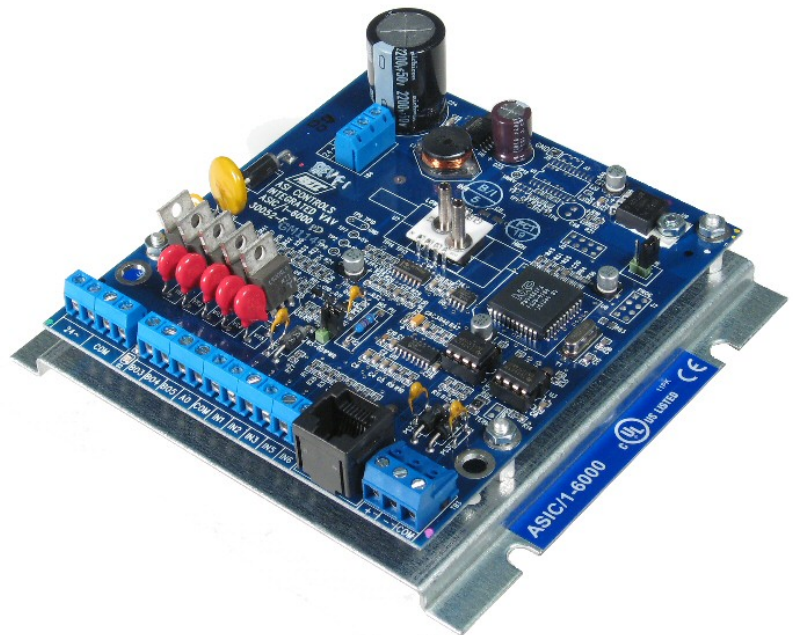


Installation Manual

By ASI Controls



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June 2012

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ASIC/1-6000 Introduction

ASIC/1-6000

The ASIC/1-6000 is an application specific networked digital controller with an integral damper actuator for control of pressure independent or pressure dependent Variable Air Volume (VAV), and Fan-Powered VAV terminal units.

The ASIC/1-6000 comes in 2 different packages: with integrated actuator, or mounted on a metal base [-MB].

The ASIC/1-6000 comes pressure independent with an airflow sensor, or pressure dependent [-PD]with no airflow sensor.

Model	Package	Airflow Sensor
ASIC/1-6000	Integral Actuator	Yes, Pressure Independent
ASIC/1-6000-PD	Integral Actuator	No, Pressure Dependent
ASIC/1-6000-MB	Metal Base	Yes, Pressure Independent
ASIC/1-6000-MB-PD	Metal Base	No, Pressure Dependent

Connect the 24 Vac power. The Fan and Electric or Hot Water Heat are connected as required.

The ASI WS-0xx wall sensor is connected using the standard ASI SCP-xxx cable. RS-485 communication is connected to the “+” and “-” positions on the T3 terminal block. If shielded cable is used, the shield is connected at only one end to the terminal marked COM. The controller is given a unique address with ASI Expert software.

The controller contains the most frequently used VAV applications and has personalities for cooling only, and cooling with hot water or electric reheat, and constant or intermittent fan.

Each ASIC/1 has a 24 hour, 8 day software clock. The clock in each controller automatically sets the appropriate operating parameters based on the schedules programmed into non-volatile memory.

To use scheduled operation, the controllers must be synchronized regularly by time broadcast on the communication line by an ASIC/2 or ASIC/3 controller or other device. Two-way communications allows information to be transmitted throughout the control system.

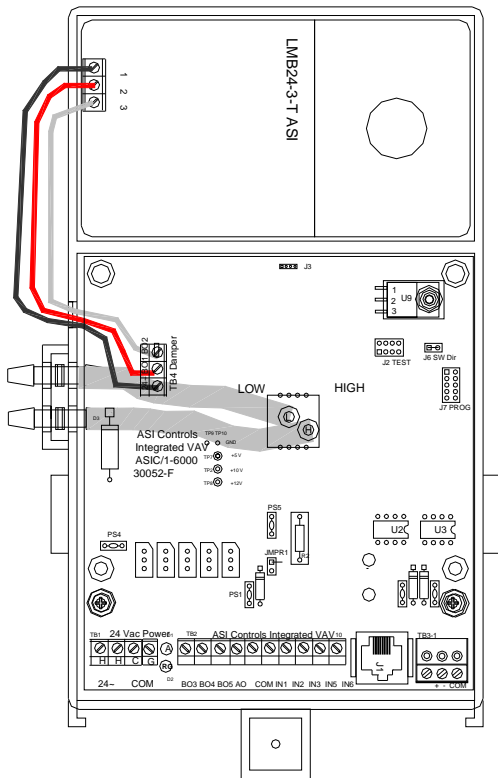
AV-003 Airflow Sensor

Starting in 2012 the ASIC/1-6000 controller will use the new AV-003 Airflow Sensor. It is a pressure device and **does not require an airflow filter**.

The ASIC/1-6000 controller comes connected to the high pressure (upstream) side of the airflow sensor, and to the external tubing barb with 0.125" ID polyurethane tubing. The low pressure (downstream) side of the airflow sensor is connected to the external tubing barb with 0.125" ID polyurethane tubing.

The barbed couplings are used to connect to the 0.25" FR Polyethylene plenum rated tubing that runs to the airflow measurement pickup in the duct.

Note: The Input 4 must be configured for the new airflow Sensor Configuration, "Primary Airflow (SDP) CFM" "Sensor Differential Pressure (SDP)"



Field Calibration

The AV-003 may need field calibration after installation, once the controller is mounted and powered up for at least 60 seconds.

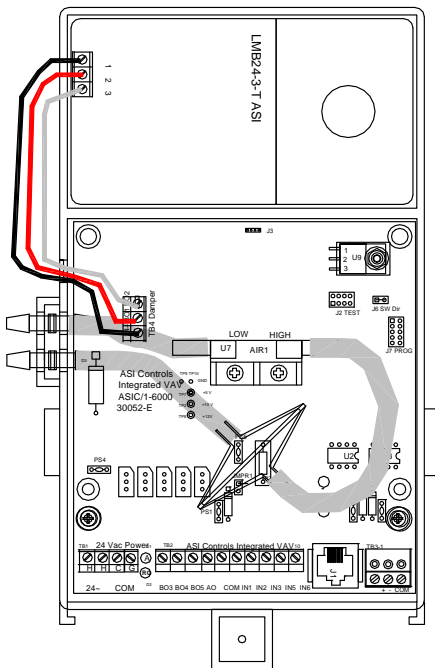
Disconnect the tubes from the sensor. Go to the Primary Airflow Screen and click on "Calib 1st AF 0.0"wc". Right-click "Refresh Static Data" to see the new value.

Alternately with the Air handler Fan Off, Drive the damper closed to ensure no airflow. Go to the Primary Airflow Screen and click on "Calib 1st AF 0.0"wc". Right-click "Refresh Static Data" to see the new value.

AV-002 Airflow Sensor

Controllers using the AV-002 Airflow Sensor which is a flow thru device, requires a low pressure drop filter on the High side of the sensor. and a built-in low pressure drop Airflow filter. The ASIC/1-6000 controller comes mounted with an AF-001 airflow filter connected to the high pressure (upstream) side of the airflow sensor, and to the external tubing barb with 0.25" OD polyurethane tubing. The low pressure (downstream) side of the airflow sensor is connected to the external tubing barb with 0.25" OD polyurethane tubing.

The barbed couplings are used to connect to the 0.25" FR Polyethylene plenum rated tubing that runs to the airflow measurement pickup in the duct.



