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Pacific Scientific Model 6420 Indexer/Driver

FEATURES

The 6420 Microstepping Indexer-Driver provides economical microstepping control with a simple mnemonic programming interface. Operation is programmed via the serial communications port. A combination of dedicated and user-programmable I/O provides motor control, status indication and sensor feedback.

- **Fixed Resolution microstepping:**
  - Binary sizes: 200 to 51,200 steps/rev. Decimal sizes: 200 to 50,000 steps/rev. Minimum and maximum step rates from 0.02 to 5700 RPM depending upon resolution.
- **Variable "on the fly" microstepping for high resolution, high speed operation: 20,000 steps/rev at 0.02 to 5700 RPM.**
- **Step and Direction outputs for independent or synchronous control of multiple axis.**
- **Single 6420 can control two independent or synchronous axis with an additional Driver and no glue logic.**
- **Panel or side mounting options.**
- **Simple mnemonic command set can be executed from internal NVRAM or from a more powerful host.**
- **Serial communications supporting RS-232, RS-422 and RS-485.**
- **Input/Output ports - Eight general purpose bi-directional user programmable input/output ports.**
- **Internal Memory - 1792 bytes of NVRAM available for user programs.**
- **Indexer optically isolated from Driver**
- **Single power supply**
- **Output current adjustable from 0.625 A to 5 A RMS with 3 position DIP switch.**
- **Idle current reduction with adjustable delay to reduce motor heating.**
- **Patented mid-range instability compensation eliminates instability from the middle to high end of the operating range.**
- **Patented 4-phase Bipolar Chopper Drive for superior current regulation and low ripple current.**
- **Fault protection:**
  - Line-to-line and line-to-neutral shorts
  - Internal power supply under-voltage
  - Bus overvoltage

A terminal or PC can be used to program the 6420. Various motion parameters can be modified and motion executed immediately from the command line or from on-board non-volatile memory. Simple, single-letter mnemonics are used to specify a wide variety of motion commands. Many users can take advantage of the simplicity of developing programs for on-board execution. If more versatility is required, the user can write a custom program running on a host computer to control the 6420.

PRODUCT DESCRIPTION

The 6420 can communicate with RS-232, RS-422 or RS-485 serial protocols at 9600 bps. Discrete I/O lines provide external start/stop and motor enable control, home and limit switch testing, motor jogging and step and direction outputs. The eight programmable bi-directional discrete I/O lines are individually jumper configurable for input or output. The 6420 operates in one of two modes, either Fixed Resolution Mode or Variable Resolution Mode. In Fixed Resolution Mode with binary steps the resolution can be set from 200 steps/rev to 51,200 steps/rev and with decimal resolution 200 steps/rev to 50,000 steps/rev. The minimum and maximum step rates range in value from 0.08 to 19,000 steps/sec vary depending on the resolution. Of course, the finer step sizes result in high shaft resolution at the expense of shaft speed. The motion profile is trapezoidal with programmable initial and final speeds. The acceleration and deceleration rates are specified by a single command in terms of acceleration and deceleration factors ranging in value from 5 to 255.

Variable Resolution Mode is beneficial where high resolution, high speed microstepping is desired. This mode allows for positioning at a resolution of 20,000 steps/rev at 0.02 to 6000 RPM.

Power-up sign-on message returned after entry of 1 or 2 spaces.

The 6420 has special memory locations. REMOTE START at Address 0, Power-up AUTOSTART program at address 1600. "FAST" memory 128-191.



