AIO-104+8

User Manual | 3810
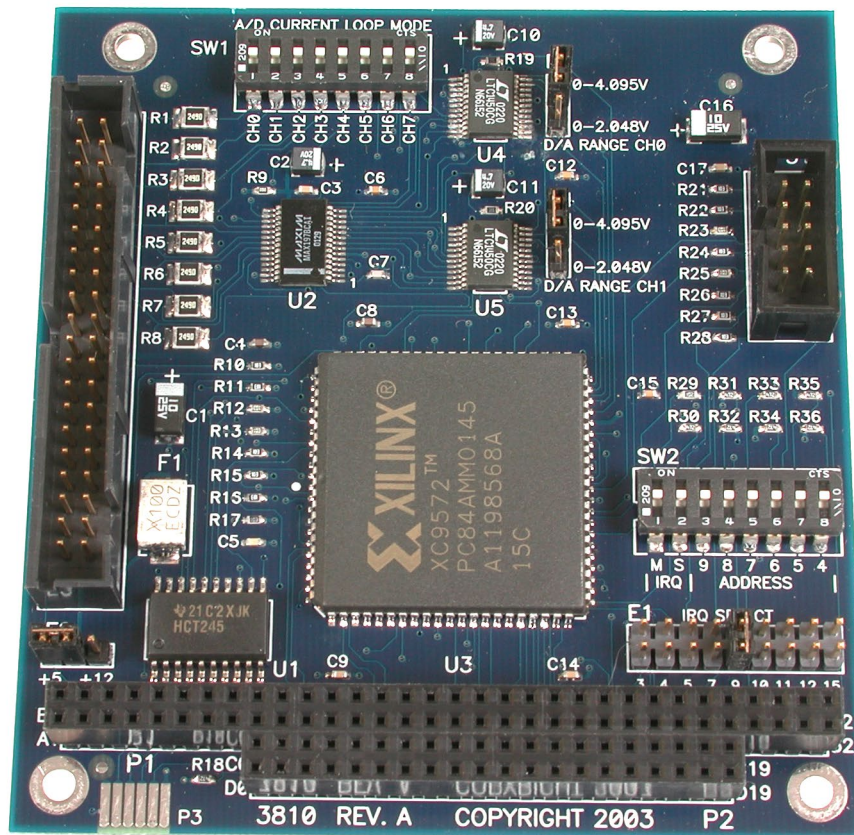
SEALEVEL®

Contents

SEALEVEL®

Introduction

Designed using the Maxim MAX197 successive approximation-type A/D chip, the **AIO-104+8** provides eight single-ended 12-bit inputs. The **AIO-104+8**'s A/D inputs are software selectable for 0-5V, 0-10V, +/-5V, and +/-10V ranges and can be configured via hardware for measuring 4−20mA current loop. The inputs feature 5MHz bandwidth track/hold and 100K bps throughput rate

SEALEVEL®

Before You Get Started

What's Included

The **AIO-104+8** is shipped with the following items. If any of these items is missing or damaged, contact the supplier.

- **AIO-104+8** Interface Adapter

Advisory Conventions

Warning

The highest level of importance used to stress a condition where damage could result to the product, or the user could suffer serious injury.

Important

The middle level of importance used to highlight information that might not seem obvious or a situation that could cause the product to fail.

Note

The lowest level of importance used to provide background information, additional tips, or other non-critical facts that will not affect the use of the product.

Optional Accessories

- **CA110** – This cable terminates the AIO-104+8's 40 pin connector with a DB37 Male connector. It is 8 inches in length.
- **CA152** – This cable terminates the AIO-104+8's 10 pin connector with a DB9 Male connector. It is 8 inches in length.
- **CA112** – This cable has one DB37 Male connector and one DB37 Female connector and is 6 feet in length.
- **CA127** – This cable has one DB9 Male connector and one DB9 Female connector and is 6 feet in length.
- **TB02** – When used with the CA112 this terminal block provides screw terminals for easy field connection. The TB02 terminal block is designed with both DB37 male and female connectors, therefore; it can be used either directly with the CA112 or with an extension cable, regardless of the port gender.
- **TB05** – When used with the CA152 this terminal block provides screw terminals for easy field connection. The TB05 terminal block is designed to directly connect with the CA152.
- **KT101** - Terminal Block KT101 includes the TB02 and CA112 (DB37 M/F cable).
- **KT105** - Terminal Block KT105 includes the TB05 and CA127 (DB9 M/F cable).

