LONMARK®
Functional Profile: Wall Unit

SFPTWallUnit
## Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Summary of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>4/19/2014</td>
<td>Initial Version</td>
</tr>
<tr>
<td>1.1</td>
<td>1/18/2015</td>
<td><strong>Correction:</strong> “BIT_8 Manufacture Alarm 2 (optional)” deleted from the documented in_alarm element of nvoUnitStatus. BIT_8 was not in the original version 1 profile resource files and also is not defined in the underlying type definition (SNVT_HVAC_STATUS). It was determined upon review the correction to the profile document is to remove the reference to the non-existent element.</td>
</tr>
</tbody>
</table>
Example Usage

The Wall Unit profile is used for equipment designed to provide compact, single unit heating and cooling capability, often used in a portable building or trailers where no additional heating or cooling source is available or needed. Wall Units combine both heating and cooling capability into a single, compact unit with an integrated controller and are typically either gas or electric based. This profile defines the mandatory and optional network variables, configuration properties, defaults, alarms, and other items necessary to implement an interoperable Wall Unit using the ISO-14908 standard communication protocol and according to the LonMark Interoperability Guidelines as published by LonMark International and the standards adopted by ISO, CEN, and ANSI/CEA. Note that if optional variables are required on a specific project, the specifier must notate that in the project and equipment design specifications.
Object Details

Figure 3 Object Details
Table 1  SNVT Details

<table>
<thead>
<tr>
<th>NV# (M/O)</th>
<th>Data Point Variable Name</th>
<th>SNVT Name</th>
<th>SNVT Index</th>
<th>Description</th>
<th>SNVT Default Value</th>
<th>SNVT Def. Service Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(M)</td>
<td>nviSpaceTemp</td>
<td>SNVT_temp_p</td>
<td>105</td>
<td>Space Temperature Input</td>
<td>+327.67°C/0x7FFF</td>
<td></td>
</tr>
<tr>
<td>2(M)</td>
<td>nviSetpoint</td>
<td>SNVT_temp_p</td>
<td>105</td>
<td>Temperature Setpoint Input (absolute)</td>
<td>+327.67°C/0x7FFF</td>
<td></td>
</tr>
<tr>
<td>3(M)</td>
<td>nviAppliMode</td>
<td>SNVT_hvac_mode</td>
<td>108</td>
<td>Application Mode Input</td>
<td>HVAC_AUTO</td>
<td></td>
</tr>
<tr>
<td>4(M)</td>
<td>nviEmergOverride</td>
<td>SNVT_hvac_emerg</td>
<td>103</td>
<td>Emergency Override Input</td>
<td>EMERG_NORMAL</td>
<td></td>
</tr>
<tr>
<td>5(M)</td>
<td>nvoSpaceTemp</td>
<td>SNVT_temp_p</td>
<td>105</td>
<td>Effective Space Temperature Output</td>
<td>+327.67°C/0x7FFF</td>
<td>ACK</td>
</tr>
<tr>
<td>6(M)</td>
<td>nvoUnitStatus</td>
<td>SNVT_hvac_status</td>
<td>112</td>
<td>Unit Status Output</td>
<td>see note 1</td>
<td>UNACK</td>
</tr>
<tr>
<td>7(M)</td>
<td>nvoEffectSetpt</td>
<td>SNVT_temp_p</td>
<td>105</td>
<td>Effective Setpoint Output</td>
<td>+327.67°C/0x7FFF</td>
<td>UNACK</td>
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<tr>
<td>8(M)</td>
<td>nvoDischargeAirTemp</td>
<td>SNVT_temp_p</td>
<td>105</td>
<td>Discharge Air Temperature Output</td>
<td>+327.67°C/0x7FFF</td>
<td>UNACK</td>
</tr>
<tr>
<td>9(M)</td>
<td>nvoDischargeAirSetpt</td>
<td>SNVT_temp_p</td>
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<td>Discharge Air Temp. Setpoint Output</td>
<td>+327.67°C/0x7FFF</td>
<td>UNACK</td>
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<tr>
<td>10(O)</td>
<td>nviOccSensor</td>
<td>SNVT_occupancy</td>
<td>109</td>
<td>Occupancy Sensor Input</td>
<td>OC_NUL</td>
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<tr>
<td>11(O)</td>
<td>nviOccSchedule</td>
<td>SNVT_tod_event</td>
<td>128</td>
<td>Occupancy Scheduler Input</td>
<td>OC_NUL,OC_NUL,OC_NUL</td>
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<td>12(O)</td>
<td>nviOccManCmd</td>
<td>SNVT_occupancy</td>
<td>109</td>
<td>Occupancy Override Input</td>
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<tr>
<td>13(O)</td>
<td>nviOutdoorAirTemp</td>
<td>SNVT_temp_p</td>
<td>105</td>
<td>Outdoor Air Temperature Input</td>
<td>+327.67°C/0x7FFF</td>
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<td>14(O)</td>
<td>nviOutdoorAirDamper</td>
<td>SNVT_lev_percent</td>
<td>81</td>
<td>Outdoor Air Damper Input</td>
<td>163.835 %/0x7FFF</td>
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<tr>
<td>15(O)</td>
<td>nvoOutdoorAirDamper</td>
<td>SNVT_lev_percent</td>
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<td>Outdoor Air Damper Output Position</td>
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<td>16(O)</td>
<td>nvoEffectOccup</td>
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<tr>
<td>17(O)</td>
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<td>SNVT_temp_p</td>
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<td>nvoFilterAlarm</td>
<td>SNVT_switch</td>
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<td>19(O)</td>
<td>nvoMixAirTemp</td>
<td>SNVT_temp_p</td>
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<td>Mixed Air Temperature</td>
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<td>20(O)</td>
<td>nvoReturnAirTemp</td>
<td>SNVT_temp_p</td>
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<td>Return Air Temperature</td>
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<tr>
<td>21(O)</td>
<td>nvoFanCurrent</td>
<td>SNVT_amp_f</td>
<td>48</td>
<td>Fan current</td>
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<td>RPT</td>
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**note1:** nvoUnitStatus

