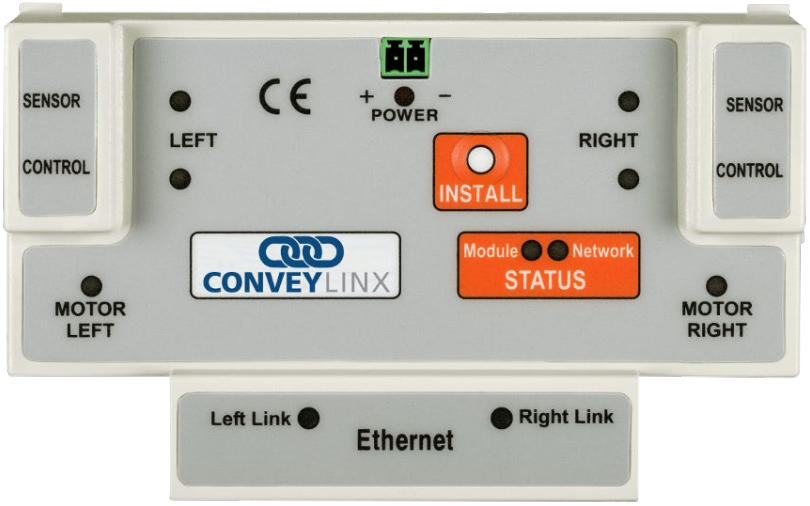
PULSEROLLER

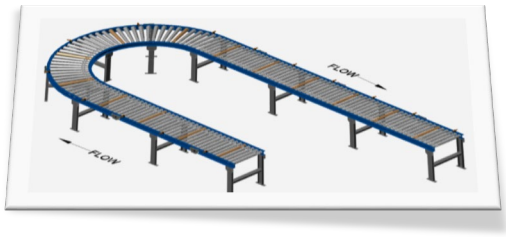
CONVEYLINX

ConveyLinx-ERSC User's Guide

Version 4.8

May 2019





Publication ERSC-1000

GLOSSARY OF TERMS

Carton	A separate (usually wrapped or boxed) object to be transported by the conveyor. The terms **tray, tote, load,** or **product** may also be used interchangeably in this document.
ConveyLinx	Conveyor controls architecture based upon modular distributed devices connected via Ethernet network.
DHCP	**D**ynamic **H**ost **C**onfiguration **P**rotocol A protocol for assigning **IP** addresses to devices on a network from a pool of available **IP's**. A dynamic **IP** address changes each time the device connects to the network
ERSC	**E**thernet **R**oller **S**peed **C**ontrol module - Conveyor control module that is part of the ConveyLinx family. Each **ERSC** can accommodate up to 2 **MDR** conveyor **zones.** In this document the term ***module*** will be synonymous with ***ERSC***
Hall Effect Sensor	Special sensor embedded within the brushless DC motor of an **MDR** used to provide motor rotor position feedback to the motor controller
JST	This is the name of a particular connector manufacturer that produces a specific plug/socket arrangement for **MDR** connection to control cards. This name is accepted within the conveyor and **MDR** industry as a simple description of the particular socket style used on **ERSC** hardware.
LED	**L**ight **E**mitting **D**iode – In the context of this document, **LED's** are used on the **ERSC** to provide visual indication of module status
Light / Dark Energized	Term used to describe how the signaling output circuit of a **photo-sensor** is configured when it detects its reflected light. A **photo-sensor** that is **light energized** will activate its output circuit when it detects its reflected light. A **dark energized** photo-sensor will activate its output circuit when it does not detect its reflected light.
MDR	**M**otorized **D**rive **R**oller or **M**otor **D**riven **R**oller - Brushless DC motor and gearbox assembly integrated into a single conveyor roller.
Normally Open / Normally Closed	Control logic terminology to define the state of the output of a Boolean "on" or "off" device. The term specifically describes the state of the output circuit when the device's sensing circuit is un-energized. In the context of **photo-sensors**; a **normally open** wired sensor would have its output circuit energized when it detected its reflected light and its output circuit would be de-energized when it did not detect its reflected light. Conversely a **photo-sensor** wired **normally closed** would energize its output circuit when it did not see its reflected light and it would de-energize its output circuit when it did detect its reflected light.
NPN / PNP	Electronics term that indicates the type of transistor circuit used for a logical input or output for controllers. **NPN** devices will provide a common or ground connection when activated and a **PNP** device will provide a logic voltage connection when activated.
Photo-sensor	A device, mounted near the end of the conveyor **zone** to sense the presence of a **carton** on the zone
PLC	**P**rogrammable **L**ogic **C**ontroller – A wide variety of industrial computing devices that control automatic equipment
PWM	**P**ulse **W**idth **M**odulation – a control scheme that utilizes high speed switching transistors to efficiently deliver power in a controlled fashion from **ERSC** controller to **MDR**.

Retro-reflective / Reflex	Term used to describe the two basic types of **photo-sensors**. **Retro-reflective photo-sensors** utilize a reflective target that must be aligned with the **photo-sensor** such that the light emitted by the photo-sensor is reflected back to it. **Reflex** (or sometimes known as **proximity**) type **photo-sensors** emit light to be reflected back from an object located sufficiently close to the sensor. For both types of **photo-sensors**, when they detect their reflected light source, their signaling output circuit changes state.
RJ-11 / RJ-12	**R**egistered **J**ack Style **11 / 12** – Standard connector / receptacle format utilizing 4 or 6 pin connections. The typical standard connection for telephones. RJ-11 utilizes 4 pins and RJ-12 utilizes 6 pins but both styles use the same physical size.
RJ-45	**R**egistered **J**ack Style **45** – Standard connector / receptacle format utilizing 8 pin connections. The typical standard for computer network cable connections
ERSC-SE4	Designed to "break-out" the RJ11 connection for easy installation. The module has an amplifier to the output giving it up to 100mA output capabilities. Configurable diodes for the inputs to minimize leakage current to and from the *ERSC*. Module also allows for external power source connection for auxiliary devices.
Singulation Release	Conveyor control method for zoned controlled conveyor that dictates that when a **zone** is discharging its ***carton***, the upstream ***carton*** waiting to enter must wait until the discharged ***carton*** is completely clear before it is allowed to enter
Slave Rollers	A set of non-motorized conveyor rollers mechanically linked to an **MDR**. The **MDR** and slave rollers make up a physical **zone**. All of the **slave rollers** in a **zone** rotate at the same speed and direction as the **MDR** because of their mechanical linkage
TCP/IP	**T**ransport **C**ontrol **P**rotocol / **I**nternet **P**rotocol - **IP** is the protocol which oversees the transmission of information packets from device to device on an Ethernet network. **TCP** makes sure the packets have arrived and that the message is complete. These two protocols are the basic language of the Internet and are often referred to together as **TCP/IP**.
Train Release	Conveyor control method for **zone** configured conveyor that dictates that when a **zone** is discharging, the upstream **zone's *carton*** can move in unison with the discharging **carton**.
Zone	A basic (linear or curved) cell of the conveyor consisting of a set of slave rollers driven by one or more **MDR's** and a single **photo-sensor**.
ZPA	**Z**ero **P**ressure **A**ccumulation – Term that describes the conveyor controls and mechanical scheme that will cause loads to queue on a conveyor in discrete **zones** such that loads do not touch each other

SYMBOL CONVENTIONS

This symbol indicates that special attention should be paid in order to ensure correct use as well as to avoid danger, incorrect application of product, or potential for unexpected results

This symbol indicates important directions, notes, or other useful information for the proper use of the products and software described herein.

IMPORTANT USER INFORMATION

*Module*s contain ESD (Electrostatic Discharge) sensitive parts and components. Static control precautions are required when installing, testing, servicing or replacing these modules. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference any applicable ESD protection handbook. Basic guidelines are:

- Touch a grounded object to discharge potential static
- Wear an approved grounding wrist strap
- Do not touch connectors or pins on component boards
- Do not touch circuit components inside the equipment
- Use a static-safe workstation, if available
- Store the equipment in appropriate static-safe packaging when not in use

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes, and standards

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Pulseroller does not assume responsibility or liability (to include intellectual property liability) for actual use based on the examples shown in this publication

SUMMARY OF CHANGES

The following table summarizes the changes and updates made to this document since the last revision

Revision	Date	Change / Update
3.0	August 31 2009	Major revision to Easy Roll software section, added descriptions for new functionality
3.1	July 2010	Updates to Hardware Interface and to *EasyRoll* software functionality, general updates
4.0	September 2012	General revision, updated SE3 section, added new appendix for real world applications, updated many graphics in the document.
4.1	November 2013	Update to Sensor & Control Port to include fusing information and current limitation, updated SE section to include ERSC-SE4 module and external power connection capability.
4.2	January 2014	Added Global Contact Information
4.3	April 2014	Updated Global Contact Information
4.4	May 2014	Minor format revision
4.5	April 2016	General revisions for firmware 4.25/5.2 release
4.6	August 2016	Updated fuse size to 100 mA for Sensor/Control port power
4.7	April 2018	Updated Flex Zone description
4.8	May 2019	Updated EasyRoll screen shots, enhanced EasyRoll section, and added items to Appendices

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SUMMARY OF HARDWARE CHANGES

The following table summarizes the changes and updates made to this document since the last hardware revision.

Hardware Revisions		
Revision	**Date**	**Change / Update**
1.0	February 2009 Serial # 87716	Initial Release
2.0	July 2010 Serial # 102311	• Advanced Ethernet switch additions includes, improved switching engine, enhanced diagnostics, and better support for straight/crossover cables. • The RJ45 Ethernet connections were physically rotated 180° for ease of installation. • Activity LED was removed from the front of the card.
3.0	April 2013 Serial # 137101	• Thicker traces and enhanced solder points in a few critical areas of the printed circuit board (PCB). • The PCB traces allowed for an increase in the hardware protection limit. Previous revisions were 19A peak, but the latest revision 3.0 has a peak of 21.5A. • Power-supply changed to be much more efficient which now uses less energy and creates less overall heat. • Changed pull-up resistors for Hall Effect inputs on the motor connector. This greatly improved operations with extension cables. • Power supply for the Hall Effect sensors was increased from 6.5V to 9V to support a wider range of motor rollers.
4.0	February 2015 Serial # 208560	• Improved short circuit immunity for sensor power supply • Changed components in sensor pull-up circuit to accept wider range of sensor manufacturers
5.0	April 2015 Serial # 22562	• Updated power MOSFET for greater wrong polarity immunity
6.0	November 2016 ERSC Serial# 352981 HTF Serial# 353482	• PCB update to reduce motor noise on Switch ground
7.0	July 2018 ERSC Serial# 567165 HTF Serial# 572000	• Updated vendor discontinued transistor with newer replacement

TABLE OF CONTENTS

PREFACE

WHO SHOULD USE THIS MANUAL?

This manual is intended for users who need basic product information and simple application procedures to implement *Module*s to control simple linear conveyor.

You should have a basic understanding of electrical circuitry and familiarity with relay logic, conveyor equipment, photo-sensors, etc. If you do not, obtain the proper training before using this product.

For users and integrators interested in PLC based control integration with *ConveyLinx Modules* should refer to Insight Automation publication *ConveyLinx-ERSC PLC Developer's Guide* (publication *ERSC-1500*)

Insight Automation offers training classes on how to best apply ConveyLinx MDR controls in your applications. Get a head start on engineering, commissioning, programming and various installation methods for ConveyLinx. Contact us at support@pulseroller.com more details and scheduling.

PURPOSE OF THIS MANUAL

The purpose of this manual is to:

- Identify the components and ports available on a module
- Provide guidelines for proper installation and wiring
- Provide examples on basic inter-module connections for linear conveyor
- Introduce the *EasyRoll* software tool and provide instructions to configure and modify parameters.

NOT INCLUDED IN THIS MANUAL

Because system applications vary; this manual assumes users and application engineers have properly sized their power distribution capacity per expected motor loading and expected operational duty cycle. Please refer to conveyor equipment and/or motor roller manufacturer's documentation for power supply sizing recommendations.

INTRODUCTION TO CONVEYLINX®

CONVEYLINX® CONCEPT

ConveyLinx control system as applied to conveyor control is a series of individual *ConveyLinx ERSC* modules (referred to herein as simply *module* or *modules*) interconnected via standard shielded Ethernet cabling to form an integrated solution for MDR (Motorized Drive Roller) conveyor functionality. Each module can accommodate up to 2 MDR's and 2 photo-sensors to provide control for up to 2 conveyor zones. Each *module* also includes convenient connectivity ports for upstream and downstream Ethernet network cabling as well as connectivity ports for discrete I/O signals with non-networked controls for local interlock interface functions.

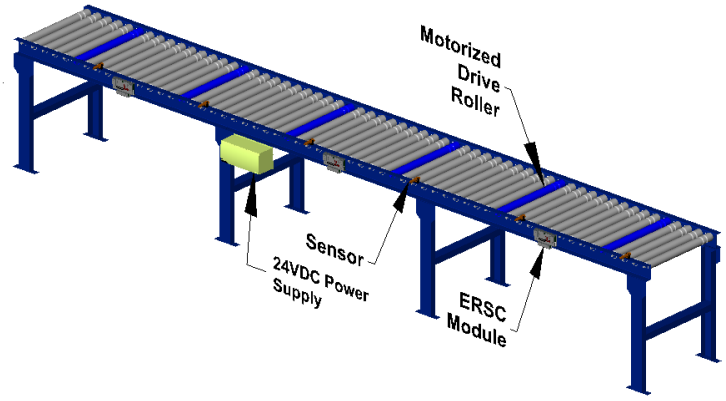
FIGURE 1 - CONVEYLINX® CONCEPT WITH ERSC MODULES

Modules can be easily automatically configured to operate multiple zones of linear conveyor "right out of the box" with the push of a button without any special tools or PC software required. However, with the *ConveyLinx Easy Roll* software tool and a PC; each *module's* default configuration can be modified to customize functionality for specific applications.

ConveyLinx® System Components

The following are the typical components required for a *ConveyLinx* controlled conveyor installation:

- ✓ *ERSC* modules
- ✓ MDRs – one or two per *module*
- ✓ Photo-sensors – one or two per module
- ✓ 24VDC Power Supplies



ConveyLinx® ERSC Module Features

Each individual *module* has the following features:

- ✓ Built-in Ethernet switch
- ✓ Modular RJ style connection ports for photo-sensors and interfacing signals
- ✓ Modular JST style connectors for MDR
- ✓ Single 24VDC power connection for motor and control
- ✓ Context-sensitive multi-color LED indicators
- ✓ Thermal and over-current protection for MDR
- ✓ Automatic light/dark operate detection for photo-sensor inputs
- ✓ Automatic PNP/NPN detection for photo-sensor and hardware inputs
- ✓ Control Port Outputs.
- ✓ Proportional / Integral (PI) MDR speed regulation option
- ✓ Four MDR braking method options
- ✓ Adjustable acceleration and deceleration time and distance capability
- ✓ MDR mechanical brake control option

CONVEYLINX® CONTROL SYSTEM FEATURES

When one or more *Modules* are installed and configured, there are several operational and configurable features of the *ConveyLinx* control system that are accessible by the *EasyRoll* software package. Some of these features are:

- ✓ Single zone to zone zero pressure accumulation (ZPA) control as default mode.
- ✓ Optional configuration for *Train Release* and *Gap Train Release* modes.
- ✓ Automatic *Flexible Zone Recognition* logic to detect and handle *carton* sizes exceeding the length of one physical zone.
- ✓ Optional configuration for *Look Ahead Slow Down* mode for higher speed applications.
- ✓ Ability to bridge separate Ethernet sub-networks for seamless operation.
- ✓ Ability to designate a *module* to be an "Extension" to another *module* such that it operates as simple motor controller.

The first sections of this manual will describe in detail the hardware and connectivity requirements for *Modules* and the "one button" configuration procedures for simple linear conveyor installation.

The latter sections of this manual will describe the *EasyRoll* software package which is used to gain access to the various optional configuration parameters and utilities. For more details, the *EasyRoll* Software package now has "Pop-Up" dialogue boxes for each function within *EasyRoll*.

MODULE HARDWARE OVERVIEW

*Module*s are designed to be installed and integrated into the conveyor's mechanical side frame assembly. Please refer to *Appendix A – Dimensions and Mounting Information* on page 117 for module dimensions and mounting details.

The *module* is a controller for up to 2 Motorized Drive Roller (MDR) conveyor zones. Each *module* provides connection points for 2 MDR units with their corresponding 2 photo-sensors as well as upstream and downstream network and discreet interconnections to form a complete control system for zoned MDR conveyors.

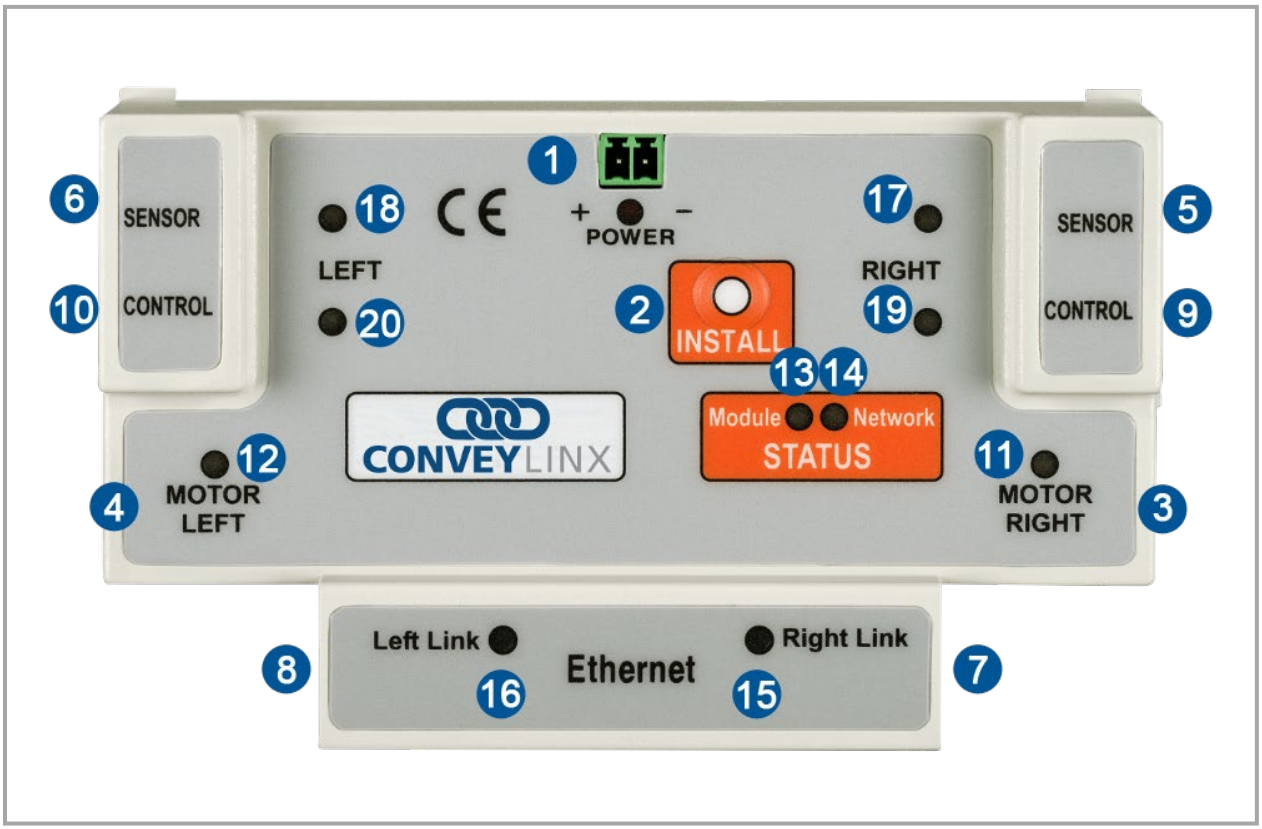


FIGURE 2 - *MODULE* HARDWARE FEATURES IDENTIFICATION

Item	Description
1	24VDC Power Connector
2	Install Button – Used for *Auto-Configuration Procedure* and module reset functions
3 & 4	*Motor Left* and *Motor Right* - 9-pin JST style header for MDR connection
5 & 6	*Left Sensor Port* and *Right Sensor Port* – RJ-12 style jack for zone photo-sensor connection
7 & 8	*Link Left* and *Link Right* –RJ-45 style Ethernet network communication connection between modules
9 & 10	*Left Control Port* and *Right Control Port* – RJ-12 style ports for discreet hard-wired signal connections for non-networked interface interlocks and zone control
11 & 12	Motor Left LED & Motor Right LED – Motor status indicators
13	Module Status LED Indicator
14	Module Network Status LED Indicator
15 & 16	Left Link & Right Link Status LED Indicators
17 & 18	Left Sensor & Right Sensor Status LED Indicators
19 & 20	Control Port Left & Control Port Right Status LED Indicators

The "left" and "right" naming convention for the module ports is based upon facing the module as shown and is not to be confused with direction of product flow on the conveyor. Product flow will be designated as "upstream" and "downstream"

HARDWARE CONNECTIONS

MOTOR LEFT AND MOTOR RIGHT PORTS

Both of these ports utilize a 9-pin JST brand female receptacle. Each receptacle is mechanically keyed to assure proper orientation upon plugging in.

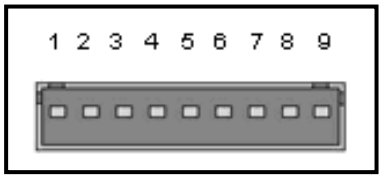


FIGURE 3–JST DIAGRAM

FIGURE 4 - MOTOR PLUG-IN EXAMPLE

Pin	Description
1	GND – Motor & Sensor Ground
2	Vcc – Hall Effect Sensor Power
3	Motor Winding U
4	Motor Winding V
5	Motor Winding W
6	Hall Effect Sensor U
7	Hall Effect Sensor V
8	Hall Effect Sensor W
9	Optional Mechanical Brake Control

SENSOR LEFT AND SENSOR RIGHT PORTS

Each sensor port is a standard RJ-11 style jack with the following pin-out:

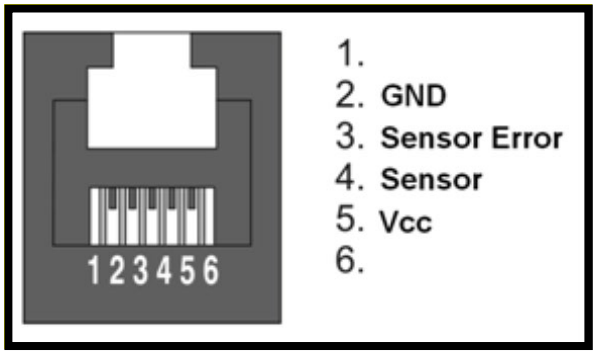


FIGURE 5–CONVEYLINX SENSOR PORT DIAGRAM

FIGURE 6 - ERSC WITH SENSOR PLUGGED IN

The signals are defined by the following chart:

Pin	Signal	Description
1		Not Used
2	GND	Module DC Common
3	Sensor Error	Logical Input for Sensor's error output – Auto detect for NPN or PNP
4	Sensor	Logical Input for Sensor's state output – Auto detect for NPN or PNP
5	Vcc	Module 24VDC Supply
6		Not Used

Shorting Pins 2 & 5 (Vcc and Gnd) may damage the port's Sensor Detect circuit. If this circuit is damaged, the module will no longer properly detect a connected sensor and will not properly Auto-Configure.

LEFT AND RIGHT CONTROL PORTS

Each of these ports is identical in logical input and output pin-out as each Sensor port. The signals are defined as in the following chart:

Pin	Signal	Description
1	Output E	Interlock with Upstream/Downstream Module, SE Module recommended
2	GND	Module DC Common
3	PNP/NPN	Optional Zone Accumulate Control
4	PNP/NPN	Interlock with Upstream/Downstream Module
5	Vcc	Module 24VDC Supply
6	Output C	Interlock with Upstream/Downstream Module, SE Module recommended

SENSOR AND CONTROL PORT FUSING

Because the *module* utilizes a single external power connection for both control power and MDR power; the module includes internal resettable fusing to protect the control power from the MDR power. The overall control power fuse is rated at 300 mA and this is the source for CPU, LED's, sensor ports, control ports, etc. From this circuit, the *Sensor* and *Control* port pairs share their own separate 100 mA fuses. *Figure 7* shows the basic schematic for the *module* control power.

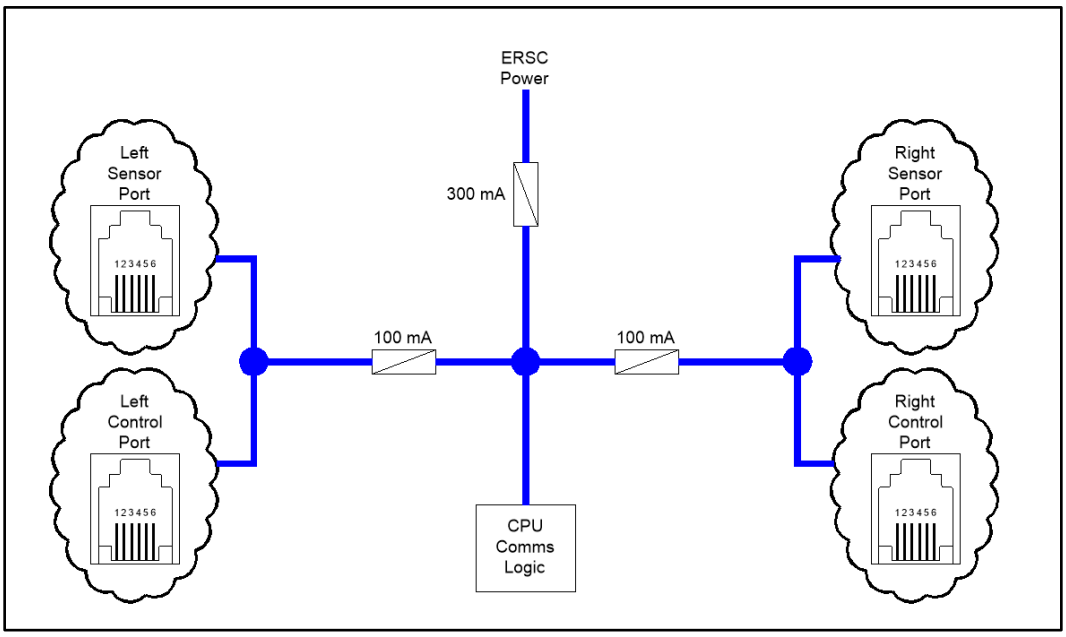


FIGURE 7 - ERSC CONTROL POWER FUSING

User's must take care in the types of sensors and devices that need to connect to a given *module* and assure that the current draw on any Sensor/Control port pair does not exceed the fuse ratings.

If any of the 100 mA fuses shown in *Figure 7* trips, there is no direct indication of this state. An indirect indication could be to see if a connected sensor is powered when plugged into either port.

If the 300 mA fuse shown in *Figure 7* trips, upon the automatic reset of the fuse, the module should reboot on its own. However, the module may require the power to be cycled manually to fully restart the module

If there are power concerns for devices connected to Sensor or Control Ports, see publication ERSC-1705 *ERSC-SE4 Technical Manual* for details on how to use an external ERSC-SE4 module to connect an external power source for Sensor / Control ports.

ETHERNET LEFT AND ETHERNET RIGHT PORTS

Both of these ports are standard RJ-45 jacks conforming to standard Ethernet connection pin-out.

FIGURE 8 - ERSC WITH LEFT & RIGHT ETHERNET CABLES

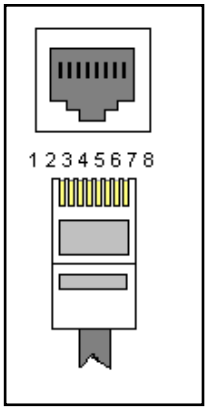


FIGURE 9 - STANDARD RJ-45 PIN-OUT

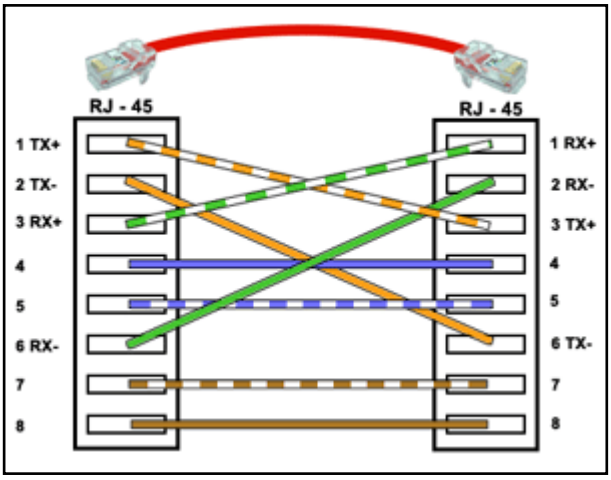


FIGURE 10 - ETHERNET CROSSOVER CABLE DIAGRAM FOR REVISION 1

All Hardware Revision 1 *Modules* must use Ethernet shielded crossover style cables. Hardware Revision 2 and later modules can use straight or crossover shielded Ethernet cables. Failure to use SHIELDED cables may result in data loss and unexpected results.

CONNECTIONS FOR LINEAR CONVEYOR

For linear conveyor operation, *Modules* are designed to perform an *Auto-Configuration Procedure* (as described in detail in section *Auto-Configuration Procedure* on page 30).

Further description and application examples of Ethernet networked solutions are included in separate Insight Automation publication *ConveyLinx-ERSC PLC Developer's Guide* (publication *ERSC-1500*).

Before the *Auto-Configuration Procedure* can be performed; each individual *module* needs to have its associated MDR's and photo-sensors connected in the proper way for expected operational results.

In general, each *module* detects which *Sensor* ports have a device connected and will use this to determine its specific configuration once it has been instructed to self-configure by the *Auto-Configuration Procedure*.

Before starting to configure your system to operate, each MDR and photo-sensor needs to be properly connected to the *Modules* mounted on the conveyor. *Modules* will determine how to operate based upon how the photo-sensors and MDR's are connected.

A single *module* can operate as a:

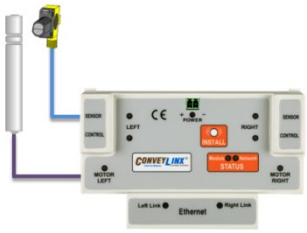
- 2 zone controller with 2 MDR's and 2 photo-sensors
- 1 zone controller with 1 MDR and 1 photo-sensor
- 1 zone controller with 2 MDR's and 1 photo-sensor

The following examples illustrate these connections.

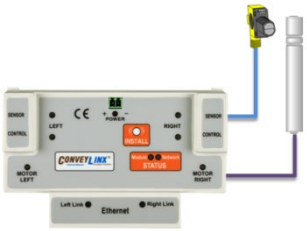
EXAMPLE 1 –TWO ZONE CONTROLLER

In this example an MDR and photo-sensor is connected to both the Left and Right group of ports. The module will control the 2 MDRs as independent logical conveyor zones.

EXAMPLE 2 – SINGLE ZONE CONTROLLER



OR



In this example, a single MDR and photo-sensor is connected to either the Left or Right group of ports. The module controls the MDR as a single independent logical conveyor zone.

EXAMPLE 3 – DUAL MDR SINGLE ZONE CONTROLLER

OR

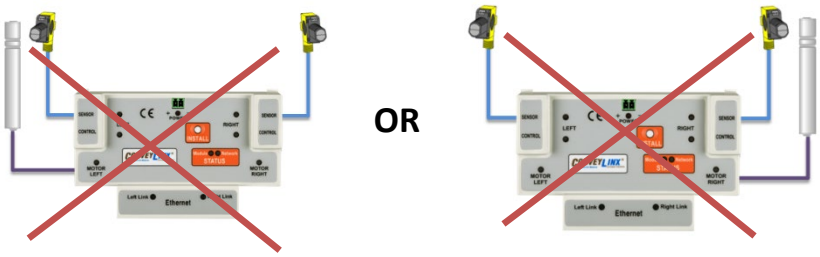
In this case the *module* will control 2 MDR's in tandem and operate as a single zone with a single photo-sensor connected to either the Left or Right port. This configuration is typical for belted zones used particularly on inclined conveyors which require the added torque of a second MDR to accommodate the conveying *carton*.

INVALID CONFIGURATION EXAMPLES

Because the *module* determines its self-configuration intention by how photo-sensors are connected; it is possible to connect photo-sensors and MDR's in invalid ways that will result in unexpected results.

OR

In these cases, the module will try to act as a Single zone conveyor control, but the MDR's are not plugged into same Left/Right port group as the photo-sensors.



In these cases, the *module* will try to act as a two-zone conveyor control but only one MDR is connected.

These invalid configurations will not cause the Auto-Configuration function to fail. The user will only experience incorrect operation and/or unexpected results.

MOTOR DIRECTION DEFINITION

The *module* uses a Clock-Wise (CW) and Counter Clock-Wise (CCW) motor rotation definition. The reference for this distinction is based upon viewing the MDR from the cable exit end of the roller as depicted below in *Figure 11*.

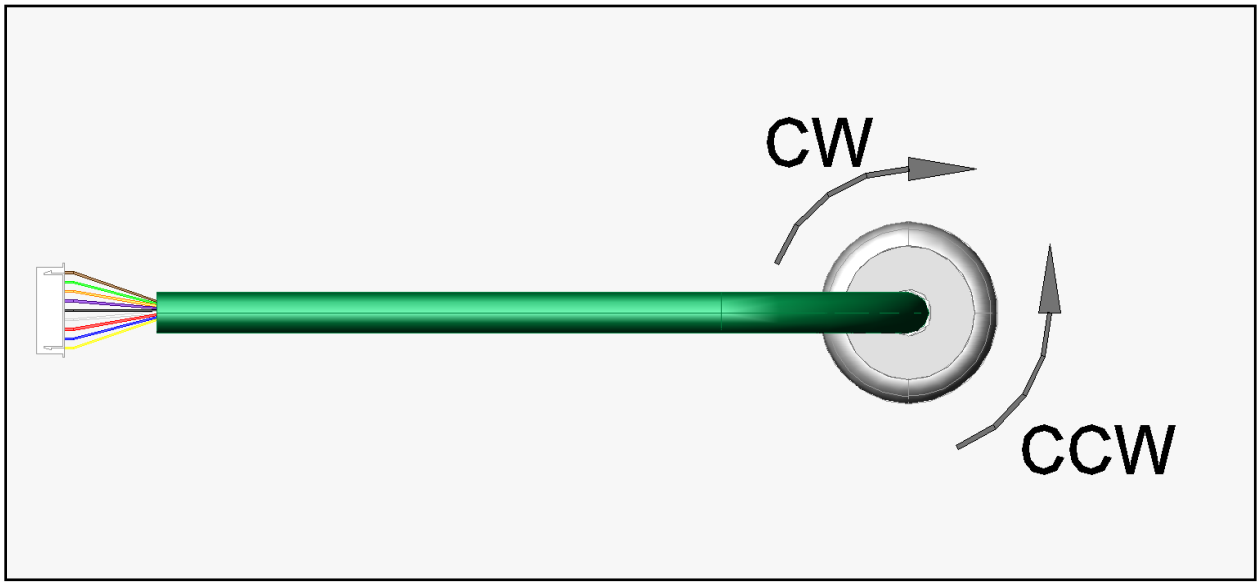


FIGURE 11 - MOTOR ROTATION DIRECTION CONVENTION

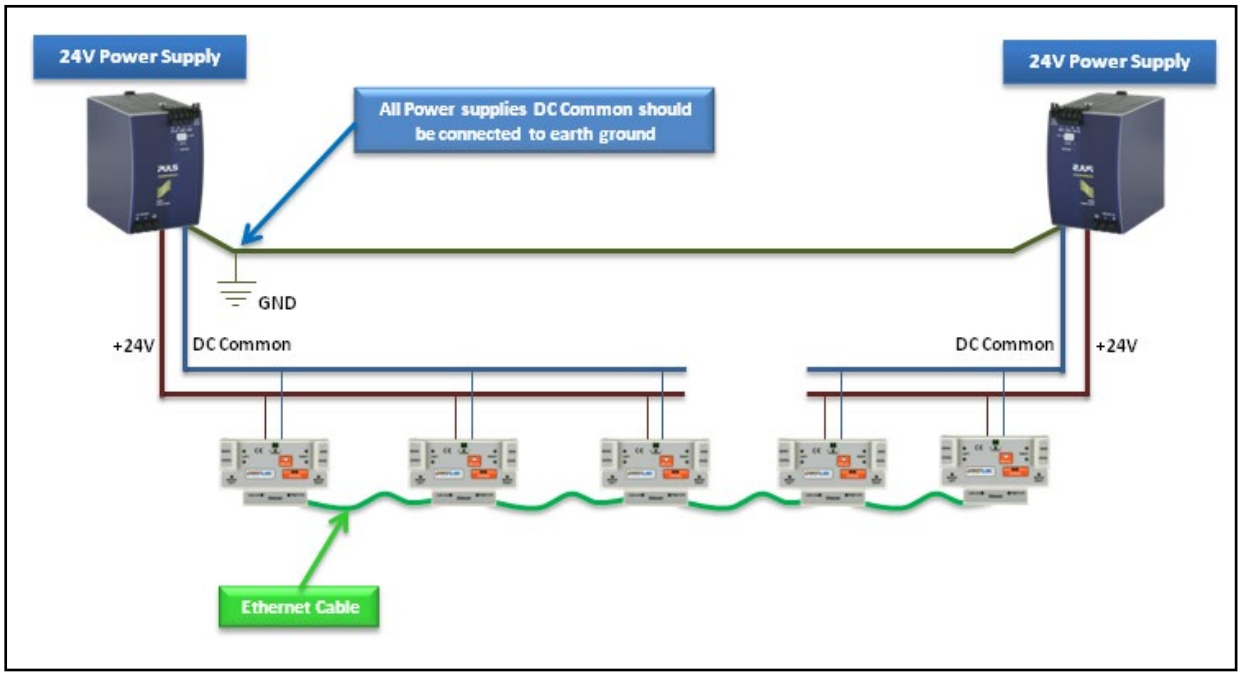
This rotation definition convention applies to all Pulseroller brand MDRs. Selection of CW and CCW for certain models of other manufacturer's MDRs may not result in actual clock-wise or counter clock-wise rotation. Installations utilizing other manufacturers MDR's may require configuration using the *EasyRoll* software tool to both select the equivalent MDR and to set the desired operational direction.

By default, Pulse Roller brand MDRs will operate in the CW direction. Use the *EasyRoll* software tool to change rotation if needed.

By default, *EasyRoll* sets the MDR type to Senergy ECO. Use the *EasyRoll* software tool to select the correct MDR type installed.

NETWORK AND POWER CONNECTIONS

Once MDR's and photo-sensors have been connected based upon the desired conveyor arrangement (1 zone, 2 zone, dual motor zone, etc.); all the *Modules* that make up the linear conveyor arrangement need to be interconnected with shielded Ethernet cables *(Hardware Rev.1 modules must use shielded crossover Ethernet cables)* and each module needs to receive a24VDC power connection. The Power Plug connection is the power source for all logic, photo-sensors, and MDR's.



This document assumes the user is aware of MDR power requirements for the application and that the user and/or installer have properly sized 24VDC power supplies and wiring based upon all applicable codes and standards. This document also assumes installation will follow proper equipment grounding practices. "DC common or -"on all power supplies should always be connected to ground. Improper power supply sizing and/or improper grounding practices will produce unexpected results.

The Ethernet interconnections between *Modules* on a linear conveyor must be continuous with no other Ethernet devices (Ethernet switch for example) physically connected between any module in the network chain. The *Auto-Configuration Procedure* described below will fail if it encounters any non-*ConveyLinx* module device on its subnet.