Dimensions

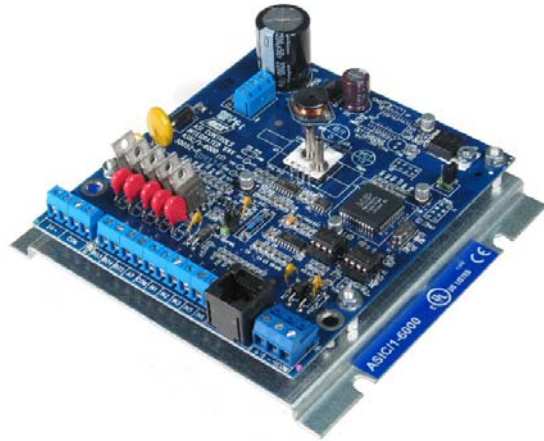
The overall dimensions of the ASIC/1-6000 [-PD] controller with enclosure are 4.84" x 8.86" x 2.58" (123 mm x 225 mm x 66 mm) The controller including the controller and damper motor weighs 1.66 lbm, (0.75 kg) The controller is mounted in a Fire Rated case.

ASIC/1-6000-MB Metal Base

The ASIC/1-6000-MB comes mounted on a metal base. The ASIC/1-6000-MB has an airflow sensor and requires an airflow filter and tubing kit.



AV-002 Airflow Sensor



AV-003 Airflow Sensor

For the AV-003, the airflow tubing kit, ATK-30, has 10 feet of 0.125 ID elastomeric tubing required for a tight seal on the airflow sensor and filter and 20 barbed fittings. The barbed fittings are used to connect to the 0.25" FR Polyethylene plenum rated tubing that runs to the airflow measurement pickup in the duct.

For the AV-002, the airflow tubing kit, ATK-10, has 10 feet of 0.25 "OD elastomeric tubing required for a tight seal on the airflow sensor and filter and 20 barbed fittings. The barbed fittings are used to connect to the 0.25" FR Polyethylene plenum rated tubing that runs to the airflow measurement pickup in the duct.

The ASIC/1-6000-MB-PD is designed for pressure dependent VAV and does not have an airflow sensor.

The ASIC/1-6000-FC is designed for use with simple 2-pipe and 4-pipe fan coil personalities and does not have an airflow sensor.

Metal Base Dimensions

The overall dimensions of the ASIC/1-6000-MB [-PD]controller with metal base are 5.50" x 5.2" x 1.80" (140 mm x 1321 mm x 46 mm). The controller including the controller and base 0.74 lbm (0.34 kg). The controller is mounted on a metal base.

Agency Approval



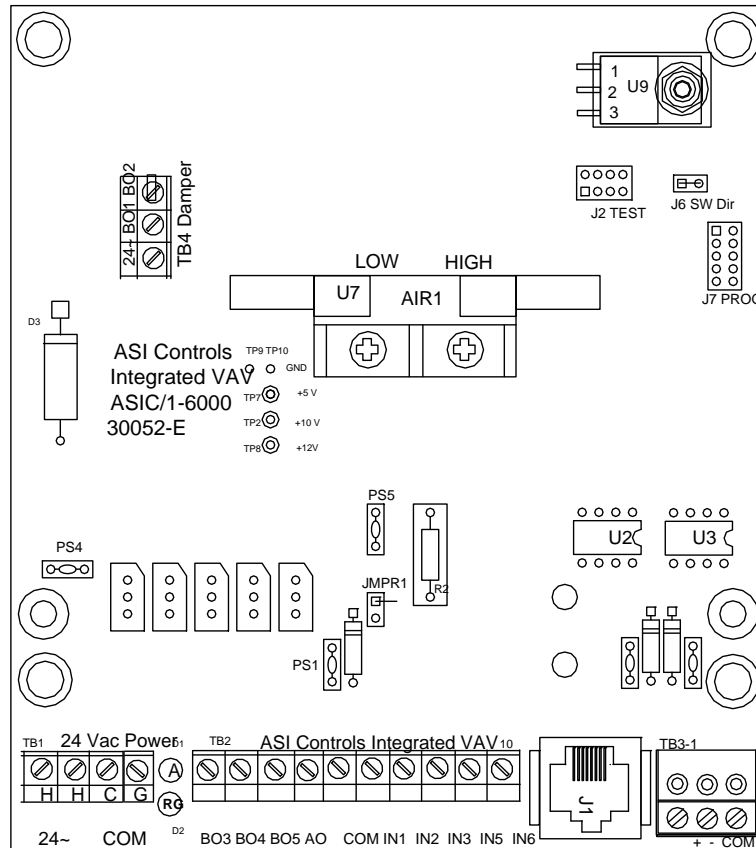
The ASIC/1-6000-MB and ASIC/1-6000-MB-PD are UL Listed.

UL-916 Open Energy Management Equipment File E123287 (PAXZ) Class 2 Device
Canada: C22.2 No. 205-M1983



ASI Controls has a Declaration of Conformity, CE, for our Commercial HVAC Controls Models: : ASIC/2-8540, ASIC/2-7540, ASIC/1-6000-MB, and ASIC/1-6000-MB-PD. Meets CE requirements. EN 61326 Class A, EN 61000-3-2 Class A and EN 61000-3-3. Complies with FCC Part 15 (CISPR 22) Class A

ASIC/1-6000 Hardware Features



The ASIC/1-6000 has a number of unique features.

- J6- Jumper can be used to reverse the direction of the actuator rotation.
- RS-485 communication is protected with self resetting polyswitches. The RS-485 chips, U2 and U3 are socketed for easy replacement.
- Input 1 and Input 6 have fixed 3.32k pull-up resistors. Input conversions for 3 kohm or 10 kohm thermistors are available.
- Input 2 and Input 3 have fixed 10 kohm pull-up resistors
- JUMPER1 and Polyswitch , PS5, on Input 2 allows easy powering of the WS-051 Digital Display Wall Sensor.
- Input 4 is dedicated for Airflow AV-002 or AV-003. Only Single Duct and Fan powered personalities are supported. The Pressure Dependent version does not have an airflow sensor.
- Input 5 has a socketed, 3.32 kohm pull-up resistor, R2, for flexible configuration.
- Screw terminals for all inputs except Input 4.
- One Analog output, 0-10 Vdc @20 mA, to control additional heating or cooling valve.
- 2 Triac Outputs BO1,BO2 dedicated for Damper control.
- 3 Triac Outputs BO3, BO4, BO5 for Fan, Electric or Hot Water Heat.
- Self-resetting 0.5 A Polyswitch for 24 Vac power protection. Also protects damper motor.

Other Information

Grounding

ASIC/1-6000's are grounded devices and must be solidly connected to the building electrical ground. The controller should be grounded by attaching #16 gauge wire from 24 Vac Common, TB1-4 to the grounded sheet metal of the VAV box being controlled.

WARNING: Failure to properly ground the controller may cause controller malfunction.

This applies to all versions of the controller including ASIC/1-6000 and ASIC/1-6000 PD (Pressure Dependent); and the Metal Base versions ASIC/1-6000-MB and ASIC/1-6000-MB-PD. See Technical Note 34, ASIC/1-6000 Controller Grounding, for further information.

Storage

Store the controllers in a clean, cool, dry environment where the temperature remains between -35 degrees F (-35C) and +180 degrees F (80 C); and the humidity remains between 5% and 95% relative humidity (non-condensing).

Environmental Considerations

The ASIC/1-6000 controller must be installed where the temperature remains between +35 degrees F (2 C) and 113 degrees F (45 C);

The controller should be in a non-condensing environment. The maximum relative humidity is 80% up to 31 C (88 F) decreasing to 50% at 40 C (104 F).

Altitude up to 2000 m (6560 ft).

