STEALTHZONE™
24 VOLT DC CONVEYOR

24vdc Conveyor

MDR Technical Handbook

Powered by Itoh Denki

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1 Stealth Zone™ Introduction

Material Handling Technologies, Inc. (**MHT**) has been producing its Stealth Zone™ MDR (motorized roller) conveyor for customers, dating back to 2001 with the first of many cosmetic handling systems. This technology is the most revolutionary since the advent of line-shaft conveyor in the late 60's. Its impact continues to expand rapidly as users and manufacturers see the benefits of this technology.

TECHNOLOGY

MHT's Stealth Zone™ conveyor is truly a modular conveyor system, utilizing 24 VDC motorized roller. This proven technology uses a self-contained motorized drive system completely contained within a roller to power a segment or zone of conveyor. Rollers adjoining the motorized roller are slave-driven with either poly-o bands or poly-v belts.

The conveyor beds shown have a maximum depth channel of 4.5" or 7" with a 2" flange to provide plenty of room for any hardware or wiring that needs to be run. All of the curves are based on true taper rollers for all widths.

Since every motorized roller can be individually controlled, every segment of the system becomes a potential zero-pressure zone. This includes curves and transfers.

FEATURES / BENEFITS

MDR eliminates the modularity restrictions of conventional conveyors. Each individual bed can have its own drive and controls. The following is a list of built-in features and their benefits.

Features	Benefits
Modular design	Easy to reconfigure
Run on demand	Less noise, wear and energy
Non-contact zero-pressure	Product protection
Compact low profile	Multi-level usage
Reversible	Less hardware required
No scheduled maintenance	Lower operating cost
Low voltage	Safety and lower cost
Simple installation	Lower cost
Soft start and stop	Low G-forces
Variable speed	Versatility to suit each requirement
Choice of control level	Meet needs and budgets
Few moving parts	Reduced maintenance cost and less noise

ENERGY SAVINGS

Stealth Zone™ conveyors can run on demand, which can provide substantial savings in power consumption costs over that of a traditional roller conveyor with AC power.

APPLICATION

Case Conveyor

The application of Stealth Zone™ case conveyors can be utilized in three key areas: transportation, standard accumulation and belted accumulation. The following beds may be configured into a customized conveying system with almost any level of control sophistication. In addition to straight bed sections for transportation or zoned accumulation, MHT offers curves in 30, 45, 60 and 90 degrees, spurs in 30 or 45 degrees, various arrangements of UBT transfers, gates, and minimum radius curve. There are many options, especially in controls, but also including roller centers, roller coatings, etc.

- For applications where zone integrity is required, the maximum speed for accumulation should be limited to 180 FPM. When accumulating at speeds greater than 180 FPM some cartons and totes may coast into the charge end of the downstream zone. This speed also becomes an issue with small, heavy products which may coast beyond the photoeye entirely.
- For application where small products or polybags are conveyed, refer to the belted Stealth Zone™ conveyors.

Pallet Convey

The application of Stealth Zone™ pallet conveyors can be utilized in two key areas: transportation and standard accumulation. The following beds may be configured into a customized conveying system with almost any level of control sophistication with loads up to 2,500 lbs. In addition to straight bed sections for transportation or zoned accumulation, MHT offers right-angle transfers that may utilize a drag chain that is powered by an AC motor.

SINGULATION RELEASE VS 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.

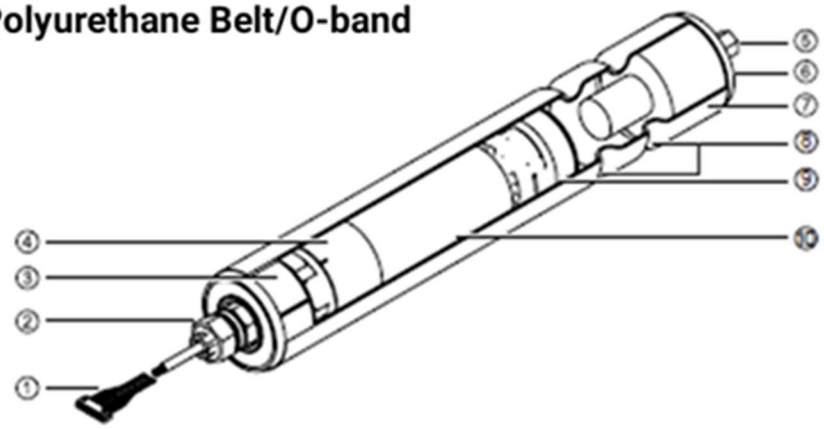
MOTORIZED DRIVEN ROLLERS

Case Conveyor

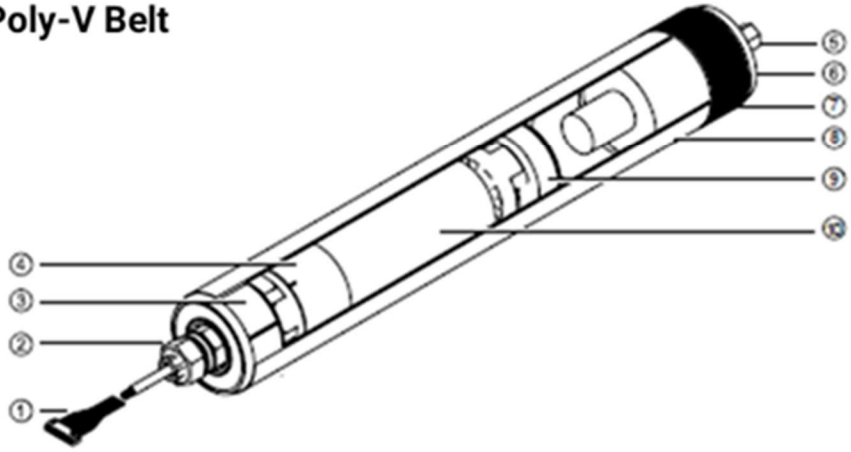
Each zone of the powered roller conveyors is driven by a 24 VDC powered roller. The motor is contained inside the 1.9" diameter roller which turns the roller.

The Roller drive is a completely self-contained electronically powered roller. The internal 24 VDC motor drives the roller and guarantees a constant speed over a wide load range and a constant torque over most of the selectable speed settings.

Polyurethane Belt/O-band



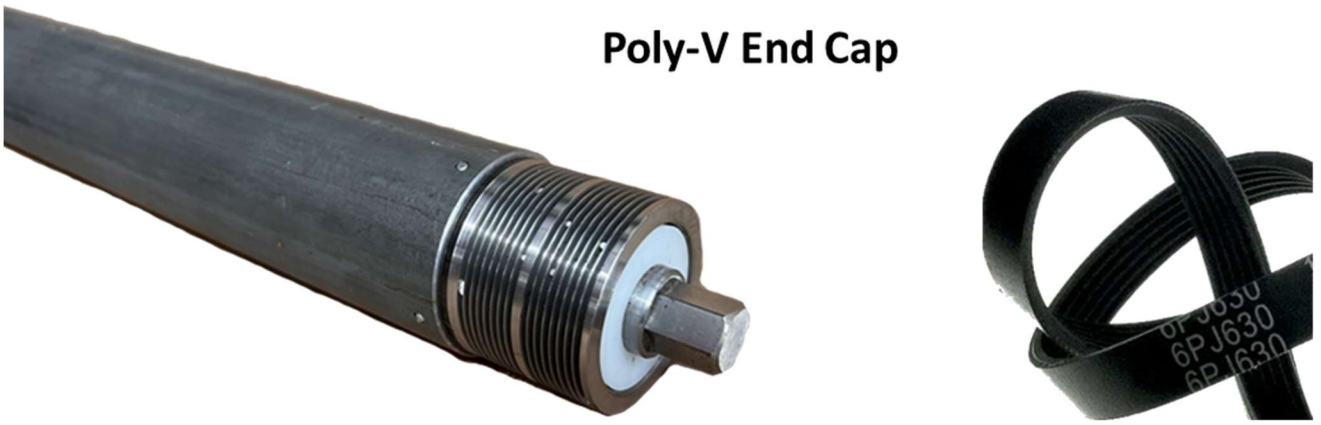
Poly-V Belt



Pallet Conveyor

Each zone of the powered roller conveyors is driven by a 24 VDC powered roller. The motor is contained inside the 2.5" diameter roller which turns the roller.

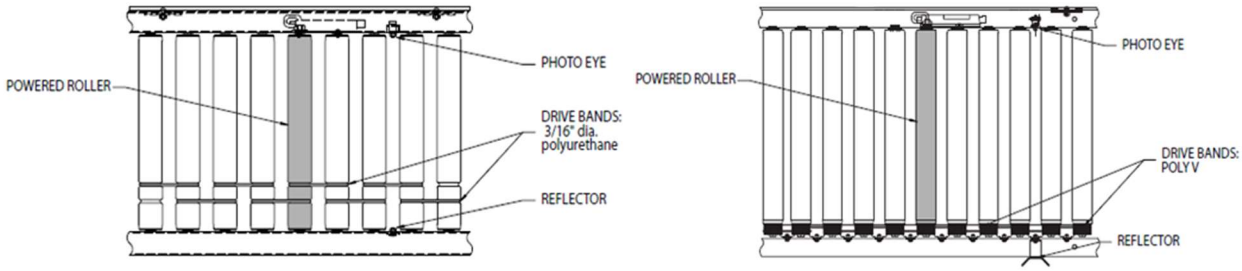
The Roller drive is a completely self-contained electronically powered roller. The internal 24 VDC motor drives the roller and guarantees a constant speed over a wide load range and a constant torque over most of the selectable speed settings. There are a couple of roller-to-roller options; chain or poly-V belt that provide the driving force within a zone (as shown below).



DRIVE BANDS OR BELTS

Case Conveyor

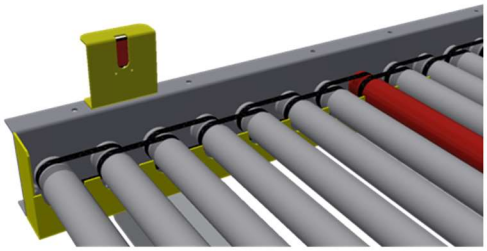
The rollers in each zone of the powered roller conveyors are connected with 3/16" Polyurethane drive belts or with either a 2 or 3-rib Poly-V belt. These accumulation zones are controlled with a photo eye.



