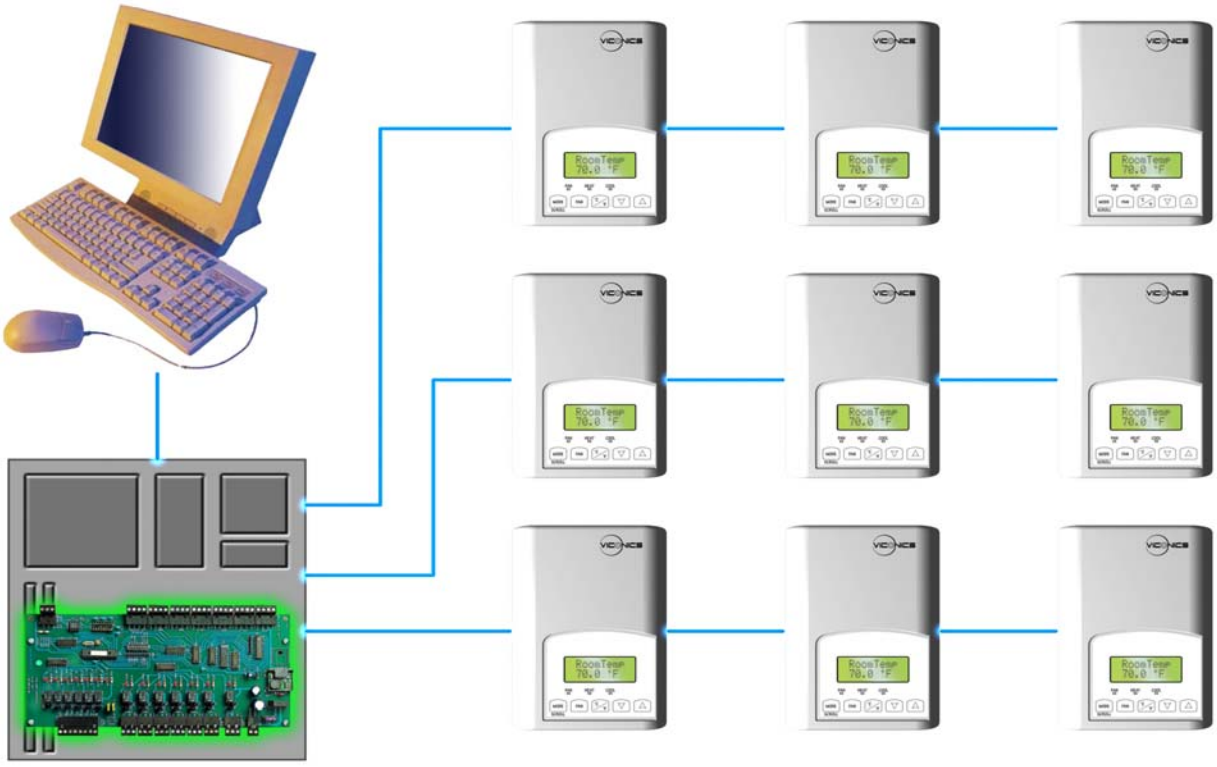
PIR Ready VT7600 Series
Programmable & Non-Programmable Thermostats
For Commercial HVAC Applications

LonWorks Integration Manual
ITG-VT7600-PIR-LON-E05

(028-6005 R5 - Issue Date: June 4, 2009)



Product Overview

Fig.1 - VT7600 Series

The VT7600 PI thermostat family is specifically designed for single stage and multi-stage control of heating/cooling equipment such as rooftop and self-contained units. The product features an intuitive, menu-driven, back-lit LCD display, which walks users through the programming steps, making the process extremely simple. Accurate temperature control is achieved due to the product's PI time proportional control algorithm, which virtually eliminates temperature offset associated with traditional, differential-based thermostats.

All models contain two digital inputs, which can be set by the user to monitor filter status, activate a remote temporary occupancy switch, and/or used as a general purpose service indicator. In addition, depending on the model, up to three remote sensor inputs are available. All models contain a SPST auxiliary switch, which can be used to control lighting or disable the economizer function and a discharge air sensor input. For more advanced applications, an economizer control logic has been integrated onto the thermostat for use with proportional damper economizer actuators.

The thermostats are also compatible with the new Viconics PIR cover accessories. Thermostats equipped with a PIR cover provide advanced active occupancy logic, which will automatically switch occupancy levels from Occupied to Unoccupied as required by local activity being present or not. This advanced occupancy functionality provides advantageous energy savings during occupied hours without sacrificing occupant comfort. All thermostats can be ordered with or without a factory installed PIR cover.

The additional following documentation is available on www.viconics.com

- Detailed information on the thermostat (VT76xxX5x00), is available on document *LIT-VT7600-PIR-Exx*
- PIR application information and examples, are available on document: *APP-VT76-PIR-Guide-Exx*
- PIR cover installation information is available on document: *PIR Cover Installation-Exx*

Contents

PID History Revision Table

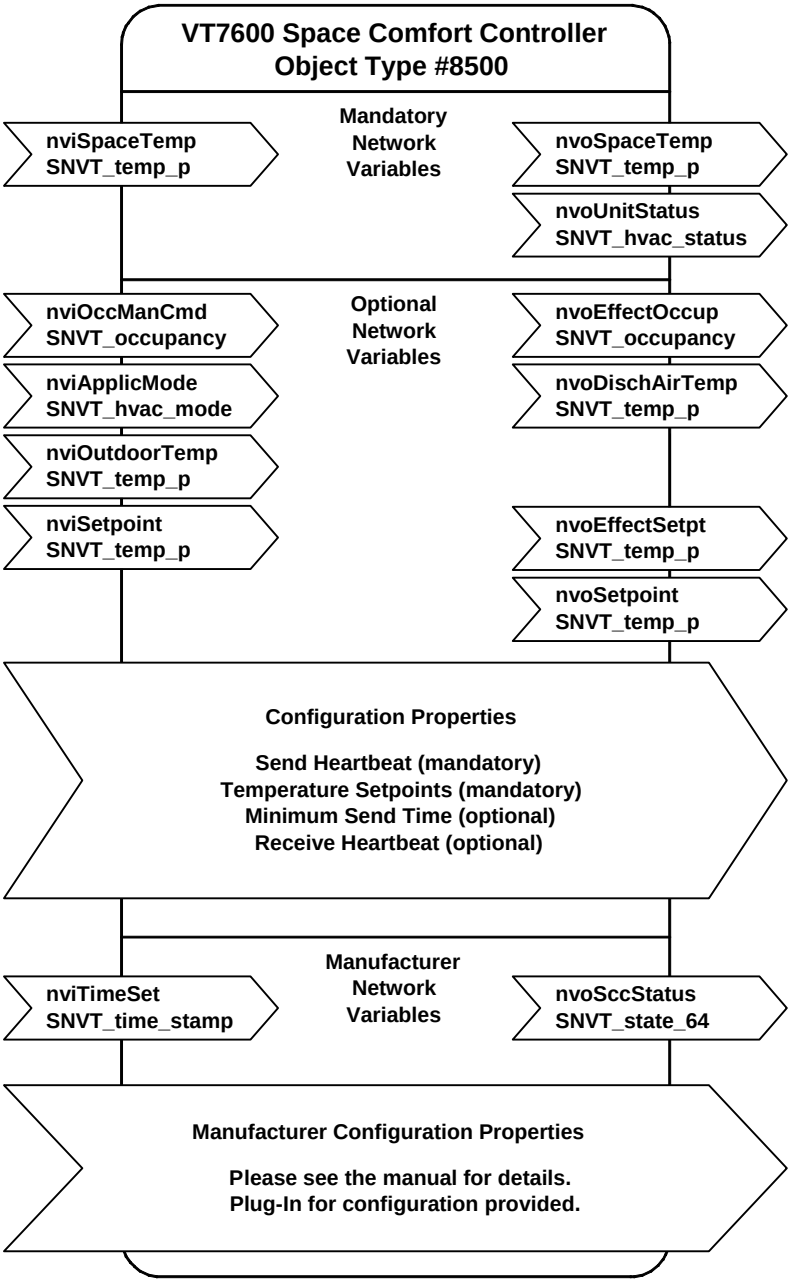
XIF, APB and NXE File Names and Corresponding PIDs. This manual information is to be used only with the current released VT7600 PIR ready thermostats.

