

MOD-RI Room Interface Modules with Modbus

The MOD-RI are room interface modules designed to provide room control interface for the building management systems.

The MOD-RI units have built-in (backlit) display that shows the system status. Depending on the model two, three or four push buttons can be used to change the setpoint, the system mode and the fan speed.

The MOD-RI units can also display alarm conditions using white, red and amber display backlight together with alarm codes.

The units have built-in temperature measurement.

The units have also modern sleek design and they can be wall mounted.

The MOD-RI units have Modbus RTU RS485 communication interface that allows them to be used with the most BMS systems and other products with Modbus RTU Master.



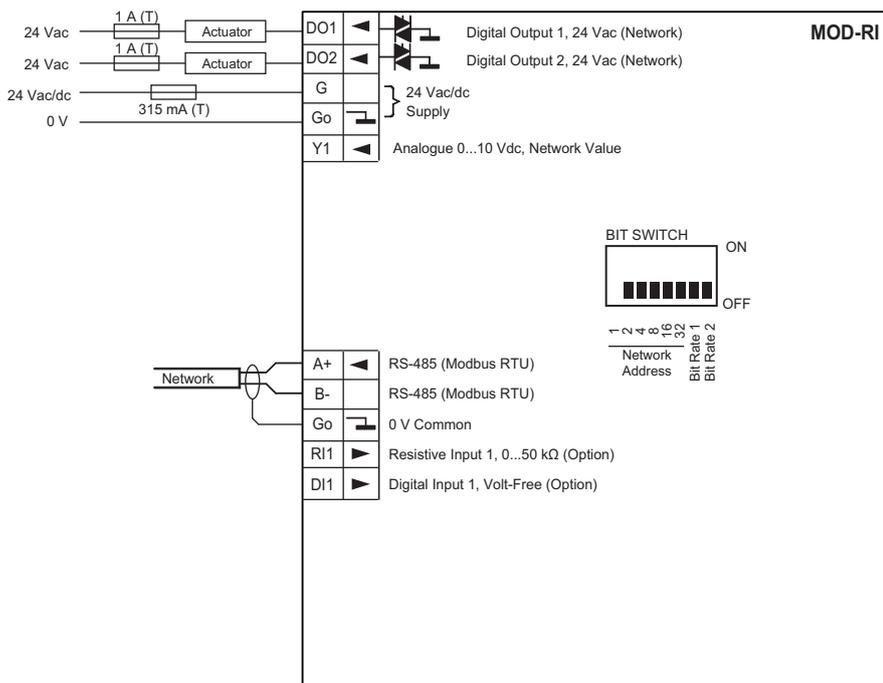
Model Type	Model	Description
	MOD-RI	Modbus Room Interface Module with LCD, built-In temperature, 1DI, 1RI, 2DO and 1AO, No Buttons
	MOD-RI-2B	Modbus Room Interface Module with LCD, built-In temperature, 1DI, 1RI, 2DO and 1AO, 2 Buttons (Setpoint)
	MOD-RI-3B	Modbus Room Interface Module with LCD, built-In temperature, 1DI, 1RI, 2DO and 1AO, 3 Buttons (Setpoint and Fan Speed)
	MOD-RI-4B	Modbus Room Interface Module with LCD, built-In temperature, 1DI, 1RI, 2DO and 1AO, 4 Buttons (Setpoint, Fan Speed and Day/Night)
	-RH	2%rH Relative Humidity Option
	-CO2	CO Measurement Option

Technical Data

Power Supply	Power supply	24 Vac/dc -10%/+15%
Displays and Interfaces	LCD	LCD Display for Showing Plant Status (Heating/Cooling Mode, Day/Night Mode, Current Temperature, Humidity, Fan Speed, Setpoint, Open / Close Arrows)
Signal Outputs (network write)	Analogue Outputs	1 x 0...10 V < 5 mA; 100k min impedance for 1 % accuracy
	Digital Outputs	2 x 24 Vac max. 1 A Triac; requires 24 Vac Power Supply (DO1 & DO2) NOTE: Switching to 0 V
Signal Inputs (network read)	Resistive Input	1 x Resistive Input, NTC10/0...50 kΩ (network read)
	Digital Input	1 x Digital Input, Volt-Free Contact, Impedance <1 kΩ
Sensing Characteristics	Temperature	
	Range	0...50 °C (32...122 °F)
	Accuracy	±0.5 °C

