Motor Control Application Guide

Guide Features and Benefits

REMOTE MOTOR CONTROL	Remote control up to 12 motors using two wireless Q120 Nodes and 12 single input/single output wireless Nodes
MOTOR RUN TIME	Track the run time and off time of all motors in the system
EVENT COUNTERS	Count the number of times each motor was run
STATUS INDICATION	Verify motor running via LEDs on 6-button box
MOTOR AUXILIARY STATUS	Utilize a motor auxiliary signal to indicate an error condition on the Q120 6-button box via LEDs
TIME STAMPED LOGGING	Use time-stamped logging to see when motors were running and for how long.
SMS TEXT/EMAIL ALERTS	Generate SMS text and/or email alerts based on specific events
EFFICIENCY METRICS	Produce efficiency metrics with provided data
CLOUD MONITORING	Push data to Cloud Webserver or PLC (via LAN or Cellular connection) for remote viewing, alerting, and logging.

Control up to 12 motors remotely using the Wireless Q120 6-button box with signal status verification. The Wireless Q120 Node provides the ability to control six motors per box by using the same button for starting and stopping a single motor. Each button also has two LEDs to indicate if the motor is running or if an error condition is reported by a motor auxiliary contact closure, such as an overload. Any Sure Cross wireless Node with a single discrete input and single discrete output can be wired to control the motor via the auxiliary contacts on the motor controller as well as receive auxiliary contact information from the motor control such as an overload condition.

The DXM Gateway provides the ability to track motor status, motor run time, the count of times that a motor was turned on, and the status of the auxiliary input. Time stamped logging can be enabled and only events such as a motor transition from ON to OFF or OFF to ON and auxiliary input changes will trigger logging events. Additional action rules can be added to send SMS texts or email alerts based on specific condition such as if a motor's auxiliary contact closes, indicating a possible overload. All the registers can also be pushed up to a cloud webserver where the data can be reviewed and stored for future use. This system is easy to install and configure and increases the flexibility for motor control while getting visual feedback and tracking important data.

Equipment



Model	Description
DX80N9Q120BL-RG or DX80N2Q120BL-RG	Sure Cross Wireless Q120 Node; select either 900 MHz or 2.4 GHz ISM radio to match the DXM100
Multiple Options	Any Sure Cross Wireless Performance Series Node with at least one Discrete Input and one Discrete Output; either 900 MHz or 2.4GHz to match the DXM100
DXM100-B1C1R1 or DXM100-B1C1R3	DXM100 Wireless Controller with Cellular Modem; select either 900 MHz or 2.4 GHz ISM radio to match the Q120s and K70s; C1 only necessary if Cell Module is desired

A PDF version of this Application Guide is available at https://goo.gl/x6WS5I

Printed in USA May 2018 P/N b_4443725 Rev. B

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

The following guide demonstrates how to bind the Wireless Q120 6-button boxes and additional Nodes connected to the motors to the DXM and load a preconfigured XML file and script for 16 motors. The XML file only requires some minor modifications to be customized for any site.

In this application, the Q120 6-button boxes need the buttons to be momentary instead of the default latching to avoid problems with a button being pressed when out of sync. To change the button type, remove the Q120 cover and change DIP switch 2 on the D2 bank of switches to the ON position (see Q120 datasheet)



Each Q120 can control up to six motors (one button per motor). The buttons on each Q120 are tied directly to a single wireless Node located near the motor. To use the buttons to control the motors, follow these steps:

1. Press the button down for a few seconds until the LED above the button flashes green. The Node sends a discrete output that can be wired into the motor controller.

   The signal stays latched after the button is released.
2. To stop the motor, press the same button until the LED stops flashing green.
3. If the motor controller has an auxiliary output to indicate overload or other conditions, wire that into the Node's input.

   A red light flashes when the input is active, whether the motor is running or not, to indicate the overload. It will not affect motor operation; the user must still press the button to stop the motor.

Step 1: Bind the System and Assign Addresses

Binding the Q120s to the DXM100 establishes a secure connection between them and assigns a specific network address to each Q120 in the wireless network. The first two Nodes in the system are reserved for binding the Q120s.

1. Apply power to the DXM.
2. On the DXM: Use the arrow button to select the **ISM Radio** menu. Press **Enter**.
3. Select **Binding** and press **Enter**.
4. Select **Bind to > 1** (the first Node) and press **Enter**.
5. On Q120 Node 1: Triple-click the binding button between buttons 1 and 4.

