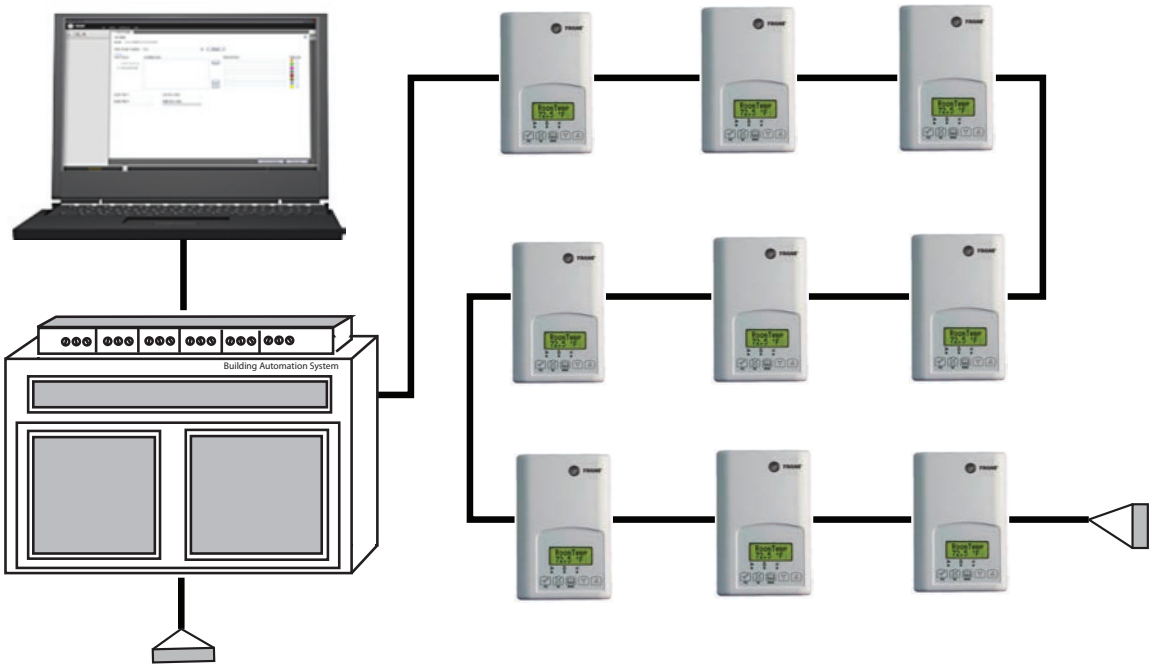
Integration Manual

Trane Communicating Thermostats (LonWorks)



⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

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Introduction

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

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Table of Contents

Overview 4
- Product Description 4
- Related Documents 5
- Planning Your Integration 5
- “How To” Information 5

Thermostat Objects 6

Summary of SNVTs and SCPTs 8
- SNVTs and SCPTs Applicable to Rooftop Units and Heat Pumps 8
- SNVTs and SCPTs Applicable to Fan Coils 11

Input Network Variables (nvi) Description 14
- nvis Applicable to Rooftop Units and Heat Pumps 14
- nvis Applicable to Fan Coils 15

Output Network Variables (nvo) Description 19
- nvos Applicable to Rooftop Units and Heat Pumps 19
- nvos Applicable to Fan Coils 21

Configuration Properties (nci) Description 23
- ncis Applicable to Rooftop Units and Heat Pumps 23
- ncis Applicable to Fan Coils 26
- Configuration Property Objects 30

Objects You Can Use in Site Graphics 31
- Rooftop and Heat Pump Units 31
- Fan Coils 32

Wiring Requirements for Communicating Thermostats 33
- Product Specifications 33
- Network Configuration 33
- Communicating Thermostat Status LEDs 35
- Troubleshooting 35

LON Network Configuration 36
- Device Identification 36
- Location Label 36
- Additional Information and Considerations 36

Overview

This manual provides reference and planning information to aid you as you integrate the Trane Communicating Thermostats into a LON network managed by Tracer SC.

Product Description

The Trane Communicating Thermostats are available for heat pump, rooftop, and fan coil applications.

- X13511541020 / -2020

  These Trane Communicating Thermostats are LON devices specifically designed for single stage and multi-stage control of heating/cooling equipment such as rooftop and self-contained units. The products feature an intuitive, menu-driven, back-lit LCD display, which walks users through the programming steps, making the process extremely simple.

  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.

- X13511543020

  This Trane Communicating thermostat is specifically designed for fan coil control. The product features a backlit LCD display with dedicated function menu buttons for simple operation.

  Three additional inputs are also provided for monitoring and / or various advanced functions.

  All models feature configurable System and Fan button functions to meet all possible applications. They all contain an SPST auxiliary switch that can be used to control lighting or auxiliary reheat.

Accurate temperature control is achieved due to the product's PI proportional control algorithm, which virtually eliminates temperature offset associated with traditional, differential-based thermostats.

The Communicating Thermostats contain an SPST auxiliary switch that can be used to control lighting or auxiliary reheat. Three additional inputs are also provided for monitoring and / or various advanced functions.

The thermostats are also compatible with the occupancy sensor cover accessories. Thermostats equipped with an occupancy sensor 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.

Related Documents

See the following documents for Communicating Thermostat installation and configuration information.

- *Trane Communicating Thermostats for Heat Pump Control User Guide* (BAS-SVU10x-EN)
- *Trane Communicating Thermostats for Rooftop Control User Guide* (BAS-SVU11x-EN)
- *Trane Communicating Thermostats for Fan Coil Control User Guide* (BAS-SVU12x-EN)
- *Trane Communicating Thermostats for Heat Pumps With Humidity Control User Guide* (BAS-SVU13x-EN)

See the following documents for Tracer SC network integration information.

- *Tracer™ SC System Controller Installation and Setup* (BAS-SVX31*x*-EN)
- *Unit Controller Wiring Guide For the Tracer SC™ System Controller* (BAS-SVN03x-EN)

Finally, see the following documents for overview information about Trane Communicating Thermostats.

- *Communicating Thermostats for Rooftop and Heat Pump Control Product Data Sheet (BAS-PRC064-EN)*
- *Communicating Thermostats for Fan Coil Control Product Data Sheet (BAS-PRC065-EN)*

All these documents are available from your Trane distributor.

Planning Your Integration

Study the following information presented in the chapters of this guide as you plan the work:

- Communicating Thermostat LonWorks Standard Network Variable Types (SNVTs) and Standard Configuration Parameter Types (SCPTs) and their properties (ranges, values, and enumeration sets). (See "Summary of SNVTs and SCPTs," p. 8, "Input Network Variables (nvi) Description," p. 14, and "Output Network Variables (nvo) Description," p. 19.)
- Available Graphical User Interface (GUI) objects that you can use in graphics presented in "Objects You Can Use in Site Graphics," p. 31.
- Wiring instructions in "Wiring Requirements for Communicating Thermostats," p. 33

"How To" Information

The following procedural questions are described or clarified here or in various places in this manual:

Question	Information Location or Answer
How do I identify the Trane Communicating Thermostat on the LonTalk link?	See "Device Identification," p. 36.
How do I change the location label of the Trane Communicating Thermostat?	See "Location Label," p. 36.
How do I install a Trane Communicating Thermostat on the Tracer SC LonTalk link?	See *Tracer™ SC System Controller Installation and Setup* (BAS-SVX31*x*-EN) (where *x* is the most recent version)

Thermostat Objects

Figure 1. Thermostat objects for fan coils (model 3020)

