PC-HELPER

Low Pass Filter Accessory for Analog Input

ATLF-8A

User's Manual

CONTEC CO.,LTD.

Check Your Package

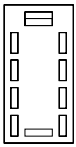
Thank you for purchasing the CONTEC product.

The product consists of the items listed below.

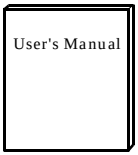
Check, with the following list, that your package is complete. If you discover damaged or missing items, contact your retailer.

Product Configuration List

- Accessory Board [ATLF-8A] …1
- User's Manual (this booklet) …1



Accessory board



User's Manual

Copyright

Trademarks

Table of Contents

Copyright ii

Trademarks ii

Table of Contents iii

1. BEFORE USING THE PRODUCT 1

About the Board 1
- Features 1
- About The Analog E Series 2
- Cable & Connector (Option) 2
- Accessories (Option) 2

Customer Support 3
- Web Site 3
- Limited One-Year Warranty 3
- How to Obtain Service 3
- Liability 3

Safety Precautions 4
- Safety Information 4
- Handling Precautions 4
- Environment 5
- Inspection 5
- Storage 5
- Disposal 5

2. HARDWARE SETUP 7

Parts of the Board and Explanation 7

Using Method 11
- Use Gain Amplifier Function Only 11
- Apply A Lowpass Filter Function To Gain Amplifier 12
- Use Temperature Sensor's Output Signal 13
- Notes of Method of Power Supply 15
- When Using 5VDC Supply through CN1 From A/D Conversion Board (When setting JP2 to (1-2)) 15
- When Using External Power Supply From +5V-+9VDC Preparation Separately. (When setting JP2 to (2-3)) 15
- Caution When Using Two ATLF-8A Boards 16

Calibration 17

3. ABOUT HARDWARE 19

Circuit 19

Hardware Specifications 21

1. Before Using the Product

About the Board

ATLF-8A is an analog signal conditioning terminal board with gain amplifier and lowpass filter function for connecting A/D convert interface board.

Features

Wide Bandwidth Gain Amplifier Function is installed.
This product has equipped eight differential gain amplifiers. These amplifiers have a wide bandwidth, from DC - 100kHz, when the input gain is 1. These amplifiers can achieve up to 500 times signal gain.

The low-pass filter of each channel is installed.
For each input channel, an onboard 4th order lower Butterworth filter can be applied. By changing jumpers, cutoff frequency of the filter can be selected: either a 20Hz cutoff frequency or a 10kHz one. A 20Hz cutoff frequency is useful when the commercial power noise is a main problem of the input signal; a 10kHz cutoff frequency is normally used for an Anti-Aliasing Filter application.

The temperature sensor that can be used for Hiyasetten amends of the thermo-couple is installed.
This product has equipped a semiconductor temperature sensor. User can use this sensor to get the board temperature. This temperature signal can be used to compensate thermocouple output by software when a thermocouple signal is applied.

Easy connection to external signal with M3 screw type terminal blocks.
There are eight M3 screw type terminal blocks for analog input signal. It is also equipped a M3 screw type terminal block for analog output signal of analog E-series boards. It is very easy for external connection with the ATLF-8A terminal board. In addition, a D type connector which is same as differential input connector of analog E-series boards.

Other Features

- Easy to connect with the analog E series board through a PCB37P, PCB37PS Series (option).
- Up to this two products can be cascaded together to supply up to 16 input channels.
- Either PC power (via CN1) or an external power source can be used to supply power to this product.
- This product can be installed on the DIN rail using the optional DIN rail installation adapter (DIN-ADP1).

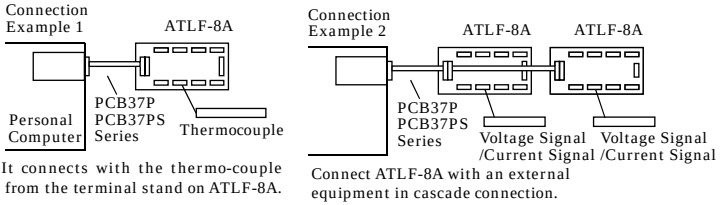


Figure 1.1 Connection Examples

About The Analog E Series

This manual uses the generic term "analog E series" to represent the following 12 products.

