Tank Level Monitoring Solution Kit

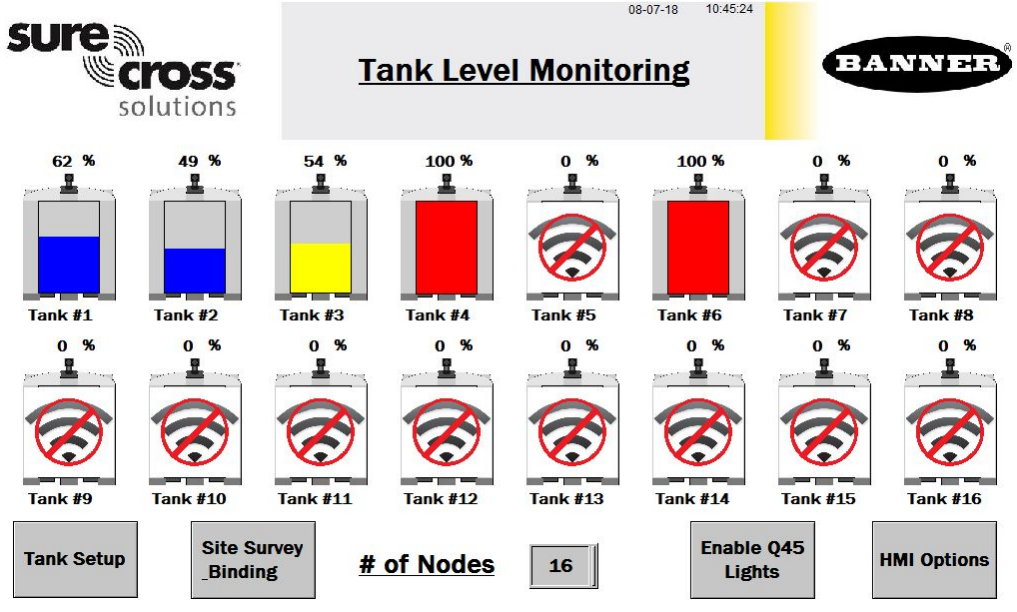
The Tank Level Monitoring Solution Kit provides a visual status of up to 16 Banner K50U Performance Node sensors (assets) that are bound to the included DXM Wireless Controller, which provides a simple and effective way of monitoring the level of many tanks, totes, or barrels to avoid disruption, downtime, 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 (document part number 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 configure 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 power input connector
- Polycarbonate enclosure, 14” × 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)



Tank Level 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 "Individual Tank Level Node Status Screen" on page 3).
- 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 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.

Original Instructions
10-Oct-24

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215580
p/n: 215580 Rev. G

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

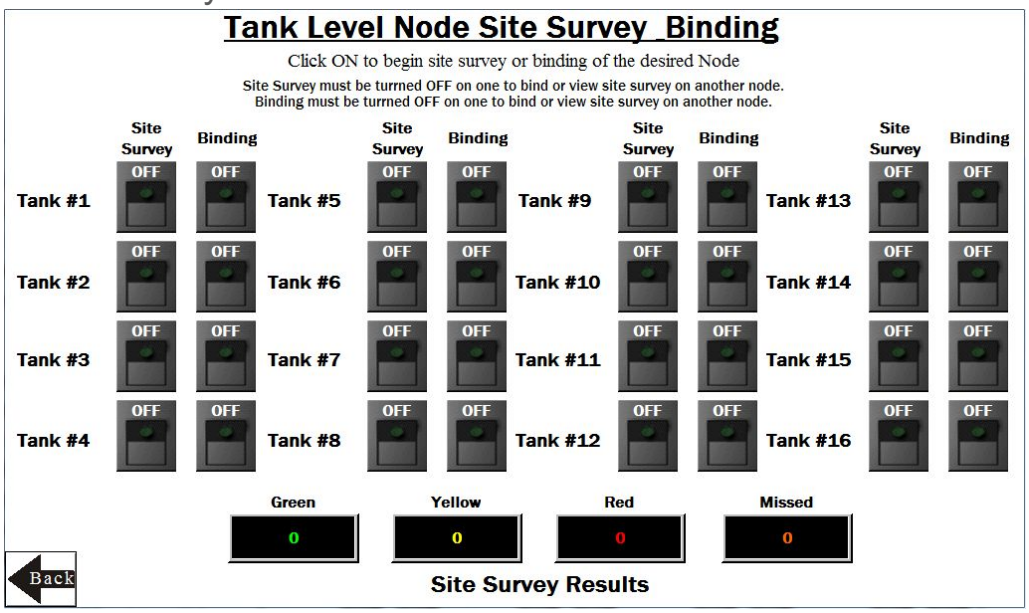
Purchase the Nodes and sensors separately. After they are installed, they must be bound individually. Follow these instructions to add a new Node/sensor radio. Perform a site survey on each Q45/P6 Node after they are installed to ensure a proper radio connection between the Nodes and DXM.

