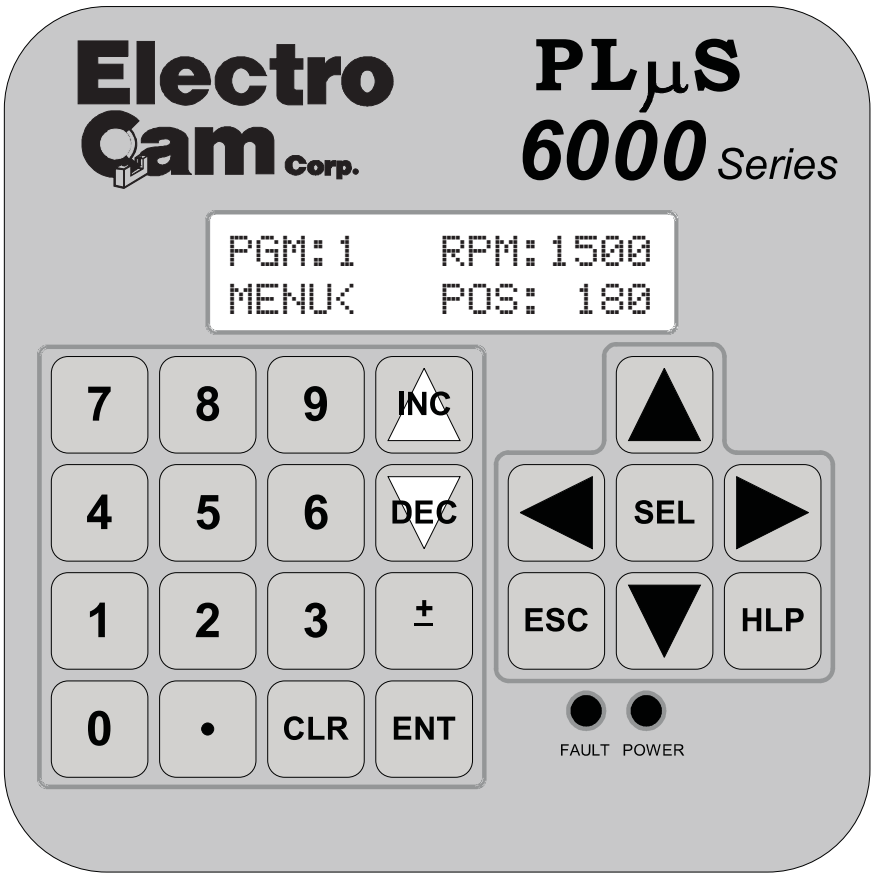
PLμS™ PS-6244 Series
Programmable Limit Switch



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Programming & Installation Manual

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Electro Cam Corp.

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1. Electro Cam Corp. warrants that for a period of twelve (12) months from the date of shipment to the original purchaser, its new product to be free from defects in material and workmanship and that the product conforms to applicable drawings and specifications approved by the Manufacturer. This warranty period will be extended on Distributor or OEM orders to a maximum of eighteen months to take into consideration Distributor or OEM shelf time.

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3. In no event, and under no circumstances, shall Electro Cam Corp. be liable for:

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    b. Product failure or damages due to misuse abuse, improper installation or abnormal conditions of temperature, dirt or other contaminants as determined at the sole discretion of Electro Cam Corp.

    c. Product failures due to operation, intentional or otherwise, above rated capacities as determined at the sole discretion of Electro Cam Corp.

    d. Non-authorized expenses for removal, inspection, transportation, repair or rework. Nor shall the manufacturer ever be liable for consequential and incidental damages, or in any amount greater than the purchase price of the equipment.

4. There are no warranties which extend beyond the description on the face hereof. This warranty is in LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED INCLUDING (BUT NOT LIMITED TO) ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE EXPRESSLY DISCLAIMED. Any legal proceeding arising out of the sale or use of this apparatus must be commenced within (18) months of the date of shipment from the manufacturer.

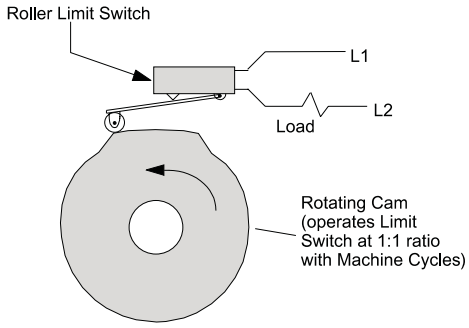
Mechanical Cam Switches

Mechanical Cams

The PS-6244 Programmable Limit Switch electronically simulates mechanical cam switches. A cam switch consists of a roller limit switch whose arm rides on a cam as shown in Figure 1. The cam shaft is driven by a machine at a 1:1 ratio, so that the cam switch turns on and off at specific positions in the machine cycle. Cam limit switches have the following disadvantages:

- The roller, the cam, and the limit switch wear out.
- The machine must be stopped during adjustment.
- On/off patterns are limited, and changing the pattern may require replacement of one cam with another. For example, a cam that switches on and off twice in one revolution would need to be replaced with a different cam if three on/off pulses per revolution were required.
- They cannot run at high speeds because of contact bounce and excessive mechanical wear.

Figure 1—Basic Cam Switch



Programmable Limit Switches

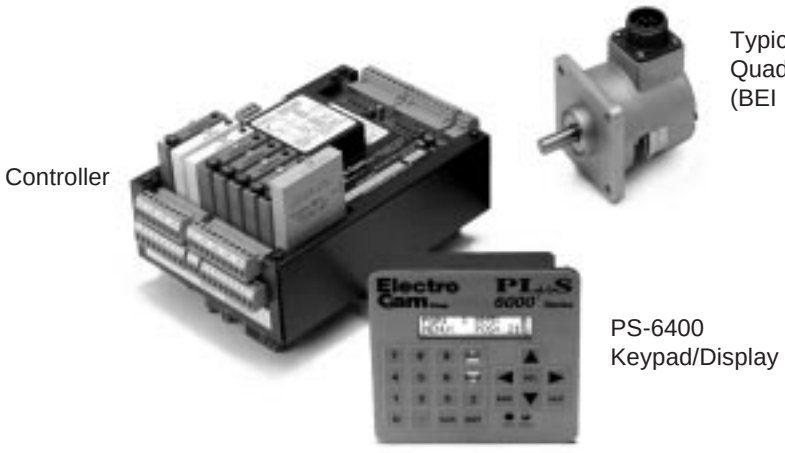
PS-6244's & Encoders

The PS-6244 Programmable Limit Switch uses a quadrature encoder (Figure 2) instead of a cam to indicate machine position. A quadrature encoder uses optical discs to generate streams of pulses that can be processed by the PS-6244. From the encoder signals, the PS-6244 can determine shaft position, direction, and speed. The encoder is usually coupled to a machine shaft at a 1:1 ratio so that one encoder shaft rotation corresponds to one machine cycle. Encoders have no brushes, contacts, or any frictional moving parts to wear out.

Based on the encoder signal, the PS-6244 Programmable Limit Switch turns electrical circuits, or "Outputs," on and off, simulating the mechanical roller limit switch. Because the combination PS-6244/encoder system is completely electronic and has no frictional parts, it offers several advantages over mechanical cam switches:

- Long service life with no parts to wear out.
- "On" and "off" points can be adjusted instantly from the keypad; there are no cams to rotate or replace.
- Adjustment is possible with the machine running or stopped.
- Programmable logic allows complex switching functions that are impossible with mechanical cams.
- Operation at speeds up to 1500 RPM.

Figure 2—PS-6244-24-N16M09 Programmable Limit Switch and Quadrature Encoder



PS-6244 Description

Controller & Keypad

PS-6244 Series Programmable Limit Switches consist of two main components: the controller and the keypad/display. The controller houses the microprocessor, associated circuitry, and all of the I/O circuits. This eliminates the need for external I/O racks.

A separate 1/4 DIN keypad/display provides a complete user interface from which every aspect of the controller's operation can be monitored and programmed. Multiple keypads can be connected to a single controller. In addition, when interfaced to a PLC or other computer, the controller can be used without a keypad/display. When properly mounted with the gasket provided, the keypad/display meets NEMA 4X standards. A clear silicon rubber boot assembly is available to provide protection for installations where harsh washdown chemicals are used.

The PS-6244 Series is available in two models: the PS-6244-24-M17 and the PS-6244-24-X16M09 Both are described in Figure 3.

Figure 3—PS-6244 Models

PS-6244-24-M17 Controller—Up to 17 Outputs

The PS-6244-24-M17 has 17 total outputs:

- Outputs 1 through 15 can accept AC or DC output modules for driving "real world" devices such as solenoids, valves, or glue guns.
- Output 16 will accept an AC or DC module, or an analog module that generates a control signal proportional to RPM.
- Output 17 is dedicated to analog output.

PS-6244-24-N16M09 Controller—Up to 25 Outputs

The PS-6244-24-N16M09 has 25 total outputs:

- 16 transistor outputs are built into the controller.
- Outputs 17 through 23 can accept AC or DC output modules for driving "real world" devices such as solenoids, valves, or glue guns.
- Output 24 will accept an AC or DC module, or an analog module that generates a control signal proportional to RPM.
- Output 25 is dedicated to analog output.

Basic Terminology

The following terms will be used throughout this manual to explain PS-6244 installation, programming and operation:

Outputs (channels)

An “output,” or “output channel,” refers to an external circuit that the PS-6244 controls based on encoder position or speed. Outputs can be one of two types:

Switching outputs turn circuits on or off.

Analog outputs generate a control signal that is proportional to RPM.

Setpoints

“Setpoints” are the points within one rotation of the encoder at which an output channel turns on or off. Setpoints can be programmed into an output channel through the keypad/display, or they can be downloaded from a computer or PLC through serial communications. The PS-6244 can turn any given output on and off multiple times within one rotation.

Pulses

A “pulse” is the “on” period between the time an output is turned on and off. The “on” point is the **leading edge** of the pulse, and the “off” point is the **trailing edge**. When multiple “on” and “off” points are programmed into one output channel, the output is said to have multiple pulses.

Programs

Suppose that 15 output channels on a cartoner are programmed with setpoints to fold and glue a certain size carton. These settings could be stored as a “program.” Then, the 15 output channels could be re-programmed with different setpoints for a different size carton. This second set of setpoints could also be stored as a program. To change carton sizes, an operator could simply activate the correct program, and the corresponding setpoints would take effect.

The use of programs can provide tremendous advantages over mechanical cam switches. Standard PS-6244’s can store up to 48 programs. The active program can be selected through the keypad/display, mechanical switches, direct PLC interface, or serial communication messages.

Inputs (hardware inputs)

In addition to accepting a signal from the encoder, the PS-6244 can accept up to 16 input signals from mechanical switches, relay contacts, DC two- or three-wire sensors, solid state DC output modules, or PLC DC outputs. The PS-6244 hardware inputs are dedicated to specific functions involving program selection and controlling output channels based on sensor signals.

PS-6244 Features

Programming Access

Three levels of programming access are provided: Operator, Setup, and Master. Each level can be assigned a password that must be entered to allow programming at that level. In addition, the Operator and Master levels can be activated on an individual keypad through hardware terminals on the back. Careful use of programming access levels can provide key personnel the flexibility they need in programming the controller, while protecting settings against accidental or unauthorized changes.

Speed Compensation

Speed compensation advances the setpoints for an output channel as machine speed increases. This eliminates the need to manually adjust the settings for fixed-response devices whenever machine speeds are changed. Speed compensation provides greater accuracy, higher production speeds, and reduced downtime for machine adjustment.

Motion ANDing

Two speed ranges can be programmed into the controller, and output channels can be ANDed with either speed range so that they will be disabled unless the machine speed is within the specified range. A common use for this feature is disabling outputs to glue valves to turn off the glue flow if the machine stops.

Input ANDing

An output channel may be ANDed with one of eight input signals so that the output is disabled unless the input signal is present.

Shift Register ANDing

The PS-6244 includes a shift register that can turn output channels on or off up to 255 revolutions after a signal is applied to Input Terminal 16, Figure 7. The terminal is usually connected to a product sensor.

Analog Outputs

PS-6244 controllers can drive up to two analog output modules whose output signal will be linearly proportional to RPM. The analog signal level at zero RPM can be programmed, as well as the RPM that corresponds to maximum signal. No measuring equipment is required for initial setup, and calibration is not needed. Typical uses for the analog output are to control glue pressure as machine speeds change, or to match speeds of other equipment to the machine being controlled by the PS-6244.

Serial Communication

Using Electro Cam Corp.'s PLuSNET software for IBM-PC compatible computers, the PS-6244's programs can be saved to a disk file or loaded from a disk file to the PS-6244. The programs can be printed or edited using the computer. Individual commands may also be sent to the PS-6244 to change settings while running.

Washdown Boot

A clear silicon rubber boot can be supplied that fits over and around the keypad face. The back of this boot provides sealing between the back of the keypad and the panel. The boot is transparent and pliable, allowing the keypad to be viewed and operated through it. In addition to preventing contamination from harsh chemicals, the boot also protects the keypad from grease, oil, dirt and normal wear that could otherwise shorten its life.

General Mounting & Wiring

Controller

The controller body mounts on a DIN rail as shown in Figure 4.

Keypad/Display

Mount the keypad/display to a panel using the four studs on the back of the keyboard. Enclosures are available from Electro Cam if an appropriate mounting location does not exist.

DIP Switches

For convenience, set the DIP switches on the side of the controller and keypad to their proper positions before mounting the units in a panel. See page 2-13 for DIP switch information.

Environment

1. Allow space at both sides and the top of controller for terminal blocks to be unplugged.
2. Ambient temperature range is +32° to +130° F (0° to +55°C)
3. Locate the controller and keypad away from devices that generate electrical noise, such as contactors and drives.
4. Use the keypad/display gasket provided to prevent contaminants from getting into the cabinet.

Terminal Blocks

All terminal blocks can be unplugged from the controller. Each block is keyed so it cannot be plugged into the wrong socket. All terminals are labelled on each block.

Wiring Guidelines

Follow normal wiring practices associated with the installation of electronic controls. Some guidelines are:

⚠ CAUTION

1. Route input and output wiring away from high voltage, motor drive, and other high level control signals.
2. Use shielded cables for encoder, input, transistor output, and communication circuits. Also shield module output circuits that are driving low current electronic input circuits.
3. Ground shielded cables at the PS-6244 end **only** (except for encoder cable). Use any of the screws on the controller back for grounding.
4. Use appropriate suppression devices where module outputs are directly driving inductive loads.

Power Supply Wiring

Connect a 20 to 30 VDC power supply to TB8 (Fig. 5 or 6). Reversing the polarity will blow the 1-1/4 amp power fuse. The controller will not be damaged, but you must correct the polarity and replace the fuse before the controller will operate.

To insure electrical noise immunity, connect a good electrical ground to the ground terminal on the power supply terminal block.

Module Mounting

A phillips head screw holds each module in place. Individual modules can be removed and installed without affecting the other modules on the unit

⚠ WARNING

However, disconnect power to the controller before changing modules.

Figure 4—Mounting Dimensions

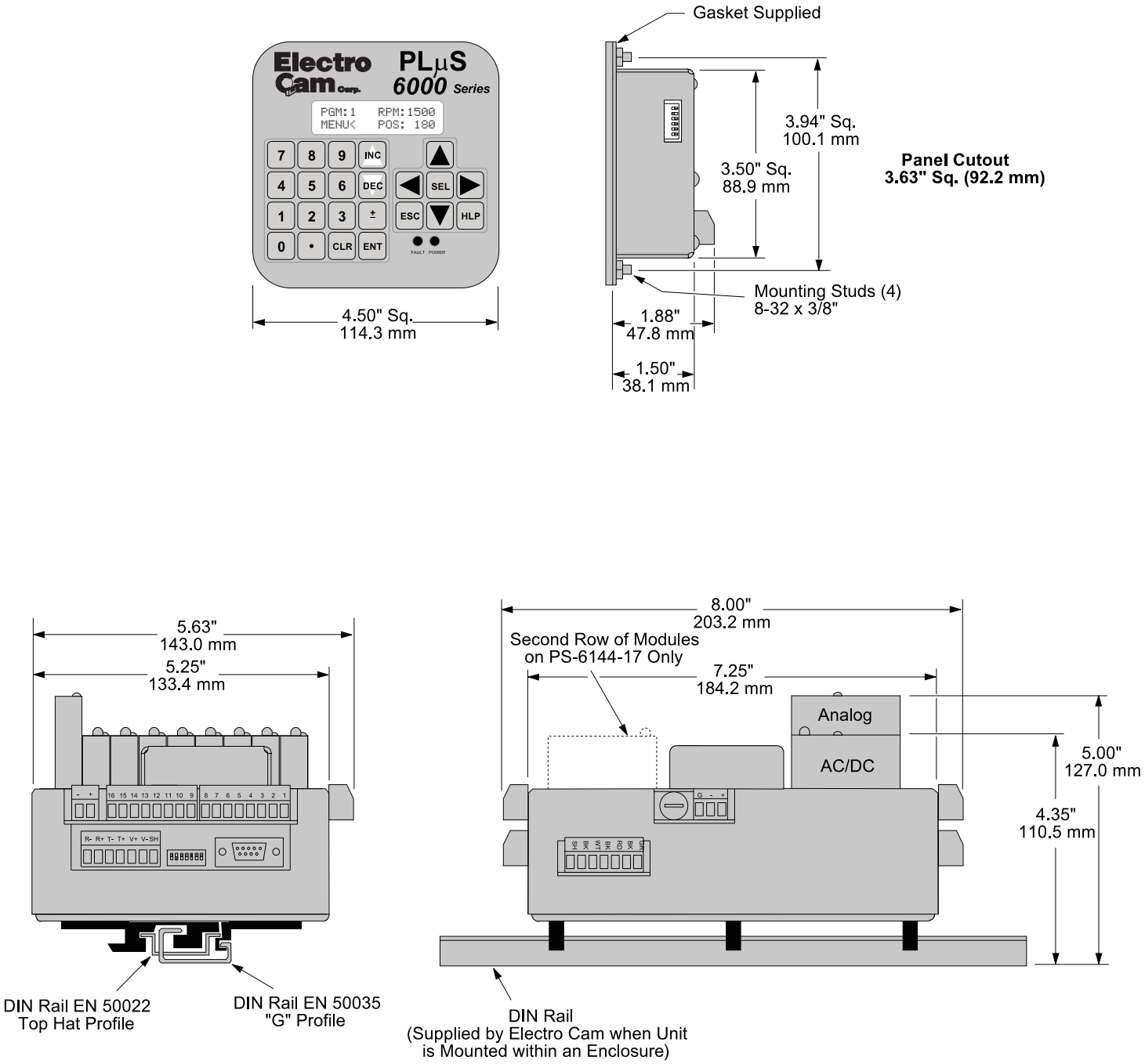
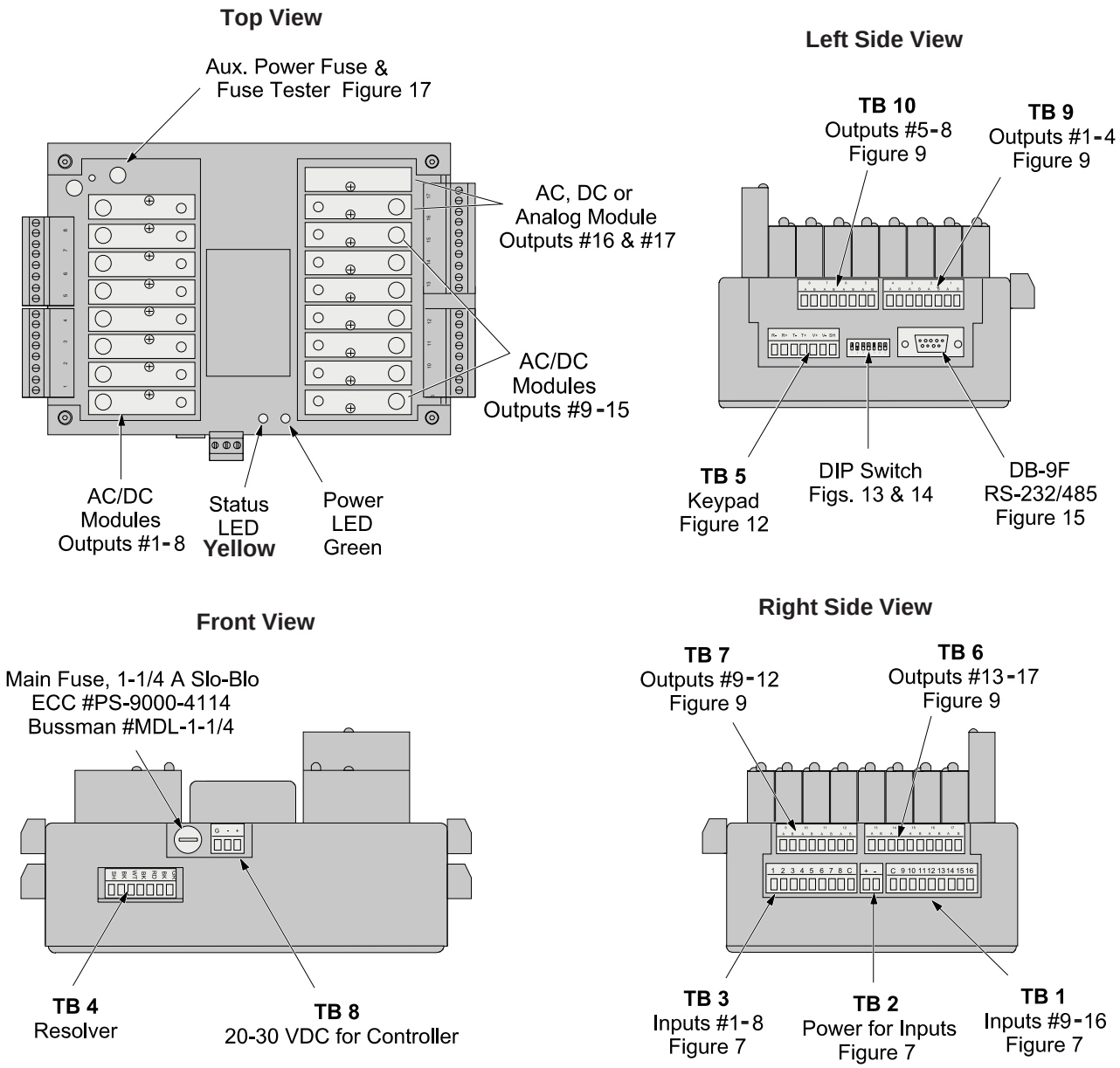


