Occupancy Solution Kit

Instruction Manual

219033

Contents

1 Emitter-Receiver Occupancy Solution Kit Quick Start Guide

1.1 System Overview

The Occupancy Solution Kit monitors the number of people into and out of an area. User-defined alert levels trigger a red indicator on the Operator Interface and Indicator Light to show that the area occupancy has been exceeded. Occupancy levels reset automatically every night at 2 AM Central Time.

Total Count Emitter-Receiver (TCER) Solution Kits are preconfigured to monitor between one and four doors with the ability to scale up to 10 doors. The sensor pairs monitor people entering and exiting a single area and give a total count of people inside. The Operator Interface displays the number of people in the area and allows for employee adjustments to the occupancy count. Indicator lights display if additional people are allowed to enter the area or if they are required to wait until the occupancy level drops below a user-defined limit.

Multiple Count Emitter-Receiver (MCER) Solution Kits are preconfigured to monitor between two and four distinct doors. Each Directional Sensor Pair monitors people entering and exiting a specific area and gives a total count of people inside the monitored door. Individual Operator Interfaces display the number of people in an area and allow for employee adjustments to the occupancy count. Green indicator lights display if additional people are allowed to enter the area. The Indicator Light turns red to indicate when people are required to wait until the occupancy level drops below a user-defined limit. The Multiple Count Emitter-Receiver Solution Kit can be expanded to monitor up to 10 different areas (doors). Contact your local distributor or Banner Engineering's Technical Support team at 1-800-203-5616 for assistance with larger systems.

1.2 Supply Power to all the Devices

The Occupancy Monitoring Kit includes all necessary power sources needed to get the system operating quickly.

This includes batteries for the Directional Sensors and Direct Select Operator Interface and a DC power supply for the DXM Controller and TL70 Wireless Indicator Light.

1.2.1 Apply Power to the Controller

Follow these instructions to apply 12–30 V DC power to the controller using a wall plug.

Equipment used:
- **DXM1200**
- **PSW-24-1** DC power supply with wall plug, 100-240 V AC 50/60 Hz input, 24 V DC 1 A output, UL Listed Class 2

5-pin M12/Euro-style Connector (male)	Pin	Wire Color	Description
	1	Brown (bn)	10 to 30 V DC
	2	White (wh)	RS485 / D1 / B / +
	3	Blue (bu)	DC common (GND)
	4	Black (bk)	RS485 / D0 / A / –
	5	Gray (gy)	Comms Gnd

> **Important:**
> - **Never operate a 1 Watt radio without connecting an antenna**
> - Operating 1 Watt radios without an antenna connected will damage the radio circuitry.
> - To avoid damaging the radio circuitry, never apply power to a Sure Cross® Performance or Sure Cross MultiHop (1 Watt) radio without an antenna connected.

1. Connect the **PSW-24-1** power supply into the DXM Controller, aligning the keys in the connector, and hand tighten.

2. Plug the **PSW-24-1**power supply into a power outlet using the appropriate regional wall adapter.

1.2.2 Apply Power to the Emitter-Receiver Sensors and Mount to the Brackets

The Directional Sensor Pair comes with two components: an emitter and a receiver with an internal radio.

1. Unscrew the four corner screws with a Phillips screwdriver on the Receiver and remove the cover.

   The Receiver has an internal radio with a radio icon on the front cover.
2. Insert the 3.6V lithium D cell battery. Verify the battery's positive and negative terminals align to the positive and negative terminals as marked.

   Caution: there is risk of damage if the batteries are installed incorrectly.
3. If the radio board Status LED does not automatically begin flashing, turn on the radio by pressing and holding the button until it begins flashing. Verify the toggle switch on the bottom of the sensor is in the ON position.
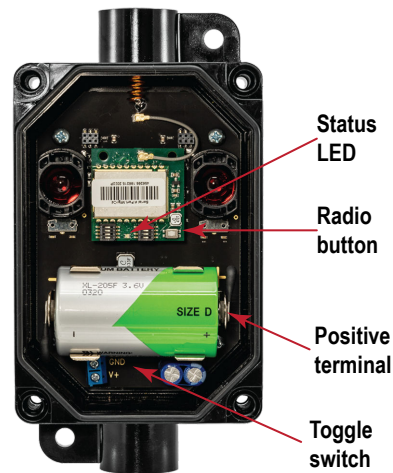
4. Place the cover back on the Receiver and hand tighten the four corner screws. Do not over-tighten.
5. Mount the supplied bracket to the Receiver. Place the L bracket between the washer and the jam nut. Thread the jam nut onto the base of the Receiver. Hand-tighten the jam nut.

6. Repeat this process for the Emitter.

1.2.3 Apply Power or Replace the Battery

Follow these instructions to install or replace the 3.6 V C cell battery.

As with all batteries, these are a fire, explosion, and severe burn hazard. Do not burn or expose them to high temperatures. Do not recharge, crush, disassemble, or expose the contents to water. Properly dispose of used batteries according to local regulations by taking the batteries to a hazardous waste collection site, an e-waste disposal center, or other facility qualified to accept lithium batteries.

1. Unscrew the four corner screws and open the Node.
2. If applicable, remove the discharged battery.

3. Install the new battery.

   Use a 3.6 V C cell lithium thionyl chloride battery (non-rechargeable, rated 8.5 Ah), Banner model **BWA-BATT-013** or equivalent.

4. Verify the battery's positive and negative terminals align to the positive and negative terminals as marked.

   ⚠️ **CAUTION:** There is a risk of explosion if the battery is replaced incorrectly.

5. Reassemble the Node and tighten the four corner screws.

6. To turn on the Direct Select Node, press and hold down the ↩ (Back) and ✅ (Check) buttons for five seconds. The red LED flashes to indicate the Node is on. When it starts to flash green, the Node is in sync and communicating to the controller.

7. To turn off the Direct Select Node, press and hold down the ↩ (Back) and ✅ (Check) buttons for five seconds. The LED stops flashing.

1.2.4 Apply Power to the TL70 Wireless Indicator Light

Follow these instructions to mount the TL70 to its bracket and apply power.

1. Position the Indicator Light on the bracket so that the icons are facing the desired orientation. Secure with the supplied lock nut. Hand tighten only.
2. Connect the power supply to the Indicator Light, aligning the keys in the connector. Hand tighten.

3. Connect the power supply into a power outlet using the appropriate regional wall adapter.

1.3 Mounting the System Components

Mounting hardware is not included with the Occupancy Solution Kit. Banner recommends using ¼-20 mounting bolts, self tapping screws, magnetic mounts, or hardware that is compatible with the mounting surface. Do not mount any radios inside metal enclosures. Metal around the radios can reduce wireless signal strength.

Mount the **DXM Controller** in a secure location, outside of any metal cabinets or enclosures. The DXM Controller has four mounting holes. Use ¼-20 mounting bolts or self tapping screws to secure the controller to a rigid surface.

Mount the **Indicator Light** indoors when possible and mount so that people entering the monitored area are able to see the occupancy status. Mount the indicator light using the supplied bracket and ¼-20 mounting bolts, self tapping screws, or optional magnetic mounts listed at the end of this document.

Mount the **Direct Select Operator Interface** to a rigid surface using the mounting holes and ¼-20 bolts, self tapping screws, or optional magnetic mounts. The Operator Interface can be mounted near a monitored door, in a central supervisory location, or can be held by an employee to actively monitor the occupancy level.

Total Count and Multiple Count Solution Kits come with a single Direct Select Operator Interface. For the Multiple Count Solution Kit, the Operator Interface is configured to monitor the count for door 1. Additional Operator Interfaces can be added to the system to monitor and make adjustments to individual doors.

When mounting the **Emitter-Receiver Directional Sensor Pair**, Banner recommends the sensors be mounted indoors when possible. The arrows on the face of the Emitter-Receiver Sensor Pair must point towards the inside of the building/ monitored area. Mount the sensors using two 1/4"-20 mounting bolts, self tapping screws, or the optional magnetic brackets. Use the side arrows on the Emitter and Receiver to mount the sensor in the correct orientation.
- Mount the Emitter-Receiver Directional Sensor Pair so that the sensor's top is at a minimum height of 1.25 m (50 in) to avoid the potential for miscounts. Mounting the sensor at a height below 1.25 m (50 in) may result in double counts by detecting arm or leg motion. The Directional Sensor Pair may need to be mounted higher than 1.25 m (50 in) to avoid counting arm motion or people carrying or pushing objects.
- Mount the Emitter and Receiver Directional Sensor Pair less than 30 ft from each other for optimal performance.

