ASIC/1-6000

Application Bulletins

By ASI Controls

August 2009

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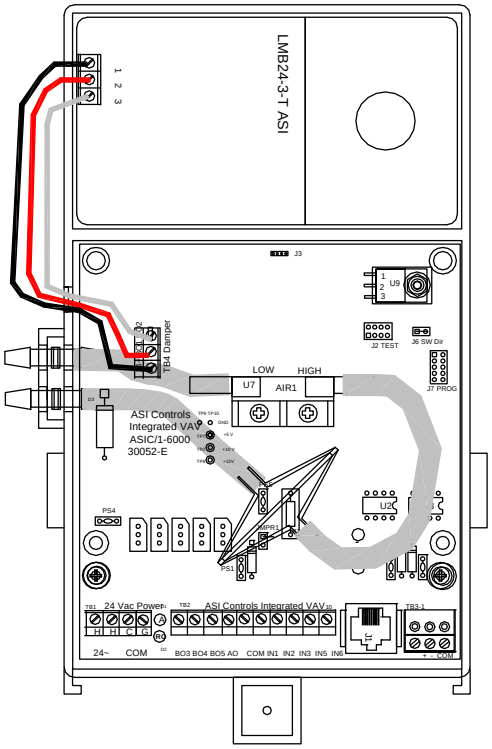
Introduction

ASIC/1-6000 VAV Controllers

The ASIC/1-6000 is an application specific networked digital controller with an integral damper actuator for control of pressure independent Variable Air Volume (VAV), and Fan-Powered VAV terminal units. The ASIC/1-6000 controller uses an on-board airflow sensor to measure duct airflow and maintains the space temperature by varying the air volume. The zone temperature measured through the WS-0X1 Wall Sensor is compared with the cooling and heating setpoints and used to calculate the correct air volume to be distributed to the space.



The ASIC/1-6000 Integrated VAV controller is packaged with a 24 Vac, Damper Actuator, 5 N-m (45 in-lbf), a V- rated enclosure, and a built-in low pressure drop Airflow filter.

This pressure independent controller is mounted directly on the VAV terminal being controlled. Just attach the motor to the damper shaft, and secure the controller with the anti- rotation screw. Connect the 24 Vac power. The Fan and Electric or Hot Water Heat are connected as required. The airflow cross is connected to the tubing barbs: The

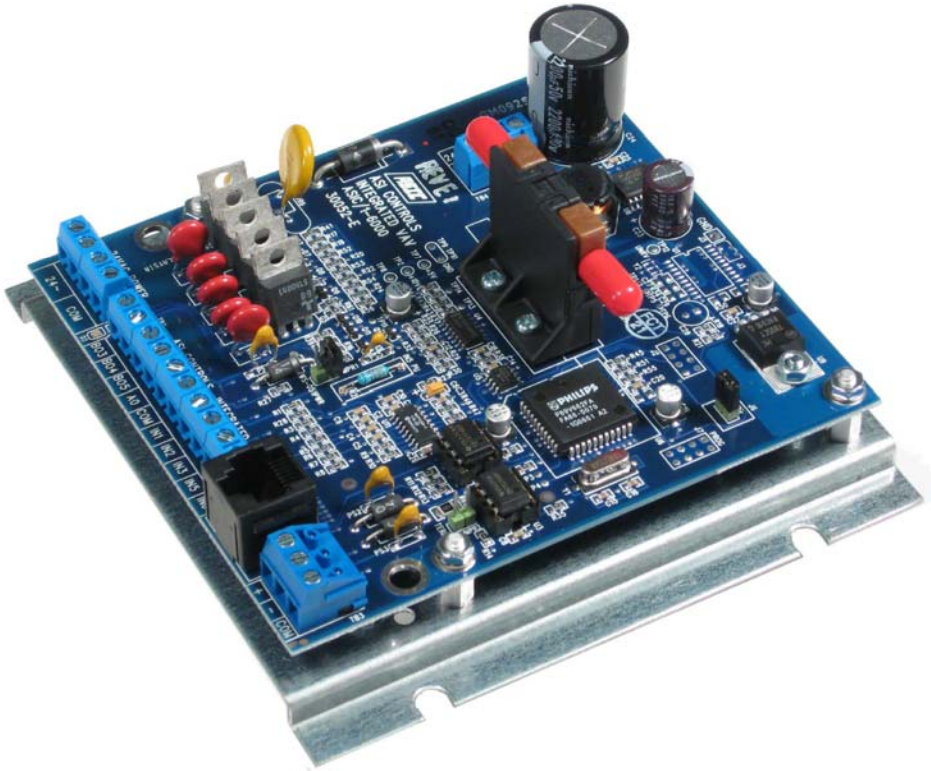
High side is connected to the filter side. The ASI WS-0xx wall sensor is connected using the standard ASI SCP-0xx cable. RS-485 communication is connected to the + and – positons on the T3 terminal block. If shielded cable is used, the shield is connected at only one end to the cerminal marked COM. The 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.

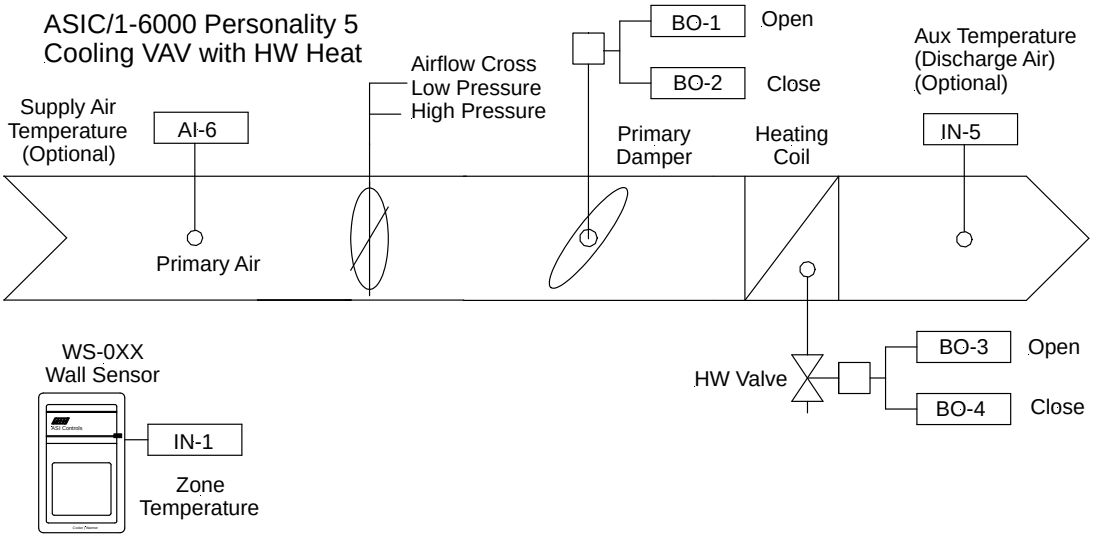
Each ASIC/1 has a 24-hour, 8-day software clock. The clock in each controller automatically sets the appropriate operating parameters based on the schedules programmed into non-volatile memory.

To use scheduled operation, the controllers must be synchronized regularly by time broadcast on the communication line by a SINC/3-3000, or ASIC/2 controller or other device. Two-way communications allows information to be transmitted throughout the control system.

The ASIC/1-6000-MB comes mounted on a metal base with airflow. The ASIC/1-6000-MB-PD has no airflow sensor.



VAV Personalities



The ASIC/1-6000 is preprogrammed with different personalities for single duct cooling VAV terminals. The Zone Temperature is compared with the Active Heating and Cooling Temperature Setpoints.

If Cooling is required, a PI calculation is used to determine the Cooling Requirement, and the Primary Airflow Setpoint is calculated between Cooling Minimum and Cooling Maximum Airflow. The Primary Air Damper is then modulated to meet the Primary Airflow Setpoint giving Pressure Independenent operation.

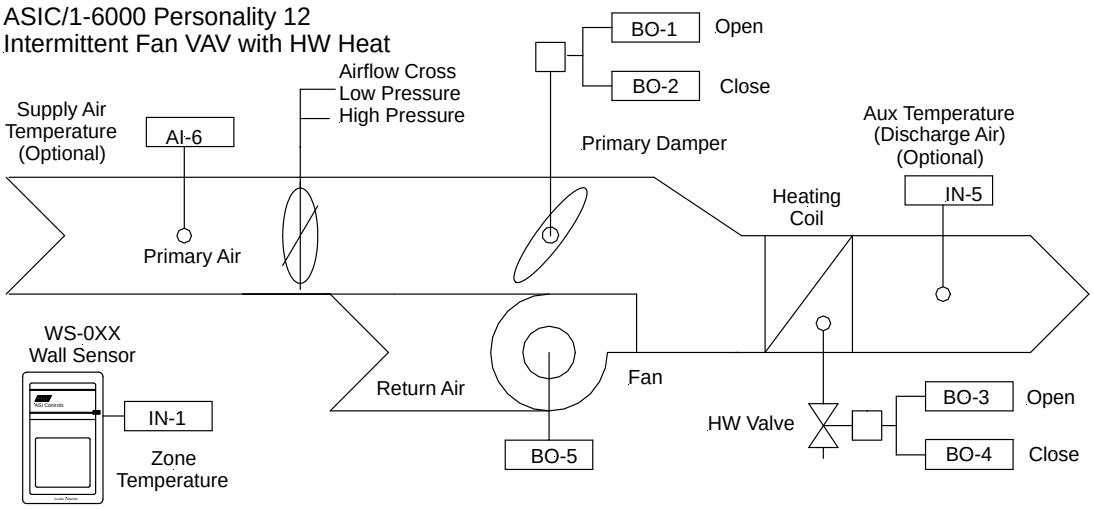
In the Deadband Control Mode the Primary Airflow is set to minimum.

If Heating is required and available the Primary Airflow is set to the Heating Minimum Airflow Setpoint and a Heating Requirement is calculated. Depending on the type of heat available, the Hot Water Valve is modulated open or closed based on drive time; one two or three stages of electric heat are duty cycled, or the Thermic Valve is pulsed on and off.

The operation of the singled duct VAV terminal is determined by the Personality selected. Please see the Application Bulletin 70, Single Duct VAV for further details.

	No Reheat	1 Stage Electric	2 Stage Electric	3 Stage Electric	HW Valve Open/Close	Thermic Valve
VAV	1	2	3	4	5	18

Intermittent Fan Personalities



The ASIC/1-6000 is preprogrammed with different personalities for fan-powered parallel VAV system with intermittent fan.

The Zone Temperature is compared with the Active Heating and Cooling Temperature Setpoints.

If Cooling is required, a PI calculation is used to determine the Cooling Requirement, and the Primary Airflow Setpoint is calculated between Cooling Minimum and Cooling Maximum Airflow. The Primary Air Damper is then modulated to meet the Primary Airflow Setpoint giving Pressure Independenent operation.

If the Primary Airflow falls below the Fan Energize Airflow Setpoint then the Fan is turned On.

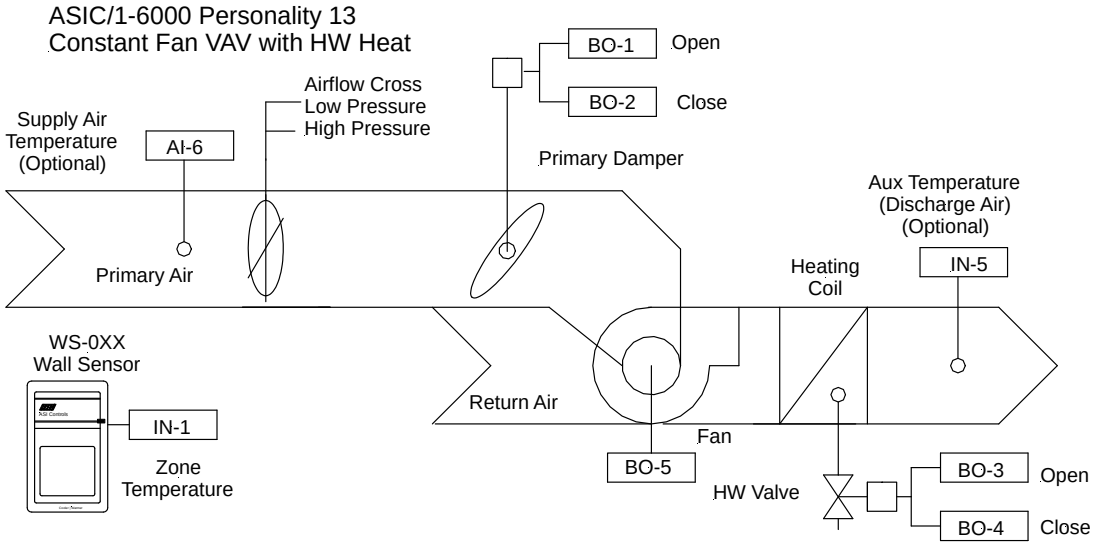
In the Deadband Control Mode the Primary Airflow is set to minimum.

If Heating is required and available the Primary Airflow is set to the Heating Minimum Airflow Setpoint and a Heating Requirement is calculated. Depending on the type of heat available, the Hot Water Valve is modulated open or closed based on drive time; one two or three stages of electric heat are duty cycled, or the Thermic Valve is pulsed on and off.

The operation of fan-powered parallel VAV terminal is determined by the Personality selected. Please see the Application Bulletin 71, Intermittent Fan VAV for further details.

	No Reheat	1 Stage Electric	2 Stage Electric	3 Stage Electric	HW Valve Open/Close	Thermic Valve
Intermittent Fan	16	6	7	NA	12	19

Constant Fan Personalities



The ASIC/1-6000 is preprogrammed with different personalities for fan-powered series VAV terminals with constant fan.

The Zone Temperature is compared with the Active Heating and Cooling Temperature Setpoints.

If Cooling is required, a PI calculation is used to determine the Cooling Requirement, and the Primary Airflow Setpoint is calculated between Cooling Minimum and Cooling Maximum Airflow. The Primary Air Damper is then modulated to meet the Primary Airflow Setpoint giving Pressure Independenent operation.

In the Deadband Control Mode the Primary Airflow is set to minimum.

If Heating is required and available the Primary Airflow is set to the Heating Minimum Airflow Setpoint and a Heating Requirement is calculated. Depending on the type of heat available, the Hot Water Valve is modulated open or closed based on drive time; one two or three stages of electric heat are duty cycled, or the Thermic Valve is pulsed on and off.

For Series Fan Powered Terminal box control, the constant fan operation is based on the control state, and mode. In Deadband the fan is on or off depending on the sequence selected. The fan is ON whenever the primary air damper is not closed. In the morning warm up state, the fan is on. In night setback or unoccupied states, the fan is off unless the system is in heating mode.

The operation of fan-powered series VAV terminal is determined by the Personality selected. Please see the Application Bulletin 72, Constant Fan VAV for further details.

	No Reheat	1 Stage Electric	2 Stage Electric	3 Stage Electric	HW Valve Open/Close	Thermic Valve
Constant Fan	17	9	10	NA	13	20

ASIC/1 WS-051 Digital Display

The ASIC/1-6000 supports the WS-051 Digital Display Wall Sensor. The Digital Display has a zone temperature sensor that is read by the ASIC/1 controller. The Digital Display is connected to the ASIC/1-6000 using the standard SCP-0xx wall sensor cable. A jumper must be set on the controller and Digital Display Enable must be set to yes using aSI Expert software. You can talk to the controller through the wall sensor using a SINC/1-1030 Portable Mini-SINC.

If User Adjust Enable is yes, the WS-051 can be used to change the Occupied Cooling and Heating Temperature setpoints. If Single Setpoint Enable is yes, then single setpoint adjustment is supported where the Occupied Cooling Temperature Setpoint is changed and the Occupied Heating Temperature Setpoint is set 2 degrees lower.

If Afterhours Enable is yes, the WS-051 can be used to start afterhours operation.

If Half Degree Enable is yes, then the temperature setpoints are maintained in 0.5 deg increments in the controller

If the Input 1 Type is Zone Temp deg C, then the temperature reading and setpoints are in Celsius units. If the Input 1 Type is Zone Temp deg F, then the temperature reading and setpoints are in Fahrenheit units.

Please see the Application Bulletin 69, ASIC/1 Digital Display for further details.

ASIC/1 Occupancy Sensor

With firmware 600a1.3 the ASIC/1-6000 supports an occupancy sensor on Input 5.If the Occupancy Sensor Enable is set, the control state is determined by the daily event schedule or by the switch attached to input 5. The switch can be sense a voltage threshold or may be two-position normally open or normally closed switch.

In the Occupied State the sensor or switch forces the controller to the Unoccupied State using the unoccupied setpoints and sequence.

In the Night Setback or Unoccupied States if Occupancy Afterhours Enable is yes, the Occupancy Sensor can initiate afterhours operation when the sensor indicates that the room is occupied.

Please see the Application Bulletin 66, ASIC/1 Occupancy Sensor for further details.

About This Document

This manual was produced using *Doc-To-Help*®, by Component One, LCC. This manual, ASIC/1-6000 Applications, DOC-1634 and Windows™ help system was last revised on 2009-08-27. 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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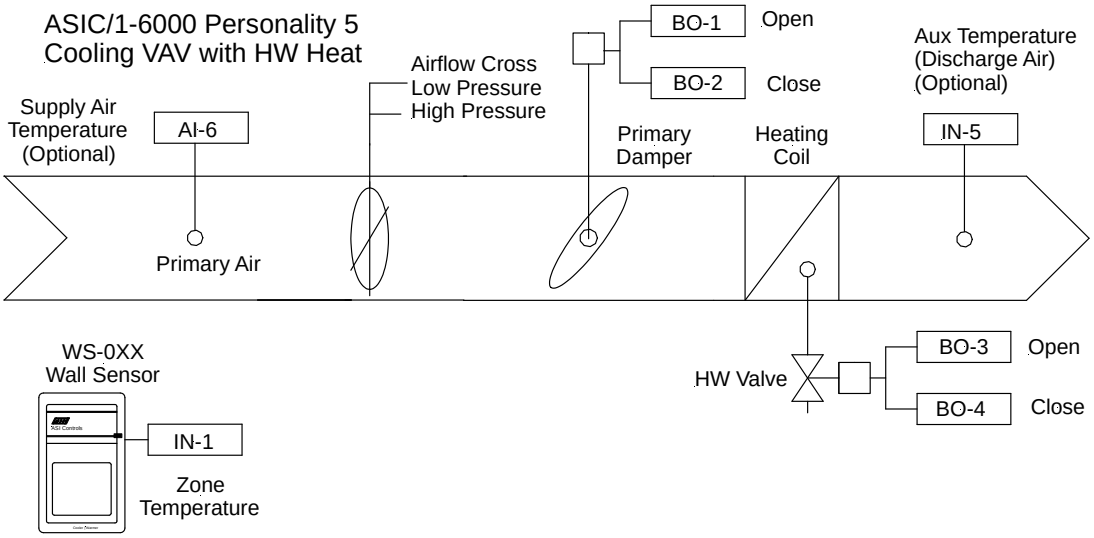
Single Duct VAV

General Description



This application bulletin describes the sequence of operation used by the ASIC/1-6000 VAV controller with integrated actuator to control zone temperature with a single duct variable air volume system. The ASIC/1-6000 uses a primary airflow sensor to give pressure independent control of the variable air volume cooling. Heating is provided with optional proportional or thermic valve hot water heat, or up to 3 stages of electric heating. The ASIC/1-6000 is preprogrammed with different personalities for single duct cooling VAV terminals.

Single Duct VAV Personalities

	No Reheat	1 Stage Electric	2 Stage Electric	3 Stage Electric	HW Valve Open/Close	Thermic Valve
VAV	1	2	3	4	5	18

Inputs

The ASIC/1-6000 controller has specific inputs for zone temperature, primary airflow, and optional supply air temperature. The default input types are set at the factory. Inputs that are not required for the sequence may be used for monitoring.

Primary Airflow

The ASIC/1-6000 uses an primary airflow sensor to give pressure independent control of the variable air volume. The primary airflow sensor, installed on input 4, is calibrated at zero airflow. An airflow filter, AF-001, is required on the inlet side of the airflow transducer, is installed in the enclosure.

The controller measures the air velocity in feet per minute (ft./min) assuming a standard velocity K-factor of 2338 ft/min. The velocity K-factor is the air velocity in ft/min required to generate a velocity pressure of 1 inch water column (1 "wc =249 Pa) The velocity K-factor is provided by the VAV box manufacturer for a particular box size and flow cross. The airflow volume Q in CFM is calculated based on the actual K-factor in feet per minute , and duct area in square feet.

$$Q\ (CFM) = Area\ (ft^2) * Velocity(ft/min) * (K\text{-}factor/2338)$$

Field adjustment of the velocity K-factor may be done by the air balancer using the air balance screen on the setup software.

Wall Sensor Connections

Zone temperature sensor is normally on input 1. Typically, the zone temperature on the WS-0xx wall sensor, is connected to the controller using a SCP-XXX sensor cable. Alternately, a zone or return air temperature sensor may be attached on input blade, IN1. If there is no zone temperature sensor , then the zone sensor input is in fault, all outputs are off, and it does not try to control.

The afterhours push-button on the WS-0X1 wall sensor if used, is always on input 2. If Afterhours Enable is Yes, then shorting the input to zero will initiate afterhours override mode for an Afterhours Time Allowed.

Input 3 is used for Interlock and may be used for variable user adjust with the WS-0XX wall sensor. When User Adjust Enable is set and input 3 is configured for Variable User adjust, 10k to 30 kohm, the zone temperature setpoint may be adjusted up or down by the User Adjust Setpoint, based on the condition of input 3.

Support is also provided for the WS-051 Digital Display Wall Sensor. The WS-051 has a zone temperature sensor on input 1 and provides both Occupied Temperature Setpoint change and afterhours override. A jumper, JMP1, may be set to provide power to the WS-051 via input 2.

