LONMARK
Functional Profile:
Unit Ventilator Controller

Overview

This document describes the profile for the Unit Ventilator Controller object. A Unit Ventilator Controller is a type of HVAC unit controller that provides space temperature control (and other related functions) for a room or " space" within a building. A Unit Ventilator Controller maintains the desired space temperature by controlling any combination of heat and cool actuator outputs as well as a unit fan.

A room temperature sensor input is mandatory and may be provided locally on the node (hardwired) or across the network via network variables.

Example Usage

The Unit Ventilator Controller resides on a LONWORKS network interacting with one or more of the following LONMARK nodes:

- space temperature sensor
- space relative humidity sensor
- space CO_2 sensor
- occupancy sensor
- other sensors
- remote wall module (including sensor(s), setpoint, fan speed and/or mode switch)
- supervisory controller (occupancy mode, heat/cool changeover, supply energy control)
- monitoring device
- installation/service tool
- heat actuator (0..100%)
- cool actuator (0..100%)
- multi-speed fan controller (n-speed)
- outside air damper actuator (0..100%)
- other nodes as required

Unit Ventilator Controller Object Details

Table 1.1: Network Variable Inputs

NV # (M/O)**	Name	Recv HrtBt	SNVT Type	SNVT Index	Class	Description
1 (M)	nviSpaceTemp	Yes	SNVT_temp_p	105	RAM	Space Temperature Input
2 (O)	nviSetpoint	No	SNVT_temp_p	105	RAM	Temperature Setpoint Input (absolute)
3 (O)	nviSetptOffset	Yes	SNVT_temp_p	105	RAM	Setpoint Offset Input
4 (O)	nviSetptShift	Yes	SNVT_temp_setpt	106	RAM	Setpoint Shift Input
5 (O)	nviOccSchedule	Yes	SNVT_tod_event	128	RAM	Occupancy Scheduler Input
6 (O)	nviOccManCmd	No	SNVT_occupancy	109	RAM	Occupancy Override Input
7 (O)	nviOccSensor	Yes	SNVT_occupancy	109	RAM	Occupancy Sensor Input
8 (O)	nviApplicMode	Yes	SNVT_hvac_mode	108	RAM	Application Mode Input
9 (O)	nviHeatCool	Yes	SNVT_hvac_mode	108	RAM	Heat/Cool Mode Input
10 (O)	nviFanSpeedCmd	No	SNVT_switch	95	RAM	Fan Speed Command Input
11 (O)	nviComprEnable	Yes	SNVT_switch	95	RAM	Compressor Enable Input
12 (O)	nviAuxHeatEnable	Yes	SNVT_switch	95	RAM	Auxiliary Heat Enable Input
13 (O)	nviEconEnable	Yes	SNVT_switch	95	RAM	Economizer Enable Input
14 (O)	nviEnergyHoldOff	Yes	SNVT_switch	95	RAM	Energy Hold Off Input
15 (O)	nviValveOverride	No	SNVT_hvac_overid	111	RAM	Water Valve Override Input
16 (O)	nviEmergOverride	No	SNVT_hvac_emerg	103	RAM	Emergency Override Input
17 (O)	nviSourceTemp	Yes	SNVT_temp_p	105	RAM	Source Temperature Input
18 (O)	nviOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor Air Temperature Input
19 (O)	nviSpaceRH	Yes	SNVT_lev_percent	81	RAM	Space Humidity Input
20 (O)	nviOutdoorRH	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Humidity Input
21 (O)	nviSpaceCO2	Yes	SNVT_ppm	29	RAM	Space CO2 Sensor Input

** M = mandatory, O = optional

Table 1.2: Network Variable Outputs

NV # (M/O)**	Name	Send HrtBt	SNVT Type	SNVT Index	Class	Description
21 (M)	nvoSpaceTemp	Yes	SNVT_temp_p	105	RAM	Effective Space Temperature Output
22 (M)	nvoEffectSetpt	Yes	SNVT_temp_p	105	RAM	Effective Setpoint Output
23 (M)	nvoUnitStatus	Yes	SNVT_hvac_status	112	RAM	Unit Status Output
24 (O)	nvoEffectOccup	No	SNVT_occupancy	109	RAM	Effective Occupancy Output
25 (O)	nvoHeatCool	Yes	SNVT_hvac_mode	108	RAM	Effective Heat/Cool Output
26 (O)	nvoSetpoint	No	SNVT_temp_p	105	RAM	Local Setpoint Output
27 (O)	nvoSetptShift	Yes	SNVT_temp_setpt	106	RAM	Local Setpoint Shift Output
28 (O)	nvoFanSpeed	Yes	SNVT_switch	95	RAM	Fan Speed Output
29 (O)	nvoDischAirTemp	No	SNVT_temp_p	105	RAM	Discharge Air Temperature Output
30 (O)	nvoLoadAbsK	No	SNVT_power_kilo	28	RAM	Absolute Power Consumption KW Output
31 (O)	nvoTerminalLoad	Yes	SNVT_lev_percent	81	RAM	Terminal Load Output
32 (O)	nvoHeatPrimary	Yes	SNVT_lev_percent	81	RAM	Primary Heat Output
33 (O)	nvoHeatSecondary	Yes	SNVT_lev_percent	81	RAM	Secondary Heat Output
34 (O)	nvoCoolPrimary	Yes	SNVT_lev_percent	81	RAM	Primary Cool Output
35 (O)	nvoOADamper	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Damper Output
36 (O)	nvoSpaceRH	Yes	SNVT_lev_percent	81	RAM	Space Humidity Output
37 (O)	nvoOutdoorRH	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Humidity Output
38 (O)	nvoOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor Air Temperature Output
39 (O)	nvoSpaceCO2	Yes	SNVT_ppm	29	RAM	Space CO2 Sensor Output
40 (O)	nvoEnergyHoldOff	Yes	SNVT_switch	95	RAM	Energy Hold Off Output

** M = mandatory, O = optional

Table 1.3: Configuration Properties

Config. Property # (M/O)**	Name	SCPT Index	SNVT Type (SNVT Index)	Class	Description
1 (M)	nciSndHrtBt	49	SNVT_time_sec (107)	NVM	Send Heartbeat
2 (M)	nciSetpoints	60	SNVT_temp_setpt (106)	NVM	Occupancy Temperature Setpoints
3 (O)	nciMinOutTm	52	SNVT_time_sec (107)	NVM	Minimum Send Time
4 (O)	nciRcvHrtBt	48	SNVT_time_sec (107)	NVM	Receive Heartbeat
5 (O)	nciLocation	17	SNVT_str_asc (36)	NVM	Location Label
6 (O)	nciBypassTime	34	SNVT_time_min (123)	NVM	Local Bypass Time
7 (O)	nciManualTime	35	SNVT_time_min (123)	NVM	Manual Override Time
8 (O)	nciOAMinPos	23	SNVT_lev_percent (81)	NVM	Outdoor Air Damper Minimum Position
9 (O)	nciSpaceCO2Lim	42	SNVT_ppm (29)	NVM	Space CO2 Limit
10 (O)	nciSpaceRHSetpt	36	SNVT_lev_percent (81)	NVM	Space Humidity Setpoint
11 (O)	nciNumValve	59	SNVT_count (8)	NVM	Number of Heating/Cooling Valves

** M = mandatory, O = optional

Mandatory Network Variables

Space Temperature Input

network input SNVT_temp_p nviSpaceTemp;

This input network variable is used to connect an external space
temperature sensor to the node. It is mandatory to the profile, but it
does not have to be bound to a sensor node if the Unit Ventilator
Controller node itself provides a locally wired space temperature
sensor. In any case, the nviSpaceTemp has priority if a valid value is
present.