Board for PCI

AD12-16(PCI)EV, AD16-16(PCI)EV, AD12-16U(PCI)EV, AD16-16U(PCI)EV,
AD12-16(PCI)E, AD16-16(PCI)E, AD12-16U(PCI)EH, AD16-16U(PCI)EH

Board for ISA

AD12-16(PC)EH, AD16-16(PC)EH, AD12-16U(PC)EH, AD16-16U(PC)EH

Cable & Connector (Option)

Shielded Cable with Two 37-pin D-SUB Connectors (Mold Type)
: PCB37PS-0.5P (0.5m)
: PCB37PS-1.5P (1.5m)

Flat Cable with Two 37-pin D-SUB Connectors
: PCB37P-1.5 (1.5m)

Accessories (Option)

DIN rail adapter : DIN-ADP1

* Check the CONTEC's Web site for more information on these options.

Customer Support

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

Web Site

Japanese http://www.contec.co.jp/
English http://www.contec.com/
Chinese http://www.contec.com.cn/

Latest product information

CONTEC provides up-to-date information on products.

CONTEC also provides product manuals and various technical documents in the PDF.

Free download

You can download updated driver software and differential files as well as sample programs available in several languages.

Note! For product information

Contact your retailer if you have any technical question about a CONTEC product or need its price, delivery time, or estimate information.

Limited One-Year Warranty

CONTEC products are warranted by CONTEC CO., LTD. to be free from defects in material and workmanship for up to one year from the date of purchase by the original purchaser.
Repair will be free of charge only when this device is returned freight prepaid with a copy of the original invoice and a Return Merchandise Authorization to the distributor or the CONTEC group office, from which it was purchased.
This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original products. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization number (RMA) from the CONTEC group office where you purchased before returning any product.

* No product will be accepted by CONTEC group without the RMA number.

Liability

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from inexperienced usage, misuse, or malfunction of this device.

Safety Precautions

Understand the following definitions and precautions to use the product safely.

Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources. Understand the meanings of these labels to operate the equipment safely.

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Handling Precautions

⚠ DANGER

Do not use the product where it is exposed to flammable or corrosive gas. Doing so may result in an explosion, fire, electric shock, or failure.

⚠ CAUTION

- Do not strike or bend this product.
  Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not touch this product's metal plated terminals (USB connector) with your hands.
  Otherwise, this product may malfunction, overheat, or cause a failure.
  If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- Please assure that there is enough power from the computer for all the parts.
  If there is no enough power, it maybe cause error, overheat or a failure.
- The specifications of this product are subject to change without notice for enhancement and quality improvement.
  Even when using the product continuously, be sure to read the manual and understand the contents.
- Do not modify this product. CONTEC will bear no responsibility for any problems, etc., resulting from modifying this product.
- Regardless of the foregoing statements, CONTEC is not liable for any damages whatsoever (including damages for loss of business profits) arising out of the use or inability to use this CONTEC product or the information contained herein.

Environment

Use this product in the following environment. If used in an unauthorized environment, the board may overheat, malfunction, or cause a failure.

Operating temperature

0 - 50ºC

Operating humidity

20 - 90%RH (No condensation)

Corrosive gases

None

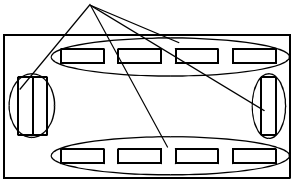
Floating dust particles

Not to be excessive

Inspection

Inspect the product periodically as follows to use it safely.

- The gold-plated leads of the bus connector have no stain or corrosion.



Storage

When storing this product, keep it in its original packing form.

(1) Put this product in the storage bag.

(2) Wrap it in the packing material, then put it in the box.

(3) Store the package at room temperature at a place free from direct sunlight, moisture, shock, vibration, magnetism, and static electricity.

Disposal

When disposing of the product, follow the disposal procedures stipulated under the relevant laws and municipal ordinances.

