

HILMOT

A TREW Company

24VDC MOTORIZED DRIVE ROLLER SPIRAL CURVE SECTION - 1500 SERIES



INSTALLATION & MAINTENANCE MANUAL

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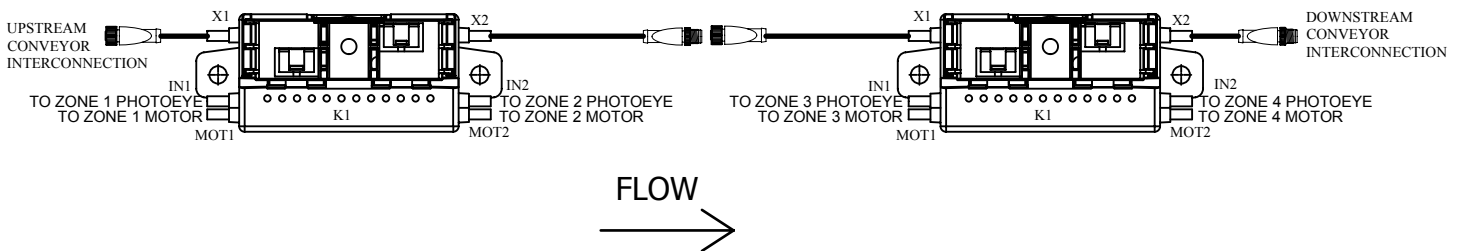
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OVERVIEW

Zero Pressure Accumulation (ZPA)

An MDR conveyor with accumulation is composed of several 'zones', as shown in the image below. Each zone is powered by a motorized drive roller (MDR). The MDRs are controlled by a communications network, allowing the zones to communicate with each other to achieve the desired accumulation method. The rollers in a zone do not rotate until product has been detected in the adjacent upstream zone. In other words, the rollers in Zone 2 do not rotate until the photo eye sensor in Zone 1 detects a product. The rollers in Zone 3 do not rotate until the photo eye sensor in Zone 2 detects a product.



There are two types of accumulation release: Singulation release and Slug release. Singulation release allows one product to be released at a time after the downstream zone has cleared. Slug release allows a predetermined amount of product to be released at one time after the downstream zone has cleared. Slug release is typically used in Palletizing or Machine loading conditions. The type of release to be used is usually determined at design time.