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
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<tr>
<td>mode</td>
<td>Manufacturer defined</td>
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<tr>
<td>heat_output_primary</td>
<td>0X7FFF</td>
</tr>
<tr>
<td>heat_output_secondary</td>
<td>0X7FFF</td>
</tr>
<tr>
<td>cool_output</td>
<td>0X7FFF</td>
</tr>
<tr>
<td>NV</td>
<td>Data Point</td>
</tr>
<tr>
<td>----</td>
<td>------------</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td></td>
</tr>
<tr>
<td>1(M)</td>
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<td>2(M)</td>
<td></td>
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<td>-----</td>
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<td>Occupancy Temp Setpoints</td>
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</tr>
<tr>
<td>Local Bypass Time</td>
<td>O</td>
</tr>
</tbody>
</table>
Mandatory Network Variables

Space Temperature Input

network input sd_string("@p|1") 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 Wall Unit 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.

Configuration Considerations

See Table 2

Temperature Setpoint Input (absolute)

network input sd_string("@p|2") 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 cpSetpoints.

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:

\[
\begin{align*}
\text{deadband\_occupied} &= \text{occupied\_cool} - \text{occupied\_heat} \\
\text{deadband\_standby} &= \text{standby\_cool} - \text{standby\_heat} \\
\text{effective\_occupied\_cool} &= \text{nviSetpoint} + 0.5 \times (\text{deadband\_occupied}) \\
\text{effective\_occupied\_heat} &= \text{nviSetpoint} - 0.5 \times (\text{deadband\_occupied}) \\
\text{effective\_standby\_cool} &= \text{nviSetpoint} + 0.5 \times (\text{deadband\_standby}) \\
\text{effective\_standby\_heat} &= \text{nviSetpoint} - 0.5 \times (\text{deadband\_standby})
\end{align*}
\]

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:

\[
\begin{align*}
\text{abs\_setpoint\_offset} &= \text{nviSetpoint} - (\text{occupied\_cool} + \text{occupied\_heat})/2 \\
\text{effective\_occupied\_cool} &= \text{occupied\_cool} + \text{abs\_setpoint\_offset} \\
\text{effective\_occupied\_heat} &= \text{occupied\_heat} + \text{abs\_setpoint\_offset} \\
\text{effective\_standby\_cool} &= \text{standby\_cool} + \text{abs\_setpoint\_offset} \\
\text{effective\_standby\_heat} &= \text{standby\_heat} + \text{abs\_setpoint\_offset}
\end{align*}
\]

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 powerup. This network variable input does not use the Receive Heartbeat function. When the default value is in effect, the Wall Unit will use the configuration property nciSetpoints.

