Installation, Operation, Maintenance Manual

MHS | CONVEYOR

IntelliROL® PZM (Pick Zone Module)

IOM Part Number: 1167035
Revision Date: April 6, 2023

Para la OIM española, seleccione

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1 IOM INTRODUCTION

IOM Purpose

It is the intent of MHS Conveyor, through this manual, to provide information that acts as a guide in the installation, operation, and maintenance of MHS Conveyor conveyors.

This manual describes basic installation practices, assembly arrangements, preventive maintenance, and assists in replacement parts identification.

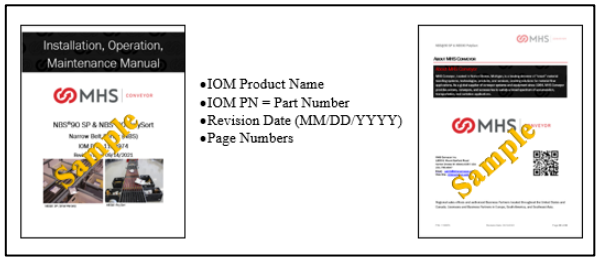
This service manual is intended for use by personnel who are knowledgeable of installation and safe working practices on conveyor systems.

Not all applications and conditions can be covered; therefore, this manual is to be used ONLY as a guide. Proper training of operating and maintenance personnel is required by the owner/operator of the equipment.

If additional copies of this manual are needed or if you have any question concerning the conveyor, please contact your MHS Distributor or MHS Lifetime Services at 231-798-4547 or visit MHS at www.mhs-conveyor.com for maintenance videos and other application information.

Manual Structure

You should receive a separate documentation for each product line of MHS Conveyor implemented in your installation. You can identify the respective product line on the back of the folder or on the cover sheet of the IOM (Installation Operation Maintenance Manual)



WARNING

- Pay attention to the safety instructions!
- Prior to working at or in the immediate vicinity of the system it is recommended that you make yourself familiar with the safety instructions included in the present document!

2 MHS CONVEYOR POLICIES

MHS Conveyor Equipment Warranty

MHS Conveyor warrants that the material and workmanship entering into its equipment is merchantable and will be furnished in accordance with the specifications stated.

MHS Conveyor agrees to furnish the purchaser without charge any part proved defective within 2 years from date of shipment provided the purchaser gives MHS Conveyor immediate notice in writing and examination proves the claim that such materials or parts were defective when furnished. For drive components specific to XenoROL® (i.e. Xeno belts, slave Xeno belts, drive spools, standard and speed-up, and spacers), this warranty shall be extended to five years of running use, provided the conveyors are applied, installed and maintained in accordance with MHS Conveyor published standards. Other than the above, there are no warranties which extend beyond the description on the face hereof. Consequential damages of any sort are wholly excluded.

The liability of MHS Conveyor will be limited to the replacement cost of any defective part. All freight and installation costs relative to any warranted part will be at the expense of the purchaser. Any liability of MHS Conveyor under the warranties specified above is conditioned upon the equipment being installed, handled, operated, and maintained in accordance with the written instructions provided or approved in writing by MHS Conveyor.

The warranties specified above do not cover, and MHS Conveyor makes no warranties which extend to, damage to the equipment due to deterioration or wear occasioned by chemicals, abrasion, corrosion or erosion; Purchaser's misapplication, abuse, alteration, operation or maintenance; abnormal conditions of temperature or dirt; or operation of the equipment above rated capacities or in an otherwise improper manner.

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXTENDING BEYOND THOSE SET FORTH IN THIS STATEMENT OF WARRANTY.

Rev 08/12/2021

MHS Environment Standards

MHS Conveyor equipment is designed to be installed in a clean, dry warehouse environment. Exposure to extreme humidly, direct sunlight, blowing dirt or rain can permanently damage some components of MHS Conveyor. In particular, the curing agents in concrete are known to attack and degrade the urethane conveyor components.

When installing conveyor on a new construction site, be sure that the concrete is properly cured before setting conveyor on it. In addition, if conveyors are stored in the proximity of curing concrete, proper ventilation must be used to direct the curing agent fumes away from the conveyor.

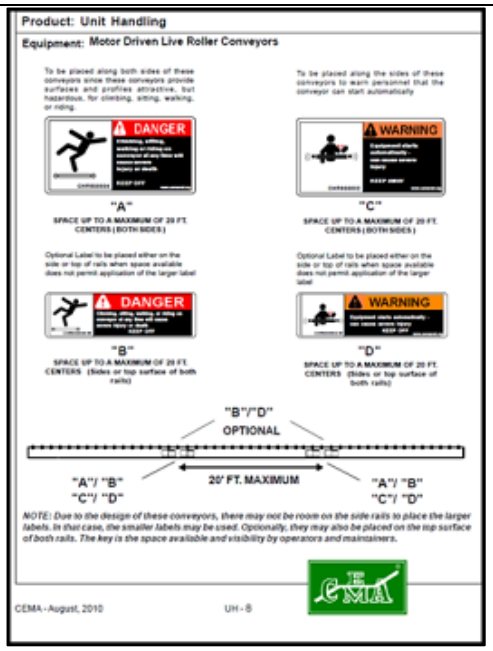
Failure to comply with these guidelines will void the MHS warranty on any failed components that result from these environment issues.

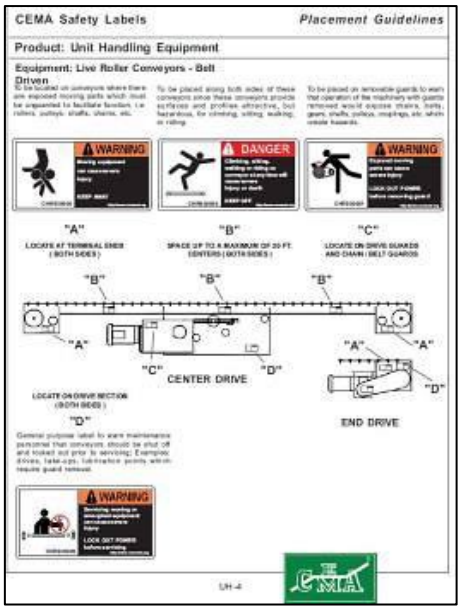
08/12/2021

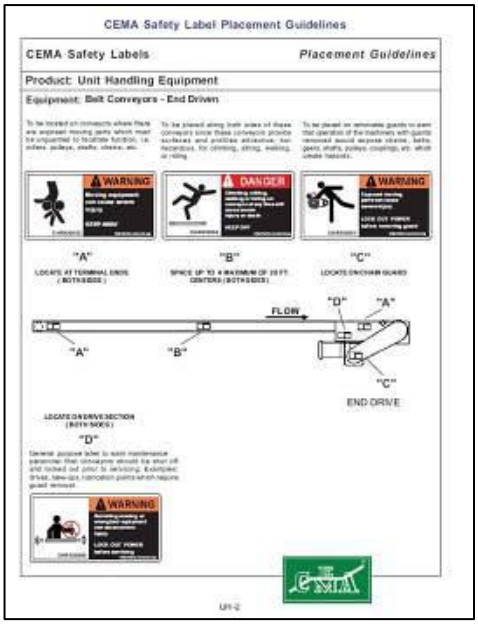
WARNING	
	• Safety: Always lock out power source and follow recommended safety procedures.

2.1 MHS RECOMMENDS PROPER LABELS FOR CONVEYOR TYPES

Shown below are some samples of labels applicable to conveyor standards.







2.2 WARNINGS AND SAFETY INSTRUCTIONS

Failure to follow the instructions and cautions throughout this manual and warning label on the conveyor may result in injury to personnel or damage to the equipment.

Your MHS Conveyor is powered by a motor and can be stopped only by turning off electrical power to the motor. As with all powered machinery, the drive-related components – including sprockets, chains, shafts, universal joints, and pneumatic devices – can be dangerous. We have installed or provided guards to prevent accidental contact with these parts, along with warning labels to identify the hazards.

Special attention must be paid to the following areas of this manual:

DANGER

- Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING

- Indicates potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION

- Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

2.2.1 Warnings and Safety Instructions

⚠ WARNING

- After maintenance, REPLACE guards immediately.
- Keep ALL warning labels clean and clear of any obstructions.
- Never remove, deface, or paint over WARNING or CAUTION labels. Any damaged label will be replaced by MHS Conveyor at no cost by contacting Lifetime Services.
- It is very important to instruct personnel in proper conveyor use including the location and function of all controls.
- Special emphasis must be given to emergency stop procedures.
- It is important to establish work procedures and access areas, which do not require any part of a person to be under the conveyor.
- It should be required that long hair is covered by caps or hairnets.
- Loose clothing, long hair, and jewelry must be kept away from moving equipment.
- Maintain enough clearance on each side of all conveyor units for safe adjustment and maintenance of all components.
- Provide crossovers or gates at sufficient intervals where needed to eliminate the temptation for personnel to climb over or under any conveyor.
- Walking or riding on a moving conveyor must be prohibited.
- Before performing maintenance on the conveyor, make sure the start-up controls are locked out and cannot be turned on by any person other than the one performing the maintenance.
- If more than, one crewmember is working on the conveyor, EACH CREW MEMBER MUST HAVE A LOCK ON THE POWER LOCKOUT.
- All pneumatic devices must be de-energized and air removed to prevent accidental cycling of the device while performing general maintenance.
- Make sure all personnel are clear of all conveyor equipment before restarting the system.
- Before restarting a conveyor, which has been stopped because of an emergency, an inspection of the conveyor must be made and the cause of the stoppage determined. The starting device must be locked out before any attempt is made to correct the cause of stoppage.