	Humidity; Option -RH	
	Range	0...100 %rH
	Accuracy	±2 %rH (within 0...90 %rh)
	Carbon Dioxide (CO ₂); Option -CO2	
	Range	0...5000 ppm CO ₂ (Range Adjustable)
	Accuracy	±50 ppm + 3 % of the reading @ 25 °C (@77 °F)
	Technology	Auto Calibrating; Patented Non-Dispersive Infrared (NDIR)
	Non-Linearity	<1% FS
	Warm-Up Time	<20 seconds
	Response Time	2 minutes
Communication	Modbus Communications	
	Protocol	Modbus RTU
	Interface	RS-485; maximum 63 devices
	Addressing	1...63 via a bit switch; 1...247 via tool / network
	Communication	9k6/19k2/38k4/57k6 Baud; Parity None/Even/Odd, 1 or 2 Stop Bits (baud rate adjustable through bit switch or network)
Connections	Terminal Connections	Solid and Stranded Cable; 55° Angle for Wiring Maximum Size: 0.05 to 1.5mm ² (EN ISO) / 14 to 30 AWG (UL) Rising Clamp: Size 2.5 x 1.9mm
Environmental Conditions	Operating	
	Temperature	0...+50 °C (32...122 °F)
	Humidity	0...95 %rh (non-cond.)
	Storage	
	Temperature	-30...+70°C (-22...158 °F)
	Humidity	0...95 %rh (non-cond.)
Standards	CE Conformity	CE Directive 2004/108/EY EN61000-6-3: 2001 (Generic Emission) EN61000-6-1: 2001 (Generic Immunity).
	Degree of Protection	IP20
Housing	Housing Material	ABS Plastics, Self Extinguishing
	Mounting	Wall or Junction Box Mounting, RAL9010 Pure White
	Dimensions	W86 x H120 x D29mm
	Weight	180g

Wiring Terminals



DO1	Digital Output; 24 Vac Triac Switching to 0 V; max. 1 A Warning: Add external fuse (1 A (T)) for the actuator connected to the output. The fuse or correct wiring accessories are not included in the product delivery.
DO2	Digital Output; 24 Vac Triac Switching to 0 V; max. 1 A Warning: Add external fuse (1 A (T)) for the actuator connected to the output. The fuse or correct wiring accessories are not included in the product delivery.
G	24 Vac/dc Power Supply Warning: Add an external fuse (315 mA (T)) for the power supply. The fuse and correct wiring accessories are included in the product delivery.
G0	0 V Common
Y1	0...10 Vdc Analogue Output (Network Write)
A+	RS-485 A+ Connection (Modbus RTU)
B-	RS-485 B- Connection (Modbus RTU)
G0	0V Common
RI1	NTC10/Resistive Input 0...50 kΩ
DI1	Digital Input; Volt-Free

Wiring Precautions

Switch off the power before any wiring is carried out. Unplug the LCD display and then wire the power supply and the analogue output, if relevant. After the wiring has been completed; plug-in the display and power up the device.

Analogue Output Y1 Operation

The analogue output Y1 value can be set over the Modbus RTU network.

DO1/DO2 Digital Output Operation

The digital outputs DO1 and DO2 can be set over the Modbus RTU network. The digital input has adjustable off delay (default 0 seconds).

Resistive Input Operation

The resistive input is configured as default to read NTC10k3 sensor and the reading is available over the Modbus network. Using SW-DCT-USB tool it is also possible to configure the input to read resistance.

Digital Input Operation

The volt-free digital input DI1 status is available over the Modbus network.

Temperature Measurement and Single Point Calibration

The devices measures room temperature and this reading is displayed on the LCD screen and it is available over the Modbus network as a Modbus value.

