



Q Gateway Features

Configurable DX80 Gateway that uses DIP switches to map inputs from up to six Nodes (or Wireless Q45 Sensors) to the Gateway's outputs

The Sure Cross® wireless system is a radio frequency network with integrated I/O that operates in most environments and eliminates the need for wiring runs. Systems are built around a Gateway, which acts as the wireless network master device, and one or more Wireless Q45 Sensors.

- Wireless industrial I/O device with six discrete (sourcing) inputs and six discrete (sourcing) outputs
- DIP switches allow the user to select one of eight defined I/O mapping configurations to automatically map the Nodes' inputs to this Gateway's outputs
- Frequency Hopping Spread Spectrum (FHSS) technology ensures reliable data delivery
- Transceivers provide bidirectional communication between the Gateway and Node, including fully acknowledged data transmission
- Site Survey analyzes the network's signal strength and reliability and displays the results on the Gateway's LCD
- LCD shows I/O status, Site Survey results, and network status information
- Lost RF links are detected and relevant outputs set to user-defined conditions



For additional information, updated documentation, and a list of accessories, refer to Banner Engineering's website, www.bannerengineering.com.

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.

Q Gateway Models

Model	Frequency	Environmental Rating	I/O
DX80G2M6-Q	2.4 GHz ISM Band	IP67, NEMA 6	Inputs: Six sourcing discrete Outputs: Six sourcing discrete
DX80G2M6-QC		IP20, NEMA 1	

Configure and Install Your Q45 Network

Follow these steps to set up and install your Wireless Q45 network.

1. On the Wireless Q45 Sensor Node:
 - a. Configure the DIP switches (if applicable).
 - b. Apply power.
2. On the Gateway or DXM:
 - a. Configure the DIP switches (if applicable).
 - b. Wire the I/O.
 - c. Apply power.
3. Bind the Q45 to the master radio.
4. Observe the LED behavior to verify the devices are communicating to each other.
5. Using the configuration software, configure the I/O mapping between the Q45 and its master radio.
6. Conduct a Site Survey between the Gateway and the Wireless Q45.
7. Install your devices.

Configure the Gateway

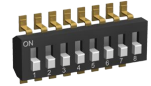
Configure the DIP Switches

Before changing DIP switch positions, disconnect the power⁽¹⁾. Any changes made to the DIP switches are not recognized until after power is cycled to the device. For parameters not set using the DIP switches, use the configuration software to make configuration changes. For parameters set using the DIP switches, the DIP switch positions override any changes made using the configuration software.

Access the Internal DIP Switches

Follow these steps to access the internal DIP switches.

1. Unscrew the four screws that mount the cover to the bottom housing.
2. Remove the cover from the housing without damaging the ribbon cable or the pins the cable plugs into.
3. Gently unplug the ribbon cable from the board mounted into the bottom housing. Skip this step if there is no ribbon cable (integrated battery models) or the ribbon cable is glued down (for C housing models).
4. Remove the black cover plate from the bottom of the device's cover.
The DIP switches are located behind the rotary dials.
5. Make the necessary changes to the DIP switches.
6. Place the black cover plate back into position and gently push into place.
7. If necessary, plug the ribbon cable in after verifying that the blocked hole lines up with the missing pin.
8. Mount the cover back onto the housing.



Q Gateway DIP Switch Settings

At this time, DIP switch 1 is not used.

Modbus/UCT Configured or DIP Switch Configured— In Modbus/Software Configured mode, use the DX80 Performance Configuration Software or a Modbus command to change the device parameters. DIP switch positions 3 through 8 are ignored. In DIP Switch Configured mode, use the DIP switches to configure the parameters listed in the table. By default, this Gateway uses the DIP switches to configure the device.

DIP Switch	
2	Modbus/UCT Configured or DIP Switch Configured
OFF *	DIP switch configured
ON	Modbus or UCT configured (DIP switches 3-8 are ignored)

Output State During a Radio Link Loss— The Sure Cross® wireless devices use a deterministic radio link time-out method to address RF link interruption or failure. When a radio link fails, all pertinent wired outputs are set to defined states until the link is recovered, ensuring that disruptions in the communications link result in predictable system behavior. Select the state the outputs are changed to during a link loss.