Used on current released thermostat	APB / NXE / XIF file names	Revision Level	Associated PID
PIR Ready VT7600 Series	VT76_PIR.XIF	Rev 3.0	80:00:C5:55:00:04:04:21

This manual information is ***NOT*** to be used only with the previously released VT7600 thermostats.

Previously released thermostat	APB / NXE / XIF file names	Revision Level	Associated PID
Non-RoHS VT7600 Series	VT7600.XIF	Rev 2.0 to 2.5	80:00:C5:55:00:04:04:02
RoHS VT7600 Series	VT7600r.XIF	Rev 2.0 to 2.5	80:00:C5:55:00:04:04:12
Non-RoHS T7600 Series	T7600.XIF	Rev 1.0	80:00:C5:55:00:04:04:0A

Thermostat Objects



SNVTs[1] and SCPTs[2] Table Per Model

No	Sub	Point Name	Type	VT7656B5x00E	VT7605B5x00E	VT7652B5x00E	VT7600B5x00E	VT7652A5x00E	VT7600A5x00E	VT7652H5x00E	VT7600H5x00E
0		**nviSpaceTemp**	SNVT_temp_p	X	X	X	X	X	X	X	X
1		**nviOutdoorTemp**	SNVT_temp_p	X	X	X	X	X	X	X	X
2		**nviOccManCmd**	SNVT_occupancy	X	X	X	X	X	X	X	X
3		**nviApplicMode**	SNVT_hvac_mode	X	X	X	X	X	X	X	X
4		**nviSetpoint**	SNVT_temp_p	X	X	X	X	X	X	X	X
5		**nviTimeSet**	SNVT_time_stamp	X	N/A	X	N/A	X	N/A	X	N/A
6		**nciDaySched[0]**	UNVT_day_sched	X	N/A	X	N/A	X	N/A	X	N/A
7		**nciDaySched[1]**	UNVT_day_sched	X	N/A	X	N/A	X	N/A	X	N/A
8		**nciDaySched[2]**	UNVT_day_sched	X	N/A	X	N/A	X	N/A	X	N/A
9		**nciDaySched[3]**	UNVT_day_sched	X	N/A	X	N/A	X	N/A	X	N/A
10		**nciDaySched[4]**	UNVT_day_sched	X	N/A	X	N/A	X	N/A	X	N/A
11		**nciDaySched[5]**	UNVT_day_sched	X	N/A	X	N/A	X	N/A	X	N/A
12		**nciDaySched[6]**	UNVT_day_sched	X	N/A	X	N/A	X	N/A	X	N/A
13		**nciSetPts**	SNVT_temp_setpt	X	X	X	X	X	X	X	X
	1	occupied_cool		x	x	x	x	x	x	x	x
	3	unoccupied_cool		x	x	x	x	x	x	x	x
	4	occupied_heat		x	x	x	x	x	x	x	x
	6	unoccupied_heat		x	x	x	x	x	x	x	x
14		**nciCfg1RtuHp**	UNVT_cfg_1_rtu_hp	X	X	X	X	X	X	X	X
Associate with UNVT_cfg_1_rtu_hp format file											
	1	password	Unsigned-Long	x	x	x	x	x	x	x	x
	2	unoccupied_timer	Unsigned-Short	x	x	x	x	x	x	x	x
	3	anticycle	Unsigned-Short	x	x	x	x	x	x	x	x
	4	power_up_delay	Unsigned-Short	x	x	x	x	x	x	x	x
	5	temporary_occ_time	Unsigned-Short	x	x	x	x	x	x	x	x
	6	heating_stages_CPH	Unsigned-Short	x	x	x	x	x	x	x	x
	7	cooling_stages_CPH	Unsigned-Short	x	x	x	x	x	x	x	x
	8	heat_max_setpoint	SNVT_temp_p	x	x	x	x	x	x	x	x
	9	cool_min_setpoint	SNVT_temp_p	x	x	x	x	x	x	x	x
	10	OA_temp_heat_lockout	SNVT_temp_p	x	x	x	x	x	x	x	x
	11	OA_temp_cool_lockout	SNVT_temp_p	x	x	x	x	x	x	x	x
	12	calib_room_sensor	SNVT_temp_diff_p	x	x	x	x	x	x	x	x
	13	calib_outside_air_sensor	SNVT_temp_diff_p	x	x	x	x	x	x	x	x
	14	deadband	Unsigned-Short	x	x	x	x	x	x	x	x
	15	fan_mode	Enumeration Set Used: fan_mode_b-t	x	x	x	x	x	x	x	x
	16	fan_control	Enumeration Set Used: off_on_state_t	x	x	x	x	x	x	x	x
	17	fan_delay	Enumeration Set Used: off_on_state_t	x	x	x	x	x	x	x	x
	18	keypad_lockout	Enumeration Set Used: rem_lock_t	x	x	x	x	x	x	x	x
	19	proportional_band	Unsigned-Short	x	x	x	x	x	x	x	x
	20	temperature_units	Enumeration Set Used: temp_unit_t	x	x	x	x	x	x	x	x
	21	frost_protection	Enumeration Set Used: off_on_state_t	x	x	x	x	x	x	x	x
	22	menu_scroll	Enumeration Set Used: scroll_type_t	x	x	x	x	x	x	x	x

1: SNVTs: Standard Network Variables Types
2: SCPTs: Standard Configuration Parameters Types

No	Sub	Point Name	Type	VT7656B5x00E	VT7605B5x00E	VT7652B5x00E	VT7600B5x00E	VT7652A5x00E	VT7600A5x00E	VT7652H5x00E	VT7600H5x00E
15		**nciCfg2RtuHp**	UNVT_cfg_2_rtu_hp	X	X	X	X	N/A	N/A	X	X
Associate with UNVT_cfg_2_rtu_hp format file											
	1	di1_config	Enumeration Set Used: input_cfg_model_d_t	x	x	x	x	x	x	x	x
	2	di2_config	Enumeration Set Used: input_cfg_model_d_t	x	x	x	x	x	x	x	x
	3	aux_contact_config	Enumeration Set Used: aux_contact_cfg_t	x	x	x	x	x	x	x	x
	4	number_of_events	Enumeration Set Used: nb_of_events_t	x	N/A	x	N/A	x	N/A	x	N/A
	5	progresive_recovery	Enumeration Set Used: off_on_state_t	x	N/A	x	N/A	x	N/A	x	N/A
	6	a.hp_rev_valve_config	Enumeration Set Used: rev_valve_b_t	N/A	N/A	N/A	N/A	N/A	N/A	x	x
	7	a.number_of_heating_stages	Enumeration Set Used: nb_stages_t	x	x	x	x	N/A	N/A	N/A	N/A
	8	number_of_cool_or_hp_stages	Enumeration Set Used: nb_stages_t	x	x	x	x	N/A	N/A	x	x
	9	econo_min_position	SNVT_lev_percent	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	10	b.hp_high_balance_point	SNVT_temp_p	N/A	N/A	N/A	N/A	N/A	N/A	x	X
	11	b.econo_changeover_setpoint	SNVT_temp_p	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	12	c.hp_low_balance_point	SNVT_temp_p	N/A	N/A	N/A	N/A	N/A	N/A	x	x
	13	c.econo_mixed_air_setpoint	SNVT_temp_p	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	14	d.hp_comfort_or_economy_mode	Enumeration Set Used: mode_t	N/A	N/A	N/A	N/A	N/A	N/A	x	x
	15	d.econo mechanical_cool_enable	Enumeration Set Used: off_on_state_t	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	16	hp compressor_auxheat_interlock	Enumeration Set Used: off_on_state_t	N/A	N/A	N/A	N/A	N/A	N/A	x	x
16		**nciHvacType**	SNVT_hvac_type	X	X	X	X	X	X	X	X
17		**nciSccModel**	UNVT_model_numbe	X	X	X	X	X	X	X	X
	1	Thermostat Model		x	x	x	x	x	x	x	x
	2	Software Version		x	x	x	x	x	x	x	x
18		**nvoSpaceTemp**	SNVT_temp_p	X	X	X	X	X	X	X	X
19		**nvoUnitStatus**	SNVT_hvac_status	X	X	X	X	X	X	X	X
	1	mode		x	x	x	x	x	x	x	x
	2	heat_output_primary		x	x	x	x	x	x	x	x
	3	heat_output_secondary		N/A	N/A	N/A	N/A	N/A	N/A	x	x
	4	cool_output		x	x	x	x	x	x	x	x
	5	econo_output		x	x	N/A	N/A	N/A	N/A	N/A	N/A
	6	Fan_output		x	x	x	x	x	x	x	x
	7	in_alarm		x	x	x	x	x	x	x	x
20		**nvoDischAirTemp**	SNVT_temp_p	X	X	X	X	X	X	X	X
21		**nvoEffectOccup**	SNVT_occupancy	X	X	X	X	X	X	X	X

