



# **Bulletin 22ZC Zone Controller User Manual**



## **Introduction**

This manual explains how to install, configure, and operate the Bulletin 22ZC Zone Controller.

**Rockwell  
Automation**

Allen-Bradley Motors

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## Overview

The 22ZC Zone Control System offers the user an economical means of conveying product on accumulation conveyor systems. The heart of this system is the zone control controller. As shown in Figure 1, one controller is mounted in every zone of the conveyor system and connected via a flat cable. Each controller accepts a sensor input and provides an output to an actuator based on the desired zone control logic for the application.

## Example of a 22ZC Zone Control System

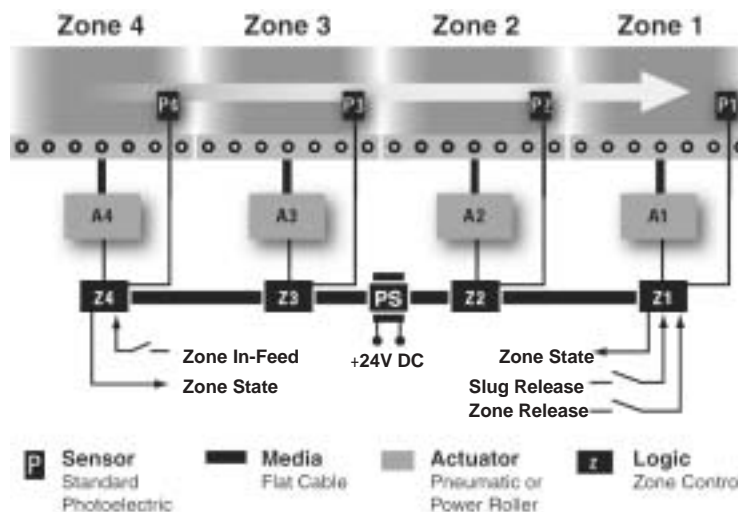


Figure 1

The system can be configured to transport, accumulate, and release product in a number of different ways to best fit the application requirements. This configuration is accomplished by manipulating DIP switches on each zone controller, thereby eliminating the need for any external programming tools. In addition, system-wide ON/OFF-delay timers can be set and broadcast to all upstream zones from a *master* zone controller located at the discharge end of the conveyor using the patented ZoneSet feature. This master controller also contains screw terminals for connection to external devices such as pendant stations, PLCs, or operator interface terminals used to control the discharge of product from the conveyor. An *in-feed* controller located at the beginning of the conveyor contains similar connections for controlling the flow of product onto the conveyor. Multiple basic controllers are located between the master and in-feed controllers. Power for both the controllers and the sensors is provided through a 1485T KwikLink power tap.

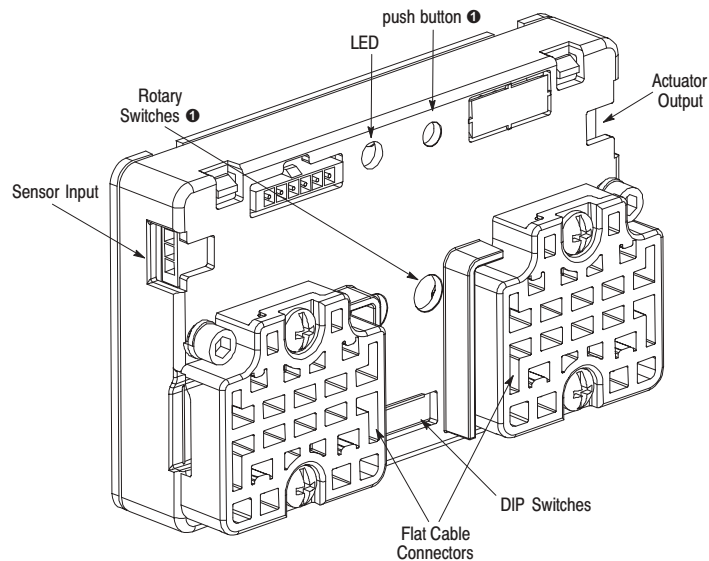
### Zone Controller Features

The 22ZC Zone Control controller is a simple, low cost zone control solution for zero pressure accumulation conveyor applications. The low profile controllers will fit into any industry standard steel conveyor frame. Vast amounts of conventional wiring are eliminated through the use of flat media for all power and signal between controllers. In addition, since a controller is used in each zone the wire lengths between the controller, sensor and actuator, are greatly reduced.

Zone logic resides in the zone control controller and is easily configurable through dip switches on each controller. In addition, system-wide timers may be set at a master controller and, at the touch of a push button, be broadcast to all upstream zones. This eliminates the need for any sophisticated programming tools.

Other features of the 22ZC Zone Control System include:

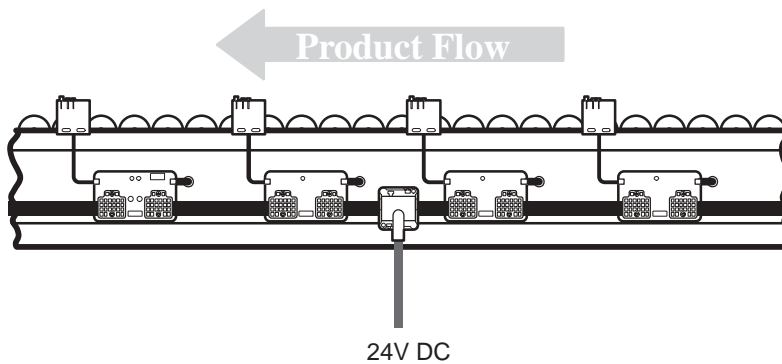
- Accepts all 2- or 3-wire, NPN, 24V DC sensor inputs
- Supports pneumatic and power roller actuator types
- Supports single- and dual-zone transport logic
- Supports singulation and slug release modes
- Selectable sleep and jam detect functions
- Selectable ON and OFF time delays
- Support for normally open or normally closed actuators



- ❶ Master controller and basic plus timer controllers only.