Card Setup

## SW1 (Analog to Digital Current Loop Mode)

DIP-switch SW1 selects the A/D Current loop Mode. With the switch on, the channel is in a 0-20mA current loop mode (with a 249 ohm 1% resister to ground and a 21K ohm input resistance, effective resistance is equal to 246.1 ohms). With it off the channel is in a software selectable mode with selections of 0-5V, 0-10V, ±5V and ±10V.
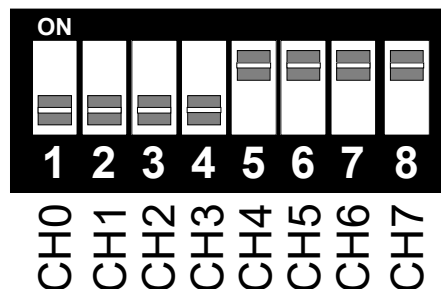
SW2 (Address and Interrupt Mode Selection)

The **AIO-104+8** will occupy 16 consecutive I/O locations. The DIP-switch SW2 is used to set the base address for these locations. Be careful when selecting the base address as some selections conflict with existing PC ports.

The following illustration shows the correlation between the DIP-switch setting and the address bits used to determine the base address. In the example below, address 300H is selected as the base address. Address 300H in binary is XX 11 0000 XXXX where X = a non-selectable address bit.
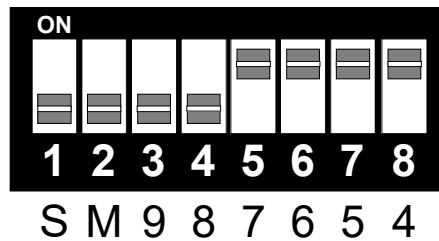
N Setting the switch 'On' or 'Closed' corresponds to a '0' in the address, while leaving it 'Off' or 'Open' corresponds to a '1'.

Switch positions 'S' and 'M' on switch SW2 selects the interrupt mode for each adapter.

With the '**S**' selected, the adapter is in a (**S**)hared interrupt mode, which allows more than one adapter to access a single IRQ.

'**M**' indicates the inclusion of a 1K-ohm pull-down resistor required on one adapter when sharing interrupts.

Set the switch to '**S**' for shared interrupt mode on all adapters sharing an IRQ. On one of the adapters sharing an interrupt set the switches for both '**S**' and for '**M**'. This provides the pull-down resistor circuit that makes sharing IRQs possible. If you are using more than one compatible adapter in a bus you should only have one adapter set to '**M**'.

Header E1 (IRQ Selection

3 4   5   7   9   10   11 12 15
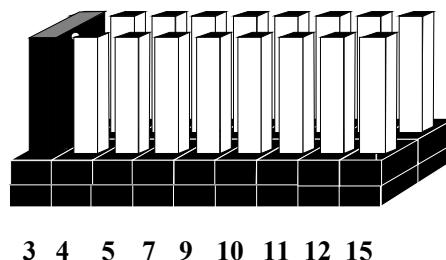
The **AIO-104+8** has an IRQ selection jumper, which should be set prior to use, if an interrupt is required by the application software. Consult the user manual for the application software being used to determine the proper setting.

Header E2 (Voltage Selection)

Header E2 selects the voltage that is supplied from the card on pin 37 of the IDC40 connector J1. It is fused at 1A and is either +5VDC or +12VDC.

Software Installation

Windows Installation

Do not install the adapter in the machine until the software has been fully installed.

