TL70 Pro Modbus Modular Tower Light Product Manual

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Chapter 1

Features

Banner's TL70 Pro Modbus Modular Tower Light is a 70 mm, modular LED indicator with bright and uniform light. The modularity gives the user flexibility to customize tower lights as needed and change positions in the field. The TL70 is also available preassembled for easy installation.

- Modbus control allows access to full color, flashing, and dimming settings, as well as advanced animations and audible tones
- Up to five indicator segments and one audible segment in one device
- Rugged, water-resistant IP65 housing with UV-stabilized material
- Bright, uniform indicator segments appear gray when off to eliminate false indications from ambient light
- Simple and fast connection with M12 quick-disconnect connector

Models

Segment Models

Model	Description
SG-TL70P-L	RGB light segment
SG-TL70P-A	Audible segment

Base Models

Model	Description
B-TL70PM-Q	Modbus RS-485 base module with an integral 4-pin M12 A-Code male quick-disconnect connector

Pre-Assembled Models

Model	Description
TL70PM3Q	Modbus RS-485 with three RGB segments
TL70PM3AQ	Modbus RS-485 with three RGB segments and an audible segment

Chapter Contents

Chapter 2   Installation Instructions

Assembling the Modules
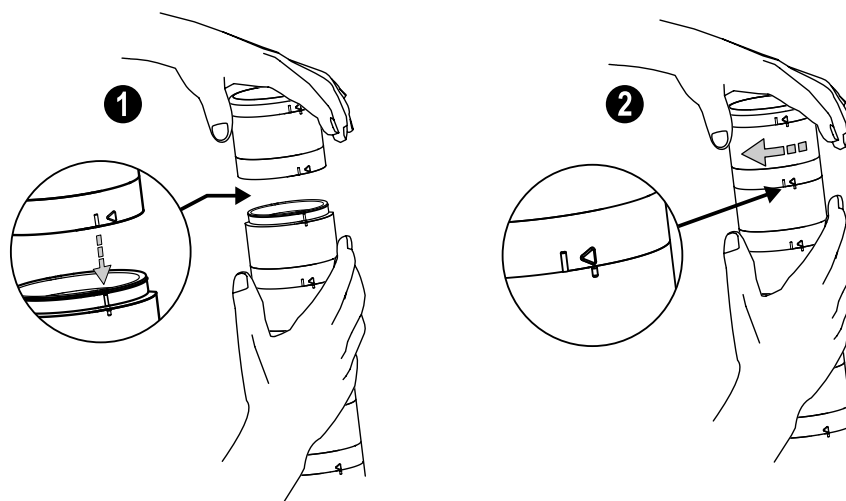
To assemble the modules:

1. Align the notches on each module and press together.
2. Rotate the top module clockwise to lock into place (notches shown in the locked position).

> **NOTE:** DIP switches should remain in the default off position.

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Chapter 3   Wiring

Wiring for Modbus Models

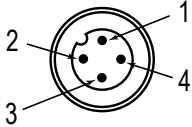| Integral 4-pin A-Code M12 Male Quick-Disconnect Connector Pinout	Pin	Wire Color	Connection
	1	Brown	18 V DC to 30 V DC
	2	White	RS-485 (+)
	3	Blue	DC common
	4	Black	RS-485 (-)