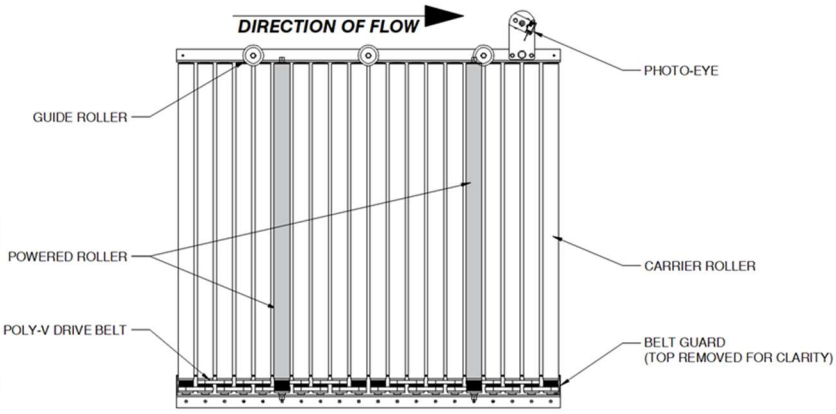
Pallet Conveyor

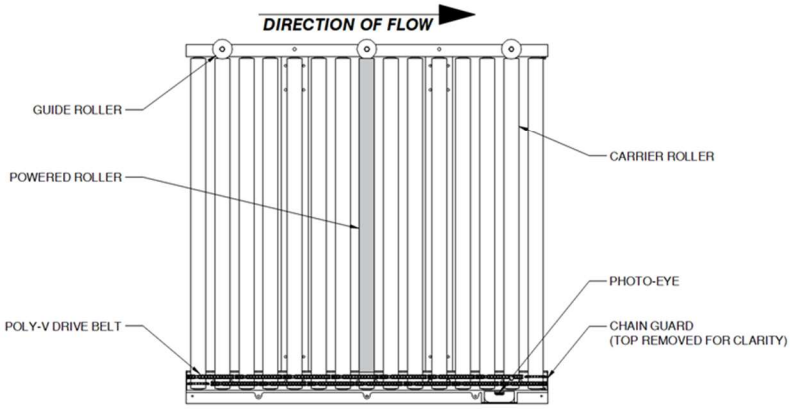
The rollers in each zone of the powered roller conveyors are connected with either 40-chain or with a 6-rib Poly-V belt. These accumulation zones are controlled with a photo eye.

Poly-V Belt Driven

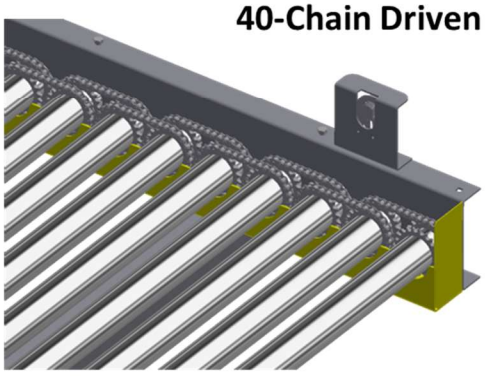


NOTE: *Upper guards removed for clarity.*





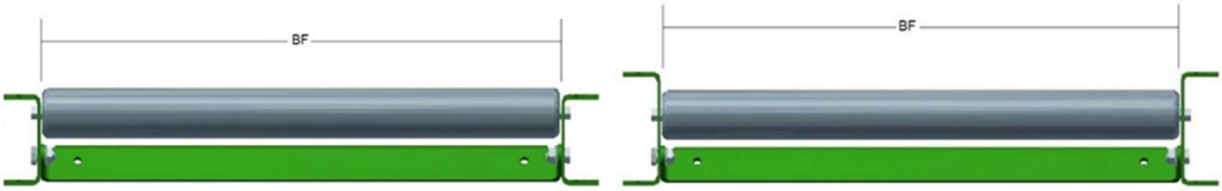
40-Chain Driven



ROLLER SET IDENTIFICATION

MDR conveyor is constructed typically in two styles which require consideration for conveyer width:

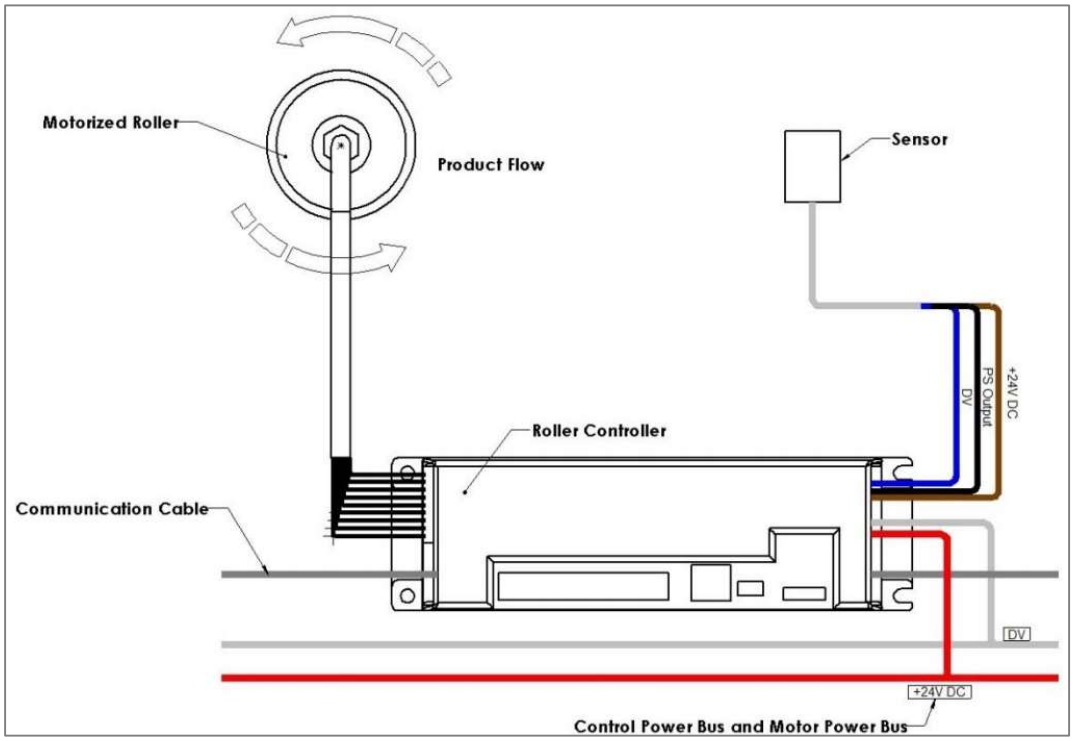
- **High-In-Frame (HIF)**: HIF designs position the rollers above the top of the frame. Where required, external guard rail can be added. In some systems this can effectively increase conveyor width instead of going to the larger roller set low conveyor. In some areas, HIF rollers are used to allow loads to be pushed onto or taken off the conveyor (i.e. spurs and transfers) without lifting it over the integral guard rail.
- **Low-In-Frame (LIF)**: LIF refers to the position of the rollers within the frame. In this case, the rollers are set low in the frame, allowing for the part of the frame that extends above the rollers to serve as an integral guard rail. However, load size is limited by the distance between the frames.



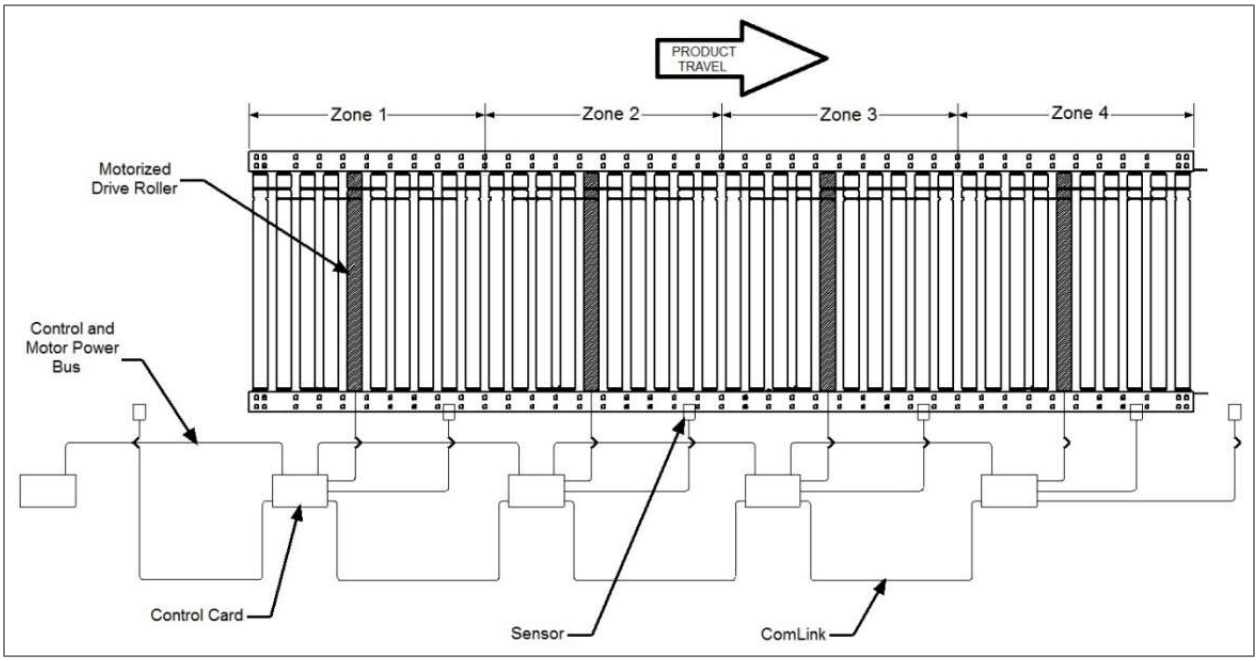
Roller Set High

Roller Set Low

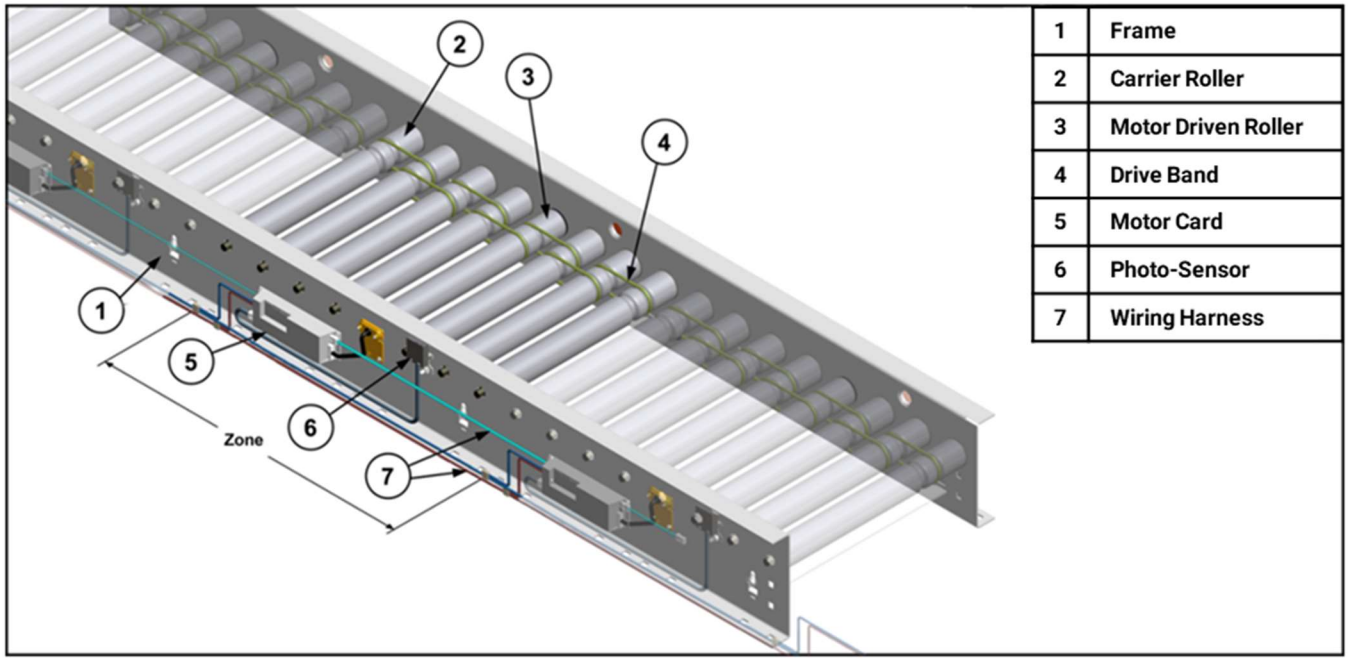
EXAMPLE OF MDR CONFIGURATION



TYPICAL SECTION SCHEMATIC



TYPICAL SECTION SCHEMATIC



1	Frame
2	Carrier Roller
3	Motor Driven Roller
4	Drive Band
5	Motor Card
6	Photo-Sensor
7	Wiring Harness

TEMPERATURE RANGE (AMBIENT)

+35° to +100°F. For applications outside this temperature range, please consult Applications Engineering.

