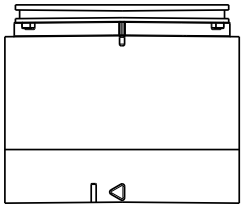
R70 Wireless MultiHop Communication Segment

Datasheet

The Sure Cross® R70 Wireless MultiHop Communication Segment combines the best of Banner's popular Tower Light family with its reliable, field proven, Sure Cross wireless architecture.

Benefits

- Enables machine monitoring and Overall Equipment Effectiveness by collecting available machine data for analysis and to identify causes of lost production
- Lowers the cost and complexity of line and plant reconfigurations
- Provides an easy way to implement remote monitoring and the Industrial Internet of Things (IIoT)



- **Easy Installation**—Adds wireless communication and networking capabilities to new or existing TL70 Tower Lights
- **Power Options**—Works with either the standard DC-powered or AC-powered TL70 base
- **Input Flexibility**—Accepts PNP or NPN inputs
- **No Constant Power**—Uses machine input power for lights and stores power to keep radio in sync
- **Industrial Design**—Rugged, water-resistant IP65 housing with UV-stabilized material
- **Powerful Radio**—Available in 900 MHz (1 watt) and 2.4 GHz (65 mW) ISM Bands

Important: Please download the complete R70 Wireless MultiHop Communication Segment 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 R70 Wireless MultiHop Communication Segment, 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 R70 Wireless MultiHop Communication Segment sur notre site www.bannerengineering.com pour les détails sur leur utilisation correcte, les applications, les notes de sécurité et les instructions de montage.

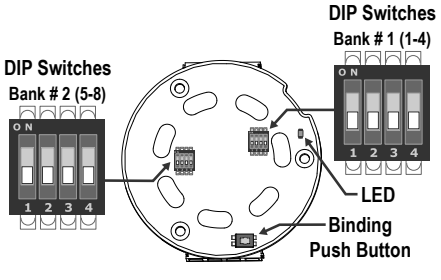
Models

Model	Base Color	Frequency	Input	Output
SG-R70-DR9M	Black	900 MHz ISM Band	Six PNP/NPN discrete	Six discrete
SG-R70-DR2M	Black	2.4 GHz ISM Band		

Configuration Instructions

DIP Switch Settings (MultiHop)

Before applying power to the device, set the radio module's DIP switches. Default configurations are noted with *.



ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Device Settings	Switches							
	1	2	3	4	5	6	7	8
Reserved	OFF *	OFF *						
Reserved			ON *	ON *				
Transmit power 900 MHz radios: 1.00 Watt (30 dBm) 2.4 GHz radios: 0.065 Watts (18 dBm) and 60 ms frame					OFF *			
Transmit power 900 MHz radios: 0.25 Watts (24 dBm) 2.4 GHz radios: 0.065 Watts (18 dBm) and 40 ms frame					ON			
Reserved						OFF *		
MultiHop radio setting: Repeater							OFF *	OFF *
Reserved							OFF	ON
MultiHop radio setting: Slave							ON	OFF
MultiHop radio setting: Reserved							ON	ON

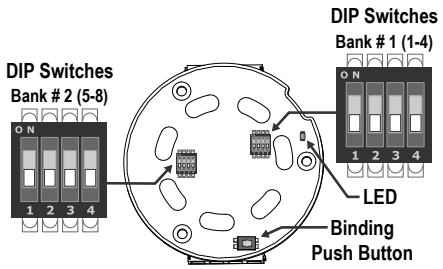
Transmit Power Levels/Frame Size

The 900 MHz data radios can be operated at 1 watt (30 dBm) or 0.250 watt (24 dBm). For most models, the default transmit power is 1 watt.

For 2.4 GHz radios, the transmit power is fixed at 0.065 watt (18 dBm) and DIP switch 5 is used to set the frame timing. The default position (OFF) sets the frame timing to 60 milliseconds. To increase throughput, set the frame timing to 40 milliseconds. For battery-powered devices, increasing the throughput decreases battery life.

Important: Prior to date code 15341 and radio firmware version 3.6, the frame timing was 40 ms (OFF) or 20 ms (ON).