No	Sub	Point Name	Type	VT7656B5x00E	VT7605B5x00E	VT7652B5x00E	VT7600B5x00E	VT7652A5x00E	VT7600A5x00E	VT7652H5x00E	VT7600H5x00E
22		**nvoSccStatus**	UNVT_thermo_state_rtu UNVT_thermo_state_hp	X	X	X	X	X	X	X	X
For all non heatpump models, associate with UNVT_thermo_state_rtu											
	1	fan_output	True bit index 2	x	x	x	x	x	x	x	x
	2	cooling_stage_1	True bit index 3	x	x	x	x	x	x	x	x
	3	cooling_stage_2	True bit index 4	x	x	x	x	N/A	N/A	x	x
	4	auxiliary_contact	True bit index 5	x	x	x	x	x	x	x	x
	5	heating_stage_1	True bit index 6	x	x	x	x	x	x	x	x
	6	heating_stage_2	True bit index 7	x	x	x	x	x	x	x	x
	7	service_alarm	True bit index 12	x	x	x	x	x	x	x	x
	8	filter_alarm	True bit index 13	x	x	x	x	x	x	x	x
	9	di2_direct_status	True bit index 17	x	x	x	x	x	x	x	x
	10	di1_direct_status	True bit index 18	x	x	x	x	x	x	x	x
	11	set_clock_alarm	True bit index 22	x	N/A	x	N/A	x	N/A	x	N/A
	12	frost_protection_alarm	True bit index 23	x	x	x	x	x	x	x	x
	13	local_pir_motion	True bit index 24	x	x	x	x	x	x	x	x
	14	fan_lock_alarm	True bit index 25								
For all heatpump models, associate with UNVT_thermo_state_hp											
	1	fan_output	True bit index 2	x	x	x	x	x	x	x	x
	2	compressor_stage_1	True bit index 3	x	x	x	x	x	x	x	x
	3	compressor_stage_2	True bit index 4	x	x	x	x	N/A	N/A	x	x
	4	auxiliary_contact	True bit index 5	x	x	x	x	x	x	x	x
	5	heating_stage_1	True bit index 6	x	x	x	x	x	x	x	x
	6	reversing valve	True bit index 7	x	x	x	x	x	x	x	x
	7	service_alarm	True bit index 12	x	x	x	x	x	x	x	x
	8	filter_alarm	True bit index 13	x	x	x	x	x	x	x	x
	9	di2_direct_status	True bit index 17	x	x	x	x	x	x	x	x
	10	di1_direct_status	True bit index 18	x	x	x	x	x	x	x	x
	11	set_clock_alarm	True bit index 22	x	N/A	x	N/A	x	N/A	x	N/A
	12	frost_protection_alarm	True bit index 23	x	x	x	x	x	x	x	x
	13	local_pir_motion	True bit index 24	x	x	x	x	x	x	x	x
	14	fan_lock_alarm	True bit index 25								
23		**nvoEffectSetpt**	SNVT_temp_p	X	X	X	X	X	X	X	X
24		**nvoSetpoint**	SNVT_temp_p	X	X	X	X	X	X	X	X
25		**nciSndHrtBt**	SNVT_time_sec	X	X	X	X	X	X	X	X
26		**nciMinOutTm**	SNVT_time_sec	X	X	X	X	X	X	X	X
27		**nciRcvHrtBt**	SNVT_time_sec	X	X	X	X	X	X	X	X
28		**nciMajVer**	SCPT_maj_ver	X	X	X	X	X	X	X	X
29		**nciMinVer**	SCPT_min_ver	X	X	X	X	X	X	X	X
30		**nciLocation**	SNVT_str_asc	X	X	X	X	X	X	X	X

Input Network Variables (nvi's) Description

Parameter	Variable Name	Function
Room Temperature	network input SNVT_temp_p **nviSpaceTemp**	➢ This input network variable provides a network remote temperature value to the thermostat. If a valid value is present, the internal temperature reading (internal sensor) is no longer used. ➢ Valid Range: -40 to 122°F (-40 to 50°C) ➢ Default Null (release) Value: 621.81°F (327.67°C or 0x7FFF) ➢ This network variable is subject to the Receive HeartBeat Time, nviRcvHrtBt.
Outdoor Air Temperature	network input SNVT_temp_p **nviOutdoorTemp**	➢ This input network variable provides outdoor air temperature information to the thermostat from a network value temperature value. If a valid value is present, the internal temperature reading (internal sensor) is no longer used. The device will automatically display the value on its display when used. ➢ Valid Range: -40 to 122°F (-40 to 50°C) ➢ Default Null (release) Value: 621.81°F (327.67°C or 0x7FFF)
Occupancy	network input SNVT_occupancy **nviOccManCmd**	➢ This input network variable is used to command the Space Comfort Controller into different occupancy modes. It is typically set by a supervisory node to manually control occupancy modes, or to override the scheduled occupancy. ➢ Default Null Value: OC_NUL = 0xFF ➢ Valid Range: 0 = OC_OCCUPIED 1 = OC_UNOCCUPIED 2 = OC_BYPASS – **Not Used** 3 = OC_STANDY – **Not Used** 0xFF = OC_NUL (Release to internal occupancy)** * OC_OCCUPIED and OC_UNOCCUPIED commands will always have full authority over the local occupancy routines of the thermostat may they be a local input or a PIR cover. ** OC_NUL command will release the thermostat to use its own internal occupancy routine driven by the local schedule, one of the digital input or a PIR cover installed on board.
System Mode	network input SNVT_hvac_mode **nviApplicMode**	➢ This network variable input is used to coordinate the Space Comfort Controller with any node that may need to control the heat/cool changeover of the unit. ➢ Default Null Value: HVAC_AUTO. ➢ This network variable is subject to the receive heartbeat time, nciRcvHrtBt ➢ Valid Range: 0 = HVAC_AUTO 1 = HVAC_HEAT 2 = HVAC_MRNG_WRMUP – **Not Used** 3 = HVAC_COOL 4 = HVAC_NIGHT_PURGE – **Not Used** 5 = HVAC_PRE_COOL – **Not Used** 6 = HVAC_OFF 7 = HVAC_TEST – **Not Used** 8 = HVAC_EMERG_HEAT – **Not Used** 9 = HVAC_FAN_ONLY – **Not Used** 12 = HVAC_MAX_HEAT – **Not Used** 13 = HVAC_ECONOMY – **Not Used** 14 = HVAC_DEHUMID – **Not Used** 15 = HVAC_CALIBRATE – **Not Used** 0xFF = HVAC_NUL – **Not Used**

