Itho Lon module for DCW

Functional Profile: Ventilation Unit
UFPTventilationUnit

Ventilation Unit: 20100
Version 1.0
August 2008

unit
with built-in LonMark adapter

LonMaker Integration Tool
or
Centralised server

LonWorks® TP/FT-10

LonMark CO₂ Sensor

Table of contents

1. Overview

This document describes the Functional Profile for the Ventilation Unit functional block, named UFPTventilationUnit (20100) having Manufacturer & Device Class scope (scope-4) of:
(Manufacturer ID: FFD2F hex / 1047855 dec)
Air Handling Device (Device Class: 5600 hex)

Figure 1 illustrates the use of this functional block for the Air Handling device.
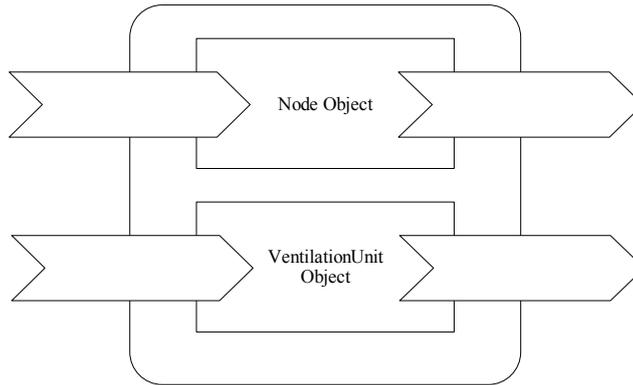
Figure 1 Device Concept

As the Ventilation Unit functional block is dedicated for use with a Itho DCW, this document also includes application specific notes which are found in the section *Addition Information* (page 40) after the Functional Profile specification.

Descriptions and specifications for the Itho DCW are outside the scope of this document. These are provided in other documents.

Important remark for CO_2 control:
With the Itho CO_2 sensor at this moment it is not possible to monitor CO_2 levels in the room directly and continuously for information needs.
For a correct CO_2 controlled ventilation it is needed to override the ventilation level with the Itho CO_2 sensor connected directly to the main box (as provided standard). However, it is not possible to use the LON CO_2 operating mode because the LON module will not be aware of the sensor input when it is connected directly to the main box.
To ensure that the Itho CO_2 sensor is able to override the ventilation level the system integrator has to keep this in mind and he has to program the LON module to make sure that it only runs at a minimum ventilation level t.ex 35%. You should also be able to monitor the CO_2 indirectly by monitoring the network variable "nvoEffSptAirflow" which should be higher than "nviSetptAirflow" if the CO_2 sensor is connected and measures enough CO_2 to exceed your LON based airflow setpoint. This is very indirect though and with a threshold value of the minimum ventilation level.
An external LON based CO_2 sensor will enable CO_2 monitoring (continuesly). It can also replace the Itho CO_2 sensor and control the DCW.

2. Functional-Block Details

Figure 2 Functional-Block Details

Table 1 Network Variable Details

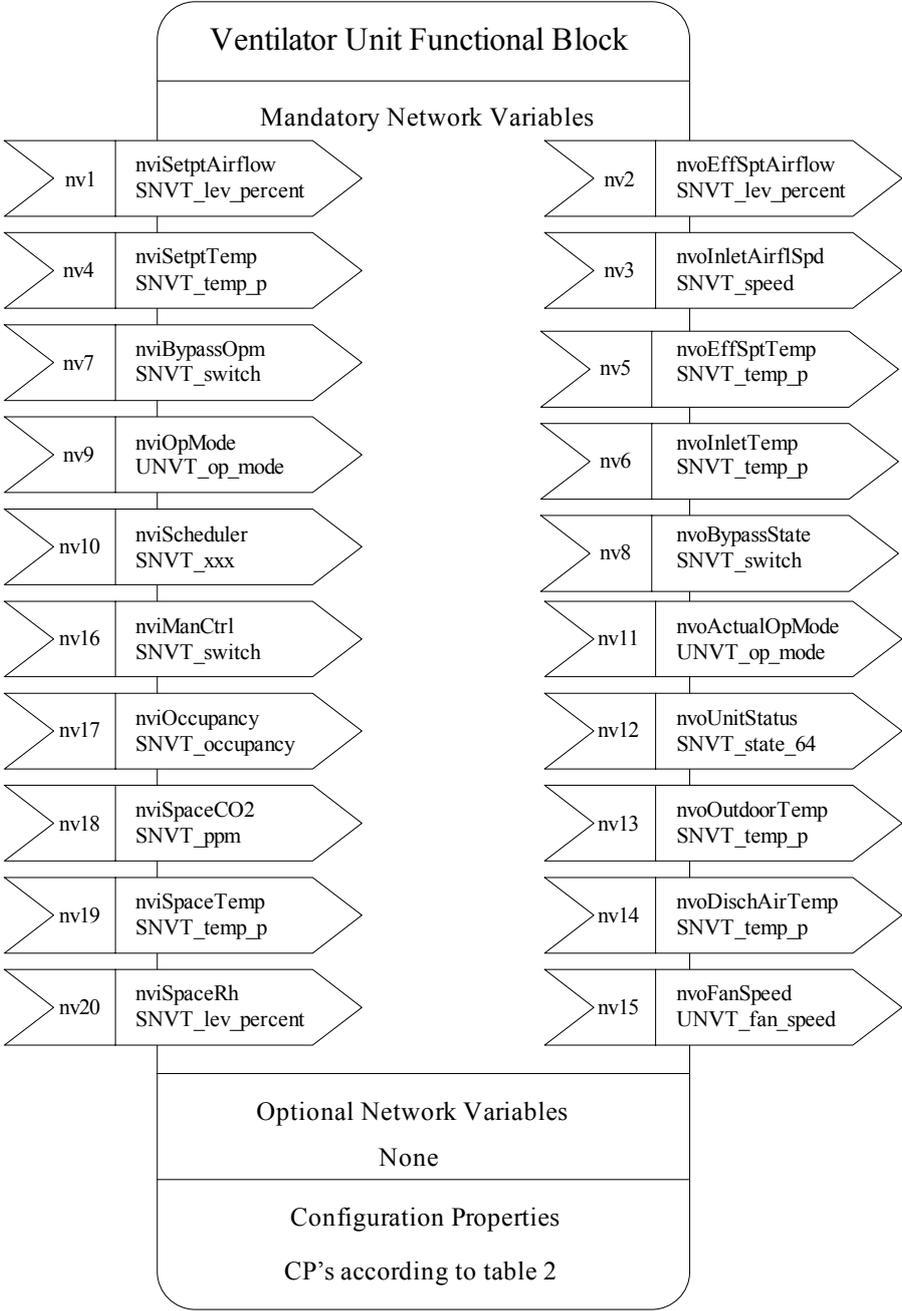| NV # (M/O)*	Variable Name	SNVT / UNVT Name	SNVT/ UNVT Index	Description
1 (M)	nviSetptAirflow	SNVT_lev_percent	81	Airflow Setpoint input
2 (M)	nvoEffSptAirflow	SNVT_lev_percent	81	Effective Airflow Setpoint output
3 (M)	nvoInletAirflSpd	SNVT_speed	34	Inlet Airflow Speed output
4 (M)	nviSetptTemp	SNVT_temp_p	105	Temperature Setpoint input
5 (M)	nvoEffSptTemp	SNVT_temp_p	105	Effective Temperature Setpoint output
6 (M)	nvoInletTemp	SNVT_temp_p	105	Inlet Temperature output
7 (M)	nviBypassOpm	SNVT_switch	95	Bypass operating mode input
8 (M)	nvoBypassState	SNVT_switch	95	Bypass state output
9 (M)	nviOpMode	UNVT_op_mode	1	Operating mode input (This input will override the operating mode set by *nviScheduler*).
10 (M)	nviScheduler	SNVT_xxx Changeable type. Default type is SNVT_tod_event (128)	xxx	Scheduler present value input. Indirectly selects operating mode according to the value set in the array element of *nciSchedModes* pointed to by this value. (Operating mode set by this input may be overridden by *nviOpMode*).
11 (M)	nvoActualOpMode	UNVT_op_mode	1	Actual operating mode
12 (M)	nvoUnitStatus	SNVT_state_64	165	Detailed Unit State (supplement to nvoStatus)
13 (M)	nvoOutdoorTemp	SNVT_temp_p	105	Outdoor Air Temperature output
14 (M)	nvoDischAirTemp	SNVT_temp_p	105	Discharge Air Temperature output
15 (M)	nvoFanSpeed	UNVT_fan_speed	2	Fan Speed output (2-element array of SNVT_switch)
16 (M)	nviManCtrl	SNVT_switch	95	Manual control input
17 (M)	nviOccupancy	SNVT_occupancy	109	Occupancy sensor input
18 (M)	nviSpaceCO2	SNVT_ppm	29	CO_2 sensor input
19 (M)	nviSpaceTemp	SNVT_temp_p	105	Space temperature sensor input
20 (M)	nviSpaceRh	SNVT_lev_percent	81	Relative Humidity Sensor inout

