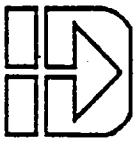


S5001 Drive
User Guide

Industrial Devices Corporation
P/N PCW- 4202 B

S5001 (SPK) STEP MOTOR CONTROL OPERATORS MANUAL

PCW-4204 Rev.B 7/91

Table of Contents

ADDENDUM FOR NEW **S2T** AND **S2N** (PARALLEL WINDINGS) MOTORS INCLUDED AFTER THE APPENDICES: WIRING AND SPECIFICATIONS

OVERVIEW

The S5001 Stepper Motor Control is a packaged drive which has been designed primarily for simple, single-axis, linear positioning applications involving the low power IDC "S2" (Nema 23 Frame Size) Stepper Motor mounted to an IDC Electric Linear Actuator.

Incorporated into the drive is an integral transformer and power supply components necessary for direct operation from a 120 Volt AC supply. Full or Half Step operation can be initiated using the internal oscillator or from a remote step pulse source. Additional features include multi-turn speed control pots and a current reduction standby circuit.

Inspection

Your S5001 Stepper System should be inspected upon receipt for obvious damage to its shipping container. Report any such damage to the shipping company as soon as possible, as Industrial Devices cannot be held responsible for damage incurred in shipment. The Stepper System should then be carefully unpacked and inspected for the following items to be present and in good condition;

* S5001 Stepper Control
* 15 Terminal Phoenix Connector
* 3 Prong AC Line Cord
* S5001 Instruction Manual

Specifications

Power Requirements:

* 105-125 VAC @ 1.0 amps in Running Mode (S2 Motor)
  @ .5 amps in Stand-By Mode (S2 Motor)
  @ 50/60 Hz Operation

Amplifier:

* Type	Bipolar Chopper Drive
* Nominal Chopping Frequency	15Khz
* Drive Supply Voltage	36VDC
* Resolution	Full Step Mode (200 steps/rev) Half Step Mode (400 steps/rev)
* Standby Reduction Current	50%
* Maximum Stepping Rate	Full Step Mode - 10Khz Half Step Mode - 20Khz
* Protection	Short Circuit Protected (Phase to Phase, Phase to Ground)

Internal Oscillator

* Speed Ranges	Slow(not ramped) 40-1000 steps/sec Fast(ramped) 400-10,000 steps/sec (S2 Motor Limited to 12RPS with S5001)
* Preset Ramp Times (Fast Speed ONLY)	Acceleration 60ms Deceleration 30ms
Command Interface	Command Inputs are normally driven by open collector outputs and are internally pulled up to 12VDC
* Step Input(CLOCK IN)	Active Low Pulse Minimum Pulse Width 10 microseconds Maximum Pulse Rate is 20Khz
* Direction(DIRN)	Logic High(open circuit)=CW Rotation Logic Low(Grounded) = CCW Rotation
* Enable(Energize)	High(open circuit)=Amplifier Disabled Logic Low(Grounded) = Amp Enabled

Inputs

* Inputs are internally pulled up to 12VDC through a 4.7Kohm resistor, sinking type configuration
* Logic Levels High(Open Circuit) = 10 - 12VDC
  Low (Grounded) = 0 - 2VDC

Output(Fault Output)

* Sinking Open Collector NPN Transistor
* Logic Levels Output Off(logic high) pulled up to 12VDC
  Output On (logic low) 0-1 VDC @25ma max

Motors

* Type Two Phase, 1.8 Degree Hybrid Stepper, Permanent Magnet
* Number of Leads 4, 6, or 8 lead (S2 motor is 4 lead)
* Inductance Range 1-35mh (S2 Motor is 29mh)

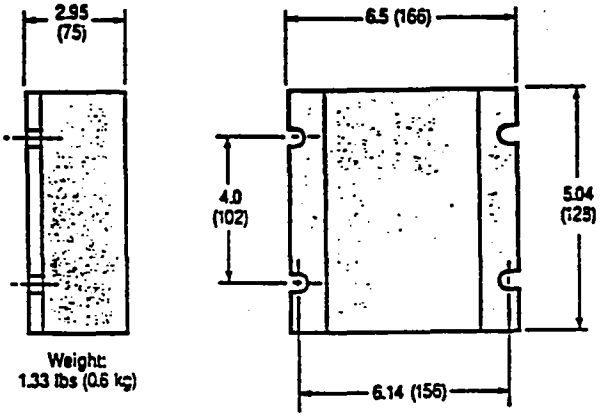
Internal Fuses

* FS1(Motor Supply Fuse) 3 amp time delay, slow blow type
* FS2(AC Input Fuse) 1 amp time delay, fast blow type

