MURPHY®

M2 Wireless
Gateway and Remotes

Installation Manual

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time. The latest version of this manual can be found at www.fwmurphy.com.

WARNING

Please read the following information before installing.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- Read and follow all installation instructions.

- Please contact FW MURPHY immediately if you have any questions.

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M2 Gateway and Wireless Remotes

The following quick connect diagram provides an overview of the M2 Wireless components and how they are connected.
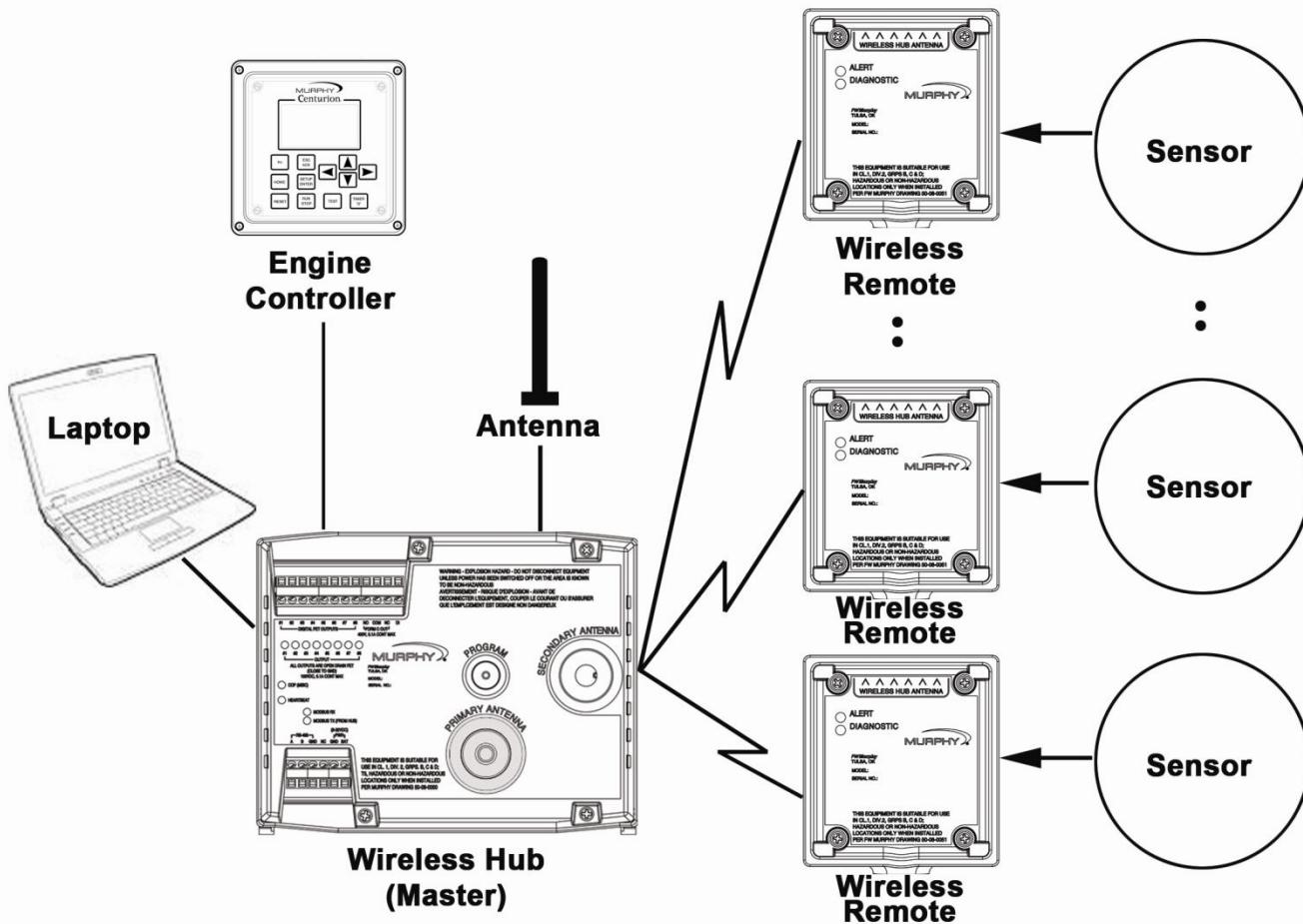
Before you begin….

Survey the location site and determine the best location for the antenna and remote units. For optimal performance, the remote units should be placed in clear line of site, or unobstructed view to the antenna. To improve line-of-site between remote and Gateway, use an appropriate length of conduit to elevate the remote above the sensor.

Tools and Equipment needed

PC, including cable to connect to RS485. RS232/RS485 adapters can be purchased from accessioproducts.com and baterunner.com. Recommended RS485 USB converter is a USB-Comi.

MODBUS configuration software is required for initial setup and activation. Listed below are two options that may be downloaded from the following sites:

- Murphy MConfig Software (www.fwmurphy.com/support/software.htm)

- Modbus Interface (www.calta.com)

- Wire cutter, stripper

- Screw driver

- Conduit, if needed to improve line-of-site between remote and Gateway

- Teflon tape

Installation Checklist

Use the checklist below as a guideline for installing and activating the M2 Wireless components.

- ❑ Site Survey - determine the best location for the antenna and remote units. (See **Before you begin….**page 1)
- ❑ Gather tools and equipment needed. (See **Tools and Equipment needed,** page 2)
- ❑ **IMPORTANT**! Shut down engine before installing M2 components.

Install the M2 Wireless Gateway and Antenna

- ❑ Mounting the Gateway (*page 4)*
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- ❑ PC to Gateway Connection (*page 7)*
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- ❑ Connect laptop PC cable to RS-485 connection on Gateway.
- ❑ Launch MODBUS program on laptop.
- ❑ Gateway Power Up – No Remotes Added Yet *(page 10)*
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- ❑ Installing Remote Units (*page 13)*

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- ❑ How to Ensure the Gateway is Powered Up (*page 11)*
- ❑ Prepare Gateway for Learn (*page 11)*
- ❑ Learn Operation (*page 15)*
- ❑ How to Reset Heartbeat Counters (*page 11)*

Installing the M2 Wireless Gateway and Antenna

Mounting the Gateway

Mount the M2 Gateway on a DIN rail inside the panel enclosure.

The M2 Gateway can be mounted vertically or horizontally on a standard DIN rail. Two clamp-type feet along the bottom of the Gateway attach to the DIN rail.

