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CE

PK3 Packaged Stepper Drive User Guide

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Part No: 1600.063.07 January, 1997

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IMPORTANT INFORMATION FOR USERS

Installation and Operation of Digiplan Equipment

It is important that Digiplan motion control equipment is installed and operated in such a way that all applicable safety requirements are met. Note that it may be necessary for the completed installation to comply with the Low Voltage Directive or Machinery Directive. It is your responsibility as an installer to ensure that you identify the relevant safety standards and comply with them; failure to do so may result in damage to equipment and personal injury. In particular, you should study the contents of this user guide carefully before installing or operating the equipment.

The installation, set-up, test and maintenance procedures given in this User Guide should only be carried out by competent personnel trained in the installation of electronic equipment. Such personnel should be aware of the potential electrical and mechanical hazards associated with mains-powered motion control equipment - please see the safety warning below. The individual or group having overall responsibility for this equipment must ensure that operators are adequately trained.

Under no circumstances will the suppliers of the equipment be liable for any incidental, consequential or special damages of any kind whatsoever, including but not limited to lost profits arising from or in any way connected with the use of the equipment or this user guide.



SAFETY WARNING

High-performance motion control equipment is capable of producing rapid movement and very high forces. Unexpected motion may occur especially during the development of controller programs. ***KEEP WELL CLEAR*** of any machinery driven by stepper or servo motors. Never touch any part of the equipment while it is in operation.

This product is sold as a motion control component to be installed in a complete system using good engineering practice. Care must be taken to ensure that the product is installed and used in a safe manner according to local safety laws and regulations. In particular, the product must be enclosed such that no part is accessible while power may be applied.

If the equipment is used in any manner that does not conform to the instructions given in this User Guide, then the protection provided by the equipment may be impaired.

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User Guide Change Summary

The following is a summary of the primary changes to this user guide since the last version was released. This user guide, version 1600.063.07, supersedes version 1600.063.06.

When a user guide is updated, the new or changed text is differentiated with a change bar in the outside margin (this paragraph is an example). If an entire chapter is changed, the change bar is located on the outside margin of the chapter title.

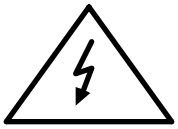
Major changes introduced at revision 07 are:

New value of mains fuse for 230V operation

Warning symbols used on the PK3 series of drives have the following meanings:


Refer to the accompanying documentation

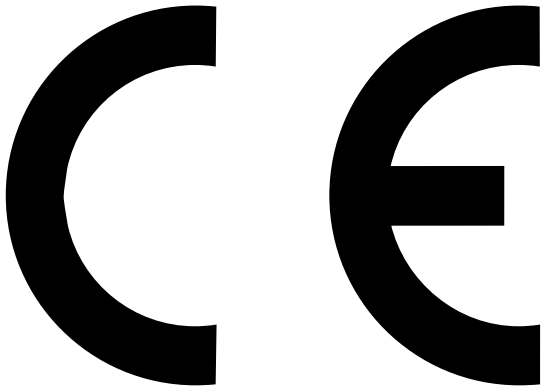

Protective conductor terminal


Risk of electric shock


Alternating current


Hot surface


Frame or chassis terminal



Product Type: **PK3 Packaged Stepper Drive**

The above product is in compliance with the requirements of directives

- **73/23/EEC** **Low Voltage Directive**
- **93/68/EEC** **CE Marking Directive**

The PK3 drive is sold as a complex component to professional assemblers, as a component it is not compliant with Electromagnetic Compatibility Directive 89/336/EEC.

Chapter 1. INTRODUCTION

Product Description

The PK3 Drive is a complete packaged full/half-step drive system offering high standards of performance for low-power applications. Front panel DIP switches allow the user to quickly program important control parameters including full/half-step modes, drive reset, energize, self test, and drive output current. LED indicators provide status and diagnostic information to the user.

Each model comes complete with drive, power supply, integral heat sink, and power cord or mains connector. The PK3 Drive features switch-selectable motor currents from 0.8 to 3.0 amps per phase. Motor/drive matching is not critical, as long as the motor meets the specified requirements.

The PK3 offers a built-in oscillator. This on-board clock allows the user to move the motor at slow (40 to 1,000 steps/sec) or high (400 to 10,000 steps/sec) speeds in forward or reverse directions. This jog feature is accessed by wiring switches directly into the 25-pin connector on the drive. The combination of push buttons and a timer or limit switch can provide indexer-type functions in simple, low-accuracy feed-to-length applications.

Drive Features

Features of the PK3 Drive are as follows:

- Fully packaged with integral power supply
- Operates directly from 115/230V AC without an external transformer
- Short-circuit protection phase-to-phase and between phases (not to ground)
- User-selectable 200 or 400 step/rev resolution
- Standby circuit reduces motor current by 50% at standstill
- User-selectable motor current from 0.8 to 3.0 amps
- Speeds up to 1,800 rpm
- LED status and diagnostic indicators
- Built-in oscillator provides manual positioning
- Compact (7.1" x 6.6" x 3") enclosure with integral heat sink

What You Should Have

Upon receipt, you should inspect your PK3 Stepper System for obvious damage to its shipping container. Report any such damage to the shipping company as soon as possible. Digiplan cannot be held responsible for damage incurred in shipment. Carefully unpack and inspect your PK3 Stepper System. The items listed in Table 1-1 should be present and in good condition.

Ship Kit Table

Part Description
PK3 Drive
Motor Connector (4-way screw terminal)
Moulded Cable 3 cond. AC (USA)
AC Power Connector (UK)
Male 25-Pin "D" Connector
25-Pin "D" Connector Shell
User Guide

Table 1-1. PK3 Ship Kit

Chapter 2. INSTALLATION

Installation

Mounting

PK3 drives must be installed by competent personnel familiar with the the installation, commissioning and operation of motion control equipment. In the final application the equipment must be enclosed to prevent the operator coming into contact with any high voltages.

The PK3 drives are not EMC compliant, they are sold as a complex component for use by professional assemblers of motion control systems.

Metal equipment cabinets offer the most advantages for siting the equipment since they can provide operator protection, EMC screening and can be readily fitted with interlocks arranged to remove all AC power when the cabinet door is opened.

Setting Drive Functions

DIP Switch Settings

Beside the D-type connector on the front panel is an 8-position DIP switch for setting the drive operating conditions. Factory default DIP switch settings for the PK3 are presented in Table 2-1.

DIP Switch	Function	Normal Setting
1	Self-Test	OFF
2	Energize	ON
3	Profile	ON
4	Full/Half-Step Mode	OFF
5	Current	OFF*
6	Current	OFF*
7	Current	OFF*
8	Current	OFF*
** This setting gives maximum motor current*		