Auxiliary Temperature Sensors

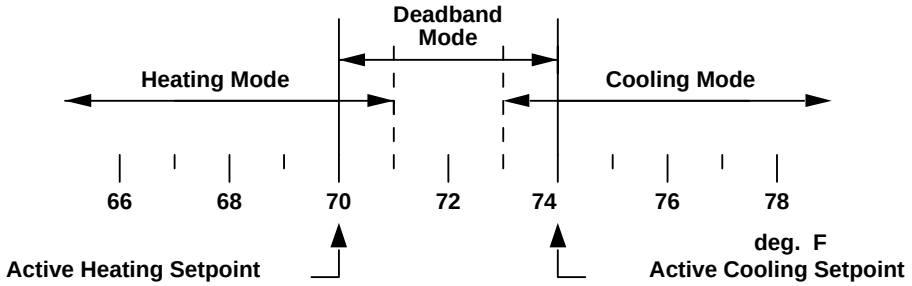
An optional duct temperature sensor, TS-DO, may be placed on input 5 or 6 for temperature monitoring. The auxiliary temperature sensors use the factory provided 3.32 kohm pull-up resistor.

Input 5 has a pin-socketed pull-up resistor. Input 6 has a fixed pull-up resistor

The duct sensor on input 6 is used for auto-changeover when the Changeover Setpoint is not zero. If the input on input 6 is in fault, then changeover is ignored. Changeover operation is described below.

Control Mode

The controller determines the Control Mode, Heating, Deadband, or Cooling by comparing the zone temperature to the Active Heating Temperature Setpoint and Active Cooling Temperature Setpoint.



The controller enters the Cooling Control Mode when the zone temperature equals or is greater than the Active Cooling Temperature Setpoint . The control reenters the Deadband mode, when the zone temperature is 1 ^{o}F below the Active Cooling Temperature Setpoint and the calculated Cooling Requirement is equal to zero.

The control enters the heating mode when the zone temperature is equal to or less than the Active Heating Temperature Setpoint. The control reenters the Deadband mode when the zone temperature is 1 ^{o}F greater than the Active Heating Temperature Setpoint and the calculated Heating Requirement is equal to zero.

Note: A 2 degree separation is required between the Active Cooling and Heating Temperature Setpoints.

Active Temperature Setpoints

The controller maintains the zone temperature between Active Cooling and Heating Temperature Setpoints. The Active Cooling and Heating Temperature Setpoints are based on Control State, the Active User Adjust based on the position of the Variable User Adjust, and the Active Demand Limit Reset.

If Half Degree Enable is set then the Temperature Setpoints are in half-degree (Fahrenheit or Celsius) increments.

If User Adjust Enable is set, the Active Temperature Setpoints may be modified by the variable user adjust potentiometer on a WS-0XX wall sensor. The Active Heating Temperature Setpoint is adjusted up and the Active Cooling Temperature Setpoint is adjusted down a fraction of the User Adjust Setpoint. If the WS-051 is used then the setpoints are adjusted with up and down arrows with in user defined limits.

If the Active Demand Level is non-zero, the Active Temperature Setpoints are also modified by a fraction of the Demand Reset Range as the Active Demand Level goes from 0 to 6. The Active Cooling Temperature Setpoint is reset upwards and the Active Heating Temperature Setpoint is reset downwards.

Cooling and Heating Requirement

In Deadband Control Mode, the Heating and Cooling Requirements are zero.

In the Cooling or Heating Control Mode, the Cooling or Heating Requirement is calculated using a PI control loop.

The change in heating or cooling requirement is calculated every 30 seconds.

In heating: Error = Active HTG SP - Zone Temp
Δ Error = Previous Zone Temp - Zone Temp

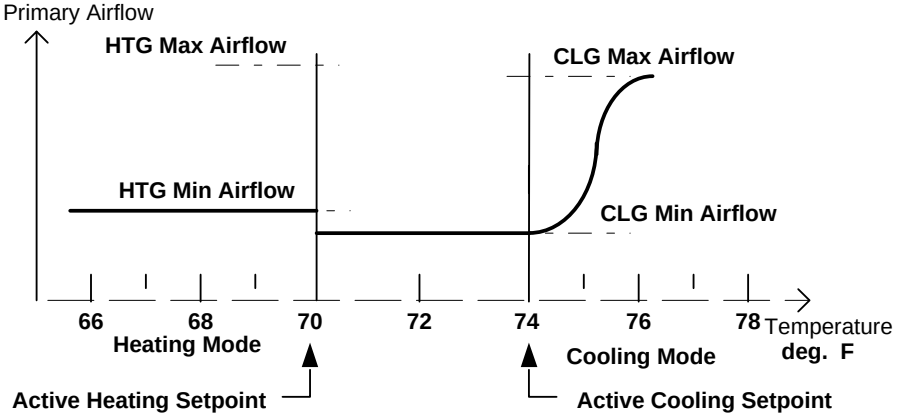
or in cooling: Error = Zone Temp - Active CLG SP
Δ Error = Zone Temp - Previous Zone Temp.

ΔRequirement = (100%/ThrottleRange)*[Error*(CalcTime/Int Time) +Δ Error]

The factory setting for throttle range is 4.0 degrees, and for integral time is 2.5 minutes.

Primary Airflow Modulation

In the Cooling Mode the primary airflow modulates between the Active Cooling Minimum and Maximum Airflow Setpoints as the cooling requirement goes from zero to 100 %.



In the Deadband Mode the Primary Airflow is typically at the Active Cooling Minimum Airflow Setpoint.

In the Heating Mode the Primary Airflow is at the Active Heating Minimum Airflow Setpoint and the Local Heat is modulated to maintain the Active Heating Temperature Setpoint. If Dual Heating Enable is set then the primary airflow also modulates between Heating Minimum and Maximum Airflow as the heating requirement goes from 0 to 100%.

Pressure Dependent Operation

If Pressure Dependent Enable is yes, then the position of the Primary Damper motor is controlled based on Damper Drive Time rather than airflow. The Cooling and Heating Damper Minimum and Maximum Positions are a percentage of the Damper Drive Time.

In the Cooling Mode the damper modulates between the Active Cooling Damper Minimum and Maximum Positions as the zone Cooling Requirement goes from zero to 100 %.

In the Deadband Mode the damper is typically at the Active Cooling Damper Minimum Position..

In the Heating Mode the damper is at the Active Heating Damper Minimum Position and the Local Heat is modulated to maintain the Active Heating Temperature Setpoint. If Dual Heating Enable is set then the damper also modulates between Heating Minimum and Maximum Airflow as the heating requirement goes from 0 to 100%.

To maintain indexing of damper position the Damper is driven fully closed for a Damper Drive Time: On reset of Power, On return from Damper Override, or Emergency Mode.

Control State

The Control State determines which Cooling and Heating Temperature Setpoints are used for zone temperature control. Four control states are possible: Occupied, Unoccupied, Night Setback, and. Morning Warm-up. If the Clock is not synchronized, the Control State is Occupied unless Default State Unoccupied is set. Otherwise the Daily Event Schedule determines the Control State.

The Control State may be overridden via a message broadcast over the communication bus from software or an ASIC/2 controller. The controller state may be returned to OCC from NSB or Unocc when the Afterhours Enable is yes and the push-button on the Wall Sensor is pushed.

The Active Cooling and Heating Minimum and Maximum Airflow Setpoints are typically given by the Occupied Cooling and Heating Minimum and Maximum Airflow Setpoints.

However, if Multiple Airflow Enable is set, the Active Cooling and Heating Minimum and Maximum Airflow Setpoints are given by: the Occupied Cooling and Heating Minimum and Maximum Airflow Setpoints in the Occupied and Morning Warm-up States; the Unoccupied Cooling and Heating Minimum and Maximum Airflow Setpoints in the Unoccupied State; or. the Night Setback Cooling and Heating Minimum and Maximum Airflow Setpoints in the Night Setback State.

Deadband Mode

In the Deadband Mode, the operation of the primary air damper (and the fan if any) depends on the Control State and option selections.

In Occupied Deadband the Primary Airflow is at the Active Cooling Minimum Airflow Setpoint.

In Unoccupied Deadband the Primary Airflow is at the Active Cooling Minimum Airflow Setpoint, unless UNO Option 2 Enable is yes, then the primary air damper is closed (and the fan if any is OFF) in Deadband

In Night Setback Deadband Mode the primary Airflow is at the Active Cooling Minimum Airflow Setpoint, unless NSB Option 2 Enable is yes, then the primary air damper is closed (and the fan if any is OFF) in Deadband.

Primary Damper Control - VAV

	Occupied	Changeover	UNOCC Option 2 = No	UNOCC Option 2 = Yes	NSB Option 2 = No	NSB Option 2 = Yes	MWU Option 2 = No	MWU Option 2 = Yes
Cooling	Modulate	Min CLG	Modulate	Modulate	Modulate	Modulate	Min HTG	Min HTG
Deadband	Min CLG	Min HTG	Min CLG	Closed	Min CLG	Closed	Min HTG	Min HTG
Heating	Min HTG	Modulate	Min HTG	Min HTG	Min HTG	Min HTG	Max HTG	Min HTG

Morning Warm-up (MWU) State

Morning Warm-up is meant as a prelude to Occupied state, to ready the building for daily use. For Morning Warm-up, the control sequence operates at full-capacity heating until the zone temperature is moved into the Deadband region.

Two MWU sequences can be selected: central heating, and local heating. In central heating MWU hot air is distributed through the primary air ducts. In local heating MWU, all heat is provided from the VAV terminal.

MWU, Central Heating

If Morning Warm-up Option 2 Enable is not set then central heating is assumed where hot air is in the duct as in changeover heating, which is described below. If the control is initially in cooling or heating mode, the opposite mode is locked-out until the end of Morning Warm-up.

All local heat is typically OFF during this sequence. However if Local Heat Enable is yes, then local heat is used in addition to central heat.

Morning warm up differs from changeover because the controller goes into heating once. In changeover it can go in and out of the heating mode many times.

MWU, Local Heat

If Morning Warm-up Option 2 Enable is set then local heating is assumed. The airflow is maintained at Occupied Heating Minimum Airflow Setpoint and all heating is provided by local hot water or electric heat .

If zone temperature is less than Occupied Heating Setpoint when the control enters MWU state, the heating requirement is 100%, the local hot water or electric heat is at 100%.

When zone temperature reaches Occupied Heating Temperature Setpoint the heating requirement is at 0% and the heat turns OFF. If the zone temperature falls 2 °F below the Occupied Heating Temperature setpoint, the heating requirement is again at 100% to maintain temperature setpoint. This cycle continues while in MWU state.

Changeover

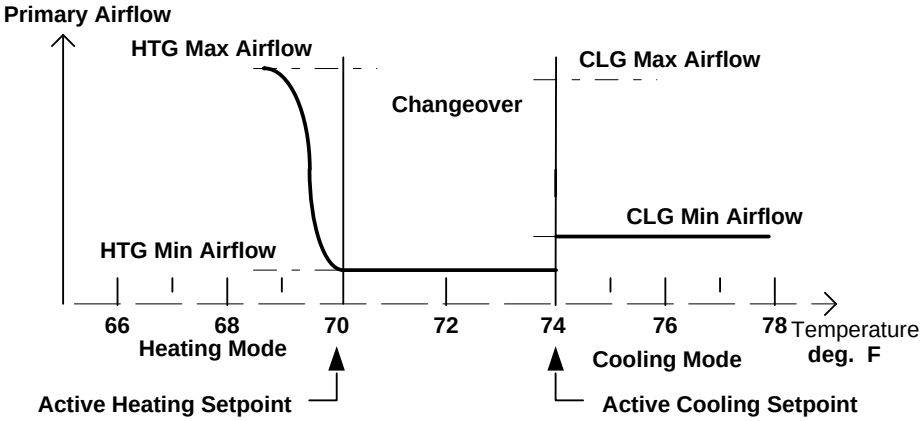
A changeover feature is available which modifies the modes of operation in Heating, Deadband, and Cooling Control Modes. In changeover it is assumed that the primary supply air temperature is appropriate for heating. Changeover is useful for applications where a single duct serves both heating and cooling at different times.

In the changeover heating mode, the Active Primary Minimum and Maximum Airflow setpoints are given by the Active Heating Minimum Airflow and Heating Maximum Airflow Setpoints. The airflow modulates based on the zone Heating Requirement.

If Local Heat Enable is set , the local heat also comes on in addition to central heat whenever the controller is operating in changeover heating.

In changeover Deadband the supply air is maintained at Active Heating Minimum Airflow Setpoint.

In changeover cooling the airflow is maintained at the Active Cooling Minimum Airflow Setpoint.



Auto-changeover

Auto-changeover requires installation of a supply air temperature sensor on input 6. If the measured supply air temperature is greater than the Changeover Setpoint, the controller goes into a heating only changeover mode. If the Changeover Setpoint is 0 F (default), the auto-changeover feature is disabled.

Remote Changeover

The controller can be forced into changeover by a command on the communications line. A remote command to set changeover OFF forces prevents all changeover control action and takes priority over auto-changeover. A remote command to restore changeover clears changeover ON and changeover OFF and enables the auto-changeover control action.

Pressure Dependent Changeover

In changeover it is assumed that the primary supply air temperature is appropriate for heating.

If Pressure Dependent Enable is yes, then in changeover heating, the damper modulates between the Active Heating Damper Minimum and Maximum Positions based on the zone Heating Requirement.

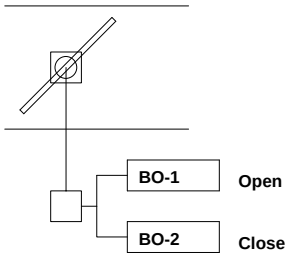
If Local Heat Enable is set, the local heat also comes on in addition to central heat whenever the controller is operating in changeover heating.

In changeover Deadband the supply air is maintained at Active Heating Damper Minimum Position.

In changeover cooling the airflow is maintained at the Active Cooling Damper Minimum Position.

Outputs

Primary Air Damper



Primary Air Damper

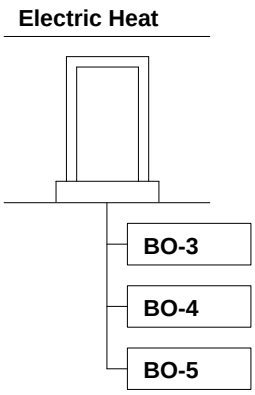
The ASIC/1-6000 comes with an Integrated Damper Motor. The direction of rotation of the motor may be reversed by changing the position of jumper, J6, SwDir.

In Single Duct personalities in Cooling Control mode, the controller modulates the Primary Airflow Setpoint between the Active Cooling Minimum and Maximum Airflow setpoints based on the Cooling Requirement.

The Primary Airflow is compared with the Primary Airflow Setpoint every a second. As the damper drives the airflow toward the setpoint, the output begins to pulse, where the pulse size in 1/6 s increments is given by 4*Airflow Error/AF Hysteresis. The smallest non-zero Airflow Hysteresis gives the fastest approach to setpoint.

As control approaches the setpoint, the airflow error is summed over time. The Airflow Integration Time [Default 4] is the time required for a 25 ft/min error to sum to give an additional pulse. To enable this algorithm you must give the Airflow Integration Time [Default 4] a non-zero value. If Airflow Integration Time is zero, then it drives to the Airflow Setpoint, and waits until airflow exceeds hysteresis.

Electric Heat Output

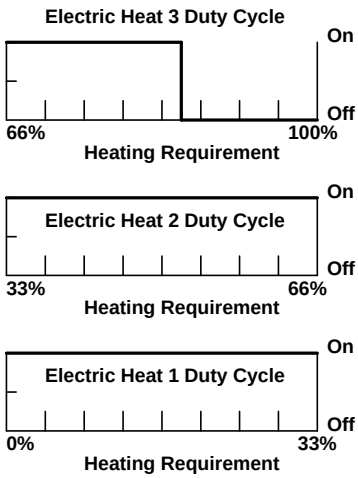


Up to 3 stages of Electric Heating output may be used to maintain the calculated heating requirement in personalities 2, 3, and 4. The output to be controlled is identified by the Electric Heat 1,2,3 Masks.

Electric Heat is locked out if the Primary Airflow falls below Electric Heat Minimum Airflow SP. If Electric Heat Min AF SP is zero then this feature is disabled.

For a controller with 1 stage of electric heat (Personality 2,6,9): Stage 1 duty cycles in proportion to the Electric Heat Base Time; from 0 to 100% as the Heating Requirement goes from 0 to 100%

For a controller with 2 stages of electric heat (Personality 3,7,10): Stage 1 duty cycles in proportion to the Electric Heat Base Time from 0 to 100% as the Heating

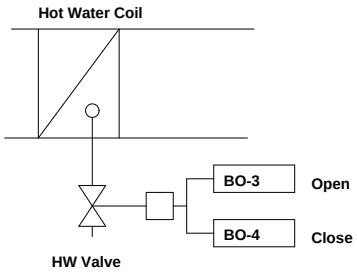


3 Stage Electric Heat at ~80% HTG

Requirement goes from 0 to 50%; and Stage 2 does not turn ON until stage 1 is on for 100% of the duty cycle time and duty cycles in proportion to the Electric Heat Base Time from 0 to 100% as the Heating Requirement goes from 50% to 100%.

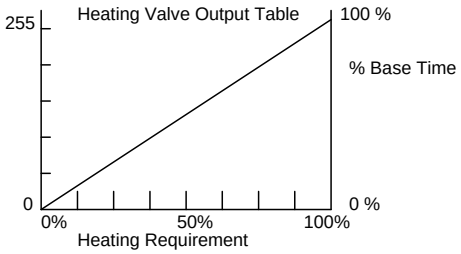
For a VAV controller with 3 stages of electric heat (Personality 4): Stage 1 duty cycles in proportion to the Electric Heat Base Time from 0 to 100% as the Heating Requirement goes from 0 to 33%; stage 2 does not turn ON until stage 1 is on for 100% of the Electric Heat Base Time and duty cycles from 0 to 100% as the Heating Requirement goes from 33% to 66%; and Stage 3 does not turn ON until stage 2 is ON for 100% of the duty cycle time and duty cycles from 0 to 100 % as the Heating Requirement goes from 66% to 100%.

Hot Water Heat Output

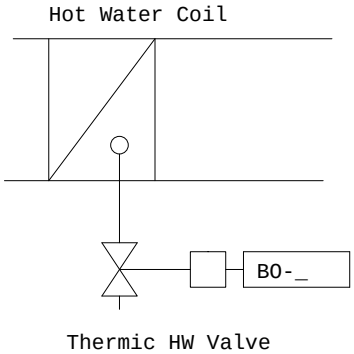


In a controller with modulated hot water heat (Personality 5,12,or 13), the valve is opened or closed a fraction of the HW Valve Base Time in proportion to the Heating Requirement. The output to be controlled is identified by the HW Valve Open Mask [Default; BO-3]and HW Valve Closed Masks [Default; BO-4]. The functional status of the HW Valve output is shown by the HW Valve Output Status

For a controller with modulated hot water heat , the valve is opened or closed a fraction of the valve time base in proportion to the Heating Requirement based on the five-value Heating Valve Output Table.



Thermic Valve On/Off (Optional)



The output to be used is assignable using the Thermic Valve On/Off Mask.[Default; BO-3]

In a controller with thermic valve hot water heat (Personality 18, 19, or 20), the valve is energized for a fraction of the HW Valve Base Time in proportion to the Heating Requirement. The thermic Valve is normally off and will be ON for a fraction of the HW Heating Base Time. It will be initially on and once it goes off it stays off for the remainder of the HW Heating Base.

Timer On Time = (HW Output/255)* HW Base Time.

If Thermic Valve Reversed is set the output will be normally on, and will be OFF for a fraction of the HW Heating Base Time.

Other Outputs

Analog Output (Optional)

An Analog Output, 0 to 10 Vdc at up to 20 mA is provided which optionally may be assigned to track the Heating or Cooling Requirement [Default; Heating]. The output goes from Minimum Output Voltage to Maximum Output Voltage as the Requirement goes from 0 to 100 %.

Auxiliary Cooling Output (Optional)

An optional auxiliary cooling output is provided. If Auxiliary Cooling Enable is set, and the Cooling Requirement is 100 % and the zone temperature exceeds the active cooling setpoint by an Auxiliary Cooling Offset [Default 2 ^{o}F] for a Auxiliary Cooling Delay Time [Default: 120 s], then an auxiliary cooling output is energized. The output to be used is assignable using the Auxiliary Cooling Output Mask [Default: None]. Once energized, the auxiliary cooling output remains on until the zone temperature falls below the active cooling temperature setpoint, and the cooling airflow falls below the maximum cooling setpoint by an amount given by the Auxiliary Cooling Hysteresis. [Default: 125 ft/min]

Auxiliary Heating Output (Optional)

If Auxiliary Heating Enable is set, the auxiliary heating output goes on whenever the controller is in the heating mode. This output is completely independent of the hot water valve or electric heat operation. It may be used to control baseboard heat used in conjunction with terminal boxes.

Auxiliary 1, 2, 3 Output (Optional)

The ASIC/1-6000 allows up to 3 outputs for auxiliary outputs which do not follow any schedule. They can be overridden On or Off, and remain in the last state commanded. The output to be controlled is identified by the Aux 1, 2, 3 Masks which are initially un-assigned. The functional status of the Aux 1, 2, 3 Outputs is shown by the Auxiliary 1, 2,3 Output Status.

Lighting Output

Each ASIC/1 has the ability to control lighting. The Lights Output Mask [Default: None] must set to an unused binary output. The Lighting schedule will automatically turns the lights on and off. By equipping the ASIC/1 with a WS-0XX wall sensor with push button override, the lights can be operated manually by the occupant during Occupied and Morning Warm-up States by pressing the button on the side of the zone sensor without affecting HVAC operation.

During Unoccupied and Night Setback States, depressing the push button will return the control to Occupied, and the lights will come on and stay on for Afterhours Time Allowed. During Emergency 1 and Emergency 2, the push-button has no effect.

If Lights Occupied Enable is yes then the lights are on whenever the Lighting Schedule is On, or the Control State is occupied.

