Wireless Overhead Thermal Sensor

Model: THM3020

Introduction

The Traf-sys/Walker Wireless Wireless Overhead Thermal Sensors are a discreet and highly accurate solution to track foot traffic through a given area or entrance. The counter consists of two parts, a base and the sensor, and determines traffic using heat signatures from customers' heads; upon a heat signature crossing configured IN/OUT lines, a count of the appropriate direction is transmitted to the wireless transmitter.

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Required Equipment

- Traf-sys/Walker Wireless Thermal Sensor Configuration Software
- Windows XP or later laptop PC with an available 9 pin RS-232 Serial Port.
- THM3020S Setup Module (do not attempt to use any other setup module).
- Straight and Philips head screwdrivers (not included)
- Mounting bolts/screws (not included)
- Wall mount bracket or ceiling mounting plate (optional; not included)
- Wireless Transmitter and Power Supply (included in kit)
- RJ-45 patch cables (included in kit)
- Category 5 Ethernet cable for multiple sensor connection (not included)
- Female to female RJ-45 Category 5 Ethernet jacks (two per sensor)
- Cable/jack tester

Mounting and Orientation

The accuracy and reliable operation of the Wireless Overhead Thermal Sensor is largely dependent on proper mounting and orientation of the sensor(s). Per Figure 1, always be sure that the sensor's LEDs are closest to the inside of the store.

INSIDE OF STORE

Figure 1

Always follow these guidelines when installing sensors:

- 60° (low mount) sensors accommodate heights between 7'3" and 15'9".
- 40° (high mount) sensors accommodate heights between 11'5" and 24'7".
- Sensors are always mounted at an entrance inside of a store/facility; never outside or in a vestibule.
- Keep field of vision of the sensor(s) free from obstruction (e.g. hanging signage or walls).
- Cable connections are not data cables; they are simply made from the same cable type. Do not alter or rewire the cabling connections.
- Ensure that the sensor base is mounted parallel to the ceiling and securely and flat against its mounting surface (ceiling, plate or bracket).

Single Sensor Entrance

A single sensor can be used when the mounting height allows the sensor's field of view to equal or exceed the width of the entrance. Figure 2 below illustrates a single sensor installation.

Wireless Transmitter
Thermal Sensor
Power Supply
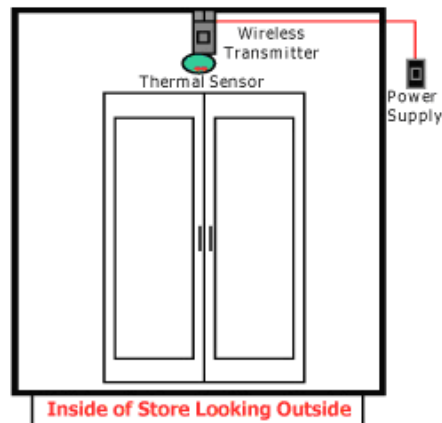**Inside of Store Looking Outside**

Figure 2

Follow these checkpoints when installing the sensor:

1. Find an appropriate mounting point for your sensor. Ensure the field of view is free from obstruction and that the mounting height allows the sensor's field of view to adequately cover the entrance.
2. Mount the sensor at the mount point and ensure the sensor's LEDs are closest to the inside of the store.
3. Connect the power supply to the wireless transmitter and the wireless transmitter to the sensor. The sensor receives its power through the wireless transmitter and also passes data to the wireless transmitter.
4. Ensure that both the sensor and wireless transmitter are receiving power. The wireless transmitter's screen should display numbers and the sensor should show activity on its LEDs.

Multiple Sensor Entrance

When an entrance's width spans an area much larger than what a single sensor can cover, multiple sensors are required. One sensor will be configured to be the master unit while the others will be configured as nodes; the nodes will receive their power and transmit data to the master in a daisy chain fashion. It is also advised that the master sensor is mounted furthest on the right when looking at the entrance from the inside of the store. See Figure 3 below for an illustration.
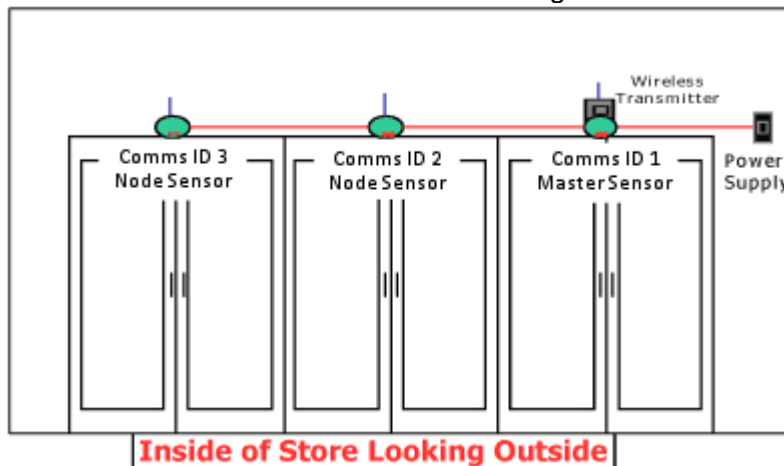

Figure 3

Follow these checkpoints when installing multiple sensors:

1. Find an appropriate mounting point for your sensors. Ensure the field of view is free from obstruction and that the mounting height allows the sensors' field of view to adequately cover the entrance.
2. Mount the sensors at the mount point and ensure the sensors' LEDs are closest to the inside of the store. Ensure that the master sensor is on the right side when looking at the entrance from the inside of the store.
3. Connect the master and node sensors together using the gray cables attached to their bases.
4. Connect the power supply to the wireless transmitter and the wireless transmitter to the master sensor via the black cable. The sensor receives

its power through the wireless transmitter and also passes data to the wireless transmitter; it will also pass to the node sensors in the same fashion.