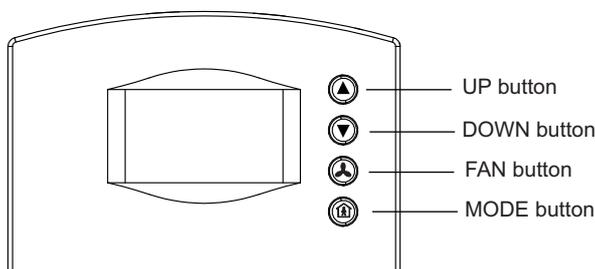
The temperature reading can be calibrated using single point calibration field.

Setpoint Buttons (2B/3B/4B Models)

By pressing the UP and DOWN buttons the current setpoint can be adjusted. The UP and DOWN buttons have autorepeat function making adjustment faster and easier. The setpoint is shown on the display when it is adjusted (backlight is switched temporarily on). The device has two network variables for the setpoint; the nominal setpoint and the current adjusted setpoint.

The current adjusted setpoint shows the last written value i.e.

- if the user adjusted the setpoint via the buttons, the current adjusted setpoint reflects the nominal setpoint +/- the user adjustment
- if the base setpoint is written via the network, then the current adjusted setpoint reflects the last written network setpoint.



It is possible to configure the current adjusted setpoint to reflect only the user adjusted setpoint. In this case set the network nominal setpoint to 0.

Fan Speed Button (MOD-RI-3B and MOD-RI-4B)

By pressing the FAN button, the current fan speed is displayed (and the backlight is switched on), then by pressing the UP and DOWN buttons is possible for the user to adjust the fan speed. After setting the fan speed, the user-set fan speed is activated for the time set in the fan override delay parameter, or until the fan speed is re-set over the Modbus network.

If the user set fan speed is active the fan button backlight is ON. The button backlight can be enabled/disabled through the configuration tool.

By setting the fan override delay to 0, the user set fan speed is active until to the next network write. Otherwise the fan speed is overridden to user defined value only the time set in the fan override delay parameter. After this time the fan speed returns to previously set network ("automatic") value.

When the fan speed is changed over the Modbus network, the local user setting is re-set to the network value.

The fan speed display / operation can have the following configurations that are set during the commissioning.

Fan Speed Mode	Description
0	0..100% Modulating Fan Speed
1	0 - 1- 2 Two Speed Fan
2	0 - 1 - 2- A Two Speed Fan with Auto Option
3	0 - 1 - 2 - 3 Three Speed Fan
4	0 - 1- 2 -3- A Three Speed Fan with Auto Option

Operating Mode Button (MOD-RI-4B Only)

By toggling the operating MODE button, the current operating mode can be changed between day and night. When the button is pressed the display backlight is also switched on. The unit remains in the day/night mode set by the user for the time specified in the mode override delay parameter (max. 7200 seconds). After this time the mode returns to the mode before the manual setting (i.e. if the mode was night and the user sets it to day, the unit returns to night mode after the delay setting). The user set condition can be removed also any time by writing to the network parameter.

By setting the mode override delay to 0, the user set mode remains until it is re-set over the communication network.

If enabled, the mode button backlight is switched on to indicate the user set condition. The button backlight switches off when the unit returns to "automatic mode" (network setting).

It is also possible to disable the day and night button operation.

LCD Display

The LCD display shows the current temperature (in Celsius/Fahrenheit) and the optional humidity reading.

