HYTROL
EZ LOGIC ™
ACCUMULATION SYSTEM

GEN3

IOP SOLUTIONS MANUAL

HYTROL CONVEYOR CO., INC.

TABLE OF CONTENTS

Contents

Overview

INTRODUCTION

This manual describes how to install, configure, and use Hytrol's *EZLogic*® Gen3 IOP technology to simplify controls interfacing on conveyors using the *EZLogic*® Gen3 accumulation system. This manual is a supplement to the "*EZLogic*® Gen3 Component Manual." Please read both manuals carefully to familiarize yourself with the system and its operation.

What is IOP?

"IOP" stands for "Input/Output/Power." The IOP system gives the integrator and/or installer one central location to wire all "real time" inputs and outputs to the *EZLogic*® Gen3 system. "Real time" inputs and outputs are signals between *EZLogic*® and other control devices that must be received as soon as they are sent. These include:

- Zone stop inputs
- Slug mode inputs
- Photo-eye outputs
- Other "real time" I/O

The IOP Concept

A typical *EZLogic®*-equipped conveyor may have several locations where control inputs and/or outputs are needed. Figure 1 shows an example of a typical conveyor and the required control wiring.
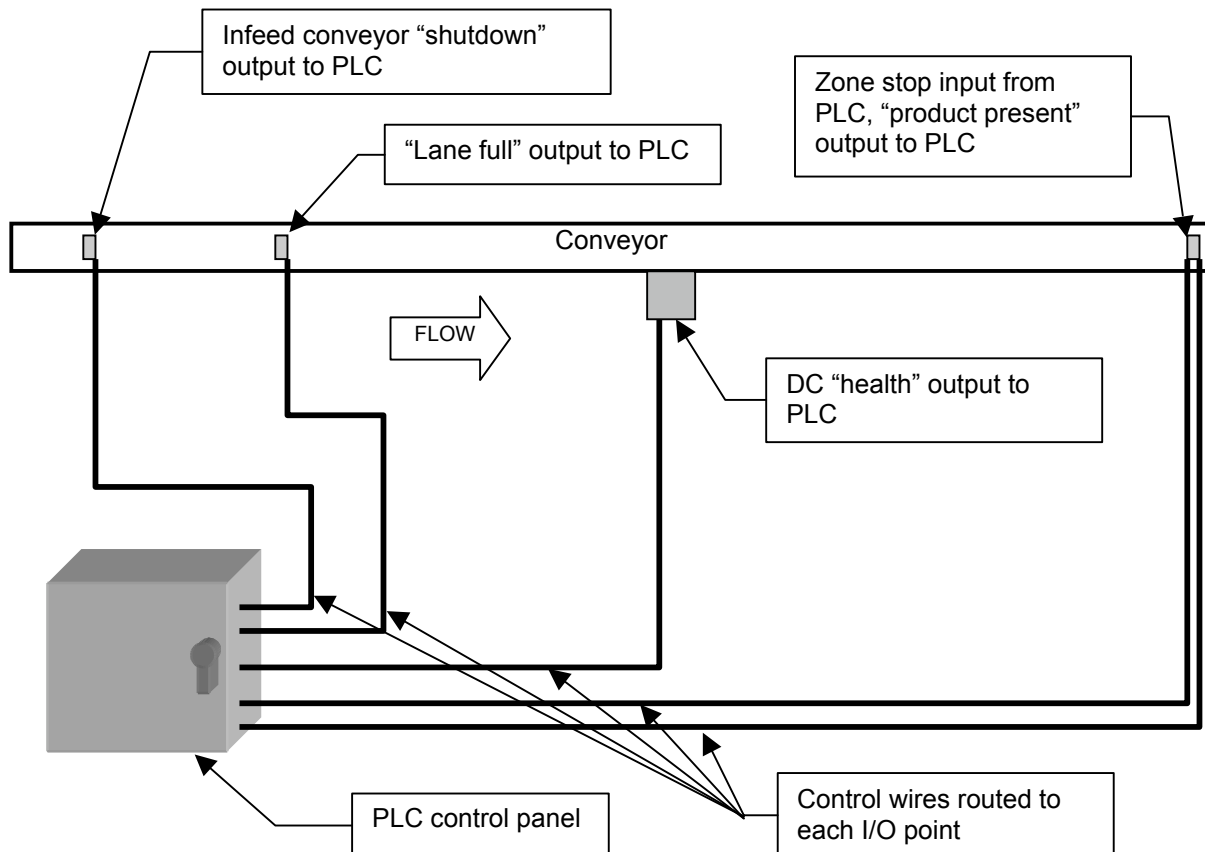
Figure 1—Typical Conveyor Control Wiring Without IOP

In this example, there are four outputs from the conveyor being sent to the PLC, along with one input from the PLC to the conveyor:

- A zone stop input signal to control the accumulation and release of cartons in the discharge zone.

- A "product present" output to inform the PLC of a carton present in the discharge zone.

- A "lane full" output to inform the PLC that cartons have accumulated on the conveyor almost back to the infeed end.

- An "infeed conveyor shutdown" output to inform the PLC that the conveyor cannot accept any more cartons from the upstream conveyor.

- An output from the "DC health" terminals in the power supply to monitor the status of DC power on the conveyor.

In a traditional system each of these I/O points must be wired "locally." That is, control wiring must be installed from the PLC control panel to each input or output at the point on the conveyor where the I/O is used, as illustrated in Figure 1. In many installations this control wiring is run in conduit, adding material and labor costs.

In Figure 2, the same conveyor is illustrated using the IOP system for the control wiring.

Infeed conveyor "shutdown" output to PLC

"Lane full" output to PLC

Zone stop input from PLC, "product present" output to PLC

Conveyor

FLOW

DC "health" output to PLC

Control signals passed through normal zone-to-zone wiring

PLC control panel

Control wires routed to one central location
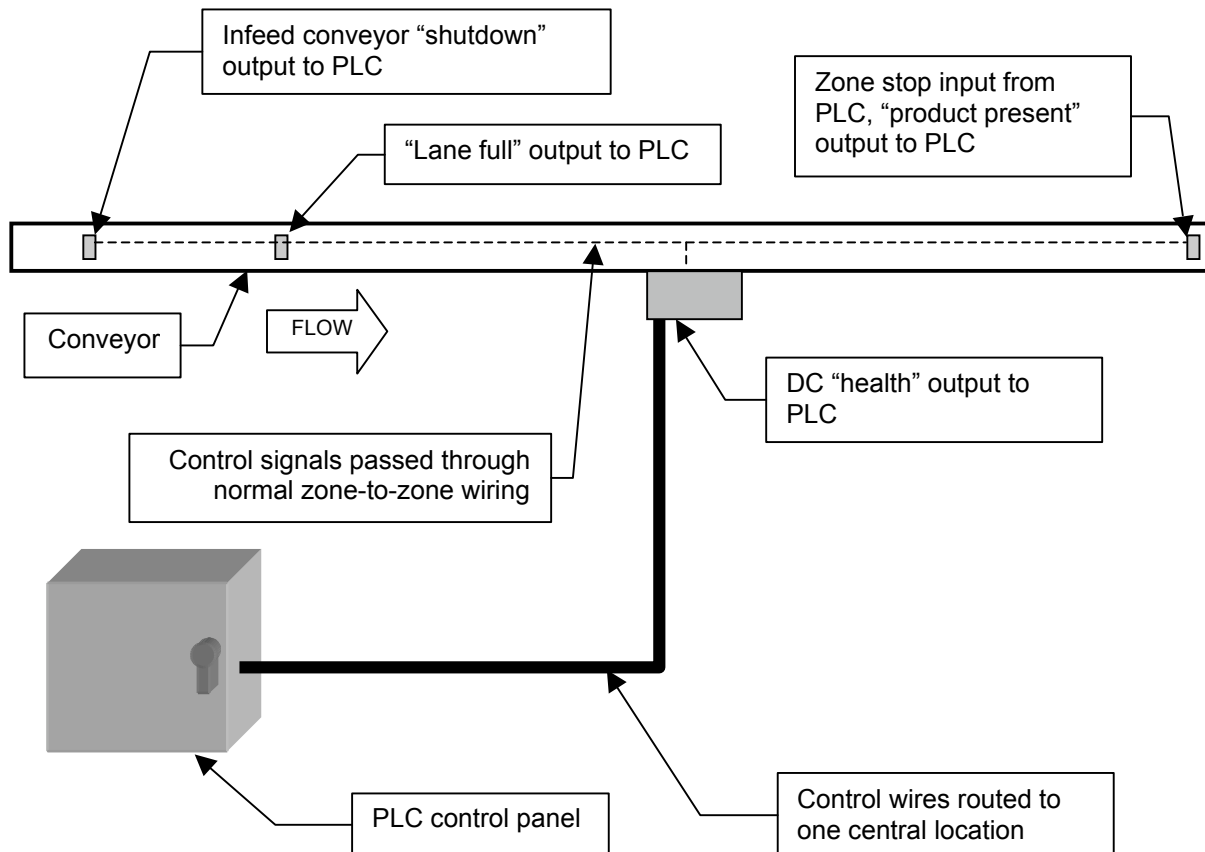
Figure 2—Conveyor Control Wiring Using the IOP System

This example uses the same input and outputs as the previous example. Instead of wiring the I/O points locally, all of the control wiring is routed to one central location, the IOP unit. From there the signals are passed to and from each I/O point using the normal *EZLogic®* zone-to-zone wiring. The *EZLogic®* zone controllers in the I/O locations are configured to send and receive the proper signals to/from the IOP unit and on to the PLC.

IOP Advantages

The IOP system offers several advantages to the integrator, installer, and end user. Some of these advantages are listed below:

- **Reduced installation costs—**The number of conduit runs and junction boxes required, as well as the labor required to install them, is greatly reduced. This eliminates the cost of these items from the installation equation.

- **Easy to reconfigure—**Inputs and outputs can be moved to other zones on the conveyor without having to run new conduit and wiring. I/O can be reconfigured by physically moving zone controllers or by changing them through software.

- **Central location for installation, I/O checking, and troubleshooting—**Since all control wiring goes to one location, installing, debugging, and troubleshooting inputs and outputs is simplified.

- **Can be used for "peer-to-peer" communication between controllers—**A signal from one zone controller may be used as an input to another zone controller several zones away, using the IOP system, without running any wires.

Components

There are four key components of the *EZLogic®* accumulation system that are required to use IOP control functionality. These work with the other components of the system to provide a feature-rich zero-pressure conveyor control package. The four key IOP components are:

- IOP unit

- IOP I/O board(s) installed in the IOP unit

- Enhanced *EZLogic®* zone controllers in locations where I/O operations are required

- *Genesis™* configuration software and PC adapter

IOP Unit

The IOP (Input/Output/Power) unit is a key component of the *EZLogic®* system. The IOP unit performs two tasks:

The unit **provides power** to the other *EZLogic®* components. It converts 100-130 VAC 1ph, or 210-250 VAC 1ph input power into the 27 VDC power required by *EZLogic®*.

The unit is the "hub" and controller for the **IOP control wiring system**. All IOP signals are passed through the IOP unit, and all control wiring is connected here.

