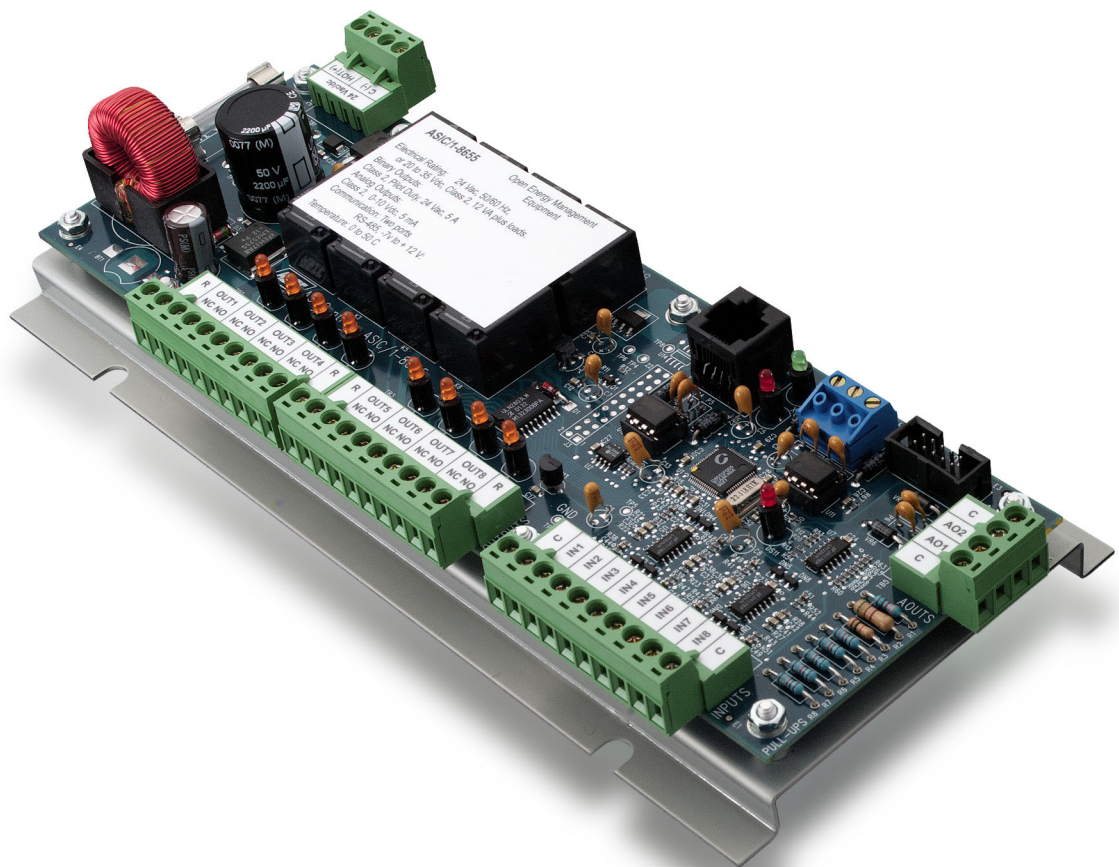


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# ASIC/1-8655

# Installation Manual

By ASI Controls



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July 2003

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# ASIC/1-8655 Introduction

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## Overview

This Installation Manual describes the mounting and wiring specifications for the ASIC/1-8655 family of Terminal Unit Controllers. These fourth generation terminal controllers use an 8-bit microprocessor and are programmed with standard application specific control sequences. Information such as name, address, operating schedules, alarm limits, setpoints and many other parameters is maintained in non-volatile Flash memory.

- The ASIC/1-8655 has 8 Form C Relay outputs that can switch 24 Vac/Vdc to a common return.
- The ASIC/1-8655 has 2 analog outputs, 1-10 Vdc, 5 mA output
- The ASIC/1-8655 has 8 universal analog/binary inputs with 10-bit resolution.
- The ASIC/1-8655 is preprogrammed with Packaged Air Conditioner and Heat Pump Sequences.
- 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.
- Modulating Economizer for Free Cooling.
- Optional Half-degree F or C Setpoints for temperature control

To use scheduled operation, the controllers must be synchronized regularly by time broadcast on the communication line by a SINC/3-3000 or other device. Two-way communications enable information to be transmitted throughout the control system providing coordination and easy maintenance access to all points.

The ASIC/1-8655 communicates at up to 19,200 baud on the RS-485 bus which is protected by self-resetting polyswitches, and transient voltage suppressors.

The ASIC/1-8655 has flash programming so that there is no need to change EPROMS to upgrade the firmware. It is possible to download new programming over the RS-485 communications bus using extended ASI Protocol Flash programming messages. The initial product will be factory programmed. Each firmware releases have its identifier, Product 8655, Firmware 655A, and Version, 1.0 .

---

# Product History

## ASIC/1-8655 Firmware Releases

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

### **ASIC/1-8655 FW655A Rev 1.2v Release 02/04/2003**

- o Fixes problem that relay may not pickup if turning on one output, at the same time as turning off an output with a higher number.
- o Fixes problem when OAT is negative with OAT Heating Lockout and with Economizer.
- o Adds Economizer Type 4, Discharge Air
- o Adds CO2 Demand Ventilation
- o Adds Custom Span and Offset for Input 4.  
Note: This shifts Span and Offsets for Input 5, 6, 7, & 8.
- o Adds Input Conversions for 10k Type 2 & Type 3 Thermistors
- o Adds Changeover Analog Output for hydronic cooling/heating, Changeover Mode, Changeover Status, Changeover Alarm  
AO Assignment 0 = None, 1= Cooling, 2=Heating 3= Economizer, 4= Changover HTG/CLG
- o Note: New parameters have been added.  
You must BRAIN Dump in upgrading from Version 1.0 to 1.2

### **ASIC/1-8655 FW655A Rev 1.1c Release 01/03/2003**

- o Adds Binary Input Types for Input Conversions
  - 128 Binary Input Normally Open
  - 129 Binary Input Normally Closed
  - 130 Binary Input TriMuxThese input types will work with any un-used input or with Personality 0.

### **ASIC/1-8655 FW655A Rev 1.0 Release 10/28/2002**

- o Improved Static writes to improve responsiveness.
- o Add Calibration parameters for Analog Outputs  
A1\_AO1Calibrate T5,E3; A1\_AO2Calibrate T5,E4 [Default 0xF1=241]  
Calibration and retest is part of Factory Test.  
BrainDump restores factory value.
- o Add Factory Test Commands MT=0x7B Calibrate  
M1= 128 0x80 Calibrate Low AI  
129 0x81 Calibrate HI AI  
130 0x82 - NA (was Calibrate AO)  
131 0x83 Factory Test - complete  
132 0x84 Setup AI Test  
133 0x85 Do AI Test  
134 0x86 Setup A0 Test  
135 0x87 Do AO Test
- o Fixes Port output during Boot Load for test jig.
- o Note: New parameters have been added including Analog Output Calibration.  
Must BRAIN Dump in upgrading from Version 0.3 to 1.0

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## About This Document

This ASIC/1-8655 Installation Manual, DOC-1592, and Windows™ help system was produced using Microsoft® *Word* and *Doc-To-Help*®, by WexTech Systems, Inc. It was last revised or printed on 07/11/2003.