⚠ WARNING

- Motor rollers can become hot!
- Workplace and traffic routes may require additional protections/guarding if nearby hazardous equipment
- IntelliROL equipment starts and stops without warning

- Employees that come in contact with the equipment must be warned of dangers of unexpected start. Hands can be crushed between products or products and channel

- Before servicing or performing any work in the motor control panel, disconnect and lock out air and the main incoming service. If only the panel disconnect is off, the incoming side will still be hot.

2.3 MHS CONVEYOR CONTROLS SAFETY GUIDELINES

The following basic conveyor control safety guidelines are recommended by MHS Conveyor even though Business Partner may or may not purchase conveyor controls from MHS Conveyor. The items listed deal with applications of controls equipment. The actual installation of the equipment must always follow the National Electric Code and all other local codes.

Start-up Warning Horn

Ideally, all conveyors should be within sight of the conveyor start pushbutton. This allows the operator to verify that no one is touching the conveyor or would be in danger if the conveyor were to start up.

If it is not possible to see the entire conveyor being started from the start pushbutton location, then some form of audible warning device is required. It could be a horn, buzzer, bell, or anything unique to that conveyor for that location. It should be loud enough to be heard at any point on the conveyor system. It should sound for approximately five seconds after the start pushbutton is pushed, prior to the actual running of conveyor. Any auxiliary equipment such as vertical lifts, turntables, etc., should also be included in the warning circuitry.

Conveyors that stop and restart under automatic control could also require a horn warning prior to restarting. If it is not easy to distinguish the difference between a fully stopped conveyor system and a momentarily stopped conveyor section, then it is advisable to add a warning horn. All conveyor sections that stop and restart automatically should be marked with appropriate signs or labels.

Start Pushbuttons

Start pushbuttons should be the flush type or guarded such that inadvertently leaning against them will not actuate the conveyor. They should be provided with a legend plate clearly defining which conveyors will be started.

Stop Pushbuttons

Stop pushbuttons should be the extended type such that any contact with it is sufficient to stop the conveyor. They would also be provided with a legend plate clearly defining which conveyors will be stopped.

Operator Controls

Additional operator controls should be designed into the system with the same guidelines that go into start and stop pushbuttons, depending upon their function. Devices which are repeated on multiple control stations, such as emergency stops, should be located at the same relative location on each station (such as lower right corner).

Emergency Stops

All locations where an operator must work directly at the conveyor may be subject to local safety codes requiring e-stops. It is the responsibility of the integrator to check with state and local authorities on the need and application of e-stops.

Emergency stops can be of the pushbutton or cable operated switch type. The pushbutton type should be a red, mushroom head maintained pushbutton which requires resetting after it is actuated. Cable operated switches should trip by pulling the cable, and require resetting at the switch.

Actuating an emergency stop must drop-out the start circuit, requiring restarting the system using the start pushbuttons provided.

An emergency stop should normally stop all conveyors in the system. Very large systems may involve dividing a system into zones of control based on proximity of personnel, safety hazards, walls obstacles, etc.

Controls Logic

Solid state controls logic devices, such as programmable controllers are used extensively for conveyor control. They are very reliable, but a hardware failure or software bug would cause an output to function erratically. For this reason, start circuits, warning horn circuits, and emergency stops should usually be configured using conventional relay logic.

Safety Switches

All conveyor control cabinets and motors should be provided with safety (or disconnect) switches. These switches must have provisions for padlocking. As required for maintenance, equipment should be locked in the off position.

Special Devices

Special devices and equipment such as vertical lifts, turntables, high speed conveyors, etc., all have unique design and safety requirements. These should be looked at in each case to determine what the requirements might be.

Rev 04/06/2023

3 RECEIVING & SITE PREPARATION

General Shipping / Packaging Information

IntelliROL conveyor is shipped in subassemblies. These subassemblies are packaged to guard against damage in shipment when handled properly.

Examination immediately following unloading will show if any damage was caused during shipment. If damage is evident, claims for recovery of expenses to repair damage or replace components must be made against the carrier immediately. While unloading, a check must be made against the Bill of Lading, or other packing lists provided, to confirm full receipt of listed items.

⚠CAUTION

- TAKE CARE DURING THE REMOVAL OF EQUIPMENT FROM THE CARRIER.
- Remove small items and boxes first.
- Pull and lift only on the skid, not on the frame, crossmember or any part of the equipment.
- Be sure the skid is free of other materials which may be on top of or against the side of the skid to be removed.

Preparation of Site

After the conveyor is received, move it to the installation site or designated dry storage area as soon as possible. Clean up all packing material immediately before parts get lost in it. Loose parts should remain in the shipping boxes until needed.

Prior to starting assembly of the conveyor, carefully check the installation path to be sure there are no obstructions that will cause interference. Check for access along the path needed to bring in bed sections and components closest to the point where they are needed. It is often necessary to give the area along the system path a general cleanup to improve installation efficiency, access and accuracy.

4 PART INVENTORY & IDENTIFICATION

Label Identification

Each subassembly is shipped completely assembled except typical loose parts, which are in boxes with the subassemblies. Segregate the conveyor subassemblies by types for inventory and ease of locating during installation.

An identification label is attached to the charged end of the center Bed of each ITR Pick Zone Module.

This label contains:

- Item number
- Description
- Job Number
- Mfg. Number
- Date of manufacture
- Tag number (if specified)
- Assembler's clock number
- QR (Quick Response) Label
  - Scan Code For IOM Manual

Scan the QR code to retrieve the IOM Manual, if nothing happens; check your scanner settings and make sure the QR Label setting is enabled.

On the supports, the tag is located on the bottom side of the foot. On special devices, it is located on a convenient flat surface that is not offensive to the appearance of the equipment but is still accessible for viewing. These numbers can be cross-referenced against the packing list. Loose parts are boxed and shipped separately.

You should have all conveyor sections and supports for a particular conveyor prior to installation. It is cost-effective to identify and procure any missing parts before they are needed for assembly. Small items like nuts and bolts are weigh-counted and packaged by size and type.

⚠ WARNING	
	• The Installation Supervisor must be experienced with conveyor and qualified in the mechanics of the equipment and enforce safe working procedures for the protection of the crew, customer, and customer's property.

⚠ WARNING	
	• Before restarting a conveyor which has been stopped because of an emergency, an inspection of the conveyor must be made and the cause of the stoppage determined. The starting device must be locked out before any attempt is made to correct the cause of stoppage.

5 PICK ZONE MODULE INSTALLATION

ITR Pick Zone Concepts

The ITR Pick Zone Module utilizes motorized roller to convey and transfer product much easier than Line Shaft conveyor.

This rapidly advancing technology uses a self-contained 24 volt DC motorized roller to power a segment or zone of the conveyor. Rollers adjoining the motorized roller are slave-driven with the same components MHS Conveyor developed in the '60s.

Operation

The product-carrying rollers are slave-driven by a series of pre-tensioned belts to the motorized roller in each zone. The rollers and urethane belts transfers are activated by a series of photo eyes. The photo eyes are already in place and factory tested

Feature/Benefits

- Flexible Modular design / easy to reconfigure
- Run on demand / less noise, wear, and energy consumption
- Non-contact zero-pressure / product protection
- Compact low profile / multi-level usage
- Reversible / less electrical hardware cost
- No scheduled maintenance / lower operating cost
- Low voltage / safety and lower cost
- Simple installation / lower cost
- Soft start/stop / low G-forces
- Variable speed / versatility to suit each requirement
- Intelligent control capabilities / cost no greater than need

A bi-directional urethane belt transfer has a maximum rate of 30 cases per minute.

⚠CAUTION
• Urethane belt, transfer belts should only run while transferring a load. (Run on Demand)

5.1 ITR PICK ZONE APPLICATION OPTIONS

The ITR Pick Zone Module has many standard sizes.

