

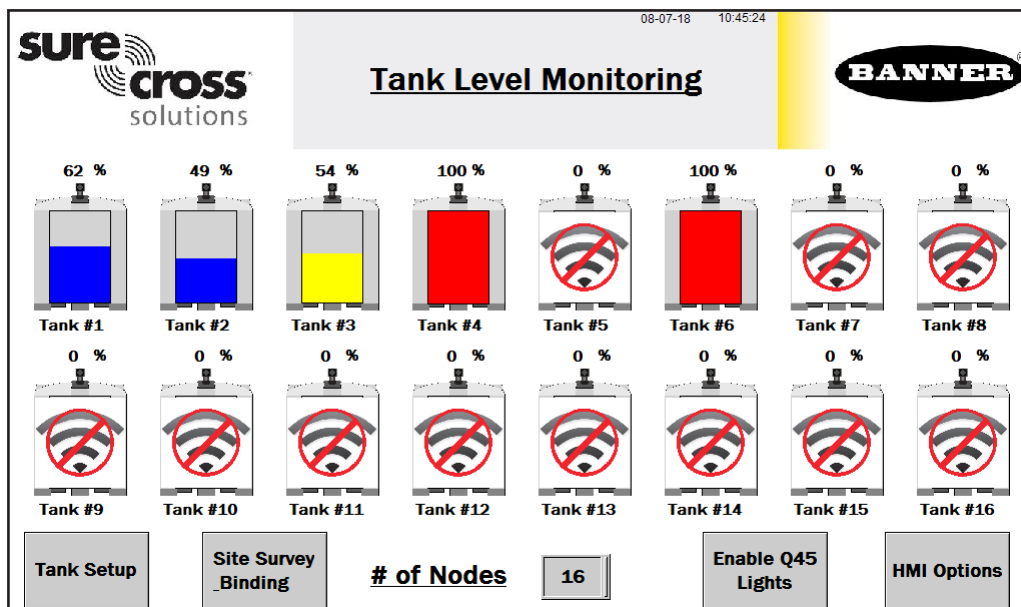
Banner Tank Level Monitoring Solutions Kit

The Solutions Kit provides visual status of up to 16 Banner K50U Performance Node sensors (assets) that are bound to the included DXM Wireless Controller. This provides a simple and effective way of monitoring the level of many tanks, totes, or barrels to avoid disruption, downtime, or damage to pumps.

This Solutions Kit uses a unique version of the Banner Tank Level Monitoring Solutions Guide software to program the DXM Wireless Controller. The Nodes take a data sample every 5 minutes and the software uses the raw data along with user tank settings to calculate the tank level percentage. Users can also enter in low or high warnings and/or alarms for visual indication of a potential problem.

Included with the Tank Level Monitoring Solutions Kit are:

- 10-inch Banner Touch Screen HMI with Ethernet connection (THM101CE)
- DXM100-B1R1 Wireless Controller (900 MHz) or DXM100-B1R3 (2.4 GHz)
- Five-port Ethernet switch
- Power supply, 24 V dc, 1.3 A
- Circuit breaker, miniature, 6A C6
- Polycarbonate enclosure, 14" x 12", with DIN rails and terminal blocks



HMI Home Screen

- Each individual Nodes' icon is a color-coded indication of the status of tank level warnings or alarms and a touch button that will bring up that Nodes' screen to view detailed data. (See page 4)
- Use the Site Survey and Binding button to conduct a site survey or bind any Node.
- Use the Tank Setup screen to define tank depth, offset, warning levels, alarm level, and/or change units.
- Change the # of Nodes from 1 to 16 to display how many Nodes are used.
- The HMI Options button provides an icon legend, options for HMI panel configuration, and access to log files.
- The Enable/Disable Q45 Lights button enables the LEDs to begin flashing on any of the Q45s that are in a warning (yellow) or alarm (red) state. No light appears in a typical situation. Press once to enable; press again to disable and save battery life.
- Touch the Node label to re-label any asset icon. The label is used on all associated screens for that Node.