Chapter 4   Modbus RTU Register Map

Name	Register	With Offset	Description	Holding Register Representation	Access
Read only	0	1	Number of segments Read	#1 - 5	-
	1	2	Mode Read	1 = Basic Mode, 2 = Advanced Mode	RO
Modbus Addressing	600	601	Baud Rate	0 = 9600 1 = 19200 2 = 38400	WO
	601	602	Parity	1 = None 2 = Odd 3 = Even	WO
	602	603	Address	1 - 254	WO
	603	604	Reserved	NA	WO
	604	605	Factory Reset	1 = Soft Reset, 2 = Hard Reset (with comms)	WO
Device Information	605-614	606-615	Banner Name	0..65535	RO
	615-630	616-631	Product Name	0..65535	RO
	631	632	Item H	0..65535	RO
	632	633	Item L	0..65535	RO
	633	634	Serial Number 1 (H)	0..65535	RO
	634	635	Serial Number 2	0..65535	RO
	635	636	Serial Number 3	0..65535	RO
	636	637	Serial Number 4 (L)	0..65535	RO
	637	638	Firmware PN H	0..65535	RO
	638	639	Firmware PN L	0..65535	RO
	639	640	Firmware Version H	0..65535	RO
	640	641	Firmware Version L	0..65535	RO
	641	642	Firmware Build Number H	0..65535	RO
	642	643	Firmware Build Number L	0..65535	RO
	643-658	644-659	User Define Tag	0..65535	RO
Basic Mode Control	5000	5001	Segment 1 State	0 = Off 1 = Basic On 2 = Basic Flash 3 = Animation	RW
	5001	5002	Segment 2 State	0 = Off 1 = Basic On 2 = Basic Flash 3 = Animation	RW

Name	Register	With Offset	Description	Holding Register Representation	Access
	5002	5003	Segment 3 State	0 = Off 1 = Basic On 2 = Basic Flash 3 = Animation	RW
	5003	5004	Segment 4 State	0 = Off 1 = Basic On 2 = Basic Flash 3 = Animation	RW
	5004	5005	Segment 5 State	0 = Off 1 = Basic On 2 = Basic Flash 3 = Animation	RW
	5005	5006	Basic Audible	0 = Off, 1 = Basic On	RW
Advanced Mode Control	5000	5001	Segment 1 Animation	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = 50/50 5 = 50/50 Rotate 6 = Chase 7 = Intensity Sweep 8 = Demo	RW
	5001	5002	Segment 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	RW

Name	Register	With Offset	Description	Holding Register Representation	Access
	5002	5003	Segment 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	RW
	5003	5004	Segment 1 Color 1 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	RW
	5004	5005	Segment 1 Color 2 Intensity	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	RW
	5005	5006	Segment 1 Speed	0 = Slow 1 = Medium 2 = Fast 3 = Custom	RW
	5006	5007	Segment 1 Pattern	0 = Normal 1 = Strobe 2 = 3-Pulse 3 = SOS 4 = Random	RW
	5007	5008	Segment 2 Animation	-	RW
	5008	5009	Segment 2 Color 1	-	RW
	5009	5010	Segment 2 Color 2	-	RW
	5010	5011	Segment 2 Color 1 Intensity	-	RW
	5011	5012	Segment 2 Color 2 Intensity	-	RW
	5012	5013	Segment 2 Speed	-	RW
	5013	5014	Segment 2 Pattern	-	RW
	5014	5015	Segment 3 Animation	-	RW
	5015	5016	Segment 3 Color 1	-	RW

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Name	Register	With Offset	Description	Holding Register Representation	Access
	5016	5017	Segment 3 Color 2	-	RW
	5017	5018	Segment 3 Color 1 Intensity	-	RW
	5018	5019	Segment 3 Color 2 Intensity	-	RW
	5019	5020	Segment 3 Speed	-	RW
	5020	5021	Segment 3 Pattern	-	RW
	5021	5022	Segment 4 Animation	-	RW
	5022	5023	Segment 4 Color 1	-	RW
	5023	5024	Segment 4 Color 2	-	RW
	5024	5025	Segment 4 Color 1 Intensity	-	RW
	55025	5026	Segment 4 Color 2 Intensity	-	RW
	5026	5027	Segment 4 Speed	-	RW
	5027	5028	Segment 4 Pattern	-	RW
	5028	5029	Segment 5 Animation	-	RW
	5029	5030	Segment 5 Color 1	-	RW
	5030	5031	Segment 5 Color 2	-	RW
	5031	5032	Segment 5 Color 1 Intensity	-	RW
	5032	5033	Segment 5 Color 2 Intensity	-	RW
	55033	5034	Segment 5 Speed	-	RW
	5034	5035	Segment 5 Pattern	-	RW
	5035	5036	Audible Type	0 = Off 1 = Tone 2 = Sync	RW
	5036	5034	Audible Volume	0 = Off 1 = Low 2 = Medium 3 = High	RW
	5037	5038	Audible Tone	0 = Freq 1 1 = Freq 2 2 = Freq 3	RW
	5038	5039	Custom Speed	dHz	RW
	5039	5040	Custom Intensity	0-100%	RW
Operating Mode	5040	5041	Operation Mode Write	1 = Basic Mode, 2 = Advanced Mode	WO

