# Banner Temperature and Humidity Monitoring Solutions Kit

The Solutions 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.

The Solutions 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 (THM101CE)
- DXM700-B1R1 wireless controller (900MHz) or DXM700-B1R3 (2.4GHz)
- 5 port Ethernet switch
- 24VDC, 1.3A power supply
- 6A C6 miniature circuit breaker
- 14"x12" Polycarbonate enclosure, din rails, and terminal blocks
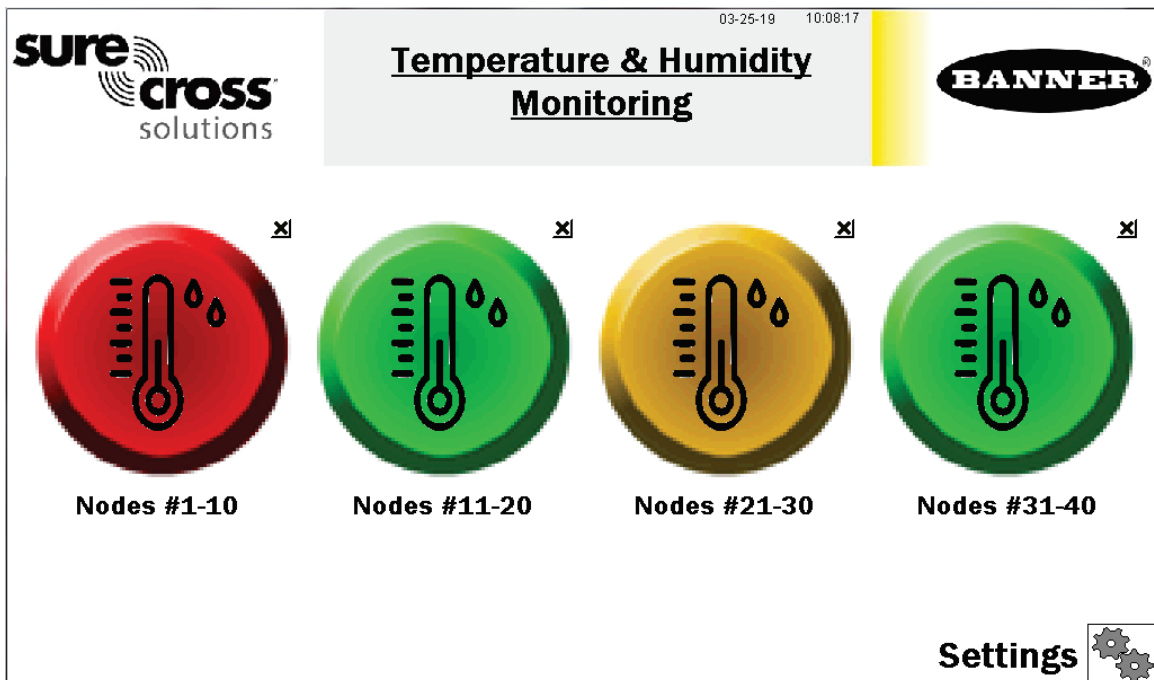
Four top level icons represent groups of 10 assets. Each icon is a color coded indication of the status of temperature and humidity warnings or alarms, or wireless Node connection status within that group. It is also a touch button that brings up the 10 individual icons that represent that assets' status and is also a touch button to view that assets' screen where detailed data viewing options are available. (See page 2)
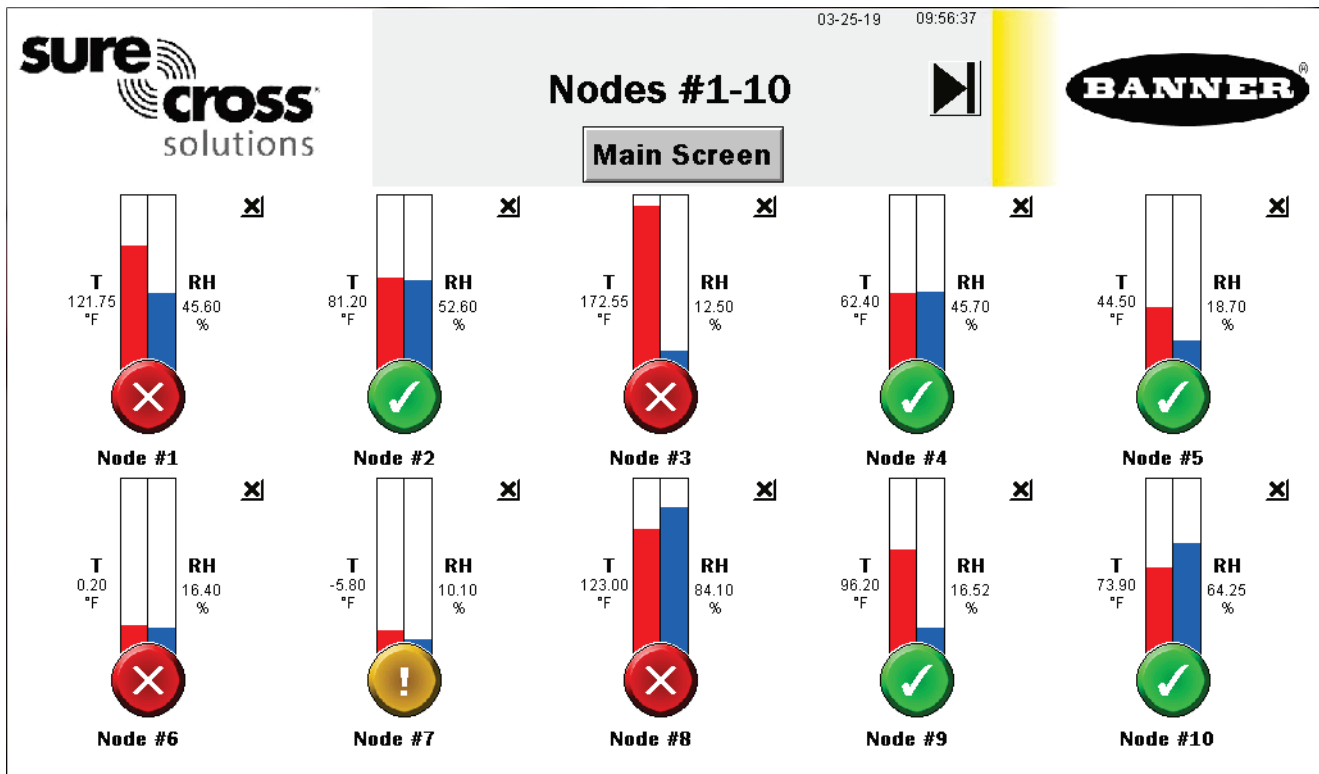
Touch the "X" button in the upper right hand corner of each icon to hide that group of assets and prevent Node status alerts for any Nodes within that group. Use the button that appears after pressing the X to unhide that group for future expansion.

