CIO-DAS-TEMP

Temperature Input Board
User's Manual

MEASUREMENT
COMPUTING™

Revision 4, November, 2000

LIFETIME WARRANTY

Every hardware product manufactured by Measurement Computing Corp. is warranted against defects in materials or workmanship for the life of the product, to the original purchaser. Any products found to be defective will be repaired or replaced promptly.

LIFETIME HARSH ENVIRONMENT WARRANTY™

Any Measurement Computing Corp. product which is damaged due to misuse may be replaced for only 50% of the current price. I/O boards face some harsh environments, some harsher than the boards are designed to withstand. When that happens, just return the board with an order for its replacement at only 50% of the list price. Measurement Computing Corp. does not need to profit from your misfortune. By the way, we will honor this warranty for any other manufacture's board that we have a replacement for!

30 DAY MONEY-BACK GUARANTEE

Any Measurement Computing Corp. product may be returned within 30 days of purchase for a full refund of the price paid for the product being returned. If you are not satisfied, or chose the wrong product by mistake, you do not have to keep it. Please call for a RMA number first. No credits or returns accepted without a copy of the original invoice. Some software products are subject to a repackaging fee.

These warranties are in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular application. The remedies provided herein are the buyer's sole and exclusive remedies. Neither Measurement Computing Corp., nor its employees shall be liable for any direct or indirect, special, incidental or consequential damage arising from the use of its products, even if Measurement Computing Corp. has been notified in advance of the possibility of such damages.

MEGA-FIFO, the CIO prefix to data acquisition board model numbers, the PCM prefix to data acquisition board model numbers, PCM-DAS08, PCM-D24C3, PCM-DAC02, PCM-COM422, PCM-COM485, PCM-DMM, PCM-DAS16D/12, PCM-DAS16S/12, PCM-DAS16D/16, PCM-DAS16S/16, PCI-DAS6402/16, Universal Library, *Insta*Cal, *Harsh Environment Warranty* and Measurement Computing Corp. are registered trademarks of Measurement Computing Corp.

IBM, PC, and PC/AT are trademarks of International Business Machines Corp. Windows is a trademark of Microsoft Corp. All other trademarks are the property of their respective owners.

Information furnished by Measurement Computing Corp. is believed to be accurate and reliable. However, no responsibility is assumed by Measurement Computing Corp. neither for its use; nor for any infringements of patents or other rights of third parties, which may result from its use. No license is granted by implication or otherwise under any patent or copyrights of Measurement Computing Corp.

Notice

Measurement Computing Corp. does not authorize any Measurement Computing Corp. product for use in life support systems and/or devices without the written approval of the President of Measurement Computing Corp. Life support devices/systems are devices or systems which, a) are intended for surgical implantation into the body, or b) support or sustain life and whose failure to perform can be reasonably expected to result in injury. Measurement Computing Corp. products are not designed with the components required, and are not subject to the testing required to ensure a level of reliability suitable for the treatment and diagnosis of people.

Table of Contents

This page is blank.

1 INTRODUCTION

The CIO-DAS-TEMP is a temperature measurement board designed for use with the AD592 semiconductor temperature sensor. Since the AD592 is a current output device, the on-board signal conditioning is optimized for that sensor. A voltage-to-frequency converter translates the signal from the sensor into a value proportional to temperature. Functions in the Universal Library convert that proportional value into a temperature reading on which you can base a control system, or simply log for later analysis.

The AD592 semiconductor temperature sensor is ideally suited for measurements in the ambient range. If you are designing an HVAC system, or need to monitor the efficiency of an existing system, the CIO-DAS-TEMP provides the best value and accuracy in the ambient range. More accurate than thermocouples and less expensive than RTDs, the AD592 sensor is available through general distribution or from Measurement Computing Corp. as an individual part or in a stainless steel probe.

Custom Ranges

The CIO-DAS-TEMP is a current input board with a fixed range of 0 to 500 µAmps. The front end may be customized to allow up to 0 to 20 mA. The CIO-DAS-TEMP provides up to a full 16 bits of resolution and will easily reject line noise. If you have a current measurement application and want a precisely matched front end, please call our technical support and explain your needs to us.

