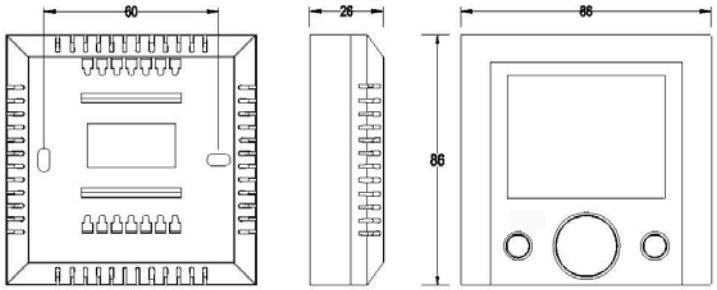
Issue Date December 16, 2013

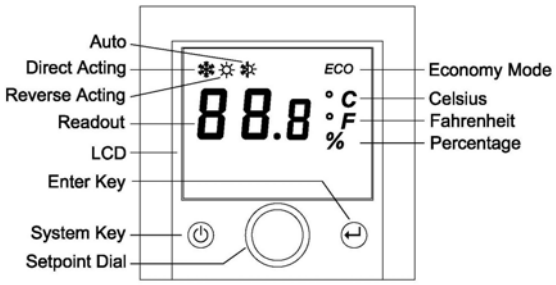
RS-485 Modbus RTU Networking Controller with 2-Wire On-Off and 3-Wire Floating Outputs

Installation, Configuration and Parameter Setup Manual

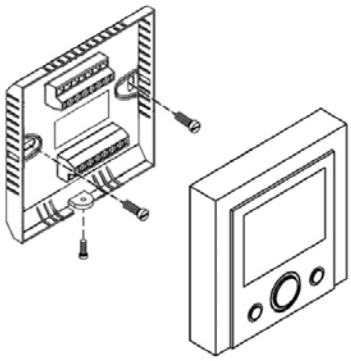
Dimensions in mm



Display Control Unit and LCD Layout



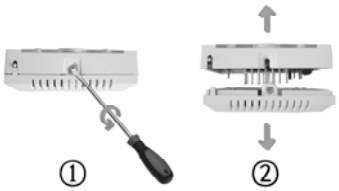
Mounting Details



Mounting

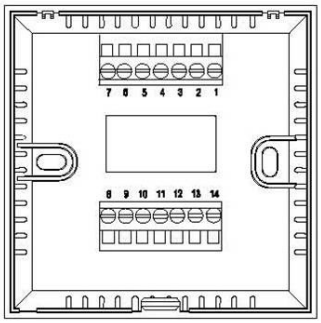
The universal controller can be surface mounted or secured to a standard European 75 x 75 x 35 mm electrical box or on a control panel. See Mounting Details. Two mounting screws are included.

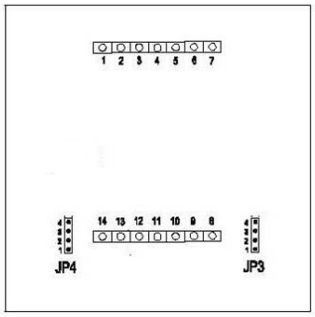
Cover Removal Procedure



1. Loosen the fixed screw.
2. Slightly twist the screw driver to crack open the cover from the base.
3. Hold the base firmly with one hand and remove the cover with another hand by pulling away from the base forcibly.