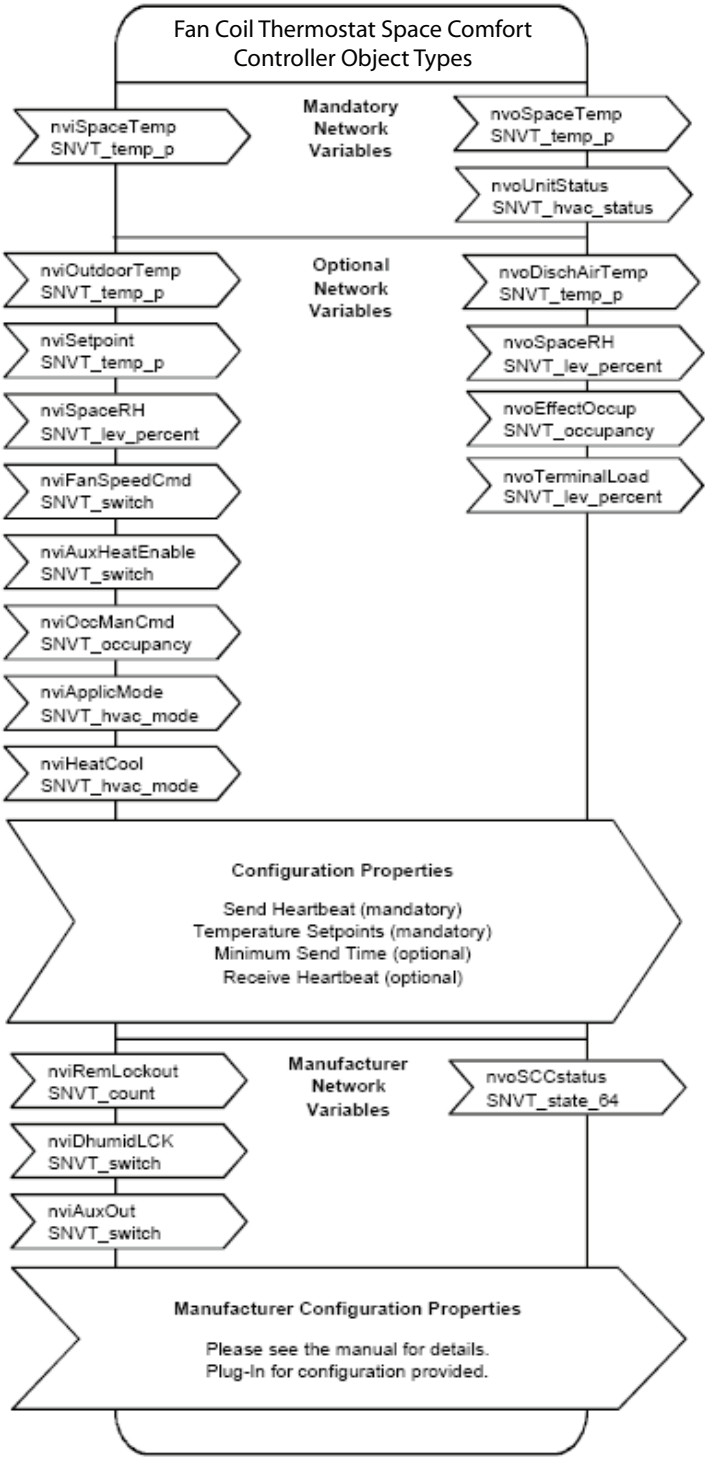
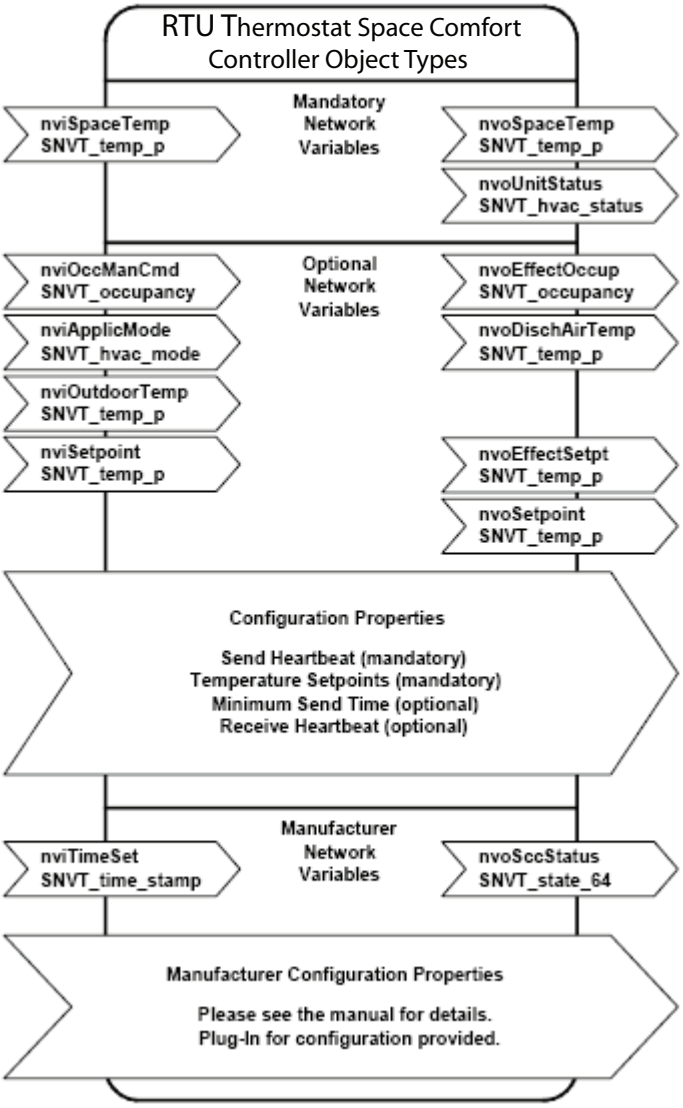


Figure 2. Thermostat objects for rooftop units and heat pumps (models -1020 and -2020)



Summary of SNVTs and SCPTs

The following table lists the Standard Network Variables Types (SNVTs) and Standard Configuration Parameters Types (SCPTs) for Trane Communicating Thermostats controlling rooftop units, heat pumps, and fan coils.

SNVTs and SCPTs Applicable to Rooftop Units and Heat Pumps

Table 1. SNVTs and SCPTs for models X13511541020 and X13511542020

No	Sub	Point Name	Type	Rooftop (-1020)	Heat Pump (-2020)
0		nviSpaceTemp	SNVT_temp_p	X	X
1		nviOutdoorTemp	SNVT_temp_p	X	X
2		nviOccManCmd	SNVT_occupancy	X	X
3		nviApplicMode	SNVT_hvac_mode	X	X
4		nviSetpoint	SNVT_temp_p	X	X
5		nviTimeSet	SNVT_time_stamp	N/A	N/A
6		nciDaySched[0]	UNVT_day_sched	N/A	N/A
7		nciDaySched[1]	UNVT_day_sched	N/A	N/A
8		nciDaySched[2]	UNVT_day_sched	N/A	N/A
9		nciDaySched[3]	UNVT_day_sched	N/A	N/A
10		nciDaySched[4]	UNVT_day_sched	N/A	N/A
11		nciDaySched[5]	UNVT_day_sched	N/A	N/A
12		nciDaySched[6]	UNVT_day_sched	N/A	N/A
13		nciSetPts	SNVT_temp_setpt	X	X
	1	occupied_cool		X	X
	3	unoccupied_cool		X	X
	4	occupied_heat		X	X
	6	unoccupied_heat		X	X
14		nciCfg1RtuHp	UNVT_cfg_1_rtu_hp	X	X
Associate with UNVT_cfg_1_rtu_hp format file				X	X
	1	password	Unsigned-Long	X	X
	2	unoccupied_timer	Unsigned-Short	X	X
	3	anticycle	Unsigned-Short	X	X
	4	power_up_delay	Unsigned-Short	X	X
	5	temporary_occ_time	Unsigned-Short	X	X
	6	heating_stages_CPH	Unsigned-Short	X	X
	7	cooling_stages_CPH	Unsigned-Short	X	X
	8	heat_max_setpoint	SNVT_temp_p	X	X
	9	cool_min_setpoint	SNVT_temp_p	X	X
	10	OA_temp_heat_lockout	SNVT_temp_p	X	X
	11	OA_temp_cool_lockout	SNVT_temp_p	X	X
	12	calib_room_sensor	SNVT_temp_diff_p	X	X
	13	calib_outside_air_sensor	SNVT_temp_diff_p	X	X
	14	deadband	Unsigned-Short	X	X
	15	fan_mode	Enumeration Set Used: fan_mode_b-t	X	X
	16	fan_control	Enumeration Set Used: off_on_state_t	X	X
	17	fan_delay	Enumeration Set Used: off_on_state_t	X	X
	18	keypad_lockout	Enumeration Set Used: rem_lock_t	X	X
	19	proportional_band	Unsigned-Short	X	X
	20	temperature_units	Enumeration Set Used: temp_unit_t	X	X