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Occupied Cool & Heat Setpoints</td><td>network Input SNVT_temp_p nviSetpoint</td><td>➢ This input network variable is used to allow the occupied temperature setpoints only to be changed via the network from a single analog value. (Note: the Unoccupied setpoints are not changed). The corresponding heating and cooling values are derived from the minimum deadband configuration value
➢ Default Null Value: 621.81°F (327.67°C or 0x7FFF)
➢ Ex. If the minimum deadband configuration value = 2 °F and nviSetpoint = 70°F.
• The resulting Occupied heating setpoint will equal 69 °F which is derived from 70 °F minus ½ the minimum deadband configuration value of 2 °F
The resulting Occupied cooling setpoint will equal 71 °F which is derived from 70 °F plus ½ the minimum deadband configuration value of 2 °F</td></tr>
<tr><td>Date and time</td><td>network input SNVT_time_stamp nviTimeSet</td><td>➢ This input network variable is used to set the time and date of the Space Comfort Controller.
➢ Default Null Value :
<table>
<tr><th>Sub</th><th>Name</th><th>Valid Range</th><th>Default Value</th></tr>
<tr><td>1</td><td>year</td><td>0 to 3000</td><td>0</td></tr>
<tr><td>2</td><td>month</td><td>0 to 12</td><td>0</td></tr>
<tr><td>3</td><td>day</td><td>0 to 31</td><td>0</td></tr>
<tr><td>4</td><td>hour</td><td>0 to 23</td><td>0</td></tr>
<tr><td>5</td><td>minute</td><td>0 to 59</td><td>0</td></tr>
<tr><td>6</td><td>second</td><td>0 to 59</td><td>0</td></tr>
</table></td></tr>
</table>

Output Network Variables (nvo's) Description

All output network variables will be updated no faster than the Minimum Send Time (nciMinOutTm) configuration value, if used.
An output network variable will be transmitted immediately when its value has changed significantly. Additionally, this variable will also be transmitted as a heartbeat output on a regular basis as dictated by the Maximum Send Time (nciSndHrtBt) configuration value.

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Room Temperature</td><td>network output SNVT_temp_p
nvoSpaceTemp</td><td>➢ This output network variable is used to monitor the effective space temperature sensor that the Space Comfort Controller is using for control. This output echoes the value of the input.
➢ Valid Range: -40 to 122°F (-40 to 50°C)
➢ The value 621.07°F (327.67°C or 0x7FFF) will be sent as an invalid value in case of a sensor failure.</td></tr>
<tr><td>Unit Status</td><td>network output SNVT_hvac_status
nvoUnitStatus</td><td>➢ This output network variable is available to report the Space Comfort Controller status. It combines the operating mode, the capacity of heating and cooling used and an indication if any alarms are present in the object.
<table>
<tr><th>Sub</th><th>Name</th><th>Valid Value</th></tr>
<tr><td>01</td><td>mode</td><td>HVAC_HEAT
HVAC_MRNG_WRMUP – Not Used
HVAC_COOL
HVAC_NIGHT_PURGE – Not Used
HVAC_PRE_COOL – Not Used
HVAC_HVAC_OFF
HVAC_HVAC_TEST – Not Used
HVAC_HVAC_EMERG_HEAT – Not Used
HVAC_FAN_ONLY – Not Used
HVAC_MAX_HEAT – Not Used</td></tr>
<tr><td>02:</td><td>heat_output_ primary</td><td>0-100%</td></tr>
<tr><td>03</td><td>heat_output_ secondary</td><td>0-100%</td></tr>
<tr><td>04</td><td>cool_output:</td><td>0-100%</td></tr>
<tr><td>05</td><td>econ_output</td><td>0-100%</td></tr>
<tr><td>06</td><td>fan_output</td><td>0-100%</td></tr>
<tr><td>07</td><td>In_alarm</td><td>0 (No alarms)
1 (Alarm On)
0x7FF (Alarming disabled) – Not Used</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Supply Temperature</td><td>network output
SNVT_temp_p
nvoDischAirTemp</td><td>➢ This output network variable is used to monitor the temperature of the air that leaves the Space Comfort Controller

➢ Valid Range: -40 to 122°F (-40 to 50°C)
➢ The value 621.81°F (327.67°C or 0x7FFF)will be sent as an invalid value in case of a sensor failure.</td></tr>
<tr><td>Occupancy</td><td>network output
SNVT_occupancy
nvoEffectOccup</td><td>➢ This output network variable is used to indicate the actual occupancy mode of the unit. This information is typically reported to a supervisory controller or provided to another Space Comfort Controller to coordinate the operation of multiple units
➢ Valid Range:
0 = OC_OCCUPIED
1 = OC_UNOCCUPIED
2 = OC_BYPASS[1]
3 = OC_STANDBY – Not Used
NOTE : OC_BYPASS can be initiated by either nviOccManCmd or a local input. NvoEffectOccup will only be in OC_BYPASS for the duration of the ToccTime (nciGenOpts), until reinitiated by either a transition of the local input or an update to nviOccManCmd.</td></tr>
<tr><td>Thermostat’s I/O status</td><td>network output
UNVT_thermo_state_rtu
UNVT_thermo_state_hp

nvoSccStatus</td><td>➢ This network variable output is used to report the Space Comfort Controller inputs’ and outputs’ status.
<table>
<tr><th>Sub</th><th>Name</th><th>Valid value</th><th>True bit index</th></tr>
<tr><td></td><td>fan output</td><td>0 = Off
1 = On</td><td>2</td></tr>
<tr><td></td><td>cooling stage 1
compressor stage 1</td><td>0 = Off
1 = On</td><td>3</td></tr>
<tr><td></td><td>cooling stage 2
compressor stage 2</td><td>0 = Off
1 = On</td><td>4</td></tr>
<tr><td></td><td>auxiliary contact</td><td>0 = Off
1 = On</td><td>5</td></tr>
<tr><td></td><td>heating stage 1</td><td>0 = Off
1 = On</td><td>6</td></tr>
<tr><td></td><td>heating stage 2
reversing valve</td><td>0 = Off
1 = On</td><td>7</td></tr>
<tr><td></td><td>service alarm</td><td>0 = Off
1 = On</td><td>12</td></tr>
<tr><td></td><td>filter alarm</td><td>0 = Off
1 = On</td><td>13</td></tr>
<tr><td></td><td>di2 direct status</td><td>0 = Activated
1 = Not Activated</td><td>17</td></tr>
<tr><td></td><td>di1 direct status</td><td>0 = Activated
1 = Not Activated</td><td>18</td></tr>
<tr><td></td><td>set clock alarm</td><td>0 = Off
1 = On</td><td>22</td></tr>
<tr><td></td><td>frost protection alarm</td><td>0 = Off
1 = On</td><td>23</td></tr>
<tr><td></td><td>local pir motion</td><td>0 = Off
1 = On</td><td>24</td></tr>
<tr><td></td><td>fan lock alarm</td><td>0 = Off
1 = On</td><td>25</td></tr>
</table></td></tr>
</table>

Parameter	Variable Name	Function
Setpoint	network output SNVT_temp_p **nvoEffectSetpt**	➢ This output network variable is used to monitor the effective temperature setpoint which may depend on nciSetpoints, nvoEffectOccup, nviSetpoint and any local setpoint adjustment. For example, if the occupancy state is unoccupied and the heat/cool state is heat, the effective setpoint would be equal to the unoccupied heating setpoint defined in nciSetpoints. ➢ Valid Range: -40 to 100°F (-40 to 37.5°C)
Local setpoint output	network output SNVT_temp_p **nvoSetPoint**	➢ This output network variable is used to monitor the space temperature setpoint ➢ Valid Range : 40°F to 100°F (4.5°C to 37.5°C) ➢ The present value is derived by the following OccHeat Setpoint + ((OccCool Setpoint – OccHeat Setpoint) / 2)