2. Hardware Setup

Parts of the Board and Explanation

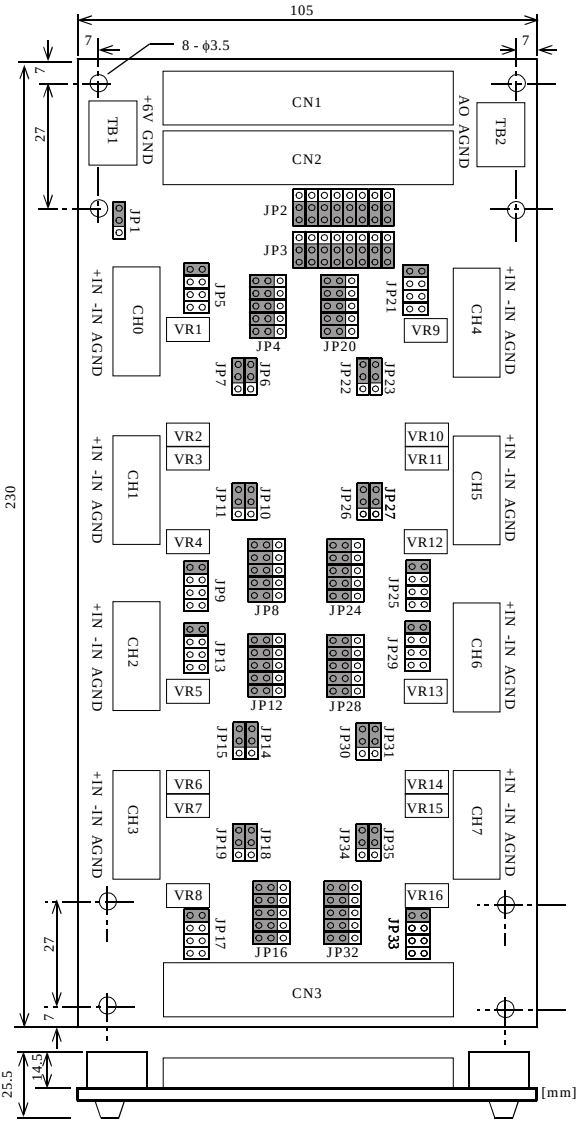


Figure 2.1 Default setting

CN1: The connector for connecting the analog to digital conversion device.
For CONTEC analog E series boards, this connector can be directly connected to the board by an optional PCB37P series or PCB37PS series cable.

CN2: The connector for cascade connection of another ATLF-8A terminal board.

CN3: The connector for connecting analog input or output signals. Signals from external equipment or optional differential input cable such as PCD8PS series or PCA37P, PCA37PS series can be connected.

The signal lines of the analog input signal are common with the signal line of CH0-CH7 and TB2.

TB1: The terminal block of external power supply (+5V - +9VDC).
When the JP1 is set as external power supply, a +6VDC power should be supplied through this terminal block.

TB2: The terminal block of analog output signal.
Analog output signal (OUT0) of an analog E series can be connected with external equipment.

CH0 - CH7: The terminal blocks of analog input signals.
External equipment and the thermo-couple can be connected.

JP1: The jumper of power supply setting.
This jumper determines how to supply the power of ATLF-8A terminal board.

- Shorting the pin1 and pin2 of the JP1 determines that the ATLF-8A will get its power supply, +5V - +9VDC, from the CN1 connector. A CONTEC analog E-series board can supply a +5V power for the ATLF-8A through a D type connector.
- Shorting the pin2 and pin3 of the JP1 determines that the ATLF-8A must be supplied by an external +5V - +9VDC power supply through the TB1 terminal block. The external power supply must satisfy the specification of the Table 2.1.

Table 2.1 External Power Specification

Item	Specification
Power voltage	+5V - +9VDC
Regulation	±5% or more
Output current voltage	1000mA or more

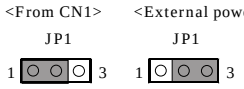


Figure 2.2 Setting the power supply

JP2: The jumper of CN1 output channel selection.

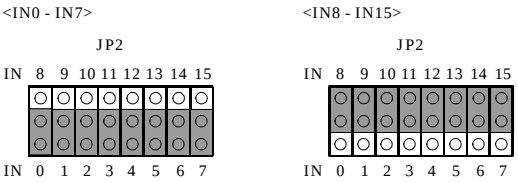


Figure 2.3 Connection Channel Setting

JP3: The jumper of external signal input or temperature sensor output selection.

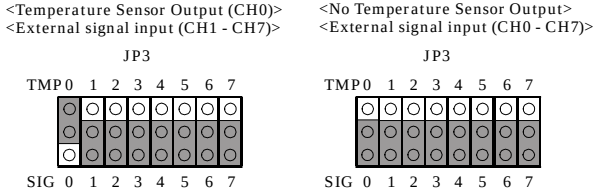


Figure 2.4 Input signal setting

⚠ CAUTION

When a channel is selected for the sensor output by the JP3, the related input signal cannot be output to the CN1 connector.