Blink Warning: One minute before automatic shut off of lights as designated in the daily event schedule, or at the end of the afterhours override period, the lights will blink off and back on again. Pressing the afterhours button will re-start the lights.

Alarms

Zone Temperature Alarm

If the zone temperature is above the Active Cooling Temperature Setpoint by the Zone Temperature Alarm Range, a High Zone Temperature Alarm is set. If the Zone temperature is below the Active Heating Temperature Setpoint by the Zone Temperature Alarm Range, a low Zone Temperature Alarm is set. No other actions are taken in response to a zone temperature alarm.

Primary Airflow Alarm

If the primary airflow is above the Primary Airflow Setpoint by the Airflow Alarm Range, then a High Primary Airflow Alarm is set. If the Primary Airflow is below the Primary Airflow Setpoint by the Airflow Alarm Range, then a Low Primary Airflow Alarm is set. No other actions are taken in response to a primary airflow alarm.

Emergency Modes

The emergency modes, Emergency 1, and Emergency 2, are overrides which are received over the communication line and remain in effect until cleared over the communication line.

Emergency 1 Mode

The control may only enter or exit Emergency 1 as a result of commands received on communications line. While in Emergency 1, no other state may be entered until Emergency 1 has been cleared via the communications line. Emergency is maintained through loss of power.

While in Emergency 1 state the controller immediately drives the damper to Maximum Cooling Airflow Setpoint, turns ON the lighting output, and turns OFF any other outputs including electric heat.

Emergency 2 Mode

The control can enter and exit Emergency 2 as the result of commands received on the communications line. If in Emergency 2, no other state except Emergency 1 may be entered until Emergency 2 has been cleared via the communications line. Emergency is maintained through loss of power.

While in Emergency 2 state the controller immediately drives the damper closed, turns ON the lighting output and turns OFF any other outputs, including electric heat.

Communications

The ASIC/1-6000 communicates at 1200 baud, 9600 baud, or 19,200 baud on the remote bus using RS-485 twisted pair communication wire, connected to remote screw terminal connector, TB-4. Access to the ASI communication bus is through a SINC/3-3000 system interface or aSIC/2 configurable controller which can also be used to broadcast time to synchronize the network of ASIC/1 controllers.

Communication with the remote bus can also be established through the WS-0XX wall sensor using a SINC/1-1030 Portable Interface connected to a lap-top computer running ASI Expert Software. It can also communicate through the WT-0XX in the remote communication mode. The local communication mode is not supported.

Each controller has a unique 16 bit address, and may also have a separate 8 bit group address. It will also respond to the global addresses 23125(5A55h) and 23130 (5A5Ah).

The ASIC/1-6000 may co-exist on the communication line with other ASIC/1 controllers. It is compatible with the ASI LinkOPC Server for seamless communication with Windows based graphic user interfaces.

System Component Checklist

Inputs

Description	Part Number	Quantity
AF-001Airflow Filter	Included	
Optional Duct Temperature Sensor (IN-05)	TS-DO-8	0,1
Optional Duct Temperature Sensor (IN-06)	TS-DO-8	0,1
Wall Mounted Zone Temperature Sensor	WS-0X1	1
Sensor Cable	SCP-0XX	1
Communication Cable twisted pair.	22-24 ga twisted	

NOTE: Consult ASIC/1-6000 Installation manual for configuration of inputs.

Outputs

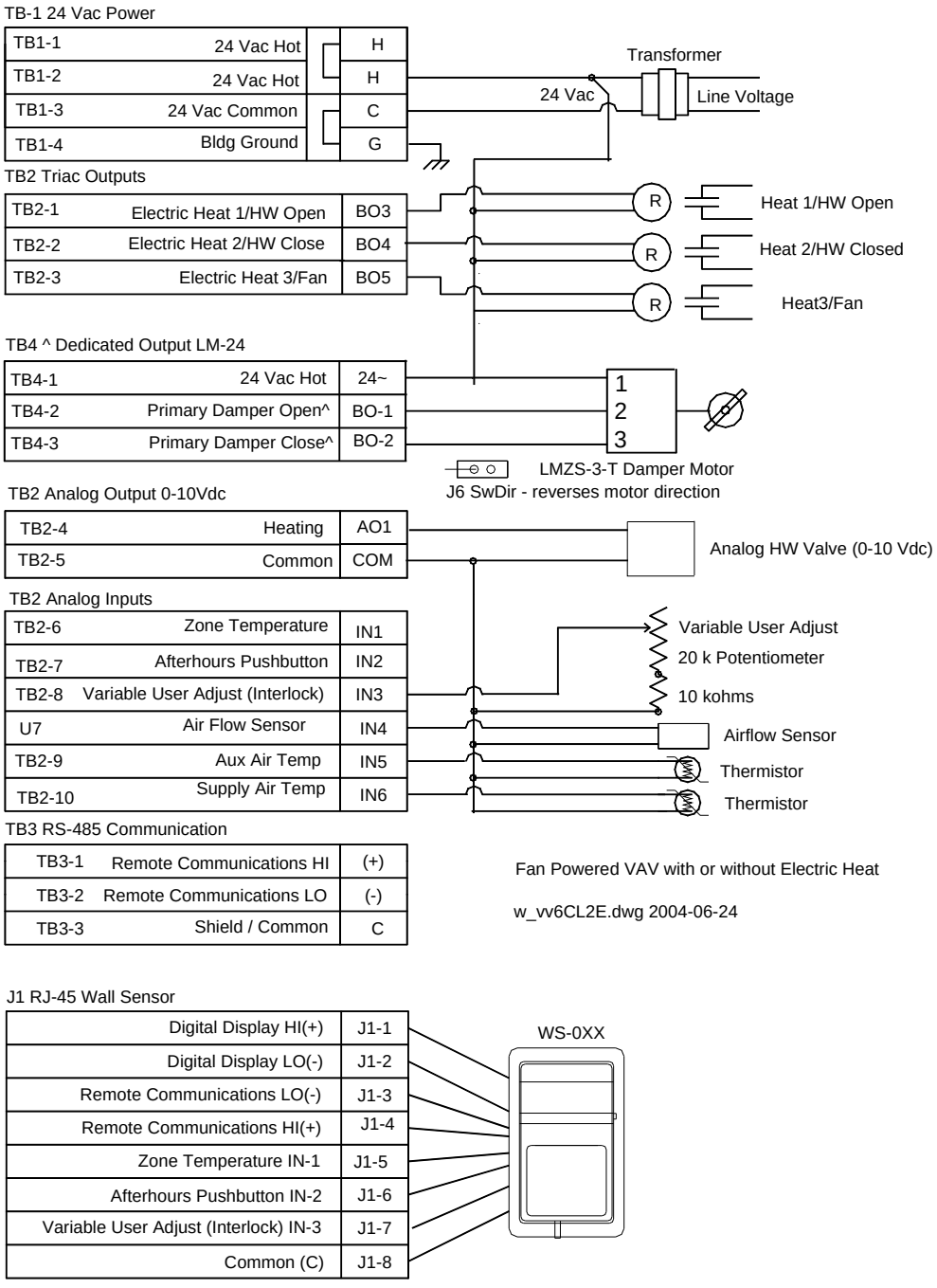
Description	Part Number	Quantity
VAV Controller	ASIC/1-6000	1
24 Vac Transformer		1
24 Vac Tri-state Primary Damper Operator	Included	1
HW Valve with 24 Vac Tri-state Operator		0,1
24 Vac Thermic Valve (Optional)		0,1
24 Vac Electric Heat Relay		0,1,2,3
24 Vac Auxiliary CLG Output Relay (Optional)		0,1
24 Vac Auxiliary HTG Output Relay(Optional)		0,1
24 Vac Auxiliary Output Relay (Optional)		0,1,2,3
24 Vac Lighting Relay (Optional)		0,1

NOTE: . The ASIC/1-6000 must be connected to a solid building ground. Metallic-oxide Varistors, MOV, are used across triac outputs to provide further protection from transients. If current interrupting relays are in series with the output circuits they must be protected with MOVs across the Relay Contacts

Wiring Layout

VAV with 3 Stages of Electric Heat

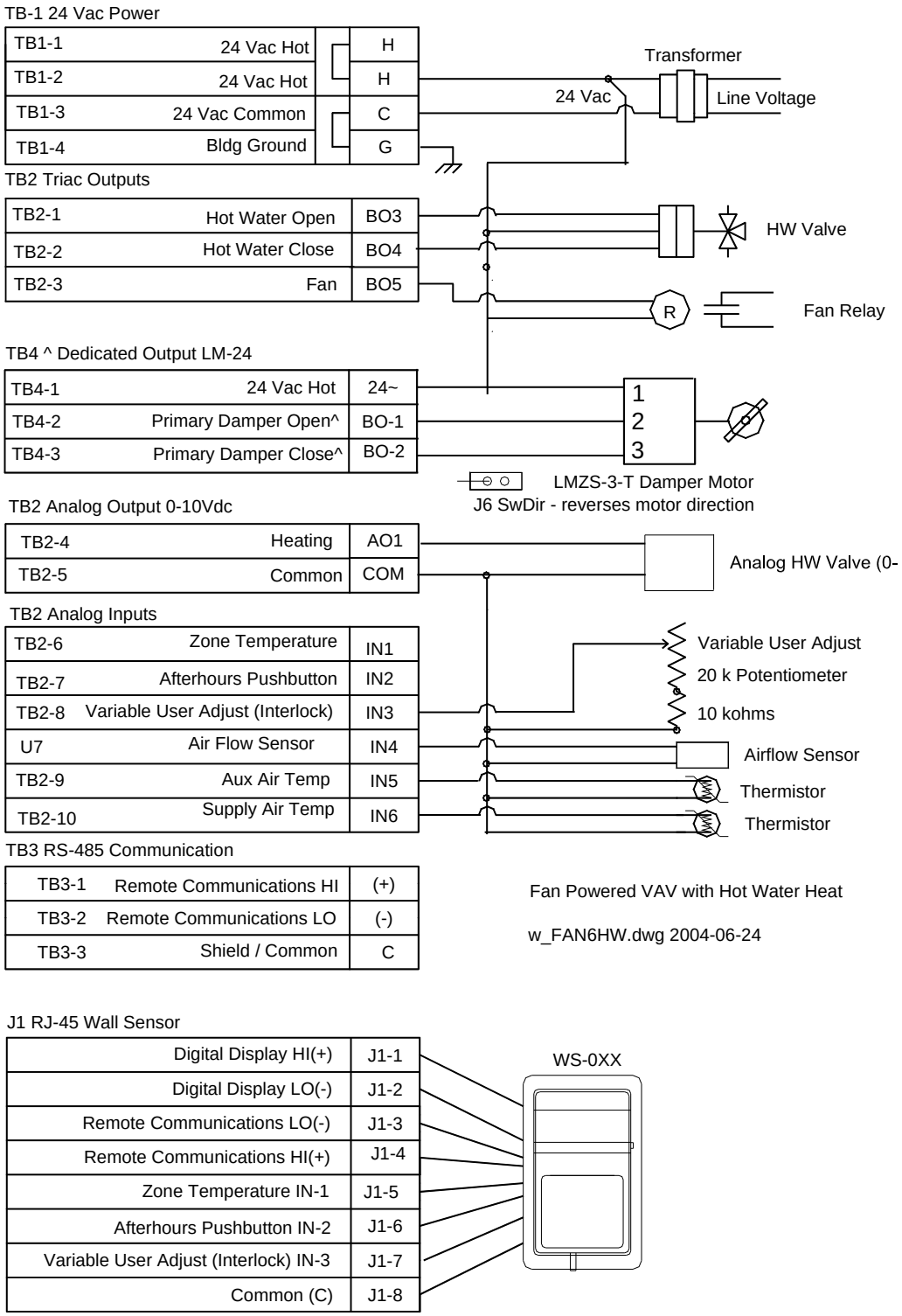
Typical single duct cooling VAV with 3 Stages of Electric Heat, for use with the following personalities: Personality 1, cooling only; Personality 2, 1 stage of electric heat; Personality 3, 2 stages of electric heat; or Personality 4, 3 stages of electric heat.



August 2009

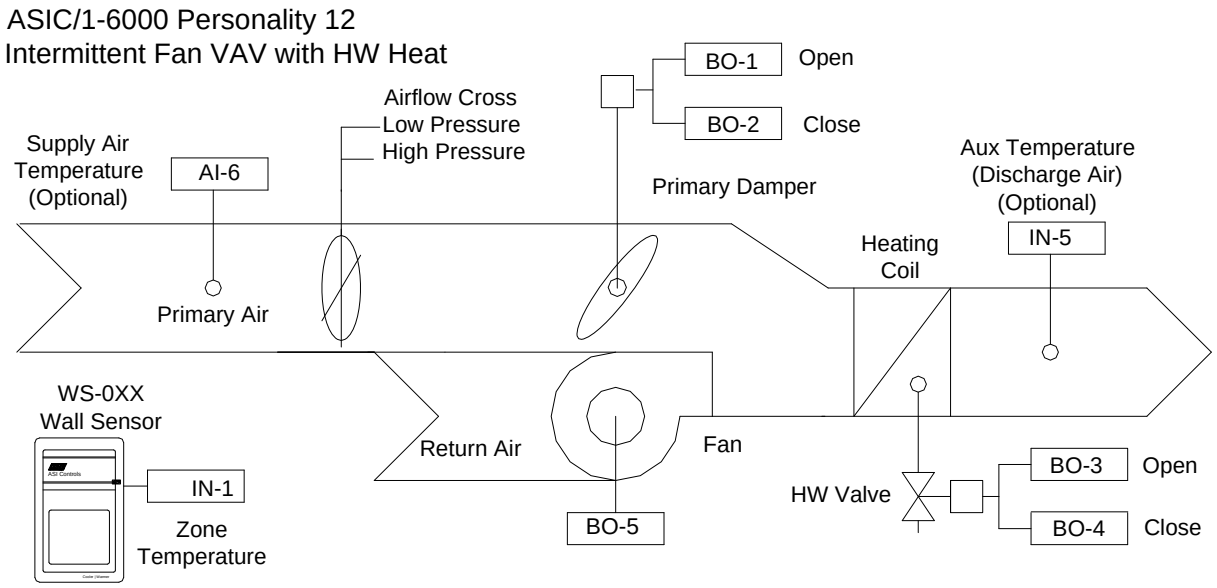
VAV with Hot Water Heat

Typical single duct cooling VAV with Hot Water Heat, for use with Personality 5, Hot Water Heat



Intermittent Fan VAV

Application



s6000_ifanhw.dwg 2004-10-05

This application bulletin describes the sequence of operation used by the ASIC/1-6000 to control zone temperature with a fan-powered parallel VAV system with intermittent fan. The ASIC/1-6000 uses a primary airflow sensor to give pressure independent control of the variable air volume cooling. Heating is provided with optional proportional or thermic valve hot water heat, or up to 3 stages of electric heating. The ASIC/1-6000 is preprogrammed with different personalities for fan-powered parallel VAV terminals.

Intermittent Fan Personalities

	No Reheat	1 Stage Electric	2 Stage Electric	3 Stage Electric	HW Valve Open/Close	Thermic Valve
Intermittent Fan	16	6	7	NA	12	19

Inputs

The ASIC/1-6000 controller has specific inputs for zone temperature, primary airflow, and optional secondary airflow, and optional supply air temperature, and optional occupancy sensor. The default input types are set at the factory. Inputs that are not required for the sequence may be used for monitoring.

Primary Airflow

The ASIC/1-6000 uses an primary airflow sensor to give pressure independent control of the variable air volume. The primary airflow sensor is installed on input 4 is calibrated at zero airflow. An airflow filter, AF-001, is required on the inlet side of the airflow transducer, is installed in the enclosure.

The controller measures the air velocity in feet per minute (ft./min) assuming a standard velocity K-factor of 2338 ft/min. The velocity K-factor is the air velocity in ft/min required to generate a velocity pressure of 1 inch water column (1 "wc =249 Pa) The velocity K-factor is provided by the VAV box manufacturer for a particular box size and flow cross. The airflow volume Q in CFM is calculated based on the actual K-factor in feet per minute , and duct area in square feet.

$$Q\ (CFM) = Area\ (ft^2) * Velocity(ft/min) * (K\text{-}factor/2338)$$

Field adjustment of the velocity K-factor may be done by the air balancer using the air balance screen on the setup software.

Wall Sensor Connections

Zone temperature sensor is normally on input 1. Typically, the zone temperature on the WS-0xx wall sensor, is connected to the controller using a SCP-XXX sensor cable. Alternately, a zone or return air temperature sensor may be attached on input blade, IN1. If there is no zone temperature sensor , then the zone sensor input is in fault, all outputs are off, and it does not try to control.

The afterhours push-button on the WS-0X1 wall sensor if used, is always on input 2. If Afterhours Enable is Yes, then shorting the input to zero will initiate afterhours override mode for an Afterhours Time Allowed.

Input 3 is used for Interlock and may be used for variable user adjust with the WS-0XX wall sensor. When User Adjust Enable is set and input 3 is configured for Variable User adjust, 10k to 30 kohm, the zone temperature setpoint may be adjusted up or down by the User Adjust Setpoint, based on the condition of input 3.

Support is also provided for the WS-051 Digital Display Wall Sensor. The WS-051 has a zone temperature sensor on input 1 and provides both Occupied Temperature Setpoint change and afterhours override. A jumper, JMP1, may be set to provide power to the WS-051 via input 2.

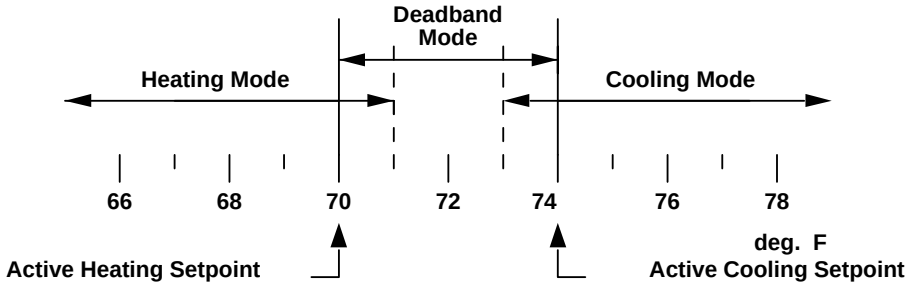
Auxiliary Temperature Sensors

An optional a duct temperature sensor, TS-DO, may be placed on input 5 or 6 for temperature monitoring. The auxiliary temperature sensors use the factory provided 3.32 kohm pull-up resistor.

The duct sensor on input 6 is used for auto-changeover if Changeover Setpoint is not zero. If the input on input 6 is in fault, then changeover is ignored. Changeover operation is described below.

Control Mode

The controller determines the Control Mode, Heating, Deadband, or Cooling by comparing the zone temperature to the Active Heating Temperature Setpoint and Active Cooling Temperature Setpoint.



The controller enters the Cooling Control Mode when the zone temperature equals or is greater than the Active Cooling Temperature Setpoint. The control reenters the Deadband mode, when the zone temperature is 1 ^{o}F below the Active Cooling Temperature Setpoint and the calculated Cooling Requirement is equal to zero.

The control enters the heating mode when the zone temperature is equal to or less than the Active Heating Temperature Setpoint. The control reenters the Deadband mode when the zone temperature is 1 ^{o}F greater than the Active Heating Temperature Setpoint and the calculated Heating Requirement is equal to zero.

Active Temperature Setpoints

The controller maintains the zone temperature between Active Cooling and Heating Temperature Setpoints. The Active Cooling and Heating Temperature Setpoints are based on Control State, the Active User Adjust based on the position of the Slide Switch or Variable User Adjust, and the Active Demand Limit Reset.

If Half Degree Enable is set then the Temperature Setpoints are in half-degree (Fahrenheit or Celsius) increments.

If User Adjust Enable is set, the Active Temperature Setpoints may be modified by the variable user adjust potentiometer on a WS-0XX wall sensor. The Active Heating Temperature Setpoint is adjusted up and the Active Cooling Temperature Setpoint is adjusted down a fraction of the User Adjust Setpoint. If the WS-051 is used then the setpoints are adjusted with up and down arrows with in user defined limits.

If the Active Demand Level is non-zero, the Active Temperature Setpoints are also modified by a fraction of the Demand Reset Range as the Active Demand Level goes from 0 to 6. The Active Cooling Temperature Setpoint is reset upwards and the Active Heating Temperature Setpoint is reset downwards.

Cooling and Heating Requirement

In Deadband Control Mode, the Heating and Cooling Requirements are zero.

In the Cooling or Heating Control Mode, the Cooling or Heating Requirement is calculated using a PI control loop.

The change in heating or cooling requirement is calculated every 30 seconds.

In heating: Error = Active HTG SP - Zone Temp
Δ Error = Previous Zone Temp - Zone Temp

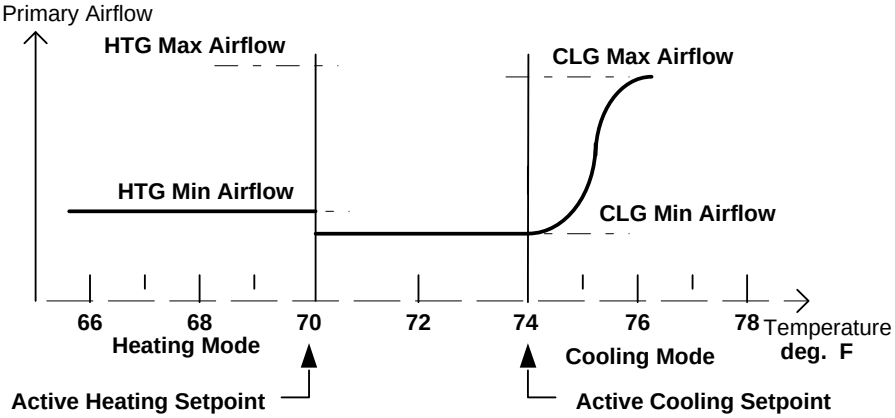
or in cooling: Error = Zone Temp - Active CLG SP
Δ Error = Zone Temp - Previous Zone Temp.

