GUIDE SPECIFICATIONS

SIMPLICITY® VAV (VARIABLE AIR VOLUME)

Optional 15 - 25 Ton Packaged Product Comfort Control System

CONTROLS SPECIFICATIONS AND CONTROL POINT DATA MAP

GENERAL DESCRIPTION

Equipment with Simplicity® as standard shall be factory run-tested through the control, after the test is complete; there will be no wires to re-connect. All control wiring points shall be tested and verified through communication.

The control shall be UL or CSA recognized. The control shall be manufactured in a manufacturing facility that is certified to ISO 9001.

VARIABLE AIR VOLUME (VAV)

A variable air volume (VAV) option using a variable frequency drive (VFD) is available for applications requiring a constant supply duct static pressure. A differential pressure transducer is used to monitor supply duct static pressure and return a speed reference signal to the VFD to control the output of the indoor blower motor.

DUCT STATIC PRESSURE TRANSDUCER

A 0-5" WC pressure transducer, located in the control box compartment, is used to sense static (gauge) pressure in the supply air duct and convert this pressure measurement to a proportional 0-5 VDC electrical output.

Pressure-transmitting plastic tubing (1/4" diameter) must be field supplied and installed from the transducer to both the ductwork and to the atmosphere. Connect the tubing from the 'HIGH' pressure tap of the transducer to a static pressure tap (field supplied) in the supply duct located at a point where constant pressure is expected. To prevent an unstable signal due to air turbulence, there should be no obstructions, turns or VAV terminal boxes up- or down-stream of the sensing tube location for at least a distance of 6-10 times the duct diameter. Tubing must also be run between the 'LOW' pressure tap of the transducer and atmospheric pressure (outside of the unit).

⚠ CAUTION

Do not run plastic tubing in the supply or return air ducts as air movement could cause erroneous pressure measurements. If the tubing penetrates through the bottom of the unit be sure openings are sealed to prevent air and water leakage.

VAV CONTROL BOARD

A VAV control board, located in the top-left corner of the control box, is used to convert the pressure transducer input signal into a speed reference signal that the drive uses to control the speed of the blower motor. This modulating speed reference signal is generated using an algorithm which continuously calculates an output value.

A brief description of the VAV board's I/O terminals that are used follows;

Inputs:

- **DUCT PRES** - a 0-5 VDC analog input provided by a factory-installed duct static pressure transducer located in the unit's control box.
- **SAT -** analog input provided by a factory-installed 10k-ohm, type 3 thermistor located in the unit's supply air compartment.
- **RAT -** analog input provided by a factory-installed 10k-ohm, type 3 thermistor located in the unit's return air compartment.
- **OAT -** analog input provided by a factory-installed 10k-ohm, type 3 thermistor located in the outdoor air compartment or mounted within the evaporator base rail for units without the installed economizer option.
- **ST -** analog input provided by field-installed space temperature sensor.
- **OH -** a 0-10 VDC analog input provided by a field-installed outdoor air relative humidity sensor for single enthalpy economizer configuration.
- **RH -** a 0-10 VDC analog input provided by a field-installed return air relative humidity sensor for dual enthalpy economizer configuration (used with OH).
- **IAQ -** a 0-10 VDC analog input provided by a field-installed carbon dioxide sensor which monitors indoor air quality (CO2 concentration) and enables call for Demand Ventilation mode for units installed with economizer option.
- **OAQ -** a 0-10 VDC analog input provided by a field-installed carbon dioxide sensor which monitors outdoor air quality (CO2 concentration) and, along with IAQ, enables call for Differential Demand Ventilation mode for units installed with economizer option.
- **APS -** a 24 VAC binary input provided by a field-installed air proving switch which monitors the pressure difference across the indoor blower.

- **DFS** - a 24 VAC binary input provided by a factory-installed or field-installed dirty filter switch which monitors the pressure difference across the unit's filters.
- **PUR -** a 24 VAC binary input for building purge calls from an external source.
- **OCC -** a 24 VAC binary input used to set the building occupancy status for the control.
- **LIMIT 2 -** a 24 VAC binary input which either confirms 2nd-stage gas heat operation or receives an error signal from the variable frequency drive.

Outputs:

- **FAN -** a 2-10 VDC analog output signal sent to the VFD to modulate the speed of the indoor blower motor.
- **ECON -** a 2-10 VDC analog output signal sent to the economizer actuator to modulate position of the return air and outdoor air dampers (optional).
- **EXH ~ -** a 24 VAC binary output signal used to turn on/off the power exhaust relay (optional).
- **VAV BOX (gas/electric heat only) -** a normally open relay contact connected to a terminal block, used to drive the building's VAV boxes to full-open during heating operation.

Programmable set points:

The *duct static set point* is the pressure that the drive will maintain when operating the unit in VAV mode. The set-point is adjustable between 0" WC and 5" WC with the default setting of 1.5" WC.

The *duct static high-limit set point* is the maximum allowable duct pressure to prevent damage from over-pressurization of the ductwork in the event of either a drive or damper failure. The high-limit set-point is adjustable between 0" WC and 5" WC with the factory default setting of 4.5" WC. If the duct static pressure reaches the high-limit set point, then the supply fan motor will be shutdown.

NOTE: Either of the set points described above can be changed through the unit control board (UCB) with the use of a USB-to-RS485 converter, personal computer or PDA and a down-loaded copy of the Simplicity® software available at the UPGnet Commercial Product Catalog website.

Refer to the VAV Data Map table at the end of this document for a complete list of the VAV board's programmable set points and defaults.

⚠ CAUTION

The customer must be aware of the duct pressure design limit, and what the duct pressure sensor is reading when the peak pressure is reached (i.e. the pressure transducer sensing tube may not be located at the place of highest pressure in the system).

FACTORY-INSTALLED VFD

The factory-installed VFD is mounted in the Blower Access Compartment above the blower assembly. The drive comes wired from the factory to include both 3-phase power and control connections (run permit signal, speed reference signal & fault signal).