Configuration properties (nci's) Description

Parameter	Variable Name	Function
Schedule	network input config UNVT_day_sched **nciDay_Sched[x]** **x** = 0 to 6	➢ This configuration property defines the schedule for every day of the week (from Monday to Sunday or from day 0 to day 6). This nci is linked with the nvoEffectOccup variable. ➢ 2 or 4 events can entered depending on the nb_of_events variable. ➢ Starting and ending time are entered in minutes, e.i. 11:59 pm is equal to 1439 minutes (23 hours * 60 min + 59 min) ➢ Valid Range : 0 to 1439 minutes ➢ Default values:

Sub	Name	Default Value
1	occupied_event_1	0
2	unoccupied_event_2	1439
3	occupied_event_3	0
4	unoccupied_event_4	1439

Temperature Setpoints	network input config SNVT_temp_setpt **nciSetPts**	➢ This configuration property defines the space temperature setpoints for various heat, cool and occupancy modes. ➢ The stand-by setpoints can be modified but are not used by the controller, as it does not support Stand-By occupancy mode. ➢ Valid Range and Default values:

Sub	Name	Valid Range	Default value
01	occupied_cool	54 to 100°F (12 to 37.5°C)	73.5°F (23°C)
02	standby_cool	**Not Used**	**Not Used**
03	unoccupied_cool	54 to 100°F (12 to 37.5°C)	82.5°F (28°C)
04	occupied_heat	40 to 90°F (4.5 to 32°C)	70°F (21°C)
05	standby_heat	**Not Used**	**Not Used**
06	unoccupied_heat	40 to 90°F (4.5 to 32°C)	61°F (16°C)

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Thermostat's common configuration parameters network input config</td><td>UNVT_cfg_1_rtu_hp
nciCfg1RtuHpt</td><td>

This configuration property defines the thermostat's common configuration parameters and their settings.
Valid Range and Default values:

<table>
<tr><th>Name</th><th>Valid Range</th><th>Default value</th></tr>
<tr><td>password</td><td>0 to 1000</td><td>0</td></tr>
<tr><td>unoccupied timer</td><td>0.5 to 24.0 hours</td><td>0.5</td></tr>
<tr><td>anticycle</td><td>0, 1, 2, 3, 4, or 5 minutes</td><td>2 minutes</td></tr>
<tr><td>power-up delay</td><td>10 to 120 sec.</td><td>10 sec.</td></tr>
<tr><td>temporary occ time</td><td>0, 1, 2, 3 to 12 hours</td><td>3 hours</td></tr>
<tr><td>heating stages cph</td><td>3, 4, 5, 6, 7 or 8 CPH</td><td>4 CPH</td></tr>
<tr><td>cooling stages cph</td><td>3 or 4 CPH</td><td>4 CPH</td></tr>
<tr><td>heat maximum setpoint</td><td>40 to 90°F (4.5 to 32°C)</td><td>90°F</td></tr>
<tr><td>cool minimum setpoint</td><td>54 to 100°F
(12 to 37.5°C)</td><td>54°F</td></tr>
<tr><td>oa temp heat lockout</td><td>-15 to 120°F (-26 to 49°C)</td><td>120°F</td></tr>
<tr><td>oa temp cool lockout</td><td>-40 to 95°F (-40 to 35°C)</td><td>-40°F</td></tr>
<tr><td>calib room sensor</td><td>±5°F (±2.5°C)</td><td>0°F</td></tr>
<tr><td>calib outdoor air sensor</td><td>±5°F (±2.5°C)</td><td>0°F</td></tr>
<tr><td>deadband</td><td>2 to 4°F with 1°F increments
(1 to 2°C)</td><td>2°F</td></tr>
<tr><td>fan mode</td><td>0 = On
1 = Auto
2 = Smart</td><td>0 = On</td></tr>
<tr><td>fan control</td><td>0 = Off
1 = On</td><td>1 = On</td></tr>
<tr><td>fan delay</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>keypad lockout</td><td>0 = No_Lockout
1 = Level_1
2 = Level_2</td><td>No_Lockout</td></tr>
<tr><td>proportional band</td><td>2 to 8 F</td><td>2 F</td></tr>
<tr><td>temperature units</td><td>0 = °C
1 = °F</td><td>°F</td></tr>
<tr><td>frost protection</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>temperature scale</td><td>0 = °C
1 = °F</td><td>°F</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Variable Name</th><th colspan="3">Function</th></tr>
<tr><td rowspan="15">Thermostat's common configuration parameters network input config</td><td rowspan="15">UNVT_cfg_2_rtu_hp
nciCfg2RtuHpt</td><td>Name</td><td>Valid Range</td><td>Default value</td></tr>
<tr><td>di1 config</td><td>0 = None
1 = RemNSB
2 = RemOVR
3 = Filter
4 = Service</td><td>0 = None</td></tr>
<tr><td>di2 config</td><td>0 = None
1 = RemNSB
2 = RemOVR
3 = Filter
4 = Service</td><td>0 = None</td></tr>
<tr><td>aux contact config</td><td>0 = NORMALLY_OPEN
1 = NORMALLY_CLOSE</td><td>0</td></tr>
<tr><td>number of events</td><td>2 or 4</td><td>2</td></tr>
<tr><td>progressive recovery</td><td>0 = Off
1 = Active</td><td>0 = Off</td></tr>
<tr><td>a.hp rev valve config</td><td>1 = Normally Heat
2 = Normally Cool</td><td>2</td></tr>
<tr><td>a.number of heating stages</td><td>1 = 1 Stage
2 = 2 Stages</td><td>2</td></tr>
<tr><td>number of cool or hp stages</td><td>1 = 1 Stage
2 = 2 Stages</td><td>2</td></tr>
<tr><td>econo min position</td><td>0 to 100%</td><td>0%</td></tr>
<tr><td>b.hp high balance point</td><td>34 to 90°F (1 to 32°C)</td><td>90°F</td></tr>
<tr><td>b.econo changeover setpoint</td><td>14 to 70°F (-10 to 21°C)</td><td>55°F</td></tr>
<tr><td>c.hp low balance point</td><td>-40 to 30°F(-40 to –1°C)</td><td>-12°F</td></tr>
<tr><td>c.econo mixed air setpoint</td><td>50 to 90°F (10 to 32°C)</td><td>50°F</td></tr>
<tr><td>d.hp comfort or economy mode</td><td>0 = Comfort
1 = Economy</td><td>0 = Comfort</td></tr>
<tr><td>d.econo mechanical cool enable</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>hp compressor auxheat interlock</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>HVAC Unit-Type Identifier</td><td>network input config
SNVT_hvac_type
nciHvacType</td><td colspan="3">➢ This configuration property helps the user identify the type of equipment being monitored.
➢ Valid Range:
<table>
<tr><th>Value</th><th>Identifier</th><th>Name</th></tr>
<tr><td>0</td><td>HVT_GENERIC – Not Used</td><td>Generic</td></tr>
<tr><td>1</td><td>HVT_FAN_COIL</td><td>Fan Coil</td></tr>
<tr><td>2</td><td>HVT_VAV – Not Used</td><td>Variable Air Volume Terminal</td></tr>
<tr><td>3</td><td>HVT_HEAT_PUMP</td><td>Heat Pump</td></tr>
<tr><td>4</td><td>HVT_ROOFTOP</td><td>Rooftop Unit</td></tr>
<tr><td>5</td><td>HVT_UNIT_VENT – Not Used</td><td>Unit Ventilator</td></tr>
<tr><td>6</td><td>HVT_CHIL_CEIL – Not Used</td><td>Chilled Ceiling</td></tr>
<tr><td>7</td><td>HVT_RADIATOR – Not Used</td><td>Radiator</td></tr>
<tr><td>8</td><td>HVT_AHU – Not Used</td><td>Air Handling Unit</td></tr>
<tr><td>9</td><td>HVT_SLF_CONT – Not Used</td><td>Self-Contained Unit</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Thermostat's model number</td><td>network input config
UNVT_model_info_2
nciSccModel</td><td>
➢ This configuration property defines model number and software version of the thermostat
➢ Valid Range and Default values:
<table>
<tr><th>Sub</th><th>Name</th><th>Valid Range</th><th>Default value</th></tr>
<tr><td>01</td><td>Thermostat Model</td><td>11 = VT7600A
12 = VT7600H
10 = VT7600B
09 = VT7605B
02 = VT7652A
06 = VT7652B
01 = VT7656B
04 = VT7652H</td><td>Depend on model being used</td></tr>
<tr><td>02</td><td>Software Version</td><td>Unsigned short</td><td>Thermostat dependent</td></tr>
</table>
</td></tr>
<tr><td>Maximum Send Time</td><td>network input config
SNVT_time_sec
nciSendHrtBt</td><td>
➢ This configuration property defines the maximum period of time that expires before the specified network variable outputs will automatically be updated
➢ Valid Range: 0 sec. To 6553.4 sec.. Setting nciSendHrtBt to 0 disables the Send Heartbeat mechanism.
➢ Default Null Value : 0.0 sec (no automatic update)
</td></tr>
<tr><td>Minimum Send Time</td><td>network input config
SNVT_time_sec
nciMinOutTm</td><td>
➢ This configuration property defines the minimum period of time between automatic network variable outputs transmissions.
➢ Valid Range: 0 sec. to 6553.4 sec.. Setting nciRcvHrtBt to 0 disables the Minimum Send Time mechanism.
➢ Default Null Value : 0.0 sec (no minimum send time)
</td></tr>
<tr><td>Minimum Receive Time</td><td>network input config
SNVT_time_sec
nciRcvHrtBt</td><td>
➢ This configuration property is used to control the maximum time that elapses after the last update to a specified network variable input before the Space Comfort Controller starts to use its default values.
➢ Valid Range: 0 sec. to 6553.4 sec.. Setting nciRcvHrtBt to 0 disables the Receive Heartbeat mechanism.
➢ Default Null Value : 0.0 sec (no failure detected)
</td></tr>
<tr><td>Hardware or Software revisions</td><td>network input config
SCPT_maj_ver
nciMajVer</td><td>
➢ This configuration property defines the major module software revisions.
➢ Valid Range: 0 to 255
</td></tr>
<tr><td>Hardware or Software revisions</td><td>network input config
SCPT_min_ver
nciMinVer</td><td>
➢ This configuration property defines the minor module software revisions.
➢ Valid Range: 0 to 255
</td></tr>
<tr><td>Location Label</td><td>network input config
SNVT_str_asc
nciLocation</td><td>
➢ 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
</td></tr>
</table>

