Installation- & user instructions
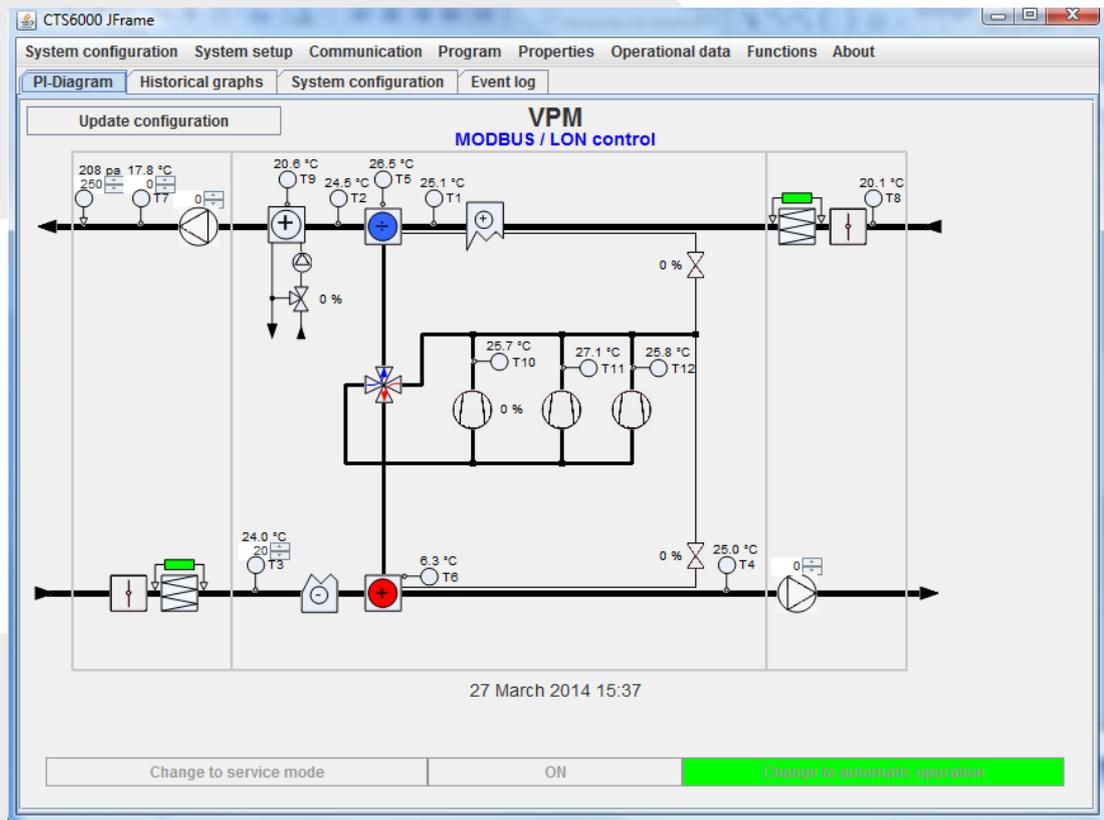
for

NILAN LON module for CTS6000

Valid for: CTS6000, SW 1.0092 ➔

Version 1.07, 16-12-2015

MARKEDSFØRENDE ERHVERVS- OG BOLIGVENTILATION MED VARMEGENVINDING

Contents

Figure table

General description of NilLON

NilLON will connect a Nilan Ventilation unit to a LON Network. Via NilLON it is possible to control the HVAC unit and get its status.

NilLON is designed using a FT-X3 , an FTT10 transceiver and a 128Kbyte Flash memory, which makes updating of software possible.

NilLON uses self documentation strings, which means an installation-tool can access the relevant information over the network, otherwise NilLON_HVAC.xif can be requested at Nilan A/S
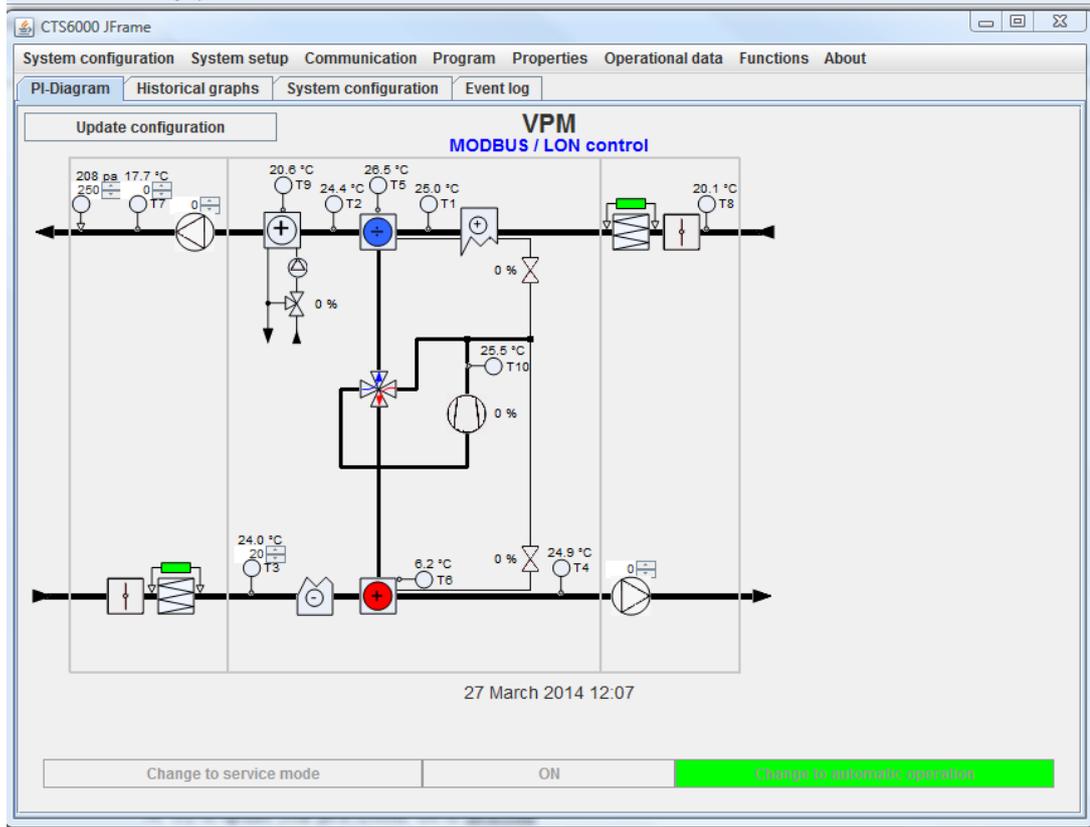
Figure 1: CTS6000 user interface

Installation

When NilLON is delivered it is already configured. This means that when it is powered up the application program will start automatically. The Flash memory will contain Firmware and application code. Furthermore the communication parameters will be present in the EEPROM memory of the neuron-chips. The customer will need to install the network and make the required bindings.
NilLON can be installed by pushing the SERVICE pin (SW2) which will cause the neuron-chip to transmit a unique 48 bit ID code to the network.
The SERVICE pin SW1 will reset and restart the LON chip. It has *NO* influence on MODBUS chip.
NilLON has a yellow service LED which indicates various states of the interface. When NilLON is installed, it should only flash for a moment and then remain off.
For further information see Echelon documentation.

