

## Introduction

The CO Transmitter uses an electrochemical sensor to monitor the carbon monoxide level and outputs a field-selectable 4-20 mA or voltage signal. The voltage signal may also be set to 0-5 or 0-10 Vdc. The sensing range and output may be scaled to either 100, 150, 300, 400 or 500 ppm via the on-board menu. A front panel LCD is standard to ensure easy setup and operation.

Other standard features include a back light for the LCD, a front panel test switch, status indication and an alarm buzzer. The test function may also be controlled remotely with a digital input signal. A three-key menu is implemented to allow local configuration of all device parameters.

Optional features include one or two alarm relays and RS-485 network communications configured for either ModBus or BACnet protocols.

## Before Installation

Read these instructions carefully before installing and commissioning the CO Transmitter. Failure to follow these instructions may result in product damage. Do not use in an explosive or hazardous environment, with combustible or flammable gases, as a safety or emergency stop device or in any other application where failure of the product could result in personal injury. Take electrostatic discharge precautions during installation and do not exceed the device ratings.

## Mounting

The CO enclosure should be mounted onto a flat surface three to five feet from the floor of the area to be controlled. The mounting hole locations are shown in the enclosure dimensional drawings. Do not mount the sensor near doors, opening windows, supply air diffusers or other known air disturbances. Avoid areas with vibrations or rapid temperature changes. Open the hinged cover by releasing the latch and connect the device according to the wiring instructions. After wiring and setup are complete, close and latch the cover. The cover may be secured with two self-tapping screws in the holes provided.

## Hardware Setup

The only hardware setup required is to select the analog output type with the pcb switch labelled **VOLT** and **mA**. Slide the switch to the correct position for the required output signal type, either 4-20 mA or 0-5/10 Vdc.

## Power and Analog Output Wiring

Use 22 AWG shielded wire for all connections and do not locate the device wires in the same conduit with wiring used to supply inductive loads such as motors. Disconnect the power supply before making any connections to prevent electrical shock or equipment damage. Make all connections in accordance with national and local codes.

The wiring configuration depends on the specific model and the installed options. Follow the example wiring diagrams to determine the correct wiring. All models have the same terminal functions. This device has a half-wave type power supply so the power supply common is the same as the output signal common. Therefore, several devices may be connected to one power supply and the output signals all share the same signal common. Use caution when grounding the secondary of an AC transformer or when wiring multiple devices so that the circuit ground point is the same on all devices and the controller.

In general, the transformer should NOT be connected to earth ground when using devices with RS-485 network connections.

This is a 3-wire sourcing device. All models require a 24 Vac/dc power supply to operate. Connect the positive dc voltage or the hot side of the ac voltage to the **ANALOG - PWR** terminal and the power supply common to the **ANALOG - COM** terminal. Note that the Analog COM terminal is NOT connected to the Relay COM terminals. The device is reverse voltage protected and will not operate if the power supply is connected backwards.

The linear output signal (either 4-20 mA or 0-5/10 Vdc) is available on the **ANALOG - CO** terminal. The signal is referenced to the Analog COM terminal. The 4-20 mA output signal operates in the Active mode and does not require a loop power supply. This means **the signal current is generated by the transmitter and must not be connected to a powered**

**input or device damage will result.** This is the typical operating mode of a “three-wire device”. Ensure the controller Analog Input (AI) matches the CO Transmitter output signal type before power is applied. The current signal has a maximum load that it will drive and the voltage output has a minimum load. Follow the ratings in the Specification section or inaccurate readings may result. The power must be disconnected to change from VOLT to mA. The analog output CO signal is typically connected directly to the Building Automation System (BAS) and used as a control parameter or for logging purposes.

**Remote Test Wiring**

The CO Transmitter has a Test function that will test the analog output and the alarm relays which is initiated by pressing the front panel TEST switch. The Test function may also be initiated remotely by shorting the **TEST +** and **TEST -** terminals. Note that the TEST - terminal is connected to the Analog COM terminal. The TEST terminals should only be connected to a dry-contact digital output from the controller that is either shorted or floating open. Ensure no power is applied to the TEST terminals. The TEST terminals may also be connected to a remote switch. If desired, only one wire need be connected to the TEST + terminal and use the power supply COM as the return signal path.

**Alarm Relay Wiring**

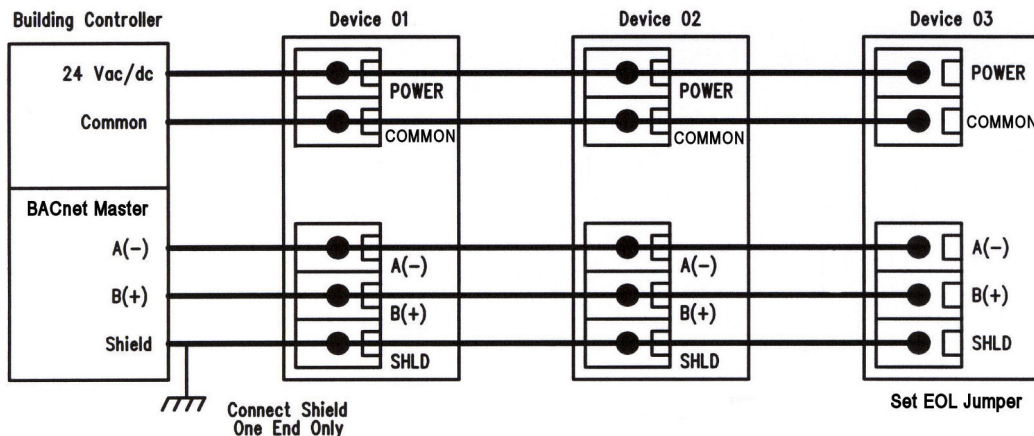
If equipped, the alarm relay outputs are available on the **NO**, **COM** and **NC** terminals for each relay. The relay COM terminals are NOT connected to the signal or power supply COM terminal nor to each other. The two relays are completely isolated and have both Normally Open (NO) and Normally Closed (NC) contacts. These signals can be used to directly control alarms, ventilation fans or may be connected to digital inputs of the BAS for status monitoring. Ensure any loads connected to the relays are within the relay ratings in the Specification section.

**RS-485 Network Wiring**

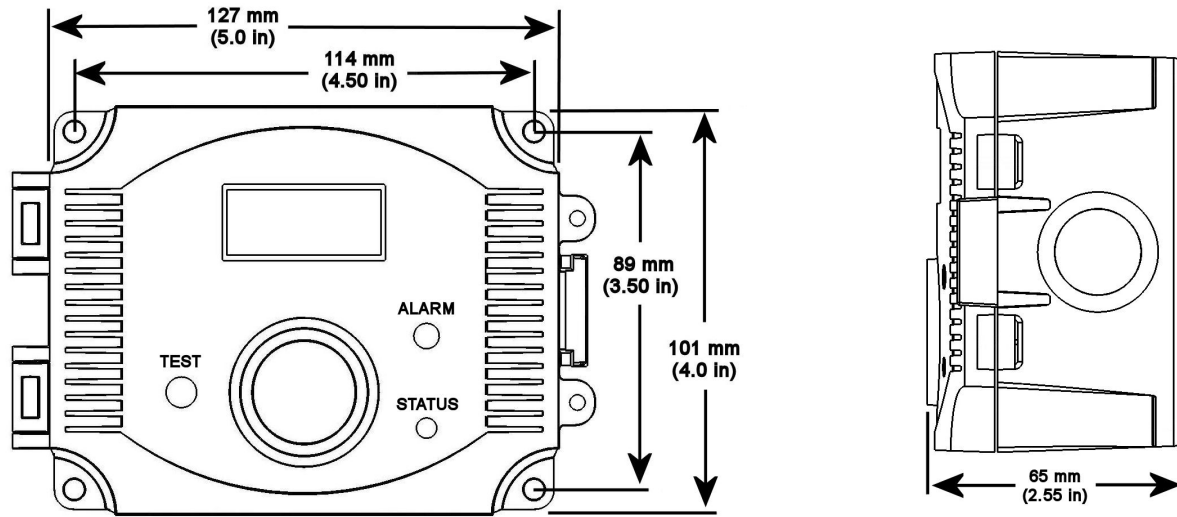
If the transmitter is equipped with RS-485 communication (ModBus), then the **COMM** terminals (**A-**, **B+** and **SHLD**) will also be available.

