

MIC-1810

Intel® Core™ i3-6100U/Celeron®
3955U DAQ Embedded
Automation Computer

ADVANTECH

Enabling an Intelligent Planet

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2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage:

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
16. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**
17. **ATTENTION: Danger d'explosion si la batterie est mal REMPLACÉ. REMPLACER UNIQUEMENT PAR LE MEME TYPE OU EQUIVALENT RECOMMANDÉ PAR LE FABRICANT, jeter les piles usagées SELON LES INSTRUCTIONS DU FABRICANT.**
18. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

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Chapter 1

Overview

This chapter provides an overview of MIC-1810 specifications.

Sections include:

- Introduction
- Safety Precautions
- Accessories
- Chassis Dimensions

1.1 Introduction

The MIC-1810 is a standalone automation controller with integrated data acquisition module and signal conditioning to provide digital I/O, analog I/O, and counter functions. This controller also supports serial communication ports and several other networking interfaces. You can seamlessly integrate your applications into the MIC-1810 series and speed up your system development with these application-ready controllers. With multiple OS and driver support, such as Windows 10/7 and embedded Linux, users can integrate applications easily in an application-ready platform that can provide versatile functions to fulfill diverse requirements.

1.2 Safety Precautions

The following sections tell how to make each connection. In most cases, you will simply need to connect a standard cable.

Warning! *Always disconnect the power cord from your chassis whenever you are working on it. Do not connect while the power is on. A sudden rush of power can damage sensitive electronic components. Only experienced electronics personnel should open the chassis.*



Warning! *Toujours à la terre pour éliminer toute charge d'électricité statique avant toucher MIC-1810. Appareils électroniques modernes sont très sensibles à charges d'électricité statique. Utilisez un bracelet antistatique à tout moment. Placez tous composants électroniques sur une surface antistatique ou dans un statique-sac blindé.*



Caution! *Always ground yourself to remove any static electric charge before touching MIC-1810. Modern electronic devices are very sensitive to static electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag.*



Caution! *Toujours débrancher le cordon d'alimentation de votre boîtier lorsque vous êtes travailler. Ne branchez pas lorsque l'appareil est allumé. Un afflux soudain de puissance peut endommager les composants électroniques sensibles. Seulement connu personnel de l'électronique devraient ouvrir le châssis.*



Caution! *Equipment is intended for installation in Restricted Access Location.*



Caution! *Les matériels sont destinés à être installés dans des EMPLACEMENTS À ACCÈS RESTREINT.*



1.3 Accessories

Please refer to the accessory list below:

- Terminal blocks: 1 x 2-pin, 1 x 16-pin, 1 x 24-pin, 3 x 10-pin

If anything is missing or damaged, contact your distributor or sales representative immediately.

1.4 Optional Accessories

- 1960099348N001 Table-Mount kit

Chapter 2

Hardware Overview

2.1 Introduction

The following figures show the connectors on MIC-1810. The following sections give you information about each peripheral.

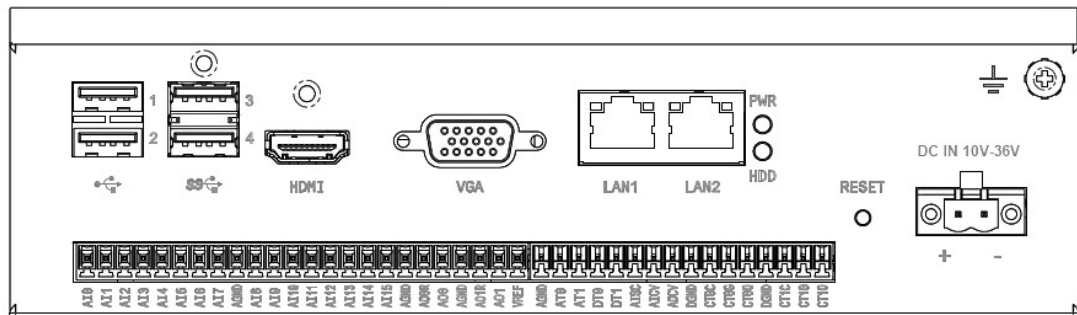


Figure 2.1 Front Panel of MIC-1810

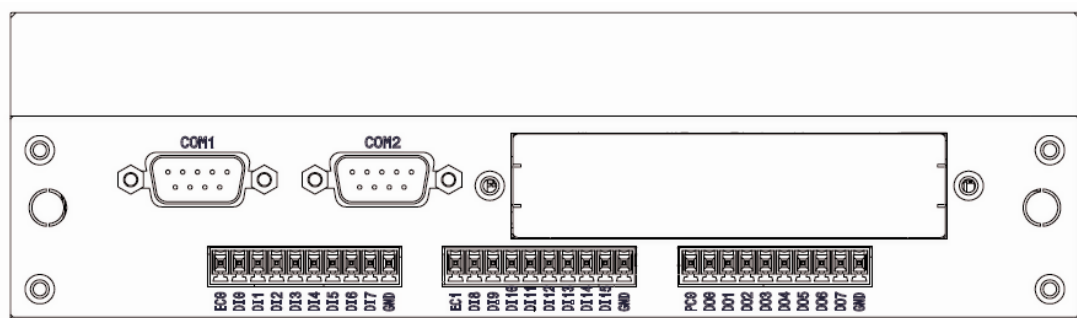


Figure 2.2 Rear Panel of MIC-1810

2.2 Platform Specifications

- **Processor:** Mobile 6th Generation Intel® Core™ Processor
 - MIC-1810-U0A1E: Celeron® 3955U 2.0GHz Dual-Core
 - MIC-1810-U3A1E: Core i3 6100U 2.3GHz Dual-Core
- **Serial Ports:** 2 x RS-232 from COM1/COM2

2.3 LAN: Gigabit Ethernet

- LAN1: Intel i219
- LAN2: Intel i210

Note! Both LAN1 and LAN2 supports EtherCAT.



2.4 Power Connector

The MIC-1810 comes with a 2-pin phoenix connector that carries 10 ~ 36V_{DC} external power input. You can connect your DC power to the MIC-1810 through this connector.

2.5 USB Connector

The USB interface supports Plug and Play, which enables you to connect or disconnect a device whenever you want, without turning off the computer. The MIC-1810 provides four connectors of USB interfaces, which gives complete Plug & Play and hot swapping for up to 127 external devices. Two of the four connectors on MIC-1810 and one of the four connectors on MIC-1810 are USB 3.0 standard. The USB interface complies with USB EHCI, Rev. 2.0 compliant. The USB interface can be disabled in the system BIOS setup.

2.6 HDMI Display Connector

The MIC-1810 provides a HDMI controller for a high resolution interface. The MIC-1810 supports up to full HD resolution for two independent displays. DisplayPort is also available on a per-project basis.

2.7 RTC Battery Specification

The MIC-1810 has an RTC battery to ensure BIOS settings and system clock can be retained, even when power is disconnected for a short time.

- Typical Voltage: 3.0 V
- Normal discharge capacity: 210 mAh

2.8 Reset Button

Press the “Reset” button to reset/restart the MIC-1810.

Chapter 3

Initial Setup

This chapter introduces how to initialize the MIC-1810 and connect input and output signals via connectors.

Sections include:

- Chassis Grounding
- Connecting Power
- Installing an SSD
- Installing a Table Mount
- DAQ Setup & Configuration
- Signal Connections
- I/O Connector Signal Description
- Analog Output Connection
- AO Sample Clock Sources Connections
- Trigger Sources Connections
- Digital Signal Connections

3.1 Chassis Grounding

MIC-1810 provides good EMI protection and a stable grounding base. There is an easy-to-connect chassis grounding point to use. Figure 3.1.

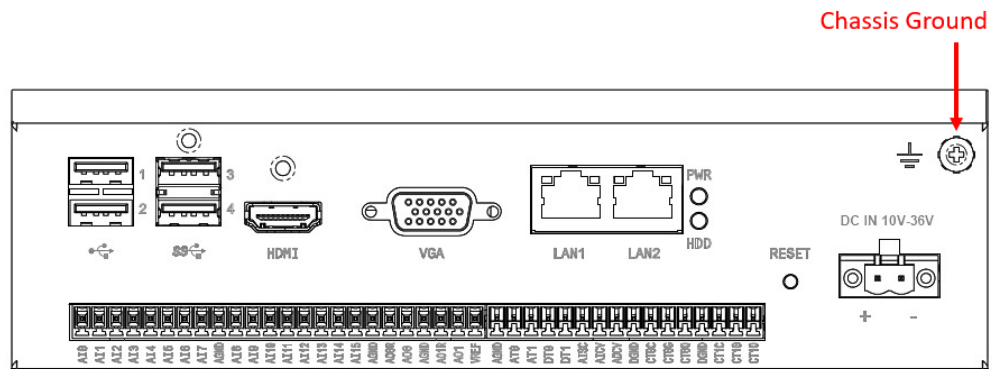


Figure 3.1 Chassis Grounding Connection

3.2 Connecting Power

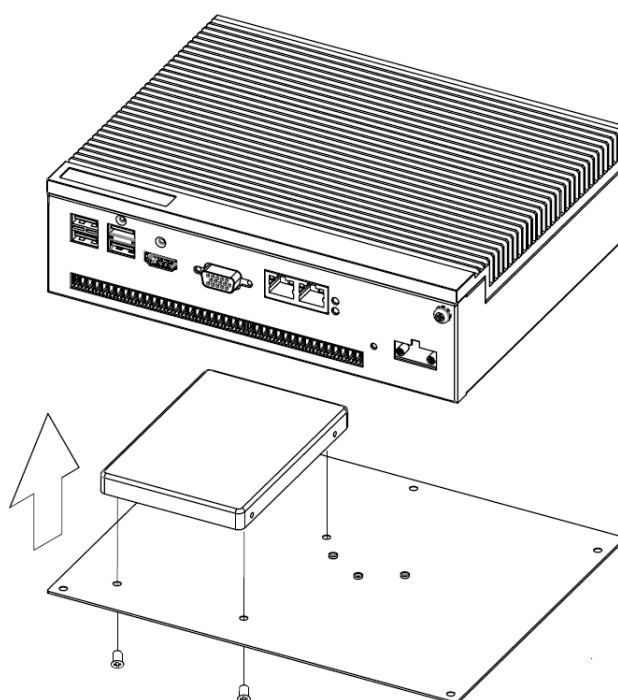
Connect the MIC-1810 to a 10~36V_{DC} power source. The power source can be from a power adapter.