ΔRequirement = (100%/ThrottleRange)*[Error*(CalcTime/Int Time) +Δ Error]

The factory setting for throttle range is 4.0 degrees, and for integral time is 2.5 minutes.

Primary Airflow Modulation

In the Cooling Mode the primary airflow modulates between the Active Cooling Minimum and Maximum Airflow Setpoints as the cooling requirement goes from zero to 100 %.



In the Deadband Mode the Primary Airflow is typically at the Active Cooling Minimum Airflow Setpoint.

In the Heating Mode the Primary Airflow is at the Active Heating Minimum Airflow Setpoint and the Local Heat is modulated to maintain the Active Heating Temperature Setpoint. If Dual Heating Enable is set then the primary airflow also modulates between Heating Minimum and Maximum Airflow as the heating requirement goes from 0 to 100%.

Pressure Dependent Operation

If Pressure Dependent Enable is yes, then the position of the Primary Damper motor is controlled based on Damper Drive Time rather than airflow. The Cooling and Heating Damper Minimum and Maximum Positions are a percentage of the Damper Drive Time.

In the Cooling Mode the damper modulates between the Active Cooling Damper Minimum and Maximum Positions as the zone Cooling Requirement goes from zero to 100 %.

In the Deadband Mode the damper is typically at the Active Cooling Damper Minimum Position.

In the Heating Mode the damper is at the Active Heating Damper Minimum Position and the Local Heat is modulated to maintain the Active Heating Temperature Setpoint. If Dual Heating Enable is set then the damper also modulates between Heating Minimum and Maximum Airflow as the heating requirement goes from 0 to 100%.

To maintain indexing of damper position the Damper is driven fully closed for a Damper Drive Time: On reset of Power, On return from Damper Override, or Emergency Mode.

Control State

The Control State determines which Cooling and Heating Temperature Setpoints are used for zone temperature control. Four control states are possible: Occupied, Unoccupied, Night Setback, and. Morning Warm-up. If the Clock is not synchronized, the Control State is Occupied by default. Otherwise the Control State is determined by the Daily Event Schedule.

The Control State may be overridden via a message broadcast over the communication bus from software or an ASIC/2 controller. The controller state may be returned to OCC from NSB or Unocc when the Afterhours Enable is yes and the push-button on the Wall Sensor is pushed.

The Active Cooling and Heating Minimum and Maximum Airflow Setpoints are typically given by the Occupied Cooling and Heating Minimum and Maximum Airflow Setpoints.

However, if Multiple Airflow Enable is set, the Active Cooling and Heating Minimum and Maximum Airflow Setpoints are given by: the Occupied Cooling and Heating Minimum and Maximum Airflow Setpoints in the Occupied and Morning Warm-up States; the Unoccupied Cooling and Heating Minimum and Maximum Airflow Setpoints in the Unoccupied State; or the Night Setback Cooling and Heating Minimum and Maximum Airflow Setpoints in the Night Setback State.

Deadband Mode

In the Deadband Mode, the operation of the primary air damper (and the fan if any) depends on the Control State and option selections.

In Occupied Deadband the Primary Airflow is at the Active Cooling Minimum Airflow Setpoint.

In Unoccupied Deadband the Primary Airflow is at the Active Cooling Minimum Airflow Setpoint, unless UNO Option 2 Enable is yes, then the primary air damper is closed (and the fan if any is OFF) in Deadband.

In Night Setback Deadband Mode the primary Airflow is at the Active Cooling Minimum Airflow Setpoint, unless NSB Option 2 Enable is yes, then the primary air damper is closed (and the fan if any is OFF) in Deadband.

Primary Damper Control - -Intermittent Fan

	Occupied	Changeover	UNOCC Option 2 = No	UNOCC Option 2 = Yes	NSB Option 2 = No	NSB Option 2 = Yes	MWU Option 2 = No	MWU Option 2 = Yes
Cooling	Modulate	Min CLG	Modulate	Modulate	Modulate	Modulate	Min HTG	Min HTG
Deadband	Min CLG	Min HTG	Min CLG	Closed	Min CLG	Closed	Min HTG	Min HTG
Heating	Min HTG	Modulate	Min HTG	Min HTG	Min HTG	Min HTG	Max HTG	Min HTG

Morning Warm-up (MWU) State

Morning Warm-up is meant as a prelude to Occupied state, to ready the building for daily use. For Morning Warm-up, the control sequence operates at full-capacity heating until the zone temperature is moved into the Deadband region.

Two MWU sequences can be selected: central heating, and local heating. In central heating MWU hot air is distributed through the primary air ducts. In local heating MWU, all heat is provided from the VAV terminal.

MWU, Central Heating

If Morning Warm-up Option 2 Enable is not set then central heating is assumed where hot air is in the duct as in changeover heating, which is described below. If the control is initially in cooling or heating mode, the opposite mode is locked-out until the end of Morning Warm-up.

All local heat is typically OFF during this sequence. However if Local Heat Enable is yes, then local heat is used in addition to central heat.

Morning warm up differs from changeover because the controller goes into heating once, while in changeover it can go in and out of the heating mode many times.

MWU, Local Heat

If Morning Warm-up Option 2 Enable is set then local heating is assumed. The airflow is maintained at Occupied Heating Minimum Airflow Setpoint and all heating is provided by local hot water or electric heat.

If zone temperature is less than Occupied Heating Setpoint when the control enters MWU state, the heating requirement is 100%, the local hot water or electric heat is at 100%.

When zone temperature reaches Occupied Heating Temperature Setpoint the heating requirement is at 0% and the heat turns OFF. If the zone temperature falls 2 °F below the Occupied Heating Temperature setpoint, the heating requirement is again at 100% to maintain temperature setpoint. This cycle continues while in MWU state.

Changeover

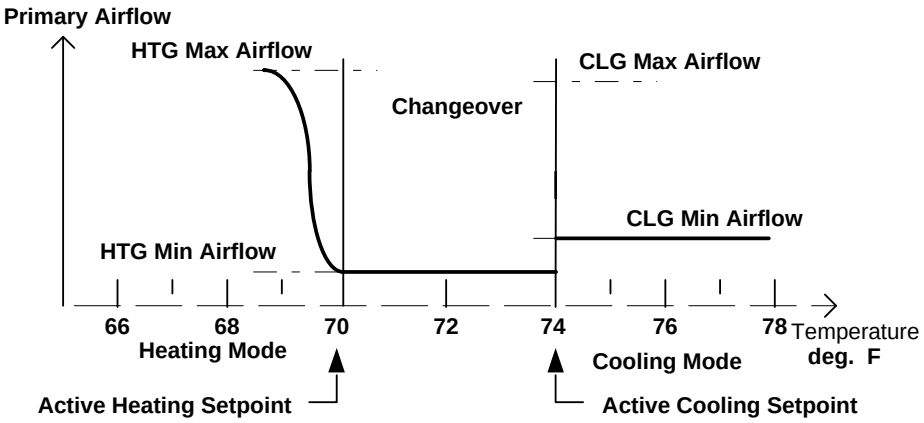
A changeover feature is available which modifies the modes of operation in Heating, Deadband, and Cooling Control Modes. In changeover it is assumed that the primary supply air temperature is appropriate for heating. Changeover is useful for applications where a single duct serves both heating and cooling at different times.

In the changeover heating mode, the Active Primary Minimum and Maximum Airflow setpoints are given by the Active Heating Minimum Airflow and Heating Maximum Airflow Setpoints. The airflow modulates based on the zone Heating Requirement.

In changeover Deadband the supply air is maintained at Active Heating Minimum Airflow Setpoint.

In changeover cooling the airflow is maintained at the Active Cooling Minimum Airflow Setpoint.

An option Local Heat Enable, if set allows local heat to come on in addition to central heat whenever the controller is operating in changeover.



Auto-changeover

Auto-changeover requires installation of a supply air temperature sensor on input 6. If the measured supply air temperature is greater than the Changeover Setpoint, the controller goes into a heating only changeover mode. If the Changeover Setpoint is 0 F (default), the auto-changeover feature is disabled.

Remote Changeover

A remote command on the communications line to set changeover ON forces the system to control in the changeover heating mode. A remote command to set changeover OFF forces prevents all changeover control action. Remote commands always take priority over auto-changeover. A remote command to restore changeover clears changeover ON and changeover OFF and enables the auto-changeover control action.

Pressure Dependent Changeover

In changeover it is assumed that the primary supply air temperature is appropriate for heating.

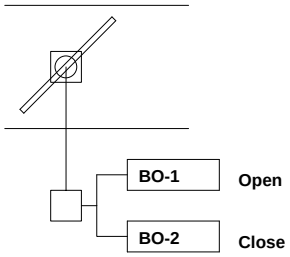
If Pressure Dependent Enable is yes, then in changeover heating, the damper modulates between the Active Heating Damper Minimum and Maximum Positions based on the zone Heating Requirement.

If Local Heat Enable is set, the local heat also comes on in addition to central heat whenever the controller is operating in changeover heating.

In changeover Deadband the supply air is maintained at Active Heating Damper Minimum Position.

In changeover cooling the airflow is maintained at the Active Cooling Damper Minimum Position.

Outputs



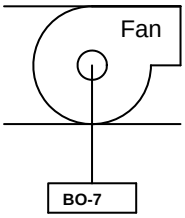
Primary Air Damper

Primary Air Damper

In Single Duct personalities in Cooling Control mode, the controller modulates the Primary Airflow Setpoint between the Active Cooling Minimum and Maximum Airflow setpoints based on the Cooling Requirement.

The Primary Airflow is compared with the Primary Airflow Setpoint every a second. As the damper drives the airflow toward the setpoint, the output begins to pulse, where the pulse size in 1/6 s increments is given by 4*Airflow Error/AF Hysteresis. The smallest non-zero Airflow Hysteresis gives the fastest approach to setpoint.

As control approaches the setpoint, the airflow error is summed over time. The Airflow Integration Time [Default 4] is the time required for a 25 ft/min error to sum to give an additional pulse. To enable this algorithm you must give the Airflow Integration Time [Default 4] a non-zero value. If Airflow Integration Time is zero, then it drives to the Airflow Setpoint, and waits until airflow exceeds hysteresis.



Intermittent Fan

For Parallel Fan Powered Terminal box control, the intermittent fan is based on the operating state, mode, and whether the supply airflow is greater than the **Fan Energize Setpoint.**

In Deadband the fan is on or off depending on the sequence selected.
The fan is ON whenever the primary airflow is less than or equal to the **Fan Energize Setpoint.** . If Ifan Heating Only Enable is true, the fan is on ONLY in the heating mode independent of the Fan Energize Setpoint.

- In the occupied state, the fan is on only if the supply airflow is less than the Fan Energize Setpoint.
- In the morning warm up state, the fan is on.
- In night setback or unoccupied states, the fan is off unless the system is in heating mode and the supply airflow is less than the Fan Energize Setpoint.
- In Emergency 1 the Fan is overridden On. In Emergency 2 the Fan is overridden Off.

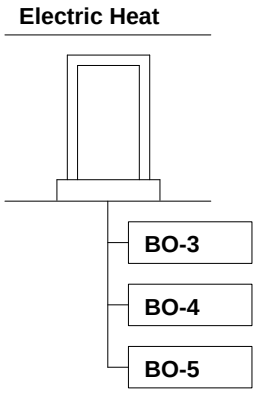
Intermittent Fan Control

(* Primary Airflow < Fan Energize SP)

	Occupied	UNOCC Option 2 = No	UNOCC Option 2 = Yes	NSB Option 2 = No	NSB Option 2 = Yes	MWU Option 2 = Yes or No
Cooling	Fan On*	Fan Off	Fan Off	Fan Off	Fan Off	Fan On

Deadband	Fan On*	Fan Off	Fan Off	Fan Off	Fan Off	Fan On
Heating	Fan On*	Fan On*	Fan On*	Fan On*	Fan On*	Fan On

Electric Heat Output



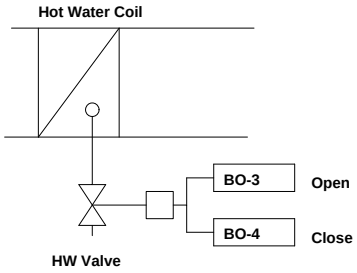
Up to 3 stages of Electric Heating output may be used to maintain the calculated heating requirement in personalities 6, and 78.

For a controller with 1 stage of electric heat (Personality 2,6,9): Stage 1 duty cycles in proportion to the Electric Heat Base Time; from 0 to 100% as the Heating Requirement goes from 0 to 100%.

For a controller with 2 stages of electric heat (Personality 3,7,10): Stage 1 duty cycles in proportion to the Electric Heat Base Time from 0 to 100% as the Heating Requirement goes from 0 to 50%; and Stage 2 does not turn ON until stage 1 is on for 100% of the duty cycle time and duty cycles in proportion to the Electric Heat Base Time from 0 to 100% as the Heating Requirement goes from 50% to 100%.

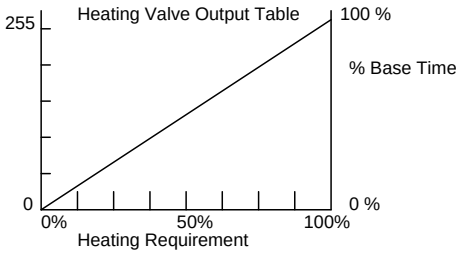
The output to be controlled is identified by the Electric Heat 1,2 Masks . The functional status of the Electric Heat Outputs is shown by the Electric Heat 1,2 Output Status bits.

Hot Water Heat Output

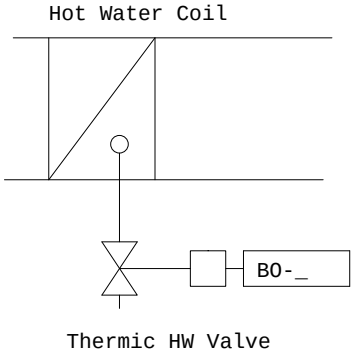


In a controller with modulated hot water heat (Personality 5, 12, or 13), the valve is opened or closed a fraction of the HW Valve Base Time in proportion to the Heating Requirement. The output to be controlled is identified by the HW Valve Open Mask [Default; BO-3] and HW Valve Closed Masks[Default; BO-4]. The functional status of the HW Valve output is shown by the HW Valve Output Status.

For a controller with modulated hot water heat , the valve is opened or closed a fraction of the valve time base in proportion to the Heating Requirement based on the five-value Heating Valve Output Table.



Thermic Valve On/Off (Optional)



The output to be used is assignable using the Thermic Valve On/Off Mask.

In a controller with thermic valve hot water heat (Personality 18, 19, or 20), the valve is energized for a fraction of the HW Valve Base Time in proportion to the Heating Requirement. The thermic Valve is normally off and will be ON for a fraction of the HW Heating Base Time. It will be initially on and once it goes off it stays off for the remainder of the HW Heating Base.

Timer On Time = (HW Output/255)* HW Base Time.

If Thermic Valve Reversed is set the output will be normally on, and will be OFF for a fraction of the HW Heating Base Time.

Other Outputs

Analog Output (Optional)

An Analog Output, 0 to 10 Vdc at up to 20 mA is provided which optionally may be assigned to track the Heating or Cooling Requirement [Default; Heating]. The output goes from Minimum Output Voltage to Maximum Output Voltage as the Requirement goes from 0 to 100 %.

Auxiliary Cooling Output (Optional)

An optional auxiliary cooling output is provided. If Auxiliary Cooling Enable is set, and the Cooling Requirement is 100 % and the zone temperature exceeds the active cooling setpoint by an Auxiliary Cooling Offset [Default 2 oF] for a Auxiliary Cooling Delay Time [Default: 120 s], then an auxiliary cooling output is energized. The output to be used is assignable using the Auxiliary Cooling Output Mask [Default: Output #5]. Once energized, the auxiliary cooling output remains on until the zone temperature falls below the active cooling temperature setpoint, and the cooling airflow falls below the maximum cooling setpoint by an amount given by the Auxiliary Cooling Hysteresis. [Default: 125 ft/min]

Auxiliary Heating Output (Optional)

If Auxiliary Heating Enable is set, the auxiliary heating output goes on whenever the controller is in the heating mode. This output is completely independent of the hot water valve or electric heat operation. It may be used to control baseboard heat used in conjunction with terminal boxes.

Auxiliary 1, 2, 3 Output (Optional)

The ASIC/1-6000 allows up to 3 outputs for auxiliary outputs which do not follow any schedule. They can be overridden On or Off, and remain in the last state commanded. The output to be controlled is identified by the Aux 1, 2, 3 Masks which are initially un-assigned.. The functional status of the Aux 1, 2, 3 Outputs is shown by the Auxiliary 1, 2,3 Output Status.

Lighting Output

Each ASIC/1 has the ability to control lighting. The Lights Output Mask [Default: None] must set to an unused binary output.The Lighting schedule will automatically turns the lights on and off. By equipping the ASIC/1 with a WS-0XX wall sensor with push button override, the lights can be operated manually by the occupant during Occupied and Morning Warm-up States by pressing the button on the side of the zone sensor without affecting HVAC operation.

During Unoccupied and Night Setback States, depressing the push button will return the control to Occupied, and the lights will come on and stay on for Afterhours Time Allowed. During Emergency 1 and Emergency 2, the push-button has no effect.

If Lights Occupied Enable is yes then the lights are on whenever the Lighting Schedule is On, or the Control State is occupied.

Blink Warning: One minute before automatic shut off of lights as designated in the daily event schedule, or at the end of the afterhours override period, the lights will blink off and back on again. Pressing the afterhours button will re-start the lights.

Alarms

Zone Temperature Alarm

If the zone temperature is above the Active Cooling Temperature Setpoint by the Zone Temperature Alarm Range, a High Zone Temperature Alarm is set. If the Zone temperature is below the Active Heating Temperature Setpoint by the Zone Temperature Alarm Range, a low Zone Temperature Alarm is set. No other actions are taken in response to a zone temperature alarm.

Primary Airflow Alarm

If the primary airflow is above the Primary Airflow Setpoint by the Airflow Alarm Range, then a High PrimaryAirflow Alarm is set. If the Primary Airflow is below the Primary Airflow Setpoint by the Airflow Alarm Range, then a Low Primary Airflow Alarm is set. No other actions are taken in response to a primary airflow alarm.

Emergency Modes

The emergency modes, Emergency 1, and Emergency 2, are overrides which are received over the communication line and remain in effect until cleared over the communication line.

Emergency 1 Mode

The control may only enter or exit Emergency 1 as a result of commands received on communications line. While in Emergency 1, no other state may be entered until Emergency 1 has been cleared via the communications line. Emergency is maintained through loss of power.

While in Emergency 1 state the controller immediately drives the damper to Maximum Cooling Airflow Setpoint, turns ON the lighting output, and turns OFF any other outputs including electric heat. In EM1 the Fan is On.

Emergency 2 Mode

The control can enter and exit Emergency 2 as the result of commands received on the communications line. If in Emergency 2, no other state except Emergency 1 may be entered until Emergency 2 has been cleared via the communications line. Emergency is maintained through loss of power.

While in Emergency 2 state the controller immediately drives the damper closed, turns ON the lighting output and turns OFF any other outputs, including electric heat.

Communications

The ASIC/1-6000 communicates at 1200 baud, 9600 baud, or 19,200 baud on the remote bus using RS-485 twisted pair communication wire, connected to remote screw terminal connector, TB-4. Access to the ASI communication bus is through a SINC/3-3000 system interface or ASIC/2 configurable controller which can also be used to broadcast time to synchronize the network of ASIC/1 controllers.

Communication with the remote bus can also be established through the WS-0XX wall sensor using a SINC/1-1030 Portable Interface connected to a lap-top computer running ASI Expert Software. It can also communicate through the WT-0XX in the remote communication mode. The local communication mode is not supported.

Communication with the remote bus can also be established through the WS-0XX wall sensor using a SINC/1-1030 Portable Interface connected to a lap-top computer running ASI SET-8055 Setup Software. It can also communicate through the WT-0XX in the remote communication mode. The local communication mode is not supported.

Each controller has a unique 16 bit address, and may also have a separate 8 bit group address. It will also respond to the global addresses 23125 (5A55h) and 23130 (5A5Ah).

The ASIC/1-6000 may co-exist on the communication line with other ASIC/1 controllers. It is compatible with the ASI LinkOPC Server for seamless communication with Windows based graphic user interfaces.

System Component Checklist

Inputs

Description	Part Number	Quantity
AF-001 Airflow Filter)	Included	
Optional Duct Temperature Sensor (IN-05)	TS-DO-8	0,1
Optional Duct Temperature Sensor (IN-06)	TS-DO-8	0,1
Wall Mounted Zone Temperature Sensor	WS-0X1	1
Sensor Cable	SCP-0XX	1
Communication Cable twisted pair.	22-24 ga twisted	

NOTE: Consult ASIC/1-6000 Installation manual for configuration of inputs.

