

MSI PC/104 Embedded PC Series

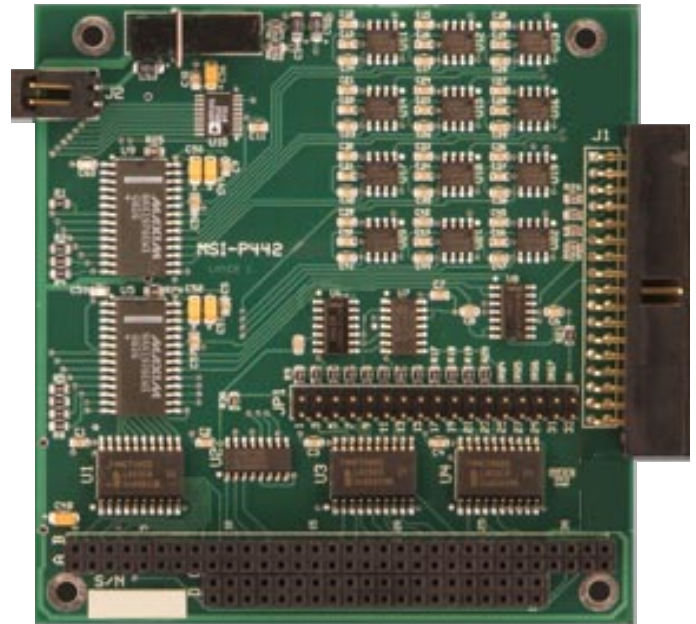
MSI-P442 Thermocouple and Analog I/O Card

FEATURES

- ◆ 12 T/C channels, Type K, low cost, high performance, $\pm 0.5^{\circ}\text{C}$ resolution.
- ◆ Four 12-bit analog input channels, $\pm 1/2$ LSB linearity, low cost, high performance.
- ◆ One 12-bit analog output channels, 0-5V, 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 M Ω (up to 1 G Ω available).
- ◆ Single +5V operation.
- ◆ 12 μs total conversion time for a 83 kbps rate for each 8 channels (166 kbps for 16 channels).
- ◆ Two programmable power down modes .
- ◆ Jumper selectable address and interrupt options.
- ◆ Operating temperature range -40°C to 85°C .
- ◆ Two-year warranty from date of shipment.

DESCRIPTION

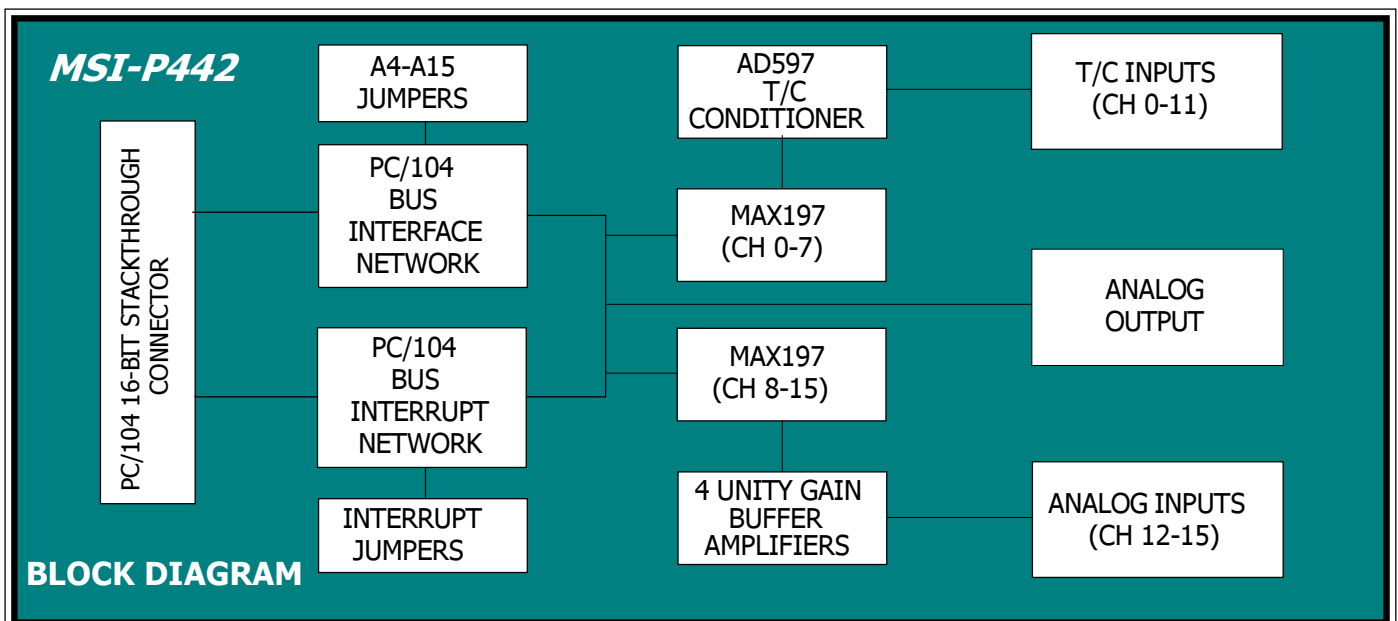
The MSI-P442 is a low cost, high performance thermocouple and 12-bit analog I/O card designed for use embedded laboratory instruments and robotic systems. Four models provide various combinations of thermocouple and analog input and output combinations which



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

(over)



A/D Converters - Up to two MAX197 8-channel provide 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 us gives a sample rate of 83 ksps for each group of eight channels yielding rates up to 166 ksps for 16 input channels.

D/A Converter - An AD5341 provides a 12-bit converter with a 0-5V output voltage. The device contains a 12-bit output data register and an output data latch. The addresses of the output data register consist of two bytes (Hi and Lo bytes).

Card Addressing - The card is I/O mapped using 16-bit addressing to select the I/O 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 input channels are

Channels	C/I Address	Status Address
0-7	base + 0 (lo) base + 1 (hi)	base + 4 (bit 0)
8-15	base + 2 (lo) base + 3 (hi)	base + 4 (bit 1)

The D/A output addresses are

Lo byte	base + 6
Hi byte	base + 7
Latch Out	base + 8

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

Programming - Performing input conversions is very simple. A control byte is written to the desired channel group followed by 2 bytes reads following the completion of conversion. For an analog output, two byte writes are performed that specify the output value. A write to the Latch Out address updates the output.

SPECIFICATIONS

PC/104 16-bit, stackthrough

Thermocouple Inputs

Channels 12
 Mode Differential Input
 Conditioner Type K Analog Devices AD597

Analog Inputs

Channels 4
 Mode Single-Ended Input
 Converter MAXIM MAX197
 Input Ranges 0-5V, 0-10V, $\pm 5V$, $\pm 10V$
 Resolution 12 bits
 Conversion Rate 82 ksps 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 12 thru 15)

Internal Reference

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

Analog Output

Converter Analog Devices AD5341
 Resolution 12 bits
 Settling Time 10 us
 Ref Voltage In 2.5V

Connector J1

3M 30334-5002 All models except
 3M 30326-5002 MSI-P442-K
 3M 30316-5002 MSI-P442-K-8

Interrupts

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

Option Jumpers

Electrical & Environmental

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

Models

MSI-P442-K/I/O 12 T/C Channels, 4 Analog Inputs, 1 Analog Output
 MSI-P442-K/I 12 T/C Channels, 4 Analog Inputs
 MSI-P442-K/O 12 T/C Channels, 1 Analog Output
 MSI-P442-K 12 T/C Channels
 MSI-P442-K-8 8 T/C Channels



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