IEC 664, Pollution Degree 1, only dry, nonconductive pollution occurs.

Main supply voltage not to exceed + 10% of nominal voltage.

The controller enclosure is designed to be installed inside another enclosure that provides adequate protection from the environment.

Note: if the equipment is used in a manner not specified by ASI Controls, the protection provided by the equipment may be impaired.

FCC Requirements

The ASIC/1-6000 controller, when properly installed and grounded, meets the limits for Class A computing devices as described in Part 15, Subpart J of the FCC rules.

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with this manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of FCC Rules. These rules are designed to provide reasonable protection against such interference when operated in a commercial environment.

Product History

ASIC/1-6000 Hardware Changes

There have been several revisions to the PCB to fix problems related to the triac and microprocessor characteristics.

ASIC/1-6000 30052-G AV-003 (forthcoming 2012)

2012-02-xx New production with 30052-G to accommodate AV-002 or AV-003 airflow sensors.

ASIC/1-6000 30052-E P89V662

2009-07-07 New production with 30052-E,

Fixes Lockup problem with P89V662FA processor. Add R58-R61 100 ohm, Add R62 120 ohm, Add JMPR2

ASIC/1-6000 30052-D P89V662 Prototypes only

Alt-U6 15184 IC,uCONTROLLER, 8 BIT, P89V662, 20MHz, 44 PIN, PLCC
Phillips P89V662FA

Fixes Lockup problem with P89V662FA processor. Add R58-R61 100 ohm, Add R62 120 ohm, Add JMPR2. Adds mounting holes for metal base.

TB4 was improperly rotated.

ASIC/1-6000 30052-C P89C668

2008-06 Older series processor, P89C668, did not have the sensitivity for locking up when triacs went off.

Alt-U6 15192 IC,uCONTROLLER, 8 BIT, P89C668, 20MHz, 44 PIN, PLCC
Phillips P89C668-HBA

ASIC/1-6000 30052-C P89V662 Rework

2007-11 Original processor P89C662 goes end of life.

New Processor P89V662, has sensitivity for locking up when triacs went off.

Alt-U6 15184 IC,uCONTROLLER, 8 BIT, P89V662, 20MHz, 44 PIN, PLCC
Phillips P89V662FA

Rework to fix lockup problem with P89V662FA Chip. Add R58-R61 100 ohm

ASIC/1-6000 30052-C P89C662

2006-05-08 New PCB30052-C, Fixes triac driver problem.

Change R17,18,20,22,24 18188 1.24kohm Add Pullups R41, R52, R53, R54, R56
pn18184 3.0 kohm

ASIC/1-6000 30052-B Reworked Pull-up

Adds pull-up for triac driver. Add Pullups R41, R52, R53, R54, R56 pn18184 3.0 kohm

ASIC/1-6000 30052-B

2005-03-01 PCB 30052-B

2005-07-22 ASIC/1-6000 FW600a Rev 1.0 Initial Release

U6 15154 IC,uCONTROLLER, 8 BIT, P89C662, 20MHz, 44 PIN, PLCC
Phillips P89C662-HBA

Had sensitivity to triacs not going off fully.

ASIC/1-6000 Firmware Releases

Please consult the read me file on the ASI Integrator Center web site at <http://www.asicontrols.com/integrator> for the latest product release information and upgrades.

ASIC/1-6000 FW600a Rev 3.2 2012-03-29 ASI PN 70024-08

- o Adds temperature compensation for AV-003 SM5852-950 Airflow Sensor calibration
- o Masks Primary Airflow Converted value below 200 fpm.
- o Adds 4 count offset to Airflow calibration

ASIC/1-6000 FW600a Rev 3.0a 2012-02-06 Preliminary

- o Supports Airflow Sensor AV-003 SM5852-950 Airflow Sensor Input 4 Conversion
 - 176 = Primary Airflow, FPM (SDP) (feet/min)
 - 178 = Primary Airflow, CFM (SDP) (cubic feet/min)
 - 180 = Primary Airflow, LPS (SDP) (liter/sec)
 - 182 = Primary Airflow, CMH (SDP) (cubic meter/hour)
- o New braindump for Min AF SP = 8 counts (200 fpm) Airflow Sensor AV-003 CFM (SDP)

ASIC/1-6000 FW600a Rev 2.2b 2011-07-18

- o Adds feature to reinitialize HW Valve by driving it fully closed once every 24 hours, if not synchronized and if HW Reset Enable T6E4bit7 is set.

ASIC/1-6000 FW600a Rev 2.1b 2010-05-27

- o Improves Single Setpoint feature so that pressing Up, Down, or Mode allows change and displays the average of the OCC HTG and CLG Temperature Setpoints. Single Setpoint Enable and User Adjust Enable must be set to enable setpoint change. Up or down arrows change the Occupied Cooling Temperature Setpoint within the cooling maximum and minimum limits. Occupied Heating Temperature Setpoint is Occupied Cooling Temperature Setpoint minus the Single Setpoint Deadband. The new setpoints are saved on timeout (15s) or pressing the Mode button.
- o Adds Occupied/Unoccupied feature. If Occupied Unoccupied Enable (T6E4 bit 5) is set, the O/R button toggles between OCC and UNOC. The Afterhours and Occupancy Sensor features have higher priority and should be disabled. In Scheduled Occupied or Morning Ready State pressing the O/R button overrides to Unoccupied. In Scheduled Unoccupied or Night Setback State, pressing the O/R button overrides to Occupied. Pressing the O/R button a second time clears the override and returns to the Scheduled State. The AUTO icon is visible when in Scheduled State and not visible if State is overridden.

ASIC/1-6000 FW600a Rev 2.0x 2009-05-19

- o WS-051 Single Setpoint change now displays average of HTG/CLG Temp SP and displays HTG, CLG and Setpoint Icons.
Note: User Adjust Enable must be set to change setpoint.
- o Fixes bug in changeover in CLG mode that would not allow it to go into DB. This condition is probably not seen in the field.
- o Now keeps current HTG calculation going into changeover. No longer zeros calculation when leaving changeover.

- o Fixes problem with EHT2 and EHT3 not going off in changeover heating.

ASIC/1-6000 FW600a Rev 1.9d 2009-04-13

- o Modified the Control Mode determination so that the controller:
Enters Cooling from Deadband when the Zone Temperature is greater than the Active CLG Temp SP
Enters Deadband from Cooling when the Zone Temperature is less than the Active CLG Temp SP by 1 degree
(0.5 degree if Half Degree Enable is Yes).
Enters Heating from Deadband when the Zone Temperature is less than the Active HTG Temp SP
Enters Deadband from Heating when the Zone Temperature is greater than the Active HTG Temp SP by 1 degree
(0.5 degree if Half Degree Enable is Yes).
- o Modified IFan Heating Only feature for intermittent fan personalities so that if IFan Heating Only Enable(T6,3,bit 7) is yes, the Fan comes On in the Heating Mode when the Heating Calc is Not zero.
In the Cooling and Deadband modes the Fan is Off.
- o If Primary AF SP = 0 then drive primary damper closed!
- o When the Primary Airflow < Electric Heat Minimum Airflow Setpoint (T3,8), then Electric Heating is turned off.
Now the Heating Analog Output is also set to Minimum.

ASIC/1-6000 FW600a Rev 1.0 2005-07-22 ASI PN 70024-01

- o Initial Release
- 7

About This Document

This ASIC/1-6000 Installation Manual, DOC-1639, was produced using *Doc-To-Help*[®], by Component One, LCC. This manual and Windows™ help system was last revised on 2012-06-20. ASI Controls is always working to improve our products. Should you have any questions, or suggestions that would help our products better meet your needs, or that would help us serve you better, please call, write, or e-mail to:

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ASIC/1-6000 Wiring

General Wiring Considerations

This section describes controller input, output and power wiring details. There should not be any power applied to the controller when wiring it. Connecting or disconnecting wires to or from the controller while power is applied can cause controller malfunction and potentially damage the equipment to which it is connected.