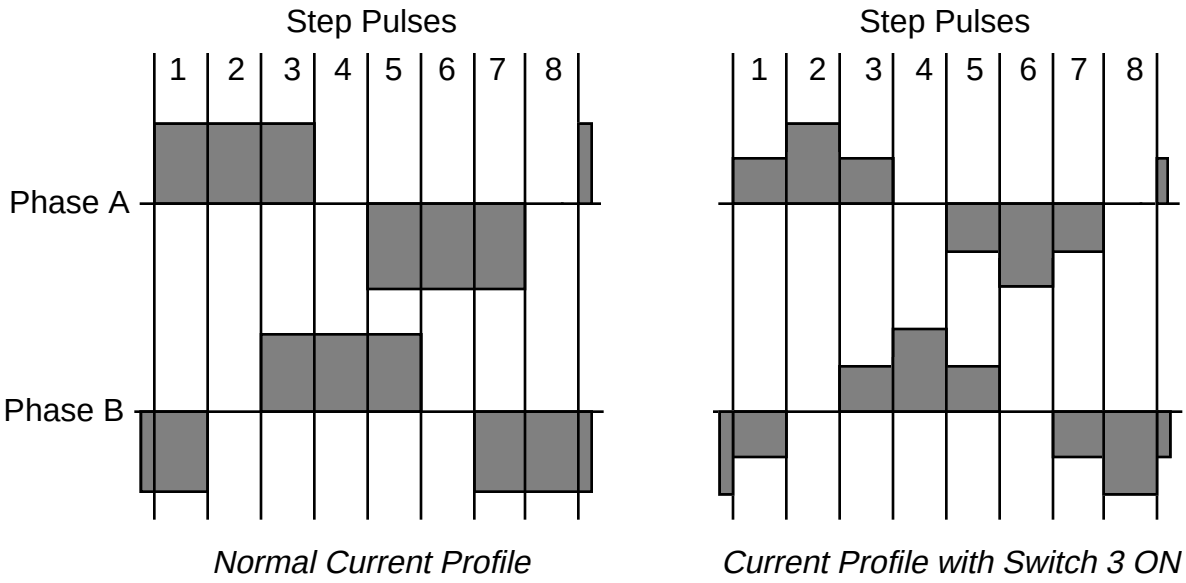
Table 2-1. Factory Default DIP Switch Settings

Self Test (Switch 1)

This switch is used for test purposes only. Turning this switch ON will cause the motor to rotate at a nominal speed of 1 rev/sec (rps) in half-step mode, and 2 rps in full-step mode. ***NOTE****: The drive must be energized (DIP Switch 2 ON) for this function to operate.* DIP switch 1 should normally be set to the OFF position.

Energize (Switch 2) Turn ON this switch to permanently energize the drive. A fault condition can be reset by momentarily turning this switch OFF. When the drive is being controlled from a Compumotor indexer, the opto-isolated *shutdown* input may be used to de-energize the drive. In this case, DIP switch 2 must be set to the ON position for the shutdown input to operate.

Profile (Switch 3) This switch is normally left in the ON position. The switch is used in the half-step mode to re-shape the drive current profile as illustrated in Figure 2-1. With the profile switch ON, the two-phase-on motor current is reduced by approximately 16%. This will result in improved smoothness at low speeds; however, there will be some loss of torque as a result of the lower average current.



Normal Current Profile *Current Profile with Switch 3 ON*

Figure 2-1. Normal Current Profile and Current Profile with DIP Switch 3 ON

Resolution Selection (Switch 4) This DIP switch selects the motor resolution. Turn ON this switch to select the full-step mode (200 steps/rev) and OFF to select the half-step mode (400 steps/rev).

CAUTION

Do not change the mode of operation hile the drive is powered up.

Switches 5 - 8

Current programming. The table below gives the settings of these four switches for various motor currents. The actual motor current will depend partly on winding inductance, a lower inductance giving a lower average current. Note that the drive current is reduced by approximately 50% at standstill.

	DIP Switch Settings Current			
Current	**5**	**6**	**7**	**8**
3.0A	OFF	OFF	OFF	OFF
2.7A	OFF	OFF	OFF	ON
2.4A	OFF	OFF	ON	OFF
2.1A	OFF	OFF	ON	ON
1.8A	OFF	ON	OFF	OFF
1.5A	OFF	ON	ON	OFF
1.2A	ON	OFF	OFF	OFF
0.8A	ON	ON	ON	ON

Table 2-2. Optional Motor Current DIP Switch Settings

Supply Setting

The PK3 can operate at either 115V AC or 230V AC. Use the power selection switch on the drive front panel to specify which input voltage you will use (see Figure 2-2). Note a change of voltage setting will require a change of fuse type, see **Specifications**.

CAUTION

Do not adjust the power selection switch while power is applied to the drive.

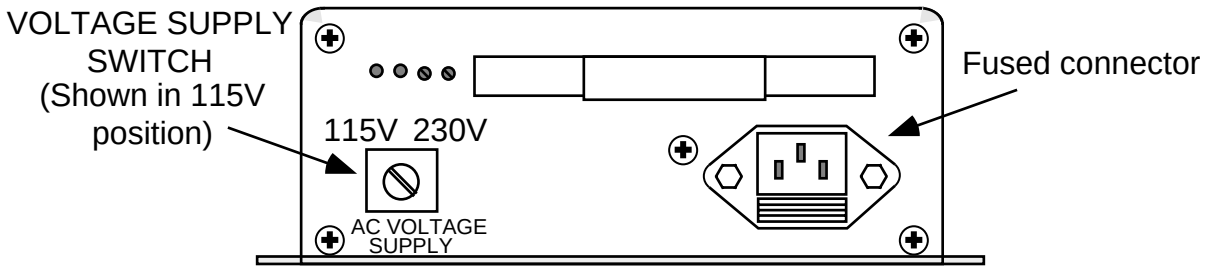


Figure 2-2. AC Supply Voltage Selection Switch

System Connections

Figure 2-3 illustrates the connectors on the PK3 front panel, and shows the pinouts for indexer and motor connections.

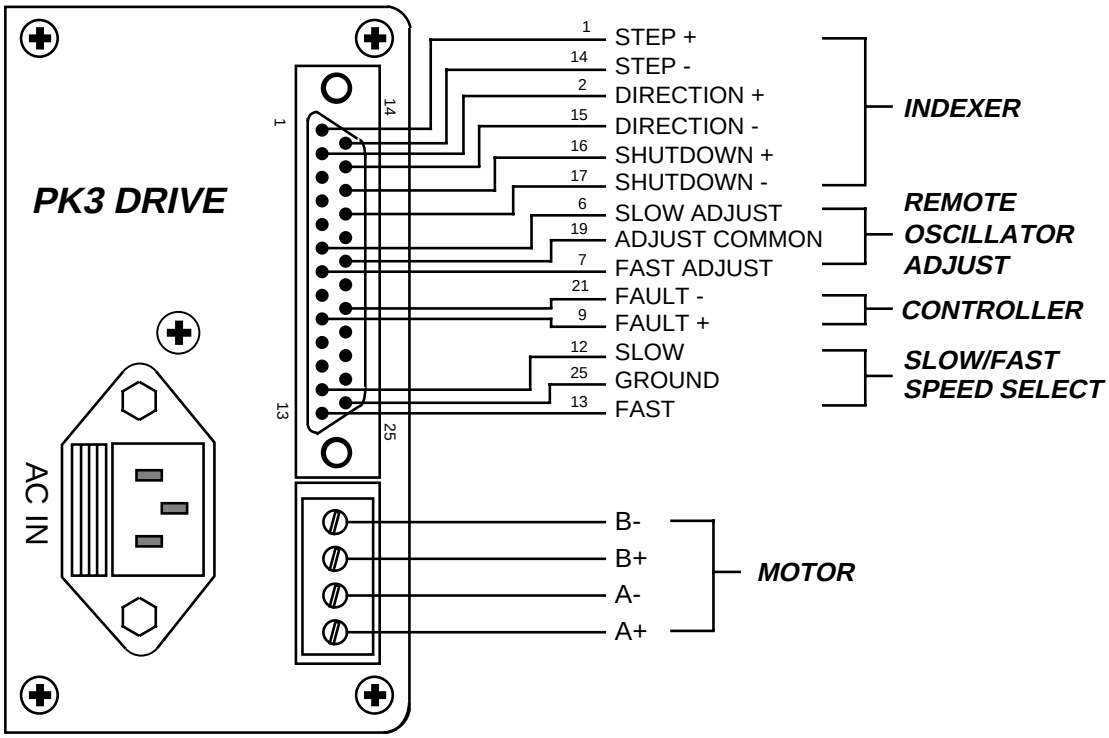


Figure 2-3. PK3 Connectors

AC Power Connections

Depending on location, the drive will be supplied either with a moulded cord or a separate connector. When using the separate connector, connect the supply to the terminals marked L and N, and ground the terminal marked E.