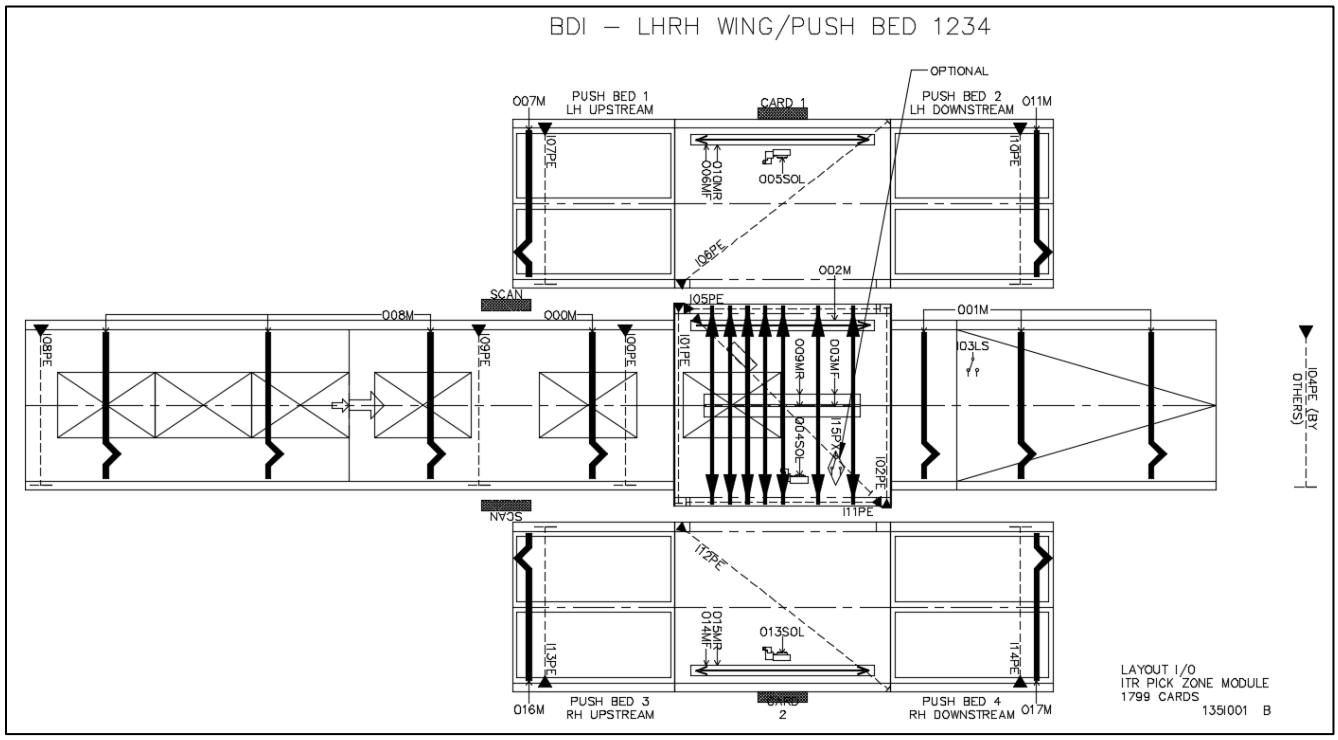
Application Specific Modules may be used to solve certain requirements within a system at a most cost-effective manner using IntelliROL conveyor.

ITR Pick Zone Standard Sizes

MODEL	ITEM #	BF (CTR-WINGS)	CONTROLS	SCANNER GAP (A)	TRANSFER GAP (B)
PZM,ITR-16BF-CB-7S-BDI 6 GAP	1155289	22-16	TERM. STRIP	6"	3"
PZM,ITR-22BF-CB-7S-BDI 6 GAP	1155290	28-22	TERM. STRIP	6"	3"
PZM,ITR-28BF-CB-7S-BDI 6 GAP	1155291	34-28	TERM. STRIP	6"	3"
PZM,ITR-16BF-CB-7S-BDI 3.5 GAP	1155292	22-16	TERM. STRIP	3-1/2"	1/2"
PZM,ITR-22BF-CB-7S-BDI 3.5 GAP	1155293	28-22	TERM. STRIP	3-1/2"	1/2"
PZM,ITR-28BF-CB-7S-BDI 3.5 GAP	1155294	34-28	TERM. STRIP	3-1/2"	1/2"
PZM,ITR-16BF-ER-7S-BDI 6 GAP	1155295	22-16	1799 ER	6"	3"
PZM,ITR-22BF-ER-7S-BDI 6 GAP	1155296	28-22	1799 ER	6"	3"
PZM,ITR-28BF-ER-7S-BDI 6 GAP	1155297	34-28	1799 ER	6"	3"
PZM,ITR-16BF-ER-7S-BDI 3.5 GAP	1155298	22-16	1799 ER	3-1/2"	1/2"
PZM,ITR-22BF-ER-7S-BDI 3.5 GAP	1155299	28-22	1799 ER	3-1/2"	1/2"
PZM,ITR-28BF-ER-7S-BDI 3.5 GAP	1155300	34-28	1799 ER	3-1/2"	1/2"

Reference Dwg. 135A012

Conveyor Flow



5.2 DEFINITION OF TERMS

Carrying Roller - The conveyor roller upon which the object being transported is supported. It has circumferential grooves near one end to allow the slave belts to ride below the carrying surface.

Coefficient of Friction - A numerical expression of the ratio between the force of contact between two surfaces and the resistant force tending to oppose the motion of one with respect to the other.

Conveyor Width - The dimension outside to outside of frame rails. For the inside dimension, the abbreviation "BF" (between frames) is used.

Crossmember - Structural member which is assembled between two side channels of a conveyor bed.

Frame - The structure which supports the components of a conveyor bed consisting of formed channel rails bolted together with crossmembers.

Indexing Control - Maintains non-contact accumulation and functionality of gates, transfers, curves, etc. by not allowing accumulation in these areas.

Roller Centers - Distance between center lines of adjacent rollers.

Roller Groove - The groove that is fabricated into the carrying roller to provide a seat for the slave belts below the carrying surface.

Singulation Release - A method of individual zone release that spaces product approximately one zone length apart.

Slave Belt - An endless round belt manufactured from elastic material, typically urethane, connecting a motorized roller, or carrying rollers or other carrying rollers within a zone.

Slug Release - Simultaneous release of several products.

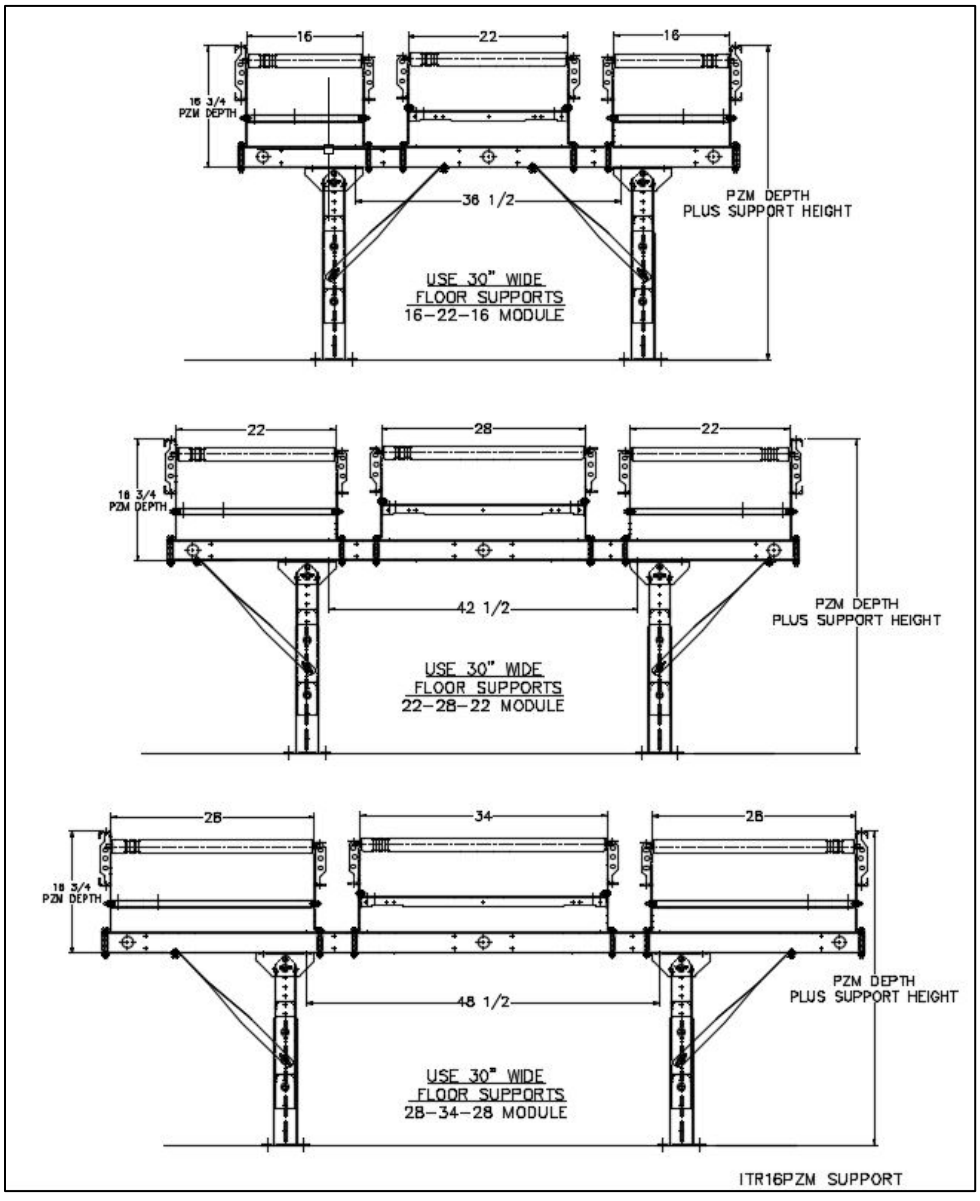
Zone - A portion of conveyor activated by a motorized roller that may be controlled by a photoeye.

