DASP-52180

12-bit 8 Isolated Analog Input w/ Free-Running Card

User's Manual

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ESD Precautions

Integrated circuits on computer boards are sensitive to static electricity. To avoid damaging chips from electrostatic discharge, observe the following precautions:

Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.

Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This helps to discharge any static electricity on your body.

Wear a wrist-grounding strap, available from most electronic component stores, when handling boards and components.

Trademarks Acknowledgments

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Chapter 1
Introduction

The DASP-52180 is a PCI-bus, 8 12-bit isolated analog input card. It provides many powerful features such as free-running mechanism, on-board watchdog timer, and isolation protection of 2500VDC. The card is suitable for laboratories, production line test automation, and measurement control.

Advanced S/W Mechanism: Free-Running

Free-running is a brand new data-retrieving mechanism to mainly save software SW RD 30% ~ 50% of the time and effort in developing application programs. It helps software RD by using several rows of simple programs to read data, instead of countless numbers in the past.

On-Board Watchdog Timer

Users can set up time intervals for the timer. While the application programs within the time interval have not connected with DASP/DASA products, the DASP/DASA will be sending out a preset safety value to a devices linked to the DASP/DASA. This helps maintain a stable system.

1.1 Features

- **12-bit 8 analog differential inputs.**
- **Analog input type: voltage and current**
- **Free running A/D sampling (auto-run and auto-update)**
- **On-board watchdog timer supported**
- **A/D Software programmable zero calibration**
- **Windows® 98/NT/2000/XP and Labview 6.0/7.0 driver supported**
- **Complete sample program- VB, VC, BCB, Delphi**

1.2 Specifications

Analog Input (A/D)

- **Channels: 8**
- **Resolution: 12-bit**
- **Input type: differential Input**
- **Max. sampling rate: 8K S/s(total channel)**
- **Cycle time: 1ms (free-running)**
- **Optical isolated: 2500VDC**
- **Input impedance: 10M**
- **Maximum input over voltage: +/- 10V**
- **Accuracy of FSR: +/- 1 LSB**
- **Input range:**
  - Voltage 10V, 5V, 0-10V, 0-5V,
  - Current 0-20mA
- **Zero calibration: EEPROM on board**

General Environment

- **I/O connector: 37-pin D-sub female**
- **Power consumption: +5V @ 900mA (max.)**
- **Operating temperature: 0 ~ 60°C**
- **Storage temperature: -20 ~ +70°C**
- **Humility: 0 ~ 90% non-condensing**
- **Dimensions: 185mm x 122 mm**

1.3 Accessories

To make the DASP-52180 functionality complete, we carry a versatility of accessories for different user requirements in the following items:

Wiring Cable

- **CB-89037-2:**
  37-pin female D-sub type cable with 2m length
- **CB-89037-5:**
  37-pin female D-sub type cable with 5m length

  The shielded D-sub cable with 2m and 5m are designed for the DASP-52180 analog I/O connector, respectively.

Terminal Block

- **TB-88037:**
  D-sub 37-pin female terminal block with DIN-rail mounting

  The terminal block is directly connected to analog I/O connector of the DASP-52180.

Chapter 2
Hardware Installation

2.1 Board Layout

Board Layout for DASP-52180

2.2 Signal Connections

2.2.1 Signal Connection Descriptions

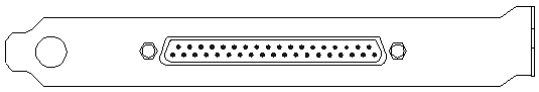
Signal Connections for DASP-52180

Referring to the above figure, the accessories of the DASP-52180 are depicted and described as below.

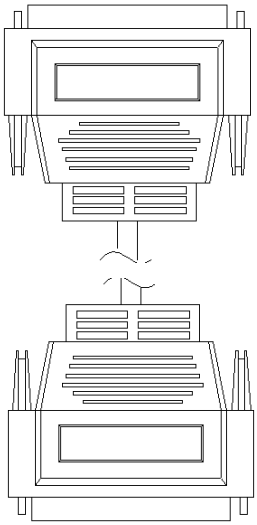
- **CON1**
  The I/O connector CON1 on the DASP-52180 is a 37-pin D-sub connector for differential type analog input signals. CON1 enables you to connect to accessory TB-88037 with the shielded cable CB-89037-2 or CB-89037-5.