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:
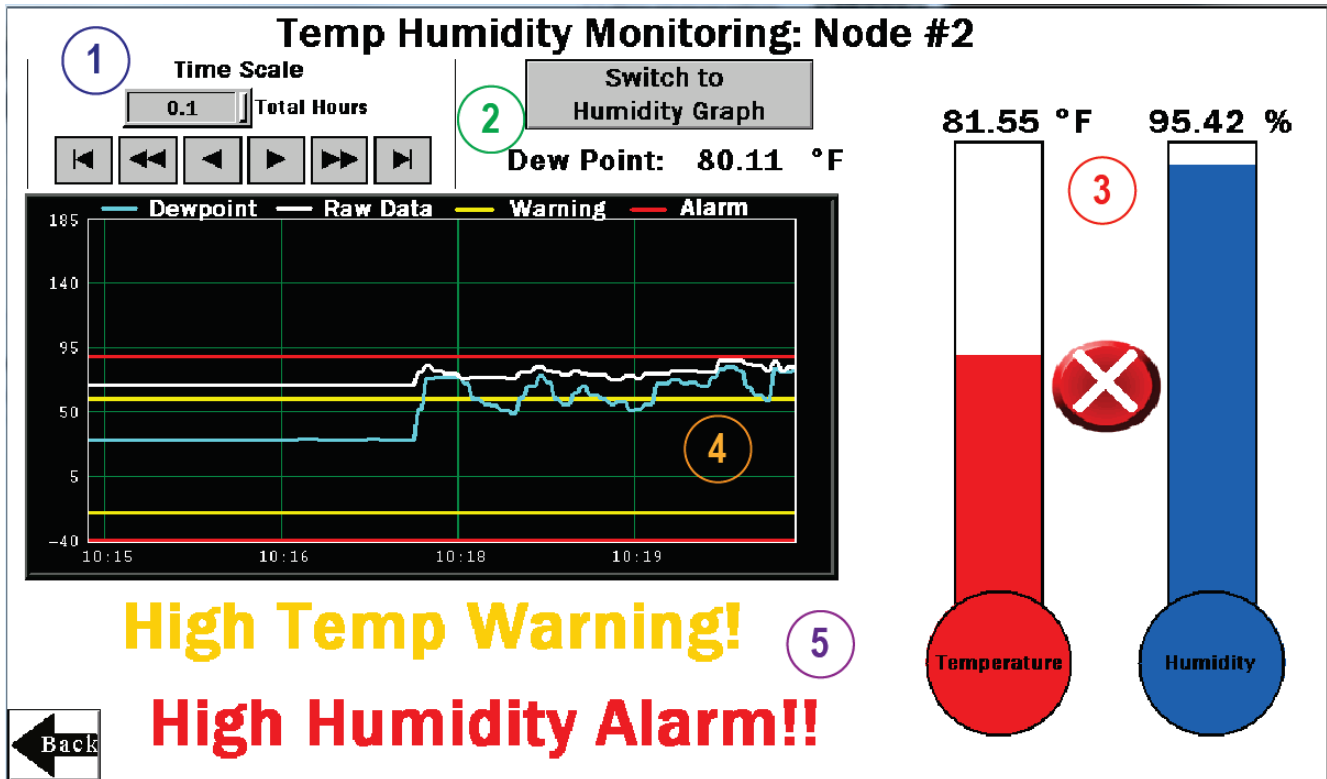
① - Select the time scale of the graph from 0.1 to 168.0 total hours. The arrow keys scroll right or left to see different periods of the collected data. Up to 168 hours or 7 days is the maximum for viewable data on the HMI.