Figure 5—PS-6244-24-M17 Terminals & Components

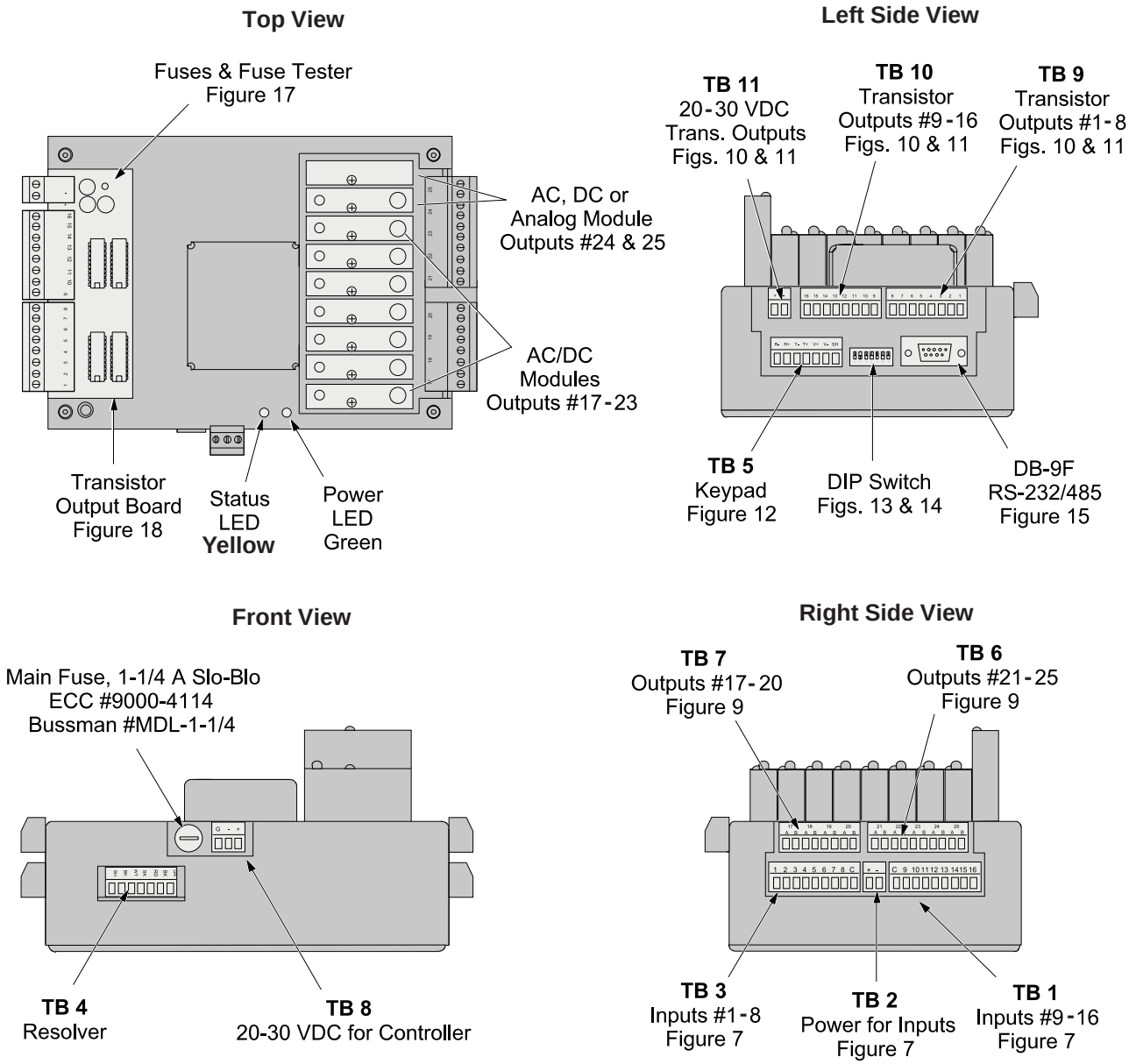


Terminal Block Details

Terminal Block	Function	ECC Part #[1]
TB 1	Inputs #9–16	PS-9006-0024
TB 2	Auxiliary power output	PS-9006-0018
TB 3	Inputs #1–8	PS-9006-0023
TB 4	Encoder connector	PS-9006-0032
TB 5	Keypad connector	PS-9006-0029
TB 6	Module outputs #13-17	PS-9006-0031
TB 7	Module outputs #9-12	PS-9006-0030
TB 8	Power for controller	PS-9006-0026
TB 9	Module outputs #1-4	PS-9006-0033
TB 10	Module outputs #5-8	PS-9006-0034

[1] Keyed to prevent accidental insertion into wrong sockets.

Figure 6—PS-6244-24-X16M09 Terminals & Components



Terminal Block Details

Terminal Block	Function	ECC Part #[1]
TB 1	Inputs #9–16	PS-9006-0024
TB 2	Auxiliary power output	PS-9006-0018
TB 3	Inputs #1–8	PS-9006-0023
TB 4	Encoder connector	PS-9006-0032
TB 5	Keypad connector	PS-9006-0029
TB 6	Module outputs #21–25	PS-9006-0028
TB 7	Module outputs #17–20	PS-9006-0027
TB 8	Power for controller	PS-9006-0026
TB 9	Transistor outputs #1–8, sinking	PS-9006-0019
	Transistor outputs #1–8, sourcing	PS-9006-0021
TB 10	Transistor outputs #9–16, sinking	PS-9006-0020
	Transistor outputs #9–16, sourcing	PS-9006-0022
TB 11	Power for transistor outputs	PS-9006-0017

[1] Keyed to prevent accidental insertion into wrong sockets.

Controller Input Wiring

Input Terminals

Hardware inputs can be used to select a program of setpoints, disable keypads, accept sensor signals, or clear the shift register. The 16 inputs on the PS-6244 are arranged on two terminal strips, TB 1 and TB 3, as shown in Figure 7. Each input is optically isolated and can be powered from an external DC power source or the Auxiliary Power terminals located on TB 2.

Sinking or Sourcing

Each terminal strip TB 1 and TB 3 can be wired to accept sinking or sourcing input signals, but all eight inputs on that strip will require the same type of signal. Many types of hardware can drive these inputs, including mechanical switches, relay contacts, DC 3-wire sensors, solid state DC output modules, and PLC DC outputs. 2-wire DC sensors can also be used, but may require a load resistor in parallel with the input. Typical wiring diagrams are shown in Figure 7.

Input Functions

Following are the input terminals and their corresponding functions:

Channel Enable (1-8)
These terminals accept signals from sensors or from PLC's. Each output channel on the 6244 can be ANDed with any one of these inputs so that the output is enabled only when a signal is present on the input terminal.

Program Select (9-13)
The on/off status of these terminals selects which program of setpoints is controlling the outputs. Binary, BCD, or Gray Code formats can drive these terminals as shown in Figure 8. Although standard controllers can store up to 48 programs, not all of these programs can be selected through the Program Select terminals.

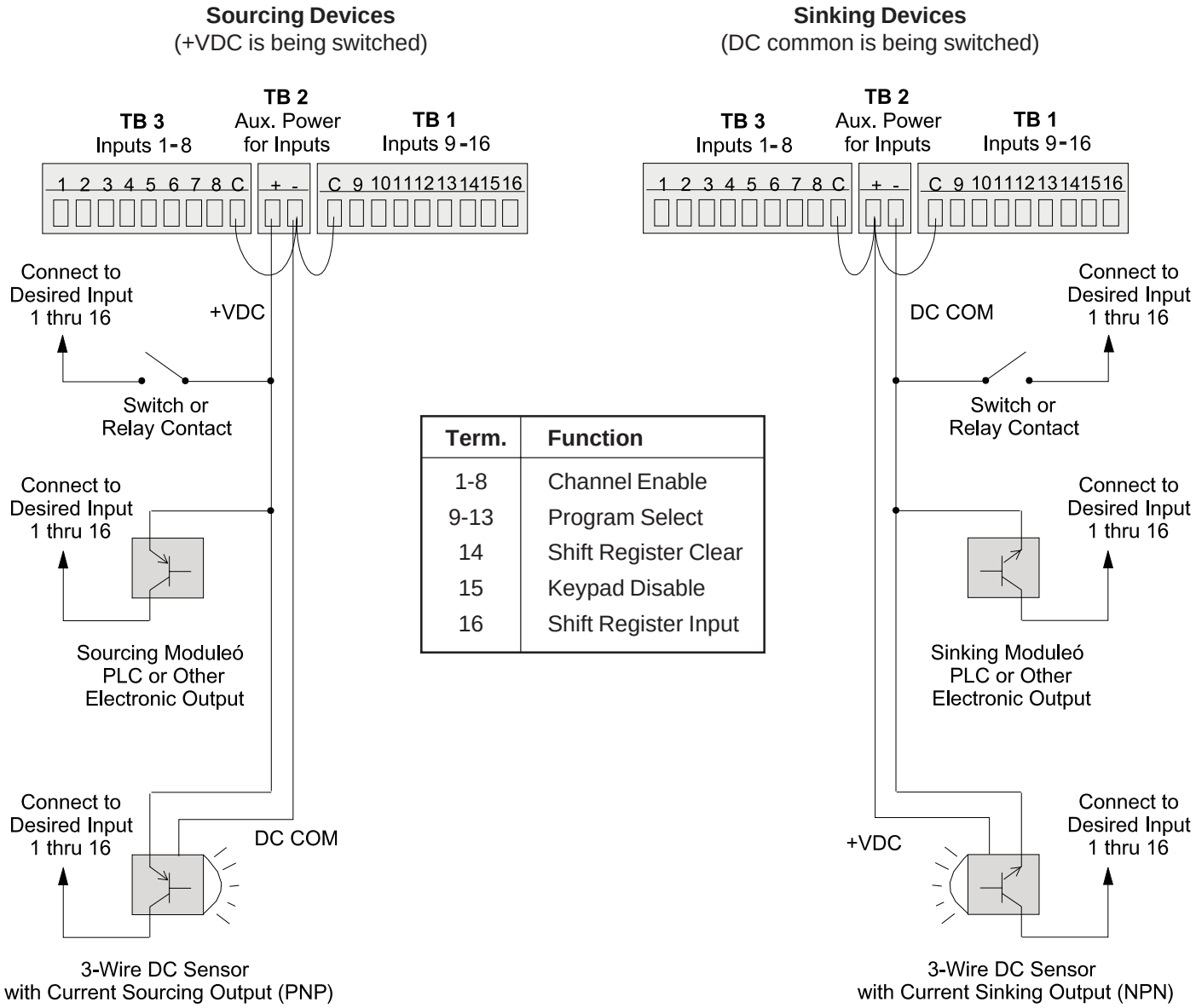
When all program select inputs are off, the "Default" program will become active as programmed through DEFAULT PROGRAM function.

Shift Register Clear (14)
A signal on this terminal will completely clear the shift register for all output channels.

Keypad Disable (15)
When energized, this terminal disables any keypads connected to the controller. If the controller will be used without any keypads, jumper this terminal so that it is always energized.

Shift Register Input (16)
The leading edge of a signal on this terminal sets a bit in the shift register. See SHIFT REGISTER ANDING for details.

Figure 7—Controller Input Wiring (See Figures 5 & 6 for Terminal Block Locations)



Term.	Function
1-8	Channel Enable
9-13	Program Select
14	Shift Register Clear
15	Keypad Disable
16	Shift Register Input

Input Wiring Guidelines

- Voltage from TB 2 will be the same as the voltage supplied to the controller.
- Each input powered from TB 2 will draw 11 mA at 24 VDC. TB 2 is fused at 1/4 amp.
- Inputs will operate with voltages from 10 to 30 VDC.
- An external power supply can be used instead of TB 2 to power inputs.
- A combination of mechanical and solid state devices can be used.
- TB 1 can be wired for sourcing while TB 3 is wired for sinking, and vice versa.

Figure 8—Program Select Terminals for Various Formats

BCD Program Select Table

The BCD format allows standard 1- or 2-digit BCD switches to operate the program select inputs. PLC's can also output values in BCD. The program number selected can be calculated by adding up the values associated with each of the input terminals that are on. For example, if Input Terminals 9, 11 and 13 are on, Program 15 would be active (10 + 4 + 1).

Please Note:

- Although the PS-6244 can store up to 48 programs, only Programs 1 through 19 can be selected using BCD input. A value larger than 19 will select Program 19.
- Only one of the normal four BCD digits for 10's is used.
- **9 is the largest valid value for the units digit.** A units digit combination larger than 9 will set the units digit to 9.

	10's	UNITS			
Input Term:	**13**	**12**	**11**	**10**	**9**
Value:	10	8	4	2	1
PGM					
Default	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1

	10's	UNITS			
Input Term:	**13**	**12**	**11**	**10**	**9**
Value:	10	8	4	2	1
PGM					
10	1	0	0	0	0
11	1	0	0	0	1
12	1	0	0	1	0
13	1	0	0	1	1
14	1	0	1	0	0
15	1	0	1	0	1
16	1	0	1	1	0
17	1	0	1	1	1
18	1	1	0	0	0
19	1	1	0	0	1

Binary Program Select Table

The binary format is convenient for PLC program select output signals. The program number selected can be calculated by adding up the values associated with each of the input terminals that are on. For example, if input terminals 9, 11 and 13 are on, program number 21 would be active (16 + 4 + 1).

Please Note:

- Although the PS-6244 can store up to 48 programs, only Programs 1 through 31 can be selected using binary input. A value larger than 31 will select Program 31.

Input Term:	**13**	**12**	**11**	**10**	**9**
Value:	16	8	4	2	1
PGM					
Default	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1

Input Term:	**13**	**12**	**11**	**10**	**9**
Value:	16	8	4	2	1
PGM					
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1

Gray Code Select Table

Electro Cam 8-position Gray Code selector switches are available as accessories for PLuS controls.

Please Note:

- Although the PS-6244 can store up to 48 programs, only Programs 1 through 31 can be selected using gray code input. A value larger than 31 will select Program 31.

Input	MSB				LSB
Term:	**13**	**12**	**11**	**10**	**9**
PGM					
Default	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	1
3	0	0	0	1	0
4	0	0	1	1	0
5	0	0	1	1	1
6	0	0	1	0	1
7	0	0	1	0	0
8	0	1	1	0	0
9	0	1	1	0	1
10	0	1	1	1	1
11	0	1	1	1	0
12	0	1	0	1	0
13	0	1	0	1	1
14	0	1	0	0	1
15	0	1	0	0	0

Input	MSB				LSB
Term:	**13**	**12**	**11**	**10**	**9**
PGM					
16	1	1	0	0	0
17	1	1	0	0	1
18	1	1	0	1	1
19	1	1	0	1	0
20	1	1	1	1	0
21	1	1	1	1	1
22	1	1	1	0	1
23	1	1	1	0	0
24	1	0	1	0	0
25	1	0	1	0	1
26	1	0	1	1	1
27	1	0	1	1	0
28	1	0	0	1	0
29	1	0	0	1	1
30	1	0	0	0	1
31	1	0	0	0	0

Output Wiring

Output Types

The outputs available depend on the PS-6244 Model:

Output Type	Model 6244-24-M17	Model 6244-24-X16M09
Transistor	None	Outputs 1-16
AC/DC/RR Modules Only	Outputs 1-15	Outputs 17-23
AC/DC/RR or Analog Modules	Output 16	Output 24
Analog Modules Only	Output 17	Output 25

The load device to be driven must match the output type.

Power Output Modules

Output modules can directly switch inductive loads and resistive loads that require more current or voltage than the transistor outputs can supply. **The modules do not supply the power for the load; they simply switch it.** Each output module has two dedicated terminals and therefore does not share any common signal with the other modules. This allows AC and DC modules to be mixed on the same control. DC modules can be wired to sink or source as shown in Figure 9.

Analog Output Modules

Analog output modules generate signals that are proportional to the encoder RPM. They can be used only in the output positions shown above. Either a 0-10 Vdc or 4-20 mA analog module can be used in either module position. ANALOG QTY must be programmed for the number of analog modules installed. An external power supply is not needed because the analog modules get the power they source from the controller. The analog output signal is completely isolated.

Transistor Outputs

PS-6244-25 models include 16 transistor outputs to drive the electronic input circuits of other control devices. The outputs are limited to 30 Vdc, 50 mA each and should not be used to control inductive devices such as solenoids, solenoid valves or relays.

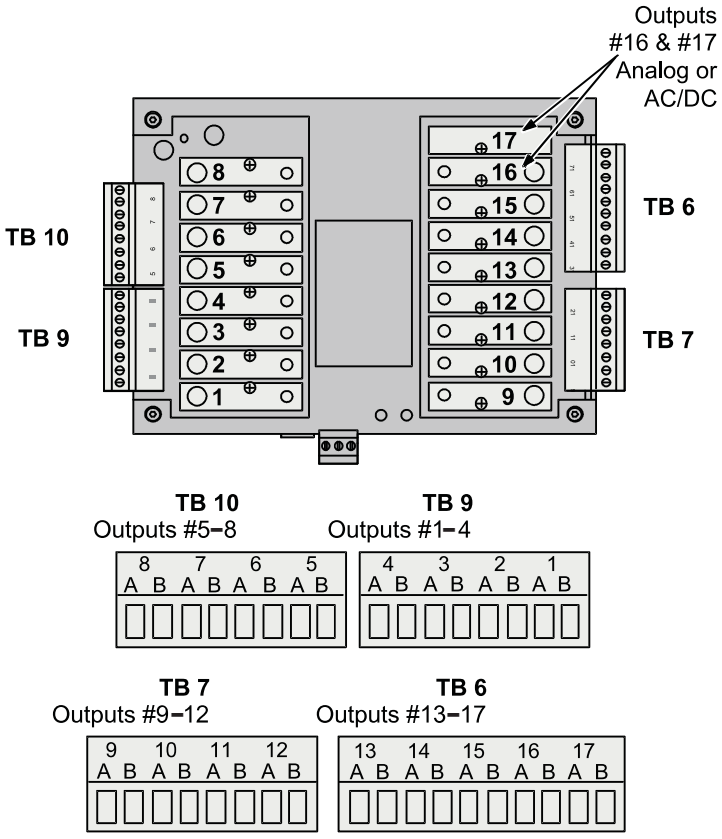
The control can be ordered with either sinking or sourcing transistor outputs. Both types require a 10-30 VDC power supply connected to TB 11 to drive the transistor output circuitry. The transistor output fuse will blow if the power supply polarity is incorrect, but the circuitry will not be damaged. See Figs. 17 & 18 for fuse and transistor chip replacement.

Sinking transistor outputs (N16 controls, Figure 10) conduct to the negative terminal of TB 11. Therefore the common for TB 11 and the load must be electrically the same. This may require connecting commons together if the power supplied to TB 11 is not also the load power supply. Electronic counters/ratemeters often fall into this category. The power supply that powers the load does not have to be the same voltage as the transistor power supplied to TB 11.

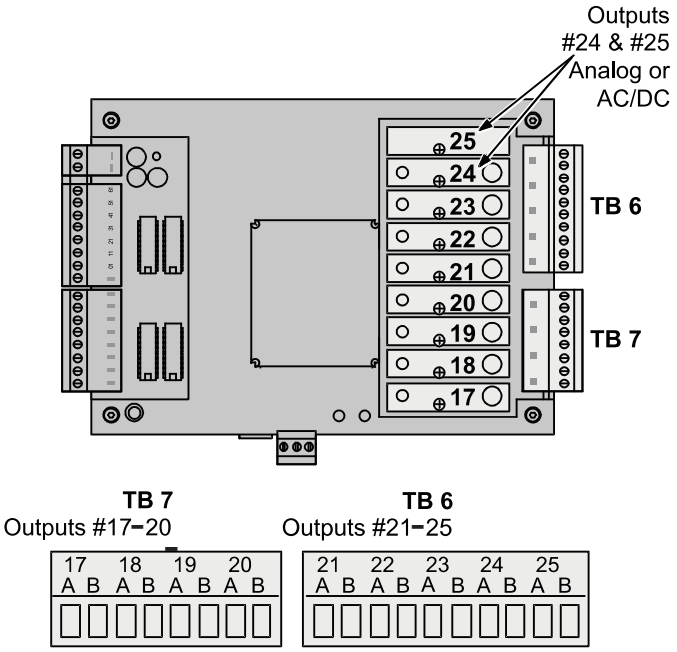
Sourcing transistor outputs (P16 controls, Figure 11) conduct to the positive power terminal of TB 11. The load is therefore powered from the same supply that is providing the transistor power.

Figure 9—Wiring for Output Modules

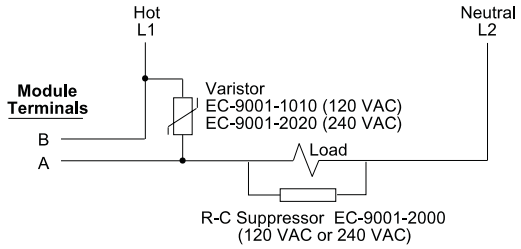
PS-6244-24-M17



PS-6244-24-X16M09

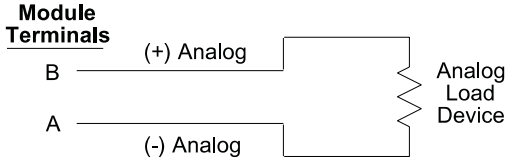


AC Output



- When other switching devices are in series or parallel with the AC output module, connect a varistor (MOV) across the terminals to prevent module damage from inductive voltage spikes.
- Output modules act like switches; they do not supply power to loads.

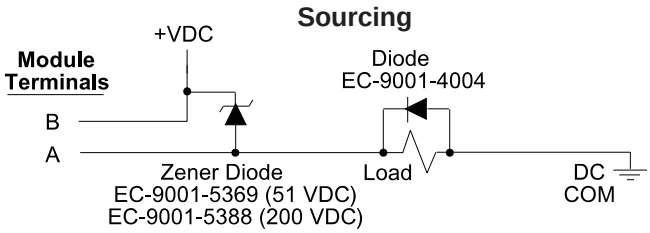
Analog Output



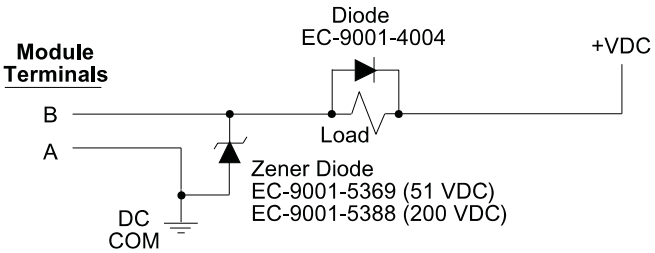
- Analog output modules source the analog signal.
- No external supply is required.
- Analog output signals are isolated.