General Concerns

Route input, output, power, and communication wire neatly inside the enclosure. Avoid looping excess wire. Use tie-wraps to dress and bundle loose groups of wires.

CAUTION: Do NOT bundle communication and input wiring with output and power wiring. It can disrupt communication and interfere with controller input measurements.

The controller should be mounted outside of high voltage compartments and away from other sources of EMI. Common sources of EMI are high voltage devices (greater than 24 Vac) such as contactors, transformers, motors, light ballasts, high voltage wires and variable speed motors, and elevator drives.

The power supply wires and the output wires connected to the ASIC/1-6000 controller should be routed separately from the communication and input wiring. ASIC/1 wiring must not be routed through conduit containing high voltage wiring.

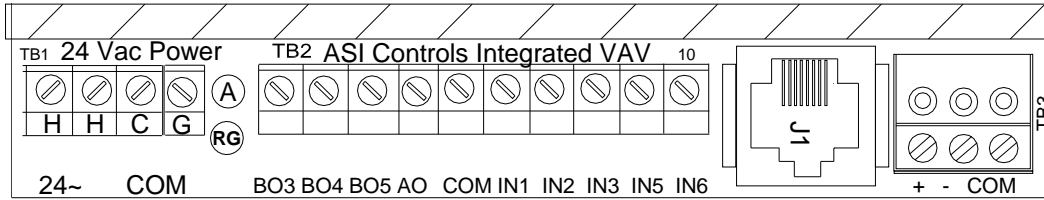
Make sure all connections to the controller are mechanically tight. Intermittent contact of connections can cause excessive electrical noise. Always route controller wiring separate from high voltage wiring to reduce the possibility of excessive EMI noise.

CAUTION: As with any electronic circuitry, ASIC/1-6000 is susceptible to damage caused by static discharge. The ASIC/1-6000 is self-contained in its enclosure and handling of the circuit board is not typically needed. However, if handling of the boards is undertaken, discharge static electricity by wearing an anti-static wrist band and/or grounding yourself to a well grounded metal object before touching any ASIC/1-6000 electronic components.

Connections

All input output and power connections to the controller are by means of screw terminals connectors, TB1 and TB2, at the edge of the board, or by means of the RJ-45 connector to the wall sensor.

Communications are via screw terminals connector TB3 at the edge of the board,



24 Vac Power

The 24 Vac power connections are located on the two screw terminals marked 24 Vac HOT and the two screw terminals, 24 Vac COM which are also board ground.

Triac Outputs

Triac outputs 1 through 6 are connected to the screw terminals marked BO1 through BO6. The specific meaning for each output depends on the output mask assignments in the controller's configuration.

NOTE: Triacs switch 24 Vac to Common.

Control Power and Grounding

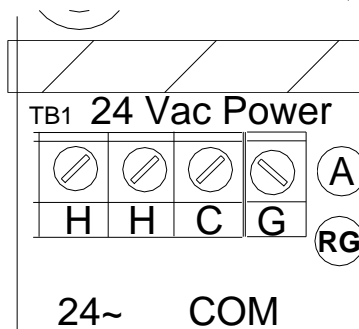
Primary Power

The power and ground terminations should be made to the screw terminals 24 Vac HOT and 24 Vac COM using wire no larger than 16 gauge and no smaller than 20 gauge stranded or solid copper wire. When making terminations with stranded wire, be particularly careful that all strands of wire are terminated inside the connector. Loose strands can short out power.

Power wiring should be routed to:

HOT, 24 Vac hot

COM, 24 Vac common, (board ground)



Control power supply specifications:

Supply Voltage:

24 Vac +/- 15%, 50/60 Hz

Power Consumption:

6 VA plus other loads

Under Voltage Protection:

70% +/- 10% line voltage brownout detect..

Power to the controller must be free of electrical noise. The secondary side should NOT share a common circuit path with any relay circuits that have large in-rush currents. The 24 Vac power to the relays and contactor coils should be run separately, connecting directly at the transformer that provides 24 Vac to the controller.

To ensure that power remains relatively free of electrical noise, the primary side of the 24 Vac transformer must be connected directly to the primary power source. Avoid any common circuit paths with heavy switched loads, high current fuses or long wire runs. Large inrush currents and switched load currents are characteristic of these primary circuits and can cause substantial fluctuations in voltage to the primary side of the control transformer, adversely affecting controller performance.

CAUTION: Always turn power OFF before connecting or disconnecting controller power leads.

ASI Controls recommends that a 24 Vac transformer be installed for each ASIC/1-6000 controller. If a single transformer powers multiple controllers, polarity **must** be observed, since one side of the 24 Vac is connected to building ground. Mis-wiring will result in damage to the controller communication bus.

Controller Grounding

The controller must be solidly connected to the building electrical ground to ensure proper operation of the controller. The ASIC/1-6000 controller is a grounded device. The controller should be grounded by attaching #16 gauge wire from 24 Vac Common, TB1-4 to the grounded sheet metal of the VAV box being controlled.

WARNING: Failure to properly connect the controller to building ground may cause controller malfunction.

This applies to all versions of the controller including ASIC/1-6000 and ASIC/1-6000 PD (Pressure Dependent); and the Metal Base versions ASIC/1-6000-MB and ASIC/1-6000-MB-PD.

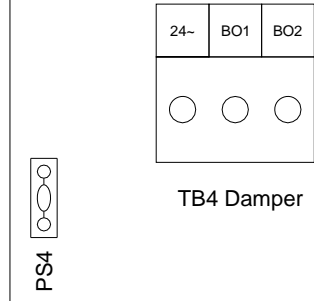
If the supply transformer is more than 4 feet from the 6000 controller, the wire connected to 24 Vac COM, Common, should also be grounded to building ground near the transformer. Determine which transformer wire is connected to 24 Vac Common, COM of the ASIC/1. Attach a #8 ring connector to this wire within 8" of the transformer. Secure it to a clean, non-painted, metal surface that is connected to building ground.

Power Protection

The controller incorporates a resettable Polyswitch rated at 500 mA @ 60 Vac to protect the controller circuitry. When fault conditions are removed the Polyswitch resets itself.

The Polyswitch, PS4, is located just above the 24 Vac power connection at the left edge of the circuit board near the damper motor connections.

Polyswitch Specification:
ASI PN: 14036, Raychem RXE050
Rating: 1/2 Amp, 60 Vac



LED Indication

There is an Amber LED located next to the power connection indicating the presence of power. This LED also blinks at 1 second intervals when an output is overridden. A combination Red/Green LED also located next to the power connection flashes red when receiving communication packets and flashes green when transmitting.

