Section 5

Troubleshooting and Repair

Section 5
# Troubleshooting and Repair

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

1. Controller Diagnostics

PC 50 Series controllers are not field repairable and must be returned to Nordson for replacement. Do not disassemble failed units.

Status LED

The yellow Status LED on the controller (Figure 5-1) blinks in various patterns, indicating the controller status.
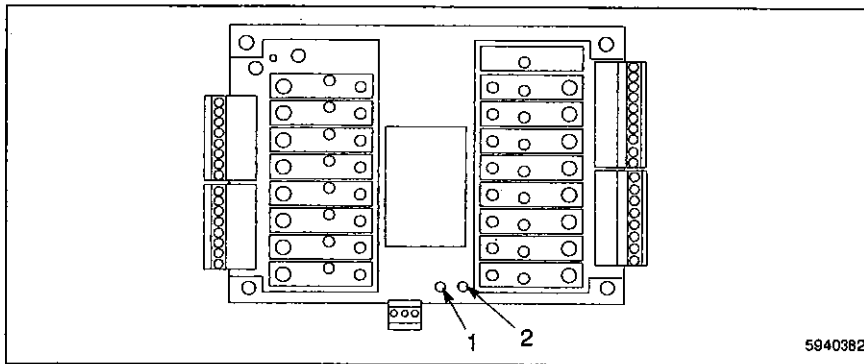
1. Yellow Status LED
2. Green Power LED

Fig. 5-1   PC 50 Series Controller Status Indicators

Normal Operation

The Status LED blinks on and off rapidly.

Keypad Not Connected

If the controller is powered without a keypad connected, the LED blinking pattern will be "off" for one second, followed by four quick "on" blinks.

Internal Errors

If the LED blinking pattern is "on" for a second, followed by one or more quick blinks "off," the controller is experiencing internal errors. The specific error is indicated by the number of "off" blinks:

One "Off" Blink—Corrupt RAM

Two "Off" Blinks—Checksum error indicating EPROM corruption.

Status LED *(contd.)*

Three "Off" Blinks—System error.

Four "Off" Blinks—System error.

If any of the above four patterns occur, power cycle the controller. If the pattern occurs again, remove the controller from service and return it to Nordson.

Five "Off" Blinks—Internal error; possibly noise problems.

Six "Off" Blinks—Internal error; possibly noise problems.

If either of these two patterns occur, check for loose connections and fix any obvious noise problems. If the problem persists, remove the controller from service and return it to Nordson.
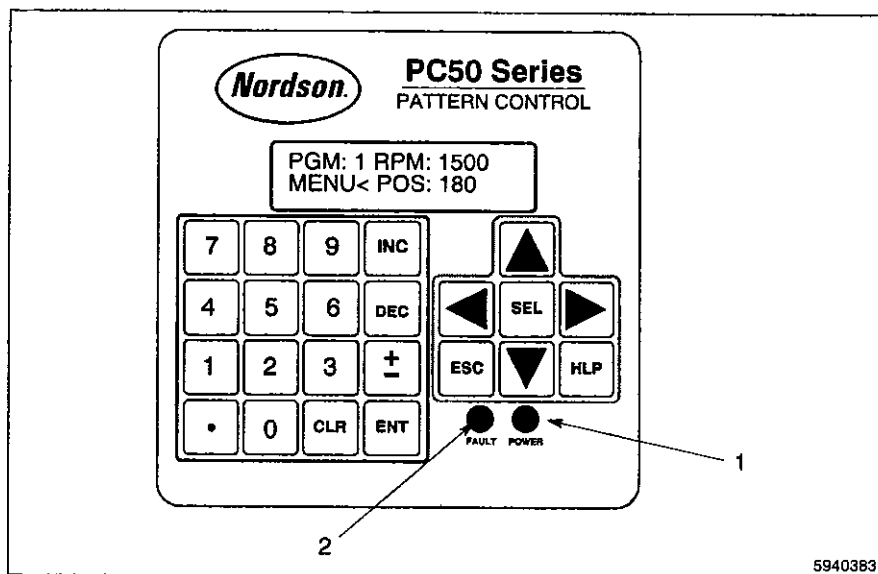
2. Keypad Diagnostics

⚠️ **WARNING:** The keypad cannot be repaired in the field. If a unit fails, do not disassemble it. Return it to Nordson for replacement.

Keypad Fault LED

If the Fault LED on the keypad lights, turn the controller off, then back on. If the keypad Fault LED does not go off, the keypad microprocessor has malfunctioned. Return the keypad to the factory.

1. Power Indicator
2. Fault Indicator

Fig. 5-2   Keypad Status Lights

Keypad Diagnostics

The Keypad includes a series of diagnostics that show the status of various keypad functions.

To start the diagnostics, turn the controller off, then restart the controller while pressing any key on the keypad.

NOTE: After each display, press the down arrow, then press SEL. A new screen appears. Press the up or down arrows to return to the menu.
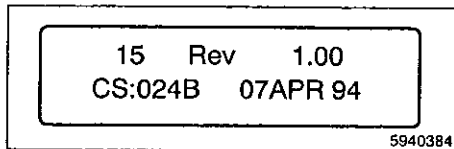
```
  15   Rev    1.00
CS:024B   07APR 94
              5940384
```
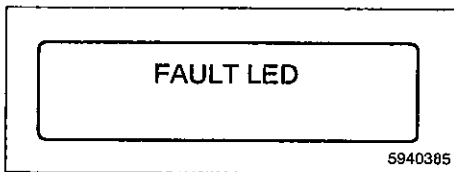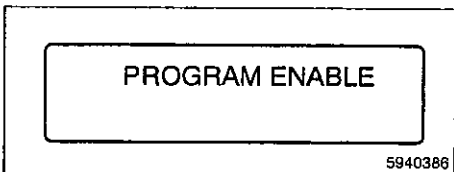
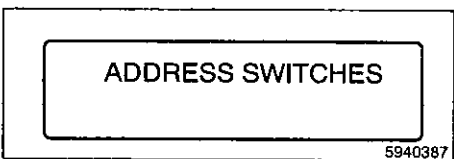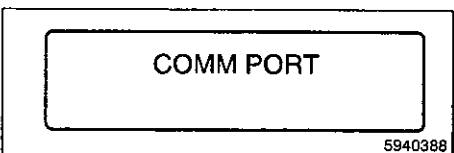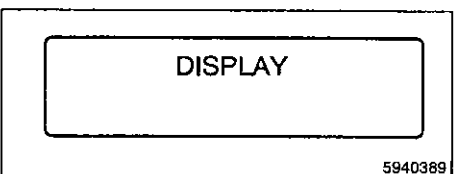*Fig. 5-3*

1. The first screen displays a unique key ID number, the firmware revision number, the keypad firmware revision date and the keypad checksum.

```
     FAULT LED
              5940385
```

Fig. 5-4

2. The Fault LED blinks on, then off, at one second intervals.

```
  PROGRAM ENABLE
              5940386
```

Fig. 5-5

3. The '1' displayed indicates for keypad terminal block sinking or sourcing wiring that E1 is jumpered; 2 indicates E2 is jumpered. (See Figures 3-27 and 3-28.)

```
  ADDRESS SWITCHES
              5940387
```

Fig. 5-6

4. The Address Switches screen displays the keypad dipswitch address setting. (See Figure 3-30)

```
    COMM PORT
              5940388
```

Fig. 5-7

5. The Comm Port tests communications. Figure 5-10 illustrates how jumpers are placed in the keypad terminal block for testing.

```
     DISPLAY
              5940389
```

Fig. 5-8

6. A complete character set scrolls across both lines. Press the up or down arrows to return to the Menu.
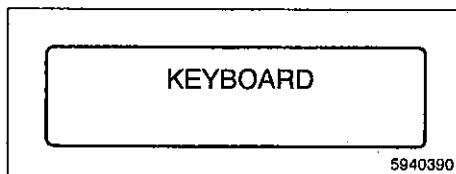
Keypad Diagnostics *(contd.)*

Fig. 5-9

7. The screen displays a unique key number for each key pressed. Press the 'hidden key' on the keypad face, just below HLP to exit.

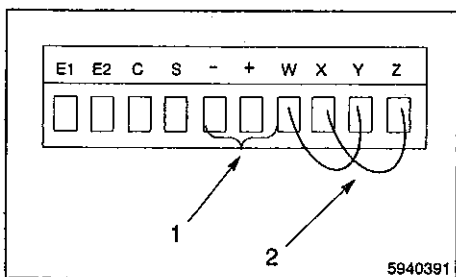### Keypad Communications Port Test Set Up

Fig. 5-10   *Keypad Terminal Block*

1. + 20-30 VDC In
2. Jumpers for Test

When the Comm Port diagnostic is run, with keypad terminals W, X, Y, and Z jumpered as illustrated in Figure 5-10, a string of "plus" signs scrolls across the display. When either jumper is removed, the scrolling stops.