All required drive parameters are pre-programmed at the factory, except in the case of 208-volt applications, in which the parameter that defines motor nameplate voltage must be changed to a value of 208.00 and the parameter that defines motor-rated current must be changed to the appropriate value appearing on the motor's nameplate. Refer to the enclosed drive material or access the UPGnet Commercial Product Catalog website for instructions on changing parameter settings.

For units also equipped with gas/electric heat, a terminal block located in the unit's control box and connected to the VAV board's "VAV BOX" terminal, must be field wired to the building's VAV boxes to ensure fully open dampers during heating operation.

MANUAL BYPASS

An optional, factory-installed manual bypass switch available with factory-installed VFD can be found in the Blower Motor Access compartment and has the following three positions:

- **DRIVE** - routes power through the VFD for modulating control of the indoor blower motor.
- **LINE** (or BYPASS) - routes power directly to the motor which provides full-speed motor operation and complete electrical isolation of the drive.
- **TEST** - routes power to the VFD but not to the motor to allow for drive programming and/or diagnostics.

If a drive failure occurs, the unit does not automatically switch to bypass mode. The LINE/DRIVE/TEST switch must be manually switched to the LINE (BYPASS) position. If there is a call for the fan, the indoor blower motor will run at full-speed while in the bypass mode.

⚠ CAUTION

If the unit is operated with the manual bypass switch in the LINE (BYPASS) position and there are VAV boxes present in the duct system, then boxes must be driven to the full-open position using a customer-supplied power source to prevent over-pressurizing and possible damage to the ductwork.

⚠WARNING

Before beginning any service, disconnect all power to the drive. Be aware that high voltages are present in the drive even after power has been disconnected. Capacitors within the drive must be allowed to discharge before beginning service.

BAS-READY VFD

Factory-installed VFD is also available with 'BAS-ready' models. Terminal blocks are provided in the control box (in place of the VAV control board) for field wiring of a customer-installed BAS to receive 24 VAC power and to connect to the following control signals:

- a duct static pressure transducer input signal (0-5 VDC)
- an economizer actuator input signal (2-10 VDC)
- an economizer actuator output signal (2-10 VDC)
- a VFD speed reference output signal (2-10 VDC)

The use of shielded cable is recommended for the above control wiring connections.

NOTE: Factory-installed VFD is not available with factory-installed BAS options due to space limitations in the control box.

A solid-state, lock-out relay (LR) and 100-µF, 50 VDC capacitor must be field-supplied and installed to provide a means to transmit a potential fault signal back to the BAS controller. The specific relay part number required will depend upon the need for either AC-output or DC-output. See price pages for further details.

Once the appropriate relay and capacitor are obtained, install the capacitor across LR terminals '3' & '4' and make the following wiring connections:

- LR '1' to BAS controller
- LR '2' to BAS controller
- LR '3' to UCB 'X'
- LR '4' to UCB 'C'

'VFD-READY' FOR CUSTOMER-INSTALLATION

Units configured as 'VFD-ready' provide provisions for a customer-installed drive. The physical dimensions of VFDs can vary greatly among manufacturers, horsepower ratings and voltage requirements. Keep in mind that drive manufacturers also require various minimum clearances to allow for adequate internal cooling of the drive during operation.

The unit comes with a mounting bracket installed in the Blower Access compartment which may accommodate other vendor's drives depending on their size. In order to utilize the unit's mounting bracket, the maximum recommended drive dimensions are as follows:

For 5-hp motor applications .....13" H x 6" W x 7" D

For 7.5 thru 15-hp motor applications .....13" H x 8" W x 8" D

If the drive will not fit in the allotted space, then it will need to be mounted elsewhere; either within the building on a perpendicular wall which is not subjected to excessive temperature, vibration, humidity, dust, corrosive gas, explosive gas, etc., or within an appropriate enclosure rated for outside installation to safeguard against moisture, dust and excessive heat.

The power leads to the drive (L1, L2, L3) and from the motor (T1, T2, T3) along with the respective ground wires are supplied with the unit and need to be connected after the drive is installed.

⚠ CAUTION

Do not connect AC power to the T1, T2, T3 drive terminals to prevent damage to the VFD.

A terminal block located in the control box is provided for field connection of the VFD speed reference signal (2-10 VDC) and to the normally-open, run-permit auxiliary contact. The use of shielded cable is recommended for the above control wiring connections.

For VFD-ready units also equipped with gas/electric heat, a terminal block located in the unit's control box and connected to the VAV board's "VAV BOX" terminal, must be field wired to the building's VAV boxes to ensure fully open dampers during heating operation.

SIMPLICITY® COMPRESSOR CONTROL

1. The control shall have a five-minute Anti-Short Cycle Delay to prevent excessive compressor cycling.

2. The control shall have a three-minute minimum run time to insure that oil is returned to the compressor each time it starts. The minimum runtime shall be programmable up to 10 minutes.

3. The control shall monitor the High Pressure switch, the Low Pressure switch, and the Compressor Overloads separately for each refrigeration circuit.

4. The control shall have a 30 second Low Pressure Switch bypass when it starts any compressor.

5. A hard compressor lockout shall occur if the control detects the same switch trip three times in a two-hour window, which starts when the first trip occurs. On the first and second trips, the control will turn the compressor off and wait five-minutes after the switch re-closes, before restarting the compressor.

6. The control shall be capable of operating both compressors and the economizer when there is a call for both stages of cooling.

7. The control shall have a means of locking out mechanical compression below a programmable low ambient trip point. This must be done without adding extra components to the unit.

8. The control shall have a means of locking out the mechanical compression when the economizer is operating in free cooling mode without additional components

9. The control shall have a means of starting the compressor before the indoor Fan comes on when operating with a Thermostat in the AUTO FAN mode.

EQUIPMENT CONTROL FEATURES

1. The control shall be capable of communicating on the Standard Open protocol, MODBUS RTU.

2. The register data for the MODBUS must be publicly available and open.

3. Monitoring software shall be provided at no cost. The monitoring software shall have a flashing icon when any unit wired to the computer has an alarm. Clicking the flashing icon shall display the fault code and the details of the fault.