DIP Switches		
3	4	Output State During a Radio Link Loss
OFF *	OFF *	Off (discrete) or 0 mA (analog)
OFF	ON	On (discrete) or 20 mA (analog)
ON	OFF	Hold last stable state
ON	ON	Reserved

* Default configuration

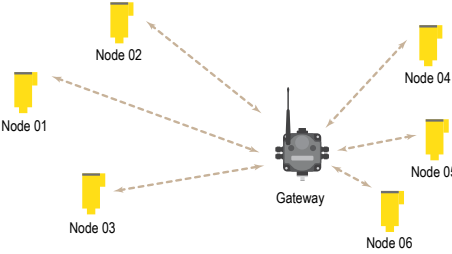
Heartbeat—In heartbeat mode, the Nodes send "heartbeat" messages to the Gateway at specific intervals to indicate the radio link is active. The heartbeat is always initiated by the Node and is used only to verify radio communications. In this network, the Wireless Q45 Sensors act as Nodes.

DIP Switch	
5	Heartbeat Settings
OFF *	30 seconds (30 to 60 second link loss timeout)
ON	5 seconds (5 to 10 second link loss timeout)

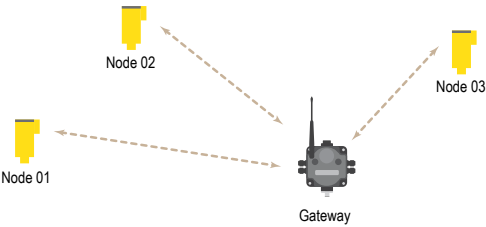
* Default configuration

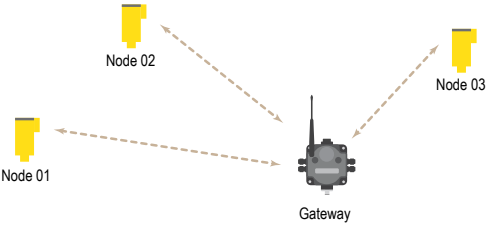
I/O and Link Loss Alarm Mapping - Wireless Q45 Sensors—The link loss alarm is set to zero (0) when the radio link is working and set to one (1) when the radio link is lost.

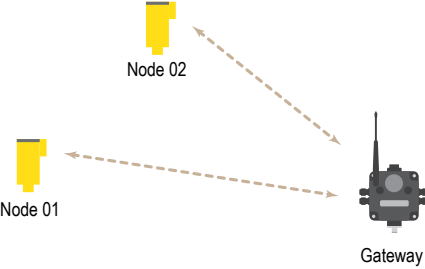
⁽¹⁾ For devices powered by batteries integrated into the housing, triple-click button 2, then double-click button 2 to reset the device without removing the battery.

Six Wireless Q45 Sensors to One Gateway	DIP Switches		
	6 = OFF*	7 = OFF*	8 = OFF*
 <p>Six Q45 Wireless Sensors: Q45 1 → Gateway OUT 1 Q45 2 → Gateway OUT 2; etc.</p>			


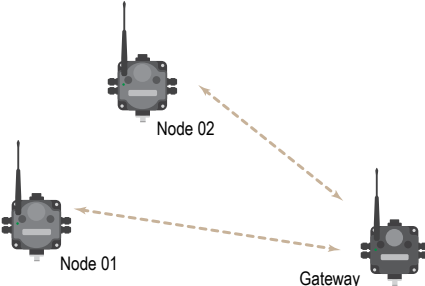
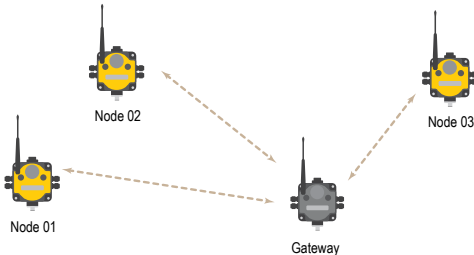
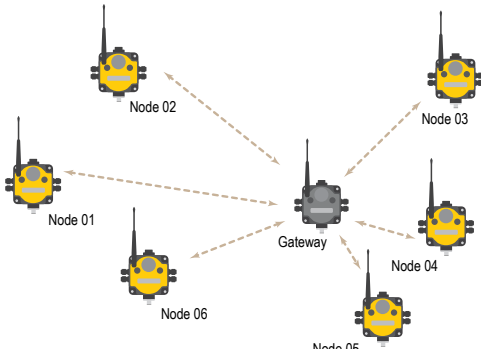
* Default configuration. To use up to 47 Nodes or Wireless Q45 Sensors with this Gateway, you must use a Modbus host controller system. For more information about using a host controller system, refer to the *Host Configuration* manual, Banner document part number 132114.