Table 1. SNVTs and SCPTs for models X13511541020 and X13511542020

No	Sub	Point Name	Type	Rooftop (-1020)	Heat Pump (-2020)
	21	frost_protection	Enumeration Set Used: off_on_state_t	X	X
	22	menu_scroll	Enumeration Set Used: scroll_type	X	X
15		nciCfg2RtuHp	UNVT_cfg_2_rtu_hp	X	X
Associate with UNVT_cfg_2_rtu_hp format file				X	X
	1	di1_config	Enumeration Set Used: input_cfg_model_d_t	X	X
	2	di2_config	Enumeration Set Used: input_cfg_model_d_t	X	X
	3	aux_contact_config	Enumeration Set Used: aux_contact_cfg_t	X	X
	4	number_of_events	Enumeration Set Used: nb_of_events_t	N/A	N/A
	5	progresive_recovery	Enumeration Set Used: off_on_state_t	N/A	N/A
	6	a.hp_rev_valve_config	Enumeration Set Used: rev_valve_b_t	N/A	X
	7	a.number_of_heating_stages	Enumeration Set Used: nb_stages_t	X	N/A
	8	number_of_cool_or_hp_stages	Enumeration Set Used: nb_stages_t	X	X
	9	econo_min_position	SNVT_lev_percent	X	N/A
	10	b.hp_high_balance_point	SNVT_temp_p	N/A	X
	11	b.econo_changeover_setpoint	SNVT_temp_p	X	N/A
	12	c.hp_low_balance_point	SNVT_temp_p	N/A	X
	13	c.econo_mixed_air_setpoint	SNVT_temp_p	X	N/A
	14	d.hp_comfort_or_economy_mode	Enumeration Set Used: mode_t	N/A	X
	15	d.econo mechanical_cool_enable	Enumeration Set Used: off_on_state_t	X	NA
	16	hp compressor_auxheat_interlock	Enumeration Set Used: off_on_state_t	N/A	X
16		nciHvacType	SNVT_hvac_type	X	X
17		nciSccModel	UNVT_model_number	X	X
	1	Thermostat Model		X	X
	2	Software Version		X	X
18		nvoSpaceTemp	SNVT_temp_p	X	X
19		nvoUnitStatus	SNVT_hvac_status	X	X
	1	mode		X	X
	2	heat_output_primary		X	X
	3	heat_output_secondary		N/A	X
	4	cool_output		X	X
	5	econo_output		X	N/A
	6	Fan_output		X	X
	7	in_alarm		X	X
20		nvoDischAirTemp	SNVT_temp_p	X	X
21		nvoEffectOccup	SNVT_occupancy	X	X
22		nvoSccStatus	UNVT_thermo_state_rtu UNVT_thermo_state_hp	X	X
For all non heatpump models, associate with UNVT_thermo_state_rtu				X	X
	1	fan_output	True bit index 2	X	X
	2	cooling_stage_1	True bit index 3	X	X
	3	cooling_stage_2	True bit index 4	X	X
	4	auxiliary_contact	True bit index 5	X	X

Summary of SNVTs and SCPTs

Table 1. SNVTs and SCPTs for models X13511541020 and X13511542020

No	Sub	Point Name	Type	Rooftop (-1020)	Heat Pump (-2020)
	5	heating_stage_1	True bit index 6	X	X
	6	heating_stage_2	True bit index 7	X	X
	7	service_alarm	True bit index 12	X	X
	8	filter_alarm	True bit index 13	X	X
	9	di2_direct_status	True bit index 17	X	X
	10	di1_direct_status	True bit index 18	X	X
	11	set_clock_alarm	True bit index 22	N/A	N/A
	12	frost_protection_alarm	True bit index 23	X	X
	13	local pir motion	True bit index 24	X	X
	14	fan_lock_alarm	True bit index 25		
For all heatpump models, associate with UNVT_thermo_state_hp				X	X
	1	fan_output	True bit index 2	X	X
	2	compressor_stage_1	True bit index 3	X	X
	3	compressor_stage_2	True bit index 4	X	X
	4	auxiliary_contact	True bit index 5	X	X
	5	heating_stage_1	True bit index 6	X	X
	6	reversing valve	True bit index 7	X	X
	7	service_alarm	True bit index 12	X	X
	8	filter_alarm	True bit index 13	X	X
	9	di2_direct_status	True bit index 17	X	X
	10	di1_direct_status	True bit index 18	X	X
	11	set_clock_alarm	True bit index 22	N/A	N/A
	12	frost_protection_alarm	True bit index 23	X	X
	13	local_pir_motion	True bit index 24	X	X
	14	fan_lock_alarm	True bit index 25		
23		nvoEffectSetpt	SNVT_temp_p	X	X
24		nvoSetpoint	SNVT_temp_p	X	X
25		nciSndHrtBt	SNVT_time_sec	X	X
26		nciMinOutTm	SNVT_time_sec	X	X
27		nciRcvHrtBt	SNVT_time_sec	X	X
28		nciMajVer	SCPT_maj_ver	X	X
29		nciMinVer	SCPT_min_ver	X	X
30		nciLocation	SNVT_str_asc	X	X

SNVTs and SCPTs Applicable to Fan Coils

Table 2. SNVTs and SCPTs for model X13511543020

No	Sub	Point Name	SNVT Type Enumeration and Signature Type	Fan Coil (-3020)
N/A: Not applicable on this model				
0		nviSpaceTemp	SNVT_temp_p	X
1		nviOutdoorTemp	SNVT_temp_p	X
2		nviSetpoint	SNVT_temp_p	X
3		nviSpaceRH	SNVT_lev_percent	N/A
4		nviFanSpeedCmd	SNVT_switch	X
5		nviAuxHeatEnable	SNVT_switch	X
6		nviOccManCmd	SNVT_occupancy	X
7		nviApplicMode	SNVT_hvac_mode	X
8		nviHeatCool	SNVT_hvac_mode	X
9		nviRemLockout	UNVT_count	X
10		nviDhumiLCK	SNVT_switch	N/A
11		nviAuxOut	SNVT_switch	X
12		nvoSpaceTemp	SNVT_temp_p	X
13		nvoDischAirTemp	SNVT_temp_p	X
14		nvoSpaceRH	SNVT_lev_percent	N/A
15		nvoEffectOccup	SNVT_occupancy	X
16		**nvoUnitStatus**	**SNVT_hvac_status**	X
	1	mode		X
	2	heat_output_primary		X
	4	cool_output		X
	6	fan_output		X
	7	in_alarm		X
17		**nvoSccStatus**	**UNVT_thermo_state_fc**	X
Associate with UNVT_thermo_state_fc format file				
	1	bi1_status	True bit index 2	X
	2	bi2_status	True bit index 1	X
	3	ui3_ status	True bit index 0	X
	4	dehumidification_active	True bit index 7	N/A
	5	state_terminal_bo1	True bit index 13	X
	6	state_terminal_bo2	True bit index 12	X
	7	state_terminal_bo3	True bit index 15	X
	8	state_terminal_bo4	True bit index 14	X
	9	state_terminal_bo5	True bit index 20	X
	10	fan_low	True bit index 21	X
	11	fan_med	True bit index 22	X
	12	fan_high	True bit index 23	X
	13	window_opened	True bit index 24	X
	14	service_alarm	True bit index 28	X
	15	filter_alarm	True bit index 29	X
	16	local_pir_motion	True bit index 39	X
18		**nvoTerminalLoad**	SNVT_lev_percent	X
19		**nciSetpoints**	SNVT_temp_setp	X
	1	occupied_cool		X
	2	standby_cool		X
	3	unoccupied_cool		X
	4	occupied_heat		X
	5	standby_heat		X
	6	unoccupied_heat		X

Table 2. SNVTs and SCPTs for model X13511543020 (continued)

