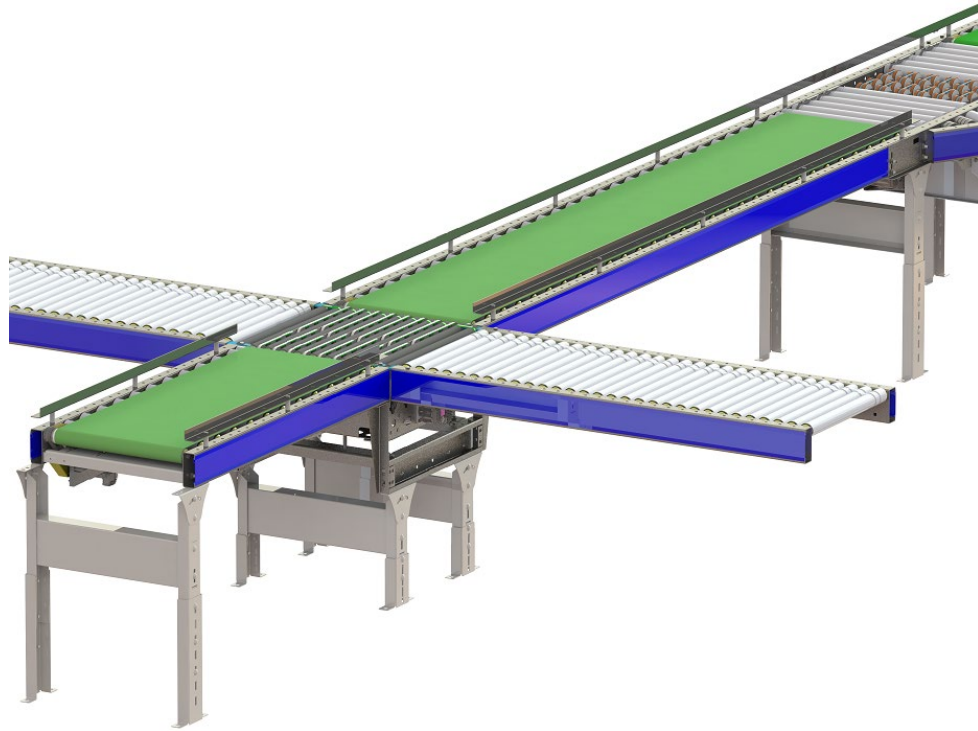




Installation and Maintenance Manual

Model: Modular Sorter (MBS)

Effective March 2022

Rev B



a TOYOTA ADVANCED LOGISTICS company

Contributions

ROLE	NAME	TITLE
Author	Brady Miller	Design Engineer II
Author	Sam Osterhout	Design Team Lead
Checker	Josh Foiles	Design Team Lead
Approver	Chris Perry	Engineering Manager

Revisions

DATE	REVISION	DESCRIPTION	AUTHOR
03/09/2020	A1	Mechanical Installation Electrical / Controls Installation	Brady Miller Jacob Clodfelter
06/25/2020	A2	Formatting and Content complete	Jacob Clodfelter
03/08/2022	B	Controls commissioning section added; ship with and ship loose info updated; cables and components updated to reflect AX part numbers; field installation prints added to Appendix; Controls design section added; Controls programming section added;	Sam Osterhout / Brady Miller

List of Definitions

TERM/ACRONYM	DEFINITION
Accumulation	The collection or staging of multiple cartons, cases, or totes of product on conveyor.
Back pressure	Pressure against carton(s) in the direction of carton flow resulting from weight of densely accumulated cartons.
BF	Between frame; this refers to the distance between conveyor bed side frames.
BRBDC	Belted Roller Bed Direct Current; DC roller conveyor format driven by brushless DC servo motors.
BZPDC	Belted Zero Pressure Direct Current; DC belted conveyor format powered by MDRs with the intent to maintain zero pressure conditions
Carton or Case	Term for conveyable items generally contained in cardboard boxes.
Discharge	The point where cartons, cases, or totes exit a conveyor or similar unit used in a material handling system.
Divert	(noun) A conveyor unit used to change the direction of a carton, case, or tote in a controlled manner. (verb) To change the direction of a carton, case, or tote in a controlled manner.
E-stop	A highly visible button or pull cable designed to shut down equipment in the case of an emergency.
Guide Rail	Mechanism used to maintain the desired position of conveyable cartons, cases, or totes on their respective conveying surface.
HRT	High-Rate Transfer; A modular conveyor unit used to either allow cartons, cases, or totes to pass straight through or be diverted perpendicular to the initial direction of travel without rotation.
Idler Roller	Cylindrically shaped material handling component that is unpowered and used to support a belt.
Infeed	The point where cartons, cases, or totes enter a conveyor or similar unit used in a material handling system.
Live	A zone of conveyor runs "live" when it runs whenever energized. It is for this reason that live zones of conveyor do not have or need any photoeyes or reflectors.
LOTO	Lockout Tagout
Mark Number	A numeric or alphanumeric term used to uniquely identify a conveyor bed or collection of beds (of similar model type) within a material handling system.
Match	A mark made on mating conveyor assemblies to assist in identifying orientation and placement within a system.
MSD	Master Specification Document; a document used to describe a product's intended capabilities, appearance, and interaction with users.
OAW	Overall width of any given conveyor bed.
OD	Outer diameter of a circular, cylindrical, or arced body.
OSHA	Occupational Safety and Health Administration
PE	Photoeye; Device used to detect the presence of an object-such as a carton, case, or tote-by use of an emitter and receiver (not necessarily in the same unit as one another).

Poly-V	A band or roller hub format with longitudinal ribs used for power transmission in DC conveyor applications.
PPE	Personal protective equipment
Prox Sensor	A sensor able to detect the presence of nearby objects without any physical contact.
PWD	Pivot Wheel Divert; A modular DC sortation unit used to divert cartons, cases, or totes onto spurs.
Reflector	A reflective component needed for retroreflective photoeyes to receive transmitted light or radiation when no object is in front of the photoeye.
Retroreflective	Of or relating to a surface or device that reflects light or other radiation back to its source.
RLSDC	Roller Live Spur Direct Current; DC roller conveyor powered by live MDRs and configured as a spur.
RLVDC	Roller Live Direct Current; DC roller conveyor powered by live MDRs.
Roller	Powered or unpowered cylindrically shaped material handling component used for mechanical power transmission, a conveying surface, and/or support for a belted conveying surface.
Side Cover	A PVC cover used to conceal and protect electrical components and wiring from foreign debris and moving obstacles.
Side Frame	Structural member used to support rotating components needed for conveyor beds.
Singulation	The active separation of cartons, cases, or totes.
Slug	The release or activation of all zones in a line of accumulating conveyor at the same time while still maintaining zero back pressure between products.
Sorter	Any piece of conveyance equipment used to divert a series of cartons, cases, or totes simultaneously.
Spur	A format of DC conveyor used to create linear transitions into intersecting lines of conveyor positioned at a non-perpendicular angle. Typically includes 30deg and 22deg configurations.
TOR	Top of roller; this refers to the elevation of the conveying surface with respect to the floor on which the conveyor is sitting.
Tracking Bands	Thin plastic bands installed on head or secondary drive roller to help keep DC format conveyor belts tracked.
Zero Pressure	Condition where adjacent cartons, cases, or totes are not in contact with one another.
Zone	Any section of DC conveyor driven by a single MDR.

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Reference Documents

Manufacturer	Manual	Location
Bastian Solutions Conveyor	PWD Installation and Maintenance Manual	https://www.bastiansolutions.com/assets/1/6/bastian_solutions_conveyor_pwd_installation_and_maintenance_manual_rev_b.pdf
Bastian Solutions Conveyor	HRT Installation and Maintenance Manual	https://www.bastiansolutions.com/assets/1/6/bastian_solutions_hrt_conveyor_installation_and_maintenance_manual_rev_e.pdf
Bastian Solutions Conveyor	Side Cover and Guiderail Installation Manual	https://www.bastiansolutions.com/assets/1/6/zipline_side_covers_and_guide_rail_installation_manual.pdf
Bastian Solutions Conveyor	Support Installation Manual	https://www.bastiansolutions.com/assets/1/6/zipline_conveyor_supports_installation_manual.pdf
Teknic	MCVC Manual	https://www.teknic.com/files/downloads/clearpath_user_manual.pdf
Dodge	Synchronous Drive Installation – MN4056	https://search.abb.com/library/Download.aspx?DocumentID=MN4056&LanguageCode=en&DocumentPartId=&Action=Launch
Dodge	Taper Lock Bushing Installation – MN4044	https://assets.unilogcorp.com/2/ITEM/DOC/Baldor_Dodge_119570_Instruction_Sheet.pdf

1 Introduction

Thank you for choosing Bastian Solutions' conveyor (BSC). The following manual serves as a guide for installation, part replacement, and general maintenance for your material handling equipment. It is important to read the manual and follow any instructions as it provides important safety information for personnel and will maximize the longevity of the conveyor.

The information contained in this manual applies only to the products described. Uses, activities, or processes related to installing or maintaining the equipment that are not explicitly described in this manual are considered out of scope. Please contact BSC for any questions or support that is not clearly addressed in this document. BSC is not responsible for misuse of the equipment described in this manual or misuse of information in this manual. If you have any questions, contact BSC customer service or support at ConveyorSupport@BastianSolutions.com.

2 OSHA And Safety

BSC is not responsible for ensuring that conveyors used in a system abide by OSHA standards. Safety is of primary importance to our company, but as a product distributor we ask that system integrators and end users conform with all applicable OSHA standards. We encourage that all warnings in this manual are followed to avoid unnecessary risk.

3 **Model: Modular Sorter (MBS)**

The Modular Sorter (MBS) is a collection of Pivot Wheel Diverts (PWDs), High Right Transfers (HRTs), Teknic motor driven Belted Roller Bed DC Conveyor (BRBDC) and Roller Live DC Conveyor (RLVDC). The purpose of the MBS is to provide a single I/O block connection point as described in section 5.2. Therefore, the MBS gives a controls package that is much easier to implement than if each component of the MBS were controlled separately. Manuals for the HRT(s) and PWD(s) found in an MBS are available for reference on the Bastian Solutions website and are not included in this document. The BRBDC(s) and RLVDC(s) found in an MBS differ slightly from standard product offerings in that they are driven by Teknic motors instead of Motorized Drive Rollers (MDRs). The model in Figure 1 shows an example of a Teknic driven RLVDC that would be used in an MBS.

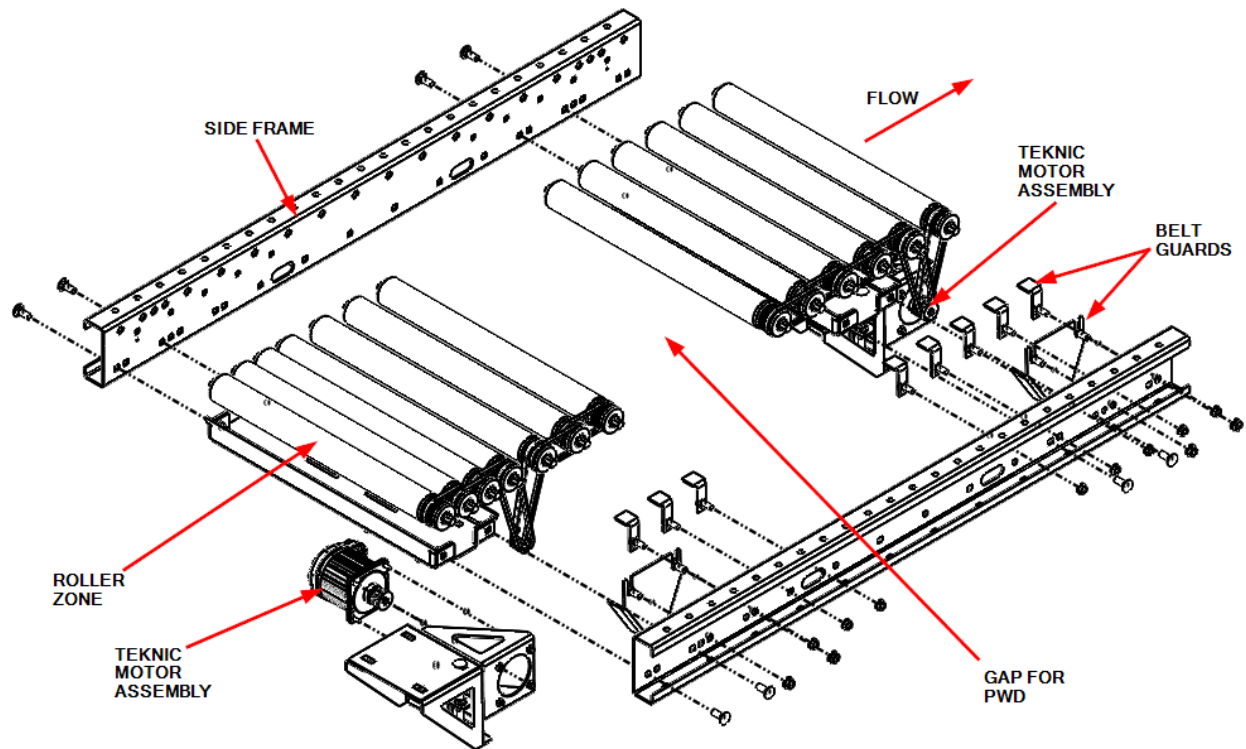


Figure 1: Exploded View of MBS RLVDC

The RLVDC model in Figure 1 consists of two Teknic driven roller zones and has a 12in gap between the zones to install a PWD. A spur (RLSDC) is able to be mounted to the side frame of the RLVDC so that the PWD that is mounted in the gap can divert product along the spur. Before each HRT or RLVDC section, a Teknic driven BRBDC section is used. The model shown in Figure 2 shows an example of a BRBDC that would be used in an MBS.

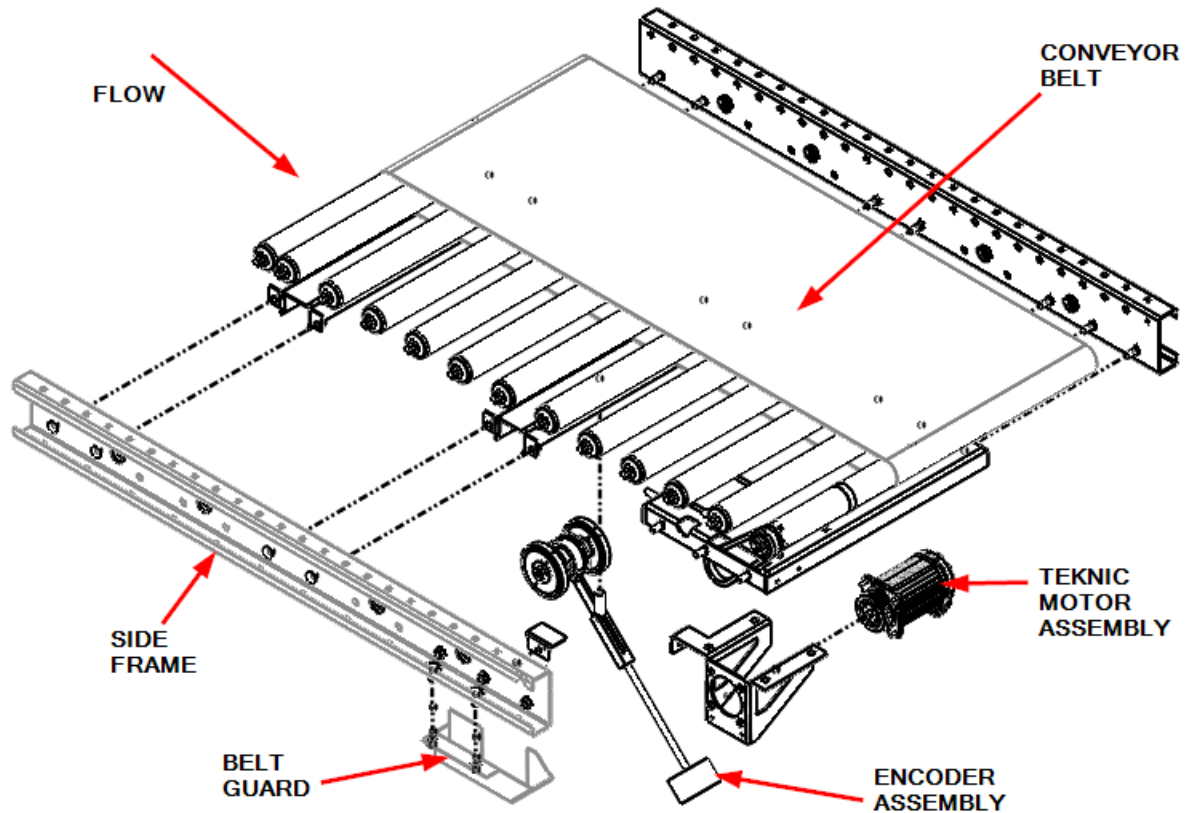


Figure 2: Exploded View of MBS BRBDC (Encoder Optional)

The BRBDC model in Figure 2 consists of a Teknic motor, timing belt and lead roller that drives a belted zone. The BRBDC is used to prevent unnecessary slip and better control product before a divert section.

4 Receiving

Upon delivery of any BSC equipment, please review and check the following:

- The quantity of items received against the Bill of Lading.
- A visual inspection of equipment should be completed to determine any damage that may have occurred during shipping. If damage is present, document with pictures.
- Review Mark Number information and layout locations. More information can be found in subsection 4.1

If there are any missing or damaged components, please contact your BSC representative with as much detail as possible. If you are unsure of your BSC representative, please contact customer service at ConveyorSupport@BastianSolutions.com.

4.1 Mark Numbers

A mark number is a specific number given to a piece of equipment. A mark number is usually made up of a single product line (RZPDC, RLVDC, BZPDC, etc.) but can contain many bed section lengths. They can range from two inches to hundreds of feet. The mark number is used to help identify where the piece of equipment will go within the system layout. Every bed section of conveyor will have (2) stickers. One sticker on the infeed end of the bed, and one sticker on the discharge end of the bed. Each sticker will contain the following information:

- BSC Project Number and Name
- Model Type
- Mark Number
- Match
- Piece
- Flow



Figure 3: Conveyor Identification

Figure 3 shows the stickers that would appear on an RZPDC that has two bed sections. The Match field is used to indicate if two bed sections are to be spliced to one another. As shown in Figure 3, the stickers where the two beds splice together both contain Match: 1, the Piece field defines the bed section number within the mark and the flow refers to the direction of product flow along the conveyor system.

4.2 Skid Contents

Skids will contain varying combinations of conveyor sections, support structures, accessories, and pertinent hardware. For protection of product integrity during shipping, accessories and supports may be delivered on separate, but labeled skids.

4.3 Skid Documentation

All shipments will contain a Bill of Lading for the delivery company, a skid label, and a skid manifest. Skid labels have the contents of each shipped item located on the skid. Figure 4 shows a sample of a skid label. These stickers are placed on the surface of each skid.



Figure 4: Skid Label

All HRTs are packaged on a skid with a box containing ship with items. Refer to the Appendix for details on these materials and how they are to be installed in the field.

4.4 Controls High Level Hardware Layout and Standard Module

The MBS has the ability to suit a large variety of installation types and use cases. The primary two types of diverts are the PWD and the HRT. Each of these diverts has been designed to include standard conveyance features and control sensors surrounding each divert to aid in modularity of control and installation. The devices for control include: motors, photo-eyes, proximity sensors, I/O modules.

Motors, photo-eyes, proximity sensors, and I/O modules will ship configured with backup installation files for download. Further troubleshooting material may be referenced for each device vendor.

The high level control component overview for each divert type is detailed below.

4.4.1 Controls PWD High Level Hardware Layout and Standard Module

The PWD divert module is sectioned into various components including conveyance section and sensor inputs. The list of these components for each standard section are as follows:

- BRBDC Zone 1 Teknic Motor (A013TM-10006)
- RLVDC Zone 1 Teknic Motor (A013TM-10003)
- PWD Roller Teknic Motor (A013TM-10006)
- PWD Pivot Teknic Motor (A013TM-10004)
- RLVDC Zone 2 Teknic Motor (A013TM-10003)
- Induct Photo-Eye (A002SE-10025)

- Divert Confirmation Photo-Eye (A002SE-10025)
- Home Proximity Sensor (A002SE-10030)

4.4.2 Controls HRT High Level Hardware Layout and Standard Module

The HRT divert module is sectioned into various components including conveyance section and sensor inputs. The list of these components for each standard section are as follows:

- BRBDC Zone 1 Teknic Motor (A013TM-10006)
- HRT Roller Teknic Motor (A013TM-10005)
- HRT Lift Teknic Motor (A013TM-10004)
- HRT Blade Teknic Motor (A013TM-10006)
- Induct Photo-Eye (A002SE-10025)
- Right Divert Confirmation Photo-Eye (A002SE-10025)
- Left Divert Confirmation Photo-Eye (A002SE-10025)
- Down Proximity Sensor (A002SE-10030)

A detailed view of each of these component locations for the two divert styles are shown in Figure 5 and Figure 6.

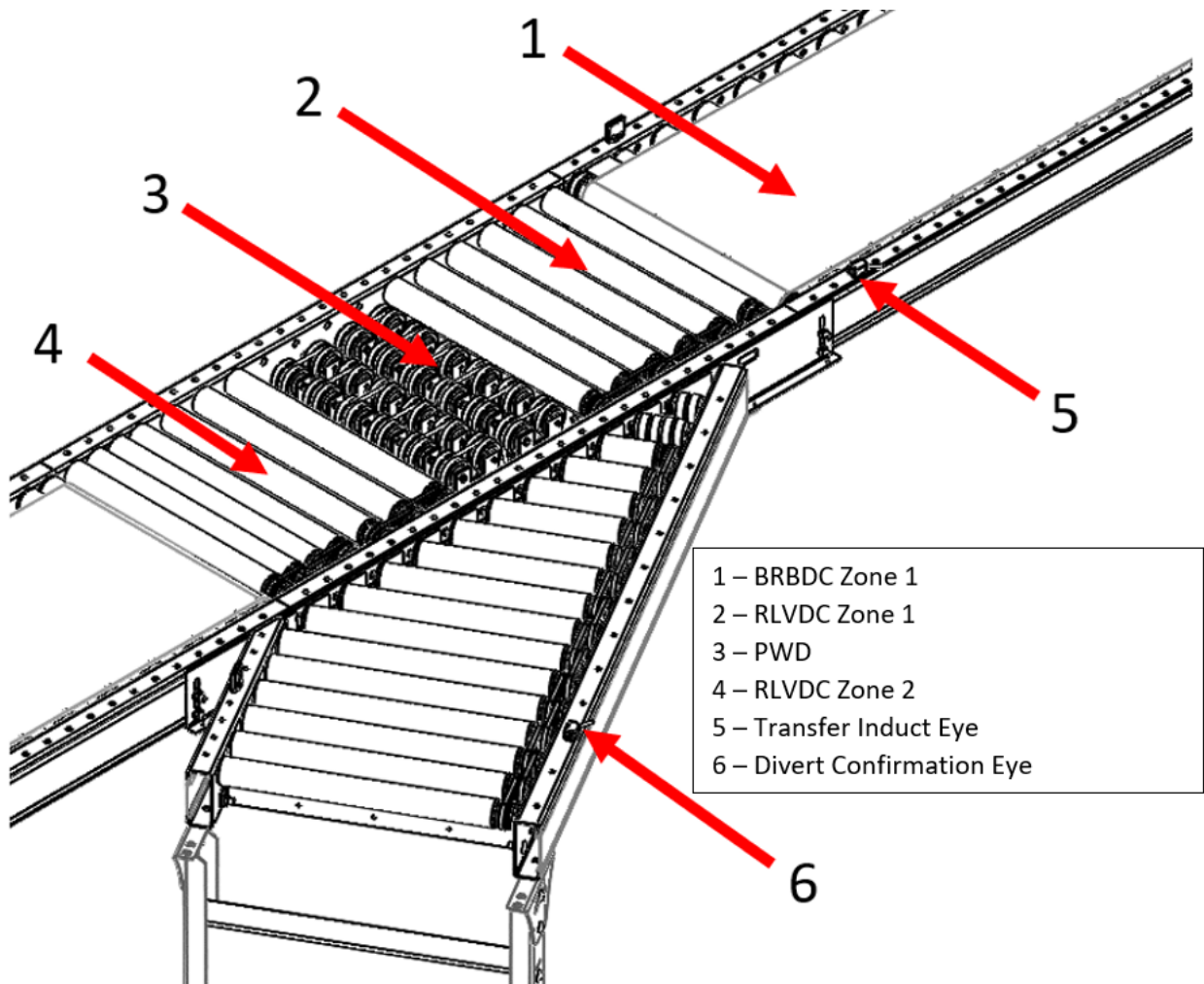


Figure 5: PWD Controls Hardware Layout

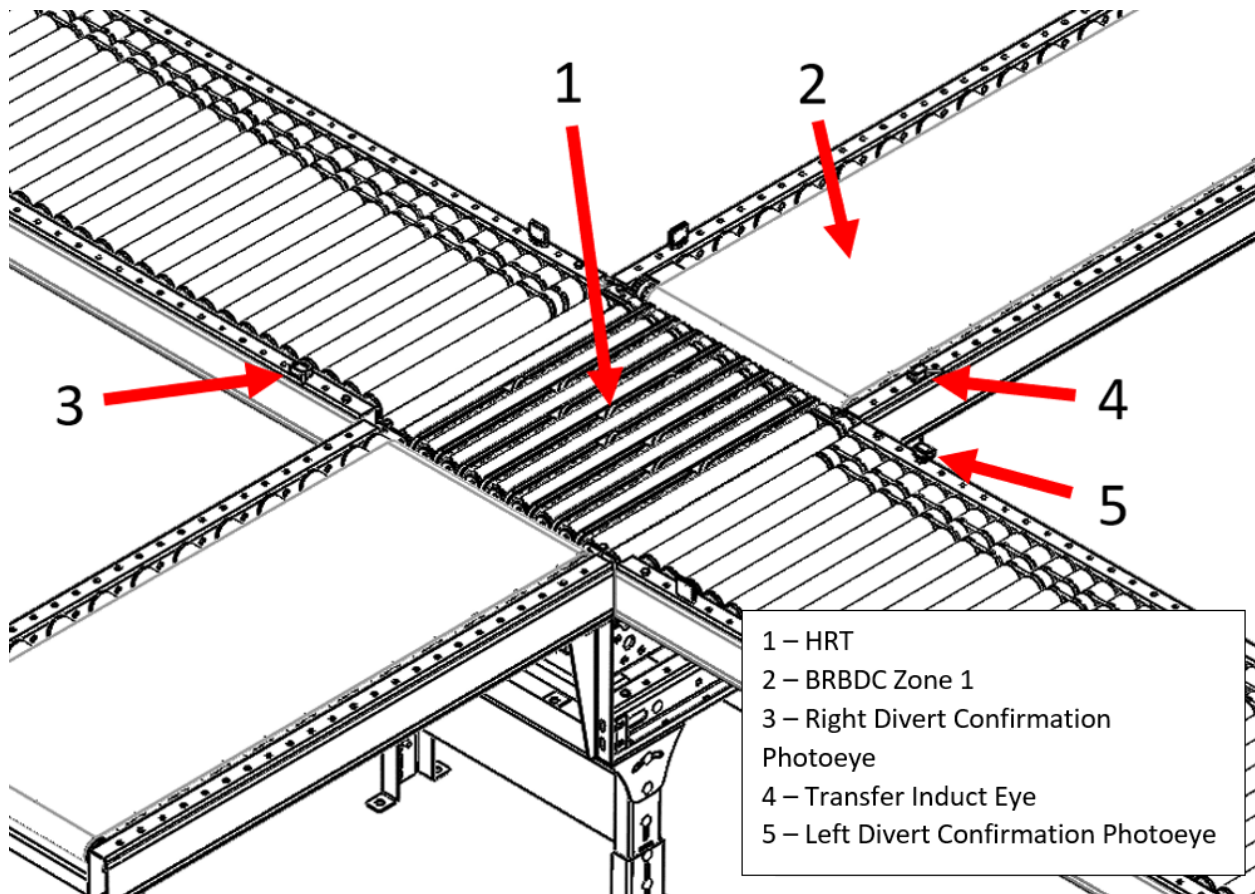


Figure 6: HRT Control Hardware Layout

5 Installation

The installation supervisor should have elevation and layout prints with detailed information regarding the placement of conveyor sections and support structures. This information is not the responsibility of BSC to provide unless otherwise specified.