STATUS INDICATORS

Module status is indicated by several LED's. All LED's with the exception of the Ethernet Link and Activity LEDs are multi-coloured and context sensitive. The following chart indicates the various meanings of all LED indicators. Please refer to *Module Hardware Overview* on page 15 for the item number locations on the module. By definition *Blinking* is approximately ½ second on/off cycle and *Flashing* is approximately ¼ second on/off cycle.

COMMUNICATIONS

Indicator	Item	LED State	Description
Ethernet Left Link	16	OFF	No connection established
		Solid Green	Connection is established
		Blinking Green	When data transmission activity is occurring
Ethernet Right Link	15	OFF	No connection established
		Solid Green	Connection is established
		Blinking Green	When data transmission activity is occurring

NETWORK & MODULE FUNCTION

Indicator	Item	LED State	Description
Module Status	13	Solid Red	*module* is booting up or during Auto-Replacement procedure, module is attempting to retrieve data from neighbor module(s)
		Blinking Red	*module* is starting task processes
		Blinking Green	*module* is ready
		Flashing Green & Blinking Red	Failsafe Mode
		Flashing Red & Blinking Green	Auto-replace procedure has been properly triggered
		Flashing Red	Auto Configure Mode is active
		Blinking Amber	Performing firmware upgrade check
		Solid Amber	Firmware upgrade in progress
Network Status	14	Solid Red	Starting Inter-module communications
		Blinking Red	Establishing inter-module connections
		Blinking Green	Inter-module communications established

MOTORS

Indicator	Item	LED State	Description
Motor Left & Motor Right	11 & 12	OFF	Motor is not running and no faults detected
		Solid Green	Motor is running
		Flashing Green (intermittent)	Motor is being moved or rotated by external force
		Solid Red	Motor is not connected or motor is stalled
		Blinking Red	Motor is overloaded or over-heated
		Flashing Red	Motor short circuit detected between at least two of the phase windings

SENSORS

Indicator	Item	LED State	Description
Sensor Left & Right	17 & 18	Solid Green	Sensor (Pin 4) Input energized
		Solid Red	Sensor (Pin 3) Error Input energized
		Blinking Red	Arrival Jam or missing sensor
		Blinking Green/Amber	Sensor Jam
		Flashing Green	When Sensor is blocked, indicates external device (PLC/PC controller or *EasyRoll*) has accumulated the zone and inhibiting release
Control Port Left & Right	19 & 20	Solid Green	Pin 4 Input energized
		Solid Red	Pin 3 Input energized
		Flashing Red	*module* configuration error

SPECIAL CASES

Indicator	Item	LED State	Description
All Sensor, Control Port, & Motor	11 & 12 17 & 18 19 & 20	Flashing Red	*Module* in stopped state
Left Sensor, Control Port, and Motor	18,20,12	Flashing Green	ZPA zone on left side of *module* is in Maintenance Mode*
Right Sensor, Control Port, and Motor	17,19,11	Flashing Green	ZPA zone on right side of *module* is in Maintenance Mode*

*Maintenance mode only accessible via remote PLC. Please refer to *ConveyLinx-ERSC PLC Developer's Guide* (publication ERSC-1500).

AUTO-CONFIGURATION OF LINEAR CONVEYOR

The purpose of *Auto-Configuration* for networked *ConveyLinx* controls is to provide a simple and easy procedure for linear conveyor system commissioning that does not require a PC or PC based software to implement. The *Auto-Configuration* of Linear Conveyor feature of *ConveyLinx* requires only the proper interconnection of each module and the press of a button on the most upstream module to complete.

LINEAR CONVEYOR DEFINITION

Auto-Configuration is only applicable to a **Linear Conveyor** arrangement. A Linear Conveyor arrangement is defined as a single uninterrupted path of conveyor with no merge or diverts mechanisms. A Linear Conveyor can include curved sections, but the flow of cartons or totes on the conveyor is continuous from in-feed zone to discharge zone.

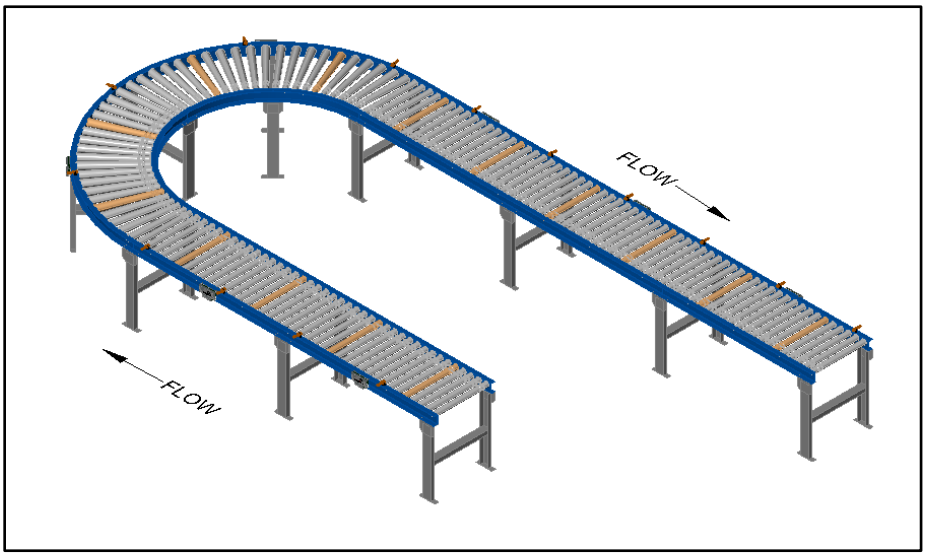


FIGURE 12 - SIMPLE LINEAR CONVEYOR EXAMPLE

A networked *ConveyLinx* solution is capable of controlling more complex conveyor paths that include diverting and merging equipment. However, this requires configuration with a PC and software. Please refer to the Pop-up self-help within the *EasyRoll* for details on PC based configuration.

AUTO-CONFIGURATION PROCEDURE

The direction of flow of the conveyor dictates how to begin the *Auto-Configuration Procedure*. The *module* located at the most upstream or in-feed end of the conveyor is defined as the ***Auto-Configuration Master***. The *Auto-Configuration Procedure* is initiated from the *Auto-Configuration Master*. Because of its physical location on the conveyor path and physical location in the Ethernet connection chain; the *Auto-Configuration Master* will automatically connect to all downstream modules and set their I.P. address for communication. Then the routine automatically sets the direction of flow. The following is the procedure to follow:

1. Press and hold *INSTALL* button on the most upstream/in-feed end module and keep it held for 5 seconds.
2. After 5 seconds the *Module Status* LED will flash RED.
3. Once *Module Status* LED begins flashing RED, the *INSTALL* button must be released within 2 seconds. If held for longer than 2 seconds; the procedure is cancelled.
4. Once the *INSTALL* button has been released within the 2 second time window, the module will be initiated as the *Auto-Configuration Master* and the *Auto-Configuration Procedure* routine will begin.

In order for the Auto-Configuration to work properly, all loads, totes, product, containers, cartons, etc. must be removed from the entire conveyor path and all photo-sensors must be aligned and adjusted so that none are detecting that their respective zone is occupied. Failure to meet these conditions will produce unexpected results.

AUTO-CONFIGURATION EXAMPLES

The *ConveyLinx Auto-Configuration Procedure* routine will detect which photo-sensors and MDR's are connected in order to configure a given module as a 1 or 2 zone controller. The physical order of module connections; from upstream to downstream, dictate the MDR direction and product flow logic. The following figures illustrate the pressing of the *INSTALL* button and the expected result of the *Auto-Configuration Procedure* routine. Please note that the green lines in the figure depict the Ethernet cable connections.

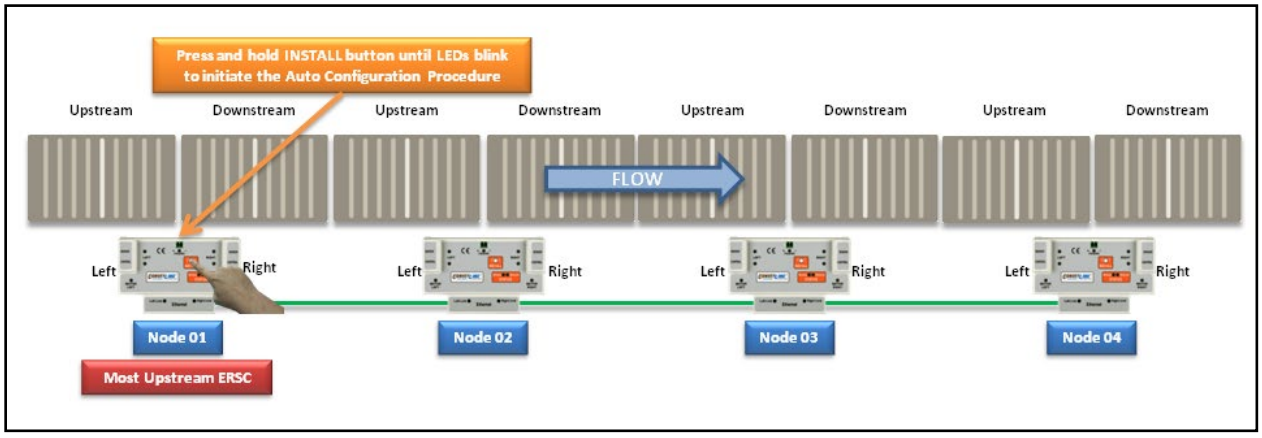


FIGURE 13 – SIMPLE AUTO CONFIGURATION EXAMPLE

Without changing any physical connections or cables; simply performing the same procedure at the opposite end of the conveyor path will re-configure all modules to operate in the reverse direction. This illustrates how the *Auto-Configuration Master* is easily changed by the *Auto-Configuration Procedure*.

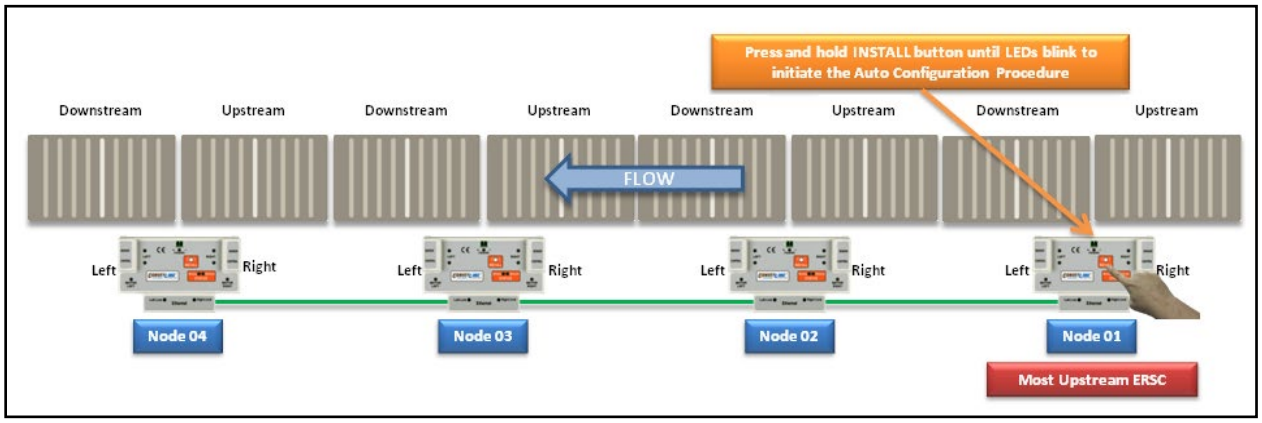


FIGURE 14 - SIMPLE AUTO CONFIGURATION EXAMPLE IN OPPOSITE DIRECTION

Please note that number of *Modules* on a single Subnet is limited to 221.

Auto Detection of Opposite Side Module Location

The Ethernet cable connections between Left and Right Ethernet ports can be used in situations where the *module* has to be mounted in the conveyor's opposite side frame. If properly connected, the Auto-Configure routine will detect this and configure the conveyor flow properly. This is illustrated in the following figure:

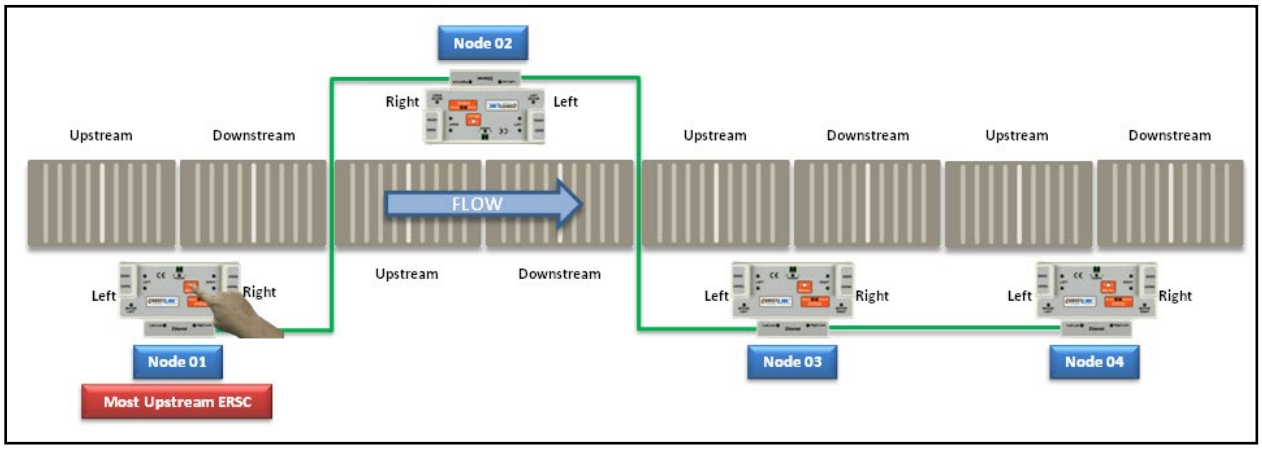


FIGURE 15 - OPPOSITE SIDE MODULE LOCATION EXAMPLE

Auto Configuration Results

Normal Results

When the *Auto-Configuration Procedure* routine is complete, each *module* will automatically reboot. When a *module* has been successfully configured and rebooted, its *Module* and *Network Status* LED's (see *Figure 2* items 13 and 14) will blink on and off green.

Please note that the time to complete the *Auto-Configuration Procedure* is dependent on the number of *Modules* being configured. Larger networks will take more time than smaller networks.

If all *module* and/or *Network Status* LED's are blinking green; then to fully verify configuration is to place a single *carton* onto the most upstream zone and see that it conveys to the discharge zone. If it does, then the *Auto-Configuration Procedure* is successful. If it does not, then see section *Trouble-shooting Failed Auto-Configuration* on page 33 for details.

Please note that once a network has been configured; pressing and holding the *Install* button on any *module* that is not the *Auto Configuration Master* will not initiate a new *Auto-Configuration Procedure*. The *module* will detect that it is not the most upstream unit and abort the procedure. However, the *module* will perform its local re-booting procedure. This procedure will take a few seconds to complete.

After a successful *Auto-Configuration Procedure*, each *module* will have at least the following default settings:

Item	Default Value or Setting
ZPA Mode	Singulation
Jam Timeout	5.0 seconds
Run After Sensor Clear Timeout	5.0 seconds

Other module settings are determined, in part, by the conditions of the *Auto-Configuration Procedure*.

If the module was previously configured and any motor parameters were changed, these changes will remain in place after a new Auto-Configuration Procedure.

These settings can be modified per individual *module* zone and/or network wide by utilizing the *EasyRoll* software tool. Please refer to section *EasyRoll Software Configuration Tool* starting on page 59 for definitions of these settings and procedures for their modification.

You should also reference the self-help pop-up dialogues within *EasyRoll* for complete up to date definitions of pin-outs, functions and settings.

Trouble-shooting Failed Auto-Configuration

The following chart lists some typical failed condition indicators and actions to take for resolution.

Failed Condition	Action
Status LED's OK with Unexpected Result	• Check that all photo-sensors are operational and that all zones are clear and perform procedure again. • Check all networks, MDR, Sensor, and power connections and perform procedure again. • Verify that all connections are valid. Refer to section *Invalid Configuration Examples* on page 23. Correct connections and perform procedure again.
Either or both Status LED's blinking or solid red on one or more modules	• Verify that there are no Ethernet Switches or PC's connected between *modules.* The *Auto-Configuration Procedure* will abort if a non-*ConveyLinx* device is detected along the path before reaching the last node. Modules up to that point will be configured, but the remaining modules will not. • When removing a *module* from an existing network that is already operational; be sure to wait at least 2 minutes to allow the Ethernet switches on the remaining *modules* to reset before attempting a new *Auto-Configuration Procedure*.

DEFAULT SINGULATION RELEASE ZPA MODE

Cartons will normally convey from upstream zone to downstream zone in singulation release fashion. With no Hardware Control connection on most downstream zone; a *carton* reaching last zone photo-sensor will cause last zone motor to continue to run to discharge the *carton* to next conveyor or position. To control whether *cartons* stop at most downstream zone, you must utilize one of the hardware interface methods described in section *Hardware Interface* on starting on page 41.

In *Singulation Release Mode*, each zone waits until the zone in front of it is clear before it is allowed to run. This mode assures at least a zone-length of gap between *cartons* as they are being conveyed. When the first *carton* needs to stop and cause all those behind it to accumulate; the trailing *cartons* stop in their respective zones when their leading edge blocks the zone's photo-sensor. *Figure 16* shows a typical example of singulation release.

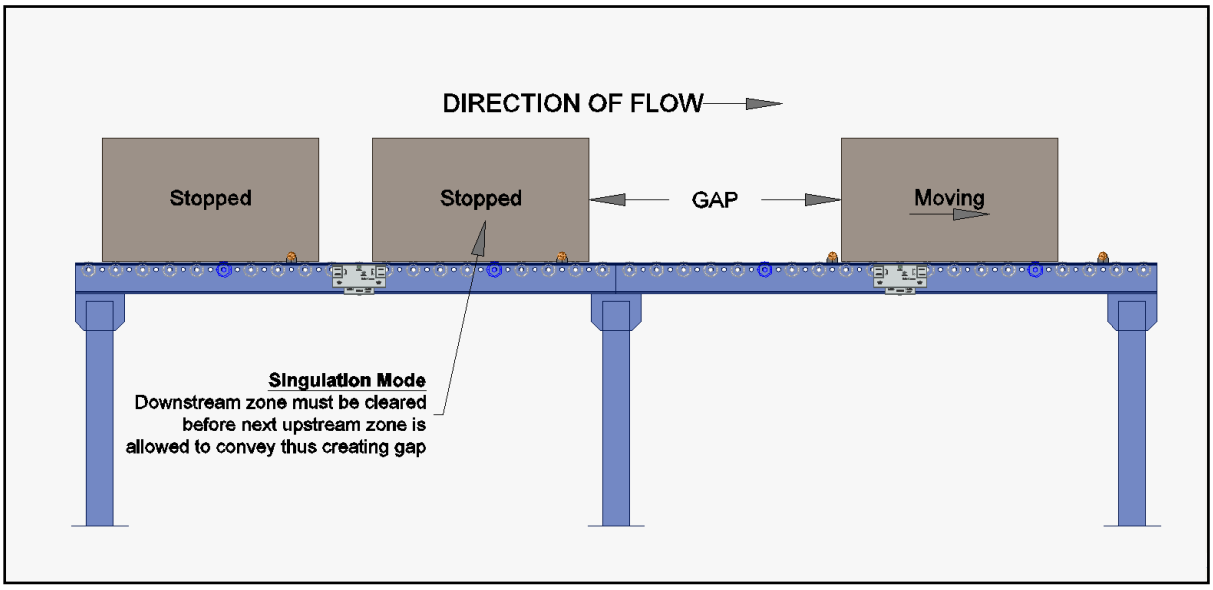


FIGURE 16 - SINGULATION RELEASE EXAMPLE

DEFAULT FLEX ZONE RECOGNITION FEATURE

Modules will automatically detect that a given carton is longer than one zone length and automatically adjust accumulation control so that the longer carton occupies two logical zones and will keep the next upstream carton from conveying into the longer carton.

Flex Zone mode only functions in singulation release mode.

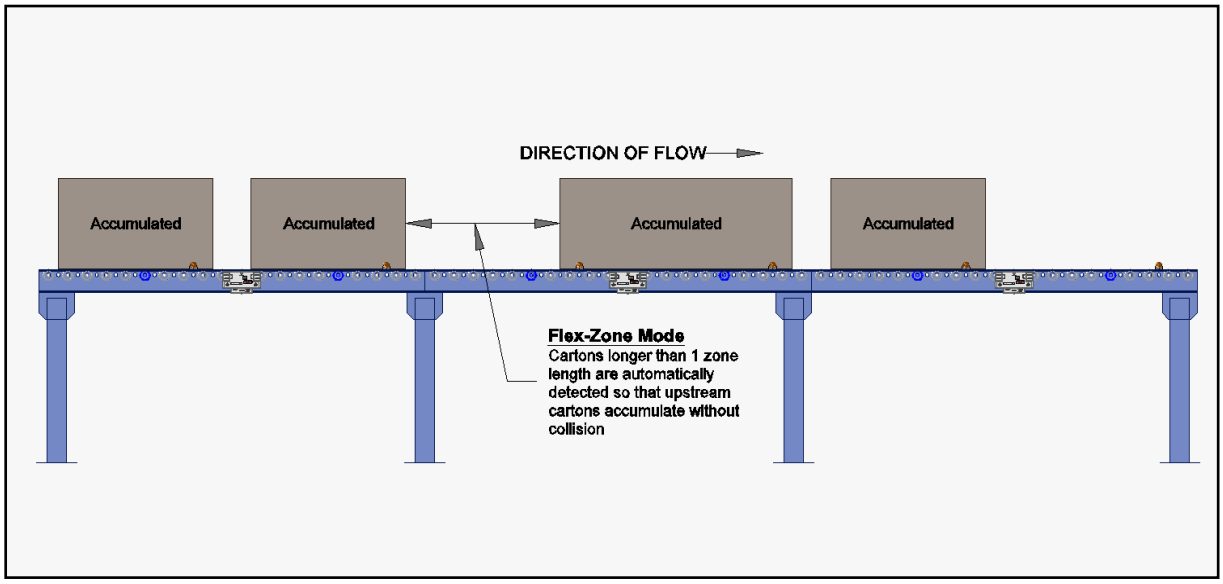


FIGURE 17 - TYPICAL FLEX ZONE MODE EXAMPLE

Please note that Flex Zone mode operates for carton lengths up to 2 zone lengths only. Operating conveyor system with cartons whose lengths are in excess of 2 zone lengths will produce undesirable results such as excessive detected jam conditions and faults.

JAM CONDITIONS

There are two (2) types of Jam conditions detected by the *module*:

- Arrival Jam
- Sensor Jam

Both of these Jam conditions utilize a single *Jam Timer* that has to expire in order for the condition to be active. Once either of these jam conditions becomes active; they will automatically clear in the logic after the *Auto Clear Time* has expired. Both the *Jam Time* and *Auto Clear Time* values are 5 seconds each by default. Please see section *Jam & Auto Clear Timers* on page 88 for details on how to change these values in *EasyRoll*.

ARRIVAL JAM

When a *carton* leaves an upstream zone and is conveyed to its next downstream zone, this upstream zone expects positive confirmation of *carton* arrival from the downstream zone. This communication occurs automatically along the *ConveyLinx* network. If a new *carton* arrives at this upstream zone while this upstream zone is waiting for a downstream arrival confirmation, the new *carton* will accumulate on this upstream zone. If the upstream zone does not receive this confirmation within the *Jam Timer* interval, the *module* will produce an *Arrival Jam* fault. Once an *Arrival Jam* occurs, the *module* will automatically hold any new *carton* at the upstream zone for a pre-determined *Auto Clear Time* Timer value and then resume normal ZPA function. By default, the *Jam Timer* and the *Auto Clear Timer* values are set to 5 seconds for each. This condition will be indicated on the corresponding Sensor LED on the *module* as shown on chart in section *Sensors* on page 28.

SENSOR JAM

While a zone is releasing a *carton*; if this *carton* remains blocking the photo-sensor for the *Jam Timer* period (default of 5 seconds), the *module* will detect a *Sensor Jam*. This will be indicated on the corresponding *Sensor LED* on the *module* as shown on chart in section *Sensors* on page 28.

SENSOR JAM AUTO CLEAR PROCEDURE

After the *Sensor Jam* occurs and the sensor remains blocked; the *module* will attempt to perform the *Sensor Jam Auto Clear Procedure*. This is the procedure that the logic performs once the *Sensor Jam* has been detected:

1. Run the zone motor in reverse until the sensor is clear or 1 second has elapsed, whichever happens first
2. Wait for the Auto Clear Timer to expire
3. Run the zone motor forward to attempt discharge to the downstream zone (Attempt #1 complete)
4. If sensor is still blocked after discharge attempt, the zone motor runs in reverse until the sensor is clear or 1 second has elapsed, whichever happens first
5. Wait for the Auto Clear Timer to expire
6. Run the zone motor forward to attempt discharge to the downstream zone (Attempt #2 complete)
7. If sensor is still blocked after discharge attempt, the zone motor runs in reverse until the sensor is clear or 1 second has elapsed, whichever happens first
8. Wait for the Auto Clear Timer to expire
9. Run the zone motor forward to attempt discharge to the downstream zone (Attempt #3 complete)
10. If sensor is still blocked after Attempt #3, the sensor must be cleared manually to reset the Sensor Jam condition

Please note that if any of the discharge to downstream attempts (steps 3, 6, or 9) are successful, the *Sensor Jam* condition is automatically reset.

The 5 second Jam Timer and Auto Clear Timer values are default settings. Please refer to section *Jam & Auto Clear Timers* on page 88 for details on how to change these values with the *EasyRoll* software.

Please refer to section *Settings Check Boxes* on page 75 or the integrated help inside *EasyRoll* for help on changing the default logic to disable *Arrival Jam* detection and/or disable the *Auto Clear Time* delays.

Network Fault

In instances where Ethernet network connection is interrupted between *Modules* while in operation, *cartons* will continue to convey and accumulate to the farthest downstream zone prior to where the network is interrupted. This farthest downstream zone will automatically accumulate the *carton* and not allow it to convey further downstream. Once network communications are re-established, the zone will return to normal operation.

Low Voltage Fault

In instances when the *module* detects that its supply voltage has dipped below 18VDC; the *module* will place its configured zone or zones into accumulation mode. The *module* will keep this state until it has detected that its input voltage has risen to at least 21VDC.

Persistent unexplained momentary stopping or hesitations in normal zone to zone *carton* movement may be an indication of low voltage conditions. If this behaviour is consistently observed; please verify voltage at farthest point from power supply and review power supply sizing and wiring practices to insure proper voltage at all modules. Please refer to *Appendix F – Power Supply Loading* for details on power supply sizing

Please refer to Appendix F – Power Supply Loading for details on power supply sizing

Automatic Module Replacement

Once a linear conveyor has been commissioned by *Auto-Configuration Procedure*, the *Modules* store configuration data about its upstream and downstream neighboring modules. This configuration data is automatically updated even if the linear conveyor has had its parameters modified by the *EasyRoll* software. The *module* firmware uses this feature to allow for easy module replacement so that the entire linear conveyor does not have to be re-configured in order to replace a single module.

For *Modules* with firmware version 1.xx: Automatic Module Replacement will only work to replace a *module* that is on a single *Subnet* network. For multiple *Subnet* installations that share a single physical network; temporarily disconnecting all *Subnets* from the affected modules *Subnet* will be required. Please refer to *Appendix B–Configuring PC for Ethernet Subnets* for a more detailed explanation of *Subnets*

For *Modules* with firmware version 2.xx and 3.xx and higher: Automatic Module Replacement will work to replace a *module* on multiple subnet installations without temporarily disconnecting any network connections.

ERSC Replacement Procedure

1. Disconnect existing module's motor(s), network, photo-sensor(s), hardware, and power connections. The order of disconnection does not matter.

2. Connect new module's motor(s), sensor(s), hardware, and network connections only. **DO NOT CONNECT POWER YET**.

3. Press and hold *INSTALL* button. **While holding** the *INSTALL* button pressed; **connect module power**.

4. Observe the Module Status LED. About 1second after applying power; the Module Status LED will start blinking red. DO NOT RELEASETHE INSTALL BUTTON YET. After another second, you will see that the Module Status LED will start to blink both RED and GREEN. This is the indication that the Auto Replace Procedure is starting and you MUST release the Install Button NOW. *Releasing the Install Button before you see the Module Status LED flashing both red and green will result in cancelling the Auto Replace Procedure.*

    a. Observation 1: A good indication that the Auto Replace Procedure is going on is that all sensor and control port LEDs will turn on solid red.

    b. Observation 2: During the Auto Replace Procedure, you will also observe that all modules on the network will briefly flash their sensor and control port LEDs. This is normal and they will return to normal operation within a few seconds.

5. Wait for at least 3 minutes before using the system or cycling power or plugging or unplugging any Ethernet connections. The module being replaced will automatically upgrade its firmware if needed and restore its configuration settings. This will involve multiple automatic restarts of the module. **Do NOT** cycle power to the module during this 3-minute period.

6. Once at least 3 minutes have passed and the new module is finished with its multiple restarting cycles, the new module should show that both its Module Status and Network LED's are blinking green. When both the Module Status and Network LED's are blinking green, you are good to go.

RESET ERSC TO FACTORY DEFAULT SETTINGS

There may be instances when you want to return a *module* to its "factory default" state. The procedure to do this is the following:

1. Unplug all sensors, devices, motors, and network cables such that the only thing connected is power
2. Press and hold the Install Button until the Module LED begins to flash
3. When the Module Status and Network Status LEDs both blink green, the procedure is complete

The following table lists the default values for the *module* after reset procedure:

Item	Default Value or Setting
IP Address Settings	• IP: 192.168.202.20 • Subnet Mask: 255.255.128.0 • Default Gateway: 192.168.202.1
Left & Right Motor Settings	• Senergy ECO • Normal Braking • Closed Loop • 100% Speed • CW Direction • 100 Pulses Acceleration • 50 Pulses Deceleration
Module Mode	• ZPA – 2 Zone – Left to Right Flow • Singulation Mode • All Settings Options Unchecked
Look Ahead & Timing Setting	• JAM Timer = 5.00 • Auto Clear Timer = 5.00 • Run After Timer = 5.00 • Sensor Debounce = 0.10 • All Induct Timers = 0.00
Control Ports	• All Options Unchecked
Sensors	• Sensors are "ON is Blocked" • Sensor Health are "ON is Error"
Connections	• All are cleared

If the module you wish to reset was installed in a subnet that was subsequently Locked from *EasyRoll*; then this module must first be Unlocked using *EasyRoll* before you can perform the procedure to reset to factory default setting. Refer to section *Network Lock Feature* on page 101 for details on Locking and Unlocking your subnet.

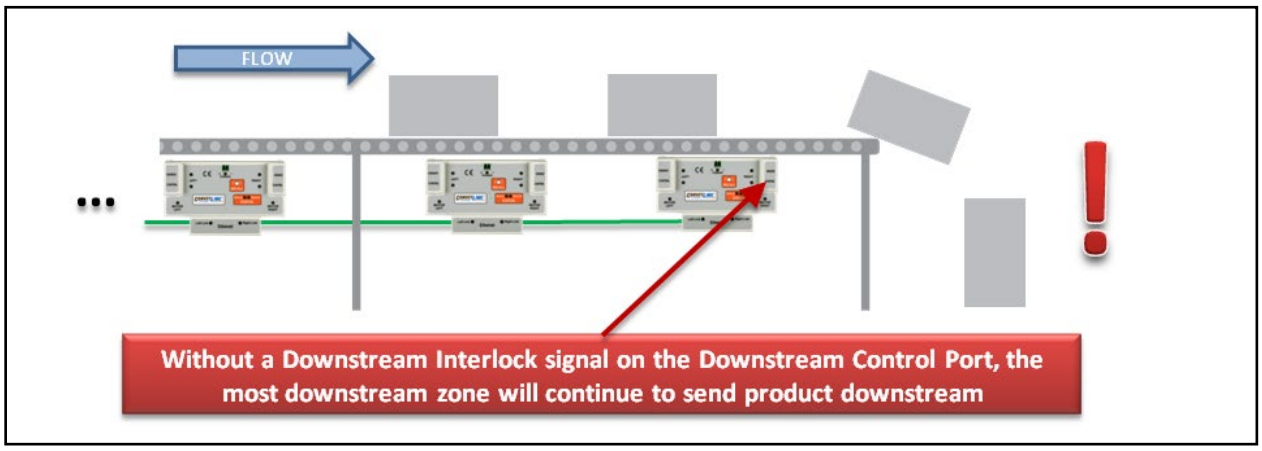
Please note that these default settings are based upon firmware version 4.25 and 5.02 and later.

HARDWARE INTERFACE WITH CONTROL PORTS

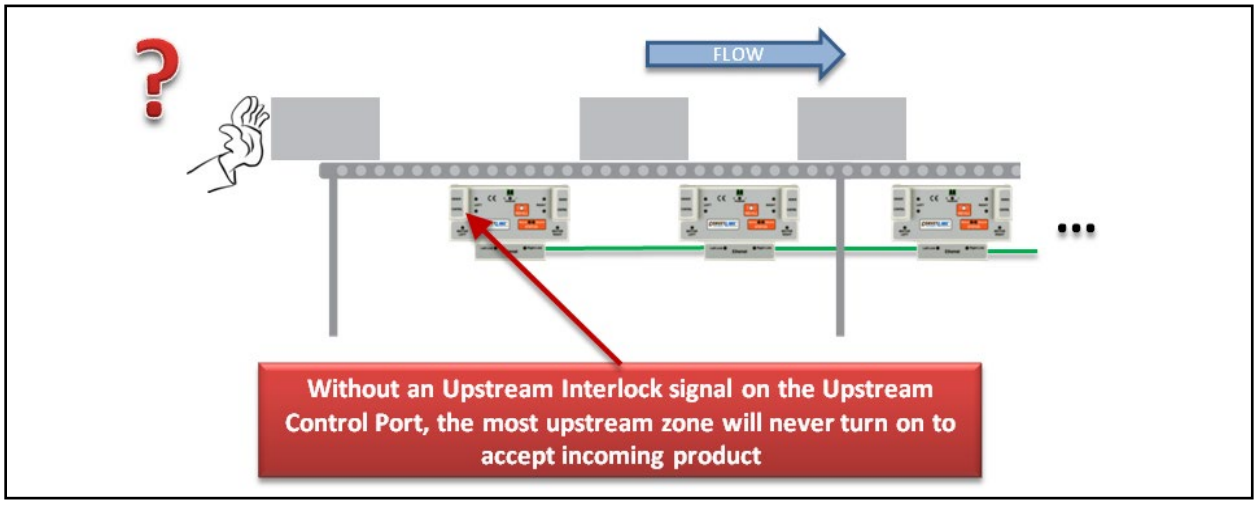
Once you have configured your linear conveyor, there are two or sometimes three basic functions that need to be addressed to get it working properly. These are:

- Control release of *cartons* at the most downstream zone
- Control in-feed of *cartons* at the most upstream zone
- Control stop and release of *cartons* at a zone in between most upstream and most downstream

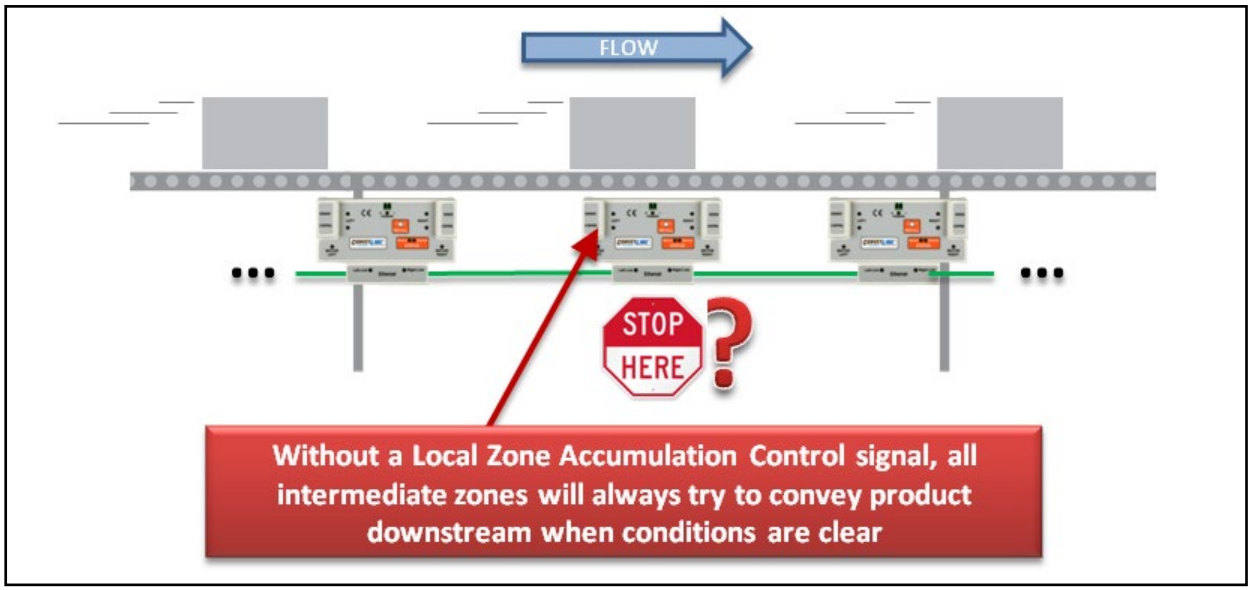
Please note that by default and without any intervention, the most downstream zone will always try to discharge product.



Similarly, by default and without any intervention, the most upstream zone will never turn on to accept new product.



Also, by default and without intervention; all zones in between the most upstream and most downstream zones always try to convey *cartons* downstream as long as the next downstream zone is clear.



Each *module* is equipped with a *Left Control Port* and a *Right Control Port*. Each of these is a 6 pin RJ-12 style socket. Each of these ports contains electrical connections for 2 logical inputs into the *module* and 1 logical output controlled by the *module*. The interpretation of the logical inputs by the on-board logic and the meaning of the logical outputs controlled by the on-board logic are based upon the conditions detected by the *module* after the *Auto-Configuration* procedure.

Both *Control Ports* provide 3 overall functions for the *module*:

- **Upstream Interlock Control**
- **Downstream Interlock Control**
- **Local Zone Accumulation Control**

The following sections describe the functionality of both ports and the *Auto-Configuration* conditions that dictate each port's interlocking configuration.

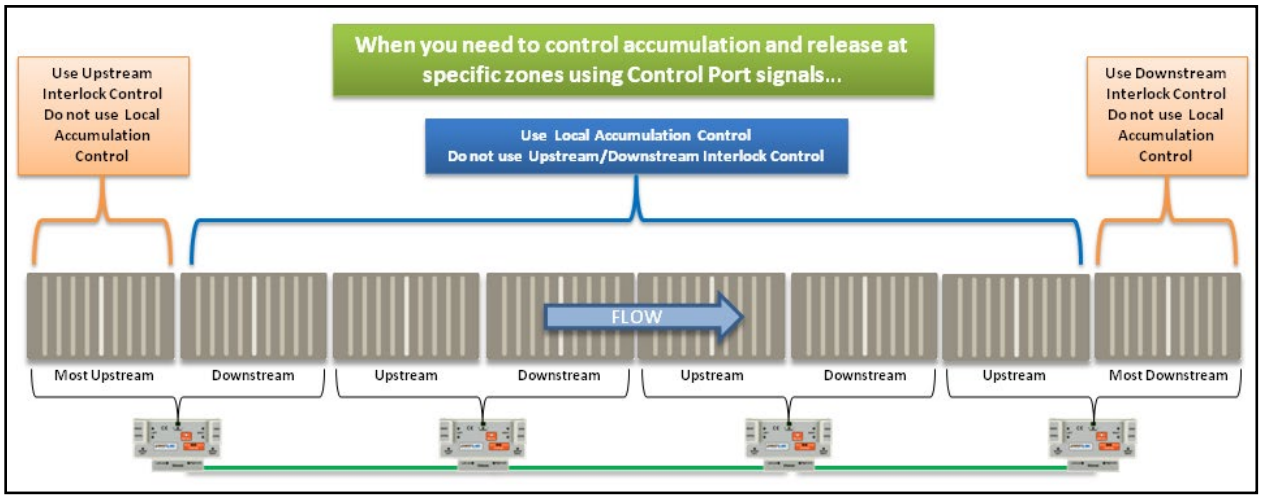


FIGURE 18 - LOCAL VS INTERLOCK FOR ZONE ACCUMULATION AND RELEASE

In general, the Local Zone's Accumulation Control connection is intended for use on any zone with the exception of the most upstream or most downstream zones. To control accumulation and release at the most upstream or most downstream zones, use Upstream and Downstream Interlock Control. Using Upstream/Downstream Interlock Control on intermediate zones can produce unexpected results.