Valid Range
The valid range is -10°C to 50°C. The value 0x7FFF=+327.67°C will be
handled as an invalid value.

Default Value
Default Value is 0x7FFF (=+327.67°C). This value will be adopted at
power-up and in case of not receiving an update within the specified
receive heartbeat time.

Mandatory Network Variables

Effective Space Temperature Output

network output SNVT_temp_p nvoSpaceTemp;

This output network variable is used to monitor the effective space
temperature that the Unit Ventilator Controller is using for control.
If the input nviSpaceTemp has a valid value, this output will echo the
value of the input. If a valid value for nviSpaceTemp does not exist,
the locally wired sensor value is used. If neither value is available,
the output will send the invalid value.

Typical Range
The typical range is -10°C to 50°C. The value 0x7FFF=+327.67°C will be
used as an invalid value in case of a sensor failure.

When Transmitted
The variable is transmitted immediately when its value has changed
significantly (manufacturer defined). Additionally, this network
variable will also be transmitted as a heartbeat output on a regular
basis as dictated by the Maximum Send Time (nciSndHrtBt)configuration
value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type

The default service type is unacknowledged.

Effective Setpoint Output

network output SNVT_temp_p nvoEffectSetpt;

This output network variable is used to monitor the effective temperature setpoint which may depend on nciSetpoints, nvoEffectOccup, nviSetpoint, nviSetpointOffset, nviHeatCool, and any local setpoint adjustment. For example, if the occupancy state is unoccupied and the heat/cool state is heat, then the effective setpoint would be equal to the unoccupied heating setpoint defined in nciSetpoints.

Typical Range

The typical range is 10°C to 35°C.

When Transmitted

The variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate

This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type

 The default service type is unacknowledged.

Unit Status Output

network output SNVT_hvac_status nvoUnitStatus;

This output network variable is available to report the Unit Ventilator Controller status. It combines the operating mode, the capacity of heating and cooling used and an indication if any alarms are present in the object. SNVT_hvac_status allows this information to be provided in one network variable.

Refer to Effective Heat/Cool Output (nvoHeatCool) for additional information regarding the value reported in the mode field. The value in the mode field will typically be the same value as the Effective Heat/Cool Output, except when the mode value is HVAC_TEST.

Valid Range

mode:	HVAC_HEAT, HVAC_MRNG_WRMUP, HVAC_COOL, HVAC_NIGHT_PURGE, HVAC_PRE_COOL, HVAC_OFF, HVAC_TEST, HVAC_EMERG_HEAT, HVAC_FAN_ONLY.
heat_output_primary:	0-100%, 0x7FFF (INVALID)
heat_output_secondary:	0-100%, 0x7FFF (INVALID)
cool_output:	0-100%, 0x7FFF (INVALID)

```
econ_output:            0-100%, 0x7FFF (INVALID)

fan_output:             0-100%, 0x7FFF (INVALID)

in_alarm:               0 Means there is no alarm.

                        Not 0 Means there is an alarm.

                        0xFF Means that alarming is disabled.
```

When Transmitted
This variable is transmitted immediately when its value has changed
significantly. Additionally, this network variable will also be
transmitted as a heartbeat output on a regular basis as dictated by the
Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Optional Network Variables

Temperature Setpoint Input (absolute)

network input SNVT_temp_p nviSetpoint;

This input network variable is used to allow the temperature setpoints
for the occupied and standby modes to be changed via the network.
(Note: The unoccupied setpoints are not changed.) If a valid value is
not present, either a locally wired setpoint knob or the appropriate
setpoint as configured in nciSetpoints will be used.

There are two methods that can be used by the controller to derive the
actual setpoints from nviSetpoint and nciSetpoints.   Method 1 is referred to as
the "symmetrical method", since the effective heat/cool setpoints are always symmetrical relative to
nviSetpoint, regardless of the values defined in nciSetpoints. Method 2 is referred to as the
"asymmetrical method", since the effective heat/cool setpoints are not always symmetrical relative to
nviSetpoint, based on the values defined in nciSetpoints. Either method can be used in the
controller, as defined by the manufacturer.

Method #1: (also known as the symmetrical method)

The effective heat/cool setpoints for the occupied and standby modes are
derived from nviSetpoint plus/minus half the occupied and standby
deadbands calculated from nciSetpoints:

        deadband_occupied = occupied_cool - occupied_heat

        deadband_standby = standby_cool - standby_heat

        effective_occupied_cool = nviSetpoint + 0.5 (deadband_ occupied)

        effective_occupied_heat = nviSetpoint - 0.5 (deadband_ occupied)

$$effective\_standby\_cool = nviSetpoint + 0.5 \; (deadband\_standby)$$

$$effective\_standby\_heat = nviSetpoint - 0.5 \; (deadband\_ standby)$$

Method #2: (also known as the asymmetrical method)

The effective heat/cool setpoints for the occupied and standby modes are derived from nciSetpoints plus the absolute setpoint offset, calculated as the difference between nviSetpoint and the mean of the occupied_heat and occupied_cool setpoints defined in nciSetpoints:

```
abs_setpoint_offset = nviSetpoint - (occupied_cool +
occupied_heat)/2

effective_occupied_cool = occupied_cool + abs_setpoint_offset
effective_occupied_heat = occupied_heat + abs_setpoint_offset
effective_standby_cool = standby_cool + abs_setpoint_offset
effective_standby_heat = standby_heat + abs_setpoint_offset
```

If nviSetpoint and nviSetptOffset are used together, the result on the effective setpoints is additive.

Valid Range
The valid range is 10°C to 35°C. The value 0x7FFF=+327.67°C will be handled as an invalid value.

Default Value
Default Value is 0x7FFF (= +327.67°C). This value will be adopted at power-up. This network variable input does not use the Receive Heartbeat function. When the default value is in effect, the Unit Ventilator Controller will use the configuration property nciSetpoints.

Setpoint Offset Input

network input SNVT_temp_p nviSetptOffset;

This input network variable is used to shift the effective occupied and standby temperature setpoints by adding nviSetptOffset to the current setpoints.   (Note: The unoccupied setpoints are not changed.) It is typically bound to a supervisory node or to an external wall module having a relative setpoint knob. All occupied and standby setpoints will be shifted upward (+) or downward (-) by the value of nviSetptOffset.

If nviSetpoint and nviSetptOffset are used together, the result on the effective setpoints is additive.

Valid Range
The valid range is -10°C to +10°C. The value 0x7FFF=+327.67°C will be handled as an invalid value.

Default Value

Default Value is 0°C to disable the setpoint offset. This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Setpoint Shift Input

network input SNVT_temp_setpt nviSetptShift;

This input network variable is used to shift the effective heat/cool setpoints by adding the corresponding value in nviSetptShift to the current setpoints. It is typically bound to a supervisory node which provides functions such as outdoor air temperature compensation. All occupied, standby and unoccupied setpoints will be shifted upward (+) or downward (-) by the corresponding value of nviSetptShift.