Tank Level Node (Asset) Site Survey & Binding Screen

Banner Wireless Q45 or P6 Nodes combined with Banner K50U ultrasonic sensors must be bound to the DXM Wireless Controller to begin communicating. After you complete these instructions, the Q45/P6 Nodes are assigned a Node address and begin communicating with the DXM.

Purchase the Nodes and sensors separately. After they are installed, they must be bound individually. Follow these instructions to add a new Node/sensor radio. Perform a site survey on each Q45/P6 Node after they are installed to ensure a proper radio connection between the Nodes and DXM.

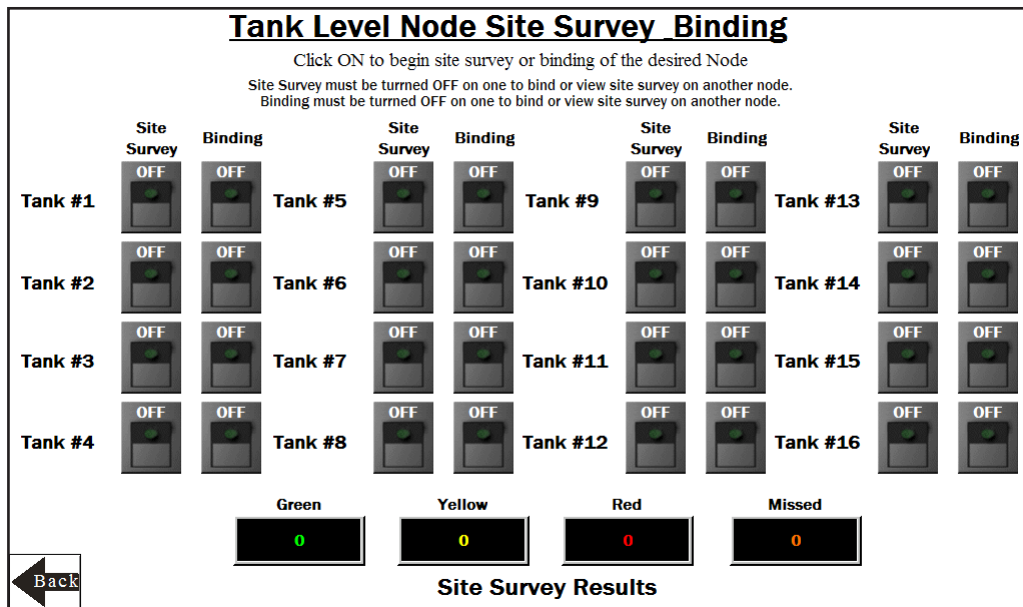
Bind a Node to the DXM

1. On the HMI screen: Touch the Binding button to turn on binding for the Node.
2. On the Node:
 - a. Connect the K50U ultrasonic sensor
 - b. Enter binding mode by triple-clicking the binding button under the Q45 lid or by triple-clicking button 2 on a P6. For the P6 follow the Node's datasheet for setting the rotary dials before binding.
 - c. After the Node is bound, the LEDs stay solid momentarily, then they flash together four times. The node automatically exits binding mode.
3. On the HMI screen, touch the same Binding switch again to toggle the switch to off.

Repeat these steps for as many Nodes as are needed for the network.

Conduct a Site Survey

1. On the HMI screen: Select Site Survey for the Node.
If the selected Node is communicating with the DXM, the site survey results display at the bottom of the HMI screen.
2. Refer to the [Conducting a Site Survey and Interpreting the Results](#) technical note (p/n 133602) on www.bannerengineering.com to interpret the Site Survey results.
3. On the HMI screen: After the site survey is complete, toggle the Site Survey switch to turn Site Survey off.