2.2.2 A/D Counter Connector CON1

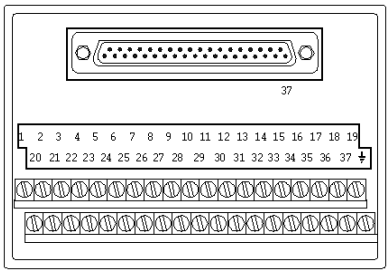
CON1: A/D Connector Pin Assignment



CON1



CB-89037

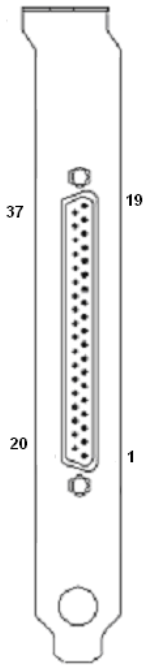


TB-88037

AIO Signal Connections for DASP-52180

D-Sub 37-pin Connector for Single-Ended Signal

Pin	Description	Pin	Description
		19	
37		18	
36		17	
35		16	
34		15	FGND
33		14	
32		13	
31		12	
30		11	
29	FGND	10	FGND
28	AGND	9	AGND
27	Analog input 7-	8	Analog input 7+
26	Analog input 6-	7	Analog input 6+
25	Analog input 5-	6	Analog input 5+
24	Analog input 4-	5	Analog input 4+
23	Analog input 3-	4	Analog input 3+
22	Analog input 2-	3	Analog input 2+
21	Analog input 1-	2	Analog input 1+
20	Analog input 0-	1	Analog input 0+

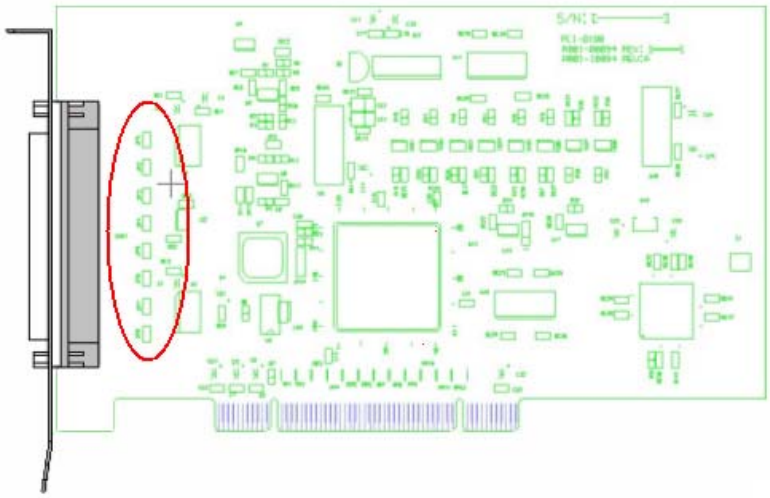


- **AGND: analog ground**
- **FGND: Connect to shielded line if necessary**

2.3 Jumper Setting

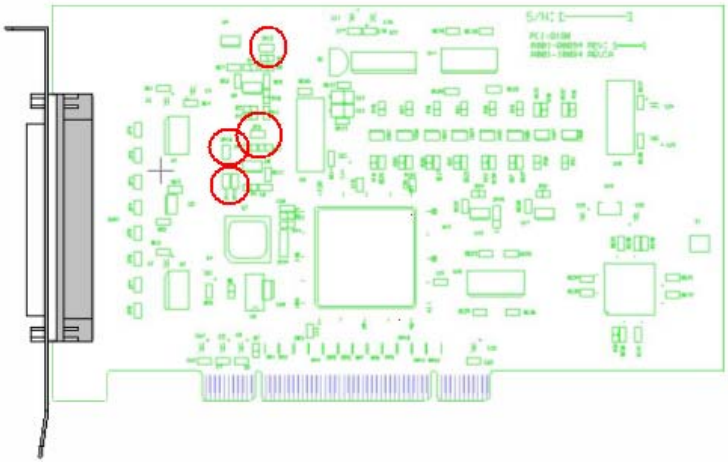
2.3.1 A/D Input Type Jumper Setting (JP1-JP8)

Analog Input Type (A/D Channel 0 – A/D Channel 7)



