ZoneFlex Advanced

ZoneFlex Manager Configuration Guide

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About This Guide

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1.1 Introduction to ZoneFlex Advanced

ZoneFlex™ Advanced provides a network approach to pneumatic zone control for accumulation conveyor. It consists of:

- A ZoneFlex Manager (ZFM)
- ZoneFlex Advanced (ZFA) Modules
- The ZoneFlex Configurator (ZFC) software

A ZFM is an intelligent controller that manages all of the connected ZFA modules. The ZFA modules report the status of inputs to the ZFM and update outputs per the ZFM's instructions.

The ZFC software is used to generate configurations for the ZFM. The configurations can be saved in XML files or in ZoneFlex Binary (ZFB) files. They can then be downloaded to the ZFM using a USB or fieldbus interface, respectively.

This guide provides the information you will need to create ZFM configurations using the ZFC. It also provides instructions for downloading the configurations to ZFMs.

1.2 System Architecture

A ZFA system consists of a ZFM and one or more ZFA modules. The ZFM acts as a master that centrally controls and monitors all of the modules in the system. The modules report the status of inputs to the ZFM and update outputs according to the ZFM's instructions. A single ZFM can support up to 100 modules.

Figure 1-1 ZoneFlex Manager

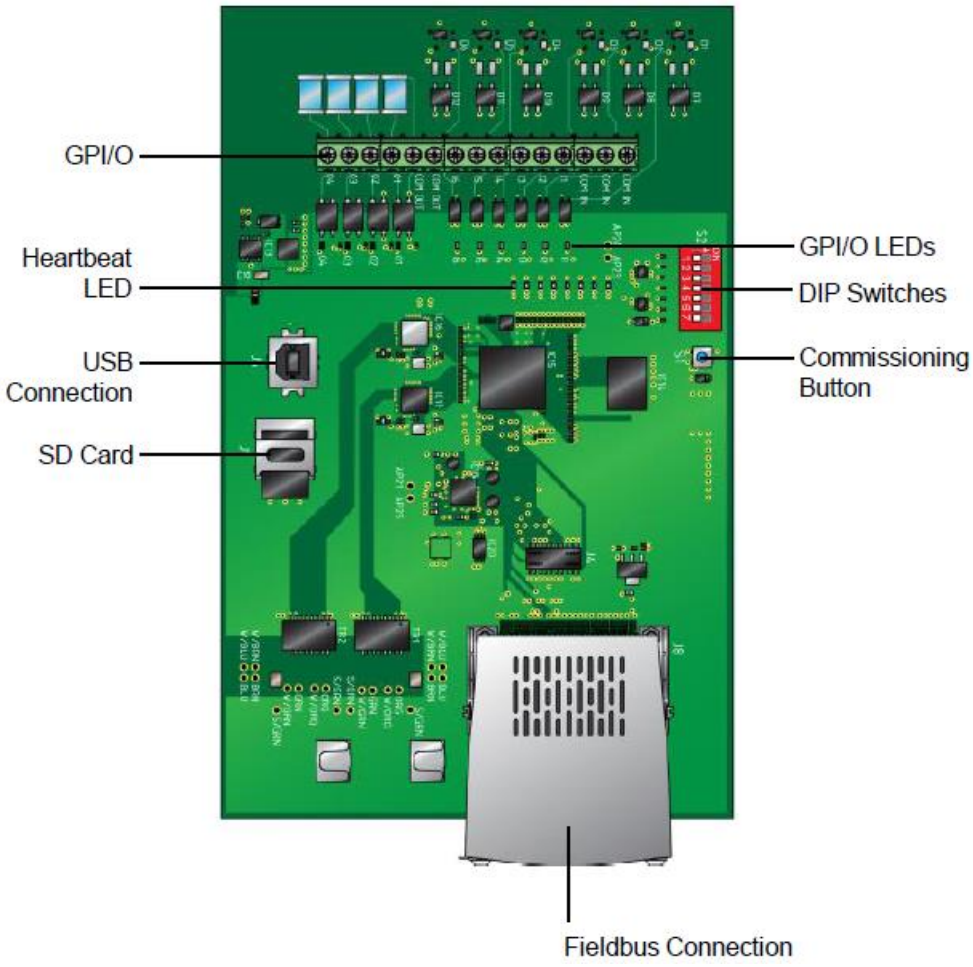
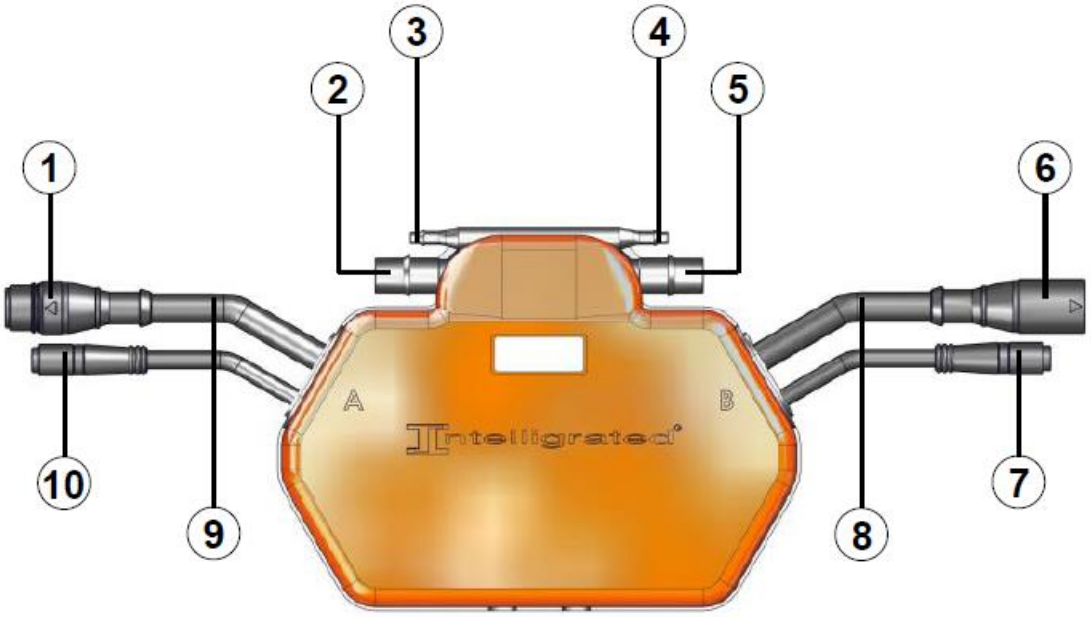
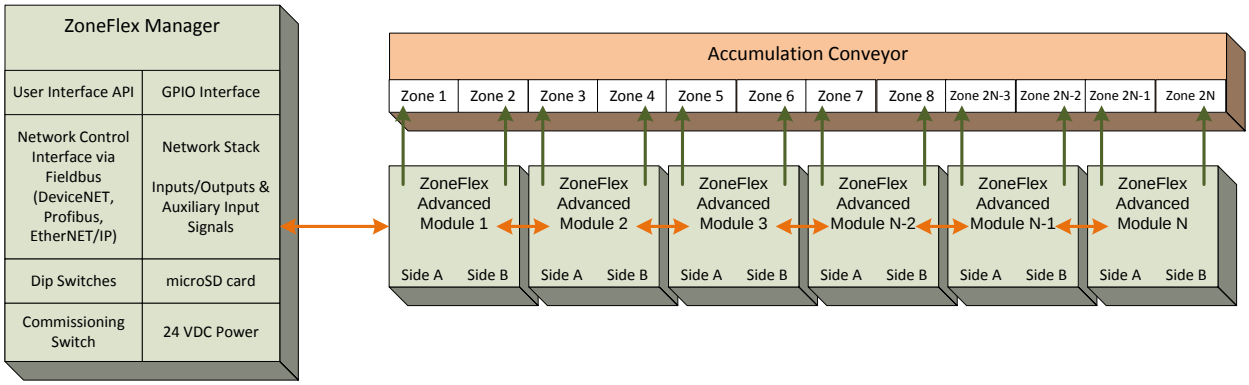


Figure 1-2 ZoneFlex Advanced Module



1	Female Micro Connector	6	Male Micro Connector
2	Air Supply	7	Photo-Eye B
3	Port A	8	Power/Communication
4	Port B	9	Power/Communication
5	Air Supply	10	Photo-Eye A

Figure 1-3 ZoneFlex Advanced System Structure



A ZFM is connected at the beginning or end of the ZFA module chain. Each module controls two zones.

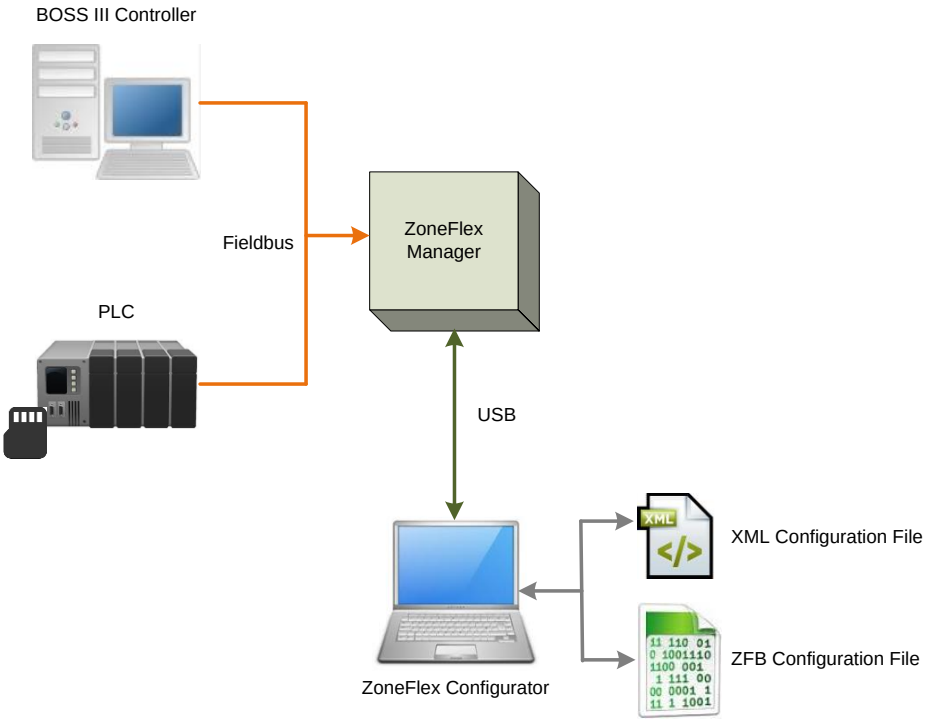
One NEC Class 2 power supply can operate 28 or 21 modules depending on where it is positioned. The Volts Direct Current (VDC) setting is also determined by where the power supply is positioned, as follows:

- When connected to the center of a chain of modules, the power supply can power 28 modules. The output VDC should be set to 24.
- When connected to the end of the chain of modules, the power supply can power 21 modules. The output VDC should be set to 27.6.
- Use a power isolating cable to separate power supplies when the module count exceeds these numbers and you have multiple power supplies on the same network. This special cable allows data to traverse the total network, but separates the power.

1.3 The ZoneFlex Configurator

The ZFC is a software application that is used to generate ZFM configurations. The configurations can be saved in XML or ZFB format. They can then be downloaded to the ZFM using the ZFC, one of Intelligrated's UIs, or a PLC.

Figure 1-4 ZoneFlex Configurator Overview



Configurations can be downloaded using the USB connection. UIs and PLCs can download ZFB configurations to a ZFM using a fieldbus connection.

Getting Started

2

2.1 Connecting a PC to a ZFM

To connect a PC to a ZFM, you will need:

- A Windows 7 PC running version 4.6.2 of the .NET Framework
- A USB cable
- Potentially, internet access and an internet browser

When you have these items, complete the following steps.

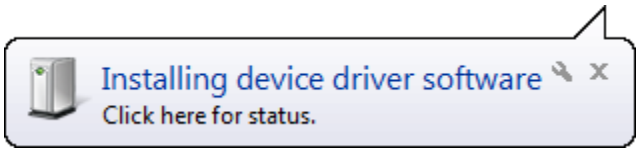
Important: If this is the first time a ZFM is being connected to the PC, complete the steps below. If, however, a ZFM has been connected to the PC before, you should keep the following in mind:

- Use the same USB port that was used previously to connect the ZFM to the PC. If you do so, the driver will still be configured for the ZFM. If you use a different USB port, a driver will need to be configured for the new port.
- If you are connecting a different ZFM to the PC but using the same USB port, the driver will notice that the ZFM has a different ID. A prompt will appear asking if want to continue. Select **Yes** to use the new ZFM.

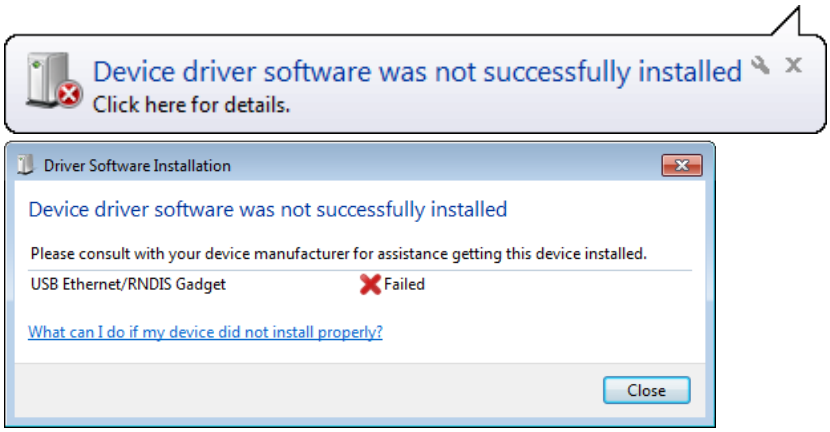
Note: A PC communicates with a ZFM using a special Ethernet over USB driver, creating another network specifically for this link.

1. Plug the B side of the USB cable into the ZFM USB port.

2. Plug the A side of the USB cable into a USB port on the PC. Windows will automatically detect the device and attempt to install the USB EtherNET/RNDIS Gadget. This is the driver that is needed for the ZFM.

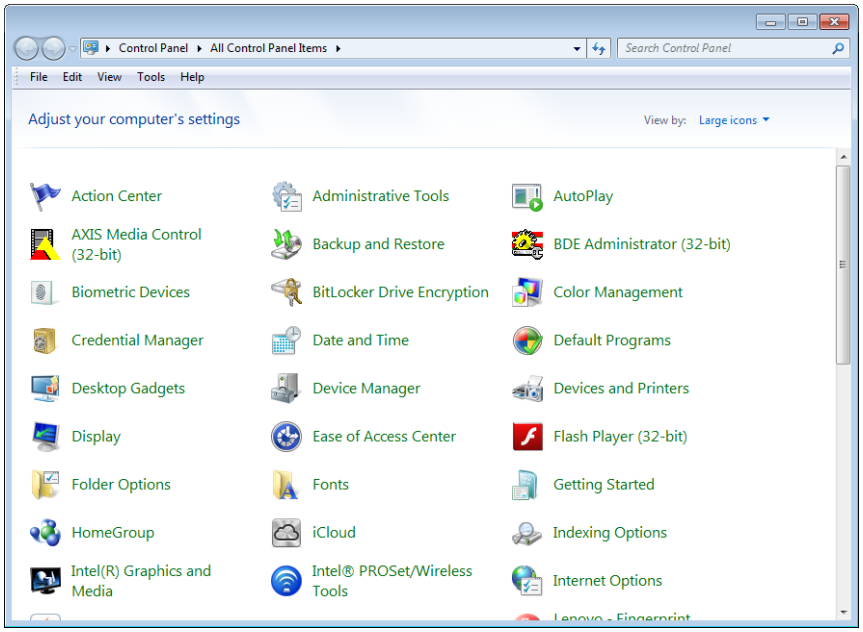


Note: You might receive an error message indicating that the device driver software was not successfully installed.

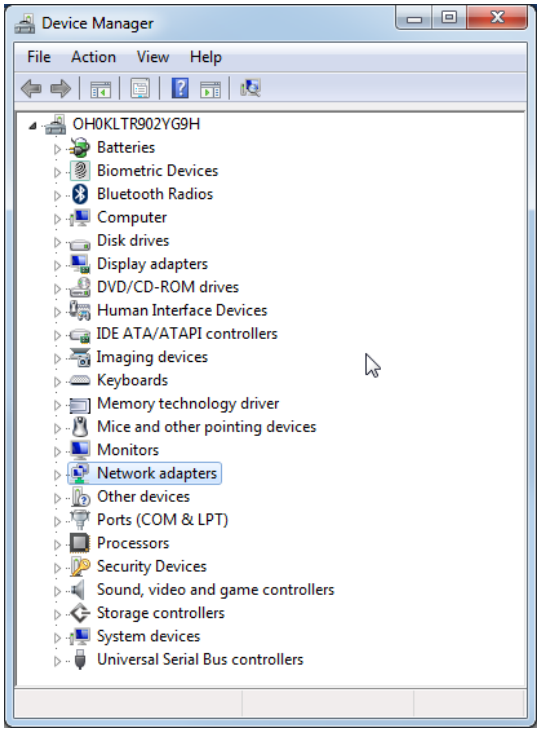


Windows displays this message because it does not yet have an IP address for the ZFM. However, it is possible that the driver was installed anyway. Proceed with the steps below to determine if it was properly installed.

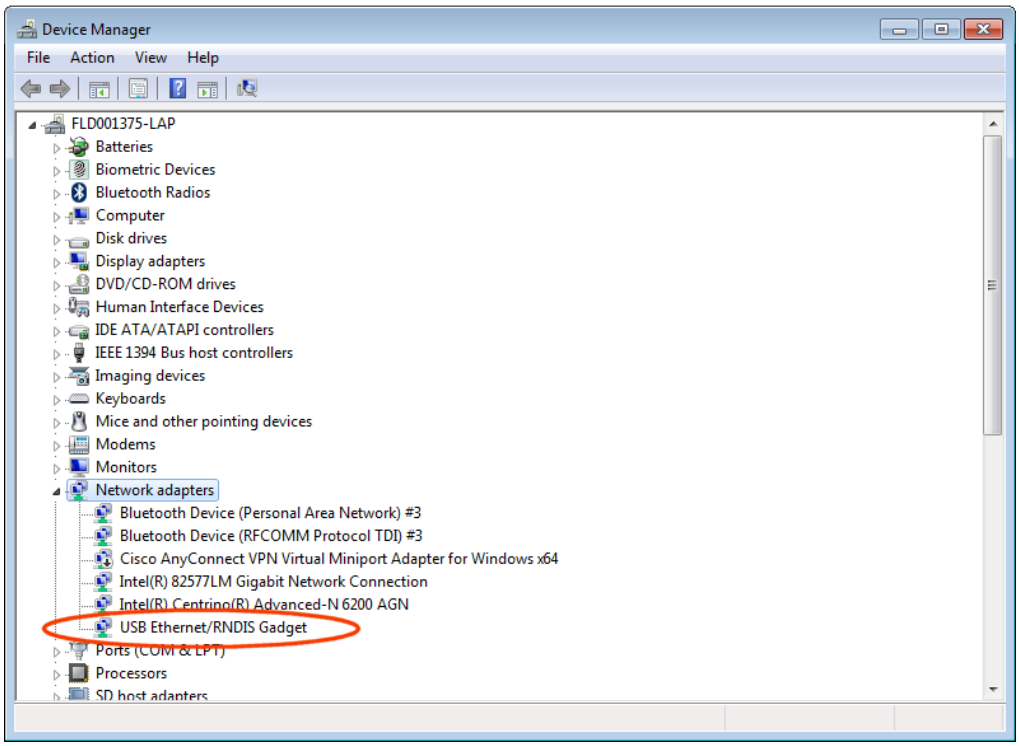
3. Click on the Windows **Start** button and select the **Control Panel** option. The Control Panel window is displayed. Select **Device Manager**.



4. The Device Manager window is displayed. Expand the **Network Adapters** group.



5. Look for the **USB EtherNET/RNDIS Gadget**. If it appears in the list, the driver has been properly installed.



If the driver does not appear in the list, you will need to install it manually. Refer to the next section for additional information.

2.1.1 Manually Installing the Device Driver

If Windows does not automatically install a driver for the ZFM, you can manually install the USB Ethernet/RNDIS Gadget by completing the following steps:

1. Download the driver from the following location:

   http://beagleboard.org/getting-started#step2

Note: If the PC has a 64-bit operating system, use the 64-bit version of the driver.

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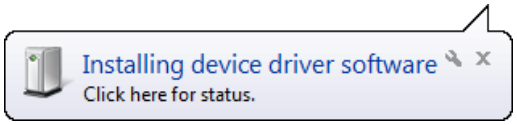
2. Double-click the downloaded file.

3. Follow the instructions on the screen to progress through the installation.

4. Plug the ZFM into the PC. Windows should detect the ZFM and apply the driver to it.



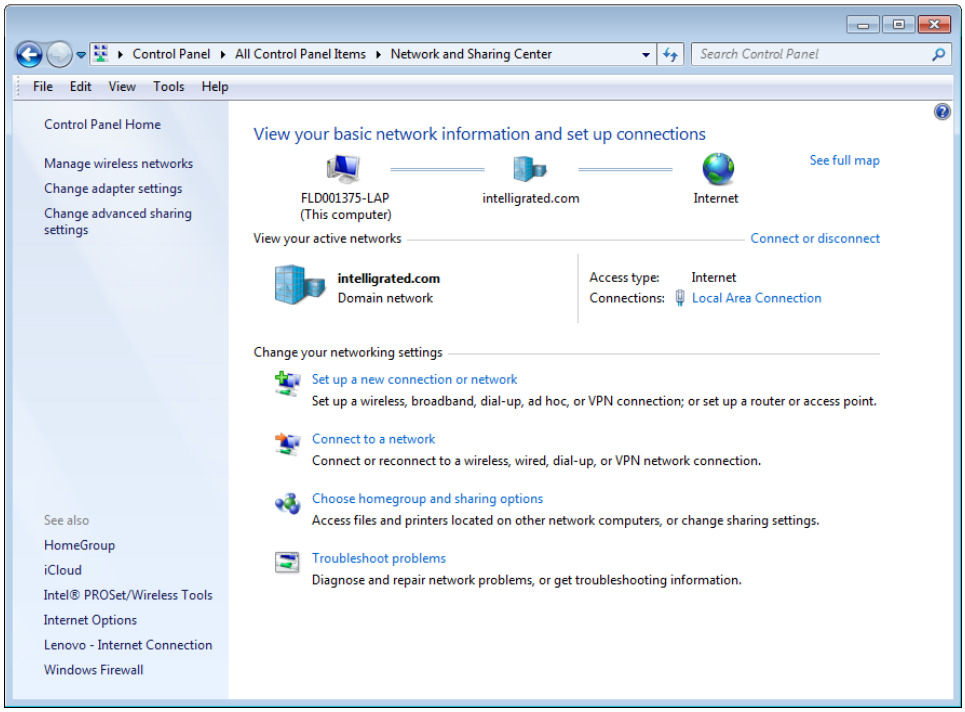
5. Confirm that the driver was properly installed by completing the steps in the previous section.

