DXM Enclosure Kit (DEK) Series

Instruction Manual

Original Instructions
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Contents

1 Kit Contents

The contents of the **DXM Enclosure Assembly** are everything needed to create the primary element of a standalone sensing network. The DXM100-A1 or DXM100-A2 Controller has a highly optimized charging circuit to manage the solar energy and battery that keeps the system operating with sufficient power for demanding applications.

The enclosure is NEMA rated for harsh environments with a hinged cover and security tab. Two three-cable cord grips are included with the kit along with a vent for heat exhaustion and a cord grip for the solar cable. The enclosure comes prefabricated with the appropriate cutouts for the cable glands, DIN rail with end clamps, aluminum mounting plate with pole clamps, and antennas for wireless communication.

A lithium-iron phosphate battery provides the principal source of power for a self-sustained monitoring system. This battery is purposefully suited for solar-supplemented systems, as the kit is delivered with a robust autonomous power circuit for those applications typically isolated from traditional infrastructure.

A five-watt solar panel delivers a nominal 12 V DC standard output built with a heavy-duty anodized frame and rugged design for withstanding high winds, hail, and snow loads.

The included mounting hardware can be used to anchor the panel to a wall or a pole for easy installation and a three-meter cable connects to the charging circuit of the DXM Controller.

The DEK Series is a Direct-to-Cloud solution using an embedded cellular module to access a wide area network from remote locations that are generally beyond an enterprise connection.

A cellular subscription plan can be readily activated and managed through the Banner Cell Data management portal. Access to a prepaid 90-day trial of the Banner Cloud Data Services web-based software is provided with an authorization code delivered with each kit. This software allows users to access, store, protect, and export critical data collected by the controller.

Users can make better, data-driven decisions as they track and analyze performance trends over time using visualization tools, trending graphs, and alert notifications.

2 Controller Enclosure

The DEK100 Series kit includes an enclosure assembly with the following parts already installed.

- DXM Controller with USB programming cable
- Lithium-Iron Phosphate ($LiFePO_4$) battery with flying leads
- LTE tape antenna threaded to the second SMA connector for the cellular module (on all models)
- Multi-band tape antenna threaded to the ANT SMA connector for the ISM radio (only on A2 model)
- DIN rail with four end clamps to securely position the DXM Controller and battery

To complete the assembly:

1. Install a set of cord grips to secure the solar cable.
2. Wire the inputs to the Controller.
3. Install the vent to exhaust excessive heat.
4. Wire the battery to the appropriate terminals to supply power to the Controller.

2.1 Install the Cord Grips

Figure 1. Cord grip placement

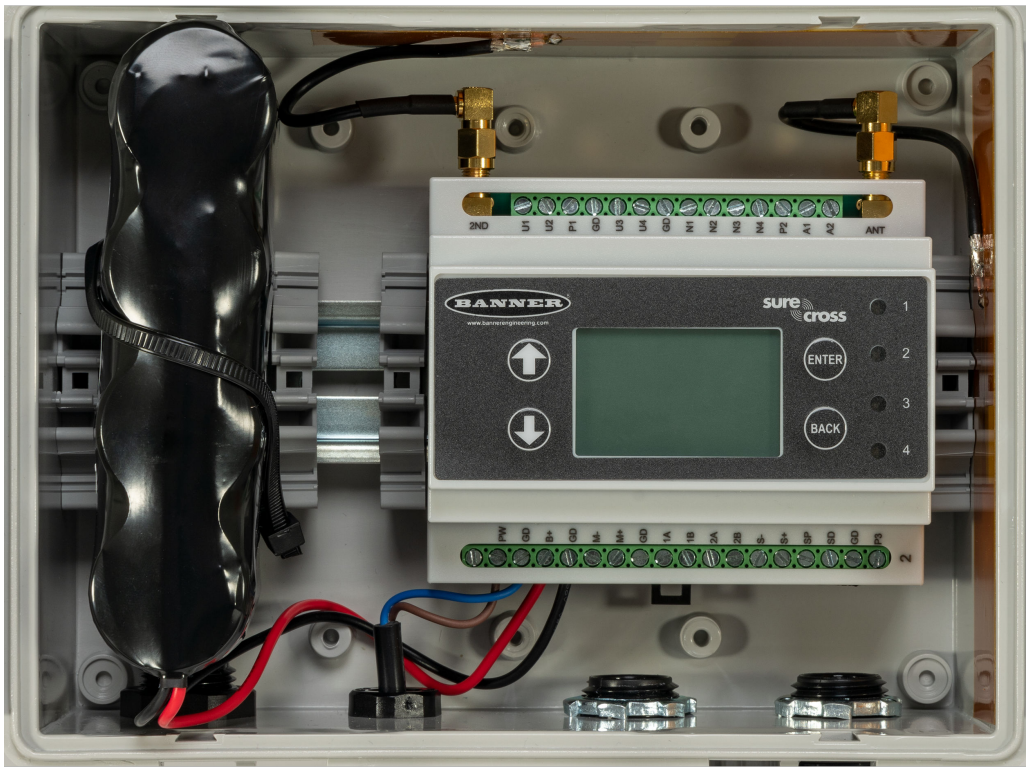
1. Open the accessory bag of cord grips and install them in the pre-drilled holes in the bottom of the enclosure.
   Tighten the cord grips carefully to avoid stripping the nut across the threads.
2. Place the vent below the battery to ensure proper ventilation (1).
3. Insert the three-cable cord grips into locations (3) and (4).
4. Install the smallest cable gland (PG7) for the solar cable at location (2).

2.2 Wire the Battery

The battery and DXM ship from the factory pre-mounted to the DIN rail.

1. If necessary, remove the DXM from the DIN rail to provide better access to the wiring terminals. To remove the DXM:
   a) insert a small flat blade screwdriver in tab shown (1) and pry the spring-loaded DIN rail catch outwards. The catch releases the bottom part of the DXM.
   b) Rock the bottom of the DXM up, then slide the DXM up and off the top part of the DIN rail.
   c) Verify the antenna connection(s) remain fastened to the DXM. Note that the antenna connected to the ANT terminal will only be available in the DEK100-A2 model.
2. On the battery's black (0 V DC) wire, cut approximately one inch off (just behind the tape cap on the end) and then strip the wire sheathing back 0.25 inches.
3. Connect the black lead to the GD terminal on the bottom of the DXM.
4. Verify the antenna(s) are still fastened to the DXM. Supplying power without a connected antenna may damage the wireless module.
5. Repeat the strip back procedure with the red lead and connect it to the **B+** terminal.
   The controller will power up at this time.