Only users running Windows 7 or newer should utilize these instructions for accessing and installing the appropriate driver via Sealevel's website. If you are utilizing an operating system prior to Windows 7, please contact Sealevel by calling 864.843.4343 or emailing support@sealevel.com to receive access to the legacy driver download and installation instructions.

1. Begin by locating, selecting, and installing the correct software from the Sealevel software driver database.

2. Select the Part Number (**#3810**) for your adapter from the listing.

3. Select the download for the SeaIO Classic for Windows (Software: SeaIO Classic V5 - Windows - Sealevel.) The setup file will automatically detect the operating environment and install the proper components. Next (depending on your browser) select the 'Run this program from its current location' or 'Open' option. Follow the information presented on the screens that follow. During setup, the user may specify installation directories and other preferred configurations. This program also adds entries to the system registry that are necessary for specifying the operating parameters for each driver. An uninstall option is also available to remove SeaIO files and registry/INI file entries from the system.

4. If installing in NT skip to 'Windows NT Card Installation' step 16.

5. Go to the "Add New Hardware Wizard" in the Control Panel.

6. When the Wizard asks if Windows should search for the new hardware, choose "No, I want to select the hardware from a list."

7. Scroll through the list of categorized hardware and select 'SeaIO Devices'. If this is the first SeaI/O device select 'Other Devices' and 'Sealevel Systems, Inc.' instead of 'SeaIO Devices'

8. Click "Next."

9. Select the card model and press "Next."

10. The Wizard will continue to guide through a few more informational prompts; continue to click "Next" until it is completed.

11. The card's resource assignments may be adjusted through the Device Manager (if, for instance, a change is needed in the I/O port address Windows assigned when the card was installed).

12. Windows software installation is complete

13. **Windows NT Card Installation**: After accomplishing steps 1 – 6, bring up the Control Panel and double-click on the SeaIO Devices icon. To install a new card, click "Add Port". Repeat this procedure for as many SeaIO cards as needed.

8

Physical Installation

Extreme care should be taken when installing the adapter to avoid causing damage to the connectors. After the adapter is installed, connect the I/O cable to P1. Please note these headers are keyed so that pin 1 of the cable matches pin 1 of the connector. Refer to Card Setup for information on setting the address before inserting the adapter onto the stack.

1. Disconnect power to host machine.

2. Gently insert the adapter connector noting proper key orientation of the expansion connector on a PC/104 compatible card. The adapter is keyed per the current PC/104 Specification. This will aid in preventing the adapter from being inserted incorrectly.

3. Mounting hardware (nylon stand-offs and screws) is provided to ensure a good mechanical connection. Retain any mounting hardware not used to allow for future expansion.

4. The cables provided are keyed and can be installed before or after the adapter is inserted in the stack.

5. Reconnect to power source.

Technical Description

The **AIO-104+8** is a PC/104 form factor adapter that provides an eight channel multiplexed; single-ended, 12-bit Analog to Digital converter and a two channel 12-bit Digital to Analog converter. The adapter also provides 16 bits of Digital I/O, with input/output direction selectable at the bit level.

The Analog to Digital Converter is software configurable to ranges of 0-5V, 0-10V, ±5V and ±10V conversions with 12-bit resolutions at a maximum sampling rate of 100K Samples per Second (SPS). Additionally, each channel may be selected via a DIP-switch to measure a 0-20 mA current-loop input.

Of particular importance is the impedance of the inputs. Typically this impedance in voltage mode is 21K unipolar mode and 16K in the bipolar mode.

If the maximum voltage is greater than ±15 volts, do not connect the board to this signal source. A maximum voltage greater than ±15 is beyond the board's usable common-mode range. Either adjust the grounding system or add some type of isolated signal conditioning to make reasonable measurements. Any voltage measured with respect to ground should not be more than ±15V as this could damage the board and possibly the PC.

The Digital I/O bits are individually selectable at the bit level as to Input or Output.