1. Clear the workspace around the portion of the layout selected for installation.
2. Measure out from a constrained origin to start placement of supports. It is recommended that snap chalk lines are used, or other methods of keeping a consistent line.
3. Use the elevation layouts to determine the conveyor's top of conveying surface.
4. Place the support type that the layout designates. Each support type has a corresponding mark sticker.
5. Check the flow direction on the mark stickers to ensure that conveyors are mounted properly.
6. Place the conveyor onto the support structure and fasten 3/8"-16 carriage bolts and wiz nuts. Torque fastener to 31 ft-lb.
7. Attach any applicable accessories and connecting hardware.
8. Check that the infeed and discharge heights of the conveyor agree with the system layout instructions.
9. Lag the supports to the floor (or other permanent fixture).

5.1 Mounting MBS into System

Installing an MBS consists of installing each component (BRBDC, RLVDC, PWD, HRT) separately. For mechanical installation instructions of BRBDC(s), RLVDC(s), PWD(s) and HRT(s), reference each respective manual.

5.1.1 BRBDC Encoder Installation

Install the BRBDC on supports before installing encoder. The encoder used within the MBS is shipped with only one BRBDC section of an MBS. Assemble the encoder to the bed spacer mount using the included encoder installation instructions as shown in Figure 7. Ensure that the wheels of the encoder are in contact with the bottom of the belt.

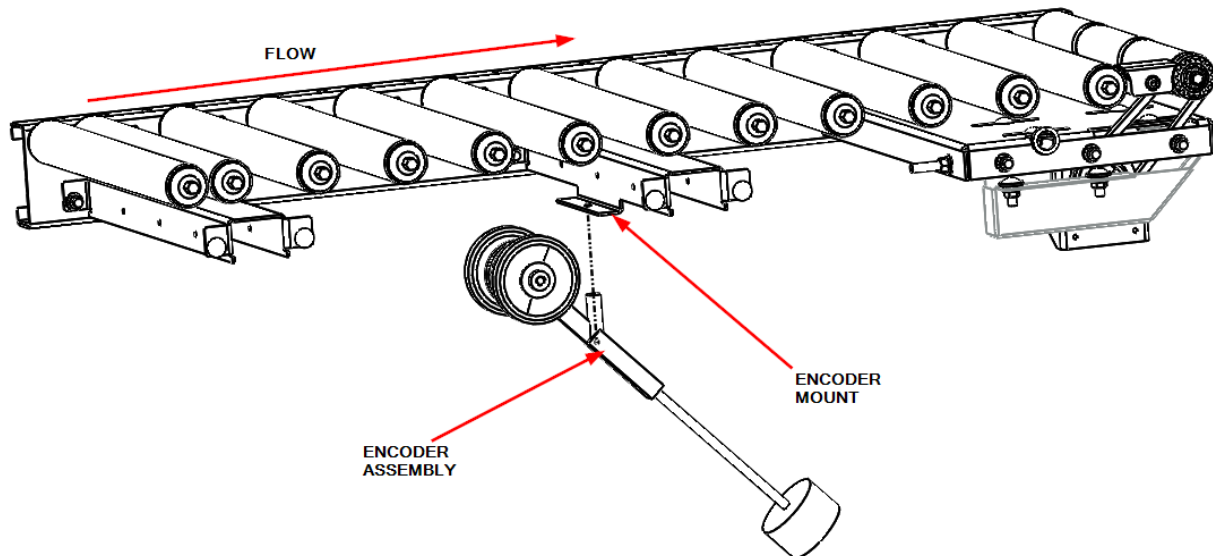


Figure 7: Encoder Installation - Side Frame and Belt Hidden

5.2 Electrical Installation

5.2.1 PWD Wire Harness Installation

The MBS comes with pre-designed and quick connect harnesses to make installation and repair as seamless as possible. These harnesses are separated once again by divert type. Each control hardware component for each divert module has its own harness and wiring requirements. This section will detail the harnesses to use for each control component in each divert module section.

5.2.1.1 PWD Wire Harness Installation Cable Overview

Each hardware component in the standard PWD module has different wiring harness requirements. These requirements for each of the components are detailed as follows:

- BRBDC Zone 1 Teknic Motor
 - a. Power Cable (A002CA-10122 (11ft) or A002CA-10179 (6ft))
 - b. I/O Cable (A002CA-10135 (6.5ft) or A002CA-10185 (16.5ft))
 - i. Molex 2x4 Mini-Fit Jr to (2) M12 right angle male connectors
- RLVDC Zone 1 Teknic Motor
 - a. Power Cable (A002CA-10124)
 - b. I/O Cable (A002CA-10135)
 - i. Molex 2x4 Mini-Fit Jr to (2) M12 right angle male connectors
- PWD Roller Teknic Motor
 - a. Power Cable (A002CA-10124)
 - b. I/O Cable (A002CA-10135)
 - i. Molex 2x4 Mini-Fit Jr to (2) M12 right angle male connectors
- PWD Pivot Teknic Motor
 - a. Power Cable (A002CA-10124)
 - b. I/O Cable (A002CA-10135)
 - i. Molex 2x4 Mini-Fit Jr to (2) M12 right angle male connectors
- RLVDC Zone 2 Teknic Motor
 - a. Power Cable (A002CA-10124)
 - b. I/O Cable (A002CA-10135)
 - i. Molex 2x4 Mini-Fit Jr to (2) M12 right angle male connectors
- Induct Photo-Eye (A002SE-10025)
 - a. Comes with M8 to M12 cable (A002CA-10168)
- Divert Confirmation Photo-Eye (A002SE-10025)
 - a. Comes with M8 to M12 cable (A002CA-10168)
- Home Proximity Sensor (A002SE-10030)
 - a. Comes with M12 patch cable (A002CA-10132)

The power harnesses also come with pre-built extension cables to route back to the power supplies mounted on the side of each PWD module. These extension cables include both male to male and female to male variants to make wiring sections easy to accommodate various chains or connections between chains of power supply cabling.

All wiring internal to the power supply needs to be done by a licensed electrician and in compliance with all relevant electrical codes.

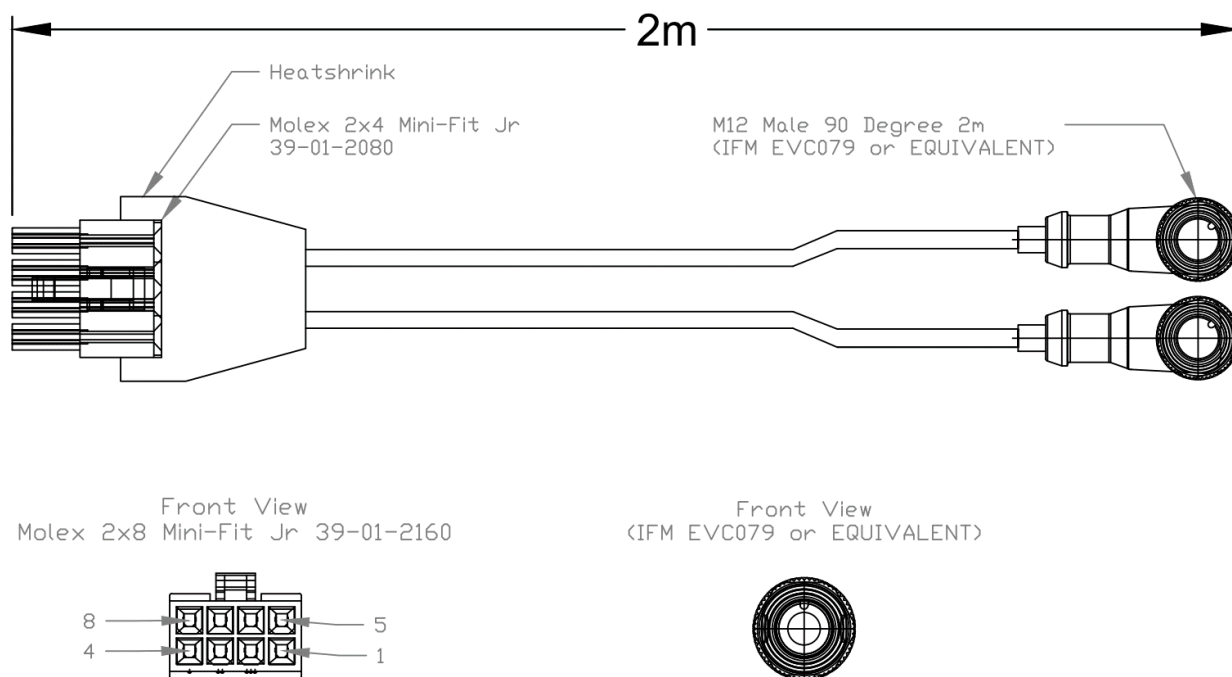


Figure 8: PWD Teknic Motor I/O Cable Schematic

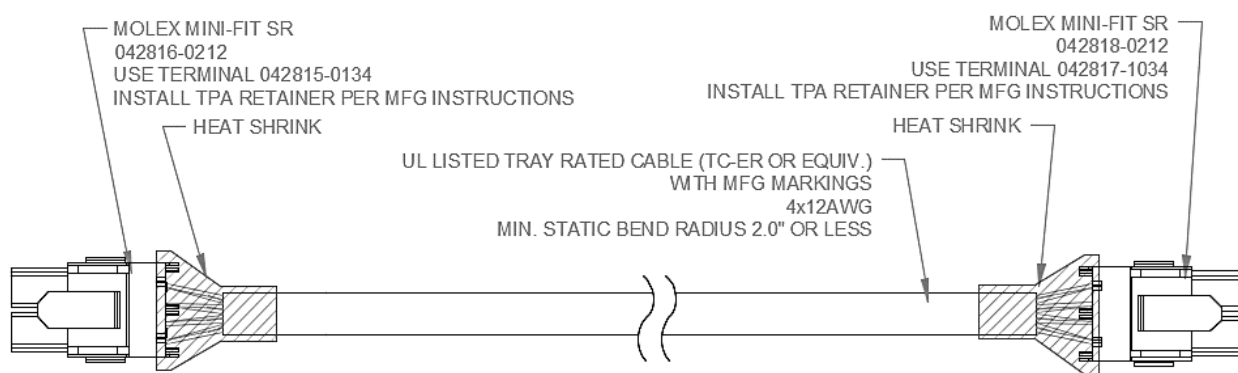


Figure 9: Teknic Motor Power Cable Male to Male



Figure 10: PWD Teknic Power Cable Schematic

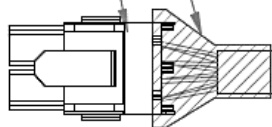


Figure 11: Teknic Power Cable Schematic Male to Female

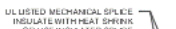


Figure 12: PWD Teknic Power Cable Schematic

5.2.1.2 PWD I/O-Link block Connections

In addition to each wiring harness, each PWD module will come with two Balluff I/O (A002CC-10003) cards to receive the inputs and outputs for hardware components in each PWD section. These cards send the input and output information via ethernet to a IO-Block Hub control block that is installed on the MBS. The IO-Block Hub control block then sends these inputs and outputs back to a PLC.

These cards will come preprogrammed to receive the correct inputs and outputs for the hardware in question. However, it is very important that a specific order of connection is followed to make sure that the standard PLC logic that has been designed for the MBS works appropriately. The cards utilize M12 female ports that mate with the male M12 cables from the Teknic motors, photo-eyes, and proximity sensors in each standard PWD module.

Each of the two Balluff I/O cards will be configured as a IO-Block Hub / expansion module. In addition there will be a IO-Block Hub control block for the entire MBS that will accept the connection from all IO-Block Hub blocks in the MBS module.

You will be able to locate these cards mounted on the side of the standard PWD module section.

In order for the Balluff modules to work properly, the inputs and outputs must be configured appropriately inside the PLC. There is a standard .L5X file provided that will install the needed I/O configuration routines automatically. Please refer to the PLC configuration section 5.3 to properly install and configure this PLC routine.

In order to facilitate troubleshooting and proper port connection, a test program is included with the PLC to help make sure all connections have been made appropriately. Unless otherwise noted, the first or top cable is assigned to I/O A which includes output A and B signals, and the second or bottom cable is assigned to I/O B which includes the health and enable signals as designated below.

5.2.1.3 PWD I/O Electrical Installation Diagrams

This section is designed to help facilitate the correct installation of electrical contacts to the Balluff modules from Teknic motors and peripheral controls hardware.

The drawings will address the motors one at a time and point them out in reference to the hardware schematic of the component controls hardware.

Cables will be labeled with the corresponding outputs from the motor to help with connections in Figure 13, Figure 14, Figure 16, Figure 17, and Figure 18.

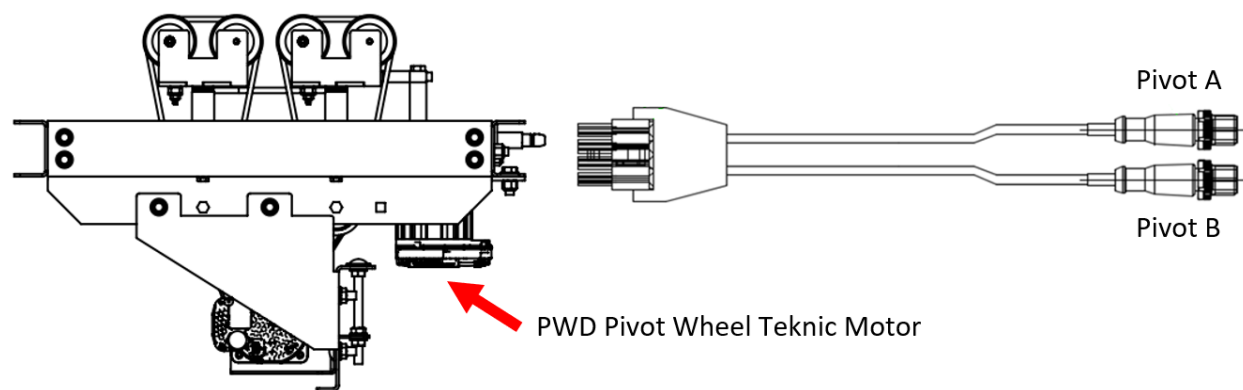


Figure 13: PWD Teknic Motor Pivot Control Hardware and Cable

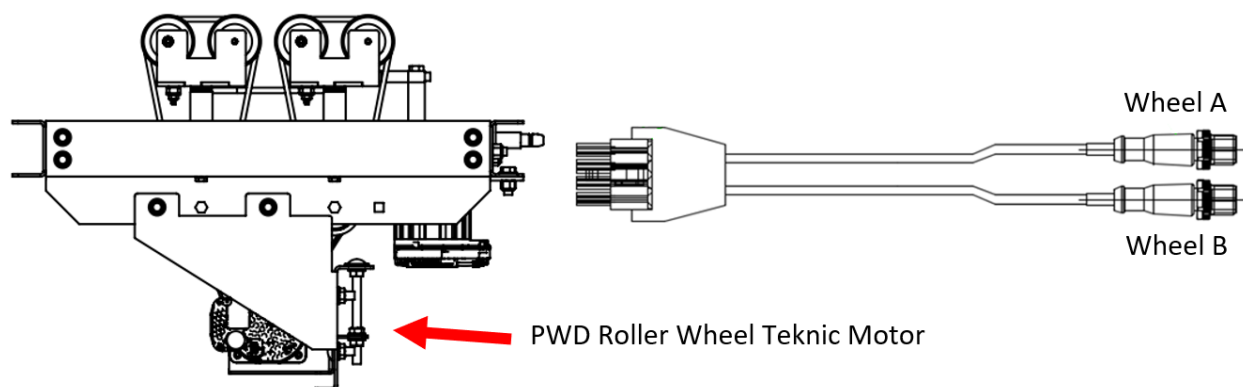


Figure 14: PWD Teknic Motor Wheel Control Hardware and Cable

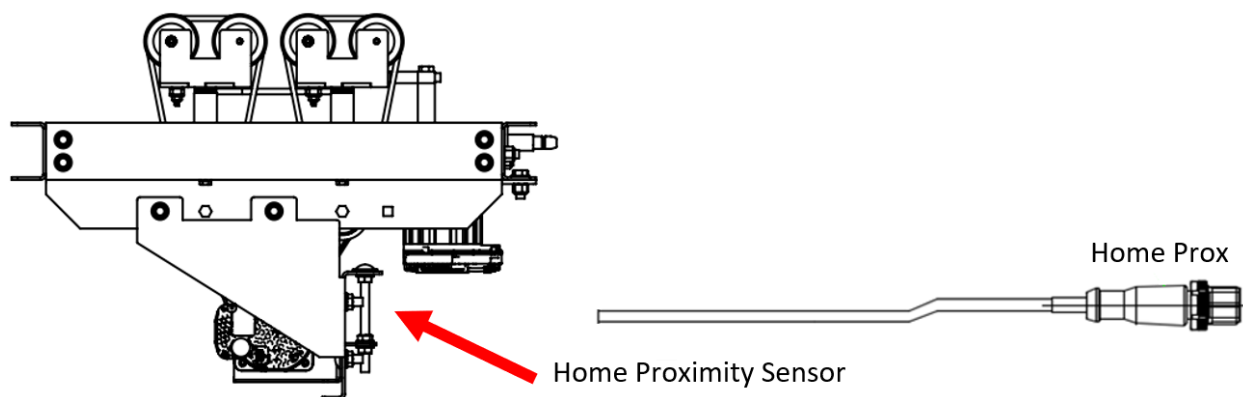


Figure 15: Home Proximity Sensor Control Hardware and Cable

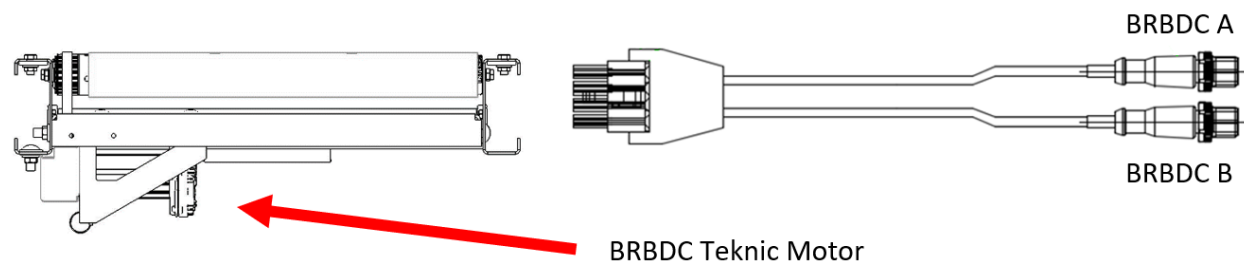


Figure 16: BRBDC Teknic Motor Control Hardware and Cable

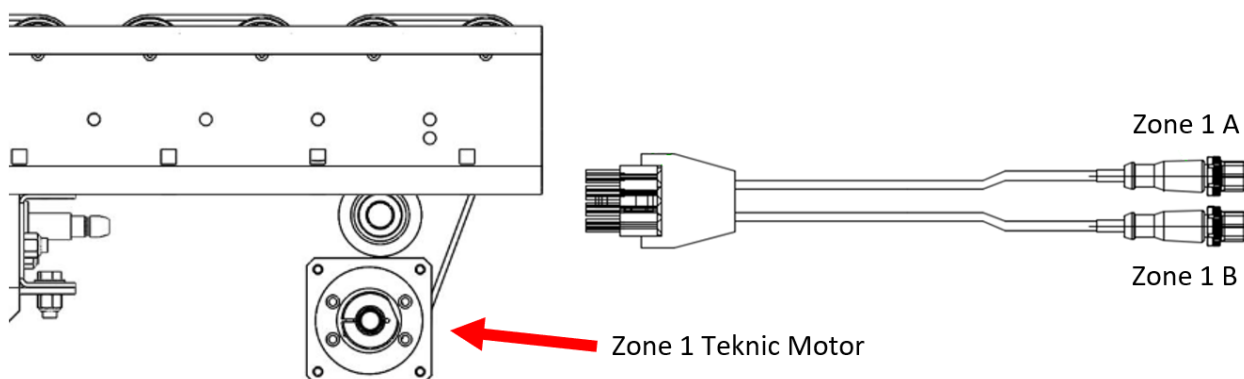


Figure 17: RLVDC Zone 1 Teknic Motor Control Hardware and Cable

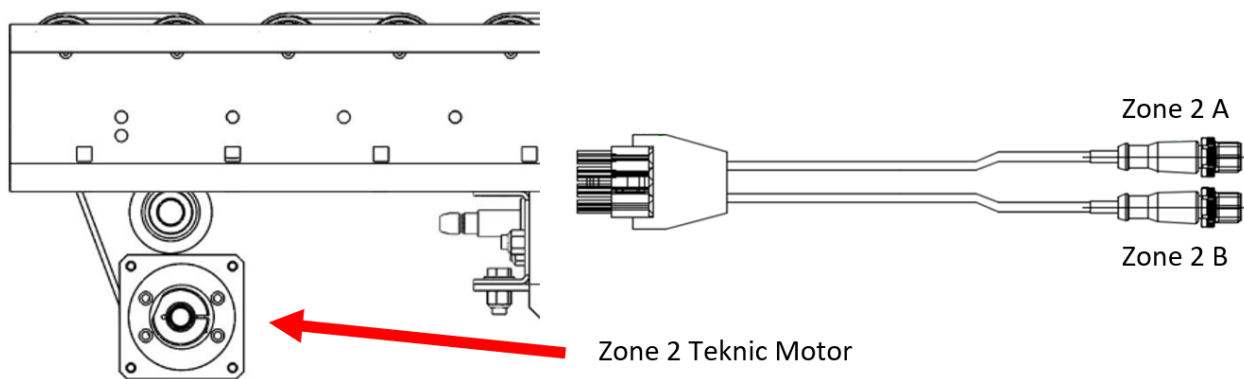


Figure 18: RLVDC Zone 2 Teknic Motor Control Hardware and Cable

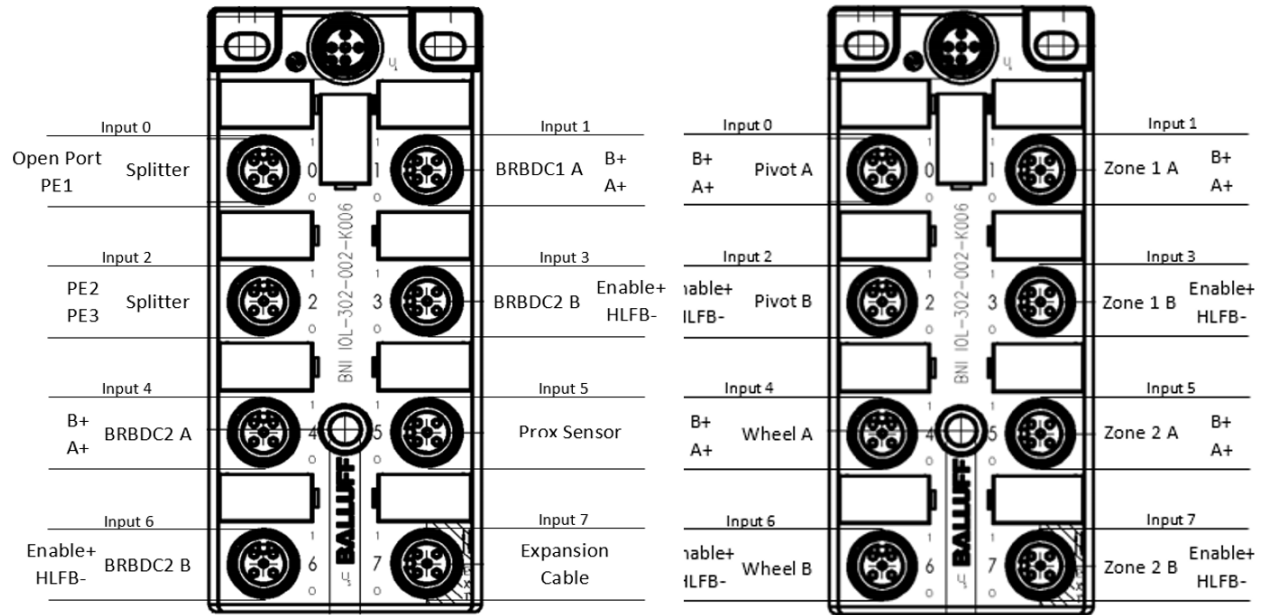


Figure 19: PWD Balluff IO Expansion Blocks

5.2.1.4 PWD Wire Harness Installation Instructions

The wiring harnesses for the PWD are designed to be easy to install, however, a standard procedure should be followed to aid in installation.

1. Refer to the hardware component overview to determine the total number of components that will need wiring harnesses.
2. Refer to the wiring harness hardware overview to determine the wire harnesses that will be needed for the hardware components in your MBS system.
3. Ensure that all of the hardware components are seated properly and are in their correct positions in relation to the PWD module (these will come pre-installed).
4. Locate the Balluff I/O cards on the side of the PWD module and make sure that you have correctly identified which is the IO-Block Hub and expansion module.
5. Install the power harnesses at their respective power supply (comes pre-installed on side of PWD module).
6. Make sure that the correct length of extension power cable is wired to reach the first Teknic motor in the PWD module (BRBDC 1 Teknic Motor)
7. Once you have reached the Teknic motor with the correct extension cable length plug in the accompanying power cable to the motor at the two-pin terminal.
8. Follow the same procedure for the rest of the Teknic motors in the PWD module.
9. Starting at the first Teknic motor, plug in the pre-built Molex to M12 cable to the eight-pin connector.
10. Route this cable as cleanly as possible to the Balluff card at the appropriate port as described.
11. Repeat steps 3-10 for all of the Teknic motors in the PWD module.
12. Repeat steps 3-10 for the photo-eyes and proximity sensors. Make sure their accompanying power lights turns on.
13. Make sure all cables have been neatly tucked into the side channels on the conveyor and make sure cables have been managed as cleanly as possible.
14. Once all PWD standard sections have been wired this way, you may proceed to the PLC testing section 5.3.4.

15. If PWD modules are not working appropriately during initialization and troubleshooting process, please refer back to the port connections and harness connections detailed in the previous section.