Environmental

* Operating Temperature	32 - 122 F.(0 - 50 C.)
* Maximum Heat Sink Temperature	185 F.(85 C.)
* Storage Temperature	-40 - 185 F.(-40 - 85 C.)
* Humidity	0 - 95% Non-Condensing

Physical Dimensions



Control Hardware Features

* 2 LED Indicators
* 2 Speed Potentiometers(Internal Clock)
* 8 Dipswitches

1. LED INDICATORS: 2 Led's used for indicating power and fault status.

   * Green Power Led

     ON: When AC Power applied to unit; Normal Operation
     OFF: When AC Power removed or internal FS1 Fuse blown

   * Red Fault Led

     ON: Indicates fault in S5001 amplifier or internal FS2 Fuse blown.
     OFF: Normal Operation

2. SPEED POTENTIOMETERS: 2 potentiometers are available to the user to set fast and slow speed settings when using the S5001 internal oscillator. * Dipswitches 7 & 8 must be ON to enable potentiometers

   * FAST — 20 turn potentiometer which controls the fast speed setting when the drive's internal oscillator is used as the stepping pulse source. The pot commands a frequency range of 400 to 10,000 steps/sec and is enabled when the "Fast" speed input(Term#12) is activated(sinking to ground).

   * SLOW — 20 turn potentiometer which controls the slow speed setting when the drive's internal oscillator is used as the stepping pulse source. The pot commands a frequency range of 40 to 1000 steps/sec and is enabled when the "Slow" speed input(Term#11) is activated(sinking to ground).

3. **DIPSWITCHES** : 8 Position Dipswitch for selecting motor current levels and to enable various operational functions.

#1 Energize Enable

ON: Energizes Motor as soon as AC power is applied to drive
OFF: Motor is energized only when the Energize Input(Term#7) is activated.

#2 Mode Resolution Selection

ON: Full Step Mode(200 Steps = 1 Motor revolution)
OFF: Half Step Mode(400 Steps = 1 Motor Revolution)

#3-#6 Motor Current setting

	Dipswitches			
Motor Current	#3	#4	#5	#6
2.0 amp	OFF	OFF	OFF	OFF
1.8 amp	OFF	OFF	OFF	ON
1.6 amp	OFF	OFF	ON	OFF
1.4 amp	OFF	ON	OFF	ON
1.2 amp	OFF	ON	ON	ON
1.0 amp	ON	OFF	OFF	OFF

* The IDC S2 Motor is 1.0 amp setting
* Motor Current is automatically reduced to 50% by the Drive when at standstill.

#7 Speed Control Adjustment

ON: Enables "slow" speed potentiometer when using the internal oscillator to control stepping rate.
OFF: When using an external speed pot for control

#8 Speed Control Adjustment

ON: Enables "fast" speed potentiometer when using the internal oscillator to control stepping rate.
OFF: When using an external speed pot for control