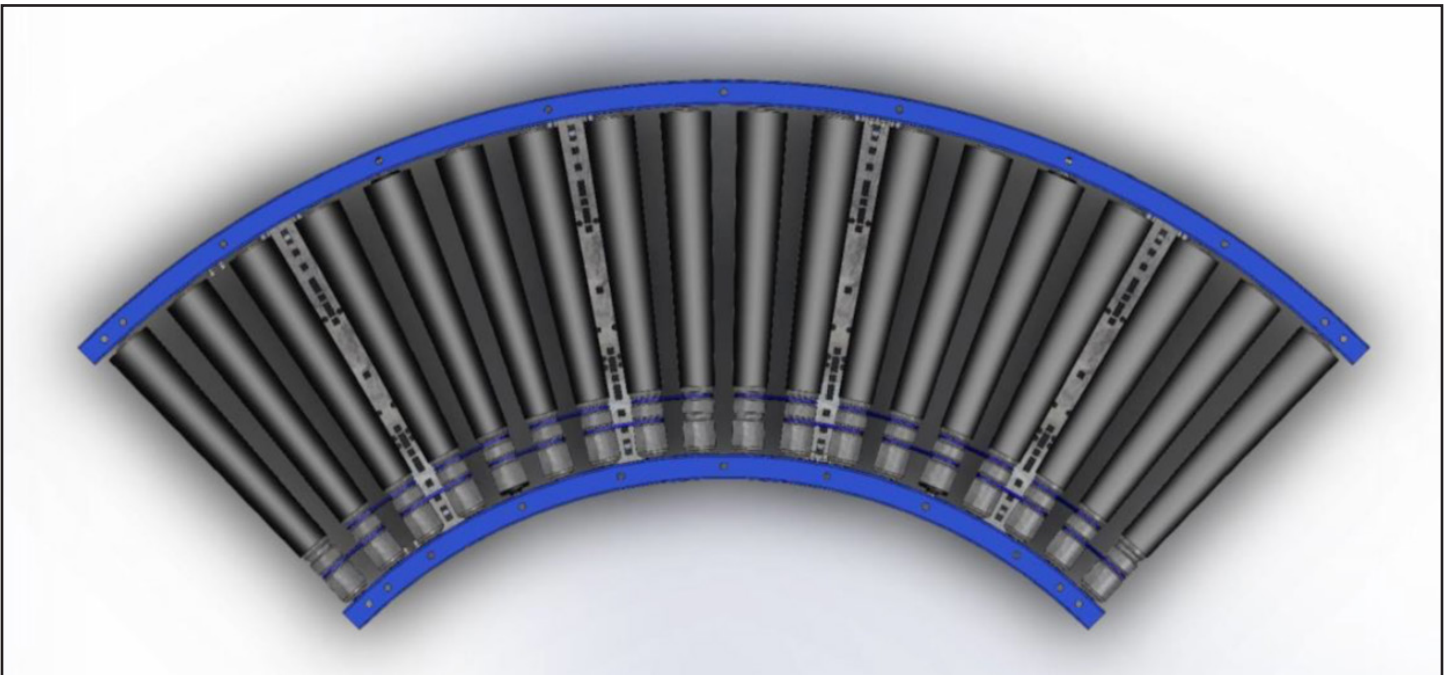
Accumulation begins when a product is forced to remain in Zone 4. The photo eye sensor in Zone 4 detects the product and turns off the motorized drive roller in Zone 4, stopping all the rollers in that zone. When a second product is detected by the photo eye sensor in Zone 3, the motorized drive roller in Zone 3 is turned off, stopping all the rollers in that zone. This accumulation sequence is repeated for each succeeding zone as long as the product in Zone 4 is forced to remain in position.

When the product in Zone 4 can be released, the motorized drive roller is turned on and the product moves down the conveyor system. When the product clears the photo eye sensor in Zone 4, the motorized drive roller in Zone 3 is turned on and the product moves from Zone 3 to Zone 4. This release sequence is repeated for each succeeding zone as long as product is not intentionally stopped in any given zone. The subsequent gap between products is approximately equal to one zone length. This accumulation sequence may be started anywhere along the length of the conveyor.

The MDR accumulation is a true zero--pressure accumulation (ZPA). This means that the product being conveyed never comes in contact with any other product; provided it is dimensionally compatible with the zone (product length is less than the zone length).

Standard Zones

The image below shows a typical zone layout for a standard intermediate zone. Each zone has one motorized drive roller (MDR), photo eye sensor, reflector, motor control card, and carrier rollers.



COMPONENTS

Motor Control Card - Auto & Full Control

The motor control card provides true zero pressure accumulation and other control options to a conveyor system. Each motor control card manages the functionality of (2) motorized drive rollers which in turn drives idler rollers using O-rings or other belts. The ZPA motor control card, MDR and idler rollers, with associated sensors and switches, are assembled into a short conveyor section - or zone. A logic-controlled, ZPA conveyor is created when a number of zones are connected together and a four-wire M12 connector links each motor control card electronically. The MDRs only operate when a package is present and is detected by a photo-eye. If the downstream zone is empty, the package moves forward. The motor control card has several design features allowing the integration of workstations, lifts and turntables into a conveyor design. If the ZPA motor card is to control only (1) motor (one zone), the seconded zone logic must be turned off with mode 2 (single).

Changing the Operation of the ZPA

Additional control signals can be sent to the motor control cards by using various I/O signals on its connectors. The logic is passed from board to board through modular RJ-11 telephone communication cables. By setting rotary switches (S_1 , S_2 , S_3), you can change its speed, direction and operating mode, respectively.