Connect the RS-485 network with twisted shielded pair to the terminals marked **A-**, **B+** and **SHLD**. The positive wire connects to **B(+)** and the negative wire connects to **A(-)** and the cable shield must be connected to the **SHLD** (shield) terminal on each device. If the device is installed at either end of the network, an end-of-line (EOL) termination resistor (121 ohm) should be installed in parallel to the A(-) and B(+) terminals. This device includes a network termination jumper and will connect the resistor correctly on the pcb. Simply move the pcb jumper to the **EOL** position and no external resistor is required. The ground wire of the shielded pair should be connected to earth ground at one end of the network. Do not run bus wiring in the same conduit as line voltage wiring.

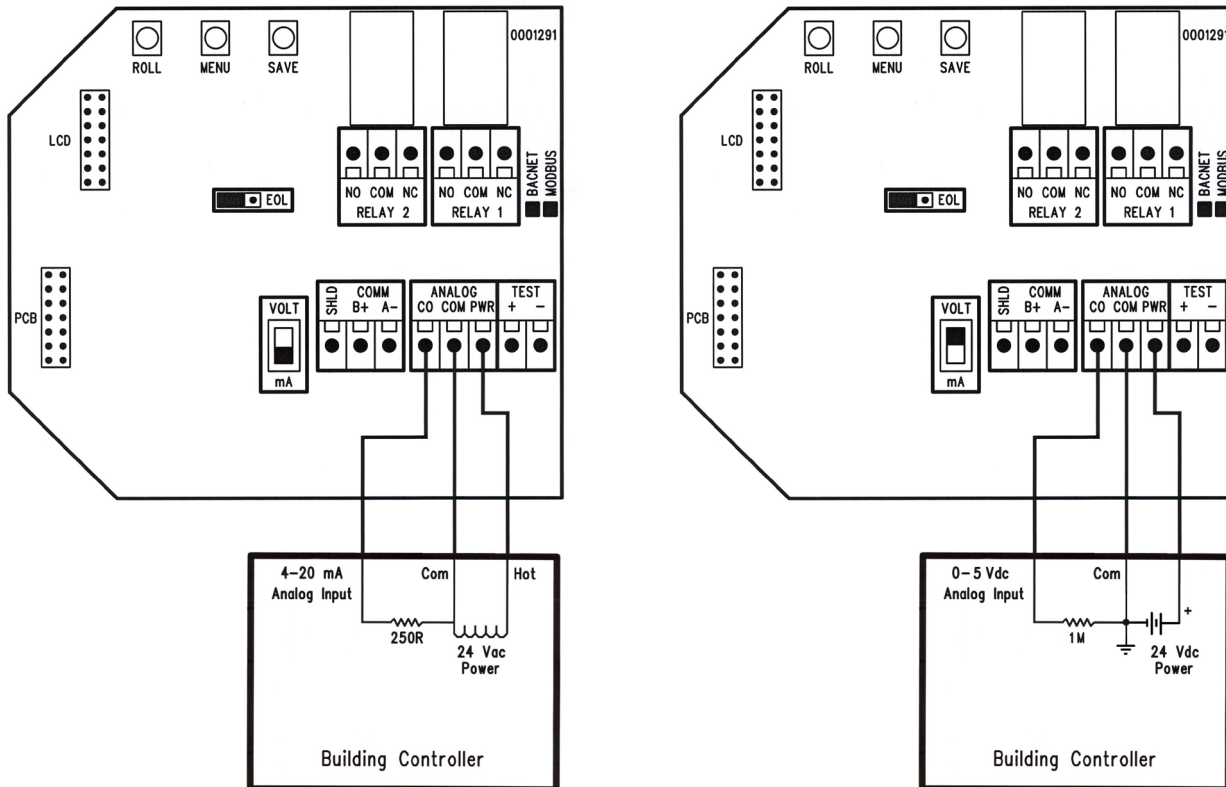
A network segment is a single shielded wire loop run between several devices (nodes) in a daisy chain configuration. The total segment length should be less than 4000 feet (1220 meters) and the maximum number of nodes on one segment is 255 for ModBus. Nodes are any device connected to the loop and include controllers, repeaters and sensors such as the CO Transmitter but do not include the EOL terminators. To install more devices, or to increase the network length, repeaters will be required for proper communication. The maximum daisy chain length (segment) depends on transmission speed (baud rate), wire size and number of nodes. If communication is slow or unreliable, it may be necessary to wire two daisy chains to the controller with a repeater for each segment.



Product Drawings



Wiring Examples



**Operation - Start-up**

Verify that the CO Transmitter is properly wired according to the wiring diagrams and all connections are tight. Ensure the output switch is in the correct position for either voltage or mA. Apply power to the device.

The device will initially start up in warm-up mode which lasts for about two minutes. Immediately after applying power the LCD will display the software version number and begin a two minute countdown. If the product has a communication option installed it will also display the ModBus address and baud rate. The alarm buzzer will also beep.

During the warm-up mode the alarm relays will be set to off, the LED will flash red, all communications are disabled, the key pad is disabled and the analog output will be set to it's minimum value.

**Operation - Normal Mode**

In normal operation the sensor will measure the CO level in the surrounding air and output a proportional value on the analog output which is scaled to the default range of 0-300 ppm. The CO reading will also be displayed on the LCD and updated in the communication value. If alarm relays are installed, the present CO reading is compared to the setpoints and appropriate action is taken if an alarm condition exists. The status LED on the front cover will be green to indicate normal operation.

**Operation - Alarm Mode**

The CO reading is compared to pre-set setpoints for alarms and if they are exceeded the device enters Alarm mode. The alarm reset back to Normal mode can be configured via the menu as either Automatic Reset or Manual Reset.

**Automatic Alarm Reset (Default)**

Two optional relays are used to indicate alarm conditions. The trip point, hysteresis and delay time of each relay can be programmed via the menu. For example, Relay 1 defaults to a 50 ppm trip point, 10 ppm hysteresis and 2 minute delay time. Relay 2 defaults to a 150 ppm trip point, 20 ppm hysteresis and 2 minute delay time. All of these values can be changed via the menu. In the example for Relay 1, a timer is started when the CO level exceeds 50 ppm (the trip level). If the level drops below 50 ppm before 2 minutes (the delay time) has expired then the relay is not activated. If the CO level exceeds 50 ppm for 2 minutes then the relay is activated. The relay will remain activated until the CO level drops below 40 ppm (trip level – hysteresis). This relay can be used to signal a “low alarm”. Relay 2 operates in the same manner and has independently programmable trip point, hysteresis and delay time. This relay can be used to signal a “high alarm”. The LCD will indicate the Alarm mode details and the LED will flash red.

The buzzer alarm defaults to a 150 ppm trip point and 5 minute delay time and can be programmed similarly to the relays. When the trip point is exceeded for a time longer than the delay time, then the buzzer will sound until the CO level falls below the trip point. The buzzer operates independently of the relay alarms and can be disabled via the menu. If enabled, and the device is in Alarm mode, pressing the TEST switch will "silence" the buzzer only. Buzzer silence will only hold until the alarm condition is cleared so the next CO setpoint alarm will activate the buzzer again.

**Manual Alarm Reset**

In this case, the alarm relays will activate the same way as described above but will not automatically reset to Normal Mode when the CO level drops below the trip level - hysteresis value. In order to reset the relay alarms to Normal Mode the user must also press the TEST switch on the front cover (or activate the remote TEST input). If the CO level is below the alarm level AND the TEST switch is pressed, then the relay alarms will return to the Normal Mode.

The Manual Reset also applies to the buzzer alarm. If the buzzer alarm is active, pressing the TEST switch will "silence" the buzzer. If the buzzer alarm was active but the CO level has been reduced below the trip point, then the TEST switch must be pressed to reset the buzzer alarm to the Normal Mode.