Outputs

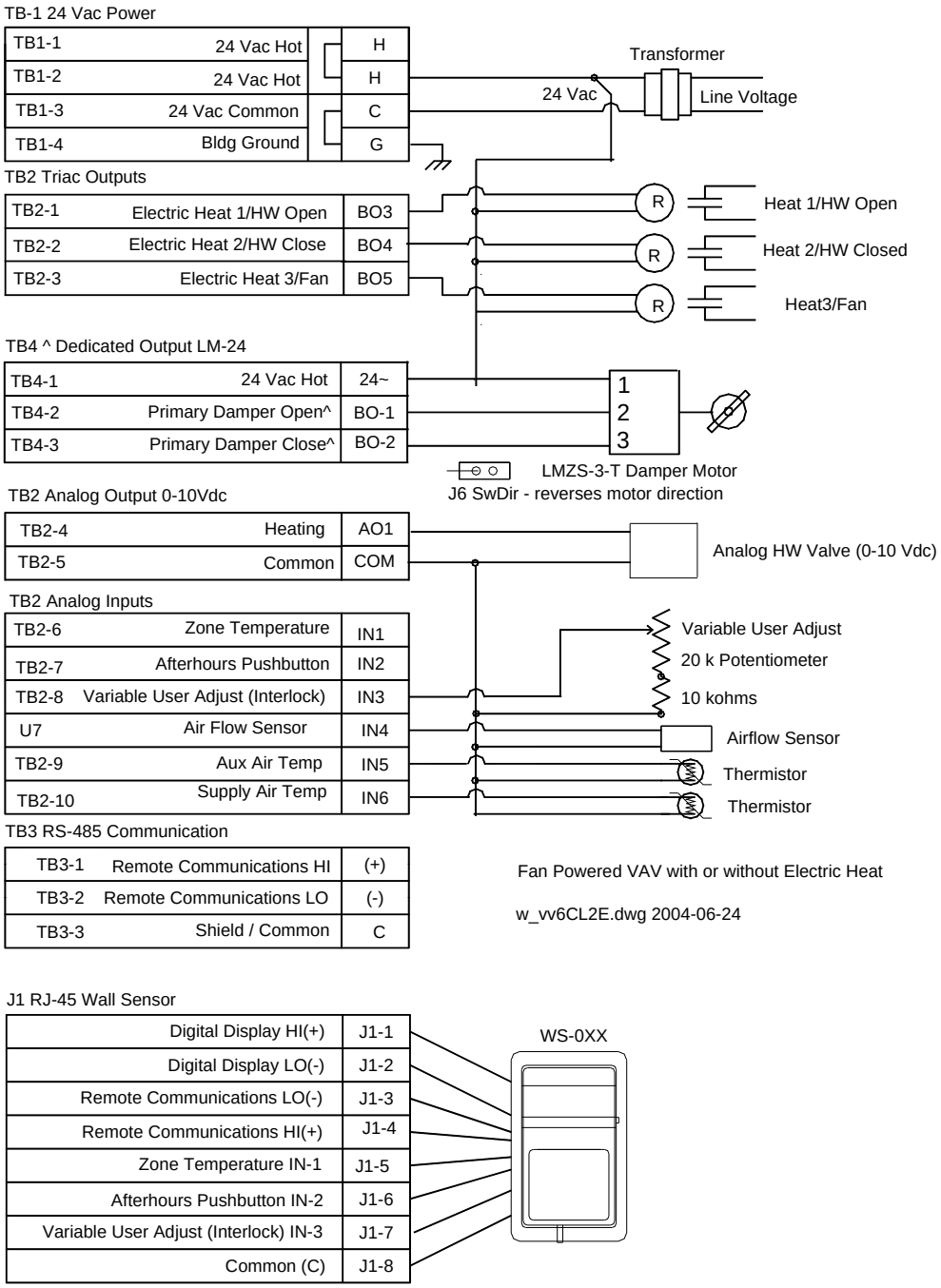
Description	Part Number	Quantity
VAV Controller	ASIC/1-6000	1
24 Vac Transformer		1
24 Vac Tri-state Primary Damper Operator		1
24 Vac Fan Control Relay		1
HW Valve with 24 Vac Tri-state Operator		0,1
24 Vac Thermic Valve (Optional)		0,1
24 Vac Electric Heat Relay		0,1,2
24 Vac Auxiliary CLG Output Relay (Optional)		0,1
24 Vac Auxiliary HTG Output Relay(Optional)		0,1
24 Vac Auxiliary Output Relay (Optional)		0,1,2,3
24 Vac Lighting Relay (Optional)		0,1

NOTE: . The ASIC/1-6000 must be connected to a solid building ground. Metallic-oxide Varistors, MOV, are used across triac outouts to provide further protection from transients. If current interrupting relays are in series with the output circuits they must be protected with MOVs across the Relay Contacts

Wiring Layout

Intermittent VAV with 2 Stages of Electric Heat

Intermittent Fan Powered VAV with up to 2 Stages of Electric Heat, for use with the following personalities: Personality16, cooling only; Personality 6, 1 stage of electric heat; or Personality 7, 2 stages of electric heat.



August 2009

Intermittent Fan with Hot Water Heat

Typical Intermittent Fan Powered VAV with Hot Water Heat for Personality 12.

TB-1 24 Vac Power

TB1-1	24 Vac Hot	H
TB1-2	24 Vac Hot	H
TB1-3	24 Vac Common	C
TB1-4	Bldg Ground	G

TB2 Triac Outputs

TB2-1	Hot Water Open	BO3
TB2-2	Hot Water Close	BO4
TB2-3	Fan	BO5

TB4 ^ Dedicated Output LM-24

TB4-1	24 Vac Hot	24~
TB4-2	Primary Damper Open^	BO-1
TB4-3	Primary Damper Close^	BO-2

TB2 Analog Output 0-10Vdc

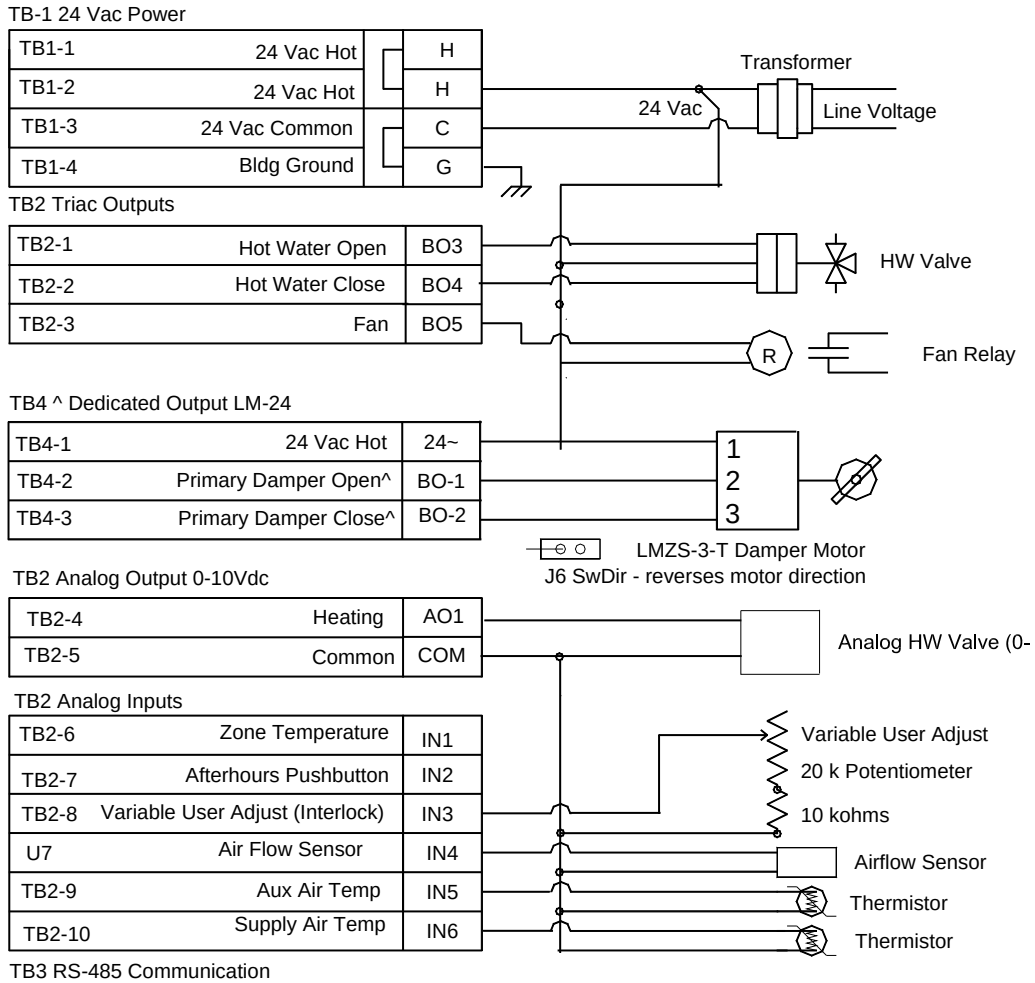
TB2-4	Heating	AO1
TB2-5	Common	COM

TB2 Analog Inputs

TB2-6	Zone Temperature	IN1
TB2-7	Afterhours Pushbutton	IN2
TB2-8	Variable User Adjust (Interlock)	IN3
U7	Air Flow Sensor	IN4
TB2-9	Aux Air Temp	IN5
TB2-10	Supply Air Temp	IN6

TB3 RS-485 Communication

TB3-1	Remote Communications HI	(+)
TB3-2	Remote Communications LO	(-)
TB3-3	Shield / Common	C

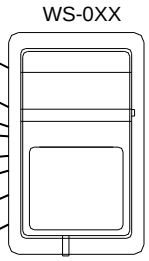


Fan Powered VAV with Hot Water Heat

w_FAN6HW.dwg 2004-06-24

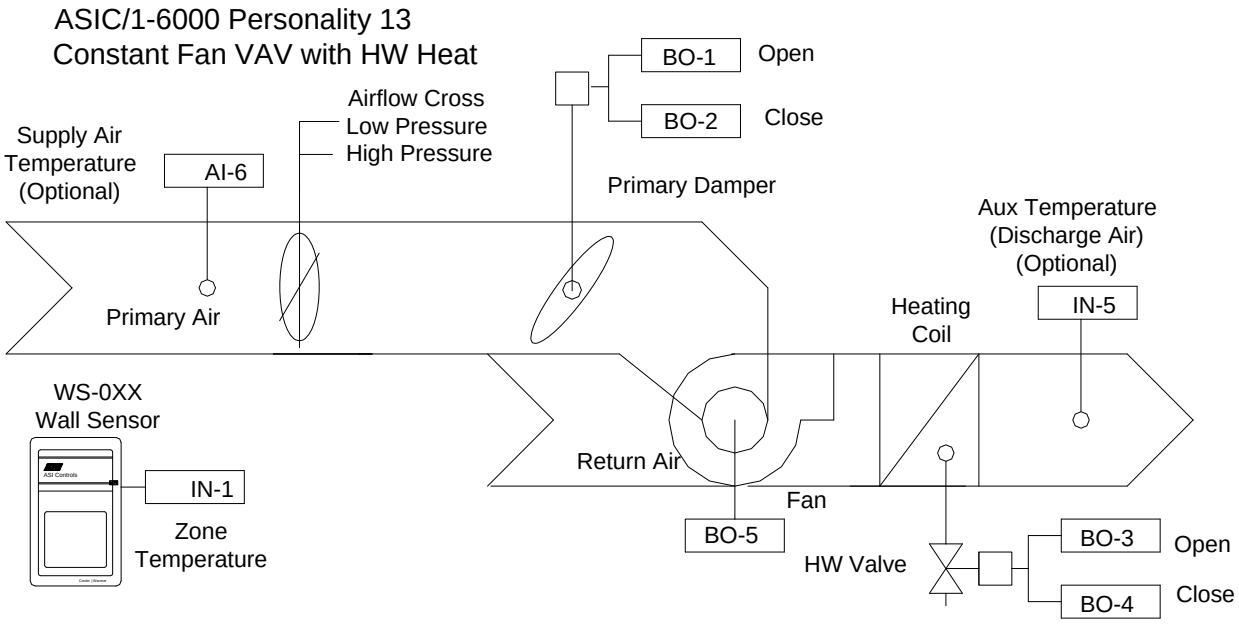
J1 RJ-45 Wall Sensor

Digital Display HI(+)	J1-1
Digital Display LO(-)	J1-2
Remote Communications LO(-)	J1-3
Remote Communications HI(+)	J1-4
Zone Temperature IN-1	J1-5
Afterhours Pushbutton IN-2	J1-6
Variable User Adjust (Interlock) IN-3	J1-7
Common (C)	J1-8



Constant Fan VAV

Application



This application bulletin describes the sequence of operation used by the ASIC/1-6000 to control zone temperature with a fan-powered series VAV system with constant fan. The ASIC/1-6000 uses a primary airflow sensor to give pressure independent control of the variable air volume cooling. Heating is provided with optional proportional or thermic valve hot water heat, or up to 2 stages of electric heating. The ASIC/1-6000 is preprogrammed with different personalities for fan-powered series VAV terminals.

Constant Fan Personalities

	No Reheat	1 Stage Electric	2 Stage Electric	3 Stage Electric	HW Valve Open/Close	Thermic Valve
Constant Fan	17	9	10	NA	13	20

Inputs

The ASIC/1-6000 controller has specific inputs for zone temperature, primary airflow, and optional supply air temperature. The default input types are set at the factory. Inputs that are not required for the sequence may be used for monitoring.

Primary Airflow

The ASIC/1-6000 uses an primary airflow sensor to give pressure independent control of the variable air volume. The primary airflow sensor is installed on input 4 is calibrated at zero airflow. An airflow filter, AF-001, is required on the inlet side of the airflow transducer, is installed in the enclosure.

The controller measures the air velocity in feet per minute (ft./min) assuming a standard velocity K-factor of 2338 ft/min. The velocity K-factor is the air velocity in ft/min required to generate a velocity pressure of 1 inch water column (1 "wc =249 Pa) The velocity K-factor is provided by the VAV box manufacturer for a particular box size and flow cross. The airflow volume Q in CFM is calculated based on the actual K-factor in feet per minute , and duct area in square feet.

$$Q\ (CFM) = Area\ (ft^2) * Velocity(ft/min) * (K\text{-}factor/2338)$$

Field adjustment of the velocity K-factor may be done by the air balancer using the air balance screen on the setup software.

Wall Sensor Connections

Zone temperature sensor is normally on Input 1. Typically, the zone temperature on the WS-0xx wall sensor is connected to the controller using a SCP-XXX sensor cable. Alternately, a zone or return air temperature sensor may be attached on input blade, IN1. If there is no zone temperature sensor , then the zone sensor input is in fault, all outputs are off, and it does not try to control.

The afterhours push-button on the WS-0X1 wall sensor if used, is always on Input 2. If Afterhours Enable is Yes, then shorting the input to zero will initiate afterhours override mode for an Afterhours Time Allowed.

Input 3 is used for Interlock and may be used for variable user adjust with the WS-0XX wall sensor. When User Adjust Enable is set and input 3 is configured for Variable User adjust, 10k to 30 kohm, the zone temperature setpoint may be adjusted up or down by the User Adjust Setpoint, based on the condition of input 3.

Support is also provided for the WS-051 Digital Display Wall Sensor. The WS-051 has a zone temperature sensor on input 1 and provides both Occupied Temperature Setpoint change and afterhours override. A jumper, JMP1, may be set to provide power to the WS-051 via input 2.

Auxiliary Temperature Sensors

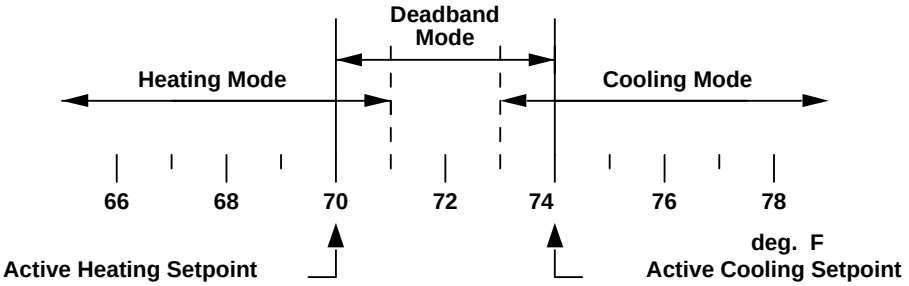
An optional a duct temperature sensor, TS-DO, may be placed on input 5 or 6 for temperature monitoring. The auxiliary temperature sensors use the factory provided 3.32 kohm pull-up resistor.

Input 5 has a pin-socketed pull-up resistor. Input 6 has a fixed pull-up resistor

The duct sensor on input 6 is used for auto-changeover if Changeover Setpoint is not zero. If the input on input 6 is in fault, then changeover is ignored. Changeover operation is described below.

Control Mode

The controller determines the Control Mode, Heating, Deadband, or Cooling by comparing the zone temperature to the Active Heating Temperature Setpoint and Active Cooling Temperature Setpoint.



The controller enters the Cooling Control Mode when the zone temperature equals or is greater than the Active Cooling Temperature Setpoint. The control reenters the Deadband mode, when the zone temperature is 1 ^{o}F below the Active Cooling Temperature Setpoint and the calculated Cooling Requirement is equal to zero.

The control enters the heating mode when the zone temperature is equal to or less than the Active Heating Temperature Setpoint. The control reenters the Deadband mode when the zone temperature is 1 ^{o}F greater than the Active Heating Temperature Setpoint and the calculated Heating Requirement is equal to zero.

Active Temperature Setpoints

The controller maintains the zone temperature between Active Cooling and Heating Temperature Setpoints. The Active Cooling and Heating Temperature Setpoints are based on Control State, the Active User Adjust based on the position of the Slide Switch or Variable User Adjust, and the Active Demand Limit Reset.

If Half Degree Enable is set then the Temperature Setpoints are in half-degree (Fahrenheit or Celsius) increments.

If User Adjust Enable is set, the Active Temperature Setpoints may be modified by the variable user adjust potentiometer on a WS-0XX wall sensor depending on the input configuration. The Active Heating Temperature Setpoint is adjusted up and the Active Cooling Temperature Setpoint is adjusted down a fraction of the User Adjust Setpoint.

If the Active Demand Level is non-zero, the Active Temperature Setpoints are also modified by a fraction of the Demand Reset Range as the Active Demand Level goes from 0 to 6. The Active Cooling Temperature Setpoint is reset upwards and the Active Heating Temperature Setpoint is reset downwards.

Cooling and Heating Requirement

In Deadband Control Mode, the Heating and Cooling Requirements are zero.

In the Cooling or Heating Control Mode, the Cooling or Heating Requirement is calculated using a PI control loop.

The change in heating or cooling requirement is calculated every 30 seconds.

In heating: Error = Active HTG SP - Zone Temp
Δ Error = Previous Zone Temp - Zone Temp

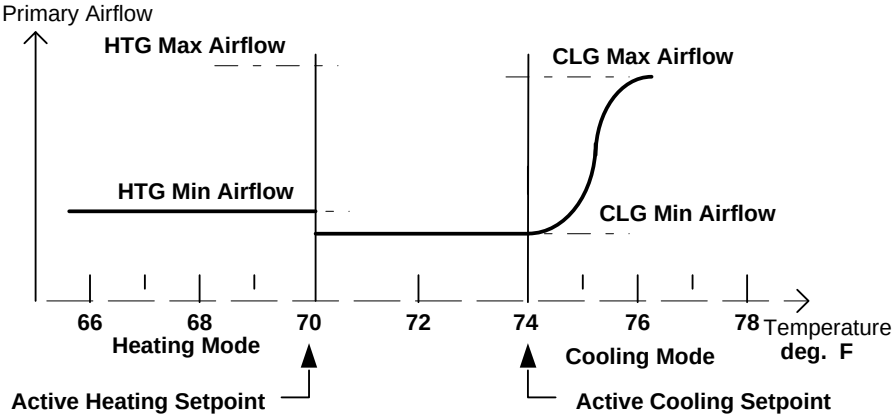
or in cooling: Error = Zone Temp - Active CLG SP
Δ Error = Zone Temp - Previous Zone Temp.

ΔRequirement = (100%/ThrottleRange)*[Error*(CalcTime/Int Time) +Δ Error]

The factory setting for throttle range is 4.0 degrees, and for integral time is 2.5 minutes.

Primary Airflow Modulation

In the Cooling Mode the primary airflow modulates between the Active Cooling Minimum and Maximum Airflow Setpoints as the cooling requirement goes from zero to 100 %.



In the Deadband Mode the Primary Airflow is typically at the Active Cooling Minimum Airflow Setpoint.

In the Heating Mode the Primary Airflow is at the Active Heating Minimum Airflow Setpoint and the Local Heat is modulated to maintain the Active Heating Temperature Setpoint. If Dual Heating Enable is set then the primary airflow also modulates between Heating Minimum and Maximum Airflow as the heating requirement goes from 0 to 100%.

Pressure Dependent Operation

If Pressure Dependent Enable is yes, then the position of the Primary Damper motor is controlled based on Damper Drive Time rather than airflow. The Cooling and Heating Damper Minimum and Maximum Positions are a percentage of the Damper Drive Time.

In the Cooling Mode the damper modulates between the Active Cooling Damper Minimum and Maximum Positions as the zone Cooling Requirement goes from zero to 100 %.

In the Deadband Mode the damper is typically at the Active Cooling Damper Minimum Position.

In the Heating Mode the damper is at the Active Heating Damper Minimum Position and the Local Heat is modulated to maintain the Active Heating Temperature Setpoint. If Dual Heating Enable is set then the damper also modulates between Heating Minimum and Maximum Airflow as the heating requirement goes from 0 to 100%.

To maintain indexing of damper position the Damper is driven fully closed for a Damper Drive Time: On reset of Power, On return from Damper Override, or Emergency Mode.

Control State

The Control State determines which Cooling and Heating Temperature Setpoints are used for zone temperature control. Four control states are possible: Occupied, Unoccupied, Night Setback, and. Morning Warm-up. If the Clock is not synchronized, the Control State is Occupied by default. Otherwise the Control State is determined by the Daily Event Schedule.

The Control State may be overridden via a message broadcast over the communication bus from software or an ASIC/2-7040 controller. The controller state may be returned to OCC from NSB or Unocc when the Afterhours Enable is yes and the push-button on the Wall Sensor is pushed.

The Active Cooling and Heating Minimum and Maximum Airflow Setpoints are typically given by the Occupied Cooling and Heating Minimum and Maximum Airflow Setpoints.

However, if Multiple Airflow Enable is set, the Active Cooling and Heating Minimum and Maximum Airflow Setpoints are given by: the Occupied Cooling and Heating Minimum and Maximum Airflow Setpoints in the Occupied and Morning Warm-up States; the Unoccupied Cooling and Heating Minimum and Maximum Airflow Setpoints in the Unoccupied State; or the Night Setback Cooling and Heating Minimum and Maximum Airflow Setpoints in the Night Setback State.

Deadband Mode

In the Deadband Mode, the operation of the primary air damper (and the fan if any) depends on the Control State and option selections.

In Occupied Deadband the Primary Airflow is at the Active Cooling Minimum Airflow Setpoint.

