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

LonWorks Integration Manual
ITG-VT7600-LON-E01

Product Overview

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, backlit LCD display that 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 sensors inputs are available.

All programmable models contain a SPST auxiliary switch, which can be used to control lighting or disable the economizer function. For more advanced applications, an economizer control logic has been integrated onto the thermostat for use with proportional damper economizer actuators.

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

- Detailed information on the thermostat (VT76xxX1020), is available on document LIT-VT7600-E01.

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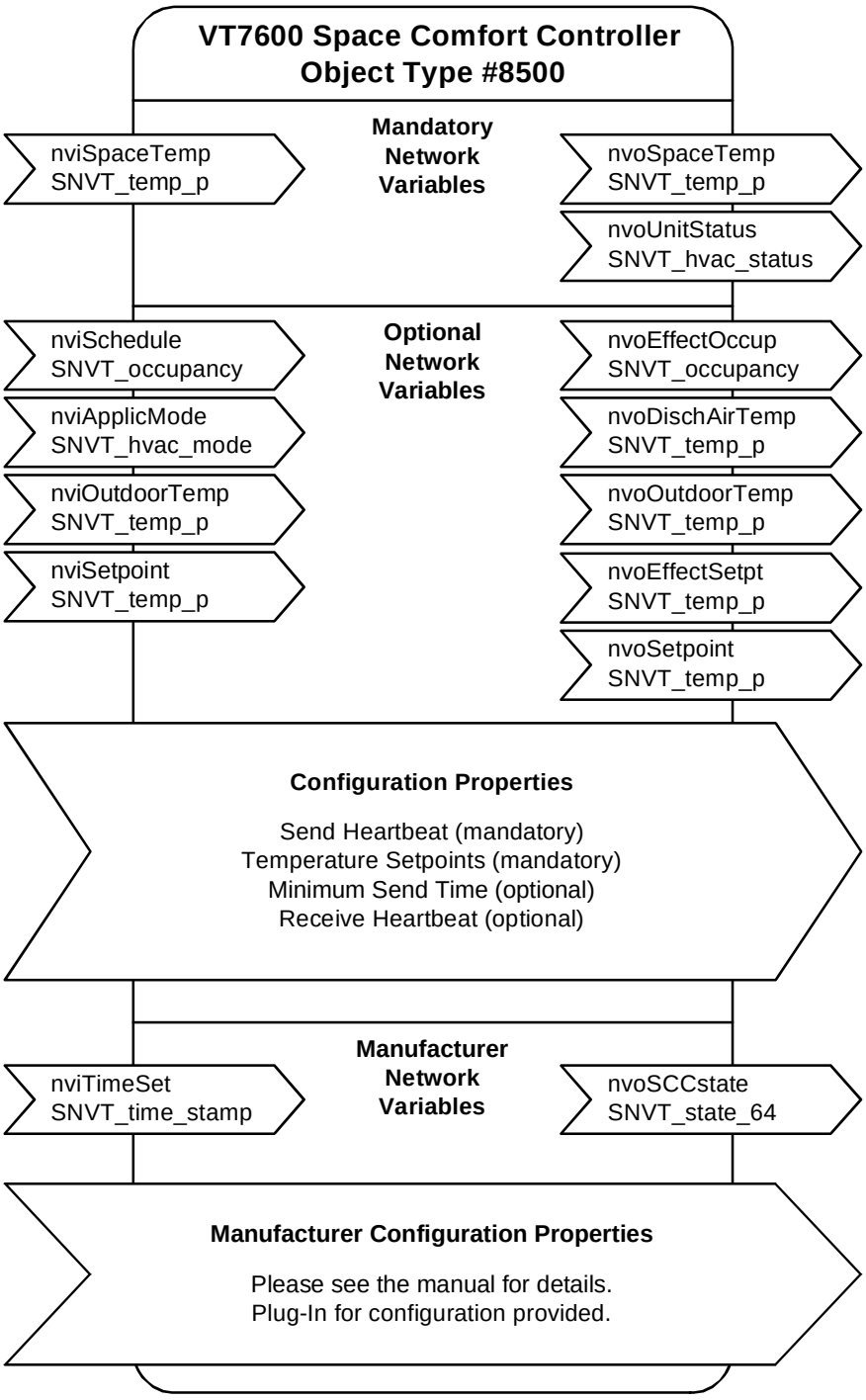
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Model Number			T7656B1020E	T7605B1020E	T7652B1020E	T7600B1020E	T7652A1020E	T7600A1020E	T7652H1020E	T7600H1020E
No	Sub	Point Name								
		N/A Not Applicable on this model								
0		**nviSpaceTemp**	X	X	X	X	X	X	X	X
1		**nviOutdoorTemp**	X	X	X	X	X	X	X	X
2		**nviOccManCmd**	X	X	X	X	X	X	X	X
3		**nviApplicMode**	X	X	X	X	X	X	X	X
4		**nviSetpoint**	X	X	X	X	X	X	X	X
5		**nviTimeSet**	X	N/A	X	N/A	X	N/A	X	N/A
6		**nciDaySched[0]**	X	N/A	X	N/A	X	N/A	X	N/A
7		**nciDaySched[1]**	X	N/A	X	N/A	X	N/A	X	N/A
8		**nciDaySched[2]**	X	N/A	X	N/A	X	N/A	X	N/A
9		**nciDaySched[3]**	X	N/A	X	N/A	X	N/A	X	N/A
10		**nciDaySched[4]**	X	N/A	X	N/A	X	N/A	X	N/A
11		**nciDaySched[5]**	X	N/A	X	N/A	X	N/A	X	N/A
12		**nciDaySched[6]**	X	N/A	X	N/A	X	N/A	X	N/A
13		**nciSetPts**	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		**nciGenOpt**	X	X	X	X	X	X	X	X
	1	Temperature Units	x	x	x	x	x	x	x	x
	2	DI1 Configuration	x	x	x	x	x	x	x	x
	3	DI2 Configuration	x	x	x	x	x	x	x	x
	4	Power-Up Delay	x	x	x	x	x	x	x	x
	5	Frost Protection	x	x	x	x	x	x	x	x
	6	Heat Maximum setpoint	x	x	x	x	x	x	x	x
	7	Cool Minimum setpoint	x	x	x	x	x	x	x	x
	8	Anticycle	x	x	x	x	x	x	x	x
	9	Heating Stages Cycles Per Hour	x	x	x	x	x	x	x	x
	10	Cooling Stages Cycles Per Hour	x	x	x	x	x	x	x	x
	11	Deadband	x	x	x	x	x	x	x	x
	12	Fan Control	x	x	x	x	x	x	x	x
	13	Fan Delay	x	x	x	x	x	x	x	x
	14	Temporay Occ Time	x	x	x	x	x	x	x	x
	15	Calibration Room Sensor	x	x	x	x	x	x	x	x
	16	Calibration Outdoor Sensor	x	x	x	x	x	x	x	x
	17	Outside Air Temperature Heating Lockout	x	x	x	x	x	x	x	x
	18	Outside Air Temperature Cooling Lockout	x	x	x	x	x	x	x	x
	10	Number of Events	x	N/A	x	N/A	x	N/A	x	N/A
	20	Auxiliary Contact Configuration	x	x	x	x	x	x	x	x
	21	Progressive Recovery Enable	x	N/A	x	N/A	x	N/A	x	N/A
	22	Keypad Lockout Levels	x	x	x	x	x	x	x	x

