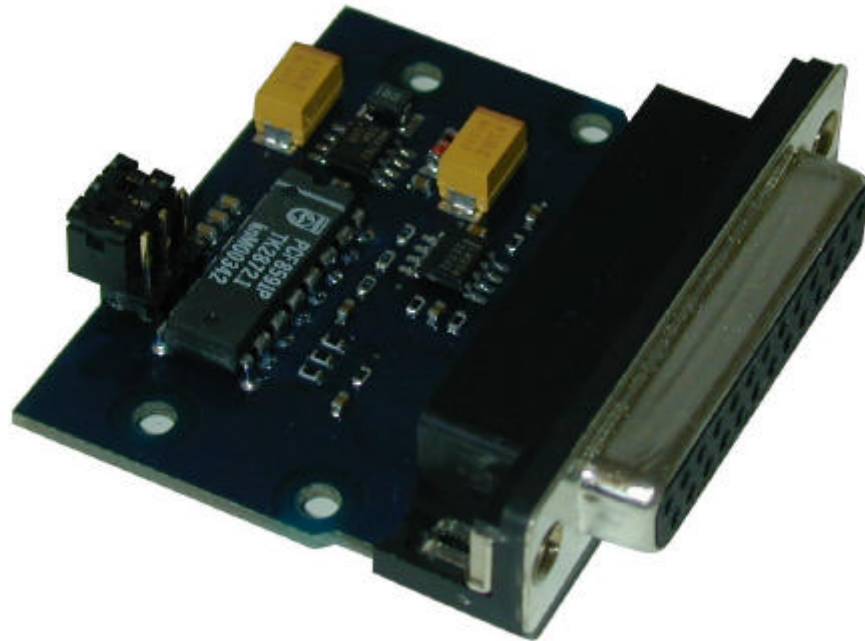


ANIMATICS AIO-110 USER MANUAL ANALOG INPUT/OUTPUT MODULE



SECTION 1.	Introduction	Page
	1.1 Product Description	2
	1.2 Features	2
	1.3 Theory of Operation	2
SECTION 2.	Specifications	
	2.1 Electrical	3
	2.2 Mechanical	3
	2.3 Environmental	3
SECTION 3.	Installation	
	3.1 Unpacking and Inspection	4
	3.2 Mounting	4
SECTION 4.	Wiring and Powering up	
	4.1 Wiring	4
	4.2 Connector Pinout	5
	4.3 Connecting to a SmartMotor Anilink Network	6
	4.4 Anilink Module Addressing	6
	4.5 Power Up.	7
SECTION 5.	Programming	
	5.1 READING AND WRITING OUTPUTS TO AIO-110.	8
SECTION 6.	Maintenance & Troubleshooting	
	6.1 Maintenance.	9
	6.2 Trouble Shooting	9

1.0 INTRODUCTION

1.1 PRODUCT DESCRIPTION

AIO-110 is an analog input and output card in the family AIO-1xx (1 series, 10 volt). The card has four analog input pins: one 0 to 10VDC analog input, Three 0 to 5V analog input. There is one analog output that creates a 0 to +10 VDC on the output pin (10AOUT) and creates a scaled output 0 to +5VDC on AOUT output pin. The resolution of the output signal is eight bits of resolution.

Produced as a general purpose peripheral, other similar peripherals have been produced within the AIO-1XX family of peripherals. Please contact your applications engineer for specifics about our special products.

1.2 FEATURES

- One analog output, 0 to +10 VDC range, 8-bit resolution.
- Three analog inputs, 0 to +5 VDC range, 8-bit resolution.
- Simple plug in operation
- Convenient size and mounting, DSUB connector
- Direct firmware support under SmartMotor command sets
- +5 V DC operation
 - Can be drawn from SmartMotor I/O connector.
 - Can be drawn directly from AniLink network cable
 - Alternate power supply port available
- AniLink Network Addressable (3-bit)
 - High speed serial communications (100K BPS)
 - Multi-drop addressing

1.3 THEORY OF OPERATION

The AIO-110 communicates serially over the AniLink bus with a Animatics SmartMotor or Animatics controller. The controller can write analog outputs to the AIO-110 module (D/A), or read analog inputs from it (A/D).

Writing to the AIO-110 is carried out as a three byte string. The first byte of a write command contains a three bit addressing scheme.