3. Resolver Troubleshooting

Mechanical Problems

If the resolver is generating erratic RPM or position readings, or the position appears to be shifting periodically with respect to the machine cycle, check the mechanical coupling between the resolver and the machine.

If the coupling is not slipping, loosen the coupling and rotate the resolver shaft in both directions with sudden, jerky motions. If the controller displays unusual position or RPM readings, the resolver may be need to be replaced.

NOTE: Resolvers cannot be repaired in the field. If a unit fails, it must be replaced. Contact your local Nordson representative.

Electrical Problems

Section 2, *Installation* provides installation procedures for the resolver and cables. If any wire in one of the three individually shielded pairs becomes disconnected, "ERROR: Resolver Not Connected" is displayed on the keypad screen.

The output channels will immediately be disabled until the resolver is re-connected. Pressing ESC clears the error message.

NOTE: ESC clears the message and restores access to keypad programming even if the resolver has not been reconnected.

Follow this procedure to troubleshoot electrical problems:

WARNING: Risk of electrical shock. Failure to observe may result in personal injury, death, or equipment damage.

1. Verify that the electrical connections at each end of the resolver cable are secure.

2. Disconnect the cable at the controller. Measure the resistances between all wires on the resolver cable terminal block. The paired wires should have the resistances shown in Table 5-1, while the resistance between every other combination of wires should be infinite. If the resistances are correct, the controller may need to be replaced.

3. If the resistances in Step 2 are incorrect, the problem may be in the cable or in the resolver. Disconnect the cable at the resolver and measure the resistances at the resolver pins. If the resistances are correct, the cable is bad. If the resistances are wrong, the resolver should be replaced.

Table 5-1. Resolver Wire Resistance

Wire Pair	Resistance
White/Black	15 to 25 Ohms
Red/Black	20 to 40 Ohms
Green/Black	20 to 40 Ohms

4. General Troubleshooting

NOTE: Controllers and keypad/displays cannot be repaired in the field. If a unit fails, do not disassemble it. Return the defective unit to Nordson for replacement.

⚠ WARNING: Risk of electrical shock. Failure to observe may result in personal injury, death, or equipment damage.

NOTE: See Figures 5-12 and 5-13 for the PC 50 Series controller cabinet general arrangement and the cabinet wiring diagram.

Table 5-2. Troubleshooting Table

Problem	Possible Cause	Corrective Action
Controller & keypad dead	Main fuse blown.	Check main fuse.
	Defective power supply to controller.	Check controller power supply.
Keypad dead, but controller LED's are on.	Incorrect wiring between keypad and controller.	Check wiring between keypad and controller.
Keypad Fault LED "On".	Keypad microprocessor has malfunctioned.	Turn the controller off and back on. If the keypad Fault LED does not go off, return the keypad to the factory.
Menu operation slow on keypad display.	KEYBOARD QTY programming incorrect.	Check KEYBOARD QTY programming. If it is set for two keypads, but only one is connected, menu operation will be very slow.
COMM FAILURE-HOST TO KEYBOARD message	This message may flash briefly on power-up under normal conditions. If the message flashes after power up, defective keypad wiring connection may exist.	Check keypad wiring connections at keypad and controller.
	Incorrect DIP switch settings.	Check DIP switch settings.

4. General Troubleshooting
(contd.)

Problem	Possible Cause	Corrective Action
ERROR: Analog Malfunction.	This is a non-fatal error, indicating the controller's internal analog chip is not working. A bad or missing RUN UP module will not cause this message.	Replace the controller.
	Performing processor-intensive programming tasks?	When performing processor intensive programming tasks, such as recalculating many setpoints due to a change in SCALE FACTOR, or creating many setpoints through STITCH, the controller may briefly lose contact with the keypad. Once the calculations are complete, contact will be re-established. Press ESC to clear any remnants of the error message.
ERROR: RESOLVER NOT CONNECTED message.	Resolver or resolver cable failure.	See *Resolver Troubleshooting* in this section.
POS (position) moves opposite to machine direction.	INCREASING DIR programmed incorrectly for the correct direction of rotation.	Check INCREASING DIR for the correct direction of rotation.
		Check resolver wiring.
POS (position) does not match machine position.	Incorrect OFFSET. Once set, the offset value should not change.	Verify that OFFSET is correct.
	Resolver coupling not tight.	Verify that the resolver coupling is tight. Tighten if loose. See *Resolver Troubleshooting* in this section.
Serial communications not working	Type, baud rate, and address incorrectly set in Communication programming.	Check communication programming to be sure type, baud rate, and address are correctly set.
	DIP switches for the controller-to-host communications are set incorrectly.	Be sure the DIP switches for the controller-to-host communications are set correctly.
	Defective communication cable wiring.	Check communication cable wiring.

4. General Troubleshooting
(contd.)

| Problem	Possible Cause	Corrective Action
Outputs cycling regularly at incorrect machine positions.	Incorrect program number is active.	Check that the correct program number is active.
	Incorrect setpoints of the output(s) in question.	Check the setpoints of the output(s) in question.
	Incorrect SPEED COMP settings.	Check SPEED COMP settings.
	Incorrect OFFSET settings.	Verify that OFFSET is correct.
Erratic Operation	Watchdog Timer test described under Memory Tests in Section 4, *Programming*.	Run the Watchdog Timer test described under Memory Tests in Section 4, *Programming*.
	Resolver problem.	See *Resolver Troubleshooting*, in this section.
RUN UP output not working.	RUN UP QTY and RUN UP Output are programmed incorrectly.	Check that RUN UP QTY and RUN UP Output are programmed correctly.
		Check that RUN UP output module is located in the correct module position. See Section 2, *Installation*.
		Check that RUN UP output wiring is correct.
		Verify that RUN UP load device is within specifications for the Run Up module.
		Try a different RUN UP output module.

4. General Troubleshooting
(contd.)

AC/DC module not working.	Incorrect program number is active.	Check that correct program number is active.
	Controller activating the output(s) at the correct position in the resolver revolution?	Use OUTPUT STATUS to see if the controller is activating the output(s) at the correct position in the resolver revolution. If not, verify that the Setpoints are correctly programmed.
		Programming that may prevent an output from energizing includes TIMED OUTPUTS (PC55 only), REM ENABLE ANDING and MIN SPEED ANDING.
	Too small a value in Timed Output.	Too small a value will not turn on output module.
	Defective module.	If OUTPUT STATUS shows the output is on, but the LED on top of the module does not light, try replacing the module.
	Defective module fuse.	If the LED on the module lights but the output terminal does not energize, check the fuse built into the top of the module. Use the fuse tester built into the controller.
	Defective wiring or no power in circuit.	Check that load power is present in the circuit and correctly wired.
		Remember that modules do not supply power to loads; they simply switch the load circuit on and off.

5. *Controller Fuse Tester & Fuse Replacement*

Fuse Tester

Figure 5-11 shows location of the fuse test socket and LED used to test TR5 style fuses. PC 50 Series controllers are shipped with a spare 4A fuse mounted in the test socket.
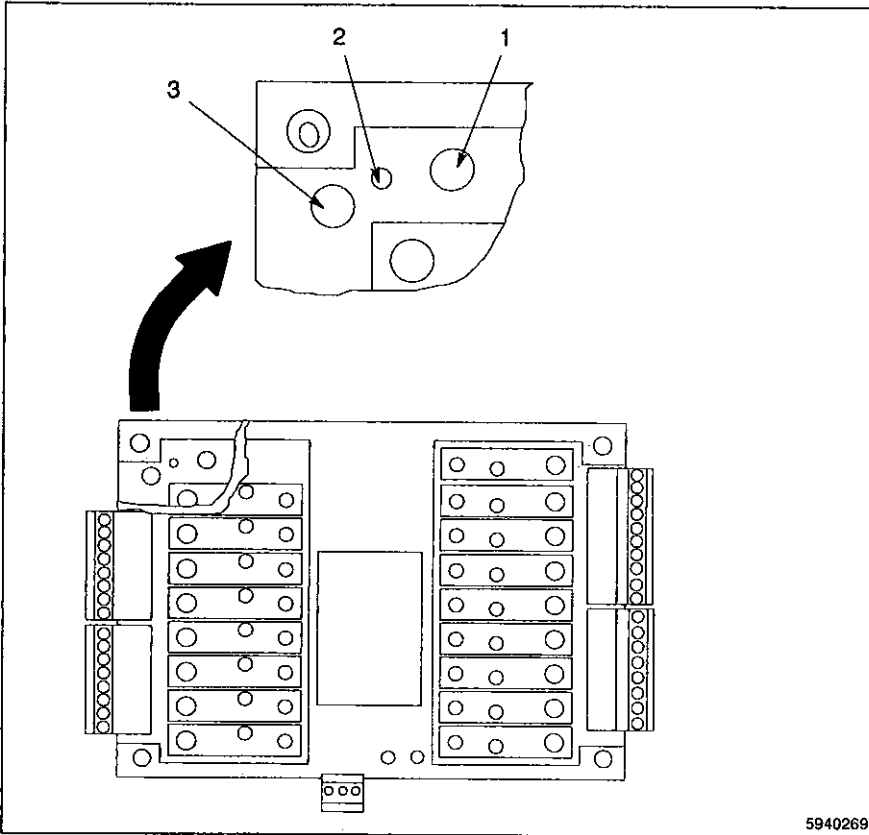
1. 250 mA TR 5 for power to Inputs TB 2