### Specifying a System

This section can be used as a resource for generating a bill of material for the 22ZC Zone Control System.



### Zone Controller

One controller is used in each zone. A master controller (22ZC-413) must be used in the discharge zone and an in-feed controller (22ZC-343) in the in-feed zone. Intermediate zones may be fitted with either a basic or basic plus timer controller. Use the table below to determine the type and quantity of controllers required.

Catalog Number	Type	Zone State Output	Zone Release/Feed Input	Slug Release Input	Local Time Delay	Location	Qty.
22ZC-413	Master	√	√	√	√	Discharge Zone	1
22ZC-223	Basic					Intermediate Zone	
22ZC-133	Basic plus Timer				√		
22ZC-343	In-Feed	√	√			In-Feed Zone	1

### Photoelectric Sensor

Each zone controller requires either a 2- or 3-wire (NPN) mechanical or opto-electric sensor to detect the presence or absence of a package within its zone. The sensor may be a mechanical switch or, more commonly, a photoelectric sensor. The advantage of using a photoelectric sensor is that there are no weight restrictions on the packages that can be sensed by this type of device.

One photoelectric sensor per zone is required. Use the table below to determine the type of sensor required.

Catalog Number	Sensor Type	Sensing Mode	Sensing Range	Reflector Required	Qty.
44RSP-2JNE3-Z6	Photoelectric	Polarized Retroreflective	3m (9.8ft)	Yes	
42EF-P2MNB-Z6	Photoelectric	Polarized Retroreflective	3m (9.8ft)	Yes	
42AR-P2JGN-Z6	Photoelectric	Polarized Retroreflective	2m (6.5ft)	Yes	
42GRU-9200-Z6	Photoelectric	Polarized Retroreflective	4.9m (16.5ft)	Yes	
44RSD-1KNC38-Z6	Photoelectric	Diffuse	380mm (15in)	No	
42EF-D1MNAK-Z6	Photoelectric	Diffuse	500mm (20in)	No	
42AR-D1KGH-Z6	Photoelectric	Diffuse	300mm (11in)	No	
42GRP-9000-Z6	Photoelectric	Diffuse	1.5m (5ft)	No	

### Power Tap

A 24V DC source of power is required for the zone controllers and connected sensors. This supply can be connected to the flat cable using the 1485T-P1H4 style tap. This tap should be placed in the center of a system (between infeed and master modules) for balanced power distribution. Power for the actuating device may be provided from this source through the zone controller (internally powered) or by an external source (externally powered). When power rollers are being used, the zone controller will provide a RUN signal to the DC amplifier, however, power for this amplifier must be provided by an external source. Pneumatic valves can be powered directly from the zone controller provided that they are rated accordingly. Use the table below to estimate the number of zone controllers permissible when using a 24V DC, 4A power supply.

Actuator					
	Powered Roller	0.5W Valve	1.0W Valve	1.5W Valve	2.0W Valve
# Controllers	60	45	40	35	30

Catalog Number	Description	Quantity
1485T-P1H4-C2X	Power Tap, with 2m Cable	
1485P-P1H4-T4	Power Tap, with Screw Terminals	

### Actuator Output Cable

The 22ZC Zone Controller contains a 4-pin MOLEX style connector for the actuating device. Therefore, a pre-fabricated or field installable cable is required to connect the device. Rockwell Automation offers the following prefabricated cables for common powered roller amplifiers and pneumatic valves. For fabricating one's own cables use the MOLEX part numbers listed below. One output cable is required per zone controller.

Pre-Fabricated Cables		
Catalog Number	Description	Quantity
60-2743	MOLEX to leads, 14in, 24AWG, (for powered roller amplifier)	
60-2752-3	MOLEX to DIN Form A, 14in, (for pneumatic valve)	
60-2752-4	MOLEX to DIN Form B 11mm, 14in, (for pneumatic valve)	
60-2752-5	MOLEX to DIN Form B 10mm, 14in, (for pneumatic valve)	
60-2752-6	MOLEX to DIN Form C 9.4mm, 14in, (for pneumatic valve)	
60-2752-7	MOLEX to DIN Form C 8mm, 14in, (for pneumatic valve)	
60-2752-8	MOLEX to 2-pin Pico QD, 14in, (for pneumatic valve)	

Self-Fabricated Cables		
Catalog Number	Description	Quantity
MOLEX 43030-0008	Terminal, 20-24AWG, gold-plated	
MOLEX 43645-0400	Receptacle, 4-pin, 3mm (0.11in) pitch	
60-2752-1	MOLEX to leads, 14in, 24AWG,	

### Flat Cable

A four conductor flat cable serves as the main trunk line between zone controllers. This flat cable provides 24V DC power for each zone controller, connected photoelectric sensors and internally powered actuators. It also provides for a means of communication between zone

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controllers. An insulation displacement (IDC) method is used to pierce the flat cable, forming an electrical connection between the flat cable and the zone controller. Each zone controller contains two IDC connectors one for upstream connection, and another for downstream. The outer jacket is made of black PVC and Class 2 rated per NEC Article 725 to carry up to 4A of current at 24V DC.

Flat cable is available in 3 spool sizes as indicated below.

Catalog Number	Description	Quantity
1485C-P1L75	Flat Cable, 245ft	
1485C-P1L200	Flat Cable, 650ft	
1485C-P1L420	Flat Cable, 1375ft	

### Optional Accessories

The items listed in the table below are optional only.