5. Ensure that all the sensors and the wireless transmitter are receiving power. The wireless transmitter's screen should display numbers and the sensor should show activity on its LEDs.

Defining Base Characteristics	Type of Base
Base with One Black Cable	Single Sensor Base
Base with One Black Cable and One Gray Cable	Master Base (Multi-Sensor)
Base with Two Gray Cables	Intermediate Node (Multi-Sensor)
Base with One Gray Cable	Final Node (Multi-Sensor)

Table 1

Calibrating the Sensors

Once the sensors are physically installed, they must be calibrated correctly to ensure high accuracy and proper operation. Single sensor and multiple sensor entrance configurations are very similar, but there are a few extra things to be mindful of when configuring a multiple sensor entrance.

Required Equipment for Calibration

- Windows XP or later laptop PC with an available 9 pin RS-232 Serial Port.
- Traf-sys/Walker Wireless Thermal Sensor Configuration Software installed. (available at http://sw.trafsys.com/IRC3000/)
- THM3020S Setup Module; see Figure 4 below (do not attempt to use any other setup module).
- A length of serial cable long enough to reach the setup module and the RS-232 port on your PC.

Attaching the Setup Module

1. Remove the sensor from its base. This can be done by twisting the sensor counter-clockwise to unlock the sensor from the base. After the sensor is unlocked, pull to remove it from the base.
2. Connect the setup module at the 10 pin female connector inside the sensor; the 10 pin connector and port are black colored plastic. See Figure 5 below; also see Figures 6 & 7 for further illustration.
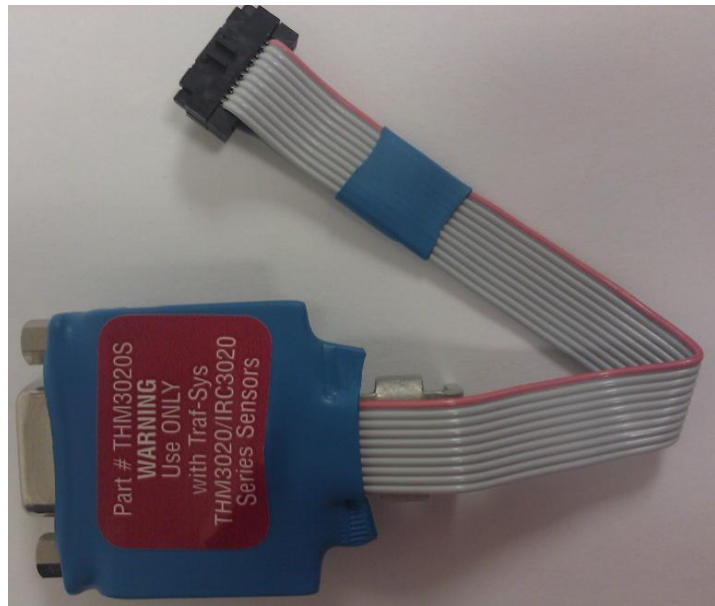
Figure 5

3. Hook the metal part of the setup module just inside the case of the sensor. This will allow the setup module to slide through a slot on the base and allow it to be available externally while the sensor is mounted. See Figure 6 & 7 below.
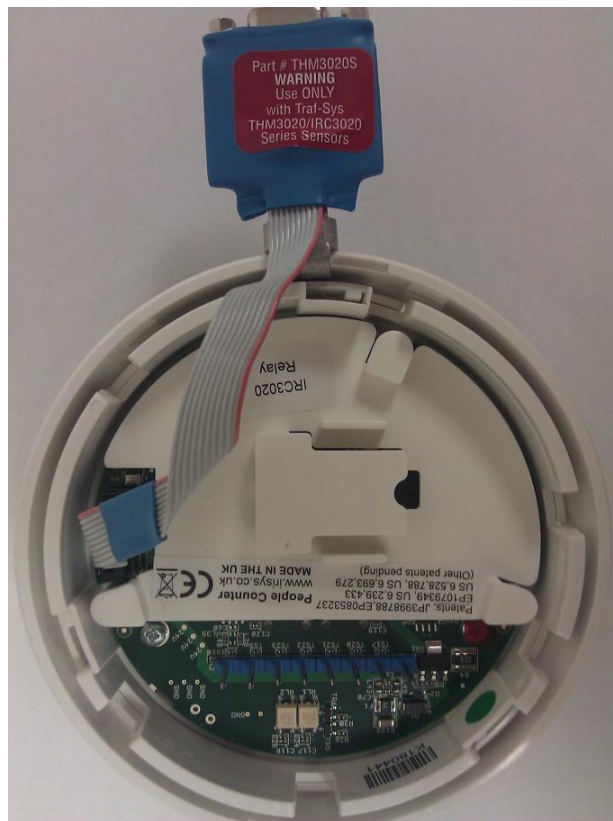

Figure 6

Figure 7

4. With the setup module in place, attach the sensor to its base again. Line the sensor back up with its pins on the base and push it into the base. Twist the sensor clockwise until it locks in to place. It is normal for the fit to tighter due to the setup module.
5. After the sensor is locked in to place, attached the serial cable to both the setup module and your laptop PC.