* M = mandatory, O = optional

Table 2 Configuration Property details

Man. Opt. *	SCPT / UCPT Name NV Name Type or SNVT	SCPT/ UCPT Index	Associated NVs **	Description
Man	SCPTmaxRcvTime nciSetPtMaxRcvT SNVT_time_sec (107)	48	nv1, nv4, nv7	Maximum time that elapses after an update to the nv input before it returns to its corresponding default value. A value of zero (0) disables the fall-back mechanism.
Man	SCPTmaxRcvTime nciOpmodeMaxRcvT SNVT_time_sec (107)	48	nv9, nv10	Maximum time that elapses after an updateto the nv input before the Fall Back operating mode (*nciSchedModes[15]*) will be used. A value of zero (0) disables the fall-back mechanism.
Man	SCPTmaxRcvTime nciSensorMaxRcvT SNVT_time_sec (107)	48	nv16, nv17, nv18, nv19, nv20	Maximum time that elapses after an update to the nv input before the sensor is ignored. A value of zero (0) disables the ignore mechanism.
Man	SCPTmaxSendTime nciPriMaxSendT SNVT_time_sec (107)	49	nv2, nv5, nv8,nv11	Maximum period of time before the associated output network variables are automatically updated.
Man	SCPTminSendTime nciPriMinSendT SNVT_time_sec (107)	52	nv2, nv5, nv8,nv11	Minimum period of time between output network variable transitions.

Man. Opt. *	SCPT / UCPT Name NV Name Type or SNVT	SCPT/ UCPT Index	Associated NVs **	Description
Man	SCPTmaxSendTime nciSecMaxSendT SNVT_time_sec (107)	49	nv3, nv6, nv12, nv13, nv14, nv15	Maximum period of time before the associated output network variables are automatically updated.
Man	SCPTminSendTime nciSecMinSendT SNVT_time_sec (107)	52	nv3, nv6, nv12, nv13, nv14, nv15	Minimum period of time between output network variable transitions.
Man	SCPTsetpoint nciDefAirflow SNVT_lev_percent (81)	213	nv1	Default setpoint for *nviSetptAirflow*
Man	UCPTairflowRelUNOCC nciAirflRelUnocc SNVT_lev_percent (81)	1	nv1	Relative airflow setpoint when operating in UNOCCUPIED mode.
Man	UCPTnightCoolAirflow nciNtCoolAirflow SNVT_lev_percent (81)	1	Entire Functional Block	Setpoint for use in operating mode OM_NIGHT_COOLING
Man	SCPTsetpoint nciDefTemp SNVT_temp_p (105)	213	nv4	Default setpoint for *nviSetptTemp*
Man	UCPTtempAdjustUNOCC nciTempAdjUnocc SNVT_temp_diff_p (147)	3	nv4	Temperature setpoint adjustment when operating in UNOCCUPIED mode.
Man	UCPTnightCoolTemp nciNtCoolTemp SNVT_temp_p (105)	4	Entire Functional Block	Setpoint for use in operating mode OM_NIGHT_COOLING
Man	SCPTsetpoint nciDefBypassOpm SNVT_switch (95)	213	nv7	Default value for *nviBypassOpm*
Man	UCPTbypassEnTdiff nciBypassEnTdiff SNVT_temp_diff_p (147)	5	Entire Functional Block	Difference temperature required to enable the bypass and cooling function.
Man	SCPTnvType nciSchedNvType SNVT_nv_type (166)	254	nv10	Sets the network variable type for *nviScheduler*
Man	SCPTvalueDefinition nciSchedModes[16] UNVT_op_mode (1)	256	nv9	Operating modes for scheduler control. Element #0-13: Operating mode according to the array element pointed to by *nviScheduler*. Element #14: Auto Start operating mode. Element #15: Fall Back operating mode. See also *nviOpMode*.
Man	UCPTmaxInletFanV nciMaxInletFanV SNVT_lev_percent (81)	10	Entire Functional Block	The maximum operating voltage for the inlet fan in percent.
Man	UCPTmaxIOutletFanV nciMaxOutletFanV SNVT_lev_percent (81)	11	Entire Functional Block	The maximum operating voltage for the outlet fan in percent.
Man	SCPTmanOvrTime nciManOnTime SNVT_time_min (123)	35	nv16	Manual override / hold time.
Man	SCPTholdTime nciOccStandbyT SNVT_time_sec (107)	91	nv17	Occupancy hold time.
Man	SCPTminSetpoint nciCO2MinAirflow SNVT_lev_percent (81)	53	nv18	Minimum airflow used when controlled by CO2 sensor

Man. Opt. *	SCPT / UCPT Name NV Name Type or SNVT	SCPT/ UCPT Index	Associated NVs **	Description
Man	SCPTlimitCO2 nciLimitCO2 SNVT_ppm (29)	42	nv18	Limit value from CO2 sensor. Exceeding this level, adjustment of the airflow setpoint will start (from *nciCO2MinAirflow*).
Man	UCPTmaxCO2 nciMaxCO2 SNVT_ppm (29)	12	nv18	Maximum value from CO2 sensor where adjusting of airflow setpoint ends (at 100%).
Man	UCPTtempTrigOCC nciTempTrigOcc SNVT_temp_p (105)	6	nv19	Trigger level used when the system is controlled by *nviSpaceTemp* in OCCUPIED mode.
Man	UCPTtempTrigUNOCC nciTempTrigUnocc SNVT_temp_p (105)	7	nv19	Trigger level used when the system is controlled by *nviSpaceTemp* in UNOCCUPIED mode.
Man	SCPTtemperatureHysteresis nciTempTrigHyst SNVT_temp_diff_p (147)	214	nv20	Hysteresis used when the system is controlled by *nviSpaceTemp*.
Man	SCPThumSetpt nciRhTrig SNVT_lev_percent (81)	36	nv20	Trigger level used when the system is controlled by *nviSpaceRh*.
Man	UCPTrhHysteresis nciRhTrigHyst SNVT_lev_percent (81)	8	nv20	Hysteresis used when the system is controlled by *nviSpaceRh*.
Man	UCPTsysConfigStatus nciSysConfigStatus	9	Entire Functional Block	System configuration status.

* "Man" = mandatory, "Opt" = optional.
** List of NV's to which this configuration property applies, or from which its data type is inherited.

3. Mandatory Network Variables

Airflow Setpoint - Input

```
network input sd_string ("@p#1") SNVT_lev_percent
nviSetptAirflow;
```

This input is the primary setpoint for the required airflow. This setpoint is used during normal operating modes (where the room is occupied). For other operating modes, this setpoint may either be adjusted, or overruled as detailed in the section *Addition Information* (see page 40).

Valid Range
The valid range is 0 to 100%

Default value
The value of **nciDefAirflow** is used as initial default value.

Configuration Considerations
This network variable is subject to the receive heartbeat time of **nciSetPtMaxRcvT**. In case the defined maximum receive time runs out, the value falls back to **nciDefAirflow**.
Setting **nciSetPtMaxRcvT** = 0, disables the fall-back mechanism.

Effective Airflow Setpoint - Output

```
network output sd_string ("@p#2") SNVT_lev_percent
nvoEffSptAirflow;
```

This output is used for monitoring the effective airflow setpoint actually used by the main controller, which is dependent of the primary setpoint, various configuration parameters and the present operating mode as detailed in the section *Addition Information* (see page 40).

Valid Range
The typical range is 0 to 100%

When transmitted
This output is transmitted if the value changes unless **nciPriMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciPriMaxSendT**.

To facilitate polling at lower intervals than are set by **nciPriMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations
Propagation intervals are affected by **nciPriMinSendT** and **nciPriMaxSendT**.

Inlet Airflow Speed - Output

```
network output sd_string ("@p#3") SNVT_speed
nvoInletAirflSpd;
```

This output is used for monitoring the inlet airflow speed in meters per second.