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 Node, 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 (document part number 133602) on www.bannerengineering.com to interpret the Site Survey results.
3. On the HMI screen: After the site survey is complete, toggle the **Site Survey** switch to turn Site Survey off.

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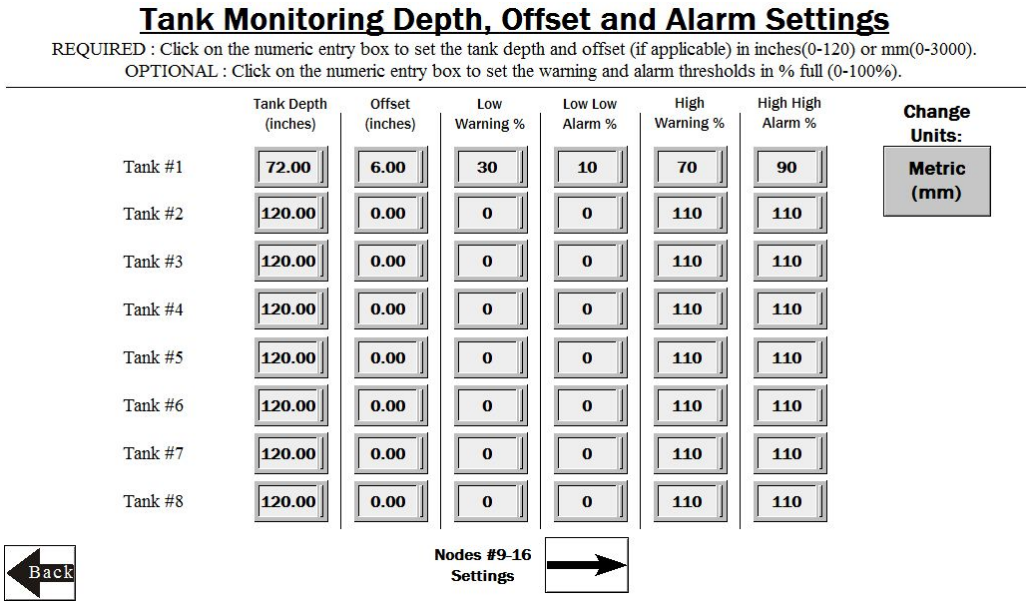
Configure Your Tank Monitoring

Each tank level monitoring Node reports back data to determine the percentage of tank depth and if any offset height is required.



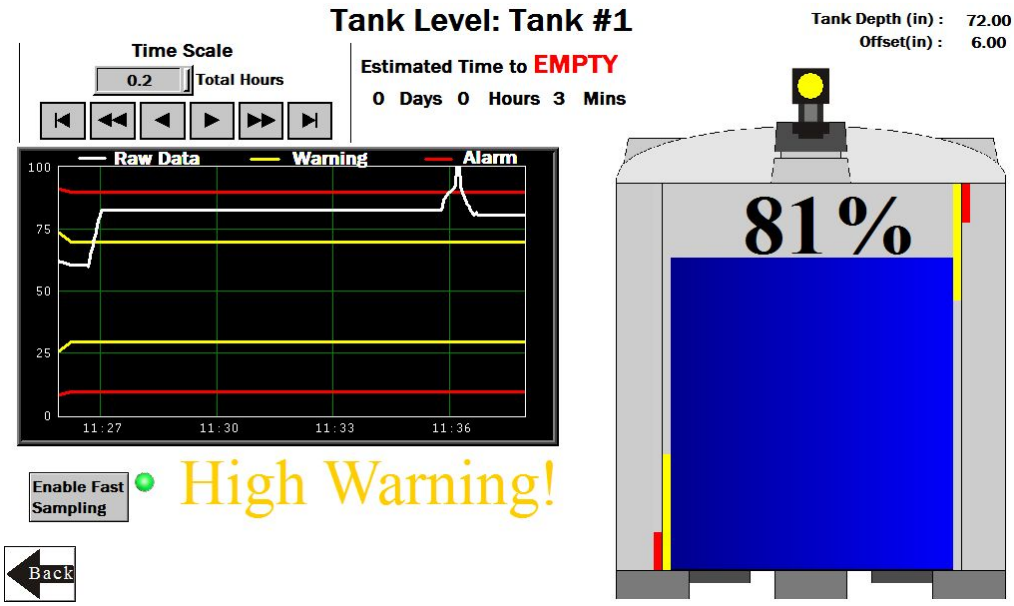
The maximum tank depth is 120 inches or 3000 mm. If there is no offset, leave it set to zero.