5.2.2 HRT Wire Harness Installation

5.2.2.1 HRT Wire Harness Installation Cable Overview

Each hardware component in the standard HRT module has different wiring harness requirements. These requirements for each of the components are detailed as follows:

- HRT Blade Teknic Motor
 - a. Power Cable (A002CA-10125)
 - b. I/O Cable (A002CA-10157)
 - i. Molex 2x8 Mini-Fit Jr to (6) M12 right angle male connectors
- HRT Lift Teknic Motor
 - a. Power Cable (A002CA-10125)
 - b. I/O Cable (A002CA-10157)
 - i. Molex 2x8 Mini-Fit Jr to (6) M12 right angle male connectors
- HRT Roller Teknic Motor
 - a. Power Cable (A002CA-10125)
 - b. I/O Cable (A002CA-10157)
 - i. Molex 2x8 Mini-Fit Jr to (6) M12 right angle male connectors
- BRBDC Zone 1 Teknic Motor
 - a. Power Cable (A002CA-10122 or A002CA-10179)
 - b. I/O Cable (A002CA-10135 (6.5ft) or A002CA-10185 (16.5ft)
 - i. Molex 2x4 Mini-Fit Jr to (2) M12 right angle male connectors
- Induct Photo-Eye (A002SE-10025)
 - a. Comes with M8 to M12 cable (A002CA-10168)
- Right Confirmation Photo-Eye (A002SE-10025)
 - a. Comes with M8 to M12 cable (A002CA-10168)
- Left Confirmation Photo-Eye (A002SE-10025)
 - a. Comes with M8 to M12 cable (A002CA-10168)
- Down Proximity Sensor (A002SE-10030)
 - a. Comes with M12 patch cable (A002CA-10132)

The power harnesses also come with pre-built extension cables to route back to the power supplies mounted on the side of each MBS module. These extension cables include both male to male and female to male variants to make wiring sections easy to accommodate various chains or connections between chains of power supply cabling.

All wiring internal to the power supply needs to be done by a licensed electrician and in compliance with all relevant electrical codes.

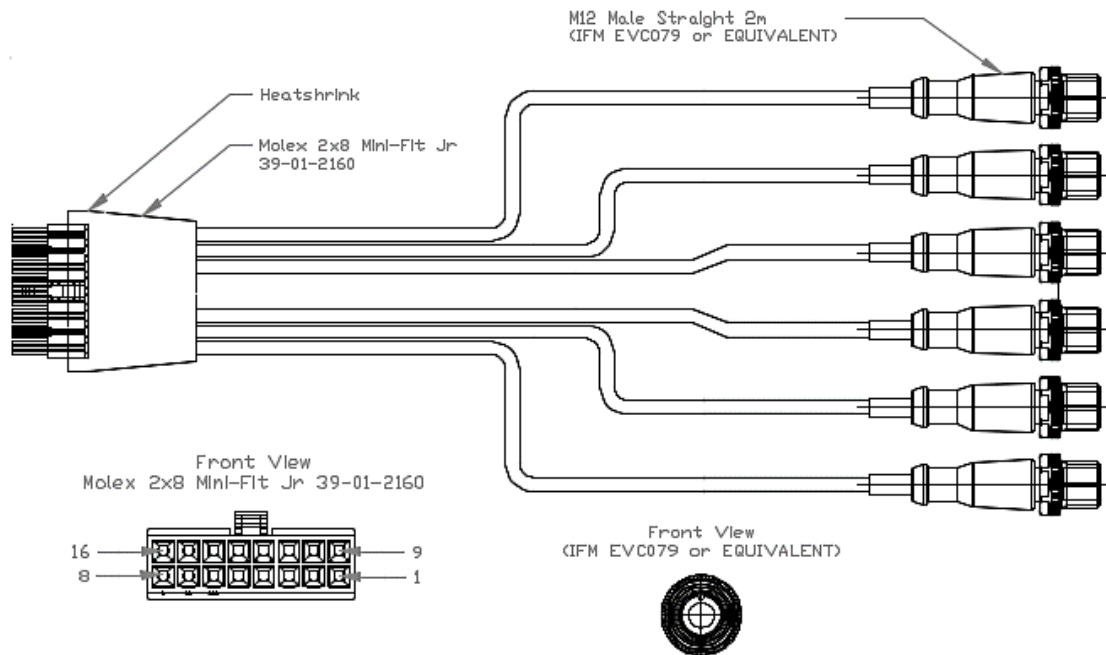


Figure 20: HRT Teknic Motor I/O Cable Schematic

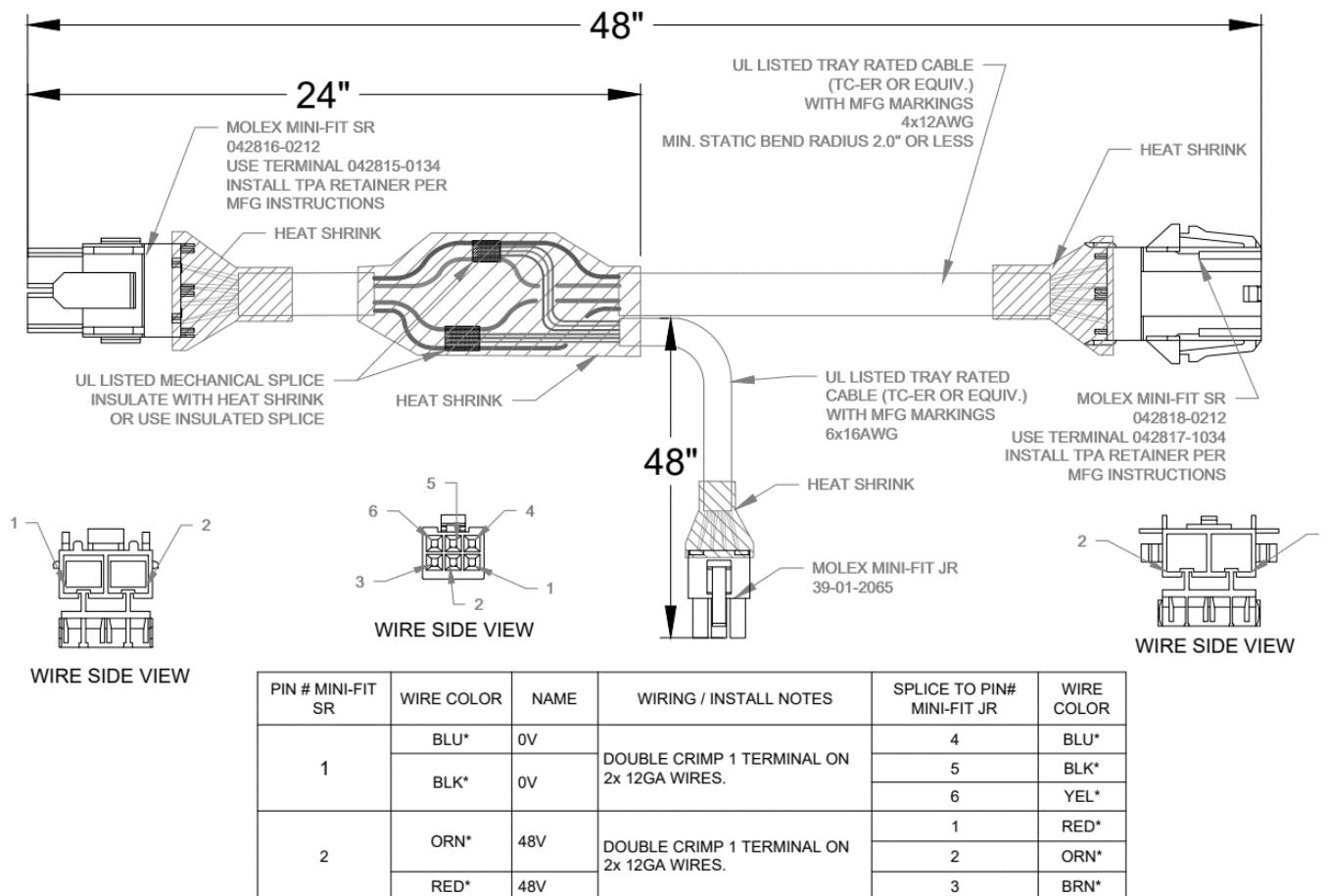


Figure 21: HRT Teknic Power Cable Schematic

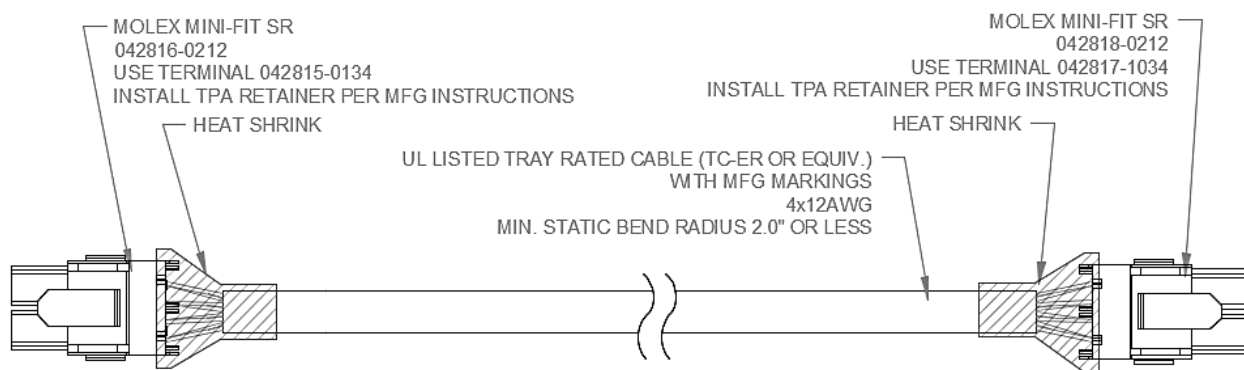


Figure 22: Teknic Motor Power Cable Male to Male

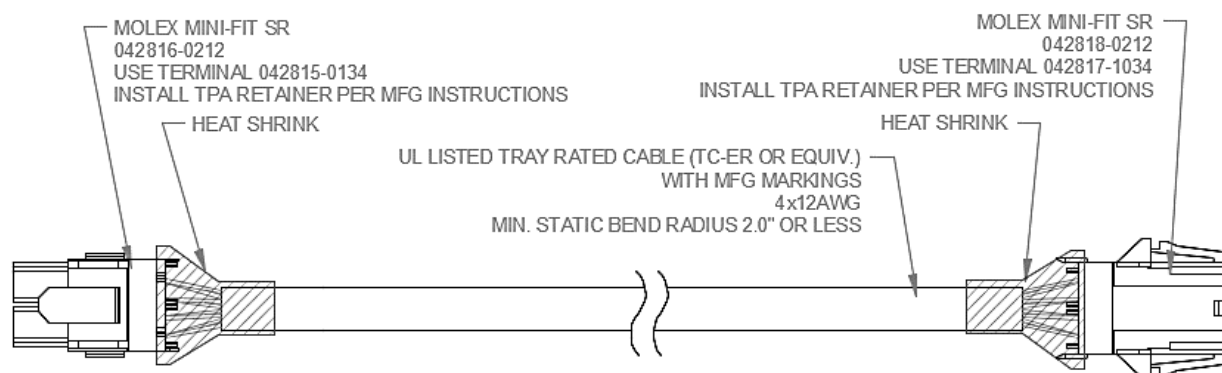


Figure 23: Teknic Power Cable Schematic Male to Female

5.2.2.2 HRT Balluff I/O Connections

In addition to each wiring harness, each HRT module will come with two Balluff I/O (A002CC-10003) cards to receive the inputs and outputs for hardware components in each HRT section. These cards send the input and output information via ethernet to a IO-Block Hub control block that is installed on the MBS. The IO-Block Hub control block then sends these inputs and outputs back to a PLC.

These cards will come preprogrammed to receive the correct inputs and outputs for the hardware in question. However, it is very important that a specific order of connection is followed to make sure that the standard PLC logic that has been designed for the MBS works appropriately. The cards utilize M12 female ports that mate with the male M12 cables from the Teknic motors, photo-eyes, and proximity sensors in each standard PWD module.

Each of the two Balluff I/O cards will be configured as a IO-Block Hub / expansion module.

You will be able to locate these cards mounted on the side of the standard PWD module section.

In order for the Balluff modules to work properly, the inputs and outputs must be configured appropriately inside the PLC. There is a standard .L5X file provided that will install the needed I/O configuration routines automatically. Please refer to the PLC configuration section 5.3 to properly install and configure this PLC routine.

In order to facilitate troubleshooting and proper port connection, a test program is included with the PLC to help make sure all connections have been made appropriately. Unless otherwise noted, the first or top cable is assigned to I/O A, and the second or bottom cable is assigned to I/O B as designated in.

5.2.2.3 HRT I/O Electrical Installation Diagrams

This section is designed to help facilitate the correct installation of electrical contacts to the Balluff modules from Teknic motors and peripheral controls hardware.

The drawings will address the motors one at a time and point them out in reference to the hardware schematic of the component controls hardware.

Cables will be labeled with the corresponding outputs from the motor to help with connections on the next page.

A single I/O cable, the HRT Teknic I/O Cable shown in Figure 24, will be used to connect to all three Teknic motors inside the HRT. There will be a cable drop within the HRT to connect this cable.

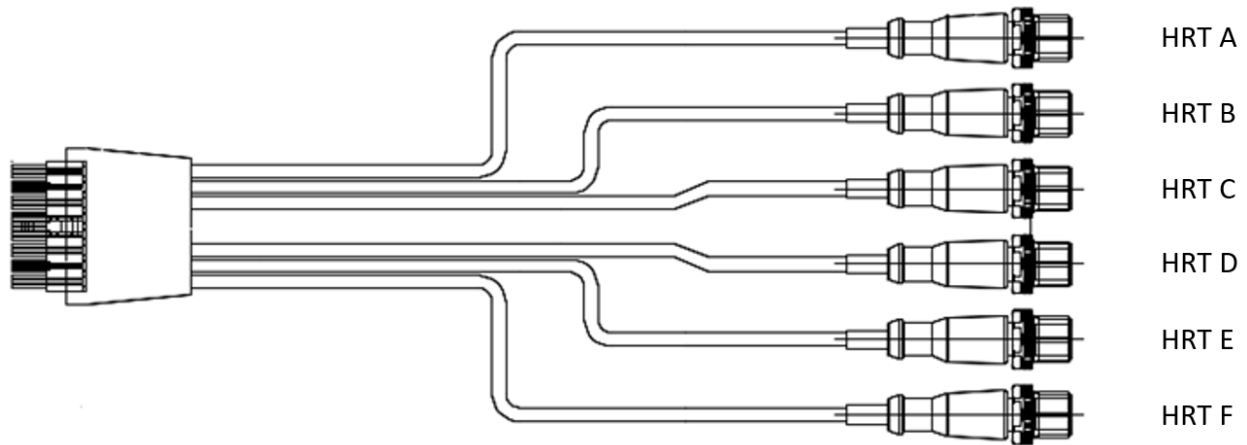


Figure 24: HRT Motor Complex Teknic Power Cable Schematic

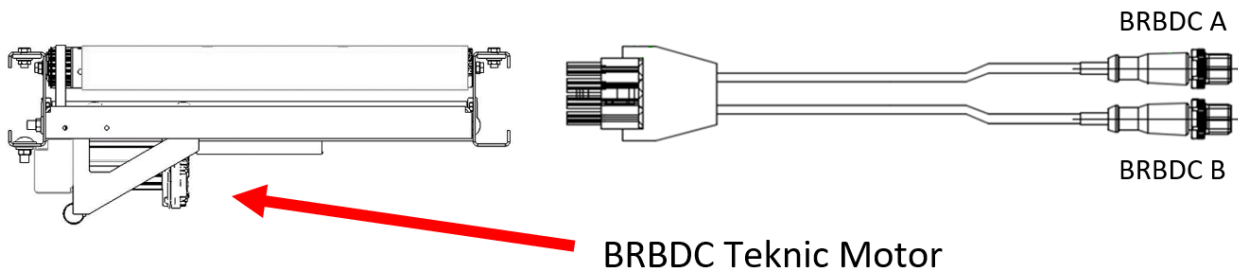


Figure 25: BRBDC Teknic Motor Control Hardware and Cable

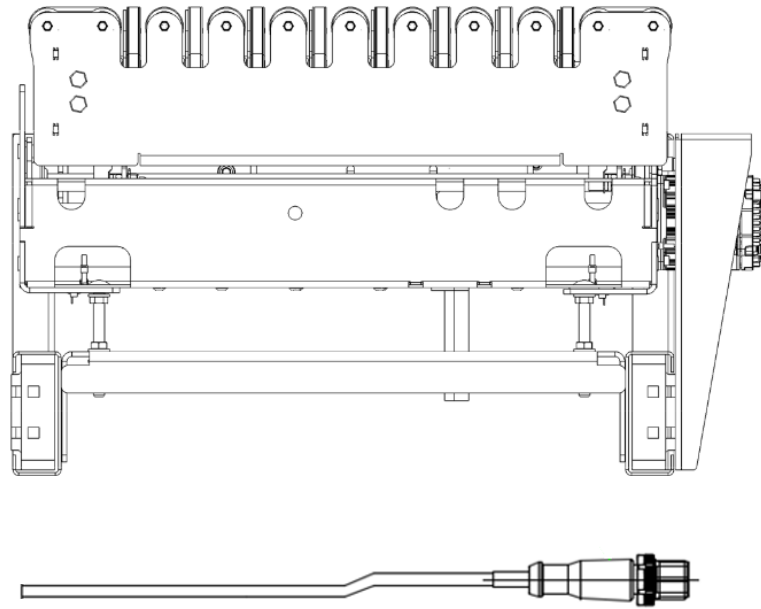


Figure 26: HRT Down Proximity Sensor Control
Hardware and Cable

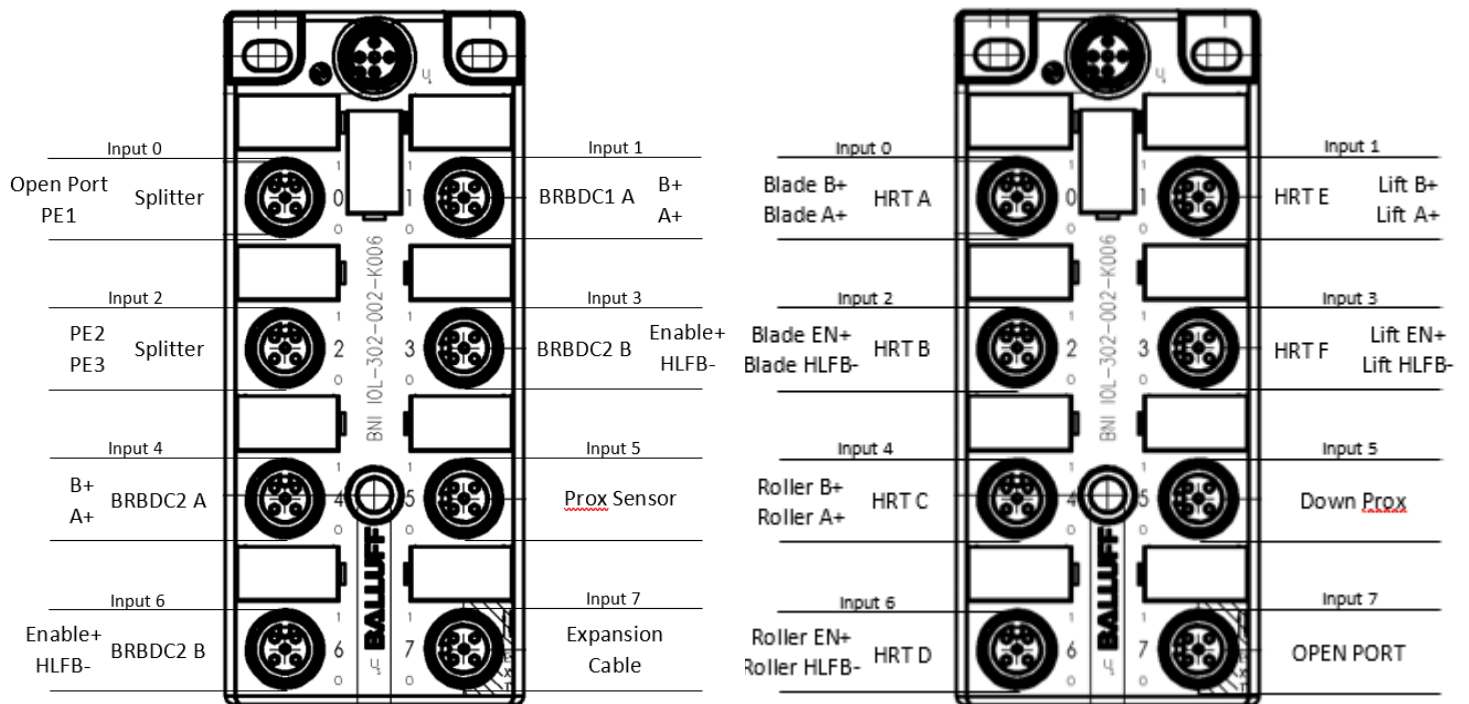


Figure 27: Balluff IO Expansion Blocks

5.2.2.4 HRT Wire Harness Installation Instructions

The wiring harnesses for the HRT are designed to be easy to install, however, a standard procedure should be followed to aid in installation.

1. Refer to the hardware component overview to determine the total number of components that will need wiring harnesses.
2. Refer to the wiring harness hardware overview to determine the wire harnesses that will be needed for the hardware components in your MBS system.
3. Ensure that all of the hardware components are seated properly and are in their correct positions in relation to the HRT module (these will come pre-installed).
4. Locate the Balluff I/O cards on the side of the HRT module and make sure that you have correctly identified which is the IO-Block Hub and expansion module.
5. Install the power harnesses at their respective power supply (comes pre-installed on side of HRT module).
6. Make sure that the correct length of extension power cable is wired to reach the first Teknic motor in the HRT module (BRBDC 1 Teknic Motor)
7. Once you have reached the Teknic motor with the correct extension cable length plug in the accompanying power cable to the motor at the two pin terminal. Make sure that the light on the Teknic motor lights up.
8. Follow the same procedure for the rest of the Teknic motors in the HRT module. Make sure that each of the lights on the Teknic motors have turned on.
9. Starting at the first Teknic motor, plug in the pre-built Molex to M12 cable to the eight pin connector.
10. Route this cable as cleanly as possible to the Balluff card at the appropriate port as described above.
11. Repeat steps 3-10 for all of the Teknic motors in the HRT module.
12. Repeat steps 3-10 for the photo-eyes and proximity sensors. Make sure their accompanying power lights turns on.
13. Make sure all cables have been neatly tucked in to the side channels on the conveyor and make sure cables have been managed as cleanly as possible.
14. Once all HRT standard sections have been wired this way, you may proceed to the PLC testing section 5.3.4.
15. If HRT modules are not working appropriately during initialization and troubleshooting process, please refer back to the port connections and harness connections detailed in the previous section.

6 **Controls**

6.1 **How to Design a Modular Sorter:**

1. Panel
 - a. PWS
 - i. Each PWD or HRT Module will use 48V @20A.
 1. Bastian Conveyor will group up to 4 of these PWS together in PWS box (80A)
 - ii. Bastian Controls will need to provide Health Check to each PWS Box
 1. Even though there are 4 individual PWS in one box. You should daisy chain the DC OK Signal through all Available PWS.
 2. If a customer requires each PWS to be monitored, then you will need to provide an input per PWS
 - iii. System Stop
 1. When designing the PWS you can put them with other PWS if needed
 2. If they are tied with other PWS on a system stop and reset the PWD and HRT for your sorter will need to rehome. Account for an additional 10 seconds before releasing into the sorter if this is the case.
 - b. Master Block
 - i. You can have up to 8 diverts on one Master Block
 - ii. Bastian Controls will need to supply 24VDC, 0VDC and an ethernet
 1. The Master block can be power by one Channel of a MURR CB
 2. There are two locations for 24VDC/0VDC both will need to be wired in the field.
2. Field Devices
 - a. Field Devices
 - i. PWS Health Check
 1. Previously mentioned with the PWS for Each PWS BOX Bastian Controls needs to provide a DC Health Check.
 - ii. Scanner Trigger
 1. The scanning solution is not part of the MBS and will need to be provided by Bastian Controls.
 - iii. Induct PE
 1. You will need to provide an Induct PE to the sorter
 - iv. Encoder
 1. Bastian Conveyor will provide an encoder, but Controls needs to plan for an IO Point for the device.
 2. This IO point can be sourced from a Standard IO point with a reduced RPI of 10ms. This IO point will be used in the fast task like our standard sorters. This decision is up to the Controls design Engineer if the IO needs to go to the PLC rack or over ethernet. Both have been used in the field and work.

6.2 How to Program a Modular Sorter

1. An MBS example will be added to the standard code. Use this as a start if you only have one.
 - a. There will be an example for HRT and PWD
2. If an MBS is added to previous code Follow these steps when adding it to avoid issues with messages getting deleted.
 - a. Add IO Baluff IO block in Io tree (keep name)
 - b. Then import into program
 - c. Then rename
 - d. Verify that you don't have any warnings for misconfigured messages.

6.3 How to Commission a Modular Sorter

1. Check All IO
 - a. Verify that the PWS are Powered on and we can see the HealthChecks in the code.
 - b. Verify setup of encoder. I used 8 PPR on the encoder but I look for a high and low signal for a total of 16 PPR.
 - c. PWD (AOI_MBS_IO_CHECK) shown in Figure 28.

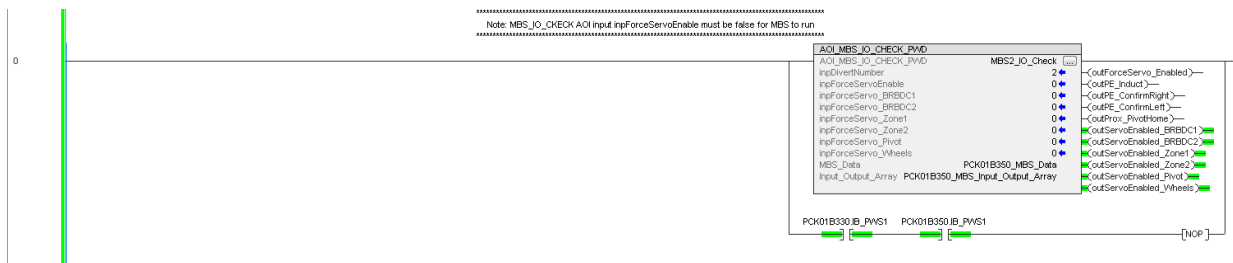


Figure 28: PWD AOI_MBS_IO_CHECK

- d. HRT (AOI_MBS_IO_CHECK) show in Figure 29.

