



# AIM104-MULTI/IO

## Assembly Kit

Each AIM104 module is supplied with a mounting kit to secure the module.

## Handling

All AIM104's contain CMOS devices which could be damaged in the event of static electricity being discharged through them. At all times please observe anti-static precautions when handling the board and always unpack and install the board in an anti-static working area.

## Software

A Utility Disk is supplied with your AIM104. It contains a host of software utilities designed specifically for each AIM104. Please refer to the *README.TXT* file on the disk for further information. It also includes a test program *EXAMP-01.EXE* which may be used to confirm access to the board. A summary of the software drivers can be found in the AIM104-Software Library.

## Introduction

The AIM104-MULTI-IO is an 8-bit PC/104 module providing 8 opto-isolated digital inputs, 2 analogue outputs (Voltage or Current Loop) and 16 single ended or 8 differential analogue inputs. The module provides up to 1000V electrical isolation between your PC/104 based control system and the electrical system under control. Isolation between adjacent channels is limited by the wiring and connectors to 30V. The module is supplied in three configurations:

<b>AIM104-MULTI-IO</b>	Module fitted with digital inputs, analogue outputs and analogue inputs.
<b>AIM104-ADC16/IN8</b>	Module fitted with digital inputs and analogue inputs only.
<b>AIM104-DAC2/IN8</b>	Module fitted with digital inputs and analogue outputs only.

The board includes jumper options for selecting all analogue inputs as 16 single ended or 8 differential. All digital inputs include a fixed 10ms debounce filter.

## Features

### DAC

- |                                |  |
|--------------------------------|--|
| • Two 12-bit analogue outputs: | Current sink: 0-25mA AND<br>Bipolar voltage: -5V to +5V                              |
| • Channel Output impedance:    | Vout = <10Ω  |
| • Voltage overhead at lout pin | 7.5V(MIN)  |
| • Channel update time:         | 320μsec/channel  |
| • Calibration accuracy @ 25°C: | ±2 LSB (MAX) (REF=5.0V)  |
| • Linearity:                   | Differential Non-linearity = ±0.5LSB (MAX)<br>Integral Non-linearity = ±3.5LSB (MAX) |
| • Offset error                 | ±4mV (-20°C to +70°C typ/0°C to 70°C max)  |
| • Gain error (cal @ 25°)       | 0.35% (-20°C to +70°C typ/0°C to 70°C max)   |

**ADC**

- Bipolar analogue input range: -5V to +5V
- 12-bit analogue inputs configured as: 16 channel single ended OR  
8 channel differential
- Channel Input impedance: 10M $\Omega$ //10pF typ
- Conversion time: 500 $\mu$ sec/channel
- Calibration accuracy @ 25°C: Adjustable
- Relative accuracy @ 25°C:  $\pm 2$ LSB (-5V to +5V)
- Linearity: Differential Non-linearity =  $\pm 1$ LSB ( No missing codes)
- Gain error (cal @ 25°) 0.5% (-20°C to +70°C typ/0°C to 70°C max)

**8 channels of isolated digital input.**

- Digital input switching voltage range: 10V to 30V
- Maximum digital input frequency: 50Hz
- Debounce filter time constant: 10ms
- All digital inputs include reverse input protection diodes.
- Link selectable base address.
- Board status register.
- Module access LED (on all decoded addresses)
- 8-bit PC/104 (IEEE996) bus interface.
- EMC guard plane.
- Operating temperature range, -20°C to +70°C.
- Power consumption from the PC/104 host:
 