How you mount your sensor varies based on the application requirements. User-provided custom mounting fixtures may be required in cases where the supplied brackets are not compatible with the installation location. Contact your local distributor or Banner Engineering's Technical Support team at 1-800-203-5616 for more mounting options.

1.3.1 Mount the Emitter-Receiver Sensors Using the Supplied Brackets

Follow these instructions to mount the Emitter-Receiver Direction Sensor Pair using the supplied brackets.

1. Mount the Emitter bracket to a rigid surface.
2. Mount the Receiver bracket at the same height as the Emitter bracket.

   Follow the bracket assembly instructions to re-assemble the Sensors to the bracket.
3. Align the Receiver by rotating the housing until it is perpendicular to the Emitter.
   Two yellow alignment LEDs should begin to flash on the Receiver when it is aligned.

1.3.2 Mount the Emitter-Receiver Sensors Directly to a Surface

Follow these instructions to mount the Emitter-Receiver Directional Sensors directly to a surface.

1. Mount the Emitter against a flat surface using the two mounting holes.
2. Place the Receiver across from the Emitter and position it at the same height as the Emitter.
3. Move the Receiver horizontally until the two yellow Alignment LEDs begin to flash.
4. Secure the Receiver after it has been aligned to the Emitter.

1.4 Define the Alert Levels for the Total Count Kit

The Occupancy Solution Kit (Total Count) is designed to provide visual indication of capacity levels for monitored areas. The Occupancy Limit indicates that the area has exceeded the capacity for people.

The indicator light alerts people attempting to enter that they need to wait until people have left the area before entering. The Occupancy Warning setting is user-defined and indicates when the occupancy level is getting close to the Occupancy Limit. The Occupancy Warning displays as a yellow flashing LED on the Operator interface and enables change of state reporting, which updates the Total Count after every person enters instead of every minute (the default update rate).

Use the Controller's LCD, button keys, and menu system to configure the warnings and alarms.

1. On the DXM Controller, use the arrow keys to select the **Registers** menu and press **ENTER**.
2. Highlight **Occupancy Limit** and press **ENTER**.
3. Enter your desired **Occupancy Limit**.

   a) Using the up and down arrow buttons, select the first digit for the limit and press **ENTER** to set the first digit.
   b) Use the up and down arrows to set the second digit (if applicable) and press **ENTER**.
   c) Repeat if you are adding a third digit.
   d) Press **ENTER** once more to highlight **SEND** and press **ENTER** to confirm.

   The screen should now display the entered **Occupancy Limit**.
4. Enter your desired **Occupancy Warning**.

   a) Using the up and down arrows, select the first digit for the warning and press **ENTER** to set the first digit.
   b) Use the up and down arrows to set the second digit (if applicable) and press **ENTER**.

c) Repeat if you are adding a third digit.
d) Press **ENTER** once more to highlight **SEND** and press **ENTER** to confirm. Note: Set the **Occupancy Warning** level below the **Occupancy Limit**.

The screen should now display the entered **Occupancy Warning**.

Additional system information is available on the DXM Controller's display.

1.5 Define the Alert Levels for the Multiple Count Kit

This Occupancy Solution Kit (Multiple Count) is designed to provide visual indication of capacity levels for monitored areas. The Door Occupancy Limit indicates that the area has exceeded the capacity of people that may enter.

The red indicator light alerts people attempting to enter that they need to wait until people have left the area before they can enter (green light). The Door Occupancy Warning setting is user-defined and indicates when the occupancy level is getting close to the Door Occupancy Limit. The Door Occupancy Warning displays as a yellow flashing LED on the Operator interface and enables change of state reporting, which updates the count after every person enters instead of once a minute (the default update rate).

Use the Controller's LCD, button keys, and menu system to configure the warnings and alarms.

1. On the DXM Controller, use the arrow keys to select the **Registers** menu and press **ENTER**.
2. Highlight **Door 1 Occupancy Limit** and press **ENTER**.
3. Enter your desired **Door 1 Occupancy Limit**.

    a) Using the up and down arrow buttons, select the first digit for the limit and press **ENTER** to set the first digit.
    b) Use the up and down arrows to set the second digit (if applicable) and press **ENTER**.
    c) Repeat if you are adding a third digit.
    d) Press **ENTER** once more to highlight **SEND** and press **ENTER** to confirm.

    The screen should now display the entered **Door 1 Occupancy Limit**.

4. Enter your desired **Door 1 Warning**.

    a) Using the up and down arrows, select the first digit for the warning and press **ENTER** to set the first digit.
    b) Use the up and down arrows to set the second digit (if applicable) and press **ENTER**.
    c) Repeat if you are adding a third digit.
    d) Press **ENTER** once more to highlight **SEND** and press **ENTER** to confirm. Note: Set the **Door 1 Warning** level below the **Door 1 Occupancy Limit**.

    The screen should now display the entered **Door 1 Warning**.

5. Repeat these steps for each additional door. By default, the **Fast Sample** setting is set to 1. This allows for change of state reporting. Change the **Fast Sample** setting to 0 to disable change of state reporting.

Additional system information is available on the DXM Controller's display.

1.6 Forming the Network

The Occupancy Solution Kits come with all Nodes pre-bound to the master radio and ready to install. Adding additional radios to an existing kit requires that the Nodes be bound to specific Node addresses to function with the pre-configured XML configuration file and script.

The following Node ID tables show the required Node addressing for the default Total Count and Multiple Count systems for the directional sensors, the TL70 Indicator, and the Direct Select Operator Interface. For future reference, label the radios with the Node ID after binding.

The Occupancy Solution Kits can be expanded to monitor up to 10 doors without additional configuration. The Nodes must follow the binding address of 1 through 10 for the Directional Sensors, 11 through 20 for the Direct Select Operator Interfaces, and 21 through 30 for the TL70 Wireless Indicators.

Node IDs for the Total Count Kit		
Node Address	Model Number	Door Number
1	DX80N*X2W-DIR	Door 1
2	DX80N*X2W-DIR	Door 2
3	DX80N*X2W-DIR	Door 3
4	DX80N*X2W-DIR	Door 4
5	DX80N*X2W-DIR	Door 5

Node IDs for the Total Count Kit		
Node Address	Model Number	Door Number
6	DX80N*X2W-DIR	Door 6
7	DX80N*X2W-DIR	Door 7
8	DX80N*X2W-DIR	Door 8
9	DX80N*X2W-DIR	Door 9
10	DX80N*X2W-DIR	Door 10
11	DX80N*DSTS	
12	DX80N*DSTS	
13	DX80N*DSTS	
14	DX80N*DSTS	
15	DX80N*DSTS	
16	DX80N*DSTS	
17	DX80N*DSTS	
18	DX80N*DSTS	
19	DX80N*DSTS	
20	DX80N*DSTS	
21	TL70DXN*GRQ	
22	TL70DXN*GRQ	
23	TL70DXN*GRQ	
24	TL70DXN*GRQ	
25	TL70DXN*GRQ	
26	TL70DXN*GRQ	
27	TL70DXN*GRQ	
28	TL70DXN*GRQ	
29	TL70DXN*GRQ	
30	TL70DXN*GRQ	

Node IDs for the Multiple Count Kit		
Node Address	Model Number	Door Number
1	DX80N*X2W-DIR	Door 1
2	DX80N*X2W-DIR	Door 2
3	DX80N*X2W-DIR	Door 3
4	DX80N*X2W-DIR	Door 4
5	DX80N*X2W-DIR	Door 5
6	DX80N*X2W-DIR	Door 6
7	DX80N*X2W-DIR	Door 7
8	DX80N*X2W-DIR	Door 8
9	DX80N*X2W-DIR	Door 9
10	DX80N*X2W-DIR	Door 10
11	DX80N*DSTS	Door 1

Node IDs for the Multiple Count Kit		
Node Address	Model Number	Door Number
12	DX80N*DSTS	Door 2
13	DX80N*DSTS	Door 3
14	DX80N*DSTS	Door 4
15	DX80N*DSTS	Door 5
16	DX80N*DSTS	Door 6
17	DX80N*DSTS	Door 7
18	DX80N*DSTS	Door 8
19	DX80N*DSTS	Door 9
20	DX80N*DSTS	Door 10
21	TL70DXN*GRQ	Door 1
22	TL70DXN*GRQ	Door 2
23	TL70DXN*GRQ	Door 3
24	TL70DXN*GRQ	Door 4
25	TL70DXN*GRQ	Door 5
26	TL70DXN*GRQ	Door 6
27	TL70DXN*GRQ	Door 7
28	TL70DXN*GRQ	Door 8
29	TL70DXN*GRQ	Door 9
30	TL70DXN*GRQ	Door 10

1.6.1 Bind Additional Nodes to the DXM and Assign the Node Address

Follow these steps to bind additional Direct Select Nodes, Tower Lights, or Emitter-Receiver Sensors to your DXM Controller.