Figure 3—IOP Unit

IOP I/O Boards

The I/O boards are the wiring point for control signals and install in the IOP unit (Figure 4). Each I/O board supports up to two I/O points, or **channels**. These may be configured as inputs or outputs as required.

Up to four I/O boards may installed in one IOP unit (Figure 5). This provides a total of eight inputs and/or outputs that may be wired through a single IOP unit.

A channel configured as an input accepts 24 VDC or 115 VAC control signals. The channel is considered "active" when a voltage is applied to the input.

A channel configured as an output provides a solid-state relay, or "contact closure" style output. This output may be used to switch a signal of 80mA @ 24 VDC, or 80mA @ 115 VAC.
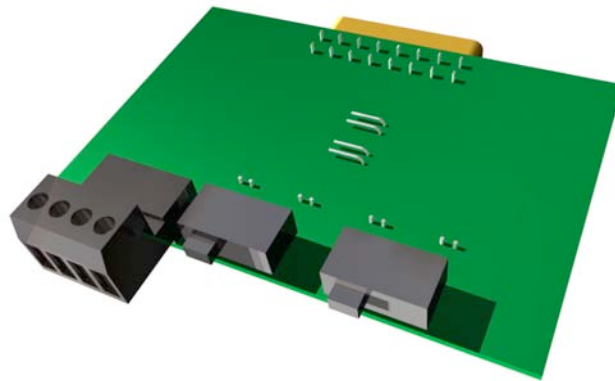
Figure 4—IOP I/O Board
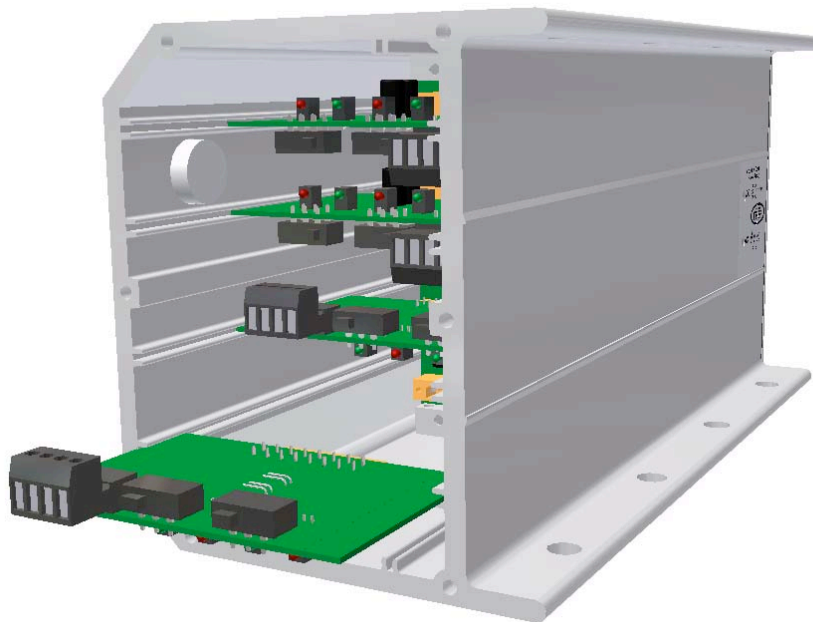
Figure 5—I/O boards installed in IOP Unit

Enhanced *EZLogic*® Zone Controllers

The *EZLogic*® zone controller is the main element of the *EZLogic*® accumulation system. There is one zone controller in every accumulation zone of the conveyor. There are two functional variations of the zone controller. Standard zone controllers provide the functionality needed in most zones of the conveyor. They are identified by the *EZLogic*® logo with a yellow background. Enhanced zone controllers incorporate an expanded function set, including the ability to work with the IOP system. They are identified by the *EZLogic*® logo with a white background.

Figure 6—Enhanced Zone Controller

Enhanced zone controllers must be installed at the locations where control input and/or output is required. Each enhanced controller may be configured to use a variety of input and output functions. The functions are each assigned to a channel, one function per channel. A single enhanced controller can be configured to use as many channels as required, up to the eight available from the IOP unit.

Genesis™ Configuration Software and Cable

The PC adapter cable with Hytrol's *Genesis™* configuration software provides access to the full feature set of the *EZLogic®* zone controller. The cable plugs to the auxiliary port of a zone controller and provides a 9-pin RS232 serial interface to a Windows PC through a built-in serial port or, by the use of a third-party adapter, through an available USB port.
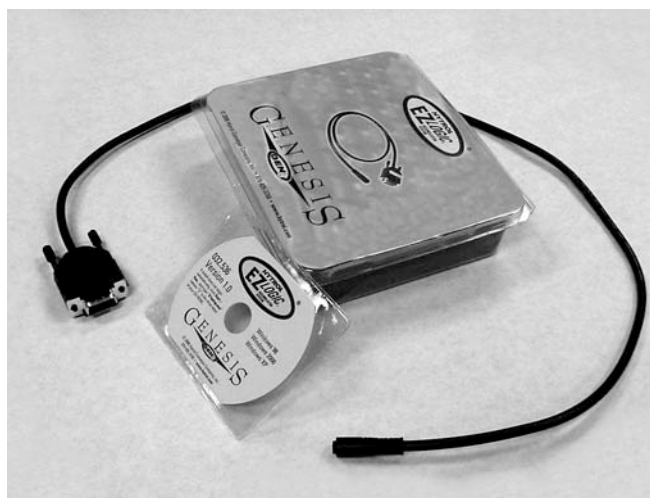
Figure 7—PC Adapter and *Genesis™* Software

Installation and Setup

Hytrol zero-pressure accumulation conveyors equipped with the *EZLogic®* system are pre-assembled at the factory. The proper setup procedure varies from conveyor model to conveyor model. The information in this manual refers to typical installations and, while accurate, may not be complete. Please refer to the installation and maintenance manual for your specific conveyor model for information about the physical setup of your conveyor.

This section describes the basic installation and setup of the components required for IOP control communications. For specific information about zone controller removal and installation, IOP unit installation, etc, please refer to the "*EZLogic®* Gen3 Component Manual."

The following steps are used to set up the IOP system:

1. . . System layout/component selection

2. . . I/O board setup and installation

3. . . IOP unit setup and installation

4. . . Enhanced zone controller setup and installation.

System Layout/Component Selection

The conveyor layout should be considered when selecting the required components for IOP communications. There are three basic layouts that may be used when setting up IOP control wiring. They are:

• Single IOP unit

• Multiple IOP units, one IOP unit used as a wiring hub

• Multiple IOP units used as wiring hubs

Single IOP Unit

A conveyor using a single IOP unit is illustrated in the following figure:

Input/Output locations on the conveyor—one enhanced zone controller in each location

Conveyor

FLOW

Single IOP unit with IOP Enabled (hub)

Control signals passed through normal zone-to-zone wiring

I/O boards installed in IOP unit (up to 4 boards for 8 channels)

PLC control panel

Control wires to/from PLC
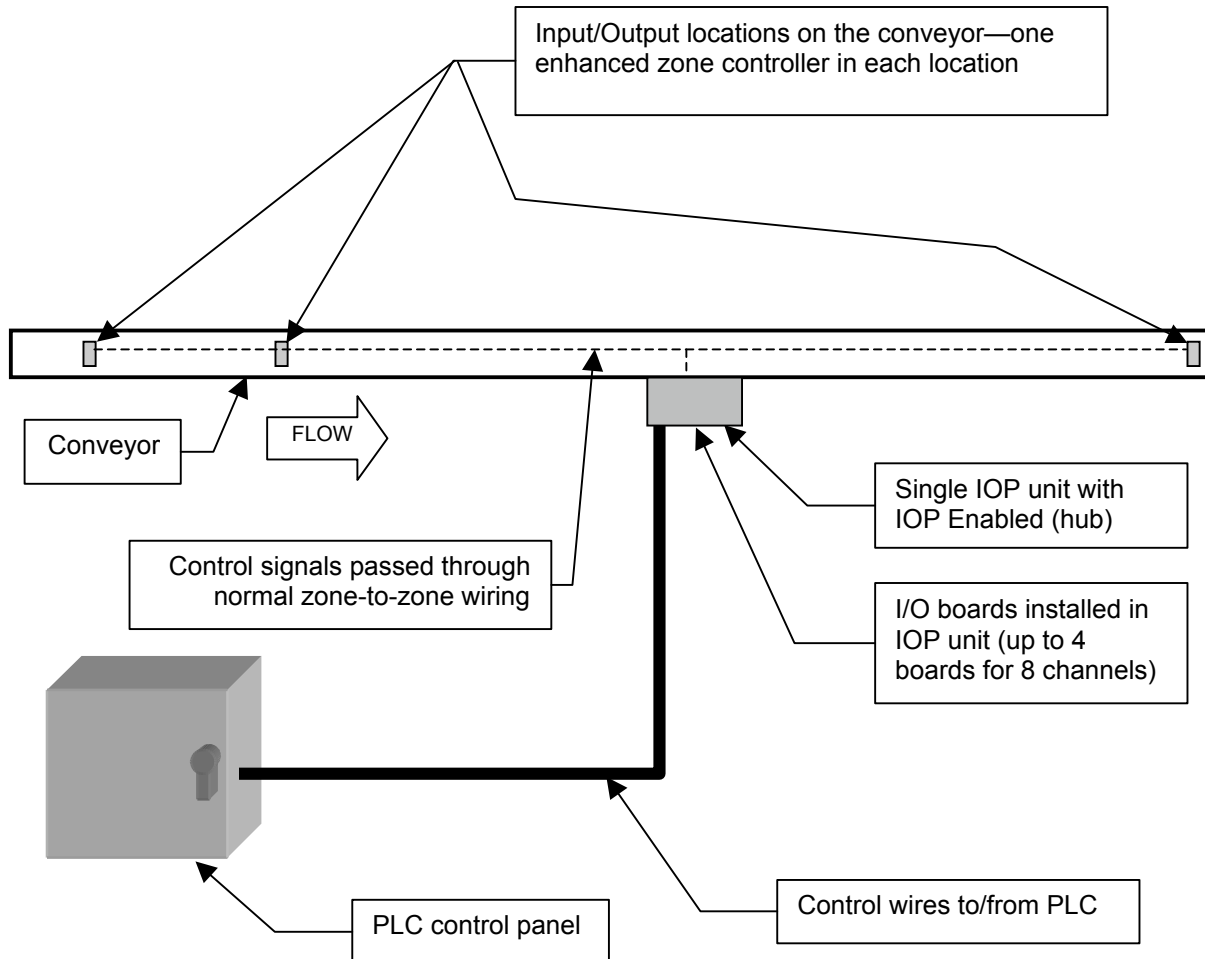
Figure 8—Single IOP Unit

This layout may be used when the system meets all of the following criteria:

- There are 50 zone controllers or less in the conveyor
- The conveyor line is 300 feet or less in length
- There are 8 inputs and/or outputs, or less, required on the conveyor

The single IOP unit layout is the simplest and most cost-effective way to take advantage of IOP control wiring technology. All control wiring is routed from the PLC control panel to the IOP unit.

Multiple IOP Units, One IOP Unit Used as a Wiring Hub

There are times when there is a conveyor line has more than fifty zones in a zone controller chain. It is possible to do this by using multiple IOP units to provide power to the zone controllers. The following illustration shows an example of a conveyor line with multiple IOP units.