ULTRAVIOLET RAYS

Avoid exposure of polyurethane O-rings to sunlight.

OILY OR WET CONDITIONS

Will impair frictional drive characteristics.

CORROSIVE OR ABRASIVE SUBSTANCES

Will adversely affect various components.

CLEANING O-RINGS

Manufacture suggested for cleaning O-rings is to use a cloth with a de-natured alcohol when cleaning the O-ring. This cleaning product would also work for cleaning the rollers.

NOTE: *Do not immerse the O-rings or any other components in a container of this cleaner.*

2 Safety Overview

This manual was prepared as a "how-to-guide" for installers, end-users and maintenance personnel. It is also intended to educate both owner (purchaser) and all individuals working around the unit, of potential hazards.

To ensure this quality product is safely and correctly utilized, all instructions within this manual must be read and understood prior to equipment start-up. Be aware of all safety labels on machinery. If you do not understand any of the safety instructions or feel there may be safety labels missing, contact your supervisor or product supplier immediately!

Failure to follow even the most basic safety suggestions can result in serious personal injury.

2.1. Compliance with Safety Standards

Compliance with safety standards, including federal, state and local codes or regulations is the responsibility of the conveyor purchaser(s). Placement of guards, safety labels and other safety equipment is dependent upon the area and use to which the system is applied. A safety study should be made of the conveyor application by the purchaser(s). It is the purchaser's responsibility to provide any additional guards, safety labels or other safety equipment deemed necessary based on this safety study.

Any violation of the following safety instructions hereby removes all product liability claims from Material Handling Technologies, Inc.

The information contained in this safety manual is correct at the time of printing. Due to the continuing development of product lines, changes in specifications are inevitable. The company reserves the right to implement such changes without prior notice.

2.2. Conveyor Safety Rules

Certain safety information in this document was reprinted from ASME B20.1-2000 by permission of The American Society of Mechanical Engineers. All rights reserved. Inspect equipment for safety labels.

- Maintain an orderly environment in the vicinity of the conveyor at all times. Clean up spilled materials or lubricants immediately.
- All personnel shall be instructed regarding the necessity for continuous care and attention to safety during the operation of a conveyor. They must be trained to identify and immediately report all unsafe conditions or practices relating to the conveyor and its operation.
- Know the location and function of all start/stop devices and keep those devices free from obstruction.
- Allow only trained and authorized personnel to maintain or repair conveyor equipment.
- Keep jewelry, clothing, hair, etc., away from the conveyor.
- **DO NOT** touch moving conveyor parts.
- **DO NOT** walk, ride or climb on the conveyor.
- **DO NOT** operate the conveyor with chain guards or other protective guards removed.
- **DO NOT** attempt to clear product jams while the conveyor is running.
- **DO NOT** load the conveyor beyond specified design limits.
- **DO NOT** attempt to make repairs to the conveyor while it is running.
- **DO NOT** modify equipment without checking with the manufacturer.
- **DO NOT** operate or perform maintenance on equipment when taking any type of drug or sedative, when under the influence of alcohol, or over-fatigued.
- **DO NOT** perform maintenance until electrical disconnect has been turned off! Know your company's machine specific **Lockout / Tagout procedure**.
- **Replace all safety devices, guards and guarding prior to equipment start-up.**
- Clear all personnel from the equipment before starting the conveyor.

2.3. Installation Safety

LOADING / UNLOADING

- Have trained personnel load or unload equipment. The conveyor must be properly handled when transferring from the unloading area to final site location to prevent damage.

GUARDS / GUARDING

- Interfacing of Equipment. When two or more pieces of equipment are interfaced, special attention shall be given to the interfaced area to ensure the presence of adequate guarding and safety devices.

- Guarding Exceptions. Wherever conditions prevail that would require guarding under this standard but such guarding would render the conveyor unusable, seek guidance from your safety professional.

ANCHORING

- **DO NOT** operate conveyor unless it is properly anchored. Serious injury or death may result.

2.4. Electrical Safety

ELECTRICAL CODE

- All electrical installations and wiring shall conform to federal, state and local codes.

- When conveyor operation is not required for a maintenance procedure, **electrical power must be turned off and locked / tagged out following your company's machine specific procedure**.

CONTROL STATION

- Control stations should be so arranged and located that the operation of the affected equipment is visible from them. Control stations shall be clearly marked or labeled to indicate the function controlled.

- A conveyor that would cause injury when started shall not be started until personnel in the area are alerted by a signal or by a designated person that the conveyor is about to start.

- Where system function would be seriously hindered or adversely affected by the required time delay, or where the intent of the warning may be misinterpreted (i.e., a work area with many different conveyors and allied devices), a clear, concise and legible warning sign needs to be provided. The warning sign shall indicate that conveyors and allied equipment may be started

at any time, that danger exists and that personnel must keep clear. These warning signs shall be provided along the conveyor at areas not guarded by position or location.

- Remotely and automatically controlled conveyors, and conveyors where operator stations are not manned or are beyond voice or visual contact from drive areas, loading areas, transfer points and other potentially hazardous locations on the conveyor path not guarded by location, position or guards shall be furnished with emergency stop buttons, pull cords, limit switches or similar emergency stop devices.

- All such emergency stop devices shall be easily identifiable in the immediate vicinity of such locations unless guarded by location, position or guards. Where the design, function and operation of such conveyor clearly is not hazardous to personnel, an emergency stop device is not required.

- The emergency stop device shall act directly on the control of the conveyor concerned and shall not depend on the stopping of any other equipment. The emergency stop devices shall be installed so that they cannot be overridden from other locations.

- Inactive and unused actuators, controllers and wiring should be removed from control stations and panel board, together with obsolete diagrams, indicators, control labels and other material that might confuse the operator.

SAFETY DEVICES

- All safety devices, including wiring of electrical safety devices, shall be arranged to operate such that a power failure or failure of the device itself will not result in a hazardous condition.

EMERGENCY STOPS AND RESTARTS

- Conveyor controls shall be so arranged that, in case of emergency stop, manual reset or start at the location where the emergency stop was initiated shall be required for the conveyor(s) and associated equipment to resume operation.

- Before restarting a conveyor that has been stopped because of an emergency, an inspection of the conveyor shall be made and the cause of the stoppage determined. The starting device and electrical power must be turned off and locked / tagged out according to your company's machine specific procedure before any attempt is made to remove the cause of the stoppage, unless operation is necessary to determine the cause or to safely remove the stoppage.

SAFETY WARNING

- ***Replace all safety devices, guards and guarding prior to equipment start-up.***

2.5. Operational Safety

- Only trained, qualified personnel shall be permitted to operate a conveyor. Training shall include instruction in operation under normal conditions and emergency situations.
- Where safety is dependent upon stopping / starting devices, they shall be kept free of obstructions to permit access.
- The area around loading and unloading points shall be kept clear of obstructions that could endanger personnel.
- Do not ride the load-carrying element of a conveyor under any circumstances, unless the conveyor is designed and equipped with safety and control devices intended to carry personnel. For no reason shall a person ride any element of a vertical conveyor. Warning labels reading "**DO NOT RIDE CONVEYOR**" shall be affixed by the owner of the conveyor.

- Personnel working on or near a conveyor shall be instructed as to the location and operation of pertinent stopping devices.
- A conveyor shall be used to transport only a load that it is designed to handle safely.
- Under no circumstances shall the safety characteristics of the conveyor be altered.
- Routine inspections and preventative and corrective maintenance programs shall be conducted to ensure that all safety features and guards are retained and function properly. Inspect equipment for safety labels. Make sure personnel are aware of and follow safety label instructions.
- Alert all personnel to the potential hazard of entanglement in conveyors caused by items such as long hair, loose clothing and jewelry.

SAFETY WARNING

- ***Replace all safety devices, guards and guarding prior to equipment start-up.***

2.6. Maintenance & Service Safety

MAINTENANCE (REPAIR)

Maintenance and service shall be performed by trained, qualified personnel only.

Where lack of maintenance and service would cause a hazardous condition, the user shall establish a maintenance program to ensure that conveyor components are maintained in a condition that does not constitute a hazard to personnel.

No maintenance or service shall be performed when a conveyor is in operation. See “Lubrication” and “Adjustment or Maintenance During Operation” for exceptions.

When a conveyor is stopped for maintenance or service, the starting devices, prime mover, powered accessories or electrical must be locked / tagged out in accordance with a formalized procedure designed to protect all persons or groups involved with the conveyor against an unexpected restart. Personnel should be alerted to the hazard of stored energy, which may exist after the power source is locked out. All safety devices and guards shall be replaced before starting equipment for normal operation.

ADJUSTMENT OR MAINTENANCE DURING OPERATION

When adjustments or maintenance must be done while equipment is in operation, only trained, qualified personnel who are aware of the hazards of the conveyor in motion shall be allowed to make adjustments, perform maintenance or service.

Conveyors shall **NOT** be maintained or serviced while in operation unless proper maintenance or service requires the conveyor to be in motion. If conveyor operation is required, personnel shall be made aware of the hazards and how the task may be safely accomplished.

LUBRICATION

Conveyors shall **NOT** be lubricated while in operation unless it is impractical to shut them down for lubrication. Only trained and qualified personnel who are aware of the hazards of the conveyor in motion shall be allowed to lubricate a conveyor that is operating.

Where the drip of lubricants or process liquids on the floor constitutes a hazard, drip pans or other means of eliminating the hazard must be provided by purchaser(s).

MAINTENANCE OF GUARDS AND SAFETY DEVICES

Guards and safety devices shall be maintained in a serviceable and operational condition. Warning signs are the responsibility of the owner of the conveyor and must be maintained in a legible / operational condition.

INSPECTIONS

- Routine inspections with preventative and /or corrective maintenance programs shall be conducted to ensure that all safety features and devices are maintained and function properly.
- All personnel shall inspect for hazardous conditions at all times. Remove sharp edges or protruding objects. Repair or replace worn or damaged parts immediately.

CLEANING

- Where light cleaning and/or casing cleaning are required, they shall be performed by trained personnel. The conveyor electrical power must be turned off and locked / tagged out following your company's machine specific procedures. Special attention may be required at feed and discharge points.

SAFETY WARNING

- ***Replace all safety devices, guards and guarding prior to equipment start-up.***

3 Receiving and Inspection

SHORTAGES, DAMAGES AND RETURN AUTHORIZATIONS

Before uncrating, check the quantity of items received against bill of lading to confirm that all material has been received. Examine the condition of the equipment to determine if any damage has occurred.