Catalog Number	Description	Quantity
1485A-FCM	Flat Cable Mount	
60-2649	Tilt/Swivel Mounting Bracket for 18mm Sensors	
60-2657	Right Angle Bracket for 18mm Sensors	
871A-BP18	Clamp Bracket for 18mm Sensors	
60-2439	Tilt/Swivel Mounting Bracket for 30mm Sensors	
60-2421	Right Angle Bracket for 30mm Sensors	
60-2725	Impact Bracket for 30mm Sensors	
92-99	Reflective Tape 1in x 100in	
92-114	Reflector, 1.36in Diameter	



## Installation

### Package Contents

- One 22ZC Zone Controller
- Installation instructions (22ZC-413 only)

### Accessories

- Refer to “Specifying a System” for required and optional accessories

### Installing a 22ZC Zone Controller

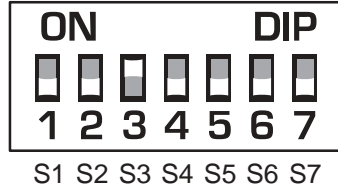
To install the 22ZC you must:

- Configure the transport mode and advanced zone logic functions
- Mount the zone controllers
- Connect the flat cable
- Connect the sensors
- Connect the actuators
- Connect the power tap(s)
- Connect the in-feed and master zone controller external connections
- Configure the system timers

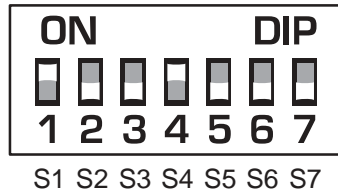
More detailed information about each of these steps is identified in the following sections.

#### A. Configure the Standard and Advanced Zone Logic Functions

Prior to mounting each zone controller both the standard and advanced zone logic functions should be configured using the 7-position dip switch on each controller. The settings below are typical and should only be changed as required. Refer to the *Standard and Advanced Zone Logic Functions* section for a description of these modes and functions and their permissible settings.



Powered Roller  
with JAM enabled



Pneumatic with  
"SLEEP" enabled

### B. Mount the Zone Controller

Once each zone controller has been configured, they may be mounted to the conveyor. The 22ZC Zone Controller should be mounted on the conveyor frame within the zone that it will be supporting. Mount the controller using two 8–32 screws. The use of lock-washers is recommended to prevent the loosening of the screws and controller. The maximum torque value for these screws is 15in-lb.

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**IMPORTANT:** The arrow on the zone controller label must be facing the direction of product flow.

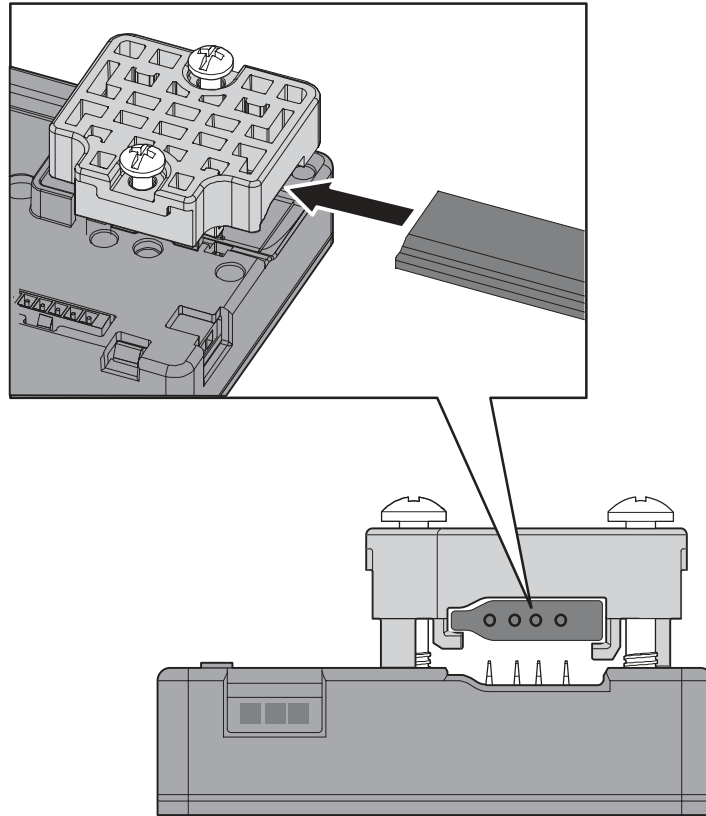
The master controller can only be located at the discharge zone of the conveyor.

The in-feed controller can only be located at the in-feed zone of the conveyor.

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### C. Connect the Flat Cable

With the zone controllers mounted, the flat cable can now be sized, cut, and installed. When installing the flat cable into the zone controller, care should be taken to ensure that the IDC blades do not bend and that the cable is fully extended toward the center of the controller. Tighten down the connector (**Note:** Alternate tightening sequence.) using the two screws provided. The maximum torque value for these screws is 15 in-lb.



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**IMPORTANT:** It is not recommended to re-use flat cable which has already been pierced.

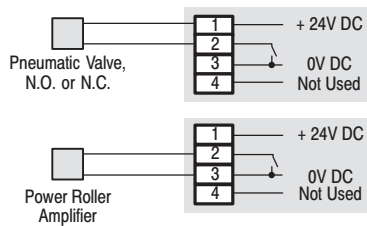
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#### **D. Connect the Sensor**

Mount the sensor to the conveyor frame using a suitable mounting bracket. If the sensor is fitted with the proper 3-pin connector, simply plug it into the zone controller making sure that it is securely seated. Otherwise, refer to Appendix A for information on fabricating the appropriate connector.