Tank Setup Screen

Each tank level Node reports back data to determine the percentage of the tank depth and if any offset height is required. The maximum tank depth is 120 inches or 3000 mm. If there is no offset, leave it set to zero. Push the Change Units button to toggle between inches and millimeters.

1. Enter in the tank depth and offset height (if applicable) for each tank level Node.
2. Set each tank level Node's low and high warning and/or alarm levels. Set those values between 0 and 100%. Leave the values at 0 for Low and 110 for High if you are not using that warning or alarm.

3. Use the arrow button next to Nodes #9-16 settings to set up the additional Nodes. Use the return arrow on that screen when complete and the Back button to return to the Tank Level Monitoring Home screen.

Tank Monitoring Depth, Offset and Alarm Settings

REQUIRED : Click on the numeric entry box to set the tank depth and offset (if applicable) in inches(0-120) or mm(0-3000).
OPTIONAL : Click on the numeric entry box to set the warning and alarm thresholds in % full (0-100%).

	Tank Depth (inches)	Offset (inches)	Low Warning %	Low Low Alarm %	High Warning %	High High Alarm %	Change Units: Metric (mm)
Tank #1	72.00	6.00	30	10	70	90	Change Units: Metric (mm)
Tank #2	120.00	0.00	0	0	110	110	
Tank #3	120.00	0.00	0	0	110	110	
Tank #4	120.00	0.00	0	0	110	110	
Tank #5	120.00	0.00	0	0	110	110	
Tank #6	120.00	0.00	0	0	110	110	
Tank #7	120.00	0.00	0	0	110	110	
Tank #8	120.00	0.00	0	0	110	110	

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Nodes #9-16 Settings →

HMI Options Menu Screen

This screen provides some added HMI functionality along with an Icon Legend and a Graph Legend.

HMI System Setup—Enters the HMI Panel Setup; clears any logged data from the graphs but will not clear any data saved to files.

Restart HMI Application—Restarts the HMI application, which clears all graphed data but retains saved logs.

Stop Operation Safely—Stops HMI operation safely without data corruption, then turns off the HMI.

The HMI provides data logging of all tank levels, tank settings, and warnings and/or alarms. This data is saved to a file every 30 minutes and a new file is generated every day and stored in monthly folders. The HMI stores about 75 days of log files. Below are some options for managing and retrieving those files.

Copy Log Files to USB Drive— Plug a USB drive into the back of the HMI and click here to select the log files or folders to copy.

Manually Delete Files Older than X Days—Delete files older than a specified number of days immediately. Use this option if the HMI is warning about an inability to save data or a lack of storage space. Shortening the auto delete days may be necessary.

Auto Delete Files Older than X Days—The HMI auto deletes files older than the selected number of days.

