V ARIABLE
A IR
V OLUME

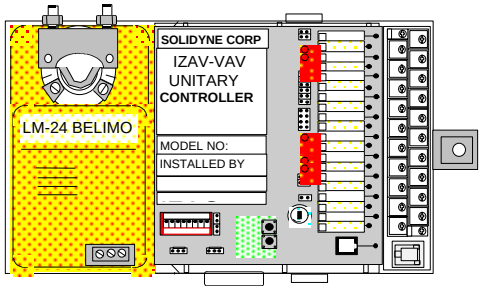
CONTROLLER

The **IZAC-VAV CONTROLLER** is a member of the **IZAC** family of **I**ntelligent **Z**one **A**utomation **C**ontrollers.

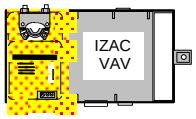
They are true Peer to Peer Networkable or Stand alone Universal Real-time embedded controllers . They can control any type of VAV Terminal Units provided that their available number of inputs and outputs are not exceeded.

IZAC-VAV offers unlimited number of application capabilities , unlike other dedicated VAV Controllers. Operating algorithms can be a standard programs for a VAV Terminal Unit or it can be expended to control any special or unique applications . These controllers have many control , log and alarm features and functions . Below are the list of these features , functions and capabilities:

- Networkable for up to 1,000 VAV Terminal Units.
- Will operate as stand alone or networked .
- Peer to Peer operation algorithms.
- Can be programmed to control any single , dual or multi-stage electric or modulated hot- water valve reheat terminal units.
- Zone temperature control in 1/10 th ° F increments .
- Real-time controller is built in.
- Internal lithium battery to hold real time and log data for many years.
- Low cost and accurate CFM Flow sensor is available.
- Fill in the blanks type interface can be used .
- Extensive logged data reporting capability internally to the controller. No dedicated PC or Master Control Unit is required.
- Other network sensors , any other equipment's input and/or output states can control and/or modify its control algorithms.
- It will reside on the same 3 wire RS-485 network along with other IZAC family of controllers.
- Can be programmed for other supervisory functions to monitor , log and control.



Model :
00-IZAC-VAV



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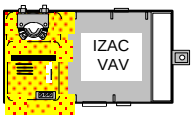

Some of the other highlights of IZAC - VAV Controllers.

Auto change over between heating and cooling based on outdoor temp, duct temp, or any other input from the network.

Two independent actuator drivers are built in.

0-10 VDC modulating Analog output is built in.

Two Actuator position inputs built in for 0 - 10 VDC or potentiometer (resistance) feed-back .

Fan and 2 stage electric REHEAT drivers built in

Unused outputs can be used for other purposes (such as lighting controls) .

Large selection of input sensors based on the applications and requirements.

Controls can be based on multiple space sensors , their average , highest , lowest , sum or difference .

Any sensor or state of an output can generate system level or local alarms with multi level alarm phone dial-out to other computers or pagers with alarm messages.

After hour occupancy allowance and duration can be programmed and logged.

Load run times are logged in one minute increments.

Each sensor is logged for the past 48 Hr. in 15 minutes increments of their averaged sensor values.

Each input is logged for the highest or lowest reading value and time of occurrence for the past 35 days.

Occupant allowed heat and cool comfort setting range is programmable.

Can be independently programmed for Optimized Start up or Shut down for heating and cooling .

Multi levels of security access to the system.

All programs , logged data , configuration , default values etc. can be auto polled , changed, reloaded via modem or direct onsite PC .

Daylight Savings time is programmable.

Up to 16 holidays can be programmed with duration from 1 to 255 days.

Any local or network wide input/output can modify on going control algorithms.

Built in RJ-11 connector for hand held DU-1 programmer and / or Zone Display STAT Module (DU-1).

3 Wire RS-485 Network circuitry is optically isolated from the processor and A/D circuitry for maximum reliability.

RS-485 comm. network circuitry is powered by an internal and totally isolated power supply.

24 VAC Input is fuse protected.

All outputs have status L.E.D.s .

Installer friendly , Mechanical design of the Controller is focused on the ease of installation and service .

Wiring terminal block is removable.

Two Override / Service jumpers are built in to the controller for ease of servicing.

Two momentary push buttons are included to rotate Main or Aux. Actuator manually .

Node ID number can be set with a built in 8 position Dip Switch and 2 jumpers.

For ease of wiring , 6 jumpers are incorporated to connect internal 24 VAC to Main and Aux. Actuator screw terminals.

Back up battery is socketed in case of servicing commonly available coin type lithium battery.

Easy to plug in Flow Sensor port and associated tubing and mounting hardware are supplied for optional low cost Flow Sensor.

RS-485 line conditioning jumpers and LAN transmit (TX) and receive (RC) LED's are incorporated.

Actuator drivers are mercury wetted NO. Reed relay contacts with over 10 billion Mechanical operation life time.

UL /CSR approvals.

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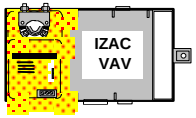

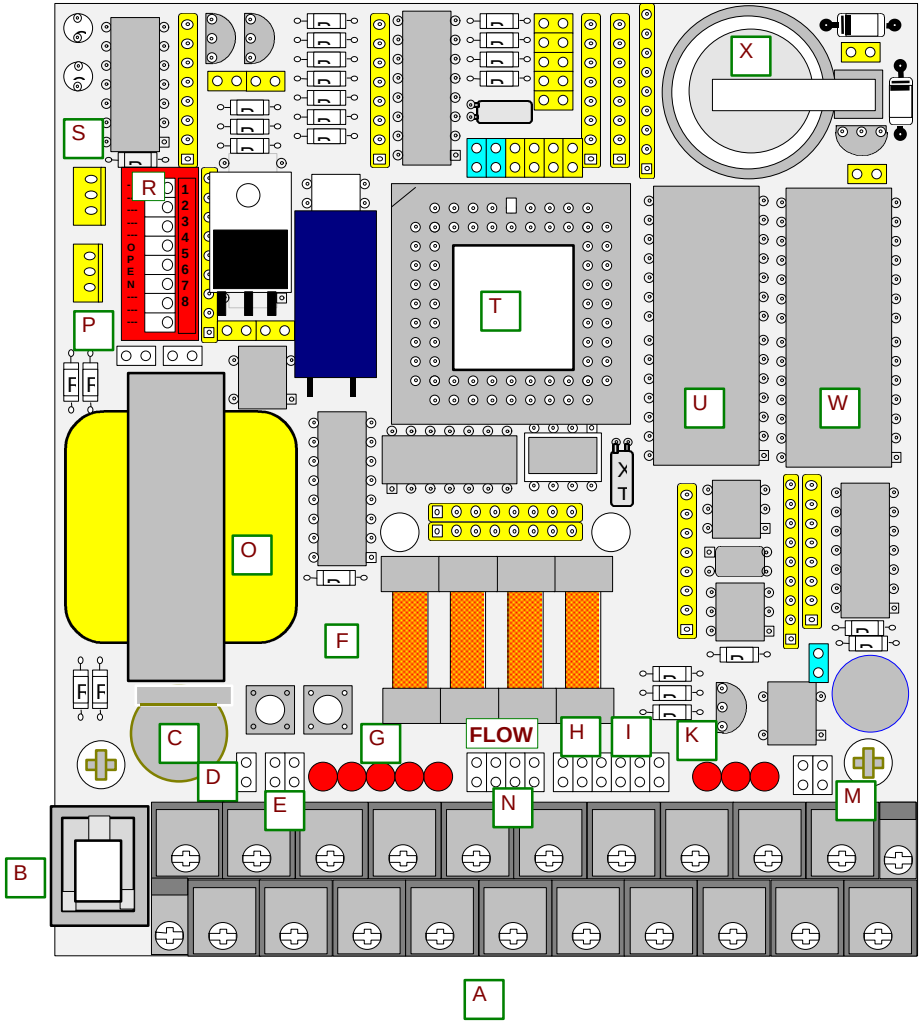

FIG. 1

Highlights of IZAC-VAV Controller Board .

A :TERMINAL BLOCK, REMOVABLE , 20 TERMINALS FOR FIELD WIRING .
TWO END SCREWS HOLD THE BLOCK IN ITS SOCKET.

B :RJ-11 CONNECTOR FOR CONNECTING DU-1 HAND HELD OR DISPLAY WALL STAT.

C :FUSE , 1 AMP, FAST BLOW 20mmx5mm . PROTECTS CIRCUITRY FROM OVER CURRENT AND OVER VOLTAGE.