Input/Output locations on the conveyor—one enhanced zone controller in each location

Conveyor

IOP unit with IOP Disabled (default)

Power Isolation Cable (032.562)

IOP unit with IOP Enabled (hub)

Control signals routed to the enabled IOP unit ("hub")

I/O boards installed in IOP unit (up to 4 boards for 8 channels)

PLC control panel

Control wires to/from PLC

Figure 9—Multiple IOP Units, One IOP Unit Used as a Wiring Hub

In this layout, two IOP units are used to provide power to the zone controllers on the conveyor line. One of the IOP units is configured to serve as the IOP hub for control wiring, while the other is set to have IOP communications disabled. (This is the default factory setting for the IOP unit. See page 21 for more information.) All control wiring is routed from the PLC control panel to the IOP hub.

A **power isolation cable (032.562)** must be installed between the regions of the zone controller chain powered by separate IOP units. The power isolation cable prevents power from "passing through" from one powered region to another, while allowing normal zone communication and IOP control signals to pass. This

cable prevents electrical interference between multiple power sources in the same zone controller chain.

This layout may be used when the system meets all the following criteria:

- The conveyor line is 300 feet or less in length

- There are 8 inputs and/or outputs, or less, required on the conveyor line

- No more than 50 enhanced zone controllers have I/O assigned to IOP channels

This layout offers the advantage that all inputs/outputs for the entire conveyor line are conveniently routed through one IOP hub.

Multiple IOP Units Used as Wiring Hubs

In applications where more than eight inputs/outputs are required on one conveyor line, or where the conveyor line is longer than 300 feet, multiple IOP hubs may be used. This is illustrated in the following diagram.

Enhanced zone controllers in this area use IOP hub "A"

Enhanced zone controllers in this area use IOP hub "B"

A

B

IOP unit with IOP Enabled (hub)

IOP Isolation Cable (032.570)

IOP unit with IOP Enabled (hub)

I/O boards installed in IOP unit (up to 4 boards for 8 channels)

Control signals routed to the enabled IOP units (hubs)

I/O boards installed in IOP unit (up to 4 boards for 8 channels)
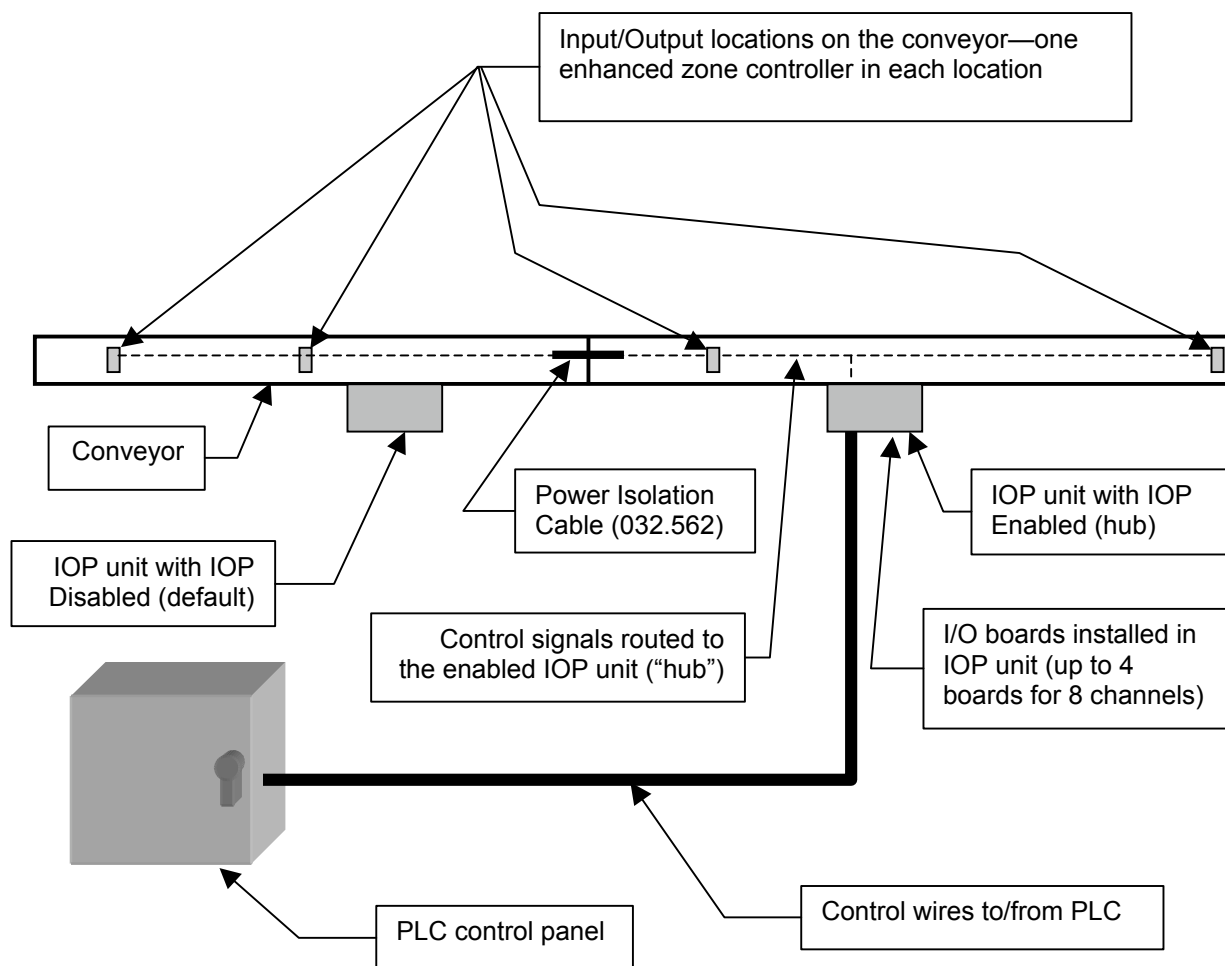
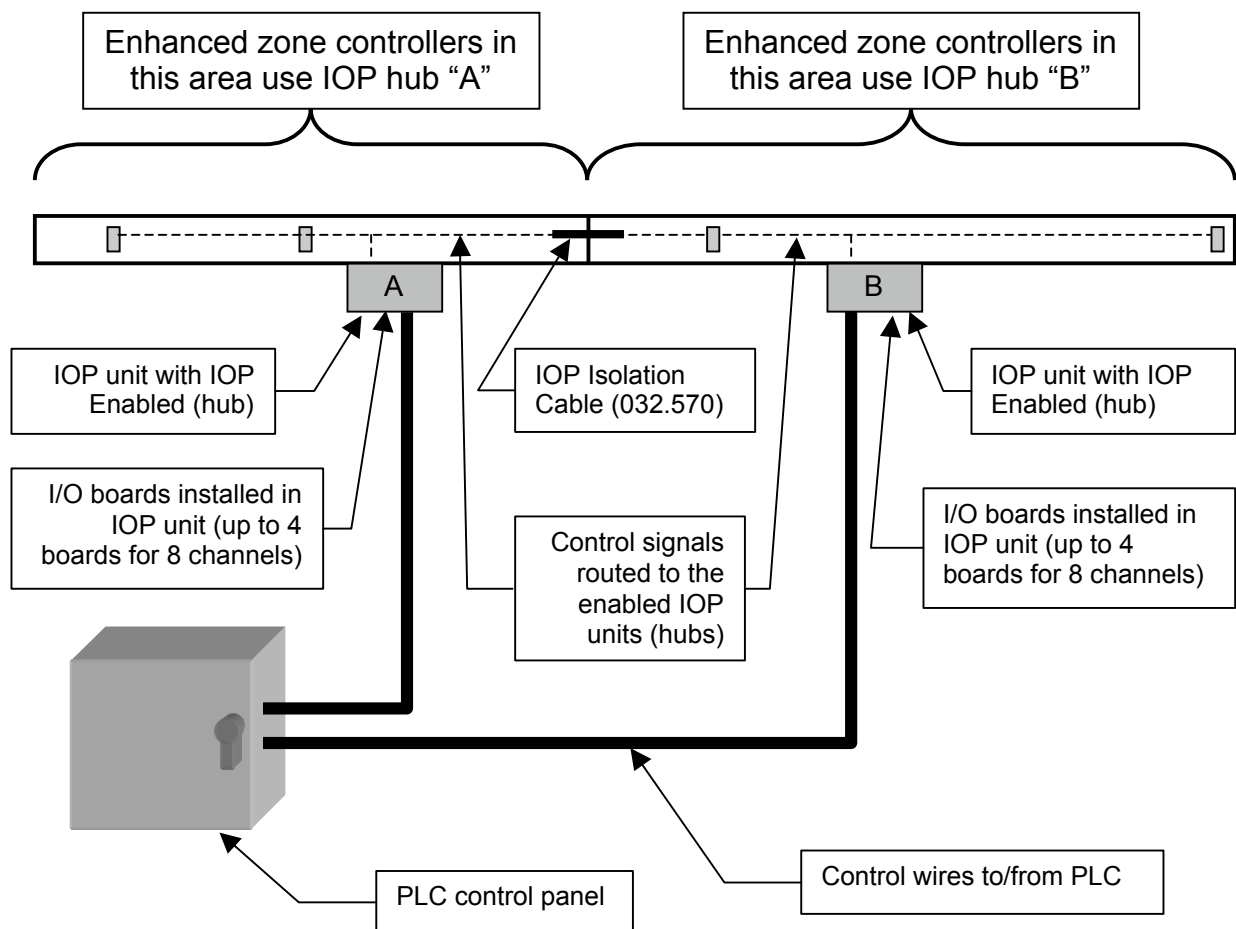Control wires to/from PLC

PLC control panel

Figure 10—Multiple IOP Units Used as Wiring Hubs

In this layout, two IOP units are used to provide power to the zone controllers on the conveyor line. Both units are also configured to serve as IOP hubs for control wiring.

The conveyor is divided into two IOP regions by an **IOP isolation cable (032.570)**. This cable is similar to the power isolation cable in that it prevents power from "passing through" from one region to another, and allows normal zone communication to pass. However, the IOP isolation cable also prevents IOP control signals from passing between regions. This allows each IOP hub to control its associated region independently of the other.

This layout may be used when the system meets all the following criteria:

- Each conveyor region is 300 feet or less in length

- There are 8 inputs and/or outputs, or less, required in each conveyor region

- No more than 50 enhanced zone controllers in each region have I/O assigned to IOP channels

This layout allows the use of more than eight inputs/outputs on the same conveyor line. It also allows the use of IOP control wiring on units longer than 300 feet.

I/O Board Setup and Installation

The IOP I/O boards are the connection point for control wiring from the PLC control panel. Each I/O board supports two IOP communications channels. These channels may be configured for use as inputs, outputs, or one of each.

What are IOP Channels?

The term "IOP channels" refers to the eight communications signals that are available through a single IOP unit. These channels are identified as "IOP channel 1" through "IOP channel 8". They provide connection between the control signals connected to the I/O boards and the enhanced zone controllers in the system.

A channel becomes "active", or on, when either:

- There is an active input signal from the PLC to the appropriate I/O board, or

- An enhanced zone controller has an output assigned to that channel that is active.

