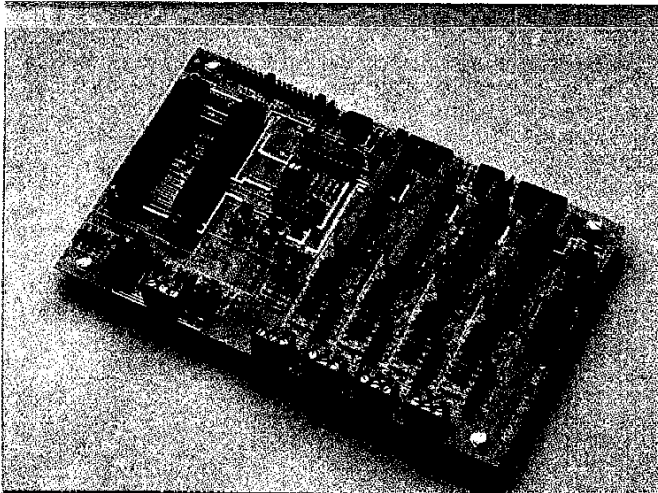


# KEITHLEY METRABYTE

**DATA ACQUISITION AND CONTROL FOR IBM PC/XT/AT AND COMPATIBLE COMPUTERS**

## ISO-4 4 CHANNEL FULLY ISOLATED EXPANSION MULTIPLEXER



### FEATURES

- Expands any analog input to 4 channels
- Supplies Cold Junction Compensation for thermocouple inputs
- Shunt Terminals are provided for current measurements
- Each channel can be set for gains of 2, 10, 50, 100, 200 or 1000.
- On board screw terminals simplify connection of field wiring
- Over 500 Volts of isolation
- Compatible with DAS-8, DAS-8PGA or DASCON-1 board (with C-1800 cable).
- Compatible with DAS-16, DAS-16G or DAS-16F (with S-1600 cable).

### FUNCTIONAL DESCRIPTION

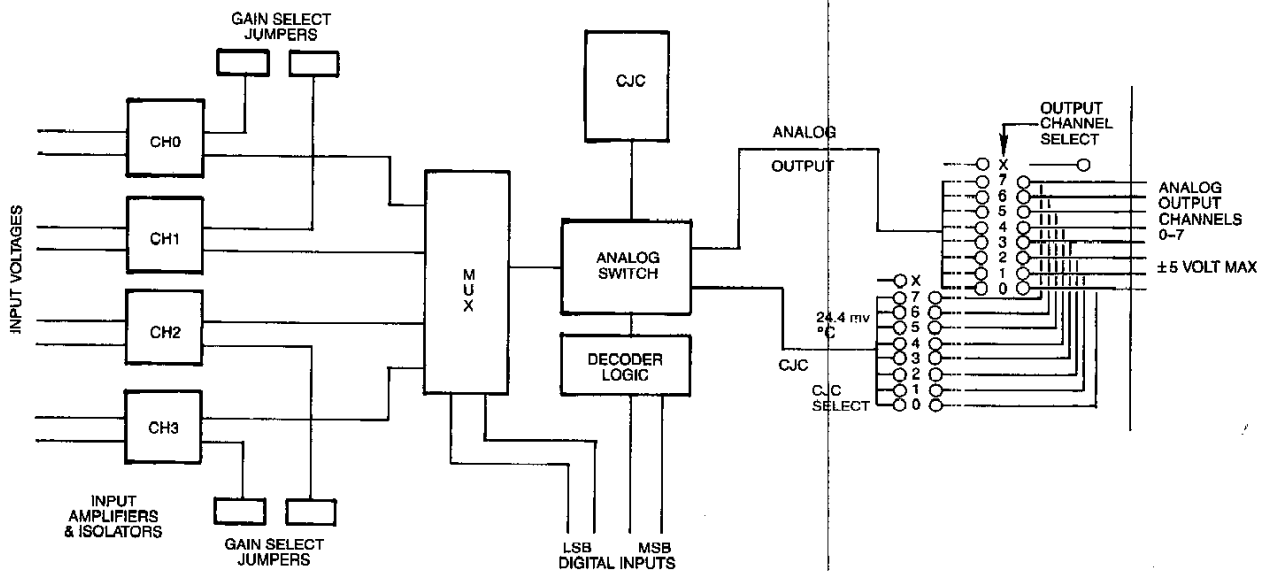
MetraByte's ISO-4 Isolated Expansion Multiplexer allows up to 128 fully isolated inputs to be connected to a DASCON-1, DAS-8, DAS-8PGA or DAS-16, (F), (G) analog input board. The ISO-4 uses 4 digital output bits from the A/D converter board to select which ISO-4 is to be monitored, and which channel is to be enabled. Each input is completely isolated from all other inputs and from the A/D converter board. Each input includes an instrumentation amplifier, that can be set for input gains between 1 and 1000. The installation of a user resistor allows non standard gains to be implemented. Provisions on the board for input shunt resistors allow simple current measurements.