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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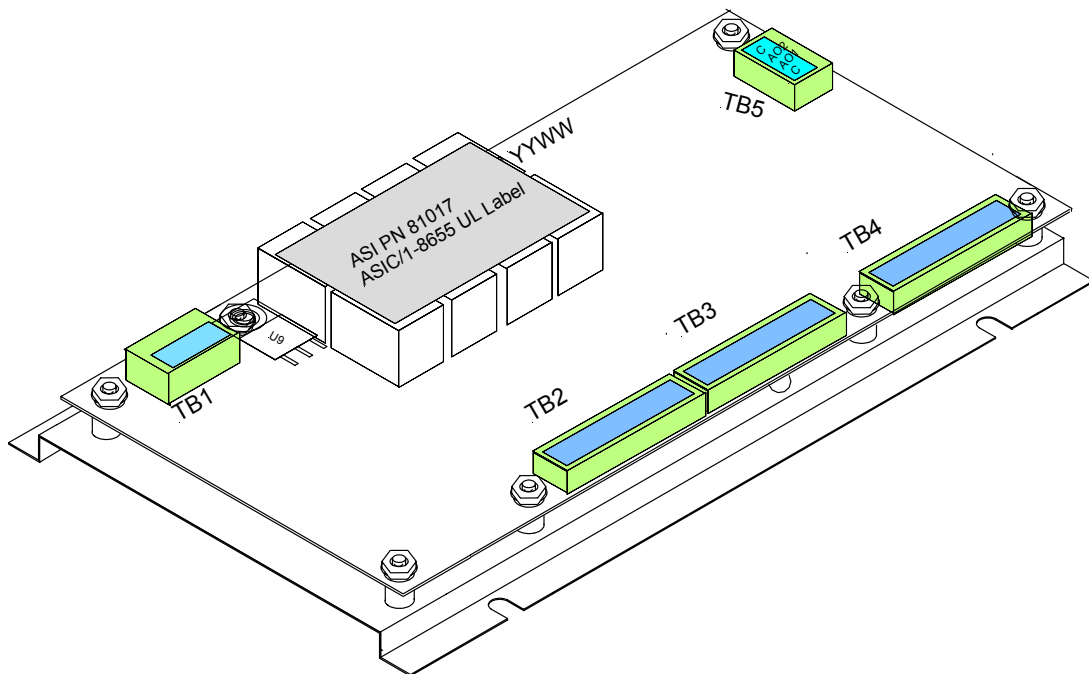




# ASIC/1-8655 Hardware

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## Controller Mounting



The ASIC/1-8655 is shipped fully assembled on a sheet metal base. All input and output connections to the controller are by means of two-part screw terminals or modular connectors .

The ASIC/1-8655 controller base can be mounted to either metallic or nonmetallic surfaces with appropriate grounding provisions. To mount the controller enclosure, follow the procedure outlined below:

- 1) Locate the ASIC/1-8655 where it is to be mounted.
- 2) Use the mounting slots in the controller base as templates to mark the location of the 4 holes. The 4 mounting centers are spaced 6.70"x 3.75" (170.2 mm x 95.2 mm).
- 3) Remove the controller and drill pilot holes for the screws
- 4) If the surface to which the ASIC/1-8655 is to be mounted is painted, an area of paint approximately 3/4" x 1/2" (19mm x 13 mm) under one mounting screw must be removed to provide good electrical contact.
- 5) Install the controller with 4 screws and tighten.

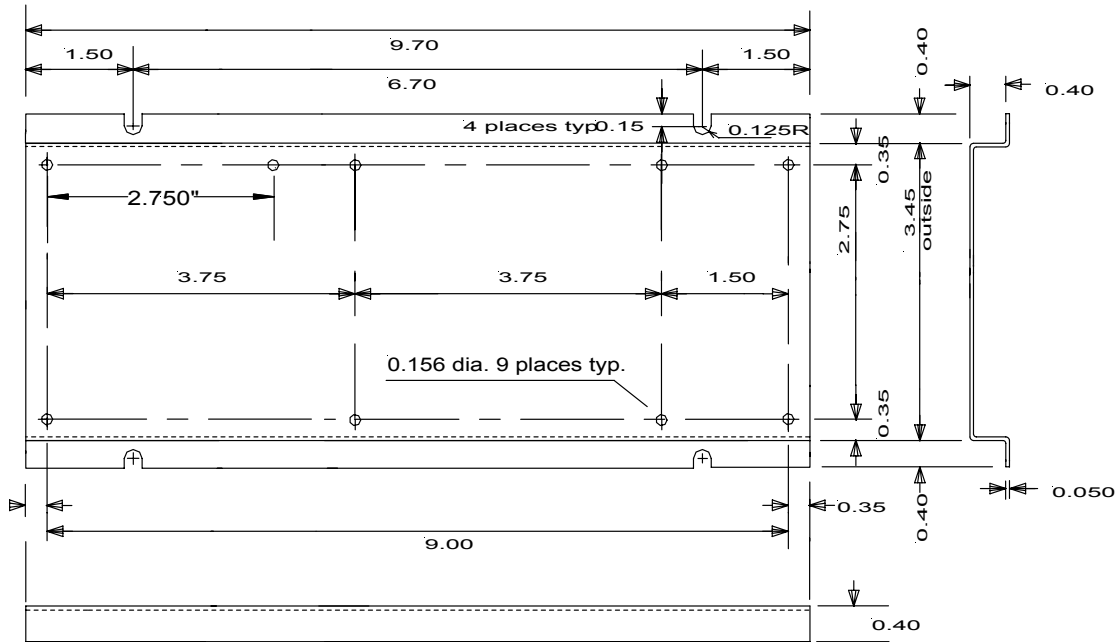
WARNING: Never drill holes in or near the controller enclosure with the electronics inside. Metal shavings will short out controller circuitry.

CAUTION: As with any electronic circuitry, ASIC/1-8655 is susceptible to damage caused by static discharge. The ASIC/1-8655 is self-contained on the metal base and handling of the circuit board is not typically needed. However, if handling of the boards is undertaken, discharge static electricity by grounding yourself to a well grounded metal object before touching any ASIC/1-8655 electronic components.

## Dimensions

The overall dimensions of the controller are 9.5" x 3.25" x 1.55" (241.3 mm x 82.6 mm x 39.4 mm). The controller weighs 0.78 lbs (0.35 kg). It is mounted with 8 metal stand-offs on a sheet metal base, 9.7" x 4.25" x 0.45" (246.4 mm x 108 mm x 11.4 mm). The base has 4 mounting holes spaced 6.70" x 3.75" (170.2 mm x 95.2 mm).

It has the same dimensions as the ASIC/1-8x55 family, except for the allowance for the two-part screw terminal connectors.



Note: all dimensions are in inches.



## EMI Noise Considerations

The ASIC/1-8655 controller is connected electrically to its base with a metal screw and support. The base is designed to shield the controller from Electro Magnetic Interference (EMI). 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, and high voltage wires.

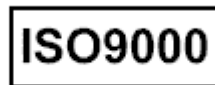
The power supply wires and the output wires connected to the ASIC/1-8X55 controller should be routed separately from the communication and input wiring. ASIC/1 wiring should not be routed through conduit containing high voltage wiring.

## FCC Requirements

The ASIC/1-8655 controller 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.

## Agency Approval (pending)



Our products are manufactured in accordance with ISO 9000 standards.

ASI control products have been listed under UL-916. Products manufactured with the UL Mark will be available in the third quarter of 1997.

ASI Controls can now issue a Declaration of Conformity, CE, for our Commercial HVAC Controls Models: ASIC/2-8040, ASIC/2-7040, DAK-002, SINC/2-2000, ASIC/1-8X55 Family

The ASIC/1-8655 has not yet received full agency approval. It has passed preliminary FCC/CE testing. We are applying for UL and CE approval, which is pending

# ASIC/1-8655 Wiring

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## General Wiring Considerations

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

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.

# Control Power and Grounding

## 24 Vac/dc Power

The 24 Vac/dc power connections are located on the 4-position screw terminals marked 24Vac/dc near the power fuse. Two positions are marked H0T. Two positions are marked NEU for neutral and are connected to board Ground.