Motor Control Card Circuit Protection

The motor outputs are protected by safety fuses with 5A-rated current. They prevent damage to the motor control chips from back EMF that might be generated by the MDR when it is rotated by an outside force such as heavy packages arriving at high speed from powered or gravity-fed conveyors. This is referred to as “over-driving” the MDR. Care should be taken to minimize over-driving.

Motor Control Card Replacement

WARNING

Before attempting to repair or replace a drive roller, drive card, controller device, or any other device connected to these components, be sure that power to the controls is locked out to prevent premature or accidental start-up. Failure to follow this instruction may result in serious personal injury, and/or equipment damage.

- 1 Turn off and lock out the power supply to the conveyor
- 2 Remove the auxillary power cable from the card
- 3 Remove the drive roller cable connector and the control cable or com-link from the drive card
- 4 Remove drive card and mounting bracket from the conveyor
- 5 Remove drive card from mounting bracket and inspect for Red LED
- 6 Inspect the original card and observe the jumper and switch settings
- 7 Set the switches and jumpers on the new card to match the old one
- 8 Replace old drive card with spare drive card
- 9 Carefully connect the control cable or com-link and drive roller cable to the card
- 10 Reconnect the auxillary power cable to the card
- 11 Unlock the power supply and turn the conveyor on

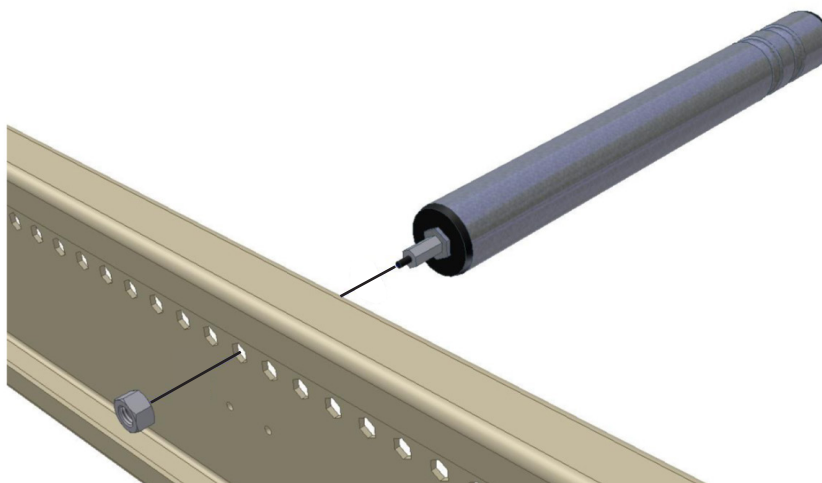
Note: Only follow motor card bracket steps if applicable, as motor card brackets are not used on Intermediate Set High.

Motorized Drive Roller (MDR)

The motorized drive roller (MDR) is the muscle of the conveyor zone. It provides the torque and speed required to move the product to the next zone. The MDR has the motor and gearing encapsulated inside the roller tube.

Replacement of MDR

- 1** Turn off and Lockout / Tag-out all power to the conveyor section
- 2** Make sure that the Gear Ratio matches that of the roller that is being replaced. Standard Gear Ratios would include: 16:1, 20:1, 24:1, 36:1, 64:1, and 96:1. This is important if the conveyor system is comprised of more than one speed
- 3** The replacement roller should include:
 - a** Motorized Drive Roller
 - b** Hardware Kit
 - i.** star washers – Qty. 2
 - ii.** motor nut
 - iii.** motor instructions
- 4** Install a star washer on the threaded motor shaft
- 5** Insert the MDR connector into the hex hole and gently pull the cable extending from the motor through
- 6** Insert the threaded hex shaft into the hex hole. Push the spring loaded idler shaft inwards and line the roller up with the hole. Release the idler shaft and allow it to pop into the hole in the frame. The image on **Page 2.6** shows an exploded view of the process
- 7** Install the outer star washer