SPECIFICATIONS

Input Power	
Voltage	24 VDC to 75 VDC.
Current	Motor and load dependent. Usually motor phase current. A 2000 uf capacitor mounted within 3 feet of the 6420 is recommended to absorb the motor regen energy.
Output Motor Phase Current	5 A rms max. 5 A peak full step, 7.1 A peak microstepping
Discrete Input Voltage	0 - 30 VDC max., Vin .8V is a logic low and Vin = 3.7V is a logic high.
Discrete Output Voltage	Open Collector 30 VDC, 70 ma sink, Vsat 1.0 VDC.
Storage Temperature	-55 C to +70 C
Operating Temperature	0 to 50 deg C ambient air
Maximum Chassis Operating Temperature	60 deg C **Note:** *For optimal thermal performance, mount the 6420 chassis back or side to a cooling plate or heatsink. Use a thermal pad or grease if surface is irregular. A fan or idle current reduction may be employed to keep chassis below 60 degrees C*
Convection Cooling	
w/optional heatsink	Full rating (5A) at 25 deg C Ambient 2.5A max at 45 deg C Ambient
without heatsink	2.5A max at 25 deg C Ambient 1.25A max at 45 deg C Ambient
Humidity Range	10 to 90%, non-condensing Adhere to the specified bus voltage range and power ratings, otherwise unit may be damaged

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Figure 1 - 6420 Connection Diagram

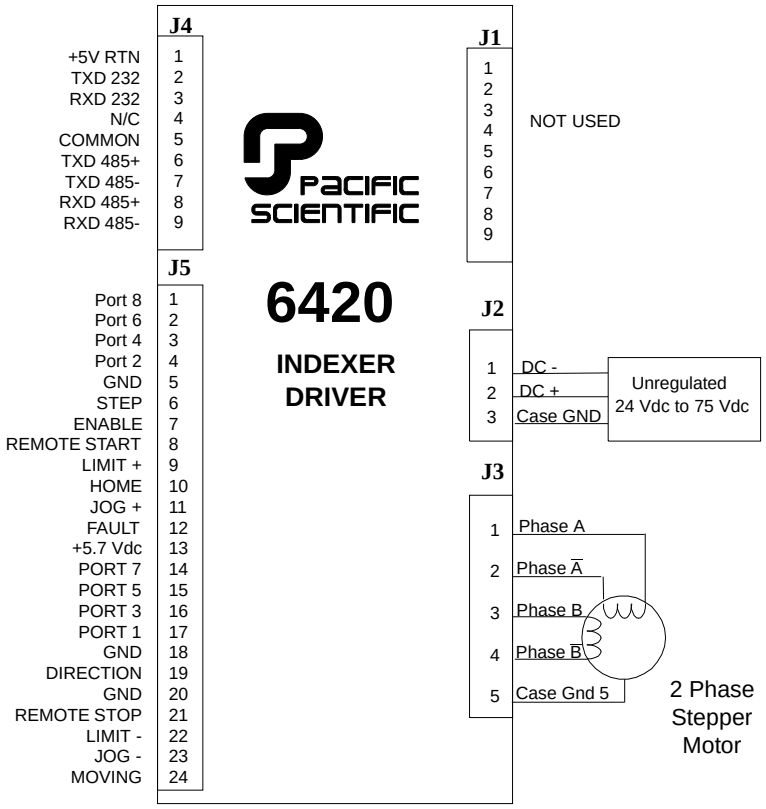
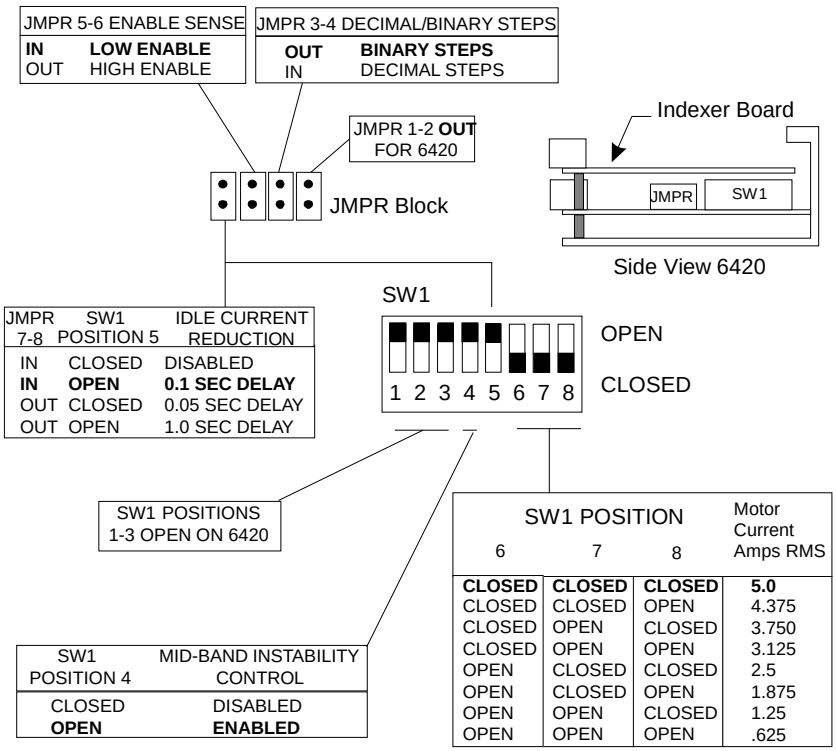