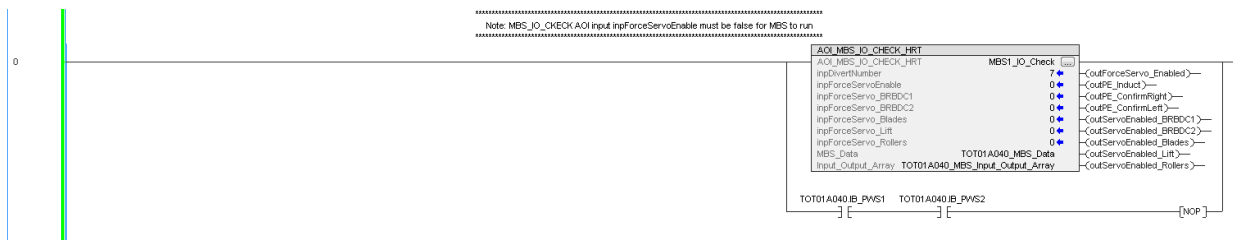


Figure 29: HRT AOI_MBS_IO_CHECK

2. Tach Each Belt and Match Speed, Direction and Acceleration
 - a. Use the ClearPath Software to make any program changes needed.
 - i. This step can also be done by the site team.
3. Set Divert Type (will copy to each divert once ran)
 - i. 0 = PWD (Will be default)
 - ii. 1 = HRT
4. Set Divert Direction (will copy to each divert once ran) Some Zones may run backwards until configured correctly.
 - i. 0 = left
 - ii. 1 = right

- iii. 2 = bi- directional
- 5. Run Calibration
 - a. Run a box through the induction photoeye through the end of the sorter.
 - i. Toggle MBS_Data.Inputs.Run_Calibration
 - ii. Run Box
 - iii. This will calculate divert lane locations
 - iv. Verify MBS_Data.Outputs.Calibration_Complete
 - b. Run the smallest box through the induction pe
 - i. Toggle MBS_CalcMinCartonLengthSTART
 - ii. Run Smallest Box
 - iii. Will Calculate Smallest Box Size. Default is 80% of smallest box size
 - iv. This value can be changed later
 - c. Run the largest box through the induction pe
 - i. Toggle MBS_CalcMaxCartonLengthSTART
 - ii. Run Largest Box
 - iii. Will Calculate Largest Box Size. Default is 120% of largest box
 - iv. This value can be changed later
 - d. Set Minimum Gap
 - i. Toggle MBS_CalcSetMinGapSTART to provide a minimum gap for the sorter
 - ii. This value can be changed later
 - e. Set Divert Delay
 - i. If PPR is filled out correctly then toggle MBS_CalcDivertWindowDelaySTART.
 - ii. The code will calculate the divert delay needed.
 - iii. Test by running box and round robin to lane
 - iv. This value can be changed later if needed
 - f. Calculate Divert Confirm Offset for Lane X
 - i. Set Divert Number in first rung
 - ii. Toggle MBS_CalcDivertConfirmOffset_START and run a box
 - iii. Will Copy the value into lane 1 and then copy the value into all lanes
 - iv. Verify Divert Confirm by going to the divert confirm code and verify the last box received a 100.
 - g. Test and Verify as much as you like.
 - h. Provide Any feedback for update to this list to Controls Engineering Team Lead or Manager.

6.4 BALLUFF IO-Block Hub Configuration

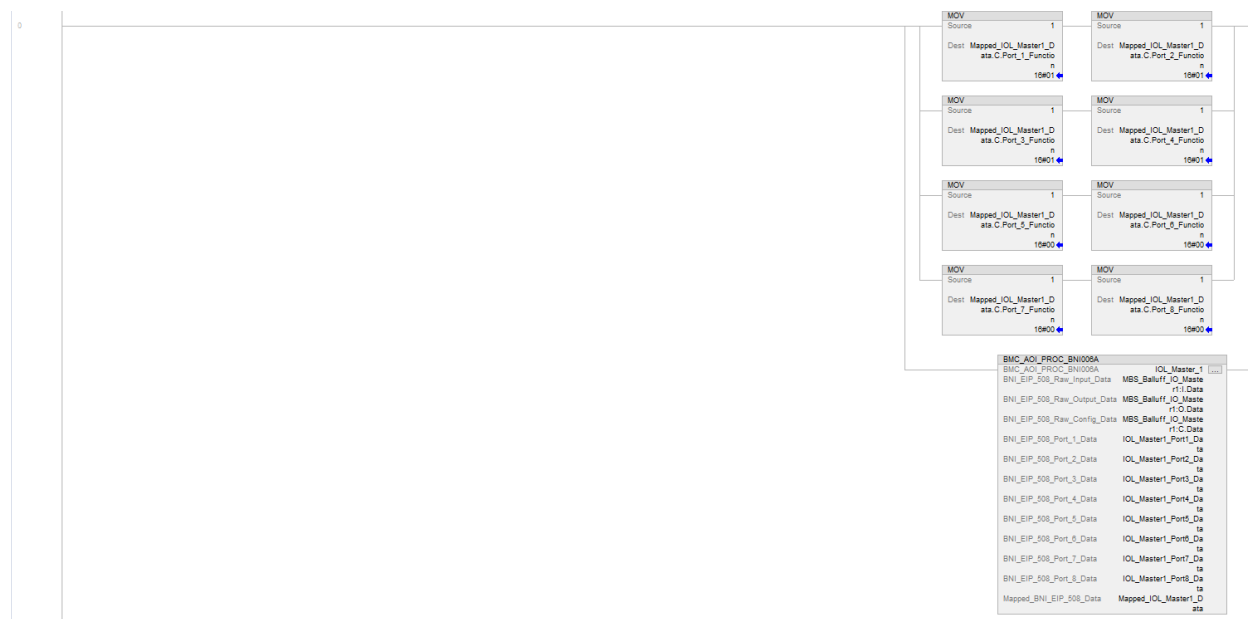


Figure 30: Balluff IO-Block Hub Port Configuration

The MBS utilizes a Balluff IO-block controller to accept incoming signals and actuate signal to and from the PLC. This portion of the Balluff IO-Block Hub Mapping controls which ports or expansion blocks are currently active for control. A 1 in the “MOV” command sets the port as active on the BALLUFF IO-Block Hub.

6.5 MBS Balluff Expansion IO-Block Configuration

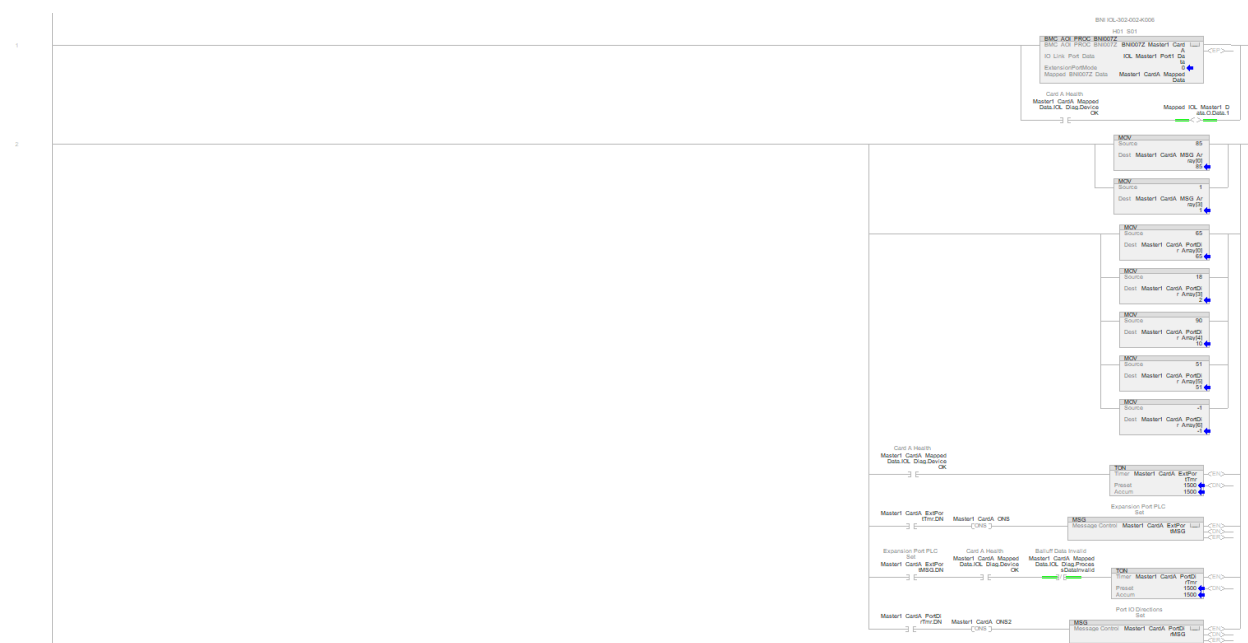


Figure 31: Balluff Expansion IO-Block Configuration

This portion of the code controls the configuration of expansion block modules and makes sure that open pins and ports are correctly configured for the standard input and output mapping of the MBS. The commissioning controls engineer will not have to change any of the settings in the Balluff configuration section unless additional IO-Block Hub blocks are utilized.

6.6 MBS Input and Output AOI Balluff IO-Link Routine

AOI_MBS_PWD_BALLUFF_Input_Mapping

AOI_MBS_PWD_BALLUFF_...	Master1_Input_Mappin	...
Master_Number	9	1
MBS_Data	MBS1_Data	
Input_Output_Array	MBS1_Input_Output_Ar	ray
CardA_MappedData	Master1_CardA_Mapped	Data
CardB_MappedData	Master1_CardB_Mapped	Data
CardC_MappedData	Master1_CardC_Mapped	Data
CardD_MappedData	Master1_CardD_Mapped	Data
CardE_MappedData	Master1_CardE_Mapped	Data
CardF_MappedData	Master1_CardF_Mapped	Data
CardG_MappedData	Master1_CardG_Mapped	Data
CardH_MappedData	Master1_CardH_Mapped	Data

AOI_MBS_PWD_BALLUFF_Output_Mapping

AOI_MBS_PWD_BALLUFF_...	Master1_Output_Mappi	...
Master_Number	ng	1
MBS_Data	MBS1_Data	
Input_Output_Array	MBS1_Input_Output_Ar	ray
CardA_MappedData	Master1_CardA_Mapped	Data
CardB_MappedData	Master1_CardB_Mapped	Data
CardC_MappedData	Master1_CardC_Mapped	Data
CardD_MappedData	Master1_CardD_Mapped	Data
CardE_MappedData	Master1_CardE_Mapped	Data
CardF_MappedData	Master1_CardF_Mapped	Data
CardG_MappedData	Master1_CardG_Mapped	Data
CardH_MappedData	Master1_CardH_Mapped	Data

Figure 32: Input and Output AOI for MBS

The MBS standard code comes with input and output mapping control for one MBS and one IO-Block Hub block standard. In order to add additional IO-Block Hub blocks to a single MBS or more MBS's to a project, the controls commissioning engineer will add additional AOIs for each IO-Block Hub block for any MBS in the system.

Tag naming should be changed from "IO-Block Hub1" and "MBS1_Data" to "IO-Block Hub2" and "MBS2_Data" respectively if the engineer wishes to add either more IO-Block Hub blocks to the same MBS

or another MBS entirely. The “IO-Block Hub” number will also change corresponding to the new tag convention for additional IO-Block Hub blocks added to a single MBS.

The naming for expansion block configuration should also be changed from “IO-Block Hub1” to “IO-Block Hub2” and so on as additional IO-Block Hub blocks are added.

The easiest way to accomplish this is to import another Balluff IO-Block Hub block mapping routine and ctrl + h replace all “IO-Block Hub1” strings to “IO-Block Hub2” and redefine the tagging.

6.7 Internal MBS Input and Output AOI Balluff IO-Link Routine

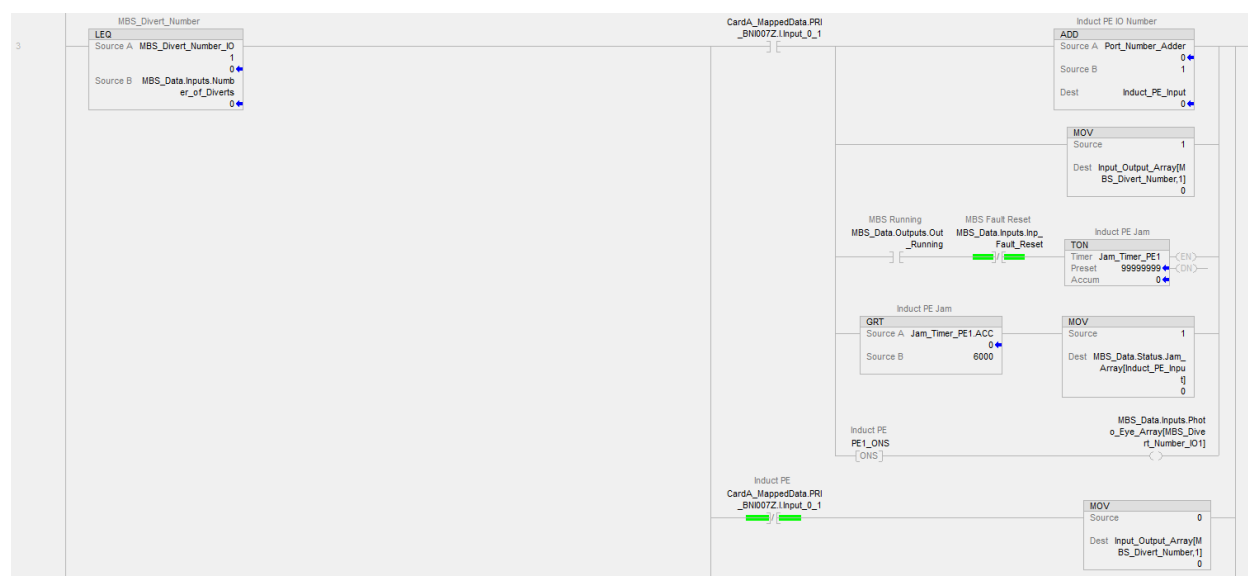


Figure 33: Internal to Input and Output AOI for MBS

Both the input and output MBS mapping AOIs can be opened to investigate specific signals that are being actuated at any given time on the MBS. The divert to which the inputs and outputs correspond will always be listed at the beginning of each divert’s rung. All inputs and outputs are commented and labelled internal to the input and output mapping AOIs.

6.8 Adding a second MBS or additional Balluff IO-Block Hub Blocks to a system

The MBS is configured to work with any number of MBS’ on the same system. However, during commissioning, there is a specific set of instructions necessary for adding additional Balluff IO-Block Hub Blocks and MBS data structures. Each Balluff IO-Block Hub block will support a maximum of 8 divers.

6.8.1 Adding an additional IO-Block Hub block to a sorter

1. Import another `_BALLUFFXX_IO_Link_IO-Block Hub .L5X` routine for each additional IO-Block Hub block necessary in the system.

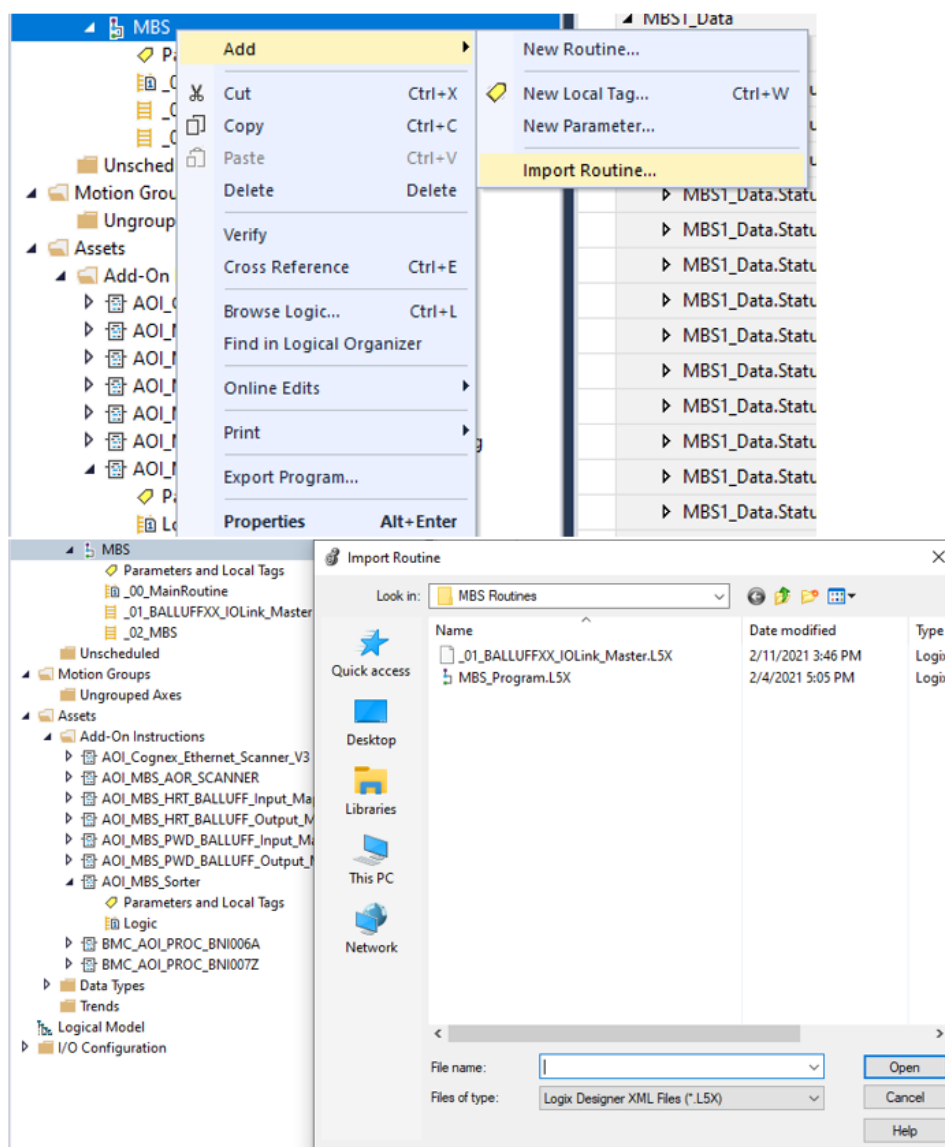


Figure 34: Importing Additional MBS IO-Block Hub

2. Add the corresponding IO-Block Hub X number Balluff network module to the ethernet devices list

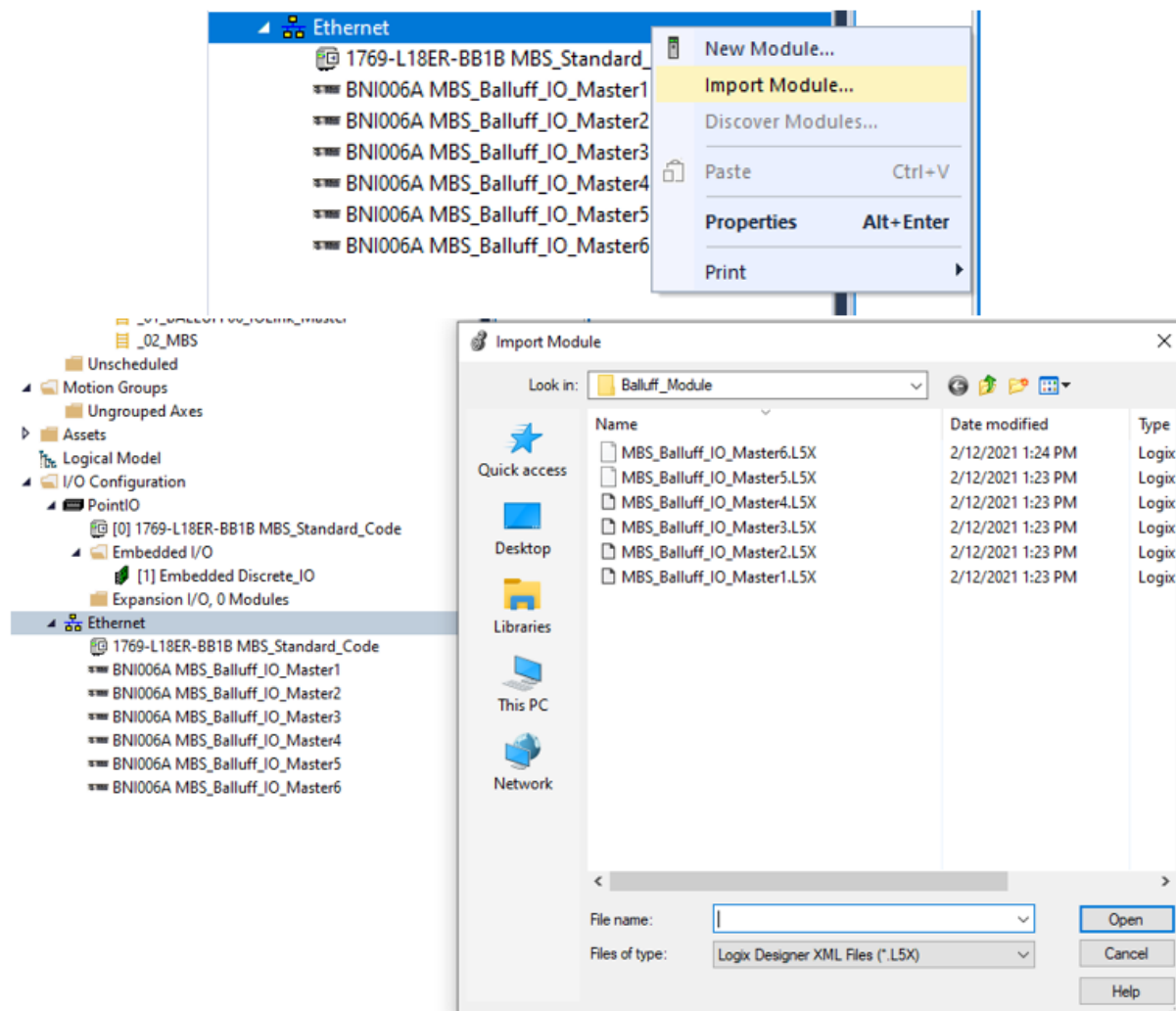


Figure 35: Importing Additional MBS Balluff Ethernet Modules

3. If adding an additional MBS to the system, change the MBS_Data and Input_Output_Array in rung 16 AOIs to match a second corresponding MBS data structure.

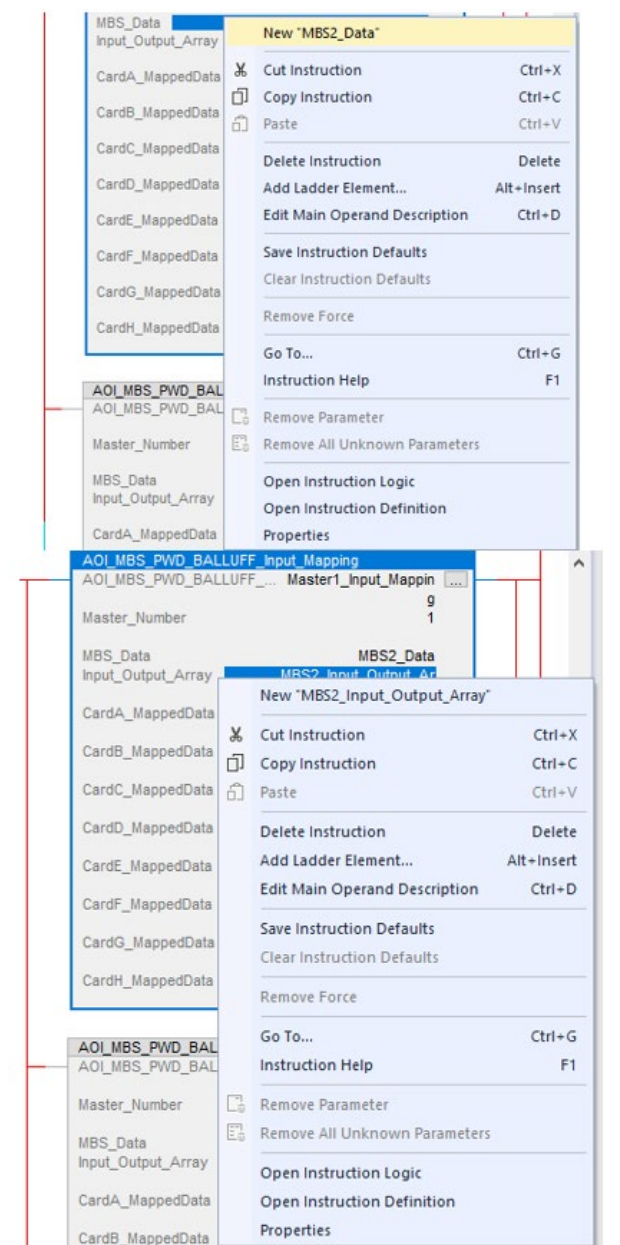


Figure 36: Defining New MBS_Data and Input_Output UDT Arrays

7 Maintenance and Operation

The longevity and proper functionality of BSC is based upon standard operating practices and general maintenance of equipment. Setting up a regular maintenance schedule will help to ensure that products comply with the equipment's warranty.



Lockout/Tagout (LOTO) procedures should be implemented before performing any maintenance.

7.1 Safety During Operation

The list below explains a series of recommended precautions that should be taken when personnel are near the equipment. This list is not intended to be the only precautions taken, but it serves as a guide of important steps to follow.

- Only fully trained employees should operate or perform maintenance on the conveyors.
- Proper training should include the detailed description of fail-safes, stopping devices, or other emergency regulations put in place.
- WARNING stickers should be replaced if worn or damaged.
- All personnel in the area should be alerted prior to starting any conveyor at all times. This process may vary depending on the conditions and layout of the site, but it should use audible and visual cues and all personnel should be made aware of the protocol.
- Operators should inspect the conveyor for damage, or foreign objects prior to engaging drive.
- Ensure that all areas are clear of objects prior to loading and unloading.
- No personnel should ever ride, climb, step, sit on, or otherwise put body weight on the conveyor. Doing so puts both personnel and equipment at risk.
- Maintenance should be performed at regular intervals to assure the safety of operators and the longest life of components. Should a component break during operation or prior to operation, then lockout/tagout instructions should be performed immediately to prevent exposure to hazards.

7.2 Maintenance Schedule

To prolong the life of your material handling equipment and reduce the risk of potential safety hazards, it is vital that a preventative maintenance program be set in place and be followed. The following instructions will help identify key areas requiring maintenance.

7.2.1 Mechanical Service

Mechanical Service for HRT(s) and PWD(s) can be found in their respective manuals. The RLVDC(s) and BRBDC(s) are specific to the MBS and their maintenance is found in this manual.

- A visual and auditory inspection of the equipment should be performed to identify unusual noise that may indicate that there is a problem with the equipment.
- Belts on BRBDC(s) should be inspected for excessive wear or improper tracking if applicable.

7.2.2 Electrical Service

- Electrical connections must be made in accordance with local regulations.
- Keep sensors free from dust, grease, and other debris and make sure mounting brackets are secure.
- Inspect panels regularly for loose wires or connections and tighten as required.
- Keep panels free of dust by wiping them down regularly.

- Refer to separate electrical manuals provided for additional maintenance procedures. All electrical procedures must be carried out in accordance with said manual.

7.2.3 RLVDC Maintenance

Poly-V bands are not easily stretched by hand. Therefore, when replacing rollers, it is advised to start at one end of the zone and remove each roller one by one until the roller needing replacement has been reached as shown in Figure 37. However, rollers that are directly connected to a Teknic motor in each zone will need their drive band tension to be relaxed. Figure 38 shows the rollers that are directly connected to the Teknic motors for a 24in OAW, 18in long zone. The locations of the rollers that are directly connected to the Teknic motor may change based on the size of the zone.

