Version 1.0
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Space Comfort Controller : 8500_10

LONMARK® Functional Profile: Space Comfort Controller

This profile describes the following Space Comfort Controller (SCC) Object types:

Object Types	Description
8500	SCC – Generic
8501	SCC – Fan Coil
8502	SCC – VAV
8503	SCC – Heat Pump
8504	SCC – Rooftop
8505	SCC – Unit Ventilator
8506	SCC – Chilled Ceiling
8507	SCC – Radiator
8508	SCC – AHU
8509	SCC – Self-Contained

Overview

This document is a Functional Profile that describes object types for a category of controllers known as Space Comfort Controllers. A Space Comfort Controller is any one of several types of HVAC unit controllers that provide space temperature control (and other related functions) for a room or "space" within a building. A Space Comfort Controller maintains the desired space temperature by controlling any combination of heat and cool actuator outputs as well as a unit fan.

Some common types of Space Comfort Controllers include:

- Fan Coil Unit Controllers
- Classroom Unit Ventilator Controllers
- Rooftop Air Conditioner Controllers
- Heat Pump Controllers (Air-to-Air and Water-Source)
- Variable Air Volume Unit Controllers
- General Purpose Space Comfort Controllers
- Radiator and/or Floor Heating Controllers
- Chilled Ceiling Controllers

A family of LONMARK objects is defined in this document that apply to the following types of space comfort controller devices

Object Types	Description
8500	SCC – Generic
8501	SCC – Fan Coil
8502	SCC – VAV
8503	SCC – Heat Pump
8504	SCC – Rooftop
8505	SCC – Unit Ventilator
8506	SCC – Chilled Ceiling
8507	SCC – Radiator
8508	SCC – AHU
8509	SCC – Self-Contained

Space Comfort Controller object types 8501-8509 indicate directly the primary application and equipment type for the device. By making use of SCC object types 8501-8509 in a SCC device a system integrator is able to directly read from the self-documentation in the device the primary application and equipment type.

If Space Comfort Controller object type 8500 is used then the inclusion of SCPThvacType is mandatory in order to indicate the application and equipment type for the device. When SCC object type 8500 is used a system integrator cannot determine the primary application and equipment type directly from the node self-documentation but requires the additional step of reading the SCPThvacType configuration property. For this reason the use of SCC object types 8501-8509 is recommended to simplify integration of SCC devices.

Example Usage

The Space Comfort 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
- wall-mounted human interface module (including 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)
- outdoor air damper actuator (0..100%)
- other nodes as required

Figure 1.1 shows an example of a Water-Source Heat Pump (WSHP) system. In this example, the WSHP Unit Controller nodes are space comfort controllers that use object type 8503 the SCC-Heat Pump object.

Figure 1.2 shows an example of a Variable Air Volume (VAV) system. In this example, the VAV Unit Controller nodes are space comfort controllers that use object type 8502 the SCC-VAV object.

REMARKS

Valid Ranges

In this document, the term "Valid Range" is used to indicate the minimum range of input values that a Space Comfort Controller object must be able to accept. Product manufacturers can choose to support a broader range in a product, at their discretion.

Mandatory Variables and Configuration Properties

In this document, mandatory variables and properties indicate the minimum features that a Space Comfort Controller object must support. Other profiles that are derived from this template can have additional mandatory features.

Typical Default Values

In this document, the term “Typical Default Value” is used to indicate a typical value for a manufacturer-specified default. This term is commonly used for Configuration Properties, whose default values are all manufacturer-defined.

Methods for Implementing Configuration Properties

Configuration Properties can be implemented as either Configuration Network Variables or by using Direct Memory Read/Write and Standard Configuration Property Type (SCPT) references. The device manufacturer needs to determine the best method for the intended application.

