

The MultiHop version of the Vibration Solutions Kit provides visual status of up to 40 Banner vibration and temperature sensors that are wirelessly linked to the included DXM Wireless Controller. This provides a simple “Check Engine Light” of the asset being monitored. The added benefits of a MultiHop style Solutions Kit include longer range capabilities by using repeater radios, wiring multiple sensors to a single radio, and more vibration information available per sensor for advanced applications.

The program takes a data sample every five minutes from the vibration sensors and the software uses the raw data to detect whether an asset is running, create a baseline of the four vibration characteristics (RMS Velocity 10-1000 Hz on Z and X axis and RMS High Frequency Acceleration 1000-4000 Hz on Z and X axis), and generate warning and alarm thresholds for those characteristics. Only data from an operational asset is used to create the baselines or thresholds and only that data is used to trigger warnings or alarms. Data from assets that are not running/operational appear on the graphs but are not used in the analysis.

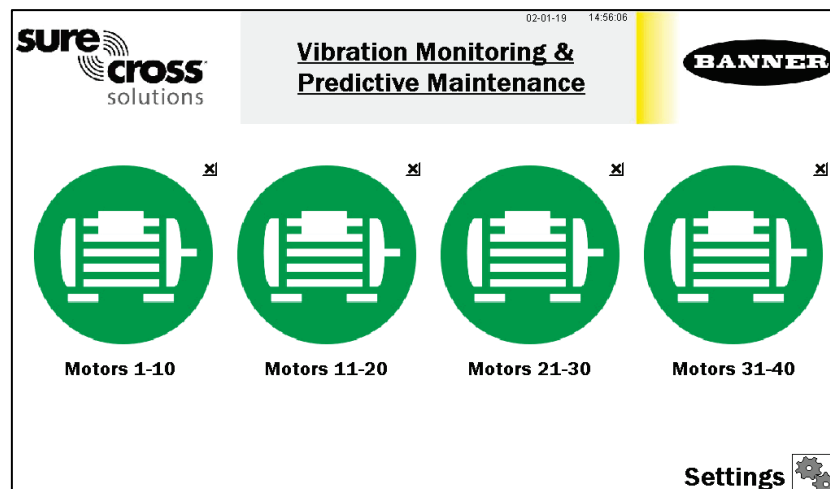
**RMS Velocity** identifies problems such as: imbalance, misalignment, looseness, and other low frequency machine issues.

**RMS High Frequency Acceleration** is used to indicate early bearing wear issues.

Solutions Kit Model	Radio Frequency	Units	Contents
SolutionsKit9-Vibe-MH	900 MHz	Imperial	10" Banner Touch Screen HMI with Ethernet connection <a href="#">DXM700-B1R2 or DXM700-B1R4 Wireless Controller</a> 5-port Ethernet switch <a href="#">14" x 12" Polycarbonate enclosure</a> , DIN rails, and terminal blocks M12/Euro-style power input connector This kit also requires a 24 V DC Class 2 (UL) or a Limited Power Source (LPS) (CE) power supply that is sold separately (Banner recommends model PSW-24-1 (FCC/CE) or model PSD-24-4 (FCC/CE) if you are powering additional indicator lights)
SolutionsKit9-Vibetric-MH	900 MHz	Metric	
SolutionsKit2-Vibe-MH	2.4 GHz	Imperial	
SolutionsKit2-Vibetric-MH	2.4 GHz	Metric	

To get started:

1. Connect and plug in the 24 V DC Class 2 or LPS power supply to the Solutions Kit to apply power to the radios.
2. Assign sensor Modbus IDs (page 2), bind the radios to the kit (page 3), and confirm your signal quality with a site survey (page 3).
3. After a radio is bound with a sensor attached, the system begins sampling data to create a baseline for that sensor.



# Home Screen

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The Home screen displays four “check engine” type icons that represent groups of 10 sensors/motors for a total of 40 motors. Each icon is a color-coded indication of the status of vibration/temperature Warnings (yellow) or Alarms (red), or wireless connection status No Alerts (green) or Node of Out of Sync (orange) within that group. Touch the icon to bring up the 10 individual icons that represent each sensors’ status. Touch the sensor status icons to view detailed data and alarm information for each sensor.

Touch the “X” button in the upper right hand corner of each icon to hide that group of sensors if they are not in use to prevent the connection status alerts for any sensors within that group from displaying. Use the button that appears after pressing the “X” button to unhide that group for future expansion. **NOTE:** In the MultiHop version, all but motor #1 start as hidden for program efficiency, only unhide sensors that have been added and are in the network.

The **Settings** button opens access to Radio binding, Radio site survey, Asset baselining, Log file downloads, and other settings.

Touch each asset group label to re-label the icon.

## Assigning Sensor Modbus IDs

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To begin configuring the sensors, each sensor must have a Modbus Sensor ID assigned to it. **Sensor Modbus IDs must be between 11-50.** Each sensor ID corresponds to an individual sensor icon on the HMI, with ID 11 as Motor #1 and ID 50 as Motor #40. Sensor IDs don’t have to be assigned in order and sensor IDs can be skipped if the goal is to have smaller groups of sensors between the other four main icons on the home page.

To assign sensor IDs, use either the menu system or the configuration software.

To use the radio’s menu system, follow these steps. For VT1 sensors, use your M-H10 radio and for VT2 sensors, use one of many radio options, such as M-H, M-H2, etc.

1. Apply power to the radio and connect one sensor at a time.
2. Push button 1 (left) until **\*DVCFG** appears then push button 2 (right).
3. Push button 1 until **-S ADR** appears and push button 2.
4. Push button 1 and wait for the radio to read the current sensor ID.  
A three-digit value appears with the current sensor ID with a blinking cursor.
5. Use the left button to cycle the value from 0-9 and the right button to accept the value and move the cursor to the next digit right. Assign a new sensor ID value to 11 through 50; do not repeat any previously used ID values.
6. Push and hold button 2 when done. The screen says **SAVING**.
7. To repeat for more sensors, unplug the sensor and plug in the next sensor and repeat steps 3 through 6 with a new device ID.
8. After you have finished, double-click button 2 to return to the main menu.
9. Connect all sensors to be attached to that radio.

To assign the IDs using the configuration software, use the [Sensor Configuration Software](#) with a computer and either the BWA-USB1WIRE-001 cable accessory for the VT1 sensor or the BWA-UCT-900 cable accessory for the VT2 sensor to connect the sensor to the tool.

Follow the instructions in the [Sensor Configuration Software Instruction Manual](#) to assign the Sensor Modbus ID to a value between 11 through 50.

## Site Survey and Binding Screen

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Banner Wireless radios, such as the battery-powered H10 radio paired with VT1 Vibration and Temperature Sensors or any Banner MultiHop Radio with RS485 connected to VT2 Vibration and Temperature Sensors, must be bound to the DXM Wireless Controller inside the Solutions Kit to begin communicating.

Following the instructions below, the radios are assigned a Modbus slave ID and begin communicating with the DXM wirelessly. Radios and sensors are purchased separately and after they are combined, must be bound

individually. A new radio and sensor can be added to the network at any time by using the binding procedure.  
**Radios must be bound to IDs 51 through 110.**

Use the site survey function to measure the signal strength of radios after the solutions kit and radios are installed. Line powered radios can be used as repeaters to improve signal connection between other nearby radios and the master radio inside the solutions kit. Battery-powered H10 radios should be configured to run only as slave radios in transparent mode (DIP switches 6 and 7 OFF).

### Vibration Radio Site Survey & Binding

Click ON to begin site survey or binding of the desired Radio

Site Survey will have a 15 second countdown and then will automatically turn off and report results.

Binding must be turned OFF to view site survey or to use network reformation.

Slave ID

51

Binding

OFF

Slave ID

0

Site Survey

OFF

**Network Reformation\***

OFF

\*Use when moving a sensor from one radio to another.

**Green**

0

**Yellow**

0

**Red**

0

**Missed**

0

**Site Survey Results**

\*\*\*Results may take slightly longer than countdown to appear depending on network.

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## Bind the Radios

1. On the HMI screen, go to the **Settings** -> **Site Survey & Binding** screen.
2. Enter in the Modbus Slave ID next to the Binding rocker switch and tap that switch to turn it ON.
3. On the radio, enter binding mode.
  - If your radio has rotary dials, set the rotary dials to the same slave ID value entered on the HMI by following the radio's data sheet and then triple-click button 2 (right) to enter binding mode.
  - If your radio does not have rotary dials, triple-click button 2 (right button).

After the radio is bound, the LEDs stay solid momentarily, then flash four times. The radio automatically exits binding mode.

4. On the HMI screen, touch the binding rocker switch to turn the switch to OFF to take the DXM out of binding mode. After the DXM is out of binding mode, the indicator LED on the radio flickers green when it is in sync with the DXM.
5. Repeat steps 1 through 4 for as many radios as are needed for the network. Entering binding mode causes all radios to go out of sync until the DXM exits binding mode. The radios will sync to the DXM within a few seconds.

## Network Reformation

Use the Network Reformation rocker switch any time a sensor is moved from one radio to another to help the network reform without requiring a reboot. The switch will turn OFF when the reformation is complete.

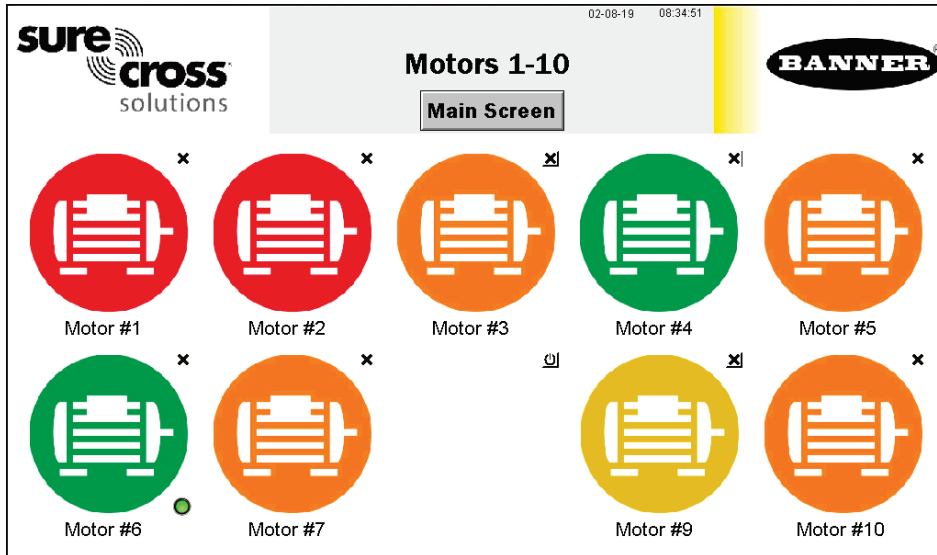
## Site Survey Signal Quality Check

1. On the HMI screen, enter in the Modbus Slave ID of the Radio (51-110) next to the Site Survey rocker switch and tap that switch to turn it ON.  
 A 15-second timer will appear next to the switch and count to 15. After the timer is complete (it may take longer depending on signal quality or if the radios are going through repeaters), the results of the site survey will appear in the Green, Yellow, Red, and Missed boxes. The results are shown as a percentage and add up to a total of 100.

2. Follow the interpreting section of the [Conducting a Site Survey and Interpreting the Results](#) technical note on bannerengineering.com to determine what your results mean for your application.

## Vibration Node Group Screens

Each sensor group on the main page has a screen of 10 individual icons, one for each vibration sensor. These icons represent the status of the motor with colored icons shown below.



Touch any icon to bring up the individual sensor's screen that includes graphs, raw data, and alert descriptions. (page 5)

Touch the "X" button in the upper right-hand corner of each icon to hide that sensor and prevent connection status alerts from that sensor from appearing on the main HMI screen. Use the button that appears after pressing the "X" button to unhide that group for future expansion. For example, Asset #8 is hidden in the sample screen.

Touch each asset label to re-label the icon. That label remains in non-volatile memory and appears on the sensor's status screen, binding screen, site survey screen, and baselining screens.

A small green lamp in the bottom right corner of a sensor's icon indicates when that sensor data is baselining. Only temperature warnings and alarms appear during the baselining phase. After baselining is complete, the threshold levels are established, and vibration alerts may begin to appear.

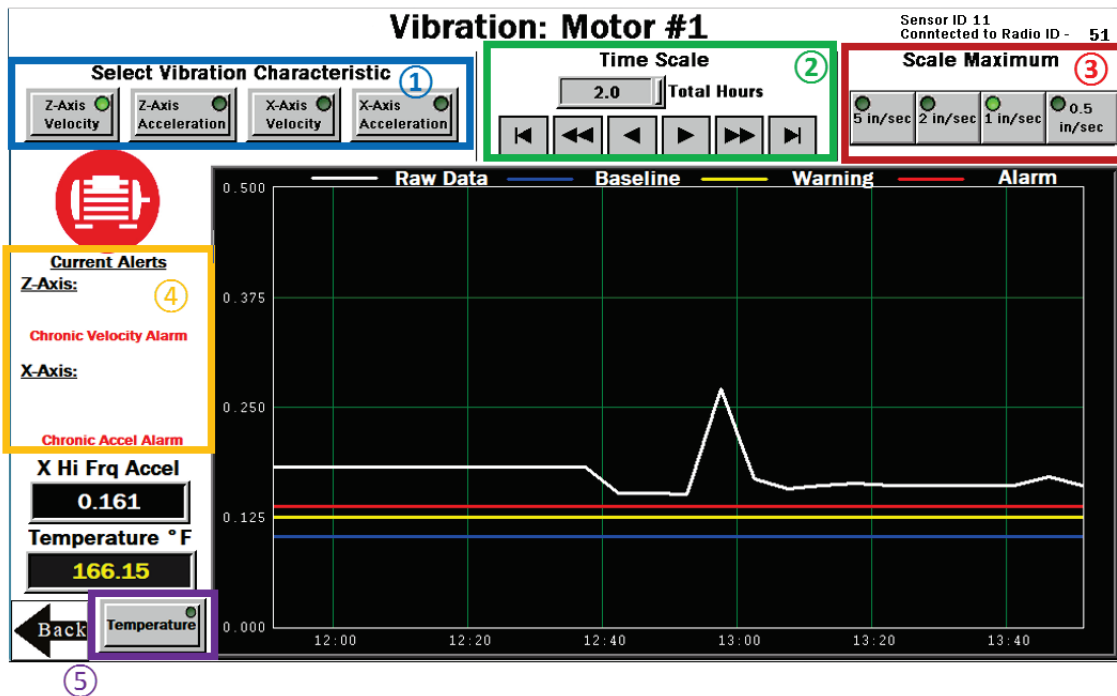
If a sensor appears out of sync (orange), that means the radio it is attached to is no longer in sync with the main controller. This may indicate you need to replace the battery in the radio or interference is preventing the radio from remaining in sync. After replacing the battery or improving the radio's site survey results, use the network reformation button in the Site Survey & Binding (page 3).

### Icon Legend



# Individual Sensor Status Screen

Selecting a sensor icon opens that sensor's status screen. Use the **Back** button in the bottom left to return to the previous screen.



① - Select the Vibration Characteristic to graph raw data. Options include: Z-Axis Velocity, Z-Axis High Frequency Acceleration, X-Axis Velocity, and X-Axis High Frequency Acceleration. The bottom left of the screen shows a real-time readout of the selected characteristic. Velocity is displayed in in/s (mm/s for Vibemetric versions) and Acceleration is displayed in gs. **Note:** Velocity values of 6.5535 and/or acceleration values of 5.355 indicate a sensor error. The system ignores these data points to avoid affecting the saved baseline or trended data. The system will not baseline when the raw data values appear as those values. Contact Banner support for troubleshooting.

② - Select the **Time Scale** of the graph from 0.1 to 168 total hours (7 days). Use the arrow keys to scroll right or left to see different periods of the collected data. The graphing data loggers have a fixed number of data points and if using the DEMO MODE button on the Settings page, then the increased sampling rate reduces the number of data points available for viewing until those data points have rolled off the end of the timeline.

③ - Select the data **Scale Maximum**. For Acceleration, the range is 0.25g to 5g (g-force) and for Velocity, the range is 0.5 inches/second to 5 inches/second (10 mm/s to 60 mm/s for metric versions).

④ - The **Current Alerts** section shows any warnings or alarms based on the Axis, Vibration Characteristic, and type (Chronic or Acute) that the system is detecting. Acute alerts are those crossing the threshold for five samples in a row (or the user setting on the **Settings** screen) and Chronic alerts are when a 100 point moving average crosses the thresholds. Only data from an operational asset is used to calculate averages and alerts.

⑤ - Select **Temperature** to view the temperature graph over the selected time period. Directly above the button is the current temperature of the selected sensor. The readout color is white if it's nominal, yellow if it's in a warning state, and red if it's in an alarm state. The warning and alarm temperature settings are 158 °F (70 °C) and 176 °F (80 °C) respectively. A raw temperature value of 327.67 indicates a sensor error. Contact Banner support for troubleshooting. In the upper right-hand corner of the screen is the Sensor's Modbus slave ID and Radio slave ID to which the sensor is attached. This can be useful in finding which radio a sensor is connected to if the orange Out of Sync status icon appears. Signal quality or battery replacement may be necessary for a radio that loses connection status.

# Settings Screen

**Site Survey & Binding** – Opens a screen to allow binding, site survey, and network reformation of each wireless Radio to the Solutions Kit.

**HMI Options** - Provides the ability to copy/manage HMI log files, HMI configuration for advanced options, functional HMI options, and an Icon Legend as well as a Graph Legend.

**DEMO MODE** – Use only for demonstration purposes when fast sampling is required. Demo mode enables a fast sampling mode on all the bound sensors, putting them and the HMI into a four-second sample rate for 10 minutes (status indicated by the green light within the button). Reduce the Baseline Samples to less than 30 for demonstration purposes. Using Demo Mode drains the battery faster and creates a larger log file that fills up memory quicker, so only use this mode when demonstrating the kit, not during standard operation. **Always use the stop operation safely button on the HMI Options screen before powering down** and especially if powering down after using the Demo Mode button.

**Enable Sensor Discovery** – Use in the following two situations: 1) Use when a sensor shows the orange “Out of Sync” icon to see if there was a signal interference issue that has since recovered. 2) Use after correcting a sensor out of sync error (battery replacement, signal adjustment, etc.) to begin sampling again or when a new sensor is added to an existing radio. The switch turns off when discovery is complete. When a sensor goes out of sync, the sensor is only checked again every four hours to keep timeouts down to a minimum.

**Baseline Samples** – The Solutions Kit takes a baseline of the first 300 running samples of an asset. This can be adjusted up or down by clicking on this numeric entry box to any desired sample. Samples are taken at a fixed five-minute interval.

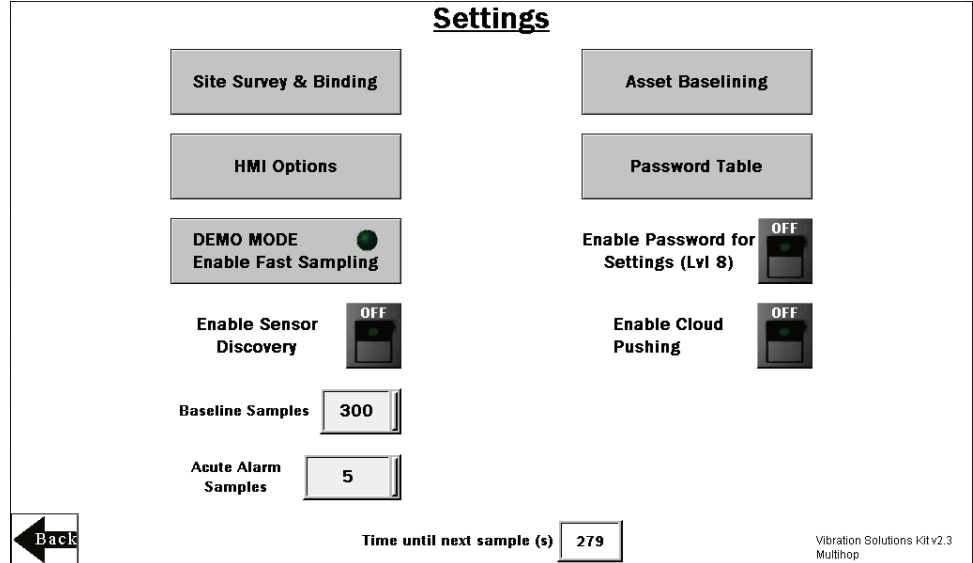
**Acute Alarm Samples** – The default number of samples above the warning or alarm threshold before an alert is triggered is five consecutive samples. Use the numeric entry box to adjust the default value up or down.

**Asset Baselining** – Sensors bound into the system automatically begin baselining. This button opens a screen to enable creation of new baselines and thresholds of each sensor individually, displays the remaining samples in the current baseline, and allows manual threshold limits to be set for both vibration and temperature on each sensor.

**Enable Password for Settings (Lvl 8)** – Turn ON/OFF the switch to enable/disable a password to access the settings menu. The default password for User Level 8 is “88888888”. This can be modified by clicking the **Password Table** button and changing the password for level 8 to any password up to 9 numbers long.

**Enable Cloud Pushing** – Turn ON/OFF the switch to enable to the DXM to begin pushing data to a cloud webserver at 5-minute intervals. This requires additional set up and modification of the XML file in the DXM to point to the correct web server with the correct site ID. Cloud pushing also requires connecting the DXM to a local network via Ethernet or a separately sold cellular modem. DO NOT set the cloud push interval in the XML file as the script triggers the push.

**Time until next sample (s)** – Displays the time (in seconds) until the Solutions Kit samples data from all bound sensors and updates graphs and other visual indicators.





# Sensor (Asset) Baselining Screen

After the sensor is installed and the system is powered on, the software automatically begins collecting data and determines if the asset is running.