Before beginning the binding procedure, apply power to all the devices.

1. On the DXM: Enter binding mode by going to the Main menu and selecting **ISM Radio** > **Binding**.
2. Select the Node ID you would like to assign to the Direct Select Node.

    Node IDs 1 through 47 are the valid selections.
3. Click **Enter** to start the binding procedure.
4. Enter binding mode on the Node.

    - On the Direct Select Node: Holding down ⤺ (Back) and clicking ✅ (Check) three times.
    - On the Receiver Sensor: Remove the cover and press the binding button on the radio face three times.
    - On the TL70 Indicator: Follow the instructions in the TL70 datasheet to access the base. Press the binding button three times.

    The red and green LEDs flash alternately and the sensor searches for a DXM in binding mode. After the Node is bound, the LEDs stay solid momentarily (appears orange), then they both flash together four times. The Node exits binding mode and power is cycled automatically.
5. Label the Node's ID number with the supplied Device ID sticker.
6. On the DXM: Click **Back** to return to the **Bind to #** screen.
7. Repeat these steps for as many Nodes as are needed for your network.
8. After binding all Nodes, exit binding mode on the DXM by clicking **Back** until you return to the **Main** menu.

1.7 Accessories for the Emitter-Receiver Occupancy Solution Kit

To add additional doors to an occupancy monitoring system, order one of each model listed below (900 MHz or 2.4 GHz). The 900 MHz models are more commonly used in the United States; 2.4 GHz models are required in the EU and many other countries.

Emitter-Receiver Sensor Pair
- **DX80N9X2W-DIR**—900 MHz Radio
- **DX80N2X2W-DIR-NB**—2.4 GHz Radio
- Powered by BWA-BATT-001

TL70 Indicator Light
- **TL70DXN9GRQ-INOUTIKIT**—900 MHz Radio
- **TL70DXN2GRQ-INOUTIKIT**—2.4 GHz Radio

Direct Select Operator Interface
- **DX80N9DSTS**—900 MHz Radio
- **DX80N2DSTS**—2.4 GHz Radio
- Powered by BWA-BATT-013

BWA-BATT-001
- 3.6 V Lithium D cell for hazardous or non-hazardous locations
- One battery

BWA-BATT-013
- 3.6 V Lithium C cell
- One battery

1.7.1 Additional Accessories

The following accessories may be added to your Solution Kit, but are not components that are typically included in the kit.

SG-TL70-Y Warning Indicator Segment
- Used with the TL70 Wireless Indicator Light
- Yellow indicator for Warning indication
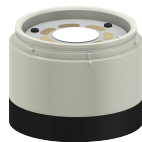
SXI-LTE-001 Cellular Modem
- Used with DXM Controller
- Allows for Cellular Connectivity to the Banner CDS platform

1.7.2 Additional Mounting Options

The following brackets are optional or replacements for the brackets included in the Occupancy Solution Kit.

The **LMB30LP** bracket can be used with the TL70 Wireless Indicator Light

LMB30LP
- Low profile
- 30 mm mounting hole
- 300 series stainless steel
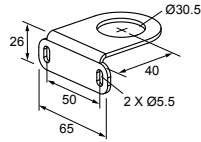
The **BWA-BK-020** bracket can be used with the Direct Select Operator Interface or the DXM Controller

BWA-BK-020
- Includes two 80-lb pull rare-earth magnet mounts and two #10-32 × 1 inch screw mounts
- Used on multiple mounting brackets
- 31.75 mm (1.25 inch) diameter
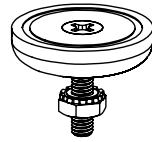
BWA-HW-OSK-001 Side Mount Bracket
- Hardware packet used for mounting the Emitter-Receiver Sensor Pair
- Stainless steel L-bracket
- Zinc-plated steel washer
- Delrin jam nut

1.7.3 Individual Replacement Sensors

Receivers	Emitters
DX80N9X2W-DIRR • 900 MHz • Includes batteries **DX80N2X2W-DIRR-NB** • 2.4 GHz • No batteries included	**DX80NxX2W-DIRE** • Includes batteries **DX80NxX2W-DIRE-NB** • No batteries included

2 Optional Configuration Q45 Occupancy Solution Kits

2.1 System Overview

The Occupancy Solution Kits work by monitoring the number of people into and out of an area. User-defined Alert levels trigger a red indicator on the Operator interface and indicator light to show that the area occupancy has been exceeded. Occupancy levels automatically reset every night at 2 AM Central Time.

Total Count (TC) Solution Kits are configured to monitor between one and four doors. The Q45 Sensor Pairs monitor people entering and exiting the area, for up to four doors, and give a total count of people inside. The Operator Interface displays the number of people in the area and allow for employee adjustments to the occupancy count. Indicator lights display if additional people can enter the area or if they are required to wait until the occupancy level drops below a user-defined limit.

Multiple Count (MC) Solution Kits are configured to monitor between two and four distinct doors. Each Q45 Sensor Pair monitors people entering and exiting a specific area and gives a total count of people inside the monitored door. Individual Operator Interfaces display the number of people in an area and allow for employee adjustments to the occupancy count. Green indicator lights display if additional people can enter the area. The indicator light turns red to indicate when people are required to wait until the occupancy level drops below a user-defined limit. The Multiple Count Solutions Kit can be expanded to monitor up to 10 different areas (doors). Contact your local distributor or Banner Engineering's Technical Support team at 1-800-203-5616 for assistance with larger systems.

Refer to Occupancy Solution Kit Setup Guide: Total Count (p/n 217889) and Occupancy Solution Kit Setup Guide: Multiple Count (p/n 217890) for detailed instructions on how to apply power, mount, and configure the Q45-based Occupancy Solution Kits.

2.2 Adding Additional Sensors to the Q45 Occupancy Solution Kit

The Q45 Occupancy Solution Kits come with all Nodes pre-bound to the master radio and ready to install. Adding additional radios to an existing kit requires that the Nodes be bound to specific addresses to function with the pre-configured XML configuration file and script.

The following Node ID tables show the required Node addressing for the default Total Count and Multiple Count systems for the Q45 Sensor Pairs, the TL70 Indicator, and the Direct Select Operator Interface. For future reference, label the radios with the Node ID after binding.