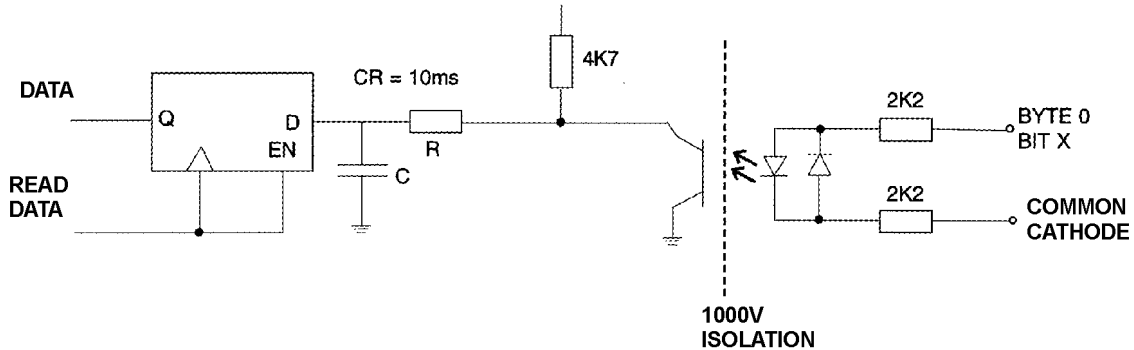
AIM104-MULTI-IO:	Max 480mA @+5V
AIM104-ADC16/IN8:	Max 410mA @+5V
AIM104-DAC2/IN8:	Max 380mA @+5V
- MTBF: (using generic figures from MIL-HDBK-217F at ground benign)
 

AIM104-MULTI-IO	267,320 hours
AIM104-ADC16/IN8	303,060 hours
AM104-DAC2/IN8	331,190 hours

# Operation

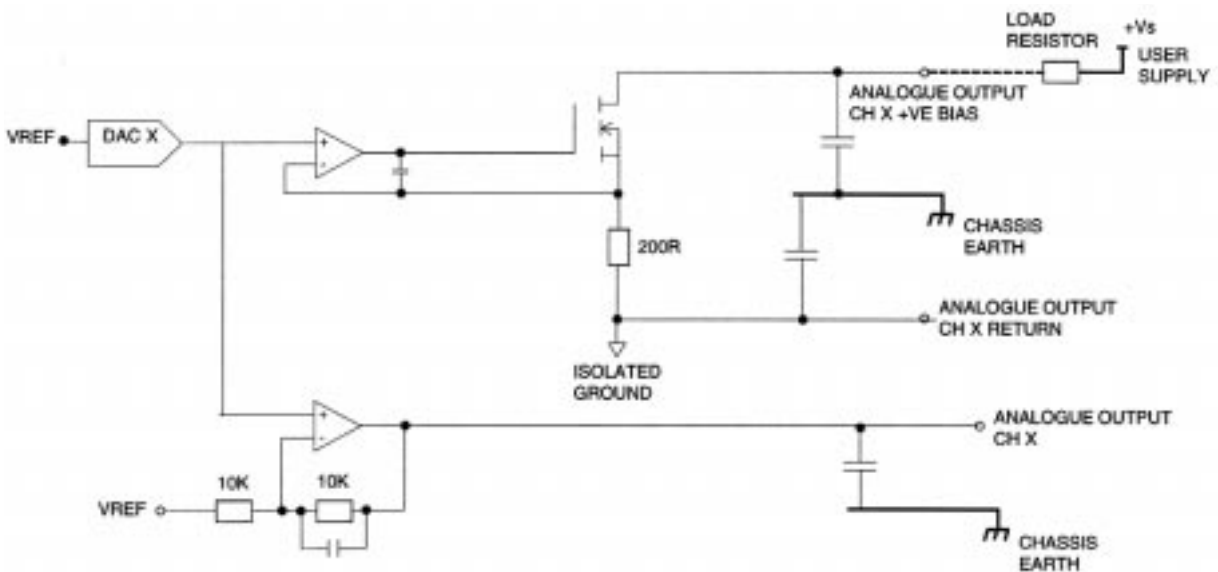
## Digital Input Operation

The status of each digital input is read from the base address, where the bit number corresponds to the channel number. When an input is switched ON, the value read by the host will be '0'. Each input is configured as follows:



## DAC Operation

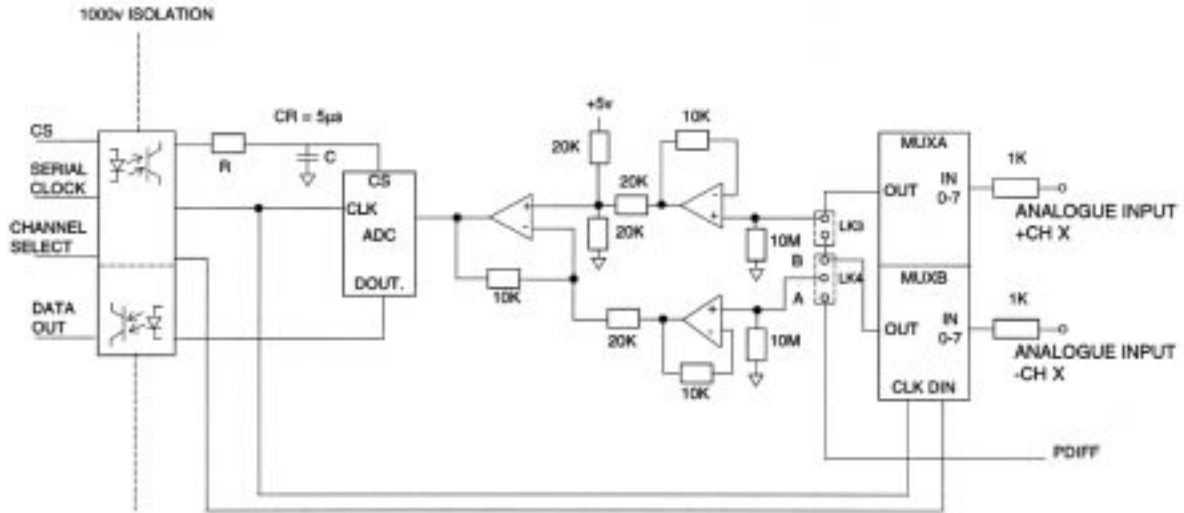
DAC data is written to DAC L-byte and DAC H-byte registers in accordance with the I/O map. Bit's 4 - 7 of the H-byte designate the DAC channel number, A value of '0' in this position writes the data to DAC channel 0 and a value of 'F' writes the data to DAC channel 1.



The 'BUSY status' register must be checked and the 'BUSY' flag bit clear before a new value is written.

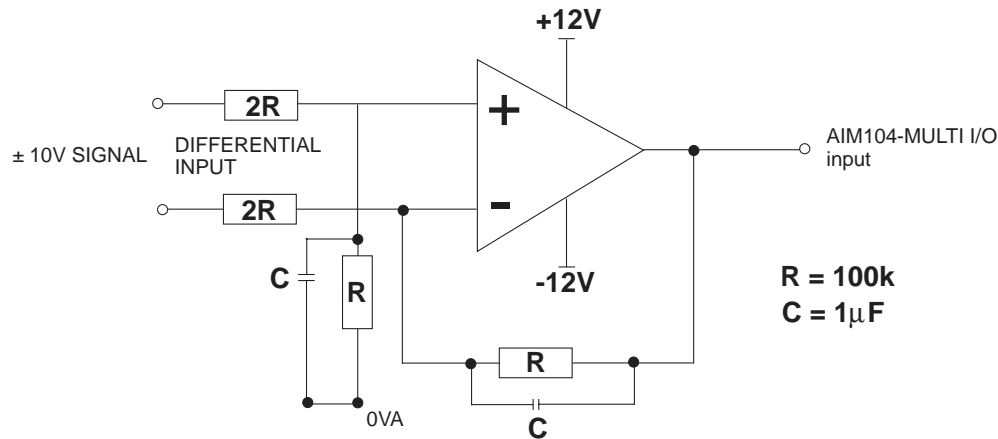
### ADC Operation

ADC conversion is initiated when multiplexer channel data is written to the 'ADC channel and start conversion' register. Conversion data may be read from the ADC L-byte and ADC H-byte registers when the status bit in the 'BUSY status' register indicates that a conversion is complete. Only the 'BUSY status' register and the 'opto inputs' register should be accessed while the board is in the Busy state. Accessing other registers before the status bit is cleared for both ADC and DAC cycles may result in data corruption.



