DDC Application Guide for MUA Heater Units

Introduction

This guide will provide a brief overview of how to control and monitor key aspects of a MUA Heater Unit when using a third party Building Management System (BMS). It will cover controlling the unit using occupancy, controlling the blower speed, heating, cooling setpoints, controlling the outdoor air damper, and monitoring heating and cooling capacity usage. Also, information on which factory settings and control points are important for each unit feature and what control point values correspond to different modes of operation will be covered.

Using Schedule to Allow for BMS Control

Point 7 allows a BMS to control the unit easily via controlling occupancy. For this method to work correctly, Scheduling must be enabled (**Point 8**). The schedule only needs to be enabled once. It does not need to be regularly switched on/off. The internal schedule must also be set to unoccupied at all hours (**Points 61-102** must be set to 1440). An input of occupancy will always override one of an unoccupied input, so setting the internal schedule to unoccupied allows the BMS full control over when the unit is in an occupied mode via **Point 7**. If any of the internal schedule points are set to something other than 1440, using **Point 7** to turn occupancy on and off in those times will not work and the schedule must be adjusted on-site. To manually set the schedule time slots to unoccupied while on-site, follow the **Scheduling** instructions.

Scheduling

To set a schedule on the HMI (**Figure 1**), you must first enable scheduling: **Factory Settings > Occupied Scheduling > On**

Set your sensor temperature set points for occupied and unoccupied schedules: **User Settings > Temp Set Points > (Varies)**

Once scheduling is enabled, and the temperature set points are configured, you may enter your scheduled days and times: **User Settings > Scheduling**

Schedule A Default
- Monday - Friday 8:00AM to 6:00PM
- Saturday and Sunday Unocc

Schedule B Default
- Monday - Friday Unocc
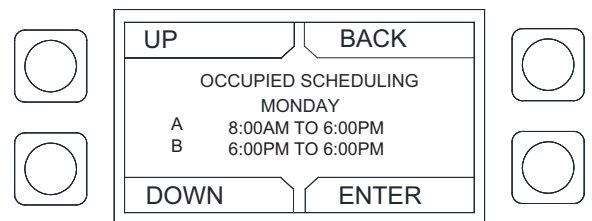- Saturday and Sunday Unocc

Schedule C Default
- Monday - Friday Unocc
- Saturday and Sunday Unocc

To adjust the settings, highlight the parameter and press **ENTER**.
- The first parameter to be highlighted will be the day. Press **UP** or **DOWN** to select the day an occupied time schedule is required.
- Press **ENTER** to continue to set a start time. Press **UP** or **DOWN** to set start time.
- Press **ENTER** to set an end time. Press **UP** or **DOWN** to set end time.

The system will run between these days, time, and desired temperature settings. When in the UNOCCUPIED setting, the system will run at the unoccupied temperature setting.

Figure 1 - Scheduling Screen


```
UP              BACK
   OCCUPIED SCHEDULING
        MONDAY
  A   8:00AM TO 6:00PM
  B   6:00PM TO 6:00PM
DOWN            ENTER
```

Controlling Blower Speed

Blower Mode **Points 20-21** allow you to determine how the blower is controlled in each occupancy mode. The values that correspond to each mode are as follows: Off = 0, Auto = 1, On = 2

In blower off mode, the blower will run only when the unit interlock pin is powered. If set to Auto, the blower will only run when there is a call for heating or cooling. If set to On, as long as the fan button is enabled, the blower will run regardless of whether the building needs heating or cooling.

Blower Manual **Points 103-106** allow you to set the speed of the blower, with separate points for VFD and ECM motors and occupied and unoccupied hours.

The speed of the motor set by **Points 103-106** must be within the max and minimum speed setpoints found in Blower VFD/PWM **Points 31-38**. Once again, there are a separate set of points for VFDs and ECM motors and occupied and unoccupied hours.

Heating/Cooling

Units can activate based on intake and/or space temperature. This is controlled with the "Activate Based On" setting found in **Points 13-14**. The values that correspond to each mode are as follows: 0 = Intake, 1 = Space, 2 = Both, 3 = Either, 4 = Stat

For intake based activation **Points 39-40** and **49-50** determine the intake setpoints for heating and cooling for occupied and unoccupied hours. These points are not used if Activate Based On is set to Space. Heating Type must also be set to a heating configuration for the heating points to be relevant.

Likewise, **Points 41-42** and **51-52** determine the space setpoints for heating and cooling for unoccupied and occupied hours. These points are not used if Activate Based On is set to Intake. Again, Heating Type must also be set to a heating configuration for the heating points to be relevant.

When active, units can target either a discharge temperature or space temperature. This is controlled by the Tempering Mode setting (**Points 9-12**). The values that correspond to each mode are as follows: 0 = Discharge, 1 = Space, 2 = BAS, 3 = DDC

If Tempering Mode is set to Space, **Points 43-44** and **47-48** control the minimum and maximum discharge temperature in heating for occupied and unoccupied times. The unit then has the ability to vary the temperature within this range to meet the space setpoint.

If tempering mode is set to discharge, **Points 45-46** control the heating discharge setpoints for occupied and unoccupied hours.

The Intake SPs serve as activation setpoints if Activate Based On is set to Intake. The Discharge SPs serve as target setpoints if Tempering Mode is set to Discharge. The Space SP can function as activation setpoints if Activate Based On is set to Space or Either and/or target setpoints if Tempering Mode is set to Space.

Outdoor Air Damper Control

Point 22 determines the mixing box mode, with the following possible modes: 0 = Off, 1 = Manual, 2 = Position, 3 = OAPercent, 4 = AnalogCtrl, 5 = PS, 6 = 100% OA.

If the mixing box mode is set to outdoor air percentage, **Points 107-108** are used to set the outdoor air percentage for occupied and unoccupied times and **Points 23-26** are used to set the minimum and maximum allowable outdoor air percentages that Points **107-108** must remain within the set value.