Integration – Global Commands

The following figure shows which objects from the thermostat can be monitored and commanded from the BAS front-end.

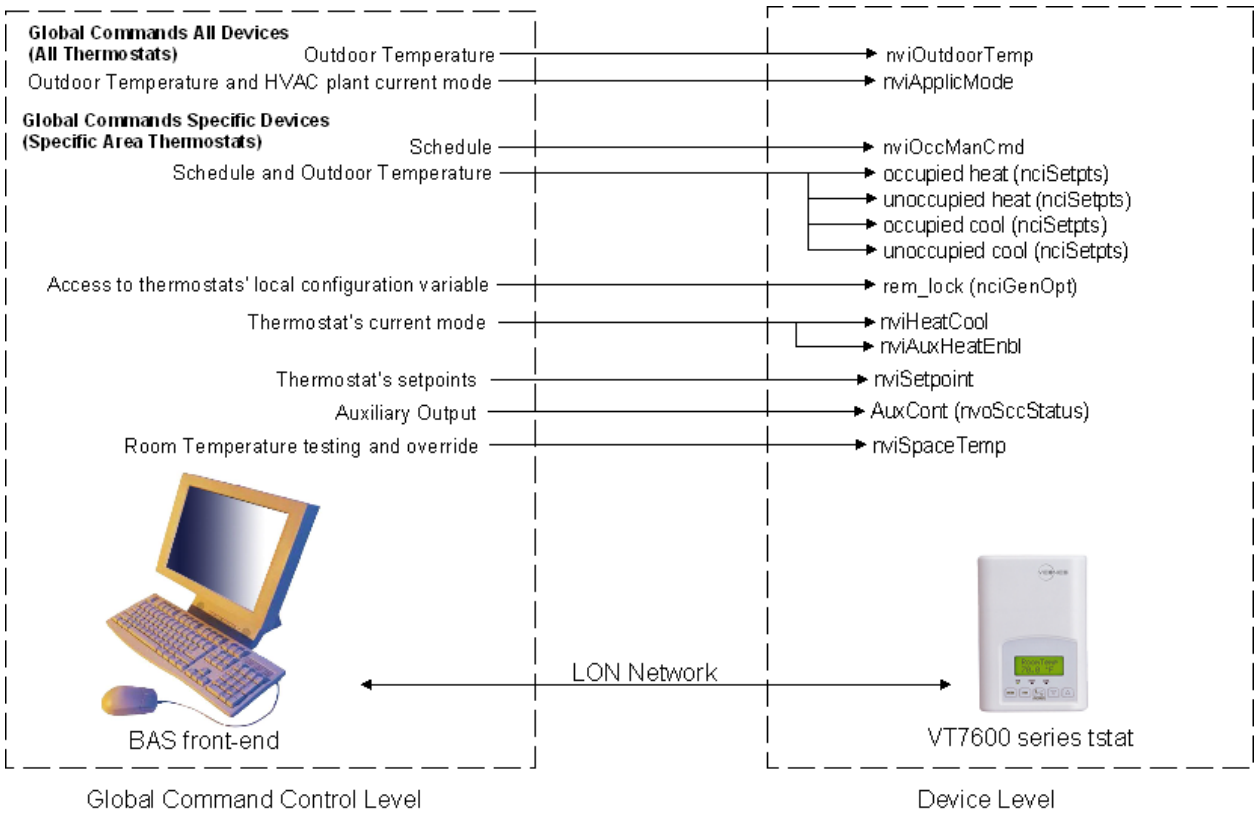


Figure 1: Global commands from a BAS front-end to a VT7600 series tstat

Integration – Graphic User Interface (GUI) Objects

The following objects should be typically used in a GUI:

- nvoSpaceTemp
- occupied_heat (nciSetpts);
- unoccupied_heat (nciSetpts);
- occupied_cool (nciSetpts);
- unoccupied_cool (nciSetpts);
- nvoDischAirTemp
- nvoEffectOccup
- heat_output_primary (nvoUnitStatus)
- cool_output (nvoUnitStatus)
- fan (nvoSccStatus)
- cool_1 (nvoSccStatus)
- cool_2 (nvoSccStatus)
- heat_1 (nvoSccStatus)
- heat_2 (nvoSccStatus)
- service_alarm (nvoSccStatus)
- filter_alarm (nvoSccStatus)
- d2_direct (nvoSccStatus)
- d1_direct (nvoSccStatus)
- frostpro_alarm (nvoSccStatus)
- econ_output (nvoUnitStatus)