> **NOTE**: Rail stops are recommended to prevent sliding.
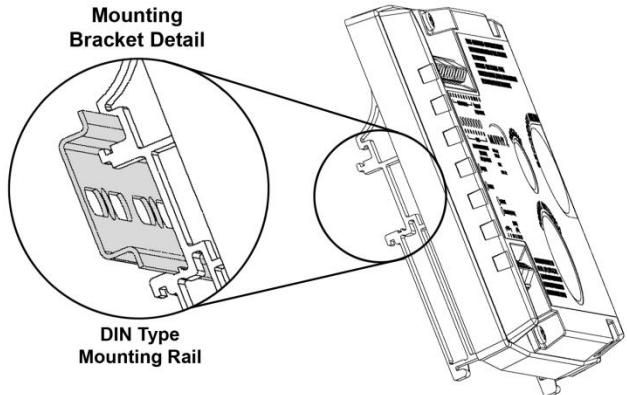
Power

Power up the Gateway by attaching a power cable to the GND/BAT terminals and connecting to a battery or power supply. Voltage must be between 8-32 volts DC.
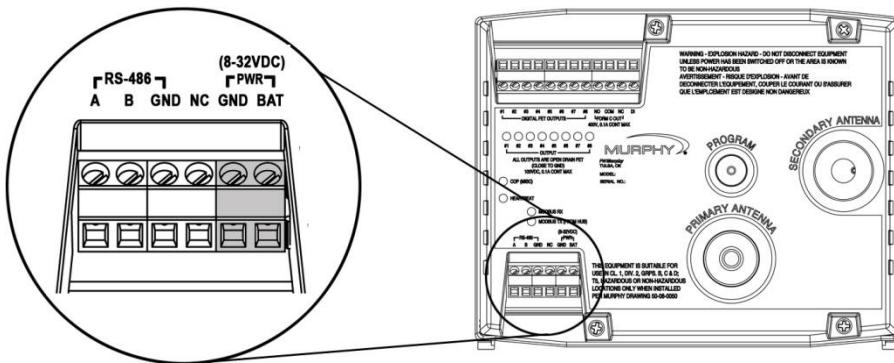
Antenna Mounting

1. Mount the antenna bracket to the top of the panel, or other structure, no more than 12 feet away from the Gateway.

2. Attach the antenna coax cable to the Primary Antenna connection on the Gateway. Feed cable down and outside of the panel through a free conduit hole. It is recommended that the coax cable be run separately from other cabling and kept away from noise sources such as the "G-Lead, cell modem cabling, antenna, etc.

3. Attach the coax cable to the antenna through the mounting bracket, locking the antenna into place.
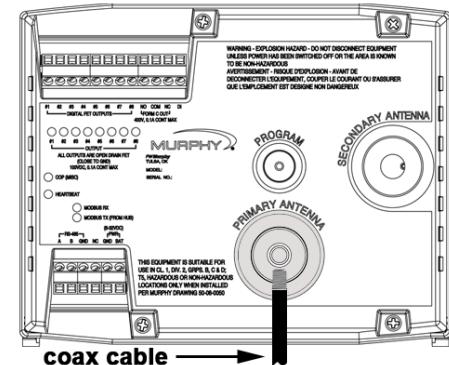
GATEWAY RF Antenna Connection
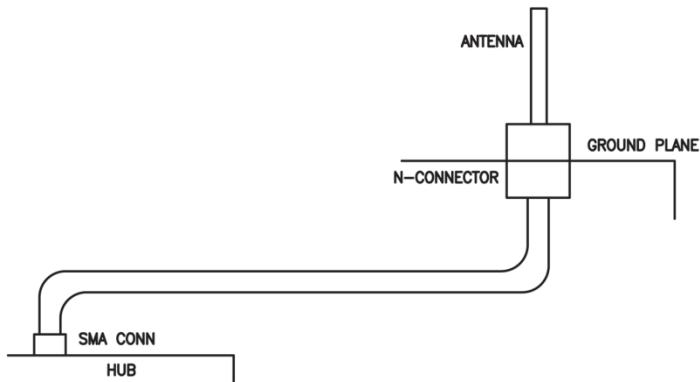
- Attach grounding plane in a horizontal position to a solid metal surface as shown.

- Base of antenna should be 3'6" to 5'6" above ground.

- Antenna should have clear line of sight to remotes for optimal performance.

PC Cabling and Software

A laptop is required to communicate MODBUS commands to the M2 Gateway. A USB-COMi port should be configured for connecting to the Gateway, and MODBUS program should be installed in order to activate the M2 Gateway and Wireless Remotes.

USB-COMi Setup

1. Open the USB-COMi USB to EIA-485 converter. Orient the converter and locate the jumper block.

2. Remove all jumpers and then reinstall a jumper at positions 1-2, 5-6, 7-8, 11-12, 15-16, and 19-20. Positions 3-4, 9-10, 13-14, and 17-18 do not have a jumper. Place excess jumpers onto one pin of positions 3-4 and 9-10 so they hang off to one side for storage. This configures the unit as terminated and transmit data echo suppression mode.

3. Reassemble the USB-COMi.

4. Locate the USB cable supplied with the USB-COMi. Connect the small end of the USB cable into the USB-COMi and install the large end of the USB cable into the computer. Do not connect USB-COMi into a USB Gateway or erratic behavior can result.

5. When Windows notifies you that "Found New hardware", insert the driver CD supplied with the USB-COMi into the computer. If the driver install does not start automatically, select "Search for the best driver for my device" on the computer and then click "Next". Click on "Specify a location" and select your CD-ROM. Driver should now install on computer.

6. "Found New Hardware" will appear again and this time it will install a USB serial port.

7. Right click on "My Computer", click on "Proprieties", click on the "Hardware" tab, and then click on "Device Manager".

