



Proposal for Conveyor Sorter System

Purpose, environment, configuration, devices and safety measures

by

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Project 1 Report
MFET0450 - Automation Control Systems

Directed to: Professor Michael Slifka

Report submitted in partial fulfillment of the
requirements for project 1

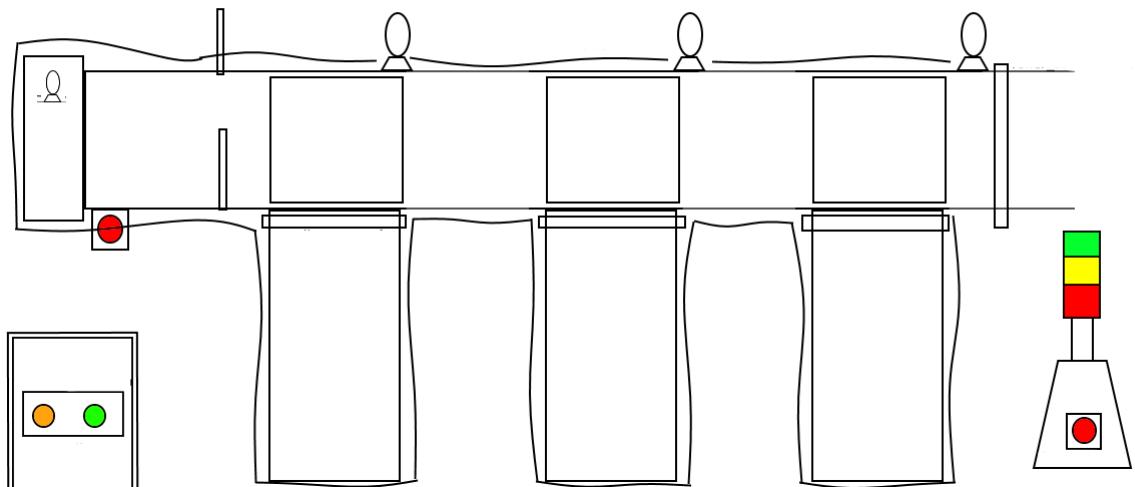
at

Rochester Institute of Technology
Department of Manufacturing and Mechanical Engineering Technology
October 2021

1 Executive Summary

Sorting high volumes of products is commonplace in key areas and industries. This text proposes a conveyor system for sorting items based on their sizes. The proposal provides a set of required devices, describes its assembly in a conveyor and continues by presenting a tested prototype simulator that implements the key areas of the proposed system. The text finishes by bringing to light security concerns and explains how they were solved.

The functionality of the system is based on sensors working together to identify, sort and move products into three different lines considering their category A, B or C. This can be done through a conveyor system controlled by a PLC, which uses ladder logic alongside several input and output components to accomplish such a task.

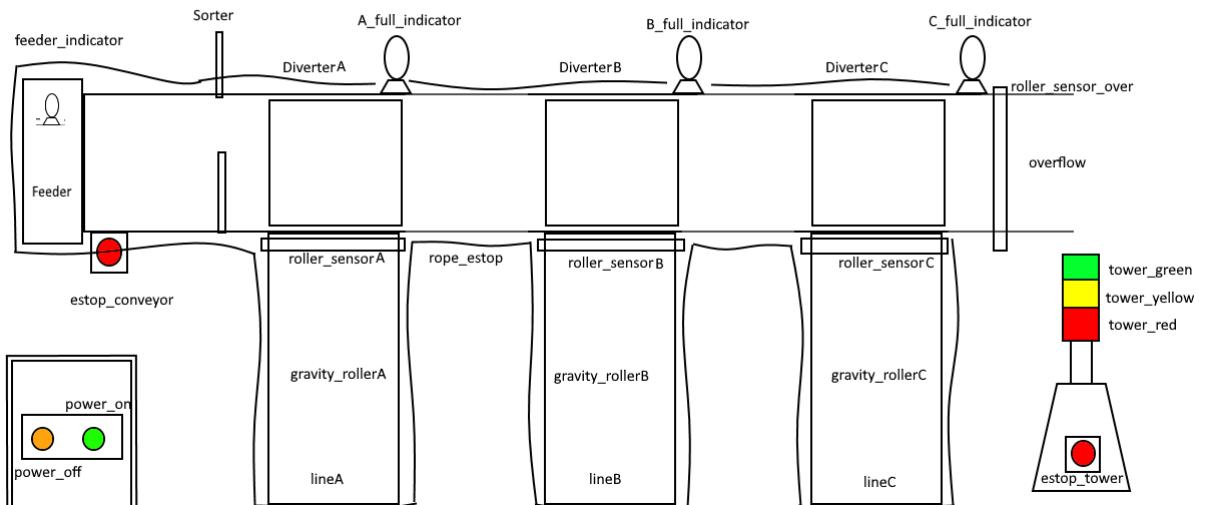


2 Full System Description

A common process that requires speed and precision is taking a collection of products, boxes, letters or parts, and breaking it into a set of collections that are related in some way. The sorting conveyor described in this text will take a collection of elements and break it into three other collections based on their sizes. Such a system has many areas of application but, to name one, consider a factory that produces a variety of products of different sizes. At some point the total production will need to be sorted and the conveyor sorting system ("System") is an option to accomplish that.

The System is recommended because it handles high production volumes, but also small ones, faster and in less space than having a team of employees would. The System also has very high accuracy and potentially costs less than maintaining a team to do the same job. In addition, the system is potentially safer to employees and machines than having materials handled manually. Overall, the System will give companies higher revenue.

The System is built to be incorporated to pre-existing production lines but it is also able to operate by itself. It can be installed and operated in common work areas as it will not incur any significant risk to personnel. However, it can be used in fully automated areas as it does not require any human interaction. See the following image.



Products will flow from the feeder, down to the belt and be sorted and moved, if possible, to their respective lines. If it is not possible to move to the designated area, the conveyor will transport the product to an overflow area. When shutting down or recovering from an emergency stop or power loss, the system will empty the conveyor by moving its products to the same overflow area.

When the feeder is filled with 12 products it will light an indicator light that lets the operator know the system can start running. If the feeder is not full, the system will not run. However, in order to successfully to startup all emergency stops must also be reset in case they were activated. The first action taken when booting the system red lights will power on and horns will ring.

After a delay, the system verifies, through internal PLC retentive counters, if it can power the main conveyor or if it should run a recover module. This decision is solely based on the count of products in the conveyor. If there are counter they will be moved to an overflow area. After startup the feeder will feed products at a constant rate until it

goes empty. There are indicator lights for when the feeder becomes empty.

The products fed to the conveyor pass by an object detection and sizing sensor that will decide to which line it should go though. After that decision is made the PLC will coordinate the position of the belt diverters so that the products reaches the correct destination. The size is not the only factor in that decision, because if a line is full the PLC program will not allow the product to be moved there and will sent it to the overflow area instead.

A line is considered full either if its collection point capacity is reached or if some predefined total value of products is reached. Those predetermined values for the featured system are 36 for line A, 24 for line B and 18 for line C. The collection point capacity is also set to 8 and 6 for lines A and C, respectively, and unbounded for line B. When either collection point is full, an indicator light will turn on the tower lights.

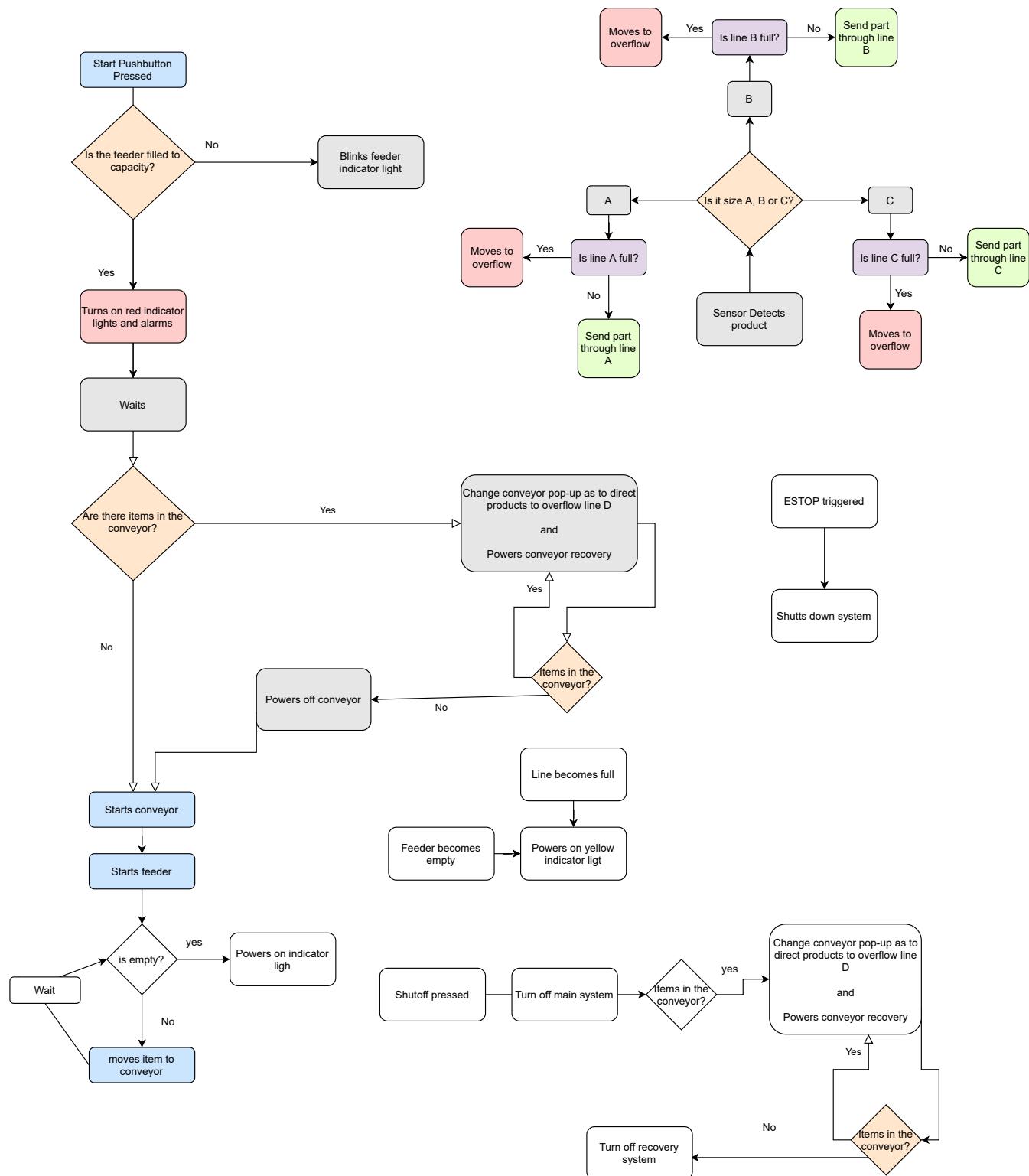
The internal counter that is used to decide if the main system can startup when the star push button is pressed works via sensors placed between the rollers of the lines and the overflow area. The count of products in the conveyor is the difference between the amount of projects that were moved from the feeder into the conveyor and the sum of the products that went through either of the four possible destinations.

Finally, when shutting down, normally, the system will make the same conveyor count verification and move of products done in the recovery module. That guarantees it can start safely in the next system startup but also makes sure no products is left behind inside the system, possibly unreachable.

The final part of the system is the way it handles emergency stop. The current state of the implemented simulation will stop both the main routine and the recovery module immediately. While that is good, it could also trigger breaks on the conveyor instead of letting the inertia take effect. That is one point of improvement that will be discussed by the end of the proposal.

3 Logic Flow Chart

The flow and logic of the System that is implemented in the form of a PLC program. This flow simulates the behavior of the proposed sorting conveyor.



4 Development Spreadsheet

TYPE	Logic Function	Name	I/O	DATATYPE	BaseTag
1 ALIAS	There is room for more A items on collection point	:CONVEYOR_A_GREEN	OUTPUT	DIGITAL	Local:6:O.Pt05.Data
2 ALIAS	Collection point A is full	:CONVEYOR_A_RED	OUTPUT	DIGITAL	Local:6:O.Pt06.Data
3 ALIAS	There is room for more C items on collection point	:CONVEYOR_C_GREEN	OUTPUT	DIGITAL	Local:6:O.Pt07.Data
4 ALIAS	Collection point C is full	:CONVEYOR_C_RED	OUTPUT	DIGITAL	Local:6:O.Pt08.Data
5 ALIAS	Indicates sorter found an A product	:CONVEYOR_SOL_A	OUTPUT	DIGITAL	Local:6:O.Pt02.Data
6 ALIAS	Indicates sorter found an C product	:CONVEYOR_SOL_B	OUTPUT	DIGITAL	Local:6:O.Pt03.Data
7 ALIAS	Feeder is full, system can start	feeder_green	OUTPUT	DIGITAL	Local:6:O.Pt00.Data
8 ALIAS	Operation stopped due to state of feeder. Overfilling or starting with feeder not full cause this light to blink.	feeder_red	OUTPUT	DIGITAL	Local:6:O.Pt01.Data
9 ALIAS	Collected total amount of C products	:TRAFFIC_A_GREEN	OUTPUT	DIGITAL	Local:5:O.Pt07.Data
10 ALIAS	Collected total amount of B products	:TRAFFIC_A_RED	OUTPUT	DIGITAL	Local:5:O.Pt05.Data
11 ALIAS	Collected total amount of A products	:TRAFFIC_A_YELLOW	OUTPUT	DIGITAL	Local:5:O.Pt06.Data
12 ALIAS	System is off, personnel can interact	tower_green	OUTPUT	DIGITAL	Local:6:O.Pt15.Data
13 ALIAS	System is on, personnel should pay attention	tower_red	OUTPUT	DIGITAL	Local:6:O.Pt13.Data
14 ALIAS	Either a collection point is full or feeder is empty	tower_yellow	OUTPUT	DIGITAL	Local:6:O.Pt14.Data
15 ALIAS	Indicates the main system is operating	:motor_1	OUTPUT	DIGITAL	Local:4:O.Pt14.Data
16 ALIAS	Indicates shutting off or recover system are operating	:motor_2	OUTPUT	DIGITAL	Local:4:O.Pt15.Data
17 ALIAS	Immediately shuts off the system	e_stop_1	INPUT	DIGITAL	Local:1:I.Pt01.Data
18 ALIAS	Immediately shuts off the system	e_stop_2	INPUT	DIGITAL	Local:2:I.Pt01.Data
19 ALIAS	When system is off, feeds the feeder with one product	:PB1_NO	INPUT	DIGITAL	Local:1:I.Pt03.Data
20 ALIAS	When system is operating, triggers the system to sort next item in the conveyor	:PB3_NO	INPUT	DIGITAL	Local:1:I.Pt07.Data
21 ALIAS	Shuts off the main system and starts shutdown of system	:PB4_NO	INPUT	DIGITAL	Local:1:I.Pt09.Data
22 ALIAS	Triggers system boot	:PB5_NO	INPUT	DIGITAL	Local:1:I.Pt11.Data
23 ALIAS		:SW3_NO_left	INPUT	DIGITAL	Local:2:I.Pt07.Data
24 ALIAS	Indicates next item in the conveyor is of type C	:SW3_NO_right	INPUT	DIGITAL	Local:2:I.Pt09.Data
25 ALIAS	Helper variable used to avoid direct access to NC input. NC is necessary because there is no center position	:SW4_aux1	INPUT	DIGITAL	Local:3:I.Pt05.Data
26 ALIAS	Indicates next item in the conveyor is of type A	:SW4_left	INPUT	DIGITAL	Local:3:I.Pt01.Data
27 ALIAS	Indicates next item in the conveyor is of type C	:SW4_right	INPUT	DIGITAL	Local:3:I.Pt00.Data
28 TAG	Indicates collection point A is full. True if collection point is full or total amount of product As were sorted sorted.	:A_full		BOOL	
35 TAG	Indicates collection point C is full. True if collection point is full or total amount of product As were sorted sorted.	:C_full		BOOL	
29 TAG	Counter for how many products are in line A	:A_in_collection_point		COUNTER	
36 TAG	Counter for how many products are in line C	:C_in_collection_point		COUNTER	
31 TAG	Counter of total sorted products A	:A_total		COUNTER	
33 TAG	Counter of total sorted products B	:B_total		COUNTER	
38 TAG	Counter of total sorted products C	:C_total		COUNTER	
30 TAG	Counter of how many products were sorted A but did not go through to line A	:A_in_D		COUNTER	
32 TAG	Counter of how many products were sorted B but did not go through to line B	:B_in_D		COUNTER	
37 TAG	Counter of how many products were sorted C but did not go through to line C	:C_in_D		COUNTER	
34 TAG	Counter of how many items are in the conveyor	:conveyor		COUNTER	
39 TAG	Counter for the maximum capacity of the feeder	:feeder_limit		COUNTER	
40 TAG	Counter to verify whether the feeder became empty	:feeder_not_empty		COUNTER	
42 TAG	Timer used to control when feeder should put products in the container	:feed_timer		TIMER	
43 TAG	Prevents the feeder from counting multiple products when only one was added	:fill_feeder_ons		BOOL	
44 TAG	Timer used to delay system activation to give personnel time to react to red lights and horns	:motor_start_delay		TIMER	
45 TAG	Auxiliary variable true when state is correct and operator triggers a sorf of an A type product	:operate_SOL_A		BOOL	
46 TAG	Auxiliary variable true when state is correct and operator triggers a sorf of an B type product	:operate_SOL_B		BOOL	
47 TAG	Auxiliary variable true when state is correct and operator triggers a sorf of an C type product	:operate_SOL_C		BOOL	
55 TAG	Auxiliary variable true when system is on. Note that when system is shutting down, this is false	:system_on		BOOL	
53 TAG	Auxiliary variable true when shutting is powering off	:shutting_off		BOOL	
48 TAG	Auxiliary variable true when system is a recovery process	:recover		BOOL	
49 TAG	Delay used to simulate an actual recovery process	:recover_simulator		TIMER	
52 TAG	Delay used to simulate an actual shutoff process	:shutoff_simulator		TIMER	
50 TAG	Timer used to delay recover system activation to give personnel time to react to red lights and horns	:recover_start_delay		TIMER	
51 TAG	Auxiliary variable used to control indicator light FEEDER_RED	:show_feeder_problem		TIMER	
54 TAG	Auxiliary variable true when SW4 is center	:SW4_center		BOOL	

5 PLC definition and specification

PLC selected:

- 5069-L306ERMS2
 - 18-32V DC
 - <https://configurator.rockwellautomation.com/#configurator/5069-L306ERMS2/summary>



Input Module selected:

- 5069-IB16F
 - 12-24V DC
 - <https://configurator.rockwellautomation.com/#/configurator/5069-IB16F>
summary



Output Module selected:

- 5069-OB16
 - 12-24V DC
 - <https://configurator.rockwellautomation.com/#/configurator/5069-OB16/summary>



Power Supply selected:

- 1756-PB50
- 12-32 V dc
- <https://configurator.rockwellautomation.com/#/configurator/1756-PB50/summary>



Find in the table below a possible way to connect the devices to the PLC slots.

Alias Tag (1)	Base Tag (10)	I/O (3)	Slot (9)	Device Type (4)	Manufacturer (5)	Device PN (6)	Contact(s) (7)	Notes (8)
estop_conveyor	Local:1:I:Pt01.Data	Input	1	Estop rope/PB	Banner Engineering	RP-RM83F	1	Both the rope and PB use the same tag
estop_tower	Local:1:I:Pt02.Data	Input	1	Estop button	Banner Engineering	SSA-EB	1	
power_on	Local:1:I:Pt03.Data	Input	1	Momentary PB	Banner Engineering	K50LYXXPPB2Q	1	
power_off	Local:1:I:Pt04.Data	Input	1	Momentary PB	Banner Engineering	K50LYXXPPB2Q	1	
Sorter	Local:1:I:Pt05.Data	Input	1	Sensor for Object detection	Banner Engineering	LX3EQ	1	
roller_sensorA	Local:1:I:Pt06.Data							
roller_sensorB	Local:1:I:Pt07.Data							
roller_sensorC	Local:1:I:Pt08.Data	input	1	Proximity Sensor	Banner Engineering	TTR1219RPSD7T	1	
roller_sensor_over	Local:1:I:Pt09.Data							
DivterterA	Local:2:O:Pt01.Data							
DivterterB	Local:2:O:Pt02.Data	output	2	Steerable wheel sorter	Nido Automation	DENEPU	1	
DivterterC	Local:2:O:Pt03.Data							
A_full_indicator	Local:2:O:Pt04.Data							
B_full_indicator	Local:2:O:Pt05.Data	output	2	Multi-color Indicator light	Banner Engineering	K50LGRY2NQ	1	Multi-color indicator lights seem to require a special cable
C_full_indicator	Local:2:O:Pt06.Data							
feeder_indicator	Local:2:O:Pt07.Data							
tower_green	Local:2:O:Pt08.Data	output	2	Indicator Tower Light	Banner Engineering	TL70GYRQ	1	These three indicator lights are located in the same device
tower_yellow	Local:2:O:Pt09.Data	output	2					
tower_red	Local:2:O:Pt10.Data	output	2					
Feeder	Local:2:O:Pt11.Data	input/output	2	Feeder	Rovibec Agrisolutions	CC718	2	
	Local:1:I:Pt10.Data		1					
gravity_rollerA	Local:2:O:Pt12.Data	output	2	Automated Gravity Roller with breaks	Materials Handling	QTY 10	1	Prove the products to the end of queue avoiding collision
gravity_rollerB	Local:2:O:Pt13.Data	output	2					
gravity_rollerC	Local:2:O:Pt14.Data	output	2					

6 Specification of input and output devices

E-stop Rope:

- Qty: 1
- PN: RP-RM83F
- <https://www.bannerengineering.com/sg/en/products/part.82128.html>



E-stop button:

- Qty: 1
- PN: SSA-EB1PLXR-12ECQ8
- <https://www.bannerengineering.com/us/en/products/part.25305.html>



Illuminated push buttons:

- Qty: 2
- PN: K50LYXXPPB2Q
- <https://www.bannerengineering.com/us/en/products/part.32021.html>



Sorter:

- Qty: 1
- PN: LX3EQ
- <https://www.bannerengineering.com/us/en/products/part.02661.html>



Proximity sensor:

- Qty: 4
- PN: TTR1219RPSD7T
- <https://www.bannerengineering.com/us/en/products/part.812487.html>



Steerable wheel sorter:

- Qty: 3
- PN: DENEB-PU
- <https://nidoworld.com/automation/sortation-systems/popup-sorter/>



Multi-color Indicator light:

- Qty: 4
- PN: K50LGRY2NQ
- <https://www.bannerengineering.com/br/pt/products/part.75668.html>



Indicator Tower Light:

- Qty: 3
- PN: TL70GYRQ
- <https://www.bannerengineering.com/us/en/products/part.92336.html>



Feeder:

- Qty: 1

- PN: CC718
- <https://rovibecagrisolutions.com/en/produit/feeder-conveyor>



Automated Gravity Roller with breaks:

- Qty: 3
- PN: QTY 10
- <https://www.materialshandling.com.au/products/gravity-roller-conveyors/>



7 Logic of the system

Find the code for the simulation system in the next few pages.

MainRoutine - Ladder Diagram

Template:MainTask:MainProgram

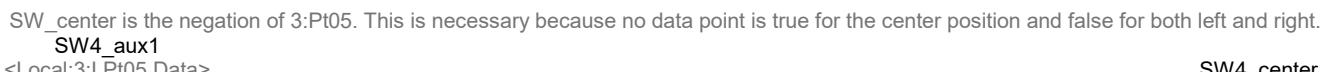
Total number of rungs in routine: 40

Page 8

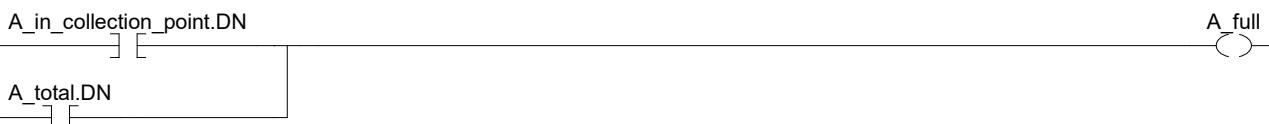
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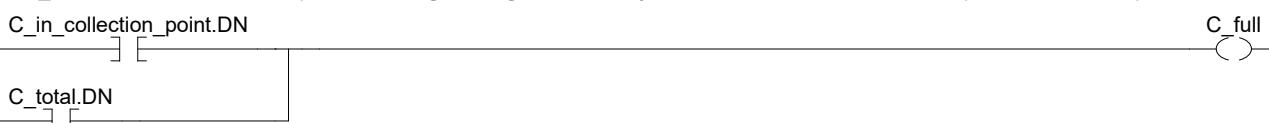
The next 6 rungs define auxiliary variable used in the remainder of the program. They serve the purpose of not repeating checks.