### E. Connect the Actuator

Mount the actuator device (amplifier for powered roller or pneumatic valve for pneumatic system) per manufacturer's instructions. If this device is fitted with the proper 4-pin connector, simply plug it into the zone controller making sure that it is securely seated. Pre-fabricated cables for both powered roller and pneumatic valve installations can be found in the "Specifying a System" section. Otherwise, refer to Appendix A for the correct pin assignments. Use the wiring diagrams below as a guide for fabricating this cable.

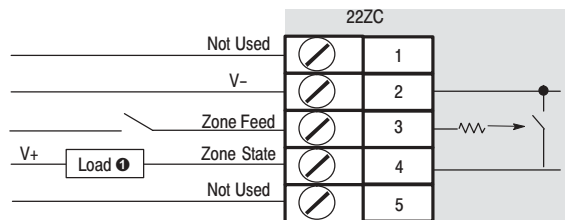


### F. Connect the 1485T-P1H4-C2X Power Tap

Power for the system is fed into the main trunk line with a KwikLink IDC Power Tap. This connector clamps onto the flat cable and contains a 2m integral round cable with 18AWG leads for connection to a Class 2 power supply. This power tap should be located in the center of a zone controller system (between infeed and master controllers) for balanced power distribution.

### G. Wiring the In-Feed Zone Controller External Connections

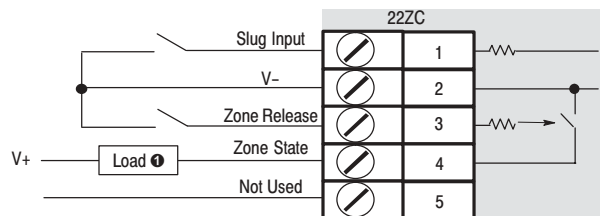
The 22ZC-343 In-feed zone controller contains screw terminals with a zone state output and zone feed input. Use the descriptions and the diagram below as a guide for wiring these connections.



❶ Load specifications: 16mA

## H. Wiring the Master Zone Controller External Connections

The 22ZC-413 master zone controller contains screw terminals with a zone state output, zone release input, and slug release input. Use the descriptions and the diagram below as a guide for wiring these connections.



❶ Load specifications: 16mA

### Zone Feed Switch

The 22ZC-343 in-feed zone controller accepts either a dry contact or sinking (NPN) output from an external device to feed product within the in-feed zone up to the sensor. When the external switch is closed and maintained, the zone controller will activate its output after satisfying any ON time delay preset.

The purpose of this input is to allow the conveyor to be loaded automatically from an upstream segment. It is also acceptable to manually drive product to the downstream side of the in-feed zone.

### Zone State Output

Both the in-feed and the master zone controllers provide a 24V DC sinking (NPN) output for connection to an external device to indicate the presence of product in the zone. If product is detected by the photoelectric sensor, (reflector blocked) this output will be ON (LO).

### Zone Release Switch

The 22ZC-413 master zone controller accepts either a dry contact or sinking (NPN) output from an external device to release accumulated product from the discharge zone. When the external switch is closed and maintained, the zone controller will activate its output after satisfying any Zone Release ON time delay preset. A momentary push button or PLC output signal may also be used in conjunction with the Zone Release Timer.

The purpose of this input is to release accumulated product from the discharge end of the conveyor one product at a time, i.e. maintaining gaps between the products.

### **Slug Input Switch**

The 22ZC-413 master zone controller accepts either a dry contact or sinking (NPN) output from an external device to input a “slug” signal into the system. Closing this switch (LO) will cause any zone which is set for Slug Release (dip switch S2 enabled) to override the photoelectric sensor state and begin driving. If a Slug Release ON time delay has been set on the zone controller, the output will not activate until the time delay preset has been reached. A momentary push button or PLC output signal may also be used in conjunction with the Slug Release Timer.

The purpose of this input is to release accumulated product from the discharge end of the conveyor as a slug, i.e. without singulating or creating gaps.

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**IMPORTANT:** A typical system will not require configuration beyond this point. Should it be necessary to customize the operation of a system follow the steps below.

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### **I. Configure the System Timers**

The 22ZC Zone Controller contains a number of user-configurable system timers to customize a system to meet specific application requirements. These timers are configured with rotary switches on the master controller. Once the values are set, they can be “broadcast” to all upstream zone controllers using the ZoneSet feature. Use the descriptions below and the tables in the Appendix to configure the system timers.

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**IMPORTANT:** Timer preset values are retained during power down cycles.

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#### **ON Delay (Run Delay)**

The ON delay timer is used to delay the “ON” output of the zone controller, thereby delaying the start of the rollers within the zone. For example, if a product is ready to be transported downstream, the rollers will not drive until the user-defined ON delay preset has expired. A system wide preset value is set using the two rotary switches and the ZoneSet feature in the master controller.

Should it be necessary to set a time delay value local to a single zone, the 22ZC-133 zone control controller should be selected. It also contains rotary switches for setting a local ON delay preset value. Any value set on

this controller will override the value broadcast by the master zone control controller.

To set a system-wide “On Delay” preset value:

1. Rotate the R1 rotary switch of the master controller to position 0.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Press the push button for 1 second to store the value.
4. Move the S6 DIP switch to the enable “On” position on the master controller to unlock the ZoneSet feature.
5. Press the push button for 1 second to broadcast the new value to the upstream zone controllers. The LED indicator will flash fast three times to indicate a successful broadcast. If the broadcast failed the LED indicator will flash 2 times.
6. Move the S6 DIP switch to the disable “Off” position on the master controller to lock the ZoneSet feature.