Installation and operating instructions
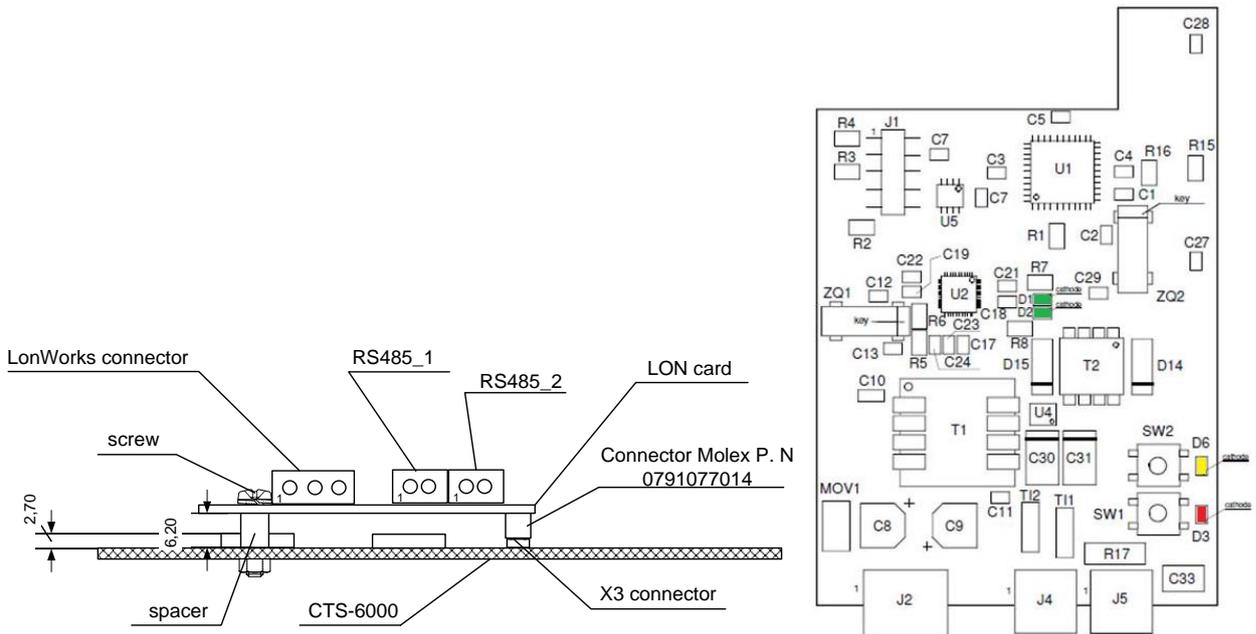
LonWorks interface connector

Pin number	Description
1	Zero
2	NETA
3	NETB

RS485 interface connector
It is mandatory to have min. 3-wire connection: RS485 –B, S485 – A & COM.
It is recommended to use a shielded connection.

Connector name	Pin number	Decription
RS485_1	1	RS485 –B (DATA -)
RS485_1	2	RS485 – A (DATA +)
RS485_2	1	COM
RS485_2	2	SHIELD

Figure 2: NilLON interface

Network variables

Network variable, Inputs

NV# (M/O)	Name	Recv HrtBt	SNVT Type	SNVT Index	Class	Description
2 (M)	nviSetpoint	No	SNVT_temp_p	105	RAM	Setpoint from Network
5 (O)	nviApplicMode	No	SNVT_hvac_mode	108	RAM	Command from System
9 (O)	nviAuxHeat nviAuxHeat2	No	SNVT_switch SNVT_switch_2	95 189	RAM	Auxiliary Heat Enable
11 (O)	nviMinInletSum	No	SNVT_temp_p	105	RAM	Minimum Inlet Temperature Summer
12 (O)	nviMinInletWin	No	SNVT_temp_p	105	RAM	Minimum Inlet Temperature Winter
13 (O)	nviMaxInlet	No	SNVT_temp_p	105	RAM	Maximum Inlet Temperature
14 (O)	nviVAVOutlet	No	SNVT_press_p	113	RAM	Pressure setpoint in Outlet Duct
15 (O)	nviVAVInlet	No	SNVT_press_p	113	RAM	Pressure setpoint in Inlet Duct
16	nviAlarmFlag nviAlarmFlag2	No	SNVT_switch SNVT_switch_2	95 189	RAM	Switch for resetting Alarms
17 (O)	nviOutletFanSpd nviOutletFanSpd2	No	SNVT_switch SNVT_switch_2	95 189	RAM	Fan speed for fixed speed fans or.VLT controlled fans
18 (O)	nviInletFanSpd nviInletFanSpd2	No	SNVT_switch SNVT_switch_2	95 189	RAM	Fan speed for fixed speed fans or.VLT controlled fans
19	nviCntSensor	No	SNVT_switch	95	RAM	Choose controlling sensor 0=T7, 1=T3
20	nviCalTime	No	SNVT_time_stamp	84	RAM	Calendar and Clock set

SNVT_switch (95) - old and supported by all systems
SNVT_switch_2 (189) is new. Present in LonMark® Resource Files ReadMe File since Version 13.02 beta, January 2008.

Each SNVT_switch_2 is duplicated by SNVT_switch variable. SNVT_switch has higher priority. If value in SNVT_switch <> 0, then SNVT_switch_2 will be ignored. Only if SNVT_switch value will be = 0, then data will be taken form SNVT_switch_2.