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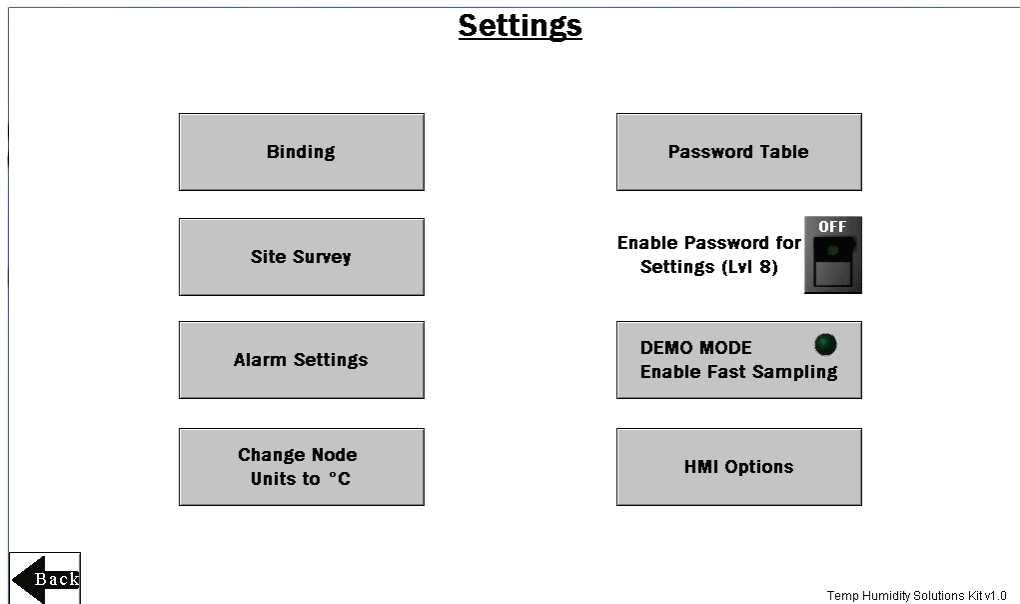
Binding – Opens a screen to bind each sensor Node to the Solutions Kit's controller. (page 5)

Site Survey – Opens a screen to perform a site survey on any sensor Node bound to the Solutions 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

Back | **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**

Back

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.
5. 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.