Zone Length - The distance between sensing devices (typically containing one motorized roller).

5.3 SUPPORTS & CONNECTIONS

For details on Supports & Connections, see Support & Connections IOM (#1200485) at mhs-conveyor.com

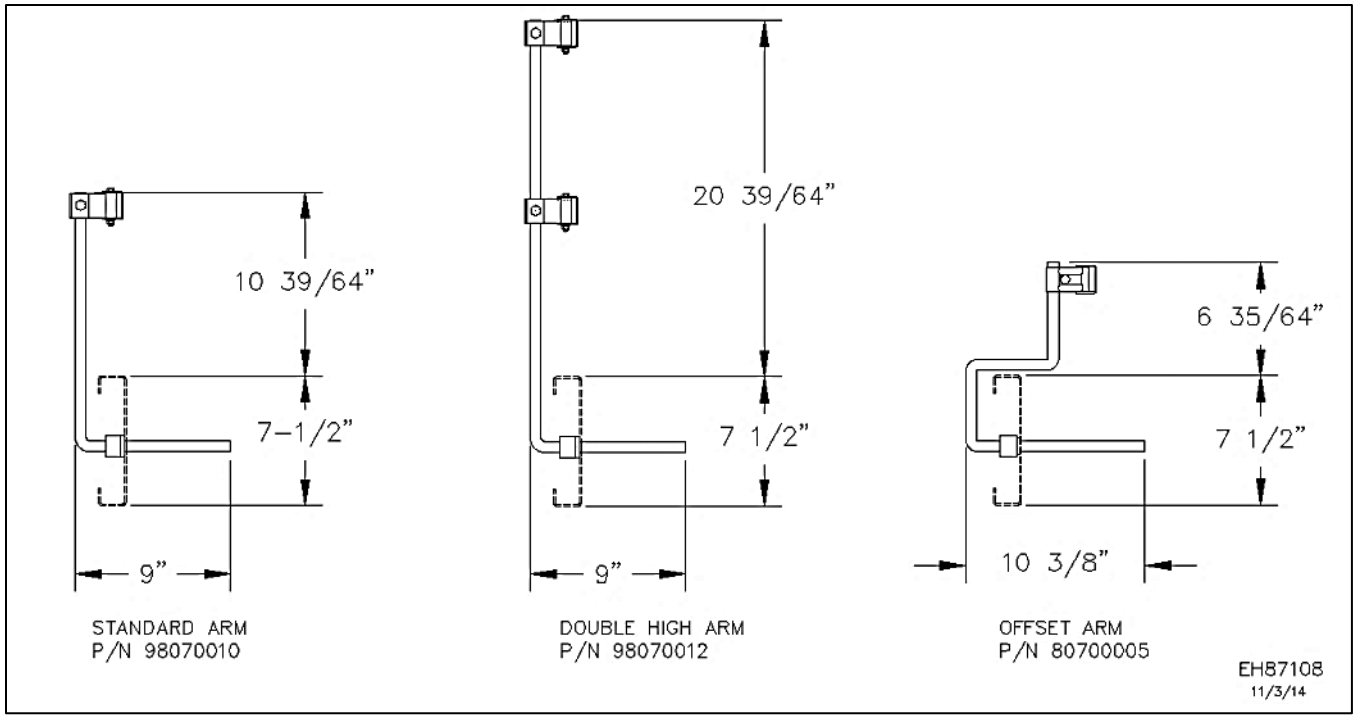
5.4 SUPPORTING ITR PICK ZONE MODULE



NOTE:

Type "C" braces (not shown) use two type "B" braces overlapped and bolted together for extended length when conveyor height is 48" or more.

5.5 ADJUSTABLE CHANNEL GUARD RAIL TO CRUZ® CHANNEL OPTIONS



5.6 ENVIRONMENT

Temperature range (ambient):

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

Ultraviolet Rays:

Avoid exposure of polyurethane O-rings to sunlight.

Oily or Wet Conditions:

Will impair frictional drive characteristics.

Corrosive or Abrasive Substances:

Will adversely affect various components.

Cleaning O-Rings

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

Note:

Do NOT immerse the O-rings or any component in a container of this cleaning product.

Accumulation with Application Engineering approval.

5.7 DIMENSIONAL REFERENCE POINTS

The path of each conveyor in the system is determined by establishing a reference point at each end. The center line of the conveyor is established and a chalk line is snapped between these points.

Conveyors should be installed with the center line of the bed matching the center line of the conveyor path within 1/8" of true center. Locate and mark the center of the crossmembers at each end of the conveyor. Use a plumb line or other acceptable means to ensure accuracy to the chalk line.

Always carry out a thorough check for any obstructions such as building columns, manholes, etc. It may be necessary to reroute the conveyor to avoid the obstruction. In this case it would be advisable to begin installation at this point, using the obstruction as a reference point (Datum), and install the sections in either direction as required.

All conveyor sections must be checked for squareness prior to installation as "racking" or being knocked out of square may have occurred during shipping and handling.

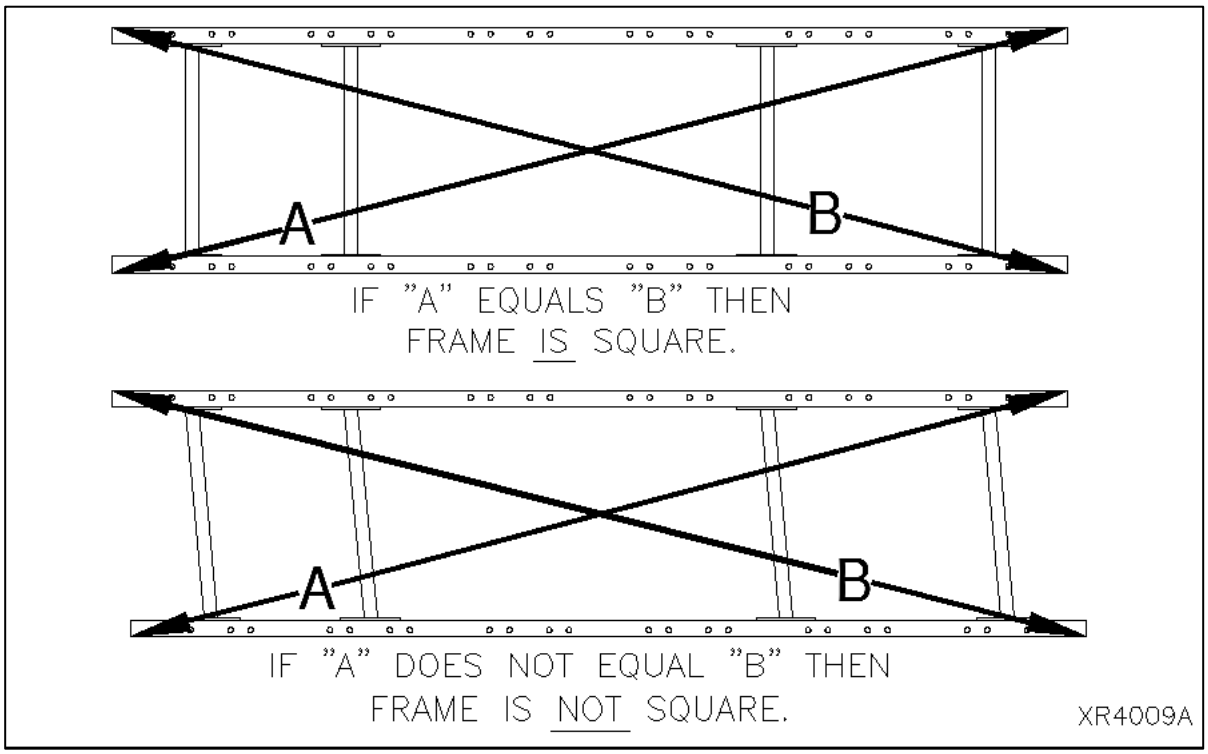
5.8 PZM INSTALLATION

The ITR Pick Zone Module may be installed using any of the supporting arrangements described under Support Arrangements in this manual. As each bed is installed in the system, level the conveyor from side to side using a bubble level on the roller at each support.

The bubble location should be within the level indicator lines of the level. The center line of the conveyor should not bow to the right or left more than 1/8" in either direction from a center line drawn between the centers of the conveyor end assemblies.

A simple way to check this is to tie a nylon string around the center of the end roller, pull it taut, and tie it to the center of the roller at the opposite end. Put a wood spacer under the string at each end so it does not rest on the rollers. With the taut string centered on each end and suspended above the rollers, check the center of the rollers at each support relative to the string and adjust accordingly. (Note that this must be done after side-to-side leveling of the conveyor at each support.)