8. Click on "Ports (COM & LPT)". You should now see an entry for USB Serial Port (COMX) where X represents the port number.
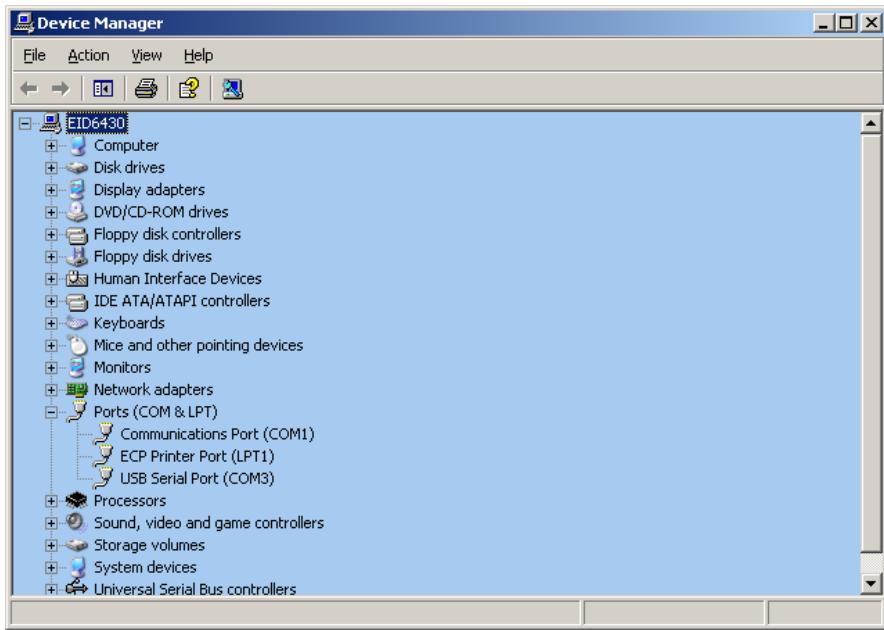
9. Double Click on USB Serial Port and a window will open that lets you set the COM port properties. Click on "Port Settings" and then set "Bits per second" to 115200 but leave "Data bits" set to 8, "Parity" to None, "Stop bits" to 1, and "Flow control" to None. Click on OK to save changes.
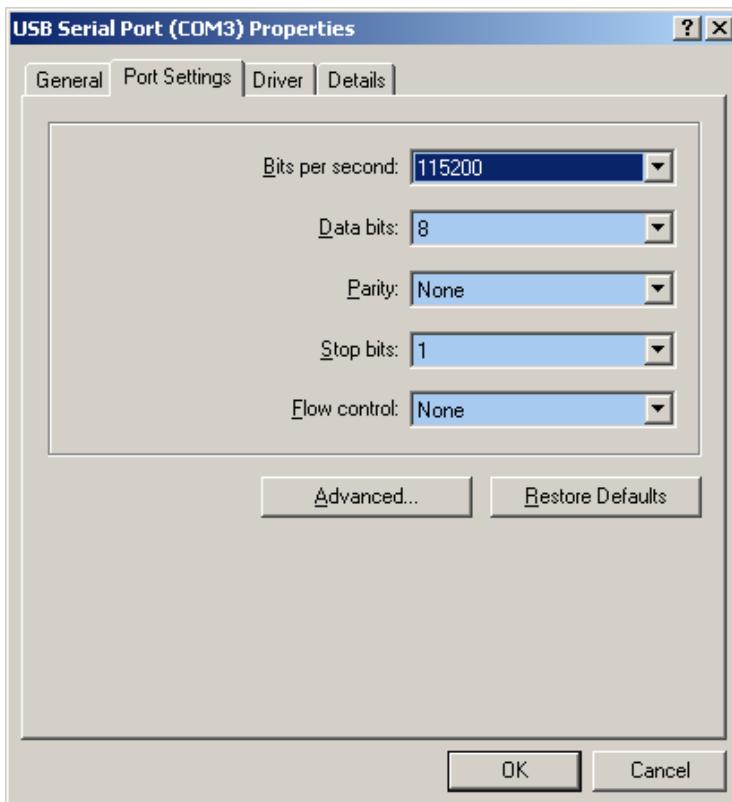
10. Close the device and properties windows.

PC to Gateway Connection

Once the USB-COMi USB to EIA-485 converter has been installed and configured on the PC, use the following guidelines to connect the PC to the Gateway.

Connect Pin 1 on USB-COMi to Gateway RS-485-B terminal

Connect Pin 2 on USB-COMi to Gateway RS-485-A terminal
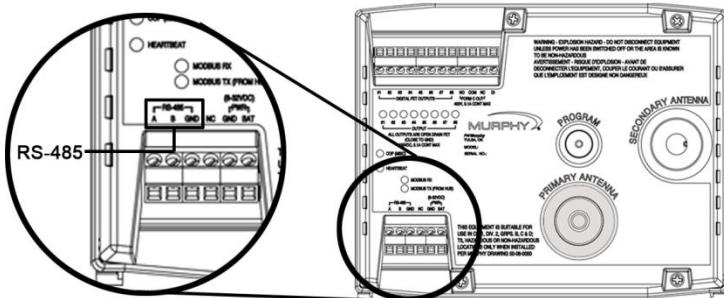
Download MODBUS configuration software

Connect to the internet and download a MODBUS application from one of the following sites:

Murphy MConfig Software (www.fwmurphy.com/support/software.htm)

"Mdbus" Interface (www.calta.com)

Follow the example below to set up the MODBUS configuration.
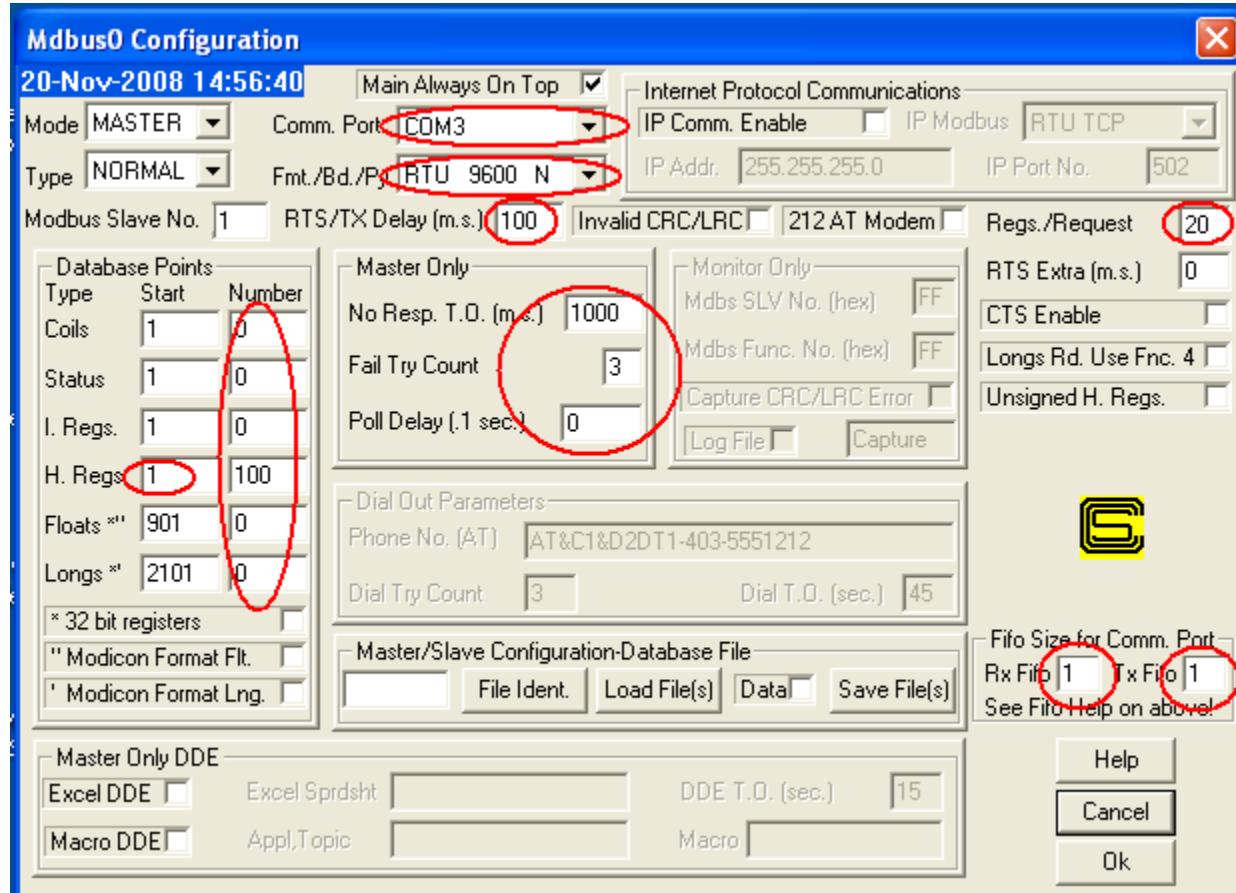
Gateway Operation