DC Output

Sourcing



Sinking

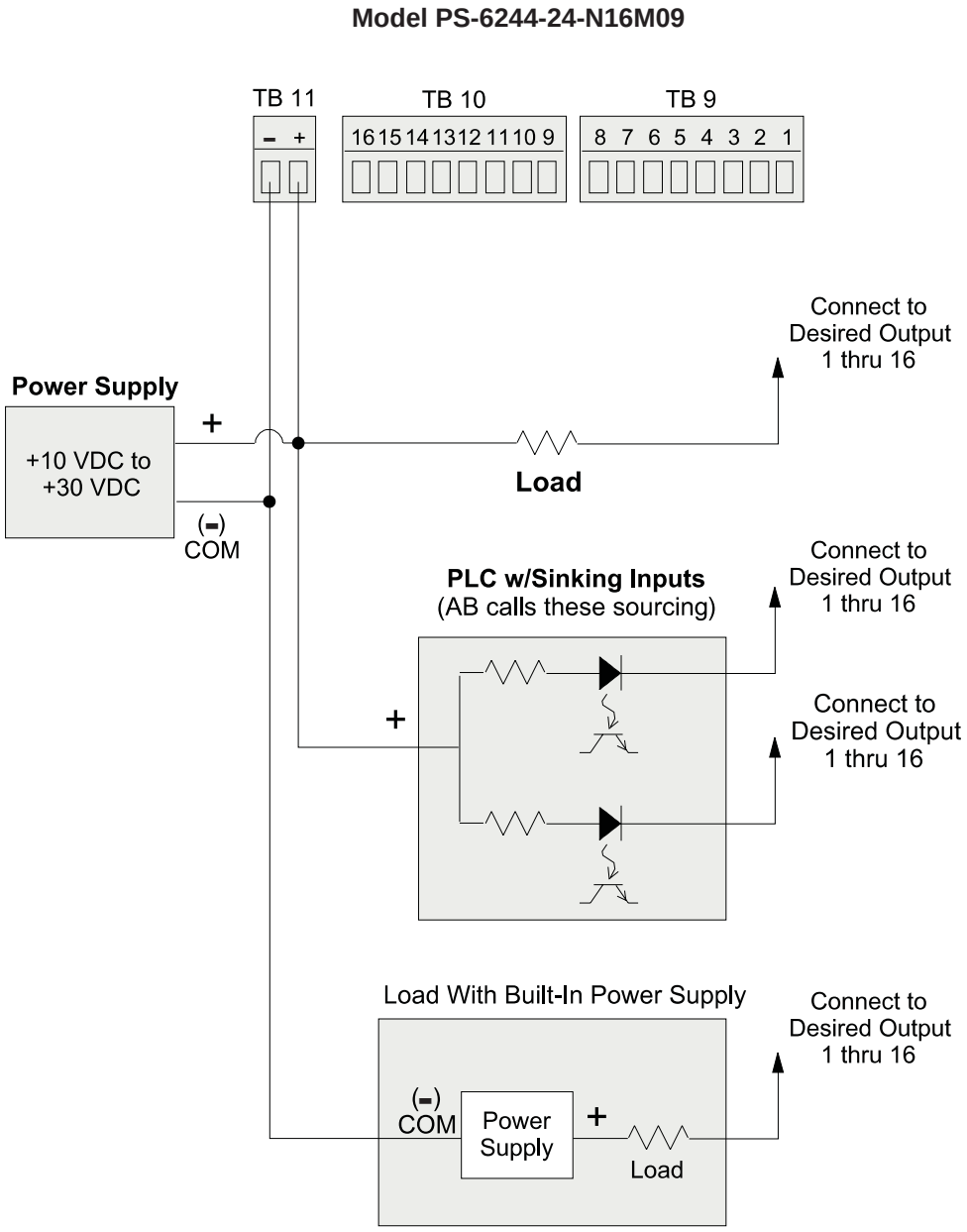


- Suppress spikes in inductive DC loads with one of the following methods:

  Connect a zener diode across the terminals. Turn off time will not be significantly affected. Voltage rating of diode must be greater than the normal circuit voltage. 50 VDC Zener, #EC-9001-5369; 200 VDC Zener, #EC-9001-5388.

  Connect a reverse-biased diode across the load. This will increase the turn off time of the load. #EC-9001-4004.

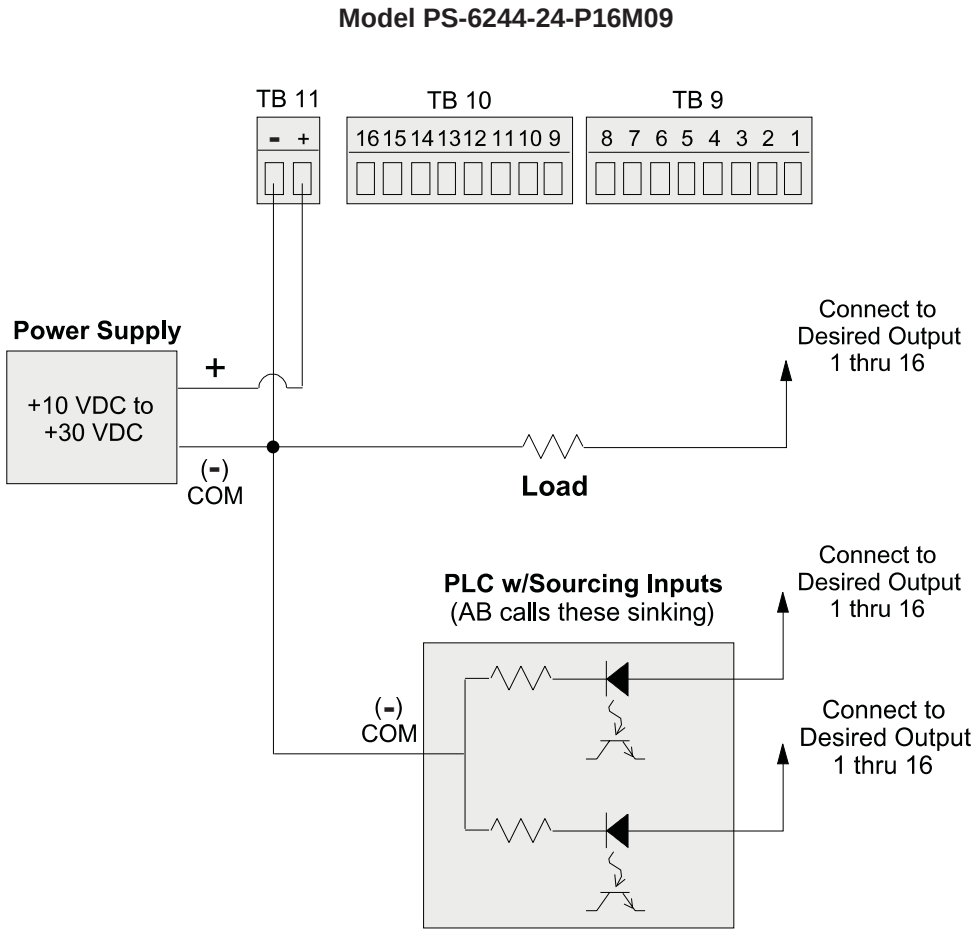
Figure 10—Wiring for Sinking Transistor Outputs (See Figure 6 for Terminal Block Locations)



Please Note:

- Outputs are rated at 30 VDC, 50 mA.
- Transistor outputs should not be used to switch inductive devices such as solenoids or relays.
- Sinking outputs conduct to the negative terminal of TB 11 when "on."
- The power supply shown in "Load with Built-In Power Supply" does not have to be the same voltage as the power supply connected to TB 11.

Figure 11—Wiring for Sourcing Transistor Outputs (See Figure 6 for Terminal Block Locations)



Please Note:

- Outputs are rated at 30 VDC, 50 mA.
- Transistor outputs should not be used to switch inductive devices such as solenoids or relays.
- Sourcing outputs conduct to the positive terminal of TB 11 when "on."

Keypad Wiring

Number of Keypads

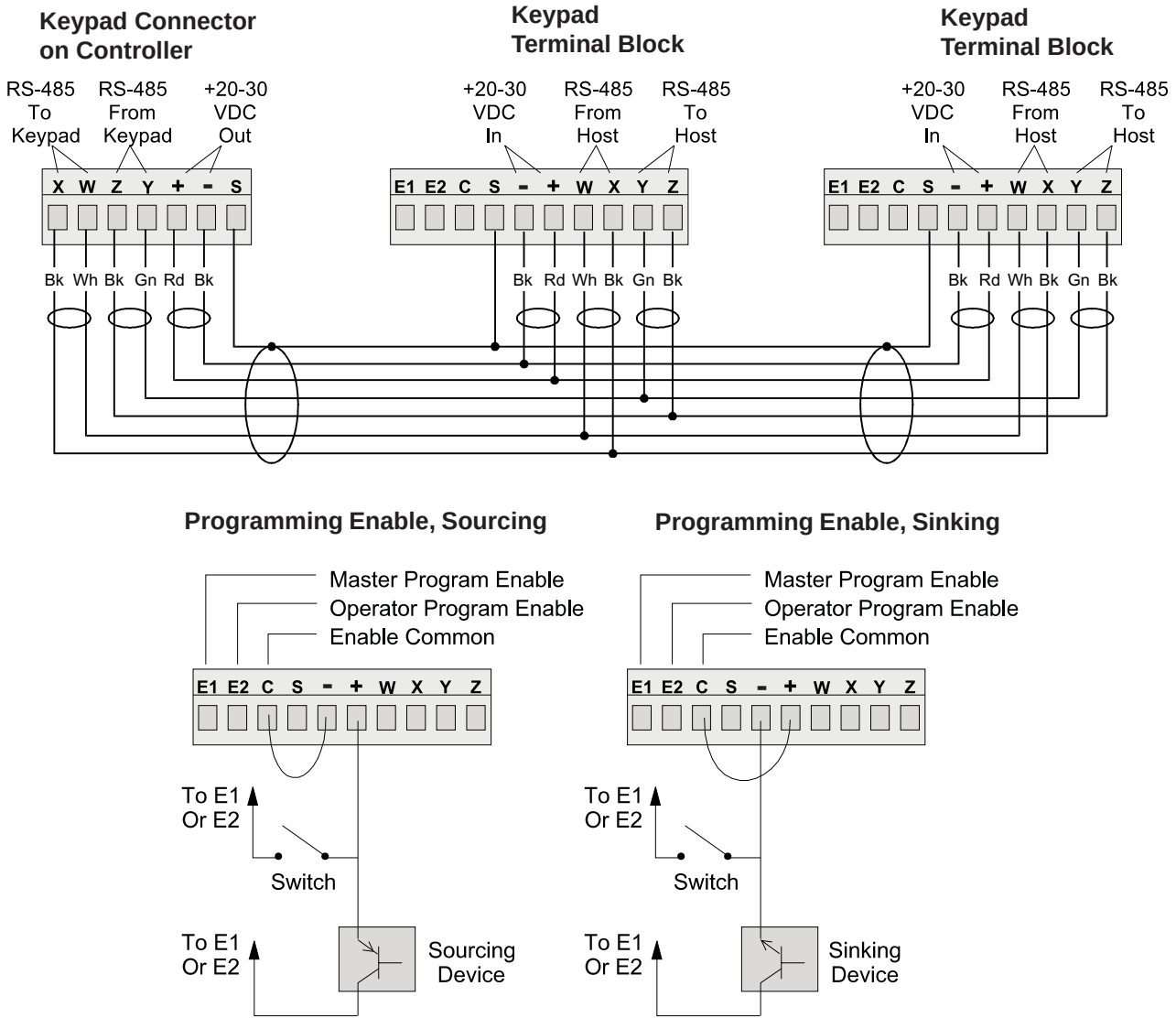
One or two keypads may be connected to a PS-6244 controller as shown in Figure 12. See Figure 14 for possible system configurations.

Programming Enable

The wiring connector on the back of each keypad includes terminals to select Operator or Master level programming for that keypad. These terminals can be temporarily jumpered during set-up to allow entry of programming access codes, or they can be switched with a variety of devices including mechanical switches, relay contacts, and PLC DC outputs. See ENABLE CODES in the programming section for details on programming access.

If a solid state device will be activating the Programming Enable terminals, that device will determine whether sourcing or sinking wiring should be used. For mechanical devices such as jumpers or key switches, either sourcing or sinking wiring may be used.

Figure 12—Keypad Wiring



DIP Switch Configurations

DIP Switches

Each keypad and controller has a DIP switch as shown in Figure 13. For convenience, set the DIP switches correctly before mounting the units in a panel.

Keypad Settings

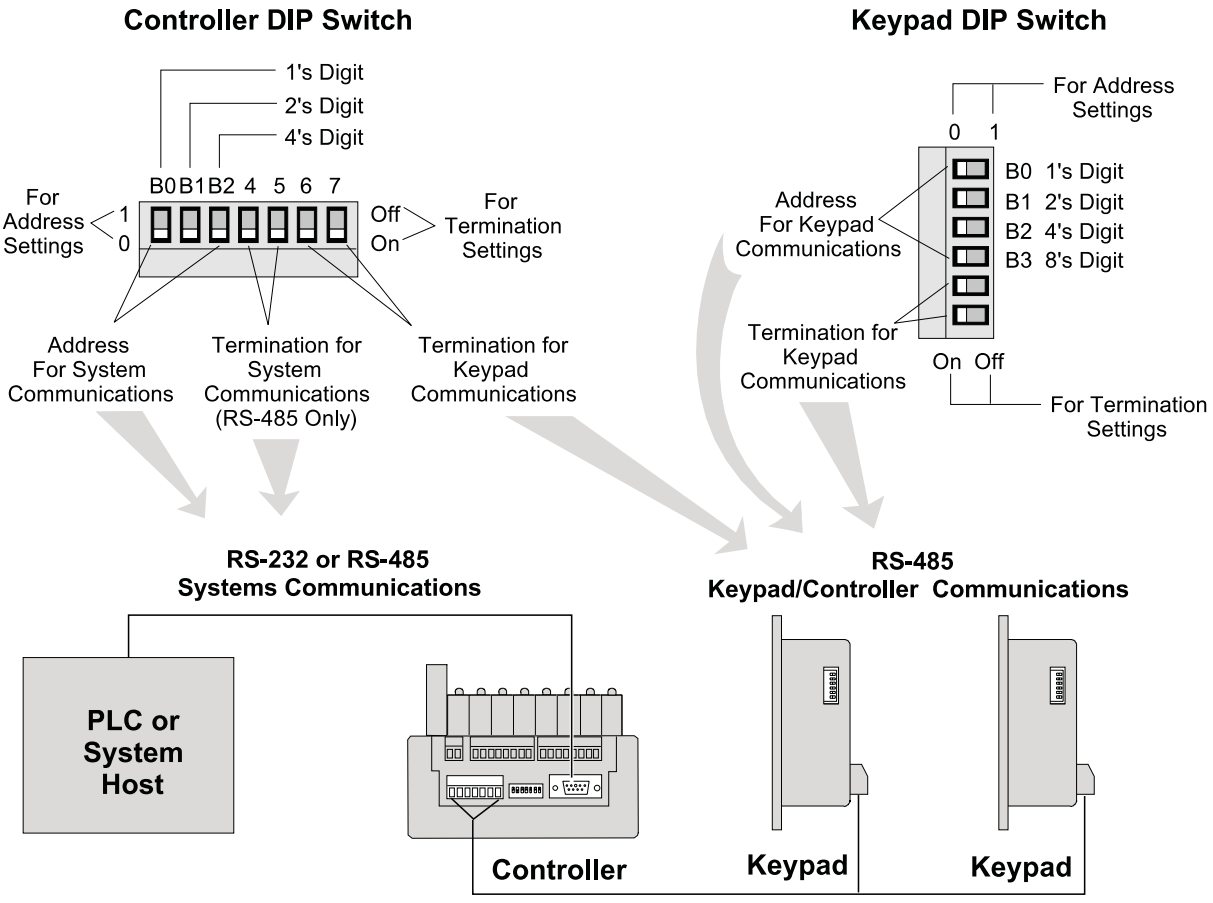
The address and termination settings on the **keypad** DIP switch apply to the RS-485 network that connects it to the controller. See Figure 14 for guidelines and sample settings.

Controller Settings

The address settings on the **controller** DIP switch apply to a network connecting the controller to a PLC or other system host. When the DIP switch is set to zero, the default address programmed through the COMMUNICATIONS function takes affect. Whereas the DIP switches can set a maximum address of "7", the COMMUNICATIONS function can establish much higher address numbers. **These settings are not related to communications with the keypads.**

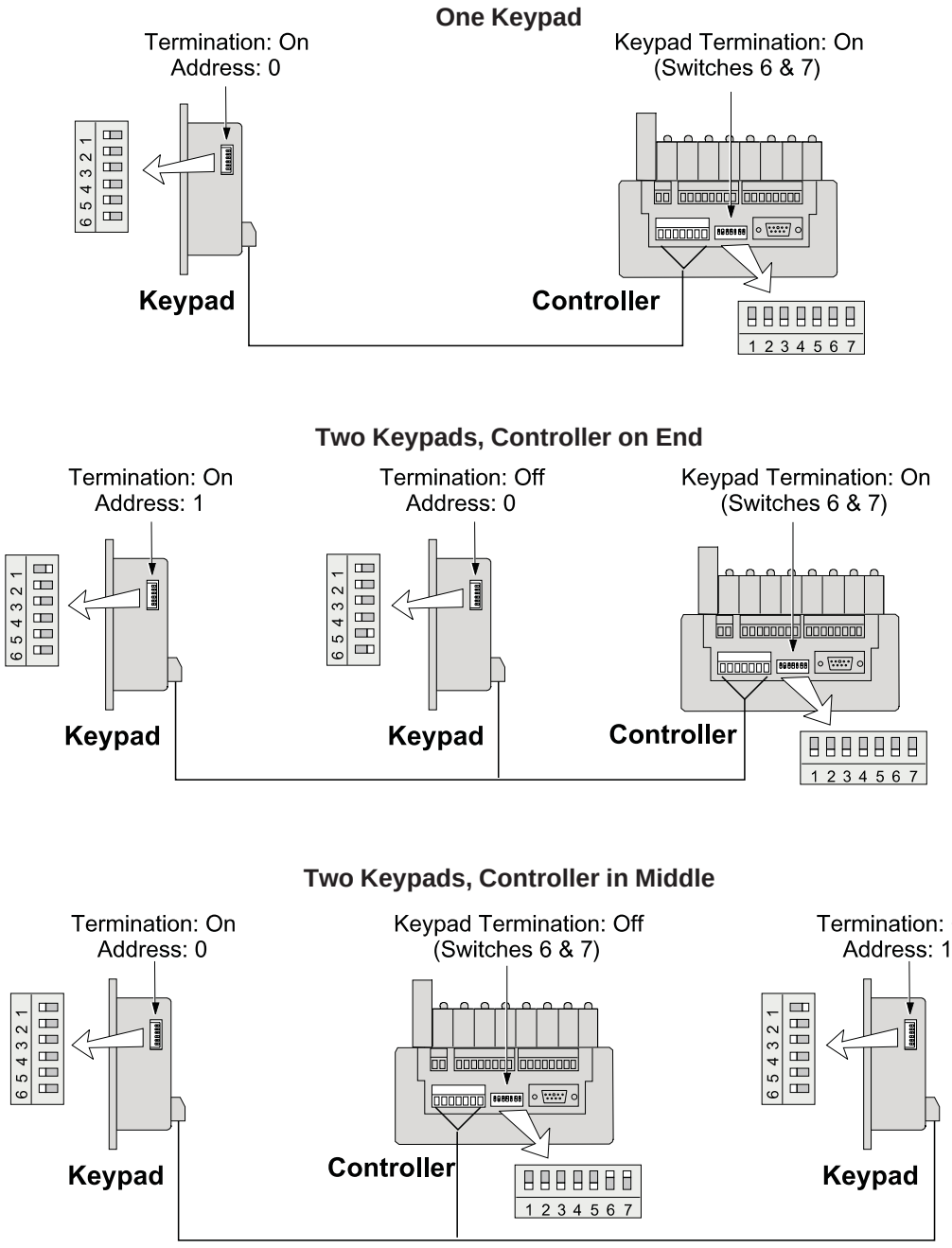
Two sets of termination switches are included on the controller. One set establishes the termination value for an RS-485 network connecting the controller to a PLC or other system host. It does not apply to an RS-232 network. The other termination switches apply to the keypad network. See Figure 14 for guidelines and sample settings.

Figure 13—DIP Switches and Related Communications Networks



NOTE: Both termination switches in a pair must be in the same position.

Figure 14—DIP Switch Settings for Typical Systems



DIP Switch Guidelines

Termination:
- Termination must be "on" for devices on each end of the chain.
- Termination must be "off" for devices in the middle of the chain.
- Both termination switches in a pair must be in the same position.

Address:
- Keypad addresses must be assigned starting with "0" and increasing sequentially.
- The physical location of a keypad in the chain has no relationship to its address.
- During initial programming, the KEYBOARD QTY function must be used to enter the number of keypads in the chain. KEYBOARD QTY can be accessed only through the keypad whose address is "0."

Communications Wiring

DB-9F Port — Serial communication to a PLC or other system host is provided through a DB-9 female connector as shown in Figures 5 & 6. This connector can be wired for RS-232 or RS-485 communications.

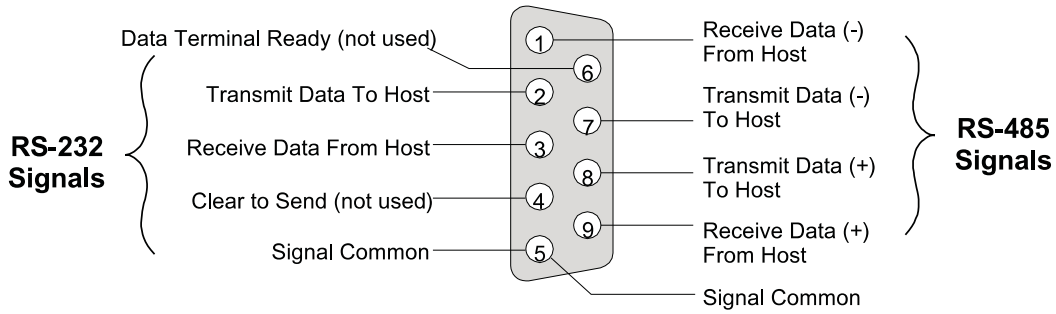
RS-485 — RS-485 can be used for “multi-drop” networks where more than one controller could be connected to the system host.

RS-232 — RS-232 can connect only a single PS-6244 to a system host.

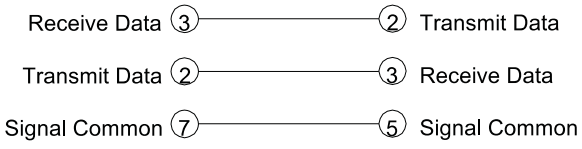
RS-232/485 Selection — Use the COMMUNICATIONS function to select RS-232 or RS-485 communications.