   The LED flashes four times after it binds to the DXM. This Node is now bound as Node ID 1 and will be linked to the wireless motor Nodes 1 through 6. Label the Q120 for future reference.
6. On the DXM: Press **Back** to return to the main menu.
7. To bind the second Q120, select **Bind to > 2** and press **Enter**.
8. On the second Q120 Box: Triple-click the binding button. This Node is now bound as Node ID 2 and will be linked to the wireless motor Nodes 7 through 12. Label the Q120 for future reference.

Bind the wireless Nodes for each motor as Nodes 3 through 14 with 3 linked to button 1 on box 1 and 14 linked to button 6 on box 2.

1. Apply power the wireless motor Node.
2. Apply power to the DXM.
3. On the DXM: Use the arrow button to select the **ISM Radio** menu. Press **Enter**.
4. Select **Binding** and press **Enter**.
5. Select **Bind to > 3** (the first Node) and press **Enter**.
6. On the wireless motor Node: Use the rotary dials on the Node to assign a Node ID between 03 and 14. The left rotary dial represents the tens digit (0-4) and the right dial represents the ones digit (0-9) of the Node address. Rotate the first dial to zero and the second dial to 3 to assign the Node to ID 3.
7. Triple-click button 2 to enter binding mode.

   After the Node is bound, the LEDs are both solid red for a few seconds. The Node cycles its power and enters RUN mode.
8. On the DXM: Press **Back** to return to the main menu.
9. Repeat steps 5, 6 and 7 for each additional Node that needs to communicate to the DXM.

When you are finished binding, press **Back** on the DXM until the DXM returns to the main menu.

Banner Engineering Corp. • Minneapolis, MN U.S.A
www.bannerengineering.com • Tel: 763.544.3164

Step 2: Run a Site Survey

Verify the wireless connection between your Q120s, wireless motor Nodes, and the DXM by running a site survey on the DXM100.

1. On the DXM: Use the arrow buttons to select the **ISM Radio** menu. Push **Enter**.
2. Select the **Site Survey** submenu, and press **Enter**.
3. Select each Node ID within the system to verify the wireless connection between the Node and the DXM.
4. When you are finished running the site survey, press **Back** twice to return to the main menu.

Step 3: Configure the System

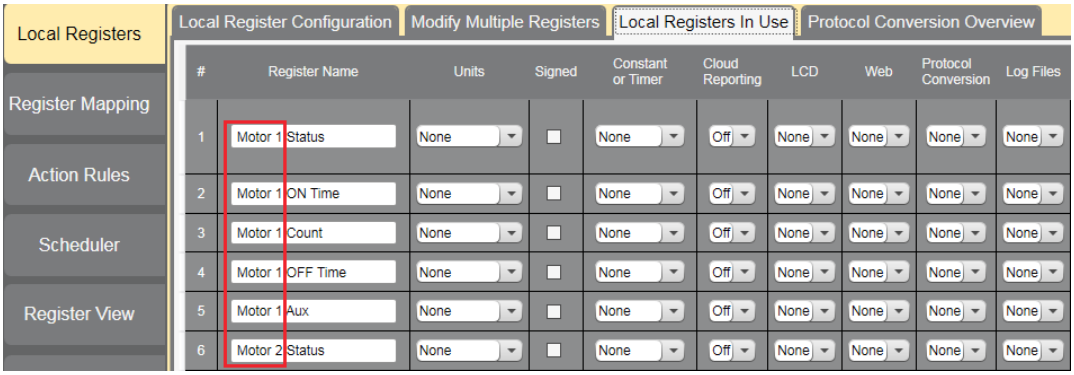
To customize the system to an actual application, make some basic modification to the template files. There are two files uploaded to the DXM: the XML file sets the DXM's initial configuration and the ScriptBasic file reads button status of the Q120, controls the output to wireless motor Nodes, control LEDs on Q120, monitors motor run time, monitors motor on count, monitors motor auxiliary output (if used), establishes a reset function for each motors timers and counts, and organizes the information in logical and easy-to-find registers in the DXM.

Loading these files and making adjustments requires the use of Banner's DXM Configuration Software and the Motor Control files available via in the links below.

1. Download the preconfigured files. (https://goo.gl/EiVxyH)
2. Extract the ZIP files into a folder on your computer. Note the location where the files were saved.
3. Connect the DXM, via the USB cable supplied with the DXM, to a computer containing the DXM Configuration Software or download the software and install it on a computer.
4. Launch the software.
5. Load the Motor Control XML file by going to **File** > **Load** and choosing the configuration files.
6. Connect the software to the DXM by going to **Device** > **Connection Settings**. Select **Serial** and then select the COM port that the USB cable is plugged into. Click **Connect**. If you are unsure which COM port to select, and multiple appear, attempt to connect to each one of them until you are successful.
7. Upload the Motor Control script file by going to the **Settings** > **Scripting** screen. Click **Upload Script** and select the file.
8. Select the uploaded file in the window to the right of the **Upload Script** button. Click **Add Selected to Startup**; the DXM will run this script every time it restarts.
9. **Save** the XML file using the **File** > **Save** menu. Save the XML file any time the XML has been changed because the tool does not autosave.