- 8 The motor nut threads on to the motorized drive roller shaft, and should be to the proper torque of: **See Page 2.5 for Proper Torque Information.**
- 9 Tools required to achieve proper torque can be seen below



- 10 Plug the motor cable into the motor control card
- 11 Turn on power to the conveyor section
- 12 Check to see if roller operates by passing your hand in front of the photo eye sensor of the zone that is being serviced or the photo eye sensor located upstream with respect to flow
- 13 If the MDR does not operate review the **Troubleshooting Section**

⚠ WARNING

These checks must be performed with the power to the conveyor section turned "ON". Only qualified electricians should be allowed to perform these checks. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Proper Torque

Gear Ratios Vary.

 16:1 35/18 EC100 S/N: 11944336 24VDC 202rpm	 12:1 46/18 EC110 S/N: 11963451 24VDC 158rpm	 20:1 35/18 EC310 S/N: 11879949 24VDC 155rpm
EC110 and EC100: 30 ft-lbs +/- 5 ft-lbs (40.7 N-M +/- 6 N-M)		EC310: 50 ft-lbs +/- 5 ft-lbs (67.8 N-m +/- 6 N-m)



ITOH:
22.5 ft-lbs +/- 5 ft-lbs
(30.5 N-M +/- 6 N-M)

Carrier Roller

The carrier roller is used to take the weight of the product and also distributes the torque generated by the motorized drive rollers via o-belts, chain, timing belts, strip belts, or full-width belts. Generally, no more than nine carrier rollers per motorized drive roller are used in each zone.

Replacement of Carrier Roller

- 1 Turn off and Lockout / Tag-out all power to the conveyor section
- 2 Use an appropriate tool to push in the spring loaded axle on the roller and free that side of the axle from the frame of the conveyor
- 3 Carefully disengage the opposite end of the roller from the frame. Make sure the axle is not pinched on the frame causing damage during removal
- 4 Remove the disengaged roller entirely from the frame section
- 5 Carefully maneuver the roller to allow the drive belts to be removed from the grooved end of the roller. Set old roller aside
- 6 Install new roller by first maneuvering grooved end through the drive belts, ensuring the belts are aligned in the appropriate grooves
- 7 Insert the axle of the replacement roller through the conveyor frame
- 8 Use an appropriate tool to push in the spring loaded axle and lower the roller into position, aligning the axle with the hex hole in the conveyor frame
- 9 Unlock and turn on the power to the conveyor section

Photo Eye Sensor

A photo eye sensor is used to sense the presence of the product. Two styles of photo eye sensors are used on standard Hilmot Conveyor: Retro-Reflective Photoelectric Sensor & Background Suppression Diffused Photoelectric Sensor.

Replacement of a Photo Eye Sensor

- 1 Turn off and Lockout / Tag-out all power to the conveyor section
- 2 Locate end of Photo Eye Sensor cable and unplug from the roller drive card
- 3 Carefully remove cable from any holes in conveyor frame.
Note the routing path of the cable
- 4 Remove fasteners from the Photo Eye Sensor mounting bracket
and remove Sensor from conveyor
- 5 Install new Sensor at the same location as the old sensor
- 6 Route the new Sensor cable through the same path as the old sensor cable
- 7 Install Sensor cable plug into the roller drive card

Standard Retro- Reflective Photoelectric Sensor

The image and diagram below displays the cable connection types for the Tru-View ML17 series photoelectric sensors - 3.5m sensing range - Polarized retro-reflective mode - PNP Dark-Operated Sensor.