UPSTREAM / DOWNSTREAM INTERLOCK DEFINITION

ConveyLinx modules provide built-in logical interlock signals to be able to automatically interface with another *ConveyLinx* system or external hard-wired controls (such as push-buttons, relay contacts, or PLC I/O) for basic conveyor flow operation. This interlocking for the *Left Control Port* and *Right Control Port* can function in one of two ways:

- *Upstream Interlock*
- *Downstream Interlock*

The Left Control Port and Right Control Port automatically configure themselves to provide either an Upstream Interlock or Downstream Interlock based upon conveyor flow after the Auto-Configuration procedure.

The logical function of both the *Upstream Interlock* and *Downstream Interlock* is exactly the same whether the hardwired connection to its respective *Control Port* is with PLC I/O or another *module*.

If the "Left" side of the *module* is controlling the most "upstream" zone with respect to conveyor flow, then the *Left Control Port* provides the *Upstream Interlock* function. Similarly, if the "Left" side of the *module* is controlling the "downstream" zone with respect to conveyor flow, then the *Left Control Port* provides the *Downstream Interlock*

function. This same description applies to the *Right Control Port*. *Figure 19* and *Figure 20* show the resulting *Control Port* functions based upon direction of conveyor flow after an *Auto-Configuration* procedure.

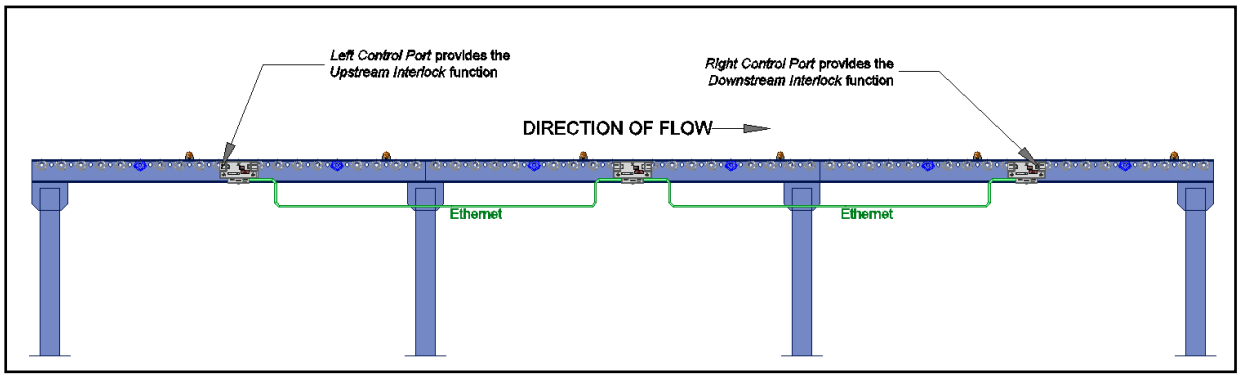


FIGURE 19 - CONTROL PORT ASSIGNMENT BASED UPON FLOW EXAMPLE

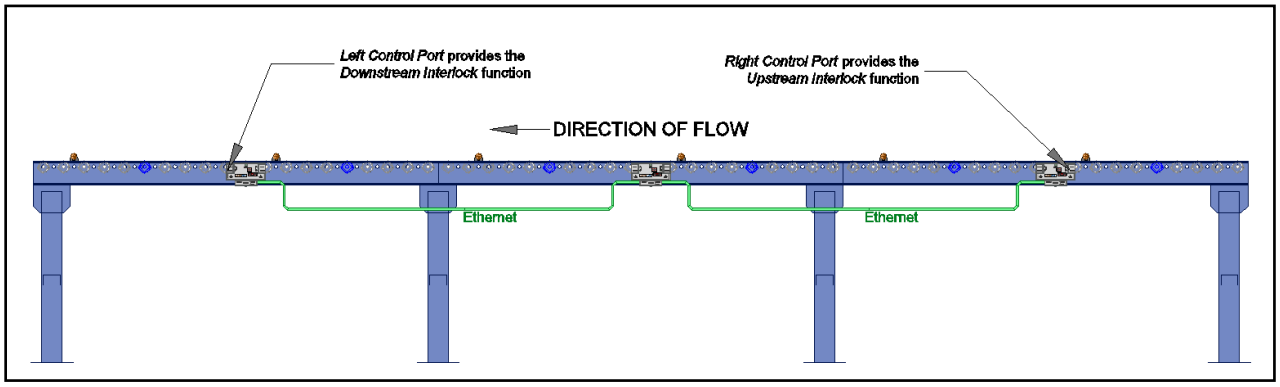


FIGURE 20 - CONTROL PORT ASSIGNMENT BASED UPON OPPOSITE FLOW EXAMPLE

INTERLOCK DEFINITION FOR SINGLE ZONE ERSC

Determining the *Upstream* or *Downstream Interlock* functionality for a given *Left Control Port* or *Right Control Port* is straight-forward when both the left and right zones of the *module* are being utilized in a standard 2 zone configuration.

However, it is likely that some conveyor sections in a typical conveyor system will only utilize one of the two available zones on a *module* and that the other zone is not used at all (i.e. no Sensor plugged in). In these cases, the *Auto-Configuration* procedure still defines the *Upstream* and *Downstream Interlock* functions for a single zone *module*. When a *module* is configured as a single zone, the *Left Control Port* and the *Right Control Port* is affected by whether the single zone's one sensor is plugged into the *Left Sensor Port* or the *Right Sensor Port*.

For a single zone module; the physical side of the module that the sensor is plugged will be the same side who's Control Port will provide the Upstream Interlock function and the opposite side's Control Port will provide the Downstream Interlock function.

Upstream Interlock for Single Zone

For example, if the most upstream *module* is configured as a single zone and has its single zone sensor and MDR plugged into its Left Side; then the *Left Control Port* will provide the *Upstream Interlock* function and the *Right Control Port* will provide the *Downstream Interlock* function. Please note that this holds true regardless of which direction the conveyor is running. The *module* side with the sensor is always the "upstream zone". An example for an *Upstream Interlock* or Wake-up is shown in *Figure 21*.

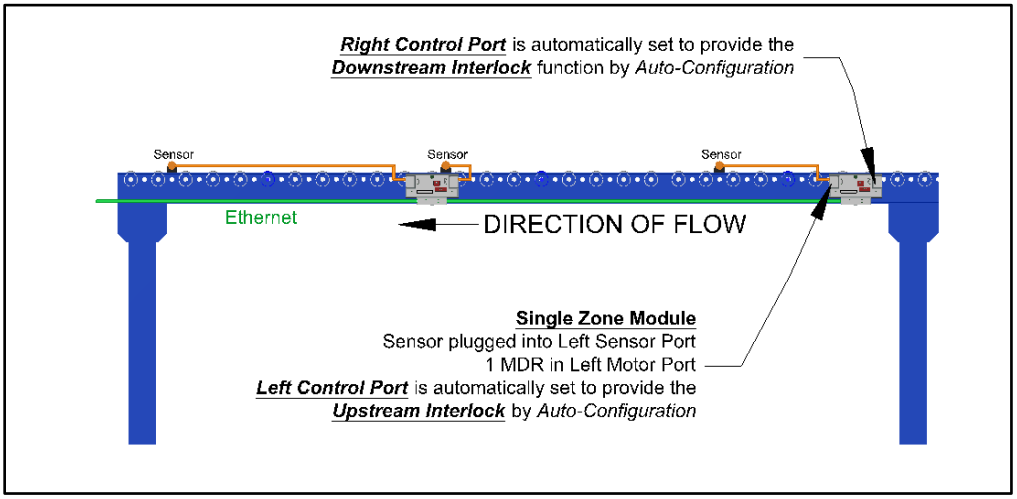


FIGURE 21 - SINGLE ZONE UPSTREAM INTERLOCK EXAMPLE

Downstream Interlock for Single Zone

For example, if the most downstream *module* is configured as a single zone and has its single zone sensor and MDR plugged into its Left Side; then the *Left Control Port* will provide the *Upstream Interlock* function and the *Right Control Port* will provide the *Downstream Interlock* function. Please note that this holds true regardless of which direction the conveyor is running. The *module* side with the sensor is always the "upstream zone". An example for a *Downstream Interlock* or Lane Full is shown in *Figure 22*.

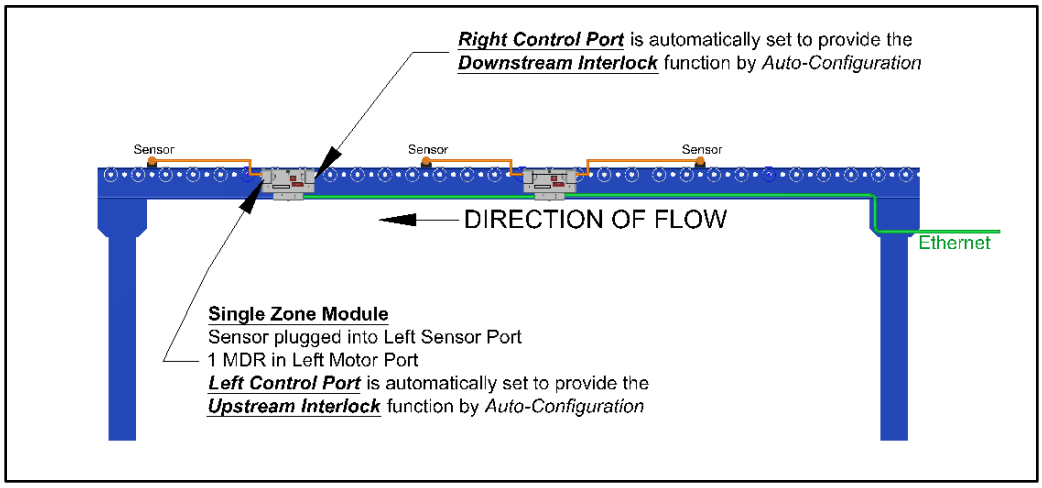


FIGURE 22 - SINGLE ZONE DOWNSTREAM INTERLOCK EXAMPLE

UPSTREAM / DOWNSTREAM INTERLOCK WITH HANDSHAKE

Once *Auto-Configuration* is complete; each *Control Port* will be logically configured to provide either an *Upstream Interlock* or *Downstream Interlock*. For either configuration; the Output on both *Control Ports* provides a signal that indicates the blocked state of the zone sensor. So, with this output signal available to external controls and input signals from external controls; a logical "handshake" interlock can be accomplished for both an Upstream or Downstream Interlock situation.

UPSTREAM INTERLOCK WITH HANDSHAKE

When a *Control Port* is acting as the *Upstream Interlock*, the *module* interprets a signal on its input Pin 4 as a command to begin running its upstream zone in order to accept product from an upstream source (conveyor or other equipment). The *Control Port* output circuit is energized when product is present on its upstream zone.

A typical scenario would be when a PLC controlled conveyor needs to discharge a *carton* onto the In-feed zone of the most upstream *module* of a *ConveyLinx* controlled conveyor as shown in *Figure 23*.

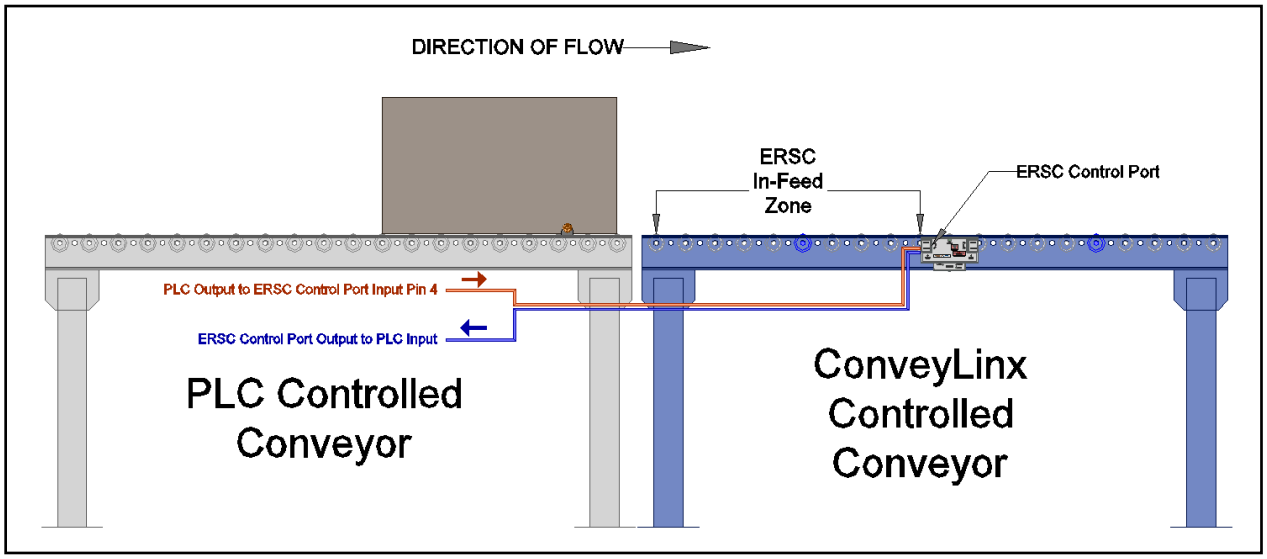


FIGURE 23 - TYPICAL UPSTREAM CONVEYOR INTERLOCK EXAMPLE

UPSTREAM HANDSHAKE INTERLOCK TIMING CHART

Figure 24 depicts timing chart for a typical *Upstream Interlock* exchange of signals over time. Following *Figure 24* is a listing of descriptions of the events from the timing chart.

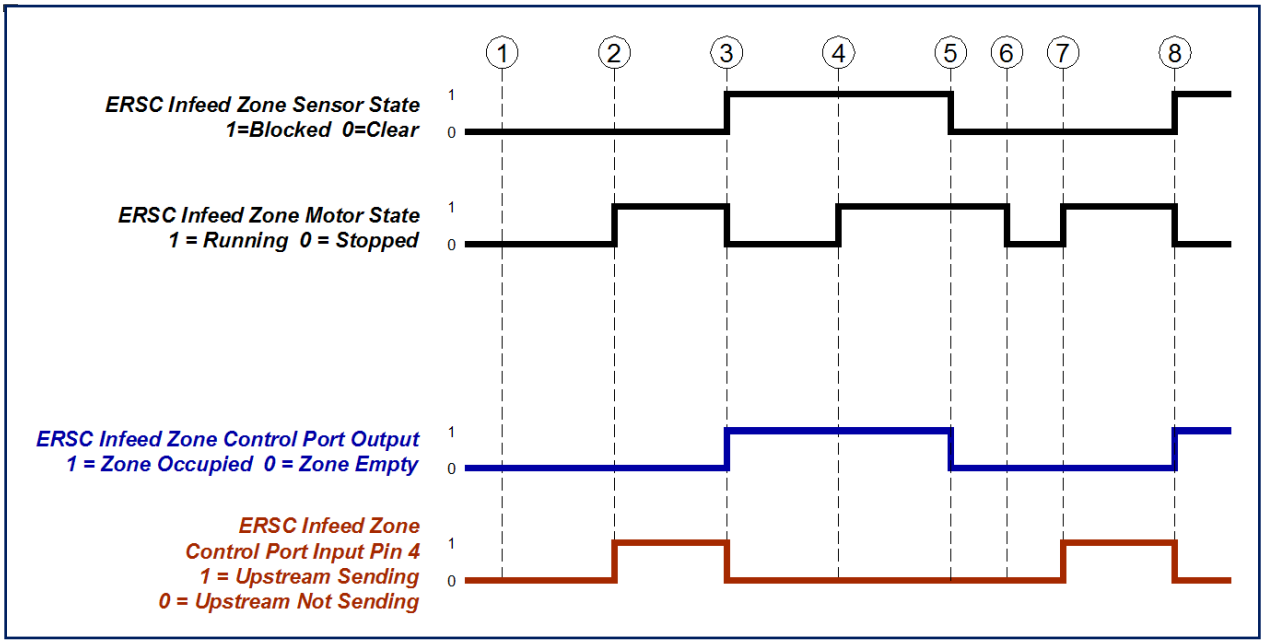


FIGURE 24 - TYPICAL UPSTREAM INTERLOCK TIMING EXAMPLE

Upstream Interlock Event Description	
①	Start with *module* In-feed zone clear and ready to accept a *carton* from upstream PLC controlled zoned conveyor. PLC Input from *Control Port* output signal will be de-energized indicating that it is clear and ready to accept *carton*.
②	PLC controlled conveyor has a *carton* ready to discharge onto *module* in-feed zone. *module* is signaled via PLC Output connected to *Control Port* input Pin 4. When this occurs, the *module* will run its in-feed zone conveyor
③	In-feed zone sensor becomes blocked, In-feed zone motor is stopped and the *module* energizes its *Control Port* output signal to indicate to PLC input that the zone is now occupied.
④	Assume that zone downstream of *module* in feed zone is ready to accept a *carton*; *module* in-feed zone motor runs to convey *carton* to next downstream zone as in normal ZPA operation.
⑤	In-feed zone sensor becomes clear and *Control Port* output is de-energized to indicate to PLC Input that in feed zone is empty. Note that motor continues to run for a pre-configured run after sensor clear timer to assure *carton* is completely conveyed from the in-feed zone.
⑥	Motor's run after sensor clear timer has expired and in-feed zone's motor is stopped
⑦	Repeat of ②
⑧	Repeat of ③

The logical "1" and "0" states for the *Control Port Input* and *Control Port Output* signals show above in *Figure 24* are the default states.

Please refer to section *Control Ports Tab* on page 107 for instructions on how to invert the expected *Control Port Input* and/or *Control Port Output* signals in order to customize functionality for your specific hard-wired / PLC application.

DOWNSTREAM INTERLOCK WITH HANDSHAKE

When a *Control Port* is acting as the *Downstream Interlock*, the *module* interprets a signal on its input Pin 4 as indication that downstream conditions do not allow for product flow. In this state, the *module* will accumulate any product that arrives in its downstream zone. The *Control Port Output* is energized when product is present on its upstream zone.

A typical scenario would be when a PLC controlled conveyor needs to accept a *carton* in a singulation fashion from the discharge zone of the most downstream *module* of a ConveyLinx controlled conveyor as shown in *Figure 25*.

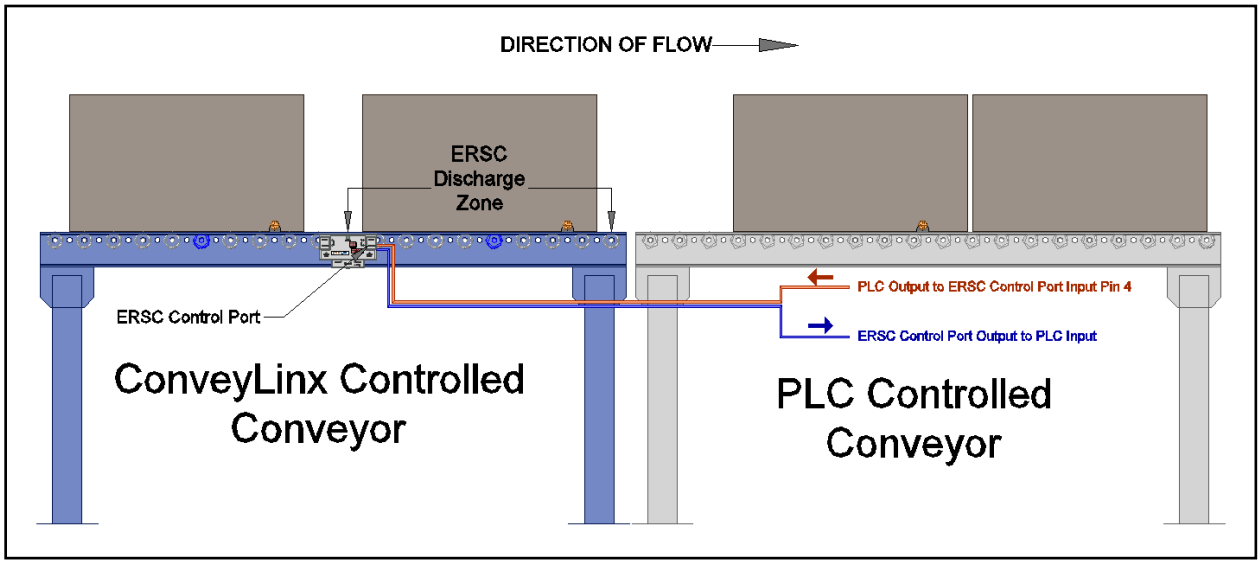


FIGURE 25 - TYPICAL DOWNSTREAM CONVEYOR INTERLOCK EXAMPLE

Downstream Handshake Interlock Timing Chart

Figure 26 depicts timing chart for a typical *Upstream Interlock* exchange of signals over time. Following *Figure 26* is a listing of descriptions of the events from the timing chart.

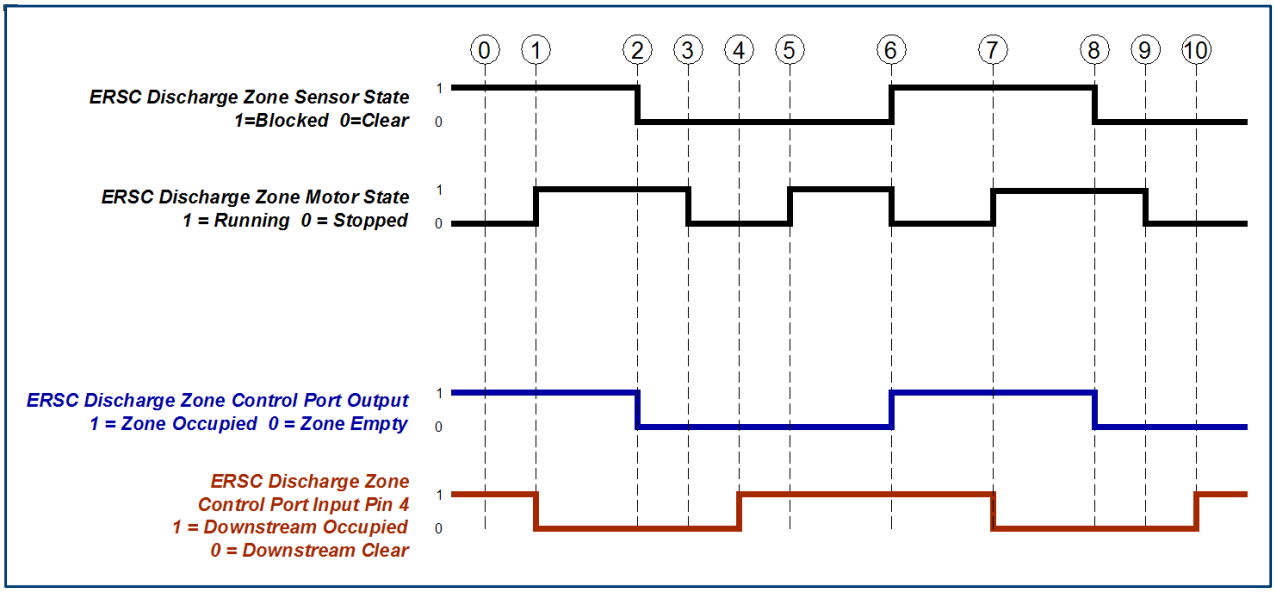


FIGURE 26 - TYPICAL DOWNSTREAM INTERLOCK TIMING EXAMPLE

Downstream Interlock Event Description	
⓪	Start with Discharge zone and the PLC controlled accepting zone both occupied. *Module* Input Pin 4 is energized from PLC output indicating that PLC controlled accepting conveyor position is occupied.
①	PLC de-energizes output to *module Control Port* Input pin 4 indicating to *module* that downstream position is ready to accept *carton*. *Module* starts to run its discharge zone motor to convey *carton* to PLC controlled conveyor.
②	*Carton* clears the Discharge zone's sensor and *Control Port* output de-energizes indicating sensor is clear. *Module* continues to run the discharge zone motor for the pre-determined Run After time to assure *carton* has completely conveyed from the zone.
③	*Module* discharge zone's Run After time has expired and the zone motor is stopped.
④	PLC energizes output to *Control Port* Pin 4 to indicate successful arrival on PLC controlled conveyor. PLC keeps this energized as long as PLC controlled conveyor is not ready to accept a new *carton*.
⑤	Assume that *module* needs to convey a *carton* into its discharge zone. Discharge zone motor runs to accept *carton* from its upstream zone under normal ZPA control.
⑥	*Carton* conveying from *module*'s upstream zone arrives at its discharge zone sensor and the discharge zone motor is stopped. *Module* also energizes its *Control Port* output indicating that the discharge zone is now occupied.
⑦	Repeat of ①
⑧	Repeat of ②
⑨	Repeat of ③
⑩	Repeat of ④

Under normal operation, the time duration between steps ② and ④ must not be greater than the *module*'s configured *Jam Timer* setting. If this time duration is greater than the configured Jam Time setting, the discharge zone will produce an *Arrival Jam* fault. The discharge zone will also produce an *Arrival Jam* fault if the PLC does not energize *Control Port* Pin 4 within the same *Jam Time* interval.

Please refer to section *Jam Conditions* on page 36 for full description and refer to section *Jam & Auto Clear Timers* on page 88 for instruction on changing the default Jam Timer setting for the discharge zone.

The logical "1" and "0" states for the *module Input* and *module Output* signals show above in *Figure 26* are the default states.

Please refer to section *Control Ports Tab* on page 107 for instructions on how to invert the expected *module Input* and/or *module Output* signals in order to customize functionality for your specific hard-wired / PLC application.

Discharge hardware interlock only functions in Singulation Release Mode. Train Release Mode is not enabled for a discharge interlock. Please refer to section *Default Singulation Release ZPA Mode* on page 34 for description of this mode of operation.

Electrical Connections for Upstream/Downstream Interlocks

Both Upstream and Downstream electrical connections are the identical. Logically, for either the *Upstream* or *Downstream Interlock* the *module* is expecting a single logical ***Input*** from a ***PLC Output*** or other signal source and provides a single logical ***Output*** to a ***PLC Input*** or other input device. The *module* automatically configures the logical meaning of each logical signal depending on whether the interlock is *Upstream* or *Downstream*.

Using ERSC-SE4 Terminal Breakout Module

Connection of these interlock signals between external control sources and a given *module's Control Port* is established by using an *ERSC-SE4 Breakout Module*. An *SE-4* module kit simplifies these connections by providing convenient removable screw terminals on a small assembly that connects to the *Control Port's* RJ-12 socket with a simple patch cable.

Regardless of a given *Control Port's* logical interlock designation (*Upstream* or *Downstream*); the input signal to the *Control Port* from external control source is always connected to the *P4* terminal of the SE-4. Similarly, the output signal from a *Control Port* (Zone sensor blocked) to external PLC input is connected to the *OUT* terminal of the *SE-4*

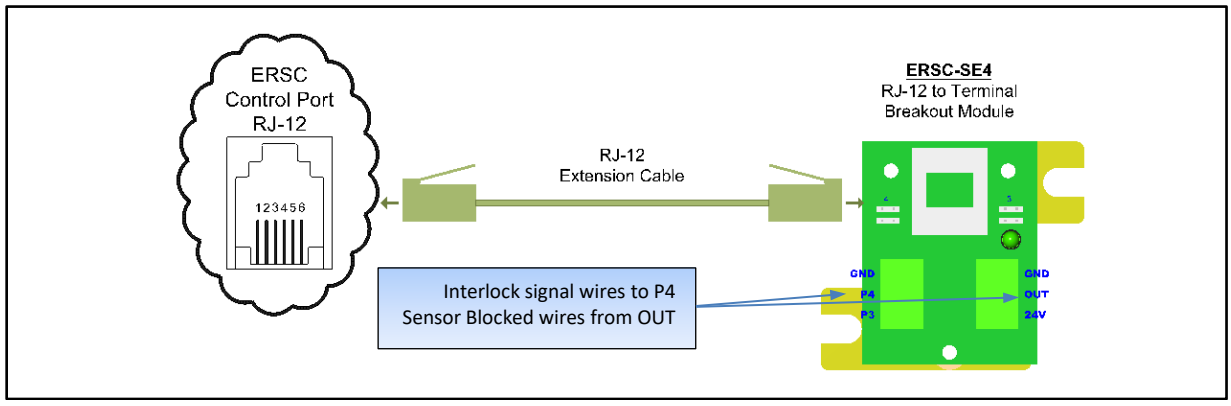


FIGURE 27 - SE-4 BREAKOUT MODULE

Please note that the *ERSC-SE4* performs other functions related to connecting PLC I/O and other devices to ConveyLinx Modules. For a complete description of the ERSC-SE4 module please refer to document *ERSC-SE4 Breakout Module Manual* (publication ERSC-1705).

Connecting the Interlock Signal

Because the *Control Port* input Pin 4 can auto-detect a PNP or NPN signal, you can use either a sourcing or sinking PLC output to activate the Pin 4 signal. *Figure 28* and *Figure 29* show typical connection diagrams for sourcing and sinking PLC output modules respectively. Regardless of whether you are using an *Upstream* or *Downstream* Interlock, you always connect to the *P4* terminal on the *SE-4*. Please note that 0V or DC Common should be connected between the PLC's 24V power supply and the ConveyLinx module's 24V power supply.

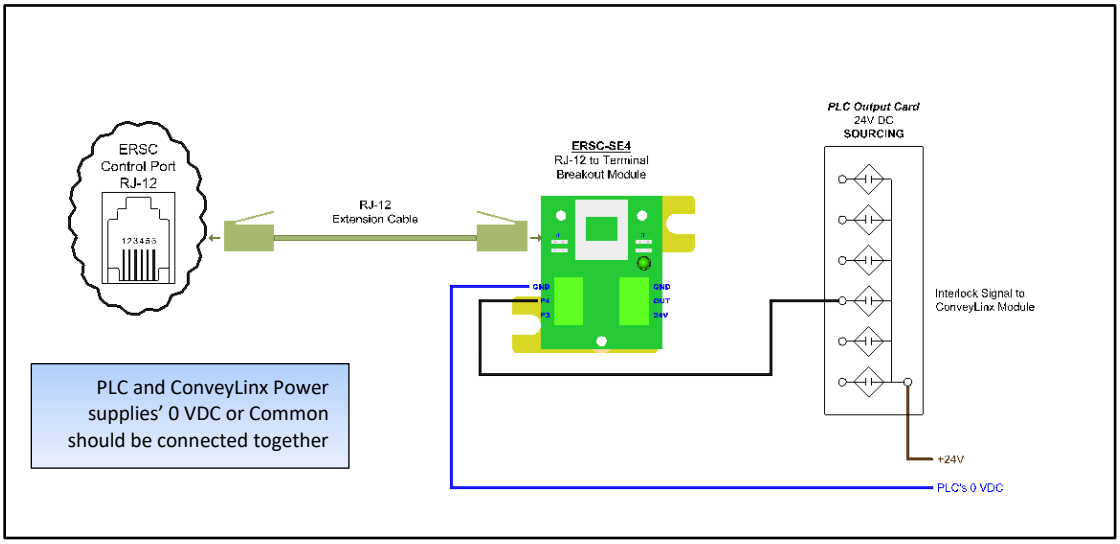


FIGURE 28 - SOURCING PLC OUTPUT CONNECTION

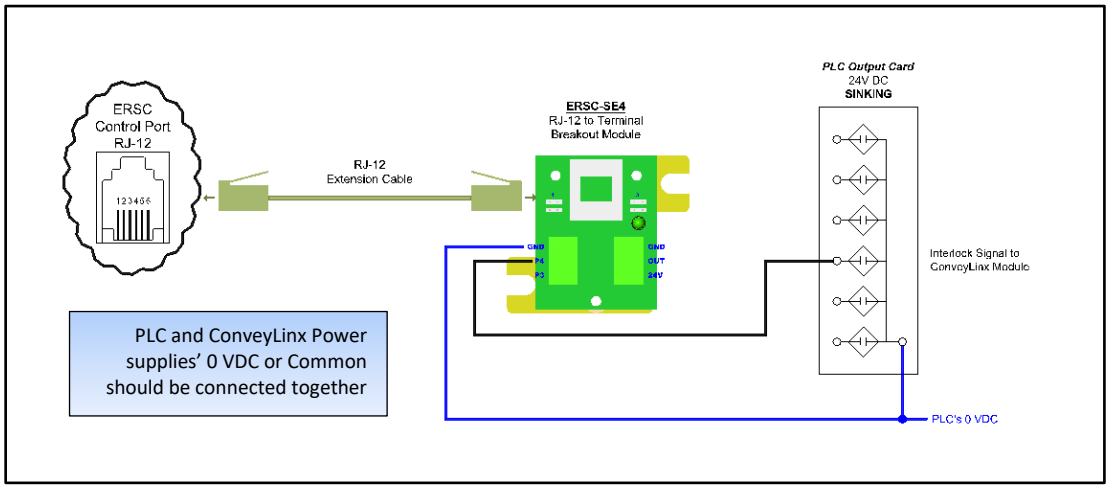


FIGURE 29 - SINKING PLC OUTPUT CONNECTION

CONNECTING THE ZONE BLOCKED SIGNAL

The zone blocked signal is optional but very useful in a full logical handshake application. This signal appears on the *OUT* terminal on the *SE-4*. *Figure 30* shows the wiring connection for the OUT signal from the SE-4 to a sinking PLC input module. Please note that the OUT signal is +24V PNP only. Please also note that 0V or DC Common should be connected between the PLC's 24V power supply and the ConveyLinx module's 24V power supply.

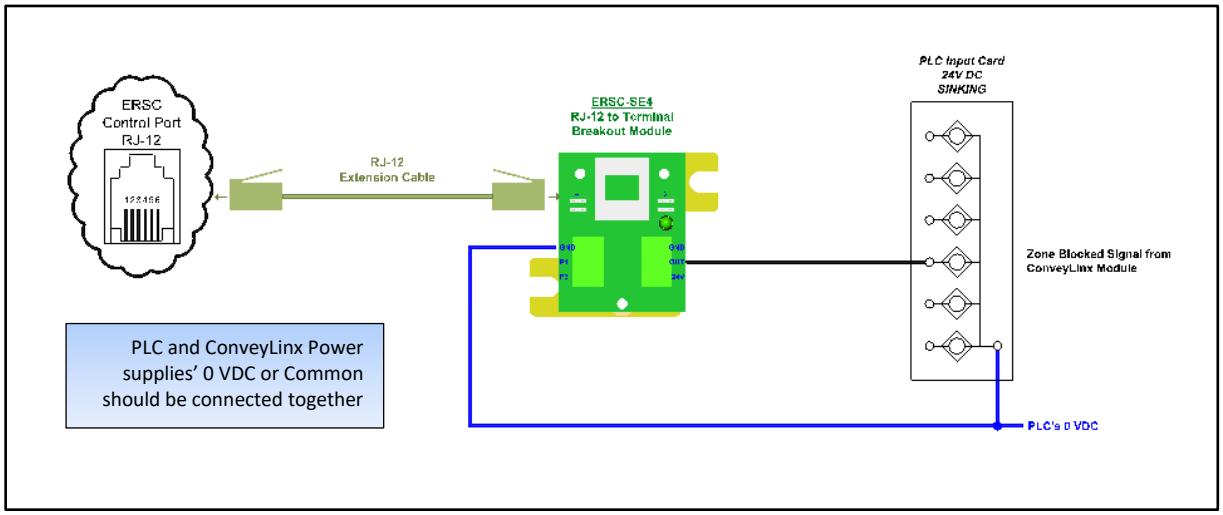


FIGURE 30 - ZONE BLOCKED OUTPUT TO SINKING PLC INPUT CONNECTION

LOCAL ZONE ACCUMULATION CONTROL

Both the *Left* and *Right Control Ports* have an input available that is reserved to provide local accumulation control for the given MDR zone. This input (Pin 3 on RJ-12 of *Control Ports*) is PNP/NPN auto-sensing that will accept a simple contact closure (relay, selector switch, foot switch, etc.). When the contact is closed, the zone will accumulate any *carton* that enters and occupies the zone and the *carton* will not release regardless of the downstream conditions. When the contact is open, the zone will return to its normal mode of operation as dictated by its configuration.

ELECTRICAL CONNECTIONS FOR LOCAL ACCUMULATE SIGNAL

A simple dry contact switch or PLC digital output can connect to the Local Accumulate signal. *Figure 31* shows simple dry contact wiring and *Figure 32* and *Figure 33* show sourcing and sinking PLC output wiring respectively.

