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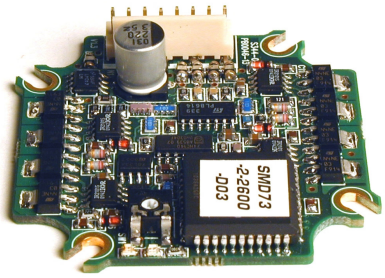
SMI70 Pulse and Direction Indexer for step- and servo motor driver.



The picture shows SMD73 but SMI70 has same shape and size

Description:

The Indexer has RS232 and RS485 interface so that serial data can be sent via PC or PLC. The indexer translates these data and generates thereby a pulse/ direction signal. Velocity, relative position and acceleration and other set-up parameters can be transferred. All kinds of drivers which use pulse/direction can be connected. The output is NPN whereby it can be used with 5V, 24V or balanced drivers. It can without problems be connected directly to JVL step and servo motor drivers, such as SMD73, SMD41 and the MAC motor series.
The Indexer can also be controlled via inputs. Pulses are generated when a start signal is applied and pulse generation is stopped when it receives a stop signal. There are different "Modes" so that each mode has its own functionality. Each mode can, more or less, use the all together 6 I/O terminals which each can be set up as a digital output, input or 0-5V analog input.

Cabinet:	SMI70 is a print card without cabinet. A housing can be obtained separately.
Print card:	The print card measures 56x56mm and is 10mm in height. It is a 4-layer print of which one is the shield layer. The print card has the same dimensions as the JVL step motor driver SMD73 and they can be mounted together so that they form a complete step motor controller.
Eksternal connections:	There are a total of 6 I/O connections. These can each be configured as:

- Digital output designed as NPN up to 30VDC.
- Digital input designed so that they accept voltages from 4-30VDC (logical 1).
- Analog 10bit input 0-5V with a welldefined input resistance of 10kOhms. Digital averaging is not used, but an averaging condenser on the print card.
- Outputs. Depending on the selection of mode, the outputs can be used for different tasks. An output can, for example, be active when a command which is not understood is received or when something unintended happens in the indexer.
- Outputs can also be used as pulse/direction outputs so that for example counting of how many pulses has been run can take place on a PLC. The number of pulses correspond to the number of pulses generated on the pulse/direction connector. Electronic gearing can not be performed.

Besides this the following is available externally.
1 pc. 5V output
1 pc. ground
An external power supply of 12-30VDC must be connected. This voltage is used for both driver and controller circuits.
Connections to an SMD73 takes place via a 4-pole "Board to board" connector.

Connectors : All I/O signals + gnd is in an 8 pole connector with 2,54 spacing as on SMD73.
Power (+24V and ground) is on a 2 pole Molex power connector.

Frequency: The processor can generate a pulse and direction signal in the range in question. The frequency range for the pulse signal must be 140 to 65530 step/sec. (5,25 til 2457RPM at 1/8step).
Dutycycle is 50% in order to secure optimal bandwith.
The velocity can be defined in steps of 10 Hz (step/sec.).

Positioning: The position ranges are 32 bit with a resolution of 1 pulse. In certain modes it is possible to start/stop the motor or to run to some fixed, preset positions. These positions are with a resolution of 1 step.
By positioning both relative and absolute positioning is possible. If relative positioning is used it is possible to have overrun in the position so that the motor does not stop when the max. position is reached. In this case it should just round off below or above and start from the beginning again.

Power Supply: Connection is to 12 to 30VDC as SMD73. Connection is via Molex connector.
SMI70 takes care of the internal voltages, as for example 5V for the processor, itself.

Indicators: 2 pc. LED have the following functions:
- Green LED for "power".
- Red LED shows if there is a failure of one or the other sort which causes that the motor can not run as expected. Exampel : Error communication via serial interface – wrong command is used.

User interface: There is an asynchronous serial port available as a small 4 pole connector "B4B-ZR" . RX and TX are in 5V level so that a JVL standard cable type "RS232-9-1-MAC" can be used as connection to a PC where JVL's MotoWare program can be used as user interface. All internal registers (velocity, position etc.) can be set via MotoWare's "On-line editor" or other units which can run with an asynchronous port. The communication format just need to be an ASCII with 8 data bit. It is not possible to address the units. Communication speed = 9600; 19200 and 38400 Baud is possible. Commands/registers are designated as on other JVL products – Example : VM=100 gives a top velocity of 100 steps/sec. When SMI70 has executed a command it sends a "Y" in return as a sign that it has received the command correctly and executed the command. It returns for example an "E01" if an error has occurred. All running distances and velocity parameters is given in steps, steps/sec or step/sec².

Processor: A 16bit processor from Hitachi with built-in Flash and RAM has been chosen. A crystal is used to secure a high precision with a small frequency tolerance.

Modes : Selection of modes is normally done via the serial connection but Mode 1 to xxx can also be selected via a dipswitch with 10 contacts. If Dip no. 1 is set = "ON" it is only the serial connection that controls internal modes/parameters.
Mode 1:
I/O1 = Input for start of motor.
I/O2 = Input for stop of motor.
I/O3 = Output. Active if motor runs, passive if motor do not run.
I/O4 = Analog input. Controls motor speed.