#### **OFF Delay (Stop Delay)**

The OFF delay timer is used to delay the ‘OFF’ output of the zone controller, thereby delaying the stop of the rollers within the zone. For example, if a product has cleared the sending zone the rollers in that zone will remain powered until the user-defined OFF delay preset has expired. A system-wide preset value is set using the two rotary switches and the ZoneSet feature in the master controller.

Should it be necessary to set a time delay value local to a single zone, the 22ZC-133 zone control controller should be selected. It also contains rotary switches for setting a local OFF delay preset value. Any value set on this controller will override the value broadcast by the master zone control controller.

To set a system-wide “Off Delay” preset value:

1. Rotate the R1 rotary switch of the master controller to position 1.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Press the push button for 1 second to store the value. The LED indicator will flash two times to indicate a successful learn.
4. Move the S6 DIP switch to the enable “On” position on the master controller to unlock the ZoneSet feature.
5. Press the ZoneSet push button for 1 second to broadcast the new timer value to the upstream zone controllers. The LED indicator will flash three times to indicate a successful broadcast.

6. Move the S6 DIP switch to the disable “Off” position on the master controller to lock the ZoneSet feature.

#### **SLEEP Timer**

The SLEEP timer is part of the SLEEP function of the 22ZC Zone Controller. It defines the period of time that zones should wait before powering down. When product is introduced onto the conveyor, the affected zones will “wake up” and revert back to normal transport.

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**IMPORTANT:** The SLEEP function and timer are only available in basic pneumatic logic operating mode.

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To set a system-wide “SLEEP” preset value:

1. Rotate the R1 rotary switch of the master controller to position 2.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Note that the factory default is 20 seconds.
4. Press the push button for 1 second to store the value.
5. Move the S6 DIP switch to the enable “On” position on the master controller to unlock the ZoneSet feature.
6. Press the ZoneSet push button for 1 second to broadcast the new timer value to the upstream zone controllers. The LED indicator will flash three times to indicate a successful broadcast. If the broadcast failed the LED indicator will flash 2 times.
7. Move the S6 DIP switch to the disable “Off” position on the master controller to lock the ZoneSet feature.

#### **Jam Timer**

The Jam timer is part of the Jam Detect function of the 22ZC Zone Controller. It defines the period of time that a sending zone should wait for product to leave its zone before powering down. For example, if the product never leaves the sending zone, the jam timer will expire, causing both the zone and the adjacent downstream zone to power down. Both zones will revert to normal transport once the jam condition is cleared.

**Note:** The jam function and timer are only available in single zone operating mode.



To set a system-wide “Jam Timer” preset value:

1. Rotate the R1 rotary switch of the master controller to position 3.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Note that the default JAM TIMER setting is 5 seconds.
4. Press the push button for 1 second to store the value.
5. Move the S6 DIP switch to the enable “On” position on the master controller to unlock the ZoneSet feature.
6. Press the ZoneSet push button for 1 second to broadcast the new timer value to the upstream zone controllers.
7. Move the S6 DIP switch to the disable “Off” position on the master controller to lock the ZoneSet feature.

---

**IMPORTANT:** The following timers and counter are only applicable to the 22ZC–413 master zone controller and are used to control the release of product from the discharge zone. These timers and counter are set in the master zone controller, and triggered by the externally connected zone release and slug release switches.

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#### **Zone Release ON Delay Timer**

The Zone Release ON Delay Timer defines the period of time that the *discharge zone* should wait to drive after the external zone release switch has been closed. The purpose of this timer is to momentarily delay the drive of product into the next conveyor segment. Product upstream of the discharge zone will follow normal transport logic.

To set a “Zone Release On Delay Timer” preset value:

1. Rotate the R1 rotary switch of the master controller to position 5.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Press the push button for 1 second to store the value.
4. Note that the default setting is “0” seconds.

#### **Zone Release One-Shot Timer**

The Zone Release One-Shot Timer defines the period of time that the *discharge zone* should drive after the external zone release switch has been *momentarily* closed. This allows product to be released from the discharge zone for a period of time as configured by the user. Once this timer has expired, arriving product will stop at the discharge zone.

The default value for this timer is zero (0), which causes the discharge zone to drive only until the product in that zone is released (sensor is clear). If the external zone release switch transitions from open to closed for a second time before the preset is reached, the one-shot timer will terminate as if it had timed out.

To set a "Zone Release One-Shot Timer" preset value:

1. Rotate the R1 rotary switch of the master controller to position 4.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Press the push button for 1 second to store the value.
4. Note that the default setting is "0" seconds.

#### **Zone Release Counter**

The Zone Release Counter allows the user to release product from the discharge zone by count rather than by time value. Each count is defined as the on/off transition from the sensor connected to the discharge zone controller. The counter starts once the external zone release switch has been *momentarily* closed. Once this counter has expired, it will reset, and upstream product will stop at the discharge zone.

The default value for this counter is zero (0), which disables the counting function, causing the discharge zone to release product by timer value only (see One-Shot Timer). If the external zone release switch transitions from open to closed for a second time before the preset is reached the counter will terminate as if it had counted down to zero.

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**IMPORTANT:** Note that if the Zone Release Count is set to a nonzero value, then the one-shot delay timing function is disabled. Product will then be released from the discharge zone by count rather than by time.

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To set a "Zone Release Counter" preset value:

1. Rotate the R1 rotary switch of the master controller to position 6.

2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Press the push button for 1 second to store the value.

**Slug Release One-Shot Timer**

The Slug Release One-Shot Timer defines the period of time that any zone with the Slug Respond switch (S2) enabled should drive after the external slug release switch has been *momentarily* closed. This causes these zones to override their sensor states and begin driving product downstream. Once this timer has expired, each zone will revert to normal transport.