No	Sub	Point Name	SNVT Type Enumeration and Signature Type	Fan Coil (-3020)
20		**nciCfg2FcuZn**	UNVT_cfg_2_fcu_zn	X
Associate with UNVT_cfg_2_fcu_zn format file				
	1	bi1_config	Enumeration Set Used: input_cfg_model_a_t	X
	2	bi2_config	Enumeration Set Used: input_cfg_model_b_t	X
	3	ui3_config	Enumeration Set Used: input_cfg_model_c_t	X
	4	room_humidity_display	Enumeration Set Used: off_on_state_t	N/A
	5	dehumidification_setpoint	SNVT_lev_percent	N/A
	6	dehumumidification_hysterisis	SNVT_lev_percent	N/A
	7	dehumidification_max_cooling	SNVT_lev_percent	N/A
	8	calib_room_humidity_sensor	SNVT_lev_percent	N/A
22		**nciSccModel**	UNVT_model_info_2	X
Associate with UNVT_model_info_2 format file				
	1	Thermostat Model		X
	2	Thermostat Software Version		X
23		nciHvacType	SNVT_hvac_type	X
24		nciSndHrtBt	SNVT_time_sec	X
25		nciMinOuttM	SNVT_time_sec	X
26		nciRcvHrtBt	SNVT_time_sec	X
27		nciMajVer	SCPT_maj_ver	X
28		nciMinVer	SCPT_min_ver	X
21		**nciCfg1FcuZn**	UNVT_cfg_1_fcu_zn	X
Associate with UNVT_cfg1_fcu_zn format file				
	1	password	Unsigned-Long	X
	2	control_type	Enumeration Set Used: clrl_type_t	X
	3	floating_actuator_time	Unsigned-Short	X
	4	cycles_per_hour	Unsigned-Short	X
	5	reverse_or_direct_acting_output	Enumeration Set Used: da_ra_type_t	N/A
	6	menu_scroll	Enumeration Set Used: scroll_type_t	X
	7	auto_mode	Enumeration Set Used: off_on_state_t	X
	8	temperature_scale	Enumeration Set Used: temp_unit_t	X
	9	pipe_number_main_out_config	Enumeration Set Used: pipe_system_t	X
	10	sequence_of_operation	Enumeration Set Used: seq_operation_t	X
	11	fan_menu_sequence	Enumeration Set Used: fan_sequence_t	X
	12	heat_maximum_setpoint	SNVT_temp_p	X
	13	cool_minimum_setpoint	SNVT_temp_p	X
	14	calib_room_sensor	SNVT_temp_diff_p	X
	15	deadband	Unsigned-Short	X
	16	setpoint_type	Enumeration Set Used: permanent_temporary_t	X
	17	setpoint_function	Enumeration Set Used: setpts_func_t	X
	18	temporary_occ_time	Unsigned-Short	X
	19	proportional_band	Unsigned-Short	X

Table 2. SNVTs and SCPTs for model X13511543020 (continued)

No	Sub	Point Name	SNVT Type Enumeration and Signature Type	Fan Coil (-3020)
	20	aux_contact_config	Enumeration Set Used: aux_contact_model_a_t	X
	21	reheat_time_base	Enumeration Set Used: reheat_option_t	X
	22	fan_mode	Enumeration Set Used: fan_mode_t	X
	23	auto_fan	Enumeration Set Used: auto_fan_t	X
	24	pir_standby_time	Unsigned-Short	X
	25	pir_unoccupied_time	Unsigned-Short	X
22		**nciSccModel**	**UNVT_model_number**	X
	1	Thermostat Model		X
	2	Software Version		X
23		nciHvacType	SNVT_hvac_type	X
24		nciSndHrtBt	SNVT_time_sec	X
25		nciMinOuttM	SNVT_time_sec	X
26		nciRcvHrtBt	SNVT_time_sec	X
27		nciMajVer	SCPT_maj_ver	X
28		nciMinVer	SCPT_min_ver	X

Input Network Variables (nvi) Description

The following table lists the input network variables for Trane Communicating Thermostats controlling rooftop units, heat pumps, and fan coils.

nvis Applicable to Rooftop Units and Heat Pumps

Table 3. nvis for models X13511541020 and X13511542020

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 always have full authority over the local occupancy routines of the thermostat whether they are a local input or from an occupancy sensor cover. ** OC_NUL command releases the thermostat to use its own internal occupancy routine driven by the local schedule, one of the digital input or that of a occupancy sensor 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
Occupied Cool & Heat Setpoints	network Input SNVT_temp_p **nviSetpoint**	• 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) • Example: 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.

Table 3. nvis for models X13511541020 and X13511542020 (continued)

Parameter	Variable Name	Function
Date and time	network input SNVT_time_stamp **nviTimeSet**	• This input network variable is used to set the time and date of the Space Comfort Controller. • Default Null Value : **Sub** **Name** **Valid Range** **Default Value** 1 year 0 to 3000 0 2 month 0 to 12 0 3 day 0 to 31 0 4 hour 0 to 23 0 5 minute 0 to 59 0 6 second 0 to 59 0

nvis Applicable to Fan Coils

Table 4.nvis for model X13511543020

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)
Occupied Cool & Heat Setpoints	network Input SNVT_temp_p **nviSetpoint**	• 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 Stand-By and 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) • Example: 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
Room Humidity	network input SNVT_lev_percent **nviSpaceRH**	• This input network variable is the measured room humidity in percent monitored by the thermostat. • Valid Range: 5 to 90% • Default Null Value: +163.835 (0x7FFF) • This network variable is subject to the Receive HeartBeat Time, nviRcvHrtBt

Table 4. nvis for model X13511543020 (continued)

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td>Fan Mode</td><td>network input
SNVT_switch
nviFanSpeedCmd</td><td>
• This input network variable is used to connect an external fan speed switch to the node or to allow any supervisory device to override the fan speed controlled by the node's control algorithm.
• This input is used in conjunction with FanMenu bit in nciGenOpts.
• Default Null Value: AUTO (state = 0xFF)
• Valid Range:
<table>
<tr><th>Fan Menu Value</th><th>State</th><th>Value</th><th>Equivalent Percent</th><th>Requested Speed</th></tr>
<tr><td>0</td><td>0
1
1
1
1
1
0xFF</td><td>N/A
0
1 to 66
67 to 133
134 to 200
201 to 255
N/A</td><td>N/A
0%
0.5 to 33%
33.5 to 66.5%
67 to 100%
100%
N/A</td><td>Off - Not Used
Off - Not Used
Low
Medium
High
3 – Not Used
Auto – Not Used</td></tr>
<tr><td>1</td><td>0
1
1
1
1
0xFF</td><td>n/
0
0 to 100
101 to 200
201 to 255
N/A</td><td>N/A
0%
0.5 to 50%
50.5 to 100%
100%
N/A</td><td>Off – Not Used
Off – Not Used
Low
High
2 – Not Used
Auto – Not Used</td></tr>
<tr><td>2</td><td>0
1
1
1
1
1
0xFF</td><td>N/A
0
1 to 66
67 to 133
134 to 200
201 to 255
N/A</td><td>N/A
0%
0.5 to 33%
33.5 to 66.5%
67 to 100%
100%
N/A</td><td>Off - Not Used
Off - Not Used
Low
Medium
High
3 – Not Used
Auto</td></tr>
<tr><td>3</td><td>0
1
1
1
1
0xFF</td><td>n/
0
0 to 100
101 to 200
201 to 255
N/A</td><td>N/A
0%
0.5 to 50%
50.5 to 100%
100%
N/A</td><td>Off – Not Used
Off – Not Used
Low
High
2 – Not Used
Auto</td></tr>
<tr><td>4</td><td>0
1
1
1
1
0xFF</td><td>n/
0
1 to 200
201 to 255
N/A</td><td>N/A
0%
0.5 to 100%
100%
N/A</td><td>Off – Not Used
Off – Not Used
On (High)
On – Not Used
Auto</td></tr>
</table>
</td></tr>
<tr><td>Sequence of Operation</td><td>network input
SNVT_switch
nviAuxHeatEnable1

(See Table 9, p. 30.)</td><td>
• This input network variable is used to enable or disable the auxiliary heat stage.
• This input is used in conjunction with nviHeatCool and SeqOper.
• Default Null Value: AUTO (state = 0xFF)
• Set value to 100% for both On & Off state
• Valid Range:
<table>
<tr><th>State</th><th>Value</th><th>Auxiliary Heat Operation</th></tr>
<tr><td>0
1
1
1
0xFF</td><td>N/A
0%
1 to 99%
100%
N/A</td><td>Disabled - Not Used
Disabled
Partially Enabled - Not Used
Enabled
Enabled (invalid)</td></tr>
</table>
</td></tr>
</table>

Table 4. nvis for model X13511543020 (continued)

Parameter	Variable Name	Function
Occupancy Command	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 remotely control the occupancy modes to override the local occupancy routines of the thermostat. • 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 from 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. • This input is used in conjunction with nviHeatCool and SeqOper. • 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
Sequence of operation	network input SNVT_hvac_mode **nviHeatCool1** (See Table 9, p. 30.)	• 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. This input is overridden by nviApplicMode, unless nviApplicMode is HVAC_AUTO. If nviApplicMode is HVAC_AUTO, then nviHeatCool determines the effective mode 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 0xFF = HVAC_NUL – Not Used