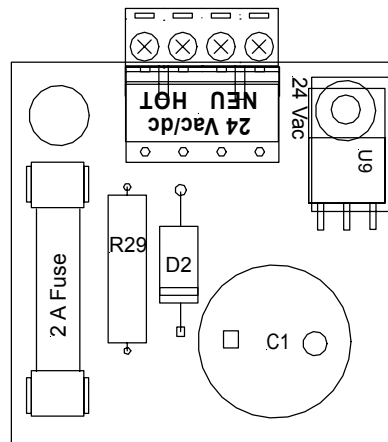
The controller uses a switching power supply with one side connected to board ground. It can be powered from 24 Vac +/- 15% or 24 Vdc +/- 15%.

The power and ground terminations should be made to terminals 24 H0T and 24 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 cause shorted connections.

Power wiring should be routed to:

H0T, 24 Vac/dc hot

NEU, 24 Vac common, (board ground)



Control power supply specifications:

|                           |   |
|---------------------------|---|
| Supply Voltage:           | 24 Vac +/- 15%, 50/60 Hz<br>24 Vdc +/- 15%, |
| Power Consumption:        | 6 VA plus other loads                       |
| Under Voltage Protection: | 80% +/- 10% line voltage brownout detect.   |
| Fuse Protection:          | 3AG, 2 Amp, 250 Vac fuse on primary.        |

Note: Each controller should be connected to its own 24 Vac/dc supply.

### Power LED indication

There is a red power LED located in the middle of the controller between the input and output connectors. . When 24 Vac/dc is applied to the controller, the LED will light indicating power. It also blinks at 1 second intervals when an output is overridden.

### Controller Power Fuse

The controller incorporates a fast blow fuse to protect controller circuitry. If burned out, the fuse can be replaced. The power fuse is located near the 24 Vac/dc power connection . Replacement fuses that meet the published specifications can be purchased from any local electronics store.

#### Fuse Specification:

Type 3AG fast-blow  
Size 1.25" long by 0.25" diameter,  
Rating: 2 Amp, 250 V

**CAUTION:** Always turn power OFF before replacing the primary fuse and connecting or disconnecting ASIC/1-8655 power leads.

## Primary Power (24 Vac)

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 replacing the primary fuse and connecting or disconnecting controller power leads.

ASI strongly recommends that a 24 Vac transformer be mounted at each ASIC/1-8655 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.

The primary power has a 2 Ampere fuse to allow for in-rush current when the switching power supply first turns on. The nominal power consumption of the controller with all relays energized is about 6 VA.

### **Multiple Phase Source**

In circuits powered by a multiphase source, the preferred way to power the controller is using a 277V/24 Vac transformer connected to an unused phase of the source and neutral. If there are no unused phases available, use the phase which experiences the least amount of power drain from inductive loads.

If the controller must be powered by a 480V/24 Vac transformer, phases which experience the least amount of power drain from inductive loads should be used. It is important to avoid phases which are on the contactor or switched side of the load.

## Primary Power (24 Vdc)

The ASIC/1-8655 can be powered from a 24 Vdc voltage source. Polarity must be observed with the Hot being positive and the Neutral Negative.

## Building Ground

The controller must be solidly connected to the building electrical ground to ensure proper operation of the controller. The controller is grounded to the base. Attach the base to a metal surface which is connected to building ground.

Controller grounding should adhere to Article 250 of the National Electrical Code on grounding and all local codes.

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

If the supply transformer is more than 4 feet from the 8655 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.

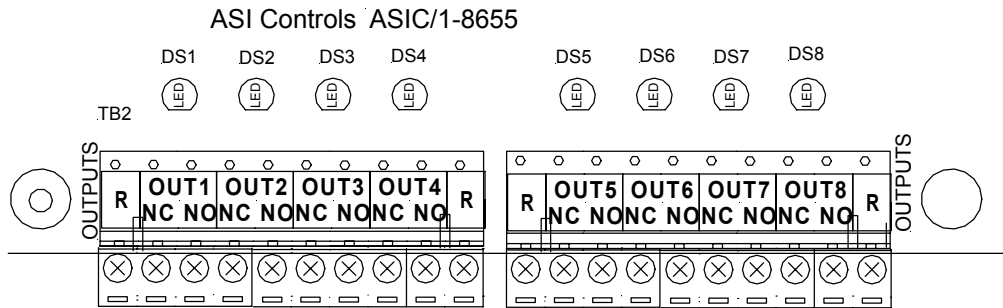
## ASIC/1-8655 Outputs

### Relay Outputs

The ASIC/1-8655 has 8 isolated Form C Relay outputs that can switch 24 Vac to a common return. There are two banks of 4 relays. Each bank has an isolated common return. The common returns must be connected if a common source is used to be switched by the relays.

The relays are rated for a maximum of 7A 24 Vac, 3.5A 24V dc. Each relay has a normally open, NO, and normally closed, NC, contact. When the relay is not energized the NC contact is connected to the common return. Each group of 4 relays has an isolated common return. The common returns are not connected on the board.

There are 8 yellow LEDs that light when the relay coils are energized.



### Relay Output Wiring

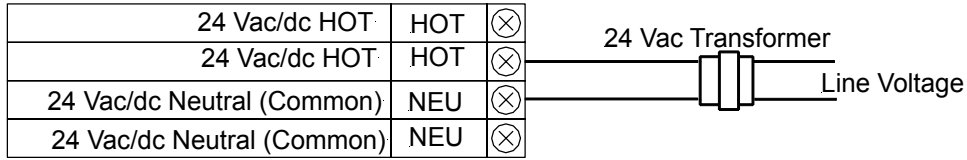
The two-part plugable connectors are designed for 12-22 AWG wire stranded or solid copper wire. When making terminations with stranded wire, be particularly careful that all strands of wire are terminated inside the connector, as loose strands can cause shorts.

**CAUTION:** Always turn power off before replacing fuses and connecting or disconnecting outputs.

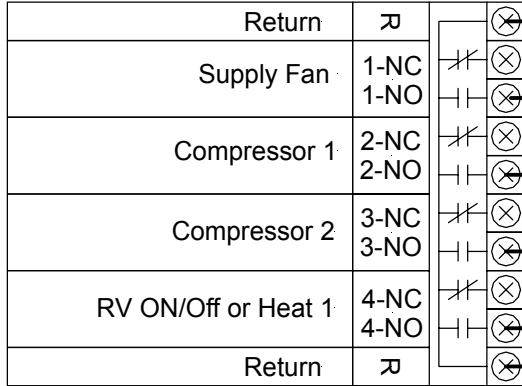
The functional assignment of the binary outputs depends on the controller personality and output mask assignments. Consult the appropriate application bulletin for the wiring details.



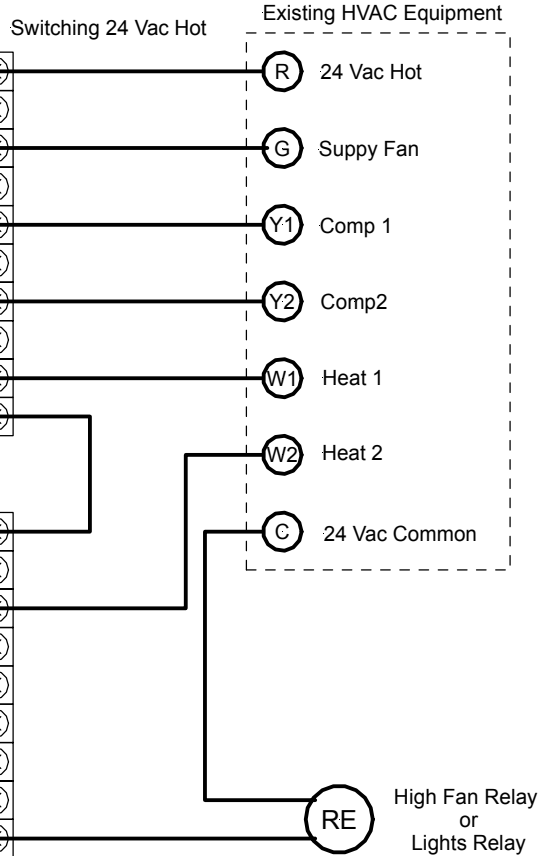
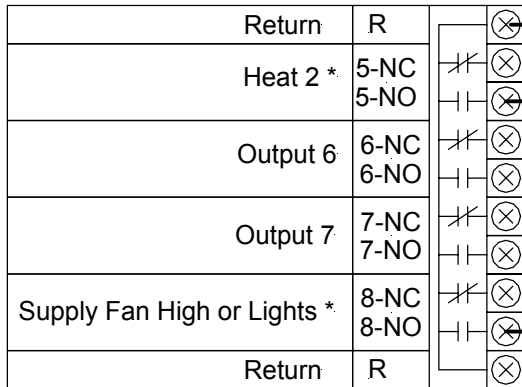
TB-1 24 Vac/Vdc



