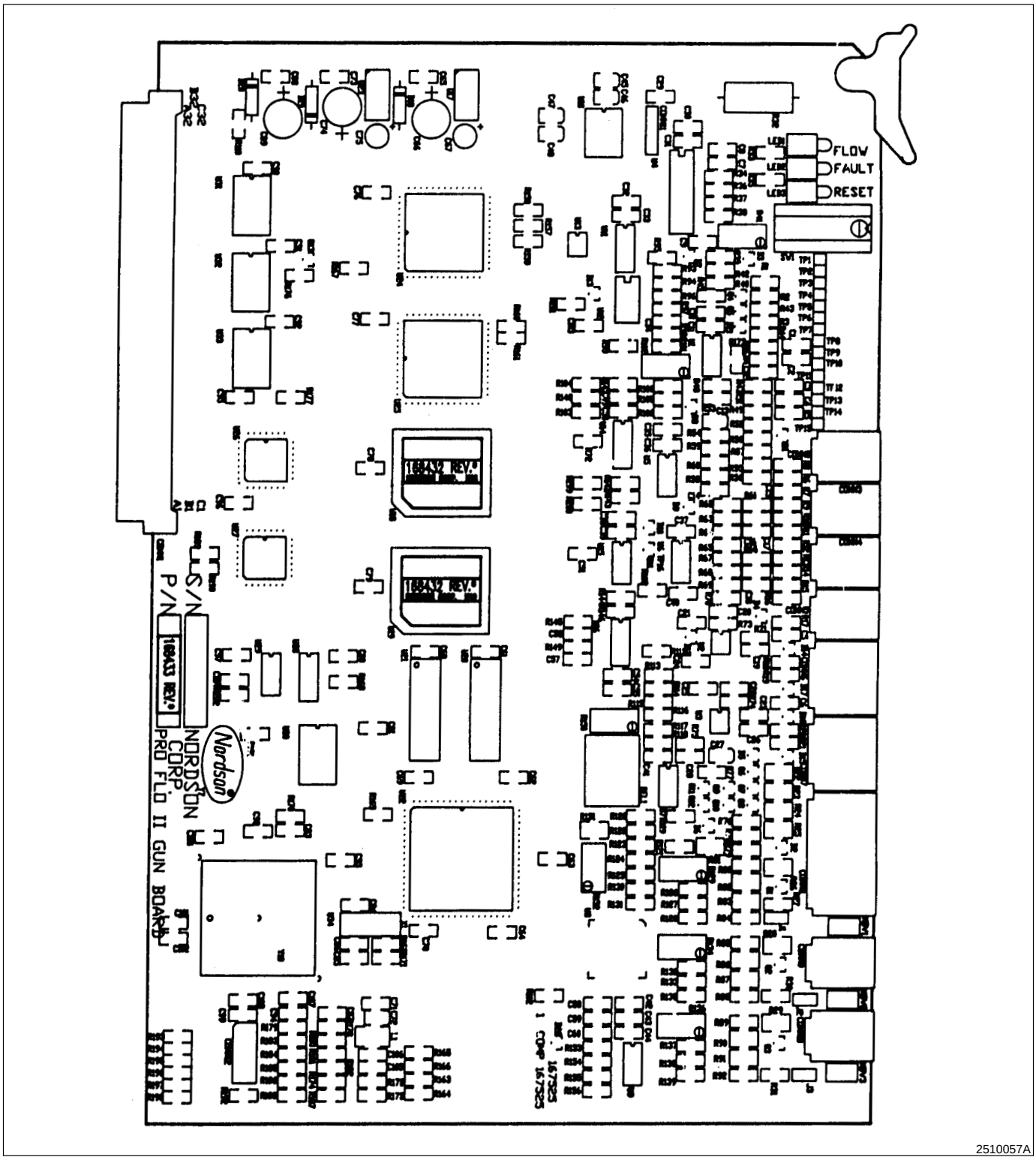
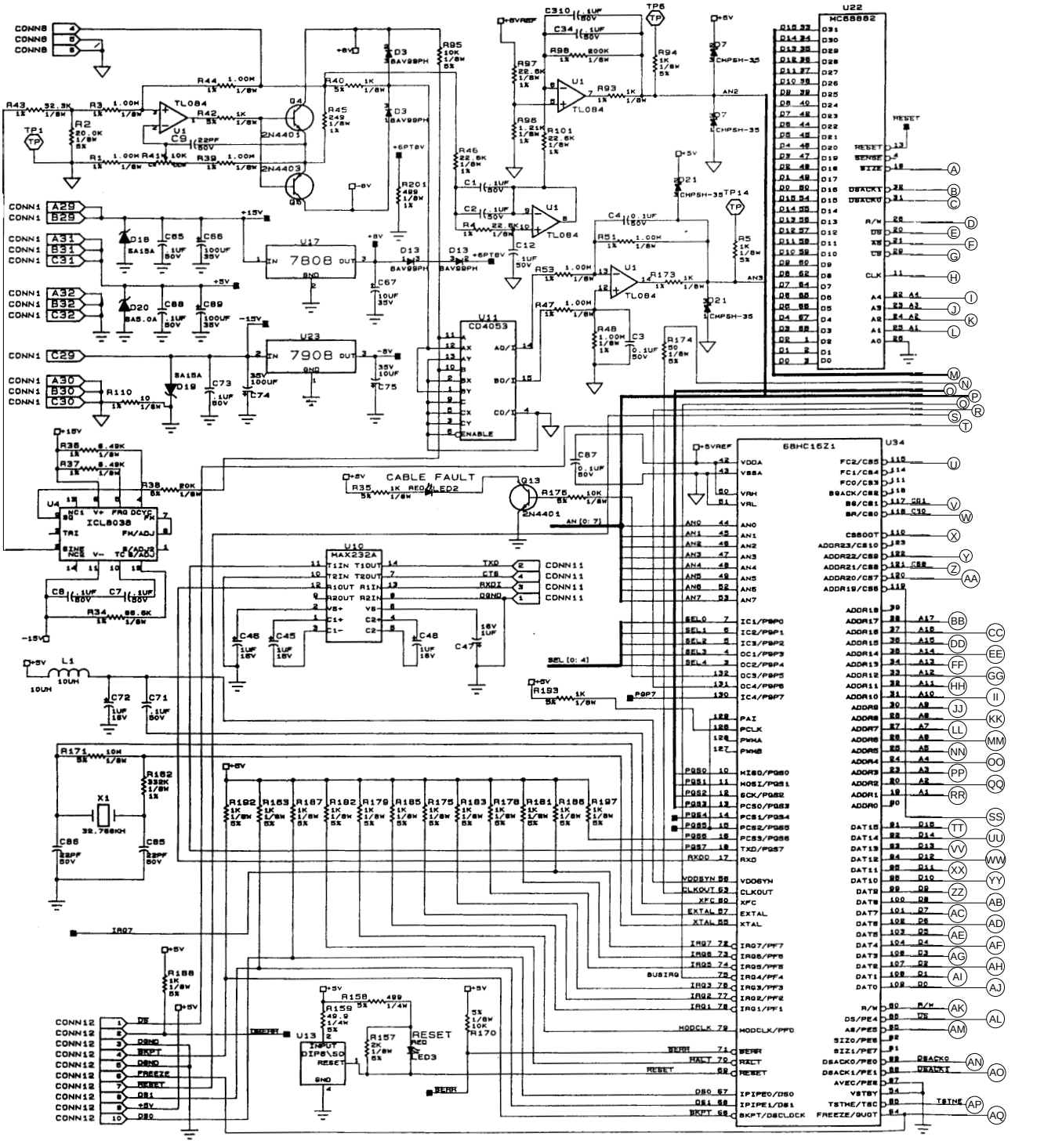


Fig. 8-5 Gun board layout

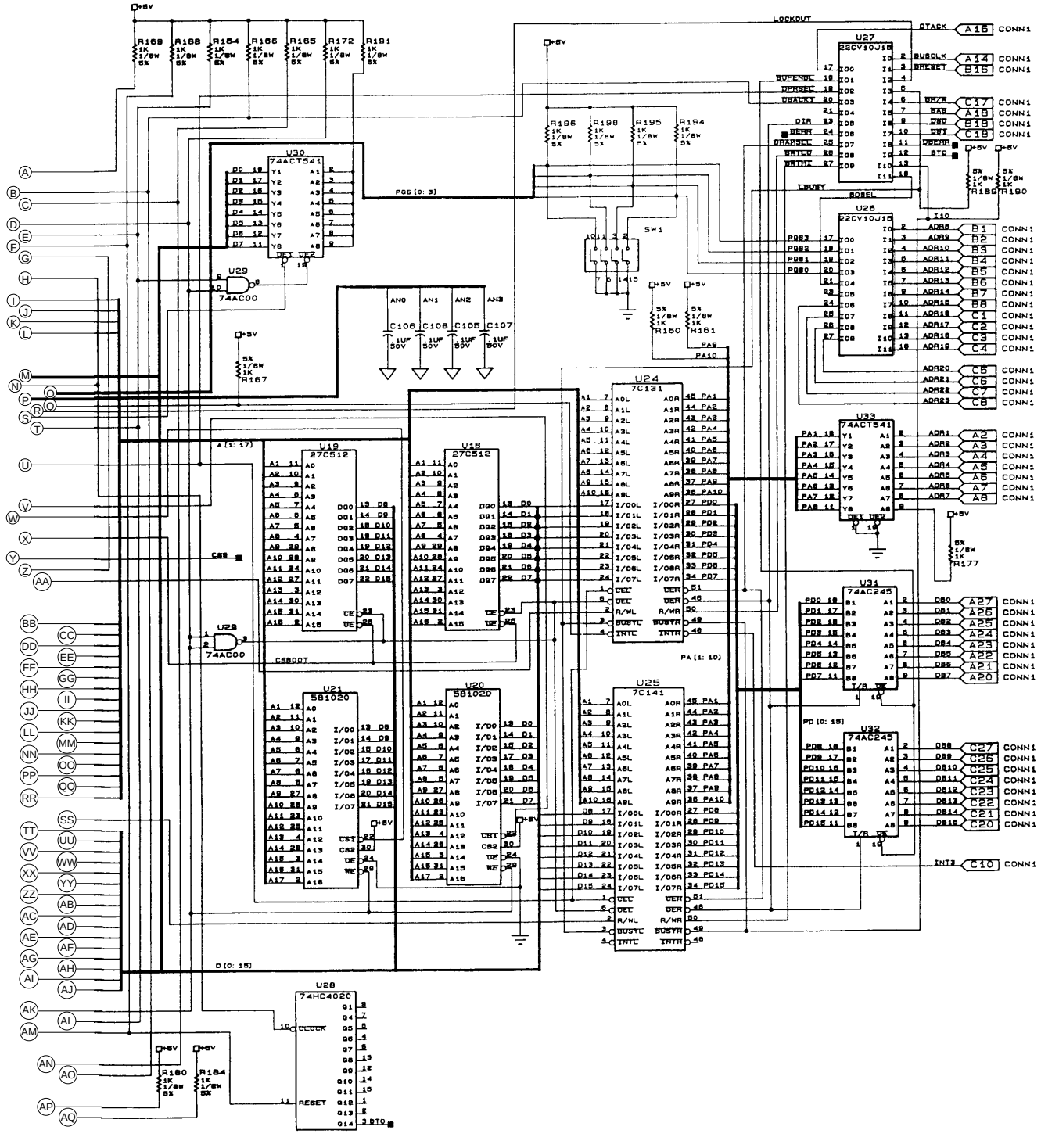
4. Circuit Board Layouts and Schematics (contd.)