2 INSTALLATION

2.1 SOFTWARE

There is a bank of switches to set before installing the board in your computer. By far the simplest way to configure your board is to use the *Insta*Cal™ program provided as part of your software package. *Insta*Cal™ will show you all available options, how to configure the switches to match your application requirements, and will create a configuration file that your application software (and the Universal Library) will refer to so the software you use will automatically know the exact configuration of the board.

Please refer to the *Software Installation Manual* regarding the installation and operation of *Insta*Cal™. The following hard copy information is provided as a matter of completeness, and will allow you to set the hardware configuration of the board if you do not have immediate access to *Insta*Cal™ and/or your computer.

2.2 HARDWARE

2.2.1 Base I/O Address

The CIO-DAS-TEMP may be set to operate at any one of a range of base addresses. The CIO-DAS-TEMP uses eight, 8-bit addresses, so the base addresses available are in steps of eight. For example, 300h, 308h, 310h and so on. Table 2-1 of occupied PC addresses below should be supplemented by information you provide about the addresses used by any other boards or devices installed in your computer. After all occupied addresses are known, choose an available block of eight I/O addresses for your CIO-DAS-TEMP. Make sure it is on a 3-bit (8-address) boundary.

Table 2-1. PC I/O Addresses

HEX RANGE	FUNCTION	HEX RANGE	FUNCTION
000-00F	8237 DMA #1	2C0-2CF	EGA
020-021	8259 PIC #1	2D0-2DF	EGA
040-043	8253 TIMER	2E0-2E7	GPIB (AT)
060-063	82C55 PPI (XT)	2E8-2EF	SERIAL PORT
060-064	8742 CONTROLLER (AT)	2F8-2FF	SERIAL PORT
070-071	CMOS RAM & NMI MASK (AT)	300-30F	PROTOTYPE CARD
080-08F	DMA PAGE REGISTERS	310-31F	PROTOTYPE CARD
0A0-0A1	8259 PIC #2 (AT)	320-32F	HARD DISK (XT)
0A0-0AF	NMI MASK (XT)	378-37F	PARALLEL PRINTER
0C0-0DF	8237 #2 (AT)	380-38F	SDLC
0F0-0FF	80287 NUMERIC CO-P (AT)	3A0-3AF	SDLC
1F0-1FF	HARD DISK (AT)	3B0-3BB	MDA
200-20F	GAME CONTROL	3BC-3BF	PARALLEL PRINTER
210-21F	EXPANSION UNIT (XT)	3C0-3CF	EGA
238-23B	BUS MOUSE	3D0-3DF	CGA
23C-23F	ALT BUS MOUSE	3E8-3EF	SERIAL PORT
270-27F	PARALLEL PRINTER	3F0-3F7	FLOPPY DISK
2B0-2BF	EGA	3F8-3FF	SERIAL PORT

The Base Address is set by a switch on the CIO-DAS-TEMP labeled ADDRESS. The CIO-DAS-TEMP uses eight, 8 bit addresses.

The board is set at the factory for address 300h (768 decimal) as shown here. It is a common address for I/O boards and may already be in use in your computer. Verify that it, or the address you choose is available.

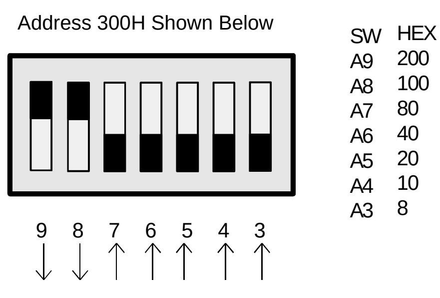

Figure 2-1. Base Address Switches

3 INTERFACING

The CIO-DAS-TEMP has 32 current inputs designed specifically for the AD592 semiconductor-type temperature sensor.

3.1 CONNECTOR DIAGRAM

The CIO-DAS-TEMP employs the 37-pin, D-type signal connector common to many I/O boards. It may be cabled to directly, or through a C37FF cable and screw terminal such as the CIO-MINI37.

Signal wires from the AD592 temperature sensors should be connected to the input terminals labeled TEMP0 through TEMP31.

All the power wires should be connected in common to the +15VDC power, pin 19.

Please make accurate notes and pay careful attention to wire connections. In a large system, finding a misplaced wire may create hours of work.

