Cyrus

Product Overview

NC24T RS485 Modbus RTU networking   LCD universal controller applies communication technology of Modbus RTU master/slave protocol to monitor and supervise year around air conditioning units in commercial, industrial and residential Installation. Measurement and control of temperature, relative humidity, absolute humidity, enthalpy, pressure differential, volumetric airflow and indoor air quality. The input scale can be set from –99 to 999 units. The start and end points of output voltage can be any value between 0 to 10 VDC.

The maximum number of NC24T slaves in a Modbus RTU network is 32.   Optional BACnet MS/TP Gateway module (BMG-NC24T) is available for order. It works as an interface to link up the NC24T controllers with BACnet MS/TP communication bus. Please refer to the product bulletin of BMG BACnet MS/TP Gateway for details.

NC24T standalone controller provides 4 numbers of on-off output which are configured as one 2-position on-off output, or two 2-position on-off outputs, or one 3-point PI output, or two 3-point PI outputs, or one 2-position and one 3-point PI outputs.

Features

- ☐ 24 VDC supply voltage
- ☐ Modern Appearance
- ☐ Stylish rotary dial and touch key
- ☐ Large LCD with backlight
- ☐ Support Modbus RTU protocol
- ☐ Support standalone operation on RS485 communication failure
- ☐ One universal input + one 0...VDC input
- ☐ Four 24 VAC output points
- ☐ 12 specific application controls
- ☐ PI Algorithm
- ☐ Eco-mode DI for energy saving purpose
- ☐ Day / night DI for action changeover
- ☐ Retention of last settings upon power failure
- ☐ Configuration and Parameter setup menu
- ☐ Customizing availability

Ordering

To order the NC24T Universal Controller, contact the nearest Cyrus' representative. Specify the desired product code number from product overviews.

Selectable Functions

- ☐ Device MAC address
- ☐ 12 control applications
- ☐ Primary input X1 can be configured to accept TE10 series temp. sensor or 0...10 VDC output device
- ☐ Selections of ºC, ºF, % or no specified unit
- ☐ Selectable display range
- ☐ Secondary 0...10 VDC input X2 can be configured for remote set-point override, higher input priority or higher output priority
- ☐ Adjustable P-band and I-time
- ☐ Adjustable actuator stroke time
- ☐ Selectable set-point range
- ☐ Selectable 0...100 % output limits
- ☐ Selectable Eco-mode set-points
- ☐ Adjustable set-point differential
- ☐ Adjustable control bandwidth
- ☐ Measured value reading offset
- ☐ Display selections between measured value of Input X1 or set-point value

Display Control Unit and LCD Layout
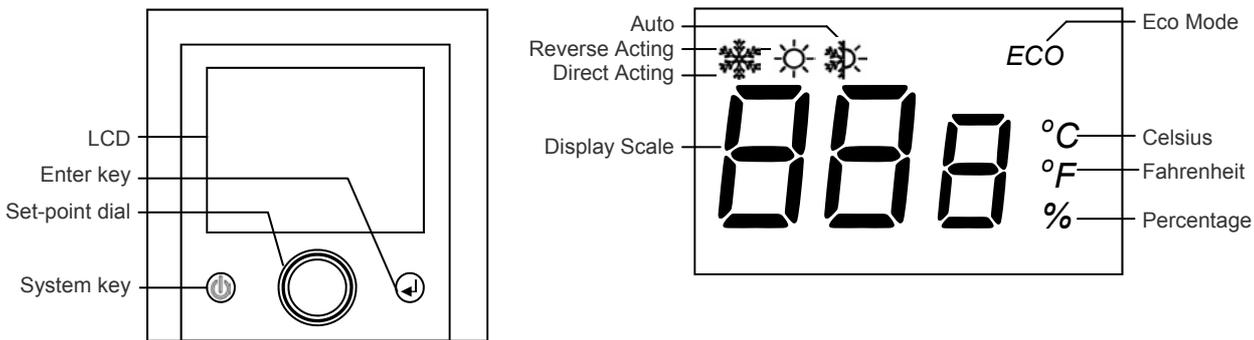
Operation Notes

Display	LCD shows measured value constantly except when set-point adjustment is being made
Backlight	The backlight will light up for 5 seconds when any button is pressed
Set-point	Increase or decrease set-point by turning the rotary dial
System and Enter Keys	The controller allows authorized service agent to change the certain number of operating parameters and configurations via pressing system and enter keys, please refer to installation and configuration menu for details.