If nviSetpoint, nviSetptOffset and/or nviSetptShift are used together, the result on the effective setpoints is additive.

Valid Range and Default Values

	Minimum	Maximum	Default
occupied_cool	-10°C	+10°C	0 °C
standby_cool	-10°C	+10°C	0 °C
unoccupied_cool	-10°C	+10°C	0 °C
occupied_heat	-10°C	+10°C	0 °C
standby_heat	-10°C	+10°C	0 °C
unoccupied_heat	-10°C	+10°C	0 °C

The valid range for each shift value is -10°C to +10°C. The value 0x7FFF=+327.67°C will be handled as an invalid value. The Default Value is 0°C to disable the setpoint shift. This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Because nviSetptShift contains six independent values, it is possible to create combinations of values that are not functional. For example, if positive shift values are used for the heating setpoints, and negative shift values are used for the cooling setpoints simultaneously, the effective heat/cool setpoints may conflict with each other. Care should be taken in the application of nviSetptShift to avoid these potential conflicts. The following table shows some examples of valid uses of nviSetptShift.

Examples of Setpoint Shift Input

	Summer Compensation	Winter Compensation	Demand Limit
occupied_cool	+2°C	+3°C	+3°C
standby_cool	+2°C	+3°C	+3°C
unoccupied_cool	0°C	0°C	0°C
occupied_heat	0°C	+3°C	-3°C
standby_heat	0°C	+3°C	-3°C
unoccupied_heat	0°C	0°C	0°C

Occupancy Scheduler Input

`network input SNVT_tod_event  nviOccSchedule;`

This input network variable is used to command the Unit Ventilator Controller into different occupancy modes. It is typically sent by a scheduler or a supervisory node.   SNVT_tod_event is a structure containing three parts. The first part, current_state, is required for this network variable input. The additional parts, next_state and time_to_next_state, are optional. They can be used for control strategies that provide improved transitions between states. A scheduler node should send OC_NUL and 0, respectively, if it does not use these functions. The controller node will ignore these values if the functions are not supported by the controller.

This input is used in conjunction with nviOccManCmd and nviOccSensor (if installed) to determine the effective occupancy mode. Refer to Effective Occupancy Output (nvoEffectOccup) for more information.

Valid Range

for current_state:

0 = OC_OCCUPIED: The Unit Ventilator Controller should operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

1 = OC_UNOCCUPIED: The Unit Ventilator Controller should operate in the unoccupied mode as defined by the manufacturer (e.g. unoccupied setpoint).

3 = OC_STANDBY: The Unit Ventilator Controller should operate in the standby mode as defined by the manufacturer (e.g. standby setpoint).

0xFF = OC_NUL: This is the initial value after power-up and it remains until another value is received. It is used to indicate that this network variable input is invalid or unused.

The interpretation of all other enumerations will be manufacturer-specific.

for next_state: (optional)

0 = OC_OCCUPIED: The Unit Ventilator Controller will operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

1 = OC_UNOCCUPIED: The Unit Ventilator Controller will operate in the
      unoccupied mode as defined by the manufacturer (e.g. unoccupied
      setpoint).

3 = OC_STANDBY: The Unit Ventilator Controller will operate in the
      standby mode as defined by the manufacturer (e.g. standby
      setpoint).

0xFF = OC_NUL: This is the initial value after power-up and it remains
      until another value is received. It is used to indicate that this
      network variable input is invalid or unused.

The interpretation of all other enumerations will be manufacturer-
      specific.

for time_to_next_state: (optional)   0 to 65,534 minutes, 0 = not
      used, 65,535 (0xFFFF) = Invalid

Default Value

current_state = 0xFF = OC_NUL

next_state = 0xFF = OC_NUL

time_to_next_state = 0 minutes

 These values will be adopted at power-up and in case of not receiving
an update within the specified receive heartbeat time.

Occupancy Override Input

network input SNVT_occupancy nviOccManCmd;

This input network variable is used to command the Unit Ventilator
Controller into different occupancy modes. It is typically sent by a
wall-mounted occupant-interface module or a supervisory node, to
manually control occupancy modes, or to override the scheduled
occupancy.

If a local Bypass Input is present, it can be used in conjunction with
this network variable input. The local input, when active, forces a
Bypass request (equivalent to OC_BYPASS), overriding nviOccManCmd for
the duration of the Local Bypass Time (determined by the configuration
property nciBypassTime). When nviOccManCmd indicates OC_BYPASS, the
Local Bypass Time is also used. Whenever an update of nviOccManCmd is
received indicating OC_BYPASS, the bypass timer is restarted. *This
network variable input should never be bound to a network variable that
uses a Send Heartbeat function.*

This input is used in conjunction with nviOccSchedule and nviOccSensor
(if installed) to determine the effective occupancy mode. Refer to
Effective Occupancy Output (nvoEffectOccup) for more information.

Valid Range

0 = OC_OCCUPIED: The Unit Ventilator Controller should operate in the
      occupied mode as defined by the manufacturer (e.g. occupied
      setpoint).

1 = OC_UNOCCUPIED: The Unit Ventilator Controller should operate in the unoccupied mode as defined by the manufacturer (e.g. unoccupied setpoint).

2 = OC_BYPASS: The Unit Ventilator Controller should operate in the occupied mode for a period of time defined by nciBypassTime.

3 = OC_STANDBY: The Unit Ventilator Controller should operate in the standby mode as defined by the manufacturer (e.g. standby setpoint).

0xFF = OC_NUL: This is the initial value after power-up and it remains until another value is received. It is used to indicate that this network variable input is invalid, unused or to cancel a previous command.

Default Value
The default value OC_NUL = 0xFF. This value will be adopted at power-up. This network variable input does not use the Receive Heartbeat function.

Occupancy Sensor Input

network input SNVT_occupancy nviOccSensor;

This input network variable is used to indicate the presence of occupants in the controlled space. It is typically sent by an occupancy sensor. In cases where an occupancy sensor is hardwired to the Unit Ventilator Controller, a valid value for nviOccSensor will take precedence over the hardwired input.

This input is used in conjunction with nviOccSchedule and nviOccManCmd (if installed) to determine the effective occupancy mode. Refer to Effective Occupancy Output (nvoEffectOccup) for more information.

Valid Range

0 = OC_OCCUPIED: The occupancy sensor is indicating that there ARE occupants in the space.

1 = OC_UNOCCUPIED: The occupancy sensor is indicating that there are NO occupants in the space.

0xFF = OC_NUL: This is the initial value after power-up and it remains until another value is received. It is used to indicate that this network variable input is invalid or unused. OC_NUL is equivalent to OC_OCCUPIED.

All other enumerations are handled as equivalent to OC_NUL.

Default Value
The default value is OC_NUL.   This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Application Mode Input

network input SNVT_hvac_mode nviApplicMode;

This network variable input is used to coordinate the Unit Ventilator
Controller with any supervisory controller. If a mode is requested that
is not supported by the unit controller, the unit controller will use a
manufacturer-defined default mode.

nviApplicMode overrides nviHeatCool, unless nviApplicMode is HVAC_AUTO,
HVAC_TEST, or HVAC_NUL. If nviApplicMode is HVAC_AUTO or HVAC_NUL, then
nviHeatCool determines the effective mode of the unit. If nviApplicMode
is HVAC_TEST, then the effective mode is manufacturer-defined. Refer to
Effective Heat/Cool Output (nvoHeatCool) for more information.