A_full indicates that no more products can go through line A. It is just a semantic name that also helps reduce code repetition.



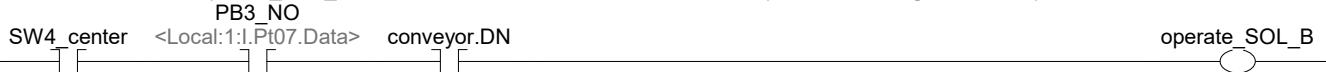
C_full indicates that no more products can go through line C. It is just a semantic name that also helps reduce code repetition.



operate_SOL_A indicates that SOLA is activated. The ONS prevents feeding line A multiple times.



operate_SOL_B indicates that SOLB is activated. The ONS prevents feeding line B multiple times.

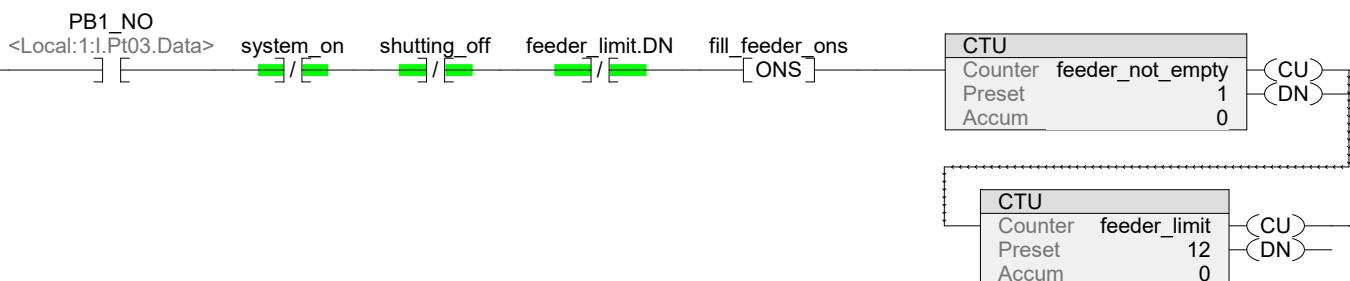


operate_SOL_C indicates that SOLC is activated. The ONS prevents feeding line C multiple times.

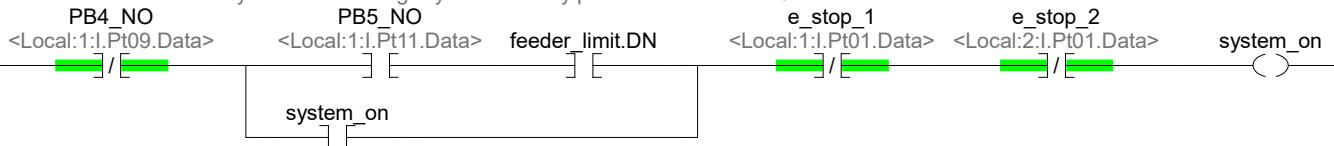


The code that de facto operates the system starts at this point.

Controls the feeder system. It does not operate when the system is running and does not allow the operator to overfill the feeder. There are two counters for products because sometimes it is needed to check whether the feeder is empty and others check whether it is full.



System starter rung. System will only power on if both ESTOPS are reset and the feeder is full.



MainRoutine - Ladder Diagram

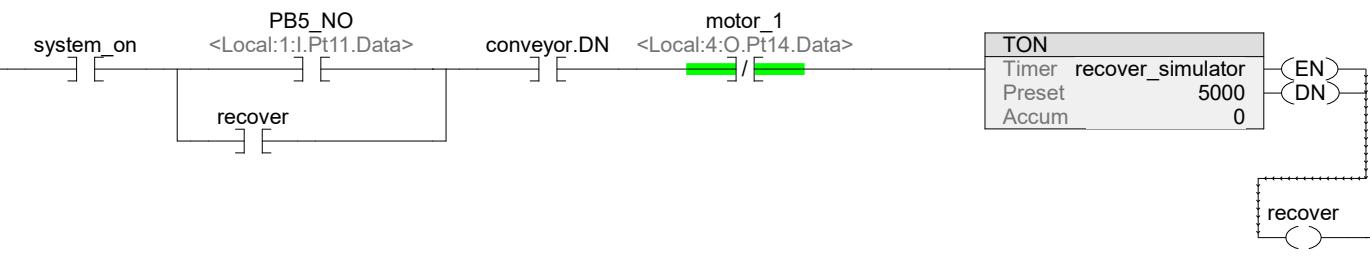
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Total number of rungs in routine: 40

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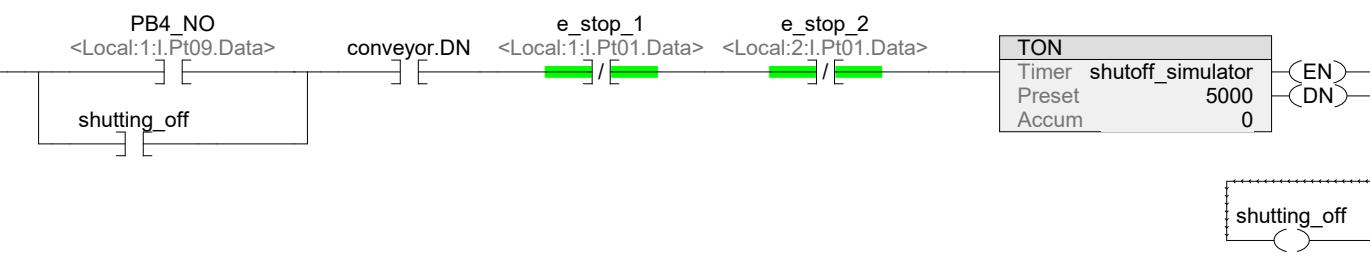
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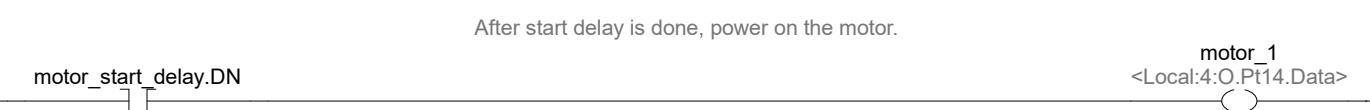
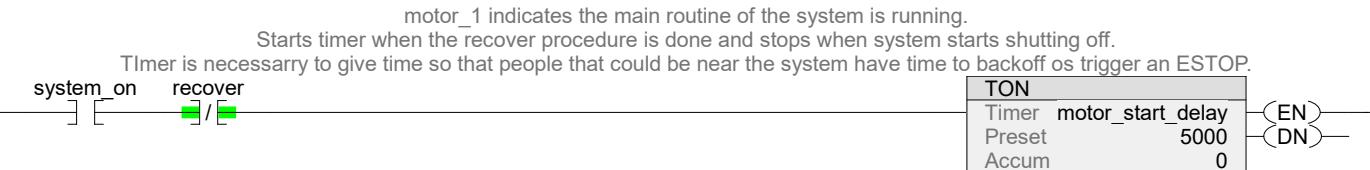
When starting off the system, if problems were detected, turn on a recover module.
In this case, we detect problems by verifying if there were items left in the conveyor. Note items might be on the conveyor during startup due to a previous ESTOP or a power outage.



When shutting off the system (normally, instead of using a ESTOP) it will run a module to make sure the system ends is a safe state.
In the simulation, it would only happen if there items in the conveyor, so that is the only check necessary before shutting off.

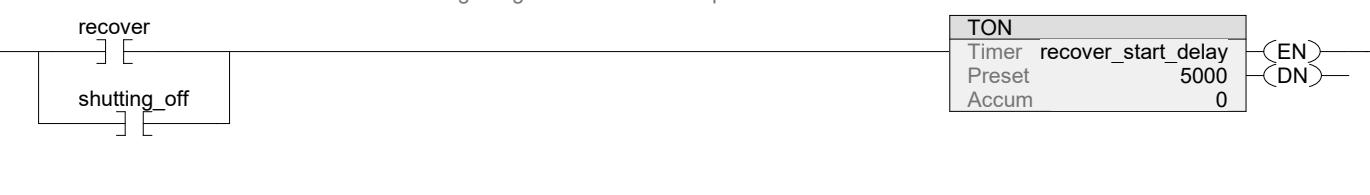


The following two rungs simulate personnel collecting the products on A and C's collection points.



motor_2 indicates the recovery module is running.
In the case of this program, since both shutoff and recover consist of moving the products in the conveyor to an overflow area, they will trigger the same module, so the same motor.

Timer is necessary in both cases, because it may run on startup (like motor 1), but also it may run on different modules so making a delay triggering shutoff seems adequate for the simulation.



MainRoutine - Ladder Diagram

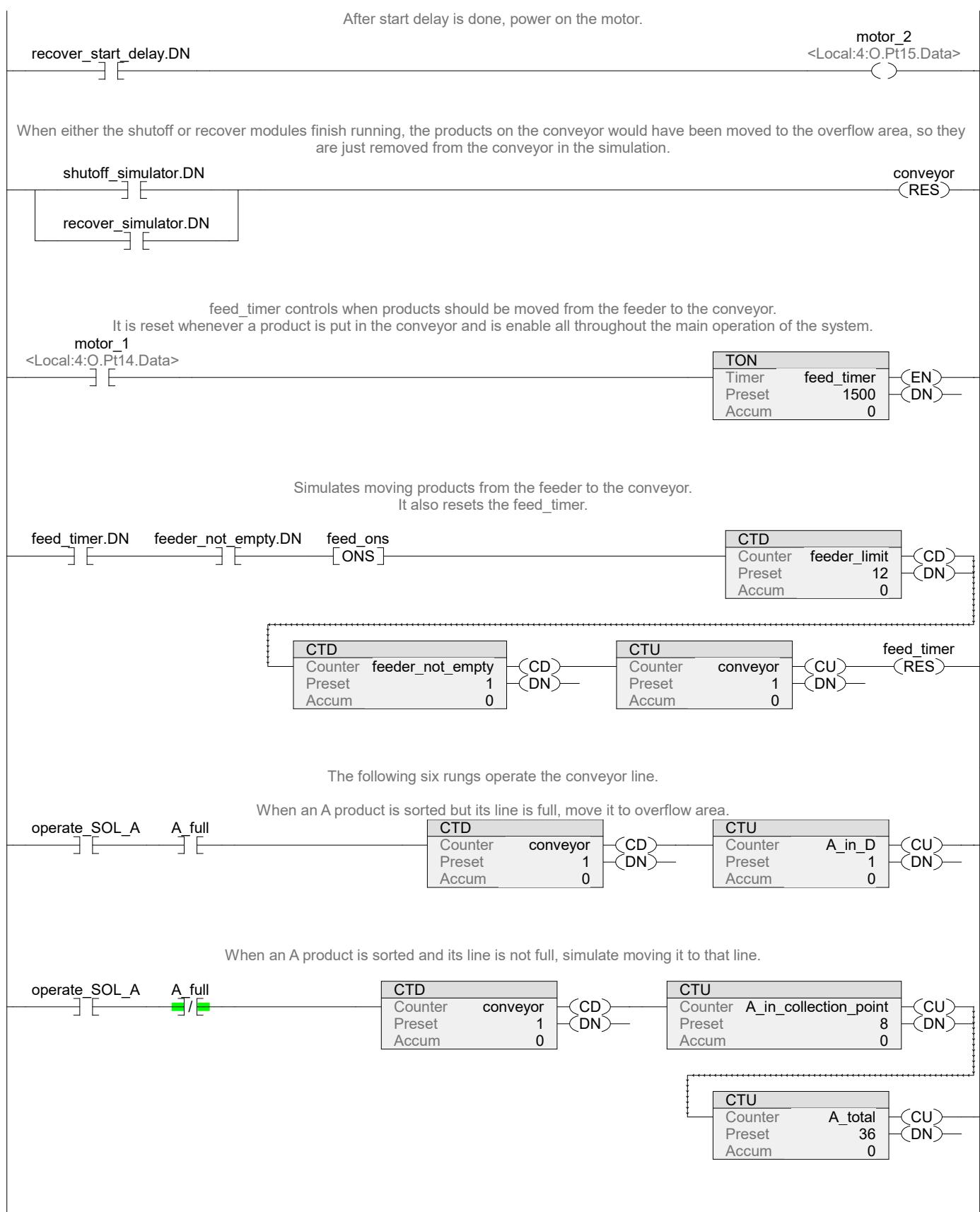
Page 10

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Total number of rungs in routine: 40

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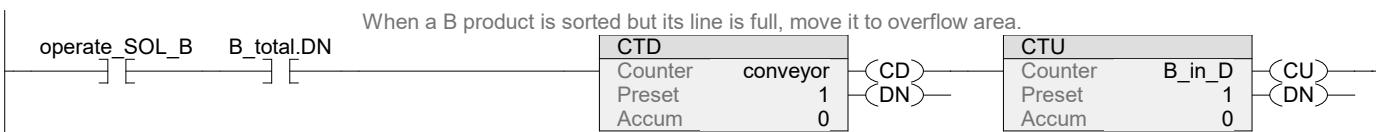


MainRoutine - Ladder Diagram

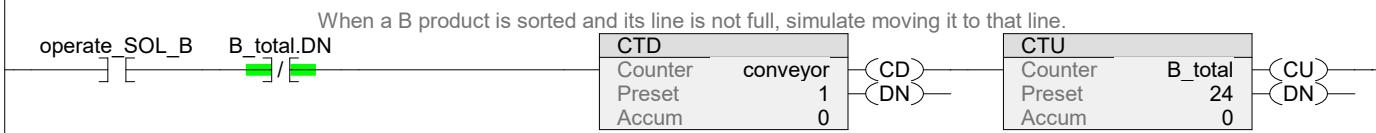
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Total number of rungs in routine: 40

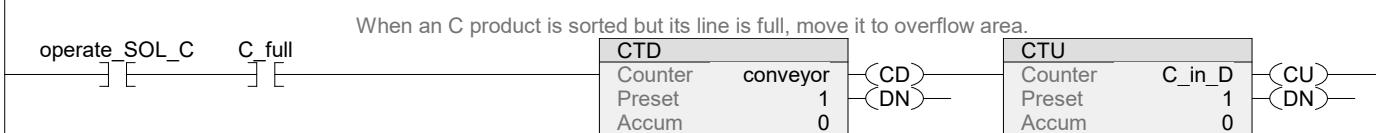
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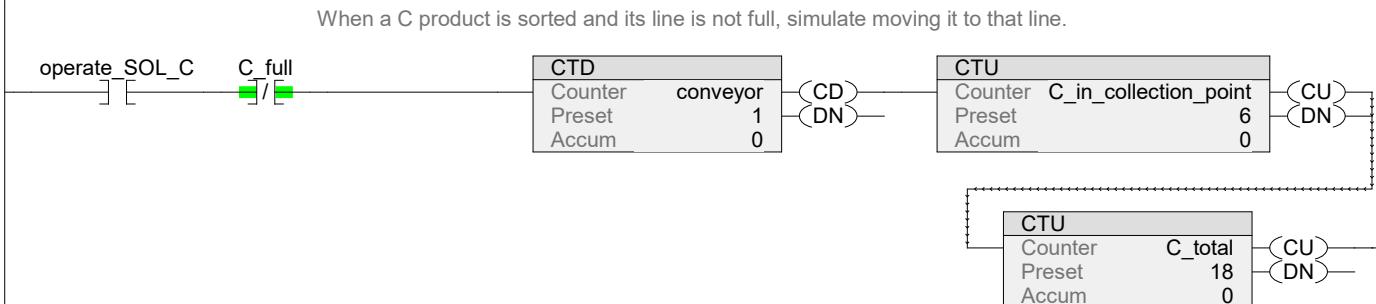
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23



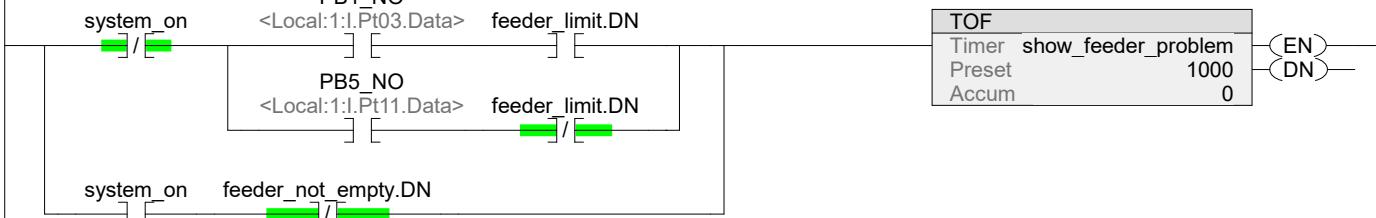
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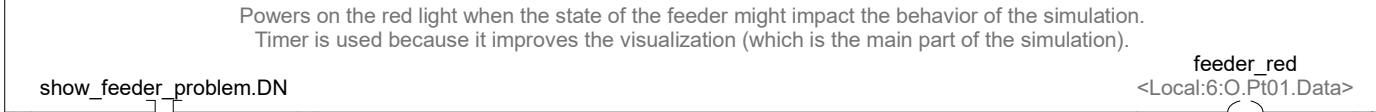
Starting from this point the rungs will only concern with displaying visual cues to allow operators visualizing the simulation. There is no added manipulation of the conveyor.

The show feeder problem is useful during the simulation as it coordinate an indicator light for problems related to the state of the feeder.

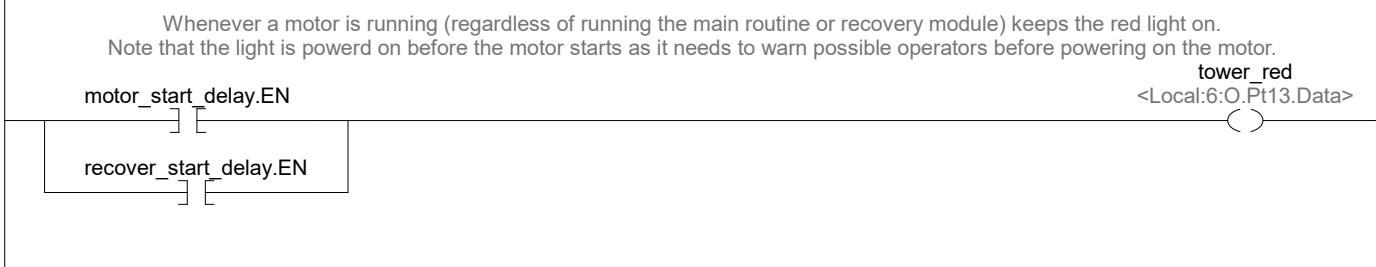
25



26



27



MainRoutine - Ladder Diagram

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Template:MainTask:MainProgram

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Total number of rungs in routine: 40

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28

When both motors timers are off, power on the green light to indicate operator it is safe to approach.
Note it is not possible to use motors as they might be in the delay timers, leading to unsafe situations.

motor_start_delay.EN recover_start_delay.EN

tower_green
<Local:6:O.Pt15.Data>

29

A_in_collection_point.DN

CONVEYOR_A_RED
<Local:6:O.Pt06.Data>

30

Controls indicator light for collection point A having space.
NOTE: the line may have space but if total number of products A have been collected, products will not be directed to line A.

A_in_collection_point.DN

CONVEYOR_A_GREEN
<Local:6:O.Pt05.Data>

31

C_in_collection_point.DN

CONVEYOR_C_RED
<Local:6:O.Pt08.Data>

32

Controls indicator light for collection point B having space.
NOTE: the line may have space but if total number of products B have been collected, products will not be directed to line B.

C_in_collection_point.DN

CONVEYOR_C_GREEN
<Local:6:O.Pt07.Data>

33

A_total.DN

TRAFFIC_A_GREEN
<Local:5:O.Pt07.Data>

34

B_total.DN

TRAFFIC_A_YELLOW
<Local:5:O.Pt06.Data>

35

C_total.DN

TRAFFIC_A_RED
<Local:5:O.Pt05.Data>

36

Indicates that either of the collection points is full. This is necessary in addition to the in-place indication because the responsible for moving products may be away from the system.

A_in_collection_point.DN

tower_yellow
<Local:6:O.Pt14.Data>

C_in_collection_point.DN

37

Visual indication that solenoid A was triggered.

Note that the product may not have been moved to correspondent A line, but to overflow area, depending on the state of the line.

operate_SOL_A

CONVEYOR_SOL_A
<Local:6:O.Pt02.Data>

38

Note that the product may not have been moved to correspondent C line, but to overflow area, depending on the state of the line.

operate_SOL_B**CONVEYOR_SOL_B**
<Local:6:O.Pt03.Data>

39

Indicates the feeder is completely filled. This is usefull during the simulation to know when the system can be powered on, but is also useful in the actual system.

feeder_limit.DN**feeder_green**
<Local:6:O.Pt00.Data>

(End)

8 Startup Configuration

The first requirement for system startup is that emergency stops are reset to their original position. This is a common and necessary procedure.

The other two startup requirements are the feeder being full and the belts being empty. While the former is not a necessity, the second one is because the system relies on constant speed and timers to calculate the position of products. Once there is a reset, like with a power loss, necessary information is lost and there is no way to recover the position of the product. If not emptied the system would end up moving products to wrong lines, to state of the possibilities.

9 Potential System Issues

The system as implemented in the simulation and described section 2 will resist some errors resulting from emergency stops and power loss. The current state of the system, however, is not safe for all scenarios, including resistance to personnel mistakes, power loss and package jams. This section brings some of them into light.

The conveyor is intended to operate in accessible places as it does not present any major or fatal injury risk. Adding physical barriers might reduce the frequency of injuries but that happens in exchange of productivity gains. It is a decision that may vary depending on the specification of sizes of products or speed of conveyors. However, when looking at production environments, which typically do not have barriers, a decision to not use them was made. The main risk is when a product is redirected by the belt diverter, a PLC or device errors happens, and the product ends up falling, maybe in some employee.

However, the current version of the system does not take into account misuse of the equipment. As from the PLC program, the collection points cannot be accessed when the machine is on due to the risk of having other products coming down from the conveyor in high speed. However, since there are no physical blocks that becomes a risk.

A second issue, that was brought to light since section two is that not all problems related to power loss were handled. If an item is high speed is coming down a line and the automated gravity rollers used do not have power to break their movement, the product may reach the end of the line, falling in the ground and breaking or maybe even hitting someone.

The third problem is that the system does not handle hardware issues, by using additional sensors for example, nor does it fail safe. When a jam happens, for example, it goes unnoticed by the system and this can lead to multiple issues, from braking products, to breaking sensors and even hurting people. While there were attempts to solve safety issues, it is very clear they persist.

Appendix A

Specifications Sheet

Find specifications sheet starting on the next page.

RP-RM83F Heavy-Duty Rope Pull Emergency Stop Switch



Datasheet

Rope pull switch with an emergency stop button for indoor or outdoor use



- Both safety contacts latch open when rope is pulled, broken, or if tension is reduced; requires manual reset (IEC 60947-5-5)
- Aluminum die-cast housing, rated IP67 and NEMA 4, suitable for demanding indoor and outdoor industrial environments
- Innovative RP-RM83F...LT.. design provides quick, easy rope adjustment
- Rope spans up to 75 m (245 ft), depending on model
- Both safety contacts are closed with normal rope tension, and open when rope is pulled or if rope breaks (or if tension is reduced from normal amount)
- Both Monitoring contacts operate opposite the safety contacts for monitoring by another device
- Additional Aux. 24V solid-state PNP output on some models provides remote rope tension monitoring
- Tension indicator window indicates proper rope tension for operation or safety contacts latched open (the rope pull or the E-stop button is actuated)

Models

Model	Max. Rope Length	Rope Connection	Aux. Status Output	Run Position	Cable Pulled/Cable Break	Switching Diagram	
RP-RM83F-75LTE	75 m (245 ft)	Built-in Turnbuckle	Yes	Cable Run Position (All Models)		No PNP Aux. Output Models	
RP-RM83F-75LRE		Ring		S1	S2		
RP-RM83F-75LT		Built-in Turnbuckle	No				
RP-RM83F-75LR		Ring					
RP-RM83F-38LTE	37.5 m (123 ft)	Built-in Turnbuckle	Yes	Cable Pulled / Cable Break Position (All Models)		PNP Aux. Output Models	
RP-RM83F-38LRE		Ring		S1	S2		
RP-RM83F-38LT		Built-in Turnbuckle	No				
RP-RM83F-38LR		Ring					

Contacts: Open Closed



Note: This symbol for a positive-opening safety contact (IEC 60947-5-1) is used in the switching diagram to identify the point in actuator travel where the normally-closed safety contact is fully open.