2. LED Lights if Fuse in Test Socket Good

3. Test Socket w/Spare 4 A TR 5 Fuse

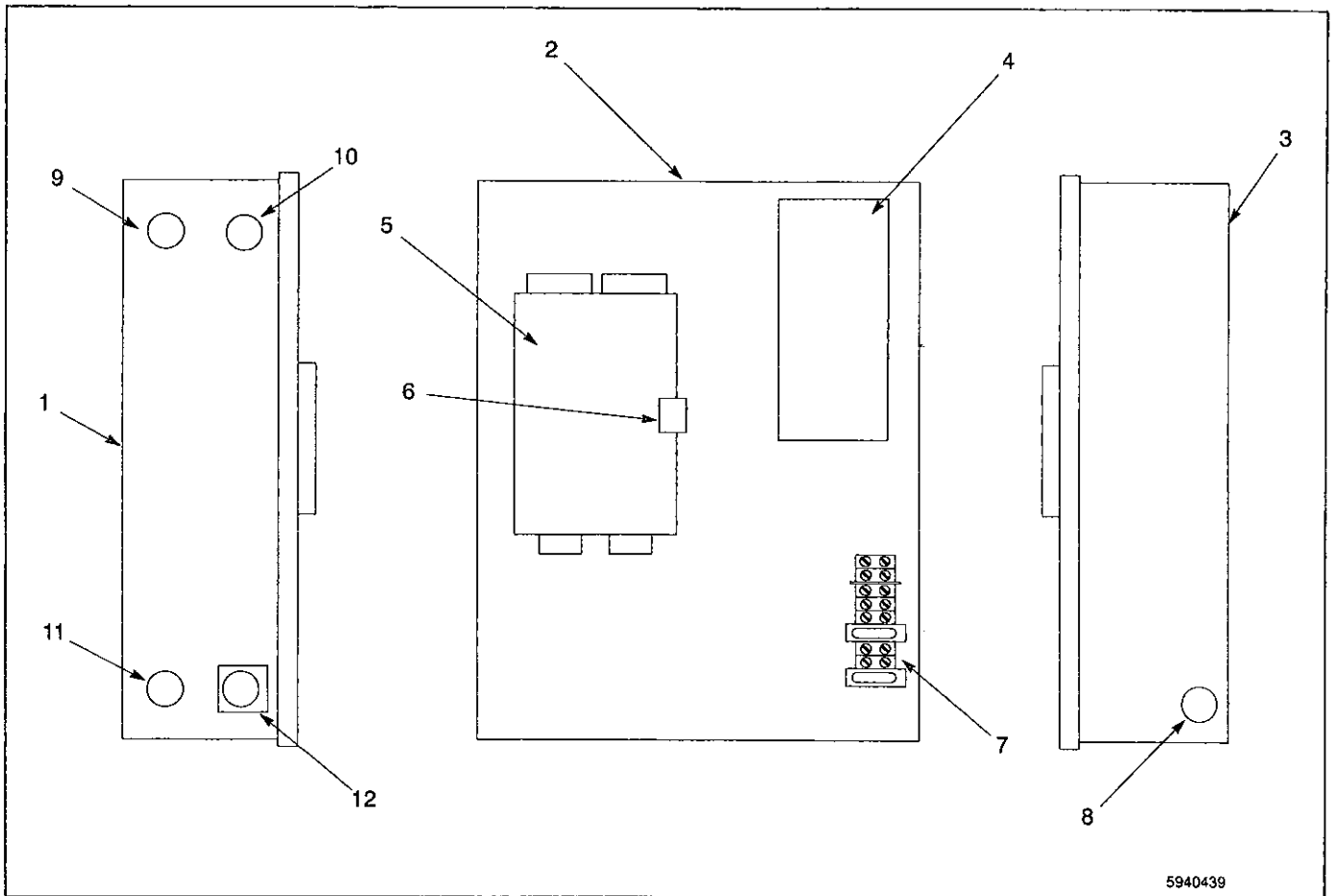5940269

Fig. 5-11   Fuse Tester Location

6. Electrical Schematics and Wiring Diagrams

WARNING: Disconnect equipment from the line voltage.

WARNING: Risk of electrical shock. Failure to observe may result in personal injury, death, or equipment damage.

5940439

Fig. 5-12   Controller Cabinet Component General Arrangement

1. Left Side Exterior View
2. Front Interior View
3. Right Side Exterior View
4. 24 VDC Power Supply

5. PC 50 Series Pattern Controller
6. TB 8 Terminal Block
7. Input Power Terminal Strip
8. Input Power Conduit Entrance

9. Input/ Output Wiring Conduit Entrance
10. Resolver Wiring Conduit Entrance w/ Nylon Fitting
11. Input/Output Wiring Conduit Entrance
12. Communications Cable Fitting

7. Electrical Schematics and Wiring Diagrams

PC 50 Series Controllers with 240 VAC Service

NOTE: Controllers are shipped configured for 240 VAC service.

WARNING: Disconnect equipment from the line voltage.

WARNING: Risk of electrical shock. Failure to observe may result in personal injury, death, or equipment damage.

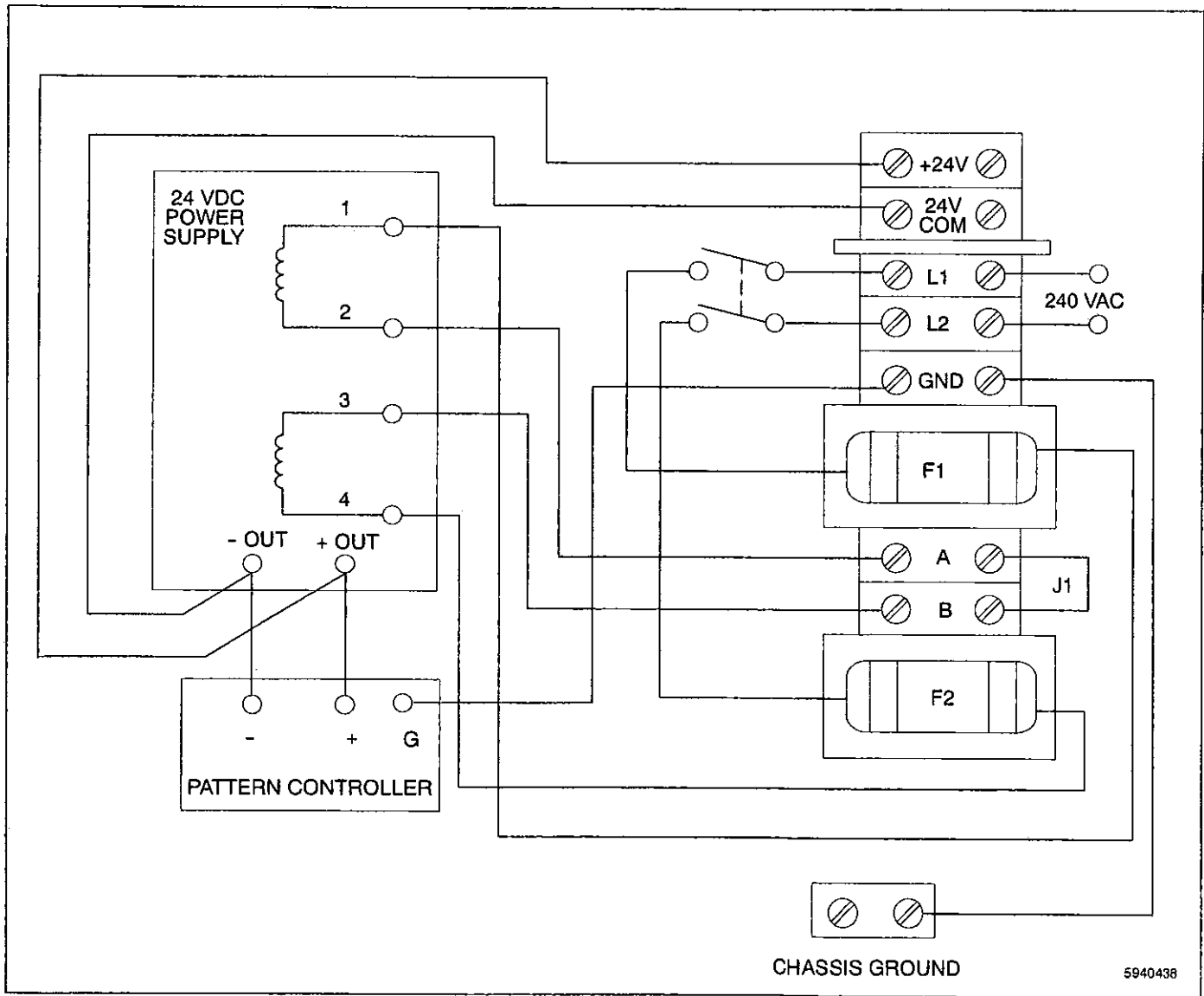Install 240 VAC input power to the terminal strip as illustrated in Figure 5-13.