Bind the R70 Wireless MultiHop Communication Segment to Form Networks



Binding MultiHop radios ensures all MultiHop radios within a network communicate only with other radios within the same network. The MultiHop radio master automatically generates a unique binding code when the radio master enters binding mode. This code is then transmitted to all radios within range that are also in binding mode. After a repeater/slave is bound, the repeater/slave radio accepts data only from the master to which it is bound. The binding code defines the network, and all radios within a network must use the same binding code.

Before using the R70 devices, you must bind them to the MultiHop master radio and assign a device ID using the master's rotary dials. There are no physical switches or dials on the R70 radio. To bind and address an R70, follow these steps.

On the MultiHop Master Radio

1. Apply power to the master radio.
2. Triple click button 2 to enter binding mode. For the two LED/button models, both LEDs flash red and the LCD shows *BINDNG and *MASTER. For single LED/button models, the LED flashes alternatively red and green.
3. Using the rotary dials, select the Device ID to assign to the R70. Use the left rotary dial for the left digit and the right rotary dial for the right digit. For example, to assign your R70 to Device ID 10, set the left dial to 1 and the right dial to 0.

On the R70 Wireless MultiHop Communication Segment

1. Click the button on R70 three times to place the R70 into binding mode. After entering binding mode, the R70 LEDs blink slowly, alternating between red and green. After the R70 receives a valid binding code from the MultiHop Master Radio, the red and green LEDs are both illuminated continuously, resulting in a slightly orange light. The red and green LEDs simultaneously flash four times to indicate that the R70 accepts the binding code. The R70 enters RUN mode.

2. After binding the R70 to the MultiHop Master Radio and assigning it a unique Device ID, write the Device ID on the R70's label.
3. Repeat this sequence (R70 steps 1 and 2) for as many R70s as you need to bind. If two R70s are accidentally assigned the same Device ID, rerun the binding procedure on one of the R70s to reassign the ID. The binding sequence may be run on a R70 as many times as necessary.

On the MultiHop Master Radio

1. To exit binding mode, double click button 2 on the MultiHop master radio. The master radio reboots and enters RUN mode.

Slave and Repeater R70 Wireless MultiHop LED Behavior

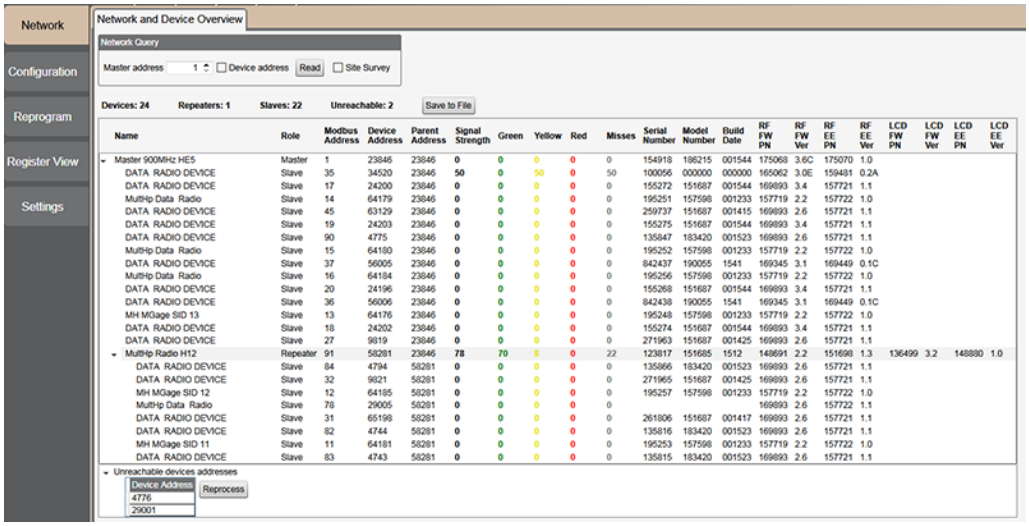
All bound radios set to slave or repeater modes follow this LED behavior after powering up.