Mains wiring should use an approved cable type (minimum CSA 0.75mm^2). The mains wiring should be routed away from signal wiring and the motor cable.

It is important that the equipment is earthed.

A disconnect device must be provided which isolates all mains supply current-carrying conductors. If the mains supply is permanently connected, a switch or circuit breaker must be included in the wiring. It must be placed close to the equipment (less than 1 metre) and marked as the disconnecting device for the equipment.

Motor Connections

Use 24/0.2mm (18 AWG, CSA 0.75mm^2) wire (or larger) for motor connections.

Tables 2-3 and 2-4 show connection details for a variety of motor types. Connect the motor leads to terminals A+, A-, B+, and B- as shown in Figure 2-5. Connect one phase of the motor to terminals A+ and A-, and the other phase to terminals B+ and B-. To reverse the direction of rotation relative to the direction control input, interchange the connections to A+ and A-.

The motor windings may be connected either in series or parallel as shown in Figure 2-4. The preferred connection mode depends on the application since the performance characteristics differ.

Series connection gives double the ampere-turns of a single coil at a given current and there is therefore a significant increase in low-speed torque. However, the inductance per phase is increased to four times the inductance of one coil, causing the high-speed torque to drop off more rapidly.

For the same current, parallel connection results in less torque at low speeds but the torque will be maintained to higher stepping rates. The maximum power obtainable from the motor is greater in the parallel mode. With a 6-lead motor, the two halves of each winding cannot be connected in parallel. However, using one-half of each winding produces the same torque as an equivalent 8-lead motor connected in parallel. The advantage of parallel connection is a reduction in resistive losses which allows a higher current to be used.

Motor Cable

The recommended gauge for PK3 drives is greater or equal to 0.75mm^2. Use a cable containing four conductors plus the braided screen. The temperature rating of the cable must be greater than or equal to the motor case temperature and should be at least 80°C.

Motor Earth It is recommended to earth the motor body.

WARNING

The case of a motor can become very hot. Precautions may need to be taken to prevent operator contact.

It is most important that any unused motor leads are individually insulated, and under no circumstance should they be joined together unless this is specified in the motor connection data. *Do not attempt to use a 5-lead motor with this drive.*

CAUTION

Be sure to use good wiring practices when connecting or jumpering motor wires.

NOTE: If the PK3 was sold with a QM or RM motor (sold in the USA) refer to the "Digiplan Motor User Guide" supplied with the motor. This motor user guide contains complete wiring and current information for these motors.

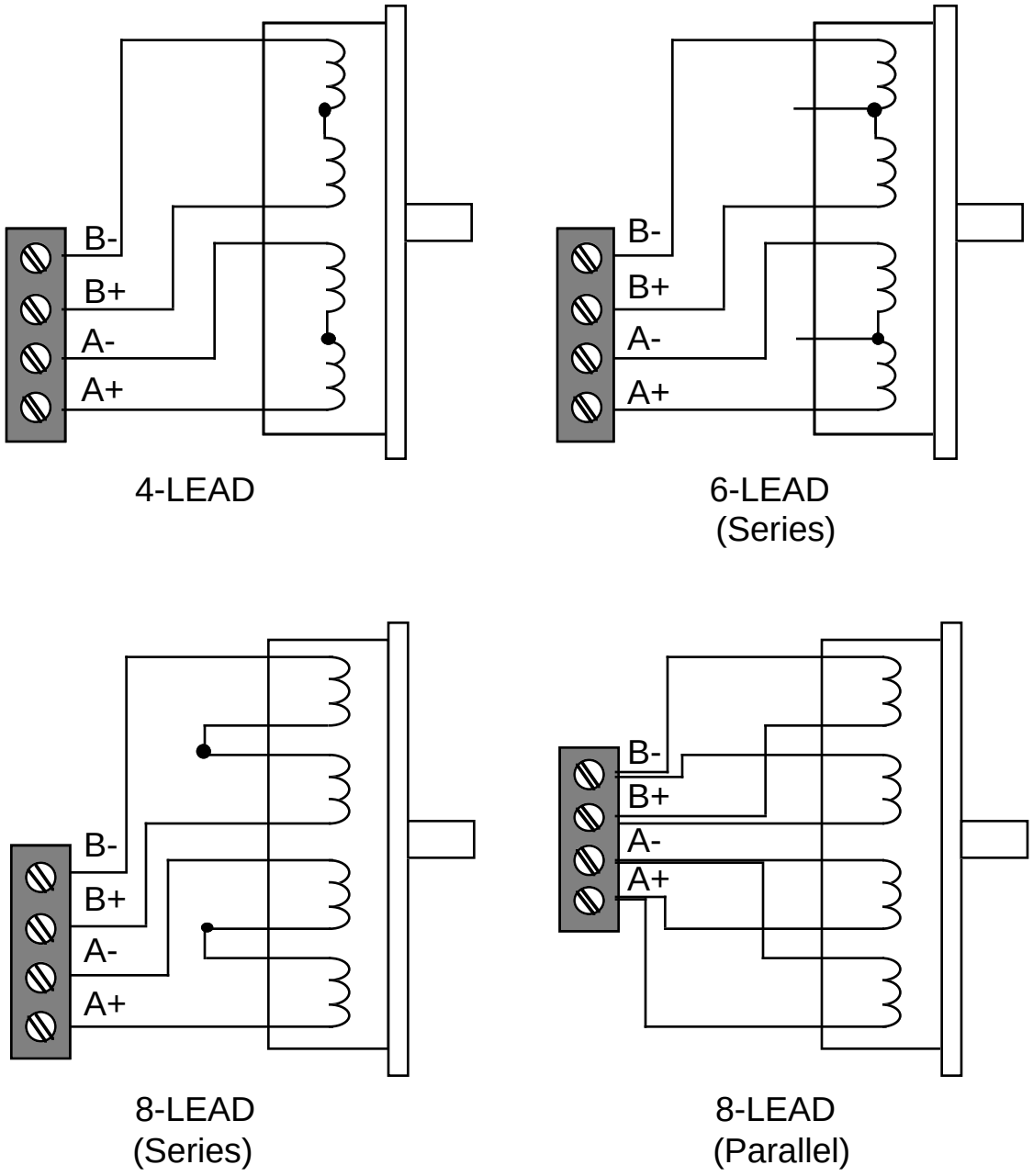


Figure 2-4. Typical Motor Connections for 4, 6, and 8 Lead Motors

N.C. - no connection.