Figure 2 - Driver Board Settings

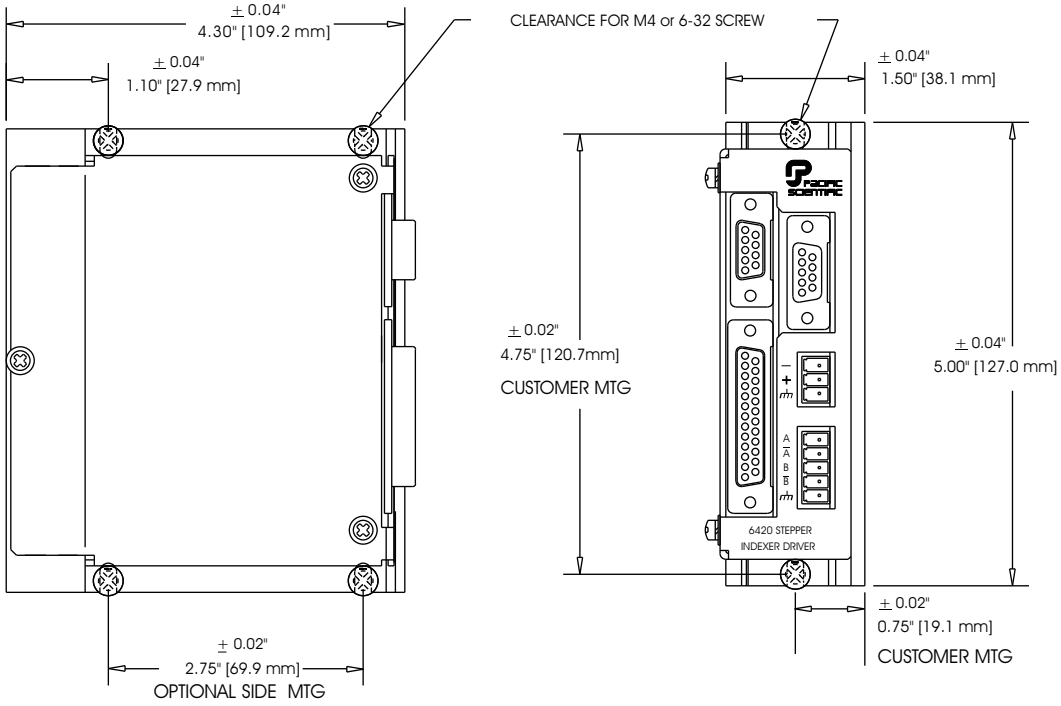


INDEXER BOARD SETTINGS

- **E1 and E2, *Factory setting: E1 IN, E2 OUT*. Should NOT be modified by user.**
- **E11 IN enables RS-485 multi-unit communication, OUT for RS-232/RS-422.** *Factory setting: Jumper OUT enabling RS-232 and RS-422 communications.*
- **E12 and E13 control slave 6410 Driver operation.** E12 IN, E13 OUT for alternating operation, E12 OUT, E13 IN for synchronous operation. *Factory setting: Jumpers E12 IN, E13 OUT.*
- **E3 to E10 control discrete I/O Port 1 to 8 bit directions.** Jumper IN to configure as an output, jumper OUT to configure as an input. *Factory setting: All jumpers OUT configuring all lines as INPUTS.* Ports are active LOW; a "1" will produce a "0" and vice-versa.