2510053A

Fig. 8-6 Gun board schematic (1 of 4)

4. Circuit Board Layouts and Schematics (contd.)



2510054A

Fig. 8-7 Gun board schematic (2 of 4)

4. Circuit Board Layouts and Schematics (contd.)

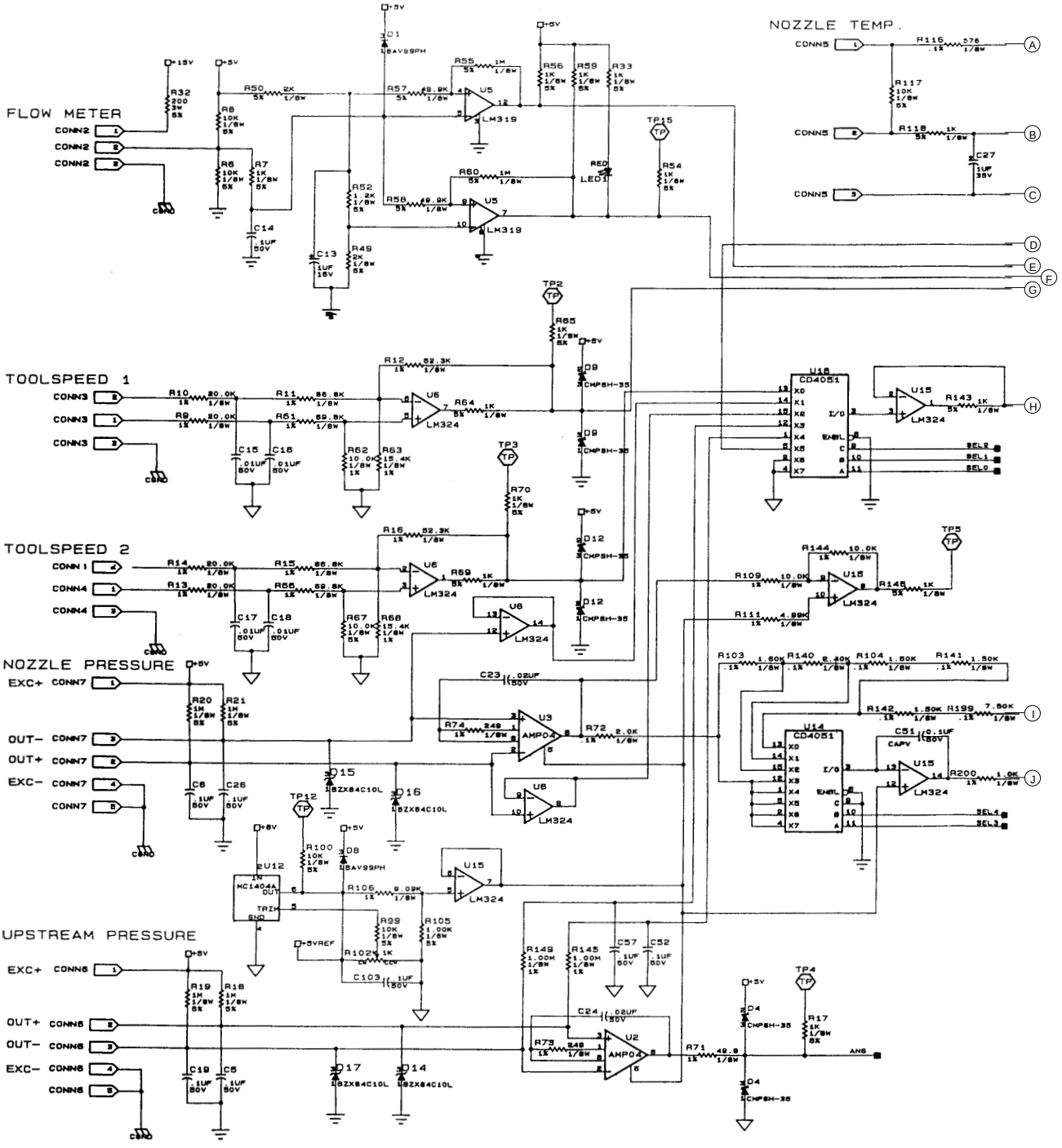
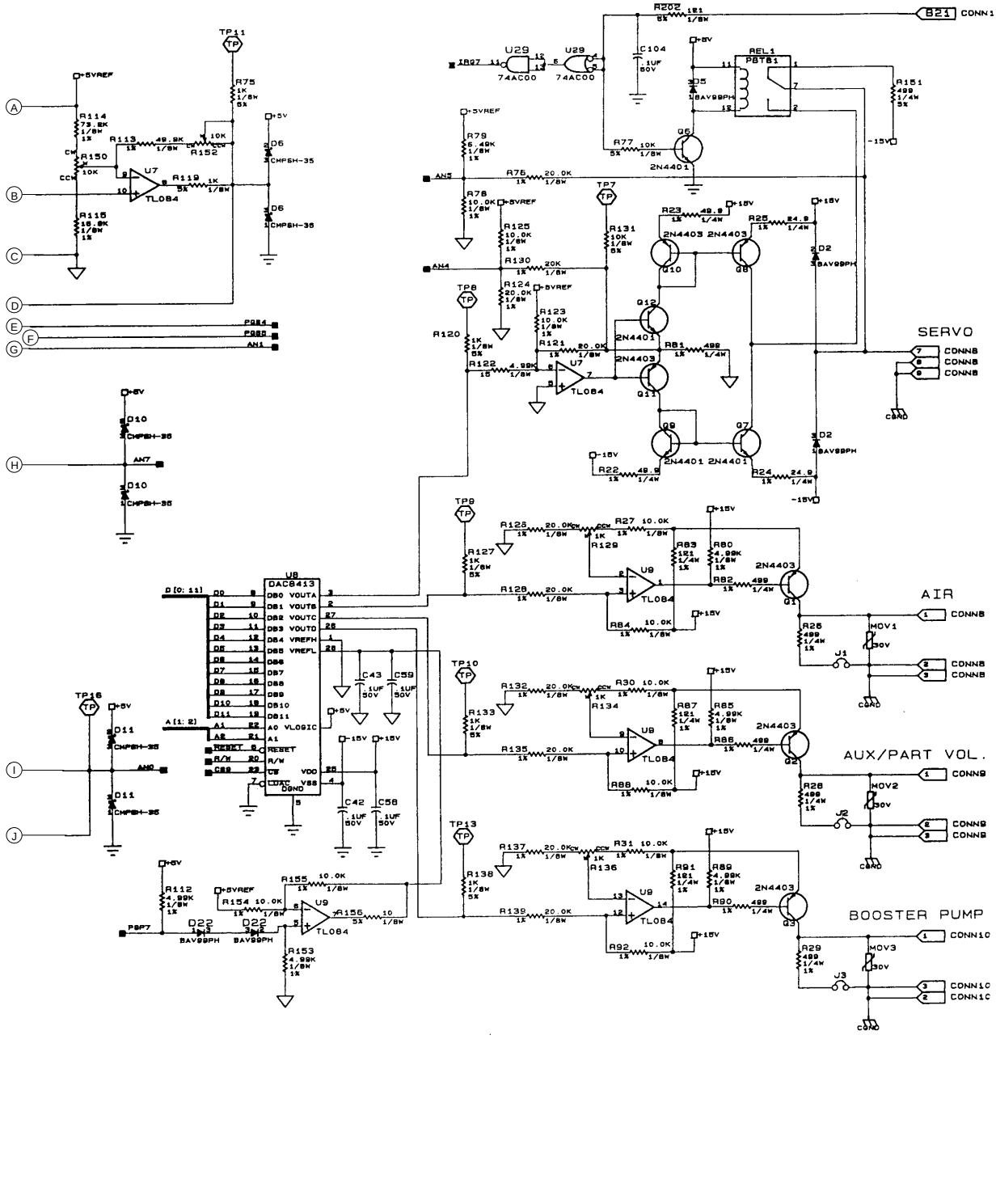


Fig. 8-8 Gun board schematic (3 of 4)

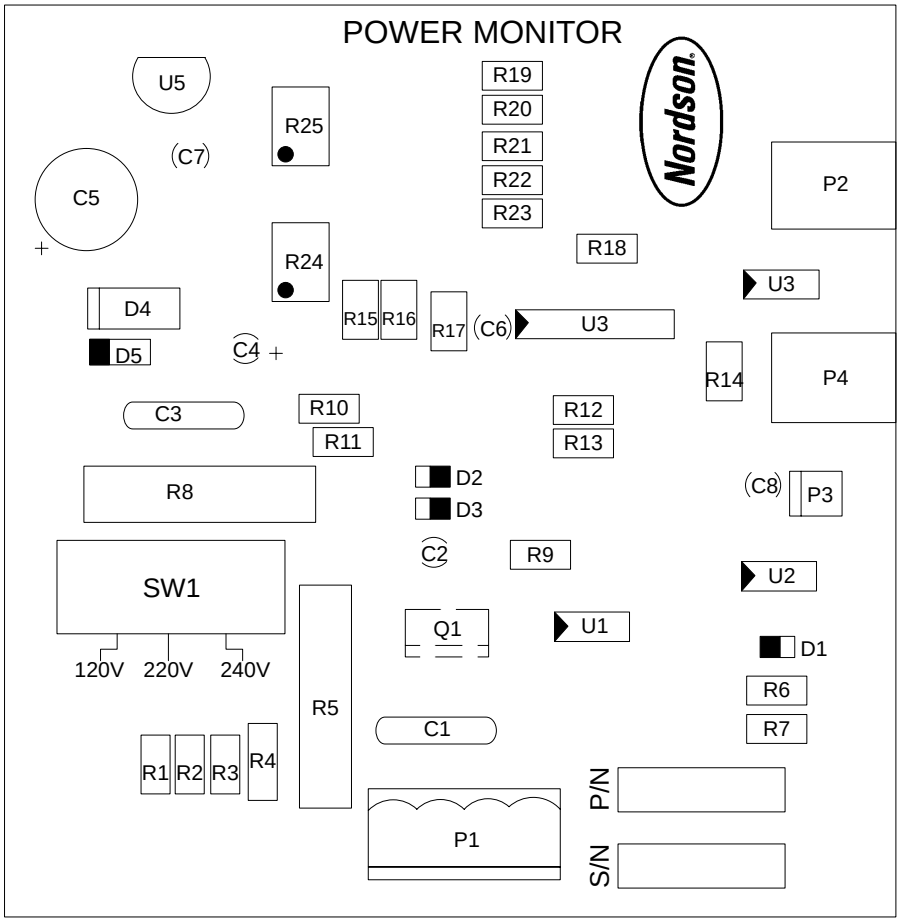
4. Circuit Board Layouts and Schematics (contd.)



2510056A

Fig. 8-9 Gun board schematic (4 of 4)

4. Circuit Board Layouts and Schematics (contd.)



2510021A

Fig. 8-10 Power monitor board layout

4. Circuit Board Layouts and Schematics (contd.)

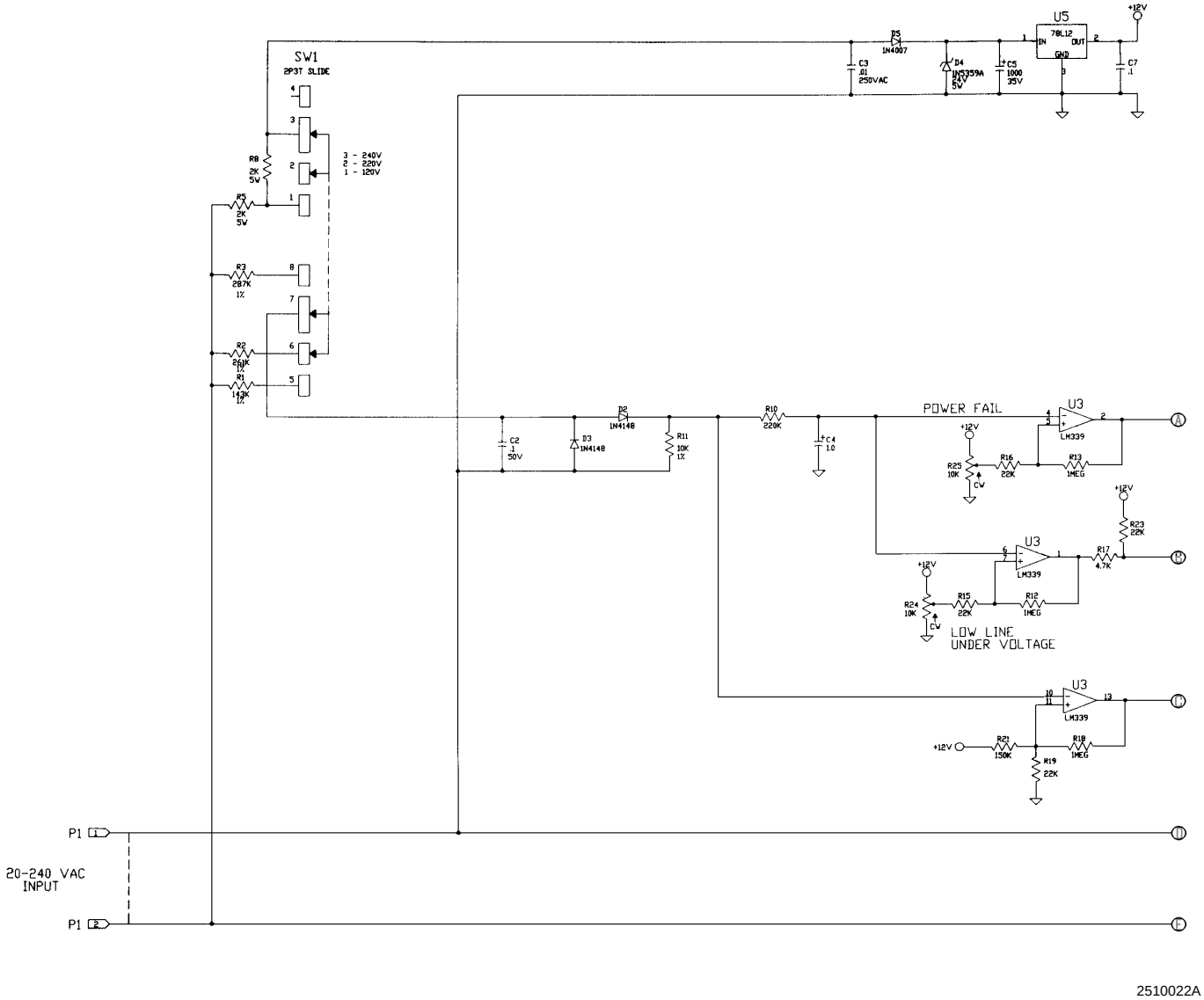
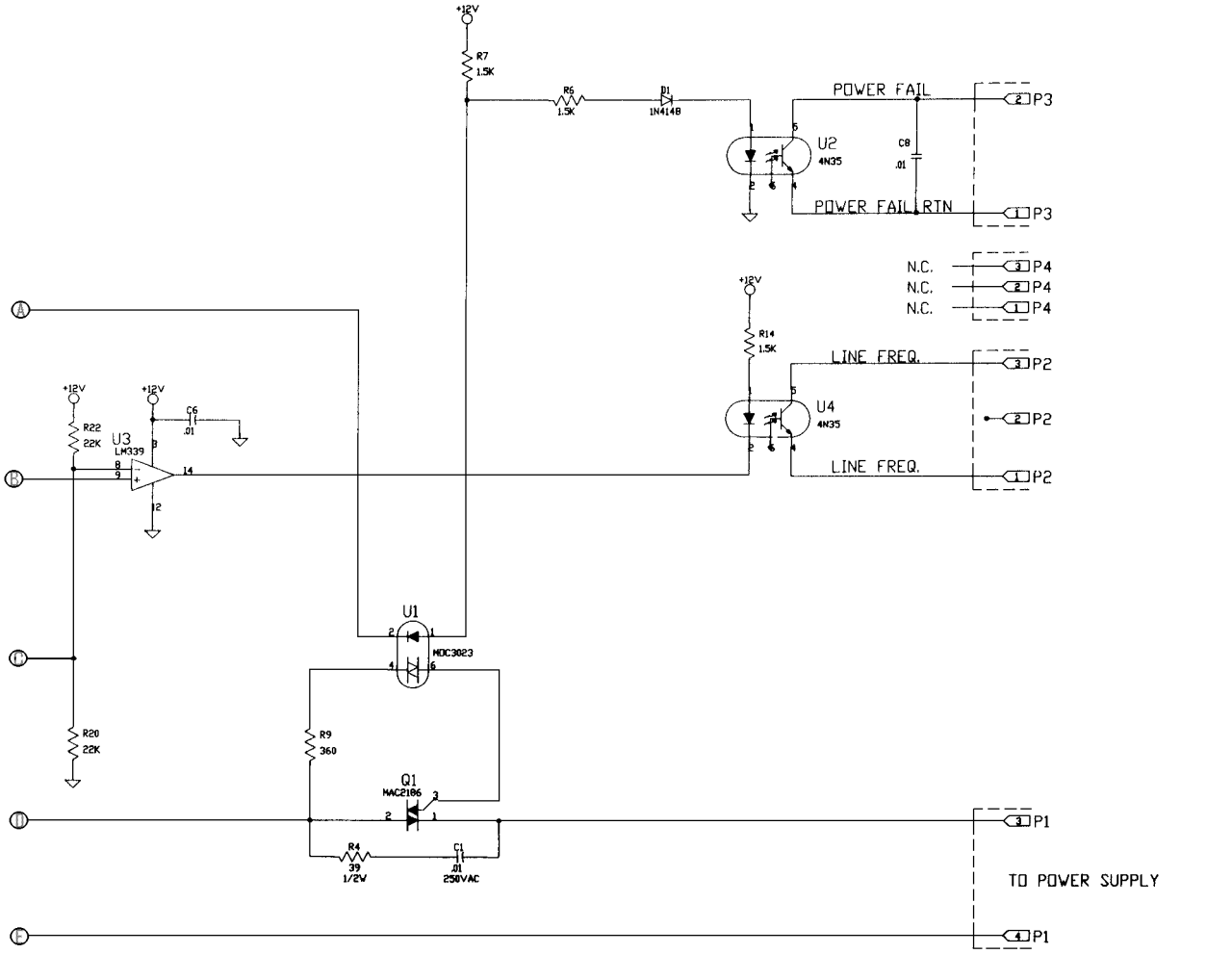