Jumper	Open Pin	Short Pin
JP1-JP8	Voltage Input (Default)	Current Input

2.3.2 A/D Input Range Jumper Setting (JP9-13)

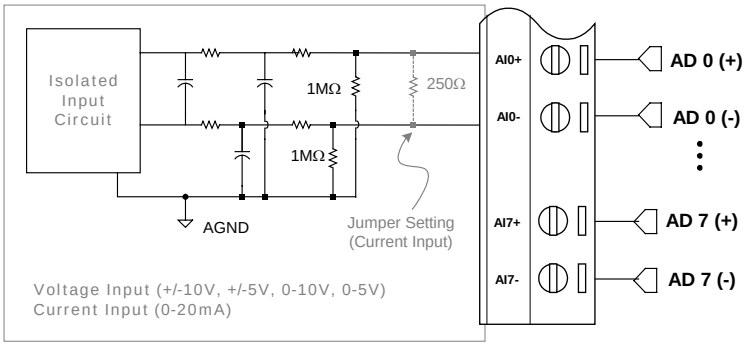


Default Setting: ±10V

Range	JP9	JP10	JP11	JP12	JP13
0~20mA	[1-2]	[1-2]	[ ]	[1-2]	[ ]
0~5 V	[1-2]	[1-2]	[ ]	[1-2]	[ ]
0~10V	[ ]	[1-2]	[ ]	[1-2]	[1-2]
±5V	[1-2]	[ ]	[1-2]	[ ]	[ ]
±10V	[ ]	[ ]	[1-2]	[ ]	[ ]

2.4 A/D Circuits and Wiring

The analog input and wiring block diagram of DASP-52180 is depicted as follows.



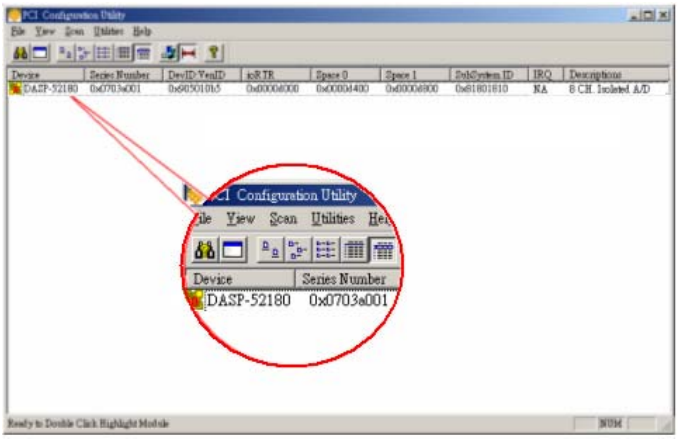
Analog Input Block Diagram for DASP-52180

2.5 Quick Setup and Test

To install a new DASP-52180 into an IBM PC compatible computer, at first, power-off the PC and open its chassis, then plug the DASP-52180 into a PCI slot. The DASP-52180 is a plug and play device for MS Windows, and the OS will detect your DASP-52180 after you power on the PC. The detail of driver and software installation is described in software manual of DASP-52180.

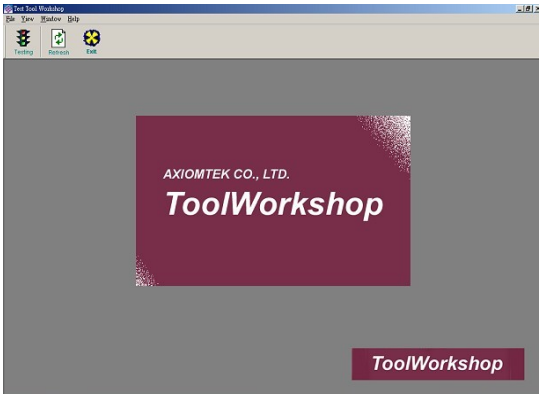
After the hardware and software installation, user can emulate and test DASP-52180 step by step as follows.

- To perform a complete test of the DASP-52180, we can route the input signals of the DASP-52180 with a specific signal source for read-back. And then, by following the DASP-52180 test branch of the *ToolWorkShop* which will fully test I/O channels of the DASP-52180 as descried in the following paragraphs.
- Launch the '*PCI Configuration Utility'* of DASP-52180 to ensure that the resource of DASP-52180 is properly dispatched by the OS. Press the scan button in the toolbar of the '*PCI Configuration Utility*' to find the installed DASP-52180, and then check the resource list as follows.