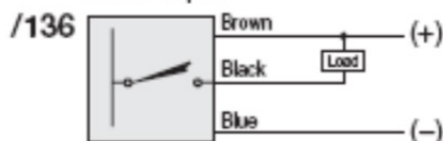
Wiring Diagrams



Cable Connection

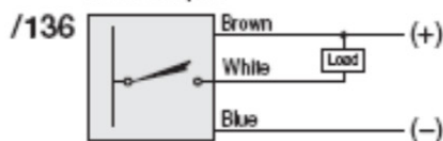
Normally Open

NPN Output



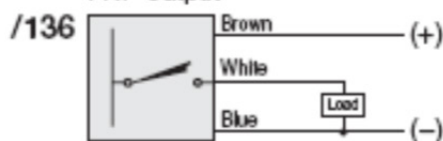
Normally Closed

NPN Output



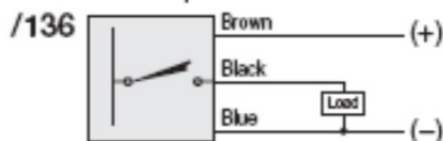
Normally Open

PNP Output



Normally Closed

PNP Output



4-in-1 Output

The 4-in-1 output offers one normally open and one normally closed output, both of which automatically detect the connected load, so the outputs either source or sink current depending on the load. A single sensor can operate as NPN normally open, NPN normally closed, PNP normally open, or PNP normally closed.

4 FOUR OUTPUTS
IN
1 ONE SENSOR



Standard Background Suppression Diffused Photoelectric Sensor (SICK)

The image and diagram below displays the connection diagram for the WTR series photoelectric sensors – 90mm sensing range – Background Suppression Diffused-4-in-1 output N.O./N.C. - 2m cable.

Features

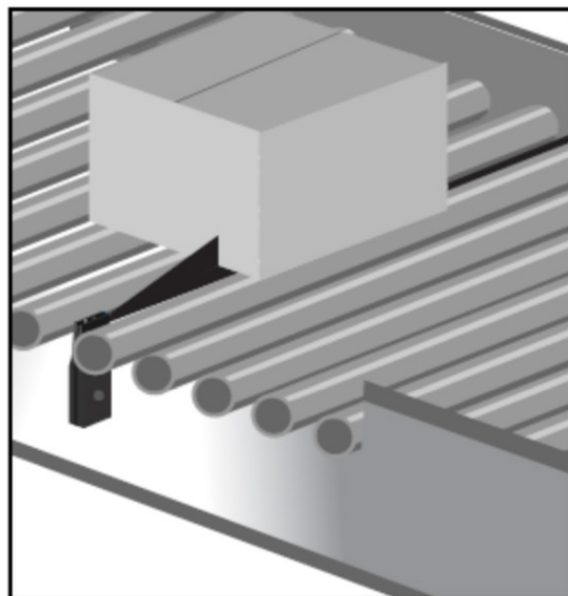
- Under-the-Conveyor Mount
- Stand alone sensor easily integrated with ZPA systems
- PNP and NPN complimentary outputs
- Adjustable Background Suppression (ABS) sensing technology, ignores background targets and no reflector is required



Connection Diagram

WTR2-P511S20

1	brown		DC 10...30 V
2	white	Q - NPN	load
4	black	Q - PNP	load
3	blue		0 V



Drive Belts (O-Bands)

MDR conveyor utilizes drive belts to connect individual rollers together to create a Zone. The drive belts can be O-bands or V belts, depending upon load and speed requirements of the conveyor.

Over time the drive belts can exhibit wear. O-bands in particular can wear or stretch, eventually allowing excessive slippage in the roller groove. When this happens, the rollers in the zones may not rotate and inadequately convey packages. Replacement of O-bands is quick and easy.

Replacement of O-Bands

- 1 Remove the roller having the affected O-band, following procedures for roller removal discussed earlier in this manual
- 2 Remove the (2) adjacent rollers. At this point, the affected O-band can be removed
- 3 Place new O-bands over the grooved end of the roller(s) and re-install the rollers

PREVENTATIVE MAINTENANCE

The satisfactory performance and reliability of this equipment is dependent upon a proficient preventive maintenance (PM) program with scheduled equipment inspections under normal operating conditions.

Accurate records of maintenance and repairs will help to identify problem areas and repetitive problem patterns. It is imperative that adequate records be kept in connection with the preventive maintenance program. These records should contain the date of inspection, inspection results, equipment services, repair history, part replacement history, and any other information that will help to make maintenance process more efficient and accurate. It is recommended that each conveyor have its own record. Properly kept, the conveyor record sheet will form a mechanical history of the equipment covered.