MAKE	TYPE	A+	A–	B–	B+	NOTES
Evershed & Vignoles	6-lead	Red	Green	Blue	Yellow	Brown & Black N.C.
	8-lead	Red	Green	Blue	Yellow	Link Grey & Pink, link White & Violet
	T.box	1	3	4	2	Link 5 & 6, link 7 & 8
Sigma	6-lead	Black	Orange	Red	Yellow	White/Blk/Org, White/Red/Yel N.C.
	8-lead	Black	Orange	Red	Yellow	Link Wh/Blk & Wh/Org Link Wh/Red & Wh/Yel
	T.box	1	3	2	4	Link 5 & 6,link 7 & 8
Astrosyn, Rapidsyn, Slo-syn	6-lead	Red	Red/Wh	Grn	Grn/Wh	White & Black N.C.
	T.box (x6)	1	3	4	5	2 & 6 N.C.
Slo-syn	8-lead	Red	Red/Wh	Grn	Grn/Wh	Link Black & White, link Org & Blk/Wh
	T.box (x8)	1	3	5	4	Link 2 & 6, link 7 & 8
Stebon	8-lead	Red	Yel	Pink	Blk	Link Blue & violet, link White & Grey
	T.box	1	2	3	4	Link 5 & 6, link 7 & 8
G.E.C.	T.box	1	2	3	4	Link 5 & 6, link 7 & 8
M.A.E.	6-lead	Grn/Wh	Grn	Red	Red/Wh	White & Black N.C.
	8-lead	Black	Orange	Red	Yellow	Link Wh/Blk & Wh/Org, Link Wh/Red & Wh/Yel
	T.box	6	5	8	7	Link 1 & 3, link 2 & 4
Zebotronics	T.box	1	4	5	8	Link 2 & 3, link 6 & 7
Oriental	6-lead	Black	Green	Red	Blue	Yellow & White N.C.
Sonceboz	8-lead	Green	Grn/Wh	Red	Red/Wh	Link Org & Blk/Wh, link Black & White
Japan Servo	6-lead	Red	Blue	Green	Yellow	2 x White N.C.
Escap	8-lead	Brown	Org/Wh	Red	Yel/Wh	Link Brn/Wh & Org, Link Red/Wh & Yellow.
Bodine	8-lead	Brown	Orange	Yellow	Red	Link Wh/Brn & Wh/Org, link Wh/Yel & Wh/Red.
	T.box	1	3	4	2	Link 5 & 7,link 6 & 8
Digiplan/Compumotor RM Motor	8-lead	Black	Orange	Red	Yellow	LinkWh/Blk & Wh/Org. Link Wh/Red & Wh/Yel
Digiplan/Compumotor QM Motor	8-lead	Red	Black	White	Green	Link Yel & Blue Link Org & Brown

Table 2-3. Motor Connection Data - Windings in Series

N.C. - no connection. For 6-lead motors, connections shown are for one half-winding.

MAKE	TYPE	A+	A–	B–	B+	NOTES
Evershed & Vignoles	6-lead	Red	Brown	Blue	Black	Grn & Yellow N.C.
	8-lead	Rd & Pink	Grn & Grey	Blue & Violet	Yel & White	
	T.box	1 & 6	3 & 5	4 & 8	2 & 7	
Sigma	6-lead	Black	Wh/Blk/ Orange	Red	Wh/Red/ Yellow	Or & Yellow N.C.
	8-lead	Black & Wh/Or	Or & Wh/Blk	Red/ Wh/Yel	Yel & Wh/Red	
	T.box	1 & 5	3 & 6	2 & 7	4 & 8	
Astrosyn, Rapidsyn, Slo-syn	6-lead	Red	Black	Green	White	Red/Wh & Grn/Wh N.C.
	T.box(x6)	1	6	4	2	3 & 5 N.C.
Slo-syn	8-lead	Red & White	Blk & Red/Wh	Grn & Blk/Wh	Org & Grn/Wh	
	T.box(x8)	1 & 2	3 & 6	4 & 7	5 & 8	
Stebon	8-lead	Rd & Blue	Yel & Violet	Wh & Pink	Black & Grey	
	T.box	1 & 6	2 & 5	3 & 8	4 & 7	
G.E.C.	T.box	1 & 6	2 & 5	3 & 8	4 & 7	
M.A.E.	6-lead	Grn/Wh	White	Red	Black	Grn & Red N.C
	8-lead	Black & Wh/Or	Or & Wh/Blk	Red & Wh/Yel	Yel & Wh/Red	
	T.box	3 & 6	1 & 5	4 & 8	2 & 7	
Zebotronics	T.box	1 & 2	3 & 4	5 & 6	7 & 8	
Oriental	6-lead	Black	Yellow	Red	White	Grn & Blue N.C.
Sonceboz	8-lead	Grn & Blk/Wh	Or & Grn/Wh	Red & White	Blk & Red/Wh	
Japan Servo	6-lead	Red	White*	Green	White*	
Escap	8-lead	Brn & Orange	Brn/Wh & Org/Wh	Red & Yellow	Red/Wh & Yel/Wh	
Bodine	8-lead	Brn & Wh/Or	Wh/Brn & Orange	Yel & Wh/Red	Wh/Yel & Red	
	T.box	1 & 7	3 & 5	4 & 6	2 & 8	
Digiplan/Compumotor RM Motor	8-lead	Black & Wh/Or	Orange & Wh/Black	Red & Wh/Yellow	Yellow & Wh/Red	
Digiplan/Compumotor QM Motor	8-lead	Red & Blue	Blk & Yellow	Wh & Brn	Green & Org.	

* Use correct White for each phase.

Table 2-4. Motor Connection Data - Windings in Parallel

I/O Connections

All control signal connections are made to a 25-pin D-type connector (see Figure 2-9). Most Digiplan and Compumotor controllers are supplied with interconnecting leads which will plug directly into the PK3.

Signal connections should be made with at least 7/0.2mm (24 AWG) wire size. To reduce the effect of radiated electrical noise it is suggested to shield all cables. *Take special care to ensure that the shield is grounded at the one end only.*

Table 2-5 below identifies the function of each pin on the 25-way D-type connector.

Pin	Function	Pin	Function
1	Step +	14	Step -
2	Direction +	15	Direction -
3	Not connected	16	Shutdown +
4	Not connected	17	Shutdown -
5	Not connected	18	Not connected
6	Slow adjust	19	Adjust common
7	Fast adjust	20	Not connected
8	Not connected	21	Fault -
9	Fault +	22	Not connected
10	Not connected	23	Not connected
11	Not connected	24	Not connected
12	$\overline{\text{Slow}}$	25	Ground
13	$\overline{\text{Fast}}$		

Table 2-5. I/O Pin Functions

Indexer Inputs

Figure 2-5 below is a block diagram illustrating connections between the PK3 and an indexer.

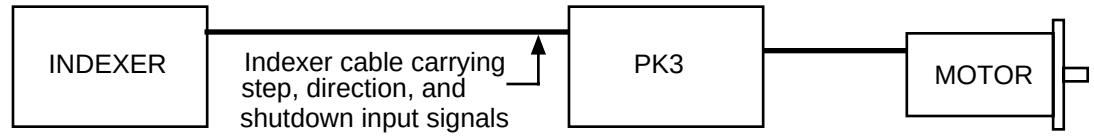


Figure 2-5. Indexer Connections

Step +/ Step - A pulse on inputs 1 and 14 will cause the motor to step. The input should remain high for at least 10μS. These inputs are internally connected to the built-in oscillator on the drive, but can be driven from an external source, such as a Digiplan or Compumotor indexer.

***NOTE**: The pulse width of all Compumotor indexers must be set to be compatible with the PK3. Consult your indexer user guide for instructions on changing pulse widths (or motor resolution).*

Direction +/ Direction - These inputs (pins 2 and 15) control the direction of the motor shaft rotation. Changing the level at these inputs will reverse direction.

Shutdown +/ Shutdown - These differential inputs (pins 16 and 17) are used in conjunction with DIP switch 2 to de-energize the motor. To remotely de-energize the motor, DIP switch 2 must be set to the ON position. When the shutdown + input is taken high, the drive will be de-energized and, if it is safe to do so, the motor shaft may be rotated *slowly* by hand. ***NOTE**: Back-driving the motor at high speed may damage the drive.* Taking the shutdown + input high will reset a fault condition, and the drive will re-energize when the input returns low.