Fig. 8-11 Power monitor board schematic (1 of 2)

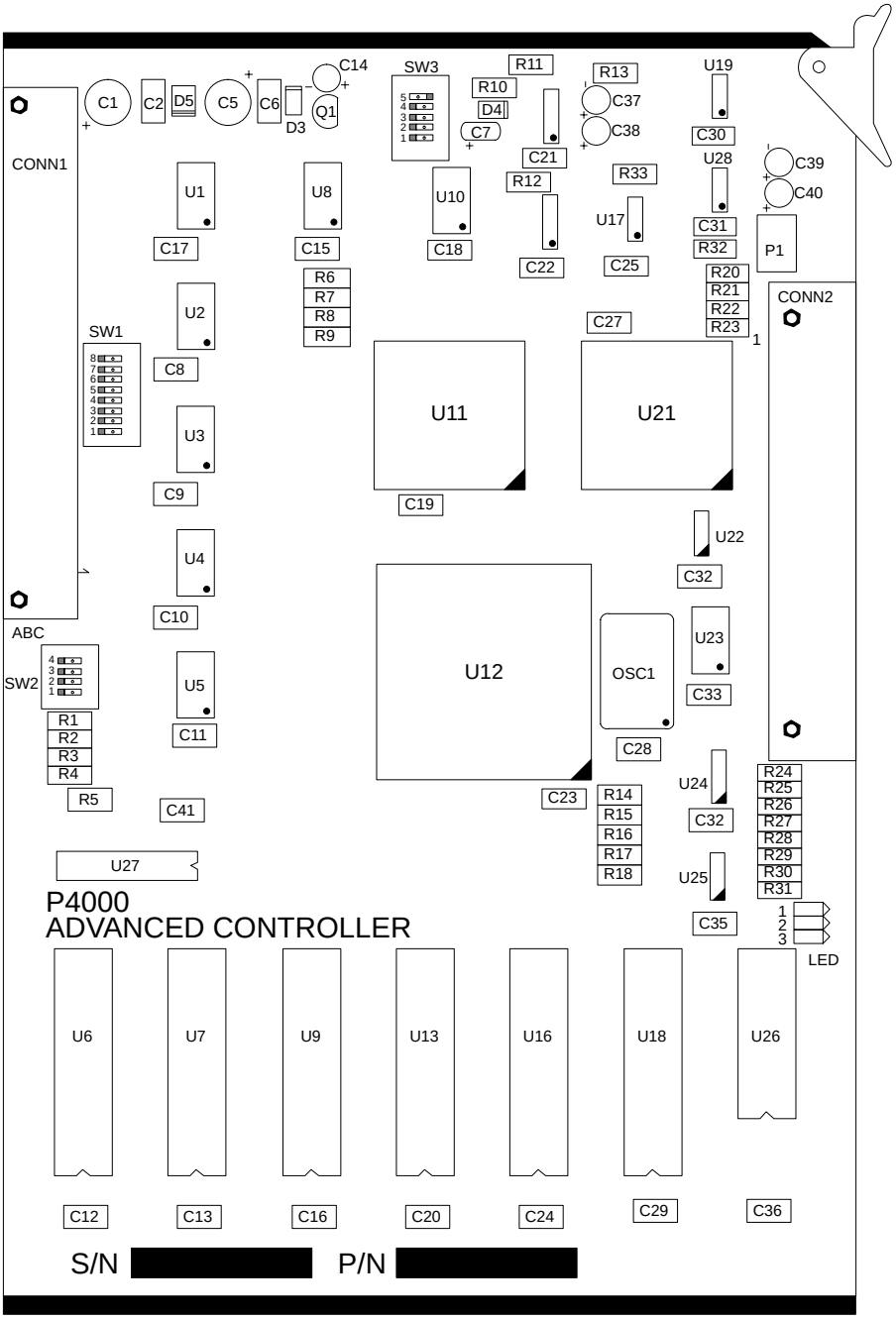
4. Circuit Board Layouts and Schematics (contd.)



2510023A

Fig. 8-12 Power monitor board schematic (2 of 2)

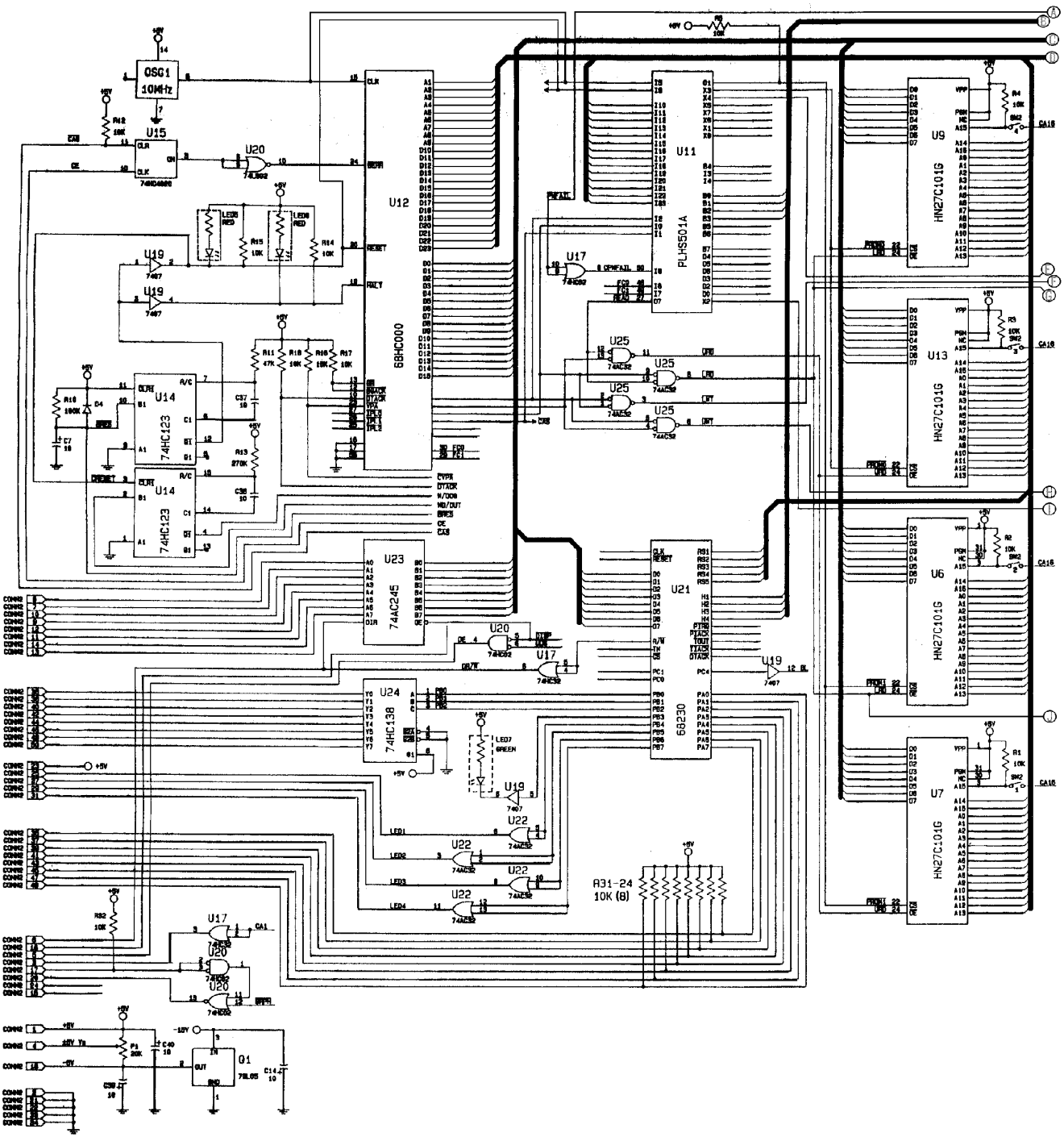
4. Circuit Board Layouts and Schematics (contd.)



2510024A

Fig. 8-13 Advanced controller board layout

4. Circuit Board Layouts and Schematics (contd.)



2510025A

Fig. 8-14 Advanced controller board schematic (1 of 2)

