S22 Pro Indicator with Modbus® Product Manual

Original Instructions
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1.1 Models 3

Chapter 1 Features



- Modbus® control allows access to full color and advanced animations
- Bright, uniform indicator
- 22 mm threaded polycarbonate base
- Up to fourteen colors in one device (Green, Red, Yellow, Blue, White, Cyan, Magenta, Orange, Amber, Lime Green, Spring Green, Sky Blue, Violet, and Rose)
- Translucent polycarbonate surface
- Rugged IP67, IP69K per ISO 20653 and UL Type 4X and UL Type 13 design

1.1 Models

Model Name	Style	Color and Input	Connector[1]
S22	**P**	**S**	**Q**
	P = Pro Indicator	S = Modbus	Q = Integral 5-pin M12 male quick-disconnect connector

[1] Models with a quick-disconnect connector require a mating cordset.

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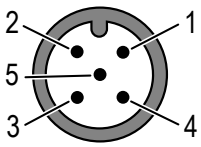
Chapter 2 Wiring

Pinout	Pin	Wire Color	Connection
	1	brown	12 V DC to 30 V DC
	2	white	RS-485 (+)
	3	blue	DC common
	4	black	RS-485 (-)
	5	gray	Not used

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Chapter 3 Overview of Modbus and PICK-IQ

3.1 Communications

These devices are powered by PICK-IQ®, a purpose-built, Modbus RTU compatible serial bus protocol that uses a Common ID to reduce the typical latency that results from polling multiple devices.

The standard Modbus protocol structure does not offer the performance required to operate medium to large sized pick-to-light systems with low latency response times. Adding more devices to a pick-to-light system running standard Modbus protocol eventually makes a pick-to-light system unusable because of the request/response nature of the protocol. The communication latency to and from the master device is too slow.

Using PICK-IQ adds a simple change to the devices that allow the Modbus master controller to run standard Modbus protocol, but achieve the performance required by a medium to large sized pick-to-light system. This change is the addition of a common ID addressing scheme.

3.2 Common ID

PICK-IQ devices each have an individual Modbus address called the device ID. PICK-IQ devices also have another address called the common ID.

By adding a common ID, the device responds to an additional address that can be shared among all devices in the system. For example, if a device has a device ID of 5 and a common ID of 195, then the device responds to all messages addressed to ID 5, regardless of actuation status, and messages are addressed to ID 195 when the device is actuated. The addition of this common address functionality allows the overall system to run much faster than a standard polling Modbus network.

When the Modbus master in the system is looking for an actuated device somewhere in the network, it only needs to poll the common ID instead of the entire system. When a device is actuated, it responds to the common ID. Through the common ID, the master can read the unit's device ID stored in register 7940. When polling the common ID, Banner recommends reading a minimum of the device ID register 7940 and the output state register 7941. These registers hold the device ID of the device that was actuated and the status of which sensor was actuated on the device. When reading information from the common ID, only registers 7940 through 7942 are accessible. All other registers should be accessed through the device IDs.

After the device ID of the actuated device is known, use direct communication to the device through its unique device ID.

To prevent the device from responding to the same actuation event, reset the output state register 7941 to 0 by either changing the value directly or by writing to any register 8700 through 8752 before polling the common ID for new actuations. Write these values through the devices' unique device ID and not the common ID. When the value in register 7941 is 0, the device will not respond to the common ID. The addition of this common address functionality allows the overall system to run much faster than a standard polling Modbus network.

Summary of registers:

- 7940—Defines the unique device ID
- 7941—Defines the output state
- 8700—Defines the device job state
- 8810—Defines the common ID

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Chapter 4 Modbus Register Map

4.1 Holding Register Column Definitions

Base 0 Address

Registers are addressed with the first register starting at zero

Base 1 Address

Registers are addressed with the first register starting at one

Description

Lists the functionality of the register

Holding Register Representation

Lists the allowed values of the register and the definition of those values

Default Value

Lists the factory default value of the register

Saved

Yes: The register value is stored in non-volatile memory, and is preserved when power is cycled
No: The register value is stored in volatile memory, and is reset to the default value when power is cycled

Access

Read Only (RO): The register can be read, but not written to
Read and Write (RW): The register can be read and written to