Wiring Terminals and Jumper Settings



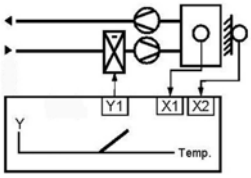


Jumper Settings	
Jumper	Jumper Position
JP3	Type of X1 input: insertion of 3 & 4 for 0-10 VDC active input (factory setting); 1 & 2 for TE10 Series NTC sensor input
JP4	Always at positions 3 and 4 for X2 with 0-10 VDC active input

Inputs and Outputs

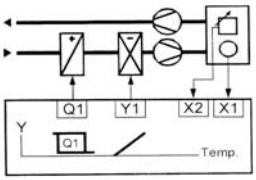
Input/Output Point	Terminal No.	Description
Universal input X1	11	The universal input X1 is used as the primary input with a passive TE10 Series temperature sensor or a 0-10 VDC active signal. Refer to jumper Settings table and setup menu for setting details.
Analog input X2	12	The analog input X2 is used as the secondary input with a 0-10 VDC active signal that allows remote setpoint override, higher input signal priority or . higher output priority. Refer to setup menu for configuring details.
Digital input DI1	8	The digital input DI1 is used to activate the ECO (economy or 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 acting (RA) or direct acting (DA)
Digital output Q2	6	24 VAC 2-position output for either reverse acting (RA) or direct acting (DA)
3-wire floating output Y1	3 and 4	3-wire floating output for either reverse acting (RA) or direct acting (DA)
3-wire floating output Y2	6 and 7	3-wire floating output for reverse acting (RA)

Typical Applications of Inputs X1, X2, DI1 and DI2



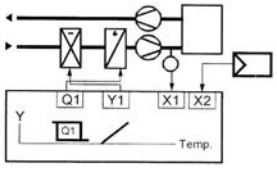
Higher Input Priority

X2 is acting as the input signal to calculate the output value of Y1 when its value is greater than the value of X1 and its value will be displayed on the LCD.



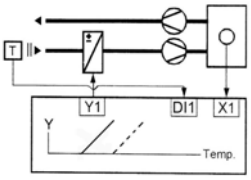
Remote Setpoint Override

A 0-10VDC signal input to X2 is acting as remote setpoint for Y1/Q1 outputs and its value will be displayed on the LCD.



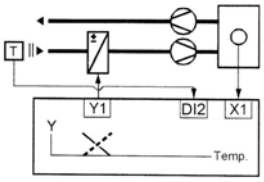
Higher Output Priority

X2 is acting as the output value of Y1 when its value is greater than the calculated output value of the cooling sequence. X2 must be the output from another controller.



ECO mode

The local setpoint will be overridden by ECO mode setpoint when DI1 contact is closed.



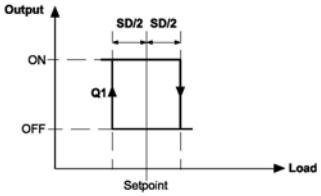
Day/night Changeover

The action of Y1 output is reversed when DI2 contact is closed.

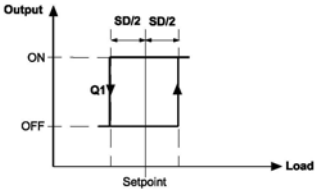
Notes: For details on how to configure X1, X2 and ECO mode functions, refer to the setup menu shown on Page 4. Illustration of application specific control is provided on this page.

Graphic Representation of Application Specific Control

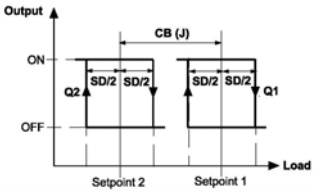
Application No. 1:
Single RA On-Off Output



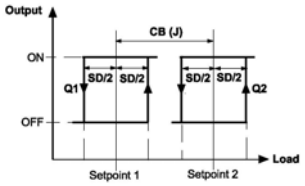
Application No. 2:
Single DA On-Off Output



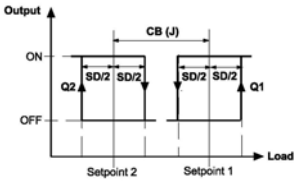
Application No. 3:
Dual RA On-Off Outputs



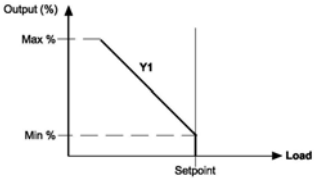
Application No. 4:
Dual DA On-Off Outputs