JP4 - JP35: The jumpers of filter's cutoff frequency selection, input gain selection, and with / without filter selection.

Table 2.2 Relationship of Input Channel and Jumpers

	Filter selection	Input gain selection	With / Without filter
CH0	JP4	JP5	JP6, 7
CH1	JP8	JP9	JP10, 11
CH2	JP12	JP13	JP14, 15
CH3	JP16	JP17	JP18, 19
CH4	JP20	JP21	JP22, 23
CH5	JP24	JP25	JP26, 27
CH6	JP28	JP29	JP30, 31
CH7	JP32	JP33	JP34, 35

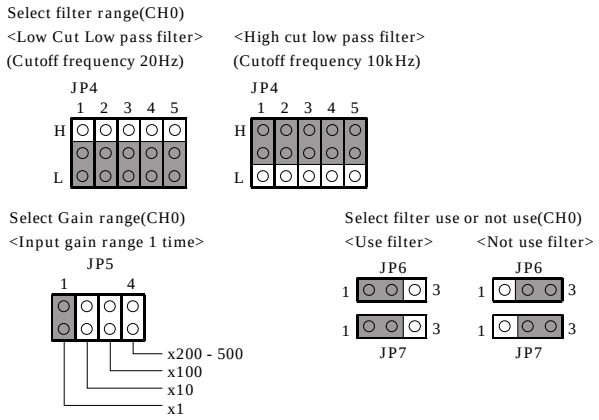


Figure 2.5 Input Gain, Filter setting <For CH0>

VR1 - VR16: The potentiometers for offset and gain adjusting of input channels.

Table 2.3 Relationship of trimmer and each channel

	Input Amp. gain	Input Amp. offset
CH0	VR1	VR2
CH1	VR4	VR3
CH2	VR5	VR6
CH3	VR8	VR7
CH4	VR9	VR10
CH5	VR12	VR11
CH6	VR13	VR14
CH7	VR16	VR15

Using Method

Each input channel can have three different applications. Here we show you these applications of CH0.

Use Gain Amplifier Function Only

Input a voltage signal, within a range of -10V - +10V, into the terminal block of CH0 or pin 1 : IN0[+], pin 2 : IN0[-] and pin 20 : AGND of input connector CN3.

The inputted signal is amplified and outputted to the output connector CN1. JP5 and VR1 can be used to select the input gain. The default setting of JP5 is gain=1.

Figure 2.6 is an example of setting that gain=1, filter is not inserted, input channels are IN0 - IN7.

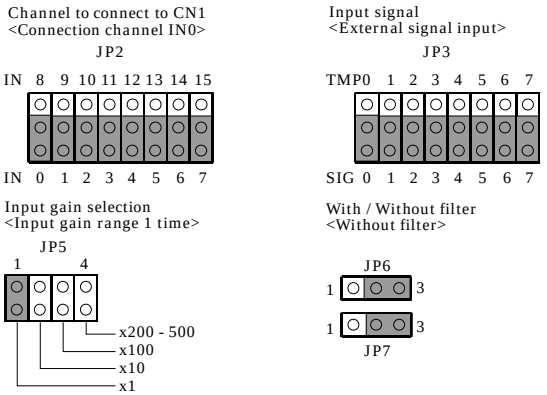


Figure 2.6 Settings of using Gain Amp. only

⚠ CAUTION

- The defaulting setting is that the input gain potentiometer is adjusted for gain=10.
- When you change a different input gain, you may need to adjust the potentiometers to get a proper input gain. In case that you cannot get a demanded output signal, you need a digital multi-meter and a standard voltage generator to calibrate the input offset and gain.
- For CH0, the potentiometer VR1 is used to adjust the input gain and the potentiometer VR2 is used to adjust the offset voltage of the amplifier. For details, please refer to chapter calibration.
- If you are going to use a large input gain, we suppose you add the lowpass filter function to this channel.
- Even though the input circuit is protected, the input signal should be in the range of ±15V relating to the AGND.
- This product should be warmed up at least 15 minutes before application.