1: SNVTs: Standard Network Variables Types

2: SCPTs: Standard Configuration Parameters Types

No	Sub	Model Number / Point Name	T7656B1020E	T7605B1020E	T7652B1020E	T7600B1020E	T7652A1020E	T7600A1020E	T7652H1020E	T7600H1020E
		N/A Not Applicable on this model								
15		**NciMultOpt (Generic format shown here)**	X	X	X	X	N/A	N/A	X	X
	1	opts_1.heating_stages	x	x	x	x	N/A	N/A	N/A	N/A
	2	opts_1.rev_valve_cfg	N/A	N/A	N/A	N/A	N/A	N/A	x	x
	3	cooling_or_heatpump_stages	x	x	x	x	N/A	N/A	x	x
	4	econo_min_pos	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	5	opts_2.econo_chng_sp	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	6	opts_2.high_balance_sp	N/A	N/A	N/A	N/A	N/A	N/A	x	X
	7	opts_3.mech_cool_enable	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	8	opts_3.mode	N/A	N/A	N/A	N/A	N/A	N/A	x	x
	9	opts_4.mix_air_sp	x	x	N/A	N/A	N/A	N/A	N/A	N/A
	10	opts_4.low_balance_sp	N/A	N/A	N/A	N/A	N/A	N/A	x	x
	11	comp_aux_interlock	N/A	N/A	N/A	N/A	N/A	N/A	x	x
16		**nciHvacType**	X	X	X	X	X	X	X	X
17		**nciSccModel**	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**	X	X	X	X	X	X	X	X
19		**nvoUnitStatus**	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		**nvoOutdoorTemp**	X	X	X	X	X	X	X	X
21		**nvoDischAirTemp**	X	X	X	X	X	X	X	X
22		**nvoEffectOccup**	X	X	X	X	X	X	X	X
23		**nvoSccStatus**	X	X	X	X	X	X	X	X
	2	Fan	x	x	x	x	x	x	x	x
	3	Cooling Stage 1	x	x	x	x	x	x	x	x
	4	Cooling Stage 2	x	x	x	x	N/A	N/A	x	x
	5	Auxiliary Contact	x	x	x	x	x	x	x	x
	6	Heating Stage 1	x	x	x	x	x	x	x	x
	7	Heating Stage 2 / O/B reversing valve	x	x	x	x	x	x	x	x
	9	Service Alarm	x	x	x	x	x	x	x	x
	10	Filter Alarm	x	x	x	x	x	x	x	x
	13	DI2 Status	x	x	x	x	x	x	x	x
	14	DI1 Status	x	x	x	x	x	x	x	x
	16	Set Clock Alarm	x	N/A	x	N/A	x	N/A	x	N/A
	17	Frost Protection Alarm	x	x	x	x	x	x	x	x