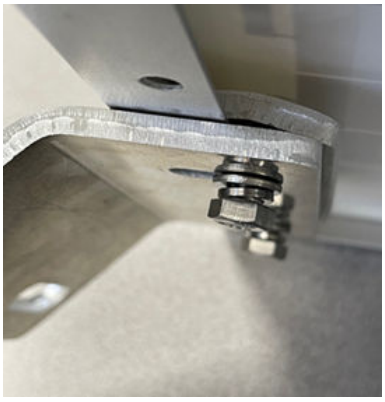
Figure 2. DEK100 internal layout



2.3 Install and Wire the Solar Panel

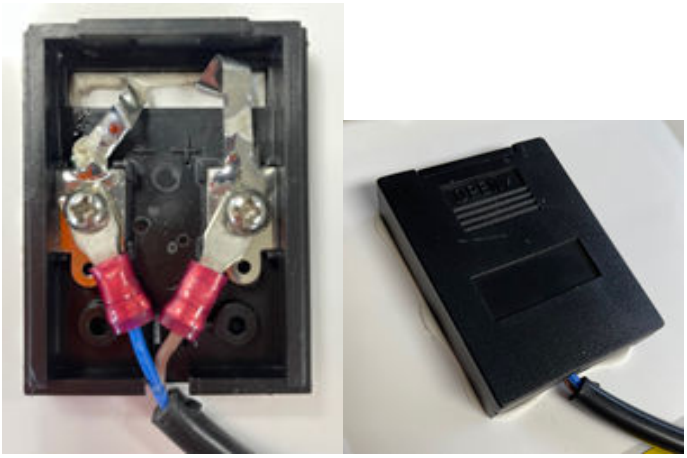
1. Install the solar panel's bracket.

Figure 3. Solar panel bracket installation



   a) Open the packaging for the five-watt solar panel and assemble the aluminum mounting cleat with the arc facing out. (Convex orientation)
   b) Leave the hardware a little loose so that the bracket can slide onto the panel frame between the mating surfaces.
   c) Move the cleat to the center of the panel and tighten the hardware to secure it. See the included manufacturer documentation for further instruction.
2. Connect the solar cable to the panel.

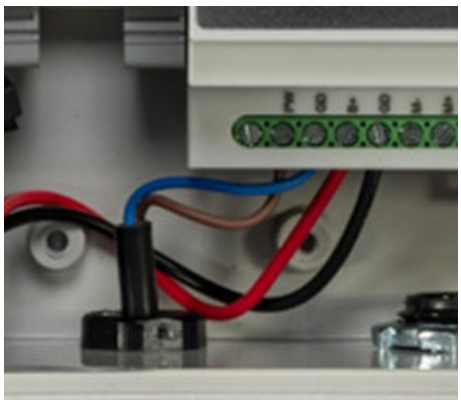
Figure 4. Solar panel wiring



a) Place the solar panel **face down** to prevent unplanned power applied to the kit.
b) Remove the black sliding cover to expose the terminals.
c) Wire the two-wire cable lead to the back of the panel. First, wire the blue lead to the negative terminal as marked on the plastic wiring chamber, then connect the brown lead to the positive terminal.
d) Tighten both screws and press down on the terminals to ensure they lay flat against the wiring chamber base.
e) Replace the cover by sliding it from the bottom back up to the top until it clicks closed.

3. Wire the solar panel to the DXM.

Figure 5. Solar panel wiring to the DXM



a) Feed the cable from the solar panel to the DXM through the small cable gland.
b) Connect the brown lead to the **PW** terminal on the bottom of the controller.
c) Connect the blue wire to the **GD** terminal next to the **PW** terminal.
d) Set the slack on the solar panel wire to prevent excess tension on the wire. Slide it in or out to leave some strain relief for the wire.
e) Tighten the cable gland by twisting the nut in a clockwise rotation.
f) Pull gently on the cable to verify it is engaged by the clamp. Adjust if necessary.

The DXM is now ready for its inputs to be configured.

3 Controller Details

3.1 DXM Controller Overview

The DXM controller is optimized for solar/battery power. A full-featured application configuration on the controller will operate over 20 days of autonomy with a 5.5 AHr LiFePO4 battery.

Use the DXM Configuration Software, DXM Instruction Manuals, technical notes, and videos at www.bannerengineering.com to configure/program the DXM for your application.

Banner's DXM Logic Controller integrates cellular connectivity and local I/O to provide a platform for the Industrial Internet of Things (IIoT).

Inputs/Outputs—On-board universal and programmable I/O ports connect to local sensors, indicators, and control equipment.

- Universal Inputs
- Discrete outputs
- Courtesy power
- Switch power
- DC latching outputs
- Analog Outputs
- SDI-12 sensor interface
- Battery backup
- Solar controller

Connectivity

Wired Connectivity

Field Bus: Modbus RS-485 Master/ Slave

Wireless Connectivity

Cellular modem: 4G LTE CATM1 (Verizon or AT&T)

Logic Controller—Program the DXM's logic controller using action rules and/or ScriptBasic language, which can execute concurrently. The control functions allow freedom when creating custom sensing and control sequences.

Action Rules

Supports simple logic, counters, arithmetic, averaging/trending, and thresholding

Low complexity solutions

SMS text message Notifications

Email Notifications

Push data on conditions

Text Programming Language

ScriptBasic

Medium complexity solutions

Scheduler

Time/calendar-based events

Astronomical clock

Dynamic scheduling for scheduling adjustments

Data Logging

Cyclic Data/Event logging

Email log files

Data Sampling

Adjust cloud push intervals and sampling intervals between pushes

User Programmable LCD—A simple user interface consists of an LCD screen and four LED indicators. Use the LCD to access the system's status and configuration, view user selectable events and data, and configure inputs and outputs.

3.1.1 DXM100-Ax Features

The **DXM100-A1** and **DXM100-A2** Controllers are programmable logic controllers with multiple I/O connectivity options or a local ISM radio network and are optimized to be powered by a solar/battery system. Collected data is sent to the cloud through the cellular modem.