To set a "Slug Release One-Shot Timer" preset value:

1. Rotate the R1 rotary switch of the master controller to position 7.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Press the push button for 1 second to store the value.
4. Note that the default setting is "0" seconds.
5. Move the S6 DIP switch to the enable "On" position on the master controller to unlock the ZoneSet feature.
6. Press the ZoneSet push button for 1 second to broadcast the new timer value to the upstream zone controllers.
7. Move the S6 DIP switch to the disable "Off" position on the master controller to lock the ZoneSet feature.

**Slug Release ON Delay Timer**

The Slug Release ON Delay Timer defines the period of time that a zone should wait to drive after the external slug release switch has been *momentarily* closed. The purpose of this timer is to momentarily delay the drive of product into the next downstream zone. Once this timer preset has been reached, the zone(s) will begin to drive until the external slug input switch has been opened.

To set "Slug Release On Delay Timer" preset value:

1. Rotate the R1 rotary switch of the master controller to position 8.
2. Set the appropriate preset according to Appendix A using the R2 rotary switch.
3. Press the push button for 1 second to store the value.
4. Note that the default setting is "0" seconds.

### **Factory Reset**

The system timer values may be restored to their factory defaults by following the procedure defined below.

1. Rotate the R1 rotary switch of the master controller to position 9.  
R2 to  $\emptyset$
2. Press the push button for 1 second to store the value.
3. Move the S6 DIP switch to the enable "On" position on the master controller to unlock the ZoneSet feature.
4. Press the ZoneSet push button for 1 second to broadcast the default timer values to the upstream zone controllers.
5. Move the S6 DIP switch to the disable "Off" position on the master controller to lock the ZoneSet feature.

### **Standard Zone Control Logic**

The zone controller has two switch selectable operating modes—single zone and basic, to suit either powered roller or pneumatic conveyor systems. Along with these modes, advanced logic functions may be activated as required by the application. Refer to the descriptions below to help determine the best configuration for the application.

#### **Single Zone Transport Mode**

In this mode of operation, *all zones are OFF* until product is ready to be transported downstream. This mode is ideal for powered roller systems as it results in power savings, and reduces roller wear and noise. As the product is introduced onto the conveyor and transported downstream, it will separate into zone length gaps. This provides for smooth, noncontact transport of product along the conveyor. When the first product reaches the last zone (zone 1) it will stop and wait to be released from the conveyor.

Gap spacing between the products may be decreased for increased throughput by setting a system wide OFF delay timer. This timer may be either system-wide, or, when using the 22ZC-133 Basic Plus Timer controller, local to specific zones. In addition, a JAM function may be activated to detect the presence of jammed products on the conveyor. These functions are discussed in greater detail in the next section.

#### **Basic Mode**

In this mode of operation, *all zones are ON* as soon as power is applied to the system. As the product is introduced onto the conveyor and transported downstream, it will separate into zone length gaps. When the first product reaches the last zone (zone 1) it will stop and wait to be

released from the conveyor. Like single zone mode described above, system throughput can be increased by setting a system-wide OFF delay timer.

To help conserve power and reduce roller noise and wear, the "SLEEP" function may be activated as described in the next section. This function will turn OFF unused zones and restart them as required.

### **Release Logic**

Once product has accumulated on the discharge side of the conveyor it can be released in one of the following manners.

#### **1. Singulation Release**

Product is released (zone will drive) from the discharge zone when the external zone release input is closed and maintained. A momentary input can also be used in conjunction with the One-Shot Zone Release timer. As the product clears the sensor, the adjacent upstream zones will advance as normal transport dictates. If the One-Shot Zone Release timer is used and the zone release input is closed for a second time before the timer preset is reached, the timer will terminate.

#### **2. Slug Release**

Product is released (zone will drive) in each zone has the slug respond DIP switch (S2) enabled AND the external slug release input closed and maintained. A momentary input can also be used in conjunction with the One-Shot Slug Release timer.

#### **3. Count Release**

Product is released (zone will drive) from the discharge zone until the user-defined preset count value is reached when the external zone release input is closed. This count preset is set using the Count release. Once the preset has been reached, the discharge zone will revert to normal transport logic. If the external zone release input is closed for a second time before the Count release preset is reached, the counter will terminate.

#### 4. Timed Release One-Shot

Product is released (zone will drive) from the discharge zone for a period of time selected by the user when the external zone release input is momentarily closed. This time preset is set using the One-shot release timer. Once the timer has timed out, the discharge zone will revert to normal transport logic. If the external zone release input is closed for a second time before the One-shot release timer expires, the timer will terminate.

### Advanced Zone Control Logic

Along with establishing the standard transport logic of the zone controller, the user can also select from three advanced logic functions. These include the “SLEEP,” jam respond, and inverted output functions.

#### “SLEEP” Function

In order to conserve power and reduce roller wear and noise, the 22ZC can be configured to power down unused zones. This feature can be activated via DIP switch S4 on each zone controller. The “SLEEP Timer” is part of this function and allows the user to preset a time for the zone to wait before powering down. The default value is 20 seconds.

---

**IMPORTANT:** This function is only available in the basic zone operating mode.

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#### Jam Respond Function

During the transport of product on the conveyor, the 22ZC will monitor for a jam condition (product never leaving the sending zone). The controller will respond by either powering down the affected zones or continuing to drive in an attempt to clear the jam condition. The response is determined by the position of DIP switch S3 on each zone controller. When enabled, the response will be to power down the zones, and when disabled, to continue to drive.