4. The networking setup shall be completed by connecting a three-wire daisy chain cable to each unit, then powering all the units up and pushing a button on each control. There shall not be any dipswitches to configure the network address.

5. The control shall use a communication driver that is capable of having 64 nodes on the bus before a repeater is needed.

6. The control shall use non-volatile memory to store the last five alarms. There shall be a single button to push to recall these last five alarms. The alarms shall be stored first in last out. The first flash code shall be the last alarm that occurred. There shall be a button press sequence to clear the alarms in non-volatile memory.

7. The control shall have a button to reset compressor lockouts without powering the unit down.

8. The control shall have a button to clear compressor Anti-Short Cycle Delays (ASCDs). When this button is pressed it will only clear the ASCDs for one cycle only and not permanently.

9. The control will be compatible with any BAS (Building Automation System). Any BAS shall be able to control the equipment when wired to the control's Thermostat Terminal Strip.

10. The control shall have loading of at least 25 milliamps on all thermostat inputs for controllers and thermostats that use output TRIACs.

11. The control shall have a Smoke Detector Shutdown input on the board. The control shall be powered through this input, so when the Smoke Detector trips, the control will shut down the unit immediately.

12. The control will have low voltage protection for the contactors and will not energize a contactor if the voltage is below 19.2 VAC, to insure contactor pull-in. If the control has a compressor contactor energized when the voltage drops, it shall not de-energize the contactor until the voltage drops below 16 VAC, which is the drop out voltage for most contactors.

13. The control shall have a means of low ambient control without adding any additional components. The control shall have a means of cycling the compressor on for 10 minutes and off for 5 minutes to defrost the indoor coil when the outside ambient is below a low ambient switch point without adding additional components.

14. The control shall have a means of storing compressor run time. This data shall be available through communication. The control shall have the ability to clear this data when a compressor is replaced.

15. The control shall have the ability to store a name of at least 26 characters in length. The control will leave the factory with the serial number of the equipment it is in, stored in non-volatile memory in the Name location.

16. The control shall have the ability to store the model number of the equipment of at least 26 characters in length. The control will leave the factory with the model number of the equipment it is in, stored in non-volatile memory.

17. The control shall have the ability to store the serial number of the equipment of at least 26 characters in length. The control will leave the factory with the serial number of the equipment it is in, stored in non-volatile memory.

18. The control shall not power the contactors through the thermostat wiring. Dropping voltage over the thermostat wiring causes chattering contactors when the contactors are powered in this manner.

19. The control will operate and monitor up to 2 stages of heat independently.

20. The control shall monitor the Gas Heat operation in the heating mode. It shall monitor the gas valve when there is a call for heating. The control shall alarm when there is a call for heat and no gas valve voltage after 5 minutes.

21. There will only be one control board for this series of units, for both CV and VAV operation.

COMFORT CONTROL FEATURES

1. The control will be installed and tested at the factory where the equipment is assembled.

2. The control will use a Wall Sensor that has a means of overriding the unoccupied mode for a programmable amount of time.

3. The Unoccupied Override time will be programmed in minutes up to 4 hours.

4. The control will use a Wall Sensor that has a warmer/cooler dial so the occupants can offset the programmed setpoint by a programmed amount between 1 and 5 degrees fahrenheit.

5. The control will have a Supply Air Sensor as standard.

6. The control will have a Return Air Sensor as standard.

7. The control will have an Outside Air Sensor as standard.

8. The control will use the Return Air Sensor in place of the Space Sensor if the Space Sensor fails for any reason,

9. The control will have a 365 day Real Time Clock.

10. The Real Time Clock will be able to do automatic Daylight Savings Time adjustment.

11. The control will have an Occupancy Schedule that allows two different Occupied schedules per day for each of the seven days of the week individually.

12. The control will have 20 Holiday Schedules, each capable of 99 days.

13. The control's Holiday Schedules will have a start time associated with each schedule.

14. The control will control the Economizer directly.

15. The control will be capable of operating the Economizer using Dry Bulb, Outside Enthalpy, or Differential Enthalpy.

16. When the control is using Enthalpy to control the Economizer, it will also have an Outside Air Temperature enable Setpoint.

17. The control will use two setpoints for Supply Air Temperature for the Economizer operation. One will be for a small space cooling demand and one for a large space cooling demand.

18. The control will have the ability to perform Demand Ventilation using one CO_2 sensor.

19. The control will have a programmable maximum Outside Air Damper Position for IAQ operation.

20. The control will have the ability to temper the ventilation air during times when heating or cooling is not required.

21. The control will have the ability to offset the operating setpoint based on high Humidity in the Space.

22. The control will have programmable limits when offsetting the Operating Setpoint to control Humidity.

23. The control must be able to lockout Cooling below a programmable Outside Air Temperature Setpoint.

24. The control will be able to lockout Heating above a programmable Outside Air Temperature Setpoint.

25. The control will have a Space Temperature Alarm.

26. The control will have a Supply Air Temperature Alarm for Heating and Cooling. The Alarm temperature will be programmable.

27. The Control will be able to perform a Pre-Occupancy Purge at a Programmable Time.

28. The control will have a hardware Smoke-Purge input.

29. The control will have the ability to read a dirty filter switch.

30. The control will have the capability of reading a fan proving switch.

31. The control will have an intelligent recovery function that will bring the space to the Occupied Setpoint just before or at the beginning of the first Occupied schedule each day. The control will learn and apply the minimum run time required to heat or cool the space to setpoint for the first Occupied period of a day.

32. The control will have Software controllable Mode Switches (Heat, Cool, and Fan).

33. The control will meter and track Unoccupied Override Time for billing purposes.

VAV Data Map

Writing to any register not in this list may cause erratic operation

This product is not designed to accept continuous writes to data stored in long term memory. It is recommended that no stored value be changed more often than an average of once per hour. Changing data more often risks damaging the ability of the control to store new data for the full life of the product.