Table 4. nvis for model X13511543020 (continued)

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td rowspan="8">Remote Lockout</td><td rowspan="8">network input
SNVT_count
nviRemLockout</td><td colspan="5">• This network variable input is used to enable or disable user access to thermostat
• Default Null Value: Level 0.
• Valid Range:</td></tr>
<tr><td>Level</td><td>Occupied Temperature Setpoints</td><td>System Mode Settings</td><td>Fan Mode Settings</td><td>Unoccupied Override</td></tr>
<tr><td>0</td><td>Yes access</td><td>Yes access</td><td>Yes access</td><td>Yes access</td></tr>
<tr><td>1</td><td>Yes access</td><td>Yes access</td><td>Yes access</td><td>No access</td></tr>
<tr><td>2</td><td>Yes access</td><td>No access</td><td>No access</td><td>Yes access</td></tr>
<tr><td>3</td><td>Yes access</td><td>No access</td><td>No access</td><td>No access</td></tr>
<tr><td>4</td><td>No access</td><td>No access</td><td>No access</td><td>Yes access</td></tr>
<tr><td>5</td><td>No access</td><td>No access</td><td>No access</td><td>No access</td></tr>
<tr><td>Dehumidification Lockout</td><td>network input
SNVT_switch
nviDhumiLCK</td><td colspan="5">• This network variable input is used to enable or disable dehumidification
• Default Null Value: Dehumidification not allowed
• Set value to 100% for both On & Off state
• Valid Range:
State =0 = Dehumidification not allowed (Thermostat’s default value)
State = 1 = Dehumidification allowed</td></tr>
<tr><td>Auxiliary Contact Remote Control</td><td>network input
SNVT_switch
nviAuxOut</td><td colspan="5">• This network variable input is used remotely command the Auxiliary Output (BO5).
Note:Auxiliary Contact configuration NEEDS to be set to 5 for this function to operate (5 = Output to follow secondary network occupancy command)
• Set value to 100% for both On & Off state
• Default Null Value: Auxiliary contact Off
• Valid Range:
State = 0 = Auxiliary contact Off (Thermostat’s default value)
State = 1 = Auxiliary contact On</td></tr>
</table>

Output Network Variables (nvo) Description

The following table lists the output network variables for Trane Communicating Thermostats controlling rooftop units, heat pumps, and fan coils.

nvos Applicable to Rooftop Units and Heat Pumps

Table 5. nvos for models X13511541020 and X13511542020

<table>
<tr><th>Parameter</th><th>Variable Name</th><th colspan="3">Function</th></tr>
<tr><td>Room Temperature</td><td>network output
SNVT_temp_p
nvoSpaceTemp</td><td colspan="3">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 rowspan="10">Unit Status</td><td rowspan="10">network output
SNVT_hvac_status
nvoUnitStatus</td><td colspan="3">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.</td></tr>
<tr><td>Sub</td><td>Name</td><td>Valid Value</td></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>
<tr><td>Supply Temperature</td><td>network output
SNVT_temp_p
nvoDischAirTemp</td><td colspan="3">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 colspan="3">• 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_BYPASS1
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>
</table>

Table 5. nvos for models X13511541020 and X13511542020 (continued)

Parameter	Variable Name	Function			
Thermostats I/O status	network output UNVT_thermo_state_rtu UNVT_thermo_state_hp **nvoSccStatus**	This network variable output is used to report the Space Comfort Controller inputs' and outputs' status.			
		Sub	Name	Valid Value	True Bit Index
			fan output	0 = Off 1 = On	2
			cooling stage 1 compressor stage 1	0 = Off 1 = On	3
			cooling stage 2 compressor stage 2	0 = Off 1 = On	4
			auxiliary contact	0 = Off 1 = On	5
			heating stage 1	0 = Off 1 = On	6
			heating stage 2 reversing valve	0 = Off 1 = On	7
			service alarm	0 = Off 1 = On	12
			filter alarm	0 = Off 1 = On	13
			di2 direct status	0 = Activated 1 = Not Activated	17
			di1 direct status	0 = Activated 1 = Not Activated	18
			set clock alarm	0 = Off 1 = On	22
			frost protection alarm	0 = Off 1 = On	23
			local pir motion	0 = Off 1 = On	24
			fan lock alarm	0 = Off 1 = On	25
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)			

nvos Applicable to Fan Coils

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 6. nvos for model X13511543020

Parameter	Variable Name	Function		
Room Temperature	network output SNVT_temp_p nvoSpaceTemp	• 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: 14 to 122°F (-10 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.		
Supply Temperature	network output SNVT_temp_p **nvoDischAirTemp**	• 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.		
Room Humidity	network output SNVT_lev_percent **nvoSpaceRH**	• This output network variable indicates the space humidity in percent. • Valid Range: 0 to 100%. • The value 0x7FFF = +163.835% will be set as an invalid value to indicate a humidity sensor failure.		
Effective Occupancy	network output SNVT_occupancy nvoEffectOccup	• This output network variable is used to indicate the actual occupancy mode of the unit. This information is typically reported to a supervisory controller or provided to another Space Comfort Controller to coordinate the operation of multiple units • Valid Range: 0 = OC_OCCUPIED 1 = OC_UNOCCUPIED 2 = OC_BYPASS1 3 = OC_STANDBY **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.		
Unit Status network output	SNVT_hvac_status **nvoUnitStatus**	• 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.		
		Sub	Name	Valid Value
		01	mode	HVAC_AUTO 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**
		02:	heat_output _primary	0-100%, 0x7FFF (Invalid)
		03	heat_output _secondary	**Not Used**
		04	cool_output:	0-100%, 0x7FFF (Invalid)
		05	econ_output	**Not Used**
		06	fan_output	0-100%, 0x7FFF (Invalid)
		07	In_alarm	0 (No alarms) 1 (Alarm On) 0x7FF (Alarming disabled) – **Not Used**

Table 6. nvos for model X13511543020 (continued)

Parameter	Variable Name	Function			
Thermostat's I/O status	network output UNVT_thermo_state_fc **nvoSccStatus**	This network variable output is used to report the Space Comfort Controller inputs' and outputs' status.			
		Sub	Name	Valid value	True Bit Index
		01	bi1 status	0 = activated 1 = not activated	2
		02	bi2 status	0 = activated 1 = not activated	1
		03	ui3 status	0 = activated 1 = not activated	0
		04	dehumidification active	0 = Off 1 = On	7
		05	state terminal bo1	0 = Off 1 = On	13
		06	state terminal bo2	0 = Off 1 = On	12
		07	state terminal bo3	0 = Off 1 = On	15
		08	state terminal bo4	0 = Off 1 = On	14
		09	state terminal bo5	0 = Off 1 = On	20
		10	fan low	0 = Off 1 = On	21
		11	fan med	0 = Off 1 = On	22
		12	fan high	0 = Off 1 = On	23
		13	window opened	0 = No alarm 1= Alarm on	24
		14	service alarm	0 = No alarm 1 = Alarm on	28
Thermostat's I/O status (Cont.)	network output UNVT_thermo_state_fc **nvoSccStatus** (Cont.)	15	filter alarm	0 = No alarm 1 = Alarm on	29
		16	local pir motion	0 = No motion 1 = Motion	39
Heating/Cooling demand	network output SNVT_lev_percent **nvoTermalLoad**	• This output indicates the current heat/cool energy demand of the unit. Positive values indicate that cooling energy is in use by the space comfort controller, while negative values indicate that heating energy is in use by the space comfort controller. • Valid Range: -100% to 100			
Temperature Setpoints	network input config **SNVT-Temp-Setpt nci**	• This configuration property defines the space temperature setpoints for various heat, cool, and occupancy modes. • Valid Range and Default values:			
		01		Valid Range	Default Value
		02		0 = activated 1 = not activated	2
		03		0 = activated 1 = not activated	1
		04		0 = activated 1 = not activated	0
		05		0 = Off 1 = On	7
		06		0 = Off 1 = On	13
Heating/Cooling demand	network output SNVT_lev_percent **nvoTerminalLoad**	• This output indicates the current heat/cool energy demand of the unit. Positive values indicate that cooling energy is in use by the space comfort controller, while negative values indicate that heating energy is in use by the space comfort controller. • Valid Range: -100% to 100%			

Configuration Properties (nci) Description

The following table lists the network configuration properties for Trane Communicating Thermostats controlling rooftop units, heat pumps, and fan coils.