D :POWER ON JUMPER, ACTS AS A SWITCH. WHEN REMOVED 24 VAC IS DISCONNECTED TO THE CIRCUITRY.

E :OVERRIDE (SERVICE) JUMPERS.THIS INPUT CAN BE PROGRAMMED SO THAT WHEN A SELECTED JUMPER IS REMOVED , CORRESPONDING ACTUATOR CAN BE FROZEN, FULLY CLOSED OR OPEN.

F :CW AND CCW MOMENTARY PUSH BUTTONS: THIS INPUT CAN BE PROGRAMMED SO THAT SELECTED ACTUATOR (VIA OVERRIDE JUMPERS) CAN BE POSITIONED CW OR CCW UPON PRESSING CORRESPONDING PUSH BUTTON.

G :STATUS LEDS. THEY INDICATE ENERGIZED STATE OF OUTPUT 1 THROUGH 5 . OUTPUT ASSIGNMENT IS SHOWN AT **TABLE - 1 .**

H :THESE 3 JUMPERS ARE FOR CONVENIENCE TO WIRE 24 VAC TO MAIN ACTUATOR. REFER TO WIRING DIAGRAM FIG. 11 FOR DETAILS .

I : SAME AS **H** ABOVE FOR AUX ACTUATOR.
REFER TO **FIG. 12** FOR DETAILS.

K : POWER ON , TRANSMIT AND RECEIVE STATUS LEDS .

M : THESE JUMPERS ARE USED TO CONDITION LINE IMPEDANCE IN A NETWORKED SYSTEM INSTALLATIONS. DEPENDING ON THE NUMBER OF NODES , WIRING OF RS-485 LAN WIRES AND TYPE OF WIRE USED , THEY WILL BE INSTALLED OR REMOVED .

N :THESE TWO STANDOFFS ARE USED TO MOUNT AND FASTEN FLOW SENSOR (MODEL NO.00-FL-2) INSIDE THE UNIT. FLOW SENSOR PLUGS IN TO 8 PIN FLOW CONNECTOR .

O : ISOLATION AND STEP DOWN TRANSFORMER .

P :POSITION FEEDBACK CONNECTORS FOR MAIN DAMPER . IT CAN BE CONNECTED TO A ACTUATOR FEEDBACK POTENTIOMETER TO MEASURE AND CONTROL MAIN ACTUATOR BASED ON ITS FULL TRAVEL.

S : SAME AS **P** FOR AUX. ACTUATOR FOR DUAL DUCT OR HOT WATER VALVE APPLICATIONS.

R : DIP SWITCH TO SET THE ID NO. OF THE NODE FOR UP TO 1,000 NODES.
SEE TABLE - 2 FOR THE SWITCH SETTINGS FOR CORRESPONDING NODE ID

T : 8/16 BIT HIGH PERFORMANCE MOTOROLA MICRO-CONTROLLER.

U : 32Kx8 RAM , BATTERY BACKED AND STORES PROGRAMS , LOGGED DATA . LABEL ATTACHED TO THIS IC IS THE SERIAL NO. OF THE CONTROLLER FROM THE FACTORY.

W : OPERATING SYSTEM EPROM. THE LABEL AND VERSION NO. ON IT IS AN IMPORTANT PIECE OF INFORMATION FOR THE FUTURE UPDATES , COMPATIABILITY ETC.

X : LITHIUM BATTERY , COMMONLY USED AND FOUND , COIN TYPE , SOCKETED FOR EASE OF FIELD SERVICE IF REQUIRED FOR ANY REASON.
THE INSULATOR AT THE TOP OF THE BATTERY MUST BE MOVED FOR THE CONTROLLER TO FUNCTION.

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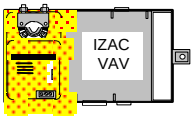


GENERAL :

The **IZAC - VAV** Controller is a member of IZAC family of controllers specifically mechanically designed and packaged for Installing and controlling VAV box mechanical terminal units. These Controllers are very similar to **IZAC-8** Unitary controllers .

All VAV units contain a main air damper and this damper has to be closed or opened , controlling volume of conditioned air going in to the space that needs to be maintained at certain target temperatures. VAV mechanical units can be a single duct, dual duct and may contain hot water or electric reheat coils. Some VAV units can be as simple as a single damper or as complicated as having multi-stage electric reheat coils combined with pocket fans .

The **IZAC -VAV** is designed as a general purpose - universal controllers with all the necessary input and output hardware requirements built into it to control any VAV terminal units in buildings . Although the Controller has various built in hardware features, they may not be needed for all specific applications . The goal and objective is to use one Universal hardware for all possible VAV applications .

The Controllers are designed so that it is quick to install, diagnose and service them.

Each controller has built in CW and CCW rotation manual control push buttons **. (FIG. 1-**and **FIG. 6**) . These switches are connected to the Controller's Input No. 8 . Hence, they can be programmed to energize corresponding Actuator output for CW or CCW rotation . If CW or CCW push button switch is closed , this will change the Input - 8 data value . Based on how programs are placed in sequence , the change of an Input value may bypass the actual control program until the push button is released.

The Controller has two additional Override Jumpers .These Jumpers are shown in **FIG-1 E** and **FIG - 5** OR Jumpers are connected to the Controller's Input No. 7.If the actuators are desired to be left at a particular position for service or other reasons , this input can be programmed to do this task by removing or installing the corresponding O.R. Jumper similar to Manual Push Buttons.

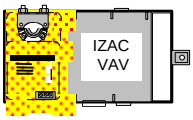
IZAC-VAV has two dedicated inputs where it can read and scale the position of feedback potentiometers , if the actuators are equipped with .These are polarized 3 pin connectors internal to the controller. (See **Fig. 1** Note **S & P**) . For any specific application , please consult with Technical Support Dept. for suggestions.

The **IZAC-VAV** is enclosed inside a flame retardant plastic enclosure . Actuators manufactured by **BELIMO** Company can be mounted inside this housing. Model No. **LM-24T** and **LM-24TP** series of Actuators are specifically designed for VAV applications by this manufacturer. Fig. 14 through 17 show various **LM-24** Actuators wired to **IZAC-VAV** Controllers for various types of VAV Units and applications.

IZAC - VAVs can be programmed via **DU -1** Display Wall Stat or modified a version of this Unit as a Hand Held programmer . Various information such as Time of Day, Node No. , Baud rate of the communication can be programmed . The connection and termination of the DU-1 to the IZAC-VAV is done by an RJ-11 connector , located next to the terminal wiring block. (See **FIG. 1 B** and **FIG. 3**) This termination requires a six conductor flat cable with both ends having RJ-11 6-pin male plugs. These plugs must be highest quality RJ-11 male plugs and should be crimped with the proper professional crimping tools.

An 8 position Node ID Dip Switch is used to set the Controllers Node ID No. (**FIG. 1- R**) These switches will allow installation of the Controller without PC or DU-1 node number programming . Once Node No. is known , various programs and configuration data can be transmitted from a central PC on site or via modem. For Node Nos. larger than 255 , two jumper wires J11 and J12 are used to address those Nodes. The Node ID Dip Switch settings are shown on **TABLE - 2** at the back of this document.

The IZAC - VAV can be installed and programmed as a stand alone unit. It will maintain its time of day, calendar and all programmed data . A PC can be plugged into its RS-485 port to receive logged data and allow any control parameters to be changed . If the DU-1 Display STAT is used , various data can be changed , such as occupied / unoccupied hours , time of day , date , desired heating and cooling parameters. The DU-1 will not enter actual program that will control the unit , this has to be loaded by a PC . However , once the programs are entered , they will be maintained by the back up battery in case of power interruptions.



PROGRAMMABLE PARAMETERS THAT SHOULD BE CONSIDERED FOR EACH APPLICATION:

1. Minimum on and off times: Each output can be set from 0 to 15 minutes. If fan or electric heat outputs needs to be on for a min. period of time , program accordingly.

2. Sequential Delays: This is a time delay of turning loads on and off sequentially. It is programmable from 0 to 255 seconds. This is important if multistage electric loads are switched to minimize demand kW.

3. Load Polarity : Each output can be programmed to be energized for on (fail-safe) or off state. Unless otherwise required, program all loads “ON-Energized”.

4. Fail Safe Operation : Can be used to set the desired output status for IZAC-VAV outputs in case of a major failure where all control programs are lost. Each output can be set to stay energized or de-energized. Program loads for “OFF- De-energized” unless otherwise is necessary.

5. Input Averaging period : Inputs can be selected as average so they will control outputs based on the average reading of the corresponding sensor over the past averaging period in minutes.