		Model Number	T7656B1020E	T7605B1020E	T7652B1020E	T7600B1020E	T7652A1020E	T7600A1020E	T7652H1020E	T7600H1020E
No	Sub	Point Name								
		N/A Not Applicable on this model								
24		**nvoEffectSetpt**	X	X	X	X	X	X	X	X
25		**nvoSetpoint**	X	X	X	X	X	X	X	X
26		**nciSndHrtBt**	X	X	X	X	X	X	X	X
27		**nciMinOutTm**	X	X	X	X	X	X	X	X
28		**nciRcvHrtBt**	X	X	X	X	X	X	X	X
29		**nciMajVer**	X	X	X	X	X	X	X	X
30		**nciMinVer**	X	X	X	X	X	X	X	X
31		**nciLocation**	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. When linked of written to, 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. The device will automatically display the value on its display when linked. ➢ 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, ot 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 schedule)
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 temperature setpoints for the occupied and standby modes to be changed via the network. (Note: the unoccupied setpoints are not changed)
➢ Valid Range: Occ Cool Setpoint 54 to 100°F (12 to 37.5°C)
Occ Heat Setpoint 40 to 90°F (4.5 to 32°C)
➢ Default Null Value: 621.81°F (327.67°C or 0x7FFF)
Occ Cool Setpoint
Occ Heat Setpoint
Standby Cool Setpoint - Not Used
Standby Heat Setpoint - Not Used</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.
An output network variable will be transmitted immediately when its value has changed significantly (manufacturer's defined). 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%, 0x7FFF (Invalid)</td></tr>
<tr><td>03</td><td>heat_output_ secondary</td><td>0-100%, 0x7FFF (Invalid)</td></tr>
<tr><td>04</td><td>cool_output:</td><td>0-100%, 0x7FFF (Invalid)</td></tr>
<tr><td>05</td><td>econ_output</td><td>0-100%, 0x7FFF (Invalid)</td></tr>
<tr><td>06</td><td>fan_output</td><td>0-100%, 0x7FFF (Invalid)</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>
<tr><td>Outdoor Temperature</td><td>network output SNVT_temp_p nvoOutdoorTemp</td><td>➢ This output network variable is used to monitor the outdoor air temperature.
➢ 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>
</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
NOTE: UI3 needs to be configured to (SS) Supply air sensor monitoring
➢ 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
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>Default Value</th></tr>
<tr><td>01</td><td>Reserved 1</td><td>Not Used</td><td>N/A</td></tr>
<tr><td>02</td><td>Fan</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>03</td><td>Cooling Stage 1</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>04</td><td>Cooling Stage 2</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>05</td><td>Auxiliary Contact</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>06</td><td>Heating Stage 1</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>07</td><td>Heating Stage 2 / O/B Reversing Valve</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>08</td><td>Reserved 2</td><td>Not Used</td><td>N/A</td></tr>
<tr><td>09</td><td>Service Alarm</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>10</td><td>Filter Alarm</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>11</td><td>Reserved 3</td><td>Not Used</td><td>N/A</td></tr>
<tr><td>12</td><td>Reserved 4</td><td>Not Used</td><td>N/A</td></tr>
<tr><td>13</td><td>DI2 Status</td><td>0 = Activated
1 = Not Activated</td><td>1 = Not Activated</td></tr>
</table></td></tr>
</table>