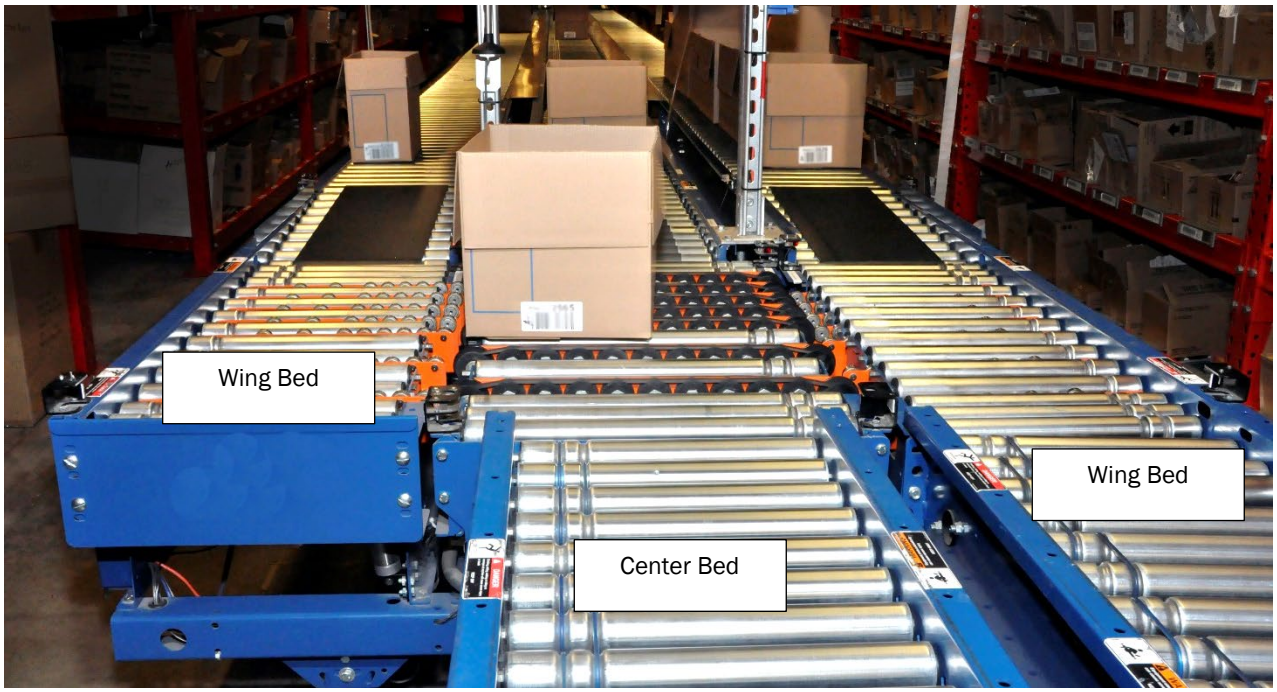
All bed frames should be checked for squareness. To check, measure diagonally from corner to corner. Measure the opposite corners in the same manner. If the bed is square, the two measurements will be the same within 1/16".



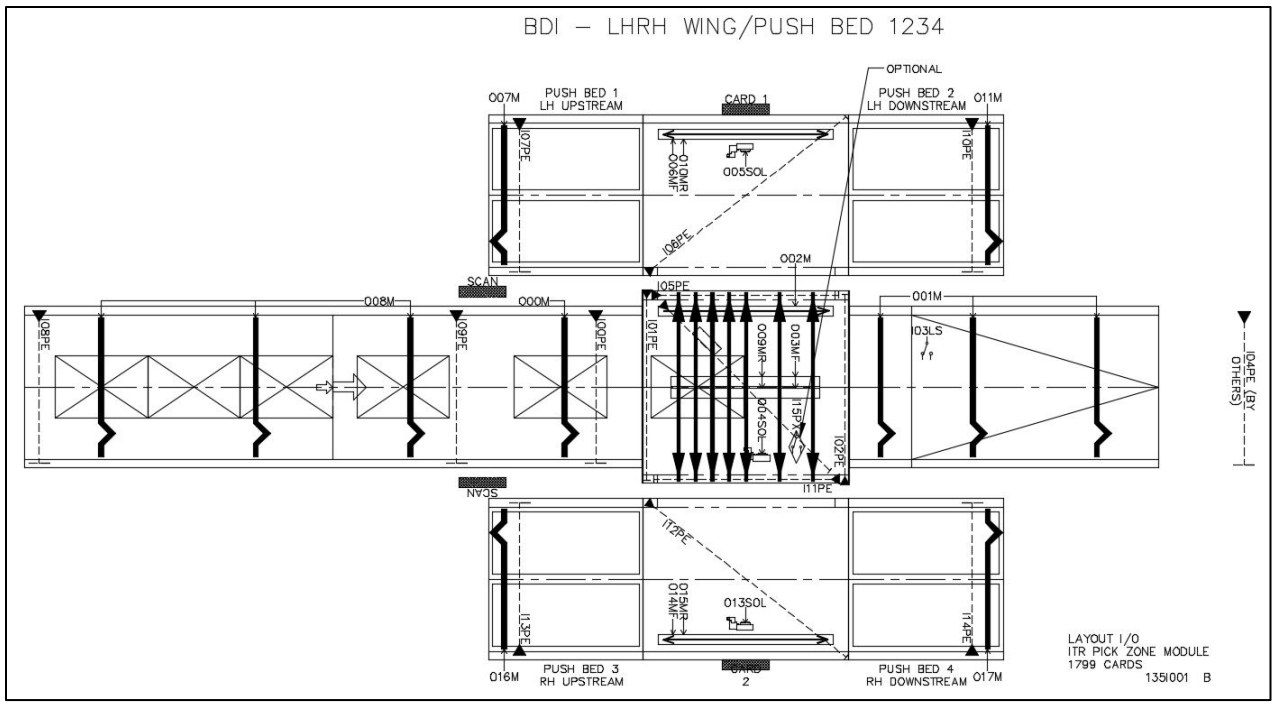
NOTE:
Conveyor frames must always be installed in a straight line from end to end. After a number of sections have been installed to the chalk line and leveled, check the alignment of each conveyor assembly.

6 ESTABLISHING CONVEYOR FLOW

The center bed carrier rollers of the ITR Pick Zone Module run in one direction while the Wing beds can be Bi-directional. The ITR Pick Zone Module has a label on the charge end of the center bed of the Module. This label indicates the direction of flow.



6.1 CONVEYOR FLOW



7 DESCRIPTION OF OPERATIONS

7.1 PZM PNEUMATIC LIFT PZM-DESCRIPTION OF OPERATION

When the system is first started, the following conditions should exist:

- Upstream induct conveyor running (O00M and O08M)
- Downstream gate conveyor running (O01M)
- Pick zone module transfer rollers running (O02M)
- Pick zone module transfer in down position (I15PX, O04SOL)
- All wing beds in down position (O05SOL, O13SOL)
- All other pick zone module conveyors not running (O03MF, O06MF, O07M, O09MR, O10MR, O11M, O14MF, O15MR, O16M and O17M)

As product appears on the induct conveyor, a gap will be created between each package. This facilitates barcode scanning and sensing of individual products prior to entering the transfer. As gapped packages travel along the induct conveyor, the customer-supplied barcode scanner can read the barcode on each package. This information is then used to determine what to do with each package at the decision point of the pick zone module. Specifically, the decisions needed at the pick zone module are as follows:

- Whether or not to divert the package
- If the transfer is bi-directional, which direction to divert the package
- If the wing bed is bi-directional, which direction to send the package

As I00PE senses a package upstream of the transfer, O00M and O08M will continue to run the induct conveyor if the transfer is clear and down (as detected by I15PX, if included.) Otherwise, O00M and O08M will stop the induct conveyor until the transfer is ready to accept another package.

Once the package has completely entered the transfer, as detected by I01PE, if the package is to be diverted and the wing bed is clear, up to four things will occur as follows:

1. O03MF will run the transfer belts
2. O04SOL will raise the transfer
3. O05SOL or O13SOL will raise the wing bed
4. If the transfer is bi-directional, O09MR will set the transfer divert direction (OFF=forward, ON=reverse)

Once the package is present on the wing bed, as detected by I06PE or I12PE, up to three things will occur as follows:

1. O06MF or O14MF will run the destination wing bed
2. O07M, O11M, O16M or O17M will run the destination push bed
3. If the wing bed is bi-directional, O10MR or O15MR will set the wing bed direction (OFF=forward, ON=reverse)

Again, these decisions are based upon the data associated with the barcode on the package. Once the trailing edge of the package enters the wing bed, as detected by I05PE or I11PE, O03MF will stop the

transfer belts, O04SOL will lower the transfer and O05SOL or O13SOL will lower the wing bed. Once the package is present on the push bed, as detected by I07PE, I10PE, I13PE or I14PE, O06MF or O14MF will stop the wing bed. Once the trailing edge of the package clears the push bed, as detected by I07PE, I10PE, I13PE or I14PE, O07M, O11M, O16M or O17M will stop the push bed. If the package is not supposed to be diverted, then the transfer will remain down and the package will travel straight through the pick zone module.