6. Input Sensor Offset and Multiplier: Each input of the controller can be modified with for an offset and multiplier.The multiplier and offset can be calculated by :

   $y = ax + b$

   y = Desired Reading
   x = Unmodified data reading .
   a = Multiplier .
   b = Offset value .

   Note : a and b can be negative numbers. If two desired data readings are known along with unmodified data reading at these corresponding values , then two equations can be solved for a and b values.

7. Holidays: Program holidays in advance for up to 16 different dates in a year and each holiday can last for a duration of 1 to 255 days.

8. Daylight Savings Dates : These dates are programmable and should be programmed in advance.

9. Override enabling and duration: Each Zone can have an Override Switch and can be programmed for a duration from 1 to 255 minutes. They can further be set for cancelable feature. This function will allow occupants to change Zone’s state from unoccupied to occupied for a predetermined period of time and can be re-started upon momentarily shorting the sensor input with the OR button before it times out. For Space Temperature Sensor applications requiring built in after hours occupancy features (override momentary switches), Solidyne’s 00-ZTS-B , 00-ZTS-A or 00-DU-1 sensors are recommended .

10. LAN ID No. : Each Node should be programmed for Node Identification Number in sequence from 1 to 1,000. Factory default Node number is 1 (one) .

11. Virtual Sensor Inputs : Each Controller can be programmed to use up to 8 Virtual Sensors . These Virtual Sensors can be a formula of various other sensors in the Controller or within the Network. Virtual Sensor capability of the Controller is a powerful tool for controlling Mechanical Equipment , Zone Comfort temperature levels and other control and monitoring capabilities . This function is explained in the PDC-832 Software manual.

12. Miscellaneous Other Parameters : Based on the application and type of actuator used , other parameters may be necessary to be program the required control functions . Since the IZAC-VAV follows the same programming strategies as IZAC-8 and -4 you can also refer to IZAC - 8 or - 4 data as well as PDC-832 version 534 (or higher) data for more extensive programming information.

SPECIFICATIONS:

ELECTRICAL:

INPUT POWER: **22** to **26.5** VAC 50/60 Hz ,

POWER CONSUMPTION: **6 VA** or less.

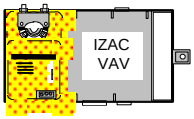
INPUT FUSE : 5mm x 20 mm 1 AMP fast blow .

OUTPUTS :

a. FAN OUTPUT: Transistor driver output , can drive up to 100mA dc current from an external or built in 12 VDC unregulated power supply, internal to the controller. See various application drawings as to how it is wired to drive 12 VDC external relays.

b. ACTUATOR OUTPUTS : Four N.O. reed relays contacts. The output relays 1 and 2 , 3 and 4 are paired for Main and Aux , respectively , for CW-CCW direction control . The 6 built in jumpers **J1 - J6 ,** canbe used to connect 24 VAC input voltage to the relay contacts and to the wiring terminal block eliminating external wiring (See **FIG. 11 and 12).** These contacts are mercury wetted and have very long life . They can handle up to max. of 1/2 Amps @ 24 VAC . (The relay’s mechanical life is in excess of 10 billion operation.) This spec is lower if the relays switch close to their max. current rating.

Aux. output contacts can be used to drive power relays to control electric heat loads if there is no Aux. actuator to control. See **Fig. 14 and 15** application examples .



c. 0-10 VDC OUTPUT : Built in analog output used to drive actuators that have 0 to 10 VDC inputs for positioning the actuator's output shaft. It can also be used for any other purpose , as long as the analog output required is "0-10VDC" . This output can drive 0 to 10 VDC into a 10 KOhm load resistance.

INPUTS :

a. Zone Sensor : This input will accept Solidyne's 00 - ZTS , 00 - ZTS-B , 00 - ZTS-A space temperature sensors or 00 - DU -1 Wall STAT. Normally the Zone sensor is a 10 KOhm Thermistor input , however it can accept other types of inputs such as 0-5 VDC 4-20 mA or other types of Thermistors.

b. Duct Sensor: This input will accept various types of inputs , similar to Zone Sensor. It is Recommended and reserved for Solidyne's 00-DS-1 duct sensor connection FOR DUCT AIR OR DISCHARGE AIR SENSING.

c. Flow Sensor : This terminal is provided in case an external Flow Sensor is required for flow measurements. Solidyne can provide Flow Sensor (Model No. **FS-2)** plugs in to the controller's mother board . There is a dedicated connector and mounting hardware built inside the Controller for connecting the **FS-2** . When installed , the **FS-2** output voltage will be electrically connected to this screw terminal.

d. Actuator Position Feed Back Pots : The connection to these inputs are made through two 3-pin male connectors. (See **FIG. 1 P** & **S**). When required , Solidyne can supply mating 3 wire cable assembly for these applications. Incorporate this hardware with your order when it is placed.

e. 0-10 VDC INPUT: This input can be used to measure DC analog voltage coming from an actuator , which indicates the position of its shaft . It can be scaled and offset to interpret total shaft rotation in " ° " radial . This input can also be used for other general purpose monitoring and control, such as sail switches, humidity , static pressure etc. However it may require external resistor for such purpose.

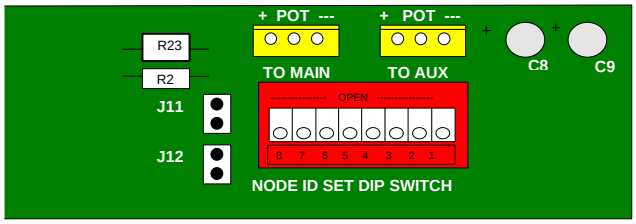


FIG. 2
Node ID Set Dip Switch, Main and Aux. Actuator Motors Position Feedback Potentiometers Connectors.

SPECIFICATIONS MECHANICAL :

The controller is enclosed in a fire retardant UL/CSA recognized plastic enclosure. The mechanical dimensions are shown in detail at Fig.4 .

COMMUNICATION :

Communication Port: 3 - wire RS-485 bus.
Optically isolated from the main circuitry and it has its own isolated power supply.

Baud Rate : Can be programmable from 1200 BPS to 9600 BPS via direct attachment to PC or via Hand Held DU-1 programmer. Units are programmed for 9600 BPS from the factory.

Synchronous Serial Port: This port is primarily used for DU-1 Wall Stat (or Hand Held DU -1).
This port is a RJ-11 Female connector , next to wiring terminal block. There are six connections to be made to connect DU-1 to IZAC-VAV . These connections and wires are as follows:

1. +12 VDC unregulated power supply .
2. Synchronous Clock (output).
3. Synchronous Data Out (output).
4. Synchronous Data In (input).
5. Zone Temperature Sensor (input-same mechanical and electrical connection to Terminal block - Zone Sensor - screw terminal. .
6. Common for logic and Sensors.

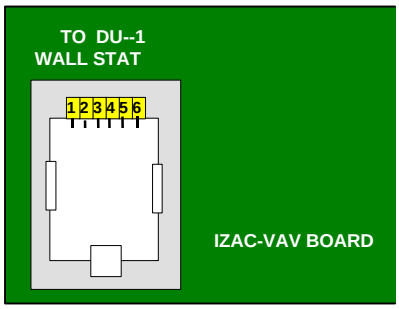


FIG.3
DU-1 RJ-11 connector location and pin assignment.

ENVIRONMENTAL SPECIFICATIONS:

Operating Temp. : +40 to +140 ° F **(INDOOR ONLY)**
Storage Temp. : -10 to +150 °F
Operating Humidity : 10 to 90 % RH non-condensing
Storage Humidity : 0 to 95 % RH non-condensing.

TABLE - 1 IZAC - VAV Input and Output Assignments:

IZAC VAV INPUTS	Recommended Input assignment Part No. for this	Type of sensor	Recommended Solidyne Products for this Application
Input - 1	Zone Space Temperature Thermistor	10 K	00-ZTS , 00-ZTS-A , 00-ZTS-B 00-DU1 See **Note 1**
Input - 2	Duct Space Temperature Thermistor	10 K	00-TS-10K , 00-DS-1 See **Note 1**
Input - 3	Auxiliary Input	0-10 VDC	See **Note 2**
Input - 4	Flow Sensor	0-10 VDC	00-FS-2 See **Note 3**
Input - 5	Main Actuator motor Position See Page 6 , FIG. 2	0-10 VDC	See **Note 4**
Input - 6	Auxiliary Actuator motor Position **See Page 6 , FIG.2**	0-10 VDC	See **Note 4**
Input - 7	Override-Service Jumper	0-10 VDC	See **Page - 9 , FIG.5**
Input -8	CW - CCW Manual Momentary	0-10 VDC	See **Page 10 , FIG. 6**

Notes :
1. This input has 12.1KOhms pull up resistor to internal 5.000 VDC Voltage reference. If required can be 0-5 VDC, 4-20mA, dry contact or other input.
2. Does not have any pull up resistor . Input is further divided by " ½ " by internal resistor network .
3. This input is floating. Can be resistance, 0-5 VDC , 4-20mA . Used by FS-2 Flow Sensor if plugged in or external sensor connected to between Flow and Common screw terminals.
4. These inputs are floating and don't have pull up resistors. Other inputs can be tied , provided these inputs are properly terminated by external resistors. Contact Solidyne Engineering Group for recommendations and assistance. 4 feet long 3 wire color coded cable assembly which mates with these connectors are available from Solidyne.