In Unoccupied Deadband the Primary Airflow is at the Active Cooling Minimum Airflow Setpoint, unless UNO Option 2 Enable is yes, then the primary air damper is closed (and the fan if any is OFF) in Deadband.

In Night Setback Deadband Mode the primary Airflow is at the Active Cooling Minimum Airflow Setpoint, unless NSB Option 2 Enable is yes, then the primary air damper is closed (and the fan if any is OFF) in Deadband.

Primary Damper Control - Constant Fan

*Cooling is locked out in MWU.

	Occupied	Changeover	UNOCC Option 2 = No	UNOCC Option 2 = Yes	NSB Option 2 = No	NSB Option 2 = Yes	MWU Option 2 = No	MWU Option 2 = Yes
Cooling	Modulate	Min CLG	Closed	Modulate	Closed	Modulate	Min HTG	Min HTG
Deadband	Min CLG	Min HTG	Closed	Closed	Closed	Closed	Min HTG	Min HTG
Heating	Min HTG	Modulate	Closed	Min HTG	Closed	Min HTG	Max HTG	Min HTG

Morning Warm-up (MWU) State

Morning Warm-up is meant as a prelude to Occupied state, to ready the building for daily use. For Morning Warm-up, the control sequence operates at full-capacity heating until the zone temperature is moved into the Deadband region.

Two MWU sequences can be selected: central heating, and local heating. In central heating MWU hot air is distributed through the primary air ducts. In local heating MWU, all heat is provided from the VAV terminal.

MWU, Central Heating

If Morning Warm-up Option 2 Enable is not set then central heating is assumed where hot air is in the duct as in changeover heating, which is described below. If the control is initially in cooling or heating mode, the opposite mode is locked-out until the end of Morning Warm-up.

All local heat is typically OFF during this sequence. However if Local Heat Enable is yes, then local heat is used in addition to central heat.

Morning warm up differs from changeover because the controller goes into heating once, while in changeover it can go in and out of the heating mode many times.

MWU, Local Heat

If Morning Warm-up Option 2 Enable is set then local heating is assumed. The airflow is maintained at Occupied Heating Minimum Airflow Setpoint and all heating is provided by local hot water or electric heat.

If zone temperature is less than Occupied Heating Setpoint when the control enters MWU state, the heating requirement is 100%, the local hot water or electric heat is at 100%.

When zone temperature reaches Occupied Heating Temperature Setpoint the heating requirement is at 0% and the heat turns OFF. If the zone temperature falls 2 °F below the Occupied Heating Temperature setpoint, the heating requirement is again at 100% to maintain temperature setpoint. This cycle continues while in MWU state.

Changeover

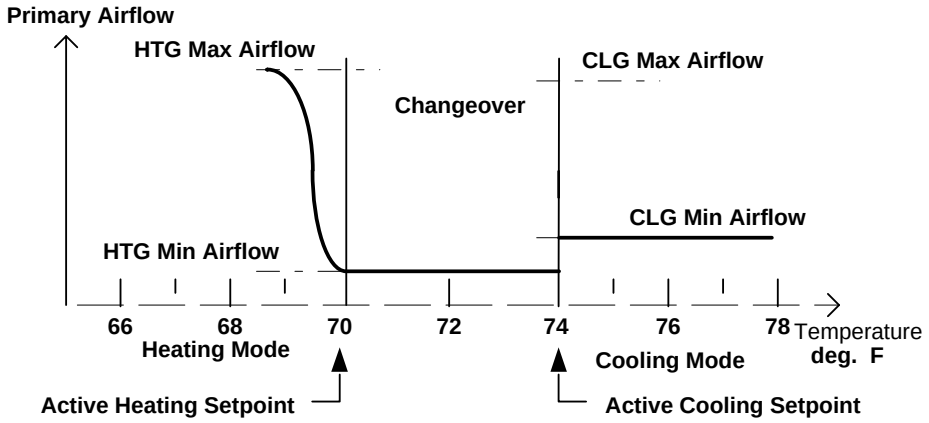
A changeover feature is available which modifies the modes of operation in Heating, Deadband, and Cooling Control Modes. In changeover it is assumed that the primary supply air temperature is appropriate for heating. Changeover is useful for applications where a single duct serves both heating and cooling at different times.

In the changeover heating mode, the Active Primary Minimum and Maximum Airflow setpoints are given by the Active Heating Minimum Airflow and Heating Maximum Airflow Setpoints. The airflow modulates based on the zone Heating Requirement.

In changeover Deadband the supply air is maintained at Active Heating Minimum Airflow Setpoint.

In changeover cooling the airflow is maintained at the Active Cooling Minimum Airflow Setpoint.

An option Local Heat Enable, if set allows local heat to come on in addition to central heat whenever the controller is operating in changeover.



Auto-changeover

Auto-changeover requires installation of a supply air temperature sensor on input 6. If the measured supply air temperature is greater than the Changeover Setpoint, the controller goes into a heating only changeover mode. If the Changeover Setpoint is 0 F (default), the auto-changeover feature is disabled.

Remote Changeover

The controller can be forced into changeover by a command on the communications line. A remote command to set changeover OFF forces prevents all changeover control action. Remote commands always take priority over auto-changeover. A remote command to restore changeover clears changeover ON and changeover OFF and enables the auto-changeover control action.

Pressure Dependent Changeover

In changeover it is assumed that the primary supply air temperature is appropriate for heating.

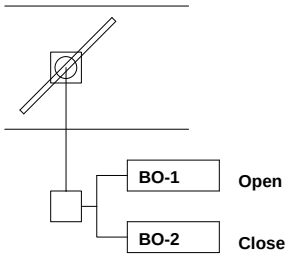
If Pressure Dependent Enable is yes, then in changeover heating, the damper modulates between the Active Heating Damper Minimum and Maximum Positions based on the zone Heating Requirement.

If Local Heat Enable is set, the local heat also comes on in addition to central heat whenever the controller is operating in changeover heating.

In changeover Deadband the supply air is maintained at Active Heating Damper Minimum Position.

In changeover cooling the airflow is maintained at the Active Cooling Damper Minimum Position.

Outputs



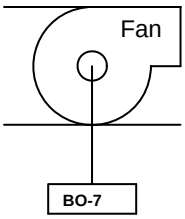
Primary Air Damper

Primary Air Damper

In Single Duct personalities in Cooling Control mode, the controller modulates the Primary Airflow Setpoint between the Active Cooling Minimum and Maximum Airflow setpoints based on the Cooling Requirement.

The Primary Airflow is compared with the Primary Airflow Setpoint every a second. As the damper drives the airflow toward the setpoint, the output begins to pulse, where the pulse size in 1/6 s increments is given by 4*Airflow Error/AF Hysteresis. The smallest non-zero Airflow Hysteresis gives the fastest approach to setpoint.

As control approaches the setpoint, the airflow error is summed over time. The Airflow Integration Time [Default 4] is the time required for a 25 ft/min error to sum to give an additional pulse. To enable this algorithm you must give the Airflow Integration Time [Default 4] a non-zero value. If Airflow Integration Time is zero, then it drives to the Airflow Setpoint, and waits until airflow exceeds hysteresis



Constant Fan

For Series Fan Powered Terminal box control, the constant fan operation is based on the operating state, and mode.

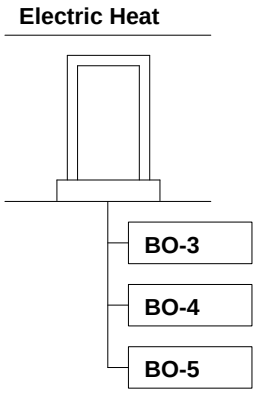
In Deadband the fan is on or off depending on the sequence selected.
The fan is ON whenever the primary air damper is not closed.

- In the morning warm up state, the fan is on.
- In night setback or unoccupied states, the fan is off unless the system is in heating mode.
- In Emergency 1 the Fan is overridden On. In Emergency 2 the Fan is overridden Off.

Constant Fan Control

	Occupied	UNOCC Option 2 = No	UNOCC Option 2 = Yes	NSB Option 2 = No	NSB Option 2 = Yes	MWU Option 2 = Yes or No
Cooling	Fan On	Fan Off	Fan On	Fan Off	Fan On	Fan On
Deadband	Fan On	Fan Off	Fan Off	Fan Off	Fan Off	Fan On
Heating	Fan On	Fan On	Fan On	Fan On	Fan On	Fan On

Electric Heat Output

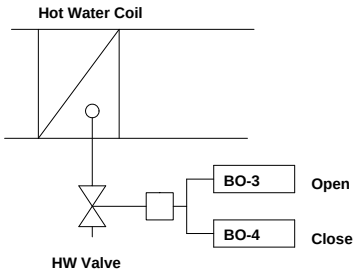


Up to 3 stages of Electric Heating output may be used to maintain the calculated heating requirement in personalities 9, 10, and 11.

For a controller with 1 stage of electric heat (Personality 2,6,9): Stage 1 duty cycles in proportion to the Electric Heat Base Time; from 0 to 100% as the Heating Requirement goes from 0 to 100%.

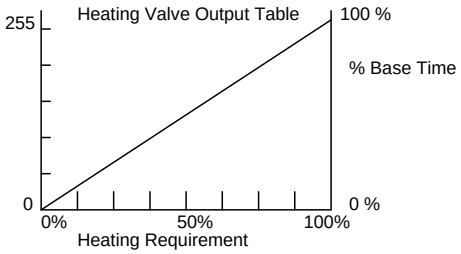
For a controller with 2 stages of electric heat (Personality 3,7,10): Stage 1 duty cycles in proportion to the Electric Heat Base Time from 0 to 100% as the Heating Requirement goes from 0 to 50%; and Stage 2 does not turn ON until stage 1 is on for 100% of the duty cycle time and duty cycles in proportion to the Electric Heat Base Time from 0 to 100% as the Heating Requirement goes from 50% to 100%.

Hot Water Heat Output

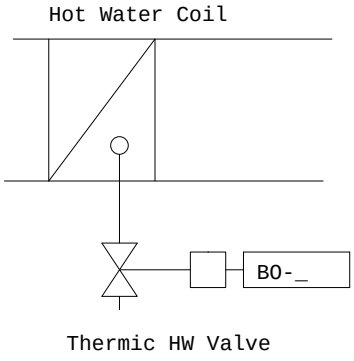


In a controller with modulated hot water heat (Personality 5, 12, or 13), the valve is opened or closed a fraction of the HW Valve Base Time in proportion to the Heating Requirement. The output to be controlled is identified by the HW Valve Open Mask and HW Valve Closed Masks. The functional status of the HW Valve output is shown by the HW Valve Output Status.

For a controller with modulated hot water heat , the valve is opened or closed a fraction of the valve time base in proportion to the Heating Requirement based on the five-value Heating Valve Output Table.



Thermic Valve On/Off (Optional)



The output to be used is assignable using the Thermic Valve On/Off Mask.

In a controller with thermic valve hot water heat (Personality 18, 19, or 20), the valve is energized for a fraction of the HW Valve Base Time in proportion to the Heating Requirement. The thermic Valve is normally off and will be ON for a fraction of the HW Heating Base Time. It will be initially on and once it goes off it stays off for the remainder of the HW Heating Base.

Timer On Time = (HW Output/255)* HW Base Time.

If Thermic Valve Reversed is set the output will be normally on, and will be OFF for a fraction of the HW Heating Base Time.

Other Outputs

Analog Output (Optional)

An Analog Output, 0 to 10 Vdc at up to 20 mA is provided which optionally may be assigned to track the Heating or Cooling Requirement [Default; Heating]. The output goes from Minimum Output Voltage to Maximum Output Voltage as the Requirement goes from 0 to 100 %.

Auxiliary Cooling Output (Optional)

An optional auxiliary cooling output is provided. If Auxiliary Cooling Enable is set, and the Cooling Requirement is 100 % and the zone temperature exceeds the active cooling setpoint by an Auxiliary Cooling Offset [Default 2 oF] for a Auxiliary Cooling Delay Time [Default: 120 s], then an auxiliary cooling output is energized. The output to be used is assignable using the Auxiliary Cooling Output Mask [Default: Output #5]. Once energized, the auxiliary cooling output remains on until the zone temperature falls below the active cooling temperature setpoint, and the cooling airflow falls below the maximum cooling setpoint by an amount given by the Auxiliary Cooling Hysteresis. [Default: 125 ft/min]

Auxiliary Heating Output (Optional)

If Auxiliary Heating Enable is set, the auxiliary heating output goes on whenever the controller is in the heating mode. This output is completely independent of the hot water valve or electric heat operation. It may be used to control baseboard heat used in conjunction with terminal boxes.

Auxiliary 1, 2, 3 Output (Optional)

The ASIC/1-6000 allows up to 3 outputs for auxiliary outputs which do not follow any schedule. They can be overridden On or Off, and remain in the last state commanded. The output to be controlled is identified by the Aux 1, 2, 3 Masks which are initially un-assigned.. The functional status of the Aux 1, 2, 3 Outputs is shown by the Auxiliary 1, 2,3 Output Status.

Lighting Output

Each ASIC/1 has the ability to control lighting. The Lights Output Mask [Default: None] must set to an unused binary output. By equipping the ASIC/1 with a WS-0XX wall sensor with push button override, the lights can be operated manually by the occupant during Occupied and Morning Warm-up States by pressing the button on the side of the zone sensor without affecting HVAC operation.

During Unoccupied and Night Setback States, depressing the push button will return the control to Occupied, and the lights will come on and stay on for Afterhours Time Allowed. During Emergency 1 and Emergency 2, the push-button has no effect.

If Lights Occupied Enable is yes then the lights are on whenever the Lighting Schedule is On, or the Control State is occupied.

Blink Warning: One minute before automatic shut off of lights as designated in the daily event schedule, or at the end of the afterhours override period, the lights will blink off and back on again. Pressing the afterhours button will re-start the lights.

Alarms

Zone Temperature Alarm

If the Zone temperature is above the Active Cooling Temperature Setpoint by the Zone Temperature Alarm Range, a High Zone Temperature Alarm is set. If the Zone temperature is below the Active Heating Temperature Setpoint by the Zone Temperature Alarm Range, a low Zone Temperature Alarm is set. No other actions are taken in response to a zone temperature alarm.

Primary Airflow Alarm

If the primary airflow is above the Primary Airflow Setpoint by the Airflow Alarm Range, then a High PrimaryAirflow Alarm is set. If the Primary Airflow is below the Primary Airflow Setpoint by the Airflow Alarm Range, then a Low Primary Airflow Alarm is set. No other actions are taken in response to a primary airflow alarm.

Emergency Modes

The emergency modes, Emergency 1, and Emergency 2, are overrides which are received over the communication line and remain in effect until cleared over the communication line.

Emergency 1 Mode

The control may only enter or exit Emergency 1 as a result of commands received on communications line. While in Emergency 1, no other state may be entered until Emergency 1 has been cleared via the communications line. Emergency is maintained through loss of power.

While in Emergency 1 state the controller immediately drives the damper to Maximum Cooling Airflow Setpoint, turns ON the lighting output, and turns OFF any other outputs including electric heat. In EM1 the Fan is On.

Emergency 2 Mode

The control can enter and exit Emergency 2 as the result of commands received on the communications line. If in Emergency 2, no other state except Emergency 1 may be entered until Emergency 2 has been cleared via the communications line. Emergency is maintained through loss of power.

While in Emergency 2 state the controller immediately drives the damper closed, turns ON the lighting output and turns OFF any other outputs, including electric heat.

Communications

The ASIC/1-6000 communicates at 1200 baud, 9600 baud, or 19,200 baud on the remote bus using RS-485 twisted pair communication wire, connected to remote screw terminal connector, TB-4. Access to the ASI communication bus is through a SINC/3-3000 system interface or ASIC/2 configurable controller which can also be used to broadcast time to synchronize the network of ASIC/1 controllers.

Communication with the remote bus can also be established through the WS-0XX wall sensor using a SINC/1-1030 Portable Interface connected to a lap-top computer running ASI Expert Software. It can also communicate through the WT-0XX in the remote communication mode. The local communication mode is not supported.

Each controller has a unique 16 bit address, and may also have a separate 8 bit group address. It will also respond to the global addresses 23125 (5A55h) and 23130 (5A5Ah).

The ASIC/1-6000 may co-exist on the communication line with other ASIC/1 controllers. It is compatible with the ASI LinkOPC Server for seamless communication with Windows based graphic user interfaces.

System Component Checklist

Inputs

Description	Part Number	Quantity
AF-001 Airflow Filter)	Included	
Optional Duct Temperature Sensor (IN-05)	TS-DO-8	0,1
Optional Duct Temperature Sensor (IN-06)	TS-DO-8	0,1
Wall Mounted Zone Temperature Sensor	WS-0X1	1
Sensor Cable	SCP-0XX	1
Communication Cable twisted pair.	22-24 ga twisted	

NOTE: Consult ASIC/1-6000 Installation manual for configuration of inputs.

Outputs

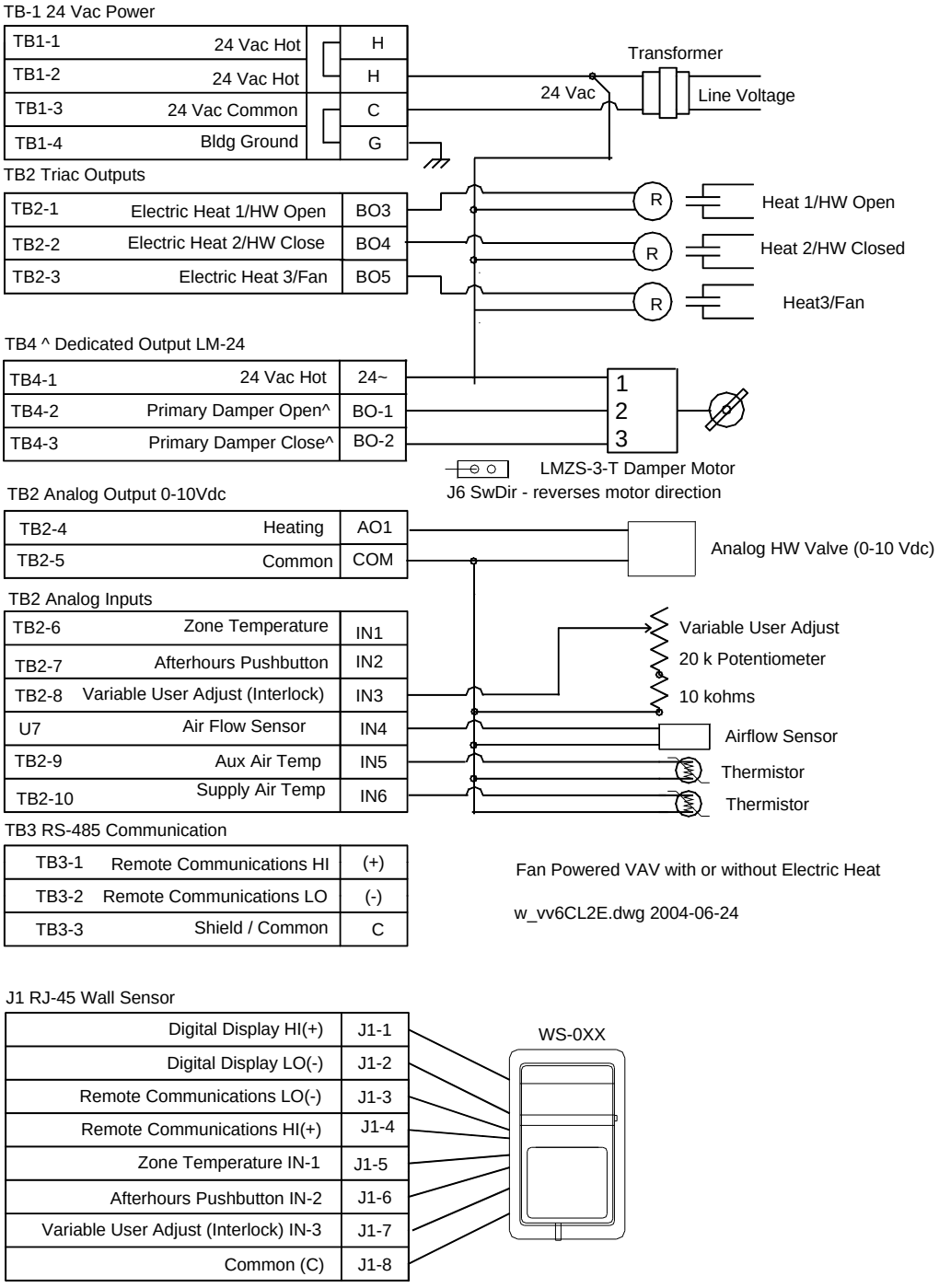
Description	Part Number	Quantity
VAV Controller	ASIC/1-6000	1
24 Vac Transformer		1
24 Vac Tri-state Primary Damper Operator	Included	1
24 Vac Fan Control Relay		1
HW Valve with 24 Vac Tri-state Operator		0,1
24 Vac Thermic Valve (Optional)		0,1
24 Vac Electric Heat Relay		0,1,2
24 Vac Auxiliary CLG Output Relay (Optional)		0,1
24 Vac Auxiliary HTG Output Relay(Optional)		0,1
24 Vac Auxiliary Output Relay (Optional)		0,1,2,3
24 Vac Lighting Relay (Optional)		0,1

NOTE: . The ASIC/1-6000 must be connected to a solid building ground. Metallic-oxide Varistors, MOV, are used across triac outouts to provide further protection from transients. If current interrupting relays are in series with the output circuits they must be protected with MOVs across the Relay Contacts