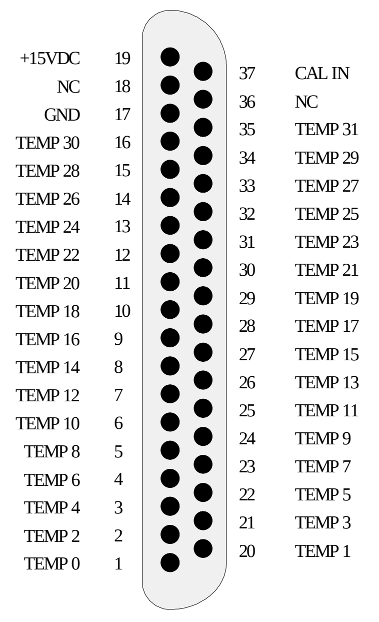

Figure 3-1. 37-Pin Connector

3.2 CONNECTING THE AD592 SENSORS

The AD592 semiconductor temperature sensor produces a current proportional to temperature. The sensor employs only two leads, a power lead and the return. The amount of current flowing through the circuit is proportional to temperature and is the signal measured by the CIO-DAS-TEMP.

The AD592 chip has three leads, two of which are used. One is the power and one is the return, the remaining pin is not to be connected and is not used. The power pins from one or all 32 sensors are connected to the +15V (pin 19) of the CIO-DAS-TEMP. The return pin is connected to the TEMP# of the CIO-DAS-TEMP.

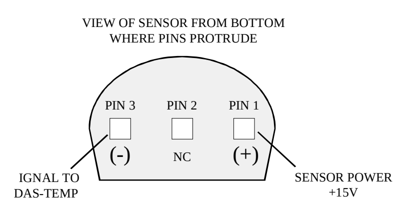

Figure 3-2. AD592 Sensor Connections

Semiconductor temperature sensors may be purchased from some electronics distributors or directly from Measurement Computing Corp. An AD592 potted into a stainless steel probe may be purchased from Measurement Computing Corp. or from other vendors of temperature sensors.

The AD592CN has excellent specifications for ambient temperature measurement (see chapter on specifications).

In addition, because it is a current-output device, the AD592CN is relatively immune to noise pickup and IR drops in the signal leads when used remotely. It is reasonably rugged and will withstand supply irregularities and variations or reversals up to 20V. Since the AD592s are laser-trimmed, they are interchangeable and have a high initial accuracy that does not degrade over time

Figure 3-3 shows Measurement Computing's SNSR-AD592-PRB6CN (six inch, CN specifications). The SNSR-AD592-PRB6CN is composed of an AD592 connected to two lead wires, inserted into a stainless steel probe and potted in place.

The unit is waterproof.

There are two wires protruding from the probe. The RED wire connects to the +15VDC power. The BLACK wire connects to the TEMP# input of the CIO-DAS-TEMP.

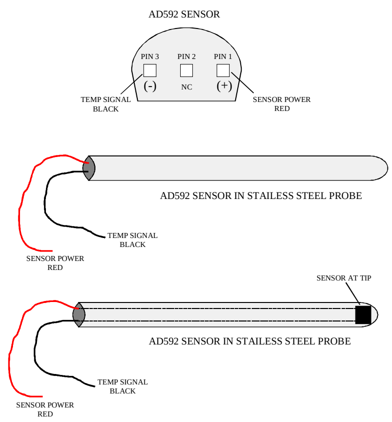

Figure 3-3. SNSR-AD592-PRB-6-BN Sensor

4 PROGRAMMING AND APPLICATIONS

Although the CIO-DAS-TEMP is part of the larger DAS family, there is no correspondence between registers. Software written at the register level for the other DAS's will not work with the CIO-DAS-TEMP.

PROGRAMMING LANGUAGES

The UniversalLibrary program provides complete access to the CIO-DAS-TEMP functions from a range of programming languages; both DOS and Windows. If you are planning to write programs, or would like to run the example programs for Visual Basic or any other language, please refer to the UniversalLibrary manual.