If the mixing box mode is set to manual, **Points 109-110** are used to set the mixing box damper voltage for occupied and unoccupied times and **Points 27-30** are used to set the minimum and maximum allowable voltages that points **109-110** must remain within the set value.

Network

NOTE: The board will reboot when altering certain factory settings.

Communication Module (Optional)

The Communication Module, PN: **SCADA**, is included in all CASlink equipped panels. It obtains operational data from various connected components. This communication wiring is either RS-485 shielded twisted pair wiring or RJ45 Cat 5 Ethernet wiring.

BACnet

BACnet IP or BACnet MS/TP (**Figure 2**) compatibility can be implemented with this package through a Protocessor, which is a BTL listed embedded Gateway configured to give a Building Management System access to monitor and/or control a list of BACnet objects. The Protocessor is mounted and factory pre-wired inside the Electrical Control Panel (ECP). Field connections to the Building Management System (BMS) are shown on wiring schematics.

The Protocessor is preconfigured at the factory to use the field protocol of the Building Management System in the specific jobsite. BACnet objects can only be accessed through the specified port and protocol.

**Figure 2 - BACnet**
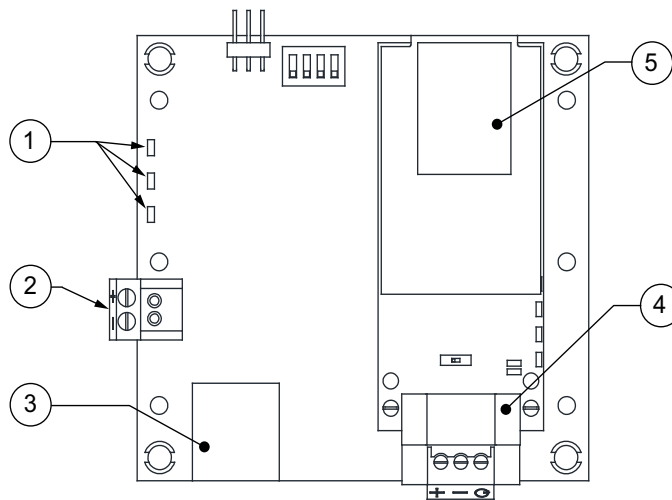
1. Status LEDs
    - Green - Data Out
    - Yellow - Data In
    - Red - Power On
2. Power Supply 24V AC/DC

3. Cat 5 Cable to MUA Board.
4. Field RS485 Connection for BACnet MS/TP
5. Field Ethernet Connection for BACnet IP

LonWorks

LonWorks compatibility (**Figure 3**) can be implemented on control packages through the ProtoNode, a LonMark certified external Gateway configured to give a Building Management System access to monitor and/or control a list of Network Variables. The ProtoNode is mounted and factory pre-wired inside the Electrical Control Panel. Refer to schematics connections to the Building Management System are shown.

Figure 3 - LonWorks
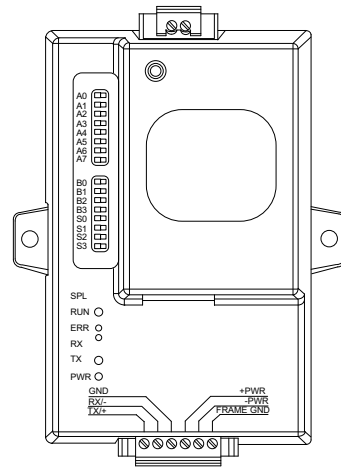

Commissioning on a LonWorks Network

During the commissioning process by the LonWorks administrator (using a LonWorks Network Management Tool), the user will be prompted to hit the Service Pin in the ProtoNode. This pin is located in the front face, and it can be pressed by inserting a small screwdriver and tilting it towards the LonWorks Port. Refer to **Figure 4** for location of the "Service Pin."

If an XIF file is required, it can be obtained by following these steps:

1. Set your computer's static IP address to 192.168.1.xxx with a subnet mask of 255.255.255.0.
2. Run a Cat 5 connection from the ProtoNode's Ethernet port to your computer.
3. On any web browser's URL field, type 192.168.1.24/fserver.xif.

The web browser should automatically download the fserver.xif file or let you save it on your computer. Save it as fserver.xif.

Figure 4 - LonWorks Service Pin
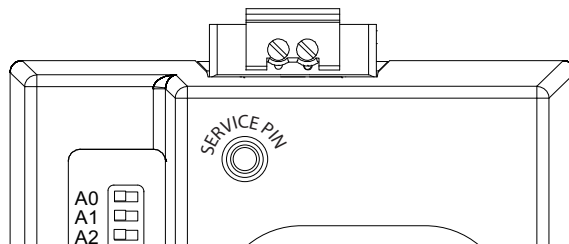
NOTE: Insert Small Screwdriver.
Tilt Toward LonWorks Port To
Activate Service Pin.

Device Instance, MAC Address, Baud Rate

Some applications may require that the Protocessor have a specific Device Instance, the default device instance is 50,000. To change the Device Instance, you must access the Web Configurator by connecting a computer to the Ethernet port of the Protocessor. The computer used must be assigned a static IP address of 192.168.1.xxx and a subnet mask of 255.255.255.0.

To access the Web Configurator, type the IP address of the Protocessor in the URL of any web browser. The default IP address of the Protocessor is 192.168.1.24. Once the landing page has loaded, if required, log in using "admin" for the username and password. If the default "admin" password does not work, the gateway should have a printed password on the module's Ethernet port.

Go to the main configuration page, select "Configure" from the left-hand menu. Select "Profile Configuration," the following window shown in **Figure 5** should appear.

The MAC address and Baud Rate, used by BACnet MTSP, are editable. The MAC address default is 127, and the Baud Rate default is 38400.