Important... Read This First

Regarding the Use of Rope Pull Switches. In the United States, the functions that Banner rope pull switches are intended to perform are regulated by the Occupational Safety and Health Administration (OSHA). Whether or not any particular rope pull switch installation meets all applicable OSHA requirements depends upon factors that are beyond the control of Banner Engineering Corp. These factors include the details of how the switches are applied, installed, wired, operated, and maintained.

Banner Engineering Corp. has attempted to provide complete application, installation, operation, and maintenance instructions in this document. Direct any questions regarding the use or installation of rope pull switches to the factory applications department.

Banner Engineering Corp. recommends that rope pull switches be applied according to the guidelines set forth in the standards listed below. In addition, the user is responsible for ensuring all local, state, and national laws, rules, codes, and regulations relating to the use of Banner rope pull switches in each application are satisfied. Extreme care is urged that all legal requirements are met and that all installation and maintenance instructions are followed.

Applicable U.S. and International Standards (not all inclusive):

ANSI B11.0 Safety of Machinery, General Requirements, and Risk Assessment

Contact: Safety Director, AMT – The Association for Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102, Tel.: 703-893-2900

ANSI B11.19 Performance Criteria for Safeguarding

Contact: Safety Director, AMT – The Association for Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102, Tel.: 703-893-2900

ANSI NFPA 79 Electrical Standard for Industrial Machinery

Contact: National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101, Tel.: 800-344-3555

ANSI/RIA R15.06 Safety Requirements for Industrial Robots and Robot Systems

Contact: Robotic Industries Association, 900 Victors Way, P.O. Box 3724, Ann Arbor, MI 48106, Tel.: 734-994-6088

EN ISO 12100 Safety of Machinery – General Principles for Design — Risk Assessment and Risk Reduction

EN 60204-1 Electrical Equipment of Machines Part 1: General Requirements

ISO 13850 (EN 418) Emergency Stop Devices, Functional Aspects – Principles for Design

IEC 60947-5-5 Low Voltage Switchgear – Electrical Emergency Stop Device with Mechanical Latching Function

These and other standards are available from:

NSSN National Resource for Global Standards: www.nssn.org (Tel: 212-642-4980)

IHS Standards Store: www.global.ihs.com (Tel: 303-397-7956, 800-854-7179)

Document Center: www.document-center.com/home.cfm (Tel: 650-591-7600)

EU Declaration of Conformity (DoC)

Banner Engineering Corp. herewith declares that these products are in conformity with the provisions of the listed directives and all essential health and safety requirements have been met.

Product	Directive
RP-RM83F Heavy-Duty Rope Pull Emergency Stop Switch	Machinery Directive

Representative in EU: Peter Mertens, Managing Director Banner Engineering Europe. Address: Park Lane, Culliganlaan 2F, bus 3,1831 Diegem, Belgium.

Overview

Models RP-RM83F-.. are rope pull emergency stop switches in compact, heavy-duty die-cast aluminum housings, for indoor or outdoor use. When used with steel wire rope, they can provide emergency stop actuation along conveyors and similar machinery. Red PVC-covered 2, 3, 4, or 5 mm diameter wire rope is recommended, depending on model (force) and rope distance.

The switches have redundant contacts; terminals 11/12 are positive opening when there is a cable-pull or cable-brake situation. When used separately, these contacts provide inputs to a dual-channel safety module. Terminals 11/12 can also be used individually to provide single-channel switching or as a single-channel input to a safety module. Terminals 23/24 are for monitoring purposes only (closed in a cable-break/cable-pull situation).

When the rope is properly tensioned (228 or 133N, depending on model), the red arrows are centered under the hash mark on the tension indicator window, the contacts at terminals 11/12 are closed, and the contacts at terminals 23/24 are open. All models feature a “latching” operation. When the rope is pulled, the switch contacts 11/12 open and remain open until the built-in E-stop/reset button is manually reset.

These rope pull emergency stop switches are not generally considered safeguarding devices, in that they do not prevent or reduce exposure of individuals to a hazard. They provide the same function as other types of emergency stop switches.



WARNING:

- **Not a safeguarding device**
- Failure to follow these instructions could result in serious injury or death.
- This device is not considered a safeguarding device because it requires an overt action by an individual to stop machine motion or hazards. A safeguarding device limits or eliminates an individual's exposure to a hazard without action by the individual or others. This device cannot be substituted for required safeguarding. Refer to the applicable standards to determine those requirements.



WARNING:

- **Do not mute or bypass any emergency stop device**
- Muting or bypassing the safety outputs renders the emergency stop function ineffective.
- ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 require that the emergency stop function remain active at all times.

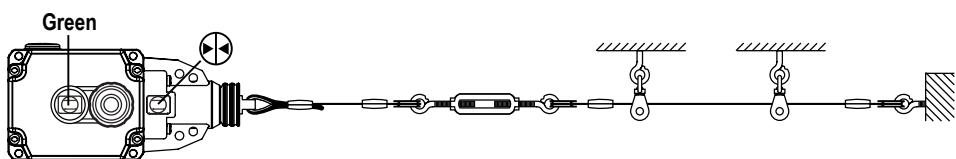


Figure 1. Run Condition (Proper Rope Tension) - Contacts 11/12 Closed

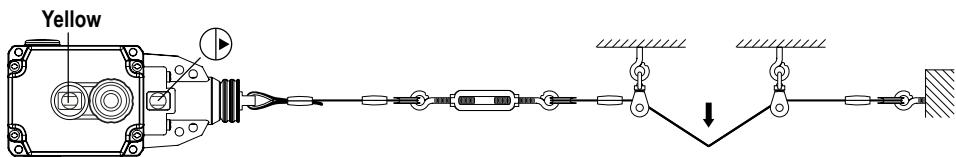


Figure 2. Rope Pulled Condition - Contacts 11/12 Open

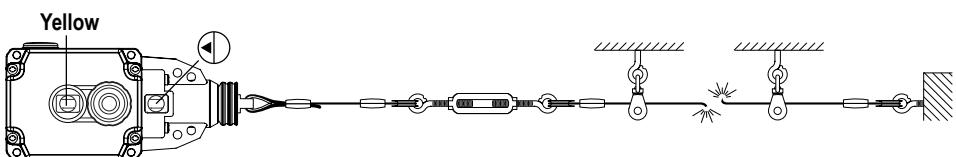


Figure 3. Rope Break Condition - Contacts 11/12 Open

Mechanical Installation

- The rope should be easily accessible and visible along its entire length. Markers or flags may be fixed on the rope to increase its visibility
- Switch body, anchor mounts and wire rope supports (pulleys or eye bolts) must be rigid and secure
- Although pulleys are preferred, a combination of pulleys and/or eye bolts are required to support the wire rope along its length. When pulled, the wire rope, should move freely through the pulleys or eye bolts to actuate the switch
- Use only pulleys (not eye bolts) when routing the rope around a corner or whenever direction changes, even slightly
- Never run rope through conduit or other tubing
- Never attach weights to the rope
- Temperature affects rope tension. The rope expands (lengthens) when temperature increases, and contracts (shrinks) when temperature decreases. Significant temperature variations require frequent checks of the tension adjustment
- Do not exceed the maximum specified total rope length. Banner offers models for other spans; contact Banner Engineering or visit www.bannerengineering.com for model selection



WARNING: Failure to use pulleys or eye bolts to support the wire rope can result in damage to the switch and may create a dangerous situation that could lead to serious injury or death.

Installation Procedure

1. Mount the switch securely on a solid stationary surface.
2. Fasten an eye bolt at the opposite end of the rope span from the switch. Verify that the anchor for the eye bolt is solid and stationary to withstand the constant tension and possible pull of the rope.

3. Assemble the rope as shown. Keep the rope's PVC cover intact along its complete length.
4. Use pulleys (recommended) or eye bolts at each support point. Always use a pulley when routing the rope around a corner, regardless of the angle.

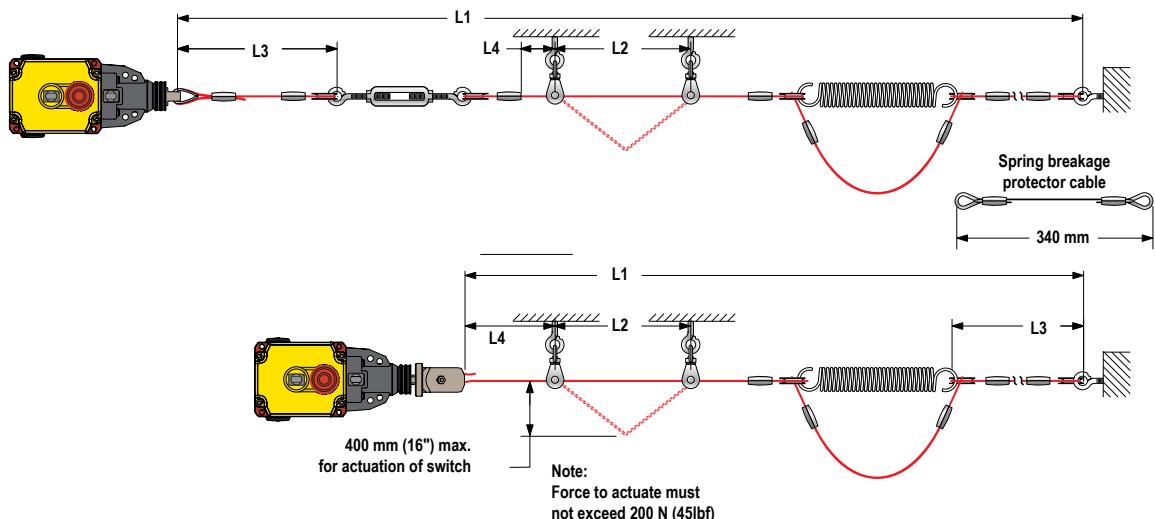


Figure 4. Assembly of Rope and Hardware

Switch Model	Max. Total Length L1	Max. Distance Between Pulleys L2	Max. Distance to Spring/Turnbuckle L3 ¹	Min. Distance Fitting to Pulley L4 ²
75 m	75 m (245 ft)	3-5 m (10-15 ft)	150 mm (6 in)	150 mm (6 in)
38 m	37.5 m (123 ft)			

All hardware is supplied by the user. See *Dimensions* (p. 8) for switch mounting hole mounting pattern and size.

Installing Models RP-RM83F-..75 and RP-LS42F-xxLF (with Integral Turnbuckle)

These models have their own integral turnbuckle and clamp to tension the rope and to hold it in place. This innovative design provides for quick and easy rope fixing and tensioning. These models require no external turnbuckle or any additional clamp at the switch end of the rope.

To install the rope at the switch end:

1. Strip away several inches of the cable covering.
2. Loosen the set screw on the switch fitting using a 4 mm hex wrench.
3. Insert the cable into the center hole, and pull the cut end out from the side hole.
4. When the tension is correct, tighten the set screw to hold the rope firmly in place.



Figure 5. Tightening the rope into the internal turnbuckle (models RP-RM83F-..LT and ..LTE)

Tensioning the Rope

After the rope span components are installed, apply tension to the rope until the arrows in the tensioning indicator are centered on the line in the tension indicator window. This indicates sufficient rope tension. (Contacts 11/12 will close.)

1. For models RP-RM83F-..LT and RP-RM83F-..LTE: Turn the external turnbuckle until the arrows are centered. For models RP-RM83F-..LR and RP-RM83F-..LRE: Turn the shaft of the switch using a 17 mm wrench as shown, until the arrows are centered.
2. Pull hard on the rope and reset the latch several times. If the arrows in the tensioning indicator window do not return to the correct position (centered on the line in the window), further tighten or loosen the rope tension as needed, then reset, until proper tension is shown.
3. Check the tension adjustment periodically to ensure proper operation.

¹ Closer, if possible

² Distance must allow necessary clearance to all mounting hardware.



Figure 6. Tension Indicator Window: too little tension shown

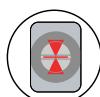


Figure 7. Tension Indicator Window: proper tension shown



Figure 8. Adjusting rope tension (models RP-RM83F-..LT and..LTE)

Electrical Installation

Accessing the Wiring Chamber

Access the wiring chamber by loosening the four corner screws to remove the front cover. Select the best wiring entrance and thread in the $\frac{1}{2}$ " x 14 NPSM conduit adapter (supplied), or the optional M20 x 1.5 cable gland (see Accessories). Wire the two switch contacts in series or independently.

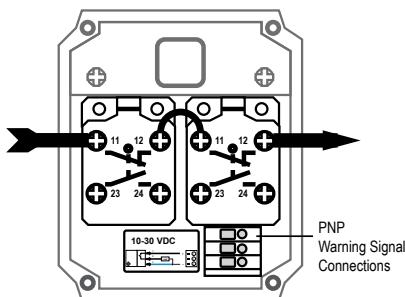


Figure 9. Single-Channel Connection

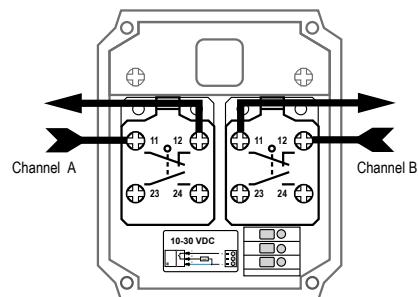


Figure 10. Dual-Channel Connection



WARNING:

- **Risk of electric shock**
- Use extreme caution to avoid electrical shock. Serious injury or death could result.
- Always disconnect power from the safety system (for example, device, module, interfacing, etc.), guarded machine, and/or the machine being controlled before making any connections or replacing any component. Lockout/tagout procedures might be required. Refer to OSHA 29CFR1910.147, ANSI Z244-1, or the applicable standard for controlling hazardous energy.
- Make no more connections to the device or system than are described in this manual. Electrical installation and wiring must be made by a Qualified Person³ and must comply with the applicable electrical standards and wiring codes, such as the NEC (National Electrical Code), ANSI NFPA79, or IEC 60204-1, and all applicable local standards and codes.

Wiring

These switch models have redundant pairs of safety contacts, so they may be wired for either single-channel or dual-channel output to a safety module or E-stop circuit. Monitor contacts may be wired as desired to an external alarm device.



CAUTION: Proper Wiring. Maximum tightening torque of contact screws is specified at 0.8 Nm; do not over-tighten. Before closing the front cover, verify no wires are trapped. Do not operate the rope pull without properly closing the cover.

Single-Channel Output: Wire contacts 11/12 together in series to the input of a safety module or E-stop circuit.

Dual-Channel Output: Wire contacts 11/12 independently to the two safety module inputs.

³ A person who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.

Warning Signal. Switch models RP-RM83F-...E provide a 24 V dc solid-state “warning signal” output, which signals when the rope tension is either too high or too low, before the safety contacts open and the switch latches OFF. This solid-state switch is located inside the wiring chamber next to the safety output contacts.

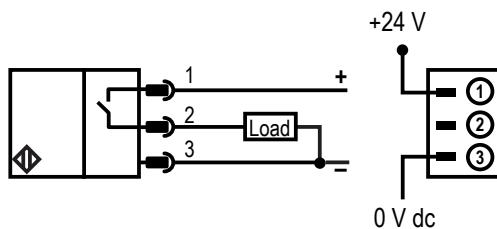


Figure 11. Warning Signal Electrical Connections

Manual/Latch Reset

E-Stop and Latch Reset. Following the rope pulling/breaking or the E-stop button being pressed, the latch must be manually reset. The E-stop can be reset only when proper tension is indicated. Pull the red E-stop button until the switch Status indicator changes from Yellow to Green and the latch makes an audible “click,” indicating that the latch has been reset.



Note: Proper rope tension must be displayed before the latch can be reset.

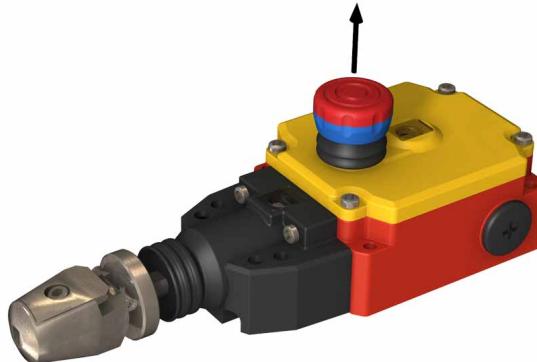


Figure 12. Resetting the Latch

Maintenance/Checkout

At switch installation or replacement and at machine set up, a Designated Person⁴ must test each switch for proper machine shutdown response and check the switch(es) and installation for proper operation, physical damage, mounting (looseness), and excessive environmental contamination. This must also take place on a periodic schedule determined by the user, based on the severity of the operating environment and the frequency of switch actuations. Adjust, repair, or replace components as needed. If inspection reveals contamination on the switch, thoroughly clean the switch and eliminate the cause of the contamination. Replace the switch and/or appropriate components when any parts or assemblies are damaged, broken, deformed, or badly worn; or if the electrical/mechanical specifications (for the environment and operating conditions) have been exceeded. Always test the control system for proper functioning under machine control conditions after performing maintenance, replacing the switch, or replacing any component of the switch.

Additional items that should be included in the checkout and/or regularly scheduled maintenance of a rope pull system:

- Check for proper rope tension and adjust as needed
- Verify free operation (no binding) of the rope and proper tripping when the rope is pulled
- Periodically lubricate the pulleys and other moving parts associated with the rope
- Repair any loose or damaged hardware, worn/frayed rope (cable), missing red rope sheathing or flags/markers (if used)
- Remove or clean off any contamination and eliminate its cause

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.

⁴ A Designated Person is identified in writing by the employer as being appropriately trained to perform a specified checkout procedure.

Specifications

Contact Rating

10 A at 24 V ac
10 A at 110 V ac
6 A at 230 V ac
6 A at 24 V dc
2.5 kV max, transient tolerance
NEMA A300 P300

Monitoring Solid-State Output Rating

Rated operational voltage: $U_e = 10$ to 30 V dc
Rated operational current: $= 50$ mA
Utilization category: DC13
Protected against reverse polarity and short circuit

European Rating

Utilization categories: AC15 and DC13
 $U_i = 500$ V ac; $I_{th} = 10$ A
Rated surge capacity: 2.5 kV

40-60 Hz		
U_e (V)	$I_e/AC-15$ (A)	$I_e/DC-13$ (A)
120	6	0.55
240	3	0.27

Contact Material

Silver-nickel alloy

Maximum Switching Speed

20 operations per minute

Recommended Rope Size

Accommodates rope sizes 2 to 5 mm diameter steel rope (see Accessories); select rope diameter based on switch model and rope length
75 m models: recommended 2 to 5 mm diameters
38 m models: recommended 2 to 5 mm diameters

Short Circuit Protection

10 amp Slow Blow, 15 amp Fast Blow. Recommended external fusing or overload protection.

Wire Connections

Screw terminals with pressure plates accept the following wire sizes:
Stranded and solid: 20 AWG (0.5 mm 2) to 16 AWG (1.5 mm 2) for one wire
Stranded: 20 AWG (0.5 mm 2) to 18 AWG (1.0 mm 2) for two wires

Mechanical Life

100,000 operations

Cable Entry

M20 x 1.5 threaded entrance. Adapter supplied to convert M20 x 1.5 to $\frac{1}{2}$ "-14 NPT threaded entrance

Construction

Die-cast aluminum housing; zinc die-cast actuator

Maximum Rope Pull Length

75 m (245 ft) or 37.5 m (123 ft), depending on model

Environmental Rating

NEMA 4, IEC IP67, per IEC/EN 60529

Operating Conditions

Temperature: -30 °C to 80 °C (-34 °F to 176 °F)

Weight

RP-RM83F-..LT and ..LTE: 1Kg (2.1 lbs.)
RP-RM83F-..LR and ..LRE: 0.77 Kg (1.6 lbs.)

Product Performance Standards

DIN EN 60947-1, DIN EN 60947-5-1, DIN EN 60947-5-5, IEC 60947-1, IEC 60947-5-1, IEC 60947-5-5, ISO 13850

Certifications


Dimensions

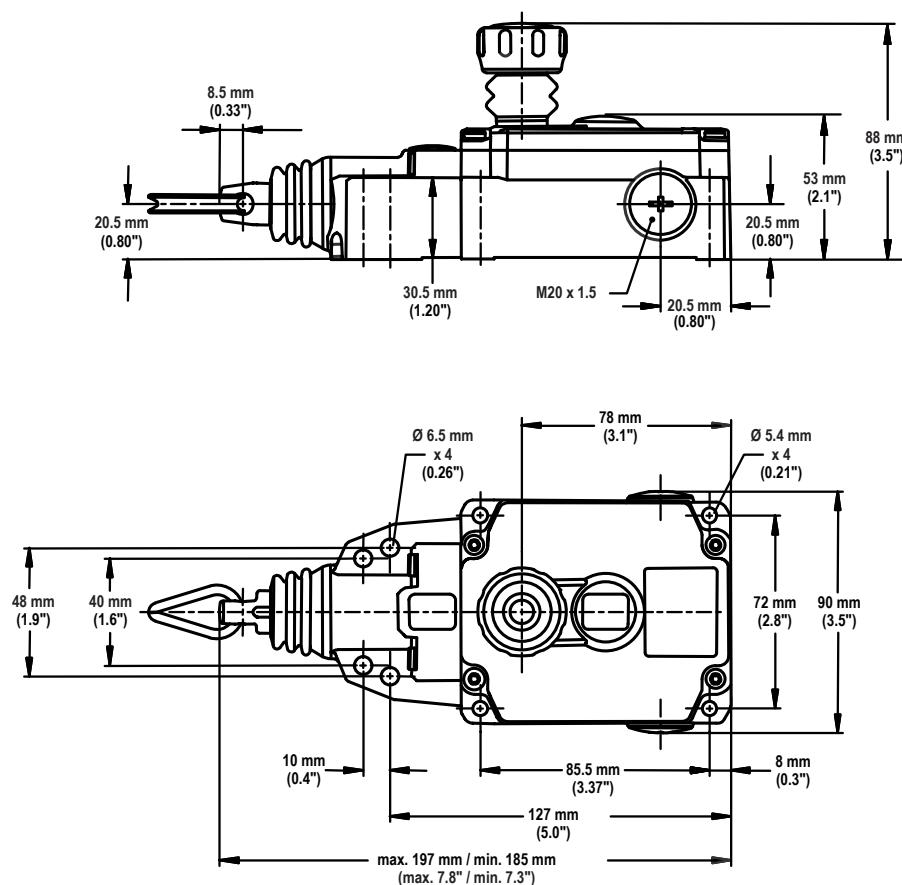


Figure 13. RP-RM83F-..LR..

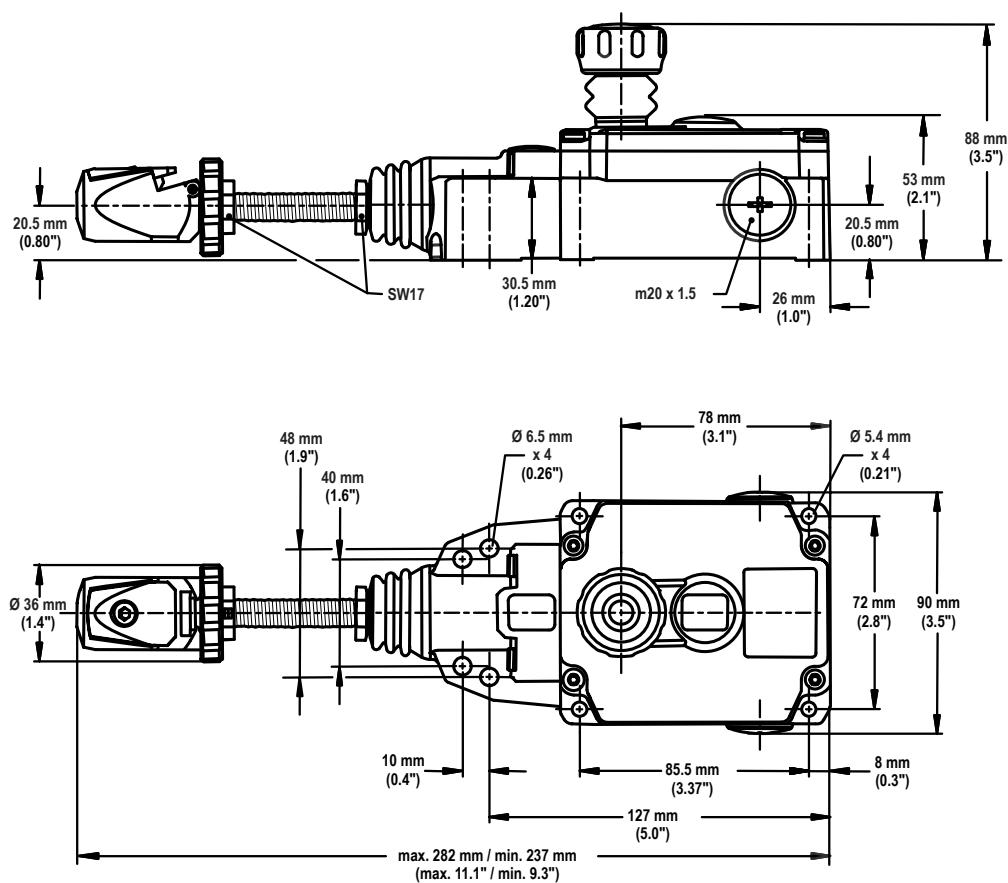


Figure 14. RP-RM83F--LT..