Wiring Layout

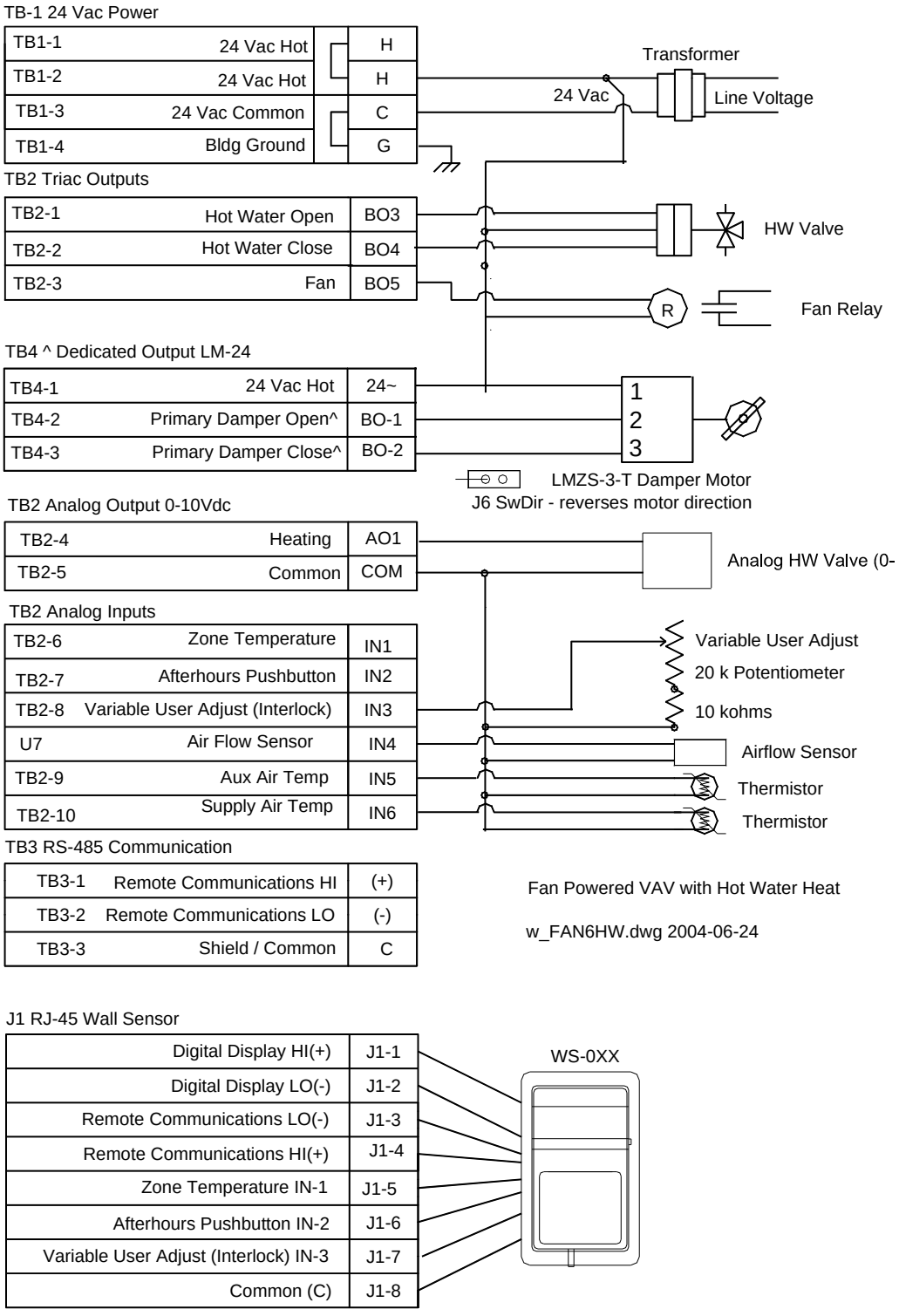
Constant Fan with up to 2 Stages of Electric Heat

Typical Constant Fan Powered VAV with 3 Stages of Electric Heat, for use with the following personalities: Personality 9, 1 stage of electric heat; and Personality 10, 2 stages of electric heat.



Constant Fan with Hot Water Heat

Typical Constant Fan Powered VAV with Hot Water Heat for Personality 13.



ASIC/1-6000-FC Fan Coil

Application

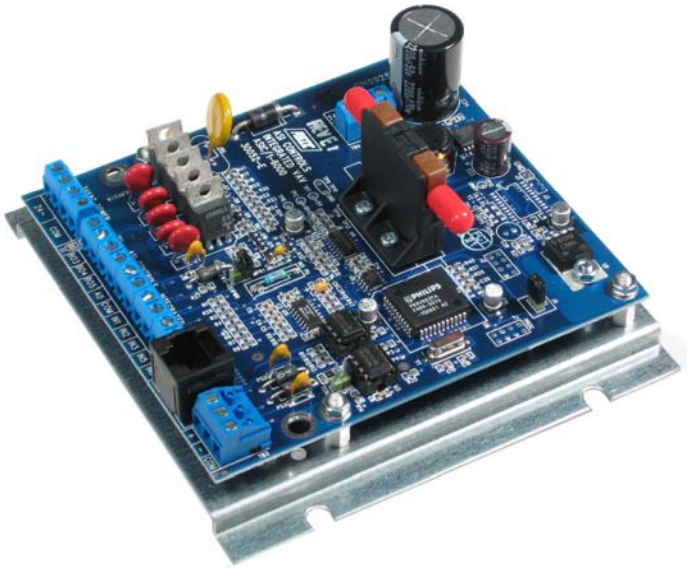
Two new personalities, 31, 2-pipe On/Off Fan Coil and 32, 4-pipe On/Off Fan Coil have been implemented for simple fan coil applications such as hotel rooms.

We also include an optional Door Event feature that works with the Occupancy sensor to determine if the zone is occupied. The Door Switch that closes when the door is closed is wired in series with a 1.82 kohm resistor on Input 6. One or more Occupancy sensor switches that close on occupancy are wired across Input 5.

There is also an optional Window Switch Feature to turn off the fan and valves if the Window is open. One or more Window Switches that close when the window is closed are wired in series with a 3.32 kohm resistor on Input 6.

When the door event feature determines that the zone is occupied, the lights are turned on. They are turned off when the zone is not occupied.

The controller ASIC/1-6000-FC is mounted on a metal base with no Airflow Sensor. This product is not currently UL Listed.

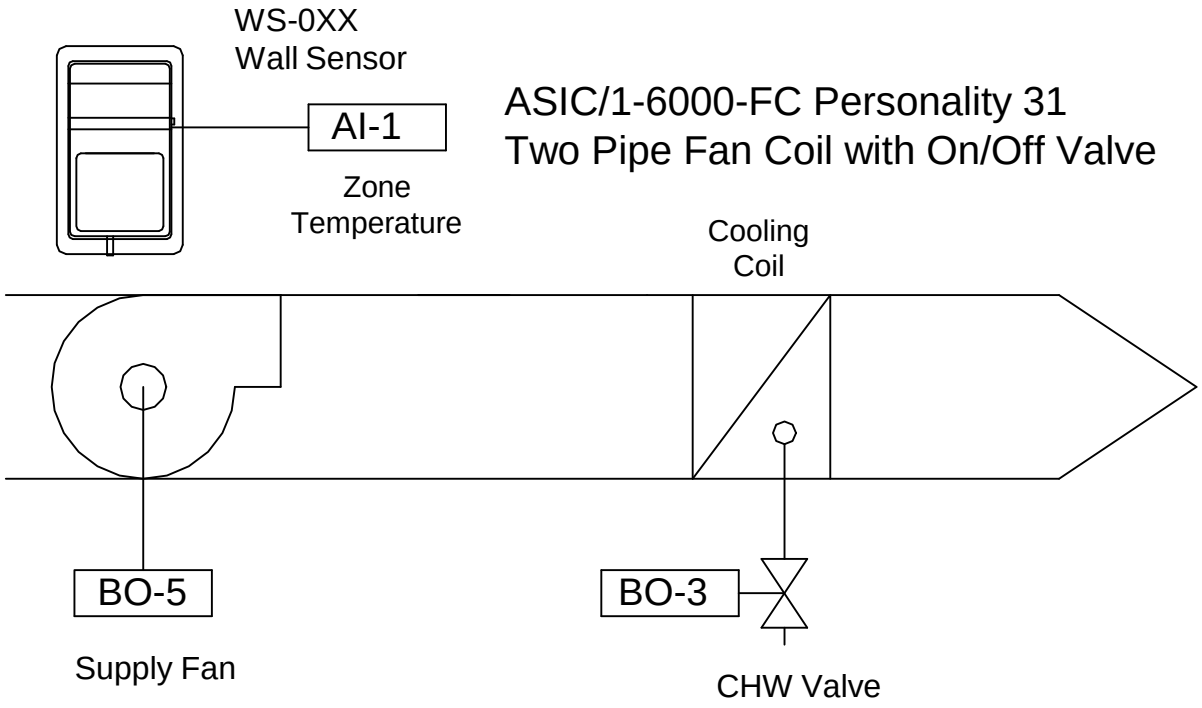


Two new Fan Coil Personalities for the 6000

31	2-Pipe On/Off Fan Coil	2P-FC
32	4-Pipe On/Off Fan Coil	4P-FC

The sequence works with WS-0x1family of wall sensors, or any 3 kohm Type 2 thermistor sensor.

Personality 31 – 2-pipe Fan Coil



The ASIC/1-6000 has a sequence for a two-pipe Fan Coil with a single on/off valve.

The Zone Temperature is compared with the Active Heating and Cooling Temperature Setpoints. The Occupied, Unoccupied, or Night Setback Heating and Cooling Temperature Setpoints are determined by the Control State.

If Cooling is required, a PI calculation is used to determine the Cooling Requirement. If in the Cooling Control Mode and the Cooling requirement is non zero, and not in changeover, then the Chilled Water Valve is opened.

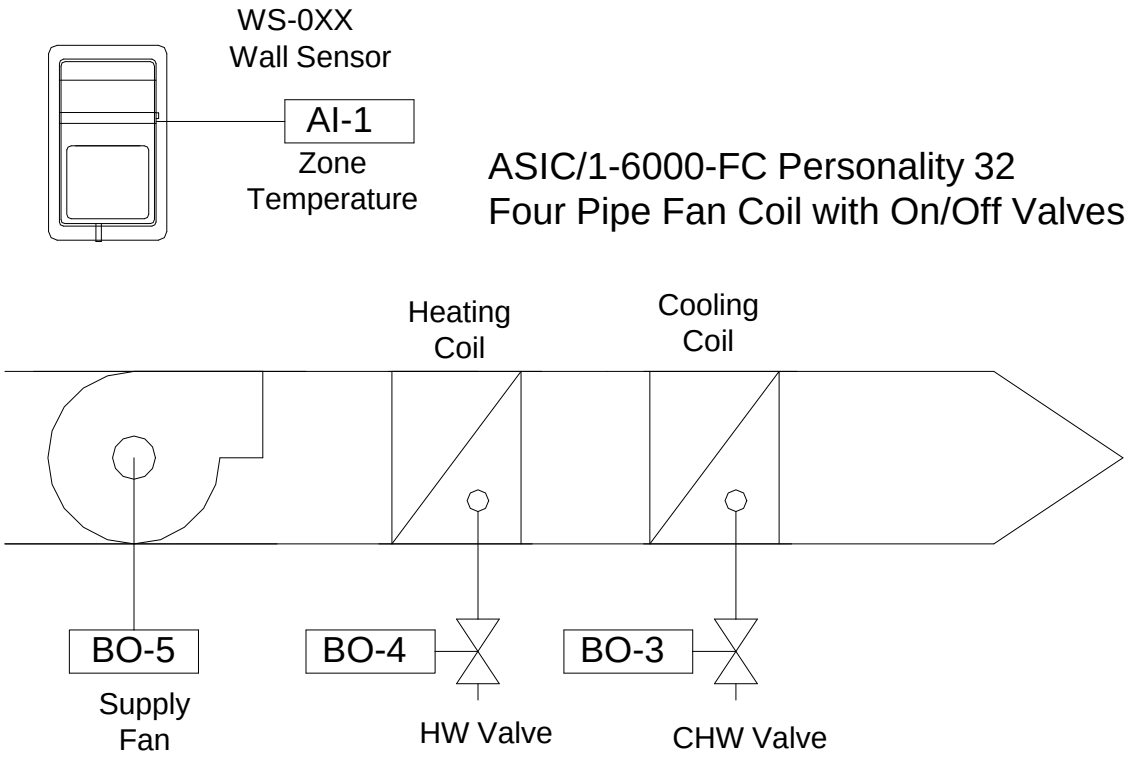
If Heating is required, a Heating Requirement is calculated. If in the Heating Control Mode and the Heating Requirement is non-zero and NOT in changeover the Chilled Water Valve remains closed. If in changeover the Chilled Water Valve is opened.

The fan is on when the Chilled Water Valve is Open.

Changeover can occur because of command on the communication line.

Note: Auto-changeover is not available if the Door or Window switch is used. Auto-changeover requires installation of a water loop temperature sensor on input 6. The water loop temperature can not be used with the Door or Window Switch.

Personality 32 – 4-pipe Fan Coil



The ASIC/1-6000 has a sequence for a four-pipe Fan Coil with on/off valves for chilled and hot water.

The Zone Temperature is compared with the Active Heating and Cooling Temperature Setpoints. The Occupied, Unoccupied, or Night Setback Heating and Cooling Temperature Setpoints are determined by the Control State.

If Cooling is required, a PI calculation is used to determine the Cooling Requirement. If in the Cooling Control Mode and the Cooling requirement is non zero, then the Chilled Water Valve is opened.

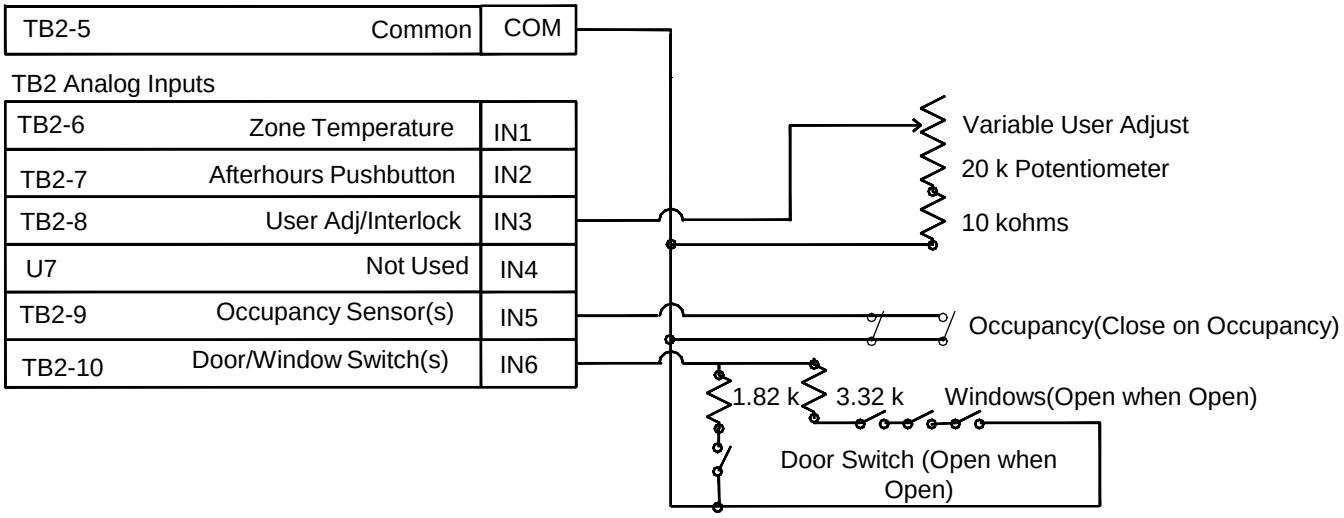
If Heating is required, a Heating Requirement is calculated. If in the Heating Control Mode and the Heating Requirement is non-zero, the Hot Water Valve is opened.

The fan is on when the Chilled Water Valve or Hot Water Valve is Open.

Door Event Feature

A Door Event feature is implemented using a Entry Door Switch and Occupancy Sensor(s). The purpose is to put the zone in occupied when occupancy is detected, and put the zone in unoccupied if no occupancy is detected after a door event.

A Window Switch (s) option is used to lock out fan, cooling or heating if an open window is detected.



Occupancy Feature

If Door Event Enable is yes, the Normally-Open Entry Door Switch is used together with the Occupancy Sensor to determine if the room should be in the Occupied or Unoccupied Control State. The State Schedule is ignored. If Door Event Enable is No, the Entry Door Switch is ignored and Occupancy Sensor acts as previously implemented.

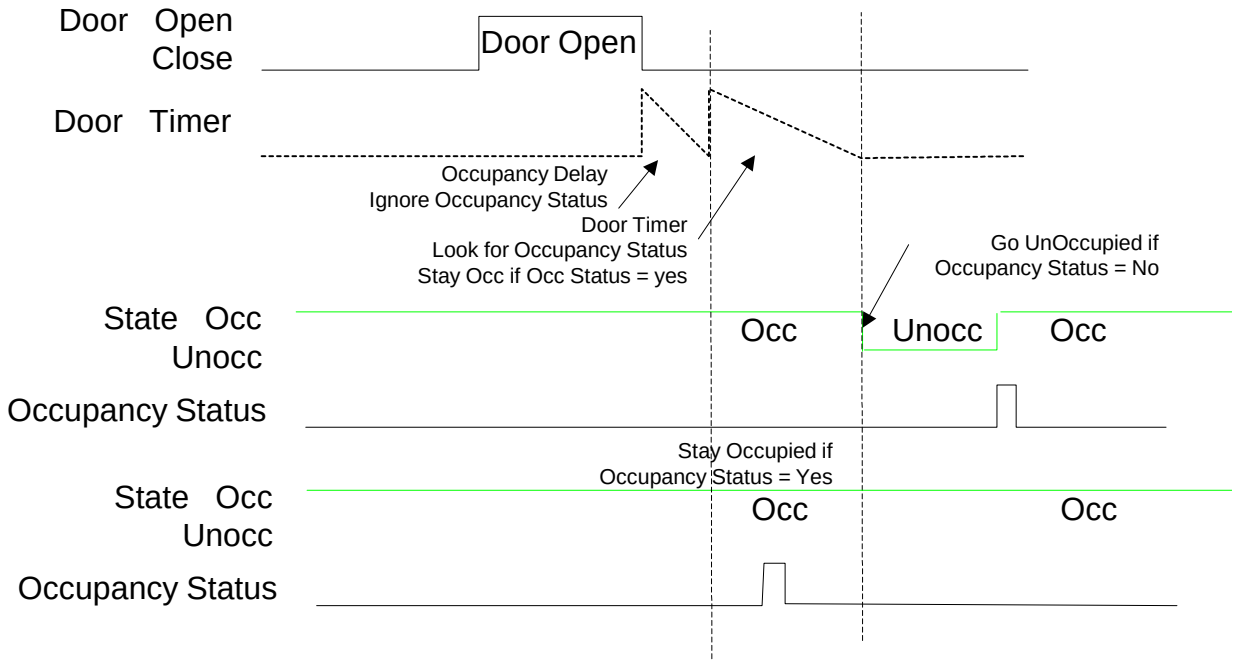
Entry Door Switch: A normally Open Switch is wired across Input 6 which closes if the Entry Door is closed triggering a door event.

Occupancy Sensor(s): One or more Normally Open occupancy sensor contacts are wired across Input 5 and close if occupancy is detected.

Door Event

If Door Event Enable is Yes and a door event is detected, an Occupancy Delay Timer and Door Event Timer (0.1023s) are started in sequence. A door event is the door opening or closing. When the door closes, an Occupancy Delay timer starts running. When it expires the Door Timer starts counting down. If an Occupancy event occurs before the Door timer expires, the controller is set to or remains in the Occupied State. If an Occupancy event does NOT occur before the Door timer expires, the controller is set to the Unoccupied State. Otherwise anytime occupancy is detected, then the Control State is overridden to Occupied until the next door event.

Note: The Door and Window Switches conflicts with the Water Loop Temperature on Input 6. If the Door or Window Switch is used, then Auto Changeover is not available.



Window Switch Feature

Window Switch (s): One or more Normally Closed window and patio door switches are wired in series with 3.32 kohm across Input 6 .

If any of the switches are open for 30 seconds indicating that a window is open, the CLG and HTG are locked out until the window is closed. The Fan is turned OFF. The Control State does not change.

Lighting Output

Each ASIC/1 has the ability to control lighting, by assigning the Light Output Mask to an unused output. If the Door Event Feature is used, the Light Output is On when the zone is occupied. The Light Output is Off when the zone is not occupied.

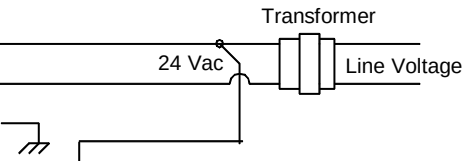
If the Door Event Feature is used, the lights schedule and the afterhours push-button are ignored.

ASIC/1-6000-FC Wiring

2-pipe or 4-pipe fan coil with On/Off valves, and Optional Occupancy, Door and Window Switches.

