16-bit Analog Input Card (ANIMATICS AIO-116) Application Note

Rev. 5 12/20/99

1. Product Description

The AIO-116 is an 8-channel, 16-bit analog input peripheral module for AniLink bus. This module allows the ANIMATICS SmartMotor to read eight analog signals.

2. Specification

2.1 Electrical

Input DC power requirement: +5V, 400 mA (add 150 mA if AIO-116 is supplying +5V power to user's device).

Analog input voltage range: +/- 10V or +/- 5V (Jumper selectable)

Analog input resolution: 16-bit

2.2 Mechanical

The board size and mounting hole locations are identical to the ANIMATICS AIO-100 analog module and DIO-100 digital module except the solders side clearance: The AIO-116 has components mounted on the solder side, so at least .250 inch of clearance on the bottom is needed.

2.3 Environmental

3. Installation

3.1 Mounting

The AIO-116 module should be mounted in a metal enclosure to shield it from electromagnetic noises. And it should be mounted away from noise sources such as transformers, switching supplies, relays, etc. if they are present inside the enclosure.

3.2 Wiring

1) DC power

The user must provide own +5VDC 400mA at J1(dual RJ11-telephone jack connector) or J3 (Green terminal block). For J1, Pin 2 is GND and pin3 is +5V counting from left. For J3, Pin2 is GND and Pin 3 is +5V counting from right. Connector J2 (DB25) can supply +5V to user's devices up to 150mA. If this is the case, user's supply must account for this increase.

ANIMAICS IOPWR105 power supply board can provide this power. The connection cable between AIO-116 and the IOPWR105 is CAB-P-X.X.

2) AniLink connection

Connect AniLink cable between a SmartMotor AniLink port and AIO-116 J1. ANIMAICS cable CAB-SM-X.X may be used.

3) Analog inputs

J2 (DB25) is the analog input connector. Pin assignment is as follows:

PIN #	SIGNAL NAME
1	AIN1+
2	AIN2+
3	AIN3+
4	AIN4+
5	AIN5+
6	AIN6+
7	AIN7+
8	AIN8+
9	
10	
11	
12	
13	+5V OUT
14	AIN1 GND SENSE
15	AIN2 GND SENSE
16	AIN3 GND SENSE
17	AIN4 GND SENSE
18	AIN5 GND SENSE
19	AIN6 GND SENSE
20	AIN7 GND SENSE
21	AIN8 GND SENSE
22	
23	A GND
24	A GND

25 GND

Connection example:
To measure an analog voltage, connect J2-1 to analog signal +, J2-14 to analog signal ground SENSE point, J2-23 or -24 to analog GND. The analog GND connection may be needed for a bias current return path. For accuracy, the voltage difference between each analog ground SENSE point and analog GND should be less than 100 mV.

The analog cable should be a shielded twisted-pair.

4. Setup

4.1 AniLink Bus Module Address

Peripherals on AniLink network must have non-conflicting addresses to function properly. This normally means a unique address for each AniLink peripherals. The AniLink peripherals use a three-bit address scheme based on the position of jumpers 1, 2 and 3 on a jumper connector (J4 on AIO-116).

Module Address	Jumper State			X = jumper in place
	1	2	3	
A	O	O	O	O = jumper absent
B	X	O	O	
C	O	X	O	
D	X	X	O	
E	O	O	X	
F	X	O	X	
G	O	X	X	
H	X	X	X	

Factory default value of this address is A.

4.2 Analog input range

+/- 10V (20V span): Set jumper between pin 1 and 4 on J6 (factory default)

+/- 5V (10V span): Set jumper between pin 2 and 5 on J6.

4.3 Filter components

Currently filter components, resistors R6, R7, R8, R9 and capacitors C6 and C8 are not loaded.

IMPORTANT:

A/D converter chip on the board has an input capacitor of 50pF. The source resistance of the customer's analog sensor plus R7 + R9 should not exceed 10 k ohms even without C6 and C8. Otherwise the RC time constant will be too large for accurate measurement. In that case a buffer board is required in front of the AIO-116 board.

In noisy environment, the buffer board should also incorporate a filter.

5. Programming

For detail of the programming language itself, refer to ANIMATICS SmartMotor user's Manual.

5.1 Calibration

Calibrate AIO-116 after power up, or before reading analog inputs by issuing:

```
DOUT{port} 63,0
```

The port address has to match the one set by jumper J4. Issue DOUTA63,0 if port address is set for A, for example. The channel number 63 and expression 0 can not be changed.

Hardware calibration will take about 60 m seconds. Wait at least this much before issuing read command.

5.2 Reading analog inputs

AniLink port reads one byte at a time. Since AIO-116 provides a 16-bit data, two bytes have to be read consecutively. Also the channel number in

the DIN command syntax specify the analog channel. The relationship between channel number and analog channel is follows:

DIN channel number	Analog channel number
0	AIN0 low byte
1	AIN1 high byte
2	AIN2 low byte
3	AIN2 high byte
4	AIN3 low byte
5	AIN3 high byte
6	AIN4 low byte
7	AIN4 high byte
8	AIN5 low byte
9	AIN5 high byte
10	AIN6 low byte
11	AIN6 high byte
12	AIN7 low byte
13	AIN7 high byte
14	AIN8 low byte
15	AIN8 high byte

Read a byte by issuing:

{User variable} = DIN{port}{channel number}

For example, in order to read AIN1 input (assuming port A), issue

a = DINA0	This will assign AIN1 low-byte to variable a.
Ra	This will print the AIN1 low-byte on the screen.
b = DINA1	This will assign AIN1 high-byte to variable b.
Rb	This will print AIN1 high-byte on the screen.

In order to print AIN8 input (assuming port A) on the screen and don't need to store the value, just issue

RDINA14	This will display AIN8 low-byte.
RDINA15	This will display AIN8 high-byte.

6. Interpretation of data

Since AIO-116 is a 16-bit data, the data range is 0 to 65535 (2 to the 16th). Data value can be calculated:

Data value = high-byte x 256 + low-byte

0 represents – (minus) full scale and 65535 represents + full scale.

If the range is set to +/- 10V by the jumper J6, 0 represents –10V and 65535 represents +10V. 32768 represents 0V.

If the range is set +/- 5V, 0 represents –5V and 65535 represents +5V.