Thermocouple measurements are handled easily with the ISO-4. The board includes a Cold Junction Temperature measurement device which

provides an input signal of 24.4 mV per degree C. With a 12 bit A/D converter and a 10 volt full scale (or  $\pm 5V$ ) this input corresponds to 10 bits/Degree C. This temperature measurement feature allows the CJC error to be subtracted out in the system software. Included with the ISO-4 are a set of thermocouple linearization routines written in BASICA. These can be merged into user programs to greatly simplify the system software effort. Linearization routines are included for J, K, T, E, S, R, and B type thermocouples.

Field wiring to the ISO-4 is made through on-board screw terminals. The screw terminals accept input wire sizes of 12-22 AWG. The board has been designed to be easily mounted on a table top, or in MetraByte RMT-02, 19 inch rack mountable enclosures.

### BLOCK DIAGRAM



**CASCADING THE ISO-4**

The ISO-4 multiplexer is controlled by 4 digital output bits from the master A/D board. Each ISO-4 has an address selection switch. To allow maximum expansion capability, the most significant 2 bits of the digital control lines are used as an ISO-4 enable control. This allows up to 4 ISO-4 boards to be connected to the same A/D input channel (one will be enabled while the other 3 will be disabled). The two least significant bits are used to control which channel on the ISO-4 is enabled.

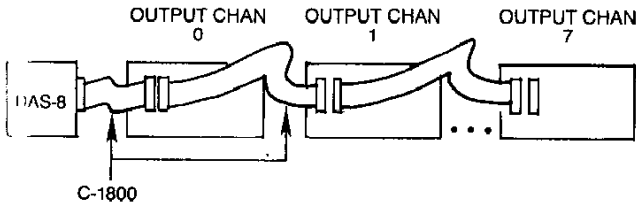
The final level of multiplexing is performed with jumpers on the ISO-4. Each board can be connected to any one of the 8 standard analog inputs on the DAS-8 or 16. The rules to remember are: 1. 4 ISO-4's can be connected to the same A/D input channel, but each must have a different MUX address. 2. The A/D input channel connected to is determined by the OUTPUT jumper on the upper left of the board.

The maximum multiplexing is possible when: There are 8 analog input channels on the A/D board. Each of these channels is connected to 4 ISO-4 boards, the most significant of the 4 digital output bits selects which ISO-4 board to read, the least significant two digital output bits select which channel on the ISO-4 to select. The sum total is the 8 A/D channels times 4 ISO-4 boards per channel times 4 channels per ISO-4 equals the 128 maximum number of channels.

A final complication arises when monitoring thermocouples. For accurate Thermocouple measurement it is necessary to know the temperature of the connection of the thermocouple wire to the input terminal. This cold junction temperature error is then compensated for in the software. However, each CJC temperature measurement device requires an A/D input channel. If each ISO-4 is also monitoring CJ temperature then 4 of the 8 available input channels are taken, and the maximum number of thermocouples that can be monitored is 64. However, if all ISO-4 boards are at approximately the same temperature, we need only connect the CJ monitoring device on one bank (the 4 ISO-4's on one channel). This allows us to measure up to 112 thermocouples with only a slight loss of accuracy.