### ADC Input Range

The standard analogue input range for the AIM104-MULTI I/O and AIM104-ADC16/IN8 is  $\pm 5V$ . Signals with greater span than this, such as  $\pm 10V$ , can be buffered with a simple amplifier circuit. The values shown below are suggested values only, and may be varied to suit the application.

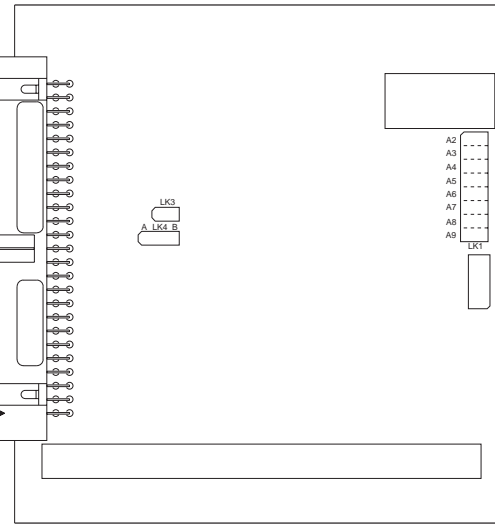
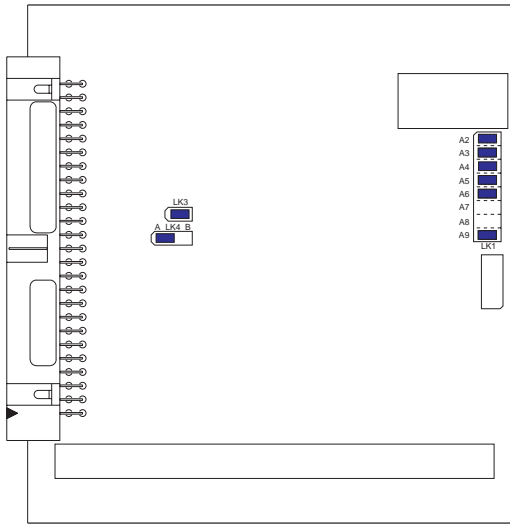


# Links

The base address of the module is set using LK1; inserting a jumper selects a '0' for the address line value.

**Default Link Position [Address is 180h]**

**User Configuration Record**



Links LK3 and LK4 select the analogue input channel configurations. For 16 channel single ended operation LK3 should be inserted and LK4 should be inserted in position 'A', PDIFF should be used as the ground reference in this configuration. For 8 channel differential operation LK3 should be removed and LK4 should be inserted in position 'B'.

Mode	LK3	LK4
16 CH SE	IN	A
8 CH DIFF	OUT	B

The board 'access' LED provides a momentary flash when the board is successfully accessed. The module registers are accessed at the following locations:

Address	Read/Write	Register Name	Register Function
Base	Read	Opto Inputs	Bit 0 - 7 0 = Input ON 1 = Input OFF
Base +1	Write	ADC channel select and start conversion	Bit 0 - 3 (Mux A) Bit 4 - 7 (Mux B)
Base +1	Read	BUSY status	Bit 0 (0 = BUSY, 1 = CLEAR)
Base +2	Read	ADC L-byte	Bit 0 - 7 (Do .. D7)
Base +3	Read	ADC H-byte	Bit 0 - 3 (D8 .. D11)
Base +2	Write	DAC L-byte	Bit 0 - 7 (Do .. D7)
Base +3	Write	DAC H-byte and transfer Channel	Bit 0 - 3 (D8 .. D11) Bit 4 - 7 (0 = CH0 F = CH1)