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
00 H	0 H	NA	20	NA	NA	Device ID = 1B (G/E), 1C (HP)
00 L	0 L	NA	-	0	255	Device Software Revision
01 H	1 H	NA 0 1 2 3 4 5 6 7	54	-	-	Option Byte #1 Bits 1 and 0 = 0,0 respectively there are 0 stages of heat; 0,1 = 1 stage; 1,0 = 2 stages; 1,1 = 3 stages 1 = Heating mode enabled for operation 1 = Turn off continuous fan when starting heat 1 = Cooling mode enabled for operation 1 = economizer loading active 1 = Space Sensor Fault override enabled 1 = VAV, 0 = CV
01 L	1 L	NA	NA	NA	NA	Active Alarm
02 H	2 H	NA	30	0	30	Fan On Delay for Heat (Seconds)
02 L	2 L	NA	60	0	255	Fan Off Delay for Heat (Seconds)
03 H	3 H	NA	0	0	30	Fan On Delay for Cool (Seconds)
03 L	3 L	NA	30	0	255	Fan Off Delay for Cool (Seconds)
04 L	4 L	NA	3	1	10	Minimum run time for compressors (Minutes)
05 H	5 H	NA	0	0	255	Heating #1 accumulated run time (Hours, high byte)
05 L	5 L	NA	0	0	255	Heating #1 accumulated run time (Hours, low byte)
06 H	6 H	NA	0	0	255	Heating #2 accumulated run time (Hours, high byte)
06 L	6 L	NA	0	0	255	Heating #2 accumulated run time (Hours, low byte)
08 H - 14 L	8 H - 20 L	NA				Registers 8 - 20 store the Unit Name. When written, all 13 registers (at 2 bytes per register) should be written. The format is ASCII. Character #1 is in 8 H. Character #2 is in 8 L. Character #3 is in 9 H, and so on.
15 H	21 H	NA 0 1 2 3 4 5 6 7	-	-	-	Input Status Byte #1 1 = Y1 ON (Cooling 1st Stage) 1 = Y2 ON (Cooling 2nd Stage) 1 = Y3 ON (Cooling 3rd Stage) 1 = Y4 ON (Cooling 4th Stage) 1 = W1 ON (Heating 1st Stage) 1 = W2 ON (Heating 2nd Stage) NA 1 = G ON (Indoor Fan)
15 L	21 L	NA 0 1 2 3 4 5 6 7	-	-	-	Input Status Byte #2 1 = HPS1 CLOSED (not tripped) 1 = HPS2 CLOSED 1 = HPS3 CLOSED 1 = HPS4 CLOSED 1 = LPS1 CLOSED (not tripped) 1 = LPS2 CLOSED 1 = LPS3 CLOSED 1 = LPS4 CLOSED
16 H	22 H	NA 0 1 2 3 4 5 6 7	-	-	-	Input Status Byte #3 NA NA NA NA 1 = Purge Switch CLOSED (active) 1 = OCC Input ON 1 = AUX Input high 1 = Dirty Filter CLOSED (dirty condition)

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
16 L	22 L	NA 0 1 2 3 4 5 6 7	-	-	-	Input Status Byte #4 1 = Gas Valve #1 ON 1 = Gas Valve #2 ON NA 1 = Limit #1 Closed (not tripped) 1 = Limit #2 Closed NA NA NA
17 H	23 H	NA 0 1 2 3 4 5 6 7	-	-	-	Input Status Byte #5 1 = Fan Overload CLOSED (not tripped) 1 = Freeze Stat CLOSED (not Low Temp) 1 = Air Proving CLOSED (Air Flow is sensed) 1 = Low Ambient Condition 1 = Space Sensor detected NA NA 1 = Low 24 VAC Supply Voltage
17 L	23 L	NA 0 1 2 3 4 5 6 7	-	-	-	Input Status Byte #6 1 = Program Button Pressed 1 = Test / Up Button Pressed 1 = Alarms / Change Button Pressed 1 = Address / Down Button Pressed 1 = FS1 Closed (not tripped) 1 = FS2 Closed (not tripped) 1 = FS3 Closed (not tripped) 1 = FS4 Closed (not tripped)
18 H	24 H	NA 0 1 2 3 4 5 6 7	-	-	-	Output Status Byte #1 1 = Compressor #1 ON 1 = Compressor #2 ON 1 = Compressor #3 ON 1 = Compressor #4 ON 1 = Condenser Fan #1 ON 1 = Condenser Fan #2 ON 1 = Indoor Fan ON 1 = Exhaust Fan ON
18 L	24 L	NA 0 1 2 3 4 5 6 7	-	-	-	Output Status Byte #2 1 = Stage 1 Heat ON 1 = Stage 2 Heat ON NA 1 = Hot Gas Reheat ON NA NA 1 = Cooling is Active 1 = Heating is Active
19 H	25 H	NA 0 1 2 3 4 5 6 7	-	-	-	Output Status Byte #3 1 = Compressors OFF because Free Cooling is available 1 = Compressors OFF because of Low Ambient 1 = Compressors OFF because supply voltage is low 1 = Control is in Comfort Ventilation mode 1 = Disable Control is Active 1 = Economizer is using Free Cooling 1 = Free Cooling is Available 1 = Occupied is current status
19 L	25 L	NA 0 1 2 3 4 5 6 7	-	-	-	Output Status Byte #4 1 = Compressor #1 OFF because of ASCD 1 = Compressor #2 OFF because of ASCD 1 = Compressor #3 OFF because of ASCD 1 = Compressor #4 OFF because of ASCD NA NA NA NA