Dipswitch Default Settings

#1	#2	#3	#4	#5	#6	#7	#8
ON	OFF	OFF	OFF	OFF	OFF	ON	ON

I/O Descriptions

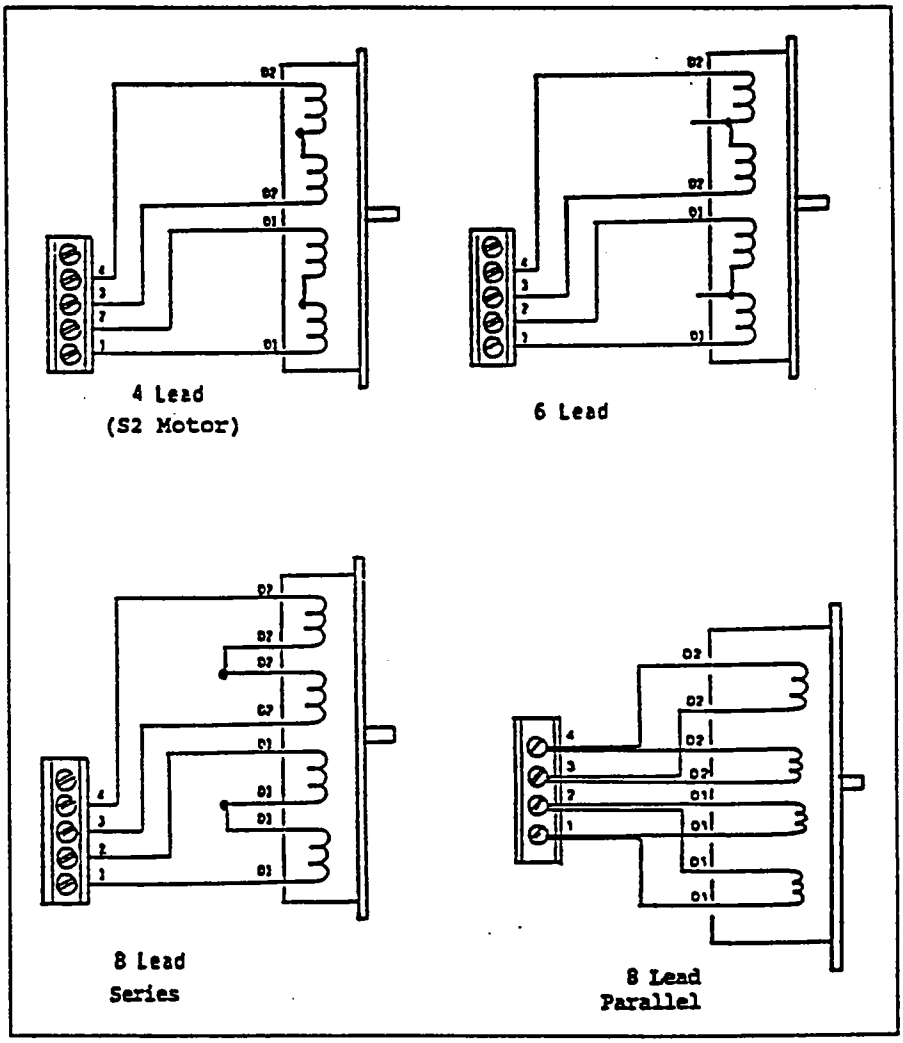
Term	Label	Description
#15	Slow Adj	(Slow Speed Adjustment) An external 100K potentiometer may be connected between this terminal and Adj Com to control the slow speed of the internal oscillator.
#14	Adj Com	(Adjustment Common) Electrical Common return connection for external speed control "Fast Adj" and "Slow Adj" inputs. (Speed Range is 40-1000 steps/sec)
#13	Fast Adj	(Fast Speed Adjustment) An external 10K potentiometer may be connected between this terminal and Adj. Com. to control the fast speed of the internal oscillator. (Speed Range is 400-10,000 steps/sec)
#12	$\overline{\text{Fast}}$	(Fast Speed Select) Connect to "Ov" to run the internal oscillator at the rate set by the "Fast" speed pot.
#11	$\overline{\text{Slow}}$	(Slow Speed Select) Connect to "Ov" to run the internal oscillator at the rate set by the "Slow" speed pot. Note: When using the internal oscillator as the stepping pulse source, adjustment of fast and slow speed settings can be done by the on board pots or by external pots. Selection of the "On Board" or "External" pots for speed adjustment is accomplished by setting Dipswitches 7 & 8.
#10	----	No Connection
# 9	$\overline{\text{CLOCK IN}}$	(Step Input) Allows the motor to be driven from an External stepping pulse source wherin the motor will step following a low-going transaction on this input. The input must remain low for at least 10us with the maximum pulse rate being 20khz. This input is driven from the internal oscillator on the drive but can also be driven from an external source or pulse train.
# 8	$\overline{\text{DIRN}}$	(Direction) Selects direction of Motor rotation. NO Connection(open circuit) : CW Motor Rotation Connect to Ov(sink to round): CCW Motor Rotation
# 7	$\overline{\text{Energize}}$/Reset	This input enables the drive to energize and de-energize the motor and also can be used to reset the drive after a fault condition has occurred. Energize: The drive will apply power to the motor when the input is connected to 0v(sinking to ground) If the input has NO connection(open circuit), then the motor will be deenergized(no power on motor). Reset: During a fault condition, momentarily taking the input high will reset the drive provided the cause of the fault has been removed. Returning the input low will re-energize the motor. The "Energize" Dipswitch(#1) must be OFF when this terminal is being used.