**ADC Channel Select Byte (Base +1)**

Differential channel	0	1	2	3	4	5	6	7
Select Byte	88	99	AA	BB	CC	DD	EE	FF

Single Ended channel	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Select Byte	08	80	09	90	0A	A0	0B	B0	0C	C0	0D	D0	0E	E0	0F	F0

## Connector (PL2) Pin Assignments

Pin No.	Function	Pin No.	Function
1	Common cathode input	2	Byte 0 - bit 0 anode
3	Byte 0 - bit 1 anode	4	Byte 0 - bit 2 anode
5	Byte 0 - bit 3 anode	6	Byte 0 - bit 4 anode
7	Byte 0 - bit 5 anode	8	Byte 0 - bit 6 anode
9	Byte 0 - bit 7 anode	10	Common cathode input
11	oVA	12	Analogue Input + Ch 0 (Ch 0)
13	Analogue Input - Ch 0 (Ch 1)	14	Analogue Input + Ch 1 (Ch 2)
15	Analogue Input - Ch 1 (Ch 3)	16	Analogue Input + Ch 2 (Ch 4)
17	Analogue Input - Ch 2 (Ch 5)	18	Analogue Input + Ch 3 (Ch 6)
19	Analogue Input - Ch 3 (Ch 7)	20	PDIFF
21	oVA	22	Analogue Input + Ch 4 (Ch 8)
23	Analogue Input - Ch 4 (Ch 9)	24	Analogue Input + Ch 5 (Ch 10)
25	Analogue Input - Ch 5 (Ch 11)	26	Analogue Input + Ch 6 (Ch 12)
27	Analogue Input - Ch 6 (Ch 13)	28	Analogue Input + Ch 7 (Ch 14)
29	Analogue Input - Ch 7 (Ch 15)	30	PDIFF
31	oVA	32	n/c
33	n/c	34	Analogue Ch 0 Current Loop
35	OVA	36	Analogue Ch 0 Return
37	n/c	38	Analogue Ch 1 Current Loop
39	OVA	40	Analogue Ch 1 Return
41	n/c	42	n/c
43	Analogue Ch 0 Vout	44	Analogue Ch 1 Vout
45	n/c	46	n/c
47	n/c	48	n/c
49	n/c	50	n/c