If the package is not being diverted, the next package does not have to wait for the transfer to be clear before being released by the induct conveyor. After a short delay, the next package can be inducted to the transfer. The amount of this delay needs to be long enough to allow the trailing edge of the first package to exit the transfer, as detected by I02PE, prior to the trailing edge of the second package completely entering the transfer, as detected by I01PE. If the package is being diverted, the next package must wait until the trailing edge of the current package enters the wing bed, as detected by I05PE or I11PE. Once this occurs, and the transfer is down, the transfer is considered clear and ready for the next package.

The gate conveyor motors are controlled by O01M. The status of the gate is monitored by I03LS. If the gate is opened, the run signal to the gate conveyor motors will be interrupted, stopping the rollers. Do not turn off O01M. In addition to running the gate conveyor rollers, the signal is also passed through the I03LS limit switch contacts, and then to the input. Also, if the gate is opened when a package is on the transfer, it can be allowed to continue if it is being diverted. Otherwise, it should not be sent straight through the transfer. If a package is stopped on the transfer due to the gate being opened, the induct conveyor should not release additional product to the transfer. This should only be an issue if the package on the transfer was going straight through, since normally a timer would allow another package to be released to the transfer without the transfer being clear.

In addition to the functionality described above, the O01M run signal is also used to power the I04PE photoeye. The O01M run signal should not be turned off when the downstream conveyor is full. The status of product on the downstream conveyor is monitored by I04PE. If the downstream conveyor is full, a package on the transfer can be allowed to continue if it is being diverted. Otherwise, it should not be sent straight through the transfer. If a package is stopped on the transfer due to the downstream conveyor being full, the induct conveyor should not release additional product to the transfer. This should only be an issue if the package on the transfer was going straight through, since normally a timer would allow another package to be released to the transfer without the transfer being clear.

If desired, the entire pick zone module can be stopped, including the induct conveyor, transfer rollers and gate conveyor, due to inactivity. If the pick zone module does not sense any product for a period of time, the system can be stopped. When product begins entering the induct conveyor, as detected by I08PE, the system can be restarted and function as described above.

As described previously in this document, the induct conveyor creates a gap between packages as they travel toward the barcode scanner and transfer. This gapping occurs due to the speed differential between the first two zones and the second two zones of the induct conveyor. If the barcode scanner is a top scanner, the induct conveyor may need to create a larger gap between packages prior to them arriving at the scanner. This can be accomplished by splitting the run signal between the third and fourth zones of the induct conveyor. The first three zones share a run signal (O08M) so that they start and stop together. The fourth zone has its own run signal (O00M) so that it can continue to run while the first

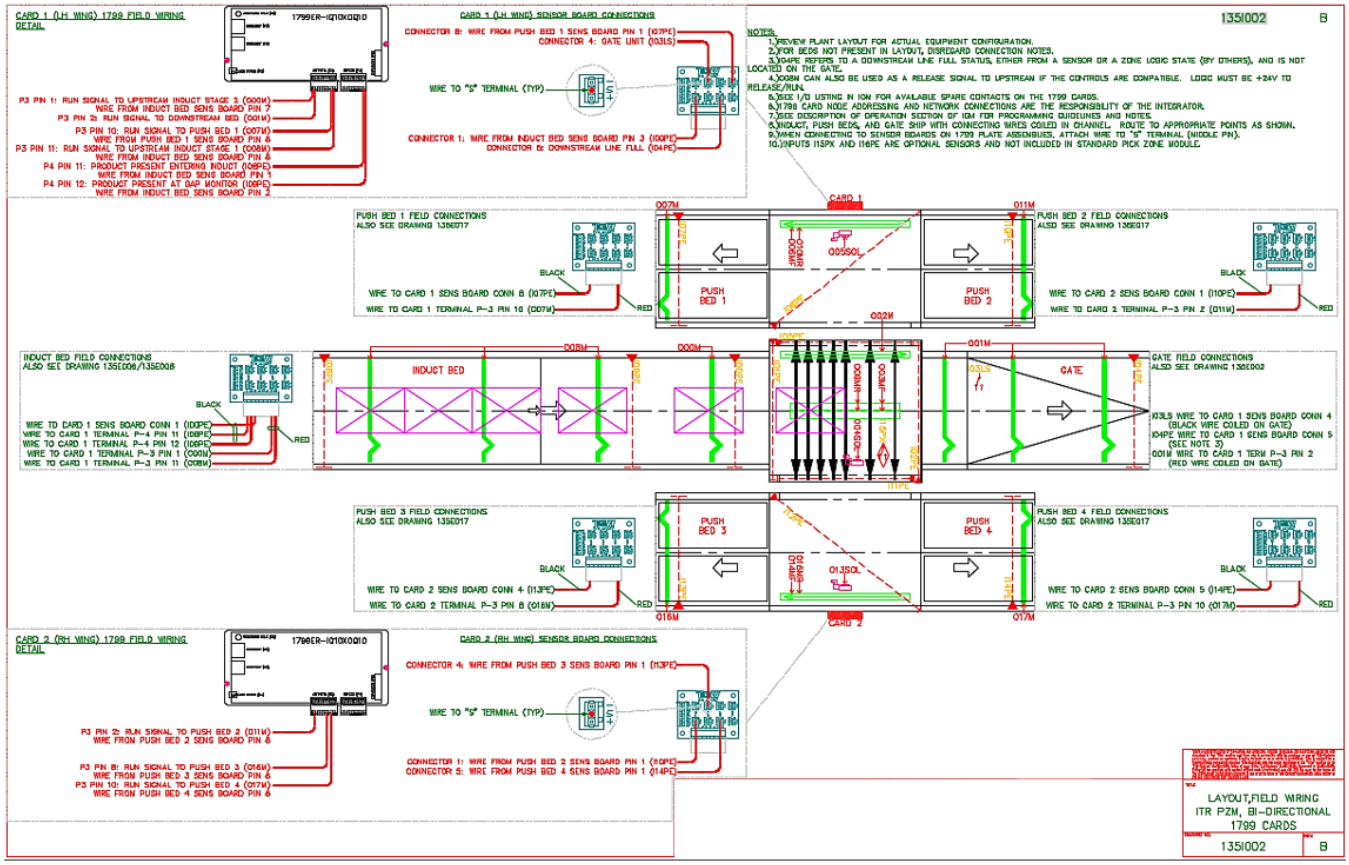
three zones are stopped. This should be done for a period of time long enough to create the desired minimum gap between each package. A photoeye (I09PE) is positioned in the third zone to monitor the gap between packages. This photoeye is used to determine if the first three zones need to be stopped to create the desired minimum gap.