Push the **Change Units** button to toggle between inches and millimeters.

1. Enter the tank depth and offset height (if applicable) for each tank-level monitoring Node.
2. Set each tank level monitoring Node's low and high warning and/or alarm level 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.

Individual Tank Level Node 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.

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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.

HMI Options Menu Screen

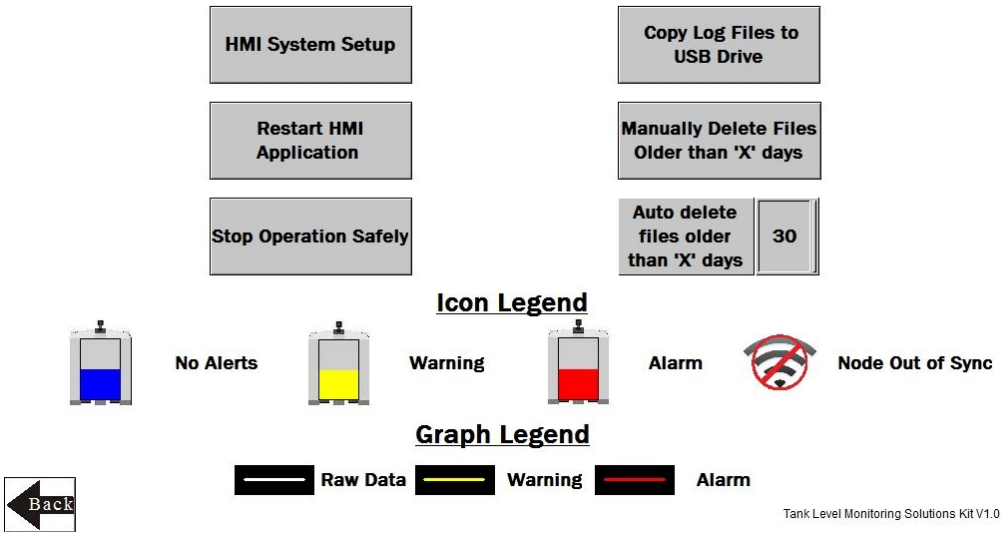
This screen provides some added HMI functionality along with an icon and graph legend.

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.

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 kit on the DIN rail adjacent to the DXM Controller.
3. Wire the input of the light or interposing relay to the DXM.

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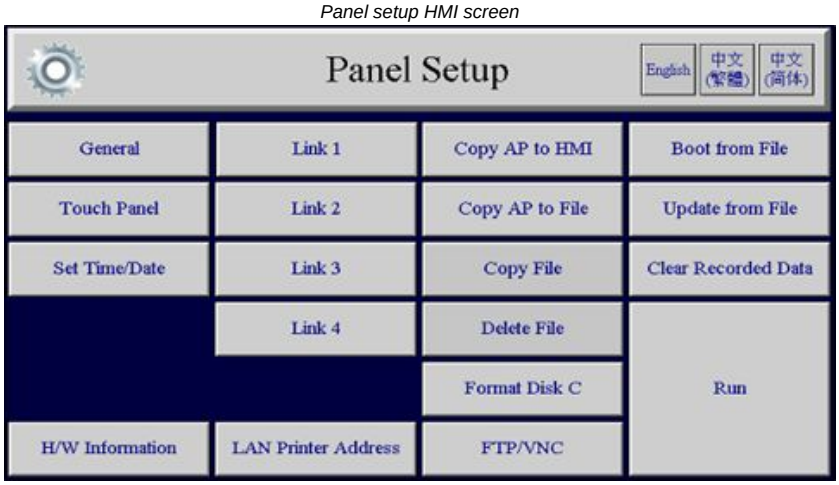
a. O1 – Pin 5 – indicates a radio/asset in an Alarm condition.
b. O2 – Pin 6 – indicates a radio/asset in a Warning condition.
c. O3 – Pin 7 – indicates a radio/asset in either a Warning or an Alarm condition.
d. O4 – Pin 8 – indicates no Warning or Alarm conditions exist.