Optional Steps: Customize the XML file

1. Within the DXM Configuration Software, go to the **Local Registers** > **Local Registers in Use** screen.
2. Rename the Motors using the text boxes in the **Register Name** column. Because there are five registers per motor, copy and paste names for efficiency.



To display the motor status, count, or timer on the website, change the **Cloud Permissions** drop-down list to **Read** for each motors' information piece (status, Timer, count, etc.).

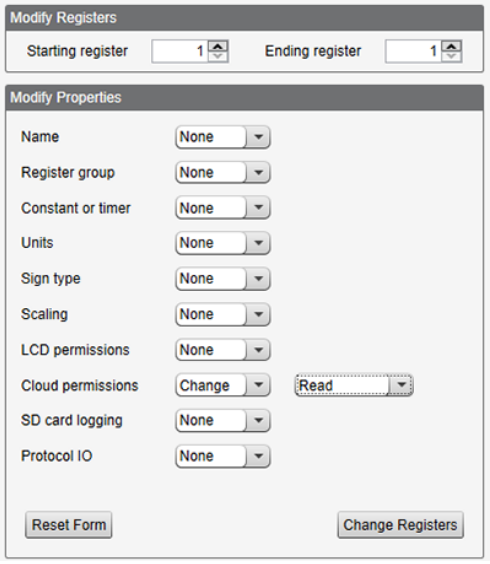
3. To display the status for each Motor on the website, change the cloud permissions.

   a) On the **Modify Multiple Registers** screen, select **Change** in the drop-down list next to **Cloud Permissions**.

   b) From the drop-down list, select **Read** for **Cloud Permissions**.

   c) Set the **Starting Register** to 1 and the **Ending Register** to the value equal to 5 × Number of motor Nodes in the system (for example, set the ending register 80 for 16 motors).

   d) Click **Change Registers**.



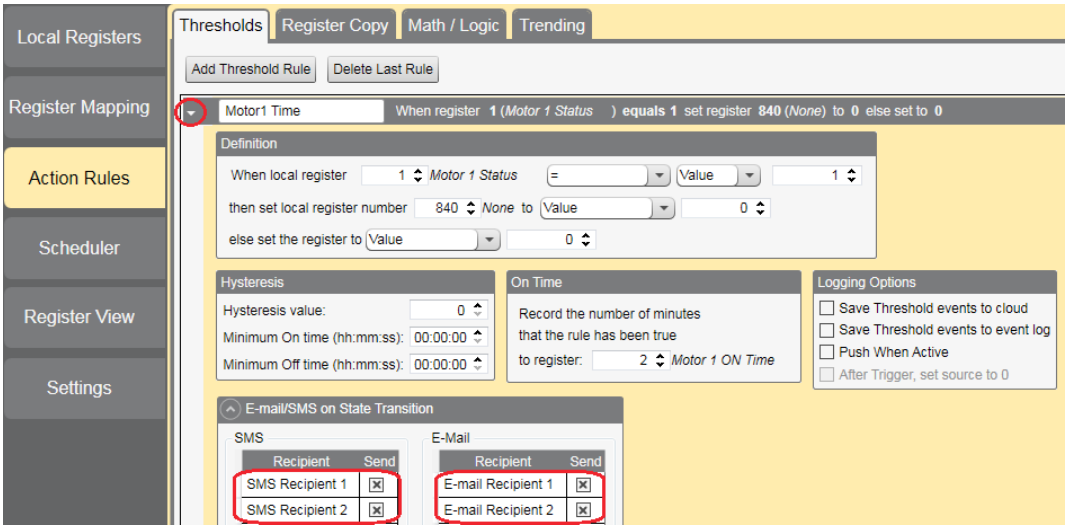
4. Configure the system to send email or text alerts based on an action rule.

   a) Go to the **Action Rules** screen. Expand any rule using the arrow next to the rule OR create a new action rule using the **Add Threshold Rule** button on the top.

   b) Click on the arrow next to **Email/SMS on State Transition**.

   c) Select the recipient of the SMS and/or email upon the action rule becoming true.

   In the example shown, both SMS Recipient 1 and 2 and Email Recipient 1 and 2 will receive a message when the action rule meets its criteria.