Node IDs for the Total Count Kit		
Node Address	Model Number	Door Number
1	DX80N*Q45LPDIR - A	Door 1 Sensor A
2	DX80N*Q45LPDIR - A	Door 2 Sensor A
3	DX80N*Q45LPDIR - B	Door 1 Sensor B
4	DX80N*Q45LPDIR - B	Door 2 Sensor B
5	DX80N*Q45LPDIR - A	Door 3 Sensor A
6	DX80N*Q45LPDIR - A	Door 4 Sensor A
7	DX80N*Q45LPDIR - B	Door 3 Sensor B
8	DX80N*Q45LPDIR - B	Door 4 Sensor B
9	DX80N*DSTS	
10	DX80N*DSTS	
11	DX80N*DSTS	
12	DX80N*DSTS	
13	TL70DXN*GRQ	
14	TL70DXN*GRQ	
15	TL70DXN*GRQ	
16	TL70DXN*GRQ	

Node IDs for the Multiple Count Kit		
Node Address	Model Number	Door Number
1	DX80N*Q45LPDIR - A	Door 1 Sensor A
2	DX80N*Q45LPDIR - A	Door 2 Sensor A
3	DX80N*Q45LPDIR - B	Door 1 Sensor B
4	DX80N*Q45LPDIR - B	Door 2 Sensor B
5	DX80N*Q45LPDIR - A	Door 3 Sensor A
6	DX80N*Q45LPDIR - A	Door 4 Sensor A
7	DX80N*Q45LPDIR - B	Door 3 Sensor B
8	DX80N*Q45LPDIR - B	Door 4 Sensor B
9	DX80N*DSTS	Door 1
10	DX80N*DSTS	Door 2
11	DX80N*DSTS	Door 3
12	DX80N*DSTS	Door 4
13	TL70DXN*GRQ	Door 1
14	TL70DXN*GRQ	Door 2

Node IDs for the Multiple Count Kit		
Node Address	Model Number	Door Number
15	TL70DXN*GRQ	Door 3
16	TL70DXN*GRQ	Door 4

For example, to add an additional door to a two door kit, use the DXM1200 Controller to bind the new sensor pair to Node ID 5 for Sensor A and ID 7 for Sensor B. To add a fourth door to this solution, bind the new sensor pair to node ID 6 for Sensor A and ID 8 for Sensor B.

2.2.1 Bind Additional Nodes to the DXM and Assign the Node Address

Follow these steps to bind additional Direct Select Nodes, Tower Lights, or Q45 Sensor Nodes to your DXM Controller.

Before beginning the binding procedure, apply power to all the devices.

1. On the DXM: Enter binding mode by going to the Main menu and selecting **ISM Radio** > **Binding**.
2. Select the Node ID you would like to assign to the Direct Select Node.

   Node IDs 1 through 47 are the valid selections.
3. Click **Enter** to start the binding procedure.
4. Enter binding mode on the Node.

   - On the Direct Select Node: Holding down ↩ (Back) and clicking ✓ (Check) three times.
   - On the Q45: Triple-click the binding button.
   - On the TL70 Indicator: Follow the instructions in the TL70 datasheet to access the base. Press the binding button three times.

   The red and green LEDs flash alternately and the sensor searches for a DXM in binding mode. After the Node is bound, the LEDs stay solid momentarily (appears orange), then they both flash together four times. The Node exits binding mode and power is cycled automatically.
5. Label the Node's ID number with the supplied Device ID sticker.
6. On the DXM: Click **Back** to return to the **Bind to #** screen.
7. Repeat these steps for as many Nodes as are needed for your network.
8. After binding all Nodes, exit binding mode on the DXM by clicking **Back** until you return to the **Main** menu.

3 Advanced Configuration

The Multiple Count Occupancy Solution Kit can be modified to monitor combinations of Total Count and Multiple Count systems onto a single DXM. This modification requires changes to the XML and Script programs loaded onto the DXM1200 Controller.

Use a text editor to modify the ScriptBasic Program (*.sb). After a ScriptBasic program is modified, save the file using the extension .sb. Note that modifications to the ScriptBasic program on the DXM1200 should be conducted by someone familiar with the ScriptBasic programming language. Changes to the program other than those described below could result in a failing system. Consult Banner Engineering's Technical Support Team for assistance.

The Multiple Count Occupancy Solution Kit program was created to allow for simple expansion and modifications by adding additional functions to the program. The Solution Kit can be configured as 10 individual door counts (10 multicount), a 10 door Total Count, or a combination of Total Count and Multiple Count systems that totals no more than 10 monitored doors. From the factory, the system is configured as a ten-door multiple count system where each monitored door has its own warning/alert settings.

The **CountingConfig** function was created to allow easy configuration for custom occupancy counting applications. The function requires several pieces of information that defines the Node addresses of the various radios in the system along with how the data should be organized. The function is shown below with the data tags that need to be entered into it to configure it.

FUNCTION **CountingConfig**(SysNum,TypeControl,DoorsCount,DirectCount,LightsCount,NodeStart,DirLightStart)

SysNum

A unique number needs to be entered into this location. This is used to create unique variables used by a specific call of the function. Each function can be thought of as an independent application (two door total count, three door multiple count, etc.).

If two function calls are needed, the first call would have a SysNum of 1 and the second call would use a SysNum of 2.

TypeControl

There are two different configurations for each CountingConfig function. When a 0 is entered into this field, the system is configured for Multiple Count. If a 1 is entered, the system is configured for Total Count.

Multiple Count is when each Directional Sensor calculates the occupancy count individually.

Total Count is when all the Directional Sensors give a single total count for the monitored area.

DoorsCount

Number of doors that the system is monitoring.

DirectCount

Number of Direct Select Nodes in this system.

LightsCount

Number of TL70 Indicators in the system.

NodeStart

The starting Node IDs for the Directional Sensor Pairs.

For the Emitter-Receiver kits, the NodeStart parameter can begin at any value that is not an existing node number.

For applications using the Q45 Sensor Pairs, the NodeStart parameter must have a value of 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, or 41. Increments of four are required to allow proper operation of the script. This also ensures proper timing between the Nodes. Follow the Q45 pair binding procedure to ensure proper operation.

DirLightStart

The starting Node IDs for the Direct Select Nodes and TL70 Indicator Lights.

The addressing begins with all the Direct Select Nodes followed by all the TL70 Indicator Lights. The starting Node IDs are determined by taking the NodeStart number and adding the DoorsCount value.

For example, a Doors Count of 4 with a NodeStart value of 1 would have the DirLightStart value of 5.

3.1 Creating Custom Configurations

To customize the Solution Kit, add additional functions to the ScriptBasic file loaded onto the DXM1200. The ScriptBasic program was created to allow for easy expandability.

To modify the existing program, add a **CountingConfig** function for each new application within the DXM or modify the existing CountingConfig function. Create a backup file before you modify the ScriptBasic file.

1. Download (p/n b_4496867) the DXM Configuration Software from www.bannerengineering.com.
2. Install and launch the software.
3. Connect the computer running the configuration software to the DXM1200 using the supplied Ethernet Cable. The default IP address is 192.168.0.1 for the Controller.

4. Verify your computer's Ethernet settings match the IP address of the DXM1200.

   The IP address can generally be found in the network settings for your computer.

5. In the DXM Configuration Software, to connect to the controller, go to **Select Mode** > **Connect to DXM using** and select **TCP/IP**.

6. Enter the DXM1200 Controller's IP address and click **Connect**.

7. Download the ScriptBasic file.

   a) Go to **Settings** > **Scripting**.
   b) Select **Script File Management** > **Refresh List**.
   c) Select the 6-digit part number and click **Save Selected** to save the .sb file locally on your PC.
   d) Make a copy of the unedited file before you make changes to it.

8. To modify the existing system, open the .sb file with a text editor software and begin by modifying the **SystemSize** parameter on line 1038 (for Q45 kits, the SystemSize parameter is on line 987). The **SystemSize** parameter determines how many different systems the Controller will have. For example, a SystemSize of 2 could include a total count application and a multiple count application on the same DXM.

```
Begin:

    CONST DoorsNum = 10
    CONST SystemSize = 1

    FOR x = 1 to SystemSize
        FirstScan[x] = 0
        LocCombinedTotals[x] = 0
        LocDirCombinedTotals[x] = 0
        LocDirTotals[x] = 0
        LocCumulativeCombinedTotals[x] = 0
        LocCumulativeDirCombinedTotals[x] = 0
        LocCumulativeDirTotals[x] = 0
        LocStoredDirTotals[x] = 0
        LocUpDown[x] = 0
        LocCumulativeUpDown[x] = 0
        LocStoredUpDown[x] = 0
        LocOccLimit[x] = 0
        LocOccWarning[x] = 0
        LocStatusNormal[x] = 0
        LocStatusWarning[x] = 0
        LocStatusAlarm[x] = 0
        LocDoorReset[x] = 0
        RequestFastSampleUpdate[x] = 0
        ManRequestFastSample[x] = 0
        ManFastSampeActivated[x] = 0
        AutoReset[x] = 0
        DTSResetRetry[x] = 0
        BootUp[x] = 0
    NEXT x

    SLEEP(10)
```

9. Go to line 1037 (for Q45 kits, the DoorsNum parameter is on line 1019) and modify the **DoorsNum** value to reflect the total number of doors that will be monitored with a single DXM.