The adapter occupies 16 consecutive I/O addresses. The following table describes each I/O bit and its usage.

Adapter I/O Map

Address	D7	D6	D5	D4	D3	D2	D1	D0
Base+0 (Read)	ADD7	ADD6	ADD5	ADD4	ADD3	ADD2	ADD1	ADD0
Base+0 (Write)	PD1	PD0	ACQMOD	RNG	BIP	A2	A1	A0
Base+1 (Read)					ADD11	ADD10	ADD9	ADD8
Base+2 (Read)								INT
Base+3								
Base+4 (R/W)	P1CF7	P1CF6	P1CF5	P1CF4	P1CF3	P1CF2	P1CF1	P1CF0
Base+5 (R/W)	P1D7	P1D6	P1D5	P1D4	P1D3	P1D2	P1D1	P1D0
Base+6 (R/W)	P2CF7	P2CF6	P2CF5	P2CF4	P2CF3	P2CF2	P2CF1	P2CF0
Base+7 (R/W)	P2D7	P2D6	P2D5	P2D4	P2D3	P2D2	P2D1	P2D0
Base+8 (Write)	X	X	X	X	X	X	X	X
Base+9 (Write)	X	X	X	X	X	X	X	X
Base+A (Write)	X	X	X	X	X	X	X	X
Base+B (Write)	X	X	X	X	X	X	X	X

SEALEVEL®

Base+C (Write)	X	X	X	X	X	X	X	X
Base+D (Write)	X	X	X	X	X	X	X	X
Base+E								

Analog to Digital

A write to Base+0 configures the Analog to Digital converter and starts a conversion cycle. When the conversion has completed, D0 of Base+2 is set to 0 (INT) and an interrupt can be generated if properly configured.

Clock and Power-Down Selection   (Base+0 bits D7 and D6)

PD1	PD0	Device Mode
0	0	Normal Operation / External Clock Mode
0	1	Normal Operation / Internal Clock Mode
1	0	Standby Power-Down (STBYPD); clock mode is unaffected
1	1	Full Power-Down (FULLPD); clock mode is unaffected

Acquisition Selection (Base+0 bit D5)

ACQMOD	Mode
0	Internally controlled acquisition (6 clock cycles)
1	Externally controlled acquisition

Range and Polarity Selection (Base+0 bits D4 and D3)

RNG	BIP	Input Range (V)
0	0	0 - 5
0	1	± 5
1	0	0 – 10
1	1	± 10

Channel Selection (Base+0 bits D2, D1 and D0)

A2	A1	A0	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
0	0	0	IN							
0	0	1		IN						
0	1	0			IN					
0	1	1				IN				
1	0	0					IN			
1	0	1						IN		
1	1	0							IN	
1	1	1								IN

Digital I/O

Each bit is individually configurable as an input or output. The table below provides the electrical characteristics of each Input/Output. Each port is directly connected to a CPLD. Each input is capable of sinking up to 24 mA, while each output can source up to 24 mA.

Recommended Operating Conditions		
	Min	Max
Input	0 V	5.25 V
Source		24 mA
Sink		24 mA

Digital I/O Port 1 Bits 1-8 (Base+4)

(J1 Pins 21-36, grounds inclusive)

P1D0 – P1D7 = Digital I/O

Port 1 configuration register (Base+5)

P1CD0 – P1CD7 = I/O configuration register 0 = input, 1 = output

SEALEVEL®

Digital I/O Port 2 Bits 1-8 (Base+6)

(J2 Pins 1-10)

P2D0 – P2D7 = Digital I/O

Port 2 configuration register (Base+7)

P1CD0 – P1CD7 = I/O configuration register 0 = input, 1 = output

Connector Pin-outs

P4 (IDC40)