- Optimized for use in a solar-powered system
- Cellular modem IIoT connectivity
- 900 MHz ISM radio module (A2 model only)
- Logic controller with action rules and ScriptBasic programming
- Interactive programmable user interface with LCD and LED indicators
- Universal, on-board I/O with analog and discrete I/O
- Industry standard RS-485 (Modbus) and USB communication ports
- Data logging with removable SD card

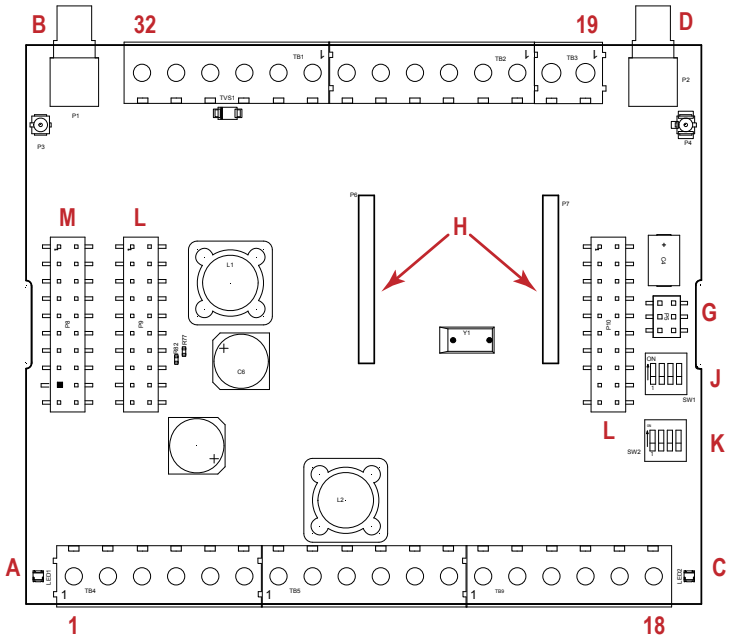
3.1.2 Models

Models	Cellular Carrier	ISM Radio	Inputs and Outputs
DXM100-A1-V	Verizon	None	Four universal inputs: Sinking/sourcing discrete, 4–20mA analog, 0–10 V analog, counter, and/or temperature with a 10 kOhm thermistor Four NMOS outputs, two 0–10 V analog outputs, and two DC Latching outputs Two adjustable 5 V to 24 V switched power outputs, one SDI switched power outputs, and one 5 V courtesy power output
DXM100-A1-A	AT&T		
DXM100-A2R1-V	Verizon	900 MHz Performance Gateway	
DXM100-A2R1-A	AT&T		

An LTE cellular modem is installed in the **DXM100-A1** or **DXM100-A2** Controller.

3.1.3 I/O Base Board for the DXM100-Ax

Figure 6. I/O base board for the DXM100-A1 and -A2 models



Pin	Name	Description
1	No Connection	Not used
2	**PW**. 12-30 V DC or solar power in (+)	Main power in for DXM Controller, can be 12-30 V DC or solar power (20 W panel max)
3	**GD**. Ground	DXM ground
4	**B+**. Battery in (< 15 V DC)	12 V battery connection, positive
5	**GD**. Ground	DXM ground
6	**M-**. Primary RS-485 -	Modbus master port (+) controlled by the DXM Controller. DXM can read/write Modbus slave devices connected to this port.
7	**M+**. Primary RS-485 +	Modbus master port (-)
8	**GD**. Ground	DXM ground
9	**1A**. DLatch 1A	Input A (+) connection for first external DC latching solenoid. Use I/O board Modbus register 507 to control.
10	**1B**. DLatch 1B	Input B (-) connection for first external DC latching solenoid

Pin	Name	Description
11	**2A**. DLatch 2A	Input A (+) connection for second external DC latching solenoid. Use I/O board Modbus register 508 to control.
12	**2B**. DLatch 2B	Input B (-) connection for second external DC latching solenoid
13	**S-**. Secondary RS-485 -	Modbus Slave RS-485 (+) connection for host system as a Modbus master communicating to the DXM controller as a Modbus Slave device.
14	**S+**. Secondary RS-485 +	Modbus Slave RS-485 (-) connection.
15	**SP**. SDI-12 Courtesy Power	Power connection for external SDI-12 sensors
16	**SD**. SDI-12 Data	Communications line for external SDI-12 sensors
17	**GD**. Ground	Ground connection for SDI-12 sensor (DXM common ground)
18	**P3**. Courtesy Power 5 V	Courtesy Power output 5 V, limited to 500 mA
19	**A2**. Analog OUT 2 (0–10 V)	Analog output 2, (0-10 V) controlled by I/O board Modbus register 508. (values range from 0-10000)
20	**A1**. Analog OUT 1 (0–10 V)	Analog output 1, (0-10 V) controlled by I/O board Modbus register 507. (values range from 0-10000)
21	**P2**. Adjustable Courtesy Power (5–24 V)	Adjustable power output 2, 5–24 V DC. Use DXM Configuration Software to set voltage output and associating power output to input pins.
22	**N4**. NMOS OUT 4	NMOS switch to ground controlled by I/O Modbus registers 504; 1A maximum at 30 V DC.
23	**N3**. NMOS OUT 3	NMOS switch to ground controlled by I/O Modbus registers 503; 1A maximum at 30 V DC.
24	**N2**. NMOS OUT 2	NMOS switch to ground controlled by I/O Modbus registers 502; 1A maximum at 30 V DC.
25	**N1**. NMOS OUT 1	NMOS switch to ground controlled by I/O Modbus registers 501; 1A maximum @ 30VDC.
26	**GD**. Ground	DXM ground
27	**U4**. Universal Input 4	Universal input #4, NPN, PNP, 0–20 mA, 0–10 V, 10k Thermistor. Use DXM Configuration Software or Modbus registers to set input type. I/O Modbus register 4
28	**U3**. Universal Input 3	Universal input #3, NPN, PNP, 0–20 mA, 0–10 V, 10k Thermistor. Use DXM Configuration Software or Modbus registers to set input type. I/O Modbus register 3
29	**GD**. Ground	DXM ground
30	**P1**. Adjustable Courtesy Power (5–24 V)	Adjustable power output 1, 5–24 V DC. Use DXM Configuration Software to set voltage output and associating power output to input pins.
31	**U2**. Universal Input 2	Universal input #2, NPN, PNP, 0–20 mA, 0–10 V, 10k Thermistor. Use DXM Configuration Software or Modbus registers to set input type. I/O Modbus register 2
32	**U1**. Universal Input 1	Universal input #1, NPN, PNP, 0–20 mA, 0–10 V, 10k Thermistor. Use DXM Configuration Software or Modbus registers to set input type. I/O Modbus register 1

A	Base board LED			J	Modbus Slave ID DIP Switches
B	A1. Cellular or secondary antenna			K	Modbus Slave ID DIP Switches
C	Radio LED	G	Programming header	L	Processor Board Connection
D	A2. ISM Antenna	H	ISM Radio Board Connection (A2 model only)	M	Display Connection

4 Configuration Instructions

4.1 DXM100-A Configuration

Use the DXM Configuration Software to customize the configuration of the controller. Select the DXM100-A model when using the configuration software.