Also, it is possible that some items may become separated from the original shipment. Therefore, when receiving goods, it is imperative that the bill of lading (or, accompanying freight documentation) be checked to ensure receipt of ALL units ordered including ALL accessories.

Damage and/or shortage in shipment should be reported immediately to both vendor and carrier. Obtain a signed damage report from carrier agent and send copy to vendor. **Do not repair any damage before obtaining this report.**

For damaged shipments, consult factory to determine if entire shipment must be returned to factory for repair or if an immediate order should enter production to produce a new, replacement shipment.

NOTE: *Do not return goods to factory without prior, written return authorization. Unauthorized returns are subject to refusal at factory.*

UNCRATING

After receipt and initial inspection is completed, carefully remove crating and look for essential components and specific accessories that may have been boxed and attached (or 'banded') to crating material. Guard rails and hardware are often packaged and shipped in this manner. Save all hardware for subsequent use by installation personnel.

The drive section will be shipped mounted to its actual operating bed section.

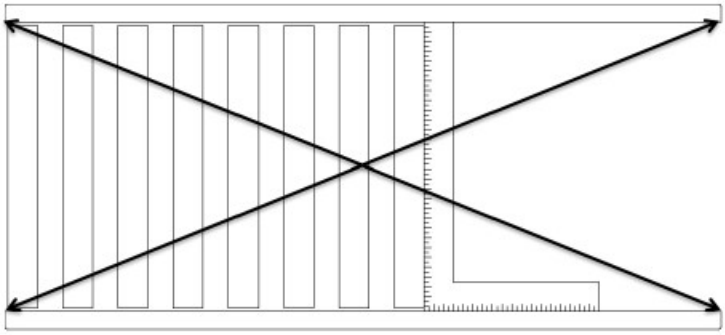
Some items (electric motors, gearbox, etc.) may be shipped direct from their manufacturer to final destination. Thus, the conveyor may consist of two or more separate shipments.

NOTE: *Carefully examine shipment during uncrating to ensure that essential components are not discarded. This includes guard rail and other necessary hardware.*

4 Installation

4.1. Checking Unit Squareness

Frame squareness can be checked by using a simple right-angle square as shown or by measuring from the same points diagonally, corner to corner.

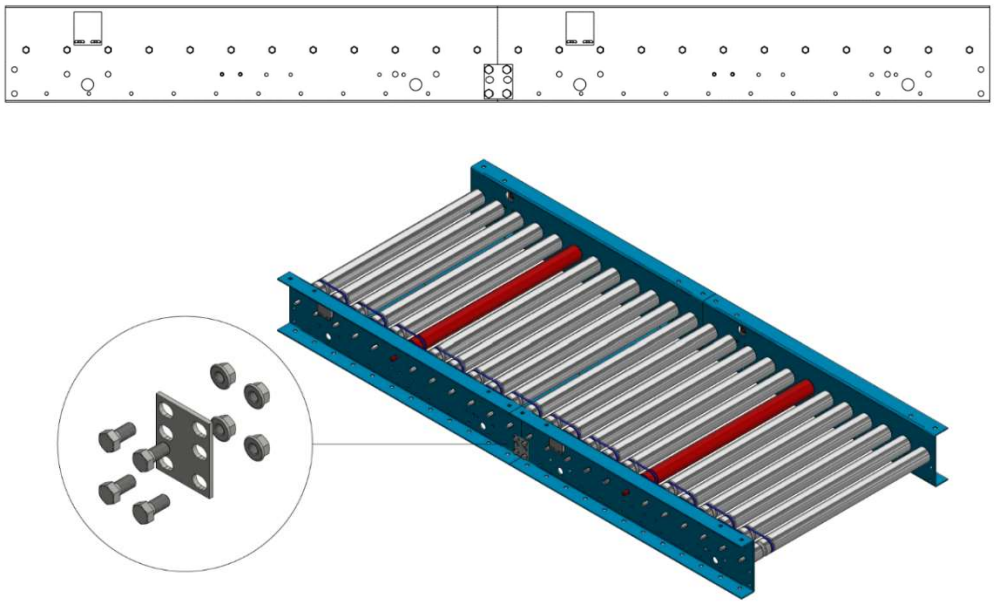


NOTE: *Make sure frames are square (as shown) or products will skew and tumble from the conveyor. Failure to square frames may also cause premature conveyor wear and failure.*

4.2. Coupling / Attaching Bed Sections

Prior to coupling the conveyor sections, make sure that the drive cards are all on the same side of each conveyor.

Couple the sections using the splice plate and bolts provided per the drawing below.

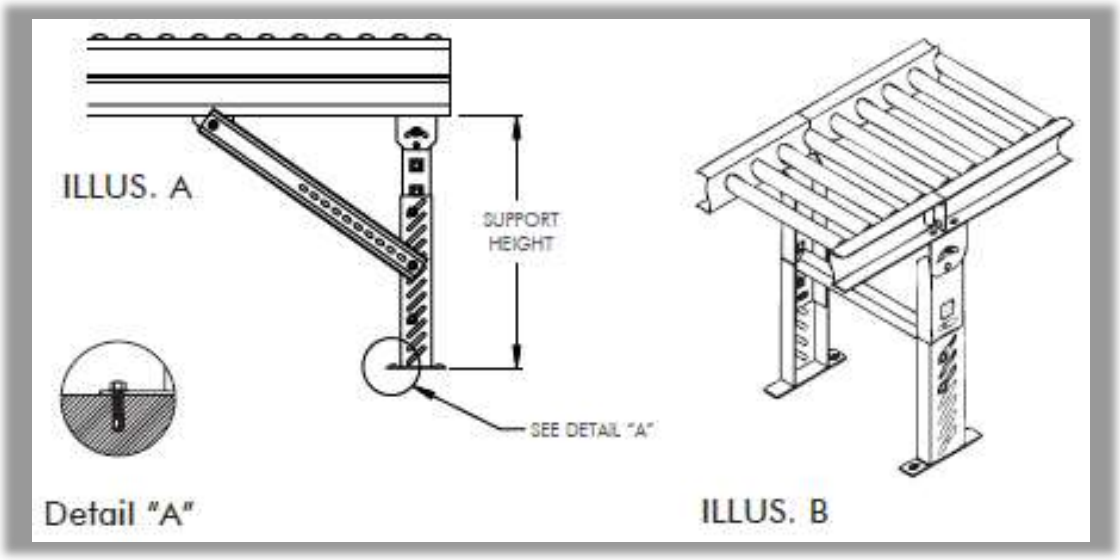


NOTE: *For ease of installation, mount legs on each conveyor section prior to coupling.*

4.3. Leg Supports and Installation

PERMANENT INSTALLATION OF LEGS

Permanent supports may be installed on conveyors at various locations. However, it is most common to use single tier permanent floor supports at each end of a powered section (see illustration A below) and where intermediate bed sections are adjoined (see illustration B below). Notice intermediate supports have two lag bolts in a diagonal pattern while end (terminal) supports have four lag bolts, one in each of the four, foot plate mounting holes.



When two (or more) powered conveyors are placed end-to-end, a single tier permanent support may be used at the end junction commonly supporting both units. Check load rating of support before using this method of installation.

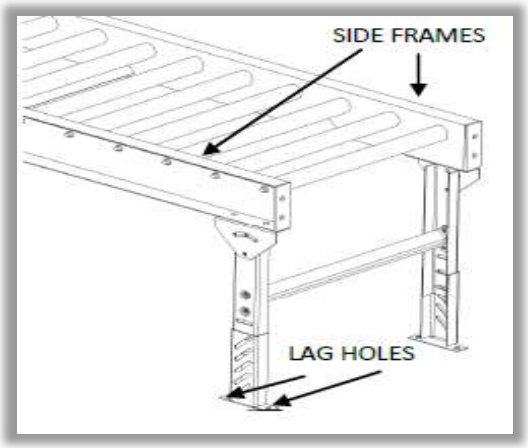
Adjust elevation to top of conveyor by loosening bolts in support uprights, raising or lowering conveyor and fully tightening bolts at desired elevation. Tighten all bolts in supports before unit operation. Complete support installation by lagging support attachment plates to floor. Confirm that unit is level across width of conveyor before completing final support height adj.

*MINIMUM / MAXIMUM SUPPORT HEIGHT			
SM-1	7-1/4" – 10-1/4"	**SM-7**	34-1/4" – 46-1/4"
SM-2	10-1/4" – 13-1/4"	**SM-8**	46-1/4" – 58-1/4"
SM-3	13-1/4" – 16-1/4"	**SM-9**	58-1/4" – 70-1/4"
SM-4	16-1/4" – 22-1/4"	**SM-10**	70-1/4" – 82-1/4"
SM-5	20-1/4" – 26-1/4"	**SM-11**	80-1/4" – 92-1/4"
SM-6	24-1/4" – 36-1/4"	**SM-12**	92-1/4" – 104-1/4"

Supports are normally shipped at minimum support height. See chart above.

LEG ADJUSTMENT: BOLT-TOGETHER LEGS

1) The conveyor electrical power must be turned off and locked / tagged out following your company's machine specific procedures.
2) Remove all load from the conveyor.
3) Position conveyor in the location to be installed.
4) Support conveyor section with jack, hoist or forklift.
5) Carefully loosen the fasteners within the slots.
6) Lift or lower conveyor until it is at the desired height.
7) Ensure that the conveyor is completely level. (reference leveling note below)
8) Tighten fasteners using torque appropriate for each fastener's size and grade. (grade 5 fasteners provided)



Secure leg supports to the floor utilizing the lag holes in the adjustable leg boot.

NOTE: *Only qualified installation professionals should level and install conveyor.*

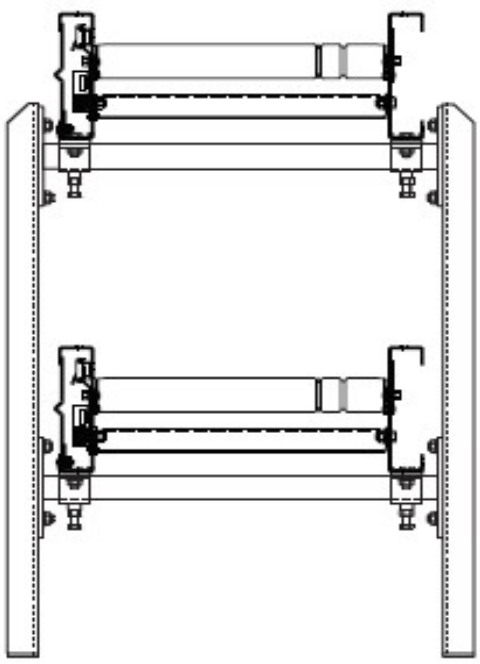
NOTE: *Make sure the conveyor is level by placing a level on the conveyor side frames. If the conveyor is not level, adjust the legs appropriately as shown below.*

4.4. Poly-tier Supports

Poly-tier supports provide convenient installation method for two or more tiers of conveyor. To install, raise conveyor to desired elevation (approximate). Place 1" inside diameter cross pipe underneath lower conveyor flange. Attach cross pipe to upright legs. Use U-shaped retainer ("hat") bracket with coupling plate to connect cross pipe to conveyor flange. Do not tighten fully at this time.