4.2 Device Information

The following registers list the model name and other device-specific information.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
1000	1001	Low word model number	Example: 0x0002A734 (hex) = 173876 (dec) High word = 0x0002 Low word = 0xA734	See Device	Yes	RO
1001	1002	High word model number			Yes	RO
1002	1003	Model version (BCD)		See Device	Yes	RO
1003-1018	1004-1019	Model name, string		See Device	Yes	RO
1019	1020	Low word configuration number	Example: 0x00016D43 (hex) = 93507 (dec) High word = 0x0001 Low word = 0x6D43	See Device	Yes	RO
1020	1021	High word configuration number			Yes	RO
1021	1022	Configuration version (BCD)		See Device	Yes	RO
1022-1037	1023-1038	Serial number/date code, string		See Device	Yes	RO

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
1038-1053	1039-1054	Serial number, string		See Device	Yes	RO

4.3 Modbus Configuration

Use these registers to configure Modbus communications.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
6100	6101	Device ID: the Modbus individual node ID	1-247	1	Yes	RW
6101	6102	Baud rate	12 = 1200 24 = 2400 48 = 4800 96 = 9600 192 = 19200	192	Yes	RW
6102	6103	Parity	0 = none 1 = odd 2 = even	0	Yes	RW
6103	6104	Stop Bits	1 = 1 2 = 2 3 = 1.5	1	Yes	RW
6120	6121	Saving: When the Saving value is 0, affected registers are saved immediately after every change. When Saving is set to 1, those registers are not saved until the Saving register is set to 0.	0 = Registers are saved to non-volatile memory (including this register) 1 = Registers are not saved to non-volatile memory (including this register)	0	0 = Yes 1 = No	RW

4.4 Operation Mode

Use this register to select the main operation mode of the device.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3200	3201	Operation Mode	0 = Multicolor Mode 1 = Reserved 2 = Advanced Mode 3 = Demo Mode 4 = PICK-IQ Mode	4	Yes	RW

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4.4.1 Multicolor Mode

Use one register to activate the defined device state. Use additional non-volatile registers to define output settings, control delays, color, intensity, flash, and other animation types for State 1, State 2, State 3, and State 4.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3001	3002	Current Multicolor Mode Animation State	0 = State 1 1 = State 2 2 = State 3 3 = State 4	0	No	RO
3020	3021	Set Multicolor Mode Animation State	0 = State 1 1 = State 2 2 = State 3 3 = State 4	0	No	RW
3300	3301	State 1 Animation Type	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	1	Yes	RW
3301	3302	State 1 Animation Pattern	0 = Flash 1 = Strobe 2 = Three Pulse 3 = SOS 4 = Random	0	Yes	RW
3302	3303	State 1 Animation Speed	0 = Slow 1 = Medium 2 = Fast 3 = Custom	1	Yes	RW
3303	3304	Reserved				
3304	3305	Reserved				
3305	3306	Reserved				

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3306	3307	State 1 Color 1	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	0	Yes	RW
3307	3308	State 1 Color 1 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW
3308	3309	State 1 Color 2	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	0	Yes	RW
3309	3310	State 1 Color 2 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3310	3311	State 2 Animation Type	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	1	Yes	RW
3311	3312	State 2 Animation Pattern	0 = Flash 1 = Strobe 2 = Three Pulse 3 = SOS 4 = Random	0	Yes	RW
3312	3313	State 2 Animation Speed	0 = Slow 1 = Medium 2 = Fast 3 = Custom	1	Yes	RW
3313	3314	Reserved				
3314	3315	Reserved				
3315	3316	Reserved				
3316	3317	State 2 Color 1	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	1	Yes	RW
3317	3318	State 2 Color 1 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3318	3319	State 2 Color 2	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	0	Yes	RW
3319	3320	State 2 Color 2 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW
3320	3321	State 3 Animation Type	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	1	Yes	RW
3321	3322	State 3 Animation Pattern	0 = Flash 1 = Strobe 2 = Three Pulse 3 = SOS 4 = Random	0	Yes	RW
3322	3323	State 3 Animation Speed	0 = Slow 1 = Medium 2 = Fast 3 = Custom	1	Yes	RW
3323	3324	Reserved				
3324	3325	Reserved				
3325	3326	Reserved				