To configure the DXM-100Ax, connect the DXM's USB to a computer. When the USB cable is plugged into the DXM Controller, the device is powered by the USB power. When the USB cable is unplugged, the device resets itself and is powered by the connected battery.

The software allows the user to define parameters for the DXM, then saves the configuration in an XML file on the PC. After the configuration file is saved, upload the XML configuration file to the DXM for operation. There are several example configuration files available in our Configuration Library at http://bannerengineering.com/dekconfig. This quick start guide outlines the basic operations to set up a DXM using the configuration software. For a more comprehensive explanation of features, refer to the software Instruction Manual (p/n 209933).

For a complete list of all associated product documentation, refer to your model's instruction manual.

The DXM100-A kit has operating limitations based on the storage capacity of the 12 V lithium iron phosphate battery (5.5 Ah), the 5 W solar panel (0.29 A maximum) and the days of autonomy desired. The main power consumption contributors are:

- Cellular push interval, which should be set to 15 minutes or longer (use the Sample Count parameter for greater granularity)
- RS485 communications of external Modbus devices using switched power
- Poor cellular signal strength and/or radio signal strength, creating multiple retry attempts.

Efficient operations include:

- DC Latch operations
- SDI-12 operations
- I/O operations
- ISM radio network operations

Some example configuration that operate on less than 5 mA (on average), and operate using the 12 V battery (5.5 Ah) without sun for over 20 days include:

- SDI-12 reading in 15-minute intervals
- Two DC latching outputs toggling every 5 minutes
- One temperature/humidity probe powered from 16 V switched power reading every 5 minutes
- ScriptBasic program controlling temperature/humidity power and reading, DC latching control
- Read rules operating every 5 to 15 minutes for solar charging parameters and SDI-12 data
- Cellular push every 15 minutes, sampling every 5 minutes, for 16 Local Registers
- ISM radio devices operating at 0.25 W transmit power mode (default radio transmit power is 1 W)

Verify the battery consumption. When creating custom configurations, measure the current draw on the battery. Load the DXM100-A device configuration and measure the average current draw over two or three cellular pushes. A meter in series with the battery may cause the device to brown out if the battery is not fully charged.

4.2 Introduction to Traditional Setup Mode

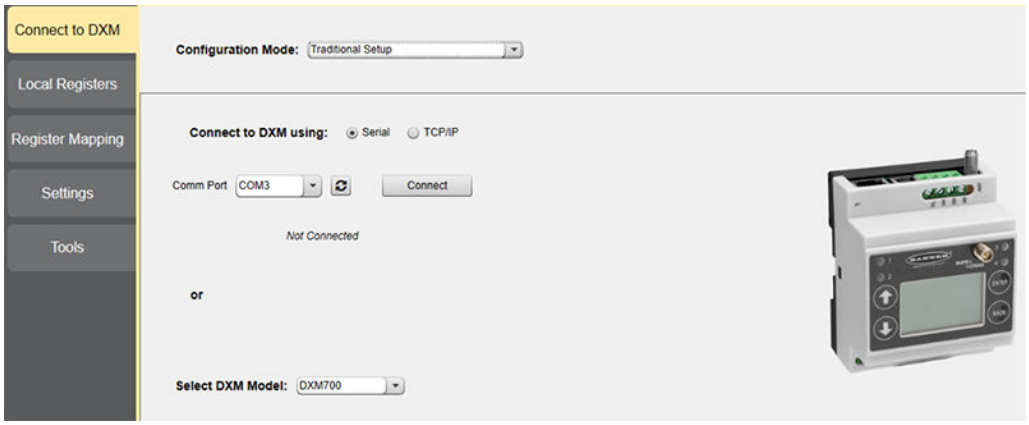
This section will walk you through the traditional method of setting up the DXM Configuration Software and communicating with a connected DXM device. Version 4 of the configuration software supports multiple DXM device models, each of which incorporates different features.

As of DXM Configuration Software v4.10.28, the Simple Setup procedure is only available with the DXM100, DXM700, DXM1000, DXM1200, and DXM1500 models.

As soon as a DXM model is connected to your computer, the software automatically detects the correct model and loads the appropriate screens. You may also manually select which model of DXM you are configuring if you intend to create a configuration file without connecting a device. This ensures that the interface and the configuration file use the correct features.

Not all screens are available for all models. To change to another model of DXM, go to the **Connect to DXM** screen and use the drop-down list to select another model. If the active configuration is incompatible with the selected model, you will be prompted to either proceed and wipe out the active configuration or cancel the model change and preserve the configuration.

Figure 7. Traditional Setup opening screen



Banner recommends disconnecting the COMM port through the **Device** menu before turning off power or disconnecting the USB cable. Use **Device** > **Reboot** to restart the DXM if needed; the tool automatically disconnects the COMM port, then reconnect it again.

Tip: If connection attempts are failing (Application Status Icon in the footer of the tool is Red), close the configuration software and disconnect the USB cable from the computer. Reconnect the cable, launch the software, and attempt connecting again.

Important: Any model of DXM may connect to the configuration software regardless of which device model is selected in the tool. Compatibility is checked before configuration files are uploaded to the device.

4.2.1 Configuration Example: Reading Registers on a Modbus Slave Device

The local registers are the main global pool of registers that are defined by the user to store data within the DXM. The local registers are listed on the **Local Registers** > **Local Registers in Use** screen.

The bottom status bar displays the communications status, application status, and the DXM Configuration Software version.

In this short example, we will configure the DXM to read six registers on an external Modbus Slave device and save the data into the local registers.

Important: The software only loads a file to the DXM. Internal parameter settings that are changed in the tool but not saved to the file will not be sent to the device.

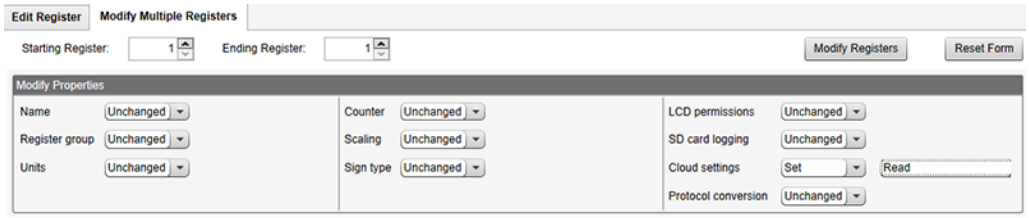
Modify Multiple Registers

Modify a range of registers from the **Local Registers** > **Local Registers in Use** > **Modify Multiple Registers** screen.