**Operation - Test Mode**

The Test mode function is disabled by default, it must be enabled via the menu to operate. To initiate the Test function during normal operation, either press and hold the TEST switch for 1 second or activate it remotely by shorting the TEST + to TEST – (COM). This will cause the Status LED to blink red, the analog output to go to 100% and both relays to activate. The buzzer will also beep once every 15 seconds if enabled and the LCD will indicate the Test mode and the remaining time. The Test function will continue for 5 minutes (default) and then the device will reset to normal operation. The Test function can be cancelled by pressing the TEST switch a second time. Test mode cannot be activated if the device is in Fault, Alarm or

Re-Cal modes of operation, only in Normal mode. The Test function is useful to verify the output and alarm relay operation and the Test time can be programmed via the menu.

### Operation - Fault Mode

The Fault mode function is disabled by default, it must be enabled via the menu to operate. The Fault function will monitor the CO sensor lifetime and indicate when the CO sensor should be replaced. If the device determines that the sensor has reached the end of its useful life and that replacement is necessary it will enter Fault mode. This will cause the Status LED to blink red and the buzzer to beep once every 10 minutes. The LCD will periodically show "Sensor Fault". The Fault mode can be disabled via the menu or enabled at any time. If enabled, and the device is in Fault mode, pressing the TEST switch will "silence" the buzzer due to the Fault alarm only. Buzzer silence due to the Fault alarm will hold until the fault condition is reset via the menu. The buzzer may still activate due to a CO setpoint alarm if enabled.

### Operation - Re-Cal Mode

The Re-Cal mode function is enabled by default, it must be disabled via the menu if it is not required. The Re-Cal function will monitor the device and indicate when the CO sensor should be re-calibrated. If the device determines that the sensor requires re-calibration it will enter Re-Cal mode. This will cause the Status LED to blink red and the buzzer to beep once every 10 minutes. The LCD will periodically show "ReCal Required". If enabled, and the device is in Re-Cal mode, pressing the TEST switch will "silence" the buzzer due to the ReCal alarm only. Buzzer silence due to the ReCal alarm will hold until the ReCal condition is reset via the menu. The buzzer may still activate due to a CO setpoint alarm if enabled.

### Network Communication

Details of the device setup can be found in the User Menu section. Specific ModBus protocol information is included in a separate document if the communication option is installed on the product.

### Operation - User Menu

The device has several parameters that can be configured locally via the User menu using the keypad and LCD. All parameters default to typical values but the installer may want to change some values. In some cases, such as the device network address, the installer MUST change the settings before operation. Any changes made are saved in non-volatile memory and are restored in case of a power loss. Only the menu items relevant to the device model will be shown. The menu can be accessed at any time after the warm-up mode and if there is 5 minutes of inactivity the menu will close and normal operation will continue. Note that the TEST switch has no affect when the User menu is in use.

The menu has several items as shown below. To enter the menu, press and release the <MENU> key. This will enter the User menu step 1, pressing the <MENU> key a second time advances to step 2. Each press of the <MENU> key advances the menu item. No values are saved or changed by using the <MENU> key. The <ROLL> key is used to make changes to program variables by scrolling through the available options. Holding the <ROLL> key pressed will scroll through some options at a faster rate. When a value is changed, use the <SAVE> key to save it to memory and advance to the next menu item. The first column below shows what will be displayed on the LCD, including the default value.

- |                         |                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <MENU>                  | Press and release the <MENU> key to enter the User menu                                                                                                                                                                                                                                                                          |
| 1. CO Range<br>0-300ppm | Press the <ROLL> key to scroll through the available options. The CO sensing range and output scale can be changed to 0-100ppm, 0-150ppm, 0-300ppm, 0-400ppm or 0-500ppm. Press the <SAVE> key to save any change. The factory default CO Range is 0-300ppm.                                                                     |
| <MENU>                  |                                                                                                                                                                                                                                                                                                                                  |
| 2. Buzzer<br>Enable     | Use the <ROLL> key to enable or disable the buzzer alarm. When disabled, the buzzer will not sound if the buzzer trip point is exceeded. The buzzer will still beep on startup and will still beep for a fault alarm (if enabled) and ReCal alarm (if enabled). Press <SAVE> to save the setting. The factory default is Enable. |
| <MENU>                  |                                                                                                                                                                                                                                                                                                                                  |
| 3. Buzzer<br>Trip 150   | Use the <ROLL> key to scroll through the available options. The buzzer alarm trip point may be set from 20 to 500 ppm in 10 ppm increments. Press <SAVE> to save the setting. The factory default is 150 ppm. This item will not be shown if the buzzer is disabled.                                                             |

<MENU>

- 4. Buzzer**      Use the <ROLL> key to scroll through the available options. The buzzer delay may be set from 0 to 10 minutes in 1 minute increments. Press <SAVE> to save the setting. The factory default is 5 minutes. This item will not be shown if the buzzer is disabled.  
Del 5Min

<MENU>

- 5. Buzzer**      Use the <ROLL> key to toggle the buzzer ON or OFF. This item will not be shown if the buzzer is disabled.  
Test OFF

<MENU>

- 6. Relay 1**      Use the <ROLL> key to scroll through the available options. The relay 1 alarm trip point may be set from 20 to 500 ppm in 10 ppm increments. Press <SAVE> to save the setting. The factory default is 50 ppm. This item will not be shown if relay 1 is not installed.  
Trip 50

<MENU>

- 7. Relay 1**      Use the <ROLL> key to scroll through the available options. The relay 1 hysteresis may be set from 10 to 100 ppm in 5 ppm increments. Press <SAVE> to save the setting. The factory default is 10 ppm. Note that the maximum value may be limited by the trip point value. This item will not be shown if relay 1 is not installed.  
Hyst 10

<MENU>

- 8. Relay 1**      Use the <ROLL> key to scroll through the available options. The relay 1 delay may be set from 0 to 10 minutes in 1 minute increments. Press <SAVE> to save the setting. The factory default is 2 minutes. This item will not be shown if relay 1 is not installed.  
Del 2Min

<MENU>

- 9. Relay 1**      Use the <ROLL> key to toggle relay 1 ON or OFF. This item will not be shown if relay 1 is not installed.  
Test OFF

<MENU>

- 10. Relay 2**      Use the <ROLL> key to scroll through the available options. The relay 2 alarm trip point may be set from 20 to 500 ppm in 10 ppm increments. Press <SAVE> to save the setting. The factory default is 150 ppm. This item will not be shown if relay 2 is not installed.  
Trip 150

<MENU>

- 11. Relay 2**      Use the <ROLL> key to scroll through the available options. The relay 2 hysteresis may be set from 10 to 100 ppm in 5 ppm increments. Press <SAVE> to save the setting. The factory default is 20 ppm. Note that the maximum value may be limited by the trip point value. This item will not be shown if relay 2 is not installed.  
Hyst 20

<MENU>

- 12. Relay 2**      Use the <ROLL> key to scroll through the available options. The relay 2 delay may be set from 0 to 10 minutes in 1 minute increments. Press <SAVE> to save the setting. The factory default is 2 minutes. This item will not be shown if relay 2 is not installed.  
Del 2Min

<MENU>

- 13. Relay 2**      Use the <ROLL> key to toggle relay 2 ON or OFF. This item will not be shown if relay 2 is not installed.  
Test OFF

<MENU>

- 14. TestMode**      Use the <ROLL> key to disable or enable the test mode. The factory default is Disable. When disabled, the TEST switch or TEST input will not initiate the test function. When enabled, pressing the TEST switch will  
Disable

initiate the test function. Note that the test mode will only function if the device is operating in the Normal mode, the test function cannot be initiated if any alarm is present. Press <SAVE> to save the setting.

<MENU>

- 15. TestMode Time 5** Use the <ROLL> key to scroll through the available options. The test mode operating time may be set from 1 to 15 minutes in 1 minute increments. Press <SAVE> to save the setting. The factory default is 5 minutes. This item sets how long the test mode will operate when the TEST switch is pressed. This item is not shown if the test mode is disabled.

