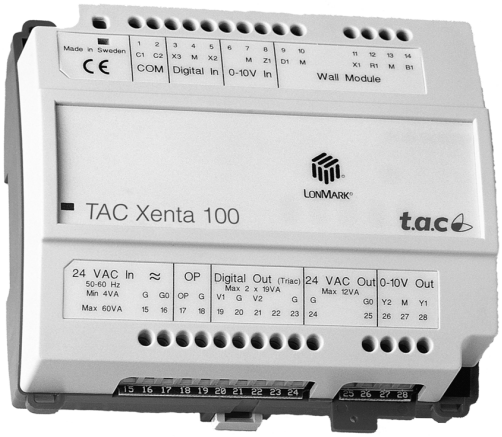
TAC Xenta® 104-A

Roof Top Unit Controller

17 Jan 2003



The TAC Xenta® 104-A is a zone controller for roof top units, small AHU, and unit ventilator applications that have heating, cooling, and economizer functions. The controller keeps a constant zone temperature through sequenced control of the heating, cooling and OA/RA dampers.

By using a discharge air temperature sensor, the discharge and zone temperatures may be controlled in cascade if the TAC Xenta 104-A configuration properties are set accordingly. Cascade control also allows minimum and maximum limiting of the discharge air temperature. The fan On/Off is controlled by a 24 VAC isolated relay contact. The fan mode may be selected to operate continuous during the occupied mode, or cycle with heating or cooling demand from the zone.

The controller is a LonMark®-compliant device that communicates on a LonTalk® TP/FT-10 network via a twisted-pair, polarity insensitive cable. It is able to operate both as a stand-alone unit and as part of a network system. All network variables can be monitored and configured via the network or by using the TAC Xenta OP (ver 3.11 or higher).

A selection of wall modules with various options can be used with the TAC Xenta 104-A controller. The wall modules are from the STR100 or ZS-100 series.

TECHNICAL DATA

Supply voltage ..... 24 V AC –10% +20%, 50–60 Hz

Power consumption:
- Controller with TAC Xenta OP ..... 5 VA
- Actuator supply ..... max. 12 VA
- Digital outputs (sep. supply) ..... max. 4×19 VA = 76 VA
- Total ..... max 93 VA

Ambient temperature:
- Operation ..... -25 to 50 °C- (13 to 122 °F)
- Storage ..... -25 to 50 °C (-13 to 122 °F)

Humidity ..... max. 90% RH, non-condensing

Enclosure:
- Material ..... ABS/PC plastic
- Enclosure rating ..... IP 30
- Color ..... grey/red
- Dimensions ..... 126×122×50 mm (5×4.8×2 in)
- Weight ..... 0.4 kg (0.88 lb)

Inputs X2–X3 for fan status and alarm sensor:
- Voltage across open contact ..... 23 V DC ± 1 V DC
- Current through closed contact ..... 4 mA
- Minimum pulse input duration ..... 17 s

Outputs V1–V4 for heating/cooling (triac):
- Type of actuator ..... increase/decrease
- Minimum output voltage ..... supply voltage – 1.5 V
- Maximum load ..... 0.8 A

Relay outputs for fan on-off control, K1 and KC1:
- Maximum voltage ..... 24 V AC
- Maximum load ..... 2 A

Input for bypass button on wall module:
- Minimum pulse input duration ..... 250 ms

Inputs for zone temperature and discharge/mixed air sensors, B1–B2:
- Thermistor type ..... NTC, 1800 Ω at 25 °C (77 °F)
- Measuring range ..... -10 to 50 °C (14 to 122 °F)
- Accuracy ..... ±0,2 °C (±0.4 °F)

Input R1, setpoint adjustment on wall module:
- Type ..... 10 kΩ linear potentiometer
- Adjustment range ..... ±5 °C (±9 °F)
- Accuracy ..... ±0,1 °C (±0.2 °F)