Valid Range
The typical range is 0 to 20 m/s.

When transmitted
This output is transmitted if the value changes unless **nciSecMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciSecMaxSendT**.
To facilitate polling at lower intervals than are set by **nciSecMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations
Propagation intervals are affected by **nciSecMinSendT** and **nciSecMaxSendT**.

Temperature Setpoint - Input

```
network input sd_string ("@p#4") SNVT_temp_p
nviSetptTemp;
```

This input is the primary setpoint for the required temperature. This setpoint is used during normal operating modes (where the room is occupied). For other operating modes, this setpoint may either be adjusted, or overruled as detailed in the section *Addition Information* (see page 40).

Valid Range
The valid range is 8 to 30°C

Default value
The value of **nciDefTemp** is used as initial default value.

Configuration Considerations

This network variable is subject to the receive heartbeat time of **nciSetPtMaxRcvT**. In case the defined maximum receive time runs out, the value falls back to **nciDefTemp**.
Setting **nciSetPtMaxRcvT** = 0, disables the fall-back mechanism.

Effective Temperature Setpoint - Output

```
network output sd_string ("@p#5") SNVT_temp_p
nvoEffSptTemp;
```

This output is used for monitoring the effective temperature setpoint actually used by the main controller, which is dependent of the primary setpoint, various configuration parameters and the present operating mode as detailed in the section *Addition Information* (see page 40).

Valid Range
The typical range is 8 to 30°C

When transmitted
This output is transmitted if the value changes unless **nciPriMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciPriMaxSendT**.
To facilitate polling at lower intervals than are set by **nciPriMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations
Propagation intervals are affected by **nciPriMinSendT** and **nciPriMaxSendT**.

Inlet Temperature - Output

```
network output sd_string ("@p#6") SNVT_temp_p
nvoInletTemp;
```

This output is used for monitoring the inlet temperature.

Valid Range
The typical range is 8 to 30°C

When transmitted

This output is transmitted if the value changes unless **nciSecMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciSecMaxSendT**.

To facilitate polling at lower intervals than are set by **nciSecMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations

Propagation intervals are affected by **nciSecMinSendT** and **nciSecMaxSendT**.

Bypass Operating Mode - Input

```
network input sd_string ("@p#7") SNVT_switch
nviBypassOpm;
```

This input controls the bypass function. Bypass can be enabled only if bypass is physically installed on the unit, which is indicated by the **bypassInstalled** field of **nciSysConfigStatus**, and also can be determined from **nvoBypassState**.

Valid Range

The valid range is according to the 2-state implementation as detailed in the LONMARK SNVT Master List, versions 13.00 and later.
Off = Bypass Disable
On = Bypass Enable

Default value

The value of **nciDefBypassOpm** is used as initial default value.

Configuration Considerations

This network variable is subject to the receive heartbeat time of **nciSetPtMaxRcvT**. In case the defined maximum receive time runs out, the value falls back to **nciDefBypassOpm**.
Setting **nciSetPtMaxRcvT** = 0, disables the fall-back mechanism.

Bypass State - Output

```
network output sd_string ("@p#8") SNVT_switch
nvoBypassState;
```

This output is used for monitoring the actual bypass state. Bypass can be enabled only if bypass is physically installed on the unit, which is indicated by the **bypassInstalled** field of **nciSysConfigStatus**. As shown below this output also indicates if bypass is physically installed

Valid Range

The valid range is as detailed in the LONMARK SNVT Master List, versions 13.00 and later. The interpretation of parameter is however extended as summarize in the table below.

nvoBypassState.state	nvoBypassState.value	Interpretation
0	0	Bypass not physically installed
1	0	Bypass physically installed, but not active
1	1 to 200 (0,5 to 100%)	Bypass physically installed and active at the indicated level (%)

.

When transmitted

This output is transmitted if the value changes unless **nciPriMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciPriMaxSendT**.

To facilitate polling at lower intervals than are set by **nciPriMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations

Propagation intervals are affected by **nciPriMinSendT** and **nciPriMaxSendT**.

Operating Mode - Input

```
network input sd_string ("@p#9") UNVT_op_mode
nviOpMode;
```

This input will set the operating mode of the ventilation unit.

The input will also override the operating mode that may previously have been set using **nviScheduler**. Setting **nviOpMode** to **OM_FALL_BACK**, removes the override, and the operating mode falls back to the present operating mode resulting from using **nviScheduler** (see also *Configuration Considerations* below).

The operating modes are outlined in the table below. Operating modes and the use of this variable is explained in more detail in the section *Addition Information* (see page 40).

vent_opmode_t

Value	Identifier	Notes
-1 (0xFF)	OM_NULL	Invalid operating mode (undefined)
0	OM_NORMAL_OCC	The system is permanently ON operating with setpoints for OCCUPIED operating mode.
1	OM_NORMAL_UNOCC	The system is permanently ON operating with setpoints for UNOCCUPIED operating mode.
2	OM_NIGHT_COOLING	The system is permanently ON operating with the "Night Cool" setpoints.
3	OM_OFF	The system is permanently OFF
4	OM_MAN	By input from a 2-state switch, the system is manually controlled to operate either in OM_NORMAL_OCC or OM_NORMAL_UNOCC
5	OM_OCC_SENS	By input from an occupancy sensor, the system is manually controlled to operate either in OM_NORMAL_OCC or OM_MAN
6	OM_CO2	By input from an CO2 sensor, the system airflow setpoint dynamically adjusted according to the CO2 value.
7	OM_TEMP_OCC	By input from a temperature sensor, the system is is set to operate either in OM_NORMAL_OCC or OM_MAN
8	OM_TEMP_UNOCC	By input from a temperature sensor, the system is is set to operate either in OM_NORMAL_UNOCC or OM_MAN
9	OM_HUMIDITY	By input from a humidity sensor, the system is is set to operate either in OM_NORMAL_OCC or OM_MAN
10	OM_COMB_OCC_SENS	Controlled from an occupancy sensor, the system is operating at the maximum airflow setpoint determined by the combination of OM_CO2, OM_TEMP_OCC, OM_TEMP_UNOCC, OM_HUMIDITY and (if unoccupied) OM_MAN.
11	OM_COMB_OCC	The system is operating at the maximum airflow setpoint determined by the combination of OM_CO2, OM_TEMP_OCC and OM_HUMIDITY
12	OM_COMB_UNOCC	The system is operating at the maximum airflow setpoint determined by the combination of OM_CO2, OM_TEMP_UNOCC and OM_HUMIDITY and OM_MAN.
127	OM_FALL_BACK	Force operating mode to fall back to the operating mode set by **nviScheduler**. This mode is mostly used when **nviOpMode** is utilized for overriding the **nviScheduler** mode setting.

Valid Range

The valid range is all valid modes defined in **vent_opmode_t**.

Default value

No default value.

Configuration Considerations

This network variable is subject to the receive heartbeat time of
nciOpmodeMaxRcvT. In case the defined maximum receive time runs out, the
operating mode falls back either to the present operating mode resulting from using
nviScheduler, or to **nciSchedModes[15]**.
Setting **nciSetPtMaxRcvT** = 0, disables the fall-back mechanism.

Scheduler Control - Input

```
network input changeable_type sd_string ("@p#10?")
SNVT_tod_event nviScheduler;
```

This input representing a present scheduler value, can indirectly control the operating
mode of the ventilation unit.
The operating mode is according to the value set in the array element of
nciSchedModes pointed to by this value.
The operating mode is determined by this input even if the operating mode has been
previously set by **nviOpMode**, but **nviOpMode** may afterwards be updated to
override the operating mode set by **nviScheduler** (see also **nviOpMode** above).

The operating modes are defined in the enumeration **vent_opmode_t** (see
specifications for **nviOpMode**). Operating modes and the use of this variable is
explained in more detail in the section *Addition Information* (see page 40).

Valid Range

This input supports changeable network variable types. With any of the supported
types the resulting value must be an index in the range from 0 to 15. Normally the
index should however be limited to the range from 0 to 13, as element 14 and 15 of
nciSchedModes has special uses (see **Operating Modes for Scheduler Control**
page 32).