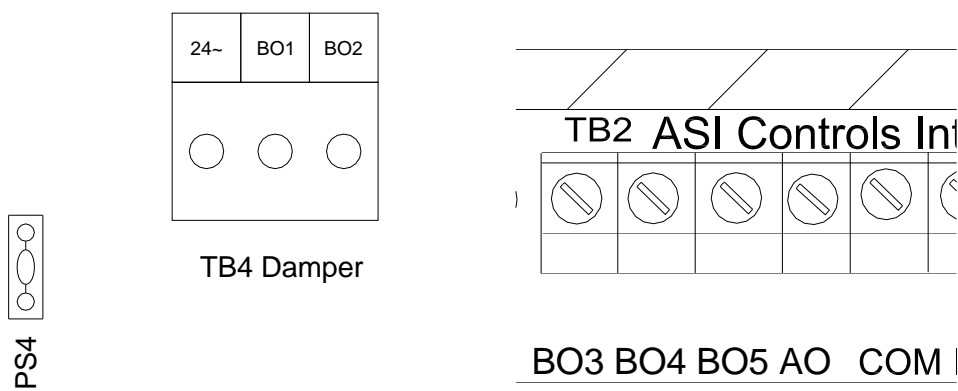
Controller Outputs

Triac Output Wiring

The ASIC/1-6000 provides five normally open triac outputs on screw terminals BO1 through BO5. These outputs, when energized, sink loads connected to 24 Vac HOT to 24 Vac common. Each of the triac outputs has protection provided by Metallic Oxide Varistors, MOVs.

The triac output specifications are as follows:

Maximum Voltage	24 Vac +/-15%
Maximum Steady State Current	1 Amp
Maximum 1/2 cycle inrush current at 60 Hz	10 Amp
Minimum Holding Current	15 mA



The functional assignment of the binary outputs depends on the controller personality and output mask assignments. Consult the appropriate application bulletin for the wiring and configuration details.

Outputs BO1 and BO2 on screw terminal connector TB4 are dedicated for the integrated damper motor, LMZS-3-T. A protected 24 Vac HOT connection is also provided. The Damper Motor is factory wired using plenum rated wire.

Jumper J6, SwDir, can be used to reverse the direction of the damper motor. Simply change the jumper from the closed, to the open position.

Connect output loads to screw terminals BO3 through BO5 using 20 gauge or larger stranded or solid copper wire. When making terminations with stranded wire, be particularly careful that all strands of wire are terminated inside the connector, as loose strands can short out power. The loads operated by these triacs must be connected to the same phase of 24 Vac power that provides power to 24 Vac HOT. These must be wired to the appropriate contactors for unit operation.

CAUTION: Always turn power off before connecting or disconnecting outputs.

There are 3 general guidelines to follow when configuring the 6000's output wiring.

- 1) When an ASIC/1 output is activated, it sinks its 24 Vac load through the triac to common. If the load can be switched to common and is within the ASIC/1's output specifications outlined above, you may connect the load directly to the ASIC/1.

- 2) If the load exceeds the ASIC/1's output specifications, then connect an interposing contactor or relay between the load and the ASIC/1.
- 3) If the loads require a 24 Vac source instead of sink, then connect an interposing relay or contactor between the load and the ASIC/1.

Safety Interlocks

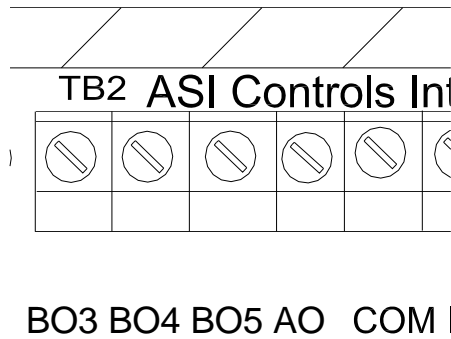
If interlocking relays such as proof of airflow switches and other safety switches are needed in the relay circuit, they must be wired in series with the load side of the contactor circuit.

An interlocking contact must NEVER be installed in series with the ASIC/1 output triac. Opening or closing of a relay contact (without a contact suppressor) that is wired in series with the ASIC/1 output triac causes a sudden voltage change across the triac. A sudden voltage change can result in the triac energizing for up to one cycle. When the triac energizes, it will cause the relay contacts to bounce introducing a significant amount of electrical noise.

WARNING: Triac outputs must not have any mechanical contact in series with the low voltage control circuit.

Analog Output Wiring

The ASIC/1-6000 controller has a single analog output which is capable of driving 0 to 10 Vdc at up to 20 mA. The analog output is connected between the screw terminals AO and COM.

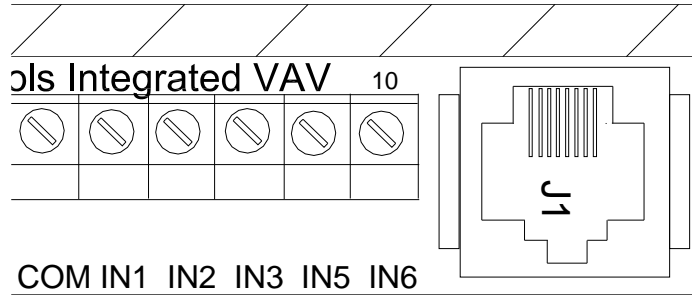


The Analog Output function may be assigned to follow the Heating Requirement or the Cooling Requirement. The Minimum and Maximum Output Voltage may be set in the configuration using ASI Expert software.

ASIC/1-6000 Input Wiring

The controller has 6 universal inputs which are used for analog, thermistor, or binary (digital) inputs

The ASIC/1-6000 inputs are connected to screw terminals IN1 through IN 3, IN5 and IN6. Input 4 is connected to the single Airflow sensor There is input common connections on the terminal marked COM next to IN1. Inputs 1 through 3 are also connected through the 8 pin modular Zone Sensor Jack, J1.



The analog input specifications are:

- Range: 0 - 5 Vdc
- Accuracy: 10 bits 0.1% full scale,
- Input Impedance: 10 kohm maximum.

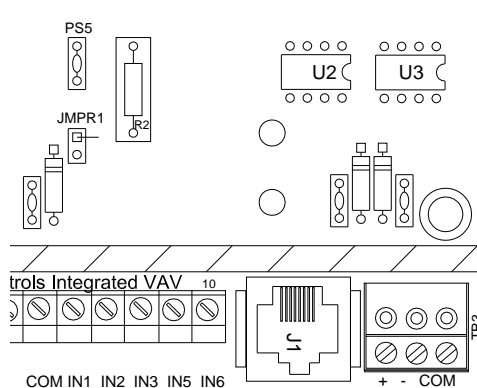
The ASIC/1-6000 reads to 12 bit resolution.

The ASIC/1-6000 inputs are somewhat configurable depending on the specific application. Spare inputs may be used for monitoring

CAUTION: The controller inputs are not fused. Connection of inputs which exceed the published specifications may cause permanent damage to the controller.

Input Hardware Configuration

The inputs in the ASIC/1-6000 controller is pre-configured from the factory. In most cases you will not have to make any changes. Consult the appropriate application bulletin to determine specific input requirements for your application.



The controller senses input conditions by measuring the voltage of each input relative to common (signal ground). Input 4 is used with an active primary airflow sensor that does not have a pull-up resistor. All other inputs are referenced to the +5 Vdc supply voltage through pull-up resistors. Only Input 5 has a socketed pull-up resistor. The others are fixed and surface mounted.

- Input 1 and Input 6 have fixed 3.32k pull-up resistors. Input conversion options for 3 kohm or 10 kohm thermistors are available.

- Input 2 and Input 3 have fixed 10 kohm pull-up resistors
- JUMPER1 and Polyswitch , PS5, on Input 2 allow use of the WT-051 Digital Display Wall Sensor without having to install a pico-fuse.
- Input 4 is dedicated for Airflow. Single Duct Only.
- A single socketed, 3.32 kohm pull-up resistor R2 on Input 5 is. shown in the figure.