Water Source Heat Pump (WSHP) System using SCC – HeatPump Object type 8503

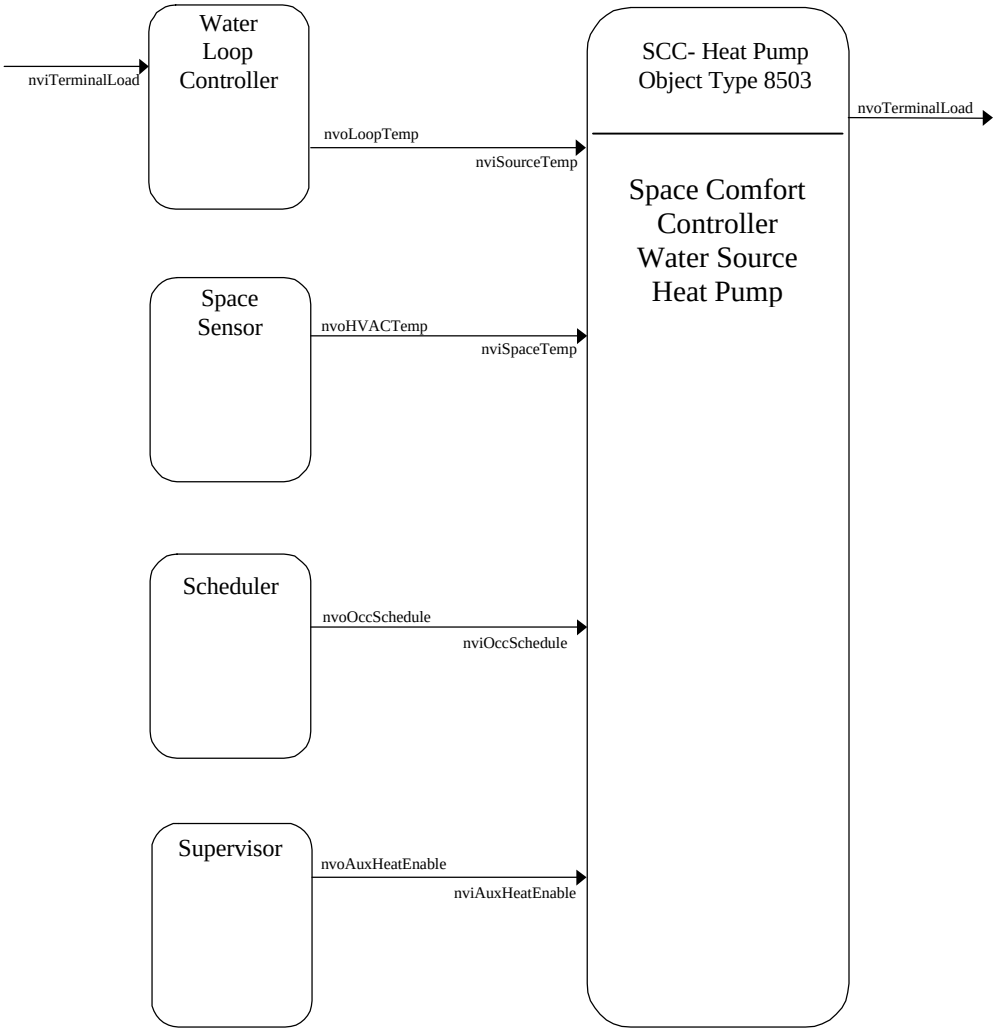

Figure 1.1 WSHP System Drawing

Variable Air Volume (VAV) System using SCC – VAV Object Type 8502

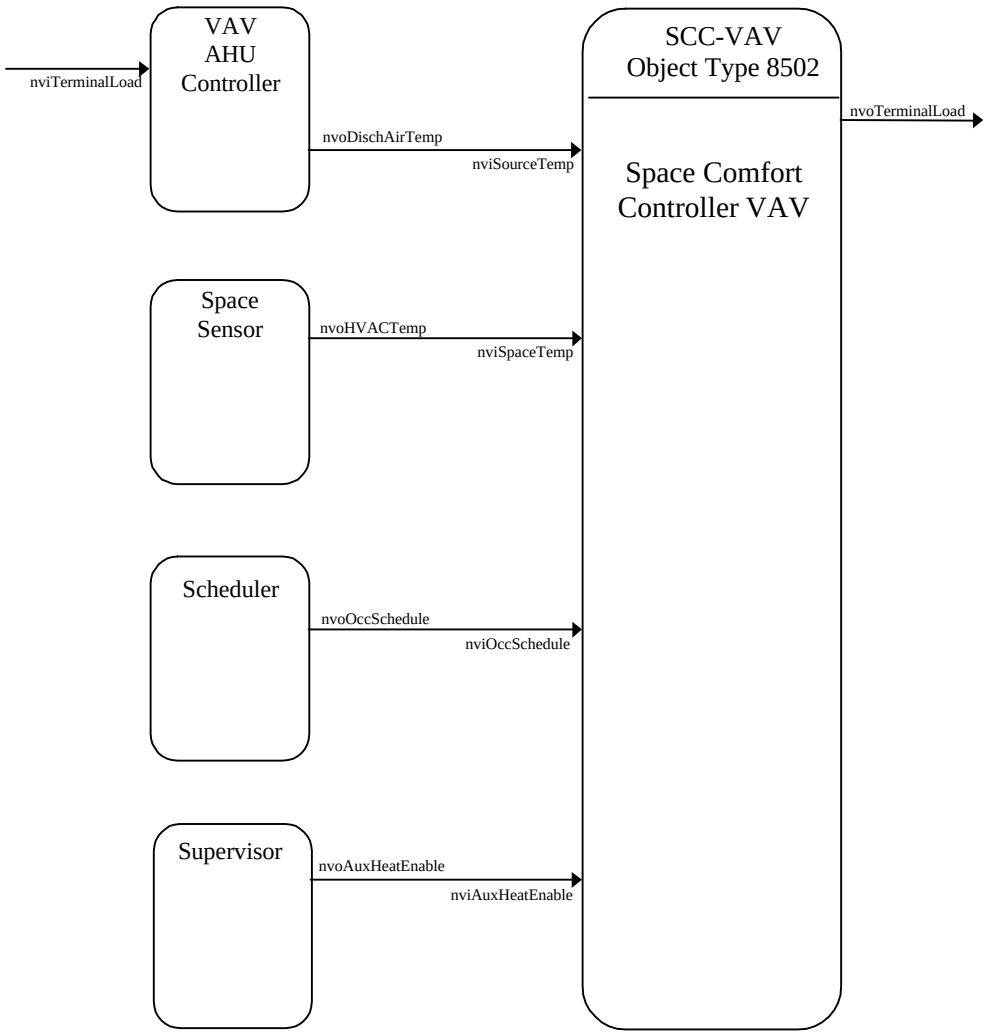

Figure 1.2 VAV System Drawing

Space Comfort Controller Object Details for object types 8500, 8501, 8502, 8503, 8504, 8505, 8506, 8507, 8508, 8509

Table 2.1: 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)	nviFlowOverride	No	SNVT_hvac_overid	111	RAM	Air Flow Override Input
17 (O)	nviEmergOverride	No	SNVT_hvac_emerg	103	RAM	Emergency Override Input
18 (O)	nviSourceTemp	Yes	SNVT_temp_p	105	RAM	Source Temperature Input
19 (O)	nviOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor Air Temperature Input
20 (O)	nviSpaceRH	Yes	SNVT_lev_percent	81	RAM	Space Humidity Input