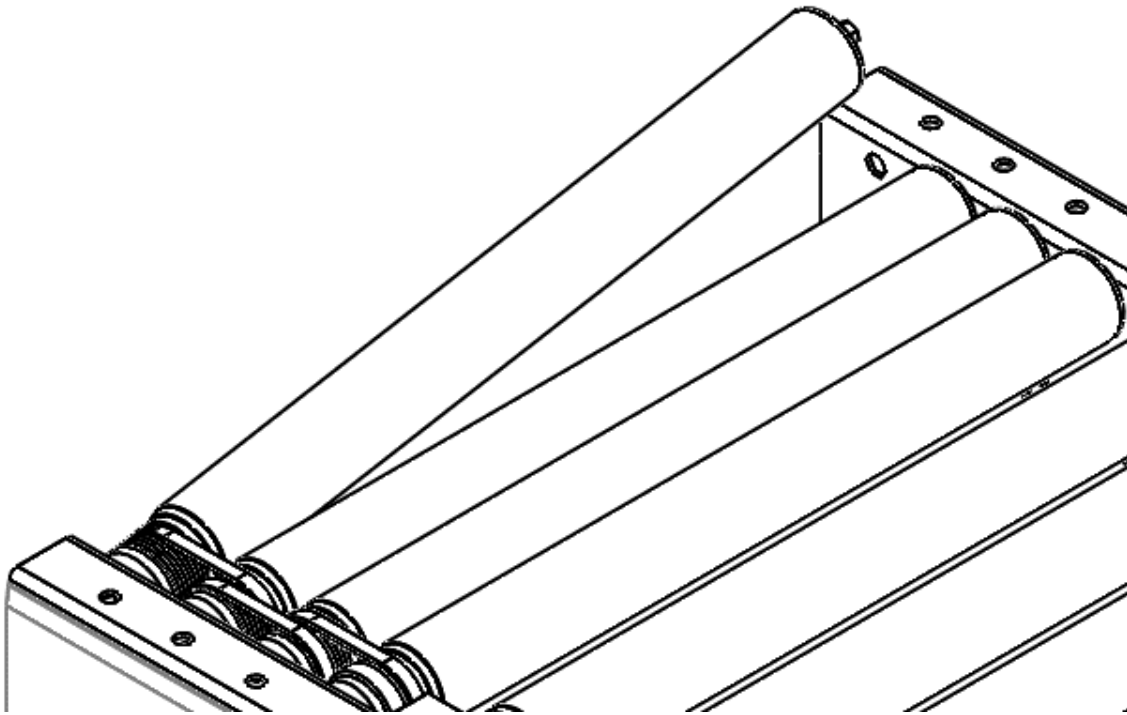


Figure 37: Roller Replacement-1

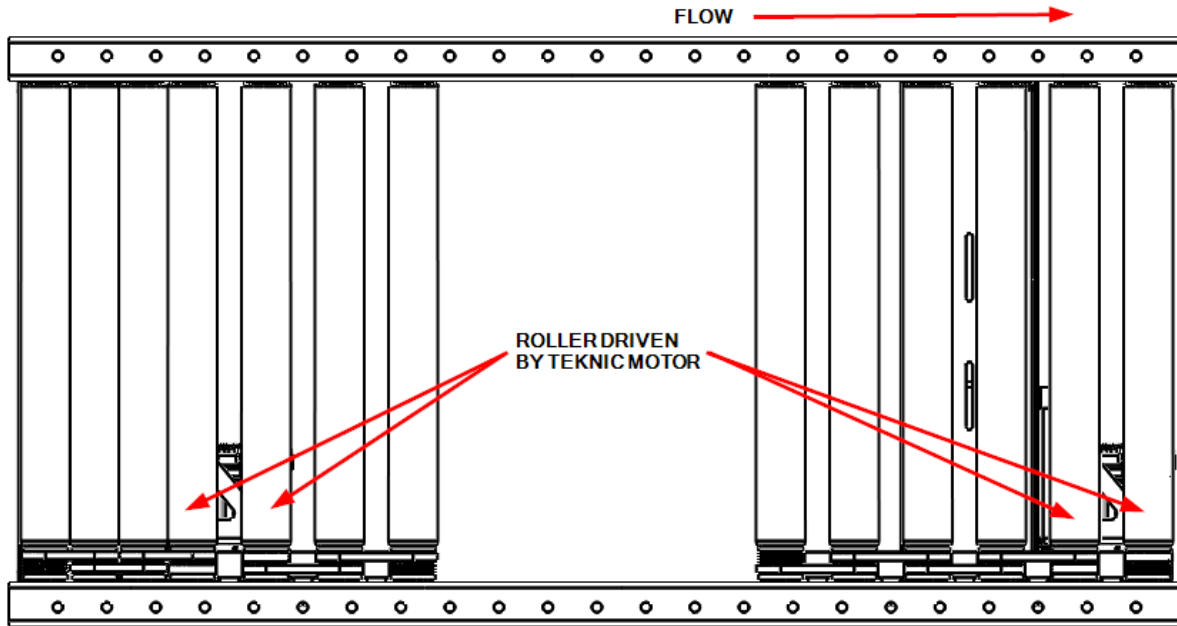


Figure 38: Roller Replacement-2

7.2.3.1 RLVDC-Replacing rollers (not directly connected to Teknic):

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Remove the side cover from the intended work area.
3. Remove the belt guards of corresponding rollers to be removed.
4. Apply pressure on the end of the hex shaft on the non-band side with a small diameter punch or similar tool until the shaft clears the frame (Refer to Figure 39).

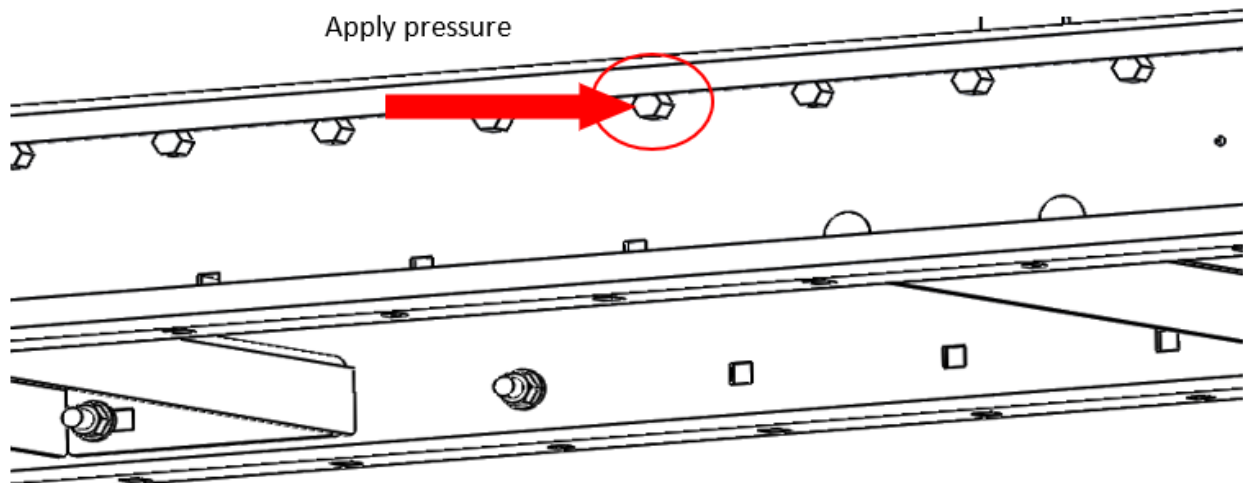


Figure 39: Roller Removal-3

5. Lift the roller body until the hex is sitting above the side frame. Refer to Figure 39. (A putty knife or other flat surface tool is recommended to be placed between the hex shaft and the inside of the frame. This will help protect the paint on the side frame.)
6. Remove the hex shaft from the opposite hex hole.

7. Pull the roller away from the band(s) until the roller is completely free of the side frames and band(s).



NOTE

Keep Poly-V bands to use for re-installation of rollers.

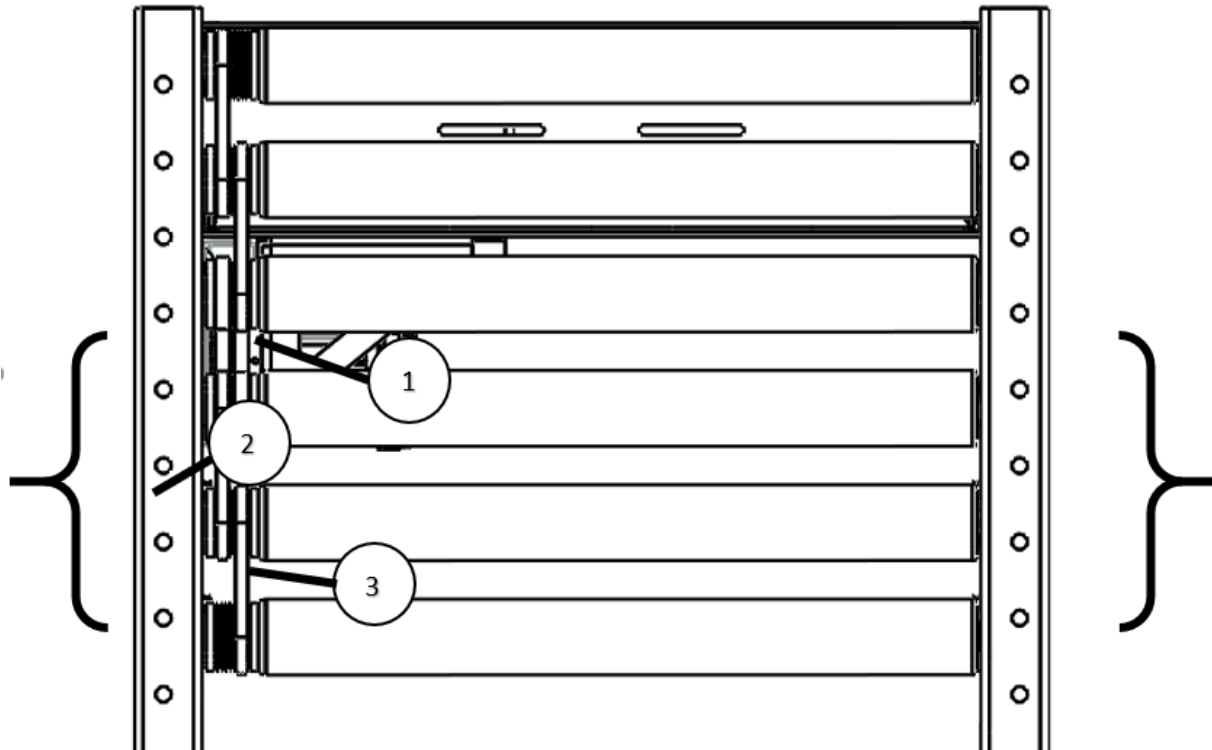
9. Slide the new roller through the band of the adjacent roller that has not been removed.



NOTE

Ensure that Poly-V bands alternate positions on the inside and outside of the hub as shown in Figure 40.

Figure 40: RLVDC Roller Removal-4, Belt Guards Hidden



10. Once the new roller is through both bands, guide the hex shaft into the hex hole on the band side.

12. Repeat steps 9-10 for each roller until all rollers have been re-installed.
13. Install all belt guards that were removed in step 3.



Ensure that the bands do not rub against the guards.

14. Track the Poly-V bands as described in section 7.2.3.5.

15. Replace the side covers.

7.2.3.2 RLVD-Replacing rollers (connected to Teknic motor):

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Remove the side cover from the intended work area.
3. Allow the motor to move within the mounting slots by loosening the four bolts shown in Figure 41

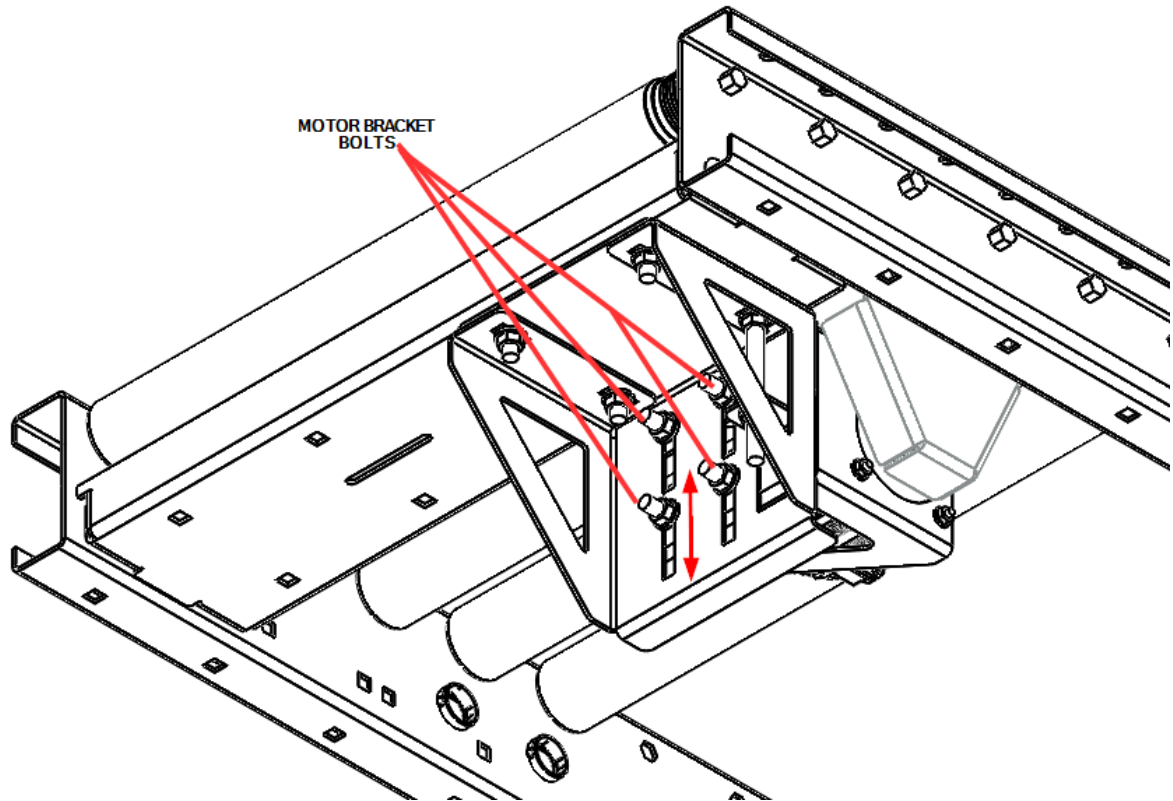


Figure 41: RLVD Motor Bracket Mounting Bolts

4. Using the top nut on the tensioner bolt shown in Figure 42, move the motor mount assembly towards the conveyor to relax the tension on the drive bands.

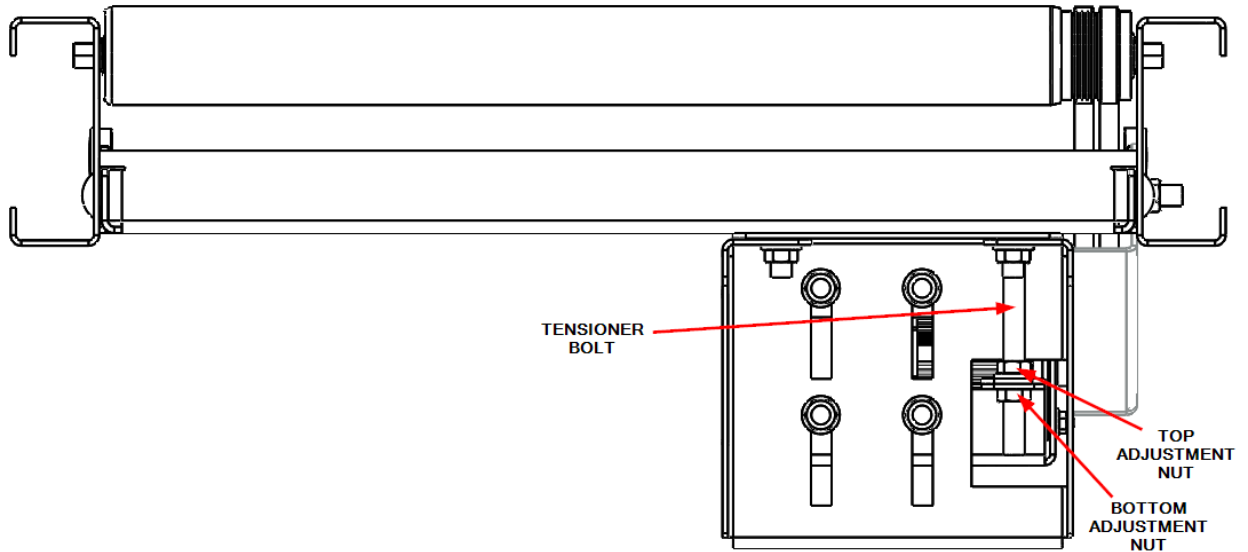


Figure 42: RLVDC Motor Drive Band Tensioner Bolt

5. Remove the rollers from the end of the zone to replace drive roller by following steps 3-8 of section 7.2.3.1
6. Route the Teknic drive band around hub of replacement drive roller.
7. Re-install rollers in the zone by following steps 9-13 of section 7.2.3.1.
8. Using the top and bottom nuts on the tensioner bolt as shown in Figure 42, move the motor mount assembly away from the conveyor to tension the drive bands.



The drive bands have been tensioned properly when there is no slip on the motor pulley or the drive rollers during operation. Repeat steps 8-9 until there is no slip during operation.

9. Torque the four bolts on the motor mount to 31ft-lbs.
10. Track the Poly-V bands as described in 7.2.3.5.
11. Replace the side covers.

7.2.3.3 RLVDC-Replacing Bands (not connected to Teknic motor)

Poly-V bands are not easily stretched by hand. Therefore, when replacing bands, it is advised to start at one end of the conveyor and remove each roller one by one until the band needing replacement has been reached.

1. Follow the lockout/tagout procedure in place to ensure safety
2. Remove the side covers from the intended work area.
3. Repeat steps 3-7 of section 7.2.3.1 for standard rollers until the band needing replacement has been removed.
4. Install the replacement band onto the hub of the Poly-V roller.



Ensure that the Poly-V bands alternate positions on the inside and outside of the hub as shown in Figure 40.

5. Repeat steps 9-13 of section 7.2.3.1 for standard rollers until all rollers have been re-installed.
6. Track the Poly-V bands as described in 7.2.3.5.
7. Replace the side cover.

7.2.3.4 RLVDC-Replacing Bands (connected to Teknic)

Poly-V bands are not easily stretched by hand. Therefore, when replacing bands, it is advised to start at one end of the conveyor and remove each roller one by one until the band needing replacement has been reached.

1. Follow the lockout/tagout procedure in place to ensure safety
2. Remove side covers from the intended work area.
3. To relax drive band tension, follow steps 3-4 of section 7.2.3.2.
4. Remove guard from Teknic motor by loosening two bolts as shown in Figure 43.

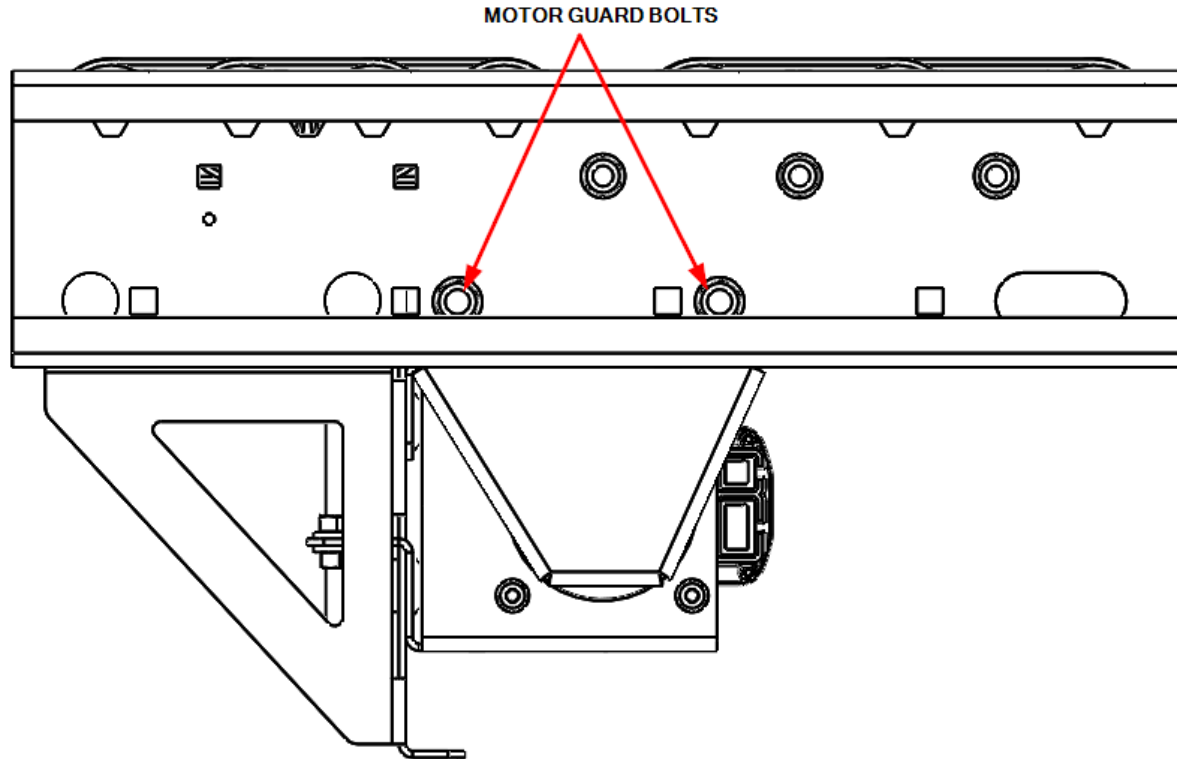


Figure 43: RLVD Motor Guard Mounting Bolts

5. Repeat steps 3-7 of section 7.2.3.1 for standard rollers until the band needing replacement has been removed from the roller and the motor pulley.
6. Install the replacement band onto the hub of the Poly-V roller and motor pulley.
7. Repeat steps 9-13 of section 7.2.3.1 for standard rollers until all rollers have been re-installed.



Ensure that the Poly-V bands alternate positions on the inside and outside of the hub as shown in Figure 40.

8. Using the top and bottom nuts on the tensioner bolt as shown in Figure 42, move the motor mount assembly away from the conveyor to tension the drive bands.



Drive bands have been tensioned properly when there is no slip on the motor or drive rollers during operation. Repeat steps 8-9 of section until there is no slip during operation.



Ensure that the bands do not rub against the guards.

9. Torque the four bolts on the motor mount to 31ft-lbs as shown in Figure 42.
10. Track the Poly-V bands as described in 7.2.3.5.
11. Install the motor guard using two bolts as shown in. Torque the bolts to 31ft-lbs

12. Replace the side cover.

7.2.3.5 RLVDC-Tracking Poly-V bands

Poly-V bands should be tracked to prevent excessive wear and extend the life of the bands. Bands are tracked properly when they are not rubbing against each other and all of the ribs are within the grooves on the hub of the roller.

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Turn the roller that is attached to the band needing tracking.
3. Apply a liner force to the side of the band near the hub of the roller while simultaneously turning the roller.
4. Repeat until all bands are free from contacting each other and within the grooves of the roller hub.



Ensure that the bands do not rub against the guards.

7.2.3.6 RLVDC-Replacing Motor Pulley

1. Follow the lockout/tagout procedure in place to ensure safety.
2. To relax the drive belt tension, follow steps 3-4 of section 7.2.3.2.
3. Remove the motor guard by loosening two bolts as shown in Figure 43.
4. Remove the loose drive bands from the motor pulley.
5. Remove the motor pulley by loosening two setscrews as shown in Figure 44



Motor shaft is keyed. Be careful not to lose key.

6. Install the replacement pulley using two setscrews and key as shown in Figure 44. Torque #10-32 set screws to 80in-lbs.

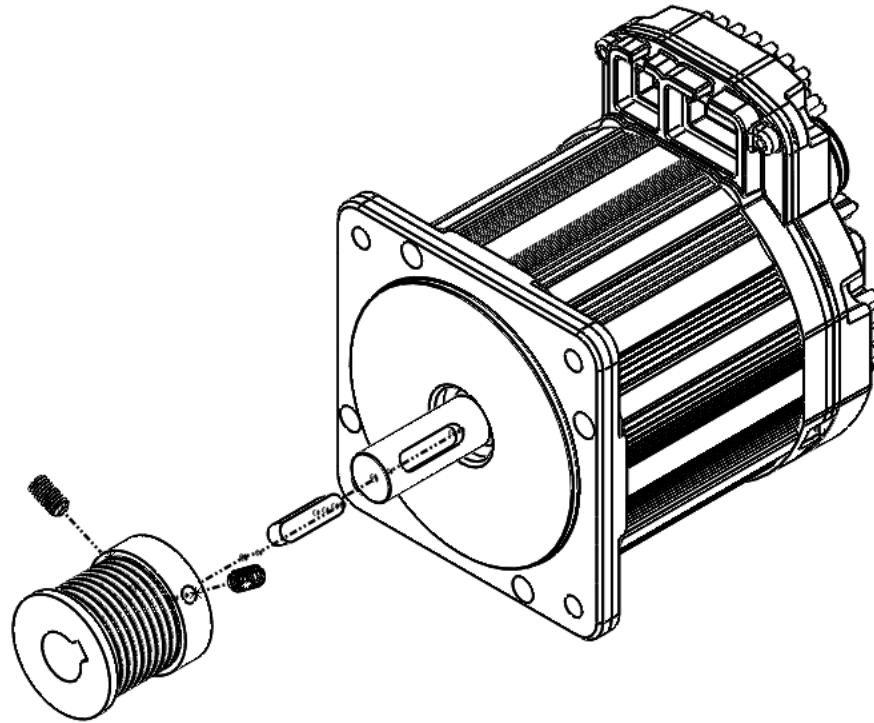


Figure 44: RLVDC Teknic Motor Pulley Assembly

7. Route the loose drive bands around the replacement motor pulley.



Ensure that the bands do not rub against the guards.

8. Using the top and bottom nuts on the tensioner bolt as shown in Figure 42, move the motor mount assembly away from the conveyor to tension the drive bands.



Drive bands have been tensioned properly when there is no slip on the motor or the drive rollers during operation. Repeat steps 8-9 of section until there is no slip during operation.

9. Tighten the four bolts on the motor mount as shown in Figure 45. Torque the bolts to 31ft-lbs.
10. Install motor guard using two bolts as shown in Figure 43.