Vibration 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

1. Touch the ON/OFF rocker switch on the HMI screen for the desired Node to turn on Site Survey for the desired Node.
2. 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.
3. To interpret the results, refer to the interpreting section of the Conducting a Site Survey and Interpretting the Results tech note on bannerengineering.com.

4. After the site survey is complete, touch the ON/OFF rocker switch to turn it to the off position on the HMI screen.
5. 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.
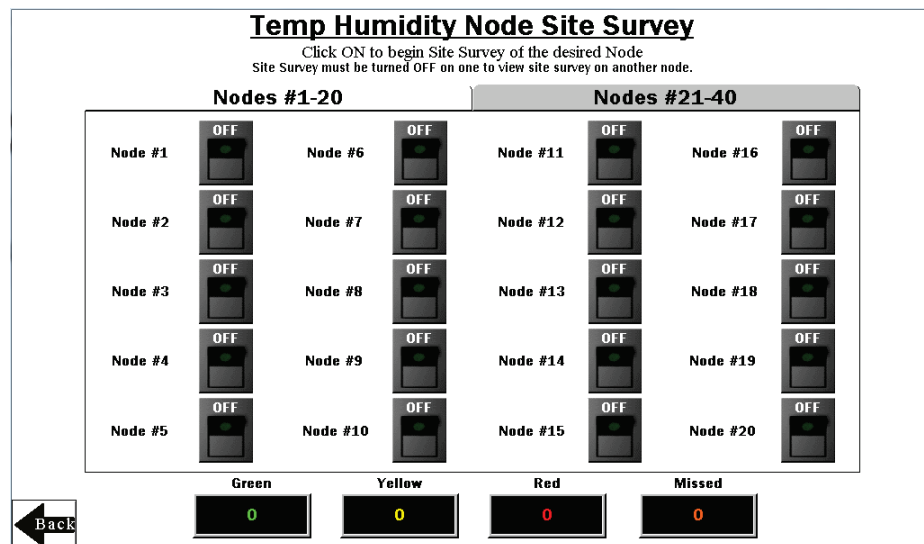
HMI Options Menu Screen

This screen provides some added HMI functionality along with an Icon Legend and a 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 bitpacked 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.
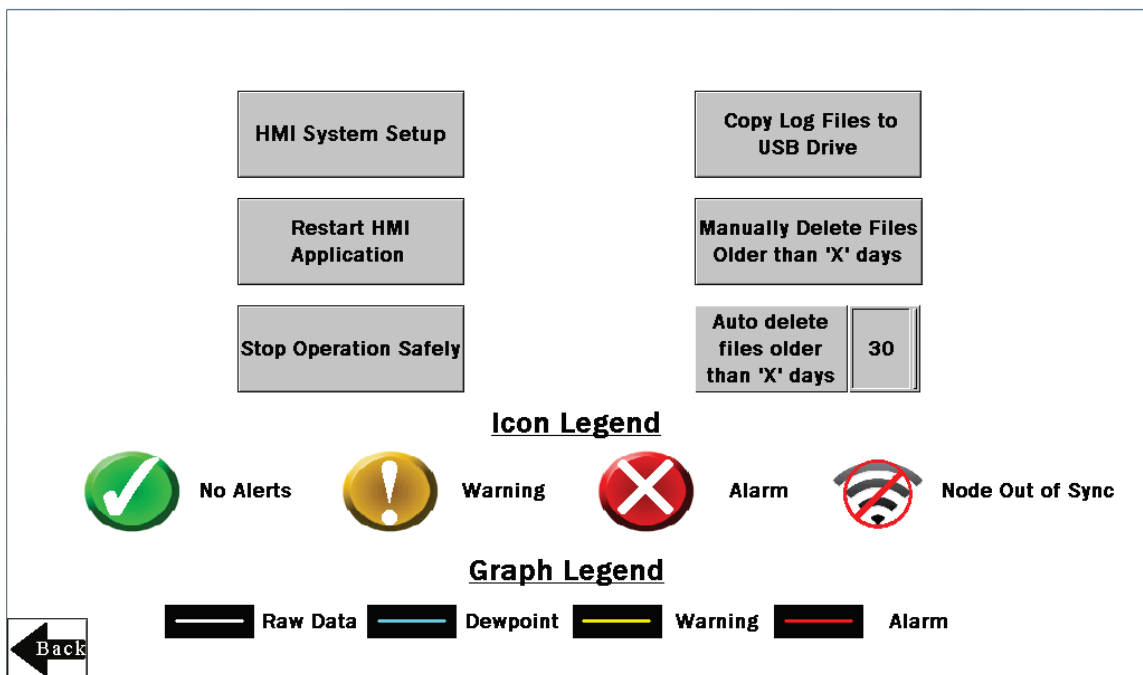
Advanced Options