IZAC VAV OUTPUTS	Recommended Output Assignment	Type of Output	Notes - Comments
Output -1	Main Actuator (Damper) motor turn CW	N.O. Dry Reed relay	½ Amps Max @ 24 VAC (**note 1**)
Output -2	Main Actuator (Damper) motor turn CCW	N.O. Dry Reed relay	½ Amps Max @ 24 VAC (**note 1**)
Output -3	Aux Actuator motor turn CW or Electric Reheat Power Relay coil	N.O. Dry Reed relay	½ Amps Max @ 24 VAC **(note 1**)
Output -4	Aux Actuator motor turn CCW or 2nd stage Electric Reheat Power Relay coil or general purpose such as lighting etc.	N.O. Dry Reed relay	½ Amps Max @ 24 VAC (**note 1**)
Output -5	Fan Output or Electric Reheat Power Relay coil	Open collector transistor	Can only drive 12 VDC coil of auxiliary Power relay . **Note 2**
Output -6	Not Used		
Output -7	Not Used		
Output -8	0-10 VDC Analog output - Modulating.	0-10 VDC amplifier	Used for equipment that has 0-10 VDC modulating inputs.

Notes :
1. These are Long life , low power switching mercury wetted contacts. Can be wired to 24 VAC power input by internal Jumpers to control actuators. See page **12 FIG.11 & 12 .** Solidyne's **00-R30-24VAC** up to 30 Amps , form C @277 VAC , 24 VAC coil relays to control high voltage high current loads is recommended.
2. Solidyne's **R30-12VDC** 30 Amps, form C @ 277VAC relays are recommended for Fan control.

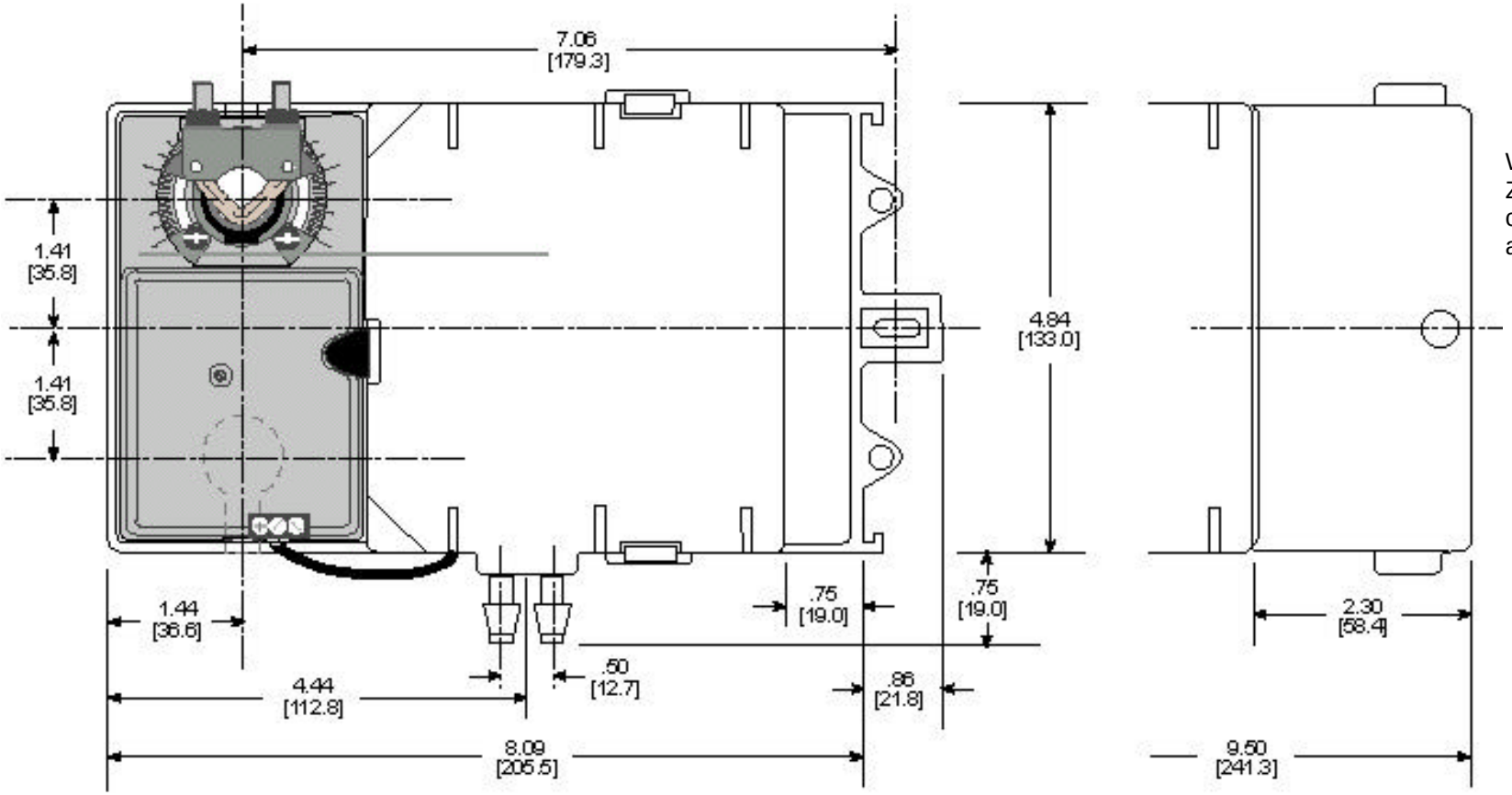


FIG. 4

Dimensions of IZAC-VAV Controller

ACTUATOR OVERRIDE JUMPERS :

The IZAC-VAV has two Override jumpers. These jumpers are normally plugged in and they are tied to Input No. 7 of the Controller. The purpose of these jumpers are to enable or disable the programs that are controlling the Main (Outputs 1 & 2) and Auxiliary (Outputs 3 & 4) Actuators .

If the Controller is programmed with its Input 7 data values effecting the operation of the Actuator driver outputs , then , removal of either jumper can be detected and identified . Hence , all programs effecting the Actuators can be disabled. In order to do that , the data values that must be used for Input No. 7 are as follows:

NOTE INPUT NO. 7 IS PROGRAMMED FOR 0-10VDC

MAIN JUMPER	AUX. JUMPER	SENSOR - 7 READING	SUGGEST USE DATA RANGE
OUT	OUT	950 +	900 - 1100
OUT	IN	595	550 - 650
IN	OUT	500	450 - 550
IN	IN	375	400 - 0

When both Jumpers are in , the Sensor Input - 7 should read data around 375. This will indicate that both Actuators are in Auto position. If the Main Override jumper is removed , Input-7 will read around 595 (between 550 and 650). If the Aux. Override Jumper is removed while the Main Jumper is in , Input -7 will read around 500 (between 450 to 550). If both jumpers are removed , the Input will read around 950 (between 900 and 1100) .

These 4 unique conditions can enable or disable programs associated with the control of the Main and /or Aux. Actuators. FIG. 5 shows a schematic representation of Main and Aux. Override Jumpers.

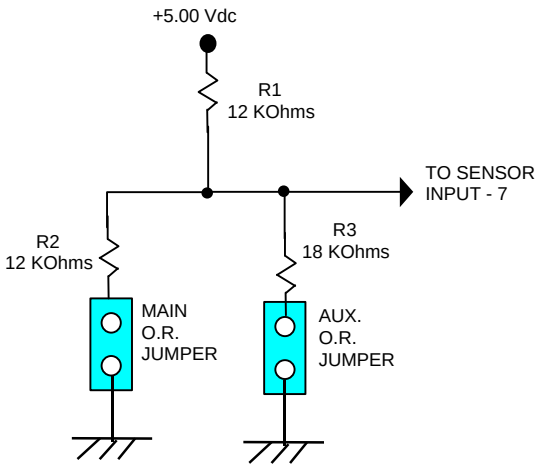


FIG. 5

SCHEMATIC REPRESENTATION OF MAIN AND AUX. OVERRIDE JUMPERS .