Network variable, Outputs

NV # (M/O)	Name	Send HrtBt	SNVT Type	SNVT Index	Class	Description
4 (M)	nvoUnitStatus		SNVT_hvac_status	112	RAM	The actual status of the unit
22	nvoTemp1	Yes	SNVT_temp_p	105	RAM	Temperature after heatpipe
23	nvoTemp2	Yes	SNVT_temp_p	105	RAM	Temperature after heat pump
24	nvoTemp3	Yes	SNVT_temp_p	105	RAM	Temperature space temperature
25	nvoTemp4	Yes	SNVT_temp_p	105	RAM	Temperature exhaust air
26	nvoTemp5	Yes	SNVT_temp_p	105	RAM	Temperature evaporator / condenser
27	nvoTemp6	Yes	SNVT_temp_p	105	RAM	Temperature evaporator / condenser
28	nvoTemp7	Yes	SNVT_temp_p	105	RAM	Temperature inlet air
29	nvoTemp8	Yes	SNVT_temp_p	105	RAM	Temperature outdoor air
30	nvoTemp9	Yes	SNVT_temp_p	105	RAM	Temperature water aux. heater
31	nvoTemp10	Yes	SNVT_temp_p	105	RAM	Temperature compressor 1
32	nvoTemp11	Yes	SNVT_temp_p	105	RAM	Temperature compressor 2
33	nvoTemp12	Yes	SNVT_temp_p	105	RAM	Temperature compressor 3
34	nvoTemp13	Yes	SNVT_temp_p	105	RAM	Temperature compressor 4, 5 and 6
35	nvoTemp14	Yes	SNVT_temp_p	105	RAM	Temperature return water aux. heater
36	nvoTemp15	Yes	SNVT_temp_p	105	RAM	Temperature T15 unused
37	nvoTemp16	Yes	SNVT_temp_p	105	RAM	Temperature T16 unused
38	nvoTemp17	Yes	SNVT_temp_p	105	RAM	Temperature T17 unused
39	nvoOutletFanCap nvoOutletFanCap2	Yes	SNVT_switch SNVT_switch_2	95 189	RAM	Capacity of outlet fan
40	nvoInletFanCap nvoInletFanCap2	Yes	SNVT_switch SNVT_switch_2	95 189	RAM	Capacity of inlet fan
41	nvoStatus	Yes	SNVT_state_64	165	RAM	Status of the units I/O
42	nvoWaterValve nvoWaterValve2	Yes	SNVT_switch SNVT_switch_2	95 189	RAM	Regulation value of auxiliary water heater
43	nvoVTZSpeed nvoVTZSpeed2	Yes	SNVT_switch SNVT_switch_2	95 189	RAM	Speed of the VTZ compressor in %
44	nvoFanOut	Yes	SNVT_switch_2	189	RAM	Outlet fan speed in %
45	nvoUnUsed	Yes	SNVT_switch_2	189	RAM	Unused output
46	nvoUnUsed	Yes	SNVT_switch_2	189	RAM	Unused output
47	nvoFanIn	Yes	SNVT_switch_2	189	RAM	Inlet fan speed in %
48	nvoPressHP	Yes	SNVT_press_f	59	RAM	Pressure at high pressure side of the compressor.
49	nvoPressLP	Yes	SNVT_press_f	59	RAM	Pressure at low pressure side of the compressor.
50	nvoFilterInlet	Yes	SNVT_press_p	113	RAM	Pressure drop over inlet filter in Pa
51	nvoFilterOutlet	Yes	SNVT_press_p	113	RAM	Pressure drop over Outlet filter in Pa
52	nvoInletPress	Yes	SNVT_press_p	113	RAM	Actual pressure in Inlet duct
53	nvoOutletPress	Yes	SNVT_press_p	113	RAM	Actual pressure in Outlet duct
54	nvoAlarm	Yes	SNVT_alarm_2	164	RAM	Latest alarm with time stamp from the unit
55	nvoCalTime	Yes	SNVT_time_stamp	84	RAM	Calendar and Clock readout

Introduction

CTS6000 is a LON <u>Slave</u> and communicates at speeds up to 38400 bps. The LON is activated by placing a tick in the LON communication box under System settings.

Preface
This manual contains information regarding the monitoring and control of Nilan CTS6000 via LON. Some examples of how LON / MODBUS are used can be found at the end of the manual.

The communication order

There is a 2 second pause between every request.

Device	CTS6000		LON Card		LON Master
Interface		IIC		UART	
	Sync the CTS6000 parameters with the Storage Memory				
	Send Output Parameters	→	Store Parameters		
	Get Input Parameters	←	Send Parameters		E
	Data exchange over Modbus				
				←	Send Request For Input Parameters
			Send Required parameters	→	
				←	Send New Parameters
			Send Acknowledge	→	

Function
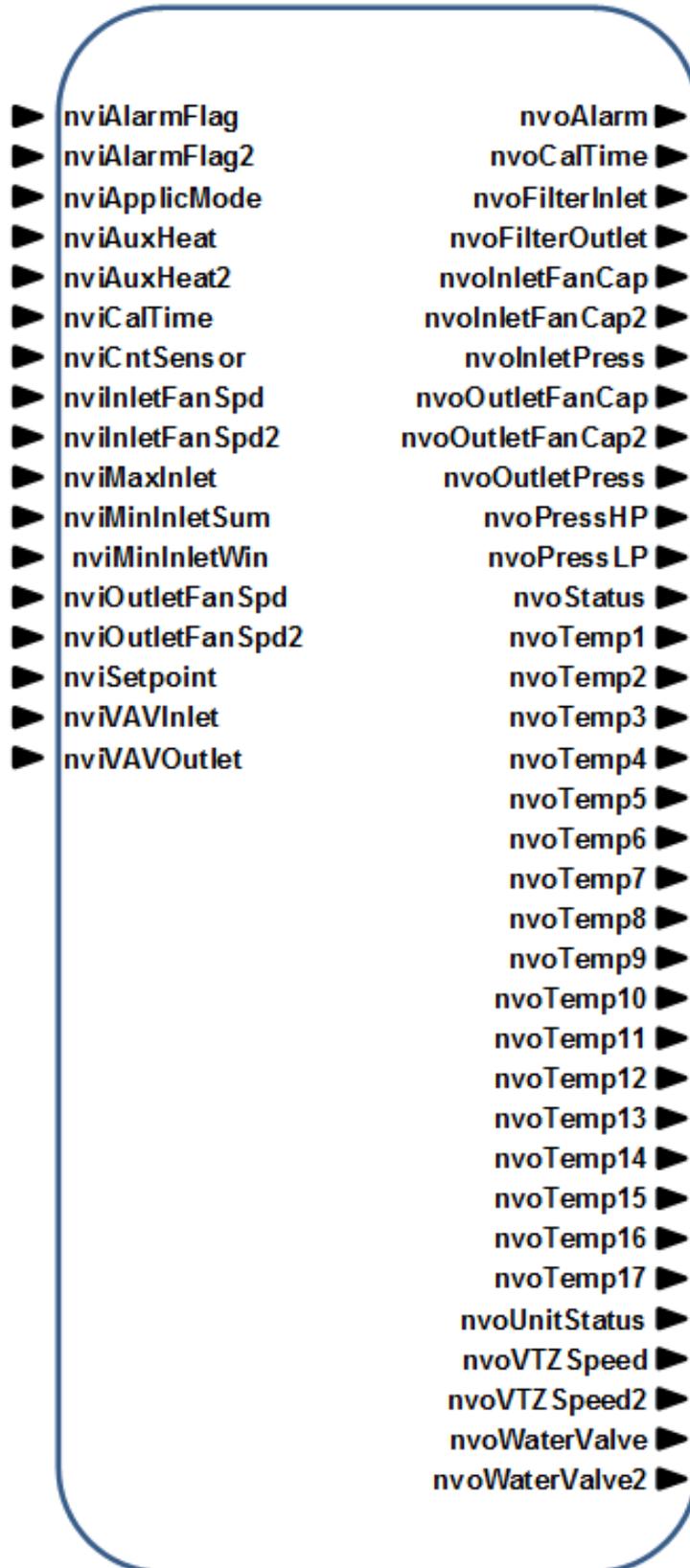
Func Block 1

Figure 3: Function block

Input variables

Temperature Setpoint Input

`network input SNVT_temp_p nviSetPoint;`
This input network variable is used to allow the temperature setpoint. This network variable input is mandatory to the profile, it does not have to be bound to any setpoint node. If a valid setpoint value is written to `nviSetPoint`, it will be used as the center setpoint.
Temperature Setpoint must be set if "Controlling Sensor" is changed.