3.3 Installing a SSD

The procedure for installing a hard disk into the MIC-1810 is below. Please follow these steps carefully. Please note the system is NOT compatible with a +12V HDD. Please use a HDD with lower power input.

1. Undo 4 screws and remove the bottom cover.
2. Undo 4 x SSD screws from bottom cover. Retain the screws.
3. Assemble SATA cable/power cable.
4. Replace bottom cover and secure with 4 x screws.

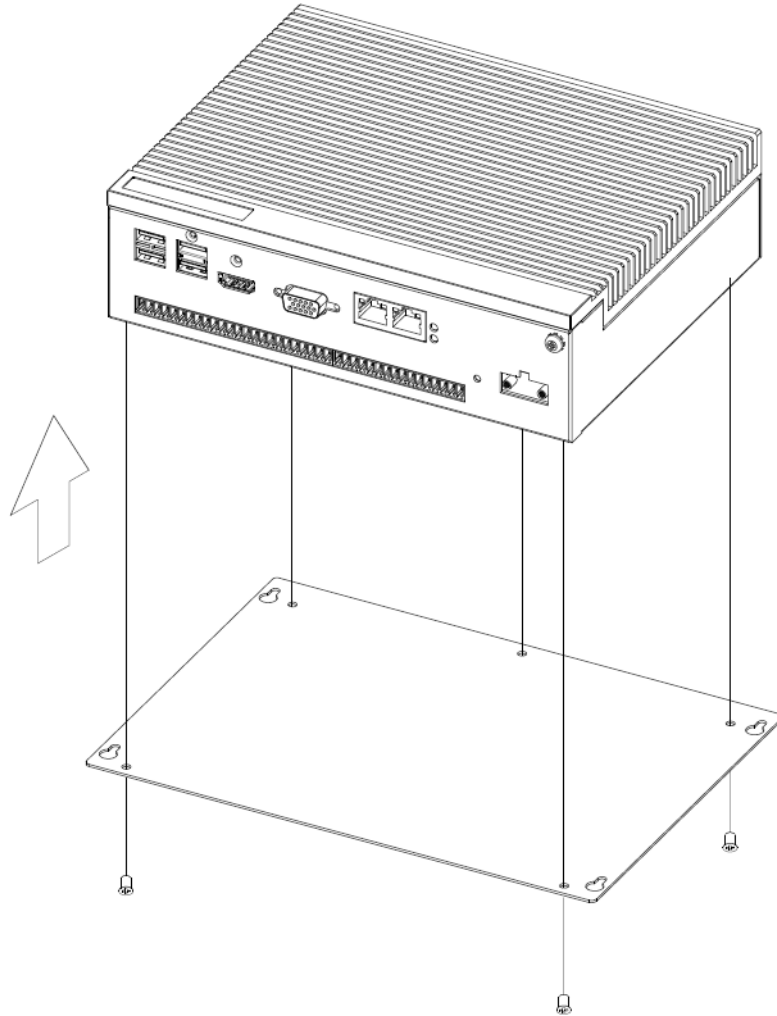
Note! The MIC-1810 only has one SATA slot.



3.4 Installing a Table Mount

MIC-1810 provides a table mount as an accessory. To avoid overheating, the extruded heat sink must be on top.

1. Undo 4 screws from bottom cover.
2. Position table mount, align with bottom cover, and secure with 4 screws.



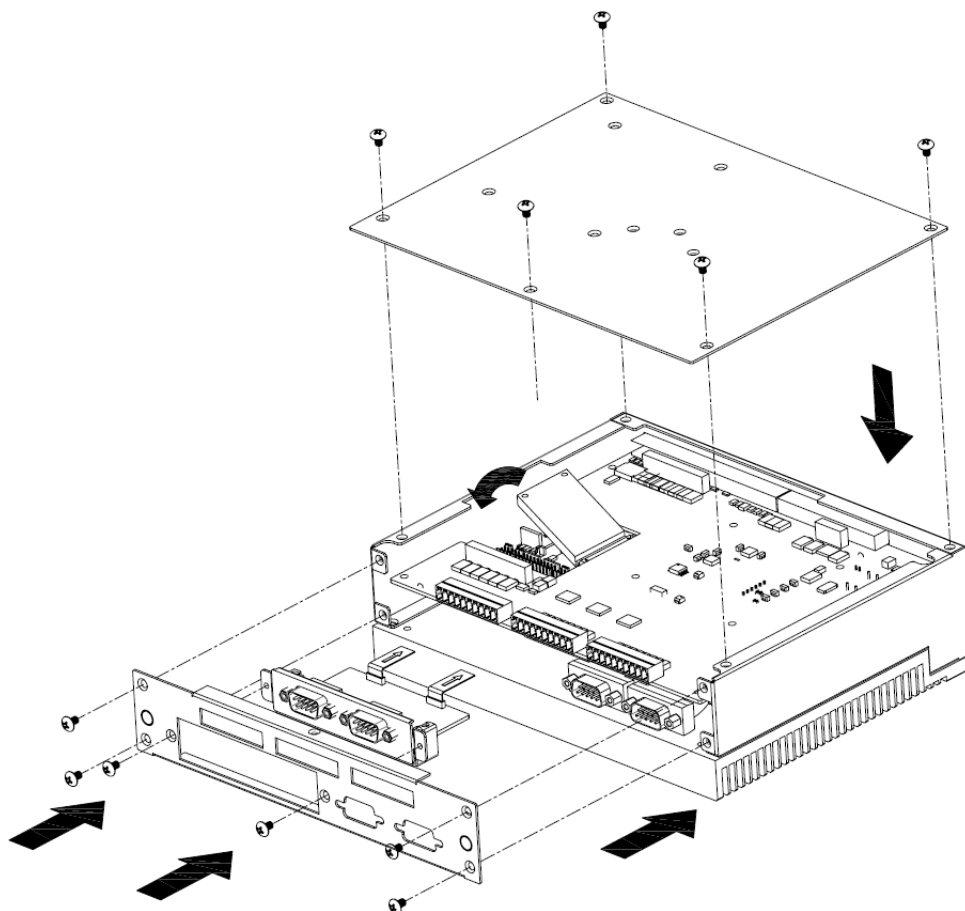
The optional table mount:

Part Number: 1960099348N001

Dimensions: 220 x 156 mm (8.66 x 6.14 in.)

3.5 iDoor Module Installation

1. Unscrew the bottom plate and back cover.
2. Unscrew the iDoor cover from the back cover assembly.
3. Insert the mini PCIe card into the mPCIe slot.
4. Plug the cable to connect the mini PCIe card and iDoor IO module.
5. Screw the IO module with the back cover.
6. Screw the back cover and bottom plate back to complete the assembly.



3.6 DAQ Setup & Configuration

MIC-1810 has a built-in DAQ card: MIOe-3810. The Advantech Navigator program is a utility that introduces setup, configuration, and testing of your MIOe-3810; it later stores your settings on the system registry. These settings will be used when you call the APIs of Advantech Device Drivers. The following PCIE-1810 details will serve as an example.

3.6.1 Setting Up the Device

1. To install the I/O device for your card, you must first run the Advantech Navigator program (by accessing Start/Programs/Advantech Automation/DAQNavi/ Advantech Navigator).
2. You can then view the device(s) already installed on your system (if any) on the Installed Devices list box. When the software and hardware installation are completed, you will see the MIOE-3810 card in the Installed Devices list.