Fig. 5-13   Input Power Wiring Diagram (240 VAC)

NOTE: Fuses F1 and F2 are 1 amp Slo Blo for 240 VAC service.

PC 50 Series Controllers with 120 VAC Service

NOTE: Controllers are shipped configured for 240 VAC service.

WARNING: Disconnect equipment from the line voltage.

WARNING: Risk of electrical shock. Failure to observe may result in personal injury, death, or equipment damage.

To reconfigure for 120 VAC service, remove J1 (see Figure 5-13) from terminals A and B, then install J2 from F1 to terminal B and J3 from F2 to terminal A as shown in Figure 5-14. Route the 120 VAC service to the terminal strip as illustrated in Figure 5-14.

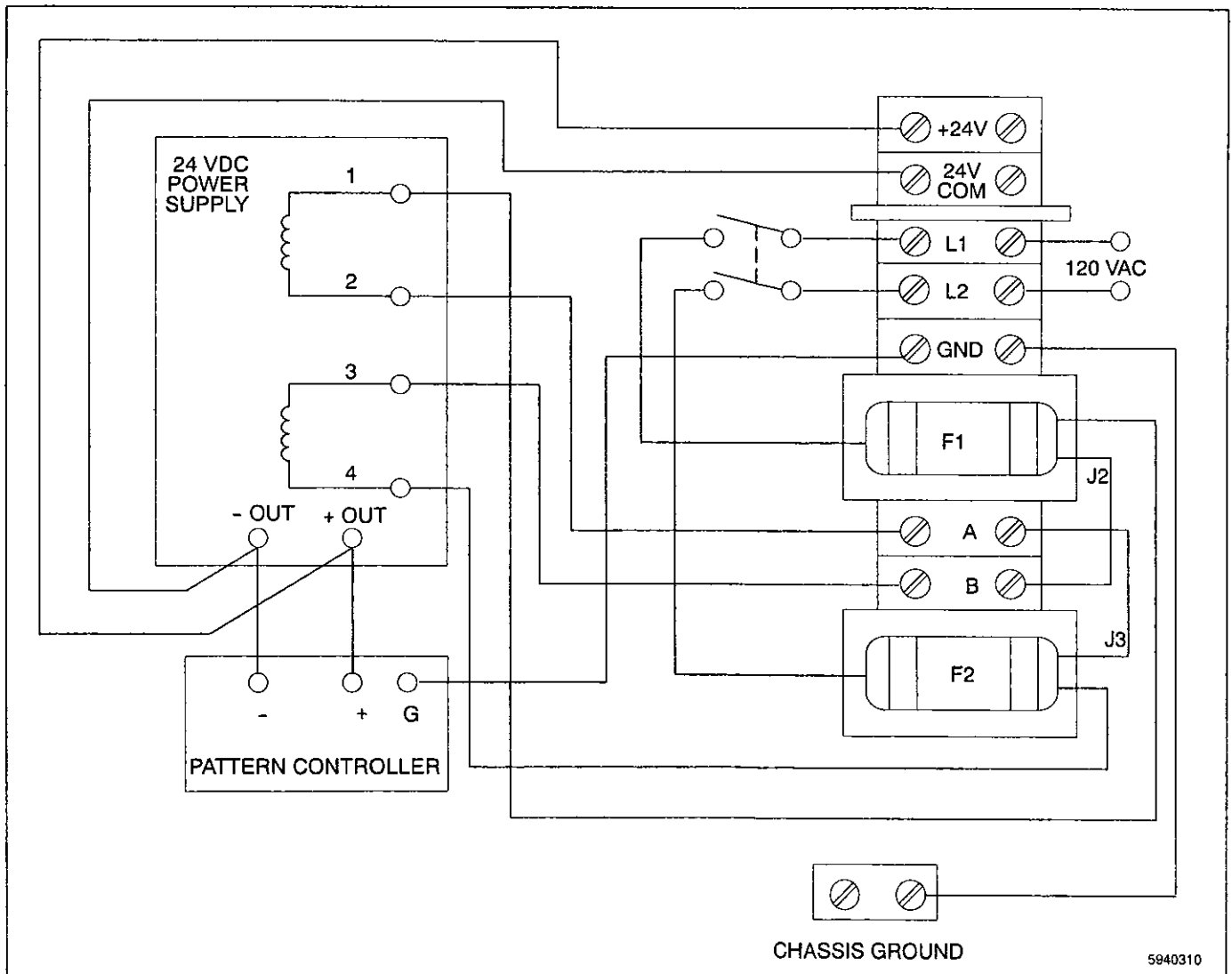**NOTE:** Replace fuses F1 and F2 with customer supplied 2 amp Slo Blo for 120 VAC service.

Fig. 5-14   Input Power Wiring Diagram (120 V AC)

Section 6

Parts

Section 6
Parts

1. Introduction

To order parts, call the Nordson Customer Service Center at 800-241-8777 or your local Nordson representative. Use this five-column parts list, and the accompanying illustration, to describe and locate parts correctly.

Using the Illustrated Parts List

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

The six-digit 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
–	000 000	Assembly	1	
1	000 000	• Subassembly	2	A
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. PC50 Series Controller Parts Lists

PC50 Systems

Item	Part	Description	Quantity	Note
-	188 096	PC54 Pattern Controller System	-	
-	188 097	PC55 Pattern Controller System	-	
-	188 063	Controller Unit, PC54	-	
-	188 064	Controller Unit, PC55	-	

Controller Output Modules

Item	Part	Description	Quantity	Note
		OUTPUT MODULES		
-	188 087	0-60 VDC, 0-3 Amp DC Output	-	
-	188 088	0-200 VDC, 0-1 Amp DC Output	-	
-	188 089	24-280 VAC, 3 Amp	-	
-	188 090	Output Reed Relay	-	
		RUN UP MODULES		
-	188 091	0-10 VDC Run-Up Output Module	-	
-	188 092	4-20 mAmp Run-Up Output Module	-	

Resolvers and Resolver Cables

Item	Part	Description	Quantity	Note
		ENCODER, PC, RESOLVERS		
-	188 065	Encoder, PC Resolvers, $^3/_4$ FT, RC,	-	
-	188 066	Encoder, PC Resolvers, $^3/_4$ FT, SC,	-	
-	188 067	Encoder, PC Resolvers, $^3/_8$ FL, RC,	-	
-	188 068	Encoder, PC Resolvers, $^3/_8$ FL, SC,	-	
-	188 069	Encoder, PC Resolvers, $^5/_8$ FT, RT,	-	
-	188 070	Encoder, PC Resolvers, $^5/_8$ FT, LT,	-	
		ENCODER, PC, RESOLVER CABLES		
-	188 071	Resolver, Cable	10 ft	
-	188 072	Resolver, Cable	30 ft.	
-	188 073	Resolver, Cable	50 ft.	
-	188 074	Resolver, Cable	100 ft.	
-	188 075	Resolver, Cable	150 ft.	
-	188 076	Cable, for Resolver, Stainless Steel	10 ft.	
-	188 077	Cable, for Resolver, Stainless Steel	30 ft.	
-	188 078	Cable, for Resolver, Stainless Steel	50 ft.	
-	188 079	Cable, for Resolver, Stainless Steel	100 ft.	
-	188 080	Cable, for Resolver, Stainless Steel	150 ft.	

Power Supply

Item	Part	Description	Quantity	Note
-	188 099	Power Supply, PC, 24 VDC, 3 Amp	-	

Keypad/Display and
Keypad /Display Cables

Item	Part	Description	Quantity	Note
-	188 098	PC50 Pattern Controller System	-	
-	188 093	Keypad/Display	-	
		KEYPAD/DISPLAY CABLES		
-	188 125	Cable, PC, Keypad/Display	2 ft.	
-	188 081	Cable, PC, Keypad/Display	5 ft.	
-	188 082	Cable, PC, Keypad/Display	10 ft.	
-	188 083	Cable, PC, Keypad/Display	30 ft.	
-	188 084	Cable, PC, Keypad/Display	50 ft.	
-	188 085	Cable, PC, Keypad/Display	100 ft.	