Controller Type and functions

The UC24T is a standalone universal controller which performs both primary and auxiliary control functions. The respective mode is defined by settings of configurations and parameters via entering into setup mode.

The controller can be configured as follows:

|		
One sequence	Q1 Y1	reverse or direct acting
Two sequences	Q1 and Q2 Y1 and Y2 Q1 and Y2 Y1 and Q2	reverse and direct acting
	Q1 and Q2 Y1 and Q2	reverse and reverse acting
	Q1 and Q2 Y1 and Q2	direct and direct acting

Inputs and Outputs

| Input / Output	Terminal No.	Description
Universal input X1	11	Universal input X1 can be used as the primary input with a TE10 Series NTC temperature sensor or an active 0...10 VDC active signal. Refer to jumper table and setup menu for details of settings
Analogue input X2	12	The analog input X2 is used as the secondary input with a 0...10 VDC active signal that allows remote set-point override, higher input priority or higher output priority. Refer to setup menu for details of configurations.
Digital input DI1	8	The digital input DI1 is used to activate the ECO-mode (Energy-saving mode)
Digital input DI2	9	The digital input DI2 is used to activate day/night changeover.
Digital output Q1	3	24 VAC 2-position output for either reverse or direct acting
Digital output Q2	6	24 VAC 2-position output for either reverse or direct acting
3-point output Y1	3 and 4	3-point modulating output for either reverse or direct acting
3-point output Y2	6 and 7	3-point modulating output for reverse acting

Application examples
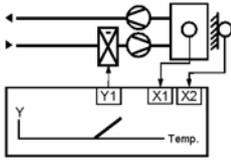
Higher input priority
X2 will be used as input parameter and LCD will display its equivalent value when X2 is greater than X1.
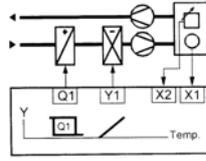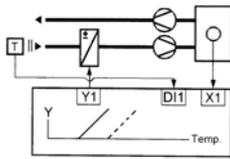

Remote set-point
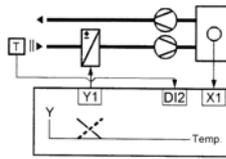A remote 0...10V signal input to X2 which is used as local set-point override.
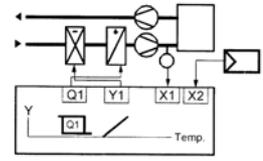
Higher output priority
The value of X2 will be used as Y1 output when its value is greater than calculated output of cooling sequence

Eco-Mode
The local set-point will be overridden by Eco-mode set-point when DI1 is in closure.

Day/night changeover
The Y1 output will be inverted when DI2 is in closure.

Remarks:
Please refer to the setup menu shown on page 3 for configuration details of X1, X2 and Eco-mode function. Illustrations of application specific control are provided below.
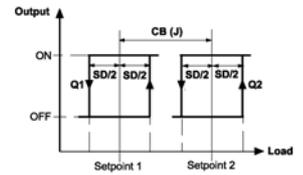
Application specific controls
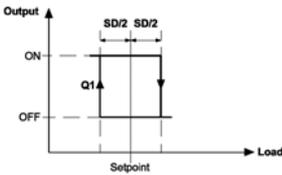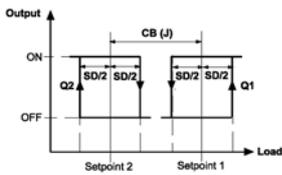

Application No. 1:
Single RA On-Off Output
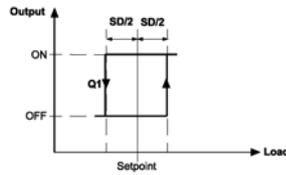
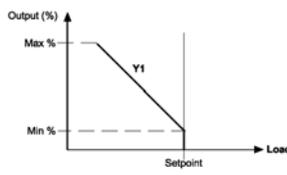Application No. 2:
Single DA On-Off Output
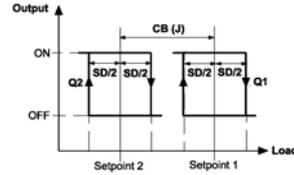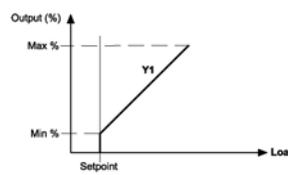