Configuration Considerations
See Table 2

---

**Application Mode Input**

```c
network input sd_string("@p|3") SNVT_hvac_mode
nviApplicMode;
```

This network variable input is used to coordinate the Wall Unit 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 defines the mandatory control of the unit from an external controller. The following defines the required functionality:

- **HVAC_AUTO** – put the unit into normal operational mode, local control
- **HVAC_OFF** – overrides the local control mode and turns the unit off (example: a fire alarm input requires the unit to turn off in the event of a fire).
- **HVAC_FAN_ONLY** – overrides the local control and turns the fan on.

All other modes are manufacturer-defined options.

**Valid Range**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>HVAC_AUTO (Mode determined by unit) - Mandatory</td>
</tr>
<tr>
<td>1</td>
<td>HVAC_HEAT (Use heat setpoints)</td>
</tr>
<tr>
<td>2</td>
<td>HVAC_MRNG_WRMUP (Morning warmup)</td>
</tr>
<tr>
<td>3</td>
<td>HVAC_COOL (Use cool setpoints)</td>
</tr>
<tr>
<td>4</td>
<td>HVAC_NIGHT_PURGE (Free cooling)</td>
</tr>
<tr>
<td>5</td>
<td>HVAC_PRE_COOL (Morning cooldown)</td>
</tr>
<tr>
<td>6</td>
<td>HVAC_OFF (No unit operation allowed) - Mandatory</td>
</tr>
<tr>
<td>7</td>
<td>HVAC_TEST (Special test mode, manufacturer-defined)</td>
</tr>
<tr>
<td>8</td>
<td>HVAC_EMERG_HEAT (Emergency heat)</td>
</tr>
<tr>
<td>9</td>
<td>HVAC_FAN_ONLY (No heating or cooling allowed) - Mandatory</td>
</tr>
<tr>
<td>12</td>
<td>HVAC_MAX_HEAT (Maximum heating - VAV)</td>
</tr>
<tr>
<td>13</td>
<td>HVAC_ECONOMY</td>
</tr>
<tr>
<td>14</td>
<td>HVAC_DEHUMID (Dehumidification)</td>
</tr>
<tr>
<td>15</td>
<td>HVAC_CALIBRATE (Calibration mode - manufacturer defined)</td>
</tr>
<tr>
<td>0xFF</td>
<td>HVAC_NUL (same as HVAC_AUTO)</td>
</tr>
</tbody>
</table>

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.

**Configuration Considerations**

See Table 2

---

**Emergency Override Input**

```
network input sd_string("@p|4") 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.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Supply Fan</th>
<th>Outdoor Air Damper</th>
<th>Exhaust Fan</th>
<th>Exhaust Damper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressurize</td>
<td>On</td>
<td>Open</td>
<td>Off</td>
<td>Closed</td>
</tr>
<tr>
<td>Depressurize</td>
<td>Off</td>
<td>Closed</td>
<td>On</td>
<td>Open</td>
</tr>
<tr>
<td>Purge</td>
<td>On</td>
<td>Open</td>
<td>On</td>
<td>Open</td>
</tr>
<tr>
<td>Shutdown</td>
<td>Off</td>
<td>Closed</td>
<td>Off</td>
<td>Closed</td>
</tr>
</tbody>
</table>

**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.

**Configuration Considerations**
Effective Space Temperature Output

```
network output sd_string("@p|5") SNVT_temp_p
nvoSpaceTemp;
```

This output network variable is used to monitor the effective space temperature that the Wall Unit is using for control. If the input nviSpaceTemp has a valid value, this output will relay 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.

**Default Value**

The value 0x7FFF=+327.67°C will be used as an invalid value in case of a sensor failure.

**Configuration Considerations**

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

**When Transmitted**

The output variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the ‘value’ has changed.
- Regularly at the interval defined by the configuration variable cpMaxSendTime.

**Default Service Type**

The default service type is acknowledged.

Unit Status Output