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Figure 3 - Mounting Dimensions



COMMAND SUMMARY

A (Clear and Restore) A *opcode*
A 0, reloads the last saved parameters from NVRAM, A 8 followed by A 9 completely initializes NVRAM to default values.

C (Read Position Counter) C *arg, arg is 0, 1*
Specifying *arg* = 1, enables continuous echoing of position via the serial interface only in single-unit mode.

E (Edit Program) E *addr*, Edit program at address *addr*.

F (Initial Velocity) F *vel,* Sets the initial velocity to *vel* step pulses/second, 0 ≤ *vel* ≤ 19,000.

G (Go) G *addr* [*trace*], 0 ≤ *addr* ≤ 1791, or 2048 for indexed jump on inputs, 0 ≤ *trace* ≤ 1.

H (Home) H *speed dir*, where: 20 ≤ *speed* ≤ 19,000 step pulses/second, *dir* must be 0 for CW and 1 for CCW motion towards Home position.

I (Resolution Mode) I *mode. mode* = 0 selects Fixed Resolution Mode, mode = 1 selects Variable Resolution Mode.

J, B (Jump Loop Nested) J, B *addr cntr,* 0 ≤ *addr* ≤ 1791, 0 ≤ *cntr* ≤ 255 for 1 to 256 iterations.

K (Read Input Port) K , Logic "0" input reads back as "1". Bit weightings 1-128 correspond to port 1 to 8. Jumpers E3 to E10 control direction of I/O ports. Jumper OUT for input, IN for output.

L (List Program) L *addr,* List Program. 0 ≤ *addr* ≤ 1791. Returns up to 20 lines at a time.

M (Accel/Decel Factor), M *accel decel,* 5 ≤ *accel* ≤ 255, 5 ≤ *decel* ≤ 255.

O (Trip Point), O *position vaddr,* Set Trip Point. -8,388,607 ≤ position ≤ +8,388,607, 0 ≤ *vaddr* ≤ 1791.

P (Store Parameters), Stores parameters to non-volatile memory.

Q (Examine Parameters), Q Displays Initial, Final Velocity, Accel/decel factors etc.

R (Run at constant velocity), R *vel,* 20 ≤ *vel* ≤ 19,000 step pulses/second.

S (Stop), S [*arg*], Embedded in a program, S 0, will cease motion but the program will continue, S 1 terminates program, placing the indexer into immediate mode.

T (Master/Slave Control), T *enb, Alternating axis operation:* E12 IN, E13 OUT, T 1 enables master, disables slave. T 0 disables master, enables slave. *Synchronous Operation:* E12 OUT, E13 IN, T 1 enables master and slave. T 0 disables both.

U (Loop on Port), U *addr cond,* Tests a port and jumps if condition is satisfied. 0 ≤ *addr* ≤ 1791. Port 1 to 8 HIGH 0,2,4,6,8,10,12,14, Port 1 to 8 LOW 1, 3, 5, 7, 9, 11, 13, 15

V (Final Velocity), V *vel,* Sets the final velocity of an absolute (@) or incremental (+ -) move. Expressed as 0 ≤ *vel* ≤ 19,000 step pulses/second.

W (Wait), W *period,* Wait. 0 ≤ *period* ≤ 65535, 10ms resolution, with 0 as wait for end of motion This command returns the status of the limit, home and jog switches and the Driver Fault status. The value of *arg* specifies whether limit switch or input line information is returned.

X (Read Limits), X *arg,* Specifying X 0 returns 1 for Limit + active, 2 for Limit - active and 3 for both active. Bit 7 is active high if the drive has faulted. Specifying X 1, returns a binary weighted value corresponding to the level of these signals: 1 = Home Input, 32 = Jog - Input, 64 = Jog + Input, 128 = Drive Fault.

Y (Write Output Port), Y *port,* Write Port. 0 ≤ *port* ≤ 255, Y 0 deactivates all bits producing Logic HIGHs, Y 255 activates all bits producing Logic LOWs.

Z (Zero Origin), Zeros position counter.

^ (Set Jog Speed), ^ *speed,* Sets jog speed, 0 ≤ *speed* ≤ 255. Actual speed is 30 * speed step pulses/second.