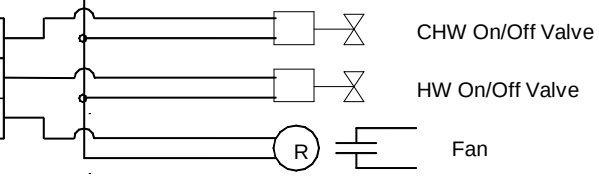
TB-1 24 Vac Power

TB1-1	24 Vac Hot		H
TB1-2	24 Vac Hot		H
TB1-3	24 Vac Common		C
TB1-4	Bldg Ground		G



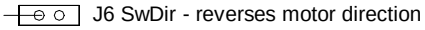
TB2 Triac Outputs

TB2-1	CHW Valve On/Off	BO3
TB2-2	(4-pipe) HW Valve On/Off	BO4
TB2-3	Fan	BO5



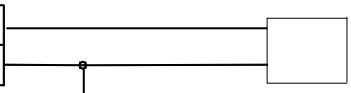
TB4 ^ Dedicated Output LM-24

TB4-1	24 Vac Hot	24~
TB4-2	Not Used	BO-1
TB4-3	Not Used	BO-2



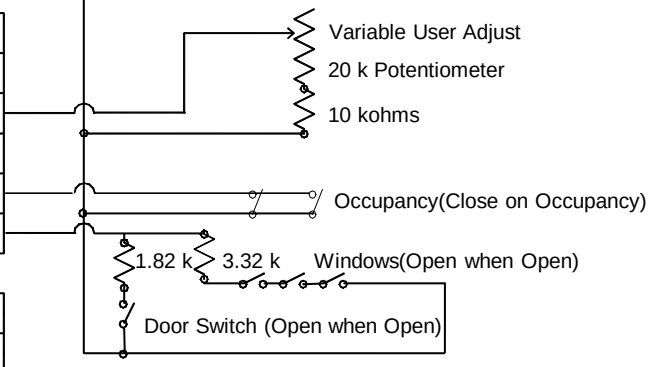
TB2 Analog Output 0-10Vdc

TB2-4	Cooling/Heating/Changeover	AO1
TB2-5	Common	COM



TB2 Analog Inputs

TB2-6	Zone Temperature	IN1
TB2-7	Afterhours Pushbutton	IN2
TB2-8	User Adj/Interlock	IN3
U7	Not Used	IN4
TB2-9	Occupancy Sensor(s)	IN5
TB2-10	Door/Window Switch(s)	IN6



TB3 RS-485 Communication

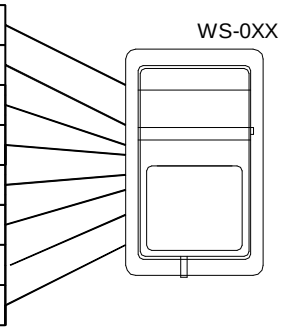
TB3-1	Remote Communications HI	(+)
TB3-2	Remote Communications LO	(-)
TB3-3	Shield / Common	C

2-Pipe ON/OFF Fan Coil

w6000_FC-2P-Hotel.dwg 2007-02-13

J1 RJ-45 Wall Sensor

Digital Display HI(+)	J1-1
Digital Display LO(-)	J1-2
Remote Communications LO(-)	J1-3
Remote Communications HI(+)	J1-4
Zone Temperature IN-1	J1-5
Afterhours Pushbutton IN-2	J1-6
Variable User Adjust (Interlock) IN-3	J1-7
Common (C)	J1-8

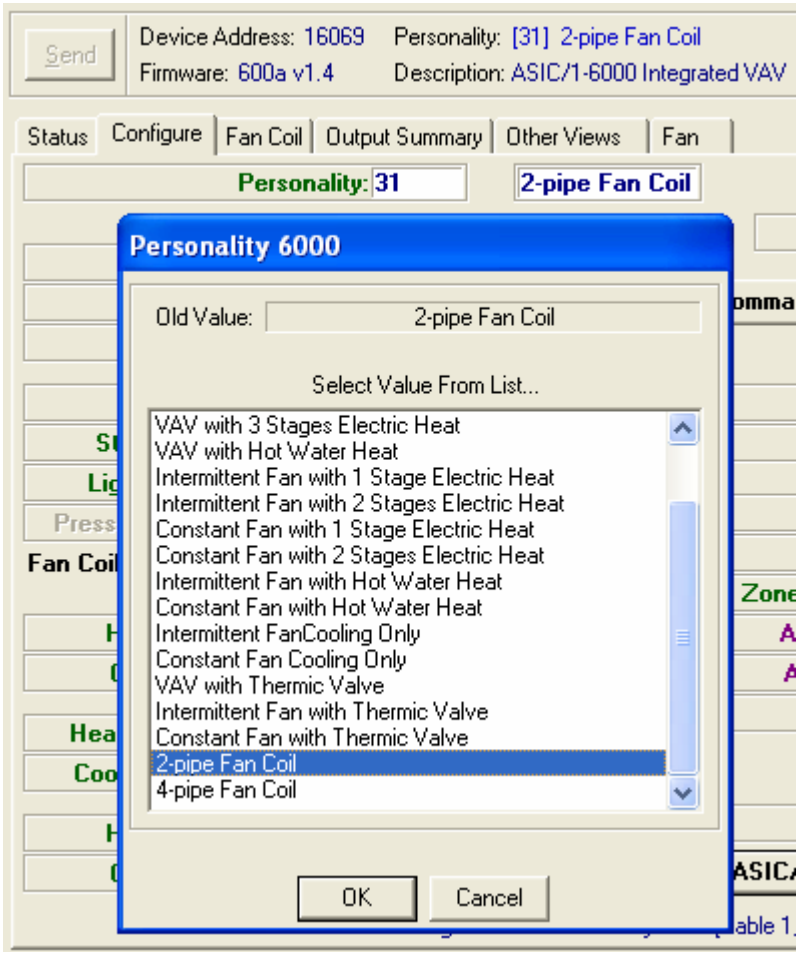


Fan Coil Configuration

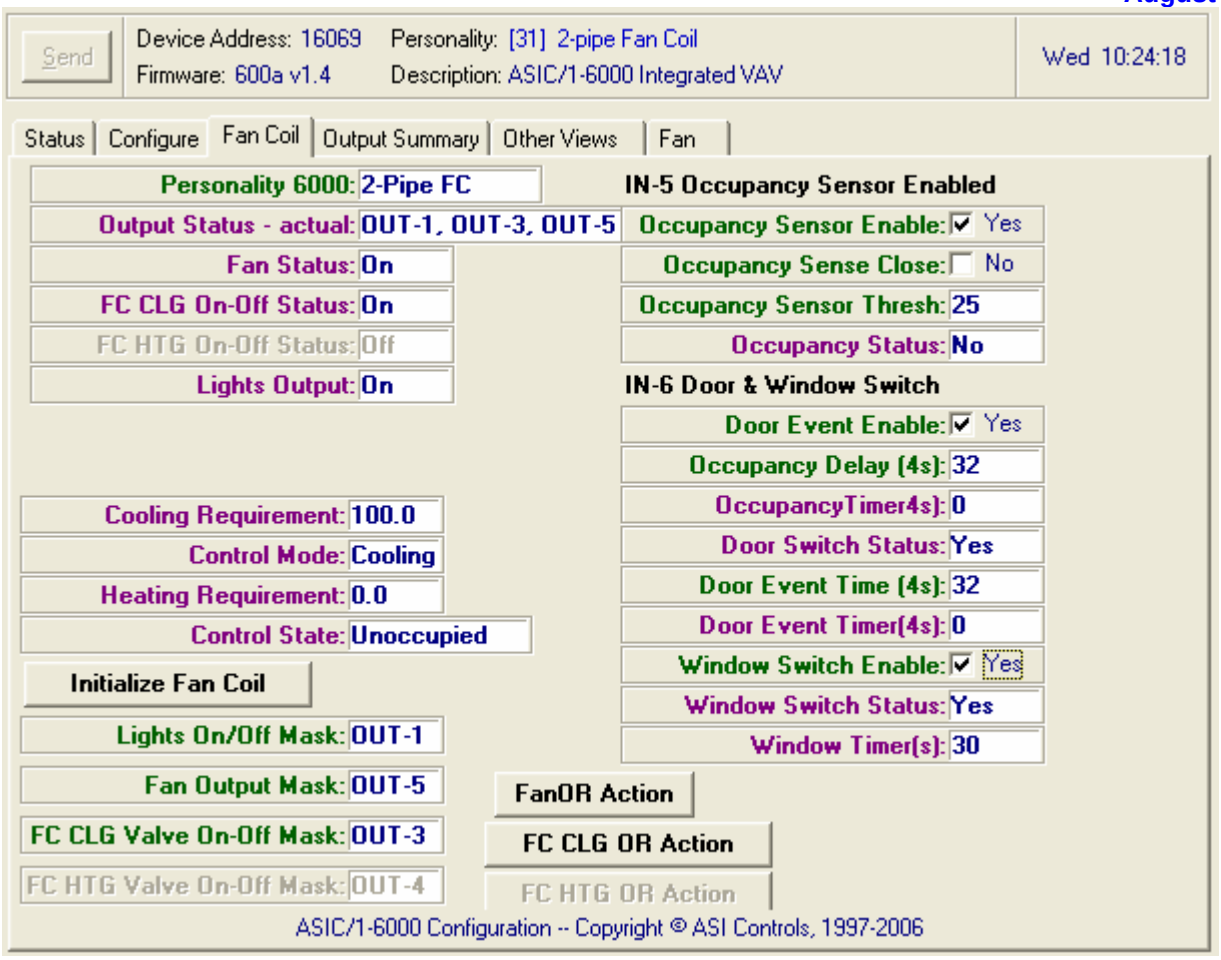
Update Expert to version 3.3.0.3 or later, and the ASIC1.mdb file to 2007-03-09 or later.
Copy the new a1-6000.pvs, and a1-6000-new.tcl file into the View\ASIC1 folder.
You must have firmware version 600a1.4 or later.

Fan Coil Personality

Select the Fan Coil Personality on the Configure screen. A Fan Coil tab will appear



Select the Fan Coil Tab. You can set the Output Masks for the Fan Coil personality by pressing the Initialize Fan Coil button.



Occupancy Features

You may now use the Occupancy Feature on Input 5 by setting Occupancy Sensor Enable to Yes. The Occupancy Status will display Yes or No. If the Occupancy switch closes on occupancy set Occupancy Sense Close to Yes. If occupancy is based on voltage threshold, set the Occupancy Sensor Threshold.

Door Event Features

If Door Event Enable is yes, you need to set the Occupancy Delay [Default 32 s] which is the time it takes for the Occupancy sensor to decide the room is no longer occupied. This can be any value up to 1020 seconds. (17 minutes).

When the door closes the Occupancy Timer starts and the occupancy sensor is ignored for an Occupancy Delay. After that if occupancy is not detected within the Door Event Time, the Control State switches to Unoccupied.

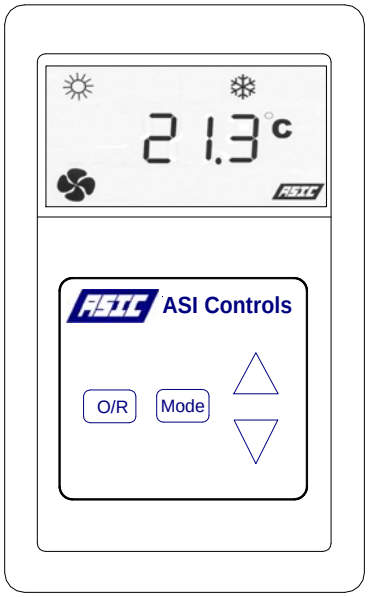
At any time occupancy is detected, except during the Occupancy Delay, the Control State switches to Occupied and remains there until the next Door Event.

Window Switch

If Window Switch Enable is yes and if a Window is opened for more than 30 seconds, the Fan Coil is disabled and the Fan is Off and the Valves are closed. The control state does not change.

ASIC/1 Digital Display

Application



This application bulletin describes the operation of a Digital Display that can be used to change the Occupied Cooling and Heating Temperature setpoints within a limited range with the ASIC/1-8800, ASIC/1-6000 VAV, ASIC/1-8055 VAV, and ASIC/1-8655 Unitary controllers.The Digital Display has a zone temperature sensor that is read by the ASIC/1 controller.

The Digital Display is connected to the ASIC/1-8800, ASIC/1-8055, ASIC/1-6000 or ASIC/1-8655 using the standard SCP-0xx wall sensor cable. The Digital display also has a 6-pin connector so that the user can talk to the controller through a SINC/1-1030 Portable Mini-SINC.

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 only supported by ASI Expert software.

If User Adjust Enable is yes, the WS-051 can be used to change the Occupied Cooling and Heating Temperature setpoints. If Single Setpoint Enable is yes, then single setpoint adjustment is supported where the Occupied Cooling Temperature Setpoint is changed and the Occupied Heating Temperature Setpoint is set 2 degrees lower.

If Afterhours Enable is yes, the WS-051 can be used to start afterhours operation.

If Half Degree Enable is yes, then the temperature setpoints are maintained in 0.5 deg increments in the controller.

If the Input 1 Type is Zone Temp deg C, then the temperature reading and setpoints are in Celsius units. If the Input 1 Type is Zone Temp deg F, then the temperature reading and setpoints are in Fahrenheit units.

The ASIC/1-8800 and ASIC/1-6000 requires a moving and connecting jumper, JMP1, to provide power through a polyswitch.

The ASIC/1-8655 requires replacing the Input 2 pull-up resistor with a 1/8 A pico-fuse to provide power.

The ASIC/1s support separate minimum and maximum limits for the Heating and Cooling Temperature Setpoints, and single setpoint adjustment.

The ASIC/1-8055 requires a modification to add a second RS-485 chip in U1 and to replace the Input 2 pull-up resistor with a 1/8 A pico-fuse to provide power. The Digital Display will not work if Fan Speed is enabled. The ASIC/1-8055 supports only a single minimum and maximum limits for the Heating and Cooling Temperature Setpoints, and does not support single setpoint adjustment.

Default Operation

If Digital Display Enable is yes, the Digital display shows the temperature of the thermistor on the digital display that is read by the controller. The numerical value ###.# is rounded and displayed to the nearest 0.1 deg. The Digital Display shows "^{o}F", or " ^{o}C" depending on the configuration of the zone temperature input.

If the Active Control Mode is Heating, then the Heat icon is displayed. If the Active Control Mode is Cooling, then the Cool icon is displayed. If the Active Control Mode is Deadband, then the Heat and Cool icons are NOT displayed.

If the Active Control State is Occupied or Morning Ready, then the Day icon is displayed. If the Active Control State is Unoccupied, then the Day icon is off. If the Active Control State is Night Setback, then the Night icon is displayed.

If the personality is Constant or Intermittent Fan and the Fan is ON, then the Fan icon is displayed. Otherwise it is not.

User Adjust Operation

If User Adjust Enable is yes, the Occupied Cooling and Heating Temp Setpoints are incremented or decremented independently by one count when the Up or Down key is pressed. The Cooling Temperature Setpoint is limited by the CLG Temperature Upper Limit and the CLG Temperature Lower Limit. . The Heating Temperature Setpoint is limited by the HTG Temperature Upper Limit and the HTG Temperature Lower Limit. A minimum two count Deadband is maintained between the Cooling and Heating Temperature Setpoints. IF Single Setpoint Enable is set then only a single Setpoint is adjusted.

Occupied Cooling Temperature Setpoint

If Digital Display Enable is yes and User Adjust Enable is yes, pressing the Mode key brings up User Adjust Operation for Occupied Cooling Temperature Setpoint and the Setpoint and Cooling icons are displayed. If Half Degree Enable is yes, then the temperature setpoints are maintained in 0.5 deg increments. The numeric display shows the Occupied Cooling Temperature Setpoint.

If the Occupied Cooling Temp SP is greater than or equal to CLG Temperature Upper Limit then pressing the Up key does nothing. Otherwise pressing the Up key increments the Occupied Cooling Temp SP by one count and displays the updated Occupied Cooling Temperature Setpoint.

Pressing the Down key decreases the Occupied Cooling Temp SP by one count and decrements the OCC Heating SP as needed to maintain a minimum 2 count separation from the OCC Heating SP. If the Occupied Cooling Temp SP is less than or equal CLG Temperature Lower Limit Temp SP, then pressing the Down key does nothing.

Occupied Heating Temperature Setpoint

Pressing the O/R Key while in User Adjust Operation toggles to the Occupied Heating Temp SP (or back to the Occupied Cooling Temp SP).

If the Occupied Heating Temp SP is less than HTG Temp Lower Limit then pressing the Down key does nothing. Otherwise pressing the Down key decrements the Occupied Heating Temp SP by one count and displays the updated Occupied Heating Temperature SP.

Pressing the Up key increases the Occupied Heating Temp SP by one count and increments the OCC Cooling SP as needed to maintain a minimum 2 count separation from the OCC Heating SP.

If the Occupied Heating Temp SP greater or equal to HTG Temp Upper Limit SP, then pressing the Up key does nothing.

Saving Setpoints

Pressing the mode key, or if no key is pressed for 30 sec, updates the Occupied Cooling and Heating Temperature Setpoints in the controller and returns to the Default Operation.

Single Setpoint Adjustment

Single setpoint adjustment is supported in FW600a1.3 and FW655a2.0 and later. If Single Setpoint Enable is yes, the Occupied Cooling Temperature Setpoint is changed and the Occupied Heating Temperature Setpoint is set 2 degrees lower. The Occupied Cooling Temperature Setpoint is kept within the cooling maximum and minimum limits.

With FW880a1.0, FW600a1.8 and FW655a2.1 Occupied Heating Temperature Setpoint is set to the Occupied Cooling Temperature Setpoint minus the Single Setpoint Deadband.

With FW880a1.1 FW600a2.0 and FW655a2.4 the average of the Occupied Cooling and Heating Setpoints is displayed.

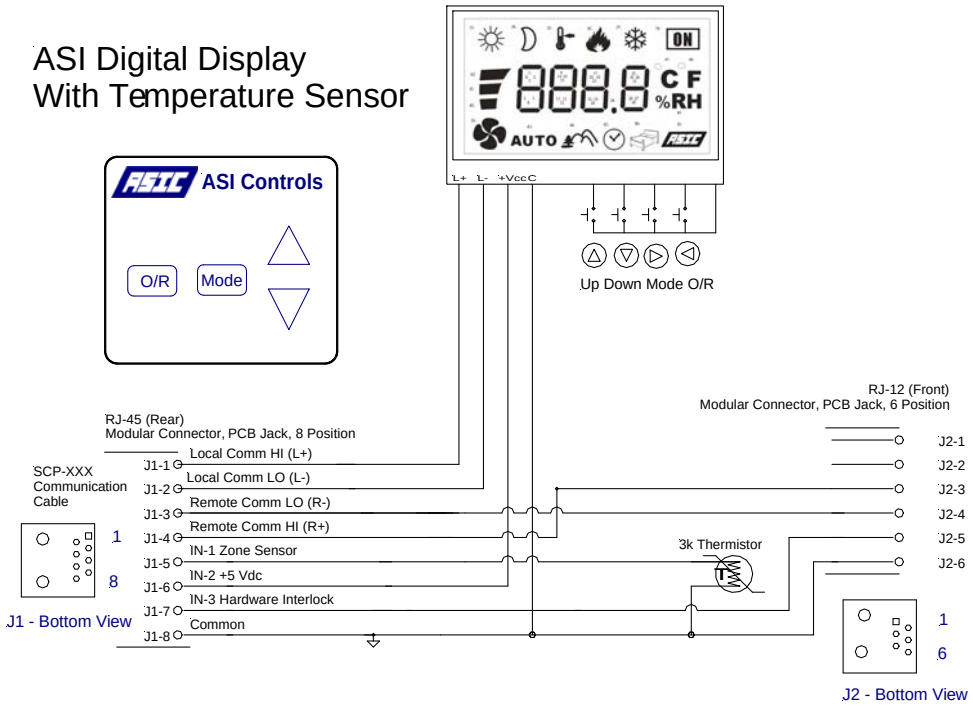
Override Operation

If Afterhours Enable is yes, then pressing the override key from Default operation triggers the “As If Pushed” action, as if the pushbutton was pressed on the WS-0xx wall sensor.

If the Active Control State is Unoccupied, or Night Setback, it triggers Afterhours operation. If the Afterhours Request is yes, the clock icon is displayed. When the controller is in the occupied state because of the Afterhours Request, the clock icon is shown on the display.

If the active control state is Occupied or Morning Ready it has the effect of toggling the Lights.

Wiring Layout



Digital Display Versions

ASIC/1-8800 FW880a

ASIC/1-8800 FW880a Rev 1.1 2009-05-19
WS-051 Single Setpoint change now displays average of HTG/CLG Temp SP and displays HTG, CLG and Setpoint Icons..

ASIC/1-8800 FW880a Rev 1.0g 2009-04-10
Adds Single Setpoint Deadband parameter to Single Setpoint feature

ASIC/1-6000 FW600a

ASIC/1-6000 FW600a Rev 2.0x 2009-05-19
WS-051 Single Setpoint change now displays average of HTG/CLG Temp SP and displays HTG, CLG and Setpoint Icons..

ASIC/1-6000 FW600a Rev 1.8z 2008-11-19
Adds Single Setpoint Deadband parameter to Single Setpoint feature

ASIC/1-6000 FW600a Rev 1.3 2007-01-04
Adds Single Setpoint Enable T6E5bit0 feature for WS-051 Digital Display
If enabled, then the CLG OCC Temp Setpoint is changed and the
HTG OCC Temp Setpoint is 2 degrees less.

ASIC/1-6000 FW600a Rev 1.0 2005-07-22
Implemented as in 655a

ASIC/1-8655 FW655a

ASIC/1-8655 FW655A Rev 2.4d 2009-05-
WS-051 Single Setpoint change now displays average of HTG/CLG Temp SP and displays HTG, CLG and Setpoint Icons..

ASIC/1-8655 FW655A Rev 2.1 2008-04-21
Adds Single Setpoint Deadband parameter to Single Setpoint feature

ASIC/1-8655 FW655A Rev 2.0 2007-01-04
Adds Single Setpoint Enable feature for If enabled, then the CLG OCC Temp Setpoint is changed and the HTG OCC Temp Setpoint is 2 degrees less.

ASIC/1-8055 FW155b

ASIC/1-8055 FW155B Rev 3.0 2005-07-26
Update for use with new ADC Chip U17 and new EE chip U14.
Supports WS-051

ASIC/1-8055 FW155B Rev 2.0 2002-07-01
Update for use with new EE chip U14.

ASIC/1-8055 FW155B Rev 1.1 2002-03-01
Revise operation of Digital Display for separate OCC CLG and HTG Temp SP
Force 2 count deadband between OCC CLG and HTG Temp SP
ASIC/1-8055 FW155B Rev 1.0 2002-02-01
Adds Half Deg Enable for 0.5 deg temperature setpoints.
Adds Digital Display Enable for Digital Display support to allow change of Occupied CLG/HTG Temp SP from Digital Display. The display shows the average of OCC HTG and CLG Temp SP The deadband between OCC HTG and CLG Temp SP remains constant.