21 (O)	nviOutdoorRH	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Humidity Input
22 (O)	nviSpaceCO2	Yes	SNVT_ppm	29	RAM	Space CO_2 Sensor Input
23 (O)	nviSpaceDewPt	Yes	SNVT_temp_p	105	RAM	Space Dew Point Temperature Input
24 (O)	nviOutdoorDewPt	Yes	SNVT_temp_p	105	RAM	Outdoor Air Dew Point Temp. Input
25 (O)	nviAirflow	Yes	SNVT_flow	15	RAM	Air Flow Input

53 (O)	nviHeatSrcTemp	Yes	SNVT_temp_p	105	RAM	Heat Source Temperature Input
54 (O)	nviCoolSrcTemp	Yes	SNVT_temp_p	105	RAM	Cool Source Temperature Input
55 (O)	nviHeatPriSlave	Yes	SNVT_lev_percent	81	RAM	Primary Heat Input for Slave Operation
56 (O)	nviHeatSecSlave	Yes	SNVT_lev_percent	81	RAM	Secondary Heat Input for Slave Operation
57 (O)	nviCoolPriSlave	Yes	SNVT_lev_percent	81	RAM	Primary Cool Input for Slave Operation
58 (O)	nviCoolSecSlave	Yes	SNVT_lev_percent	81	RAM	Secondary Cool Input for Slave Operation