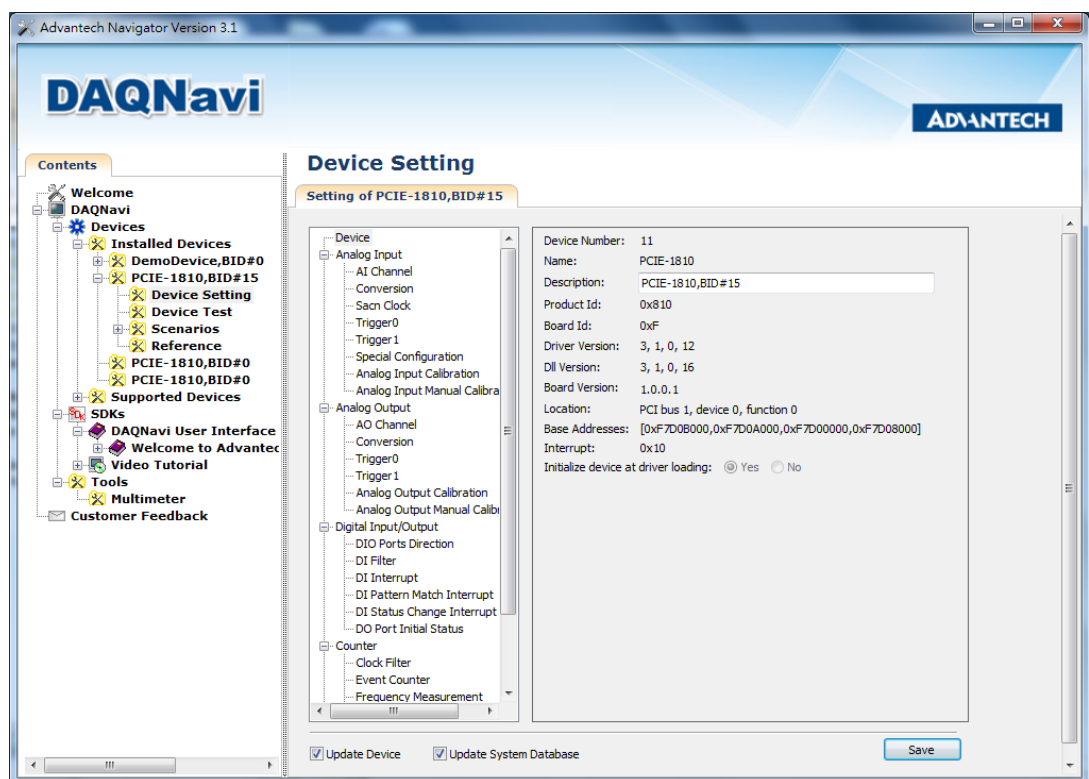


Figure 3.2 The Device Setting for MIOE-3810

3.6.2 Configuring the Device

1. Please go to the Device Setting to configure your device. Here you can configure not only the analog Input/Output of MIOE-3810 but also digital Input/Output.

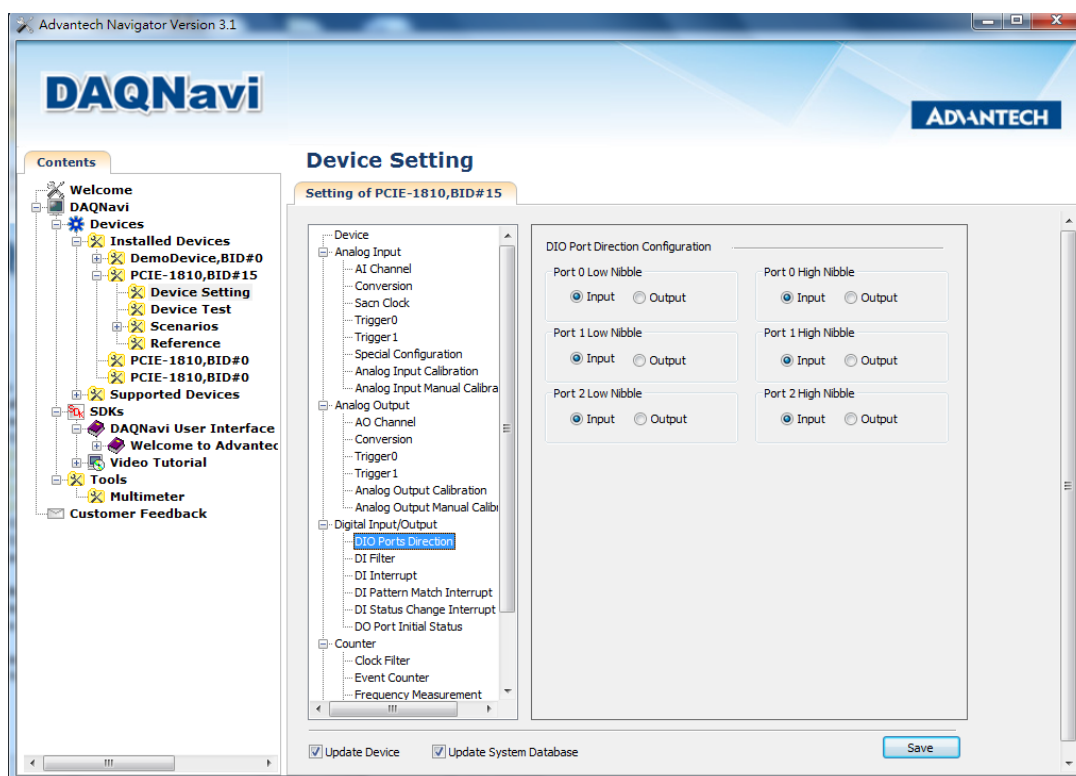


Figure 3.3 Device Setting Page

2. After your card is properly installed and configured, you can go to the Device Test page to test your hardware by using the testing utility supplied.

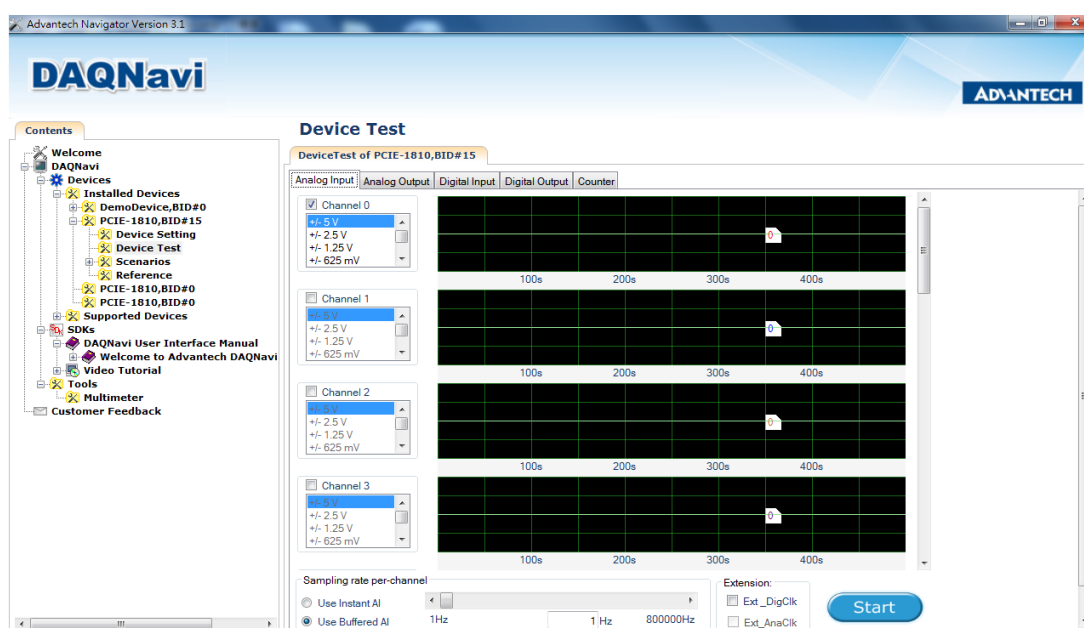


Figure 3.4 Device Testing Page

For detailed information related to the software and settings, please refer to the Advantech Navigator.

3.7 MIC-1810 DAQ Function Block

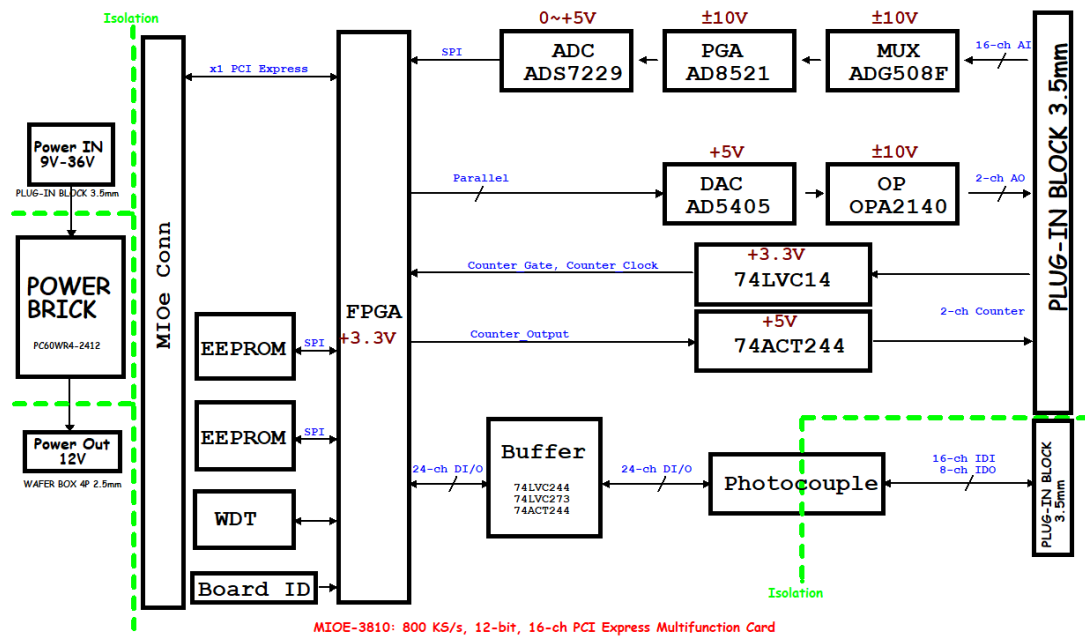


Figure 3.5 MIC-1810 DAQ Function Block

3.8 I/O Connector Signal Description

The pin assignments for the terminal blocks on the MIC-1810 please refer to Figure 2.1 and 2.2, and Table 3.1 shows its I/O connector signal description.