Refer to the diagram below when following the procedures outlined in this section.
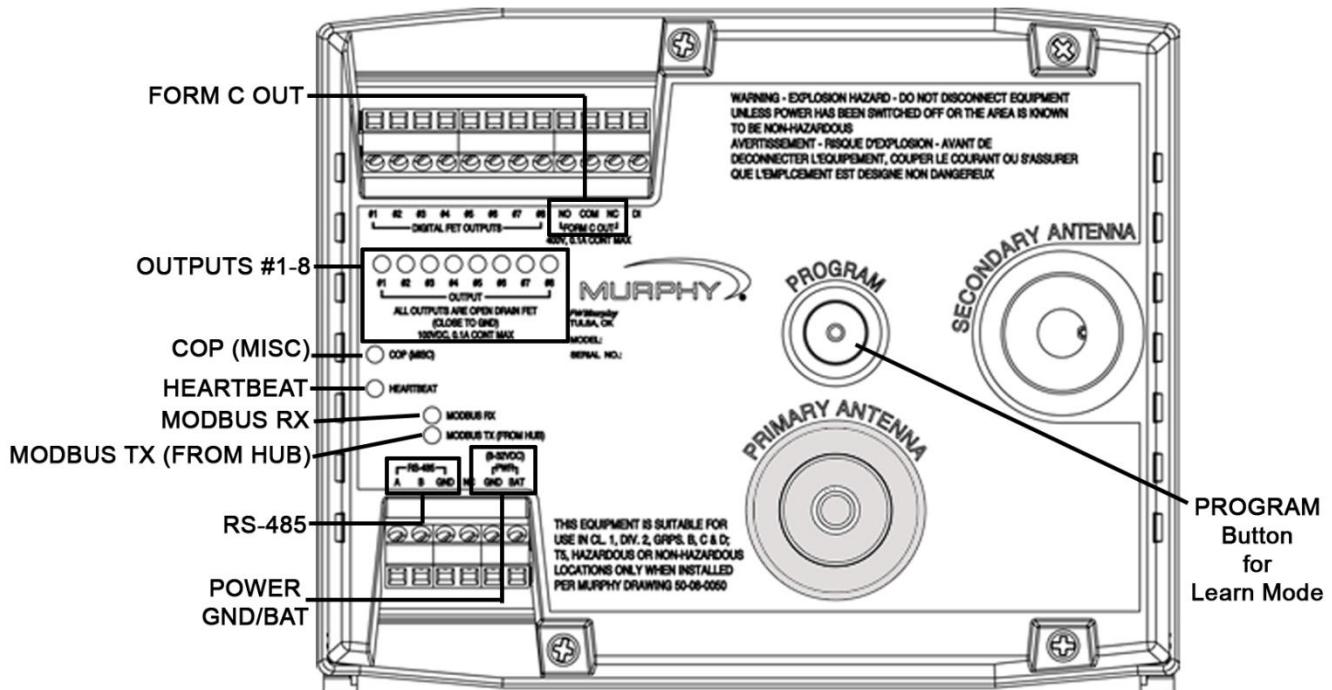
> **IMPORTANT:**
>
> When no remotes have been added to the system, the Form-C relay output will be in an alarm condition and the heartbeat LED will flash slowly.
>
> The Form-C relay output will be connected between 'COM & NO'.
>
> The LED will change state every 2 seconds.
>
> After the first remote has been added to the system, the heartbeat LED will flash more quickly.

Program the Network Address

- Ensure the Gateway is powered up.

- To enable MODBUS writes, send a value of 4660 to MODBUS address 40053.

- Set the network address by sending a unique value to MODBUS address 40051. Enter this unique value on the '**M2 Wireless Setup Sheet**' included with this manual.

- Verify that the value was programmed via the MODBUS map.

  > **IMPORTANT!**
  >
  > Network address must be programmed before Learn Mode can be enabled.
  >
  > It is important to maintain a list of network addresses at location so that two Gateways are not each programmed with the same address.
  >
  > Each Gateway must have a unique address between 1 - 255.

Gateway Power Up – No Remotes Added Yet

- Turn the power to the Gateway off.

- Leave power off for at least 10 seconds.

- Turn power to the Gateway back on.

- The 'Heartbeat' LED will start flashing slowly approximately every 2 seconds.

- All of the 'Output' LED's will be off and the 'Form C' output will be connected between 'COM & NO'.

- If there is MODBUS communication with the Gateway, then the MODBUS LED's will be flashing; otherwise they will be off.

Gateway Power Up – Remotes Already Added

- Turn the power to the Gateway off.

- Leave power off for at least 10 seconds.

- Turn power to the Gateway back on.

- The 'Heartbeat' LED will start flashing on a periodic basis.

- All of the 'Output' LED's will be off for at least 90 seconds.

- If there is MODBUS communication with the Gateway, then the MODBUS LED's will be flashing; otherwise they will be off.

- The 'Form C' output will be connected between 'COM' & 'NO' until all Remotes have reported in.

- As soon as all Remotes report in subsequent to Gateway power up, the 'Form C" output will be connected between 'COM' & 'NC'.

- In the event all Remotes do not report in within 90 seconds, the 'Output' LED(s) corresponding to the Remote(s) that have not reported in will be illuminated and the 'Form C' output will not change state.

Gateway Power Up - Power Input is Less Than 6.1 Volts but Greater Than 5.0 Volts

- The 'Heartbeat' & 'Misc' LED's are on and do not go off.

- When the power input is greater than or equal to 6.1 volts, the 'Misc' LED will go off and the 'Heartbeat' LED will start flashing on a periodic basis.

How to Ensure the Gateway is Powered Up

- Measure the voltage across the BAT/GND terminals of the power connection inputs.

- The voltage across the BAT/GND terminals must be between 8-32 VDC.

- The 'Heartbeat' LED will flash.

Prepare Gateway for Learn Operation

1. Ensure the Gateway is powered up.

2. If necessary, Reset the Gateway to Factory Defaults – this is required if the Gateway is used at a new location. (*See **How to Reset the Gateway to Factory Defaults**, page 13*).

3. Verify the Network address has been programmed into the Gateway. (*See page 10).*

> **IMPORTANT!**
>
> When no remotes have been added to the system, the Form-C relay output will be In an alarm condition and the heartbeat LED will flash.
>
> The Form-C relay output will be connected between 'COM & NO'.
>
> The LED will change state every 2 seconds.
>
> After the first remote has been added to the system, the heartbeat LED will flash every 2 seconds (approx).

