

MSI PC/104 Embedded PC Series

MSI-P440 Thermocouple and A/D Input Card

FEATURES

- ◆ 8 T/C channels, Type K, low cost, high performance, $\pm 0.5^{\circ}\text{C}$ resolution.
- ◆ 8 12-bit analog input channels, $\pm 1/2$ LSB linearity, low cost, high performance.
- ◆ Software selectable input ranges of 0-5V, 0-10V, $\pm 5\text{V}$, or $\pm 10\text{V}$.
- ◆ Input Impedance $1\text{ M}\Omega$ (up to $1\text{ G}\Omega$ available).
- ◆ Single +5V operation.
- ◆ 12 μs total conversion time for a 83 kcps rate for each 8 channels (166 kcps for 16 channels).
- ◆ Two programmable power down modes .
- ◆ 8-bit stackthrough PC/104 with I/O mapped 16-bit addressing.
- ◆ Jumper selectable address and interrupt options.
- ◆ Operating temperature range -40°C to 85°C .
- ◆ Two-year warranty from date of shipment.

DESCRIPTION

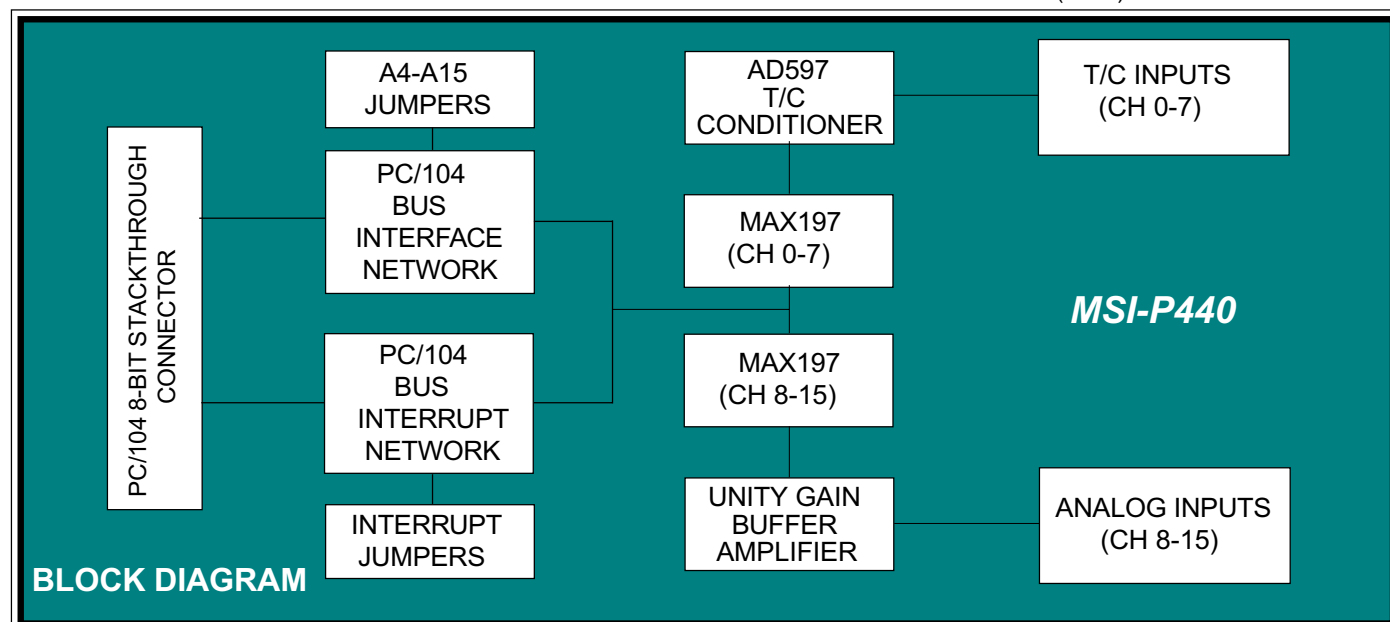
The MSI-P440 is a low cost, high performance thermocouple and 12-bit analog input card designed for use with all PC/104 embedded systems. Four models provide various combinations of thermocouple and analog input combinations which operate from the PC/104



bus +5V supply. Software programmable input ranges are 0-5V, 0-10V, $\pm 5\text{V}$ and $\pm 10\text{V}$ with a linearity of $1/2$ LSB. In addition, a fault condition on any channel will not effect the conversion result on the selected channel.

T/C Conditioners - Analog Devices AD597 (Type K, -200°C to 1000°C) thermocouple conditioners provide ice point compensation and $10\text{mV}/^{\circ}\text{C}$ proportional operation.

(over)



A/D Converters - The card employs up to two MAX197 eight-channel A/D converters that incorporate a precision 2.5V reference source with buffer amp, an internal 1.56 MHz clock, and successive approximation and internal input track/hold circuitry to convert the analog signal of each channel into a 12-bit digital signal. Low span and offset errors result in no adjustments being required for these functions. Typical total conversion times of 12 μ s gives a sample rate of 83 ksp/s for each group of eight channels yielding rates up to 166 ksp/s for 16 input channels.

Card Addressing - The card is I/O mapped using 16-bit addressing to select the input channels and device status. Option jumpers are provided for specifying the card **base** address (A4 - A15). The address of the control word/input data (C/I) and status for each channel is

Channels	C/I Address	Status Address
0-7	base + 0 (lo) base + 1 (hi)	base + 8 (bit 0)
8-15	base + 2 (lo) base + 3 (hi)	base + 8 (bit 1)
16-23	base + 4 (lo) base + 5 (hi)	base + 8 (bit 2)
24-31	base + 6 (lo) base + 7 (hi)	base + 8 (bit 3)

Interrupts - Interrupt processing is provided for IRQ4 thru IRQ7 and IRQ9 using options jumpers.

Programming - Performing conversions is very simple. A control byte is written to the desired channel group lo byte specifying the channel within the group (bits 0-2), input range (bit 3), polarity (bit 4), mode (bit 5), and the clock and power down selection (bits 6-7). The status bit of the channel group indicates when the conversion is complete. The data is then read, D0-D7 at the lo address of the channel group and D8-D11 at the hi address of the channel group, bits 0-3. The read operation can be performed under software polling or by using interrupt processing.

SPECIFICATIONS

PC/104

8-bit, stackthrough

Thermocouple Inputs

Channels	8
Mode	Differential Input
Conditioner	
Type K	Analog Devices AD597

Analog Inputs

Channels	8
Mode	Single-Ended Input
Converter	MAXIM MAX197
Input Ranges	0-5V, 0-10V, \pm 5V, \pm 10V
Resolution	12 bits
Conversion Rate	82 ksp/s per 8 channels
Non-linearity	\pm 1/2 LSB
Offset Error	< 0.5% Span
Gain Error	< 0.5% Span
Signal-to-Noise	70 dB min
Input Resistance	1 M Ω (Ch 8 thru 15)

Internal Reference

Ref Out Voltage	4.096 V \pm 1.5% max.
Temp. Coeff.	40 ppm/ $^{\circ}$ C

Connectors

MSI-P440-K	(16-pin).
MSI-P440-K/A	(34-pin).

Interrupts

Channels	One, sharing with tri-state buffer for IRQ4-7, 9 .025" square posts, 0.1" grid
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Option Jumpers

Electrical & Environmental

+5V @ 40 mA typical
-40 $^{\circ}$ to 85 $^{\circ}$ C

Models

MSI-P440-K	8 T/C Type K Channels
MSI-P440-K/A	8 T/C Type K Channels 8 12-bit Analog Channels



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