Select which parameter fields to modify. Most parameters have three selections.

- Unchanged—no changes
- Default—change to default settings
- Set—modify parameter. Other selections will appear based on the parameter.

Figure 8. Modify Multiple Registers screen



1. Enter the **Starting register** and **Ending register**.
2. Select the value to change using the drop-down list next to each value.
3. Enter the new value in the field provided.
4. To push register values to the web server, set **Cloud Permissions** to read.

If the **Cloud Permissions** are set to Read, the web server only views data from the device and cannot write data to the device. If the permissions are set to Write, the web server only writes to the device and cannot read the data. If the permissions are set to Read/Write, the web server can read the data from the device and write to the device from the web.

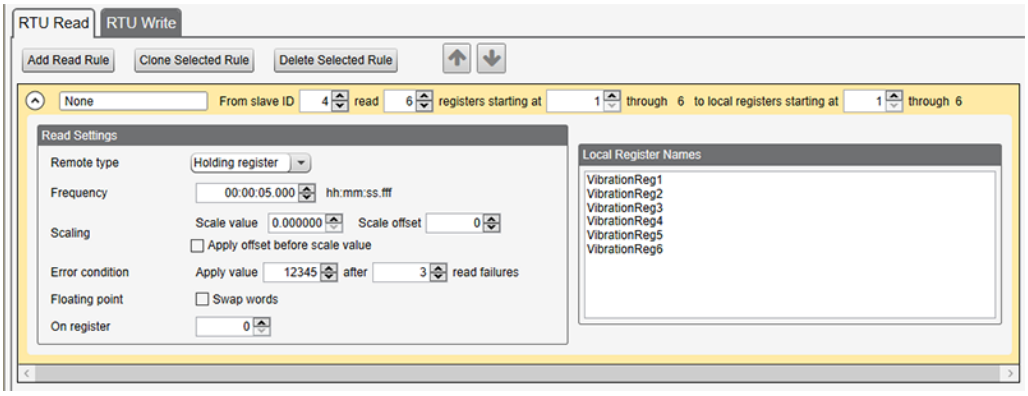
5. Click **Modify Registers** to save and apply the changes.

Define an RTU Read Rule

Follow these steps to create a new read rule.

This example screen shows a read rule created to read six registers (address 1 through 6), from Modbus Slave 4. The results are stored in the Local Registers 1 through 6.

Figure 9. Read Rules - Configuration Example

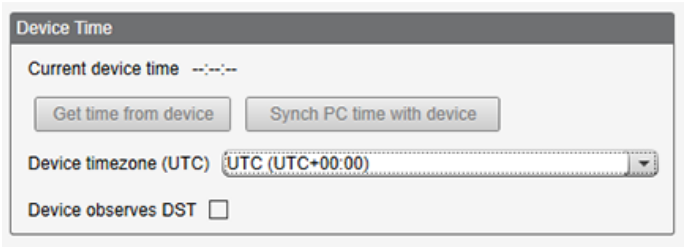


1. From the **Register Mapping** > **RTU** > **RTU Read** screen, click **Add Read Rule**.
2. Click the arrow next to the name to display the parameters.
3. Name your rule.
4. Select the slave ID.
5. Select how many registers to read, and the beginning register.
6. Define the register type, how often to read the register, and any other appropriate parameters.
7. If necessary, select the error condition. For this example, if the read function fails after three attempts, the read rule writes 12345 to the DXM local registers. Notice the list of local register names this read rule is using.

Set the Time

Use the **Settings** > **System** screen to define the time zone and daylight saving option. The time zone and DST options are saved into the configuration file.

Figure 10. Settings > System > Device Time



1. Go to the **Settings** > **System** screen.
2. If you connect the DXM to a computer, click **Sync PC Time with Device** to set the time on the DXM to match the time of the computer.
3. Set your time zone and select whether or not your device observes daylight saving time (DST).

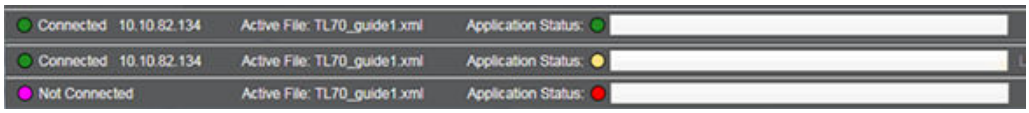
4.2.2 Save and Upload the Configuration File

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.

Figure 11. 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 yellow, the file transfer is in progress.

The device reboots and begins running the new configuration.

4.3 DXM100-A2 Models Only

4.3.1 Binding and Conducting a Site Survey with the ISM Radio

Before the ISM radio can communicate, the ISM radio within the DXM must be bound to the other radios in the wireless network.

Use the DXM LCD menu to bind external radios to the internal ISM radio.

If you are having difficulty running binding or site surveys, it may be because of the speed of the XML configuration file or script running on the DXM. To resolve this issue, try one of the following options:

- Disable the XML and script by setting DIP switch 4 on the processor board to ON and cycling the power to the DXM. After binding the devices, turn DIP switch 4 back OFF and cycle power again to return to normal operation of the XML and script.
- Adjust the XML or script to slow down the RTU read or write rules.
- Upload a blank XML, bind all devices, then upload the configured XML file.

4.3.2 Bind a DX80 Node to a DXM and Assign the Node Address

Binding Nodes to a Gateway ensures the Nodes only exchange data with the Gateway they are bound to. After a Gateway enters binding mode, the Gateway automatically generates and transmits a unique extended addressing (XADR), or binding, code to all Nodes within range that are also in binding mode. The extended addressing (binding) code defines the network, and all radios within a network must use the same code.