4. Program the Network Address (*page 10).*

5. Press and hold the **PROGRAM** button on the Gateway until the COP (MISC) LED flashes three times, then release.

6. The COP (MISC) LED should begin flashing rapidly indicating that the Gateway has entered 'learn mode' and is waiting for a remote to initiate the learn operation.

7. If the Gateway does not detect a remote initiating the learn operation within 30 seconds, it will time out and return to normal operation. Subsequent to timing out, the COP (MISC) LED will turn off and the 'Heartbeat' LED will begin flashing again.

How to Reset Heartbeat Counters

1. Insure the Gateway is powered up.

2. On the Gateway, write a value of 4660 to MODBUS address 40053.

3. On the Gateway, write a value of 165 to MODBUS address 40098

4. On the Gateway, write a value of 161 to MODBUS address 40098

5. On the Gateway, write a value of 163 to MODBUS address 40098

How to Reset the Gateway to Factory Defaults

Program Button Method

- Press and hold the 'Program' button until the COP (MISC) LED flashes at least ten times and release.

- Turn off Gateway power.

- Wait at least 10 seconds.

- Turn Gateway power back on.

- Verify that the Gateway has been reset to factory defaults

How to Verify the Gateway is Reset to Factory Defaults

- MODBUS address 51 is zero indicating that the Network Address has been reset.

- MODBUS address 8 is zero indicating that no remotes have been added to the network.

- The 'HEARTBEAT' LED will toggle slowly. It will change state every 2 seconds.

- The 'Form C' output will be connected between 'COM & NO.'

Installing Remote Units

Read MODBUS address 40016. This will contain the remote ID of the next remote you will be adding to the network. Label the next remote to be added with the value contained in address 40016. This is done to create a reference between the remote and the MODBUS map.

> **NOTE:** The first 8 remote units correspond to Gateway LEDs 1 through 8.
> Additional remotes will use LED 8 to display sensor events.
> When a sensor event occurs, a heartbeat is missed, or the remote's
> battery is low, the Gateway will light up the appropriate LED 1 through 8.

1. Loosen the 4 screws and remove the lid to the remote enclosure. Take out the PC board and place it onto the lid. Set aside for later.

2. Place 2 wraps of Teflon tape in a clockwise fashion around threaded connection as shown.

3. Run sensor wires into the remote case, leaving a few inches of extra wire outside of the case.

4. Attach the remote case to the sensor or conduit, leaving the case opening face up.

5. Snap the battery into place on the back side of the pc board, aligning the +/- as indicated below.
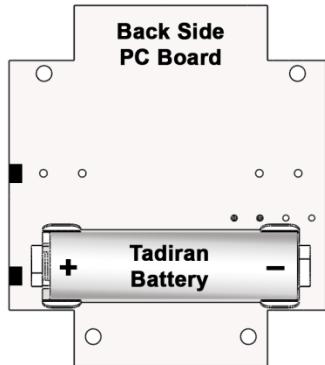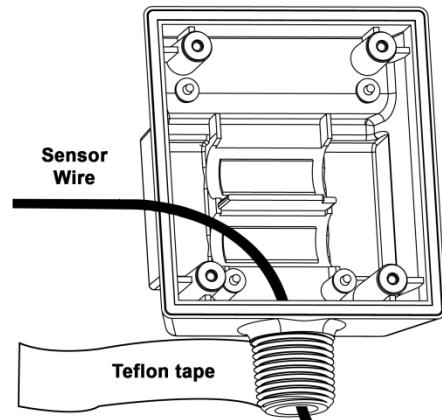
> **NOTE:** Use only **Tadiran TL-5903-S 3.6 volt Lithium batteries**. (*See How to Install a Battery in the Remote.*)

6. Replace the PC board into the casing, battery side down.

7. Trim wires and strip ends approximately 9/32 inch minimum.

8. Place wire ends in slot and screw down until snug.

> **NOTE:** Make sure wire connects directly to the J301 terminal without looping the wire inside casing.

9. Rotate the remote unit clockwise to 90° vertical position.

10. Repeat steps 1-9 for each additional remote unit. Do not replace lid until the remote has been activated and is recognized by the Gateway.
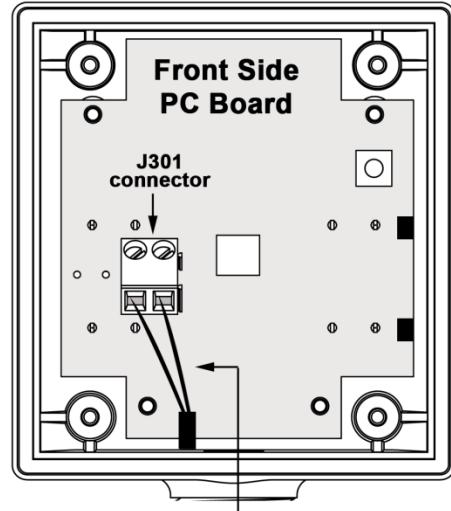
> **NOTE:** The sensor resistance must be less than 25K Ohm. If the sensor is greater than 25K Ohm, excessive current will reduce battery life.

11. Follow the instructions for "Remote Activation". Ensure the signal is recognized by the Gateway before replacing the lid in the next step.

12. Replace the lid. Hand tighten all 4 screws, then tighten-to-snug in a cross pattern to ensure even seating, as illustrated below.
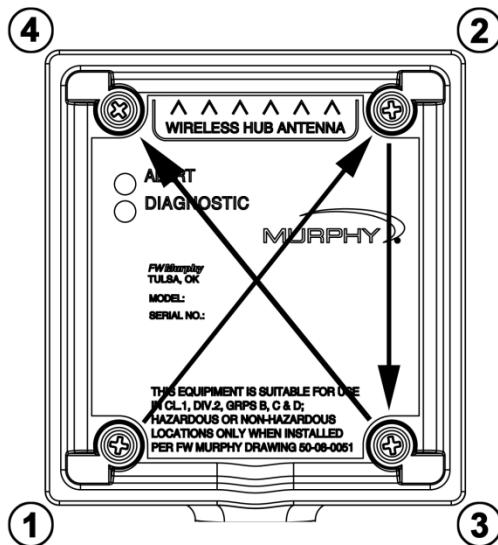
> **IMPORTANT!** In order to meet NEMA 4 requirements, ensure all 4 screws are used to hold the lid in place.

Learn Operation

NOTE: After performing the Learn Operation, you will want to reset the heartbeat counters so that accurate statistics can be recorded. Use the PC to send a command to the Gateway to Reset Heartbeat Counters (*see page 13*). This will clear any LED fault lights on the Gateway as well.

NOTE: The remote and Gateway must be a minimum of 2 feet apart at all times. If the units are placed closer than 2 feet apart, either unit may experience temporary loss of RF functionality. If this occurs, simply remove power for at least 30 seconds. Subsequent to powering back up, verify functionality

NOTE: Fifteen remotes can be added to the network.