P4 Pin#	Description		P4 Pin#	Description
1	A/D CH0		21	DI/O D0
2	GND		22	GND
3	A/D CH1		23	DI/O D1
4	GND		24	GND
5	A/D CH2		25	DI/O D2
6	GND		26	GND
7	A/D CH3		27	DI/O D3
8	GND		28	GND
9	A/D CH4		29	DI/O D4
10	GND		30	GND
11	A/D CH5		31	DI/O D5
12	GND		32	GND
13	A/D CH6		33	DI/O D6
14	GND		34	GND
15	A/D CH7		35	DI/O D7
16	GND		36	GND
17	No Connect		37	12Vor 5V fused
18	GND		38	No Connect
19	No Connect		39	No connect
20	GND		40	No Connect

SEALEVEL®

Optional DB37 Male (CA110)

DB-37	Description		DB-37	Description
1	A/D CH0		20	GND
2	A/D CH1		21	GND
3	A/D CH2		22	GND
4	A/D CH3		23	GND
5	A/D CH4		24	GND
6	A/D CH5		25	GND
7	A/D CH6		26	GND
8	A/D CH7		27	GND
9	No Connect		28	GND
10	No Connect		29	GND
11	DI/O D0		30	GND
12	DI/O D1		31	GND
13	DI/O D2		32	GND
14	DI/O D3		33	GND
15	DI/O D4		34	GND
16	DI/O D5		35	GND
17	DI/O D6		36	GND
18	DI/O D7		37	GND
19	12Vor 5V fused			

P5 (IDC10)

P5 Pin #	Description
1	Port2 D0
2	Port2 D1
3	Port2 D2
4	Port2 D3
5	Port2 D4
6	Port2 D5
7	Port2 D6
8	Port2 D7

SEALEVEL®

9	GND
10	GND

Optional DB9 Male (CA152)

P5 Pin #	DB-9	Description
1	1	Port2 D0
2	6	Port2 D1
3	2	Port2 D2
4	7	Port2 D3
5	3	Port2 D4
6	8	Port2 D5
7	4	Port2 D6
8	9	Port2 D7
9	5	GND
10		GND

SEALEVEL®

Specifications

Analog to Digital converter Specifications

A/D type	MAX127 (Maxim)
Resolution	12 bits
Number of Channels	8
Input Dynamic Resistance	Unipolar = 21K
	Bipolar = 16K
Input Ranges	
Software Selectable	0-5V, 0-10V, ± 5V, ± 10V
Hardware Selectable	0-20mA current loop
Sampling Rate	100Ksps
Integral Nonlinearity	± 1 LSB
Differential Nonlinearity	± 1 LSB
Offset Error Unipolar	± 5 LSB
Offset Error Bipolar	± 10 LSB
Channel to Channel Offset Error Matching Unipolar	± 0.1 LSB
Channel to Channel Offset Error Matching Bipolar	± 0.3 LSB

SEALEVEL®

Gain Error Unipolar	± 10 LSB
Gain Error Bipolar	± 10 LSB
Gain Temperature Coeff. Unipolar	3 ppm/C
Gain Temperature Coeff. Bipolar	5 ppm/C

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0º to 70º C (32º to 158º F)	-50º to 105º C (-58º to 221º F)
Humidity Range	10% to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

Manufacturing

All Sealevel Systems Printed Circuit boards are built to UL 94V0 rating and are 100% electrically tested. These printed circuit boards are solder mask over bare copper or solder mask over tin nickel.

Power Requirements

Supply line	+5 VDC
Rating (mA)	150 mA

Physical Dimensions

Board length	3.550 inches (9.017 cm)
Board Width	3.775 inches (9.589 cm)

SEALEVEL®

Appendix A – Troubleshooting

The adapter should provide years of trouble-free service. However, in the event that device appears to not be functioning incorrectly, the following tips can eliminate most common problems without the need to call Technical Support.

1. Identify all I/O adapters currently installed in your system. This includes your on-board serial ports, controller cards, sound cards etc.

2. Configure your Sealevel Systems adapter so that there is no conflict with currently installed adapters. No two adapters can occupy the same I/O address.