Table 3.1: I/O Connector Signal Descriptions			
Signal Name	Reference	Direction	Pin Description
AI[15:0]	AGND	Input	AI Channels 0 to 15. Each channel pair, AI[i+1:i](i=0,2,4...14), can be configured as either two single-ended inputs or one differential input.
AGND	-	-	Analog Ground. These pins are the reference points for single-ended measurements and the bias current return point for differential measurement. The ground reference (AGND and DGND) are connected together on the MIC-1810.
ATRG0(AT0) ATRG1(AT1)	AGND	Input	Analog Threshold Trigger. These pins are the analog input threshold trigger input. Digital Trigger. These pins are the digital input. The left pins are used to start or stop a data acquisition. Analog Threshold Trigger and Digital Trigger are used to execute a specific data acquisition mode – an acquisition which consists of one or more scans. And then a data acquisition behavior needs a stop trigger signal while the pin is used to stop function. The active edge of the start and stop function could be programmed to be rising or falling.
DTRG0(DT0) DTRG1(DT1)	DGND	Input	
AI_SCAN(AISC)	DGND	Input	AI Scan Clock. This pin is used to initiate a set of data acquisition. The card samples the AI signals of every channel in the scan list once for every AI Scan Clock.
AI_CONV(AICV)	DGND	Input	AI Conversion Clock. This pin is to initiate a single AI conversion on a single channel. A Scan (controlled by the AI Scan Clock) consists of one or more conversions.
AO0_REF(AO0R) AO1_REF(AO1R)	AGND	Input	AO Channel 0/1 External Reference. This is the external reference input for the analog output channel 0/1.
AO0_OUT(AO0) AO1_OUT(AO1)	AGND	Output	AO Channels 0/1. This pin supplies the voltage output of analog output channel 0/1.
AO_CONV(AOCV)	DGND	Input	AO Convert Clock. This pin is to initiate AO conversion. Each sample updates the output of all of the DACs. You can specify an internal or external source for AO Convert Clock.
DI(0~15)	EC	Input	Isolated digital input. Refer to signal connection for the actual connection with ECOM.
EC	--		Common pin for connecting external signal and digital input.
DO(0~7)	DGND	Output	Isolated digital output. Refer to signal connection for the actual connection with PC and DGND.

Table 3.1: I/O Connector Signal Descriptions			
Signal Name	Reference	Direction	Pin Description
PC	--		Connection to unload the back EMF.
DGND	-	-	Digital Ground. This pin supplies the reference for the digital channels at the I/O connector as well as the +5V and +12V DC supply. The ground references (AGND and DGND) are connected together on the MIC-1810.
CNT0.CLK(CT0C) CNT1.CLK(CT1C)	DGND	Input	Counter 0/1 External Clock Input. The clock input of counters can be either external (up to 10MHz) or internal (20MHz), as set by software.
CNT0.OUT(CT0O) CNT1.OUT(CT1O)	DGND	Output	Counter 0/1 Output.
CNT0.GATE(CT0G) CNT1.GATE(CT1G)	DGND	Input	Counter 0/1 Gate Control.
+12V	DGND	Output	+12V DC Source. This pin is +12V DC power supply for external use. (0.1A maximum)
+5V	DGND	Output	+5V DC Source. This pin is +5V DC power supply for external use. (0.3A maximum)

The MIC-1810 supports either 16 single-ended or 8 differential analog inputs.

Single-ended Channel Connections

Single-ended connections use only one signal wire per channel. The voltage on the line references to the common ground on the card. A signal source without a local ground is called a “floating” source. It is fairly simple to connect a single ended channel to a floating signal source. A standard wiring diagram looks like this:

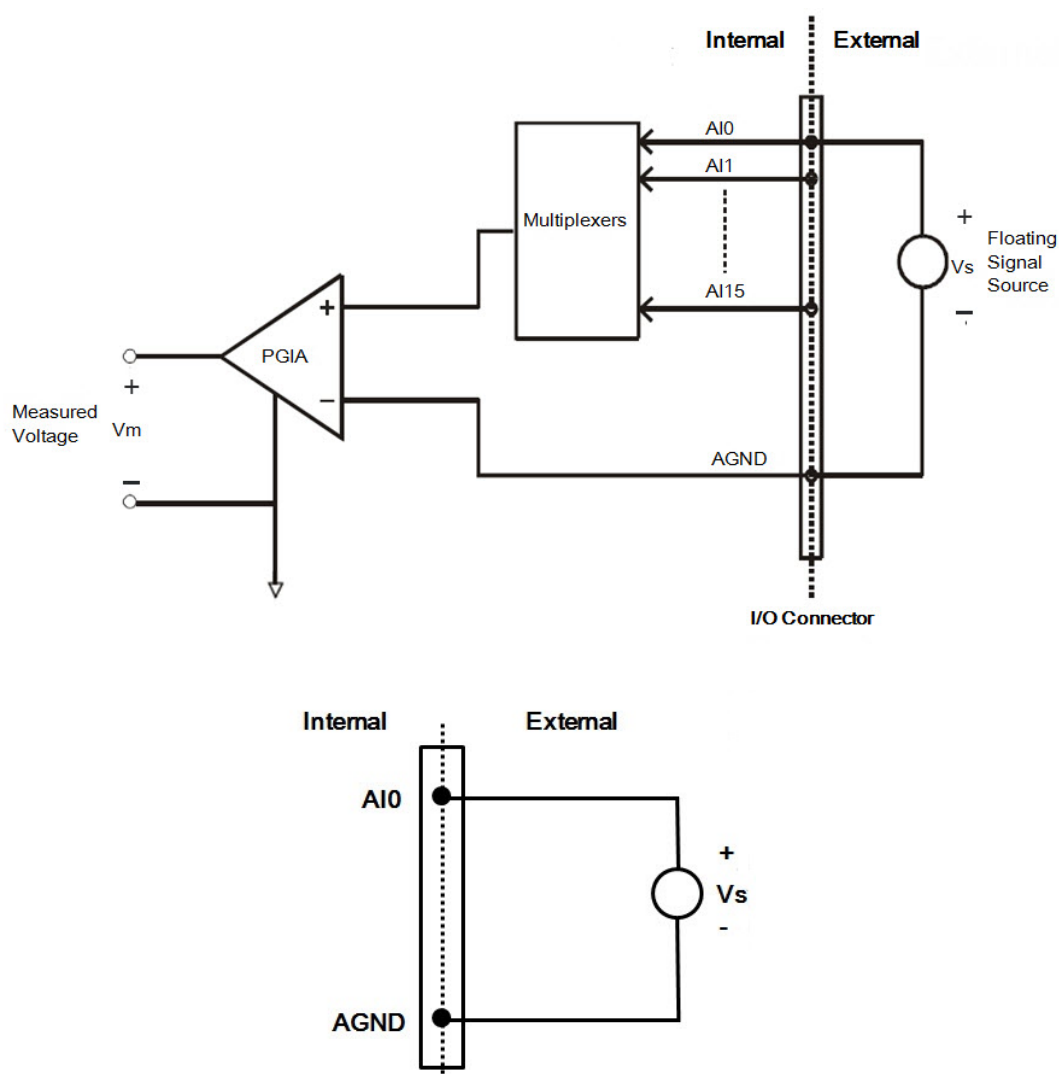


Figure 3.6 Single-ended input channel connections

When to use single-ended channel connections?

Single-ended connections are only used for the following conditions:

- All input signals that can share a common reference point, AGND.
- The wires connecting the signal to the device are less than 3 m.

3.8.1 Differential Channel Connections

The differential input channels operate with two signal wires for each channel, and the voltage difference between both signal wires is measured. On MIC-1810, when all channels are configured to differential input, up to 8 analog channels are available.

If one side of the signal source is connected to a local ground, the signal source is ground-referenced. Therefore, the ground of the signal source and the ground of the card will not be exactly of the same voltage. The difference between the ground voltages forms a common-mode voltage (V_{cm}).

To avoid the ground loop noise effect caused by common-mode voltages, you can connect the signal ground to the Low input. Figure 3.7 shows a differential channel connection between a ground reference signal source and an input channel on the MIC-1810. With this connection, the PGA rejects a common-mode voltage V_{cm} between the signal source and the MIC-1810 ground, shown as V_{cm} in Figure 3.7.