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3326	3327	State 3 Color 1	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	4	Yes	RW
3327	3328	State 3 Color 1 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW
3328	3329	State 3 Color 2	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	0	Yes	RW
3329	3330	State 3 Color 2 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3330	3331	State 4 Animation Type	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	1	Yes	RW
3331	3332	State 4 Animation Pattern	0 = Flash 1 = Strobe 2 = Three Pulse 3 = SOS 4 = Random	0	Yes	RW
3332	3333	State 4 Animation Speed	0 = Slow 1 = Medium 2 = Fast 3 = Custom	1	Yes	RW
3333	3334	Reserved				
3334	3335	Reserved				
3335	3336	Reserved				
3336	3337	State 4 Color 1	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	9	Yes	RW
3337	3338	State 4 Color 1 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3338	3339	State 4 Color 2	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	0	Yes	RW
3339	3340	State 4 Color 2 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW

4.4.2 Advanced Mode

Use volatile registers to control color, intensity, flash, and other animation types. Use custom registers to create custom colors, intensity, and speeds.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3060	3061	Animation Type	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	1	Yes	RW
3061	3062	Animation Pattern	0 = Flash 1 = Strobe 2 = Three Pulse 3 = SOS 4 = Random	0	Yes	RW
3062	3063	Animation Speed	0 = Slow 1 = Medium 2 = Fast 3 = Custom	1	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3063	3064	Reserved				
3064	3065	Reserved				
3065	3066	Reserved				
3066	3067	Color 1	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	0	Yes	RW
3067	3068	Color 1 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW
3068	3069	Color 2	0 = Green 1 = Red 2 = Orange 3 = Amber 4 = Yellow 5 = Lime Green 6 = Spring Green 7 = Cyan 8 = Sky Blue 9 = Blue 10 = Violet 11 = Magenta 12 = Rose 13 = White 14 = Custom 1 15 = Custom 2	0	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3069	3070	Color 2 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	0	Yes	RW

4.4.3 Demo Mode

Cycles through color spectrum, two color sweep, and intensity sweep mode. When set to demo mode, the device will cycle through the defined sequence when power is applied regardless of its connection to a Modbus master.

4.4.4 PICK-IQ Mode

Basic Mode - This operating mode is the most straightforward to configure. In basic mode, the master controls all aspects of the device. The master must communicate all logic functions by defining what the transitions will look like.