ASIC/1-6000 Factory Pull-ups

R27 = IN-1 Pull-up (fixed) - 3.32 kohm 1% 1/4 watt IN1 to + Vcc
 R1 = IN-2 Pull-up (fixed) – 10.0 kohm 1% 1/4 watt IN2 to + Vcc
 R3 = IN-3 Pull-up (fixed) - 10.0 kohm 1% 1/4 watt IN3 to + Vcc
 R2 = IN-5 Pull-up (socketed) - 3.32 kohm 1% 1/4 watt IN5 to + Vcc
 R8 = IN-6 Pull-up (fixed)- 3.32 kohm 1% 1/4 watt IN6 to + Vcc

Inputs Assignments

The inputs for the ASIC/1-6000 pre-programmed controllers are somewhat configurable using ASI Expert software. For example both 3 kohm and 10 kohm Type II Thermistors are supported. Specific input conversions identify the Zone Temperature Sensor, and the Primary Airflow Sensor inputs. The controller interprets the voltage as temperature, airflow, etc. based on firmware and uses this information to control its outputs. The typical input assignments are described below. Unused inputs may be reassigned for monitoring. The assignment and meaning of the inputs depends on specifically how they are used in each application.

ASIC/1-6000 VAV Controller

IN-1 Zone Temp
 IN-2 Slide Switch & Afterhours Push-button, or digital display
 IN-3 Variable User Adjust/Interlock
 IN-4 Primary Airflow
 IN-5 Aux Temp
 IN-6 Supply Air Temperature for Changeover

Required Pull-up Resistors

The required pull-up resistors for different types of inputs are shown below. Each input is assigned an Input Type and a Convert Type that must be appropriate to the type of input used. Default input assignments are provided in the Default brain dump table for the controller.

Input Type	Specification
0 to 5 Vdc	No Pull-up; Active Device
4 to 20 mA	No Pull-up; External resistor 249 ohm to common is required, 0.1%, 1/4 W, MF
Thermistor, 3 kohm Type II	3.32 kohm, 1%, 1/4 W, MF
Thermistor, 10 kohm Type II	3.32 kohm, 1%, 1/4 W, MF
Binary	(Typical) 3.32kohm, 1%, 1/4 W, MF
Airflow Sensor	No Pull-up; Active Device
Variable User Adjust	10 kohm (10 to 30k pot) (IN-3)

Input Type (Thermistor)

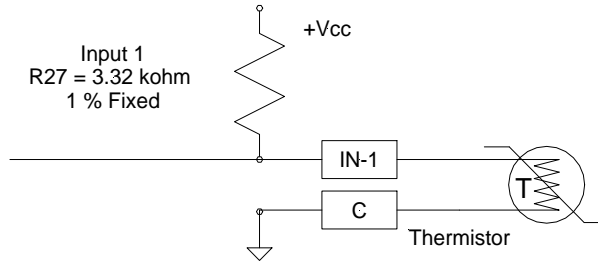
Thermistors are sensors used for measuring temperature. The resistance of a thermistor changes with respect to temperature. As the resistance changes, the voltage measured across it by the controller changes. The controller uses a voltage divider circuit to

measure the voltage across the thermistor. The pull-up resistor required depends upon the temperature range and the thermistor used.

The ASIC/1-6000 has built in tables for 3,000 ohm and 10 kohm at 77 F (25C), Type II Thermistor using 3.32 kohm pull-up resistors. Conversion is in degrees Fahrenheit or Celsius depending on the conversion selected.

Input 1 - Temperature Sensor

A Temperature Sensor is installed between input 1 and common with a 3.32 kohm pull-up resistor installed in R15. Input 1 is normally used for the Zone Temperature Sensor.

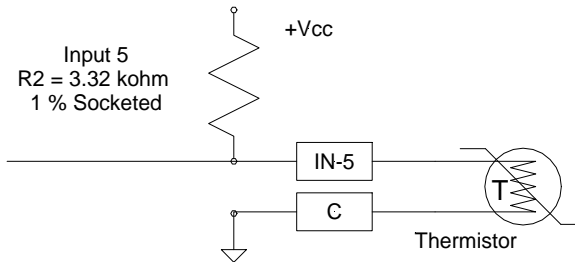


CAUTION: The common input connection and the 24 Vac power common, COM, connection are electrically connected together on the board.

Input 5 - Auxiliary Temperature Sensor (Optional)

If a TS-D Series duct temperature sensor with a Type 2 3-kohm thermistor, or Type 2 10-kohm thermistor, or a Type 3, 10-kohm thermistor is placed on Input 5, with a 3.3 k ohm pull-up resistor in the pin sockets, then the readings in the range from 0 to 240 F is measured by the controller and can be displayed.

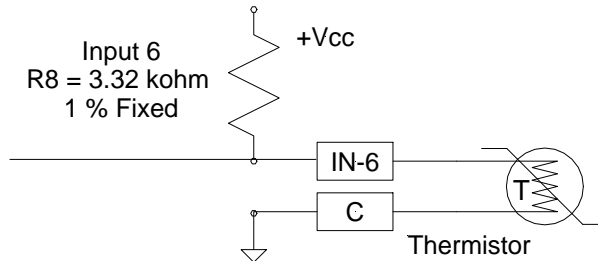
Input Configuration is Input Type = 1 - Temperature, Convert Type = 2 - Temperature, 0.01 deg F (3.32 kohm pull-up resistor).



Input 6 – Auxiliary/Duct Temperature Sensor(Optional)

If a TS-D Series duct temperature sensor, , is placed on Input 6 which has a fixed 3.32-k ohm pull-up resistor , then the readings in the range from 0 °F to 240 °F is measured by the controller and can be displayed.

If **Changeover Setpoint** is not zero, the duct sensor on Input 6 is used for auto-changeover. If the input on Input-06 is in fault, Open, or Short, then changeover is ignored.



WS-051 Digital Display Sensor

The ASIC/1-6000 VAV controllers support the WS-051 Digital Display that monitors the temperature, mode, and fan status and allows the occupant to change the Occupied Cooling and Heating Temperature setpoints within a limited range. Pressing the O/R button will trigger afterhours operation. The controller can optionally also use temperature setpoints in 0.5 deg increments. It also has a **Single Setpoint Enable feature** introduced with FW600a20 that displays the midpoint between the Heating and Cooling Setpoints

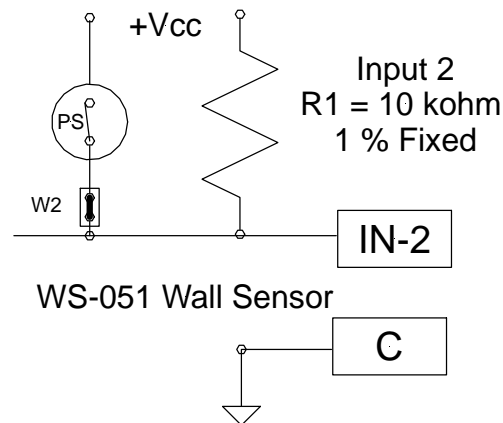
Input 2 can optionally be used to power the WS-051 Digital Display Wall Sensor. Jumper, JMPR1, when closed, connects Input 2 to the +5 Vdc protected by a 50 mA Polyswitch, Raychem RXE005. Input 2 will then always read + 5 Vdc. You will need to enable the Digital Display with the software.



The Digital Display has a zone temperature sensor that is read by the ASIC/1 controller on Input 1. The Digital Display is only active if Digital Display Enable is yes. When Digital Display Enable is yes, the ASIC/1 communicates with the digital display on a second RS-485 communication port. The Digital Display configuration is supported by ASI Expert software.

Input 3 still is used for interlock. The afterhours and user adjust must be enabled in the controller and are triggered by digital communication with the WS-051.

The RS-485 chip U3 is socketed and can be replaced if necessary.