Single Sensor Entrance Calibration

Now that you are connected serially to the sensor with your laptop, please follow these steps to calibrate the sensor:

1. Launch the Thermal Sensor Configuration Software.
2. Select the appropriate COM port that your serial cable is connected to and click OK.
3. After the software connects to the sensor, the setup wizard will run and should tell you that the IDs need to be configured. Press Next and you will be asked to enter a Comms ID for the sensor with flashing lights. In a single sensor setup, using "1" will be safe. See Figure 8 below for illustration.
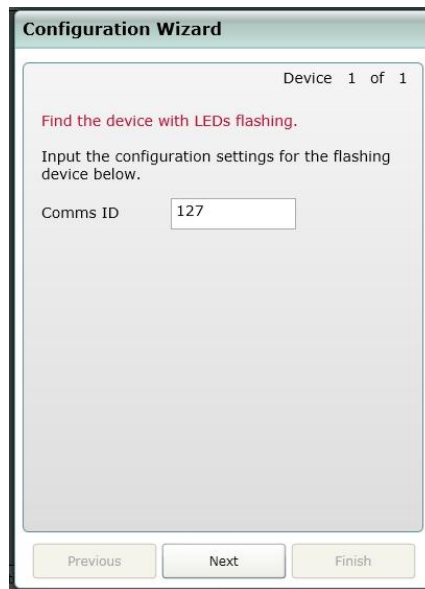
Figure 8

4. After setting the Comms ID, press Next and the wizard should report that it has saved your settings successfully.
5. Press Next and you will be presented with a screen detailing Master Nodes, Configured Nodes and Unconfigured Nodes. Click and drag the red circle for your sensor to the Master Nodes section; the number on the circle represents its Comms ID. See Figure 9 & 10 below for illustration.
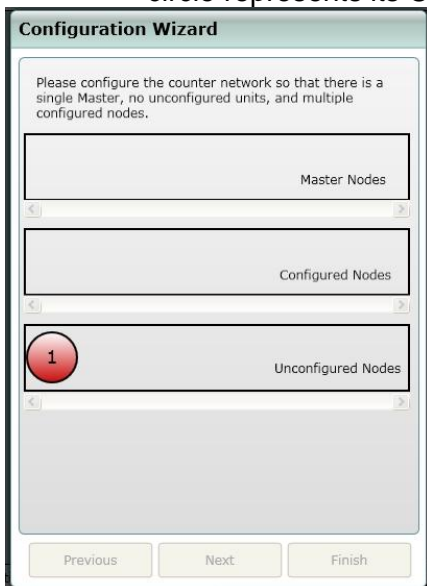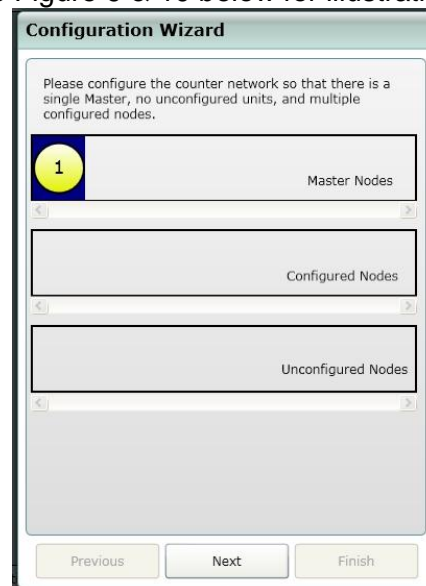

Figure 9   Figure 10

6. Press Next and the wizard should report that it has saved your settings successfully.

7. Press Next and you will be presented with a confirmation screen showing the number of sensors and the desired measurement format. See Figure 11 below for an illustration.
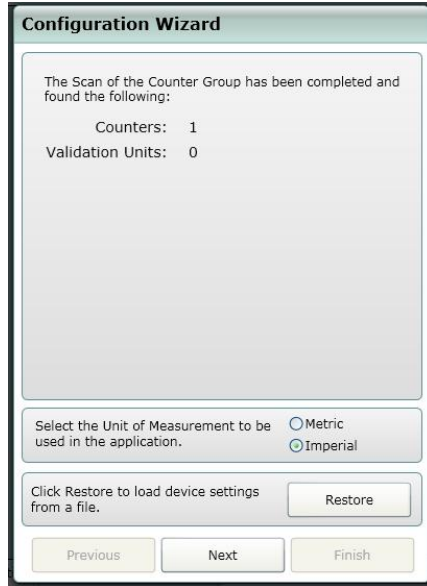