TB-2 Binary Outputs 1-4  
(Fixed assignment)



TB-3 Binary Outputs 5-8  
(May be assigned)



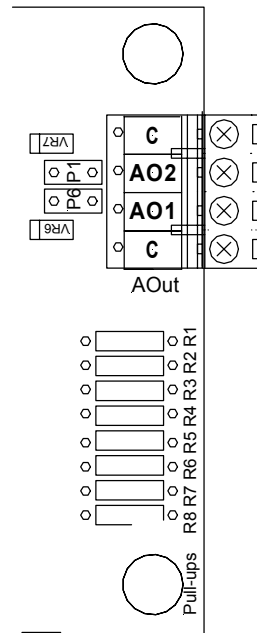
\* Note: Default Assignments

Note: It is recommended that each controller be connected to its own 24 Vac/dc supply. Using power from the unit under control may be subject to voltage drop when fans and compressors start. In addition safeties, such as Smoke Detectors, may be wired to kill 24 Vac control power to the unit also shutting down the controller.

## Analog Outputs

The ASIC/1-8655 has 2 analog outputs that generate 0 to 10 Vdc at up to 5 mA.

These analog outputs can be assigned to drive actuators for Cooling Requirement (Chilled Water Valve), Heating Requirement (Hot Water Valve), or to the Economizer Cooling Requirement (Economizer Damper).



The analog outputs are protected by Transient Voltage Suppressors and by Poly-switches. The analog outputs are designed as a voltage source. If the load being driven has a strong pull-up so that the analog output must be as voltage sink, it may not be accurate below 0.7 Vdc.

# ASIC/1-8655 Input Wiring

The controller has 8 universal inputs that are used for analog, thermistor, or binary (digital) inputs

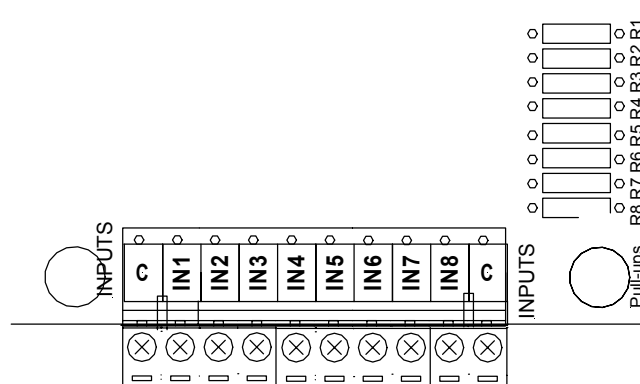
All ASIC/1-8655 inputs are connected to two-part screw terminals IN1 through IN 8. There are two input common connections marked COM just above IN1

The analog input specifications are:

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

The ASIC/1-8655 reads to 10 bit resolution

ASIC/1-8655 has configurable inputs that depend on the specific application and configuration. Spare inputs may be used for monitoring



The controller input connectors are designed to be used with no larger than 16 gauge and no smaller than 20 gauge stranded or solid copper wire. 12 gauge to 22 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.

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

The ASIC/1-8655 controller is designed to work without shielded wire. If the input wiring is run in close proximity to with other AC wiring, etc., shielded cable is required. The shield wire should be connected to the controller COM terminal. Tape back the shield at the other end of the wire, taking care to prevent shorting the shield to ground at both ends.

**CAUTION:** Only terminate the shield at the controller. Do NOT terminate the shield at both ends of the wire.

## Inputs Assignments

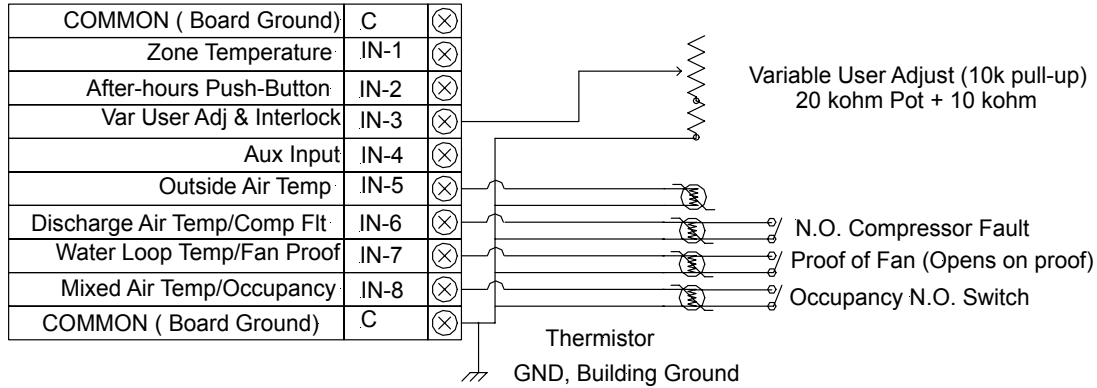
The input assignments for the ASIC/1-8655 pre-programmed controllers are somewhat configurable. The assignment and meaning of the inputs depends on specifically how they are used in each application. The controller interprets the voltage as temperature, etc. based on firmware and uses this information to control its outputs. Specific input conversions identify the Zone Temperature Sensor, and the Primary and Secondary Airflow Sensor inputs. The typical input assignments are described below.

### **ASIC/1-8655 Package Air Conditioner Controller**

IN-1 Zone Temp  
IN-2 Slide Switch & Afterhours Push-button  
IN-3 Variable User Adjust/Interlock

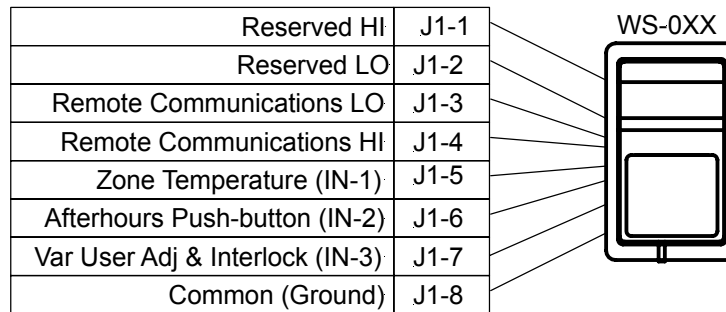
- IN-4 Aux Temperature
- IN-5 Outdoor Air Temperature
- IN-6 Discharge Air Temperature
- IN-7 Water loop Temperature
- IN-8 Aux Temperature / Occupancy Sensor

TB-4 Analog Inputs 0- 5 Vdc



### Wall Sensor Input

Inputs 1 through 3 are also connected through the 8 pin modular Zone Sensor Jack, J1 which is used with a SCP-0XX sensor cable to connect to an ASI WS-0XX wall sensor.