2.2 Configuring a Secondary Network

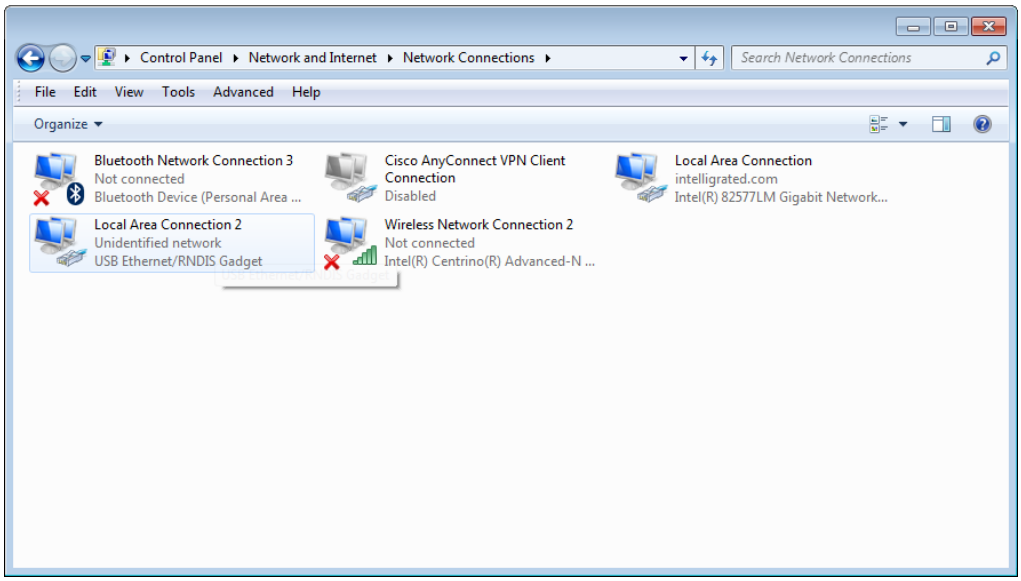
You will need to configure a secondary network for the ZFM. To do so, complete the following steps:

1. Click on the Windows **Start** button and select the **Control Panel** option. The Control Panel window is displayed.

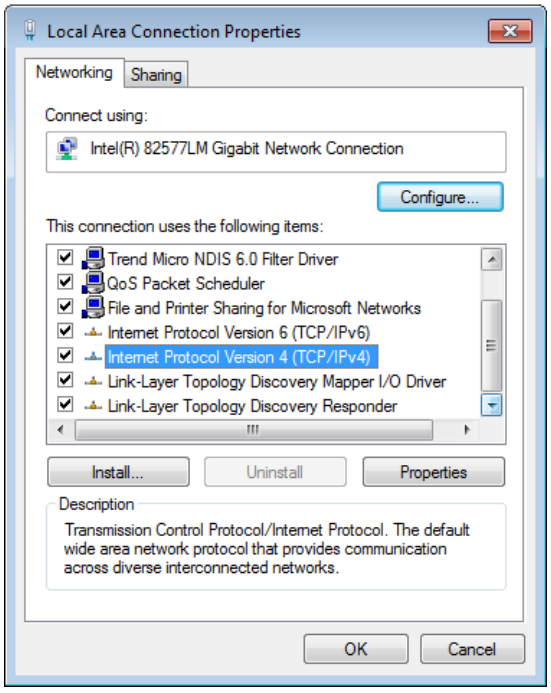
2. Select **Network and Sharing Center**. The basic network information for the PC is displayed on the right side of the window.



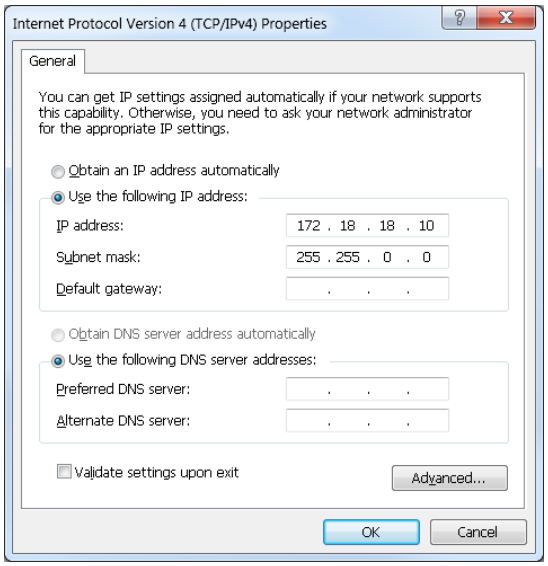
3. In the left navigation pane, select **Change Adapter Settings**. A list of networks is displayed. Notice that there are two Local Area Connections. The second one, Local Area Connection 2, was created for the USB when the ZFM was detected.



4. Right click on **Local Area Connection 2** and select **Properties**. A dialog box appears.



5. Click on the **Internet Protocol Version 4 (TCP/IPv4)** option and select the **Properties** button. A dialog box appears.



6. Enable the **Use the following IP address** radio button.

7. Enter the following IP address:

```
172.18.18.X
```

   where *X* is any number except for 3. The ZFM will use 172.18.18.3.

8. Use the default **Subnet mask** and the **Default gateway**.

9. Click **OK** to save your changes.

10. Click **OK** to close the dialog box.

2.2.1 Testing PC Communication with the ZFM

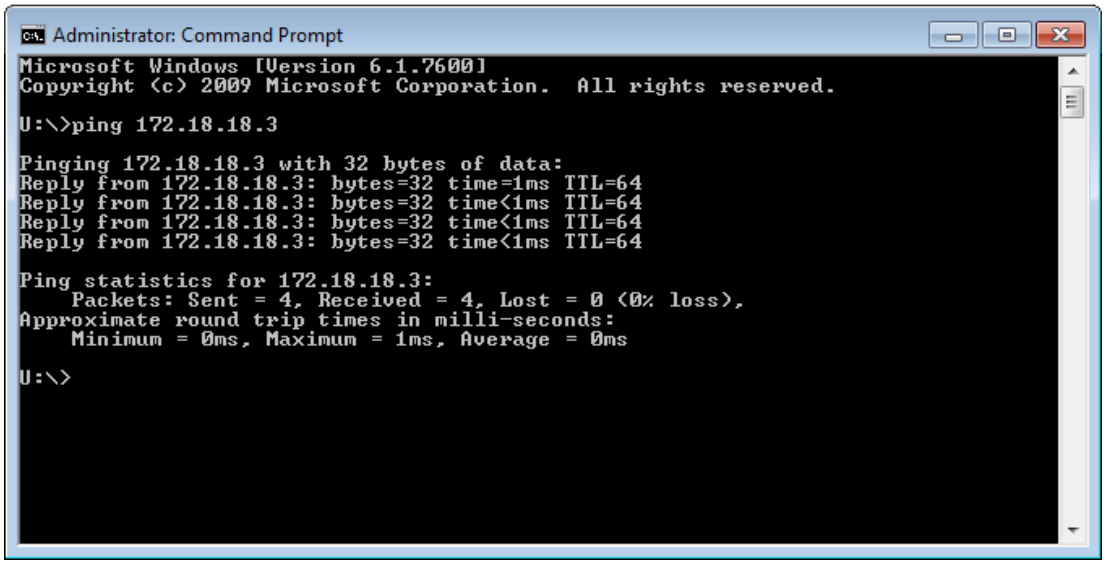
Now that the driver has been installed and the ZFM network has been configured, you can test communication with the ZFM. To do so, complete the following steps:

1. Click on the Windows **Start** button and select **Command Prompt**.

2. Type

```
ping 172.18.18.3
```

and press **Enter**. If the PC is communicating with the ZFM, you will receive the following message:



2.3 Installing the ZoneFlex Configurator

To install the ZFC software, complete the following steps:

Note: If an earlier version of the ZFC is installed on the PC, it must be removed before the new version is installed.

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1. Log in to Intelligrated's Dashboard:

   https://dashboard.intelligrated.com/

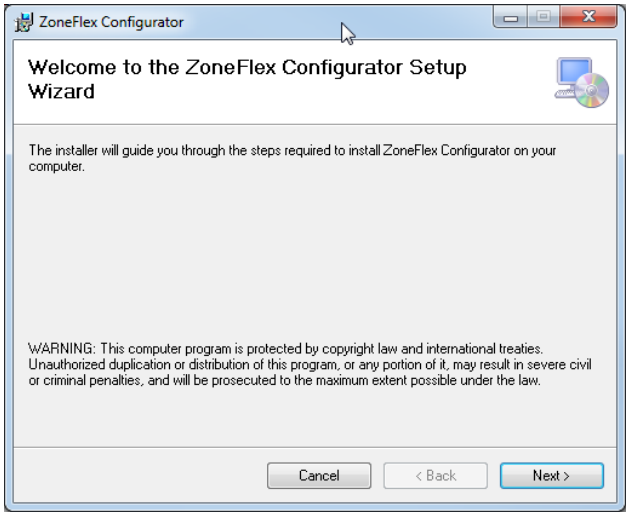
   You'll need to create a Dashboard account if you do not already have one.

2. Click on the **Knowledgebase** link at the top of the screen.

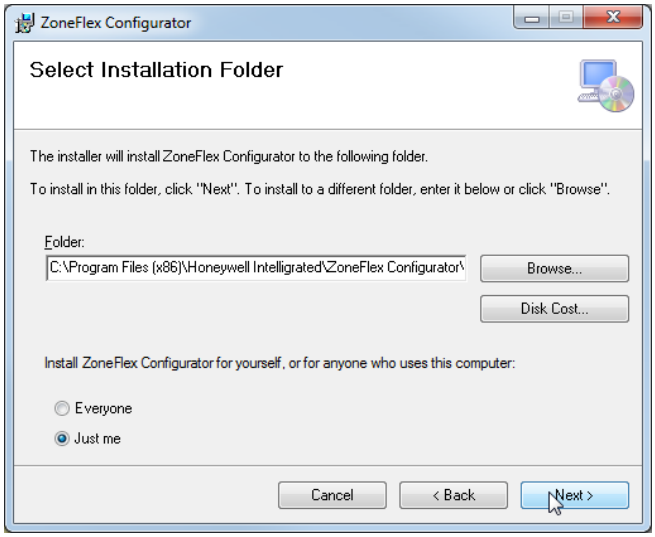
3. Search on the term ZFC. Article KB-10826 should be displayed.

4. Click on the **Setup.msi** link in the article. The setup file is downloaded.

5. Double-click the Setup.msi file. The Setup Wizard is displayed.

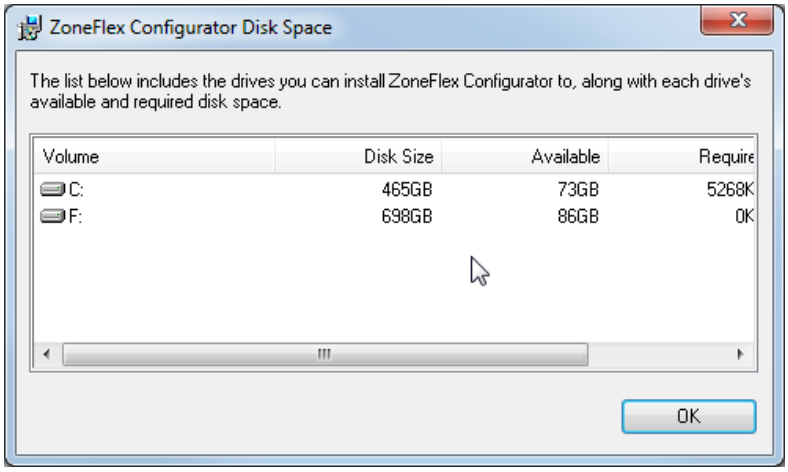


6. Click **Next**. The Installation Folder window is displayed.



7. If you do not want to install the software at the default location, click the **Browse** button. A Browser window appears. Use it to browse to the location where you would like to install the software.

8. If you have multiple hard drives and are not sure which hard drive has the space to accommodate it, click the **Disk Cost** button. A dialog box appears listing all of the hard drives attached to the computer and the amount of available space on each.



It also displays the amount of space that is required for the ZFC software.

9. If you would like to make the ZFC available to all of the users on the computer, select the **Everyone** radio button. If you only want the ZFC to be visible to your user account, select the **Just Me** button.

10. Click **Next**. A confirmation window appears.

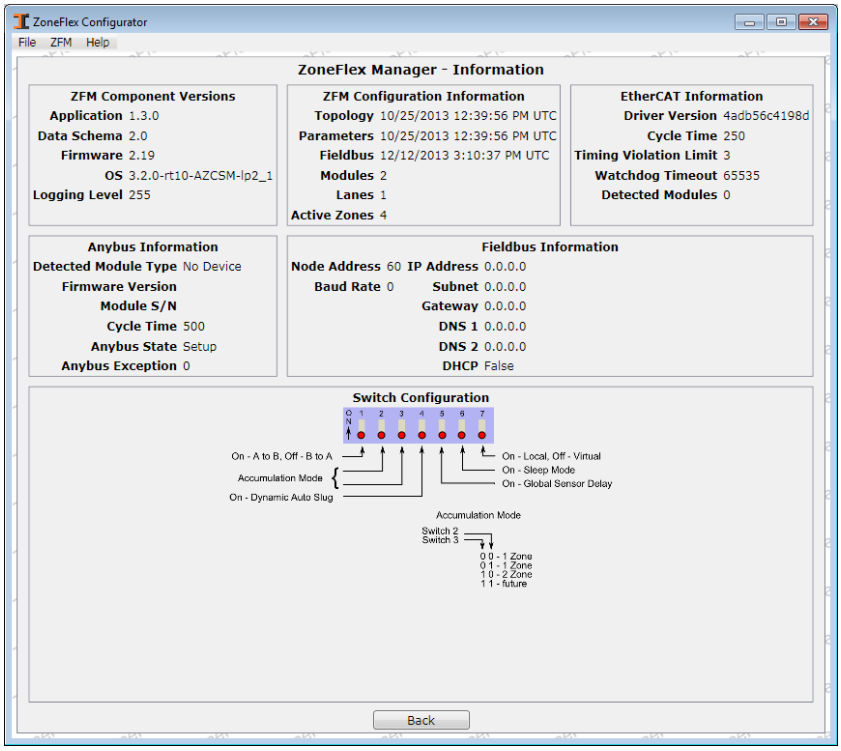
11. Click **Next** to begin the installation. A loading bar appears while the software is installed.

    When the installation is complete, the Installation Complete window is displayed.

12. Click **Close** to exit the wizard. You can find the ZFC at the location that you specified in Step 7.

2.4 Testing the Software/ZFM Connection

You can test that the software is communicating properly with the ZFM by starting the ZFC and selecting **ZFM** | **ZFM Information**. The software will read the information from the ZFM and display it on the screen.



If you receive a GetADI() Exception error, check the following:

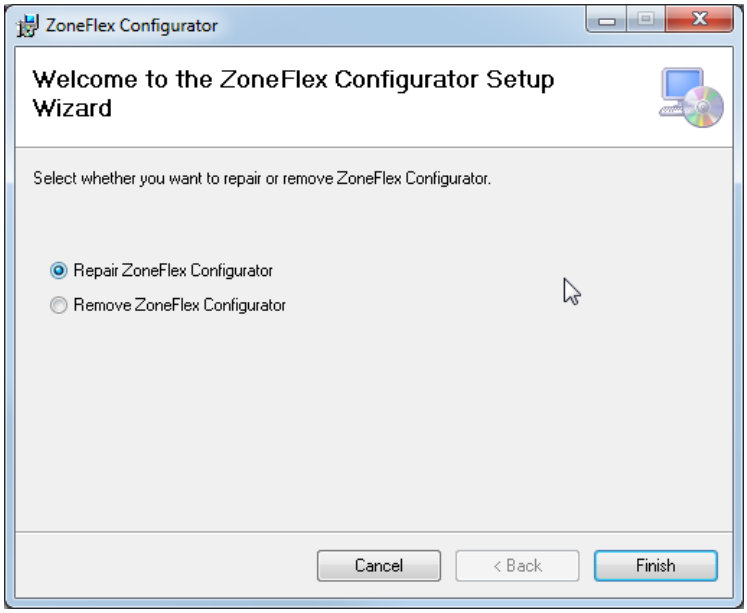
- Make sure the ZFM is powered up and connected using a USB.
- Be sure you are using the same USB port on the PC that you used when you first set up the driver. Each port is independent.

- Check the driver installation again and be sure the RNDIS gadget appears in Device Manager as described earlier in this chapter.
- Check the network installation again and be sure you can ping the ZFM as described earlier in this chapter.
- Check the LAN settings by opening **Internet Options** and selecting the **Connections** tab. The LAN Settings button is at the bottom of the dialog box. Click the button and make sure none of the settings are enabled.

2.5 Repairing the Configurator

If you need to repair the ZFC, complete the following steps:

1. Locate the Setup.msi file on the computer.
2. Double-click the Setup.msi file. The Setup Wizard is displayed.
3. Make sure the **Repair ZoneFlex Configurator** option is selected.



4. Click **Finish**. A loading bar briefly appears while the wizard repairs the ZFC's files.

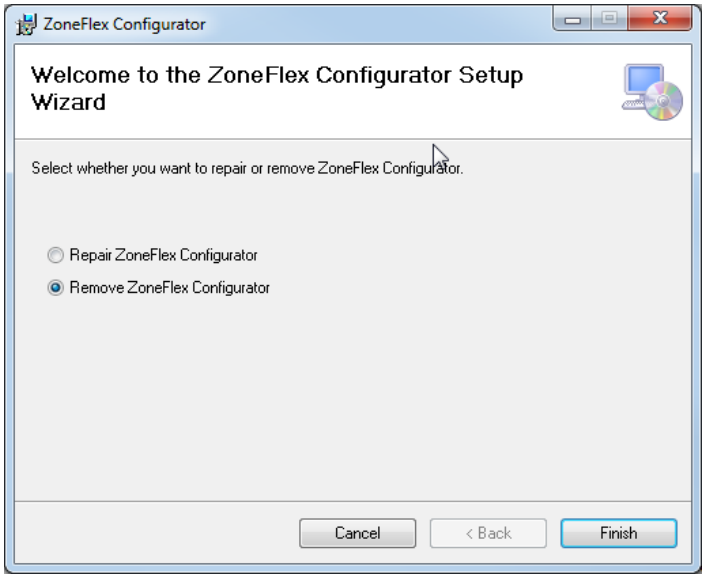
   When it is finished, an information screen is displayed.

5. Click **Close** to exit the wizard.

2.6 Uninstalling the Configurator

If you would like to remove the ZFC from a computer, complete the following steps:

1. Locate the Setup.msi file on the computer.
2. Double click the Setup.msi file. The Setup Wizard is displayed.
3. Make sure the **Remove ZoneFlex Configurator** option is selected.



4. Click **Finish**. A loading bar appears while the wizard deletes the ZFC's files.

   When the wizard is finished, an information screen is displayed.

5. Click **Close** to exit the wizard.

3 Advanced Accumulation Modes

3.1 Introduction

A ZFM can be configured using the ZFC or using the DIP switches on the ZFM. Both types of configurations determine which accumulation mode is used throughout the system. This chapter describes the accumulation modes, signals, and other advanced features and settings that are available for ZFA systems.

3.1.1 Selecting a Configuration Type

To configure a ZFM using the ZFC, make sure DIP switch 7 is in the OFF position. To configure a ZFM using the DIP switches, also known as Local Mode, make sure DIP switch 7 is ON. For additional information about DIP switch settings, refer to **ZFM Default Settings** later in this chapter.

3.2 Accumulation Modes

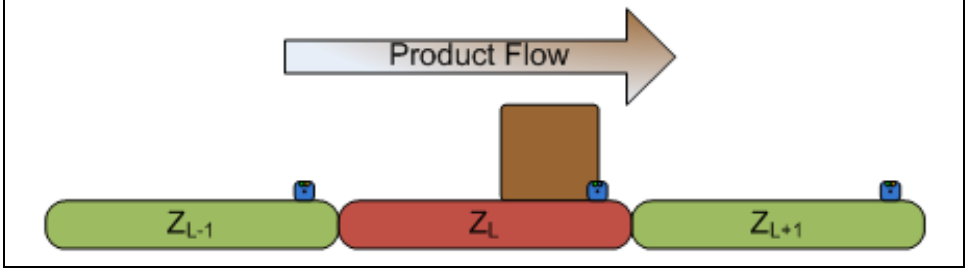
Accumulation modes define the basic control logic for staging product on an accumulation conveyor. The logic behind the mode refers to the action of the local zone based on the state of its neighboring zones. For this reason, the logic contains local functions.

3.2.1 0-Zone Accumulation

With 0-Zone accumulation, the local zone uses the status of the local zone sensor to determine its operating state. This can be useful as a run-up eye or as a replacement for Gen 1.5 hardware where the valve is physically piped to the upstream eye.

Table 3-1 0-Zone Accumulation States

Zone Sensor State(s)			Operating State(s)	
Local	1st Downstream	2nd Downstream	Local Valve	Local Zone
Not Occupied	-	-	Energized	Active
Occupied	-	-	De-energized	Inactive

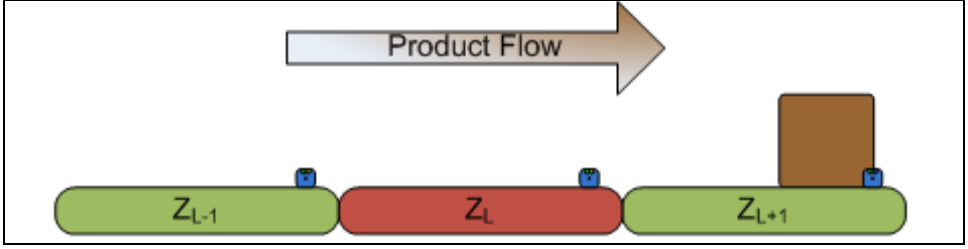


3.2.2 1-Zone Accumulation

With 1-Zone accumulation, the local zone uses the status of the first downstream zone sensor to determine its operating state. The discharge zone is inactive when a system is configured for 1-Zone because there is not an immediate (i.e., first) downstream zone sensor. An external release command is required for the discharge zone to become active.

Table 3-2 1-Zone Accumulation States

Zone Sensor State(s)			Operating State(s)	
Local	1st Downstream	2nd Downstream	Local Valve	Local Zone
-	Not Occupied	-	Energized	Active
-	Occupied	-	De-energized	Inactive

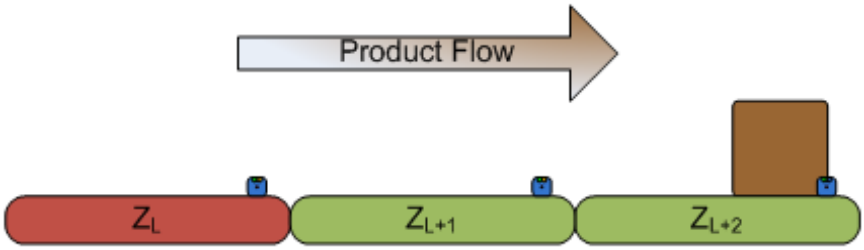


3.2.3 2-Zone Accumulation

With 2-Zone accumulation, the local zone uses the status of the second downstream zone sensor to determine its operating state. The discharge zone and its upstream zone are inactive when a system is configured for 2-Zone because there is not a second downstream zone sensor. An external release command is required for both zones to become active.

Table 3-3 2-Zone Accumulation States

Zone Sensor State(s)			Operating State(s)	
Local	1st Downstream	2nd Downstream	Local Valve	Local Zone
-	-	Not Occupied	Energized	Active
-	-	Occupied	De-energized	Inactive

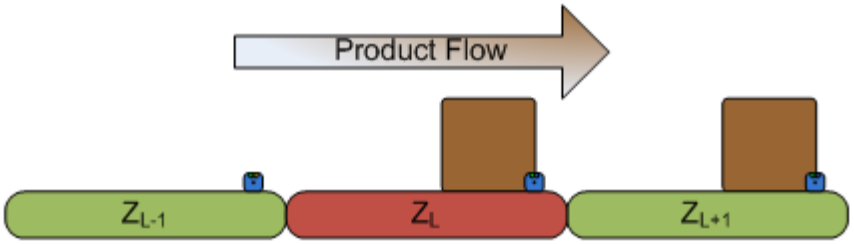


3.2.4 0&1-Zone Accumulation

With 0&1-Zone accumulation mode, the local zone uses the status of the local zone sensor and the first downstream zone sensor to determine its operating state. The discharge zone functions as it would with 1-Zone accumulation because there is not an immediate (i.e., first) downstream zone sensor.

Table 3-4 0&1-Zone Accumulation States

Zone Sensor State(s)			Operating State(s)	
Local	1st Downstream	2nd Downstream	Local Valve	Local Zone
Not Occupied	Not Occupied	-	Energized	Active
Occupied	Not Occupied	-	Energized	Active
Not Occupied	Occupied	-	Energized	Active
Occupied	Occupied	-	De-energized	Inactive

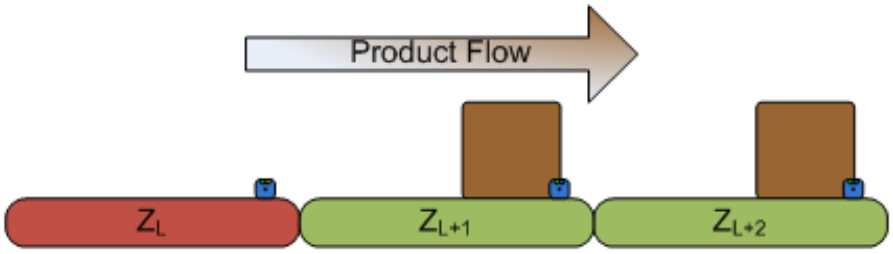


3.2.5 1&2-Zone Accumulation

With 1&2-Zone accumulation, the local zone uses the status of the first downstream zone sensor and the second downstream zone sensor to determine its operating state. The discharge zone is inactive because there is not an immediate (i.e., first) or second downstream zone sensor. An external release command is required for the discharge zone to become active. The upstream zone of the discharge zone operates as a 1-Zone because there is not a second downstream zone sensor.