HMI System Setup

Copy Log Files to USB Drive


Restart HMI Application

Manually Delete Files Older than 'X' days


Stop Operation Safely

Auto delete files older than 'X' days 30


Icon Legend




No Alerts



Warning




Alarm




Node Out of Sync


Graph Legend



Raw Data



Warning

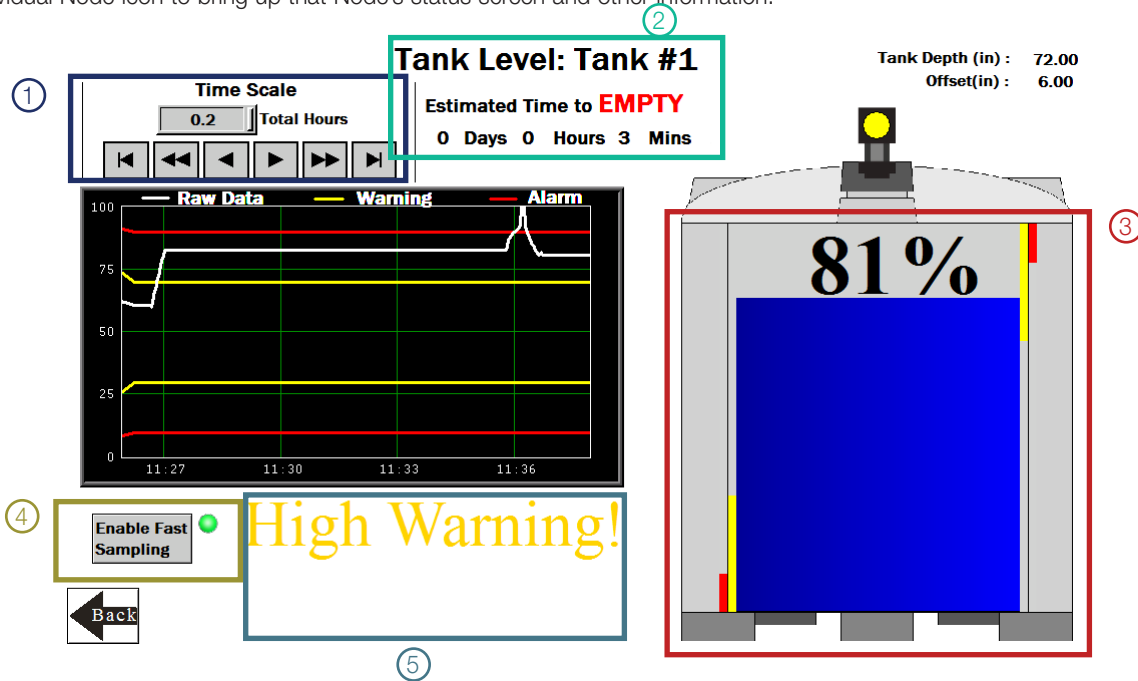


Alarm

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Individual Tank Level Node (Asset) Status Screen

Select an individual Node icon to bring up that Node's status screen and other information.



- ① **Time Scale**—Selects the time scale of the graph from 1 to 168 total hours. Use the arrow keys to scroll to view different periods of the collected data. Maximum viewable data on the HMI: 168 hours or 7 days.
- ② Indicates whether the tank is filling or emptying and the estimated time to full or empty based on the change in depth during the last two samples.
- ③ **Tank Level Display**—The image of the tank shows the current tank depth with the warning and alarm levels. The simulated Q45 light on top of tank changes color to match any warning (yellow) or alarm (red) state.
- ④ **Enable Fast Sampling**—Enables fast sampling of the Node associated with the current screen and enables the graph to start logging every two seconds. The green light indicates when the fast sampling for the graph is enabled and automatically turns off after 15 minutes. Each Node's fast sampling is independently set. NOTE: If this button had already been pressed on another tank screen, the green light might already be lit even if the Node isn't fast sampling because the Node doesn't report its fast sampling status. If you are unsure of the Node's state, pressing the button again resends the fast sample command to that particular Node and restarts the 15 minute timer. This should only be used to quickly monitor a filling or emptying situation; frequent use reduces the battery life of the Node(s) being fast sampled.
- ⑤ Indication of any current warnings or alarm display near the bottom of the screen, below the graphs.

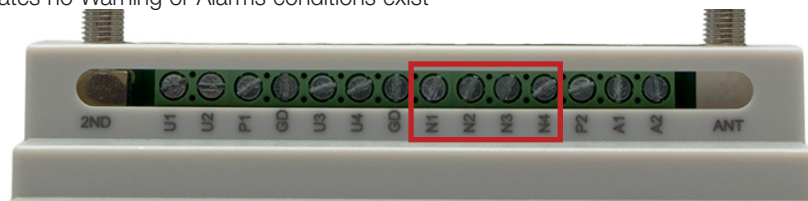
Advanced Options

Installing a Warning/Alarm Light Indicator

A tower light or indicator light (such as a K70, TL50, TL70, etc.) may be added to the solution box for added local indications of all clear, warnings or alarms. The light must use the NMOS output on the DXM Wireless Controller and the power supply terminals inside the box.