<MENU>

- 16. Fault Md Disable** Use the <ROLL> key to select Enable, Disable or Reset. When disabled, the device will not sound the buzzer or provide LCD and status LED indication when the sensor life is exceeded. When enabled, the fault alarm will activate to indicate the sensor life is exceeded. Press <SAVE> to save the setting. The factory default is Disable. If it is set to Reset and <SAVE> is pressed, then the fault condition is cleared, the life-time timer is reset and fault mode is set back to its default of disable. It may be enabled again. This can be used if the fault alarm is required and the CO sensor is replaced.

<MENU>

- 17. Fault Md Time 3yr** Use the <ROLL> key to set the fault mode timer to 3, 4, 5 or 6 years. The factory default is 3 years. This item is not shown if the fault mode is disabled. Press <SAVE> to save the setting. If the desired time has already been exceeded, then it cannot be selected.

<MENU>

- 18. ReCal Md Enable** Use the <ROLL> key to select Enable, Disable or Reset. When disabled, the device will not sound the buzzer or provide LCD and status LED indication when the sensor requires re-calibration. When enabled, the ReCal alarm will activate to indicate the sensor requires re-calibration. Press <SAVE> to save the setting. The factory default is Enable. If it is set to Reset and <SAVE> is pressed, then the ReCal condition is cleared, the ReCal timer is reset and ReCal mode is set back to its default of Enable. This can be used if the CO sensor is required to be re-calibrated at known intervals.

<MENU>

- 19. ReCal Md Time 1yr** Use the <ROLL> key to set the ReCal mode timer to 1, 2 or 3 years. The factory default is 1 year. This item is not shown if the ReCal mode is disabled. Press <SAVE> to save the setting. This is used to set the CO sensor re-calibration interval.

<MENU>

- 20. Alarm Md Auto** Use the <ROLL> key to set the Alarm Mode to Auto or Manual. The factory default is Auto. This setting controls how the relay alarms and the buzzer alarm resets back to Normal mode. For the Auto setting, the device will reset the alarms automatically once the CO level drops below the set alarm thresholds. For the Manual setting, the CO level must be below the alarm thresholds AND the user must press the TEST switch on the device to reset the alarms. Press <SAVE> to save the setting.

<MENU>

- 21. 0 Filter Enable** Use the <ROLL> key to enable or disable the zero filter. When enabled, the device will filter low ppm readings such that 0-5 ppm CO will display and output 0 ppm. When disabled, 0-5 ppm will display and output actual 0-5 ppm. Press <SAVE> to save the setting. The factory default is Enable. Note that this should be set to Disable when doing a ZERO gas calibration.

<MENU>

- 22. Display CO Value** Use the <ROLL> key to toggle the setting to either CO Value or Status. When set to CO Value, the actual ppm value of the CO reading will be displayed on the LCD. When set to Status, the ppm value will not be displayed only the device operating status. Press <SAVE> to save the setting. The factory default is CO Value.

<MENU>

23. BackLite Enable Use the <ROLL> key to enable or disable the LCD backlight. When enabled the backlight is always on and when disabled it never lights. Press <SAVE> to save the setting. The factory default is Enable.

<MENU>

24. Out Type 0-5 Vdc Use the <ROLL> key to toggle the voltage output type to either 0-5 Vdc or 0-10 Vdc. Press <SAVE> to save the setting. The factory default is 0-5 Vdc. Note that this item is only shown if the pcb switch is in the VOLT position. Also note that the output type can only be changed by disconnecting the power to the unit.

<MENU>

25. Output Test OFF Use the <ROLL> key to scroll through the available options. The output and display depends on the output type configuration. For 4-20 mA output the settings are OFF/4/8/12/16/20 mA, for 0-5 Vdc output they are OFF/0/1/2/3/4/5 Vdc and for 0-10 Vdc output they are OFF/2/4/6/8/10 Vdc. This can be used to test the output signal.

<MENU>

**The next steps are only shown if the ModBus communication protocol is installed.**

26. ModBus Addr 01 Use the <ROLL> key to select a unique slave address from 1-255. Press <SAVE> to save the change. The factory default ModBus slave address is 1. Each device on the network must have a unique address.

<MENU>

27. BaudRate 9600 Use the <ROLL> key to select a baud rate of 300, 600, 1200, 2400, 4800, 9600 or 19200. Press <SAVE> to save the setting. The factory default ModBus baud rate is 9600.

<MENU>

28. TranMode RTU Use the <ROLL> key to toggle between RTU and ASCII modes. Press <SAVE> to save the setting. The factory default ModBus transmission mode is RTU.

<MENU>

29. Parity None Use the <ROLL> key to select a parity value of None, Odd or Even. Press <SAVE> to save the setting. The factory default ModBus parity bit is None.

<MENU>

30. StopBit 1 Use the <ROLL> key to toggle the stop bit setting between 1 and 2 (*for some configurations the value is fixed*). Press <SAVE> to save the setting. The default ModBus stop bit setting is 1.

<MENU>

31. CRC Mode A001 Use the <ROLL> key to set the CRC value to A001 (CRC-16 reverse), 1021 (CITT), 8005 (CRC-16), or 8408 (CITT reverse), then <SAVE> the value. The default RTU mode CRC polynomial is 0xA001.

<MENU>

32. Delay Minimum Use the <ROLL> key to change the value from Minimum to 50, 100, 150, 200, 250, 300 or 350ms, then <SAVE> the value. The factory default ModBus slave response delay is Minimum (*minimum delay means just more than 3.5 character time delays, 4ms for 9600 baud rate, for example*).

<MENU>

33. Menu Exit Press <SAVE> to exit the menu and return to normal operation or <MENU> to repeat the menu.



### Calibration

The CO transmitter features a cover mounted sensor pcb that is pre-calibrated. This means that the entire sensor pcb can simply be replaced with a new calibrated pcb if desired without having to remove the enclosure and the main processor board. This sensor swap can be completed in seconds. Simply unplug the device ribbon cable connection, remove the old sensor pcb, install the new pcb and reconnect the ribbon cable. There is no need to make any adjustments or apply gas to the transmitter using the sensor swap method. **In this case, the Fault Mode should be reset if it is enabled.**

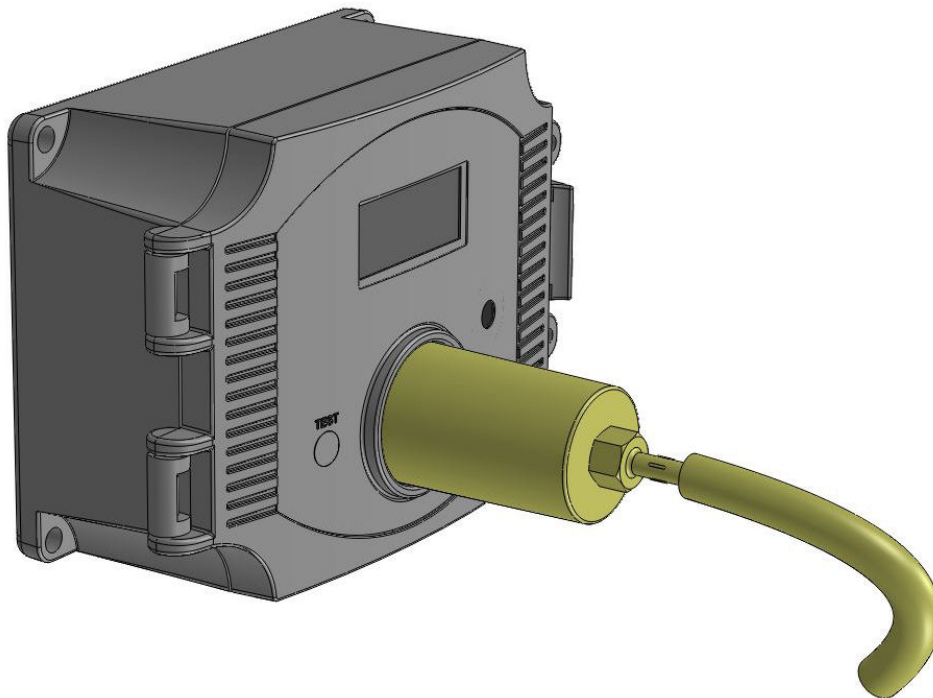
The device may also be calibrated or verified with CO gas if required. This requires a field calibration kit consisting of a bottle of gas (250 ppm CO in air for example), a tank pressure regulator with flow restrictor and the necessary tubing with a calibration cap to cover to the sensor. Calibration can be done at 20-27 °C.