3.2 Create a 10-Door System

Follow these steps to create a 10-door Total Count system.

1. Set the **SystemSize** parameter to a value of 1.
2. Set the **DoorsNum** parameter to a value of 10.
3. Create a function call: CountingConfig(1,1,10,10,10,1,11).

   The Q45 kits require the function call to be configured as (1,1,10,10,10,1,21) because each Q45 Directional Sensor Pair requires two Node addresses. Follow one of the following options:

   - Copy the function call into the .sb program at line 1158 (for Q45 kits, copy the function call into line 1112). Comment out the original function call by adding a " ' " at the beginning of the line.
   - Change the default function call from CountingConfig(1,0,10,10,10,1,11) to CountingConfig(1,1,10,10,10,1,11). The default configuration on Q45 kits is defined as (1,0,4,4,4,1,9) and should be changed to (1,1,10,10,10,1,21).

   Default configuration to copy for Emitter-Receiver Multiple Count Kits:

```
'Function for occupancy counting application.  Has the following parameters.
'SysNum:  1 for unique identification of this Function call.
'TypeControl: 0 for a system which all doors are separate.
'DoorsCount: 10 doors in the system
'DirectCount: 10 Direct Selects in the System.
'LightsCount: 10 Tower Lights in the system.
'NodeStart: Entry/Exit location sensors start at Node address 1.
'DirLightStart: Direct Select and Tower Lights start at Node address 11.
CountingConfig(1,0,10,10,10,1,11)
```

10-Door Total Count configuration:

```
'Function for occupancy counting application.  Has the following parameters.
'SysNum:  1 for unique identification of this Function call.
'TypeControl: 1 for a system which all doors are giving a total count.
'DoorsCount: 10 doors in the system
'DirectCount: 10 Direct Selects in the System.
'LightsCount: 10 Tower Lights in the system.
'NodeStart: Entry/Exit location sensors start at Node address 1.
'DirLightStart: Direct Select and Tower Lights start at Node address 11.
CountingConfig(1,1,10,10,10,1,11)
```

The function has a SysNum of 1, a TypeControl of 1 (Total Count), 10 monitored doors that equates to 10 Directional Sensor Pairs in the system (for Q45 Kits, this is a total of 20 Q45 units), 10 Direct Select Nodes, and 10 Tower Light Nodes.

For Emitter-Receiver kits, the Sensor Node IDs begin at 1 and the Direct Select/Lights start at Node ID 11 with the Direct Select Nodes at IDs 11 through 20 and the TL70 Indicator Lights at Node IDs 21 through 30.

The Q45 units start at Node ID 1 and the Direct Select/Lights start at Node ID 21. The Direct Select Nodes are at IDs 21 through 30 and the TL70 Indicator Lights are at ID 31 through 40. This example shows only a one-system configuration.

After the modifications to the script basic program are complete, label the local registers on the XML so that the data reflects its associated system.

Save the script basic program and load it to the DXM controller via the DXM Configuration Software. Reboot the DXM to apply the changes.

3.3 Create a Hybrid Application Monitoring Seven Doors

Create a hybrid application with seven doors. The application consists of fours rooms: two individual one-door rooms, one two-door room, and one three-door room.

The following example is shown for the Emitter-Receiver Occupancy Monitoring Kit. Q45 kits require twice as many Node IDs for the sensors.

1. Set the **SystemSize** parameter to 3.
2. Set the **DoorNum** parameter to 7.
3. Create a function call for the first system (two individual one-door rooms).
   a) Copy the function call from lines 1149-1157 into the .sb program at line 1159. Comment out line 1157 by adding a " ' " at the beginning of the line. This line contains the default settings.
   b) Change the default function call CountingConfig(1,0,10,10,10,1,11) to CountingConfig(1,0,2,2,2,1,11).

```
'Function for occupancy counting application.  Has the following parameters.
'SysNum:  1 for unique identification of this Function call.
'TypeControl: 0 for a system which all doors are separate.
'DoorsCount: 2 doors in the system
'DirectCount: 2 Direct Selects in the System.
'LightsCount: 2 Tower Lights in the system.
'NodeStart: Entry/Exit location sensors start at Node address 1.
'DirLightStart: Direct Select and Tower Lights start at Node address 11.
CountingConfig(1,0,2,2,2,1,11)
```

   CountingConfig(1,0,2,2,2,1,11) creates the first system, a two-door "Multiple Count" system, each with one Direct Select Node and one TL70 Indicator Light. Node IDs 1 and 2 are for the Directional Sensors, Node IDs 11 and 12 are for the Direct Select Nodes, and Node IDs 13 and 14 are for the TL70 Indicator Lights.

4. Create a function call from lines 1149–1157 for the second system (one two-door room):
   CountingConfig(2,1,2,1,1,3,15).
   a) Copy the function call into the .sb program below the first system function.
   b) In this example, the function begins on line 1177. The function description, lines 1169–1176 are commented out but left as a reference.

```
'Function for occupancy counting application.  Has the following parameters.
'SysNum: 2 for unique identification of this Function call.
'TypeControl: 1 for a system which all doors are giving a total count.
'DoorsCount: 2 doors in the system
'DirectCount: 1 Direct Selects in the System.
'LightsCount: 1 Tower Lights in the system.
'NodeStart: Entry/Exit location sensors start at Node address 3.
'DirLightStart: Direct Select and Tower Lights start at Node address 15.
CountingConfig(2,1,2,1,1,3,15)
```

   This creates the second system, a two door "Total Count" system with one Direct Select Node and one TL70 Indicator Light. Node IDs 3 and 4 are for the Directional Sensors, Node ID 15 is for the Direct Select Node, and Node ID is 16 for the TL70 Indicator Light.

5. Create a function call for the third system (one three-door room): CountingConfig(3,1,3,1,2,5,17).

a) Copy the function call into the .sb program below the second system function.

b) In this example, the function begins on line 1132. The function description, lines 1124 - 1131 are commented out but left as a reference.

```
'Function for occupancy counting application.  Has the following parameters.
'SysNum:  3 for unique identification of this Function call.
'TypeControl: 1 for a system which all doors are giving a total count.
'DoorsCount: 3 doors in the system
'DirectCount: 1 Direct Selects in the System.
'LightsCount: 2 Tower Lights in the system.
'NodeStart: Entry/Exit location sensors start at Node address 5.
'DirLightStart: Direct Select and Tower Lights start at Node address 17.
CountingConfig(3,1,3,1,2,5,17)
```

This creates the third system, a three door "Total Count" system with one Direct Select Node and two TL70 Indicator Lights. The Node IDs 5 through 7 are for the Directional Sensors Nodes, Node ID 17 is for the Direct Select Node, and Node IDs 18 and 19 are for the TL70 Indicator Lights.

After the modifications to the ScriptBasic program are complete, name the local registers in the XML configuration file to associate the data with the correct system.

Save the ScriptBasic program and upload it to the DXM Controller using the DXM Configuration Software. Reboot the DXM to apply the changes.

4 Additional Information

4.1 Optional Cloud Connectivity

Banner Engineering's Occupancy Solution Kit offers a fast and easy way to gain access to the data and history of the occupancy at your facility.

The following section will show you how to configure your gateway over Ethernet and quickly create your solution on the Banner CDS platform. See your data on a default dashboard and create your own visual tools and reporting.

Connect the devices using the supplied cables.

1. Plug the threaded end of the Ethernet cable to the DXM Controller. Aligning the pins and connect the quick disconnect connector. Hand-tighten only.
2. Connect the RJ45 connector to a local area network device, such as a Wi-Fi router or network modem.