NOTE: In the event a remote has been deleted from the network, subsequently adding a new remote will fill in the next available remote location. For instance, if remote #3 was removed from a network of eight remotes, then a new remote will be added as remote #3.
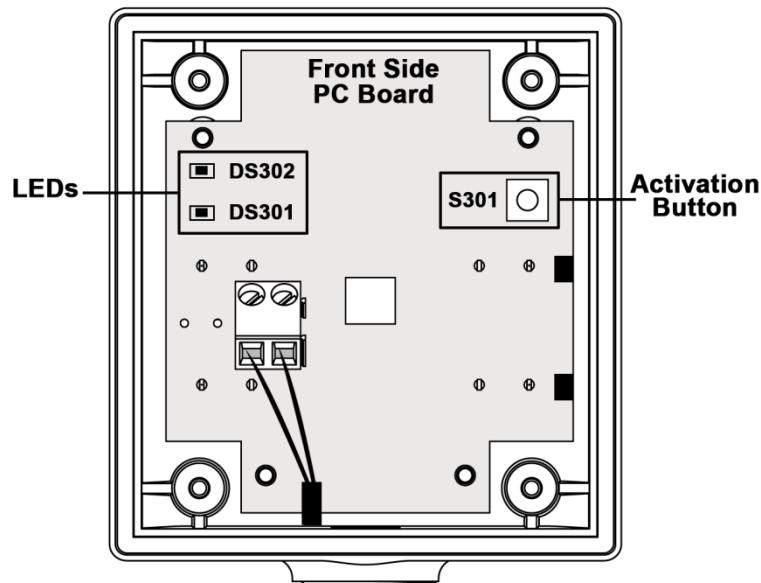
1. Verify the Network Address has been programmed on the Gateway (*see page 10*).

2. Prepare the Gateway for the Learn Operation *(see page 11)*.

3. Initiate Learn Operation at the Remote by pressing and holding the Activation Button (S301) on the Remote until DS302 flashes two times, then release.

4. Learn Operation Visual Indication

   o Learn Operation Succeeded:

      ▪ Remote: DS301 will flash rapidly followed by DS302 flashing two times to confirm success.

      ▪ Gateway: The COP (MISC) LED will stop flashing rapidly and the FET LED will illuminate that corresponds to the Remote we just added.

   o Learn Operation Failed:

      ▪ Remote: DS301 will stay on continuously while DS302 flashes five times to confirm failure.

      ▪ Gateway: The COP (MISC) LED may stop flashing as soon as the learn operation is initiated at the Remote indicating that the Learn Operation failed part way through the learn process.

      ▪ Gateway: The COP (MISC) LED may continue to flash indicating that the Gateway never received the initial communication packet from the Remote.

5. Learn Operation success can be confirmed via the MODBUS map by viewing the following MODBUS registers:

   o Register 8 which holds the 'Number of Remotes Added' will increment each time a remote is added.

   o Register 15 which holds the 'Next Remote to Add' will increment each time a remote is added.

How to Remove a Remote from the Network

1. Ensure the Gateway is powered up.

2. On the Gateway, write a value of 4660 to MODBUS address 40053 to enable MODBUS writes.

3. On the Gateway, write the remote ID to be removed to MODBUS address 40055 two times. This will remove the remote from the network.

4. Continue removing any undesired remotes.

5. Confirm that the MODBUS registers associated with the Remote have been reset to zero. See the insert for a listing of these registers.

6. Reset Heartbeat Counters (*see page 13*).

How to Install a Battery in the Remote

IMPORTANT:
USE ONLY AUTHORIZED 3.6 VOLT LITHIUM BATTERIES.

NEVER MIX OLD AND NEW BATTERIES.

ALWAYS INSTALL A BATTERY IN THE CORRECT ORIENTATION.

The thermocouple remote requires two (2) batteries.

The discrete remote requires one (1) battery.

1. You must use an approved battery such as a Tadiran TL-5903-S which is available from digikey.com.

2. Remove the PCB from the remote enclosure.

3. Remove the battery if one is installed.

4. In the event a battery was previously installed, press the switch for one second to drain any residual energy stored on the Remote.

5. Insert the battery in the remote PCB assembly, while observing the battery polarity between the battery clips in the PCB assembly.
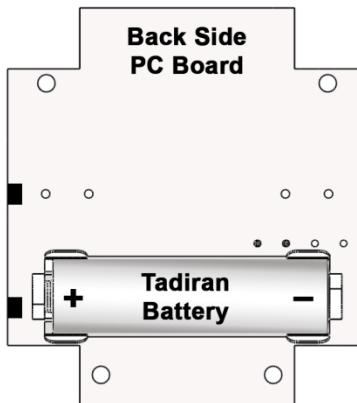
MODBUS Register Access

Gateway:
- MODBUS Registers 1-199

- See the MODBUS map overview for more information (see below).

Remote:

Each Remote is provided with a dedicated range of 50 (fifty) MODBUS registers as outlined in the table below. Access to a remote is made by adding the MODBUS register you wish to access to the base address of the remote in question.

For instance, the firmware revision is located at register 6 into each remote's address space. Therefore, reading the firmware revision requires a read from register:

- Remote #1 would read from 206 (200 + 6).
- Remote #6 would read from 456 (450 + 6).

Writing to a Remote operates the same way. For instance, Configuration Register 0 (CONFIG_0) is located at register 38. Writing to CONFIG_0 requires writing to:

- Remote #1 would write to 238 (200 + 38).
- Remote #6 would write to 488 (450 + 38).

Remote 1: • MODBUS Registers 200-249	Remote 2: • MODBUS Registers 250-299
Remote 3: • MODBUS Registers 300-349	Remote 4: • MODBUS Registers 350-399
Remote 5: • MODBUS Registers 400-449	Remote 6: • MODBUS Registers 450-499
Remote 7: • MODBUS Registers 500-549	Remote 8: • MODBUS Registers 550-599
Remote 9: • MODBUS Registers 600-649	Remote 10: • MODBUS Registers 650-699
Remote 10: • MODBUS Registers 700-749	Remote12: • MODBUS Registers 750-799
Remote 13: • MODBUS Registers 800-849	Remote 14: • MODBUS Registers 850-899
Remote 15: • MODBUS Registers 900-949	-------------------------------------

How to Program the Remote Configuration Registers

The configuration registers contain information that tells the Remote how to operate. They generally contain information related to sensor operation and behavior. For instance, it will tell the remote whether a discrete input is configured as normally open or normally closed, whether a thermocouple is type J or type K, etc.

> **NOTE:** See the section titled *MODBUS Register Access* for more information on general MODBUS register layout.

Generally, programming a configuration register is simply a matter of:

- Enabling MODBUS writes by sending a value of 4660 to MODBUS address 40053

- Writing to the desired configuration register

When a configuration register is written to, the Gateway will buffer a command that will be sent to the remote during the next heartbeat operation. This command is stored at register 34 into each remotes address space. Therefore, the command for Remote #1 would be located at register 234, Remote #2 at register 284, etc.

> **IMPORTANT:** The Gateway will not send configuration information to a remote if a sensor event exists at a remote. This is a failsafe to insure that the system is operating normally before making changes.