```
network output sd_string("@p|6") SNVT_hvac_status
nvoUnitStatus;
```

This output network variable is available to report the Wall Unit 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.

**Valid Range**

**mode:** 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)
13 = HVAC_ECONOMY
14 = HVAC_DEHUMID (Dehumidification)
15 = HVAC_CALIBRATE (Calibration mode - manufacturer defined)
16 = HVAC_EMERG_COOL (Emergency cool mode)
17 = HVAC_EMERG_STEAM (Emergency steam mode)
18 = HVAC_MAX_COOL
19 = HVAC_HVC_LOAD
20 = HVAC_NO_LOAD

The value of ‘mode’ is determined by the values of nviApplicMode, and logic in the controller as manufactory defined.

**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.

**Alarm Value**

The SNVT_hvac_status.in_alarm byte will be used in the Wall Unit as Bit-fields to identify various simultaneously occurring alarms:

BIT_0: TEMP HIGH: An alarm output is triggered when space temperature exceeds cpHighTempAlarm value (physical alarm from temp sensor). Space temperature is the temperature reflected by the value of nvoSpaceTemp.

BIT_1: TEMP LOW: An alarm output is triggered when a space temperature drops below cpLowTempAlarm value. (physical alarm from temp sensor)

BIT_2: COMPRESSOR ALARM: This alarm is triggered from any compressor in the system

BIT_3: FAN CURRENT ALARM: An alarm output is triggered when the fan current or fan on/off state is in alarm as defined by the cpLow/HighFanCurrentAlarm limit or fan on/off alarm state is defined (physical alarm from fan current sensor or hard wired point)

BIT_4: FAN COMMAND FAILURE: An alarm output is triggered when the fan change of state command has failed as defined by the manufacturer (logical alarm)

BIT_5: Manufacturer Defined Alarm 1 (optional)

BIT_6: SAFETY INTERLOCK ALARM: An alarm output is triggered when the request for heating/cooling command is not activated by the wall unit (logical alarm)

BIT_7: FILTER ALARM

**Default Value**

mode: manufacturer defined.

heat_output_primary: 0x7FFF (INVALID)

heat_output_secondary: 0x7FFF (INVALID)

cool_output: 0x7FFF (INVALID)
econ_output: 0x7FFF (INVALID)
fan_output: 0x7FFF (INVALID)
in_alarm: 0 Means there is no alarm.

**Configuration Considerations**

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

**When Transmitted**

The output variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the ‘value’ has changed.
- Regularly at the interval defined by the configuration variable cpMaxSendTime.

**Default Service Type**

The default service type is unacknowledged.

---

**Effective Setpoint Output**

```c
network output sd_string("@p|7") SNVT_temp_p nvoEffectSetpt;
```

This output network variable is used to monitor the effective temperature setpoint which may depend on nciSetpoints, nvoEffectOccup, nviSetpoint, nviApplicMode, 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.

**Default Value**

The default value of SNVT_temp_p.

**Configuration Considerations**

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

The output variable is transmitted:

• Upon node reset, after obtaining valid data.
• When the ‘value’ has changed.
• Regularly at the interval defined by the configuration variable cpMaxSendTime.

Default Service Type

The default service type is unacknowledged.

Discharge Air Temperature Output

network output sd_string("@p|8") SNVT_temp_p
nvoDischargeAirTemp;

This output network variable is used to monitor the temperature of the discharge air that leaves the Wall Unit, 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.

Default Value

The default value of SNVT_temp_p.

Configuration Considerations

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

When Transmitted

The output variable is transmitted:

• Upon node reset, after obtaining valid data.
• When the ‘value’ has changed.
• Regularly at the interval defined by the configuration variable cpMaxSendTime.

Default Service Type

The default service type is unacknowledged.
**Discharge Air Temperature Setpoint Output**

```plaintext
network output sd_string("@p|9") SNVT_temp_p
nvoDischargeAirSetpt;
```

This output network variable is used to monitor the discharge air temperature setpoint.

**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 WALL UNIT failure.

**Default Value**

The default value of SNVT_temp_p.

**Configuration Considerations**

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

**When Transmitted**

The output variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the ‘value’ has changed.
- Regularly at the interval defined by the configuration variable cpMaxSendTime.

**Default Service Type**

The default service type is unacknowledged.

---

**Optional Network Variables**

**Occupancy Sensor Input**

```plaintext
network input sd_string("@p|10") 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 Wall Unit 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.