Parameter	Variable Name	Function			
Thermostat's I/O status	network output UNVT_thermo_state **nvoSccStatus**	Sub	Name	Valid value	Default Value
		14	DI1 Status	0 = Activated 1 = Not Activated	1 = Not Activated
		15	Reserved 5	**Not Used**	N/A
		16	Set Clock Alarm	0 = Off 1 = On	0 = Off
		17	Frost Protection Alarm	0 = Off 1 = On	0 = Off
		18	Reserved 6	**Not Used**	N/A
		19	Reserved 7	**Not Used**	N/A
		20	Reserved 8	**Not Used**	N/A
		21	Reserved 9	**Not Used**	N/A
		22	Reserved 10	**Not Used**	N/A
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)			

Configuration properties (nci's) Description

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Schedule</td><td>network input config
UNVT_day_sched
nciDay_Sched[x]
x = 0 to 6</td><td>
➢ 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:
<table>
<tr><td>Sub</td><td>Name</td><td>Default Value</td></tr>
<tr><td>1</td><td>occupied_event_1</td><td>0</td></tr>
<tr><td>2</td><td>unoccupied_event_2</td><td>1439</td></tr>
<tr><td>3</td><td>occupied_event_3</td><td>0</td></tr>
<tr><td>4</td><td>unoccupied_event_4</td><td>1439</td></tr>
</table>
</td></tr>
<tr><td>Temperature Setpoints</td><td>network input config
SNVT_temp_setpt
nciSetPts</td><td>
➢ 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:
<table>
<tr><td>Sub</td><td>Name</td><td>Valid Range</td><td>Default value</td></tr>
<tr><td>01</td><td>occupied_cool</td><td>54 to 100°F
(12 to 37.5°C)</td><td>75°F (24°C)</td></tr>
<tr><td>02</td><td>standby_cool</td><td>Not Used</td><td>Not Used</td></tr>
<tr><td>03</td><td>unoccupied_cool</td><td>54 to 100°F
(12 to 37.5°C)</td><td>80°F (26.5°C)</td></tr>
<tr><td>04</td><td>occupied_heat</td><td>40 to 90°F
(4.5 to 32°C)</td><td>72°F (22°C)</td></tr>
<tr><td>05</td><td>standby_heat</td><td>Not Used</td><td>Not Used</td></tr>
<tr><td>06</td><td>unoccupied_heat</td><td>40 to 90°F
(4.5 to 32°C)</td><td>62°F (16.5°C)</td></tr>
</table>
</td></tr>
<tr><td>Thermostat's common configuration parameters network input config</td><td>UNVT_gen_opts
nciGenOpt</td><td>
➢ This configuration property defines the thermostat's common configuration parameters and their settings.
➢ Valid Range and Default values:
<table>
<tr><td>Sub</td><td>Name</td><td>Valid Range</td><td>Default value</td></tr>
<tr><td>01</td><td>Temperature Units</td><td>0 = Celsius
1 = Fahrenheit</td><td>1 = Fahrenheit</td></tr>
<tr><td>02</td><td>DI1 Configuration</td><td>0 = None
1 = Rem NSB
2 = Motion NO
3 = Motion NC
4 = Window</td><td>0 = None</td></tr>
<tr><td>03</td><td>DI2 Configuration</td><td>0 = None
1 = Rem NSB
2 = Motion NO
3 = Motion NC
4 = Window</td><td>0 = None</td></tr>
<tr><td>04</td><td>Power-Up Delay</td><td>10 to 120 sec.</td><td>10 sec.</td></tr>
<tr><td>05</td><td>Frost Protection</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>06</td><td>Heating Maximum Setpoint</td><td>40 to 90°F (4.5 to 32°C)</td><td>90°F</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Variable Name</th><th colspan="4">Function</th></tr>
<tr><td rowspan="14">Thermostat's common configuration parameters network input config</td><td rowspan="14">UNVT_gen_opts
nciGenOpt</td><td>Sub</td><td>Name</td><td>Valid Range</td><td>Default value</td></tr>
<tr><td>07</td><td>Cooling Minimum Setpoint</td><td>54 to 100°F
(12 to 37.5°C)</td><td>54°F</td></tr>
<tr><td>08</td><td>Anticycle</td><td>0, 1, 2, 3, 4, or 5 minutes</td><td>2 minutes</td></tr>
<tr><td>09</td><td>Heating Stages Cycles Per Hour</td><td>3, 4, 5, 6, 7 or 8 CPH</td><td>4 CPH</td></tr>
<tr><td>10</td><td>Cooling Stages Cycles Per Hour</td><td>3 or 4 CPH</td><td>4 CPH</td></tr>
<tr><td>11</td><td>Deadband</td><td>2 to 5°F with 0.5 increments (1 to 2.5°C)</td><td>2°F</td></tr>
<tr><td>12</td><td>Fan Control</td><td>0 = Off
1 = On</td><td>1 = On</td></tr>
<tr><td>13</td><td>Fan Delay</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>14</td><td>Temporary Occ Time</td><td>0, 1, 2, 3 to 12 hours</td><td>3 hours</td></tr>
<tr><td>15</td><td>Calibration Room Sensor</td><td>±5°F (±2.5°C)</td><td>0°F</td></tr>
<tr><td>16</td><td>Calibration Outdoor Sensor</td><td>±5°F (±2.5°C)</td><td>0°F</td></tr>
<tr><td>17</td><td>Outdoor Air Temperature Heating Lockout</td><td>-15 to 120°F (-26 to 49°C)</td><td>120°F</td></tr>
<tr><td>18</td><td>Outdoor Air Temperature Cooling Lockout</td><td>-40 to 95°F (-40 to 35°C)</td><td>-40°F</td></tr>
<tr><td>19</td><td>Number of Events</td><td>2 or 4</td><td>2</td></tr>
<tr><td>20</td><td>Auxiliary Contact Configuration</td><td>0 = NORMALLY_OPEN
1 = NORMALLY_CLOSE</td><td>0</td></tr>