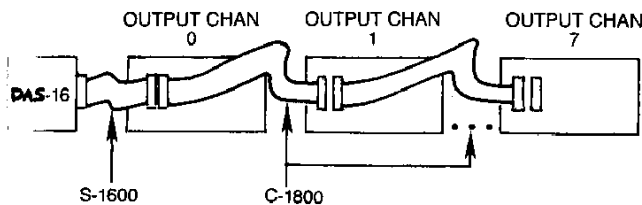
**CONNECTING THE ISO-4 TO THE DAS-8**

The C-1800 cable has been designed to directly connect the ISO-4 to the DAS-8. Additional ISO-4's may be connected with additional C-1800's. The diagram below shows a typical DAS-8/ISO-4 connection.



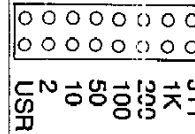
**CONNECTING THE ISO-4 TO THE DAS-16(F)**

The S-1800 cable has been designed to directly connect the ISO-4 to the DAS-16. Additional ISO-4's may be daisy chained along with C-1800's. The diagram below shows a typical DAS-16/ISO-4 connection.



**GAIN SELECTION**

Each channel allows a jumper block to be installed that selects the channel input gain. The following diagram shows a sample gain setting terminal block. To select a gain simply place the jumper block across the terminals corresponding to the desired gain.



A special "USER" gain resistor may be installed for gains not selectable by simple jumper. The formula to select the resistor to install is:

$$R_{user} = 100 / (GAIN - 1) \text{ where } R_{user} \text{ is in Kohms}$$

**OUTPUT AND CJC CHANNEL SELECT**

DIFFERENTIAL ANALOG INPUT CHANNELS 0-15, SELECTED BY CHANNEL SELECT BITS A0-A3, WILL BE OUTPUTTED TO CHANNEL 0. COLD JUNCTION COMPENSATION IS ON OUTPUT CHANNEL 7.

OUTP JT CHAN: 0 1 2 3 4 5 6 7 X  
         J4

CJC CHANNEL:         J3

BOARD OUTPUT CHANNEL AND COLD-JUNCTION COMPENSATION CHANNEL SELECT

**RECOMMENDED THERMOCOUPLE GAIN SETTINGS**

The following table lists the recommended gain settings for thermocouples over their entire operating range.

THERMOCOUPLE TYPE	MAXIMUM OUTPUT	MAXIMUM DEG. C.	SUITABLE GAIN*
J	43 mV	760	100
K	55 mV	1370	50
T	21 mV	400	200
E	76 mV	1000	50
S	19 mV	1760	200
R	21 mV	1760	200
B	14 mV	1760	200

\*Higher Gains may be used for less than full scale span. Gains based on ±5V Output.

**SPECIFICATIONS**

- Number of channels: 4
- Available input gains: Times 1, 2, 10, 50, 100, 200, 1000
- Isolation: 500 VDC (minimum)
- Input offset voltage: 150 uVolt max.
- Input offset current: 6 nAmps max.
- Input Bias Current: ±12 nAmps max.
- Input Impedance: 8 meg Ohms min. 33 meg Ohms typ.
- Temperature drift: 20 ppm/Deg. C typ.
- Non-Linearity: ±0.125 % typ.
- Input Bandwidth: 5 KHz. Min.

**COLD-JUNCTION COMPENSATION**

+24.4 mV/Deg C. (.1 Deg C / bit for 10 VFS, 12-bit converter.)

**POWER SUPPLY**

+5V at 400 mA max.

**ENVIRONMENTAL**

- Operating Temp.: 0-60 Deg. C.
- Storage Temp.: -40 to 100 Deg. C.
- Humidity: 0-95% non-condensing

**PHYSICAL**

Dimensions: 8"L x 4.75"W x .75"H  
 Weight: .6 lbs.

**ORDER: ISO-4**