The second byte of a write enables the analog output and performs housekeeping functions, the third byte contains the output value.

A read is carried out a string of two bytes, and it may cause the AIO-110 to return up to five bytes since the channels must be converted in order. When a conversion of a channel is started, an input voltage sample is stored on the chip, and converted to an eight bit binary code. The conversion rate is determined by the actual speed of the AniLink bus.

SECTION 2: SPECIFICATIONS

All listed specifications are correct as of the date of printing. See errata for latest details. Any and all product specifications are subject to change without notice by the manufacturer.

2.1 ELECTRICAL

Table 1: Electrical Specifications

Bus DC line voltage	5V DC
Normal Maximum DC current	50 ma

2.2 MECHANICAL

The mechanical drawing of the AIO-110 is presented in Figure 1. The board can be mounted using #4 screws or other mounting hardware using the four 0.125 in thru holes.

Weight: 0.8 oz Height: 0.625 in
Length: 1.59 in Width: 2.00 in

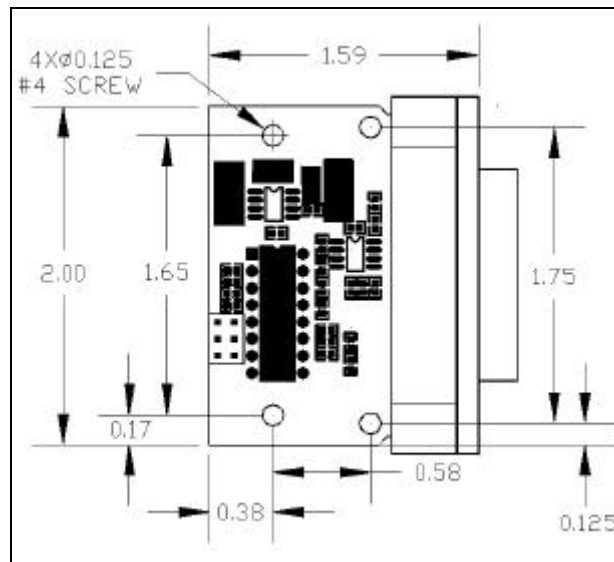


Figure 1: Mounting Layout

2.3 ENVIRONMENTAL

Operating temperature 0°C to 50°C Storage temperature -20°C to 70°C
Humidity 0 % to 90 % (non-condensing)

3.0 INSTALLATION

3.1 UNPACKING & INSPECTION

Upon receipt of the equipment, carefully inspect to ensure that no damage has occurred during shipment. If damage is detected, notify the carrier immediately. Equipment should be stored in its original shipping container until ready for use.

3.2 MOUNTING

The AIO-110 module should be mounted inside a cabinet or suitable enclosure to protect it from physical and environmental damage. It must be kept free of combustible or flammable materials, oil vapor, steam, excessive moisture, corrosives and general debris.

Mounting holes for standard 4-40 screws are located in four places on the board. The board can also be secured using the two threaded 4-40 nuts in the 25-pin DSUB connector. Jack screws are suggested for this purpose.

4.0 WIRING & POWER UP

4.1 WIRING

The AIO-110 needs to be supplied with communication and power. Use the SmartMotor to supply the AIO card with a +5V dc, ground (signal ground), Anilink Data line and Anilink clock line. These can be wired either from a SmartMotor or Animatics Anilink peripheral. The Figure 2 shows an example wiring scheme. Refer to Table 2 for pinouts.

The AIO-110 can be networked with other AniLink devices using a RJ11-6 connector (6 pin phone jack connector) wired in parallel to pass the +5V,GND, Anilink Data and Anilink Clock to the additional AniLink modules. The schematic Figure 2.

Longer runs of AniLink cable are possible. Maximum tested runs for the “phone cable” wiring and RJ11-6 type connectors is about 3 feet. Use of higher efficiency shielded cable and better connectors will allow much longer runs.

When several AniLink peripherals are connected to the same network, the available controller power supply may not to maintain operating voltage to the peripherals. If additional power is fed into one module of an AniLink network that power will be distributed to the other modules over the +5V line of the AniLink network.