State Mode - State mode requires the configuration of the device to define the visual settings for the four standard pick-to-light logic states, defined below. These settings are embedded inside the device and do not require communication from the master device to change visual states after the device is actuated. This allows the device to respond immediately to any interaction and allows the communication to the master to happen simultaneously.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
7940	7941	Modbus slave ID of active device, same as register 6100	1-247	1	Yes	RO
8810	8811	Common ID	1-247	195	Yes	RW
-	-	-	-	-	-	-
3001	3002	Current PICK-IQ Animation State	0 = Waiting State 1 = Reserved 2 = Job State 3 = Acknowledge StateReserved	0	No	RO
-	-	-	-	-	-	-
6300	6301	Enable Basic or State Mode	0 = Basic Mode, 1 = State Mode	0	Yes	RW
Basic Mode Registers						
8701	8702	Basic Animation Type	0 = Off 1 = Steady 2 = Flash 3 = Strobe 11-20 N-Pulse (N = Index - 10) (for example, 13 = 3 Pulse)	0	No	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
8702	8703	Basic Color 1	0 = Off 1 = Red 2 = Green 3 = Yellow 4 = Blue 5 = Magenta 6 = Cyan 7 = White 8 = Amber 9 = Rose 10 = Lime Green 11 = Orange 12 = Sky Blue 13 = Violet 14 = Spring Green	0	No	RW
6200	6201	Basic Color 1 Intensity	0 = Low 1 = Medium 2 = High	1	Yes	RW
State Mode Registers						
8700	8701	Job State Any write to this register resets the device latch in Register 7941	0 = Waiting State, 1 = Job State	0	No	RW
8701	8702	Job State Override Animation Active when Job State = 1. This value will then override the value in register 6323.	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	0	No	RW
8702	8703	Job State Override Color 1 Active when Job State = 1. This value will then override the value in register 6324.	0 = Red 1 = Green 2 = Yellow 3 = Blue 4 = Magenta 5 = Cyan 6 = White 7 = Amber 8 = Rose 9 = Lime Green 10 = Orange 11 = Sky Blue 12 = Violet 13 = Spring Green	0	No	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
6301	6302	Waiting State: Animation	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	1	Yes	RW
6302	6303	Waiting State: Color 1	0 = Red 1 = Green 2 = Yellow 3 = Blue 4 = Magenta 5 = Cyan 6 = White 7 = Amber 8 = Rose 9 = Lime Green 10 = Orange 11 = Sky Blue 12 = Violet 13 = Spring Green	1	Yes	RW
6303	6304	Waiting State: Color 2	0 = Red 1 = Green 2 = Yellow 3 = Blue 4 = Magenta 5 = Cyan 6 = White 7 = Amber 8 = Rose 9 = Lime Green 10 = Orange 11 = Sky Blue 12 = Violet 13 = Spring Green	1	Yes	RW
6304	6305	Waiting State: Intensity for Color 1	0 = High 1 = Medium 2 = Low 3 = Off	0	Yes	RW
6305	6306	Waiting State: Intensity for Color 2	0 = High 1 = Medium 2 = Low 3 = Off	0	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
6306	6307	Waiting State: Animation Speed	0 = Slow 1 = Standard 2 = Fast	1	Yes	RW
6307	6308	Waiting State: Animation Pattern	0 = Normal 1 = Strobe 2 = Three Pulse 3 = SOS 4 = Random	0	Yes	RW
6308	6309	Reserved				
6309	6310	Reserved				
6310	6311	Reserved				
6311	6312	Reserved				
6323	6324	Job State: Animation	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = Intensity Sweep 5 = Color Sweep	1	Yes	RW
6324	6325	Job State: Color 1	0 = Red 1 = Green 2 = Yellow 3 = Blue 4 = Magenta 5 = Cyan 6 = White 7 = Amber 8 = Rose 9 = Lime Green 10 = Orange 11 = Sky Blue 12 = Violet 13 = Spring Green	0	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
6325	6326	Job State: Color 2	0 = Red 1 = Green 2 = Yellow 3 = Blue 4 = Magenta 5 = Cyan 6 = White 7 = Amber 8 = Rose 9 = Lime Green 10 = Orange 11 = Sky Blue 12 = Violet 13 = Spring Green	1	Yes	RW
6326	6327	Job State: Intensity for Color 1	0 = High 1 = Medium 2 = Low 3 = Off	0	Yes	RW
6327	6328	Job State: Intensity for Color 2	0 = High 1 = Medium 2 = Low 3 = Off	0	Yes	RW
6328	6329	Job State: Animation Speed	0 = Slow 1 = Standard 2 = Fast	1	Yes	RW
6329	6330	Job State: Animation Pattern	0 = Normal 1 = Strobe 2 = Three Pulse 3 = SOS 4 = Random	0	Yes	RW
6330	6331	Reserved				
6331	6332	Reserved				
6332	6333	Reserved				
6333	6334	Reserved				

4.5 Custom Settings Configuration

Use these registers to configure custom colors, intensity, and speeds.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3400	3401	Custom Color 1 Green, Custom Color 1 Red	0-255, 0-255 (Two 8-bit numbers)	255, 255	Yes	RW
3401	3402	Custom Color 1 Blue	0-255	255	Yes	RW

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Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
3410	3411	Custom Color 2 Green, Custom Color 2 Red	0-255, 0-255 (Two 8-bit numbers)	255, 255	Yes	RW
3411	3412	Custom Color 2 Blue	0-255	255	Yes	RW
3420	3421	Custom Intensity	0-100	100	Yes	RW
3421	3422	Custom Speed	5-255	15	Yes	RW
3422	3423	Restrict To Gamut	0 = Off, 1 = On	0	Yes	RW

4.6 Test Mode and Restore Factory Defaults

Use these registers to enter test mode and to restore the factory defaults of the device.