If any changes are made, **click on the submit button for each individual change.** Each individual change will require the system to restart.

Figure 5 - Configuration Parameters Page

Configuration Parameters		
Parameter Name	Parameter Description	Value
bac_device_id	**BACnet Device Instance** This sets the BACnet device instance. *(1 - 4194303)*	50177 Submit
bac_mac_addr	**BACnet MSTP Mac Address** This sets the BACnet MSTP MAC address. *(1 - 127)*	7 Submit
bac_baud_rate	**BACnet MSTP Baud Rate** This sets the BACnet MSTP baud rate. *(9600/19200/38400/76800)*	76800 Submit
bac_max_master	**BACnet MSTP Max Master** This sets the BACnet MSTP max master. *(1 - 127)*	127 Submit

Changing the IP Address

Some BACnet IP applications may require changing the IP address of the Protocessor. To change the IP address, go to the internal server by typing the default IP address of the Protocessor, 192.168.1.24, in the URL field of any web browser. The computer used must have a static IP address of 192.168.1.xxx. The window shown in **Figure 6** appears. Click on the "Diagnostics and Debugging" button in the lower right corner.

Click on "Setup" from the left-hand side menu and select "Network Settings." The window shown in **Figure 6** will appear. You can now modify the IP address to whatever is required in the application. Once the IP address has been modified, click on "Update IP Settings."

Figure 6 - Network Settings Page

DDC Control Points

Refer to DDC Notes - 1-5.

Name	Point	Object Type	Lon SVNT Name	Function	Modbus	Description
DDCHeatCommand (1)	1	Binary Value (BV)	nviDDCHeat/nvoDDCHeat	Read/Write	10000	Heating command, requires heat tempering mode = DDC
DDCCoolCommand1 (1)	2	BV	nviDDCCool1/nvoDDCCool1	Read/Write	10001	Cooling stage 1 command, requires cool tempering mode = DDC
DDCCoolCommand2 (1)	3	BV	nviDDCCool2/nvoDDCCool2	Read/Write	10002	Cooling stage 2 command, requires cool tempering mode = DDC
DDCCoolCommand3 (1)	4	BV	nviDDCCool3/nvoDDCCool3	Read/Write	10003	Cooling stage 3 command, requires cool tempering mode = DDC
DDCBlowerCommand (1)	5	BV	nviDDCBlow/nvoDDCBlow	Read/Write	10004	Blower command, requires both heat and cool tempering modes = DDC
DDCHeatModulation (1)	6	Analog Value (AV)	nviDDCModHeat/nvoDDCModHeat	Read/Write	10005	Heat modulation signal, 0-10V. 0V = low fire and 10V = high fire. Requires heat tempering mode = DDC
DDCOccupiedOverride (4)	7	BV	nviDDCOccOvrrd/nvoDDCOccOvrrd	Read/Write	10006	Occupied override command, requires SchedulingEnabled = ON (1)
SchedulingEnabled (4)	8	BV	nviSchedEnabled/nvoSchedEnabled	Read/Write	15016	Enable scheduling
HeatTemperModeOcc (2)	9	AV	nviHeatModeOcc/nvoHeatModeOcc	Read/Write	15055	Heat tempering mode during occupied time
HeatTemperModeUnocc (2)	10	AV	nviHeatModeUnocc/nvoHeatModeUnocc	Read/Write	15056	Heat tempering mode during unoccupied time
CoolTemperModeOcc (2)	11	AV	nviCoolModeOcc/nvoCoolModeOcc	Read/Write	15057	Cool tempering mode during occupied time
CoolTemperModeUnocc (2)	12	AV	nviCoolModeUnocc/nvoCoolModeUnocc	Read/Write	15058	Cool tempering mode during unoccupied time
ActivateOnOcc (2)	13	AV	nviActOnOcc/nvoActOnOcc	Read/Write	15059	"Activate based on" during occupied time
ActivateOnUnocc (2)	14	AV	nviActOnUnoc/nvoActOnUnoc	Read/Write	15060	"Activate based on" during unoccupied time
SpaceHeatHyst (2)	15	AV	nviSpaceHeatHyst/nvoSpaceHeatHyst	Read/Write	15064	Space Heating Hysteresis
IntakeHeatHyst (2)	16	AV	nviInHeatHyst/nvoInHeatHyst	Read/Write	15065	Intake Heating Hysteresis