An "active" channel has the following effect on IOP components:

- If the I/O board I/O point for that channel is set to "output" then that output to the PLC becomes active ("contact" is closed)

- If an enhanced zone controller has an input assigned to that channel, the input becomes active in the zone controller.

I/O Board Setup

The following illustration shows the key parts of an I/O board.

Backplane connector

A1 A2 B2 B1

SW1

SW2

Input

Output

"Even" channel I/O selector switch

"Odd" channel screw terminals

"Even" channel screw terminals

"Odd" channel I/O selector switch

Green LED, on when switch is set to "input" mode

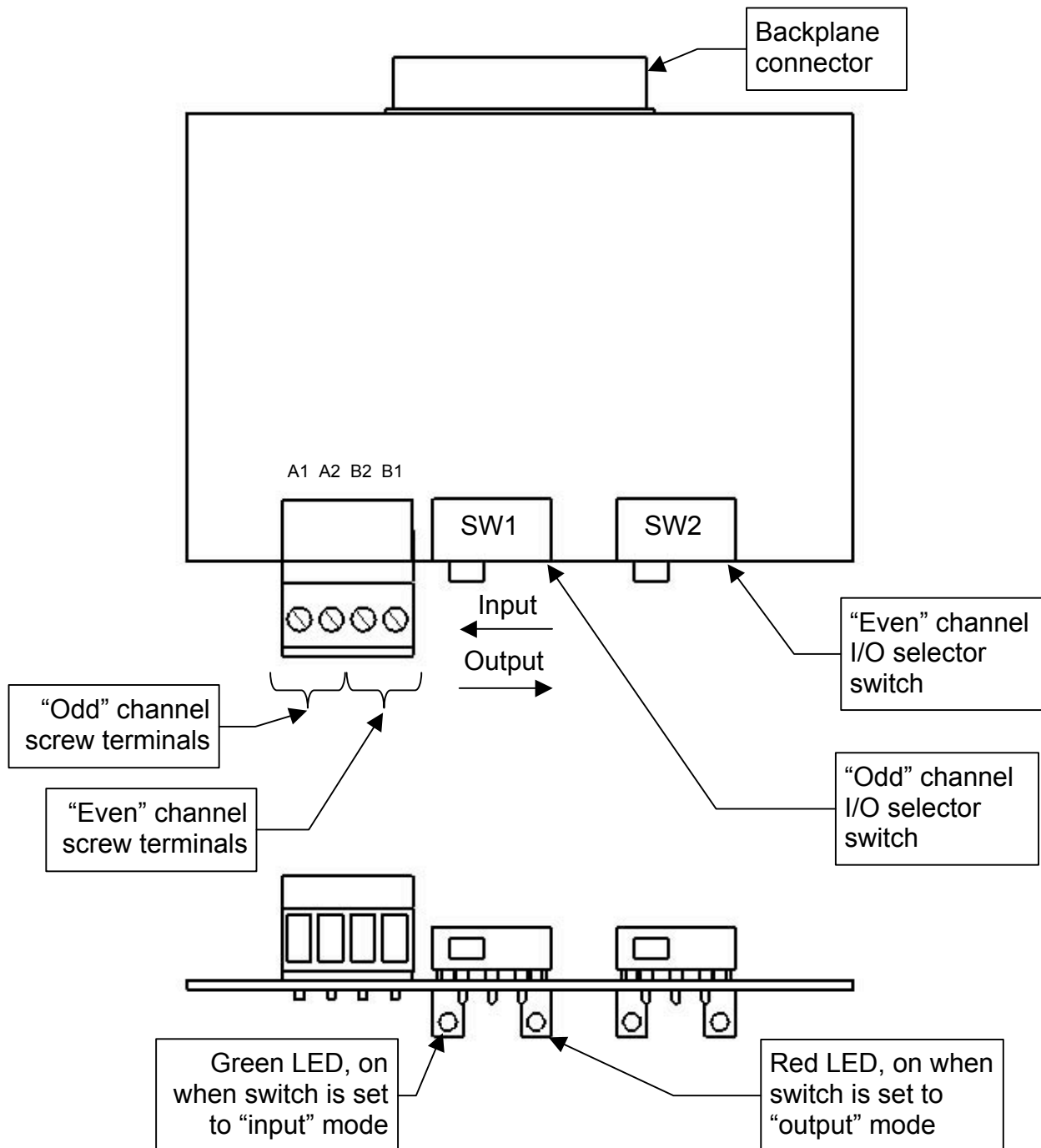Red LED, on when switch is set to "output" mode

Figure 11—I/O Board Setup

The following is a description of the components of the I/O board identified above and their purpose:

Backplane Connector

The backplane connector connects the I/O board to the backplane inside the IOP unit.

Screw Terminals

The screw terminals are where control wires from the PLC are wired to the I/O board. This is a convenient 4-position "plug in" screw terminal, which means that the control wires are connected by screw clamps to a plug, which is then plugged into the I/O board.

The two terminals labeled "A1" and "A2" on the board correspond to an "odd-numbered" channel—1, 3, 5, or 7. The terminals labeled "B1" and "B2" correspond to an "even-numbered" channel—2, 4, 6, or 8. The actual channels assigned to these terminals are determined by the "slot" in the IOP unit where the board is installed. With the IOP unit positioned in the upright position, a board installed in the bottom slot is assigned channels 1 and 2, the board in the second slot from the bottom is assigned channels 3 and 4, and so on. See Figure 12.
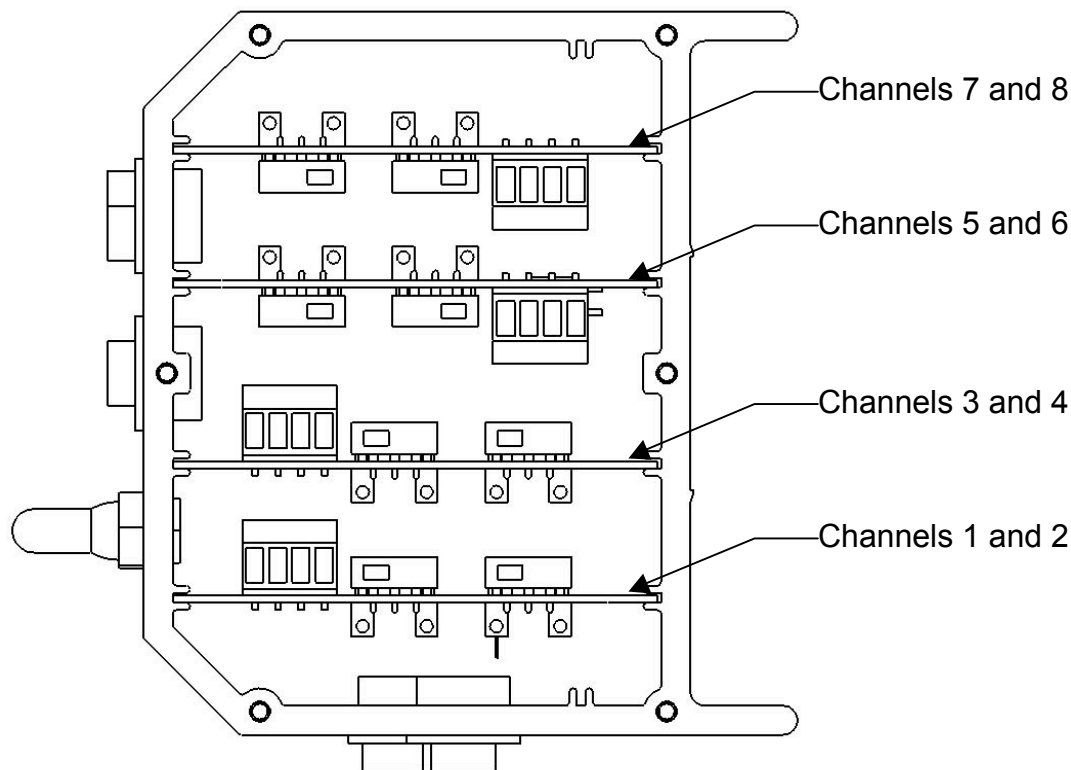

Figure 12—IOP I/O Board/Channel Assignments

The inputs/outputs on these screw terminals are not polarity-sensitive.

I/O Selector Switches

The I/O selector switches determine if the I/O board interprets each channel as an input or an output. The switch nearest the screw terminals, labeled "SW1", selects the "odd" channel type, while the switch farthest from the screw terminals, labeled "SW2", selects the "even" channel type.

To set up a channel as an INPUT—slide the appropriate switch toward the screw terminals.

To set up a channel as an OUTPUT—slide the appropriate switch away from the screw terminals.

IMPORTANT! — Make sure the proper input/output setting has been selected before operating the system and/or communicating with the PLC. Damage to components may result if the incorrect setting is selected.

Indicator LEDs

There are four indicator LEDs (two red, two green) located on the opposite side of the I/O board from the selector switches. One green LED and one red LED are associated with each channel, opposite the appropriate switch for the channel.

When the I/O boards are installed in the IOP unit and power is applied, the LEDs indicate the selected I/O type for their associated channel:

Red LED illuminated—The channel is set up as an OUTPUT

Green LED illuminated—The channel is set up as an INPUT

I/O Board Installation

To install the I/O boards, proceed as follows:

1. . . Loosen the captive screws holding the end plate opposite the "switch end" of the IOP unit. You may leave one screw loosely screwed into the unit to allow the end plate to swing out of the way.

2. . . Orient the I/O board so that the backplane connector enters the IOP unit first. For the lower two slots, turn the board so the switch-side of the board is up. For the upper two slots, turn the board so that the LED-side of the board is up.

3. . . Insert the I/O board into the appropriate slot by engaging the side edges of the board in the guide slots of the IOP housing. Press carefully but firmly on the I/O board until the backplane connector is firmly seated in its mating connector in the IOP unit.

4. . . Route the control wires from the PLC through one of the entry holes provided in the IOP housing (you must remove a plug from the hole you wish to use). Connect the control wires to the proper terminals.

5. . . Set the selector switches for both channels to "input" or "output" as required.