CW - CCW MANUAL PUSH BUTTONS :

The IZAC - VAV has two momentary push buttons built in. These buttons are incorporated to enable service and installation technicians to use for convenience .
These push buttons are connected to Input No. 8 of the Controllers . Schematic representation of these Switches are shown in FIG. 6 .

If the Controller is programmed with its INPUT 8 data value effecting the operation of the Actuators, removing the Actuator O.R. Jumper will allow the actuator to be manually moved in the CW or CCW direction as long as a momentary push button is pressed.

The following steps are recommended:

1. Program INPUT 8 as 0-10VDC input.

2. Table below shows typical input data readings when CW or CCW Button is pressed:

PUSH BUTTON CW	CCW	SENSOR -8 READING	SUGGEST USE DATA RANGE
---	---	950 +	900 - 1100
PUSH	---	450	400 - 500
---	PUSH	290	250 - 350
PUSH	PUSH	215	150 - 250

Both Button pushed condition should be ignored.

By using Block Enable Programs , The Controller can be programmed where, if INPUT 7 reads less than 650 and more then 550 , then a Block Enable program may enable a program turning on Outputs 1 and 2 based on Input - 8 data values .

If Input 8 is reading in the range of 400 to 500 then energize on Output 1 to turn Main Actuator CW.

If Input 8 reads between 250 and 350 , Output 2 is turned on to energize the Main Actuator CCW.

Similarly , if Input 7 reads between 450 and 550 , then the Block Enable program may enable a program turning Outputs 3 and 4 based on INPUT 8 data values . If Input 8 is between 500 and 400 , then Output 3 can be energized to rotate the Aux. Actuator CW .

If INPUT 8 reads between 250 and 350 , then Output 4 can be energized , rotating the Aux. Actuator CCW.

All other Input data , not in the range of 250 to 350 and 400 to 500 , can be ignored and as a result . The over-ride jumper can then be removed , leaving the damper at a desired manual angular position .

Similar methods can be applied so that O.R. Jumpers and Momentary Push Buttons can be used for other desired applications.

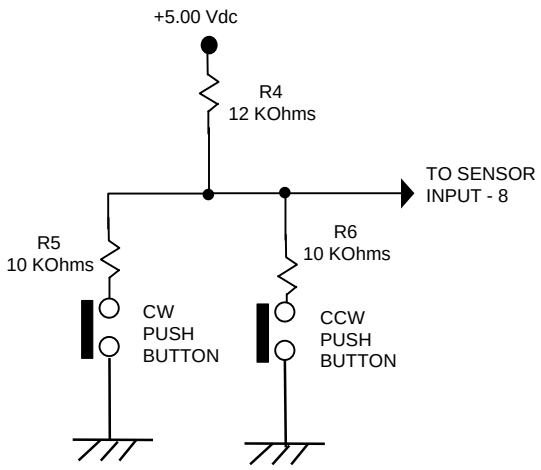


FIG. 6

Schematic Representation Of CW And CCW Momentary Push Button Circuitry.

MAIN AND AUXILARY ACTUATOR OUTPUTS JUMPERS J1-J3 AND J4-J6

The IZAC-VAV has two groups of jumpers that are supplied to make installation and wiring easier . J1-J3 are incorporated for Main and J4-J6 are incorporated for Aux. Actuators (See **FIG-1 I** and **H**) . These jumpers connect 24 VAC input power to the Output Relay contacts , CW , CCW and COMMON screw terminals . The detailed internal wiring is shown in **Fig.11** and **12** .

Note that 24 VAC power is fused (1 Amp Fast Blow fuse). If J1 -J6 are used and if the Actuators have high start up or stall currents , the actuators should be wired externally with additional jumpers J2 (Main actuator) and J5 (Aux. Actuator) . Jumpers J3 and J4 should not be in the circuit , otherwise the fuse will blow and disconnect power to the Controller.

It is important to note that if all jumpers are installed , this will cause for 24 VAC to be shorted and will blow the internal Fuse.

You can contact Customer Service Dept. for further question related to the internal wiring and / or how to wire and control other types of actuators.

INSTALLATION OF THE CONTROLLER TO MAIN DAMPER SHAFT :

The Controller is enclosed in a housing with an LM24 - series BELIMO Actuator . It is important to note that , if the Actuator is mounted on a damper shaft , then the housing should also be fastened to the mounting surface of the duct at the opposite end with the mounting screw. This point is the tab of the enclosure by the terminal block (See **FIG. 7**). As a result , the Actuator will be free to shift as the actuator moves its shaft. This way , maximum torque will be applied to the damper shaft without losing any part of output torque to overcome mounting surface and other imperfections.

For proportional modulation and control of the Dampers Actuator, sizing should be performed according to the damper Manufacturer's specifications and recommendations. Follow Actuator Manufacturer's Installation Instructions for proper mounting and wiring of the Actuator. If you purchased the Actuator directly from Solidyne , installation and wiring instructions are included with the type of Actuator you ordered.

INSTALLATION OF INTERNALLY MOUNTED FS-2 FLOW SENSOR:

For applications and installations that require Flow Sensor and control of Zone temperature along with minimum and/or maximum CFM air flow requirements, Solidyne's FS-2 Flow sensor is recommended . (See **Fig. 8**)

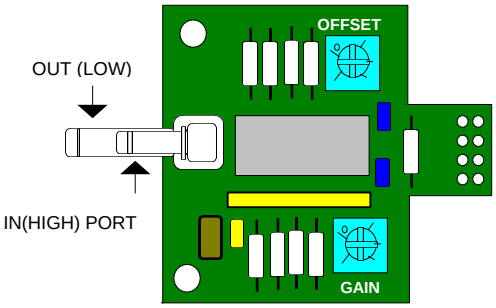


FIG. 8 **FS-2** Flow Sensor

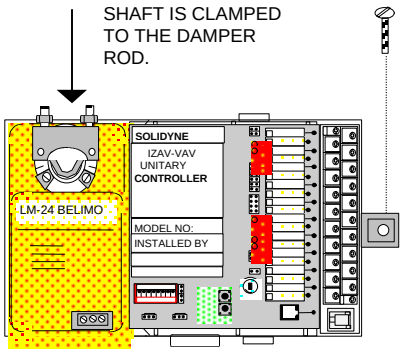


Fig. 7-a

IT MAY BE DESIRABLE TO MOUNT 1/8" HIGH ABOVE THE MOUNTING SURFACE.

MOUNTING HARDWARE IS INCLUDED WITH THE CONTROLLER.

MOUNTING BY ONE SCREW ONLY.

THE ACTUATOR HAS TO SWIVEL FREELY TO APPLY MAX TORQUE TO OUTPUT SHAFT.

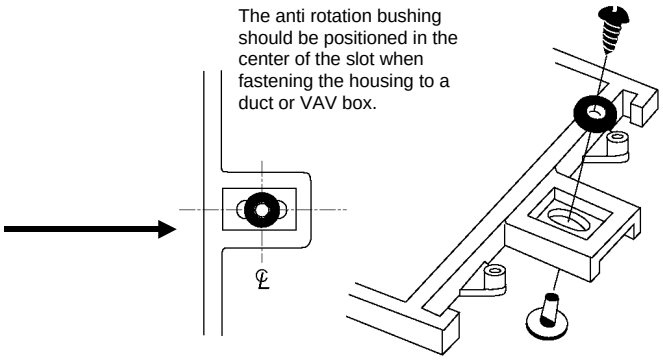
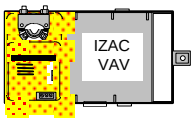


Fig. 7-b

FIG. 7 Mounting of the Controller with Belimo LM-24T series actuator.