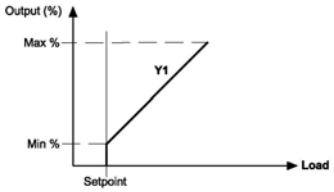
Application No. 5:
DA On-Off + RA On-Off Outputs



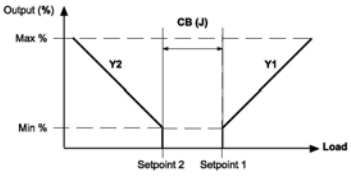
Application No. 6:
Single RA 3-Wire Floating Output



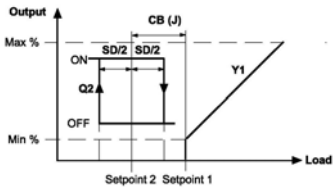
Application No. 7:
Single DA 3-Wire Floating Output



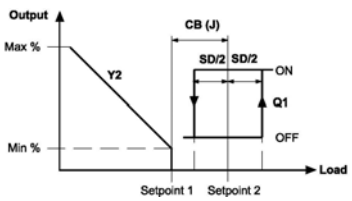
Application No. 8:
RA + DA 3-Wire Floating Outputs



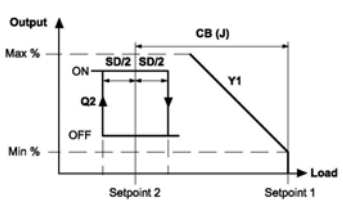
Application No. 9:
DA 3-Wire Floating + RA On-Off Outputs



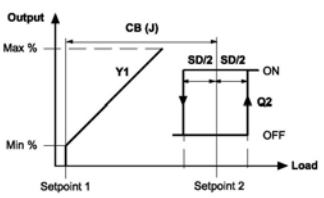
Application No. 10:
RA 3-Wire Floating + DA On-Off Outputs



Application No. 11:
RA 3-Wire Floating + RA On-Off Outputs



Application No. 12:
DA 3-Wire Floating + DA On-Off Outputs

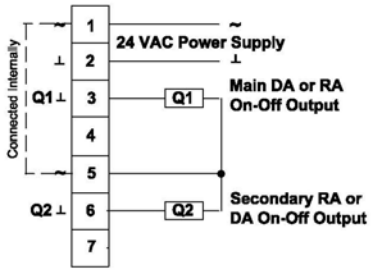


Wiring Notes

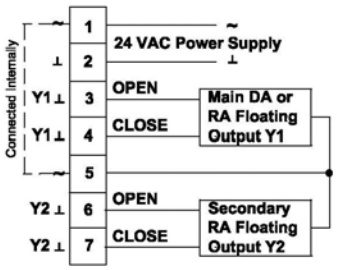
- The controller is designed for 24 VAC power supply.
- Move jumper JP2 to open position if 2-10 VDC proportional output is required.
- Conventional cables can be used for the controller but shielded cables are recommended if and when installed in an intense EMI environment.
- 22 or 24 AWG twisted shielded pair double-insulated cable must be used as RS-485 communication wiring and its length must not exceed 1,000 m without a repeater.
- 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 the same conduit.
- Run the external sensor wires away from any electric motors or power wiring. 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 universal controller.