Application program:
- Cycle time ..... 5 s

Indication LED colors:
- Power ..... green
- Service ..... red

Interoperability:
- Standard ..... conforms to LonMark Interoperability Guidelines and LonMark Functional Profile: RTU Controller
- Communication protocol ..... LonTalk®
- Physical channel ..... TP/FT-10, 78 kbps
- Neuron® type ..... 3150®, 10 MHz

Conformance to standards:
- Emission ..... C-Tick, EN 50081-1, FCC Part 15
- Immunity ..... EN 50082-1
- Safety:
  - CE ..... EN 61010-1
  - UL 916 ..... Energy Management Equipment
  - ETL listing ..... UL 3111-1, first edition ..... CAN/CSA C22.2 No. 1010.1-92
  - Flammability class, materials ..... UL 94 V-0

Part number, TAC Xenta 104-A:
- Controller 0-073-0591
- Handbook (GB) 0-004-7661
- Plug-in Terminal Blocks TAC Xenta 100 0-073-0914

MAIN FUNCTIONS

The TAC Xenta 104-A controller can be applied to the following HVAC systems:

- Standard RTU with 2 stage cool, 2 stage heat. (With or without economizer).
- Standard RTU with modulating tri-state re-heat instead of 2-stage heat. (With or without economizer).
- Split HVAC systems with 2 stage cool, 2 stage heat, (With or without economizer).
- Unit ventilators with tri-state heat, economizer, (with or without DX).
- Fan Coil Units with tri-state heat, economizer, (with or without DX).
- Standard "Residential" style furnace with or without DX.
- Very small AHU's with 2 stage cooling, 2 stage or tri-state heating. (With or without economizer).

The functions of TAC Xenta 104-A are determined by the occupancy mode, the application mode and the node state.

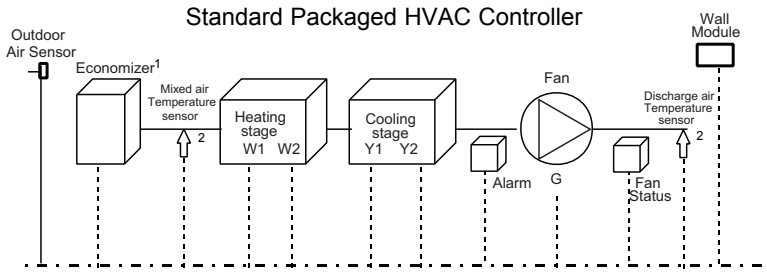
When the zone temperature falls below the heating setpoint, heating outputs will be staged On in sequence. If tri-state heating is selected, the increase output will begin to pulse On to open the tri-state heating valve. When the heating setpoint is satisfied, the two stage heating outputs will sequence off. If tri-state heating is selected, the decrease output will begin to pulse On to close the tri-state heating valve. When the zone temperature rises above the present cooling setpoint, cascade mixed air temperature control will modulate the economizer damper if the economizer is enabled via the floating lockout setpoint. When the economizer reaches 100%, or if the economizer is locked out, the two cooling outputs will be staged On in sequence. This cooling sequence is reversed when the room temperature falls below the cooling setpoint.

A minimum economizer damper position is set to maintain minimum ventilation requirements as determined by the facilities engineer.

Cascade Control

Cascade temperature control allows the zone temperature deviation from setpoint to establish an inversely reset discharge and/or mixed air temperature setpoint decreases, and vice versa. The minimum and maximum discharge and/or mixed air temperature setpoints can be adjusted using configuration parameters. Economizer and tri-state heating control are always based on cascade control.

APPLICATION EXAMPLE



1) Only relevant in stand alone installations.
2) One of the sensors can be used in a stand alone installation. Both can be used in a network installation.