Figure 15—Communications Wiring

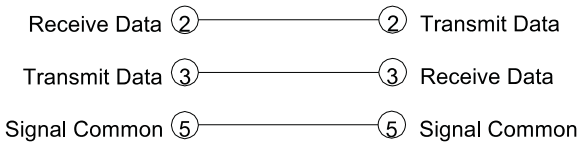
DB-9 Female Connector on Controller
(See Figures 5 & 6 for Location)



RS-232 Cable Wiring
DB-25 (Host) **to DB-9F** (PS-6244)



RS-232 Cable Wiring
DB-9 (Host) **to DB-9F** (PS-6244)



Encoder Wiring

General Information

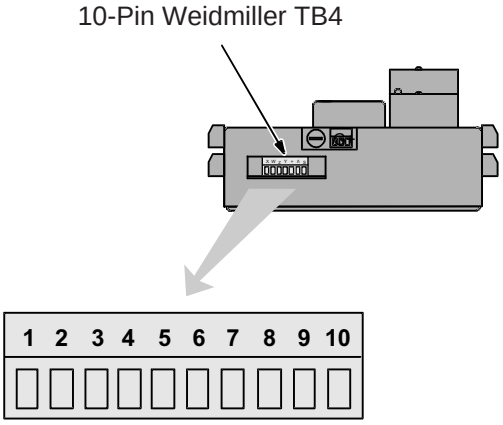
Choose a mounting location for the encoder that allows convenient mechanical connection of the encoder shaft to the machine. The encoder is normally driven at a 1:1 ratio to machine cycles, but this is not true in all applications. Commonly used methods for driving the encoder shaft include flexible couplings, timing belts and pulleys, chains, and sprockets. Insure that the coupling method used is tight enough to minimize backlash without placing excessive side load on the encoder shaft.

If possible, select a location that shelters the encoder from accidental mechanical abuse, lubricants, wash down chemicals or any other liquids.

Encoder Wiring

Use shielded cable for wiring the encoder to the PS-6244 controller.

Figure 16—Encoder Connector Wiring



Pin	Connection
1	+ENC
2	VREF
3	A
4	–A
5	B
6	–B
7	Z
8	–Z
9	COM
10	Shield

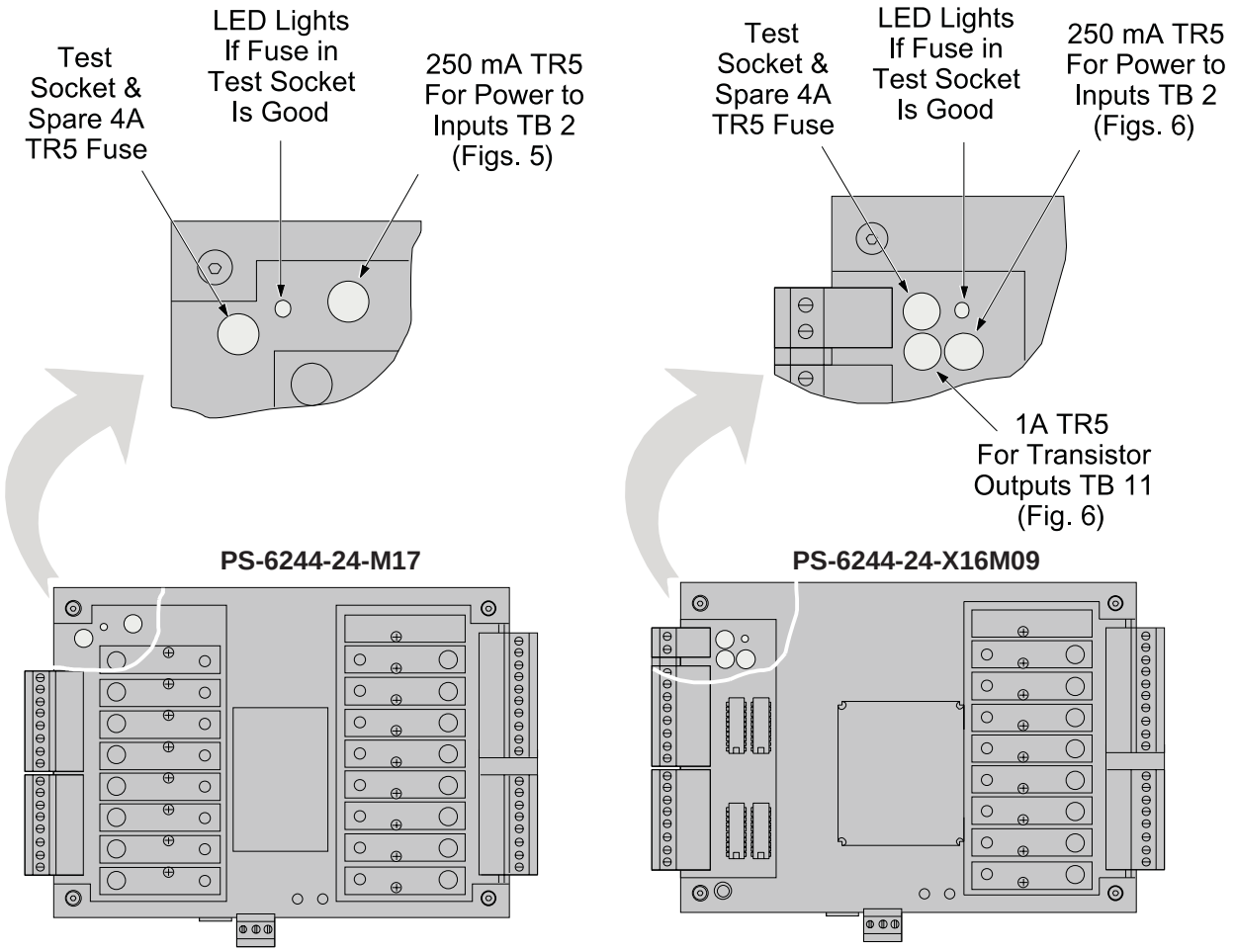
TB4 is EC part# PS-9006-0032.

It is keyed to prevent accidental insertion into the wrong sockets.

Fuse Tester

Figure 17 shows the location of a fuse test socket and LED which can be used to test TR5 style fuses. PS-6244 controllers are shipped with a spare 4A fuse mounted in the test socket.

Figure 17—TR5 Fuse Tester and Fuse Locations



Replacement TR5 Fuse Part Numbers

Rating	Function	ECC Part #	Wickmann Part #
250 mA	Power for Inputs (TB 2)	PS-9005-0250	1937-035
1 A	Power for Transistor Outputs (TB 11)	PS-9005-0001	19370
4 A	Fuse for Output Modules	PS-9005-0004	19370-K

Output Transistor Replacement

Check Fuse First

If all of the transistor outputs fail to work, check the 1A fuse shown in Figures 17 & 18. Also check to be sure that a 10–30 VDC power supply is connected to TB 11, Figure 6.

Correct Problems

Chips will most likely be damaged by one of two events:

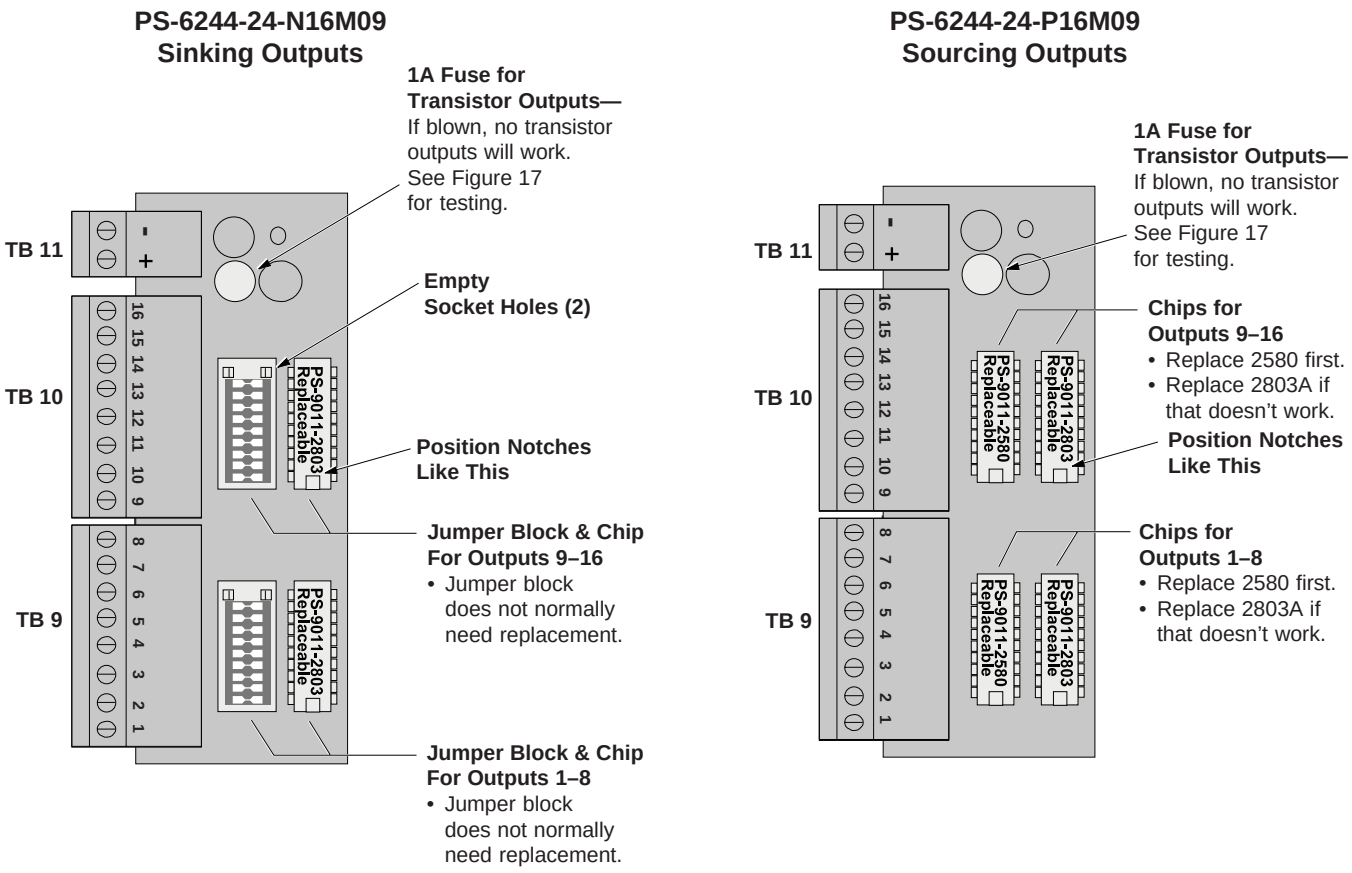
- A short circuit connected to one of the transistor outputs.
- A load exceeding 50 mA connected to one of the transistor outputs.

Before replacing a transistor output chip, fix the problem that damaged it.

Proper Placement

When replacing a chip, be sure that all of the pins are properly seated in the socket. Position the notch on the end of the chip as shown below.

Figure 18—Transistor Chip Replacement



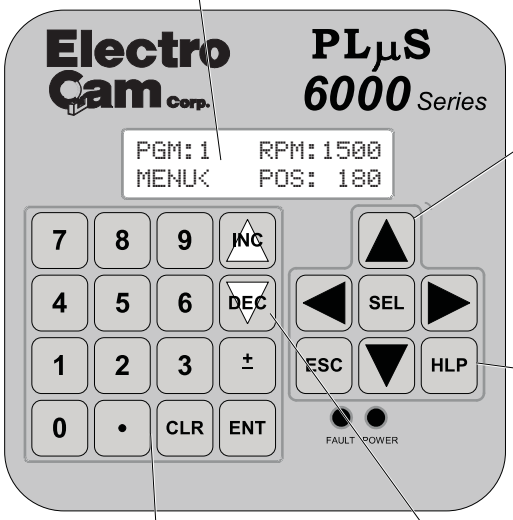
Replacement Part Numbers

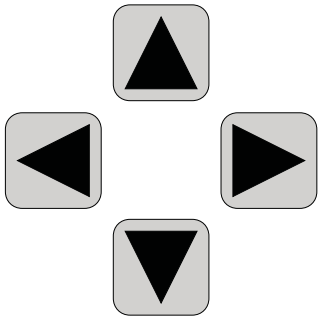
Description	ECC Part #
UDN 2580	PS-9011-2580
ULN 2803A	PS-9011-2803
DIP Jumper Block	PS-9006-0015

Figure 19—Keypad Keys and Corresponding Functions

Main Screen

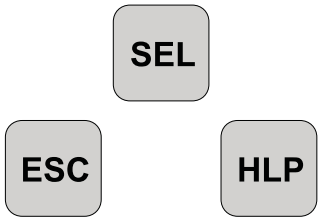
- Shows Active Program, RPM, and Position and Group # if applicable.
- Flashing cursor points to menu.
- **Press SEL key to enter Menu Tree (Fig. 20) and initiate programming.**





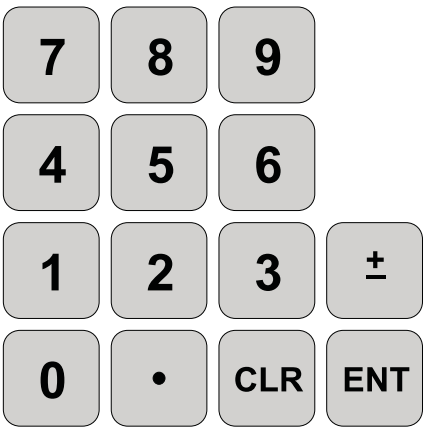
Cursor Keys

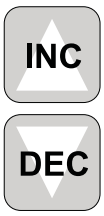
- Scroll through Menu Tree (Fig. 20).
- Move around **within a screen.**
- Scroll through setpoints.



ESC, SEL, HLP Keys

- **ESC** exits from current menu level to previous menu, or aborts numeric entry.
- **SEL** enters a new menu level or toggles a value.
- **HLP** shows help regarding menu selection and what keys to press. **Use this key if unsure what to do.**





INC, DEC Keys

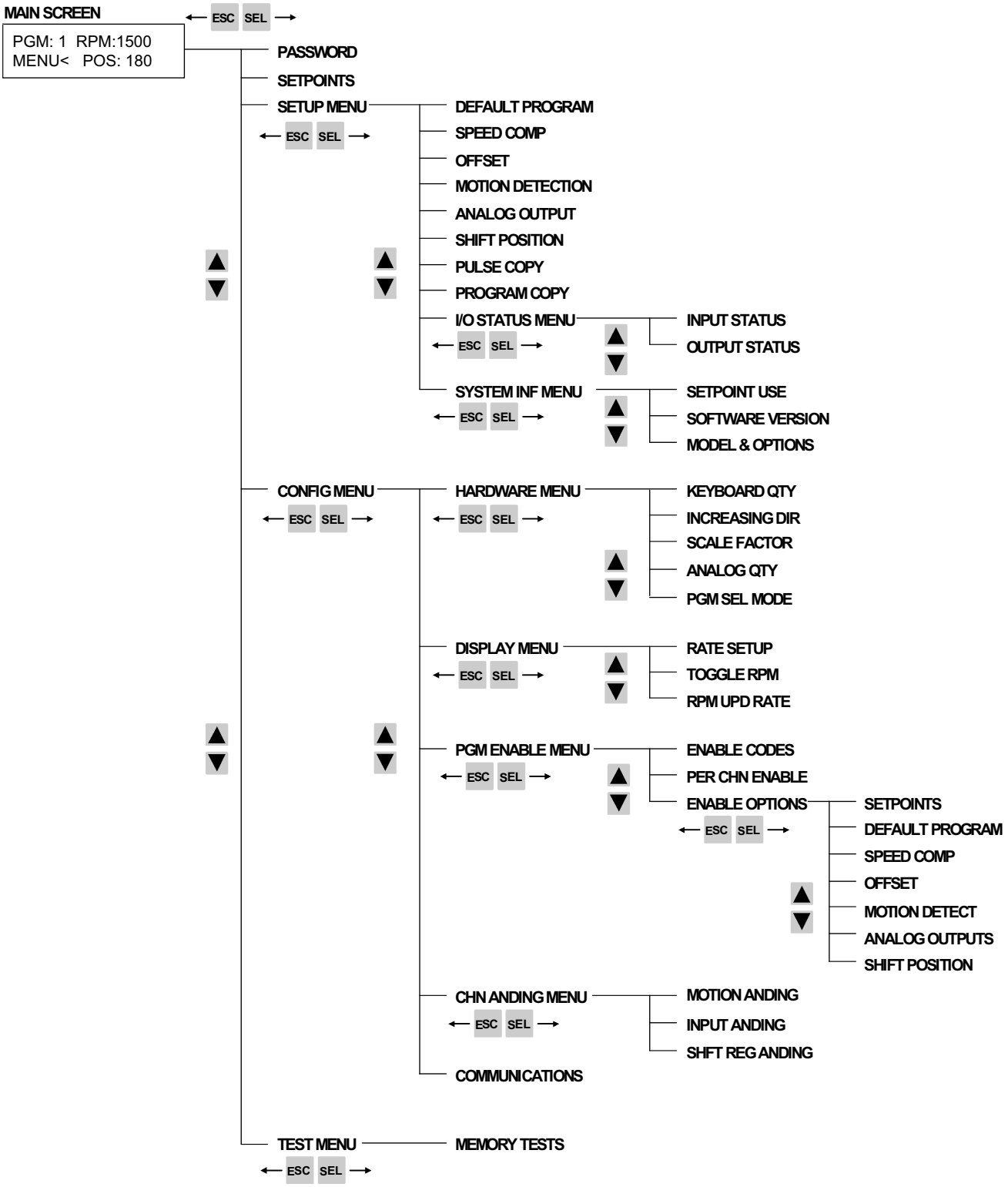
- Increment or decrement a value **within a field.**
- Hold for rapid scrolling of value.

Numeric Keys

- Input numeric values within a field.
- **ENT must be pressed to enter the value;** entry will flash until ENT is pressed.
- **CLR** will backspace within an entry prior to pressing ENT.
- ± will convert a positive number to a negative number, or vice versa.

Figure 20—PS-6244 Menu Tree

- **Press SEL to move from Main Screen into Menu Tree.**
- **Functions are listed alphabetically in Section 3 of this manual starting on page 3-4.**



Bench Test

To test the PS-6244 prior to installing it, do the following:

1. Plug output modules into the controller beginning with Position 1 on the 6244-24-M17, or Position 17 on the 6244-24-X16M09. See Figure 9.
2. Connect an encoder. See Figure 16.
3. Connect the keypad/display to the controller. See Figure 12.
5. Set the **keypad** DIP switch to address “0” and termination “on,” as shown in Figure 13. Set switches 6 and 7 on the **controller** DIP switch to “on,” also shown in Figure 13.
5. Use two jumper wires to enable Master Level programming as shown in Figure 12. Connect one jumper from “+” of the keypad terminal block to “C.” Connect the other jumper from “–” to “E1.” These jumpers will permit access to the entire menu tree shown in Figure 20.
6. Connect DC input power.

When experimenting with the controller, note that the LED on an output module will light when that output channel is turned on. By hand-turning the encoder shaft and watching the module LED’s, you can observe the effects of programming setpoint values. Remember that on a PS-6244-24-X16M09, outputs 1-16 are transistor outputs. To activate the LED on a module installed in Position 17, enter the setpoint values into Output Channel 17.

Machine Setup

After installing the PS-6244 on a machine, program the following set-up information into the controller before attempting any other programming:

Information	Menu Selection	Page
Direction of Rotation	INCREASING DIR	3-10
No. of Keypads	KEYBOARD QTY	3-12
No. of Analog Outputs	ANALOG QTY	3-5
Offset	OFFSET	3-15

Once this information is entered, setpoints can be established and modified as described on page 3-22.

Analog Output

Menu Path

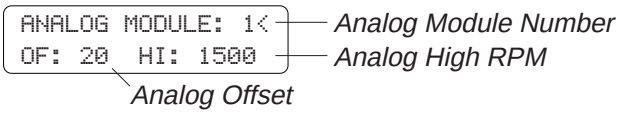
MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to ANALOG OUTPUT SEL

Purpose

Analog output signals are linearly proportional to the encoder RPM. Two types of analog output modules are available: 0-10 VDC and 4-20 mA.

This function assigns Offset and High RPM values to output positions for analog modules.

Screen



Module Number

The following table shows the relationship between the analog module number on the screen and the module position on the controller back. See Figure 9 for an illustration of analog module positions.

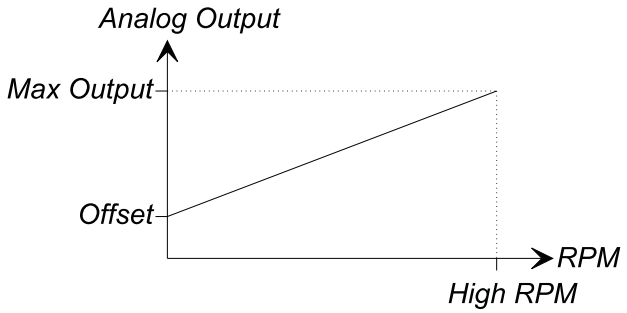
Model	Module #1 On Screen	Module #2 On Screen
PS-6244-17	Output #17[1]	Output #16[2]
PS-6244-25	Output #25[1]	Output #24[2]

[1] Dedicated to analog control.
[2] Will accept either an analog or an AC/DC module.

- Analog characteristics can be programmed for Modules #1 and #2 even if no analog modules are physically mounted on the controller. Programming can be done first, and modules mounted later.
- To program Offset and High RPM for Module #2, be sure ANALOG QTY is set to "2." If ANALOG QTY is set to "1," programming for Module #2 will not be available.
- When two analog outputs are used, the two outputs can have different values for Offset and High RPM.

High RPM

Analog High RPM is the encoder speed at which full scale analog output will occur. It is programmed in whole RPM. When this speed is reached, the analog output signal level will be at full scale (10 VDC or 20 mA). Increasing speed beyond the High RPM will **not** increase the analog output beyond full scale.



(continued)

Analog Output (cont'd)

Offset

Analog Offset is the analog signal level that will be output when the encoder is at zero RPM. This allows the minimum analog signal to be greater than zero volts or 4 mA. Because the analog output module has 4096 increments (12 bits) of signal level available, the offset is specified as the number of increments of signal that should be output at zero RPM. Calculate Analog Offset values as follows:

For 0-10 VDC: (Minimum Signal/10) x 4096

Example: For a 2 VDC minimum signal; Offset = (2/10) x 4096 = 819

For 4-20 mA: ((Minimum Signal - 4)/16) x 4096

Example: For a 5 mA minimum signal; Offset = ((5-4)/16) x 4096 = 256

See Also

OUTPUT STATUS

Analog Quantity

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL HARDWARE MENU SEL ▼ to ANALOG QTY SEL

Screen

Purpose

This screen displays the number of analog outputs that will be programmed into the controller.