Three Wireless Q45 Sensors to One Gateway	DIP Switches		
	6 = OFF	7 = OFF	8 = ON
 <p>Three Wireless Q45 Sensors and three link loss: Q45 1 → Gateway OUT 1; Link loss alarm for Q45 1 → Gateway OUT 2 Q45 2 → Gateway OUT 3; Link loss alarm for Q45 2 → Gateway OUT 4 Q45 3 → Gateway OUT 5; Link loss alarm for Q45 3 → Gateway OUT 6</p>			

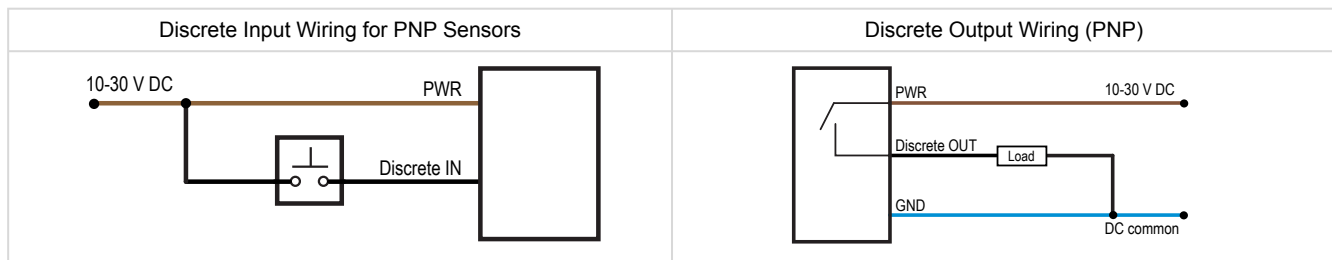
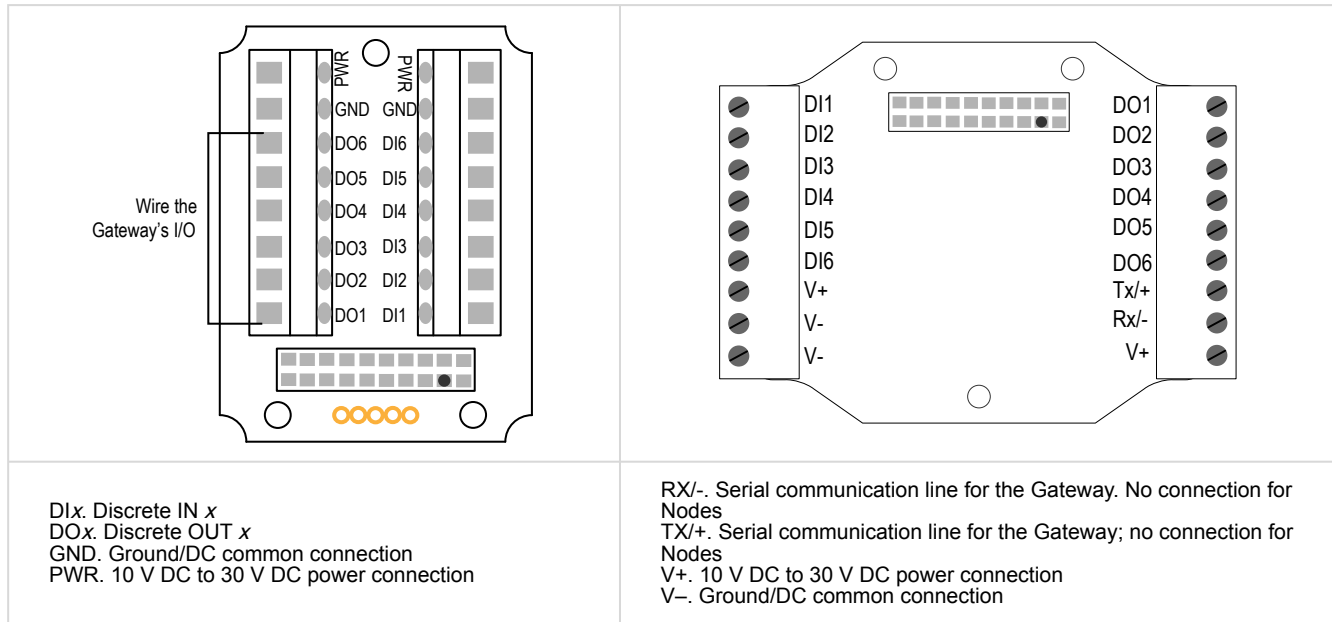
Three Wireless Q45 Sensors to One Gateway	DIP Switches		
	6 = OFF	7 = ON	8 = OFF
 <p>Three Wireless Q45 Sensors, two inputs each: Q45 1, IN 1 → Gateway OUT 1; Q45 1, IN 2 → Gateway OUT 2 Q45 2, IN 1 → Gateway OUT 3; Q45 2, IN 2 → Gateway OUT 4 Q45 3, IN 1 → Gateway OUT 5; Q45 3, IN 2 → Gateway OUT 6</p>			