** M = mandatory, O = optional

Table 2.2: Network Variable Outputs

NV # (M/O)**	Name	Send HrtBt	SNVT Type	SNVT Index	Class	Description
26 (M)	nvoSpaceTemp	Yes	SNVT_temp_p	105	RAM	Effective Space Temperature Output
27 (M)	nvoUnitStatus	Yes	SNVT_hvac_status	112	RAM	Unit Status Output
28 (O)	nvoEffectSetpt	Yes	SNVT_temp_p	105	RAM	Effective Setpoint Output
29 (O)	nvoEffectOccup	No	SNVT_occupancy	109	RAM	Effective Occupancy Output
30 (O)	nvoHeatCool	Yes	SNVT_hvac_mode	108	RAM	Effective Heat/Cool Output
31 (O)	nvoSetpoint	No	SNVT_temp_p	105	RAM	Local Setpoint Output
32 (O)	nvoSetptShift	Yes	SNVT_temp_setpt	106	RAM	Local Setpoint Shift Output
33 (O)	nvoFanSpeed	Yes	SNVT_switch	95	RAM	Fan Speed Output
34 (O)	nvoDischAirTemp	No	SNVT_temp_p	105	RAM	Discharge Air Temperature Output
35 (O)	nvoLoadAbs	No	SNVT_power	27	RAM	Absolute Power Consumption Output
36 (O)	nvoLoadAbsK	No	SNVT_power_kilo	28	RAM	Absolute Power Consumption KW Output
37 (O)	nvoTerminalLoad	Yes	SNVT_lev_percent	81	RAM	Terminal Load Output
38 (O)	nvoHeatPrimary	Yes	SNVT_lev_percent	81	RAM	Primary Heat Output
39 (O)	nvoHeatSecondary	Yes	SNVT_lev_percent	81	RAM	Secondary Heat Output
40 (O)	nvoCoolPrimary	Yes	SNVT_lev_percent	81	RAM	Primary Cool Output
41 (O)	nvoCoolSecondary	Yes	SNVT_lev_percent	81	RAM	Secondary Cool Output
42 (O)	nvoOADamper	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Damper Output
43 (O)	nvoSpaceRH	Yes	SNVT_lev_percent	81	RAM	Space Humidity Output
44 (O)	nvoOutdoorRH	Yes	SNVT_lev_percent	81	RAM	Outdoor Air Humidity Output
45 (O)	nvoOutdoorTemp	Yes	SNVT_temp_p	105	RAM	Outdoor Air Temperature Output
46 (O)	nvoSpaceCO2	Yes	SNVT_ppm	29	RAM	Space CO_2 Sensor Output
47 (O)	nvoSpaceDewPt	Yes	SNVT_temp_p	105	RAM	Space Dewpoint Temperature Output
48 (O)	nvoHumidifier	Yes	SNVT_lev_percent	81	RAM	Humidifier Output
49 (O)	nvoEnergyHoldOff	Yes	SNVT_switch	95	RAM	Energy Hold Off Output
50 (O)	nvoEffectFlowSP	No	SNVT_flow	15	RAM	Effective Air Flow Setpoint Output
51 (O)	nvoFlowSetpoint	Yes	SNVT_lev_percent	81	RAM	Flow Control Damper Setpoint Output
52 (O)	nvoAirflow	Yes	SNVT_flow	15	RAM	Air Flow Output

** M = mandatory, O = optional

Table 2.3: 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 CO_2 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
12 (O)	nciDuctArea	46	SNVT_area (110)	NVM	Duct Area
13 (O)	nciNomFlow	57	SNVT_flow (15)	NVM	Nominal Air Flow
14 (O)	nciFlowGain	67	SNVT_multiplier (82)	NVM	Air Flow Measurement Gain
15 (O)	nciMinFlow	54	SNVT_flow (15)	NVM	Minimum Air Flow
16 (O)	nciMaxFlow	51	SNVT_flow (15)	NVM	Maximum Air Flow
17 (O)	nciMinFlowHeat	55	SNVT_flow (15)	NVM	Heating Minimum Air Flow
18 (O)	nciMaxFlowHeat	37	SNVT_flow (15)	NVM	Heating Maximum Air Flow
19 (O)	nciMinFlowStdby	56	SNVT_flow (15)	NVM	Standby Minimum Air Flow
20 (M)	nciHvacType		SNVT_hvac_ type	NVM	HVAC Unit-Type Identifier (required for Device Class 85.00 only)

** M = mandatory, O = optional

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 Space Comfort 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.