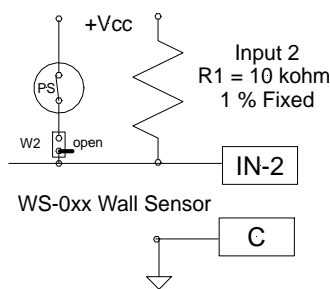
WS-0X1 Wall Sensor (8 pin RJ-45)

The ASIC/1-6000 has a modular 8 pin RJ-45 jack, J2, to provide connection using the SCP-0XX sensor cables to the WS-0X1 wall sensors for Inputs 1, 2, and 3. A WS-R Series Wall Sensor connects directly to the input screw terminals.

Afterhours Switch

For the ASIC/1-6000 controller, the afterhours switch is always on IN-2. Afterhours Enable must be set to yes.

The WS-0xx wall sensor has several jumpers which can be used to configure the wall sensor for a specific application. Set the WS-011 & WS-031 jumper, W6, or connect the WS-041 membrane switch so that the afterhours switch is on IN-2.



Note: JMPR1 must be in the open position.

Input 3 - Variable User Adjust

For the ASIC/1-6000 controller, the variable user adjust is always on IN-3. User Adjust Enable must be set to yes using ASI Expert software.

Set the WS-021, WS-031, & WS-041 jumper W5 so that the variable user adjust is on IN-3. The variable user adjust uses a linear 20 kohm potentiometer in series with a 10 kohm resistor, and using the fixed 10 kohm pull-up resistor for Input-3.

Input 3 - Interlock

Input 3 is also used for the controller Interlock. If shorted, it indicates that the interlock is in place. The SINC/1-1030 cable provides the interlock. The “loop” end should be plugged into the sensor for the interlock to be connected, so that the controller address can be retrieved. The interlock may also be applied externally shorting the Input 3 terminal to common. Once the controller address has been retrieved, you may wish to disconnect the interlock, by reversing the SINC/1-1030 cable so that the “loop” is not at the sensor, or by removing the short to Input 3.

NOTE: The Variable User Adjust will not read correctly as long as the interlock jumper is in place.

Input 4 - Airflow Sensor(AV-003)

A primary airflow sensor on Input 4, is used with a properly positioned airflow cross to monitor primary airflow. The ASIC/1-6000 Revision F uses the AV-003. SM585 2 pressure sensor. The microprocessor reads to 12-bit resolution. The primary airflow sensor is calibrated at zero at the factory.

An in line **Airflow Filter is NOT required.**

Proper values of K-factor and area for this primary sensor must be set in the controller. The primary airflow volume is monitored by the ASIC/1-6000. The air balancer in the field does final calibration by adjusting the velocity K-factor.

Input 4 - Airflow Sensor(AV-002)

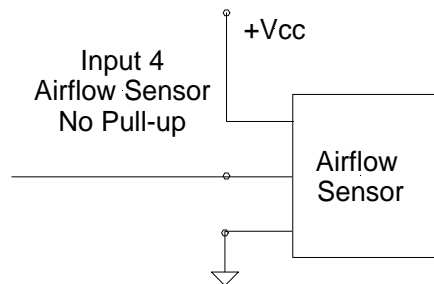
A primary airflow sensor on Input 4, is used with a properly positioned airflow cross to monitor primary airflow. The ASIC/1-6000 uses the Microswitch AWM3300 Airflow Sensor. The microprocessor reads to 12-bit resolution. The primary airflow sensor is calibrated at zero at the factory.

An AF-001 in line air flow filter is installed in the enclosure on the high pressure (upstream) side of the air flow sensor.

Proper values of K-factor and area for this primary sensor must be set in the controller. The primary airflow volume is monitored by the ASIC/1-6000.

Because it is a flow through device, the velocity pressure signal from the airflow cross may be modified because of tubing length and resistance to flow through the sensor. The air balancer in the field does final calibration by adjusting the velocity K-factor.

It is calibrated at zero airflow. The resolution at 10-bit measurement is 5 fpm/count at a K-factor of 2338. With a full scale of 3300 ft/min, the absolute accuracy with calibration is 5% of full scale. $5\% * 3300 \text{ ft/min} = 165 \text{ ft/min}$. Input Configuration is Input Type = 2 - AV3300 Airflow Sensor, Convert Type = 2 - Primary Airflow, CFM The absolute accuracy of the device is +/- 0.2 V which is +/- 40 counts at 10 bit resolution which give $40 \text{ counts} * 5 \text{ fpm/count} = 200 \text{ ft/min}$.



Active Transducers

To measure voltage produced by an active input transducer, such as an airflow transducer, or 4 to 20 mA transducer, the pull-up resistor is removed.

CAUTION: The common input connection is identical with the building ground. The common of the transducer **MUST** be referenced to building ground.

Input Type (4 to 20 mA)

A 4 to 20 mA transducer requires a 249 ohm, 0.1%, external resistor between the input and common, and the removal of the pull-up resistor. This will generate a 1 Vdc to 5 Vdc input voltage.

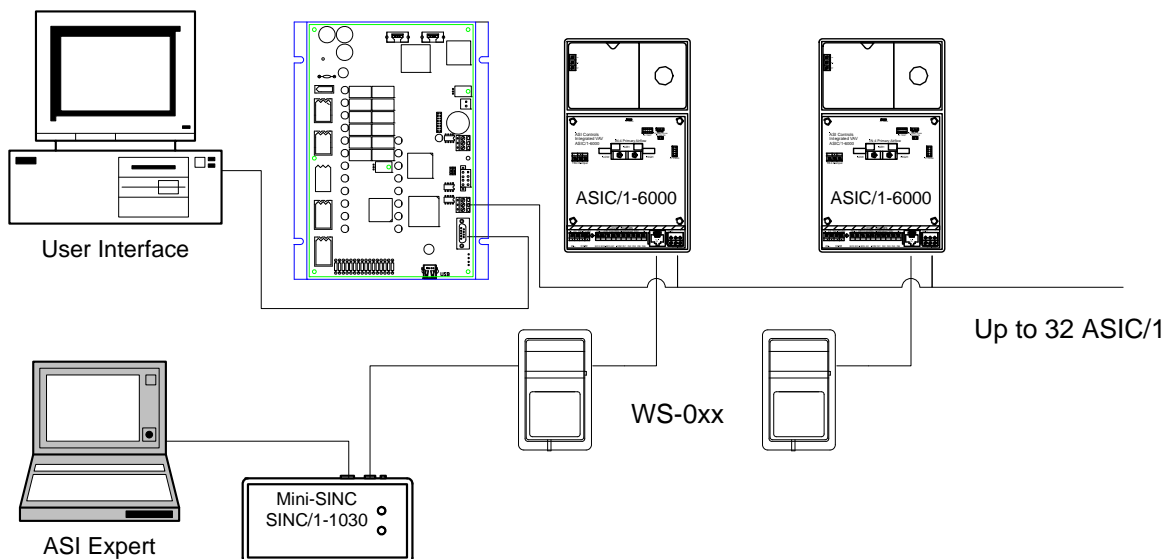
ASIC/1-6000 Communications

Communication Wiring

Communications between ASI controllers are carried on a 2-wire RS-485 communication bus. The communication line has a HI (+) and a LO (-) side, and care must be taken that every controller is connected correctly. A third board common connection, COM, is available for connecting the shield. To avoid ground loops the shield should only be connected at one end.

A 2-wire communication cable is used to interconnect several controllers using the screw terminal connector TB3. By connecting a communication cable from one ASIC/1 to another, communications can be established with any controller on the bus. The communications can be wired in a daisy chain or a star, or a combination. Every controller on the bus hears every message.