Valid Range
-327.68 to 327.66°C (0.01°C)
The value 0x7FFF=+327.67°C will be handled as an invalid value.

Default Value
The Default Value is the invalid value of 0x7FFF which equates to+327.67°C.
This value will be adopted at power-up and remains in effect until an update is received. This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Application Mode Input

`network input SNVT_hvac_mode nviApplicMode;`
This network variable input is used to coordinate the Heat Pump with any supervisory controller or intelligent human interface device.
This network variable is required for Water Source Heat Pumps that do not have another way of detecting waterflow to the unit. This network variable is used to lock out compressor operation when a supervisory controller determines that water is not being provided to the unit. In this case, the HVAC_FANONLY state is necessary to provide ventilation to the space and disable compressor operation at the same time.

Valid Range

HVAC_AUTO	:	The control loop automatically changes between application modes (e.g. HEAT and COOL) to provide the control objectives. Both Heating and Cooling are enabled .
HVAC_HEAT	:	Heating is enabled and Cooling is disabled.
HVAC_MRNG_WRMUP	:	Requires recirculation module, warmup is performed using auxiliary heat, inlet fan is running
HVAC_COOL	:	Cooling is enabled and Heating is disabled.
HVAC_FANONLY	:	Both Heating and Cooling are disabled. This disables compressor operation. Fan Operation is enabled.
HVAC_OFF	:	The control loop is "off" and all outputs are "off" position.
HVAC_FREE_COOL	:	Fan Operation is enabled. Both Heating and Cooling is disabled.
HVAC_NUL	:	0xFF, Invalid value

The other enumerations provided by SNVT_hvac_mode are optional.

Default Value
The default value is HVAC_AUTO. This value will be adopted at power-up and remains in effect until an update is received. This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Auxilliary Heat

`network input SNVT_switch nviAuxHeat;`
This input network variable indicates whether auxilliary heat has been enabled or disabled. If auxilliary heat is enabled, it is allowed in the heating mode.
This command does not force the unit into heating.

Valid Range

Level Value	Command Explanation
0 (OFF)	Disabled
1 (ON)	Enabled

Note: any non-zero value can be used as enabling command

Value field: Not used

Default Value
The default value is ON. This value will be adopted at power-up and remains in effect until an update is received. This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`. Setting this value to ON ensures that if an auxilliary heat enable command is not provided, the unit will be will be able use an auxiliary source of heat if it exists.

Minimum Summer Inlet Temperature Input

`network input SNVT_temp_p nviMinInletSum;`
This input network variable is used to set the minimum inlet temperature allowed when the HVAC unit is running in summer mode.

Valid Range
0 to 38.0°C (0.1°C)
A value of 32767 (0x7fff) indicates an invalid value.

Default Value
The Default Value is +16.00°C. This value will be adopted at power-up and remains in effect t until an update is received.
This value will also be adopted if a bound input does not receive an update within the Optional Receive Heartbeat, `nciRcvHrtBt`.

Minimum Winter Inlet Temperature Input

`network input SNVT_temp_p nviMinInletWin;`
This input network variable is used to set the minimum inlet temperature allowed when the HVAC unit is running in winter mode.

Valid Range
0 to 38.0°C (0.1°C)
A value of 32767 (0x7fff) indicates an invalid value.

Default Value
The Default Value is +18.00°C. This value will be adopted at power-up and remains in effect until an update is received.
This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Static pressure Outlet duct Input

`network input SNVT_press_p nviVAVOutlet;`
This input network variable is used to set the setpoint for the Outlet duct static pressure

Valid Range
0 .. 400 Pa (1 Pa)
A value of 32767 (0x7fff) indicates an invalid value.

Default Value
The Default Value is +10 Pa. This value will be adopted at power-up and remains in effect until an update is received.
This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Maximum Inlet Temperature

`network input SNVT_temp_p nviMaxInlet;`
This input network variable is used to set the maximum inlet temperature allowed when the HVAC unit is running.

Valid Range
+10.0 to +50.0°C (0.1°C)
A value of 32767 (0x7fff) indicates an invalid value.

Default Value
The Default Value is +30.00°C. This value will be adopted at power-up and remains in effect until an update is received.
This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Static pressure Inlet duct Input

`network input SNVT_press_p nviVAVInlet;`
This input network variable is used to set the setpoint for the inlet duct static pressure.

Valid Range
0 .. 400 Pa (1 Pa)
A value of 32767 (0x7fff) indicates an invalid value.

Default Value
The Default Value is +10 Pa. This value will be adopted at power-up and remains in effect until an update is received.
This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Alarm Flag

```
network input SNVT_switch nviAlarmFlag;
```
Following an alarm message the HVAC unit will enter a fault condition. Only after the fault has been rectified and the master has acknowledged the alarm message by setting nviAlarmFlag, can the HVAC unit resume operation.

Valid Range

Level Value	Command Explanation
0 (OFF)	No function
1 (ON)	Reset

Note: any value different from zero causes alarm reset

Value field: Not used

Default Value
The default value is OFF. This value will be adopted at power-up and remains in effect until an alarm is received

```
network input SNVT_switch nviAlarmFlag;
```

Outlet Fan speed Input

`network input SNVT_switch nviOutletFanSpd;`
This input network variable is used to set the outlet fan speed, for HVAC units equipped with one -, two speed or VLT controlled fan motors without pressure transmitters.