The software generates a baseline and thresholds based on the first 300 data samples or about 24 hours of asset running time (unless modified on the Settings page).

When an asset is replaced, repaired, or has heavy maintenance done, create a new baseline. If the sensor is moved after the initial baseline is calculated, generate a new baseline.

**Vibration: Baselining Assets**

Click ON to begin re-baselining the desired Asset  
Baseline Switch will remain ON during baselining and will reset to OFF once baseline is complete

<b>Motor #1</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #6</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments
<b>Motor #2</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #7</b>	<input checked="" type="checkbox"/> 150	Manual Warning & Alarm Adjustments
<b>Motor #3</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #8</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments
<b>Motor #4</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #9</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments
<b>Motor #5</b>	<input checked="" type="checkbox"/> 25	Manual Warning & Alarm Adjustments	<b>Motor #10</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments

Assets #1-10   Assets #11-20   Assets #21-30   Assets #31-40

[Back](#)

1. Turn on baselining for the appropriate sensors if a new baseline needs to be generated. The initial baseline is generated any time a new sensor is connected to the system and begins sending data without the need to trigger these switches. The number of baseline samples remaining displays next to the ON/OFF switch. The baseline switch remains on during baselining and resets to off after the baseline is complete.
2. Use the tabs **Assets #1-10**, **Assets #11-20**, **Assets #21-30**, and **Assets #31-40** to access baselining switches for sensors.
3. Use the corresponding **Manual Warning & Alarm Adjustments** button for each sensor to open an individual windowed screen where current baseline threshold settings are visible.
4. Touch the numeric entry box in any of the **New Settings** rows to manually enter a new value for any or all the warning or alarm thresholds, including temperature.
5. Set the vibration settings back to zero to use the original baseline setting. Temperature is not a baselined value so although it displays a baseline value, the value is for reference if the new setting is changed. Manually set the temperature back to the baseline setting by entering 158°F (70°C) for warning or 176°F (80°C) for alarm.

**N1 Warning & Alarm Adjust**

**Warning & Alarm Adjustments**

**Motor #1**

	Z Velocity Warning	Z Hi Accel Warning	X Velocity Warning	X Hi Accel Warning	High Temp Warning
<b>New Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0"/>
<b>Baseline Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="158"/>
	Z Velocity Alarm	Z Hi Accel Alarm	X Velocity Alarm	X Hi Accel Alarm	High Temp Alarm
<b>New Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0"/>
<b>Baseline Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="176"/>

\*\*Vibration "New Settings" at Zero will use Baseline Setting

# HMI Options Menu Screen

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

**HMI System Setup** – Enters HMI Panel Setup. Use for setting Time, Date, and Advanced Options. Entering this screen will clear any logged data from the graphs but will not clear any data saved to files.

**Stop Operation Safely** – Stops HMI operation safely without data corruption before you power off the HMI.

**Always use this button prior to powering down to avoid data file corruption.** If a “Filed to write logged data to file” or “Failed to save” message appears this is due to a power during the saving process and will require the file from the day of the power down to be deleted under the HMI System Setup menu.

The HMI provides data logging of all the raw data, baselines and thresholds. 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 has storage for about 45 days of log files. Below are some options for managing and retrieving those files:

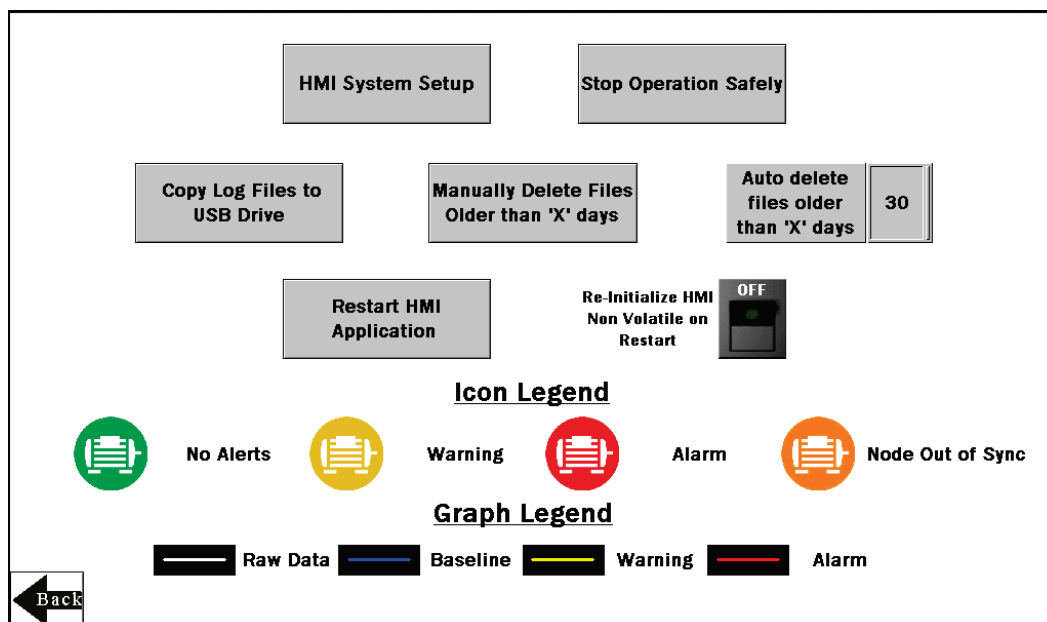
**Copy Log Files to USB Drive** – Plug a USB drive into the back of the HMI and click here to select the log files or folders to copy.

**Manually Delete Files Older than ‘X’ Days** – Deletes 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 parameter may be necessary.

**Auto Delete Files Older than ‘X’ Days** –The HMI auto deletes files older than the selected number of days. Default is 30 days with a maximum of 45 days.

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

**Re-Initialize HMI Non Volatile on Restart** – Flip the switch to ON before restarting the HMI to reinitialize default settings and labels.





# Advanced Options

## Install a Warning/Alarm light indicator

Add a tower light or indicator light (such as a K70, TL50, TL70, etc.) to the solution box for added local indications of all clear, warnings, or alarms. The DXM Wireless Controller uses PNP outputs with a maximum of 100 mA per output so an interposing relay may need to be added to accommodate higher amperage lights.

To install:

1. Carefully cut an appropriately sized hole in the box and mount the light accordingly. (Standard size is 30 mm diameter)
2. Wire DC ground to the light or an interposing relay from the bottom row of the gray two-row terminal blocks inside the Solutions Kit on the DIN rail adjacent to the DXM Controller.
3. Wire the input of the light or interposing relay to the DXM as follows:
  - a. O1 – Pin 5 – indicates any sensor/asset in Alarm or Out of Sync condition
  - b. O2 – Pin 6 – indicates any sensor/asset in Warning condition
  - c. O3 – Pin 7 – indicates any sensor/asset in either Warning, Alarm, or Out of Sync condition
  - d. O4 – Pin 8 – indicates no Warning or Alarms conditions exist

## Additional Vibration Information

The vibration solutions kit provides machine learning for baseline and alerting on RMS Velocity and High Frequency Acceleration for both the X and Z Axis. However, the vibration sensor contains many additional registers of vibration information that are stored in the local registers and can be polled by any host connected to the same network or the data can be sent to the cloud. Below is a register list of the additional available information.

Register Number	Description
6141 + S × 10	Z Axis Peak Acceleration
6142 + S × 10	X Axis Peak Acceleration
6143 + S × 10	Z Axis Peak Velocity Frequency
6144 + S × 10	X Axis Peak Velocity Frequency
6145 + S × 10	Z Axis RMS Low Frequency Acceleration
6146 + S × 10	X Axis RMS Low Frequency Acceleration
6147 + S × 10	Z Axis Kurtosis
6148 + S × 10	X Axis Kurtosis
6149 + S × 10	Z Axis Crest Factor
6150 + S × 10	X Axis Crest Factor

Where S is the sensor number 1-40

In addition to this information, spectral banding information for three bands of each axis at 1x, 2x, and 3x-10x the rotational speed of the motor is available based on a dynamic speed input. To use this feature, have a host system or read rule from a MultiHop radio with speed input place the speed in Hz into registers 6581–6620 (Sensors 1–40) at a rate of no more than once per hour. Below is a list of the spectral band information that is available in floating point registers 1001–1960. For more information, please read the [Spectral Banding Technote](#) on the Vibration and Temperature sensor webpage. Only the default configuration of 1x, 2x, 3-10x is available on the Solutions Kit.

Register Number	Description
1001 + S × 36	Z Axis Velocity 1x Band
1003 + S × 36	Z Axis Peak Velocity 1x Band
1005 + S × 36	Z Axis Velocity Peak Frequency 1x Band
1007 + S × 36	Z Axis Velocity 2x Band
1009 + S × 36	Z Axis Peak Velocity 2x Band

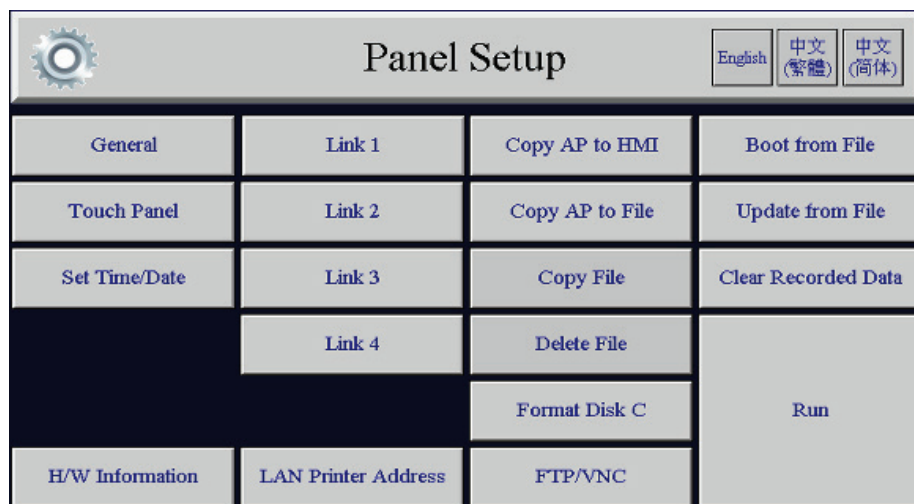
Register Number	Description
1011 + S × 36	Z Axis Velocity Peak Frequency 2x Band
1013 + S × 36	Z Axis Velocity 3x-10x Band
1015 + S × 36	Z Axis Peak Velocity 3x-10x Band
1017 + S × 36	Z Axis Velocity Peak Frequency 3x-10x Band
1019 + S × 36	X Axis Velocity 1x Band
1021 + S × 36	X Axis Peak Velocity 1x Band
1023 + S × 36	X Axis Velocity Peak Frequency 1x Band
1025 + S × 36	X Axis Velocity 2x Band
1027 + S × 36	X Axis Peak Velocity 2x Band
1029 + S × 36	X Axis Velocity Peak Frequency 2x Band
1031 + S × 36	X Axis Velocity 3x-10x Band
1033 + S × 36	X Axis Peak Velocity 3x-10x Band
1035 + S × 36	X Axis Velocity Peak Frequency 3x-10x Band

Where S is the sensor number 1-40

## Connect the DXM and HMI to a Wide Area Network (WAN)

By default, the HMI and DXM Wireless Controller are configured to communicate using static Internet Protocol (IP) addresses. To connect to a WAN, the two devices need to be configured to either have new static IP address on the new network or to acquire their own IP address via Dynamic Host Configuration Protocol (DHCP).

Connecting to a WAN allows the devices to be configured by any computer on the network and allows the DXM to be configured to push data to a cloud webserver for remote monitoring.



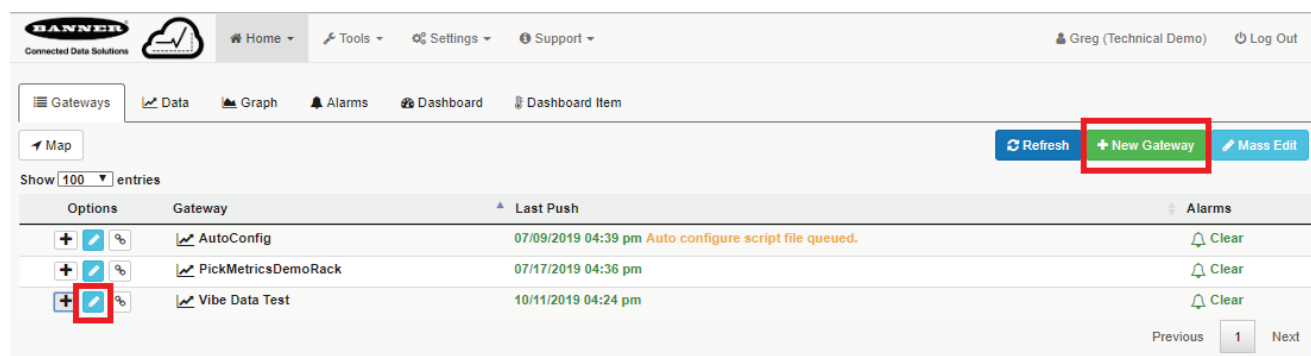
1. Open the solution box and connect an ethernet cable from the WAN to the ethernet switch inside the solution box.
2. On the DXM: With power applied to the DXM, use the arrow keys to select **System Config** and hit **Enter**.
3. Use the arrow keys to select **Ethernet**.
4. If you are using a static IP address, select the IP address shown and click **Enter**. Then use the arrow and Enter keys to set the new static IP address. If you are using DHCP, click **Enter** on **DHCP** and use the arrow keys to select **DHCP ON** and hit **Enter**. A device reboot is requested if any changes are made to these settings.
5. If you are using DHCP, navigate to the **System Info-> Ethernet** and write down the IP address to enter into the HMI. Subnet mask can be adjusted here as well if needed.
6. On the HMI: From the main screen go to the **HMI Options** screen and then choose **HMI System Setup**.
7. In the Panel Setup screen select **General**.

8. On the pop-up screen that appears, set up DHCP in one of two ways:
  - a. Type in the IP address and network information for a static IP address by selecting the appropriate fields; or
  - b. Toggle from false to true in the field next to **Get an IP address automatically**, then press **OK**.
9. Push **Link 1** and press on the IP address field. Enter in the IP address of the DXM from earlier and press **OK**.
10. To finish press **Run**.

## Push Information to the Cloud

The DXM Wireless Controller can connect to the Web via Ethernet or an internal cell module. The controller pushes data from the DXM to the cloud to be stored and displayed 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://bannercds.com/>. Banner Connected Data Services will automatically generate dashboard icons and graphs for the Solutions Kit that can be placed in the Dashboard tab. Email alerts can be set up on the Alarms tab as well.



1. On the Website: Visit the Banner Connected Data Solutions website (<https://bannercds.com/>) and log into an existing account or register a new account. Click **+ New Gateway**. Name the Gateway then click **Create**.
2. After the Gateway appears, click the + symbol on the far left and highlight and copy the Gateway ID.
3. On the computer: Open the [DXM Configuration Software v4](#).
4. On the DXM: Apply power to the DXM.
5. Connect the DXM Controller to the computer with a USB cable or skip if the DXM is connected to the same network as the computer.
6. Select DXM Model as **DXM700** and connect the DXM to the tool by clicking **Device-> Connection Settings** in the menu bar.
7. 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 and multiple appear, attempt to connect to each one of them until successful. If connected to the same network as the DXM, select **TCP/IP** and enter the DXM IP address and click **Connect**.
8. After the DXM is connected to the software, get the current XML file by clicking **Device->Get XML configuration from DXM**. Name and save the file to the computer.
9. Within the tool, click the **Settings** tab on the left and then the **Cloud Services** tab on the top.
10. Make sure the **Server name/IP** is set to push.bannercds.com.
11. Select the appropriate **Push interface** to either Cellular or Ethernet. (To set up Ethernet, use the Network Tab under settings. To set up cellular, refer to the [Activating a Cellular Modem](#) tech note)
12. Leave the **Cloud push interval** and **Sample count** set as they were. The DXM script controls this to push every 5 minutes.
13. Registers are preselected to push to the cloud. Some registers can be removed if you are not using all 40 sensors. Additional registers can be added by going to the **Local Registers** tab on the left. The preselected READ registers are 1-200 for the raw sensor data, 201-240 for vibration failure mask info, 281-320 for sensor connection status, and 5181-5660 for baseline/threshold data. The preselected READ/WRITE registers are 321-360, which are the re-baselining registers. READ/WRITE is used so the

Baseline registers can be updated from the website from a 0 to a 1 to trigger a new baseline remotely.

To modify registers either:

- a. Click on each register and edit the Cloud Permissions at the bottom of the screen; or
  - b. Choose the Modify Multiple Registers tab at the bottom of the screen of the Local Register tab to edit the Cloud Permissions for a block of registers
14. Under Web Server heading, keep the **Site ID is** drop-down selection as **GUID** and paste the copied ID from the webpage into the Site ID field.
  15. Save the XML file (**File > Save**).
  16. Upload the file to the DXM (**Device > Send XML Configuration to the DXM**).
  17. On the Website: Click the blue pencil icon under the **Options** column on the row of the newly created Gateway. Click the “Choose File” next to **Update XML** and select the XML file that was just uploaded to the DXM.
  18. Click **Save** to complete the connection to the website.

The screenshot shows the 'Cloud Services' configuration page. On the left is a sidebar with 'Select Model', 'Local Registers', 'Register Mapping', 'Scheduler', and 'Settings'. The main area has tabs for 'System', 'Cloud Services', 'Ethernet', 'Notifications', 'Logging', 'Scripting', and 'Administration'. Under 'Cloud Services', there's a 'Show advanced settings' checkbox. The 'Network Interface' section has a 'Push interface' dropdown set to 'Ethernet'. The 'Web Server' section has fields for 'Server name/IP' (push.bannercds.com), 'Page' (/push.aspx), 'Host header', and 'Gateway ID is' (GUID). A text field below 'Gateway ID is' contains a long GUID string, and a 'Clear' button is next to it. Red boxes highlight the 'Push interface' dropdown, the 'Server name/IP' field, and the 'Gateway ID is' section.

## Virtual Network Computing (VNC) Viewing on Laptop and Mobile Device

The Solutions Kit HMI can be viewed and controlled through a VNC application (a form of remote computing) on either a mobile phone, tablet, or laptop connected to the same network as the Solutions Kit. Follow the steps in the following Tech Note to set up VNC remote viewing and control. [Tech Note: View Solutions Kit Data on a Mobile Device or PC \(b 4492805\)](#)

This creates continuity between the site created on the website with the DXM. If the DXM has network connection, it will upload data on its next cloud push interval. Refer to the [Banner CDS Web Services 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, contact your local Banner distributor and follow the instructions in the [Tech Note: Connecting DXM Wireless Controller to Banner Web Services Demo Site](#) for modified instructions on how to send data to the Demo site.

For additional advanced options using the DXM, such as sending email or SMS/text alerts, refer to the [Vibration & Predictive Maintenance Solution Guide](#) on the Banner Engineering website. NOTE: The files used in the Solutions Kit are slightly different than those used with the Solutions Guide and should NOT be installed on the DXM being used with the HMI. Use the DXM Configuration Software and perform a **Device -> Get XML configuration from DXM** to make modifications to the file pre-loaded to the DXM in the Solutions Kit.

For additional information on the DXM Wireless Controller, MultiHop industrial radios, VT1 and VT2 sensors, visit [www.bannerengineering.com/wireless](http://www.bannerengineering.com/wireless).

# Specifications

## Supply Voltage

24 V DC ( $\pm 10\%$ ) (use only with a Class 2 (UL) power supply or a Limited Power Source (LPS) (CE) power supply)

## Power Consumption

9 W average; 30 W maximum

## Operating Conditions

0 °C to +50 °C (32 °F to +122 °F) (HMI);  
-20 °C to +60 °C (-4 °F to +140 °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)

## Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

## Antenna Minimum Separation Distance

900 MHz 150 mW/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

## Mounting

A mounting system with various mounting options is 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 (on a wall) or horizontally (table top).

## Certifications



(CE applies only to model  
SolutionsKit2-Vibemetric-MH)



(NOM applies only to the 900  
MHz models)

## 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

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](http://www.bannerengineering.com).

For patent information, see [www.bannerengineering.com/patents](http://www.bannerengineering.com/patents).

## Notas Adicionales

Información México: La operación de este equipo está sujeta a las siguientes dos condiciones: 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

Antenas SMA	Modelo
Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho	BWA-9O2-C
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	BWA-9O5-C

Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	BWA-9O6-A
Antena, Yagi, 900 MHz, 10 dBd, N Hembra	BWA-9Y10-A

## Mexican Importer

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The Solutions Kit provides visual status of up to 40 Banner 1-wire serial or All-in-One Vibration Sensor Nodes (assets) that are bound to the included DXM Wireless Controller. This provides a simple “check engine light” of the monitored asset. The Condition Monitoring VT/CT Node (CM1L) can also take advantage of current measurements in combination with the vibration and temperature measurements.

The Solutions Kit uses the [Banner Vibration Monitoring & Predictive Maintenance Solution Guide](#) software to program the DXM Wireless Controller.

The Sensor Nodes take a data sample every 5 minutes and the software uses the raw data to detect whether an asset is running, creates a baseline of the four vibration characteristics (RMS Velocity (10-1000Hz) and RMS High Frequency Acceleration(1000-4000Hz) on Z and X axis), and generates warning and alarm thresholds for those characteristics. Only data from an operational asset is used to create the baselines or thresholds and only that data is used to trigger warnings or alarms. Data from assets that are not operational appear on the graphs but is not used in the analysis.