Preventive maintenance consists of regular service (lubrication, adjustments, cleaning, etc.). In addition, it consists of "keeping your eyes, ears, and nose open." Use your eyes to see potential component failure. Use your ears to listen for abnormal or louder than normal noises. Use your nose to smell a motor running abnormally warm in time to prevent its burnout. These sights, noises, and smells can be indicators of lack of lubrication, misalignment, or other potential trouble. Ignore them and you will be replacing a shaft, motor, or whatever does go out when a component is lacking proper preventive maintenance.

Only qualified maintenance specialists should maintain the mechanical, electrical and pneumatic portion of the conveyor.

WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Maintenance Precautions

WARNING

You must read and understand these precautions completely before operating, setting up, running, or performing maintenance on the equipment. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

- 1 When testing operating performance, do not start the equipment until all operations and maintenance personnel are notified and clear of the unit being tested
- 2 Be certain that required safety guards are never removed without authorization
- 3 Never run the equipment under production conditions without safety guards in place
- 4 Do not make any equipment repairs, while the conveyor is running
- 5 Keep hands, hair and clothing clear of any moving parts
- 6 Never attempt to clear load jams, while equipment is running
- 7 Always use appropriate tools when making repairs or adjustments
- 8 Observe all warning labels and follow plant safety rules
- 9 Make sure all connectors are secure and all wires are free from interference, obstruction, and any moving parts

Cleaning and Inspection

Generally, there are many reasons for cleaning:

- 1 To allow heat to dissipate (motors and gearboxes)
- 2 To prevent wear on moving parts
- 3 To prevent binding
- 4 For proper operation
- 5 Operating personnel will most likely treat clean equipment with more care

Any prescribed cleaning schedule should be modified as experience is gained. A thorough inspection should be performed while cleaning problem areas.

The total value of inspection procedures is determined largely by the consistency and regularity of the schedule. A definite interval of inspection must be established and obeyed. This is usually easier to accomplish if a "round robin" system of inspection is used. It is recommended that a general inspection that will ensure a thorough examination of each component and assembly contained in the system be done at least once for each thirty day period of operation. Results of these general inspections should be documented in the conveyor record of the unit inspected.

The probability of mechanical/electrical problems increase during periods of heavy usage, so an additional inspection immediately before and after a these periods is recommended.

Daily Inspection

Walk the entire length of conveyor system and observe the following:

- 1** With the conveyor running, listen for abnormal noises that could indicate:
 - Worn bearings in rollers, motors, reducers, etc.
 - O-Belt making contact due to misalignment or improper adjustment
- 2** With the conveyor shut down, look for the following:
 - Strings or other foreign material wrapped around bearings, shafts, or rollers. Remove all foreign material immediately
 - Shavings or belt dust under conveyor that would indicate misaligned or damaged components
 - Oil leakage that would indicate faulty bearings or seals in rollers, motors, reducers, etc.
- 3** Check pneumatic regulators for proper setting and listen for air leaks

Weekly Inspection

- 1 Visually inspect belts and rollers for wear, improper alignment, or buildup of foreign materials and repair/clean as required
- 2 Visually inspect all motors
- 3 Check pneumatic water traps and drain as required

Inspection Every 6 Months

- 1 Clean and lubricate all drive chains with SAE-10 to SAE-40 oil
- 2 Check all set screws and tighten as necessary. These may work loose during normal operation
- 3 Check all bolted connections and tighten as needed. Bolted connectors may work loose during normal operation

WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Replacing Rollers

- 1 Turn off and Lockout/Tagout all power to the conveyor
- 2 Use a tool to push in the spring loaded axle on the roller to free one end of the axle from the frame of the conveyor
- 3 Carefully disengage the opposite end of the roller from the frame and remove. Make sure the axle is not pinched on the frame causing damage during removal
- 4 Insert the axle of the replacement roller through the hole on the conveyor frame
- 5 Use tool to compress the spring loaded axle on the roller and lower the roller into its proper position
- 6 Release the spring loaded axle and make sure it fully engages in the hole in the frame

WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Lubrication

Check the following maintenance items immediately after start-up, during initial run-in, at 100 hours, and thereafter at 500 hour intervals under average conditions. Under adverse conditions, more frequent maintenance checks should be performed.