The Step, Direction, and Shutdown inputs on the PK3 are optically isolated within the drive and are intended to be driven differentially from 5V logic levels. Figure 2-6 shows the circuit used on the step and direction inputs. In the case of the shutdown input, the capacitor is omitted and the resistor value is increased to 270Ω.

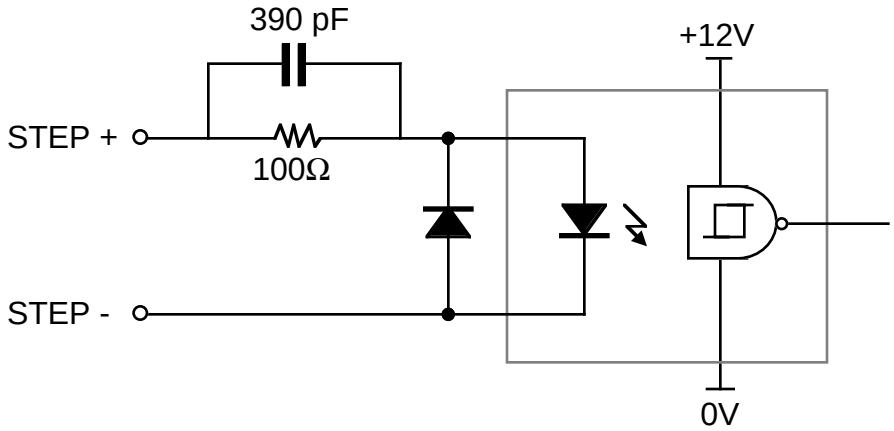


Figure 2-6. Opto-Isolated Input Circuits

If you control the drive from an alternative source, one of the methods shown in Figure 2-7 may be used. Circuits (a) and (b) both produce differential drive signals which give good noise immunity and represent the preferred driving method. Circuits (c) or (d) can be used when the source is an open-collector transistor

and either +5V or +24V is available as a pull-up source.

Note that the Step and Shutdown inputs are active when the opto-isolator is energized. In the case of an open-collector drive, the *transistor-on* condition will activate the input function.

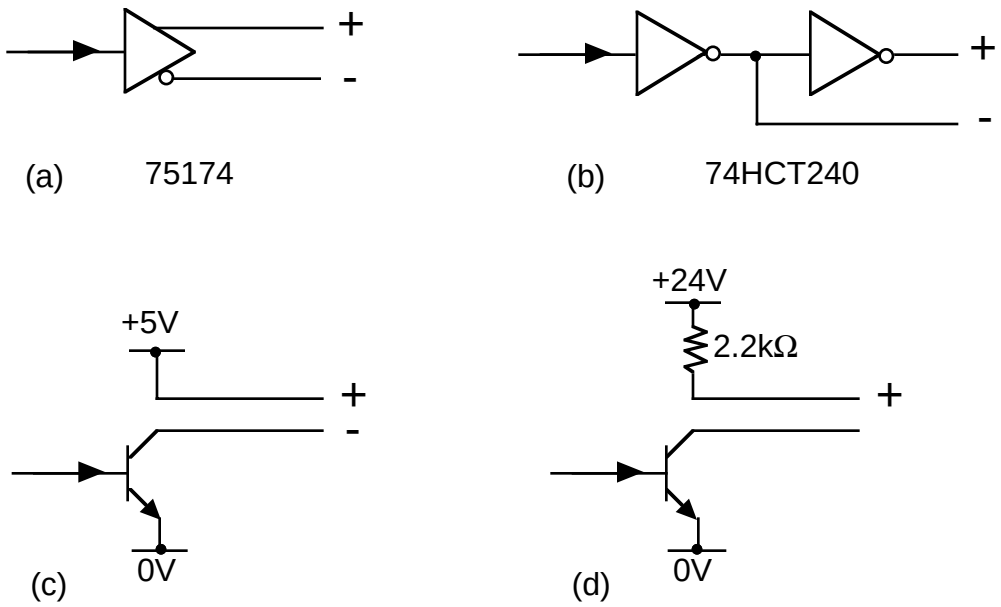


Figure 2-7. Alternative Drive Circuits

Control I/O

Fault +/ Fault - These are open collector outputs which go open when a fault condition occurs. Figure 2-8 shows a method of connecting the fault outputs (pins 9 and 21) using an external pull-up resistor.

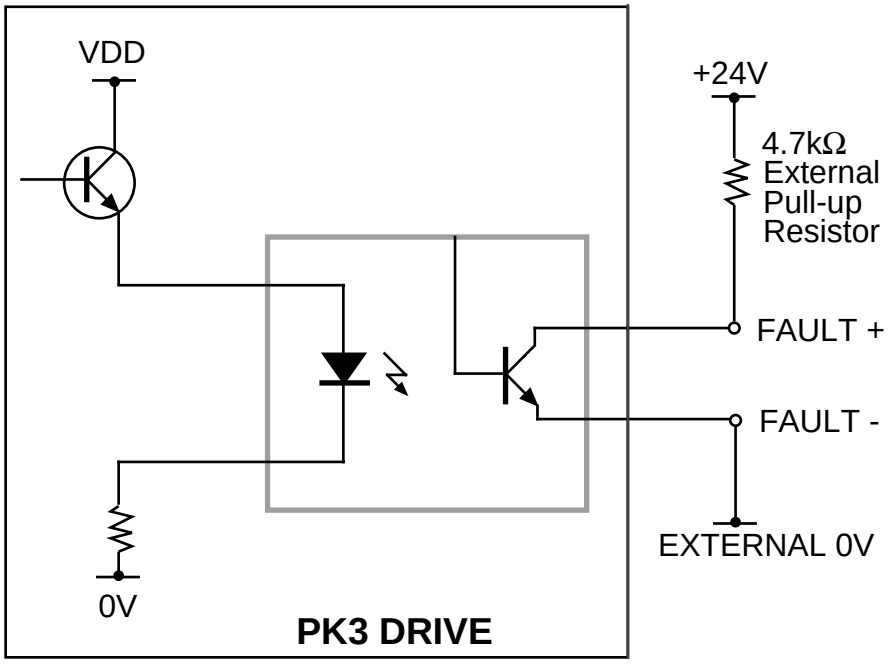


Figure 2-8. Fault Output Circuit

$\overline{\text{Slow}}$ Ground this input (pin 12) to run the internal oscillator at the slow rate (speed range 40 to 1000 steps/sec). Use the SLOW/Slow adjust potentiometer to set the desired rate.

$\overline{\text{Fast}}$ Ground this input (pin 13) to run the internal oscillator at the fast rate (speed range 400 to 10,000 steps/sec). Use the FAST/Fast adjust potentiometer to set the desired rate.

Ground (0V) Use this input (pin 25) as the common return point for the control signals SLOW and FAST.

Figure 2-9 is a wiring diagram illustrating typical control connections.

To change the motor direction when using the internal oscillator, the circuit shown may be used. The 3.9k resistor is used to supply current to the input opto-isolator.