ncis Applicable to Rooftop Units and Heat Pumps

Table 7. ncis for models X13511541020 and X13511542020

<table>
<tr><th>Parameter</th><th>Variable Name</th><th colspan="4">Function</th></tr>
<tr><td>Schedule</td><td>network input config UNVT_day_sched
nciDay_Sched[x]
x = 0 to 6</td><td colspan="4">• 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 colspan="4">• 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>73.5°F (23°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>82.5°F (28°C)</td></tr><tr><td>04</td><td>occupied_heat</td><td>40 to 90°F
(4.5 to 32°C)</td><td>70°F (21°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>61°F (16°C)</td></tr></table></td></tr>
</table>

Table 7. ncis for models X13511541020 and X13511542020 (continued)

Parameter	Variable Name	Function		
Thermostat's common configuration parameters network input config	UNVT_cfg_1_rtu_hpnciCfg1RtuHpt	• This configuration property defines the thermostat's common configuration parameters and their settings. • Valid Range and Default values:		
		Name	Valid Range	Default value
		password	0 to 1000	0
		unoccupied timer	0.5 to 24.0 hours	0.5
		anticycle	0, 1, 2, 3, 4, or 5 minutes	2 minutes
		power-up delay	10 to 120 sec.	10 sec.
		temporary occ time	0, 1, 2, 3 to 12 hours	3 hours
		heating stages cph	3, 4, 5, 6, 7 or 8 CPH	4 CPH
		cooling stages cph	3 or 4 CPH	4 CPH
		heat maximum setpoint	40 to 90°F (4.5 to 32°C)	90°F
		cool minimum setpoint	54 to 100°F (12 to 37.5°C)	54°F
		oa temp heat lockout	-15 to 120°F (-26 to 49°C)	120°F
		oa temp cool lockout	-40 to 95°F (-40 to 35°C)	-40°F
		calib room sensor	±5°F (±2.5°C)	0°F
		calib outdoor air sensor	±5°F (±2.5°C)	0°F
		deadband	2 to 4°F with 1°F increments (1 to 2°C)	2°F
		fan mode	0 = On 1 = Auto 2 = Smart	0 = On
		fan control	0 = Off 1 = On	1 = On
		fan delay	0 = Off 1 = On	0 = Off
		keypad lockout	0 = No_Lockout 1 = Level_1 2 = Level_2	No_Lockout
		proportional band	2 to 8 F	2 F
		temperature units	0 = °C 1 = °F	°F
		frost protection	0 = Off 1 = On	0 = Off
		temperature scale	0 = °C 1 = °F	°F

Table 7. ncis for models X13511541020 and X13511542020 (continued)

Parameter	Variable Name	Function			
Thermostat's common configuration parameters network input config	$UNVT_cfg_2_rtu_h **nciCfg2RtuHpt**	Name		Valid Range	Default Value
		di1 config		0 = None 1 = RemNSB 2 = RemOVR 3 = Filter 4 = Service	0 = None
		di2 config		0 = None 1 = RemNSB 2 = RemOVR 3 = Filter 4 = Service	0 = None
		aux contact config		0 = NORMALLY_OPEN 1 = NORMALLY_CLOSE	0
		number of events		2 or 4	2
		progressive recovery		0 = Off 1 = Active	0 = Off
		a.hp rev valve config		1 = Normally Heat 2 = Normally Cool	2
		a.number of heating stages		1 = 1 Stage 2 = 2 Stages	2
		number of cool or hp stages		1 = 1 Stage 2 = 2 Stages	2
		econo min position		0 to 100%	0%
		b.hp high balance point		34 to 90°F (1 to 32°C)	90°F
		b.econo changeover setpoint		14 to 70°F (-10 to 21°C)	55°F
		c.hp low balance point		-40 to 30°F(-40 to –1°C)	-12°F
		c.econo mixed air setpoint		50 to 90°F (10 to 32°C)	50°F
		d.hp comfort or economy mode		0 = Comfort 1 = Economy	0 = Comfort
		d.econo mechanical cool enable		0 = Off 1 = On	0 = Off
		hp compressor auxheat interlock		0 = Off 1 = On	0 = Off
HVAC Unit-Type Identifier	network input config SNVT_hvac_type **nciHvacType**	• This configuration property helps the user identify the type of equipment being monitored. • Valid Range:			
		Value		Identifier	Name
		0	HVT_GENERIC – **Not Used**		Generic
		1	HVT_FAN_COIL		Fan Coil
		2	HVT_VAV – **Not Used**		Variable Air Volume Terminal
		3	HVT_HEAT_PUMP		Heat Pump
		4	HVT_ROOFTOP		Rooftop Unit
		5	HVT_UNIT_VENT – **Not Used**		Unit Ventilator
		6	HVT_CHIL_CEIL – **Not Used**		Chilled Ceiling
		7	HVT_RADIATOR – **Not Used**		Radiator
		8	HVT_AHU – **Not Used**		Air Handling Unit
		9	HVT_SLF_CONT – **Not Used**		Self-Contained Unit
Thermostat's model number	network input config UNVT_model_info_2 **nciSccModel**	• This configuration property defines model number and software version of the thermostat • Valid Range and Default values:			
		Sub	Name	Valid Range	Default Value
		01	Thermostat Model	09 = Rooftop Unit 12 = Heat Pump	Depend on model being used
		02	Software Version	Unsigned short	Thermostat dependent

Table 7. ncis for models X13511541020 and X13511542020 (continued)

Parameter	Variable Name	Function
Maximum Send Time	network input config SNVT_time_sec **nciSendHrtBt**	• 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)
Minimum Send Time	network input config SNVT_time_sec **nciMinOutTm**	• 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)
Minimum Receive Time	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 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)
Hardware or Software Revsions	network input config SCPT_maj_ver **nciMajVer**	• This configuration property defines the major module software revisions. • Valid Range: 0 to 255
Hardware or Software Revsions	network input config SCPT_maj_ver **nciMinVer**	• This configuration property defines the minor module software revisions. • Valid Range: 0 to 255
Location Label	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

ncis Applicable to Fan Coils

Table 8. ncis for model X13511543020

Parameter	Variable Name	Function			
Temperature Setpoints	network input config SNVT_temp_setpt nciSetPts	• This configuration property defines the space temperature setpoints for various heat, cool and occupancy modes. • Valid Range and Default values:			
		Sub	Name	Valid Range	Default value
		01	occupied_cool	54 to 100°F (12 to 37.5°C)	75°F (24.0°C)
		02	standby_cool	54 to 100°F (12 to 37.5°C)	78°F (25.5°C)
		03	unoccupied_cool	54 to 100°F (12 to 37.5°C)	80°F (26.5°C)
		04	occupied_heat	40 to 90°F (4.5 to 32°C)	72°F (22.0°C)
		05	standby_heat	40 to 90°F (4.5 to 32°C)	69°F (20.5°C)
		06	unoccupied_heat	40 to 90°F (4.5 to 32°C)	62°F (16.5°C)

Table 8. ncis for model X13511543020 (continued)

Parameter	Variable Name	Function			
RH Model Options	network input config UNVT_cfg_2_fcu_zn **NciCfg2FcuZn**	• This configuration property defines the space humidity parameters and their settings. • Valid Range and Default values:			
		Sub	Name	Valid Range	Default value
		01	bi1 config	0 = None 1 = Rem NSB 2 = Motion NO 3 = Motion NC 4 = Window	0 = None
		02	bi2 config	0 = None 1 = Door Dry 2 = Override 3 = Filter 4 = Service	0 = None
		03	ui3 config	0 = None 1 = COC/NH 2 = COC/NC 3 = COS 4 = SS	0 = None
		04	room humidity display	0 = Not active 1 = Active	0 = Not active
		05	dehumidification setpoint	30 to 100% RH	50% RH
		06	dehumidification hysterisys	2 to 20% RH	5% RH
		07	dehumidification max cooling	20 to 100% RH	100% RH
		08	calib room humidity sensor	-15 to +15% RH	0% RH
Thermostat Common Configuration Parameters	network input config UNVT_cfg_1_fcu_zn **nciCfg1FcuZn**	• This configuration property defines the thermostat's common configuration parameters and their settings. • Valid Range and Default values:			
		Sub	Name	Valid Range	Default value
		01	password	0 to 1000	0
		02	control type	0 = On/Off Control 1 = Floating Control	0 = On/Off Control
		03	floating actuator time	0.5 to 9 minutes (0.5 increments)	1.5 minutes
		04	cycles per hour	3, 4, 5, 6, 7 and 8 CPH	4 CPH
		05	reverse or direct acting output	0 = Direct Acting (DA) 1 = Reverse Acting (RA)	0 = Direct Acting (DA)
		06	temperature scale	0 = °C 1 = °F	°F
		07	auto mode	0 = Not Active 1 = Active	1 = Active
		08	temperature scale	0 = °C 1 = °F	°F
		09	pipes number main out config	2 = 2 pipe 4 = 4 pipe	4 pipe
		10	sequence of operation	0 = Cooling Only 1 = Heating Only 2 = Cooling & Reheat 3 = Heating & Reheat 4 = Cooling/Heating 4 pipes 5 = Cooling /Heating 4 pipes & Reheat	1 = Heating Only