Terminal Blocks

Item	Part	Description	Quantity	Note
		TERMINAL BLOCKS		
-	188 112	Terminal Block, PC Resolver Cable	1	
-	188 113	Terminal Block, PC Input Power	1	
-	188 114	Terminal Block, PC Input 1-8	1	A
-	188 122	Terminal Block, PC Input 9-16	1	A
-	188 115	Terminal Block, PC 20-30 VDC Input	1	
-	188 116	Terminal Block, PC Keypad/Display	1	
-	188 120	Terminal Block, PC Output 9-12	1	A
-	188 121	Terminal Block, PC Output 13-17	1	A
-	188 117	Terminal Block, PC Output 1-4	1	A
-	188 119	Terminal Block, PC Output 5-8	1	A
-	188 118	Terminal Block, PC Output 5-9	1	B
-	188 123	Terminal Block, PC Output 1-4	1	B
-	188 124	Terminal Block, PC, Input 1-8	1	B

NOTE A: For PC55 only
B: For PC54 only

Spare Parts

Item	Part	Description	Quantity	Note
-	188 101	Fuse, PC, Output Module, 4 Amp	Pkg of 5	
-	188 102	Fuse, PC, PC 54/55 Control,1.25 Amp	Pkg of 5	
-	188 103	Fuse, PC, PC, Accessory Power, 0.25 Amp	Pkg of 5	
-	188 104	Strain Relief, PC, Cable		
-	188 111	Connector, PC, Resolver Cable		
-	-	Fuse, 1 Amp, Sol Blo (Controllers w/240 VAC input power to Terminal Strip)	-	
-	-	Fuse, 2 Amp, Sol Blo (Controllers w/120 VAC input power to Terminal Strip)	-	A
NOTE A: 2 amp Slo Blo fuses are customer supplied items.				

Section 7

Specifications

Section 7
Specifications

Electrical

Input Power: 20-30 VDC Keypad/display is powered from controller.

Input Current: PC54 System – 400 mA max. @ 20 VDC (includes controller, 1 keypad, resolver, 8 power modules, 1 Run Up module and 8 inputs, all ON. Current less at higher voltage500 mA maximum (control only).

PC55 System – 650 mA max. @ 20 VDC (includes controller, 2 keypads, resolver, 15 power modules, 2 Run Up modules and 16 inputs, all ON. Current less at higher voltage.

Permanent Memory: EEPROM (no battery required)

Environment

Operating Temp: 32° to 131 °F (0° to +55 °C)

Storage Temp: –40° to 160 °F (–40° to +70 °C)

Humidity: 95% maximum relative non-condensing

NEMA Rating: Keypad/display: NEMA 4X (NEMA 1, 4, 4X and 12)

Physical

Overall Dimensions: See Section 2, *Description*

Weight: Controller: 3.5 lbs. (1.6 kg). Keypad/Display: 0.5 lbs. (0.2 kg)

PC50 Series Controller Cabinet Mounting

Wall or machine mounting by bolts through cabinet flanges.

Optional auxiliary keypad (PC55 only) may be mounted up to 1000 feet from controller cabinet.

Controller unit, if ordered as individual unit not mounted in cabinet, provided with EN-50035 ("G" profile) or EN-50022 ("Top Hat" profile).

Inputs

DC Inputs:

PC54 - 8 DC inputs configurable as sinking or sourcing as a group of 8. Optically isolated as a group of 8.

PC55 - 16 DC inputs, configurable as sinking or sourcing in groups of 8. Optically isolated in groups of 8.

Input ON
State Voltage:

10-30 VDC

Input Current:

11 mA @ 24 VDC

Program Select
Response:

100 ms typical (may be longer with large number of setpoints)

Response of All Other
Inputs:

1 – 2 scans

Outputs

DC Outputs

60 VDC

Output Voltage: 0-60 VDC
Output Current: 3 amps DC @/ below
35 °C (95 °F) Above 35 °C derate 35.7 mA/°C
(19.8 mA/°F)
Turn On/Off Time: Each, 50 microseconds

200 VDC

Output Voltage: 0-200 VDC
Output Current: 1 amp DC @/ below
45 °C (113 °F) Above 45 °C derate 18 mA/°C
(10 mA/°F)
Turn On/Off Time: Each, 50 microseconds

Run Up Outputs

0-10 VDC

Output Voltage: 0-10 VDC, proportional to RPM
Output Current: 10 mA maximum
Resolution: 12 bits (4096 increments)
Load Resistance 1 K Ohm minimum

4-20 VDC

Output Current: 4-20 mA
Resolution: 12 bits (4096 increments)
Load Resistance 450 Ohm maximum

Operation

Scan Time:	300–500 µsec typical (exact time determined by programming)
Position Resolution:	PC54 – 1024 increments PC55 – 4096 increments
Gun Compensation:	Programmed in 0.1 ms steps, Pull in/Drop out times can be individually compensated. Calculations every 10 ms. PC54 – All channels can be individually compensated. PC55 – Up to 16 channels can be individually compensated.
Number of Timed Outputs:	4 maximum (PC55 only)
Multiple Programs:	PC54 - 16 programs standard PC55 - 64 programs standard
Total Duration Memory:	1258 durations
Durations per Program:	512 maximum
Durations per Output:	512 maximum
Maximum Speed:	3000 RPM

RS-232 Serial Communication

Baud Rates:	4800, 9600, 19.2K, 38.4K

Section 8

Options

Section 8
Options

1. Washdown Boot

Description

The washdown boot, (P/N 188 105) a clear silicon rubber boot fitting over and around the keyboard area, protects the keyboard during caustic chemical washdown. The transparent and pliable boot, allows the keyboard to be viewed and operated through it. In addition to preventing contamination from harsh chemicals, the boot protects the keyboard from grease, oil, dirt, and normal wear that could otherwise shorten keyboard life.

The boot is available separately and can be installed on existing controls in the field.

Installing the Washdown Boot

1. Remove the nuts and regular black rubber gasket from the keyboard.

2. Carefully slip the silicone rubber boot over the keyboard. Slowly work it over the mounting studs, being careful not to cause any tears in the boot.

   NOTE: Silicone rubber is very notch sensitive, tearing easily.

3. Smooth the boot into position so no stretching takes place. It should be able to move into position easily.

4. Install the keyboard into the panel. The nut tightening sequence is important. Start with a corner of the unit, holding the rubber boot snugly to the edge of the keyboard while bringing the nut to a finger tightness. Select the next nut, again tightening while holding the boot snugly to the keyboard edge. When all the nuts are in place, tighten each nut a little more, tightening one at a time. The silicone rubber tends to extrude from under the keyboard if the bolts are not tightened in an even sequence or if they are over torqued.

   NOTE: Applying too much torque to the nuts does not improve sealing. Damage to the silicone rubber seal may occur.

2. Program Enable and Select Switches

Available as an option on PC50 Series controllers, program enable (P/N 188 108) and program select (P/N 188 107) switches prevent unauthorized programming changes to the controller and allow remote selection of the Active Program.

Program Enable Switch

The switch is wired to the Master Program Enable terminal on the back of the keyboard. A second switch may be wired to Operator Enable.

NOTE: See *Keypad Wiring* in Section 3, *Installation* for additional information necessary to install the program enable switch.

The terminal block on the back of each keypad includes terminals to select Master or Operator level programming access for that keypad. See PASSWORDS in Section 4, *Programming* for details on programming access.

For the program enable switch, either sourcing or sinking wiring may be used. Figures 8-1 and 8-2 illustrate keypad terminal block sinking and sourcing wiring for programming enable.
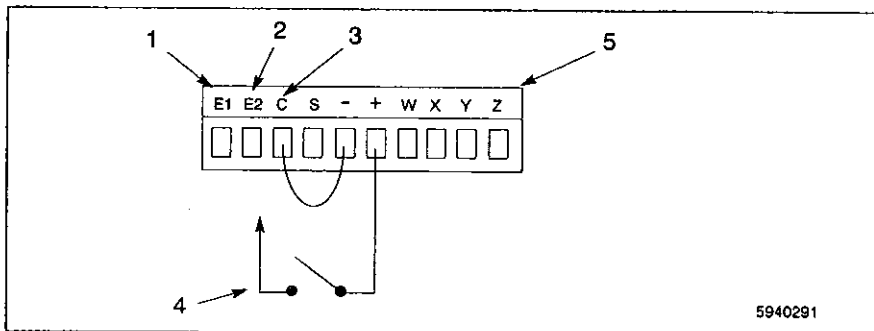
1. Master Program Enable
2. Operator Program Enable
3. Enable Common
4. Switch (To E1 or E2)
5. Terminal Block on Keypad