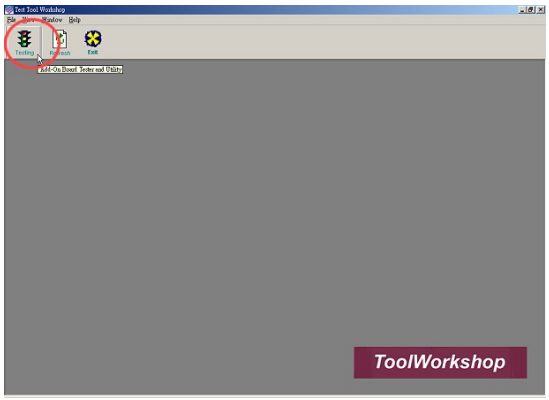


Scan DASP-52180 with PCI configuration Utility and check *the dispatched resource*

- Exit the 'PCI Configuration Utility' and launch the 'ToolWorkShop' for DASP-52180. As shown follows.

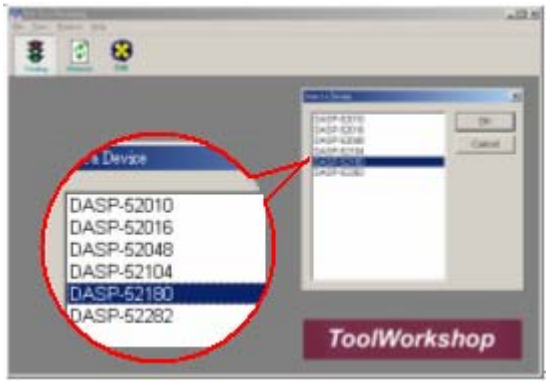


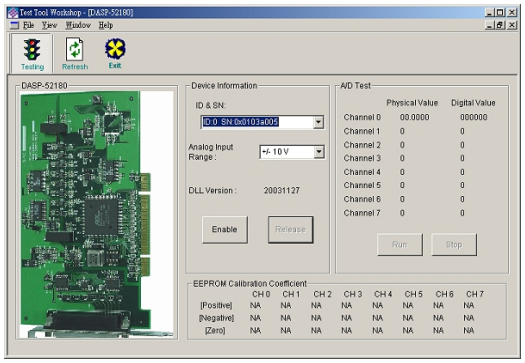
launch ToolWorkShop



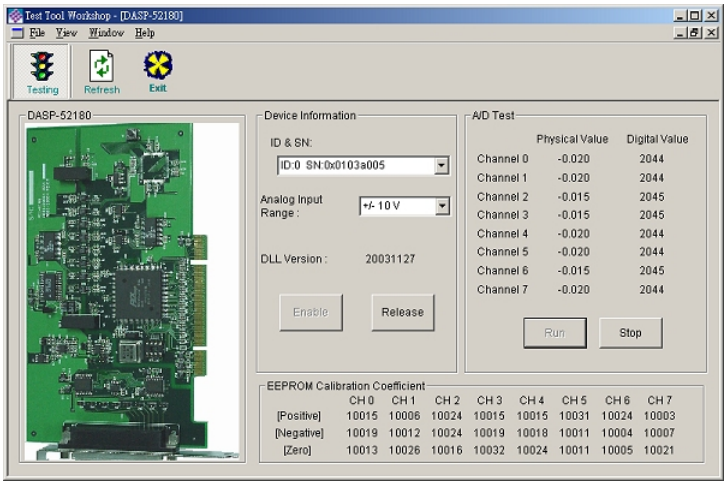
Select board test

- Perform Timer/Counter and DIO test of DASP-52180 as shown in following.





③ Select Test Target: DASP-52180



④ Check Device Information and Press 'Setup' Button to Load DASP-52180 Library. Perform Analog Input Test by Pressing the 'Run' Button to Read Back the AI Value of DASP-52180

- Before exiting '*ToolWorkShop*', press 'Release' button to release DASP-52180 library.