Table 3-5 1&2-Zone Accumulation States

Zone Sensor State(s)			Operating State(s)	
Local	1st Downstream	2nd Downstream	Local Valve	Local Zone
-	Not Occupied	Not Occupied	Energized	Active
-	Occupied	Not Occupied	Energized	Active
-	Not Occupied	Occupied	Energized	Active
-	Occupied	Occupied	De-energized	Inactive

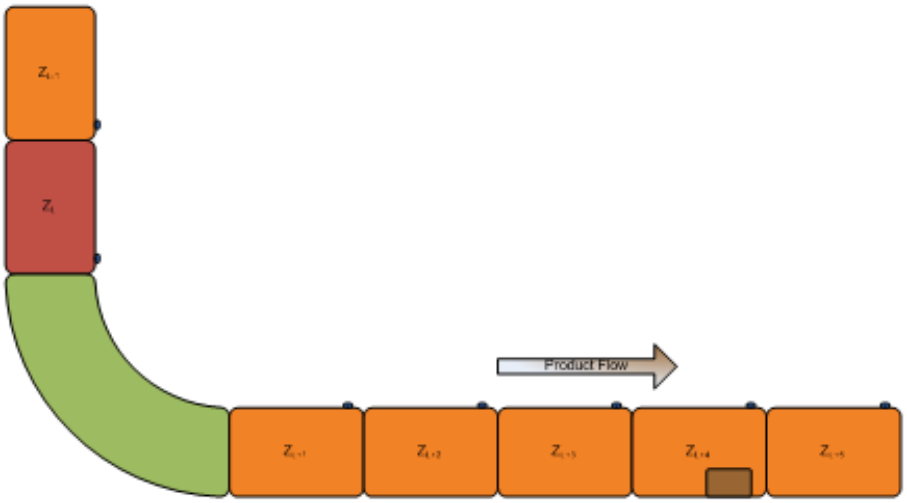


3.2.6 4-Zone Accumulation

With 4-Zone accumulation, the local zone uses the status of the fourth downstream zone sensor to determine its operating state. Typically, this mode is used for a non-accumulating curve.

Table 3-6 4-Zone Accumulation States

Zone Sensor State(s)			Operating State(s)	
Local	4th Downstream*	5th Downstream*	Local Valve**	Local Zone
-	Not Occupied	-	Energized	Active
-	Occupied	-	De-energized	Inactive
*Downstream of the of the curve			**Local immediately before the curve	

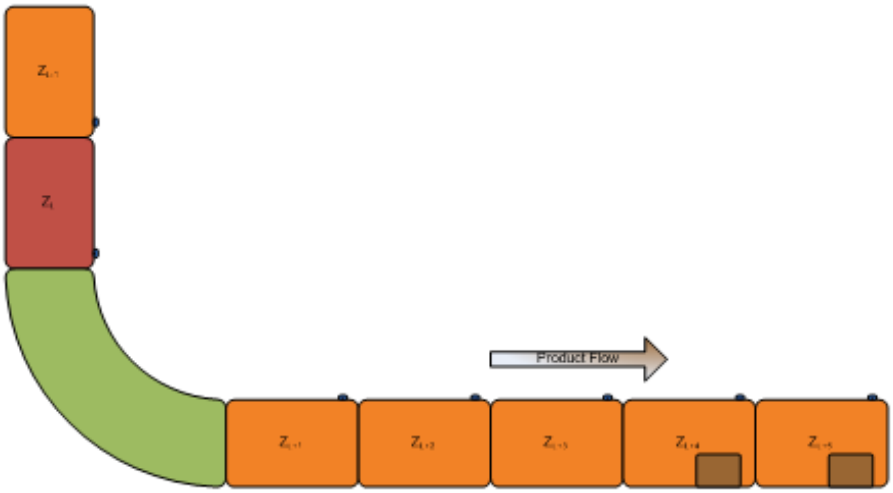


3.2.7 4&5-Zone Accumulation

With 4&5-Zone accumulation, the local zone will use the status of the fourth and the fifth downstream zone sensor to determine its operating state. Typically, this mode is used for a non-accumulating curve.

Table 3-7 4&5 Zone Accumulation States

Zone Sensor State(s)			Operating State(s)	
Local	4th Downstream*	5th Downstream*	Local Valve**	Local Zone
-	Not Occupied	Not Occupied	Energized	Active
-	Occupied	Not Occupied	Energized	Active
-	Not Occupied	Occupied	Energized	Active
-	Occupied	Occupied	De-energized	Inactive
*Downstream of the of the curve			**Local immediately before the curve	



3.2.8 External Control (Smart Actuator)

External control provides manual control of the zone valve. In this logical mode, a zone's operating state will follow the state of the configured command input. Zones that are in External Control mode are evaluated by the upstream zone's accumulation mode logic. For example, if the zone upstream of a zone in External Control mode is in 1-zone mode, that zone will follow the state of the eye in the zone that is in External Control mode. The smart actuators are configured using a user interface. The command input can be from a network-level control, discrete input to the ZFM GPIO, or a direct signal on the auxiliary input of a ZFA module.

3.3 Accumulation and Release Commands

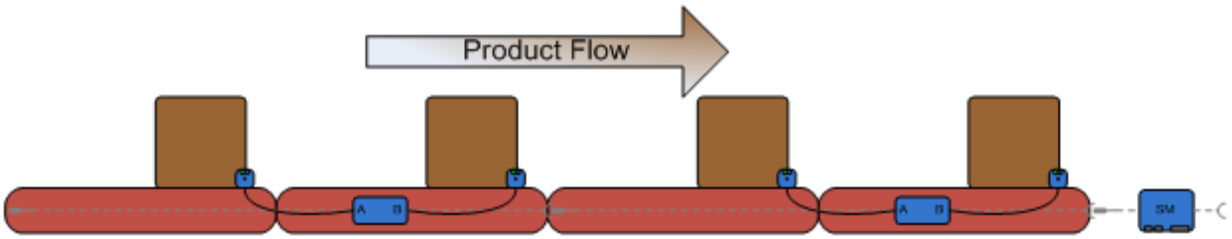
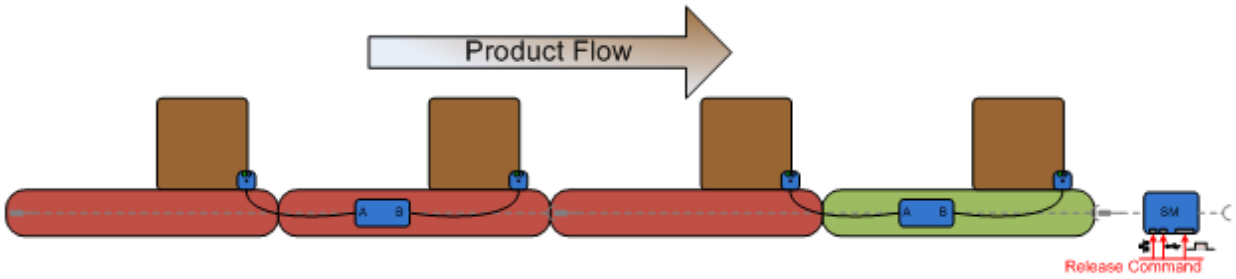
Release commands are used to manually control product flow after accumulation has occurred. Using a release command will force a zone to become active. Accumulation commands are used to force a zone to become inactive so that product will accumulate. Both types of commands are applied externally using one of the following methods:

- Network-level control using the fieldbus (i.e., Profibus, DeviceNET, EtherNET/IP)
- Discrete input to the ZFM GPIO (default)
- Auxiliary input on a ZFA module (for discharge zone only)

Note: For certain commands that are sent using the fieldbus (e.g., discharge zone release, external control), the user should make sure the active state is 1 (true). If the fieldbus connection is lost or if it errors out, the state of these commands will be set to 0 (false). This ensures that the command will only initiate when the fieldbus is active and not in an error state.

3.3.1 Discharge Zone Release Command

The Discharge Zone release command forces a discharge zone to become active for the duration of the command. Upstream product is then transported according to the individual accumulation mode settings in each zone.

All zones are accumulated waiting for release

A release command is applied at the ZFM which causes the discharge zone to become active. The accumulation modes of the upstream zones determine how product is transported.


3.3.2 Stop Zone Accumulation Command

The Stop Zone accumulation command is used to manually force a zone to become inactive for the duration of the command. Zones included in a slug region that is upstream of a stopped zone are transported per the individual zone accumulation modes as long as the Stop Zone command is being asserted. A stopped zone is reported as accumulated to upstream zones.

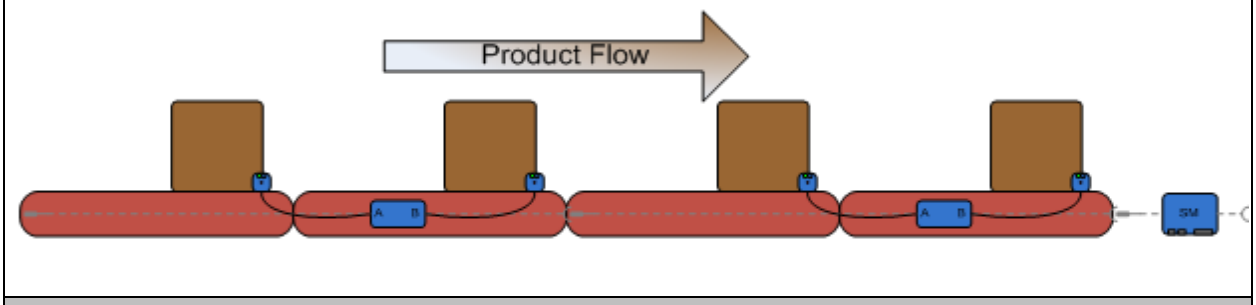
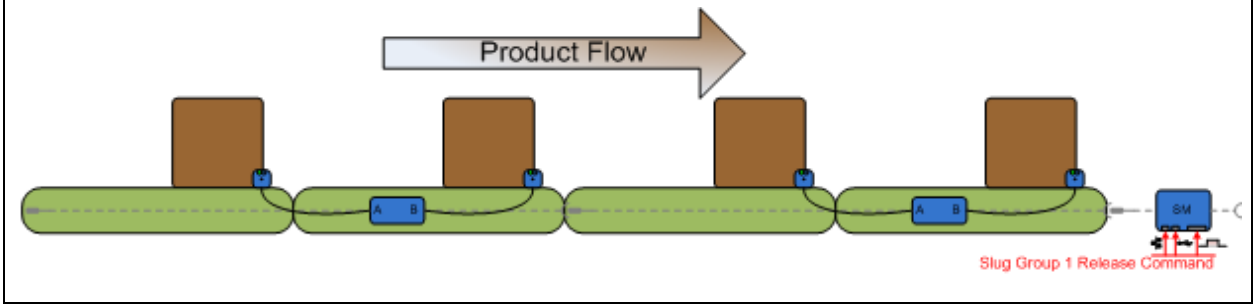
The Stop Zone command is configured using a UI. Zones will respond to a Stop Zone command from a network level control, discrete input to the ZFM GPIO, or a direct signal on the auxiliary input of a ZFA module.

Note: The auxiliary input/output serves a dual purpose. If the auxiliary output is enabled by a controller, the auxiliary input will go to an enabled or high state. If the zone is configured as a Stop Zone, it will stop. Therefore, the auxiliary output should not be controlled in a zone that is configured as a stopped zone.

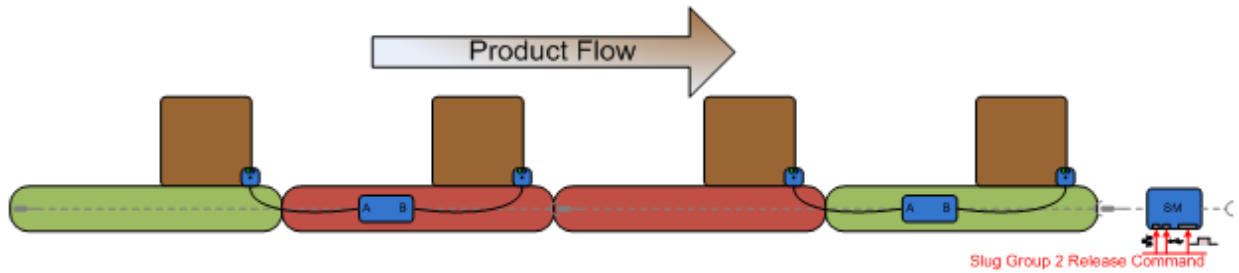
3.3.3 Slug and Drop-to-Gravity Groups

Slug and drop-to-gravity groups are select group zones that are forced active (i.e., slug) or inactive (i.e., drop-to-gravity) for the duration of an external command. The zones for each group are defined using a UI. It is possible to define up to six independent slug or drop-to-gravity groups for which any zone can be selected. All zones of a given group must be either slug or drop-to-gravity. A given zone can be selected for both a slug group and a separate drop-to-gravity group but will operate as drop-to-gravity when it receives both commands. The external command to trigger the slug/gravity group can be from a network level control, discrete input to the ZFM GPIO, or a direct signal on the auxiliary input of a ZFA module.

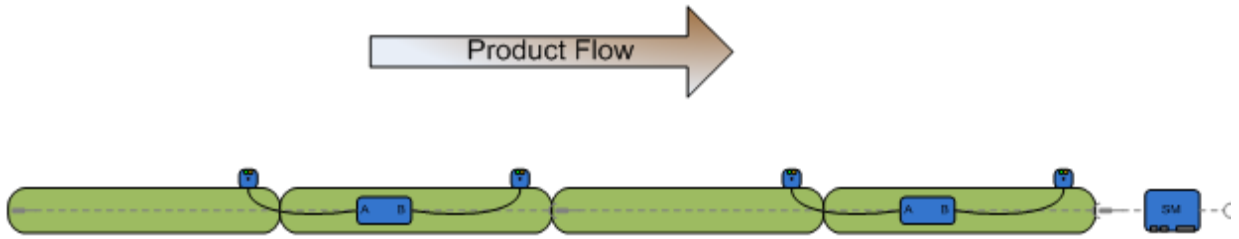
The following example illustrates groups:

All zones are accumulated waiting for release

A command for slug group #1 is applied at the ZFM. Slug group #1 happens to be configured for all zones to be active.


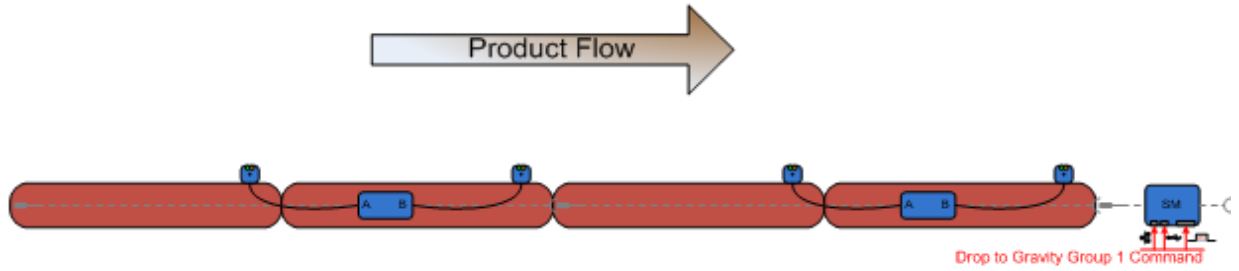
Or, a command for slug group #2 is applied instead. Slug group #2 is configured so that the first and last zones become active.



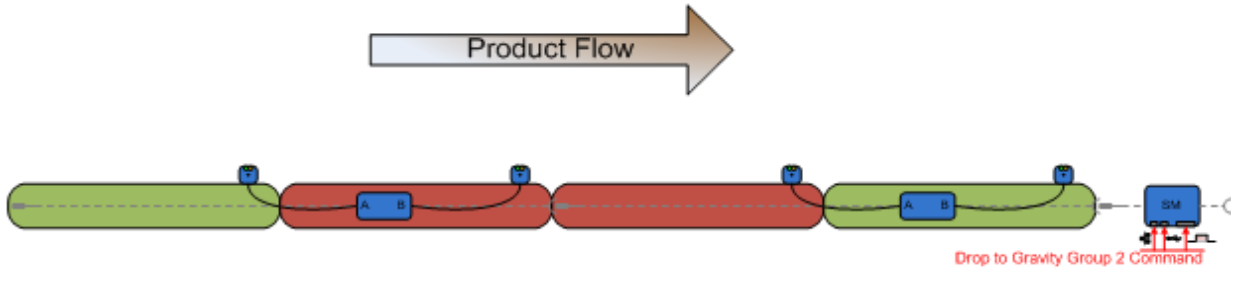
All zones are active awaiting product.



A command for drop-to-gravity group #1 is applied at the ZFM. Drop-to-gravity group #1 is configured for all zones in this example.



A command for drop-to-gravity group#2 is applied at the ZFM. Drop-to-gravity group #2 is configured for the middle two zones in this example.



3.3.4 Manual Override Slug

A manual override slug group can also be defined to provide a method for clearing jam conditions. By default, all zones are members of this group. This mode is only active while the signal is high. A manual override slug can only be configured to be selected by GPIO.

3.4 Special Modes and Functions

3.4.1 Latching

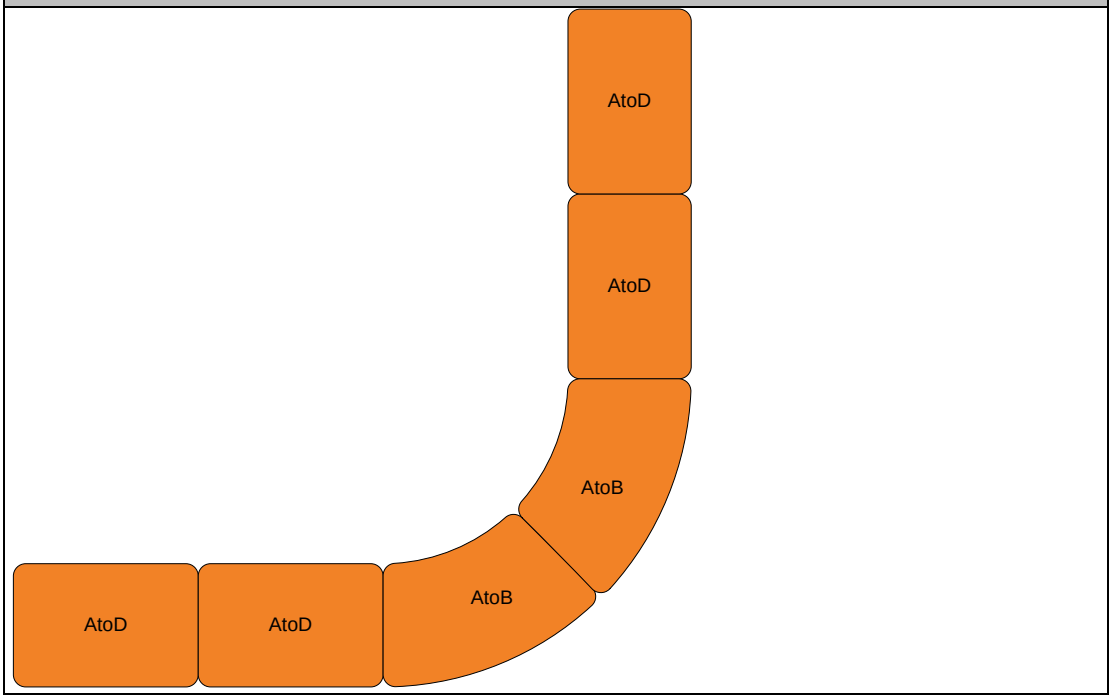
Latching is used to make a photo-eye appear blocked even though the product has passed the eye. This stops the zone so that smaller packages don't continuously pass through to downstream zones, potentially causing a jam. For example, if a small carton causes a zone to be de-energized but stops past the zone sensor, the zone is actually still occupied and the latched Zone Sensor State reflects that until the zone is energized.

Latching is configurable by zone. When the sensor detects product, the latch is set (blocked). In order for the latch to be reset (cleared), the sensor has to be cleared and the valve output has to be energized. If latching is disabled for a zone, the Zone Sensor State will follow the value of the zone sensor, subject to the energized state.

3.4.2 Valve Output Inversion

The normal valve output state is Air-to-Drive (AtoD). However, there are cases where the valve output state needs to be inverted to support Air-to-Brake (AtoB). This can be configured at the zone level and has no effect on the local zone's logic mode. It should be noted that this inverted operating state may not be failsafe.

The zones in an accumulating curve require the valve to operate as AtoB instead of AtoD.

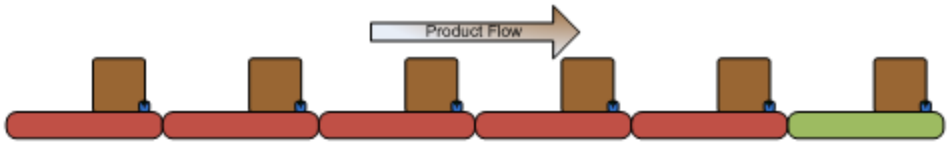
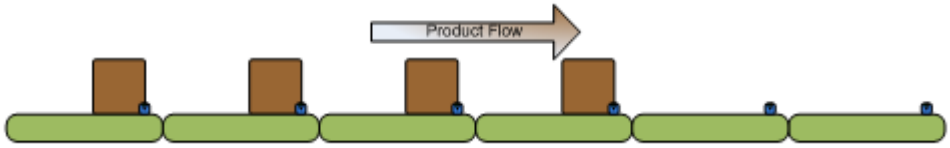


3.4.3 Dynamic Auto Slug

If any zone configured for Dynamic Auto Slug (DAS) is clear and its immediate downstream zone is also clear then all contiguous upstream zones that are configured for DAS will become active. A Blocked state on either of the zones that triggered the DAS will stop the DAS operation and return the upstream zones to Local Accumulation Mode.

If local DIP switches 4 and 7 are ON, then all zones on a given zone control network are configured for DAS. If local DIP switch 7 is OFF, DAS is configured by zone through the UI.

Table 3-8 DAS Zone States

<table>
<tr><th colspan="2">Zone State(s)</th><th>Operating State(s)</th></tr>
<tr><td>Local</td><td>1st Downstream</td><td>Upstream Zone(s)</td></tr>
<tr><td>Blocked</td><td>Blocked</td><td rowspan="3">Per Local Logic Mode</td></tr>
<tr><td>Blocked</td><td>Clear</td></tr>
<tr><td>Clear</td><td>Blocked</td></tr>
<tr><td>Clear</td><td>Clear</td><td>All Upstream Dynamic Auto Slug Zones Active</td></tr>
<tr><td colspan="3">All zones are configured for DAS and 1-Zone accumulation. The furthest downstream zone pictured is active.</td></tr>
<tr><td colspan="3"> 
</td></tr>
<tr><td colspan="3">The furthest two consecutive downstream zones pictured are clear which causes all upstream zones to become active.</td></tr>
<tr><td colspan="3"> 
</td></tr>
</table>

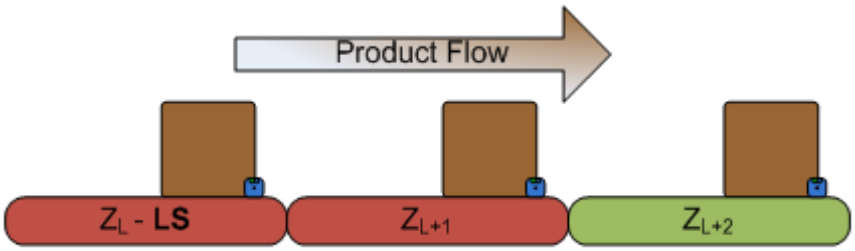
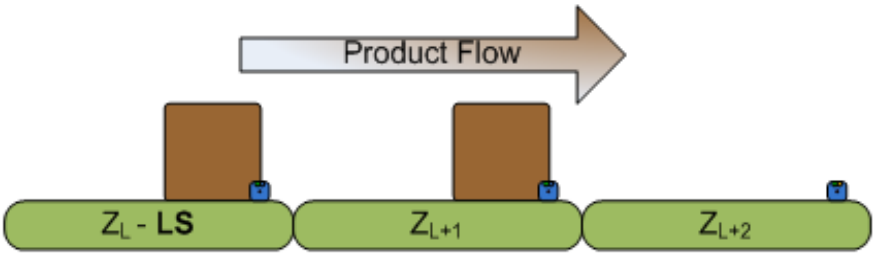
Dynamic Auto Slug Delay

DAS delay is a lane setting that extends the time until DAS is engaged with a time delay. The time delay is configurable between 0-30 seconds using a user interface.

3.4.4 Fixed Auto Slug

Fixed auto slug, previously known as local slug, links the local zone operating state to the first downstream zone. The local zone becomes active when the first downstream zone is active. It will become inactive as set by the accumulation mode if the first downstream zone is inactive.