Accessories

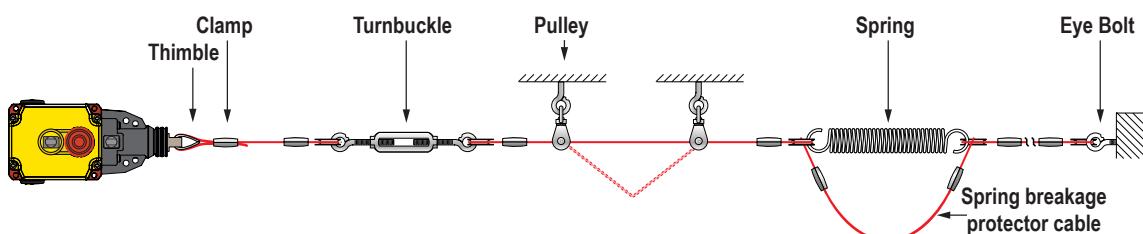


Figure 15. Wire Rope Assembly Components

Model	Length	Description	Wire Rope
RPA-C1-10	10 m (33 ft)		
RPA-C1-20	20 m (66 ft)	2 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	
RPA-C1-100	100 m (330 ft)		

Model	Length	Description	Wire Rope
RPA-C2-10	10 m (33 ft)		
RPA-C2-20	20 m (66 ft)	3 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	
RPA-C2-50	50 m (264 ft)		
RPA-C2-80	80 m (264 ft)		

Model	Length	Description	Wire Rope
RPA-C3-20	20 m (66 ft)		
RPA-C3-100	100 m (330 ft)	4 mm steel wire rope with 0.5 mm red PVC jacket (unterminated)	

Model	Quantity	Description	Thimble
RPA-T1-4	4	Thimble for 2 mm wire rope	
RPA-T2-4	4	Thimble for 3 mm wire rope	
RPA-T3-4	4	Thimble for 4 mm wire rope	

Model	Quantity	Description	Clamp
RPA-CC1-4	4	Clamp for 2 mm wire rope	
RPA-CC2-4	4	Clamp for 3 mm wire rope	
RPA-CC3-4	4	Clamp for 4 mm wire rope	

Model	Quantity	Description	Turnbuckle
RPA-TA1-1	1	#4 Turnbuckle	

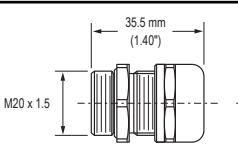
Model	Quantity	Description	Eye Bolt
RPA-EB1-1	1	1/4"-20 Eye bolt (3" bolt shaft)	

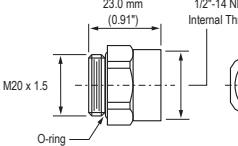
Model	Quantity	Description	Eye Bolt
RPA-EB2-1	1	5/16"-18 Eye bolt (3" bolt shaft)	

Model	Quantity	Description	Pulley
RPA-P1-1	1	Hanging pulley for in-line use	
RPA-DP1-1	1	Right-angle mount deflection pulley for corner turns (90 to 180 degrees)	

Model	Quantity	Description	Tensioning Spring	Used With
RPA-S3-1	1	Tensioning spring #3		RP-LM40D-6 RP-LM40D-6L RP-RM83F-.75..
RPA-S5-1	1	Tensioning spring #5		RP-RM83F-.38..

Model	Quantity	Description	Tensioning Spring	Used With
RPA-S4-1	1	Tensioning spring #4 with built-in eye bolt, cable thimble, clamping, tensioning, and overload protection.		RP-LM40D-6 RP-LM40D-6L RP-RM83F-..75..
RPA-S6-1	1	Tensioning spring #6 with built-in eye bolt, cable thimble, clamping, tensioning, and overload protection.		RP-RM83F-..38..

Model	Size	For Cable Diameter	Dimensions	Used With
SI-QM-CGM20	M20 × 1.5 Metal	5.0 to 12.0 mm (0.20 to 0.47 inches)		SI-LM40 Safety Interlock Switches SI-QM100 Safety Interlock Switches RP-RM83 Rope Pull Switches RP-LM40 Rope Pull Switches RP-QM72/QMT72 Rope Pull Switches RP-QM90 Rope Pull Switches

Model	Size	Thread Conversion	Dimensions	Used With
SI-QM-M20	1/2 in-14 NPT Metal	M20 × 1.5 to 1/2 in-14 NPT		SI-LM40 Safety Interlock Switches SI-QM100 Safety Interlock Switches RP-RM83 Rope Pull Switches RP-LM40 Rope Pull Switches RP-QM72/QMT72 Rope Pull Switches RP-QM90 Rope Pull Switches

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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This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

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



more sensors, more solutions

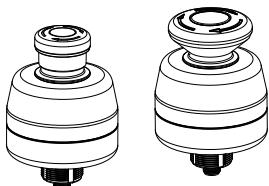
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SSA-EB Series Lighted Emergency Stop Push Button



Datasheet

Illuminated 30 mm Mount Electro-mechanical Push Buttons



- Rugged design; easy installation with no assembly or individual wiring required
- Push-to-stop, twist-to-release, or pull-to-release operation per EN 60947-5-5
- Models with the washdown cover are push-to-stop and pull-to-release operation per EN 60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per EN 60947-5-1
- Compliant with ANSI B11.19, NFPA 79, and IEC/EN 60204-1 Emergency Stop requirements
- "Safe Break Action" ensures normally closed (NC) contacts will open if the contact block is separated from the actuator
- 8-pin M12 quick disconnect
- Models with yellow and red indication of actuation (armed or depressed/latched button)
- "Emergency Stop" legend included
- U.S. Patent No. Des. 700,149
- FDA-grade silicone cover withstands high pressure, high temperature washdown, and increases the product rating to IP69; the cover is ECOLAB® certified to withstand aggressive cleaning procedures with chemicals used in the food processing industry

Models SSA-EB... series are "mushroom-style" electro-mechanical emergency stop push buttons. When the button is armed, the switch's safety contacts (normally closed/NC) are closed and its monitoring contacts (normally open/NO), if present, are open. When the button is pushed, the switch's safety contacts open, and the monitoring contacts close. The contacts remain in this condition until the push button is manually rearmed by pulling or twisting clockwise the red push button actuator.

The SSA-EB1PL and -EB2PL...-ECQ.. series has a 30 mm mounting base similar to Banner's OTB, VTB, and STB Optical Touch Buttons for ease of mounting without requiring an additional enclosure. The EZ-LIGHT® illumination logic allows for easy identification of a pushed/actuated button. An armed button will light a steady yellow or green illumination or off (depending on model), a pushed/actuated button is indicated by a red illumination (flashing or solid depending on model). An optional input allows an armed button to illuminate a steady red to indicate a machine stop or emergency stop condition.

Models

Model	Push Button	EZ-LIGHT® Illumination Logic	Connection
SSA-EB1PL-12ECQ8	Standard 40 mm	OFF (armed), RED (solid, PUSH)	8-pin M12/Euro-style quick disconnect
SSA-EB1PLXR-12ECQ8		OFF (armed), RED (flash, PUSH)	
SSA-EB1PLYR-12ECQ8		YELLOW (armed), RED (flash, PUSH)	
SSA-EB1PLGR-12ECQ8		GREEN (armed), RED (flash, PUSH)	
SSA-EB2PLXR-12ECQ8	Large 60 mm	OFF (armed), RED (flash, PUSH)	

Important... Read this before proceeding!

The user is responsible for satisfying all local, state, and national laws, rules, codes, and regulations relating to the use of this product and its application. Banner Engineering Corp. has made every effort to provide complete application, installation, operation, and maintenance instructions. Please contact a Banner Applications Engineer with any questions regarding this product.

The user is responsible for making sure that all machine operators, maintenance personnel, electricians, and supervisors are thoroughly familiar with and understand all instructions regarding the installation, maintenance, and use of this product, and with the machinery it controls. The user and any personnel involved with the installation and use of this product must be thoroughly familiar with all applicable standards, some of which are listed within the specifications. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.



**WARNING:**

- **Not a safeguarding device**
- Failure to follow these instructions could result in serious injury or death.
- This device is not considered a safeguarding device because it requires an overt action by an individual to stop machine motion or hazards. A safeguarding device limits or eliminates an individual's exposure to a hazard without action by the individual or others. This device cannot be substituted for required safeguarding. Refer to the applicable standards to determine those requirements.

U.S. Application Standards

ANSI B11.0 Safety of Machinery; General Requirements and Risk Assessment

ANSI B11.19 Performance Criteria for Safeguarding

NFPA 79 Electrical Standard for Industrial Machinery

International/European Standards

EN ISO 12100 Safety of Machinery – General Principles for Design — Risk Assessment and Risk Reduction

ISO 13850 (EN 418) Emergency Stop Devices, Functional Aspects – Principles for Design

IEC 62061 Functional Safety of Safety-Related Electrical, Electronic and Programmable Control Systems

EN ISO 13849-1 Safety-Related Parts of Control Systems

IEC/EN 60204-1 Electrical Equipment of Machines Part 1: General Requirements

EN 60947-1 Low Voltage Switchgear – General Rules

EN 60947-5-1 Low Voltage Switchgear – Electromechanical Control Circuit Devices

EN 60947-5-5 Low Voltage Switchgear – Electrical Emergency Stop Device with Mechanical Latching Function

Emergency Stop Considerations

NFPA 79, ANSI B11.19, IEC/EN 60204-1, and ISO 13850 specify emergency stop requirements, including the following:

- Emergency-stop push buttons shall be located at each operator control station and at other operating stations where emergency shutdown is required.
- Stop and emergency-stop push buttons shall be continuously operable and readily accessible from all control and operating stations where located. Do not mute or bypass E-stop buttons.
- Actuators of emergency-stop devices shall be colored red. The background immediately around the device actuator shall be colored yellow (where possible). The actuator of a push-button-operated device shall be of the palm or mushroom-head type.
- The emergency-stop actuator shall be a self-latching type.

**WARNING:**

- **Do not mute or bypass any emergency stop device**
- Muting or bypassing the safety outputs renders the emergency stop function ineffective.
- ANSI B11.19, NFPA 79 and IEC/EN 60204-1 require that the emergency stop function remains active at all times.

**WARNING:**

- **Connect two or more devices to the same safety module (controller) in series**
- Connecting devices in parallel defeats the switch contact monitoring ability of the module and creates an unsafe condition that could result in serious injury or death.
- Failure to test each device individually in this manner could result in undetected faults and create an unsafe condition that could result in serious injury or death.
- Connect the contacts of the corresponding pole of each switch in series. Never connect the contacts of multiple switches in parallel. Individually actuate (engage) each device, then release (or re-arm) and reset the safety module. This allows the module to check each switch and its wiring to detect faults. Perform this check during the prescribed checkouts.

EU Declaration of Conformity (DoC)

Banner Engineering Corp. herewith declares that these products are in conformity with the provisions of the listed directives and all essential health and safety requirements have been met. For the complete DoC, please go to www.bannerengineering.com.

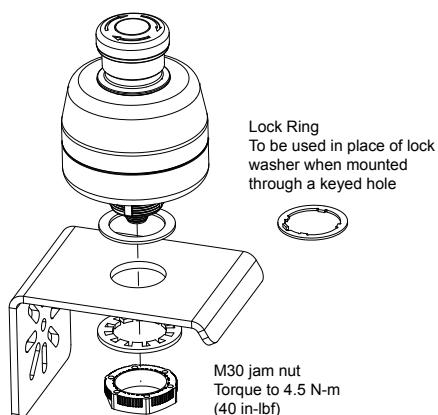
Product	Directive
SSA-EB1PL and -EB2PL.. Emergency Stop Push Button	Machinery Directive (2006/42/EC), Low Voltage Directive (2014/35/EU)

Representative in EU: Peter Mertens, Managing Director, Banner Engineering BV. Address: Park Lane, Culliganlaan 2F, bus 3, 1831 Diegem, Belgium.

Installation and Maintenance

The device must not be affected by environmental conditions. **Install the device so that operation is not impeded, but should be protected against inadvertent operation** (for example, accidental actuation by being bumped or leaned against). Do not operate the switch using a tool. Do not expose the switch to excessive shocks and vibrations, otherwise the switch may be deformed or damaged, causing malfunction or operation failure. Hardware includes jam nut, lock washer, lock ring, and seal washer. The lock ring may be used to prevent switch rotation if a 5mm hole keyway is provided in the 30 mm mounting hole. The threaded base contains external M30 threads for the supplied jam nut, as well as internal 1/2-14 NPSM threads for an alternate mounting option.

Figure 1. Mounting the E-stop



Electrical installation must be made by qualified personnel¹ and must comply with NEC (National Electrical Code), NFPA 79 or IEC/EN 60204-1, and all applicable local standards. It is not possible to give exact wiring instructions for a device that interfaces to a multitude of machine control configurations. The following is general in nature; it is recommended to perform a risk assessment to ensure appropriate application, interfacing/hookup, and risk reduction (see ISO 12100 or ANSI B11.0).



WARNING:

- **Risk of electric shock**
- Use extreme caution to avoid electrical shock. Serious injury or death could result.
- Always disconnect power from the safety system (for example, device, module, interfacing, etc.), guarded machine, and/or the machine being controlled before making any connections or replacing any component. Lockout/tagout procedures might be required. Refer to OSHA 29CFR1910.147, ANSI Z244-1, or the applicable standard for controlling hazardous energy.
- Make no more connections to the device or system than are described in this manual. Electrical installation and wiring must be made by a Qualified Person² and must comply with the applicable electrical standards and wiring codes, such as the NEC (National Electrical Code), NFPA 79, or IEC 60204-1, and all applicable local standards and codes.

¹ A Qualified Person possesses a recognized degree or certificate or has extensive knowledge, training, and experience to solve problems relating to the emergency stop installation.

² A person who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.

Table 1: Wiring

Pin	Color	Function	Connection and Pinout
1	White	AUX N.O. Output (Switched pin 2)	
2	Brown	+24 V DC (12–30 V DC)	
3	Green	Stop Signal input from safety module or machine +24 V DC (12–30 V DC)	
4	Yellow	CH2a	
5	Gray	CH2b	
6	Pink	CH1a	
7	Blue	0 V DC	
8	Red	CH1b	

Table 2: SSA-EB1xxLYR-xx or SSA-EB1xxLGR-xx

See Figure 2 on p. 5.

Situation	Indication	Illumination Logic
Button Armed Pin 3 open	YELLOW / SOLID or GREEN / SOLID	<ul style="list-style-type: none"> Indicates button is armed If used, ES-FA-11AA Module status is in a reset/run condition (31/32 open)
Button Pushed Pin 3 open or +V DC	RED / FLASH	<ul style="list-style-type: none"> Indicates the button is pushed (actuated) Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V DC	RED / SOLID	<ul style="list-style-type: none"> Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) This optional signal (12 to 30 V DC) allows the user to indicate a stop condition by turning the armed indication to red (steady) indication

Table 3: SSA-EB1(2)xxLXR-xx

See Figure 2 on p. 5.

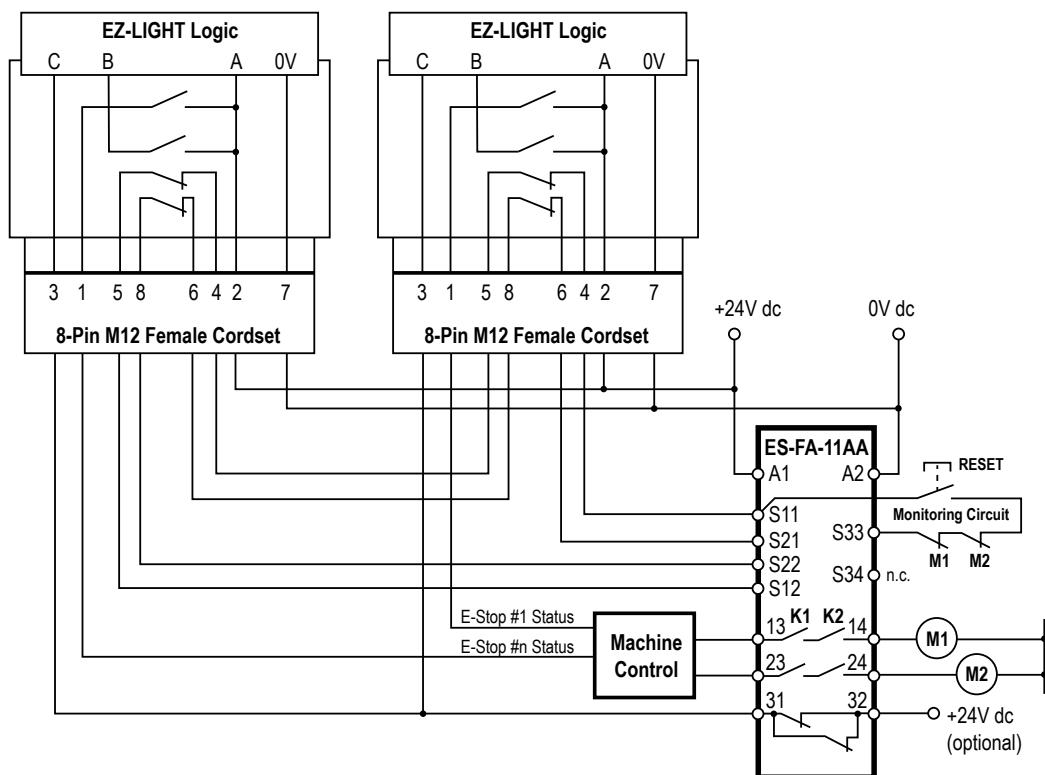
Situation	Indication	Illumination Logic
Button Armed Pin 3 open	OFF	<ul style="list-style-type: none"> Indicates button is armed If used, ES-FA-11AA Module status is in a reset/run condition (31/32 open)
Button Pushed Pin 3 open or +V DC	RED / FLASH	<ul style="list-style-type: none"> Indicates the button is pushed (actuated) Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V DC	RED / SOLID	<ul style="list-style-type: none"> Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) This optional signal (12 to 30 V DC) allows the user to indicate a stop condition by turning the armed indication to red (steady) indication

Table 4: SSA-EB1xxL-xx

See Figure 2 on p. 5.

Situation	Indication	Illumination Logic
Button Armed Pin 3 open	OFF	<ul style="list-style-type: none"> Indicates button is armed If used, ES-FA-11AA Module status is in a reset/run condition (31/32 open)
Button Pushed Pin 3 open or +V DC	RED / SOLID	<ul style="list-style-type: none"> Indicates the button is pushed (actuated) Signal on Pin 3 has no effect on a button that has been pushed (actuated)
Button Armed Pin 3 = +V DC	RED / SOLID	<ul style="list-style-type: none"> Indicates the machine is in an Emergency Stop or other stop condition, but that specific button has not been pushed (actuated) This optional signal (12 to 30 V DC) allows the user to indicate a stop condition by turning the armed indication to red (steady) indication

Figure 2. Illuminated models - example hookup



Note: Refer to the ES-FA-11AA E-Stop Safety Module datasheet (p/n 60606) for complete safety module installation information.

Checkout

At machine set up, a *Designated Person*³ should test each safety point for proper machine shutdown response. A *Designated Person* should check the safety point for proper operation, physical damage, button looseness, and excessive environmental contamination. This should take place on a periodic schedule determined by the user, based on the severity of the operating environment and the frequency of switch actuations.

Adjust, repair, or replace components as needed. If inspection reveals contamination on the switch, thoroughly clean the switch and eliminate the cause of the contamination. Replace the switch and/or appropriate components when any parts or assemblies are damaged, broken, deformed, or badly worn; or if the electrical/mechanical specifications (for the environment and operating conditions) have been exceeded.

Always test the control system for proper functioning under machine control conditions after performing maintenance, replacing the safety point, or replacing any component of the device.

³ A *Designated Person* is identified in writing by the employer as being appropriately trained to perform a specified checkout procedure. A *Qualified Person* possesses a recognized degree or certificate or has extensive knowledge, training, and experience to solve problems relating to the emergency stop installation.

Installing the Silicone Cover

To properly install the FDA-grade silicone cover and achieve an IP69 rating, follow these instructions.

1. Turn the cover inside-out, except for the top portion the button fits into.
2. Place the cover on top of the emergency stop unit.
3. Roll the cover onto the e-stop unit.
4. Continue rolling the cover down, around the base of the e-stop unit, until the entire unit is covered.
5. Mount the e-stop and cover assembly to a bracket wide enough to cover the base of the assembly. The cover should be clamped firmly between the e-stop button and the bracket.



Note: This cover is suitable for applications with pull-to-release resetting methods.



Note: The FDA-grade silicone cover withstands high pressure, high temperature washdown, and increases the product rating to IEC IP69. The cover is ECOLAB® certified to withstand aggressive cleaning procedures with chemicals used in the food processing industry.

Specifications

Housing / Button

Polycarbonate / Polyamide
Threaded base has M30 by 1.5 external threads; Maximum Tightening Torque: 4.5 N·m (40 in-lbf)

Operating Conditions

-25 °C to +55 °C (-13 °F to +131 °F)
45% to 85% relative humidity (no condensation)

Environmental Rating

For Indoor Use Only
IP65 (IEC 60529), UL Type 4X and UL Type 13
IP67, IP69 (IEC 60529), and UL Type 4X and UL Type 13 (with SSA-EB1P-ECWC cover installed)

Insulation Resistance

100 MΩ minimum (500 V DC megger)

Impulse Withstand Voltage

2.5 kV

Pollution Degree

3

Output Configuration

See [Installation and Maintenance](#) on p. 3

Oversupply Category

II

Contact Material/Bounce⁴

Gold plated silver / 20 ms

Electrical Life

100,000 operations minimum, 250,000 operations minimum at 24 V AC/DC, 100 mA

Mechanical Life

250,000 operations

Rated Current (I_{th})

2A

Vibration Resistance

Operating extremes: 10 Hz to 500 Hz, amplitude 0.35 mm acceleration 50 m/s²

LED Color

Yellow - 590 nm, Red - 618 nm, Green - 525 nm

LED Flash Rate

1.6 Hz at 50% duty cycle

LED Voltage/Current

SSA-EB1.LYR-.., SSA-EB1(2).LXR-.., and SSA-EB1.. L-..: 12 V DC to 30 V DC; 120 mA at 12 V DC, 65 mA at 24 V DC, 60 mA at 30 V DC
SSA-EB1.LGR-..: 12 V DC to 30 V DC; 135 mA at 12 V DC, 75 mA at 24 V DC, 70 mA at 30 V DC

Electrical Rating

Minimum load: 1 mA at 5 V AC/DC

SSA-EB1(2)xx-xxECQ8: 2A at 60 V AC / 75 V DC maximum

UL Applications: 1.5 A at 250 V AC, 1 A at 30 V DC (pilot duty)

CE Applications: AC-15: 1.5 A at 250 V AC, DC-13: 1 A at 30 V DC

Shock Resistance

Operating extremes: 150 m/s² (15G)

Rated Insulation Voltage (Ui)

60 V AC / 75 V DC

B10d

100,000 (based on ISO13849-1(2006))

Date code format (U.S. Standard Format)

YYWWX: 2-digit year, 2-digit week, "X" internal code

Design and Application Standards

Compliant with EN 60497-1 / -5-1, ISO 13850, ANSI B11.19, ANSI NFPA79, IEC/EN 60204-1

Certifications



⁴ When the button is reset, the normally closed contacts will chatter. When pressing the button, the normally open contacts will chatter. When designing a control circuit, take the contact chatter time into consideration. Do not expose the switch to external shocks, otherwise the contacts will bounce.