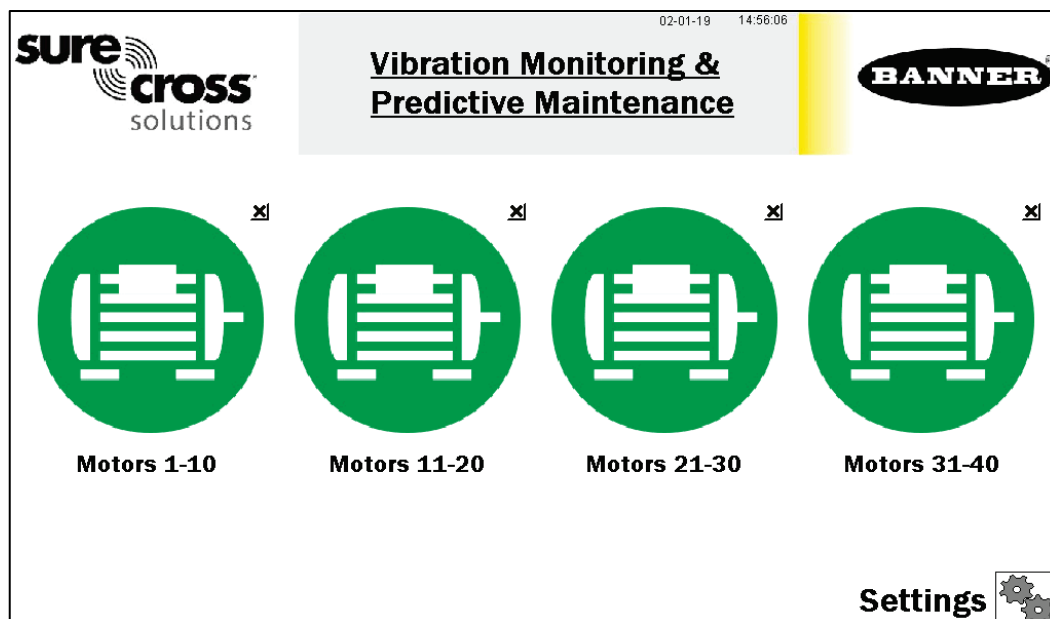
**RMS Velocity** identifies problems such as: imbalance, misalignment, looseness, and other low frequency machine issues. **RMS high frequency acceleration** is used to indicate early bearing wear issues.

The items included with the Vibration Monitoring and Predictive Maintenance Solutions Kit are:

- 10” Banner Touch Screen HMI with Ethernet connection
- [DXM700-B1R1 Wireless Controller](#)
- 5-port Ethernet switch
- M12/Euro-style power input connector
- This kit also requires a 24 V DC Class 2 (UL) or a Limited Power Source (LPS) (CE) power supply that is sold separately (Banner recommends model PSW-24-1 (FCC/CE) or model PSD-24-4 (FCC/CE) if you are powering additional indicator lights)
- [14”x12” Polycarbonate enclosure](#), DIN rails, and terminal blocks

## HMI Home Screen

- Four “check engine” type icons that represent groups of 10 assets. Each icon is a color-coded indication of the status of vibration warnings or alarms, temperature warnings or alarms, or wireless Node connection status within that group. The icon acts as a touch button that brings up the 10 individual icons that represent that assets’ status and acts as a touch button to view that assets’ screen where detailed data viewing options are available. (see page 2).



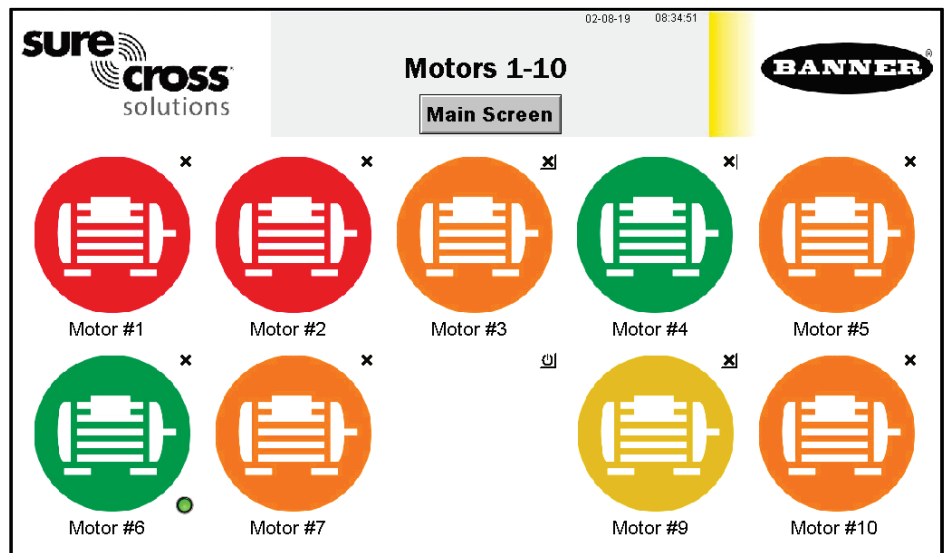


- Touch the “X” button in the upper right hand corner of each icon to hide that group of assets and prevent Node status alerts for any Nodes within that group. Use the button that appears after pressing the “X” button to unhide that group for future expansion.
- The **Settings** button opens access to Node binding, Node site survey, asset baselining, log file downloads, and other settings. (see page 4)
- Touch each asset group label to re-label the icon.

## Vibration Node Group Screens

Each asset/Node group on the main page has a screen of 10 individual icons, one for each sensor/Node pair. These icons represent the status of the motor with colored icons shown below.

- Touch any icon to bring up the individual sensor Node’s screen that includes graphs, raw data, and alert descriptions. (see page 3)
- Touch the “X” button in the upper right hand corner of each icon to hide that asset and prevent Node status alerts from that Node from appearing on the main HMI screen. Use the button that appears after pressing the “X” button to unhide that group for future expansion. For example, Asset #8 is hidden in the sample screen.
- Touch each asset label to re-label the icon. That label remains in non-volatile memory and appears on the Node’s status screen, binding screen, site survey screen, and baselining screens.
- A small green lamp in the bottom right corner of a Node’s icon indicates when that Node is baselining. Only temperature warnings and alarms appear during the baselining phase. After baselining is complete, the threshold levels are established and vibration alerts may begin to appear.



# Individual Node (Asset) Status Screen

Selecting a Node icon opens that Node's status screen.

① - Select the Vibration Characteristic to graph raw data. Options include: Z-Axis Velocity, Z-Axis High Frequency Acceleration, X-Axis Velocity, and X-Axis High Frequency Acceleration. The bottom left of the screen shows a real-time readout of the selected characteristic. Velocity is displayed in in/s (mm/s for Vibemetric versions) and Acceleration is displayed in gs. **Note:**

Velocity values of 6.5535 and/or acceleration values of 5.355 indicate a sensor error. The system ignores these data points to avoid affecting the saved baseline or trended data. The system will not baseline when the raw data values appear as those values. Contact Banner support for troubleshooting.

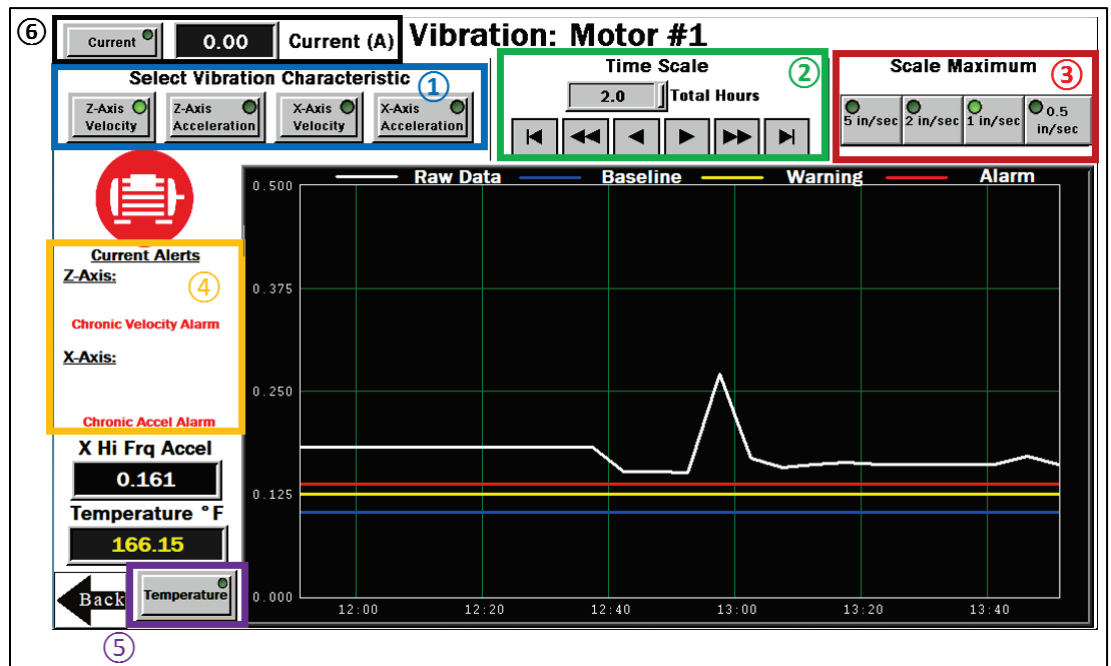
② - Select the time scale of the graph from 1 to 168 total hours. Use the arrow keys to scroll right or left to see different periods of the collected data. The maximum viewable data on the HMI is 168 hours or 7 days. The graphing data loggers have a fixed number of data points and using the DEMO MODE button on the Settings page, which samples at 2 seconds and reduces the number of data points available for viewing until those data points have rolled off the end of the timeline.

③ - Select the data Scale Maximum. For Acceleration, the range is 0.25g to 5g (g-force). For Velocity, the range is 0.5 inches/ second to 5 inches/second.

④ - The Current Alerts section shows any warnings or alarms based on the Axis, Vibration Characteristic, and type (Chronic or Acute) that the system is detecting. Acute alerts are those crossing the threshold for five samples in a row (or the user setting on the **Settings** screen) and Chronic alerts are when a 100 point moving average crosses the thresholds. Only data from an operational asset is used to calculate averages and alerts.

⑤ - Select **Temperature** to view the temperature graph over the selected time period. Directly above the button is the current temperature in degrees Fahrenheit of the selected Node. The readout color is white if it's nominal, yellow if it's in a warning state, and red if it's in an alarm state. The warning and alarm temperature settings are 158°F and 176°F respectively. A raw temperature value of 327.67 indicates a sensor error. Contact Banner support for troubleshooting.

⑥ - Select **Current** to view the current graph over the selected time period. Directly to the right of the button is the raw current reading in Amps of the selected Node. The readout color is white if it's normal, yellow if it's in a warning state, and red if it's in an alarm state. Requires the use of the Banner CM1L Condition Monitoring VT/CT node. This option only appears if **Enable Current Measurements** is turned on within the Settings screen. Warning and alarm settings are set on the **Current Alarm Settings** screen within the Settings page.



# Settings Screen

**Binding** – Opens a screen to allow binding of each sensor Node to the Solutions Kit. (see page 5)

**Site Survey** – Opens a screen to perform a site survey on any sensor Node bound to the Solutions Kit network. (see page 6)

**Asset Baselining** – Nodes bound into the system automatically begin baselining. This button opens a screen to enable creation of new baselines and thresholds of each sensor Node individually, displays the remaining samples in the current baseline, and allows manual threshold limits to be set for both vibration and temperature on each sensor Node. (see page 7)

**HMI Options** - Provides the ability to copy/manage HMI log files, HMI configuration for advanced options, functional HMI options, and an Icon Legend as well as a Graph Legend.

**Enable Password for Settings (Lvl 8)** – Turn ON/OFF the switch to enable/disable a password to access the settings menu. The default password for User Level 8 is “88888888”. This can be modified by clicking the **Password Table** button above and changing the password for level 8 to any number password up to 9 numbers long.

**Enable Cloud Pushing** – Turn ON/OFF the switch to enable to the DXM to begin pushing data to a cloud webserver at 5 minute intervals. This requires additional set up and modification of the XML file in the DXM to point to the correct web server with the correct site ID. Cloud pushing also requires connecting the DXM to a local network via Ethernet or a separately sold cellular modem.

**Baseline Samples** – The Solutions Kit takes a baseline of the first 300 running samples of an asset. This can be adjusted up or down by clicking on this numeric entry box to any desired sample. Samples are taken at a fixed 5 minute interval.

**Acute Alarm Samples** – The default number of samples above the warning or alarm threshold before an alert is triggered is five consecutive samples. Use the numeric entry box to adjust the default value up or down.

**Time until next sample (s)** – Displays the time (in seconds) until the Solutions Kit samples data from all bound sensor Nodes and updates graphs and other visual indicators.

**DEMO MODE** – Use only for demonstration purposes when fast sampling is required. Demo mode enables the Teach mode on all the bound sensor Nodes, putting them into a 2 second sample rate and changing the HMI graphs to log at a 2 second sample rate for 15 minutes (status indicated by the green light within the button). We also recommend you reduce the Baseline Samples to less than 30 for demonstration purposes. Using Demo Mode drains the battery faster and creates a larger log file that fills up memory quicker, so only use this mode when to demonstration the kit, not during standard operation.

**Enable Current Measurements** – Turn ON this rocker switch when using the Banner VT/CT CM1L Condition Monitoring Node to enable current measurements and graphs on individual asset screens. This setting also enables the **Current Alarm Settings** button below the rocker switch to set the scale, warning, and alarm settings for the current measurements on each Node.

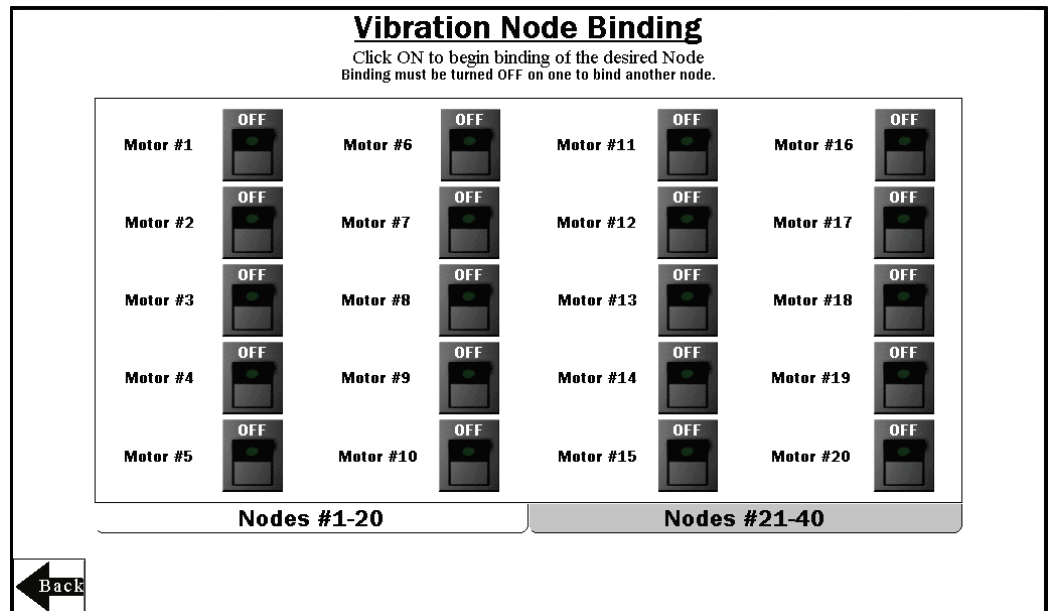
# Vibration Node (Asset) Binding Screen

Banner Wireless Q45 or P6(L) Nodes combined with Banner's QM42VT Vibration and Temperature Sensors or the Q45VA All-in-One Vibration Sensor Node must be bound to the DXM Wireless Controller to begin communicating.

Following the instruction below, the Q45/P6 Nodes are assigned a Node address and begin communicating with the DXM Wirelessly. Nodes and sensors are purchased separately and after they are combined, must be bound individually. A new Q45/P6 Node and sensor can be added to the network at any time by using the binding procedure.

## Bind the Nodes

1. On the HMI screen, touch the ON/OFF rocker switch for the desired Node to turn on binding.
2. On the Node, triple-click the binding button under the Q45 lid or triple-click button 2 (right) on a P6 or P6L to enter binding mode. For the P6, follow the Node's datasheet to setting the rotary dials before entering binding mode. After the Node is bound, the LEDs stay solid momentarily, then flash four times. The Node automatically exits binding mode.
3. On the HMI screen, touch the same ON/OFF rocker switch to turn the switch to off to take the DXM out of binding mode. After the DXM is out of binding mode, the indicator LED on the Node flickers green when the node is in sync with the DXM.
4. Repeat steps 1 through 3 for as many Nodes as are needed for the network. Use the **Nodes #1-20** and **Nodes #21-40** tabs to access binding switches for up to 40 sensor Nodes. NOTE: Entering binding mode causes all Nodes to go out of sync until the DXM exits binding mode. The Nodes will sync to the DXM within a few seconds.



# Vibration Node (Asset) Site Survey Screen

Perform a site survey on each Q45/P6 Node after they are installed to analyze the wireless communication between the Nodes and DXM.

### Vibration Node Site Survey

Click ON to begin Site Survey of the desired Node  
Site Survey must be turned OFF on one to view site survey on another node.

Nodes #1-20

Nodes #21-40

Motor #1	OFF	Motor #6	OFF	Motor #11	OFF	Motor #16	OFF
Motor #2	OFF	Motor #7	OFF	Motor #12	OFF	Motor #17	OFF
Motor #3	OFF	Motor #8	OFF	Motor #13	OFF	Motor #18	OFF
Motor #4	OFF	Motor #9	OFF	Motor #14	OFF	Motor #19	OFF
Motor #5	OFF	Motor #10	OFF	Motor #15	OFF	Motor #20	OFF

Green

0

Yellow

0

Red

0

Missed

0

Back

## Conduct a Site Survey

1. On the HMI, touch the ON/OFF rocker switch for the desired Node to turn on Site Survey mode for that Node. If the Node is communicating with the DXM, the results display at the bottom of the HMI screen. The results add up to a total of 100. It takes several seconds for the first 100 packets to display complete results.
2. Follow the interpreting section of the [Conducting a Site Survey and Interpreting the Results](#) technical note on [bannerengineering.com](#).
3. After the site survey is complete, touch the ON/OFF rocker switch to turn Site Survey mode off.
4. Repeat for each additional Node. Use the tabs **Nodes #1-20** and **Nodes #21-40** to access site survey switches for the up to 40 sensor Nodes. NOTE: Entering site survey mode causes all the Nodes to go out of sync with the DXM until the DXM exits Site Survey mode. The Nodes will resume communicating with the DXM within a few seconds.

# Node (Asset) Baselining Screen

After the sensor Node is installed and the system is powered on, the software automatically begins collecting data and determines if the asset is running.

The software generates a baseline and thresholds based on the first 300 data samples or about 24 hours of asset running time (unless modified on the Settings page).

When an asset is replaced, repaired, or has heavy maintenance done, create a new baseline. If the sensor is moved after the initial baseline is calculate, generate a new baseline.

1. Turn on baselining for the appropriate Nodes if a new baseline needs to be generated. The initial baseline is generated any time a new Node is bound to the DXM and begins sending data without the need to trigger these switches. The number of baseline samples remaining displays next to the ON/OFF switch. The baseline switch remains on during baselining and resets to off after the baseline is complete.
2. Use the tabs **Nodes #1-10**, **Nodes #11-20**, **Nodes #21-30**, and **Nodes #31-40** to access baselining switches for the up to 40 sensor Nodes.
3. Use the corresponding **Manual Warning & Alarm Adjustments** button for each Node to open an individual windowed screen where current baseline threshold settings are visible.
4. Touch the numeric entry box in any of the **New Settings** rows to manually enter a new value for any or all the warning or alarm thresholds, including temperature.
5. Set vibration settings back to zero to use the original baseline setting. Temperature is not a baselined value so although it displays a baseline value, the value is for reference if the new setting is changed. Manually set the temperature back to the baseline setting by entering 158°F (70°C) for warning or 176°F (80°C) for alarm.

**Vibration: Baselining Assets**

Click ON to begin re-baselining the desired Asset

Baseline Switch will remain ON during baselining and will reset to OFF once baseline is complete

<b>Motor #1</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #6</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments
<b>Motor #2</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #7</b>	<input checked="" type="checkbox"/> 150	Manual Warning & Alarm Adjustments
<b>Motor #3</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #8</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments
<b>Motor #4</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments	<b>Motor #9</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments
<b>Motor #5</b>	<input checked="" type="checkbox"/> 25	Manual Warning & Alarm Adjustments	<b>Motor #10</b>	<input type="checkbox"/>	Manual Warning & Alarm Adjustments

Assets #1-10   Assets #11-20   Assets #21-30   Assets #31-40

[Back](#)

**N1 Warning & Alarm Adjust**

**Warning & Alarm Adjustments**

**Motor #1**

	Z Velocity Warning	Z Hi Accel Warning	X Velocity Warning	X Hi Accel Warning	High Temp Warning
<b>New Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0"/>
<b>Baseline Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="158"/>
	Z Velocity Alarm	Z Hi Accel Alarm	X Velocity Alarm	X Hi Accel Alarm	High Temp Alarm
<b>New Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0"/>
<b>Baseline Setting</b>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.000"/>	<input type="text" value="176"/>

**\*\*Vibration "New Settings" at Zero will use Baseline Setting**

# Current Alarm Settings Screen

After enabling the Current measurements rocker switch, users are able to adjust the CT scale, current warning, and alarm measurements. The CT scale from the DIP switch settings of the Condition Monitoring VT/CT Node are read and populated into the scale field.

1. **CT Scale** – Default setting will be based on the DIP switch setting of the Condition Monitoring Node. If the user replaces the 20A or 150A CT provided with the Condition Monitoring Node, adjust the scale manually.
2. **Current Warning** – Set the warning level for the current data to trigger yellow motor icons when in a warning state.
3. **Current Warning** – Set the alarm level for the current data to trigger red motor icons when in an alarm state.
4. Use the tabs “Nodes #1-10”, “Nodes #11-20”, “Nodes #21-30”, and “Nodes #31-40” to access the scale, warning, and alarm settings for the up to 40 Sensor Nodes.