Table 3-9 Fixed Auto Slug States

Zone State(s)		Operating State
Local	1st Downstream	Local Zone
Inactive	Inactive	Per Local Logic Mode
Inactive	Active	Active
Active	Inactive	Per Local Logic Mode
Active	Active	Active
The local zone is configured for fixed auto slug and all zones are configured for 1-Zone accumulation. The 2nd downstream zone is active.		
		
The 1st downstream zone is active due to 1-Zone accumulation logic. The local zone is, therefore, also active due to fixed auto slug. This occurs even though 1-Zone accumulation logic determines the local zone should be accumulated.		
		

3.4.5 Sleep

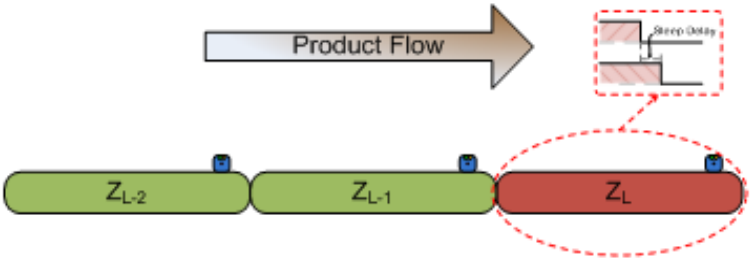
Sleep is a temporary state that zones enter if the zone's photo-eye and the zone photo-eye in the first and second upstream zones have been clear for a configurable period of time. The time delay will reset if any of the pertinent zone sensors become blocked. A zone in Sleep is considered inactive.

Sleep is used to cut down on noise and wear on rollers by not running the conveyor's rollers when product has not been detected.

The infeed zone will use only its local zone sensor to determine its Sleep operating state. The downstream zone of the infeed zone will use the status of its local zone sensor and the infeed zone sensor to determine its Sleep operating state.

Table 3-10 Sleep Zone States

Zone Sensor State(s)			Time Delay		Operating State
2nd Upstream	1st Upstream	Local	Start	Expire	Local Zone
Clear	Clear	Clear	X	-	Active
			X	X	Inactive
Clear	Clear	Blocked	-	-	Per Local Logic Mode
Clear	Blocked	Clear	-	-	
Blocked	Clear	Clear	-	-	
Clear	Blocked	Blocked	-	-	
Blocked	Clear	Blocked	-	-	
Blocked	Blocked	Clear	-	-	
Blocked	Blocked	Blocked	-	-	

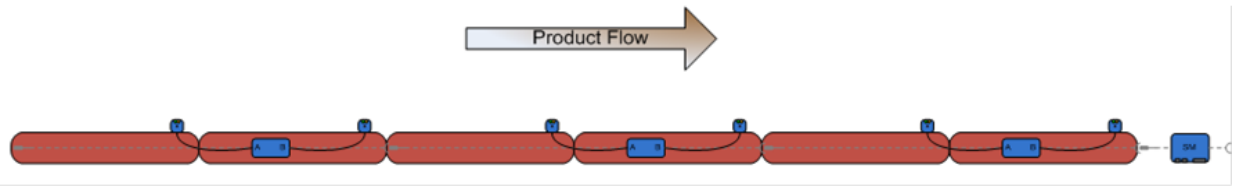
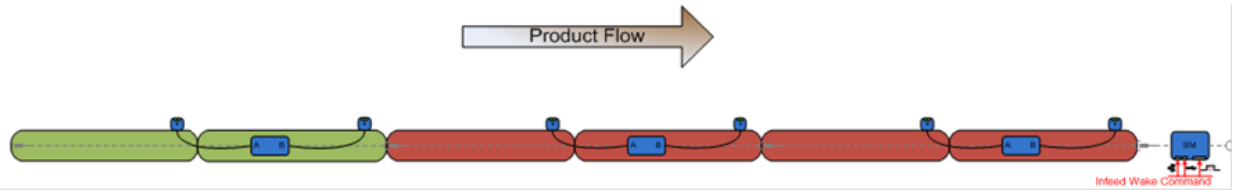


Sleep Delay

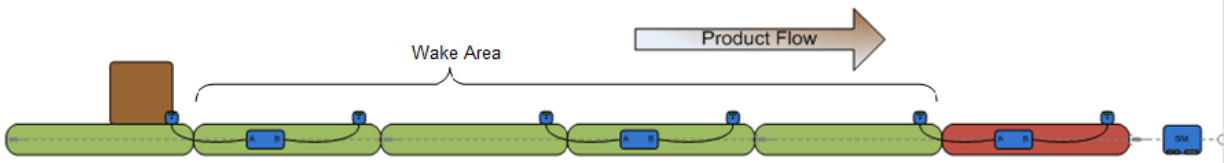
The Sleep Delay is a configurable time in seconds that will cause a zone to enter the Sleep state as described above. A setting of 0 for delay will effectively turn off the sleep function. The setting is a lane level setting but applies to each zone as described in Sleep, above. This can be set using a UI.

3.4.6 Infeed Wake

Infeed wake forces the infeed zones to become active after sleeping for the duration of an external infeed wake command. Infeed wake will respond to a command from a network level control, discrete input to the ZFM GPIO, or a direct signal on the auxiliary input of a ZFA module. As product flows from the infeed and blocks a photo-eye, the downstream zones form a wake area and exit sleep mode as instructed by the sleep logic. The wake area is made up of at least three zones plus an additional variable number of zones when Neighborhood Mode is used downstream of the waking zones. The infeed zones will not sleep as long as an infeed wake command is present; the sleep timer will resume running on removal of the wake command as if it where the upstream photo-eye. The normal behavior of the GPIO for wake is normally low, set high to signal wake, the normal behavior of the auxiliary input is high, set low to signal wake. This allows a photo-eye connected to the auxiliary input to be used to signal wake. When used as the infeed wake signal, both the GPIO and auxiliary input signal state can be inverted.

All zones are in Sleep.

The Infeed Wake command is applied at the ZFM. The infeed zones exit Sleep and become active.


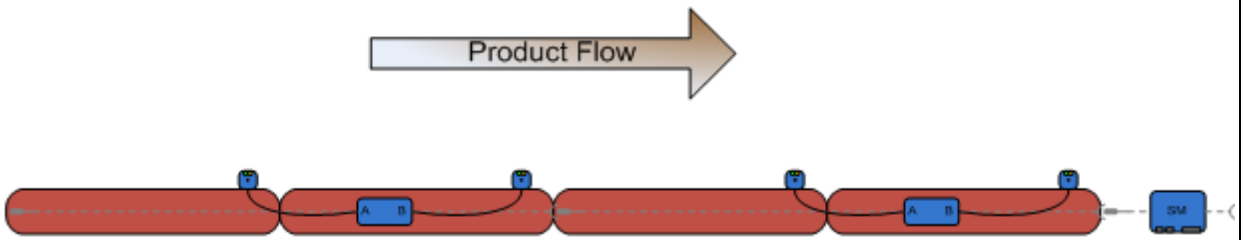
-continued-

Product is detected at the infeed zone which causes the wake area, consisting of three or more downstream zones, to exit Sleep due to the Sleep logic. Note that the Infeed Wake command is not necessarily applied.


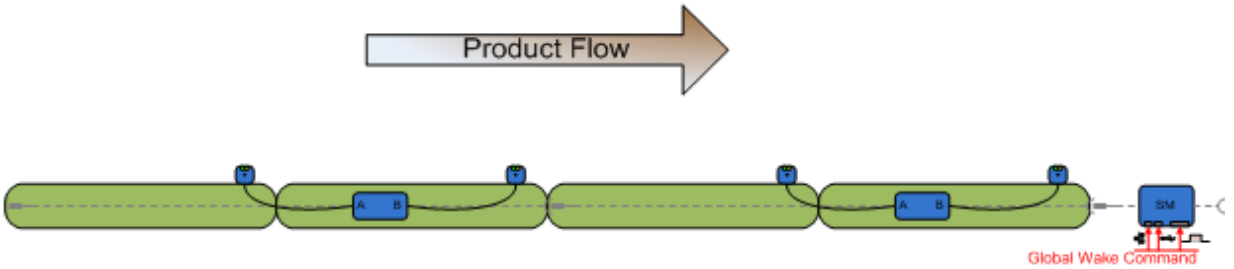
Note: Rather than install a separate photo-eye upstream of the conveyor to trigger infeed wake, turn the Infeed Wake signal ON all of the time by selecting any unused signal (i.e., an unused GP Input) with the Signal Picker and setting the Active State to 0. This will result in the infeed zones ignoring sleep, ensuring product traveling from the supply conveyor makes it to the infeed zone photo-eye which propagates the wake as the product advances through the zones.

3.4.7 Global Wake

Global Wake forces all zones in a given zone control network to become active after having slept for the duration of an external global wake command. The command is configured using a UI. Global Wake will respond to a command from a network level control, discrete input to the ZFM GPIO, or a direct signal on the auxiliary input of a ZFA module. No zone will sleep as long as a Global Wake command is in force. The sleep timer will resume running on removal of the command, as if it were the upstream photo-eye. The normal behavior of the GPIO for Global Wake is normally low, set high to signal wake. The normal behavior of the auxiliary input is high, set low to signal wake. This allows a photo-eye connected to the auxiliary input to be used to signal wake. When used as the infeed wake signal, both the GPIO and auxiliary input signal state can be inverted.

All zones are in Sleep.


-continued-

The Global Wake command is applied at the ZFM. All zones exit Sleep and become active


3.4.8 Crowding

Crowding is a local control strategy that attempts to minimize product gap on an accumulated local zone by pulsing the local zone active and inactive. It begins when a local zone is accumulated for a set time delay and the first downstream zone is reporting as Crowded or is not set for Crowding. A local zone not configured for Crowding will always report as crowded to the first upstream zone. A discharge zone cannot be configured for Crowding but will always report as crowded.

When Crowding, the local zone will run for the configured Crowding Duration at a percentage of the Lane Max Speed as configured in Crowding Percentage and will then report as Crowded if the photo-eye does not clear.

Note: To start a new segment of Crowding, set Disable Crowding in a zone. This can often decrease the time required to crowd a line.

A zone is configured for Crowding using a UI. The Crowding delay is configurable from 0-30 seconds and the Crowding Duration (run time) is configurable from 0-10 seconds.

3.4.9 All Clear

All Clear provides an indication that all zones on a lane have not been occupied for a set period of time. The state is reported as configured to a ZFA module aux output or as a ZFM GPIO output and is also available over a network-level control. It is configurable from 0-30 seconds for each individual zone using a UI. If any zone becomes occupied, the All Clear indication for the lane is canceled.

3.4.10 Sensor Delay

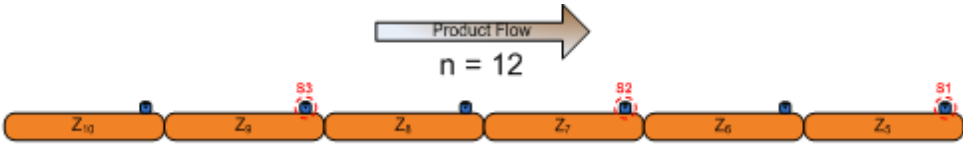
Sensor Delay is a time delay placed on a zone sensor signal. There are both accumulation and release sensor delays. Lane-level Sensor Delays apply to all zones in a lane. Zone-level Sensor Delays apply to an individual zone sensor. Both accumulation and release sensor delays are configured between 0-30 seconds using a UI or network-level control. When used in local mode, an accumulation delay of one second can be applied using a ZFM DIP switch. If the ZFC is used and a Local Sensor Delay is set to 255, the zone will use the lane-level setting.

3.4.11 Zone Eye Status

Zone Eye Status provides the logical state with latching applied, if enabled, of a configured zone sensor. The state is reported as configured to a ZFA module aux output or as a ZFM GPIO output and is also available over a network-level control. When the logical state of the eye is clear, the output is ON.

By default, the status of three zone eyes are provided. The zones reported are based on the number of zones in a given zone control network as shown in the algorithm in the following table. These can be modified by the user.

Table 3-11 Zone Eye Statuses

Zone Eye	Location	Example
infeed zone = n	*n = number of zones*	
S1	$Z_{((n-3)/2)}$	
S2	$Z_{(3*(n-3)/4)}$	
S3	$Z_{(n-3)}$	

The intent of default Zone Eye Status is to provide a 50%, 75%, and 100% lane full indication.

Note: The default values are minimized if the zone control network contains more than one lane.

Note: Users should verify that the location of the zone eye isn't impacted in an unintended manner by the configuration of the zones around it. For example, if a zone eye that was intended as a flow control eye was calculated to be interior to a section of zones configured as 4&5-Zone accumulation, it might not detect back-up conditions as intended.

3.4.12 Jam and Stall

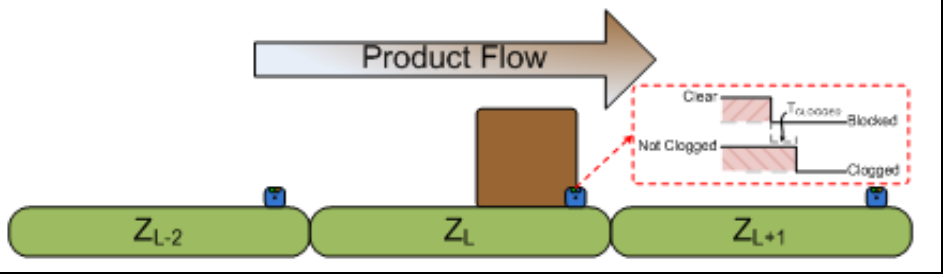
Jam and stall are control strategies for when product is not being transported in a zone as expected. They are local evaluations for each zone in a zone control network. Stall is the preamble to jam. Both require the definition of some additional zone states that are unique to their operation, as described in the following sections.

Clogged

The Clogged state indicates an apparent or potential obstruction in a zone. A local zone is labeled as clogged if the local zone sensor is blocked for a set period of time. This period of time is called the Clogged Delay. The Clogged Delay resets when the local zone sensor becomes clear. A default Clogged Delay of 12 seconds is applied to all zones. It is configurable from 0-30 seconds for each individual zone using a user interface.

Table 3-12 Clogged States

Sensor State	Clogged Delay		Jam and Stall State
Local Zone	Start	Expire	Local Zone
Clear	-	-	Not Clogged
Blocked	X	-	Not Clogged
	X	X	Clogged

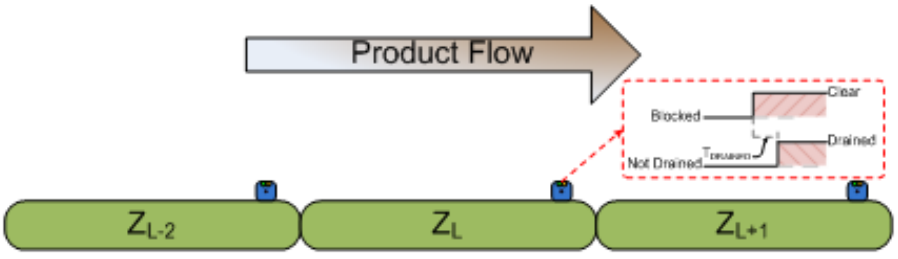


Drained

The Drained state indicates a complete lack of product flow. A local zone is labeled as drained if the local zone sensor is clear for a set period of time. This period of time is called the Drained Delay. The Drained Delay resets when the local zone sensor becomes blocked. A default Drained Delay of ten seconds is applied to all zones. It is configurable from 0-30 seconds for each individual zone using a user interface.

Table 3-13 Drained States

Sensor State	Drained Delay		Jam and Stall State
Local Zone	Start	Expire	Local Zone
Blocked	-	-	Not Drained
Clear	X	-	Not Drained
	X	X	Drained

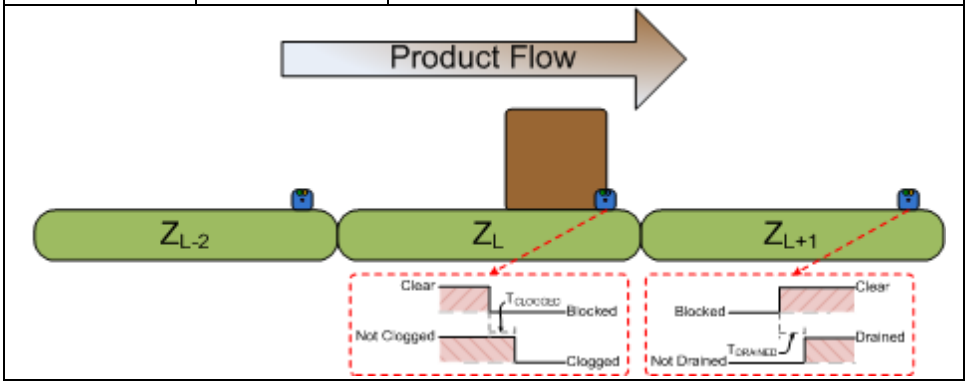


Stall

A Stall state indicates that product movement has been impaired or that a zone sensor is misaligned. A local zone is labeled as stalled when the zone has been labeled as clogged and its first downstream zone is labeled as drained. A stall will clear if the local zone sensor is cleared. A zone Stall state is available over a network-level control.

Table 3-14 Stall States

Zone Jam and Stall State(s)		Operating State
Local	1st Downstream	Local
Drained	Drained	Per Local Logic Mode
Drained	Clogged	Per Local Logic Mode or Downstream Stall conditions
Clogged	Drained	Push-Thru per setting
Clogged	Clogged	Per Local Logic Mode or Downstream Stall conditions



Push–Thru

Push-thru occurs when a stall is declared by the local zone. It couples the local zone operating state (i.e., active/inactive) to the first upstream zone(s). This attempt to push product through the stall will cease if the stall is cleared. There are three push-thru settings, as follows:

Table 3-15 Push-Thru Settings

#	Setting	Description
1	No Push-Thru	Stall will result in no additional action in the upstream zones.
2	1-Zone Push-Thru	The first upstream zone operating state is coupled to the local zone operating state.
3	2-Zone Push-Thru	The first and second upstream zone operating states are coupled to the local zone operating state. In local mode, 2-Zone Accumulation will result in 2-Zone Push-Thru.

The setting can be selected using a UI. 1-Zone push-thru is the default.

Jam

Jam indicates that product transport has essentially stopped due to a stall that could not be successfully pushed through. A local zone is labeled as jammed when it has been labeled stalled and the first upstream zone (if in 1-Zone push-thru) and the second upstream zone (if in 2-Zone push-thru) have been labeled clogged. Jam disables push-thru from a stall and forces all zones in the jam area to operate according to their local logic mode. A jam area is made of the zone reporting the jam, any push-thru zones, and six additional zones upstream of the push-thru zones. Any dynamic, fixed, or group slug command that contains a zone within the jam area is canceled to remove back pressure on a jam. The zone upstream of the jam area are re-evaluated for DAS and any other group slug command applied is activated normally. The Manual Override Slug group is unaffected by jams.

Table 3-16 Jam Zones and Stall States

Mode	Zone Jam and Stall State(s)			Operating State
	2nd Upstream	1st Upstream	Local	Local Zone
Jam (Gray is 1 Zone Push Through only, entire table is for 2 Zone)	Drained	Drained	Stall	Per Local Logic Mode
	Drained	Clogged	Stall	
	Clogged	Drained	Stall	
	Clogged	Clogged	Jam	

Note: A Stalled state is only reported through a fieldbus interface. A Stalled state is not assignable to an output.

3.4.13 Speed Regulation

Speed regulation is a control strategy that uses Pulse-Width Modulation (PWM) (US Patent 5,823,319) to change the effective speed of the product. The Speed Regulator function is called to control the valve, regardless of release or accumulation mode, and uses passed data to modulate the state of the valve to create the effective reduced speed. The current perceived speed and the current state of the valve will be taken into consideration whenever the requested effective speed is changed.

3.4.14 Disabled Zone Control

The actuator in zones that are configured as disabled zones follows the state of the aux input in that zone. In this mode, the amber LED for that zone follows the state of the actuator. Since the zone is configured as disabled, it is not evaluated as a zone in the logic of the other zones in that lane. There is no additional configuration beyond disabling the zone required.

Note: This mode can be useful for controlling a brake module.

Important: During configuration, zones are configured as disabled as part of the topology configuration. Changes to the topology reset the entire topology and lane/zone configurations.

3.4.15 Commissioning Mode

The purpose of Commissioning Mode is to simplify commissioning and troubleshooting of the electrical and mechanical components of the conveyor line by placing all the ZFA modules in the network in a known, and simple, mode. Commissioning Mode is selected by pressing the Commissioning Button on the ZFM for more than 3 seconds. The green LED on the ZFM will flash and the amber System Status LED on the ZFA modules will blink to indicate that the network is in Commissioning Mode. Commissioning Mode is cancelled by pressing the Commissioning Button for more than 3 seconds. Cycling the power of the ZFM will also clear Commissioning Mode. When the ZFM exits Commissioning Mode, it will return to normal accumulation logic mode.

In Commissioning Mode, non-disabled ZFA module valve outputs are active when the sensor input for a zone is high and are inactive when the sensor input is low.

3.4.16 Diagnostics

Jam and Stall states, if configured, are available over a network-level control. The LEDs on both the ZFM and the ZFA modules indicate status and errors. Refer to the next section for definitions of the LED states.

3.5 ZFM Default Settings

The following table contains the default values for the various configurable items in the ZFM. When you turn ON the ZFM for the first time, these settings will be in use.

Table 3-17 ZFM Default Settings

Item	Default Value or Assignment	Notes
GPIO (Also used in DIP switch mode.)	IN1 = Release IN2 = Group 1 Activate (Slug) IN3 = Global Wake IN4 = Infeed Wake IN5 = Manual Override Slug Group Active IN6 = Group 2 Activate (Drop to Gravity) OUT1 = Jam Detected OUT2 = Zone Eye Status 1 (S1) OUT3 = Zone Eye Status 2 (S2) OUT4 = Zone Eye Status 3 (S3)	Infeed Wake's Active State = 0, which causes the infeed zones to ignore sleep. S1 Zone # = (n-3)/2 (50 %) S2 Zone # = (3*(n-3)/4) (75%) S3 Zone # = (n-3) (100%)

Item	Default Value or Assignment	Notes
Discharge Zone (Zone 1)	Accum Mode = 1-Zone NOT a Member of Group 1 (Slug) Member of Group 2 (Drop to Gravity) Member of Manual Override Slug Group Latching = Disabled Valve Output Inversion = Disabled Accumulation Delay = 255 (sec) Release Delay = 255 (sec) External Control = Disabled Stop Zone = Disabled Crowding = Disabled Clogged = 12 sec Drained = 10 sec Push-Thru = 1-Zone	 If = 255, use lane value If = 255, use lane value
Discharge Zone (Zone 1) (*-continued-*)	Dynamic Auto Slug = Disabled Fixed Auto Slug (Local Slug) = Disabled Neighborhood = Disabled Accel = 200 (ft/min/sec) Decel = 35 (ft/min/sec) LengthOfZone = 36 (inches) MinRegulatorOnTime =0.35 (sec) MinRegulatorOffTime=0.35 (sec) ZoneSpeedMin = 0 (ft/min) ZoneSpeedMax = 200 (ft/min) Crowding = Disabled Crowding Delay = 0 (sec) Crowding Duration = 2 (sec) Crowding % = 15%	

Item	Default Value or Assignment	Notes
Zone 2	Accum Mode = 1-Zone Member of Group 1 (Slug) Member of Group 2 (Drop to Gravity) Member of Manual Override Slug Group Latching = Disabled Valve Output Inversion = Disabled Accumulation Delay = 255 (sec) Release Delay = 255 (sec) External Control = Disabled Stop Zone = Disabled Crowding = Disabled Clogged = 12 sec (0 to disable) Drained = 10 sec (0 to disable) Push-Thru = 1-Zone Dynamic Auto Slug = Disabled Fixed Auto Slug (Local Slug) = Disabled Neighborhood = Disabled Accel = 200 (ft/min/sec) Decel = 35 (ft/min/sec) LengthOfZone = 36 (inches) MinRegulatorOnTime =0.35 (sec) MinRegulatorOffTime=0.35 (sec) ZoneSpeedMin = 0 (ft/min) ZoneSpeedMax = 200 (ft/min) Crowding = Disabled Crowding Delay = 0 (sec) Crowding Duration = 2 (sec) Crowding Percent = 15%	 If =255, use lane value If =255, use lane value Jam is enabled.