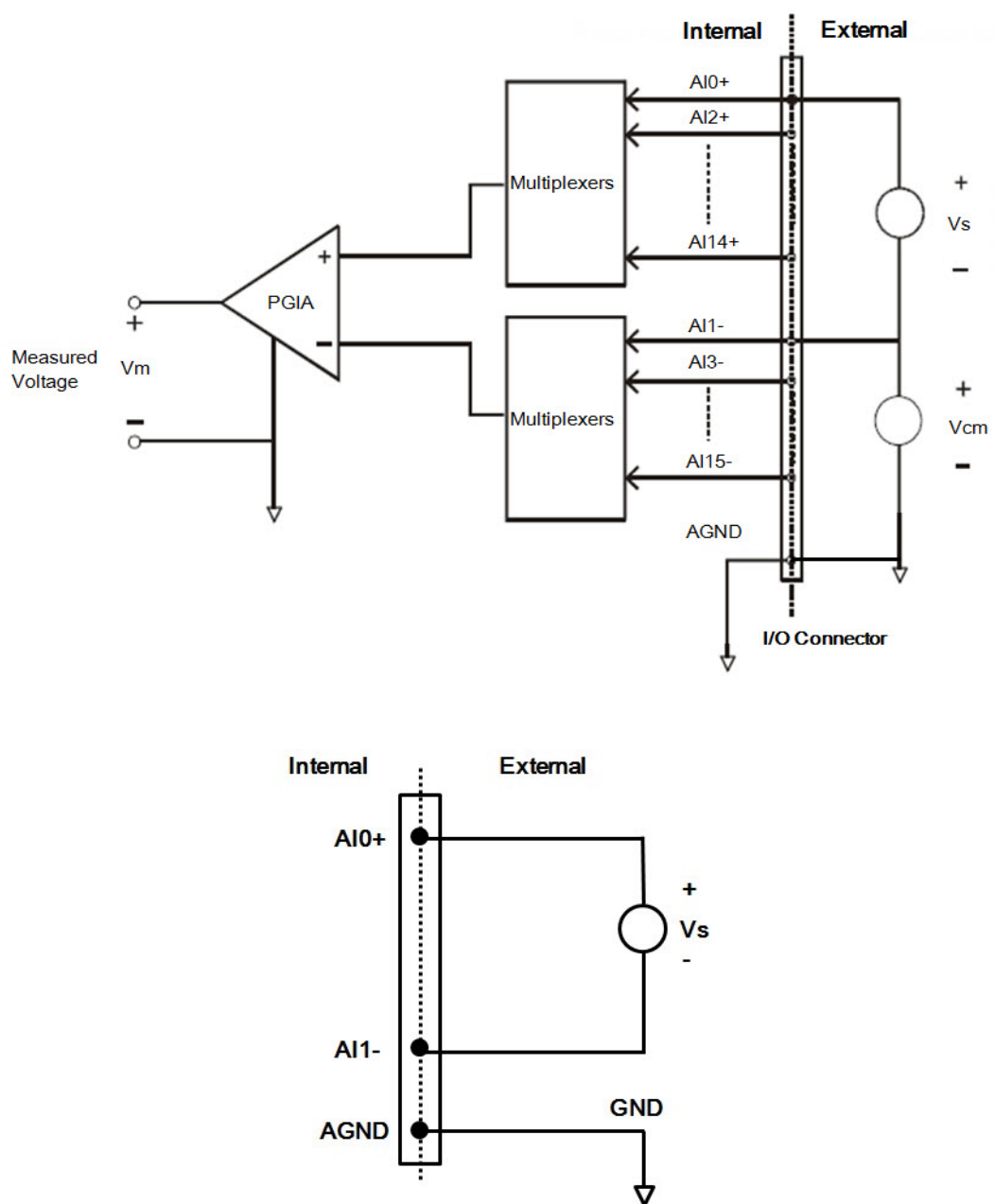


Figure 3.7 Differential input channel connections

If a floating signal source is connected to the differential input channel, the signal source might exceed the common-mode signal range of the PGIA, and the PGIA will be saturated with erroneous voltage-readings. You must therefore reference the signal source against the AGND.

Figure 3.8 shows a differential channel connection between a floating signal source and an input channel on the MIC-1810. In this figure, each side of the floating signal source is connected through a resistor to the AGND. This connection can reject the common-mode voltage between the signal source and the MIC-1810 ground.

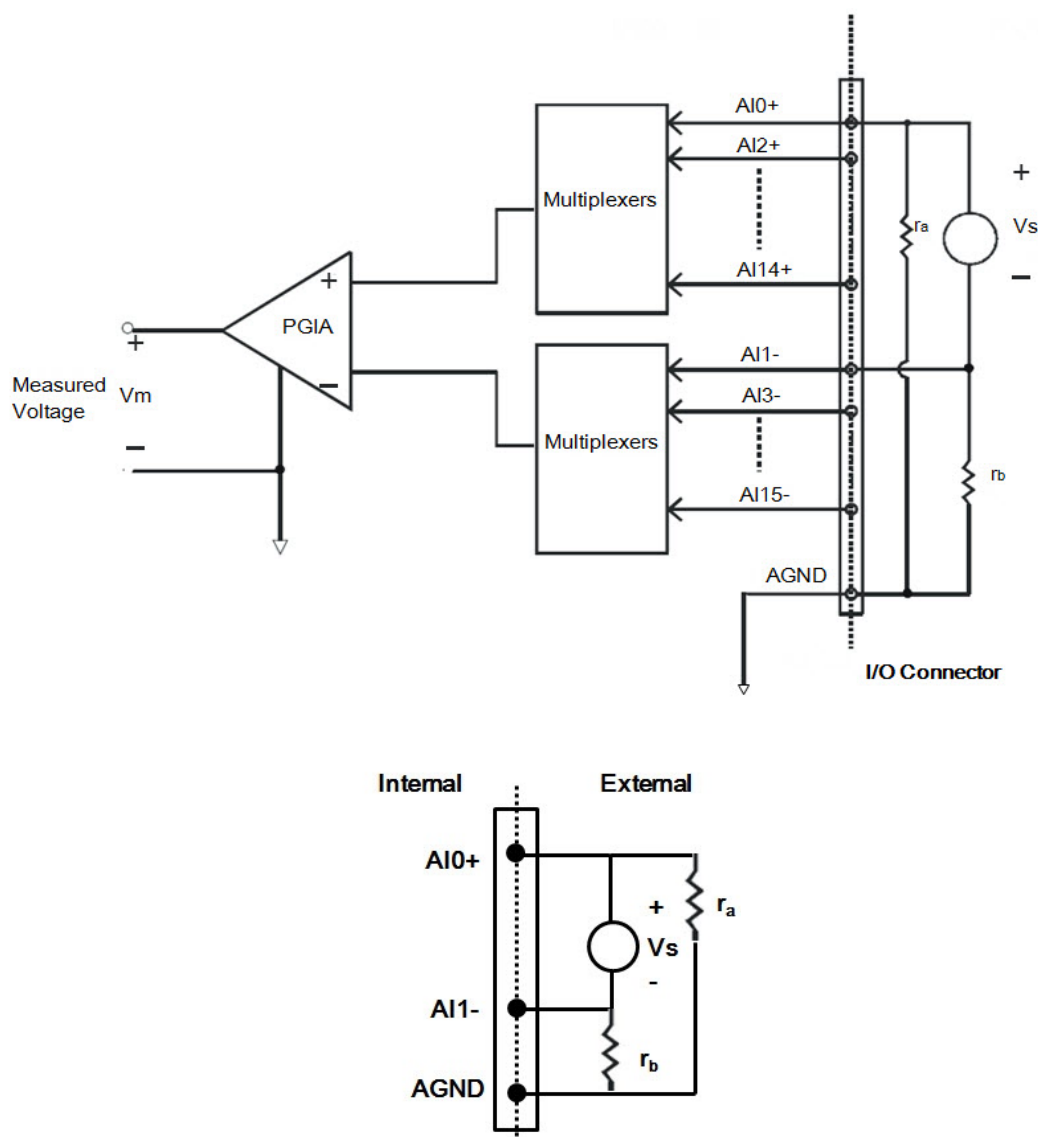
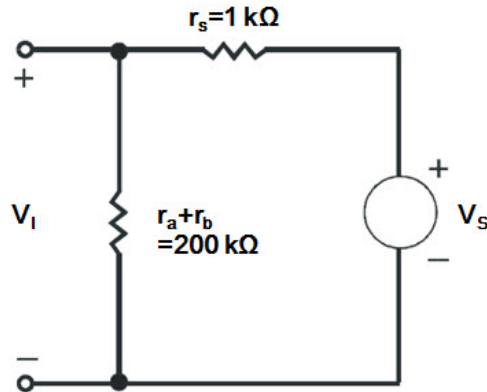


Figure 3.8 Differential input channel connection - floating signal source

However, this connection has the disadvantage of loading the source down with the series combination (sum) of the two resistors. For r_a and r_b , for example, if the input impedance r_s is 1k Ohm, and each of the two resistors is 100k Ohm, then the resistors load down the signal source with 200 Ohm (100 Ohm+ 100 Ohm), resulting in a 0.5% gain error. The following gives a simplified representation of the circuit and calculating process.



V_s : ideal signal source

V_I : measured signal source

r_s : output impedance of signal source

r_a, r_b : series-wound resistors

$$V_I = \frac{r_a + r_b}{r_s + r_a + r_b} V_s = \frac{200}{1 + 200} V_s = \frac{200}{201} V_s$$

$$\text{Gain error} = \frac{V_I - V_s}{V_s} = -\frac{1}{201} = -0.5\%$$

3.8.2 AI Sample Clock Source Connections

Internal AI Sample Clock

The internal AI sample clock uses a 100 MHz time base. Conversions start on the rising edge of the counter output. You can use software to specify the clock source as internal and the sampling frequency to pace the operation. The minimum frequency is 0.024 S/s, the maximum frequency is 500 KS/s. According to the sampling theory (Nyquist Theorem), you must specify a frequency that is at least twice as fast as the input's highest frequency component to achieve a valid sampling. For example, to accurately sample a 20 kHz signal, you have to specify a sampling frequency of at least 40 kHz. This consideration can avoid an error condition often known as aliasing, in which high frequency input components appear erroneously as lower frequencies when sampling.