**Note:** Single Ended Channels shown (Ch x)

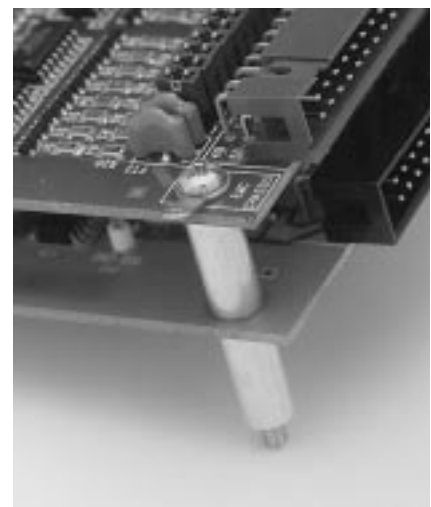
## Calibration

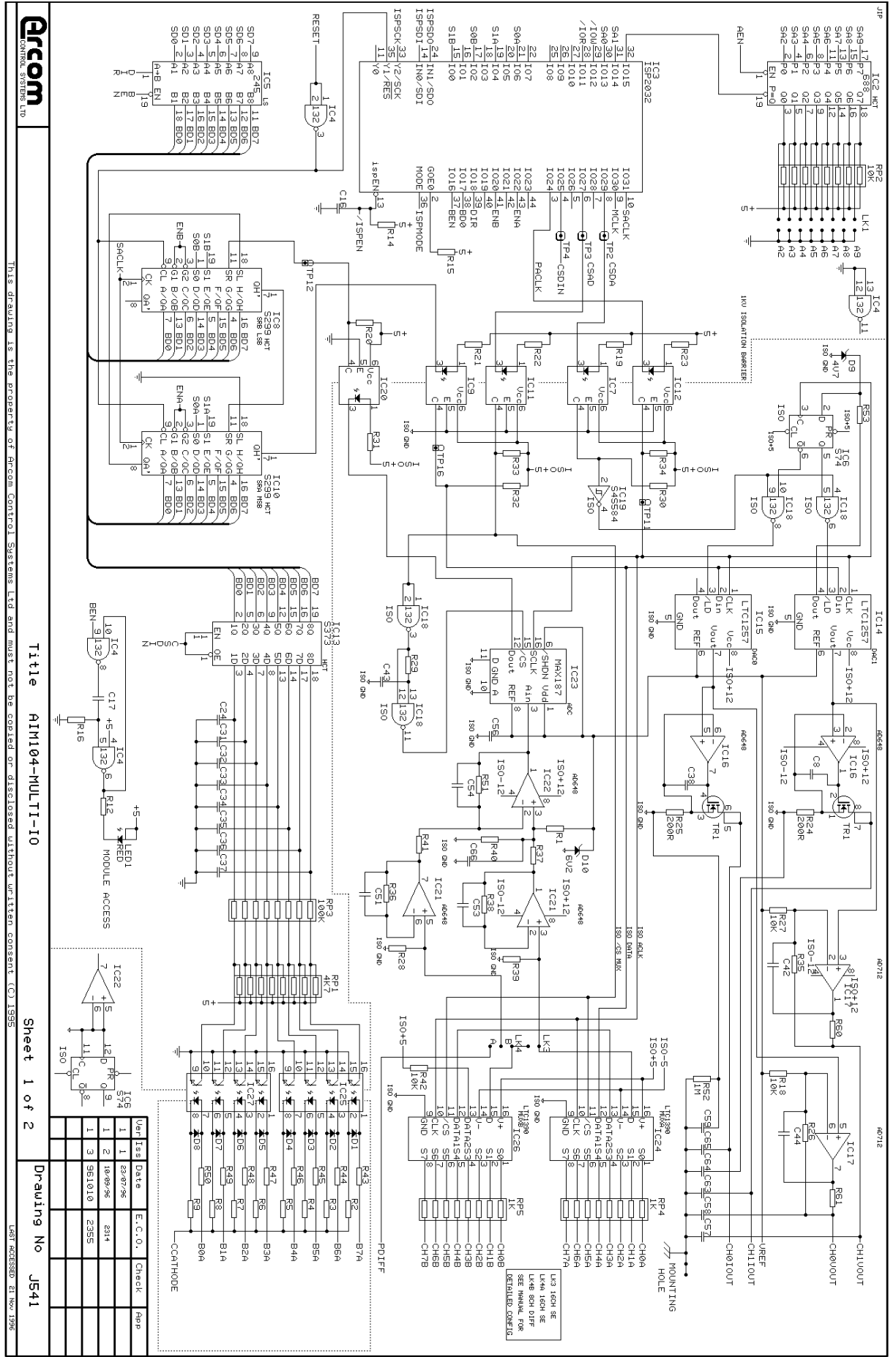
The AIM104-MULTI-IO is pre-calibrated and should require no user calibration before operation. Periodically the calibration may be checked and if required adjustments to the on board reference can be made. Adjust the multi turn trimmer VR1 while monitoring TP10. The voltage at TP10 should be 5.0v. Further calibration is achieved through software.

## EMC Issues

The opto-isolation provides a good barrier for noise emissions generated by the high frequency host PC/104 system. The AIM104-MULTI-IO includes additional components on board to minimise high frequency noise transfer. This filtering requires that the earth tab supplied with the module is connected by a good earth wire to the chassis of the system.

If the electronic system requires input protection against high voltage transient (to meet CE requirements) it is recommended that an external interface board is located at the point where the external wiring enters the electronic system enclosure.