Apply A Lowpass Filter Function To Gain Amplifier

A lowpass filter can be inserted into the gain amplifier. This lowpass filter has two different cutoff frequencies. A 20Hz(LOW) cutoff frequency can be used to cut the noise of power supply and a 10kHz(HIGH) cutoff frequency can be used to from an Anti-Aliasing filter. Setting of JP4, JP6 and JP7 determine whether the lowpass filter is inserted or not and which cutoff frequency is applied.

The default setting of cutoff frequency is 20Hz.

Figure 2.7 is an example of inserting a lowpass filter into a gain=1 amplifier. The output signals are connected to the IN0 to IN7 of CN1.

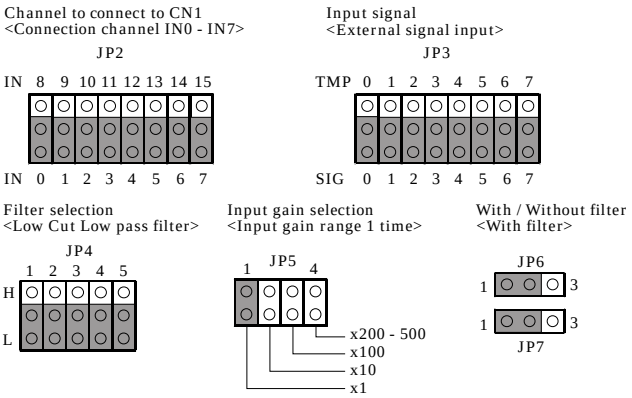


Figure 2.7 Example of Applying A Lowpass Filter Function To Gain Amplifier

⚠ CAUTION

- After adding lowpass filter function, you may need to calibrate the offset voltage.
- Please warm up the board for at least 15 minutes.

Use Temperature Sensor's Output Signal

You can monitor this product's board temperature by using on board sensor.

If one set of JP3 is connected onto the TMP side, the related input signal will not be outputted to the CN1 connector. Instead of this input signal, the sensor's output signal is then outputted to the CN1 connector. Therefore, you can get the sensor output from the CN1 and monitor the board temperature. The default setting of JP3 is that all sets of jumpers are connected onto SIG side.

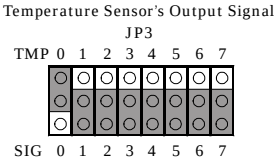


Figure 2.8 Example of using Temperature Sensor's Output Signal

Following is the relationship formula of sensor's voltage output and board's temperature:

$T = V / 0.01$ •••••••• (1)

V : Output voltage signal of the sensor.[V]

T : temperature of this product's board.[ºC]

When a thermocouple is directly connected onto this product, you can use this product temperature signal to perform a Cold Junction Compensation by software.

When a thermocouple is directly connected onto ATLF-8A's terminal block, the temperature of the thermocouple's base junction is the board temperature. The cold junction compensation, therefore, can be done by software.

First, calculate board temperature T[ºC] by formula (1).
Second, get the output voltage E_T[V], which is responding to the output voltage of the thermocouple at the T[ºC], from temperature / voltage table of the used thermocouple type.
Third, input the thermocouple voltage E_S[V] from this product.
Fourth, compensate this thermocouple voltage Es[V] by formula (2).

$E_C = E_S + E_T$ •••••••• (2)

here, E_C[V] is the compensated output voltage of the thermocouple.
Then, you should do linearizing to get a linearity temperature signal.

⚠ CAUTION

- If the IN0 is connected with the temperature sensor signal, you cannot input the CH0 from this IN0 channel.
- This product is not equipped the open connection detective function.
- Please warm up the board for at least 15 minutes.

Notes of Method of Power Supply

When Using 5VDC Supply through CN1 From A/D Conversion Board(When setting JP2 to (1-2))

If the cable connection this product to A/D conversion board is too long, the resistance of the cable will be too large and this product might can't operate normally because of not enough power supply from A/D conversion board.

Please connect it with PCB37PS-0.5 or PCB37PS-1.5 cable when using only one this product.

Please connect it with PCB37PS-0.5 cable when using two this products together.

When using cables other than the PCB37PS series, please select ones which the resistance in the power supply line is smaller than 0.1Ω.

When Using External Power Supply From +5V - +9VDC Preparation Separately. (When setting JP2 to (2-3))

Table 4 shows the specification of the recommended external power supply.