6. . . Replace the end plate.
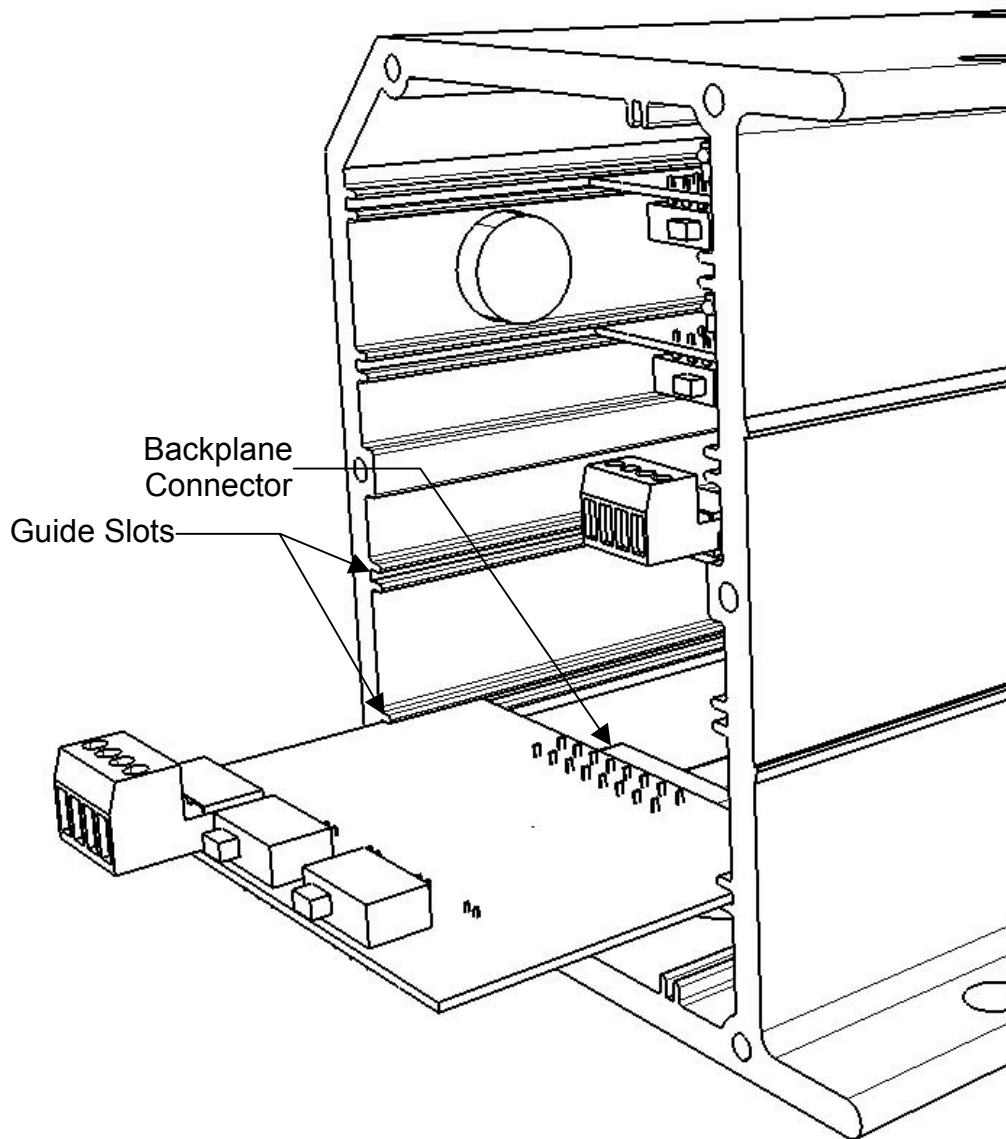
Backplane
Connector

Guide Slots

Figure 13—Inserting the I/O Board Into the IOP Unit

IOP Unit Setup and Installation

Installation of the IOP unit is described in the "*EZLogic®* Gen3 Component Manual". Please be sure to follow all instructions found in that manual when installing the IOP unit.

In most cases the IOP unit is shipped from the factory with no I/O boards installed and with IOP hub capability disabled. In order to use the IOP unit as an IOP wiring hub, one or more I/O boards must be installed in the IOP unit and IOP hub capability must be enabled.

Installing I/O Boards in the IOP Unit

Follow the instructions on page 19 to set up and install the I/O board(s) in the IOP unit.

Enable/Disable IOP Hub Capability

Use the following steps to enable or disable IOP hub capability in an IOP unit

1. . . Loosen the captive screws holding the end plate on the "switch end" of the IOP unit. You may leave one screw loosely screwed into the unit to allow the end plate to swing out of the way.

2. . . Locate the "IOP Enable" jumper inside the IOP unit. The IOP enable jumper is located near the ground lug (see Figure 14).

3. . . To enable or disable IOP hub capability, position the IOP enable jumper as shown in Figure 15.
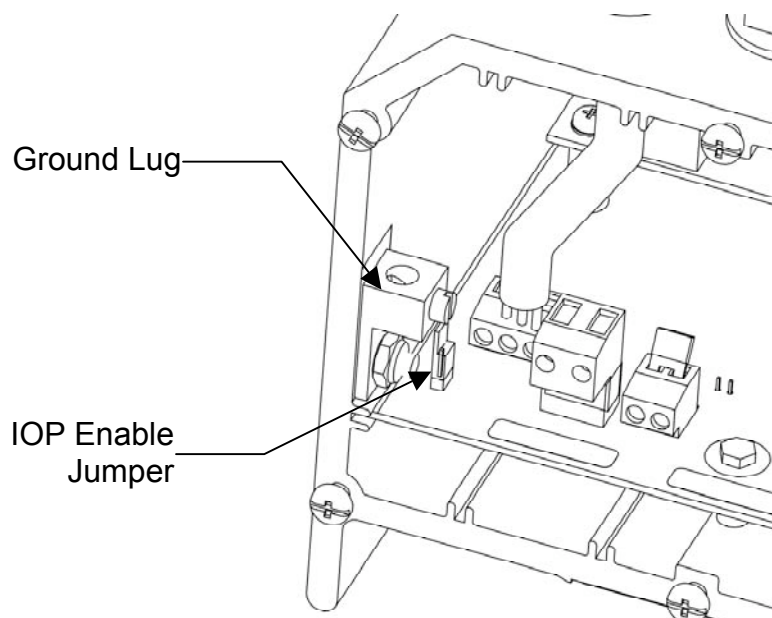
4. . . Replace the end plate.

Ground Lug

IOP Enable Jumper

Figure 14——IOP Enable Jumper Location

IOP Disabled   IOP Enabled
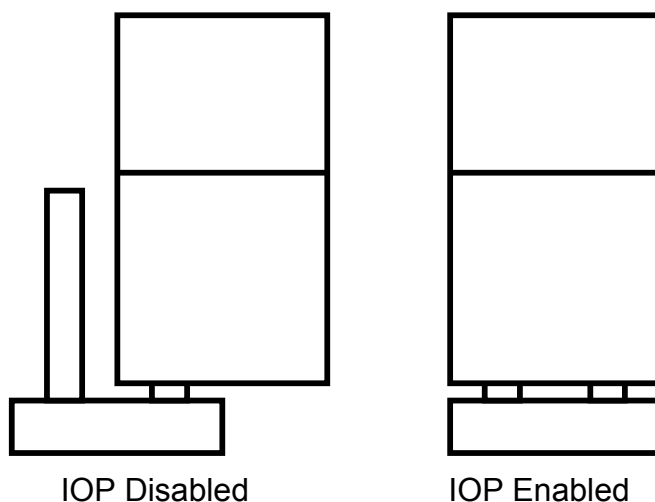
Figure 15—IOP Enable Jumper Positions

Enhanced Zone Controller Installation and Setup

Enhanced *EZLogic*® zone controllers must be installed at the zone locations where an input and/or output is required. Refer to the *EZLogic*® Gen3 Component manual for instructions on how to install the zone controllers.

Hytrol's *Genesis™* configuration software and a PC adapter cable are required to configure an enhanced zone controller for use with the IOP system. Follow the instructions provided in the *EZLogic*® Gen3 Component Manual to install *Genesis™* and to familiarize yourself with its use.

Connecting the PC to a Zone Controller

1. . .   Connect the PC adapter cable to an available 9-pin serial port on the PC. If the PC does not have a serial port, a USB-to-serial adapter (supplied by others) may be used.

2. . .   Connect the other end of the PC adapter cable to the auxiliary port of the zone controller.

Configuring IOP Settings

Once the PC is connected to the enhanced zone controller, start the *Genesis™* software. *Genesis™* will read the current settings from the zone controller and display them as shown in Figure 16.
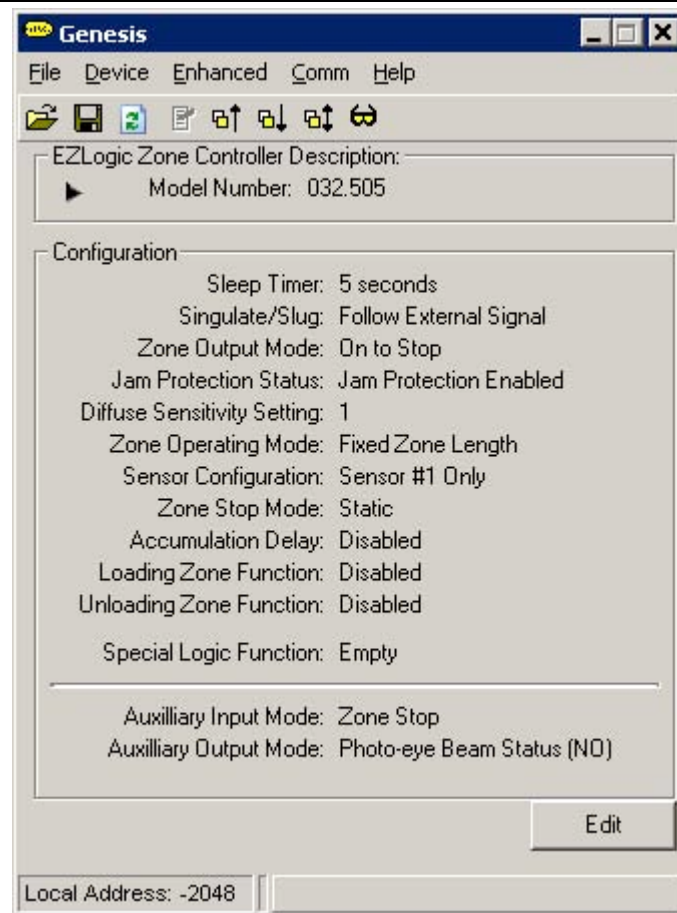
Figure 16— *Genesis*™ Main Screen

From the "Enhanced" menu, select "IOP Configuration" as shown in Figure 17.
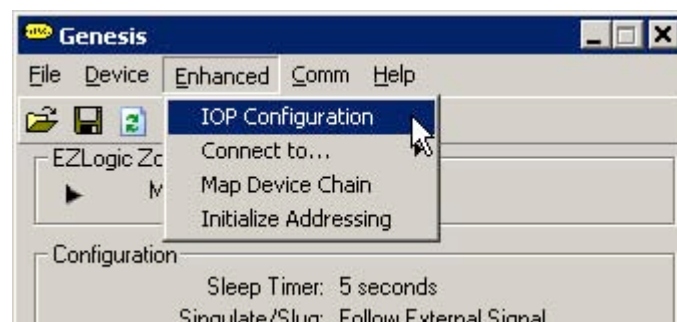
Figure 17—Selecting "IOP Configuration"