> **IMPORTANT:** Under certain conditions it is not possible to write to the configuration registers. If attempts to write to the configuration registers fail, the Gateway will return a MODBUS failure. Confirm that MODBUS writes are enabled and then retry the programming operation. If the failure occurs again, then wait for two heartbeat operations. If register 34 still contains a buffered command, then insure that a sensor event does not exist at the remote in question (see above note).

General Operation: Discrete Remote – ONE CHANNEL

The sensor polarity for a single channel discrete remote can be configured for a Normally Open (NO) or Normally Closed (NC) sensor contact.

A Discrete Remote is a very low power device that utilizes sleep functionality to extend battery life. The Remote remains in a sleep state until one of the following conditions occur:

- A heartbeat needs to be sent to the Gateway.

- The switch that the Remote is connected to changes state.

Heartbeat:

The Remote is programmed to send a heartbeat to the Gateway on a periodic basis which allows the Gateway to detect if a Remote goes offline due to RF communication issues or some other failure condition.

Switch State Change:

When the sensor changes state, the remote detects this change and immediately sends a special message to the Gateway alerting it that an event occurred. It then waits to receive an acknowledge (ACK) from the Gateway. If an ACK is not received within a specified time period, a series of steps are taken to insure the Gateway receives notice that a sensor event occurred. This continues until the Remote receives an ACK from the Gateway.

After receiving an ACK from the Gateway, the remote will return to normal heartbeat operation. If the switch is still in a tripped state, this event condition will be reported during the next heartbeat transmission. This allows the operator to know that a sensor needs to be manually reset or some other event condition is still active.

After the switch returns to a normal state, the Remote returns to normal operation.

How to Configure a Discrete Remote – ONE CHANNEL

Configuring a Remote for NO/NC operation is done by programming Configuration Register 0 (CONFIG_0) which is located at MODBUS register 38 in each Remote's register space.

> **NOTE:** The Remote will initially be programmed for Normally Open (NO) operation.

> **NOTE:** See *How to Program Remote Configuration Registers* for additional information on programming the Configuration Registers.

Follow these steps to program the polarity:

1. Confirm that a command for the remote is not already pending.

    o   Read register 34 in the Remote's register space and confirm that the value is zero.

    o   If the value is not zero then wait until two heartbeats have occurred at which time the value should be zero.

2. Enable MODBUS writes by sending a value of 4660 to MODBUS address 40053

3. Write a value of '0' or '1' to MODBUS register 38 in the Remote's register space.

    o   Normally Open   0
    o   Normally Closed   1

4. Confirm that the value was written correctly.

    > **NOTE:** Always test Remote operation after programming.

General Operation: Thermocouple Remote – ONE CHANNEL

A Thermocouple Remote (TC Remote) can read either Type K or Type J thermocouples and it reports temperature in Fahrenheit.

The TC Remote reports two temperatures to the Gateway every time it sends a heartbeat. These temperatures are located at:

- Ambient Temp   Register 17 into the Remotes register space (217, 267, …)
- Thermocouple Temp   Register 23 into the Remotes register space (223, 273, …)

A TC Remote is a low power device that utilizes sleep functionality to extend battery life. The Remote remains in a sleep state until one of the following conditions occur:

- A heartbeat needs to be sent to the Gateway.
- The thermocouple inputs need to be tested.

Heartbeat:

The Remote is programmed to send a heartbeat to the Gateway on a periodic basis which allows the Gateway to detect if a Remote goes offline due to RF communication issues or some other failure condition.

During the heartbeat operation, the Remote's ambient temperature and thermocouple temperature are sent to the Gateway.

Reading the Thermocouple Input:

The TC Remote wakes up on a periodic basis and reads the TC inputs. If the value is within operational parameters, then the Remote simply goes back to sleep until it is time to send a heartbeat or take another TC reading.

> **NOTE:** Default reading delay is 15 seconds.

If the TC indicates that an event condition exists, then the Remote takes appropriate action immediately. Several things can cause an event condition including:

- Inability to initialize the sensor hardware.
- An open circuit is detected for the TC sensor.
- The TC fell below an absolute minimum temperature.
  - Default is 32F
- The TC rose above an absolute maximum temperature.
  - Default is 195F

- The TC fell below the last heartbeat reading by more than the allowed amount.
  - Default is 10F
- The TC rose above the last heartbeat reading by more than the allowed amount.
  - Default is 5F
- The TC returned within the absolute temperature range after being outside, but has not passed beyond a hysteresis threshold. Hysteresis prevents false events/resets when the TC is near one of the absolute limits.
  - Default is 5F

TC Sensor Event:

When an event occurs, the Remote sends a special message to the Gateway alerting it of that fact. It then waits to receive an acknowledge (ACK) from the Gateway. If an ACK is not received within a specified time period, a series of steps are taken to insure the Gateway receives notice that a sensor event occurred. This continues until the Remote receives an ACK from the Gateway.

After receiving an ACK from the Gateway, the remote will return to normal heartbeat operation. If the thermocouple is still in an event condition, this will be reported during the heartbeat transmission. This allows the operator to know that the thermocouple event still exists.

After the temperature returns to acceptable operating parameters, the Remote returns to normal operation.

How to Configure a Thermocouple Remote – ONE CHANNEL

Configuring a Thermocouple Remote is done by programming Configuration Registers 0 -> 6 (CONFIG_0 -> CONFIG_6) which are located at MODBUS register 38 -> 44 in each Remote's register space.

> **NOTE:** See *How to Program Remote Configuration Registers* for additional information on programming the Configuration Registers.

Follow these steps to program the operating parameters:

1. Confirm that the command register is either 0 (zero) or 150. This tells us if a command is pending.
   - Read register 34 in the Remote's register space and confirm that the value is 0 (zero) or 150
   - If the value is not 0 (zero) or 150, then wait until two heartbeats have occurred at which time the value should be zero.

2. Enable MODBUS writes by sending a value of 4660 to MODBUS address 40053

3. The following configuration values can be set:
   - CONFIG_0 (register 38) Thermocouple Type
     - Type K   0
     - Type J   1
   - CONFIG_1 (register 39) Sample Frequency
     - Default is 15 seconds
     - Min value is 3 seconds
     - Max value is 60 seconds
   - CONFIG_2 (register 40) Hysteresis around the absolute min/max temperature.
     - Default is 5F
     - Min value is 0F
     - Max value is 10F
   - CONFIG_3 (register 41) Degrees the TC is allowed to increase since the last heartbeat before generating an event.
     - Default is 5F
     - Min value is 1F
     - Max value is 100F
   - CONFIG_4 (register 42) Degrees the TC is allowed to decrease since the last heartbeat before generating an event.
     - Default is 10F

- Min value is 1F
- Max value is 100F
  - CONFIG_5 (register 43) Absolute maximum temperature before generating an event
    - Default is 195F
    - Min value is 0F
    - Max value is 2150F
  - CONFIG_6 (register 44) Absolute minimum temperature before generating an event
    - Default is 32F
    - Min value is 0
    - Max value is 2150F

4. Confirm that the values are written correctly.

   NOTE: Always test Remote operation after programming.