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
1A H	26 H	NA 0 1 2 3 4 5 6 7	12	-	-	Option Byte #2 Bits 1 and 0 = 0,0 respectively there are 2 stages of compression; 0,1 = 3 stages; 1,0 = 4 stages; 1,1 = 4 stages 1 = SAT Limit for Cooling enabled 1 = SAT Limit for Heating enabled 1 = Hydronic heating enabled 1 = Hydronic heat actuator valve reverse acting 1 = Remote Control input enabled for third party BAS 1 = Hot Gas Reheat enabled
1A L	26 L	NA 0 1 2 3 4 5 6 7	4	-	-	Option Byte #3 1 = VAV Occupied heating enabled 1 = VAV Unoccupied heating enabled 1 = Economizer present 1 = Outside Air Humidity sensor present 1 = Return Air Humidity sensor present 1 = Pre-occupancy purge enabled 1 = Demand Ventilation enabled 1 = Building pressure sensor installed
1B H	27 H	NA 0 1 2 3 4 5 6 7	193	-	-	Option Byte #4 1 = Power exhaust present 1 = Modulating power exhaust present 1 = Exhaust VFD present 1 = Low Ambient kit installed 1 = Dirty Filter switch present 1 = Intelli-start operation enabled 1 = Indoor fan operates with space sensor present [CV] 1 = Daylight savings time enabled
1B L	27 L	NA 0 1 2 3 4 5 6 7	8	-	-	Option Byte #5 1 = Run test enabled 1 = Meter of unoccupied override enabled 1 = Metric display enabled 1 = Use Thermostat or Communications flag for Occupied signal 1 = Lead/Lag: Equalize compressor run time enabled 1 = Hot gas bypass present on compressor #1 1 = Remote Control of Economizer enabled 1 = Morning warm-up enabled
1C H	28 H	NA	0	0	255	Alarm 1 - Most recent alarm.
1C L	28 L	NA	0	0	255	Alarm 2
1D H	29 H	NA	0	0	255	Alarm 3
1D L	29 L	NA	0	0	255	Alarm 4
1E H	30 H	NA	0	0	255	Alarm 5 – Oldest stored Alarm.
1F H	31 H	NA	0	0	255	Compressor #1 accumulated run time (Hours, High byte)
1F L	31 L	NA	0	0	255	Compressor #1 accumulated run time (Hours, Low byte)
20 H	32 H	NA	0	0	255	Compressor #2 accumulated run time (Hours, High byte)
20 L	32 L	NA	0	0	255	Compressor #2 accumulated run time (Hours, Low byte)
21 H	33 H	NA	0	0	255	Compressor #3 accumulated run time (Hours, High byte)
21 L	33 L	NA	0	0	255	Compressor #3 accumulated run time (Hours, Low byte)
22 H	34 H	NA	0	0	255	Compressor #4 accumulated run time (Hours, High byte)
22 L	34 L	NA	0	0	255	Compressor #4 accumulated run time (Hours, Low byte)
24 H	36 H	NA	1	1	250	Requested address change (Bus address)

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
25 H	37 H	NA 0 1 2 3 4 5 6 7	0	0	NA	Comm Options 1 = Accept Comm Value for ST (Space Temp) 1 = Accept Comm Value for RH 1 = Accept Comm Value for OH 1 = Accept Comm Value for OAT 1 = Ignore Address button single push NA NA NA
26 L	38 L	NA 0 1 2 3 4 5 6 7	NA	NA	NA	Requested Operation 1 = Request for 1st stage Cooling 1 = Request for 2nd stage Cooling 1 = Request for 3rd stage Cooling 1 = Request for 4th stage Cooling 1 = Request for 1st stage Heating 1 = Request for 2nd stage Heating 1 = Request for 3rd stage Heating 1 = Request for Fan
27 H - 33 L	39 H - 51 L	NA				Registers 39 - 51 store the Model Number. When written, all 13 registers (at 2 bytes per register) should be written. The format is ASCII. Character #1 is in 39 H. Character #2 is in 39 L. Character #3 is in 40 H, and so on.
34 H - 40 L	52 H - 64 L	NA				Registers 52 - 64 store the Serial Number. When written, all 13 registers (at 2 bytes per register) should be written. The format is ASCII. Character #1 is in 52 H. Character #2 is in 52 L. Character #3 is in 53 H, and so on.
41 H	65 H	NA 0 1 2 3 4 5 6 7				Stage Lockouts 1 = Lockout 1st stage Cooling 1 = Lockout 2nd stage Cooling 1 = Lockout 3rd stage Cooling 1 = Lockout 4th stage Cooling 1 = Lockout 1st stage Heating 1 = Lockout 2nd stage Heating NA NA
41 L	65 L	NA 0 1 2 - 7	NA	NA	NA	Redline/Loadshed status (5 minute timer is started each write. Value is cleared if timer is allowed to finish.) 1 = Set Redline operation 1 = Set Loadshed operation Bits 2-7 Unused
42 L	66 L		255			Clear lockout status Write "00" to clear all lockouts. Any other value is ignored. Always reads 255.
43 H	67 H		-	0	255	Reading this address returns EEPROM checksum High byte
43 L	67 L		-	0	255	Reading this address returns EEPROM checksum Low byte
44 H	68 H		4	0	99	Real Time Clock Year Value
44 L	68 L		1	1	12	Real Time Clock Month Value
45 H	69 H		1	1	31	Real Time Clock Day of Month Value
45 L	69 L		1	1	7	Real Time Clock Day of Week Value
46 H	70 H		0	0	23	Real Time Clock Hour Value
46 L	70 L		0	0	59	Real Time Clock Minute Value
47 H	71 H		72	45	99	Occupied Cooling Setpoint
47 L	71 L		68	45	99	Occupied Heating Setpoint
48 H	72 H		85	45	99	Un-Occupied Cooling Setpoint (CV only)
48 L	72 L		60	45	99	Un-Occupied Heating Setpoint
49 H	73 H		0	0	23	Day 1 – Occupied hour #1
49 L	73 L		0	0	59	Day 1 – Occupied minute #1
4A H	74 H		0	0	23	Day 1 – Un-Occupied hour #1
4A L	74 L		0	0	59	Day 1 – Un-Occupied minute #1
4B H	75 H		0	0	23	Day 1 – Occupied hour #2
4B L	75 L		0	0	59	Day 1 – Occupied minute #2
4C H	76 H		0	0	23	Day 1 – Un-Occupied hour #2
4C L	76 L		0	0	59	Day 1 – Un-Occupied minute #2