This will open the "IOP Configuration" Dialog. This screen is used to select various inputs and outputs to assign to one of the eight IOP channels. The default state of some of the outputs may be modified in the same dialog.
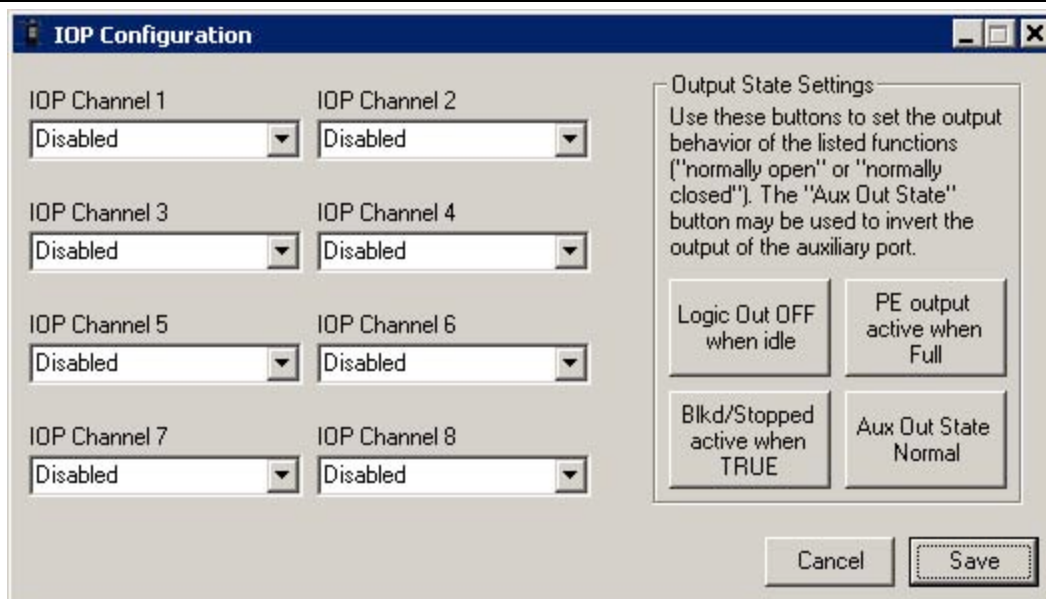
Figure 18—IOP Configuration Dialog for Series A2 Controllers

If the zone controller is labeled as series A3 or higher (and/or *Genesis*™ indicates that the firmware revision of the controller as 2.0 or higher) then a slightly different dialog is displayed.
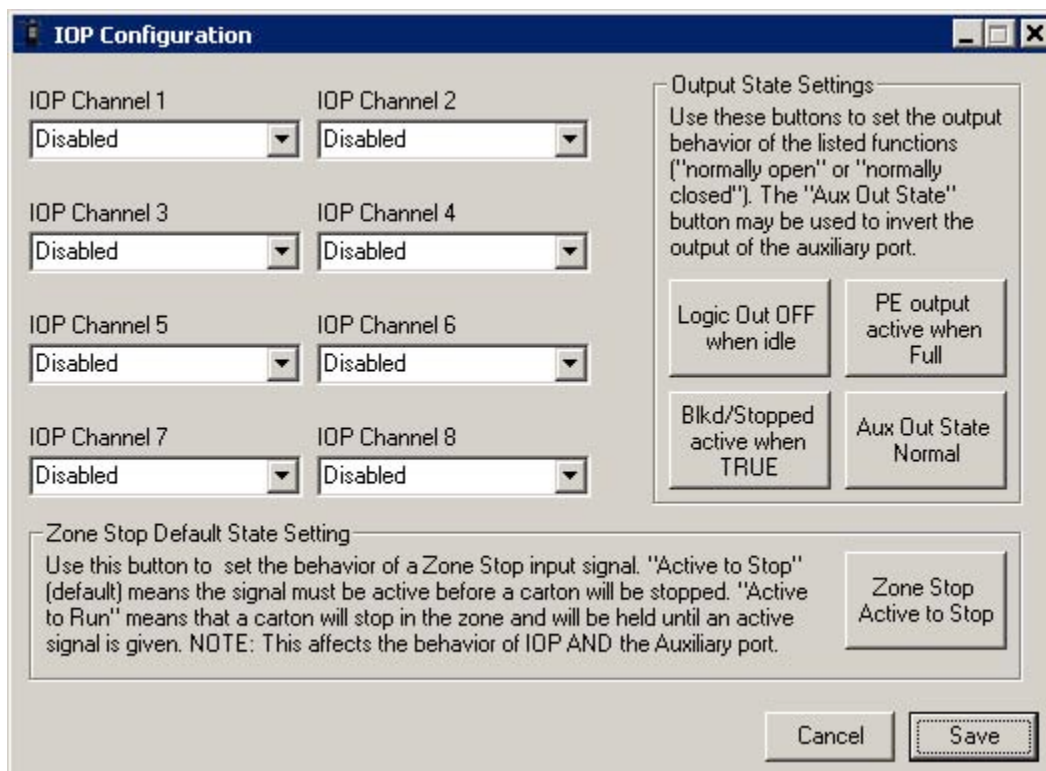
Figure 19—IOP Configuration Dialog for Series A3 and Higher Controllers

IOP Channel Boxes

The IOP channel boxes allow you to configure the IOP channel settings. One input or output may be assigned to a channel. Inputs/outputs for this zone controller may be assigned to any or all channels, as required.

Each channel has a list of available inputs and outputs that may be assigned in the zone controller to that channel. The following inputs and outputs are available:

Disabled

This selection disables IOP communication with the channel by this zone controller.

Zone Stop Input

This selection causes the zone controller to interpret an active signal on this channel as a zone stop input.

Slug Control Input

This selection causes the zone controller to interpret an active signal on this channel as a "slug" signal. When the zone controller receives a slug signal it sends a signal to all other zone controllers in the chain to operate in slug mode.

Wake-Up Input

This selection causes the zone controller to interpret an active signal on this channel as a "wake-up" signal. When the zone controller receives this signal it "wakes up" (if it is in sleep mode). If the zone controller is in the infeed zone of the controller chain, selecting this input will allow the zone to "go to sleep" until it detects a load or the wake-up signal becomes active.

Logic Input

This selection causes the zone controller to interpret an active signal on this channel as an input to a special logic function. If there is a special logic function loaded into the zone controller that uses a logic input (such as the "Zone Kill" function), the logic function will "see" the input and use it in the operation of the function.

Directional Input

This selection causes the zone controller to interpret an active signal on this channel as a directional input. When the zone controller receives a directional signal it generates a "reverse direction" signal that is sent to the other zone controllers in the chain. To use the reverse feature, the following components must be used:

- Enhanced remote zone controllers (032.507), Series A3 (firmware revision 2.0) or later, in all zones of the reversing conveyor
- Dual transducers in all zones

- *Genesis™* software and PC adapter (to configure this setting)

If a reverse input is inactive, *EZLogic®* operates in the default forward direction (defined by the way the cordsets are installed) using transducer #1 as the sensor. If a reverse input is active, *EZLogic®* operates in the reverse direction, using transducer #2 as the sensor. **NOTE:** The directional input signal only affects the logical operation of the *EZLogic®* controls. It does not reverse the direction of the conveyor's drive mechanism. The conveyor drive itself must be reversed to operate in the reverse direction.

Transducer Output

This selection causes the zone controller to assign a transducer (sensor) output to this channel. When the sensor of the zone controller detects a carton a signal is sent to the channel.

Blocked/Stopped Output

This selection causes the zone controller to assign a "zone blocked and stopped" output to this channel. When the zone controller both sees a carton and has stopped driving (indicating that cartons are accumulated back to this point) a signal is sent to the channel.

Directional Output

This selection causes the zone controller to assign an "direction of flow" output to this channel. An output signal is given when the zone controller is operating in reverse mode. This output may be used when an action needs to be triggered on another conveyor or other device when the conveyor is operating in reverse mode. **NOTE**: reverse mode is only available when using enhanced remote zone controllers (032.507) labeled Series A3" or later (and/or with firmware revision 2.0 or later) and dual transducers.

Logic Output

This selection causes the zone controller to assign an output generated by a special logic function to this channel. If there is a special logic function loaded that generates a logic output (such as the "PE On-Delay" and "PE Off-Delay" functions) that output is sent to the channel.

Jam Detected

This selection causes the zone controller to assign a "jam detected" output to this channel. If the zone controller is operating in "slug mode" and detects a jam, this signal is sent to the channel. The signal is only generated when this specific controller detects the jam, so to be effective multiple zone controllers should have "jam detected" assigned to the same channel.

Short Circuit, Low Voltage, Over Current

These selections cause the zone controller to assign the named output to this channel. If the selected condition exists in the zone controller a signal is sent to the channel. The signal is only generated when the selected condition exists in

this zone controller. However, multiple enhanced zone controllers may be configured to assign the output to the same channel. This provides a way to monitor some line conditions through the IOP system.

Output State Selection

The buttons on the right hand side of the IOP Configuration dialog allow the output of some of the available outputs to be modified. These options are described below.

Aux Out State Normal (Inverted)

This button toggles between "Aux Out State Normal" and "Aux Out State Inverted". This button may be used when the user wishes to use both an IOP channel and the auxiliary port of the zone controller to retrieve the same output. When the button is set to "normal" the auxiliary port signal state is the same as the IOP channel state. When the button is set to "inverted" the auxiliary port signal state is opposite the IOP channel state.

PE Output Active When Full (Empty)

This button toggles the output state of a transducer output between being active when the zone is full (carton detected) and being active when the zone is empty (no carton detected).

Blkd/Stopped Active When True (False)

This button toggles the output state of a blocked and stopped output between being active when a blocked and stopped condition exists, and being active when a blocked and stopped condition does NOT exist.

Logic Out OFF (On) When Idle

This button toggles the output state of a logic function-generated output between being off (inactive) when the logic function is not running, and being on (active) when the function is not running.

Zone Stop Default State Selection

If the zone controller is labeled as series A3 or higher (and/or *Genesis™* indicates that the firmware revision of the controller as 2.0 or higher) then the default behavior of the zone stop function may be selected using the button shown in the lower part of the dialog. The choices are described below.

Zone Stop Signal "Active to Stop" (default)

An active input to the controller "arms" the zone stop function to stop the next carton detected. When the signal is inactive, cartons flow through normally. This is the same as earlier *EZLogic®* versions.

Zone Stop Signal "Active to Run" ("failsafe")

The zone stop function is "armed" when the input is inactive. An active input to the controller "disarms" the zone stop feature. This means that a carton that enters the zone will be stopped by default. An active signal is required to release the carton. This setting may be used at the discharge zone of any conveyor when it is important that product is held back should a controls failure occur.

To Configure an Enhanced Zone Controller:

1. . .   Connect the PC to the zone controller and start *Genesis™*.

2. . . Click on "Enhanced—IOP Configuration" to bring up the IOP Configuration dialog

3. . .   Select the IOP channel you wish to use. Be sure to select the channel that corresponds to the I/O board channel to which the PLC control wires are connected.

4. . .   Select the type of input or output you wish to assign to the channel.

5. . .   Set the required output state for the selected output, if applicable.

6. . .   If another channel is being assigned in the same zone controller, repeat steps 3 through 5 for the remaining channel(s).

Notes on IOP System Configuration

The following are some tips and reminders about IOP system configuration for reference:

- Once a zone controller has been configured and has one or more inputs/outputs assigned to an IOP channel, the configuration is maintained until changed again using the *Genesis™* software. This feature makes it easy to move an input or output to another zone. For example, suppose an enhanced zone controller is located in the 10th zone from the discharge end of the conveyor and is configured to provide a transducer (photo-eye) output to the PLC. If the user later decides that this output should be located in the 12th zone, the zone controllers in zones 10 and 12 may simply be swapped. The configured controller, now located in zone 12, will continue to provide the output to the PLC from the new location.

- Keep a record of the location of zone controllers configured for IOP communication along with their configuration information (input/output type, channel assignments, etc). This will prove very valuable should any changes be required in the future.