Please select the maximum current consumption of this product about the current capacity that can be supplied for enough power supply.

Moreover, it will go out of the prescribed accuracy range if the noise included in the power supply line is too large.

Table 2.4 External Power Specification

Item	Specification
Power voltage	+5V - +9VDC
Regulation	±5%
Output current voltage	1000mA

Caution When Using Two ATLF-8A Boards

When two ATLF-8A Boards are used together, you must connect the CN2 of first board to the CN1 of the second board. .

Output signals of the second ATLF-8A board will then be outputted to the IN8 to IN15 of the CN1 of the first ATLF-8A board through this connection. JP2 should be set as:

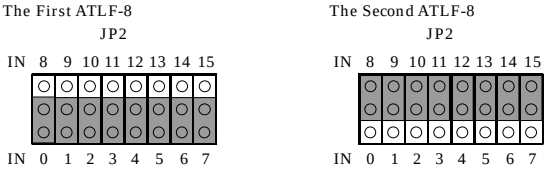


Figure 2.9 Example of using two ATLF-8A boards

JP1 is used to select power supply of ATLF-8A. To short pin1 and pin2 of the JP1s means that these two ATLF-8A boards will be supplied through their CN1.

To short pin2 and pin3 of the JP1s means that these two ATLF-8A boards must be supplied through their external power terminal TB1s..

Calibration

All the potentiometers have been adjusted before shipping (Gain=10).
In case that you can't get expected data, please calibrate the board with a multimeter. Following pages give you an example of how to calibrate CH0.

Preparation :

You need to set the jumpers to a required configuration that you are going to calibrate.

Here is a calibrating example of gain=1, lowpass filter is inserted.

Please set JP4 onto L side (low frequency filter); Set JP5 at 1(gain=1); Short pin1 and pin2 of JP6 and JP7(insert filter); Set JP2 onto IN0 side and channel 0 of JP3 onto SIG side(connect input CH0 to CN1's IN0 pin).

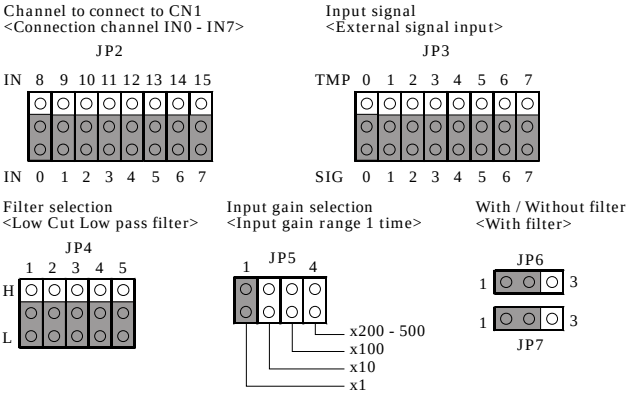


Figure 2.10 Setting condition

⚠ CAUTION

- Please use a multimeter with more than 12-bit precision for calibration.
- Before any calibration, please warm up this product for more than 15 minutes.

Calibration

(1) Brief Adjusting of Input Gain
When you set an input gain of gain=10, 100, 200 - 500, you must calibrate the input gain.

Connect the digital multimeter to IN0 and AGND of CN1. From the voltage generator, input a voltage signal that equals the largest input voltage into CH0 terminal block or into pin 1, pin 2 and pin 20 of CN3 (This largest input voltage = 10.000V / designed gain. If the designed gain is 500, the largest input voltage equals 10.000V / 500 = 0.02V). Then adjust potentiometer VR1 until you get a +10.000V voltage from your multimeter.

(2) Calibrate Offset of Gain Amplifier
Connect the digital multimeter to IN0 and AGND of CN1.
Input a 0.0000V voltage signal into CH0 terminal block or into pin1, pin2 and pin20 of CN3 , Then adjust potentiometer VR2 until you get a 0.0000V voltage from your multimeter.