Two Wireless Q45 Sensors to One Gateway	DIP Switches		
	6 = OFF	7 = ON	8 = ON
 <p>Two Wireless Q45 Sensors, two inputs each, with link loss: Q45 1, IN 1 → Gateway OUT 1 Q45 1, IN 2 → Gateway OUT 2 Link loss alarm for Q45 1 → Gateway OUT 3 Q45 2, IN 1 → Gateway OUT 4 Q45 2, IN 2 → Gateway OUT 5 Link loss alarm for Q45 2 → Gateway OUT 6</p>			

I/O and Link Loss Mapping - Nodes and Gateways

One Node to One Gateway	DIP Switches		
	6 = ON	7 = OFF	8 = OFF
 <p>Node 01</p> <p>Gateway</p>	<p>One Sure Cross DX80 Node with 6 inputs and 6 outputs:</p> <p>Node 1, IN 1 → Gateway OUT 1; Gateway IN 1 → Node 1, OUT 1</p> <p>Node 1, IN 2 → Gateway OUT 2; Gateway IN 2 → Node 1, OUT 2</p> <p>Node 1, IN 3 → Gateway OUT 3; Gateway IN 3 → Node 1, OUT 3</p> <p>Node 1, IN 4 → Gateway OUT 4; Gateway IN 4 → Node 1, OUT 4</p> <p>Node 1, IN 5 → Gateway OUT 5; Gateway IN 5 → Node 1, OUT 5</p> <p>Node 1, IN 6 → Gateway OUT 6; Gateway IN 6 → Node 1, OUT 6</p>		
Two Nodes to One Gateway	DIP Switches		
	6 = ON	7 = OFF	8 = ON
 <p>Node 02</p> <p>Node 01</p> <p>Gateway</p>	<p>Two Sure Cross DX80 Nodes, each with 3 inputs and 3 outputs</p> <p>Node 1, IN 1 → Gateway OUT 1; Gateway IN 1 → Node 1, OUT 1</p> <p>Node 1, IN 2 → Gateway OUT 2; Gateway IN 2 → Node 1, OUT 2</p> <p>Node 1, IN 3 → Gateway OUT 3; Gateway IN 3 → Node 1, OUT 3</p> <p>Node 2, IN 1 → Gateway OUT 4; Gateway IN 4 → Node 2, OUT 1</p> <p>Node 2, IN 2 → Gateway OUT 5; Gateway IN 5 → Node 2, OUT 2</p> <p>Node 2, IN 3 → Gateway OUT 6; Gateway IN 6 → Node 2, OUT 3</p>		
Three Nodes to One Gateway	DIP Switches		
	6 = ON	7 = ON	8 = OFF
 <p>Node 02</p> <p>Node 01</p> <p>Node 03</p> <p>Gateway</p>	<p>Three Sure Cross DX80 Nodes, each with 2 inputs and 2 outputs</p> <p>Node 1, IN 1 → Gateway OUT 1; Gateway IN 1 → Node 1, OUT 1</p> <p>Node 1, IN 2 → Gateway OUT 2; Gateway IN 2 → Node 1, OUT 2</p> <p>Node 2, IN 1 → Gateway OUT 3; Gateway IN 3 → Node 2, OUT 1</p> <p>Node 2, IN 2 → Gateway OUT 4; Gateway IN 4 → Node 2, OUT 2</p> <p>Node 3, IN 1 → Gateway OUT 5; Gateway IN 5 → Node 3, OUT 1</p> <p>Node 3, IN 2 → Gateway OUT 6; Gateway IN 6 → Node 3, OUT 2</p>		
Six Nodes to One Gateway	DIP Switches		
	6 = ON	7 = ON	8 = ON
 <p>Node 02</p> <p>Node 01</p> <p>Node 06</p> <p>Node 03</p> <p>Node 04</p> <p>Node 05</p> <p>Gateway</p>	<p>Six Sure Cross DX80 Nodes, each with 1 input and 1 output</p> <p>Node 1, IN 1 → Gateway OUT 1; Gateway IN 1 → Node 1, OUT 1</p> <p>Node 2, IN 1 → Gateway OUT 2; Gateway IN 2 → Node 2, OUT 1</p> <p>Node 3, IN 1 → Gateway OUT 3; Gateway IN 3 → Node 3, OUT 1</p> <p>Node 4, IN 1 → Gateway OUT 4; Gateway IN 4 → Node 4, OUT 1</p> <p>Node 5, IN 1 → Gateway OUT 5; Gateway IN 5 → Node 5, OUT 1</p> <p>Node 6, IN 1 → Gateway OUT 6; Gateway IN 6 → Node 6, OUT 1</p>		