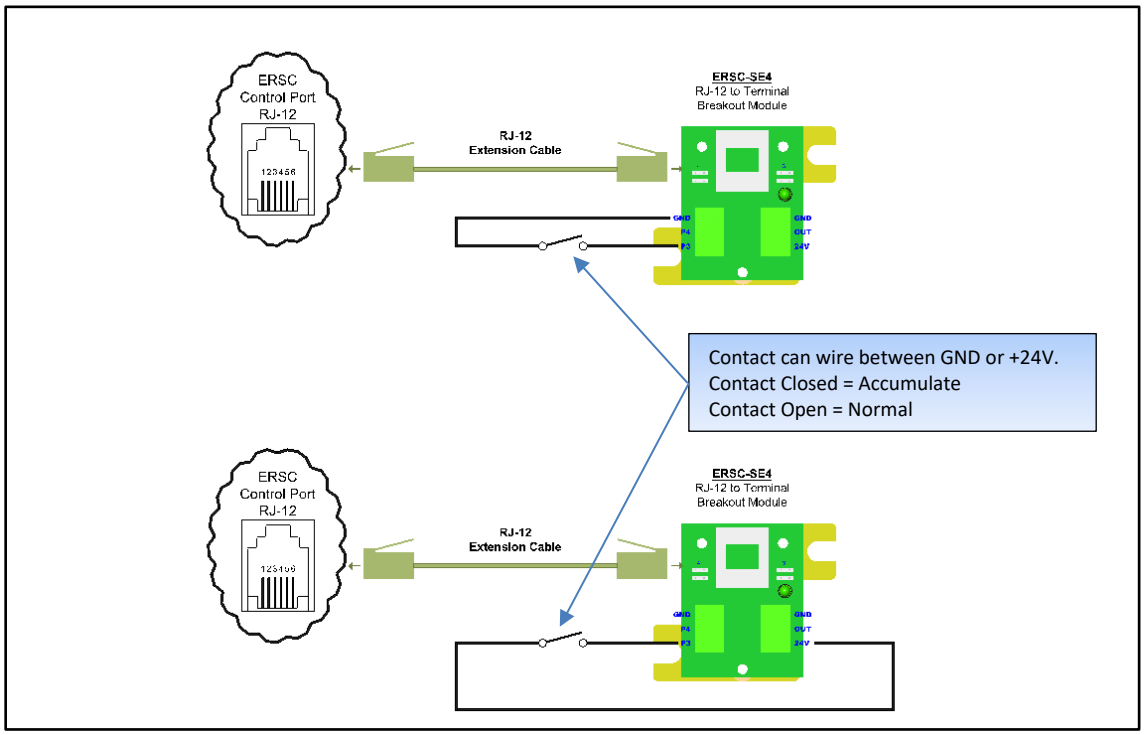


FIGURE 31 - LOCAL ACCUMULATION CONTROL WIRING FOR DRY CONTACT

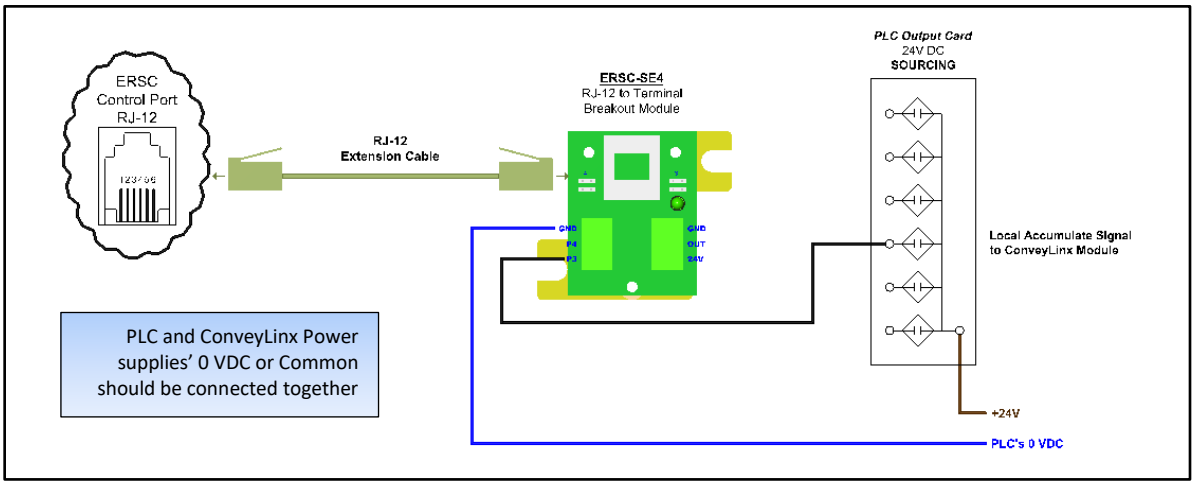


FIGURE 32 - LOCAL ACCUMULATE CONTROL WIRING FOR SOURCING PLC OUTPUT

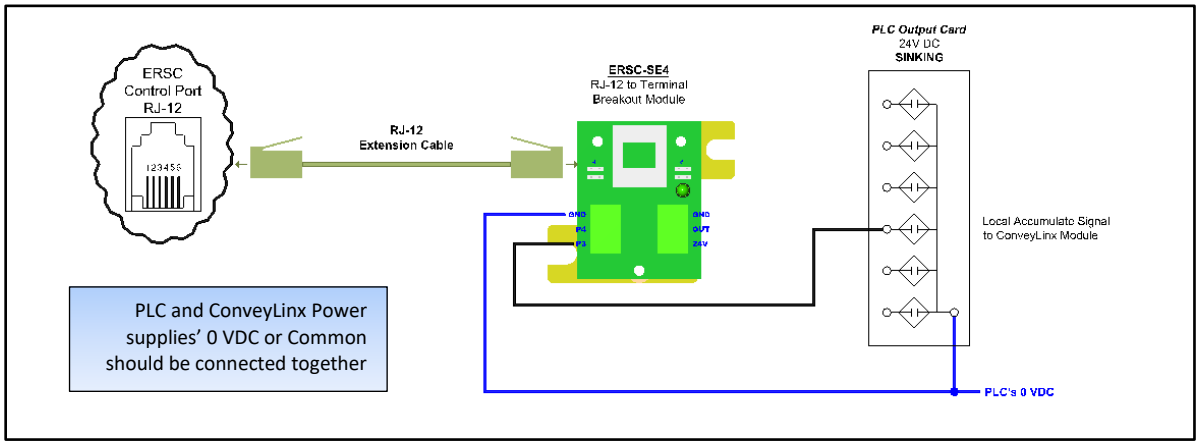


FIGURE 33 - LOCAL ACCUMULATE CONTROL WIRING FOR SINKING PLC OUTPUT

Please note that if the accumulation control connection becomes closed while a *carton* is in transit in a zone (MDR is running and *carton* still blocking the photo-sensor); the *module* will immediately stop the MDR and begin accumulation.

The "open" and "closed" states for the *Accumulate Input* signal shown above in *Figure 31* are the default states. Please refer to section *Control Port Inputs* on page 107 for instructions on how to invert the expected *Accumulate Input* signal for your specific application.

USING SENSORS IN CONTROL PORTS

The *Left Control Port* and the *Right Control Port* are electrically very similar to the *Left* and *Right Sensor Ports* such that the *Control Port* will power a photo-sensor and the photo-sensor's output connects to the *module's* interlocking input. For certain basic applications, plugging a photo sensor into a *Control Port* can be used to stop product flow for *module*-controlled discharge zones and can be used to start or "wake-up" *module* controlled in feed zones.

SENSOR IN CONTROL PORT FOR DOWNSTREAM INTERLOCK

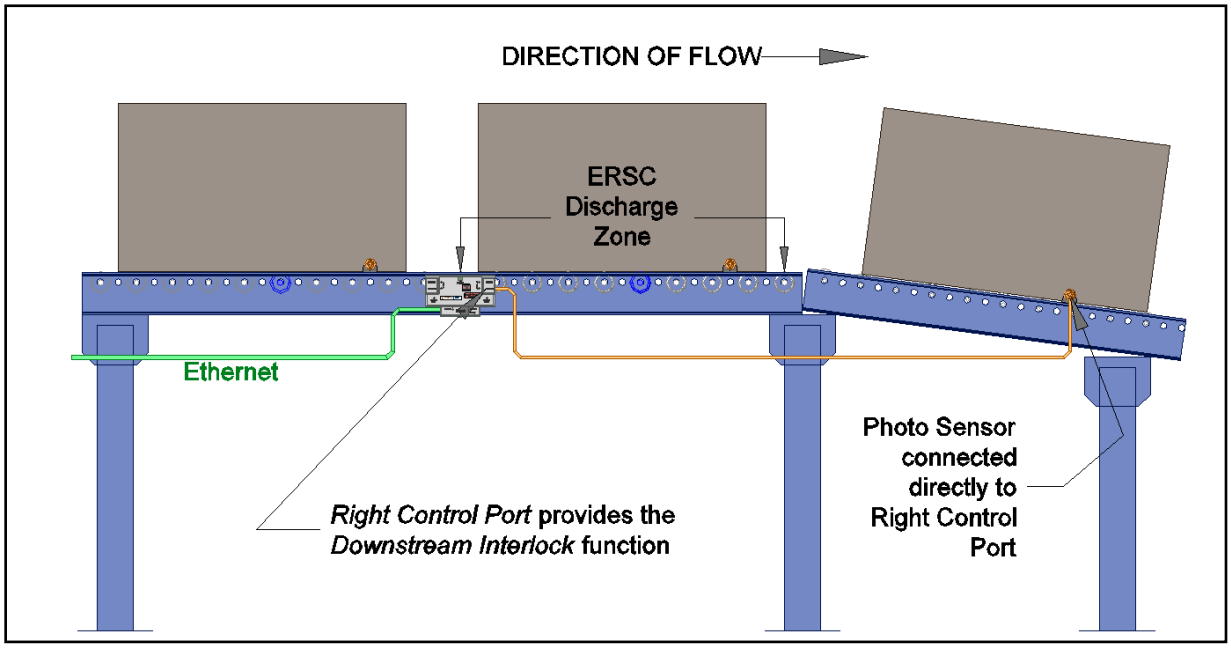


FIGURE 34–SENSOR IN DOWNSTREAM INTERLOCK CONTROL PORT EXAMPLE

Figure 36 shows a typical example where the application calls for the *module*-controlled discharge zone to accumulate a *carton* when a downstream section (in this example a pitched gravity section) is occupied. In essence, the photo sensor plugged into the *Right Control Port* provides the "downstream occupied" signal to the *module*. When the photo-sensor's output is energized, the *module* interprets this condition as "downstream zone is occupied" and will thus accumulate any *carton* that is conveyed into its discharge zone. If the photo-sensor's output is de-energized, then the *module* will discharge the *carton* from the last downstream zone.

Please refer to section *Lane Full Interface* on page 110 for details on how to enhance this functionality as a Lane Full Interface. Activating the Lane Full Interface provides a block and clear time for this "Downstream occupied" signal to the *module* which allows for common applications such as running MDR onto gravity conveyor or other conveyor types for a period of time.

UPSTREAM SENSOR IN CONTROL PORT

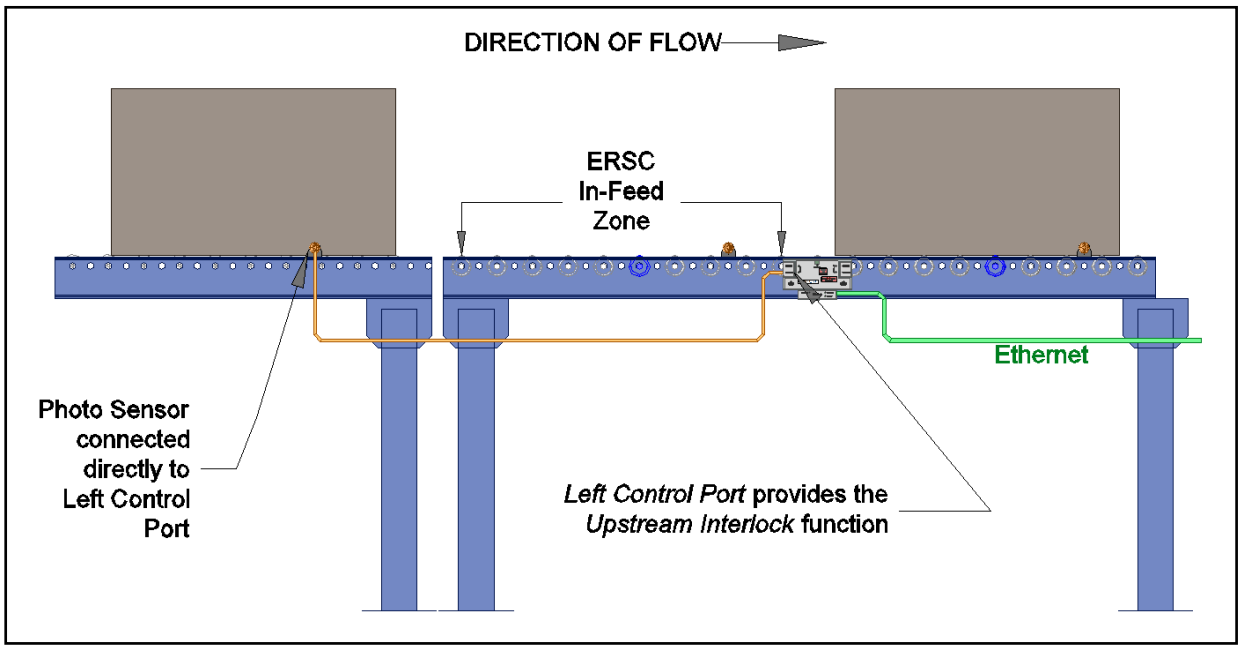


FIGURE 35–SENSOR IN UPSTREAM INTERLOCK CONTROL PORT EXAMPLE

Figure 37 shows a typical example where the application calls for the *module* controlled in-feed zone to run to accept a *carton* if an upstream sensor is blocked. In essence, the photo sensor plugged into the *Left Control Port* provides the "upstream is sending" signal to the *module*. When the photo-sensor's output is energized, the *module* interprets this condition as "upstream *carton* is sending" and will thus begin to run its in-feed zone to accept the new *carton* in transit. If the photo-sensor's output is de-energized, then the *module* will not run its in-feed zone.

Photo-sensor outputs can be either "light energized" or "dark energized" as well as being either "Normally Open" or "Normally Closed". For both of the preceding examples of Sensors in Hardware *Control Port*; the default configuration of *Control Port* inputs is for the sensor's output signal to be energized when the zone is occupied.

Please refer to section *Control Port Inputs* on page 107 for instructions on how to invert the signal of the photo-sensor to indicate zone is occupied when sensor output is de-energized.

Please note that single zone configuration definitions and considerations as to which *Control Ports* are configured with the Upstream or Downstream Interlock functions still apply for photo-sensor connections to *Control Ports*.

Some photo sensors (particularly models that already include an RJ-11 / RJ-12 connector) utilize a separate "sensor health or light operate/dark operate" signal that resides on Pin 3 of the RJ connection. If this type of sensor is used with a *Control Port*, the *module* will interpret this signal on Pin 3 as an "unconditional accumulate" command and will cause the zone to operate as described in section *Local Zone Accumulation Control* on page 54. If such a photo sensor energizes its sensor health when sensor health is "OK" or light operate/dark operate signal when clear, then this sensor cannot be used with a *Control Port* because simply plugging it into a *Control Port* will cause its zone to unconditionally accumulate. If such a sensor only

energizes its sensor health signal upon a "Not OK" condition, then this photo sensor may be used with a *Control Port* with the understanding that a "not OK" health condition will cause the *module* to unconditionally accumulate its *Control Port*'s zone.

EASYROLL SOFTWARE CONFIGURATION TOOL

INTRODUCTION

The *EasyRoll* Software Configuration Tool is a PC based application that provides an alternative means to configure a *ConveyLinx* controlled conveyor system. *EasyRoll* also provides the ability to change each *module*'s default parameters that are otherwise not accessible from the module's built-in *Auto-Configuration* routine.

BASIC FEATURES

Some of the basic module parameters that can be modified by *EasyRoll* are:

- ZPA Mode Selection (singulation, train, etc.)
- MDR brand and type
- MDR rotation direction
- MDR speed, acceleration and deceleration time values
- Jam and Run After clear time values
- *Look Ahead* slow down and *Lane Full Interface* settings
- *Blink &Wink* function used to visually locate a *module* on the conveyor
- Change parameters for a single module or group of modules all at once
- Display status for any module connected to the network

ADVANCED FEATURES

Some of the advanced features available with *EasyRoll* are:

- Firmware Upgrade utility for one or a group of *modules.*
- *Discover* utility used to find all *modules* on a network and manually set their I.P. addresses.
- Module *Connection* mapping to logically link two or more separate *ConveyLinx* networks.
- *Extensions* to allow a *module* to suspend its ZPA function and be logically connected to an adjacent *module* for motor run command.
- *PLC* mode selection allows a *module* to suspend its *ZPA* function and be logically controlled from an external PLC or PC.
- The ability to Back-Up and Restore the Network Configuration.
- The ability to restore a backup by IP or by Nodes. Restoring by IP's is useful when you need to duplicate part or all of a system.

INSTALLING EASYROLL TOOL ON YOUR PC

The files for *EasyRoll* can be download for free at www.pulseroller.com and will be typically in a compressed (i.e. ".zip") format. Once you have extracted the contents of the compressed file; the result will be a folder named with the format "EasyRoll_Vx_nn" where x is the main version number and the nn is the revision level. Inside this folder is a file named "Setup.exe". Double click this file to begin the install procedure. *EasyRoll* installs like any standard Windows application and you will be prompted for typical Windows prompts. By accepting the defaults for the prompts; *EasyRoll* will install on your local *Operating System* drive under the " \Program Files (x86)\Industrial Software\EasyRoll\" or " \Program Files\Industrial Software\EasyRoll\".

CONVEYLINX ETHERNET DEFINITION

Please refer to *Appendix B–Configuring PC for Ethernet Subnets* for pre-requisite information on understanding Ethernet network I.P. addresses and Subnet concepts. Further description in this section assumes you have a general knowledge level of I.P. addressing and subnets.

All *Module*s communicate over Ethernet network and use TCP/IP based protocols for normal function. All TCP/IP protocols require that each device on a network have a unique I.P. address assigned to it in order to function properly.

An I.P. address is in the format of: `AAA.BBB.CCC.DDD` where `AAA`, `BBB`, `CCC`, and DDD are numerical values between 0 and 255.

For the purposes of *ConveyLinx;* the `AAA.BBB.CCC` portion of the I.P. address taken together is defined as the ***Subnet***. The DDD value of the address minus 19 is defined as the ***Node***.

For example; if a *module* has an I.P. address of "192.168.25.20" then its *Subnet* address is "192.168.25" and its *Node* is 1 (i.e. 20-19 = 1)

At the factory, each and every *module* is assigned a temporary I.P. address that is used by automated testing equipment and fixtures so that every *module* is verified prior to shipment. When a *module* is taken "out of the box" it will still have this I.P. address stored in its memory.

When the *Auto-Configuration Procedure* is initiated; one of the many things that occur is that each module is automatically assigned a new I.P. address. This I.P. address for all modules is determined by the ***Subnet*** of the I.P. address already stored inside whichever *module* is selected as the *Auto Configuration Master*. Even if all downstream modules from the *Auto Configuration Master* have the same or different *Subnet* or *Node* values; these downstream modules will have their *Subnet* changed to the existing *Subnet* of the *Auto Configuration Master*. Furthermore, when the *Auto Configuration Procedure* occurs; the *Auto Configuration Master* will also have its DDD octet value changed to **20**. All downstream *Modules* will then have their respective DDD values automatically set beginning with 21.

In the example below; 4 *modules* are installed "out of the box" onto the conveyor. Once the *Auto Configuration Master* is identified and the *Auto-Configuration Procedure* is performed; all 4 *modules* will have their I.P. address configured as shown.

Figure 38 shows a 4-module network with possible I.P. addresses that would have been on the *module* from the factory. Note that their subnets could be different as well as there could be duplicate addresses.

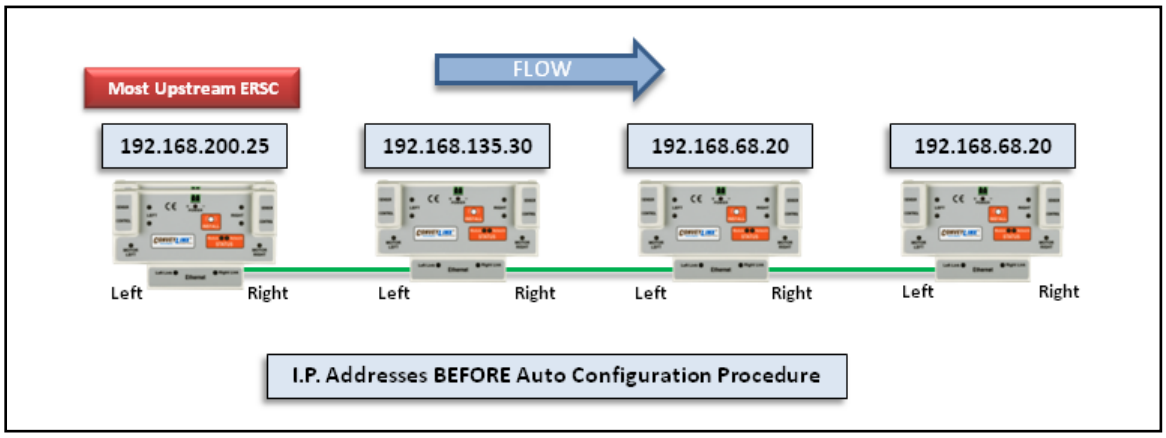


FIGURE 36 - "OUT OF THE BOX" MODULES BEFORE AUTO-CONFIGURATION

Figure 39 shows the same 4 *module* network after the *Auto-Configuration Procedure* has completed. Please note that all *module*s take on the first 3 octets of the I.P. address that was in the most upstream *module* (192.168.200 in this case).

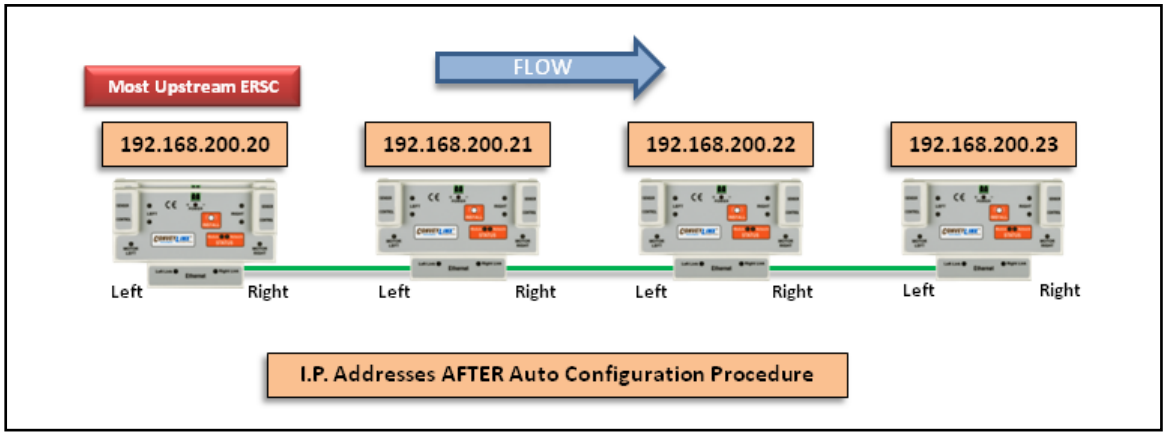


FIGURE 37 - EXAMPLE NETWORK AFTER AUTO-CONFIGURATION

The *Auto-Configuration Procedure* will assign *Nodes* up to and including DDD octet *240*. Therefore, each *Subnet* is limited to 221 *module Nodes.*

CONNECTING YOUR PC TO CONVEYLINX NETWORK

Using a straight through Ethernet cable (or crossover Ethernet cable for Hardware Revision 1); connect your PC's Ethernet port to the *Auto-Configuration Master* as shown below in *Figure 40*

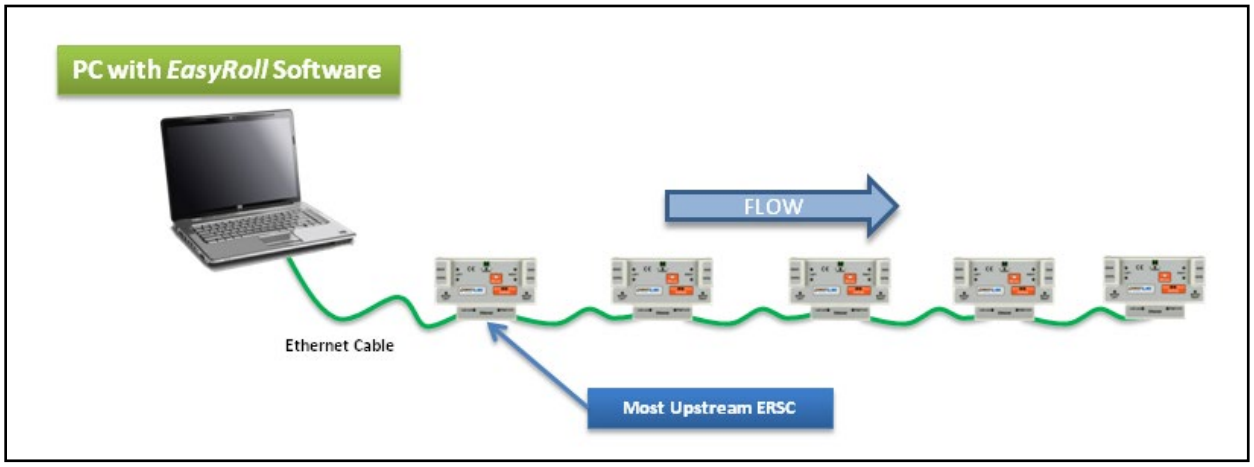


FIGURE 38 - INITIAL PC CONNECTION TO CONVEYLINX SUBNET

It is highly recommended to connect the PC directly to the ConveyLinx network. Avoid trying to connect via Ethernet switches or wireless router/switches. If a wireless switch is not setup properly then the Discover Feature will not work. Also ensure that network firewall is turned off for proper discovery.

OPTIONS FOR CONFIGURING YOUR PC'S IP ADDRESS

Once a *ConveyLinx* network or *Subnet* has been configured by the *Auto-Configuration Procedure* with the *Subnet* value taken from the factory "out of the box" IP address of the *Auto Configuration Master* (similar to example shown above); you will need to do **one** of the **three** following procedure in order to have your PC be able to connect to the *Subnet* and use *EasyRoll* software:

Option	Description
Method 1	Allow *ConveyLinx's* built-in *DHCP* service automatically assign an I.P. address to your PC
Method 2	Manually change the I.P. address and/or subnet mask of your PC to match the *ConveyLinx Subnet*
Method 3	Manually change the I.P. address of the *Auto-Configuration Master* to a new *Subnet* that is accessible from the I.P. address already configured in your PC

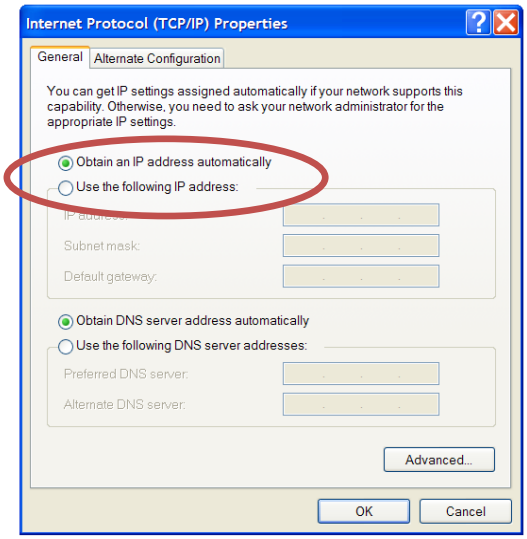
Any of these choices is equally valid and totally dependent on user preference.

METHOD 1 - USING DHCP SERVICE FOR PC I.P. ADDRESS

For installations where you are connecting to a single simple *Subnet* and your PC is already configured to have its I.P. address assigned; it is recommended to allow the *ConveyLinx* network automatically assign an I.P. address to your PC utilizing *ConveyLinx's* built-in *DHCP* service. This is the easiest method particularly if your PC is already set-up to have its I.P. addressed assigned.

If using the ConveyLinx *DHCP* service to assign your PC's I.P. address; you do not need to even start *EasyRoll* to accomplish this.

If your PC is already configured to obtain an IP address automatically; then by simply connecting you PC as shown in *Figure 40 - Initial PC Connection to ConveyLinx Subnet* is all you have to do to have the PC's I.P. address configured so you can use *EasyRoll*



MANUAL I.P. ADDRESS CONFIGURATION METHODS

Manual configuration of your PC's I.P. address may be your preference for larger system configurations with multiple *Subnets* and/or installations where you want to keep a dedicated PC connected all the time.

For installations where there are multiple *ConveyLinx Subnets* that share the same physical Ethernet cabling (either directly or through Ethernet switches); it is recommended that the *Subnets* be pre-determined and that each *Auto-Configuration Master* have its *Subnet* set in advance of performing each of their respective *Auto-Configuration Procedures*. By pre-determining all *Subnets* required; your PC can have its I.P. address and subnet mask set to appropriate values so that you can access all of your *ConveyLinx Subnets* from a single PC with *EasyRoll*.

Further description and application examples of multiple *ConveyLinx Subnet* solutions are included in separate Insight Automation publication *ConveyLinx-ERSC PLC Developer's Guide* (publication *ERSC-1500*)

Regardless of which manual procedure you choose, with your PC and *EasyRoll* you can easily accomplish either.

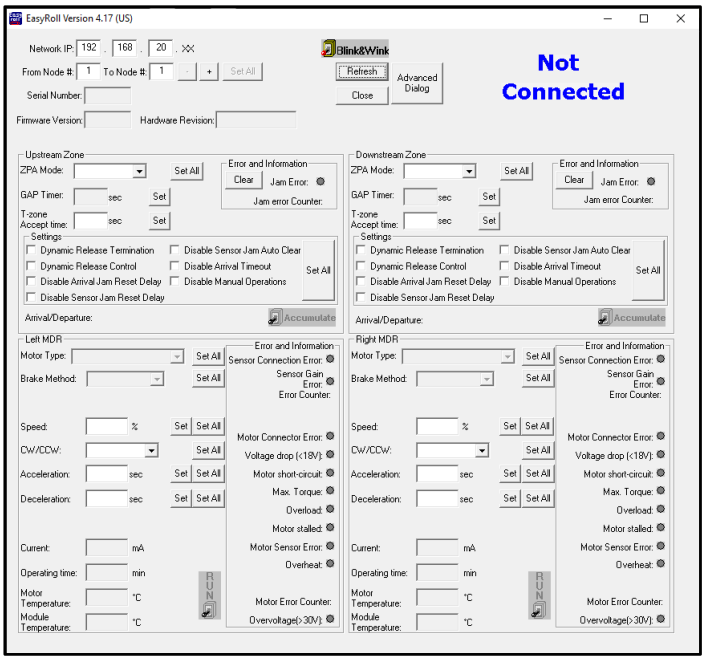
USING EASYROLL TO LOCATE AUTO-CONFIGURATION MASTER

For either manual method of I.P. address configuration, you must access the I.P. address information of the *Auto-Configuration Master module* on your network by using *EasyRoll*.

STARTING EASYROLL APPLICATION

If you followed the default installation setting when you installed *EasyRoll*; the program should be selected from "Start – All Programs – Industrial Software – EasyRoll". If you selected a different location when you installed; go to that location and run "EasyRoll.exe".

When you first run *EasyRoll*; you should see a window similar to this with greyed out status values and blank parameter boxes



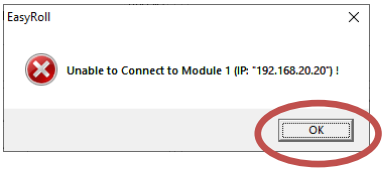
Regardless of whether you need to change your PC's I.P. address to match your already configured *ConveyLinx Subnet* or change the *ConveyLinx Subnet's Auto-Configuration Master* to match a subnet address you want to use; you have to connect to the *Auto-Configuration Master*.

USING THE DISCOVER UTILITY

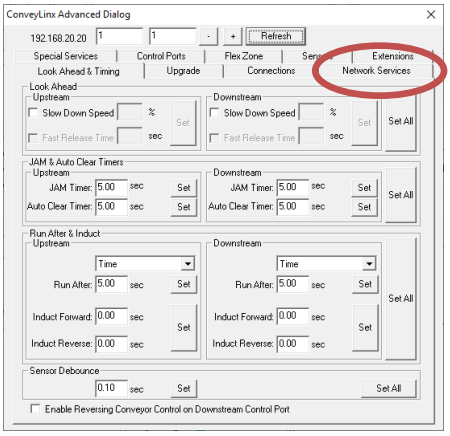
One of the features of *EasyRoll* is that it has a utility called *Discover* that allows your PC to go and find any *Modules* that may be physically connected to you network regardless of the I.P. address settings of your PC or the I.P. address settings of the *Modules*.

To access the Discover Utility; you need to invoke the *ConveyLinx Advanced Dialog* window. To do this, either click the *Advanced Dialog* button at the top-center of the Main screen or press **F2.**

When you press **F2**, *EasyRoll* will try to first communicate with the subnet shown in the *Network IP* boxes, then because the *Node No.* fields are blank; you will see an error message similar to that shown here. This is normal and you can simply click OK.

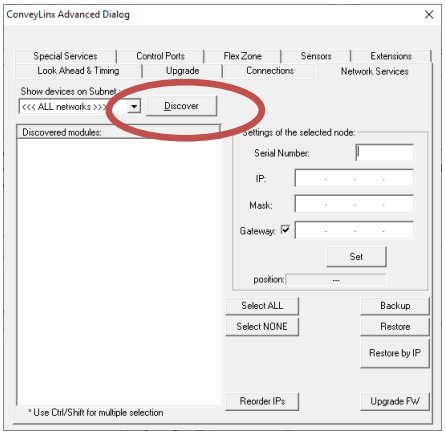


After clicking OK on the error message above, *EasyRoll* will display the *ConveyLinx Advanced Dialog* screen. Click on the tab *Network Services.*



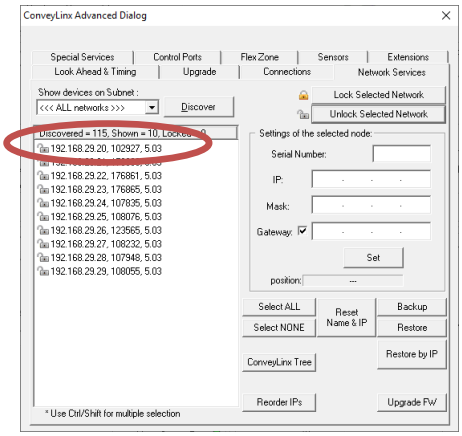
After clicking the *Network Services* tab, you will see the screen you will use to both "discover" the *modules* that can be found as well as select a specific *module* in which to modify its I.P. address settings.

On this screen, click the *Discover* button



After clicking the *Discover* button, *EasyRoll* will query the network and return a list of all *Modules* it finds and shows each module's I.P. address, serial number and current Firmware version. We already know that the *Auto-Configuration Master* is the *module* with the last octet of 20.

In this example, *Auto-Configuration Master* is at 192.168.29.20, its serial number is 102927 and has Firmware 5.03



Please refer to section *ConveyLinx Advanced Dialog* on page 84 for further descriptions for the remaining *ConveyLinx Advanced Dialog* screen selection tabs.

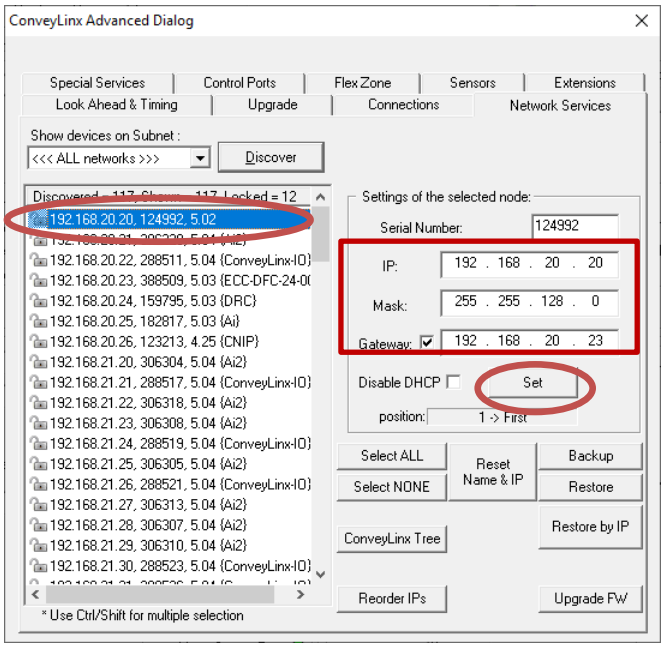
METHOD 2 - CHANGE PC TO MATCH AUTO-CONFIG MASTER

At this point, because you now know the *Auto-Configuration Master*'s I.P. address you can simply change your PC's IP address configuration so that is can have access to the *Auto-Configuration Master's Subnet*. In the example above, the *Auto-Configuration Master's* I.P. address is 192.168.26.20 therefore the *ConveyLinx Subnet* is 192.168.26. Please refer to *Appendix B–Configuring PC for Ethernet Subnets* for details on how to set your PC's IP address and subnet mask to access the *ConveyLinx Subnet* you discovered.

METHOD 3 - CHANGE AUTO-CONFIG MASTER I.P. ADDRESS

In cases where you want to set the *Auto-Configuration Master's* I.P. address to something other than the default it used when the *Auto Configuration Procedure* was performed, you can do this from the same *Network Services* screen.

Single click the *Auto-Configuration Master* in the list. When you do this, its I.P. address information is filled in as shown. Simply enter in the new I.P. address information you want to use and then click the "Set" button.



After clicking the *Set* button, you can click the *Discover* button again and *EasyRoll* will refresh the list of modules at the left. You can then verify that the module has the new I.P. address settings.

At this point, this particular *ConveyLinx Subnet* will no longer operate because its *Auto Configuration Master's* I.P. address has been changed. You must perform the *Auto Configuration Procedure* again so that all downstream *modules* will have their I.P. address updated to match the *Auto Configuration Master's* new *Subnet.*

If you have changed the subnet of your *Auto Configuration Master* module and performed a new *Auto Configuration Procedure*, unplug your Ethernet cable from your PC and then plug it back in in order for your PC to get a fresh I.P. address from the *Auto Configuration Master* module (*AAA.BBB.CCC.20*).

EASYROLL MAIN SCREEN

Assuming you have either changed your PC's configuration or changed the *Auto Configuration Master's* configuration as described above; you should now be able to use the *EasyRoll* main screen to view your system's status and change operational parameters. If you have followed the above example, simply closing the *Advanced Dialog* will show the main screen. The main screen is also shown when you first run *EasyRoll*. *Figure 41* shows a typical main screen.

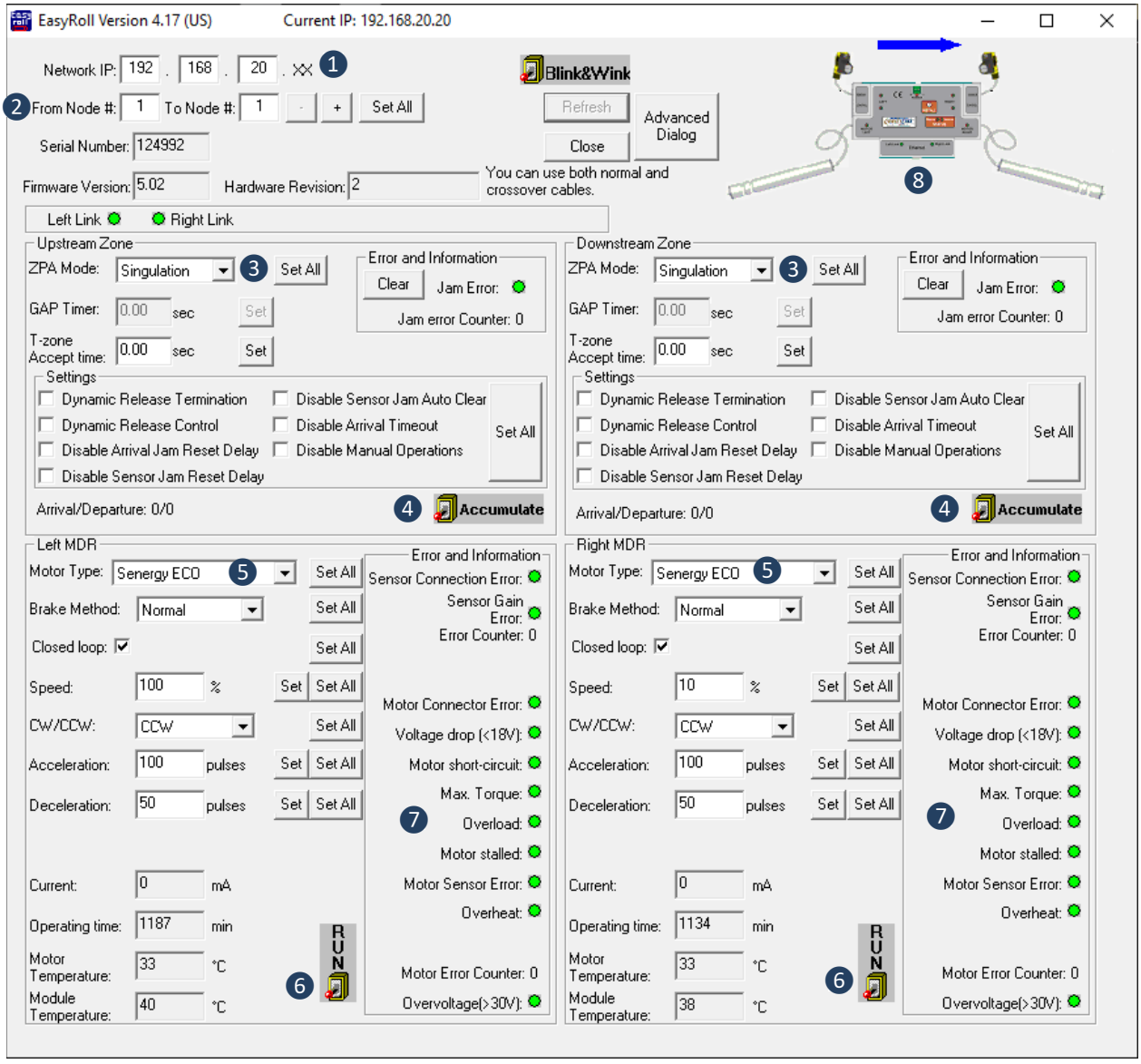


FIGURE 39 - EASYROLL MAIN SCREEN

The numbered items in *Figure 41* show the basic functional areas and detailed descriptions will follow for each.