4. Circuit Board Layouts and Schematics (contd.)

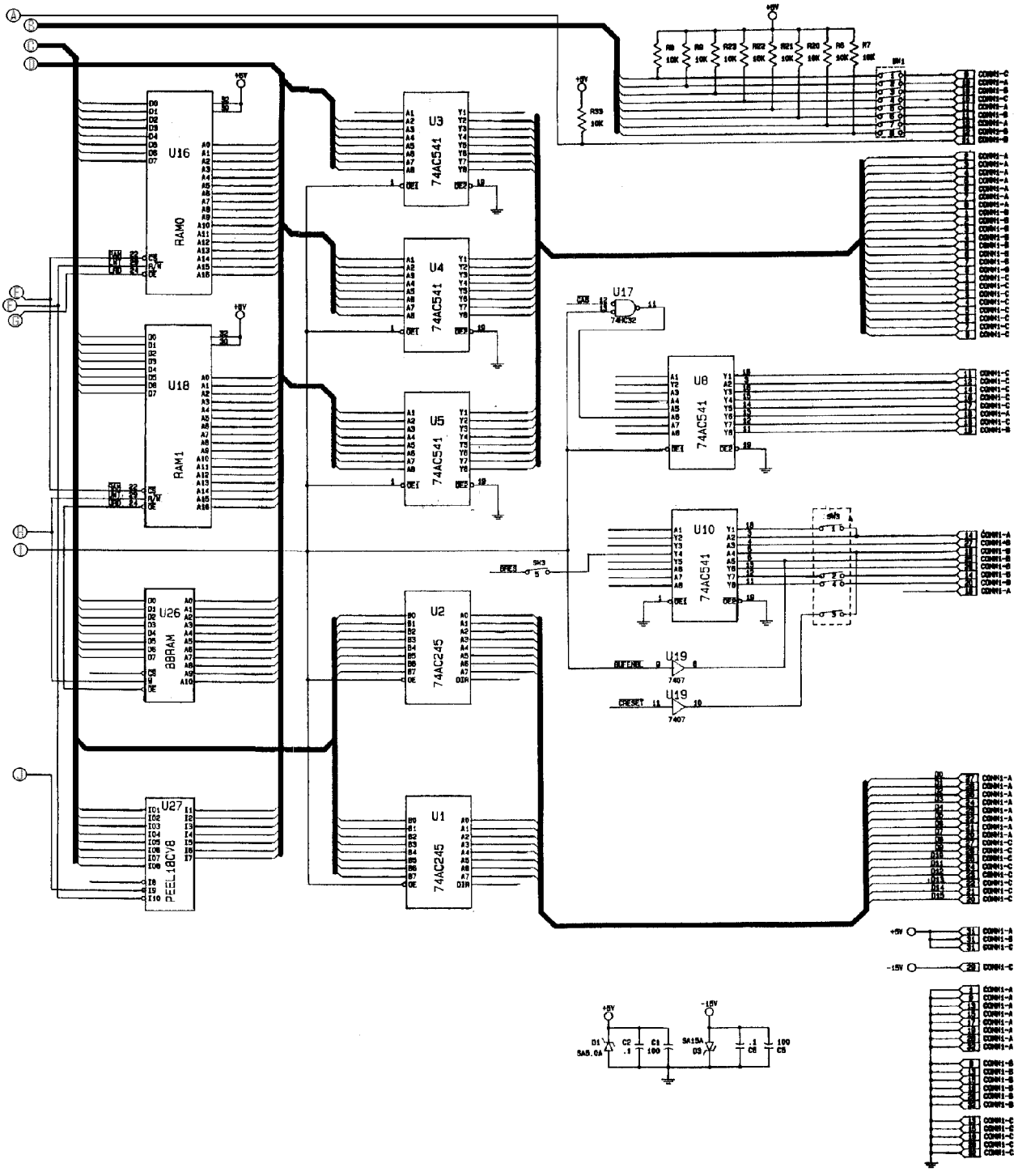
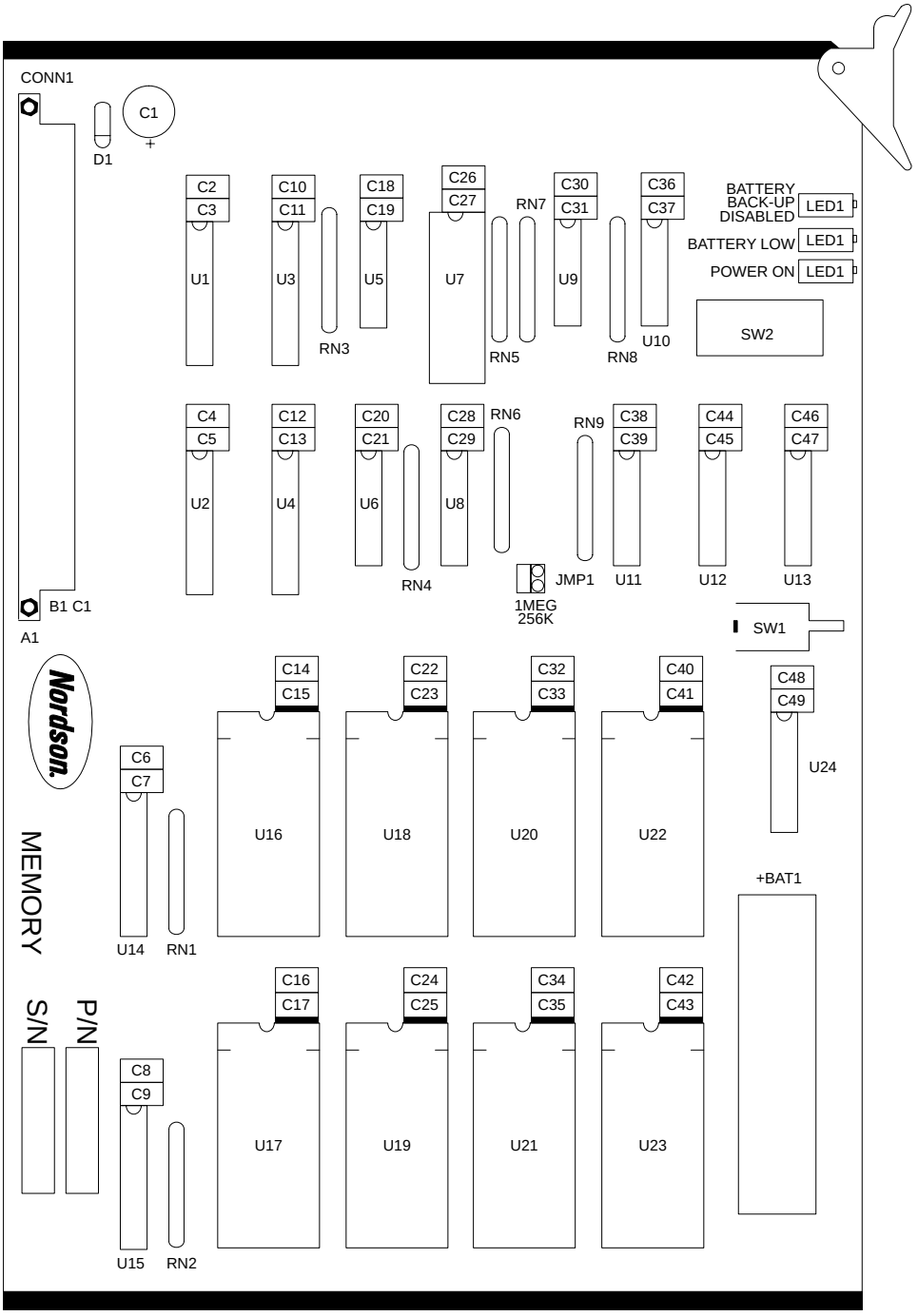


Fig. 8-15 Advanced controller board schematic (2 of 2)

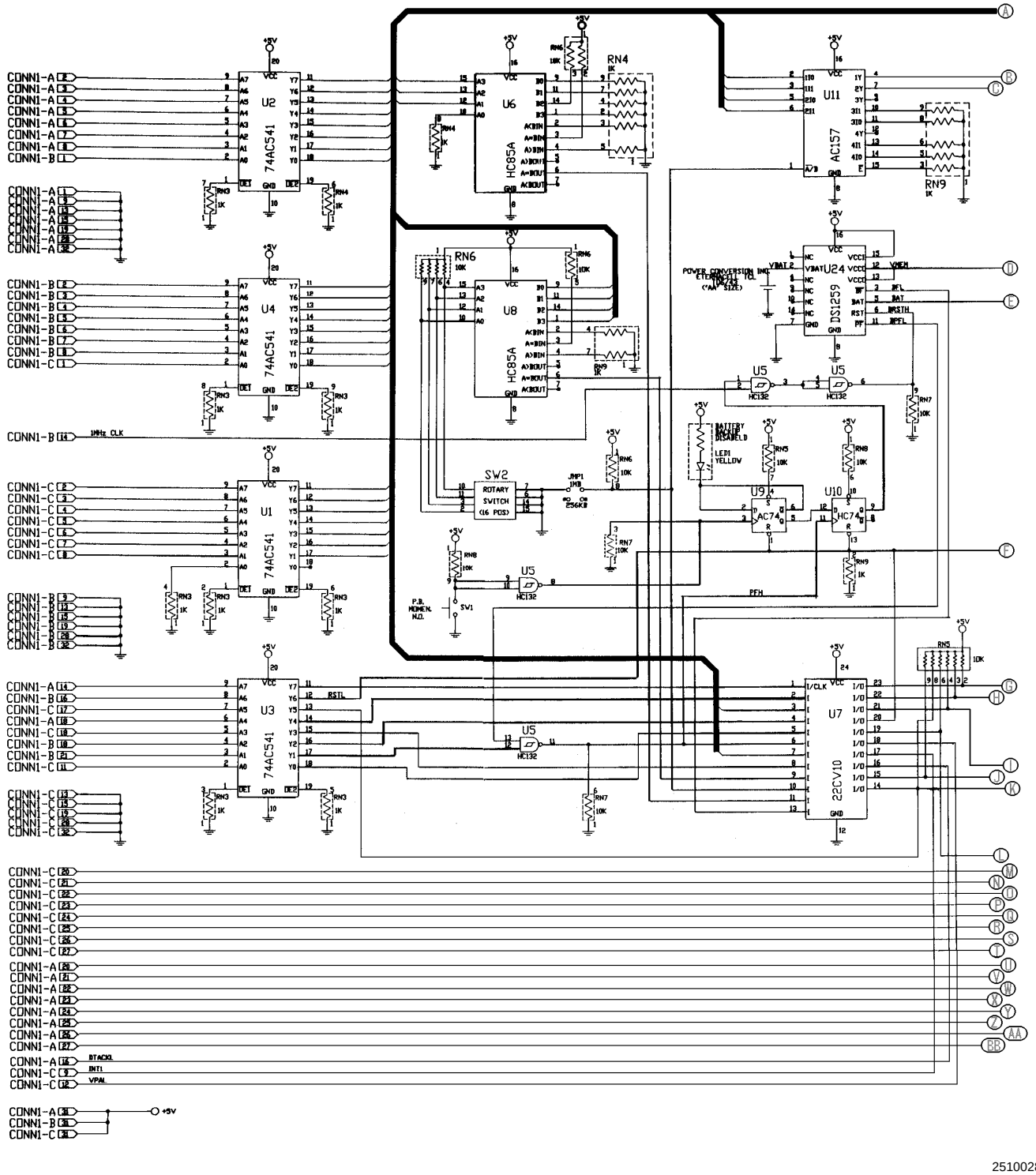
4. Circuit Board Layouts and Schematics (contd.)



2510027A

Fig. 8-16 Memory board layout (1 meg)

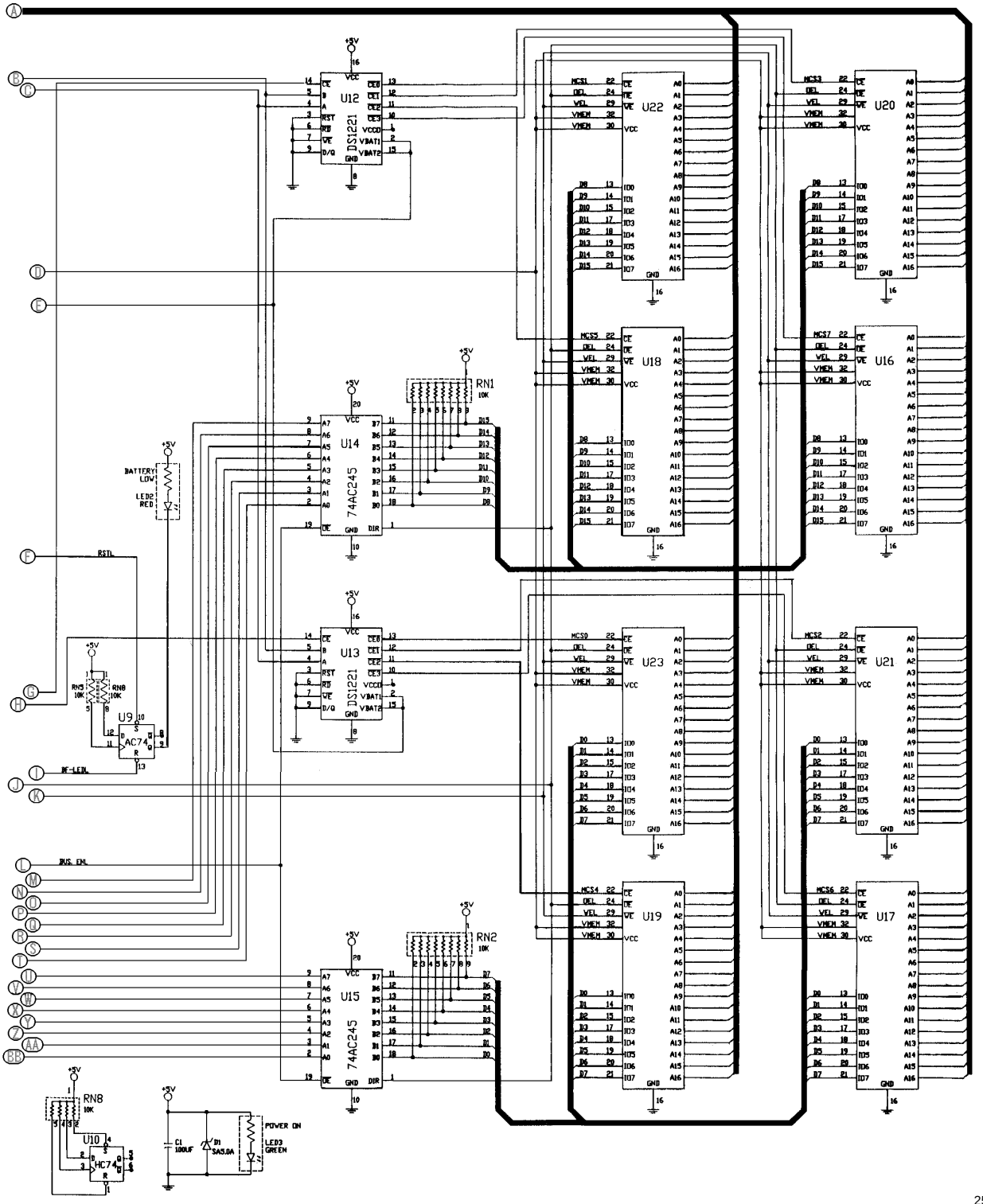
4. Circuit Board Layouts and Schematics (contd.)