The controller can have one or two analog outputs, and each can be offset and scaled by different values. See ANALOG OUTPUT for details.

Programming

Use the numeric keys to enter "1" or "2" analog channels. An analog output module is required to generate an analog output signal.

See Also

ANALOG OUTPUT

OUTPUT STATUS

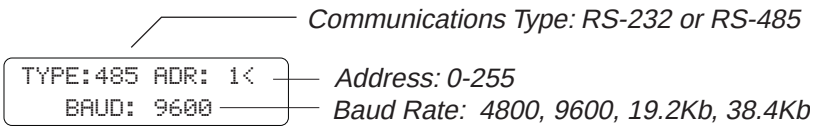
Communications

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL
▼ to COMMUNICATIONS SEL

Purpose

The Communications function sets the communications type, **controller** address, and baud rate for communicating with a host computer.



Type

Use SEL to toggle between RS-232 and RS-485 communications.

Address

The address must be unique for each controller installed on a network. This address is used by a host computer running PLuSNet software to identify and send information to a particular controller. A PLuS controller will ignore incoming information if the address field of the communication packet does not match the address of the controller.

The address set through COMMUNICATIONS takes affect only when the DIP switch shown in Figure 13 is set to an address value of zero. Whereas the DIP switches can set a maximum address of "7," the COMMUNICATIONS function can establish addresses ranging from 0-255.

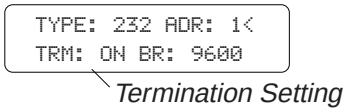
Use the numeric keys and ENT to program the address.

Baud Rate

Use SEL to toggle between the available baud rates. The baud rate must match that of the host computer. Available baud rates are:

4,800, 9,600, 19,200, 38,400

Effective with Software Versions 1.97 and higher, the communications screen has been revised as shown below:



The termination setting should be ON if TYPE is set to RS-232, or if TYPE is set to RS-485 and only one PS-6244 controller is in the multi-drop network. **Setting the termination to OFF in these configurations may cause inaccurate RPM readings.**

If multiple PS-6244 controllers are connected in an RS-485 network, termination should be set to OFF on one and only one PS-6244 controller.

The termination setting in this screen is independent of all DIP switch settings. Use the SOFTWARE VERSION function to determine version number.

Default Program

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL DEFAULT PROGRAM SEL

Background

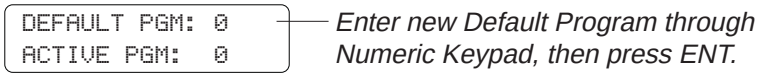
The PS-6244 controller can store up to 48 programs in its memory. The **Default Program** is the program that controls the output channels when there are no hardware input signals on terminals 9-13 of TB 1, Figure 7.

The **Active Program** is the program number that is currently controlling the output channels. If there are program select inputs on TB 1, those inputs will determine the Active Program, and the Default Program will be ignored. If no hardware inputs are active, the Default Program will become the Active Program.

For installations where the program select inputs on TB 1 are not used, the Default Program will always be the Active Program.

This function displays the current Default Program and allows you to select a different one.

Screen



Programming

Use the numeric keys and ENT to enter or modify the Default Program.

⚠ WARNING

If hardware input signals are used to select the Active Program, and those signals are lost due to a malfunction, the Default Program will activate. To prevent sudden changes in machinery operation that may damage equipment or injure personnel, program the Default Program with settings that will not cause harm in the event of sudden activation.

See Also

PGM SEL MODE

Enable Codes

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL

▼ to PGM ENABLE MENU SEL ENABLE CODES SEL

Background

The PS-6244 has three levels of programming access: Operator, Setup, and Master in order of increasing capabilities. Figure 21 lists the menu functions that can be programmed under the various levels of access.

Programming levels can be activated, or "enabled," by entering a password on the keypad, or by activating Terminals E1 or E2 on the back of the keypad as shown in Figure 12. The first two rows of Figure 21 show which methods can be used to enable the various levels of programming access.

Screen

This screen is used to establish the numbers that will be used as passwords to enable the Operator, Setup, and Master levels.

```
LEVEL: OPERATOR
PASSWORD: 1234
```

Enable Level: Operator, Setup, or Master

Password Number

Use the SEL key to toggle between enable levels.

Use the numeric keys, followed by ENT to assign codes.

Operation

- Each programming level can have only one code. That code is stored in the controller and applies to all keypads connected to that controller.
- If a code is entered into a keypad that has a programming enable terminal energized, the access level will be the highest of the two.
- If one keypad in a two-keypad system is enabled, the other keypad will continue to operate in the "Normal Display" mode.
- If both keypads in a two-keypad system are enabled, each keypad will operate at the programming level enabled on it. For example, if Operator Level is enabled on Keypad 1, and Setup Level is enabled on Keypad 2, Keypad 1 will operate at the Operator Level and Keypad 2 will operate at the Setup Level.

See Also

PER CHN ENABLE

ENABLE OPTIONS

PASSWORD

Figure 21—Programming Access Levels for Various Menu Items

	Programming Level			
	Normal Display	**Operator**	**Setup**	**Master**
Can Be Enabled By…				
Keypad Terminal	---	Yes, E2	No	Yes, E1
Password	---	Yes	Yes	Yes
Menu Item Access				
Password	Enter	Enter	Enter	Program
Setpoints	View	Program[1]	Program	Program
Setup Menu				
Default Program	View	Program[1]	Program	Program
Speed Comp	View	Program[1]	Program	Program
Offset	View	Program[1]	Change	Program
Motion Detect	View	Program[1]	Program	Program
Analog Output	View	Program[1]	Program	Program
Shift Position	View	Program[1]	Program	Program
Pulse Copy	View	View	Program	Program
PGM Copy	View	View	Program	Program
I/O Status Menu				
Input Status	View	View	View	View
Output Status	View	View	View	View
System Info Menu				
Setpoint Use	View	View	View	View
Software Version	View	View	View	View
Model & Options	View	View	View	View
Config Menu				
Hardware Menu				
Keyboard Qty	---	---	---	Program[2]
Increasing Dir	---	---	---	Program
Scale Factor	---	---	---	Fixed
Analog Qty	---	---	---	Program
Pgm Sel Mode	---	---	---	Program
Display Menu				
Rate Setup	---	---	---	Program
Toggle RPM	---	---	---	Program
RPM Upd Rate	---	---	---	Program
Pgm Enable Menu				
Enable Codes	---	---	---	Program
Per Chn Enable	---	---	---	Program
Enable Options				
Setpoints	---	---	---	Program
Default Program	---	---	---	Program
Speed Comp	---	---	---	Program
Offsets	---	---	---	Program
Motion Detect	---	---	---	Program
Analog Output	---	---	---	Program
Shift Position	---	---	---	Program
Chn ANDing Menu				
Motion ANDing	---	---	---	Program
Input ANDing	---	---	---	Program
Shft Reg ANDing	---	---	---	Program
Communications	---	---	---	Program
Test Menu				
Memory Tests	---	---	---	Run

[1] Can be programmed only if specified through PER CHN ENABLE and ENABLE OPTIONS.
[2] KEYBOARD QTY can be programmed only through the keypad whose address is "0." See Figure 14.

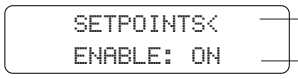
Enable Options

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL
▼ to PGM ENABLE MENU SEL ▼ to ENABLE OPTIONS SEL

Purpose

The Enable Options screen controls Operator Level access to SETUP MENU programming as indicated in Figure 21, note 1.



SETPOINTS or SETUP MENU screen.
Scroll through choices with UP and Down cursor keys.

OPERATOR ENABLE: ON/OFF
(Toggle with SEL key)

This screen lists the various items in the SETUP MENU, and allows you to turn Operator access to those items on or off.

IMPORTANT

Access to the "on" items will be available only for those output channels that have been turned ON in PER CHN ENABLE.

Programming

Press the Up Cursor and Down Cursor keys to select the function you wish to change. Press the SEL key to turn Operator access ON or OFF.

Setup Menu Items

Access can be turned on or off for the following SETUP MENU items:

SETPOINTS
DEFAULT PROGRAM
SPEED COMP
OFFSET
MOTION DETECT
ANALOG OUTPUTS
SHIFT POSITION

See Also

PER CHN ENABLE

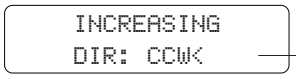
Increasing Direction

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL HARDWARE SEL
▼ to INCREASING DIR SEL

Purpose

The Increasing Direction screen displays the direction of encoder rotation (CW or CCW as viewed from the shaft end) that will cause the position display to increase in value.



Direction of resolver shaft rotation (viewed from shaft end) that will cause the postion display to increase in value.

This is normally set so the position value increases as the machine turns in its forward direction.

Changing Direction

Press SEL to toggle the value of increasing direction. The new value will begin flashing. Press the ENT key to confirm your selection.

Input ANDing

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL
▼ to CHN ANDING MENU SEL ▼ to INPUT ANDING SEL

Background

Terminals 1 through 8 of TB 3, Figure 7, can accept hardware input signals from sensors or PLC's. By ANDing an output channel with one of these terminals, the output channel will be "on" only when a signal is present on that terminal AND the setpoints programmed for that output channel are "on."

```
CHN:  1
INPUT AND:IN1
```

Output Channel
Input Terminal (1-8, or OFF)

Programming

Use the INC and DEC keys, or the numeric keypad and ENT to select an output channel.

Use the SEL key to select input terminals 1 through 8, or to turn Channel ANDing "off" for that output channel. IN1 = Input Terminal 1, IN2 = Input Terminal 2, and so on.

Operation

- Any number of output channels can be ANDed to a single input terminal.
- Input ANDing, Shift Register ANDing, and Motion ANDing can be combined for any given output channel.
- When Input ANDing is activated for a channel, it will apply to that channel in all programs.

Input Status

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to I/O STATUS SEL
▼ to INPUT STATUS SEL

The input status screen displays the On/Off status of the DC inputs on Terminal Blocks TB 9 and TB 11, Figure 7.

```
12345678 INPUT
01001001 1-8<
```

Input Numbers (1-8)
Input On/Off Status (0=Off, 1=On)

```
90123456 INPUT
01001001 9-16<
```

Input Numbers (9-16)

Inputs are numbered 1 through 16, but only 8 inputs are shown at one time. The On/Off status is shown under the input number; 0=Off, 1=On.

Selecting Inputs

You may view inputs 1-8 or 9-16. Press the SEL key to toggle between the two groups of inputs.

Keyboard Quantity

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL HARDWARE MENU SEL KEYBOARD QTY SEL

Purpose

The Keyboard Quantity screen shows the number of keypads the controller will communicate with.

```
KEYBOARD
 QTY: 1<
```

Number of keyboard/display units attached to controller

The controller will attempt to establish communication with as many keypads as are programmed through this screen. Keypads are assumed to be addressed sequentially, starting at address "0" as shown in Figure 14.

Keypad "0" Only

You can change the number of keypads shown in KEYBOARD QTY only from the keypad whose address is "0."

⚠ IMPORTANT

If KEYBOARD QTY is set to "2," but only one keypad is physically connected, Menu Tree operation will be very slow. Change KEYBOARD QTY to "1" to restore normal Menu Tree speed.

Main Screen

On power-up, or after five minutes of keypad inactivity, the controller will display the main screen.

Active Program

```
PGM: 1 RPM: 1500
MENU<  POS:  180
```

Machine Speed

Machine Position = Shaft Position + Offset

To enter Menu Tree, press SEL when cursor is here

Active Program

The PS-6244 can store up to 48 programs of setpoints. The "Active Program" is the program currently controlling the output channels.

If hardware inputs are being used to select the Active Program, the display will indicate the program selected by the inputs.

If hardware inputs are not used, or if all hardware inputs are off, the Active Program will be the Default Program specified through the DEFAULT PROGRAM function.

For information on using hardware inputs to select the Active Program, see "Controller Input Wiring" in Section 2.

Machine Speed

When the machine is moving, the Machine Speed is displayed in user selectable units of RPM (revolutions per minute), BPM (bags per minute), or CPM (cartons per minute). Machine Speed is displayed as a value which is 1X, 2X, or 3X the encoder RPM. See RATE SETUP for details.

Machine Position

Machine Position indicates encoder position. The number of increments depends on the encoder model.

Machine Position is displayed only when the encoder speed is below the TOGGLE RPM speed. At higher speeds, Machine Position will be blank. See TOGGLE RPM for programming details.

```
PGM: 1 RPM: 1500
MENU<
```

Machine position not shown above toggle RPM

Entering the Menu Tree

To enter the Menu Tree from the Main Screen, move the cursor to "MENU" and press the SEL key.

Memory Tests

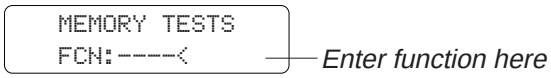
Menu Path

MAIN SCREEN SEL ▼ to TEST MENU SEL ▼ to MEMORY TESTS SEL

Purpose

This menu selection provides three functions that allow you to clear programmed values from the controller. An additional function tests the controller's watchdog timer.

Screen



Programming

To perform one of the memory test functions, enter the function number using the numeric keys and press SEL.

Function 7000

Clears all setpoints and configuration settings from the controller's EEPROM. After clearing the setpoints, the controller will reload the factory default settings listed in the Appendix.

Function 7001

Clears all configuration settings from the controller's EEPROM. These include all of the programming performed through the Setup Menu and Config Menu on the menu tree, Figure 20. When finished, the controller will reload the factory default settings listed in the Appendix.

Function 7002

Clears all setpoints from the controller's EEPROM. These include any on/off setpoints programmed through SETPOINTS. All other settings will remain intact.

Function 7998

Watchdog Timer Test. The "Watchdog Timer" monitors the operation of the controller's microprocessor and shuts the controller down if any internal malfunction is detected. If the Watchdog Timer fails, the controller may continue to operate. However, any subsequent malfunctions or noise-induced irregularities may go undetected, and the controller may begin to operate erratically.

To test the Watchdog Timer, run Function 7998. If the controller's Watchdog Timer is working properly, the controller will reset. If Function 7998 does not reset the controller, the Watchdog Timer has failed. Replace the controller immediately and return the faulty unit to the factory.

⚠ IMPORTANT

If a controller fails the Watchdog Timer test fails, do not continue to operate the controller. Although the controller may appear to be functioning normally, any internal malfunction may cause erratic operation, possibly activating outputs at the wrong point in the machine cycle. Such erratic operation may damage products and machinery, and injure machinery operators.

Motion ANDing

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL ▼ to CHN ANDING MENU SEL MOTION ANDING SEL

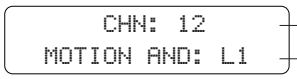
Purpose

This function is used to tie the operation of output channels to the Motion Detection levels programmed through MOTION DETECTION. Each output channel may be ANDed with either Motion Detection level. If an output is Motion ANDed, it will turn on only when the encoder RPM is in the range specified for that Motion Detection level, AND the setpoints programmed for that channel are "on."

Outputs that must always operate, regardless of machine speed, should **not** be ANDed with a Motion Detection level.

Screen

This screen displays the channel number and the Motion Detection level for Motion ANDing: L1, L2, or OFF. The channel will not be Motion ANDed if the enable is OFF.



Channel number
Motion ANDing level: L1, L2, or OFF. (Toggle with SEL key)

Programming

Select a new channel by pressing the INC/DEC keys, or through direct numeric entry followed by ENT.

Press the SEL key to toggle the ANDing to L1, L2, or OFF.

Operation

- Any number of output channels can be ANDed to a single Motion Detection level.
- Motion ANDing, Input ANDing, and Shift Register ANDing can be combined for any given output channel.
- When Motion ANDing is activated for a channel, it will apply to that channel in all programs.

Motion Detector

An output channel can be used as a motion detector by programming it to be on at "1" and off at "1," and then ANDing it with the desired Motion Level. This will turn the output on constantly as long as the machine speed is within the specified Motion Level range.

See Also

MOTION DETECTION

Motion Detection

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to MOTION DETECT SEL

Background

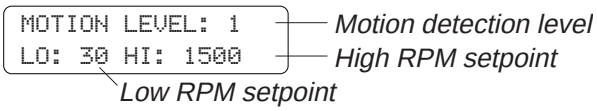
Motion Detection establishes one or two “Motion Levels,” or speed ranges, with low and high RPM values. These two ranges are independent of each other.

Using the MOTION ANDING screen, each output channel can be ANDed with either Motion Level. ANDed outputs will be enabled only when the encoder speed is within the specified speed range. Output channels that are not ANDed will be “on” whenever the machine position is within their programmed setpoints, regardless of machine speed.

One use of Motion Levels and Motion ANDing is to turn off devices such as glue guns if the machine stops or jams.

Screen

The Motion Detection screen displays the Motion Level, the Low RPM, and the High RPM.



Programming

Use the numeric keys and ENT to change values for Motion Level, Low RPM, and High RPM.

Motion Detector

An output channel can be used as a motion detector by programming it to be on at “1” and off at “1,” and then ANDing it with the desired Motion Level. This will turn the output on constantly as long as the machine speed is within the specified Motion Level range.

See Also

MOTION ANDING

Offset

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to OFFSET SEL

Purpose

This screen allows the encoder position to be set to zero at the desired machine position, eliminating the need to mechanically adjust the encoder shaft coupling to the machine.

Position Setup

In order to set the Position to match the machine position, simply stop the machine at a known position and enter the desired Position value. For example, jog the machine to a position at the start of a new cycle, then set the Position to “0.”

Absolute Offset

When you modify the Position, the Absolute Offset will change to the following number:

(Previous Absolute Offset) + (Change in Position)

- The Change in Position will be negative if the new position is less than the original position, and will thus be subtracted from the Previous Absolute Offset.

Example: Absolute Offset is zero, and the machine is jogged to the start of a new cycle, where the Position is 150. Using the keypad, the Position is reset to zero, for a change in Position of (–150). The new Absolute Offset is thus zero minus 150. Since the model of encoder used in this example shows positions from zero to 1000, the 150 is subtracted from 1000, resulting in an Absolute Position of 850.

Absolute Offset is intended to be used for "archival purposes", in case you lose correct machine position and need to set the machine back up. Absolute Offset can be modified using the numeric keypad.

Output Status

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to I/O STATUS SEL ▼ to OUTPUT STATUS SEL

Purpose

This screen shows the On/Off state of the output channels.

Both Models, Outputs 1-8

```
12345678 OUTPUT
01001001 1-8<
```

Output Numbers (1-8)

Output On/Off Status (O=Off, 1=On)

PS-6344-17, Outputs 9-17

```
901234567 OUTPUT
0100100AA 9-17<
```

Output Numbers (9-17)

Analog Modules shown with "A"

PS-6344-25, Outputs 9-25

```
90123456 OUTPUT
01001000 9-16<
```

Output Numbers (9-16)

```
789012345 OUTPUT
0100100AA 17-25<
```

Output Numbers (17-25)

Analog Modules shown with "A"

If any output positions have been programmed as analog outputs, the On/Off status will show “A” instead of “0” or “1.”

Selecting Outputs

To change the set of outputs displayed, press the SEL key.

Password

Menu Path

MAIN SCREEN SEL PASSWORD SEL

This screen provides an area to enter a password. It also shows the current programming access level and the status of the Programming Enable terminals on the back of the keypad, Figure 12.

```
PASSWORD:****<
LEV:NONE INP:OFF
```

Password entry area

Keypad programming terminal input status

Current programming level (hardware or software)

Enable Levels

There are three programming access levels; OPERATOR, SETUP, and MASTER. See Figure 21 for a summary of the programming functions available to the different levels. The codes that correspond to each level are established in the ENABLE CODES screen.

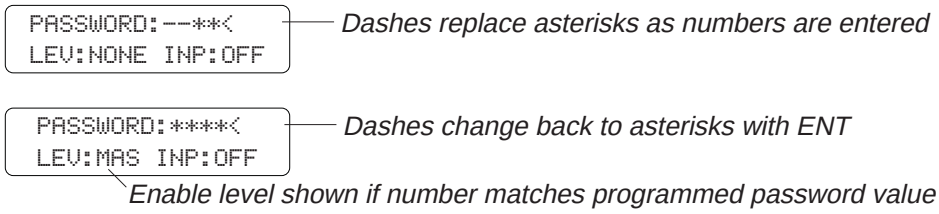
Entering a Password

Enter a password through the numeric keypad followed by ENT. As you press the number keys, the asterisks will be replaced by dashes. If you make a mistake, press CLR to erase the last key you pushed.

Password (Cont'd)

If you enter a password that has been programmed through ENABLE CODES, the keypad will function at the corresponding programming level.

If either of the programming enable terminals on the back of the keypad is active when a password is entered, the programming level will be whichever is greater.



Clearing a Password

When programming operations are completed, enter a password value of "0," then ENT to clear the enable level.

If a keypad is left unattended with an active password, the access code will clear after five minutes of keypad inactivity and the keypad will revert to the "Normal Display" mode shown in Figure 21.

See Also

ENABLE CODE

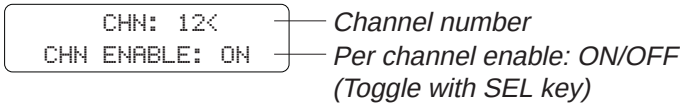
Per Channel Enable

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL ▼ to PGM ENABLES SEL ▼ to PER CHN ENABLE SEL

Purpose

This screen is used to enable Operator Level access to individual output channels. CHN ENABLE is used in conjunction with the ENABLE OPTIONS screen to assign Operator Level access to selected programming functions.



Channel Select

Press the INC/DEC keys, or use the numeric keys and ENT.

Enable Toggle

Press the SEL key to toggle the enable ON or OFF.