Item	Description
1	Network IP – This is where you enter the *Subnet* of the particular *ConveyLinx* network you wish to connect
2	Node No. – This is where you enter a range of *Nodes* in which to connect. Entering values here will cause the "Refresh" button to enable. Clicking this button will cause the rest of the items (3, 4, and 5) to be populated
3	Upstream Zone / Downstream Zone – These selections allow you to change the ZPA mode of the particular zone as well as several check boxes to change the default operation of certain jam conditions, etc.
4	Upstream Zone / Downstream Zone – Selector to cause the local zone to Accumulate if a *carton* arrives and to cause the local zone to be in Accumulate mode upon power up of the *module*
5	Left MDR / Right MDR – Selections for MDR type, speed control, acceleration, deceleration, etc.
6	Left MDR / Right MDR – Selector to click to jog the MDR, click again to stop
7	Left MDR / Right MDR – Visual indicators for various MDR status and diagnostics information
8	Diagnostic Window – Click the graphic image to open a details Diagnostics window. See section *Diagnostic Window* on page 82 for details.

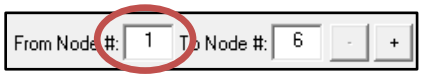
Please note that some of the detailed information shown in this figure may be different for your particular system and that most of these fields will be blank until you actually initiate communications.

CONNECTING TO CONVEYLINX

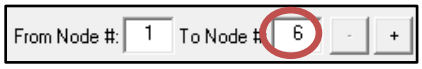
Once the Network IP boxes (❶) have been entered with the correct *Subnet*, you then type in a range of *Nodes* (❷) you wish to connect; the *Refresh* button will become enabled. Click the *Refresh* button and data for the rest of the main screen should fill in.

NODE NAVIGATION

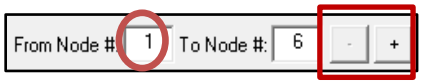
Whatever value is entered in the *From Node #* box will be the particular *module* Node data shown in the remainder of the main screen.



The value entered in the *To Node #* box does not have to be the actual "last" Node of the network. If you enter a value higher than what exists; an error message will display after you click the *Refresh* button. For the example shown; if there were only 4 Nodes installed and you entered 6, you would receive 2 error messages in succession after clicking the *Refresh* button.



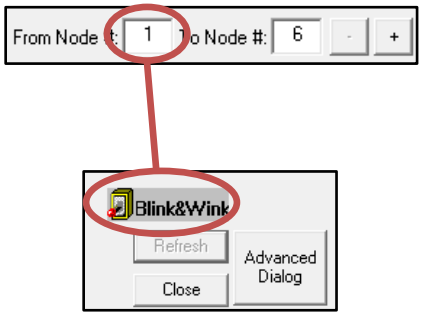
Clicking the + and - buttons will increment / decrement the *Node* value in the *From Node #* box and display the *module* data for the new Node selected. Please note that if you increment past the value of the last physical *Node* installed, you will receive an error message.



NODE IDENTIFICATION

*EasyRoll*main screen has a feature identified as "Blink & Wink" that allows you to visually verify the *Node* you have selected.

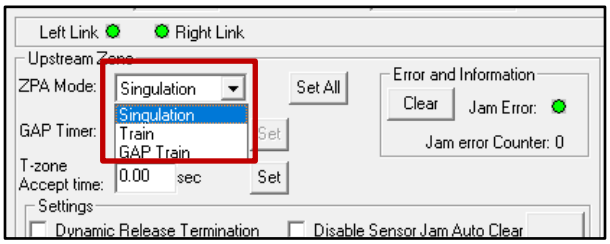
If a valid Node is selected in the *From Node #* text box and its information is displayed on the main screen; clicking the *Blink & Wink* switch icon will signal the selected *module* to blink on and off all of its LED indicators. Click the *Blink & Wink* switch again to turn this off.



UPSTREAM / DOWNSTREAM ZONE CONFIGURATION

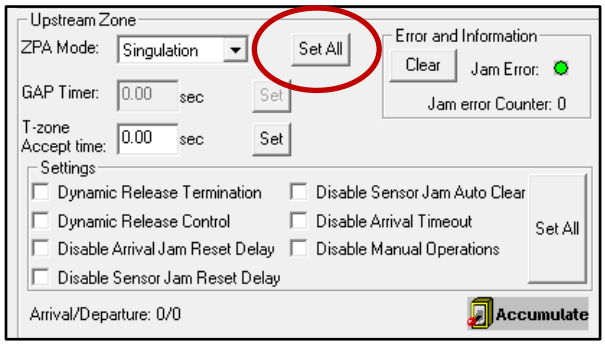
Once you have selected the particular *Node* you wish to view and/or modify, you can go to the particular settings.

Selecting the pull-down box for *ZPA Mode* will show the available selections. *Singulation* is the default configuration. Please refer to section *ZPA Mode Selections* for descriptions for *Train* and *GAP Train* modes.

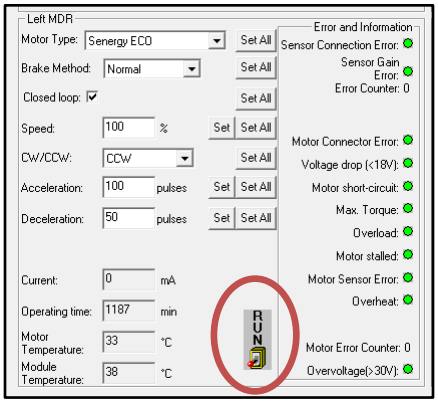


Selecting a new setting from the *ZPA Mode* drop down box immediately changes the zone's mode. If you want to set all Upstream zones for the range of nodes entered in the *Node No.* text boxes, then click the *Set All* button.

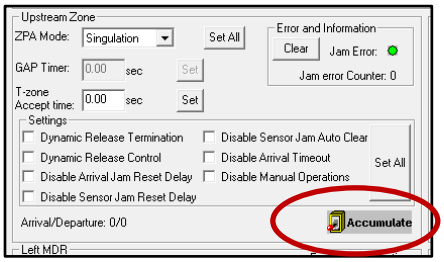
Similarly, you can do the same operation in the "Downstream Zone" portion of the main screen.



Clicking the *Run* switch icon will cause the zone's MDR to jog in its default rotation direction. Note that there are separate *Run* controls for Left and Right MDRs.



Clicking the *Accumulate* switch icon will place the zone in accumulation mode and the next *carton* that arrives at that zone will stop and remain until you click the switch again to turn off the accumulation mode.



ZPA Mode Selections

Singulation mode is the default configuration for all zones upon the completion of the *Auto Configuration Procedure*. Please refer to section *Default Singulation Release ZPA Mode* on page 34 for description. The following sections describe the ZPA modes available via *EasyRoll*.

Train Release Mode

For zones configured for *Train Release Mode*; when the downstream train zone releases, all subsequent upstream zones begin to run simultaneously. This makes the MDR conveyor operate similar to a conventional single drive roller conveyor in that all *cartons* move at once. *Figure 42* illustrates a typical *Train Release* example.

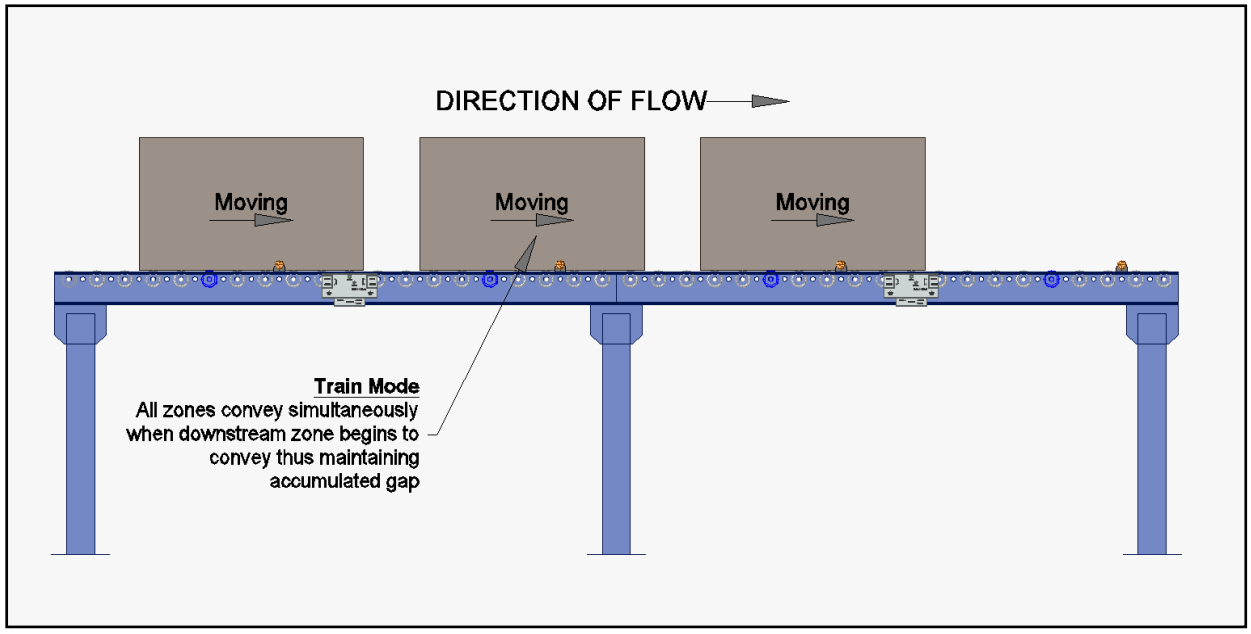


FIGURE 40 - TRAIN RELEASE EXAMPLE

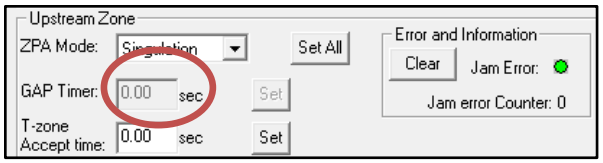
Please note that singulation and train modes are configurable per zone and can be mixed on the same network.

GAP Train Release Mode

Gap Train is a variant to *Train* release in that it incorporates a fixed time delay prior to allowing the *cartons* to move. The typical usage of *Gap Train* would be to apply this configuration to the discharge zone of a group of zones already placed in *Train* mode. This configuration could be used to assure a specific minimum gap between cartons.

For example, let's say we have *Gap Train* set for 10 zones with the *Gap Timer* set to 0.5 seconds for each of these zones. We will start with all 10 zones stopped and accumulated with *cartons*. When the most downstream zone of the 10 releases, the zone behind it will wait 0.5 seconds then it will release, then the one behind it will wait 0.5 seconds and then release and so on until all 10 zones have released.

When you select *Gap Train* from the *ZPA Mode* drop-down box; the *Gap Timer* data entry box and *Set* button are enabled. Simply enter the desired time value and click the *Set* button to update the value in the selected Node.



Gap Train mode is designed to be used at the discharge zone of a group of zones configured for _Train_ mode. If more than one consecutive zone is configured as _Gap Train_; then each of these zones will in turn require that their respective gap timers expire. Depending on the time value used, the result will appear to be _Singulation_ mode.

T-ZONE CONFIGURATION

In conveyor applications, transferring a *carton* at a right angle from one conveyor to another often requires special lifting and lowering mechanisms. In certain applications, one conveyor can simply drive its *carton* off of its downstream zone directly onto the upstream zone of another conveyor that is perpendicularly oriented. This type configuration is commonly defined as a *T-Zone* arrangement. *ConveyLinx* contains the logic to control a *T-Zone* arrangement without requiring any external control interface or programming. *Figure 43* shows the kind of *T-Zone* arrangement that is available within *ConveyLinx* without any external control interface.

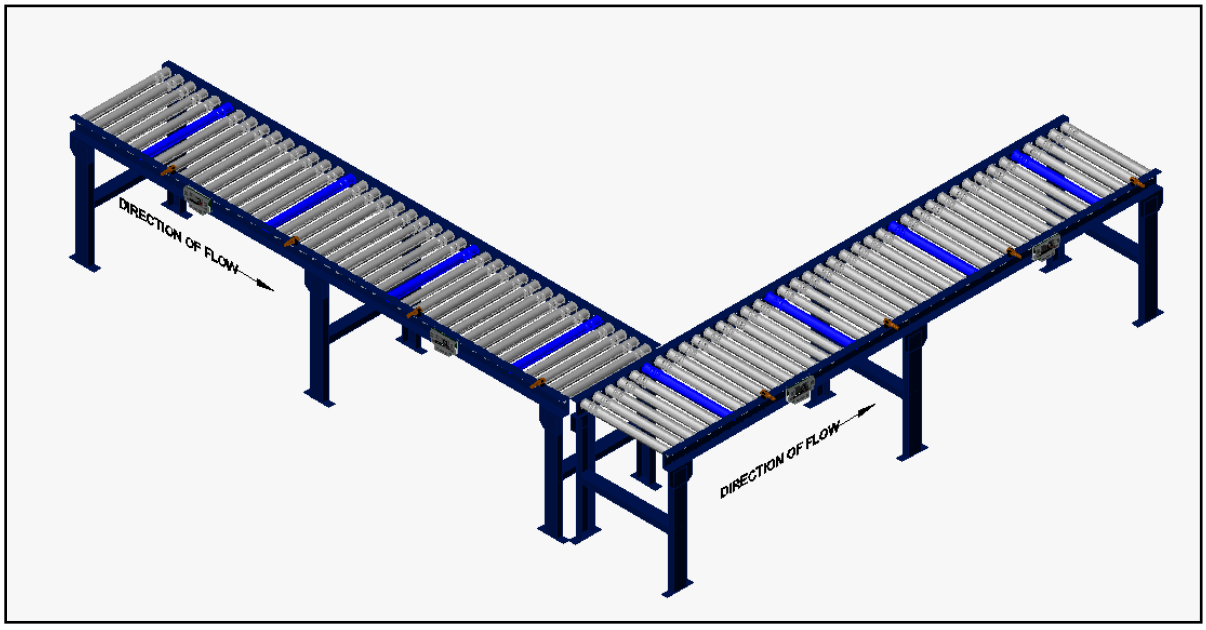


FIGURE 41 - TYPICAL T-ZONE CONFIGURATION

Material handling considerations such as discharge conveyor speed and load weight have to be analysed prior to implementing a _T-Zone_ configuration. Be sure to verify your mechanical design and carton characteristics before utilizing a _T-Zone_ arrangement.

CONNECTING ERSC FOR T-ZONE ARRANGEMENT

A *T-Zone* arrangement can be made operational in one of two ways:

1. Sending and Accepting zones can be on the same *module*
2. Sending and Accepting zones can be on two different *modules* as long as they have established their upstream/downstream connections by the *Auto Configuration Procedure.*

Figure 44 and *Figure 45* depict two ways to connect the MDR's and photo-sensors to *Modules* to result in a valid T-Zone configuration.

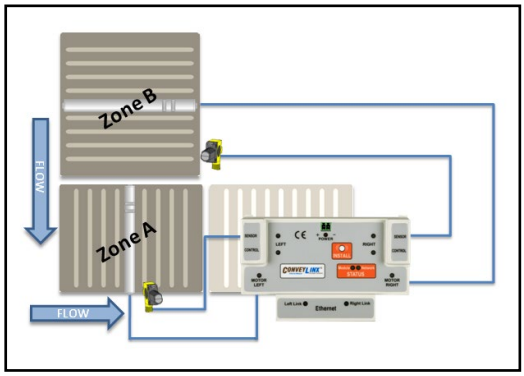


FIGURE 42 - SINGLE ERSC T-ZONE EXAMPLE

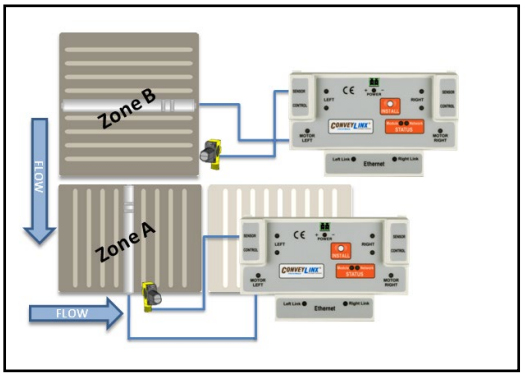
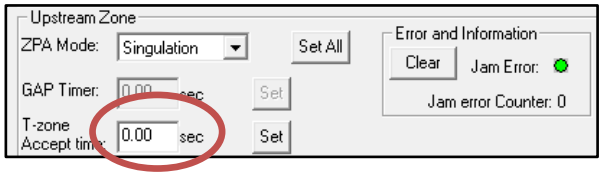


FIGURE 43 - TWO ERSC T-ZONE EXAMPLE

To configure a T-Zone arrangement to operate properly, the "T-zone Accept Time" on the main screen must be set to a non-zero value. This time value is the duration that the accepting zone's rollers will delay in running so the upstream sending zone can convey the *carton* onto stopped rollers in the accepting zone. Once this time value has expired, the accepting zone's rollers will be enabled to run based upon normal downstream conditions. A value of 200 milliseconds is typical for nominal MDR system speeds.

Enter the value, for example 0.200 for 200 milliseconds and click the *Set* button. Whether to change the *Upstream Zone* or *Downstream Zone* value on the main screen is dependent upon which zone is the *accepting* zone. The *T-zone Accept time* is always applied to the *accepting* zone.

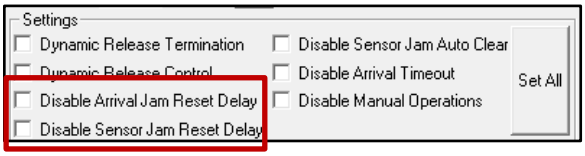


SETTINGS CHECK BOXES

DISABLE RESET DELAYS

Any individual zone or group of zones can be configured to ignore the *Auto Clear Time* delay for either or both of the *Arrival Jam* (see section *Arrival Jam* on page 36) and *Sensor Jam* (see section *Sensor Jam* on page 36). Selecting either of these options will not eliminate the detection of the particular jam condition; it simply eliminates the default *Auto Clear Time* delay the logic utilizes before automatically clearing the condition.

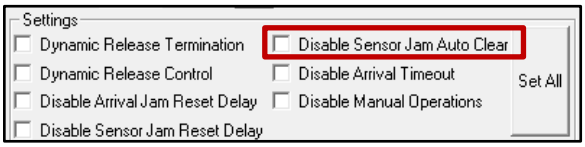
Clicking either or both checkboxes will cause the zone's logic to ignore the *Auto Clear Time* delay for the particular jam condition.



DISABLE SENSOR JAM AUTO CLEAR

Section *Sensor Jam Auto Clear Procedure* on page 36 describes how the logic will make 3 attempts to clear a *Sensor Jam* if one occurs. There may be instances at specific zones or range of zones where you do not want this functionality to happen. There is a check box that allows you to disable this functionality.

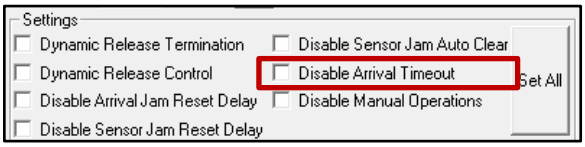
Clicking the *Disable Sensor Jam Auto Clear* check box will disable the 3 attempts to clear the *Sensor Jam* and will cause the zone to remain in the jam state until the sensor is cleared manually.



DISABLE ARRIVAL TIMEOUT

Section *Arrival Jam* on page 36 describes how default zone to zone logic utilizes the *Jam Time* value for the discharging zone to wait for the accepting zone to indicate successful arrival of the *carton* into the accepting zone. In certain applications for a given zone, you may want to disable this functionality.

Clicking the *Disable Arrival Timeout* check box will prevent the discharging zone from registering an *Arrival Jam* condition. Upstream *cartons* will not wait to enter the discharging zone once a *carton* has left the discharging zone.

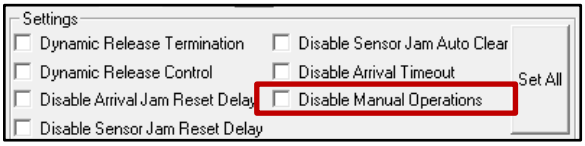


DISABLE MANUAL OPERATION

In normal ZPA operation, if a zone is in Accumulation (either by external device or Local Zone Accumulation control by Pin 3 on the Control Port) and the *carton* is subsequently manually removed from the conveyor; the zone downstream of the accumulated zone will run in an attempt to "find the lost *carton*". In certain applications or

situations where manually removing *cartons* from accumulated zones is expected; you can disable the running of the downstream zone to "find the lost *carton*.

You first navigate the main screen to the zone you want to prevent from running when it's upstream neighboring zone has its *carton* removed. Clicking the *Disable Manual Operations* check box will prevent this zone from running when its upstream neighbor has an accumulated *carton* manually removed.



Dynamic Release

Some conveyor application may require that you be able to switch a defined quantity of zones between singulation and train release modes depending on operational conditions. *Dynamic Release* allows you to utilize *Control Port* signals to remotely perform this switching. There are two zones that require configuration in order to use Dynamic Release. The most downstream zone in the range of zones you wish to control is the *Dynamic Release Control* zone and the most upstream zone in the range of zones you wish to control is the *Dynamic Release Termination* zone. The *Dynamic Release Control* zone requires you to energize its *Control Port Pin 3* signal to toggle between release modes. If the default release mode for the range is *Singulation*, then energizing Pin 3 will switch the range to *Train*. If the default release mode is *Train*, then energizing Pin 3 will switch the range to *Singulation*. *Figure 46* depicts an example of Dynamic Release for 5 zones.

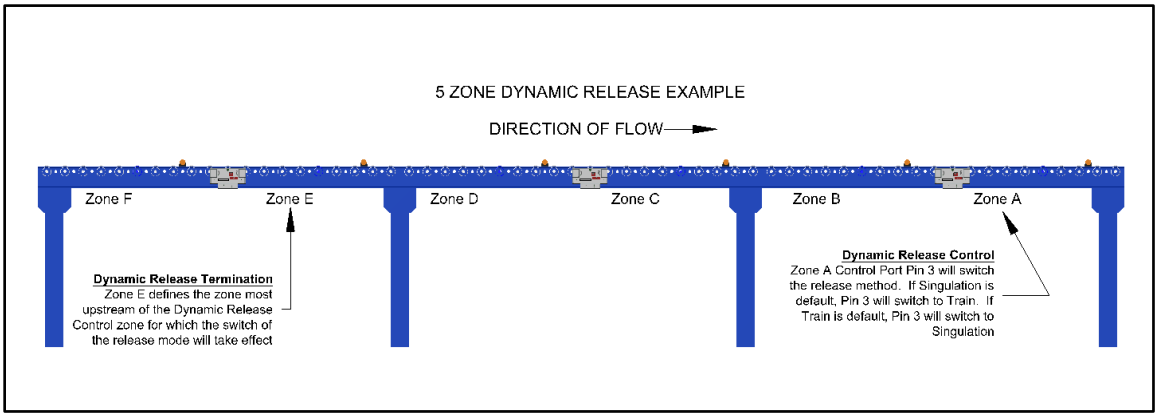
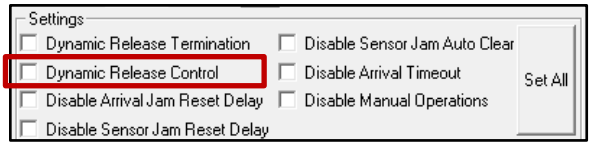


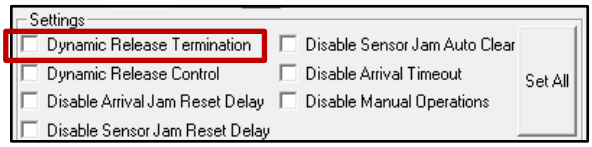
FIGURE 44 - DYNAMIC RELEASE EXAMPLE

In this example, the *Dynamic Release Control* zone is Zone A and the *Dynamic Release Termination* zone is Zone E. The release of Zones A thru E will be governed by the energized state of Zone A Control Port Pin 3.

You first navigate the main screen to the most downstream zone of the Dynamic Release range. Clicking the *Dynamic Release Control* will set this zone's *Control Port* to look for Pin 3 energized to switch the release method.



Then you navigate the main screen to the upstream zone of the *Dynamic Release* range. Clicking the *Dynamic Release Termination* will set this zone as the "termination" of the *Dynamic Release* range.

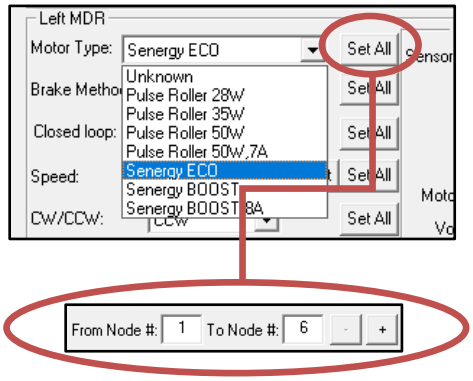


MDR Settings

The two largest areas of the main screen are for "Left Zone" and "Right Zone" and these areas display MDR settings and overall status as well as the ability to change motor settings.

Motor Type

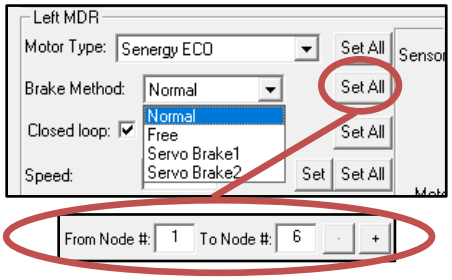
The *Motor Type* pull-down box lists all motor brand and types whose profiles are available for the *module*. *Senergy ECO* is the default setting upon completion of the *Auto-Configuration Procedure*. The new settings are downloaded to the selected Node upon selecting a new item from the list. Clicking *Set All* will download the selected setting to the Left MDR of all *modules* entered in the range of *Nodes* at the top of the main screen in the *From Node # / To Node #* boxes. If for example these boxes had the values of 1 and 6; changing the selection in the *Motor Type* pull down will change Node 1 and clicking *Set All* will change *Nodes* 2 thru 6 to the same setting as Node 1.



Please consult your particular MDR's documentation and review your application if you are unsure as to which motor-type setting to use.

Brake Method

The *Brake Method* pull-down box lists all the MDR braking methods available for the *module*. *Normal* is the default setting upon completion of the *Auto-Configuration Procedure*. The new settings are downloaded to the selected Node upon selecting a new item from the list. Clicking *Set All* will download the selected setting to the Left MDR of all *modules* entered in the range of *Nodes* at the top of the main screen in the *From Node # / To Node #* boxes. If for example these boxes had the values of 1 and 6; changing the selection in the *Motor Type* pull down will change Node 1 and clicking *Set All* will change *Nodes* 2 thru 6 to the same setting as Node 1.



The following table defines the MDR Braking Methods available:

Method	Description
Normal	Standard Dynamic braking - MDR power circuit in the *module* is internally connected during motor stop sequence to provide backward energy to bring rotor to a stop. When the *module* has detected that the motor has stopped; all winding current is shut off from the MDR. This is the MDR industry standard braking method and is the default factory setting for all *module* zones from the *Auto-Configuration Procedure*
Free	MDR power circuit in the *module* is internally disconnected to allow rotor to "free spin" until its mechanical load brings it to a stop.

Method	Description
Servo Brake 1	When a zone is commanded to stop; the *module* utilizes the MDR's Hall Effect sensors to determine the position of the rotor and will inject current into the motor windings to maintain rotor position. *Servo Brake 1* utilizes 2 of its power transistors for current injection.
Servo Brake 2	When a zone is commanded to stop; the *module* utilizes the MDR's Hall Effect sensors to determine the position of the rotor and will inject current into the motor windings to maintain rotor position. *Servo Brake 2* utilizes 3 of its power transistors for current injection.

Servo Brake 1 and 2 are functionally equivalent. Servo Brake 2 utilizes more power and provides more holding torque. Consequently, because Servo 2 uses more current, the potential for heat build-up is present depending on your application. If Servo Brake 1 provides enough holding torque for the application, it is recommended using it in lieu of Servo Brake 2. Servo Brake 2 should only be used when Servo Brake 1 does not provide enough holding torque for the application.

SPEED

The *Speed* setting value is in % of the selected *Motor Type*'s rated **P**ulse **W**idth **M**odulation (PWM) current. The MDR's speed is directly proportional to the PWM current being fed to it. The default setting is 100% which means that the *module* power circuit delivers 100% of the rated PWM current for whichever *Motor Type* is selected. This rated PWM current value is part of the motor profile data associated with the *Motor Type* selected and is determined for each MDR brand and model listed.

Please consult your particular motor brand and model's documentation for determining the actual speed of the MDR's for your application. The actual mechanical speed of the MDR is determined by the mechanical gearing attached to the motor. MDR's with identical motors may run at very different speeds and have very different torque characteristics depending on the mechanical gearing used.

CLOSED LOOP

Closed Loop speed control utilizes a proportional – integral (PI) algorithm to regulate MDR speed. When enabled, the *module* motor control processor accepts the input from the MDR's Hall Effect sensors to measure rotor speed and will adjust motor current accordingly to more precisely regulate speed. The default setting is for *Closed Loop* to be enabled.

Closed Loop speed regulation can be used for applications where you need maintaining constant speed with varying *carton* weights. Without *Closed Loop* enabled (default) the *module* will provide the %PWM current specified by the *Speed* setting and actual MDR speed can fluctuate depending on mechanical loading of the MDR.

Also note that when Closed Loop is enabled; the units for Acceleration and Deceleration change from time-based (seconds) to distance-based (pulses). Motor pulses can be converted to linear distance based upon knowing the particular speed code of your MDR and its tube diameter. Please refer to *Appendix E – Motor Pulse to Distance Calculation* for details and an example of calculating this distance.

Closed Loop speed control will provide PWM current to the MDR up to the limit of the particular MDR's selected profile and or the current limits allowed by the module's built in protection algorithms and circuitry. Please consult your particular motor brand and model's documentation and review your particular mechanical application prior to implementing Closed Loop speed control.

Due to lower inductance of higher speed Senergy Motors, the chances of Short Circuit Errors increase when using very low deceleration values.

SHORT CIRCUIT ERRORS may occur when using speeds over 75% along with deceleration values less than 0.1 second with Servo Braking (1 or 2) and Closed Loop disabled. This error may also occur when Closed Loop is enabled and using Servo 2 braking while in Senergy Eco Mode. There are 4 ways to reset a Short Circuit Error:

1. **Go to the Special Services Tab in the *EasyRoll* and click Reset.**
2. **Cycle power to the *module*.**
3. **By remote PLC over the Ethernet network**
4. **Local program code within a ConveyLogix program**

Motor Direction

This setting is either **C**lock-**W**ise (CW) or **C**ounter-**C**lock **W**ise and is determined for each *module* based upon the *Auto-Configuration Procedure* results. Please refer to section *Motor Direction Definition* on page 25 for definition of rotation direction.

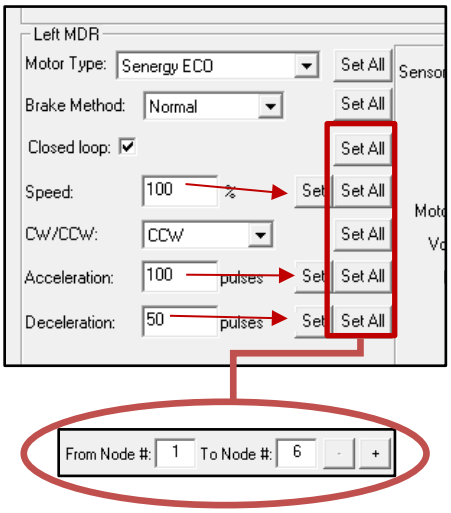
This setting is available because some in some situations where the MDR has to be mounted such that its cable exits the opposite side of the conveyor, its rotation direction has to be changed to match the direction of the other MDRs.

Please note that Motor Direction does not have a "Set All" button because motor direction is determined during the *Auto-Configuration Procedure*.

Acceleration / Deceleration

The acceleration and deceleration control for a given MDR is configurable in pulses when motor control is closed loop and in time when motor control is in open loop.

Unlike the drop-down selections, for parameters for which you enter values; you need to click the corresponding *Set* button to send the data to the *module*. *Closed Loop*, *Speed CW/CCW*, *Acceleration*, and *Deceleration* are each equipped with their corresponding *Set All* button that works with the *From Node # / To Node #* boxes on the Main screen to apply the same settings to a range of Nodes the same as previously shown for the *Motor Type* and *Brake Mode* settings.



DIAGNOSTIC WINDOW

You access the *Diagnostic Window* by clicking the image in the upper right portion of the *Main Screen* (numbered item 8 in *Figure 41*) An example of the *Diagnostic Window* is shown in *Figure 47*

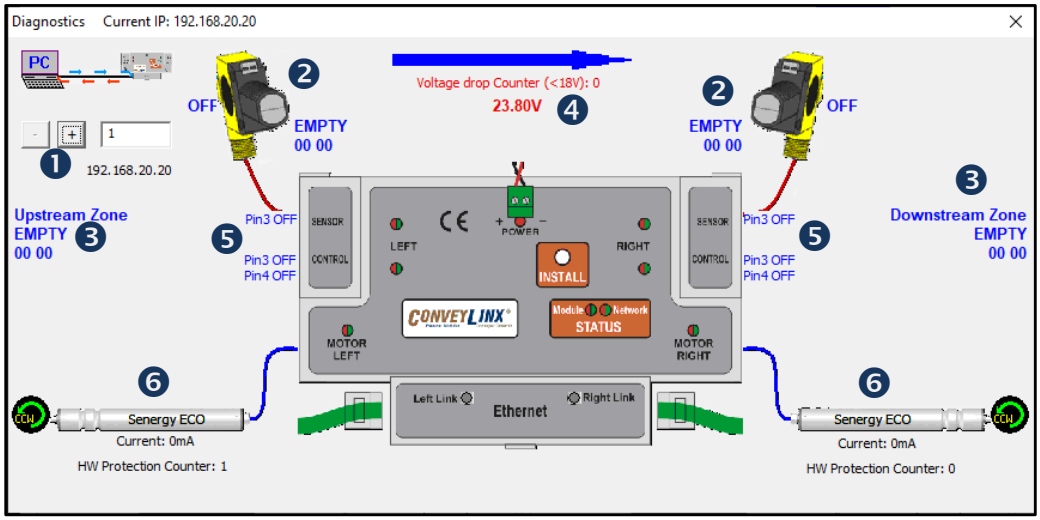


FIGURE 45 - DIAGNOSTICS WINDOW

The following chart provides a brief description of the numbered items shown for the *Diagnostic Window*.

Item	Description
1	You can navigate to the next or previous module's *Diagnostic Window* by clicking the + and - buttons
2	Displays the current ZPA status of the zone and the state of the sensor
3	Displays the status of the upstream and downstream zones to the selected module. Note that the values depicted below the text ("00 00" in the example) indicate the contents of the Tracking Registers. Please refer to *ConveyLinx ERSC PLC Developers Guide* (publication ERSC-1500) for details on how to use the Tracking Registers
4	Displays the current input voltage to the module as well as the count of the number of times the power supply went below 18 volts but did not completely shut off. This is useful for diagnosing possible power supply issues.
5	Displays the current state of each Sensor Port and Control Port input signals
6	Displays current status of each motor. Please note that this data is also shown on the main screen as well

ACCUMULATION STATUS

If a *carton* is accumulated on a particular zone, the *Diagnostic Window* will indicate a reason for the accumulated state. Also note that in situations where an external device (PLC or PC controller) or the *Accumulate* icon on the Main Screen has been activated; the Sensor LED on the module for the stopped *carton's* zone will be fast blinking green. You can then consult the *Diagnostic Window* for more detailed information on the exact reason.

As shown in the example in *Figure 48*, in the downstream zone on the selected *Module*, it shows "Pin3 Control Port Accumulation" as the reason a *carton* is stopped at this zone even though the zone that is downstream of this module is empty.

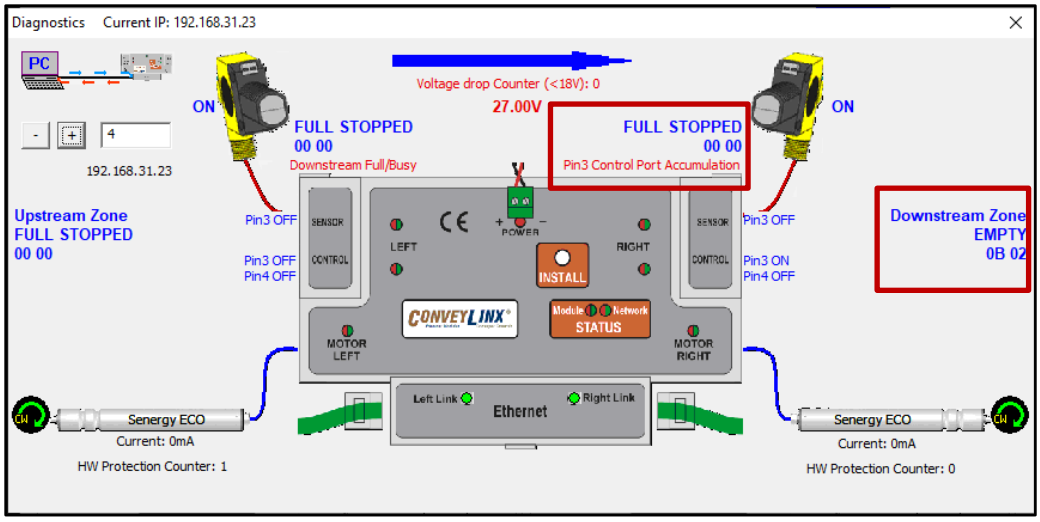


FIGURE 46 - ACCUMULATION REASON DISPLAY

CONVEYLINX ADVANCED DIALOG

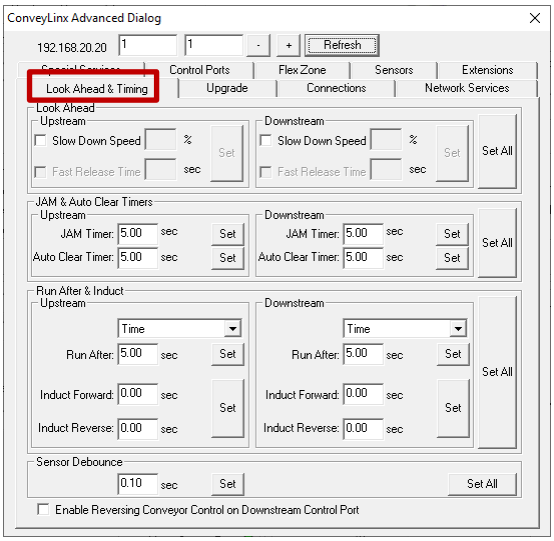
We introduced the *ConveyLinx Advanced Dialog* briefly in section *Using the Discover Utility* on page 64. This section will define the remaining tab selections from this screen.