Figure 1

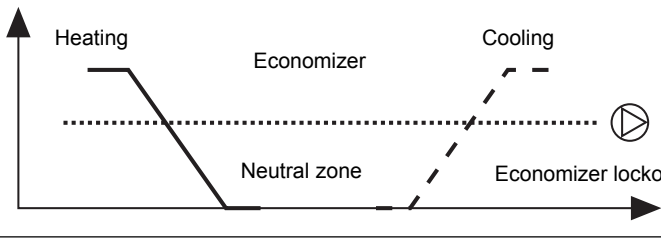


Figure 2

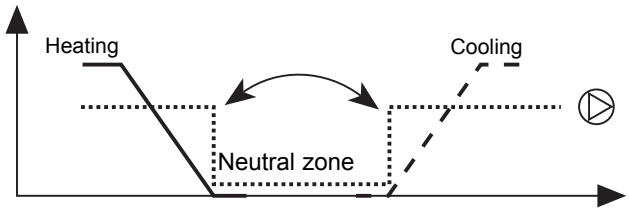


Figure 3

Settings and adjustments can be made via a network variable, NV, or using the TAC Xenta OP.

Low Temperature Protection

When the zone temperature falls below an adjustable limit, the controller goes into the heating mode to ensure low temperature protection in the "Off" and "Fan only" modes.

OPERATING MODES

Operation Modes:

The RTU controller can be set to three different control modes: Occupied, Unoccupied, Bypass; and to five different control configurations: Heating only, Cooling only, Auto changeover, Fan only and Off. The emergency modes also allow a smoke purge mode or shutdown mode.

Fan Function Modes:

Fan operation during the Comfort mode can be configured for continuous operation or fan cycling with zone heating/cooling functions.

When fan configuration is set for "Cycling", the fan will be Off until the zone temperature controller calls for heating or cooling.

CONTROL FUNCTIONS

Economizer

The economizer will function only in the cooling or Auto changeover modes. The economizer will stay at the minimum position setpoint when the controller is in the "Comfort" operating mode. The economizer output is controlled via a PI regulator that normally uses the sensor connected to B2 as its input.

There is a built in software lock to hold the economizer at 100% outdoor air position if outdoor air is useful for cooling when any stage of mechanical cooling is on. This will provide maximum energy savings and prevent economizer damper hunting when the mechanical cooling is cycling on and off.

Cooling (DX)

The cooling outputs are controlled by a PI regulator that uses room temperature as its input. If cooling is allowed and outdoor temperature is above cooling lockout setpoint, it will sequence the two outputs *on*. The outputs have an adjustable anti-cycle timer for short cycle protection. An NV is available to read on the network to indicate the percent of cooling called for by the cooling regulator. The PI regulator tuning parameters can be adjusted via the TAC Xenta OP or an NV.

cont'd

CONTROL FUNCTIONS (CONT'D.)

Staged Heating
The heating outputs are controlled by a PI regulator that uses room temperature as its input. If heating is allowed it will sequence the two outputs on. The heating outputs do not have a fixed delay set point. The timing and delay function is a result of the PI regulator.

Tri-state Heating
The heating outputs can be configured as tri-state control for controlling a heating valve in Unit Ventilator or small AHU applications. When tri-state is selected and the outdoor temperature is supplied as an NV (in a networked system), the heating controller uses the sensor connected to terminal U1.
When used as a stand alone controller (U1 used for outdoor air), the heating controller instead uses the sensor connected to terminal B2 and its value for heating as well as economizer control.

If a thermo actuator is used for heating and some modulation is desired then it must be connected to the increase output. Also the P and I band must be set very low to allow the output to operate as soon as the demand for heat exists. When heating demand is 100% the output will be on continually.

Night free cooling mode:
This can be accomplished by sending the operating mode "cooling only", then sending an NV for reduced room temperature set-points, and sending an NV for cooling lockout.

Sensor options:
If the controller is networked, the sensor connected to terminal B2 should be used as a mixed air sensor for economizer control and a sensor connected to U1 should be used as a discharge air sensor if set up for tri-state heating control. Then an NV for outdoor air temperature has to be used.
If a controller is set up as a stand-alone RTU control, then the sensor connected to terminal U1 must be outdoor air temperature. This is used for economizer and compressor lockout. The sensor connected to terminal B2 is again used for mixed air temperature.