Standard elevation style attachment brackets offer unit elevation of 3-1/2" + frame and includes bracket welded to cross pipe which is bolted to upright legs during installation.

When unit is at operating elevation and unit has been checked across width for level, tighten locking bolts in U-shaped bracket. Add knee braces for unit rigidity.



POLY-TIER SUPPORT CHANNEL HEIGHT					
PSM-1	23"	**PSM-6**	53"	**PSM-11**	83"
PSM-2	29"	**PSM-7**	59"	**PSM-12**	89"
PSM-3	35"	**PSM-8**	65"	**PSM-13**	95"

PSM-4	41"	**PSM-9**	71"	**PSM-14**	101"
PSM-5	47"	**PSM-10**	77"	**PSM-15**	107"

NOTE: *Make sure that the conveyor is stable prior to multi-tier assembly. Use of a forklift or crane may be required to ensure safe handling. Only experienced installation professionals should install conveyor.*

NOTE: *To install, raise conveyor to desired elevation, place cross pipe underneath frame, attach cross pipe to upright legs and use U-shaped retainer ("hat") bracket to connect cross pipe to lower conveyor flange.*

4.5. Knee Braces, Casters and Ceiling Hangers

INSTALLING KNEE BRACES

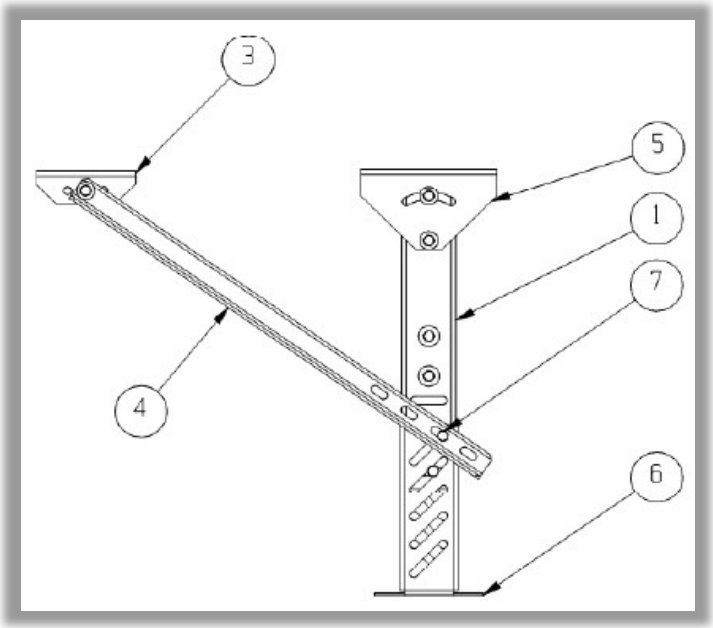
Knee braces add strength to permanent supports and stability to units in portable applications. Install knee brace (when supplied) after final permanent support installation and elevation adjustment. Its pivot bracket is bolted to underneath side of lower conveyor flange and slotted end is attached to outer side of support.

STEP 1 – After leg supports are set in place, attach brace bracket.

STEP 2 - Attach knee brace angle to the leg support and brace bracket.

(Knee brace angle may need to be cut, drilled and trimmed for proper fit and to eliminate interference with adjacent equipment)

DETAIL	DESCRIPTION
1	UPRIGHT
2	SPREADER
3	BRACE BRACKET
4	KNEE BRACE ANGLE
5	PIVOT BRACKET
6	FOOT
7	HEX HEAD CAP SCREW

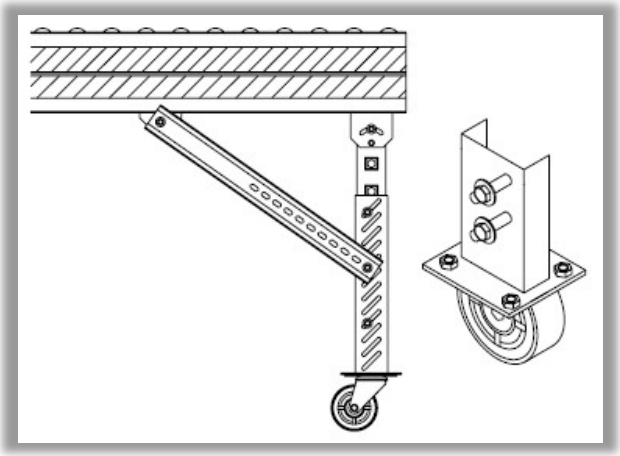


NOTE: *Knee braces are recommended when the conveyor height exceeds 36" and/or when additional stability is needed.*

INSTALLING CASTERS

Casters (when supplied) are generally installed at the factory. However, when receiving casters direct from their supplier, final attachment to support is necessary. A special slotted pre-punched caster attachment plate is supplied on supports designed for casters.

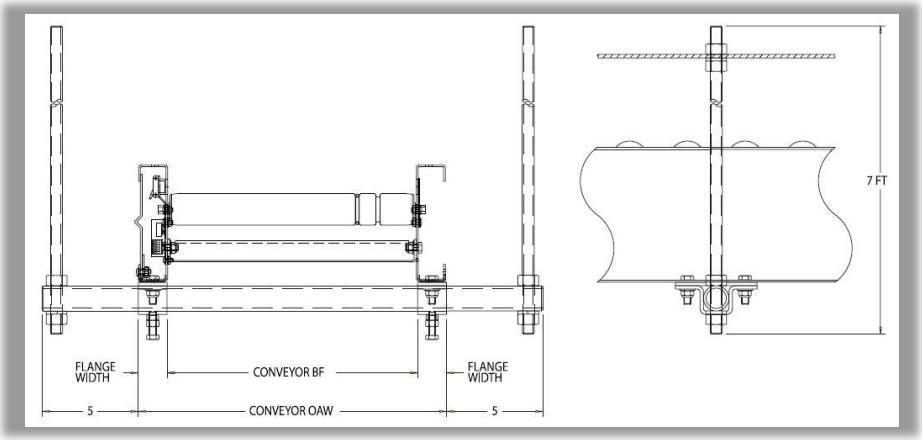
A standard support is not designed for attachment to casters. Field modification or replacement of outside support assemblies is required.



NOTE: *Leg supports with casters follow similar installation instructions as standard leg supports and knee braces.*

NOTE: *Once in position, casters should be locked until conveyor needs to be moved again.*

INSTALLING CEILING HANGERS



Ceiling hangers are frequently used in high-elevation applications for suspension from ceiling. The 5/8” diameter (#11 UNC) all threaded rod is supplied to allow infinite vertical adjustment along the length of the suspension rod (see illustration above).

Attach and firmly tighten U-shaped retainer (“hat”) bracket with coupling plate to underneath side of frame with hardware provided to hold cross pipe (1” inside diameter) against underneath side of conveyor.

Do not tighten cross pipe locking bolts (these attach in the bottom of the U-shaped retainer bracket) until threaded suspension rods have been firmly secured to ceiling structure.

To adjust conveyor elevation, tighten or loosen lower nut and jam nut on threaded suspension rods to desired elevation. A lock washer must be used on suspension rods to maintain unit at desired elevation.

When unit is at operating elevation and unit has been levelled across bed width, tighten locking bolts in U-shaped bracket to secure position of cross pipe.

NOTE: *When installing ceiling hangers, refer to local building codes to ensure that materials comply. Only experienced material handling installers should attempt to install conveyors.*

4.6. Power and Control

A typical MHT system uses rollers containing a 24 VDC brushless motor. This roller is connected to slaved rollers with urethane belts. Each motorized roller includes a driver card which provides a means to adjust the roller speed and direction. Photoeyes are used to detect product and provide run-on-demand and accumulation control.

Unlike a typical conveyor installation, where 460 VAC is delivered to widely distributed AC motors. MHT applications require 24 VDC with relatively high current requirements for each conveyor section. A typical 10' bed with 30" zones will require 4 motorized rollers, each demanding about 2.2 amps at 24 VDC.

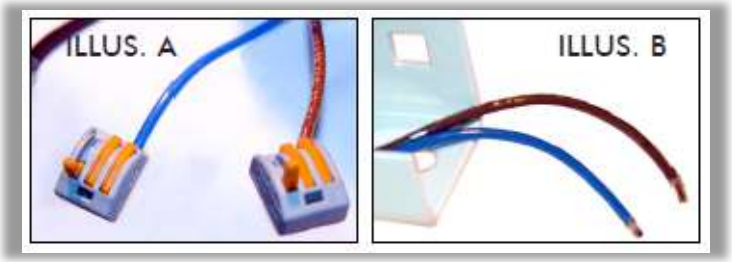
MHT can provide 24 VDC power supplies, with 10 up to 160 amps of output current available. These power supplies should be mounted as near to the conveyor as possible. These supplies require either 120 or 240 VAC single-phase or 480 VAC three-phase to be hard-wired to them, and the DC power side wired to the drive rollers. Wiring for the 24 VDC power along the length of the conveyor is provided by MHT.

REMOTE POWER SUPPLIES

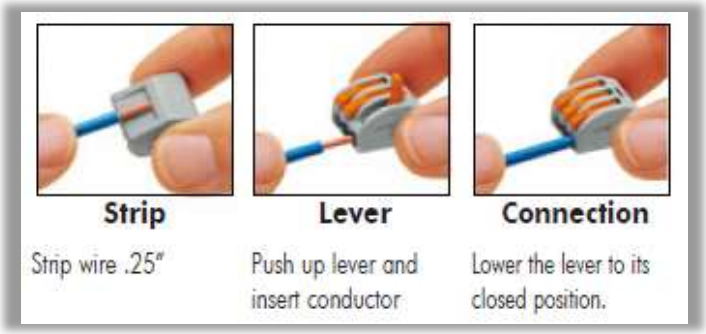
Remote power supply panels (RPP) are utilized throughout a typical MDR installation. MHT can provide 24 VDC power supplies, with 10 up to 160 amps of output current available. These remote power supplies should be mounted as near to the conveyor as possible. These supplies require either 120 or 240 VAC single-phase or 480 VAC three-phase to be hard-wired to them, and the DC power side wired to the drive rollers. Wiring for the 24 VDC power along the length of the conveyor is provided by MHT (refer to Connecting Bed Sections below for details).

CONNECTING BED SECTIONS

To connect bed sections, locate the WAGO connectors shown in illustration A and the coordinating wires on the next bed section shown in illustration B.



Match wire colors and connect as demonstrated below.



CONTROL METHODS

There are typically two types of Controls utilized with Stealth Zone conveyors. The first being the simplest and often least costly solution uses powered roller control modules that have built-in zone-to-zone communications. When connected to photoeye, this solution provides run-on-demand, zero-pressure accumulation control. The lead zone can be controlled to force accumulation, or released for transportation. This solution operates with no external control, providing for a system that is truly stand-alone.