**CT Scale & Current Alarm Settings**  
Click on the numeric entry box to set the scale, warning and alarm thresholds.  
Threshold settings are not required. CT Scale is required to properly calculate the current. Set 50/60 Hz via dipswitches in Node.

	CT Scale	Current Warning	Current Alarm		CT Scale	Current Warning	Current Alarm
Motor #1	20	10.00	15.00	Motor #6	20	200.00	250.00
Motor #2	20	8.00	12.00	Motor #7	150	200.00	250.00
Motor #3	150	75.00	90.00	Motor #8	20	200.00	250.00
Motor #4	150	200.00	250.00	Motor #9	150	200.00	250.00
Motor #5	150	200.00	250.00	Motor #10	20	200.00	250.00

Assets #1-10   Assets #11-20   Assets #21-30   Assets #31-40

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# HMI Options Menu Screen

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

**HMI System Setup** – Enters HMI Panel Setup. Use for setting Time, Date, and Advanced Options. Entering this screen will clear any logged data from the graphs but will not clear any data saved to files.

**Stop Operation Safely** – Stops HMI operation safely without data corruption before you power off the HMI.

The HMI provides data logging of all the raw data, baselines and thresholds.

This data is saved to a file every 10 minutes and a new file is generated every day and stored in monthly folders. The HMI has storage for 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** – Deletes 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 parameter may be necessary.

**Auto Delete Files Older than 'X' Days** –The HMI auto deletes files older than the selected number of days. Default is 30 days with a maximum of 60 days.

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

HMI System Setup   Stop Operation Safely

Copy Log Files to USB Drive   Manually Delete Files Older than 'X' days   Auto delete files older than 'X' days 30

Restart HMI Application   Re-Initialize HMI Non Volatile on Restart OFF

**Icon Legend**

No Alerts   Warning   Alarm   Node Out of Sync

**Graph Legend**

Raw Data   Baseline   Warning   Alarm

Back



**Re-Initialize HMI Non Volatile on Restart** – Flip the switch to ON before restarting the HMI to reinitialize default settings and labels.

## Advanced Options

### Install 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 DXM Wireless Controller uses PNP outputs with a maximum of 100 mA per output so an interposing relay may need to be added to accommodate higher amperage lights.

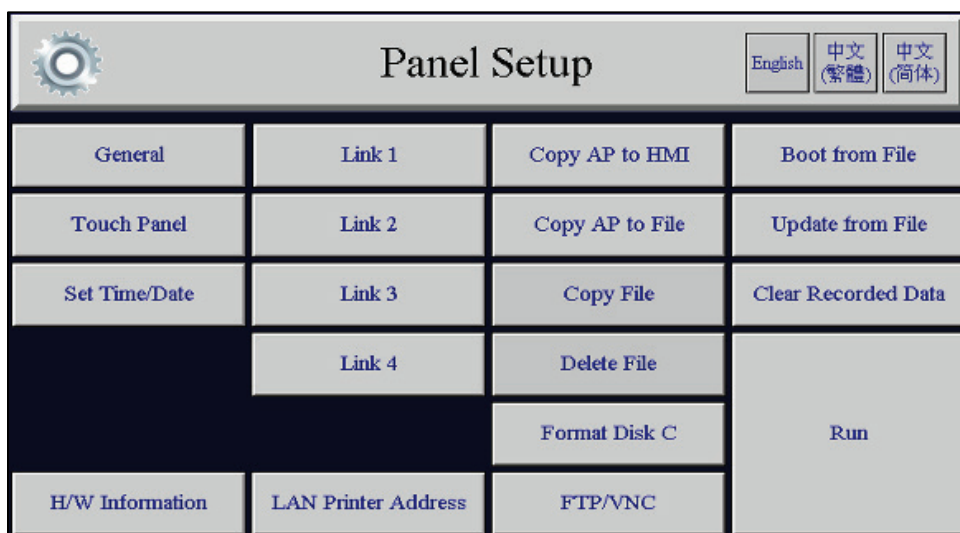
To install:

1. Cut a hole in the box and mount the light accordingly.
2. Wire DC ground to the light or an interposing relay from the bottom row of the gray 2-row terminal blocks inside the Solutions Kit on the DIN rail adjacent to the DXM controller.
3. Wire the input of the light or interposing relay to the DXM as follows:
  - a. O1 – Pin 5 – indicates any node/asset in Alarm condition
  - b. O2 – Pin 6 – indicates any node/asset in Warning condition
  - c. O3 – Pin 7 – indicates any node/asset in either Warning or Alarm condition
  - d. O4 – Pin 8 – indicates no Warning or Alarms conditions exist

### Connect the DXM and HMI to a Wide Area Network (WAN)

By default, the HMI and DXM Wireless Controller are configured to communicate using static IP addresses. To connect to a WAN, the two devices need to be configured 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 configured by any computer on the network and allows the DXM to be configured to push data to a cloud webserver for remote monitoring.

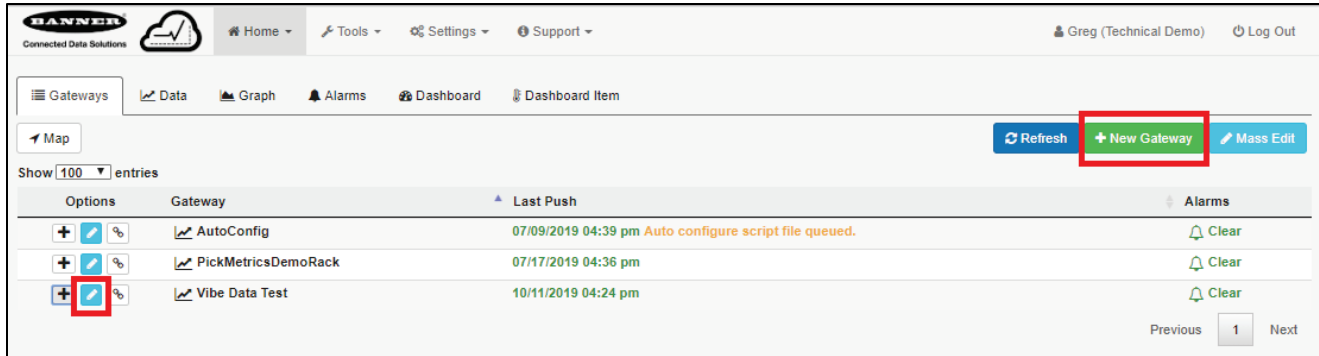


1. Open the solution box and connect an ethernet cable from the WAN to the ethernet switch inside the solution box.
2. On the DXM: With power applied to the DXM, use the arrow keys to select **System Config** and hit **Enter**.
3. Use the arrow keys to select **Ethernet**.
4. If you are using a static IP address, select the IP address shown and click **Enter**. Then use the arrow and Enter keys to set the new static IP address. If you are using DHCP, click **Enter** on **DHCP** and use the arrow keys to select **DHCP ON** and hit **Enter**. A device reboot is requested if any changes are made to these settings.
5. If you are using DHCP, navigate to the **System Info-> Ethernet** and write down the IP address to enter into the HMI. Subnet mask can be adjusted here as well if needed.
6. On the HMI: From the main screen go to the **HMI Options** screen and then choose **HMI System Setup**.
7. In the Panel Setup screen select **General**.
8. On the pop-up screen that appears, set up DHCP in one of two ways:
  - a. Type in the IP address and network information for a static IP address by selecting the appropriate fields; or
  - b. Toggle from false to true in the field next to **Get an IP address automatically**, then press **OK**.
9. Push **Link 1** and press on the IP address field. Enter in the IP address of the DXM from earlier and press **OK**.
10. To finish press **Run**.

## Push Information to the Cloud

The DXM Wireless Controller can connect to the Web via Ethernet or an internal cell module. The controller pushes data from the DXM to the cloud to be stored and displayed 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://bannercds.com/>. Banner Connected Data Services will automatically generate dashboard icons and graphs for the Solutions Kit that can be placed in the Dashboard tab. Email alerts can be set up on the Alarms tab as well.



1. On the Website: Visit the Banner Connected Data Solutions website (<https://bannercds.com/>) and log into an existing account or register a new account. Click **+ New Gateway**. Name the Gateway then click **Create**.
2. After the Gateway appears, click the + symbol on the far left and highlight and copy the Gateway ID.
3. On the computer: Open the [DXM Configuration Software v4](#).
4. On the DXM: Apply power to the DXM.
5. Connect the DXM Controller to the computer with a USB cable or skip if the DXM is connected to the same network as the computer.
6. Select DXM Model as **DXM700** and connect the DXM to the tool by clicking **Device-> Connection Settings** in the menu bar.
7. 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 and multiple appear, attempt to connect to each one of them until successful. If connected to the same network as the DXM, select **TCP/IP** and enter the DXM IP address and click **Connect**.
8. After the DXM is connected to the software, get the current XML file by clicking **Device->Get XML configuration from DXM**. Name and save the file to the computer.
9. Within the tool, click the **Settings** tab on the left and then the **Cloud Services** tab on the top.
10. Make sure the **Server name/IP** is set to push.bannercds.com.
11. Select the appropriate **Push interface** to either Cellular or Ethernet. (To set up Ethernet, use the Network Tab under settings. To set up cellular, refer to the [Activating a Cellular Modem](#) tech note)
12. Leave the **Cloud push interval** and **Sample count** set as they were. The DXM script controls this to push every 5 minutes.
13. Registers are preselected to push to the cloud. Some registers can be removed if you are not using all 40 sensors. Additional registers can be added by going to the **Local Registers** tab on the left. The preselected READ registers are 1-200 for the raw sensor data, 201-240 for vibration failure mask info, 281-320 for sensor connection status, and 5181-5660 for baseline/threshold data. The preselected READ/WRITE registers are 321-360, which are the re-baselining registers. READ/WRITE is used so the Baseline registers can be updated from the website from a 0 to a 1 to trigger a new baseline remotely. To modify registers either:
  - a. Click on each register and edit the Cloud Permissions at the bottom of the screen; or
  - b. Choose the Modify Multiple Registers tab at the bottom of the screen of the Local Register tab to edit the Cloud Permissions for a block of registers
14. Under Web Server heading, keep the **Site ID is** drop-down selection as **GUID** and paste the copied ID from the webpage into the Site ID field.
15. Save the XML file (**File > Save**).
16. Upload the file to the DXM (**Device > Send XML Configuration to the DXM**).

17. On the Website: Click the blue pencil icon under the **Options** column on the row of the newly created Gateway. Click the “Choose File” next to **Update XML** and select the XML file that was just uploaded to the DXM.
18. Click **Save** to complete the connection to the website.

The screenshot shows the Banner Engineering website configuration interface. The sidebar on the left includes 'Select Model', 'Local Registers', 'Register Mapping', 'Scheduler', and 'Settings'. The main area has tabs for 'System', 'Cloud Services', 'Ethernet', 'Notifications', 'Logging', 'Scripting', and 'Administration'. Under the 'Cloud Services' tab, there are three sections: 'Network Interface' with a 'Push interface' dropdown set to 'Ethernet'; 'Cloud Push' with a 'Cloud push interval' dropdown set to 'None'; and 'Web Server' with fields for 'Server name/IP' (push.bannercds.com), 'Page' (/push.aspx), 'Host header', and 'Gateway ID is' (GUID). A 'Clear' button is next to the 'Gateway ID is' field. Red boxes highlight the 'Push interface' dropdown, the 'Server name/IP' field, and the 'Gateway ID is' section.

## VNC Viewing on Laptop and Mobile Device

The Solutions Kit HMI can be viewed and controlled through a VNC application on either a mobile phone, tablet, or laptop connected to the same network as the Solutions Kit. Follow the steps in the following Tech Note to set up VNC remote viewing and control. [Tech Note: View Solutions Kit Data on a Mobile Device or PC \(b 4492805\)](#)

This creates continuity between the site created on the website with the DXM. If the DXM has network connection, it will upload data on its next cloud push interval. Refer to the [Banner CDS Web Services 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, contact your local Banner distributor and follow the instructions in the [Tech Note: Connecting DXM Wireless Controller to Banner Web Services Demo Site](#) for modified instructions on how to send data to the Demo site.

For additional advanced options using the DXM, such as sending email or SMS/text alerts, refer to the [Vibration & Predictive Maintenance Solution Guide](#) on the Banner Engineering website. NOTE: The files used in the Solutions Kit are slightly different than those used with the Solutions Guide and should NOT be installed on the DXM being used with the HMI. Use the DXM Configuration Software and perform a **Device -> Get XML configuration from DXM** to make modifications to the file pre-loaded to the DXM in the Solutions Kit.

For additional information on the DXM Wireless Controller, Q45U Wireless Node, P6 Node, or QM42VT1 sensor, visit [www.bannerengineering.com/wireless](http://www.bannerengineering.com/wireless).

# Specifications

## Supply Voltage

24 V DC ( $\pm 10\%$ ) (use only with a Class 2 (UL) power supply or a Limited Power Source (LPS) (CE) power supply)

## 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 (on a wall) or horizontally (table top).

## Certifications



(CE applies only to model  
SOLUTIONSKIT2-VIBEMETRIC)



(NOM applies only to the 900  
MHz models)

## 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

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](http://www.bannerengineering.com).

## Notas Adicionales

Información México: La operación de este equipo está sujeta a las siguientes dos condiciones: 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

Antenas SMA	Modelo
Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho	BWA-9O2-C
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	BWA-9O5-C

Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	BWA-9O6-A
Antena, Yagi, 900 MHz, 10 dBd, N Hembra	BWA-9Y10-A

## Mexican Importer

Banner Engineering de México, S. de R.L. de C.V.  
David Alfaro Siqueiros 103 Piso 2 Valle oriente  
San Pedro Garza Garcia Nuevo León, C. P. 66269  
81 8363.2714

## Banner Tank Level Monitoring Solution Kit

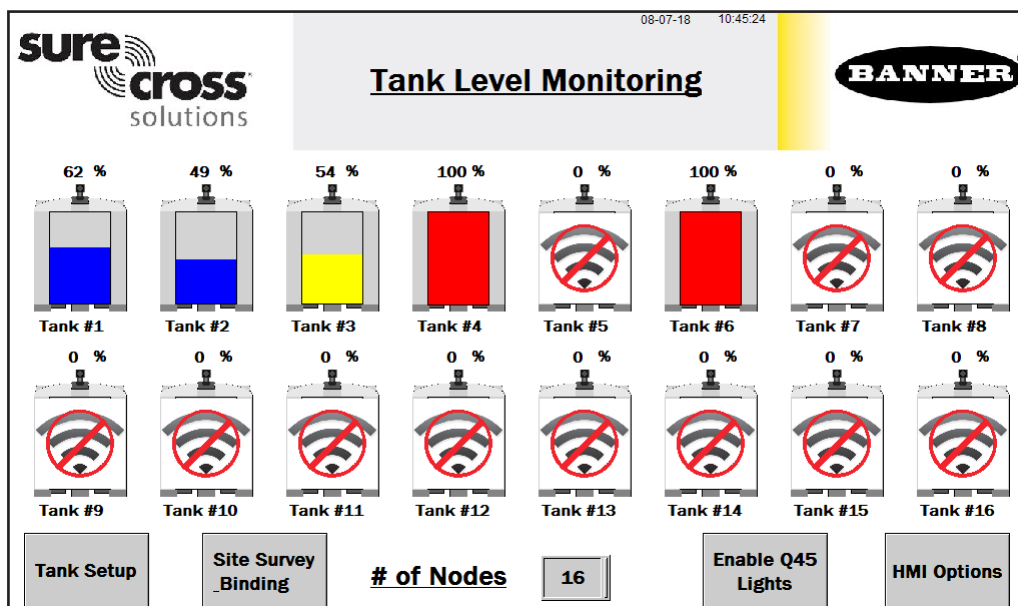
This kit provides visual status of up to 16 Banner K50U Performance Node sensors (assets) that are bound to the included DXM Wireless Controller. This provides a simple and effective way of monitoring the level of many tanks, totes, or barrels to avoid disruption, downtime, or damage to pumps.

To use any analog sensor input for monitoring tank levels, refer to the [Measuring Larger Tanks with the Tank Level Solution Kit](#) documentation (p/n b\_4503670).

This 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
- DXM700-B1R1 Wireless Controller (900 MHz) or DXM700-B1R3 (2.4 GHz)
- 5-port Ethernet switch
- M12/Euro-style power input connector
- Polycarbonate enclosure, 14" x 12", with DIN rails and terminal blocks
- This kit also requires a 24 V DC Class 2 (UL) or a Limited Power Source (LPS) (CE) power supply that is sold separately (Banner recommends model PSW-24-1 (FCC/CE) or model PSD-24-4 (FCC/CE) if you are powering additional indicator lights)



## 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 and 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](http://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 Level Node Site Survey Binding

Click ON to begin site survey or binding of the desired Node

Site Survey must be turned OFF on one to bind or view site survey on another node.  
Binding must be turned OFF on one to bind or view site survey on another node.

	Site Survey	Binding		Site Survey	Binding		Site Survey	Binding		Site Survey	Binding
Tank #1	OFF	OFF	Tank #5	OFF	OFF	Tank #9	OFF	OFF	Tank #13	OFF	OFF
Tank #2	OFF	OFF	Tank #6	OFF	OFF	Tank #10	OFF	OFF	Tank #14	OFF	OFF
Tank #3	OFF	OFF	Tank #7	OFF	OFF	Tank #11	OFF	OFF	Tank #15	OFF	OFF
Tank #4	OFF	OFF	Tank #8	OFF	OFF	Tank #12	OFF	OFF	Tank #16	OFF	OFF

Green      Yellow      Red      Missed

0

0

0

0

**Site Survey Results**

←

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## 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.

<b>Tank Monitoring Depth, Offset and Alarm Settings</b>						
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 %
Tank #1	72.00	6.00	30	10	70	90
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

**Change Units:**  
**Metric (mm)**

← Back
Nodes #9-16 Settings →

## HMI Options Menu Screen

This screen provides some added HMI functionality along with an icon and 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

Restart HMI Application

Stop Operation Safely

Copy Log Files to USB Drive

Manually Delete Files Older than 'X' days

Auto delete files older than 'X' days 30

**Icon Legend**  

No Alerts

Warning

Alarm

Node Out of Sync

**Graph Legend**  

Raw Data

Warning

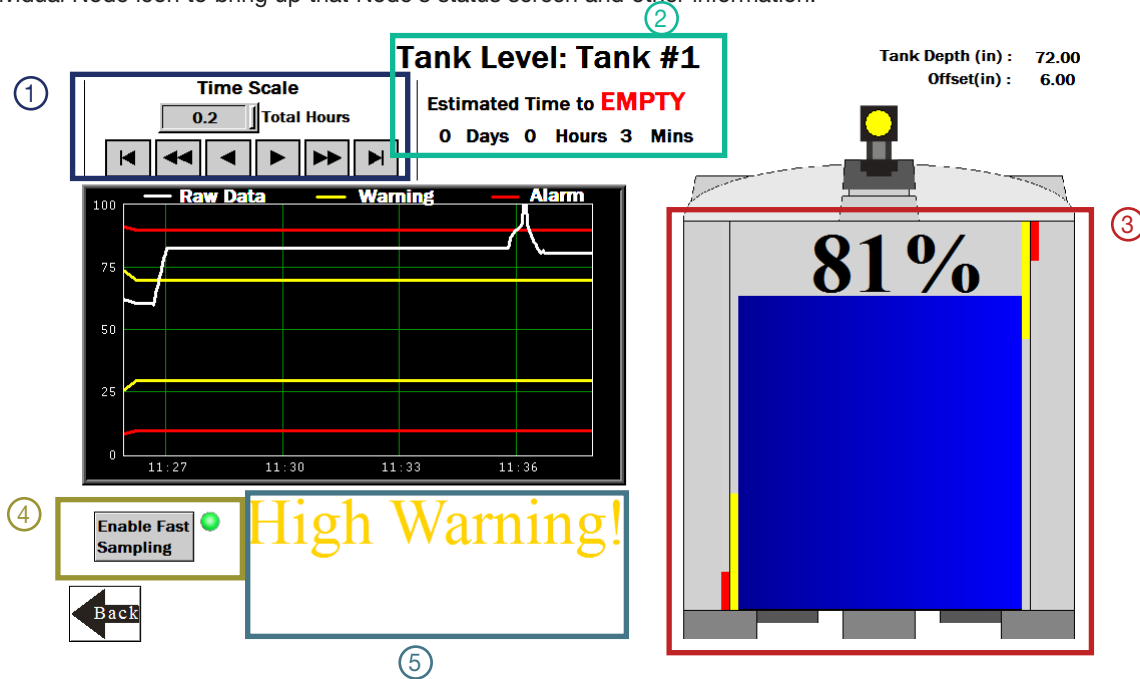
Alarm

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Tank Level Monitoring Solutions Kit V1.0

## 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 DXM Wireless Controller uses PNP outputs with a maximum of 100 mA per output so an interposing relay may need to be added to accommodate higher amperage lights. To install:

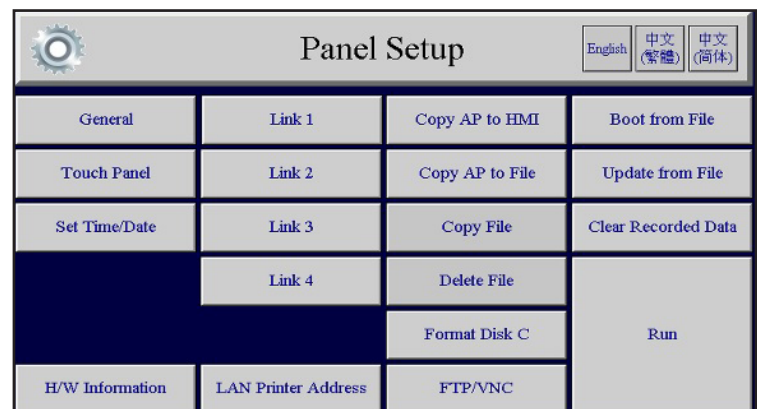
1. Cut a hole in the box and mount the light accordingly.
2. Wire DC ground to the light or an interposing relay from the bottom row of the gray 2-row terminal blocks inside the kit on the DIN rail adjacent to the DXM Controller.
3. Wire the input of the light or interposing relay to the DXM as follows:
  - a. O1 – Pin 5 – indicates any node/asset in Alarm condition
  - b. O2 – Pin 6 – indicates any node/asset in Warning condition
  - c. O3 – Pin 7 – indicates any node/asset in either Warning or Alarm condition
  - d. O4 – Pin 8 – 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 Cloud Data Services website.