StepSpeed 1..4 = {25, 50, 75, 100}

```
0%                                                    100%

         S1              S2              S3              S4
```
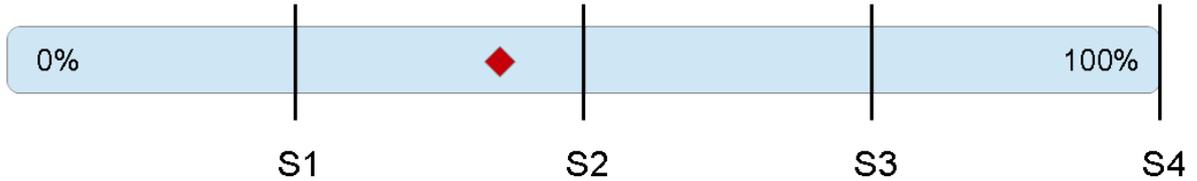
Modbus data = value x 2;

```
E.g. Modbus data = 35
Value = 35%
Speed = [S2] = 50%
```

Formula: Value / 2 = Fan speed

Speed	Fan type		
	1 Speed	2 Speeds	VLT controlled
Off	1	1	1
1	200	150/167[1]	S1[2]
2	-	200	S2[2]
3	-	-	S3[2]
4	-	-	S4[2]

1. Fan speed depends on settings: fan speed can be 50% or 66% of power.
2. FAN speed may be adjusted individually, but always 1 < S1 < S2 < S3 < S4.

A value of -128 (0) indicates an invalid value.

Default Value
The Default Value is 100%. This value will be adopted at power-up and remains in effect until an update is received.
This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Inlet Fan speed Input

`network input SNVT_switch nviInletFanSpd;`
This input network variable is used to set the outlet fan speed, for HVAC units equipped with one -, two speed or VLT controlled fan motors without pressure transmitters.

Formula: Value / 2 = Fan speed

Speed	Fan type		
	1 Speed	**2 Speeds**	**VLT controlled**
Off	1	1	1
1	200	150/167[1]	S1[2]
2	-	200	S2[2]
3	-	-	S3[2]
4	-	-	S4[2]

1. Fan speed depends on settings: fan speed can be 50% or 66% of power.
2. FAN speed may be adjusted individually, but always 1 < S1 < S2 < S3 < S4.

A value of -128 (0) indicates an invalid value.

Default Value
The Default Value is 100%. This value will be adopted at power-up and remains in effect until an update is received.
This value will also be adopted if a bound input does not receive an update within the optional Receive Heartbeat, `nciRcvHrtBt`.

Controlling sensor Input

`network input SNVT_switch nviCntSensor;`
This input network variable is used to define, which sensor will be the controlling sensor for the HVAC unit. When "Controlling sensor" is changed, the "Temperature Setpoint" must be set too.

Valid Range

Level Value	Command Explanation
0 (OFF)	Controlling sensor is T7 constant inlet temperature
1 (ON)	Controlling sensor is T3 room compensated

Value field: Not used

Default Value
The default value is OFF. This value will be adopted at power-up and remains in effect until an alarm is received

Calendar and Time Input

`network input SNVT_time_Stamp nviCalTime;`
This input network variable is used to set the internal Clock in the HVAC unit.

Valid Range
Year   : 0-3000, 0xFFFF (INVALID). Zero (0) means year not specified. Minus one (-1)
               represents NULL date.
Month   : 0-12, 0xFFFF (INVALID).Zero (0) means month not specified.
Day   : 0-31, zero (0) means day not specified.
Hour   : 0-23, This field uses a 24-hour value.
Minutes : 0-59, Minute of Hour output field will be zero if it doesn't apply to a particular unit.
Second: 0-59, Second of minute.

Default Service Type
The default service type is unacknowledged.

`network input SNVT_time_Stamp nviCalTime;`

Output variables

Unit Status Output

`network output SNVT_hvac_status nvoUnitStatus;`
Heat and cooling fan outputs are calculated as mean values for the components.

This output network variable is available to report the object status. It combines the operating mode, the capacity of heating and cooling used and an indication if any alarms are present in the object.

Valid Range

Mode	:	HVAC_AUTO, HVAC_HEAT, HVAC_ MRNG_WRMUP. HVAC_COOL HVAC_OFF, HVAC_FANONLY. HVAC_FREE_COOL Other enumeration is optional.
heat_output_primary	:	0-100%, 0xFFFF (INVALID). (Compressor)
heat_output_secondary	:	0-100%, 0xFFFF (INVALID). (Heating Element)
cool_output	:	0-100%, 0xFFFF (INVALID). (Compressor)
econ_output	:	0-100%, 0xFFFF (INVALID). The economizer output field will be zero if it doesn't apply to a particular unit. (Not used)
fan_output	:	0-100%, 0xFFFF (INVALID). For fans that have only an on/off state the capacity values will be either 0.0 or 100.0% respectively.
in_alarm	:	0 Means there is no alarm. Not 0 Means there is an alarm. A filter alarm will also be indicated using this field.

When Transmitted
The variable is transmitted immediately when its value has changed significantly.
Additionally this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the optional Maximum Send Time configuration, `nciSndHrtB`t.

Default Service Type
The default service type is unacknowledged.

Calender and Clock readout

`network input SNVT_time_Stamp nvoCalTime;`
This output network variable is used to readout the internal Clock in the HVAC unit.

Valid Range

Year	:0-3000, 0xFFFF (INVALID). Zero (0) means year not specified. Minus one (-1) represents NULL date.
Month	:0-12, 0xFFFF (INVALID).Zero (0) means month not specified.
Day	:0-31, zero (0) means day not specified.
Hour	:0-23, This field uses a 24-hour value.
Minutes	:0-59, Minute of Hour output field will be zero if it doesn't apply to a particular unit.
Second	:0-59, Second of minute.

Default Service Type
The default service type is unacknowledged.

Temperature T1 to T17 Output

`network output SNVT_temp_p nvoTemp1 to nvoTemp17;`
These output network variables are used to show the temperatures which are relevant for the HVAC unit.

Valid Range
-327.68 to 327.66°C (0.01°C)
A value of 32767 (0x7fff) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

Outlet Fan capacity

`network output SNVT_switch nvoOutletFanCap;`
This output network variable is used to show the actual capacity of the outlet fan depending on the settings in either `nviVAVOutlet` or `nviOutletFanSpd`.

Valid Range
0 .. 100% (1%)
A value of -128 (0) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

Inlet Fan capacity

`network output SNVT_switch nvointletFanCap;`
This output network variable is used to show the actual capacity of the outlet fan depending on the settings in either `nviVAVInlet` or `nviInletFanSpd`.

Valid Range
0 .. 100% (1%)
A value of -128 (0) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

HVAC Status Output

```
network output SNVT_state_64 nvoStatus;
```
This output network variable provides detailed diagnostic information on the status of the HVAC unit.