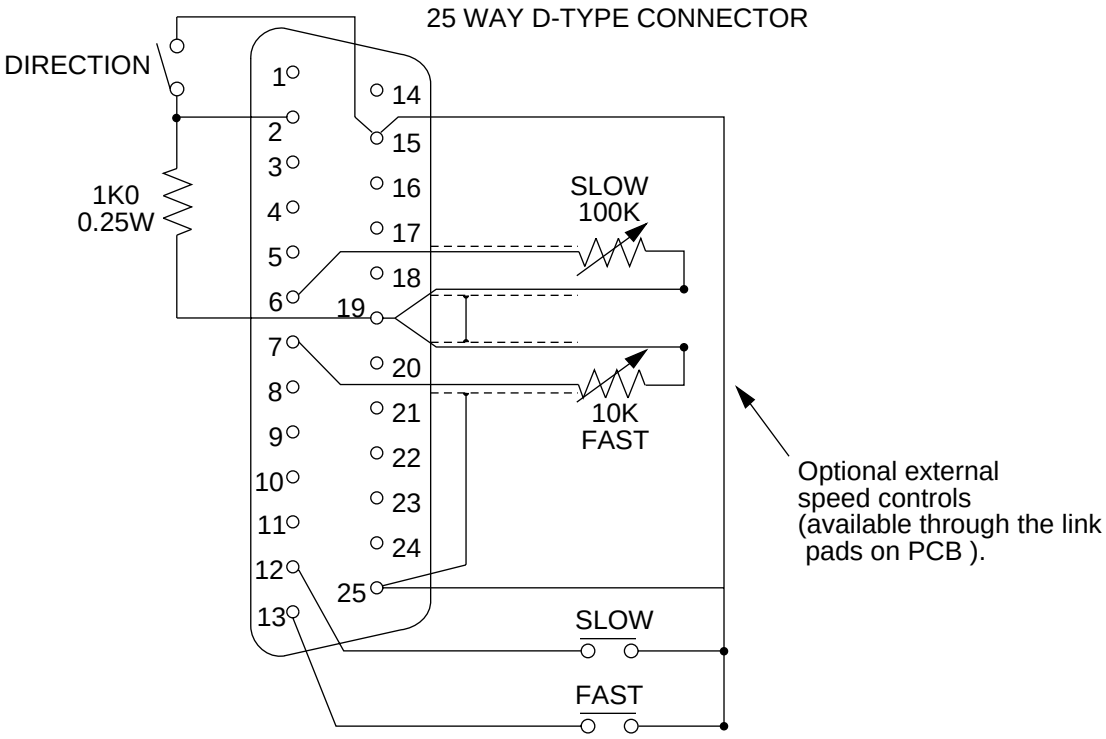


Figure 2-9. I/O Wiring Diagram

Fast and Slow Adjust

The functions Fast adjust, Slow adjust, and Adjust common (pins 6, 7, & 19) are brought out to the 25-pin D connector. Links are formed by soldering the two parts of link pads together (see Figure 2-10). The link pads are located behind the control connector on the component side of the board, and are accessible by removing the drive cover. The links are supplied soldered. If pins 6,7 & 19 need to be disconnected (e.g. for compatibility with early Compumotor indexers) the solder can be removed.

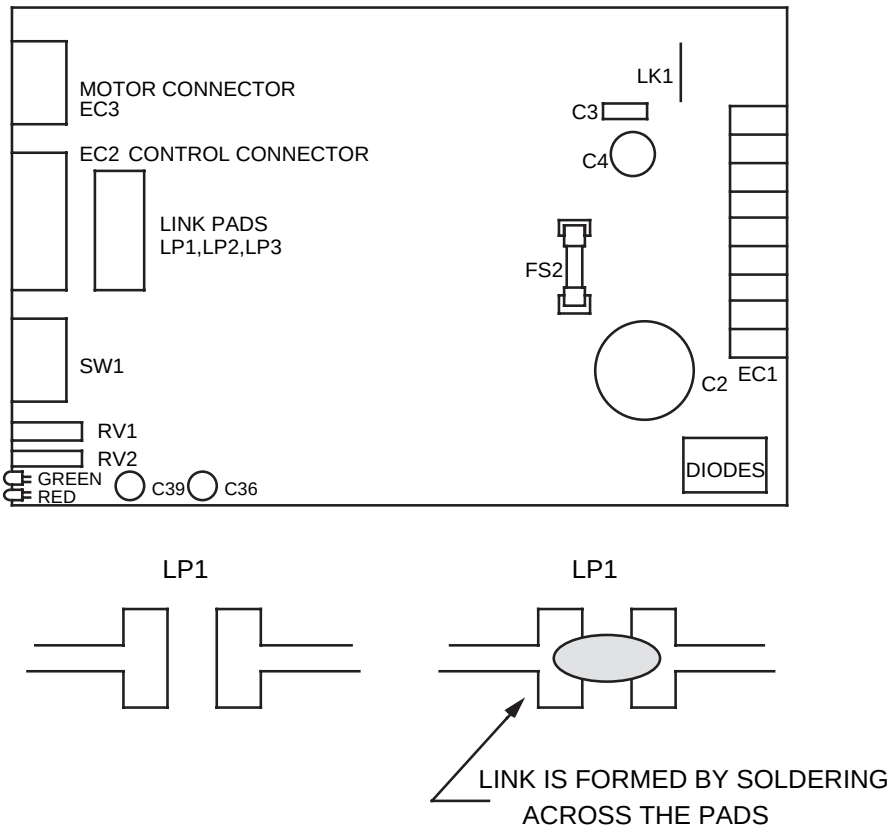


Figure 2-10. Location of Solder Link Pads

Slow/Slow Adjust

You can use the SLOW potentiometer, located next to the DIP switches on the drive front panel, to adjust the slow speed of the internal oscillator.

As illustrated in Figure 2-9, an alternative remote adjustment is possible by connecting an external potentiometer between the Slow adjust input (pin 6) and Adjust common (pin 19). A suitable value for the external potentiometer is 100KΩ. To use this facility, it is advisable to turn the SLOW potentiometer fully counterclockwise.

Fast/Fast Adjust

You can use the FAST potentiometer, also located next to the DIP switches on the drive front panel, to adjust the fast speed of the internal oscillator.

As illustrated in Figure 2-9, an alternative remote adjustment is possible by connecting an external potentiometer between the Fast adjust input (pin 7) and Adjust common (pin 19). A suitable value for the external potentiometer is 10KΩ. To use this facility, it is advisable to turn the FAST potentiometer fully counterclockwise.

Adjust Common

This input is used in conjunction with Slow adjust (pin 6) or Fast adjust (pin 7) to control the speed of the internal oscillator.

Internal Oscillator Ramping

The preset acceleration and deceleration times on the internal oscillator are nominally 60mS and 30mS respectively. These times may be extended by the addition of capacitor C36; use a dipped tantalum capacitor rated at 25 volts and observe the polarity. The capacitor should be top-soldered to the board, keeping the legs as short as possible. The location for C36 is at the bottom left-hand corner of the board close to the two LEDs (see 'Removal and Replacement of the Top Cover' Chapter 4).

The following table gives approximate values for the acceleration and deceleration times as a function of C36.