## Input Hardware Configuration

The inputs in the ASIC/1-8655 controllers is preconfigured 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). The ASIC/1-8655 has pin socketed pull-up resistors to allow changing the input configuration. All inputs are referenced to the +5 Vdc supply voltage through pull-up socketed resistors. They can be removed if required for connecting active sensors.

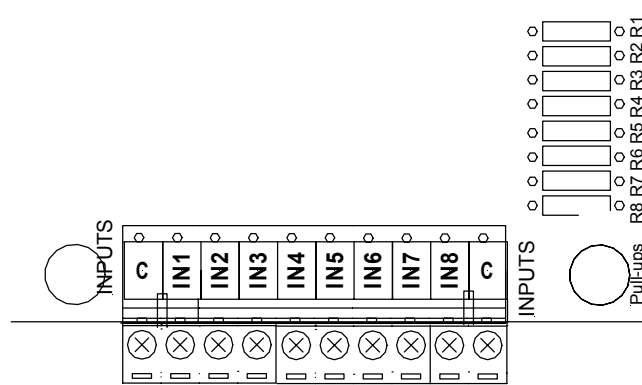
Input 4 is typically used with an active sensor that does not have a pull-up resistor.

The location of the pull-up and pull-down resistors and other details are described below.

### ASIC/1-8655 Factory Pull-ups

- R1 = IN-1 Pull-up - 3.32 kohm 1% 1/4 watt IN1 to + Vcc
- R2 = IN-2 Pull-up - 510 ohm 1% 1/4 watt IN2 to + Vcc
- R3 = IN-3 Pull-up - 10.0 kohm 1% 1/4 watt IN3 to + Vcc
- R4 = IN-4 Pull-up - 1.82 kohm 1% 1/4 watt IN4 to + Vcc
- R5 = IN-5 Pull-up - 1.82 kohm 1% 1/4 watt IN5 to + Vcc
- R6 = IN-6 Pull-up - 1.82 kohm 1% 1/4 watt IN6 to + Vcc

R7 = IN-7 Pull-up - 1.82 kohm 1% 1/4 watt IN7 to + Vcc  
 R8 = IN-8 Pull-up - 1.82 kohm 1% 1/4 watt IN8 to + Vcc



### Changing Input Configuration

If it is necessary to change the input pull-up resistors, remove the old resistor and insert the appropriate pull-up resistors into the pin sockets as shown above..

To remove resistors:

- o Turn controller power OFF.
- o Identify the proper resistor.
- o Grip the resistor with a pair of long nose pliers.
- o Gently remove one pin of the resistor.
- o Gently remove the other resistor pin.

To insert resistors:

- o Turn controller power OFF.
- o Identify the proper resistor.
- o Grip the resistor with a pair of long nose pliers.
- o Align and partially insert one pin of the resistor.
- o Align and partially insert the other resistor pin.
- o Confirm both pins are properly aligned.
- o Using the pliers, gently work the resistor into the socket.

If more resistors are required, they can be purchased from ASI Controls or at a local electronics store. If they are purchased from a local electronics store, they must meet all stated specifications for required pull-up resistors as shown below.

## 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, 3 kohm Type II | 1.82 kohm, 1%, 1/4 W, MF   |
| Binary                     | (Typical) 1.82 kohm, 1%, 1/4 W, MF   |
| Afterhours Pushbutton      | 510 ohm 5%, 1/4 W, CF (IN-2)   |
| Variable User Adjust       | 10 kohm 1%, 1/4 W, MF<br>for 10 to 30k pot (IN-3)                            |

## Input Type (Thermistor)

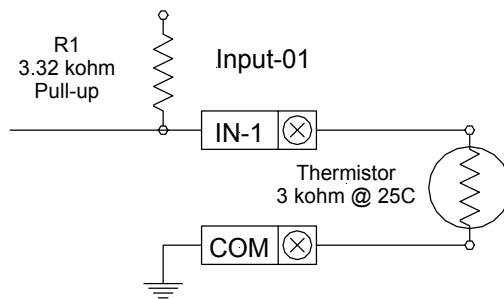
Thermistors are sensors used for measuring temperature. The resistance of a thermistor changes with respect to temperature. As the resistance changes, the voltage measured across it by the controller changes. The controller uses a voltage divider circuit to measure the voltage across the thermistor. The pull-up resistor required depends upon the temperature range and the thermistor used.

The ASIC/1-8655 has built in tables for 3,000 ohm at 77 F (25C), Type II Thermistor using either 3.32 kohm or 1.82 kohm pull-up resistors. Conversion is in degrees Fahrenheit or Celsius depending on the conversion selected.

To configure the controller to accept a thermistor input, verify that the installed pull-up resistor, matches the Input Type and Conversion that is selected. Avoid long wire runs between the controller and the thermistor whenever possible.

### Input 1 - Temperature Sensor

A Temperature Sensor is installed between input 1 and common with a 3.32 kohm pull-up resistor installed in R1. Input 1 is normally used for the Zone Temperature Sensor.



Type II Thermistor inputs, 3000 ohm at 77 F, require either a 3.32 kohm or 1.82 kohm pull-up resistor depending on the analog conversion type.

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

### Input 2 – Afterhours Push-button

The controller is expecting an Afterhours Push-button on input 2. In Occupied it is used to toggle the lighting output. In Unoccupied it triggers Afterhours operation.

Note that it will toggle the output assigned to the Light Output Mask, even if the lighting schedule is NOT used, and Afterhours is disabled. To prevent this you must set the Light Output Mask to None.

**Input 3 – User Adjust/Interlock**

Input 3 is used for the variable user adjust, but it is also used for interlock that allows certain critical data to be changed, and for the controller to respond to a "FindIt" message. The interlock shorts Input 3 to common! The user adjust feature will not function while the interlock is in place.

**Auxiliary Temperature Sensors**

Auxiliary temperature sensors may be installed on Input 6, 7 or 8. Some inputs have been identified with specific functions, as discussed below. Please consult the appropriate application bulletin for specific usage.

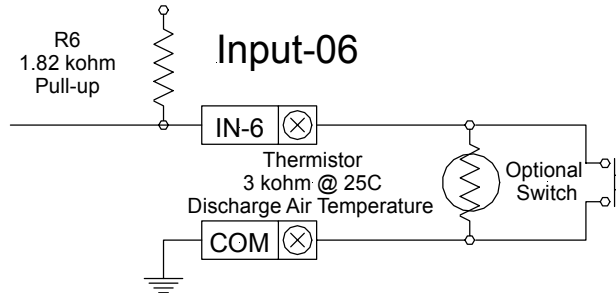
A 3 kohm @ 77 F Type II Thermistor Temperature Sensor on Input 6, 7, or and common will read -50.00 to 212.00 F (-45.50 C to 100.00 C) with a 1.82 kohm pull-up or -30 to +180 F (-34.4 C to 82.20 C) with a 3.32 kohm pull-up depending on configuration. A 1.82 kohm pull-up resistor is typically installed in pull-up resistors, R6, R7, and R8.

- ASIC/1-8655    Input 4 Aux Temperature, R4 = 1.82 kohm
- Input 5 Outside Air Temperature, R5 = 1.82 kohm
- Input 6 Discharge Air Temperature, R6 = 1.82 kohm
- Optional Compressor Fault Switch
- Input 7 Water Loop Temperature, R7 = 1.82 kohm.
- Optional Proof of Fan Switch
- Input 8 Mixed Air Temperature(future), R8 = 1.82 kohm
- Optional Occupancy Switch

**Input 6 – Discharge Air Temperature**

An Discharge Air Temperature sensor can be installed between Input 6 and input common. A 1.82 kohm pull-up resistor is installed in R6.