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

Rated Operating Current and Voltage (Ue)

Safety Contact (N.C.)	30 V	60 V AC/75 V DC
AC 50/60 Hz	Resistive Load (AC-12)	-
	Inductive Load (AC-15)	2 A
DC	Resistive Load (DC-12)	2 A
	Inductive Load (DC-13)	0.4 A

Auxiliary Output (N.O.)	30 V	60 V AC/75 V DC
12 to 30 V DC (from supply pin 2)	Resistive Load (DC-12)	0.25 A
	Inductive Load (DC-13)	0.25 A

The operating current is classified according to EN 60947-5-1 making and breaking capacities and are measured at resistive/inductive load types specified in EN 60947-5-1. See "Electrical Rating" above for specific model and UL/CE maximum ratings.

Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.

Figure 3. Standard 40 mm Pushbutton

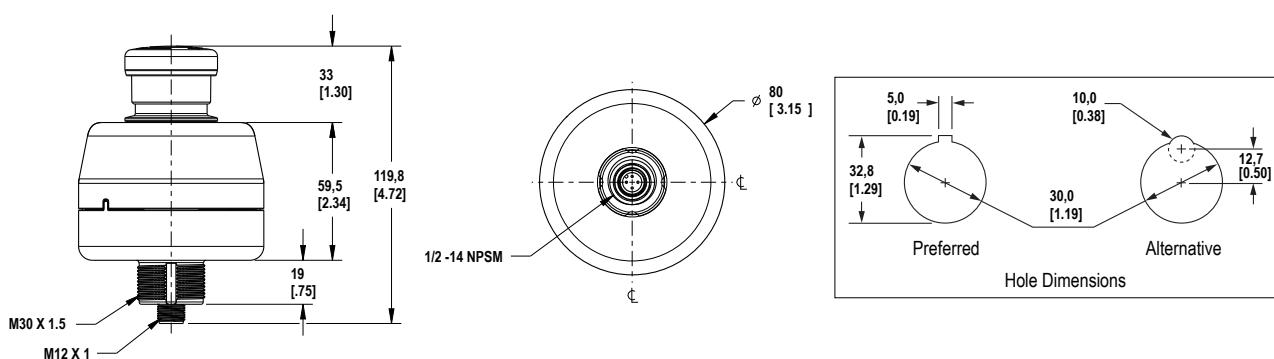
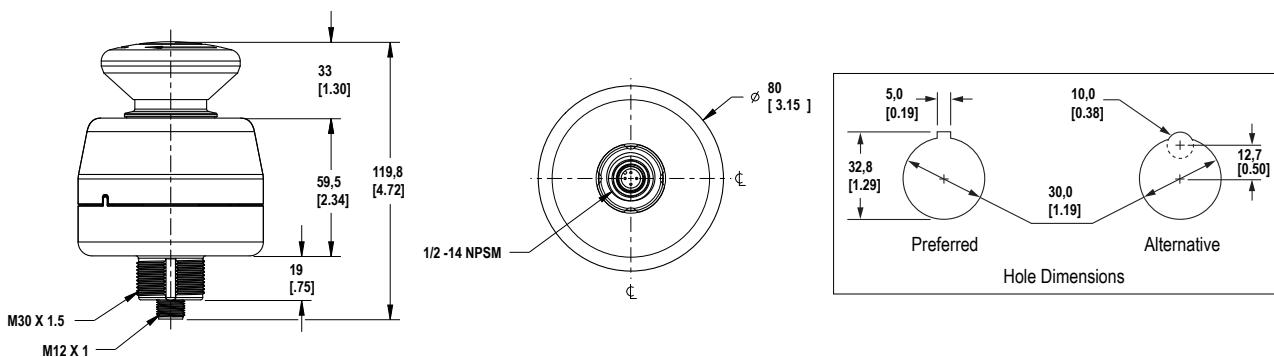


Figure 4. Large 60 mm Pushbutton



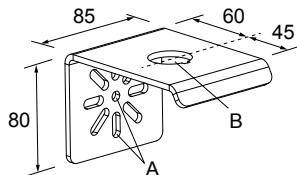
Accessories

Mounting Brackets

SSA-MBK-EEC1

- Single 30 mm hole
- 8 gauge steel, black finish (powder coat)
- Front surface for customer applied labels

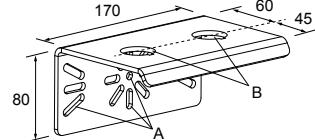
Hole size: A = \varnothing 7 , B = \varnothing 30



SSA-MBK-EEC2

- Two 30 mm holes
- 8 gauge steel, black finish (powder coat)
- Front surface for customer applied labels

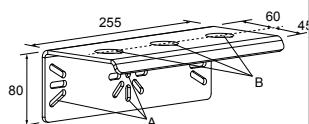
Hole size: A = \varnothing 7 , B = \varnothing 30



SSA-MBK-EEC3

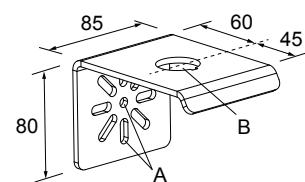
- Three 30 mm holes
- 8 gauge steel, black finish (powder coat)
- Front surface for customer applied labels

Hole size: A = \varnothing 7 , B = \varnothing 30



SSA-MBK-EEC1-SS

- Single 30 mm hole
- 8 gauge 316 stainless steel
- Front surface for customer applied labels



Hole size: A = \varnothing 7 , B = \varnothing 30

The SSA-MBK-EECx brackets offer:

- Horizontal and vertical (post) mounting
- Interchangeable positions of mounted devices (e.g. OTB/STB/VTB, E-Stop, K50s)

Cordsets

8-Pin Threaded M12 Cordsets—Flying Leads				
Model	Length	Style	Dimensions	Pinout (Female)
SXA-815D	4.57 m (15 ft)			
SXA-825D	7.62 m (25 ft)			
SXA-850D	15.24 m (50 ft)	Straight	 M12 x 1 Ø 14.5	 1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Red
SXA-8100D	30.48 m (100 ft)			

8-Pin Threaded M12 Cordsets—Double Ended											
Model (8-pin/8-pin) ⁵	Length	Style	Dimensions	Pinout							
DEE2R-81D	0.3 m (1 ft)										
DEE2R-83D	0.91 m (3 ft)										
DEE2R-88D	2.44 m (8 ft)										
DEE2R-815D	4.57 m (15 ft)										
DEE2R-825D	7.62 m (25 ft)										
DEE2R-850D	15.24 m (50 ft)										
DEE2R-875D	22.86 m (75 ft)	Female Straight/ Male Straight		 							
DEE2R-8100D	30.48 m (100 ft)			<table> <tr> <td>1 = White</td> <td>5 = Gray</td> </tr> <tr> <td>2 = Brown</td> <td>6 = Pink</td> </tr> <tr> <td>3 = Green</td> <td>7 = Blue</td> </tr> <tr> <td>4 = Yellow</td> <td>8 = Red</td> </tr> </table>	1 = White	5 = Gray	2 = Brown	6 = Pink	3 = Green	7 = Blue	4 = Yellow
1 = White	5 = Gray										
2 = Brown	6 = Pink										
3 = Green	7 = Blue										
4 = Yellow	8 = Red										

See Banner Engineering catalog or go to www.bannerengineering.com for additional models and complete information.

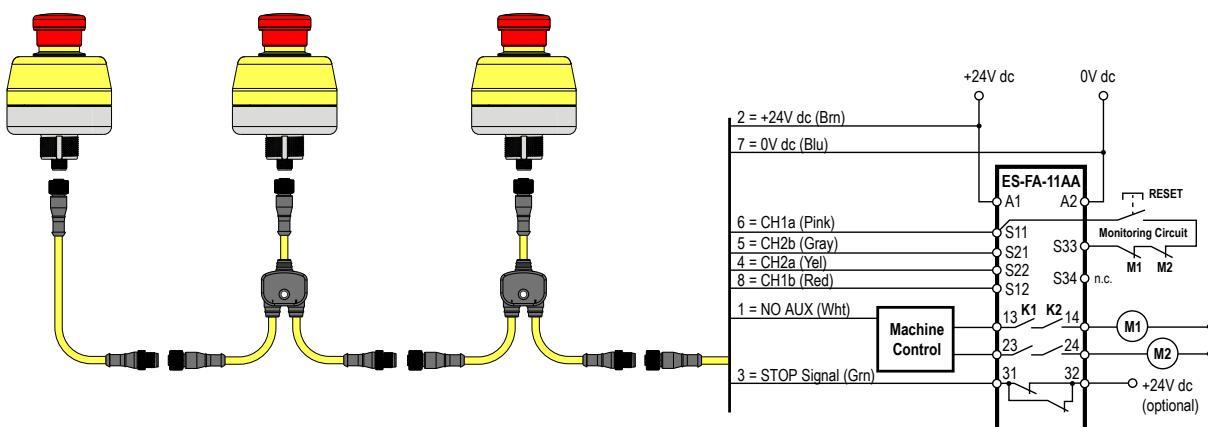
Series Connection Cordset Solution

This interconnection solution allows for quick wiring of a series of string emergency stop buttons. For the models listed below, Branch #1 and Branch #2 are 300 mm (12 in) in length and the length of the trunk is listed below.



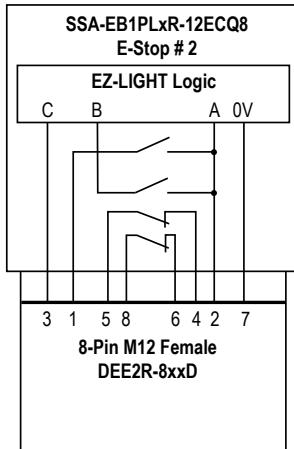
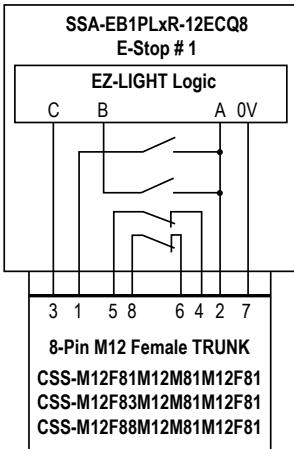
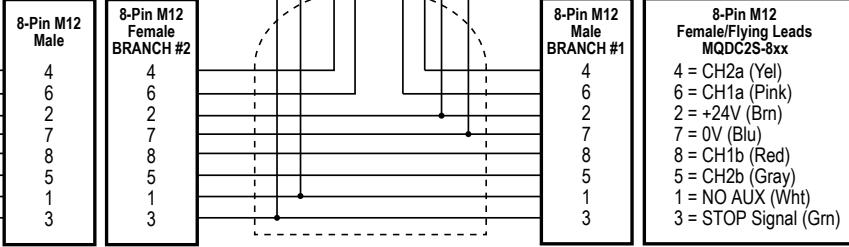
WARNING:

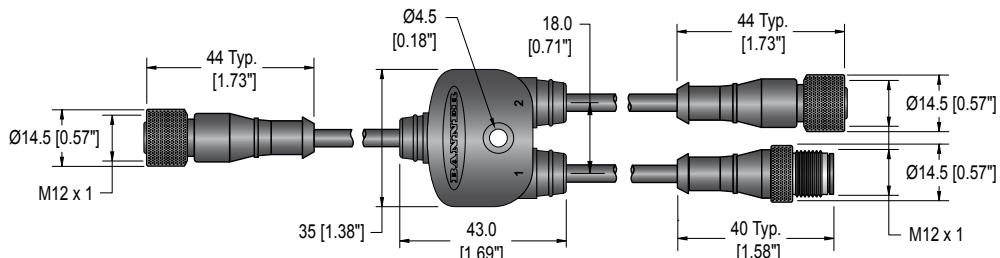
- **Do not defeat the cordset installation**
- Defeating the series connection cordset solution could result in serious injury or death.
- Install the CSS series connection cordset solution so they cannot be easily defeated. Ensure that mounting and routing of the cordsets that are connected to the Trunk, Branch #1, Branch #2, and the E-Stop QD connector does not allow access to the QD connectors or allow improper connection bypassing the function of the Emergency Stop.



Model	Length	Description
CSS-M12F81M12M81M12F81	1 ft	
CSS-M12F83M12M81M12F81	3 ft	8-pin M12/Euro-style QD splitter cordset for use with SSA-EB1PLxR-12ECQ8
CSS-M12F88M12M81M12F81	8 ft	

⁵ Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add the suffix "B" to the model number (example, DEE2R-81DB)

Model	Length	Description								
 SSA-EB1PLxR-12ECQ8 E-Stop # 2 EZ-LIGHT Logic <table border="1"> <tr><td>C</td><td>B</td><td>A</td><td>0V</td></tr> </table> <p>3 1 5 8 6 4 2 7</p> <p>8-Pin M12 Female DEE2R-8xxD</p>  SSA-EB1PLxR-12ECQ8 E-Stop # 1 EZ-LIGHT Logic <table border="1"> <tr><td>C</td><td>B</td><td>A</td><td>0V</td></tr> </table> <p>3 1 5 8 6 4 2 7</p> <p>8-Pin M12 Female TRUNK CSS-M12F81M12M81M12F81 CSS-M12F83M12M81M12F81 CSS-M12F88M12M81M12F81</p>  <p>8-Pin M12 Male</p> <p>4 6 2 7 8 5 1 3</p> <p>8-Pin M12 Female BRANCH #2</p> <p>4 6 2 7 8 5 1 3</p> <p>8-Pin M12 Male BRANCH #1</p> <p>4 6 2 7 8 5 1 3</p> <p>8-Pin M12 Female/Flying Leads MQDC2S-8xx</p> <p>4 = CH1a (Yel) 6 = CH1a (Pink) 2 = +24V (Brn) 7 = 0V (Blu) 8 = CH1b (Red) 5 = CH2b (Gray) 1 = NO AUX (Wht) 3 = STOP Signal (Grn)</p>	C	B	A	0V	C	B	A	0V	Length	Description
C	B	A	0V							
C	B	A	0V							

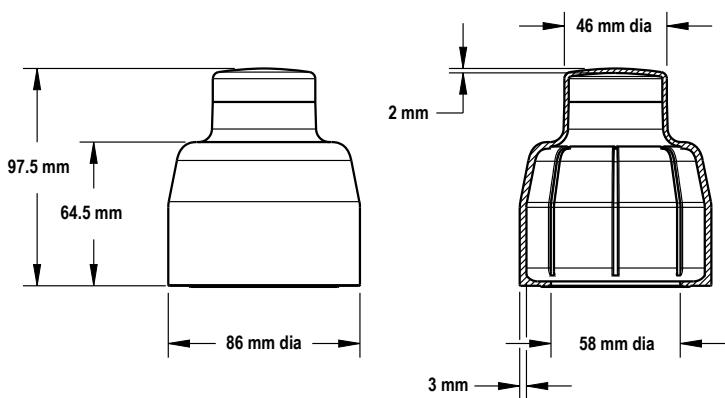


Washdown Silicone Cover SSA-EB1P-ECWC

To order a model with the washdown cover installed, add "-WC" to the model number. For example, **SSA-EB1PLYR-12ECQ8-WC**.

Washdown Cover Model	For Push Button Models	Description
SSA-EB1P-ECWC	Standard 40 mm	FDA-grade silicone cover

SSA-EB Series Lighted Emergency Stop Push Button

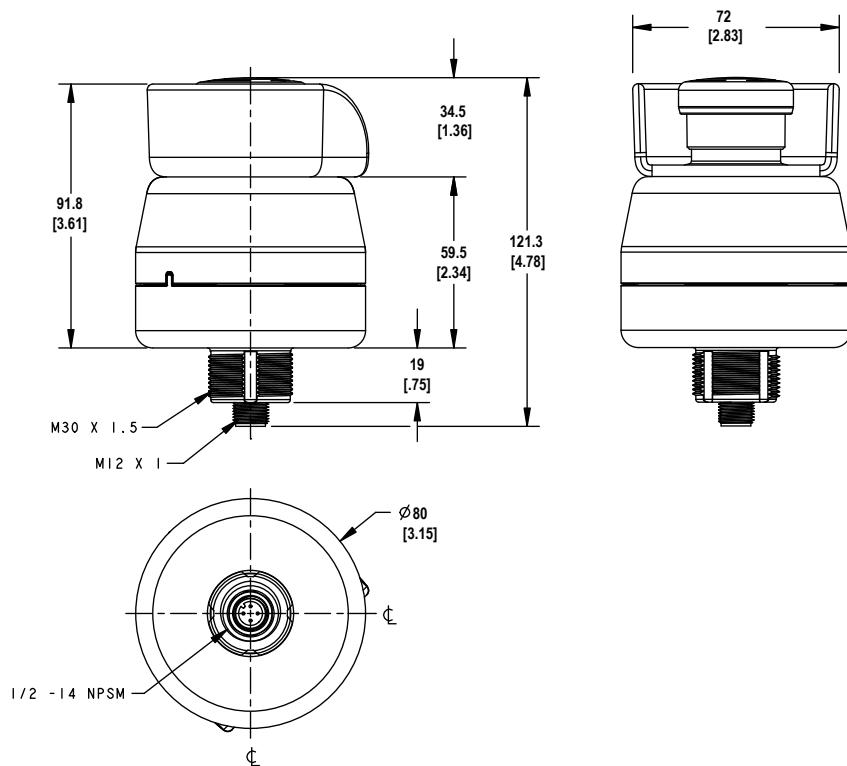


Pre-Installed Shroud

To order a unit with a shroud (model **ESC-1-YW**) pre-installed, the model number has an S1 inserted after the LED color characters (for example **SSA-1EB1PLYR-12ECQ8** becomes **SSA-EB1PLYRS1-12ECQ8**). Contact Banner Engineering for availability.

Figure 5. SSA-EB1PLxx-12ECQ8 E-Stop with a Shroud

Figure 6. Dimensions for the SSA-EB1PLxx-12ECQ8 E-stop button with shroud



Banner Engineering Corp. Limited Warranty

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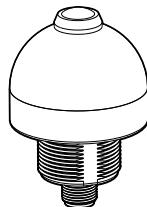
more sensors, more solutions

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Datasheet

Compact Indicator with One, Two, or Three Colors and a Momentary Push Button Output

To view or download the latest technical information about this product, including specifications, dimensions, accessories, and wiring, see www.bannerengineering.com.



- Rugged, cost-effective and easy-to-install multicolor indicator light with pushbutton
- Waterproof IEC IP65 construction for washdown environments
- Excellent for panel mounting or as a stand-alone device
- Immune to EMI and RFI interference
- 12 V dc to 30 V dc operation
- Cabled and quick disconnect models available
- Up to 3 independent colors in one unit



WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel **protection**. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

Models

Family	Color 1	Color 2	Color 3	Input	Output	Connector
K50L	G	R	Y	P	PB2	Q
	G = Green			P = PNP	PB2 = Momentary Push Button	Q = Euro Integral QD
	R = Red					Blank = 2 m Integral Cable
	Y = Yellow					QP = Euro Pigtail QD
	B = Blue					
	W = White					
	T = Turquoise					
	O = Orange					
	V = Violet					
	M = Magenta					
	X = No color in this position					

Example Model	# of LED Colors	LED Indicators	Connection ¹
K50LGXXPPB2Q	1	Green	4-pin M12/Euro-style integral QD Connector
K50LRXXPPB2Q		Red	
K50LGRXPPB2Q	2	Green, Red	5-pin M12/Euro-style QD Connector
K50LGYXPPB2Q		Green, Yellow	
K50LGRYPPB2Q	3	Green, Red, Yellow	8-pin M12/Euro-style QD Connector

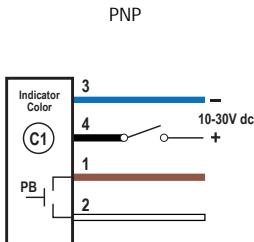
¹ Integral quick disconnect models are listed.

- To order the 2 m (6.5 ft) PVC cable model, omit the suffix "Q" in the model number. For example, K50LGXXPPB2.
- To order the 150 mm (6 in) PVC cable model, replace the suffix "Q" with "QP" in the model number. For example, K50LGXXPPB2QP.
- Models with a quick disconnect require a mating cordset.



Wiring Diagrams

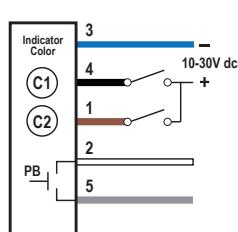
4-Pin Models



PNP

Key
1 = Brown
2 = White
3 = Blue
4 = Black
C1 = Color 1
PB = Push Button

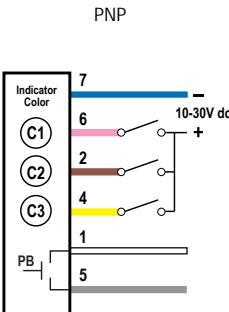
5-Pin Models



PNP

Key
1 = Brown
2 = White
3 = Blue
4 = Black
5 = Gray
C1 = Color 1
C2 = Color 2
PB = Push Button

8-Pin Models



PNP

Key
1 = White
2 = Brown
3 = Green (not used)
4 = Yellow
5 = Gray
6 = Pink
7 = Blue
8 = Red (not used)
C1 = Color 1
C2 = Color 2
C3 = Color 3
PB = Push Button

Installation

Install the K50 sensor at such a height and in a location that will be easy for the user and/or supervisor to see the indicator and comfortable for the user to press the push-button.

Specifications

Supply Voltage and Current

12 V dc to 30 V dc
65 mA at 12 V dc; 35 mA at 30 V dc maximum, current per LED color

Supply Protection Circuitry

Protected against transient voltages and reverse polarity

Switch Contact Rating

150 mA at 30 V dc

Contact Bounce

10 ms maximum

Environmental Rating

IEC IP65
NEMA/UL Type 4X, 13

Construction

Base: polycarbonate
Translucent dome: polycarbonate
Push button: thermoplastic

Mounting Torque

2.25 Nm (20 in-lbf) maximum

Connections

Integral M12/Euro-style quick disconnect, 2 m (6.5 ft) PVC jacketed cable or 150 mm (6 in) PVC cable with quick disconnect, depending on model

Operating Temperature

-40 °C to +50 °C (-40 °F to +122 °F)

Max. Relative Humidity

90% at +50 °C maximum relative humidity (non-condensing)

Storage Temperature

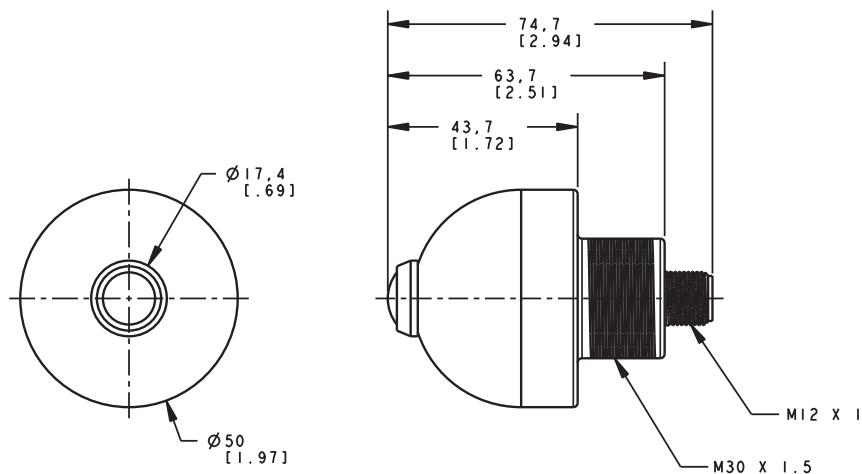
-40 °C to +70 °C (-40 °F to +158 °F)

Certifications



Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.

