High-Speed Part Counting Application Guide

Guide Features and Benefits

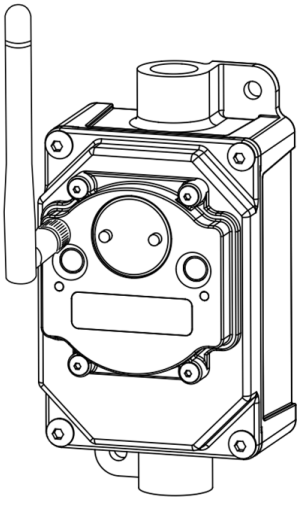
HIGH SPEED PART COUNTING	Two asynchronous part counting inputs per Node (up to 16 Nodes) with up to 10 kHZ event counting.
STATE INDICATION	Monitor and log the current state of both part counting inputs to determine if the input is blocked or missing parts.
PARTS RATE	Calculate parts per minute for both part counting inputs based on user configurable reporting rate.
RATE WARNINGS	User configurable warnings for both part counting inputs based on the parts per minutes.
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.

Increase production efficiency by monitoring multiple part counts with to up 16 wireless Performance Nodes. The high-speed asynchronous totalizing done by the DX80-P16E Node gives the ability to totalize up to 10,000 parts per second. Monitoring the current state of part counting inputs along with parts per minute rates can be used to establish errors or inefficiencies in the system.

Warnings are generated based on user input and the part rate to alert to conditions that are below standard operating conditions. These warnings can be used to alert supervisors or production managers about an issue in the system via SMS text messaging, email alerts, or a remote master light.

Equipment

Model	Description
DX80N9X1SX-P16E OR DX80N2X1SX-P16E	Sure Cross® Wireless Performance Node P16E; select either a 900 MHz or 2.4 GHz ISM radio to match the DXM100
Various	Any sourcing (PNP) or sinking (NPN) input.
DXM100-B1C1R1 or DXM100-B1C1R3	DXM100 Wireless Controller with Cell; select either 900 MHz or 2.4 GHz ISM radio to match the Q120s and K70s; the C1 model is only necessary if cellular communiation is needed





A PDF version of this Application Guide is available at https://goo.gl/SJ1zBN

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The following guide demonstrates how to bind the wireless DX80-P16E part counting Nodes to the DXM100 and load a preconfigured XML file and script for 16 Nodes. The XML file only requires some minor modifications to be customized for any site. Follow the datasheet for the DX80-P16E for proper set up of DIP switches and wiring sensors into the Nodes.

Step 1: Bind the Radios and Assign Device IDs

Binding the DX80-P16E Nodes to the DXM100 establishes a secure connection between them and assigns a specific network address to each radio within the wireless network.

1. Apply power to the DXM.
2. On the DXM: Use the arrow button to select the **ISM Radio** menu on the DXM's LCD. Press **Enter**.
3. Select **Binding** and press **Enter**.
4. Select **Bind to > 1** (the first Node) and press **Enter**.
5. On DX80-P16E Node 1: Turn the dials on the face to read 0 on the left and 1 on the right.
6. Triple-click the binding button (right button on face of radio).

   The LEDs on the radio flash four times after it binds to the DXM. This Node is now bound as Node ID 1. Label the Node for future reference.
7. On the DXM: Press **Back** to return to the main menu.
8. To bind additional DX80-P16Es, select **Bind to > X** and press **Enter**.
9. On the second DX80-P16E: Turn the left dial to 0 and the right dial to 2.
10. Triple-click the binding button to start binding Node 2 to its master radio.

If more DX80-P16Es are being used in the system, continue binding each Node to its master radio until all radios are bound to the DXM and have been assigned a unique Node ID. On the tenth node, turn the left dial to 1 and the right dial to 0 then increase the right dial by 1 to get to eleven for the eleventh node and so on up to 16.

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

Step 2: Run a Site Survey

Verify the wireless connection between your DX80-P16Es 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.

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Step 3: Configure the System

To customize the system to an actual application, make some basic modifications 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 the part counts and part counting input states. It then uses these to calculate the part counting rate, set warnings, establish a reset for each Node, and organize the information in logical and easy-to-find registers in the DXM.