Valid Range

    0 = HVAC_AUTO (Mode determined by unit)

    1 = HVAC_HEAT (Use heat setpoints)

    2 = HVAC_MRNG_WRMUP (Morning warmup)

    3 = HVAC_COOL (Use cool setpoints)

    4 = HVAC_NIGHT_PURGE (Free cooling)

    5 = HVAC_PRE_COOL (Morning cooldown)

    6 = HVAC_OFF (No unit operation allowed)

    7 = HVAC_TEST (Special test mode, manufacturer-defined)

    8 = HVAC_EMERG_HEAT (Emergency heat)

    9 = HVAC_FAN_ONLY (No heating or cooling allowed)

    0xFF = HVAC_NUL (same as HVAC_AUTO)

    All other enumerations will be interpreted as manufacturer-defined.

Default Value
The default value is HVAC_AUTO. This value will be adopted at power-up
and in case of not receiving an update within the specified receive
heartbeat time.

Heat/Cool Mode Input

network input SNVT_hvac_mode nviHeatCool;

This network variable input is used to coordinate the Unit Ventilator
Controller with any node that may need to control the heat/cool
changeover of the unit. For example, one Unit Ventilator Controller
node may coordinate it's heat/cool mode with another Unit Ventilator
Controller node serving the same area, or the heat/cool mode could be
manually selected from a human interface device. If a mode is requested
that is not supported by the unit controller, the unit controller will
use a manufacturer-defined default mode.

This input is overridden by nviApplicMode, unless nviApplicMode is
HVAC_AUTO, HVAC_TEST, or HVAC_NUL. If nviApplicMode is HVAC_AUTO or
HVAC_NUL, then nviHeatCool determines the effective mode of the unit.
If nviApplicMode is HVAC_TEST, then the effective mode is manufacturer-
defined. Refer to Effective Heat/Cool Output (nvoHeatCool) for more
information.

Valid Range

  0 = HVAC_AUTO (Mode determined by unit)

  1 = HVAC_HEAT (Use heat setpoints)

  2 = HVAC_MRNG_WRMUP (Morning warmup)

  3 = HVAC_COOL (Use cool setpoints)

  4 = HVAC_NIGHT_PURGE (Free cooling)

  5 = HVAC_PRE_COOL (Morning cooldown)

  6 = HVAC_OFF (No unit operation allowed)

  7 = HVAC_TEST (Special test mode, manufacturer-defined)

  8 = HVAC_EMERG_HEAT (Emergency heat)

  9 = HVAC_FAN_ONLY (No heating or cooling allowed)

  0xFF = HVAC_NUL (same as HVAC_AUTO)

  All other enumerations will be interpreted as manufacturer-defined.

Default Value
The default value is HVAC_AUTO. This value will be adopted at power-up
and in case of not receiving an update within the specified receive
heartbeat time.

Fan Speed Command Input

network input SNVT_switch nviFanSpeedCmd;

This input network variable is used to connect an external fan speed
switch to the node or to allow any supervisory device to override the
fan speed controlled by the node's control algorithm. The unit
controller can override this command when required for equipment
protection. This input can be used with 1-speed, 2-speed, 3-speed, n-speed
and variable-speed fans.

Valid Range

1-speed Fan

State	Value	Equivalent Percent	Requested Speed
0	n/a	n/a	OFF
1	0	0%	OFF
1	1 to 200	0.5 to 100.0%	ON
1	201 to 255	100.0%	ON

0xFF	n/a	n/a	AUTO

2-speed Fan

State	Value	Equivalent Percent	Requested Speed
0	n/a	n/a	OFF
1	0	0%	OFF
1	1 to 100	0.5 to 50.0%	1
1	101 to 200	50.5 to 100.0%	2
1	201 to 255	100.0%	2
0xFF	n/a	n/a	AUTO

3-speed Fan

State	Value	Equivalent Percent	Requested Speed
0	n/a	n/a	OFF
1	0	0%	OFF
1	1 to 66	0.5 to 33.0%	1
1	67 to 133	33.5 to 66.5%	2
1	134 to 200	67.0 to 100.0%	3
1	201 to 255	100.0%	3
0xFF	n/a	n/a	AUTO

Variable-speed Fan

State	Value	Equivalent Percent	Requested Speed
0	n/a	n/a	OFF
1	0	0%	OFF
1	1 to 200	0.5 to 100.0%	0.5 to 100.0%
1	201 to 255	100.0%	100.0%
0xFF	n/a	n/a	AUTO

n-speed Fan

State	Value	Equivalent Percent	Requested Speed
0	n/a	n/a	OFF
1	0	0%	OFF
1	1 to (1/n)200	0.5 to (1/n)100%	Fan speed #1
1	1+(1/n)200 to (2/n)200	0.5+(1/n)100 to (2/n)100%	Fan speed #2
1	1+((m-1)/n)200 to (m/n)200	0.5+((m-1)/n)100 to (m/n)100%	Fan speed #m
1	1+((n-1)/n)200 to 200	0.5+((n-1)/n)100 to 100%	Fan speed #n
0xFF	n/a	n/a	AUTO

Default Value

Default value is AUTO (state = 0xFF). This value will be adopted at
power-up. This network variable input does not use the Receive
Heartbeat function.

Compressor Enable Input

network input SNVT_switch nviComprEnable;

This input is used to disable compressor operation. This input is
typically sent from a system coordination panel. For example, in
compressor-bearing unit ventilator, compressor operation would be
disabled until system pump operation is verified. It is also possible
to have a hardwired input to a unit controller to be used for compressor
enable. In instances where both a hardwired input and network input are
present, the network variable has precedence over the physical input.

This input can be used for simple enable/disable functions, or can be
used to enable a portion of the unit's compressor capacity. For
example, if a unit has 2 compressors, a value of 100 (50.0%) could
indicate that only one compressor is enabled. The interpretation of
values less than 100.0% is manufacturer-defined, based on the specific
equipment and control algorithms used.

Valid Range

State	Value	Equivalent Percent	Compressor Operation
0	n/a	n/a	Disabled
1	0	0.0%	Disabled
1	1 to 199	0.5 to 99.5%	Partially Enabled
1	200 to 255	100.0%	Enabled
0xFF	n/a	n/a	Enabled

			(Invalid)

Default Value

Default Value is manufacturer-defined. This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Auxiliary Heat Enable Input

network input SNVT_switch nviAuxHeatEnable;

This input is used to disable auxiliary heat operation. This input is typically sent from a system supervisor panel. For example, during peak electrical demand periods, electric heat operation could be disabled. It is also possible to have a hardwired input to a unit controller to be used for auxiliary heat enable. In instances where both a hardwired input and network input are present, the network variable has precedence over the physical input.

This input can be used for simple enable/disable functions, or can be used to enable a portion of the unit's auxiliary heat capacity. For example, if a unit has 2 stages of electric heat, a value of 100 (50.0%) could indicate that only one stage is enabled. The interpretation of values less than 100.0% is manufacturer-defined, based on the specific equipment and control algorithms used.