Speed Reducers

Standard speed reducers are sealed and maintenance free. They incorporate a pressure compensating chamber, which eliminates the lengthy preparation normally required to put a reducer into service and prevents atmospheric contamination. These reducers are properly filled at the factory with sufficient lubrication for all mounting positions. The lubricant is Mobil SHC--634, a synthesized hydrocarbon formulated for extremely long life. Refer to the manufacturers instructions for more information.

WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

In an atmosphere that contains abrasive particles, it is better not to have conventional lubricants on the surface of the chain that collect or retain abrasive particles. Use dry lubricants such as molybdenum disulfide or deflocculated colloidal graphite in a volatile carrier.

Motors and Carrier Rollers

All motors and carrier rollers are equipped with sealed bearings.
No additional lubrication is required.

WARNING

Be sure to replace the drive guarding after inspection or maintenance. Failure to follow this instruction may result in serious personal injury and/or equipment damage

SUPPORT

When troubleshooting equipment problems, it is essential to completely understand how the system functions during normal operation. Thoroughly review the operational description, the circuit drawings, and the electrical diagrams sent with your equipment. Once the system operation is understood, it is usually best to start at the problem, and then work back to the source.

Procedures are discussed at length in the following pages; however, there are certain guidelines that should be followed for all troubleshooting problems.

- 1 Locate the problem
- 2 Listen and observe
- 3 Identify problem as electrical, mechanical, or pneumatic
- 4 Determine symptoms through observations
- 5 List short and long term solutions
- 6 Select a solution or possible solutions
- 7 Implement and document one solution at a time

Troubleshooting a Dead Zone on the Conveyor

Perform the following visual checks prior to any troubleshooting:

- 1 Visually check and confirm that all wires are plugged in, intact and all connectors are secure
- 2 Visually check and confirm that there are no obstructions to the rollers
- 3 Inspect the photo eye sensor and check for proper operation as described in the Preventative Maintenance section of this manual.

WARNING

These checks must be performed with the power to the conveyor section turned “ON”. Only qualified electricians should be allowed to perform these checks. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Controller Check

The controller typically controls 2 zones. If the 2 zones are not functional, check individual M12 cables. Unplug and plug in the MDR and PE.

Check the controller. If no voltage is detected, check the in-line fuse.

If the in-line fuse is functional, check the power supply. Unplug and plug in black cable. Replace drive card.

Power Supply Check

The power supply typically supplies voltage to multiple zones. If the power supply is defective, all zones supplied will be inoperative. If only one or two zones are inoperative, check the individual connection cables and connectors going to each card.

Check the input voltage into the power supply. Check the power supply fuse or the circuit breaker. Replace if defective.

Motor Control Card / Motorized Drive Roller Checks

This check determines if the motor control card and the motorized drive roller are functional and must be done with power to the conveyor turned on.

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This check determines if the motor control card and the motorized drive roller are functional and must be done with power to the conveyor turned on.

⚠ WARNING

These checks must be performed with the power to the conveyor section turned “ON”. Only qualified electricians should be allowed to perform these checks. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

- 1 Determine if red fault light is on the drive card
- 2 Unplug and plug black auxillary cable into ZPA card
- 3 Unplug and plug M8 and M12 cables
- 4 Check that photoeyes are aligned and motors are torqued down
- 5 Remove drive card and make sure rotary rotary dials are the same as previous card

If the motorized drive roller rotates, the motor control card is defective. Replace the motor control card using the procedure **Motor Control Card section** of this manual (2.4). If the motorized drive roller still does not rotate, the motorized drive roller is defective. Replace the motorized drive roller using the procedure in the **Motorized Drive Roller (MDR) section** of this manual (2.5).