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.

Panel setup HMI screen



1. Open the 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 BannerCDS

The Tank Level Monitoring Solution Kit can connect to the Web via Ethernet or an internal cell module. The controller pushes data from the Solution Kit to be stored and displayed on a website.

The Banner platform for storing and monitoring the system's data is https://bannercds.com. The Banner Cloud Data Services website automatically generates dashboard content for the application that is populated onto the Dashboard. Email alerts can be configured using the Alarms screen.

To push data to the cloud, change register 844 to one (1).

For more information on creating accounts on and using the Banner Cloud Data Services (CDS) system, please refer to the Banner CDS Quick Start Guide (p/n 201126).

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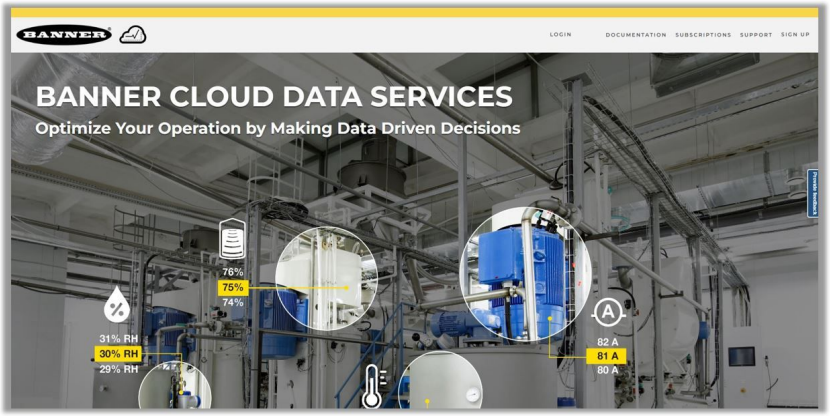
Logging into the Web Service

The web server captures data from the Solution Kit using either a cellular connection or an Ethernet connection. Users collect and view the data or update and manage the Solution Kit using a web browser.

Within a few minutes of your purchase, you will receive an email with your authorization code and details regarding the data subscription service. If the authorization code is not received within 10 minutes, please check your spam folder or contact Banner Engineering at 1-888-373-6767 to obtain the code.

Use both the website and the DXM Configuration Software to set up and configure your data collection. Use the latest version of your browser (Google Chrome is recommended) and enter the URL: https://bannercds.com. The login page appears.

Banner CDS home screen



Create a New Gateway

After you log into the Banner Cloud Data Services website, the **Overview** screen displays. Follow these steps to create a new monitoring site.

1. Click on **New Gateway** (top right corner of the **Overview** screen).
   Create a new Gateway for each DXM Controller that sends data to the web server.
   A **New Gateway** prompt appears.
2. Verify **Traditional** is selected for the **Gateway Type**.
3. Enter a **Gateway Name**.
4. Select the **Company** from the drop-down list.
5. Copy the **Gateway ID** number located within the prompt window to your computer's clipboard.
   The **Gateway ID** number created by the web server is a required parameter in the configuration of the DXM. The **Gateway ID** is the address the webserver uses to store the data pushed from the DXM.
6. Click **Submit** to close the prompt window.

Connect the DXM700 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

> **IMPORTANT:** Do not adjust the Cloud Push Interval. The push frequency is controlled by the script. Adjusting the cloud push interval through this configuration may result in excessive amounts of data being pushed to Banner CDS.

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1. Within the DXM Configuration Software, go to the **Local Registers in Use** screen.
2. Set the **Value Type** of register 844 to **Constant** and a value of 1 to enable the data push.
3. Go to the **Settings › Cloud Services** screen.
4. Set the **Server name/IP** to push.bannercds.com.
5. In the **Web Server** section, paste the **Gateway ID** copied from the BannerCDS configuration screen into the appropriate field.
6. Use the **File › Save** menu to save the XML file to your hard drive.
7. Send the updated XML to the DXM Controller using the **DXM › Send XML Configuration to DXM** menu.

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.