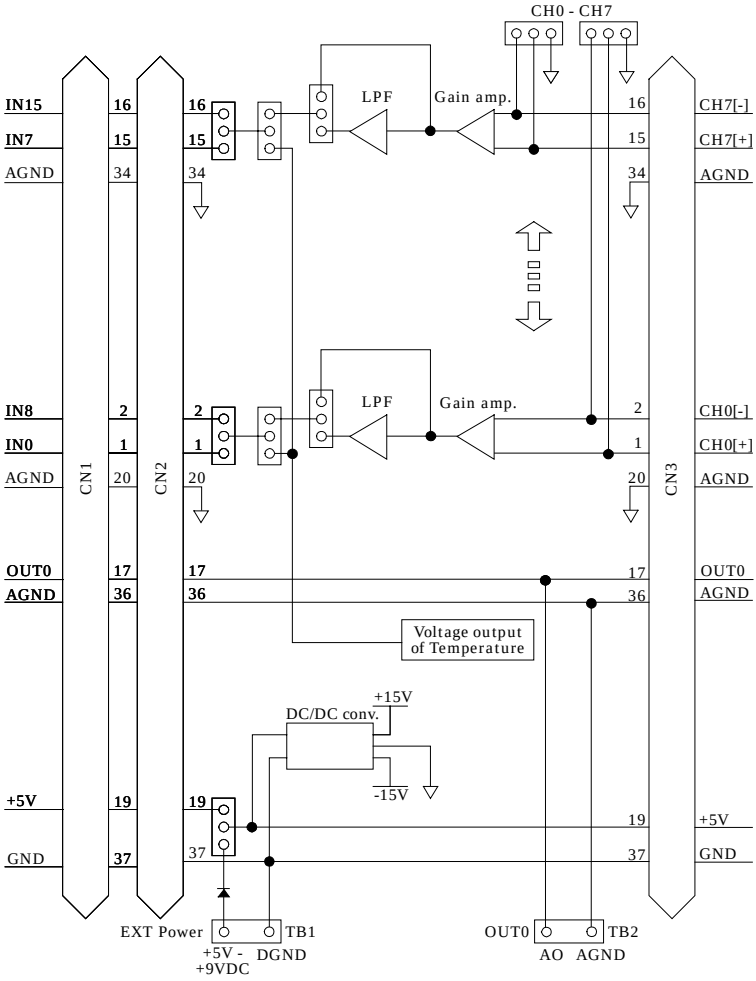
(3) Calibrate Gain of the Gain Amplifier
When JP5 is set for gain = 1, this calibration is not needed.
If JP5 is set for Gain = 10, Gain = 100, or Gain = 200 to 500, this calibrate is necessary.
Connect the digital multimeter to IN0 and AGND of CN1.

Input a voltage signal that equals the largest input voltage into CH0 terminal block or into pin1, pin2 and pin20 of CN3 (This largest input voltage=10.000V/designed gain. If the designed gain is 500, the largest input voltage equals 10.000V/500=0.02V). Then adjust potentiometer VR1 until you get a +10.000V voltage from your multimeter.

(4) Repeat (2) and (3) until you satisfy the output signal.

3. About Hardware

Circuit



- The AGND means analog ground. Then DGND means digital ground.
- Pin 20 - 35 of all three connectors (CN1 - CN3) are connecting to AGND.

Figure 3.1 Circuit Block Diagram

Input Circuit <for CH0>

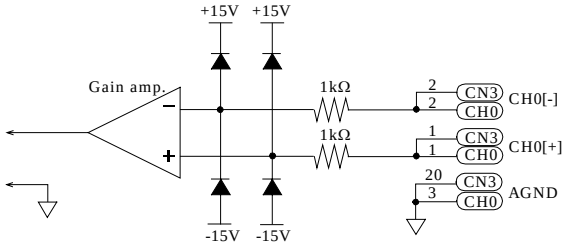


Figure 3.2 Input Circuit <for CH0>

Pin Assignments of CN1 - CN3

CN1,CN2

Description	No.			No.	Description
Analog Input 0	1	1	20	20	Analog Ground
Analog Input 8	2	2	21	21	Analog Ground
Analog Input 1	3	3	22	22	Analog Ground
Analog Input 9	4	4	23	23	Analog Ground
Analog Input 2	5	5	24	24	Analog Ground
Analog Input 10	6	6	25	25	Analog Ground
Analog Input 3	7	7	26	26	Analog Ground
Analog Input 11	8	8	27	27	Analog Ground
Analog Input 4	9	9	28	28	Analog Ground
Analog Input 12	10	10	29	29	Analog Ground
Analog Input 5	11	11	30	30	Analog Ground
Analog Input 13	12	12	31	31	Analog Ground
Analog Input 6	13	13	32	32	Analog Ground
Analog Input 14	14	14	33	33	Analog Ground
Analog Input 7	15	15	34	34	Analog Ground
Analog Input 15	16	16	35	35	Analog Ground
Analog Output	17	17	36	36	Analog Ground
Reserved	18	18	37	37	Digital Ground
+5V DC to PC	19	19			