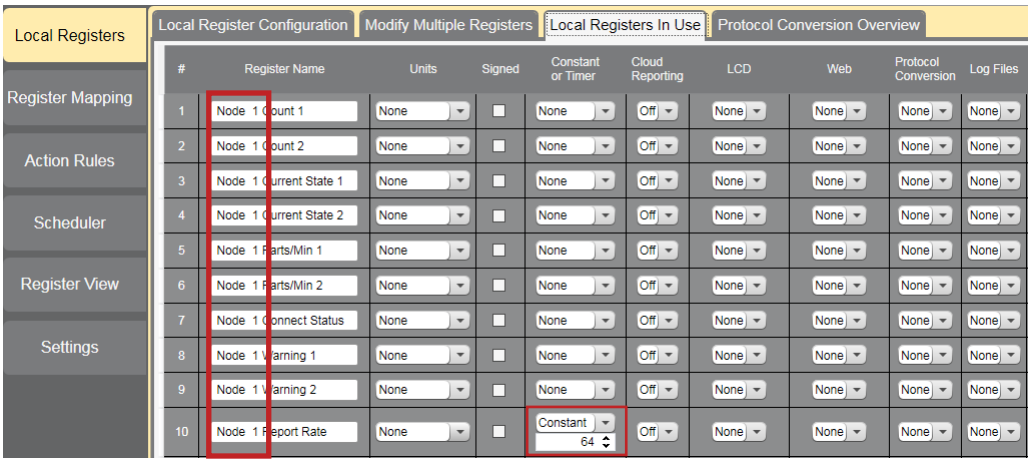
Loading these files and making adjustments requires using Banner's DXM Configuration Software and the "High Speed Part Counting" files available using in the links below.

1. Download the preconfigured files. (https://goo.gl/USfTYy)
2. Extract the ZIP files into a folder on your computer. Note the location where the files were saved.
3. Connect the DXM, using 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 DXM Configuratin Tool software.
5. Load the "High Speed Part Counting" 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 is the correct choice, and multiple appear, attempt to connect to each one until you are successful.
7. Upload the "High Speed Part Counting" 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 (**File > Save**). 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 Tool, go to the **Local Registers > Local Registers in Use** screen.
2. Name the Nodes using the **Register Name** fields. Because there are 10 registers per Node, copy and paste names for efficiency.

   To display the Node counts, current states, parts/min, warnings or connection status on the website, change the **Cloud Permissions** column drop-down lists to **Read** for each Nodes' information piece (count, current state, parts/min, count, etc.) that you would like to appear on the website.
3. If the Node report rate has been changed from the default of 64 seconds, go to the **Local Registers In Use** screen. Find the 10th



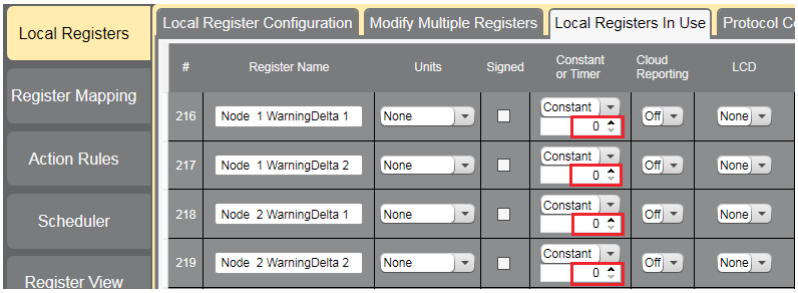
   register for each Node, labeled "Node X Report Rate" and change the number underneath the **Constant** drop-down box to the number of seconds matching the report rate for that particular Node.

   Each Node's report rate defaults to 64 s. If the DIP switches or UCT tool configured the P16E Node to a different report rate, the report rate must be changed to match that setting within the DXM Configuration Tool.
4. Each Node has two warnings based on the parts per minute rates of their counters. Users must set the parts per minute warning

threshold in registers 216 through 247. On the **Local Registers In Use** screen, find register 216, labeled “Node X Warning Delta1” and change the number underneath the **Constant** drop-down box to the desired parts per minute threshold.

When the Node’s first counters’ parts per minute rate is below this threshold, the “Node X Warning 1” field turns on. Users can set both the WarningDelta1 and 2 thresholds for each Node in the system. Leave at the default value of zero if no warning is desired.