To install:

1. Cut a hole in the box and mount the light accordingly.
2. Wire 24 V dc to the light from the top row of the gray 2-row terminal blocks located next to the DXM Controller.
3. Wire the input of the light to the DXM as follows:
 - a. N1 – Pin 25 – indicates any Node/asset in Alarm condition
 - b. N2 – Pin 26 – indicates any Node/asset in Warning condition
 - c. N3 – Pin 27 – indicates any Node/asset in either Warning or Alarm condition
 - d. N4 – Pin 28 – indicates no Warning or Alarms conditions exist



Connecting the DXM and HMI to a wide area network (WAN)

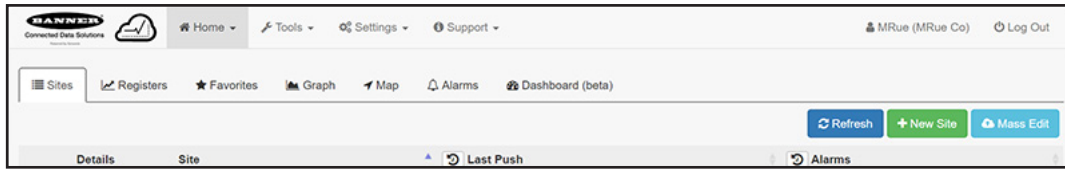
By default, the HMI and DXM Wireless Controller are configured to communicate via static IP addresses.

To connect to a WAN, the two devices need to be adjusted to either have new static IP address on the new network or to acquire their own IP address via DHCP. Connecting to a WAN allows the devices to be accessed for configuration by any computer on the network and allows the DXM to be set up to push data to a cloud webserver for remote monitoring on the web. Follow the instructions in Push Information to the Cloud to connect the DXM to the Banner Connected Data Solutions website.

1. Open the solution box and connect an Ethernet cable from the WAN to the Ethernet switch inside the solution box.
2. [DXM]: With power applied to the DXM, use the arrow keys to select **System Config** and press **Enter**.
3. [DXM]: Use the arrow keys to select **Ethernet**.
4. [DXM]: If you are using a static IP address
 - a. Select the IP address shown and click **Enter**.
 - b. Use the arrow and **Enter** keys to set the new static IP address.
 - c. Reboot the DXM after making these changes.
- [DXM]: If you are using DHCP
 - a. Click **Enter** on DHCP.
 - b. Use the arrow keys to select **DHCP ON** and press **Enter**.
 - c. Reboot the DXM after making these changes.
- d. Navigate to the **System Info > Ethernet** and write down the IP address for entering into the HMI. The subnet mask can be adjusted here as well if needed.
- e. [HMI]: From the main screen go to the **HMI Options** screen and then choose **HMI System Setup**.
- f. [HMI]: In the **Panel Setup** screen select, **General**.
- g. [HMI]: On the pop-up screen that appears, either adjust the IP address and network information for a static IP address by touching the boxes for the appropriate fields or in the box next to Get an IP address automatically push on the box to change **False** to **True** then press **OK**.
5. [HMI]: Press **Link 1** and select the IP address field.
6. [HMI]: Enter the IP address of the DXM from earlier and click **OK**.
7. [HMI]: To finish press **Run**.

Panel Setup			
General	Link 1	Copy AP to HMI	Boot from File
Touch Panel	Link 2	Copy AP to File	Update from File
Set Time/Date	Link 3	Copy File	Clear Recorded Data
	Link 4	Delete File	Run
		Format Disk C	
H/W Information	LAN Printer Address	FTP/VNC	