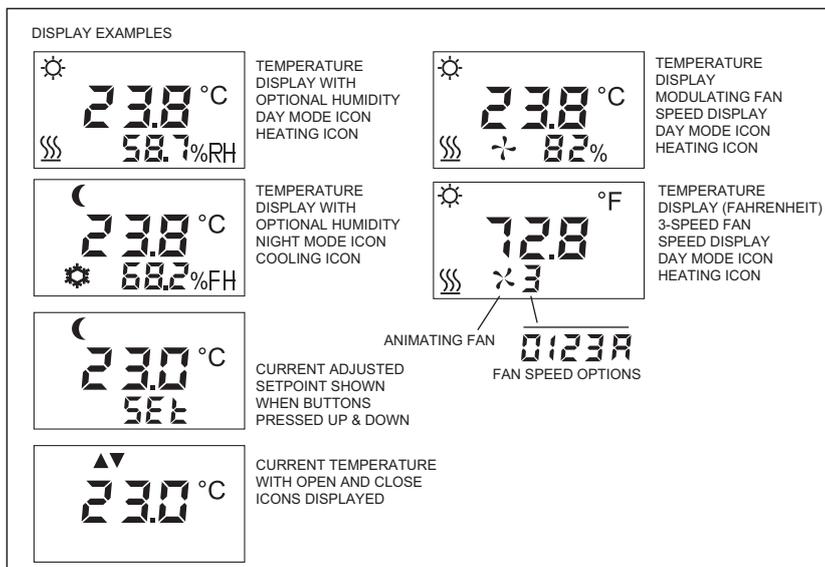
The display can also show the following additional information:-

- current setpoint when the setpoint is adjusted (network +/- user adjustment)
- current fan speed with animated fan icon (set by network and/or by the fan button with MOD-RI2 model)
- day and night mode (set by network and/or by the mode button with MOD-RI2 model)
- heating and cooling icons (set by network)
- open and close icons (set by network)

- alarm code display

When any of the buttons is pressed, the white LCD backlight is switched temporarily on.

If the CO2-option is fitted, then the LCD display alternates the temperature and CO2 measurement on the screen.



Alarm Display

The LCD can be configured to show alarm conditions on the display. The alarm condition includes a Code value display together with backlight (white/amber/red, permanent or flashing). The alarm condition display alternates between the normal temperature sensor reading display and the alarm display.



Using the Code value and describing this in the customer hand-out documentation it is possible to communicate various fault conditions from the building management system to the building users.

Network Alarm Value	Description
0	No Alarm
1	Red Backlight Flashing
2	Red Backlight Permanent
3	Amber Backlight Flashing
4	Amber Backlight Permanent
100-199	Display Code + Flashing Red Backlight
200-299	Display Code + Permanent Red Backlight
300-399	Display Code + Flashing Amber Backlight
400-499	Display Code + Permanent Amber Backlight
500-599	Display Code + No Backlight
600-999	Display Code + White Backlight at Installer Configured Level (None, 10 to 100%)

CO2 Measurement Enable

CO2 measurement is enabled by inserting CO2 link jumpers (two) on the Conn1.

CO2 Measurement Auto-Calibration

The CO2 sensor has automatic auto-calibration feature. This feature monitors the background CO2 level over the calibration period (8 days), and calibrates the CO2 level to the lowest point measured during this period. The sensors are supplied as factory calibrated to the typical background levels. After powering up the sensor, the sensor carries out initial calibration within 1 day after which the CO2 level is calibrated every 8 days automatically. The auto calibration logic virtually eliminates the need for manual calibration in applications where the indoor CO2 drops to outside levels during unoccupied periods.

NOTE: If the CO2 sensor is fitted in spaces where the background level does not drop close to the typical background level (= fresh air) of 400ppm (e.g. greenhouses) it is essential that the auto-calibration feature is disabled during the commissioning. This can be done using CO2 tool.