5. To display the counts, states, parts/min, and warnings for each Node on the website, change the cloud permissions.

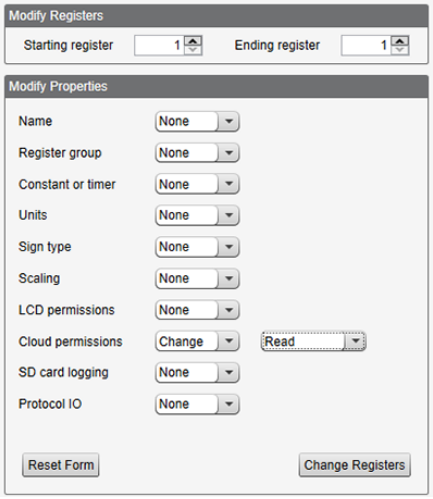


a) On the **Modify Multiple Registers** screen, select **Change** in the drop-down list next to **Cloud Permissions**.

b) In the drop-down list to the right, select Read for **Cloud Permissions**.

c) Set the Starting Register to 1 and the Ending Register to the value equal to 10 × Number of Nodes in the system (for example, set the ending register 160 for 16 Nodes).

d) Click **Change Registers** on the bottom right of the section.



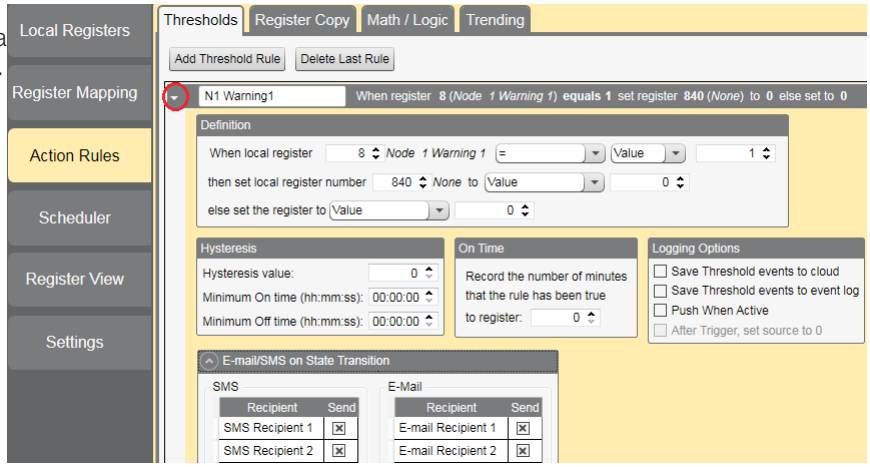
6. Configure to **Receive Email or Text Alerts** based on an **Action Rule**.

a) Click on the **Action Rules** tab and 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.



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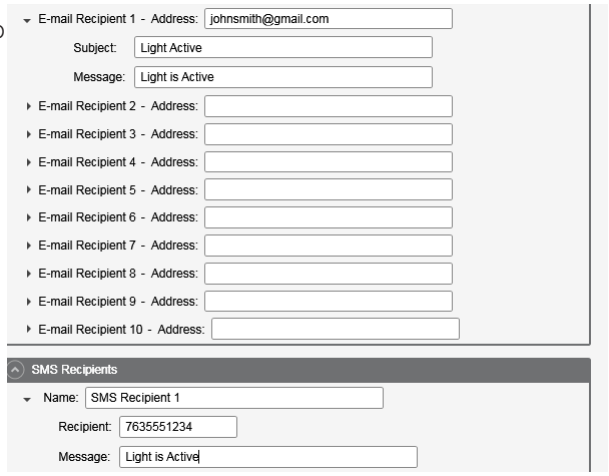
Set up the Ethernet or Cellular Connection