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Title AIM104-MULTI-IO

Sheet 1 of 2

Drawing No J541

Ver	Iss	Date	E.C.O.	Check	App
1	1	22/07/95			
1	2	18/09/95	2314		
1	3	26/10/10	2355		



J1P



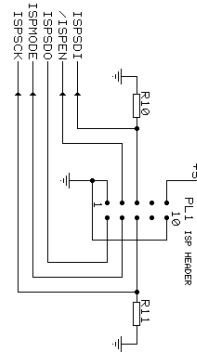
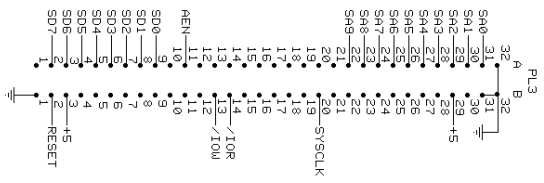
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Title AIM104-MULTI-10

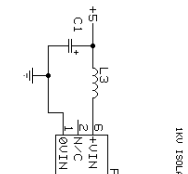
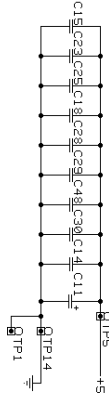
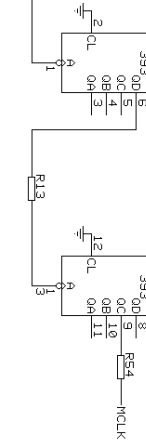
Sheet 2 of 2

Drawing No J541

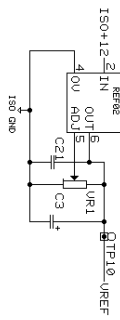
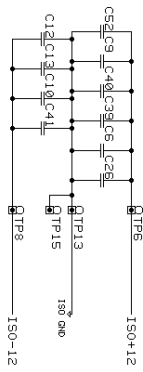
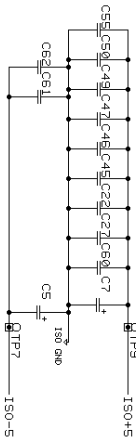
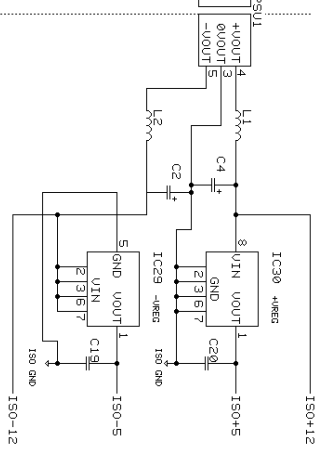
Last Accessed: 21 Nov 1995



14.318MHz



10V ISOLATION BARRELS



Ver	Iss	Date	E.C.O.	Check	App
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1	2	18/09/95	2314		
1	3	30/10/10	2355		

- CH110U1\*38
- CH110U1\*34
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- CH110U1\*6
- CH110U1\*5
- CH110U1\*4
- CH110U1\*3
- CH110U1\*2
- CH110U1\*1





## Revision History

Manual	PCB	Comments	
Issue A	V1 I2	960920	First full release of manual. (Aim104 Module Manual).
Issue B	V1 I3	961223	Edits to J538, J541, J559 & Aim104 Software Library. (Aim104 Module Manual).
Issue C	V1 I3	970604	[ECO 2494, 2502, 2516] (Aim Module Manual).
Issue D	V1 I3	980303	[ECO 2679] (Manual split up into Datasheets.)

**NOTE:** 960920- The Arcom Aim104 Modules were all put together in one manual (2192-08164-000-000), then updated to Issues B and C (2192-08240-000-000 & 2192-08521-000-000). During the lifetime of Issue C it was decided that the Aim Module Manual should be split into separate Datasheets [ECO 2679]. Hence, the Revision History for Issues A, B & C of the manual refer to the Aim Module Manual as was.

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