7.1.1 Wing Bed LH & RH Push Beds 1234 (1799)

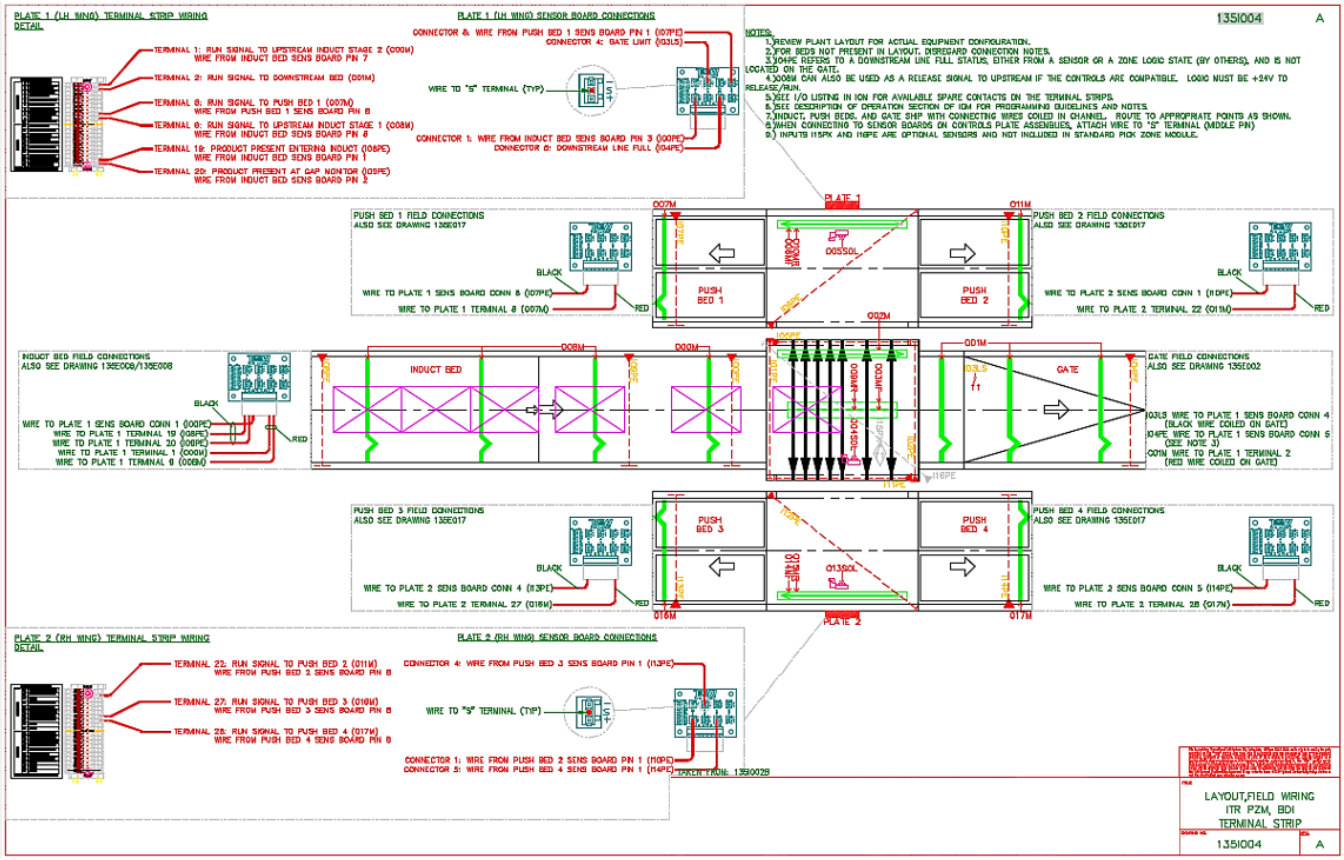
1799 Inputs (Terminal P4)			
Device Tag	**Pin #**	**Description**	**Wired At:**
I00PE	1	Product Present Upstream of Transfer	Field
I01PE	2	Product Present Entering Transfer	Bench
I02PE	3	Product Present Exiting Transfer Straight	Bench
N/A	4	0V	Bench
I03LS	5	Downstream Gate Closed	Field
I04PE	6	Downstream Conveyor Full	Field
I05PE	7	Product Present Entering Wing Bed 1 (LH)	Bench
I06PE	8	Product Present On Wing Bed 1 (LH)	Bench
N/A	9	0V	Bench
I07PE	10	Product Present On Push Bed 1 (LH Upstream)	Field
I08PE	11	Product Present Entering Induct	Field
I09PE	12	Product Present At Gap Monitor	Field
I10PE	1	Product Present On Push Bed 2 (LH Downstream)	Field
I11PE	2	Product Present Entering Wing Bed 2 (RH)	Bench
I12PE	3	Product Present On Wing Bed 2 (RH)	Bench
N/A	4	0V	Bench
I13PE	5	Product Present On Push Bed 3 (RH Upstream)	Field
I14PE	6	Product Present On Push Bed 4 (RH Downstream)	Field
I15PX	7	Transfer Lowered (Optional)	Bench
I16PE	8	Product Present On Transfer (Optional)	Bench
N/A	9	0V	Bench
I17	10	Spare	
I18	11	Spare	
I19	12	Spare	
1799 Outputs (Terminal P3)			
Device Tag	**Pin #**	**Description**	**Wired At:**
O00M	1	Run Upstream Induct Stage 2	Field
O01M	2	Run Downstream	Field
O02M	3	Run Transfer Rollers	Bench
N/A	4	0V	N/C
O03MF	5	Run Transfer Belts	Bench
O04SOL	6	Raise Transfer	Bench
O05SOL	7	Raise Wing Bed 1 (LH)	Bench
O06MF	8	Run Wing Bed 1 (LH)	Bench
N/A	9	24V	N/C
O07M	10	Run Push Bed 1 (LH Upstream)	Field
O08M	11	Run Upstream Induct Stage 1	Field
O09MR	12	Reverse Direction Transfer Belts	Bench
O10MR	1	Reverse Direction Wing Bed 1 (LH)	Bench
O11M	2	Run Push Bed 2 (LH Downstream)	Field
O12	3	Spare	
N/A	4	0V	N/C
O13SOL	5	Raise Wing Bed 2 (RH)	Bench
O14MF	6	Run Wing Bed 2 (RH)	Bench
O15MR	7	Reverse Direction Wing Bed 2 (RH)	Bench
O16M	8	Run Push Bed 3 (RH Upstream)	Field
N/A	9	24V	N/C
O17M	10	Run Push Bed 4 (RH Downstream)	Field
O18	11	Spare	
O19	12	Spare	

3/6/2014

7.1.2 Layout Field Wiring ITR PZM, Bi-Directional 1799 Cards



7.1.3 Layout Field Wiring ITR PZM BID Terminal Strip



7.2 PZM ELECTRIC LIFT PZM DESCRIPTION OF OPERATION

When the system is first started, the following conditions should exist:

- Upstream induct conveyor running (O00M and O08M)
- Downstream gate conveyor running (O01M)
- Pick zone module transfer rollers running (O02M)
- Pick zone module transfer in down position (I17PX)
- All wing beds in down position (I18PX and I20PX)
- All other pick zone module conveyors not running (O03M, O06M, O07M, O11M, O14M, O16M and O17M)

As product appears on the induct conveyor, a gap will be created between each package. This facilitates barcode scanning and sensing of individual products prior to entering the transfer. As gapped packages travel along the induct conveyor, the customer-supplied barcode scanner can read the barcode on each package. This information is then used to determine what to do with each package at the decision point of the pick zone module. Specifically, the decisions needed at the pick zone module are as follows:

- Whether or not to divert the package
- If the transfer is bi-directional, which direction to divert the package
- If the wing bed is bi-directional, which direction to send the package

As I00PE senses a package upstream of the transfer, O00M and O08M will continue to run the induct conveyor if the transfer is clear and down (as detected by I17PX.) Otherwise, O00M and O08M will stop the induct conveyor until the transfer is ready to accept another package.

Once the package has completely entered the transfer, as detected by I01PE, if the package is to be diverted and the wing bed is clear, the following three things will occur:

1. O03M will run the transfer belts
2. O04M will raise the transfer, I16PX when detected will stop transfer in the raised position
3. O05M or O13M will raise the wing bed, I19PX or I21PX when detected will stop the wing bed in the raised position

Once the package is present on the wing bed, as detected by I06PE or I12PE, the following two things will occur:

1. O06M or O14M will run the destination wing bed rollers
2. O07M, O11M, O16M or O17M will run the destination push bed

Again, these decisions are based upon the data associated with the barcode on the package. Once the trailing edge of the package enters the wing bed, as detected by I05PE or I11PE, O03MF will stop the transfer belts, O04M will lower the transfer and O05M or O13M will lower the wing bed. Once the package is present on the push bed, as detected by I07PE, I10PE, I13PE or I14PE, O06M or O14M will stop the wing bed. Once the trailing edge of the package clears the push bed, as detected by I07PE, I10PE, I13PE or I14PE, O07M, O11M, O16M or O17M will stop the push bed. If the package is not supposed to be diverted, then the transfer will remain down and the package will travel straight through the pick zone module.

If the package is not being diverted, the next package does not have to wait for the transfer to be clear before being released by the induct conveyor. After a short delay, the next package can be inducted to the transfer. The amount of this delay needs to be long enough to allow the trailing edge of the first package to exit the transfer, as detected by I02PE, prior to the trailing edge of the second package completely entering the transfer, as detected by I01PE. If the package is being diverted, the next package must wait until the trailing edge of the current package enters the wing bed, as detected by I05PE or I11PE. Once this occurs, and the transfer is down, the transfer is considered clear and ready for the next package.

The gate conveyor motors are controlled by O01M. The status of the gate is monitored by I03LS. If the gate is opened, the run signal to the gate conveyor motors will be interrupted, stopping the rollers. Do not turn off O01M. In addition to running the gate conveyor rollers, the signal is also passed through the I03LS limit switch contacts, and then to the input. Also, if the gate is opened when a package is on the transfer, it can be allowed to continue if it is being diverted. Otherwise, it should not be sent straight through the transfer. If a package is stopped on the transfer due to the gate being opened, the induct conveyor should not release additional product to the transfer. This should only be an issue if the package on the transfer was going straight through, since normally a timer would allow another package to be released to the transfer without the transfer being clear.

In addition to the functionality described above, the O01M run signal is also used to power the I04PE photoeye. The O01M run signal should not be turned off when the downstream conveyor is full. The status of product on the downstream conveyor is monitored by I04PE. If the downstream conveyor is full, a package on the transfer can be allowed to continue if it is being diverted. Otherwise, it should not be sent straight through the transfer. If a package is stopped on the transfer due to the downstream conveyor being full, the induct conveyor should not release additional product to the transfer. This should only be an issue if the package on the transfer was going straight through, since normally a timer would allow another package to be released to the transfer without the transfer being clear.

