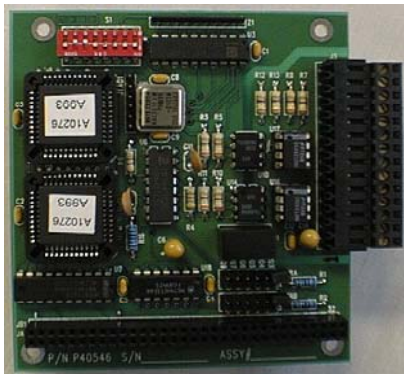
Product Specification for Model PC4-TEMP



The Model PC4-TEMP is a PC/104 form factor and bus compatible module that provides two channels of magnetostrictive transducer interface. The module interrogates the transducers and converts the timing information to position values. The module operates with Start Stop, Pulse Width Modulated or optionally with the SSI transducer. On a single Start Stop transducer the module supports one to thirty one recirculations or from one to 31 magnets when in the multi-magnet mode. All operations are software controlled. A 56 MHz oscillator provides excellent resolution even in the multi-magnet mode. The transducers are electrically isolated from the PC104 power supply. Transducer and power supply connections are made easy with a removable screw terminal.

1 FEATURES

- Supports two magnetostrictive transducers
- Supports Pulse Width Modulated or Start Stop transducers. (optional SSI)
- 56 Mhz Count oscillator provides 0.001 inch resolution with 2 recirculations
- 24 bit counter for each transducer
- Software selectable recirculations or magnets, 1 to 31
- MultiMagnet mode measures from 1 to 31 magnets on each of the transducers
- Optical isolation between the transducer and the board to prevent damage to PC104 stack.
- Cables directly to the transducer, +/- 15V power not required by the board.
- Software controlled interrupt supports IRQ3, 4, 5, 6, 7, and 9
- Status register provides ready indication
- Compact PC/104 dimensions (3.6 in x 3.8 in)
- Switch selectable I/O address selectable in 8 byte increments from 0 to 7FFH

2 SPECIFICATIONS

- 56 MHz oscillator provides 0.001 inch resolution with 2 recirculations
- Multi-magnet mode requires Start Stop transducer and must be interrogated once for each magnet
- 14 pin screw terminal to connect transducers
- Plus and Minus Interrogate output RS422 compatible (1 micro second duration)
- GATE+ and GATE- inputs are RS422 compatible
- Recirculations are software settable from 1 to 31.
- Magnet number in Multi-magnet mode is software settable from 1 to 31
- 8 Bit I/O Bus Interface , base address settable from 0 to 7FFH in 8 byte increments
- Power Requirements: 5 VDC @ 200 ma.
- Size: 3.6 inch L x 3.8 inch W x 0.6 inch H (90 x 96 x 16 MM).

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Models: PC4-TEMP-A-B-C

A - Number of channels: 2 is standard, 1 is optional

B - Transducer type: Start Stop/PWM is standard, SSI optional

C - Oscillator frequency, 56 standard, 28 optional

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3 Theory of operation: Start/Stop, PWM

The host PC104 processor writes a recirculation value and mode to the Control/Status register, loading the recirculation count. The control register write causes an interrogation pulse to be issued from the EPLD which in turn causes a 1 microsecond pulse to be issued from the Intertogate + and - outputs of the board. The transducer immediately responds with a 1 microsecond Gate + and - pulse. This pulse increments the recirculation register and starts the position counter counting. After the time required for the torque pulse to propagate down the transducer from the magnet (9 * inches microseconds) another Gate + and Gate - pulse is returned from the transducer. This again increments the recirculation counter. If it is not the last recirculation another one microsecond interrogate pulse is issued. This process continues until the last interrogation when the last Gate+ and Gate - pulse returned stops the position counter and sets the process completed flag. The 24 bit counter can now be read and will hold a value of (inches * Gradient * 56 * recirculations).

When operating in the PWM mode the counter counts from the leading edge to the trailing edge of the Gate pulse. The multi-magnet mode functions the same as the recirculation mode except that only one interrogate pulse is issued. The magnet measured is determined by the recirculation count programmed. Since only a single magnet can be measured at one time, the transducer must be interrogated once for each new magnet position desired. The software must wait each time for all of the magnets to respond, this is best accomplished by waiting a time equal to 9 * (length of the transducer + 10) microseconds between interrogations..