Wire the Q Gateway IO



Modbus Register Table for the Gateway with Switch-Based Mapping

I/O	Modbus Holding Register (Gateway)	I/O Type	I/O Range		Holding Register Representation		Terminal Block Labels
			Min.	Max.	Min. (Dec.)	Max. (Dec.)	
1	1	Discrete IN 1	0	1	0	1	DI1
2	2	Discrete IN 2	0	1	0	1	DI2
3	3	Discrete IN 3	0	1	0	1	DI3
4	4	Discrete IN 4	0	1	0	1	DI4
5	5	Discrete IN 5	0	1	0	1	DI5
6	6	Discrete IN 6	0	1	0	1	DI6
7	7	Reserved					
8	8	Device Message					
9	9	Discrete OUT 1	0	1	0	1	DO1
10	10	Discrete OUT 2	0	1	0	1	DO2
11	11	Discrete OUT 3	0	1	0	1	DO3
12	12	Discrete OUT 4	0	1	0	1	DO4
13	13	Discrete OUT 5	0	1	0	1	DO5
14	14	Discrete OUT 6	0	1	0	1	DO6
15	15	Control Message					
16	16	Reserved					

Discrete Bit-Packed Registers

Discrete bit-packed registers include the discrete status registers, discrete inputs, and discrete outputs.

Bit packing involves using a single register, or range of contiguous registers, to represent I/O values.

When networks use similar Nodes to gather data using the same I/O registers for each Node, discrete data from multiple Nodes can be bit packed into a single register on the Gateway. The bit-packed data is arranged by I/O point starting at Modbus register 6601. For example, Discrete IN 1 for all the Nodes in the network is stored in three contiguous 16-bit registers.

The most efficient way to read (or write) discrete data from a Sure Cross® DX80 Gateway is by using these bit-packed registers because users can read or write registers for all devices using one Modbus message. The following registers contain discrete bit-packed I/O values for the Gateway and all Nodes. Values are stored first for the Gateway, then for each Node in order of Node address.

Discrete bit-packed register addresses and bit positions

Bit-Packed Device Status Registers

Register Address	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
6601	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8	Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Gateway
6602	Node 31	Node 30	Node 29	Node 28	Node 27	Node 26	Node 25	Node 24	Node 23	Node 22	Node 21	Node 20	Node 19	Node 18	Node 17	Node 16
6603	Node 47	Node 46	Node 45	Node 44	Node 43	Node 42	Node 41	Node 40	Node 39	Node 38	Node 37	Node 36	Node 35	Node 34	Node 33	Node 32

Bit-Packed Discrete Input 1

Register Address	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
6611	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8	Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Gateway
6612	Node 31	Node 30	Node 29	Node 28	Node 27	Node 26	Node 25	Node 24	Node 23	Node 22	Node 21	Node 20	Node 19	Node 18	Node 17	Node 16
6613	Node 47	Node 46	Node 45	Node 44	Node 43	Node 42	Node 41	Node 40	Node 39	Node 38	Node 37	Node 36	Node 35	Node 34	Node 33	Node 32

Bit-Packed Discrete Output 1

Register Address	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
6691	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8	Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Gateway
6692	Node 31	Node 30	Node 29	Node 28	Node 27	Node 26	Node 25	Node 24	Node 23	Node 22	Node 21	Node 20	Node 19	Node 18	Node 17	Node 16
6693	Node 47	Node 46	Node 45	Node 44	Node 43	Node 42	Node 41	Node 40	Node 39	Node 38	Node 37	Node 36	Node 35	Node 34	Node 33	Node 32