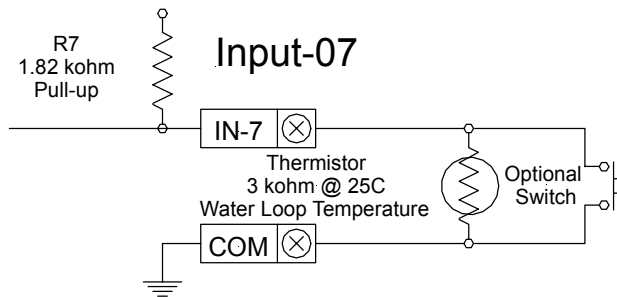
An Optional Switch across input 6 can be used to detect compressor faults. .



**Input 7 – Water Loop Temperature**

A Water Loop Temperature can be installed between Input 7 and input common. A 1.82 kohm pull-up resistor is installed in R7. Typically, this is used to determine the water loop temperature for hydronic heat pump systems.

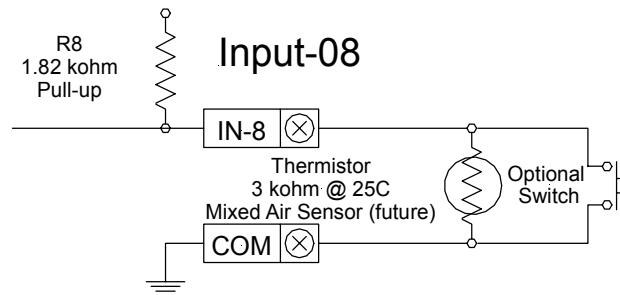
An Optional Switch across input 7 can be used to detect proof of fan.



### Input 8 – Mixed Air Temperature

A Mixed Air Temperature sensor can be installed between Input 8 and input common. A 1.82 kohm pull-up resistor is installed in R8. This will be used in a future release for a Mixed Air Economizer sequence.

An optional switch across input 8 can be used to indicate occupancy status.



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

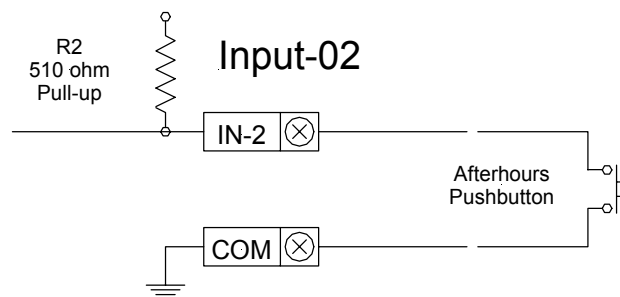
The ASIC/1-8655 has a modular 8 pin RJ-45 jack, J2, to provide connection using the SCP-0XX sensor cables to the WS-0X1 wall sensors for Inputs 1, 2, and 3.

The WS-0X1 wall sensor has several jumpers that can be used to configure the wall sensor for a specific application.

- The WS-011 & WS-031 afterhours switch should be selected for IN-2 using jumper W6. For the WS-041 the membrane switch is also connected at pin headers at W6.
- The WS-021, WS-031, & WS-041 variable user adjust should be selected for IN-3 using jumper W5.
- When used with the ASIC/1-8015, 8205, or -8305, the jumpers, W3 and W4, must be moved to connect local ( L ) and remote ( R ) communication.

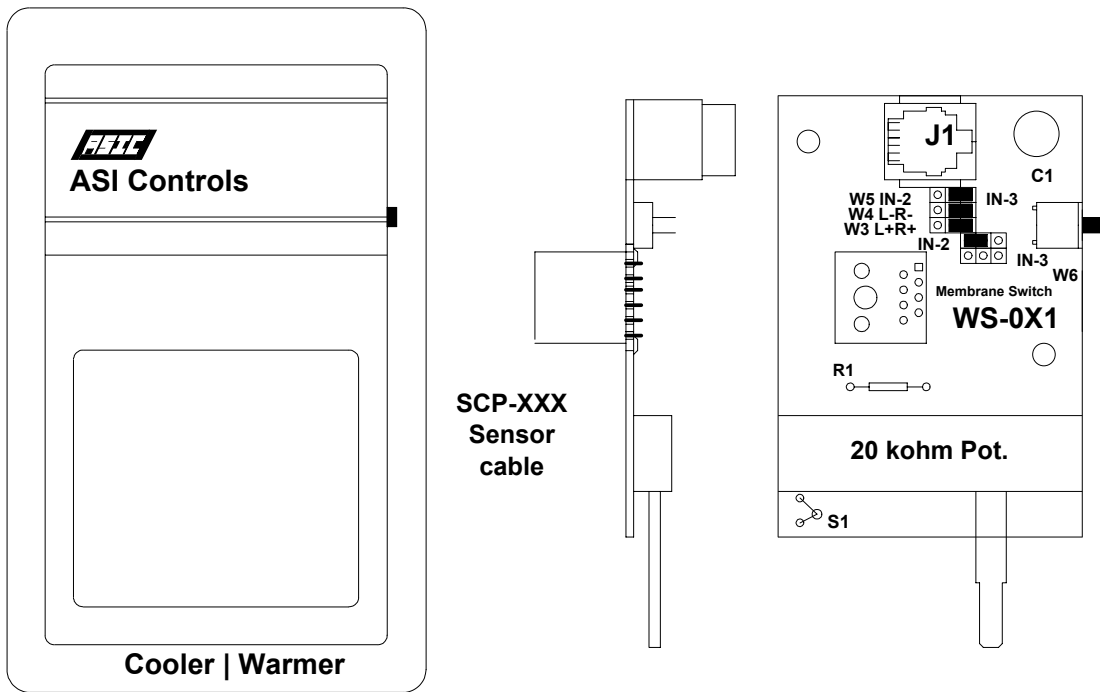
### Afterhours Switch

For the ASIC/1-8655 controller, the Afterhours switch is always on IN-2.



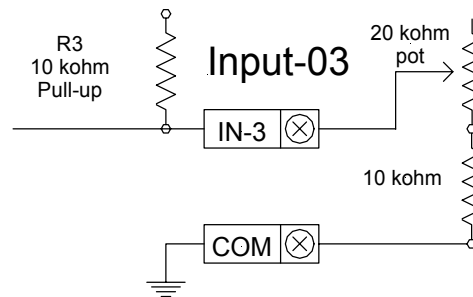
The afterhours switch can be selected for IN-2 or IN-3 using jumper W6. For the WS-041 the membrane switch is also connected at pin headers at W6.





### Variable User Adjust

The variable user adjust uses a linear 20 kohm potentiometer in series with a 10 kohm resistor, and using a 10 kohm pull-up resistor. Note: this is the standard pull-up resistor value for Input-3.



For the ASIC/1-8655 controller, the user adjust input is on Input-3. An appropriate input conversion generates -100% to +100 % of the User Adjust Setpoint, as the potentiometer goes from minimum to maximum. The WS-021, WS-031, & WS-041 variable user adjust can be selected for IN-2 or IN-3 using jumper W5.

Input 3 is also used for 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 blade 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.

To use Input 3 for variable user adjust requires the following:

- 1) User Adjust Enable is Yes.

- 2) Input 3 Configuration is Input Type = 3 - User Adjust, Convert Type =2, 10 to 30 kohm, -100%,+100%. Input 3 is used for the variable user adjust and the potentiometer allows continuous resetting of the active temperature setpoint upwards or downwards by up to of the User-Adjust Setpoint.  
Note: Input 2 should be configured to read Raw value, not User Adjust.
- 3) Input 3 pull-up resistor, R3, is 10 kohm. This is the factory value.

### Input 8 - Occupancy Sensor Switch

The purpose of this option is to use the unoccupied setpoints and sequence when the MOT Series occupancy sensor, or a manual switch thrown by the occupant, indicates the space is not occupied. It only has effect when the scheduled state is occupied.