Name	Register	With Offset	Description	Holding Register Representation	Access
Basic Mode Segment 1 Configuration	5110	5111	Basic Color	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	RW
	5111	5112	Basic Flash Speed	0 = Standard 1 = Fast 2 = Slow 3 = Custom	RW
	5112	5113	Basic Animation	0 = Off 1 = Steady 2 = Flash 3 = Two Color Flash 4 = 50/50 5 = 50/50 Rotate 6 = Chase 7 = Intensity Sweep 8 = Demo	RW
	5113	5114	Basic 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	RW

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Name	Register	With Offset	Description	Holding Register Representation	Access
	5114	5115	Basic 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	RW
	5115	5116	Basic Intensity 1	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	RW
	5116	5117	Basic Intensity 2	0 = High 1 = Medium 2 = Low 3 = Off 4 = Custom	RW
	5117	5118	Basic Speed	0 = Slow 1 = Medium 2 = Fast 3 = Custom	RW
	5118	5119	Basic Pattern	0 = Normal 1 = Strobe 2 = 3-Pulse 3 = SOS 4 = Random	RW
Segment Mode Segment 2 Configuration	5120	5121	Basic Color	-	RW
	5121	5122	Basic Flash Speed	-	RW
	5122	5123	Basic Animation	-	RW
	5123	5124	Basic Color 1	-	RW
	5124	5125	Basic Color 2	-	RW
	55125	5126	Basic Intensity 1	-	RW
	5126	5127	Basic Intensity 2	-	RW
	5127	5128	Basic Speed	-	RW
	5128	5129	Basic Pattern	-	RW

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Name	Register	With Offset	Description	Holding Register Representation	Access
Segment Mode Segment 3 Configuration	55130	5131	Basic Color	-	RW
	5131	5132	Basic Flash Speed	-	RW
	5132	5133	Basic Animation	-	RW
	5133	5134	Basic Color 1	-	RW
	5134	5135	Basic Color 2	-	RW
	5135	5136	Basic Intensity 1	-	RW
	5136	5137	Basic Intensity 2	-	RW
	55137	5138	Basic Speed	-	RW
	5138	5139	Basic Pattern	-	RW
Segment Mode Segment 4 Configuration	5140	5141	Basic Color	-	RW
	5141	5142	Basic Flash Speed	-	RW
	5142	5143	Basic Animation	-	RW
	5143	5144	Basic Color 1	-	RW
	5144	5145	Basic Color 2	-	RW
	5145	5146	Basic Intensity 1	-	RW
	5146	5147	Basic Intensity 2	-	RW
	5147	5148	Basic Speed	-	RW
	5148	5149	Basic Pattern	-	RW
Segment Mode Segment 5 Configuration	5150	5151	Basic Color	-	RW
	55151	5152	Basic Flash Speed	-	RW
	5152	5153	Basic Animation	-	RW
	5153	5154	Basic Color 1	-	RW
	5154	5155	Basic Color 2	-	RW
	5155	5156	Basic Intensity 1	-	RW
	5156	5157	Basic Intensity 2	-	RW
	5157	5158	Basic Speed	-	RW
	5158	5159	Basic Pattern	-	RW
Basic Segment Audio Configuration	5160	5161	Audible Type	0 = Off 1 = Tone 2 = Sync	RW
	5161	5162	Audible Volume	0 = Off 1 = Low 2 = Medium 3 = High	RW
	5162	5163	Audible Tone	0 = Freq 1 1 = Freq 2 2 = Freq 3	RW

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Tower Light Segment Modes

Basic Segment Mode

Use a single run time register per LED segment to set it to Off, On, Flash, or Animation mode.