2510028A

Fig. 8-17 Memory board schematic (1 meg) (1 of 2)

4. Circuit Board Layouts and Schematics (contd.)

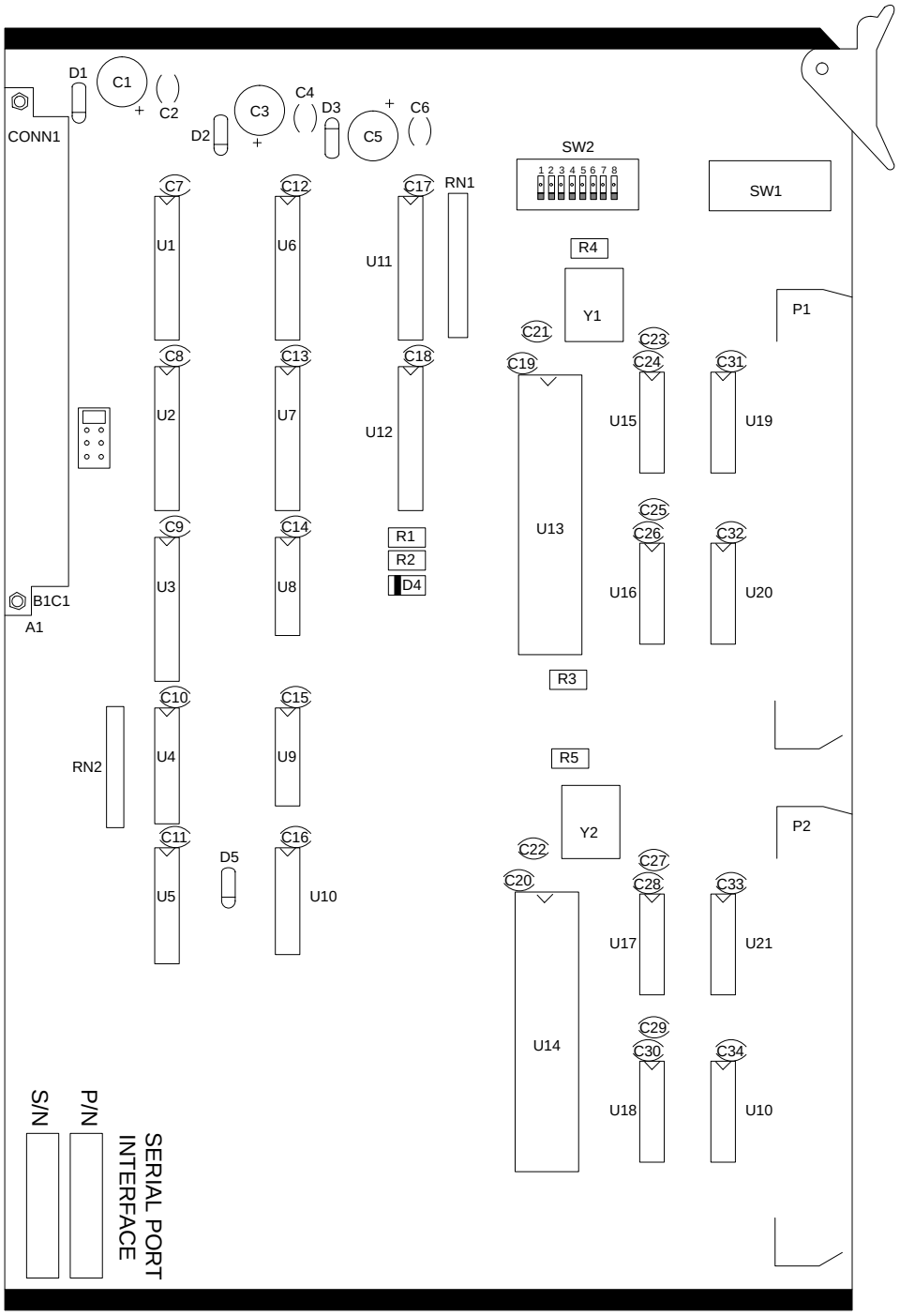


2510029A

Fig. 8-18 Memory board schematic (1 meg) (2 of 2)

4. Circuit Board Layouts and Schematics (contd.)

NOTE: Use this board if the SLTA is included with your unit. If SLTA is not included use board in Figure 8-20.

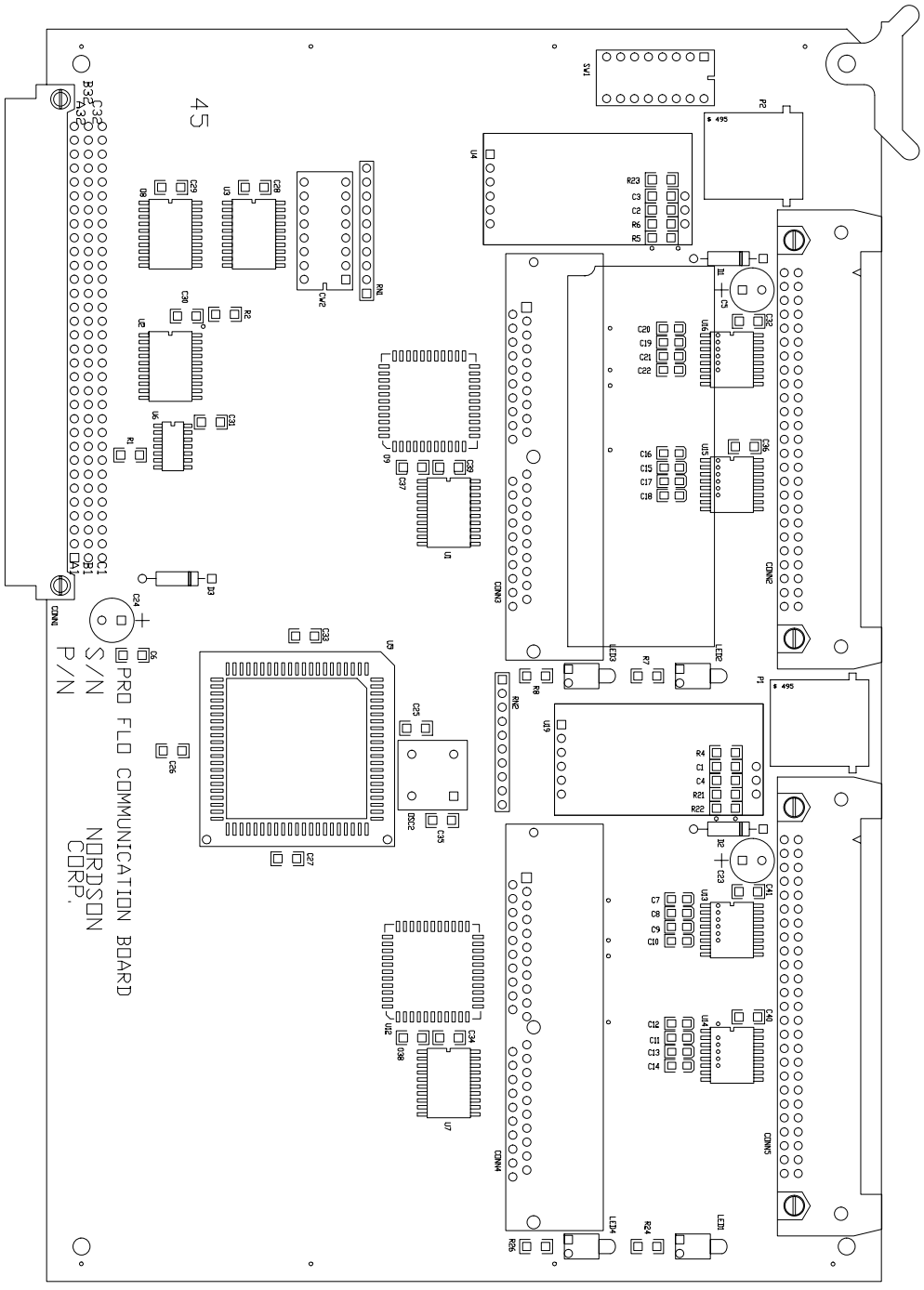


2510030A

Fig. 8-19 Serial interface board layout

4. Circuit Board Layouts and Schematics (contd.)

NOTE: Use this board if SLTA is not included with your unit. If SLTA is included use board on Figure 8-19.



2510030B

Fig. 8-20 Serial interface board (non SCTA)

4. Circuit Board Layouts and Schematics (contd.)

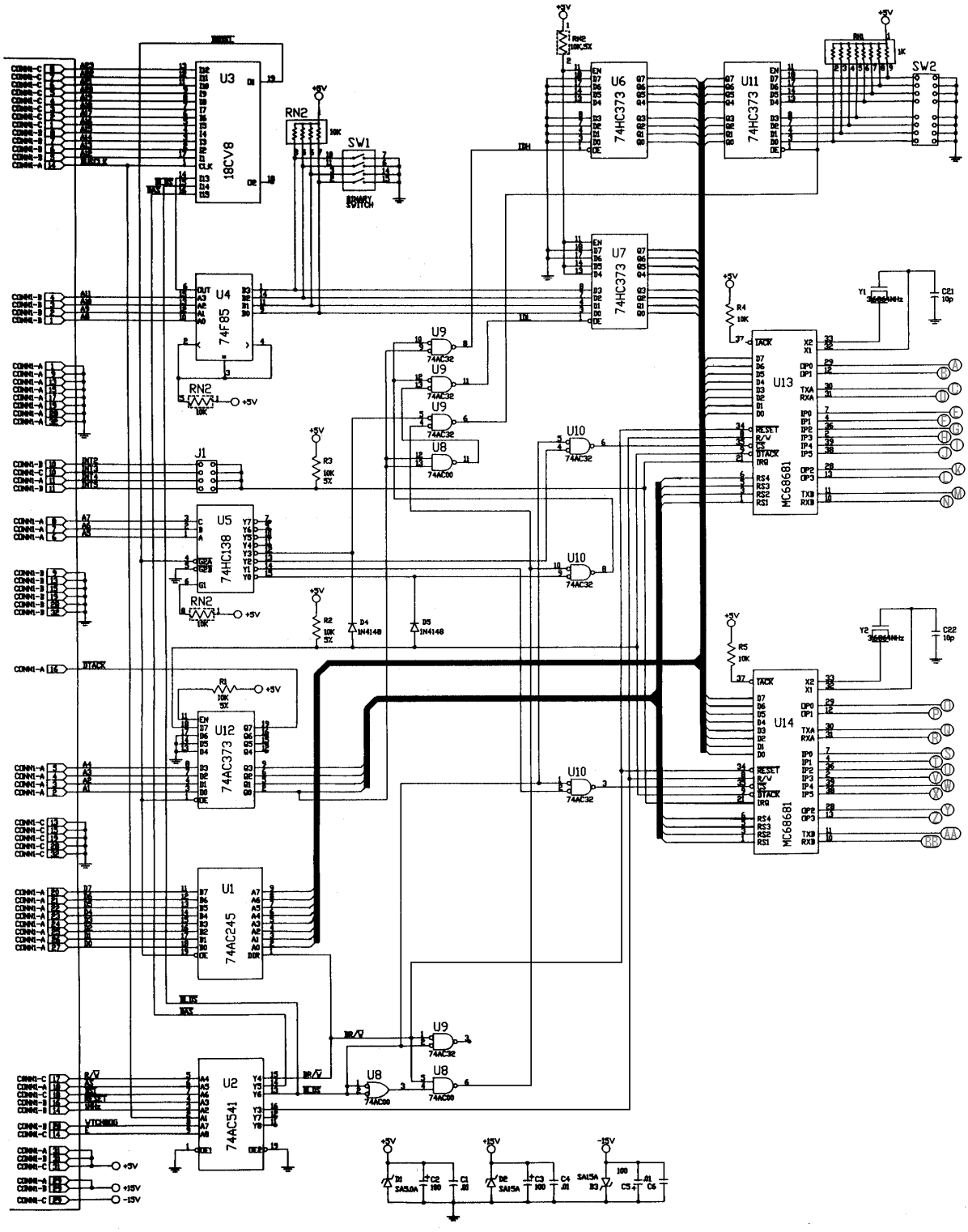


Fig. 8-21 Serial interface board schematic (1 of 2)