<tr><td>21</td><td>Progressive Recovery Enable</td><td>0 = Off
1 = Active</td><td>0 = Off</td></tr>
<tr><td>22</td><td>Keypad Lockout Levels</td><td>0 = No_Lockout
1 = Level_1
2 = Level_2</td><td>No_Lockout</td></tr>
<tr><td>Thermostat's configuration parameters network input config</td><td>UNVT_mult_opts
nciMultOpt</td><td colspan="4">➢ This configuration property defines the thermostat's parameters and their settings. These parameters may not be accessible depending on the thermostat model being monitored.
➢ NOTE: nciMultOpt may have 3 different formats: the generic format (for any models), the heat pump format (for heat pump models) and the roof top format (for a roof top models). Lynxspring strongly recommend selecting either the heat pump or the roof top format depending on the model being commissioned and not to use the generic format file
➢ Valid Range and Default values:
Generic Format file
(UNVT_multi_opts#US or UNVT_multi_opts#SI)
<table>
<tr><td>Sub</td><td>Name</td><td>Valid Range</td><td>Default value</td></tr>
<tr><td>1</td><td>opts_1.heating_stages</td><td>1 = Normally Heat
2 = Normally Cool</td><td>2</td></tr>
<tr><td>2</td><td>opts_1.rev_valve_cfg</td><td>1 = 1 Stage
2 = 2 Stages</td><td>2</td></tr>
<tr><td>3</td><td>cooling_or_heatpump_ stages</td><td>1 = 1 Stage
2 = 2 Stages</td><td>2</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Thermostat's configuration parameters network input config</td><td>UNVT_mult_opts
nciMultOpt</td><td>
<table>
<tr><th>Sub</th><th>Name</th><th>Valid Range</th><th>Default value</th></tr>
<tr><td>4</td><td>econo_min_pos</td><td>0 to 100%</td><td>0%</td></tr>
<tr><td>5</td><td>opts_2.econo_chng_sp</td><td>14 to 70°F (-10 to 21°C)</td><td>55°F</td></tr>
<tr><td>6</td><td>opts_2.high_balance_sp</td><td>34 to 90°F (1 to 32°C)</td><td>90°F</td></tr>
<tr><td>7</td><td>opts_3.mech_cool_
enable</td><td>0 = Off
1 = On</td><td>0 = Off</td></tr>
<tr><td>8</td><td>opts_3.mode</td><td>0 = Comfort
1 = Economy</td><td>0 =
Comfort</td></tr>
<tr><td>9</td><td>opts_4.mix_air_sp</td><td>50 to 90°F (10 to 32°C)</td><td>50°F</td></tr>
<tr><td>10</td><td>opts_4.low_balance_sp</td><td>-40 to 30°F(-40 to –1°C)</td><td>-12°F</td></tr>
<tr><td>11</td><td>comp_aux_interlock</td><td>0 = Off
1 = On</td><td>0</td></tr>
</table>
Heat Pump Format file
(UNVT_hp_opts#US or UNVT_hp_opts#SI)
<table>
<tr><th>Sub</th><th>Name</th><th>Valid Range</th><th>Default value</th></tr>
<tr><td>01</td><td>opts1.rev_valve_cfg</td><td>1 = Normally Heat
2 = Normally Cool</td><td>2</td></tr>
<tr><td>02</td><td>heatpump_
stages</td><td>1 = 1 Stage
2 = 2 Stages</td><td>2</td></tr>
<tr><td>03</td><td>Not_Used</td><td>Not_Used</td><td>Not_Used</td></tr>
<tr><td>04</td><td>high_balance_sp</td><td>34 to 90°F (1 to 32°C)</td><td>90°F</td></tr>
<tr><td>05</td><td>mode</td><td>0 = Comfort
1 = Economy</td><td>0 = Comfort</td></tr>
<tr><td>06</td><td>low_balance_sp</td><td>-40 to 30°F(-40 to –1°C)</td><td>-12°F</td></tr>
<tr><td>07</td><td>comp_aux_nterlock</td><td>0 = Off
1 = On</td><td>0</td></tr>
</table>
Roof Top Format file
(UNVT_rt_opts#US or UNVT_rt_opts#SI)
<table>
<tr><th>Sub</th><th>Name</th><th>Valid Range</th><th>Default value</th></tr>
<tr><td>01</td><td>heating_stages</td><td>1 = 1 Stage
2 = 2 Stages</td><td>2</td></tr>
<tr><td>02</td><td>cooling_stages</td><td>1 = 1 Stage
2 = 2 Stages</td><td>2</td></tr>
<tr><td>03</td><td>econo_min_pos</td><td>0 to 100%</td><td>0%</td></tr>
<tr><td>04</td><td>econo_chng_sp</td><td>14 to 70°F (-10 to 21°C)</td><td>55°F</td></tr>
<tr><td>05</td><td>mec_cool_enabled</td><td>0 = Off
1 = On</td><td>0</td></tr>
<tr><td>06</td><td>mix_air_sp</td><td>50 to 90°F (10 to 32°C)</td><td>50°F</td></tr>
<tr><td>07</td><td>Unused</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>HVAC Unit-Type Identifier</td><td>network input config SNVT_hvac_type
nciHvacType</td><td>
➢ 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</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</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_number
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 = VT7600A1000E
12 = VT7600H1000E
10 = VT7600B1000E
09 = VT7605B1000E
02 = VT7652A1000E
06 = VT7652B1000E
01 = VT7656B1000E
04 = VT7652H1000E</td><td>Depend on model being used</td></tr>
<tr><td>02</td><td>Software Version</td><td>0</td><td>0</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 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 hardware and 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 hardware and 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.