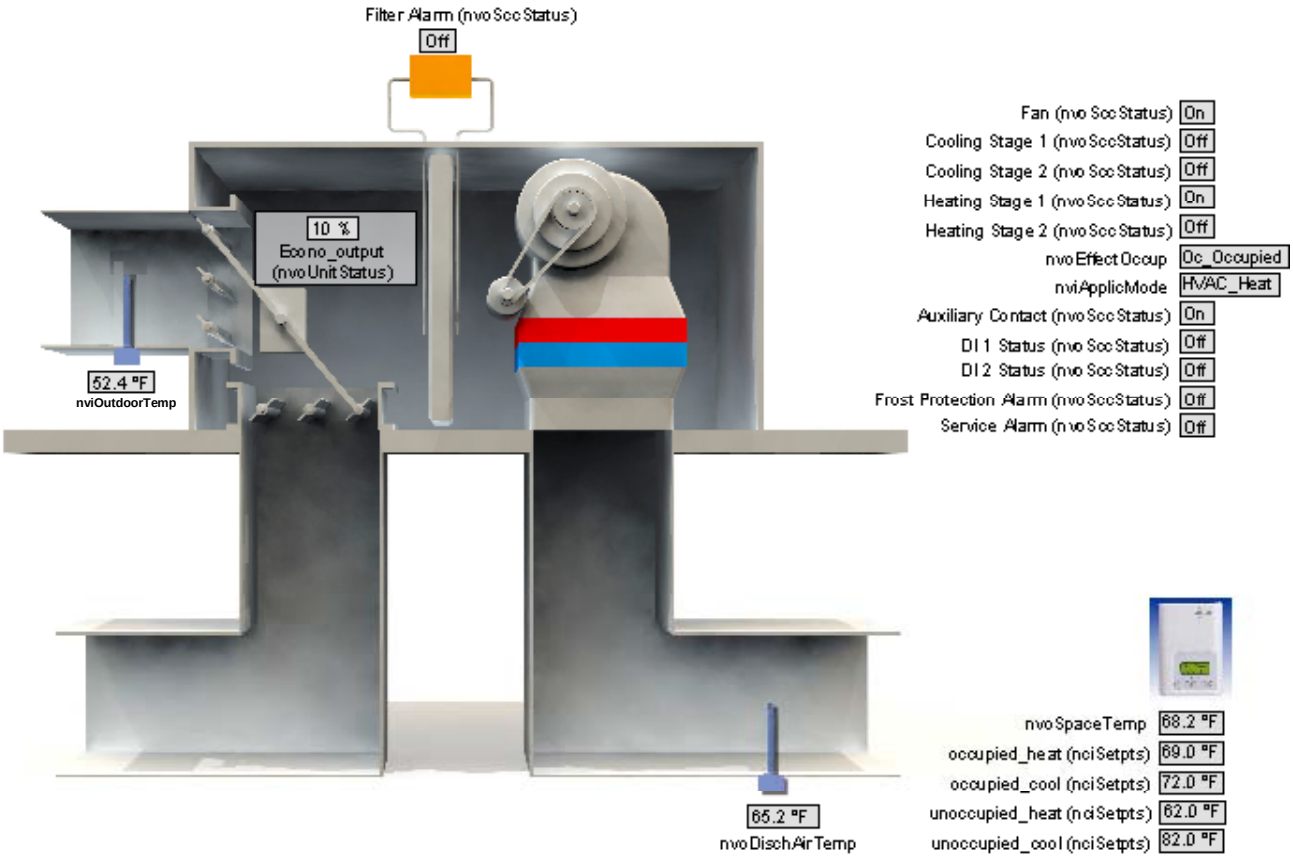


Figure 2: Graphical User Interface (GUI) example of a Roof Top Unit

Configuration Objects

The following SNVT and UNVT should be typically used for configuration purposes:

- nciCfg1RtuHp;
- nciSetpoints;
- nciCfg2RtuHp;
- nviDaySchedule[0]
- nviDaySchedule[1]
- nviDaySchedule[2]
- nviDaySchedule[3]
- nviDaySchedule[4]
- nviDaySchedule[5]
- nviDaySchedule[6]

Wiring Guide

Overview

For clarity we will use the term "Device" to represent any product with an active Echelon network connection, including Viconics and non-Viconics controllers.

Summary Specifications:

Parameter	Details
Network Wiring	24 to 16AWG, twisted pair
Maximum total wire length[1]	1600 feet (500 meters) in free topology
Maximum device-to-device distance	1600 feet (500 meters) in free topology
Polarity	Polarity insensitive
Multi-drop	Free Topology
Termination for Free Topology Network Segment	One RC network with Ra = 52.3Ω±1%, 1/8W
Termination for Doubly Terminated Bus Network Segment	Two RC network with Ra = 105Ω±1%, 1/8W
Number of transceivers per segment	Up to 64
Baud rate	78000 bits per second

[1]Network segment length varies depending on wire type.

Table 1: Summary of Specifications for a Viconics' EIA-485 Network

Network Configuration

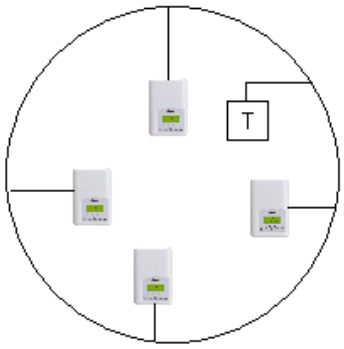
The Echelon network is designed to support free topology wiring and will accommodate bus, star, loop or any of these topologies. Echelon devices can be located at any point along the network wiring.

Figures 3.1 to 3.5 present five different network topologies. The actual termination circuit will vary by application.

Figure 3.1 Singly Terminated Bus Topology

Figure 3.2 Doubly Terminated Bus Topology

Figure 3.3 Star Topology



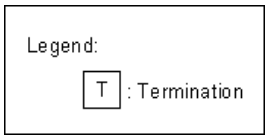


Figure 3.4 Loop Topology

Figure 3.5 Mixed Topology

Maximum Number Of Devices

Up to 64 transceivers are allowed per network segment. If your network requires more than 64 transceivers a repeater is then required to extend your network

Maximum Cable Length

The maximum length of a chain is related to its transmission speed. Using proper cable, Echelon supports a baud rate of 78 kilobits per second for distances up to 1600-ft (500 m) in free topology and 8800 ft (2700 m) in bus topology with double terminations.

If you require a maximum network length of more than 1600-ft (500 m) or 8800 ft (2700 m), then a repeater is required to extend the network.

Repeater

In the event that the limits on the number of transceivers or total wire distance are exceeded, a physical layer repeater can be added to interconnect two or more network segments. A repeater will double the overall channel capability, including node count and network extent, but not bandwidth. Note that only one physical layer repeater should be placed in series between any two nodes on a channel. If additional cabling or network bandwidth is required, then a LonWorks Router should be used in place of a repeater.

Terminators

Echelon network segments requires termination for proper data transmission performance. The type of terminator varies depending on whether shielded or unshielded cable is used. Free topology and Bus networks also differ in their termination requirements. The following sections describe the various terminators and terminations procedure.

Free Topology Network Segment

In a free topology segment, only one termination is required and may be placed anywhere on the free topology segment. There are two choices for the termination:

1. RC network with Ra = 52Ω±1%, 1/8W
2. LPI-10 Link Power Interface, with jumper at “1 CPLR” setting.

Doubly Terminated Network Segment

In a doubly terminated bus topology, two terminations are required, one at each en of the bus. There are two choices for each termination:

1. RC network with Ra = 105Ω±1%, 1/8W
2. LPI-10 Link Power Interface, with jumper at “2 CPLR” setting.

Only one LPI-10 interface is supported per segment. The other terminator must be an RC-type.

Grounding Shielded Twisted Pair Cable

When using Shielded Twisted Pair, terminate the twisted pair as listed in the previous section and ground the cable shield by using a capacitor, to tie the shield to earth ground, and a large-value resistor to bleed off any static charge on the shield. Tying the shield to earth ground through a capacitor will avoid DC and 50/60Hz ground paths from being formed through the shield. Typical values for resistor and capacitor are as follows:

Capacitor = 0.1μF, 10%, Metalized Polyester, ≥ 100V
Resistor = 470kΩ, 1/4W, ±5%

The cable shield should be grounded at least once per segment, and preferably at each node. Grounding the shield at every node will assist in suppressing 50/60Hz standing waves.

Network Adapter

Although network connections are polarity insensitive, it is good practice to keep polarity consistent throughout the entire site. Figure 4 shows a network connection example and the location of the Status LED. This Status LED may help to troubleshoot network problems.