4. Circuit Board Layouts and Schematics (contd.)

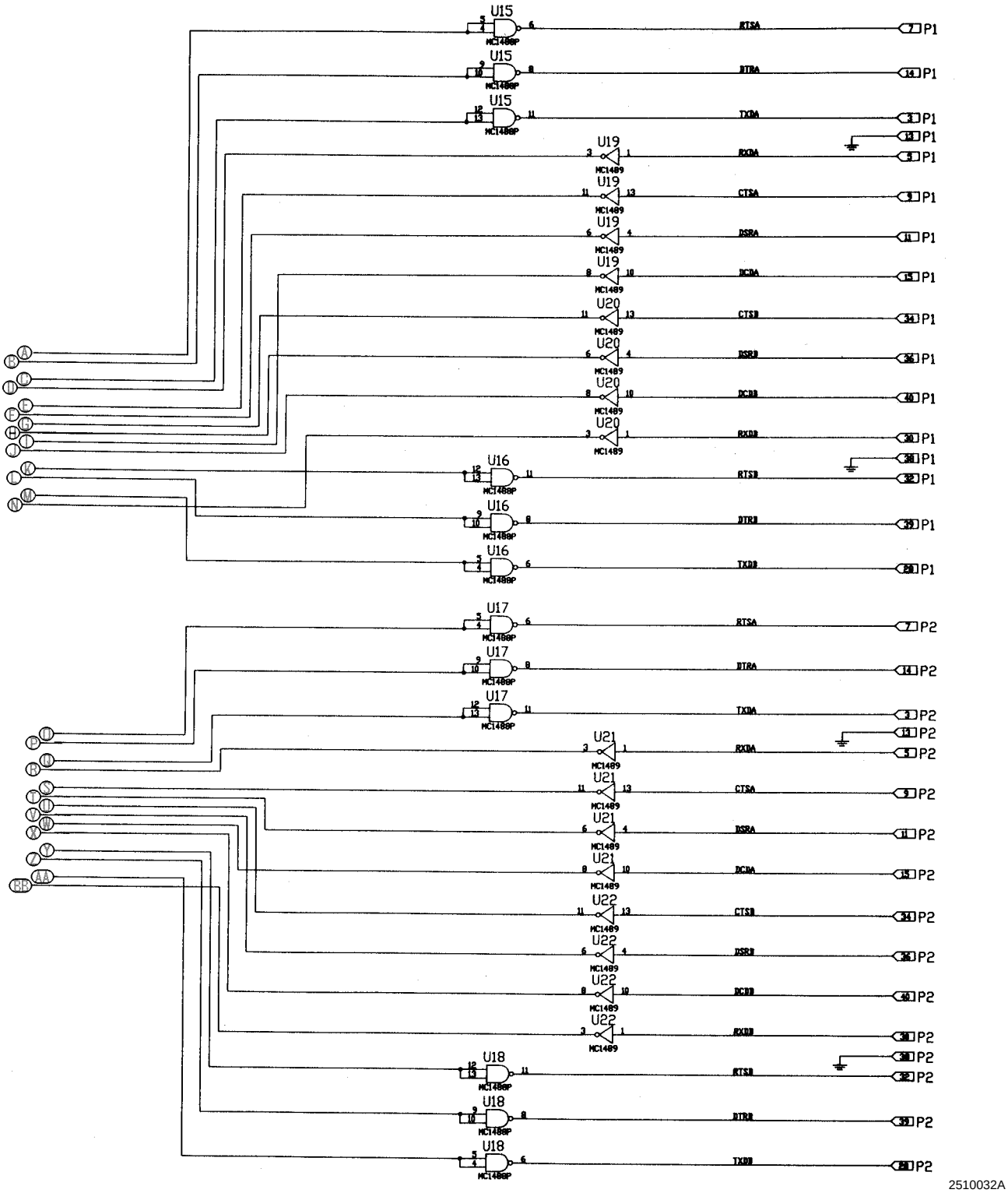
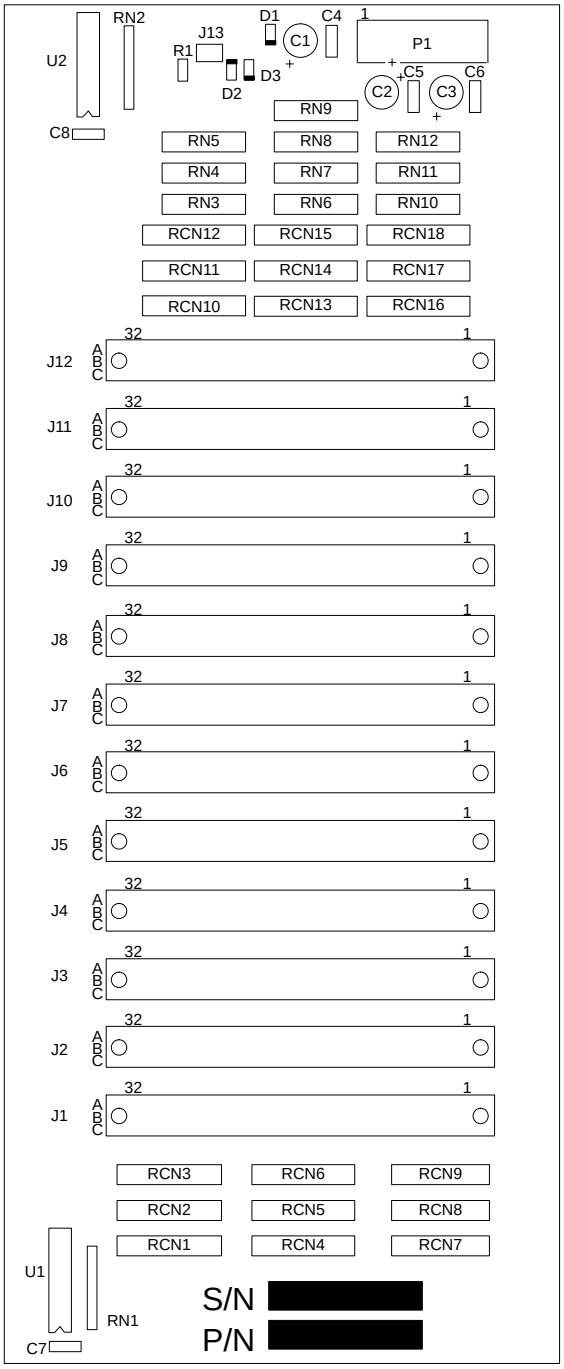


Fig. 8-22 Serial interface board schematic (2 of 2)

4. Circuit Board Layouts and Schematics (contd.)



2510033A

Fig. 8-23 Backplane board layout

4. Circuit Board Layouts and Schematics (contd.)

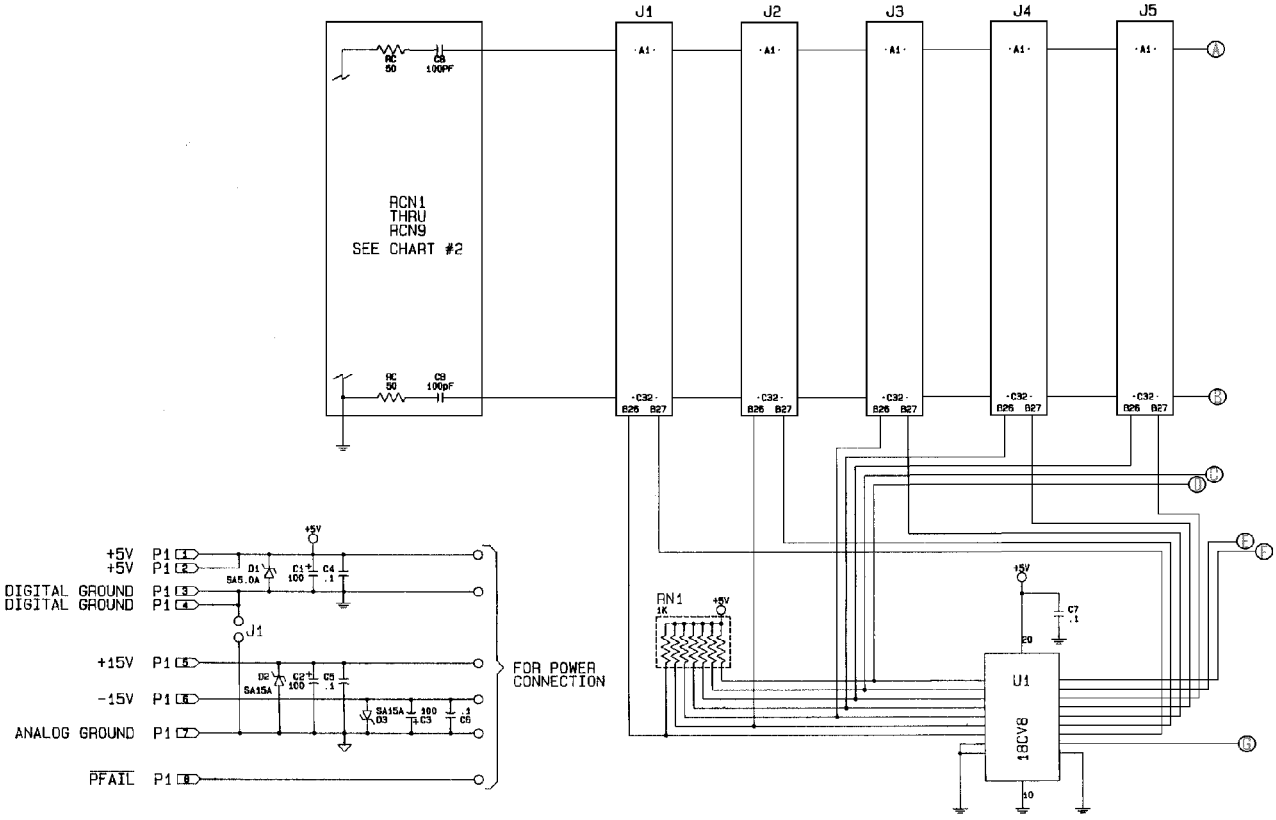


CHART #1
BUS CONNECTOR PIN ASSIGNMENT

PIN NO.	ROW "A"	ROW "B"	ROW "C"
1	GND	A8	A16
2	A1	A9	A17
3	A2	A10	A18
4	A3	A11	A19
5	A4	A12	A20
6	A5	A13	A21
7	A6	A14	A22
8	A7	A15	A23
9	GND	GND	INT1
10	INT2	INT3	INT4
11	INT5	INT6	IACK
12	INT7	INT8	VPA
13	GND	GND	GND
14	BUSCLK	1MHzCLK	E
15	GND	GND	GND
16	DTK	RESET	VMA
17	GND	RESERVED	R/W
18	AS	DS0	DS1
19	GND	GND	GND
20	D7	WATCHDOG	D15
21	D6	PFAIL	D14
22	D5	RESERVED	D13
23	D4	RESERVED	D12
24	D3	RESERVED	D11
25	D2	BUSY	D10
26	D1	BREQ	D9
27	D0	BGRNT	D8
28	GND	GND	GND
29	+15V	+15V	-15V
30	AGND	AGND	AGND
31	+5V	+5V	+5V
32	GND	GND	GND