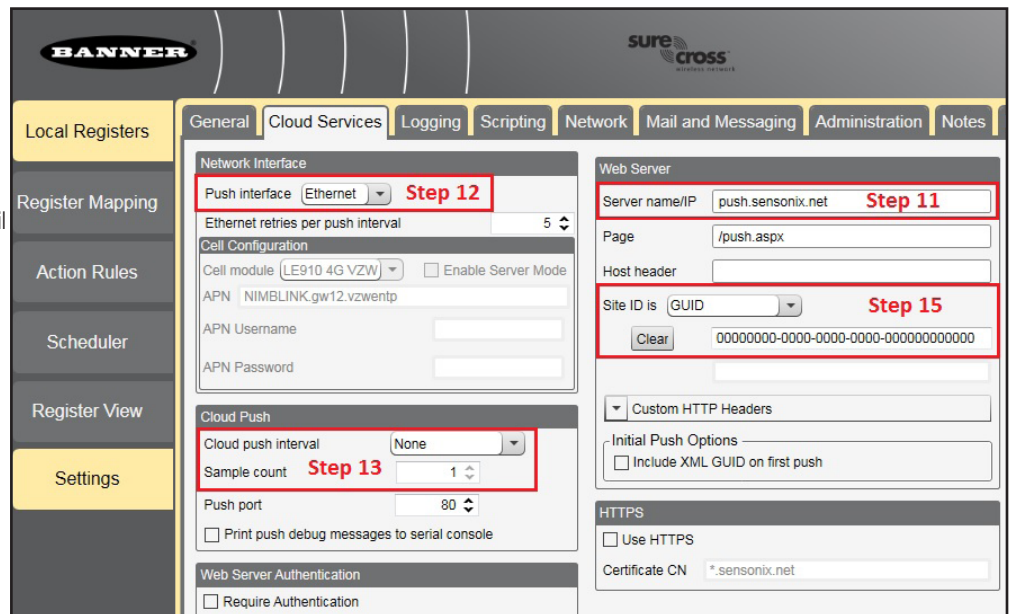
Push Information to the Cloud



The DXM Wireless Controller can connect to the web via Ethernet or an internal cell module to push data from the DXM to the cloud for storage and display on a website. To enable this capability, modify the DXM's XML configuration file. The Banner website for storing and monitoring the system's data is <https://data.sensonix.net/>.

1. [WEB]: Visit the Banner Connected Data Solutions by Sensonix website (<https://data.sensonix.net/>) and log into an existing account or register a new account.
2. [WEB]: Click **+ New Site** and name the site.
3. [WEB]: Highlight and copy the Site ID, then click **Save**.
4. [DXM]: Download the [DXM Configuration Tool v3](#) from the Banner Engineering website and install it on a computer.
5. [DXM]: Apply power to the DXM.
6. [DXM]: Connect the DXM Controller to the computer with a USB cable or skip this step if the DXM is on the same network as the computer.
7. [DXM]: Open the DXM Configuration Tool software and connect the software to the DXM clicking **Device > Connection Settings** in the menu bar.

8. [DXM]: If you are using the USB cable, select **Serial** then select the COM port that the USB cable is plugged into. Click **Connect**. If you are unsure which COM port to select and multiple appear, attempt to connect to each one of them until you are successful. If the computer is connected to the same network as the DXM, select **TCP/IP** and enter the DXM IP address and click **Connect**.
9. [DXM]: After you are connected, get the current XML file by clicking **Device > Get XML configuration from DXM**. Name and save the file to the computer.



10. [DXM]: Within the tool, go to the **Settings > Cloud Services** screen.
11. [DXM]: Set the **Server name/IP** to `push.sensonix.net`.
12. [DXM]: Select the appropriate **Push interface** to either Cellular or Ethernet. (To set up Ethernet, use the Settings > Network screen. To set up cellular, refer to the Activating a Cellular Modem technical note).
13. [DXM]: Leave the **Cloud push interval** and **Sample count** set as they were. The DXM script will control this to push every 5 minutes.
14. [DXM]: To select which registers push to the cloud, go to the Local Registers screen. The most likely registers to select are those 1–80 for the raw Node data, 101–116 for vibration failure mask info, 191–206 for Node connection status, and 501–692 for baseline/threshold data. Then either:
 - a. Expand each register and select Cloud Permissions to Read; or
 - b. Choose the Modify Multiple Registers tab to select Cloud Permissions Read for a block of registers
15. [DXM]: Under the Web Server section, keep the **Site ID** drop-down selection as **GUID** and paste the copied ID into the Site ID field.
16. [DXM]: Save the XML file (**File > Save**).
17. [DXM]: Upload the file to the DXM (**Device > Send XML Configuration to the DXM**).
18. [WEB]: Return to the Banner Connected Data Solutions by Sensonix website. Click **Options** on the row of the newly created site, select **XML Config**, and select the XML file that was just saved and uploaded to the DXM.
19. [WEB]: Click **Save** to complete the connection to the website.