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**.
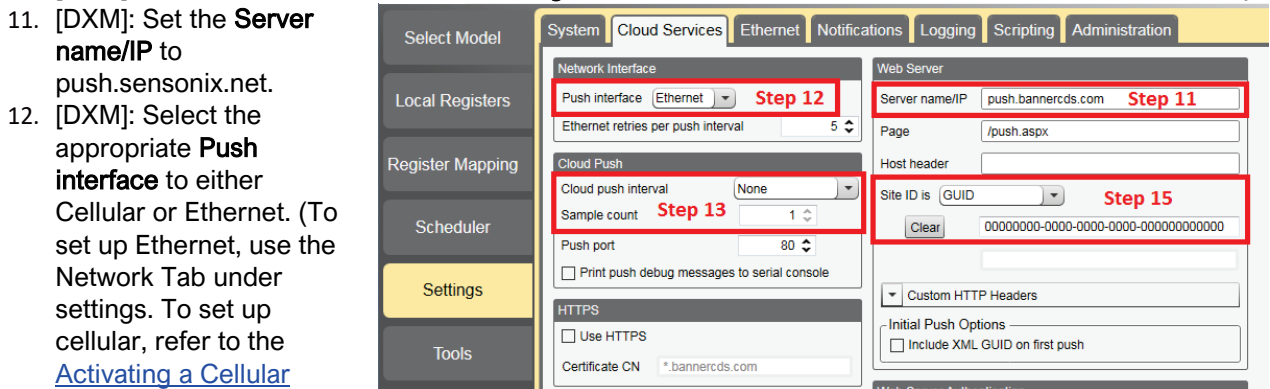

Push Information to the Cloud

The DXM Wireless Controller can connect to the web via Ethernet or an internal cell module to push 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 has dashboarding capability through codeless widgets that are easy to establish for easy monitoring. Email alerts can be set up on the alarms tab as well.

1. [WEB]: Visit the Banner Connected Data Solutions by Sensonix website (https://bannercds.com/) and log into an existing account or register a new account.
2. [WEB]: Click **+ New Site** and name the site.