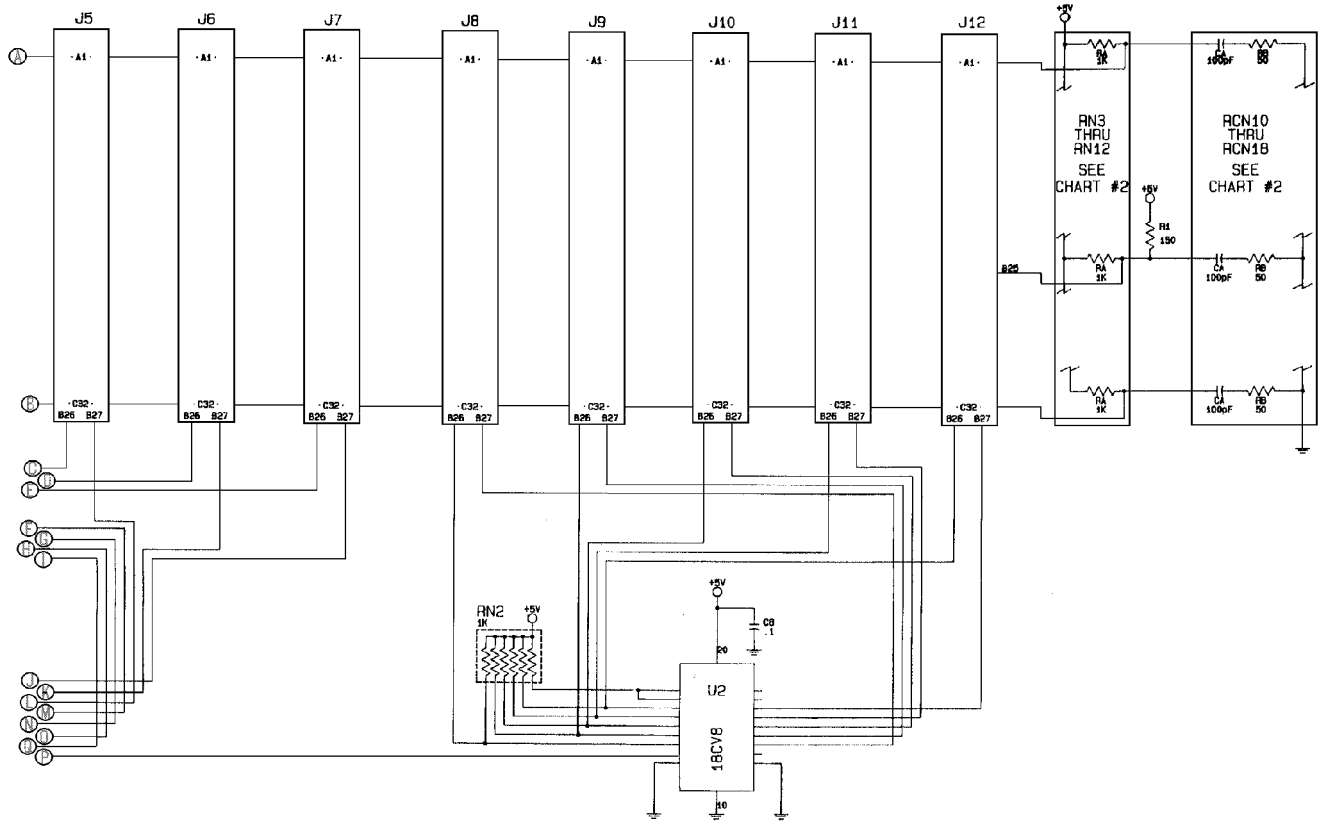
CHART #2
ADVANCED CONTROLLER BUS CONNECTOR PIN ASSIGNMENT

RCN NO.	PIN NO.	SIGNAL	RCN NO.	RN NO.	RCN NO.	PIN NO.	SIGNAL	RCN NO.	RN NO.	RCN NO.	PIN NO.	SIGNAL	RCN NO.	RN NO.
	1	GND			8-9	1	A8	17-9	11-8	7-9	1	A16	16-9	12-8
9-9	2	A1	18-9	10-8	8-8	2	A9	17-8	11-7	7-8	2	A17	16-8	12-7
9-8	3	A2	18-8	10-7	8-7	3	A10	17-7	11-6	7-7	3	A18	16-7	12-6
9-7	4	A3	18-7	10-6	8-6	4	A11	17-6	11-5	7-6	4	A19	16-6	12-5
9-6	5	A4	18-6	10-5	8-5	5	A12	17-5	11-4	7-5	5	A20	16-5	12-4
9-5	6	A5	18-5	10-4	8-4	6	A13	17-4	11-3	7-4	6	A21	16-4	12-3
9-4	7	A6	18-4	10-3	8-3	7	A14	17-3	11-2	7-3	7	A22	16-3	12-2
9-3	8	A7	18-3	10-2	8-2	8	A15	17-2	7-8	7-2	8	A23	16-2	8-8
	9	GND				9	GND			9-2	9	INT1	16-2	8-8
6-9	10	INT2	15-9	6-8	5-9	10	INT3	14-9	7-7	4-9	10	INT4	13-9	9-7
6-8	11	INT5	15-8	6-7	5-8	11	INT6	14-8	7-6	4-8	11	IACK	13-8	9-6
6-7	12	INT7	15-7	6-6	5-7	12	INT8	14-7	7-5	4-7	12	VPA	13-7	9-5
	13	GND				13	GND				13	GND		
6-6	14	BUSCLK	15-6	6-5	5-6	14	1MHzCLK	14-6	7-4	4-6	14	E	13-6	9-4
	15	GND				15	GND				15	GND		
6-5	16	DTK	15-5	6-4	5-5	16	RESET	14-5	7-3	4-5	16	VMA	13-5	9-3
	17	GND			5-4	17	RESERVED	14-4	7-2	4-4	17	R/W	13-4	9-2
6-4	18	AS	15-4	6-3	5-3	18	DS0	14-3	9-5	4-3	18	DS1	13-3	9-5
	19	GND				19	GND				19	GND		
4-2	20	D7	15-2	6-2	5-2	20	WATCHDOG	14-2	9-4	4-2	20	D15	13-2	9-6
3-9	21	D6	12-9	3-8	2-9	21	PFAIL	11-9	4-7	1-9	21	D14	10-9	5-8
3-8	22	D5	12-8	3-7	2-8	22	RESERVED	11-8	4-6	1-8	22	D13	10-8	5-7
3-7	23	D4	12-7	3-6	2-7	23	RESERVED	11-7	4-5	1-7	23	D12	10-7	5-6
3-6	24	D3	12-6	3-5	2-6	24	RESERVED	11-6	4-4	1-6	24	D11	10-6	5-5
3-5	25	D2	12-5	3-4	2-5	25	BUSY	11-5	4-3	1-5	25	D10	10-5	5-4
3-4	26	D1	12-4	3-3		26	BREQ			1-4	26	D9	10-4	5-3
3-3	27	D0	12-3	3-2		27	BGRNT			1-3	27	D8	10-3	5-2
	28	GND				28	GND				28	GND		
	29	+15V				29	+15V				29	-15V		
	30	AGND				30	AGND				30	AGND		
	31	+5V				31	+5V				31	+5V		
	32	GND				32	GND				32	GND		

2510034A

Fig. 8-24 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. 8-25 Backplane board schematic (2 of 2)

4. Circuit Board Layouts and Schematics (contd.)

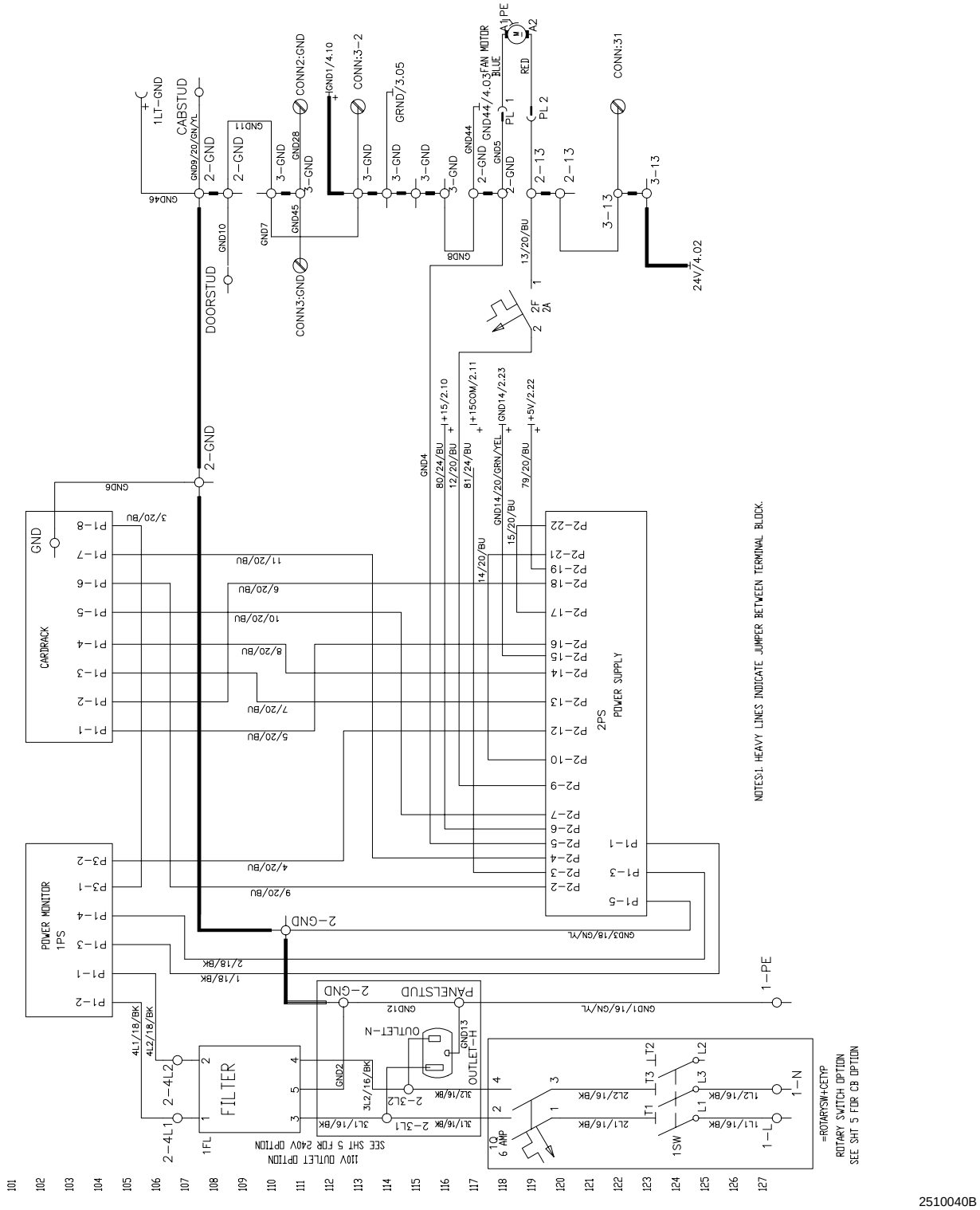
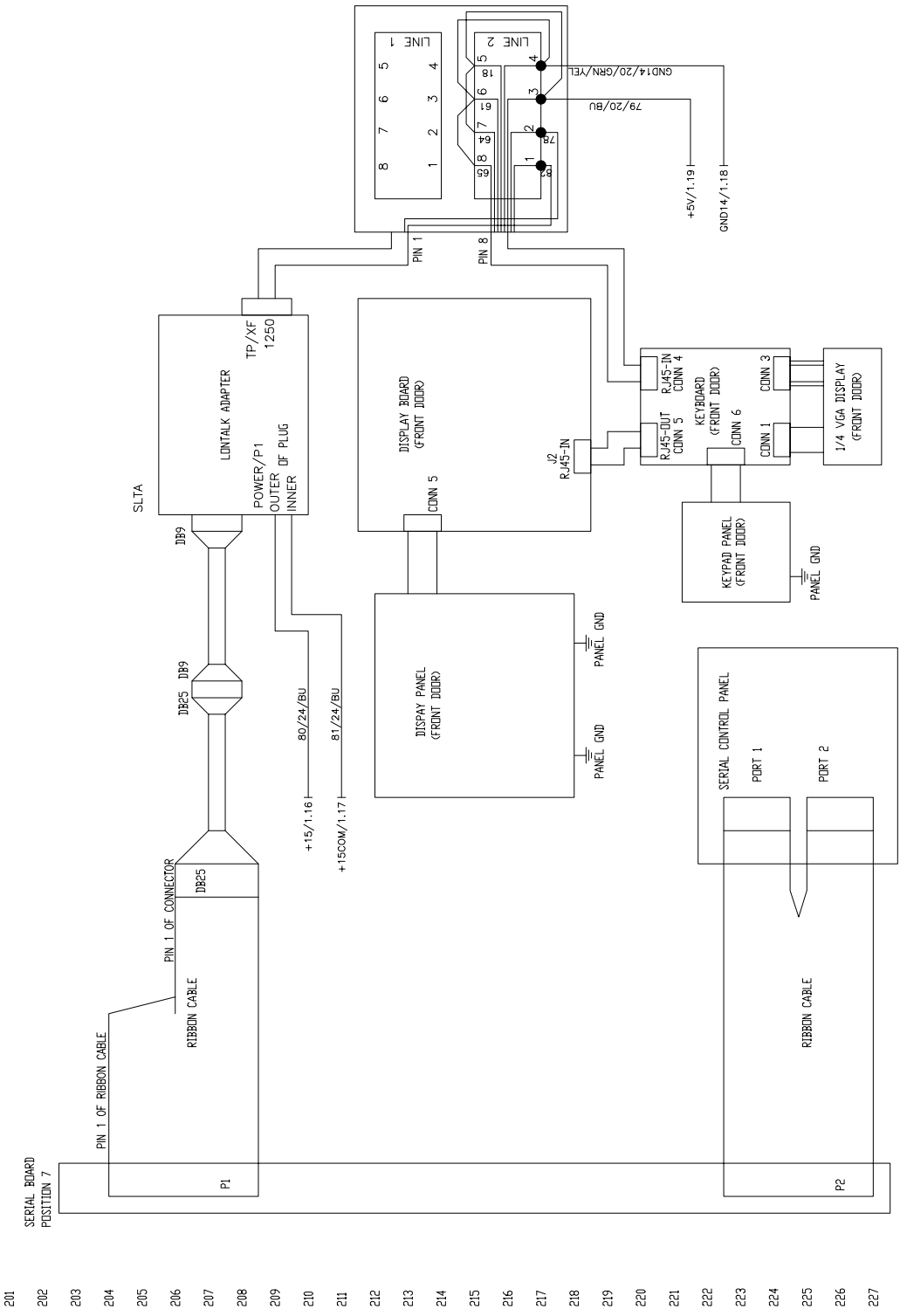


Fig. 8-26 Controller wiring diagram (1 of 6)

4. Circuit Board Layouts and Schematics (contd.)



2510036B

Fig. 8-27 Controller wiring diagram (2 of 6)

4. Circuit Board Layouts and Schematics (contd.)

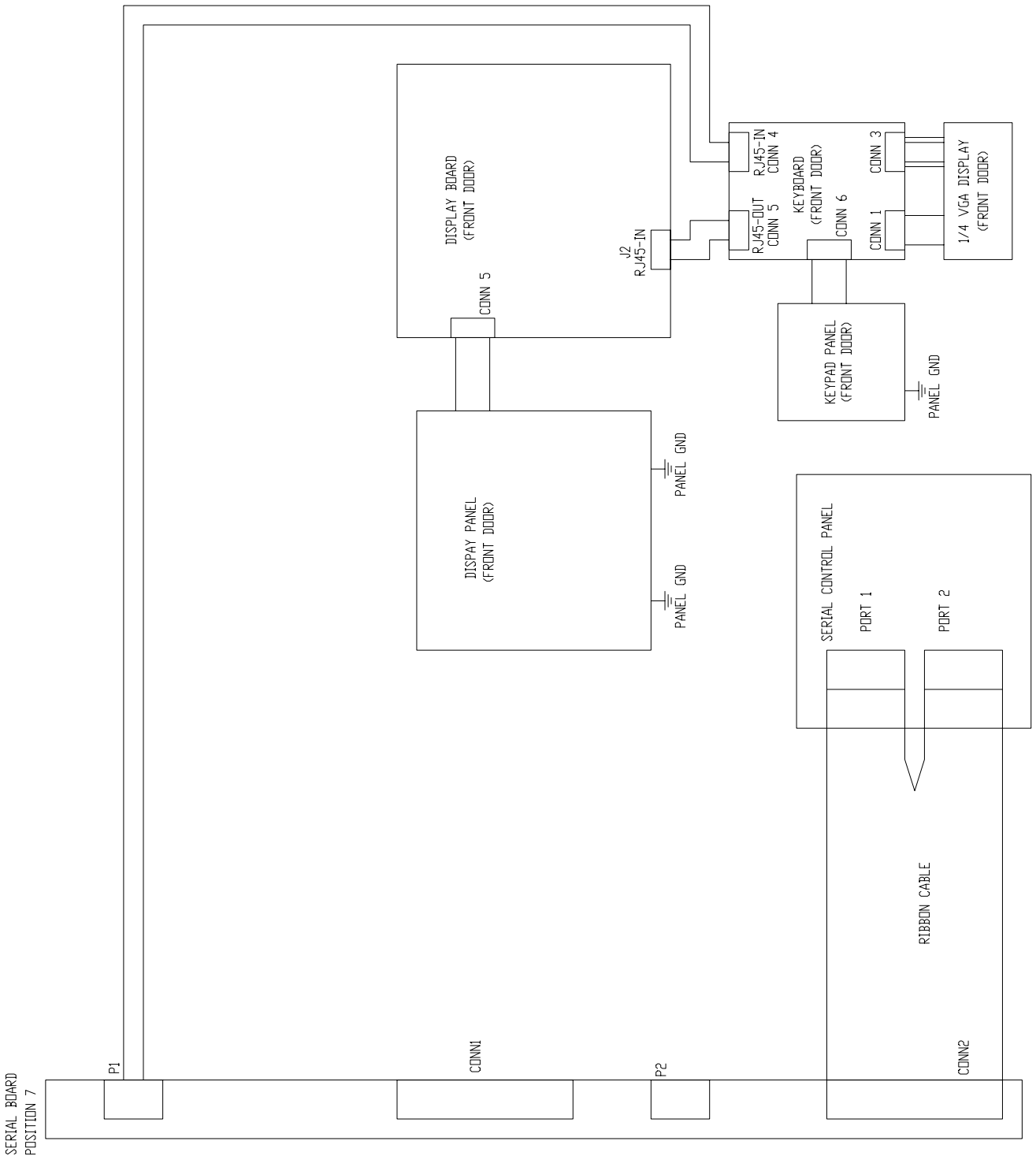


Fig. 8-28 Controller wiring diagram without SLTA (3 of 6)