INVOKING THE CONVEYLINX ADVANCED DIALOG

To invoke the *ConveyLinx Advanced Dialog* you can do any of the following:

- Click *Advanced Dialog* button
- Press F2
- Simultaneously press [Ctrl] [Shift] U

The *ConveyLinx Advanced Dialog* pops up over the Main screen display and defaults to show the *Look Ahead & Timing* tab



LOOK AHEAD & TIMING TAB

The *Look Ahead & Timing Tab* has 4 sections of settings:

- *Look Ahead*
- *Jam & Auto Clear Timers*
- *Run After & Induct*
- *Sensor Debounce*.

LOOK AHEAD FEATURE

The *Look Ahead* feature configures the logic to "look ahead" to its next downstream zone and if it is occupied when a *carton* is entering its zone, the *module* will dynamically adjust the MDR to the selected speed. This feature would be used in higher speed applications were increased stopping distance is required to keep *cartons* from over-travelling their stop positions. This function can be applied per zone or for multiple zones.

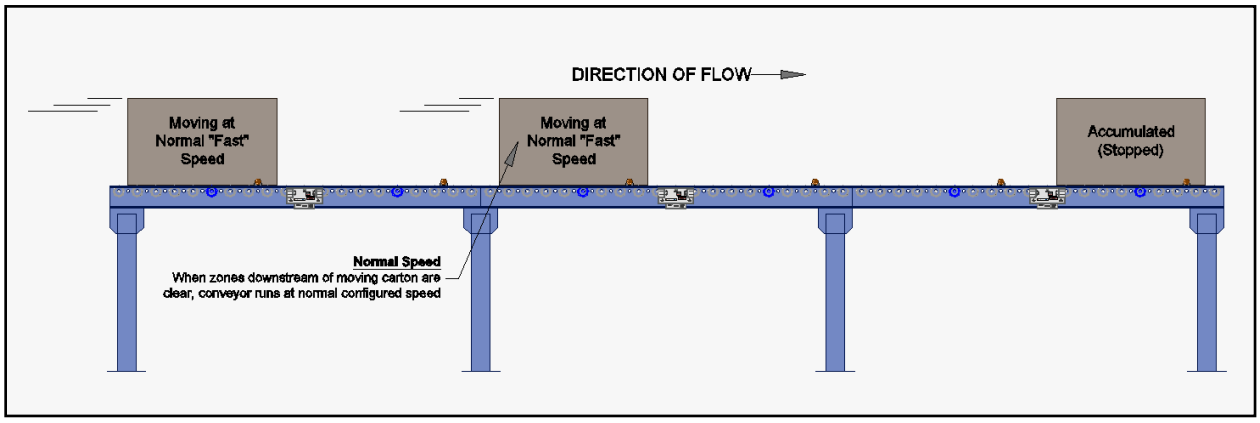


FIGURE 47 - NORMAL RUNNING BEFORE LOOK AHEAD ENABLES

In *Figure 49*, conveyor runs at the speed configured for the *module* per the *Auto-Configuration Procedure* or the value entered if it was manually changed.

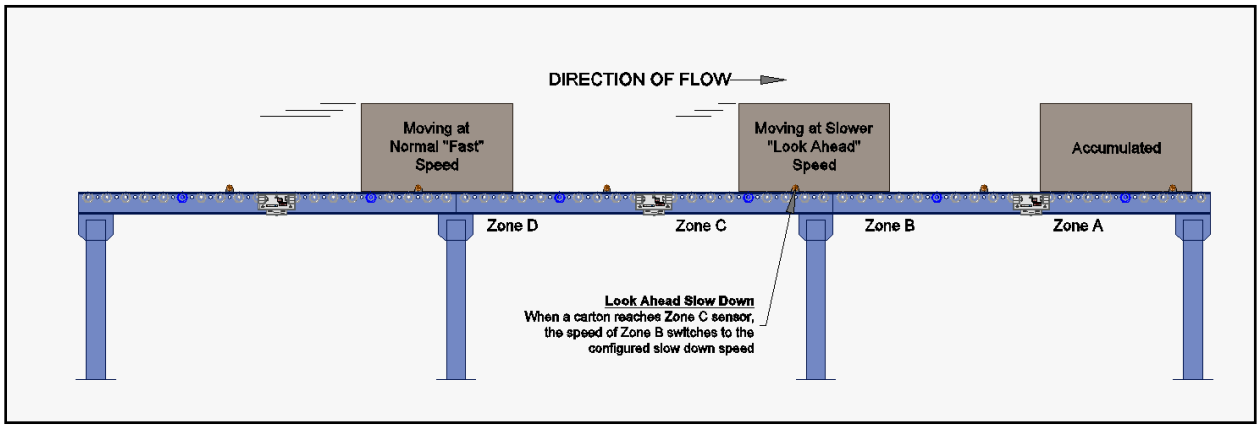
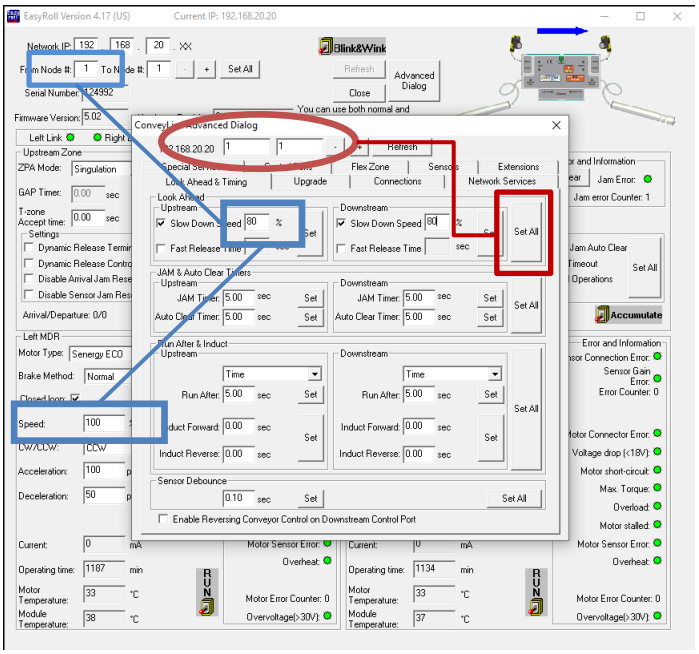


FIGURE 48 - LOOK AHEAD ENABLED

As shown in *Figure 50*, when a carton arrives at Zone C's photo-sensor, Zone B's *module* will automatically adjust the speed of Zone B to the configured *Look Ahead* speed.

Click the checkbox to enable the *Look Ahead* feature for the selected Node. Clicking the *Set* buttons will download the setting to the respective zone on the selected Node. The value entered for the slowdown speed is in percent of the Node's normal speed as set on the main screen. In this example, the slowdown speed will be proportional to 80% of 100% PWM current. If the PWM speed on the main screen was set to 70% PWM, then the slowdown speed would be "80% of 70% PWM".

Also note there is a *Set All* button that will apply the settings to the range of Nodes entered.



Fast Release Time Option

The *Fast Release Time* option allows you to set a delay before the slow down speed is engaged for the slow-down zone. This option may be useful for singulation release applications when the zone that was initially accumulated is in the process of releasing downstream but it has not completed the move. In this situation, the slow down zone would already be set to run at the slow down speed because the initially accumulated zone is technically still occupied in the ZPA logic. This situation is shown in *Figure 51*.

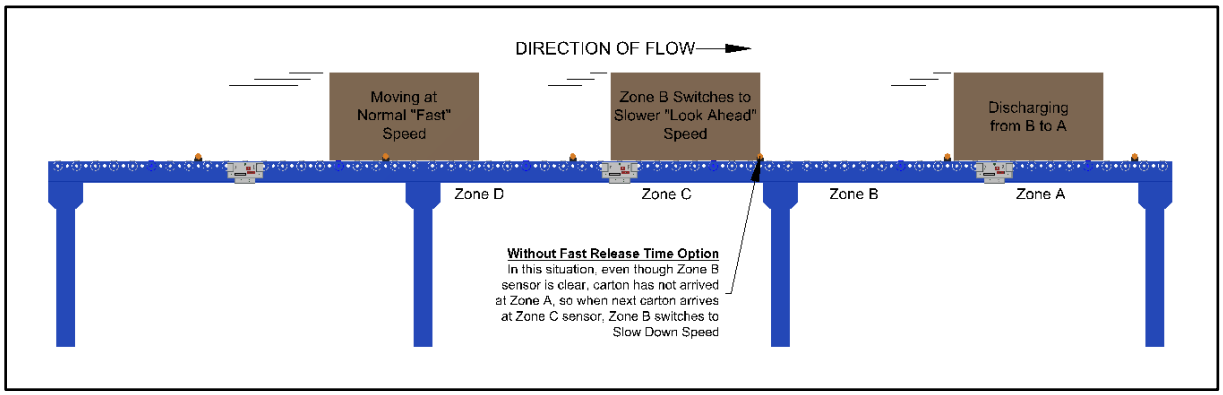


FIGURE 49 - EXAMPLE WITHOUT FAST RELEASE TIME OPTION

The *Fast Release Time* causes the slow down zone to wait until this time expires before actually switching to the slow down speed. In the scenario described, the *Fast Release Timer* is engaged when the upstream *carton* begins to enter the slow down zone. While this timer is engaged, the slow down zone will remain at normal speed. If the initially

accumulated zone's status changes to unoccupied before the *Fast Release Time* has expired; the slow down zone will not switch to the slow down speed and remain at normal speed. This is shown in *Figure 52*.

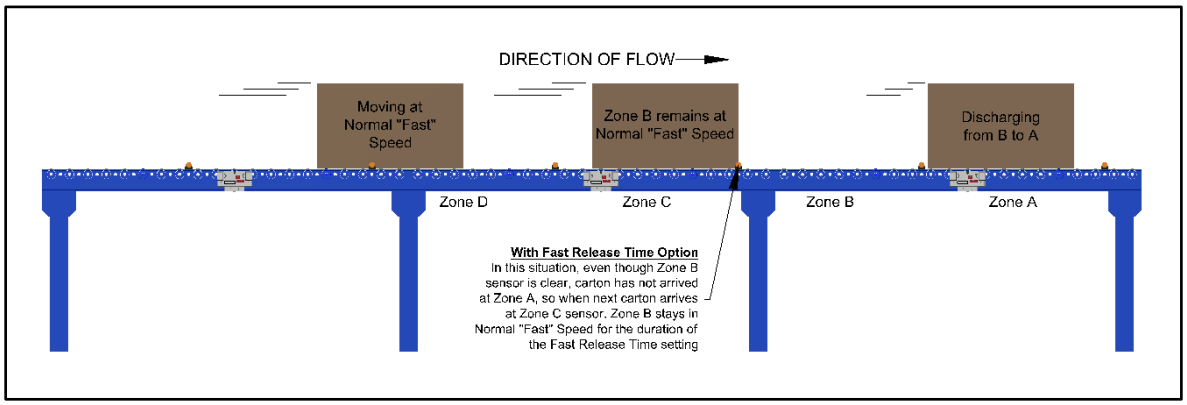
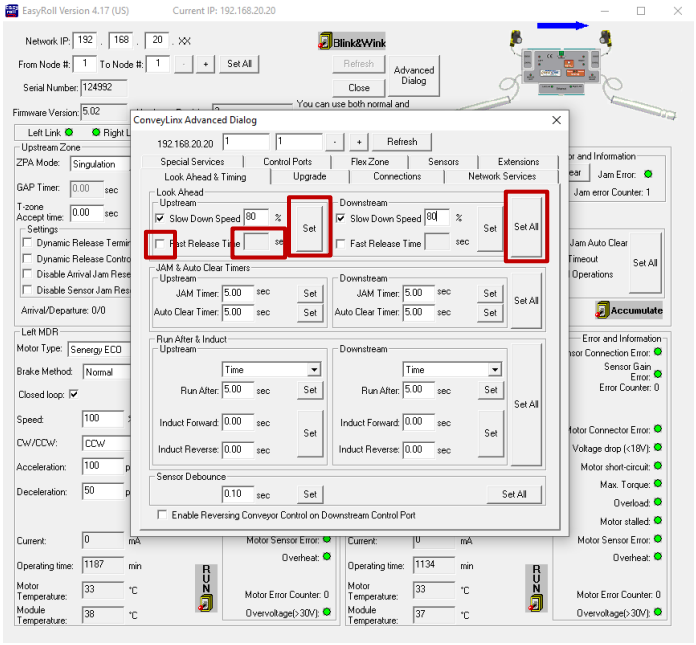


FIGURE 50 - EXAMPE WITH USING THE FAST RELEASE TIME OPTION

To use the Fast Response Time option, click the *Fast Release Time* checkbox and enter a time value (in seconds) into the value entry box. Click *Set* to write the changes to the module and use the *Set All* feature as desired.

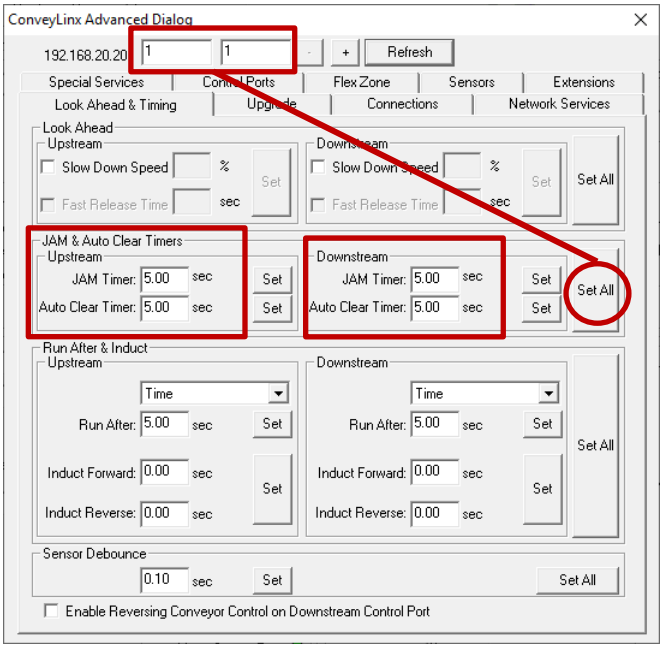


JAM & AUTO CLEAR TIMERS

The *Jam* timer for a given Upstream or Downstream zone is used for both detecting an *Arrival Jam* and a *Sensor Jam*. Please refer to sections *Arrival Jam* on page 36 and *Sensor Jam* on page 36 for description and details. The *Jam Timer* should be set as the maximum expected time it takes for a *carton* to travel from one zone to the next plus a small addition to prevent nuisance jam occurrences. The default value for the *Jam Timer* is 5 seconds and the valid range of values is from 1 seconds to 65 seconds.

The *Auto Clear Timer* is the amount of times that the logic maintains the jam condition before auto resetting the jam. The default value for the *Auto Clear Timer* is 5 seconds and the valid range of values is from 0 seconds to 65 seconds.

Enter new values for either or both the *Jam Timer* and/or *Auto Clear Timer* and click the corresponding *Set* button for each. The *Set All* button will apply these same settings for the range of modules indicated at the top of the dialog.

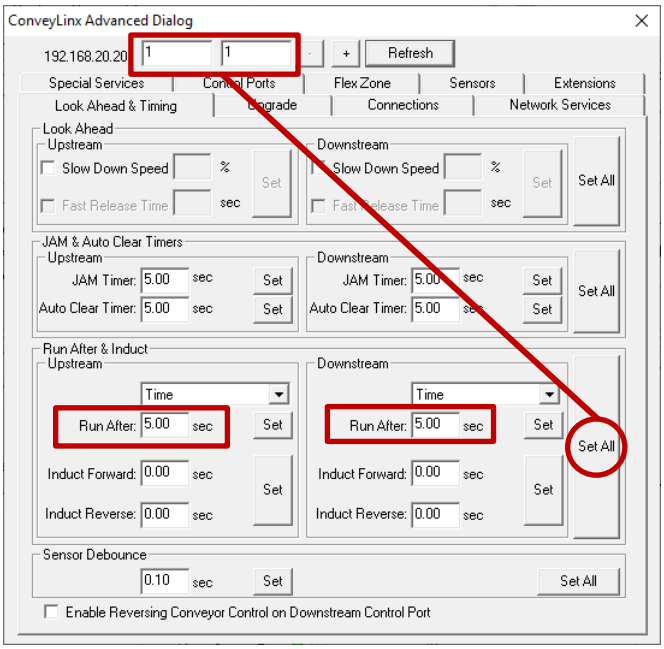


Run After & Induct

Run After Time

The *Run After* time value is used by the logic for normal zone discharge. This is the amount of time the zone's MDR will continue run after its photo-sensor has been clear when discharging to the next downstream zone. This extra run time allows the zone to run so that the trailing edge of the carton to completely pass the photo-sensor and fully enter the next zone. This value is adjustable to compensate for special conditions where a zone photo-sensor is required to be placed farther upstream or downstream.

Enter new values for upstream and/or downstream *Run After* time and click the corresponding Set button. The default is 5 seconds and the valid range is 0 to 65 seconds. The *Set All* button will apply these same settings for the range of modules indicated at the top of the dialog.

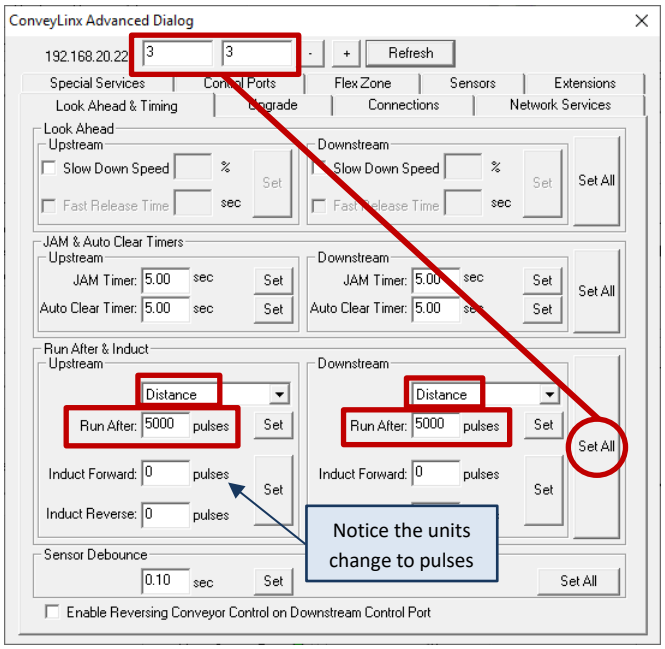


Run After Distance

EasyRoll provides the option to change the *Run After* metric to be distance based instead of time based. When the metric is distance, the value entered is motor pulses instead of seconds.

Please refer to Appendix E – Motor Pulse to Distance Calculation for details on calculating distance based upon motor pulses

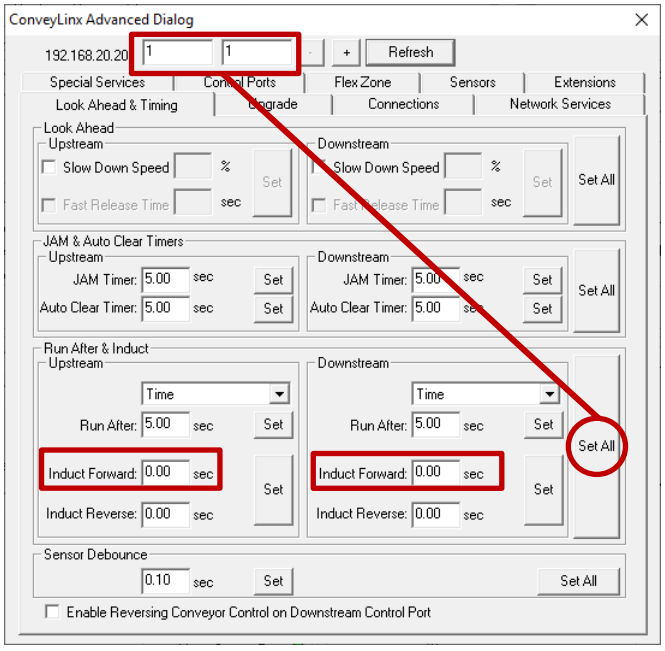
Select *Distance* from the drop-down box and enter new values for upstream and/or downstream *Run After* pulses and click the corresponding Set button. The default is 5000 pulses and the valid range is 0 to 65,535. The *Set All* button will apply these same settings for the range of modules indicated at the top of the dialog.



Induct Forward Time

Induct Forward value is used to cause the MDR to continue to run after the zone's photo-sensor has been blocked when receiving a *carton* from upstream. This value is adjustable per zone to compensate for special conditions when for example a zone's photo-sensor needs to be placed farther upstream from the discharge end of the zone.

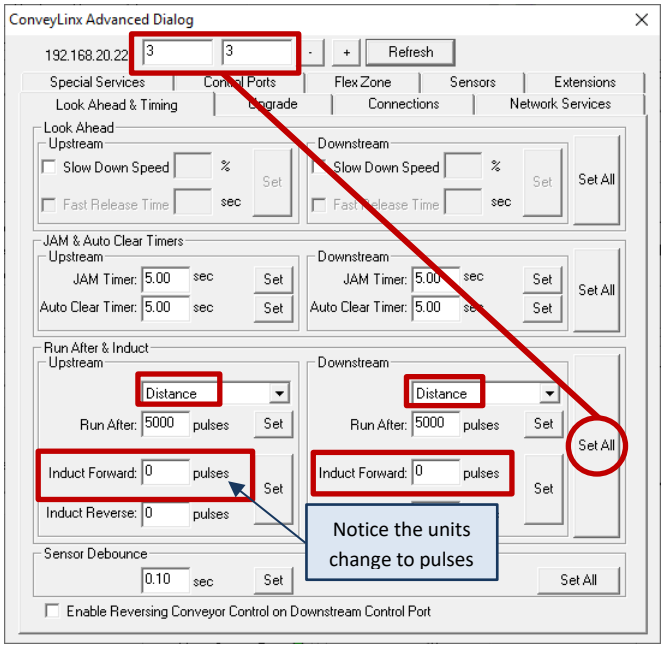
Enter new values for upstream and/or downstream *Run After* time and click the corresponding Set button. The default is 5 seconds and the valid range is 0 to 65 seconds. The *Set All* button will apply these same settings for the range of modules indicated at the top of the dialog.



INDUCT FORWARD DISTANCE

EasyRoll provides the option to change the *Induct Forward* metric to be distance based instead of time based. When the metric is distance, the value entered is motor pulses instead of seconds.

Select *Distance* from the drop-down box and enter new values for upstream and/or downstream *Induct Forward* pulses and click the corresponding Set button. The default is 0 pulses and the valid range is 0 to 65,535. The *Set All* button will apply these same settings for the range of modules indicated at the top of the dialog.



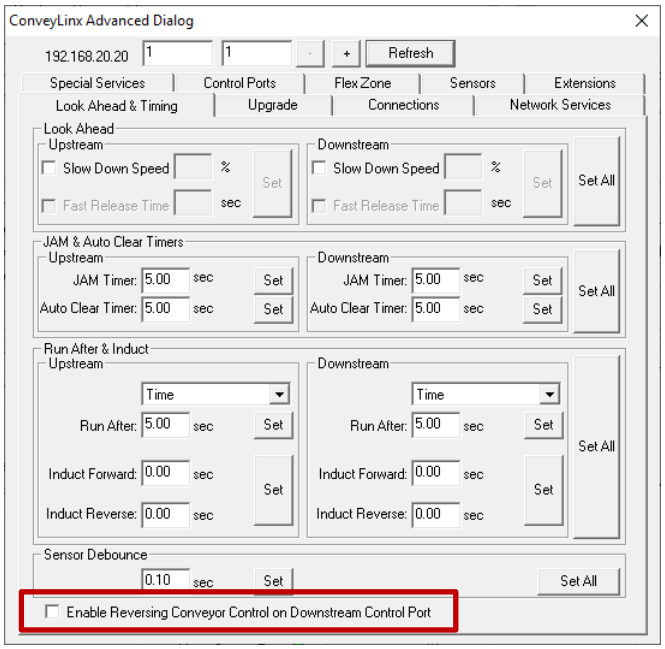
INDUCT REVERSE

ConveyLinx allows for reversing conveyor operation within its built-in ZPA control logic. A prerequisite for using reversing conveyor is that the *cartons* handled should be roughly the same length in the direction of travel. Based upon this pre-requisite, the zone sensor should be located roughly in the center of the zone. You will want to roughly center the *carton* in the zone if it needs to accumulate, so you would use the *Induct Forward* setting to accomplish this for the default or forward direction. *EasyRoll* provides an *Induct Reverse* setting to provide this setting for the reverse direction in the event that the adjustment needs to be different based upon conveyor direction. Also note that the time or distance selection applies to the *Induct Reverse* setting.

REVERSING CONTROL

There is a checkbox on the *Look Ahead & Timing* tab for *Enable Reversing Conveyor Control on Downstream Control Port* located at the bottom of the dialog. Reversing conveyor control applies to an entire subnet of *Modules* and the *Control Port* used for this functionality is always assigned to the Downstream zone of the most upstream *module*. Please refer to *Appendix D – Application Examples*/*Reversing Conveyor Using Hard-Wired Control Ports* for details on configuring reversing conveyor operation.

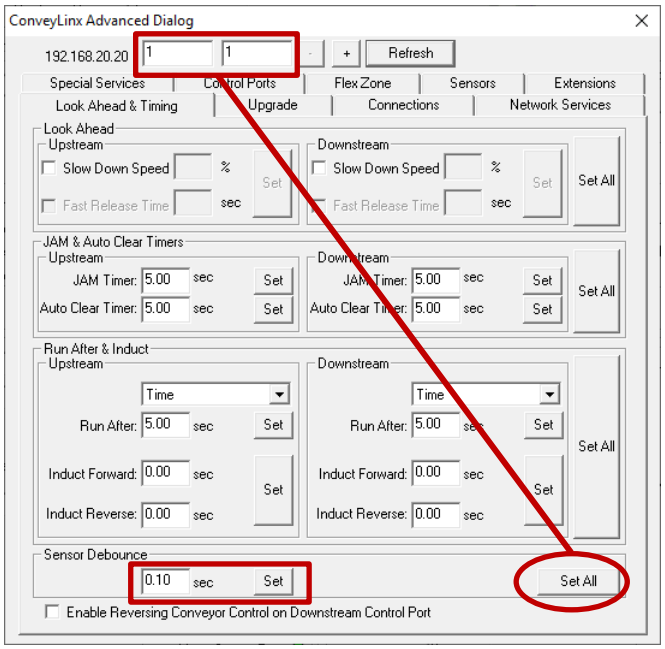
This checkbox should only be checked on the *module* that is the most upstream in a subnet. Please see *Appendix D – Application Examples* for details on how to configure and use reversing conveyor.



SENSOR DEBOUNCE

Sensor Debounce setting is the time the logic holds the state of its Sensor inputs after a change of state. Keep in mind this is not a delay prior to detecting a *carton* when it first blocks the sensor. The *module* will detect the leading edge of a *carton* and hold this state for the *Sensor Debounce* time period. Similarly, when the trailing edge of the *carton* clears the sensor, the logic holds this state for the *Sensor Debounce* time period.

Enter the desired value in seconds and click the Set button. The default is 0.1 seconds and the valid range is 0 to 2 seconds. Please note this setting applies to both the Left and Right Sensor ports. The *Set All* button will apply these same settings for the range of modules indicated at the top of the dialog

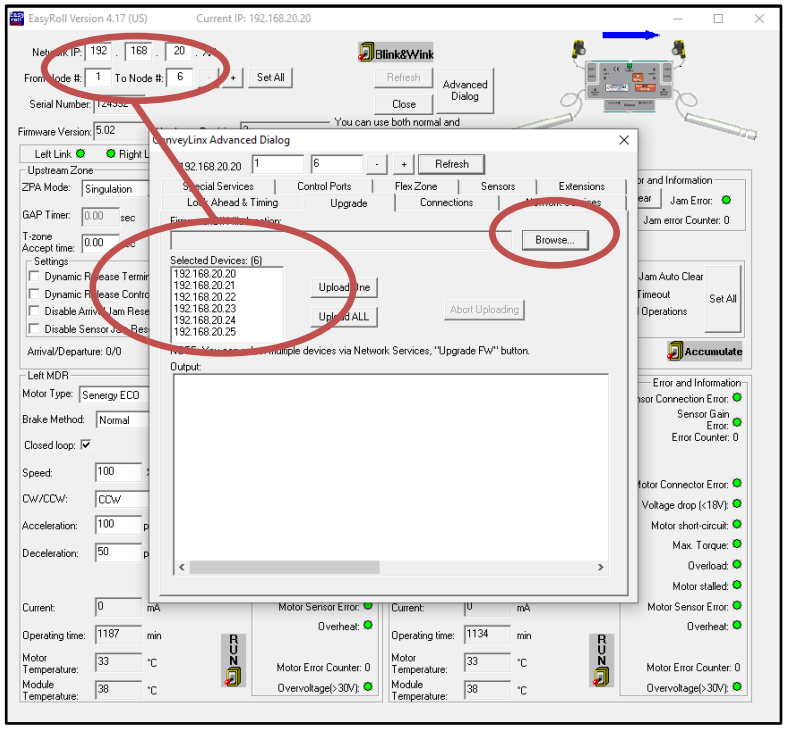


UPGRADE TAB

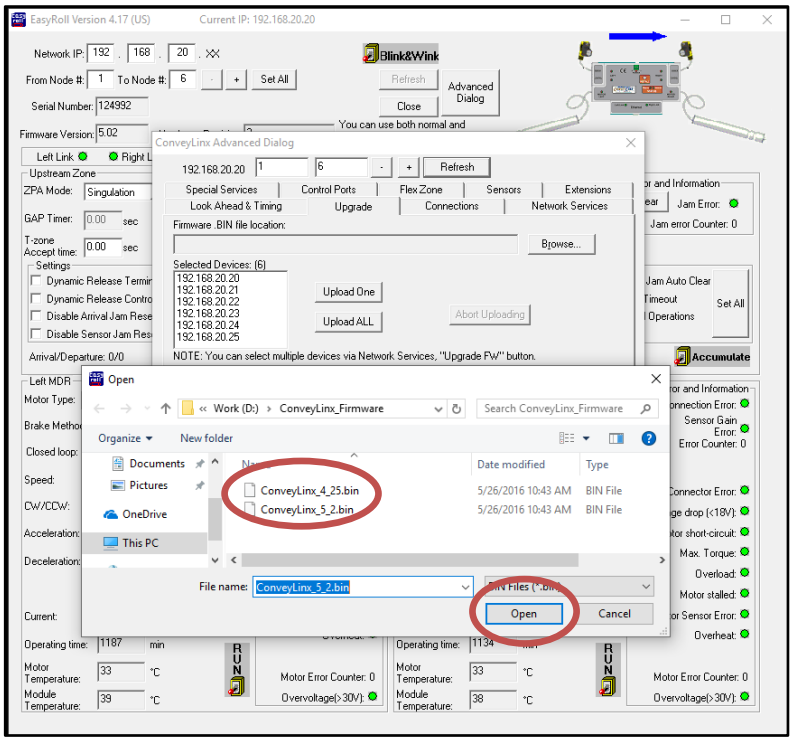
The *Upgrade* tab screen gives access to the *module* firmware utility. Over time, enhancements and features may be added to the *ConveyLinx* family of products. These features and enhancements are typically made available to customers in the form of firmware upgrade files that need to be uploaded to your *Modules*.

A firmware upgrade will be in the form of a data file sent to you or made available for download. The *Upgrade* utility allows you to browse for this data file and then select a single *Node* or group of *Nodes* to upload.

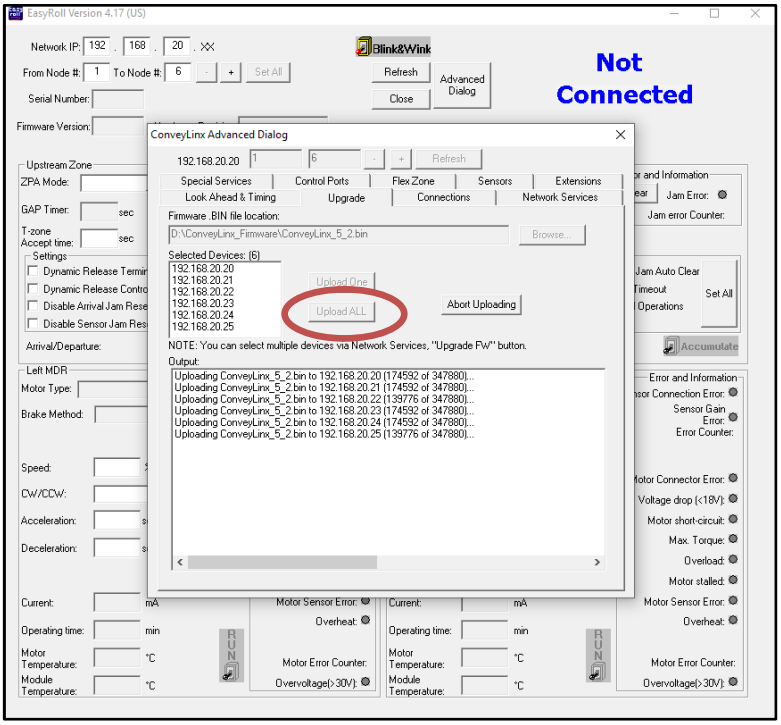
Upon selecting the *Upgrade* screen tab, *EasyRoll* fills in the I.P. address of the range of *Nodes* entered on the main screen. Click the *Browse* button to open a file selection dialog window.



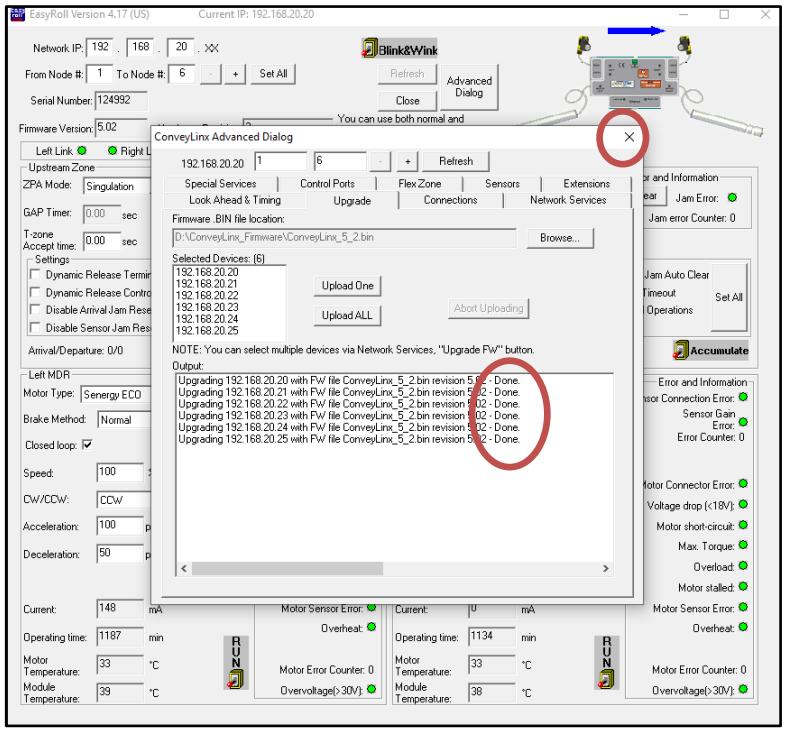
With the “Open” dialog displayed, navigate to the location on your PC where you placed the firmware upgrade file you received. Select the file and click *Open*.



In this example, we clicked *Upload ALL* so the selected firmware upgrade file will be sent to all 6 *Nodes*. The *Output* window will update the progress of the file uploading process. The time it takes for this process will vary depending upon how many *Nodes* are being uploaded.



When all *Nodes* report back to the *Output* window with a status of *Done*; then the upload is complete and you can close the *ConveyLinx Advanced Dialog* window.



Please note that if you upgrade firmware, all of each module's settings (motors, speeds, ZPA options, etc.) are preserved.

CONNECTIONS TAB

The *Connections* utility uses *EasyRoll* to instruct a given *module* to make a logical connection to another *module* that it otherwise would not have made during the *Auto-Configuration Procedure*. For applications where you have more than one *ConveyLinx Subnet*, this would be the way to logically connect the most downstream *Node* of one *Subnet* to the most upstream *Node* of another *Subnet*.

CONNECT TWO NETWORKS TOGETHER

Figure 53 shows a typical boundary between two *Subnets*. The most downstream *Node* of the first *Subnet* has an I.P. address of 192.168.20.25 and the most upstream *Node* of the second *Subnet* has an I.P. address of 192.168.21.20.

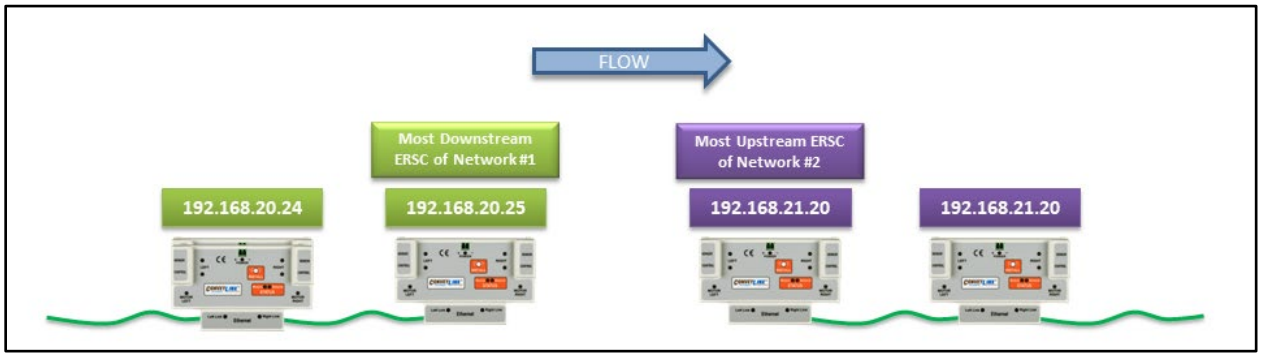


FIGURE 51 - SUBNET BOUNDARY EXAMPLE

By simply connecting an Ethernet cable between these two boundary *Nodes* and then using *EasyRoll* to establish the "logical" connection between the two *Subnets*; you can achieve seamless flow between the two networks. This is shown in *Figure 54*.