**Configuration Considerations**

See Table 2

---

**Occupancy Scheduler Input**

```
network input sd_string("@p11") SNVT_tod_event
nviOccSchedule;
```

This input network variable is used to command the Wall Unit 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 Wall Unit Controller should operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).

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

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

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

3 = OC_STANDBY: The Wall Unit 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.

**Configuration Considerations**
See Table 2

---

**Occupancy Override Input**

```c
network input sd_string("@p|12") SNVT_occupancy nviOccManCmd;
```

This input network variable is used to command the Wall Unit 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 Wall Unit Controller should operate in the occupied mode as defined by the manufacturer (e.g. occupied setpoint).
- **1 = OC_UNOCCUPIED**: The Wall Unit Controller should operate in the unoccupied mode as defined by the manufacturer (e.g. unoccupied setpoint).
- **2 = OC_BYPASS**: The Wall Unit Controller should operate in the occupied mode for a period of time defined by nciBypassTime.
- **3 = OC_STANDBY**: The Wall Unit 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.
Configuration Considerations

See Table 2

Outdoor Air Temperature Input

network input sd_string("@p13") SNVT_temp_p nviOutdoorAirTemp;

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 nviOutdoorAirTemp 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.

Configuration Considerations

See Table 2

Outdoor Air Damper Position Input

network input sd_string("@p14") SNVT_lev_percent nviOutdoorAirDamper;

This input network variable is used to provide an outdoor air damper position.

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.

Configuration Considerations
Outdoor Air Damper Output Position

network output sd_string("@p|15") SNVT_lev_percent nvoOutdoorAirDamper;

This output network variable reflects the current position of the outdoor supply air damper controlled by the Wall Unit controller.

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.

Default Value

0x32767.

Configuration Considerations

See Table 2.

When Transmitted

The output variable is transmitted:

• Upon node reset, after obtaining valid data.
• When the ‘value’ has changed.
• Regularly at the interval defined by the configuration variable cpMaxSendTime.

Default Service Type

The default service type is unacknowledged.

Effective Occupancy Output

network output sd_string("@p|16") SNVT_occupancy nvoEffectOccup;

This output network variable is used to indicate the actual occupancy mode of the unit. This information is typically reported to a supervisory controller, or provided to another Unit Heater 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)

<table>
<thead>
<tr>
<th>nviOccManCmd</th>
<th>nviOccSensor</th>
<th>nviOccSchedule</th>
<th>nvoEffectOccup</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC_OCCUPIED</td>
<td>Don’t Care</td>
<td>Don’t Care</td>
<td>OC_OCCUPIED</td>
</tr>
<tr>
<td>OC_UNOCCUPIED</td>
<td>Don’t Care</td>
<td>Don’t Care</td>
<td>OC_UNOCCUPIED</td>
</tr>
<tr>
<td>OC_STANDBY</td>
<td>Don’t Care</td>
<td>Don’t Care</td>
<td>OC_STANDBY</td>
</tr>
<tr>
<td>OC_BYPASS¹</td>
<td>Don’t Care</td>
<td>OC_OCCUPIED</td>
<td>OC_OCCUPIED</td>
</tr>
<tr>
<td></td>
<td>OC_OCCUPIED³</td>
<td>Don’t Care</td>
<td>OC_OCCUPIED</td>
</tr>
<tr>
<td>any other case</td>
<td></td>
<td></td>
<td>OC_BYPASS</td>
</tr>
<tr>
<td>OC_NUL</td>
<td>Don’t Care</td>
<td>OC_OCCUPIED</td>
<td>OC_OCCUPIED</td>
</tr>
<tr>
<td>OC_UNOCCUPIED</td>
<td>OC_OCCUPIED</td>
<td>OC_OCCUPIED</td>
<td>OC_OCCUPIED</td>
</tr>
<tr>
<td>OC_OCCUPIED</td>
<td>OC_STANDBY</td>
<td>OC_OCCUPIED</td>
<td>OC_OCCUPIED</td>
</tr>
<tr>
<td>OC_OCCUPIED³</td>
<td>OC_NUL</td>
<td>OC_OCCUPIED</td>
<td>OC_OCCUPIED</td>
</tr>
<tr>
<td>OC_BYPASS¹</td>
<td>OC_OCCUPIED⁶</td>
<td>OC_BYPASS⁷</td>
<td></td>
</tr>
<tr>
<td>OC_BYPASS¹</td>
<td>OC_STANDBY</td>
<td>OC_BYPASS</td>
<td></td>
</tr>
<tr>
<td>OC_BYPASS¹</td>
<td>OC_NUL</td>
<td>OC_BYPASS</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