Below the interpretation of each supported network variable type is explained.

```
SNVT_tod_event
```
nviScheduler. current_state
nviScheduler. next_state

OC_NUL	ignore command
OC_OCCUPIED	index set to 0
OC_UNOCCUPIED	index set to 1
OC_BYPASS	index set to 2
OC_STANDBY	index set to 3

nviScheduler. time_to_next_state   number of minutes (value from 0 to 65535)

Treatment of the parameter will be prioritized ad below:
1. If **time_to_next_state** = 0 and **next_state** is valid, **next_state** will be used, and **current_state** will be ignored.
2. If **current_state** is valid it will be used, otherwise it is just ignored.
3. If **time_to_next_state** is > 0 and **next_state** is valid, **next_state** will be used after the elapsed timed set by **time_to_next_state**. The **nviScheduler** receive heartbeat timer will not time out while the **time_to_next_state** is counting down, but the receive heartbeat timer will be started when **next_state** is brought to use.
   In case the **nviOpmode** has been updated to override the operating mode, the operating mode defined by **next_state**, will only take effect after the **nviOpMode** receive heartbeat timer has expired, or the **nviOpMode** has been updated with the value **OM_FALL_BACK**.
4. If both **current_state** and **next_state** are set to **OC_NUL**, the command is ignored, but will act as a retrigger to the receive heartbeat timer. This can be a useful way to prevent the operating mode to fall back to the default fall back mode (**nciSchedModes[15]**).

```
SNVT_scene
```
nviScheduler.function

SC_NUL	ignore command
SC_RESET	index set to 0
Any other	index set to value of (**scene_number** – 1)

nviScheduler.scene_number   value from 1 to 16

```
SNVT_sched_val
```
nviScheduler   index set to variable value

```
SNVT_occupancy
```
nviScheduler

OC_NUL	ignore command
OC_OCCUPIED	index set to 0
OC_UNOCCUPIED	index set to 1
OC_BYPASS	index set to 2
OC_STANDBY	index set to 3

```
SNVT_switch
```
The valid range is according to the 2-state implementation as detailed in the LONMARK SNVT Master List, versions 13.00 and later.

Off	index set to 1
On	index set to 0
Others	ignore command

Default value

No default value.
The default network parameter type is `SNVT_tod_event`.

Configuration Considerations

The network variable type is defined using **nciSchedNvType**.
The values set in the **nciSchedModes** array define the actual operating modes selected trough this parameter.
This network variable is subject to the receive heartbeat time of **nciOpmodeMaxRcvT**. In case the defined maximum receive time runs out, the scheduler operating mode falls back to **nciSchedModes[15]**. Setting **nciSetPtMaxRcvT** = 0, disables the fall-back mechanism. Note that the receive heartbeat time will be retrigged, also in case the command itself is ignored.

Actual Operating Mode - Output

```
network output sd_string ("@p#11") UNVT_op_mode
nvoActualOpmode;
```

This output is used for monitoring the actual operating mode for the unit. The operating modes set by either **nviOpMode** or **nviScheduler** will in combination with the state of various sensor inputs result in a set of basic operating modes, indicated by this output.
Note that the detailed operating status of the unit can be obtained from **nvoUnitStatus** (see below).

Valid Range

The valid range is a subset of the operating modes defined in the enumeration **vent_opmode_t** (see specifications for **nviOpMode**):
    OM_NORMAL_OCC
    OM_NORMAL_UNOCC
    OM_NIGHT_COOLING
    OM_OFF
    OM_CO2

Default value

No default values.

When transmitted

This output is transmitted if the value changes unless **nciPriMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciPriMaxSendT**.
To facilitate polling at lower intervals than are set by **nciPriMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations

Propagation intervals are affected by **nciPriMinSendT** and **nciPriMaxSendT**.

Unit Status - Output

```
network output sd_string ("@p#12") SNVT_state_64
nvoUnitStatus;
```

This output provides detailed status of a Ventilation Unit.

The status information is grouped as indicated in the table below.

Group	Bit no	Byte no
General Status	bit-0 to bit-7	0
Alarms	bit-8 to bit-15	1
Unit Status	bit-16 to bit-31	2 - 3

In the General status group, two bits indicate the validity of Alarm Status and Unit Status, and one bit indicates if any alarms are active. Thus by reading the first byte it can be determined if alarm and status information is valid, and if any alarm is active.

The table below details the Unit Status structure. Each field is a Boolean, single-bit value.

Bit no	Designation	Description
0	ST_ALARM_VALID	Alarm states are valid (bit-8 to bit-15)
1	ST_UNIT_STATE_VALID	Unit states are valid (bit-15 to bit-31)
. . .		
7	ST_ALARMS	At least one alarm is active (bit-8 to bit-15)
. . .		
8	AL_FLOW	Alarm: Flow
9	AL_LOW_TEMP	Alarm: Low temperature
10	AL_DEFROST	Alarm: Defrost
11	AL_CONDENSATION	Alarm: Condensation
. . .		
16	US_BYPASS	Unit status: Bypass
17	US_DEFROST	Unit status: Defrost
18	US_LOW_TEMP	Unit status: Low temperature
19	US_CONDENSATION	Unit status: Condensation
20	US_NIGHT_COOLING	Unit status: Night cooling
21	US_BACKG_VENT	Unit status: Background ventilation
22	US_RUNNING	Unit status: Running
23	US_STARTING	Unit status: Starting
24	US_STOPPING	Unit status: Stopping
25	US_STOPPED	Unit status: Stopped
. . .		
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Valid Range

The valid range is according to the *LONMARK SNVT and SCPT Master List* (versions 13.00 or later).

Default value

No default values.

When transmitted

This output is transmitted if the value changes unless **nciSecMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciSecMaxSendT**.
To facilitate polling at lower intervals than are set by **nciSecMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations

Propagation intervals are affected by **nciSecMinSendT** and **nciSecMaxSendT**.

Outdoor Temperature - Output

```
network output sd_string ("@p#13") SNVT_temp_p
nvoOutdoorTemp;
```

This output is used for monitoring the outdoor temperature.

Valid Range
The typical range is -30 to +40°C

When transmitted
This output is transmitted if the value changes unless **nciSecMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciSecMaxSendT**.
To facilitate polling at lower intervals than are set by **nciSecMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations
Propagation intervals are affected by **nciSecMinSendT** and **nciSecMaxSendT**.

Discharge Air Temperature - Output

```
network output sd_string ("@p#14") SNVT_temp_p
nvoDischAirTemp;
```

This output is used for monitoring the discharge air temperature.

Valid Range
The typical range is -20 to +40°C

When transmitted
This output is transmitted if the value changes unless **nciSecMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciSecMaxSendT**.
To facilitate polling at lower intervals than are set by **nciSecMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations
Propagation intervals are affected by **nciSecMinSendT** and **nciSecMaxSendT**.

Fan Speed - Output

```
network output sd_string ("@p#15") UNVT_fan_speed
nvoFanSpeed;
```

This output is used for monitoring speed of ventilators.

```
typedef struct {
    SNVT_switch             fan[2];
} UNVT_fan_speed;
```

ventilator_1 (array index 0)
ventilator_2 (array index 1)

Valid Range
The valid range is as detailed in the LONMARK SNVT Master List, versions 13.00 and later.
nvoFanSpeed.info[n].state
   0   Ventilator Speed = 0
   1   Ventilator Speed > 0

nvoFanSpeed.info[n].value indicates the actual ventilator speed in percent.

When transmitted
This output is transmitted if the value changes unless **nciSecMinSendT** restricts this. If the value does not change, the output is re-transmitted at intervals set by **nciSecMaxSendT**.
To facilitate polling at lower intervals than are set by **nciSecMinSendT**, the value of this network variable is updated (but not necessarily propagated) whenever a change is detected (at ~2 sec interval).

Configuration Considerations
Propagation intervals are affected by **nciSecMinSendT** and **nciSecMaxSendT**.

Manual Control - Input

```
network input sd_string ("@p#16") SNVT_switch
nviManCtrl;
```

This input is used for manual control functions, when applicable according to the operating mode.

Valid Range
The valid range is according to the 2-state implementation as detailed in the LONMARK SNVT Master List, versions 13.00 and later.

Default value
No default value. Until the first update of this input, the sensor is considered not to be present, and the input is ignored.

Configuration Considerations

Whenever **nviManCtrl** changes from *OFF* to *ON*, the internal value will be held as *ON* for the time set in **nciManOnTime** and will hereafter revert to OFF. The hold time can be retrigged, but not interrupted.
Setting **nciManOnTime** = 0 disables this hold and revert mechanism.
This network variable is subject to the receive heartbeat time of **nciSensorMaxRcvT**. In case the defined maximum receive time runs out, the sensor is considered not to be present, and the input is ignored.
Setting **nciSensorMaxRcvT** = 0, disables the ignore mechanism.