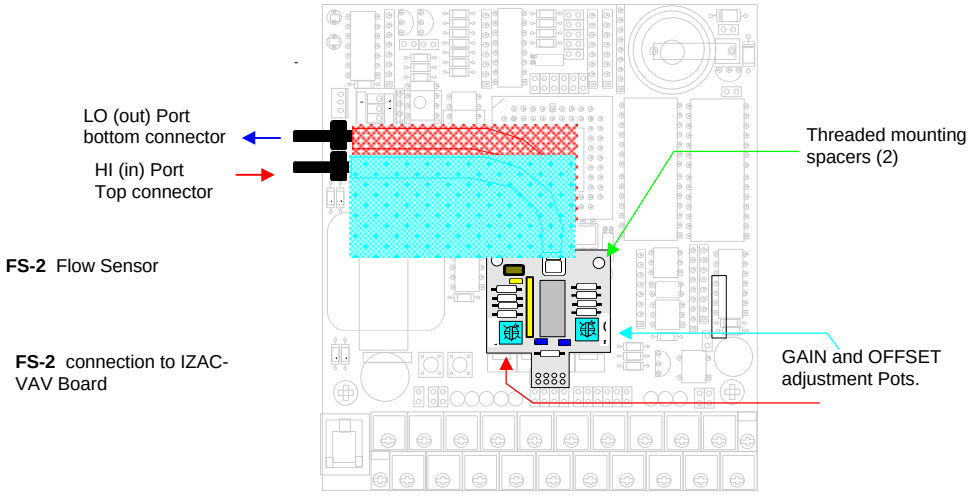
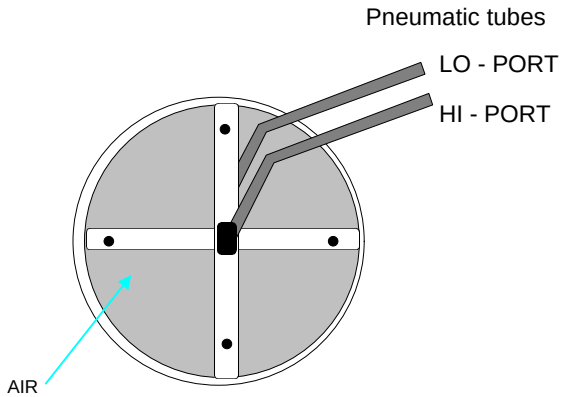


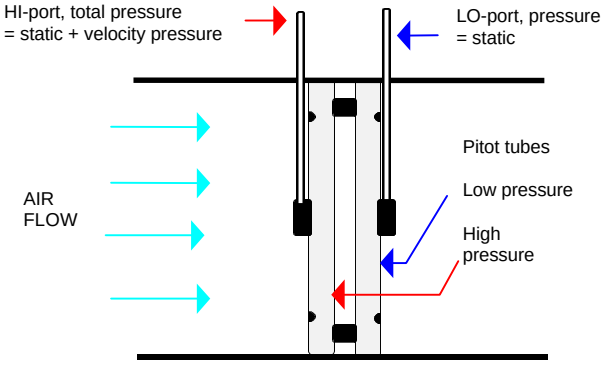
FIG. 9 Mounting of **FS-2** Flow Sensor inside the IZAC - VAV Controller.

FS-2 the Flow sensor is supplied with all the hardware necessary to mount it inside the VAV Controller and to attach its HI and LO ports to Averaging type Pitot tubes. Pitot Tubes are typically built into the VAV boxes. Most Pitot tubes are manufactured in a cross-sectional fashion where one tube faces in the direction of the air flow - called HI port and the second tube facing opposite direction, LO port. **FIG. 10 a** and **b** show typical round duct Pitot Tube cross sectional construction .

Differential pressure is velocity pressure.

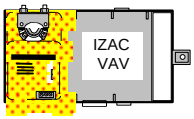


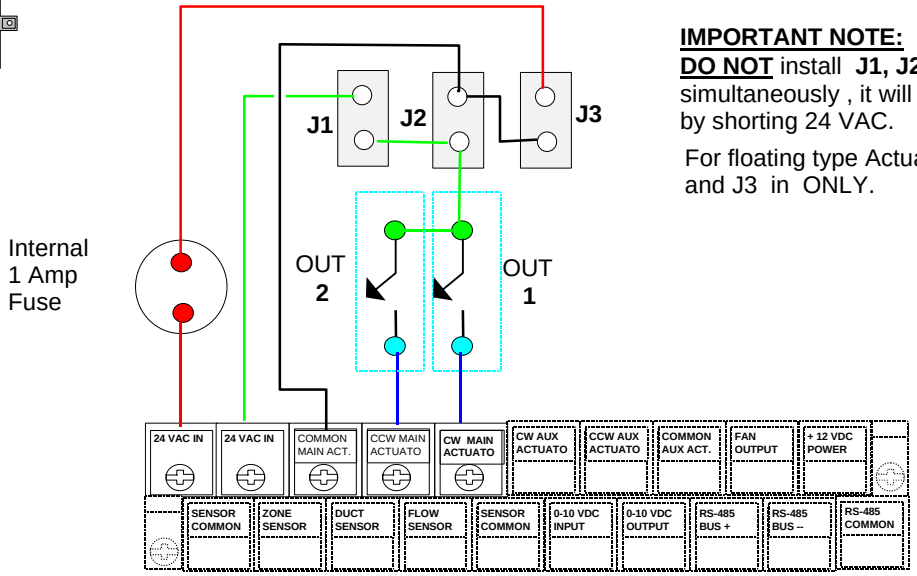
10 a. Cross section of a duct and Pitot Tubes located inside the duct .



10 b. Cross section of the duct and view of Pitot Tubes for measuring air velocity.

FIG. 10 Mechanical construction of Pitot Tubes in a circular duct to measure air velocity .



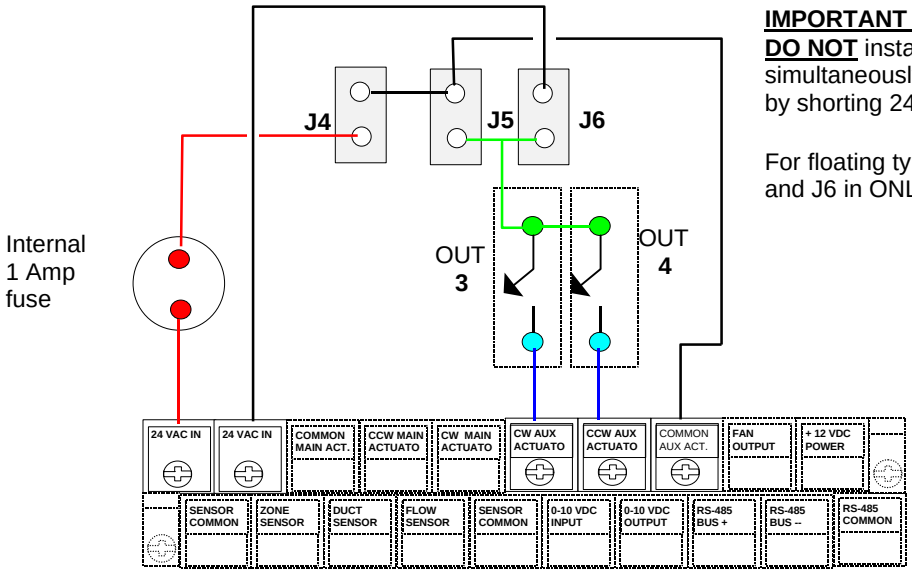


IMPORTANT NOTE:
DO NOT install **J1, J2, J3** simultaneously , it will blow the fuse by shorting 24 VAC.

For floating type Actuators plug J1 and J3 in ONLY.

FIG. 11

Internal wiring of output 1, output 2 , 24 VAC , J1 , J2 , J3
To terminal block terminals " Common Main Act." ,
"CW Main Act. " And " CCW Main Act. "

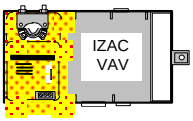


IMPORTANT NOTE:
DO NOT install **J4,J5,J6** simultaneously , it will blow the fuse by shorting 24 VAC.

For floating type Actuators plug J4 and J6 in ONLY.

FIG. 12

Internal wiring of output 3, output 4 , 24 VAC , J4 , J5 , J6
To terminal block terminals " Common Aux. Act." ,
"CW Aux. Act. " And " CCW Aux. Act. "



INSTALLATION :

1. **Please read the Instructions carefully.**

2. The use of Solidyne specified Input/output modules and wiring guidelines are strongly recommended. Otherwise , there can be problems associated with the reliable operation and communication of the network .

3. The Installation should be done by trained and experienced technicians. All standard precautions for handling electronic PCBs should be taken.

4. Prior to applying power to the Controllers check :
- All wiring for proper connection and termination.
- Node ID and baud rate settings.
- Always check power input 24 VAC voltage prior to connecting it to the Controllers for correct voltage.

5. Make sure that Controllers are powered with Power On Jumper is in place (See **FIG. 1 D**).

SELECTING MOUNTING LOCATION :

The controllers should be installed indoors in a location that is not exposed to water leaks , condensation , extreme heat , excessive dust , vibration or high voltage wiring . Do not install the Controller next to or on enclosures that house electric heat coils. Excessive heat may effect proper operation of the Controllers .

TREAT ELECTRONIC CONTROLLERS AS DELICATE INSTRUMENTS AND HANDLE THEM WITH CAUTION AND CARE.