This creates continuity between the site created on the website with the DXM. If the DXM has network connection, it will push up data on its next cloud push interval. Refer to the [Banner Connected Data Solutions Instruction Manual](#) to review all the features available for monitoring, comparing data, and establishing warnings/alarms on the website.

To access a Demo version of the website, please contact your local Banner distributor and follow the instructions in the technical note [Connecting DXM Wireless Controller to Banner Connected Data Solutions Demo Site](#) for modified instructions on how to send data to the Demo site.

For additional advanced options using the DXM, refer to the [Banner Tank Level Monitoring Solutions Guide](#) on the Banner Engineering website. NOTE: The files used in the Solutions Kit are slightly different than those used with the Solutions Guide. Use the Solutions Kit files with the DXM being used with the HMI. To apply any of the advanced options mentioned in the Vibration and Predictive Maintenance Solutions Guide, first use the DXM Configuration Tool and perform a Device > Get XML configuration from DXM to download the Solutions Kit XML configuration file.

For additional information on the DXM Wireless Controller, Wireless Q45U Node, P6 Node, or QM42VT1 sensor, visit www.bannerengineering.com/wireless.

Specifications

Supply Voltage

AC: 100 to 240 V ac (-15%/+10%) at 50 or 60Hz

Power Consumption

9 W average; 30 W maximum

Operating Conditions

0 °C to +50 °C (32 °F to +122 °F) (HMI);

-40 °C to +85 °C (-40 °F to +185 °F) (DXM);

-20 °C to +80 °C (-4 °F to +176 °F) (DXM LCD)

Micro SD Card (if applicable): -25 °C to +85 °C (-13 °F to +185 °F)

90% maximum relative humidity (non-condensing)

900 MHz Compliance (1 Watt)

FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247

IC: 7044A-RM1809

2.4 GHz Compliance

FCC ID UE300DX80-2400: This device complies with FCC Part 15, Subpart C, 15.247

ETSI EN 300 328: V1.8.1 (2012-04)

IC: 7044A-DX8024

Radio Range

900 MHz, 1 Watt: Up to 9.6 km (6 miles)

2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

Antenna Minimum Separation Distance

900 MHz, 150 mW and 250 mW: 2 m (6 ft) 900 MHz, 1 Watt: 4.57 m (15 ft)

2.4 GHz, 65 mW: 0.3 m (1 ft)

Radio Transmit Power

900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)

2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

Mounting

A mounting system that provides for various mounting options has been provided with this enclosure.

To connect the mounting brackets, turn the enclosure such that the backside is visible. Place the mounting brackets over the octagon bosses either horizontally, diagonally, or vertically, and fasten them with the ¼"-20 x 0.25" SS, countersunk Philips drive screws provided (torque limit = 30 in. lbs.). The enclosure can be mounted vertically (ie. on a wall) or horizontally (ie. table top).

Certifications



(applies only to model SOLUTIONSKIT2-TANK)

FCC Part 15 and CAN ICES-3 (B)/NMB-3(B)

This device complies with part 15 of the FCC Rules and CAN ICES-3 (B)/NMB-3(B). 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.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules and CAN ICES-3 (B)/NMB-3(B). These 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 manufacturer.

Banner Engineering Corp. Limited Warranty

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