# 6	Fault	(Fault Output) This is a normally ON (sinking to ground) open-collector output which goes off in the event of a drive fault (Current Overload, overtemperature, or power supply failure).
# 5	0v	(DC Ground)

Motor Connections

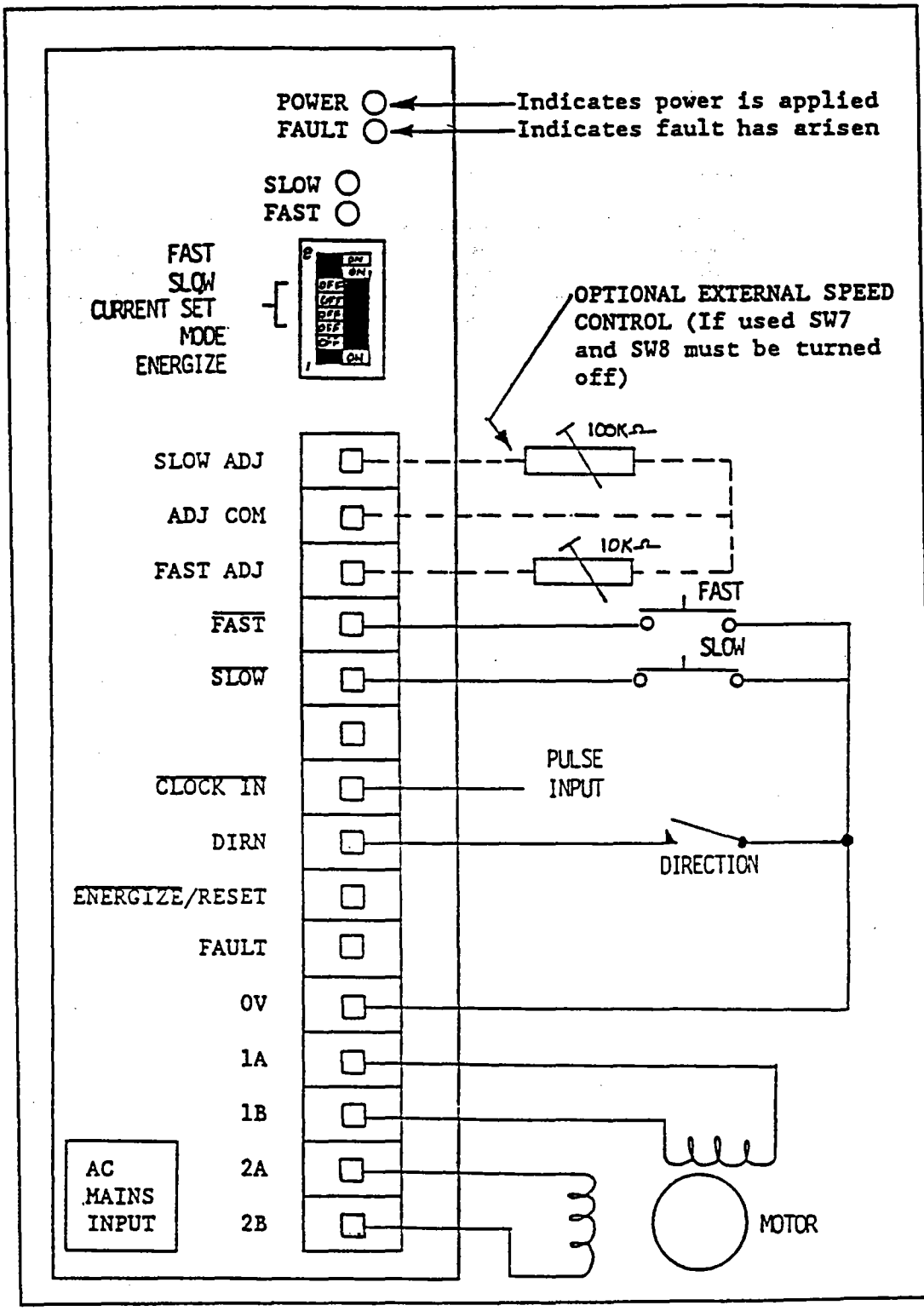
Term	Label	Description	S2 Motor Color Code	QF Cable Color Code
# 4	1A	Phase 1+	Red	Red
# 3	1B	Phase 1-	Red/White	Orange
# 2	2A	Phase 2+	Black	Black
# 1	2B	Phase 2-	Black/White	White