PACKAGED APPLICATION PROGRAMS

Many packaged application programs, such as Labtech Notebook and SoftWIRE now have drivers for the CIO-DAS-TEMP. If the package you own does not appear to have drivers for the CIO-DAS-TEMP please fax the package name and the revision number from the install disks. We will research the package for you and advise by return fax how to obtain CIO-DAS-TEMP drivers.

5 THEORY OF OPERATION

5.1 OVERVIEW

The CIO-DAS-TEMP is composed of a Current to Voltage (C/V) converter, a Voltage to Frequency (V/F) converter, a channel multiplexer, a sensor excitation power supply and control registers (see Figure 5-1).

The temperature signals, connected to the channel multiplexer, are converted from a current to a voltage then from a voltage to a frequency. The frequency is determined by counting pulses from the V/F for a given period. The frequency is use to calculate the temperature.

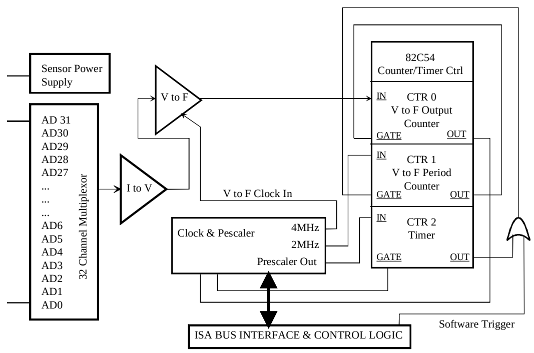

Figure 5-1. Board Block Diagram

The C/V converter has an output of 0 to 10 volts, which corresponds to the full scale of the current input or 0 to 500 µA. This input range may be customized at the factory by changing one resistor and one potentiometer. Please call if you have applications requiring up to 0 to 20 mA input.

The V/F converter has an output of 0 to 2 MHz, which corresponds to the full scale of the voltage input of 0 to 10 volts. An AD592 sensor will produce frequency in the range of 992 kHz (−25°C) to 1.512 MHz (105°C). Other sensors such as the AD590 (−55°C to 150°C) may be used as well. The equation for temperature is:

Kelvin = ((10 Volts) * (Fout)) / ((20,000Hz) * (20,000 Ohms) * (1 * 10^{-6} Amps))

Kelvin = Fout / 4000

5.2 SIGNAL RESOLUTION AND CONVERSION SPEED

The voltage to frequency converter provides a resolution dependent on the sampling rate. The lower the sampling rate, the higher the resolution. Sampling rates may vary from 25 samples per second (approximately 16-bit resolution) to 4,000 samples per second (approximately 8-bit resolution). For most temperature measurement applications, rates up to 200 Hz are useful.

The formula for the resolution of the board is:

Full scale range / counts in counter 1

500 µA / (2 <= N <= 65,535)

The duration of one count is 0.5 µs because the CLK input is 2 MHz

The CIO-DAS-TEMP is constructed of a current-to-voltage front-end and a voltage-to-frequency converter. The V/F converter outputs a frequency that is proportional to the voltage of its input. Resolution increases with sample time since the V/F conversion is an average of the signal over the time of the conversion. The longer the V/F has to settle, the more precise the measurement.

Note that the signal you are measuring should be stable over the period of measurement. The CIO-DAS-TEMP is not designed for measurement of very rapid changes in temperature. For example, the maximum sampling rate for the CIO-DAS-TEMP is 200 samples per second. If your temperatures are changing faster than 200 significant steps per second and you need to precisely trigger and sample that temperature, you have the wrong product and should call technical support to discuss your application.

The CIO-DAS-TEMP is capable of rejecting line noise when the conversion rate is a multiple of the line frequency of the power to the PC power supply. Here are the recommended conversion rates and the accompanying resolutions:

Rate	Resolution	Line Frequency
30 Samples/Second	0.015 °C*	60 Hz
25 Samples/Second	0.0125 °C*	50 Hz
200 Samples/Second	0.1 °C	400 Hz

*Note: Exceeds the accuracy of the AD592 sensor.

5.3 OPERATION OF THE COUNTERS

The 8254 counters 0 and 1 are used to make the frequency measurement of the V/F output. Counter 1 is clocked by the 2 MHz clock source. A value loaded into counter 1 is used to count down to zero thereby providing a precise time interval, known as the gate time. For example, if counter 1 were loaded with the value 5,000 it would count down for 2.5 ms (5,000 / 2,000,000 = 0.0025 sec.).