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
4D H - 50 L	77 H - 80 L		NA	NA	NA	Day 2 (Same format as day #1)
51 H - 54 L	81 H - 84 L		NA	NA	NA	Day 3 (Same format as day #1)
55 H - 58 L	85 H - 88 L		NA	NA	NA	Day 4 (Same format as day #1)
59 H - 5C L	89 H - 92 L		NA	NA	NA	Day 5 (Same format as day #1)
5D H - 60 L	93 H - 96 L		NA	NA	NA	Day 6 (Same format as day #1)
61 H - 64 L	97 H - 100 L		NA	NA	NA	Day 7 (Same format as day #1)
65 H	101 H		0	0	12	Holiday #1 – Start month
65 L	101 L		0	0	31	Holiday #1 – Start day of month
66 H	102 H		0	0	23	Holiday #1 – Start hour
66 L	102 L		0	0	59	Holiday #1 – Start minute
67 L	103 L		0	0	99	Holiday #1 – Number of days
68 H - 6A L	104 H - 106 L		NA	NA	NA	Holiday #2 (Same Format as Holiday #1)
6B H - 6D L	107 H - 109 L		NA	NA	NA	Holiday #3 (Same Format as Holiday #1)
6E H - 70 L	110 H - 112 L		NA	NA	NA	Holiday #4 (Same Format as Holiday #1)
71 H - 73 L	113 H - 115 L		NA	NA	NA	Holiday #5 (Same Format as Holiday #1)
74 H - 76L	116 H - 118 L		NA	NA	NA	Holiday #6 (Same Format as Holiday #1)
77 H - 79 L	119 H - 121 L		NA	NA	NA	Holiday #7 (Same Format as Holiday #1)
7A H - 7C L	122 H - 124 L		NA	NA	NA	Holiday #8 (Same Format as Holiday #1)
7D H - 7F L	125 H - 127 L		NA	NA	NA	Holiday #9 (Same Format as Holiday #1)
80 H - 82 L	128 H - 130 L		NA	NA	NA	Holiday #10 (Same Format as Holiday #1)
83 H - 85 L	131 H - 133 L		NA	NA	NA	Holiday #11 (Same Format as Holiday #1)
86 H - 88 L	134 H - 136 L		NA	NA	NA	Holiday #12 (Same Format as Holiday #1)
89 H - 8B L	137 H - 139 L		NA	NA	NA	Holiday #13 (Same Format as Holiday #1)
8C H - 8E L	140 H - 142 L		NA	NA	NA	Holiday #14 (Same Format as Holiday #1)
8F H - 91 L	143 H - 145 L		NA	NA	NA	Holiday #15 (Same Format as Holiday #1)
92 H - 94 L	146 H - 148 L		NA	NA	NA	Holiday #16 (Same Format as Holiday #1)
95 H - 97 L	149 H - 151 L		NA	NA	NA	Holiday #17 (Same Format as Holiday #1)
98 H - 9A L	152 H - 154 L		NA	NA	NA	Holiday #18 (Same Format as Holiday #1)
9B H - 9D L	155 H - 157 L		NA	NA	NA	Holiday #19 (Same Format as Holiday #1)
9E H - A0L	158 H - 160 L		NA	NA	NA	Holiday #20 (Same Format as Holiday #1)
A1 H	161 H		-	0	255	Supply Air Temperature (1/10 degrees, High byte, 16 bit value, 0 = -40 degrees F)
A1 L	161 L		-	0	255	Supply Air Temperature (1/10 degrees, Low byte, 16 bit value, 0 = -40 degrees F)
A2 H	162 H		-	0	255	Outside Air Temperature (1/10 degrees, High byte, 16 bit value, 0 = -40 degrees F)
A2 L	162 L		-	0	255	Outside Air Temperature (1/10 degrees, Low byte, 16 bit value, 0 = -40 degrees F)
A3 H	163 H		-	0	255	Return Air Temperature (1/10 degrees, High byte, 16 bit value, 0 = -40 degrees F)
A3 L	163 L		-	0	255	Return Air Temperature (1/10 degrees, Low byte, 16 bit value, 0 = -40 degrees F)
A4 H	164 H		-	0	255	Space Sensor temperature (room air) (1/10 degrees, High byte, 16 bit value, 0 = -40 degrees F)
A4 L	164 L		-	0	255	Space Sensor temperature (room air) (1/10 degrees, Low byte, 16 bit value, 0 = -40 degrees F)