Banner Engineering Corp. • Minneapolis, MN U.S.A
www.bannerengineering.com • Tel: 763.544.3164

Set up the Ethernet or Cellular Connection

By default, the XML file configures the DXM100 with an Ethernet Push interface with the ability to send emails and push the data registers to a webserver. The device can also be configured to use a cellular push if the DXM Controller contains a cellular module and data plan. This section is only necessary if the user wants to receive or display information beyond just the DXM Controller's LCD.

1. If the DXM will text, email, or push to the cloud webserver, set up the push interface.

   a) On the DXM Configuration Tool, go to the **Settings > Cloud Services** screen.

   b) Select the appropriate **Push Interface** (Ethernet or Cell) from the drop-down list. Selecting **Cell** requires a cellular module be installed in the DXM Controller and a wireless plan be set up for sending data.

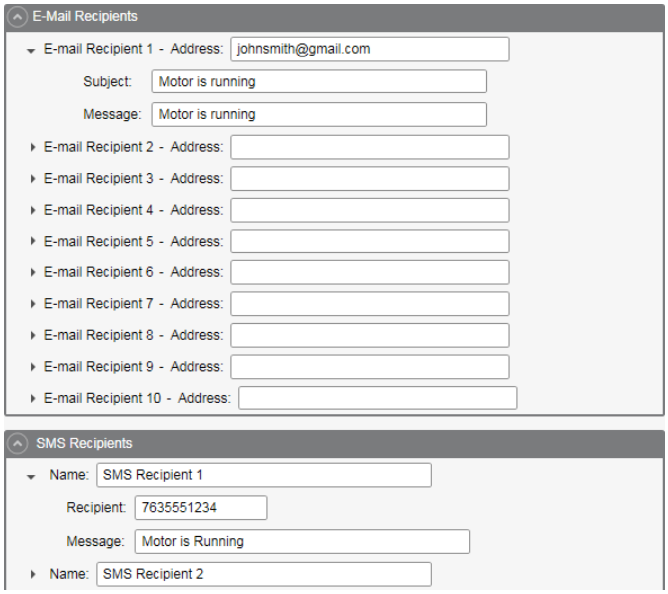
2. The **Cloud Push Interval** determines how often the DXM pushes the current status data to the webserver. By default, this interval is set to zero and should not be changed. If data is being pushed to the cloud, set the **Cloud Push Interval** to 00:15:00 (15 minutes).
3. Set up the email and text messages. SMS works only if the DXM has a cellular module. Expand the **Email Recipients** and **SMS Recipients** to enter up to 10 email addresses and 10 phone numbers, along with a custom message.

   a) Go to the **Settings > Mail and Messaging** screen.

   b) All SMTP fields should remain set to their default values, except the **Password** field. Enter “sxiemail1” into the password field.

   c) Click **Send SMTP Password**.

   d) Click **Yes** when asked to reboot the device.



Step 5: Save and Load the XML File

When changes are made to the XML file, save the changes. To apply the changes, load the XML file to the DXM.

1. Save the file by going to the **File** > **Save** menu.
2. Load the file onto the DXM by going to the **Device** > **Send Configuration to Device** menu.

Because of the size of the XML file, the file may take up to three minutes to load. Verifying the file is loading by looking at the Application Status indicator in the status bar.

If the Application Status indicator is red, close and restart the DXM Configuration Tool, unplug and re-plug in the USB 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.



Step 6: Push Information to the Cloud

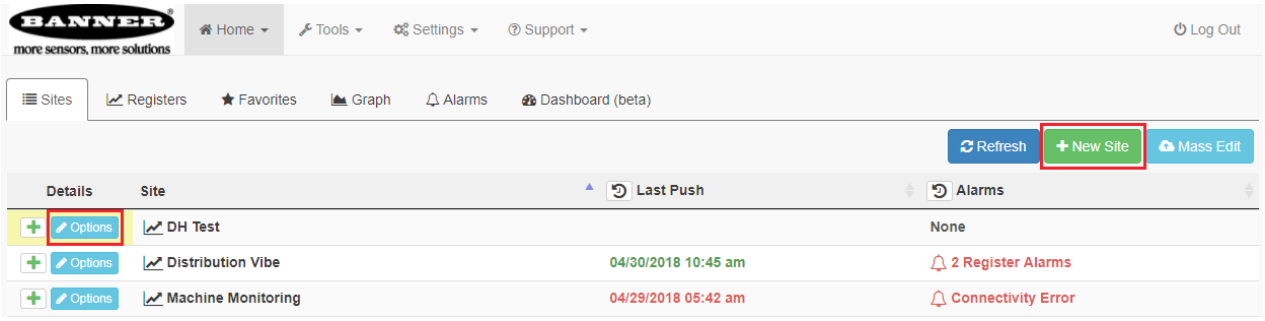
The DXM100 can connect to the web via Ethernet or an internal cell module to push data from the site to display on a website. To enable this capability for remote monitoring and alarms settings, modify the XML file.