Discrete bit-packed registers for inputs and outputs

Inputs		Outputs	
Modbus Register Address (Decimal)	Description (Inputs)	Modbus Register Address (Decimal)	Description (Outputs)
6601–6603	Status for all devices		
6611–6613	Input 1 from all devices	6691–6693	Output 1 from all devices
6621–6623	Input 2 from all devices	6701–6703	Output 2 from all devices
6631–6633	Input 3 from all devices	6711–6713	Output 3 from all devices
6641–6643	Input 4 from all devices	6721–6723	Output 4 from all devices
6651–6653	Input 5 from all devices	6731–6733	Output 5 from all devices
6661–6663	Input 6 from all devices	6741–6743	Output 6 from all devices
6671–6673	Input 7 from all devices	6751–6753	Output 7 from all devices
6681–6683	Input 8 from all devices		

Status registers (6601–6603) contain a bit-packed representation defining the devices that are operational in the wireless system. Each bit indicates Node in Sync (1) or Node Not in Sync (0).

A one (1) written to the Discrete Status Register area indicates the device is active within the wireless system. A zero (0) indicates the device is not active within the wireless network.

Input registers from all devices use Modbus registers 6611 through 6683 to organize the least significant bit into a sequential array of registers. The first register contains the least significant bit from the input values for the Gateway through Node 15. The second register contains the input values for Node 16 through Node 31, and the third register contains the input values for Nodes 32 through 47.

For discrete inputs, only the least significant bit is used. For analog inputs, the least significant bit indicates if the analog value is above or below the selected threshold value (when using the threshold parameter configured in the User Configuration Software). For example, a least significant bit of one (1) indicates the analog value is above the selected threshold value. A least significant bit of zero (0) indicates the analog value is below the threshold value.

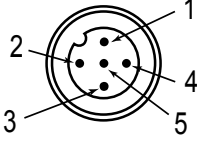
Output registers from all devices use Modbus registers 6691 through 6753 to organize the least significant bit into a sequential array of registers. Output 8 (I/O point 16) cannot be written using the discrete format.

Apply Power to the Gateway

5-pin M12 Wiring

Wiring the 5-pin M12 connector depends on the model and power requirements of the device. Connecting power to the communication pins will cause permanent damage.

5-pin M12 male connector wiring

5-pin M12 Male Connector	Pin	Wire Color	Description
	1	Brown (bn)	10 to 30 V DC
	2	White (wh)	RS485 / D1 / B / +
	3	Blue (bu)	DC common (GND)
	4	Black (bk)	RS485 / D0 / A / -
	5	Gray (gy)	Comms Ground

Apply Power to the DX80C Nodes

Wiring power to the DX80...C models varies depending the power requirements of the model. Connecting DC power to the communication pins (Tx/Rx) causes permanent damage. For *FlexPower* devices, do not apply more than 5.5 V to the B+ terminal.

Wiring for the C housing models

Terminal Label	Gateway and DX85	10 V DC to 30 V DC Powered Nodes	Battery-Powered Nodes
V+	10 V DC to 30 V DC	10 V DC to 30 V DC	
Tx/+	RS485 / D1 / B / +		
V-	DC common (GND)	DC common (GND)	DC common (GND)
Rx/-	RS485 / D0 / A / -		
B+			3.6 V DC to 5.5 V DC

Bind to the Gateway and Assign the Node Address

Before beginning the binding procedure, apply power to all the devices. Separate the devices by two meters when running the binding procedure. Put only one Gateway into binding at a time to prevent binding to the wrong Gateway.

- On the Gateway: Enter binding mode.
 - For housed DX80 Gateways, triple-click button 2 on the Gateway. Both LEDs flash red.
 - For Gateway board modules, triple-click the button. The green and red LED flashes.
- Assign the Q45 a Node address using the Gateway's rotary dials. Use the left rotary dial for the left digit and the right rotary dial for the right digit. For example, to assign your Q45 to Node 10, set the Gateway's left dial to 1 and the right dial to 0. Valid Node addresses are 01 through 47.
- On the Q45: Loosen the clamp plate on the top of the Q45 and lift the cover.
- Enter binding mode on the Q45 by triple-clicking the Q45's button.
The red and green LEDs flash alternately and the sensor searches for a Gateway in binding mode. After the Q45 is bound, the LEDs stay solid momentarily, then they flash together four times. The Q45 exits binding mode.
- Label the sensor with the Q45's Node address number for future reference.
- Repeat steps 2 through 5 for as many Q45s as are needed for your network.
- On the Gateway: After binding all Q45s, exit binding mode.
 - For housed DX80 Gateways, double-click button 2.
 - For board-level DX80 Gateways, double-click the button.