Effective Space Temperature Output

```
network output SNVT_temp_p  nvoSpaceTemp;
```

This output network variable is used to monitor the effective space temperature that the Space Comfort 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.

Unit Status Output

```
network output SNVT_hvac_status  nvoUnitStatus;
```

This output network variable is available to report the Space Comfort 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, HVAC_MAX_HEAT.
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.

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, nviSetptOffset and/or nviSetptShift 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 Space Comfort 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, nviSetptOffset and/or nviSetptShift 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 Space Comfort 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 Space Comfort Controller should operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

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

3 = OC_STANDBY: The Space Comfort 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 Space Comfort Controller will operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

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

3 = OC_STANDBY: The Space Comfort 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 Space Comfort 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 Space Comfort Controller should operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

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

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

3 = OC_STANDBY: The Space Comfort 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 Space Comfort 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 Space Comfort 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)

12 = HVAC_MAX_HEAT (Maximum heating - VAV)

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 Space Comfort Controller with any node that may need to control the heat/cool changeover of the unit. For example, one Space Comfort Controller node may coordinate it's heat/cool mode with another Space Comfort 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)

12 = HVAC_MAX_HEAT (Maximum heating - VAV)

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 a WSHP system, 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).

Air Flow Override Input

```
network input SNVT_hvac_overid  nviFlowOverride;
```

This input network variable is used for commanding the controller into a manual mode for overriding air flow control (most commonly when air balancing the system). This input would typically be initiated from a supervisory controller or service tool. It can be used to override heating and/or cooling flow devices. 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 damper position to the value in the percent field.

2 = HVO_FLOW_VALUE: Control flow to the value in the flow field.

3 = HVO_FLOW_PERCENT: Control flow to the value in the percent field. This is a percent of the maximum flow setting.

4 = HVO_OPEN: Fully open the damper.

5 = HVO_CLOSE: Fully close the damper.

6 = HVO_MINIMUM: Control flow to the minimum flow setting.

7 = HVO_MAXIMUM: Control flow to the maximum flow setting.

8 – 16 = Unused

17 = HVO_POSITION_1: Set heating damper position to the value in the percent field.

18 = HVO_FLOW_VALUE_1: Control heating flow to the value in the flow field.

19 = HVO_FLOW_PERCENT_1: Control heating flow to the value in the percent field. This is a percent of the maximum flow setting.

20 = HVO_OPEN_1: Fully open the heating damper.

21 = HVO_CLOSE_1: Fully close the heating damper.

22 = HVO_MINIMUM_1: Control heating flow to the minimum flow setting.

23 = HVO_MAXIMUM_1: Control heating flow to the maximum flow setting.

24 – 32 = Unused

33 = HVO_POSITION_2: Set cooling damper position to the value in the percent field.

34 = HVO_FLOW_VALUE_2: Control cooling flow to the value in the flow field.

35 = HVO_FLOW_PERCENT_2: Control cooling flow to the value in the percent field. This is a percent of the maximum flow setting.

36 = HVO_OPEN_2: Fully open the cooling damper.

37 = HVO_CLOSE_2: Fully close the cooling damper.

38 = HVO_MINIMUM_2: Control cooling flow to the minimum flow setting.

39 = HVO_MAXIMUM_2: Control cooling flow to the maximum flow setting.

40 – 48 = Unused

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

for percent: 0 to 100%

for flow: 0 to 65,534 liters/sec

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 air or 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 CO_2 Sensor Input

```
network input SNVT_ppm  nviSpaceCO2;
```

This input network variable measures the space CO_2 levels in PPM. The unit can also have a locally wired CO_2 sensor. Valid values of `nviSpaceCO2` have priority over local sensor values.

Valid Range

The valid range is 0 to 5000 PPM. The value 0xFFFF = 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.

Space Dew Point Temperature Input

```
network input SNVT_temp_p  nviSpaceDewPt;
```

This input network variable is the measured space dew point temperature. This input is typically sent from either a supervisory controller or communicating sensor. Valid values of `nviSpaceDewPt` have priority over local sensor values.

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

Outdoor Air Dew Point Temperature Input

```
network input SNVT_temp_p  nviOutdoorDewPt;
```

This input network variable is the measured outdoor dew point temperature. This input is typically sent from either a supervisory controller or communicating sensor. Valid values of `nviOutdoorDewPt` 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.