Base 0 Address	Base 1 Address	Description	Holding Register Representation	Default Value	Saved	Access
6500	6501	Enable Test Mode: Indicator flashes blue	0 = Disabled, 1 = Enabled	0	No	RW
6600	6601	Restore Factory Defaults	0 = Disabled, 1 - 65335 = Enable	0	No	RW
6601	6602	Restore Factory Defaults Key 1	43690(0xAAAA) = Enable	0	No	RW
6602	6603	Restore Factory Defaults Key 2	21845(0x5555) = Enable	0	No	RW

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Chapter 5 Specifications

Supply Voltage
12 V DC to 30 V DC

Supply Current
30 mA maximum current at 12 V DC
25 mA maximum current at 18 V DC
20 mA maximum current at 24 V DC
20 mA maximum current at 30 V DC

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Connections
Integral 5-pin M12 male quick-disconnect connector
Models with a quick-disconnect connector require a mating cordset

Mounting
M22 by 1.5 threaded base, maximum torque 2.25 N·m (20 inch·lbf)
Mounting nut included

Default Indicator Characteristics

Color	Dominant Wavelength (nm)or Color Temperature (CCT)	Color Coordinates[2]		Lumen Output (Typical at 25 °C)
		x	y	
Green	527	0.178	0.7	1.9
Red	625	0.699	0.298	0.8
Yellow	571	0.424	0.511	2.5
Blue	465	0.139	0.052	0.3
White	5700K	0.328	0.337	2.5
Cyan	492	0.158	0.34	2
Magenta	–	0.345	0.161	1.2
Amber	585	0.517	0.438	1.8
Rose	–	0.491	0.215	0.9
Lime Green	557	0.347	0.571	2.2
Sky Blue	485	0.151	0.248	1.9
Orange	596	0.585	0.386	1.4
Violet	435	0.204	0.082	0.5
Spring Green	507	0.169	0.524	1.9

[2] Refer to the CIE 1930 (x,y) Chromaticity Diagram, to show equivalent color with indicated color coordinates.

Construction
Base, Dome, and Nut: Polycarbonate

Vibration and Mechanical Shock
Meets IEC 60068-2-6 requirements (Vibration: 10 Hz to 55 Hz, 1.0 mm amplitude, 5 minutes sweep, 30 minutes dwell)
Meets IEC 60068-2-27 requirements (Shock: 30G 11 ms duration, half sine wave)

Operating Conditions
–40 °C to +50 °C (–40 °F to +122 °F)
90% at +50 °C maximum relative humidity (non-condensing)
Storage Temperature: –40 °C to +70 °C (–40 °F to +158 °F)

Environmental Rating
IP67, IP69K per ISO 20653

Certifications

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

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

5.1 FCC Part 15 Class B for Unintentional Radiators

(Part 15.105(b)) This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

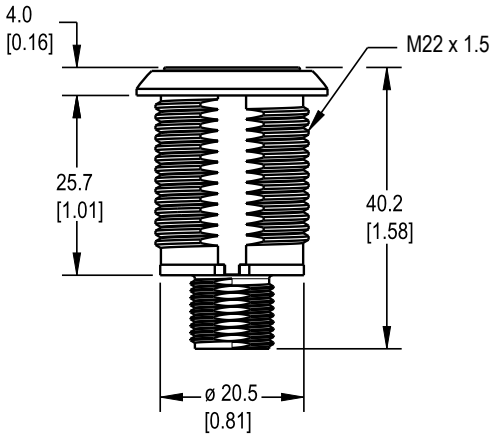
5.2 Industry Canada ICES-003(B)

This device complies with CAN ICES-3 (B)/NMB-3(B). Operation is subject to the following two conditions: 1) This device may not cause harmful interference; and 2) This device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme à la norme NMB-3(B). Le fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne peut pas occasionner d'interférences, et (2) il doit tolérer toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité du dispositif.

5.3 Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise. The measurements provided are subject to change.



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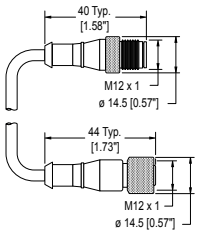
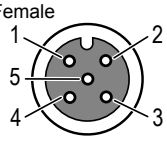
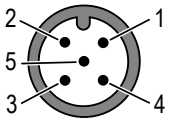
6.1 Cordsets

5-pin A-Code Double-Ended M12 Female to M12 Male Cordsets (datasheet p/n 236183)				
Model	**Length**	**Dimensions (mm)**	**Pinouts**	
BC-M12F5-M12M5-22-1	1 m (3.28 ft)		Female  Male 	1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
BC-M12F5-M12M5-22-2	2 m (6.56 ft)			
BC-M12F5-M12M5-22-5	5 m (16.4 ft)			
BC-M12F5-M12M5-22-8	8 m (26.25 ft)			
BC-M12F5-M12M5-22-10	10 m (30.81 ft)			
BC-M12F5-M12M5-22-15	15 m (49.2 ft)			

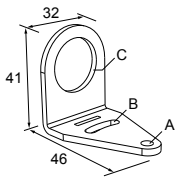
6.2 Brackets

All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.