7.2.3.7 RLVDC-Replacing Teknic Motor

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Relax the drive belt tension by following steps 3-4 of section 7.2.3.2.
3. Remove the motor pulley by following steps 3-5 of section 7.2.3.6.
4. Remove the Teknic motor from the mounting bracket by loosening four bolts as shown in Figure 45.
5. Install the replacement motor to the mounting bracket using the four bolts in Figure 45. Torque the bolts to 81in-lbs

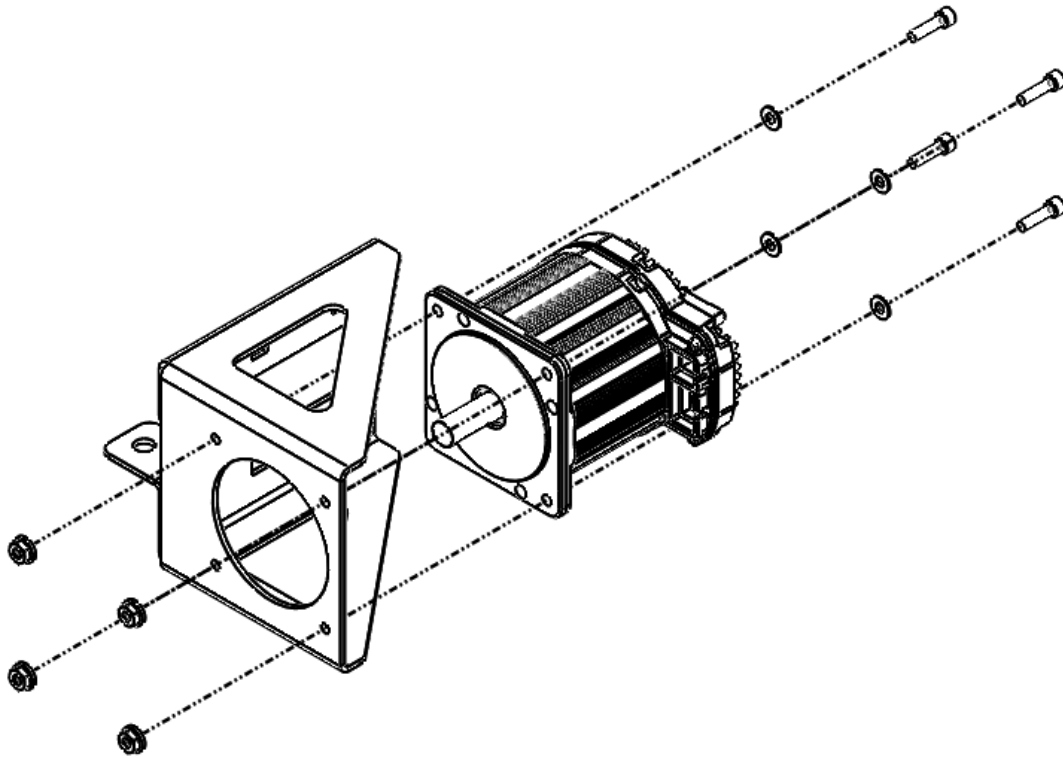


Figure 45: RLVDC Motor Mount

6. Install the motor pulley and tension the drive bands by following steps 6-9 of section 7.2.3.6.
7. Install the motor guard using two bolts as shown in Figure 43. Torque the bolts to 31ft-lbs

7.2.4 BRBDC Maintenance

7.2.4.1 BRBDC-Replacing Idler Rollers



Belt does not need to be removed to replace the idler rollers.

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Remove the side cover from the intended work area.
3. Locate the roller needing replacement and apply pressure on one end of the hex shaft with a small diameter punch or similar tool until the shaft clears the frame (refer to Figure 46).
4. Lift up on the roller body until the hex is sitting above the side frame. Refer to Figure 46 (belt hidden for visibility of rollers). A putty knife or other flat surface tool is recommended to be placed between the hex shaft and the inside of the frame. This will help protect the paint on the side frame.

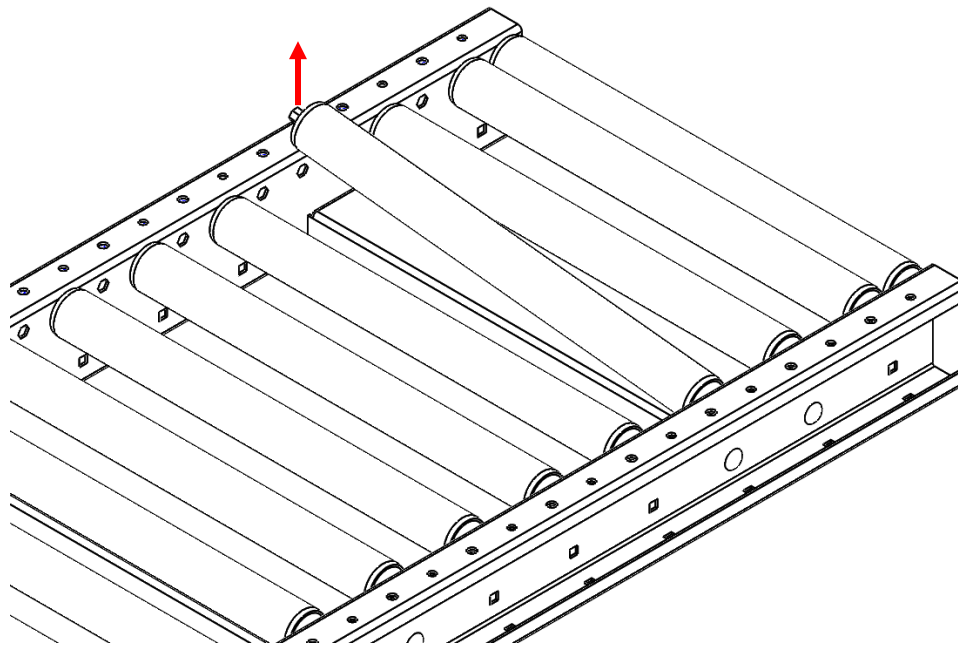


Figure 46: Removing Idler Roller from BRBDC (Belt Hidden)

5. Remove the hex shaft from the opposite hex hole and slide out from underneath the belt.
6. Slide the replacement roller underneath the belt and guide the hex shaft into hole in one of the side frames.
7. After the hex shaft is in the hex hole, the opposite side shaft can be inserted into the appropriate hex hole. Use a putty knife or other flat surface tool to guide the hex shaft into the opposite hex hole.



Ensure that the rollers maintain 4" roller spacing and are perpendicular to the side frame as shown in Figure 47.



The infeed of the bed may start with 2" roller spacing for the first two rollers and be 4" for the rest of the bed (refer to Figure 47). The doubled infeed roller depends on the length of the bed.

8. Replace the side cover.

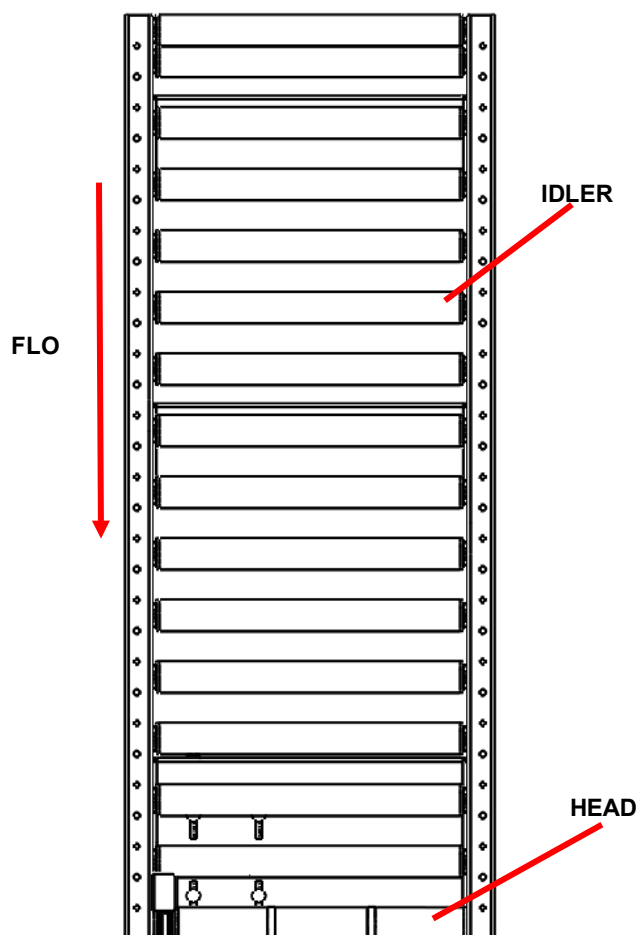


Figure 47: Top View of BRBDC, (Belt Hidden)

7.2.4.2 BRBDC-Replacing Head Roller

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Remove the side covers.
3. Remove encoder from mounting frame (if applicable) by removing the clevis pin that the assembly pivots on.
4. Relax the drive belt tension by loosening (4) bolts and the tensioner bolt as shown in Figure 48.

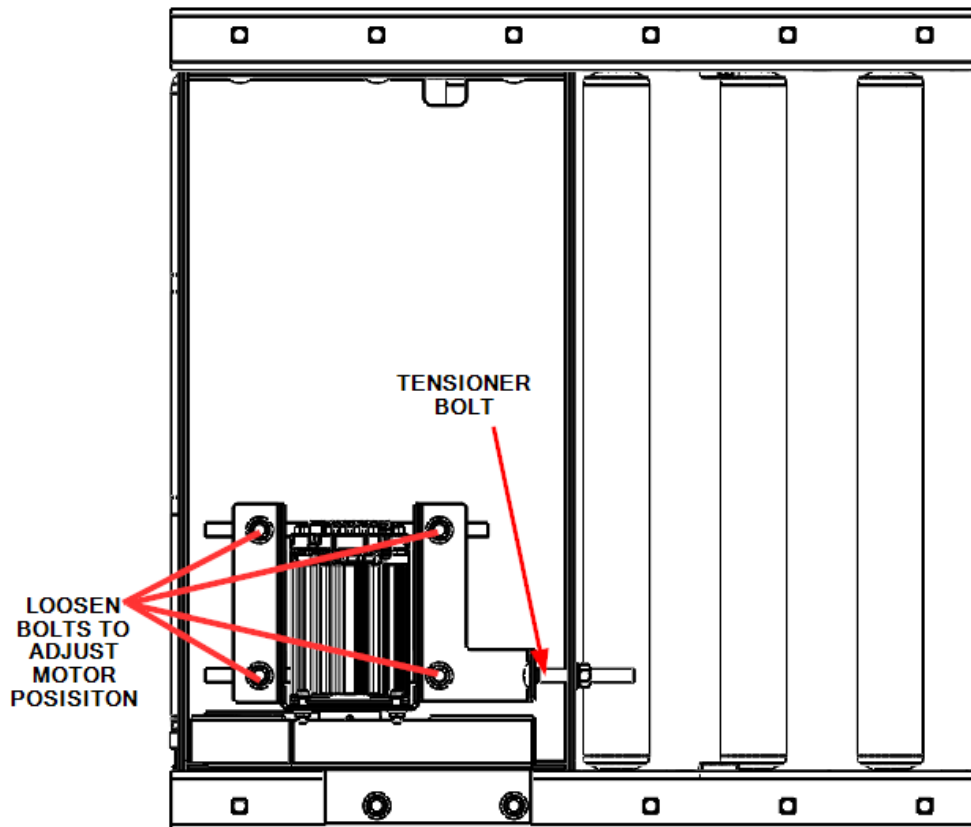


Figure 48: BRBDC Drive Belt Tensioning

5. Begin to relax the conveyor belt tension by removing the second, third and fourth rollers after the most infeed roller. Follow steps 3-5 of section 7.2.4.1 for roller removal.



Do not remove the most infeed roller until the subsequent rollers have been removed.

6. Continue to relax conveyor belt by routing a ratchet strap around each side of the infeed roller and fix the straps to something sturdy upstream of the conveyor.
7. Using ratchet straps, provide equal tension to each side of the roller.
8. Ensuring that ratchet straps are taut, remove infeed roller by applying pressure on one end of the hex shaft with a small diameter punch or similar tool until the shaft clears the frame. Repeat to the other side of hex shaft.



There is a large amount of tension on the conveyor belt. Ensure that the ratchet straps are taut to handle the belt tension.

9. Using ratchet straps routed around infeed roller, relax the conveyor belt tension.
10. Once the conveyor belt and drive belt tension has been relaxed, the head roller can be uninstalled by removing (2) bolts and bevel washers as shown in Figure 49.
11. Remove the head roller from underneath conveyor belt and route the new head roller under the conveyor belt.
12. Route the drive belt around the timing hub of the replacement head roller.
13. Install the head roller using bolts and bevel washers as shown in Figure 49.



Only tighten the head roller hardware finger tight until the conveyor belt has been re-tensioned. This will help with belt tracking.

14. Tension conveyor belt using (2) ratchet straps at the infeed of the conveyor. Begin by slipping one of the idler rollers that was removed underneath the conveyor belt.
15. Route a ratchet strap around each side of the roller to be installed and fix each end to something sturdy upstream of the conveyor.
16. Using the ratchet straps, provide equal tension to each side of the roller to get it near the furthest infeed hex holes.
17. Guide one side of the hex shaft into the hex hole.
18. After the hex shaft is in the hex hole, the opposite side shaft can be inserted into the appropriate hex hole. Use a putty knife or other flat surface tool to guide the hex shaft into the opposite hex hole.
19. Once the most infeed roller has been installed, relax tension on the ratchet straps and push the belt by hand to remove folds in belt that will form.
20. Slide remaining idler rollers underneath the belt and guide the hex shaft into one of the appropriate holes in one of the side frames.
21. After the hex shaft is in the hex hole, the opposite side shaft can be inserted into the appropriate hex hole. Use a putty knife or other flat surface tool to guide the hex shaft into the opposite hex hole.



Ensure that the rollers maintain 4" roller spacing and are perpendicular to the side frame as shown in Figure 47.



The infeed of the bed may start with 2" roller spacing for the first two rollers and be 4" for the rest of the bed (refer to Figure 47). The doubled infeed roller configuration depends on the length of the bed.

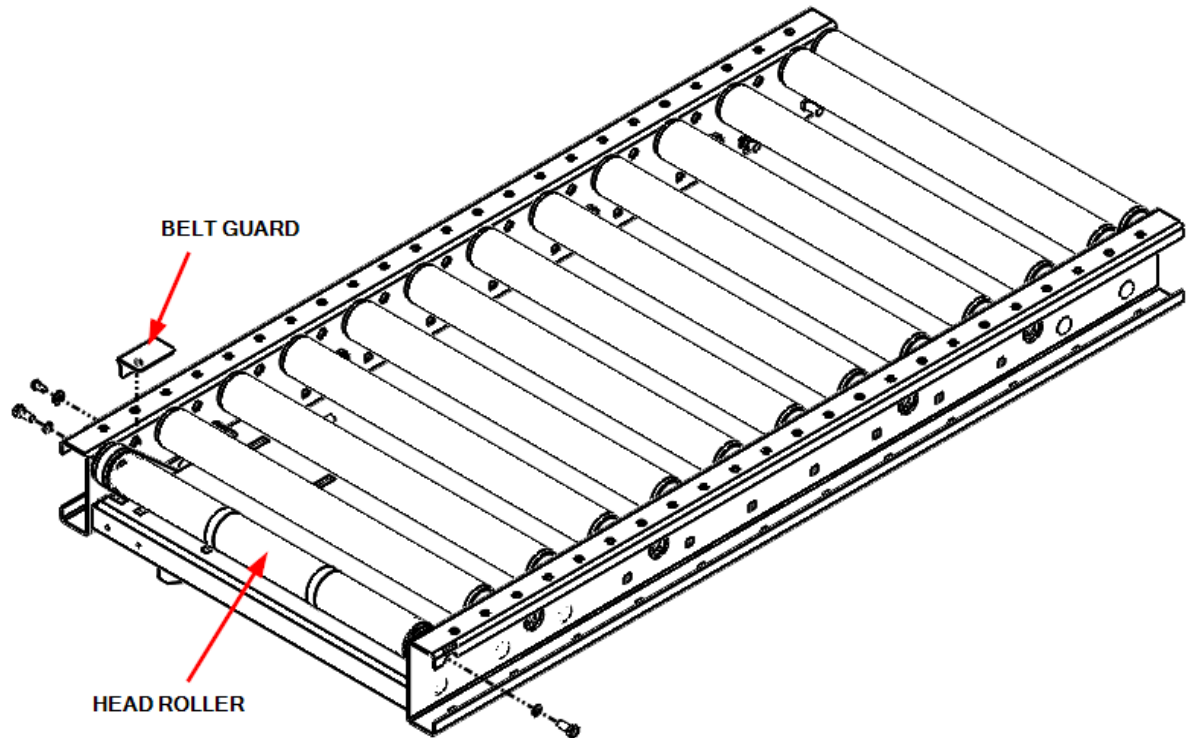


Figure 49: BRBDC Head Roller Installation (Belt Hidden)

22. Finish tightening the head roller by torquing bolts to 209in-lbs.
23. Tension the timing belt using the tensioner bolt as shown in Figure 48 and torquing the mounting bolts to 31ft-lbs. Band should be tensioned to 40-50N (9-11.25lbs).



The timing belt tension is critical to the performance and life of the conveyor. It is recommended to use a sonic tension meter, such as the BTM-1 from Habasit (or equivalent), to measure timing belt tension. Reference the Dodge Synchronous Drive Installation manual (Doc number MN4056). Belt frequency should fall between 89 and 99Hz.



Ensure that the motor shaft is parallel to the head roller and the pulley is positioned where the belt is not able to rub against any part of the conveyor (i.e. belt guards, bed spacer, etc.).

24. Ensure that the belt is tracking appropriately by following section 637.2.4.7.
25. Install the encoder (if applicable) to the bed spacer mount using the clevis pin removed in step 3.
26. Replace the side covers.

7.2.4.3 BRBDC-Replacing Motor Sprocket

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Relax the drive belt tension by loosening (4) bolts and the tensioner bolt as shown in Figure 48.
3. Remove the motor guard by loosening (2) bolts as shown in Figure 50.

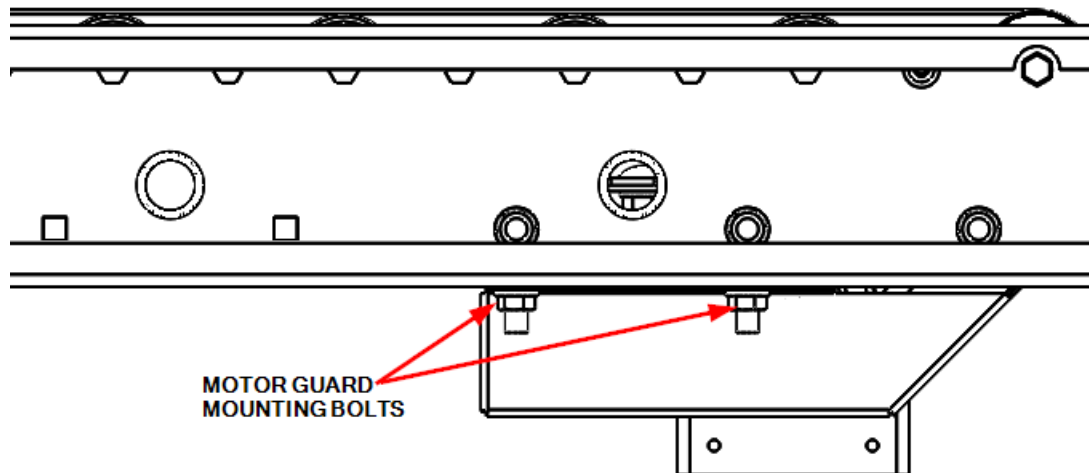


Figure 50: BRBDC Motor Guard

4. Remove the loosened timing belt from the sprocket.
5. Remove the sprocket from the motor by removing the taper lock bushing as shown in Figure 51.



Screw from the taper lock bushing can be used in open tapped hole to remove bushing.

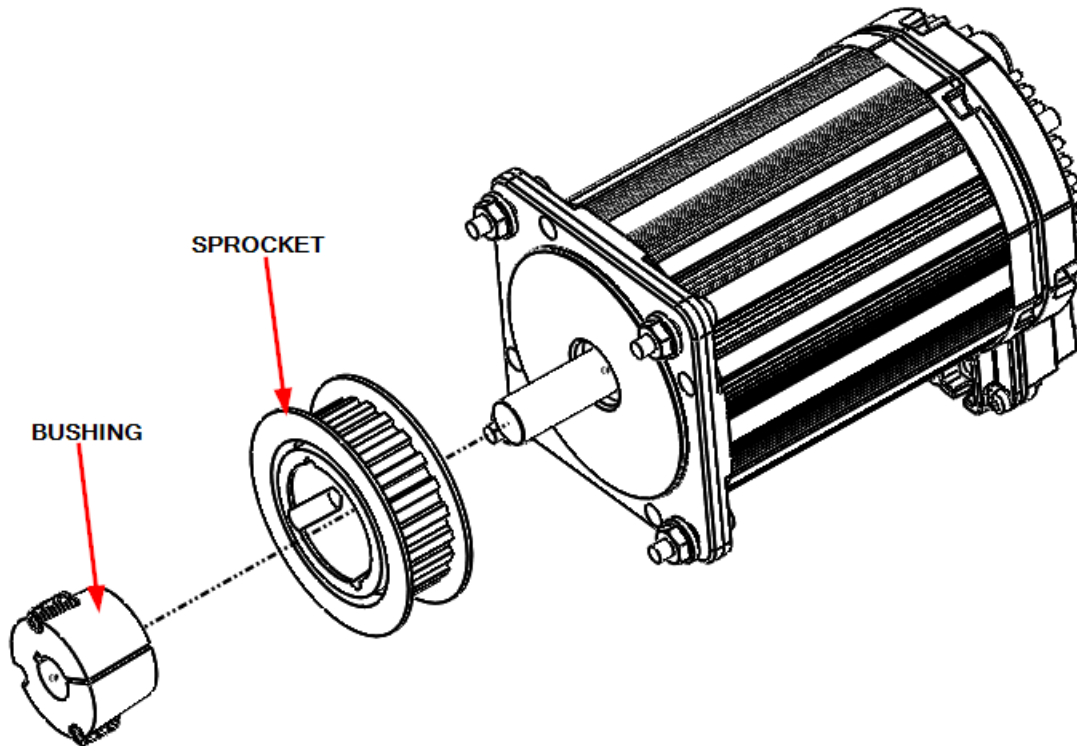


Figure 51: BRBDC Motor Assembly

6. Install replacement sprocket using the taper lock bushing as shown in Figure 51. Torque the taper lock screws to 55in-lbs by following Dodge taper lock bushing installation instructions (Doc Number MN4044, bushing no. 10008).
7. Route the timing belt around replacement sprocket.



Ensure that the motor shaft is parallel to the head roller and the pulley is positioned where the belt is not able to rub against any part of the conveyor (i.e. belt guards, bed spacer, etc.).

8. Tension the timing belt by tightening the tensioner bolt as shown in Figure 48 and torquing the mounting bolts to 31ft-lbs. The belt should be tensioned to 40-50N (9-11.25lbs).



The timing belt tension is critical to the performance and life of the conveyor. It is recommended to use a sonic tension meter, such as the BTM-1 from Habasit (or equivalent), to measure timing belt tension. Reference the Dodge Synchronous Drive Installation manual (Doc number MN4056). Belt frequency should fall between 89 and 99Hz.

9. Install the motor guard using two bolts shown in Figure 50. Torque bolts to 31ft-lbs.

7.2.4.4 BRBDC-Replacing Motor

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Relax the drive belt tension by following steps 2-4 of section 7.2.4.3.
3. Remove the motor and sprocket assembly from the motor mount by loosening the four bolts shown in Figure 52.

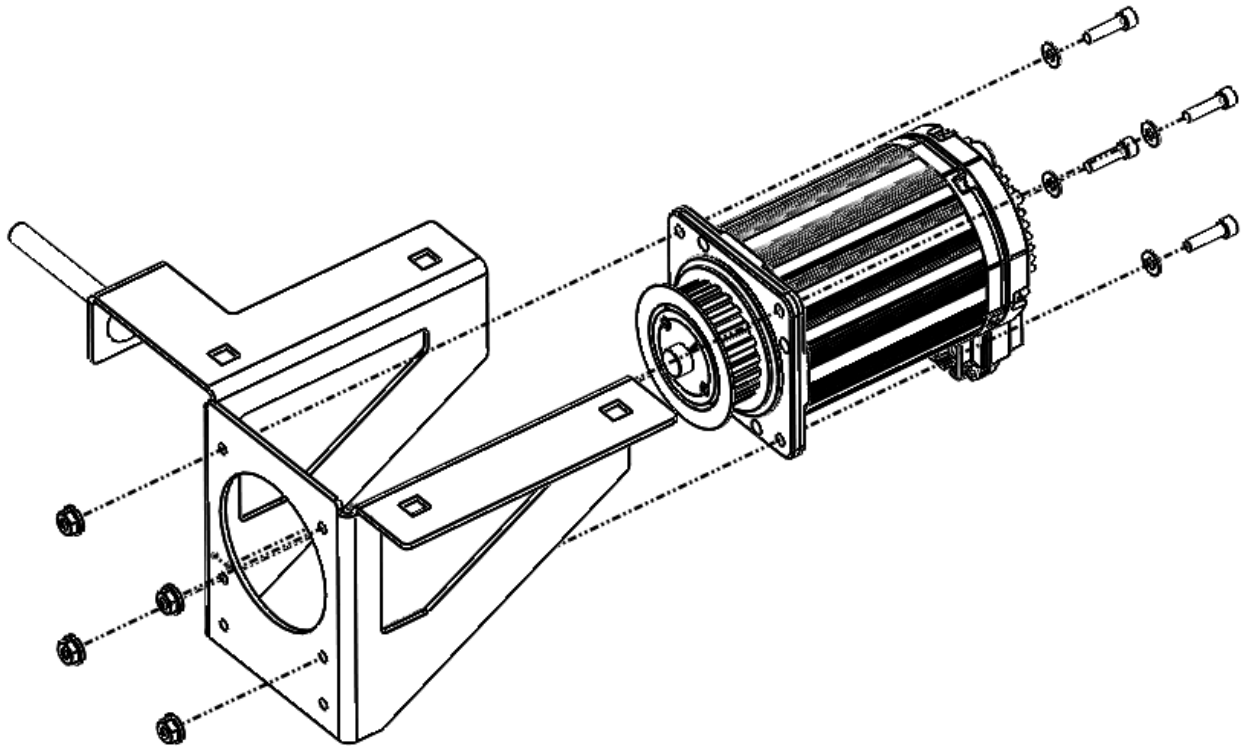


Figure 52: BRBDC Motor Mount Assembly

4. Remove the sprocket from motor shaft by removing taper lock bushing as shown in Figure 51.



Screw from taper lock can be used in open tapped hole to remove bushing.

5. Install the sprocket on replacement motor using taper lock bushing as shown in Figure 51. Torque taper lock screws to 100in-lbs.
6. Install the motor assembly using four bolts shown in Figure 52. Torque bolts to 80in-lbs.
7. Route the timing belt around sprocket.



Ensure that the timing belt teeth are engaged with sprocket teeth.

8. Tension the timing belt by tightening the tensioner bolt as shown in Figure 48 and torquing the mounting bolts to 31ft-lbs. Band should be tensioned to 40-50N (9-11.25lbs).



The timing belt tension is critical to the performance and life of the conveyor. It is recommended to use a sonic tension meter, such as the BTM-1 from Habasit (or equivalent), to measure timing belt tension. Reference the Dodge Synchronous Drive Installation manual (Doc number MN4056). Belt frequency should fall between 89 and 99Hz.



Ensure that the belt guard is not in contact with belts or rollers to extend the life of the components.

9. Install motor guard using two bolts shown in Figure 50. Torque bolts to 31ft-lbs.

7.2.4.5 BRBDC-Replacing Drive Band

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Relax the drive belt tension by loosening (4) bolts and the tensioner bolt as shown in Figure 48.
3. Remove encoder assembly (if applicable) from bed spacer mount by removing clevis pin that assembly pivots on.
4. Relax conveyor belt tension as described in section 7.2.4.2.
5. Once the conveyor belt and drive belt tension has been relaxed, the head roller can be uninstalled by removing (2) bolts and bevel washers as shown in Figure 49.
6. Once the head roller is uninstalled, remove the loose drive band from the sprocket and hub of the head roller.
7. Route the replacement drive band around the sprocket and hub of the head roller.
8. Re-install the head roller using (2) bolts and bevel washers as shown in Figure 49. Bolts only need to be finger tight until conveyor belt has been tensioned.