Fig. 8-1   Program Enable - Sourcing
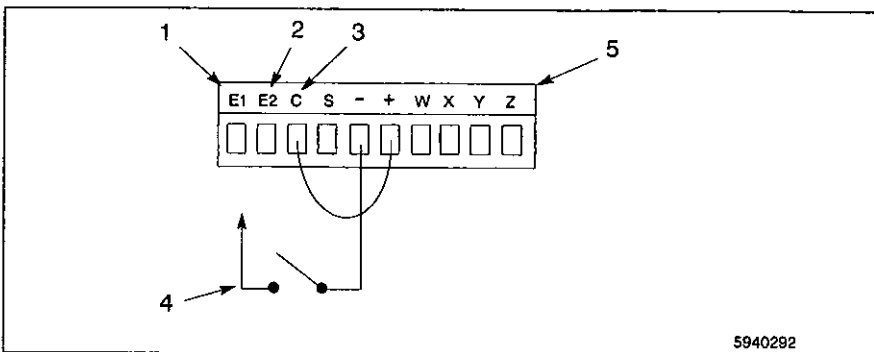
1. Master Program Enable
2. Operator Program Enable
3. Enable Common
4. Switch (To E1 or E2)
5. Terminal Block on Keypad

Fig. 8-2   Program Enable - Sinking

Program Select Switch

The program select switch, which allows remote control of the Active Program, allows the operator to change programs but does not allow changing setpoints in the output channels. The switch provides access to 8 programs in the active program bank.
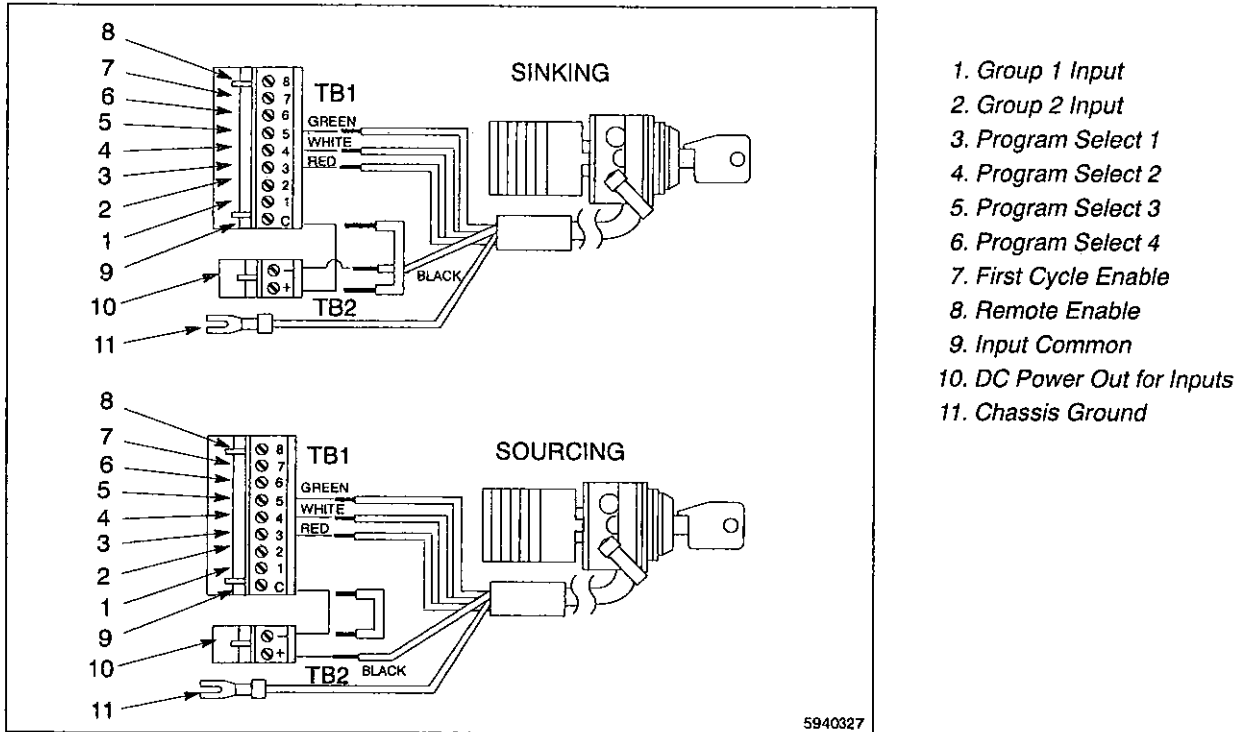
Fig. 8-3   PC54 Program Select Switch Wiring

1. Group 1 Input
2. Group 2 Input
3. Program Select 1
4. Program Select 2
5. Program Select 3
6. Program Select 4
7. First Cycle Enable
8. Remote Enable
9. Input Common
10. DC Power Out for Inputs
11. Chassis Ground
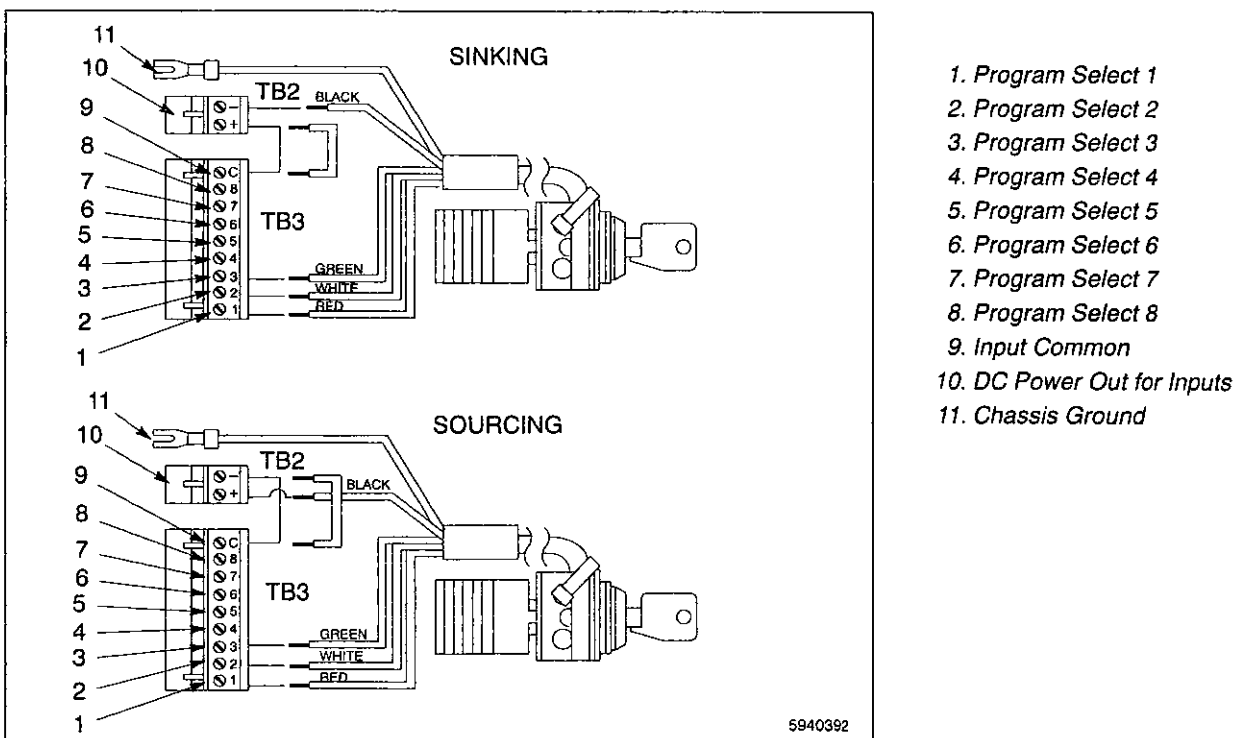
Fig. 8-4   PC55 Program Select Switch Wiring

1. Program Select 1
2. Program Select 2
3. Program Select 3
4. Program Select 4
5. Program Select 5
6. Program Select 6
7. Program Select 7
8. Program Select 8
9. Input Common
10. DC Power Out for Inputs
11. Chassis Ground

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3. PC50 Series Controller Communication Software

Description

Communication software for PC50 Series controllers is available in two forms:

Nordson Communication Software

Available as an option on both PC54 and PC55 controllers, Nordson's Communication Software is a DOS program that runs on most IBM-PC compatible computers. When the serial port of the PC is connected to the female DB-9 port on the PC50 Series controller, (See Figures 3-34, 3-35, and 3-36), the software can transfer, in either direction, programming values between the computer and the controller.

Insert the instruction sheet and diskette holder provided with the communication package in Section 9, *Communications* for storage and future reference.

Modbus Communication

Not available on PC54 controllers, Modbus communication capability is a standard feature of PC55 controllers. Modbus communication provides serial interface, using Modbus ASCII protocols, allowing interface with a variety of compatible machine controllers.