Access to the RS-485 communication bus is through the local bus of an ASIC/2 controller, or through a SINC/1-1030 Mini-SINC connected at the WS-0xx Wall Sensor. An RS-485 communication repeater should be used on applications that require more than 32 ASIC/1 controllers on a single local communication bus. All controllers on a single communication bus should be at the same baud rate, typically 9600 or 19200 baud.



Installation Rules

RS-485 communication is noise resistant. However, a few basic rules must be followed to avoid communication problems. Taking the time to make sure communication wiring is installed properly in the beginning helps avoid communication problems later. Make sure to observe the following communication installation rules:

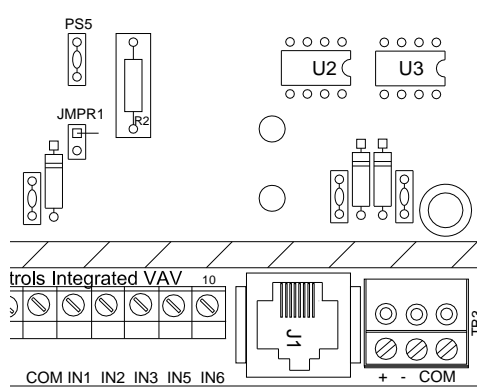
- o Install only communication cable which meets the ASI Controls specifications.
- o Do not run communication wiring close to AC wiring.
- o Do not physically stress the communication cables, especially when pulling the communication cable around sharp bends and over rough surfaces.
- o Avoid splicing communication cables. Use continuous pieces of cable between controllers.
- o Use only use factory fabricated and tested wall sensor cables, SCP-0XX .
- o Do NOT exceed 32 controllers on the local communication bus. If more than 32 controllers are connected together, use an RS-485 communication repeater to strengthen the signal.
- o Verify communications as you go. As each controller is connected to the remote communication bus, verify communication with both the current controller, and the one previous, on the network.
- o If the communication wiring is run in conjunction with AC power wiring, shielded wire should be used.
- o If possible, keep communication wiring away from electrical noise sources such as power wiring, variable speed drives, large power consuming or power-generating equipment, etc. If possible cross power wiring at right angles.
- o o Make sure all connections to the controller are mechanically tight. Intermittent contact of connections can cause excessive electrical noise. Always route controller wiring separate from high voltage wiring to reduce the possibility of excessive EMI noise.

CAUTION: Do NOT bundle communication or input wiring with output and power wiring. It can disrupt communication and/or interfere with controller input measurements.

Connections

The following communication connections are available on the ASIC/1-8X55:

- o RS-485 Communications, TB3
- o Wall Sensor Communication, J1



Communication, TB3

The ASIC/1-6000 uses screw terminals, TB-3, for connection to the communication bus. By connecting a communication cable from one ASIC/1 to another, communications can be established with any controller in the system.

Remote Communication, TB4. connections:

- TB4-1 Remote (+) HI RS-485 Communication
- TB4-2 Remote (-) LO RS-485 Communication
- TB4-3 Common, Shield if used.

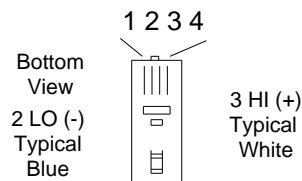
Each of the communication wires is labeled with a "+" and "-" sign indicating polarity. The connector TB3 is two part and can be separated from the controller without disconnecting the wire.

NOTE: Maintain a consistent wiring color code throughout the communication network to prevent mis-wiring.

The ASIC/1 communication network is designed to daisy chain or star connect controllers together. Up to 32 controllers can be daisy chained together. By using two part screw-terminal connectors, a controller can be taken out of the network simply by unplugging that controller. Do NOT splice the communication line. This makes it difficult to trouble shoot.

The screw terminals are designed to be used with 16 gauge to 24 gauge stranded or solid wire.

It is important to maintain polarity of the communication bus when connecting to a network of the older ASIC/1-8015 or ASIC/1-8010 families of controllers that use modular connectors. The polarity can be determined by inspecting the modular plug from the bottom side. The negative, LO, is to the left, the positive, HI, is to the right. Verify the color code of the wire before cutting the wire.



CCP-XXX Cable
Communication
Modular Plug

Communication Protection

The controller communication circuitry incorporates 100mA polyswitches and transorbs to clamp the allowed voltage to protect the communication bus. The poly-switches automatically reset when the disturbance has passed and should not need to be replaced. The RS-485 driver chip, U3, is socketed, so that it may be easily repaired. There is a second RS-485 driver chip, U2, which is used only for the WS-051 Digital Display . Replacement RS-485 Chip: NATIONAL DS3695N, or TEXAS INST. SN75176BP.

Communication Wire Specification

Shielded Wire

Shielded communication wire is required to meet CE certification. However even if CE certification is not required, shielded wire should be used if the communication bus wiring is run in conjunction with AC power wiring or is subject to electrical noise.



Shielded Communication wire should meet the following specifications:

Wire:	22-24 gage, solid
# of conductors:	2, twisted pair
Nominal Capacitance	
Between Conductors:	24 pF/ft
Between 1 Conductor and Shield:	42 pF/ft

Plenum Rated Cable meets these specifications and is described as follows: Tinned copper conductors; Teflon(TM) insulated; conductors cabled; Beldfoil (TM) aluminum; polyester shield with 85% tinned copper braid shield; 150V NEC 725 Class 2 for use in air plenums; non-conduit.

Note: We do not recommend using wire with more than one pair! If communication wire has more than 1 pair, then the other wires should be terminated at ground on one end to prevent induced noise.

Unshielded Wire

Unshielded Communication wire should meet the following specifications:

Wire:	22-24 gage, solid
# of conductors:	2-wire, twisted pair
Nominal Capacitance Between Conductors:	approx. 20-30 pF/ft

Wall Sensor Access, J1

The ASI Wall Sensor, WS-0XX connects using a SCP-0xx Sensor Cable to the 8 pin modular jack, J2. A second communication port is used by the Digital Display Sensor, WS-051, and requires a second RS-485 chip, U2.

WS-0X1 Access, J1 connections:

WS J2-1	2nd port (+) HI RS-485 Communication (WS-051)
WS J2-2	2nd port (-) LO RS-485 Communication (WS-051)
WS J2-3	Remote (-) LO RS-485 Communication
WS J2-4	Remote (+) HI RS-485Communication
WS J2-5	Input 1 Zone Sensor
WS J2-6	Input 2 Push-button, User Adjust
WS J2-7	Input 3 Interlock
WS J2-8	Common

The ASIC/1-6000 is designed for use with the WS-0xx series Wall sensors using the RJ-45 connector J2.

When the software asks for the address using address B455h with message MT=42 only the controllers with the hardware interlock will respond. The interlock is provided by the “loop” on the SINC/1-1030 access cord, or by shorting Input 3, as was discussed earlier.

The controller will act on messages sent to the Terminal Global address, 5A5Ah and to the ASIC/1 Global address, 5A55h. It will also respond to Device Global Addresses: 23,045 (5A 05 hex) ASIC/1VAV Controllers

The operator access is through the 6 pin modular jack, J8, on the WS-0XX or WT-0XX wall sensor. A lap-top used for operator access is connected through the SINC/1-1030 to the modular 6-pin RJ-12 connector J8. J8 is AMP 520250-3.

Sensor Cable, SCP-XXX

The sensor cable SCP-XXX is used to connect the zone sensor WS-XXX to the 8 pin ASIC/1 modular jack, J1. The use of factory tested sensor cables is strongly recommended.

WS-R Wall Sensor

The WS-R Series Wall Sensor connects directly to the input screw terminals and does not have a communication connection. To communicate with the controller you must connect directly to the controller through the SINC/1-1030 to the terminal block, TB3, or through the black curly-cord with an 8-position connector to J1.