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.

Air Flow Input

```
network input SNVT_flow  nviAirFlow;
```

The measured supply air flow value is typically provided by a flow sensor on the network. This value would be communicated as an input to a controller. Valid values of `nviAirFlow` have priority over local sensor values.

Valid Range
The valid range is 0 to 65,534 liters/sec. The value 0xFFFF=65,535 liters/sec will be handled as an invalid value.

Default Value
Default Value is 0x7FFF (65,535 liters/sec). This value will be adopted at power-up and in case of not receiving an update within the specified receive heartbeat time.

Heat Source Temperature Input

```
network input SNVT_temp_p  nviHeatSrcTemp;
```

This input network variable is used to indicate the temperature of the air or water being supplied to the unit for heating 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 `nviHeatSrcTemp` 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.

Cool Source Temperature Input

```
network input SNVT_temp_p  nviCoolSrcTemp;
```

This input network variable is used to indicate the temperature of the air or water being supplied to the unit for 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 `nviCoolSrcTemp` have priority over local sensor values.

Valid Range

The valid range is 0°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.

Primary Heat Input for Slave Operation

```
network input SNVT_lev_percent  nviHeatPriSlave;
```

This input network variable is intended for slave operation. It is typically bound to the output `nvoHeatPrimary` of a master controller. When the controller is in slave mode the value of `nviHeatPriSlave` will be used to control the primary heat source i.e. any control algorithm in the slave controller is bypassed.

The mechanism for enabling of slave mode is manufacturer dependant.

Valid Range

The valid range is 0% to 100%. The value 0x7FFF = +163.84 % will be handled as an invalid value.

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.

Secondary Heat Input for Slave Operation

```
network input SNVT_lev_percent  nviHeatSecSlave;
```

This input network variable is intended for slave operation. It is typically bound to the output `nvoHeatSecondary` of a master controller. When the controller is in slave mode the value of `nviHeatSecSlave` will be used to control the secondary heat source i.e. any control algorithm in the slave controller is bypassed.

The mechanism for enabling of slave mode is manufacturer dependant.

Valid Range

The valid range is 0% to 100%. The value 0x7FFF = +163.84 % will be handled as an invalid value.

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.

Primary Cool Input for Slave Operation

```
network input SNVT_lev_percent  nviCoolPriSlave;
```

This input network variable is intended for slave operation. It is typically bound to the output `nvoCoolPrimary` of a master controller. When the controller is in slave mode the value of `nviCoolPriSlave` will be used to control the primary cool source i.e. any control algorithm in the slave controller is bypassed.

The mechanism for enabling of slave mode is manufacturer dependant.

Valid Range

The valid range is 0% to 100%. The value 0x7FFF = +163.84 % will be handled as an invalid value.

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.

Secondary Cool Input for Slave Operation

```
network input SNVT_lev_percent  nviCoolSecSlave;
```

This input network variable is intended for slave operation. It is typically bound to the output `nvoCoolSecondary` of a master controller. When the controller is in slave mode the value of `nviCoolSecSlave` will be used to control the secondary cool source i.e. any control algorithm in the slave controller is bypassed.

The mechanism for enabling of slave mode is manufacturer dependant.

Valid Range

The valid range is 0% to 100%. The value 0x7FFF = +163.84 % will be handled as an invalid value.

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.

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.

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 Space Comfort 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 Space Comfort Controller should operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

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

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

3 = OC_STANDBY: The Space Comfort 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 Space Comfort 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)

12 = HVAC_MAX_HEAT (Maximum heating - VAV)

The value of nvoHeat Cool 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_MAX_HEAT	HVAC_MAX_HEAT
	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
HVAC_MAX_HEAT	Don't Care	HVAC_MAX_HEAT

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 Space Comfort 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 Output

```
network output SNVT_power  nvoLoadAbs;
```

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.

A manufacturer can choose to provide either nvoLoadAbs or nvoLoadAbsK (or both), based on the range required for the application.

Typical Range
The typical range is 0.0 to 6553.5 Watts.

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.

A manufacturer can choose to provide either nvoLoadAbs or nvoLoadAbsK (or both), based on the range required for the 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).

Default Service Type
The default service type is unacknowledged.