Figure 3.3 Pin Assignments of CN1 and CN2

CN3

Description	No.			No.	Description
Input CH0 [+]	1	1	20	20	Analog Ground
Input CH0 [-]	2	2	21	21	Analog Ground
Input CH1 [+]	3	3	22	22	Analog Ground
Input CH1 [-]	4	4	23	23	Analog Ground
Input CH2 [+]	5	5	24	24	Analog Ground
Input CH2 [-]	6	6	25	25	Analog Ground
Input CH3 [+]	7	7	26	26	Analog Ground
Input CH3 [-]	8	8	27	27	Analog Ground
Input CH4 [+]	9	9	28	28	Analog Ground
Input CH4 [-]	10	10	29	29	Analog Ground
Input CH5 [+]	11	11	30	30	Analog Ground
Input CH5 [-]	12	12	31	31	Analog Ground
Input CH6 [+]	13	13	32	32	Analog Ground
Input CH6 [-]	14	14	33	33	Analog Ground
Input CH7 [+]	15	15	34	34	Analog Ground
Input CH7 [-]	16	16	35	35	Analog Ground
Analog Output	17	17	36	36	Analog Ground
Reserved	18	18	37	37	Digital Ground
+5V DC to PC	19	19			

Figure 3.4 Pin Assignments of CN3

CN1, CN2 and CN3 are shown looking at the receptacle on the board from the plug.

Hardware Specifications

Table 3.1 Basic Specifications

Item	Specification
Number of input channel	Differential input 8 channels
Input voltage range (Max.)	-10V - +10V
Input gain (Jumper setting)	Gain = 1, Gain = 10 (Adjusting is required), Gain = 100 (Adjusting is required), Gain = 200 - 500 (Adjusting is required)
Input impedance	1MΩ or more
Accuracy	Gain = 1 ±0.05%, Gain = 10 ±0.05%, Gain = 100 ±0.05% *1, Gain = 500 ±0.2% *1
Band width	100kHz (Gain=1)
Filter type	4th order Butterworth filter
Cutoff frequency (jumper select)	20Hz, 10kHz
Temperature sensor's accuracy	±2℃
Warm-up time	15 minutes or more
Current consumption (mm)	5VDC 700mA
Operating condition	0 - 50℃, 20 - 90%RH (No condensation)
External dimension (mm)	105(W) x 230(D) x 25.5(H)
Weight	350g
Supported board	Board for PCI AD12-16(PCI)EV, AD16-16(PCI)EV, AD12-16U(PCI)EV, AD16-16U(PCI)EV, AD12-16(PCI)E, AD16-16(PCI)E, AD12-16U(PCI)EH, AD16-16U(PCI)EH Board for ISA AD12-16(PC)EH, AD16-16(PC)EH, AD12-16U(PC)EH, AD16-16U(PC)EH

*1 The accuracy that the 20Hz Lowpass filter is applied.

Table 3.2 Terminal (CH0 - CH7, TB1, TB2) Specifications

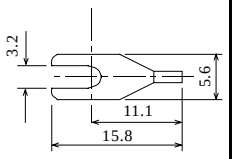
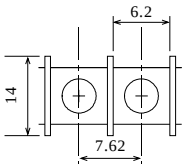
Used terminal	ML-40S1BYF [mfd. by Sato Parts] equivalent	Compatible Y pin	C3A [mfd. by J.S.T.] equivalent
Pin screw	M3	Y pin dimension [mm]	
Terminal block dimension [mm]			

Table 3.3 Interface Connector (CN1 - CN3) Specifications

Used connector	37-pin D-SUB connector [F (female) type] DC-37ST-N [mfd. by JAE] equivalent
Lock nut	Screw size #4-40UNC GM-25HU [mfd. by HONDA] equivalent
Compatible connector	37-pin D-SUB connector [M (male) type] (DCSP-JB37PF [mfd. by JAE] equivalent), (747306-1[mfd. by AMP] equivalent), etc

ATLF-8A

User's Manual

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