Item	Default Value or Assignment	Notes
Remaining Zones Settings	Accum Mode = 1-Zone Member of Group 1 (Slug) Member of Group 2 (Drop to Gravity) Member of Manual Override Slug Group Latching = Disabled Valve Output Inversion = Disabled Accumulation Delay = 255 Release Delay = 0 sec External Control = Disabled Stop Zone = Disabled Crowding = Disabled Clogged = 12 sec (0 to disable) Drained = 10 sec (0 to disable) Push-Thru = 1-Zone Dynamic Auto Slug = Disabled Fixed Auto Slug (Local Slug) = Disabled Neighborhood = Disabled Accel = 200 (ft/min/sec) Decel = 35 (ft/min/sec) LengthOfZone = 36 (inches) MinRegulatorOnTime =0.35 (sec) MinRegulatorOffTime=0.35 (sec) ZoneSpeedMin = 0 (ft/min) ZoneSpeedMax = 200 (ft/min) Crowding = Disabled Crowding Delay = 0 Crowding Duration = 2 Crowding Percent = 15%	In Local Mode, the DIP switch settings will dictate these values. Jam is enabled.
ZFA Node IO	Input 1 = Sensor Input 2/Output 2 = Aux Output 1 = Valve	
Groups	Group 1 = All zones, Slug (except zone 1) Groups 2 = All zones, Drop to Gravity Groups 3-6 = Empty	
Manual Override Slug Group	All Zones	
Dynamic Auto Slug Delay	0	
Sleep Delay	20 seconds	Sleep delay is set by lane and applies to all zones. Set to 0 to disable.
All Clear Output	None assigned	
All Clear Delay	3 seconds	

<table>
<tr><th>Item</th><th>Default Value or Assignment</th><th>Notes</th></tr>
<tr><td>Neighborhood Mode</td><td>MaxReleaseSpeedPct = 100
LaneFullSpeed = 200 fpm
OverrideRegulatorOnIdle = TRUE</td><td>Don’t pulse when idle.</td></tr>
<tr><td>ZFM DIP 1</td><td>ON = A-B Product Flow
OFF = B-A Product Flow</td><td></td></tr>
<tr><td>ZFM DIP 2 & 3</td><td>OFF = 0 ON = 1
<table>
<tr><th>DIP 3</th><th>DIP 2</th><th>Mode</th></tr>
<tr><td>0</td><td>0</td><td>0 & 1 Zone</td></tr>
<tr><td>0</td><td>1</td><td>1 Zone</td></tr>
<tr><td>1</td><td>0</td><td>2 Zone</td></tr>
<tr><td>1</td><td>1</td><td>Future (1 Zone)</td></tr>
</table></td><td></td></tr>
<tr><td>ZFM DIP 4</td><td>ON = Dynamic Auto Slug Enabled
OFF = Dynamic Auto Slug Disabled</td><td></td></tr>
<tr><td>ZFM DIP 5</td><td>ON = Sensor Delay Enabled Globally
OFF = Sensor Delay Disable Globally</td><td></td></tr>
<tr><td>ZFM DIP 6</td><td>ON = Sleep Mode Enabled
OFF = Sleep Mode Disabled</td><td>*When sleep is enabled in Local Mode, two infeed zones stay on</td></tr>
<tr><td>ZFM DIP 7</td><td>ZFM Active Settings:
ON = based on DIP Switch settings
OFF = based on downloaded Config</td><td>Changes to other DIP switches require power or DIP 7 to be cycled in order for the changes to be applied.</td></tr>
<tr><td>S1</td><td>Commissioning Button</td><td>Press and hold for > 3 seconds to enter commissioning mode.
Press and hold for > 3 seconds to exit commissioning mode.
With no modules connected, press and hold for > 6 seconds to delete the current configuration (will need reconfigured after)</td></tr>
<tr><td>ZFA x
(1 set of 3 LEDs for each zone)</td><td>Green ON = sensor Clear
Green OFF = sensor Blocked
Green Slow Blink = Zone is asleep
Red ON = Zone Disabled
Red Fast Flash (120 Hz) = Jam
Red Med Flash (60 Hz) = Stall
Red Slow Flash (30 Hz) = Clogged
Amber ON = Valve Energized
Amber OFF = Valve De-energized</td><td>Accounts for dark activated eyes</td></tr>
</table>

Item	Default Value or Assignment	Notes
ZFA System Status LED	Green ON = Communicating with ZFM Yellow Blink = Commissioning Mode Red Fast Flash – Network Topology error, doesn't match configuration.	EtherCAT network All available and expected modules will fast flash.

Generating a Configuration

4

4.1 Introduction

You'll use the ZFC to specify configuration settings for a ZFM. You will then save the configuration and download it to the ZFM.

This chapter describes how to specify configuration settings.

4.2 Software Configuration Overview

These are the general steps you'll use to generate a ZFM configuration. Each step is described in more detail in the sections and chapters that follow.

In the ZoneFlex Configurator:

1. Start a new configuration.
2. Enter project information.
3. Configure lane speeds.
4. Configure lane-level settings.
5. Configure zones.
6. Configure a fieldbus, when applicable.

7. Save the configuration.

8. Download the configuration to a ZFM or transfer it to a controller or PLC.

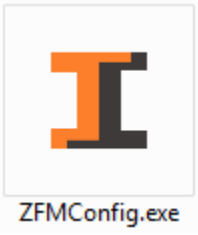
4.2.1 Starting the Configurator

To start the ZFC:

1. Locate the application on the PC. This is the same location that you specified during the installation process.

2. When you locate the executable file, double-click on it to start the application.

Figure 4-1 ZoneFlex Configurator Executable

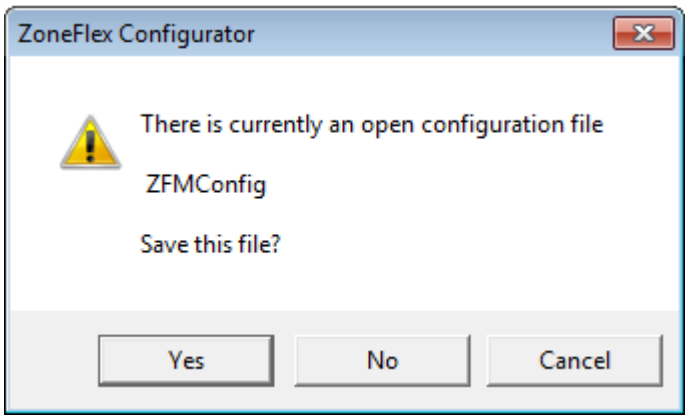


4.2.2 Exiting the Configurator

To close the ZFC:

1. Go to the **File** menu and select **Exit**.

2. If you have an open configuration and you have made changes to the file, a prompt will appear.



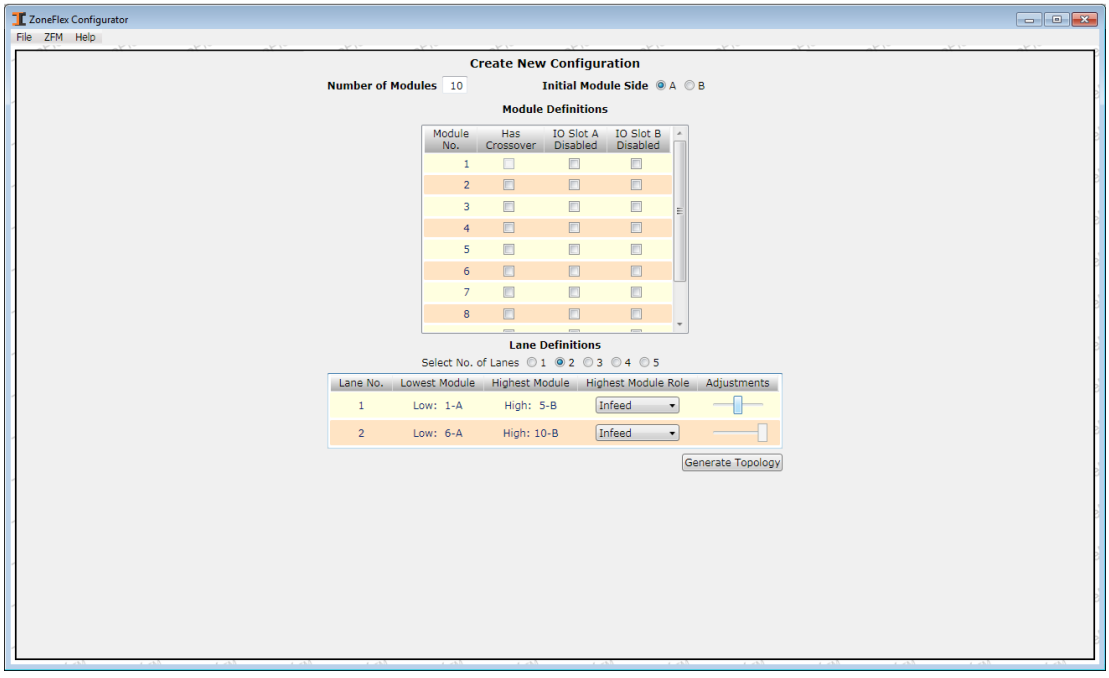
3. If you would like to save the configuration, select **Yes**. If you would like to discard the file, select **No**. Select **Cancel** to keep the ZFC running.

4. If you select **Yes**, a Browser window will appear allowing you to select a location for the file. The ZFC will save the configuration and close once you have selected a location.

4.2.3 Starting a New Configuration

When the ZFC is started, the window is empty. To start creating a configuration, complete the following steps:

1. Go to the **File** menu and select **New Configuration**. The first configuration screen is displayed.



Note: If you want to work with an existing configuration, Open, Import, and Read functions are available. For more information, refer to **Working with Configuration Files** later in this guide.

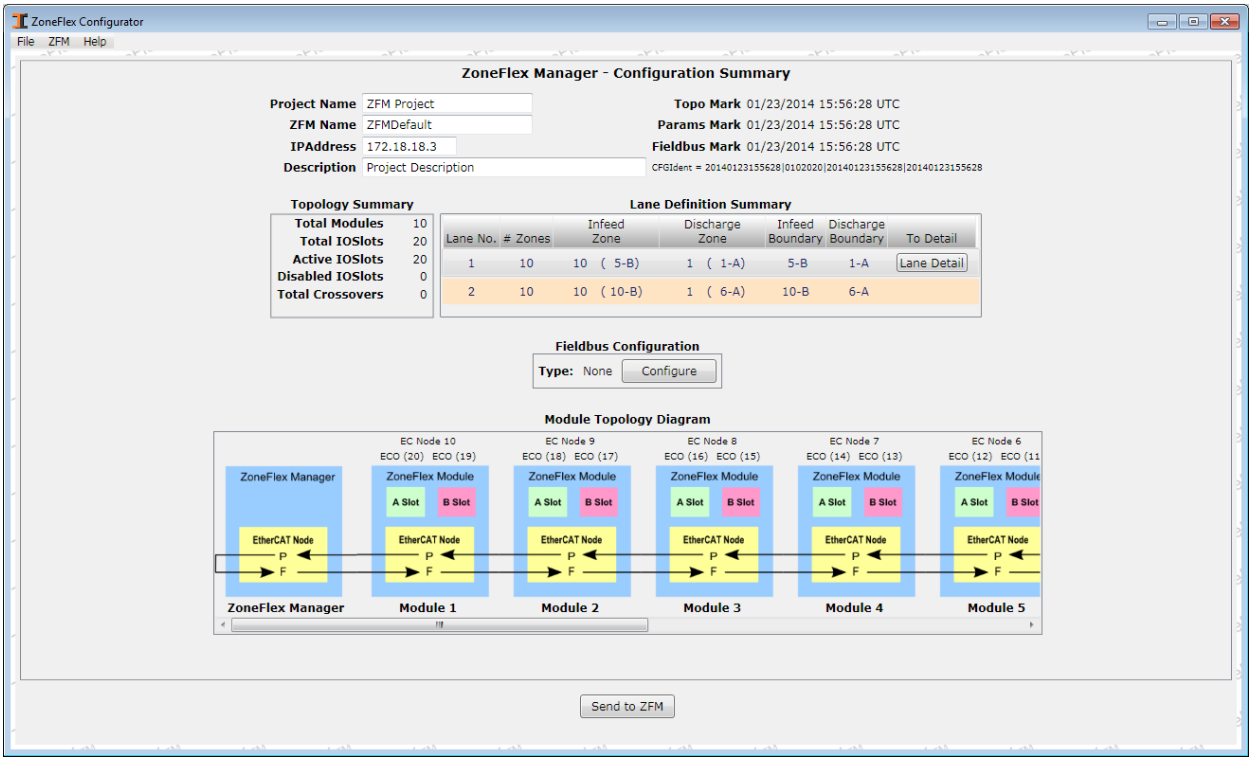
This screen allows you to define the number of modules and lanes in the network. Complete the fields on this screen as follows:

Group	Field	Description
	Number of Modules	Complete this field with the number of ZFA modules that are connected to the ZFM. When you do, the Module Definitions table will be populated with one row of information for each module. The range of this field is 1 - 100.
	Initial Module Side	The side of the first ZFA module (i.e., A or B) to which the ZFM is attached.
Module Definitions	Has Crossover	If the B side of the first ZFA is the side to which the ZFM is attached, a crossover is required. A-to-A and B-to-B connections also require crossovers. Crossovers are always placed before the ZFA modules.
Module Definitions	IO Slot A Disabled/ IO Slot B Disabled	Conveyor sections are sometimes made up of an odd number of zones. Enabling these checkboxes disables any unused module's I/O slot.
Lane Definitions	Select No. of Lanes	Select the radio button that represents the number of conveyor lanes that are present in the network. The number of rows in the Lane Definitions table will increase to represent the number of lanes you selected.
Lane Definitions	Highest Module Role	Select the role of the highest module number in the lane: infeed or discharge.
Lane Definitions	Adjustments	Use the Adjustments slider to adjust the range of modules in each lane. Moving the bar to the left reduces the number of modules in the lane while moving it to the right increases the number. Be sure that the resulting range identically matches the physical installation of the modules.

Note: If this project uses Intelligrated's ICAD-E plugin to AutoCAD Electrical to develop stick drawings for the accumulating conveyors, you can save a *.zfe extract file. This file saves time since it contains all of the above information. Use the **File** | **New Configuration (AutoCAD)** menu option to open the file.

2. When you have finished defining the lanes and modules in the network, the ZFC has enough general information to create a schematic description of the arrangement of the network, which is known as the topology.

   To create the description, click the **Generate Topology** button. The Configuration Summary is displayed.



4.2.4 Entering Project Information

The Configuration Summary screen contains an overview of the ZoneFlex Advanced network that you are configuring. The fields at the top of the screen contain general information about the network and about the configuration file you are creating.

Figure 4-2 Project Information

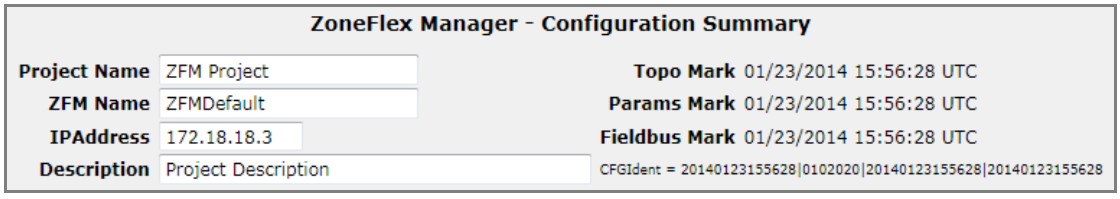


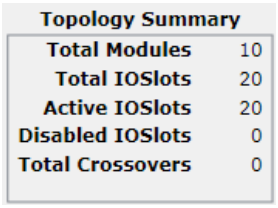
Table 4-1 ZFM Configuration Summary Fields

Field	Description
Project Name	The name of the customer for which the system is being installed. You can also include a location to distinguish between the installation sites for that customer.
ZFM Name	The name that has been assigned to this ZFM. One customer site can have any number of ZFM networks. This name helps to distinguish between them.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>IP Address</td><td>The IP address of the ZFM, which is the IP address for communication across the USB port. This should remain 172.18.18.3.</td></tr>
<tr><td>Description</td><td>A description of the network and/or project.</td></tr>
<tr><td>Topo Mark</td><td>The UTC time when the topology was generated.</td></tr>
<tr><td>Params Mark</td><td>The UTC time when the last parameter was changed.</td></tr>
<tr><td>Fieldbus Mark</td><td>The UTC time when the fieldbus configuration was changed.</td></tr>
<tr><td>CFGIdent</td><td>A unique identification number for the configuration. It is comprised of the Topo Mark, information about the modules and zones, and the Params Mark, as follows:
TTTTTTTTTTTTTT|MMMLZZZ|PPPPPPPPPPPPPP|FFFFFFFFFFFFFF
where,
<table>
<tr><th>Variable</th><th>Description</th></tr>
<tr><td>T_1 – T_{14}</td><td>The Topo Mark value, which can be found immediately below the CFGIdent field.</td></tr>
<tr><td>MMM</td><td>The number of modules in the configuration.</td></tr>
<tr><td>L</td><td>The number of lanes.</td></tr>
<tr><td>ZZZ</td><td>The number of active zones in the configuration.</td></tr>
<tr><td>P_1-P_{14}</td><td>The Params Mark value, which can be found below the Topo Mark field.</td></tr>
<tr><td>F_1-F_{14}</td><td>The Fieldbus Mark value, which can be found below the Params Mark.</td></tr>
</table>
</td></tr>
</table>

Below the general information is a Topology Summary.

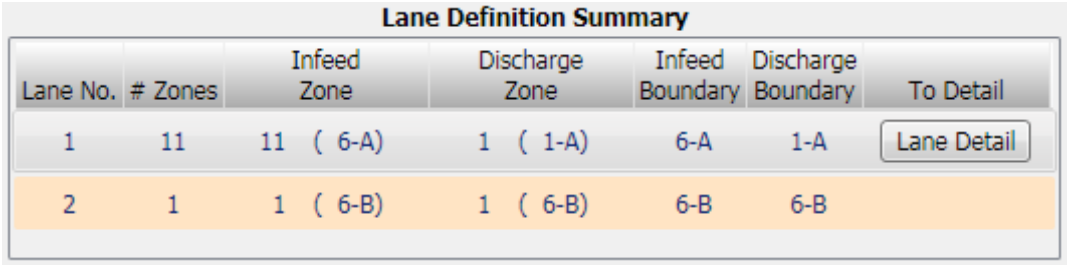
Figure 4-3 Topology Summary



4.2.5 Viewing Lane Details

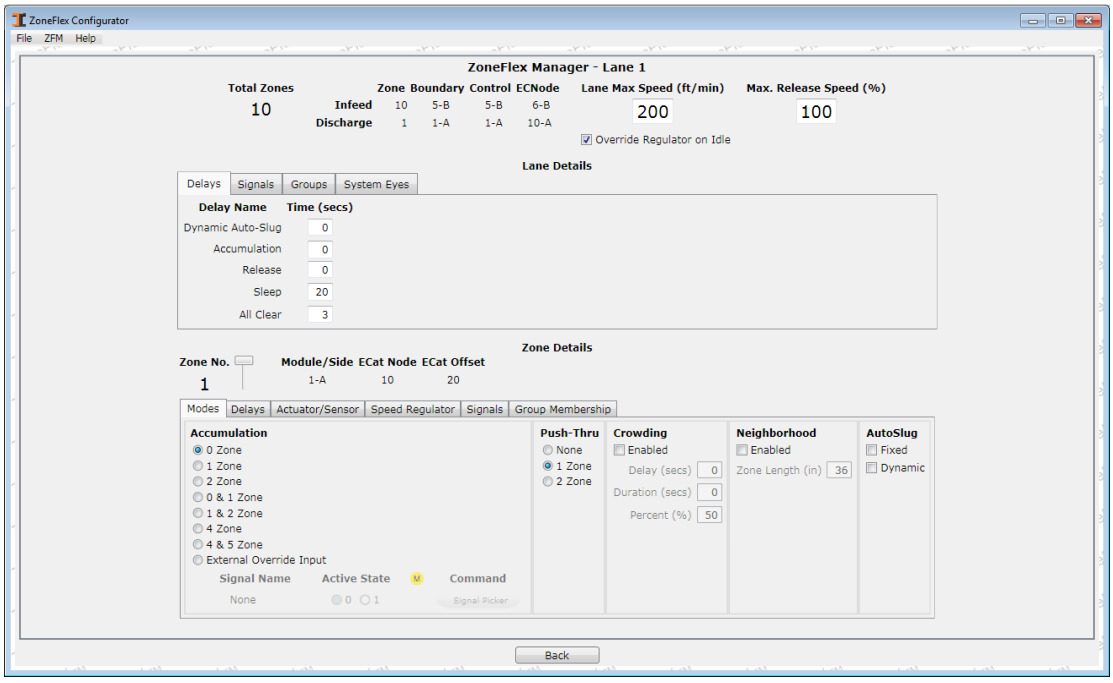
The Lane Definition Summary table on the Configuration Summary screen displays the lane information that you entered on the Create New Configuration screen. It also contains a button that allows you to view detailed information about each lane.

Figure 4-4 Lane Definition Summary Table



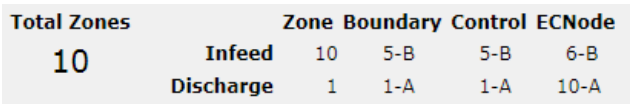
To configure the details for a lane, click on the lane in the summary table. A **Lane Detail** button appears in the **To Detail** column. Click on the button to display the Lane Detail screen for the selected lane.

Figure 4-5 Lane Detail Screen



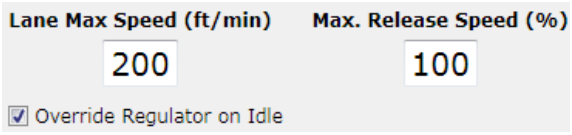
The Lane Detail screen provides the information and settings you need to configure lane settings, zones, accumulation modes, and special modes/functions. The information at the top left of the screen is a summary of the information that you entered on the previous screens.

Figure 4-6 Zone Configuration Summary



The fields and checkbox at the top right of the screen are used to enter a maximum lane speed, maximum release speed percent, and the regulator override on the Idle function.

Figure 4-7 Configure Lane Speeds



The tabs in the center of the Lane Detail screen are used to configure lane level settings. The tabs at the bottom of the screen are used to configure individual zones.

Use the **Back** button to return to the Configuration Summary screen.

4.2.6 Configuring Lane Speeds

Figure 4-8 Configure Lane Speeds

Complete the fields and checkbox as follows:

Table 4-2 Configure Lane Speeds

Element	Description
Lane Max. Speed	The maximum allowable speed for this lane in feet/minute. The range for this field is 1 – 650. This speed is typically dictated by the equipment that is in use.
Max. Release Speed	The maximum allowable release speed for this lane given as a percentage. The range for this field is 0 – 100. This is also known as the Speed Regulator.
Override Regulator on Idle	Indicate whether, when the zone is idle, it should follow the regulated speed or remain at full speed (recommended). Remaining at full speed saves air and makes less noise.

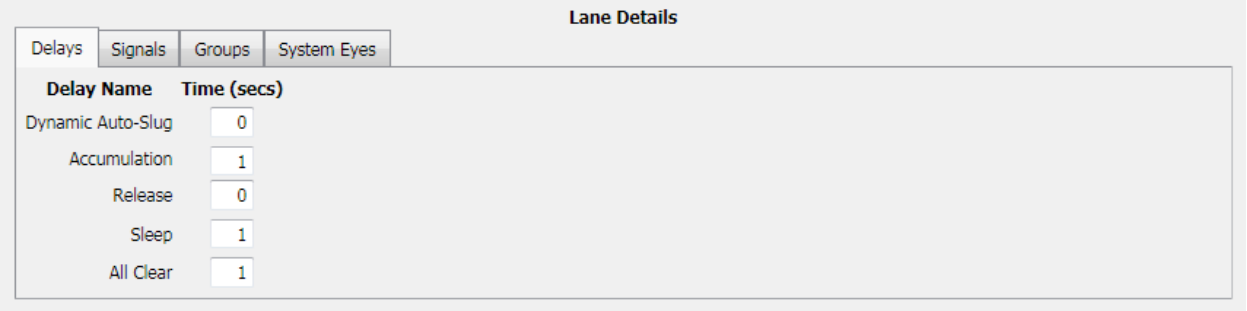
4.2.7 Configuring Lane-Level Settings

The Delays, Signals, Groups, and System Eyes tabs are used to configure settings that are on the lane-level in scope. Whenever a zone makes use of a mode or function that requires a lane level setting, the value that you enter in this group of tabs will be used.

Configuring Lane-Level Delays

The Delays tab contains fields that allow you to enter time delay values. Accumulation and Release Delay settings here will only affect zones whose corresponding delay is set to 255. A zone's corresponding Accumulation and Release Delay set at 255 will direct the logic to use the lane-level setting. Any value other than 255 in a zone's Accumulation and Release Delay setting will override the lane-level setting for that zone.