3. Make sure the Sealevel Systems adapter is securely installed.

4. The following are known I/O conflicts:

   - The 278 and 378 settings may conflict with your printer I/O adapter.

   - 3B0 cannot be used if a Monochrome adapter is installed.

   - 3F8-3FF is typically reserved for COM1:

   - 2F8-2FF is typically reserved for COM2:

   - 3E8-3EF is typically reserved for COM3:

   - 2E8-2EF is typically reserved for COM4:

5. Always use the Sealevel Systems diagnostic software when troubleshooting a problem. This will help eliminate any software issues and identify any hardware conflicts.

If these steps do not solve your problem, please call Sealevel Systems' Technical Support, (864) 843-4343. Our technical support is free and available from 8:00 A.M.- 5:00 P.M., Eastern Time Monday through Friday. For email support contact support@sealevel.com.

Appendix B – How To Get Assistance

Please refer to Troubleshooting Guide prior to calling Technical Support.

1. Begin by reading through the Trouble Shooting Guide in Appendix A. If assistance is still needed, please see below.

2. When calling for technical assistance, please have your user manual and current adapter settings. If possible, please have the adapter installed in a computer ready to run diagnostics.

3. Sealevel Systems provides an FAQ section on its web site. Please refer to this to answer many common questions. This section can be found at http://www.sealevel.com/faq.asp.

4. Sealevel Systems maintains a web page on the Internet. Our home page address is www.sealevel.com. The latest software updates, and newest manuals are available via our web site.

5. Technical support is available Monday to Friday from 8:00 A.M. to 5:00 P.M. Eastern Time. Technical support can be reached at (864) 843-4343. For email support contact support@sealevel.com.

RETURN AUTHORIZATION MUST BE OBTAINED FROM SEALEVEL SYSTEMS BEFORE RETURNED MERCHANDISE WILL BE ACCEPTED. AUTHORIZATION CAN BE OBTAINED BY CALLING SEALEVEL SYSTEMS AND REQUESTING A RETURN MERCHANDISE AUTHORIZATION (RMA) NUMBER.