1. Apply power to all the devices.

   Separate radios by two meters when running the binding procedure. Put only one DXM Gateway into binding mode at a time to prevent binding to the wrong Gateway.
2. Enter binding mode on the DXM radio:
   a) Use the arrow keys to select the **ISM Radio** menu on the LCD and press **ENTER**.
   b) Highlight the **Binding** menu and press **ENTER**.
3. Assign the Node address to the Node.
   - For Nodes without rotary dials: Use the DXM arrow keys to select the Node address to assign to the DX80 Node about to enter binding mode. The DXM assigns this Node address to the next Node that enters binding mode. Only bind one Node at a time.
   - For Nodes with rotary dials: Use the Node's rotary dials to assign a valid decimal Node Address (between 01 and 47). The left rotary dial represents the tens digit (0 through 4) and the right dial represents the ones digit (0 through 9) of the Node Address. You can leave the DXM "Bind to" address set to 1 because the Node's rotary dials will override that setting.
4. Start binding mode on the DXM radio by pressing **ENTER** on the DXM radio.
5. Enter binding mode on the DX80 Node.
   - For housed radios, triple-click button 2.

- For board-level radios, triple-click the button.
- For Nodes without buttons, refer to the Node's datasheet for instructions on entering binding mode.

The left and right LEDs flash alternately and the Node searches for a Gateway in binding mode. After the Node binds, the LEDs stay solid momentarily, then they flash together four times. The Node automatically exits binding mode and reboots.

6. Label the Node with the assigned address number for future reference.
7. Press **BACK** on the DXM to exit binding mode for that specific Node address.
   The Node LEDs continue to flash red until the DXM exits binding mode with that Node address.
8. Repeat these steps for as many DX80 Nodes as are needed for your network.
9. When you are finished binding, press **BACK** on the DXM until you return to the main menu.

4.3.3 Conduct a Site Survey from the DXM

Conduct a Site Survey to verify the wireless communication between the radios within your wireless network. Conduct the site survey when the Nodes and DXM Controller are at the proposed installation sites to determine each radio's signal strength with the DXM.

For a DX80 network, the Gateway controls the site survey and the results display on the LCD. Running a site survey on a DX80 network does not affect the throughput of the DX80 network. The DX80 Gateway-Node system can run a site survey analysis while the network is operational. For a MulitHop network, the master device passes the site survey request to the intended Modbus slave device. The Site Survey runs and the results display on the LCD. Running a site survey on a MultiHop network stops all network traffic to that device.

1. On the DXM: Use the arrow buttons to select the **ISM Radio** menu and press **ENTER**.
2. Select the **Site Survey** menu and press **ENTER**.
3. Use the Up or Down arrows to select the device ID number and press **ENTER** to run the site survey with that radio.
   The site survey results display as green, yellow, red, and missed packets. Green indicates the highest signal strength, then yellow, and red. Missed packets were not received.
4. When you are finished running the Site Survey, press **Back** twice to return to the main menu and exit site survey mode.

If the Site Survey fails (100 missed packets), verify the radios are at least 10 feet from the DXM and/or rerun the binding procedure. If you find poor signal quality, common solutions include moving the DXM to a more central location relative to the Nodes or using higher-gain antennas on the DXM. Contact your local Banner Engineering representative for assistance.

5 Activating Services

5.1 Banner Cellular Data Services

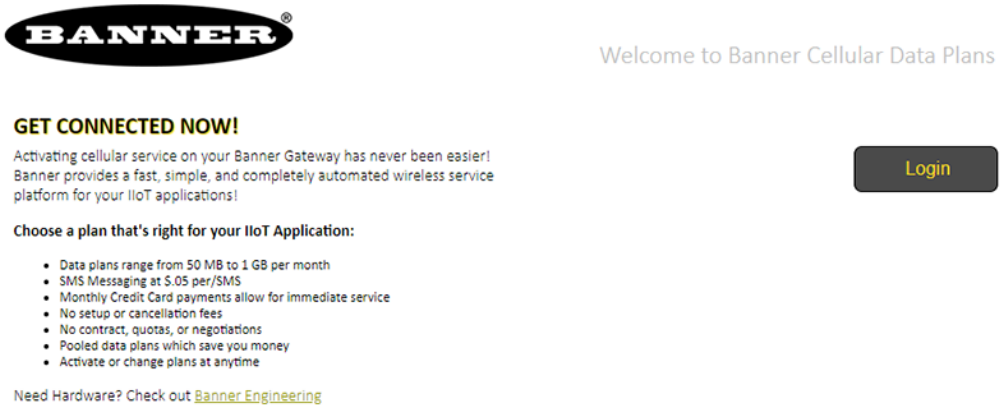
5.1.1 Activate Cell Services

Follow these instructions to activate the cellular data plan for your DEK Series Kit.

The DEK Series kit uses a cellular network specifically designed for IoT devices that use low power, have minimal data consumption, and are low cost. Banner has created several tiers of service plans for IoT deployment. Select the appropriate plan size for the kit to avoid any data overage fees applied to your account.

1. Visit the cellular data calculator at our support site to determine a suitable plan for your needs.
2. Using a web browser, navigate to secure.bannercelldata.com.

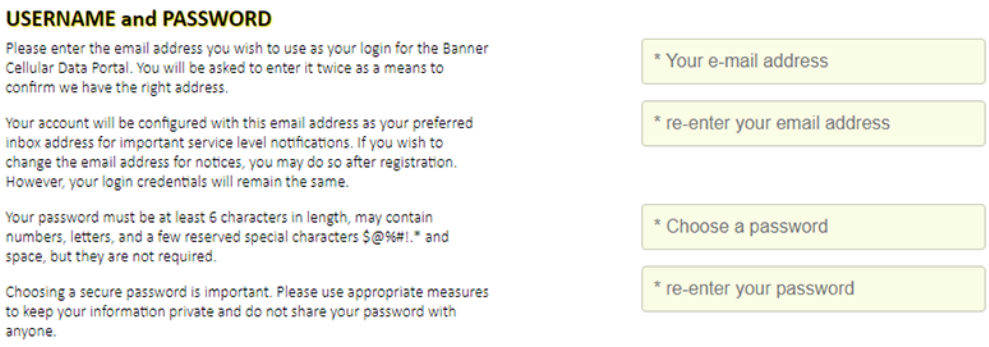
Figure 12. Banner cellular data opening screen



3. Select the region the system is operating in.
   - If the system is within the contiguous United States, select **United States** from the region drop-down list.
   - If the system will be used in Alaska, Hawaii, Canada, or Mexico, select **North America**.
4. From the drop-down list of cellular data plans, select the plan identified by the cellular data calculator.

5.1.2 Create an Account

Figure 13. Banner cell data username and password screen



1. Enter an email address (username) and password.
2. Enter the requested payment information for your account.
3. Enter your mailing address and contact information.
4. Review and accept the terms and conditions.