C36 (μF)	Acceleration time (mS)	Deceleration time (mS)
–	60	30
4.7	70	45
10	90	70
15	110	90
25	155	130
35	200	160
45	230	200
55	270	210
220	1050	930

Table 2-6. Internal Oscillator Acceleration Times

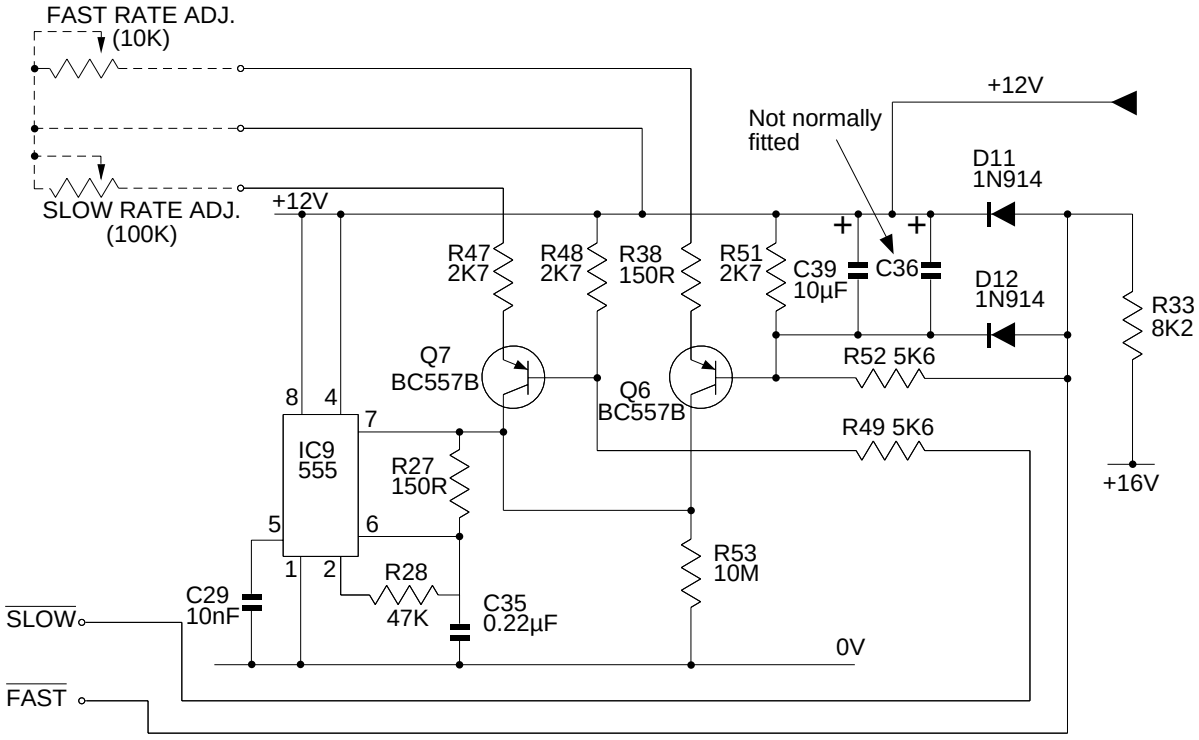


Figure 2-11. Internal Oscillator Circuit

System Mounting

Drive Mounting

The drive may be mounted in any orientation. However, there are a number of factors to keep in mind when deciding on the location.

Airflow

The ambient temperature range for safe operation is 0° to 40°C. However, for continuous or high duty cycles and in applications where the shaft power is more than 20 watts, forced cooling may be necessary. It is therefore preferable to mount the drive on open rails or stand-offs to allow the maximum unobstructed air flow (see example in Figure 2-12). If you mount the PK3 in an enclosure with an indexer, the horizontal clearance should be no less than 150mm (6 inches) (see Figure 2-12). Also, do not mount large, heat-producing equipment directly beneath the PK3 drive.

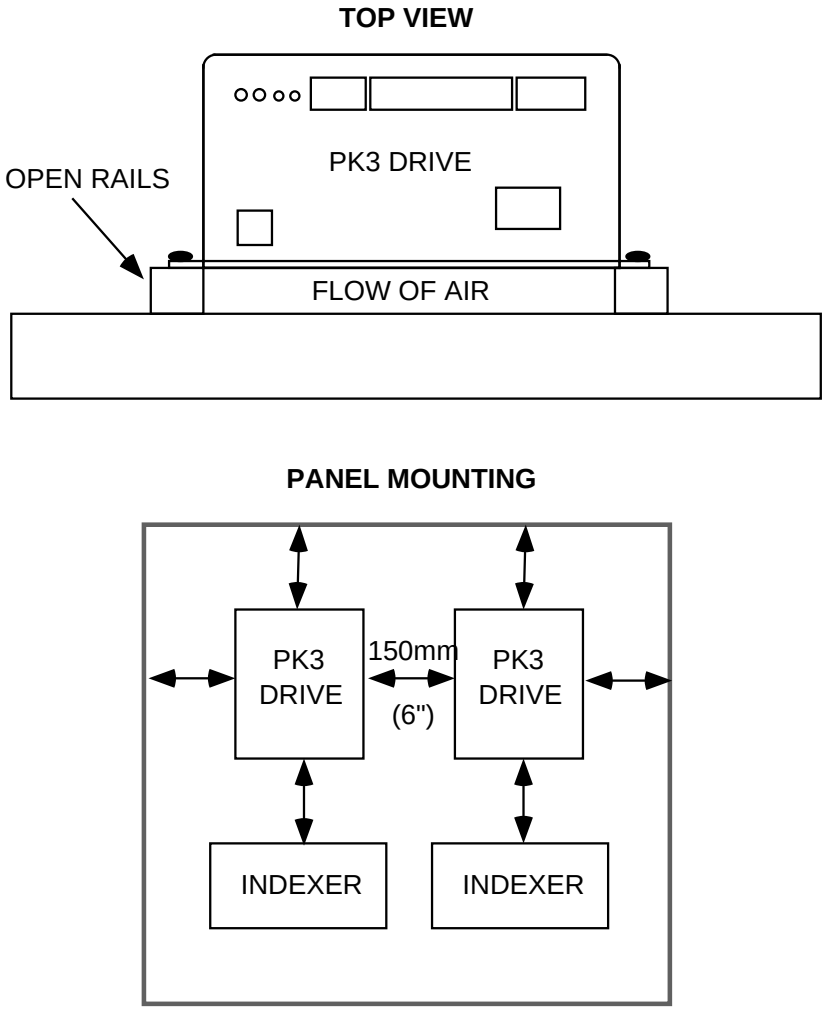


Figure 2-12. Mounting the PK3 for Proper Airflow

Signal Where there is considerable distance between the control system (indexer) and the motor, the drive should generally be located as close to the control system as possible. Long motor leads seldom present a problem as long as they have a low resistance and are shielded. Low-level control signals may become prone to noise pick-up or cross-talk problems over long distances.

Access For set-up purposes, you should mount the drive so that you have easy access to the front panel. In the final installation, operator access should be prevented.

Security of Connections Avoid mounting the drive in a position that could allow connectors to become detached from the front panel.

Environmental Specifications

The operational temperature range for the drive system is:

- Operating Temperature: 0° to 40°C (32° to 102°F)
- Relative Humidity: 0% to 95% (non-condensing)
- Storage Temperature: -40° to 85°C (-40° to 185°F)

Refer to the manufacturer's environmental specifications for the maximum motor case temperature when it is in operation. This may be a hazard to system operators.

The mains input to the drive must be Installation Category II maximum.

PK3 drives can be used in a Pollution Degree 2 environment i.e., one in which only non-conductive pollution occurs.

You should install the drive system in an enclosure to protect it against atmospheric contaminants such as oil, moisture, dirt and to prevent operator access. In the USA, the National Electrical Manufacturers Association (NEMA) has established standards that define the degree of protection that electrical enclosures provide. The enclosure should conform to NEMA Type 12 standards if the intended environment is industrial and contains airborne contaminants. Proper layout of components is required to ensure sufficient cooling of equipment within the enclosure.