Process Steps	Response	LED
1	Apply power to the radio	Solid red and green (orange) for 8 seconds
2	The slave/repeater searches for a parent device.	Flashes red
3	A parent device is detected. The slave/repeater searches for other parent radios within range.	Solid red
4	The slave/repeater selects a suitable parent.	Solid red and green (orange)
5	The slave/repeater attempts to synchronize to the selected parent.	Solid red
6	The slave/repeater enters RUN mode.	Solid green, then flashes green
7	The slave/repeater is synchronized to the parent.	Flashes green
	Serial data packets begin transmitting between the slave/repeater and its parent radio.	Flashes red and green (orange)

MultiHop Configuration Software

Use Banner's MultiHop Configuration Software to view your MultiHop radio network and configure the radio and its I/O.

Figure 1. MultiHop Configuration Software Network and Device Overview screen



The software connects to a MultiHop master radio using one of four methods.

- Serial; using a USB to RS-485 (for RS-485 radios) or a USB to RS-232 (for RS-232 radios) converter cable.
- Modbus TCP; using an Ethernet connection to an Ethernet radio master.
- Serial DXM; using a USB cable to a DXM Controller to access a MultiHop master radio.
- TCP DXM: using an Ethernet connection to a DXM Controller to access a MultiHop master radio.

For MultiHop DX80DR9* models, Banner recommends using **BWA-UCT-900**, an RS-485 to USB adapter cable with a wall plug that can power your 900 MHz 1 Watt MultiHop radio while you configure it. The adapter cable is not required when connecting to a DXM Controller.

Download the most recent software revision from the Wireless Reference Library on Banner Engineering's website: www.bannerengineering.com.