Valid Range

State	Value	Equivalent Percent	Auxiliary Heat Operation
0	n/a	n/a	Disabled
1	0	0.0%	Disabled
1	1 to 199	0.5 to 99.5%	Partially Enabled
1	200 to 255	100.0%	Enabled
0xFF	n/a	n/a	Enabled (Invalid)

Default Value

Default Value is Enabled (state = 0xFF). This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Economizer Enable Input

network input SNVT_switch nviEconEnable;

This input is used to enable and disable economizer operation. This input is typically sent from a system supervisor panel to override the local economizer enable/decision. For this input, economizer Auto means

that the local decision determines economizer operation. Enabled or Disabled means that economizer operation is allowed or not allowed (respectively), overriding the local decision.

Valid Range

State	Value	Economizer
0	n/a	Disabled
1	0	Disabled
1	1-255	Enabled
0xFF	n/a	Auto (Invalid)

Default Value

Default Value is Auto (State = 0xFF). This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Energy Hold Off Input

network input SNVT_switch nviEnergyHoldOff;

This input is used to stop heating and cooling while allowing the unit to protect the space from temperature extremes. When the unit is in Energy Hold Off, the unit will not operate unless the space temperature exceeds manufacturer-defined limit setpoints. This input is usually associated with a device such as a window contact sensor. If a physical sensor is connected *and* the network variable is present, either input can initiate Energy Hold Off.

Valid Range

State	Value	Energy Hold Off
0	n/a	Normal
1	0	Normal
1	1-255	Energy Hold Off
0xFF	n/a	Normal (Invalid)

Default Value

Default Value is Normal (State = 0xFF). This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Water Valve Override Input

```
network input SNVT_hvac_overid  nviValveOverride;
```

This input network variable is used for commanding the controller into a manual mode for overriding water valves controlled by the unit (most commonly when water balancing the system). This input would typically be initiated from a supervisory controller or service tool. It can be used to override all water valves, heating valves only or cooling valves only. A product manufacturer can implement an optional time limit for this input, as defined by the Manual Time Limit (nciManualTime) configuration property. The response to unused or invalid values is manufacturer-defined.

Valid Range

for state:

0 = HVO_OFF: Normal control.

1 = HVO_POSITION: Set all valves to the value in the percent field.

2 - 3 = Not used.

4 = HVO_OPEN: Fully open all valves.

5 = HVO_CLOSE: Fully close all valves.

6 - 16 = Not used.

17 = HVO_POSITION_1: Set all heating valves to the value in the percent field.

18 - 19 = Not used.

20 = HVO_OPEN_1: Fully open all heating valves.

21 = HVO_CLOSE_1: Fully close all heating valves.

22 - 32 = Not used.

33 = HVO_POSITION_2: Set all cooling valves to the value in the percent field.

34 - 35 = Not used.

36 = HVO_OPEN_2: Fully open all cooling valves.

37 = HVO_CLOSE_2: Fully close all cooling valves.

38 - 48 = Not used.

0xFF = NUL: INVALID (same as 0 = HVO_OFF).

for percent: 0 to 100%

for flow: 0 liters/sec (Not used)

Default Value

The default value is 0 = HVO_OFF. This value will be adopted at power-up. This network variable input does not use the Receive Heartbeat function. Optionally, a manufacturer can choose to use the default value if an update is not received within the Manual Time Limit (nciManualTime).

Emergency Override Input

network input SNVT_hvac_emerg nviEmergOverride;

This input network variable is used to command the device into different emergency modes. It is typically set by a supervisory node. The response to each mode is manufacturer-specific, based on the equipment type. An example of a possible application is given below.

Valid Range
The valid range is described in the table below:

0 = EMERG_NORMAL: Normal operation

1 = EMERG_PRESSURIZE: Start the PRESSURIZE operation

2 = EMERG_DEPRESSURIZE: Start the DEPRESSURIZE operation

3 = EMERG_PURGE: Start the PURGE operation

4 = EMERG_SHUTDOWN: SHUTDOWN all unit functions

0xFF = EMERG_NUL: Invalid mode (same as EMERG_NORMAL).

Example: Typical usage of these modes is shown in the table below.

	Supply Fan	Outdoor Air Damper	Exhaust Fan	Exhaust Damper
Pressurize	On	Open	Off	Closed
Depressurize	Off	Closed	On	Open
Purge	On	Open	On	Open
Shutdown	Off	Closed	Off	Closed

Default Value
The default value is EMERG_NORMAL. This value will be adopted at power-up, until an update is received. This network variable input does not use the Receive Heartbeat function.

Source Temperature Input

network input SNVT_temp_p nviSourceTemp;

This input network variable is used to indicate the temperature of the water being supplied to the unit for heating and/or cooling capacity. This value can be used for unit protection, control mode switching and/or to enable/disable certain functions. This value is typically sent from a supervisory controller or temperature sensor node. The unit may also have a locally wired source temperature sensor. Valid values of nviSourceTemp have priority over local sensor values.

Valid Range
The valid range is 0°C to 100°C. The value 0x7FFF = +327.67°C will be handled as an invalid value in case of a sensor failure.

Default Value
Default Value is 0x7FFF (= +327.67°C). This value will be adopted at
power-up and in case of not receiving an update within the specified
receive heartbeat time.

Outdoor Air Temperature Input

network input SNVT_temp_p nviOutdoorTemp;

This input network variable represents information from an outdoor air
temperature sensor. This value is typically generated from either a
communicating sensor or a supervisory controller. The unit may also have
a locally wired outdoor air temperature sensor. Valid values of
nviOutdoorTemp have priority over local sensor values.

Valid Range
The valid range is -40°C to 50°C. The value 0x7FFF = +327.67°C will be
handled as an invalid value in case of a sensor failure.

Default Value
Default Value is 0x7FFF (= +327.67°C). This value will be adopted at
power-up and in case of not receiving an update within the specified
receive heartbeat time.

Space Humidity Input

network input SNVT_lev_percent nviSpaceRH;

This input network variable is the measured space humidity in percent.
This input is typically sent from a communicating humidity sensor. Valid
values of nviSpaceRH have priority over local sensor values.

ValidRange
The valid range is 0 to 100 %. The value 0x7FFF = +163.835 will be
handled as an invalid value in case of a sensor failure.

Default Value
Default Value is 0x7FFF. This value will be adopted at power-up and in
case of not receiving an update within the specified receive heartbeat
time.

Outdoor Air Humidity Input

network input SNVT_lev_percent nviOutdoorRH;

This input network variable is the measured outdoor humidity in percent.
This input is typically sent from either a supervisory controller or
communicating humidity sensor. Valid values of nviOutdoorRH have
priority over local sensor values.

Valid Range
The valid range is 0 to 100 %. The value 0x7FFF = +163.835 will be
handled as an invalid value in case of a sensor failure.

Default Value

Default Value is 0x7FFF. This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Space CO2 Sensor Input

network input SNVT_ppm nviSpaceCO2;

This input network variable measures the space CO2 levels in PPM. The unit can also have a locally wired CO2 sensor. Valid values of nviSpaceCO2 have priority over local sensor values.

Valid Range

The valid range is 0 to 5000 PPM. The value 0x7FFF = 65,535 will be handled as an invalid value in case of a sensor failure.