Verification with gas can be done without removing the device cover. Simply apply gas using the calibration cap attached directly to the port on the cover and monitor the output signal or LCD.

The device cover must be opened to perform an actual calibration. In this case, the gas calibration cap attaches to the sensor fixture on the cover as before. The sensor must be continuously powered for at least 1/2 hour prior to calibration. Calibrate the sensor first in clean air with no CO gas present. Simply adjust the ZERO pot on the sensor board until a 4 mA (or 0 Vdc) output is obtained and the LCD displays 0 ppm. Note that the "0 Filter" menu item should be disabled to set the 0 ppm. The ZERO and SPAN pots are located on the edge of the cover sensor pcb and are clearly marked on the pcb.

Then attach the gas supply. Turn the regulator on/off knob fully off and attach it to the 250 ppm gas bottle and firmly tighten it by hand. Moisten the sponge and squeeze out any excess water. Place the sponge in the cap so that it will not touch the sensor but does not plug the hole in the side of the cap. Attach the cap to the fixture over the sensor. If the gas cap is too loose on the fixtures, simply place a wrap of electrical tape around the cap to tighten it up. Slowly turn the valve knob on the regulator to let the gas begin flowing.

The regulator will restrict the flow rate to the specified 200 ml/min and the sponge will ensure the gas is in the right humidity range. Wait for 5 minutes and then adjust the SPAN pot on the sensor board until the output and LCD reads 250 ppm. Close the valve on the tank and take the cap off from the sensor. Calibration is complete. **In this case, the ReCal Mode should be reset if it is enabled.**



**Specifications**

Measurement . . . . .	Electrochemical
Sample Method . . . . .	Diffusion
Measurement Range . . . . .	0-100, 150, 300, 400 or 500 ppm (selectable)
Accuracy . . . . .	± 5 ppm or ± 5% of reading (whichever is greater)
	0-50 °C (32-122 °F), 15-90 %RH
Operating Conditions . . . . .	-20-50 °C (-4 -122 °F), 15-90 %RH, 0.9-1.1 atm
Stability . . . . .	< 5% signal loss/year
Response Time . . . . .	< 35 seconds for 90 % step change
Typical Area Coverage . . . . .	700 m <sup>2</sup> (7500 ft <sup>2</sup> ) or 15 m (50 ft) radius
Power Supply . . . . .	24 Vdc ± 20% or 24 Vac ± 10% (non-isolated half-wave rectified)
Consumption . . . . .	100 mA max (with all options on)
Protection Circuitry . . . . .	Reverse voltage protected, output limited and transient protected
Output Signal . . . . .	4-20 mA active, 0-5 or 0-10 Vdc (selectable)
Output Drive Capability . . . . .	450 ohms max for current output, 10 Kohm min for voltage output
LCD Display . . . . .	1 ppm resolution, 1.4" w x 0.6" h (35 x 15 mm) alpha-numeric 2 line x 8 characters with backlight
Status LED . . . . .	Two color (red/green) on front panel
Test Switch . . . . .	Performs I/O tests, front panel and remote connection
Buzzer alarm . . . . .	85db @ 10 feet
Buzzer Trip Point . . . . .	Programmable 20-500 ppm in 10 ppm increments
Buzzer Delay . . . . .	Programmable 0-10 minutes in 1 minute increments
Wiring Connections . . . . .	Screw terminal block (14 to 22 AWG)
Enclosure . . . . .	5.0"w x 4.0"h x 2.55"d (127 x 101 x 65 mm)
Agency Approvals . . . . .	Sensor is UL Recognized for ANSI/UL-2034 and UL-2075, E240671
Optional Relay	
Outputs . . . . .	Form C contacts (NO and NC), 5 Amps @ 250 Vac, 5 Amps @ 30 Vdc
Relay 1 Trip Point . . . . .	Programmable 20-500 ppm in 10 ppm increments
Relay 2 Trip Point . . . . .	Programmable 20-500 ppm in 10 ppm increments
Relay Hysteresis . . . . .	Programmable 10-100 ppm in 5 ppm increments
Relay Delay . . . . .	Programmable 0-10 minutes in 1 minute increments
Optional ModBus	
Hardware . . . . .	2-wire RS-485
Software . . . . .	Native ModBus MS/TP protocol (RTU or ASCII)
Baud Rate . . . . .	Locally set to 300, 600, 1200, 2400, 4800, 9600 or 19200
Slave Address Range . . . . .	Locally set to 1-255 (factory default is 1)

## Network Communication

The device parameters must be set before connection to the network and will ensure each device will have a unique ModBus address for startup. Details of the device setup can be found in the User Menu section. Once set, all parameters are saved in non-volatile memory. The local menu and LCD are used to set the ModBus device address (1-255) and the baud rate. The factory defaults are address 01 and 9600 baud.

The menu is also used to select RTU/ASCII mode, the parity, number of stop bits, the CRC value and ModBus delay values so the device can be completely configured for the communication parameters before being connecting to the network.

## Modbus Trouble-shooting

The CO Transmitter operates as a slave. It will not communicate unless a master is connected to the network and sends a request for information, then the slave will answer. If the device does not communicate properly, first check that the communication wires are not reversed. Then check the communication parameters in the menu in the following sequence: Slave address, baud rate, transmission mode, parity bit, stop bit, RTU mode CRC polynomial and slave response delay.

The factory default Modbus address is 01 and each device must have its unique address to communicate properly on the bus. Use the menu to change the Slave address to a unique number for each unit.

The default Modbus baud rate is 9600. Use the menu to change the baud rate to the correct setting.

The default transmission mode is RTU. If this is incorrect, use the menu to change the transmission mode to ASCII.

The default Modbus parity is None. If this is not correct, use the menu to change the parity from None to Odd or Even.

The default stop bits is 1. Use the menu to change the stop bit setting to 2. For some configurations the value is fixed.

The default Modbus CRC value is A001. The menu can be used to change this setting. This only applies to RTU mode and has no effect in ASCII mode. It is the CRC polynomial setting and can be changed between A001, 1021, 8005 or 8408.

The default Modbus delay is minimum (0). This can be changed in the menu. It is the slave response delay and can be set from minimum to 350ms. For example, the minimum delay means 3.5 character time delays or 4ms for 9600 baud rate.

## ModBus Protocol

This section describes the implementation of the Modbus protocol used in the CO Transmitter. It is intended to assist control system programmers who may need to add support to their systems to communicate with this device. The CO Transmitter communicates on standard Modbus networks using either RTU or ASCII mode transmission. It operates as a slave device (address from 01 to 255) and expects a Modbus master device to transmit queries, which it will answer.