If set up as a stand-alone small Unit Ventilator controller (tri-state), the sensor connected to terminal B2 must be installed in the discharge air stream since it will be used as real value for both heating and economizer control.

LONMARK OBJECTS AND NETWORK VARIABLES

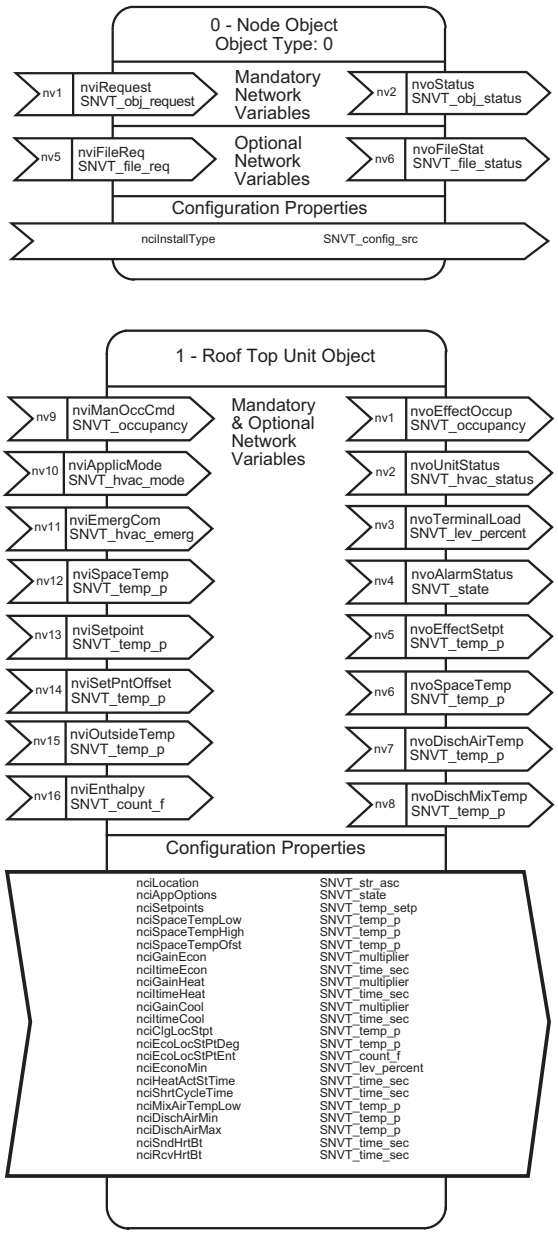


Figure 4

If the controller is set-up using an NV for outdoor air temperature, the supply air temperature can be monitored and displayed at the TAC Xenta OP (*nvoDischAirTemp*), TAC Vista® or bound to a NV in a TAC Xenta 300 or TAC Xenta 400.

This will provide a fully functional RTU control system, either stand-alone or networked. A network system can display both the mixed and supply air temperature for monitoring and diagnostics.

LOCKOUT FUNCTIONS

Economizer
There are three economizer lockout options. First, if the outdoor temperature sensor is connected and configured it will be used to determine economizer lockout. Second, if the outdoor sensor is not connected, an NV must be sent to give the controller the outdoor air temperature. Third, an enthalpy NV may be sent to the controller and an enthalpy lockout setpoint used to determine economizer operation. The economizer is also locked out on a loss of fan proof.

Cooling (DX)
If the outdoor temperature sensor is connected and configured it will be used to determine cooling lockout. If it is not connected then an NV must be sent to give outdoor temperature. Cooling is locked out on a loss of fan proof.

Heating
Locked out on a loss of fan proof.