3. [WEB]: Highlight and copy the Site ID then click **Save**.
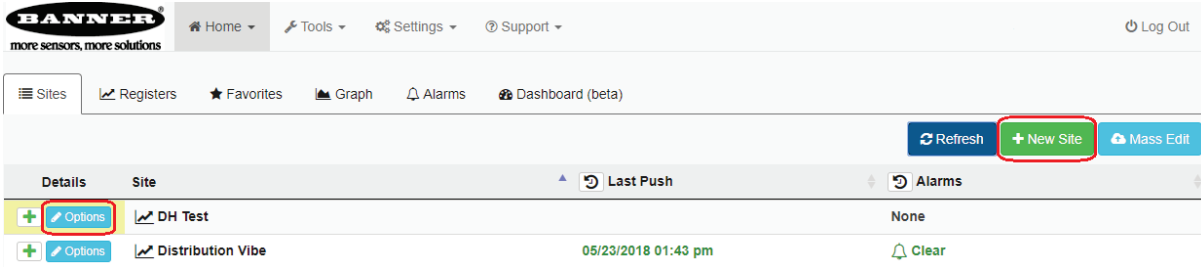
4. [DXM]: Download the [DXM Configuration Software v4](#) from the Banner Engineering website and install on a computer.
5. [DXM]: Apply power to the DXM.
6. [DXM]: Connect the DXM to the computer with a USB cable or skip if connected to the same network as the computer.
7. [DXM]: Open the DXM Configuration Software. Select the DXM Model as **DXM700.** Connect the DXM to the tool by clicking **Device-> Connection Settings** in the top toolbar.
8. [DXM]: If 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 you are successful. If you are connected to the same network as the DXM, select **TCP/IP** and enter the DXM IP address and click **Connect**.
9. [DXM]: After you are connected, get the current XML file by clicking **Device->Get XML configuration from DXM.** Name and save the file to the computer.
10. [DXM]: Within the software click the **Settings** tab on the left and then the **Cloud Services** tab on the top.
11. [DXM]: Set the **Server name/IP** to push.sensonix.net.
12. [DXM]: Select the appropriate **Push interface** to either Cellular or Ethernet. (To set up Ethernet, use the Network Tab under settings. To set up cellular, refer to the [Activating a Cellular Modem](#) tech note)

13. [DXM]: Set the **Cloud push interval** and **Sample count** to the desired push rate. Recommended 5 minutes.
14. [DXM]: Registers are preselected to push to the cloud. Some registers can be removed if you are not using all 40 Nodes. Add additional registers using the **Local Registers** screen. The preselected READ registers are 1-80 for the raw temperature and humidity data, 81-120 for Node connection status, 121-160 for dew point data, and 481-520 for alarm bit packed information. The preselected READ/WRITE registers are 7001-7320, which are the warning and alarm level settings. These registers are only set to 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:
    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
15. [DXM]: Under Web Server heading, keep the **Site ID is** dropdown selection as **GUID** and paste the copied ID from the webpage into the Site ID field.
16. [DXM]: Save the XML file (**File > Save**).
17. [DXM]: Upload the file to the DXM (**Device > Send XML Configuration to the DXM**).

18. [WEB]: Returning to the Banner Connected Data Solutions by Sensonix website, click **Options** on the row of the newly created site, click the checkbox next to **XML Config** and select the XML file that was just saved and uploaded to the DXM.
19. [WEB]: Click **Save** to complete the connection to the website.

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 Solutions 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 Connected Data Solutions Instruction Manual to review all the features available for monitoring, comparing data, and establishing warnings/alarms on the website.

To access a demonstration version of the website please 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 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.

Specifications

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

Power Consumption
9 W average; 30 W maximum

Operating Conditions
0 °C to +50 °C (32 °F to +122 °F) (HMI);
–40 °C to +85 °C (–40 °F to +185 °F) (DXM);
–20 °C to +80 °C (–4 °F to +176 °F) (DXM LCD)
Micro SD Card (if applicable): –25 °C to +85 °C (–13 °F to +185 °F)
90% maximum relative humidity (non-condensing)

900 MHz Compliance (1 Watt)
FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247
IC: 7044A-RM1809

2.4 GHz Compliance
FCC ID UE300DX80-2400: This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328: V1.8.1 (2012-04)
IC: 7044A-DX8024

Radio Range
900 MHz, 1 Watt: Up to 9.6 km (6 miles)
2.4 GHz, 65 mW: Up to 3.2 km (2 miles)

Antenna Minimum Separation Distance
900 MHz, 150 mW and 250 mW: 2 m (6 ft) 900 MHz, 1 Watt: 4.57 m (15 ft)
2.4 GHz, 65 mW: 0.3 m (1 ft)

Radio Transmit Power
900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)
2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

Spread Spectrum Technology
FHSS (Frequency Hopping Spread Spectrum)

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

Certifications
(applies only to model SOLUTIONSKIT2-TH)
CE

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.

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