Figure 11

8. Confirm that the information displayed is correct and press Next. The wizard should report that it has saved your settings successfully.
9. Press Next and you will be presented with a screen stating that configuration is complete. Press Finish to exit the wizard. See Figure 12 below for an illustration.
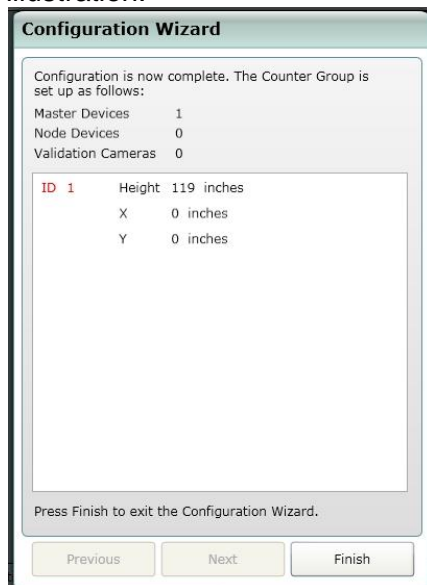

Figure 12

10. In the main screen of the configuration utility, there are a few important buttons to be mindful of: Menu, Advanced and Device Settings. The locations of these menus are highlighted in red in Figure 13 below.
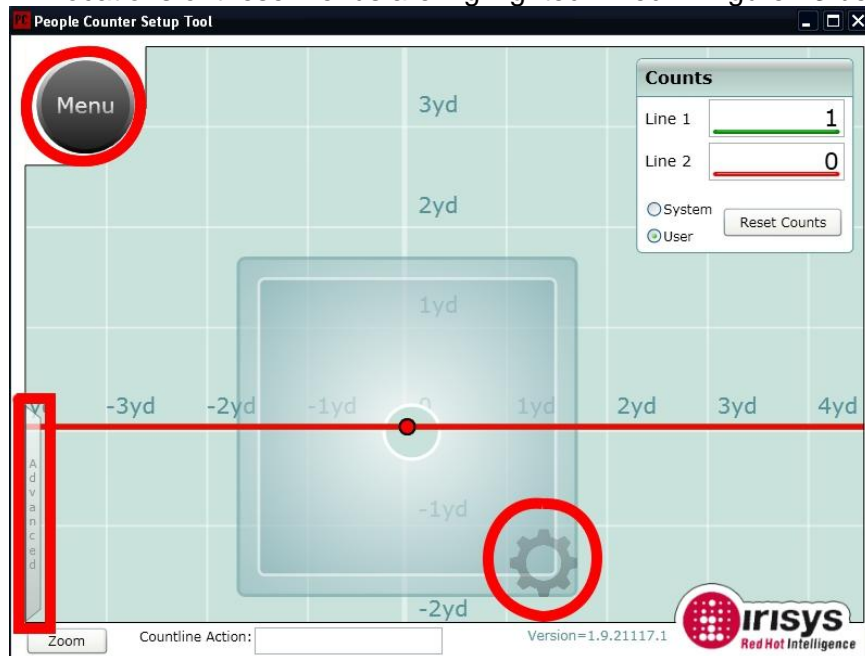