If the **Occupancy Sensor Enable** is set, the control state is determined by the daily event schedule or by the 2 position switch attached to input #8. The switch can be normally open or normally closed. If **Occupancy Sense Closed** is No, then an open contact, no low input fault, places the room in occupied, **Occupancy Status** = yes. If **Occupancy Sense Closed** is yes, then a Closed contact low input fault, places the room in occupied. If Occupancy Status is No, control is in the Unoccupied state. If Occupancy Status is Yes, control is in the state determined by schedule or if **State Schedule Disable** is set, in the Occupied State.

An **Sensor Threshold** allows adjusting the transition level on input 8.

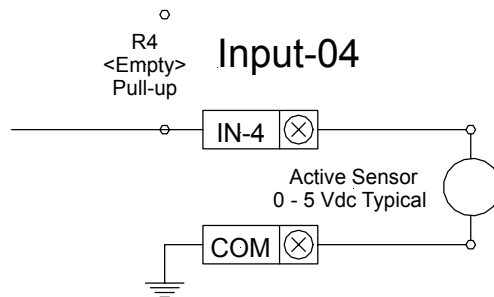
## Active Transducers

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.

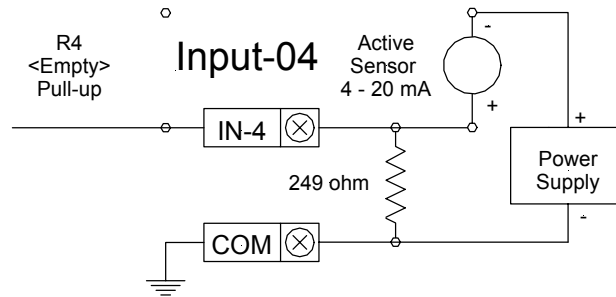
### Input Type (0 to 5 Vdc)

An active sensor that generates 0 Vdc to 5 Vdc input voltage can be directly connected to the input, with the pull-up resistor removed..



### **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.



Input 4 requires the removal of the pull-up resistor, R4. A 4 to 20 mA transducer requires a 249 ohm, 0.1%, external resistor between the input and common. The external power supply must be properly grounded.



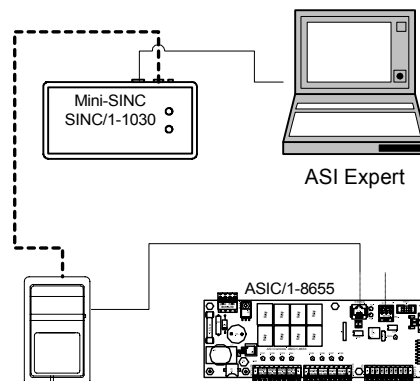
# ASIC/1-8655 Communications

## Communication Wiring

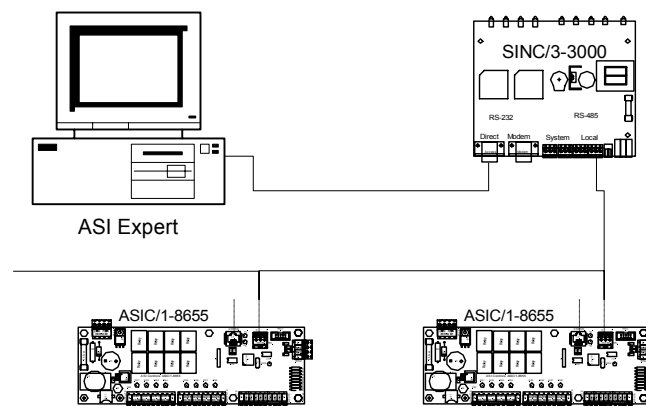
Communications between ASI controllers are carried on a 2-wire RS-485 communication bus. The communication line has a HI (+) and a LO (-) side, and care must be taken that every controller is connected correctly.

A 2 wire communication cable, is used to interconnect several controllers using the screw terminal connector TB6. By connecting a communication cable from one ASIC/1 to another, communications can be established with any controller in the system. 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 a SINC/1-1030 Portable Interface .



The ASIC/1-8655 can also be networked and connected through the local bus of a SINC/3 or an ASIC/2 controller.



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## Installation Rules

RS-485 communication is highly 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:

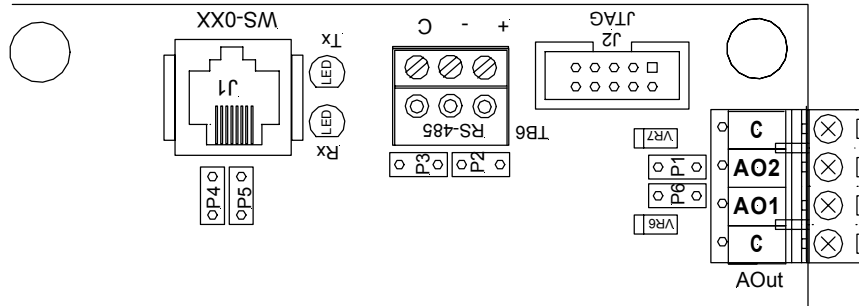
- o Install only communication cable which meets the ASI Controls stated specifications.
- o Do not run communication wiring close to AC wiring.
- o Do not physically stress the communication cables, especially when pulling the communication cable around sharp bends and over rough surfaces.
- o Avoid splicing communication cables. Use continuous pieces of cable between controllers.
- o Use only use factory fabricated and tested wall sensor cables, SCP-X0XX .
- o Do NOT exceed 32 controllers on the local communication bus. If more than 32 controllers are connected together, use an RS-485 repeater to repeat the signal.
- o Verify communication 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, large power consuming or power-generating equipment, etc.. If possible cross power wiring at right angles.
- o 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.
- 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, TB6
- o Wall Sensor Communication, J1
- o Communication Protection



## Communication, TB6

The ASIC/1-8XX5 uses screw terminals, TB-4, for connection to the communication bus. This connects the ASIC/1-8X55 to other ASIC/1-8X55s in the system. By connecting a communication cable from one ASIC/1 to another, communications can be established with any controller in the system.

Remote Communication, TB6. connections:

- TB6-1 Remote (+) HI RS-485 Communication
- TB6-2 Remote (-) LO RS-485 Communication
- TB6-3 Common, Shield if used.

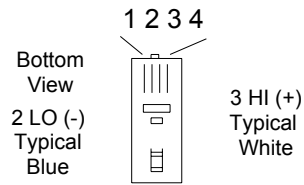
Each of the communication wires is labeled with a "+" and "-" sign indicating polarity. The "+" or HI is connected to TB6-1. The "-" or LO is connected to TB6-2. It is important that polarity of the communication wiring is maintained throughout the communication network. The connector TB6 is two part and can be separated from the controller without disconnecting the wire.

Maintaining consistent wiring color codes throughout the communication network helps prevent mis-wiring.

The ASIC/1 communication network is designed to daisy chain or star controllers together from one controller to the next. Up to 32 controllers can be daisy chained together. By use of 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.