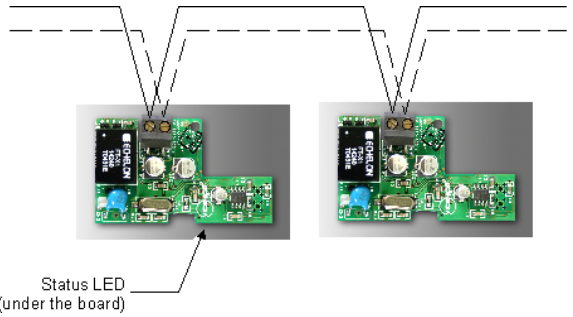


Figure 4: Network connections and location of the Status LED on a LON module

Table 2 shows the different possibilities with the Status LED behavior of the LON module.

Condition of the Status LED	Explanation
➢ Continuously ON	The Echelon communication module has no valid application loaded in its memory.
➢ Flashing at a rate of 1/2Hz	The Echelon communication module has an application loaded in its memory but is Unconfigured. When an Echelon communication module is in the unconfigured state, the application is not running. This is the default state when the devices are shipped. A network management tool should be used to configure the module and integrate the device to a LonWorks network.
➢ Continuously OFF	The Echelon communication module has an application loaded into its memory and the application is running.

Table 2: Status LED condition

Software Files

XIF: When binding a node onto the network, an XIF file is needed. The XIF file has information that is used by the network management tool to help ease the installation and maintenance process of a node. It is also used for offline configuration of the node.

APB and NXE: When running an application program associated with a XIF file, an APB or NXE file is needed. Please note that the thermostats have the APB file already flashed from the factory.

Device Resource File (DRF): When a LON network management tool is used; a DRF file must be installed. DRF files are needed to display special manufacturer defined variables or configurations correctly.

- **Please note that all release notes for the XIF, APB & NXE software files will be included under the following folder name on your hard drive: C:\LonWorks\Import\Viconics. The name of the file is: VT7xxxReadme.txt**

Plug-Ins File: Plug-Ins simplify start-up, maintenance, configuration and reduce the installation effort.

- **Please note that all release notes for Plug-Ins files will be included under the following folder name on your hard drive: C:\LonWorks\Plug-Ins\Viconics\VT7xxx. The name of the file is: Readme.txt.**
- **All the latest software files can be downloaded from VICONICS' web site at** http://www.viconics.com

Device Identification

An Echelon device has a unique mechanism to identify itself, the Neuron ID, which is obtained during commissioning.

There are two ways of getting the Neuron ID: with a Service Pin or manually.

Service PIN

The Service PIN is used to identify the device at commissioning. By pressing simultaneously the “Yes” button and the “No” button located on the keypad interface of a VT7600 device, the program ID and the Neuron ID (LonWorks Unique ID) contained in the device are transmitted to the commissioning or service tool. The Status LED will blink when the device accepts the Service PIN command.

Figures 6 and 7 show an example of a Service PIN request made through a commissioning tool

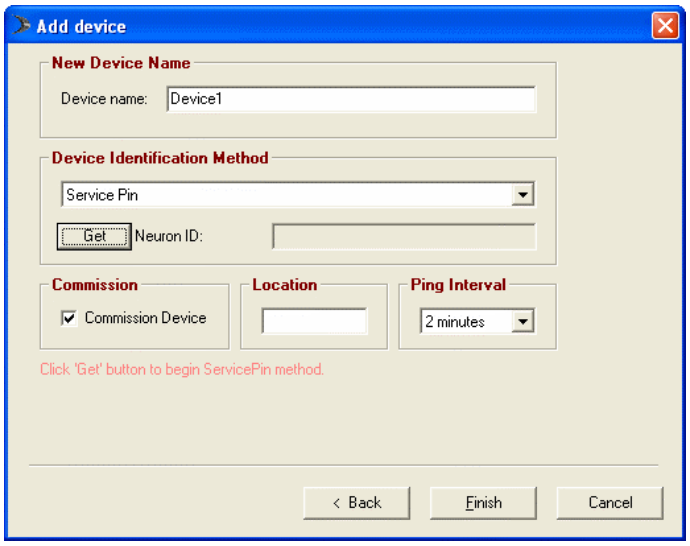


Figure 6: Service Pin request through a commissioning tool

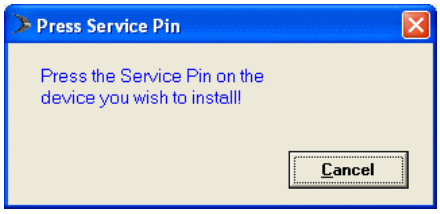


Figure 7: Service Pin request through a commissioning tool

Manual Identification

Neuron ID of a device can also be entered manually through a commissioning or service tool. Neuron ID should be located on the Echelon chip of the device being commissioned.

Figure 8 shows an example of a Manual Neuron ID request made through a commissioning tool.

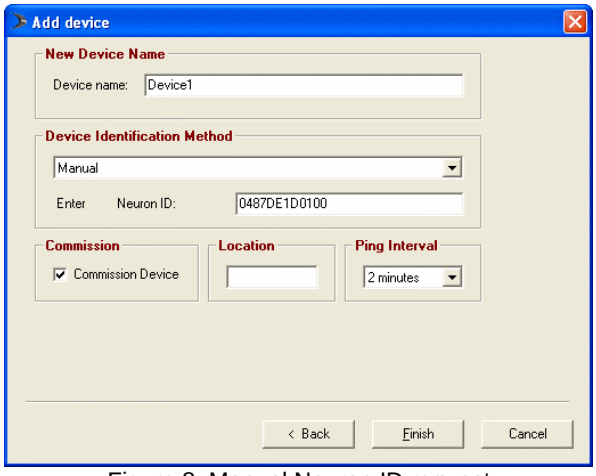


Figure 8: Manual Neuron ID request

Tips And Things You Need To Know

- In order to operate nviAuxOut (auxiliary output) from the network, Aux contact configuration (Auxcont nciGenOpt) needs to be set as "NetworkControlled";
- If the heartbeat is lost, the module will release the network sensor value for the Room Temperature (nviSpaceTemp) and the Outdoor Temperature (nviOutdoorTemp);
- The heartbeat parameter of a Tridium front-end should be set at the slowest configuration possible so that nviTimeStamp updates correctly;
- With any LNS Tools, nviTimeStamp should be set to refresh everyday or on power-up;
- For nciMultOpt, Viconics strongly recommend to use either one of the following format file:
    - UNVT_rt_opts#US or UNVT_rt_opts#SI for Roof Top models
    - UNVT_hp_opts#US or UNVT_hp_opts#SI for Heat Pump models

Troubleshooting Section

Error / Trouble Condition	Possible Cause	Solution
Thermostat does not come online	The LON network has too many devices.	Do not exceed the maximum number of devices and maximum length allowed by the EIA-485 specifications.
	Too many devices were installed without any repeaters.	Repeaters need to be installed as specified in this document.
	The LON cable runs are broken	Locate the break and correct wiring
	The thermostat does not have power	Apply power to the thermostat

Document Control

Document Name: ITG-VT7600-PIR-LON-E05
Document Filename: ITG-VT7600-PIR-LON-E05.pdf

Revision	Date	Changes
1.0	January 4, 2006	Created to coincide with release of the VT7600 as a LonMark certified product.
2.0	April 25, 2006	Removed any Application Guide reference, set MS default Stpt to 55 and modified the nciGenOpt – DIs enumeration and removed a line in the nvoDischAirTemp on page 10
3.0	July 11, 2006	Modified the Software Files section and added a RoHS / Non-RoHS section
4.0	Feb 06, 2009	Added changes for new PID supported 80:00:C5:55:00:04:04:21 Added revision history table for all VT7600 PID's
5.0	June 4, 2009	Removed nvoOutdoorTemp