A “Jam Timer” is part of this function and allows the user to set the time that the zone will drive before powering down. A time value of between 0.5 and 20 seconds may be selected. The default value is 5 seconds.

---

**IMPORTANT:** This function is only available in the single zone operating mode.

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### Inverted Output Function

The output logic of the 22ZC may be reversed to make it compatible with both normally open and normally closed pneumatic valves. This function can be activated via DIP switch S5 on each zone controller.

### Troubleshooting Guide

With power applied to the system and set to single zone operating mode, the yellow LED does not illuminate.	This is normal. The LED will illuminate and the zone will drive when the sensor is blocked AND there is no product in the adjacent downstream zone.
With power applied to the system, the LED on some zone controllers flashes at a very slow rate.	<p>This indicates that zone controller is not communicating with one of the adjacent controllers.</p> <p>Ensure that the flat cable connection between these zone controllers is properly made.</p> <p>Ensure that the zone controllers are in the correct sequence on the conveyor, i.e. master at the discharge, in-feed at the beginning, etc.</p>
When power is applied to the system, the LED on some zone controllers flashes at a very fast rate.	<p>This indicates that the zone controller is in a short circuit protection (SCP) state caused by a short circuit condition at the actuator output.</p> <p>Ensure that the actuator electrical characteristics do not exceed those allowed by the zone controller.</p> <p>Ensure that the patchcord between the actuator and the zone controller is properly fabricated.</p>
When power is applied to the system, and the zone controller output is active (indicated by the LED), but the actuator does not energize.	<p>For pneumatic valve application</p> <p>Ensure that the electrical characteristics do not exceed those allowed by the zone controller. Power for the valve is provided through the flat cable and zone controller.</p> <p>Ensure that the patchcord between the actuator and the zone controller is properly fabricated.</p> <p>For powered roller application</p> <p>Ensure that auxiliary power for the rollers is provided and connected per manufacturer specifications. The zone controller only provides the RUN signal to the powered roller amplifier.</p> <p>Ensure that the actuator output cable between the amplifier and the zone controller is properly wired.</p>

## Terms and Abbreviations

For a complete listing of Rockwell Automation terminology, refer to the Rockwell Automation/Allen-Bradley Industrial Automation Glossary, Publication AG-7.1.

**Accumulation Conveyor:** A type of conveyor which allows for the collection (accumulation) of product at a predetermined point.

**Accumulation Phase:** The phase, after transport, when product begins to collect at a predetermined point (discharge end) of the conveyor.

**Actuator:** A device used to start or stop the rollers within a zone. This device may be either a pneumatic valve or a DC driver card for power-roller applications.

**Discharge End:** Section where product is removed from the conveyor.

**Downstream:** Toward the discharge end of the conveyor, i.e. direction of product flow.

**Flow:** The direction of product travel on the conveyor.

**In-Feed:** The induction end of the conveyor where product is loaded.

**Inverted Output Function:** As it applies to the 22ZC zone controller product, the output state is inverted to support the use of either a normally open or normally closed pneumatic valve actuator.

**Jam Condition:** A condition in which the product being conveyed has become jammed in the sending zone.

**Jam Respond Function:** As it applies to the 22ZC zone controller product, the controller will either drive or power down upon detection of a jam condition.

**Sensor:** A device used to detect the presence of a product in a zone, i.e. mechanical or photoelectric switch.

**Singulation Release:** A type of release mode in which product is discharged from the conveyor one at a time.

**Sleep Function:** As it applies to the 22ZC zone controller product, this function will power down unused zones to conserve power and reduce roller wear and noise.

**Slug Release:** A type of release mode in which product is discharged from the conveyor in predetermined groups.

**Upstream:** Toward the in-feed end of the conveyor, i.e. direction opposite product flow.

**Transport Phase:** The phase when product is introduced and conveyed downstream toward the discharge end of the conveyor.



**Zero Pressure Accumulation Conveyor:** A type of conveyor designed to have zero buildup of pressure between adjacent products.

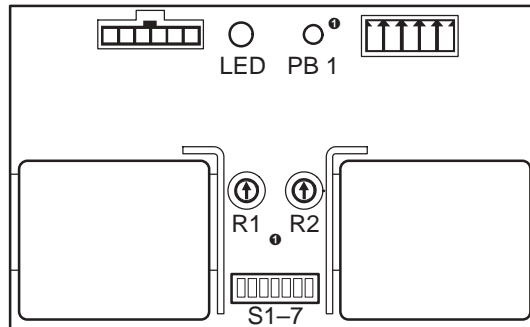
**Zone:** A section of conveyor made up of the following key items: drive and idler rollers, sensor, zone logic, and actuator. The sensor is used to detect product, the zone logic to act upon that input, and the actuator to start/stop the rollers within the zone.

**Zone State:** The status of product in a zone. A zone full state is when product is either stopped or moving within a zone.

**Zone Release State:** A state when stopped product within a zone is discharged into the adjacent downstream zone (or from the conveyor itself) by an external input.

## Appendix A

### User Interface



① Master and basic plus timer controllers only.

### LED Indicators

The 22ZC Zone Controller uses a single orange LED indicator to indicate actuator output states and fault conditions. The states of this LED are defined below.

Color	State	Indication
Orange	OFF	Output Inactive
	ON	Output Active
	Slow Flashing (0.75Hz)	Lost Communications with Adjacent Zone Controllers
	Medium Flashing (2Hz)	Jam Condition
	Fast Flashing (4Hz)	Actuator Output Overcurrent or Short Circuit
	Flash 3X Fast	ZoneSet Successful
	Flash 3X Slow	ZoneSet Not Successful
	Flash 2X Slow	Timer values stored successfully ②

② Affects only master controller zone and basic plus timer controllers.