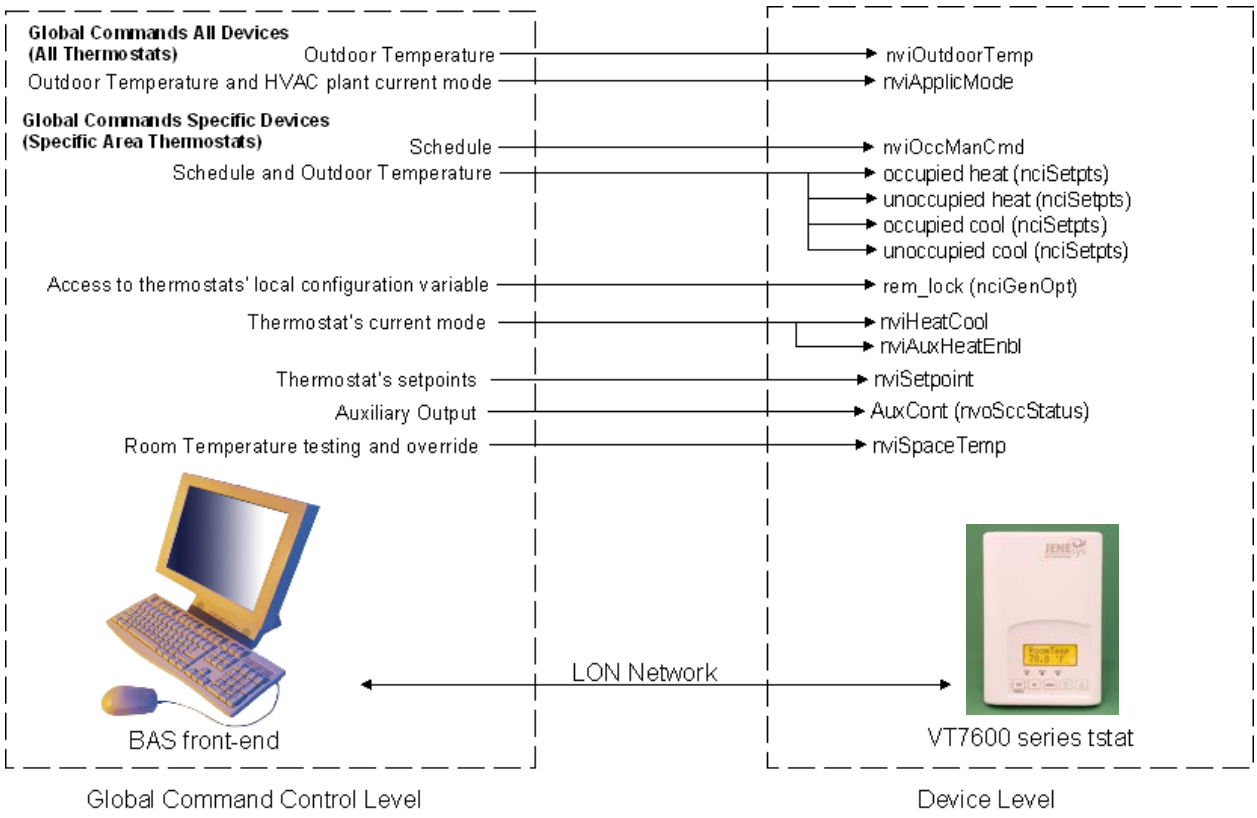


Figure 1: Global commands from a BAS front-end to a VT7600 series tstat

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);
- nvoOutdoorTemp
- 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)