SpaceCoolHyst (2)	17	AV	nviSpaceCoolHyst/nvoSpaceCoolHyst	Read/Write	15072	Space Cooling Hysteresis
IntakeCoolHyst (2)	18	AV	nviInCoolHyst/nvoInCoolHyst	Read/Write	15073	Intake Cooling Hysteresis
EvapHyst (2)	19	AV	nviEvapHyst/nvoEvapHyst	Read/Write	15074	Evap Cooling Hysteresis
BlowerModeOcc (2)	20	AV	nviBlowModeOcc/nvoBlowModeOcc	Read/Write	15081	Blower mode during occupied times
BlowerModeUnocc (2)	21	AV	nviBlowModeUnoc/nvoBlowModeUnoc	Read/Write	15082	Blower mode during unoccupied times
MixingBoxMode (2)	22	AV	nviMixingBoxMode/nvoMixingBoxMode	Read/Write	15096	Mixing box mode
MixingBoxMinOAPercentOcc (2)	23	AV	nviMBMinOAPerOcc/nvoMBMinOAPOcc	Read/Write	15099	Min occupied outdoor air percent when mixing box mode = outdoor air percent
MixingBoxMinOAPercentUnocc (2)	24	AV	nviMBMinOAPerUn/nvoMBMinOAPUnoc	Read/Write	15100	Min unoccupied outdoor air percent when mixing box mode = outdoor air percent
MixingBoxMaxOAPercentOcc (2)	25	AV	nviMBMaxOAPerOcc/nvoMBMaxOAPOcc	Read/Write	15101	Max occupied outdoor air percent when mixing box mode = outdoor air percent
MixingBoxMaxOAPercentUnocc (2)	26	AV	nviMBMaxOAPerUn/nvoMBMaxOAPUnoc	Read/Write	15102	Max unoccupied outdoor air percent when mixing box mode = outdoor air percent
MixingBoxMinVoltsOcc (2)	27	AV	nviMBMinVoltsOcc/nvoMBMinOAVOcc	Read/Write	15156	Min occupied mixing box voltage when mixing box mode = manual
MixingBoxMinVoltsUnocc (2)	28	AV	nviMBMinVoltsUn/nvoMBMinOAVUnoc	Read/Write	15157	Min unoccupied mixing box voltage when mixing box mode = manual
MixingBoxMaxVoltsOcc (2)	29	AV	nviMBMaxVoltsOcc/nvoMBMaxOAVOcc	Read/Write	15158	Max occupied mixing box voltage when mixing box mode = manual
MixingBoxMaxVoltsUnocc (2)	30	AV	nviMBMaxVoltsUn/nvoMBMaxOAVUnoc	Read/Write	15159	Max unoccupied mixing box voltage when mixing box mode = manual
BlowerVFDMinFreqOcc (2)	31	AV	nviVFDMinFreqOcc/nvoVFDMinFreqOcc	Read/Write	15085	Min blower VFD Frequency when occupied
BlowerVFDMinFreqUnocc (2)	32	AV	nviVFDMinFUnocc/nvoVFDMinFUnocc	Read/Write	15086	Min blower VFD Frequency when unoccupied
BlowerVFDMaxFreqOcc (2)	33	AV	nviVFDMaxFreqOcc/nvoVFDMaxFreqOcc	Read/Write	15087	Max blower VFD Frequency when occupied
BlowerVFDMaxFreqUnocc (2)	34	AV	nviVFDMaxFUnocc/nvoVFDMaxFUnocc	Read/Write	15088	Max blower VFD Frequency when unoccupied
BlowerPWMMinOcc (2)	35	AV	nviPWMMinOcc/nvoPWMMinOcc	Read/Write	15089	Min blower ECM speed when occupied
BlowerPWMMinUnocc (2)	36	AV	nviPWMMinUnocc/nvoPWMMinUnocc	Read/Write	15090	Min blower ECM speed when unoccupied
BlowerPWMMaxOcc (2)	37	AV	nviPWMMaxOcc/nvoPWMMaxOcc	Read/Write	15091	Max blower ECM speed when occupied
BlowerPWMMaxUnocc (2)	38	AV	nviPWMMaxUnocc/nvoPWMMaxUnocc	Read/Write	15092	Max blower ECM speed when unoccupied
IntakeHeatOccSP (3)	39	AV	nviInHeatOccSP/nvoInHeatOccSP	Read/Write	16000	Intake Heating Occupied Setpoint
IntakeHeatUnoccSP (3)	40	AV	nviInHeatUnoccSP/nvoInHeatUnocSP	Read/Write	16001	Intake Heating Unoccupied Setpoint
SpaceHeatOccSP (3)	41	AV	nviSpHeatOccSP/nvoSpHeatOccSP	Read/Write	16002	Space Heating Occupied Setpoint
SpaceHeatUnoccSP (3)	42	AV	nviSpHeatUnoccSP/nvoSpHeatUnocSP	Read/Write	16003	Space Heating Unoccupied Setpoint
MinDischargeHeatOccSP (3)	43	AV	nviMinDHeatOccSP/nvoMinDHeatOccSP	Read/Write	16004	Min Discharge Heating when occupied, relevant only if heat tempering mode = space
MinDischargeHeatUnoccSP (3)	44	AV	nviMinDHeatUnoSP/nvoMinDHeatUnoSP	Read/Write	16005	Min Discharge Heating when unoccupied, relevant only if heat tempering mode = space