For Gateways with single-line LCDs: After binding your Q45 to the Gateway, make note of the binding code displayed under the Gateway's *DVCFG menu, XADR submenu on the LCD. Knowing the binding code prevents having to re-bind all Q45s if your Gateway is ever replaced.

Verify Communication Between the Gateway and the Wireless Q45 Sensor

After powering up and binding the Wireless Q45 Sensors to the Gateway, verify all devices are communicating properly. Verify the Gateway's LED 1 is green. Until communication is established with the Gateway, the Q45's red LED flashes. After communication is established, the Q45's green LED flashes.

When testing the Gateway and Wireless Q45 Sensors, verify all radios are at least two meters apart or the communications may fail.

Conducting a Site Survey (Gateway and Nodes)

A Site Survey, also known as a Radio Signal Strength Indication (RSSI), analyzes the radio communications link between the Gateway and any Node within the network by analyzing the radio signal strength of received data packets and reporting the number of missed packets that required a retry.

Perform a Site Survey before permanently installing the radio network to ensure reliable communication. Activate Site Survey mode from either the Gateway buttons or the Gateway Modbus holding register 15. Only the Gateway can initiate a Site Survey, and the Site Survey analyzes the radio communications link with one Node at a time.

Conduct a Site Survey Using the Menu System





Initiate a Site Survey using the Gateway's buttons and menu system.

1. Remove the Gateway's rotary dial access cover.
2. Set the Gateway's rotary dials to the desired Node number.
For example, to check the status of Node 1, set the Gateway's left rotary dial to 0 and the right rotary dial to 1. To check the status of Node 32, set the Gateway's left rotary dial to 3 and the right rotary dial to 2.
The Gateway is now enabled to read the status of the selected Node. The display scrolls through the Node's I/O status.
3. Single-click button 1 to scroll across the menu levels until reaching the Site Survey (SITE) menu.
4. Single-click button 2 to enter the Site Survey menu.
5. Single-click button 2 to begin conducting a Site Survey with the Node selected in step 2.
The Gateway analyzes the quality of the signal from the selected Node by counting the number of data packets it receives from the Node.
6. Examine reception readings (M, R, Y, G) of the Gateway at various locations.
Site survey results display as a percentage. M represents the percent of missed packets while R, Y, and G represent the percent of received packets at a given signal strength.
M = Percent of missed packets; R = RED marginal signal; Y = YELLOW good signal; G = GREEN excellent signal. Record the results if you need troubleshooting assistance from the factory.
7. Change the Gateway's rotary dials to conduct a Site Survey with another Node and repeat steps 2 through 6.
8. To end the Site Survey, double-click the Gateway's button 2.
9. Change the Gateway's rotary dials back to 0.
The LCD displays the device readings for the Gateway.
10. Double-click button 2 to move back to the top level menu.
11. Single-click button 1 to return to RUN mode.
12. Install the rotary dial access cover, referring to the Installation section of the manual to create an IP67 seal.

Interpreting the Site Survey Results

Site Survey results are listed as a percentage of data packets received and indicate the signal strength of the received signal.

Site survey results

	Result	Description
	Green	Packets received at a strong signal strength. A strong signal strength is greater than -90 dBm at the receiver.
	Yellow	Packets received at a good signal strength. A good signal is between -90 and -100 dBm at the receiver.
	Red	Packets received at a weak signal strength. A weak signal is less than -100 dBm at the receiver.
	Missed	Packets not received on the first transmission and requiring a retry.

Judging if the reliability of a network's signal meets the needs of the application is not just a matter of green, yellow, and red packets received. In normal operating mode, when data packets are not received, the transmitter re-sends the packet until all data is received.

For slow monitoring applications such as a tank farm, where data is required in terms of seconds or minutes, receiving most of the data in the 'red' range, indicating a weak but reliable signal, transmits enough data for accurate monitoring. Nodes positioned near the outside range of the radio signal may have 90% of the data packets received in the red zone, again indicating a weak, but reliable signal.

We recommend keeping the missed packets average to less than 25%. When the network misses more than 25% of the data packets, the signal is usually too unreliable or obstacles may be interfering with the signal. When Site Survey reports the missed packets are 25% or higher, improve the radio system performance by:

- **Mounting the network's antennas higher** to clear obstacles in the area and improve the line of sight between Sure Cross® devices
- **Using higher gain antennas** to focus the energy of the radio signal in a specific direction and extend the signal's range

- **Adding data radios to the network** to extend the range of a radio network. For more information on data radios, please refer to Banner's white paper on range extension on www.bannerengineering.com/wireless.