While counter 1 is counting down, the output pin CTR 1 OUT goes high (a programmable feature implemented in the Universal Library, or your software). This signal is used to gate counter 0.

Counter 0 is used to accumulate counts from the V/F converter. Recall that the V/F converter produces a train of pulses proportional to the voltage on its input. At 0 volts the V/F produces zero Hz and at 10 volts, 2 MHz. If the V/F senses 5 volts on its input, it will output pulses at 1 MHz. If counter 1 has been loaded with a value of 5,000, counter 0 will count pulses for 2.5 ms. 1,000,000 x 0.0025 = 2,500 pulses. Note that the pulses counted from the V/F are exactly ½ the value loaded into counter 1; the time period to count pulses. This is a general rule:

Voltage = 10 x (CTR 1 Load / CTR 0 Counts)

In general, a counter 1 period value of 5,000 is a good choice and will yield good results. The relationship of degrees Kelvin to counts is:

Kelvin/Count = 500 / Full Scale Count

If the full scale count is 5,000 (as suggested) the relationship is:

500 / 5000 = 0.1K per count

5.4 LINE NOISE REJECTION

V/F converters will reject signal noise that is periodic and of a consistent amplitude because the V/F converter averages the signal. Sinusoidal noise associated with line frequencies is an example. Since the signal is averaged (equal areas over and under the mean cancel each other out) the measurement period must be equal to one cycle, or a multiple of the cycle frequency if noise rejection is desired.

For example, if there is 60 Hz line noise on the signal, the measurement period would have to be:

1/60 = 0.1666

0.16666 x 2,000,000 = 33,333 counts   Load this value or a multiple of it into counter 1

For 50 Hz, the calculations are similar. 1/50 x 2,000,000 = 0.02 x 2,000,000 = 40,000

5.4.1 Gate-Time, Resolution and Noise Rejection

The choice of gate time has an affect on the resolution of the measurement, line cycle noise rejection and the rate over which multiple channels can be scanned. Increasing gate time improves both resolution and noise rejection but it will decrease the scanning (multiple channel measurement) rate.

Generally, the choice of gate time is a matter of factoring the desired resolution against the time the actual measurement takes.

Multiple Channels:

When scanning over multiple channels, the software must explicitly select the next channel in the scan and start a new conversion. Once the next channel is selected, enough time must be allowed for the new channel's current to propagate through the multiplexers and Current-to-Voltage Converter to settle at the Voltage-to-Frequency converter input. This is most easily done by doing an extra, or 'dummy' conversion, waiting for it to complete and then starting the 'real' conversion. Thus, if a gate time of 0.0166 seconds is chosen, the maximum scan rate will be:

Scan Rate = 1 / 2 x [gate time]

= 1 / 2 x [0.0166 seconds]

= 30 samples per second

The following table can be used to select the Gate Count based on either desired maximum sampling rate or desired resolution.

Desire Max Sample Rate	Gate Count Required	Gate Time	Resolution	Line Frequency Rejection
30 samples / sec	33,333	0.01 sec	0.015 °C	60Hz
25 samples / sec	40,000	0.02 sec	0.0125 °C	50Hz
200 samples / sec	5,000	0.0025 sec	0.1 °C	400Hz

6 REGISTER MAP

A base address register controls the beginning, or 'Base Address' of the I/O addresses occupied by the control registers of the CIO-DAS-TEMP. In all, eight addresses are occupied. The registers control the programmable aspects of the CIO-DAS-TEMP performance.

6.1 CONTROL REGISTERS

After a base address has been established, the CIO-DAS-TEMP is controlled by writing to and reading from the control registers. While it is possible to write your own control routines for the CIO-DAS-TEMP, routines have been written and are available in Universal Library for DOS and Windows programming languages. Unless you have a specific need to program at the register level, it is recommended that you use the Universal Library or a packaged application program.