Name	Point	Object Type	Lon SVNT Name	Function	Modbus	Description
DischargeHeatOccSP (3)	45	AV	nviDisHeatOccSP/nvoDisHeatOccSP	Read/Write	16006	Discharge heating setpoint when occupied, requires heat tempering mode = discharge
DischargeHeatUnoccSP (3)	46	AV	nviDisHeatUnocSP/nvoDisHeatUnocSP	Read/Write	16007	Discharge heating setpoint when unoccupied, requires heat tempering mode = discharge
MaxDischargeHeatOccSP (3)	47	AV	nviMaxDHeatOccSP/nvoMaxDHeatOccSP	Read/Write	16008	Max Discharge Heating when occupied, relevant only if heat tempering mode = space
MaxDischargeHeatUnoccSP (3)	48	AV	nviMaxDHeatUnoSP/nvoMaxDHeatUnoSP	Read/Write	16009	Max Discharge Heating when unoccupied, relevant only if heat tempering mode = space
IntakeCoolOccSP (3)	49	AV	nviInCoolOccSP/nvoInCoolOccSP	Read/Write	16010	Intake Cooling Occupied Setpoint
IntakeCoolUnoccSP (3)	50	AV	nviInCoolUnocSP/nvoInCoolUnocSP	Read/Write	16011	Intake Cooling Unoccupied Setpoint
SpaceCoolOccSP (3)	51	AV	nviSpCoolOccSP/nvoSpCoolOccSP	Read/Write	16012	Space Cooling Occupied Setpoint
SpaceCoolUnoccSP (3)	52	AV	nviSpCoolUnocSP/nvoSpCoolUnocSP	Read/Write	16013	Space Cooling Unoccupied Setpoint
IntakeCoolStagingDiffOcc (3)	53	AV	nviInCoolStDifOc/nvoInCoolStDifOc	Read/Write	16020	Intake Cooling Stage Differential Setpoint when occupied
IntakeCoolStagingDiffUnocc (3)	54	AV	nviInCoolStDifUn/nvoInCoolStDifUn	Read/Write	16021	Intake Cooling Stage Differential Setpoint when unoccupied
SpaceCoolStagingDiffOcc (3)	55	AV	nviSpCoolStDifOc/nvoSpCoolStDifOc	Read/Write	16022	Space Cooling Stage Differential Setpoint when occupied
SpaceCoolStagingDiffUnocc (3)	56	AV	nviSpCoolStDifUn/nvoSpCoolStDifUn	Read/Write	16023	Space Cooling Stage Differential Setpoint when unoccupied
RoomOverrideOccSP (3)	57	AV	nviRoomOvOccSP/nvoRoomOvOccSP	Read/Write	16024	Room Override Occupied Setpoint
RoomOverrideUnoccSP (3)	58	AV	nviRoomOvUnocSP/nvoRoomOvUnocSP	Read/Write	16025	Room Override Unoccupied Setpoint
OAEvapCoolOccSP (3)	59	AV	nviOAEvaCoolOCSP/nvoOAEvaCoolOCSP	Read/Write	16026	Outdoor air evap cooling occupied setpoint
OAEvapCoolUnoccSP (3)	60	AV	nviOAEvaCoolUnSP/nvoOAEvaCoolUnSP	Read/Write	16027	Outdoor air evap cooling unoccupied setpoint
ScheduleSundayAStart (4)	61	AV	nviSundayAStart/nvoSundayAStart	Read/Write	16037	Daily schedule start/end time in minutes
ScheduleSundayAEnd (4)	62	AV	nviSundayAEnd/nvoSundayAEnd	Read/Write	16038	Daily schedule start/end time in minutes
ScheduleSundayBStart (4)	63	AV	nviSundayBStart/nvoSundayBStart	Read/Write	16039	Daily schedule start/end time in minutes
ScheduleSundayBEnd (4)	64	AV	nviSundayBEnd/nvoSundayBEnd	Read/Write	16040	Daily schedule start/end time in minutes
ScheduleSundayCStart (4)	65	AV	nviSundayCStart/nvoSundayCStart	Read/Write	16041	Daily schedule start/end time in minutes
ScheduleSundayCEnd (4)	66	AV	nviSundayCEnd/nvoSundayCEnd	Read/Write	16042	Daily schedule start/end time in minutes
ScheduleMondayAStart (4)	67	AV	nviMondayAStart/nvoMondayAStart	Read/Write	16043	Daily schedule start/end time in minutes
ScheduleMondayAEnd (4)	68	AV	nviMondayAEnd/nvoMondayAEnd	Read/Write	16044	Daily schedule start/end time in minutes
ScheduleMondayBStart (4)	69	AV	nviMondayBStart/nvoMondayBStart	Read/Write	16045	Daily schedule start/end time in minutes
ScheduleMondayBEnd (4)	70	AV	nviMondayBEnd/nvoMondayBEnd	Read/Write	16046	Daily schedule start/end time in minutes
ScheduleMondayCStart (4)	71	AV	nviMondayCStart/nvoMondayCStart	Read/Write	16047	Daily schedule start/end time in minutes
ScheduleMondayCEnd (4)	72	AV	nviMondayCEnd/nvoMondayCEnd	Read/Write	16048	Daily schedule start/end time in minutes
ScheduleTuesdayAStart (4)	73	AV	nviTuesdayAStart/nvoTuesdayAStart	Read/Write	16049	Daily schedule start/end time in minutes
ScheduleTuesdayAEnd (4)	74	AV	nviTuesdayAEnd/nvoTuesdayAEnd	Read/Write	16050	Daily schedule start/end time in minutes
ScheduleTuesdayBStart (4)	75	AV	nviTuesdayBStart/nvoTuesdayBStart	Read/Write	16051	Daily schedule start/end time in minutes
ScheduleTuesdayBEnd (4)	76	AV	nviTuesdayBEnd/nvoTuesdayBEnd	Read/Write	16052	Daily schedule start/end time in minutes
ScheduleTuesdayCStart (4)	77	AV	nviTuesdayCStart/nvoTuesdayCStart	Read/Write	16053	Daily schedule start/end time in minutes
ScheduleTuesdayCEnd (4)	78	AV	nviTuesdayCEnd/nvoTuesdayCEnd	Read/Write	16054	Daily schedule start/end time in minutes
ScheduleWednesdayAStart (4)	79	AV	nviWedAStart/nvoWedAStart	Read/Write	16055	Daily schedule start/end time in minutes
ScheduleWednesdayAEnd (4)	80	AV	nviWedAEnd/nvoWedAEnd	Read/Write	16056	Daily schedule start/end time in minutes
ScheduleWednesdayBStart (4)	81	AV	nviWedBStart/nvoWedBStart	Read/Write	16057	Daily schedule start/end time in minutes
ScheduleWednesdayBEnd (4)	82	AV	nviWedBEnd/nvoWedBEnd	Read/Write	16058	Daily schedule start/end time in minutes
ScheduleWednesdayCStart (4)	83	AV	nviWedCStart/nvoWedCStart	Read/Write	16059	Daily schedule start/end time in minutes
ScheduleWednesdayCEnd (4)	84	AV	nviWedCEnd/nvoWedCEnd	Read/Write	16060	Daily schedule start/end time in minutes
ScheduleThursdayAStart (4)	85	AV	nviThursAStart/nvoThursAStart	Read/Write	16061	Daily schedule start/end time in minutes
ScheduleThursdayAEnd (4)	86	AV	nviThursAEnd/nvoThursAEnd	Read/Write	16062	Daily schedule start/end time in minutes
ScheduleThursdayBStart (4)	87	AV	nviThursBStart/nvoThursBStart	Read/Write	16063	Daily schedule start/end time in minutes
ScheduleThursdayBEnd (4)	88	AV	nviThursBEnd/nvoThursBEnd	Read/Write	16064	Daily schedule start/end time in minutes
ScheduleThursdayCStart (4)	89	AV	nviThursCStart/nvoThursCStart	Read/Write	16065	Daily schedule start/end time in minutes
ScheduleThursdayCEnd (4)	90	AV	nviThursCEnd/nvoThursCEnd	Read/Write	16066	Daily schedule start/end time in minutes
ScheduleFridayAStart (4)	91	AV	nviFridayAStart/nvoFridayAStart	Read/Write	16067	Daily schedule start/end time in minutes
ScheduleFridayAEnd (4)	92	AV	nviFridayAEnd/nvoFridayAEnd	Read/Write	16068	Daily schedule start/end time in minutes
ScheduleFridayBStart (4)	93	AV	nviFridayBStart/nvoFridayBStart	Read/Write	16069	Daily schedule start/end time in minutes
ScheduleFridayBEnd (4)	94	AV	nviFridayBEnd/nvoFridayBEnd	Read/Write	16070	Daily schedule start/end time in minutes
ScheduleFridayCStart (4)	95	AV	nviFridayCStart/nvoFridayCStart	Read/Write	16071	Daily schedule start/end time in minutes
ScheduleFridayCEnd (4)	96	AV	nviFridayCEnd/nvoFridayCEnd	Read/Write	16072	Daily schedule start/end time in minutes
ScheduleSaturdayAStart (4)	97	AV	nviSatAStart/nvoSatAStart	Read/Write	16073	Daily schedule start/end time in minutes
ScheduleSaturdayAEnd (4)	98	AV	nviSatAEnd/nvoSatAEnd	Read/Write	16074	Daily schedule start/end time in minutes