Ensure that the motor shaft is parallel to the head roller and the pulley is positioned where the belt is not able to rub against any part of the conveyor (i.e. belt guards, bed spacer, etc.).

9. Tension conveyor belt and re-install idler rollers as described in section 7.2.4.2.
10. Finish tightening the head roller by torque bolts to 209in-lbs.
11. Tension the timing belt using the tensioner bolt as shown in Figure 48 and torquing the mounting bolts to 31ft-lbs. Band should be tensioned to 40-50N (9-11.25lbs).



The timing belt tension is critical to the performance and life of the conveyor. It is recommended to use a sonic tension meter, such as the BTM-1 from Habasit (or equivalent), to measure timing belt tension. Reference the Dodge Synchronous Drive Installation manual (Doc number MN4056). Belt frequency should fall between 89 and 99Hz.

12. Ensure that the belt is tracking appropriately by following section 7.2.4.7.

13. Install the encoder assembly (if applicable) using clevis pin that was removed in step 3.
14. Replace the side covers.

7.2.4.6 BRBDC-Replacing Conveyor Belt

1. Follow the lockout/tagout procedure in place to ensure safety.
2. Remove the side covers from intended work area.
3. Relax the drive belt tension by loosening (4) bolts and the tensioner bolt as shown in Figure 48.
4. Remove the encoder assembly (if applicable) from the bed spacer mount as shown in Figure 7.
5. Relax the conveyor belt tension as described in section 7.2.4.2.
6. Remove all remaining idler rollers as described in section 7.2.4.1.
7. Uninstall the head roller by removing (2) bolts and bevel washers as shown in Figure 49.
8. Remove the conveyor belt from the bed section by sliding the belt off of the head roller.
9. Feed the head roller through one end of the replacement belt.
10. Install the head roller using (2) bolts and bevel washers as shown in Figure 49.



Only tighten the head roller hardware finger tight until the conveyor belt has been re-tensioned. This will help with belt tracking.

11. Re-install the remaining idler rollers from discharge to infeed as described in section 7.2.4.1.



Do not install the last 3-4 rollers until conveyor belt has been tensioned.

12. Tension the conveyor belt as described in section 7.2.4.2.
13. Install the remaining idler rollers as described in section 7.2.4.1.
14. Finish tightening the head roller by torque bolts to 209in-lbs.
15. Tension the timing belt using the tensioner bolt as shown in Figure 48 and torquing the mounting bolts to 31ft-lbs. Band should be tensioned to 40-50N (9-11.25lbs).



The timing belt tension is critical to the performance and life of the conveyor. It is recommended to use a sonic tension meter, such as the BTM-1 from Habasit (or equivalent), to measure timing belt tension. Reference the Dodge Synchronous Drive Installation manual (Doc number MN4056). Belt frequency should fall between 89 and 99Hz.



Ensure that the belt guard is not in contact with belts or rollers.

16. Install encoder assembly (if applicable) using clevis pin that was removed in step 4.
17. Ensure that the belt is tracking appropriately by following section 7.2.4.7.
18. Replace side covers.

7.2.4.7 BRBDC-Tracking Belt

Tracking the belt on any BRBDC should only require adjusting the floor supports to be level and square. If this is ineffective, loosen both bolts securing the head roller and allow the tension of the belt to pull the roller all the way toward one side of the mounting holes. Re-tighten the bolts and ensure drive belt tension is still within the required 9 – 11.25lb or 89 – 99Hz range. If not, refer back to section 7.2.4.5



NOTE

Refer to the “Bastian Solutions’ conveyor: Support Installation Manual” for more information on adjusting floor supports.



NOTE

The MAB belt used on Modular Sorter BRBDCs is intended to be biased toward one side (shown in Figure 53). If properly installed, the drive belt will be fully exposed.

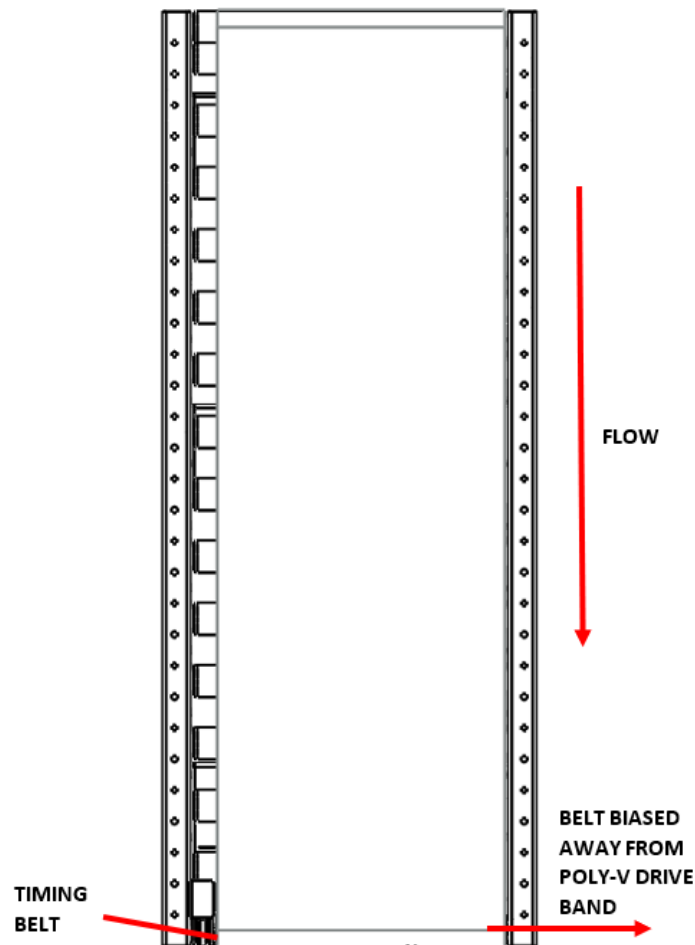


Figure 53: BRBDC Belt Tracking

8 Troubleshooting and Repair

Several issues that may arise with BSC equipment can be corrected with minimal field repairs. BSC encourages using the following troubleshooting techniques shown in Table 1 and Table 2 before contacting your BSC representative. The troubleshooting techniques provided are the same operations followed by our field service engineers. To swiftly address any issues on site, BSC asks that any issues that arise with the equipment be recorded in a log, with the mark number, description of the issue, and steps that were taken to resolve the issue.

For troubleshooting any servo motor (including LED blink code definitions), please refer to the Teknic motor's respective manuals.

Table 1: Troubleshooting Guide-RLVDC

ERROR	CAUSE	ACTION
Poly-V drive band rubs on finger guard	Band is misaligned	Track drive band as described in 7.2.3.5
Roller has difficulty turning or not turning at all	Roller needs replacement	Replace roller as described in section 7.2.3.1/7.2.3.2
	Debris in bands	Remove debris from bands

Table 2: Troubleshooting Guide-BRBDC

ERROR	CAUSE	ACTION
Belt is not tracking properly	Floor support height is not level	Ensure that supports are both square and level. Refer to the "Bastian Solutions' conveyor: Support Installation Manual" for more information on adjusting floor supports.
Timing belt rubs on finger guard	Belt is misaligned	Track drive belt to be centered within sprocket and timing hub.
	Guard is not installed at a poor angle	Ensure that the top face of the finger guard is parallel with the top of the side frame.
Band/Belt dust in drive band guard.	Belt not tracked properly	Refer to section 7.2.4.7
	Timing belt rubs on finger guard	Refer to "Timing belt rubs on finger guard" error within this table (row 2).
Roller has difficulty turning or not turning at all	Idler roller needs replacement	Replace idler roller as described in 7.2.4.1
	Head roller needs replacement	Replace head roller as described in 7.2.4.2

8.1 Controls Troubleshooting

The MBS is built to be robust and handle a large number of different conveyance scenarios, however, in certain very rare instances troubleshooting may be necessary.

The first thing that should always be verified is that the I/O check procedure produces accurate results. This routine has been created to insure that all connections have been wired correctly. This is imperative for all other functions of the MBS to function properly.

Initialize the I/O check tag in the MBS AOI to 1 to begin the I/O check and run through the following sequence of actions for each MBS standard divert module. The corresponding actions should produce the expected result for each sensor and motor.

PWD

- a. Flagging induct photo-eye → runs first BRBDC zone
- b. Flagging right confirmation photo-eye and holding → runs first zone then second zone
- c. Flagging left confirmation photo-eye and holding → runs second zone then first zone

HRT

- a. Flagging induct photo-eye and holding → runs first BRBDC zone
- b. Flagging right confirmation photo-eye and holding → run HRT lift then blades then rollers
- c. Flagging left confirmation photo-eye and holding → run HRT lift then rollers then blades

If there is a motor servo fault please refer to the Teknic motor manuals to diagnose fault codes.

All logical troubleshooting may reference the programming section 5.3.

For all other logical or hardware issues you may contact the Bastian support line at 844-BASTIAN.

Option number 2 will bring you in contact with a controls support engineer who can help you diagnose the issue with your system. When you call in please make sure that you have a good description of the issue and section to help our support engineers locate and diagnose the issue.

9 Standard Spare Parts

Table 3 and Table 4 list standard spare parts that can be ordered for any Modular Sorter RLVDC and BRBDC, respectively. Figure 54 and Figure 55 show the location for each standard spare part on an RLVDC and BRBDC, respectively. For spare parts on the PWD and HRT, please refer to the “Bastian Solutions’ conveyor – PWD Installation and Maintenance Manual” or “[...] HRT Installation and Maintenance Manual.”

Table 3: General Spare Parts List for RLVDC

Item No.	Description	Part Number
1	Roller	A001RL-10047
2	Teknic Motor	A013TM-10003
3	Motor pulley	A001CP-10044
4	Poly-V bands (3in RS)	A001BA-10005
5	Poly-V bands (2in RS)	A001BA-10003
6	Poly-V bands (435)	A001BA-10009

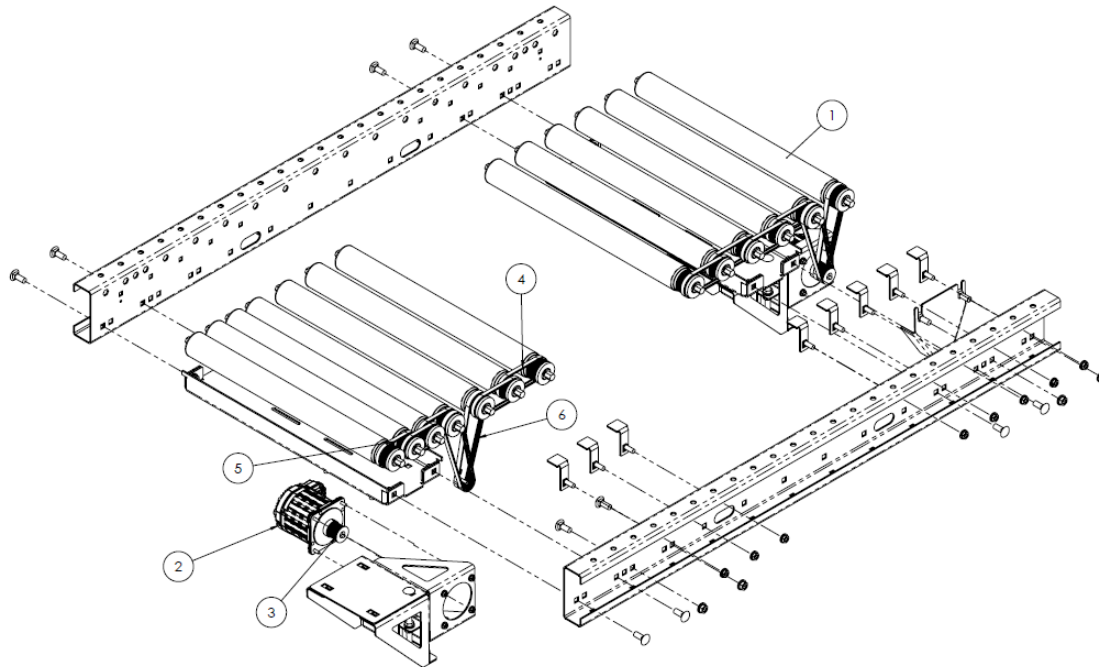


Figure 54: RLVDC Spare Parts

Table 4: General Spare Mechanical Parts List for BRBDC

Item No.	Description	Part Number
1	Idler Roller	A001RL-10041
2	Head Roller	A001RL-10226
3	Teknic Motor	A013TM-10006
4	Motor Sprocket	A001CP-10104
5	Drive Belt	A001TB-10022

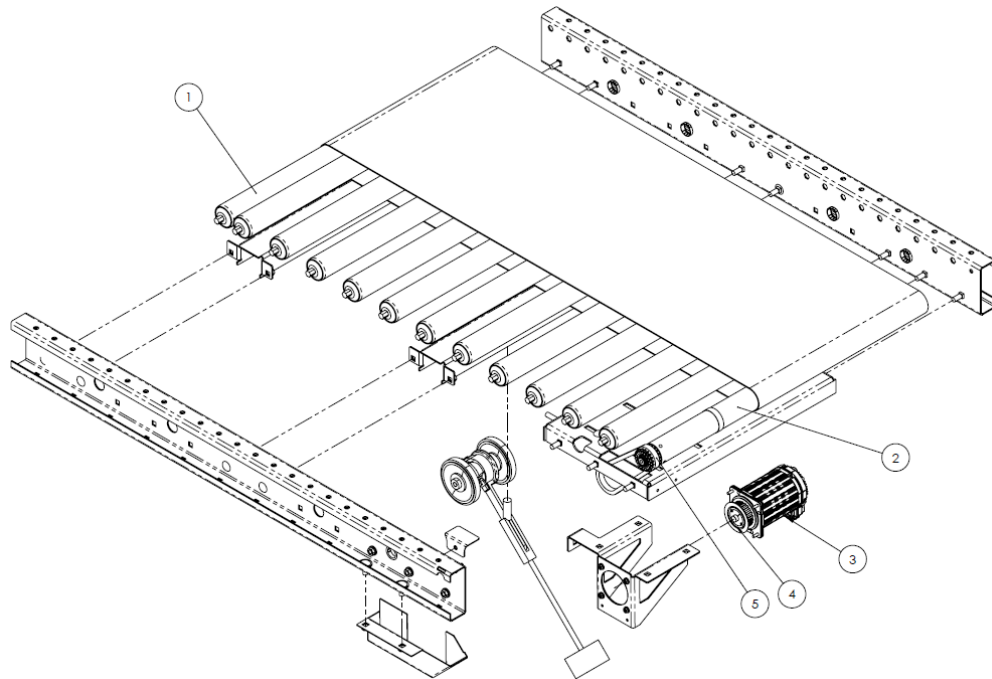


Figure 55: BRBDC Spare Parts

The IO-block for any given transfer can support IO for up to two BRBDCs in addition to the transfer it is wired to. Transfers will always have one BRBDC upstream; this is referred to as the MODS-BRBDC-INDUCT. If upwards of 10ft of transport conveyor is required between transfers, a second BRBDC can be added. In this instance, a second BRBDC would be immediately downstream of the transfer it is assigned to; this is referred to as the MODS-BRBDC-DISCHARGE. The “DISCHARGE” BRBDC requires a longer IO cable and will not come with a photoeye installed.

For all electronics, cables, and peripheral spares required, see Table 5.

Table 5: General Spare Parts List for Electronics and Cables

Description	Instance Description	Part Number
MBS HRT IO Block Assembly	One per HRT	Z075MA-10002
MBS PWD IO Block Assembly	One per PWD	Z075MA-10003
IO Hub Assembly	One for every 8 diverts (PWD/HRT)	Z075MA-10004
MBS HRT IO Cable	One per HRT	A002CA-10157
MBS HRT Power Cable	One per HRT	A002CA-10125
MBS PWD IO Cable	One per PWD and BRBDC-INDUCT	A002CA-10135
MBS PWD Power Cable	One per PWD	A002CA-10124
MBS BRBDC Power Cable 6ft	One per BRBDC <6ft Long	A002CA-10122
MBS BRBDC Power Cable 11ft	One per BRBDC >5.5ft Long	A002CA-10179
MBS BRBDC IO Cable X-Long	One per BRBDC-DISCHARGE	A002CA-10185
20A PS with 20A Breaker	One per transfer	A002PS-10058
40A PS with 40A Breaker	One for up to 2 transfers	A002PS-10059
80A PS with (2) 40A Breakers	One for up to 4 transfers	A002PS-10060
Universal Power Extension Cable	One per 20A and 40A PS / Two per 80A PS	A002CA-10123
Power Gender Changer	One per 80A PSU	A002CA-10155
M8 4-Pin Photoeye	One per sorter, one per transfer, and one per divert lane	A002SE-10025
Reflector Assembly	One per photoeye	Z080LR-10001
M8 to M12 Cable	One per photoeye	A002CA-10168
Encoder	One per sorter	A002SE-10057
Encoder Cable	One per sorter	A002CA-10159

9.1 Shipping

Table 6 lists the “ship with” items that come with an MBS. “Ship with” materials are included on the same skid as the conveyor marks they are intended to be mounted to and/or used with. Table 7 lists the “ship loose” items that come with an MBS. In addition to the list provided, all standard splice plates, guide rail, guide rail hardware, side covers, and floor support equipment spec’d out are considered ship loose materials and may vary depending on the application.

Table 6: “Ship with” items

Part Number	Description
Z075MA-10015	ASM, MODS-PWD OR MODS-HRT, DIVERT CONFIRMATION PHOTOEYE KIT (INCLUDES PHOTOEYE, MOUNTING HARDWARE, REFLECTOR ASSEMBLY, AND PHOTOEYE CABLE)
Z075MA-10014	ASM, MODS-BRBDC, INFEED, ENCODER AND ACCESSORY KIT (INCLUDES ENCODER, ENCODER CABLE, AND DIVERT CONFIRMATION PHOTOEYE KIT)
A002SE-10057	ENCODER, MEASURING WHEEL, WITH COUNTERWEIGHT AND YOKE, 12in CIRCUMFERENCE, 1 TO 2400 PPR
Z075MA-10004	ASM, IO-LINK BLOCK HUB, 8 PORT (INCLUDES BLOCK HUB IO, POWER CABLE AND INSTALLATION HARDWARE)
A002CA-10161	CABLE, M12 STRAIGHT FEMALE TO M12 STRAIGHT MALE, 1m L
A002CA-10162	CABLE, M12 STRAIGHT FEMALE TO M12 STRAIGHT MALE, 2m L
A002CA-10163	CABLE, M12 STRAIGHT FEMALE TO M12 STRAIGHT MALE, 5m L
A002CA-10164	CABLE, M12 STRAIGHT FEMALE TO M12 STRAIGHT MALE, 10m L
A002CA-10165	CABLE, M12 STRAIGHT FEMALE TO M12 STRAIGHT MALE, 15m L
A002CA-10166	CABLE, M12 STRAIGHT FEMALE TO M12 STRAIGHT MALE, 20m L

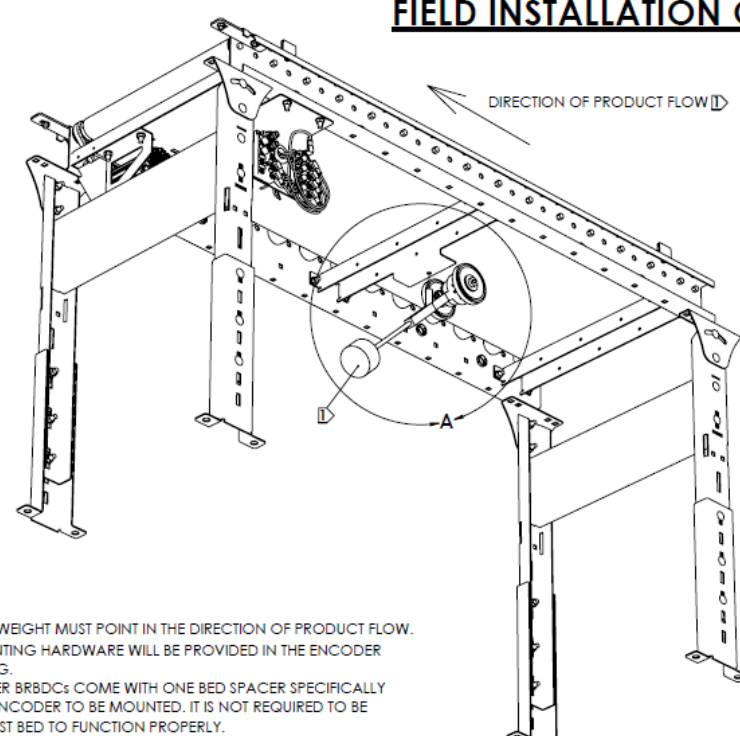
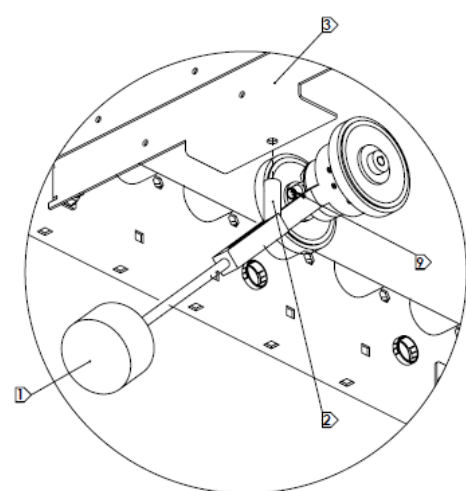
Table 7: “Ship loose” items

Part Number	Description
A002PS-10058	POWER SUPPLY, 400 – 500VAC, 3 PHASE INPUT, QTY (1) 20A BREAKER, 48VDC OUTPUT
A002PS-10059	POWER SUPPLY, 400 – 500VAC, 3 PHASE INPUT, QTY (1) 40A BREAKER, 48VDC OUTPUT
A002PS-10060	POWER SUPPLY, 400 – 500VAC, 3 PHASE INPUT, QTY (2) 40A BREAKERS, 48VDC OUTPUT
A002CA-10123	CABLE, 1x2 MINI-FIT SR PLUG TO 1x2 MINI-FIT SR RECEPTACLE, 6ft L, 12AWG, 4 CONDUCTOR, TRAY RATED (1 PROVIDED FOR 20A AND 40A POWER SUPPLY, 2 PROVIDED FOR 80A POWER SUPPLY)
A002CA-10155	CABLE, GENDER CHANGER, 1x2 MINI-FIT SR PLUG TO 1x2 MINI-FIT SR PLUG, 6in L, 12AWG, 4 CONDUCTOR, TRAY RATED

Appendix A: Field Installation Prints

4 3 2 1

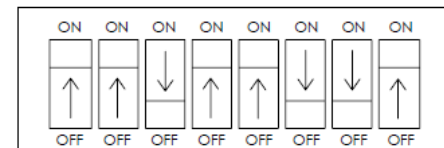
FIELD INSTALLATION OF ENCODER

**DETAIL A
SCALE 1 : 4**

NOTES:

- D ENCODER COUNTERWEIGHT MUST POINT IN THE DIRECTION OF PRODUCT FLOW.
- E ALL ENCODER MOUNTING HARDWARE WILL BE PROVIDED IN THE ENCODER VENDOR PACKAGING.
- F ALL MODULAR SORTER BRBDCs COME WITH ONE BED SPACER SPECIFICALLY DESIGNED FOR THE ENCODER TO BE MOUNTED. IT IS NOT REQUIRED TO BE MOUNTED TO THE FIRST BED TO FUNCTION PROPERLY.
- G THIS DIP SWITCH SETTING IS RECOMMENDED FOR ALL MODULAR SORTERS. SHOULD YOU CHOOSE TO USE A DIFFERING DIP SWITCH SETTING, THE SORTER PACKAGE TRACKING MAY NOT FUNCTION AS EXPECTED.
- H DIP SWITCH 1 IS USED TO CONFIGURE THE DIRECTION OF ROTATION. THE REQUIRED DIRECTION OF ROTATION IS CW. ENSURE DIP SWITCH IS SET TO OFF.
- I DIP SWITCHES 2 - 7 ARE USED TO CONFIGURE ENCODER RESOLUTION. THE RECOMMENDED SETTINGS PROVIDE A RESOLUTION OF 75 PULSES PER REVOLUTION (i.e. 6.25 PULSES PER INCH).
- J DIP SWITCH 8 IS USED TO CONFIGURE THE LINE DRIVER. WHEN SET TO OFF, Vout = 5V, OTHERWISE Vout = Vin.
- K IF FOR THE SPECIFIC APPLICATION, A DIFFERENT ENCODER RESOLUTION IS REQUIRED, REFER TO ENCODER MODEL-SPECIFIC SPEC SHEET AND (IF SYSTEM HAS ALREADY BEEN CALIBRATED IN THE PAST) RE-CALIBRATE MODULAR SORTER AOL IF ISSUES PERSIST, CONTACT BASTIAN CONVEYOR.
- L EACH ENCODER KIT COMES WITH CABLE A002CA-10159; AN 8-PIN M12 TO FLYING LEADS CABLE. THIS IS USED TO PROVIDE THE PLC WITH ENCODER PULSES. REFER TO SICK ENCODER MODEL DUV60 OPERATING INSTRUCTIONS WHEN WIRING.