See Section 9, *Communications* for a complete description of Modbus communications and its use.

Section 9

Communications

Section 9
Communications

1. Introduction

This section contains descriptions of and the operating requirements for PC50 Series controller communications packages.

Nordson Communication Software

If the optional Nordson Communication Software package is ordered, insert the instruction sheet and diskette holder, with diskettes at the indicated place at the end of this section.

Modbus Communication Software

Modbus Communication software is a standard feature of PC55 controllers. Insert the diskette holders, with diskettes, at the end of the Modbus software discussion.

NOTE: Modbus Communication is provided as a tool for customers familiar with Modbus and experienced with computer programming and developing control device interfaces. Modbus communications capability on the PC55 provides a means for other control devices to interrogate the PC55. This section provides the Discrete I/O elements and memory register addresses. The two DOS utilities provided with the software package enable PC55 connection with IBM compatible computers and provide a means for mapping Data Display registers.

2. Modbus Communications

Introduction

Modbus communication provides serial interface, using Modbus ASCII protocols, allowing interface with a variety of compatible machine controllers. Compatible controllers can interrogate the PC55 for configuration, or other operating data, and can change the data.

Due to the relatively slow speed of serial communication, applications are usually limited to supervisory functions, such as selecting programs of settings during a product changeover, rather than used to monitor real time parameters such as machine position or rpm.

NOTE: Modbus protocol used in the PC55 is Modbus ASCII. Modbus Plus or other variations will not work.

NOTE: When using serial communications, the host device must be set for seven (7) data bits, two (2) stop bits and no parity.

Data Organization

The two types of data available through Modbus communications are Discrete I/O and Registers.

- Discrete I/O - These elements represent input/output status. They include coils which can be forced on or off. Forcing outputs is used mainly for troubleshooting or diagnostic purposes.

- Registers - All controller data such as Duration setpoints, Gun Compensation values and configuration settings are available through registers. Values may be read from registers and changes in controller configuration may be made by writing to registers.

Some data is represented by more than one register. ON and OFF points, for example, for a particular Duration are referenced through five separate registers: Program Index (40264), Channel Index (40265), Duration Index (40266), Duration On (40267), and Duration Off (40268).

In order to read the On and Off setpoints for a Duration, data must first be written to the three index registers to specify which Duration is to be read.

Data reading from the controller has been streamlined by providing, special Data Display registers. By mapping a particular indexed element to a Data Display register, the values for that element can be read without always writing the appropriate index values.

EXAMPLE:

To map a specific Duration to a Data Display register:

1. Specify the Program, the Channel, and the Duration by writing to Program Index (40264), Channel Index (40265) and Duration Index (40266).

2. Using the Duration Mapping register, (40261), specify the Data Display registers that reference this Duration.

Data Organization *(contd.)*

Once this Duration is mapped to these Data Display registers, reading the registers returns the On and Off setpoints of the mapped Duration, regardless of later changes to the values in the Index registers.

Careful use of the mapping registers allows a device to quickly read a series of data from the PC55 without first having to specify the Index registers for each element being read.

NOTE: Data Display registers will not accept mapping values until the Map Limit register (40296) has been programmed with a value greater than zero (0).

NOTE: When reading or writing to registers, no more than 32 consecutive registers may be referenced at one time.

DOS Utilities

On the diskette, furnished with the software package, are two (2) DOS utilities for use with serial communications.

MODCMD. EXE

The MODCMD.EXE program allows an IBM compatible computer, connected to a PC55 controller, to send and receive individual Modbus commands for experimentation or manual programming. For each command and response, the ASCII strings are displayed. This assists the programmer in developing applications involving the PC55 controller.

The menu system is self-explanatory.

NOTE: When reading or writing to registers, use only the last three (3) digits of the register.

- For example, to read or write to register 40305 (keyboard quantity), type 305 when prompted. *Do not enter 0305 or 40305.*

NOTE: When using Mapping registers to specify a Data Display register, do not add any leading zeroes (0) to the Data Display value.

- For example, to map an element to Data Display 40017, enter 17 when prompted by the program. *Do not enter 017 or 40017.*

DOS Utilities *(contd.)*

MODMAP. EXE

Unlike Discrete I/O elements and registers which are dedicated to specific parameters, the Data Display registers must be mapped for a specific application in order to be useful. MODMAP. EXE is a utility designed to simplify the programming and storage of Data Display mapping.

MODMAP. EXE can be used to upload, from the PC55 controller to an IBM compatible computer, the Data Display mappings that have been established using MODCOM. EXE or another program. The mappings can be saved as a text file, which can be reviewed, edited and then downloaded to other PC55 controllers. The file can also be saved for archival purposes.

Included with MODMAP. EXE is a text file called MAPPING. FMT which can be opened in MODMAP and studied. This file explains the formats used by MODMAP and includes a mapping example which can be downloaded to a PC55 controller. The menus in MODMAP are self-explanatory.

Modbus Register Map

This section provides a list of PC55 controller addresses for Discrete I/O elements and memory registers.

Discrete I/O

Inputs

10001 – 10016 DC Inputs

These points represent the status of the DC inputs.

Outputs

00001 – 00100 Channel Outputs

These coils represent the status of the channel outputs. Forcing these coils directly will set/clear the appropriate ORing and ANDing coils as required.

The Channel Output Coil status before OR/ANDing is determined by setpoints, group modes, speed compensation, motion ANDing, enable input ANDing, timed outputs, and resolver fault status.

ORing and ANDing

00101 - 00200 Channel ORing Setting

Setting these coils to '1' will force the corresponding channel Output Coil ON.

00201 – 00300 Channel ANDing

Setting these coils to '1' will force the corresponding Channel Output Coil OFF.

Discrete I/O *(contd.)*

Special Purpose (00301-00400)

301 Global Unforce

Clears all OR and AND coils when set from '0' to '1' (edge active).

302 Duration Register Enable

When '1', this coil enables the creation of new Durations through writes to the New Off Register. When this coil is '0', writes to New Off Register do not create a new Duration.

303 Create New Duration

Creates a new Duration defined by the New On and New Off registers when set from '0' to '1' (edge active). This coil is ignored if coil 302 is '1'.

304 Move Both Edges of Duration

When '1', this coil will cause both edges of a Duration to move when either the leading or trailing edge is changed by '1' (incremented or decremented).

305 Move All Durations in Channel

When '1', this coil will cause all edges of all Durations in a channel to move when either the leading or trailing edge is changed by '1' (incremented or decremented).

316 Auto Increment

When '1', this coil enables the auto increment feature on index registers. This feature allows sequential reading of indexed values without changing the index register.

Registers

Special Purpose and Data Display

40017 Data Display (240 registers)

These registers (017 – 256) are used by the Mapping functions to display individual instances of indexed data.

RPM

40257 RPM

Read only

Returns the current RPM.

Position

40258 Position Mapping

Read/write

Values: 17 – 256

Specifies the general purpose register used to display the position for the output group specified by the Group Index Register.

40259 Position Index

Read/write

Values: 1 – 6

Specifies the output group whose position is displayed in the Position Register.

40260 Position

Read only

Values: 0 – (Scale Factor – 1)

Returns the current position for the output group specified by the Group Index Register.

Registers *(contd.)*

Duration Programming

40261 Mapping

Read/write

Values: 17 – 255

General Purpose Register used for mapping the On and Off values for the Duration specified by the index registers. Two registers will be used; the first contains the On value, the second contains the Off value.

40262 Total Duration Count

Read/write

Values: 0 – n

Returns the total number of Durations for all channels. Writing a value of '0' to this register will erase all Durations. You can only write to this register when the Stop register is '1'.

40263 Channel Duration Count

Read only

Values: 0 – n

Returns the number of Durations in the channel defined by the index registers below.

40264 Program Index

Read/write

Values: 0 – Max Program Number

Contains the current program number for Duration access. Writing to this register resets the Channel Index Register and the Duration Index Register to '1'. When this register is '0', the current active program is used for setpoint access and for mapping (setpoints mapped with a program index of '0' will automatically change when the active program changes).

40265 Channel Index

Read/write

Values: 1 – Max Channel Number

Contains the current channel number for Duration access. Writing to this register resets the Duration Index Register to '1'. This register is reset to '1' when the Program Index Register is changed.

Registers *(contd.)*

Duration Programming *(contd.)*

40266 Duration Index

Read/write

Values: 1 - n

Contains the current Duration number for Duration access. This register is reset to '1' when the Program Index Register or Channel Index Registers are changed.

40267 Duration On

Read/write

Values: 0 - (Scale Factor - 1)

Duration On Value.

40268 Duration Off

Read/write

Values: 0 - (Scale Factor - 1)

Duration Off Value.

40269 New On

Read/write

Values: 0 - (Scale Factor - 1)

New Duration On Value

Writing to this register loads the On setpoint of a new Duration for the program and channel specified by the index registers above.