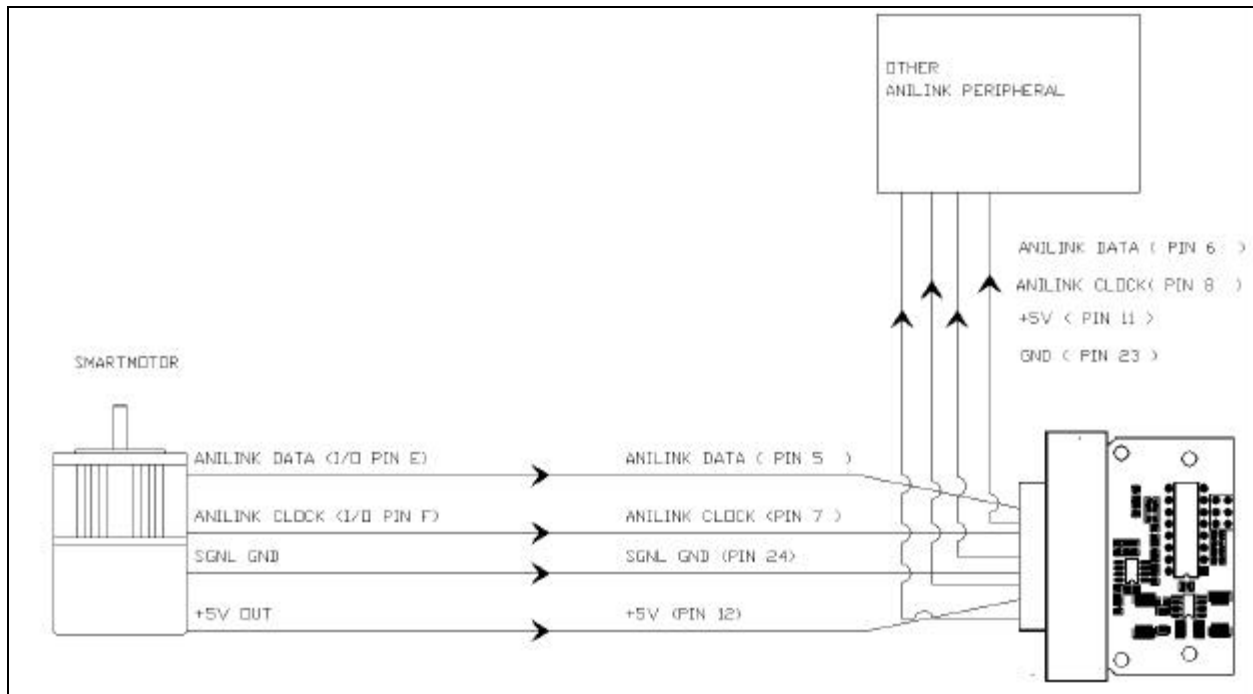


Figure 2: Wiring Scheme

4.2 CONNECTOR PINOUTS

The AIO110's I/O connector is a standard female 25 pin DSUB. Peripheral systems can be powered from the AIO-110's +5 VDC and GND up to the maximum available current on the AniLink network. The pin assignment is listed below in Figure 2.

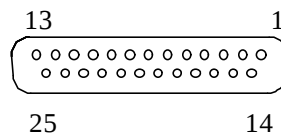


TABLE 2: AIO-110 Pinout, 25 Pin Connector

PIN #	SIGNAL	DESCRIPTION	COMMENTS
1		Reserved, do not use	
2	INPUT#2	Analog Input #2 (0 to +5V)	8 bit resolution
3	INPUT#3	Analog Input #3 (0 to +5V)	8 bit resolution
4	INPUT#4	Analog Input #4 (0 to +5V)	8 bit resolution
5	ANILINK DATA	AniLink peripheral bus data line	Connect to SmartMotor i/o pin E
6	ANILINK DATA	AniLink peripheral bus data line	Tied to pin 5 on board
7	ANILINK CLOCK	AniLink peripheral bus clock line	Connect to SmartMotor i/o pin F
8	ANILINK CLOCK	AniLink peripheral bus clock line	Tied to pin 7 on board
9	INPUT#1 (10V)	Analog Input#1 (0 to +10V)	8 bit resolution
10	5V AOUT	Analog output (0 to +5V)	8 bit resolution (1/2 voltage of pin13)
11	+5V in	+5V DC in	Pin 11 & 12 Tied on board
12	+5V in	+5V DC in	Pin 11 & 12 Tied on board
13	10V AOUT	Analog Output (0 to +10V)	8 bit resolution
14 TO 25	GND	GROUND	All GND are tied together on board

The AOOUT and 10VAOOUT output a voltage when an analog output command is issued. The pins are connected thru a resistor network thus “5V AOOUT” pin is ½ the voltage of the “10VAOOUT” pin. To connect the AIO-110 card to other AniLink devices with a double RJ11-6 connector for networking AniLink devices, make a cable assembly to match the pin out is provided below.