No Voltage to the Motor Control Card

This check determines if there is power being supplied to the motor control card and must be done with power to the conveyor turned on.

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⚠ WARNING

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- 1 Determine which motor control card is being used at the zone location
- 2 If the voltage is not between 24-26VDC, check the downstream zone motor control card for voltage. If the same condition exists (voltage is not between 24-26VDC), check the Power Supply with a Multi-Meter
- 3 If the voltage is between 24-26VDC, check the M12 and M8 connectors

The Troubleshooting Appendix gives a general guide for some of the common problems that might be seen with Motorized Drive Roller Conveyor.

Note: The troubleshooting guide does not cover issues involving zones controlled by a programmable logic controller.

Symptom	Probable Cause	Corrective Action
Zone will not run (dead zone)	Mechanical Transmission	Insure proper mechanical connection (O-bands, drive chain loops, timing belts, etc.) between MDR & carrier rollers
	No voltage to motor control card	Check voltage across motor control card
		Check power supply
		Inspect interconnect wiring for loose wires
	Motor control card dip switch settings are incorrect	Verify dip switch settings according to electrical interconnect drawing
	Motorized drive roller is defective	Replace motorized drive roller
	Disconnected photo-eye sensor	reconnect photo-eye sensor
	Faulty communication cable	Replace communication cable
		Replace motor control card
	DC common is not connected between power supplies	Verify DC common are connected
Zone runs in wrong direction	Motor control card dip switch settings are incorrect	Verify dip switch settings according to electrical interconnect drawing
	Faulty power supply	Replace power supply
Zone runs continuously	Photo-eye sensor misaligned on upstream zone	Align photo-eye sensor, clean photo-eye sensor lens

Symptom	Probable Cause	Corrective Action
Zone runs continuously (continued)	Disconnected photo-eye sensor	Reconnect photo-eye sensor
	Faulty communication cable	Replace motor control card
Motorized drive roller makes excessive noise	Faulty motorized drive roller	Replace motorized drive roller
Zone runs at a different speed than rest of conveyor	Gear ration of MDR is incorrect	Verify proper MDR, and replace if needed
	Speed potentiometer on motor control card is incorrect	Using a terminal screwdriver, adjust potentiometer on motor control card
	Motorized drive roller is defective	Replace motorized drive roller
Large batch of zones do not operate	Faulty power supply	Replace power supply
	Breaker blown at main panel	Reset breaker - if problem persists call for servicing
	Breaker blown at local power supply	Reset breaker - if problem persists call for servicing
	Disconnect switched at local power supply	Turn disconnect to ON position
	Interconnect wires - loose connection	Check wiring
Boxes run into each other	Photo-eye sensor not operating	Verify photo-eye sensor wiring
		Verify proper photo-eye sensor alignment
		Clean photo-eye sensor lens

Symptom	Probable Cause	Corrective Action
Boxes run into each other (continued)	Dead zone	See: zone will not run (dead zone)
	Speed set too high	See: zone runs at different speed than rest of conveyor
	Package larger than zone	Verify package size to original conveyor specifications
	Photo-eye sensor location is incorrect	Move photoeye sensor to proper location specified conveyor purchase
	Motor control card dip switch settings are incorrect	Verify dip switch settings according to electrical interconnect drawing
Green lights on card not lit	Motor control card is faulting	See: motor control card section of this maintenance manual for fault information
	No voltage to motor control card	Check voltage across motor control card
		Check power supply
		Inspect interconnect wiring for loose wires
Product bounces sporatically while in transportation	Conveyor sections do not have smooth transition at conveyor connection	Readjust conveyor height
	Debris on conveyor	Remove debris from conveyor
	Debris on conveyed product	Remove debris from conveyed product
Irregular movement of package while in transporation	Package large than zone	Verify package size to original conveyor specifications
	Different zone speeds	See: zone runs at different speed than rest of conveyor

Support

If you need further assistance:

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