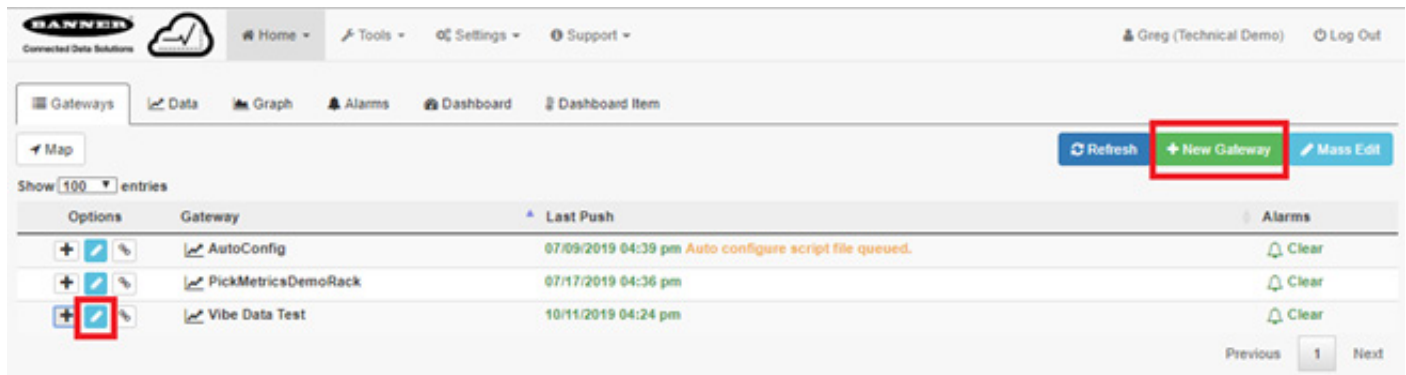
1. Open the solution box and connect an Ethernet cable from the WAN to the Ethernet switch inside the solution box.
2. [DXM]: With power applied to the DXM, use the arrow keys to select **System Config** and press **Enter**.
3. [DXM]: Use the arrow keys to select **Ethernet**.
4. [DXM]: If you are using 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**.



## Push Information to the Cloud

The DXM Wireless Controller can connect to the Web via Ethernet or an internal cell module. The controller pushes data from the DXM to the cloud to be stored and displayed 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://bannercds.com/>. The Banner Cloud Data Services website automatically generates dashboard icons and graphs for the Solutions Kit that can be placed in the Dashboard tab. Email alerts can be set up on the Alarms tab as well.



1. On the Website: Visit the Banner Cloud Data Services website (<https://bannercds.com/>) and log into an existing account or register a new account. Click + New Gateway. Name the Gateway then click Create.
2. After the Gateway appears, click the + symbol on the far left and highlight and copy the Gateway ID.
3. On the computer: Open the DXM Configuration Software v4.
4. On the DXM: Apply power to the DXM.
5. Connect the DXM Controller to the computer with a USB cable or skip if the DXM is connected to the same network as the computer.
6. Select DXM Model as DXM700 and connect the DXM to the tool by clicking Device-> Connection Settings in the menu bar.
7. 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 and multiple appear, attempt to connect to each one of them until successful. If connected to the same network as the DXM, select TCP/IP and enter the DXM IP address and click Connect.
8. After the DXM is connected to the software, get the current XML file by clicking Device->Get XML configuration from DXM. Name and save the file to the computer.
9. Within the tool, click the Settings tab on the left and then the Cloud Services tab on the top.
10. Make sure the Server name/IP is set to push.bannercds.com.
11. Select the appropriate Push interface to either Cellular or Ethernet. (To set up Ethernet, use the Network Tab under settings. To set up cellular, refer to the Activating a Cellular Modem tech note)
12. Leave the Cloud push interval and Sample count set as they were. The DXM script controls this to push every 5 minutes.
13. Registers are not preselected to push to the cloud. Some registers can be removed if you are not using all 16 Nodes. Additional registers can be added by going to the Local Registers tab on the left. The recommended READ registers are  $1+10*(N-1)$  (N=node number) for the tank level data, 160-236 for individual warnings and alarms (0/1), and 251-266 for sensor connection status.
14. Under Web Server heading, keep the Site ID is drop-down selection as GUID and paste the copied ID from the webpage into the Site ID field.
15. Save the XML file (File > Save).
16. Upload the file to the DXM (Device > Send XML Configuration to the DXM).
17. On the Website: Click the blue pencil icon under the Options column on the row of the newly created Gateway. Click the "Choose File" next to Update XML and select the XML file that was just uploaded to the DXM.
18. Click Save to complete the connection to the website.

The screenshot shows the 'Cloud Services' configuration page. On the left is a sidebar with 'Select Model', 'Local Registers', 'Register Mapping', 'Scheduler', and 'Settings'. The main area has tabs for 'System', 'Cloud Services', 'Ethernet', 'Notifications', 'Logging', 'Scripting', and 'Administration'. Under 'Cloud Services', there's a 'Show advanced settings' checkbox. The 'Network Interface' section shows 'Push interface' as a dropdown menu currently set to 'Ethernet'. The 'Cloud Push' section shows 'Cloud push interval' as a dropdown menu currently set to 'None'. The 'Web Server' section shows 'Server name/IP' as a text field with 'push.bannercds.com', 'Page' as a text field with '/push.aspx', and 'Host header' as a text field. Below these, 'Gateway ID is' is a dropdown menu set to 'GUID', followed by a 'Clear' button and a text field containing a long GUID string.

## Specifications

### Supply Voltage

24 V DC ( $\pm 10\%$ ) (use only with a Class 2 (UL) power supply or a Limited Power Source (LPS) (CE) power supply)

### Power Consumption

9 W average; 30 W maximum

### Operating Conditions

-20 °C to +60 °C (-4 °F to +140 °F)  
95% 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 V2.1.1:2016  
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

### Important

Please download the complete technical documentation, available in multiple languages, from [www.bannerengineering.com](http://www.bannerengineering.com) for details on the proper use, applications, Warnings, and installation instructions of this device.

Por favor descargue desde [www.bannerengineering.com](http://www.bannerengineering.com) toda la documentación técnica, disponibles en múltiples idiomas, para detalles del uso adecuado, aplicaciones, advertencias, y las instrucciones de instalación de estos dispositivos.

Veuillez télécharger la documentation technique complète sur notre site [www.bannerengineering.com](http://www.bannerengineering.com) pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

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



(CE applies only to the 2.4 GHz models)



(NOM applies only to the 900 MHz models)

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

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

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](http://www.bannerengineering.com).

For patent information, see [www.bannerengineering.com/patents](http://www.bannerengineering.com/patents).

## Notas Adicionales

Información México: La operación de este equipo está sujeta a las siguientes dos condiciones: 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

Antenas SMA	Modelo
Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho	BWA-902-C
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	BWA-905-C

Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	BWA-906-A
Antena, Yagi, 900 MHz, 10 dBd, N Hembra	BWA-9Y10-A

### Mexican Importer

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more sensors, more solutions

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P/N 215580 Rev. C



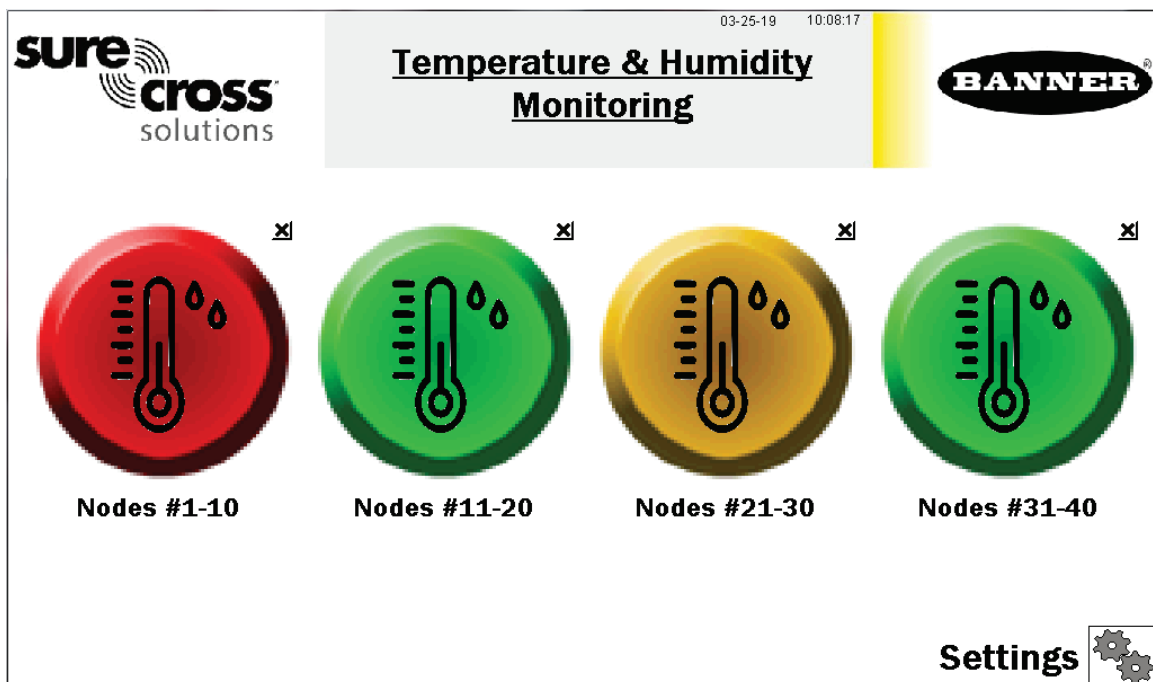
## Banner Temperature and Humidity Monitoring Solution Kit

The Solution Kit provides visual status of up to 40 Banner M12FTH4Q Temperature and Humidity Sensors attached to Performance Series Nodes communicating to the included DXM Wireless Controller. This provides a simple and effective way of monitoring the temperature and humidity of many locations in a single centralized point.

This kit uses a unique version of the [Banner Temperature and Humidity Monitoring Solutions Guide](#) software to program the DXM Controller. The sensor Nodes take a data sample every five minutes and the software uses the raw data to compare to user entered low or high warnings and/or alarms for visual indication of a potential problem. There is also indication of Node communication status and calculated dew point values for each sensor Node.

Included with the Temperature and Humidity Monitoring Solutions Kit:

- 10" Banner Touch Screen HMI with Ethernet connection
- [DXM700-B1R1 Wireless Controller \(900MHz\) or DXM700-B1R3 \(2.4 GHz\)](#)
- 5-port Ethernet switch
- M12/Euro-style power input connector
- [14"x12" Polycarbonate enclosure](#), DIN rails, and terminal blocks
- This kit also requires a 24 V DC Class 2 (UL) or a Limited Power Source (LPS) (CE) power supply that is sold separately (Banner recommends model PSW-24-1 (FCC/CE) or model PSD-24-4 (FCC/CE) if you are powering additional indicator lights)



Four top level icons represent groups of 10 assets. Each icon is a color coded indication of the status of temperature and humidity warnings or alarms, or wireless Node connection status within that group. It is also a touch button that brings up the 10 individual icons that represent that assets' status and is also a touch button to view that assets' screen where detailed data viewing options are available. (See page 2)



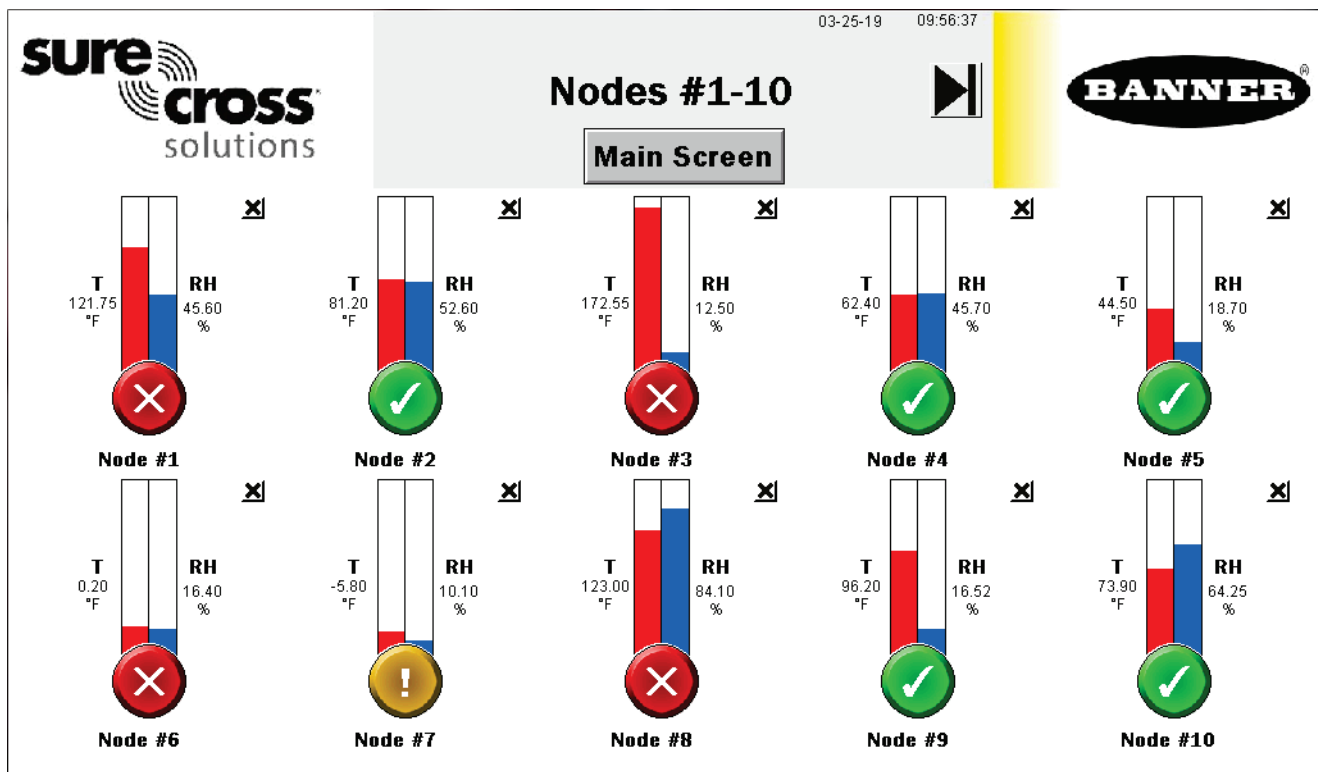
Touch the “X” button in the upper right hand corner of each icon to hide that group of assets and prevent Node status alerts for any Nodes within that group. Use the button that appears after pressing the X to unhide that group for future expansion.

The **Settings** button opens access to Node binding, Node site survey, alarm settings, log file downloads, and many additional settings. (See page 4)

Each asset group label can also be touched to re-label the icon.

## Temperature and Humidity Node Group Screens

Each asset/Node group on the main page has a screen of 10 individual icons, one for each sensor/Node. These icons use colored icons to represent the alarm status. A temperature and humidity gauge and raw sensor readings are also displayed.



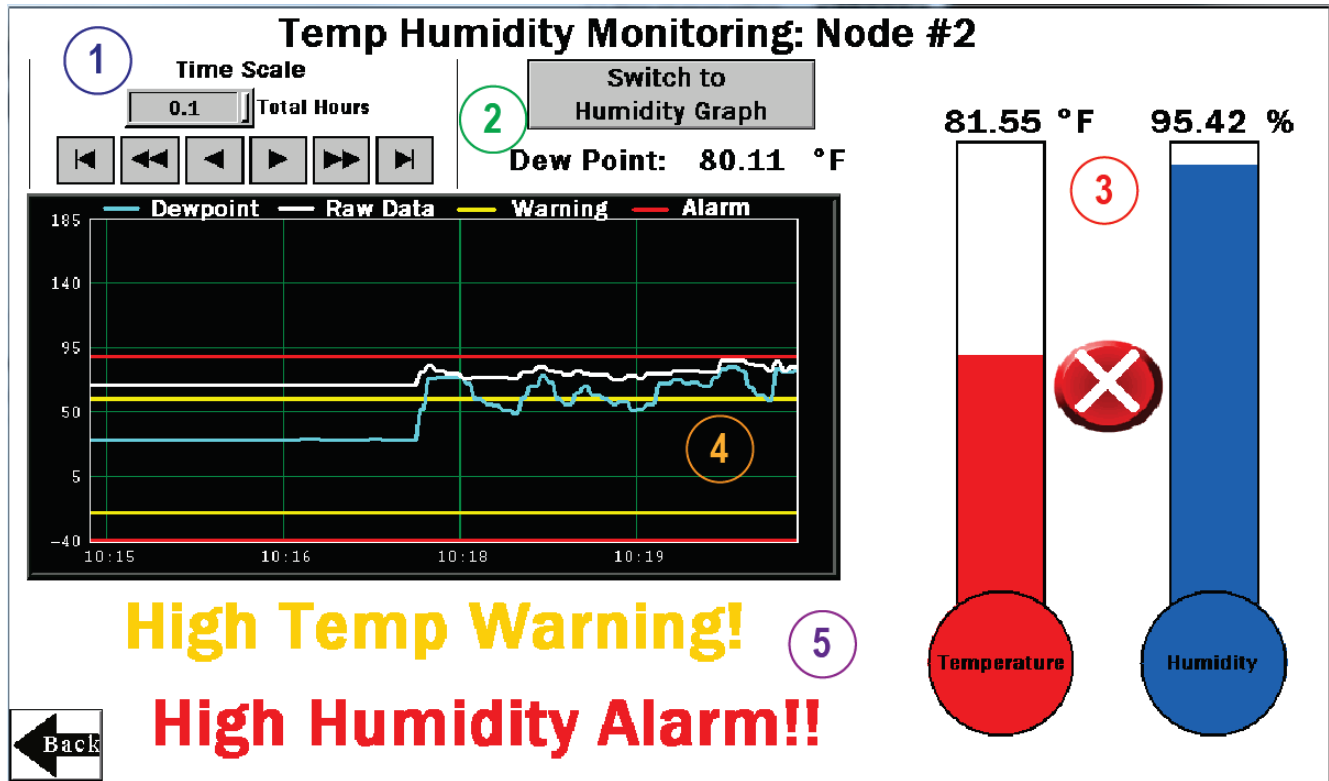
Touch any icon to bring up the individual sensor Node's screen that includes historic graphs, dew point value, and raw data. (See page 3)

Touch the X button in the upper right hand corner of each icon to hide that asset and prevent Node status alerts from that Node from appearing on the main HMI screen. Use the button that appears after pressing the X button to unhide that group for future expansion.

Touch each asset label to re-label the icon. That label remains in non-volatile memory and appears on the Node's status, binding, site survey, and alarm setting screens.

# Individual Temperature and Humidity Node (Asset) Status Screen

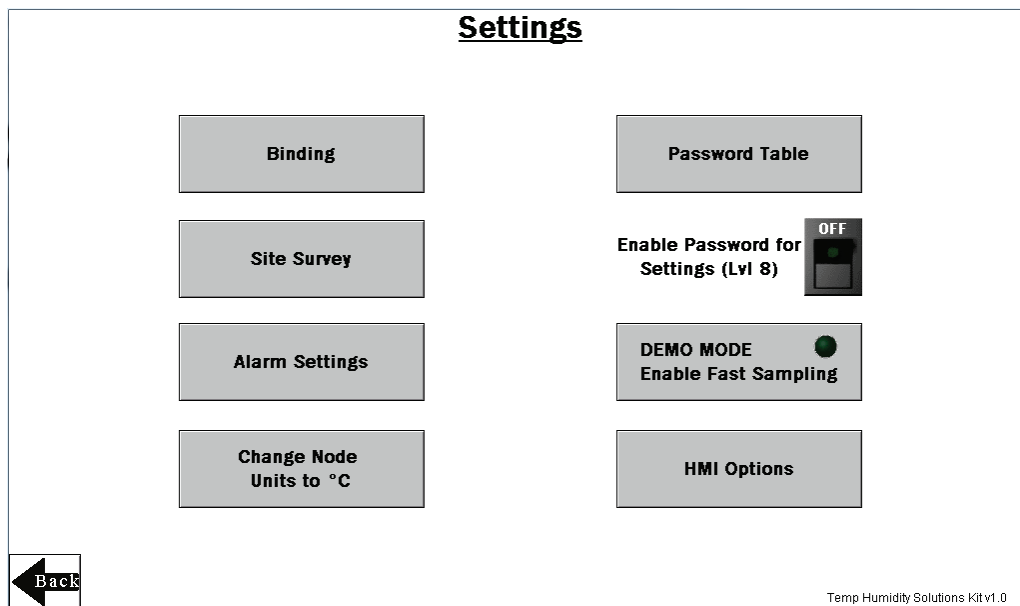
Selecting an individual node icon brings up an individual Node status screen along with many other key pieces of information, shown below:



- ① - Select the time scale of the graph from 0.1 to 168.0 total hours. The arrow keys scroll right or left to see different periods of the collected data. Up to 168 hours or 7 days is the maximum for viewable data on the HMI.
- ② - This area includes the raw dew point data and a button to switch between the temperature and dew point graph to the humidity graph.
- ③ - Gauges and raw data of the temperature and humidity levels. Also contains a green, yellow, red icon indicating the warning or alarm state of the node based on the thresholds set on the alarm settings screen.
- ④ - Graphical representation of temperature, dewpoint, humidity, warning levels, and alarm levels.
- ⑤ - Indication of any current warnings or alarm will be displayed here.