Figure 4-9 Lane Level Delays Tab



The time delays are described as follows:

Table 4-3 Configure Lane Level Delays

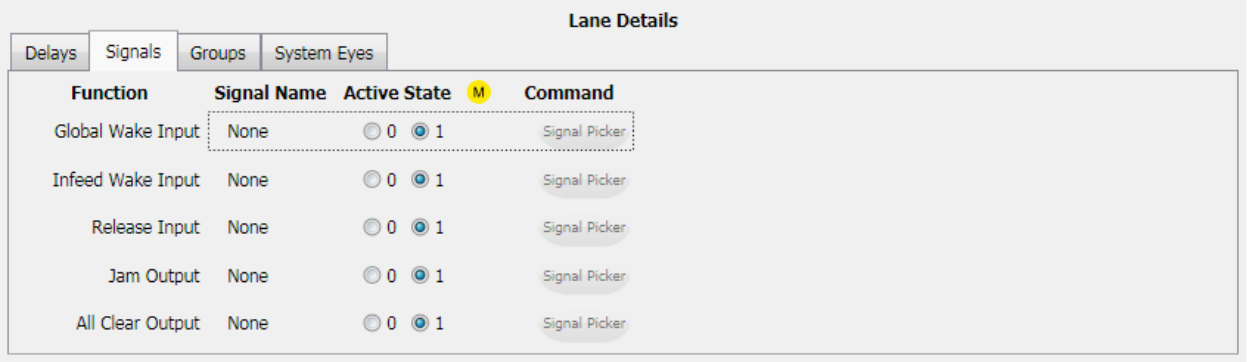
Time Delay	Description
Dynamic Auto Slug	The Dynamic Auto Slug (DAS) time delay is in seconds. For additional information about DAS, refer to the **Dynamic Auto Slug** section earlier in this guide.
Accumulation	The amount of time that the photo-eye is blocked before the zone is considered accumulated (depending on the accumulation mode in use). The range for this field is in seconds.
Release	The delay between when the photo-eye becomes clear and the release occurs. The range for this field is in seconds.
Sleep	The Sleep time delay is the amount of time a zone's photo-eye must remain Clear prior to entering Sleep. The value is in seconds. For additional information about Sleep mode, refer to **Sleep** earlier in this guide.

Time Delay	Description
All Clear	All clear indicates that all zones on a lane have not been occupied for a set period of time. The time delay is the period of time that must transpire before All Clear is activated. The range for this field is in seconds. For additional information, refer to **All Clear** earlier in this guide.

Configuring Lane-Level Signals

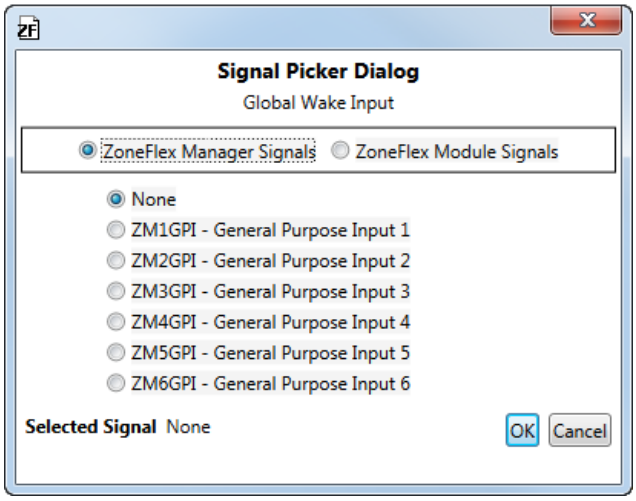
Signals can be used to trigger ZFM special functions and to report status. For inputs, an Active State selection of 1 will trigger the function when the input is ON. Conversely, an Active State selection of 0 will trigger the function when the input is OFF. For outputs (status) an active state selection of 1 will turn the output ON when the status condition is true while an active state selection of 0 will turn the output ON when the status condition is false.

Figure 4-10 Lane Level Signals Tab



To configure a signal, complete the following steps:

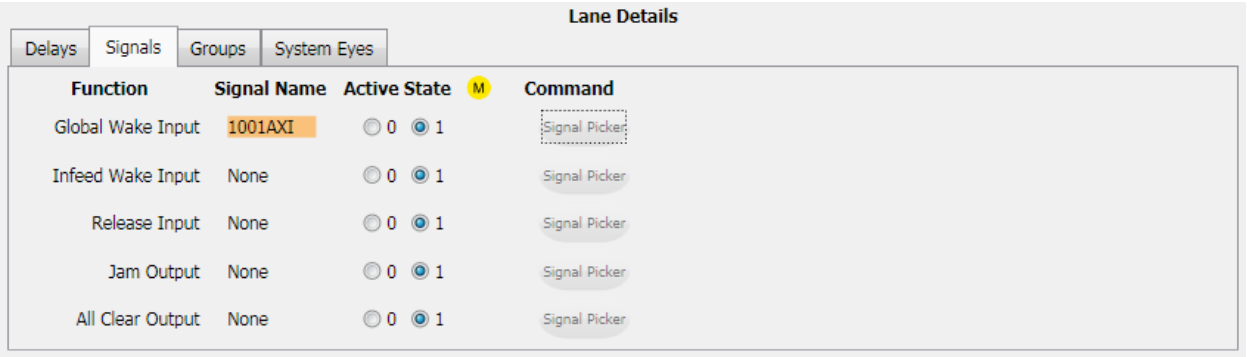
1. Locate the function or status for which you want to configure a signal.
2. Select the desired active state for the function or signal.
3. Click the **Signal Picker** button in the **Command** column. The signal picker dialog box appears.



4. Select the **ZoneFlex Manager Signals** radio button to display the inputs and outputs that are available on the ZFM. Select the **ZoneFlex Module Signals** radio button to display the inputs and outputs that are available on the ZFA modules.

5. Make a selection from the list of signals.

6. Click **OK** to save your selection and close the dialog box. Notice that the name of the signal you selected now appears in the **Name** column and it is shaded orange to indicate that it is not currently the default.



Note: The M icon identifies signals that have been referenced more than once. It is a visual cue to alert you to that fact, even if the signal has been referenced more than once intentionally.

7. Decide if you would like to restore the previous default or make the new signal the default for this function.

   If you would like to make the signal you selected the default for that function, right click on the name of the signal in the **Name** column and select **Set as New Default** from the context menu. The orange shading will be removed to indicate that the signal is now the default.

   If you would like to revert back to the previous default, select **Restore Previous Default** from the context menu. This option is not available once you have set a new default.

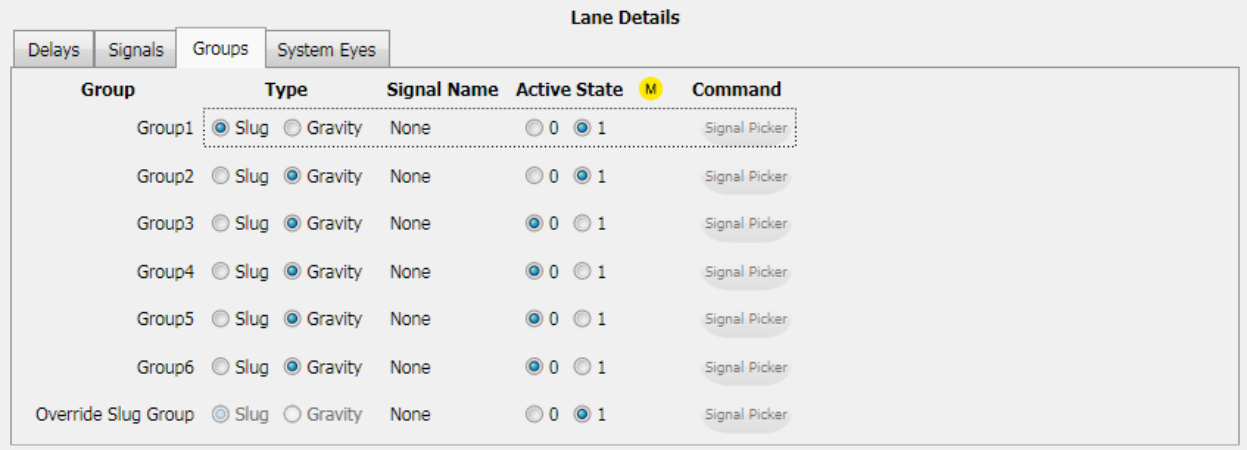
8. Repeat Steps 1 through 7 for each of the functions that you will be using in the ZFA network.

Configuring Groups

Zones can be assigned to groups which can then be forced to slug mode or drop-to-gravity mode. A zone can be a member of more than one group.

On the Groups tab, you can specify up to six groups and determine whether each is a slug or drop-to-gravity group type.

Figure 4-11 Groups Tab



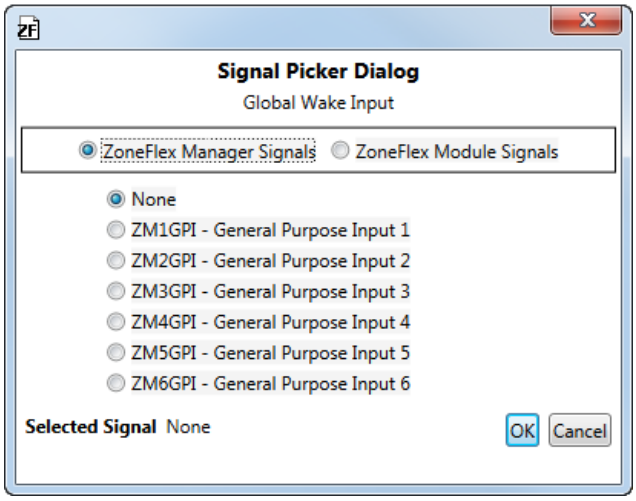
To configure a group, complete the following steps:

1. Locate the group that you want to configure in the Group column.

2. Enable the **Slug** radio button if you would like it to be a slug group. Enable the **Gravity** radio button if you would like it to be a drop-to-gravity group.

3. Select the **0** or **1** Active State radio button to indicate when the group should be activated. If 1 is selected (recommended), the group will be activated when the signal is ON. If 0 is selected, the group will be activated when the signal is OFF.

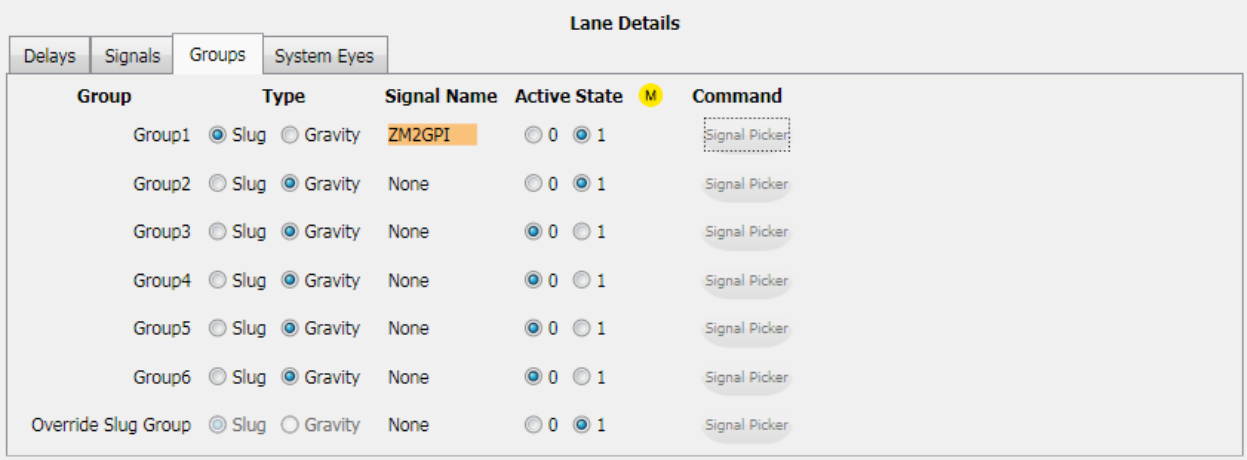
4. Click the **Signal Picker** button in the Command column. The signal picker dialog box appears.



5. Select the **ZoneFlex Manager Signals** radio button to display the inputs and outputs that are available on the ZFM. Select the **ZoneFlex Module Signals** radio button to display the inputs and outputs that are available on the ZFA modules.

6. Make a selection from the list of signals.

7. Click **OK** to save your selection and close the dialog box. Notice that the name of the signal you selected now appears in the Name column and it is shaded orange to indicate that it is not the current default.



Note: The M icon identifies signals that have been referenced more than once. It is a visual cue to alert you to that fact, even if the signal has been referenced more than once intentionally.

8. Decide if you would like to restore the previous default or make the new signal the default for this function.

   If you would like to make the signal you selected the default for that function, right click on the name of the signal in the **Name** column and select **Set as New Default** from the context menu. The orange shading will be removed to indicate that the signal is now the default.

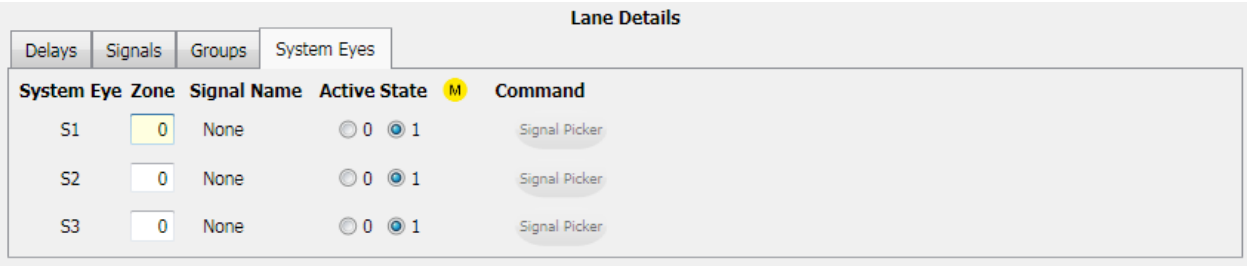
   If you would like to revert back to the previous default, select **Restore Previous Default** from the context menu. This option is not available once you have made a signal the default.

9. Repeat Steps 1 through 8 for each of the groups in your ZFA network.

Configuring System Eyes

The System Eyes tab allows you to configure the status monitoring of three zone photo-eyes. Generically labeled as S1/S2/S3, these are used to report the full level of the lane as 50%, 75%, and 100% full, respectively. When the topology is created from a configuration containing only a single lane, an algorithm within the ZFC is used to populate these three fields with the zone numbers that would typically be used for reporting 50%, 75%, and 100% full.

Figure 4-12 System Eyes Tab



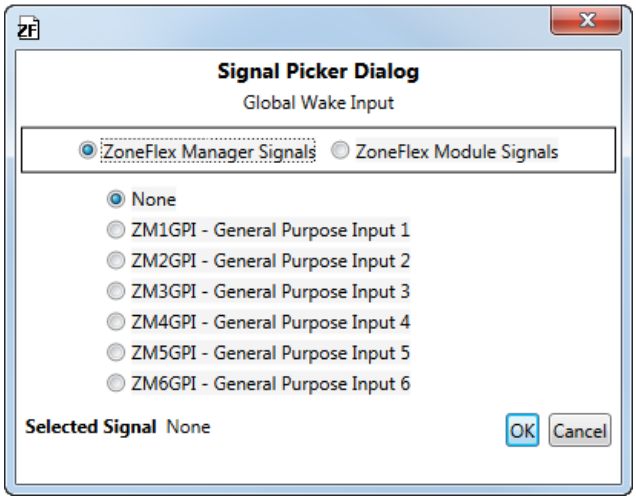
To configure a signal for a photo-eye, complete the following steps:

1. Locate the photo-eye that you want to configure in the System Eye column.

2. Enter the number of the zone to which the photo-eye is attached in the **Zone** field.

3. Select the **0** or **1** radio button to configure the active state of the signal. An Active State of 0 will turn the output signal ON when the photo-eye is blocked. An Active State of 1 will turn the output ON when the photo-eye is clear.

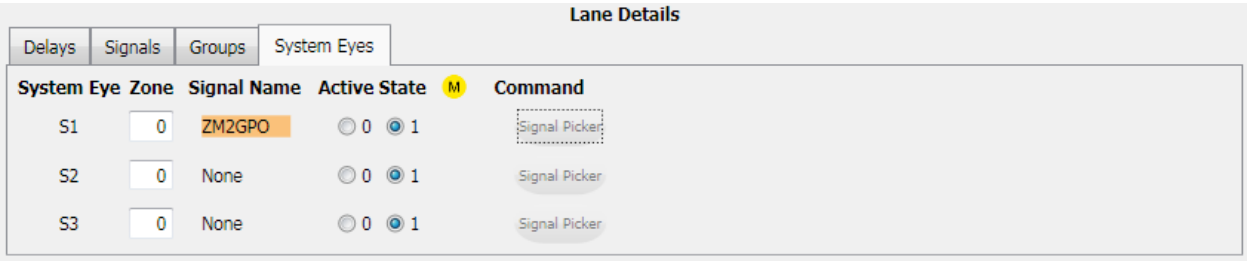
4. Click the **Signal Picker** button in the **Command** column. The signal picker dialog box appears.



5. Select the **ZoneFlex Manager Signals** radio button to display the inputs and outputs that are available on the ZFM. Select the **ZoneFlex Module Signals** radio button to display the inputs and outputs that are available on the ZFA modules.

6. Make a selection from the list of signals.

7. Click **OK** to save your selection and close the dialog box. Notice that the name of the signal you selected now appears in the Name column and it is shaded orange to indicate that it is not the default.



Note: The M icon identifies signals that have been referenced more than once. It is a visual cue to alert you to that fact, even if the signal has been referenced more than once intentionally.

8. Decide if you would like to restore the previous default or make the new signal the default for this function.

   If you would like to make the signal you selected the default for that function, right click on the name of the signal in the **Name** column and select **Set as New Default** from the context menu. The orange shading will be removed to indicate that the signal is now the default.

   If you would like to revert back to the previous default, select **Restore Previous Default** from the context menu. This option is not available once you have made a signal the default.

9. Repeat Steps 1 through 8 for each photo-eye that you want to configure.

4.2.8 Configuring Zones

The Zone Details portion of the screen consists of two groups of settings. The upper grouping is used to select the zone that will be configured. The lower grouping of tabs is used to configure the zone.

Figure 4-13 Zone Details

Use the slider to select the zone that you want to configure. To increment/decrement the zone number by one, click above/below the slider. Notice that as you change the zone number, the Module, ECN Node, and ECN Offset values change to reflect the correct information for each zone.

The default configuration on the Modes, Delays, Actuator/Sensor, Signals, and Group Membership tabs will also change depending on the zone that is selected, as follows:

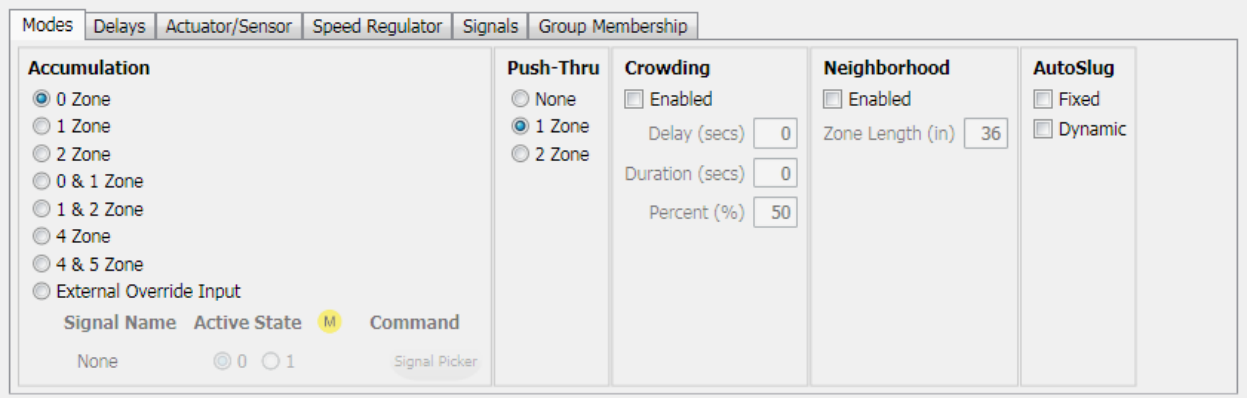
Table 4-4 Zone Configurations

Zone	Configuration
Zone 1	Zone 1 has a unique default configuration.
Zone 2	Zone 2 has a unique default configuration.
Zones 3-*N*	Zones 3 through *N* share a common default configuration. It is easy to propagate a change in any zone (from 3-*N*) to all other zones (from 3-*N*). To do so, change a configuration option, right click on it, and select **Set as New Default for Zones 3-N**. The new option will be set and be the default for zones 3 through *N*.

Configuring Accumulation Modes

The Modes tab allows you to choose the accumulation characteristics for the selected zone.

Figure 4-14 Modes Tab



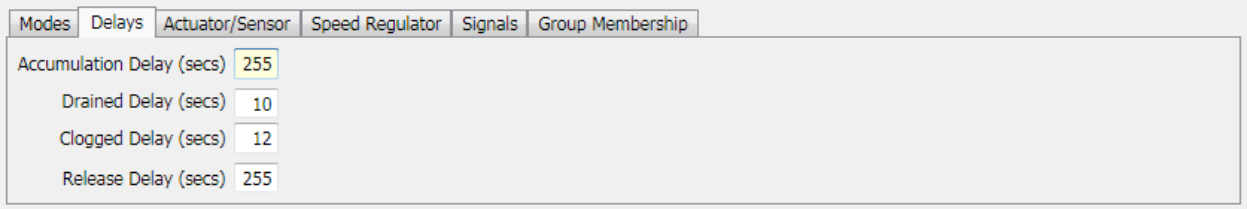
For information about the various modes, functions, and settings that are available, refer to Chapter 3.

Note: Configuring crowding and neighborhood mode is reasonably easy and is described in Chapter 8. The recommended initial settings provided in this chapter offer a starting point for these features.

Configuring Zone Delays

The Delays tab is used to configure delays that are unique to each zone.

Figure 4-15 Zone Delays Tab



Complete the fields on the Delays tab as follows:

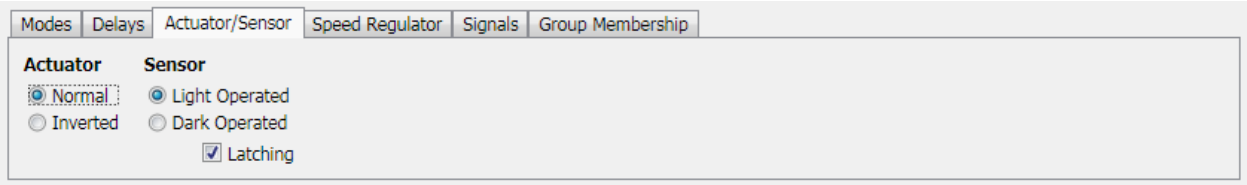
Table 4-5 Zone Delays Tab Fields

Field	Description
Accumulation Delay	The amount of time that the photo-eye is blocked before the zone is considered accumulated (depending on the accumulation mode in use). The range for this field is in seconds. Enter 255 to indicate that the lane-level setting should be used.
Drained Delay	A default Drained Delay of 10 seconds is applied to all zones. It can be modified to between 0 and 30 seconds for each individual zone.
Clogged Delay	A default Clogged Delay of 12 seconds is applied to all zones. It can be modified to between 0 and 30 seconds for each individual zone.
Release Delay	The amount of time between when the photo-eye becomes clear and the release occurs. The range for this field is 0 – 30 seconds. Enter 255 to indicate that the lane-level setting should be used.

Configuring Actuators and Sensors

The Actuator/Sensor tab is used to specify the behavior of the actuator and the interpretation of the photo-eye state for each zone.

Figure 4-16 Actuator/Sensor Tab



The selections on this tab are described as follows:

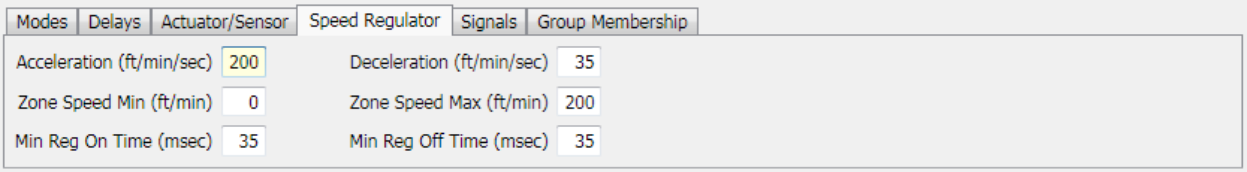
Table 4-6 Actuator/Sensor Tab Selections

Group	Selection	Description
Actuator	Normal	Solenoid valve is energized for motion.
Actuator	Inverted	Solenoid valve is de-energized for motion.
Sensor	Light Operated	Sensor is ON when clear. This is dictated by the type of sensor that is in use.
Sensor	Dark Operated	Sensor is ON when blocked. This is dictated by the type of sensor that is in use.
Sensor	Latching	The logical state of the sensor remains blocked until motion is commanded, regardless of the photo-eye state.