External AI Sample Clock

The external AI sample clock is useful when you want to pace acquisitions at rates not available with the internal AI sample clock, or when you want to pace at uneven intervals. Connect an external AI sample clock to screw terminal AI_CLK on the screw terminal board. Conversions will start on the rising edge of the external AI sample clock input signal. You can use software to specify the clock source as external. The sampling frequency is always limited to a maximum of 10 MHz for the external AI sample clock input signal.

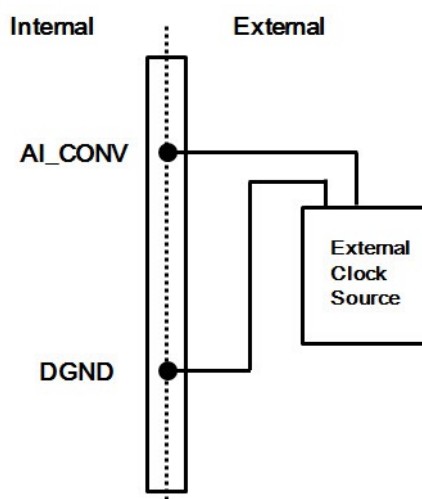


Figure 3.9 External Clock Source Connection

3.8.3 Trigger Sources Connections

External Digital (TTL) Trigger

For analog input operations, an external digital trigger event occurs when the MIC-1810 detects either a rising or falling edge on the External AI TTL trigger input signal from screw terminal DTRG0 and DTRG1 on the screw terminal board. The trigger signal is TTL-compatible.

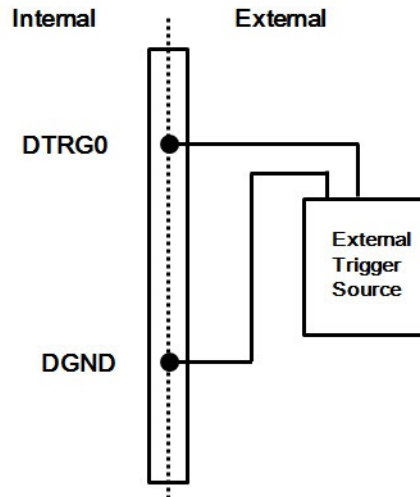


Figure 3.10 External Digital Trigger Source Connection

Analog Threshold Trigger

For analog input operations, an analog trigger event occurs when the MIC-1810 detects a transition from above a threshold level to below a threshold level (falling edge), or a transition from below a threshold level to above a threshold level (rising edge). User should connect analog signals from external device or analog output channel on board to external input signal ATRG0 and ATRG1. On the MIC-1810, the threshold level is set using a dedicated 12-bit DAC. By software, you can program the threshold level by writing a voltage value to this DAC; this value can range from -10V to +10V.

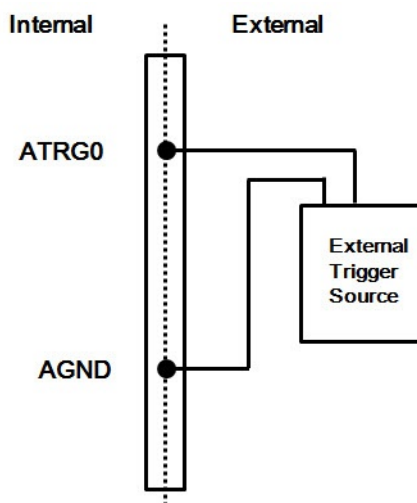




Figure 3.11 External Analog Trigger Source Connection

3.8.4 Measurement Type Selection

Measurement Type Selection

MIC-1816/MIC-1810 provides both current and voltage measurement for customers to choose from. To configure this, you should follow below steps:

1. Unscrew the bottom plate.
2. Set the measurement type on SW2401 (Voltage: OFF, Current: ON).
3. Set the channel to differential in software if current measurement mode is selected.
4. Set corresponded value range according to the switch setting.

SW2401			
	OFF, Voltage Measurement Mode (Default)		
	ON, Current Measurement Mode		
Switch & Channel No.			
Switch No.	Channel	Switch No.	Channel
1	CH0 & CH1	5	CH8 & CH9
2	CH2 & CH3	6	CH10 & CH11
3	CH4 & CH57	7	CH12 & CH13
4	CH6 & CH7	8	CH14 & CH15

3.9 Analog Output Connection

The MIC-1810 provides two AO output channels. You can use the internal precision -5 V or -10 V reference to generate 0 to +5 V or 0 to +10 V AO output. Use an external reference for other AO output ranges. The maximum reference input voltage is ± 10 V and maximum output scaling is ± 10 V. Loading current for AO outputs should not exceed 5 mA.

Fig. 3.12 shows how to make analog output and external reference input connections on the MIC-1810.

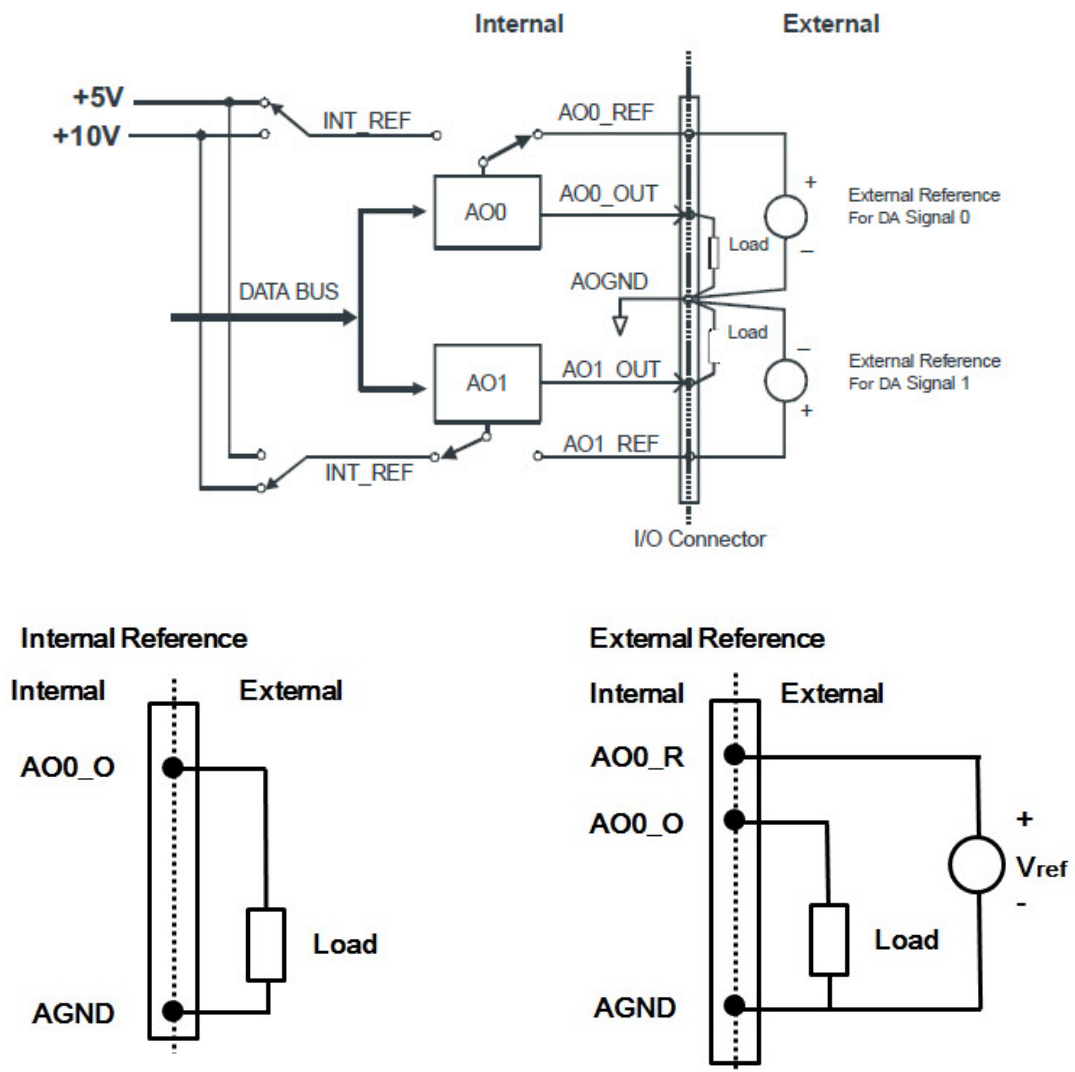


Figure 3.12 Analog Output Connections

3.9.1 AO Sample Clock Source Connections

Internal AO Output Clock

The internal AO output clock applies a 100MHz time base divided by a 32-bit counter. Conversions start on the rising edges of counter output. Through software, the user can specify the clock source and clock frequency to pace the analog output operation. The maximum frequency is 3.030303MS/s.

External AO Output Clock

The external AO output clock is useful when you want to pace analog output operations at rates not available with the internal AO output clock, or when you want to pace at uneven intervals. Connect an external AO output clock to the pin and then the conversions will start on input signal's rising edge. You can use software to specify the clock source as external. The maximum input clock frequency is 3MS/s.