3.1.1 Programming (start/Stop and PWM)

Command register: Bits 0 thru 4 = recircs. Bit 5 = PWM when 1, Bit 6 = MultiMag when 1, Bit 7 = Interrupt Enable

Status Register Bits 0 thru 4 = recircs. Bit 5 = PWM when 1, Bit 6 = MultiMag when 1, Bit 7 = 1 When Data Ready

4 Theory of operation: SSI

The host PC104 processor writes a bit length value to the Control/Status register causing the clock generator to start the clock data process. The board generates the proper number of clock pulses at 218 KHz and clock in the data response from the transducer. When all 24 or 25 bits have been clocked into the registers the data ready flag is set. If interrupts were enable the interrupt line is driven high. Data is available in the four registers. The transducer controls the resolution and data format, Gray code or binary.

4.1 Programming (SSI)

4.1.1 Command register:

Bits 0 thru 4 = unused
Bit 5 = 24 bit when 0, 25 bit when 1
Bit 6 = unused
Bit 7 = Interrupt Enable

4.1.2 Status Register

Bits 0 = Bit 25 of the data
Bits 1 through 4 are 0
Bit 5 = 0 for 24 bit or 1 for 25 bit
Bit 6 unused
Bit 7 = Data Ready flag, 1 when data ready

5 Connections:

All connections to the transducers are made through the J3 connector.

J3-1:	Gate + from transducer A	(Pink)	(Data + for SSI option)
J3-2:	Gate - from transducer A	(Gray)	(Data - for SSI option)
J3-3:	Interrogate + to transducer A	(Yellow)	(Clk + for SSI option)
J3-4:	Interrogate - to transducer A	(Green)	(Clk- for SSI option)
J3-5:	Gate + from transducer B	(Pink)	(Data + for SSI option)
J3-6:	Gate - from transducer B	(Gray)	(Data - for SSI option)
J3-7:	Interrogate + to transducer B	(Yellow)	(Clk + for SSI option)
J3-8:	Interrogate - to transducer B	(Green)	(Clk- for SSI option)
J3-9:	Vacant pin shorted to Pin 13	(Red)	optional see note below
J3-10:	Vacant pin shorted to Pin 14	(Blue)	optional see note below
J3-11:	DC common to the transducers	(White)	
J3-12:	DC common to the transducers	(White)	
J3-13:	Vacant pin shorted to pin 9		
J3-14:	Vacant pin shorted to pin 10		

Pins 9 and 13 are not required by the PC4-TEMPO board but can be used to connect the + voltage to the transducer (Red) by bringing the +voltage onto pin 13.
Pins 10 and 14 are not required by the PC4_TEMPO board but can be used to connect the - voltage to the transducer (Blue) by bringing the -voltage onto pin 14.

6 Addressing

Address setting: Dip switch 1 determines the base address: A3 through A10, On= 0 and Off = 1
Switch binary values: S1 = 8, S2 = 0x10, S3= 0x20, S4 = 0x 40h , S5 = 0x80, S6 = 0x100, S7 = 0x200, S8 = 0x400
Example addresses:

Address	S1	S2	S3	S4	S5	S6	S7	S8
300H	On	On	On	On	On	Off	Off	On
308H	Off	On	On	On	On	Off	Off	On
208H	Off	On	On	On	On	Off	On	On
700H	On	On	On	On	On	Off	Off	Off

Base +0	Base +1	Base +2	Base +3	Base +4	Base +5	Base +6	Base +7
Ch A Posn Byte 0	Ch A Posn Byte 1	Ch A Posn Byte 2	Ch A Command / Status	Ch B Posn Byte 0	Ch B Posn Byte 1	Ch B Posn Byte 2	Ch B Command / Status