If possible , use mounting locations with the easiest service access to the controllers.

The IZAC - VAV enclosure is designed for direct mounting to air duct surfaces . However , local fire and other ordinances may require for it to be further enclosed in an electrical boxes. You should be knowledgeable with local codes , installation requirements and regulations and perform installations accordingly.

Note : It is highly recommended to connect Sensor Common to a Good chassis Ground for better Electrical noise immunity .

WIRING :

IZAC-VAV Controller has a removable 20 pin terminal block . This terminal block is fastened to its socket located on the Controller .
Two end screws should be used to secure the terminal strip once it is properly seated into its socket. (See **FIG. 13**) Never use excessive force , you may bend or break the male pins on the socket. Tighten the end screws until they come to stop , no need to make it very tight .

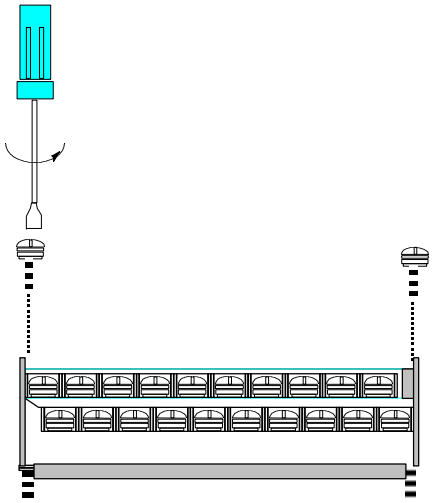


FIG. 13

Be careful not to wire 24 VAC to sensor and network terminals . Make sure that jumpers J1 -6 are properly installed for the type of actuator is used. Never have all J1 -6 jumpers installed at the same time . This will short 24 VAC and blow the internal 1 Amp fuse (see page 12).

If flow sensor is used , make sure that it is properly inserted to its mating connector.

If the DU-1 Display Wall Stat is used , make sure that you either a prefabricated 6 Conductor RJ-11 cable or high quality professional crimping tool to crimp the RJ-11 male plugs to the end of the cables with correct polarity.

Always use wires with insulation rating of 300V or higher , preferably stranded wires . Do not use existing , old unknown wires , they will always be a potential source of trouble. **Always use high quality hardware for wiring .**

FOLLOW ALL THE LOCAL REQUIREMENTS AND CODES FOR WIRING, TERMINATION AND INSTALLATION. DO NOT MIX CLASS - I AND CLASS - II WIRING .

IMPORTANT NOTE: **Jumpers In : J1,3,4.6** **Jumpers Out : J2,4**

IZAC -- VAV CONTROLLER REMOVABLE WIRING TERMINAL BLOCK

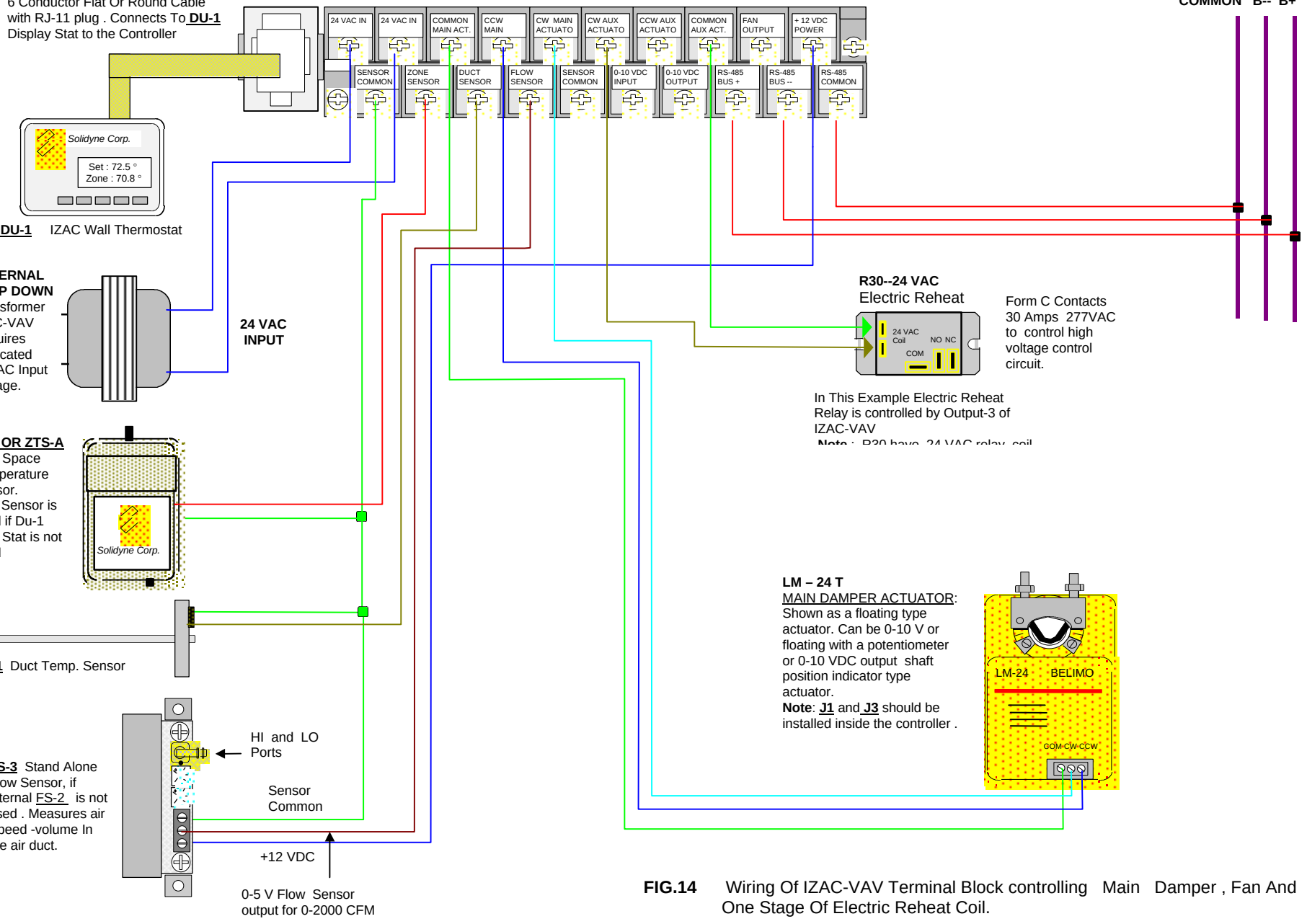


FIG.14 Wiring Of IZAC-VAV Terminal Block controlling Main Damper , Fan And One Stage Of Electric Reheat Coil.