Network Configuration— The Occupancy Solution Kit can be connected to a network using either Static IP or Dynamic IP (DHCP). By default, the Occupancy Solution Kit is configured to use DHCP. Use DHCP when connecting directly to a modem or router. Use a Static IP address if directed to by your IT department.

4.1.1 Set a Static IP Address

Change the IP address of the DXM to connect to a local area network, Modbus TCP/IP host controller, or EtherNet/IP host controller.

There are two ways to set the IP address: using the DXM's LCD menu or using the configuration software to change the XML file. IP addresses entered into the LCD menu system override the IP addresses in the XML configuration files. To use the IP addresses set in the XML configuration file, clear the IP addresses from the menu system.

Figure 1. System Config menu options
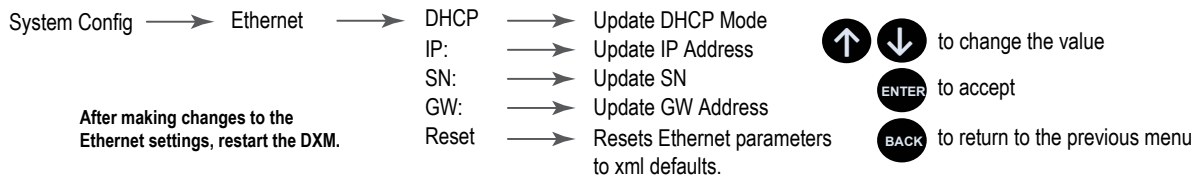
1. On the DXM, use the arrows and move to the **System Config** menu. Press **ENTER**.
2. Use the arrow keys to select the **Ethernet** menu. Press **ENTER**.
3. Highlight the **DHCP** selection and press **ENTER**. Set DHCP to OFF.
4. The system will request a restart, press **ENTER** to confirm.
5. Follow steps 1 and 2 to reenter the Ethernet menu. Use the arrow keys to select **IP**. Press **ENTER**.
   The IP address displays (for example, 192.168.0.1).
6. Use the up and down arrows to change the IP address. Press **ENTER** to move to the next octet.
7. Press **ENTER** on the final octet to accept the changes.
8. Cycle power to the DXM.
   The changes are saved on the DXM and the new IP address will be used.

Use this same procedures to set the subnet mask (SN) and default gateway (GW) to match your network requirements. Your IT department can provide these settings if needed.

4.1.2 Banner Cloud Data Services (CDS)

The DXM can be connected and sharing data with the Banner Cloud Data Services (CDS), a web-based software platform that allows users to access, store, protect, visualize, and export critical data collected by Banner's DXM Controllers. This software complements our wireless product portfolio and provides customers with complete end-to-end IIoT solutions to solve the most pressing problems of the industrial market.
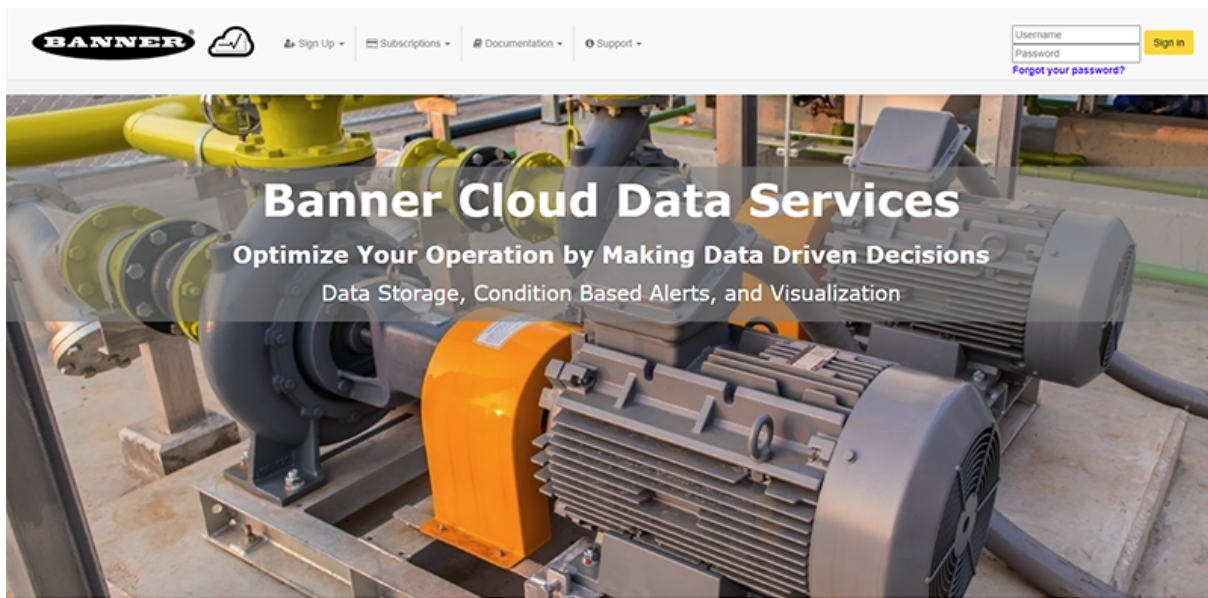
Visit the Banner CDS site for account access and technical support at https://bannercds.com. From the home page you can:
- Log into the website if you already have an account
- Subscribe to a data services plan
- Learn more about the subscription service plans
- Access support documentation, videos, and frequently asked questions
- Recover lost passwords

Activating a cellular data plan allows the DXM to communicate using the cellular network. A web services data plan subscription provides cloud storage, data visualization, notifications, and data management for the DXM.

4.1.3 Enter Your Authorization Code

The Solutions Kits come with a unique code generated for each individual kit. All kits include a 90-day prepaid trial account for the Banner Cloud Data Services and Banner Cellular Data Plan.

1. Register your account by going to the **Sign Up** menu.
2. Select **Enter Authorization Code**.
3. Enter the requested information. The authorization code is on the Banner Cloud Authorization Code Insert included with the Occupancy Solution Kit.

4.1.4 Add a New Gateway

After launching the CDS webpage, the **Gateways** screen displays. Use the **Gateways** screen to add the DXM Controller to the Cloud application and generate a Dashboard.

1. Click on [+ New Gateway] (+New Gateway) in the top-right corner of the Gateways screen.
2. Name your DXM Controller and enter the Serial Number. The Serial Number can be found using the DXM Controller's LCD. On the DXM's main menu, scroll to **System Info** and then press **ENTER** twice to view the seven-digit serial number at the bottom of the information list.
3. Enter all seven digits into the DXM Serial # entry field on Banner CDS.
4. Verify that **Configuration** is set to **Solutions** and select the appropriate **Kit Type** for your application. This allows the Banner CDS application to automatically create Dashboard layouts and metrics for the solution. Click [Create] (Create).

The Banner CDS application creates a site for the system and begins searching for a data push from the DXM Controller. The Occupancy Solutions Kit is designed to push data once every five minutes to the Cloud.

The DXM Controller could take up to five minutes to complete recognition by the system.

4.1.5 View the Dashboard

After Banner CDS has created the site and detected the DXM Controller, click on [Go to Dashboard] (Go to Dashboard). The [Dashboard] (Dashboard) panel appears and indicates the metrics of the Occupancy Solutions Kit.

The data on this dashboard will include a historical indication of the Occupancy of the area and a means of updating the Occupancy Limit and Occupancy Warning parameters.