Standard Motor Connections for 4, 6, and 8 lead motors

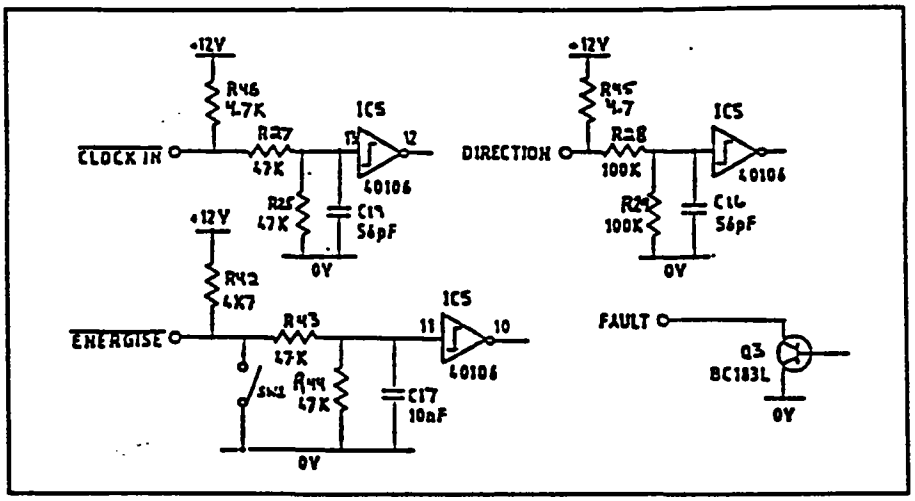


Control Diagrams

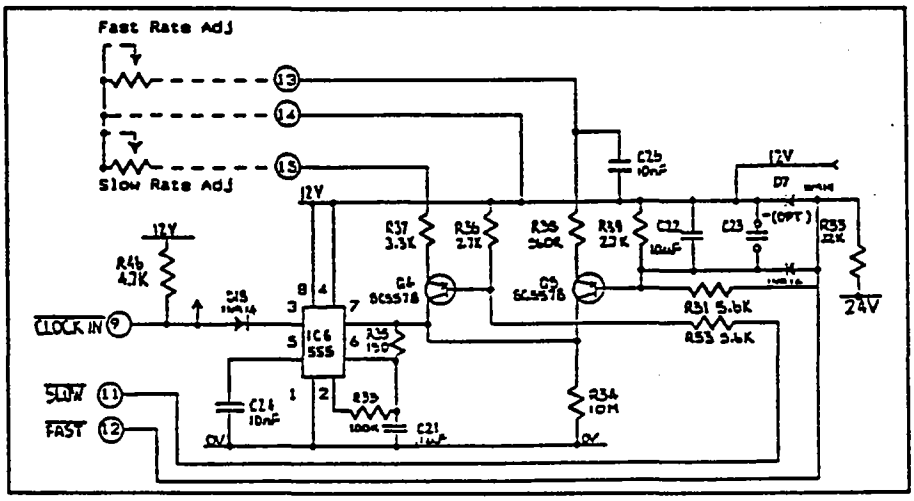
Front Panel Layout & Typical I/O Wiring Interface