# Settings Screen

**Binding** – Opens a screen to bind each sensor Node to the Solutions Kit's controller. (page 5)



**Site Survey** – Opens a screen to perform a site survey on any sensor Node bound to the kit. (page 5)

**Alarm Settings** – Set alarm and warning thresholds for both temperature and humidity on both high and low levels. (page 6)

**Change Node Units** – Changes the default Node units from °F to °C; displays raw data and scaling of graphs and gauges.

**Enable Password for Settings (Lvl 8)** – Turn ON/OFF the switch to enable/disable a password to access the Settings menu. The default password for User Level 8 is “88888888”. To change the password, click the **Password Table** button. The password for level 8 may be any numbered password up to nine numbers long.

**DEMO MODE** – Used only for demonstration purposes when fast sampling is required. This enables Teach mode on all the bound sensor Nodes, puts them into a two second sample rate, and changes the HMI graphs to log at two second sample rate for 15 minutes (status indicated by the green light within the button. Using Demo Mode drains battery life faster and creates a larger log that fills up memory quicker, so it is only recommended to use when running a demonstration, not during standard operation. You **must use the Q45U Node** for fast sample mode; the Q45TH will not go into fast sample mode.

**HMI Options** – Provides the ability to copy/manage HMI log files, configure the HMI for advanced options and functional HMI options, and displays an icon and graph legend. (page 7)

## Temperature and Humidity Alarm Settings Screen

Each temperature and humidity sensor Node reports back data in Fahrenheit or Celsius and relative humidity percent. The operating minimums and maximums are -40°F to 185°F (-40°C – 85°C) and 0-100%.

Each temperature and humidity sensor Node can have low and high warning and/or alarm levels. Set those values between -40°F to 185°F (or -40°C – 85°C if the **Change Node Unit to °C** button has been used) and 0 – 100% for humidity. Leave the values at -40°F/C or 0% for Low, and 185°F/85°C or 110% for High if you are not using that warning or alarm.

Use the tabs “**Assets #1-8**”, “**Assets #9-16**”, “**Assets #17-24**”, “**Assets #25-32**”, and “**Assets #33-40**” to access alarm settings for the up to 40 sensor Nodes. Alarm Settings are saved in non-volatile memory and remain through a power outage or reboot.

Temperature and Humidity Alarm Settings								
Click on the numeric entry box to set the warning and alarm thresholds.								
Threshold settings are not required. Temperature Range (-40°F/°C - 185°F/85°C) / Humidity Range (0 - 100%)								
	Low Temp Alarm	Low Temp Warning	High Temp Warning	High Temp Alarm	Low Humidity Alarm %	Low Humidity Warning %	High Humidity Warning %	High Humidity Alarm %
Node #1	-20	-5	90	95	15	20	70	90
Node #2	-40	-20	60	90	20	40	70	85
Node #3	-30	-5	100	150	10	20	70	80
Node #4	-40	-40	75	80	0	0	110	110
Node #5	-40	-40	185	185	0	0	110	110
Node #6	-40	-40	185	185	0	0	110	110
Node #7	-40	0	185	185	0	0	110	110
Node #8	-40	-40	185	185	0	0	110	110

Assets #1-8   Assets #9-16   Assets #17-24   Assets #25-32   Assets #33-40

## Temperature and Humidity Node (Asset) Site Survey and Binding Screen

Banner Wireless Q45 or P6(L) Nodes combined with Banner M12FTH4Q sensors must be bound to the DXM Wireless Controller to begin communicating.

After you run the binding procedure, the Q45/P6(L) Nodes are assigned a Node address and begin communicating with the DXM. Nodes and sensors are purchased separately and after they are combined, must be bound individually.

Run the binding procedure at any time to add a new Node and sensor to the network.

Perform a site survey on each Node after they are installed to ensure proper radio communication between the Nodes and DXM.

Temp Humidity Node Binding							
Click ON to begin binding of the desired Node Binding must be turned OFF on one to bind another node.							
Node #1	OFF	Node #6	OFF	Node #11	OFF	Node #16	OFF
Node #2	OFF	Node #7	OFF	Node #12	OFF	Node #17	OFF
Node #3	OFF	Node #8	OFF	Node #13	OFF	Node #18	OFF
Node #4	OFF	Node #9	OFF	Node #14	OFF	Node #19	OFF
Node #5	OFF	Node #10	OFF	Node #15	OFF	Node #20	OFF

Nodes #1-20   Nodes #21-40

### Bind a Node

1. Touch the ON/OFF rocker switch on the HMI screen for the desired Node to turn on binding mode.
2. On the Node, connect the M12FTH4Q sensor.
3. Enter binding mode by triple-clicking the binding button under the Q45 lid or by triple-clicking button 2 on a P6 or P6L. For the P6, follow the Node's datasheet to set the rotary dials before binding. After the node is bound, the LEDs are on momentarily, then flash four times. The Node automatically exits binding mode.
4. On the HMI: Touch the same ON/OFF rocker switch on the HMI screen to turn the switch to off. The DXM exits binding mode. After the DXM exits binding mode, the indicator LED on the Node flashes green when the Node is in sync with the DXM.

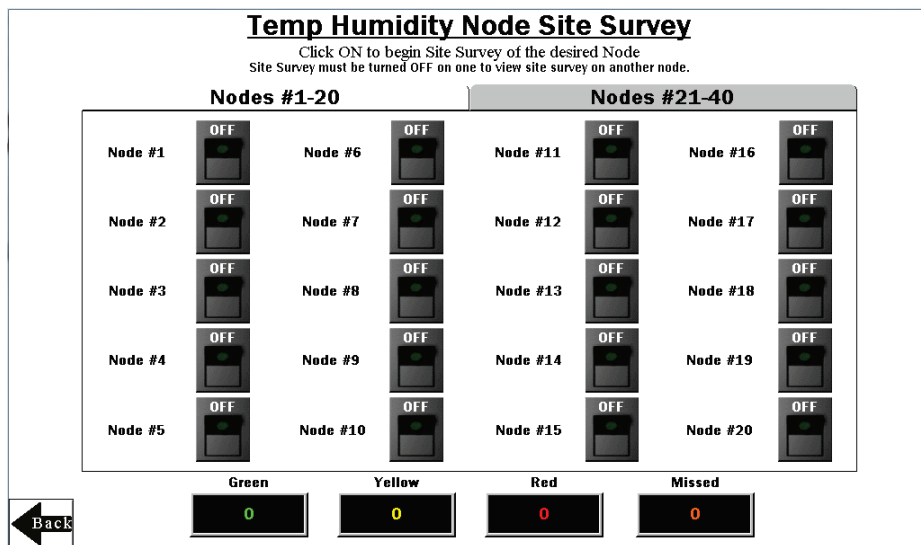
- Repeat steps 2 through 4 for as many Nodes as are needed for the system. Use the tabs “Nodes #1-20” and “Nodes #21-40” to access binding switches for the up to 40 sensor Nodes. **NOTE:** Entering binding mode will cause all the Nodes to go out of sync until the DXM exits binding mode. They will re-sync with the master radio within a few seconds.

## Temp Humidity Node (Asset) Site Survey Screen

Perform a site survey on each Q45/P6(L) Node after they are installed to verify you have good radio communication between the Nodes and DXM.

### Conduct a Site Survey

- Touch the ON/OFF rocker switch on the HMI screen for the desired Node to turn on Site Survey for the desired Node.
- If the selected Node is communicating with the DXM, the results display at the bottom of the HMI screen. The results add up to a total of 100. It takes several seconds for the first 100 packets to display complete results.
- To interpret the results, refer to the interpreting section of the [Conducting a Site Survey and Interpreting the Results](#) tech note on [bannerengineering.com](#).
- After the site survey is complete, touch the ON/OFF rocker switch to turn it to the off position on the HMI screen.
- Repeat steps 1 through 4 for each additional Node. Use the tabs “Nodes #1-20” and “Nodes #21-40” to access site survey switches for the up to 40 sensor Nodes. **NOTE:** Entering site survey mode causes all the Nodes to go out of sync until the DXM exits site survey mode. They will re-sync with the master radio within a few seconds.



## HMI Options Menu Screen

This screen provides some added HMI functionality along with an icon and graph legend.

**HMI System Setup** – Enter HMI Panel Setup, which clears 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.

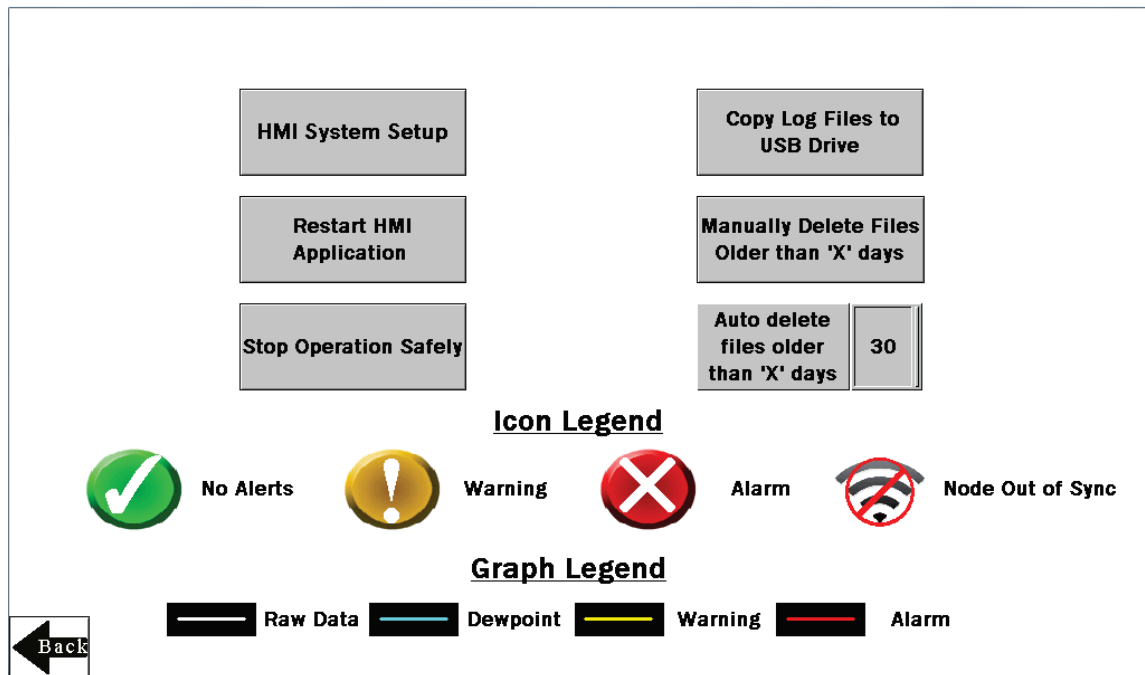
**Stop Operation Safely** – Stops HMI operation safely without data corruption before you power off the HMI.

The HMI provides data logging of all the temperature and humidity levels, warning or alarm settings, and any triggered warnings and/or alarms (in a bit-packed register). 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 has storage for about 45 days of log files. Below are some options for managing and retrieving those files.

**Copy Log Files to USB Drive** – Plug in a USB drive to 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 lack of storage space. Shortening the auto delete days may be necessary.

**Auto Delete Files Older than 'X' Days** –The HMI automatically deletes files older than the selected number of days.



## Advanced Options

### Install a Warning/Alarm Light Indicator

Add a tower light or indicator light (such as a K70, TL50, TL70, etc.) to the solutions kit for added local indications of all clear, warnings, or alarms. The DXM Wireless Controller uses PNP outputs with a maximum of 100 mA per output, so an interposing relay may need to be added to accommodate higher amperage lights. To install:

1. Cut a hole in the box and mount the light accordingly.
2. Wire DC ground to the light or an interposing relay from the bottom row of the gray 2-row terminal blocks inside the Solutions Kit on the DIN rail adjacent to the DXM Controller.
3. Wire the input of the light or interposing relay to the DXM as follows:
  - a. O1 – Pin 5 – indicates any Node/asset in Alarm condition
  - b. O2 – Pin 6 – indicates any Node/asset in Warning condition
  - c. O3 – Pin 7 – indicates any Node/asset in either Warning or Alarm condition
  - d. O4 – Pin 8 – indicates no Warning or Alarms conditions exist

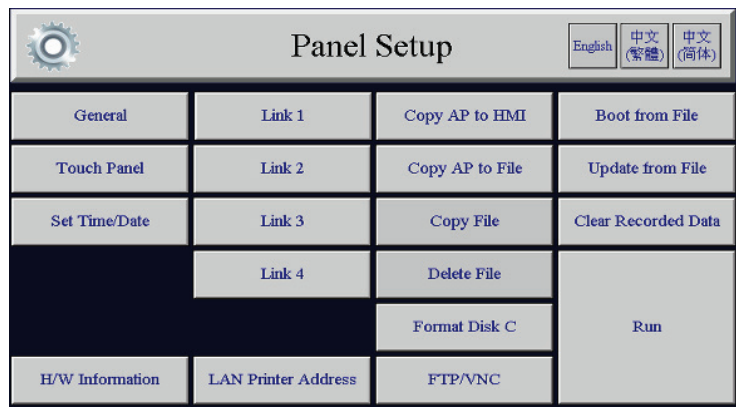
### Connect the DXM and HMI to a Wide Area Network (WAN)

By default, the HMI and DXM Wireless Controller are configured to communicate via static IP addresses. To connect to a WAN, adjust the two devices to use a 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 configured to push data to a cloud webserver for remote monitoring on the web. Follow instructions in the next section for connecting to the DXM to the Banner cloud webserver.



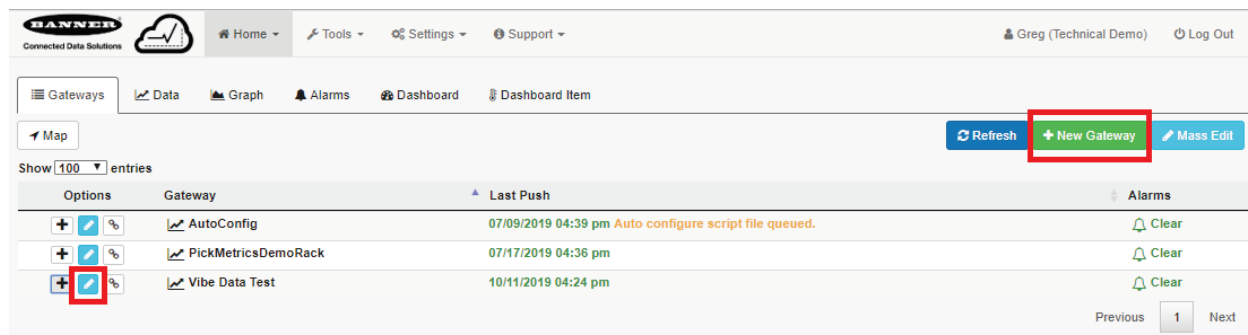
1. Open the solution box and connect an ethernet cable from the WAN to the ethernet switch inside the solution box.
2. [DXM]: With power applied to the DXM, use the arrow keys to select **System Config** and hit **Enter**.
3. [DXM]: Use the arrow keys to select **Ethernet**.
4. [DXM]: If using a static ip address, select the IP address shown and click **Enter**. Then use the arrow and Enter keys to set the new static IP address. If using DHCP, click **Enter** on **DHCP** and use the arrow keys to select **DHCP ON** and hit **Enter**. A reboot of the device will be requested on the screen if any changes are made to these settings.
5. [DXM]: If using DHCP, navigate to the **System Info-> Ethernet** and write down the IP address for entering into the HMI. Subnet mask can be adjusted here as well if needed.
6. [HMI]: From the main screen go to the **HMI Options** screen and then choose **HMI System Setup**.
7. [HMI]: In the Panel Setup screen select, **General**.
8. [HMI]: On the pop-up screen that appears, either type in the IP address and network information for a static IP address by pushing on the appropriate fields or next to the field that states **Get an IP address automatically** push on the the False to change it to True then push **OK**. This sets up DHCP.
9. [HMI]: Push **Link 1** and push on the field of the IP address. Then enter in the IP address of the DXM from earlier and push **OK**.
10. [HMI]: To finish press **Run**.



## Push Information to the Cloud

The DXM Wireless Controller can connect to the Web via Ethernet or an internal cell module. The controller pushes data from the DXM to the cloud to be stored and displayed 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://bannercds.com/>. The Banner Cloud Data Services (CDS) website automatically generates dashboard icons and graphs for the kit that can be placed in the Dashboard tab. Email alerts can be set up on the Alarms tab as well.



1. On the Website: Visit the Banner Cloud Data Services website (<https://bannercds.com/>) and log into an existing account or register a new account. Click **+ New Gateway**. Name the Gateway then click **Create**.
2. After the Gateway appears, click the + symbol on the far left and highlight and copy the Gateway ID.
3. On the computer: Open the [DXM Configuration Software v4](#).
4. On the DXM: Apply power to the DXM.

5. Connect the DXM Controller to the computer with a USB cable or skip if the DXM is connected to the same network as the computer.
6. Select DXM Model as **DXM700** and connect the DXM to the tool by clicking **Device-> Connection Settings** in the menu bar.
7. 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 and multiple appear, attempt to connect to each one of them until successful. If connected to the same network as the DXM, select **TCP/IP** and enter the DXM IP address and click **Connect**.
8. After the DXM is connected to the software, get the current XML file by clicking **Device->Get XML configuration from DXM**. Name and save the file to the computer.
9. Within the tool, click the **Settings** tab on the left and then the **Cloud Services** tab on the top.
10. Make sure the **Server name/IP** is set to push.bannercds.com.
11. Select the appropriate **Push interface** to either Cellular or Ethernet. (To set up Ethernet, use the Network Tab under settings. To set up cellular, refer to the [Activating a Cellular Modem](#) tech note.)
12. Leave the **Cloud push interval** and **Sample count** set as they were. The DXM script controls this to push every 5 minutes.
13. Registers are preselected to push to the cloud. Some registers can be removed if you are not using all 40 sensors. Additional registers can be added by going to the **Local Registers** tab on the left. The preselected READ registers are 1-80 for sensor data, 81-120 for radio connection status, 121-160 for dew point, and 481-520 for bit-packed alarm status. The preselected READ/WRITE registers are 7001-7320, which are the user adjustable warning and alarm levels. To modify registers either:
  - a. Click on each register and edit the Cloud Permissions at the bottom of the screen; or
  - b. Choose the Modify Multiple Registers tab at the bottom of the screen of the Local Register tab to edit the Cloud Permissions for a block of registers
14. Under Web Server heading, keep the **Site ID is** drop-down selection as **GUID** and paste the copied ID from the webpage into the Site ID field.
15. Save the XML file (**File > Save**).
16. Upload the file to the DXM (**Device > Send XML Configuration to the DXM**).
17. On the Website: Click the blue pencil icon under the **Options** column on the row of the newly created Gateway. Click the "Choose File" next to **Update XML** and select the XML file that was just uploaded to the DXM.
18. Click **Save** to complete the connection to the website.

The screenshot shows the 'Cloud Services' configuration tab in the software. On the left sidebar, 'Settings' is selected. The main panel has tabs for 'System', 'Cloud Services', 'Ethernet', 'Notifications', 'Logging', 'Scripting', and 'Administration'. Under 'Cloud Services', there are sections for 'Network Interface' and 'Web Server'. In the 'Network Interface' section, 'Push interface' is set to 'Ethernet'. In the 'Web Server' section, 'Server name/IP' is 'push.bannercds.com', 'Page' is '/push.aspx', and 'Host header' is empty. The 'Gateway ID is' dropdown is set to 'GUID', and the text field below it contains a long GUID string. The 'Clear' button is visible next to the GUID field.

## VNC Viewing on Laptop and Mobile Device

The Solutions Kit HMI has the capability of being viewed and controlled through a VNC app on either a mobile phone, tablet, or laptop that is connected to the same network as the Solutions Kit. Follow the steps in [Tech Note: View Solution Kit Data on a Mobile Device or PC \(b 4492805\)](#) to set up VNC remote viewing and control.

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

To access a demonstration version of the website please contact your local Banner distributor and follow the instructions in the [Tech Note: Connecting a DXM Wireless Controller to the Banner Web Services Demo Site](#) for modified instructions on how to send data to the demo site.

For additional advanced options using the DXM such as email or SMS alerts, refer to the [Temperature and Humidity Monitoring Solutions Guide](#) on the Banner Engineering website. NOTE: The files used in the Solutions Kit are different than those used with the Solutions Guide and should NOT be installed on the DXM being used with the HMI. Use the DXM Configuration Software and perform a Device -> Get XML configuration from DXM to make modifications to the file pre-loaded to the DXM in the Solutions Kit.

For additional information on the DXM Wireless Controller, Q45U/Q45TH Wireless Nodes, P6/P6L Nodes, or M12FTH4Q sensor, visit [www.bannerengineering.com/wireless](http://www.bannerengineering.com/wireless).

## Specifications

### Supply Voltage

24 V DC ( $\pm 10\%$ ) (use only with a Class 2 (UL) power supply or a Limited Power Source (LPS) (CE) power supply)

### 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)

### Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

### 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

### 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 1/4"-20 x 0.25" SS, countersunk Phillips drive screws provided (torque limit = 30 in. lbs.). The enclosure can be mounted vertically (on a wall) or horizontally (table top).

### Certifications



(CE applies only to model SOLUTIONSKIT2-TH)



(NOM applies only to the 900 MHz models)

## 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

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.

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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.

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For patent information, see [www.bannerengineering.com/patents](http://www.bannerengineering.com/patents).