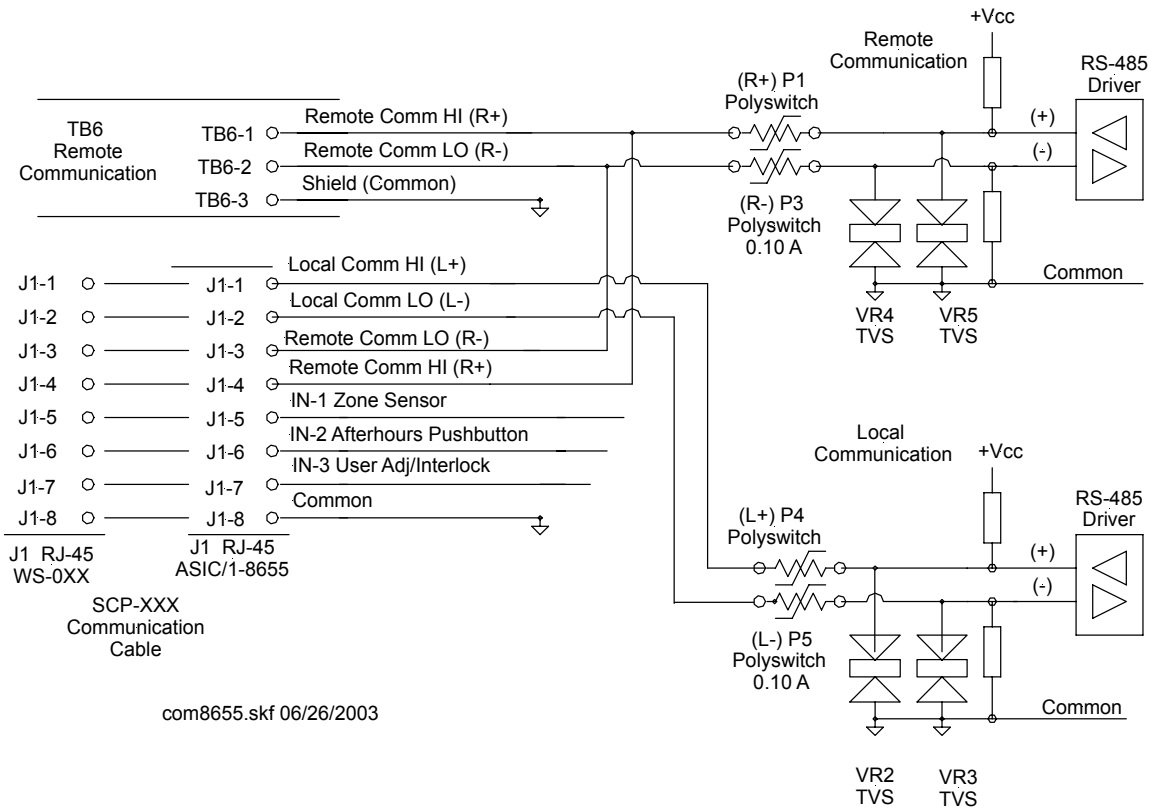
The screw terminals are designed to be used with 16 gauge to 24 gauge stranded or solid wire. When making terminations with stranded wire, be particularly careful that all strands of wire are terminated inside the connector. Loose strands can short out communication.

If connection with a network of the older ASIC/1-8015 or ASIC/1-8010 families of controllers that use modular connectors, it is important to determine the polarity of the communication bus 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 0.100 A poly-switches and Transient Voltage Suppressors to clamp the allowed voltage to protect the communication bus.

The Transient Voltage Suppressors are ASI PN17009, General Semiconduction, SA 7.0C(A), Diode Voltage Clamp, 7.0 Vdc, Bipolar.

The poly-switches P2 and P3 are located next to the RS-485 connector TB6, and automatically restore when excess voltage is removed. Polyswitches are ASI PN14021, Raychem RXE010, 60V, 100 mA

The RS-485 driver chip, U11, is socketed, so that if installation errors cause damage to the controller it may be easily repaired. U11, is Texas Instruments, SN75176BP.



## Communication Wire Specification

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  |

Plenum Rated Cable meets these specifications and is described as follows: Tinned copper conductors; Teflon(TM) insulated; twisted pair; 150V NEC 725 Class 2 for use in air plenums; non-conduit.

### Shielded Wire

Shielded wire is generally not recommended over ceilings for the communication bus. However, if the communication bus wiring is run in conjunction with AC power wiring, shielded wire should be used.



Note: Shielded communication wire is required to meet CE certification.

If shielded wire is required for the communication wiring, it should meet the following specifications:

### Shielded Pair Specification

|                                 |                   |
|---------------------------------|-------------------|
| 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.

## Wall Sensor Access, J1

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

WS-0X1 Access, J1 connections:

|         |   |
|---------|---|
| WS J1-1 | 2nd port (+) HI RS-485 Communication - future |
| WS J1-2 | 2nd port (-) LO RS-485 Communication - future |
| WS J1-3 | Remote (-) LO RS-485 Communication            |
| WS J1-4 | Remote (+) HI RS-485 Communication            |
| WS J1-5 | Input 1 Zone Sensor                           |
| WS J1-6 | Input 2 Push-button, User Adjust              |
| WS J1-7 | Input 3 Interlock                             |
| WS J1-8 | Common  |

The ASIC/1-8655 is designed to be compatible with the WT-0XX and WS-0XX series Wall sensors using the RJ-45 connector J1, however communication must always be in the REMOTE mode.

This significantly reduces the numbers of termination needed to ensure system wide communications. 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.

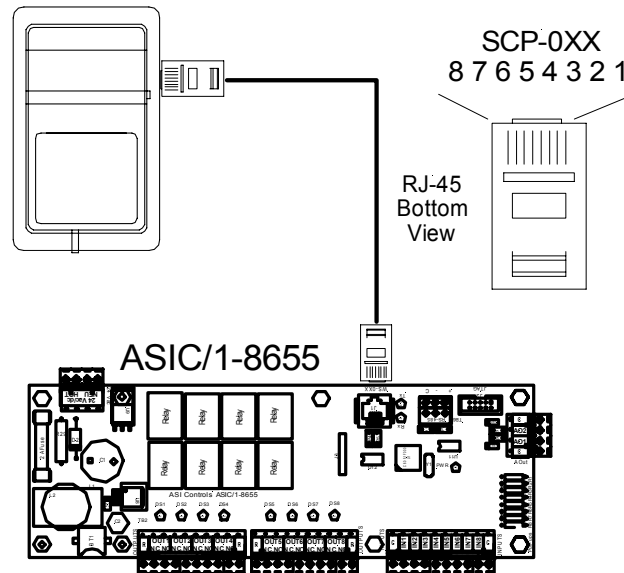
The controller will act on messages sent to the Terminal Global address, 5A5Ah and to the ASIC/1-8x55 Global address, 5A55h. It will also respond to Device Global Addresses:

Address 23,045 (5A 05 hex) ASIC/1-8055 VAV Controllers (155A1.9..)

Address 23,077 (5A 25 hex) ASIC/1-8255, Fan Coil Controllers (255A16..)

Address 23,093 (5A 35 hex) ASIC/1-8355, PAC Controllers (355A1.7..)

Address 23,141 (5A 65 hex) ASIC/1-8655, Roof Top Controllers (655A1.0..)



### **Sensor Cable, SCP-XXX**

The sensor cable SCP-XXX is used to connect the zone sensor WS-XXX to the 8 pin ASIC/1-8655 modular jack, J1. The use of factory tested sensor cables is strongly recommended.

The ASIC/1-8655 does not use a relay in the wall sensor. All communication with the ASIC/1-8655 is in the remote mode. The yellow LED on the SINC/1-1030 should NOT be illuminated.

If necessary to disconnect the controller from the communication bus this can be done by temporarily separating the two part connector, TB6.

In an application without a zone sensor, a jumper cable is not needed by the ASIC/1-8655. However, an appropriate zone sensor must be connected to input 1.

# ASIC/2-7040 Communication Network

The ASIC/1-8655 is designed to integrate the zone temperature control with that of the system controller controlling the building functions. The configurable ASIC/2-7040 or ASIC/2-8040 can poll the terminal unit controllers on its local communication bus. ASIC/1-8655, ASIC/1-8015, ASIC/1-8205, and the ASIC/1-8055 may be intermixed on the local bus. Operation of the building system may be modified based on information obtained from the ASIC/1 controllers.

Polling in the ASIC/2-7040 is concurrent, that is it takes place at the same time as other communication on the system bus.

Note: the RS-232 connection on the ASIC/2-7040 is not designed to provide communication with a network of controllers. It is only designed to communicate with one controller. It does not provide the network driving capability of the SINC/1-1030.