Specifications

Radio Specifications for 2.4 GHz Performance

Supplied Antenna

A 2 dB antenna ships with this device. High-gain antennas are available, but the transmit power and range depends on the antenna gain, environment, and line of sight. Always verify your wireless network's range by performing a Site Survey.

Radio Transmit Power (2.4 GHz radios)

Conducted: < 18 dBm (65 mW)
EIRP with the supplied 2 dB antenna: < 20 dBm (100 mW)

Radio Range

2.4 GHz: Up to 3.2 km (2 miles) with the supplied 2 dB antenna

Antenna Minimum Separation Distance

2.4 GHz (65 mW): 0.3 m (1 ft) with the supplied 2 dB antenna

Spread Spectrum Technology

FHSS (Frequency Hopping Spread Spectrum)

Link Timeout (Performance)

Gateway: Configurable via User Configuration Software
Node: Defined by Gateway

Antenna Connection

Ext. Reverse Polarity SMA, 50 Ohms
Max Tightening Torque: 0.45 N·m (4 lbf·in)

2.4 GHz Compliance (DX80-2400 Radio Module)

Radio module is indicated by the product label marking
Contains FCC ID: UE300DX80-2400: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
Contains IC: 7044A-DX8024
ANATEL: 15966-21-04042



2.4 GHz Compliance (SX243 Radio Module)

Radio module is indicated by the product label marking
Contains FCC ID: UE3SX243: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
ETSI/EN: EN 300 328 V2.2.2 (2019-07) [RED HarmStds]
Contains IC: 7044A-SX243
ANATEL: 03737-22-04042



RS-485 Communication Specifications

Communication Hardware (RS-485)

Interface: 2-wire half-duplex RS-485

Baud rates: 9.6k, 19.2k (default), or 38.4k
Data format: 8 data bits, no parity, 1 stop bit

Q Gateway Specifications

Supply Voltage

10 V DC to 30 V DC; Outside the USA: 12 V DC to 24 V DC, ± 10%
For European applications, power this device from a Limited Power Source as defined in EN 60950-1.
Consumption: Less than 1.4 W (60 mA) at 24 V DC

Discrete Inputs

Rating: 3 mA max current at 30 V DC
Sample Rate: 62.5 milliseconds
Report Rate: On change of state
ON Condition (PNP): Greater than 8 V
OFF Condition (PNP): Less than 5 V

Discrete Outputs

Update Rate: 125 milliseconds
ON Condition: Supply minus 2 V
OFF Condition: Less than 2 V
Output State Following Timeout: OFF

Discrete Output Rating (PNP)

100 mA max current at 30 V DC
ON-State Saturation: Less than 3 V at 100 mA
OFF-state Leakage: Less than 10 µA

Housing

Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers
Weight: 0.26 kg (0.57 lbs)
Mounting: #10 or M5 (SS M5 hardware included)
Max. Tightening Torque: 0.56 N·m (5 lbf·in)

Interface

Indicators: Red/Green Power LED, Red/Yellow Signal LED

Wiring Access

Two 1/2-inch NPT

Certifications



Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM



Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

(CE/UKCA approval only applies to 2.4 GHz models)

Environmental Specifications (IP67 Housing Models)

Operating Conditions

−40 °C to +85 °C (−40 °F to +185 °F) (Electronics); −20 °C to +80 °C (−4 °F to +176 °F) (LCD)

95% maximum relative humidity (non-condensing)

Radiated Immunity: 10 V/m (EN 61000-4-3)

Shock and Vibration

All models meet IEC 60068-2-6 and IEC 60068-2-27 testing criteria

Shock: 30G 11 ms duration, half sine wave per IEC 60068-2-27

Vibration: 10 Hz to 55 Hz, 0.5 mm peak-to-peak amplitude per IEC 60068-2-6

Environmental Ratings

IEC IP67; NEMA 6

For installation and waterproofing instructions, go to www.bannerengineering.com and search for the complete instruction manual (p/n 132607)

Operating the devices at the maximum operating conditions for extended periods can shorten the life of the device.

Warnings



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: Please download the complete Gateway for the Wireless Q45 Sensors 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 Gateway for the Wireless Q45 Sensors, 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 Gateway for the Wireless Q45 Sensors sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

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 dBi. Antennas not included in this list or having a gain greater than 9 dBi 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:

- **Never operate a radio without connecting an antenna**
- Operating 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 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.

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.

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

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Original Instructions
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