Status indicator bar



   - If the Application Status indicator is red, close and restart the DXM Configuration Tool, unplug and re-plug in the 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 gray and the green status bar is in motion, the file transfer is in progress.

   After the file transfer is complete, 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. On the BannerCDS website, select **Gateways** on the **Overview** screen.
2. On the row displaying your **Gateway**, click the **Details** under **View**.
3. Select **Edit Gateway**.
   The **Edit Gateway** prompt appears.
4. Click **Select File** under **Update XML**.
5. Select the file that was just updated to the DXM and click **Open**.
   After the XML file is loaded into the webserver, the webserver uses the register names and configurations defined in the configuration file. The same XML configuration file is now loaded on both the DXM and the Website. After some time, the data should be seen on the website.
6. To view the data from the Gateway's screen, click on the **Details** link for each **Gateway**.
   The Gateway **Details** screen lists the **Sensor** objects and default **Alarms** for that gateway. You may view the individual register information by selecting **Registers**.

Completing these steps creates continuity between the **Gateway** 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.

Tank Level Monitoring Kit Specifications

Supply Voltage
24 V DC (±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

Radio Range
A 2 dB antenna ships with this device.

Transmit power and range are subject to many factors, including antenna gain, installation methods, characteristics of the application, and environmental conditions.

Please refer to the following documents for installation instructions and high-gain antenna options.

Installing Your Sure Cross® Radios (151514)
Conducting a Site Survey (133602)
Sure Cross® Antenna Basics (132113)

Radio Transmit Power
900 MHz Conducted: 27 dBm (500 mW); EIRP with the supplied antenna: < 36 dBm

2.4 GHz Conducted: < 18 dBm (65 mW); EIRP with the supplied antenna: < 20 dBm (100 mW)

Antenna Minimum Separation Distance
900 MHz radios transmitting at ≥ 500 mW: 4.57 m (15 ft) with the supplied antenna

2.4 GHz radios transmitting at 65 mW: 0.3 m (1 ft) with the supplied antenna

Spread Spectrum Technology
FHSS (Frequency Hopping Spread Spectrum)

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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).

Operating Conditions

–20 °C to +60 °C (–4 °F to +140 °F)

95% maximum relative humidity (non-condensing)

900 MHz Compliance (SX7023EXT Radio Module)

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX7023EXT

Contains IC: 7044A-SX7023EXT

2.4 GHz Compliance (SX243 Radio Module)

Radio module is indicated by the product label marking

Contains FCC ID: UE3SX243

Radio Equipment Directive (RED) 2014/53/EU

Contains IC: 7044A-SX243

Certifications

CE/UKCA approval only applies to 2.4 GHz models

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ANATEL
Agência Nacional de Telecomunicações
03737-22-04042

FCC Part 15 Class A for Intentional Radiators

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. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.

Industry Canada Statement for Intentional Radiators

This device contains licence-exempt transmitters(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs/récepteurs exemptés de licence conformes à la norme Innovation, Sciences, et Développement économique Canada. L’exploitation est autorisée aux deux conditions suivantes:

1. L’appareil ne doit pas produire de brouillage.
2. L’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

ANATEL

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados. Para maiores informações, consulte o site da ANATEL www.gov.br/anatel/pt-br/

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Agência Nacional de Telecomunicações

Important - Download Complete Documentation

IMPORTANT: Please download the complete Tank Level Monitoring Solution Kit technical documentation, available in multiple languages, from www.bannerengineering.com for details on the proper use, applications, Warnings, and installation instructions of this device.

IMPORTANT: Por favor descargue desde www.bannerengineering.com toda la documentación técnica de los Tank Level Monitoring Solution Kit, disponibles en múltiples idiomas, para detalles del uso adecuado, aplicaciones, advertencias, y las instrucciones de instalación de estos dispositivos.

IMPORTANT: Veuillez télécharger la documentation technique complète des Tank Level Monitoring Solution Kit sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

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

Notas Adicionales (con Antena)

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.

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Approved Antennas

BWA-9O2-C--Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho
BWA-9O5-C--Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho
BWA-9O6-A--Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra
BWA-9Y10-A--Antena, Yagi, 900 MHz, 10 dBd, N Hembra

Mexican Importer

Banner Engineering de Mèxico, S. de R.L. de C.V. | David Alfaro Siqueiros 103 Piso 2 Valle oriente | San Pedro Garza Garcia Nuevo Leòn, C. P. 66269

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