40270 New Off

Read/write

Values: 0 - (Scale Factor - 1)

New Duration Off Value.

Writing to this register loads the Off setpoint of a new Duration for the program and channel specified by the index registers above. The Duration is stored when the Off value is written if the Duration Register Enable Coil is set to '1'; otherwise the Duration is stored when the Create New Duration Coil is changed from '0' to '1' (edge active).

Registers *(contd.)*

Default Program

40271 Default Program

Read/write

Values: 1 – Max program number

Defines the active program if no hardware program select inputs are active.

Gun Compensation

40272 Gun Comp Mapping

Read/write

Values: 17 – 255

General purpose register used for mapping gun compensation values. Two registers will be used; the first will contain the leading edge value, the second will contain the trailing edge value.

40273 Channel Index

Read/write

Values: 1 – Max Channel Number

Channel index for speed comp values.

40274 Leading Edge Comp

Read/write

Values: 0 – n (.1mS)

Specifies the leading edge gun comp value.

40275 Trailing Edge Comp

Read/write

Values: 0 – n (.1mS)

Specifies the trailing edge speed comp value.

Registers *(contd.)*

Timed Outputs

40276 Timed Output Mapping

Read/write

Values: 17 – 255

General purpose register used for mapping timed output values.

40277 Channel Index

Read/write

Values: 1 – Max Channel Number

Channel index for time delay values.

40278 Time Delay

Read/write

Values: 0 – n (1mS)

Specifies the maximum time in milliseconds that a channel may stay on after it has been turned on.

Offset

40279 Offset Mapping

Read/write

Values: 17 – 256

General purpose register used for mapping Group Offset values.

40280 Group Index

Read/write

Values: 1 – 6

Group index for offset values.

40281 Group Offset

Read/write

Values: 0 – (Scale Factor – 1)

Offset value for the specified group.

NOTE: This value is a PRESET value for groups in Operating Modes 1 or 2.

Registers *(contd.)*

Speed Enable/Disable

40282 Speed Enable/Disable Mapping

Read/write

Values: 17 – 255

General purpose register is used for mapping low and high motion detection values. Two registers are used; the first contains the low motion detection rpm value, the second contains the high motion detection rpm value.

40283 Channel Index

Read/write

Values: 1, 2

Motion detection level index for high and low motion detection values.

40284 Min Speed Detection RPM

Read/write

Values: 0 – n

Min Speed low limit for the level specified by the index register.

40285 – Max Speed Detection RPM

Read/write

Values: 0 – n

Max Speed high limit for the level specified by the index register.

Registers *(contd.)*

Run Up Output

40286 Run Up Output Mapping

Read/write

Values: 17 – 255

General purpose register used for mapping Run Up offset and high RPM values. Two registers will be used; the first contains the Run Up offset value, the second contains the high RPM value.

40287 Channel Index

Read/write

Values: 1, 2

Run Up channel index for Run Up offset and high RPM values.

40288 Run Up Offset

Read/write

Values: 0 – 4095

Run Up output at 0 RPM.

40289 Run Up High RPM

Read/write

Values: 0 – n

RPM at which Run Up output is 4095.

Registers *(contd.)*

Mapping Registers

40296 Map Limit

Read/write

Values: 0 - 256

Sets the maximum number of data mappings.

40297 Map Quantity

Read/write

Values: 0 - 256

Returns the number of data mappings active in the controller.

NOTE: Writing a '0' to this register will delete all data mappings!

40298 Map Store

This register is only for use by utility programs.

40299 Map Recall

This register is only for use by utility programs.

Registers *(contd.)*

Model Information

40300 Model

Read only

Returns the controller model number.

40301 Revision

Read only

Returns the major software revision.

40302 Output Quantity

Read only

Returns the number of output channels (8, 9, 16, 17, 25, etc.).

40303 Option Index

Read/write

Values: 1 – n

Used as index for reading installed controller options through the Option Register.

40304 Option

Read only

Values: 0 – n

Returns installed controller options as specified through the Option Index Register. A value of '0' at index '1' means no options are installed.

Registers *(contd.)*

Hardware Configuration

40305 Keyboard Quantity

Read/write

Values: 1, 2

Number of keyboards attached to the controller.

40306 Increasing Direction

Read/write

Values: 0 = CCW, 1 = CW

Specifies the resolver's rotation direction (viewed from the shaft end) that results in an increasing numerical display of position.

40307 Scale Factor

Read/write

Values: 2 - 1024 (4096 with "-H" Option)

Scale factor used for Duration, position, and offset programming.

40308 Shaft Position

Read only

Values: 0 - (Scale Factor - 1)

Returns the current resolver shaft position, including the shaft offset.

40309 Shaft Offset

Read/write

Values: 0 - (Scale Factor - 1)

Offset that is added to raw resolver position to make Shaft Position.

Registers *(contd.)*

Hardware Configuration

40310 Run Up Quantity

Read/write

Values: 0, 1, 2

Specifies the number of Run Up modules active.

40311 Resolver Type

Read/write

Values: 0 = Nordson, 1 = Other

Specifies type of resolver attached to controller.

40312 Program Select Module

Read/write

Values: 0 = Binary, 2 = BCD, 1 = Gray code

Specifies how the program select inputs determine the active program.

40316 Termination Resistor Two

Read/write

Values: 0 = Off, 1 = On

Termination resistor On/Off for RS-232/RS-485 communication port.

40318 Rate Multiplier

Read/write

Values: 1 - 1091

RPM rate multiplier.

40319 Rate Divisor

Read/write

Values: 1 - 63

RPM rate divisor.

Registers *(contd.)*

Display Configuration

40320 Rate Decimal Point Position

Read/write

Values: 0 - 3

RPM decimal point position.

40321 Rate Units

Read/write

Values: 0 = RPM, 1 = BPM, 2 = CPM, 3 = IPM

RPM display units.

40322 Toggle RPM

Read/write

Values: 0 - n

Specifies the RPM which causes the position display to blank.

40325 Group Position Display Mode

Read/write

Values: 0 = Each, 1 = One

Specifies whether the positions for output groups are individually displayed, or if they are displayed as one value for all groups. Output group positions can only be displayed as one if none are in mode 1 or mode 2 (re-zero modes).

Password ID Numbers

40326 Operator ID

Read/write

Values: 0 - n

Specifies the Operator ID number used to enable the Operator access level for programming.

40328 Master ID

Read/write

Values: 0 - n

Specifies the Master ID number used to enable the Master access level for programming.

Registers *(contd.)*

Min Speed ANDing

40332 Channel Index

Read/write

Values: 1 – Max Channel Number

Channel index for the Min Speed Enable Level Register.

40333 Motion Enable Level

Read/write

Values: 0 = Off, n = Min Speed Level

Specifies the motion detection level used for a channel.

Rem Enable ANDing

40334 Output Enable Index

Read/write

Values: 1 – Max Channel Number

Channel index for the Rem Enable register.

40335 Rem Enable

Read/write

Values: 0 = Channel not ANDed, 1 = Channel ANDed

Specifies whether a channel is ANDed with the Enable input.

Registers *(contd.)*

Group Programming

40336 Group Quantity

Read/write

Values: 1 – 6

Specifies the number of output groups.

40337 Group Index

Read/write

Values 1–6

Group index for Channel Quantity and Group Mode Registers.

40338 Channel Quantity

Read/write

Values: 0 – n

Defines the number of channels in the output group specified by the Group Index Register.

40339 Group Mode

Read/write

Values: 0 – 5

Defines the operating mode for the output group specified by the Group Index Register.

NOTE: Groups in mode '0' do not need (or have) an enable input.

Registers *(contd.)*

Run Time Control

40340 Stop Control

Read/write

Values: 0 = Running, 1 = Stopped

When the PC55 controller is STOPPED, changes written to registers do not update the checksum in EEPROM memory. Changes are faster when unit is stopped, but you must read from the Checksum Register when changes are complete to establish a valid checksum. Writing a '1' value to this register will place the PC55 controller in STOPPED mode. Writing a '0' to this register will restart the PC55 controller via a watchdog timer reset.

40341 EEPROM Checksum

Read only

Returns the current checksum of EEPROM memory. If computed checksum of EEPROM memory does not match the current value (i.e. if changes were made while unit STOPPED), a new value will be written to EEPROM memory.

40342 EEPROM Changed

Read only

Values: 0 = no change, 1 = changed

A value of '1' in this register means that the EEPROM has been changed (through the keyboard) since the last time this register was read. Reading this register sets it to '0'.

3. Nordson Communication Software

Remove this page and insert the instruction sheet and diskette holder provided with the optional Nordson Communication Software package.

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Index

C

D

E

G

I

Index (contd.)

I (contd.)

K

M

O

O (contd.)

P

Index (contd.)

Index (contd.)

S (contd.)

T

W