Occupancy Sensor - Input

```
network input sd_string ("@p#17") SNVT_occupancy
nviOccupancy;
```

This input is used for occupancy control functions, when applicable according to the operating mode.

Valid Range
The valid range is according LONMARK SNVT Master List, versions 13.00 and later.

Default value
No default value. Until the first update of this input, the sensor is considered not to be present, and the input is ignored.

Configuration Considerations
Whenever **nviOccupancy** changes from **OC_OCCUPIED** to another state, any other value of **nviOccupancy** than **OC_OCCUPIED** will internally be overridden to **OC_STANDBY** in the time set in **nciOccStandbyT**.
Setting **nciOccStandbyT** = 0 disables this standby hold mechanism.
This network variable is subject to the receive heartbeat time of **nciSensorMaxRcvT**. In case the defined maximum receive time runs out, the sensor is considered not to be present, and the input is ignored.
Setting **nciSensorMaxRcvT** = 0, disables the ignore mechanism.

Space CO2 Sensor - Input

```
network input sd_string ("@p#18") SNVT_ppm
nviSpaceCO2;
```

This input is used for CO2 dependent airflow adjustment, when applicable according to the operating mode as detailed in the section *Addition Information* (see page 40).
Important remark: please also read the remark on page 4 of this document.

Valid Range

The valid range is according LONMARK SNVT Master List, versions 13.00 and later. If however the input is above 3000 ppm, the CO2 sensor will be regarded defective, and considered not present.

Default value
No default value. Until the first update of this input, the sensor is considered not to be present, and the input is ignored.

Configuration Considerations
This network variable is subject to the receive heartbeat time of **nciSensorMaxRcvT**. In case the defined maximum receive time runs out, the sensor is considered not to be present, and the input is ignored.
Setting **nciSensorMaxRcvT** = 0, disables the ignore mechanism.

Space Temperature Sensor - Input

```
network input sd_string ("@p#19") SNVT_temp_p
nviSpaceTemp;
```

This input is used for temperature dependent control functions, when applicable according to the operating mode.

Valid Range
The valid range is according LONMARK SNVT Master List, versions 13.00 and later.

Default value
No default value. Until the first update of this input, the sensor is considered not to be present, and the input is ignored.

Configuration Considerations
This network variable is subject to the receive heartbeat time of **nciSensorMaxRcvT**. In case the defined maximum receive time runs out, the sensor is considered not to be present, and the input is ignored.
Setting **nciSensorMaxRcvT** = 0, disables the ignore mechanism.

Space Relative Humidity Sensor - Input

```
network input sd_string ("@p#20") SNVT_lev_percent
nviSpaceRh;
```

This input is used for humidity dependent control functions, when applicable according to the operating mode.

Valid Range

The valid range is according LONMARK SNVT Master List, versions 13.00 and later.

Default value
No default value. Until the first update of this input, the sensor is considered not to be present, and the input is ignored.

Configuration Considerations
This network variable is subject to the receive heartbeat time of **nciSensorMaxRcvT**. In case the defined maximum receive time runs out, the sensor is considered not to be present, and the input is ignored.
Setting **nciSensorMaxRcvT** = 0, disables the ignore mechanism.

4. Optional Network Variables
None specified.

5. Configuration Properties

Maximum Setpoint Input Heartbeat Time

```
SCPTmaxRcvTime cp_family
nciSetPtMaxRcvT;
```

This configuration property is associated with the 'setpoint group' of network variable inputs (see Table 1). It sets the maximum time that elapses after the last update to a network variable before is falls back to the corresponding default value.

Valid Range
The valid range is 0 to 6553sec.
The value 0 is disables the fall-back mechanism.

Default value
The default value is 600sec.

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

Maximum Operating Mode Input Heartbeat Time

```
SCPTmaxRcvTime cp_family
nciOpmodeMaxRcvT;
```

This configuration property is associated with the 'operating mode group' of network variable inputs (see Table 1). It sets the maximum time that elapses after the last update to a network variable before the operating mode fall back to the default value.

Valid Range
The valid range is 0 to 6553sec.
The value 0 is disables the fall-back mechanism.

Default value
The default value is 1800sec.

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

Maximum Sensor Input Heartbeat Time

```
SCPTmaxRcvTime cp_family
nciSensorMaxRcvT;
```

This configuration property is associated with the 'sensor input group' of network variable inputs (see Table 1). It sets the maximum time that elapses after the last update to a network variable before the corresponding sensor is considered not to be present, and the input is ignored.

Valid Range
The valid range is 0 to 6553sec.
The value 0 is disables the ignore mechanism.

Default value
The default value is 600sec.

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

Maximum Primary Output Send Time

```
SCPTmaxSendTime cp_family
nciPriMaxSendT;
```

This configuration property is associated with the group of primary network variable outputs (see Table 1). It sets the maximum period of time before the output network variables is automatically propagated.

Valid Range
The valid range is 0 to 6553sec.
The value 0 is interpreted as infinite.

Default value
The default value is 240sec.

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

Minimum Primary Output Send Time

```
SCPTminSendTime cp_family
nciPriMinSendT;
```

This configuration property is associated with the group of primary network variable outputs (see Table 1). It sets the minimum period of time between the output network variable is propagated.
To facilitate polling of network variables at lower intervals, the value of these network variables is updated (but not necessarily propagated) whenever a change is detected.

Valid Range
The valid range is 0 to 6553sec.

Default value
The default value is 30sec.

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

Maximum Secondary Output Send Time

```
SCPTmaxSendTime cp_family
nciSecMaxSendT;
```

This configuration property is associated with the group of secondary network variable outputs (see Table 1). It sets the maximum period of time before the output network variables is automatically propagated.

Valid Range
The valid range is 0 to 6553sec.
The value 0 is interpreted as infinite.

Default value
The default value is 240sec.

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

Minimum Secondary Output Send Time

```
SCPTminSendTime cp_family
nciSecMinSendT;
```

This configuration property is associated with the group of secondary network variable outputs (see Table 1). It sets the minimum period of time between the output network variable is propagated.
To facilitate polling of network variables at lower intervals, the value of these network variables is updated (but not necessarily propagated) whenever a change is detected.

Valid Range
The valid range is 0 to 6553sec.

Default value
The default value is 30sec.

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

Default Airflow Setpoint

```
SCPTsetpoint cp_family
nciDefAirflow;
```

This configuration property sets the airflow setpoint used by **nviSetptAirflow** as default and optional fall-back value.

Valid Range
The valid range as for **nviSetptAirflow**.

Default value
The default value is 100 %.

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

Relative Airflow Setpoint for Unoccupied Modes

```
UCPTairflowRelUNOCC cp_family
nciAirflRelUnocc;
```

This configuration property sets relative airflow setpoint when operating in any unoccupied operating mode. To obtain the airflow setpoint for the unoccupied

operating mode, the value of **nciAirflRelUnocc** is multiplied with the airflow setpoint for occupied operating mode (see **nviSetptAirflow**).

Valid Range

The valid range is 0 to 150%.
Setting the value to 0% will turn the system off in any unoccupied operating mode.

Default value

The default value is 30 %.

Configuration Requirements/Restrictions

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

Airflow Setpoint for Night Cooling

```
UCPTnightCoolAirflow cp_family
nciNtCoolAirflow;
```

This configuration property sets the airflow setpoint used for the **OM_NIGHT_COOLING** operating mode.

Valid Range

The valid range as for **nviSetptAirflow**.

Default value

The default value is 100 %.

Configuration Requirements/Restrictions

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

Default Temperature Setpoint

```
SCPTsetpoint cp_family
nciDefTemp;
```

This configuration property sets the airflow setpoint used by **nviSetptTemp** as default and optional fall-back value.

Valid Range

The valid range as for **nviSetptTemp**.

Default value

The default value is 19 °C.

Configuration Requirements/Restrictions

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

Temperature Setpoint Adjustment for Unoccupied Modes

```
UCPTtempAdjustUNOCC cp_family
nciTempAdjUnocc;
```

This configuration property sets the adjustment for the temperature setpoint when operating in any unoccupied operating mode. To obtain the temperature setpoint for the unoccupied operating mode, the value of **nciTempAdjUnocc** is added to the temperature setpoint for occupied operating mode (see **nviSetptTemp**).