## Notas Adicionales

Información México: La operación de este equipo está sujeta a las siguientes dos condiciones: 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

Antenas SMA	Modelo
Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho	BWA-902-C
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	BWA-905-C

Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	BWA-906-A
Antena, Yagi, 900 MHz, 10 dBd, N Hembra	BWA-9Y10-A

## Mexican Importer

Banner Engineering de México, S. de R.L. de C.V.  
 David Alfaro Siqueiros 103 Piso 2 Valle oriente  
 San Pedro Garza Garcia Nuevo León, C. P. 66269  
 81 8363.2714

# Pressure Monitoring Solutions Kit Quick Start Guide



## Pressure Monitoring Solutions Kit

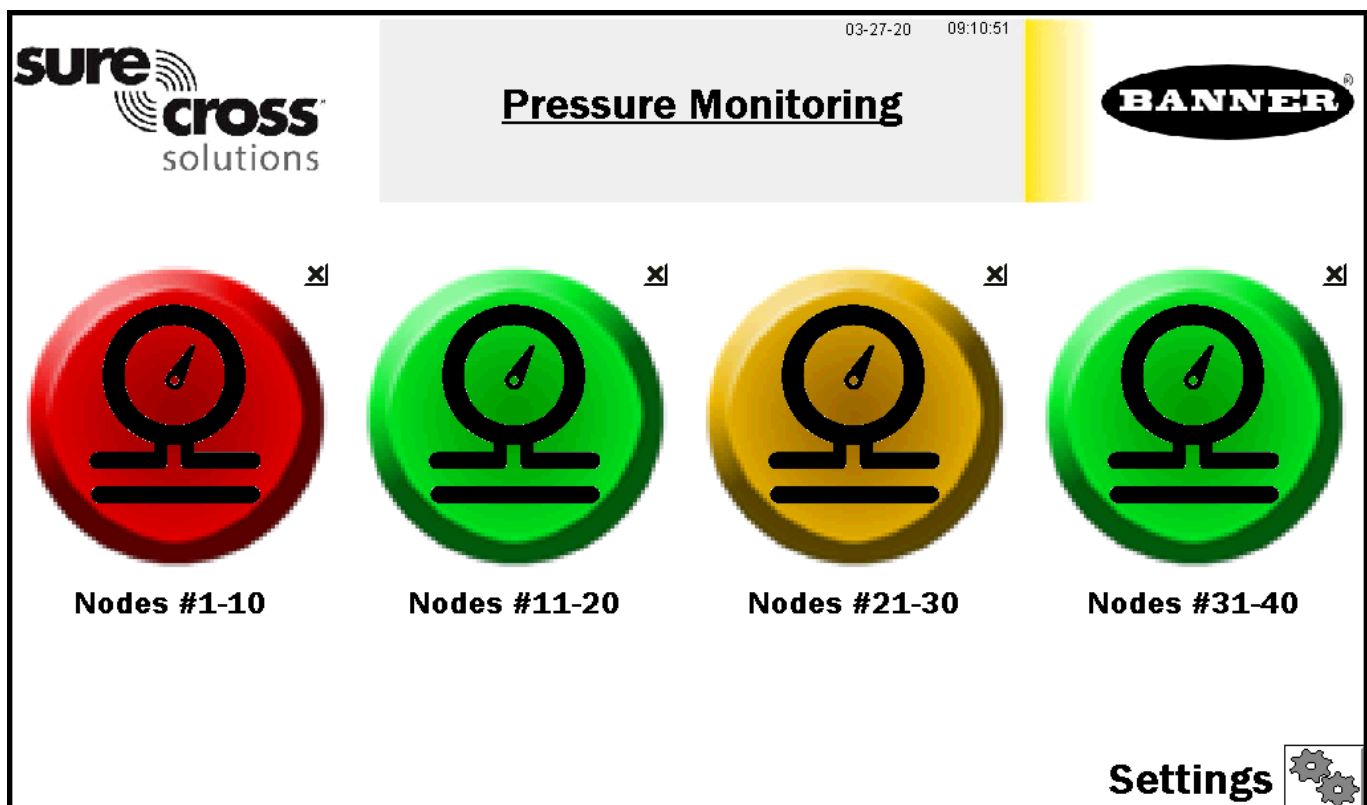
The Pressure Monitoring Solutions Kit provides visual status for up to 40 Banner pressure sensors attached to Performance Series Nodes that are bound to the included DXM Wireless Controller. This provides a simple and effective way of monitoring the pressure of many locations from one centralized point.

The Solutions Kit uses a unique version of the Banner scripting software to program the DXM Wireless Controller. The sensor Nodes take a data sample every five minutes and the software compares the sensor data to user-defined low or high warnings and/or alarms for a visual indication of a potential problem. The kit also indicates the communication status for each Sensor Node.

The following items are included with the Pressure Monitoring Solutions Kit:

- 10" Banner Touch Screen HMI with Ethernet connection
- [DXM700-B1R1 Wireless Controller \(900 MHz\)](#)
- Five-port Ethernet switch
- M12/Euro-style power input connector
- [14 inch x 12 inch Polycarbonate enclosure](#), DIN rails, and terminal blocks

This kit requires a 24 V DC Class 2 (UL) or a Limited Power Source (LPS) (CE) power supply that is sold separately. For most applications, Banner recommends model **PSW-24-1** (FCC/CE). Banner recommends model **PSD-24-4** (FCC/CE) if you are powering additional indicator lights.



The four top-level touch-button icons represent groups of 10 assets. Each icon is a color-coded indication of the status of pressure warnings or alarms or wireless Node connection status within that group. Touch each button to display the status of the Nodes and access more details about each Node.

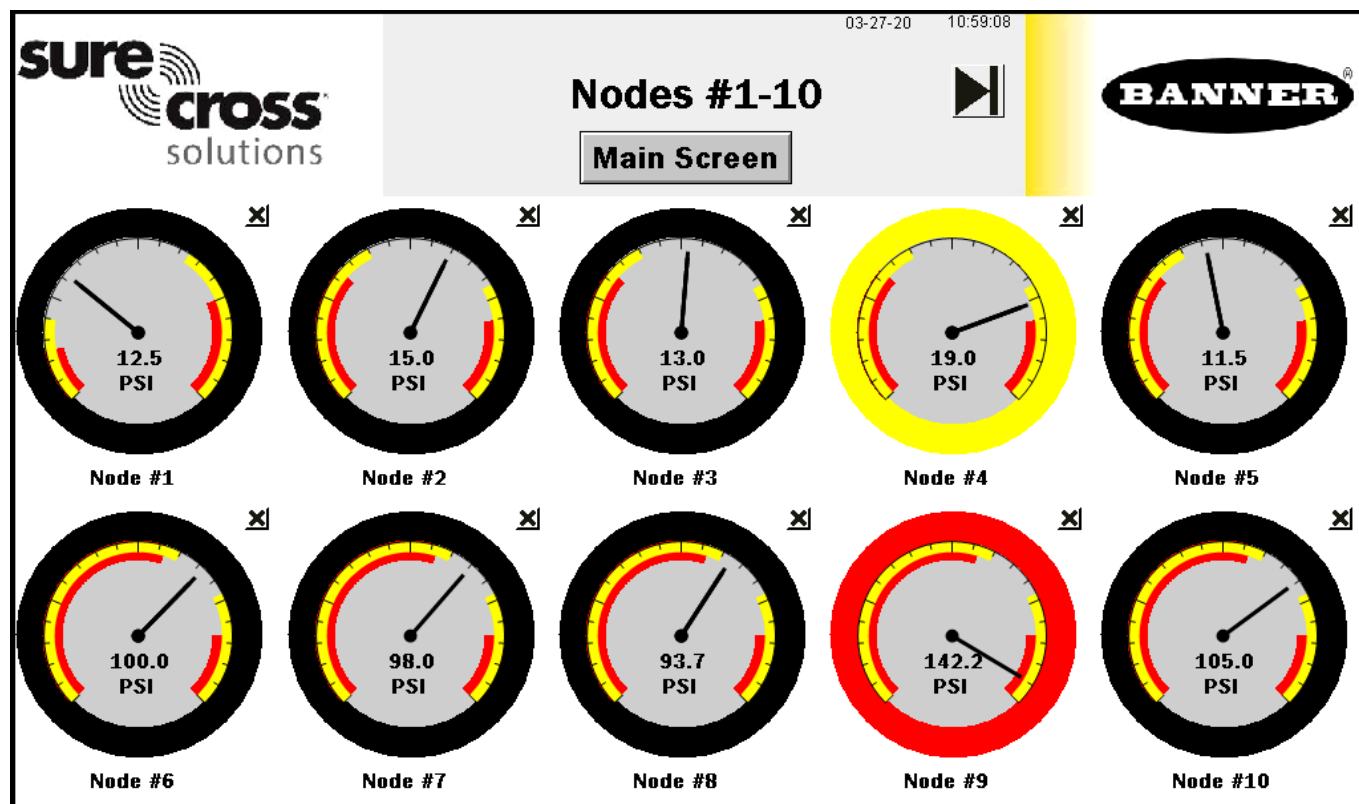
Touch the **X** in the upper right corner of each icon to hide that group of assets and prevent Node status alerts for any Nodes within that group. Use the button that appears after pressing the X to unhide that group for future expansion.

**Settings** accesses Node binding, Node site survey, alarm settings, log file downloads, and other settings.

Touch each asset group label to re-label the icon.

## Pressure Node Group Screens

Each asset/Node group on the main page has a screen of 10 individual icons, one for each Sensor Node. These icons represent the alarm status along with a pressure gauge and raw sensor readings as shown.



Touch any icon to access that Sensor Node's screen, which includes historic graphs and raw data.

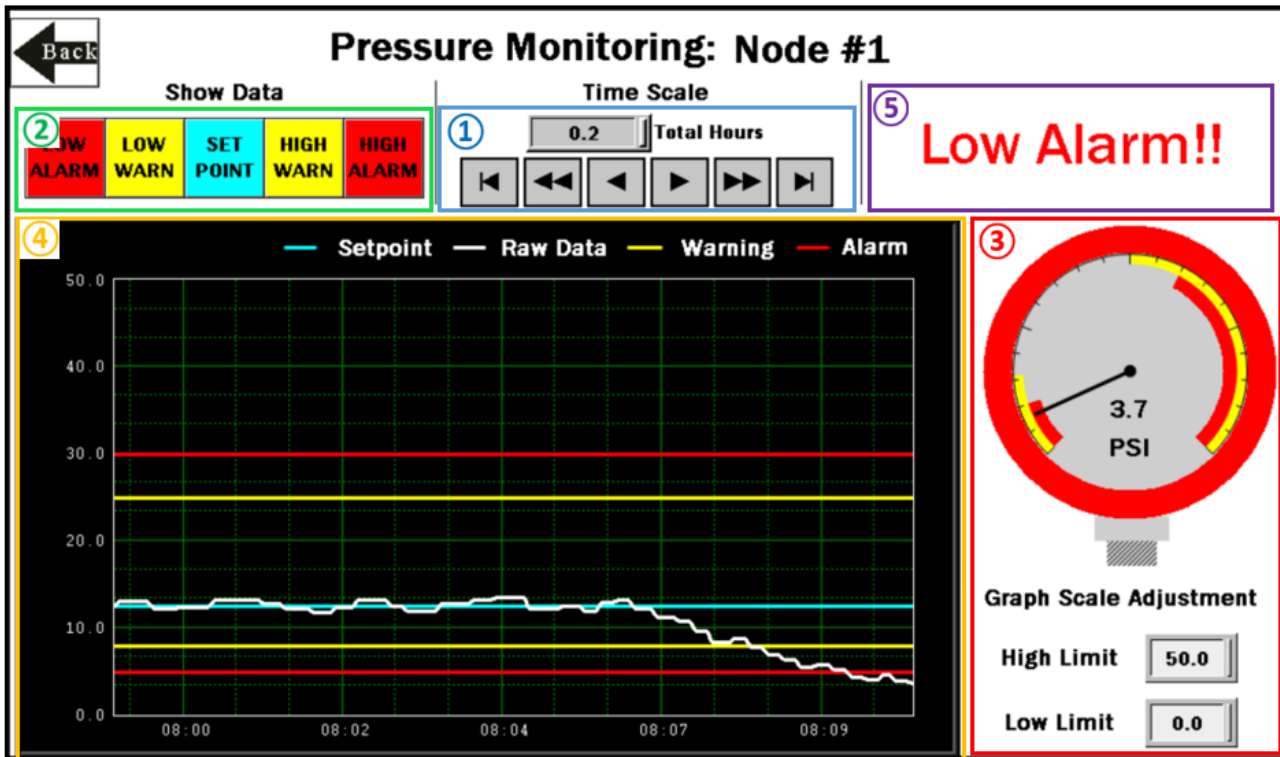
Touch the X in the upper right corner of each icon to hide that Node and prevent that Node's status alerts from appearing on the main HMI screen. Touch the button again to unhide that Node.

Touch the Node's label to edit the label. The label remains in non-volatile memory and appears on the Node's status screen, binding screen, site survey screen, and alarm setting screens.



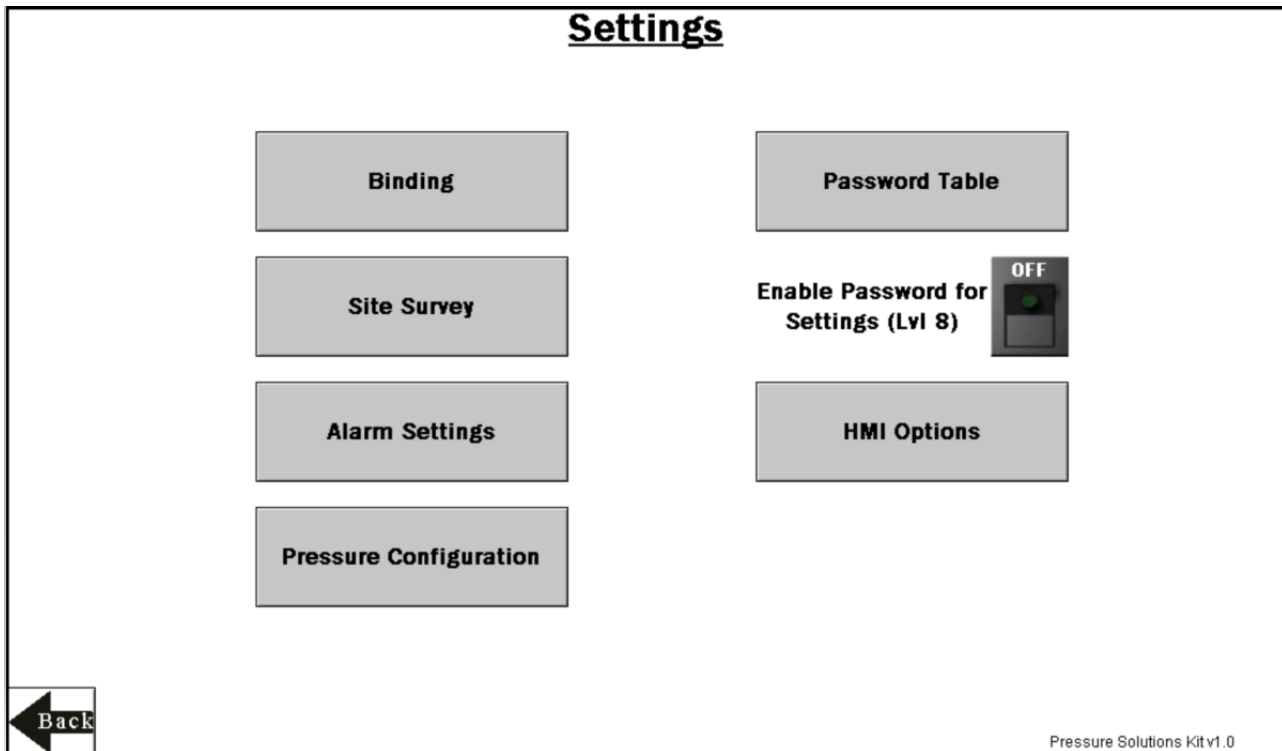
## Pressure Node Status Screen

Select an individual Node icon to display that Node's status.



1. Select the time scale of the graph from 0.1 to 168.0 total hours. The arrow keys scrolls right or left to see different periods of the collected data. The 168 hours (7 days) is the maximum for viewable data on the HMI.
2. This area allows you to turn the warning, alarm, and setpoint lines on or off. This is only for the trend graph and does not disable the warning and alarms. If a value is 0 in the Pressure Alarm Settings page, the Sensor Node defaults to an off state.
3. Scaled data of the pressure level including units. The outside of the gauge indicates the warning or alarm state of the Node based on the thresholds set on the alarm settings screen. High and low limits of the gauge and graph match the values set by **Graph Scale Adjustment**. These values default to the full scale of the Node but can be adjusted to show a more specific range.
4. Graphical representation of pressure, setpoint, warning levels, and alarm levels.
5. Current warnings or alarm display here.

## Settings Screen

**Alarm Settings**

Assign setpoint (optional) and set alarm and warning thresholds for pressure on both high and low levels.

**Binding**

Bind each Sensor Node to the Solutions Kit.

**Enable Password for Settings (Lvl 8)**

Turn ON/OFF the switch to enable/disable a password to access the settings menu.

The default password for User Level 8 is 8888888888. To change your password, click **Password Table** and change the password for level 8 to any number up to 9 numbers long.

**HMI Options**

Copy and manage HMI log files, configure the HMI for advanced options, and display an Icon Legend and Graph Legend.

**Pressure Configuration**

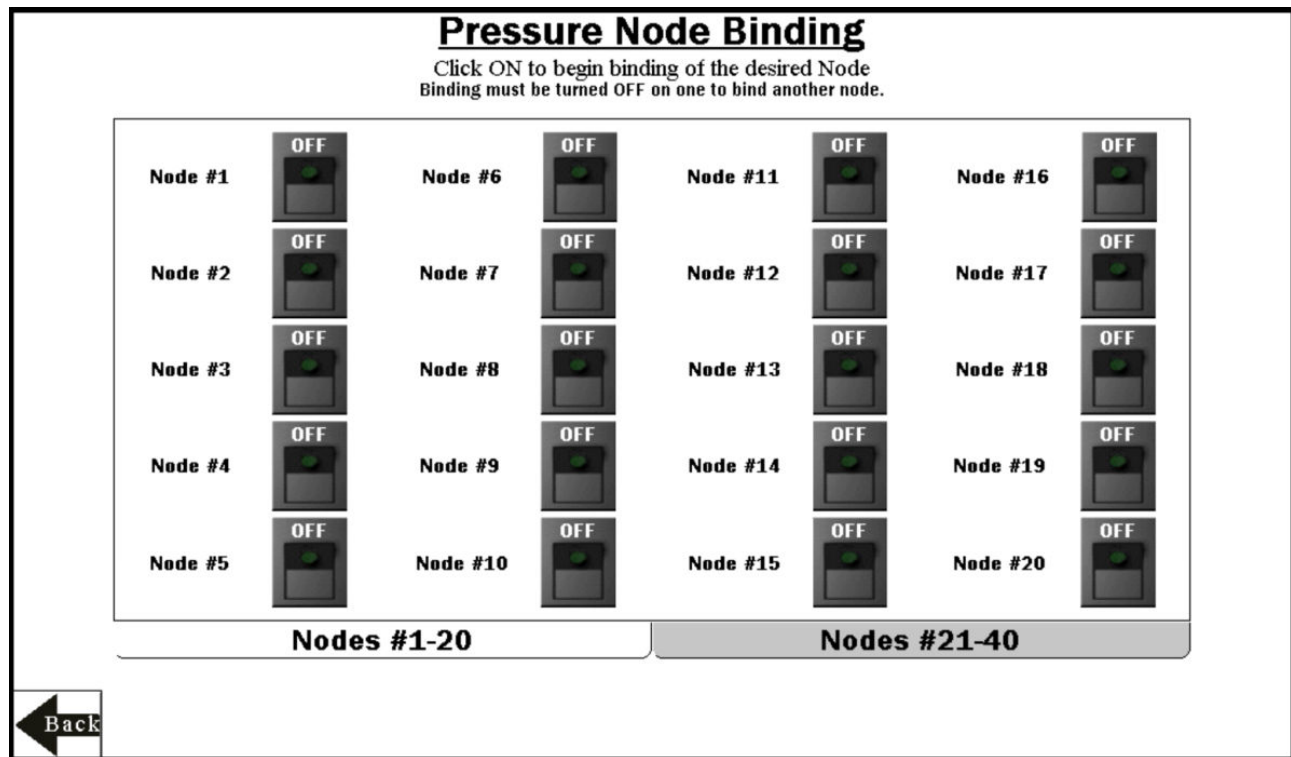
Select the units for the entire kit and range each of the pressure Nodes.

**Site Survey**

Perform a site survey on any sensor node previously bound to the Solutions Kit.

## Pressure Node Binding Screen

Banner Wireless Q45 or DX80 Nodes combined with Banner pressure sensors must be bound to the DXM Wireless Controller to begin communicating.



During the binding procedure, the Q45/DX80 Nodes are assigned a Node address and begin communicating with the DXM. Each Node must be bound one at a time, and a new Node and sensor can be added at any time.

Perform a site survey on each Node after they are installed to ensure proper radio communication between the Nodes and DXM.

### Bind a Node

Follow these instructions to bind each of your Nodes to the DXM Controller master radio.

1. On the HMI, turn on binding for a Node by touching the ON/OFF rocker switch on the HMI screen for the desired Node.
2. Enter binding mode on the Node.
  - For Q45 Nodes—Triple-click the binding button under the Q45 lid.
  - For Performance DX80 Nodes—Triple-click button 2.

The Node enters binding mode. 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, touch the same ON/OFF rocker switch to turn the switch to **OFF**.  
The DXM exits binding mode. After the DXM is out of binding mode, the Node's indicator LED flickers green when the Node is in sync with the DXM.
4. Repeat steps 1–3 for as many Nodes as are needed for the system.