See Also

ENABLE OPTIONS

Program Copy

Menu Path

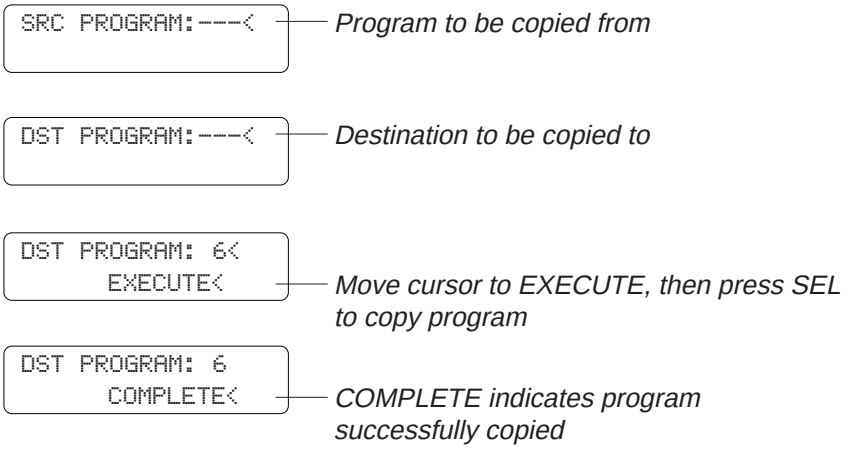
MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to PGM COPY SEL

Purpose

Program Copy allows you to copy all of the channels and setpoints from one program to another. It is often easier to copy an existing program and modify it, than to enter a new program from scratch.

Screens

The Program Copy function consists of four screens:



Programming

Use the numeric keys and SEL to enter program numbers.

During programming, the cursor keys allow you to move between the Source and Destination screens to allow you to change values before selecting EXECUTE.

Program Select Mode

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL HARDWARE SEL ▼ to PGM SEL MODE

Purpose

This screen allows you to specify the format for the hardware Program Select inputs on terminals 9 through 13 of Terminal Block 11, Figure 7.

The Program Select inputs can operate in Binary, BCD, or Gray Code formats as shown in Figure 8.

Use the SEL key to toggle the input format.

⚠ WARNING

If the input signals controlling program selection are lost due to a malfunction, the Default Program will activate. To prevent sudden changes in machinery operation that may damage equipment or injure personnel, program the Default Program with settings that will not cause harm in the event of sudden activation.

See Also

DEFAULT PROGRAM

Pulse Copy

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to PULSE COPY SEL

Purpose

Pulse Copy allows you to program a series, or “train” of pulses into a channel without having to enter the On and Off setpoints for each pulse. The Pulse Copy function prompts you for the beginning and ending setpoints for the pulse train; the number of pulses in the train; and the duration of a pulse. Pulse Copy then divides the designated portion of the encoder cycle into the specified number of pulses, evenly dividing the unused portion of the segment between the pulses.

Screens

The Pulse Copy function consists of eight screens:

```
PROGRAM:---<
```
Program to add pulses to;
Enter number, then SEL to go to next screen

```
CHANNEL:---<
```
Channel to add pulses to;
Enter number, then SEL to go to next screen

```
ON:---<
```
"On" time of leading edge of first pulse;
Enter number, then ENT & SEL to go to next screen

```
OFF:---<
```
"Off" time of trailing edge of last pulse;
Enter number, then ENT & SEL to go to next screen

```
COUNT---<
```
Total number of pulses to be added;
Enter number, then ENT & SEL to go to next screen

```
DURATION:---<
```
Duration of each pulse added;
Enter number, then ENT & SEL to go to next screen

```
DURATION: 35
  EXECUTE<
```
Move cursor to EXECUTE, then press SEL to generate pulses. To review values before executing, move cursor to top row and press SEL as needed

```
DURATION: 35
  COMPLETE<
```
COMPLETE indicates pulses have been generated

Example

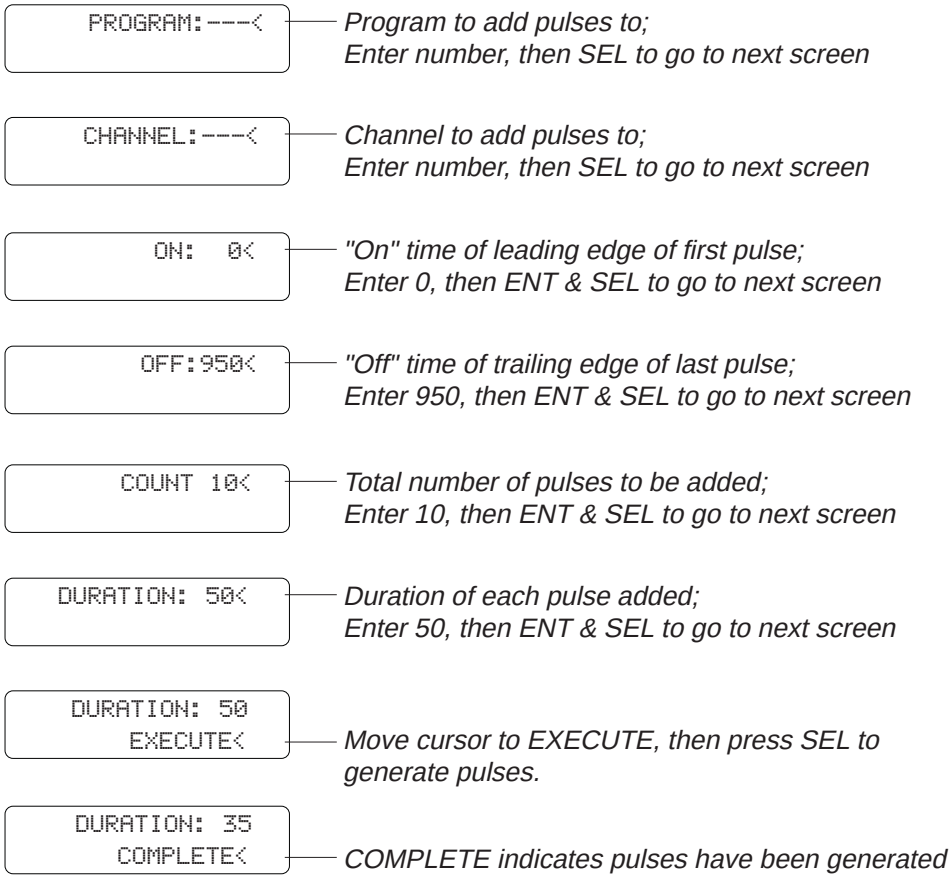
Generate a train of pulses for a Krones Label Check Unit as follows:

Pulse	On	Off
1	0	50
2	100	150
3	200	250
4	300	350
5	400	450
6	500	550
7	600	650
8	700	750
9	800	850
10	900	950

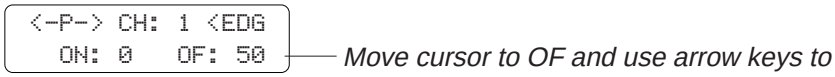
Pulse Copy (cont'd)

Each pulse is 50 increments wide, separated from the next pulse by 50 increments.

Program PULSE COPY as follows:



Go to SETPOINTS to confirm the pulse train:



Rate Setup

Menu Path

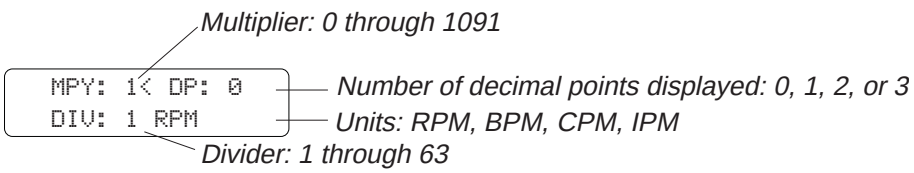
MAIN SCREEN SEL ▼ to CONFIG MENU SEL ▼ to DISPLAY SEL

RATE SETUP SEL

Purpose

The Rate Setup function allows you to configure the RPM display on the Main Screen. The Main Screen can display the encoder speed in units of Revolutions Per Minute (RPM), Bags Per Minute (BPM), or Cartons Per Minute (CPM). The encoder speed can also be displayed as .5X, 1X, 2X, or 3X actual RPM.

Screen



Rate Setup (Cont'd)

Press the SEL key to toggle display mode or rate. Following is a chart summarizing the relationships between encoder speed, units, and rate multiplier:

If Units Are…	And Rate Is…	Then an Encoder Speed Of…	Is Displayed As…
RPM	.5X	100 RPM	50 RPM
	1X	100 RPM	100 RPM
	2X	100 RPM	200 RPM
	3X	100 RPM	300 RPM
BPM	.5X	100 RPM	50 BPM
	1X	100 RPM	100 BPM
	2X	100 RPM	200 BPM
	3X	100 RPM	300 BPM
CPM	.5X	100 RPM	50 CPM
	1X	100 RPM	100 CPM
	2X	100 RPM	200 CPM
	3X	100 RPM	300 CPM

RPM Update Rate

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL ▼ to DISPLAY SEL ▼ RPM UPD RATE SEL

Purpose

The RPM Update Rate is how often the RPM display on the Main Screen is updated. This rate can be programmed to be 1/Sec, 2/Sec, or 10/Sec.

Screen

RPM Update Rate: How often RPM display on main screen is updated; 1/Sec, 2/Sec, or 10/Sec.

Press the SEL key to toggle the selection.

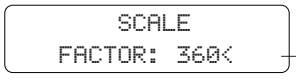
Scale Factor

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL ▼ to HARDWARE MENU SEL SCALE FACTOR SEL

Purpose

The Scale Factor screen displays the number of increments into which one encoder revolution is divided. For the PS-6244 special unit, Scale Factor is fixed at 1000.



Number of increments each revolution is broken into

Setpoint Use

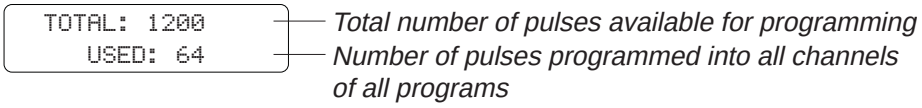
Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to SYSTEM INFO SEL SETPOINT USE SEL

Purpose

This function displays the total number of setpoint On/Off pairs, or “pulses” available for programming, and the number of pulses that have been programmed.

Screen



The number of setpoints shown as "Used" is the sum of all pulses that are programmed into all channels of all programs. The "Total" value is the number of pulses that can be stored in non-volatile EEPROM memory. The difference between the two numbers is the number of pulses available for programming.

The number of pulses programmed into all channels of all programs cannot exceed the value displayed as Total.

There are no values that can be changed in this screen.

Setpoints

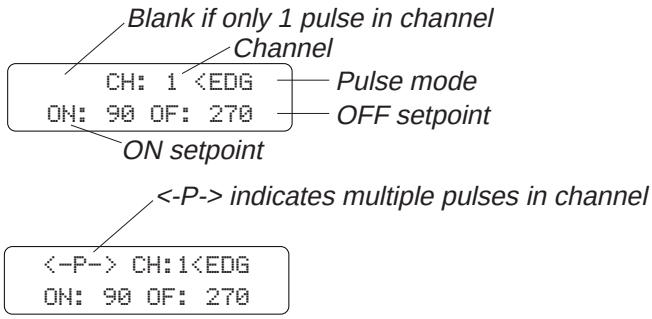
Menu Path

MAIN SCREEN SEL ▼ to SETPOINTS SEL

Screens

When SETPOINTS is selected, a preliminary screen specifies the program whose setpoints will be programmed.

The active program is displayed, but any other program can be specified by using the numeric keys or INC and DEC to choose a program, then pressing SEL to move to setpoint programming.



Channel to Edit

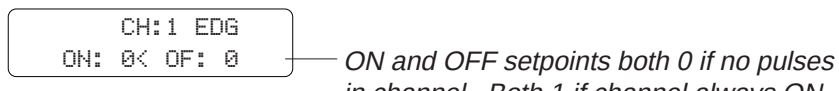
Use the numeric keypad and ENT to select the channel to program.

- **CHN 91 is a special channel used for shift register functions.** See “Shift Register ANDing” for details.

Setpoint Values

Use the left and right arrow keys to move between the On and Off setpoints.

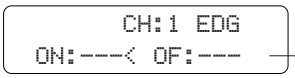
- If a channel has more than one pulse, you may view the other pulses by pressing the right cursor key when viewing the Off setpoint, or by pressing the left cursor key when viewing the On setpoint.
- If a channel contains no pulses, the On and Off setpoints will be “0.”
- If a channel is always on, both the On and Off setpoints will be “1.”



Setpoints (cont'd)

Adding a Pulse

You may add a new pulse to a channel by pressing the SEL key when the cursor points to either the On or the Off setpoint.



Enter ON setpoint, then ENT or right cursor to OF.
Enter OFF setpoint, then press ENT.

The display will change to show blank On and Off setpoints; the cursor will point to the On setpoint. Enter the On setpoint through the numeric keypad, and then press the ENT key or the right cursor to move to the Off setpoint. Enter the Off setpoint through the numeric keypad and then press the ENT key.

Adding Multiple Pulses

If On and Off setpoints for a pulse are visible on the screen and you press SEL to program a new pulse, the original pulse will remain in the output channel. If the On or Off setpoints you enter overlap an existing pulse in the channel, you will see an "Error: Pulse Overlap" message.

To abort entering a pulse at any time, press ESC.

Changing Setpoints

Change a setpoint value with the numeric keys followed by ENT, or with the INC and DEC keys.

Pulse Modes

The Pulse Mode controls how the INC and DEC keys modify setpoints. There are three modes; **EDG** (edge), **PUL** (pulse), and **CHN** (channel.) You change the Pulse Mode by pressing the SEL key when the cursor points to the Pulse Mode.

In **EDG** mode, the INC and DEC keys will affect the selected On or Off setpoint only.

In **PUL** mode, both On and Off setpoints will be incremented or decremented simultaneously.

In **CHN** mode, **all** On and Off setpoints for all pulses in the channel will be incremented or decremented simultaneously.

Deleting a Pulse

A pulse may be deleted by making On equal to Off, or vice versa. If there is more than one pulse in the channel, the next pulse will appear in the On/Off setpoint area. If the channel has no more pulses, the On and Off setpoint will both be zero.

Clearing a Channel

To clear a channel of all pulses, enter a new pulse with On and Off setpoints of "0."

Channel Always ON

A channel may be programmed to be On for a full revolution (always On) by entering a new pulse with both On and Off values equal to "1."

Record Setpoints

Photocopy the form inside of the back cover and use it to write down setpoints for each program.

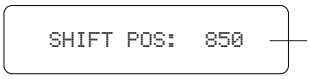
Shift Position

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to SHIFT POSITION SEL

Purpose

The Shift Position is the point in the encoder revolution at which the shift register data shifts. See Shift Register ANDing for details.



Position at which Shift Register will shift.

Programming

Use INC and DEC, or the numeric keys and ENT.

Shift Register ANDing

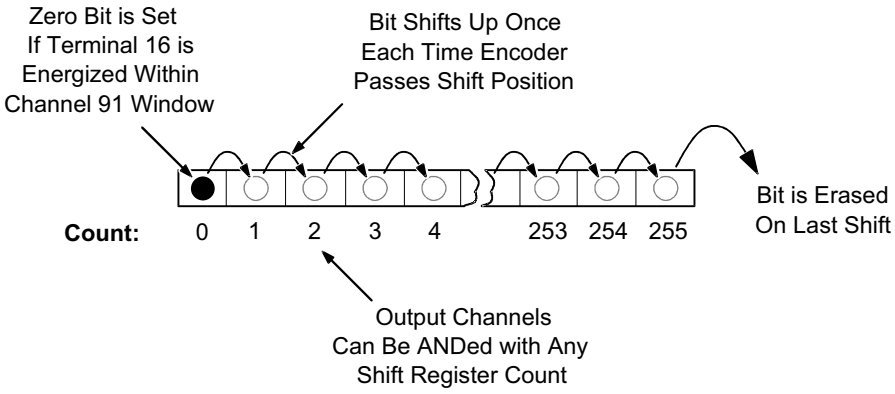
Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL ▼ to CHN ANDING MENU SEL SHFT REG ANDING SEL

Background

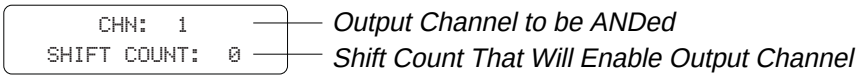
The shift register is a form of electronic memory that sets a “bit” in the zero count of the register when a signal is applied to Terminal 16, Fig. 7. Afterwards, each time the encoder passes the point programmed through SHIFT POSITION, the register “shifts” the bit to the next higher count. The bit passes along the shift register until, on the 256th shift, the bit is erased.

An output channel can be ANDed with any count in the shift register, so that the channel is enabled only when a bit appears in that count. In this way, output channels can be enabled up to 255 revolutions after Terminal 16 is energized.



Programming

This screen allows you to enter the output channel to ANDed with the shift register, and the shift register count that will enable it.



To select the output channel and the shift register count, use the numeric keys and ENT, or use the INC and DEC keys.

- **ANDing an output channel with Count “0” is the same as turning Shift Register ANDing off.** The shift register will have no affect on channel operation.
- Any number of output channels can be ANDed to a single shift register count.
- Shift Register ANDing, Input ANDing, and Motion ANDing can be combined for any given output channel.

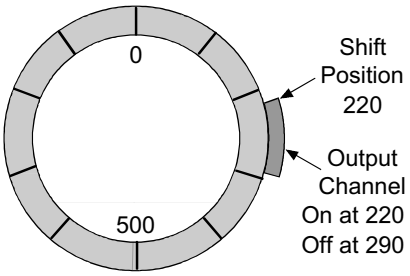
Input Window

A bit is set in Position “0” of the shift register when Terminal 16 of TB 1, Figure 7, is energized. A special channel, Channel 91, is provided to limit the portion of an encoder revolution during which the signal will be accepted from Terminal 16. A “window” can be programmed into Channel 91 so that a bit is set in the register only if Terminal 16 becomes energized within that window.

Shift Position

The point in the encoder revolution at which the register shifts data is programmed through SHIFT POSITION. When programming Shift Position and the On/Off setpoints for a channel, remember the following:

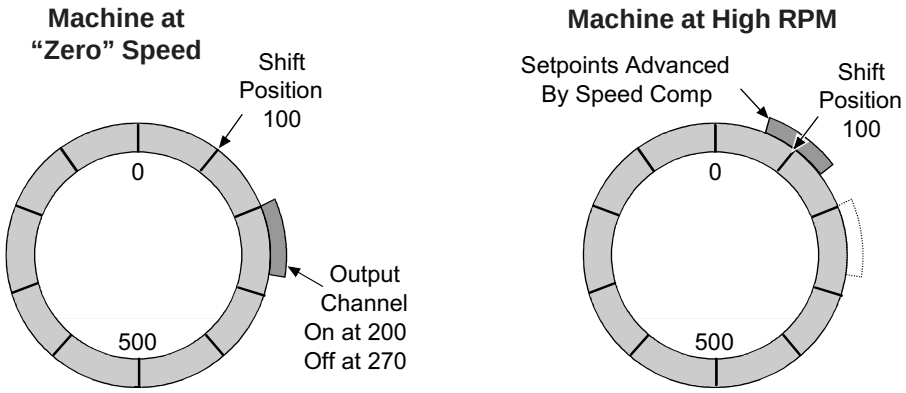
Don't Place the Shift Position at the Start of a Pulse



When a pulse starts at the Shift Position, as shown here, the pulse will be enabled as soon as a bit is shifted into the programmed shift count.

Although the output will function normally on this revolution, a small output spike may occur on the following revolution as the bit is shifted to the next shift count.

Don't Let Speed Comp Move a Pulse Onto the Shift Position



At "Zero" Speed in this example, the output turns on 100 increments after the Shift Position. However, as the machine accelerates, speed compensation advances the setpoints until they overlap the Shift Position. This may split the pulse between two machine cycles. The portion of the pulse following the Shift Position may activate during one cycle, while the portion ahead of the Shift Position may activate during the following cycle.

The Channel 91 Window is "edge sensitive" to the signal from Terminal 16. The leading edge of the signal must appear in the window for a bit to be set in the register.

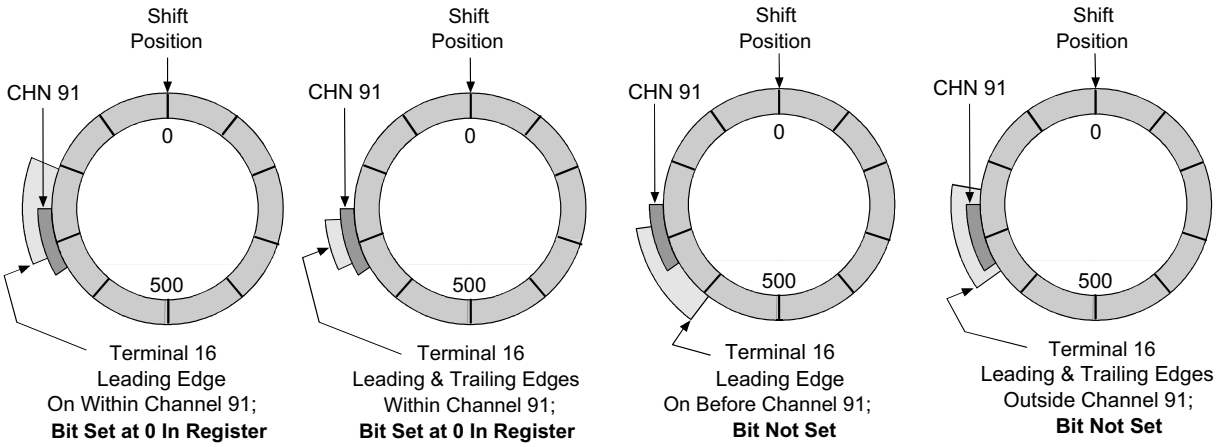
Shift Register Clear

Energizing Terminal 14 on TB 1, Figure 7, clears all bits from the shift register immediately.

(continued)

Edge Sensitivity of Channel 91 Window

(Channel 91 programmed "on" at 650, "off" at 750 in this example; Shift Position = 0)



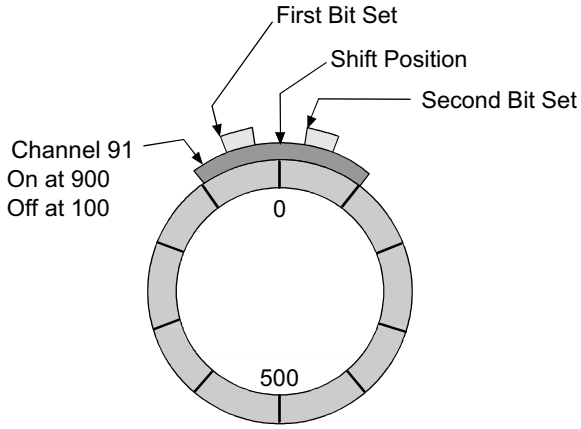
Channel 91 Overlaps Shift Position—Not Recommended!

When Channel 91 overlaps the shift position as shown here, two problems may occur.

One Product, Two Bits: Due to variations in conditions, sensors sometimes generate more than one pulse for a product. If the product sensor sends a pulse early in the window, that pulse will shift when the encoder reaches the shift position. If the sensor sends a second pulse for the same product after the shift position, a second bit will be set for the same product.