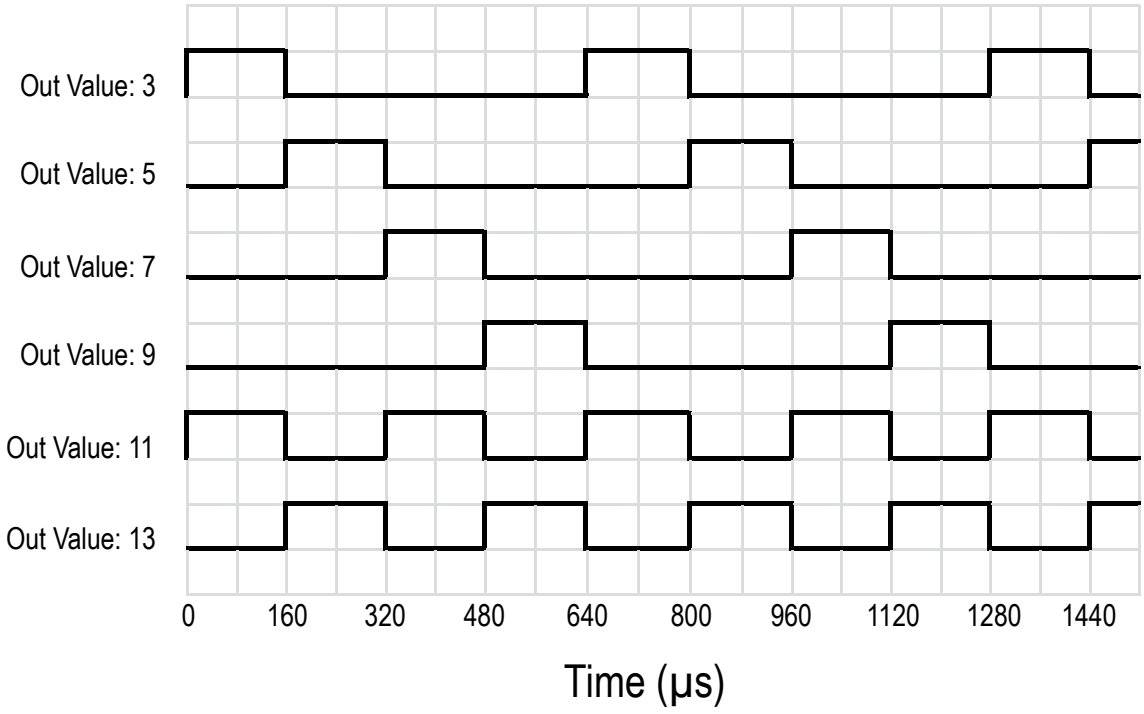
Modbus Registers

Modbus Holding Register (4xxxx)	I/O Type	I/O Range		Holding Register Representation (Dec.)		Module #
		Min.	Max.	Min.	Max.	
1	Discrete IN 1	0	1	0	1	M1
2	Discrete IN 2	0	1	0	1	M2
3	Discrete IN 3	0	1	0	1	M3
4	Discrete IN 4	0	1	0	1	M4
5	Discrete IN 5	0	1	0	1	M5
6	Discrete IN 6	0	1	0	1	M6
501	Light OUT 1	0	65535	0	65535	M1
502	Light OUT 2	0	65535	0	65535	M2
503	Light OUT 3	0	65535	0	65535	M3
504	Light OUT 4	0	65535	0	65535	M4
505	Light OUT 5	0	65535	0	65535	M5
506	Light OUT 6	0	65535	0	65535	M6

Flash Pattern

Write specific values to the light OUT registers to control the light's behavior.

Light OUT Register Value	Light Operation
1	On
3	Flashing at 1.5 Hz
5	Delay of 160 µs, then flashing at 1.5 Hz
7	Delay of 320 µs, then flashing at 1.5 Hz
9	Delay of 480 µs, then flashing at 1.5 Hz
11	Flashing at 3 Hz
13	Delay of 160 µs, then flashing at 3 Hz



Example -- Lights Racing Up the Stack

To program all four lights to come on at a different time to appear to race up the light stack, write a 3 to M1, 5 to M2, 7 to M3, and a 9 to M4.

Specifications

MultiHop Radio with Internal Antenna Specifications

Radio Range [1]
900 MHz, 1 Watt: Up to 3.2 km (2 miles) with line of sight (internal antenna)
2.4 GHz, 65 mW: Up to 1000 m (3280 ft) with line of sight (internal antenna)

Antenna Minimum Separation Distance
900 MHz, 150 mW and 250 mW: 2 m (6 ft)
900 MHz, 1 Watt: 4.57 m (15 ft)
2.4 GHz, 65 mW: 0.3 m (1 ft)

Radio Transmit Power
900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)
2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP

Spread Spectrum Technology
FHSS (Frequency Hopping Spread Spectrum)

900 MHz Compliance (1 Watt)
FCC ID UE3RM1809: FCC Part 15, Subpart C, 15.247
IC: 7044A-RM1809
IFT: RCPBARM13-2283

(NOM approval only applies to 900 MHz models)

2.4 GHz Compliance (MultiHop)
FCC ID UE300DX80-2400: FCC Part 15, Subpart C, 15.247
Radio Equipment Directive (RED) 2014/53/EU
IC: 7044A-DX8024
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Radio Packet Size (MultiHop)
900 MHz: 175 bytes (85 Modbus registers)
2.4 GHz: 75 bytes (37 Modbus registers)

R70 Specifications

Supply Voltage and Current
12 V DC to 30 V DC (Outside the USA: 12 V DC to 24 V DC, ± 10%) [2]
900 MHz Consumption: Maximum current draw is < 40 mA and typical current draw is < 30 mA at 24 V DC. (2.4 GHz consumption is less.)

Indicator Color or Audible Model	Maximum Current (mA)	
	at 12 V DC	at 30 V DC
Blue, Green, White	420	150
Red, Yellow, Orange	285	120
Standard Audible	30	30
Loud Audible (Intensity 1)	18	14
Loud Audible (Intensity 2)	40	28
Loud Audible (Intensity 3)	160	70
Loud Audible (Intensity 4)	350	110

Supply Protection Circuitry
Protected against transient voltages

Construction
Bases, Segments, Covers: Polycarbonate

Indicators
1 to 6 colors depending on model (Green, Red, Yellow, Blue, White, and Orange)
LEDs are independently selected
Flash Rates: 1.5 Hz ±10% and 3 Hz ±10%

Indicator Response Time
Off Response: 150 µs (maximum) at 12 V DC to 30 V DC
On Response: 180 ms (maximum) at 12 V DC; 50 ms (maximum) at 30 V DC

Operating Conditions
–40 °C to +50 °C (–40 °F to +122 °F)
95% at +50 °C maximum relative humidity (non-condensing)

Audible Alarm
Standard Audible: 2.6 KHz ± 250 Hz oscillation frequency; maximum intensity (typical) 92 dB at 1 m (3.3 ft)
Loud Audible: 2.6 KHz ± 250 Hz oscillation frequency; maximum intensity (typical) at 1 m (3.3 ft)