Use a single run time register for an audible segment to set it to Off or On.

Use additional configuration registers to change color, intensity, flash speed, and select animation type on LED segments and change volume and tone on audible segment.

Advanced Segment Mode

Use multiple run time registers per LED segment to control color, intensity, flash, and other animation types.

Use multiple run time registers for an audible segment to control sync, volume, and tone settings.

Use additional configuration registers to create custom intensity and flash speeds.

LED Segment Control

Animation	Description
Off	Segment 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
50/50	Color 1 is displayed on 50% of the segment and Color 2 is displayed on the other 50% of the segment at the defined color intensities
50/50 Rotate	Color 1 is displayed on 50% of the segment and Color 2 is displayed on the other 50% of the segment while rotating at the defined speed and color intensities
Chase	Color 1 is displayed as a single spot against the background of Color 2 while rotating at the defined speed, color intensities, and rotational direction
Intensity Sweep	Color 1 repeatedly increases and decreases intensity between 0% to 100% at defined speed and color intensity
Demo	Demo sequence cycles through several sets of colors and configurations to highlight example applications

Audible Segment Control

Setting	Description
Audible State	Sets the segment to off, on, or synced to flash pattern of last LED segment
Audible Volume	Defines the volume of the audible tone
Audible Tone	Defines the audible tone frequency

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Chapter 5   Specifications

Supply Voltage
> 18 V DC to 30 V DC

Supply Current

Device	Typical Current (mA) per Device			Max Current (mA)
	18 V DC	24 V DC	30 V DC	
Modbus Base	60	45	40	75
Light and Audible segment	110	85	75	125

Environmental Rating
> IP65

Supply Protection Circuitry
> Protected against reverse polarity and transient voltages

Initial Startup Time
> 30 seconds

Construction
> Bases, segments, and covers: polycarbonate

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

Connections
> See "Wiring" on page 5

Audible Alarm
> Tone 0: 1.7 kHz ± 250 Hz oscillation frequency; maximum intensity (typical) 81 dB at 1 m (3.3 ft)
> Tone 1: 2.2 kHz ± 250 Hz oscillation frequency; maximum intensity (typical) 100 dB at 1 m (3.3 ft)
> Tone 2: 2.7 kHz ± 250 Hz oscillation frequency; maximum intensity (typical) 104 dB at 1 m (3.3 ft)

Vibration and Mechanical Shock
> Meets IEC 60068-2-6 requirements (Vibration: 10 Hz to 55 Hz, 0.5 mm amplitude, 5 minutes sweep, 30 minutes dwell)
> Meets IEC 60068-2-27 requirements (Shock: 15G 11 ms duration, half sine wave)

Certifications

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

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

Default Light Segment Characteristics

Color	Dominant Wavelength (nm) or Color Temperature (CCT)	Color Coordinates[1]		Lumen Output Per Segment (Typical at 25 °C)
		X	Y	
Green	532	0.181	0.735	34.8
Red	621	0.691	0.308	15.4
Yellow	578	0.473	0.474	21
Blue	467	0.137	0.056	27.6
White	5700K	0.328	0.337	29.7
Cyan	492	0.150	0.334	20.9
Magenta	-	0.379	0.177	18.7
Amber	590	0.552	0.414	6.6
Rose	-	0.508	0.230	9.3
Lime Green	565	0.393	0.535	23.8
Sky Blue	485	0.146	0.241	14.1
Orange	600	0.611	0.370	24.1
Violet	-	0.212	0.091	19.6
Spring Green	509	0.157	0.553	12.7