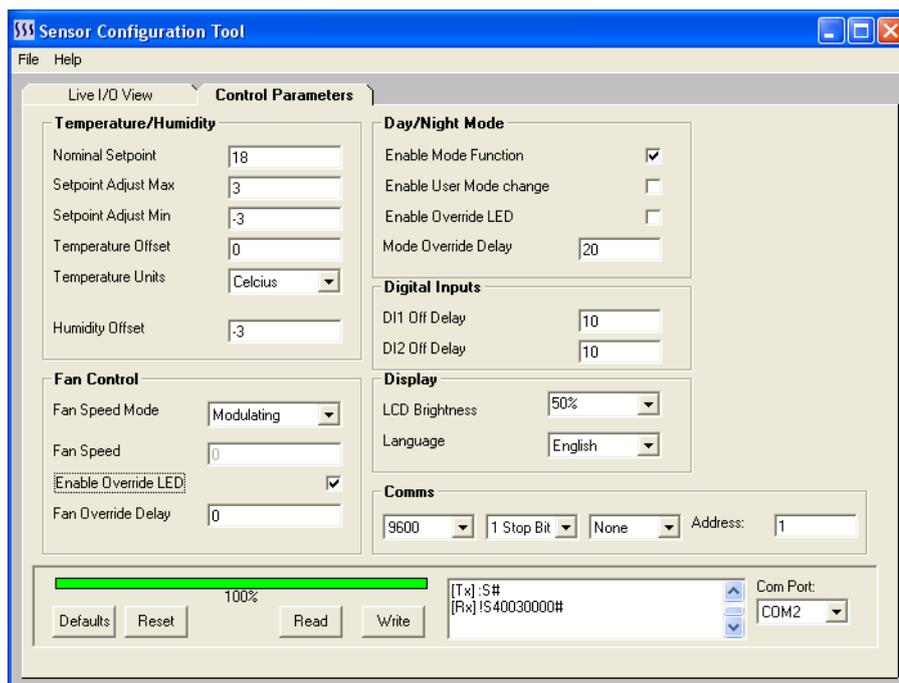
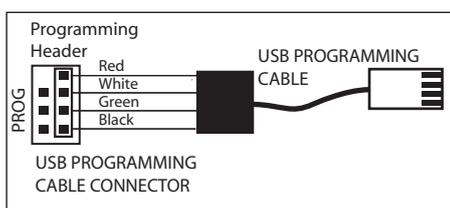
Configuration Parameters and Programming

The parameter options can be configured using the DCT Device Configuration Tool software; or over the Modbus (few advanced settings are available only through the configuration tool). The DCT Configuration software is connected via the PC USB cable to the programming header of the device as shown on the image below.

The correct process for connecting the room interface via the USB is as follows:-

- Disconnect USB Connector from PC
- Power Down the Room Interface
- Plug-In the 4-Way Connector to the Room Interface Unit
- Connect the USB to the PC
- Power Up the Room Interface Unit

NOTE: Always disconnect USB from PC before plugging the cable into the Room Interface Unit.



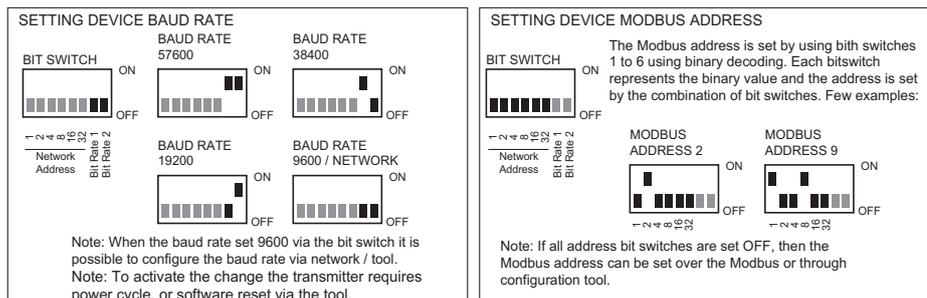
Parameter Storage

The configuration parameters are stored in the non-volatile memory. When the changes are carried out over the Modbus network, then "NonVol Update" flag is required to be forced on to save the changes. The NonVol Update parameter returns automatically to the off state once the values have been stored. The DCT tool applies automatically the non-volatile memory save when configuration changes are applied. An additional configuration parameter is available to store the parameters & user adjustment to the non-volatile after every setpoint adjustment of the unit.

Setting Up Modbus Address and Baud Rate

The Modbus address and the baud rate is normally set through the bit switch. It is also possible to set the address and baud rate over the configuration tool or over the Modbus communication network.

NOTE: From software version 1.43 onwards the new settings are activated automatically after the bit switches have been altered. The earlier versions require software reset or power down/up cycle.