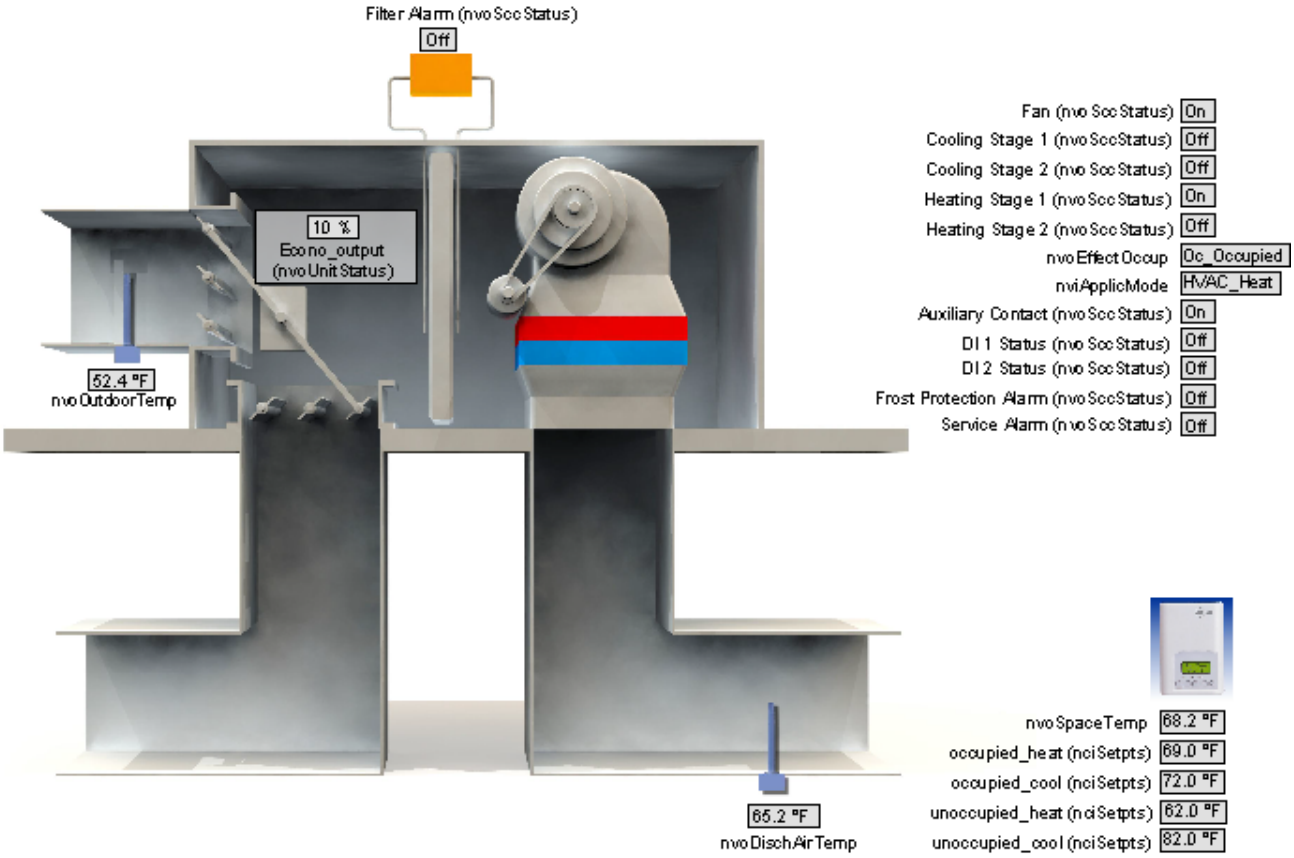


Figure 2: Graphical User Interface (GUI) example of a Roof Top Unit

Configuration Objects

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

- nciGenOpt;
- nciSetpoints;
- nciMultOpt;
- 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 Lynxspring and non-Lynxspring 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 Lynxspring LON Network

Network Configuration

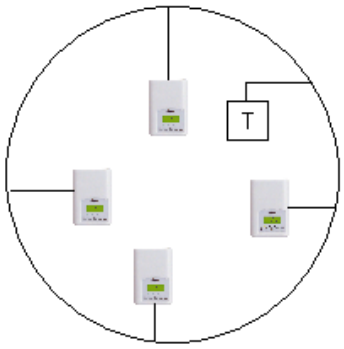
The Echelon network is designed to support free topology wiring and will accommodate bus, star, loop or any of these topologies. Echelon devices can be located at any point along the network wiring.

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



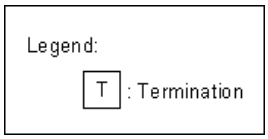


Figure 3.4 Loop Topology

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.

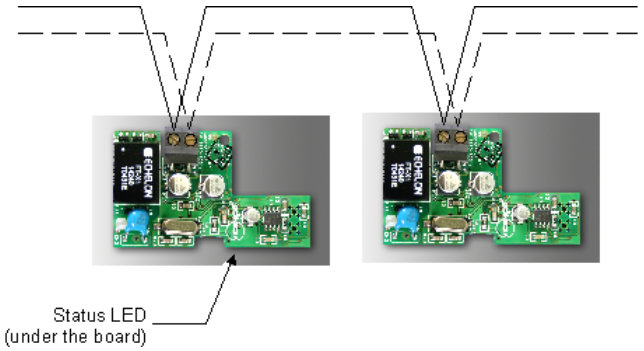


Figure 4: Network connections and location of the Status LED on a LON module

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

Condition of the Status LED	Explanation
➢ Continuously ON	The device has no application loaded in its memory and is Unconfigured
➢ Flashing at a rate of 1/2Hz	The device has an application loaded in its memory but is Unconfigured. When a device is in the unconfigured state, it does not know which devices to communicate with. A network management tool is used to logically bind the node to another in a LonWorks network.
➢ Continuously OFF	The device has an application loaded into its memory and is bound onto a Lonworks network.

Table 2: Status LED condition