Valid Range
The valid range is -10 to +10 °C.

Default value
The default value is 0 °C.

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

Temperature Setpoint for Night Cooling

```
UCPTnightCoolTemp cp_family
nciNtCoolTemp;
```

This configuration property sets the temperature setpoint used for the **OM_NIGHT_COOLING** operating mode.

Valid Range
The valid range as for **nviSetptTemp**.

Default value
The default value is 15 °C.

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

Default Bypass Operating Mode

```
SCPTsetpoint cp_family
nciDefBypassOpm;
```

This configuration property sets the operating mode used by **nviBypassOpm** as default and optional fall-back value.

Valid Range
The valid range as for **nviBypassOpm**.

Default value
The default value is *Bypass Disabled*.

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

Default Bypass Enable Difference Temperature

```
UCPTbypassEnTdiff cp_family
nciBypassEnTdiff;
```

This configuration property sets the temperature difference required to start the bypass and cooling function.
If **nviBypassOpm** is set to *Bypass Enabled*, the bypass and cooling function is started when:
nvoInletTemp > (**nvoEffSptTemp** + **nciBypassEnTdiff**)

Note: Requires that bypass is physically installed.

Valid Range
The valid range is 0 to 10 °C.

Default value
The default value is 2 °C.

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

Network Type for nviScheduler

```
SCPTnvType cp_family
nciSchedNvType;
```

This configuration property sets the network variable type to be used for
nviScheduler.

Valid Range
The valid range is according to the set of network variable types listed under
nviScheduler (see page 15).

Default value
The default value is **SNVT_tod_event**.

Configuration Requirements/Restrictions
Before modifying this CP, the functional block must be disabled.

Operating Modes for Scheduler Control

```
SCPTvalueDefinition cp_family
nciSchedModes[16];
```

This configuration property sets in an array of 16 elements the operating mode
selected by the index resulting from updates to **nviScheduler**. Operating modes are
of type **UNVT_op_mode (**see **nviOpMode** page 13).

Two array elements have a special function:
- Auto start mode - Array element [14]
   At node power up or reset, the node will set the unit to the operating
   mode set by this element. Setting this element to **OM_NULL** disables the
   auto start mode.
- Fall Back mode - Array element [15]
   In various situations, such as missing input updates, the operating mode
   will fall back to the operating mode set by this element. Setting this
   element to **OM_NULL** will disable the fall back mechanism.

Valid Range
The valid range are the modes according to **vent_opmode_t,** (see **nviOpMode**
page 13) excluding: **OM_FALL_BACK**.

Default value
The default value for all elements is **OM_NORMAL_OCC**.

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

Maximum Inlet Fan Operating Voltage

```
UCPTmaxInletFanV cp_family
nciMaxInletFanV;
```

This configuration property sets the maximum operating voltage for the inlet fan. The value is set in percent of the system defined maximum allowable operating voltage.

Valid Range
The valid range is 0 to 100 %.

Default value
The default value is 50 %. Note however, that this value at the first power up may be overwritten from the Main Controller, as the parameter is reliant on actual physical unit configuration.

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

Maximum Outlet Fan Operating Voltage

```
UCPTmaxOutletFanV cp_family
nciMaxOutletFanV;
```

This configuration property sets the maximum operating voltage for the outlet fan. The value is set in percent of the system defined maximum allowable operating voltage.

Valid Range
The valid range is 0 to 100 %.

Default value
The default value is 65 %. Note however, that this value at the first power up may be overwritten from the Main Controller, as the parameter is reliant on actual physical unit configuration.

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

Manual Override Time

```
SCPTmanOvrTime cp_family
nciManOnTime;
```

This configuration property sets the manual override time. The *OverrideTimer* is retrigged whenever **nviManCtrl** changes from *OFF* to *ON* (see **nviManCtrl)**.

Valid Range
The valid range is 0 to 65534 min.
The value 0 disables the *OverrideTimer*.

Default value
The default value is 60 min.

Configuration Requirements/Restrictions
This CP has no modification restrictions. It can be modified at any time. The new value will take effect next time the *OverrideTimer* is triggered.

Occupancy Hold Time

```
SCPTholdTime cp_family
nciOccStandbyT;
```

This configuration property sets the occupancy hold time. The *HoldTimer* is retrigged whenever **nviOccupancy** changes from **OC_OCCUPIED** to any other state (see **nviOccupancy)**.

Valid Range
The valid range is 0 to 6553 sec.
The value 0 disables the *HoldTimer*.

Default value
The default value is 1800 sec.

Configuration Requirements/Restrictions
This CP has no modification restrictions. It can be modified at any time. The new value will take effect next time the *HoldTimer* is triggered.

Minimum Airflow for CO2 Controlled Operating Mode

```
SCPTminSetpoint cp_family
nciCO2MinAirflow;
```

This configuration property sets the minimum airflow used for a CO2 controlled operating mode as detailed in the section *Addition Information* (see page 40).

Valid Range
The valid range as for **nviSetptAirflow**.

Default value
The default value is 30 %.

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

Limit value for CO2 Airflow Adjustment

```
SCPTlimitCO2 cp_family
nciLimitCO2;
```

When in CO2 controlled operating mode, this configuration property sets the limit value from CO2 sensor, which when exceeded start the adjustment of the airflow setpoint (starting from the value set by **nciCO2MinAirflow**). See also the section *Addition Information* (see page 40).

Valid Range
The valid range as is from 0 ppm to the value of **nciMaxCO2**.

Default value
The default value is 500 ppm.

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

Maximum value for CO2 Airflow Adjustment

```
UCPTmaxCO2 cp_family
nciMaxCO2;
```

When in CO2 controlled operating mode, this configuration property sets the maximum value from CO2 sensor. At this level the adjustment of the airflow setpoint will end (at 100%). See also the section *Addition Information* (see page 40).

Valid Range

The valid range is form the value of **nciLimitCO2** to 3000 ppm.

Default value

The default value is 1500 ppm.

Configuration Requirements/Restrictions

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

Trigger Level for Temperature Controlled Occupied Operating Mode

```
UCPTtempTrigOCC cp_family
nciTempTrigOcc;
```

This configuration property sets the temperature trigger level used for temperature controlled occupied operating mode.

Valid Range

The valid range as for **nviSetptTemp**.

Default value

The default value is 23 °C.

Configuration Requirements/Restrictions

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

Trigger Level for Temperature Controlled Unoccupied Operating Mode

```
UCPTtempTrigUNOCC cp_family
nciTempTrigUnocc;
```

This configuration property sets the temperature trigger level used for temperature controlled unoccupied operating mode.

Valid Range

The valid range as for **nviSetptTemp**.

Default value

The default value is 21 °C.

Configuration Requirements/Restrictions

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

Hysteresis for Temperature Controlled Operating Mode

```
SCPTtemperatureHysteresis cp_family
nciTempTrigHyst;
```

This configuration property sets the temperature hysteresis used for temperature controlled operating mode.

Valid Range
The valid range as for 0 to 10°C.

Default value
The default value is 2 °C.

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

Trigger Level for Humidity Controlled Operating Mode

```
SCPThumSetpt cp_family
nciRhTrig;
```

This configuration property sets the humidity trigger level used for humidity controlled unoccupied operating mode.

Valid Range
The valid range as for **nviSpaceRh**.

Default value
The default value is 70 %.

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

Hysteresis for Humidity Controlled Operating Mode

```
UCPTrhHysteresis cp_family
nciRhTrigHyst;
```

This configuration property sets the humidity hysteresis in pp (percentage points) used for humidity controlled operating mode.

Valid Range
The valid range as for 0 to 25 pp

Default value
The default value is 10 pp.

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

System Configuration Status

```
UCPTsysConfigStatus cp_family
nciSysConfigStatus;
```

This configuration property shows the system configuration to indicate if the bypass system is physically installed. It also indicates the major and minor software versions of the units Main controller, the Fieldbus Interface Controller (FIC) and the Fieldbus Interface Protocol (FIP) used between the LonWorks node and the FIC.

```
typedef struct {
    boolean                stausValid;
    boolean                bypassInstalled;
    unsigned short         mainCtrlMajorVer;
    unsigned short         mainCtrlMinorVer;
    unsigned short         ficMajorVer;
    unsigned short         ficMinorVer;
    unsigned long          fipVersion;
} UCPTsysConfigStatus;
```

Valid Range

nciSysConfigStatus.statusValid	TRUE or FALSE
nciSysConfigStatus.bypassInstalled	TRUE or FALSE
nciSysConfigStatus.mainCtrlMajorVer	0 to 255
nciSysConfigStatus.mainCtrlMinorVer	0 to 255
nciSysConfigStatus.ficMajorVer	0 to 255
nciSysConfigStatus.ficMinorVer	0 to 255
nciSysConfigStatus.fipVersion	1 to 32767

Default value
No default value.