SMB22A

- Right-angle bracket with curved slot for versatile orientation
- 12-ga. stainless steel
- Mounting hole for 22 mm sensor
- CAD Files: DXF, PDF, IGS, STP

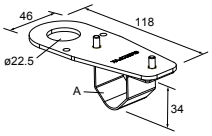
Hole center spacing: A to B = 26.0
Hole size: A = ø 4.6, B = 4.6 x 16.9, C = 22.2



SMB22FVK

- V-clamp, flat bracket and fasteners for mounting to pipe or extensions
- Clamp accommodates 28 mm diameter tubing or 1 in. square extrusions
- 22 mm hole for mounting sensor
- CAD Files: DXF, PDF, IGS, STP

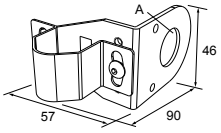
Hole size: A = ø 22.5



SMB22RAVK

- V-clamp, right-angle bracket and fasteners for mounting to pipe or extensions
- Clamp accommodates 28 mm diameter tubing or 1 in. square extrusions
- 22 mm hole for mounting sensor
- CAD Files: DXF, PDF, IGS, STP

Hole size: A = ø 22.5



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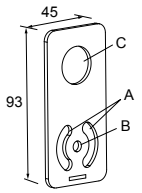
SMBAMS22P

- Flat SMBAMS series bracket with 22 mm hole for mounting sensors
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel
- CAD Files: DXF, PDF, IGS, STP

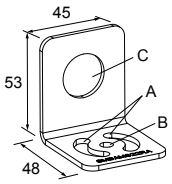
Hole center spacing: A = 26.0, A to B = 13.0
Hole size: A = 26.8 x 7.0, B = ø 6.5, C = ø 22.5



SMBAMS22RA

- Right-angle SMBAMS series bracket with 22 mm hole for mounting sensors
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A = 26.0, A to B = 13.0
Hole size: A = 26.8 x 7.0, B = ø 6.5, C = ø 22.5



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Chapter 7 Product Support and Maintenance

7.1 Animation Definitions

The following table describes the definitions for device states.

Name	Description
Animation Type:	
Off	Indicator is off
Steady	Color 1 is solid on at defined intensity
Flash	Color 1 flashes at defined speed, color intensity, and pattern
Two Color Flash	Color 1 and Color 2 flash alternately at defined speed, color intensities, and pattern
Intensity Sweep	Color 1 repeatedly increases and decreases intensity between 0% to 100% at defined speed and color intensity
Color Sweep	Color 1 and Color 2 transition alternately at defined speed and color intensities
Animation Pattern	Defines the flash pattern for flash and two color flash animations (normal, strobe, three pulse, SOS, or random)
Animation Speed	Defines the animation speed (slow, medium, fast, or custom)
Color 1	Defines Color 1 of defined animation
Color 1 Intensity	Defines the intensity of Color 1 in the animation (high, medium, low, off, or custom)
Color 2	Defines Color 2 of defined animation
Color 2 Intensity	Defines the intensity of Color 2 in the animation (high, medium, low, off, or custom)

7.2 Clean with Mild Detergent and Warm Water

Wipe down the device with a soft cloth dampened with a mild detergent and warm water solution. Do not use any other chemicals for cleaning.

7.3 Repairs

Contact Banner Engineering for troubleshooting of this device. **Do not attempt any repairs to this Banner device; it contains no field-replaceable parts or components.** If the device, device part, or device component is determined to be defective by a Banner Applications Engineer, they will advise you of Banner's RMA (Return Merchandise Authorization) procedure.

> **IMPORTANT:** If instructed to return the device, pack it with care. Damage that occurs in return shipping is not covered by warranty.

7.4 Contact Us

Banner Engineering Corp. | 9714 Tenth Avenue North | Plymouth, MN 55441, USA | Phone: + 1 888 373 6767

For worldwide locations and local representatives, visit www.bannerengineering.com.

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7.5 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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