Inconsistent Timing: Some products may appear early in the Channel 91 window, while others appear late. For early products, a bit will be set, then immediately shifted at the shift position. For late products, a bit will be set after the shift position, and a full revolution will occur before the bit shifts to 1.

In most applications, programming Channel 91 to overlap the Shift Position will cause problems.



Software Version

Menu Path MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to SYSTEM INFO SEL ▼ to SOFTWARE VERSION SEL

Purpose The Software Version screen displays the revision number of the firmware contained within the controller. This information may be useful if the unit needs to be returned for service.

```
MAJOR REV:1.75
 BASE REV:1.17
```

There are no values that can be changed in this screen.

Speed Compensation

Menu Path

MAIN SCREEN SEL ▼ to SETUP MENU SEL ▼ to SPEED COMP SEL

Background

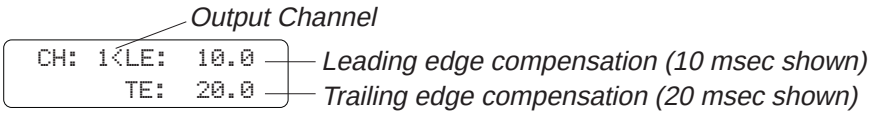
Some devices such as hydraulic cylinders and glue guns require a fixed amount of time to perform their function. As a machine speeds up, these devices need to be actuated earlier in the cycle in order to complete their action at the required time. Speed compensation automatically advances the On/Off setpoints of specified output channel(s) as the machine speeds up, maintaining proper synchronization at all speeds.

Speed Comp Units

Speed compensation is programmed by entering the response time of the output device in milliseconds (.001 Sec). The output will always turn on this number of mSec before the programmed On position is reached, and turn off this number of mSec before the programmed Off position is reached. As speed increases, the number of degrees of advance will automatically increase to maintain the number of mSec of advance.

Screen

The speed compensation screen shows the Output Channel and the speed compensation value for that channel.



To change speed comp values, use the numeric keys or INC and DEC. You can enter values of speed comp in milliseconds without using the decimal point: “12 ENT” will result in a value of 12.0.

To change output channels, move the cursor to the channel number and enter a new one. You may also INC or DEC the channel number.

Negative Speed Comp

Negative values of speed compensation cause the output channel to lag its programmed machine position by the specified number of mSec.

It is used when an input sensor is being gated, by the corresponding output channel, into another control system (PLC, registration control, etc.) Sensor lag can cause an object that is present at the correct position in the cycle to appear late. Negative speed comp can retard the gate signal so the sensor and gate signals are in sync when the object is in the correct position.

Since most sensors have very fast response times, negative speed comp is needed only where the sensor is slow to respond or the machine speeds are high and sensor timing is critical.

It may also be used if there is mechanical "wrap up" present in the machine being controlled. Wrap up will cause machine elements to shift relative to each other as speed increases. This situation may cause an event to happen later in the cycle as the machine goes faster.

Setting Negative Comp

Press the +/- key **after** entering a number but **before** pressing ENT, or by decrement a value below zero.

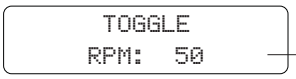
Toggle RPM

Menu Path

MAIN SCREEN SEL ▼ to CONFIG MENU SEL ▼ to DISPLAY MENU SEL ▼ to TOGGLE RPM SEL

Purpose

Toggle RPM is the encoder speed at which the Position display on the Main Screen will disappear. At speeds below the Toggle RPM the Position display will be visible; at speeds above the Toggle RPM the Position will not be shown.



Toggle RPM: Position display on main screen is not shown at speeds above Toggle RPM

This screen displays the Toggle RPM.

Controller Diagnostics

CAUTION

The controller cannot be repaired in the field. If a unit fails, do not disassemble it. Return it to the factory for replacement.

Status LED

The red Status LED on the controller, Figures 5 & 6, blinks in various patterns to indicate the controller status.

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.

Three "Off" Blinks—System error.

Four "Off" Blinks—System error.

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

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 the factory.

Keypad Diagnostics

CAUTION **The keypad cannot be repaired in the field. If a unit fails, do not disassemble it. Return it to the factory for replacement.**

Keypad Fault LED

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

Keypad Diagnostics

The 6400 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.

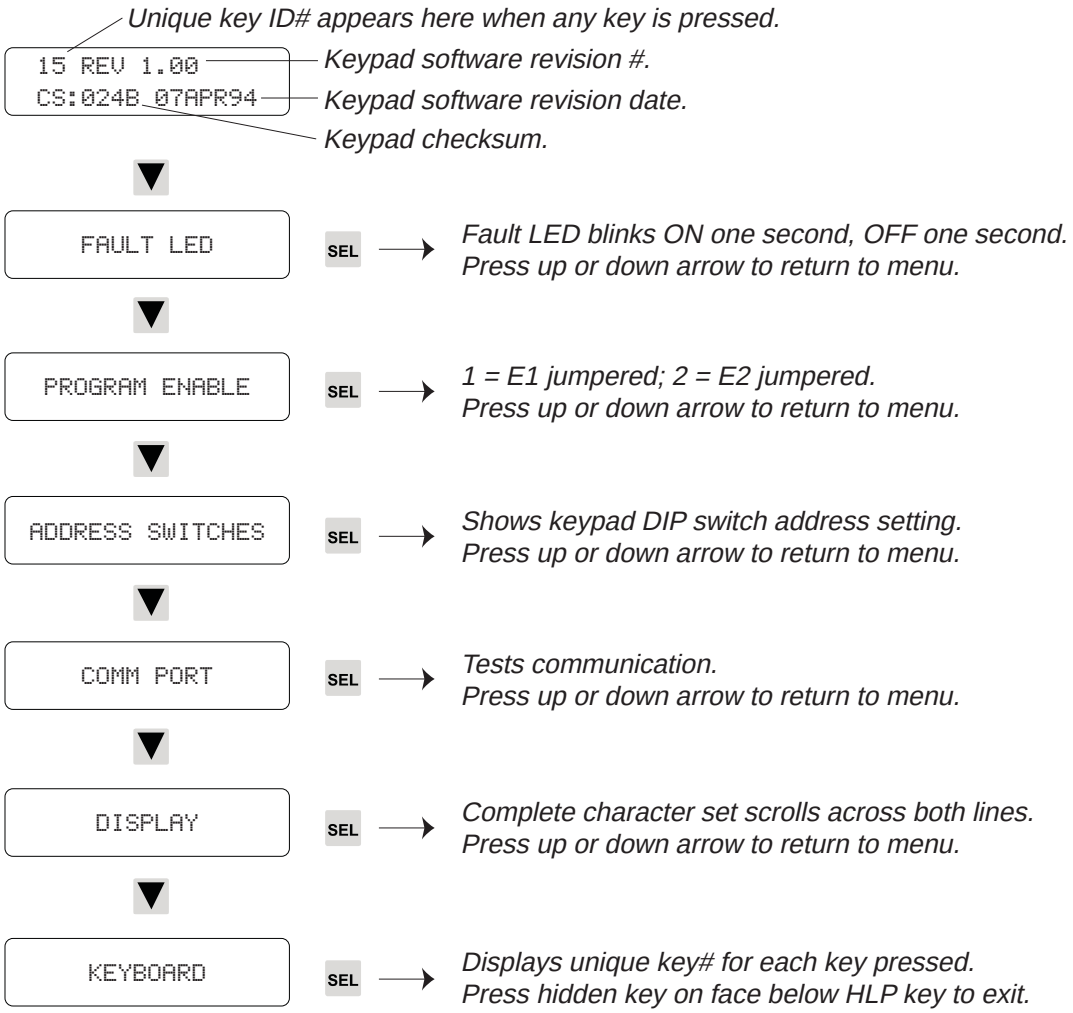
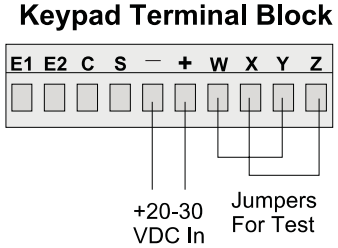


Figure 22—Keypad Communications Port Test Setup



When the COMM PORT diagnostic is run with keypad terminals W, X, Y, and Z jumpered as shown, a string of “plus” signs will scroll across the display. When either jumper is removed, the scrolling will stop.

Encoder Troubleshooting

Encoder Type

The encoder used with the PS-6244 controller is an incremental quadrature encoder. The encoder sends three signals to the controller: A, B, and Z, as shown below in Figure 23.

Failure Symptoms

Most encoder failures or wiring problems will affect the POS (position) display. Some of the possible symptoms are listed below:

Pins 1, 2, 3, 5, 9:

Failure Before Startup

Position display remains at zero.

Failure During Operation

The display will freeze on the position at the time of circuit break. If the circuit is reconnected before power is turned off, the display will resume incrementing until the zero pulse (Signal "Z") is received, at which time the display will return to its programmed offset value.

Pin 7:

Failure Before Startup

Position display remains at zero.

Failure During Operation

Operation will appear to be unaffected. However, errors in count values may accumulate, and on subsequent startup, the display will remain at zero.

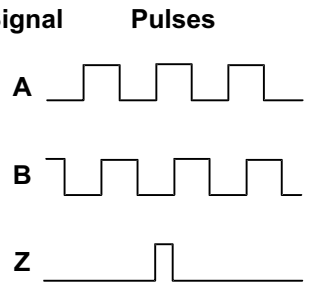
IMPORTANT

Depending on the type and timing of encoder failure, the machine may continue operating normally until it is turned off. On subsequent startup, the POS (position) display may be "frozen" at zero.

Figure 23—Quadrature Encoder Signals & Controller Pin Connections

10-Pin Weidmiller TB4

Pin	Connection
1	+ENC
2	VREF
3	A
4	–A
5	B
6	–B
7	Z
8	–Z
9	COM
10	Shield



Function

Increments position; relationship with "B" indicates direction.

Increments position; relationship with "A" indicates direction.

Resets position to "0" once per revolution.

IMPORTANT **The controller and keypad cannot be repaired in the field. If a unit fails, do not disassemble it. Return it to the factory for replacement.**

Problem	Possible Solution
Controller & keypad dead.	1. Check main fuse shown in Figs. 5 & 6. 2. Check power supply to controller.
Keypad dead, but controller LED's are on.	1. Check wiring between keypad and controller, Figure 12.
Keypad **Fault LED** "On"	1. 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	1. 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	1. This message may flash briefly on power-up under normal conditions. 2. If the message persists, check keypad wiring connections at keypad and controller, Figure 12. 3. Check DIP switch settings, Figures 13 & 14. 4. Be sure Input Terminal #15, Figure 7, is not energized.
Programming functions not accessible.	1. Programming not enabled. See Figure 12, and also ENABLE CODES for details.
POS (position) **frozen at "0"**	1. Encoder or encoder wiring may have failed. Unplug cable at encoder and plug a spare encoder into the cable. If this solves the problem replace the encoder on the machine. If not, prepare a short encoder cable (Fig. 16), unplug the cable at the controller, and plug the short cable with spare encoder into the controller. If this solves the problem, replace the cable on the machine. See page 4-3 for more.
POS (position) moves opposite to machine direction.	1. Check INCREASING DIR for the correct direction of rotation. 2. Check encoder wiring, Figure 16.
POS (position) does not match machine position.	1. Verify that OFFSET is correct. Once set, the offset value should not change. If it does, check the encoder coupling to be sure it is not loose. Also see "Encoder Trouble-shooting," page 4-3. An intermittent encoder connection on controller pins 1, 2, 3, 5, or 9 might cause POS to lag the actual encoder position until the next "zero" pulse ("Z" signal) is received from the encoder.
Serial communications not working	1. Check COMMUNICATIONS programming to be sure type, baud rate, and address are correctly set. 2. Be sure the DIP switches for the PLuS-to-host communications are set correctly as shown in Figure 13. 3. Check communication cable wiring, Figure 2-15.
Outputs cycling regularly at incorrect machine positions	1. Check that the correct program number is active. 2. Check the setpoints of the output(s) in question. Also check SPEED COMP settings. 3. Verify that OFFSET is correct.
Erratic Operation	1. Run the Watchdog Timer test described under MEMORY TESTS in the programming section of this manual. 2. See "Encoder Troubleshooting," page 4-3.

(continued)

Analog output not working.	1. Check that ANALOG QTY and ANALOG OUTPUT are programmed correctly. 2. Check that analog output module is located in the correct module position. See Figure 5 or 6. 3. Check correct wiring of analog output. 4. Verify that analog load device is within specifications for the analog module. 5. Try a different analog output module.
Some **transistor outputs** are not working.	1. Check that the correct program number is active. 2. Use OUTPUT STATUS to see if the controller is activating the output(s) at the correct position in the encoder revolution. If not, verify that the SETPOINTS are correctly programmed. Other programming that may prevent an output from energizing includes MOTION ANDING, INPUT ANDING, and SHFT REG ANDING. 3. If OUTPUT STATUS shows the output is on, use a meter to see if the output terminal is energized. If so, check the load device and its wiring. If not, go to Step 4. 4. Check the transistor array chips, Figure 17.
All **transistor outputs** are not working.	1. Check that the correct program number is active. 2. Use OUTPUT STATUS to see if the controller is activating the output(s) at the correct position in the encoder revolution. If not, verify that the SETPOINTS are correctly programmed. Other programming that may prevent an output from energizing includes MOTION ANDING, INPUT ANDING, and SHFT REG ANDING. 3. If OUTPUT STATUS shows the output is on, use a meter to see if the output terminal is energized. If so, check the load device and its wiring. If not, check the transistor output fuse, Figure 18. Use the fuse tester built into the controller, Figure 17. 4. Check that 10-30 VDC power is connected to TB 11, Figure 10 & 11.
AC/DC module output not working.	1. Check that correct program number is active. 2. Use OUTPUT STATUS to see if the controller is activating the output(s) at the correct position in the encoder revolution. If not, verify that the SETPOINTS are correctly programmed. Remember that AC/DC output modules are controlled by Channels 17 through 24. Other programming that may prevent an output from energizing includes MOTION ANDING, INPUT ANDING, and SHFT REG ANDING. 3. If OUTPUT STATUS shows the output is on, but the LED on top of the module does not light, try replacing the module. 4. 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, Figure 17. 5. 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.

Fuse Part Numbers

Fuse	Description	Mfct. Part #	Electro Cam Part #
Main Fuse (Figs. 5 & 6)	1-1/4 Amp Slo-Blo Glass	Bussman MDL-1-1/4	PS-9000-4114
Module Fuse	4 Amp TR-5	Wickmann 19370-K	PS-9005-0004
Input Fuse (Fig. 17)	250 mA TR-5	Wickmann 1937-035	PS-9005-0250
Output Transistor Fuse (Fig. 17)	1 Amp TR-5	Wickmann 19370	PS-9005-0001

Introduction To Speed Compensation

What Is It?

"Speed compensation" refers to the ability of the PS-6244 controller to automatically advance or retard setpoints in any output channel depending on the speed of the machine. Speed compensation allows devices with fixed response times, such as glue guns, to perform their functions with high accuracy over a wide range of machine speeds. Without speed compensation, a glue bead may tend to "drift" out of position as machine speed increases. By properly programming speed compensation for the output channel controlling the glue gun, the glue bead position can be maintained precisely over the complete range of machine speeds.

Benefits

Proper use of speed compensation can provide substantial benefits:

- **Increased Productivity—**If a machine incorporates components with fixed response times, speed compensation can often increase line speeds by as much as 50%.
- **Reduced Scrap Rate—**Speed compensation maintains the accuracy of critical operations such as gluing, thereby reducing rejects, rework, and scrap.
- **Simplified PLC Systems—**Programming speed compensation into standard motion control equipment such as PLC's, stepper motors, and stepper motor controls is difficult. To perform speed compensation at high machine speeds, the PLC hardware must be extremely fast, and therefore expensive. Integrating a PS-6244 into the control system eliminates the need to write custom PLC speed compensation programming, and provides excellent high speed control at a fraction of the hardware cost.

Fixed Response Times

Electromechanical components of automated systems often have fixed response times regardless of the line speed. For example, a glue gun may require ten milliseconds from the time the gun is actuated to the time that glue begins flowing. At the slowest line speed, the gun might need to be triggered when the carton is one inch away, so that the carton arrives under the gun just as glue begins flowing. As the line speed increases and the product travels faster, the lead distance from the carton to the gun must increase in order for the gun, with its fixed response time, to still hit the correct spot on the product. By programming speed compensation into the PS-6244, the timing of glue guns and similar mechanisms can be automatically advanced as speed increases, maintaining proper operation over a wide range of machine speeds.

Example

Figure 24 on the next page illustrates a simple carton gluing application. A conveyor moves cartons under a glue gun which releases glue onto the flaps. The conveyor is connected through a timing chain and sprocket to a transducer which rotates one revolution for each carton that passes under the gun.

As the transducer dial shows, SHAFT POSITION has been programmed so that the leading edge of the box passes under the gun at 110° and the trailing edge at 360°. Glue begins flowing ten msec after the gun is energized, and it stops flowing ten msec after the gun is de-energized. Once the glue leaves the nozzle, it requires another five msec to travel to the carton. Combining the glue gun response time with the travel time results in a system response time of 15 msec, regardless of line speed.

At very slow, or essentially zero speed, the gun would be energized at a transducer position of 110° and de-energized at 360°. As the line speed increases, however, the gun needs to be energized before 110° to allow the glue to hit the carton in the correct spot. The faster the line speed, the earlier in the transducer cycle the gun must be triggered.

Calculation

To calculate the amount of speed compensation required, use the following relationships between the transducer's RPM (revolutions per minute) and degrees of rotation:

1 RPM = 360°/min = 6°/sec = 0.006°/msec,
RPM x 0.006 = deg/msec,
thus: @ 100 RPM, the transducer will rotate 0.6°/msec
@ 1000 RPM, the transducer will rotate 6.0°/msec

Calculation (cont'd)

In the previous example, the gluing system requires 15 msec from the time the gun is energized to the time the glue hits the carton. At 100 RPM, the transducer will rotate 0.6°/msec. Therefore, in the 15 msec response time, the transducer will rotate (15 msec x 0.6°), or 9°. This means the glue gun must be energized at 101°, which is 9° before the box arrives under the gun, and de-energized at 351°. At 1000 RPM, the transducer will rotate (15 msec x 6°), or 90° during the response time, and the gun must be energized at 20° and de-energized at 270°. These values are visually represented in Figure 25 below.

Setting Speed Comp

In many applications, speed compensation can be set by jogging the line to determine ON and OFF setpoints at zero speed, then entering the speed compensation value into the controller. In the previous example, the line would be jogged until the leading edge of the box reaches the gun at 110° of transducer rotation. The glue gun output would be set to turn on at this point. Then, the line would be jogged until the trailing edge is under the gun at 360°, and the glue gun output would be set to turn off.

Once these on and off setpoints are entered, the glue system response time of 15 msec would be entered through SPEED COMP programming as described in Section 3. As line speed increases, the PS-6244 will automatically advance the setpoints to maintain the accuracy of the glue bead position.

⚠ CAUTION

When setting speed compensation on a system where zero speed setpoints have been established, always adjust the speed compensation value. Do not adjust the individual output setpoints!

Figure 24—Simple Application Using Speed Compensation

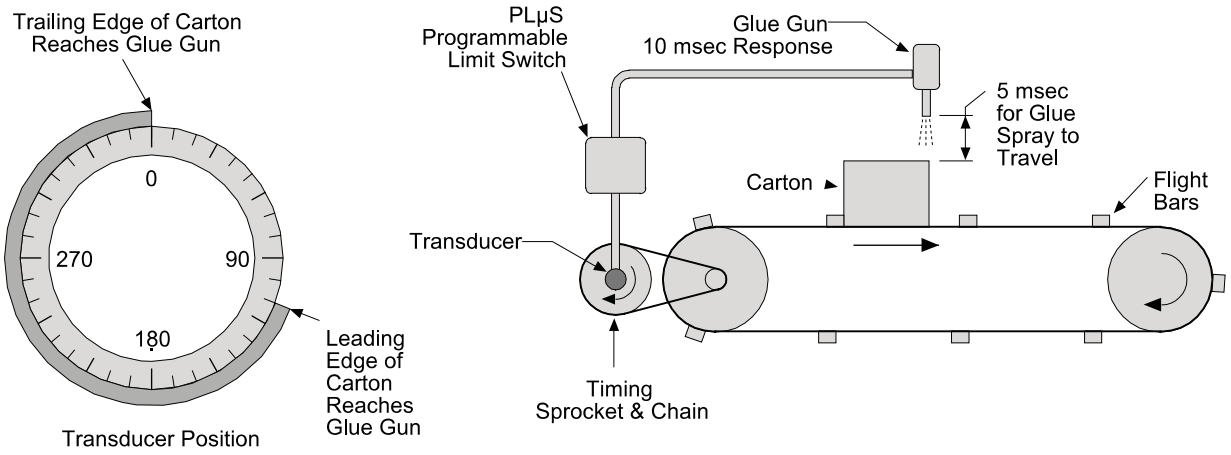
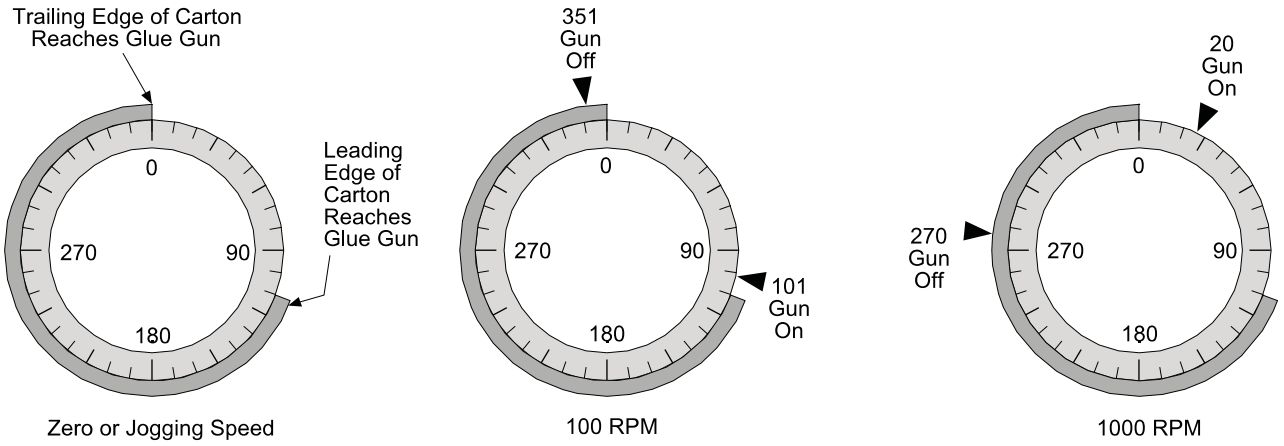


Figure 25—Speed Compensation at Various Speeds



Response Time Unknown

Suppose that in the previous example, the response time was unknown. To set up the machine, jog a carton through the machine and set the glue gun ON and OFF setpoints as described earlier. Then, estimate a response time and enter it into the controller using the SPEED COMP function described in Section 3.