1 - OC_BYPASS can be initiated by either nviOccManCmd, nviOccSensor or a local input. nvoEffectOccup will only be OC_BYPASS for the duration of the Local Bypass Time (cpBypassTime), until reinitiated 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_UNOCCUPIED.

4 - For nviOccSchedule, this refers to the “current state” field.

5 - “Don’t Care” = Any State

6 - Since OC_BYPASS does not make sense for a schedule input, it is interpreted as OC_OCCUPIED.

7 - Can be interpreted as OC_UNOCCUPIED to prevent off-hours occupancy detection (optional/manufacturer specific).
Valid Range

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

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

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

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

Default Value

0xFF = OC_NUL.

Configuration Considerations

See Table 2

When Transmitted

The output variable is transmitted:

• Upon node reset, after obtaining valid data.

Default Service Type

The default service type is unacknowledged.

Outdoor Air Temperature Output

```
network output sd_string("@p|17") SNVT_temp_p
nvoOutdoorAirTemp;
```

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 -50°C to 70°C. The value 0x7FFF = +327.67°C will be handled as an invalid value in case of a sensor failure.

Default Value
Configuration Considerations

See Table 2

When Transmitted

The output variable is transmitted:

• Upon node reset, after obtaining valid data.
• When the ‘value’ has changed.
• Regularly at the interval defined by the configuration variable cpMaxSendTime.

Default Service Type

The default service type is unacknowledged.

Filter Alarm Output

network output sd_string("@p18") bind_info(ackd)
SNVT_switch nvoFilterAlarm;

This output network variable is used to report a filter alarm.

Valid Range

The valid range of SNVT_switch.

Default Value

No default value

Configuration Considerations

See Table 2

When Transmitted

The output variable is transmitted:

• Upon node reset, after obtaining valid data.
• When the ‘value’ has changed.
• Regularly at the interval defined by the configuration variable cpMaxSendTime.

**Default Service Type**
The default service type is repeated.

**Mixed Air Temperature Output**

```network input sd_string("@p|19") SNVT_temp_p nvoMixAirTemp;
```

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

**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).

**Configuration Considerations**

See Table 2

**When Transmitted**

The output variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the ‘value’ has changed.
- Regularly at the interval defined by the configuration variable cpMaxSendTime.

**Default Service Type**
The default service type is repeated.
Return Air Temperature Output

network input sd_string("@p|20") SNVT_temp_p nvoReturnAirTem;

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

**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).

**Configuration Considerations**

See Table 2

**When Transmitted**

The output variable is transmitted:

• Upon node reset, after obtaining valid data.
• When the ‘value’ has changed.
• Regularly at the interval defined by the configuration variable cpMaxSendTime.

**Default Service Type**

The default service type is repeated.

---

Fan Current Output

network output sd_string("@p|21") bind_info(ackd) SNVT_amp_f nvoFanCurrent;

This output network variable is used to report the actual current of the fan.

**Valid Range**

The valid range of SNVT_amp_f.

**Default Value**

No default value
**Configuration Considerations**

See Table 2

**When Transmitted**

The output variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the ‘value’ has changed.
- Regularly at the interval defined by the configuration variable cpMaxSendTime.

**Default Service Type**

The default service type is repeated.