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

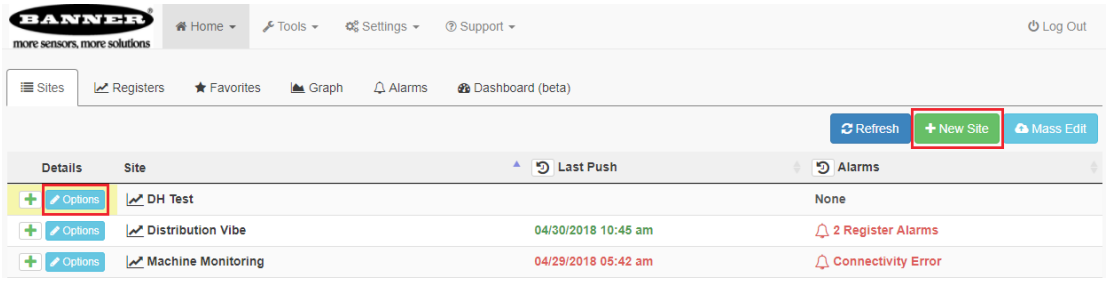
The DXM100 can connect to the web via Ethernet or an internal cell module to push data from the site to display on a website. To enable this capability for remote monitoring and alarms settings, modify the XML file.

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 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 Tool: 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.



Additional Features

Resetting the Counts

Each Node 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 on that particular Node. There is also a Reset All register to reset all Nodes in the system.

Resetting from the DXM

1. On the DXM: Use the arrows to select **Registers**. The registers are labeled **Reset X** (where X is the P16E Node ID you want to reset). There is a **Reset All** that resets all statistics for each P16E Node.
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 Node is reset.

Resetting from the Website

1. Go to the **Dashboard > Sites** screen.
2. Click **Options** for the site where the particular Node exists.
3. Click the **Update** tab in the pop-up window that appears.
4. From the **Register Name** drop-down list, select the Node you want to reset.
5. Enter 1 into the **Value** field and click **Queue**.

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6. Repeat steps 4 and 5 for each Node that needs to be reset or use the Reset All register following steps 4 and 5.
   When the next data push occurs, the chosen units reset. The reset registers automatically return to zero after the Node resets.

Creating a Master Light

Local Registers 195–196 are used to OR each warning independently for all the P16E Nodes (for example, 195 is 1 when ANY Warning 1 in the system is ON).

A master light can be used as one of the 16 Nodes in the system to reflect these OR'd warnings.

1. On the DXM Configuration Software: Go to **Register Mapping > Write Rules**.
2. Select **Add Write Rule** and map two registers starting at 195 to slave ID 1 at the two output registers for the Master Light. The register number for the master light outputs is N × 16 + 9, where N is the Node ID of the master light. The example shows the setup for the Master Light on Node ID 10 (10 × 16 + 9 = 169).



Configuring Time Stamped Logging

To setup 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 10 × Number of Nodes in the system (ex. Ending Register 160 for 16 Nodes). Finally click the Change Registers button on the bottom right portion of the section.

Retrieving a Log File

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

	Local Register #	Description
Part Counting Node Information	1 + 10 × (N – 1)	Part Count #1
	2 + 10 × (N – 1)	Part Count #2
	3 + 10 × (N – 1)	Current State of Counter #1
	4 + 10 × (N – 1)	Current State of Counter #2
	5 + 10 × (N – 1)	Parts per minute #1
	6 + 10 × (N – 1)	Parts per minute #2
	7 + 10 × (N – 1)	Connection Status
	8 + 10 × (N – 1)	Warning #1
	9 + 10 × (N – 1)	Warning #2
	10 + 10 × (N – 1)	User Configurable Report Rate Constant
ANY Warning Register	195–196	ANY Warning 1 and 2
Node Status	200–215	Node Connection Status
Warning Delta 1	216–247	User Configurable Warning PPM Thresholds
Resets	300–316	Register and Counter Resets
Register Reads from Gateways	317–332	Node 1–16 Current State 1 Reads
	333–348	Node 1–16 Current State 2 Reads
	349–364	Node 1–16 Count 1 High Word Reads
	365–380	Node 1–16 Count 1 Low Word Reads
	381–396	Node 1–16 Count 2 High Word Reads
	397-412	Node 1–16 Count 2 Low Word Reads
Timers to reset Prior Counts	413–428	Node 1–16 Count 1 Timers
	429–444	Node 1–16 Count 2 Timers
Prior Counts	445–476	Prior report Counts for establishing PPM

Where N represents the DX80-P16 Node ID Number.

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