FCC Part 15 Class A for Unintentional Radiators

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(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.
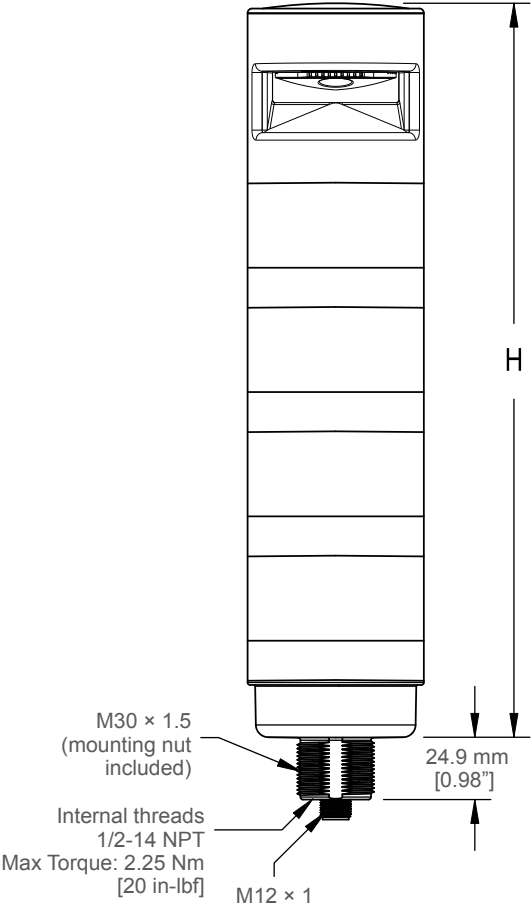
Industry Canada ICES-003(A)

This device complies with CAN ICES-3 (A)/NMB-3(A). 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(A). 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.

[1] Refer to CIE 1931 chromaticity diagram or color chart to show equivalent color with indicated color coordinates. Actual coordinates may differ by 10%.

Dimensions

M30 × 1.5
(mounting nut
included)

Internal threads
1/2-14 NPT
Max Torque: 2.25 Nm
[20 in-lbf]

M12 × 1

24.9 mm
[0.98"]

H

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 (13.51 in)

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Chapter 6   Accessories

Cordsets

4-Pin Single-Ended, M12 Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDC-406	2 m (6.56 ft)	Straight		
MQDC-415	5 m (16.4 ft)			
MQDC-430	9 m (29.5 ft)			
MQDC-450	15 m (49.2 ft)			
MQDC-406RA	2 m (6.56 ft)	Right-Angle		1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused
MQDC-415RA	5 m (16.4 ft)			
MQDC-430RA	9 m (29.5 ft)			
MQDC-450RA	15 m (49.2 ft)			

4-Pin Double-Ended, M12 Female-M12 Male Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout**
MQDEC-401SS	0.31 m (1 ft)	Male Straight/ Female Straight		Female Male 1 = Brown 2 = White 3 = Blue 4 = Black
MQDEC-403SS	0.91 m (2.99 ft)			
MQDEC-406SS	1.83 m (6 ft)			
MQDEC-412SS	3.66 m (12 ft)			
MQDEC-415SS	4.58 m (15 ft)			
MQDEC-420SS	6.10 m (20 ft)			
MQDEC-430SS	9.14 m (30.2 ft)			
MQDEC-450SS	15.2 m (49.9 ft)			

Mounting Brackets

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

|	
SMB30A • Right-angle bracket with curved slot for versatile orientation • Clearance for M6 (¼ in) hardware • Mounting hole for 30 mm sensor • 12-gauge stainless steel **Hole center spacing:** A to B=40 **Hole size:** A=ø 6.3, B= 27.1 × 6.3, C=ø 30.5	
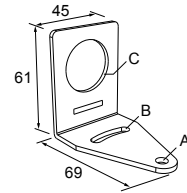
SMB30MM • 12-gauge stainless steel bracket with curved mounting slots for versatile orientation • Clearance for M6 (¼ in) hardware • Mounting hole for 30 mm sensor **Hole center spacing:** A = 51, A to B = 25.4 **Hole size:** A = 42.6 × 7, B = ø 6.4, C = ø 30.1	
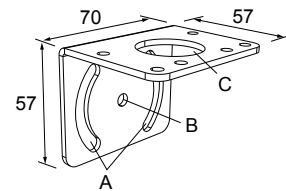
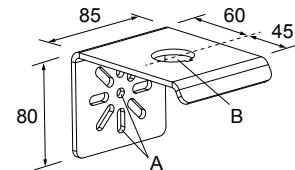|	
SMBAMS30P • Flat SMBAMS series bracket • 30 mm hole for mounting sensors • Articulation slots for 90°+ rotation • 12-gauge 300 series stainless steel **Hole center spacing:** A=26.0, A to B=13.0 **Hole size:** A=26.8 × 7.0, B=ø 6.5, C=ø 31.0	
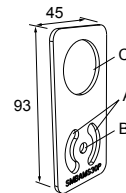
SSA-MBK-EEC1 • Single 30 mm hole • 8 gauge steel, black finish (powder coat) • Front surface for customer-applied labels **Hole size:** A = ø 7 , B = ø 30	