### RTU Mode Message Format

Modbus Framing	8 bit binary
Data Bits	start bits --- 1 data bits --- 8 parity bits --- none, odd or even stop bits --- 1 or 2
Baud Rate	300, 600, 1200, 2400, 4800, 9600 or 19200
Duplex	Half duplex
Error Checking	Cyclical Redundancy Check (CRC) CRC-16 --- polynomial $x^{16}+x^{15}+x^2+x^0$ 0x8005 or reversed version 0xA001 or CRC-CITT --- polynomial $x^{16}+x^{12}+x^5+x^0$ 0x1021 or reversed version 0x8408
Latency	More than 3.5 characters --- minimum, 50, 100, 150, 200, 250, 300 or 350 mS

**ASCII Mode Message Format**

Modbus Framing	ASCII characters 0...9, A...F
Data Bits	start bits --- 1 data bits --- 7 parity bits --- none, odd or even stop bits --- 1 or 2
Baud Rate	300, 600, 1200, 2400, 4800, 9600 or 19200
Duplex	Half duplex
Error Checking	Longitudinal Redundancy Check (LRC)
Latency	More than 3.5 characters --- minimum, 50, 100, 150, 200, 250, 300 or 350 mS

**Framing Support and Bit Sequences**

RTU Mode	Start	1	2	3	4	5	6	7	8	Stop	
	Start	1	2	3	4	5	6	7	8	Stop	Stop
	Start	1	2	3	4	5	6	7	8	Odd	Stop
	Start	1	2	3	4	5	6	7	8	Even	Stop
ASCII Mode	Start	1	2	3	4	5	6	7	Stop	Stop	
	Start	1	2	3	4	5	6	7	Odd	Stop	
	Start	1	2	3	4	5	6	7	Odd	Stop	Stop
	Start	1	2	3	4	5	6	7	Even	Stop	
	Start	1	2	3	4	5	6	7	Even	Stop	Stop

**Modbus Register Addressing**

Modbus Address	Typical Offset	Units	Data Type	Access	Notes
40001	+0		Word	Read	Unsigned 16-bit integer 0x0000 = CO in normal status, 0x0001 = in abnormal status
40002	+1	PPM	Word	Read	Unsigned 16-bit integer, CO value
40003	+2	°F/°C	Word	Read	Unsigned 16-bit integer, Temperature value x 10 (the application program must divide the value by 10) (For example: 214 = 21.4 °C) (0-50 °C / 32-122 °F range)
40004	+3		Word	Read	Unsigned 16-bit integer 0x0000 = buzzer not activated, 0x0001 = buzzer activated
40005	+4		Word	Read	Unsigned 16-bit integer 0x0000 = relay1 not activated, 0x0001 = relay1 activated
40006	+5		Word	Read	Unsigned 16-bit integer 0x0000 = relay2 not activated, 0x0001 = relay2 activated
40007	+6		Word	Read	Unsigned 16-bit integer 0x0000 = test not activated, 0x0001 = test activated
40008	+7		Word	Read	Unsigned 16-bit integer 0x0000 = fault not activated, 0x0001 = fault activated

40009	+8		Word	R/W	Unsigned 16-bit integer 0x0000 = Buzzer Disable, 0x0001 = Buzzer Enable
40010	+9		Word	R/W	Unsigned 16-bit integer, BUZZER_TRIP = 0 to 0x0030 TRIP = 20 + 10 * (BUZZER_TRIP) = 20 to 500 ppm
40011	+10	MIN	Word	R/W	Unsigned 16-bit integer, BUZZER_DELAY = 0 to 0x000A DELAY = BUZZER_DELAY = 0 to 10 minutes
40012	+11		Word	R/W	Unsigned 16-bit integer, RELAY1_TRIP = 0 to 0x0030 TRIP = 20 + 10 * (RELAY1_TRIP) = 20 to 500 ppm
40013	+12		Word	R/W	Unsigned 16-bit integer, RELAY1_HYST = 0 to 0x0012 HYST = 10 + 5 * (RELAY1_HYST) = 10 to 100 ppm
40014	+13	MIN	Word	R/W	Unsigned 16-bit integer, RELAY1_DELAY = 0 to 0x000A DELAY = RELAY1_DELAY = 0 to 10 minutes
40015	+14		Word	R/W	Unsigned 16-bit integer, RELAY2_TRIP = 0 to 0x0030 TRIP = 20 + 10 * (RELAY2_TRIP) = 20 to 500 ppm
40016	+15		Word	R/W	Unsigned 16-bit integer, RELAY2_HYST = 0 to 0x0012 HYST = 10 + 5 * (RELAY2_HYST) = 10 to 100 ppm
40017	+16	MIN	Word	R/W	Unsigned 16-bit integer, RELAY2_DELAY = 0 to 0x000A DELAY = RELAY2_DELAY = 0 to 10 minutes
40018	+17		Word	R/W	Unsigned 16-bit integer 0x0000 = Test Mode Disable, 0x0001 = Test Mode Enable
40019	+18		Word	R/W	Unsigned 16-bit integer, TEST_TIME = 0 to 0x000E TIME = 1 + (TEST_TIME) = 1 to 15 minutes
40020	+19		Word	R/W	Unsigned 16-bit integer 0x0000 = Fault Mode Disable, 0x0001 = Fault Mode Enable 0x0002 = Fault Mode Reset, Revert to Disable
40021	+20		Word	R/W	Unsigned 16-bit integer, FAULT_TIME = 0 to 0x0003 TIME = 3 + (FAULT_TIME) = 3 to 6 years
40022	+21		Word	R/W	Unsigned 16-bit integer 0x0000 = Status Display, 0x0001 = CO Value Display
40023	+22		Word	R/W	Unsigned 16-bit integer 0x0000 = Backlight Disable, 0x0001 = Backlight Enable
40024	+23		Word	R/W	Unsigned 16-bit integer, OUT_TEST = 0 to 0x0006 OUT = 0(OFF), 1(4mA), 2(8mA), 3(12mA), 4(16mA), 5(20mA) or OUT = 0(OFF), 1(0V), 2(1V), 3(2V), 4(3V), 5(4V), 6(5V) or OUT = 0(OFF), 1(0V), 2(2V), 3(4V), 4(6V), 5(8V), 6(10V)
40025	+24		Word	R/W	Unsigned 16-bit integer 0x0000 = ReCal Mode Disable, 0x0001 = ReCal Mode Enable 0x0002 = ReCal Mode Reset, Revert to Enable
40026	+25		Word	R/W	Unsigned 16-bit integer, ReCal_TIME = 0 to 0x0002 TIME = 1 + (ReCal_TIME) = 1 to 3 years
40027	+26		Word	R/W	Unsigned 16-bit integer 0 = °C, 1 = °F
40028	+27	°C/°F	Word	R/W	Unsigned 16-bit integer, TEMPERATURE_OFFSET = 0 to 0x14 C_OFFSET = TEMPERATURE_OFFSET / 2 - 5 = -5.0 to 5.0 °C F_OFFSET = TEMPERATURE_OFFSET - 10 = -10 to 10 °F

**Function Codes (RTU mode)****0x03 --- Read holding registers**

Query

Slave address (0x01 to 0xFF)	Function code (0x03)	Starting address MSB	Starting address LSB	Quantity of registers MSB	Quantity of registers LSB	CRC LSB	CRC MSB
---------------------------------	-------------------------	-------------------------	-------------------------	------------------------------	------------------------------	------------	------------

\* Starting address = 0x0000 to 0xFFFF, Quantity of registers = 0x0000 to 0x007D

Response

Slave address (0x01 to 0xFF)	Function code (0x03)	Byte count 2N	Register value MSB	Register value LSB	...	CRC LSB	CRC MSB
---------------------------------	-------------------------	------------------	-----------------------	-----------------------	-----	------------	------------

\* N= Quantity of registers

**0x06 --- Write single register**

Query

Slave address (0x01 to 0xFF)	Function code 0x06	Register address MSB	Register address LSB	Register value MSB	Register value LSB	CRC LSB	CRC MSB
---------------------------------	-----------------------	-------------------------	-------------------------	-----------------------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	Function code 0x06	Register address MSB	Register address LSB	Register value MSB	Register value LSB	CRC LSB	CRC MSB
---------------------------------	-----------------------	-------------------------	-------------------------	-----------------------	-----------------------	------------	------------

\* Register address = 0x0000 to 0xFFFF, Registers value = 0x0000 to 0xFFFF

**Exception response**

Slave address (0x01 to 0xFF)	Function code + 0x80	Exception code 0x01, 0x02 or 0x03	CRC LSB	CRC MSB
---------------------------------	-------------------------	--------------------------------------	------------	------------

\* An exception response is only returned if the CRC is correct  
Exception code 01 --- illegal function, 02 --- illegal address, 03 --- illegal data value**The RTU function codes supported by the CO Transmitter are shown below.****0x03 --- Read CO Status**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x00	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value 0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------------------------	-----------------------	------------	------------

\* Register value = 0x0000 in normal status, 0x0001 in abnormal status

**0x03 --- Read CO PPM**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x01	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value MSB (PPM)	Register value LSB (PPM)	CRC LSB	CRC MSB
---------------------------------	------	------	-----------------------------	-----------------------------	------------	------------

\* Register value = 0x0000 to 0x01F4, corresponding to 0 to 500 ppm

**0x03 --- Read Temperature**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x02	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value 0x00	Register value (C/F x 10)	CRC LSB	CRC MSB
---------------------------------	------	------	------------------------	------------------------------	------------	------------

Note: The temperature reading will only be valid for space type products (sensor on front cover) when the product is mounted flat on a wall with the sensor facing the operator and the LCD to the top. Changing the position will create reading inaccuracies.