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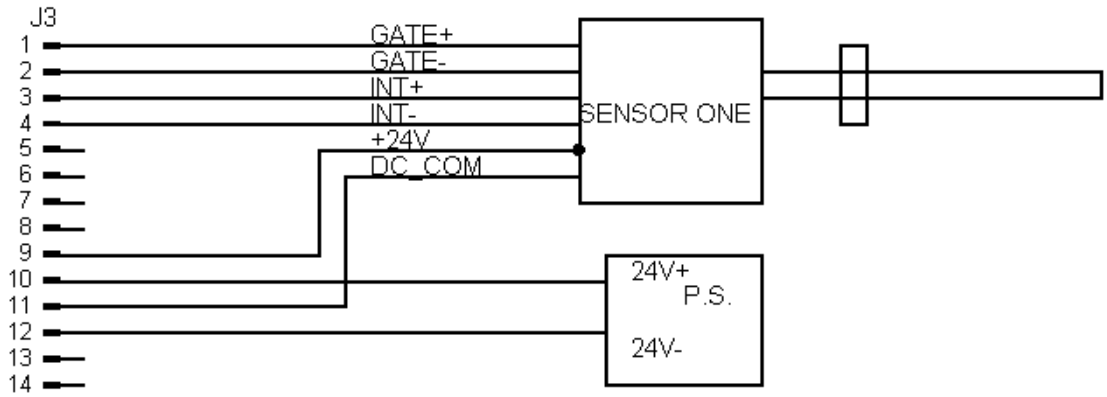
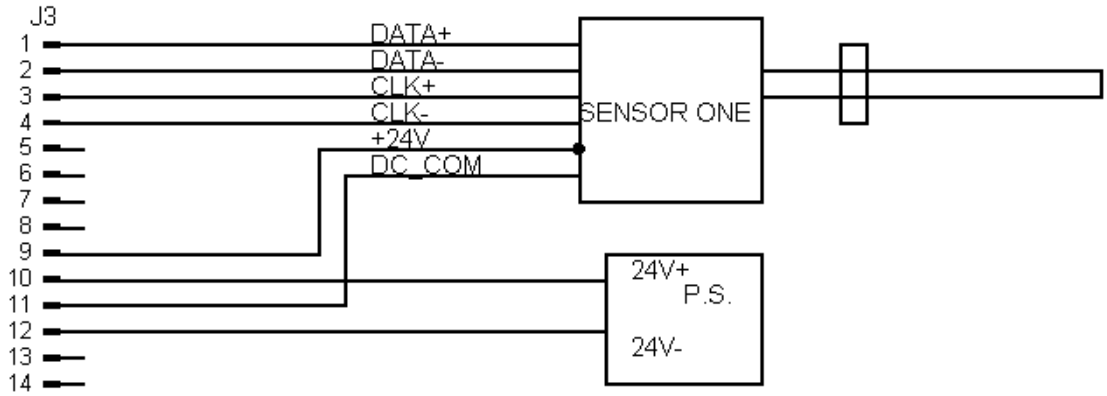
PC4-TEMP October 27, 2006

Connections for one 24V transducer



Connections for one 24V SSI transducer



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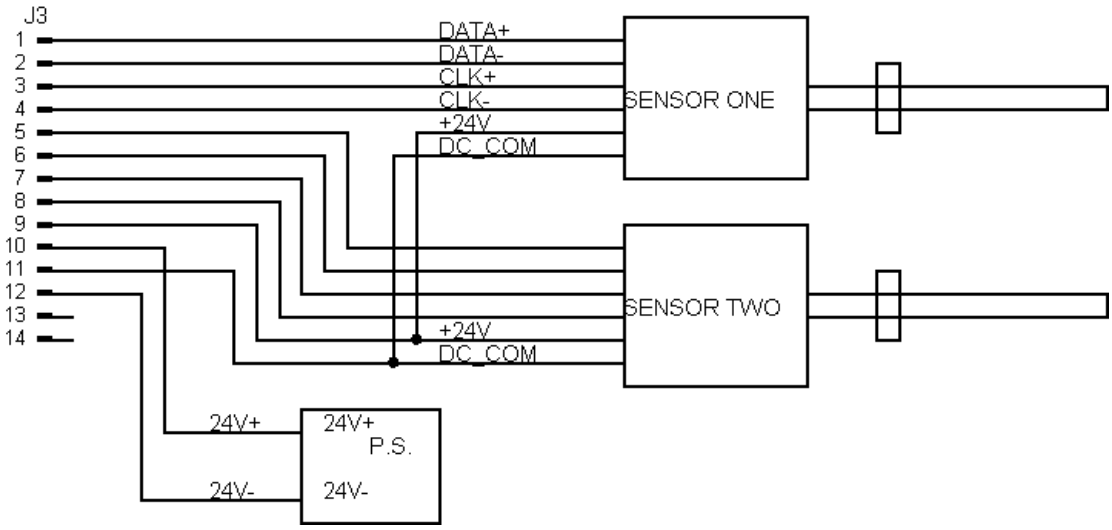
Connections for two 24V SSI transducers



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