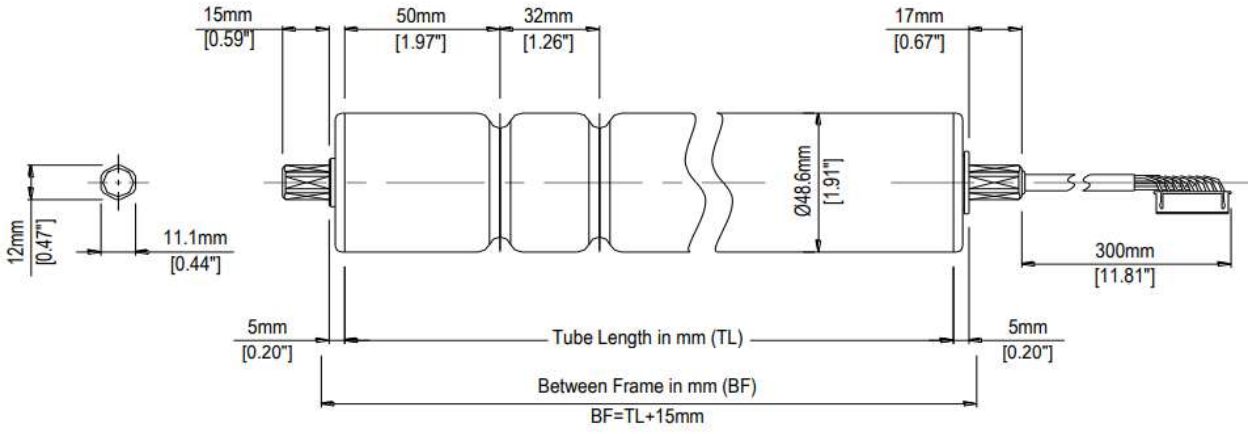
The use of a distributed I/O bus network provides a way to connect the conveyor sections to a central control processor. This is a good solution where more complex controls requirements need to be satisfied. MHT provides Ethernet I/P or other such bus systems as required. Remote control of conveyor direction and speed as well as system diagnostics can be provided for with a bus network. The controller platform can be either PLC-based or PC-based.

SUPPLIER REFERENCE DOCUMENTATION

MHT provides a wide array of MDR conveyors and utilizes different suppliers and their products to meet the individual customers' needs. Below are products by equipment type that are commonly used when manufacturing conveyors and the appropriate user reference manuals have been provided along with this technical handbook for cross referencing.

4.7. 24VDC Motor Driven Rollers

ITOH DENKI® - MODEL: PM486FE (1.91" DIAMETER):



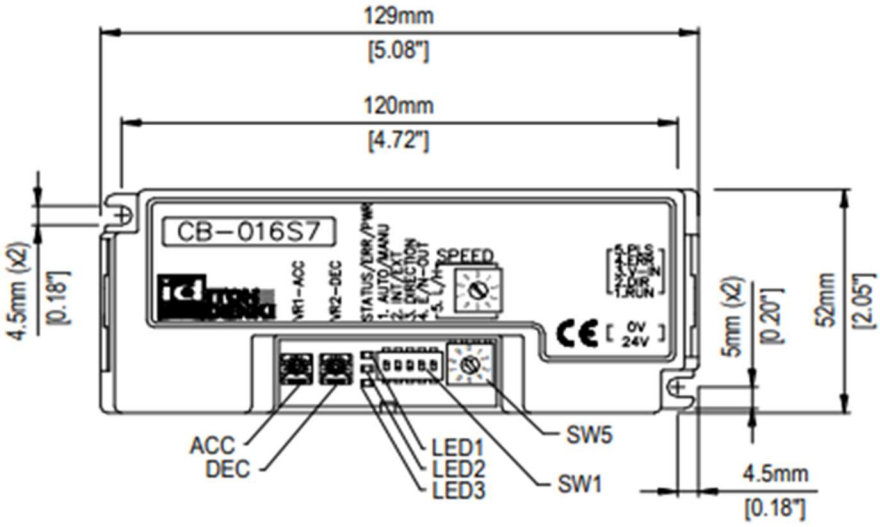
Standard Hex Shafts with Grooved Tube

NOTE: *For technical specifications or specific troubleshooting of the PM486FE powered roller, please refer to the* ***Itoh Denki PM486FE Instructional Manual*** *provided.*

4.8. 24VDC Motor Driver Cards

ITOH DENKI® - MODEL: CB-016S7 (DISCREET TRANSPORTATION CARD):

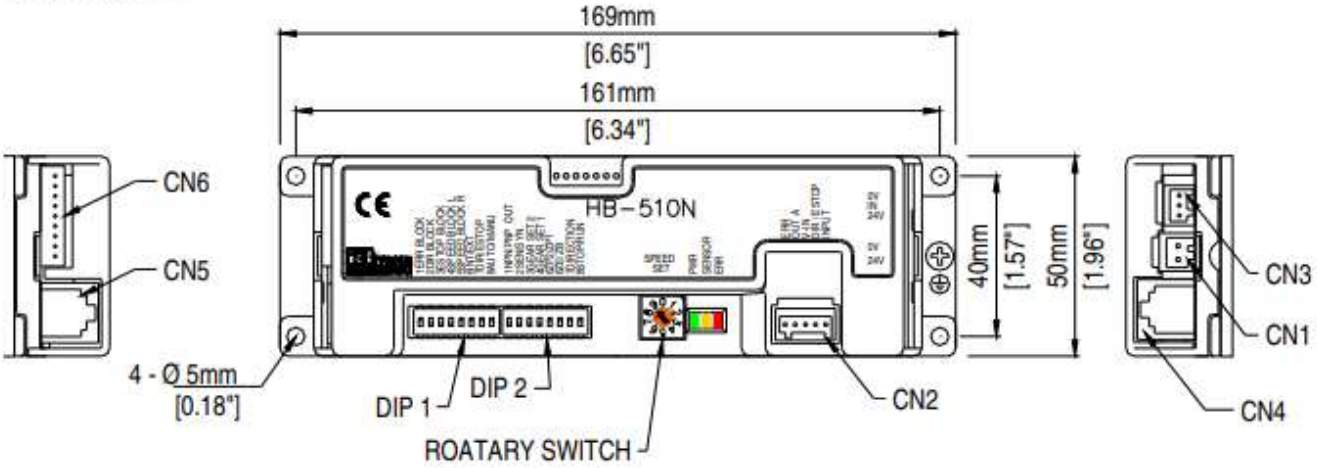
Dimensions



NOTE: *For technical specifications or specific troubleshooting of the CB-016S7 card, please refer to the* ***Itoh Denki CB-016 Technical Manual*** *provided.*

ITOH DENKI® - MODEL: HB-510N (ZPA LOGIC HYBRID CARD):

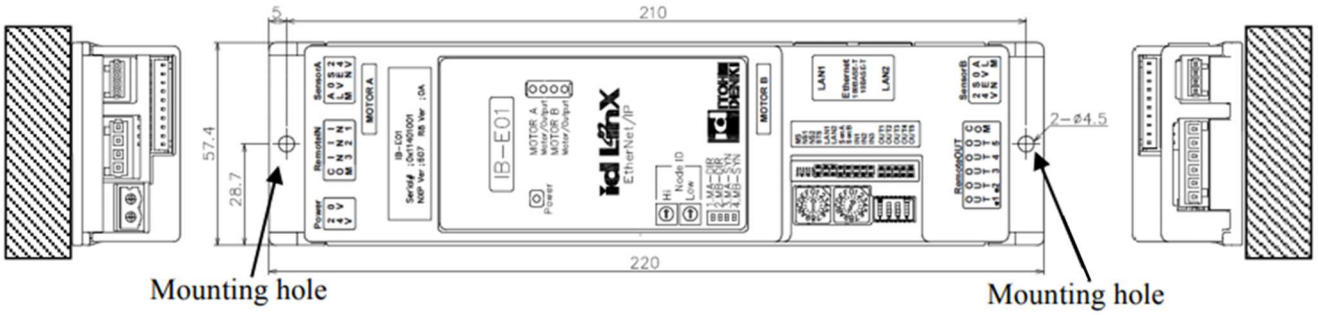
Dimensions



NOTE: *For technical specifications or specific troubleshooting of the HB-510N card, please refer to the* ***Itoh Denki HB-510 Technical Manual*** *provided.*

ITOH DENKI® - MODEL: IB-E03B (PROGRAMMABLE, NETWORK-READY):

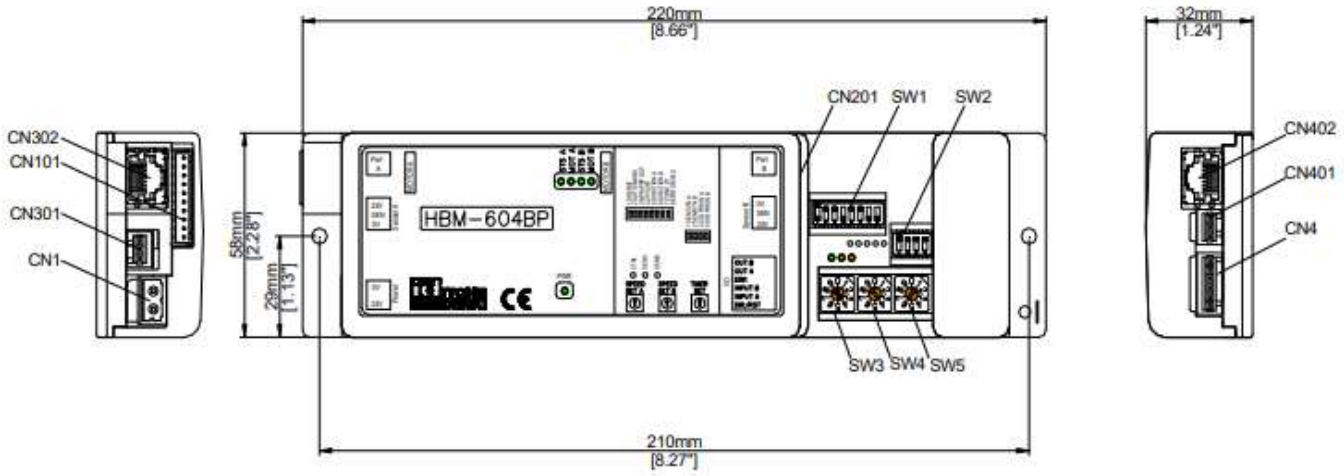
Dimensions



NOTE: *For technical specifications or specific troubleshooting of the IB-E03B card, please refer to the* ***Itoh Denki IB-E Technical Manual*** *provided.*

ITOH DENKI® - MODEL: HBM-604BP (2-ZONE, ZPA NETWORK CARD)

Dimensions



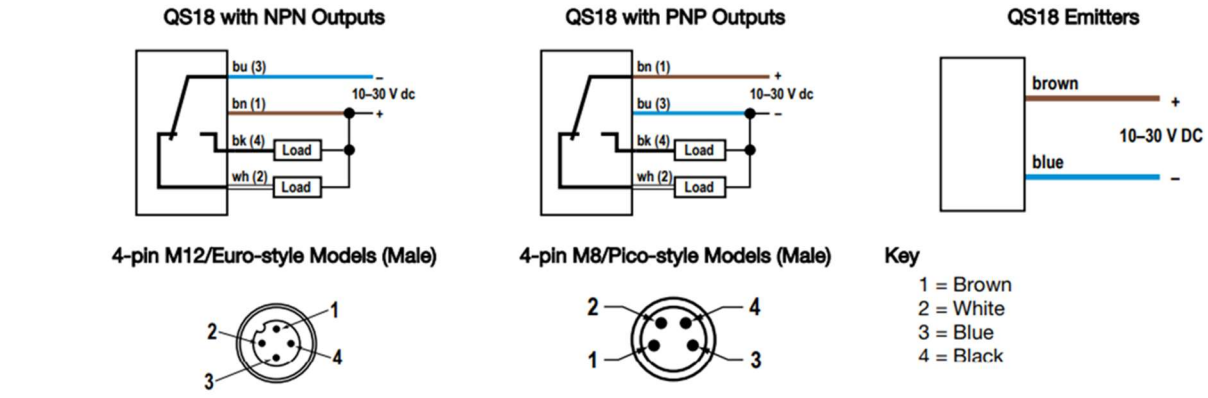
NOTE: *For technical specifications or specific troubleshooting of the HBM-604BP card, please refer to the* ***Itoh Denki HBM-604BN/BP Technical Document*** *provided.*

4.9. Photo Sensors

BANNER® - MODEL: QS18 SERIES (RETROREFLECTIVE)

The Banner® QS18 Series Photoelectric Sensor is utilized in both case and pallet conveyor applications.