5.1.3 Add a Device to the Cellular Network

1. Navigate to the **My Services and Equipment** section.
   The purchased type of service displays.

2. Click on the drop-down arrow next to the cellular carrier to expose the **ICCID** and **IMEI** entry fields.
3. Select the appropriate cellular carrier for your kit.
   - For a kit model number ending in **-V**, select **Verizon**.
   - For a kit model number ending in **-A**, select **AT&T**.
4. Enter the **ICCID** and **IMEI** numbers.

   The ICCID and IMEI numbers are on the back label of the DXM.
5. Refresh the page as prompted.
   The device appears under the carrier line of service with a **Status** of **Active**.

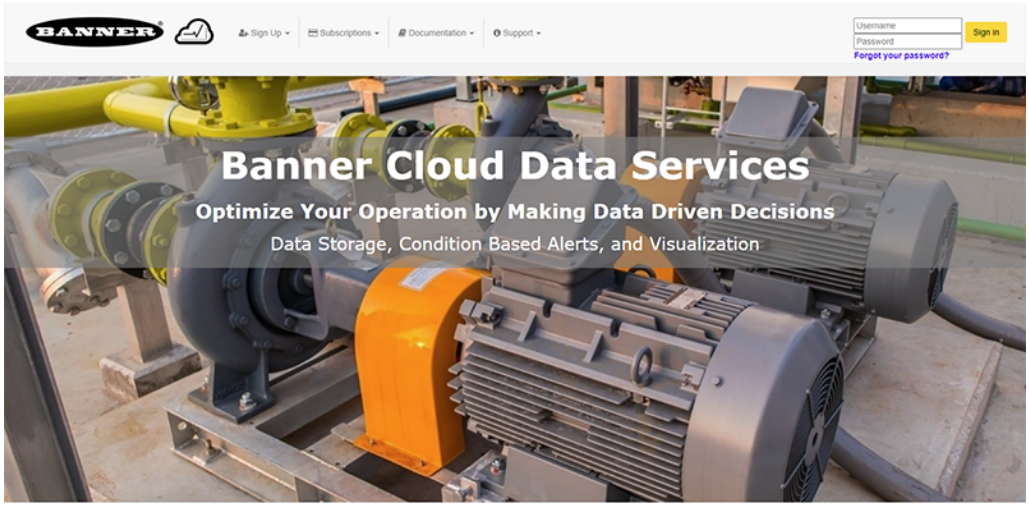
It can take up to five minutes for the cellular module to be recognized by the network. Please wait until **Status** has changed to **Active** before proceeding. You will also receive a confirmation email that your device has been activated.

The DXM is now connected to the cellular network.

5.2 Banner Cloud Data Services (BannerCDS)

5.2.1 Activate Cloud Services

Follow these instructions to activate your cloud services account.



1. Go to the bannercds.com website.
2. Register your account by going to the **Sign Up** menu.
3. Select **Enter Authorization Code and Create Account**.
4. Enter the requested information. The authorization code is on the Authorization Card included with your kit.
5. Read and accept the Services Access and Use Agreement.

5.2.2 Create a New Gateway

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

1. Click on **+New Gateway**.

   Create a new Gateway/site for each device that will be sending data to the web server.

   A **Create New Gateway** prompt appears.
2. Verify **Traditional** is selected for the **Configuration**.

3. Enter a site name.
4. Click **Create**.
   The Gateway/Site appears in the listing of devices on the Gateways screen.
5. Click **Edit Gateway** (pencil icon) next to your Gateway/Site name.
   The Gateway detail window appears.
6. Copy the **Site ID** number located at the top of this window.

   The Site ID number created by the web server is a required parameter in the configuration of the DXM. The Site ID is the address the webserver uses to store the data pushed from the DXM.
7. Click **Save**.

5.2.3 Modifying the XML Configuration File

Use the DXM Configuration Software to configure the operation of the DXM.

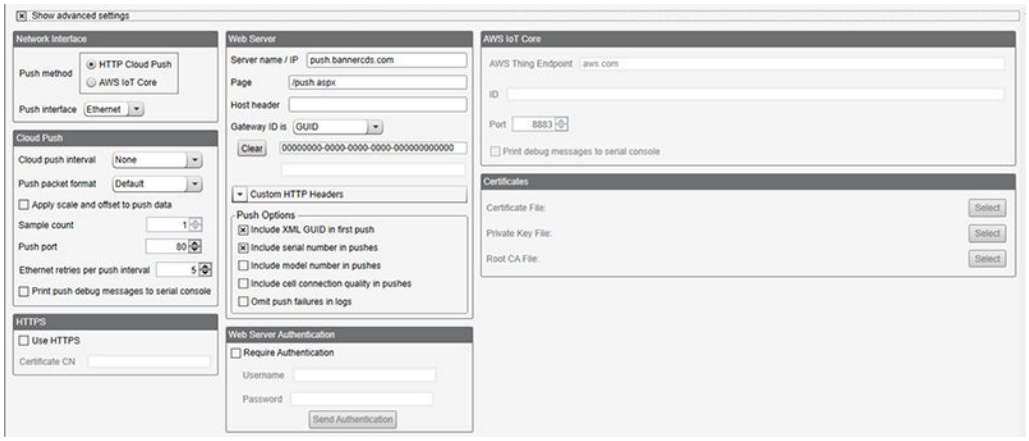
Launch the software. You can use one of these three screens to modify registers:

- **Local Registers**—Edits individual registers
- **Modify Multiple Registers**—Edits multiple registers at the same time
- **Local Registers in Use**—Edits individual registers

Refer to the DXM Configuration Software Instruction Manual (p/n 209933) for more details.

5.2.4 Configure the Cloud Data Services Settings

1. To configure the connection to the web server, go to the **Settings** > **Cloud Services** screen.



2. Copy and paste the **Site ID**.

   The Site ID is that long string of numbers and letters from the Banner Cloud Data Services website.
3. Verify the **Server Name/IP** is set to `push.bannercds.com` and the **Page** is set to `/push.aspx` for sending to the website.
4. Set the **Cloud Push Interval** to a value appropriate for your application.

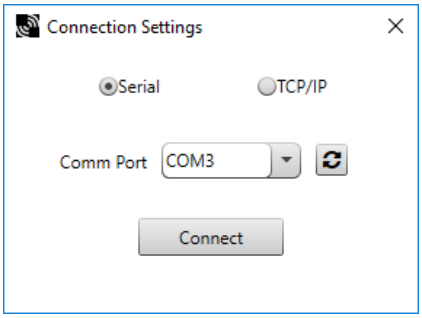
   The **Cloud Push Interval** determines how often the device pushes the data to the web. The faster the push interval, the more data is sent to the site. Cellular plans can only push at an interval of 10 minutes or longer. The **Sample Count** specifies how many times the data is gathered within the **Cloud Push Interval**.