Valid range
The individual bits of the network variable are used as follows:
Bit0 = Compressor 1 *(1 = On ; 0 = Off)*
Bit1 = Compressor 2 *(1 = On ; 0 = Off)*
Bit2 = Compressor 3 *(1 = On ; 0 = Off)*
Bit3 = Bypass valve heat *(1 = Open ; 0 = Closed)*
Bit4 = 4-way valve (0 *= Heat mode ; 1 = Cooling mode)*
Bit5 = Electric heater step 1 *(1 = On ; 0 = Off)*
Bit6 = Electric heater step 2 *(1 = On ; 0 = Off)*
Bit7 = Electric heater step 3 *(1 = On ; 0 = Off)*
Bit8 = Pump statusfor water heating element *(1 = On ; 0 = Off)*
Bit9 = Active cooling *(1 = the unit is running active cool ; 0 = the unit is running in heat mode)*
Bit10 = Common Alarm *(1 = there is no alarms ; 0 = there is an alarm on the unit)*
Bit11 = Exhaust fan step 1 *(1 = On ; 0 = Off)*
Bit12 = Exhaust fan step 2 *(1 = On ; 0 = Off)*
Bit13 = Inlet fan step 1 *(1 = On ; 0 = Off)*
Bit14 = Inlet fan step 2 *(1 = On ; 0 = Off)*
Bit15 = Bypass valve Cooling *(1 = Open ; 0 = Closed)*
Bit16 = Digital Out 1 *(1 = On ; 0 = Off)*
Bit17 = Digital Out 2 *(1 = On ; 0 = Off)*
Bit18 = Digital Out 3 *(1 = On ; 0 = Off)*
Bit19 = Digital Out 4 *(1 = On ; 0 = Off)*
Bit20 = Digital Out 5 *(1 = On ; 0 = Off)*
Bit21 = Digital Out 6 *(1 = On ; 0 = Off)*
Bit22 = Digital Out 7 *(1 = On ; 0 = Off)*
Bit23 = Digital Out 8 *(1 = On ; 0 = Off)*
Bit24 = AUX 1*(1 = On ; 0 = Off)*
Bit25 = AUX 2 *(1 = On ; 0 = Off)*
Bit26 = AUX 3 / Dampers *(1 = On ; 0 = Off)*
Bit27 = AUX 4 *(1 = On ; 0 = Off)*
Bit28 to Bit63 = future use

When transmitted
This value is transmitted immediately when its state has changed . Additionally, this network variable will also be transmitted as a heartbeat output on a regular basis as specified by the Maximum Send Time `nciSndHrtBt` configuration property.

Water valve capacity

`network output SNVT_switch nvoWaterValve;`
This output network variable is used to show the actual capacity of the Water valve when auxillary heat is required.

Valid Range
0 .. 100% (1%)
A value of -128 (0) indicates an invalid value.

When Transmitted
The variable is transmitted immediately when its value has changed significantly.
Additionally this network variable will also be transmitted as a heartbeat output on a regular basis as dictated by the optional Maximum Send Time configuration `nciSndHrtBt.`
Default Service Type
The default service type is unacknowledged.

VTZ performance

`network output SNVT_switch nvoVTZSpeed;`
This output network variable is used to show the actual performance of the VTZ compressor.

Valid Range
0 .. 100% (1%)
A value of -128 (0) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

Compressor Pressure HP

`network output SNVT_press_f nvoPressHP;`
This output network variable is used to show the actual pressure at the pressurized side of the compressor.
The pressure is read out in Pascal but should be converted to Bar (**100000 Pa** = 1 **bar), giving nvoPressHP/100000 = pressure in bar.**

Valid Range
-340282E38 .. 340282E38 (Pa)

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

Default Service Type
The default service type is unacknowledged.

Compressor Pressure LP

```
network output SNVT_press_f nvoPressLP;
```
This output network variable is used to show the actual pressure at the suction side of the compressor.
The pressure is read out in Pascal but should be converted to Bar (**100000 Pa** = 1 **bar), giving** nvoPressLP/100000 = pressure in bar.

Valid Range
-340282E38 .. 340282E38 (Pa)

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

Default Service Type
The default service type is unacknowledged.

Pressure drop inlet filter

```
network output SNVT_press_p nvoFilterInlet;
```
This output network variable is used to show the pressure drop over the inlet filter.
The pressure read out is in Pascal.

Valid Range
-32768 .. 32766 (Pa)
A value of -32767 (0x7FFF) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

Pressure drop outletfilter

```
network output SNVT_press_p nvoFilterOutlet;
```
This output network variable is used to show the pressure drop over the outlet filter.
The pressure read out is in Pascal.

Valid Range
-32768 .. 32766 (Pa)
A value of -32767 (0x7FFF) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

Actual Pressure in inlet Duct

`network output SNVT_press_p nvoInletPress;`
This output network variable is used to show the actual pressure in the inlet duct.
The pressure read out is in Pascal.

Valid Range
-32768 .. 32766 (Pa)
A value of -32767 (0x7FFF) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

Actual Pressure in outlet Duct

`network output SNVT_press_p nvoOutletPress;`
This output network variable is used to show the actual pressure in the outlet duct.
The pressure read out is in Pascal.

Valid Range
-32768 .. 32766 (Pa)
A value of -32767 (0x7FFF) indicates an invalid value.

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

Default Service Type
The default service type is unacknowledged.

Alarms

```
network output SNVT_alarm_2 nvoAlarm;
```
This output network variable is used to report alarm status for the device.

Formula: Alarm type   : ID number
            Priority level : 1 – 2 – 3 – 4
            Alarm time   : Time in seconds since 2000-01-01T00:00:00Z = recorded value
            Milliseconds   : Milliseconds = recorded value.
            Alarm text   : Alarm text = recorded value as null terminated string.

            Level 1 = for information
            Level 2 = the Alarm leads to a warning and status of the system. The system continues
        to operate under the actual conditions.
            Level 3 = an Alarm to control the compressor = stop compressor; but the regulation is
        still active. Acknowledge of alarm needed to allow compressor to run.
            Level 4 = critical alarm that stop the entire system.

Valid Range
alarm_type: *alarm_type_t* strucutre
priority_level: *priority_level_t* strucutre
alarm_time: Unix format
milliseconds: 0 to 999 ms
sequence_number: 0 to 255
description: 22 chars of English text

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

Default Service Type
The default service type is unacknowledged.

Configuration Properties

Temperature Setpoints (Mandatory)

network input config SNVT_temp_setpt nciTempSetpts;
This configuration property defines the occupancy temperature setpoints for heat and cool mode.
The setpoint will have an assigned upper and lower limit for each state defined below within the
min. and max. range.

Valid Range and Default Value

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

SCPT Reference
SCPTsetPnts(60)

Send Heartbeat (Mandatory)

network input config SNVT_time_sec nciSndHrtBt;
This configuration network variable defines the maximum period of time that expires before the
following network variable outputs will automatically being updated:
· nvoSpaceTemp,
· nvoUnitStatus,
· nvoEffectSetPt

Valid Range
The valid range is any value between 0.0 sec and 600 sec. Setting nciSndHrtBt = 0
disables the automatic update mechanism.

Default Value
0 (no automatic update)

SCPT Reference
SCPTMaxSendTime(49)

Location Label (optional)

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

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

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

SCPT Reference
SCPT_location (17)

Receive Heartbeat (optional)

```
network input config SNVT_time_sec nciRcvHrtBt;
```
This configuration property is used to control the maximum time that elapses after the last update to a bound network input before the Heat Pump object adopts a default value for the following:
· nviSpaceTemp,
· nviSetpoint,
· nviApplicMode,
· nviOccCmd,
· nviOccupSw,
· nviSetPtOffset,
· nviAuxHeat.