---

**Configuration Properties**

---

**Receive Heartbeat (Mandatory)**

```plaintext
network input config sd_string("&2,i.j.k,0\x80,48")
SNVT_time_sec cpMaxRcvTime;
```

This input configuration property sets the maximum period of time that can expire before the functional block will use the default values for the following network variables:

- nv1 – nviSpaceTemp
- nv2 - nviSetpoint
- nv3 - nviApplicMode
- nv10 – nviOccSensor
- nv11 – nviOccSchedule
- nv13 – nviOutdoorAirTemp
- nv14 - nviOutdoorAirDamper

i.j.k are the indices of the NVs in relation to their declaration order within the device, when implemented.

**Valid Range**

The valid range is 1.0 to 3600.0 seconds.
**Default Value**

The default value is: see Table 2

Setting SCPTmaxRcvTime to zero disables the receive failure detect mechanism.

**Configuration Requirements/Restrictions**

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

**SCPT Reference**

SCPTmaxRcvTime (48)

---

**Send Heartbeat (Mandatory)**

```c
network input config sd_string("&2,i.j,k,0\x80,49")
SNVT_time_sec cpMaxSendTime;
```

This input configuration property sets the maximum period of time that can expire before the Object will automatically update the following network variables:

- `nv5` - `nvoSpaceTemp`
- `nv6` - `nvoUnitStatus`
- `nv7` - `nvoEffectSetpt`
- `nv8` - `nvoDischargeAirTemp`
- `nv9` - `nvoDischargeAirSetpt`
- `nv15` - `nvoOutdoorAirDamper`
- `nv16` - `nvoEffectOccup`
- `nv17` - `nvoOutdoorAirTemp`
- `nv18` - `nvoFilterAlarm`
- `nv19` - `nvoMixAirTemp`
- `nv20` - `nvoReturnAirTemp`
- `nv21` - `nvoFanCurrent`

`i.j.k` are the indices of the NVs in relation to their declaration order within the device, when implemented.
**Valid Range**

The valid range is 1.0 to 3600.0 seconds.

Values outside this range are invalid and will disable the automatic update mechanism. A value of zero (0) will be used for the internal timer in cases where configured values are above 3600.0 seconds.

**Default Value**

The default value is: see Table 2

**Configuration Requirements/Restrictions**

This CP has no modification restrictions (no restrictions). It can be modified at any time.

**SCPT Reference**

SCPTmaxSendTime (49)

---

**Send Throttle (Mandatory)**

```c
config network input sd_string("&2,i.j.k,0\x80,52")
SNVT_time_sec cpMinSendTime;
```

This input configuration property sets the minimum period of time that must expire before the functional block will allow updates of the following network variables to propagate across the network:

- nv5 - nvoSpaceTemp
- nv6 - nvoUnitStatus
- nv8 – nvoDischargeAirTemp
- nv9 – nvoDischargeAirSetpt
- nv15 - nvoOutdoorAirDamper
- nv17 - nvoOutdoorAirTemp
- nv19 - nvoMixAirTemp
- nv20 - nvoReturnAirTemp
- nv21 – nvoFanCurrent

i.j.k are the indices of the NVs in relation to their declaration order within the device, when implemented.
Valid Range
The valid range is 1.0 to 3600.0 seconds.

Default Value
The default value is: see Table 2
Setting SCPTminSendTime to zero disables the throttling mechanism.

Configuration Requirements/Restrictions
This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference
SCPTminSendTime (52)

Send on Delta (Mandatory)

```
config network input sd_string("&2,i.j.k,0\x80,27")
SNVT_time_sec cpMinSendTime;
```

This input configuration property sets the minimum change required to force transmission of the output value to propagate across the network:

- nv5 - nvoSpaceTemp
- nv6 - nvoUnitStatus
- nv8 – nvoDischargeAirTemp
- nv9 – nvoDischargeAirSetpt
- nv15 - nvoOutdoorAirDamper
- nv17 - nvoOutdoorAirTemp
- nv19 - nvoMixAirTemp
- nv20 - nvoReturnAirTemp
- nv21 – nvoFanCurrent

i.j.k are the indices of the NVs in relation to their declaration order within the device, when implemented.