Wiring Diagrams

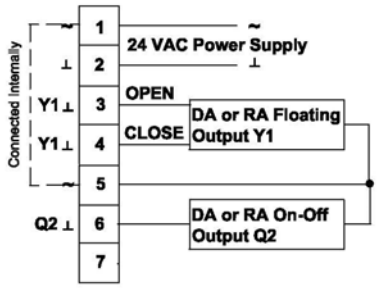
For Application No. 1, 2, 3, 4 and 5



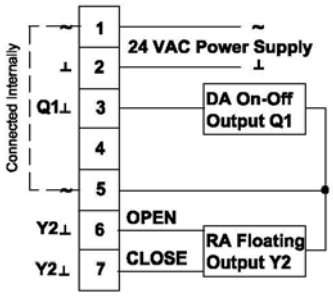
For Application No. 6, 7 and 8



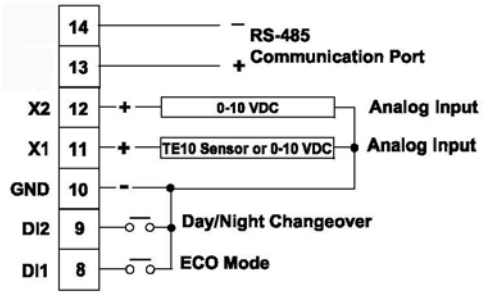
For Application No. 9, 11 and 12



For Application No. 10



For All Applications



Controller Errors Reporting

When the following errors are reported on the LCD unit, these errors will prevent the controller from normal operation and all controller functions will be locked out:

E-1 EEPROM read/write error
E-2* Temperature sensor open-circuited
E-3** Temperature sensor short-circuited

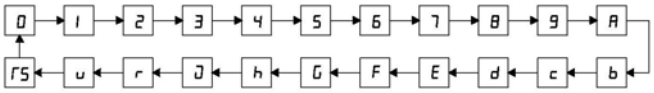
* JP3 jumper must be inserted between positions 1 and 2 when TE10 passive sensor is used and connected across Terminals 10 and 11, with function 202 being set in setup menu, or otherwise **E-2** error will be reported. **E-2** error will also be reported if the TE10 sensor has been disconnected. Check the sensor's connection and resistive value. If **E-2** error is still reported after proper positioning of JP3 and sensor connection, return the controller to the manufacturer for repair.

** When TE10 passive sensor is used and connected across Terminals 10 and 11, with function 202 being set in setup menu, and JP3 jumper is removed from positions 1 and 2, **E-3** will be reported. **E-3** error will also be reported if the TE10 sensor has been short-circuited. Check the sensor's connection and resistive value. If **E-3** error is still reported, return the controller to the manufacturer for repair.

When the error **E-1** is reported, return the controller to the manufacturer for repair.

Configuration and Parameter Setup Procedure

1. The configuration and parameter setup menu is accessible when the controller is energized except in ECO mode.
2. Press and hold the ↵ key for 5 seconds to enter into the configuration and parameter setup menu.
3. After entering into the setup mode, press the Φ key consecutively to access the various configurations and operating parameters which are displayed in sequence as shown below in flashing mode. The various configurations and operating parameters to be set are indicated by the 3-digit indicator. When flashing stops, the indicator shows the parameter value. Each configuration and parameter function is included in the table as shown below.



4. Rotate the adjustment dial clockwise or counter-clockwise to change the value of the desired parameter when function symbol is flashing.
5. Press and hold the ↵key followed by pressing the Φ key. Then release the ↵key and continue to hold the Φ key for 2 seconds. A beep will be heard and the controller will resume to operating mode with new settings of configurations and parameters.
6. The controller will exit setup mode automatically without saving new settings if and when there is no key operation in 30 seconds during setup mode.