Valid Range
The valid range is any value between 0.0 sec and 600 sec. Setting nciRcvHrtBt = 0 disables this network variable receive failure detect mechanism.

Default Value
0 (no failure detect)

SCPT Reference
SCPTMaxRcvTime(48)

Power-up State

Upon power-up the input variables are set to their default values. The output network variables will be set to their initial value as follows:

```
nvoSpaceTemp          : INVALID
nvoEffectSetPt        : 0
```

The fields in `nvoUnitStatus` will be set to the initial values :

```
Mode                  : HVAC_OFF
heat_output_primary   : 0
heat_output_secondary : 0
econ_output           : 0
fan_output            : 0
in_alarm              : 0
```

Additional Considerations

MODBUS communication according to instruction:
"Database for CTS6000 MODBUS",
Version 1.08-2, and
Variable List, V2.02.

Eksample

Preface

Figure 4 illustrates the basic example described in the following. When LON / Modbus communication is active, it is not possible to stop the unit via the Java.
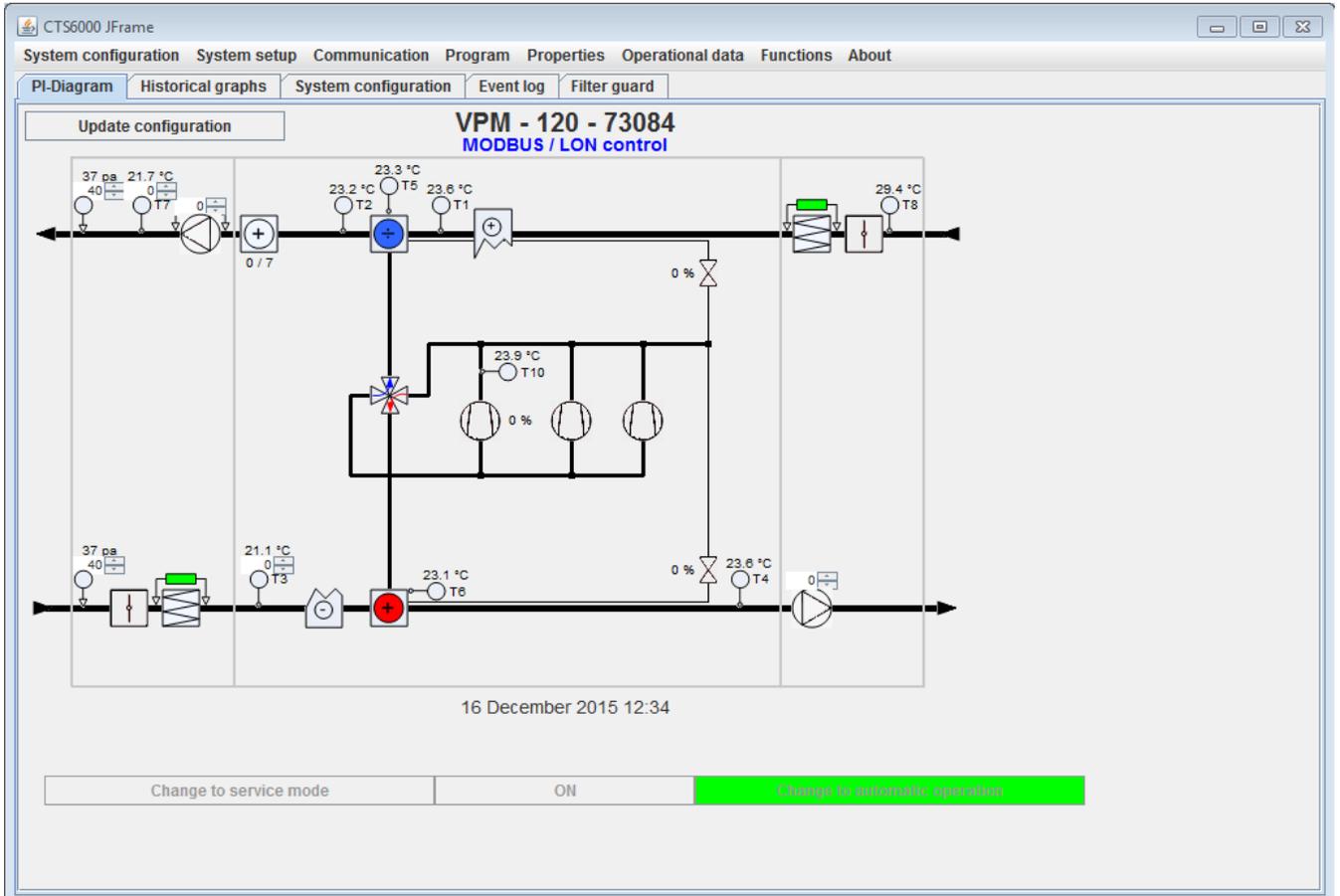