The temperature register will not give accurate duct temperature values for duct style products (air flow pickup tube on the rear of the enclosure).

**0x03 --- Read Buzzer Status**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x03	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value 0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------------------------	-----------------------	------------	------------

\* Register value = 0x0000 = buzzer not activated, 0x0001 = buzzer activated

**0x03 --- Read Relay 1 Status**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x04	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value 0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------------------------	-----------------------	------------	------------

\* Register value = 0x0000 = relay 1 not activated, 0x0001 = relay 1 activated

**0x03 --- Read Relay 2 Status**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x05	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value 0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------------------------	-----------------------	------------	------------

\* Register value = 0x0000 = relay 2 not activated, 0x0001 = relay 2 activated

**0x03 --- Read Test Mode Status**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x06	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value 0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------------------------	-----------------------	------------	------------

\* Register value = 0x0000 = test mode not activated, 0x0001 = test mode activated

**0x03 --- Read Fault Mode Status**

Query

Slave address (0x01 to 0xFF)	0x03	0x00	0x07	0x00	0x01	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x03	0x02	Register value 0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------------------------	-----------------------	------------	------------

\* Register value = 0x0000 = fault mode not activated, 0x0001 = fault mode activated

**0x06 --- Write single register (BUZZER\_ENABLE)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x08	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x08	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 = buzzer disable, 0x0001 = buzzer enable

**0x06 --- Write single register (BUZZER\_TRIP)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x09	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x09	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x0030, corresponding to 20 to 500 ppm, TRIP = 20 + 10 \* (BUZZER\_TRIP)



**0x06 --- Write single register (BUZZER\_DELAY)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0A	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0A	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x000A, corresponding to 0 to 10 minutes

**0x06 --- Write single register (RELAY1\_TRIP)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0B	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0B	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x0030, corresponding to 20 to 500 ppm, TRIP = 20 + 10 \* (RELAY1\_TRIP)

**0x06 --- Write single register (RELAY1\_HYST)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0C	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0C	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x0012, corresponding to 10 to 100 ppm, HYST = 10 + 5 \* (RELAY1\_HYST)

**0x06 --- Write single register (RELAY1\_DELAY)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0D	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0D	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x000A, corresponding to 0 to 10 minutes

**0x06 --- Write single register (RELAY2\_TRIP)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0E	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0E	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x0030, corresponding to 20 to 500 ppm, TRIP = 20 + 10 \* (RELAY2\_TRIP)

**0x06 --- Write single register (RELAY2\_HYST)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x0F	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x0F	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x0012, corresponding to 10 to 100 ppm, HYST = 10 + 5 \* (RELAY2\_HYST)

**0x06 --- Write single register (RELAY2\_DELAY)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x10	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x10	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x000A, corresponding to 0 to 10 minutes

**0x06 --- Write single register (TEST\_MODE\_ENABLE)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x11	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x11	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 = test mode disable, 0x0001 = test mode enable

**0x06 --- Write single register (TEST\_TIME)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x12	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x12	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x000E, corresponding to 1 to 15 minutes, TIME = 1 + (TEST\_TIME)

**0x06 --- Write single register (FAULT\_MODE\_ENABLE)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x13	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x13	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 = fault mode disable, 0x0001 = fault mode enable, 0x0002 = fault mode reset, revert to disable

**0x06 --- Write single register (FAULT\_TIME)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x14	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x14	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x0003, corresponding to 3 to 6 years, TIME = 3 + (FAULT\_TIME)

**0x06 --- Write single register (DISPLAY\_MODE)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x15	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x15	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 = status display, 0x0001 = CO value display

**0x06 --- Write single register (BACKLIGHT\_ENABLE)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x16	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x16	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 = backlight disable, 0x0001 = backlight enable

**0x06 --- Write single register (OUTPUT\_TEST)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x17	0x00	Register value LSB*	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x17	0x00	Register value LSB*	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------------------------	------------	------------

\* Registers value = 0x0000 to 0x0006, corresponding to the output signal level (depends on output setting)

OUT = 0(OFF), 1(0V), 2(1V), 3(2V), 4(3V), 5(4V), 6(5V) for 0-5 Vdc output

OUT = 0(OFF), 1(0V), 2(2V), 3(4V), 4(6V), 5(8V), 6(10V) for 0-10 Vdc output

OUT = 0(OFF), 1(4mA), 2(8mA), 3(12mA), 4(16mA), 5(20mA), 6(20mA) for 4-20 mA output

**0x06 --- Write single register (RECAL\_MODE\_ENABLE)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x18	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x18	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 = ReCal mode disable, 0x0001 = ReCal mode enable, 0x0002 = ReCal mode reset, revert to enable

**0x06 --- Write single register (RECAL\_TIME)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x19	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x19	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* Register value = 0x0000 to 0x0002, corresponding to 1 to 3 years, TIME = 1 + (RECAL\_TIME)

**0x06 --- Write single register (C/F)**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x1A	0x00	Register value LSB*	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x1A	0x00	Register value LSB*	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	------------------------	------------	------------

\* Registers value = 0x0000 to 0x0001, corresponding to 0 = C and 1 = F

**0x06 --- Write TEMPERATURE\_OFFSET**

Query

Slave address (0x01 to 0xFF)	0x06	0x00	0x1B	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

Response

Slave address (0x01 to 0xFF)	0x06	0x00	0x1B	0x00	Register value LSB	CRC LSB	CRC MSB
---------------------------------	------	------	------	------	-----------------------	------------	------------

\* This register is used to add or subtract an offset to the temperature value if necessary to conform to a local reference.

Register value = 0x0000 to 0x0014

For °C operation, this corresponds to T\_OFFSET / 2 - 5 = -5.0 to 5.0 °C. ie: 0x0003 => 3/2 - 5 = -3.5 °C offset.

For °F operation, this corresponds to T\_OFFSET - 10 = -10 to 10 °F. ie: 0x0003 => 3 - 10 = -7 °F offset.

The operating temperature units (°C or °F) for the device should be selected first, and then add any offset if necessary.

**Exception response**

Slave address (0x01 to 0xFF)	Function code + 0x80	Exception code * 0x01, 0x02 or 0x03	CRC LSB	CRC MSB
---------------------------------	-------------------------	----------------------------------------	------------	------------

\* An exception response is only returned if the CRC is correct  
Exception code 01 --- illegal function, 02 --- illegal address, 03 --- illegal data value

**Function codes (ASCII mode)****0x03 --- Read holding registers**

Query

Start character (:) 0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	Function code (0x03) MSB (0x30)	Function code (0x03) LSB (0x33)	Starting address MSB	Starting address	Starting address	Starting address LSB
Quantity of registers MSB	Quantity of registers	Quantity of registers	Quantity of registers LSB	LRC MSB	LRC LSB	Return-line feed (CRLF) 0x0D	Return-line feed (CRLF) 0x0A	

\* Starting address = 0x0000 to 0xFFFF, Quantity of registers = 0x0000 to 0x007D

Response

Start character (:) 0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	Function code (0x03) MSB (0x30)	Function code (0x03) LSB (0x33)	Byte count MSB (N)	Byte count LSB (N)	
Register value MSB	Register value	Register value	Register value LSB	LRC MSB	LRC LSB	Return-line feed (CRLF) 0x0D	Return-line feed (CRLF) 0x0A