5 Product Support and Maintenance

5.1 Troubleshooting

Problem	Possible Causes / Solutions
Directional Counts are not changing	Sensors may not be properly aligned. Verify the Receivers and Emitters are aligned and verify the yellow alignment LEDs on the Receivers are flashing. If they are not flashing yellow, check if there are obstructions between the Sensors and realign them. Batteries may need to be replaced
Directional Count is opposite of expectation	Directional Sensor Pair may be installed in the incorrect location. Verify the emitter and receiver are installed in the correct orientation. The arrows on the covers should be pointing toward the inside of the monitored area.
Sensors are double counting	Sensors may not be mounted too low. Adjust the sensor height to avoid shopping carts, arm motion, or leg motion that may trigger double counts
Sensors missing directional counts or over counting	People may be entering side-by-side, causing the sensors to view a single count instead of two people. People stopping in the middle of the beam path may block others coming through and being counted. If someone walks into the beam path without going through completely, stops, then turns around, the person may not have been counted properly. Recommend instructing people to walk through in a single file pattern and not to stop in front of the sensor's beam path.
Counts reset unexpectedly	Pushing the back arrow on the Operator Interface clears all the counts, similar to the daily reset. To avoid resetting the count, instruct your operators to not press the back arrow.
All counts reset overnight	The DXM Controller is programmed to reset all counts at 2 AM Central (observing DST). Contact your local distributor or Banner Engineering's technical support team at 1-800-203-5616 for assistance on changing the reset schedule.
Operator Interface no longer displays the counts	After the DXM Controller is rebooted, a delay of 5 minutes may occur before counts are displayed. The Operator Interface may not be communicating with the DXM Controller. Check the status LED above the ✓ (check mark) button. If the status LED flashes red, change the positioning of the DXM Controller or Operator Interface so that they are closer to each other (they should have a minimum separation distance of 15 feet). The status LED should flash green when the Operator Interface is communicating to the DXM Controller. If the status LED does not begin to flash green, contact your local distributor or Banner Engineering's technical support team at 1-800-203-5616.
Sensor's red LED is flashing	Sensors are not communicating with the DXM Controller. Change the positioning of the DXM Controller to improve radio signal. The status LEDs should flash green when the Sensors are communicating to the DXM Controller. If the status LEDs do not flash green, contact your local distributor or Banner Engineering's technical support team at 1-800-203-5616.
Wireless TL70 Indicator Light is not lighting up	After the DXM Controller reboots or cycles power, a delay of up to five minutes may occur before the indicators turn on. The TL70 Wireless Indicator Light may not be communicating with the DXM Controller. Remove the light module above the base by rotating the base counterclockwise and pulling it off of the segments, the lines on the notches should align. Verify the internal status LED is flashing green. If the LED is flashing red, change the positioning of the DXM Controller or TL70 Wireless Indicator Light so they are closer to each other to improve communication. The status LED should flash green when the Indicator Light is communicating to the DXM Controller. If the status LEDs do not begin to flash green, contact your local distributor or Banner Engineering's technical support team at 1-800-203-5616.

5.2 Modbus Registers for the Emitter-Receiver Occupancy Solution Kits

Registers for the Total Count (TCER) Occupancy Solution Kit		
DXM Register	Description	Notes
840	Reset Web	Triggers a cloud push when the system resets via a negative count

DXM Register	Description	Notes
Registers for the Total Count (TCER) Occupancy Solution Kit		
DXM Register	**Description**	**Notes**
845	Reset Count	Resets the current occupancy count and the stored occupancy count. Value of 1 resets the count.
851	Occupancy Limit	The Occupancy limit for the monitored area. Triggers the red lights on the TL70 Indicators
852	Occupancy Warning	The Occupancy warning for the monitored area. Set below the Occupancy limit value. Triggers the yellow lights on the TL70 Indicators
898	Delay Mode	Used for debugging purposes only. Adds a four second sleep to the program. Value of 1 enables Delay Mode.
899	Fast Sample Mode	Enables change of state reporting for directional sensor pairs. Value of 1 enables fast sample. Else the sensors report once a minute
900	First Run	Sets up all relevant Node parameters. This is only used when the DXM Controller is powered on for the first time. Value of 0 enables First Run, value of 1 disables First Run.
5001	Count IN Screen	Current count of persons in the monitored area
5002	Cumulative Daily Total	Sum of Current Count and Stored Count
5006	Total Directional In	Current sum of all sensor directional in counts
5007	Total Directional Out	Current sum of all sensor directional out counts
5008–5011	Door 1–4 Count	Current difference of Door in and out counts
$5012 + 2 \times (N - 1)$	Door N In Count	Current Door N in count
$5013 + 2 \times (N - 1)$	Door N Out Count	Current Door N out count
5020	Warning On	Occupancy has exceeded Warning level
5021	Alarm On	Occupancy has exceeded Alarm level
5022	Normal Operation	Occupancy below Warning level
5023	Manual Up/Down Adjust	Current difference of Manual Up and Down adjustments
5024	Total Manual Up Adjust	Current sum of manual up adjustments
5025	Total Manual Down Adjust	Current sum of manual down adjustments
5026	Daily Cumulative Directional In Count	Sum of Current Directional In count and Stored Directional In count
5027	Daily Cumulative Directional Out Count	Sum of Current Directional Out count and Stored Directional Out count
5028–5031	Door 1–4 Total Daily Cumulative Count	Sum of Current Door Count and Stored Door Count
$5032 + 2 \times (N - 1)$	Door N Daily Cumulative In Count	Sum of Current Door N In Count and Stored Door N In Count
$5033 + 2 \times (N - 1)$	Door N Daily Cumulative Out Count	Sum of Current Door N Out Count and Stored Door N Out Count
5040	Cumulative Up Adjust	Sum of Current DSTS Up and Stored DSTS Up adjustments
5041	Cumulative Down Adjust	Sum of Current DSTS Down and Stored DSTS Down adjustments
5042	Cumulative In/Out	Sum of Current In/Out count and Stored In/Out count
5043	Cumulative Up/Down	Sum of Current DSTS Manual Up/Down Adjust and Stored DSTS Manual Up/Down Adjust
5044–5049	Door 5–10 Count	Current difference of Door N in and out counts
$5050 + 2 \times (N - 1)$	Door N In Count	Current Door N in count
$5051 + 2 \times (N - 1)$	Door N Out Count	Current Door N out count
5062–5067	Door 5–10 Total Daily Cumulative Count	Sum of Current Door Count and Stored Door Count
$5068 + 2 \times (N - 1)$	Door N Daily Cumulative In Count	Sum of Current Door N In Count and Stored Door N In Count
$5069 + 2 \times (N - 1)$	Door N Daily Cumulative Out Count	Sum of Current Door N Out Count and Stored Door N Out Count

Registers for the Total Count (TCER) Occupancy Solution Kit		
DXM Register	Description	Notes
7001–7010	Door 1–10 Previous In Count	Stored in count. Values are stored whenever the system count goes negative
7011–7020	Door 1–10 Previous Out Count	Stored Out count. Values are stored whenever the system count goes negative
7021	Previous Up Adjust	Stored sum of DSTS Up adjustments. Values are stored whenever the system count goes negative
7022	Previous Down Adjust	Stored sum of DSTS Down adjustments. Values are stored whenever the system count goes negative

Registers for the Multiple Count (MCER) Occupancy Solution Kit		
DXM Register	Description	Notes
338–347	Doors 1–10 Status	Connectivity Status for the sensors at Doors 1–10. Value of 128 = good connection status.
348–357	Direct Select 1–10 Status	Connectivity Status for Direct Selects 1–10. Value of 128 = good connection status.
358–367	TL70 1–10 Status	Connectivity Status for TL70s 1–10. Value of 128 = good connection status.
406–415	Output 1 for TL70 1–10	Output 1 Register for TL70 1–10
454–463	Output 2 for TL70 1–10	Output 2 Register for TL70 1–10
502–511	Output 3 for TL70 1–10	Output 3 Register for TL70 1–10
636–645	Direct Select 1–10 Screen Output	Current count of persons in the monitored area
810	Reset Web	Triggers a cloud push when the system resets via a negative count
845	Reset Count	Resets the current occupancy count and the stored occupancy count. Value of 1 resets the count.
851–860	Door 1–10 Occupancy Limit	The Occupancy limit for the monitored area. Triggers the red lights on the TL70 Indicators
871–880	Door 1–10 Occupancy Warning	The Occupancy warning for the monitored area. Set below the Occupancy limit value. Triggers the yellow lights on the TL70 Indicators
897	Timer Control	The Timer Control function enables a timed reset for the counters, identical to the Reset Count function. Enter the time in seconds to enable a reset after X amount of time. The reset occurs if a sensor has not updated the count after X seconds.
898	Fast Sample Mode	Enables change of state reporting for directional sensor pairs. Value of 1 enables fast sample. Else the sensors report once a minute
899	First Run	Sets up all relevant Node parameters. This is only used when the DXM Controller is powered on for the first time. Value of 0 enables First Run, value of 1 disables First Run.
900	Delay Mode	Used for debugging purposes only. Adds a 4 second sleep to the program. Value of 1 enables Delay Mode.
$5001 + 5 \times (N - 1)$	Total Count	Register only used by Total Count systems, where N indicates the system number. Total Count is the sum of the In count and DSTS Up adjust minus the Out count and DSTS Down adjust.
$5002 + 5 \times (N - 1)$	Total In Count	Register only used by Total Count systems, where N indicates the system number. Sum of all directional sensor In counts
$5003 + 5 \times (N - 1)$	Total Out Count	Register only used by Total Count systems, where N indicates the system number. Sum of all directional sensor Out counts
$5004 + 5 \times (N - 1)$	Total DSTS Up	Register only used by Total Count systems, where N indicates the system number. Sum of all Direct Select Up adjusts
$5005 + 5 \times (N - 1)$	Total DSTS Down	Register only used by Total Count systems, where N indicates the system number. Sum of all Direct Select Down adjusts
5101–5110	Door 1–10 Total Count	Current difference of Door in and out counts, used for Multiple Door systems only