Application No. 3:
Dual RA On-Off Outputs

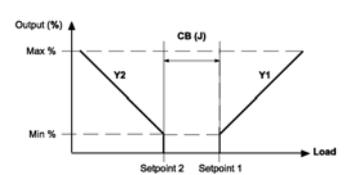Application No. 4:
Dual DA On-Off Outputs

Application No. 5:
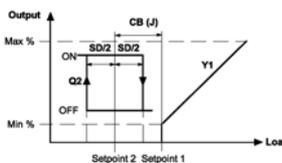RA On-Off & DA On-Off Output

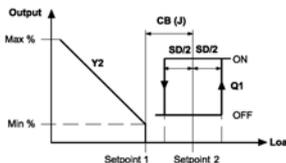Application No. 6:
Single RA Modulating Output

Application No. 7:
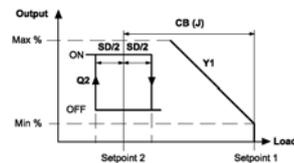Single DA Modulating Output

Application No. 8:
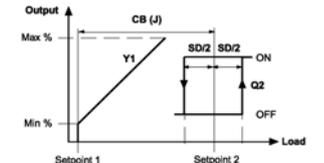RA Modulating &
DA Modulating Output

Application No. 9:
RA On-Off Output &
DA modulating Output

Application No. 10:
RA Modulating Output &
DA On-off Output

Application No. 11:
RA On-Off Output &
RA Modulating Output

Application No. 12:
DA Modulating Output &
DA On-Off Output

Network & Cabling Requirements

To ensure network stability and reliable communications, particularly at high speeds on a BACnet MS/TP or Modbus RTU network for a number of devices, it is imperative that the following network and cabling requirements are adhered to:

Item	Description
Cabling	For BACnet MS/TP and Modbus RTU networks, it is recommended to use networking cabling that matches the following specifications: • Balanced 100 to 120 ohms nominal impedance, 22 or 24 AWG Twisted Shielded Pair (TSP) Cable • Nominal capacitance of 52 pF/m or lower • Nominal velocity of propagation of 66% or higher
Topology	Ensure the MS/TP or Modbus RTU network cable is installed as a daisy chain from one device to the next.
Maximum Nodes	The maximum number of devices per MS/TP or Modbus RTU network without any repeaters is 32.
Terminator	A terminator of 120-ohm impedance must be installed at each end of each MS/TP or Modbud RTU network segment, or two per MS/TP or Modbus RTU network. Ensure that this requirement is not overlooked in laying out the network architecture and ordering product.
Repeater	A repeater is not necessary unless the MS/TP or Modbus RTU network is extended beyond 1,000 m.

Network Configuration
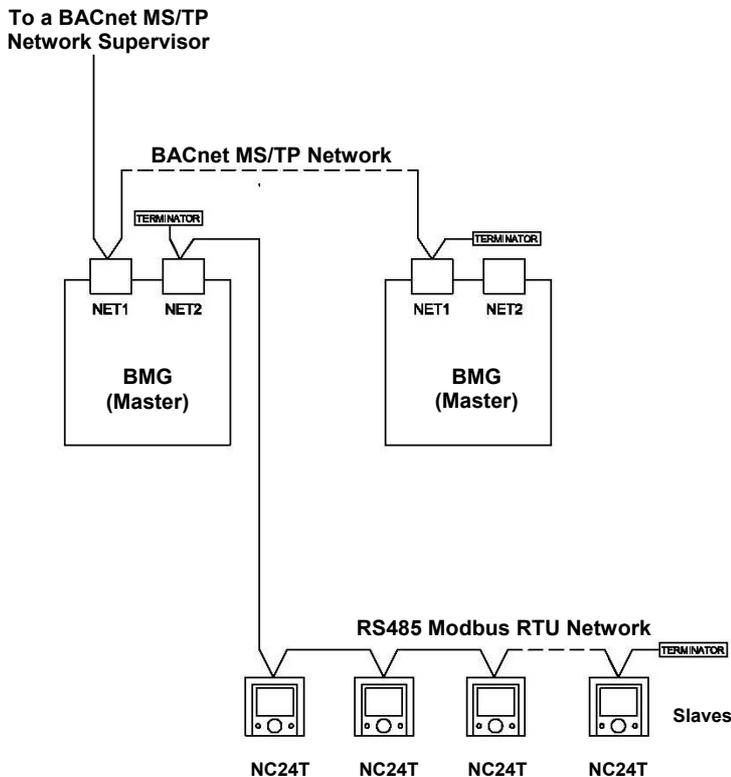
BACnet MS/TP Network Notes:

1. Ensure the recommended balanced cable is used.
2. Ensure the cable is installed as a daisy chain from one device to the next (1,000 m maximum) and the shield is grounded at one single point of the network only.
3. Ensure a MS/TP terminator is installed on each end of each MS/TP network.
4. The maximum nodes per MS/TP network is 32 without a repeater.

Modbus RTU Network Notes:

1. Ensure the recommended balanced cable is used.
2. Ensure the cable is installed as a daisy chain from one device to the next (1,000 m maximum) and the shield is grounded at one single point of the network only.
3. Ensure a terminator is installed on each end of each or Modbus RTU network.
4. The maximum nodes per Modbus RTU network is 32

Technical Specifications

Product Model	NC24T
Power Requirements	24 V ±15% 50/60 Hz
LCD	3 digits
Display range	-99...999
Set Point Range	-99...999
Universal Input X1	TE10 NTC temperature sensor (-50...110 ^{o}C), or 0...10 VDC active input corresponding to adjustable (^{o}C, ^{o}F, % or no unit)
Secondary Analogue Input X2	0...10 VDC active input
DI 1 and DI 2	Input signal from external voltage-free contact
Digital Outputs	20 VA @ 24 VAC
RS485 communication speed	Baud rate fixed at 19,200 bps
Device MAC addressing	01-32 via parameter setup menu, factory setting is 01
Body Material	Self-extinguishing, molded ABS
Ambient/Storage Temperature Limits	0 to 50 ^{o}C / -30 to 50 ^{o}C, 10% to 90% RH non-condensing
Agency Approval	CE Mark compliant to EMC and low voltage directives
Shipping Weight	120 g
Dimensions	See Dimensions drawing in mm

## Dimensions (mm) and Mounting
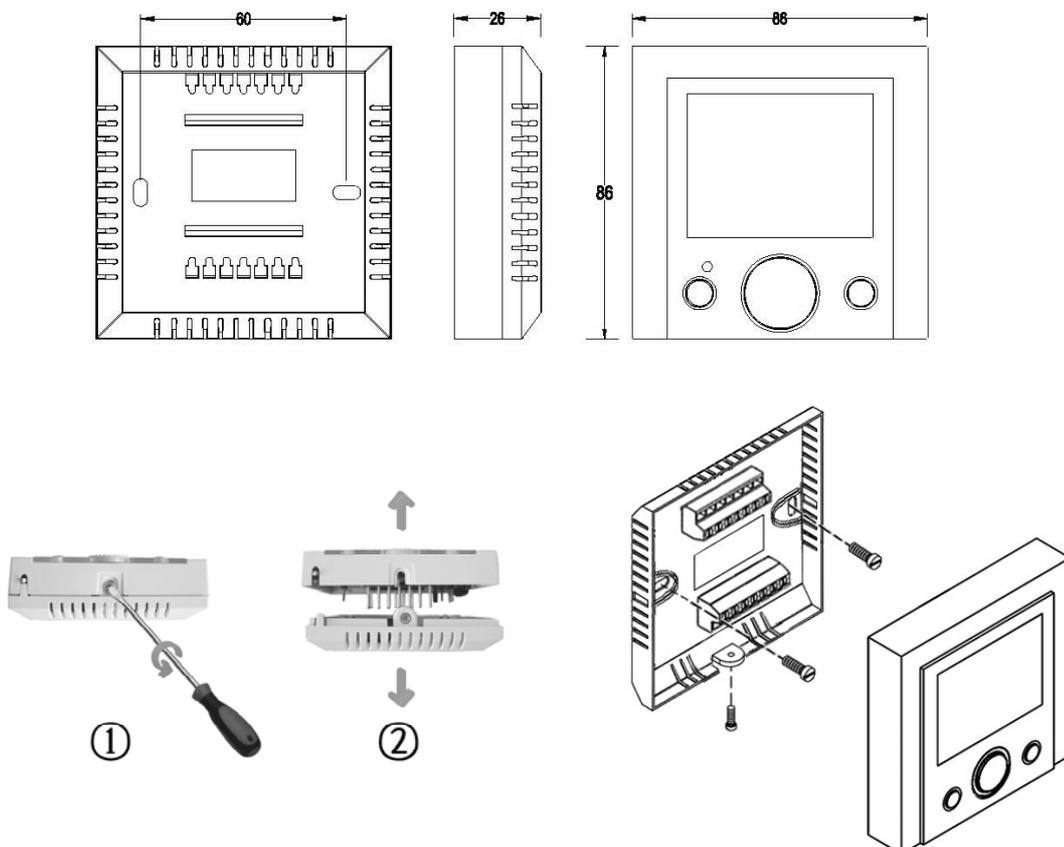
Wiring Terminals and Jumper Settings
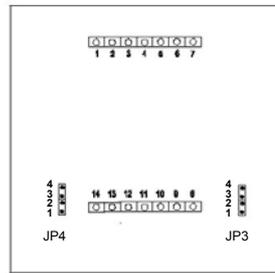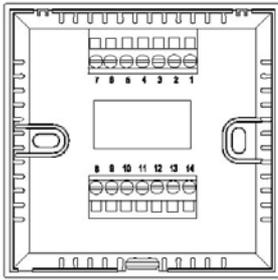
| Jumper Settings for Inputs X1 and X2	
Jumper	Socket Position
JP3	Insert at position 3 & 4 for 0...10 V active input X1 (Factory setting), Insert at position 1& 2 for TE10 sensor input
JP4	Always at position 3 & 4 for 0...10 input X2