\* N= Quantity of registers

**0x06 --- Write single register**

Query

Start character (:) 0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	Function Code (0x06) MSB (0x30)	Function Code (0x06) LSB (0x36)	Register address MSB	Register address	Register address	Register address LSB
Register value MSB	Register value	Register value	Register value LSB	LRC MSB	LRC LSB	Return-line feed (CRLF) 0x0D	Return-line feed (CRLF) 0x0A	

\* Register address = 0x0000 to 0xFFFF, Registers value = 0x0000 to 0xFFFF

Response

Start character (:) 0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	Function Code (0x06) MSB (0x30)	Function Code (0x06) LSB (0x36)	Register address MSB	Register address	Register address	Register address LSB
Register value MSB	Register value	Register value	Register value LSB	LRC MSB	LRC LSB	Return-line feed (CRLF) 0x0D	Return-line feed (CRLF) 0x0A	

**Exception response**

Start character (:) 0x3A	Slave address (0x01 to 0xFF) MSB	Slave address (0x01 to 0xFF) LSB	Function Code + 0x80 MSB	Function Code + 0x80 LSB	Exception code 0x30		
Exception code 0x01, 0x02 or 0x03 (0x31, 0x32 or 0x33)			LRC MSB	LRC LSB	Return-line feed (CRLF) 0x0D	Return-line feed (CRLF) 0x0A	

\* An exception response is only returned if the LRC is correct  
Exception code 01 --- illegal function, 02 --- illegal address, 03 --- illegal data value

**The ASCII function codes supported by the CO Transmitter are shown below.****0x03 --- Read CO Status**

## Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x30
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

## Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
0x30	0x30	0x30	0x30 (CO normal) 0x31 (CO abnormal)	LRC MSB	LRC LSB	0x0D	0x0A

**0x03 --- Read CO PPM**

## Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x31
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

## Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
Register value MSB (PPM)	Register value (PPM)	Register value (PPM)	Register value LSB (PPM)	LRC MSB	LRC LSB	0x0D	0x0A

**0x03 --- Read Temperature °C / °F**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x32
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
Register value MSB (PPM)	Register value (PPM)	Register value (PPM)	Register value LSB (PPM)	LRC MSB	LRC LSB	0x0D	0x0A

**0x03 --- Read Buzzer Status**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x33
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
0x30	0x30	0x30	0x30 (buzzer not activated) 0x31 (buzzer activated)	LRC MSB	LRC LSB	0x0D	0x0A

**0x03 --- Read Relay 1 Status**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x34
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
0x30	0x30	0x30	0x30 (relay 1 not activated) 0x31 (relay 1 activated)	LRC MSB	LRC LSB	0x0D	0x0A

**0x03 --- Read Relay 2 Status**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x35
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
0x30	0x30	0x30	0x30 (relay 2 not activated) 0x31 (relay 2 activated)	LRC MSB	LRC LSB	0x0D	0x0A

**0x03 --- Read Test Mode Status**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x36
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
0x30	0x30	0x30	0x30 (test not activated) 0x31 (test activated)	LRC MSB	LRC LSB	0x0D	0x0A

**0x03 --- Read Fault Mode Status**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x30	0x30	0x37
0x30	0x30	0x30	0x31	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x33	0x30	0x32	
0x30	0x30	0x30	0x30 (fault not activated) 0x31 (fault activated)	LRC MSB	LRC LSB	0x0D	0x0A



**0x06 --- Write single register (BUZZER\_ENABLE)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x38
0x30	0x30	0x30	0x30 (buzzer disable) 0x31 (buzzer enable)		LRC MSB	LRC LSB	0x0D	0x0A

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x38
0x30	0x30	0x30	0x30 or 0x31		LRC MSB	LRC LSB	0x0D	0x0A

**0x06 --- Write single register (BUZZER\_TRIP)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x39
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x39
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (BUZZER\_DELAY)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x40
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x40
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (RELAY1\_TRIP)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x41
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x41
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (RELAY1\_HYST)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x42
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x42
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (RELAY1\_DELAY)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x43
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x43
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (RELAY2\_TRIP)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x44
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x44
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (RELAY2\_HYST)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x45
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x30	0x45
0x30	0x30	Register value	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (RELAY2\_DELAY)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x30
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x30
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (TEST\_MODE\_ENABLE)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x31
0x30	0x30	0x30	0x30 (buzzer disable) 0x31 (buzzer enable)	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x31
0x30	0x30	0x30	0x30 or 0x31	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (TEST\_TIME)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x32
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x32
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (FAULT\_MODE\_ENABLE)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x33
0x30	0x30	0x30	0x30 (fault mode disable) 0x31 (fault mode enable) 0x32 (fault mode reset)	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x33
0x30	0x30	0x30	0x30 or 0x31 or 0x32	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (FAULT\_TIME)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x34
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x34
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (DISPLAY\_MODE)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x35
0x30	0x30	0x30	0x30 (status display) 0x31 (CO value display)	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x35
0x30	0x30	0x30	0x30 or 0x31	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (BACKLIGHT\_ENABLE)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x36
0x30	0x30	0x30	0x30 (backlight disable) 0x31 (backlight enable)	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x36
0x30	0x30	0x30	0x30 or 0x31	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (OUTPUT\_TEST)**

Query

0x3A	Slave address 0x01 to 0xFF MSB		Slave address 0x01 to 0xFF LSB		0x30	0x36	0x30	0x30	0x31	0x37
0x30	0x30	0x30	0x30 to 0x36			LRC MSB	LRC LSB		0x0D	0x0A

Response

0x3A	Slave address 0x01 to 0xFF MSB		Slave address 0x01 to 0xFF LSB		0x30	0x36	0x30	0x30	0x31	0x37
0x30	0x30	0x30	0x30 to 0x36			LRC MSB	LRC LSB		0x0D	0x0A

**0x06 --- Write single register (RECAL\_MODE\_ENABLE)**

Query

0x3A	Slave address 0x01 to 0xFF MSB		Slave address 0x01 to 0xFF LSB		0x30	0x36	0x30	0x30	0x31	0x38
0x30	0x30	0x30	0x30 (recal mode disable) 0x31 (recal mode enable) 0x32 (recal mode reset)			LRC MSB	LRC LSB		0x0D	0x0A

Response

0x3A	Slave address 0x01 to 0xFF MSB		Slave address 0x01 to 0xFF LSB		0x30	0x36	0x30	0x30	0x31	0x38
0x30	0x30	0x30	0x30 or 0x31			LRC MSB	LRC LSB		0x0D	0x0A

**0x06 --- Write single register (RECAL\_TIME)**

Query

0x3A	Slave address 0x01 to 0xFF MSB		Slave address 0x01 to 0xFF LSB		0x30	0x36	0x30	0x30	0x31	0x39
0x30	0x30	0x30	Register value LSB			LRC MSB	LRC LSB		0x0D	0x0A

Response

0x3A	Slave address 0x01 to 0xFF MSB		Slave address 0x01 to 0xFF LSB		0x30	0x36	0x30	0x30	0x31	0x39
0x30	0x30	0x30	Register value LSB			LRC MSB	LRC LSB		0x0D	0x0A

**0x06 --- Write single register (C/F)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x40
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x40
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**0x06 --- Write single register (TEMPERATURE\_OFFSET)**

Query

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x41
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

Response

0x3A	Slave address 0x01 to 0xFF MSB	Slave address 0x01 to 0xFF LSB	0x30	0x36	0x30	0x30	0x31	0x41
0x30	0x30	0x30	Register value LSB	LRC MSB	LRC LSB	0x0D	0x0A	

**Exception response**

0x3A	Slave address (0x01 to 0xFF) MSB	Slave address (0x01 to 0xFF) LSB	Function Code * + 0x80 MSB	Function Code * + 0x80 LSB	0x30
Exception code 0x01, 0x02 or 0x03 (0x31, 0x32 or 0x33)			LRC MSB	LRC LSB	Return-line feed (CRLF) 0x0D Return-line feed (CRLF) 0x0A

\* If Function Code = 03, then MSB = 0x38, LSB = 0x33, for example