19

SEALEVEL®

Appendix C – Silk Screen
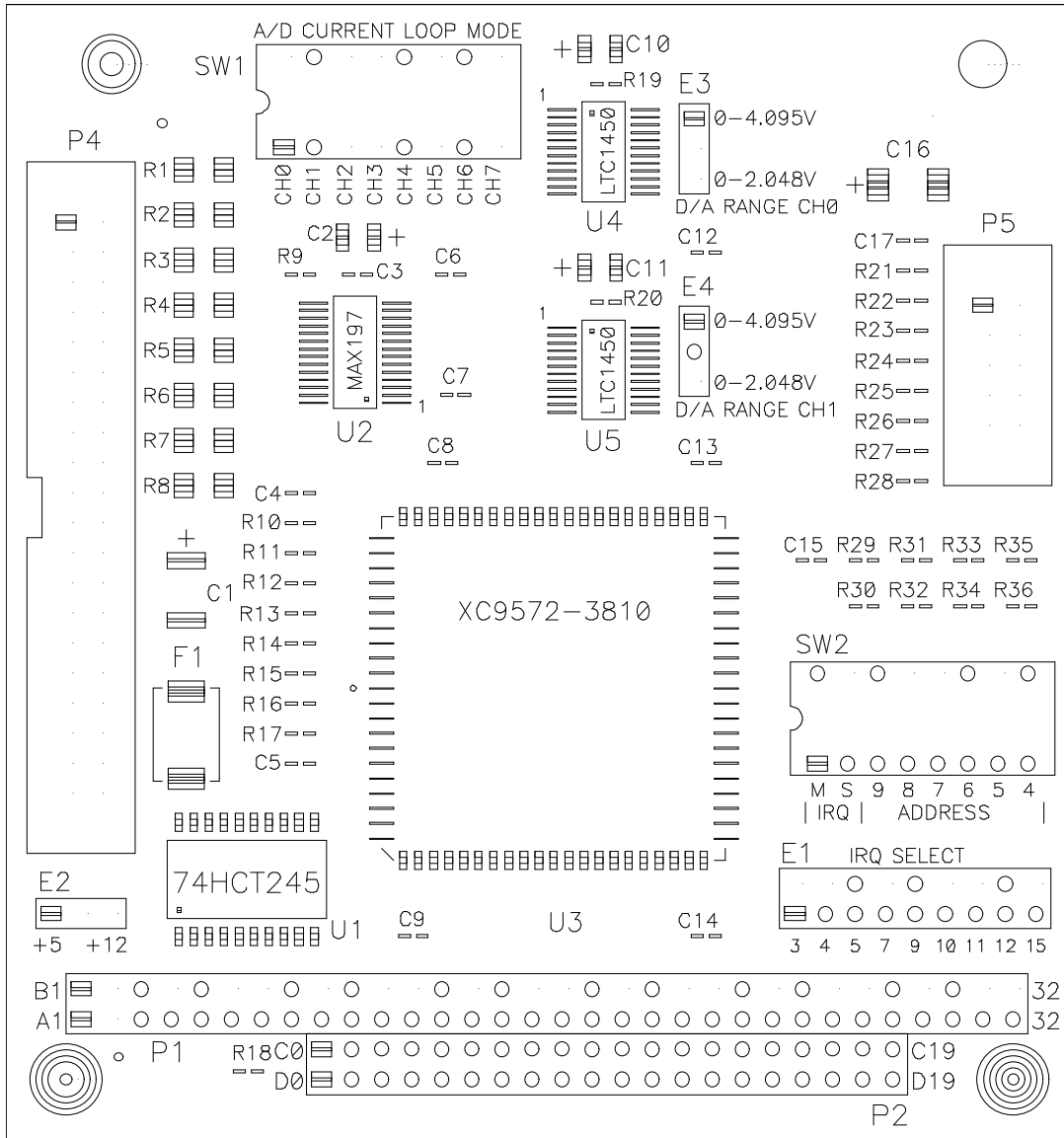
Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured I/O products. We are able to offer this warranty due to our control of manufacturing quality and the historically high reliability of our products in the field. Sealevel products are designed and manufactured at its Liberty, South Carolina facility, allowing direct control over product development, production, burn-in and testing. Sealevel achieved ISO-9001:2015 certification in 2018.

Warranty Policy

Sealevel Systems, Inc. (hereafter "Sealevel") warrants that the Product shall conform to and perform in accordance with published technical specifications and shall be free of defects in materials and workmanship for the warranty period. In the event of failure, Sealevel will repair or replace the product at Sealevel's sole discretion. Failures resulting from misapplication or misuse of the Product, failure to adhere to any specifications or instructions, or failure resulting from neglect, abuse, accidents, or acts of nature are not covered under this warranty.

Warranty service may be obtained by delivering the Product to Sealevel and providing proof of purchase. Customer agrees to ensure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to Sealevel, and to use the original shipping container or equivalent. Warranty is valid only for original purchaser and is not transferable.

This warranty applies to Sealevel manufactured Product. Product purchased through Sealevel but manufactured by a third party will retain the original manufacturer's warranty.

Non-Warranty Repair/Retest

Products returned due to damage or misuse and Products retested with no problem found are subject to repair/retest charges. A purchase order or credit card number and authorization must be in an RMA (Return Merchandise Authorization) number prior to returning Product.

How to obtain an RMA (Return Merchandise Authorization)

If you need to return a product for warranty or non-warranty repair, you must first obtain an RMA number. Please contact Sealevel Systems, Inc. Technical Support for assistance:

Available Monday – Friday, 8:00 AM to 5:00 PM EST
Phone   864-843-4343
Email   support@sealevel.com

Trademarks

Sealevel Systems, Incorporated acknowledges that all trademarks referenced in this manual are the service mark, trademark, or registered trademark of the respective company.

SEALEVEL®