DIP Switches		Max Intensity (Loud Audible)
9	10	
ON	ON	Intensity 4: 101 dB
OFF	ON	Intensity 3: 99 dB
ON	OFF	Intensity 2: 92 dB
OFF	OFF	Intensity 1: 85 dB

Audible Adjustment
Standard Audible: Rotate the cover until the desired volume is reached
Loud Audible Adjustment: Select the desired volume using DIP switches 9 and 10
Typical Reduction in Sound Intensity with Audible Adjustment (maximum to minimum):
- **Standard Audible:** 8 dB
- **Loud Audible:** 16 dB

Connections
5-pin M12/Euro-style quick disconnect, 8-pin M12/Euro-style quick disconnect, 150 mm (5.9 in) PVC cable with an M12/Euro-style quick disconnect, or 2 m (6.5 ft) unterminated cable, depending on model

Vibration and Mechanical Shock
Vibration: 10 Hz to 55 Hz, 0.5 mm peak-to-peak amplitude per IEC 60068-2-6
Shock: 15G 11 ms duration, half sine wave per IEC 60068-2-27

Environmental Rating
IP65

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

[1] Range depends on the environment and decreases significantly without line of sight. Always verify your wireless network's range by performing a Site Survey.
[2] For European applications, power this device from a Limited Power Source as defined in EN 60950-1.

Indicator Characteristics

Color	Dominant Wavelength (nm) or Color Temperature (CCT)	Color Coordinates [3]		Lumen Output (Typical at 25 °C)
		x	y	
Green	525 nm	–	–	92
Red	625 nm	–	–	40
Yellow	590 nm	–	–	22
Blue	470 nm	–	–	32
White	5000 K	–	–	125
Orange	–	0.66	0.33	33

Certifications

CE

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

(CE approval only applies to 2.4 GHz models)

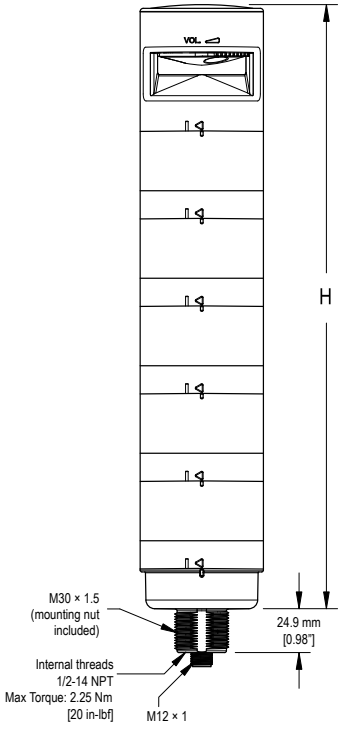
Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Dimensions



Model	Height (H)
1 light module	87.6 mm (3.45 in)
1 light module, 1 audible module	144.3 mm (5.68 in)
2 light modules	137.3 mm (5.41 in)
2 light modules, 1 audible module	194 mm (7.64 in)
3 light modules	187 mm (7.36 in)
3 light modules, 1 audible module	243.7 mm (9.59 in)
4 light modules	236.7 mm (9.32 in)
4 light modules, 1 audible module	293.4 mm (11.55 in)
5 light modules	286.4 mm (11.28 in)
5 light modules, 1 audible module	343.1 mm (13.5 in)

[3] Refer to CIE 1931 chromaticity diagram or color chart, to show equivalent color with indicated color coordinates.

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Antenas SMA	Modelo
Antena, Omni 902-928 MHz, 2 dBd, junta de caucho, RP-SMA Macho	**BWA-9O2-C**
Antena, Omni 902-928 MHz, 5 dBd, junta de caucho, RP-SMA Macho	**BWA-9O5-C**

Antenas Tipo-N	Modelo
Antena, Omni 902-928 MHz, 6 dBd, fibra de vidrio, 1800mm, N Hembra	**BWA-9O6-A**
Antena, Yagi, 900 MHz, 10 dBd, N Hembra	**BWA-9Y10-A**

Mexican Importer

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David Alfaro Siqueiros 103 Piso 2 Valle oriente
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more sensors, more solutions

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