Figure 4 PI diagram normal operation

Switching to LON/ Modbus communication

To switch to LON / Modbus communication, open Unit configuration and place a tick in the box beside LON control, and press OK. When you open the window again you will see the card version. In this case ver. 1.7.4
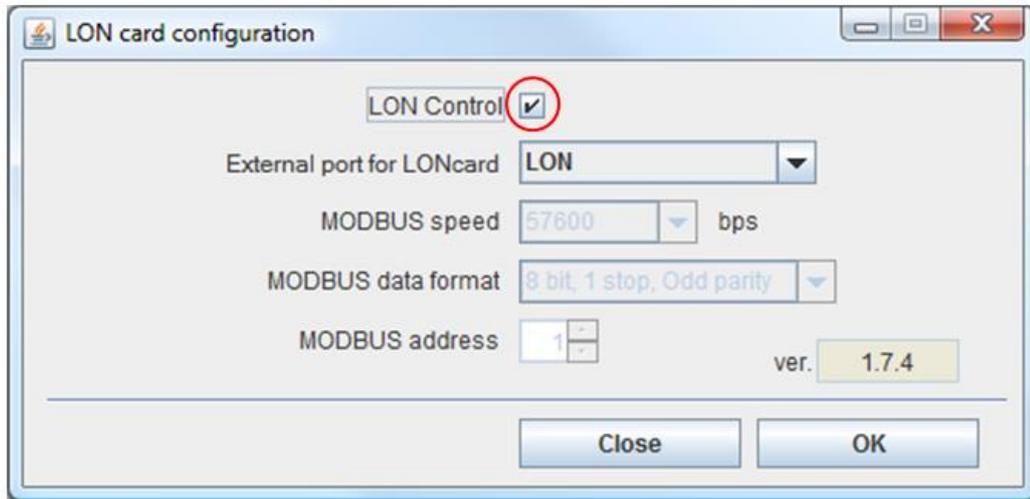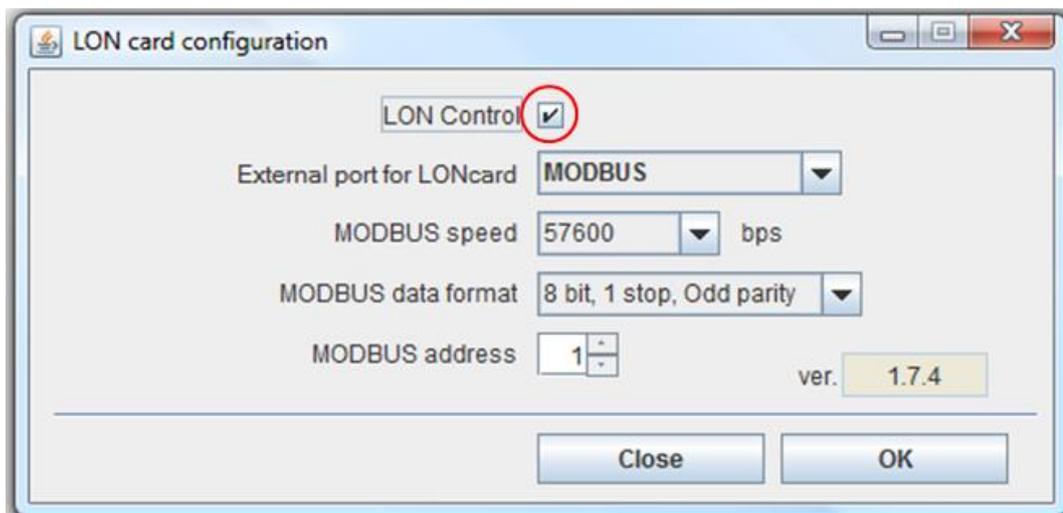
Figure 5 Activating LON

Figure 6 Activating MODBUS

Modbus **/LON operation (normal)**

This type of regulation is used for normal operation. The system operates according to the values entered in Setpoint, Manual control and VAV values. To set up the system, proceed as follows.

1. Set the required temperature in nviSetpoint.
2. Set the required fan speed in nviOutletFanSpd and nviInletFanSpd or
   a. Set the required inlet pressure for VAV control in nviVAVInlet
   b. Set the required exhaust pressure for VAV control in nviVAVOutlet
3. Set Start control in nviApplicMode.

Once the above-mentioned settings have been made, all that is required to start and stop the system is to write to start/stop control in nviApplicMode.

An example of how the parameters should be set is shown below:

nviSetpoint = 2100((21.0°C)
Either nviOutletFanSpd and nviInletFanSpd = 200 (100% for exhaust and inlet)
         Or nviVAVInlet = 300 (300 Pa for inlet)
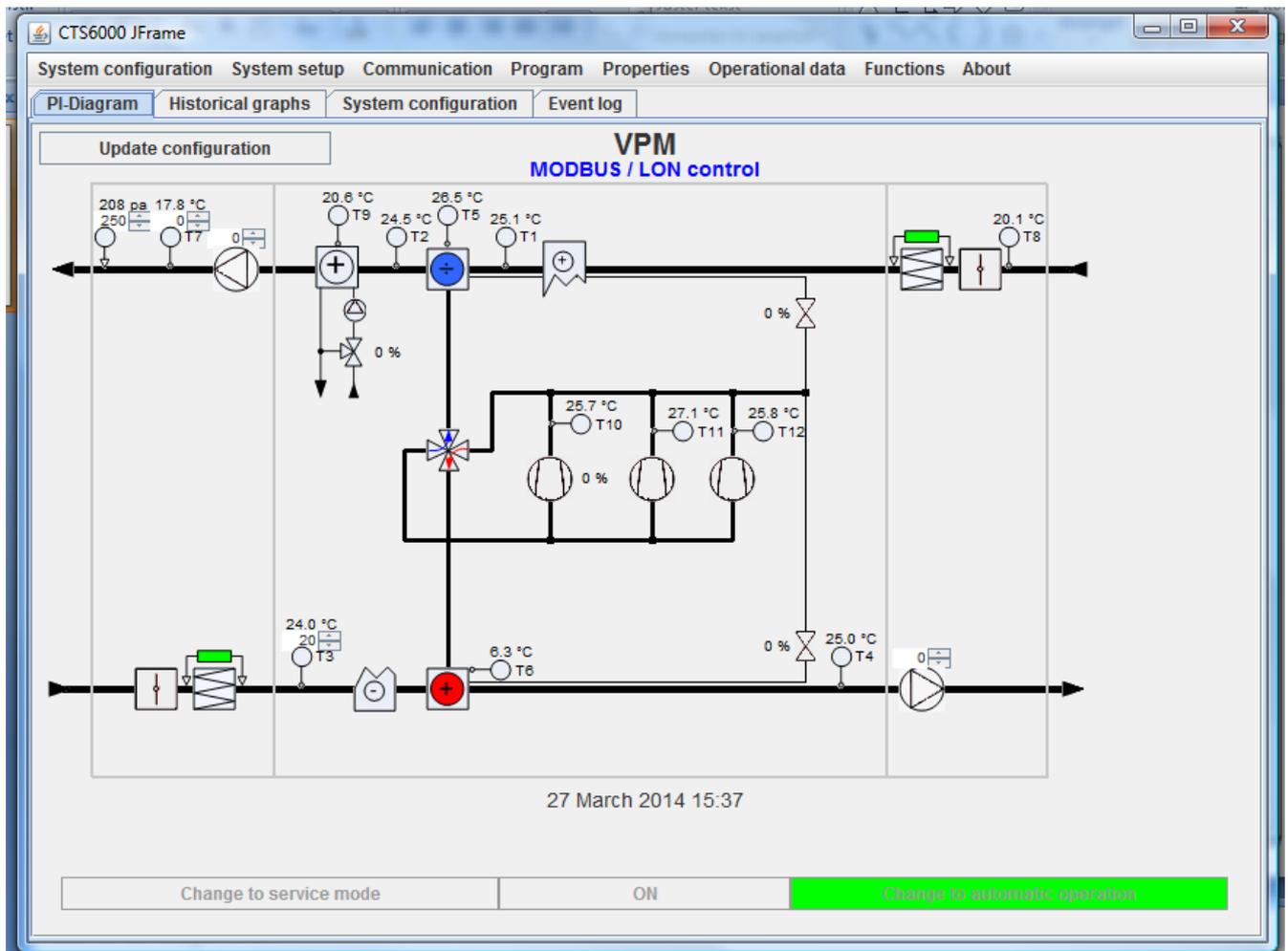   and nviVAVOutlet = 300 (300 Pa for exhaust)
nviApplicMode = 0 (Start automatic operation)

Figure 7 Modbus/LON setpoint operation