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 space comfort controller, while negative values indicate that heating energy is required (or in use) by the space comfort 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.

Examples of Primary and Secondary Heat

HVAC Unit-Type	Primary Heat	Secondary Heat
Fan Coil	Hydronic	Electric
Heat Pump	Compressor	Electric
VAV	Source Air	Electric/Hydronic
Rooftop	Electric/Gas	n/a

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.

Secondary Cool Output

```
network output SNVT_lev_percent  nvoCoolSecondary;
```

This output network variable reflects the current level of the secondary 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 secondary 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 Space Comfort 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 Space Comfort 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 Space Comfort Controller Device has a locally wired CO_2 sensor.

Typical Range
The typical range is 0 to 5000 ppm. The value 0xFFFF = 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.

Space Dewpoint Temperature Output

```
network output SNVT_temp_p  nvoSpaceDewPt;
```

This output network variable indicates the space dew point temperature. This value can be measured or calculated by the Space Comfort Controller.

Typical Range

The typical range is -10°C to 50°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.

Humidifier Output

```
network output SNVT_lev_percent  nvoHumidifier;
```

This output network variable reflects the current value of the humidifier (if hardwired) or can be used to control a remote humidifier or control valve.

Valid Range

The valid range is 0% to 100%. The value 0x7FFF = +163.835 % will be sent as an invalid value to indicate that no humidifier 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.

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.

Effective Air Flow Setpoint Output

```
network output  SNVT_flow   nvoEffectFlowSP;
```

This output network variable is used to indicate the active flow setpoint used by the flow control loop. It can be used for monitoring purposes or used with a compatible remote flow control device.

Valid Range

The valid Range is 0 to 65,534 liters/sec. The value 0xFFFF=65,535 will be handled as an invalid value.

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.

Flow Control Damper Setpoint Output

```
network output  SNVT_lev_percent   nvoFlowSetpoint;
```

This output network variable is used to indicate the active flow setpoint used by the flow control loop. It represents the flow setpoint as a percent of the Nominal Air Flow (nciNomFlow) of the unit. It can be used for monitoring purposes or used with a compatible remote flow control device.

Valid Range
The valid Range is 0 to 163 %. The value 0x7FFF = +163.835 % will be sent as an invalid value.

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.

Air Flow Output

```
network output  SNVT_flow   nvoAirflow;
```

The output network variable is used to indicate the measured air flow in the unit.

Valid Range
The valid Range is 0 to 65,534 liters/sec. The value 0xFFFF=65,535 will be handled as an invalid value.

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.

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)

HVAC Unit-Type Identifier

```
network input config SNVT_hvac_type  nciHvacType;
```

If the SCC-Generic object type is selected then the use of SCPThvacType is mandatory to indicate the primary application and equipment type for the space comfort controller device. For other SCC object types the application and equipment type can be determined directly from the object type and corresponding device class within the standard program id.

The HVAC Unit-Type configuration property is only required for Device Class 85.00, SCC – Generic. It can be polled by a tool or an operator interface device, to help the user identify the type of equipment.

The HVAC Unit-Type is typically either set at the time of manufacture or set by a configuration tool, which is used to select various controller functions. Although the HVAC Unit-Type can be read via the network, it typically should not be changed. The configuration property SCPThvacType should be declared using the device_specific_flg so that it can be protected by the network configuration tool to avoid inadvertent modification in the field by the installer. The use of the device_specific_flg will also allow devices to a have common *.XIF file where the only network interface difference is the value of this configuration property. If it is changed, the user must verify the application for the selected HVAC Unit-Type.

Valid Range

The following HVAC Unit-Types can be selected:

Value	*Identifier*	*Name*
0	HVT_GENERIC	Generic
1	HVT_FAN_COIL	Fan Coil
2	HVT_VAV	Variable Air Volume Terminal
3	HVT_HEAT_PUMP	Heat Pump
4	HVT_ROOFTOP	Rooftop Unit
5	HVT_UNIT_VENT	Unit Ventilator
6	HVT_CHILL_CEIL	Chilled Ceiling
7	HVT_RADIATOR	Radiator
8	HVT_AHU	Air Handling Unit
9	HVT_SELF_CONT	Self-Contained Unit

Typical Default Value

0 = HVT_GENERIC = Generic

SCPT Reference

SCPThvacType (169)

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 Space Comfort 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 CO_2 Limit

```
network input config SNVT_ppm  nciSpaceCO2Lim;
```

This configuration property defines a high limit CO_2 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 CO_2 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)

Duct Area

```
network input config SNVT_area  nciDuctArea;
```

This configuration property is used to provide the nominal cross-sectional airflow area of a VAV terminal. This value is necessary to determine the airflow (liters/sec) of the VAV terminal from the measured airflow velocity.