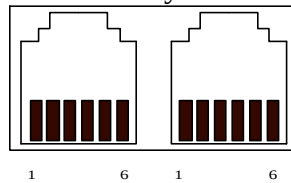


TABLE 3: Pinout, RJ11 AniLink Network Connector

PIN	SIGNAL	DESCRIPTION
1		Reserved, do not use
2	GND	To SmartMotor signal ground
3	+5V DC	AniLink Power from SmartMotor (limited to about 150 mA)
4	AniLink Clock	AniLink Clock (I/O pin E)
5	AniLink Data	AniLink Data (I/O pin F)
6		Reserved, do not use

4.3 CONNECTING TO A SMARTMOTOR ANILINK NETWORK

Each AIO-110 has a hardware selectable peripheral address. The factory default setting on the card is address “A”. If you are using multiple-AniLink peripherals on one AniLink network, each device must have a different address to function properly.

4.4 ANILINK MODULE ADDRESSING

AniLink peripherals addresses available are A to H, which are set by set three jumpers. The address is set by inserting the jumpers to electrical conduct across the column of jumpers 1, 2 or 3 in the pattern detailed in Table 4 and Figure 3 for jumper location on the i/o card.

Table 4: Peripheral Device Address Jumper setting (√= jumper in place O = jumper absent)

MODULE ADDRESS	JUMPER 1	JUMPER 2	JUMPER 3
A	O	O	O
B	√	O	O
C	O	√	O
D	√	√	O
E	O	O	√
F	√	O	√
G	O	√	√
H	√	√	√

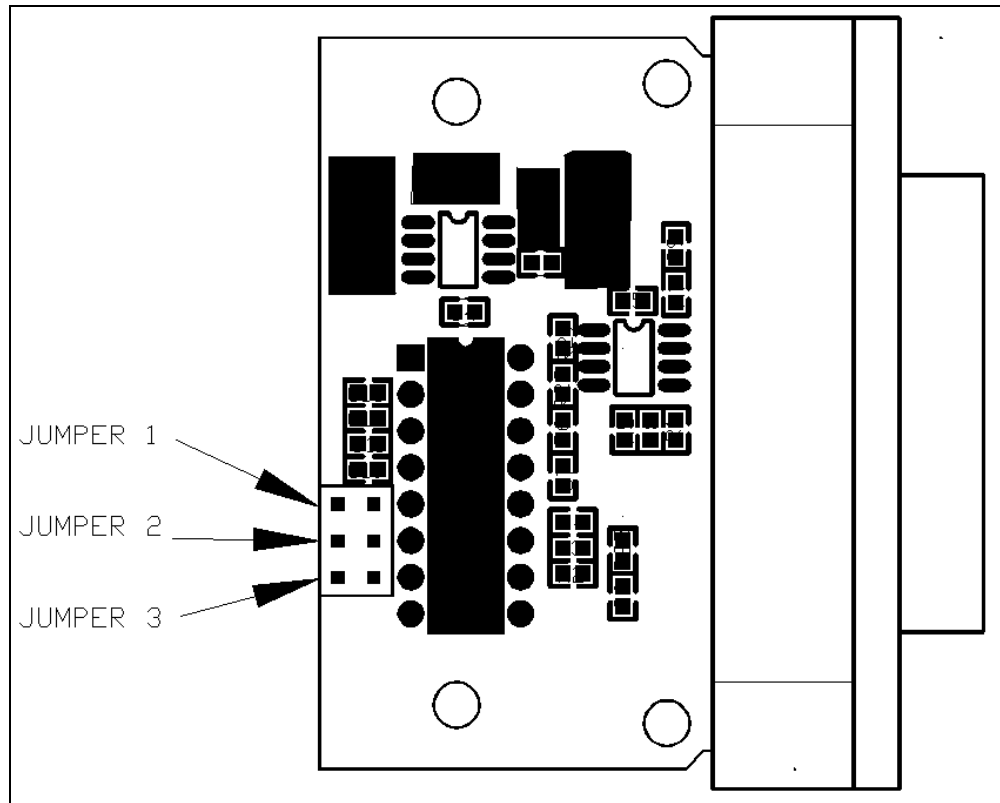


Figure 3: Address Jumpers Location

4.5 POWER-UP

No particular power up procedure is necessary for the AIO-110.