Symbol	Function	Description
0	MCU firmware revision level	Firmware revision 0x.x appears after entering the setup menu
1	Choice of application specific control	101 = application 01 - single RA on-off output 102 = application 02 - single DA on-off output 103 = application 03 - Dual RA on-off outputs 104 = application 04 - Dual DA on-off outputs 105 = application 05 - DA on-off and RA on-off outputs 106 = application 06 - Single RA 3-wire floating output 107 = application 07 - Single DA 3-wire floating output (factory setting) 108 = application 08 - RA 3-wire floating and DA 3-wire floating outputs 109 = application 09 - DA 3-wire floating and RA on-off outputs 110 = application 10 - RA 3-wire floating and DA on-off outputs 111 = application 11 - RA 3-wire floating and RA on-off outputs 112 = application 12 - DA 3-wire floating and DA on-off outputs
2	Configuration of universal input X1	201 = active 0-10 VDC (factory setting) when JP3 is shorted between 3 & 4 202 = passive TE10 Series NTC sensor when JP3 is shorted between 1 & 2
3	Choice of engineering unit	3-C = ºC 3-F = ºF 3-P = % (factory setting) 3-0 = no specified unit
4	Low-end value of universal input readout (X1)	From: -50 (when 202 and 3-C are set), default setting = -50 or -99 (when 201 and 3-C, 201 and 3-F, or 201 and 3-0 are set), default setting = 0 or -58 (when 202 and 3-F are set), default setting = 58 or 0 (when 201 and 3-P are set) (factory setting) To: current high-end value of X1 minus 4 units
5	High-end value of universal input readout (X1)	From: current low-end value of X1 plus 4 To: 110 (when 202 and 3-C are set), default setting = 110 or 999 (when 201 and 3-C, 201 and 3-F, or 201 and 3-0 are set), default setting = 50 or 230 (when 202 and 3-F are set), default setting = 230 or 100 (when 201 and 3-P are set) (factory setting)
6	Configuration of analog input X2	600 = no action (factory setting) 601 = remote setpoint override (local setpoint value overriden by X2 value) 602 = higher input priority (X1 is overriden by X2 only when X2 value is higher) 603 = higher output priority (0-10 VDC calculated output value of Y1 is overridden by X2 value when X2 value is higher)
7	Proportional band	When 3-C, 3-F or 3-P is selected, 701 = 1 …….705 = 5 (factory setting)……..720 = 20; When 3-0 is selected, 701 = 1 … ...799 = 99
8	Integral time	800 = 0 min …….815 = 15 min. (factory setting)……..830 = 30 min.; setting = 0 means integral time being turned off.
9	Choice of valve stroke time for 3-wire floating models	901 = 10 seconds...912 = 120 seconds (factory setting)...924 = 240 seconds
A	Low-end value of X1 setpoint range	From low-end value of universal input readout of X1 to high-end value of setpoint range minus 4 units
b	High-end value of X1 setpoint range	From low-end value of setpoint range plus 4 units to high-end value of universal input readout of X1
c	Minimum limit of Y1 and Y2 outputs (Min %)	From c00 (factory setting) to value of maximum limit minus 1 (Example: c01 = 10%)
d	Maximum limit of Y1 and Y2 outputs (Max %)	From value of minimum limit plus 1 to d10 (factory setting) (Example: d10 = 100%)
E	ECO mode setpoint value of RA output(s)	From low-end value of setpoint range to ECO mode DA setpoint value minus 4
F	ECO mode setpoint value 0f DA output(s)	From ECO mode RA setpoint value plus 4 to high-end value of setpoint range
G	Setpoint differential (SD)	G01 = 1 (factory setting)……..G20 = 20 when 3-C, 3-F or 3-P is selected; or G01 = 1 … ...G99 = 99 when 3-0 is selected
h	Display offset for readout value of X1 input	-50 to 99, factory setting = 0
J	Control bandwidth between setpoint 1 and setpoint 2 (available and functional only for Applications No. 5, 6, 7, 8 and 9)	-99 to 99, factory setting = 2
r	Controller MAC address setting	To set the slave device address from r01 to r32 (factory setting = 01)
u	Choice of constant display of X1 input or set-point value	u-1 = constant display of X1 input value (factory setting) u-2 = constant display of setpoint value
rS	Restoration of default factory settings	rS1 = Retain current settings (factory setting) rS2 = Restore default factory settings

Example of Setting Up Configurations and Parameters

Requirements:

a. 2-pipe cooling only application with 3-wire floating valve actuator (Application No. 7)
b. Actuator stroke time is 120 seconds
c. With 0-50°C temperature transmitter (0-10 VDC active input)
d. Setpoint range to be 0-50°C
e. With 0-100% RH humidity controller (higher output priority)
f. Proportional bandwidth and integral time to be 5K and 15 minutes respectively (P = 5 and I = 15)
g. ECO mode to be activated when sensing temperature is at or higher than 26°C (ECO mode cooling setpoint)
h. Minimum and Maximum output limits to be 30% and 80% respectively
i. Setpoint Differential (SD) to be 1
j. The controller to display setpoint value constantly
k. Controller MAC address is 01

Note: Make sure that jumper JP3 is inserted between positions 3 and 4.