Typical Range
0.0000 to 5.0000 square meters

Typical Default Value
0

SCPT Reference
SCPTductArea (46)

Nominal Air Flow

```
network input config SNVT_flow  nciNomFlow;
```

This configuration property is used to provide the nominal airflow volume of a VAV terminal.

Typical Range
0 to 10,000 liters/sec

Typical Default Value
0 liters/sec

SCPT Reference
SCPTnomAirFlow (57)

Air Flow Measurement Gain

```
network input config SNVT_multiplier  nciFlowGain;
```

This configuration property is used to calibrate the airflow reading of a VAV terminal. This value provides a simple method for air balance personnel to correct airflow readings without changing other configuration parameters, and potentially causing configuration errors. The VAV controller multiplies the actual airflow reading by the Air Flow Measurement Gain to determine the corrected airflow reading. This value is nominally 1.000 which results in no airflow reading correction.

Typical Range
0.000 to 2.000

Typical Default Value
1.000

SCPT Reference
SCPTsensConstVAV (67)

Minimum Air Flow

```
network input config SNVT_flow  nciMinflow;
```

This configuration property is used to define the minimum airflow setpoint of a VAV terminal. The value of the minimum flow setpoint must be validated against the value of the maximum flow setpoint as follows:

$0 \leq$ minimum flow setpoint $\leq$ maximum flow setpoint

Typical Range
0 to 10,000 liters/sec

Typical Default Value
0 liters/sec

SCPT Reference
SCPTminFlow (54)

Maximum Air Flow

```
network input config SNVT_flow  nciMaxFlow;
```

This configuration property is used to define the maximum airflow setpoint of a VAV terminal. The value of the maximum flow setpoint must be validated against the value of the minimum flow setpoint as follows:

$0 \leq$ minimum flow setpoint $\leq$ maximum flow setpoint

Typical Range
0 to 10,000 liters/sec

Typical Default Value
0 liters/sec

SCPT Reference
SCPTmaxFlow (51)

Heating Minimum Air Flow

```
network input config SNVT_flow  nciMinFlowHeat;
```

This configuration property is used to define the minimum airflow setpoint of a VAV terminal while heating. The value of the heating minimum flow setpoint must be validated against the value of the heating maximum flow setpoint as follows:

0 ≤ heating minimum flow setpoint ≤ heating maximum flow setpoint

Typical Range
0 to 10,000 liters/sec

Typical Default Value
0 liters/sec

SCPT Reference
SCPTminFlowHeat (55)

Heating Maximum Air Flow

```
network input config SNVT_flow  nciMaxFlowHeat;
```

This configuration property is used to define the maximum airflow setpoint of a VAV terminal while heating. The value of the heating maximum flow setpoint must be validated against the value of the heating minimum flow setpoint as follows:

0 ≤ heating minimum flow setpoint ≤ heating maximum flow setpoint

Typical Range
0 to 10,000 liters/sec

Typical Default Value
0 liters/sec

SCPT Reference
SCPTmaxFlowHeat (37)

Standby Minimum Air Flow

```
network input config SNVT_flow  nciMinFlowStdby;
```

This configuration property is used to define the minimum airflow setpoint of a VAV terminal in the Standby (occupancy) mode. The value of the standby minimum flow setpoint must be validated against the value of the maximum flow setpoint as follows:

0 ≤ standby minimum flow setpoint ≤ maximum flow setpoint

Typical Range
0 to 10,000 liters/sec

Typical Default Value
0 liters/sec

Data Transfer

None specified.

Power-up State

There is no immediate network action on Power-up State.

Boundary and Error Conditions

None specified.

Additional Considerations

The HVAC Unit-Type Identifier (SCPThvacType) configuration property is only mandatory if the “SCC – Generic” (Device Class 85.00) object type is selected, to indicate the primary application and equipment type for the SCC device.