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
A5 L	165 L		3	0	5	Space Sensor offset range (degrees)
A6 H	166 H		-	0	100	Supply Duct Air Humidity (%)
A6 L	166 L		-	0	100	Return Air Humidity (%)
A7 L	167 L		-	0	100	Outside Air Humidity (%)
A8 H	168 H		-	0	255	Demand Ventilation (IAQ) value (PPM value, High byte)
A8 L	168 L		-	0	255	Demand Ventilation (IAQ) value (PPM value, Low byte)
A9 H	169 H		-	0	255	Building pressure value (0.001" WC, High byte, 0 = - 0.250" WC, max = 0.250" WC)
A9 L	169 L		-	0	255	Building pressure value (0.001" WC, Low byte, 0 = - 0.250" WC, max = 0.250" WC)
AA H	170 H		-	0	255	Duct Pressure value (0.01" WC, High byte, 0 = 0.00" WC, max = 5.00" WC)
AA L	170 L		-	0	255	Duct Pressure value (0.01" WC, Low byte, 0 = 0.00" WC, max = 5.00" WC)
AB H	171 H		0	0	250	Remote Control input value (0.05 VDC counts) (cooling SAT setpoint or Economizer)
AB L	171 L		40	0	200	Demand Ventilation setpoint (25 PPM increments, maximum 5000 PPM)
AC H	172 H		80	0	200	Outdoor Air Quality sensor range (25 PPM increments, maximum 5000 PPM)
AC L	172 L		80	0	200	Air Quality (DV) sensor range (25 PPM increments, maximum 5000 PPM)
AD L	173 L		60	0	240	Unoccupied override time period (minutes)
AE H	174 H		45	0	100	Outdoor Air Temperature cooling lockout temperature (degrees F, 0 = disabled)
AE L	174 L		75	0	100	Outdoor Air Temperature heating lockout temperature (degrees F, 0 = disabled)
AF H	175 H		50	40	65	SAT Cooling Limit setpoint (degrees F)
AF L	175 L		135	100	180	SAT Heating Limit setpoint (degrees F)
B0 H	176 H		120	80	180	Hydronic heating stage #1 supply air setpoint (degrees F)
B0 L	176 L		150	80	180	Hydronic heating stage #2 supply air setpoint (degrees F)
B1 H	177 H		80	60	85	Comfort ventilation upper setpoint (degrees F)
B1 L	177 L		70	60	85	Comfort ventilation lower setpoint (degrees F)
B2 H	178 H		60	40	70	VAV cooling Supply Air Temperature: upper setpoin (degrees F)
B2 L	178 L		55	40	70	VAV cooling Supply Air Temperature: lower setpoint (degrees F)
B3 H	179 H		72	40	85	VAV cooling Supply Air Temperature: Reset Setpoint (degrees F)
B4 H	180 H		70	50	85	Morning Warm-Up and VAV heating: Return Air Temperature setpoint (degrees F)
B4 L	180 L		40	40	60	SAT Tempering with Hydronic Heat Setpoint
B5 H	181 H		60	0	200	Duct pressure setpoint (0.025" WC increments, default = 1.500" WC ↔ 60)
B5 L	181 L		180	0	200	Duct pressure shutdown setpoint (0.025" WC increments, default = 4.500" WC ↔ 180)
B6 H	182 H		70	0	100	Building pressure setpoint (0.005" WC increments, 0 = -0.250" WC, default = 0.100" WC ↔ 70)
B8 H	184 H		20	0	100	Economizer minimum position (percent)
B9 H	185 H		27	10	50	Economizer outside air enthalpy setpoint (BTU per pound)
B9 L	185 L		27	10	50	Economizer return air enthalpy setpoint (BTU per pound)
BA H	186 H		55	40	80	Economizer Outside Air Temperature enable setpoint (degrees F)
BB H	187 H		4	0	23	Pre-occupancy purge time (hours)
BB L	187 L		0	0	59	Pre-occupancy purge time (minutes)
BC H	188 H		80	10	100	Exhaust damper position for exhaust fan to turn on - Modulating only (percent)
BC L	188 L		20	0	90	Exhaust damper position for exhaust fan to turn off - Modulating only (percent)

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
BD H	189 H		60	10	100	Economizer damper position for exhaust fan to turn on – Non-modulating only (percent)
BD L	189 L		20	0	90	Economizer damper position for exhaust fan to turn off – Non-modulating only (percent)
BE H	190 H		0	0	80	Supply Air Temperature alarm setpoint for cooling (degrees F, 0 = disabled)
BE L	190 L		0	0	120	Supply Air Temperature alarm setpoint for heating (degrees F, 0 = disabled)
BF H	191 H		5	0	25	Space Sensor alarm temperature (degrees F, 0 = disabled)
BF L	191 L		60	0	120	Space Sensor alarm time (minutes, 0 = disabled)
C2 H	194 H		0	0	255	Intelli-start recovery time (minutes, 0 = disabled)
C3 H	195 H		-	-	-	ASCD Timer for Compressor #1 High byte
C3 L	195 L		-	-	-	ASCD Timer for Compressor #1 Low Byte. (Seconds, counts down)
C4 H	196 H		-	-	-	ASCD Timer for Compressor #2 High Byte
C4 L	196 L		-	-	-	ASCD Timer for Compressor #2 Low Byte (Seconds, counts down)
C5 H	197 H		-	-	-	ASCD Timer for Compressor #3 High byte
C5 L	197 L		-	-	-	ASCD Timer for Compressor #3 Low Byte. (Seconds, counts down)
C6 H	198 H		-	-	-	ASCD Timer for Compressor #4 High Byte
C6 L	198 L		-	-	-	ASCD Timer for Compressor #4 Low Byte (Seconds, counts down)
C7 H	199 H		0	-	-	Compressor #1 Minimum Run timer high byte (Seconds, counts down)
C7 L	199 L		0	-	-	Compressor #1 Minimum Run timer low byte (Seconds, counts down)
C8 H	200 H		0	-	-	Compressor #2 Minimum Run timer high byte (Seconds, counts down)
C8 L	200 L		0	-	-	Compressor #2 Minimum Run timer low byte (Seconds, counts down)
C9 H	201 H		0	-	-	Compressor #3 Minimum Run timer high byte (Seconds, counts down)
C9 L	201 L		0	-	-	Compressor #3 Minimum Run timer low byte (Seconds, counts down)
CA H	202 H		0	-	-	Compressor #4 Minimum Run timer high byte (Seconds, counts down)
CA L	202 L		0	-	-	Compressor #4 Minimum Run timer low byte (Seconds, counts down)
CB H	203 H		-	-	-	Fan ASCD Timer High byte (Always zero)
CB L	203 L		-	-	-	Fan ASCD Timer Low byte. (Seconds, counts down)
CC H	204 H		0	-	-	Fan Minimum Run Timer (Seconds, counts down)
CD H	205 H		0	-	-	Fan On Delay Timer for Heat (Seconds, count down)
CD L	205 L		0	-	-	Fan Off Delay Timer for Heat (Seconds, count down)
CE H	206 H		0	-	-	Fan On Delay Timer for Cool (Seconds, count down
CE L	206 L		0	-	-	Fan Off Delay Timer for Cool (Seconds, count down)
CF H	207 H		0	0	255	Accumulated Unoccupied Override time (Hours, High byte)
CF L	207 L		0	0	255	Accumulated Unoccupied Override time (Hours, Low byte)
D4 H	212 H		-	0	100	Supply Fan VFD Output Status, 0-100% (2 – 10 VDC)
D4 L	212 L		-	0	100	Exhaust Damper Output Status, 0-100% (2 – 10 VDC)
D5 H	213 H		-	0	100	Hot Water Valve Output Status, 0-100% (2 – 10 VDC)
D5 L	213 L		-	0	100	Hot Gas Reheat Valve Output Status, 0-100% (2 – 10 VDC)
D6 H	214 H		-	0	100	Economizer Damper Output Status, 0-100% (2 – 10 VDC)