A checkout procedure can be derived from the programming examples found later in this manual. Use a 5 K pot and a voltmeter or oscilloscope to check the expected ranges and returns if desired.

Be sure to apply common safety practices when working on any motion based system: make sure that there is no possibility of personal injury or machine damage before first time power up.

SECTION 5.0 PROGRAMMING

5.1 READING AND WRITING OUTPUTS TO AIO-110

The SmartMotor has direct command software support for the AIO-110 module and can read four analog inputs and write one analog output. To read and write to the AIO-110 issue the commands in the format described in the table below:

COMMAND FORMAT	COMMENTS
AIN {module address}{ input number}	Read analog input from input pin from module . Module Address Range: A to H (default is address A) Input Number Range: 1 to 4
AOUT {module address}, {output value}	Outputs an analog voltage to a 8 bit digital D/A converter to turn on analog output on both 10VAOUT pin and AOUT pin. Module Address Range: A to H (factory setting is address A) Output Value Range: 0 to 255 , where 255 is maximum voltage, 0 is zero volts. Voltage Output range. "10V AOUT" pin: 0 to +10 volt DC. "AOUT" pin: 0 to +5 volt DC.

5.2 PROGRAMMING EXAMPLES

1) READING INPUT:

```
aa=AINA1  'read Analog Input from address A, input#1, store to variable aa.
bb=AINA2  'read analog input,address A, input number 2 and store to bb.
cc=AINA3  'read analog input,address A, input number 3 and store to cc.
dd=AINA4  'read analog input,address A, input number 4 and store to dd.
f=AINB1   'read Analog Input from address B, input#1, store to variable f.
g=AINB2   'read analog input,address B, input number 2 and store to g.
h=AINB3   'read analog input,address B, input number 3 and store to h.
i=AINB4   'read analog input,address B, input number 4 and store to i.
```

2) WRITING OUTPUT:

```
AOUTA,255  'Turn on Analog OUTPUT,address A,output value 255(max voltage)
           '      to 10V AOUT pin and AOUT pin.

ee=128
AOUTA,ee    'Analog Output, address A, output value ee=128.

AOUTE,255   'Turn on Analog OUTPUT,address E,output value 255(max voltage)
           '      to 10V AOUT pin and AOUT pin.

j=128
AOUTE,j     'Analog Output, address E, output value j=128.
```

3) MATH/LOGIC OPERATIONS ON INPUTS:

The inputs can be used in direct math and logical operations that are permitted by the SmartMotor command set. Refer to SmartMotor Manual and addendum for math and logic capabilities.

```
bbb=AINA2-64      ' math operation on an analog input #2
IF AINA4>=128     ' logical comparison on analog input #4
    AOUTA,bbb
ENDIF
```

6.0 MAINTAINENCE AND TROUBLE SHOOTING

6.1 MAINTAINENCE

There are no user serviceable components on the AIO-110. The only periodic maintenance requirement is to keep the board clean.

6.2 TROUBLE SHOOTING

A failure of the AIO-110 module would be indicated by observably incorrect command returns at the host controller, or by invalid signals appearing at the output. These conditions would present themselves as a loss of control in an application.

As these units have no user serviceable parts, trouble shooting is usually limited to checking for power and ground, and checking for communications signal.

As a part of documenting your application, you should record acceptable test levels for future use during the development process. Should questions arise later about the serviceable condition of an AIO-110 card, comparison levels can be a tremendous asset.

The commands and programming techniques found in the programming section of this document will be useful in the troubleshooting process.

If your unit is not working:

1. Check cabling for unplugged connectors or cable cuts.
2. Check for power using a voltmeter to check voltage between +5V pin and GND. If not receiving power, locate cause.
3. Check for signal on AniLink Clock and Data lines using a logic probe or oscilloscope. Logic and Data lines are normally high between data transmissions.
4. If power, data and clock all show correct signals, and your unit is still not working, contact an applications engineer at Animatics tech support .