Use the tabs **Nodes #1-20** and **Nodes #21-40** to access binding switches for up to 40 Sensor Nodes. Note that entering binding mode causes all the Nodes to go out of sync with the DXM until after the DXM exits binding mode. The Nodes will resume communicating with the DXM within a few seconds.

## Pressure Node Site Survey Screen

Perform a site survey on each Q45 or Performance DX80 Node after they are installed to ensure a good radio connection between the Nodes and DXM master radio.

### Pressure Node Site Survey

Click ON to begin Site Survey of the desired Node  
Site Survey must be turned OFF on one to view site survey on another node.

Nodes #1-20		Nodes #21-40	
Node #1	OFF	Node #6	OFF
Node #2	OFF	Node #7	OFF
Node #3	OFF	Node #8	OFF
Node #4	OFF	Node #9	OFF
Node #5	OFF	Node #10	OFF
Node #11	OFF	Node #16	OFF
Node #12	OFF	Node #17	OFF
Node #13	OFF	Node #18	OFF
Node #14	OFF	Node #19	OFF
Node #15	OFF	Node #20	OFF

**Green**  

0

**Yellow**  

0

**Red**  

0

**Missed**  

0

← Back

### Perform a Site Survey

Perform a site survey on each Node after they are installed to analyze the wireless communication between the Nodes and DXM.

1. On the HMI, touch the ON/OFF rocker switch for the desired Node to turn on Site Survey mode for that Node. If the Node is communicating with the DXM, the results display at the bottom of the HMI screen. The results add up to a total of 100. It takes several seconds for the first 100 packets to display complete results.
2. Follow the interpreting section of the [Conducting a Site Survey and Interpreting the Results](http://www.bannerengineering.com) technical note on [www.bannerengineering.com](http://www.bannerengineering.com).
3. After the site survey is complete, touch the ON/OFF rocker switch to turn Site Survey mode off.
4. Repeat for each additional Node.

Use the tabs **Nodes #1-20** and **Nodes #21-40** to access site survey switches for up to 40 sensor Nodes. Note that entering site survey mode causes all the Nodes to go out of sync with the DXM until the DXM exits Site Survey mode. The Nodes will resume communicating with the DXM within a few seconds.

## Pressure Alarm Settings Screen

Each Pressure Sensor Node reports back data in psi. The operating maximums depend on the pressure sensor that you are using. Alarm settings are saved in non-volatile memory and are not lost during a power outage or reboot.

### Pressure Alarm Settings

Click on the numeric entry box to set the warning and alarm thresholds.  
If threshold is set to 0, no alarming will occur for that value.

	High Alarm	High Warning	Setpoint	Low Warning	Low Alarm			
Node #1	30.0	25.0	12.5	8.0	5.0			
Node #2	20.0	18.0	0.0	10.0	8.0			
Node #3	20.0	18.0	0.0	10.0	8.0			
Node #4	20.0	18.0	0.0	10.0	8.0			
Node #5	20.0	18.0	0.0	10.0	8.0			
Node #6	125.0	110.0	0.0	90.0	85.0			
Node #7	125.0	110.0	0.0	90.0	85.0			
Node #8	125.0	110.0	0.0	90.0	85.0			

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Assets #1-8

Assets #9-16

Assets #17-24

Assets #25-32

Assets #33-40

Each Pressure Sensor Node can have low and high warning and/or alarm levels. Set those values between 0 and 6500. Note that the alarm values do not change when the units change. If you change from psi to bar, adjust your values accordingly. Leave the values at 0 for Low and 3000 for High if you are not using that warning or alarm.

Use the tabs **Assets #1-8**, **Assets #9-16**, **Assets #17-24**, **Assets #25-32**, and **Assets #33-40** to access alarm settings for up to 40 Sensor Nodes.

## Pressure Configuration Settings Screen

Each pressure sensor Node is scaled from the factory in psi (pounds per square inch). Select from 50, 150, 500, or 3000 psi based on the model you've purchased. This is required for the screen to display the correct values. Configuration settings are saved in non-volatile memory and remain through a power outage or reboot.

### Pressure Configuration Settings

Units  
GLOBAL ☒ STANDARD ☐ METRIC

Click on the numeric entry box.  
Threshold settings are not required.

	Scale MAX Pressure	Min Scale (0V)	Max Scale (10V)
Node #1	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		
Node #2	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		
Node #3	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		
Node #4	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		
Node #5	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		
Node #6	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		
Node #7	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		
Node #8	● 50 ○ 150 ○ 500 ○ 3000 ○ Custom		

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Assets #1-8

Assets #9-16

Assets #17-24

Assets #25-32

Assets #33-40

If you would like use your own pressure sensor, select the Custom value. (Banner recommends model DX80N9X1S-P14 or DX80N9X1W-P14L with a 0–10 V DC analog sensor wired into input 2). If you select Custom, you must also configure the Minimum Scale (0 V) and Maximum Scale (10V).

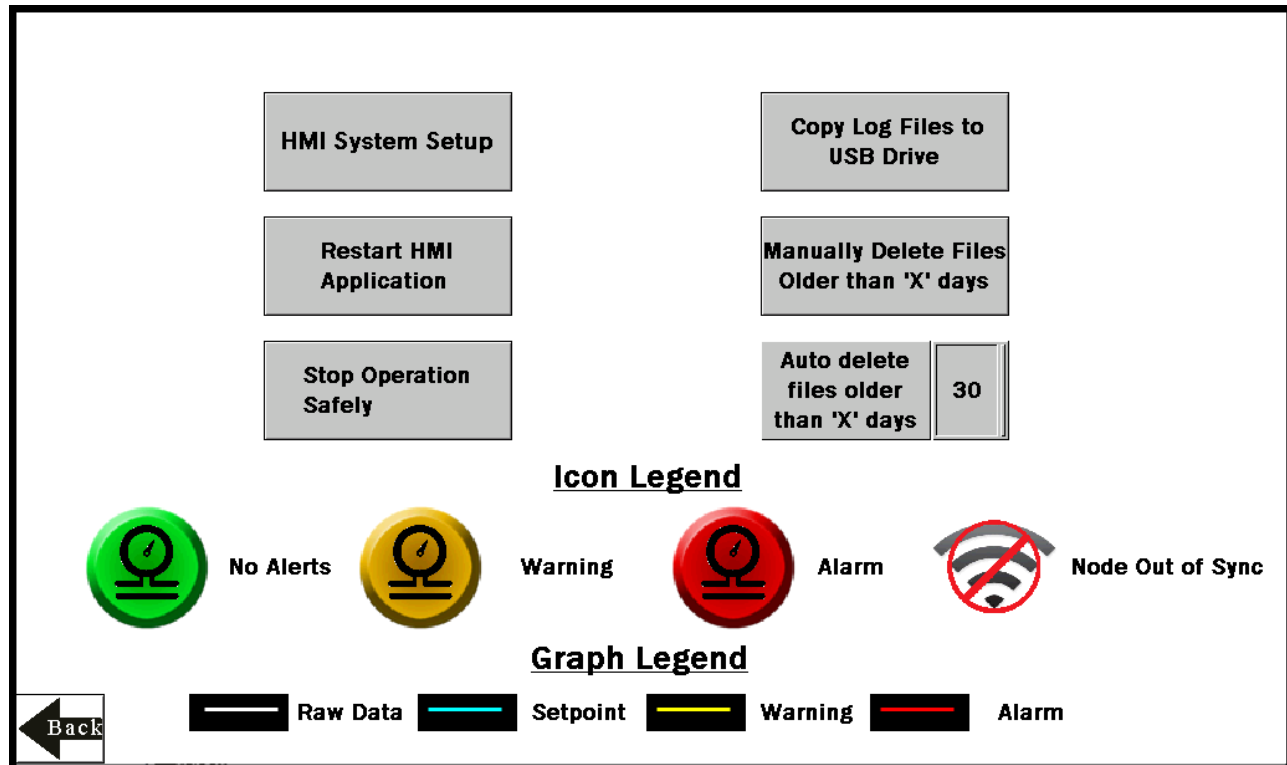
To change the values to the metric unit of pressure (bar), toggle the **Units GLOBAL** selection in the upper right corner. This re-scales the raw value but will not change any warning or alarm values that have already been configured.

Use the tabs **Assets #1-8**, **Assets #9-16**, **Assets #17-24**, **Assets #25-32**, and **Assets #33-40** to access configuration settings for up to 40 Sensor Nodes.



## HMI Options Menu Screen

The HMI Options screen provides some added HMI functionality along with icon and graph legends.



The HMI also provides data logging of all the raw data, baselines, and thresholds. 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 has storage for about 90 days of log files.

### HMI System Setup

Enters HMI Panel Setup. Use for setting Time, Date, and Advanced Options. Entering this screen will clear any logged data from the graphs but will not clear any data saved to files.

### Stop Operation Safely

Stops HMI operation safely without data corruption before you power off the HMI.

### 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

Deletes 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 parameter may be necessary.

### Auto Delete Files Older than 'X' Days

The HMI auto deletes files older than the selected number of days. Default is 30 days with a maximum of 90 days.

### Restart HMI Application

Restarts the HMI application, which clears all graphed data but retains any saved logs.

## Advanced Options

### Install a Warning or Alarm Light

Add a tower light or indicator light (such as a K70, TL50, TL70, etc.) to the solution box for added local indications of all clear, warnings, or alarms.

The DXM Controller uses PNP outputs with a maximum of 100 mA per output. An interposing relay may need to be added to accommodate higher amperage lights.

1. Cut a hole in the box and mount the light accordingly.
2. Wire the dc ground to the light or an interposing relay from the bottom row of the gray two-row terminal blocks inside the Solutions Kit on the DIN rail adjacent to the DXM Controller.

3. Wire the input of the light or interposing relay to the DXM.
  - a) O1 – Pin 5 – indicates a Node/asset in an Alarm condition
  - b) O2 – Pin 6 – indicates a Node/asset in a Warning condition
  - c) O3 – Pin 7 – indicates a Node/asset in either a Warning or an Alarm condition
  - d) O4 – Pin 8 – indicates no Warning or Alarm conditions exist

## Connect the DXM and HMI to a Wide Area Network (WAN)

By default, the HMI and DXM Controller are configured to communicate using static IP addresses. To connect to a WAN, configure the two devices to have a 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 configured by any computer on the network and allows the DXM to be configured to push data to a cloud webserver for remote monitoring.

1. Open the Solution Kit's enclosure and connect an ethernet cable from the WAN to the ethernet switch inside the enclosure.
2. On the DXM: With power applied to the DXM, use the arrow keys to select **System Config**. Press **Enter**.
3. Use the arrow keys to select **Ethernet**.
4. Set the IP address.
  - If you are using a static IP address, select the IP address shown and press **Enter**. Then use the arrow and **Enter** keys to set the new static IP address.
  - If you are using DHCP, press **Enter** on DHCP. Use the arrow keys to select DHCP ON and press **Enter**.

A device reboot is requested if any changes are made to these settings.

5. If you are using DHCP, navigate to the **System Info > Ethernet** and write down the IP address to enter into the HMI. The subnet mask can be adjusted here as well if needed.
6. On the HMI: From the main screen, go to the **HMI Options** screen and choose **HMI System Setup**.
7. In the **Panel Setup** screen, select **General**.
8. On the pop-up screen that appears, set up DHCP in one of two ways:
  - Type in the IP address and network information for a static IP address by selecting the appropriate fields.
  - Toggle from false to true in the field next to **Get an IP address automatically**, then press **OK**.
9. Press **Link 1** and select the IP address field.
10. Enter in the IP address of the DXM from earlier and press **OK**.
11. Press **Run**.

## Push Information to the Cloud

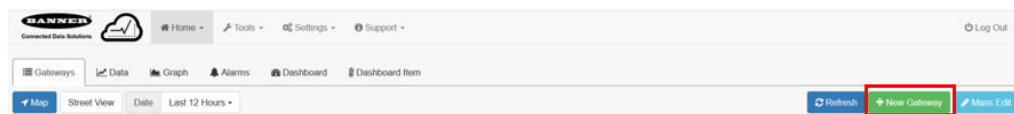
The DXM Wireless Controller can connect to the Web via Ethernet or an internal cell module. The controller pushes data from the DXM to the cloud to be stored and displayed on a website. To enable this capability, modify the DXM's XML configuration file.

The Banner website for storing and monitoring the system's data is <https://bannercds.com>. The Banner Cloud Data Services website automatically generates dashboard icons and graphs for the Solutions Kit that can be placed in the Dashboard tab. Email alerts can be set up on the Alarms tab as well.

## Create a New Gateway

After you log into the Banner Cloud Data Services website, follow these steps.

1. Click on **+New Gateway**.  
Create a new Gateway/site for each device that will be sending data to the web server.



2. Enter a site name.
3. Under the **Options** column, click **+**.  
Detailed information about your new site displays.
4. Copy the **Site ID** number shown on the dashboard.  
The Site ID number created by the web server is a required parameter in the configuration setup of the DXM. The Site ID is the address the webserver uses to store the data pushed from the DXM.
5. Click **Save**.

## Connect to the Software and Download the Existing Configuration

Follow these steps to connect your DXM to the configuration software and download the existing configuration file from your DXM to your hard drive.

1. On the computer, download the [DXM Configuration Software v4](#) from the Banner Engineering website and install it.
2. On the DXM: Apply power to the DXM.
3. Connect the DXM Controller to the computer with a USB cable or skip if the DXM is connected to the same network as the computer.
4. On the computer: Launch the DXM Configuration Software.
5. From the **DXM Model** drop-down list, select DXM700.
6. On the menu bar, go to **Device > Connection Settings**.
  - 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 and multiple appear, attempt to connect to each one of them until successful.
  - If you are connected to the same network as the DXM, select **TCP/IP** and enter the DXM IP address. Click **Connect**.
7. After the DXM is connected to the software, click **Device > Get XML configuration from DXM** to download the current XML file.
8. Name and save the file to the computer.

## Configure the DXM to Push Information to the Cloud

1. Within the DXM Configuration Software, go to the **Settings > Cloud Services** screen.

2. Set the **Server name/IP** to push.bannercds.com.
3. 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](#) (p/n 205026) technical note.
4. Leave the **Cloud push interval** and **Sample count** unchanged. The DXM script controls this to push every 5 minutes.

5. Modify the **Cloud Permissions** for the registers.

Registers are preselected to push to the cloud. Some registers can be removed if you are not using all 40 Nodes. Additional registers can be added by going to the Local Registers tab on the left.

The preselected READ registers are 1-40 for the scaled pressure data, 41-80 for node connection status, and 301-340 for alarm bit packed information.

The preselected READ/WRITE registers are 7001-7200 (warning and alarm level settings), 7281 (standard or metric units), 7301-7340 (pressure scale for each node), and 7401-7480 (custom scaled analog values). These READ/WRITE registers are configured to only push once per day at UTC 00:00 to avoid pushing unnecessary data points. READ/WRITE is used so the threshold registers can be updated/changed from the website.

To modify registers either:

- Click on each register and edit the **Cloud Permissions** at the bottom of the screen; or
  - Choose the **Modify Multiple Registers** tab at the bottom of the **Local Register** screen to edit the **Cloud Permissions** for a block of registers
6. In the Web Server section, keep the **Site ID** is drop-down selection as **GUID** and paste the copied ID from the webpage into the **Site ID** field.

## Step 6: Save and Upload the Configuration File

After making any changes to the configuration, you must save the configuration files to your computer, then upload it to the device.

Changes to the XML file are not automatically saved. Save your configuration file before exiting the tool and before sending the XML file to the device to avoid losing data. If you select **DXM > Send XML Configuration to DXM** before saving the configuration file, the software will prompt you to choose between saving the file or continuing without saving the file.

1. Save the XML configuration file to your hard drive by going to the **File > Save As** menu.
2. Go to the **DXM > Send XML Configuration to DXM** menu.

Connected	10.10.82.134	Active File: TL70_guide1.xml	Application Status: <span style="color: green;">●</span>
Connected	10.10.82.134	Active File: TL70_guide1.xml	Application Status: <span style="color: yellow;">●</span>
Not Connected		Active File: TL70_guide1.xml	Application Status: <span style="color: red;">●</span>

- If the Application Status indicator is red, close and restart the DXM Configuration Tool, unplug and re-plug in the USB or Ethernet cable and reconnect the DXM to the software.
- If the Application Status indicator is green, the file upload is complete.
- If the Application Status indicator is yellow, the file transfer is in progress.

The device reboots and begins running the new configuration.

## Upload the XML Configuration File to the Website

To upload an XML configuration file to the website, follow these instructions.

1. At the webserver, select the **Home** screen.



2. On the row displaying your new site, click the **Edit Gateway** (pencil) icon.
3. Select **Update XML**.

- Click **Choose File** and select the file that was just updated to the DXM and click **Save**.

The screenshot shows a web interface for configuring a VKJT gateway. At the top, the title 'VKJT' and a unique ID '52df5c36-50f9-40a6-b67f-a6d43f294826' are displayed. Below this is a form with several sections: 'Company' with a dropdown menu set to 'Technical Demo'; 'Gateway Name' with a text field containing 'VKJT'; 'Update XML' with a 'Choose File' button and the text 'No file chosen'; 'XML History' with a list item 'vibekitworkingcell.xml - 11/20/2019 11:34 am' and a 'Get' button; 'Script File' with a checkbox, the text 'Disabled', and a 'Get' button; and 'Authentication' with a checkbox. At the bottom of the form are three buttons: 'Delete Gateway' (red), 'Close' (grey), and 'Save' (green).

Figure 1. Example file selection screen that may not represent your specific kit

After the XML file is loaded into the webserver, the webserver uses the register names and configurations defined in the configuration file.

- Click on the **Site Name** link to go to the configured registers to see the values uploaded by the DXM. The same XML configuration files is now loaded on both the DXM and the Website. After some time, the data should be seen on the website.

Completing these steps creates continuity between the site created on the website with the DXM used in the field. The DXM pushes data to the website, which can be viewed at any time.

## VNC Viewing on Laptop and Mobile Devices

The Solutions Kit HMI can be viewed and controlled through a VNC application on either a mobile phone, tablet, or laptop connected to the same network as the Solutions Kit. Follow the steps in the Tech Note to set up VNC remote viewing and control: [View Solutions Kit Data on a Mobile Device or PC \(b\\_4492805\)](#)

This creates continuity between the site created on the website with the DXM. If the DXM has network connection, it will upload data on its next cloud push interval. Refer to the [Banner CDS Web Services 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, contact your local Banner distributor and follow the instructions in the technical note [Connecting DXM Wireless Controller to Banner Web Services Demo Site](#) for modified instructions on how to send data to the Demo site.

For additional advanced options using the DXM, such as sending email or SMS/text alerts, refer to the [Vibration & Predictive Maintenance Solution Guide](#) on the Banner Engineering website. NOTE: The files used in the Solutions Kit are slightly different than those used with the Solutions Guide and should NOT be installed on the DXM being used with the HMI. Use the DXM Configuration Software and perform a **Device > Get XML configuration from DXM** to make modifications to the file pre-loaded to the DXM in the Solutions Kit.

For additional information on any products, visit [www.bannerengineering.com](http://www.bannerengineering.com).

## Specifications

### Radio Range<sup>1</sup>

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

### 900 MHz Compliance (1 Watt)

FCC ID UE3RM1809: FCC Part 15, Subpart C, 15.247  
IC: 7044A-RM1809  
IFT: RCPBARM13-2283

### 2.4 GHz Compliance

FCC ID UE300DX80-2400: FCC Part 15, Subpart C, 15.247  
Radio Equipment Directive (RED) 2014/53/EU  
IC: 7044A-DX8024

### Antenna Connection

Ext. Reverse Polarity SMA, 50 Ohms  
Max Tightening Torque: 0.45 N-m (4 lbf-in)

### Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

<sup>1</sup> Radio range is with the 2 dB antenna that ships with the product. High-gain antennas are available, but the range depends on the environment and line of sight. Always verify your wireless network's range by performing a Site Survey.

**Supply Voltage**

24 V DC ( $\pm 10\%$ ) (use only with a suitable Class 2 power supply (UL) or a SELV (CE) power supply)

**Power Consumption**

9 W average; 30 W maximum

**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  $\frac{1}{4}$ "-20 x 0.25" SS, countersunk Phillips drive screws provided (torque limit = 30 in. lbs.). The enclosure can be mounted vertically (on a wall) or horizontally (table top)

**Operating Conditions**

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

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

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

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

90% maximum relative humidity (non-condensing)

**Certification**

(CE approval only applies to 2.4 GHz models)



(NOM approval only applies to 900 MHz models)

## 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.**

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For patent information, see [www.bannerengineering.com/patents](http://www.bannerengineering.com/patents).

## 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 B 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.

## Notas Adicionales

Información México: La operación de este equipo está sujeta a las siguientes dos condiciones: 1) es posible que este equipo o dispositivo no cause interferencia perjudicial y 2) este equipo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Banner es una marca registrada de Banner Engineering Corp. y podrán ser utilizadas de manera indistinta para referirse al fabricante. "Este equipo ha sido diseñado para operar con las antenas tipo Omnidireccional para una ganancia máxima de antena de 6 dBd y Yagi para una ganancia máxima de antena 10 dBd que en seguida se enlistan. También se incluyen aquellas con aprobación ATEX tipo Omnidireccional siempre que no excedan una ganancia máxima de antena de 6dBd. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 6 dBd en tipo omnidireccional y 10 dBd en tipo Yagi, quedan prohibidas. La impedancia requerida de la antena es de 50 ohms."

Antenas SMA	Modelo	Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho	<b>BWA-902-C</b>	Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	<b>BWA-906-A</b>
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	<b>BWA-905-C</b>	Antena, Yagi, 900 MHz, 10 dBd, N Hembra	<b>BWA-9Y10-A</b>



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