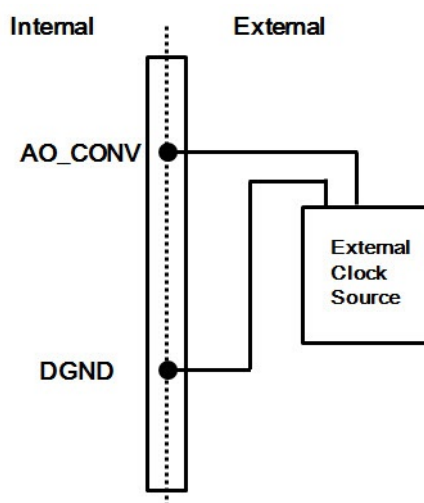


Figure 3.13 External Clock Source Connection

3.9.2 Trigger Sources Connections

External Digital (TTL) Trigger

The MIC-1810 supports External digital (TTL) trigger to activate AO conversions for continuous output mode. An external digital trigger event occurs when the MIC-1810 detects either a rising or falling edge on the External AO TTL trigger input signal from the pin of connector. The user can define the type of trigger source as rising-edge or falling-edge by software. The trigger signal is TTL-compatible.

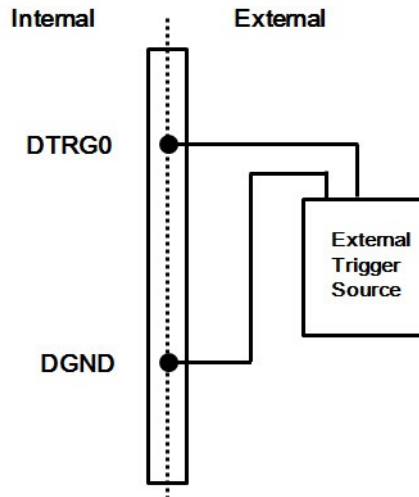


Figure 3.14 External Digital Trigger Source Connection

Analog Threshold Trigger

For analog input operations, an analog trigger event occurs when the MIC-1810 detects a transition from above a threshold level to below a threshold level (falling edge), or a transition from below a threshold level to above a threshold level (rising edge). User should connect analog signals from external device or analog output channel on board to external input signal ATRG0 and ATRG1. On the MIC-1810, the threshold level is set using a dedicated 12-bit DAC. By software, you can program the threshold level by writing a voltage value to this DAC; this value can range from -10V to +10V.

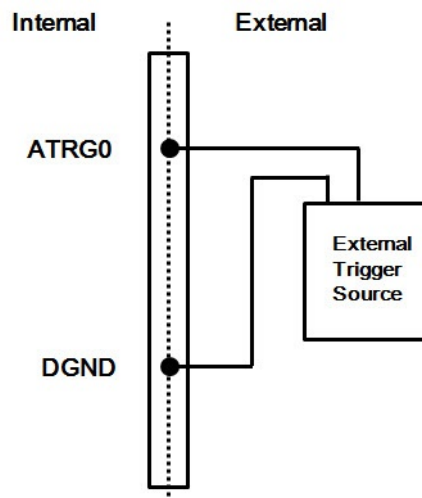


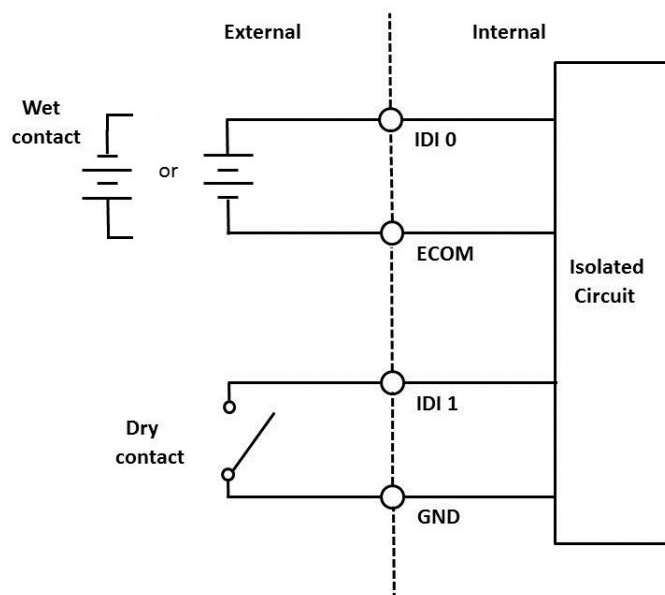
Figure 3.15 External Analog Trigger Source Connection

3.10 Digital Signal Connections

The MIC-1810 has 16 isolated digital input channels and 8 isolated digital output channels.

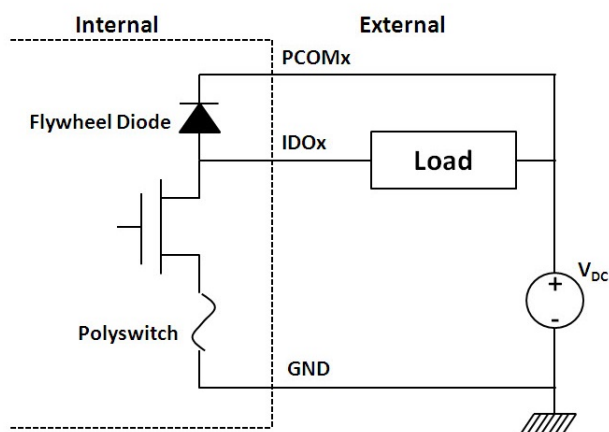
Isolated Digital Input

MIC-1810 provides both wet and dry contact connections. Figure4 describes the connection.



Isolated Digital Output

MIC-1810 provides NPN connection for digital output. Figure4 describes the connection. If there's inductive load connected, the PCOM should be connected in order to protect the internal output circuit from damaging.



Appendix **A**

Specification

A.1 Analog Input

Channels		16 single-ended/8 differential					
Resolution		12-bit					
Build-in memory		4K samples					
Sampling Rate		Single-channel		500 KS/s			
		Multi-Channel		800 KS/s			
Input Range and Gain List		Gain	0.5	1	2	4	8
		Unipolar	NA	0~10	0~5	0~2.5	0~1.25
		Bipolar	±10/ 0~20mA/ 4~20mA	±5	±2.5	±1.25	±0.625
Drift		Gain	0.5	1	2	4	8
		Zero	25 ppm/°C				
		Span	15 ppm/°C				
Input Signal Band Width (-3dB)		Gain	0.5	1	2	4	8
		BW (MHz)	1	1.6	1.2	1.2	1.2
Max. Input Voltage		± 15 V					
Input Impedance		1G Ω/2pF					
Sampling Mode		Software or external					
Trigger Mode		Start trigger, Delay to Start trigger, Stop trigger, Delay to Stop trigger					
Accuracy	DC	INLE: ± 1 LSB (Under manual adjustment)					
		DNLE: ± 1 LSB (Under manual adjustment)					
		Offset error: Adjustable to zero					
		Gain	0.5	1	2	4	8
		Gain Error (%FSR)	0.1	0.1	0.2	0.2	0.4
		Channel Type	Single-Ended/Differential				
	AC	SNR: 68 dB					
		ENOB: 10.5 bits					
External Digital Trigger		Low: 0.8V max.; High: 2.0V min.					
		Min. pulse width: 50 ns					
External Analog Trigger		Range: -10V ~ +10V					
		Resolution: 12-bit (4.88mV/step)					

A.2 Analog Output

Channels	2		
Resolution	12-bit		
Memory Size	4K samples		
Update Rate	500 KS/s		
Output Range	Internal Reference	0V~5V, 0V~10V, ±5V, ±10V	
	External Reference	Reference Input	Maximum Range
	Unipolar	0V ≤ x ≤10V	0 ~ x V
	Bipolar	-10V ≤ x ≤10V	-x V ~ x V
Accuracy	Relative	±1 LSB	
	Differential Non-Linearity	±1 LSB (under manual adjustment)	
Slew Rate	20 V/us		
Gain Error	Adjustable to zero		
Drift	30 ppm/°C		
Driving Capability	5 mA		
Update Mode	static update, waveform		
Output Impedance	max. 500pF		

A.3 Isolated Digital Input

Channels	16		
Input Voltage Level	Wet Contact: Low: 0~3VDC High: 10~30VDC Dry Contact: Low: Connect to GND High: Open		
Input Resistance	3 k Ω		
Isolation Protection	2500V _{DC}		
Response Time	100 μ s		

A.4 Isolated Digital Output

Channels	8		
Output Voltage	5~40V _{DC}		
Output Type	Sink (NPN)		
Sink Current	350mA max./channel @ 25 $^{\circ}C$ 250mA max./channel @ 60 $^{\circ}C$		
Isolation Protection	2500V _{DC}		
Response Time	100 μ s		

A.5 Counter/Timer

Counter chip	N/A	
Channels	2 channels (independent)	
Resolution	32-bit	
Compatibility	TTL level	
Base Clock	Internal 20MHz or external clock (10 MHz max.). Selected by software	
Input Frequency	Max. 10MHz	
Clock Input	Low	0.8 V max.
	High	2.0 V min.
Gate Input	Low	0.8 V max.
	High	2.0 V min.
Counter Output	Low	0.8 V max. @+15mA
	High	2.0 V min. @-15mA
Error in Advanced Functions	Frequency Measurement	0.1% when input signal frequency \geq 40KHz
	Pulse Width Measurement	0.1% when input signal frequency \leq 40KHz
	Pulse Output	within 2% when output frequency > 1MHz
	PWM Output	within 2% when output frequency > 1MHz