Wiring Diagram

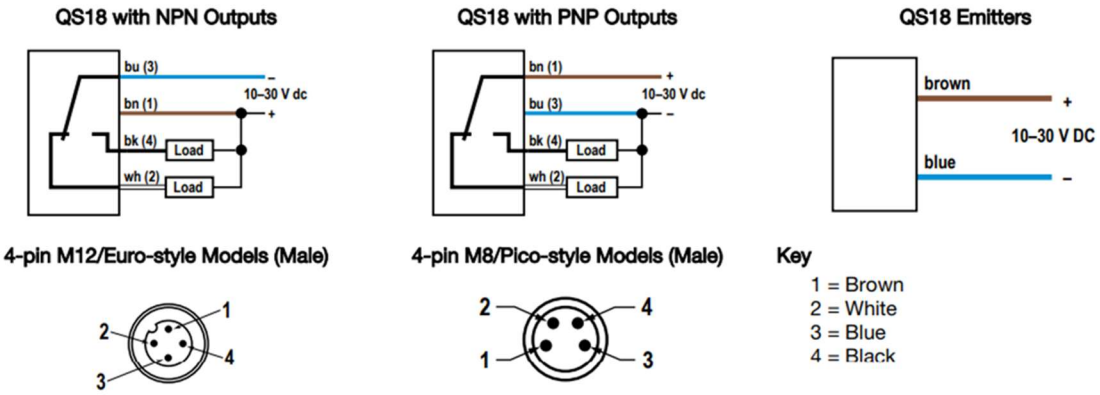


NOTE: *For technical specifications or specific troubleshooting of the QS18 Sensor, please refer to the* ***BANNER QS18 Series Sensor Technical Document*** *provided.*

BANNER® - MODEL: QS18 SERIES (DIFFUSED)

The Banner® QS18 Series Photoelectric Sensor is utilized in both case and pallet conveyor applications.

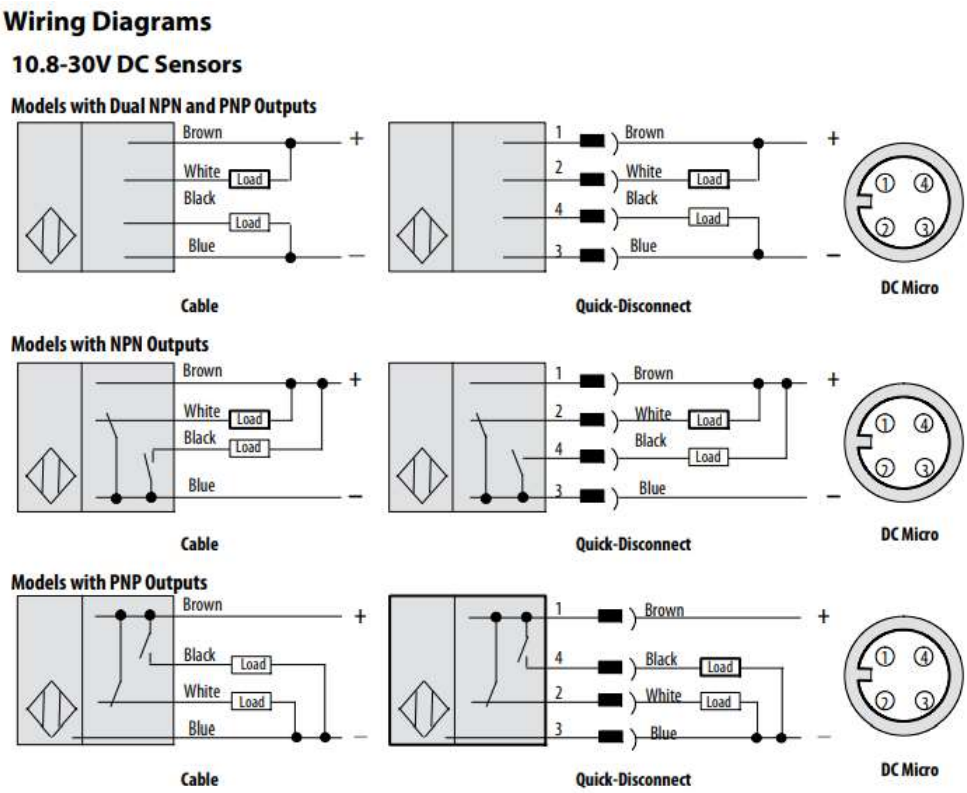
Wiring Diagram



NOTE: *For technical specifications or specific troubleshooting of the QS18 Sensor, please refer to the* ***BANNER QS18 Series Sensor Technical Document*** *provided.*

ALLEN-BRADLEY® - MODEL: 42EF SERIES (PHOTOELECTRIC)

The Allen Bradley® 42EF RightSight™ Series Photoelectric Sensor is utilized in applications that require clear-object detection.



NOTE: *For technical specifications or specific troubleshooting of the QS18 Sensor, please refer to the* ***Allen Bradley RightSight™ 42EF Series Sensor Technical Document*** *provided.*

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5 Support

INTRODUCTION

MATERIAL HANDLING TECHNOLOGIES conveyors are designed to operate with a minimum of maintenance. Downtime on any part of a conveyor system involves both time and money. Certainly not all breakdowns or failures can be detected before they occur, however, many can be prevented if you follow a regular maintenance program. When you install new equipment, you should establish a schedule of preventive maintenance. The preventive maintenance procedures outlined in this manual provide an easy means of determining the operational status of the equipment. The preventive maintenance procedures enable you to identify possible trouble areas, so that the suspect condition does not deteriorate to the point of equipment failure.

5.1. Preventative Maintenance

Preventive maintenance ensures the equipment is working at maximum efficiency over long periods of time and eliminates costly repairs and downtime.

To ensure effective control over maintenance operations and to permit comparability between equipment as a means of evaluating the maintenance program, preventive maintenance procedures are criteria that may be applied at all equipment locations.

Preventive maintenance can be divided into three categories, each of which is represented by a separate type of checklist.

Inspection Checklists

These checklists specify those activities that call for the highest level of mechanical and electrical skill. These checklists are primarily concerned with inspection and adjustments, though tightening

and cleaning activities may be included when delicate or complex equipment is involved. Inspection checklist activities are limited to weekly, monthly, quarterly, semiannually, and annual intervals. During an inspection, never touch a moving belt or rotating part.

Cleaning and Lubricating Checklists

These checklists are primarily concerned with cleaning, lubricating, and tightening activities. These jobs do not require as high a level of technical skill as those appearing on inspection checklists. Performance frequencies for cleaning and lubricating checklist activities are also limited to monthly, quarterly, semiannual, and annual intervals.

Routine Preventive Maintenance Checklists

These checklists are concerned with all of the activities listed above, but are normally directed at a level of skill between that required for inspection checklists and that required for cleaning and lubricating checklists. Inspection and adjustment work assigned at this level is less complex than work listed on inspection checklists. Performance frequencies for routine preventive maintenance checklist activities are, in most cases, limited to daily, weekly, and biweekly intervals.

5.2. Scheduled Maintenance

The following is a general maintenance which covers the major components of material handling system. This will be helpful in establishing a standard maintenance schedule.

DAILY WALK-THROUGH INSPECTION (EACH SHIFT)

- **MHT System Components:** Monitor product flow and familiarize with the conveyor and component operation sounds. Inspect material handling equipment for any unusual noise or operational problems. Immediately correct the faulty conditions promptly.
- **Work Area:** Clean any accumulation of dust and/or dirt from the conveyor surfaces and remove any accumulation of debris. Do this with the conveyor belt stopped. Never touch a moving belt or rotating part.
- **Photo eyes and reflectors:** Make sure that all photo eyes are not blocked and properly aligned. Clean photo eyes and reflectors with a clean soft cloth.
- **Product spills:** Inspect conveyor components (rollers, belts, etc.) and platforms. Conveyor spills should be wiped off with damp cloth. Spills on platforms should be mopped each day.

WEEKLY MAINTENANCE

- **Rollers:** Check drive rollers, wipe clean as necessary, and inspect rollers for damage.
- **Poly-V Belts:** Inspect and ensure belts are aligned and not touching adjacent belts. Look for missing or damaged poly-v belts.
- **O-rings:** Inspect O-rings on diverts, replace missing or damaged O-rings.
- **Safety:** Observe all safety precautions. Turn off the conveyor except when operations must be performed with equipment running. Never touch a moving belt or rotating part.
- **Examine controls and wiring:** With the conveyor shut down and disconnected, look for damage to conduit and wiring. Do not touch loose wires.
- **Clean Conveyor:** Remove any accumulated debris from beneath the surfaces of the conveyor. Make sure the conveyor is locked out.
- **Clean Up:** Restore conveyor to its original status. Ensure all inspection equipment is removed from work area. Initiate repair work orders as required. Inspect and report serious deficiencies to the maintenance supervisor.

MONTHLY MAINTENANCE

- **General Structure:** Make sure that the conveyor structure is sound.
- **Guards and Safety devices:** Make sure that guards are in place and the safety devices are working properly.
- **Rollers:** Listen for bearing noise and if making noise remove and inspect. Repair as needed.
- **Examine Belt:** Check for consistent belt tension between rollers and replace belts as needed. Never perform any work on the belt while it is moving.
- **Examine Mounting Bolts:** Check all drive motors by jogging units to ensure mounting bolts are tight. Check conveyor hold-down bolts to ensure the conveyor will not come loose from floor hold-down devices.
- **Electrical Cable Reel:** Inspect the electrical cable to ensure that cable is not pulling out from a cable connector. Also completely extend and retract the conveyor, observing the recoil of the cable. If the cable is sagging, completely extend the conveyor and attempt to add an additional wrap to the spring at the reel housing. Do not over-tension the spring by over-wrapping the cable. See manufacturer's literature.
- **Electrical Wiring:** Check all electrical conduits and fittings to ensure damage has not been done to the system. Fix damaged, loose, or bare wiring or connections.
- **Clean Up:** Restore the conveyor to its original status. Ensure all inspection equipment is removed from the work area. Initiate repair work orders as required. Report serious deficiencies to the maintenance supervisor.

