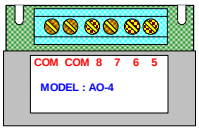
4 CHANNEL
0-10 VDC
ANALOG OUTPUT
MODULE

The AO - 4 four channel analog output module provides IZAC Controllers with aninterface to various Actuators and/or equipment for Proportional Control . It has four analog outputs which vary from 0 to 10 VDC based on the programs in the IZAC Controllers , controlling and generating these signals.



- Four channels of 0-10 VDC Analog Output Signals
- Very accurate and quick response time.
- Inexpensive and modular .
- Can interface to any Damper Actuators
- Can interface to Frequency Drives
- High Output drive current.
- Precision incremental Output Voltage change

Model :
AO - 4

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OPERATION :

The AO - 4 four channel 0-10 VDC Analog Output module is designed as a plug in module for the IZAC - 4 and - 8 Controllers .

This module is used for applications that require more than one 0-10 VDC analog output control signal for the IZAC Controller .

Both the IZAC - 4 and - 8 already have one 0-10 VDC analog output built into the Controller . For those applications that require more than one 0-10 VDC analog output control signal , the AO - 4 can be used.

0-10 VDC control voltages are connected to various actuators and controllers . Some typical actuator applications include : mixing , hot & chilled water valves , control of various dampers for economizers, by-pass , outside, return and discharge exhaust air dampers .

These actuators , if equipped with control circuitry to accept 0-10 VDC voltage signals , will change their rotational or linear moving shafts based on the input voltages applied.

A Frequency Drive is a type of Controller that will control loads based on applied 0-10 VDC input control signal. The Frequency Drives apply 120 to 480 VAC single or three phase voltages to Fans , motors , pumps and other equipment and change the applied frequency of the AC voltage to control the speed of the device .

SPECIFICATIONS :

Input Signal : 0 to 100 % fast PWM internally from IZAC Controller .

Output Signal : 0 to 10 VDC

Input Voltage : Supplied internal by the Controller

Power Consumption : 0.2 VA

Accuracy : ± 0.2 VDC or ± 2 % full scale

Minimum Incremental Change : 0.1 VDC

Output Load Drive Capacity : 10 KOhms minimum

Output Short Circuit : 25 mA DC current

Dimensions : 2.00 " L x 1.180 " W x 0.900 " H

Operating Temperature : 32 ° F to 140 ° F

Storage Temperature : -40 ° F to 165 ° F

Operating Humidity : 10 to 95 % non condensing

WIRING:

The AO-4 module has a six position terminal block , consisting of four 0-10 VDC analog outputs and two commons . Fig. 1 below shows the module and its terminal connection .

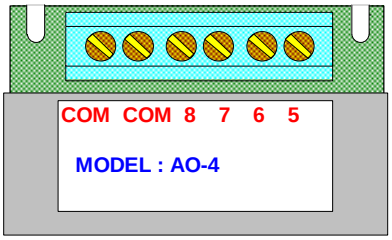

Fig . 1 AO - 4 Analog Output Module

The terminals labeled 5,6,7and 8 represent the four 0-10 VDC voltage outputs . These numbers correspond to the outputs of the IZAC Controller that can be used to generate the 0-10 VDC output signals .

Two terminals labeled " COM " are the common (return) terminals for all four outputs.

The AO - 4 can be configured to take place of the Controller's relay outputs 5, 6, 7 and 8 including the IZAC- 4 , which does not have relay outputs 5, 6, 7 and 8 as hardware.

INSTALLATION :

To insure proper stable and operation , the AO - 4 must be mounted onto the IZAC Controller via the mounting kit supplied with the Module . This mounting kit , included with each AO - 4 consists of :

1. 4-Flat head screws .
2. 2-Hex spacers .
3. 2-Insulating washers

Illustration of the mounting procedure is shown in Fig. 2 .

