

# MSI PC/104 Embedded PC Series

# MSI-P402 Quadrature Decoder/Counter Card

## FEATURES

- ◆ 2, 4, 6 or 8 channels of quadrature encoder inputs.
- ◆ 32-bit binary up/down counter with selectable 1X, 2X or 4X decoding using a Agilent HCTL-2032 decoder IC.
- ◆ Ideal for monitoring shaft positions and rotations in machinery and robotic applications.
- ◆ Individual software reset for each channels.
- ◆ Selectable interrupts IRQ3 thru IRQ9 for processing roll-overs at  $\pm 2,147,483,647$  counts.
- ◆ Single +5V operation.
- ◆ 8-bit stackthrough PC/104 with I/O mapped 16-bit addressing.
- ◆ Jumper selectable card addresses.
- ◆ Operating temperature range  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .
- ◆ Two-year warranty from date of shipment.

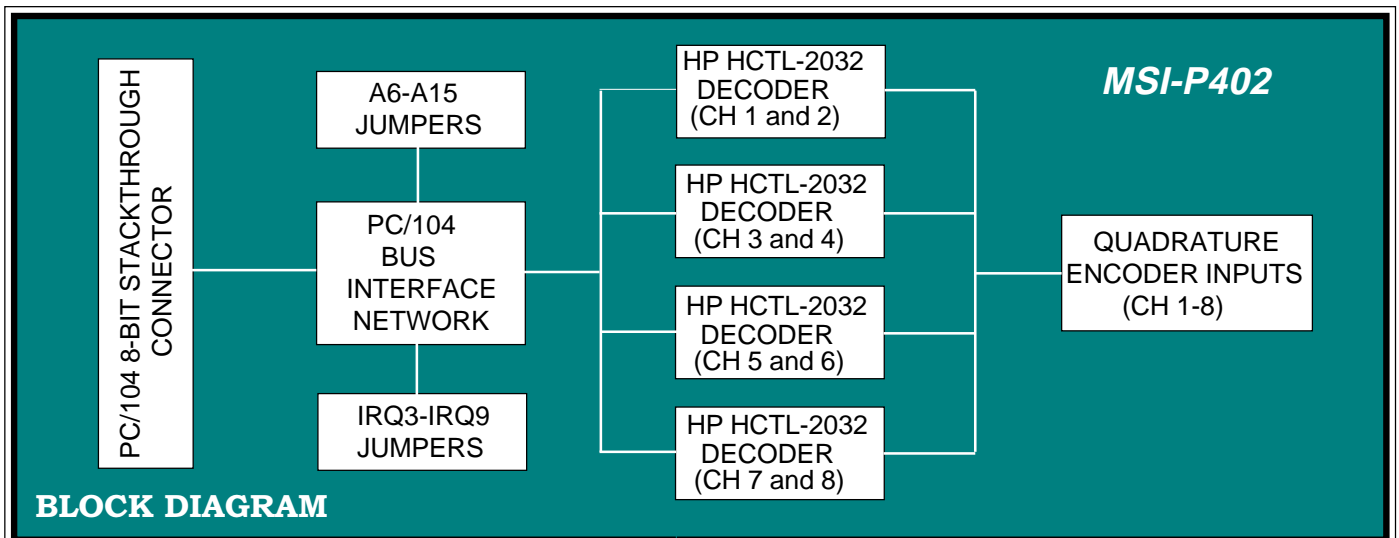


## DESCRIPTION

The MSI-P400 is a 32-Bit quadrature decoder/counter PC/104 card designed for monitoring up to 8 quadrature encoder inputs used in monitoring shaft positions and rotations. Each channel provides a 32-bit binary up/down counter with selectable 1X, 2X or 4X decoding using an Agilent HCTL-2032 decoder IC. This device provides a digital noise filter network, decoding logic, a 32-bit counter, and a 32-bit latched output for two quadrature decoder

channels. A block diagram of the card is shown below. Inputs from quadrature encoders are applied via an input connector (J1) that requires a frequency and a reference signal input for each channel in use. Input signals are TTL levels. The clock employed for processing the input signals is selectable from SYSCLK (6 to 8.33 MHz, depending on the processor card used, or OSC at 14.318 MHz) of the PC/104 bus. As an option, clock oscillators from 2 to 33 MHz are available.

(over)



## SPECIFICATIONS

In addition to the frequency and reference quadrature inputs, +5V and GND connections are provided on the input connector for supplying power to the encoder of each channel. Surge protectors are provided on each all quadrature inputs to protect against damage due to voltage surges in noises environments.

The maximum frequency that can be applied to either a frequency or reference input is

$$f_{\max} = \text{CLK}/7$$

Therefore, for CLK = 8.33 MHz,  $f_{\max} = 1.19$  MHz and for CLK = 14.318 MHz,  $f_{\max} = 2.045$  MHz.

Each channel has a 32-bit up/down counter and an output latch. When the frequency input leads the reference input (nominally by 90 degrees), the counter counts up. Conversely, when the reference input leads the frequency input (nominally by 90 degrees), the counter counts down. Counts range from 0 to FFFFFFFF hexadecimal (0 to 4,294,967,295 decimal). Data reads require four Byte I/O reads to acquire the 32-bit count of each channel. Roll-over occurs for 0-to-FFFFFFF and FFFFFFFF-to-0 count transitions. These transitions are OR'ed together for use with interrupts IRQ3 thru IRQ9. The monitoring software must account for the roll-over events. Illustrative techniques are given in the MSI-P402 User's Manual.

A software reset is provided for each channel that sets the count to 0. The card is an 8-bit stackthrough unit that requires +5V from the PC/104 bus.

### PC/104

8-bit, stackthrough

### Quadrature Encoder Inputs

No. of Channels 2, 4, 6 or 8

Freq & Ref (Quad. inputs for each channel)

Low level 1.5V Max.\*

High Level 3.5V Min.\*

Input Impedance 10 KW \*

Surge Supression Varistors on each input

\* Note: 10K pull-up on all quadrature inputs.

### Input Frequency

$f_{\max} = \text{SYSCLK}/7$

$f_{\max} = 1.19$  MHz for SYSCLK = 8.33 MHz

$f_{\max} = 2.045$  MHz for SYSCLK = 14.318 MHz

### Input Connector (J1)

Quadrature Inputs, +5V and GND

One (1) 3M 303XX-5002 or equivalent.

XX = 10, 2 channels.

XX = 16, 4 channels.

XX = 26, 6 channels.

XX = 34, 8 channels.

### Address Selection Jumpers

A6 thru A15

0.025" square posts, 0.1" grid

### Electrical & Environmental

+5V @ 2 mA/Channel Typical

-40° to 85° C

### Models

MSI-P402 - X, X = no. of channels (2, 4, 6, 8).



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