Table 8. ncis for model X13511543020 (continued)

Parameter	Variable Name	Function			
Thermostat Common Configuration Parameters	network input config UNVT_cfg_1_fcu_zn **nciCfg1FcuZn**	• This configuration property defines the thermostat's common configuration parameters and their settings. • Valid Range and Default values:			
		11	fan menu	0 = Low-Med-High 1 = Low-High 2 = Low-Med-High-Auto 3 = Low-High-Auto 4 = On-Auto	4 = On-Auto
		12	heat maximum setpoint	40 to 90°F (4.5 to 32°C)	90°F (32°C)
		13	cool minimum setpoint	54 to 100°F (12 to 37.5°C)	54°F (12°C)
		14	calib room sensor	± 5°F (±2.5°C)	0°C
		15	deadband	2, 3, 4 or 5 °F (1 to 2.5°C)	2°F (1°C)
		16	setpoint type	0 = Permanent 1 = Temporary	0
		17	setpoint function	0 = Dual Setpoints 1 = Attached Setpoints	0 = Dual Setpoints
		18	temporary occ time	0, 1, 2, 3, up to 24 hours	2 hours
		19	proportional band	3 to 10 F	3 F
		20	aux contact config	0 = Aux Contact used for reheat 1 = Aux NO with occupancy 2 = Aux NC with occupancy 3 = Aux NO with occupancy & Fan On 4 = Aux NC with occupancy & Fan On 5 = Remote control nviAuxOut	0
		21	reheat time base	0 = 15 minutes 1 = 10 seconds	0
		22	fan mode	0 = Low 1 = Med 2 = High 3 = Auto 4 = On	Depending on Fan Menu Selected
		23	auto fan	0 = Auto Speed 1 = Auto Speed and Auto Demand	0 = Auto Speed
		24	pir stand-by timer	0.5 to 24.0 Hours	0.5 Hours
		25	pir unoccupied timer	0.0 to 24.0 Hours	0.0 Hours
Thermostat's model number	network input config UNVT_model_info_2 **nciSccModel**	This configuration property defines model number and software version of the thermostat ??Valid Range and Default values:			
		Sub	Name	Valid Range	Default value
		01	Thermostat Model	44 = 7300C	Depend on model being used
		02	Software Version	Unsigned short	Thermostat dependent

Table 8. ncis for model X13511543020 (continued)

Parameter	Variable Name	Function
HVAC Unit-Type Identifier	network input config SNVT_hvac_type **nciHvacType**	• This configuration property helps the user identify the type of equipment being monitored. • Valid Range:

Sub	Identifier	Name
0	HVT_GENERIC – Not Used	Generic
1	HVT_FAN_COIL	Fan Coil
2	HVT_VAV – Not Used	Variable Air Volume Terminal
3	HVT_HEAT_PUMP– Not Used	Heat Pump
4	HVT_ROOFTOP – Not Used	Rooftop Unit
5	HVT_UNIT_VENT – Not Used	Unit Ventilator
6	HVT_CHIL_CEIL – Not Used	Chilled Ceiling
7	HVT_RADIATOR – Not Used	Radiator
8	HVT_AHU – Not Used	Air Handling Unit
9	HVT_SLF_CONT – Not Used	Self-Contained Unit

Maximum Send Time	network input config SNVT_time_sec **nciSendHrtBt**	• 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)
Minimum Send Time	network input config SNVT_time_sec **nciMinOutTm**	• 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)
Minimum Receive Time	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 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)
Hardware or Software revisions	network input config SCPT_maj_ver **nciMajVer**	• This configuration property defines the major module hardware and software revisions. • Valid Range: 0 to 255
Hardware or Software revisions	network input config SCPT_min_ver **nciMinVe**r	• This configuration property defines the minor module hardware and software revisions. • Valid Range: 0 to 255

Table 9. Use of nviHeatCool, nviAuxHeatEnable, and SeqOpera (Sequence of Operation)

	NviAuxHeat Enable = Enabled	NviAuxHeat Enable = Disabled	Current SeqOpera	If nviHeatCool changed to:	New SeqOpera
2 Pipe Application					
3 = HVAC_COOL		X	0 = Cooling Only	1= HVAC_HEAT	1 = Heating Only
3 = HVAC_COOL	X		2 = Cooling & Reheat	1= HVAC_HEAT	3 = Heating & Reheat
1 = HVAC_HEAT		X	1 = Heating Only	3= HVAC_COOL	1 = Cooling Only
1 = HVAC_HEAT	X		3 = Heating & Reheat	3= HVAC_COOL	2 = Cooling & Reheat
4 Pipe Application					
3 = HVAC_COOL		X	0 = Cooling Only	0= HVAC_AUTO 1= HVAC_HEAT	4 = Cool/Heat 4 Pipes 1 = Heating Only
3 = HVAC_COOL	X		2 = Cooling & Reheat	0= HVAC_AUTO 1= HVAC_HEAT	5 = Cool/Heat 4P & Reheat 3 = Heating & Reheat
1 = HVAC_HEAT		X	1 = Heating Only	0= HVAC_AUTO 3= HVAC_COOL	4 = Cool/Heat 4 pipes 1 = Cooling Only
1 = HVAC_HEAT	X		3 = Heating & Reheat	0= HVAC_AUTO 3= HVAC_COOL	5 = Cool/Heat 4P & Reheat 2 = Cooling & Reheat
0 = HVAC_AUTO		X	4 = Cool/Heat 4 Pipes	1= HVAC_HEAT 3= HVAC_COOL	1 = Heating Only 0 = Cooling Only
0 = HVAC_AUTO	X		5 = Cool/Heat 4P & Reheat	1= HVAC_HEAT 3= HVAC_COOL	3 = Heating & Reheat 2 = Cooling & Reheat

Configuration Property Objects

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

- nciCfg1FcuZn
- nciCfg2FcuZn
- nciSetpoints

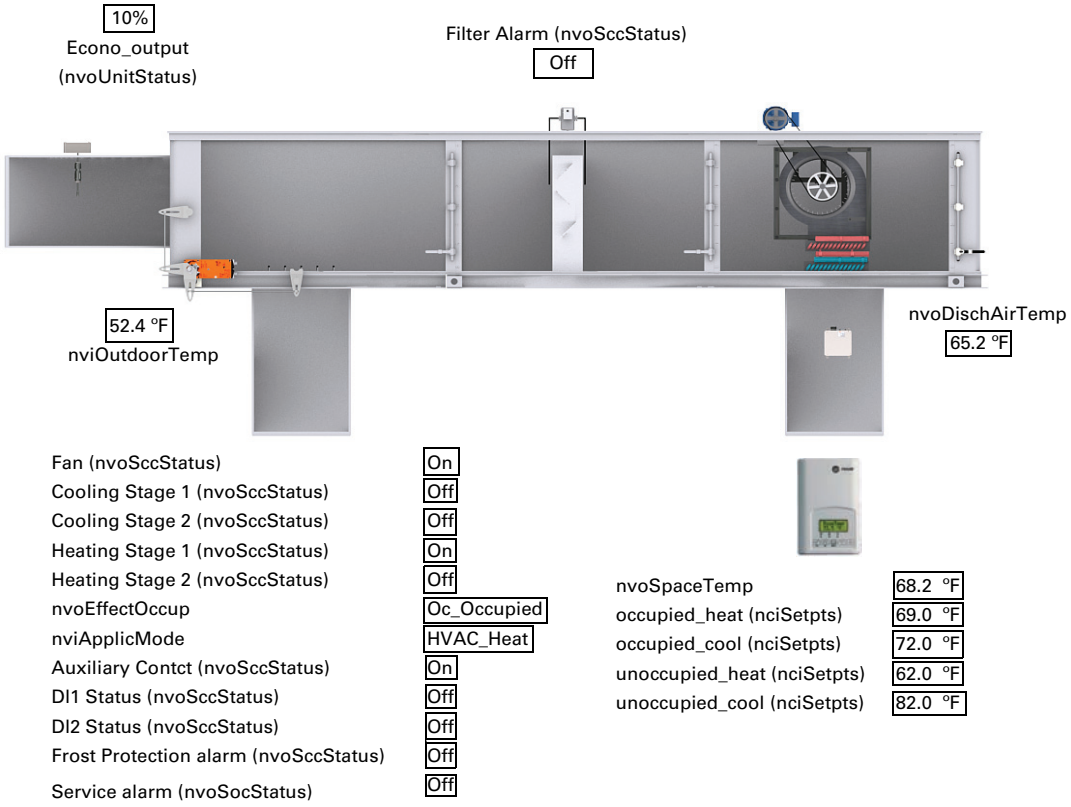
Objects You Can Use in Site Graphics

Rooftop and Heat Pump Units

The following objects should be typically used in site graphics:

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 3. Sample rooftop graphic

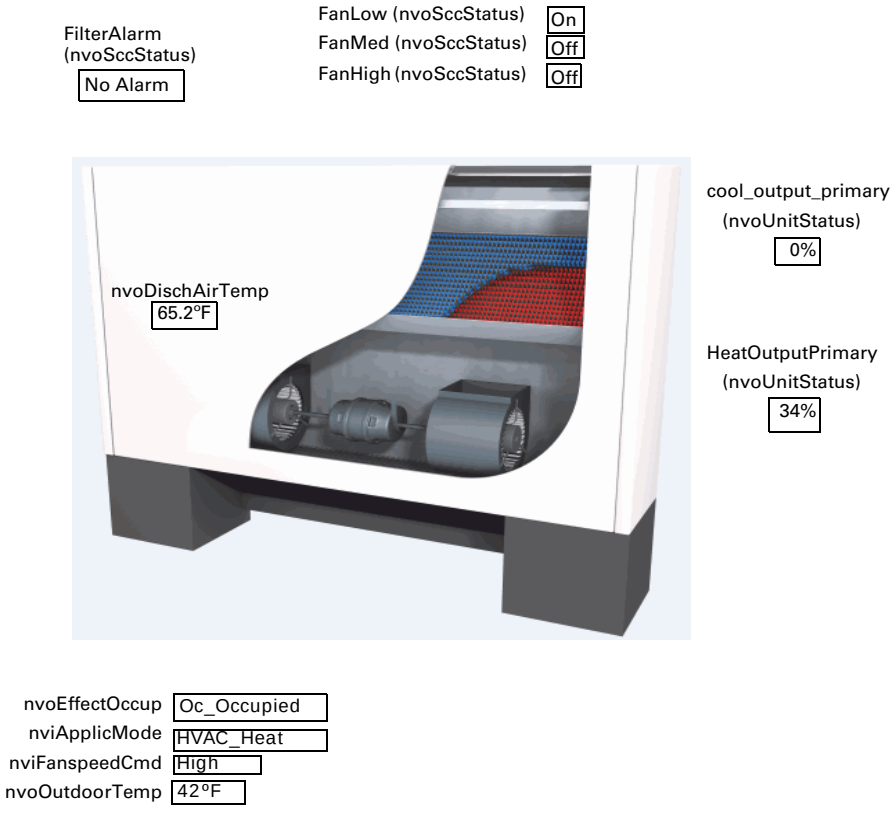


Fan Coils

You can use the following objects in site graphics:

- nvoSpaceTemp
- occupied_heat (nciSetpts)
- unoccupied_heat (nciSetpts)
- occupied_cool (nciSetpts)
- unoccupied_cool (nciSetpts)
- nvoSpaceRH
- RHsetpoint (nciRHmodel)
- nvoOutdoorTemp
- nvoDischAirTemp
- nviOccManCmd
- nvoEffectOccup
- nvoTerminalLoad
- heat_output_primary (nvoUnitStatus)
- cool_output (nvoUnitStatus)
- Service_Alarm (nvoSccStatus)
- Filter_Alarm (nvoSccStatus)
- WindowOpened(nvoSccStatus)

Figure 4. Sample fan coil graphic



Wiring Requirements for Communicating Thermostats

The term “Device” is used to represent any controller with an active Echelon network connection, including Trane controllers.

Product Specifications

Specifications for Communicating Thermostats are as follows.

Table 10. Summary of specifications for a LON network

Specification	Details
Network Wiring	22 AWG Echelon Level 4, unshielded, twisted pair
Polarity	Polarity insensitive
Termination for Doubly Terminated Bus Network Segment	Two RC network with Ra = 105Ω±1%, 1/8W
Number of transceivers per segment	Up to 60
Number of communication stubs per LonTalk link	8 (16 if a repeater is used)
Maximum wire length per communication stub	50 feet (15 m)
Baud rate	78000 bits per second

Network Configuration

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

The following figures present five different network topologies. The actual termination circuit will vary by application.

Figure 5. Singly terminated bus topology

Legend: T Termination

Figure 6. Doubly terminated bus 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. The longer the chain, the slower the speed. Using proper cable, Echelon supports a baud rate of 78 kilobits per second for distances up to 4500 ft (1371.60 m) in bus topology with double terminations.

If you require a maximum network length of more than 4500 ft (1371.60 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 doubles 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.

Resistance Termination for LonTalk Links

To correctly install a LonTalk link, termination resistors are required at the first and last devices on each link. Electrical resistors drop the voltage of the current flowing through the wire so that electrical noise is absorbed.

For correct termination placement, follow these guidelines:

- Terminate a daisy-chain configuration with a 105 ohm resistor at each end of the link.
- If a repeater is used, each link of the configuration that is created by the repeater requires termination resistors.
- Trane recommends that only 22-gauge, Level 4 wire be used for the LonTalk communication link.
- During installation, compile a set of as-built drawings or a map of the communication wire layout. Sketches of the communication layout should feature the termination resistor placement.

Polarity

Although network connections are polarity insensitive, it is good practice to keep polarity consistent throughout the entire site.

Communicating Thermostat Status LEDs

Table 11 explains the different behaviors of the Status LED on a LON thermostat.

Table 11. Fan coil thermostat LED behaviors

Behavior	Explanation
Continuously ON	The device has no application loaded in its memory and is Un-configured
Blinking	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.

Troubleshooting

Table 12 lists possible causes and solutions when the thermostat does not come online.

Table 12.Troubleshooting Causes and Solutions

Error / Trouble	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

LON Network Configuration

This section covers need-to-know topics related to LON network configuration.

Device Identification

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

You can use the equivalent of a Service PIN to identify the device at commissioning. However, the LonTalk card does not have a Service PIN on top of the board. Instead perform the following actions:

- For fan coil thermostats

  Press simultaneously the **Up** button and the **Down** button located on the keypad interface of a thermostat.

- For rooftop unit and heat pump thermostats

  Press simultaneously the **Yes** and **No** buttons located on the keypad interface.

In either case, the Program ID and the Neuron ID (LonWords Unique ID) contained in the device are transmitted to the commissioning or service tool.

A single green status LED located on the bottom of the LonTalk board is normally off. It will blink once when the device accepts the Service PIN command. There is no Service LED.

Location Label

The location label cannot be set in Rover. NLUtil can change the location label, but you need to use ASCII characters to set each letter. To set the location label, download NLUtil from www.newron-system.com and an ASCII table from www.ascitable.com.

Because Rover does not have a plug-in, we cannot perform adequate pre-commissioning start-up without NLUtil, and we cannot verify setup with Rover.

Additional Information and Considerations

Items that apply to all thermostats

- In order to operate nviAuxOut (auxiliary output) from the network, Aux contact configuration (Auxcont nciGenOpt) needs to be set as “Network Controlled.”
- If the heartbeat is lost, the module will release the network sensor value for the Room Temperature (nviSpaceTemp) and the Outdoor Temperature (nviOutdoorTemp).

Items that apply to fan coils

The SeqOpera value (Sequence of Operation) depends on the nviHeatCool value and nviAuxHeatEnable value. (See Table 9, p. 30 for all the details.)

Items that apply to rooftop units and heat pumps

For nciMultOpt, Trane recommends use of either one of the following format files:

- 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

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