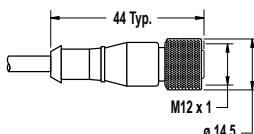
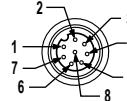


Accessories

Quick-Disconnect (QD) Cordsets

4-Pin Threaded M12/Euro-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-415	4.57 m (15 ft)			
MQDC-430	9.14 m (30 ft)			
MQDC-450	15.2 m (50 ft)			

5-Pin Threaded M12/Euro-Style Cordsets—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC1-501.5	0.50 m (1.5 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDC1-506	1.83 m (6 ft)			
MQDC1-515	4.57 m (15 ft)			
MQDC1-530	9.14 m (30 ft)			
MQDC1-506RA	1.83 m (6 ft)	Right-Angle		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDC1-515RA	4.57 m (15 ft)			
MQDC1-530RA	9.14 m (30 ft)			

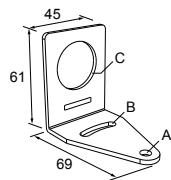
8-Pin Threaded M12/Euro-Style Cordsets with Shield				Pinout (Female)
Model	Length	Style	Dimensions	
MQDC-806	1.83 m (6 ft)	Straight		 1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Shield
MQDC-815	4.57 m (15 ft)			
MQDC-830	9.14 m (30 ft)			

Brackets

All measurements are in mm

SMB30A

- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 ($\frac{1}{4}$ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel

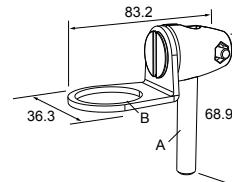


Hole center spacing: A to B=40

Hole size: A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

SMB30FA

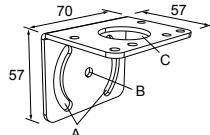
- Swivel bracket with tilt and pan movement for precise adjustment
- Mounting hole for 30 mm sensor
- 12-ga. 304 stainless steel
- Easy sensor mounting to extrude rail T-slot
- Metric and inch size bolt available



Bolt thread: SMB30FA, A= 3/8 - 16 x 2 in; SMB30FAM10, A= M10 - 1.5 x 50
Hole size: B= ø 30.1

SMB30MM

- 12-ga. stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 ($\frac{1}{4}$ in) hardware
- Mounting hole for 30 mm sensor

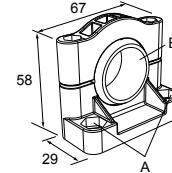


Hole center spacing: A = 51, A to B = 25.4

Hole size: A = 42.6 x 7, B = ø 6.4, C = ø 30.1

SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included



Hole center spacing: A=ø 50.8

Hole size: A=ø 7.0, B=ø 30.0

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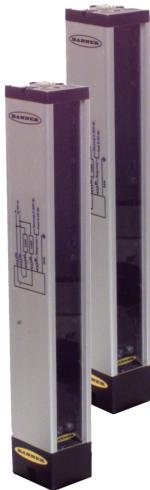
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LX Series Part-Sensing Light Curtain



Datasheet

For sensing small or flat parts at high speeds



- Emitter and receiver pair produce a strobed web of modulated light beams in 12 lengths and two sensing ranges
- Simple, economical and highly reliable means of sensing small parts or flat items which pass anywhere through the light screen
- Response speeds as fast as 0.8 ms with an output that includes a 5 ms pulse stretcher for interfacing reliability
- Simple wiring configuration; emitter and receiver do not need a synchronization wire
- Rugged, self-contained and compact construction; rated IEC IP65
- Bipolar design offers both NPN (current sinking) and PNP (current sourcing) solid-state outputs



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.

Models

An LX Series Part-Sensing Light Curtain system requires an emitter and receiver pair that match in range and sensing array length.

Emitter Models	Receiver Models	Range	Sensing Array Length
LX3ESR	LX3RSR	75 mm to 200 mm (3 in to 8 in)	67 mm (2.6 in)
LX6ESR	LX6RSR	5.6 mm dia. Minimum Object Detection Size	143 mm (5.6 in)
LX12ESR	LX12RSR		295 mm (11.6 in)
LX3E	LX3R		67 mm (2.6 in)
LX6E	LX6R		143 mm (5.6 in)
LX9E	LX9R		218 mm (8.6 in)
LX12E	LX12R		295 mm (11.6 in)
LX15E	LX15R		371 mm (14.6 in)
LX18E	LX18R	150 mm to 2 m (6 in to 6.5 ft)	447 mm (17.6 in)
LX21E	LX21R	9.5 mm dia. Minimum Object Detection Size	523 mm (20.6 in)
LX24E	LX24R		599 mm (23.6 in)
LX27E	LX27R		686 mm (27 in)
LX30E	LX30R		762 mm (30 in)
LX33E	LX33R		838 mm (33 in)
LX36E	LX36R		914 mm (35.9 in)

Additional sizes available on request; contact Banner Engineering. The 2 m (6.5 ft) unterminated 5-wire PVC cable models are listed. To order the 150 mm (6 in) cable with the 5-pin M12 QD model, add the suffix "Q" to model number (for example, LX3EQ). Models with a quick disconnect require a mating cordset.



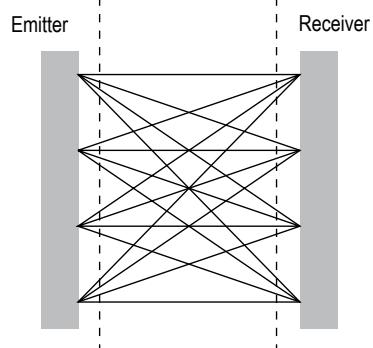
Theory of Operation

The LX Series light screen sensing system consists of two self-contained units: an emitter and a receiver of equal size and sensing range. The emitter has multiple infrared LEDs spaced at 9.5 mm (0.38 in) increments, and the receiver has corresponding photodiodes. The emitter sequentially fires each infrared LED. Multiple photodiodes in the receiver recognize each of the emitted pulses; the result is a "cross-hatched" optical pattern. Optical synchronization enables the receiver to recognize light from each of the emitter LEDs.

The optical crosshatch pattern enables the LX system to detect targets of very small diameter, and extremely thin, flat objects—as thin as a piece of paper or an envelope. For small diameter objects, the sensing resolution is less effective at the exact center (see the minimum object detection size specification) of the sensing range and at the extreme edges of the pattern (close to the emitter and receiver faces); sensing should take place within the center 80 percent of the range, as shown.

Figure 1. LX Series optical crosshatch pattern

Sensing is most effective in the center 80% of the sensing range



LX Series sensors are available in two ranges: short and standard. Short-range emitters and receivers may be located as close together as 75 mm (3 in), with a maximum separation of 200 mm (8 in). Standard-range sensors may be separated 150 mm to 2 m (6 in to 6.5 ft) apart. Both emitter and receiver must be either short-range or standard models, of the same length. Detection sensitivity varies somewhat, depending on the distance between the sensors and the position of the target object.

For closer-range applications, the working range of any sensor pair can be reduced by connecting the sensor's Select wire to 0 V DC to 2 V DC (see the sensing range specification).

The receiver output interfaces directly with DC loads or circuits up to 30 V DC, and offers both sinking (NPN) and sourcing (PNP) output transistors. Outputs conduct whenever a beam is broken. A 5 millisecond pulse stretcher (OFF-delay) is included to improve interfacing reliability.

Typical Applications

Typical applications for the LX Series include parts ejection verification and package detection on a conveyor.

Installation and Alignment

Reliable performance of the LX series light screen systems requires a simple alignment process. Mount the sensor in a location as free from vibration as possible.

Sensors may be mounted using the accessory brackets (available separately) or using the T-slots in the sensor housings. After mechanical alignment is completed, the sensors can be wired and power applied.

1. Loosely mount the emitter and receiver at their operating locations with their front panels opposite each other, and at approximately the same level.
2. Adjust the emitter position until the receiver detects alignment (the yellow LED turns OFF). For best alignment, position the emitter in the middle of the positions that cause a clear receiver condition.
3. Tighten the bracket hardware.
4. Position a pencil or similar object within the sensing area to verify that it can be reliably detected throughout the sensing area.

Wiring Diagrams

Figure 2. Wiring for the integral cable models

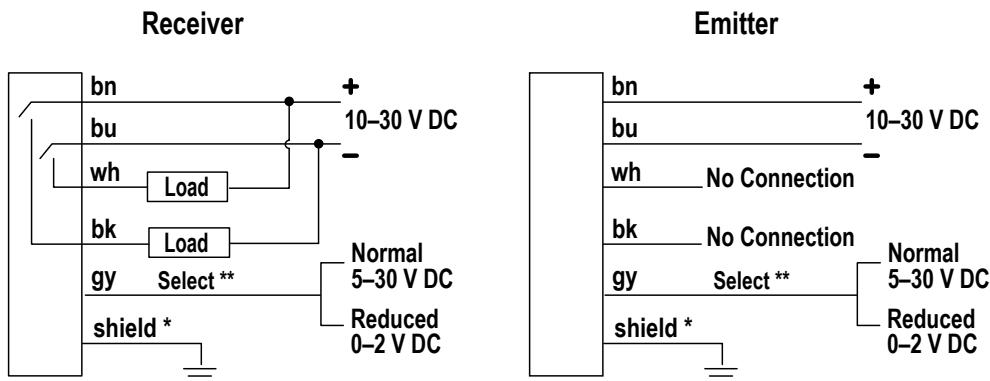
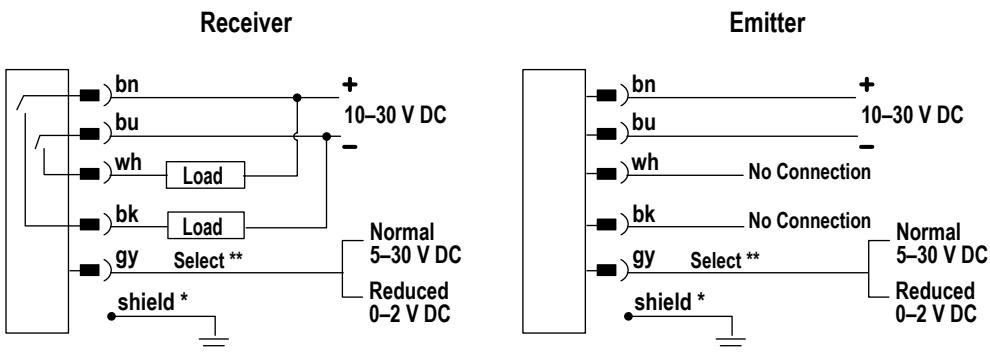


Figure 3. Wiring for the quick disconnect models



* Banner recommends connecting the shield wire to earth ground or DC common.

** If there is no connection, the Normal Range will be used.

Specifications

Supply Voltage and Power

10 V DC to 30 V DC (10% maximum ripple) at less than 1 watt each for emitter and receiver (exclusive of load)

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Sensing Range

Models	Normal	Reduced
Short-Range	100 to 200 mm (4 in to 8 in)	75 to 150 mm (3 in to 6 in)
Standard-Range	300 mm to 2 m (1 ft to 6.5 ft)	150 mm to 600 mm (6 in to 24 in)

See [Wiring Diagrams](#) on p. 3

Output Configuration

Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor

Output Rating

125 mA maximum each output
Off-state leakage current: less than 5 microamps
Output saturation voltage (PNP output): < 1 V at 10 mA and < 1.5 V at 100 mA
Output saturation voltage (NPN output): < 0.5 V at 10 mA and < 0.6 V at 100 mA

Output Protection Circuitry

Protected against false pulse on power-up and continuous overload or short circuit of outputs

Minimum Object Detection Size (MODS)

Smallest diameter rod that can be detected in sensing range:
Short-Range: 5.6 mm (0.22 in)
Standard-Range: 9.5 mm (0.38 in)

Indicators

Emitter:

- **LED1 (green)**
 - ON: Power ON, good sensor
 - OFF: Reduced Range
 - ON: Power ON, good sensor
- **LED2 (red)**
 - ON: Reduced range
 - OFF: Normal range
 - Flashing: Emitter hardware failure

Receiver:

- **LED1 (yellow)**
 - ON: Output conducting
 - OFF: Output not conducting
- **LED2 (bicolor green/red)**
 - Green: Normal range
 - Red: Reduced range
 - Flashing Red: Receiver hardware failure

Output Response Time

LX3: 0.8 ms ON-time; 6 ms OFF-time (5 ms OFF-delay)
 LX6: 1.6 ms ON-time; 7 ms OFF-time (5 ms OFF-delay)
 LX9: 2.4 ms ON-time; 7.5 ms OFF-time (5 ms OFF-delay)
 LX12: 3.2 ms ON-time; 8.5 ms OFF-time (5 ms OFF-delay)
 LX15: 4.0 ms ON-time; 9 ms OFF-time (5 ms OFF-delay)
 LX18: 4.8 ms ON-time; 10 ms OFF-time (5 ms OFF-delay)
 LX21: 5.6 ms ON-time; 11 ms OFF-time (5 ms OFF-delay)
 LX24: 6.4 ms ON-time; 11.5 ms OFF-time (5 ms OFF-delay)
 LX27: 7.2 ms ON-time; 12 ms OFF-time (5 ms OFF-delay)
 LX30: 8 ms ON-time; 13 ms OFF-time (5 ms OFF-delay)
 LX33: 8.8 ms ON-time; 14 ms OFF-time (5 ms OFF-delay)
 LX36: 9.6 ms ON-time; 15 ms OFF-time (5 ms OFF-delay)

Construction

Aluminum housing, die cast zinc with black e-coat painted endcaps, acrylic lens window

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

Connections

2 meter (6.5 ft) 5-conductor (with drain) pvc-jacketed attached cable or a 150 mm (6 in) PVC cable with a 5-pin M12 male quick disconnect, depending on the model

Application Notes

1. The best sensing resolution occurs within the center 80% of the sensing range ([Figure 1](#) on p. 2).
2. Low-profile packages can be reliably detected.
3. Outputs are active while the light screen is interrupted.
4. For reliable detection, successive parts must be spaced up to the total of ON-time plus OFF-time apart. (that is, 12 milliseconds for the LX12)

Environmental Rating

Meets IEC IP65

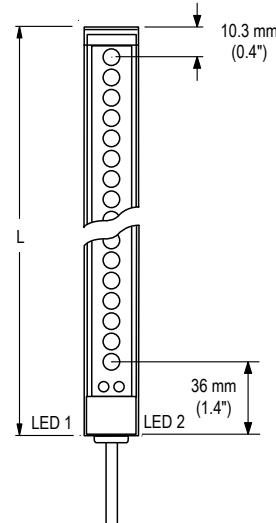
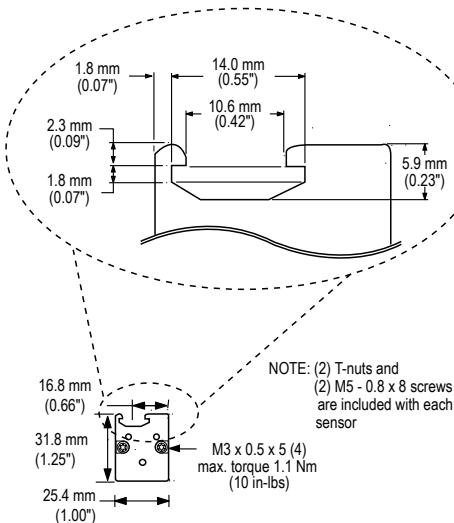
Operating Conditions

-20 °C to +70 °C (-4 °F to +158 °F)

90% at +50 °C maximum relative humidity (non-condensing)

Certifications

Class 2 Power
UL Environmental
Rating: Type 1

Dimensions

Model	Length (L)
LX3	113.4 mm (4.46 in)
LX6	189.6 mm (7.46 in)
LX9	265.8 mm (10.46 in)
LX12	342 mm (13.46 in)
LX15	418.2 mm (16.46 in)
LX18	494.4 mm (19.46 in)
LX21	570.6 mm (22.46 in)
LX24	646.8 mm (25.46 in)
LX27	723 mm (28.46 in)
LX30	799.2 mm (31.46 in)
LX33	875.4 mm (34.46 in)
LX36	951.6 mm (37.46 in)

Accessories

Quick-Disconnect (QD) Cables

5-Pin Threaded M12 Cordsets with Shield—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDEC2-506	2 m (6.56 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDEC2-515	5 m (16.4 ft)			
MQDEC2-530	9 m (29.5 ft)			
MQDEC2-550	15 m (49.2 ft)			
MQDEC2-506RA	2 m (6.56 ft)	Right-Angle		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDEC2-515RA	5 m (16.4 ft)			
MQDEC2-530RA	9 m (29.5 ft)			
MQDEC2-550RA	15 m (49.2 ft)			

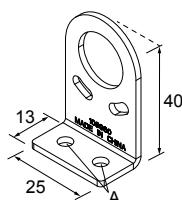
Mounting Brackets

SMBLX

- End-cap brackets; set of 2
- Zinc-plated cold rolled steel
- *Hardware included for mounting brackets to sensor*

Hole center spacing: A = 12.7

Hole size: A = \varnothing 4.3

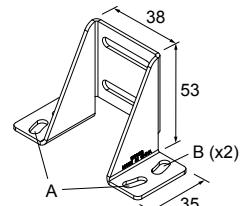


SMBLXR

- Back-mount bracket for secure one-end mounting
- Zinc-plated cold rolled steel
- *Hardware included for mounting bracket to sensor*

Hole center spacing: A , B = 63.5, A to B = 10.2

Hole size: A , B = 5.2 x 11.6



LX Series Lens Shields

Lens Shield Model Number	Fits LX Series Sensor Model	
LXS3	LX3	Self-adhesive polycarbonate lens shields protect the sensor lens window from impact or weld flash. When shields are installed on both emitter and receiver, excess gain is reduced by 36% (maximum operating range reduces by 20%).
LXS6	LX6	
LXS9	LX9	
LXS12	LX12	
LXS15	LX15	
LXS18	LX18	
LXS21	LX21	
LXS24	LX24	
LSX36	LX36	

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more sensors, more solutions

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Through the Roller Sensor Family



Datasheet



- Reliable leading edge detection of letters, thin packages, poly bags, totes, boxes or other product on roller conveyors
- Mounts between conveyor roller gap to standard hex or round side rail holes with no extra hardware required or on the T-Slot with customer supplied bracket and hardware
- Spring loaded end caps reduce installation and alignment time for reduced labor costs
- Built to order with specified length and beam spacing: 200 mm to up to 1500 mm (8 in to up to 59 in) depending on mounting configuration, with 2 to 7 sensors for maximum flexibility
- Robust aluminum housing, ambient light and ESD resistance for enhanced durability



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.

Models

Model Name	Between Frame Distance (mm)	Output Type	Special Feature	Beam Spacing	No. of Beams	End Cap Style	Cable Length (m)	Connector Style	First Beam Distance from Cable End Cap (mm)
TTR	384	AP	S	A	6	T	2.0	FL	CTR
End Cap Style T: 200-1500 mm		BM = Bimodal AP = Light Operate PNP AN = Light Operate NPN RP = Dark Operate PNP RN = Dark Operate NPN	S = Standard G = Ground Strap	A = 54 mm B = 93.1 mm C = 108 mm D = 162 mm E = 186.2 mm	1,2,3,4,5,6,7	A,B,C,D,E,F,G,T	0.5 m, 1.0 m, 2.0 m	FL RJ = RJ11 Q5 = M12 Q3 = M8	CTR = Beams centered between frames 059-200 = First beam distance from cable end cap
End Cap Styles A, B, D, & E: 200-915 mm									
Model Name = TTR 384 AP S A 6 T - 2.0 FL CTR									



Note: For definition of the End Cap Styles, see [Table 1](#) on p. 2.

Configurations

Figure 1. Spring End Cap Configuration

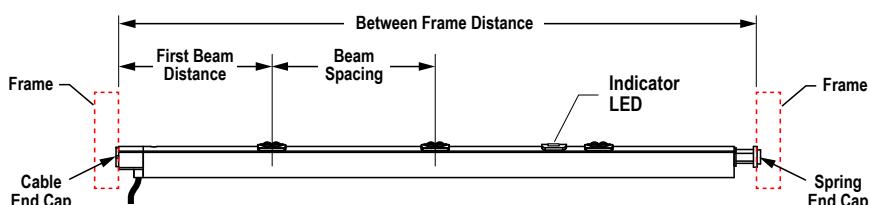


Figure 2. T-Slot Configuration

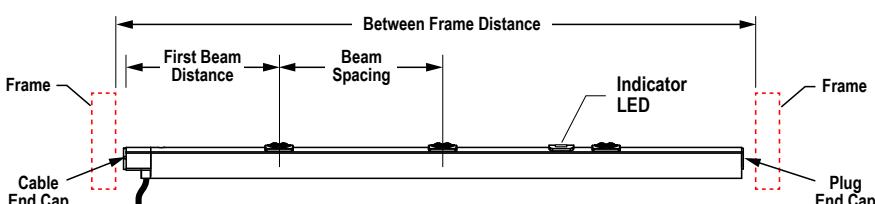


Figure 3. Adhesive End Cap Configuration

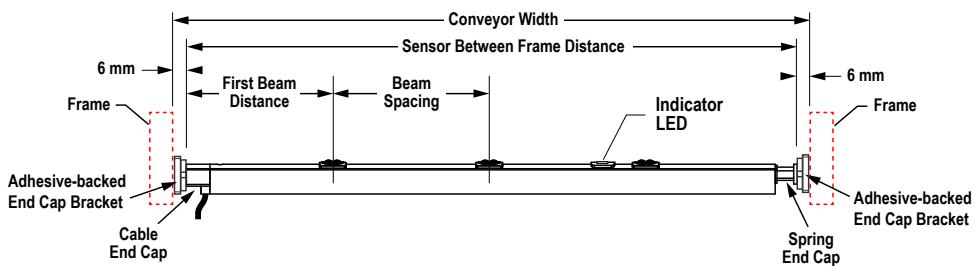


Table 1: End Cap Styles

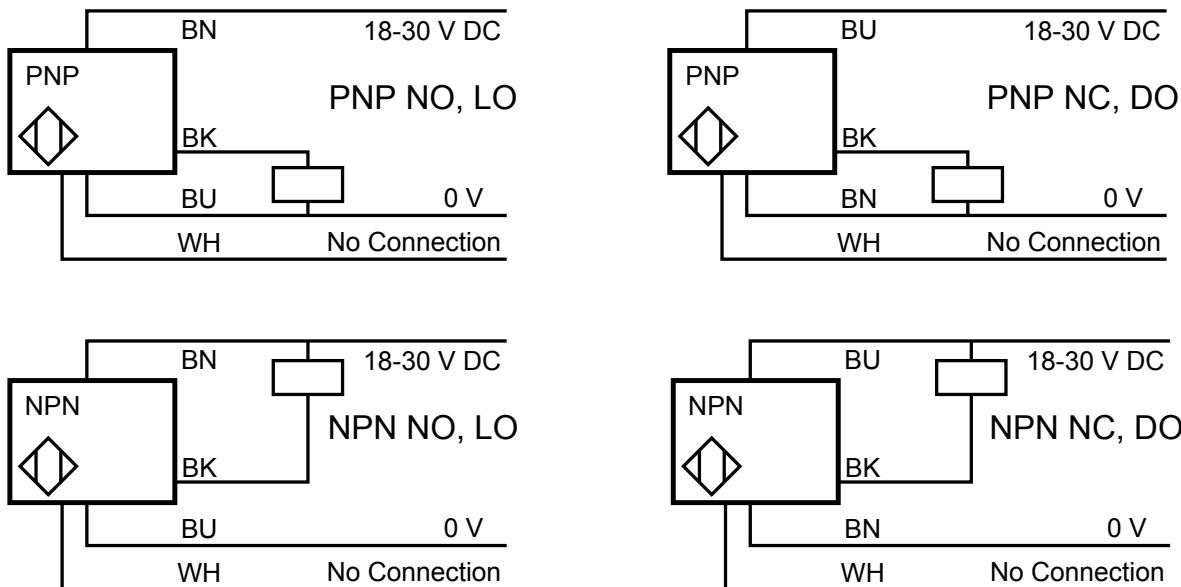
End Cap Style	End 1	End 2
A	11 mm Hex, flat side up	Spring 11 mm hex / 8 mm round
B	11 mm Hex, point up	Spring 11 mm hex / 8 mm round
C	Adjustable 11 mm Hex, can be positioned in 10 degree increments	Spring 11 mm hex / 8 mm round
D	11 mm Hex, flat side up	Spring 8 mm round
E	11 mm Hex, point up	Spring 8 mm round
F	Adjustable 11 mm Hex, can be positioned in 10 degree increments	Spring 8 mm round
G	Adjustable 11 mm Hex, can be positioned in 10 degree increments / adhesive backed bracket	Spring 11 mm hex / 8 mm round / adhesive backed bracket
T	11 mm Hex, flat side up	Plug



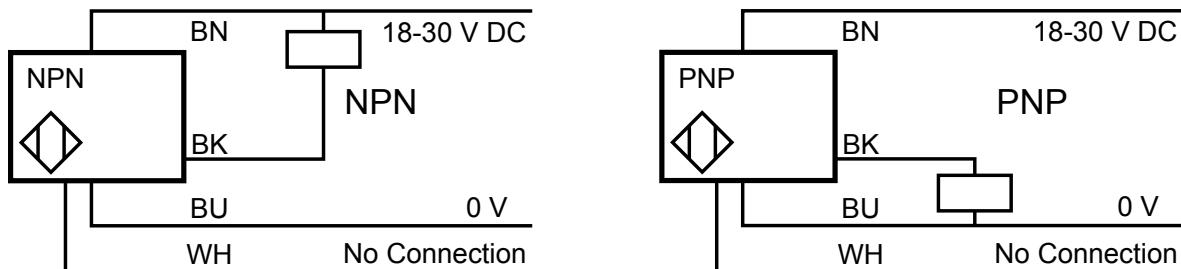
Note: T-Slot mounted sensors with the **T** End Cap Style are 6 mm shorter than the specified Between Frame Distance.