Electrical Installation

- NC24T is designed for 24 VAC operating voltage
- Standard cables can be used for the controller, however, shielded cables are recommended when installed in an environment greatly exposed to EMI
- 22 or 24 AWG twisted shielded pair double-insulated cable is recommended as temperature sensor wiring and its length must not exceed 25 m
- Do not bundle and run power wiring and sensor wiring in a same conduit
- Run the sensor wires away from any electric motors or power wiring when external temperature sensor is connected. Failure to do so may result in poor controller performance due to electrical noise
- When several isolated double-wound step-down transformers are used in a control loop, observe the polarities of the AC power supply of all devices including the NC24T controller.
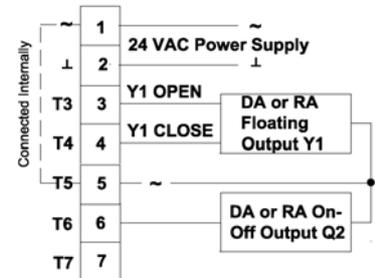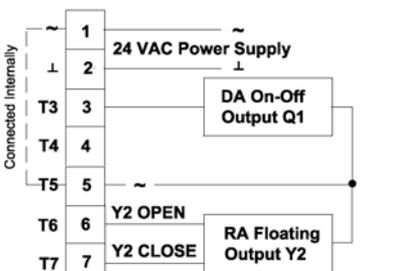
Wiring Diagram
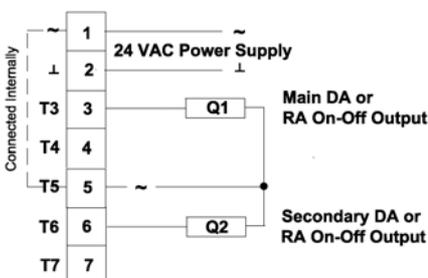
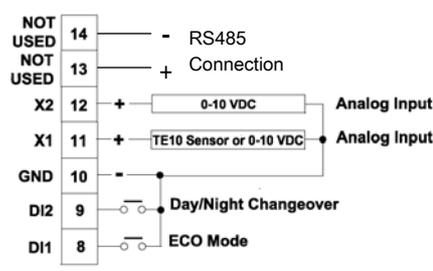**Wiring diagram for applications 1,2,3,4 and 5**
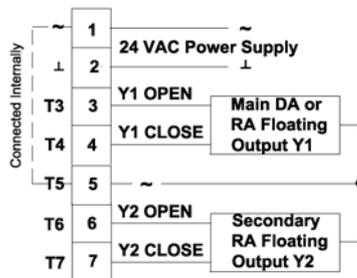
Wiring diagram for applications 6,7 and 8

Wiring diagram for applications 9,11 and 12

Wiring diagram for application 10

Wiring diagram for all applications Analog and Digital Inputs