Figure 13

11. These three menus expand to reveal sub-menus. In Figure 14 below you will see the expanded Menu and Advanced while in Figure 15 below you will see the Device Settings menu (opened by clicking the gear).
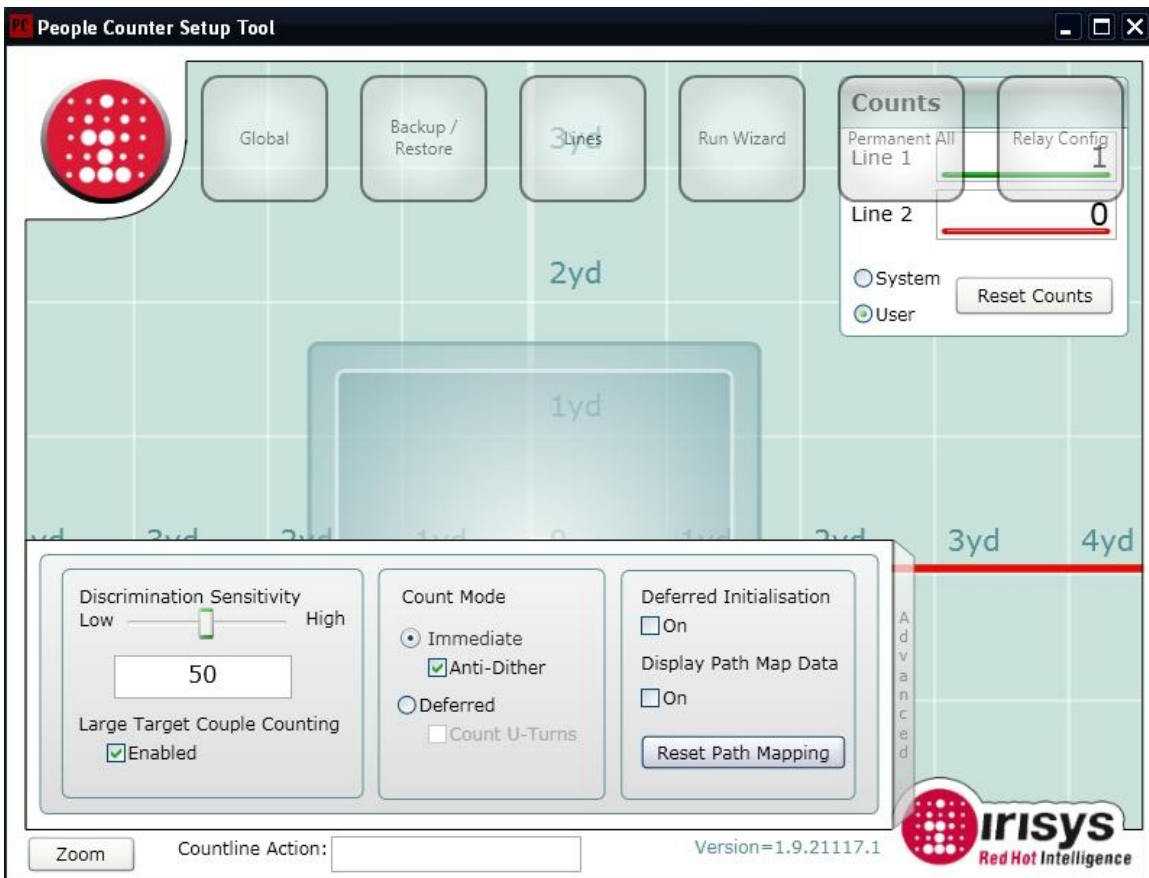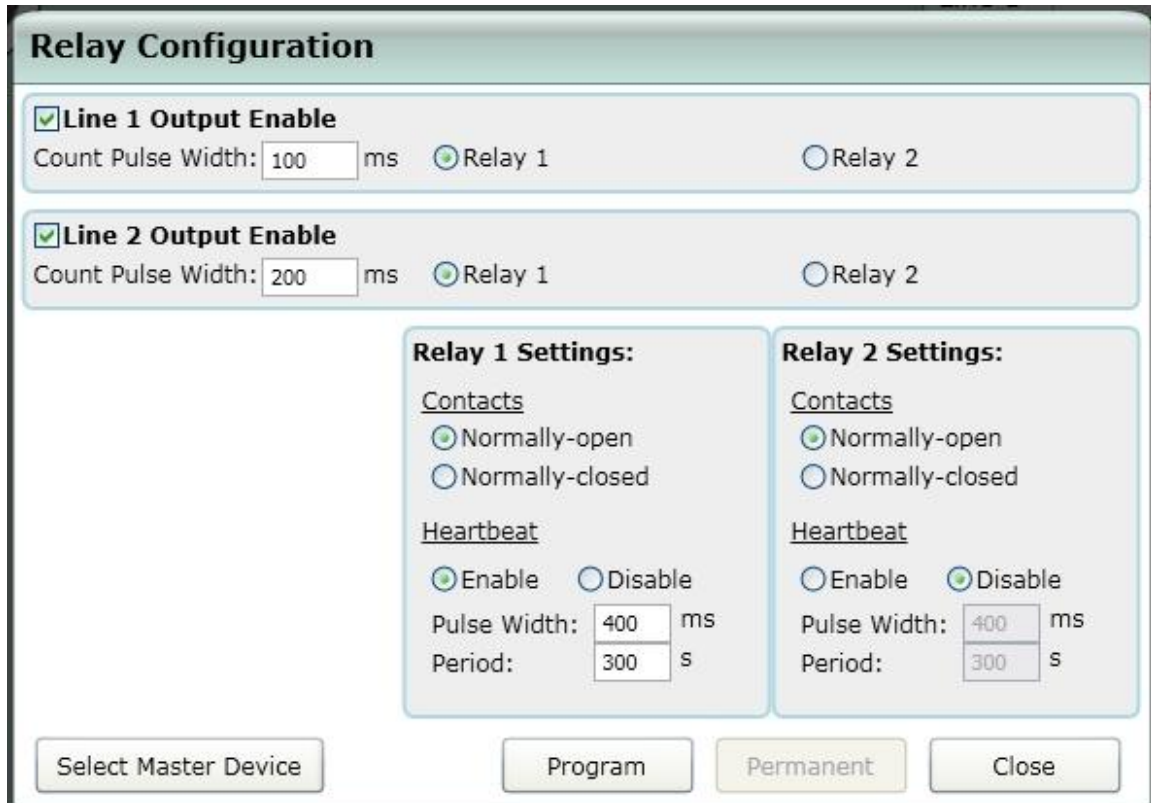
Figure 14

Figure 15

12. The sub-menu functions of Menu are as follows:

a. Global – The global settings and errors generated. Global Settings allow you to set Site information, Date, Time, Time Zone and Logging Interval. Errors and Warnings displays generated errors and warnings as well as options to clear and save them.

b. Backup/Restore – You may choose to Backup, Restore or Compare settings in this menu. Backup saves settings to a file; Restore takes settings from a file and applies them to the current sensor while Compare will compare the current settings to a previously saved file.

c. Lines – This menu allows you to reset the lines to their default positions or to invert their directions.

d. Run Wizard – Allows you to run the wizard detailed in steps 3-9 again.

e. Permanent All – This sub-menu saves all changes made to be persistent. This sub-menu should be used frequently and after any changes are made that should remain.

f. Relay Config – This sub-menu controls which relays the counter communicates on. The settings in this menu are crucial to the counter operating properly. See Figure 16 below for the correct

settings to communicate with the Traf-sys/Walker Wireless Wireless Transmitter devices.