Valid Range
The valid range for this configuration property is any value within the defined limits of the data type in question.
Default Value
The default value is: see Table 2
Setting SCPsndDelta to zero disables the sending mechanism.

Configuration Requirements/Restrictions
This CP has no modification restrictions (no_restrictions). It can be modified at any time.

SCPT Reference
SCPTsndDelta (27)

Occupancy Temperature Setpoints (Mandatory)

network input config sd_string("&1,p,0\x80,60")
SNVT_temp_setpt cpSetpoints;

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.

Default Value

<table>
<thead>
<tr>
<th>Setpoint Type</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>occupied_cool</td>
<td>10°C</td>
<td>35°C</td>
<td>23°C</td>
</tr>
<tr>
<td>standby_cool</td>
<td>10°C</td>
<td>35°C</td>
<td>25°C</td>
</tr>
<tr>
<td>unoccupied_cool</td>
<td>10°C</td>
<td>35°C</td>
<td>28°C</td>
</tr>
<tr>
<td>occupied_heat</td>
<td>10°C</td>
<td>35°C</td>
<td>21°C</td>
</tr>
<tr>
<td>standby_heat</td>
<td>10°C</td>
<td>35°C</td>
<td>19°C</td>
</tr>
<tr>
<td>unoccupied_heat</td>
<td>10°C</td>
<td>35°C</td>
<td>16°C</td>
</tr>
</tbody>
</table>

Configuration Requirements/Restrictions
None

SCPT Reference
SCPTsetPnts (60)
Local Bypass Time (Optional)

network input config sd_string("&1,p,0\x80,34")
SNVT_time_min cpBypassTime;

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 cpBypassTime = 0 disables the Bypass function.

Typical Default Value
0 (no bypass allowed)

Configuration Requirements/Restrictions
None.

SCPT Reference
SCPTbypassTime (34)

Temp High Limit Alarm (Optional)

network input config sd_string("&1,p,0\x80,9")
SNVT_xxx cpTempHighLimitAlarm;

This configuration property defines the maximum temperature when an alarm in the SNVT_hvac_status.in_alarm BIT_0 will be generated.

Typical Range
The valid range is any value within the defined limits of the SNVT concerned.

Typical Default Value
None

Configuration Requirements/Restrictions
None.
**SCPT Reference**

SCPT highLimit1 (9)

---

**Temp Low Limit Alarm (Optional)**

```c
network input config sd_string("&1,p,0\x80,10")
SNVT_xxx cpTempLowLimitAlarm;
```

This configuration property defines the minimum temperature when an alarm in the SNVT_hvac_status.in_alarm BIT_1 will be generated.

**Typical Range**
The valid range is any value within the defined limits of the SNVT concerned.

**Default Value**
None

**Configuration Requirements/Restrictions**
None.

---

**SCPT Reference**

SCPT lowLimit1 (10)

---

**Fan Current High Limit Alarm (Optional)**

```c
network input config sd_string("&1,p,0\x80,9")
SNVT_xxx cpHighCurrentFanAlarm;
```

This configuration property defines the maximum fan current when an alarm in the SNVT_hvac_status.in_alarm BIT_3 will be generated.

**Typical Range**
The valid range is any value within the defined limits of the SNVT concerned.

**Typical Default Value**
None
**Configuration Requirements/Restrictions**

None.

**SCPT Reference**

SCPT highLimit1 (9)

---

**Fan Current Low Limit Alarm (Optional)**

```plaintext
network input config sd_string("&1,3,0\x80,10")
SNVT_xxx cpLowCurrentFanAlarm;
```

This configuration property defines the minimum current when an alarm in the SNVT_hvac_status.in_alarm BIT_3 will be generated.

**Typical Range**

The valid range is any value within the defined limits of the SNVT concerned.

**Default Value**

None

**Configuration Requirements/Restrictions**

None.

**SCPT Reference**

SCPT lowLimit1 (10)
**Key for Unresolved References**

i,j,k are the indices of the CP-associated NVs in relation to their declaration order within the node, when implemented.

p is this Object’s index relative to the node sd_string declaration, when implemented.

---

**Power-up State**

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

---

**Boundary and Error Conditions**

None specified.

---

**Additional Considerations**

None specified.

---

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