Registers for the Multiple Count (MCER) Occupancy Solution Kit		
DXM Register	Description	Notes
5201 + 2 × (N – 1)	Door N In Count	Current Door N in count
5202 + 2 × (N – 1)	Door N Out Count	Current Door N out count
5401 + 2 × (N – 1)	Direct Select N Up Adjust	Current Direct Select N manual up adjustments
5402 + 2 × (N – 1)	Direct Select N Down Adjust	Current Direct Select N manual down adjustments
5701 + 2 × (N – 1)	Door N Cumulative In Count	Sum of Current Door N In Count and Stored Door N In Count
5702 + 2 × (N – 1)	Door N Cumulative Out Count	Sum of Current Door N Out Count and Stored Door N Out Count
5901 + 2 × (N – 1)	Door N Cumulative Up Adjust	Sum of Current DSTS N Up and Stored DSTS N Up adjustments
5902 + 2 × (N – 1)	Door N Cumulative Down Adjust	Sum of Current DSTS N Down and Stored DSTS N Down adjustments
6001–6010	Door 1–10 Normal Operation	Door 1–10 Occupancy below Warning level
6101–6110	Door 1–10 Warning On	Door 1–10 Occupancy has exceeded Warning level
6201–6210	Door 1–10 Alarm On	Door 1–10 Occupancy has exceeded Alarm level
6601–6610	Door 1–10 Reset	Door 1–10 Manual Reset, a value of 1 resets the individual door counts
6701–6710	Door 1–10 Cumulative Sensor Count	Sum of Current Sensor Count and Stored Sensor Count
6801–6810	Door 1–10 Cumulative Up/Down adjust	Sum of Current Up/Down adjust and Stored Up/Down adjust
7001 + 2 × (N – 1)	Door N Stored In Count	Stored in count. Values are stored whenever the system count goes negative
7002 + 2 × (N – 1)	Door N Stored Out Count	Stored Out count. Values are stored whenever the system count goes negative
7201 + 2 × (N – 1)	Direct Select N Stored Up Adjust	Stored sum of DSTS Up adjustments. Values are stored whenever the system count goes negative
7202 + 2 × (N – 1)	Direct Select N Stored Down Adjust	Stored sum of DSTS Down adjustments. Values are stored whenever the system count goes negative

5.3 Modbus Registers for the Multiple Count Q45 Occupancy Solution Kits

DXM Register	Description	Notes
851 to 870	Occupancy Limit	Value at which an alarm is activated. Default value is 3. Red light is activated on the Tower light when the occupancy reaches the alarm level.
871 to 890	Occupancy Warning	Value at which a warning is activated. Default value is 3. Yellow light is activated on the Tower light, if used, when the alarm is activated. If both the Limit and Warning are the same value, then the Limit takes priority and the warning is ignored.
898	Fast Sample Mode	Default is set to 1. When set to a value of 1, all Q45 Sensor Nodes in the system enter fast sample mode. This enables change of state reporting. When the value is 0, the units follow standard operation. Standard operation is a one-minute reporting rate until the Occupancy Warning level is achieved. Then the Q45 units enter fast sample mode.
899	First Run	When the DXM first powers up after the Occupancy script has been loaded, this register value goes to 1 to signifies that the initial parameters for the system have been set. This occurs only once.
900	Delay Mode	The system operates normally when this value is 0. Setting to non-zero sets a four second delay. The script works normally, but at the end of the script, the system delays for four seconds before starting another loop. This is helpful when you are troubleshooting the system.

DXM Register	Description	Notes
5001 to 5099	Totalized System Specific Totals	Only calculated when a system is configured in Total Count mode. This takes all Q45 Directional Totals and the Direct Select Up & Down Totals and creates a singular total system count. Only used by Type 1 systems
5101 to 5199	Individualized System Specific Totals	Only calculated when a system is configured in Multiple Count mode. This takes the count from a single Q45 Directional Total and Direct Select Up & Down Total to create a value for that set of units. Each set of units has an individualized total calculated. Only used by Type 0 systems
5201 to 5299	Q45 Directional Totals	The sum of In and Out directional count for a Q45 Sensor pair.
5301 to 5399	Q45 Sensor Totals	Sensor A and Sensor B count for a Q45 sensor pair.
5401 to 5499	Direct Select Up & Down Totals	System Totals for the Up and Down button presses for the Direct Select units.
5501 to 5599	Cumulative Totalized System Count Totals	Only calculated when a system is configured in Total Count mode. Uses the Q45 Direction Totals, Direct Select Up & Down Totals, Stored Q45 Directional Totals, and Stored Direct Select up & Down Totals to generate the Cumulative total for the system. Only used by Type 1 systems
5601 to 5699	Cumulative Individualized System Count Totals	Only calculated when a system is configured in Multiple Count mode. Uses the Q45 Direction Totals, Direct Select Up & Down Totals, Stored Q45 Directional Totals, and Stored Direct Select up & Down Totals to generate the Cumulative total for each Q45 pair in the system. Only used by Type 0 systems
5701 to 5799	Cumulative Q45 Directional Totals	Combines the Q45 Direction Totals and the Stored Q45 Directional Totals together.
5801 to 5899	Cumulative Q45 Sensor Totals	Combines the Q45 Sensor Totals and the Stored Q45 Sensor Totals together.
5901 to 5999	Cumulative Direct Select Up & Down Totals	Combines the Direct Select Up & Down Totals and the Stored Direct Select Up & Down Totals together.
6001 to 6099	System Status - Normal	States that the System is in Normal state.
6101 to 6199	System Status - Warning	States that the System is in Warning state.
6201 to 6299	System Status - Alarm	States that the System is in Alarm state.
6601 to 6699	Manual Reset	Door 1–10 Manual Reset; a value of 1 resets the individual door counts
7001 to 7099	Stored Q45 Directional Totals	The stored directional totals for the Q45 sensor pairs. When the System Specific Totals go negative the current Direction Totals is moved into this location. Then the System Specific Total is reset. This data is then used to create the Cumulative totals.
7101 to 7199	Stored Q45 Sensor Totals	The stored sensor totals for the Q45 sensor pairs. When the System Specific Totals go negative the current Sensor Totals is moved into this location. Then the System Specific Total is reset. This data is then used to create the Cumulative totals.
7201 to 7299	Stored Direct Select Up & Down Totals	The stored Direct Select Up and Down totals. When the System Specific Totals go negative the current Direct Select Up & Down Totals is moved into this location. Then the System Specific Total is reset. This data is then used to create the Cumulative totals.

A Type 1 system is a multiple-count system and a Type 0 system is a total-count system.

5.4 Contact Us

Banner Engineering Corp. headquarters is located at:

9714 Tenth Avenue North
Minneapolis, MN 55441, USA
Phone: + 1 888 373 6767

For worldwide locations and local representatives, visit www.bannerengineering.com.

5.5 Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

For patent information, see www.bannerengineering.com/patents.

www.bannerengineering.com - Tel: + 1 888 373 6767