Wiring

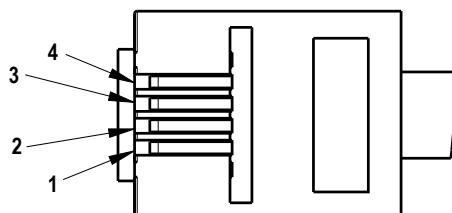
Bimodal Output Wiring Diagrams



Fixed NPN and PNP Output Wiring Diagrams: Light and Dark Operate by Model Number

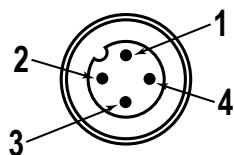


RJ-11 Pinout

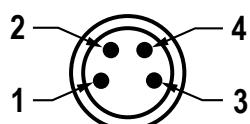


RJ-11 Key

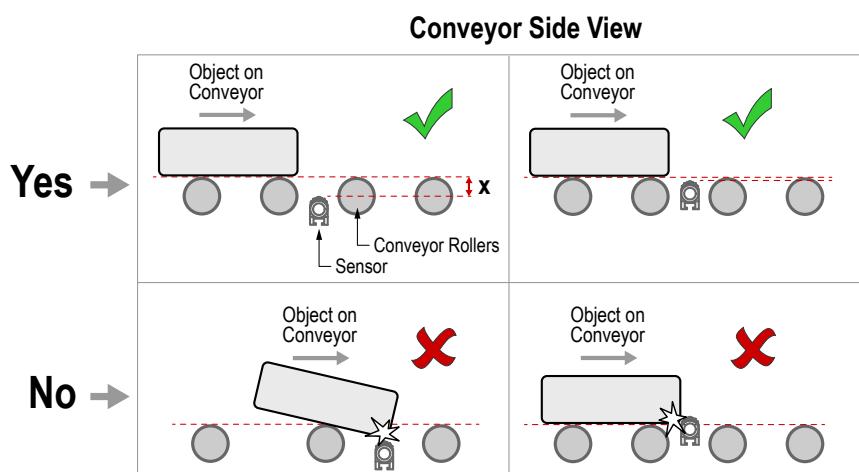
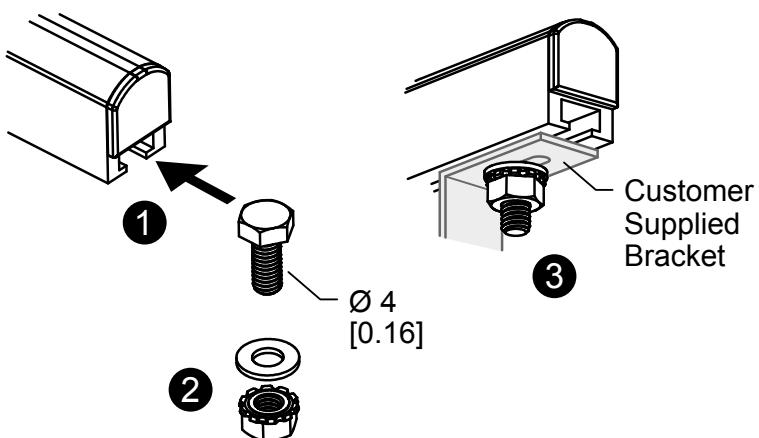
1. Brown
2. Black
3. White
4. Blue

M12 Pinout**M12 Key**

- 1. Brown
- 2. White
- 3. Blue
- 4. Black

M8 Pinout**M8 Key**

- 1. Brown
- 2. White
- 3. Blue
- 4. Black

Installation**Mounting Considerations****T-Slot Installation**

Specifications

Supply Voltage

18 V DC to 30 V DC (24 V nominal with 10% maximum ripple)
Use only with a suitable Class 2 power supply (UL) or SELV power supply (CE)

Supply Current

45 mA

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Wavelength

Infrared LED, 940 nm

Output Response

1 ms on/off

Output Configuration

Rating: 100 mA max output at 25 °C
Output Voltage High: Greater than V_{Supply} – 2.5 V
Output Voltage Low: Less than 2.5 V
For loads less than 1 Meg Ohm
Protected against false pulse on power-up and continuous overload or short-circuit of output

Indicators

Amber on: Light sensed

Sensing Mode

Diffuse, Infrared, 940 nm

Range

0 to ≥ 120 mm on 90% white card
0 to ≥ 50 mm on 18% gray card
≤ 3 to ≥ 30 mm on 6% black card

Operating Conditions

-10 °C to +55 °C (+14 °F to +131 °F)

Environmental Rating

IEC IP50

Vibration and Mechanical Shock

All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F, Method 201A (Vibration: 10 Hz to 60 Hz, 0.5 mm peak-to-peak)
Shock: 30G 11 ms duration, half sine wave per IEC 60068-2-27

Cable

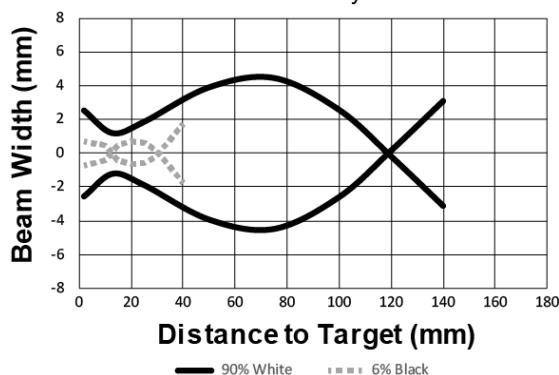
Minimum static bend radius: 20 mm
Flex life > 10,000 cycles at flexing bend radius > 40 mm

Certifications

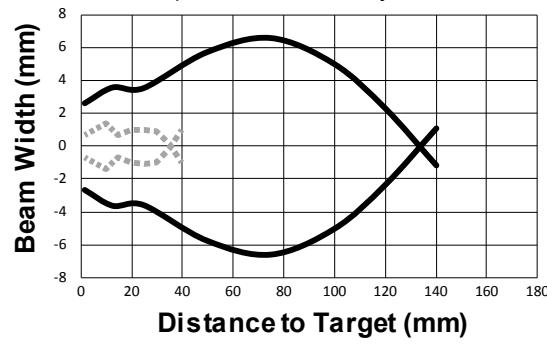


Performance Curves

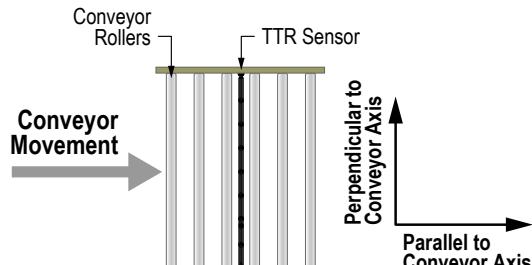
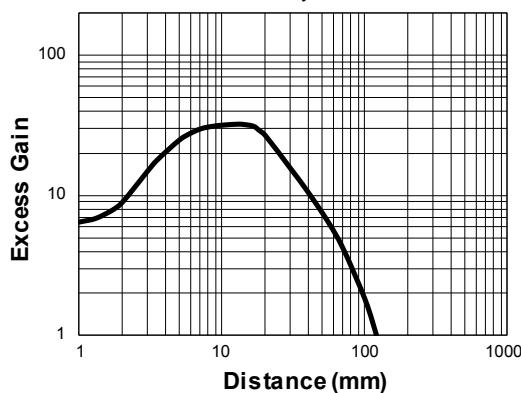
Average Sensor Beam Pattern
Parallel to Conveyor Axis



Average Sensor Beam Pattern
Perpendicular to Conveyor Axis

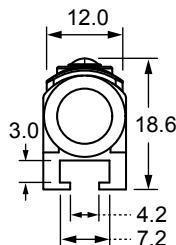


90% Reflectivity White Card

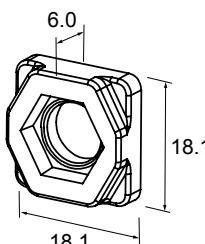


Dimensions

All measurements are listed in millimeters, unless noted otherwise.



End View



Adhesive End Cap

Accessories

TTR-HK1

- Hardware packet for T-style End-Cap TTRs
- (2) M4 screws
- (2) Hex nuts
- (2) Lock washers

TTR-HK2

- Hardware packet for G-style End-Cap TTRs
- (2) Adhesive backed mounting brackets

Note: Two adhesive backed mounting brackets are included with each G-style sensor. Adhesive backed mounting brackets are also compatible with A-, B-, or C-style sensors.

TTR-HK20

- Hardware packet for G-style End-Cap TTRs
- (20) Adhesive backed mounting brackets



Note: Two adhesive backed mounting brackets are included with each G-style sensor. Adhesive backed mounting brackets are also compatible with A-, B-, or C-style sensors.

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Steerable wheel sorter	DENE-B-PU Series
Item Types	cartons, flexible packaging, envelopes flat pieces
Diverting angle	90 degree (both side)
Throughput	3000PPH
Loading size	140x140x1 to 900x600x600 mm
Max weight	8 kg
Conveyor running speed	1.5m/sec

EZ-LIGHT Indicators for 3-Color, 7-Function



Datasheet

DC-operated LED indicators with solid ON or flashing capability and a Euro-style integral QD¹. Choose from red, yellow, or green ON, flashing, or rotating (depending on wiring).²

Models	Construction	Inputs
	M18GRY2PQ	PNP
	M18GRY2NQ	NPN
	T30GRY2PQ	PNP
	T30GRY2NQ	NPN
	K50LGRY2PQ	PNP
	K50LGRY2NQ	NPN
	K50FLGRY2PQ	PNP
	K50FLGRY2NQ	NPN
	K80LGRY2PQ ³	PNP
	K80LGRY2NQ	NPN

Other Models: Standard integral QD models only are listed (mating cordset required). To order 2 m (6.5 ft) cable models, omit suffix **Q** from model number (example, M18GRY2P). To order models with 150 mm (6 inch) PVC pigtail with 5-pin Euro QD connector, replace suffix **Q** with **QP** (example, M18GRY2PQP).

Specifications

Supply Voltage and Current

M18 Models: 10 to 30 V dc at 40 mA max.
 T30 Models: 10 to 30 V dc at 50 mA max.
 K50L, K50FL and K80L Models: 18 to 30 V dc at 50 mA max.

Indicators

Entire translucent diffuser or dome provides indication.
 LEDs are independently selected: Green, Red, Yellow, ON steady or flashing.
 For other colors/combinations, contact Factory for availability

Input Response Time

Indicator ON: 250 ms (max.)
 Indicator OFF: 10 ms (max.)

Indicator Flash Rate

Single Color: 1 second flash rate (500 ms ON)
 Three Color: 1.5 second rotation rate (500 ms per color)

Connections

K80L Models: 5-pin Euro-style integral QD (Q) standard. Terminal-wired models available for use with bulk cable; compression fitting optional. Contact Factory for cable information.

Other Models: 5-pin Euro-style integral QD (Q); 6" pigtail QD (QP), (do not use center pin 5); or 5-wire, 2 m (6.5') integral cable

Operating Conditions

Temperature: -40 °C to 50 °C (-40 °F to 122 °F)

Environmental Rating

Rated IEC IP67. K80L has encapsulated electronics only; other models fully encapsulated.
 K50L, and K50FL quick-disconnect models meet IP69K per DIN 40050-9
 Cabled models also meet IP69K if the cable and cable entrance are protected from high-pressure spray.

¹ Pin 5 is not used; connects to 4-wire QD cordset. If a cordset other than those specified in this document is used, use a 5-pin mating cordset.

² Contact Factory for other colors/color combinations, including: blue, white, orange.

³ K80L Models: Standard 5-pin Euro integral QD connector models only are listed (mating cordset required). For terminal-wired model, omit suffix Q (example, K80LGRY2P).



Dimensions

M18 Models	T30 Models	K50L Models
<p>Dimensions for M18 Models:</p> <ul style="list-style-type: none"> Total height: 61 mm (2.4") Thread diameter: Ø 16.5 mm (0.65") Thread length: 30 mm (1.2") Shaft diameter: M18 X 1 Shaft length: 23 mm (0.9") Base diameter: M12 X 1 	<p>Dimensions for T30 Models:</p> <ul style="list-style-type: none"> Outer diameter: Ø 40.0 mm (1.57") Thread: M30 x 1.5 Thread Height: 63.7 mm (2.51") Shaft diameter: Ø 15 mm (0.59") Shaft length: M12 X 1 Shaft diameter: 45.0 mm (1.77") 	<p>Dimensions for K50L Models:</p> <ul style="list-style-type: none"> Outer diameter: 50.0 mm (1.97") Height: 38 mm (1.50") Mounting nut: M30 x 1.5 (mounting nut included) Max. Torque: 4.5 Nm (40 in-lbf) Internal Threads: 1/4 - 14 NPSM Max. Torque: 2.25 Nm (20 in-lbf) Shaft diameter: 20 mm (0.79") Shaft length: 11 mm (0.43")
K50FL Models		
<p>Dimensions for K50FL Models:</p> <ul style="list-style-type: none"> Outer diameter: Ø 50 [1.97"] Height: 60.0 [2.36"] Shaft diameter: 2x 5.0 [0.20"] Shaft length: 2x 5.0 [0.21"] Shaft diameter: 40.0 [1.58"] Shaft length: 17.0 [0.67"] 	<p>Dimensions for K80L Models:</p> <ul style="list-style-type: none"> Outer diameter: 80.8 mm (3.18") Height: 65.0 mm (2.56") Shaft diameter: 66.3 mm (2.61") Shaft length: 26.0 mm (1.02") Mounting nut: M12 X 1 Internal Threads: 1/4 - 14 NPSM Max. Torque: 2.25 Nm (20 in-lbf) Shaft diameter: 4X Ø 5.5 mm (Ø 0.22") Max. Torque: 1.12 Nm (10 in-lbf) with supplied screws Shaft diameter: 4X 8-32 UNC Max. Torque: 1.12 Nm (10 in-lbf) 	

Wiring

Table 1: Select from 7 operating schemes, depending on wiring

LED Function	PNP Models				NPN Models			
	Brown Wire	White Wire	Black Wire	Blue Wire	Blue Wire	White Wire	Black Wire	Brown Wire
Red ON	+V dc			0 V dc	0 V dc			+V dc
Red Flashing	+V dc		+V dc	0 V dc	0 V dc		0 V dc	+V dc
Yellow ON		+V dc		0 V dc		0 V dc		+V dc
Yellow Flashing	+V dc	+V dc		0 V dc	0 V dc	0 V dc		+V dc
Green ON			+V dc	0 V dc			0 V dc	+V dc
Green Flashing		+V dc	+V dc	0 V dc		0 V dc	0 V dc	+V dc
Rotating Red-Green-Yellow	+V dc	+V dc	+V dc	0 V dc	0 V dc	0 V dc	0 V dc	+V dc

Table 2: Only QD wiring is shown; cabled wiring is functionally identical.

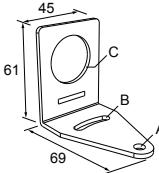
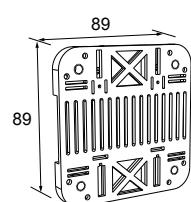
PNP Models	NPN Models
G = Green R = Red Y = Yellow X = Not Used	

Accessories

4-Pin Threaded M12/Euro-Style Cordsets—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC-406	1.83 m (6 ft)	Straight		
MQDC-415	4.57 m (15 ft)			
MQDC-430	9.14 m (30 ft)			
MQDC-450	15.2 m (50 ft)			
MQDC-406RA	1.83 m (6 ft)	Right-Angle		1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-415RA	4.57 m (15 ft)			
MQDC-430RA	9.14 m (30 ft)			
MQDC-450RA	15.2 m (50 ft)			

To order bulk cable for terminal-wired K80L models, contact the factory. If cables other than those listed are used, use a 5-pin mating cable.

Brackets	
SMB18A <ul style="list-style-type: none"> Right-angle mounting bracket with a curved slot for versatile orientation 12-ga. stainless steel 18 mm sensor mounting hole Clearance for M4 (#8) hardware <p>Hole center spacing: A to B = 24.2 Hole size: A = Ø 4.6, B = 17.0 × 4.6, C = Ø 18.5</p>	<p>For use with M18 and T18 models or base-mount T30 models. Other available 18 mm dia. brackets:</p> <p style="margin-left: 20px;">SMB1815SF SMB18Q SMB18SF SMB312PD SMBAMS18RA SMBAMS18P</p>

Brackets	
SMB30A <ul style="list-style-type: none"> Right-angle bracket with curved slot for versatile orientation Clearance for M6 (1/4 in) hardware Mounting hole for 30 mm sensor 12-ga. stainless steel <p>Hole center spacing: A to B=40 Hole size: A=Ø 6.3, B= 27.1 x 6.3, C=Ø 30.5</p>	 <p>For use with T30 models or base-mount K50L models. Other available 30 mm diameter brackets are:</p> <p>SMBAMS30RA SMBAMS30P SMB30SC SMB30SC SMB30MM SMB3018SC</p>
SMBDX80DIN <ul style="list-style-type: none"> Black reinforced thermoplastic Bracket for mounting on a 35 mm DIN rail 	 <p>K50FL models include a 48 mm (1.9 inch) circular velcro mounting kit for easy mounting with no additional hardware</p>

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TL70 Modular Tower Light



Instruction Manual

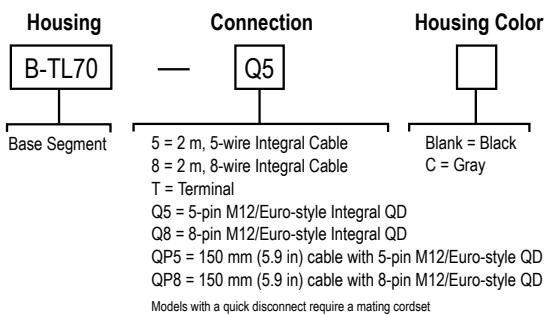


Banner's TL70 Tower Light is a 70 mm, modular LED indicator with extremely bright and uniform light. The modularity gives the user flexibility to customize tower lights as needed and change positions in the field. The TL70 is also available preassembled for easy installation.

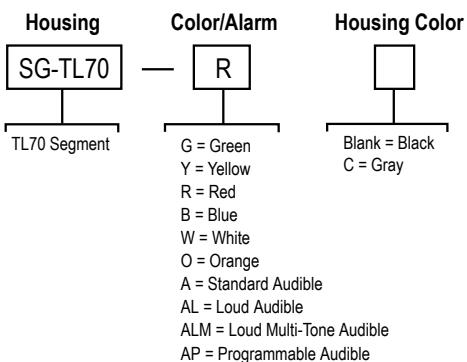
- Light segments have user-selectable solid ON or flashing
- Up to six colors, or five colors plus audible, in one device
- Rugged, water-resistant IP65 housing with UV-stabilized material
- Bright, uniform indicator segments appear gray when off to eliminate false indication from ambient light
- Several connection options to choose from including M12 quick disconnect, cabled, and terminal-wired

Models

TL70 Base



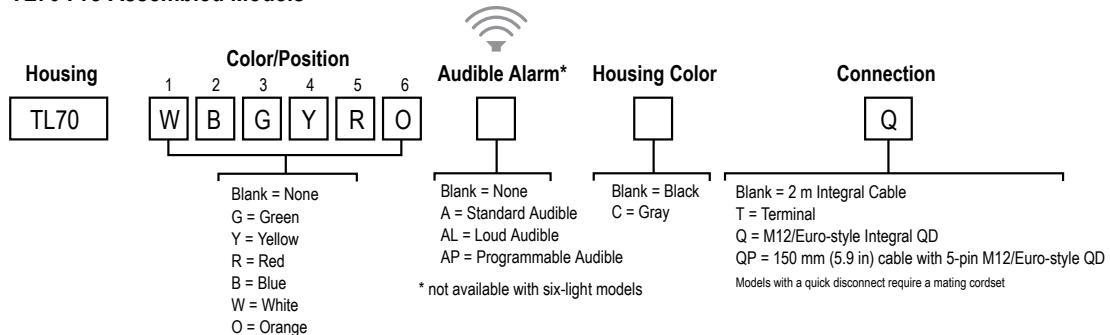
TL70 Segments



Select the 5-pin base for tower light configurations of up to 4 modules. Select the 8-pin base for tower light configurations of up to 6 modules.

- Example base model number: B-TL70-Q5
- Example light segment model number: SG-TL70-G
- Example audible segment model number: SG-TL70-A

TL70 Pre-Assembled Models



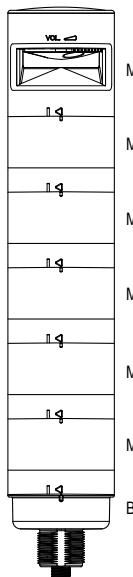
- Example pre-assembled model number: TL70GYRAQ.



Configuring the Modules



Turn on the appropriate DIP switch to set the order of the components, counting up from the tower light's base.

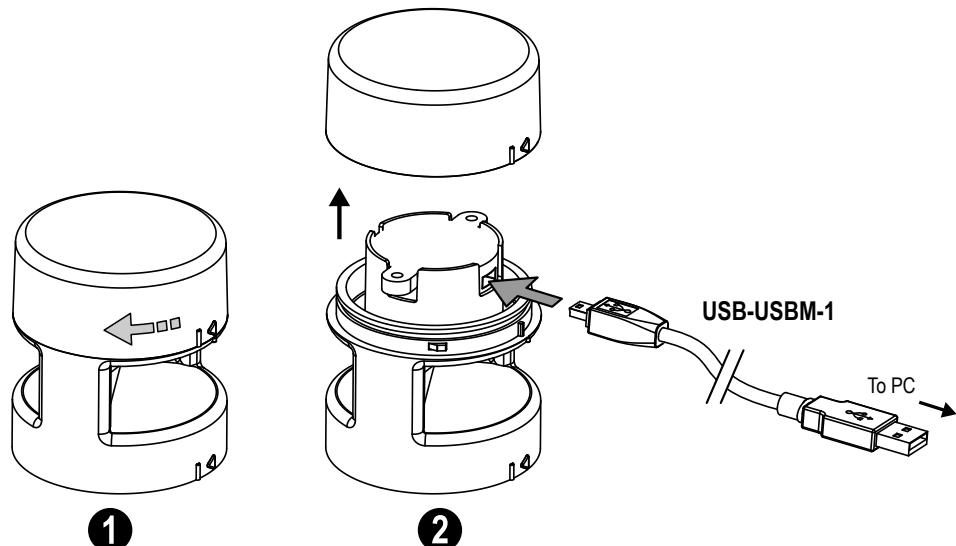


Assembly Options		DIP Switches							
		1	2	3	4	5	6	7	8
Light and Standard Audible Components	Module 1	ON							
	Module 2		ON						
	Module 3			ON					
	Module 4				ON				
	Module 5					ON			
	Module 6						ON		
Light Module Flash Rate	3 Hz						ON	OFF	
	1.5 Hz						ON	ON	
	Solid On*						OFF	OFF	
Standard Audible Module Settings	Pulse 1.5 Hz						ON	OFF	
	Chirp Alarm						ON	ON	
	Siren Alarm						OFF	ON	
	Continuous Alarm*						OFF	OFF	

Assembly Options		DIP Switches									
		1	2	3	4	5	6	7	8	9	10
Loud Audible Module Settings	Pulse 1.5 Hz							ON	OFF		
	Chirp Alarm							ON	ON		
	Siren Alarm							OFF	ON		
	Continuous Alarm*							OFF	OFF		
	Low Intensity*									OFF	OFF
	Med. Intensity									ON	OFF
	Med./Loud Intensity									OFF	ON
	Loud Intensity									ON	ON

* Factory default setting

Programming the Audible Tower Module



Loading Files into the SG-TL70-AP

The SG-TL70-AP has 4MB of on-board flash memory and can playback any WAV or MP3 audio file that is 4MB or smaller. If the file is too large, a program such as Audacity can be used to compress or shorten the file to decrease the size.

Multiple files can be loaded onto the SG-TL70-AP. Files playback according to the file name in alpha-numeric order.



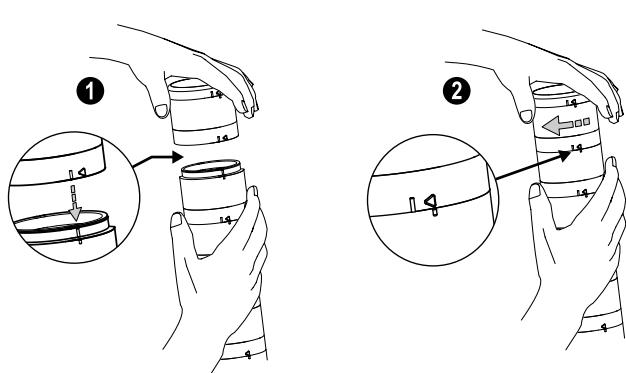
Note: Add a number to the beginning of the file name to create the order in which the files run. Files play consecutively without any pause.