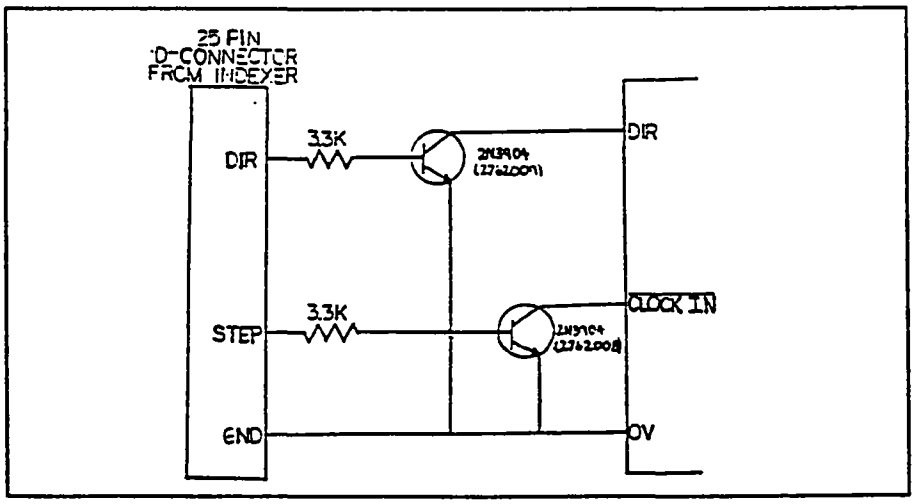
Wiring Interface: Internal Logic



Wiring Interface: Oscillator Circuit

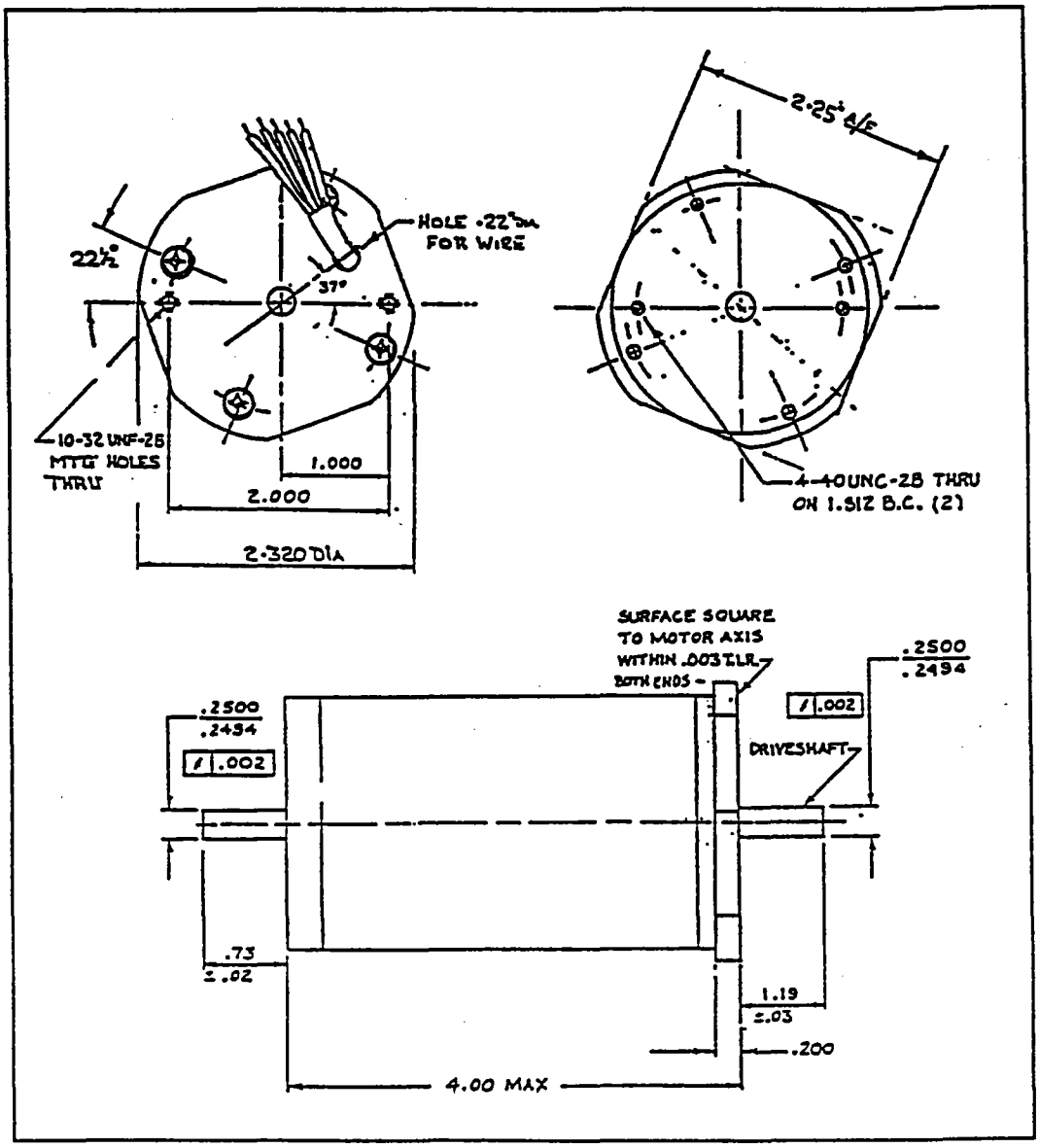


Wiring Interface: 5vdc TTL Square Wave to S5001 12Volt Logic



APPENDIX A S2 Stepper Motor

Motor Dimensions



Motor Specifications

Motor Type : 4 Lead, 1.8 Degree, 2 Phase Hybrid Stepper Motor
Static Torque: 200 oz-in
Rotor Inertia: 1.7 oz-in^2
Inducatnce : 29mh
Windings
  Amps : 1 amp
  Resistance : 5.4 ohms