Table 5-1. Control Registers

I/O ADDRESS	READ	WRITE
BASE + 0	8254 Counter 0 Data Read	Data Load
BASE + 1	8254 Counter 1 Data Read	Data Load
BASE + 2	8254 Counter 2 Data Read	Data Load
BASE + 3	8254 Status	8254 Counter Control
BASE + 4	Channel & Status	Channel Control & Status
BASE + 5	Interrupt & Prescaler Control	Clear
BASE + 6	None	Reload
BASE + 7	None	Counter Control

Register Descriptions
The register descriptions include functions of each bit in each 8-bit register as well as some design and use descriptions

BASE + 0 Write - Counter 0 Load Register of the 82C54

7	6	5	4	3	2	1	0
Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0

Write an initial value of 65,536 to this register after programming the 82C54 control register for CTR 0 to be an event counter. It works as a down-counter, the only choice available.

BASE + 0 Read - Counter 0 Current Count Register of the 82C54

7	6	5	4	3	2	1	0
Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0

The total of the V/F output should be read from this register after Counter 1 reaches terminal count

BASE + 1 Write - Counter 1 Load Register of the 82C54

7	6	5	4	3	2	1	0
Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0

First, program the 82C54 control register for CTR 1 to produce a single pulse for the duration of the count period. Next, load an initial value equal to the period for which counts from the V/F converter will be totaled See the previous explanation of initial count values for information on what value to load into this counter. It works as a down-counter, the only choice available.

BASE + 1 Read - Counter 1 Current Count Register of the 82C54

7	6	5	4	3	2	1	0
Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0

Will return current count.

BASE + 2 Write - Counter 2 Load Register of the 82C54

7	6	5	4	3	2	1	0
Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0

This counter is used to sequence through multiple channels when more than one channel is read. First, program the 82C54 control register for CTR 2 to function as a rate generator. The register at Base + 5 sets the input (prescaler) frequency for this counter.
Next, load an initial value equal to the number of clock periods between channel readings

BASE + 2 Read - Counter 2 Current Count Register of the 82C54

7	6	5	4	3	2	1	0
Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0

Will return current count.

BASE + 3 Write - Control Register of the 82C54

7	6	5	4	3	2	1	0
SC1	SC0	RW1	RW0	M2	M1	M0	BCD

The 82C54 counter is described in great detail in the Harris or Instel 82C54 data sheet. A brief description of the control bits follows.

SC1	SC0	Function
0	0	Select counter 0
0	1	Select counter 1
1	0	Select counter 2
1	1	Read Command

RW1	RW0	Function
0	0	Counter latch
0	1	Read/Write least significant byte of selected counter
1	0	Read/Write most significant byte of selected counter
1	1	Read/Write least significant byte then most significant byte

M1	M0	M0	Function
0	0	0	Program selected counter as event counter, mode 0
0	0	1	Hardware triggered one shot. Pulse is the duration of the load value
0	1	0	Rate generator. CLK is divided by load value
0	1	1	Square wave. Period equals CLK divided by load value
1	0	0	Software triggered strobe
1	0	1	Hardware triggered strobe

When BCD = 0, the counter counts in binary, 16-bit count. When BCD = 1, the counter counts in binary-coded-decimal.

BASE + 3 Read - Status Register of the 82C54

7	6	5	4	3	2	1	0
SC1	SC0	RW1	RW0	M2	M1	M0	BCD

Will return current status.

BASE + 4 Write - Channel select and mux enable

7	6	5	4	3	2	1	0
CHEN	X	X	CH4	CH3	CH2	CH1	CH0

Select channel 0 to 31 in standard binary counting. CHEN enables the mux so that the current channel sensor is connected to the output of the mux

BASE + 4 Read - Channel, interrupt, calibration switch and EOC status

7	6	5	4	3	2	1	0
INT	CAL	CONV	CH4	CH3	CH2	CH1	CH0

CH4 through CH0 read back the current channel.

CONV is high when a conversion is in progress and low when conversion is complete, that is when the counter value in counter 1 has reached zero.

CAL indicates the position of the CAL/NORM switch. NORM = 0, CAL = 1

INT is the status of the interrupt flip flop. It is set whenever conversion is complete (terminal count in counter 1) whether or not interrupts are enabled. Clear INT by reading Base + 5.

BASE + 5 Write - Interrupt select and trigger mode

7	6	5	4	3	2	1	0
P3	P2	P1	P0	TMRE	IR2	IR1	IR0

P3 through P0 control a prescalar divider or a 2MHz clock by 4 to 32768 in the steps shown in Table 5-2 below. The output of the prescaler is the input to counter 2, the channel mux sequencer.