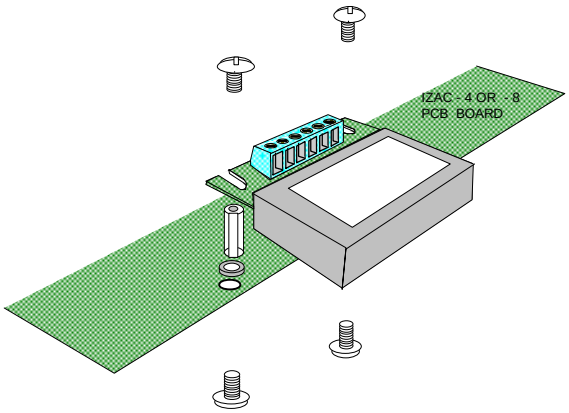

Fig.2
Mounting AO - 4 on to IZAC Controller board

CONFIGURATION :

IZAC Controllers are normally configured to provide 4 or 8 digital relay outputs. The AO-4 provides the capability of adding up to 4 , 0 to 10 VDC analog outputs on the IZAC Controllers .

The configuration is flexible , any combination of the four analog outputs can be activated. Output 4 (four) on both the IZAC - 4 and - 8 are programmable for either relay or 0 to 10 VDC analog output and this feature is built in .

Furthermore , any one or combination of digital outputs 5 through 8 can be configured to be 0 - 10 VDC output or a digital relay output but not both .

The IZAC Controllers must be configured through PDC-832 software . To use one or more of the AO - 4 module's 0-10 VDC outputs , the corresponding load must be configured as Fast PWM output. This configuration is accessible via Load Details software menu .

STEPS :

1. Place the two insulating washers on the top side of the IZAC Controller PCB , over the two mounting holes on both sides of the Analog Output Port connector .
2. Insert two of the flathead screws up through the bottom of the IZAC board and the washers.
3. Mount the two hex threaded spacers on to the two screws protruding through the PCB. The insulator washers should be between the spacers and the IZAC board so that metal hex spacer does not short out foils on the IZAC board.
4. Tighten both screws and spacers firmly.
5. Insert the AO - 4 module into the Analog Out Port connector on the IZAC . The slots on the AO - 4 will line up with the two hex spacers when AO - 4 is properly inserted .
6. Secure the AO - 4 by inserting the remaining 2 flathead screws into the hex spacers , tighten the screws firmly.

The default output voltages for the AO - 4 module is different for each output . The default voltage is generated immediately after the corresponding load is configured for fast PWM even before entering any PWM programs into the Controller. These voltages are listed below :

OUTPUT No.	Default PWM %	DC voltage
Out - 5	20	2.00 V
Out - 6	40	4.00 V
Out - 7	60	6.00 V
Out - 8	80	8.00 V

OPERATION :

The AO - 4 module converts the Fast PWM percentage from the IZAC Controller to a 0 - 10 VDC voltage range . As the PWM percentage varies from 0% to 100% , the corresponding output voltage will vary from 0 to 10 VDC. With a 1% or 0.100 volts increments and resolution . For example , if the PWM is 68% , the DC voltage output will be 6.80 volts.

SAMPLE PROGRAM :

1. Control the position of a damper actuator to maintain the Zone temperature at target temperature. The Actuator has 0 - 10 VDC modulating input .
2. Also maintain a minimum CFM during occupied hours .
3. Fully close the damper during unoccupied hours when the temperature is within the unoccupied range .

Desired Values :

Occupied target space temp. :	73 to 71 ° F
Heat -Cool switch over , when duct temp. is	82 °
Actuator minimum position voltage:	2.00 VDC
Actuator full open voltage:	10 VDC
Actuator fully closed voltage:	0.0 VDC

OCC. Schedule: Mon. through Fri. 8:00 AM till 5:00 PM

The following steps summarize the functions and objectives of the sample program:

1. Program step 1 (Analog Enable) determines the mode of operation based on duct temp during occupied hours and days for heating or cooling . If the duct temp is at or above 82 ° F , the Analog Enable program will activate program # 2 for heating . If the duct temp is at or below 81 ° F the Analog Enable will activate program # 3 .
2. The program # 2 , Proportional-Integral PWM modulates the actuator to maintain a heating target of 71 ° F. This program is reverse acting due to negative max. output change . The damper will close as the space temp rises and opens when it falls. A damper with a min. 2.00 VDC implies that the min. CFM requirement is satisfied.
3. Program # 3 , Proportional-Integral PWM is similar to program # 2 to maintain cool target of 73 ° F . The set point is direct acting due to positive max. output change. The damper will open as the space temp rises and close as temperature falls .
4. Programs #s 4,5,and 6 provide unoccupied control targets similar to the first 3 programs. The min. output is 0 % or 0.0 VDC to fully close the damper. The heating and cooling targets reflect the unoccupied temperatures for heat and cool .

-- 1 ----------
OCCUPIED SCHEDUL — Analog enable
From 8:00 AM - - M T W T F -
until 5:00 PM - - M T W T F -

Use sensor DUCT -A to activate
next setpoint when sensor >= 82.0 and
second next setpoint when sensor <= 81.0 .

The sensor sample RATE is once per MINUTE.

Activating either succeeding
setpoint inactivates the other.

-- 2 ----------
PWM HEATING — Prop/Integral PWM
From 8:00 AM - - M T W T F -
until 5:00 PM - - M T W T F -

control DAMPER using MASTER sensor .
load(s) and SLAVE sensor SPACE -A.

if At MASTER sensor upper limit 0.0
load(s) SLAVE target is 71.0 .
ON and OFF.
-------- -------- At MASTER sensor lower limit 0.0
SLAVE target is 0.0

Slave target proportional band is 5.0 .
Maximum output change is -5%.
NORMAL maximum output is 100%.
NORMAL minimum output is 20%.
Update interval is 60 second(s).

-- 3 ----------
PWM COOLING — Prop/Integral PWM
From 8:00 AM - - M T W T F -
until 5:00 PM - - M T W T F -

control DAMPER using MASTER sensor . -A
load(s) and SLAVE sensor SPACE -A.

if At MASTER sensor upper limit 0.0
load(s) SLAVE target is 73.0 .
ON and OFF.
-------- -------- At MASTER sensor lower limit 0.0
SLAVE target is 0.0 .

Slave target proportional band is 5.0 .
Maximum output change is 5%.
NORMAL maximum output is 100%.
NORMAL minimum output is 20%.
Update interval is 60 second(s).

-- 4 ----------
UNOCC CONTROL — Analog enable
From 5:00 PM - - M T W T F -
until 8:00 AM - - M T W T F -

Use sensor DUCT -A to activate
next setpoint when sensor >= 82.0 and
second next setpoint when sensor <= 81.0 .

The sensor sample RATE is once per MINUTE.

Activating either succeeding
setpoint inactivates the other.

-- 5 ----------
UNOCC HEATING — Prop/Integral PWM
From 5:00 PM - - M T W T F -
until 8:00 AM - - M T W T F -

control DAMPER using MASTER sensor . -A
load(s) and SLAVE sensor SPACE -A.

if At MASTER sensor upper limit 0.0
load(s) SLAVE target is 55.0 .
ON and OFF.
-------- -------- At MASTER sensor lower limit 0.0
SLAVE target is 0.0 .

Slave target proportional band is 5.0 .
Maximum output change is -5%.
NORMAL maximum output is 100%.
NORMAL minimum output is 0%.
Update interval is 60 second(s).

-- 6 ----------
UNOCC COOLING — Prop/Integral PWM
From 5:00 PM - - M T W T F -
until 8:00 AM - - M T W T F -

control DAMPER using MASTER sensor . -A
load(s) and SLAVE sensor SPACE -A.

if At MASTER sensor upper limit 0.0
load(s) SLAVE target is 85.0 .
ON and OFF.
-------- -------- At MASTER sensor lower limit 0.0
SLAVE target is 0.0 .

Slave target proportional band is 5.0 .
Maximum output change is 5%.
NORMAL maximum output is 100%.
NORMAL minimum output is 0%.
Update interval is 60 second(s).

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