Figure 16

13. The options of the Advanced menu function as follows and an illustration of correct Advanced menu settings will be show in Figure 17 below:
   a. Discrimination Sensitivity – This slider can be adjusted for accuracy fine tuning.
   b. Large Target Couple Counting – When Enabled the sensor attempts to count large targets (couples) as a single count. This is typically disabled.
   c. Count Mode – Immediate registers counts as lines are crossed. Deferred registers counts using the last line crossed after the customer leaves the field of view. Deferred should be used with Count U-Turns disabled.
   d. Deferred Initialization – This option adds an extra step to the initialization process in an attempt to prevent "ghost" counts from a floor that is subject to rapid temperature changes. Only use this option if this specific scenario is observed.
   e. Display Path Map Data/Reset Path Mapping – This is mostly for calibration purposes; it gives a visual representation of where customers get initialized and their path through the field of view.
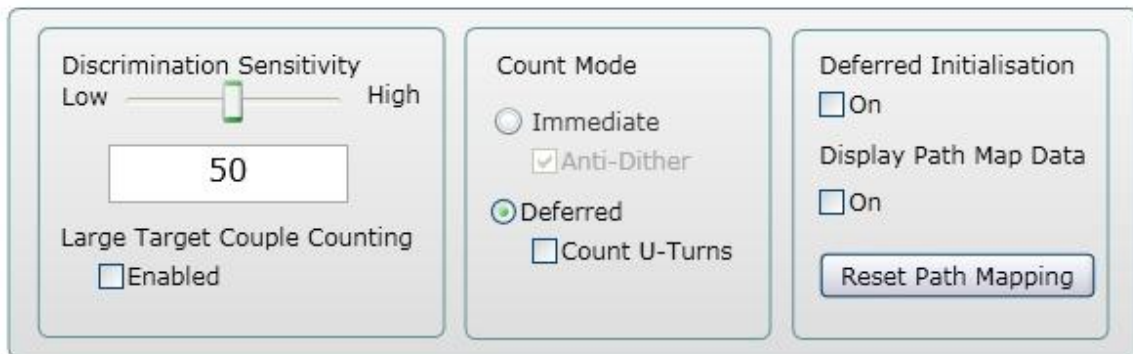
Figure 17

14. In the Device Settings menu, you will be able to adjust the Mounting Height, the X-Y and the Comms ID. The X-Y is the position relative to the 0yd, 0yd point on the graph shown in the background; X controls horizontal positioning and Y controls vertical positioning. Unit Descriptor, Device ID, Site Name, Site ID and Locale are optional settings used for device identification and informational purposes. Refer to Figure 14 above.

15. The last step of sensor calibration is adjusting the line configuration. To move the line as a whole, click on anywhere on the line that is not a dot. Clicking on the dots on the line(s) allows you to create anchor points; anchor points allow you to create a curved or otherwise customized count line. See Figure 18 below for an illustration.
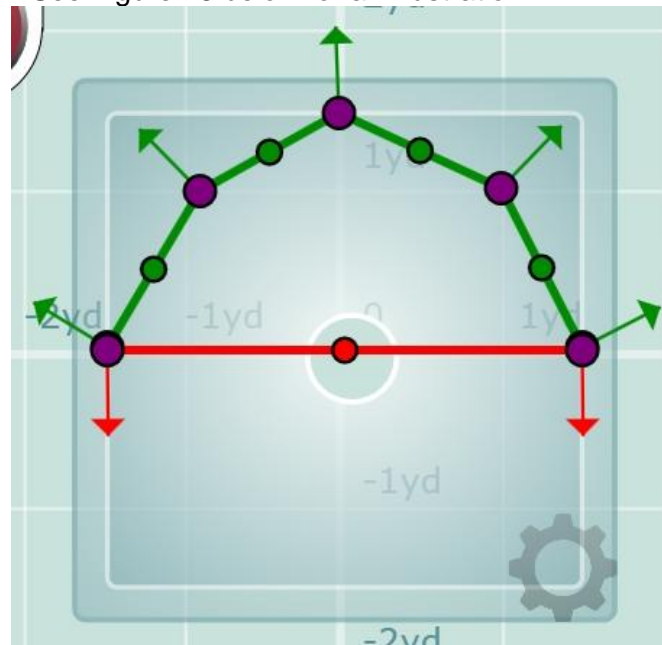

Figure 18

16. Click the Permanent All sub-menu under Menu to make all settings persistent.

17. You will now want to test your configuration (this may require the assistance of additional people). Be sure to test the following scenarios in addition to "normal" counting:
    a. People walking into the store and making a sharp turn. If the sensor fails to count, you may have to customize the line shape to better capture this type of behavior.
    b. Two or more people entering at the same time, side-by-side. This may require Large Target Couple Counting being disabled or enabled based upon customer's request.
    c. People quickly entering and leaving the store. The sensor should not miss counts of fast moving targets. If the sensor is missing these counts, the lines will have to be adjusted further inside of the store to allow more initialization time.
18. Is the sensor counting accurately? If not, adjust the appropriate settings and repeat step 17. If the sensor is counting accurately, repeat step 16 to make the settings permanent and you are finished calibrating.