Configuring the Speed Regulator

The Speed Regulator tab allows you to configure the neighborhood characteristics for the selected zone.

Figure 4-17 Zone Speed Regulator Tab



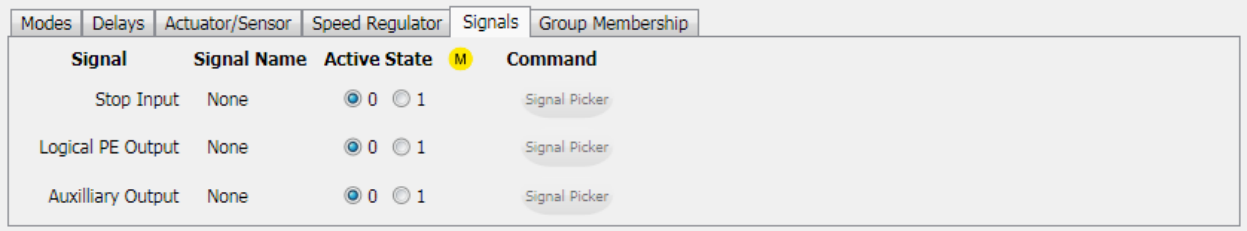
For information about the various settings that are available, refer to Chapter 3.

Note: Configuring neighborhood mode and the associated speed regulator is reasonably easy and is described in Chapter 8. The recommended initial settings provided in this chapter offer a starting point for these features.

Configuring Zone Signals

Signals can be used to trigger ZFM special functions and to report status. For inputs, an Active State selection of 1 will trigger the function when the input is ON. Conversely, an Active State selection of 0 will trigger the function when the input is OFF. For outputs (status) an Active State selection of 1 will turn the output ON when the status condition is true while an Active State selection of 0 will turn the output ON when the status condition is false.

Figure 4-18 Zone Signals Tab

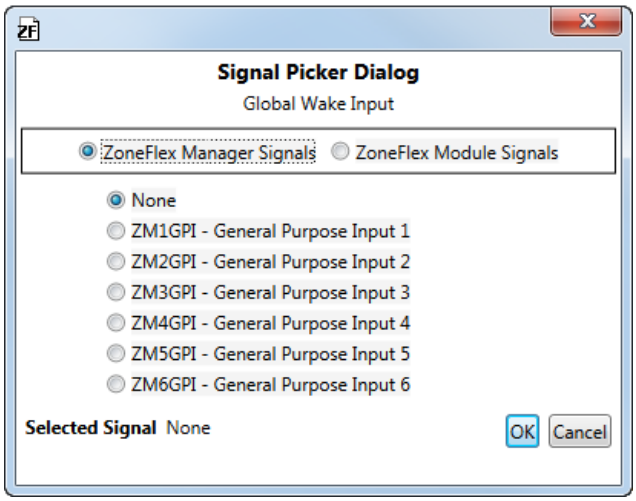


To configure a signal, complete the following steps:

1. Locate the function that you want to configure in the Signal column.

2. Select the desired active state for the function or signal.

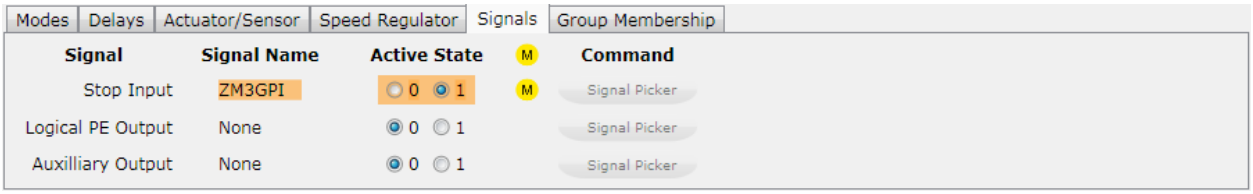
3. Click the **Signal Picker** button in the Command column. The signal picker dialog box appears.



4. Select the **ZoneFlex Manager Signals** radio button to display the inputs and outputs that are available on the ZFM. Select the **ZoneFlex Module Signals** radio button to display the inputs and outputs that are available on the ZFA modules.

5. Make a selection from the list of signals.

6. Click **OK** to save your selection and close the dialog box. Notice that the name of the signal you selected now appears in the Name column and it is shaded orange to indicate that it is not the current default.



Note: The M icon identifies signals that have been referenced more than once. It is a visual cue to alert you to that fact, even if the signal has been referenced more than once intentionally.

7. Decide if you would like to restore the previous default or make the new signal the default for this function.

   If you would like to make the signal you selected the default for that function, right click on the name of the signal in the Name column and select **Set as New Default** from the context menu. The orange shading will be removed to indicate that the signal is now the default.

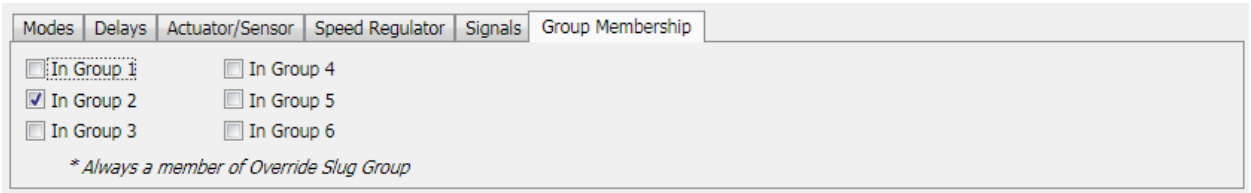
   If you would like to revert back to the previous default, select **Restore Previous Default** from the context menu. This option is not available once you have made a signal the default.

8. Repeat Steps 1 through 7 for each of the signals in the ZFA network.

Configuring Group Membership

A zone can be a member of one or more groups. The Group Membership tab is used to identify the group(s) to which a zone belongs.

Figure 4-19 Group Membership Tab

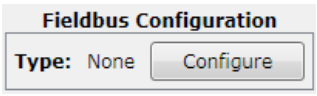


To configure group membership, enable the checkboxes next to the group(s) you want the current zone to be part of.

4.3 Configuring Fieldbus

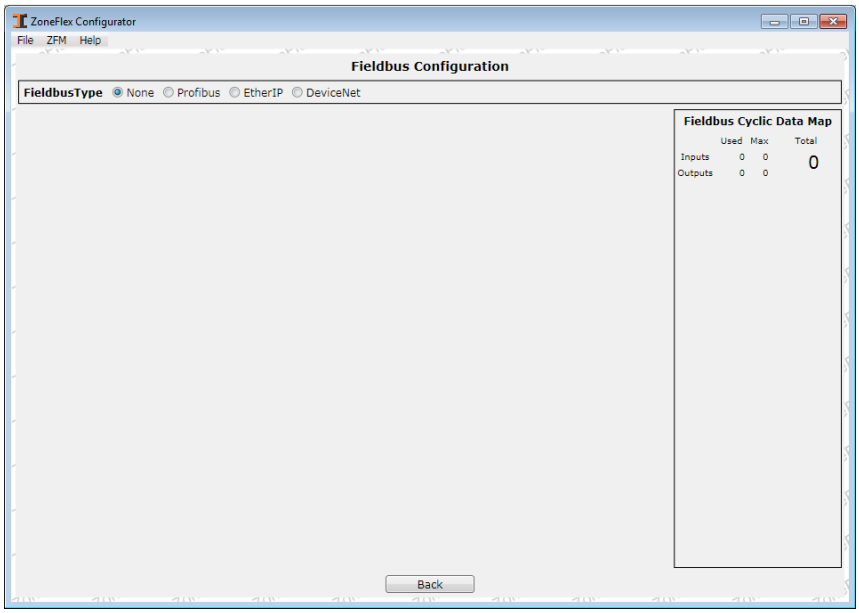
The ZFM often contains a fieldbus adapter that can be used to connect it to a controller or PLC using Profibus, DeviceNet (PLC only), or Ethernet/IP. The Configure button on the Configuration Summary screen is used to display the Fieldbus Configuration screen. From this screen, you can select the I/O points that you would like to cyclically monitor and/or set.

Figure 4-20 Fieldbus Configuration Button

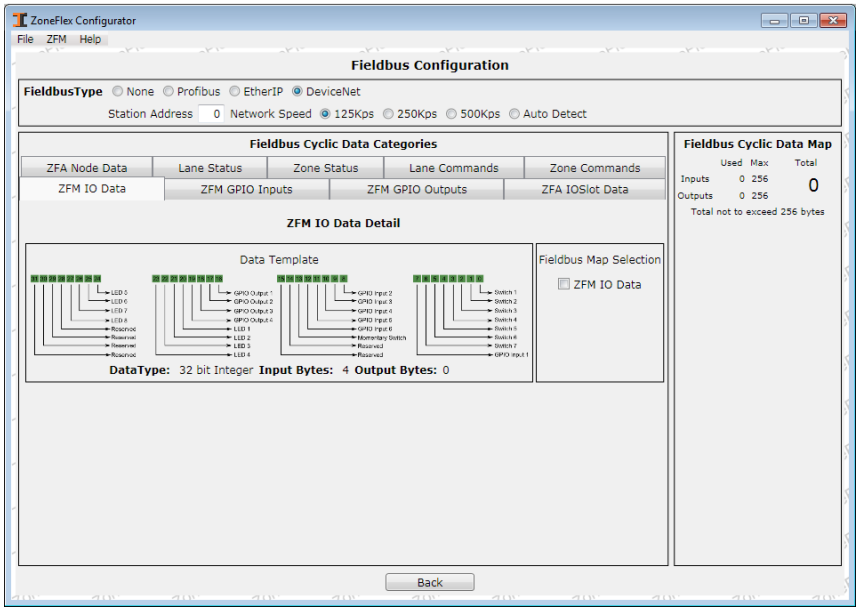


To configure fieldbus, complete the following steps:

1. Click the **Configure** button on the Configuration Summary screen. The Fieldbus Configuration screen is displayed.



2. Select a network type at the top of the screen. Configuration settings will appear below the selection and Fieldbus Cyclic Data Categories will be displayed.



3. Complete the configuration settings with information about the network. The settings will vary depending on the type of network you are using.

4. Use the tabs in the Fieldbus Cyclic Data Categories to select the types of data and I/O that you would like to monitor/set. Mouse over the checkboxes to view the Application Data Instances (ADIs) number. Refer to the next section for information about each type of data and I/O.

5. Review the information in the Fieldbus Cyclic Data Map. The header contains a summary of the bytes you elected to use listed by input/output, the total bytes available, and the total bytes used. The columns in the lower portion of the map identify the ADI and bytes used. Mouse over the graphic to see which data or I/O point a row is describing.

4.3.1 ZoneFlex Manager's Runtime Data

The ZFMs runtime data is live data representing either raw I/O or internal states and variables. You can configure fieldbus to monitor this data using the tabs in the Fieldbus Cyclic Data Categories.

The following sections describe each data type in greater detail.

ZFM I/O Data

4 bytes	Input (UINT32)
A 32-bit value that represents the current state of LEDs, switches, and general purpose inputs/outputs on the ZFM. The data is returned as illustrated in the Data Template on the ZFM I/O Data tab.	

ZFA I/O Slot Data

1 byte	Input (UINT8)
Each ZFA module has an 8-bit value that represents the current state of the LEDs, valve, auxiliary output, and photo-eye. The data is returned as illustrated in the Data Template on the ZFA I/O Slot Data tab.	

ZFA Node Data

1 byte	Input (UINT8)
Each ZFA module has an 8-bit value that represents the current state of module level LEDs, test output, and test input. The data is returned as illustrated in the Data Template on the ZFA Node Data tab.	

ZFM GPIO Inputs

1 byte	Input (UINT8)
An 8-bit value that represents the ZFM's six general purpose, read only inputs. The values are also available in the ZFM I/O Data value. This selection allows only the inputs to be read. The data is returned as illustrated in the Data Template on the ZFM GPIO Inputs tab.	

ZFM GPIO Outputs

2 bytes	Input (UINT8)/Output (UINT8)
An 8-bit value that represents the ZFM's four general purpose outputs. The values are also available in the ZFM I/O Data value. This selection allows the values to be set. It also allows only the outputs to be monitored. The data is returned as illustrated in the Data Template on the ZFM GPIO Output tab.	

Lane Status

1 byte	Input (UINT8)
An 8-bit value that represents the status for lanes 1-5. Status can be obtained for any configured lane. This data is read only. The data is returned as illustrated in the Data Template on the Lane Status tab.	

Lane Commands

2 bytes	Input (UINT16)
A 16-bit value that provides real time control of a specific lane. Commands are triggered at the bit level	

Zone Status

1 byte	Input (UINT8)
An 8-bit value that represents the status of configured zones. The status of two zones is available in a single byte. This data is read only. The data is returned as illustrated in the Data Template on the Zone Status tab.	

Zone Commands

1 byte	Input (UINT8)
An 8-bit value that provides real time control of a specified zone pair in a configured lane. Commands are triggered at the bit level.	

Saving a Configuration

5

After you have generated a configuration, you can save it in an XML or ZFB file. The format you elect to use will be determined by how you plan to download the configuration to the ZFM.

If you plan to download the configuration using the ZFC, you can save the file in either XML or ZFB format. The ZFC can open/import either type of file and download it using a USB connection.

If you plan to download the configuration using a controller or a PLC, you should save the file in ZFB format. The controller or PLC can then download the file using a fieldbus connection (if one exists).

5.1 Saving an XML Configuration

To save a configuration in an XML file, complete the following steps:

1. Select the **Save Configuration** option from the **File** menu. A browser window is displayed.
2. Enter a name for the configuration file in the **File Name** field. Be sure to use the .XML extension.
3. Browse to the location where you would like to save the file.
4. Select **Save** to save the file and close the browser window.

5.2 Saving a ZFB Configuration

To save a configuration in a ZFB file, complete the following steps:

1. Select **Export Binary File** from the **File** menu. A browser window is displayed.
2. Enter a name for the configuration file in the **File Name** field. Be sure to use the .ZFB extension.

Note: The filename should include a reference to the network and the ZFM station address.

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3. Browse to the location where you would like to save the file.
4. Select **Save** to save the file and close the browser window.

Downloading Configuration Files

6

If a configuration is saved in an XML file, it can be downloaded to the ZFM using the ZFC and the USB connection.

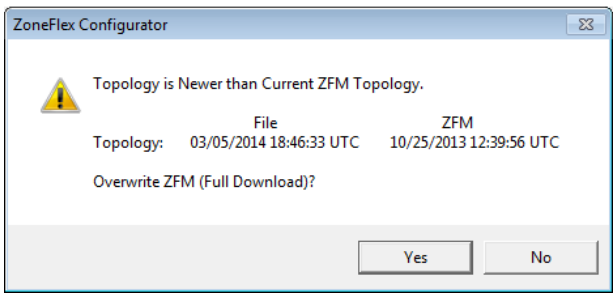
If a configuration is saved in a ZFB file, it can be downloaded using the ZFC, a controller, or a PLC. If you will be using a BOSS III controller or PLC to perform the download, the ZFB file will need to be copied to the controller. From there, it can be downloaded to the ZFM using a fieldbus connection.

6.1 Downloading a Configuration from the ZFC

To download a configuration from the ZFC, complete the following steps:

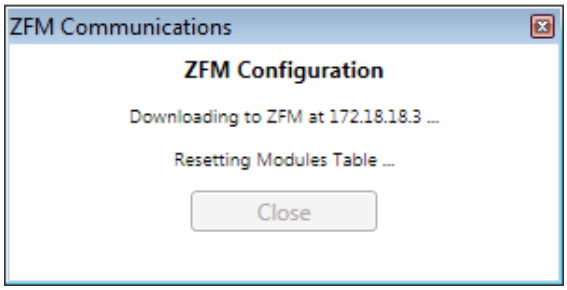
1. Open or import the configuration file in the ZFC. For information about opening and importing files, refer to Chapter 7.

2. Go to the **ZFM** menu and select **Write ZFM Configuration** or select the **Send to ZFM** button at the bottom of the screen. A prompt similar to the one below is displayed.



The prompt will identify which part(s) of the configuration, if any, are newer or older than the existing configuration. It will also indicate whether a full or partial download is required.

3. Select **Yes** to download the configuration. A prompt appears showing the status of the download.



When the download is finished, the prompt indicates that it is complete.

4. Select **Close** to close the prompt.

6.2 Deploying a Configuration

To deploy a ZFB configuration to a ZFM over fieldbus from a controller, you need to transfer the ZFB file to the controller.

To transfer a ZFB file from a PC to a controller, copy the file to a portable storage device, connect to the controller using Remote Desktop or FTP. You can then copy the file to the controller. The UI can then be used to deploy (i.e., write) the configuration to the ZFM. For additional information, refer to the UI documentation.

6.3 Downloading a Configuration from a PLC

To download a configuration from a PLC to a ZFM, the ZFB configuration files must be resident on the PLC's memory card. An Index file that lists the resident configuration file names is also required. For information about naming configuration files and creating Index files, refer to the *ZoneFlex Advanced PLC Implementation Guide*.

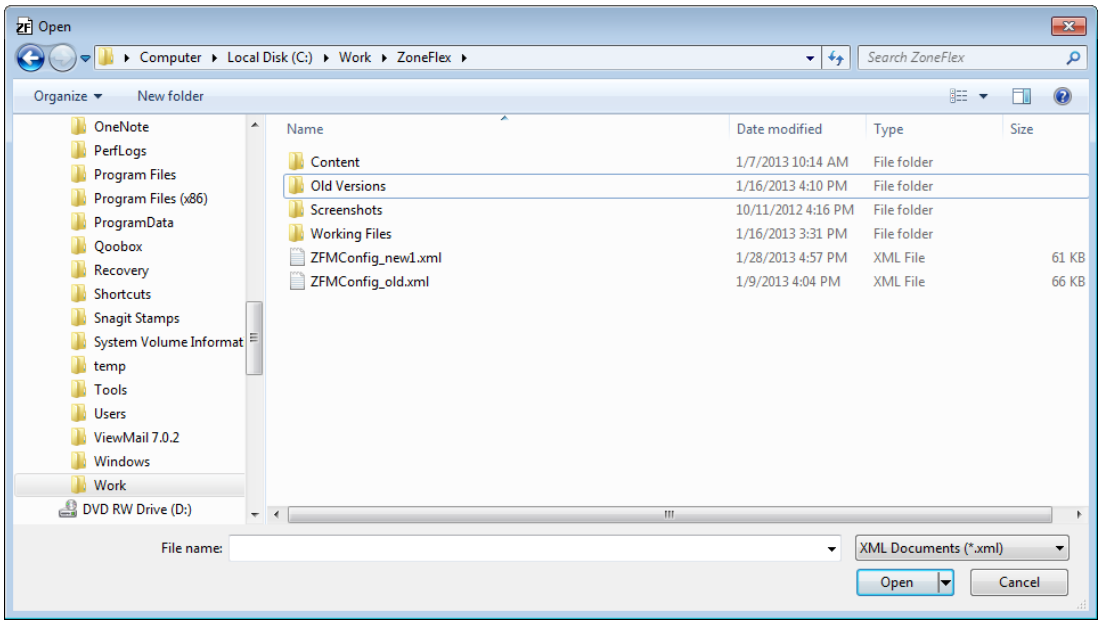
Working with Configuration Files

7

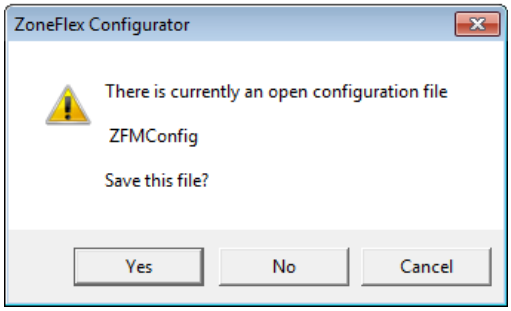
7.1 Opening an XML Configuration File

After you have created and saved configurations, you can open them in the ZFC. To do so, complete the following steps:

1. Go to the **File** menu and select **Open Configuration File**. A browser window opens.



If a configuration file is currently open and changes have been made to it, but not saved, a prompt is displayed.



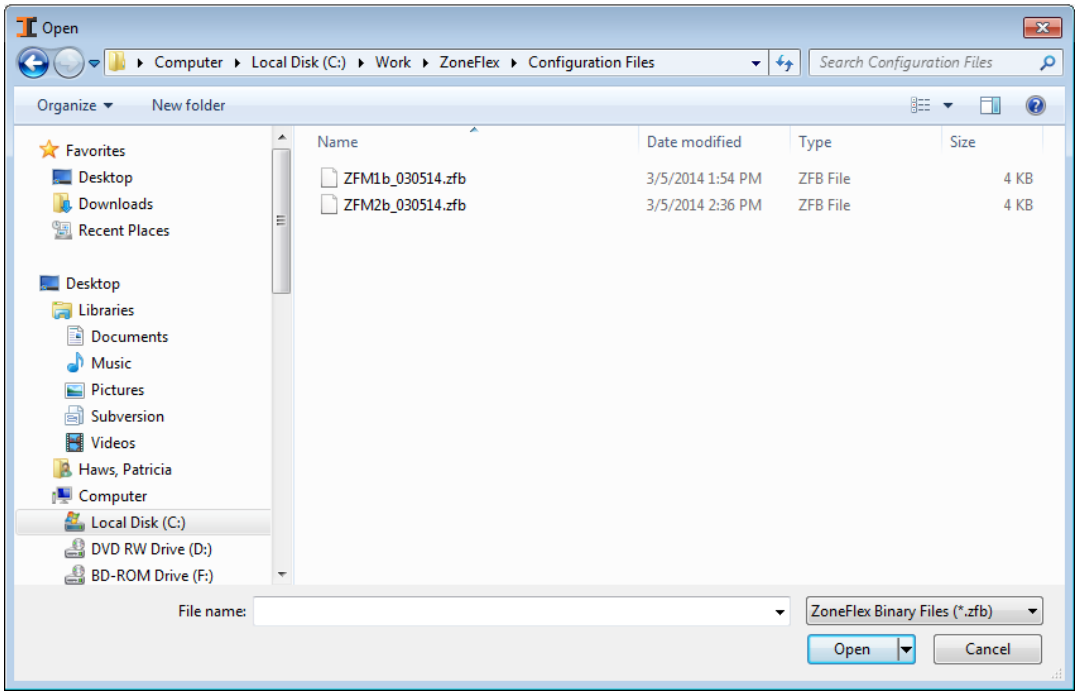
Select **Yes** to save the configuration. Select **No** to discard the changes to the configuration. Select **Cancel** to close the prompt without any action being taken.

2. Browse to the location of the configuration file that you want to open.

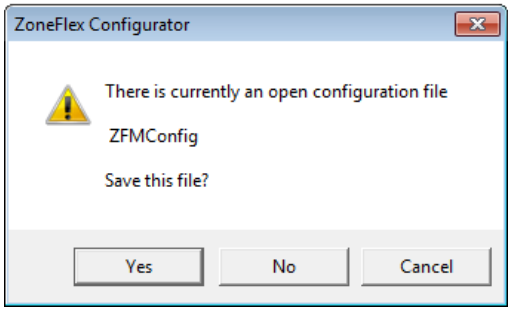
3. Double-click on the file name to open it in the ZFC.

7.2 Importing a ZFB Configuration File

1. Go to the **File** menu and select **Import Binary File.** A browser window is displayed.



If a configuration file is currently open and changes have been made to it, but not saved, a prompt is displayed.



Select **Yes** to save the configuration. Select **No** to discard the changes to the configuration. Select **Cancel** to close the prompt without any action being taken.

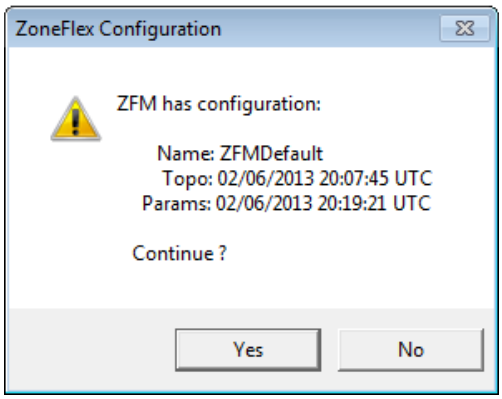
2. Browse to the location of the configuration file that you want to import.

3. Double click on the file name to import it into the ZFC.

7.3 Reading a ZoneFlex Manager's Configuration

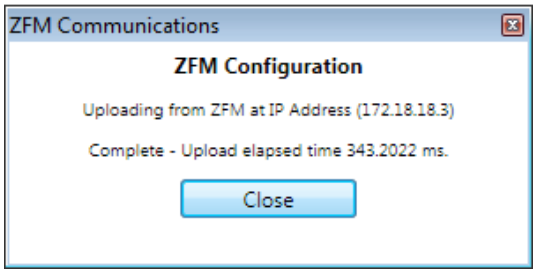
To read the configuration from a ZFM, complete the following steps:

1. Select **Read Configuration** from the **ZFM** menu. A prompt appears.



The prompt contains the name of the configuration, the date and time that the topology was created, and the date and time that the last parameter was changed.