- Only one IOP unit should be configured as an IOP hub (IOP communications enabled) in one zone controller chain, unless an IOP isolation cable is used between IOP regions.

- A zone controller chain using IOP communications and one IOP hub should not exceed 300 feet in length.

- No more than 50 enhanced zone controllers may be configured to use IOP communications with one IOP hub.

IOP System Operation

The IOP system is a powerful tool for providing real-time communications between an *EZLogic*®-equipped conveyor and external controls. Once the components have been installed and configured, the system is ready for operation.

This section of the manual describes the basic operation of the IOP system. Read this section if you wish to have a more thorough understanding of how the IOP system works.

IOP Channels

As mentioned previously in this manual, the term "IOP channels" refers to the eight communications signals that are available through a single IOP unit. These channels are identified as "IOP channel 1" through "IOP channel 8". They provide connection between the control signals connected to the I/O boards and the enhanced zone controllers in the system.

Figure 20 illustrates a basic IOP communication setup using one IOP channel, one enhanced zone controller, and one I/O board.

The I/O board supports two IOP channels. As described in the illustration, when the I/O board is installed in the bottom slot of the IOP unit, these two channels are assigned as channel 1 and channel 2. In the illustration, channel 2 is not being used and is shown for reference only.

Since the example in the illustration is describing the signal as a zone stop input, the I/O selector switch for channel 1 is set to the "input" position. When an input is applied to the channel 1 terminals, it causes channel 1 to become "active".

The zone controller is configured to look for an active signal on channel 1 and to interpret this as a zone stop input. Any time channel 1 becomes active the zone stop function of the zone controller will be triggered.

Legend

——— Inactive signal/channel

━━━ Active channel

— — Active input

········· Active output

Enhanced Zone Controller

IOP "Channels"

2

1

An output from a PLC (or other external control device) is wired to the first two screw terminals on an I/O board installed in the bottom slot of the IOP unit (these terminals correspond to channel 1). The channel 1 I/O selector switch is placed in the "input" position.

An input from the external control device (115 VAC/24 VDC) provided to the terminals will cause channel 1 to become "active".

Using the "Genesis" configuration software, the controller is set up so that an active signal on channel 1 is interpreted as a "zone stop" input to this controller. Any time channel 1 is "active" (a signal has been applied to channel 1) this controller will detect that and will "fire" its zone stop function, just as if an auxiliary input cable were connected to the controller with an active zone stop signal.

I/O Board

1   2

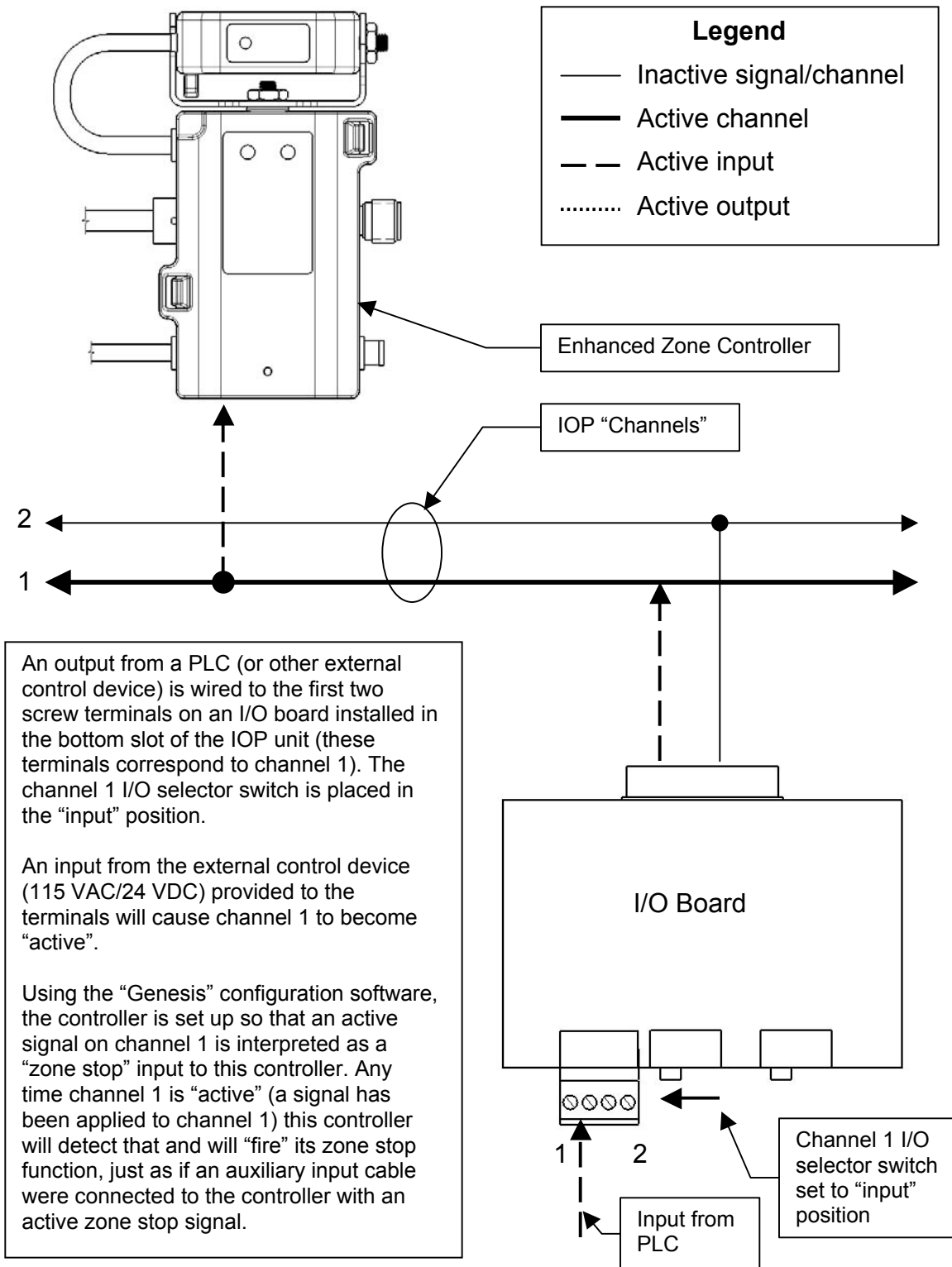Channel 1 I/O selector switch set to "input" position

Input from PLC

Figure 20—Basic IOP Communication, One Channel

Figure 21 shows a system with the maximum of four I/O boards installed in the IOP unit. Three of the channels, 1, 5, and 7, are being used for IOP communications. The other five channels are not being used, and are shown for reference only.

In the example, controller "A" has an output assigned to channel 1. This may be any of the outputs described under "IOP Channel Boxes" beginning on page 25. When the zone controller triggers this output signal, it is sent to channel 1, which becomes "active." This in turn triggers the output on the channel 1 terminals of the first I/O board, thus sending the signal to the PLC.

Controller "C" has an output assigned to channel 7. Again, this may be any of the outputs described under "IOP Channel Boxes" beginning on page 25. When the zone controller triggers this output signal, it is sent to channel 7, which becomes "active." This in turn triggers the output on the channel 7 terminals of the fourth I/O board, thus sending the signal to the PLC.

Controller "C" also has an input assigned to channel 5. This may be any of the inputs described under "IOP Channel Boxes" beginning on page 25. When channel 5 becomes active as a result of a signal from the PLC to the channel 5 terminals on the third I/O board, controller "C" interprets this as the assigned input and responds accordingly.

Controller "A"   Controller "B"   Controller "C"

Output assigned to channel 1

Output assigned to channel 7

IOP "Channels"

Input assigned to channel 5

8
7
6
5
4
3
2
1

1   2   3   4   5   6   7   8

Signals to/from PLC

Legend

—— Inactive signal/channel
—— Active channel
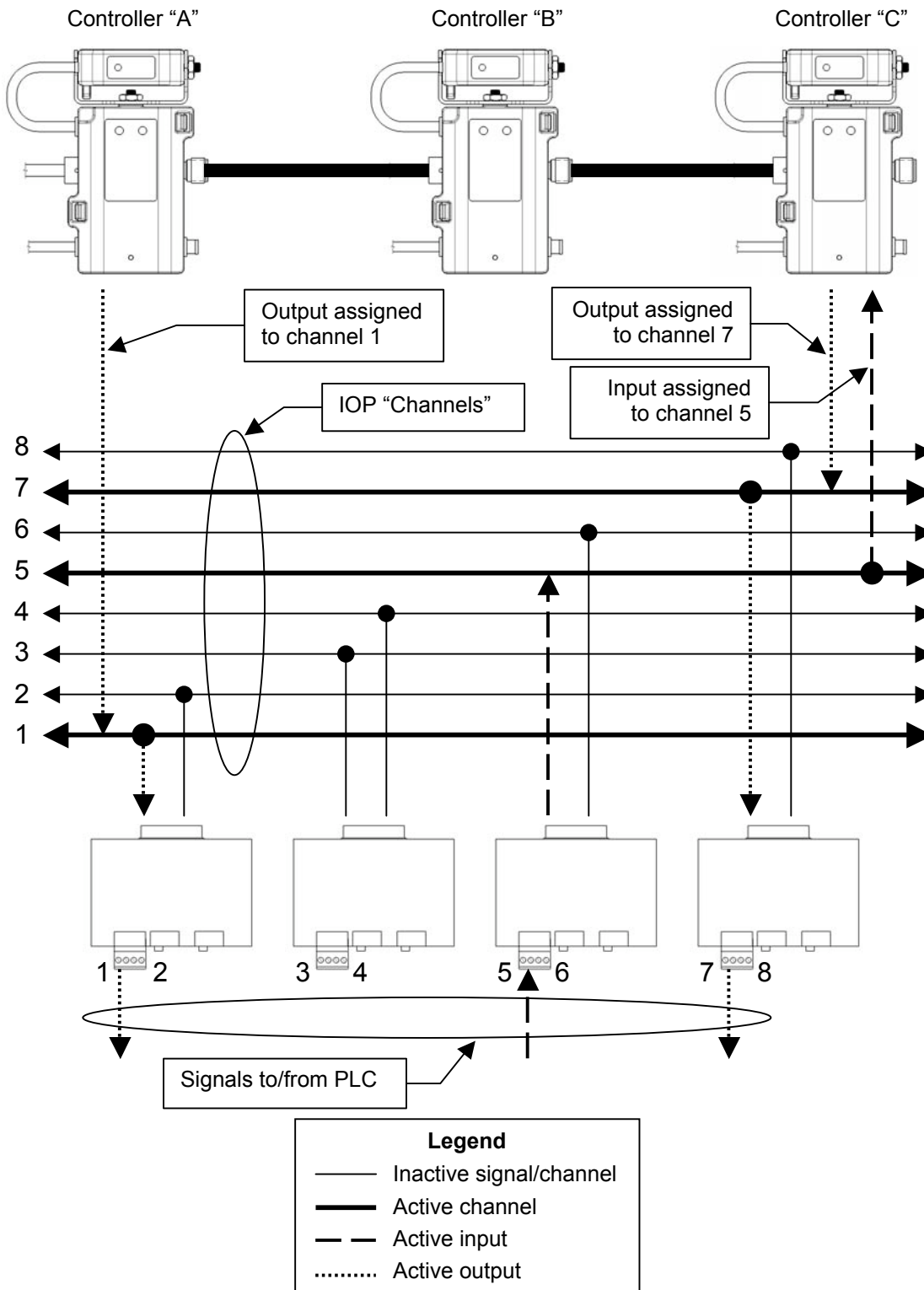– – Active input
.... Active output

Figure 21—IOP Communications, Three Channels

Using the IOP System for "Peer-to-Peer" Communications

There may be times when it is desirable to use an output from one *EZLogic®* zone controller as an input to another zone controller in the same controller chain. For example, you might want the zone controller in the tenth zone of the conveyor to signal the first (discharge) zone when zone 10 is blocked and stopped, so that the first zone can release the contents of the ten zones.