Multiple Sensor Entrance Calibration

Single sensor configuration is remarkably similar to multiple sensor configuration, just take note of a few key points from below:

1. You will be configuring multiple Comms IDs in step 3. The master sensor will be Comms ID 1 and the closest sensor on its left (looking out of the store) will be Comms ID 2. Continue in this fashion incrementing the Comms ID for each additional sensor. You will be asked to set the Comms ID for the sensor that is blinking its LED lights one at a time. See Figure 3 for illustration.
2. You will have 1 Master Node and at least 1 Configured Node in step 5. You will have to drag and drop the sensors into their necessary roles. See Figure 19 below.
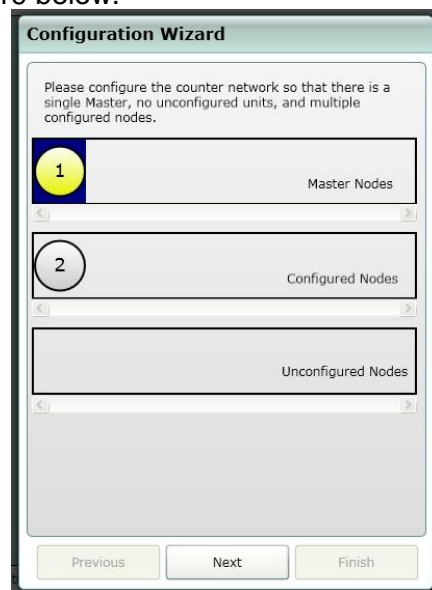
Figure 19

3. You will be required to configure the Height and X-Y of the sensors during the wizard process. Measure the appropriate Height value and use the Traf-sys Sensor Wide Opening Setup Calculator to determine the necessary X-Y offsets. See Figures 20 & 21 below.

Figure 20

Figure 21

4. There will be one square for each sensor's field of view and one gear icon on each field of view to open the Device Settings menu specific to that device. See Figure 22 below.

Figure 22

5. In step 15, ensure that the configured count lines span across all of the sensors' fields of view. As also shown in Figure 22 above.

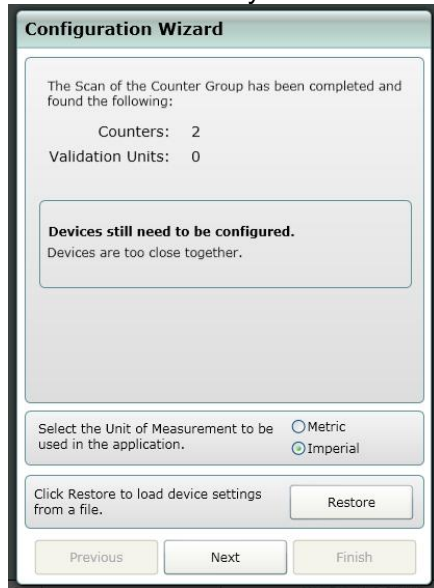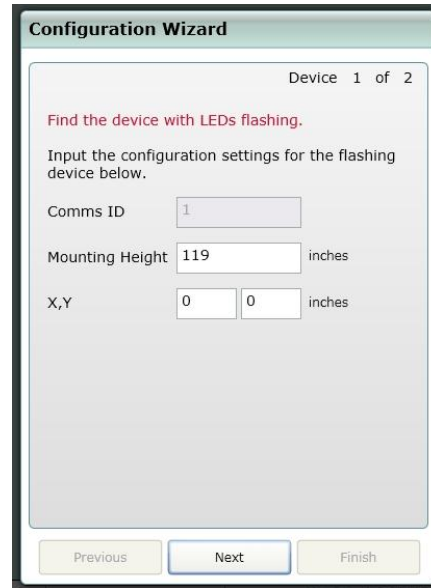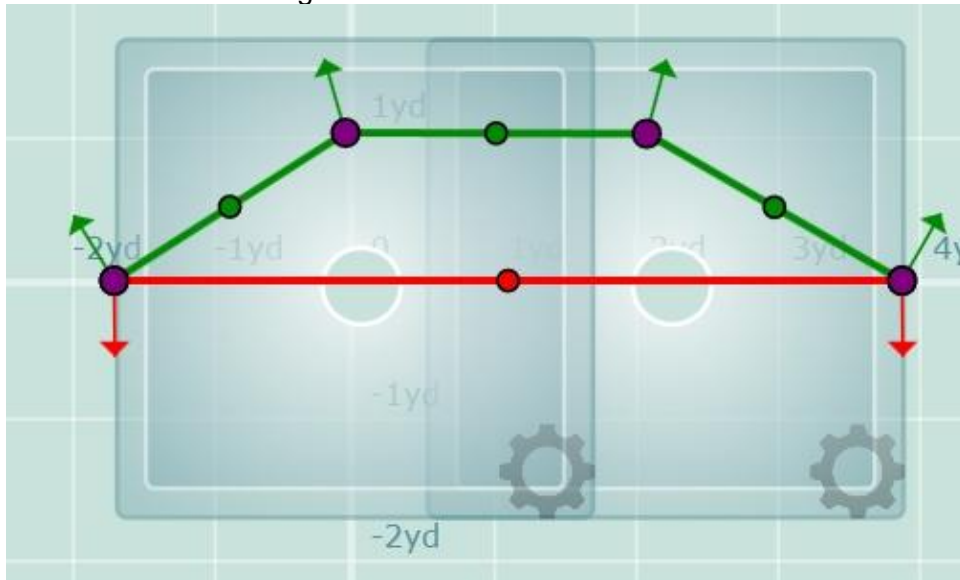## Troubleshooting

Below are solutions to common problems you may experience with the Wireless Overhead Thermal Sensor.