   For example, if the **Cloud Push Interval** is 15 minutes and the **Sample Count** is set to 3, then during each data push (every 15 minutes), 3 samples are sent to the web. This is one sample every 5 minutes.
5. Set the **Push Method** to **HTTP Cloud Push** and the **Push Interface** to **Cell**.
6. On the **Cellular** screen, select the appropriate **Cell Module**.
   - Select **SXI-CATM1VZW-001** for kit model numbers ending in **-V**
   - Select **SXI-CATM1ATT-001** for kit model numbers ending in **-A**

   The **APN** will automatically change accordingly.
7. Save the configuration file by going to **File** > **Save**.

   File names must be no more than 30 characters long, and should not contain any spaces or special characters.
8. With a USB cable connected to the device, go to the **Device** > **Connection Settings** menu.

9. Select the appropriate **Comm Port** and click **Connect**.



If multiple comm ports are visible, try each one until the software is able to connect to the device.

10. Go to **Device** > **Send Configuration to the Device** to upload the new XML file.

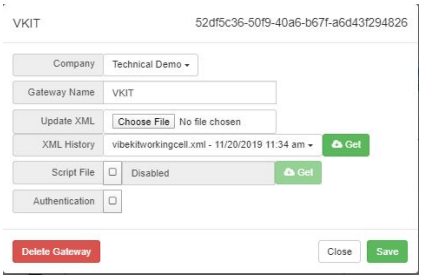
5.2.5 Upload the XML Configuration File to the Website

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

Figure 14. 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.

5. 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.

Refer to the Banner Cloud Data Services Instruction Manual (p/n 178337) to review all the features available for monitoring, comparing data, and establishing warnings/alarms on the website.

6 Installation Instructions

6.1 Install the Enclosure's Mounting Plate

The DEK100 kit includes a custom mounting plate designed to be fastened to a pole with the included clamps or bolted to a wall or flat surface.

1. Close the enclosure's lid and fasten the latches.
2. Turn the enclosure over and place on a flat surface with the lid facing down.
3. Remove the mounting plate from the packaging along with the self-tapping screws and pole clamps.
4. Align the four holes of the mounting plate with the embossed holes of the enclosure.
5. Verify the plate is oriented such that the countersunk hole faces outward from the enclosure.
6. Use the included screws to fasten the plate to the enclosure. Do not over-torque.
7. Use the 2 13/16" to 3 3/4" pole clamps and the geometry of the plate tabs to fasten the enclosure to an appropriately sized pole.

Figure 15. Pole clamp and plate tab

6.2 Mount the Solar Panel

Mount the solar panel at an angle appropriate with your geographic region and avoid any light obstructions to the panel for best performance.

Note: A three-inch u-bolt is required when mounting to a pole (not included).

The typical angle for solar panel orientation is no less than 20 degrees from parallel to avoid rain accumulation on the surface. There are many online resources to determine the best angle for each geographical region.

7 Product Support and Maintenance

7.1 Final Support Information

Congratulations! You have successfully configured and installed your kit. Please visit www.bannerengineering.com for detailed information regarding the DXM Controller; wired analog, discrete, and Modbus sensors; wireless Sensor Nodes; and Banner Cloud Data Services.

Please visit our Configuration Library (http://bannerengineering.com/dekconfig) for configuration and script files to help deploy the DEK kit for your application.

Banner Engineering is available to assist with all your predictive maintenance and condition monitoring applications. Please contact our applications team to assist in continuing software services after the trial period has concluded. Contact Banner Engineering's support team at 1-888-373-6767 or fill out the **Contact an Engineer** form at www.bannerengineering.com.

7.2 DXM100-Ax Documentation

For more information about the DXM100 family of products, please see additional documentation and videos on the Banner website: www.bannerengineering.com.

- DXM100-A1 and A2 Datasheet, p/n 212027
- DXM100-Bx Wireless Controller Instruction Manual, p/n 190037
- DXM ScriptBasic Instruction Manual, p/n 191745
- DXM Controller API Protocol, p/n 186221
- DXM Controller Configuration Quick Start, p/n 191247
- DXM Enclosure Kit Setup Guide (Solar Kits), p/n 223953
- DXM Configuration Software v4 (p/n b_4496867)
- DXM Configuration Software v4 Instruction Manual, p/n 209933
- Banner CDS Web Service Quick Start Guide, p/n 201126
- Banner CDS Web Service Instruction Manual, p/n 178337
- Additional technical notes and videos

Technical notes, configuration examples, and ScriptBasic program examples are available at www.bannerengineering.com.

7.3 Warnings

Install and properly ground a qualified surge suppressor when installing a remote antenna system. Remote antenna configurations installed without surge suppressors invalidate the manufacturer's warranty. Keep the ground wire as short as possible and make all ground connections to a single-point ground system to ensure no ground loops are created. No surge suppressor can absorb all lightning strikes; do not touch the Sure Cross® device or any equipment connected to the Sure Cross device during a thunderstorm.

Exporting Sure Cross® Radios. It is our intent to fully comply with all national and regional regulations regarding radio frequency emissions. **Customers who want to re-export this product to a country other than that to which it was sold must ensure the device is approved in the destination country.** The Sure Cross wireless products were certified for use in these countries using the antenna that ships with the product. When using other antennas, verify you are not exceeding the transmit power levels allowed by local governing agencies. This device has been designed to operate with the antennas listed on Banner Engineering's website and having a maximum gain of 9 dBm. Antennas not included in this list or having a gain greater that 9 dBm are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen such that the equivalent isotropically radiated power (EIRP) is not more than that permitted for successful communication. Consult with Banner Engineering Corp. if the destination country is not on this list.

Important: Please download the complete DXM Enclosure Kit (DEK) Series 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 DXM Enclosure Kit (DEK) Series, 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 DXM Enclosure Kit (DEK) Series sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Important:

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

Important:

- **Electrostatic discharge (ESD) sensitive device**
- ESD can damage the device. Damage from inappropriate handling is not covered by warranty.
- Use proper handling procedures to prevent ESD damage. Proper handling procedures include leaving devices in their anti-static packaging until ready for use; wearing anti-static wrist straps; and assembling units on a grounded, static-dissipative surface.

7.4 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.**

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