Connections

J3	J3 description	J4	J4 description
1	Ground	1	5VDC
2	I/O/AI 5	2	RX
3	5VDC	3	TX
4	I/O/AI 6	4	Ground
5	I/O/AI 1		
6	I/O/AI 2	J12	J12 description
7	I/O/AI 3	1	5VDC
8	I/O/AI 4	2	RS485 B
		3	RS485 A
J1	J1description	4	Ground
1	12-30VDC		
2	Ground		

MODE survey :

See table below for a mode survey. D1 – Selection of run via DIP-switch or serial communication. D0 –Not used.

D9	D8	D7	D6	D5	D4	D3	D2	Function	MO
X	X	X	X	X	X	0	0	Baud=9600	
X	X	X	X	X	X	0	1	Baud=19200	
X	X	X	X	X	X	1	0	Baud=38400	
X	X	X	X	X	X	1	1	Baud =Reserved	
X	X	X	0	0	1	X	X	Running continuously or relative (CB12=1). Start with I1 and stop with I2. CBx=1 to 4 can be used. Motor profile defined by VM,VS,ACC,DEC.	1
X	X	X	0	1	0	X	X	Running continuously or relative (CB12=1). As long as the I1 are active will the motor run. I2 select direction. Only CB1 or CB2 can be used. I2: Direction. Motor profile defined by VM,VS,ACC,DEC.	2
X	X	X	0	1	1	X	X	Position mode. SR=+x. Run relative pulses in +- direction. Only via serial RS232 commands. Motor profile defined by VM,VS,ACC,DEC	3
X	X	X	1	0	0	X	X	Running continuously or relative (CB12=1). Speed = XV1 if I1 active. Speed= XV2 if I2 active. Zero speed if I1 and I2 not are active. CBx=1 to 4 can be used to select active condition	4
X	X	X	1	0	1	X	X	Same as MO=4 but with I3 is use to start the motor if active and stop the motor id inactive.	5
X	X	X	1	1	0	X	X	Start motor via binary input. 16 different relative or absolute position, velocity, acceleration can be selected with I1 to I4 and executed with I5. Binary 0: XA0:Accelleration, XV0:Speed, XP0:Position, XR0: Relative or absolute selection. Binary 1: XA1:Accelleration, XV1:Speed, XP1:Position, XR1: Relative or absolute selection. Binary n: XAn:Accelleration, XVn:Speed, XPn:Position, XRn: Relative or absolute selection. Binary 15: XA15:Accelleration, XV15:Speed, XP15:Position, XR15: Relative or absolute selection. Input 5: Read I1 to I4 and execute a running accordingly.	6

Register survey

Reg	Function	Description	Example	Default	R/W	Range
CB1	Function/Trigger IO1	**INPUTS** 1: Rising edge 2: Falling edge 3: ”0” 4: ”1” **OUTPUTS** 5: Error active ‘1’ 6: Error active ‘0’ 7: Position ok - active ‘1’ 8: Position ok - active ‘0’ 9: Speed =0 - active ‘1’ 10: Speed =0 - active ‘0’ 11: Direction output 12: Step Pulse output	CB1=4	CB1=1	R/W	
CB2	Function/Trigger IO2	**INPUTS** 1: Rising edge 2: falling edge 3: ”0” 4: ”1” **OUTPUTS** 5: Error active ‘1’ 6: Error active ‘0’ 7: Position ok active ‘1’ 8: Position ok active ‘0’ 9: Speed =0 active ‘1’ 10: Speed =0 active ‘0’ 11: Direction output , 12: Step Pulse output	CB2=3	CB2=1	R/W	
CB3	Function/Trigger IO3	**INPUTS** 1: Rising edge 2: Falling edge 3: ”0” 4: ”1” **OUTPUTS** 5: Error active ‘1’ 6: Error active ‘0’ 7: Position ok active ‘1’ 8: Position ok active ‘0’ 9: Speed =0 active ‘1’ 10: Speed =0 active ‘0’	CB3=2	CB3=1	R/W	
CB4	Function/Trigger IO4	**INPUTS** 1: Rising edge 2 falling edge, 3 ”0” 4: ”1” **OUTPUTS** 5: Error active ‘1’ 6: Error active ‘0’ 7: Position ok active ‘1’ 8: Position ok active ‘0’ 9: Speed =0 active ‘1’ 10 Speed =0 active ‘0’	CB4=1	CB4=1	R/W	
CB5	Function/Trigger IO5	**INPUTS** 1: Rising edge 2: Falling edge 3: ”0” 4: ”1” **OUTPUTS** 5: Error active ‘1’ 6: Error active ‘0’ 7: Position ok active ‘1’ 8: Position ok active ‘0’	CB5=5	CB5=1	R/W	