A.6 System

- **Processor:** Generation 6 Intel Core U-series
 - MIC-1810-U0A1E: Celeron 3955U1 2.0 GHz, dual-core, two threads
 - MIC-1810-U3A1E*: i3 6100U 2.3 GHz, dual-core, four threads
- **L3 Cache:**
 - MIC-1810-U0A1E: 2MB
 - MIC-1810-U3A1E*: 3MB
- **I/O interface of Platform Controller Hub:**
 - Integrated Serial ATA Host Controller:
 - Data transfer rates up to 6.0 Gb/s (600 MB/s)
 - Integrated AHCI controller
 - USB:
 - xHCI Host Controller, supporting 2 SuperSpeed USB 3.0 ports
 - One EHCI Host Controllers, supporting 2 HighSpeed USB 2.0 ports
 - Supports wake-up from sleeping states S1, S3
 - Supports legacy Keyboard/Mouse software
 - Power Management:
 - Full support of ACPI C-states as implemented by the following processor
 - Cstates: — C0, C1, C1E, C3, C6, C7, C8, C9, C10
 - Enhanced Intel SpeedStep® Technology
- **System Memory Support**:**
 - Non-ECC, DDR3L/DDR3L-RS and LPDDR3 memory with dual SO-DIMM up to 16GB
 - DDR3L/DDR3L-RS I/O Voltage of 1.35V:
 - 1333 MT/s (PC3-10600), 1600 MT/s (PC3-12800)
 - 64-bit wide channels
 - Intel® Fast Memory Access (Intel® FMA):
 - Just-in-Time Command Scheduling

Command Overlap
Out-of-Order Scheduling

■ **Integrated Graphics Controller:**

- Contains a generation 9 graphics core architecture (Intel® HD Graphics 620/520/510 (Celeron))
- Intel® QuickSync & Clear Video Technology HD Support
- Full Hardware Accelerated Video Decode: AVC/VC1/MPEG2/HEVC/VP8/JPEG.
- OpenGL4.4 and OpenCL2.1 support
- DirectX 12, DirectX 11.3, DirectX 11.2, DirectX 11.1, DirectX 10, DirectX 9 support
- Support Extend, Clone and Collage mode with multi-display device
- Dual Display: Any two combination between: VGA, LVDS***, HDMI (from Rear I/O line)
- Triple Display: VGA+HDMI+ LVDS***
- Integrated Dual-channel LVDS*** support resolution up to 1920x1200 at 60 Hz
- Analog RGB display (VGA) output up to resolution 1920 x 1200 with 60 Hz, or 2048 x 1152 @ 60Hz with reduced blanking
- HDMI interface supports the HDMI 1.4a specification with audio up to 4096x2160 at 24 Hz (Supporting 4K display required two DDR channels of same size).

■ **Gigabit Ethernet:**

- Port 1: Integrated Intel 100 Series Chipset (MAC) + i219 GbE (PHY):
Integrated ASF Management Controller
10/100/1000 BASE-T IEEE 802.3 specification conformance
Supports the Energy Efficient Ethernet (EEE) IEEE802.3az specification
Supports up to 9 KB jumbo frames (full duplex)
802.1as/1588 conformance
- Port 2: i210 Gigabit Ethernet Controller:
Flow Control Support compliant with the 802.3X Specification
Compliant with the 1 Gb/s IEEE 802.3 802.3u 802.3ab Specifications
Magic Packet* wake-up enabled with unique MAC address
Supports IEEE 1588

■ **BIOS:** AMI UEFI 128 Mbit

* The Core i3 isn't standard product of MIC-1800. Please contact Advantech if this is needed.

** MIC-1800 series use DDR3 4GB in default. Customization is available.

*** LVDS is inside the MIC-1800 system.

A.7 General

■ Electrical:

- Power Input: 10-36V_{DC}
- Power Consumption: Typ. 11W @ 24V, Max. 31.7W @24V
- RTC Battery:
Typical Voltage: 3.0 V
Normal discharge capacity: 210 mAh

■ Environment:

- Operating Temperature: -20 ~ 60 °C (-4 ~140 °F) @ 5 ~ 85% RH with 0.7m/s air flow -20~60 °C
- Storage Temperature: -20 ~ 80 °C (-4 ~ 176 °F)
- Storage Humidity: 5 ~ 95% RH, non-condensing
- Random Vibration: 1Grms, 1hr per axis w/SSD equipped (IEC60068-2-64)
- Shock: 10G, 11ms (IEC60068-2-27)

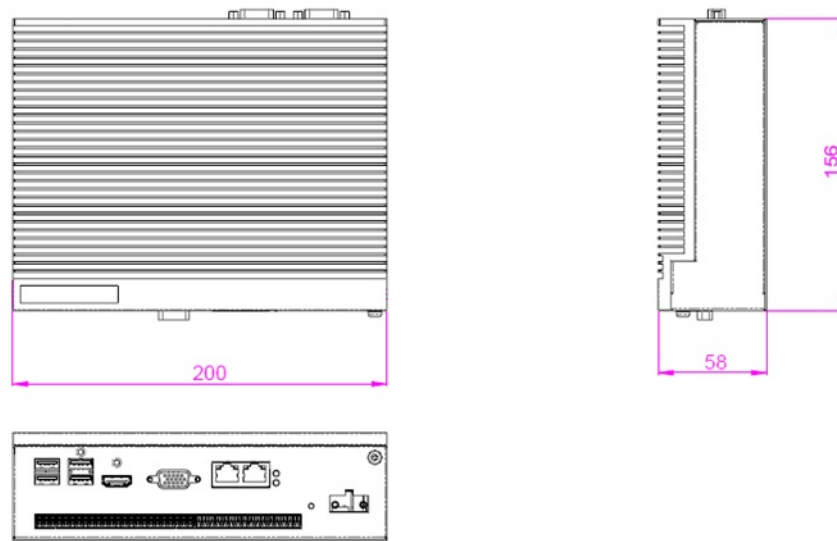
■ Mechanical:

- System Dimension: 200 x 156 x 58 mm (7.87" x 6.14" x 2.28")
- Weight: 2.41kg (5.3lb)

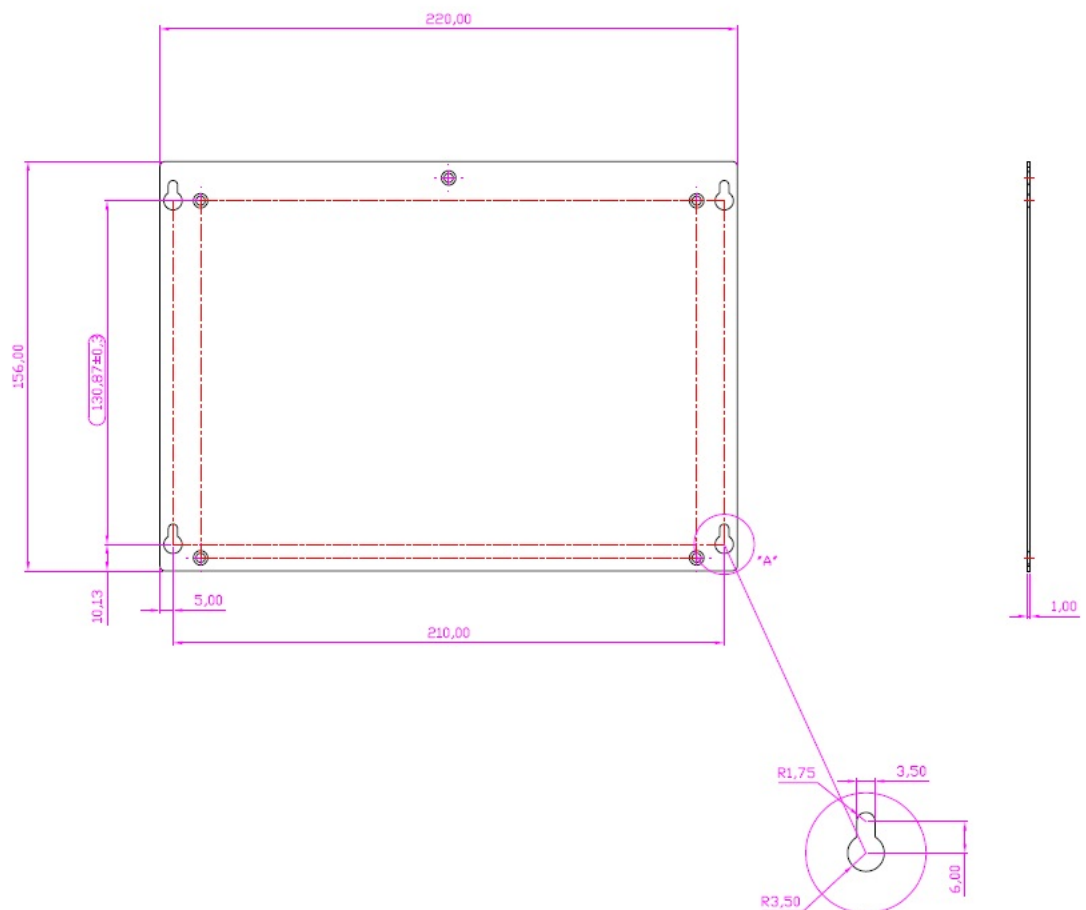
Appendix **B**

System Dimensions

B.1 MIC-1810/16 System



B.2 Table Mount Kit



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Please verify specifications before quoting. This guide is intended for reference purposes only.

All product specifications are subject to change without notice.

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