4. Circuit Board Layouts and Schematics (contd.)

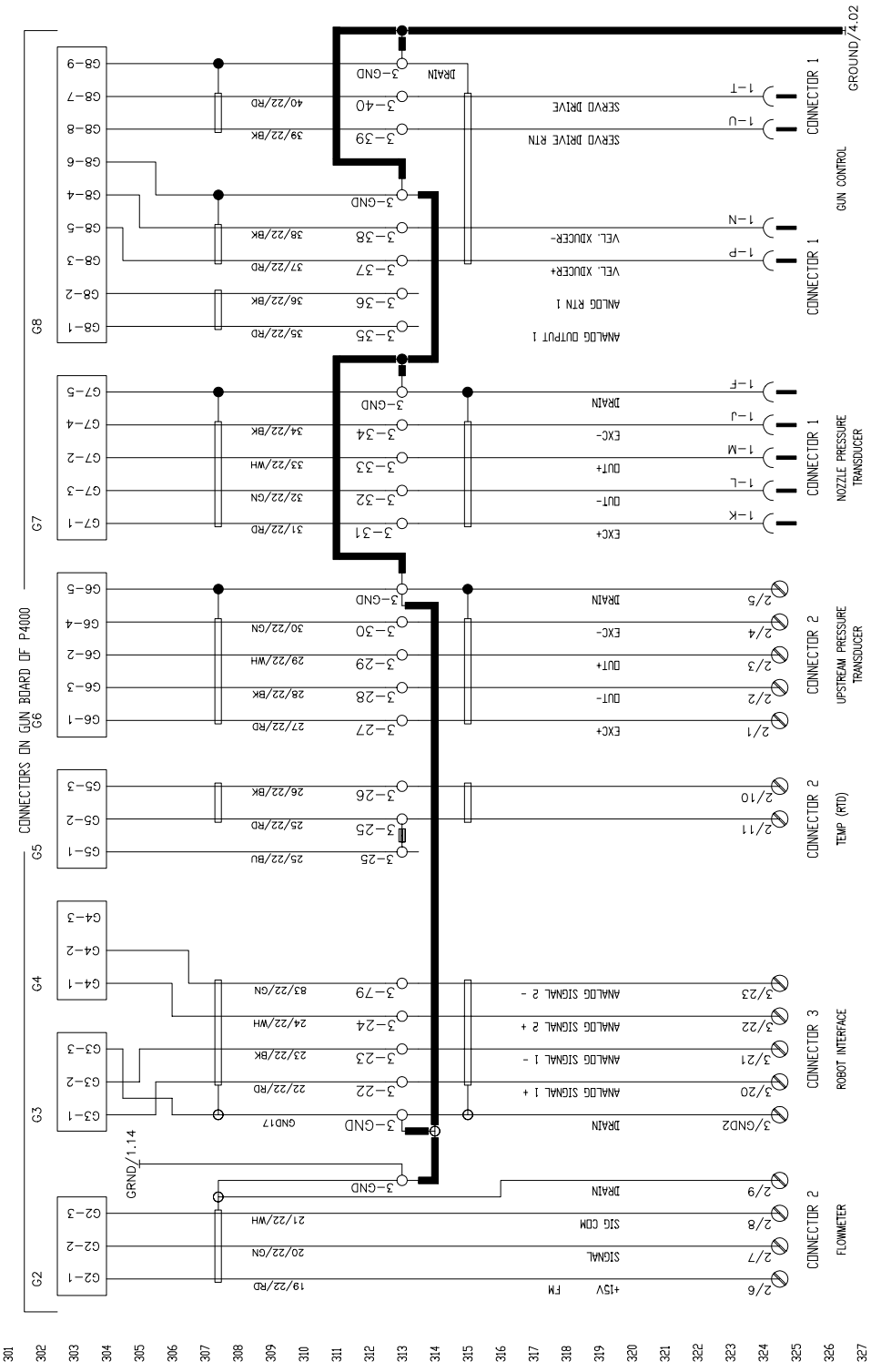
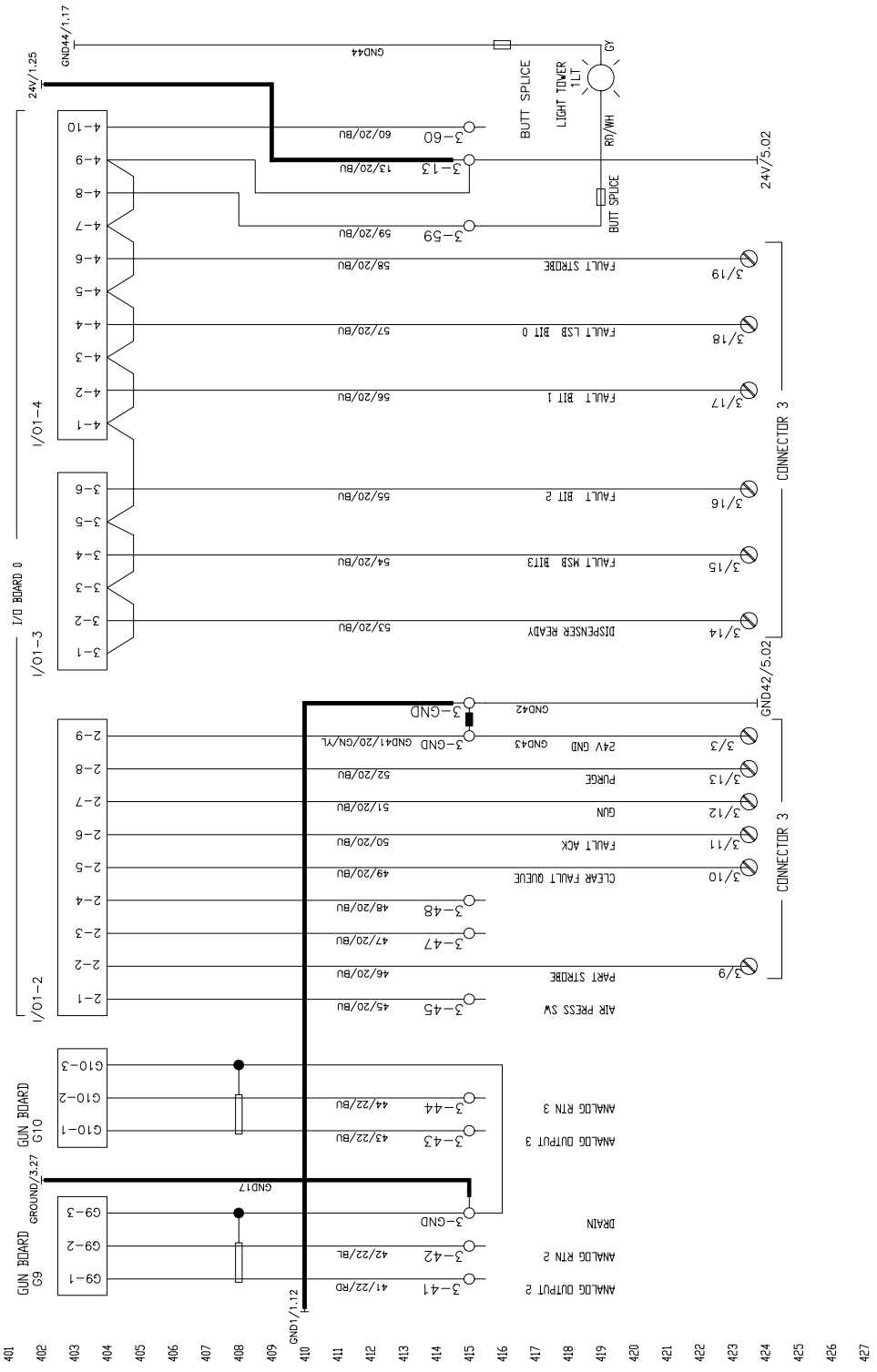


Fig. 8-29 Controller wiring diagram (4 of 6)

4. Circuit Board Layouts and Schematics (contd.)



2510038B

Fig. 8-30 Controller wiring diagram (5 of 6)

4. Circuit Board Layouts and Schematics (contd.)

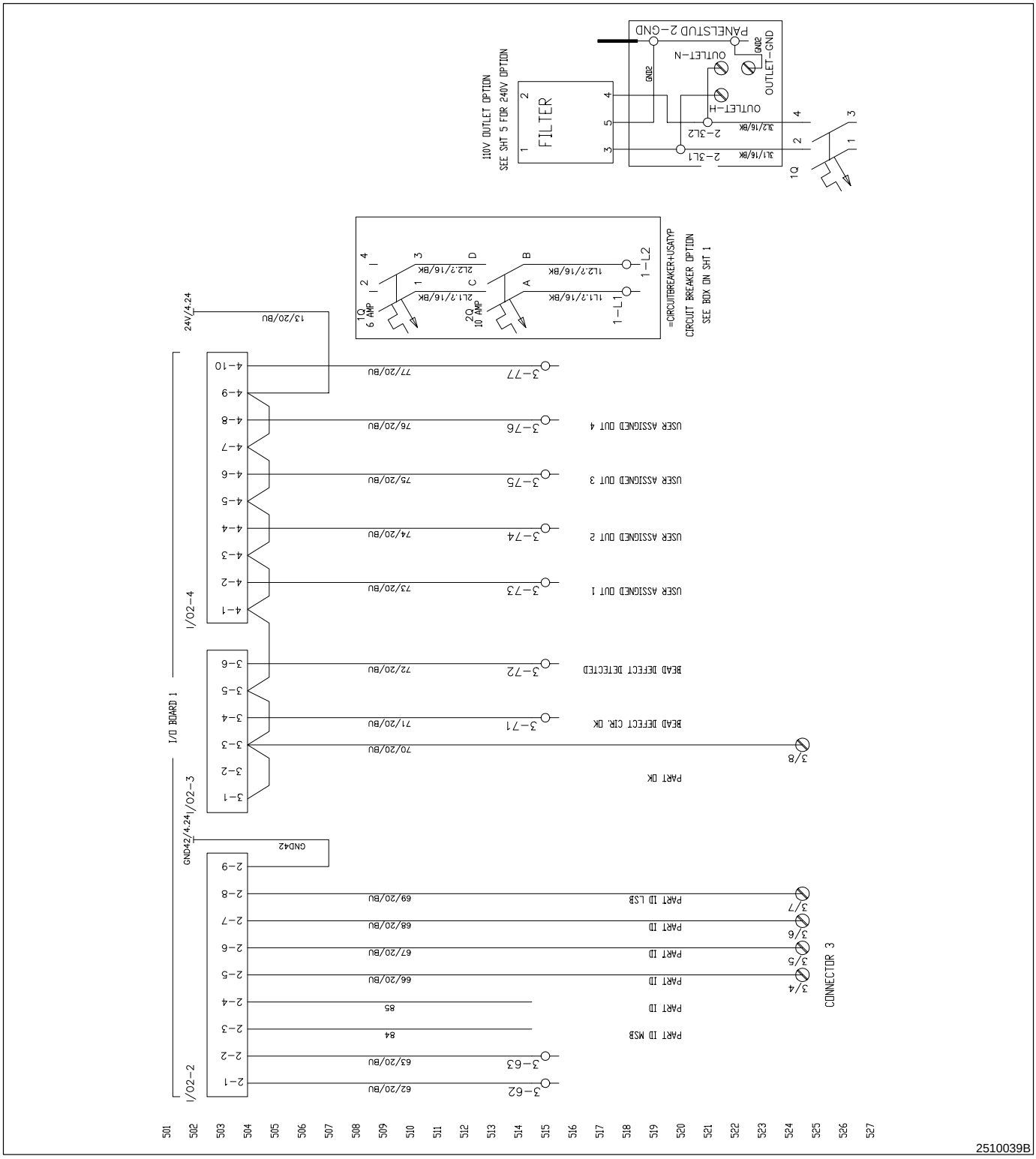


Fig. 8-31 Controller wiring diagram (6 of 6)

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

Date: 25 July 96

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Luneburg, Germany
Phone: 011-49-4131-8940

Nordson Corporation Westlake, Ohio