To program the module:

1. Remove the module top cover by rotating counterclockwise.
 2. Connect the programming cable (USB-USBM-1) from the PC's USB connection to the USB mini-connection of the audible module.
- The SG-TL70-AP is recognized by the PC as a USB flash drive. The default drivers for a USB drive are assigned to the device, as well as a unique disk drive letter assignment (such as D:).
3. Drag-and-drop the audio files that are saved on the PC to the USB drive location.
 4. Assign numbers to each file to designate their playback order, otherwise files playback in alpha-numeric order.
 5. Remove the cable from the audio module.
 6. Re-install the top cover by aligning the protruding alignment marks and turning clockwise.
 7. The audible module is now ready for use with a compatible TL70 DC Base or Universal Voltage AC Base.

When the selected Input Channel is activated, the audible module begins playing the files in sequential order.

Assembling the Modules

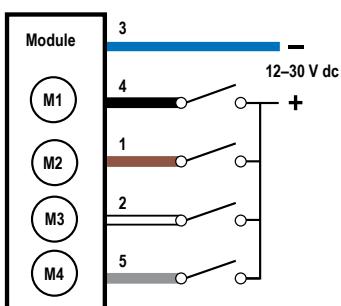


To assemble the modules:

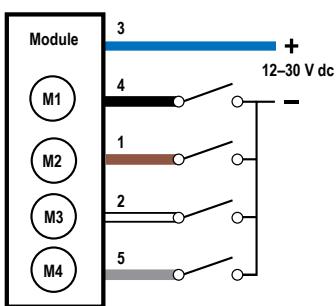
1. Align the notches on each module and press together.
2. Rotate the top module clockwise to lock into place (notches shown in the locked position).

Wiring Diagrams

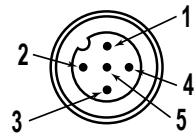
PNP Input



NPN Input



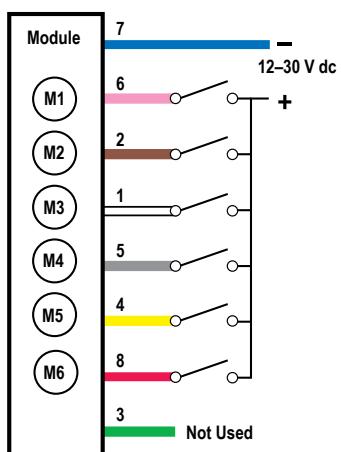
Euro-style Male Pinouts



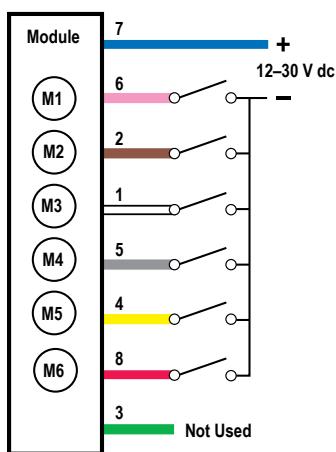
Key

- 1 = brown
- 2 = white
- 3 = blue
- 4 = black
- 5 = gray
- M1 = Module 1
- M2 = Module 2
- M3 = Module 3
- M4 = Module 4

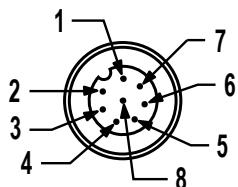
PNP Input



NPN Input



Euro-style Male Pinouts



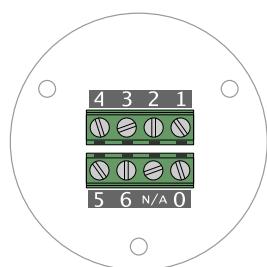
Key

- 1 = white
- 2 = brown
- 3 = green
- 4 = yellow
- 5 = gray
- 6 = pink
- 7 = blue
- 8 = red
- M1 = Module 1
- M2 = Module 2
- M3 = Module 3
- M4 = Module 4
- M5 = Module 5
- M6 = Module 6



Note: Models SG-TL70-ALM and SG-TL70-ALMC are not compatible with NPN input wiring.

Wiring Terminal Block



Terminal Block Key

- 0 = dc common
- 1 = Module 1
- 2 = Module 2
- 3 = Module 3
- 4 = Module 4
- 5 = Module 5
- 6 = Module 6

Specifications

Supply Voltage and Current

12 V DC to 30 V DC

Indicator Color or Audible Model	Maximum Current (mA)		
	at 12 V DC	at 24 V DC	at 30 V DC
Blue, Green, White	420	200	150
Red, Yellow, Orange	285	145	120
Standard Audible	30	30	30
Loud Audible (Intensity 1)	30	28	25
Loud Audible (Intensity 2)	50	45	40
Loud Audible (Intensity 3)	165	90	75
Loud Audible (Intensity 4)	350	160	120
Programmable Audible	290	140	125

Supply Protection Circuitry

Protected against transient voltages

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

Indicator Characteristics

Color	Dominant Wavelength (nm) or Color Temperature (CCT)	Color Coordinates ¹		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

Connections

5-pin M12 quick disconnect connector, 8-pin M12 quick disconnect connector, 150 mm (5.9 in) PVC cable with an M12 quick disconnect connector, terminal block, or 2 m (6.5 ft) unterminated cable, depending on model

Terminal Block Models

14 to 28 AWG wire

Operating Conditions

-40 °C to +50 °C (-40 °F to +122 °F)

95% at +50 °C maximum relative humidity (non-condensing)

Environmental Rating

IEC IP65

Certifications



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) (see table)

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: 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

Construction

Bases, Segments, Covers: polycarbonate

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

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.

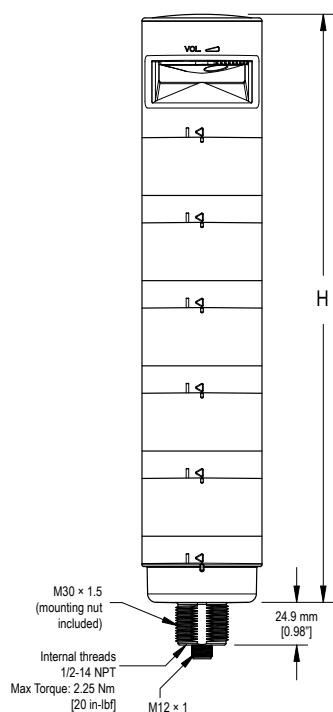
Supply wiring leads < 24 AWG shall not be spliced.

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

¹ Refer to CIE 1931 chromaticity diagram or color chart, to show equivalent color with indicated color coordinates.

Dimensions

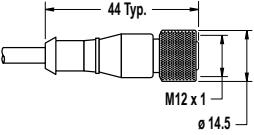
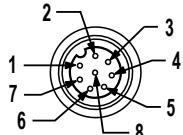
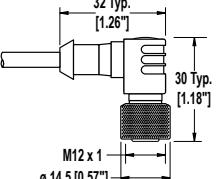
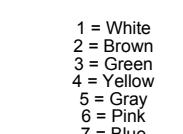


Model	Height (H)
1 light module	87.6 mm (3.45 in)
1 light module, 1 audible module	144.3 mm (5.68 in)
2 light modules	137.3 mm (5.41 in)
2 light modules, 1 audible module	194 mm (7.64 in)
3 light modules	187 mm (7.36 in)
3 light modules, 1 audible module	243.7 mm (9.59 in)
4 light modules	236.7 mm (9.32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

Accessories

Cordsets

5-Pin Threaded M12 Cordsets—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC1-501.5	0.5 m (1.5 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDC1-506	2 m (6.5 ft)			
MQDC1-515	5 m (16.4 ft)			
MQDC1-530	9 m (29.5 ft)			
MQDC1-506RA	2 m (6.5 ft)			
MQDC1-515RA	5 m (16.4 ft)			
MQDC1-530RA	9 m (29.5 ft)	Right-Angle		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray

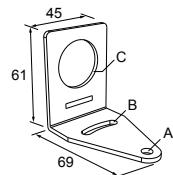
8-Pin Threaded M12 Cordsets with Open-Shield—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC2S-806	2.04 m (6.7 ft)	Straight		 1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red
MQDC2S-815	5.04 m (16.54 ft)			
MQDC2S-830	10.04 m (32.95 ft)			
MQDC2S-850	16 m (52.49 ft)			
MQDC2S-806RA	2 m (6.56 ft)	Right-Angle		 1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red
MQDC2S-815RA	5 m (16.4 ft)			
MQDC2S-830RA	10 m (32.81 ft)			
MQDC2S-850RA	16 m (52.49 ft)			

Mounting Brackets

All measurements are listed in millimeters, unless noted otherwise.

SMB30A

- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 ($\frac{1}{4}$ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel

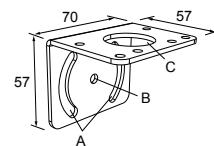


Hole center spacing: A to B=40

Hole size: A=Ø 6.3, B= 27.1 x 6.3, C=Ø 30.5

SMB30MM

- 12-ga. stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 ($\frac{1}{4}$ in) hardware
- Mounting hole for 30 mm sensor

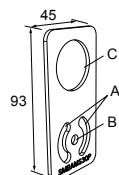


Hole center spacing: A = 51, A to B = 25.4

Hole size: A = 42.6 x 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-ga. 300 series stainless steel

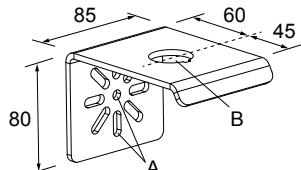


Hole center spacing: A=26.0, A to B=13.0

Hole size: A=26.8 x 7.0, B=Ø 6.5, C=Ø 31.0

SSA-MBK-EEC1

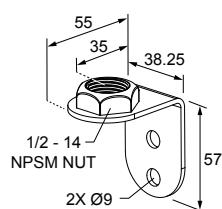
- Single 30 mm hole
- 8 gauge steel, black finish (powder coat)
- Front surface for customer applied labels



Hole size: A = Ø 7 , B = Ø 30

LMBE12RA35

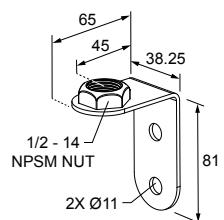
- Direct mounting of stand-off pipe, with common bracket type
- Zinc-plated steel
- 1/2-14 NPSM nut
- Mounting distance from the wall to the center of the 1/2-14 NPSM nut is 35 mm



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			<ul style="list-style-type: none"> Streamlined black PC or Gray PC thread cover Covers M30 thread on the light base Mounting hardware included 		
SA-M30C - Gray Polycarbonate					
Polished 304 Stainless Steel	Black Anodized Aluminum	Clear Anodized Aluminum			
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	<ul style="list-style-type: none"> 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-E12-900SS 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					
SA-E12M30C - White UHMW			<ul style="list-style-type: none"> 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	Features	Construction	
SA-F12	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> For use with 1/2 inch stand-off pipes Stainless steel hardware 	Black polycarbonate	
SA-FFB12C		Gray polycarbonate	

LMB Sealed Right-Angle Bracket

Model	Description	Construction	
LMB30RA		Black polycarbonate	
LMB30RAC	Direct-Mount Models: Bracket kit with base, 30 mm adapter, set screw, fasteners, O-rings, and gaskets.	Gray polycarbonate	
LMBE12RA		Black polycarbonate	
LMBE12RAC	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).	Gray polycarbonate	

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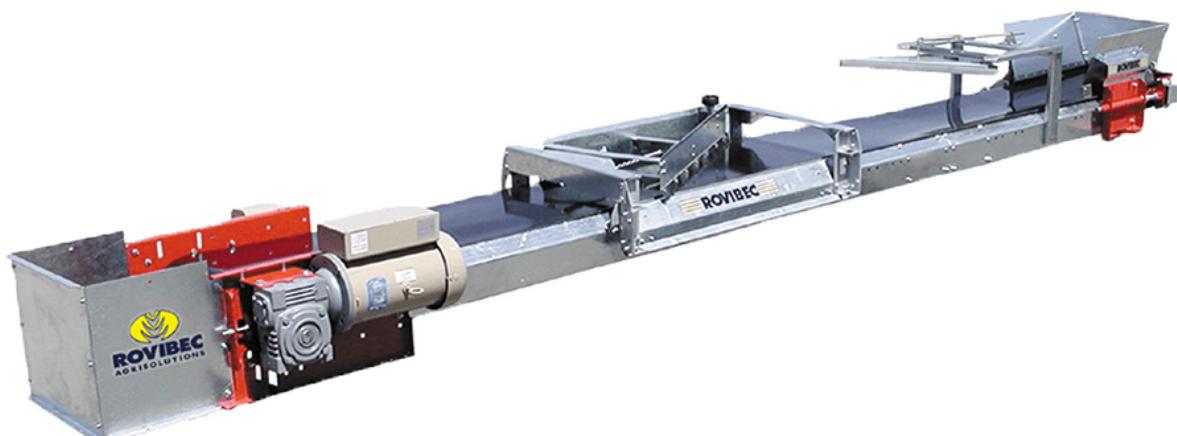
For patent information, see www.bannerengineering.com/patents.



more sensors, more solutions

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FEEDER CONVEYOR

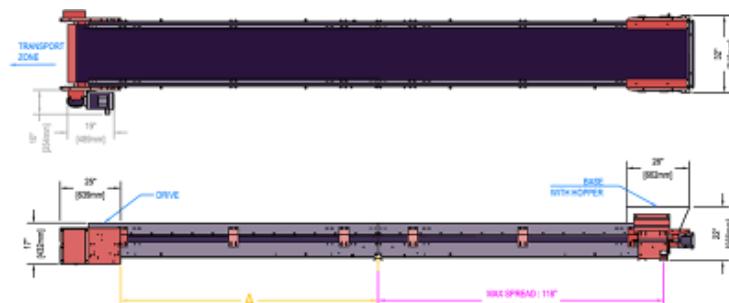


OVERVIEW

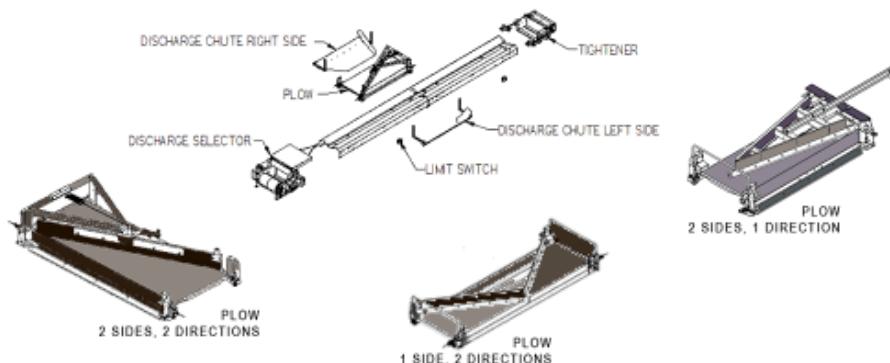
- Silent mechanism requiring very little maintenance
- (Conical) base covered with non-slip rubber roller
- Better grip and traction of the belt
- Treated belt offered in smooth or textured for cold temperature
- For tight spaces, a low profile version is available
- Made to measure according to your specific needs



TECHNICAL DRAWINGS



(https://rovibecagrisolutions.com/wp-content/themes/rovibec_theme/inc/timthumb.php?zc=2&w=1000&src=https://rovibecagrisolutions.com/wp-content/uploads/2015/04/rovibec_feeder-conveyor_1.png)



(https://rovibecagrisolutions.com/wp-content/themes/rovibec_theme/inc/timthumb.php?zc=2&w=1000&src=https://rovibecagrisolutions.com/wp-content/uploads/2015/04/rovibec_feeder-conveyor_2.png)

See specification chart (https://rovibecagrisolutions.com/wp-content/themes/rovibec_theme/inc/timthumb.php?zc=2&w=1000&src=https://rovibecagrisolutions.com/wp-content/uploads/2015/04/rovibec_feeder-conveyor.gif)

TECHNICAL SPECS

STRUCTURE & CHASSIS

Painted structural steel 3/16 "(5mm) thick

BOTTOM OF THE APRON

Galvanized steel

SIDES

Galvanized steel

POWER PACKAGE

Reversible 3/4HP motor available in 240V or 600V

PLOW

Mobile device that can serve either to the left or right

AVAILABLE SECTIONS (A *)

In multiples of 2.5 - 4-5-8-10 ft. (76-122-152-244-305cm)



GRAVITY ROLLER CONVEYORS

SPECIFICATIONS

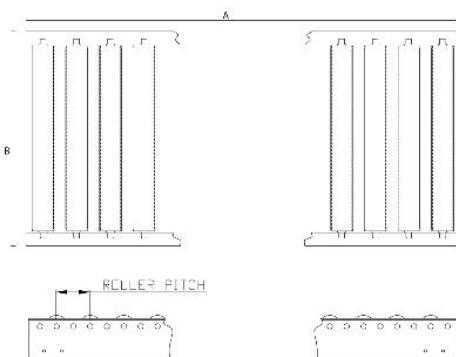
Gravity roller conveyors provide essential material handling free moving, efficient and safe transportation of goods at any operational stage of a conveyor line on a daily basis.

Gravity roller conveyors are an economical solution ideal for moving heavy and non standard shaped items along processing and packaging lines. Providing versatility with interlocking sections supplied as standard in 1.5 and 3 m lengths allowing for addition and of conveyor as required. Our conveyors have been designed with heavy duty channels, stronger cross members and a high quality powder coated finish for maximum rigidity.

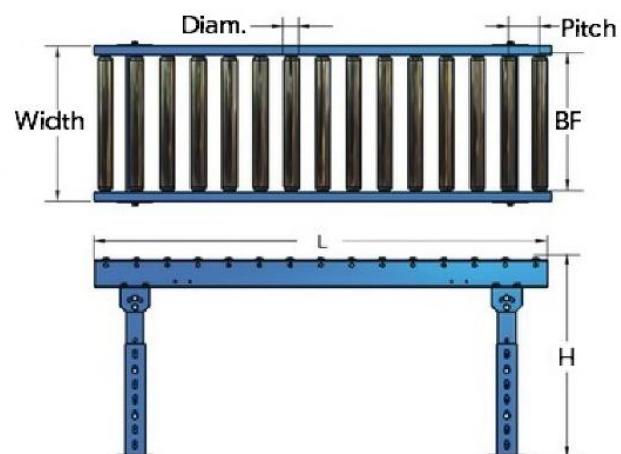
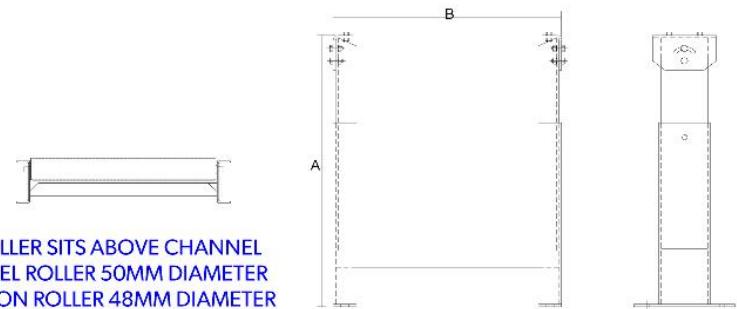
It is recommended that there be a minimum of three rollers under the product to being transported at any one time. The size of the smallest object being transported can help determine the roller pitch on your conveyor system.

The steel channel is 30 mm wide x 80 mm tall with holes punched at 37.5mm centres. The conveyor frames can optionally be supplied with height adjustable support stands. Conveyor width typically refers to the overall width of the frame.

Choose from either galvanised steel (50 mm diam) rollers or plastic nylon (48 mm diam) rollers.



ROLLER SITS ABOVE CHANNEL
STEEL ROLLER 50MM DIAMETER
NYLON ROLLER 48MM DIAMETER



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sales@materialshandling.com.au | www.materialshandling.com.au | 1300 25 84 07

MATERIALS
Handling Pty Ltd Working with ease

GRAVITY ROLLER CONVEYORS

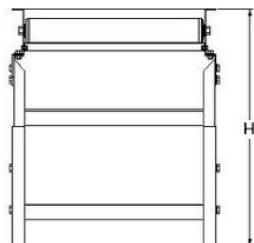
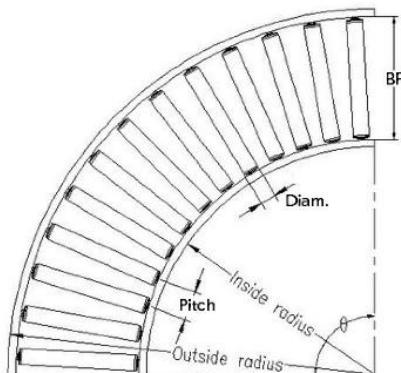
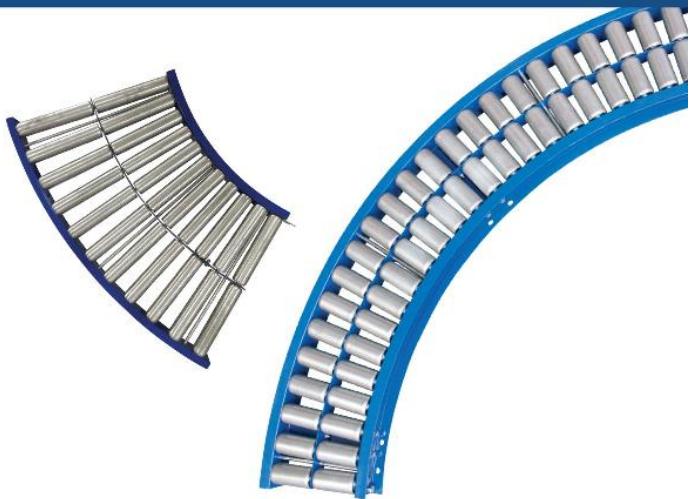
SPECIFICATIONS

Gravity roller conveyors can be extended with the addition of clever curve sections.

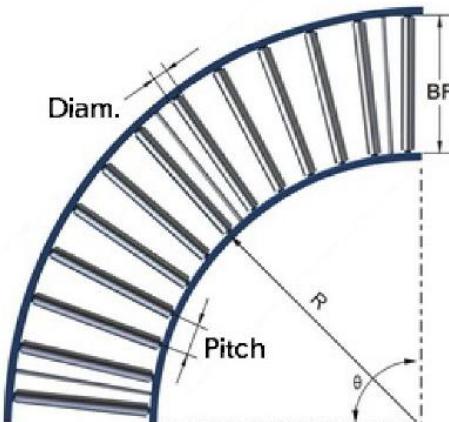
Gravity roller curves are ideal for moving items around 45 or 90 degree bends. Able to interlock with standard section lengths allowing for addition and of conveyor as required. Our conveyors have been designed with self-tracking rollers. Each shaft has two rollers to accommodate the product movement around the bend and eliminate the need for side-guides.

The conveyor frames can optionally be supplied with height adjustable support stands. It is recommended that each 45-degree section be supported at each end with a support stand. Each 90-degree section should have a stand at each end and in the middle.

Conveyor curves are only available with galvanised steel (50 mm diam) rollers with split shafts.



ROLLER SITS ABOVE CHANNEL
STEEL ROLLER 50MM DIAMETER



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MATERIALS
Handling PVT LTD Working with ease

Technical Specifications

- Frame details: Lengths – 1500, 3000 mm and curves 45° 90°
- Frame widths: 300, 450 and 600 mm (overall width)
- Roller lengths: 230, 390 and 540 mm (overbearing dimension)
- Rollers per 1500 mm frame:
 - 75 mm pitch = QTY 20
 - 115 mm pitch = QTY 13
 - 150 mm pitch = QTY 10
- Rollers per 3000 mm frame:
 - 75 mm pitch = QTY 40
 - 115 mm pitch = QTY 26
 - 150 mm pitch = QTY 20
- Stands are height adjustable from 715 – 1015 mm

Our conveyors are easy to order and can be fully customised!

It's incredibly easy to get your hands on a Gravity Roller Conveyor. Simply select the:

- Length and Width
- Pitch
- Type of roller (steel or plastic)
- Quantity of Frames, Rollers and Number of Stands.

Our conveyors can also be built to suit your specific requirements. We can completely customise the conveyor systems to suit your requirements. Just specify your length, width, pitch or roller requirement and we'll develop the solution for you.

Please Note: Frames and rollers are purchased individually for the straight conveyors. The curved conveyors are ordered complete with rollers fitted into the frame.