The IOP system may be used for such "peer-to-peer" communications. Refer to the example in Figure 22.

Controller "A"   Controller "B"   Controller "C"

Output assigned to channel 5

Input assigned to channel 5

8 7 6 5 4 3 2 1

IOP "Channels"

Legend
— Inactive signal/channel
━ Active channel
– – Active input
.... Active output

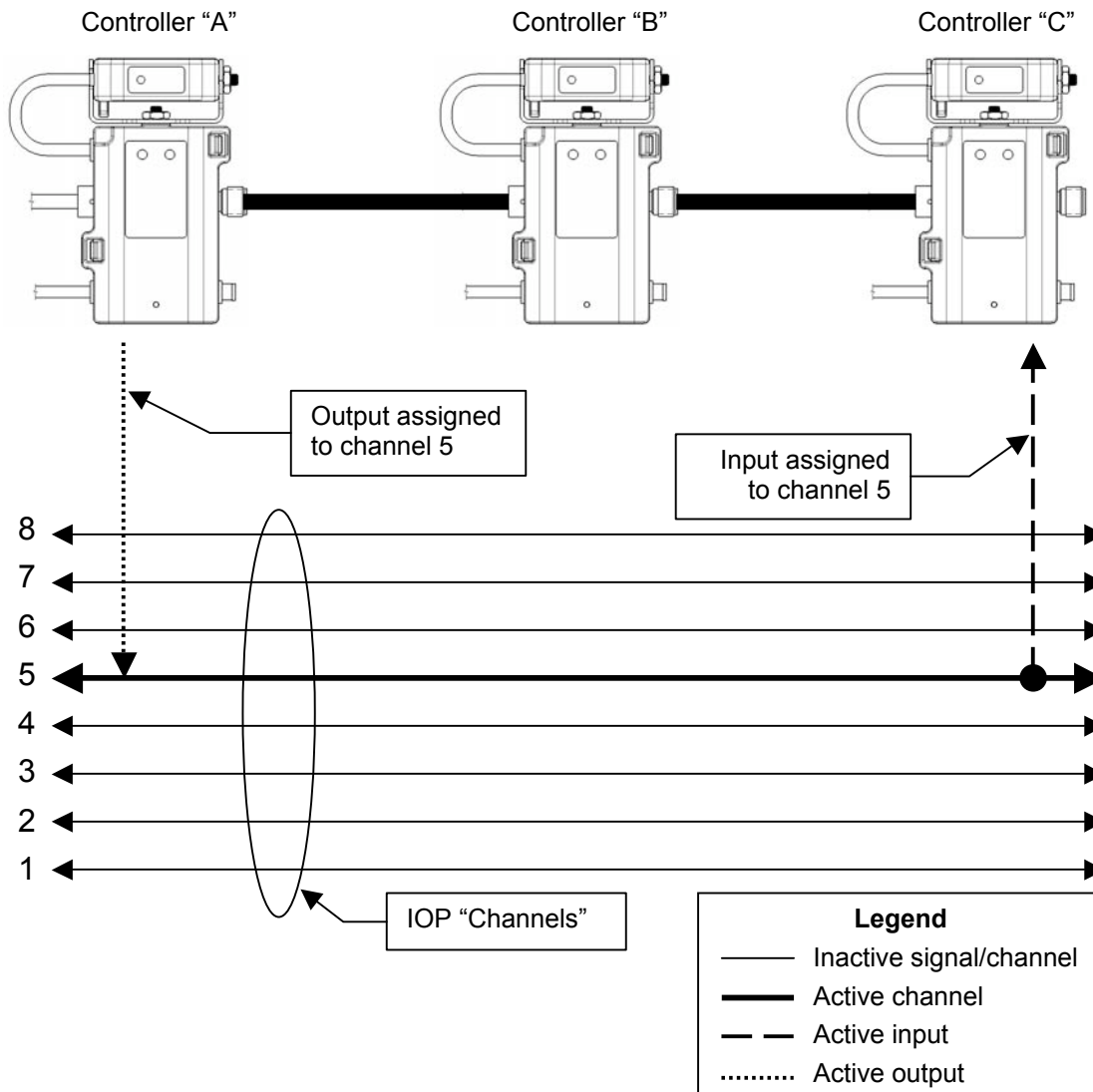**Figure 22—Peer-to-Peer Example Using IOP**

In this example, controller "A" has an output assigned to IOP channel 5. Whenever controller "A" sends the output, channel 5 becomes "active".

Controller "C" has an input that is also assigned to channel 5. Whenever channel 5 is "active", controller "C" interprets this as the assigned input. Therefore when controller "A" sends the output and activates channel 5, controller "C" receives an input.

This type of "peer-to-peer" communication does not require the use of I/O boards in the IOP unit. However, if an I/O board is present in the third I/O slot of the IOP unit, it can also receive the output or produce the input on channel 5.

IOP Communications System Specifications

I/O Board

General

Inputs/Outputs per I/O Board --2

Number of I/O Boards per IOP Unit (Max)-----------------------------------4

Inputs

Voltage--115 VAC, 24 VDC

Off State ------------------------ Less than 18 VAC/16 VDC, less than 5mA

On State Current --------------------------------40mA maximum @ 115 VAC

Inputs can share commons if desired

Outputs

Output Type ----------------------------------- Contact Closure (Solid State)

Nominal Voltage ---115 VAC, 24 VDC

Maximum Allowable Current--80mA

Off State Leakage----------------- <2mA @ 115 VAC, <0.5mA @ 24 VDC

Outputs can share supply voltage if desired

IOP Unit (IOP Communications Information ONLY)

General

Maximum Zone Controllers Using IOP Communication----------------- 50

Number of IOP Channels (Max) ---8

Maximum Length of Communication Chain --------------------------- 300 ft

Enhanced Zone Controller (IOP Information ONLY)

Available Inputs

Zone Stop

Slug Control

Wake-Up

Logic

Direction of flow

Available Outputs

Transducer (photo-eye)

Blocked/Stopped

Direction of flow

Logic

Jam Detected

Short Circuit

Low Voltage

Over current

Output States

Aux Out State Normal/Inverted

PE Output Active When Empty/Full

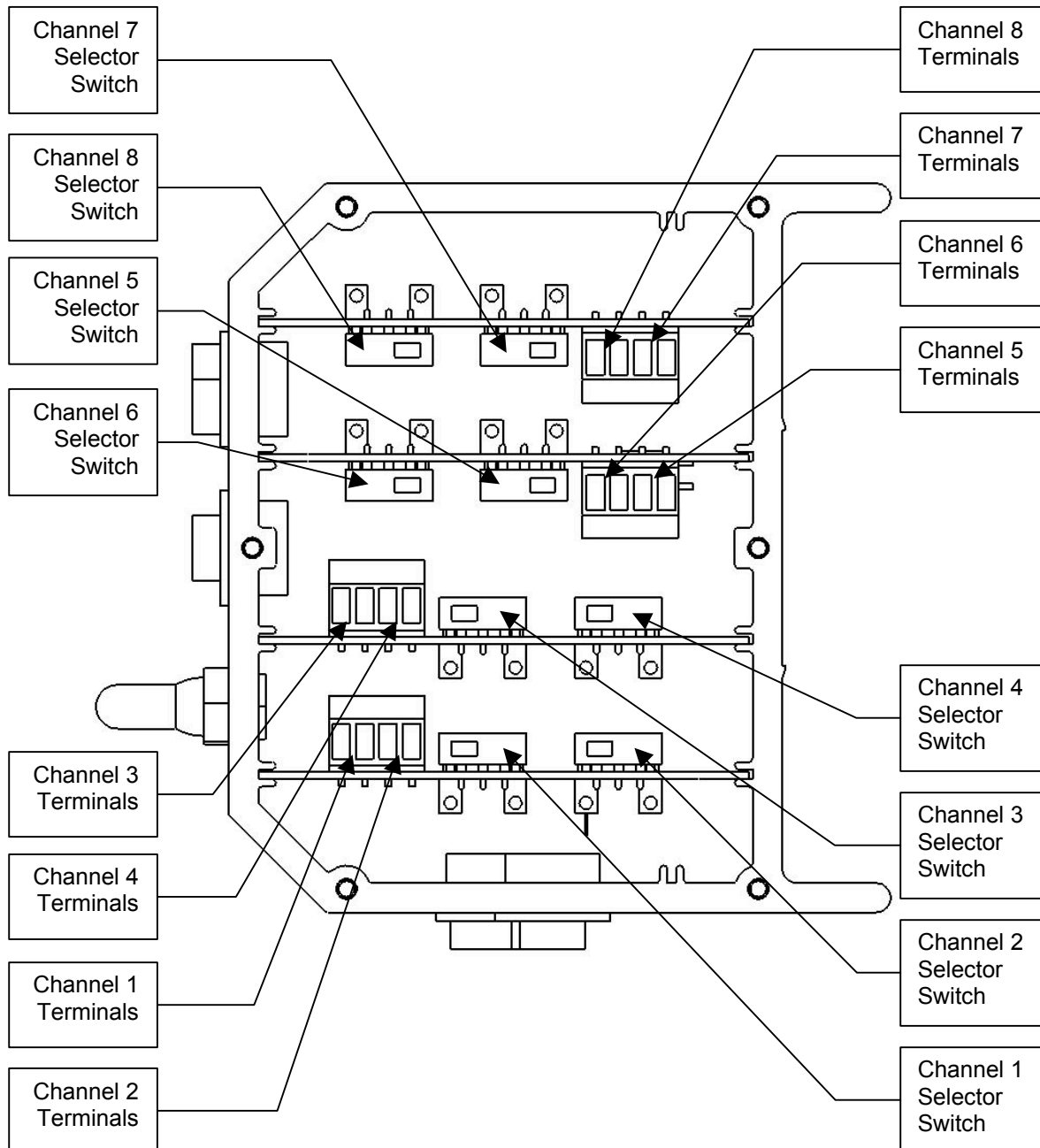Blocked/Stopped Output Active When True/False

Logic Out OFF/ON When Idle

Channel 7 Selector Switch

Channel 8 Selector Switch

Channel 5 Selector Switch

Channel 6 Selector Switch

Channel 3 Terminals

Channel 4 Terminals

Channel 1 Terminals

Channel 2 Terminals

Channel 8 Terminals

Channel 7 Terminals

Channel 6 Terminals

Channel 5 Terminals

Channel 4 Selector Switch

Channel 3 Selector Switch

Channel 2 Selector Switch

Channel 1 Selector Switch

Figure 23—IOP Channel Terminal and Switch Locations

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