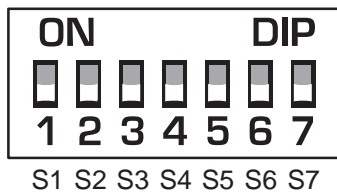
### Dip Switch Settings

The 22ZC zone controller uses a bank of seven DIP switches to allow configuration of operating modes and enabling/disabling advanced functions. The function of these switches is defined below.

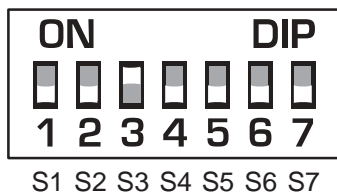
#### Zone Controller DIP Switches

Switch	Function	Default
S1	Operating Mode—Single Zone or Basic	Single Zone
S2	Slug Respond—Enable or Disable	Disable
S3	Jam Respond—Zone ON or Zone OFF ❶	Disable
S4	“SLEEP” Function—Enable or Disable ❷	Disable
S5	Inverted Output—Standard or Inverted	Standard
S6	ZoneSet—Enable or Disable ❸	Disable
S7	Not Used	

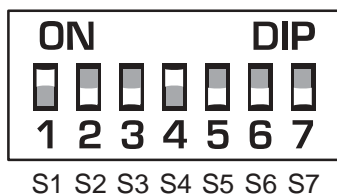
- ❶ Only valid in single zone operating mode.
- ❷ Only valid in basic operating mode.
- ❸ Affects only master controller zone.



Factory Default  
(All switches off)



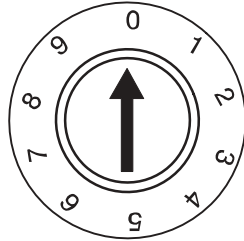
Powered Roller  
with JAM enabled



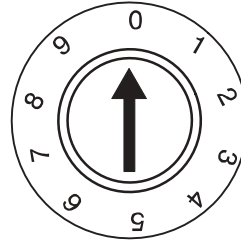
Pneumatic with  
“SLEEP” enabled

### Rotary Switch Settings

The Master zone controller contains two 10-position rotary switches to configure both the system timers and the discharge zone release timers. The function of these rotary switches is defined below.



Rotary Switch R1



Rotary Switch R2

### Master controller Rotary Switches

Switch	Position	Function	Default
R1	0	ON Time Delay	0
	1	OFF Time Delay	0
	2	“SLEEP” Timer	20 seconds
	3	Jam Timer	5 seconds
	4	Zone Release Timer—One Shot ❶	0
	5	Zone Release Timer—ON Delay ❶	0
	6	Zone Release Count ❶	0
	7	Slug Release Timer—One Shot ❶	0
	8	Slug Release Timer—ON Delay ❶	0
	9	Factory Reset	
R2	0	0 seconds	
	1	0.3 seconds	
	2	0.5 seconds	
	3	0.8 seconds	
	4	1.0 seconds	
	5	1.3 seconds	
	6	1.5 seconds	
	7	1.8 seconds	
	8	2.0 seconds	
	9	10.0 seconds	

❶ Affects only master controller zone.

## Zone Controller Connections

### Photoelectric Sensor

Pin	Label	Function
1	S	Sensor Input (NPN)
2	+	+24V DC
3	-	0V DC

### Actuator Connections

Pin	Label	Function
1	+	+24V DC
2	S	Actuator Output (NPN)
3	-	0V DC
4		Unused

### 1485T-P1H4-C2X Power Tap Connections (2m cable)

Color	Function
Brown	V + (24V DC)
Blue	V -

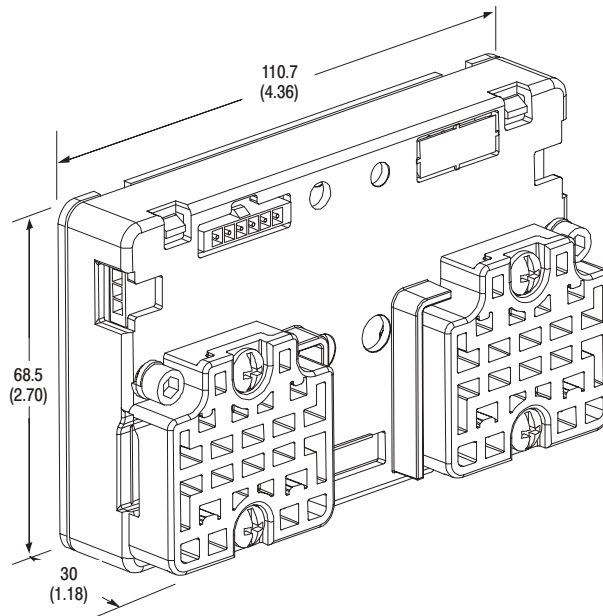
### Master controller External Connections (screw terminal)

Pin	Label	Function	Type
1	1	Slug Input	Contact Closure or +24V DC NPN Output
2	2	V —	0V DC
3	3	Zone Release Input	Contact Closure or +24V DC NPN Output
4	4	Zone State Output	+24V DC NPN Output
5	5	Not Used	—

### In-Feed controller External Connections (screw terminal)

Pin	Label	Function	Type
1	1	Not Used	-
2	2	V-	0V DC
3	3	Zone Feed Input	Contact Closure or +24V DC NPN Output
4	4	Zone State Output	+24V DC NPN Output
5	5	Not Used	—

## Zone Controller Dimensions—mm (inches)



[www.rockwellautomation.com](http://www.rockwellautomation.com) [www.ab.com/sensor](http://www.ab.com/sensor) or safety

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