Name	Point	Object Type	Lon SVNT Name	Function	Modbus	Description
ScheduleSaturdayBStart (4)	99	AV	nviSatBStart/nvoSatBStart	Read/Write	16075	Daily schedule start/end time in minutes
ScheduleSaturdayBEnd (4)	100	AV	nviSatBEnd/nvoSatBEnd	Read/Write	16076	Daily schedule start/end time in minutes
ScheduleSaturdayCStart (4)	101	AV	nviSatCStart/nvoSatCStart	Read/Write	16077	Daily schedule start/end time in minutes
ScheduleSaturdayCEnd (4)	102	AV	nviSatCEnd/nvoSatCEnd	Read/Write	16078	Daily schedule start/end time in minutes
BlowerManualFreqOcc (2)	103	AV	nviBlowManFreqOc/nvoBlowManFreqOc	Read/Write	16079	VFD frequency when occupied, requires blower control = VFD manual
BlowerManualFreqUnocc (2)	104	AV	nviBlowManFreqUn/nvoBlowManFreqUn	Read/Write	16080	VFD frequency when unoccupied, requires blower control = VFD manual
BlowerManualPwmRateOcc (2)	105	AV	nviBlowManPwmOc/nvoBlowManPwmOc	Read/Write	16081	ECM speed when occupied, requires blower control = ECM manual
BlowerManualPwmRateUnocc (2)	106	AV	nviBlowManPwmUn/nvoBlowManPwmUn	Read/Write	16082	ECM speed when unoccupied, requires blower control = ECM manual
MixingBoxManualOAOcc (2)	107	AV	nviMixBoxManOAOc/nvoMixBoxManOAOc	Read/Write	16084	Mixing Box Outdoor Air Percent during occupied times, requires mixing box mode = outdoor air percent
MixingBoxManualOAUnocc (2)	108	AV	nviMixBoxManOAUn/nvoMixBoxManOAUn	Read/Write	16085	Mixing Box Outdoor Air Percent during unoccupied times, requires mixing box mode = outdoor air percent
MixingBoxManualVoltsOcc (2)	109	AV	nviMixBoxManVOc/nvoMixBoxManVOc	Read/Write	16093	Mixing Box damper voltage during occupied times, requires mixing box mode = manual
MixingBoxManualVoltsUnocc (2)	110	AV	nviMixBoxManVUn/nvoMixBoxManVUn	Read/Write	16094	Mixing Box damper voltage during unoccupied times, requires mixing box mode = manual
DryModeDischTempSpOcc (3)	111	AV	nviDryDischTSpOc/nvoDryDischTSpOc	Read/Write	16101	Dry mode discharge temperature setpoint when occupied
DryModeDischTempSpUnocc (3)	112	AV	nviDryDischTSpUn/nvoDryDischTSpUn	Read/Write	16102	Dry mode discharge temperature setpoint when unoccupied
DryModeDewPointSP	113	AV	nviDryDewSp/nvoDryDewSp	Read/Write	15249	Dry mode dew point setpoint
DryModeOAPercent	114	AV	nviDryOAPer/nviDryOAPer	Read/Write	16122	Dry mode outdoor air percentage
StaticPressureLowOcc (2)	115	AV	nviStatPLowOcc/nviStatPLowOcc	Read/Write	16095	Static Pressure Low setpoint when occupied
StaticPressureLowUnocc (2)	116	AV	nviStatPLowUnoc/nviStatPLowUnoc	Read/Write	16096	Static Pressure Low setpoint when unoccupied
StaticPressureHighOcc (2)	117	AV	nviStatPHighOcc/nviStatPHighOcc	Read/Write	16097	Static Pressure High setpoint when occupied
StaticPressureHighUnocc (2)	118	AV	nviStatPHighUnoc/nviStatPHighUnoc	Read/Write	16098	Static Pressure High setpoint when unoccupied
OutdoorStatTemp (5)	119	AI	nvoOutdoorTemp	Read Only	9057	Outdoor temperature
ReturnStatTemp (5)	120	AI	nvoReturnTemp	Read Only	9058	Return temperature
DischargeStatTemp (5)	121	AI	nvoDischargeTemp	Read Only	2220	Discharge temperature
IntakeStatTemp (5)	122	AI	nvoIntakeTemp	Read Only	9060	Intake temperature
SpaceStatTemp (5)	123	AI	nvoSpaceTemp	Read Only	9061	Space temperature (thermistor)
Hmi1Temp (5)	124	AI	nvoHmi0Temp	Read Only	9063	Unit HMI temperature
Hmi2Temp (5)	125	AI	nvoHmi1Temp	Read Only	9064	Remote HMI 1 temperature
Hmi3Temp (5)	126	AI	nvoHmi2Temp	Read Only	9065	Remote HMI 2 temperature
Hmi4Temp (5)	127	AI	nvoHmi3Temp	Read Only	9066	Remote HMI 3 temperature
Hmi5Temp (5)	128	AI	nvoHmi4Temp	Read Only	9067	Remote HMI 4 temperature
IntakeRh (5)	129	AI	nvoIntakeRh	Read Only	9078	Intake relative humidity
SpaceRh (5)	130	AI	nvoSpaceRh	Read Only	9079	Space relative humidity
AdjustableDamperPosition (2)	131	AI	nvoDampPosition	Read Only	9085	Mixing Box Damper signal
Hmi1Rh (5)	132	AI	nvoHmi0Rh	Read Only	9097	Unit HMI relative humidity
Hmi2Rh (5)	133	AI	nvoHmi1Rh	Read Only	9098	Remote HMI 1 relative humidity
Hmi3Rh (5)	134	AI	nvoHmi2Rh	Read Only	9099	Remote HMI 2 relative humidity
Hmi4Rh (5)	135	AI	nvoHmi3Rh	Read Only	9100	Remote HMI 3 relative humidity
Hmi5Rh (5)	136	AI	nvoHmi4Rh	Read Only	9101	Remote HMI 4 relative humidity
ActiveFault1Id (5)	137	AI	nvoActiveFault0	Read Only	30501	Active Fault Code (see fault code table)
ActiveFault2Id (5)	138	AI	nvoActiveFault1	Read Only	30502	Active Fault Code (see fault code table)
ActiveFault3Id (5)	139	AI	nvoActiveFault2	Read Only	30503	Active Fault Code (see fault code table)
ActiveFault4Id (5)	140	AI	nvoActiveFault3	Read Only	30504	Active Fault Code (see fault code table)
ActiveFault5Id (5)	141	AI	nvoActiveFault4	Read Only	30505	Active Fault Code (see fault code table)
ActiveFault6Id (5)	142	AI	nvoActiveFault5	Read Only	30506	Active Fault Code (see fault code table)
CurrentHvacState (5)	143	AI	nvoCurrentState	Read Only	2083	HVAC State (Idle = 0, Blower = 1, Heating = 2, Cooling = 3)
OccupiedbySchedule (4)	144	AI	nvoOccbySchedule	Read Only	2125	Occupied due to the schedule
OccupiedbyInput (5)	145	AI	nvoOccbyInput	Read Only	2132	Occupied due to hardware input
OccupiedbyDDC (5)	146	AI	nvoOccbyDDC	Read Only	2133	Occupied due to DDC command
OccupiedbyHMIOverride (5)	147	AI	nvoOccbyHMI	Read Only	2134	Occupied due to HMI command
CurrentOccupiedStatus (5)	148	AI	nvoOccStatus	Read Only	2140	Occupancy status, occupied = 1, unoccupied = 0
CalculatedAverageSpaceTemp (5)	149	AI	nvoAvgSpaceTemp	Read Only	2144	Average space temperature