Default Value

Default Value is 0x7FFF. This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Optional Network Variables

Effective Occupancy Output

network output SNVT_occupancy nvoEffectOccup;

This output network variable is used to indicate the actual occupancy mode of the unit. This information is typically reported to a supervisory controller, or provided to another Unit Ventilator Controller to coordinate the operation of multiple units. The occupancy mode is determined by a combination of optional input network variables and logic in the controller, as defined by the controller manufacturer. An example of how the Effective Occupancy Output could be determined from various inputs is shown in the table below.

Effective Occupancy Output (example application)

nviOccManCmd	nviOccSchedule[4]	nviOccSensor[2]	nvoEffectOccup
OC_OCCUPIED	Don't Care	Don't Care	OC_OCCUPIED
OC_UNOCCUPIED	Don't Care	Don't Care	OC_UNOCCUPIED
OC_BYPASS[1]	OC_OCCUPIED	Don't Care	OC_OCCUPIED
	OC_UNOCCUPIED	Don't Care	OC_BYPASS[1]
	OC_STANDBY	Don't Care	OC_BYPASS[1]
	OC_NUL	OC_OCCUPIED[3]	OC_OCCUPIED
		OC_UNOCCUPIED	OC_BYPASS[1]
OC_STANDBY	Don't Care	Don't Care	OC_STANDBY

OC_NUL	OC_OCCUPIED	OC_OCCUPIED[3]	OC_OCCUPIED
		OC_UNOCCUPIED	OC_STANDBY
	OC_UNOCCUPIED	Don't Care	OC_UNOCCUPIED
	OC_STANDBY	Don't Care	OC_STANDBY
	OC_NUL	OC_OCCUPIED[3]	OC_OCCUPIED
		OC_UNOCCUPIED	OC_UNOCCUPIED

Notes:

1   OC_BYPASS can be initiated by either nviOccManCmd or a local input. nvoEffectOccup will only be OC_BYPASS for the duration of the Local Bypass Time (nciBypassTime), until re-initiated by either a transition of the local input or an update to nviOccManCmd.

2   The occupancy sensor can be either a local input or a network input. If a valid value for the network input is present, it has precedence over a local input.

3   For the occupancy sensor, OC_NUL (and no local input) is interpreted as OC_OCCUPIED.

4   For nviOccSchedule, this refers to the " current state" field.

5   " Don't Care" = Any State

Valid Range

0 = OC_OCCUPIED: The Unit Ventilator Controller should operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

1 = OC_UNOCCUPIED: The Unit Ventilator Controller should operate in the unoccupied mode as defined by the manufacturer (e.g. unoccupied setpoint).

2 = OC_BYPASS: The Unit Ventilator Controller should operate in the occupied mode for a period of time defined by nciBypassTime.

3 = OC_STANDBY: The Unit Ventilator Controller should operate in the standby mode as defined by the manufacturer (e.g. standby setpoint).

When Transmitted
The variable is transmitted immediately when its value has changed. Additionally, this network variable may also (as defined by the manufacturer) be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt)configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Effective Heat/Cool Output

network output SNVT_hvac_mode nvoHeatCool

This output network variable is used to indicate the actual heat/cool mode of the unit. This information is typically reported to a supervisory controller, or provided to another Unit Ventilator Controller to coordinate the operation of multiple units. The heat/cool mode is determined by a combination of optional input network variables and logic in the controller. The " mode" value reported in nvoUnitStatus is typically the same as nvoHeatCool, except when nviApplicMode is HVAC_TEST.

Valid Range
The valid range is described in the table below:

    1 = HVAC_HEAT (Controller is using heat setpoints)

    2 = HVAC_MRNG_WRMUP (Morning warmup)

    3 = HVAC_COOL (Controller is using cool setpoints)

    4 = HVAC_NIGHT_PURGE (Free cooling)

    5 = HVAC_PRE_COOL (Morning cooldown)

    6 = HVAC_OFF (No unit operation allowed)

    7 = HVAC_TEST (Special test mode, manufacturer-defined)

    8 = HVAC_EMERG_HEAT (Emergency heat)

    9 = HVAC_FAN_ONLY (No heating or cooling allowed)

The value of nvoHeatCool is determined by the values of nviApplicMode, nviHeatCool and logic in the controller, as described in the following table.

Effective Heat/Cool Output

nviApplicMode	nviHeatCool	nvoHeatCool[1]
HVAC_AUTO	HVAC_AUTO	Determined by Controller
HVAC_NUL	HVAC_HEAT	HVAC_HEAT
	HVAC_MRNG_WRMUP	HVAC_MRNG_WRMUP
	HVAC_COOL	HVAC_COOL
	HVAC_NIGHT_PURGE	HVAC_NIGHT_PURGE
	HVAC_PRE_COOL	HVAC_PRE_COOL
	HVAC_OFF	HVAC_OFF
	HVAC_TEST	HVAC_TEST
	HVAC_EMERG_HEAT	HVAC_EMERG_HEAT
	HVAC_FAN_ONLY	HVAC_FAN_ONLY
	HVAC_NUL	Determined by Controller
HVAC_HEAT	Don't Care	HVAC_HEAT
HVAC_MRNG_WRMUP[3]	Don't Care[3]	HVAC_MRNG_WRMUP[3]
HVAC_COOL	Don't Care	HVAC_COOL
HVAC_NIGHT_PURGE	Don't Care	HVAC_NIGHT_PURGE
HVAC_PRE_COOL	Don't Care	HVAC_PRE_COOL
HVAC_OFF	Don't Care	HVAC_OFF
HVAC_TEST[1]	Don't Care	Manufacturer Defined[2]
HVAC_EMERG_HEAT	Don't Care	HVAC_EMERG_HEAT
HVAC_FAN_ONLY	Don't Care	HVAC_FAN_ONLY

Notes:

1 The "mode" field of nvoUnitStatus will typically report the same value as nvoHeatCool, unless nviApplicMode is HVAC_TEST. (See note 2)

2 The "mode" field of nvoUnitStatus will report HVAC_TEST. Only the value of nvoHeatCool is manufacturer-defined.

3 If nviApplicMode = HVAC_MRNG_WRMUP and nviHeatCool = HVAC_EMERG_HEAT, then nvoHeatCool = HVAC_EMERG_HEAT.

4 "Don't Care" = Any State

When Transmitted
This variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type

The default service type is unacknowledged.

Local Setpoint Output

network output SNVT_temp_p nvoSetpoint;

This output network variable is used to monitor the space temperature setpoint if a setpoint device is locally wired. If this setpoint is not locally wired, the output will send the invalid value.

Typical Range

The typical range is 10°C to 35°C. The value 0x7FFF=+327.67°C will be sent as an invalid value in case of a setpoint device failure.

When Transmitted

The variable is transmitted immediately when its value has changed significantly (manufacturer defined). Additionally, this network variable may also (as defined by the manufacturer) be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt)configuration value.

Update Rate

This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type

The default service type is unacknowledged.

Local Setpoint Shift Output

network output SNVT_temp_setpt nvoSetptShift;

This output network variable is used to report a locally-determined shift of the effective heat/cool setpoints. For example, if the controller uses local outdoor air temperature compensation logic to shift the heat/cool setpoints, the amount of that shift (for each setpoint) is reported by nvoSetptShift. (Note: This output only reports a locally-calculated shift, and is not affected by nviSetptShift.) It is typically bound to a supervisory node for monitoring, or to nviSetptShift on another controller node to provide an equivalent setpoint shift in that controller.