Modbus Registers

The device supports the following Modbus registers and function codes. The default communication speed is 9600 bps, 8 data bits, Parity None and 1 Stop Bit. The default Modbus Slave address is 0. The device Parity can be changed between Odd, None and Even. The baud rate is selectable between 9600, 19200, 38400 and 57600 bps. The baud rate speeds can be selected using the built-in bit switch, or over the network if BR1 and BR2 are set to OFF. The sensor addresses 1 to 63 can be set using the local bit switch, and over the Modbus the adjustable address range is 1 to 247.

Please note that Modbus register space is specified from the Modbus master perspective as in the Modbus Application Protocol specification. The Modbus registers for Function Codes 02, 03, 06 and 16 have presentation for both Modbus "address blocks" and for actual Modbus register offsets. For example, the Temperature is read from Modbus register 1 using Function Code 04. Some Modbus masters will require Function Code 04, register 1 to be entered, whereas the others will require register 30001 and Function Code 04. The Modbus addressing starts from the zero Base address. (Some Modbus masters start addressing from 1, in this case add one to the listed register values).

Register	Parameter Description	Data Type	Raw Data	Range
FUNCTION CODE 01 - READ COILS				
FUNCTION CODE 05 - WRITE SINGLE COIL				
FUNCTION CODE 15 - WRITE MULTIPLE COILS				
0	Digital Output 1 Override (Network Write)		0..1	Off - On
1	Digital Output 2 Override (Network Write)		0..1	Off - On
2	Heating Icon Display		0..1	Off - On
3	Cooling Icon Display		0..1	Off - On
4	Day/Night Icon Display		0..1	0 = Night 1 = Day
5	Open (Up) Arrow Display		0..1	Off - On
6	Close (Down) Arrow Display		0..1	Off - On
7	Reset SPA - Setpoint Adjustment (Network Write)		0..1	Off - On
FUNCTION CODE 02 - READ DISCRETE INPUTS (Add 10,000 for Modicon Addressing)				
0	Digital Input 1 Status		0..1	Off - On
2	Digital Output 1 Status		0..1	Off - On
3	Digital Output 2 Status		0..1	Off - On
FUNCTION CODE 04 - READ INPUT REGISTERS (Add 30,000 for Modicon Addressing)				
0	CO2 Measurement	Unsigned 16	0..2000	0..2000 ppm
1	Temperature Measurement	Signed 16	0..500 320..1220	0.0..50.0°C (32.0..122.0°F)
2	Relative Humidity Measurement (Option)	Unsigned 16	0..1000	0..100.0 %rH
4	Resistive Input 1	Unsigned 16	0..50000	0..50000 Ohms
6	Current Adjusted Setpoint <i>Note 1)</i>	Signed 16	-32,767..+32,767 7	-3,276..+3,276.. Act Setpoint or Low..High Value
7	Analogue Output Y1	Unsigned 16	0..1000	0..100.0 %
12	NTC10 Input 1 (RI1 in NTC mode)	Signed 16	-400...3020	-40.0...302.0 °F -40.0...150.0 °C
100	Firmware Version	Unsigned 16	n/a	n/a