Name	Point	Object Type	Lon SVNT Name	Function	Modbus	Description
BlowerVFDFrequency (5)	150	AI	nvoBlowVFDFreq	Read Only	2146	Blower VFD frequency
BlowerVFDCurrent (5)	151	AI	nvoBlowVFDAmps	Read Only	2150	Blower VFD current
BlowerVFDPower (5)	152	AI	nvoBlowVFDPower	Read Only	2152	Blower VFD power
CalculatedAverageRh (5)	153	AI	nvoAvgRh	Read Only	2190	Average space relative humidity
GasValveOutput (5)	154	AI	nvoGasOutput	Read Only	1045	Controller output to the modulating gas valve. 0% = Low Fire, 100% = High Fire
CFMReading (5)	155	AI	nvoCFMReading	Read Only	2207	Fan CFM Reading
StaticOaPsLowOcc (5)	156	AI	nvoStatOaPsLoOcc	Read Only	16208	Static Outdoor Air Pressure Low (Occupied)
StaticOaPsLowUnocc (5)	157	AI	nvoStatOaPsLoUn	Read Only	16209	Static Outdoor Air Pressure Low (Unoccupied)
StaticOaPsHighOcc (5)	158	AI	nvoStatOaPsHiOcc	Read Only	16210	Static Outdoor Air Pressure High (Occupied)
StaticOaPsHighUnocc (5)	159	AI	nvoStatOaPsHiUn	Read Only	16211	Static Outdoor Air Pressure High (Unoccupied)
PressureSensor1 (5)	160	AI	nvoPressSensor1	Read Only	2205	Duct Static Pressure
PressureSensor2 (5)	161	AI	nvoPressSensor2	Read Only	2235	Building Static Pressure