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
D7 H	215 H	NA 0 1 2 3 4 5 6 7	0	-	-	Option Byte #6 1 = Comfort ventilation for cooling enabled 1 = Comfort ventilation for heating enabled 1 = Temperature / Humidity control enabled 1 = Hot gas reheat alternate operation enabled 1 = Network Occupied flag: OCC is On 1 = Differential Air Quality enable 1 = Differential enthalpy mode enabled 1 = Variable Heat Proportional Output
D7 L	215 L	NA 0 1 2 3 4 5 6 7	0	-	-	Option Byte #7 1 = ERV enabled 1 = ERV Unoccupied Fan enabled 1 = Lockout Compressors in Free Cooling 1 = Lockout Compressors in Low Ambient 1 = Variable Hot Gas Reheat enable 1 = Thermostat Only Control enable 1 = Limit 2: Input for VFD failure 1 = SAT Tempering w/ Hydronic Heat enable
D8 H	216 H		50	0	100	Hot gas reheat humidity setpoint (percent humidity)
D8 L	216 L		50	20	80	Temperature / Humidity setpoint (percent humidity)
D9 H	217 H		3	0	5	Maximum Temperature / Humidity offset (degrees F)
D9 L	217 L		5	1	10	Temperature / Humidity value that = 1° F of offset (percent humidity)
DA H	218 H		1	1	5	Operating setpoint differential (degrees F)
DB H	219 H		72	45	99	Operating Cooling Setpoint (degrees F)
DB L	219 L		68	45	99	Operating Heating Setpoint (degrees F)
DC H	220 H		-	10	50	Outside air enthalpy (BTUs per pound)
DC L	220 L		-	10	50	Return air enthalpy (BTUs per pound)
DD H	221 H		NA	0	255	Outside Demand Ventilation (OAQ) value (PPM value, High byte)
DD L	221 L		NA	0	255	Outside Demand Ventilation (OAQ) value (PPM value, Low byte)
DE H	222 H		24	0	200	Differential Air Quality (IAQ/OAQ) setpoint (25 PPM increments, maximum 5000 PPM)
DE L	222 L		50	0	100	Maximum Demand Ventilation economizer position (percent open)
DF H	223 H		-	0	10	Space Sensor Offset (0 = -5° F, 10 = +5° F)
DF L	223 L		28	0	80	Indoor / outdoor demand ventilation setpoint (25 PPM increments, maximum 2000 PPM)
E0 H	224 H		-	-	-	ASCD Timer for Heating stage #1 (seconds, counts down)
E0 L	224 L		-	-	-	Heating stage #1 Minimum Run timer (seconds, counts down)
E1 H	225 H		-	-	-	ASCD Timer for Heating stage #2 (seconds, counts down)
E1 L	225 L		-	-	-	Heating stage #2 Minimum Run timer (seconds, counts down)
E3 H	227 H		0	0	99	Low Ambient economizer minimum position (percent)
E3 L	227 L		0	0	60	Low Ambient economizer setpoint (degrees F)
E4 H	228 H			40	70	Operating Cooling SAT Setpoint (degrees F)
E4 L	228 L			80	180	Operating Heating SAT Setpoint (degrees F)
E5 H	229 H			0	100	CV-VFD: OCC, No Heat or Cool
E6 H	230 H			0	100	CV-VFD: OCC, C1 only
E6 L	230 L			0	100	CV-VFD: OCC, H1 only
E7 H	231 H			0	100	CV-VFD: OCC, All C outputs are On
E7 L	231 L			0	100	CV-VFD: OCC, All H outputs are On
E8 H	232 H		-	0	255	SLT: Suction Line Temperature (1/10 degrees, High byte, 16 bit value, 0 = -40 degrees F)
E8 L	232 L		-	0	255	SLT: Suction Line Temperature (1/10 degrees, Low byte, 16 bit value, 0 = -40 degrees F)

Addr (Hex)	Addr (Dec)	Bit	Init/ Default	Min Value	Max Value	Description
E9 H	233 H		-	0	255	LLT: Liquid Line Temperature (1/10 degrees, High byte, 16 bit value, 0 = -40 degrees F)
E9 L	233 L		-	0	255	LLT: Liquid Line Temperature (1/10 degrees, Low byte, 16 bit value, 0 = -40 degrees F)
EA H	234 H		-	0	255	EST: Evaporator Saturation Temperature (1/10 degrees, High byte, 16 bit value, 0 = -40 deg. F)
EA L	234 L		-	0	255	EST: Evaporator Saturation Temperature (1/10 degrees, Low byte, 16 bit value, 0 = -40 deg. F)
EB H	235 H		-	0	255	CST: Condenser Saturation Temperature (1/10 degrees, High byte, 16 bit value, 0 = -40 deg. F)
EB L	235 L		-	0	255	CST: Condenser Saturation Temperature (1/10 degrees, Low byte, 16 bit value, 0 = -40 deg. F)
EC H	236 H	NA 0 1 2 3 4 5 6 7	0	-	-	Option Byte #8 1 = APS present NA NA NA NA NA NA NA
EC L	236 L	NA 0 1 2 3 4 5 6 7	0	-	-	Option Byte #9 NA NA NA NA NA NA NA NA
ED H	237 H	NA 0 1 2 3 4 5 6 7	0	-	-	Option Boards Present 1 = 4-Stage board present 1 = VAV board present NA NA NA NA NA NA

407466-UGS-A-0508
Supersedes: Nothing

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