Thermal Issues

The Wireless Overhead Thermal Sensors perform at their best in a stable thermal environment. Situations to avoid:

- Locations where machinery or high powered lighting can cause hot spots of false heat signatures that could be read by the sensor.
- Where flooring materials could acquire and store heat via sunlight or high powered lighting.
- Locations where temperatures changes rapidly.

Mounting Issues

- Ensure that the field of view is not obstructed by any type of hanging signage, decorations, fans or lighting.
- When mounting sensors to a wall, use the supplied bracket(s) and ensure that the sensor(s) look directly downward on the detection area.
- Do not mount sensors adjacent to vibrating equipment, HVAC vents or pipes that could cause temperature changes.

Software Issues

- The sensor view freeze for a moment or two during use.
    - Some serial port drivers buffer data rather than passing it immediately to the program connected to the COM port. This can cause a pause during streaming data. This is not a fault of the sensor, but a feature of the communication port/device. Certain USB to serial converters may exhibit this problem.
- "Device did not reply to ping"
    - This error is most common when using the incorrect COM port or the sensor(s) are not powered on. Check your COM port and sensor power and try again.
- The COM port I would like to use is not listed.
    - Check other running applications. Certain applications may require the use of a COM port (virtual or physical) and may lock a COM port down while the application is running. Exit any application you feel might be locking up a COM port.
    - If you feel you do not have an application running that would be locking the COM port, check to make sure that you are using the correct COM port and that the drivers for the device are correctly installed.

Safety and Occupancy Issues

The use of Wireless Overhead Thermal Sensors for Occupancy or Safety related applications is <u>not</u> recommended. No automated people counting solution is 100% accurate, and applications of Occupancy and Safety would almost require

that level of accuracy. If you decide to use the Wireless Overhead Thermal Sensors for an Occupancy or Safety related application, do so at your own risk and keep in mind that there is likely to be an error margin involved.

LED Codes

The LED Codes below are for Normal Operation. You should not be concerned when these occur.

- **Both LEDs ON: Unit Start**
  - o As soon as power is applied to the counter it will start a boot up stage, this lasts approximately 10 seconds and is indicated by both the red and green LEDs on solidly. Close examination of the LEDs will reveal two small (<100ms) off periods as different code sections are booted. Once the counter finishes its boot up stage, it will begin its array stabilization stage.
- **LEDs Alternate Flashing: Array Stabilization**
  - o As each counter is a thermal sensing device it must stabilize to its installed environment. This stabilization stage lasts between 45 seconds and 2 minutes, dependant on ambient temperature, supply voltage/current etc. During this time, the two LEDs will alternately flash starting with red ON and green OFF, then changing to red OFF and green ON, repeating, and changing every second. If connected via the setup software then an animation will also be displayed.
- **Occasional LED 'Blip': Functioning**
  - o Following a successful warm-up period, counters will begin tracking targets and counting normally. If the counter is not yet configured then it will flash an error sequence as below. If the counter is configured, then, at this point, counters will blip both of their LEDs, together, every 5 seconds to indicate correct operation (a 'Heart beat'). Each LED will also blip independently when a person crosses the corresponding count line; green LED for Line 1, red LED for Line 2.
- **Both LEDs Flashing Together Very Quickly: Unit Identification**
  - o All counters must be configured before they will count correctly – details such as the height and ground plane position must be entered along with giving each counter a unique CAN address. Because every counter will have the same default address when installed, an LED flash sequence is instigated by the counter setup software to indicate which counter you are currently configuring. The sequence is both the red and green LEDs flashing together very quickly. This is essential when configured a network of more than one counter as it is extremely important to verify the correct counter is being configured by recognizing this identification sequence.

The LED codes below are for Error Conditions. You should be concerned when these occur. Error Conditions are noted by the red LED staying on permanently with a flash sequence coming from the green LED.

- **Red LED ON, Green LED OFF.**
  - o This indicates an internal fault which is not resolvable by the user. The only course of action available is to power down the unit, wait 10 seconds and power on again. This will rectify the problem in the majority of cases. If this does not correct the fault then the unit should be returned to your supplier for repair.
- **Red LED ON, Green LED Flashing Once per Second Repeating**
  - o This indicates that the counter is has not been configured and is at factory default address of 127. This is perfectly normal for a new unit and merely indicates that

it requires configuring. All units should be configured as part of the installation process to ensure accurate count data, and a Comms ID of between 1 and 120 should be entered for each counter. Remember that correct count line positioning and counter configuration is the key to accurate counting.

- **Red LED ON, Green LED Flashing Twice per Second Repeating**
  - o This error can only occur on a master counter; it indicates that the master is not receiving responses from nodes that were previously connected. This will occur if a node is removed or disconnected; or if a node has been powered off; or there is a wiring break between the master and the node(s). This error should not be confused with the Green LED flashing three times error (below) which can only occur on a node, although these errors may be seen together in certain circumstances.

- **Red LED ON, Green LED Flashing Three Times per Second Repeating**
  - o This error can only occur on a node unit; it indicates that the node is not been polled by the master unit. This will occur if the master is removed or disconnected; or if the master is powered off; or if there is a wiring break between the master and the node(s). This error should not be confused with the Green LED flashing twice error (above) which can only occur on a master, although these errors may be seen together in certain circumstances.

Appendix A: Sensor Base Wiring

Traf-Sys Thermal Camera – Camera Base Wiring; Singles vs. HUBs vs. NODES