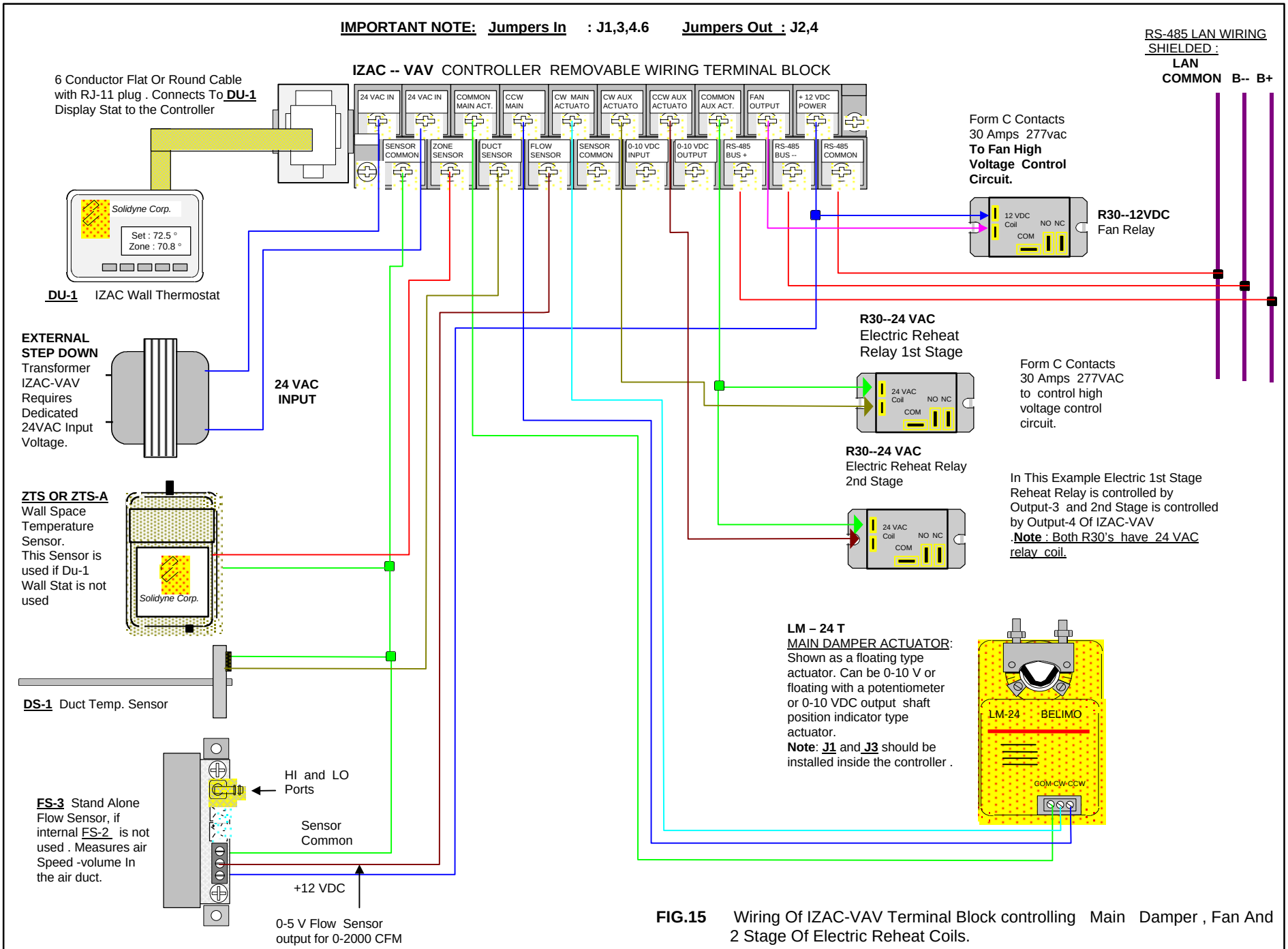


FIG.15 Wiring Of IZAC-VAV Terminal Block controlling Main Damper , Fan And 2 Stage Of Electric Reheat Coils.

Node I.D. Dip Switch Settings (IZAC-VAV)

(No Jumpers)

Node	Switches *Closed*							Node	Switches *Closed*							Node	Switches *Closed*							Node	Switches *Closed*						
1							1	51			6	5			2	1	101		7	6			3		1	151	8			5		3	2	1	201	8	7			4			1
2						2		52			6	5		3			102		7	6			3	2		152	8			5	4				202	8	7			4		2	
3						2	1	53			6	5		3		1	103		7	6			3	2	1	153	8			5	4			1	203	8	7			4		2	1
4					3			54			6	5		3	2		104		7	6		4				154	8			5	4		2		204	8	7			4	3		
5					3		1	55			6	5		3	2	1	105		7	6		4			1	155	8			5	4		2	1	205	8	7			4	3		1
6					3	2		56			6	5	4				106		7	6		4		2		156	8			5	4	3			206	8	7			4	3	2	
7					3	2	1	57			6	5	4			1	107		7	6		4		2	1	157	8			5	4	3		1	207	8	7			4	3	2	1
8				4				58			6	5	4		2		108		7	6		4	3			158	8			5	4	3	2		208	8	7		5				
9				4			1	59			6	5	4		2	1	109		7	6		4	3		1	159	8			5	4	3	2	1	209	8	7		5				1
10				4		2		60			6	5	4	3			110		7	6		4	3	2		160	8		6						210	8	7		5			2	
11				4		2	1	61			6	5	4	3		1	111		7	6		4	3	2	1	161	8		6					1	211	8	7		5			2	1
12				4	3			62			6	5	4	3	2		112		7	6	5					162	8		6			2			212	8	7		5		3		
13				4	3		1	63			6	5	4	3	2	1	113		7	6	5				1	163	8		6			2	1		213	8	7		5		3		1
14				4	3	2		64	7								114		7	6	5			2		164	8		6			3			214	8	7		5		3	2	
15				4	3	2	1	65	7							1	115		7	6	5			2	1	165	8		6			3		1	215	8	7		5		3	2	1
16			5					66	7						2		116		7	6	5		3			166	8		6			3	2		216	8	7		5	4			
17			5				1	67	7						2	1	117		7	6	5		3		1	167	8		6			3	2	1	217	8	7		5	4			1
18			5			2		68	7					3			118		7	6	5		3	2		168	8		6		4				218	8	7		5	4		2	
19			5			2	1	69	7					3		1	119		7	6	5		3	2	1	169	8		6		4			1	219	8	7		5	4		2	1
20			5		3			70	7					3	2		120		7	6	5	4				170	8		6		4		2		220	8	7		5	4	3		
21			5		3		1	71	7					3	2	1	121		7	6	5	4			1	171	8		6		4		2	1	221	8	7		5	4	3		1
22			5		3	2		72	7				4				122		7	6	5	4		2		172	8		6		4	3			222	8	7		5	4	3	2	
23			5		3	2	1	73	7				4			1	123		7	6	5	4		2	1	173	8		6		4	3		1	223	8	7		5	4	3	2	1
24			5	4				74	7				4		2		124		7	6	5	4	3			174	8		6		4	3	2		224	8	7	6					
25			5	4			1	75	7				4		2	1	125		7	6	5	4	3		1	175	8		6		4	3	2	1	225	8	7	6					1
26			5	4		2		76	7				4	3			126		7	6	5	4	3	2		176	8		6	5					226	8	7	6				2	
27			5	4		2	1	77	7				4	3		1	127		7	6	5	4	3	2	1	177	8		6	5				1	227	8	7	6				2	1
28			5	4	3			78	7				4	3	2		128	8								178	8		6	5			2		228	8	7	6			3		
29			5	4	3		1	79	7				4	3	2	1	129	8							1	179	8		6	5			2	1	229	8	7	6			3		1
30			5	4	3	2		80	7		5						130	8					2			180	8		6	5		3			230	8	7	6			3	2	
31			5	4	3	2	1	81	7		5					1	131	8					2	1		181	8		6	5		3		1	231	8	7	6			3	2	1
32		6						82	7		5			2			132	8				3				182	8		6	5		3	2		232	8	7	6		4			
33		6					1	83	7		5			2	1		133	8				3		1		183	8		6	5		3	2	1	233	8	7	6		4			1
34		6				2		84	7		5		3				134	8				3	2			184	8		6	5	4				234	8	7	6		4		2	
35		6				2	1	85	7		5		3			1	135	8				3	2	1		185	8		6	5	4			1	235	8	7	6		4		2	1
36		6			3			86	7		5		3	2			136	8				4				186	8		6	5	4		2		236	8	7	6		4	3		
37		6			3		1	87	7		5		3	2		1	137	8				4			1	187	8		6	5	4		2	1	237	8	7	6		4	3		1
38		6			3	2		88	7		5	4					138	8				4		2		188	8		6	5	4	3			238	8	7	6		4	3	2	
39		6			3	2	1	89	7		5	4				1	139	8				4		2	1	189	8		6	5	4	3		1	239	8	7	6		4	3	2	1
40		6		4				90	7		5	4		2			140	8				4	3			190	8		6	5	4	3	2		240	8	7	6	5				
41		6		4			1	91	7		5	4		2		1	141	8				4	3		1	191	8		6	5	4	3	2	1	241	8	7	6	5				1
42		6		4		2		92	7		5	4	3				142	8				4	3	2		192	8	7							242	8	7	6	5			2	
43		6		4		2	1	93	7		5	4	3			1	143	8				4	3	2	1	193	8	7						1	243	8	7	6	5			2	1
44		6		4	3			94	7		5	4	3	2			144	8			5					194	8	7					2		244	8	7	6	5		3		
45		6		4	3		1	95	7		5	4	3	2		1	145	8			5				1	195	8	7					2	1	245	8	7	6	5		3		1
46		6		4	3	2		96	7	6							146	8			5			2		196	8	7				3			246	8	7	6	5		3	2	
47		6		4	3	2	1	97	7	6						1	147	8			5			2	1	197	8	7				3		1	247	8	7	6	5		3	2	1
48		6	5					98	7	6					2		148	8			5		3			198	8	7				3	2		248	8	7	6	5	4			
49		6	5				1	99	7	6					2	1	149	8			5		3		1	199	8	7				3	2	1	249	8	7	6	5	4			1
50		6	5			2		100	7	6				3			150	8			5		3	2		200	8	7				4			250	8	7	6	5	4		2	
For larger networks, contact Technical Support for File: *1000 VAV Node DipSwitch Table.xls*																																	251	8	7	6	5	4		2	1