APPENDIX B S Series Cylinders

Available Linear Speeds — Model Number : 3 or 4 Digit Code

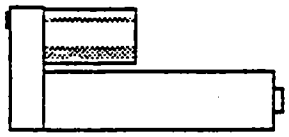
Model	in/sec	Model	in/sec	Model	in/sec
S2102	6.00	S2105	2.40	S2108	1.50
152	4.00	155	1.60	158	1.00
202	3.00	205	1.20	208	.75
352	----	355	.67	358	.43
992	6.00	995	2.40	998	1.50
		1205	.20	1208	.125
Ballscrew 2 pitch		Acme/Ballscrew 5 pitch		Acme 8 pitch	

*** Final move speeds are LOAD & LENGTH DEPENDENT ***

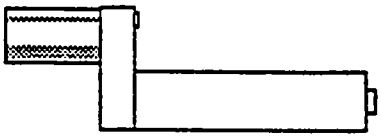
Note 1: The 3 or 4 digit code on the Cylinder label indicates the system model number and specifies the Gear Ratio and Screw Pitch.
Note 2: Linear Speeds are based on a max. Motor Speed of 12RPS.

Standard Cylinder Configurations

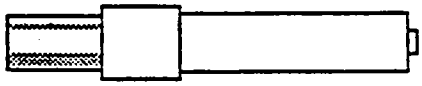
Parallel



Reverse/Parallel

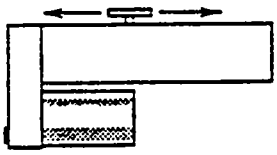


Inline

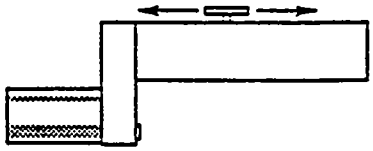


Rodless Cylinder Configurations

Parallel



Reverse/Parallel



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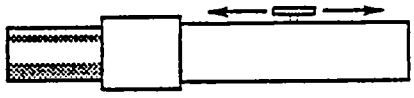

Warranty and Service Policy

All Industrial Devices products are tested for function and compliance to specification prior to shipment. It is possible that defects in this equipment may subsequently be discovered. If this should occur, Industrial Devices offers the following warranty.

Industrial Devices Corporation warrants all electrical cylinders and electronic controllers to be free of defects in workmanship for a period of one year from the date of shipment to the end user.

Products returned prepaid to the factory will be repaired or replaced at the company's option at no charge, and returned prepaid to the user.

Products that have expended their useful life in less than one year or have been improperly used or damaged, in the opinion of the company, are not subject to the terms of this warranty.

Industrial Devices Corporation maintains a repair facility for all units which Industrial Devices Corporation manufactures, including a complete inventory of parts to ensure quick service turn around.

In Case of Failure

1. Get the Model and Serial number of the defective unit.
2. Prepare a purchase order for the repair cost if the unit is out of warranty.
3. Contact Industrial Devices Corporation for a Return Material Authorization Number. Call (415) 883-3535 and ask for Customer Service.
4. Ship the unit prepaid to:

   Industrial Devices Corporation
   64 Digital Drive
   Novato, CA 94949
   Attn: RMA # _____

Addendum to S5001 Manual

S2N & S2T Motor (used with the S5001 Control)

Type: 8 lead, Nema 23 Frame, 3 stack, 1.8 Hybrid Step Motor

Note: S2T is an IDC 8 lead motor with windings prewired in a series configuration and the S2N is the same motor with 8 bare leads, user must wire in series.

		#3	#4	#5	#6
Dipswitches (Motor Current)	2.00 amps	Off	Off	Off	Off

Wiring Color Codes (Motor)

S5001 Term. #	Label	S2N Motor 8 Lead Series Windings	S2T Motor QF3-12 Cable Pre-Wired (Series)
4	1A (A+)	Yellow	Red
3	1B (A-)	Red	Red w/Yellow Stripe
2	2A (B+)	Black	Red w/White Stripe
1	2B (B-)	Orange	Red w/Black Stripe

Ext. Connection White/Yellow to White/Red
Ext. Connection White/Orange to White/Black

Motor Dimensions