The Banner Cloud Data Services (BannerCDS) website for storing and monitoring the system's data is https://bannercds.com.

1. Connect the DXM to a computer with the DXM Configuration Software.
2. Launch the software and connect to the DXM.
3. Load the saved XML file.
4. Go to the **Settings** > **Cloud Services** screen.
5. Visit the BannerCDS website and log into an existing account or register a new account.
6. Click **+ New Site** and name your site.
7. Highlight and copy the Site ID.
8. On the DXM Configuration Software: Return to the **Settings** > **Cloud Services** screen and paste the copied ID into the Site ID field.
9. Save the XML file (**File** > **Save**).
10. Upload the file to the DXM (**Device** > **Send Configuration to the Device**).
11. On the 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/uploaded to the DXM.
12. Click **Save** to complete the connection to the website.

This 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 to review all the features available for monitoring, comparing data, and establishing warnings/alarms on the website.

To access a demo version of the website please contact your local Banner distributor and follow the instructions in the technical note: Connecting to the Banner Cloud Data Services Demo Site for modified instructions on how to send data to the demo site.



Banner Engineering Corp. • Minneapolis, MN U.S.A
www.bannerengineering.com • Tel: 763.544.3164

Additional Features

Resetting the Timer and Counts

Each motor in the system has a reset register that is available on the face of the DXM's LCD and via the website. Setting this register to 1 resets all the counts and timers on that particular motor.

Resetting from the DXM

1. On the DXM: Use the arrows to select **Registers**. The registers are labeled **Reset X** (where X is the Node Number you want to reset). **Reset All** resets all statistics for each motor.
2. Select the appropriate register to reset.
3. Click **Enter**.
4. Change the value to 1 then click **Enter** three times.

   The reset register automatically returns to zero after the motor is reset.

Resetting from the Website

1. Go to the **Dashboard > Sites** screen.
2. Click **Options** for the site where the particular motor exists.
3. Click the **Update** tab in the pop-up window that opens.
4. From the **Register Name** drop-down list, select the motor you want to reset.
5. Enter 1 into the **Value** field and click **Queue**.
6. Repeat steps 4 and 5 for each motor that needs to be reset or use the **Reset All** register and follow steps 4 and 5.

   When the next data push occurs, the chosen units reset. The reset registers automatically return to zero after the Motor is reset.

Configuring Time Stamped Logging

To set up time-stamped logging, follow these steps.

1. Go to the **Local Registers > Modify Multiple Registers** screen.
2. Click **Reset Form**.
3. From the **SD Card Logging** drop-down list, select **Change**.
4. Select Log 1 in the drop-down list that appears to the right.
5. Set the **Starting Register** to 1 and the **Ending Register** to the value equal to 5 × Number of Motors in the System (ex. Ending Register 80 for 16 motors).
6. Click **Change Registers**.

Retrieving a Log File

1. Connect the DXM to the computer via USB or Ethernet.
2. On the DXM Configuration Software: Go to the DXM using the **Device > Connection Settings** menu.
3. Go to the **Settings > Logging** screen.
4. Click **Refresh List**.
5. In the **Log File Management** window, select the file to save.
6. Click **Save Selected** to save the file to a folder on your computer.

Local Registers

	Local Register #	Description
Motor Information	1 + 5 × (N – 1)	Current Motor Node Output Status
	2 + 5 × (N – 1)	Motor Output Status ON Time
	3 + 5 × (N – 1)	Count of Motor Output ON Transitions
	4 + 5 × (N – 1)	Motor Output Status OFF Time
	5 + 5 × (N – 1)	Motor Auxiliary Input Status
Box Input Status	200–211	Box Input Statuses
Box Output Status	212–223	Box Output Statuses
Motor Node Control Output	300–311	Motor Node Output Control Signal
Motor Node Input	312–323	Motor Node Auxiliary Input Status
Motor Node Output	324–335	Motor Node Output Status
Motor Node Connection Status	336–347	Connection Status of Motor Nodes
Resets	400	Reset All Motors
	401–412	Reset Motors 1–12

Where N represents the Motor Number.

more sensors, more solutions

© Banner Engineering Corp. All rights reserved

P/N b_4443725 Rev. B