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@ (Absolute Move), @ *position*, Absolute Index
In Fixed Resolution:
- 8,388,607 ≤ *position* ≤ + 8,388,607.
Variable Resolution:
- 8,388,607.99 ≤ *position* ≤ + 8,388,607.99 with .01 resolution.

+ (Positive Incremental Move), + *steps*, Positive Incremental Index.
Fixed Resolution: 0 ≤ *steps* ≤ + 8,388,607. Variable Resolution, 0.00 ≤ *steps* ≤ + 8,388,607.99.

- (Negative Incremental Move), - *steps*, Negative Incremental Index.
Fixed Resolution: 0 ≤ *steps* ≤ + 8,388,607.
Variable Resolution, 0.00 ≤ *steps* ≤ + 8,388,607.99.

^C or ESC (Software Reset), Stops all activity. Indexer will wait for the space bar sign-on or external Remote Start or Jog pulse inputs.

\ (Step Size, VelScale) \ *arg*. Sets the step size in Fixed Resolution Mode, binary and decimal step sizes. In Variable Resolution Mode, scales the step pulse rates. For 0 ≤ *arg* ≤ 8 :

Fixed Binary	Fixed Decimal	VR Speed
0 = Full	Not allowed	Full speed
1 = 1/2	Full	1/2
2 = 1/4	1/2	1/4
3 = 1/8	1/5	1/8
4 = 1/16	1/10	1/16
5 = 1/32	1/25	1/32
6 = 1/64	1/50	1/64
7 = 1/128	1/125	1/128
8 = 1/256	1/250	1/256

> (Read Memory), > *addr size*,
0 ≤ *addr* ≤ 2047, 0 ≤ *size* 255 bytes.
Displays a block of memory starting at *addr* in decimal format, returning a total of *size* bytes.

< (Write Memory), < *addr data*,
0 ≤ *addr* ≤ 2047, 0 ≤ *data* ≤ 255.
Writes a *data* byte to an address specified by *addr* in memory.

] (Read Moving Status), Returns a decimal number representing the current move status. Bit weights: 1 = Indexing, 2 = Constant, 128 = Drive Fault

‘ (Trip and Output), ‘ *nextpos port*.
0 ≤ *nextpos* ≤ + 8,388,607,
0 ≤ *port* ≤ *255*.
Used within a Trip Point Service Routine (TPSR) and provides the capability of setting or clearing user I/O lines as a function of current position. The value *port* is written to the I/O ports when the previously set position is reached. Next trip point set to position *nextpos*.

= (Limit Switch Polarity), = *polarity*
0 = default active LOW limit input,
1 = active HIGH limit input

: (Selective Termination), : *axis*
Aborts operations on a particular axis when configured for RS-485 communications mode.

Step Size	Min. Speed RPM (full steps/sec)	Max. Speed RPM (full steps/sec)	Resolution Pulses/rev.
Fixed Resolution - Binary Steps			
Full	6 (20)	5700 (19,000)	200
1/2	3 (10)	3000 (10,000)	400
1/4	1.5 (5)	1500 (5000)	800
1/8	.75 (2.5)	750 (2500)	1,600
1/16	.37 (1.25)	375 (1250)	3,200
1/32	.19 (.625)	188 (635)	6,400
1/64	.09 (.312)	93.75 (312)	12,800
1/128	.05 (.156)	46.87 (156)	25,600
1/256	.02 (.078)	23.43 (78)	51,200
Fixed Resolution - Decimal Steps			
Full	6 (20)	5700 (19,000)	200
1/2	3 (10)	3000 (10,000)	400
1/5	1.2 (4)	1200 (4000)	1000
1/10	.60 (2)	600 (2000)	2,000
1/25	.24 (.8)	240 (800)	5,000
1/50	.12 (.4)	120 (400)	10,000
1/125	.048 (.16)	48 (160)	25,000
1/250	.024 (.08)	24 (80)	50,000
Variable Resolution			
Step sizes automatically chosen. User specifies position to within 1/100 of a step.	.02 (.078)	5700 (19,000)	20,000

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