DDC Notes

(1) Full Control Points

- Use only if Heating and/or Cooling tempering mode has been set to "DDC" through the unit's HMI.
- Setting the Heating and Cooling modes to "DDC" disables temperature based activation of these functions. The preferred heating and cooling activation method are to use space and/or intake temperatures along with unit set points.
- Heating and Cooling cannot be called for at the same time.
- The Fan Control point will only work if the heating or cooling mode is set to DDC.

(2) Factory Setting Points

- Avoid writing to these on a regular basis.
- The Allow Schedule point tells the unit whether scheduling is allowed or not. It is **NOT** an occupancy command.
- Unit Status: 0 = Idle, 1 = Blower, 2 = Heating, 3 = Cooling
- OA Mode: 0 = Off, 1 = Manual, 2 = 2 Position, 3 = OA Percent, 4 = Analog Ctrl, 5 = PS, 6 = 100% OA, 7 = Modes
- Occupancy Status: 0 = OFF, 1 = ON
- Heat Tempering Mode Occ: 0 = Discharge, 1 = Space, 2 = BAS, 3 = DDC
- Activate Based ON Occ: 0 = Intake, 1 = Space, 2 = Both, 3 = Either, 4 = Stat
- Cool Tempering Mode Occ: 0 = Intake, 1 = Space, 2 = BAS, 3 = DDC
- Heat Tempering Mode Unocc: 0 = Discharge, 1 = Space, 2 = BAS, 3 = DDC
- Activate Based ON Unocc: 0 = Intake, 1 = Space, 2 = Both, 3 = Either, 4 = Stat
- Cool Tempering Mode Unocc: 0 = Intake, 1 = Space, 2 = BAS, 3 = DDC
- Blower Mode Occ: 0 = Auto, 1 = OFF, 2 = ON
- Blower Mode Unocc: 0 = Auto, 1 = OFF, 2 = ON

(3) Temperature Set Points

- The preferred method for DDC control is through set point manipulation. Use the set points shown above along with the "DDC Occupied Override" point in the Runtime settings section to control the blower and to determine when to heat or cool.
- Temperatures can be in degrees F or degrees C, depending on the "Temp Units" point in the factory settings.

(4) On-Board Scheduling

- Values are based on minutes in a day. 1439 minutes = 11:59 PM, 0 = 12:00AM.
- The end value of the A set or B set must be greater than or equal to the start value in that set (A start <= A end, B start <= B end).
- The B set must be greater than the A set and cannot overlap it (A end <= B start).
- The value 1440 is a special value meaning that there is no scheduling for that set. Both the start and end value of a set must have the value for it to be valid. If the A set has this value, the B set must also have this value (no scheduling for the entire day).

NOTE: The preferred method for a BMS to control occupancy is through the "DDC Occupied Override" binary point. The "On-Board Schedule" points should all be set to unoccupied (1440) if the "DDC Occupied Override" is used.

(5) Sensor Values and Alerts

- For Alert Codes 0-5, refer to **DDC Fault List**.

DDC Fault List

Fault Number	Fault Description	Fault Number	Fault Description	Fault Number	Fault Description
0	None	40	BrokenSensorReturn	143	Vfd571EpmHw
1	FireDetect	49	RtcTempSensor	144	Vfd571Internal1
2	SmokeDetect	50	AuxRtcTempSensor	145	Vfd571Internal2
3	SupplyOverload	51	Hmi0TempInvalid	146	Vfd571Internal3
4	ExhaustOverload	52	Hmi1TempInvalid	147	Vfd571Internal4
5	MasterRomCrc	53	Hmi2TempInvalid	148	Vfd571Internal5
6	AuxRomCrc	54	Hmi3TempInvalid	149	Vfd571Internal6
7	FlameProving	55	Hmi4TempInvalid	150	Vfd571Internal7
8	IntakeFirestat	56	ProofOfClosure	151	Vfd571Internal8
9	DischargeFirestat	57	LowFlameVoltage	152	Vfd571Personality
10	Freezestat	58	SpPressureLowLimit	153	Vfd571Internal10
12	HighTempLimit	59	SpPressureHighLimit	154	Vfd571RemoteKeypadLost
13	FireEyeAlarm	86	SpaceRh	155	Vfd571AssertionLevel
14	GasHighPs	87	IntakeRh	156	Vfd571Internal11
15	GasLowPs	88	DischargeRh	157	Vfd571Internal12
16	AuxGasHighPs	92	HmiMbComm0	158	Vfd571Internal13
17	AuxGasLowPs	93	HmiMbComm1	159	Vfd571Internal14
18	CoAlarm	94	HmiMbComm2	160	Vfd571CommModuleFail
19	EvapWaterPs	95	HmiMbComm3	161	Vfd571Network
20	EvapFloat	96	HmiMbComm4	162	Vfd571Network1
21	DxFloat	121	Co2ShutdownRequired	163	Vfd571Network2
22	FurnaceFloat	122	Co2Override	164	Vfd571Network3
23	BlowerVfdMbComm	127	Vfd571IgbtTemp	165	Vfd571Network4
24	DoorInterlock	128	Vfd571Output	166	Vfd571Network5
26	MuaToAuxMbComm	129	Vfd571Ground	167	Vfd571Network6
27	IntakeDamperEnd	130	Vfd571Temp	168	Vfd571Network7
28	DischargeDamperEnd	131	Vfd571FlyingStart	169	Vfd571Network8
29	BlowerAirProving	132	Vfd571HighDcBus	170	Vfd571Network9
30	CloggedFilter	133	Vfd571LowDcBus	171	ReturnRh
31	MissingSensorIntake	134	Vfd571Overload	173	OutsideRh
32	BrokenSensorIntake	135	Vfd571Oem	174	Co2Threshold
33	MissingSensorDischarge	136	Vfd571IllegalSetup	175	ErvDoorInterlock
34	BrokenSensorDischarge	137	Vfd571DynamicBrake	176	ExternalInterlockActive
35	MissingSensorSpace	138	Vfd571PhaseLost	182	ExhFanContactor1Prv
36	BrokenSensorSpace	139	Vfd571External	183	ExhFanContactor2Prv
37	MissingSensorOutsideAir	140	Vfd571Control		
38	BrokenSensorOutsideAir	141	Vfd571Start		
39	MissingSensorReturn	142	Vfd571IncompatParamSet		