Valid Range

	Minimum	Maximum
occupied_cool	-10°C	+10°C
standby_cool	-10°C	+10°C
unoccupied_cool	-10°C	+10°C
occupied_heat	-10°C	+10°C
standby_heat	-10°C	+10°C
unoccupied_heat	-10°C	+10°C

The valid range for each shift value is -10°C to +10°C. A value of 0°C
indicates that there is no local shift in effect for the corresponding
setpoint.

When Transmitted
This variable is transmitted immediately when its value has changed
significantly. Additionally, this network variable will also be
transmitted as a heartbeat output on a regular basis as dictated by the
Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Fan Speed Output

network output SNVT_switch nvoFanSpeed;

This output network variable reflects the actual fan speed of a local
multi-speed fan as well as the requested speed of a remote fan. It can
be used as part of a control loop and for monitoring purposes.

When used to control a remote fan, this output indicates a requested fan
speed. When used to report the status of a hardwired fan output(s),
this output indicates the actual fan speed.

Valid Range

State	Value	Equivalent Percent	Actual or Requested Fan State	Actual or Requested Fan Speed
0	n/a	n/a	OFF	n/a
1	1 to 199	0.5 to 99.5%	ON	Mfgr. Defined
1	200	100.0%	ON	High or 100%
0xFF	n/a	n/a	Invalid	Invalid

When Transmitted
This variable is transmitted immediately when its value has changed
significantly. Additionally, this network variable will also be
transmitted as a heartbeat output on a regular basis as dictated by the
Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type

The default service type is unacknowledged.

Discharge Air Temperature Output

network output SNVT_temp_p nvoDischAirTemp;

This output network variable is used to monitor the temperature of the air that leaves the Unit Ventilator Controller, if the unit controller provides a hardwired temperature sensor for this purpose.

Typical Range

The typical range is 0°C to 100°C. The value 0x7FFF=+327.67°C will be sent as an invalid value in case of a sensor failure.

When Transmitted

The variable is transmitted immediately when its value has changed significantly (manufacturer defined). Additionally, this network variable may also (as defined by the manufacturer) be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt)configuration value.

Update Rate

This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type

The default service type is unacknowledged.

Absolute Power Consumption KW Output

network output SNVT_power_kilo nvoLoadAbsK;

This output network variable can used to indicate the current power consumption of the unit. Since this value is unsigned, the Terminal Load output (nvoTerminalLoad) must be used to determine if the power consumption is currently being used for heating or cooling. The determination of this value is manufacturer-defined, based on the type of unit and its application.

Typical Range

The typical range is 0.0 to 200.0 Kilowatts.

When Transmitted

The variable is transmitted immediately when its value has changed significantly (manufacturer defined). Additionally, this network variable may also (as defined by the manufacturer) be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt)configuration value.

Update Rate

This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Terminal Load Output

network output SNVT_lev_percent nvoTerminalLoad;

This output indicates the current heat/cool energy demand of the unit. Positive values indicate that cooling energy is required (or in use) by the Unit Ventilator controller, while negative values indicate that heating energy is required (or in use) by the Unit Ventilator controller.

The actual determination of the value of nvoTerminalLoad is manufacturer-defined. One typical method is to report the output of the heating/cooling control algorithm. Another method is to report only the heating/cooling energy required from a central source, such as a water loop or air handling unit.

Typical Range

The typical range is -100.0% to 100.0%.

When Transmitted

This variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate

This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type

The default service type is unacknowledged.

Primary Heat Output

network output SNVT_lev_percent nvoHeatPrimary;

This output network variable reflects the current level of the primary heat output (if hardwired) or can be used to control a remote primary heat source (valve, compressor, etc.).

Valid Range

The valid range is 0% to 100% of primary heat capacity. The value 0x7FFF = +163.835 % will be sent as an invalid value to indicate that no primary heat is used.

When Transmitted

This variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Secondary Heat Output

network output SNVT_lev_percent   nvoHeatSecondary;

This output network variable reflects the current level of the secondary
heat output (when present) or can be used to control a remote secondary
heat source (valve, electric heat, etc.).

Valid Range
The valid range is 0% to 100% of secondary heat capacity. The value
0x7FFF = +163.835 % will be sent as an invalid value to indicate that no
secondary heat is used.

When Transmitted
This variable is transmitted immediately when its value has changed
significantly. Additionally, this network variable will also be
transmitted as a heartbeat output on a regular basis as dictated by the
Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Primary Cool Output

network output SNVT_lev_percent   nvoCoolPrimary;

This output network variable reflects the current level of the primary
mechanical cooling output (if hardwired) or can be used to control a
remote mechanical cooling source.

Valid Range
The valid range is 0% to 100% of primary cooling capacity. The value
0x7FFF = +163.835 % will be sent as an invalid value to indicate that no
cooling is used.

When Transmitted
This variable is transmitted immediately when its value has changed
significantly. Additionally, this network variable will also be
transmitted as a heartbeat output on a regular basis as dictated by the
Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Outdoor Air Damper Output

network output SNVT_lev_percent nvoOADamper;

This output network variable reflects the current position of the
outdoor air damper (if hardwired) or as a request to a remote outdoor
air damper.

Valid Range
The valid range is 0% to 100% outdoor air damper position. The value
0x7FFF = +163.835 % will be sent as an invalid value to indicate that no
outdoor air damper is used.

When Transmitted
This variable is transmitted immediately when its value has changed
significantly. Additionally, this network variable will also be
transmitted as a heartbeat output on a regular basis as dictated by the
Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Space Humidity Output

network output SNVT_lev_percent nvoSpaceRH;

This output network variable indicates the space humidity in percent, if
the Unit Ventilator Controller Device has a locally wired humidity
sensor.

Typical Range
The typical range is 0 % to 100 %. The value 0x7FFF = +163.835 % will
be sent as an invalid value to indicate that the locally wired humidity
sensor is failed.

When Transmitted
This variable is transmitted immediately when its value has changed
significantly. Additionally, this network variable will also be
transmitted as a heartbeat output on a regular basis as dictated by the
Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time
(nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Outdoor Air Humidity Output

network output SNVT_lev_percent nvoOutdoorRH;

This output network variable indicates the outdoor air humidity in percent, if the Unit Ventilator Controller Device has a locally wired humidity sensor.

Typical Range
The typical range is 0 % to 100 %. The value 0x7FFF = +163.835 % will be sent as an invalid value to indicate that the locally wired humidity sensor is failed.

When Transmitted
This variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Outdoor Air Temperature Output

network output SNVT_temp_p nvoOutdoorTemp;

This output network variable is used to monitor the outdoor air temperature if the unit controller provides a hardwired temperature sensor for this purpose.

Typical Range
The typical range is -40°C to 70°C. The value 0x7FFF = +327.67°C will be handled as an invalid value in case of a sensor failure.

When Transmitted
This variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Space CO_2 Sensor Output

network output SNVT_ppm nvoSpaceCO2;

This output network variable indicates the space CO_2 concentration in ppm, if the Unit Ventilator Controller Device has a locally wired CO_2 sensor.

Typical Range
The typical range is 0 to 5000 ppm. The value 0x7FFF = 65,535 is reserved to indicate an invalid value, such as a failed sensor.