External Interface File (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. The latest XIF file can be downloaded from VICONICS' web site at http://www.viconics.com/ .

	XIF File Name	XIF Release Date	Program ID
1	T7600.XIF	03/06/2004	80:00:C5:55:00:04:04:0A
2	VT7600.XIF	13/02/2006	80:00:C5:55:00:04:04:02

Application Binary File (APB)

When running an application program associated with a XIF file, an APB file is needed. The latest APB file can be downloaded from VICONICS' web site at http://www.viconics.com/ .

	APB File Name	APB File Date
1	T7600.APB	03/06/2004
2	VT7600.APB	13/02/2006

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. The latest DRF file can be downloaded from VICONICS' web site at http://www.viconics.com/ .

	DRF Files Names	APB File Date
1	Viconics.enu Viconics.fmt Viconics.fpt Viconics.typ	19/12/2005 19/12/2005 31/01/2005 19/12/2005
Most recent files are:		
2	VT7xxx.enu VT7xxx.fmt VT7xxx.fpt VT7xxx.typ	14/02/2006 14/02/2006 14/02/2006 14/02/2006

Plug-Ins File

Plug-Ins simplify start-up, maintenance, configuration and reduce the installation effort. The latest Plug-Ins can be downloaded from VICONICS web site at http://www.viconics.com/ .

Plug-In File Name	Plug-In File Date
VT7600_series_plug-in_(Rel_1.2_February_13_2006).exe	14/02/2006

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 Service PIN command is accepted by the device.

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, TAC 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-LON-E01
Document Filename: ITG-VT7600-LON-E01.pdf

Revision	Changes
1.0	Created to coincide with release of the VT7600 as a LonMark certified product.