Configuration Requirements/Restrictions
This CP is read-only, and must always be read from the device. The value is updated shortly after a Node Reset. The values should only be used when the **statusValid** field is TRUE, indicating that all fields are updated and valid.

6. Key for Unresolved References

p is this functional block's index relative to the Device Self-Documentation String (DSDS) declaration, when implemented in the device.

7. Additional Information

Overview

This section will provide information about the implementation of the LonWorks enabled Air Handling device. Also it will provide a comprehensive view and more detailed information about the Ventilation Unit functional block and the use and interrelations of its various network and configuration parameters. The following issues are dealt with in this section:

- System implementation
- LonWorks implementation
- Primary setpoints
- Operating modes
- Controlling operating modes.

System Implementation

The LonWorks device is implemented as a front end controller, enabling existing Air Handling devices to be part of a LonWorks system. The primary control of system elements is performed by the units Main Controller. A Fieldbus Interface Controller (FIC) provides a link between the Main Controller and the LonWorks front end device.

LonWorks Implementation

The LonWorks device for the Air Handling device is comprised of two objects:

SFPTnodeObject
0000

UFPTventilationUnit
20100
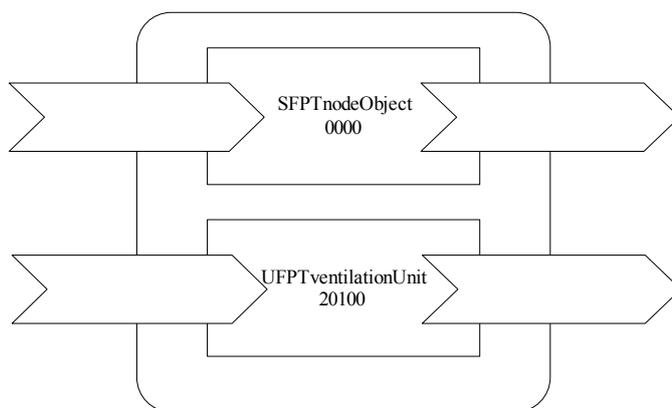
Node Object (index 0)

The SFPTnodeObject (0000) implements:
- all mandatory network variables
- configuration property SCPTdevMajVer (165)
- configuration property SCPTdevMinVer (166)
- configuration property SCPTlocation (17)
- configuration property SCPTmaxSndT (22)

The **SCPTmaxSndT** sets the Heartbeat max. send time for **nvoStatus**.

Ventilation Object (index 1)

The UFPTventilationUnit (20100) object implements:
- all mandatory network variables
- all mandatory configuration properties.

The following situations are reported via the Node Objects **nvoStatus**:
- **nvoStatus.out_of_service**
  Indicating that FIC (Filedbus Interface Controller) has no communication with Main Controller.
- **nvoStatus. feedback_failure**
  Indicating synchronization failure between Node and FIC.
- **nvoStatus.comm_failure**
  Indicating communication errors between Node and FIC.
- **nvoStatus.self_test_in_progress**
  Indicating failure in FIP (Fieldbus Interface Protocol) version negotiation
- **nvoStatus.fail_self_test**
  Indicating communication errors between Node and FIC.

Atempting to change the type for **nviSceduler** to an unsupported data type will result in:
- Setting **nvoStatus.invalid_request**.
- Posting application error 0x01 to the Neuron Chip error log.
- Disabling of the VentilationUnit Object.

General

When sending a WINK command to the device, the service LED flashes 5 times over a period of ~15 seconds.

Primary Setpoints

The primary dynamic setpoints for the system are:
```
nviSetptAirflow      SNVT_lev_percent
nviSetptTemp         SNVT_temp_p
```

In case any of the above dynamic variables are not used or not updated within a set heartbeat interval the corresponding default configuration setpoint will be used:

```
nciDefAirflow          SNVT_lev_percent      (default 100%)
nciDefTemp             SNVT_temp_p           (default 19°)
```

The above dynamic and default setpoints are used for normal operation also
designated *OCCOPIED* operating modes.

For *UNOCCUPIED* operating modes, the normal operating setpoints are adjusted
using the following configuration parameters:
```
nciAirflRelUnocc       SNVT_lev_percent      (default 30% / range 0-
150%)
nciTempAdjUnocc        SNVT_temp_p           (default 0°/ range ±10°)
```

UNOCCUPIED airflow setpoint:
normal airflow setpoint x **nciAirflRelUnocc** (resulting limited range of 0-100%).
UNOCCUPIED temperature setpoint:
normal temperature setpoint + **nciTempAdjUnocc** (resulting limited range of
0-30°).

Setting **nciAirflRelUnocc** = 0, will turn the system off in the *UNOCCUPIED*
operating modes.

Operating Modes

Operating modes are defined in the enumeration **vent_opmode_t** (see **nviOpMode**
page 13). Below each of the operating modes and their associated parameters are
described in detail.

M_NORMAL_OCC

Controling prameters
None.

Description
The system is permanently ON operating with setpoints for *OCCUPIED* operating
mode.

OM_NORMAL_UNOCC

Controling prameters
None.

Description
The system is permanently ON operating with setpoints for *UNOCCUPIED*
operating mode.

OM_NIGHT_COOLING

Controling prameters

None.

Operational parameters

```
nciNtCoolAirflow        SNVT_lev_percent     (default 100%)
nciNtCoolTemp           SNVT_temp_p          (default 15°)
```

Description

The system is permanently ON operating with the *NIGHTCOOL* setpoints defined above.

OM_OFF

Controling prameters

None

Description

The system is permanently OFF.
However, to facilitate the use of a manual start option on the units Main Controller, the airflow and temperature setpoints are set as for the normal *OCCUPIED* operating mode.

OM_MAN

Controling prameters

```
nviManCtrl              SNVT_switch
nciManOnTime            SNVT_time_min (default 60 min)
```

Switch modes

Switch mode 1

This mode is employed when **nciManOnTime** > 0.
Whenever **nviManCtrl** changes from *OFF* to *ON*, the internal state will be held as *ON* for the time set in **nciManOnTime** and will hereafter revert to *OFF*. The hold time can be retrigged, but not interrupted.

Switch mode 2

This mode is employed when **nciManOnTime** is = 0.
There internal state follows the *ON/OFF* state of **nviManCtrl**.

Description

If the internal state is detected *ON*, the system operates as **OM_NORMAL_OCC**, else the system operates as **OM_NORMAL_UNOCC**.

OM_OCC_SENS

Controling prameters

```
nviOccupancy        SNVT_occupancy
nciOccStandbyT      SNVT_time_sec (default 30 min)
```

Detection modes

Detect mode 1

This mode is employed when **nciOccStandbyT** > 0.
Whenever **nviOccupancy** changes from *OC_OCCUPIED* to another state, any other
value of **nviOccupancy** than *OC_OCCUPIED* will internally be overridden to
OC_STANDBY in the time set in **nciOccStandbyT**.

Detect mode 2

This mode is employed when **nciOccStandbyT** = 0.
Here (relying on the timer-settings in the occupancy sensor) the internal value
follows the values of **nviOccupancy**.

Description

If the internal occupancy state is detected as *OC_OCCUPIED* or *OC_STANDBY* the
system operates as **OM_NORMAL_OCC**, else the system operates as **OM_MAN**.

OM_CO2

Controling prameters

```
nviSpaceCO2         SNVT_ppm
nciCO2MinAirflow    SNVT_lev_percent (default 30%)
nciLimitCO2         SNVT_ppm  (default 500ppm)
nciMaxCO2           SNVT_ppm  (default 1500ppm)
```

Operational parameters

For airflow, see description below.
For temperature, the setpoint for *OCCUPIED* operating mode is used.