Chapter 3. HARDWARE REFERENCE

Specifications

Parameter	Value
Drive circuit	MOSFET chopper-regulated with overload protection
Switching sequence	Full step or half step (optional profile set by a switch)
Nominal output current	PK3 3 amps/phase (current may be set to lower value by switches)
Drive supply voltage	33.5VDC
Suitable motor type	4, 6 or 8 lead (5 lead not suitable); Hybrid or Permanent Magnet. Motors with a frame size of 42 or more are not recommended.
Minimum motor inductance	1mH
Nominal chopping freq.	15 kHz
Internal oscillator speed range	Slow (not ramped) 40-1,000 steps/sec Fast (ramped) 400-10,000 steps/sec
Acceleration time	60mS
Deceleration time	30mS
Standby circuit	Automatic reduction in motor phase current. Operates approx. 100mS after last clock pulse.
Opto-isolated input levels	3V to 5V differential at 20mA
Opto-isolated output levels	Low (transistor on) +1V maximum at 5mA High (transistor off) +24V maximum
AC power requirements	110 -120V (±10%) 220 - 240V (±10%)
Frequency	47 - 63Hz
Power	150VA
Ambient temperature range: Operating Storage Max. Heatsink	 0° to 40°C (32° - 104°F) -40° to 85°C (-40° - 185°F) 85°C (185°F)

Table 3-1. PK3 Drive Specifications

Relative humidity	0 to 95% (Non-condensing)
Dimensions	181 x 76 x 167mm (7.1 x 3.0 x 6.6in)
Weight	2.8Kg (6.2lbs)
Max stepping rate	200 step/10kHz/50rps* 400 step/20kHz/50rps* * Max. pulse input not max. motor speed
Fuses: IEC Mains connector FS2	 115V-2A/230V-1A T HB 5 x 20mm 4A 5 x 20mm (FS2 is a quick-acting DC motor supply fuse) High Breaking Capacity

Table 3-1. PK3 Drive Specifications (continued)

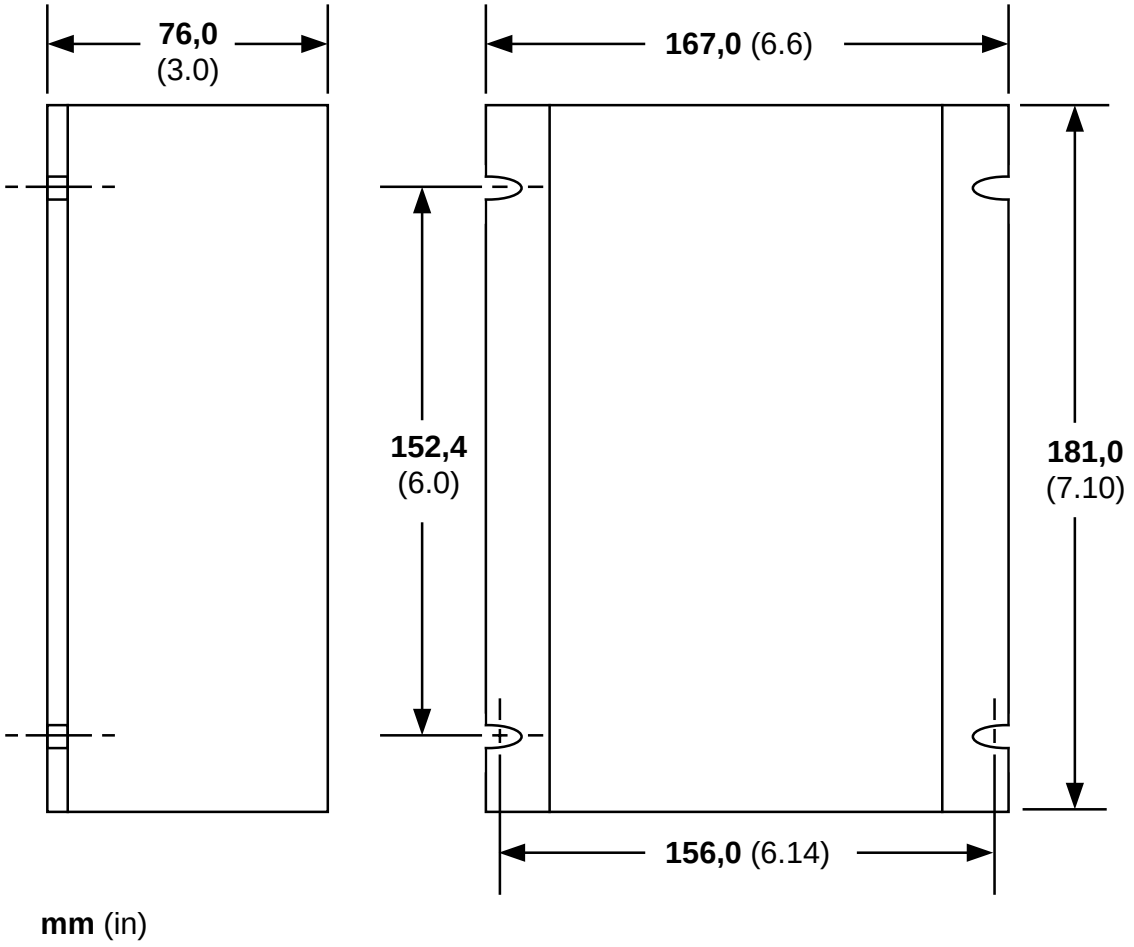


Figure 3-1. PK3 Drive Dimensions

Chapter 4. MAINTENANCE & TROUBLESHOOTING

Fault-Finding Guide

Take care, unexpected motion may occur at any time whilst troubleshooting motion control equipment.

If there is no response from the motor, check which LEDs are illuminated.

Green LED

Illumination of this LED indicates that there is power to the drive, and non-illumination implies a power supply failure. Should this be the case, check that the AC supply is present. If OK, turn off the power to the drive, remove the cover, and check the fuses on the drive card (refer to Chapter 3. Hardware Reference for fuse ratings). If these are OK, then there is probably an internal failure within the power supply circuitry, and the drive should be returned for repair.

Red LED

Illumination of this LED indicates a power overload or short-circuit. Turn off the power to the drive, disconnect the motor, and turn on power again. If the LED is still on, the drive is faulty. If not, check for short-circuits, crossed motor connections, or faulty fuses. A very low inductance motor could also cause the drive to trip out. If this is suspected, try connecting the motor in series. Note that the current rating of the motor is halved when changing from parallel to series.

If the red LED is off and the green LED is on, and there is still no response from the motor, check that DIP switch 2 is ON and turn DIP switch 1 ON. If the motor doesn't rotate, then there is probably an internal failure and the drive should be returned for repair.

Removal and Replacement of the Top Cover

The removal of the cover is easily achieved in the following manner:

(a) Ensure that all supplies have been switched off and capacitors have time to discharge. Remove the AC mains plug and the 25-way D-type connector.

(b) Remove the four M4 x 10mm bolts which secure the back panel.

(c) Unscrew the two upper M4 x 10mm bolts which hold the front panel to the top cover. The top cover can now be removed complete with the PCB. It is unnecessary to disconnect the transformer leads.

(d) When replacing the top cover, take care to relocate the LEDs correctly in the front panel.

Returning the System

Contact the Parker Automation Technology Centre or the machinery manufacturer who supplied the product. Equipment for repair should NOT be returned directly to Digiplan without prior authorisation. Repairs will be carried out by Digiplan but will be processed via your supplier.

Digiplan may at their discretion authorise direct shipment to and from Poole or Rohnert Park, but only by prior arrangement with your supplier. Existing UK and USA customers who purchase equipment directly from Digiplan should contact Poole or Rohnert Park for further information (contact numbers are at the front of this User Guide).

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