When Transmitted
This variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Energy Hold Off Output

network output SNVT_switch nvoEnergyHoldOff;

This output indicates the state of an Energy Hold Off device that is hardwired to the controller. Refer to the Energy Hold Off Input.

Valid Range

State	Value	Energy Hold Off
0	n/a	Normal
1	200	Energy Hold Off
0xFF	n/a	Invalid

When Transmitted
This variable is transmitted immediately when its value has changed significantly. Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

Update Rate
This value will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used (manufacturer-defined).

Default Service Type
The default service type is unacknowledged.

Mandatory Configuration Properties

Send Heartbeat

```
network input config SNVT_time_sec  nciSndHrtBt;
```

This configuration property defines the maximum period of time that
expires before the specified network variable outputs will automatically
be updated. The specific method for sending heartbeat updates is
manufacturer-defined.

Network variable outputs can be defined in 2 categories for the use of
send heartbeat, based upon whether they are specified for send heartbeat
in the Network Variable Outputs Table, as shown below:

Network Variable Output	Specified for Send Heartbeat in Table?	Result: Use Send Heartbeat?
Category 1	Yes	Yes
Category 2	No	Manufacturer-defined

Valid Range
The valid range is any value between 0.0 sec and 6,553.4 sec. Setting
nciSndHrtBt = 0.0 disables the Send Heartbeat mechanism.

Typical Default Value
0 (no automatic update)

SCPT Reference
SCPTmaxSendTime (49)

Occupancy Temperature Setpoints

```
network input config SNVT_temp_setpt  nciSetpoints;
```

This configuration property defines the space temperature setpoints for
the various heat, cool and occupancy modes. The occupied and standby
setpoints are defaults which can be modified by various input variables,
such as nviSetpoint and nviSetpointOffset. The unoccupied setpoints are
always valid.

The values of the individual setpoints within nciSetpoints must be kept
in ascending order as follows: unoccupied_heat ≤ standby_heat ≤
occupied_heat ≤ occupied_cool ≤ standby_cool ≤ unoccupied_cool.

Typical Range and Default Values

	Minimum	Maximum	Default
occupied_cool	10°C	35°C	23 °C
standby_cool	10°C	35°C	25 °C
unoccupied_cool	10°C	35°C	28 °C
occupied_heat	10°C	35°C	21 °C
standby_heat	10°C	35°C	19 °C
unoccupied_heat	10°C	35°C	16 °C

SCPT Reference
SCPTsetPnts (60)

Optional Configuration Properties

Minimum Send Time

```
network input config SNVT_time_sec  nciMinOutTm;
```

This configuration property defines the minimum period of time between automatic network variable output transmissions. The specific use of nciMinOutTm is manufacturer-defined. For example, it can be applied to some network variable outputs (such as sensor values) but not to all network variable outputs.

Although this configuration property is optional, it must be provided if the minimum send time function is used in the controller. If this configuration property is not present, the controller cannot use the minimum send time function.

Valid Range
The valid range is any value between 0.0 sec and 6,553.4 sec. Setting nciMinOutTm = 0.0 disables the Minimum Send Time mechanism.

Typical Default Value
0 (no minimum send time)

SCPT Reference
SCPTminSendTime (52)

Receive Heartbeat

```
network input config SNVT_time_sec  nciRcvHrtBt;
```

This configuration property is used to control the maximum time that elapses after the last update to a specified network variable input before the Unit Ventilator Controller starts to use its default values. Network variable inputs can be defined in 3 categories for use of receive heartbeat, based upon whether they are specified for receive heartbeat in the Network Variable Inputs Table and whether they are bound, as shown below:

Network Variable Input	Specified for Receive Heartbeat in Table?	Bound?	Result: Use Receive Heartbeat?
Category 1	Yes	Yes	Yes
Category 2	Yes	No	Manufacturer-defined
Category 3	No	Don't Care	No

Valid Range
The valid range is any value between 0.0 sec and 6,553.4 sec. Setting nciRcvHrtBt = 0.0 disables the Receive Heartbeat mechanism.

Typical Default Value
0 (no failure detect)

SCPT Reference
SCPTmaxRcvTime (48)

Location Label

network input config SNVT_str_asc nciLocation;

This configuration property can optionally be used to provide more descriptive physical location information than can be provided by the Neuron Chip's 6 byte location string. The location relates to the object and not to the node.

Valid Range
Any NULL terminated ASCII string of 31 bytes total length.

Typical Default Value
The typical default value is an ASCII string containing all zeros
(" \0").

SCPT Reference
SCPTlocation (17)

Local Bypass Time

network input config SNVT_time_min   nciBypassTime;

This configuration property defines the maximum amount of time that the controller can be in the Bypass (occupancy) mode following a single Bypass request from either a local (hardwired) bypass switch or nviOccManCmd. Additional Bypass requests can restart the timer.

Typical Range
The typical range is 0 to 240 minutes (4 hours). Setting nciBypassTime = 0 disables the Bypass function.

Typical Default Value
0 (no bypass allowed)

SCPT Reference
SCPTbypassTime (34)

Manual Override Time

network input config SNVT_time_min nciManualTime;

This configuration property is used to set the maximum time that the controller will stay in a manual mode that was requested by a network variable input, without receiving an update on that network variable. For example, if a override request is received on nviValveOverride, and an update is not received within the Manual Override Time, the controller will go back to the default value. Updates to the network variable input will restart the timer. The specific network variable inputs that this timer is used for is manufacturer-defined.

Typical Range

The typical range is 0 to 240 minutes (4 hours). Setting
nciManualTime = 0 disables the timer function.

Typical Default Value

0 (no timer function)

SCPT Reference

SCPTmanovrTime (35)

Outdoor Air Damper Minimum Position

network input config SNVT_lev_percent nciOAMinPos;

This configuration property indicates the outdoor air damper minimum
position. The controller will use this value in modes where outdoor air
ventilation is required.

Typical Range

0 to 100%.

Typical Default Value

10%.

SCPT Reference

SCPTminRnge (23)

Space CO2 Limit

network input config SNVT_ppm nciSpaceCO2Lim;

This configuration property defines a high limit CO2 setpoint for the
controlled space. The controller ventilation functions, in response to
this limit, are manufacturer-defined.

Typical Range

300 to 3000 PPM. A value of 0 PPM will disable the CO2 Limit functions
in the controller.

Typical Default Value

0 (no limit functions)

SCPT Reference

SCPTlimitCO2 (42)

Space Humidity Setpoint

network input config SNVT_lev_percent nciSpaceRHSetpt;

This configuration property defines a high limit humidity setpoint for
the controlled space. The controller dehumidification functions, in
response to this limit, are manufacturer-defined.

Typical Range
40 to 100%. A value of 0% will disable the dehumidification functions
in the controller.

Typical Default Value
0% (no dehumidification functions)

SCPT Reference
SCPThumSetpt (36)

Number of Heating/Cooling Valves

network input config SNVT_count nciNumValve;

This configuration property indicates whether the controller is used in
a two-pipe (one valve) or four-pipe (two valves) system.

Valid Range
The value 1 indicates a single valve (two-pipe system) and the value 2
indicates two valves (four-pipe system).

Typical Default Value
2

SCPT Reference
SCPTnumValves (59)

Data Transfer

None specified.

Power-up State

None specified.

Boundary and Error Conditions

None specified.

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