HARDWARE INTERFACE

No.	Designation	Description
1	C1	TP/FT-10 communication channel
2	C2	TP/FT-10 communication channel
3	X3	Input, alarm
4	M	Measurement neutral
5	X2	Input, fan status
6	B2	Input, discharge/mixed air temperature sensor
7	M	Measurement neutral
8	U1	Input, OA/discharge air temperature sensor
9	D1	Output, indication on wall module
10	M	Measurement neutral
11	X1	Input, bypass button on wall module
12	R1	Input, setpoint offset dial on wall module
13	M	Measurement neutral
14	B1	Input, room temperature sensor

No.	Designation	Description
15	G	24 V AC (G) input
16	G0	24 V AC (G0) input
17	OP	24 V AC supply for TAC Xenta OP
18	G	24 V AC supply for TAC Xenta OP
19	V1	Heating Stage 1 / increasing
20	VC1	Heating Common V1 / V2
21	V2	Heating Stage 2 / decreasing
22	V3	Cooling Stage 1
23	VC2	Cooling Common V3 / V4
24	V4	Cooling Stage 2
25	M	Economizer Signal Common
26	Y1	Economizer Signal 2-10 VDC
27	K1	Fan Start / Stop 24 VAC
28	KC1	Fan Common 24 VAC

DIMENSIONS

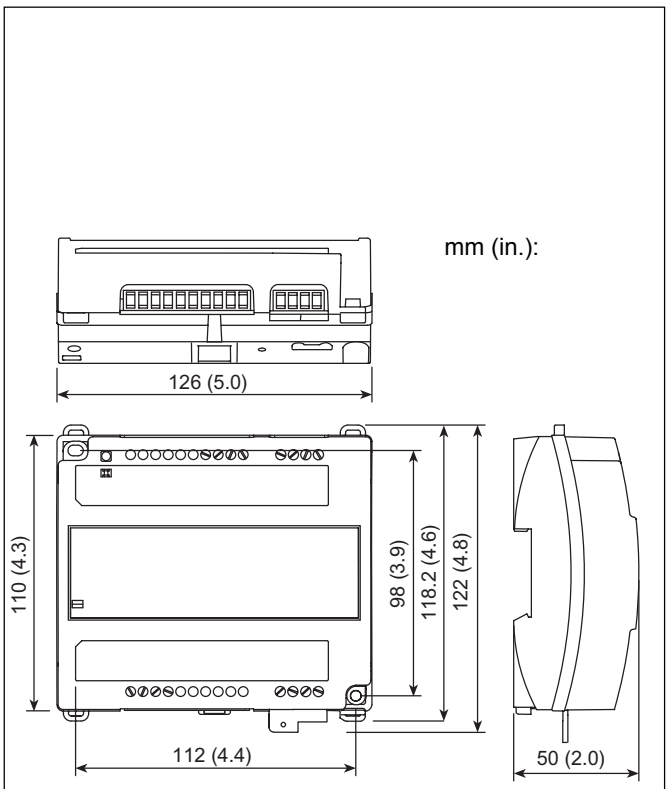


Figure 5

STR WALL MODULES

Designation Part number	Description
STR100 0-046-0010	Temperature sensor
STR101 0-046-0020	Temperature sensor, mode indication and OP connector
STR102 0-046-0030	Temperature sensor, setpoint dial, mode indication and OP connector
STR104 0-046-0040	Temperature sensor, setpoint dial, mode indication, bypass button and OP connector
STR150 0-046-0280	Temperature sensor, setpoint dial, mode indication, bypass button and OP connector

ZS WALL MODULES

Designation Part number	Description
ZS 101 0-073-0908	Temperature sensor, mode indication and OP connector
ZS 102 0-073-0909	Temperature sensor, setpoint dial, mode indication and OP connector
ZS 103 0-073-0910	Temperature sensor, mode indication, bypass button and OP connector
ZS 104 0-073-0911	Temperature sensor, mode indication, bypass button, setpoint dial and OP connector