Start the line and run cartons through it at a fixed line speed. Program SPEED COMP to adjust the **speed compensation value** as required for proper gluing. This can be done while the line is in motion. Once programmed, vary the line speed to confirm proper operation at all speeds, and fine tune the SPEED COMP value if necessary.

Can't Be Jogged?

Some machinery can't be jogged to determine ON and OFF setpoints. To set up this type of equipment, start the line, run cartons through it at a fixed line speed, and set the ON and OFF setpoints as required for proper gluing. Write them down for reference in the next step. SPEED COMP should be set to zero.

Next, increase the line speed and adjust the **setpoints** to restore proper gluing. You might be tempted to enter a speed compensation value to do this. However, since the setpoints were adjusted at the first speed with zero compensation, any change in compensation value now will upset the first pair of setpoints.

Once the second pair of setpoints is established, compare them to the first pair that you wrote down. Establish a ratio of degrees the setpoints advance versus the speed as shown in Figure 26. Convert this ratio to response time and enter it as the speed compensation value.

Since the new speed compensation value will affect the ON and OFF setpoints already programmed, you will need to start the line one more time and, at a constant speed, adjust the **ON and OFF setpoints** for proper gluing. Once set, vary the line speed to confirm that the speed compensation value is accurately adjusting the setpoints over the operating speed range.

Figure 26—Example for Calculating Speed Compensation

	RPM	Glue On	Glue Off	Difference
1st Line Speed:	200	73°	156°	83°
2nd Line Speed:	680	49°	132°	83°

Difference in Position: 73° - 49° = 24°
Difference in Speed: 680 RPM - 200 RPM = 480 RPM

Speed Compensation Value: Divide difference in position by difference in speed:

24°/480 RPM = 0.05° per 1 RPM

Since a shaft at 1 RPM rotates 0.006°/msec, this shaft would require (0.05/0.006), or 8.3 msec to rotate 0.05°. The speed compensation value is 8.3.

Leading/Trailing

In the previous example, the response time of the glue gun was the same whether turning on or turning off. While this applies to many systems, some devices have different on/off response times. For these devices, PS-6244 controllers with the "-L" option (Leading/Trailing Edge) provide the ability to program different speed compensation values for the leading and trailing edges of the pulse driving the device.

Setting Leading/Trailing Speed Comp

If the ON and OFF response times are known, jog the line to determine ON and OFF setpoints at zero speed. Then enter the speed compensation values through SPEED COMP programming as described in Section 3. When programming SPEED COMP, enter the leading edge, or ON response time at the "LE" prompt, and the trailing edge, or OFF response time at the "TE" prompt.

When setting speed compensation on a system where zero speed setpoints have been established, always adjust the speed compensation value. Do not adjust the individual output setpoints!

Response Times Unknown

IMPORTANT

If the response times are unknown, jog the line to determine ON and OFF setpoints at zero speed. Estimate both ON and OFF response times and enter them through the SPEED COMP function. The leading edge, or "LE" value will control the ON timing, while the trailing edge, or "TE" value will control the OFF timing. Start the line, run product through it at a fixed speed, and adjust each **speed compensation value** as required for proper gluing. This can be done while the line is in motion. Once programmed, vary the line speed to confirm proper operation at all speeds, and fine tune the SPEED COMP values if necessary.

Can't Be Jogged?

If it is impossible to jog the line, run the line at a fixed speed and set the ON and OFF setpoints as required with SPEED COMP set to zero for both the leading and trailing edges. Write down the ON and OFF setpoints.

Next, increase the line speed and adjust the **setpoints** to restore proper gluing. You might be tempted to adjust speed comp values to do this. However, since the setpoints were adjusted at the first speed with zero compensation, any change in compensation value now will upset the first pair of setpoints.

Once the second pair of setpoints is established, calculate separate leading and trailing edge speed comp values as shown in Figure 27 on the next page.

Since the new speed compensation value will affect the ON and OFF setpoints already programmed, you will need to start the line one more time and, at a constant speed, adjust the **ON and OFF setpoints** for proper gluing. Once set, vary the line speed to confirm that the speed compensation values are accurately adjusting the setpoints over the operating speed range.

Figure 28—Simple Sensor Gating Scheme

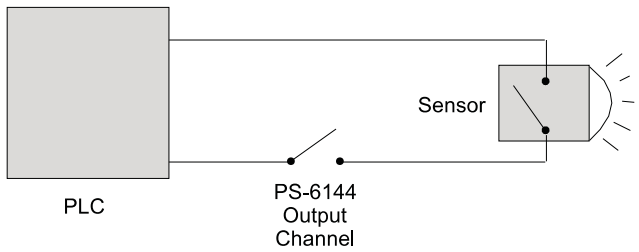


Figure 27—Example for Calculating Leading and Trailing Edge

	RPM	Glue On	Glue Off	Difference
1st Line Speed:	200	73°	156°	83°
2nd Line Speed:	680	49°	144°	95°

Note that the length of the pulse is 83° at 200 RPM, and 95° at 680 RPM. This means that the leading and trailing edges require different speed compensation values.

Leading Edge:

Difference in Position: 73° - 49° = 24°

Difference in Speed: 680 RPM - 200 RPM = 480 RPM

Speed Compensation Value: Divide difference in position by difference in speed:

24°/480 RPM = 0.05° per 1 RPM

Since a shaft at 1 RPM rotates 0.006°/msec (see page 4-2), this shaft would require (0.05/0.006), or 8.3 msec to rotate 0.05°. The speed compensation value is 8.3.

Trailing Edge:

Difference in Position: 156° - 144° = 12°

Difference in Speed: 680 RPM - 200 RPM = 480 RPM

Speed Compensation Value: Divide difference in position by difference in speed:

12°/480 RPM = 0.025°/1 RPM

Since a shaft at 1 RPM rotates 0.006°/msec (see page 4-2), this shaft would require (0.025/0.006), or 4.2 msec to rotate 0.05°. The speed compensation value is 4.2.

Negative Speed Compensation

Negative Speed Comp

Normal speed compensation **advances** the setpoints in an output channel to compensate for a fixed response time in the device being controlled. In some applications, however, **negative** speed compensation is required to **retard** the setpoints in an output channel. Negative speed compensation is usually found in two situations:

"Wrap-Up"

As some machines increase in speed, the drive train at some point between the resolver and the product "wraps-up," or shifts with respect to the resolver. If the wrap-up is proportional to machine speed, negative speed compensation can be used to retard an output channel's setpoints from the true resolver position, thus maintaining output accuracy.

Sensor Lag

While output channels are usually used to switch devices on and off, another use is to "gate" a sensor into a PLC or other computer. Figure 28 on the preceeding page illustrates a basic sensor gating scheme. In the illustration, the signal from the sensor reaches the PLC only when the output channel from the PLS is turned on.

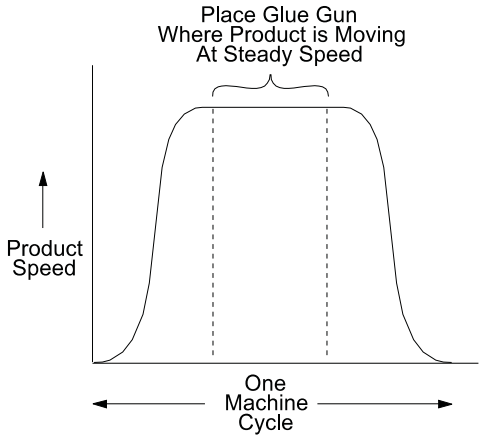
Most sensing devices have very fast response times. However, if a sensor's response time is slow, its signal will appear later and later in the machine cycle as the machine speeds up. Eventually, the sensor may lag the resolver so much that its signal fails to appear during the window programmed into the PS-6244's output channel.

Negative speed compensation will correct this problem by causing the output channel to lag its programmed machine position by a specified number of milliseconds. Negative speed compensation is calculated using the same method as standard speed compensation. See SPEED COMP in Section 3 for details on programming negative speed comp.

Device Placement

For speed compensation to work most effectively, the device being controlled by the output channel should be located on the machine in a position where the product is moving past the device at a constant speed. See Figure 29 below for an example. In the case of a glue gun, if the gun is ON when the speed is changing, the glue distribution may be inconsistent from carton to carton at varying machine speeds.

Figure 29—Product Speed Should be Constant Past Controlled Device



PLμSNet II Upload/Download Program (Must use version 2.34 or higher)

Description

PLμSNet II is a DOS program that will run on most IBM-PC compatible computers. When the serial port of the PC is connected to a PLμS Programmable Limit Switch, PLμSNet II can transfer programming values between the computer and the controller in either direction. PLμSNet II includes its own communications software with selection of baud rate, PLμS controller address, and the computer's COM port. No other communication software is needed.

Functions

PLμSNet II provides two main functions: **Uploading** a controller's complete set of programming values from the controller to an ASCII file on the PC; and **downloading** the contents of an ASCII from a computer to the PLμS controller. PLμSNet II also provides a text editor to view and change the contents of an ASCII file.

Applications

Hard Copy Reference—Using PLμSNet II, a PLμS controller's programming can be saved as an ASCII file and printed out for reference. The printout can be used to study line operation or to program other PLμS controllers in the plant.

Archival Storage—The ASCII file containing a PLμS controller's programming can be stored on a hard drive or floppy disk. In the event of accidental alteration or erasure of the controller's programming, PLμSNet II can be used to download the ASCII file to the controller to restore normal operation.

Programming Multiple Units—If several PLμS controllers will have the same values, one controller can be programmed correctly and its setpoints uploaded to a PC using PLμSNet II. The programming can then be downloaded to the other PLμS controllers, eliminating the need to manually re-enter setpoints for each controller.

Modify Programming—Once a program has been saved as an ASCII file, it can be studied and edited to create other versions of the program.

Contents

The PLμSNet II Communications Software Program includes these materials:

(1) Introduction sheet.

(1) Vinyl diskette holder with two diskettes: One containing the PLUSNET.EXE file, one to store uploaded files.

Cable

To use PLμSNet II, a serial communications cable is required to connect the PLμS controller to an IBM compatible personal computer. This cable can be purchased from Electro Cam Corp., or it can be built by the customer using the wiring information shown in the PLμS Programming and Installation Manual.

Installation

Copy the PLUSNET.EXE file to the desired directory on the PC.

Operation

Connect the PC and the PLμS controller with a communications cable and turn both units ON.

Start PLUSNET.EXE from the DOS command line, or from a DOS window within Microsoft Windows. The menus in the program are self-explanatory.

Sample ASCII Program Copied from PS-6244 Using PLuSNET II

```
2: 6244              ;Model
3: 197               ;Firmware revision
4: 24                ;Output quantity
5: 5,1               ;Option: -H; High resolution
5: 7,1               ;Option: -A; Analog output
6: 1                 ;Default Program
7: 1,400,400         ;Speed comp (.1mS): chn, leading, trailing
7: 3,350,350         ;Speed comp (.1mS): chn, leading, trailing
7: 6,100,100         ;Speed comp (.1mS): chn, leading, trailing
9: 1,90              ;Offset: group#, offset
11: 1,10,3000        ;Motion detection: level#, low rpm, high rpm
11: 2,10,200         ;Motion detection: level#, low rpm, high rpm
16: 1                ;Keyboard quantity
17: 1                ;Direction of increasing rotation: 0=CCW, 1=CW
18: 1000             ;Scale factor
19: 0                ;Shaft offset
20: 0                ;Analog quantity
21: 0                ;Resolver type: 0=ECC, 1=Other
22: 1                ;Program select mode: 0=bin, 1=BCD, 2=Gray
24: 0                ;Time base: 0=1mS, 1=.5mS, 2=.2mS
25: 1,1              ;Termination resistors: grp1 on/off, grp2 on/off
27: 1,1,0,0          ;Rate setup: mpx, div, dec pt, units
28: 50               ;Toggle rpm
29: 1                ;Rpm update rate: 0=1/Sec, 1=2/Sec, 2=10/Sec
30: 0                ;Speed comp mode: 0=Single, 1=L/T
31: 0                ;Group pos display mode: 0=Each, 1=One
32: 1                ;Operator ID number
33: 2                ;Setup ID number
34: 3                ;Master ID number
35: 1;1,1,1,1,1,1,1,1  ;Per chn enable: chns 1-8; chn on/off
35: 2;1,1,1,1,1,1,1,1  ;Per chn enable: chns 9-16; chn on/off
35: 3;1,1,1,1,1,1,1,1  ;Per chn enable: chns 17-24; chn on/off
35: 4;0,0,0,0,0,0,0,0  ;Per chn enable: chns 25-32; chn on/off
36: 1                ;Operator enable: Setpoints
37: 1                ;Operator enable: Default program
38: 1                ;Operator enable: Speed comp
39: 1                ;Operator enable: Timed outputs
40: 1                ;Operator enable: Offsets
41: 1                ;Operator enable: Motion detection
43: 1;0,1,2,0,0,0,0,0  ;Motion ANDing: chns 1-8; chn levels (0=none)
43: 2;0,0,0,0,0,0,0,0  ;Motion ANDing: chns 9-16; chn levels (0=none)
43: 3;0,0,0,0,0,0,0,0  ;Motion ANDing: chns 17-24; chn levels (0=none)
43: 4;0,0,0,0,0,0,0,0  ;Motion ANDing: chns 25-32; chn levels (0=none)
45: 1                ;Output group quantity
46: 1,24,0           ;Output group config: group, #chns, mode
47: 1                ;Enable input quantity
49: 1,1,0,90         ;Pulse: pgm, chn, on, off
49: 1,2,0,90         ;Pulse: pgm, chn, on, off
49: 1,3,0,90         ;Pulse: pgm, chn, on, off
49: 1,4,0,90         ;Pulse: pgm, chn, on, off
49: 1,5,0,90         ;Pulse: pgm, chn, on, off
49: 1,6,0,90         ;Pulse: pgm, chn, on, off
49: 1,7,0,90         ;Pulse: pgm, chn, on, off
49: 1,8,0,90         ;Pulse: pgm, chn, on, off
49: 1,9,0,90         ;Pulse: pgm, chn, on, off
49: 1,10,0,90        ;Pulse: pgm, chn, on, off
49: 1,11,0,90        ;Pulse: pgm, chn, on, off
49: 1,12,0,90        ;Pulse: pgm, chn, on, off
49: 1,13,0,90        ;Pulse: pgm, chn, on, off
49: 1,14,0,90        ;Pulse: pgm, chn, on, off
49: 1,15,0,90        ;Pulse: pgm, chn, on, off
49: 1,16,0,90        ;Pulse: pgm, chn, on, off
49: 1,17,0,90        ;Pulse: pgm, chn, on, off
49: 1,18,0,90        ;Pulse: pgm, chn, on, off
49: 1,19,0,90        ;Pulse: pgm, chn, on, off
49: 1,20,0,90        ;Pulse: pgm, chn, on, off
49: 1,21,0,90        ;Pulse: pgm, chn, on, off
49: 1,22,0,90        ;Pulse: pgm, chn, on, off
49: 1,23,0,90        ;Pulse: pgm, chn, on, off
49: 1,24,0,90        ;Pulse: pgm, chn, on, off
```

NOTE: Some functions may be listed on printout that are not actually in the unit.

PS-6244-24-N16M09 Controller Specs

Electrical

Input Voltage	20 - 30 VDC. Keypad/display is powered from controller.
Input Current	500 mA maximum (control only)
Power Consumption:	35 VA
Permanent Memory:	EEPROM (no battery required)
Accessory Power Out:	20 - 30 VDC, 250 mA Max (same source and voltage as input power)
Safety Compliance:	Listed to UL 508 industrial control equipment, file E151636

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
UL/NEMA Rating:	Keypad/display: 1, 4, 4X, or 12 enclosure

Physical

Overall Dimensions:	See Figure 4
Weight:	Controller: 3.5 lbs (1.6 kg). Keypad/Display: 0.5 lbs. (0.2 kg)

Mounting

Controller:	Brackets accept EN-50035 (“G” profile) or EN-50022 (“Top Hat” profile) DIN rail.
Keypad/Display:	May be mounted up to 1000' from controller. Multiple keypads may be connected to one controller.

Inputs

DC Inputs:	8 sinking or sourcing DC inputs, optically isolated.
Input On State Voltage:	10-30 VDC
Input Current:	11 mA @ 24 VDC
Program Select Response:	100 msec (hardware response plus processing time)
Response of All Other Inputs:	1 msec

Outputs

DC (Transistor) Outputs:	Outputs #1 through #16 are sinking, optically isolated.
Real World Outputs:	Outputs #17 through #24 may be any mix of AC, DC, or reed relay Slimline modules. Output #24 may also be a Slimline analog module. Output #25 must be a Slimline analog module. All modules optically isolated.

Analog Output

Output Types:	4-20 mA or 0-10 VDC, proportional to RPM.
Resolution:	12 bit
Update Frequency:	10 times/sec (100 msec)
Linearity:	±0.2% @ 77° F (25° C)
Set-up:	Offset & full scale RPM are programmable.

Operation

Scan Time:	100-250 microseconds (exact time determined by programming)
Position Resolution:	1000 increments
Speed Compensation:	Programmed in 0.1 msec steps. 16 individually compensated outputs max. Updated ten times per second.
Multiple Programs:	48 programs
Total Pulse Memory:	926 pulses
Pulses per Program:	512 maximum
Pulses per Output:	512 maximum
Maximum Speed:	3000 RPM

SLIMLINE Output Module Specifications

AC Outputs — **Part # EC-OAC240-3**

Output Voltage:	24 to 280 VAC
Output Current:	3 Amps cont. up to 113° F
	2 Amps cont. @ 158° F
1 Cycle Surge:	80 Amps peak
Turn On Time:	Random (Not 0 Cross)
Turn Off Time:	0 Cross (max time: 1/2 cycle)
Off State Leakage:	2 mA max
Output Voltage Drop:	1.6 Volts max
Operating Temp.	–22° to +158° F

DC Output, 60 VDC — **Part # EC-ODC060-3**

Output Voltage:	0 to 60 VDC
Output Current:	3 Amps cont. up to 113° F
	2 Amps cont. @ 158° F
1 Second Surge:	5 Amps
Turn On Time:	40 Microseconds
Turn Off Time:	140 Microseconds
Off State Leakage:	1 uA typical
Output Voltage Drop:	1.6 Volts max
Operating Temp.	–22° to +158° F

DC Outputs, 200 VDC — **Part # EC-ODC200-1 (Slimline)**

Output Voltage:	0 to 200 VDC
Output Current:	1 Amp cont. up to 113° F
	.5 Amps cont. @ 158° F
1 Second Surge:	5 Amps
Turn On:	40 Microseconds
Turn Off:	140 Microseconds
Off State Leakage:	1 uA typical
Output Voltage Drop:	1.6 Volts max
Operating Temp.	–22° to +158° F

Transistor Outputs — **Part # PS-9011-2803** (ULN 2803A)

Output Type:	Current Sinking (NPN)
Output Voltage:	5–30 VDC
Output Current:	50 mA cont. max (each output)
Input Voltage:	10–30 VDC

Analog Output, 0-10 VDC — **Part # EC-SANL-010V**

Resolution:	12 Bits (4096 Increments)
Output Voltage:	0-10 VDC
Output Current:	5 mA Max
Output Type:	Isolated
Load Resistance:	2 K Ohm min.
Linearity:	±0.2% @ 77° F (25° C)

Analog Output, 4-20 mA — **Part # EC-SANL-420M**

Resolution:	12 Bits (4096 Increments)
Output Voltage:	4-20 mA
Output Current:	20 mA Max
Output Type:	Isolated
Load Resistance:	275 Ohm max.
Linearity:	±0.2% @ 77° F (25° C)

Factory Defaults

Analog Outputs	
Quantity:	0
Offset:	0
High RPM:	2000
Communications	
Type:	RS-485
Baud Rate:	9600
Default Program:	1
Enable Codes	
Operator:	1
Setup:	2
Master:	3
Enable Options:	ON for all functions
Increasing Direction:	CCW
Input ANDing:	OFF
Keyboard Quantity:	1
Motion ANDing:	OFF
Motion Detection:	Lo 10 RPM, Hi 3000 RPM both levels
Offset:	0
Per Channel Enable:	All channels ON
Program Select Mode:	BIN (Binary)
Rate:	1X, RPM
RPM Update:	1/S
Shift Position:	0
Shift Reg. ANDing:	OFF
Speed Comp:	All channels 0
Toggle RPM:	20 RPM

Index

Entries in ALL CAPS are programming functions which are arranged alphabetically in Section 3.

Entries in ALL CAPS are programming functions which are arranged alphabetically in Section 3.

PLuS 6244 Setpoint Record

Date:

PLuS Program #:_____ **Description:** _____

ANDed With…

CHN	On	Off	Input #	Motion Level #	Shift Count	Speed Comp	Other Comments (multiple pulses, etc.)
1	____	____	____	____	___	_____	_____
2	____	____	____	____	___	_____	_____
3	____	____	____	____	___	_____	_____
4	____	____	____	____	___	_____	_____
5	____	____	____	____	___	_____	_____
6	____	____	____	____	___	_____	_____
7	____	____	____	____	___	_____	_____
8	____	____	____	____	___	_____	_____
9	____	____	____	____	___	_____	_____
10	____	____	____	____	___	_____	_____
11	____	____	____	____	___	_____	_____
12	____	____	____	____	___	_____	_____
13	____	____	____	____	___	_____	_____
14	____	____	____	____	___	_____	_____
15	____	____	____	____	___	_____	_____
16	____	____	____	____	___	_____	_____
17	____	____	____	____	___	_____	_____
18	____	____	____	____	___	_____	_____
19	____	____	____	____	___	_____	_____
20	____	____	____	____	___	_____	_____
21	____	____	____	____	___	_____	_____
22	____	____	____	____	___	_____	_____
23	____	____	____	____	___	_____	_____
24	____	____	____	____	___	_____	_____
25	____	____	____	____	___	_____	_____

Analog Outputs

Output Channel #: _____ ✶ 4-20mA ✶ 0-10 VDC Offset: ____ High RPM: _____

Output Channel #: _____ ✶ 4-20mA ✶ 0-10 VDC Offset: ____ High RPM: _____

Global Settings

Motion Detection Levels: L1: _____ RPM L2:_____ RPM

Shift Position: _____

Offset: _____

Comments: _____

_____

_____

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