LMBE12RA35 • Direct mounting of stand-off pipe, with common bracket type • Zinc-plated steel • 1/2-14 NPSM nut • Mounting distance from the wall to the center of the 1/2-14 NPSM nut is 35 mm **Hole center spacing:** 20.0	

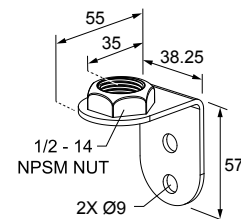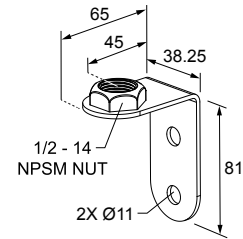**LMBE12RA45**
- Direct mounting of stand-off pipe, with common bracket type
- Zinc-plated steel
- 1/2-14 NPSM nut
- Mounting distance from the wall to the center of the 1/2-14 NPSM nut is 45 mm

Hole center spacing: 35.0

Elevated Mount System

Model			Features	Components
SA-M30 - Black Polycarbonate			• Streamlined black PC or Gray PC thread cover • Covers M30 thread on the light base • Mounting hardware included	
Polished 304 Stainless Steel	**Black Anodized Aluminum**	**Clear Anodized Aluminum**	• Elevated-use stand-off pipe (½ in. NPSM/DN15) • Polished 304 stainless steel, black anodized aluminum, or clear anodized aluminum surface • ½ in. NPT thread at both ends • Compatible with most industrial environments	
SOP-E12-150SS 150 mm (6 in) long	SOP-E12-150A 150 mm (6 in) long	SOP-E12-150AC 150 mm (6 in) long		
SOP-E12-300SS 300 mm (12 in) long	SOP-E12-300A 300 mm (12 in) long	SOP-E12-300AC 300 mm (12 in) long		
SOP-E12-900SS 900 mm (36 in) long	SOP-E12-900A 900 mm (36 in) long	SOP-E12-900AC 900 mm (36 in) long		
SA-E12M30 - Black Acetal			• Streamlined black acetal or white UHMW mounting base adapter/cover • Connects between ½ in. NPSM/DN15 pipe and 30 mm (1-3/16 in) drilled hole • Mounting hardware included	

Pipe Mounting Flange			
Model	**Description**	**Construction**	
SA-F12	• Elevated-use stand-off pipes (½ in, NPSM/DN15) • M5 mounting hardware and nitrile gasket included	Die-cast zinc base with black paint	
SA-F12-3	• Elevated-use stand-off pipes (½ in, NPSM/DN15) • M4 mounting hardware and nitrile blend gasket included	Black Polycarbonate	

Foldable Mounting Brackets			
Model	**Features**	**Construction**	
SA-FFB12	• For use with 1/2 inch stand-off pipes • Stainless steel hardware	Black polycarbonate	

LMB Sealed Right Angle Bracket

Model	Description	Construction	
LMB30RA	**Direct-Mount Models:** Bracket kit with base, 30 mm adapter, set screw, fasteners, O-rings, and gaskets.	Black polycarbonate	
LMBE12RA	**Pipe-Mount Models:** Bracket kit with base, ½–14 pipe adapter, set screw, fasteners, O-rings, and gaskets. For use with stand-off pipe (listed and sold separately).	Black polycarbonate	

Chapter Contents

Chapter 7   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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