Configuration and parameter setup steps:

1. Press and hold the ↵key for 5 seconds to enter into configuration and parameter setup mode. LCD displays 0-:-.
2. Press the Φ key momentarily until symbol 1 flashes. Rotate the adjustment dial to change the value to 107.
3. Press the Φ key momentarily until symbol 2 flashes. Make sure the LCD displays the value of 201 (factory setting).
4. Press the Φ key momentarily until symbol 3 flashes. Rotate the adjustment dial to change the value to 3-C.
5. Press the Φ key momentarily until symbol 4 flashes. Make sure the LCD displays the value of 0 (factory setting).
6. Press the Φ key momentarily until symbol 5 flashes. Rotate the adjustment dial to change the value to 50.
7. Press the Φ key momentarily until symbol 6 flashes. Rotate the adjustment dial to change the value to 603.
8. Press the Φ key momentarily until symbol 7 flashes. Make sure the LCD displays the value of 705.
9. Press the Φ key momentarily until symbol 8 flashes. Make sure the LCD displays the value of 8 15.
10. Press the Φ key momentarily until symbol 9 flashes. Rotate the adjustment dial to change the value to 9 12
11. Press the Φ key momentarily until symbol A flashes. Rotate the adjustment dial to change the value to 0.
12. Press the Φ key momentarily until symbol b flashes. Rotate the adjustment dial to change the value to 50.
13. Press the Φ key momentarily until symbol c flashes. Rotate the adjustment dial to change the value to c03.
14. Press the Φ key momentarily until symbol d flashes. Rotate the adjustment dial to change the value to d08.
15. Press the Φ key momentarily until symbol E flashes. Make sure the LCD displays the value of 0 (factory setting).
16. Press the Φ key momentarily until symbol F flashes. Rotate the adjustment dial to change the value to 26.
17. Press the Φ key momentarily until symbol G flashes. Rotate the adjustment dial to change the value to G01 (factory setting).
18. Press the Φ key momentarily until symbol h flashes. Make sure the LCD displays the value of 0 (factory setting).
19. Press the Φ key momentarily until symbol J flashes. Make sure the LCD displays the value of 2 (factory setting).
20. Press the Φ key momentarily until symbol r flashes. Rotate the adjustment dial to change the value to r01.
21. Continue to press the Φ key momentarily until symbol u flashes. Rotate the adjustment dial clockwise to change the value to u-2.
22. Press and hold the ↵key followed by pressing the Φ key. Then release the ↵key and continue to hold the Φ key for 2 seconds. A beep will be heard and the controller will resume to operating mode with new settings of configurations and parameters.

Operation Notes

Operation

- LCD shows ambient temperature constantly except when set point adjustment is being made.
- Press the system key **Φ** to enter into the desired operating mode.
- Increase or decrease temperature set point by rotating the adjustment dial clockwise or counter-clockwise. When the dial is rotated, the LCD shows the existing setpoint setting.

ECO Mode

- When the ECO contact closes, it will override the operating mode and operate the controller in energy saving mode despite the controller being in operating or standby mode.
- In ECO mode, the factory-set cut-in points will be activated and all operating keys are locked out until the ECO contact opens.

Day/Night Mode

- When the DI2 contact closes, it will reverse the Y1 output action of the controller and maintain the desired ambient temperature at night.

Parameter Setup Mode

- The controller allows authorized service agent to change a number of operating parameters in the field. Refer to the parameter setup menu for details.

Error Reporting

- All controller outputs will be shut down when error is reported. Details of error reporting are provided on Page 3.