Description

The airflow setpoint is adjusted by the parameter **nviSpaceCO2**, using the following
configuration parameters:
- **nciCO2MinAirflow**   minimum airflow
- **nciLimitCO2**   CO2 minimum regulating limit
- **nciMaxCO2**   CO2 maximum regulating limit

The airflow setpoint adjustment is depicted in the diagram below.
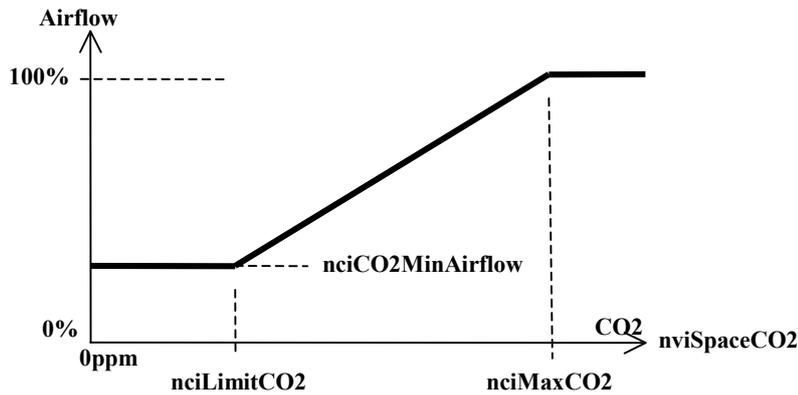
Note:
In case the sensor is not present or its variable is not updated within a set heartbeat interval, the operating mode will be set to **OM_NORMAL_OCC**.

OM_TEMP_OCC

Controling prameters

```
nviSpaceTemp        SNVT_temp_p
nciTempTrigOcc      SNVT_temp_p          (default 23°)
nciTempTrigHyst     SNVT_temp_p          (default 2°)
```

Description

When (**nviSpaceTemp** > **nciTempTrigOcc**) the system is set to operate as **OM_NORMAL_OCC**.
When (**nviSpaceTemp** < (**nciTempTrigOcc** - **nciTempTrigHyst**) the system is set to operate as **OM_MAN**.

Note:
In case the sensor is not present or its variable is not updated within a set heartbeat interval, the operating mode will be set to **OM_NORMAL_OCC**.

OM_TEMP_UNOCC

Controling prameters

```
nviSpaceTemp        SNVT_temp_p
nciTempTrigUnocc    SNVT_temp_p          (default 21°)
nciTempTrigHyst     SNVT_temp_p          (default 2°)
```

Description

When (**nviSpaceTemp** > **nciTempTrigUnocc**) the system is set to operate as **OM_NORMAL_UNOCC**.
When (**nviSpaceTemp** < **nciTempTrigUnocc** - **nciTempTrigHyst**) the system is set to operate as **OM_OFF**.

Note:
In case the sensor is not present or its variable is not updated within a set heartbeat interval, the operating mode will be set to **OM_MAN**.

OM_HUMIDITY

Controling prameters

```
nviSpaceRh            SNVT_lev_percent
nciRhTrig             SNVT_lev_percent (default 70%)
nciRhTrigHyst         SNVT_lev_percent (default 10 pp)
```

Description

When (**nviSpaceRh** > **nciRhTrig**) the system is set to operate as
OM_NORMAL_OCC
When (**nviSpaceRh** < (**nciRhTrig** - **nciRhTrigHyst**) the system is set to operate as
OM_MAN.

Note:
In case the sensor is not present or its variable is not updated within a set heartbeat interval, the
operating mode will be set to **OM_NORMAL_OCC**.

OM_COMB_OCC_SENS

Description

If the occupancy state is detected as **OC_OCCUPIED** or **OC_STANDBY** the system will
operate at the maximum airflow resulting from any of the following operating
modes:

- **OM_CO2**
- **OM_TEMP_OCC**
- **OM_HUMIDITY**

If the occupancy state is not detected as **OC_OCCUPIED** or **OC_STANDBY** the system
will operate at the maximum airflow resulting from any of the following operating
modes, using setpoints for the *UNOCCUPIED* operating mode:

- **OM_CO2** (using temperature setpoint for the UNOCCUPIED operating mode)
- **OM_TEMP_UNOCC**
- **OM_HUMIDITY** (using setpoints for the UNOCCUPIED operating mode)
- **OM_MAN** - for overruling the operating mode to **OM_NORMAL_OCC**

Note:
In case a controlling sensor (CO2, Temperature or Humidity) is not present or does not update its
variable, the corresponding operating mode will simply be ignored. If all of the controlling sensors are
missing, the operating mode will be according to **OM_OCC_SENS**.

OM_COMB_OCC

Description

The system will operate at the maximum airflow resulting from any of the following
operating modes:

- **OM_CO2**
- **OM_TEMP_OCC**
- **OM_HUMIDITY**

Note:
In case a controlling sensor (CO2, Temperature or Humidity) is not present or does not update its
variable, the corresponding operating mode will simply be ignored. If all of the controlling sensors are
missing, the operating mode will be set to **OM_NORMAL_OCC**.

OM_COMB_UNOCC

Description

The system will operate at the maximum airflow resulting from any of the following operating:

- **OM_CO2** (using temperature setpoint for the UNOCCUPIED operating mode)
- **OM_TEMP_UNOCC**
- **OM_HUMIDITY** (using setpoints for the UNOCCUPIED operating mode)
- **OM_MAN** - for overruling the operating mode to **OM_NORMAL_OCC**

Note:
In case a controlling sensor (CO2, Temperature or Humidity) is not present or does not update its variable, the corresponding operating mode will simply be ignored. If all of the controlling sensors are missing, the operating mode will be according to **OM_MAN**.

Controlling Operating Modes

The system operating mode is controlled using either or both of:

```
nviOpMode           UNVT_op_mode
nviScheduler        SNVT_xxx (changeable type)
```

nviOpMode
> Directly sets the operating mode, and will also override the operating mode set via **nviScheduler**.

nviScheduler points to the array:

```
nciSchedModes[16]   UNVT_op_mode (default for all: OM_NORMAL_OCC)
```

The system operates according to the operating mode set in the **nciSchedModes[]** element pointed to by **nviScheduler**.

If only using the **nviOpMode** input, this will control the unit operating mode. In case the input is not updated within a set heartbeat interval, the operating mode will fall back to the default Fall Back mode set in **nciSchedModes[15]**.

If only using **nviScheduler**, this will control the unit operating mode. In case the input is not updated within a set heartbeat interval, the operating mode will fall back to the default Fall Back mode set in **nciSchedModes[15]**.

If using both **nviOpMode** and **nviScheduler**, an update to **nviScheduler** will set the unit operating mode, but subsequently updating to **nviOpMode**, will override the operating mode previously set by **nviScheduler**. The override condition will remain until the **nviOpMode** receive heartbeat time runs out, or **nviOpMode** is updated with the value **OM_FALL_BACK.** In case **nviScheduler** is not updated within a set heartbeat interval, the scheduler operating mode will fall back to the mode set in **nciSchedModes[15]**.

In order to offer support for different scheduler implementations, **nviScheduler** is implemented as a changeable network type supporting:

```
SNVT_tod_event  (0 to 3)      (occup_t enumeration)
SNVT_scene      (0 to 15)     (scene no. 1-16)
SNVT_sched_val  (0 to 15)
SNVT_switch     (0 or 1)      (ON /OFF) See Note
SNVT_occupancy  (0 to 3)      (occup_t enumeration)
```

Note:
For the `SNVT_switch` type, the interpretation is inverted in order to resemble the functionality for occupancy devices that sends '0' for occupied state. Thus switch ON is interpreted as occupied state, giving the value '0'.

The interpretation of the different network variable types is described under **nviScheduler** (see page 15).

The changeable network type for **nviScheduler** provides flexibility for using different schedulers. It also allows for controlling the operating modes using a 2-position switch or an occupancy sensor to index the operating modes defined in the array **nciSchedModes[]**, which is an alternative to using such sensors as inputs for the operating modes **OM_MAN** and **OM_OCC_SENS**.

Scheduler Operations

A single scheduler unit can control several Air Handling devices in combination with light, heat and other controls.
The Scheduler may output a single parameter (basically representing a numeric value) that can be interpreted individually by a number of different devices. For the Air Handling device, the interpretation of the scheduler value is done by setting the appropriate operating modes in the array **nciSchedModes[]**.

Auto Start

At node power up or reset, the node will set the unit to the operating mode set by **nciSchedModes[14]**. Setting this element to **OM_NULL** disables the auto start mode.

8.

Appendix

Wiring diagram – connection terminals

Mounting plate

Controller box in ventilation unit

LonWorks
TP/FT-10

AMFIC with LON expansion module

-w1 2x2x0,6
L = 3,0 m