		9: Speed =0 active '1' 10 Speed =0 active '0'				
CB6	Function/Trigger IO6	**INPUTS** 1: Rising edge 2: Falling edge 3: "0" 4: "1" **OUTPUTS** 5: Error active '1' 6: Error active '0' 7: Position ok active '1' 8: Position ok active '0' 9: Speed =0 active '1' 10: Speed =0 active '0' 11: See CB12	CB6=7	CB6=1	R/W	
CB9	Analogue speed (CB9=1)	VM=((R2-R1)*AI1/8191)+R1 R2: Velocity @ 5V (step/sec) R1: Velocity @ 0V (Step/sec) AI1: 0-8191 (0-5VDC)	R2=10000 R1=1000 CB9=1	CB9=0	R/W	Min,Max ?
	Analogue speed via internal pot meter (CB9=2)	VM=((R2-R1)*AIINT/8191)+R1 R2: Velocity @ 5V (step/sec) R1: Velocity @ 0V (Step/sec) AIINT: 0-8191 (0-5VDC)	CB9=2	CB9=0	R/W	Min,Max ?
CB10	Analogue absolute Position (CB10=1)	SP=((R4-R3)*AI2/8191)+R3 R4: Position @ 5V (step/sec) R3: Position @ 0V (Step/sec) AI2: 0-8191 (0-5VDC)	R4=10000 R3=1000 CB10=1	CB10=0	R/W	Min,Max ?
CB11	Start up zero seek	Start zero seek at power up. See SZ for running parameters	CB11=1	CB11=0	R/W	
CB12	Select running mode	Select continuously (CB12=0) or relative running (CB12=1) in different modes. XP0: Relative pulses. If CB6=11 will O6 be activated if XP0 are reached. O6 will be deactivated at next motor movement.	CB12=1	CB12=0	R/W	
CV	Actual Velocity		CV=140		R	
***	****	*****	****	***	***	
R1	User register	-2.147.483.648 to +2.147.483.647	R1=40000	R1=0	R/W	
R2	User register	-2.147.483.648 to +2.147.483.647	R2=-4	R2=0	R/W	
R3	User register	-2.147.483.648 to +2.147.483.647	R3=-888888	R3=0	R/W	
R4	User register	-2.147.483.648 to +2.147.483.647	R4=+79	R4=0	R/W	
XA0-XA15	Acceleration in register mode	0-100.000	XA1=1000	XA1=0	R/W	Min,Max ?
XV0-XV15	Velocity in register mode	0-60.000	XV1=500	XV1=0	R/W	Min,Max ?
XP0-XP15	Absolute or relative position	-2.147.483.648 to +2.147.483.647	XP1=123456	XP1=0	R/W	
XR0-XR15	Relative or absolute selection	0-1	XR1=1	XR1=0	R/W	
***	****	*****	****	***	***	
ACC	Acceleration up	0, 140 -100.000 RPM/sec. When ACC are used will the value be copied to DCC register so ACC and DCC are equal.	AC=2000	100step/sec2	R/W	100-65.535
AC	Acceleration up/ down	1-100.000 step (ACC/DEC not active if ACP specified)	AC=30	100	R/W	
DCC	Deceleration down	0, 140-100.000 RPM/sec. If not specified are ACC used as DEC	DEC=500	100step/sec2	R/W	

VM	Velocity	140-65530 step/sec	VM=200	1000step/sec	R/W	
VS	Start velocity	140-65530 step/sec	VS=140	300 step/sec	R/W	
AP	Position	-2147483648 to +2147483647	AP=-200	AP=0	R/W	
SR	Relative position	-2147483648 to +2147483647	SR=+100	SR=0	R/W	
SP	Absolute position	-2147483648 to +2147483647	SP=+10000	SP=0	R/W	
SRC	Continues move	0:continues negative 1:cont positive	SRC=0	SRC=1	R/W	
RS	Motor status	0: Stopped 1:Acc 2: Running 3:Decel. 4: Error	RS	RS=0	R	
SD	Set default	All registers and parameters will be set to default excepts MSU	SD	-	W	
SZ	Zero seek	Run continuous after XA0, XV0 until input 6 are active (CB6 setup)	SZ=1		R/W	
MS	Save parameters and registers	All parameters and user setting will be saved in FLASH memory. Notice that it maximum is possible to save data 2000 times. Se MSU for how many times there had been written data to FLASH.	MS	-	W	
MSU	Number of savings	Maximum savings I FLASH are 2000 times. This number shows how many times the user have tried to save data in FLASH	MSU=100	-	R	0-65.535
MO	Mode	0-15 . 0: Mode selected via dipswitch 1: Start I1 / Stop I2 2: Run I1 / Dir I2 3: Position mode. SR=x 4: Running cont. I1: XV1, I2:XV2 Select speed. 5: Running cont. I1:XV1, I2:XV2 Select speed- I3=1 stop motor. I3: running 6: Run relative length. SR=x I1: start via CB1 select, I2: stop via CB2 select	MO=1	MO=3	R/W	0-15
?	Show all registers				W	
Exx	Error	00: No errors 01: Missing sign 02: Out of range 03: Wrong value 04: To low speed 05: Syntax error 15 ..	E01	E00	R	