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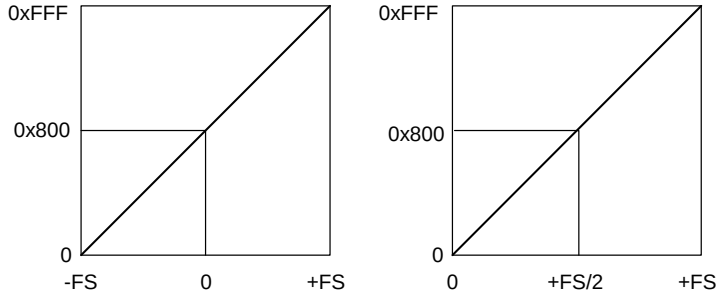
Chapter 3

Analog Input Range, ADC Code and AD Value

A almost linear mapping exist between the 12-bit ADC code and analog input for the DASP-52180. The following figure depicts the linear mapping of AD code of DASP-52180 and the analog input signal. FS denotes the full span of analog input under the user configured analog input range. The mapping of analog input to ADC code of DASP-52180 at ±FS and 0 input under different analog input ranges are listed in following table.



Bipolar Input **Uni-Polar Input**

Mapping of 12-bit ADC Code and Analog Input for DASP-52180

Input Range	+Full Scale	Zero	-Full Scale	Data Resolution
±10V	+9.99512	±00.000	-10.000	0.00488V
	0xFFF/4095	0x800/2048	0x0/0	1LSB
±5V	+4.99756	±00.000	-5.000	0.00244V
	0xFFF/4095	0x800/2048	0x0/0	1LSB
0~10V	+9.99756	±00.000	***	0.00244V
	0xFFF/4095	0x0/0	***	1LSB
0~5V	+4.99878	±00.000	***	0.00122V
	0xFFF/4095	0x0/0	***	1LSB
0~20mA	+19.9912	±00.000	***	0.00488mA
	0xFFF/4095	0x0/0	***	1LSB

Input Range, Data / Code and Resolution of DASP-52180

Chapter 4
Register Structure and Format

4.1 Overview

The DASP-52180 board occupies 16 consecutive I/O address. The address of each register is defined as the board's base address plus an offset. The I/O registers and their corresponding functions are listed in the followings.

$\overline{RD}$	$\overline{WR}$	A4	A3	A2	A1	Port Name
0	1	0	X	X	X	Read A/D Channels 0 ~ 7
1	0		0	X	X	Reserved
0	1	1	0	0	0	Reserved
1	0					Reserved
0	1	1	0	0	1	Reserved
1	0					Reserved
0	1	1	0	1	0	Reserved
1	0					Reserved
0	1	1	0	1	1	Reserved
1	0					Reserved
0	1	1	1	0	0	Reserved
1	0					Reserved
0	1	1	1	0	1	Reserved
1	0					Reserved
0	1	1	1	1	0	Reserved
1	0					Reserved
0	1	1	1	1	1	Read HAL ID
1	0					Reserved

4.2 I/O Register Map

4.2.1 Read A/D Channel 0-7 (Base Address + Offset 0x00-07)

D7	D6	D5	D4	D3	D2	D1	D0
12 bit A/D Data (D0-D7)							

D15	D14	D13	D12	D11	D10	D9	D8
0	0	0	0	12 bit A/D Data (D8-D11)			

4.2.2 Read Axiomtek Product ID (Base Address + 0x0F)

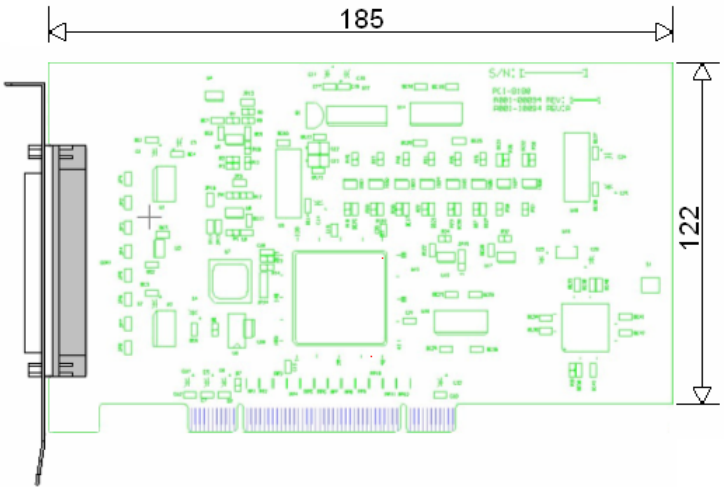
D7	D6	D5	D4	D3	D2	D1	D0
Card ID: 00001100							
FPGA Version (00000000 ~ 11111111)							