Sensor Event Retry Counter

The sensor event retry counter is located at MODBUS register 20 into each Remotes MODBUS map. Therefore, the counter for Remote #1 would be located at register 220, Remote #2 at register 270, etc.

When a sensor event occurs, the Remote transmits this event to the Gateway. If this transmission was received by the Gateway, then the sensor event retry counter would read 1 (one).

If it took the Remote three times to transmit the event to the Gateway, then the sensor event retry counter would read 3 (three).

This counter provides the operator with a measure of the system operational integrity when a sensor event occurs.

Deep Sleep

The M2Wireless system can be placed into deep sleep when the operator knows that the Gateway will be powered off for more than a few days. This will significantly conserve Remote battery life.

> **IMPORTANT:**
> It may take up to ten minutes to wake up from deep sleep. Because of this delay, be sure to power up the gateway at least ten minutes before needing the system to be operational.

Placing the System in Deep Sleep

> **IMPORTANT:**
> There are two ways to enter Deep Sleep mode including:
> **1.** The operator tells the Gateway to enter Deep Sleep.
> **2.** The Gateway is powered off for more than one week. Remotes will enter Deep Sleep automatically without operator intervention.

Operator Manually Tells Gateway to Enter Deep Sleep

1. Write a value of 3000 to register 91.

2. Reading from register 91 should return a value of 3000. If the value is 5555, then this means that the command was rejected because one or more Remotes had commands buffered. Wait two minutes and re-issue the Deep Sleep command.

   > **IMPORTANT:**
   > It is important that no commands are buffered and waiting to be sent to any of the Remotes. See How to Program the Remote Configuration Register for more detail on buffered commands. If a command is buffered for any Remote, the Deep Sleep command will be rejected and register 91 will contain a value of 5555.

3. Immediately after writing to register, the Gateway will buffer the Deep Sleep command so that it can be sent to each Remote. This command will be sent to each Remote when it reports in for a heartbeat.

4. After all Remotes have been told to enter Deep Sleep, register 91 will change to a value of 3333.

5. After register 91 changes to a value of 3333, the Gateway can be powered off.

<u>Remotes Automatically Enter Deep Sleep</u>

In the event the Gateway is powered off for more than 1 week, the Remotes will automatically enter Deep Sleep.

> **IMPORTANT:**
> It is important to recognize that the Gateway does not know that the Remotes entered Deep Sleep. Because of this, the Gateway will likely indicate a fault condition at power up because the Remotes will not be reporting in as expected.

Operation While in Deep Sleep

While in Deep Sleep, the following behavior will be exhibited:

- Remotes will not respond to changes in the sensor inputs.

  > **CRITICAL:**
  > Because Remotes will not respond to changes in sensor inputs until communication with the Gateway is re-established, it is imperative that the equipment being protected not be allowed to run until the Gateway indicates that they system is fully operational and the Form-C relay output is connected between 'COM & NC'

- Remotes will send heartbeats much less frequently in order to conserve battery life.

Wakeup from Deep Sleep

> **IMPORTANT:**
> Because the Remotes are sending a wakeup command less frequently than during normal heartbeat operation, it can take up to ten minutes for the Gateway to register all remotes in the network after coming out of Deep Sleep mode.

> **IMPORTANT:**
> When the Gateway is powered up after being in Deep Sleep, the Form-C relay output will be connected between 'COM & NO' until the system is fully operational.

Wakeup After the Operator Manually Tells the Gateway to Enter Deep Sleep

Because the Gateway is aware that they system was placed in Deep Sleep mode prior to power-down, the Gateway will expect the Remotes to take additional time to report in.

1. Power up the Gateway.

2. Immediately after power up, the Form-C output will be connected between 'COM & NO'.

3. As the Remotes report in, the individual bits in the 'Remote Status' register (register 25) will change state from '1' to '0'. Each bit in this register maps directly to a Remote in the network.

4. If all Remotes report in within ten minutes, the Form-C output will change state to connect between 'COM & NC'. MODBUS register 91 will read a value of zero.

5. If all Remotes do not report in within ten minutes, the FET LED's will illuminate and the FET's Outputs will short to ground. You can review the 'Remote Status' register (see step 3 above) to determine which Remote(s) did not report in as expected.

Wakeup After the Remotes Automatically Enter Deep Sleep

Because the Gateway is not aware that they system was placed in Deep Sleep mode, it is likely that the Gateway will indicate a problem after the 75 second boot-up timeout. This occurs because the remotes are in a Deep Sleep state and will not send a heartbeat frequently enough to prevent this from happening.

1. Power up the Gateway.

2. Immediately after power up, the Form-C output will be connected between 'COM & NO'.

3. As the Remotes report in, the individual bits in the 'Remote Status' register (register 25) will change state from '1' to '0'. Each bit in this register maps directly to a Remote in the network.

4. If all Remotes report in within 75 seconds, the Form-C output will change state to connect between 'COM & NC'. MODBUS register 91 will read a value of zero.

5. If all Remotes do not report in within 75 seconds, the FET LED's will illuminate and the FET's Outputs will short to ground. You can review the 'Remote Status' register (see step 3 above) to determine which Remote(s) did not report in as expected.

6. After any Remotes report in, MODBUS register 91should read a value of 2222. This indicates that the Remotes entered Deep Sleep without being told to by the Gateway. After all Remotes report in, register 91 should read a value of zero.

7. Subsequent to register 91 reading a value of zero, the Gateway should be reset. See <u>How to Reset Heartbeat Counters</u>.

LED Functionality

<u>Heartbeat LED:</u>

- No Remotes added to the network:

  - The LED will toggle slowly. It will change state every 2 seconds.

- Remotes added to the network:

  - The LED will turn on for ¼ second followed by an off time of 2 seconds.

- Learn Mode:

  - The LED will change state at a rate of ¾ second – this is a fast blink rate.

- RF system did not initialize

  - The LED will change state every ¼ second – this is a very rapid blink rate indicating an error condition.

<u>COP (MISC) LED:</u>

- This is used when pressing the 'Program' button.

FCC Compliance & Warnings

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The FCC Class B limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the point of purchase or service representative for additional suggestions.

The manufacturer is not responsible for any radio or television interference caused by using other than recommended cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate this equipment.

This equipment must be installed by qualified professionals or contractors in accordance with FCC Part 15.203, Antenna Requirements.

- Do not use any antenna other than the one provided for the unit.

Warnings

RF Exposure – To comply with FCC RF exposure requirements for mobile transmitting devices, this equipment should only be used or installed at locations where there is normally at least a 12 inch separation between the antenna and all persons. NOTE: The remote contains an internal antenna while the Gateway uses an external antenna.

Do not co-locate and operate in conjunction with any other antenna, antenna cable, or transmitter.

Changes or modifications not expressly approved by Recognition Source could void the user's authority to operate this equipment.

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