Register	Parameter Description	Data Type	Raw Data	Range
FUNCTION CODE 03 - READ HOLDING REGISTERS (For Modicon Addressing Add 40,000)				
FUNCTION CODE 06 - WRITE SINGLE HOLDING REGISTER				
FUNCTION CODE 16 - WRITE MULTIPLE HOLDING REGISTERS				
0	Analogue Output Y1 Override Value	Unsigned 16	0..1000	0..10.0 V Default 0
15	Network Nominal Setpoint	Unsigned 16	0..1500	0.0...150.0 (°C/F) Default 20
34	Delay Time Setting for Fan Override	Unsigned 16	1..7200	1..7200 Seconds (Default 0)
35	Delay Time Setting for Mode Override	Unsigned 16	1..7200	1..7200 Seconds (Default 0)
36	Minimum Position Setpoint Adjustment	Signed 16	-5000...0	-500.0...0.0 (°C/F) (Default -3)
37	Maximum Position Setpoint Adjustment	Unsigned 16	0...5000	0.0...500.0 (°C/F) (Default 3)
39	Temperature Unit Selection	Unsigned 16	0..1	0 = Celsius (Default) 1 = Fahrenheit
46	One Point CO2 Calibration Field	Signed 16	-200..+200	-200..+200ppm (Default 0ppm)
47	One Point Temperature Calibration Field	Signed 16	-30..+30	-3.0..+3.0°C/°K (Default 0°C)
50	Modbus Address	Unsigned 16	0..247 See Note 1	0..247
51	Modbus Baud Rate	Unsigned 16	0...3 See Note 2	0 = 9600 (Default) 1 = 19200 2 = 38400 3 = 57600
52	Modbus Parity	Unsigned 16	0...2	0 = None (Default) 1 = Odd 2 = Even
53	Stop Bits	Unsigned 16	0...1	0 = 1 Stop Bit (Default) 1 = 2 Stop Bits
60	Fan Speed Mode Selection	Unsigned 16	0..3	0 = 0..100% 1 = 0 - 1 - 2 2 = 0 - 1 - 2 - A (default) 3 = 0 - 1 - 2 - 3 4 = 0 - 1 - 2 - 3 - A 5 = None
61	Current Fan Speed	Unsigned 16	0..100	0, 1, 2, 3, 4 (=A) 0 .. 100%
62	Fan Manual Override LED Enable	Unsigned 16	0..1	Off - On (Default On)
63	Day / Night Mode Enable (Icon)	Unsigned 16	0..1	Off - On (Default On)
64	Day / Night Mode Manual Override Enable	Unsigned 16	0..1	Off - On (Default On)
65	Day/Night Mode Manual Override LED Enable	Unsigned 16	0..1	Off - On (Default On)
66	Network Alarm	Unsigned 16	0..999	0..999 (Default 0) Note 5
67	Hold On Delay Setting for Digital Input 1	Unsigned 16	1..7200	1..7200 Seconds (Default 10)
68	Hold On Delay Setting for Digital Input 2	Unsigned 16	1..7200	1..7200 Seconds (Default 10)
70	Single Point Calibration for RI1/NC10	Signed 16	-10,000..+10,000	-1,000..+1,000 °C, °F or Ohms
80	LCD Backlight Level	Unsigned 16	0..10	0..10
81	Reset SPA on Setpoint Change	Unsigned 16	0..1	0 = Disabled, 1 = Enabled (Default)
82	Save SPA (user adjustment on exit)	Unsigned 16	0..1	0 = Disabled (Default), 1 = Enabled
100	Force Reset	Unsigned 16	0..1	0 = Normal 1 = Force Reset
101	Non Volatile Memory Update	Unsigned 16	0..1 Note 3	0 = Normal 1 = Update

Register	Parameter Description	Data Type	Raw Data	Range
103	Force Factory Defaults	Unsigned 16	0..1	0 = Normal 1 = Force Defaults
104	Force 0..10V Output Calibration Routine	Unsigned 16	0..1	0 = Normal 1 = Force Calibration

Note 1. The current adjusted setpoint displays the network **nominal setpoint + user adjustment**. Set network base setpoint to 0 if +/- adjustment is required to be shown.

Note 2. Modbus address can be configured via network only if the bit switches 1-6 are switched off. Please note if changed over the Modbus, the Non Volatile Memory Updated parameter **MUST BE** exercised before power cycle or reset.

Note 3. Modbus Baud Rate can be configured over the Modbus if bit switches 7 & 8 are in off state (9600). Please note if changed over the Modbus, the Non Volatile Memory Updated parameter **MUST BE** exercised before power cycle or reset.

Note 4. When the settings are changed over the communication bus, the changes for the configuration parameters are not stored in the non-volatile memory automatically. In order to store the changes "Non Volatile Memory Update" is required to be set true. If Device Configuration Tool is used, the tool will automatically force non-volatile data update.

Note 5. See **Alarm Display** section for the detailed description.

Dimensions