Table 5-2. Prescalar Divider/2 MHz Clock Control Codes

P3	**P2**	**P1**	**P0**	**Output Freq**	**P3**	**P2**	**P1**	**P0**	**Output Freq**
0	0	0	0	None	1	0	0	0	7,812.5
0	0	0	1	None	1	0	0	1	3,906.25
0	0	1	0	500,000	1	0	1	0	1,953
0	0	1	1	250,000	1	0	1	1	976.56
0	1	0	0	125,000	1	1	0	0	488.28
0	1	0	1	62,500	1	1	0	1	244.14
0	1	1	0	31,250	1	1	1	0	122.07
0	1	1	1	15,625	1	1	1	1	61.01

When TMRE = 0, the Prescaler and Counter 2 are disabled. When TMRE = 1, the prescaler and Counter 2 are enabled.

IR2	IR1	IR0	Hardware IRQ
0	0	0	Disable interrupts
0	0	1	Disable interrupts
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

BASE + 5 Read - Read bit settings

7	6	5	4	3	2	1	0
P3	P2	P1	P0	TMRE	IR2	IR1	IR0

BASE + 6 Write - Load counter 0
A write to this address loads the value 65,535 into counter 0. This must be done before triggering a conversion.

BASE + 7 Not used

7 SPECIFICATIONS

POWER CONSUMPTION

+5V Normal Operation	890 mA Typical	960 mA Max

ANALOG INPUT

Channels	32 Current Input, AD592 Sensor Specific
Range	0 to 500 µA
Input Impedance	20 KOhm (nominal)
Resolution	
30 S/S	0.015 Deg C (60 Hz Line Frequency)
25 S/S	0.0125 Deg C (50 Hz Line Frequency)
200 S/S	0.1 Deg C (400 Hz Line Frequency)
Current/Temp	1.0 Degrees Kelvin / µAmp
Accuracy	± 0.02%
Linearity Error	± 0.02%
Gain Drift	±75 ppm/°C
V/F Converter	AD652
Calibration	0 to 5V (pin 37) @ 10,000 KOhm Input Impedance

COUNTERS

Counter Type	82C54 Three 16-Bit Down-counters, 10 MHz Max Input
Prescaler	2 MHz divided by 14 programmable steps
Interrupts	2 through 7 Programmable

ENVIRONMENTAL

Operating Range	0 to 60°C
Storage Range	−40 to 100°C
Humidity	0 to 90% non-condensing

SENSORS

AD592 Sensor	**CN Suffix**	**BN Suffix**
Temp Range	−25 to 105°C	−25 to 105°C
Accuracy at range	0 to 70°C, ± 0.8°C	0 to 70°C, ± 1.5°C
	−25 to 105 °C, ± 1.0°C	−25 to 105°C, ± 2.0°C
Temperature drift	±25 ppm/°C	±25 ppm/°C
Storage Range	−45 to 125C	−45 to 125°C

For for Notes.

EC Declaration of Conformity

We, Measurement Computing Corp., declare under sole responsibility that the product:

Part Number	Description
CIO-DAS-TEMP	Temperature Input Board

to which this declaration relates, meets the essential requirements, is in conformity with, and CE marking has been applied according to the relevant EC Directives listed below using the relevant section of the following EC standards and other normative documents:

EU EMC Directive 89/336/EEC: Essential requirements relating to electromagnetic compatibility.

EU 55022 Class B: Limits and methods of measurements of radio interference characteristics of information technology equipment.

EN 50082-1: EC generic immunity requirements.

IEC 801-2: Electrostatic discharge requirements for industrial process measurement and control equipment.

IEC 801-3: Radiated electromagnetic field requirements for industrial process measurements and control equipment.

IEC 801-4: Electrically fast transients for industrial process measurement and control equipment.

Carl Haapaoja, Director of Quality Assurance

Measurement Computing Corporation
16 Commerce Boulevard,
Middleboro, Massachusetts 02346
(508) 946-5100
Fax: (508) 946-9500
E-mail: info@measurementcomputing.com
www. measurementcomputing.com