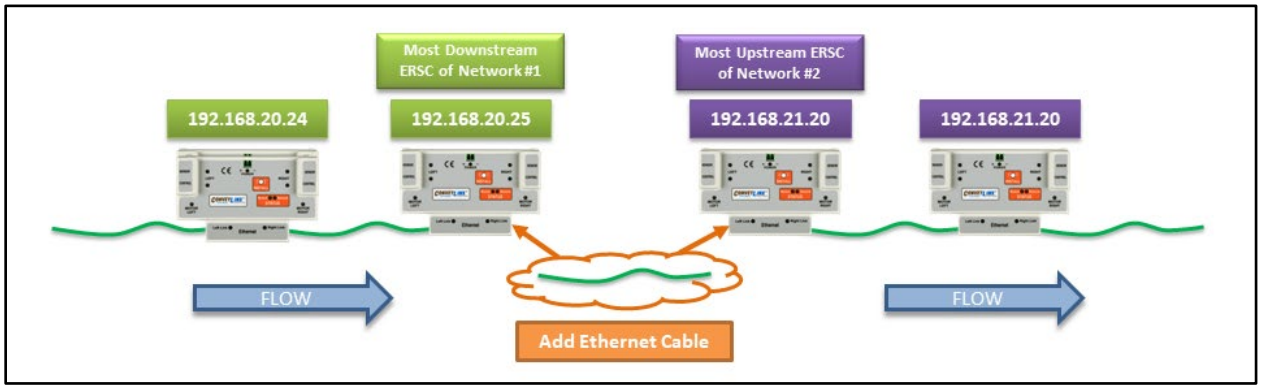
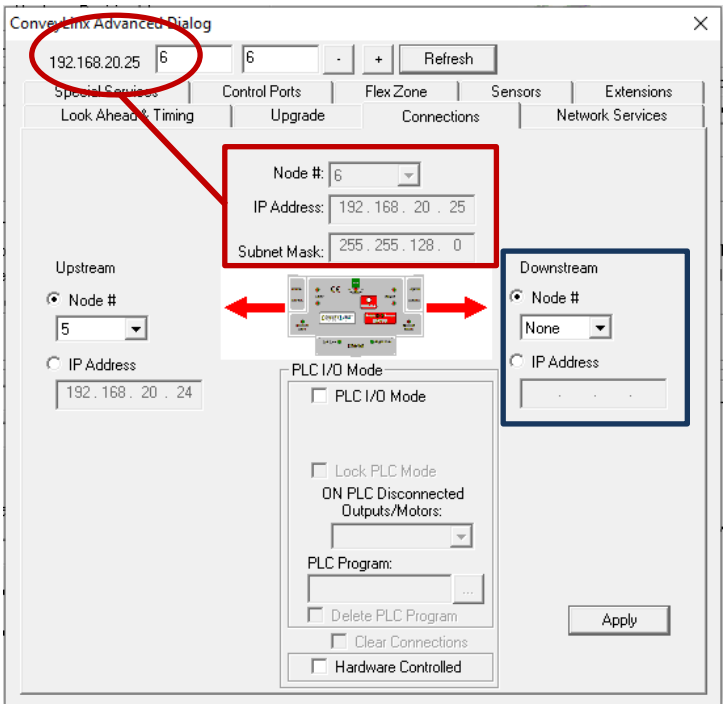


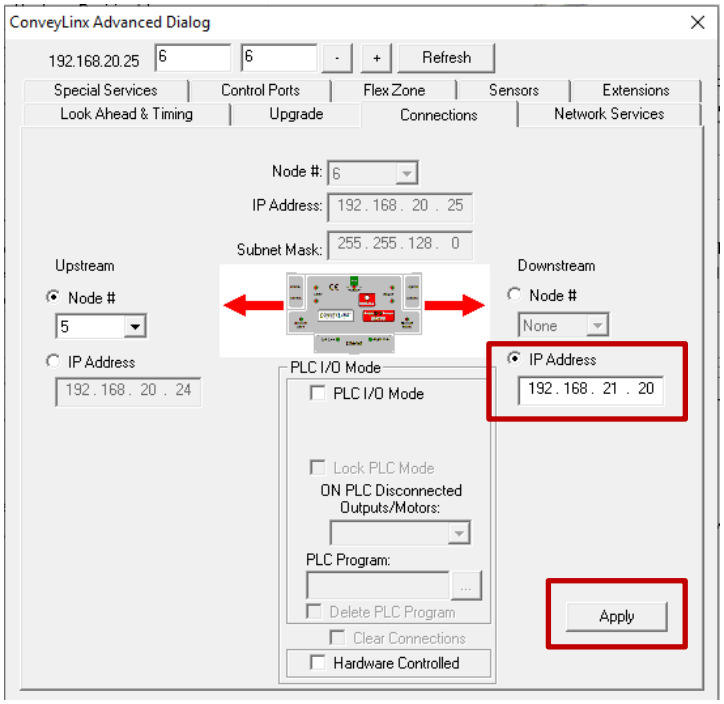
FIGURE 52 - SUBNET BOUNDARY EXAMPLE WITH CABLE

The procedure requires that you have to instruct *Node* at 192.168.20.25 to convey *cartons* to *Node* at 192.168.21.20, and likewise you have to instruct *Node* at 192.168.21.20 to accept *cartons* from *Node* at 192.168.20.25.

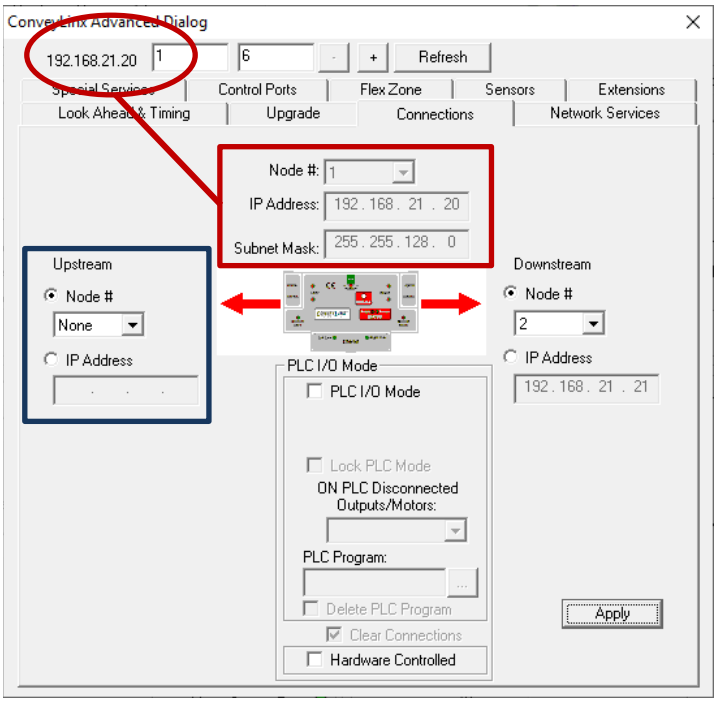
Navigate to Node 6 of the 192.168.20 subnet (i.e. 192.168.20.25). Notice that the module's network data appears in the center. Also notice that the Downstream connection for this Node is *None*.



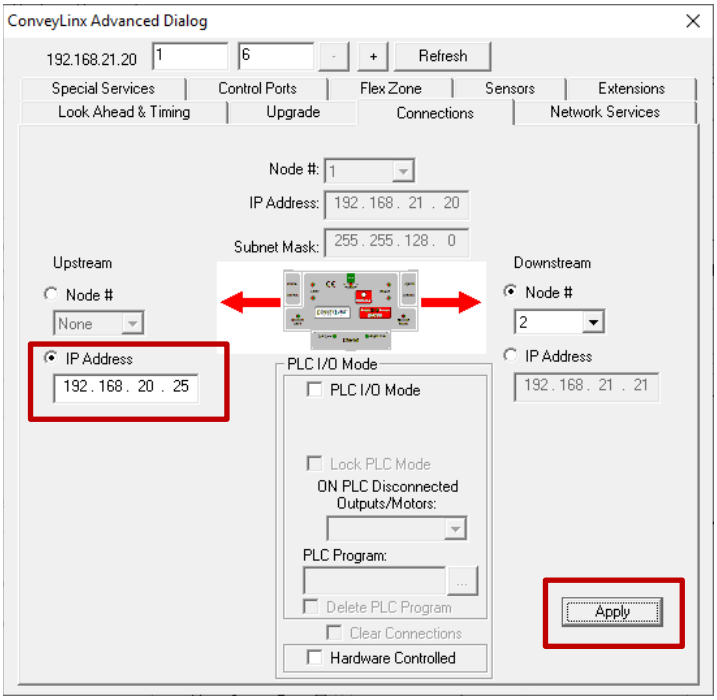
Enter *192.168.21.20* as the I.P. address for Node 6's new Downstream connection. Click *Apply* to make the change. Please note that it will take a few seconds for this to complete.



Navigate to Node 1 of the 192.168.21 subnet (i.e. 192.168.21.20). Notice that the module's network data appears in the center. Also notice that the Upstream connection for this Node is *None*.



Enter *192.168.20.25* as the I.P. address for Node 1's new Upstream connection. Click *Apply* to make the change. Please note that it will take a few seconds for this to complete.



The above example requires that your PC can access multiple *Subnets*. Please refer to *Appendix B–Configuring PC for Ethernet Subnets* for further details.

Please Note: Each *module* also has hard-wired functionality built-in to accomplish a simple network-to-network connection to maintain product flow. The limitation of the hard-wired connection is that the release mode from upstream to downstream is always singulation. With a full logical network to network connection established through *EasyRoll* as described, full release mode capability is maintained. For example, you can seamlessly maintain *Train* or *Gap Train* modes through the network boundary.

Further description and application examples of Ethernet networked solutions are included in separate Insight Automation publication *ConveyLinx-ERSC PLC Developer's Guide* (publication *ERSC-1500*)

NETWORK SERVICES TAB

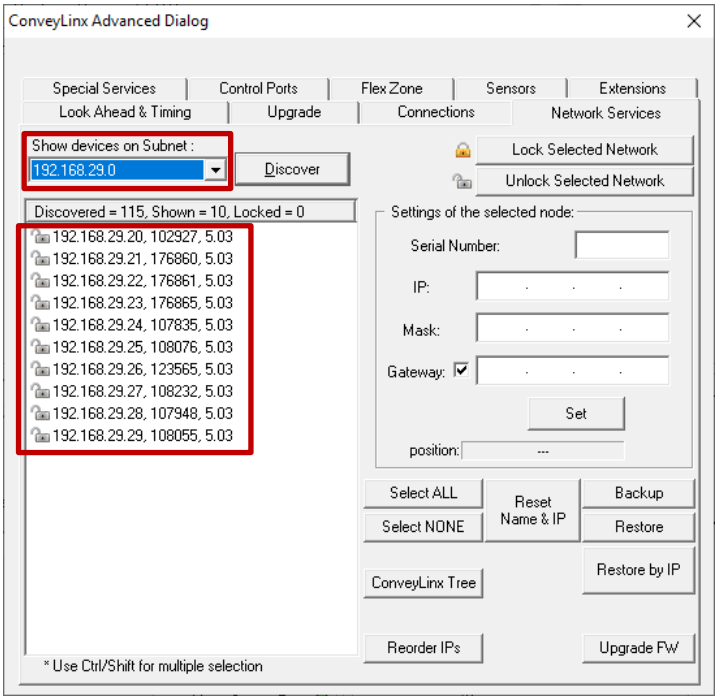
The *Network Services* screen provides multiple functions related to module and network management. These functions are:

- Discover and IP Address Set
- Network Lock/Unlock
- Backup and Restore
- Firmware Upgrade

DISCOVER AND IP ADDRESS SET

The *Discover* function was introduced previously in section *Using the Discover Utility* on page 64. What is not specifically covered in that section is the ability to filter subnets to display in the discovered module window.

In this example there are 115 module devices discovered, however we are only interested in seeing the modules on subnet 192.168.29. By selecting this subnet from the drop-down box; only those modules in that particular subnet are displayed in the discover list

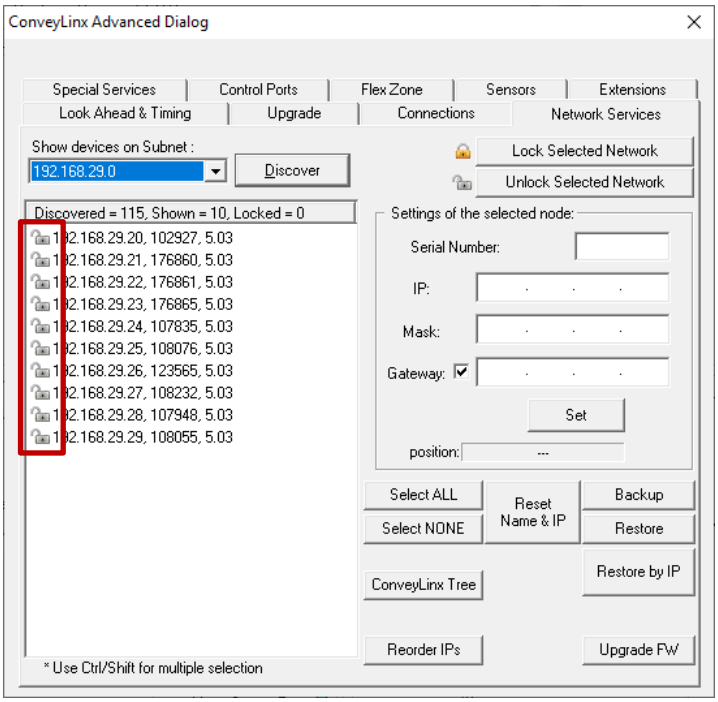


You also have the ability to manually set the I.P. Address for a given module from the *Network Services* tab. This was described previously in section *Method 3 - Change Auto-Config Master I.P. Address* on page 66

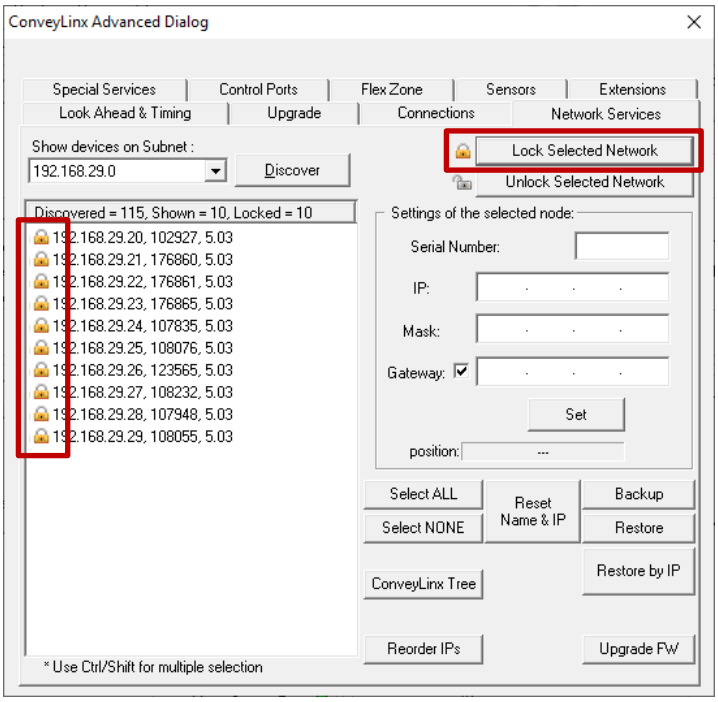
NETWORK LOCK FEATURE

The Lock Feature allows you to "lock" a specific subnet so that no accidental pressing of the *Install* button on any of the *modules* will inadvertently cause an *Auto Configuration Procedure* to be activated. Please note that this function applies to all the *modules* within a selected subnet and cannot be activated for an individual *module*.

In this example, the 192.168.29 subnet is selected and you can see by the icons next to each module entry in the list that they are "Unlocked"



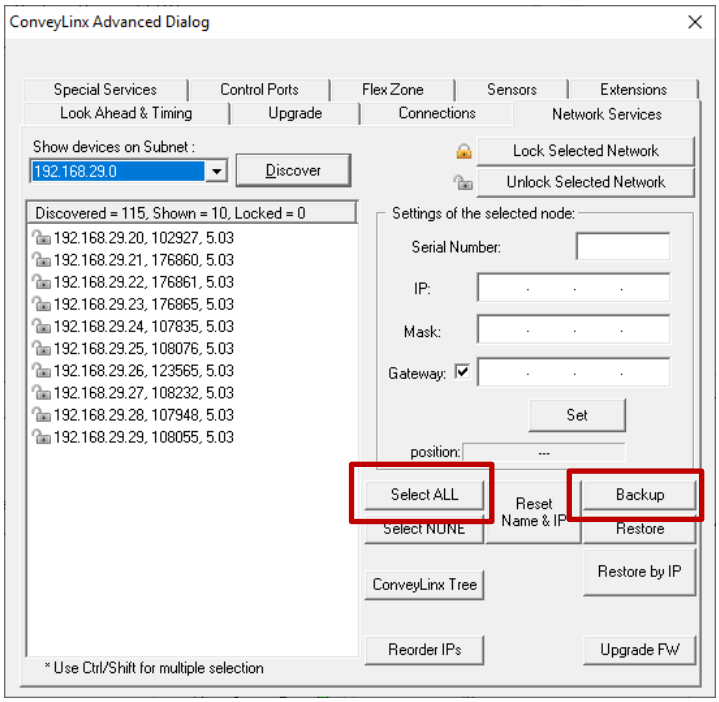
By clicking the *Lock Selected Network* button, all modules in the subnet listed will be "Locked" as indicated by the icons in the list. Clicking the *Unlock Selected Network* button will "Unlock" all the modules in the list.



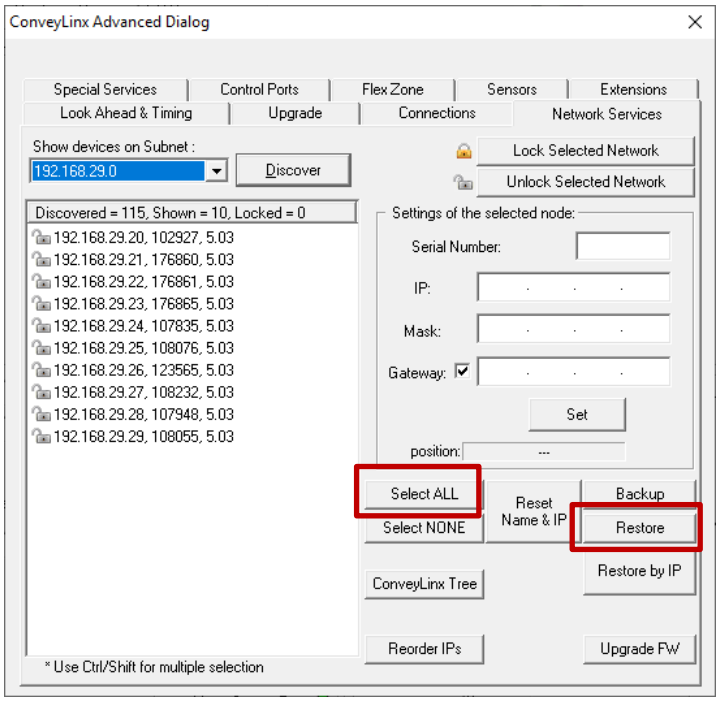
BACKUP AND RESTORE

You have the ability to select a subnet or all subnets discovered and generate a *Backup* file that will contain all the parameters and settings for each *module* included in the selection. This means all motor settings (speed, acceleration, deceleration, braking, etc.), ZPA settings, Advanced Dialog settings, etc. are captured in this file that can be saved on your PC. Conversely you can use this *Backup* file to *Restore* settings to a subnet or all subnets in the event settings are inadvertently modified or you simply want to return your subnets and modules to a previously known state.

To perform a backup, click the *Select ALL* button to select all the items in the list. In this example we are going to backup subnet 192.168.29. Once all *modules* are highlighted, click the *Backup* button. A "Save As" file dialog will appear and you provide a filename and location to save the file.



Conversely, if you have a Backup file that you want to use to get your subnet's settings restored; click the *Select ALL* button and then click the *Restore* button. An "Open File" dialog will appear for you to navigate to the location of your backup file.



Please note that the Restore function will only restore settings to modules that have a matching Serial Number in the Backup file. For situations where module serial number are different but functionality still needs to be restored, you will need to use the Restore by IP function.

Restore By IP Address

Because the default *Restore* function restores settings by module Serial Number only, in situations such as duplicating a subnet or restoring functionality from an older backup where some of the modules were replaced since the Backup file was generated, you need to restore the settings by IP address instead of by module Serial Number. To do this you follow the same restore procedure as previously shown except you click the *Restore by IP* button instead of the *Restore* button

Backup and Restore Recommendations and Tips

Sometimes there are situations where just because a software application will allow you to do something does not always mean that you should. The *Backup* and *Restore* functions in *EasyRoll* can fall into this scenario. Even though you can technically create a backup file for a few or even a single *module* from within a subnet of many *modules*, it is not recommended that you do so. *ConveyLinx* support engineer's experience to date has indicated that when customers perform *Backup* and *Restore* functions for, at a minimum, all *modules* in a subnet, you will have fewer or no problems with your *ConveyLinx* networks. Systems that were once working and then start producing unexpected results often stem from performing a *Restore* function to a small portion of *modules* instead of the entire subnet and/or starting with a backup file that did not include all *modules* in the subnet. So, here is a list of tips:

- When you perform a *Backup*; at a minimum, select all modules in a given subnet
- When you perform a *Restore*; at a minimum, select all modules in a given subnet
- Perform a new *Backup* after you make any settings changes to one or more modules in a subnet
- Perform a new *Backup* after every time you perform an *Auto Configure Procedure*

Special Services Tab

Reset Operating Time

Each *module* maintains a non-volatile data register for each MDR whose value is the number of minutes the motor has been run. This value is displayed as *Operating Time* on the *Main Screen*. This screen on the *ConveyLinx Advanced Dialog* allows you to reset this meter in the event you have to replace a given MDR. Click either the *Left Motor* or *Right Motor* buttons in the *Reset Operating Time* area to reset the corresponding value to 0.

Clear Motor Short Circuit Error

Another function on the *Special Services* tab is a button used to clear an MDR short circuit error. This particular error is not logically cleared based upon an elapsed period timeout or other such reset. An MDR short circuit error requires that either the *module* be powered down and then powered back up or by clicking the *Reset* button on this tab. This function is made available in *EasyRoll* as a convenience so you don't have to cycle the power on the *module*.

Touch & Go

The Touch & Go function is available in ZPA mode and when activated causes the MDR in the activated zone to sense rotational movement of the MDR in its default direction. If this rotational movement (such as someone pushing a *carton* onto the zone) is of sufficient duration and speed; the zone will "wake up" as if its upstream interlock had been energized. You enable this function by checking the appropriate *Upstream* or *Downstream* checkbox in the *Touch & Go* area.

CONTROL PORTS TAB

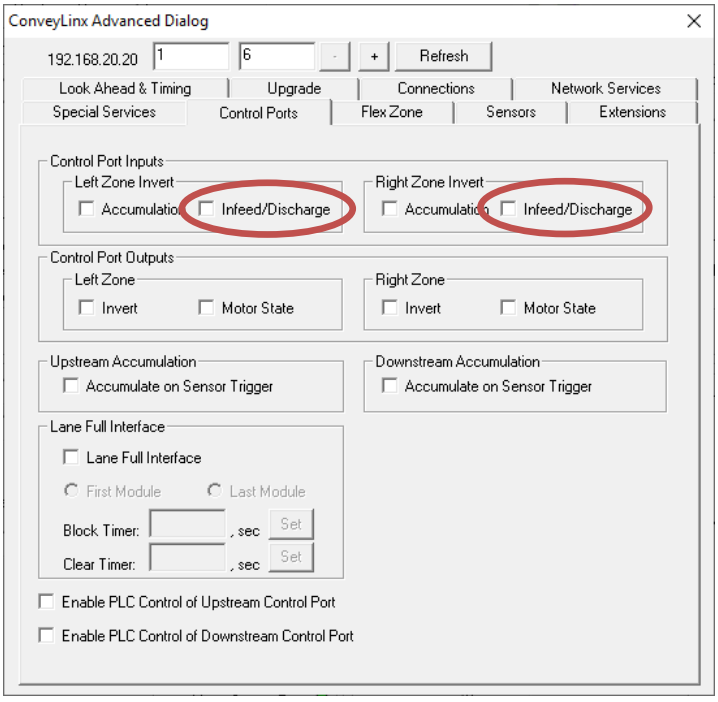
The *Control Ports* tab provides you with the ability modify the function of one or both of the *Control Ports*. This tab is organized in the following areas:

- *Control Port* Inputs
- *Control Port* Outputs
- Upstream/Downstream Accumulation
- Lane Full Interface
- PLC Control

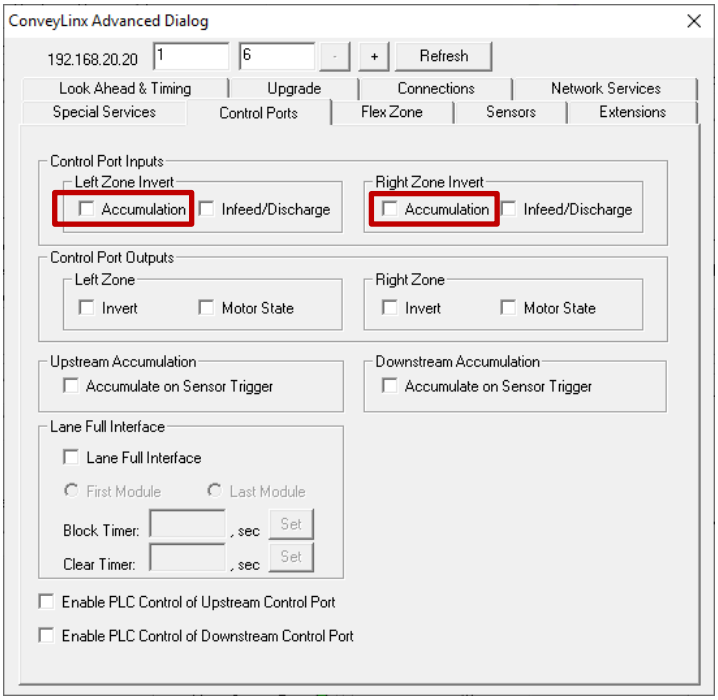
CONTROL PORT INPUTS

Each of the two *Control* ports on the *module* has a 2 input signals: *Local Accumulation* and *Infeed/Discharge Interlock*. Each of these inputs has a default logical state (on or off) that enables the function. The *Control Port Inputs* area contains check boxes to invert the logical state of these inputs to accommodate your particular needs. Please note that these checkboxes are for Left and Right ports on the *module* and not the logical *Upstream* or *Downstream* zones.

By default, the *module* interprets the "Infeed/Discharge" input signal (Interlock Pin 4 on RJ-12 *Control Port or P4* on a *SE-4*) when energized or ON to mean a logical "1". By clicking the check box to invert the "Infeed/Discharge" input signal, a de-energized or "OFF" condition will mean a logical "1" to the *module* for the Interlock Pin 4 *Control Port* signal.



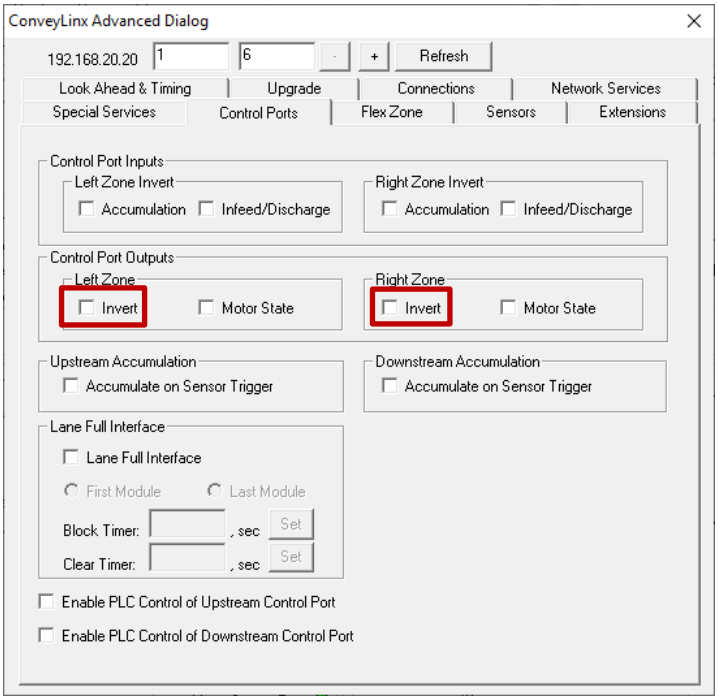
By default, the *module* interprets the "Accumulation" input signal (Pin 3 on RJ-12 *Control Port* or *P3* on a *SE-4*) when energized or ON to mean a logical "1". By clicking the check box to invert the "Accumulation" input signal, a de-energized or "OFF" condition will mean a logical "1" to the *module* for the Pin 3 *Control Port* signal.



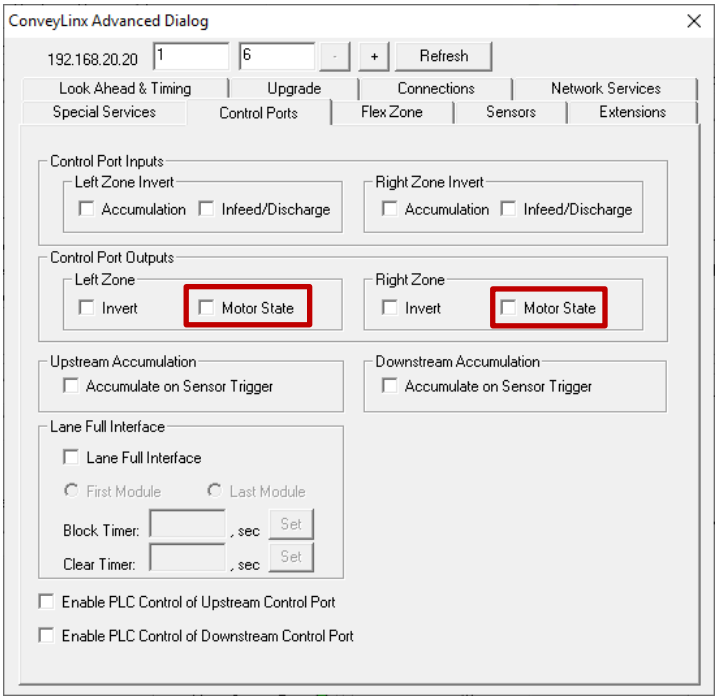
CONTROL PORT OUTPUTS

Control Port outputs are very low power. You need to use an SE-4 Module to connect your external device. Please refer to section Using ERSC-SE4 Terminal Breakout Module on page 51 for details.

The default *Control* port output configuration signal is “ON” or logical “1” to indicate to external controls that it is associated zone is occupied. By clicking the associated *Invert* check box, the *module* will make the output “OFF” or logical “0” when its associated zone is occupied.



The default operation of each Control Port output signal is to indicate whether the zone is blocked. You can change this operation to indicate that the motor is running instead of zone blocked by clicking the *Motor State* checkbox. Please note that the Invert function applies to this option as well.



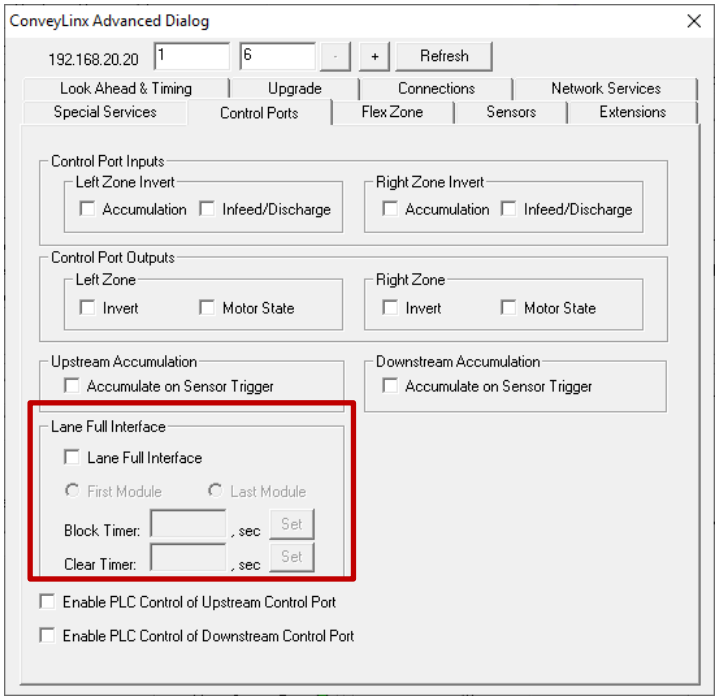
Upstream/Downstream Accumulation

One of the *Control Port* input signals previously mentioned above is the *Local Accumulate* signal (Pin 3 on RJ-12 *Control Port* or *P3* on a *SE-4*). By default, this signal causes the local zone to accumulate when its zone sensor is blocked. If this signal is removed when a *carton* is blocking the sensor, the *carton* will discharge to the next downstream zone (if of course it is clear). While the *carton* is discharging and still blocking the zone sensor, if the Accumulate signal is re-energized, the zone will stop. In situations (like an operator workstation) where you for example want every *carton* to accumulate upon its arrival, you would leave the Accumulate signal energized all the time and then have an operator momentarily de-energize the signal to cause the *carton* to discharge. In this situation you probably do not want the operator to have to watch and wait for the *carton* to fully discharge from the zone in order for them to re-energize the *Accumulate* signal so that the next *carton* will stop at the zone. The *Accumulate on Sensor Trigger* checkboxes for the Upstream and Downstream zones allow you to tell either or both the Upstream or Downstream zones on the *module* to remember that the *Accumulate* signal was momentarily de-energized so the *carton* will discharge without any further operator intervention and automatically know to accumulate the zone upon the arrival of the next *carton*.

Lane Full Interface

Section *Sensor in Control Port for Downstream Interlock* on page 56 describes plugging a sensor into one of the *Control Ports* to provide a *Downstream Interlock* signal. The *Control Ports* tab provides selection and adjustment to this functionality to allow the plugged-in sensor to provide *Lane Full Interface* functionality that is typical in conveyor applications. With *Lane Full Interface* checkbox checked; the *Downstream Interlock* will change its default functionality to essentially ignore the confirmation signal from the downstream controls and thus eliminate the logical *Arrival Jam* condition. This will allow the downstream zone to continually release as long as the sensor signal is OFF (default). This option also allows the user to set a block and clear time for the sensor for added flexibility.

When a sensor is plugged into the downstream *Control Port*, you can check the *Lane Full Interface* checkbox. This will cause the zone to no longer require a downstream arrival interlock and use the sensor signal to stop and start releasing form the zone. Block and Clear timers are provided to adjust the behaviour of product flow based upon the blocking and clearing of the sensor.

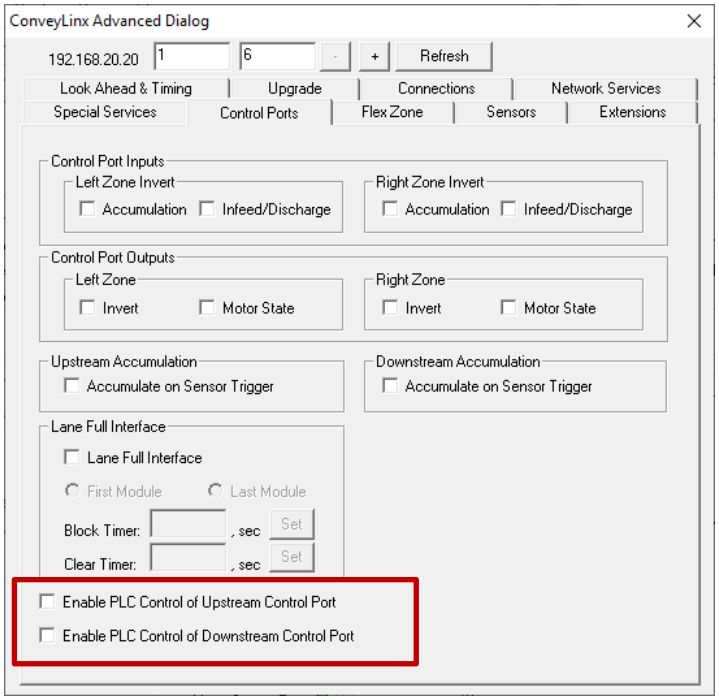


PLC CONTROL

Please note this function involves external PLC control over the Ethernet Network. Please refer to ConveyLinx ERSC PLC Developer's Guide (Publication ERSC-1500) for details on PLC usage and connectivity

If you have a PLC connected to a *module* while it is in ZPA mode, you have the option of disabling the default ZPA functionality of either *Control Port* (or both) and allow your external PLC to access the 2 input signals and the one output signal available on each port. This means that when selected for a given zone's *Control Port*; energizing either input signal will not indicate Local Accumulation or Infeed/Discharge Interlock functions and the output signal will not become energized when the zone is occupied. Your PLC program will have access to these inputs and output to use as remote I/O over the *ConveyLinx* Ethernet network.

You can select either or both the Upstream and/or Downstream Control Ports to be controlled by your remote PLC over the *ConveyLinx* Ethernet network. Checking the appropriate checkbox will immediately make the change. If a checkbox is already checked, unchecking it will return the associated port back to its ZPA functionality.

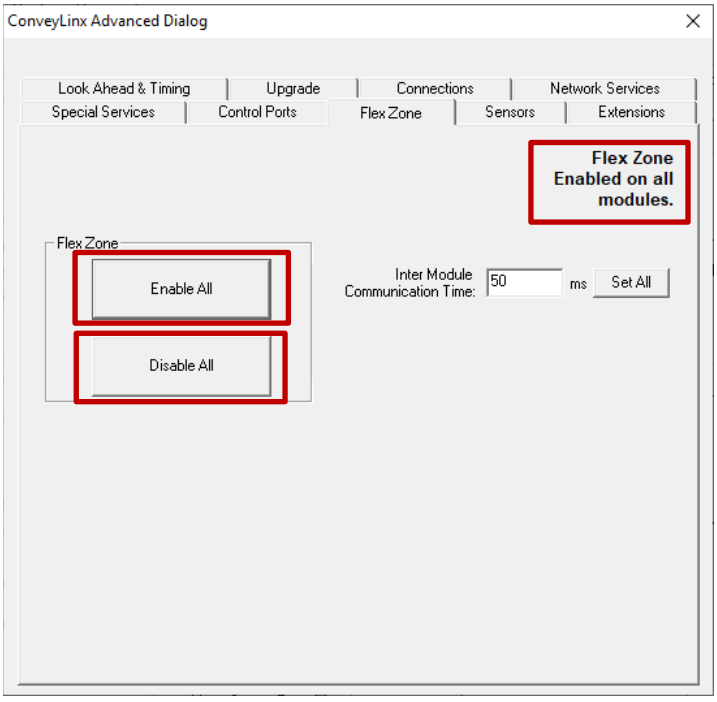


FLEX ZONE TAB

Please refer to section *Default Flex Zone Recognition Feature* on page 35 for details on how it works. The *Flex Zone* feature is enabled by default when you perform the *Auto Configure Procedure*. There can be certain situations such as higher speed applications and/or applications where a large percentage of *cartons* are at a length very close to the zone length where a "false triggering" of a flex zone condition can occur. In these situations, when product needs to accumulate, you may see several zones unoccupied because of this false triggering. For these applications where accumulation density is paramount, you can disable *Flex Zone* to eliminate this false triggering situation.

Please note that Flex Zone function has to be enabled or disabled for the entire subnet. It cannot be disabled or enabled on a per zone basis or for a group of zones within the same subnet.

Click the appropriate button to either Disable or Enable Flex Zone based upon the subnet's current status as indicated. Because this function applies to all modules in the subnet, it does not matter what module you were connected to when you invoked the *Advance Dialog* in order to disable or enable *Flex Zone*

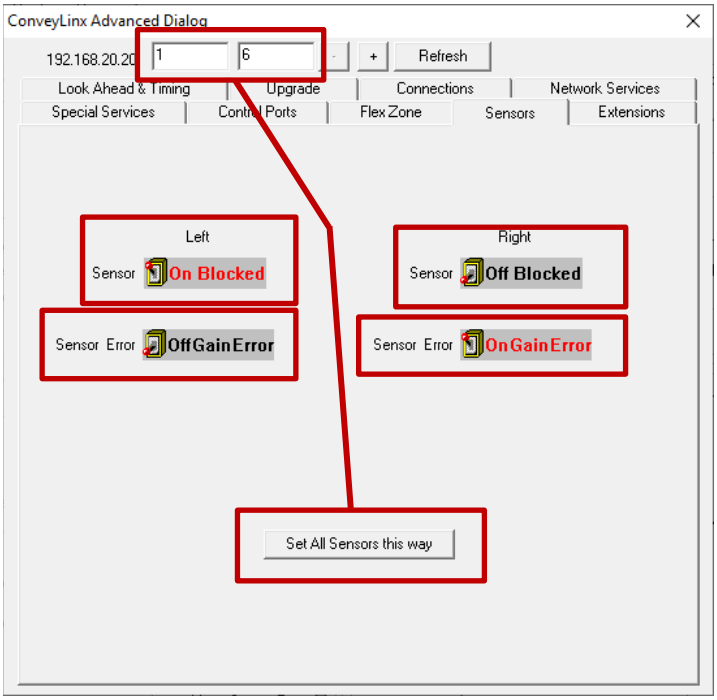


SENSORS TAB

The sensors tab displays the status of how the two sensor signals were configured during the *Auto Configuration Procedure*. If for some reason one or more of the sensors was not configured properly during the *Auto Configuration Procedure*; for example they were not aligned with their reflector or there was an obstruction blocking the sensor at the time the procedure was performed, the *Sensors Tab* will allow you to change the sensor's configuration without requiring you to re-perform the *Auto Configuration Procedure* for the entire subnet.