**ENCODER DIP SWITCH 45678
CONFIGURATION**

4 3 2 1



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ASSEMBLY/ALLOY:
ENCODER: 303 - 316

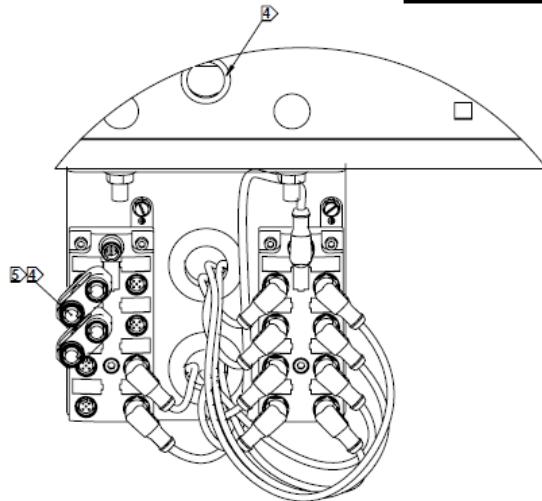
WELDMENTS:
ENCODER: 303 - 316

FABRICATED PARTS:
ENCODER: 303 - 316

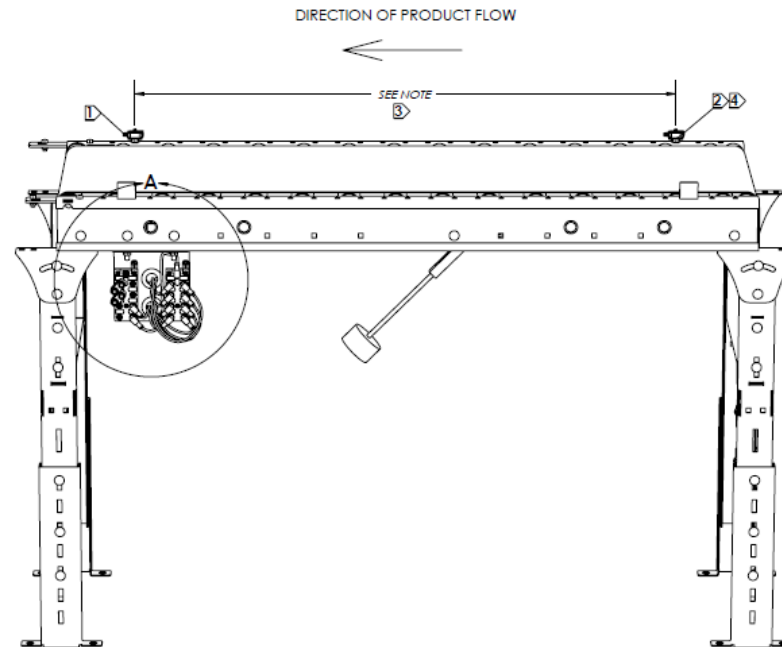
MACHINED PARTS:
ENCODER: 303 - 316

DESCRIPTION: GENERAL ARRANGEMENT - INSTALLATION OF MODULAR SORTER ENCODER				DATE:	1ST PROCESS:
PART NUMBER: GA-MODS-ENCODER-INSTALL	REVISION: SAM OSTERHOUT	DATE REVISED: 02/12/2021	TYPE ID:	2ND PROCESS:	
MATERIAL:	APPROVED BY:	DATE APPROVED:	FACTOR:	3RD PROCESS:	
LEGACY PART NUMBER:	ORIGINAL ENGINEER: SAM OSTERHOUT	DATE CREATED: 02/12/2021	SHEET 1 OF 1		FINISH:

FIELD INSTALLATION OF MODULAR SORTER INDUCT EYE



DETAIL A
SCALE 1 : 2.5



NOTES:

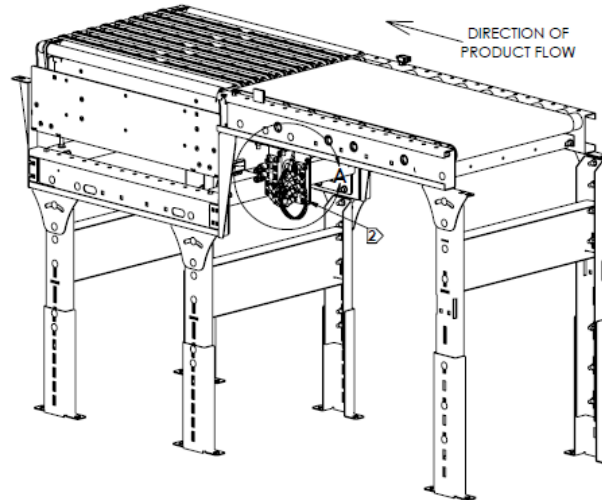
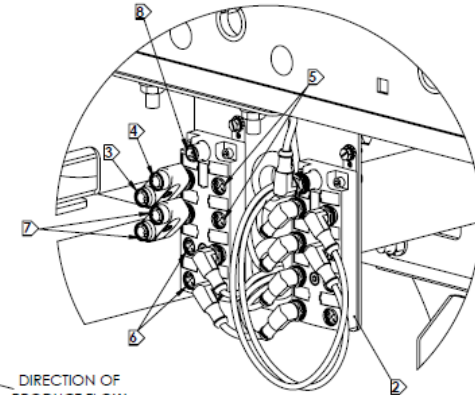
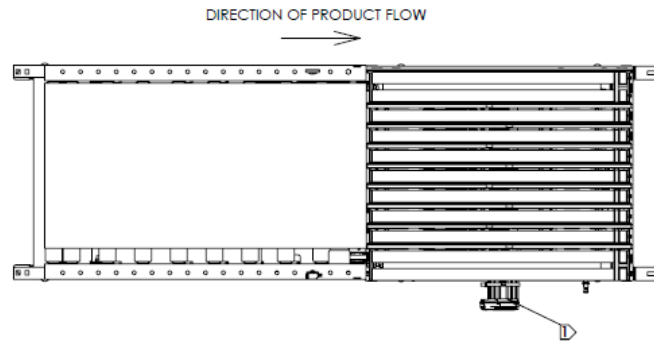
- 1 THE FIRST BRBDC IN ANY GIVEN MODULAR SORTER IS THE ONLY BRBDC IN THE SORTER THAT REQUIRES TWO PHOTOEYES. THE PHOTOEYE THAT ARRIVES INSTALLED IS THE INDUCT PHOTOEYE FOR THE FIRST TRANSFER.
- 2 THE PHOTOEYE THAT ARRIVES IN A KIT WITH A REFLECTOR AND CABLE A002CA-10168 IS REQUIRED AS THE OVERALL SORTER INDUCT EYE AND IS ALWAYS INSTALLED IN THE FIELD.
- 3 THE DISTANCE BETWEEN THE SORTER INDUCT EYE AND FIRST TRANSFER INDUCT EYE MUST BE GREAT ENOUGH THAT THE MODULAR SORTER AOI RECEIVES THE DESTINATION FROM AOR BEFORE THE PRODUCT REACHES THE FIRST TRANSFER INDUCT EYE. NETWORK LATENCY REQUIRES CONSIDERATION. SHOULD THE SORTER INDUCT EYE NEED TO BE INSTALLED FURTHER UPSTREAM THAN THE BRBDC, ENSURE PRODUCT STABILITY IS CONSISTENT ON UPSTREAM CONVEYOR.
- 4 ONCE MODULAR SORTER INDUCT PHOTOEYE IS INSTALLED, USE CABLE A002CA-10168; AN M8 TO M12 CABLE TO CONNECT PHOTOEYE TO IO-BLOCK. RUN CABLE THROUGH THE SIDE FRAME, PASS THROUGH GROMMETS AND BED SPACER-USING ZIP-TIES TO PREVENT SAGGING-AND CONNECT TO THE LEFT-HAND PORT ON THE PORTO SPLITTER.
- 5 THE FIRST TRANSFER'S IO-BLOCK ASSEMBLY IS THE ONLY ONE WITH A PLANNED CONNECTION ON LEFT-HAND PORT ON THE PORTO SPLITTER. ON ALL OTHER TRANSFER IO-BLOCK ASSEMBLIES, THIS IS USED AS A CONFIGURABLE INPUT FOR APPLICATION-SPECIFIC USES. THIS IS TO BE PROGRAMMED AND USED IN THE FIELD AS REQUIRED (e.g. POWER SUPPLY HEALTH).
- 6 SEE GA-MODS-PWD-IO-BLOCK-INSTALL OR GA-MODS-HRT-IO-BLOCK-INSTALL WHEN WIRING THE IO-BLOCK ASSEMBLY TO THE IO-BLOCK HUB.



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WESTFIELD, IN 46074
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B	ASSEMBLY LAYOUT: ANGLES: 1" x 2" DECIMAL: 100 + 0.100	DESCRIPTION: GENERAL ARRANGEMENT - INSTALLATION OF MODULAR SORTER INDUCT EYE			STATE:	1ST PROCESS:
	WELDMENTS: ANGLES: 1" x 2" DECIMAL: 100 + 0.100	PART NUMBER: GA-MODS-ENCODER-INSTALL	REVISION: REVISION ENGINEER: SAM OSTERHOUT	DATE REVISED: 02/12/2021	TYPE ID:	2ND PROCESS:
	FABRICATED PARTS: ANGLES: 1" x 2" DECIMAL: 100 + 0.100	MATERIAL:	APPROVED BY:	DATE APPROVED:	S-FACTOR:	3RD PROCESS:
	MACHINED PARTS: ANGLES: 1" x 2" DECIMAL: 100 + 0.100	LEGACY PART NUMBER:	ORIGINAL ENGINEER: SAM OSTERHOUT	DATE CREATED: 02/12/2021	SHEET 1 OF 1	FINISH:

FIELD INSTALLATION OF HRT IO-BLOCK AND DIVERT CONFIRMATION PHOTOEYE



DETAIL A
SCALE 1 : 3

NOTES:

- 1 WHEN INSTALLING HRT, IF IT IS MONODIRECTIONAL, THE LIFT MOTOR IS TO BE INSTALLED UNDER THE DIVERT LANE. IF IT IS FOR ABIDIRECTIONAL APPLICATION, THE LIFT MOTOR IS TO BE INSTALLED ON THE RIGHT-HAND SIDE (AS SHOWN).
- 2 THE HRT IO-BLOCK ASSEMBLY WILL ARRIVE IN A BOX WITH ITS RESPECTIVE TRANSFER, AND WILL BE WIRED AS SHOWN. IT IS TO BE MOUNTED IN THE FIELD; THE RECOMMENDED MOUNTING LOCATION IS THE DISCHARGE END OF THE INDUCT BRBDC (AS SHOWN), BUT CAN BE MOUNTED ELSEWHERE AS NEEDED (GIVEN CUSTOM CABLES ARE NOT REQUIRED).
- 3 ON ALL BUT THE FIRST TRANSFER, THE LEFT-HAND PORT OF THE PORT 0 SPLITTER IS A COURTESY IO POINT. LOGIC REQUIRED FOR THE ADDITIONAL IO POINT IS NOT SUPPORTED BY THE STANDARD SORTER AOI.
- 4 THE M12 SIDE OF THE A002CA-10168 M8 TO M12 CABLE (CONNECTED TO THE INDUCT PHOTOEYE AND SPOOLED IN THE BRBDC SIDE FRAME ON ARRIVAL) IS TO BE RUN THROUGH THE SIDE FRAME GROMMETS, ZIP-TIED ALONG THE BED SPACER, AND PLUGGED INTO THE RIGHT-HAND PORT OF THE PORT 0 SPLITTER.
- 5 INFEED BRBDC TEKNIC MOTOR IO-CABLE (A002CA-10135) IS TO BE PLUGGED INTO IO-BLOCK PORT 1 (M12 CABLE LABELED 'A'), AND PORT 3 (M12 CABLE LABELED 'B').
- 6 GIVEN THE PRESENCE OF TWO BRBDCs DOWNSTREAM OF THE TRANSFER BEING WIRED, THE FIRST OF THOSE BRBDCs IS TO BE WIRED TO THIS IO-BLOCK. THIS BRBDC TEKNIC MOTOR IO-CABLE (A002CA-10185) IS TO BE PLUGGED INTO IO-BLOCK PORT 4 (M12 CABLE LABELED 'A'), AND PORT 6 (M12 CABLE LABELED 'B').
- 7 DIVERT CONFIRMATION PHOTOEYES ARRIVE AS A KIT INCLUDING THE CABLE, INSTALLATION HARDWARE, AND REFLECTOR ASSEMBLY. THESE ARE TO BE INSTALLED IN THE FIELD AS REQUIRED. IF A RIGHT-HAND DIVERT CONFIRM, THIS PHOTOEYE IS TO BE WIRED TO THE LEFT-HAND SIDE OF PORT 2 SPLITTER. IF A LEFT DIVERT CONFIRM, IT IS TO BE WIRED TO THE RIGHT-HAND SIDE OF THE PORT 2 SPLITTER.
- 8 EACH IO-BLOCK ASSEMBLY WILL COME WITH ONE M12 TO M12 MALE TO FEMALE CABLE EITHER 2m (A002CA-10162), 5m (A002CA-10163), 10m (A002CA-10164), 15m (A002CA-10165), OR 20m (A002CA-10166) IN LENGTH. THIS CABLE IS USED TO CONNECT THE IO-BLOCK ASSEMBLY TO THE IO-BLOCK HUB ASSEMBLY. CONNECT FEMALE SIDE OF CABLE TO EXPANSION PORT. SEE GA-MODS-IO-BLOCK-HUB-INSTALL PRINT FOR ADDITIONAL DETAILS.



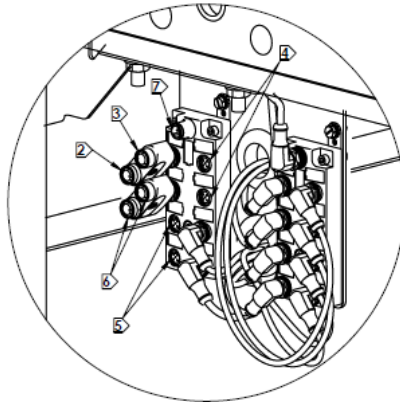
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DECIMAL: .001" x .001"
WELDMENTS:
ANGLES: 1" x 1"
DECIMAL: .001" x .001"
FABRICATED PARTS:
ANGLES: 1" x 1"
DECIMAL: .001" x .001"
MACHINED PARTS:
ANGLES: 1" x 1"
DECIMAL: .001" x .001"

DESCRIPTION:
GENERAL ARRANGEMENT - HRT IO-BLOCK INSTALLATION
PART NUMBER: GA-MODS-HRT-IO-BLOCK-INSTALL
REVISION: 02/12/2021
REVISION ENGINEER: SAM OSTERHOUT
DATE REVISED: 02/12/2021
APPROVED BY:
DATE APPROVED:
LEGACY PART NUMBER:
ORIGINAL ENGINEER: SAM OSTERHOUT
DATE CREATED: 02/12/2021

STATE:
TYPE ID:
S-FACTOR:
SHEET 1 OF 1

1ST PROCESS:
2ND PROCESS:
3RD PROCESS:
FINISH:

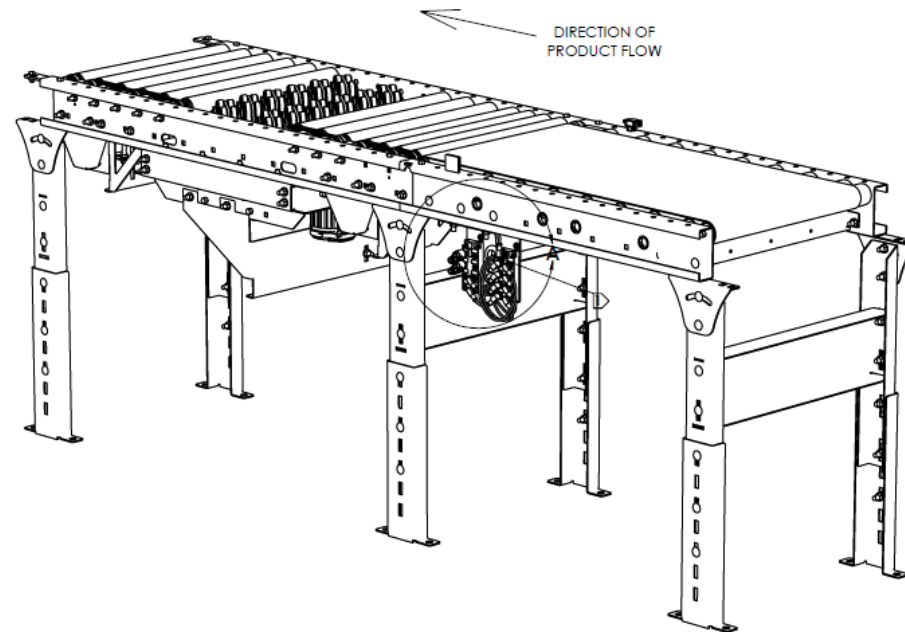
FIELD INSTALLATION OF PWD IO-BLOCK AND DIVERT CONFIRMATION PHOTOEYE



DETAIL A
SCALE 1 : 3

NOTES:

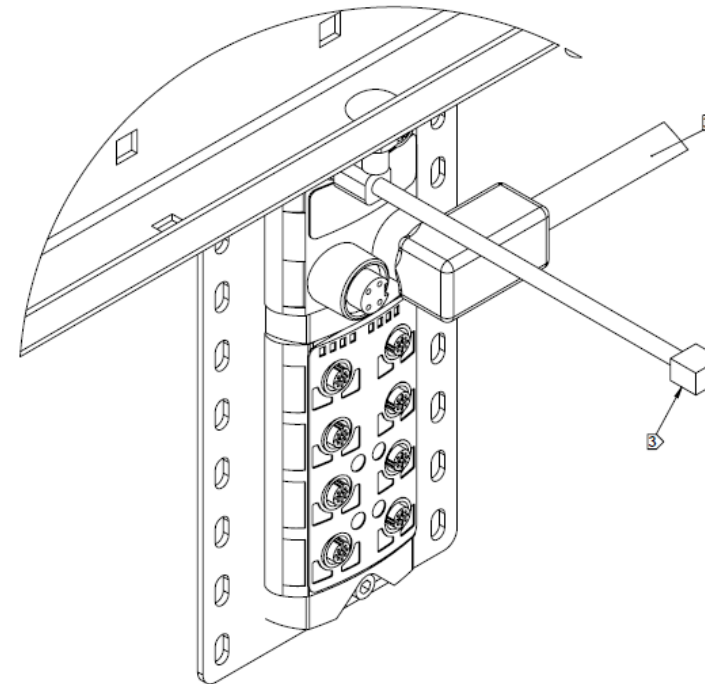
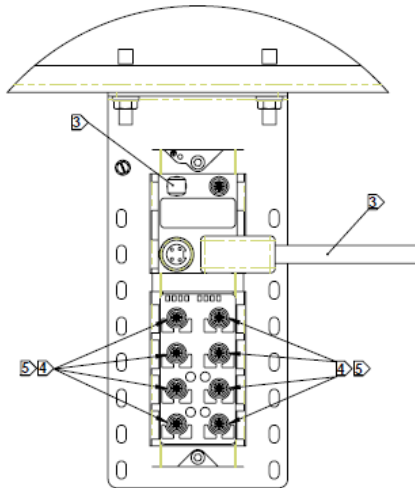
- 1 THE PWD IO-BLOCK ASSEMBLY WILL ARRIVE IN A BOX WITH ITS RESPECTIVE TRANSFER, AND WILL BE WIRED AS SHOWN. IT IS TO BE MOUNTED IN THE FIELD: THE RECOMMENDED MOUNTING LOCATION IS THE DISCHARGE END OF THE INDUCT BRBDC (AS SHOWN), BUT CAN BE MOUNTED ELSEWHERE AS NEEDED (GIVEN CUSTOM CABLES ARE NOT REQUIRED).
- 2 ON ALL BUT THE FIRST TRANSFER, THE LEFT-HAND PORT OF THE PORT 0 SPLITTER IS A COURTESY IO POINT. LOGIC REQUIRED FOR THE ADDITIONAL IO POINT IS NOT SUPPORTED BY THE STANDARD SORTER AOL.
- 3 THE M12 SIDE OF THE A002CA-10168 M8 TO M12 CABLE (CONNECTED TO THE INDUCT PHOTOEYE AND SPOOLED IN THE BRBDC SIDE FRAME ON ARRIVAL) IS TO BE RUN THROUGH THE SIDE FRAME GROMMETS, ZIP-TIED ALONG THE BED SPACER, AND PLUGGED INTO THE RIGHT-HAND PORT OF THE PORT 0 SPLITTER.
- 4 INFED BRBDC TEKNIC MOTOR IO-CABLE (A002CA-10135) IS TO BE PLUGGED INTO IO-BLOCK PORT 1 (M12 CABLE LABELED 'A'), AND PORT 3 (M12 CABLE LABELED 'B').
- 5 GIVEN THE PRESENCE OF TWO BRBDCs DOWNSTREAM OF THE TRANSFER BEING WIRED, THE FIRST OF THOSE BRBDCs IS TO BE WIRED TO THIS IO-BLOCK. THIS BRBDC TEKNIC MOTOR IO-CABLE (A002CA-10185) IS TO BE PLUGGED INTO IO-BLOCK PORT 4 (M12 CABLE LABELED 'A'), AND PORT 6 (M12 CABLE LABELED 'B').
- 6 DIVERT CONFIRMATION PHOTOEYES ARRIVE AS A KIT INCLUDING THE CABLE, INSTALLATION HARDWARE, AND REFLECTOR ASSEMBLY. THESE ARE TO BE INSTALLED IN THE FIELD AS REQUIRED. IF A RIGHT-HAND DIVERT CONFIRM, THIS PHOTOEYE IS TO BE WIRED TO THE LEFT-HAND SIDE OF PORT 2 SPLITTER. IF A LEFT DIVERT CONFIRM, IT IS TO BE WIRED TO THE RIGHT-HAND SIDE OF THE PORT 2 SPLITTER.
- 7 EACH IO-BLOCK ASSEMBLY WILL COME WITH ONE M12 TO M12 MALE TO FEMALE CABLE EITHER 2m (A002CA-10162), 5m (A002CA-10163), 10m (A002CA-10164), 15m (A002CA-10165), OR 20m (A002CA-10166) IN LENGTH. THIS CABLE IS USED TO CONNECT THE IO-BLOCK ASSEMBLY TO THE IO-BLOCK HUB ASSEMBLY. CONNECT FEMALE SIDE OF CABLE TO EXPANSION PORT. SEE GA-MODS-IO-BLOCK-HUB-INSTALL PRINT FOR ADDITIONAL DETAILS.



ASSEMBLY/LAYOUT:
ANGLES: 300° ± 0.1°
WELDMENTS:
ROBOTS: 300° ± 0.1°
FABRICATED PARTS:
ANGLES: 300° ± 0.1°
MACHINED PARTS:
ROBOTS: 300° ± 0.1°

DESCRIPTION: GENERAL ARRANGEMENT - PWD IO-BLOCK INSTALLATION				DATE:	1ST PROCESS:
PART NUMBER:	REVISION:	REVISION ENGINEER:	DATE REVISED:	TYPE ID:	2ND PROCESS:
GA-MODS-PWD-IO-BLOCK-INSTALL		SAM OSTERHOUT	02/12/2021	6-FACTOR:	3RD PROCESS:
MATERIAL:	APPROVED BY:	DATE APPROVED:	DATE CREATED:		FINISH:
LEGACY PART NUMBER:	ORIGINAL ENGINEER:		02/12/2021	SHEET 1 OF 1	
	SAM OSTERHOUT				

FIELD INSTALLATION OF MODULAR SORTER IO-BLOCK HUB INSTALLATION



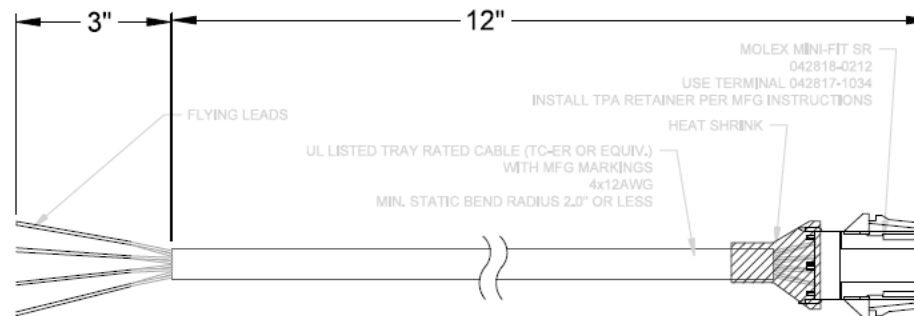
NOTES:

1. EACH IO-BLOCK HUB IS CAPABLE OF SUPPORTING UP TO EIGHT TRANSFER IO-BLOCK ASSEMBLIES. YOUR IO-BLOCK HUB ASSEMBLY WILL ARRIVE WITH THE CONVEYOR BED IT IS INTENDED TO BE MOUNTED TO.
2. ALL M12 PATCH CABLES REQUIRED TO CONNECT IO-BLOCK ASSEMBLIES TO THE IO-BLOCK HUB ASSEMBLY WILL ARRIVE WITH THEIR RESPECTIVE TRANSFERS. THE CABLE LENGTH PROVIDED IS BASED ON THE SYSTEM LAYOUT.
3. THE IO-BLOCK HUB ASSEMBLY WILL ARRIVE IN A BOX WITH THE BRBDC BED THAT IT IS TO BE MOUNTED TO. INCLUDED IN THAT BOX IS A M12 TO RJ45 CABLE (A002CA-10127) REQUIRED TO PROVIDE COMMUNICATION BACK TO THE PLC, AND A 7/8" FORMAT CABLE (A002CA-10126) REQUIRED TO PROVIDE POWER TO THE IO-BLOCK HUB. SEE VENDOR CUT SHEET FOR CABLE PINOUT.
4. PORT ASSIGNMENT ON THE IO-BLOCK HUB IS BASED ON PLACEMENT OF THE TRANSFERS IN THE SORTER (I.E. THE FIRST TRANSFER IO-BLOCK ASSEMBLY WILL CONNECT TO PORT 0, THE SECOND TO PORT 1, ETC.).
5. THE CABLES REQUIRED TO MAKE THIS CONNECTION WILL BE EITHER 2m (A002CA-10162), 5m (A002CA-10163), 10m (A002CA-10164), 15m (A002CA-10165), OR 20m (A002CA-10166). SEE PRINTS GA-MODS-HRT-IO-BLOCK-INSTALL OR GA-MODS-PWD-IO-BLOCK-INSTALL FOR FURTHER DETAILS.



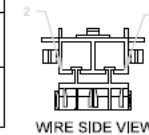
ASSEMBLY SAVOUR: ANGLE: 1" x 1" x 1/8" DECIMAL: 200 x 1/8"				DESCRIPTION: GENERAL ARRANGEMENT - IO-BLOCK HUB INSTALLATION		STATE:	1ST PROCESS:
WELDMENTS: ANGLE: 1" x 1" x 1/8" DECIMAL: 200 x 1/8"		REVISION: GA-MODS-IO-HUB-INSTALL		REVISION ENGINEER: SAM OSTERHOUT	DATE REVISED: 02/12/2021	TYPE ID:	2ND PROCESS:
FABRICATED PARTS: ANGLE: 1" x 1" x 1/8" DECIMAL: 200 x 1/8"		MATERIAL:		APPROVED BY:	DATE APPROVED:	S-FACITOR:	3RD PROCESS:
MACHINED PARTS: ANGLE: 1" x 1" x 1/8" DECIMAL: 200 x 1/8"		LEGACY PART NUMBER:		ORIGINAL ENGINEER: SAM OSTERHOUT	DATE CREATED: 02/12/2021	SHEET 1 OF 1	FINISH:

POWER SUPPLY PIG TAIL PINOUT



PIN #	WIRE COLOR	NAME	WIRING / INSTALL NOTES
1	BLU*	0V	DOUBLE CRIMP 1 TERMINAL ON 2x 12GA WIRES.
	BLK*	0V	
2	ORN*	48V	DOUBLE CRIMP 1 TERMINAL ON 2x 12GA WIRES.
	RED*	48V	

*ALTERNATE WIRE COLORS OK, PLEASE NOTIFY SO PRINT CAN BE UPDATED



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A	ORIGINAL DESIGN	07/29/19	BPB		
NO.	REVISION	DATE	BY		

DRAWN BY	BPB	DATE	07/29/19
CHECKED BY		DATE	
OFFICE	ZIPLINE	SCALE	NOT TO SCALE
SHEET	1	SIZE	B

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DRAWING TITLE
CABLE, POWER SUPPLY MOUNT, 1X2 MINI-FIT
SR RECEPTACLE TO FLYING LEADS, 24in L,
8AWG, 2 CONDUCTOR, THHN

DRAWING NO.
A002CA-10158

REV.
A

Bastian Solutions Conveyor Installation and Maintenance Manual: Modular Sorter (MBS)

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Bastian Solutions, LLC
1821 Bastian Court
Westfield, IN 46074

Customer Service: ConveyorSupport@BastianSolutions.com