2. Select **Yes** to start reading the configuration. A prompt appears that displays the IP address of the ZFM and the progress of the upload.



3. When the upload is complete, click **Close**. A Configuration Summary is displayed.

Application Guide

8

8.1 Approach and Fine Tuning

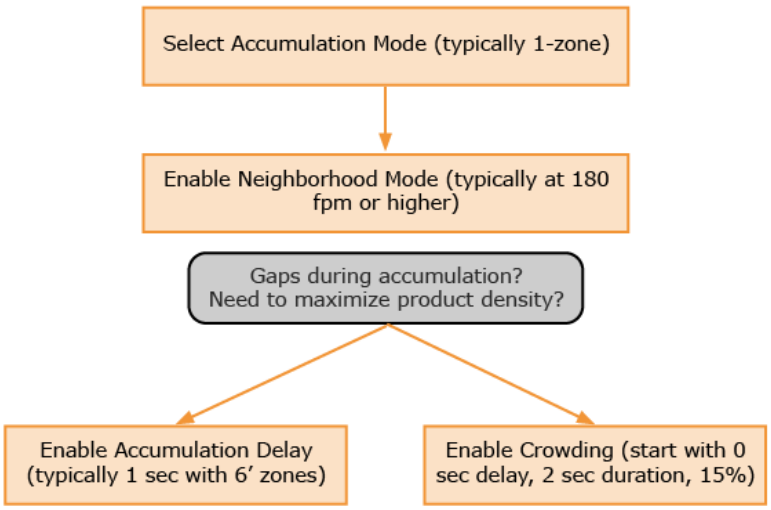
Use the following processes and charts to initially configure and fine tune the conveyor's accumulation performance.

Note: Print out this chapter to use while configuring or fine tuning a ZFA conveyor.

To start the basic process, complete the following steps:

1. Select the accumulation mode.
2. Enable neighborhood mode, if applicable.
3. Test and fine tune the settings (e.g., accumulation, auto slug, accel/decel).
4. If gaps between product continue to result during accumulation, or if you need to further maximize product density, enable crowding and/or enable the accumulation delay.

Figure 8-1 Approach to Tuning ZFA



8.2 Initial ZoneFlex Manager Settings

Refer to the following table for the initial recommended ZFM settings. Depending on product mix, some fine tuning might be necessary.

Note: Apply the special settings to curves on Accuglide conveyors in Notes.

Table 8-1 Recommended Initial Settings

Configurable Setting	Conveyor Speed	Discharge Idler Length	ROC Zone Length	Discharge Zone	2nd Zone	Zones 3-n	Notes
Accumulation Mode	<180 fpm	3'	3'	1-zone	1-zone	1-zone	- 0-zone for the 6' zone discharge idlers - AG Curves always 0&1 zone
			6'	1-zone	1-zone	1-zone	
		6'	3'	0-zone	1-zone	1-zone	
			6'	0-zone	1-zone	1-zone	
	>=180 and <=270	3'	3'	1-zone	1-zone	1-zone	
			6'	1-zone	1-zone	1-zone	
		6'	3'	0-zone	1-zone	1-zone	
			6'	0-zone	1-zone	1-zone	
	>270 fpm	3'	3'	1-zone	1-zone	1-zone	
			6'	1-zone	1-zone	1-zone	
		6'	3'	0-zone	1-zone	1-zone	
			6'	0-zone	1-zone	1-zone	

Configurable Setting	Conveyor Speed	Discharge Idler Length	ROC Zone Length	Discharge Zone	2nd Zone	Zones 3-n	Notes
Crowding				Tune as necessary depending on product mix after testing, if needed. Default setting is OFF.			- Settings at "0" delay, "2 sec" duration, 15% - AG Curves always "OFF"
Neighborhood Mode	<180 fpm	3'	3'	OFF	OFF	OFF	- Be sure each zone length is correct - AG Curves always "OFF" - OFF for discharge zones except for above 270 fpm - OFF when there is a brake in the zone
			6'	OFF	OFF	OFF	
		6'	3'	OFF	OFF	OFF	
			6'	OFF	OFF	OFF	
	>=180 and <=270	3'	3'	OFF	ON	ON	
			6'	OFF	ON	ON	
		6'	3'	OFF	ON	ON	
			6'	OFF	ON	ON	
	>270 fpm	3'	3'	ON	ON	ON	
			6'	ON	ON	ON	
		6'	3'	ON	ON	ON	
			6'	ON	ON	ON	
Dynamic Auto Slug	<180 fpm	3'	3'	OFF	OFF	ON	- AG Curves always "OFF" - ON for zones 3-n
			6'	OFF	OFF	ON	
		6'	3'	OFF	OFF	ON	
			6'	OFF	OFF	ON	
	>=180 and <=270	3'	3'	OFF	OFF	ON	
			6'	OFF	OFF	ON	
		6'	3'	OFF	OFF	ON	
			6'	OFF	OFF	ON	
	>270 fpm	3'	3'	OFF	OFF	ON	
			6'	OFF	OFF	ON	
		6'	3'	OFF	OFF	ON	
			6'	OFF	OFF	ON	
Accumulation Delay	<180 fpm	3'	3'	None	None	None	- AG Curves always No Delay - 1 sec for slower speeds and 6' zones
			6'	None	1 sec	1 sec	
		6'	3'	None	None	None	
			6'	1 sec	1 sec	1 sec	
	>=180 and <=270	3'	3'	None	None	None	
			6'	None	1 sec	1 sec	
		6'	3'	None	None	None	
			6'	1 sec	1 sec	1 sec	
	>270 fpm	3'	3'	None	None	None	
			6'	None	None	None	
		6'	3'	None	None	None	
			6'	None	None	None	
Latching	<180 fpm	3'	3'	OFF	OFF	OFF	ON for the 6' discharge

Configurable Setting	Conveyor Speed	Discharge Idler Length	ROC Zone Length	Discharge Zone	2nd Zone	Zones 3-n	Notes
			6'	OFF	OFF	OFF	zones for higher speeds
		6'	3'	OFF	OFF	OFF	
			6'	OFF	OFF	OFF	
	>=180 and <=270	3'	3'	OFF	OFF	OFF	
			6'	OFF	OFF	OFF	
		6'	3'	OFF	OFF	OFF	
			6'	OFF	OFF	OFF	
	>270 fpm	3'	3'	OFF	OFF	OFF	
			6'	OFF	OFF	OFF	
		6'	3'	ON	OFF	OFF	
			6'	ON	OFF	OFF	
Slug groups	Can set up two or more separate slug release groups. Release based on how full the conveyor is.						
Drop-to-Gravity	Set up all zones in one drop-to-gravity group for use at startup if no VFD/soft start is used at speeds <300 fpm. Speeds >=300 fpm always requires a VFD/soft start.						

Note: This table of settings is already specifically tailored to the application type (e.g., sawtooth merge, IntelliMerge, aftersort, standalone, recirc) by the accumulating conveyor's construction. When the conveyor was being concepted, the speed, discharge idler length, and Rest of Conveyor (ROC) zone length were built in such a way that this table can give you the best possible starting foot forward. The chart is based on testing and results at various locations and with various product mixes.

8.3 Set Speed Regulator for Neighborhood Mode

The neighborhood mode feature uses ZFA's speed regulator, which requires three pieces of information to handle product correctly: zone length, acceleration, and deceleration. The zone length is set for each zone in the ZFC. Likewise, the acceleration and deceleration values are set for each zone and are based on average live load, speed, and container type (cartons or totes).

To correctly configure neighborhood mode, set the zone length, acceleration and deceleration values for each zone using the ZFC. Use the table below to find the proper acceleration and deceleration values for the conveyor and product. In situations where mixed product weight exists, start with finding the average and adjust if needed during commissioning.

Table 8-2 Speed Regulator Settings

		Cartons		Totes	
Live Load	**Speed**	**Acceleration**	**Deceleration**	**Acceleration**	**Deceleration**
Light (<=15 lb/ft)	150	414	48	373	42
	180	414	51	373	45
	240	414	59	373	53
	270	414	63	373	57
	300	414	66	373	60
	400	414	79	373	73
Average (>15 and < 50 lb/ft)	150	344	43	310	37
	180	344	46	310	41
	240	344	54	310	48
	270	344	58	310	52
	300	344	61	310	56
	400	344	74	310	68
Heavy (>=50 lb/ft)	150	292	39	263	34
	180	292	43	263	38
	240	292	50	263	45
	270	292	54	263	49
	300	292	58	263	53
	400	292	70	263	65

Troubleshooting

9

9.1 Issues and Resolutions

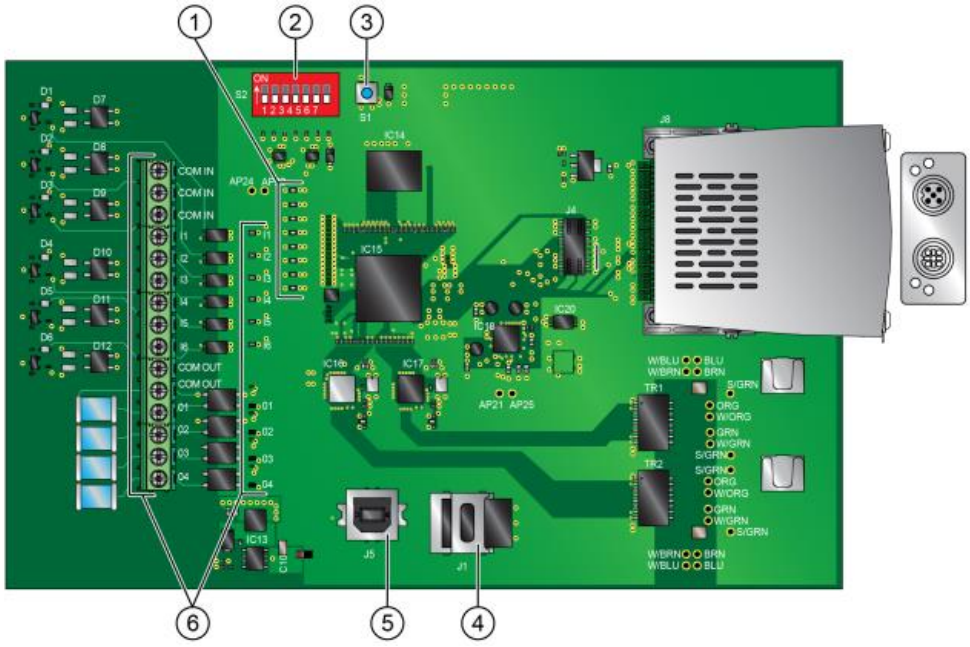
Condition	Resolution
The ZoneFlex Configurator cannot connect to the ZFM and/or gives GetADI() Exception time out error.	1. Verify that the ZFM is powered. 2. Verify that the USB cable is correctly connected. 3. Verify that the secondary network is configured correctly and ensure you can ping the ZFM. 4. Be sure you are using the same USB port you used when first setting up the driver. Each USB port is independent. 5. Check the driver installation again and ensure the RNDIS Gadget appears in Device Manager. 6. Ensure there is nothing checked in Internet Options | Connections tab | LAN Settings.
Driver cannot find the ZFM at the configured IP address.	Complete the device driver configuration as described in Chapter 2. If this has already been completed, make sure the ZFM is connected to the same USB port that was used when the configuration was performed. If it is connected to a different USB port, the configuration described in Chapter 2 will need to be completed again for the new port.
The ZFC software cannot be installed on a PC.	Confirm that you have the appropriate rights on the PC.
The ZFC software will not run on a PC.	Confirm that you have the appropriate rights on the PC and that the ZFC is available to your user account.
I cannot select a tab or the Back button.	Check to see if a yellow error message is displayed. If one is displayed, resolve the issue before attempting to navigate to a different screen or tab.

Condition	Resolution
I get the following message when I try to open a configuration file: *File (<filename>.xml) is corrupt and cannot be used.*	The file may have been saved using a different version of the ZFC. To resolve this issue, complete one of the following tasks: • Re-read the configuration from the ZFM, save it to a new file, and delete the corrupt file. • Use the same version of the ZFC that was used to save the original configuration file. • Open the file with a browser, for reference, and re-enter the configuration using the ZFC.
Conveyor does not work. There is no heartbeat on the ZFM and the modules only have one green LED ON.	Cycle power to the ZFM. Give the ZFM about 2 minutes to power up completely. If the heartbeat returns, continue to use. If the heartbeat is still missing, turn the ZFM off and replace the SD card with one from another ZFM. If the heartbeat returns, the hardware is fine and the SD card needs to be replaced. Order one from Intelligrated. If the heartbeat does not return, replace the ZFM.

9.2 ZFM and Module LEDs

Both the ZFM and ZFA modules have LEDs that provide status information. After bootup, a properly running ZFM provides a heartbeat signal with a red status LED, indicating the program is running. You will need to open the ZFM's enclosure to see the components described in this section.

Figure 9-1 ZFM Circuit Board Components



#	Component	Description
1	System Status LEDs	**Note:** LED #1 is closest to the DIP switches. (LED 1 to 6 are the status of the General Purpose Inputs.) The System Status LEDs provide status information about the following modes: • Release Signal • Slug Release Signal • Global Wake Up Signal • Infeed Wake Up Signal • Manual Override Slug Group Active Signal • Drop-to-Gravity Signal • Commissioning Mode The red blinking LED is a heartbeat that indicates that the program is running.
2	DIP Switches	The ZFM has seven DIP switches that are used for local configuration of simple or standalone systems.
3	Commissioning Mode Button	You can use this button to enter and exit Commissioning Mode. To enter this mode, press and hold the button for 3 seconds. The Commissioning LED on the ZFM and the ZFA modules will blink to indicate that the mode is active. To exit Commissioning Mode, hold down this button for 3 seconds. While Commissioning Mode is active, all modules are in 0-Zone mode and each zone photo-eye controls the valve in the same zone. The Commissioning Mode button can also be used to delete the factory configuration. If no slaves are plugged in and the commissioning button is held down for 6 seconds, the ZFM will delete any saved settings (i.e., database files).
4	microSD card	ZoneFlex Manager includes a microSD card that stores: • The operating system • The base software An event log
5	USB Port	The ZFM has a standard USB, Type B vertical connector that provides access to configuration information and event logs and also provides access to the UI-API configuration file.

#	Component	Description
6	GPIO Terminals and LEDs	The ZFM has ten General Purpose Input/Output (GPIO) points. All inputs must be AC or DC: • ON > 10V AC/DC • OFF < 6V AC/DC All outputs must be AC or DC • Voltage = 0 - 250V AC/DC • Maximum Current = 50mA A separate connection point for the inputs and outputs is provided for electrical common (ground). A mini 8-pin cable is provided for inputs and a mini 6-pin cable is provided for outputs. Single color LEDs are located by each input and output to indicate that a signal is applied. The LED color for inputs is amber and the LED color for outputs is green. LEDs illuminate when the input/output is ON and do not illuminate when the input/output is OFF.

The ZFA modules also provide information using the following LEDs.

Figure 9-2 ZFA Module LEDs

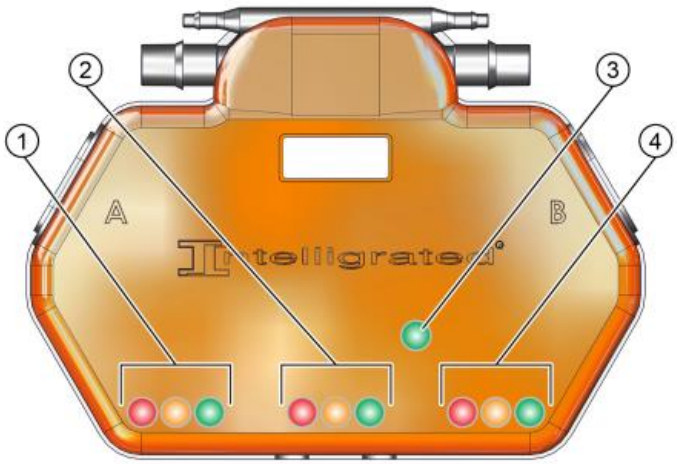


Table 9-1 ZFA Module LEDs

Problem/Status	LED Color/State	Cause	Solution
Zone Status LEDs (Callouts 1 and 4)			
Red Zone LED	Solid	Zone is disabled.	No action needed.
	Fast Flash	Jam is detected.	Clear the jam photo-eye.
	Med Flash	Product is stalled.	Wait for zones to try to push product through the stall condition.
			Remove the cause of the stall.
			Align the zone sensor if needed.
	Slow Flash	Clog is detected.	Wait for zones to try to push product through the clog condition.
			Remove the cause of the clog.
	OFF	No alarms are detected.	No action needed.
Amber Zone LED	Solid ON	Valve is energized.	No action needed.
	OFF	Valve is de-energized.	
Green Zone LED	Solid ON	Sensor is clear.	No action needed.
	OFF	Sensor is blocked.	
	Slow Flash	Zone is asleep.	Wake up the zone by temporarily blocking the sensor. When the sensor clears, the zone will wake up.
System Status LEDs (Callouts 2 and 3)			
Red System Status LED	Fast Flash	Network topology error (configuration/zone count mismatch) is detected.	Check for faulty or disconnected module in the line.
Amber System Status LED	Flashing	Commissioning mode is active. Mode is used for commissioning and for troubleshooting mech./elec. components	Press the Commission switch for more than 3 seconds.
			Deactivate mode through the UI or Fieldbus.
			Cycle the power of the ZoneFlex Manager.
	OFF	System is operating per defined configuration.	No action needed.

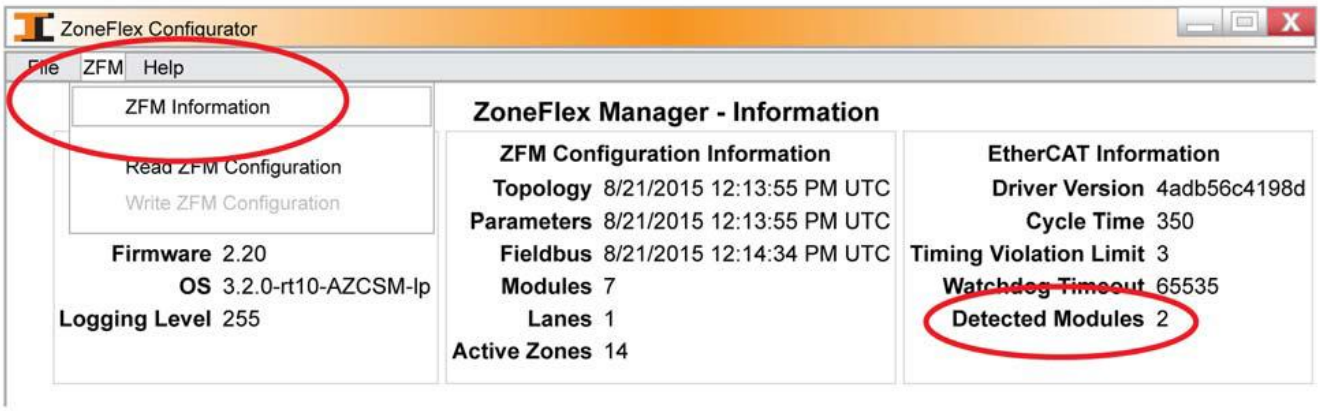
Problem/Status	LED Color/State	Cause	Solution
Green System Status LED	Solid ON	Network is online and the ZoneFlex Module is communicating with the ZoneFlex Manager.	No action needed.
	Flashing	Line Fault detected somewhere in the system. Upstream or downstream modules flash green lights trending in the direction of the line fault.	Follow the lights towards the faulty module. Reconnect or replace the module.
	OFF	Network is offline and the ZoneFlex Module is not communicating with the ZoneFlex Manager.	Check the connection between the ZoneFlex Module and the ZoneFlex Manager.
			Make sure the ZoneFlex Manager is turned ON.
Indicators for Commissioning Mode			
System Status			When all of the LEDs are, at the same time, in the state described in the LED Color/State column, the system is in Commissioning Mode.
Red Status LED	OFF	(Not applicable)	
Amber Status LED	Flashing		
Green Status LED	Solid ON		
Zone Status			
Red Zone LED	OFF	(Not applicable)	
Amber Zone LED	Solid ON	Valve is energized.	
	OFF	Valve is de-energized.	
Green Zone LED	Solid ON	Sensor is clear.	
	OFF	Sensor is blocked.	

9.3 Locating Bad ZFA Module(s) Process

In order to locate bad ZFA modules, you will need to have the following:

- a network extension cable (male-to-female)
- gender changer cables of both types (male-to-male and female-to-female)

1. Connect a laptop to the ZFM
2. Display the ZFM Information screen and note the number of detected modules.



3. Starting at the ZFM, follow the physical path of the ZFA network. Count the ZFA modules and stop at the module that matches the detected count.
4. Disconnect the module's cables from both ports.
5. Connect the outgoing port to the cable that supplies the incoming port using the gender changer cable.
6. Allow up to 15 seconds for the ZFM to detect the module.

   If the network light comes on, that module is good and the next module is bad. If the network light does not come on, that module is bad.
7. Replace the bad module
8. Remove the gender changer cable and connect the new module to the network.

9. Repeat the above process until all of the bad modules have been replaced.

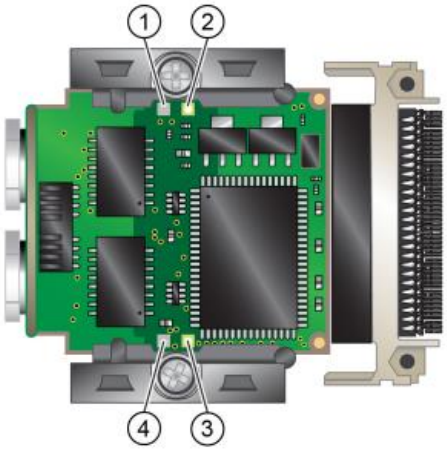
Note: Always check the last module in the daisy chain to ensure its exit port is functioning.

9.4 Troubleshooting Fieldbus Connections

Troubleshooting the fieldbus network connection can be achieved through looking inside of the box for two to four blinking LEDs on the Anybus fieldbus communication card.

The following sections describe the different LED states for each fieldbus type. The descriptions assume the fieldbus connections are oriented toward the left.

Figure 9-3 Standard LED positions and mounting



9.4.1 Profibus

Table 9-2 Network Status/Operation Mode LED

LED State	Description
Off	Not online/No power
Green	Data exchange
Green, flashing	Clear
Flashing Red (1 flash)	Parametrization error
Flashing Red, (2 flashes)	PROFIBUS Configuration Error

Table 9-3 Module Status LED

LED State	Description
Off	Not initialized. Anybus state = “SETUP” or “NW_INIT”
Green	Initialized. Anybus module has left the “NW_INIT” state
Green, flashing	Initialized, diagnostic event(s) present. Extended diagnostic bit is set
Red	Exception error. Anybus state = “EXCEPTION”

Profibus does not use the Link/Activity LEDs.

9.4.2 EtherNetIP

Table 9-4 Network Status LED

LED State	Description
Off	No power or no IP address
Green	Online, one or more connections established (CIP class 1 or 3)
Green, flashing	Online, no connections established
Red	Duplicate IP address, FATAL error
Red, flashing	One or more connections timed out (CIP Class 1 or 3)

Note: A test sequence is performed on this LED during startup.

Table 9-5 Module Status LED

LED State	Description
Off	No power
Green	Controlled by a Scanner in Run state
Green, flashing	Not configured, or Scanner in Idle state
Red	Major fault (EXCEPTION-state, FATAL error, etc.)
Red, flashing	Recoverable fault(s)

Note: A test sequence is performed on this LED during startup.

Table 9-6 Link/Activity LED

LED State	Description
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green, flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flickering	Activity (10 Mbit/s)

9.4.3 DeviceNet

Table 9-7 Network Status LED

LED State	Description
Off	Not online/No power
Green	Online, one or more connections are established
Green, flashing	Online, no connections established
Red	Critical link failure
Red, flashing	One or more connections timed out
Alternating Red/Green	Self test

Table 9-8 Module Status LED

LED State	Description
Off	No power
Green	Operating in normal condition
Green, flashing	Missing or incomplete configuration, device needs commissioning
Red	Unrecoverable fault(s)
Red, flashing	Recoverable fault(s)
Alternating Red/Green	Self test

DeviceNet does not use the Link/Activity LEDs.

9.5 Troubleshooting Help

If you need further assistance, please visit our website at www.intelligrated.com or call our Technical Support Department at 1-877-315-3400.

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