D15	D14	D13	D12	D11	D10	D9	D8
0	1	0	0	1	0	0	0
0	1	0	1	0	1	1	0

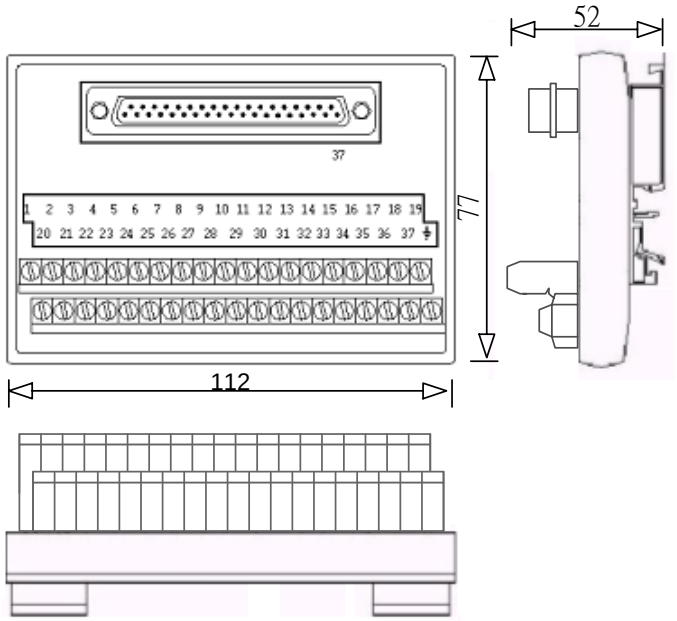
- **Note:**
  - 01001000 (48H): ASCII 'H' for HAL
  - 01010110 (56H): ASCII 'V' for Version
  - Remarks: Read this port twice to get both HAL product information.

Appendix A
Dimension of DASP-52180 and Accessories

- **DASP-52180**



- **TB-88037**


52
37
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
77
112

Appendix B
The AD Calibration of DASP-52180

Zero Voltage Calibration

- Execute the calibration program:
  CalibrationDASP52180.exe
- Select *(1) Reset EEPROM*
- Press <ESC> to exit calibration program
- Re-execute the calibration program:
  CalibrationDASP52180.exe
- Press <Enter> under Calibration selection, the calibration coefficients update to 1000
- Press <Enter>
- Input "0" voltage from external signal source
- Recode the input voltage of each channel
- Press <ESC> to exit calibration program
- Select *(2) Write Zero Coefficient to EEPROM*
- Input the 0V calibration coefficients from CH0 to CH7. The coefficients are decided as following:
  - If the measurement voltage is higher than 0mV, the coefficient equals to 1000 + the integer part of measurement value (unit: mV)
  - If the measurement voltage is less than 0mV, the coefficient equals to 1000 - the integer part of measurement value (unit: mV)
- Press <ESC> to exit calibration program and repeat step 4 and 5
- The coefficient 16~23 should be the previous input value and others were 10000
- Input "0" voltage under Analog Input (AD) Test menu
- Measure the voltage of each channel, the value should be less then +/- 2mV

+/- 10V Voltage Calibration

- Execute the calibration program: ***CalibrationDASP52180.exe***
- Press <Enter> under Calibration selection, The coefficient from 00 to 15 should be 10000 and CH16~23 should be the previous input value
- Press <Enter>, Input "10" V from external signal source
- Recode the input voltage of each channel
- Input "-10" V from external signal source
- Recode the input voltage of each channel
- Press <ESC> to exit calibration program and repeat step 1
- Select *(3) Write Span Coefficient to EEPROM*
- Input the +/- 10V calibration coefficients from AD0 to AD7. The coefficients equal to the integer part of (1000 X measurement value (unit: mV))
- Repeat 7 and Press <Enter> under Calibration selection, The coefficient from should be the previous input value
- Press <Enter>, read AD value under Analog Input (AD) Test menu. The voltage of each channel should be in the range of 10V+/- 2mV
- Press <Enter>, read AD value under Analog Input (AD) Test menu. The voltage of each channel should be in the range of -10V+/- 2mV

1. Press <ESC> to exit calibration program