For example, if all the sensors on the system are light energized normally open then the corresponding zone's sensor graphic on this tab will show *Off Blocked*. Similarly, if the sensor is equipped with a separate health or low gain signal and this signal is on when there is no error, the graphic on this tab will show *Off Gain Error*.

Click the appropriate icon to change the sensor's blocked and/or gain error signal state. Note that you can make the same change for a group of modules by clicking the *Set All Sensors this Way* button.

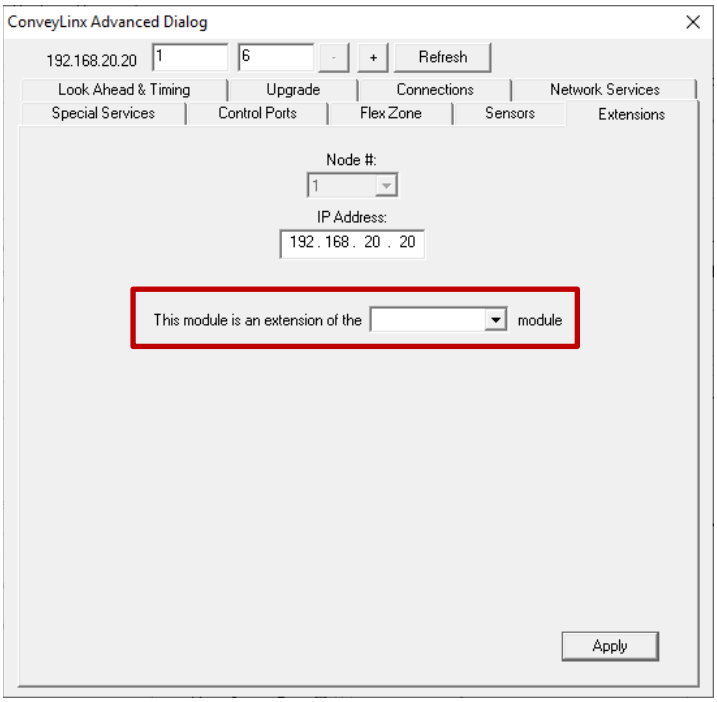


EXTENSIONS TAB

The *Extensions Tab* allows you to extend or "slave" single or multiple zones to one "master" zone. An example situation could be that you have for example certain length zones and on a given conveyor line there is a need for an extra partial zone that is too short to be a functional zone that accumulates a *carton*, but at the same time it is long enough that mechanically you need to have an MDR in that zone. In this situation you would like to provide a *module* and an MDR but no sensor and you want this zone to run its MDR when either its adjacent upstream or downstream zone is also running. In essence you want to make this partial zone a logical extension to one of its neighbors.

One example of extensions in use can be found in *Appendix D – Application Examples* section *Using Connections & Extensions for a Lift Gate* on page 125.

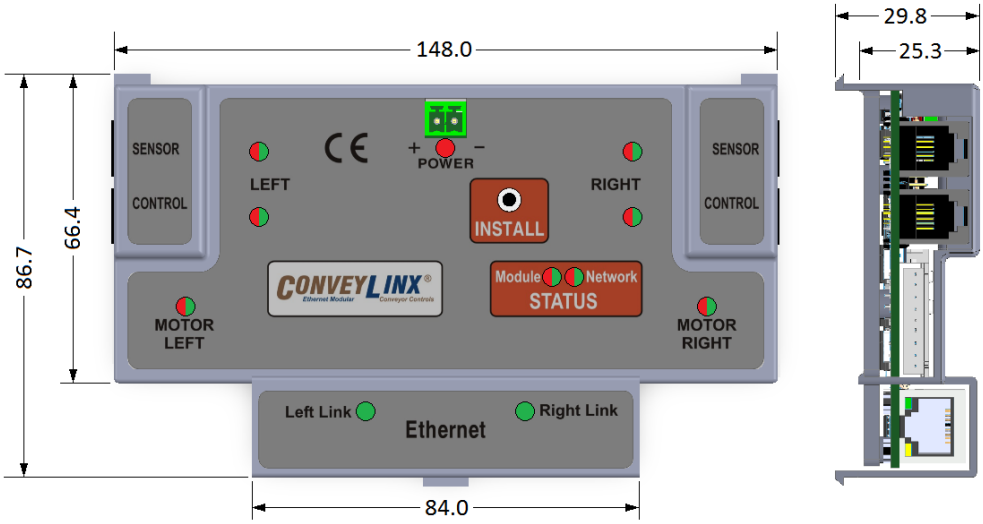
Navigate to the module that is going to be the extension and select either *Upstream* or *Downstream* from the drop-down box.



APPENDIX A – DIMENSIONS AND MOUNTING INFORMATION

CONVEYLINX MODULE DIMENSIONS

Dimensions in mm



CONVEYOR FRAME FABRICATION DETAIL

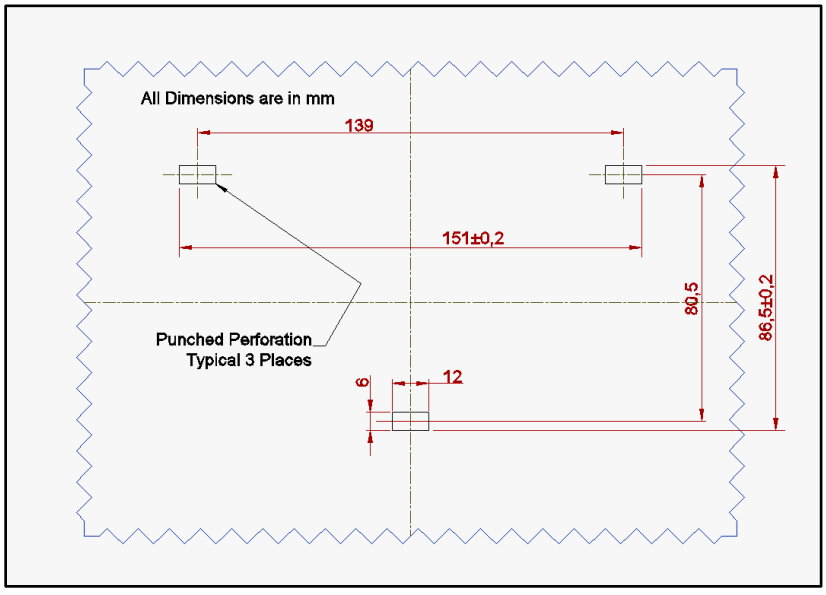


FIGURE 53 - CONVEYOR SIDE FRAME ELEVATION VIEW OF PERFORATION

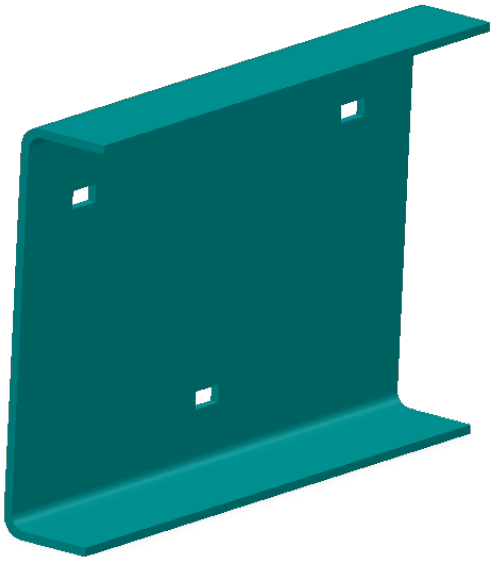


FIGURE 54 - PERFORATION PATTERN FOR CONVEYOR SIDE FRAME

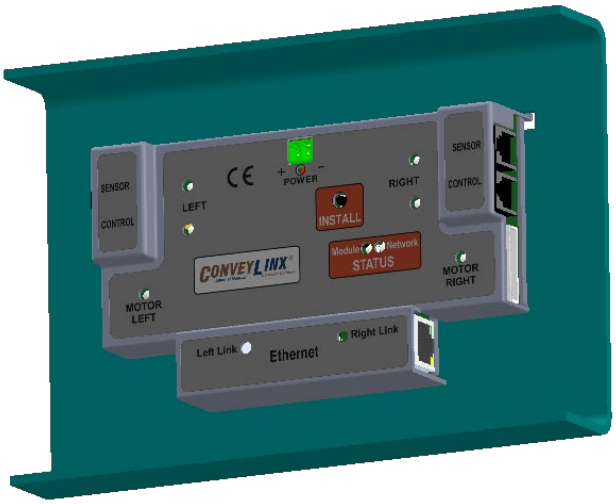


FIGURE 55 - TYPICAL RAIL SECTION WITH ERSC MOUNTED

APPENDIX B–CONFIGURING PC FOR ETHERNET SUBNETS

CONVEYLINX, IP ADDRESSES, AND SUBNETS

In order to connect to a *ConveyLinx* network and/or utilize and manage a multiple subnet *ConveyLinx* conveyor installation; a certain level of Ethernet I.P. addressing knowledge is required. This reference provides some background information and a quick guide for setting up your PC to be able to take full advantage of *ConveyLinx* and *EasyRoll*.

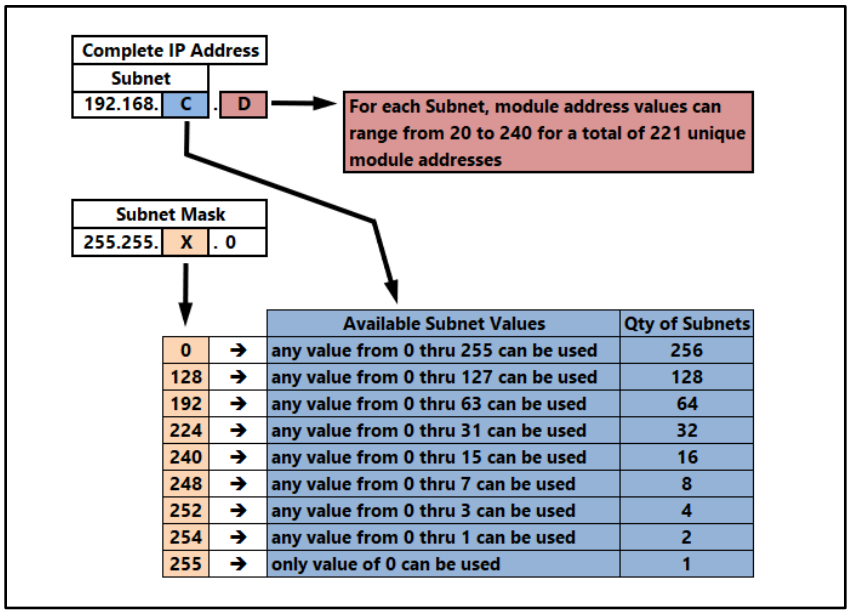
Your PC's I.P. address is used by an Ethernet network to identify the PC on a network. An I.P. address is constructed of 4 numbers or *octets*. Each of the numbers can be a value from 0 to 255. The format of an I.P. address is:

AAA.BBB.CCC.DDD

Where AAA, BBB, CCC, and DDD can theoretically be any values from 0 to 255 each. For any given network, this I.P. address is unique for each PC on the network. The AAA value identifies the *Class* of the network and is most relevant to I.T. professionals and other entities such as internet providers, etc. For our purposes, we will use a *Class C* type network which uses the value *192* for AAA. For the BBB value we will use *168*. The *192.168* value for the first 2 octets of our I.P. address is the most common for user configurable networks. The values AAA.BBB.CCC together identify the *Subnet* that the PC will be connected. The *Subnet* can be thought of as a group of PCs or *ConveyLinx* modules that can all communicate directly with each other. For example, if a PC's I.P. *Subnet* (AAA.BBB.CCC) address is 192.168.0; then any other PC or device on the same network whose *Subnet* is equal to 192.168.0 can communicate with each other. In this case, our network can have up to 256 devices because the DDD octet has to be in the range of 0 to 255 and each complete I.P. address has to be unique. Any other PC's or *ConveyLinx* modules on our network whose *Subnet* does not equal 192.168.0 will not be able to communicate with each other.

In order to allow your PC to communicate with more than 256 possible address on its network; your PC's I.P. address configuration also uses another 4-octet value known as the *Subnet Mask*. This value allows your PC to see other *Subnets* on the same network.

The following figure shows some typical values for *Subnet Mask* and the resulting number of *Subnets* that can be addressed:



		Available Subnet Values	Qty of Subnets
0	→	any value from 0 thru 255 can be used	256
128	→	any value from 0 thru 127 can be used	128
192	→	any value from 0 thru 63 can be used	64
224	→	any value from 0 thru 31 can be used	32
240	→	any value from 0 thru 15 can be used	16
248	→	any value from 0 thru 7 can be used	8
252	→	any value from 0 thru 3 can be used	4
254	→	any value from 0 thru 1 can be used	2
255	→	only value of 0 can be used	1

FIGURE 56 - AVAILABLE SUBNETS PER TYPICAL SUBNET MASK VALUES

As you can see, by simply manipulating the *Subnet Mask* values, you can configure your PC to see multiple *ConveyLinx* networks.

CONFIGURATION EXAMPLE

Your PC's I.P. address is used by an Ethernet network to identify the PC on a network. For most office networks, the I.P. address is automatically assigned by your office network or in smaller networks (like a home network) the IP address is assigned by a router device. In some cases, your I.T. department may assign your PC or laptop a fixed I.P. address.

For our example we wish to be able to communicate with up to 4 separate *ConveyLinx Subnets*. With a properly configured PC, we can use *EasyRoll* to view and set parameters for all modules on all 4 networks.

The following figure illustrates how we want our PC's I.P. address settings to be configured:

PC's Address & Subnet Mask	
I.P. Address	192.168.0.10
Subnet Mask	255.255.252.0

Possible ConveyLinx Subnets		
Subnet 0	192.168.0.20 thru 192.168.0.240	221 Modules
Subnet 1	192.168.1.20 thru 192.168.1.240	221 Modules
Subnet 2	192.168.2.20 thru 192.168.2.240	221 Modules
Subnet 3	192.168.3.20 thru 192.168.3.240	221 Modules

FIGURE 57 - IP ADDRESS CONFIGURATION EXAMPLE

Please Note: The *ConveyLinx* IP address structure is designed such that all *module's* last *octet* (DDD) of their address is greater than or equal to 20 and less than or equal to 240. This leaves 35 spare valid addresses (256 – 221 = 35) on the same *Subnet* for other devices such as PC's and PLC's. In our example, the last *Octet* for the PC's I.P. address is

arbitrarily set to 10. This value could be any value from 0 to 19 or 241 to 255. Network conventions are such that on a given *Subnet* the last octet (DDD) values of 0 and 1 are usually reserved for the *Default Gateway* which is often the address of an Ethernet router.

Also note that our example is utilizing all the possible *Subnets* for the Subnet Mask (255.255.252.0) shown. From *Figure 58* above; we could have selected any of the values for X on the chart that was listed above the 252 value. In these cases, there would simply be more *Subnets* available to address.

Please consult your I.T. department if you are unsure about modifying your PC's IP Address.

APPENDIX C – CONVEYLINX ACCESSORIES

Included in this manual are various details for you to assemble your own various cable assemblies, connection kits, and power supplies to provide a successful installation. However, Insight Automation has made it easy for you to purchase approved and proven *ConveyLinx* accessories. Please contact Insight Automation for pricing and delivery.

Accessory	Part Number	Description
Motor Extension	CACRSC-EXT-050	Motor Extension Harness – 50 cm
	CACRSC-EXT-100	Motor Extension Harness – 100 cm
	CACRSC-EXT-150	Motor Extension Harness – 150 cm
	CACRSC-EXT-200	Motor Extension Harness – 200 cm
	CACRSC-EXT-250	Motor Extension Harness – 250 cm
	CACRSC-EXT-300	Motor Extension Harness – 300 cm
Shielded Ethernet Patch Cable	IN-CAT5-1-100601BK	Cat 5 - 1' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-3-100603BK	Cat 5 - 3' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-5-100604BK	Cat 5 - 5' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-7-100605BK	Cat 5 - 7' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-10-100606BK	Cat 5 - 10' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-15-100607BK	Cat 5 - 15' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-20-100616BK	Cat 5 - 20' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-25-100608BK	Cat 5 - 25' Ethernet Shielded Patch Cable - Black Overmold
	IN-CAT5-50-100609BK	Cat 5 - 50' Ethernet Shielded Patch Cable - Black Overmold
Breakout Module	ERSC-SE4	RJ-12 to Screw Terminal Breakout Module with Output Amplifier and Bias Diodes and a short time to ensure outputs do not initialize during the power up phase. Includes blocking diode circuit to allow external power to be used. *(By Adding "Kit" at the end of the part number now includes the necessary 8" Cable that runs between the SE and ConveyLinx module.*

Accessory	Part Number	Description
Sensors	IN1-PE-KIT-RJ11-1	Kit: QS18VP6LP Sensor w/ RJ11 and 1 meter cable, assembled to bracket, Reflector assembled to Bracket
	IN1-PE-KIT-RJ11-2	Kit: QS18VP6LP Sensor w/ RJ11 and 2 meter cable, assembled to bracket, Reflector assembled to Bracket
	IN1-PE-RJ11-1	Sensor Only w/ The RJ11 Connector and 1 Meter cable
	IN1-PE-RJ11-2	Sensor Only w/ The RJ11 Connector and 2 Meter cable
	N-PE-DIFKIT-RJ	Wenglor Diffuse Reflective Photoeye and bracket Kit, between roller type OPT103-550mm range NPN Output no health (Order Part Number Wenglor OPT-320 kit)
	IN-M12-RJ11-EXT-100	Standard M12 Connector to RJ11 Connector (For use with Wenglor Sensor Kit), 1 Meter Length (Order Banner P/N MQDC-403-MOD-6P4C)
	IN-M12-RJ11-EXT-200	Standard M12 Connector to RJ11 Connector (For use with Wenglor Sensor Kit), 2 Meter Length (Order Banner P/N MQDC-406-MOD-6P4C
	IN-REF-42D	Banner Reflector 42mm Diameter with threaded stud, washer and nut (Banner P/N BRT-42D)
	MB-ERSC-14GA	Universal ERSC mounting bracket. Can be mounted within the conveyor frame or below. Painted Steel
DC Power Supplies *(Omit "DIS" For No Load Switch/Add "UL" after IN to make any Box UL Approved)*	IN-P-DIS-PS-10-120	MDR|Power 10amp@24VDC, 120VAC Input w/ Load Switch,Transparent Poly Carbonate Enclosure
	IN-P-DIS-PS-20-120	MDR|Power 20amp@24VDC, 120VAC Input w/ Load Switch, Transparent Poly Carbonate Enclosure
	IN-P-DIS-PS-40N-120	MDR|Power - 40amp@24VDC, 120VAC Input w/ Load Switch, Transparent Poly Carbonate Enclosure
	IN-P-DIS-PS-20-480	MDR|Power 20amp@24VDC, 480VAC Input w/ Load Switch, Transparent Poly Carbonate Enclosure
	IN-P-DIS-PS-40-480	MDR|Power 40amp@24VDC, 480VAC Input w/ Load Switch, 2 20A-Circuit Breaker, Transparent Poly Carbonate Enclosure

APPENDIX D – APPLICATION EXAMPLES

USING CONNECTIONS & EXTENSIONS FOR A LIFT GATE

A common use of the *Extension* mode configuration available from the *Connections* tab selection is for a powered lift gate. *Figure 60* shows a typical powered lift gate example. In this example the *module* on the lifting or gate portion of conveyor has 2 MDR's and no photo-sensors. Normal operation when the gate is down is for the MDR's on the gate to run when its immediate downstream zone runs so as to create "one long logical zone". This means that if a *carton* is accumulated on the upstream zone of *Node* 192.168.20.25; a *carton* arriving at the downstream zone of *Node* 192.168.20.23 will stop and accumulate and no loads will ever be logically accumulated or stopped on the gate portion. In order to accomplish this, all we need to do is instruct *Node* 192.168.20.24 to be an *Extension* of its downstream neighbor *Node* 192.168.20.25.

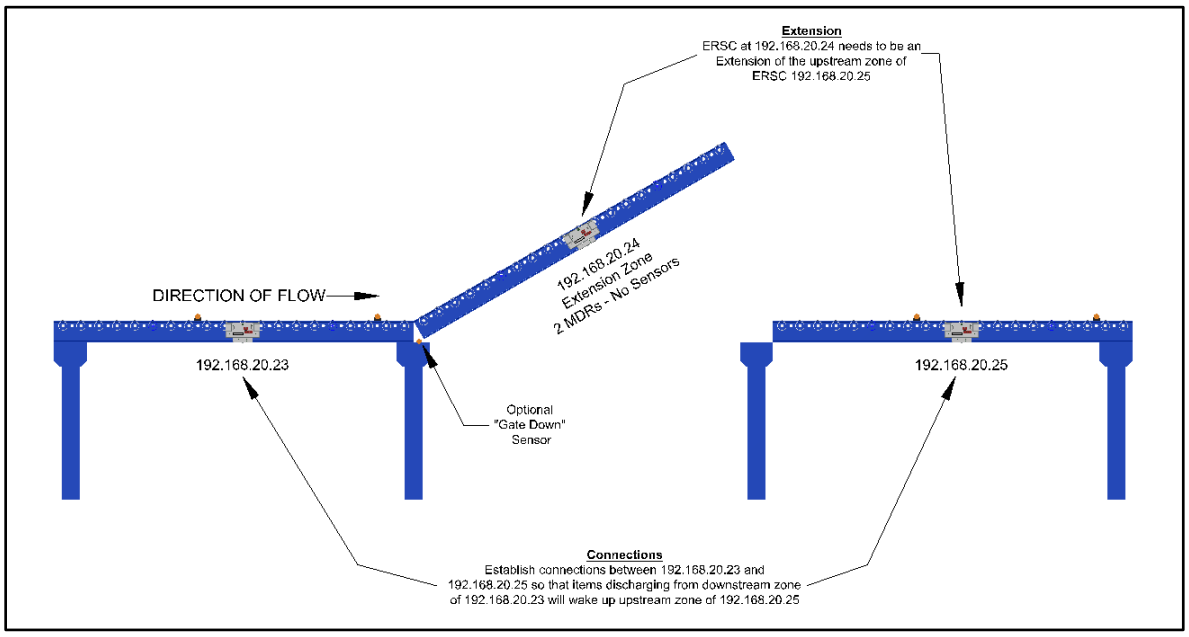
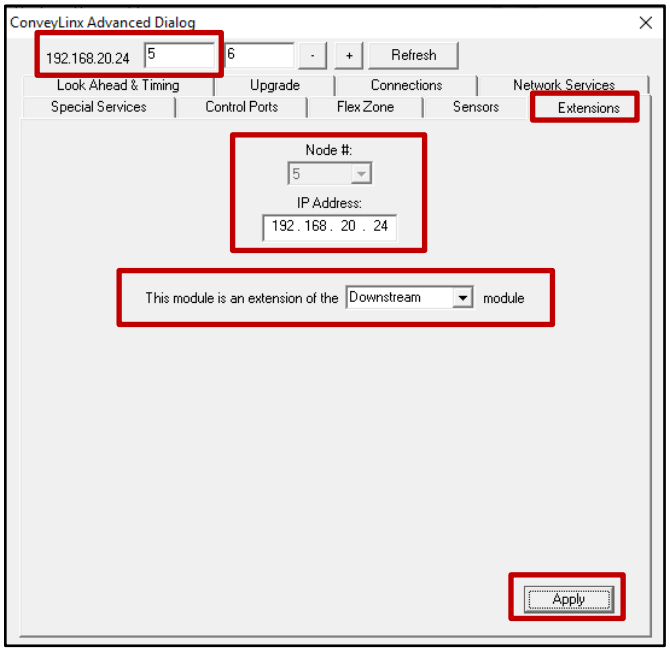
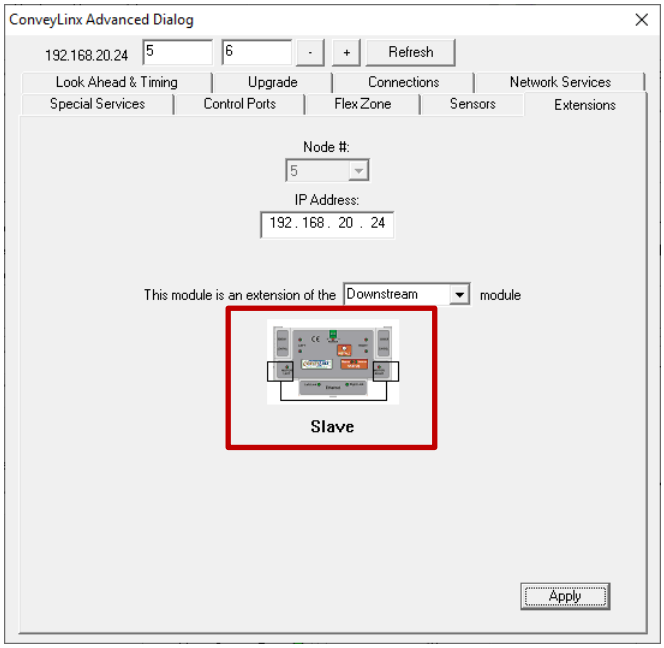


FIGURE 58 - TYPICAL LIFT GATE EXAMPLE

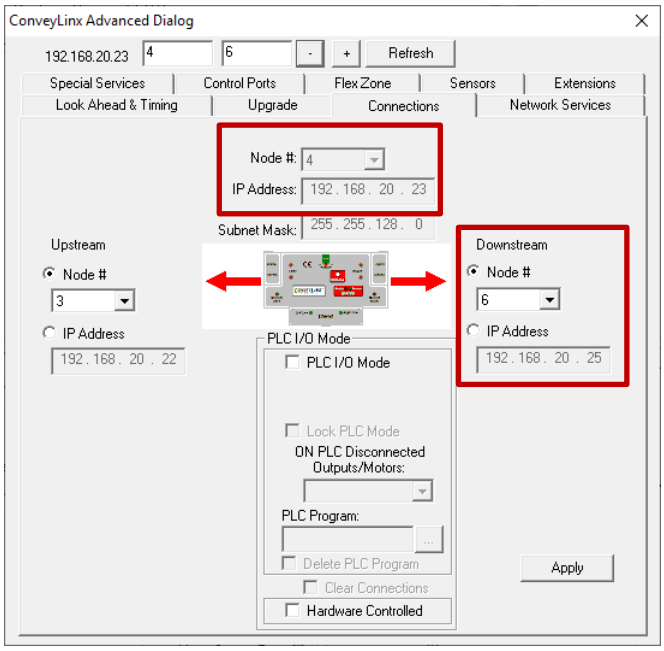
In the *Advanced Dialog*, navigate to *Node 5* and click the *Extensions* Tab. Notice that Node 5's IP address 192.168.20.24 is filled in. In the drop-down box, select *Downstream* and click *Apply*. Note that this may take a few seconds to complete.



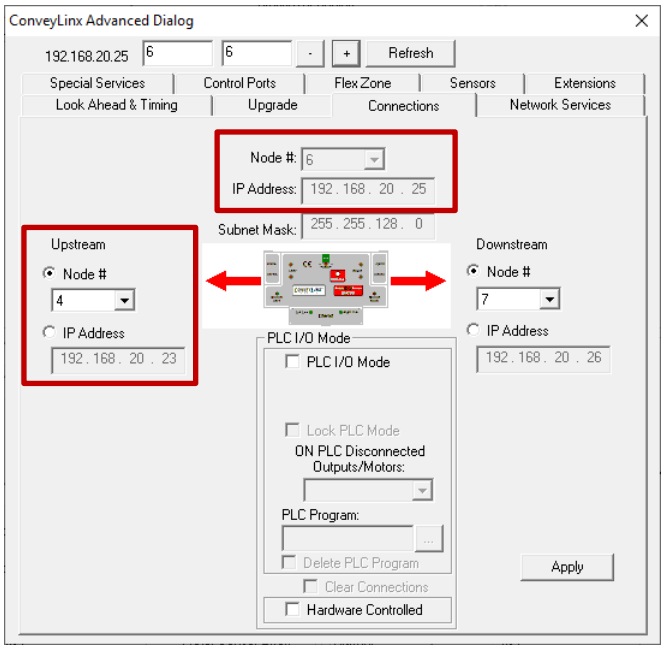
After clicking *Apply*, the screen will update and show you that the module has been configured as an extension or "slave" of its downstream neighbor.



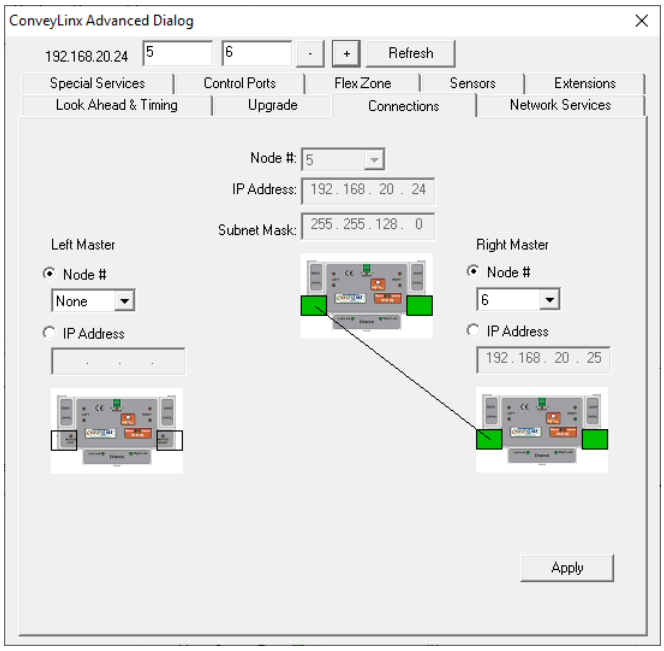
Now if you navigate back to *Node 4* and look at the *Connections* Tab, you can see that the downstream connection of *Node 4* is now *Node 6* instead of *Node 5*



And then when you navigate to *Node 6*, you can see that its upstream connection is now *Node 4* instead of *Node 5*.



And when you navigate to *Node 5*, you can see that it is configured as an *Extension* of *Node 6*



In *Figure 60*, there is an optional "Gate Down" sensor shown. This can be provided to hard-wire back to *module* 192.168.20.23's *Downstream Control Port Local Accumulate* signal (Pin 3). This sensor should energize Pin 3 when the gate is open to cause any *carton* that appears in the downstream zone of 192.168.20.23 to stop and accumulate. When the gate is down, the sensor should de-energize Pin 3 in order to allow the zone to release. You can also reverse the polarity of this sensor (i.e. energized when down and de-energized when open) and invert the Pin 3 signal as described in section *Control Port Inputs* on page 107 for details.

Reversing Conveyor Using Hard-Wired Control Ports

Reversing conveyor utilizing hard-wired signal to *Control Ports* is enabled in *EasyRoll* as indicated in section *Reversing Control* on page 91. *Figure 61* depicts a simple 8 zone example and indicates which signals on which *Control Ports* will provide the control. Reversing function applies to all *modules* in a subnet will work for any number of zones up to the maximum that can be included in a single subnet.

Please note that you can utilize reversing control for a portion of a subnet by utilizing a remote PLC via the Ethernet network. Please refer to ConveyLinx-ERSC PLC Developer's Guide (publication ERSC-1500) for details.

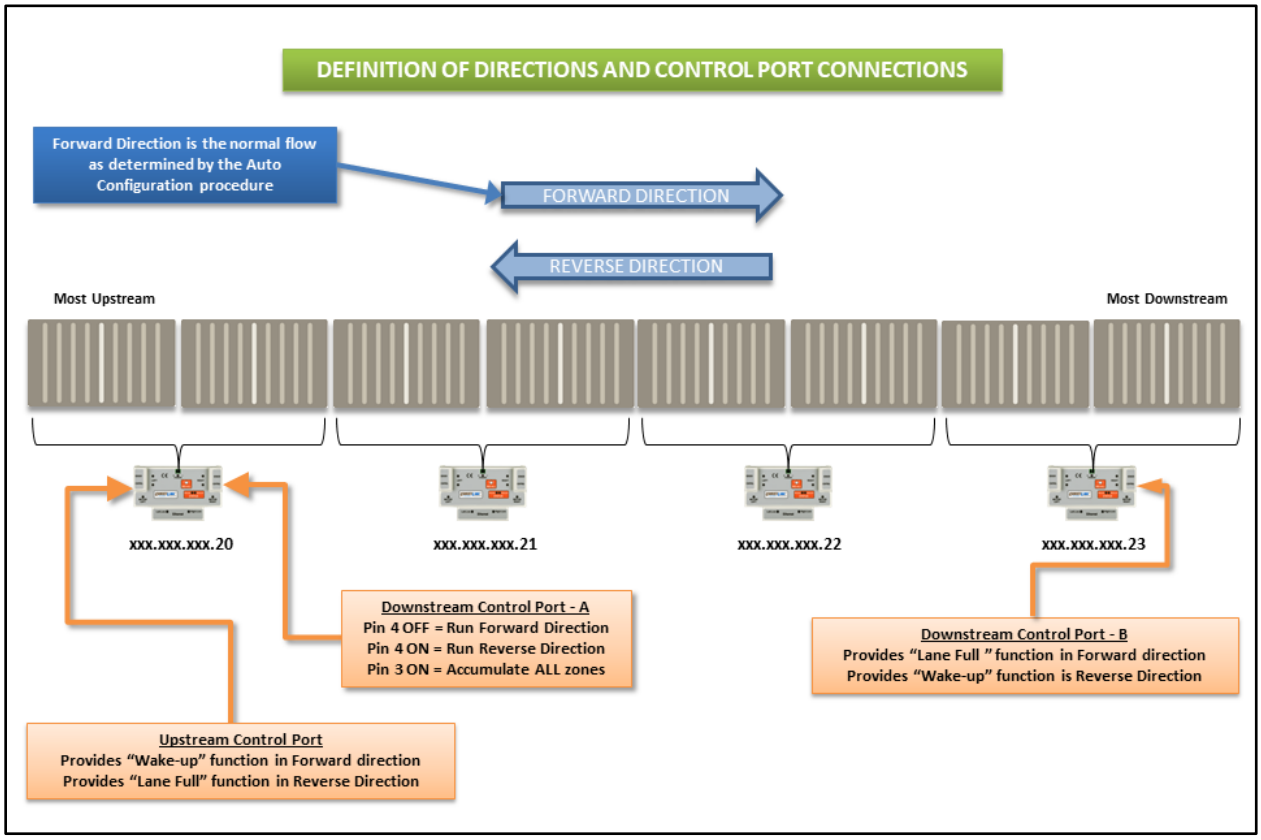
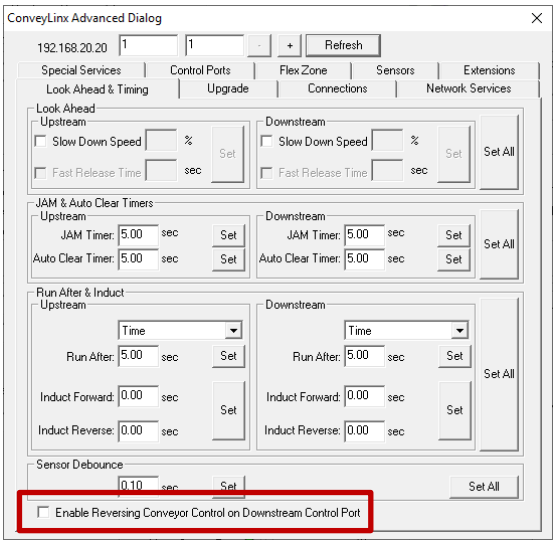


FIGURE 59 - REVERSING CONVYEOR EXAMPLE WITH CONTROL PORT CONNECTIONS

Navigate to Node 1 (xxx.xxx.xxx.20) and check the *Enable Reversing Conveyor Control on Downstream Control Port* check box.



Sequence of Operation

Forward Direction

- All signals are OFF on *Downstream Control Port - A* of the xxx.xxx.xxx.20 module
- You can use the *Upstream Control Port* to wake up the most upstream zone
- You can use the *Downstream Control Port-B* to hold and accumulate the most downstream zone

Switching to Reverse Direction

- Energize *Pin 3* on *Downstream Control Port-A* to cause all zones in the subnet to accumulate
- Wait for all zones to stop and accumulate (time value dependent upon zone length and speed – 2 or 3 seconds is typical)
- Energize *Pin 4* on *Downstream Control Port-A* to logically switch the direction to *Reverse*
- De-energize *Pin 3* on the *Downstream Control Port-A* to remove accumulation for all zones in subnet to start reversing operation
- Note that the *Upstream Control Port* and *Downstream Control Port-B* have also reversed their respective functions. *Upstream Control Port* now provides the *Downstream Interlock* (lane full) function and the *Downstream Control Port-B* provides the *Upstream Interlock* (wake-up) function

Switching Back to Forward Direction

- Energize *Pin 3* on *Downstream Control Port-A* to cause all zones in the subnet to accumulate
- Wait for all zones to stop and accumulate (time value dependent upon zone length and speed – 2 or 3 seconds is typical)
- De-energize *Pin 4* on *Downstream Control Port-A* to logically switch the direction to *Forward*
- De-energize *Pin 3* on the *Downstream Control Port-A* to remove accumulation for all zones in subnet to start forward operation

APPENDIX E – MOTOR PULSE TO DISTANCE CALCULATION

For the *Senergy* motor there are 30 pulses per revolution of the motor shaft. The formula to calculate the linear distance the roller would turn in one pulse is:

$$\frac{mm}{pulse} = \frac{\pi \times RollerDiameter}{30 \times Gear\ Ratio}$$

Roller Diameter and *Gear Ratio* values for specific roller diameters and speed codes are found in our *Pulseroller Global Motor Roller Technologies Product Catalog* available at www.pulseroller.com

For example, we have a standard *Senergy* roller with a diameter of 48.6 mm (standard 1.9" tube) and our speed code is 60. From the chart on page 10 (2019 edition of the Catalog) indicates that the Gear ratio for a 60-speed code is 11. From this information we plug in the values into our formula:

$$\frac{\pi \times 48.6}{30 \times 11} = 0.463\ \frac{mm}{pulse}$$

For this 60-speed code *Senergy* roller, when you set the *Deceleration* in *Closed Loop* mode to 50 pulses; the roller will decelerate for a distance of

$$0.463\ \frac{mm}{pulse} \times 50\ pulses \cong 23\ mm$$

APPENDIX F – POWER SUPPLY LOADING

The current loading on the power supply for a group of *modules* depends upon the *Motor Type* selected. Each of the motor types available has an associated rated current that the motor will draw at rated torque and maximum speed. Each motor type also has an associated allowed current draw that is available for a period of time upon the initial starting of the motor. Theses current values and starting times are shown in the following chart:

	ECO	*Boost*	*Boost 8*
Power supply load **per Motor Port** at rated torque at maximum speed	2.5 A	3.5 A	3.5 A
Power supply load **per Motor Port** during motor starting period	3.0 A	5.0 A	8.0 A
Duration of motor starting period	5.0 sec.	1.5 sec	3.0 sec

Please note that the current values shown are per Motor Port, so if both Motor Ports are being used on a given *module*, the current load seen by the power supply for that module will be double the value shown.

NOTES:

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