SEMI-ANNUAL MAINTENANCE

- **Examine master control panel:** Wipe dust from exterior of panel. Open panel door. Remove dust from the interior of the panel. "'Do not touch wires.'" Look for burned wiring and loose terminal connections. Close panel.
- **Observe drive section:** Ensure that drive roller is operating within its proper heat and noise range.
- **Extendable conveyor:** Keep the floor clean and clear of debris around the extendable conveyor. The caster wheels should be checked for build-up of dirt and debris. Keep floor clean and swept.

6 Troubleshooting

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

6.1. Visual Inspections

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.

DEAD ZONE ON THE CONVEYOR

Perform the following visual checks prior to any troubleshooting:

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

MOTOR CONTROL CARD CHECK

The controller card typically controls 1 or 2 zones. If the zone(s) are not functional, check individual communication 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.

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.

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.

- Determine if red fault light is on the drive card
- Unplug and plug black auxiliary cable into ZPA card
- Unplug and plug all harnesses to confirm proper seating
- Check that photoeyes are aligned and motors are torqued down
- Remove drive card and make sure 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. If the motorized drive roller still does not rotate, the motorized drive roller is defective. Replace the motorized drive roller.

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.

- Determine which motor control card is being used at the zone location
- 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

If the voltage is between 24-26VDC, check the all connectors are properly seated.

6.2. Troubleshooting Scenarios

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

Symptom	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

Symptom	Cause	Corrective Action
Zone runs continuously	Photo-eye sensor misaligned on upstream zone	Align photo-eye sensor, clean photo-eye sensor lens
	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 group 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
	Dead zone	See: zone will not run (dead zone)

Symptom	Cause	Corrective Action
(continued)… Boxes run into each other	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 sporadically 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 transportation	Package large than zone	Verify package size to original conveyor specifications
	Different zone speeds	See: zone runs at different speed than rest of conveyor

6.3. How-To's

Replacement of a Motor Control Card

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 a motorized drive rollers which in turn drives carrier (idler) rollers using O-rings or other poly-V belts. The motor control card, MDR and idler rollers, with associated sensors and switches, are assembled into a short conveyor section or zone.

1 Turn off and Lockout / Tag-out all power to the conveyor section

2 Remove the auxiliary 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 auxiliary power cable to the card.

11 Unlock the power supply and turn the conveyor on.

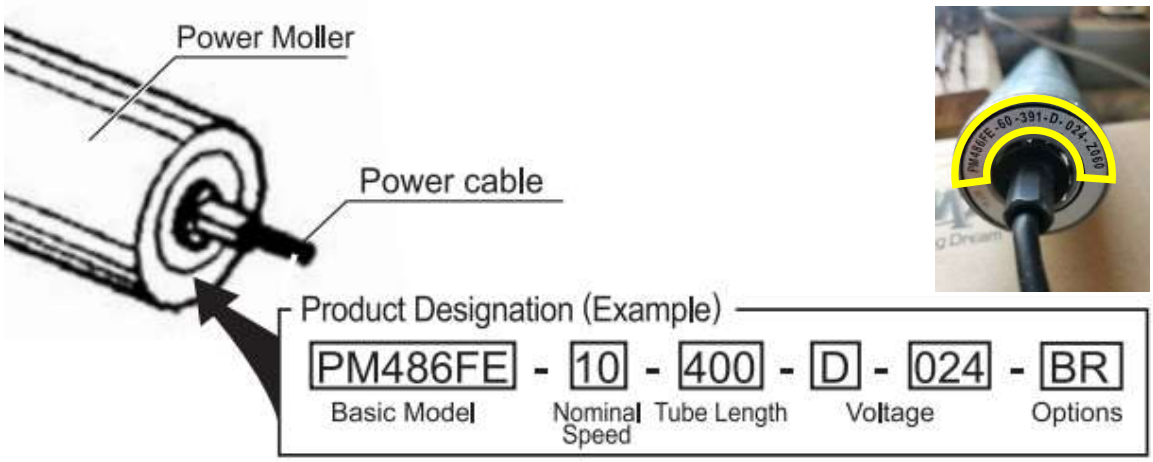
Power must be cycled on the Motor Control Card if dip switches or jumpers need to be modified/changed after plugging the power in for the Motor Control Card to take the setting change.

Replacement of a 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.

1 Turn off and Lockout / Tag-out all power to the conveyor section

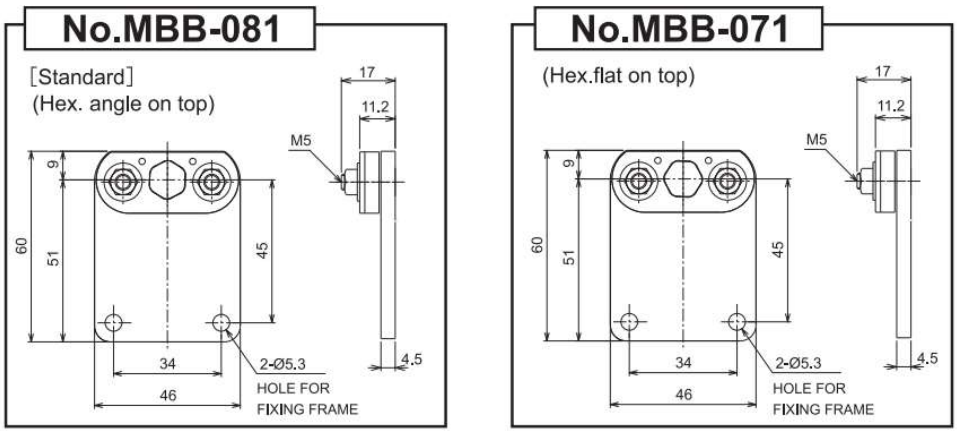
2 Make sure that the Product Designation matches that of the roller that is being replaced. This is important if the conveyor system is comprised of more than one speed



3 The replacement roller should include:

a. Motorized Drive Roller

b. Mounting Bracket Kit (if installed parts are damaged or lost)



4 Tools required:

   c. Torque wrench with M5 crows foot wrench (extension may be useful)

   d. M5 combination wrench

   e. Straight blade screwdriver or putty knife

⚠ CAUTION

Unit's shaft must be fixed to the conveyor frame with Mounting Bracket supplied with the unit. Rattling or idle rotation of the shaft may break the power cable, by which the powered roller will cease functioning.

5 Insert the unit's shaft with power cable through the conveyor frame shaft hole, taking attention not to damage the cable.

6 Press the spring-loaded shaft and insert into the other side of the conveyor frame shaft hole.

7 Insert the power cable through the hex holes of the large mounting plate and gently pull the cable through until the mounting plate sits on the hex shaft of the roller.

8 Insert the power cable through the smaller locking plate of the mounting bracket and gently pull the cable through until the locking plate sits on the hex shaft of the roller.

9 Secure the large mounting plate to the conveyor frame with the M5 hex bolts and M5 star nuts with the following torque specification (3.5 Nm or 2.6 ft-lbs)

10 Secure the smaller locking plate to the mounting plate with the supplied M5 flange nuts with the following torque specification (6-10Nm or 4.4 – 7.4 ft-lbs)

11 Route rollers power cable to the motor card and plug in. Confirm that the plug is fully seated before turning the power back on.

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.

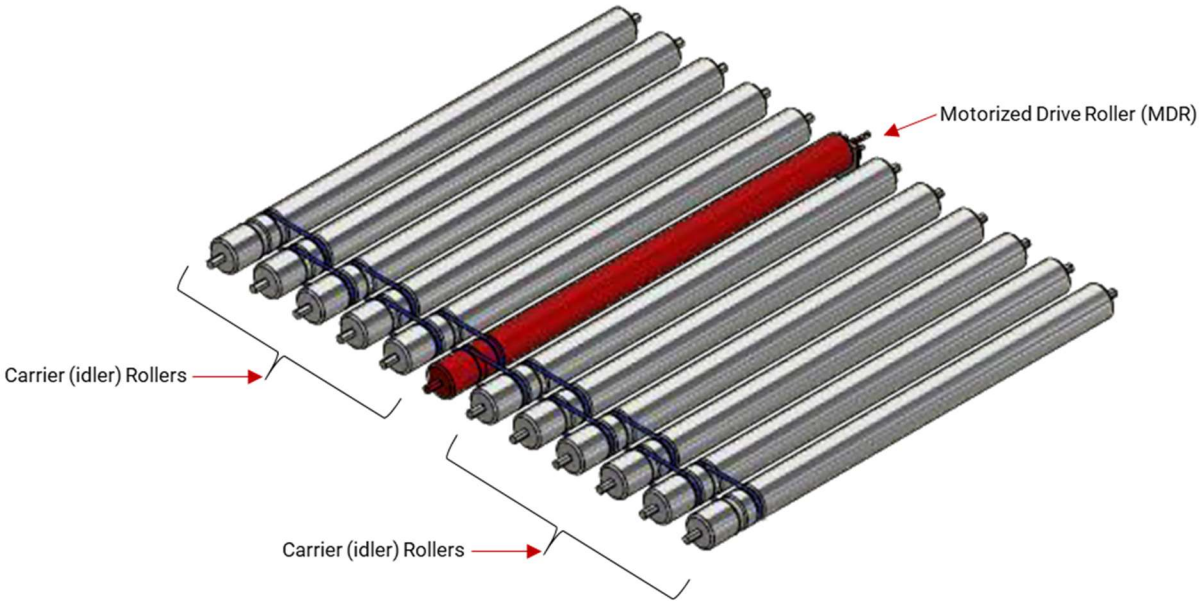
13 If the MDR does not operate review the **Troubleshooting Section**

⚠ 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.

Replacement of a 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.



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.

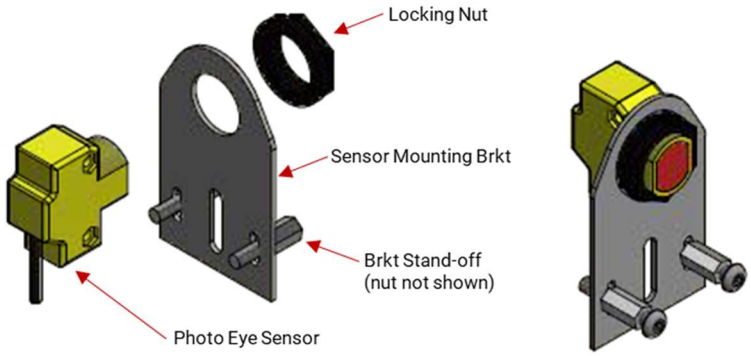
7 Insert the axle of the replacement roller through the conveyor frame

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

Replacement of a Photo-Eye Sensor

A photo eye sensor is used to sense the presence of the product. Two styles of photo eye sensors are used: Retro-Reflective Photoelectric Sensor & Background Suppression Diffused Photoelectric 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 Photo Eye Sensor from mounting bracket by removing locking nut on sensors barrel and remove Sensor from conveyor.

5 Install new Sensor at the same location as the old sensor and securing the locking nut.

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.

   a. In some instances, the photo eye wiring connector into the motor drive card may need to be reused. Technician must remove connector from faulty sensor and wire the new sensor into the connector. Pay close attention to the existing wiring order in the connector.

8 Check to see if zone operates by passing your hand in front of the photo eye sensor that is being serviced.

If replacing a Diffused Photoelectric Sensor, it is strongly recommended that the sensor be "zeroed out" by rotating the adjusting pot on the sensor and turning the "gain" up until desired results are achieved.

9 If the MDR does not operate review the **Troubleshooting Section**

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