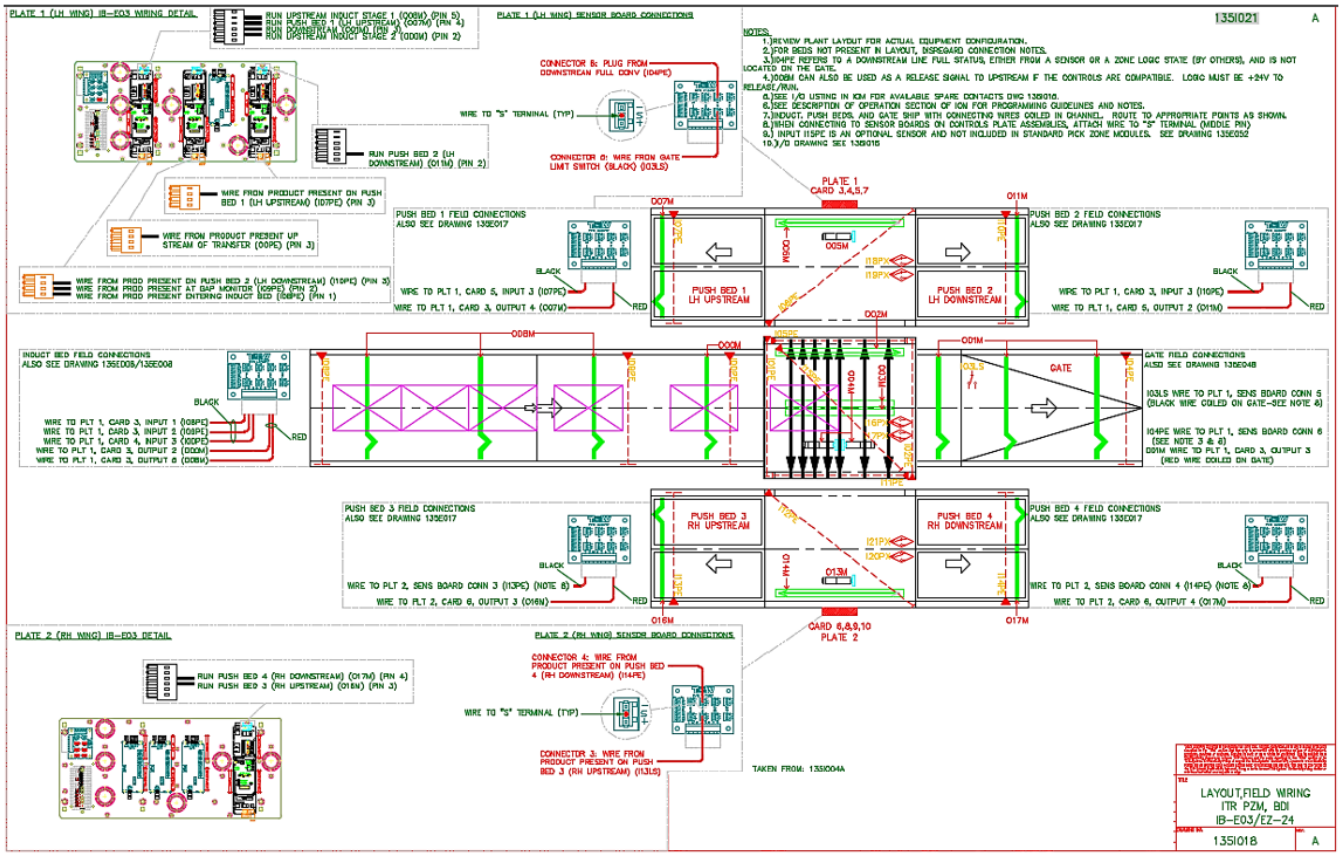
If desired, the entire pick zone module can be stopped, including the induct conveyor, transfer rollers and gate conveyor, due to inactivity. If the pick zone module does not sense any product for a period of time, the system can be stopped. When product begins entering the induct conveyor, as detected by I08PE, the system can be restarted and function as described above.

As described previously in this document, the induct conveyor creates a gap between packages as they travel toward the barcode scanner and transfer. This gapping occurs due to the speed differential between the first two zones and the second two zones of the induct conveyor. If the barcode scanner is a top scanner, the induct conveyor may need to create a larger gap between packages prior to them arriving at the scanner. This can be accomplished by splitting the run signal between the third and fourth zones of the induct conveyor. The first three zones share a run signal (O08M) so that they start and stop together. The fourth zone has its own run signal (O00M) so that it can continue to run while the first three zones are stopped. This should be done for a period of time long enough to create the desired minimum gap between each package. A photoeye (I09PE) is positioned in the third zone to monitor the gap between packages. This photoeye is used to determine if the first three zones need to be stopped to create the desired minimum gap.

7.2.1 Wing Bed LH & RH Push Beds 1234 (IB-E)

IBE-03 Inputs - Electric Lifts				
Device Tag	Card #	Terminal #	Description	Wired At:
I00PE	4	IN 3	Product Present Upstream of Transfer	Field
I01PE	3	SEN B	Product Present Entering Transfer	Bench
I02PE	4	SEN B	Product Present Exiting Transfer Straight	Bench
I03LS	5	ALM B	Downstream Gate Closed	Field
I04PE	5	SEN B	Downstream Conveyor Full	Field
I05PE	3	SEN A	Product Present Entering Wing Bed 1 (LH)	Bench
I06PE	5	SEN A	Product Present On Wing Bed 1 (LH)	Bench
I07PE	5	IN 3	Product Present On Push Bed 1 (LH Upstream)	Field
I08PE	3	IN 1	Product Present Entering Induct	Field
I09PE	3	IN 2	Product Present At Gap Monitor	Field
I10PE	3	IN 3	Product Present On Push Bed 2 (LH Downstrea	Field
I11PE	4	SEN A	Product Present Entering Wing Bed 2 (RH)	Bench
I12PE	6	SEN A	Product Present On Wing Bed 2 (RH)	Bench
I13PE	6	ALM B	Product Present On Push Bed 3 (RH Upstream)	Field
I14PE	6	SEN B	Product Present On Push Bed 4 (RH Downstrea	Field
I15PE	3	ALM B	Product Present On Transfer (Optional)	Bench
I16PX	5	IN 1	Transfer Raised	Bench
I17PX	5	IN 2	Transfer Lowered	Bench
I18PX	4	IN 1	Wing Bed 1 (LH) Lowered	Bench
I19PX	4	IN 2	Wing Bed 1 (LH) Raised	Bench
I20PX	6	IN 1	Wing Bed 2 (RH) Lowered	Bench
I21PX	6	IN 2	Wing Bed 2 (RH) Raised	Bench
	3	ALM A	OPEN	
	4	ALM A	OPEN	
	4	ALM B	OPEN	
	5	ALM A	OPEN	
	6	IN 3	OPEN	
	6	ALM A	OPEN	
IBE-03 Outputs				
Device Tag	Card #	Terminal #	Description	Wired At:
O00M	3	OUT 2	Run Upstream Induct Stage 2	Field
O01M	3	OUT 3	Run Downstream	Field
O02M	4	MTR A	Run Transfer Rollers	Bench
O03M	3	MTR A&B	Run Transfer Belts	Bench
O04M	6	OUT 2	Raise/Lower Transfer	Bench
O05M	5	OUT 1	Raise/Lower Wing Bed 1 (LH)	Bench
O06M	5	MTR A	Run Wing Bed 1 (LH)	Bench
O07M	3	OUT 4	Run Push Bed 1 (LH Upstream)	Field
O08M	3	OUT 5	Run Upstream Induct Stage 1	Field
O11M	5	OUT 2	Run Push Bed 2 (LH Downstream)	Field
O13M	6	OUT 1	Raise/Lower Wing Bed 2 (RH)	Bench
O14M	6	MTR A	Run Wing Bed 2 (RH)	Bench
O16M	6	OUT 3	Run Push Bed 3 (RH Upstream)	Field
O17M	6	OUT 4	Run Push Bed 4 (RH Downstream)	Field
	3	OUT 1	OPEN (TERMINAL STRIP 11)	
	4	OUT 1	OPEN	
	4	OUT 2	OPEN	
	4	OUT 3	OPEN	
	4	OUT 4	OPEN	
	4	OUT 5	OPEN	
	4	MTR B	OPEN	
	5	OUT 3	OPEN	
	5	OUT 4	OPEN	
	5	OUT 5	OPEN	
	5	MTR B	OPEN	
	6	OUT 5	OPEN	
	6	MTR B	OPEN	
				09/25/2017

7.2.2 Layout Field Wiring ITR PZM, Bi-Directional IB-E03/EZ-24 Cards



8 ELEVATIONS

All conveyors should be installed in accordance with the elevations shown on the drawings. In addition, all conveyors must be level across the frame width and length (if horizontal). Leveling of the frames is best done using a rotating laser level or a builder's level.

After the first elevation is established at a critical point, the elevation of all other points shall be relative to this first point. Normal practice is to dimension the layout and measure elevations from the floor at each point of support.

As the conveyor system proceeds onto another floor or into another building or room, a new elevation will be measured from the floor at that point. This new elevation will then become the reference for subsequent elevations.

When installing an overhead system, the first elevation is measured from the floor and becomes the reference elevation point until a change in elevation is shown on the layout. Any new elevation is also measured from the floor and becomes the new reference point. The process is repeated each time an elevation change occurs.

⚠CAUTION

- Consult the building architect or a structural engineer regarding ceiling loading or structural limitations of the building if any conveyor section is ceiling hung.

8.1 COMPONENT ORIENTATION

Using your conveyor system layout drawing and the numbers on the I.D. tags on each component, position and orients the conveyor sections. You must know:

- The direction of product flow
- The elevation height
- Charge and discharge end beds

IMPORTANT! Do not make alterations to the equipment without consulting with user's representative and MHS Conveyor . Unauthorized modifications to the equipment may impair its function, create a hazardous condition, affect its useful life and/or void the warranty.

Example: Product In Feed Must Be At This End

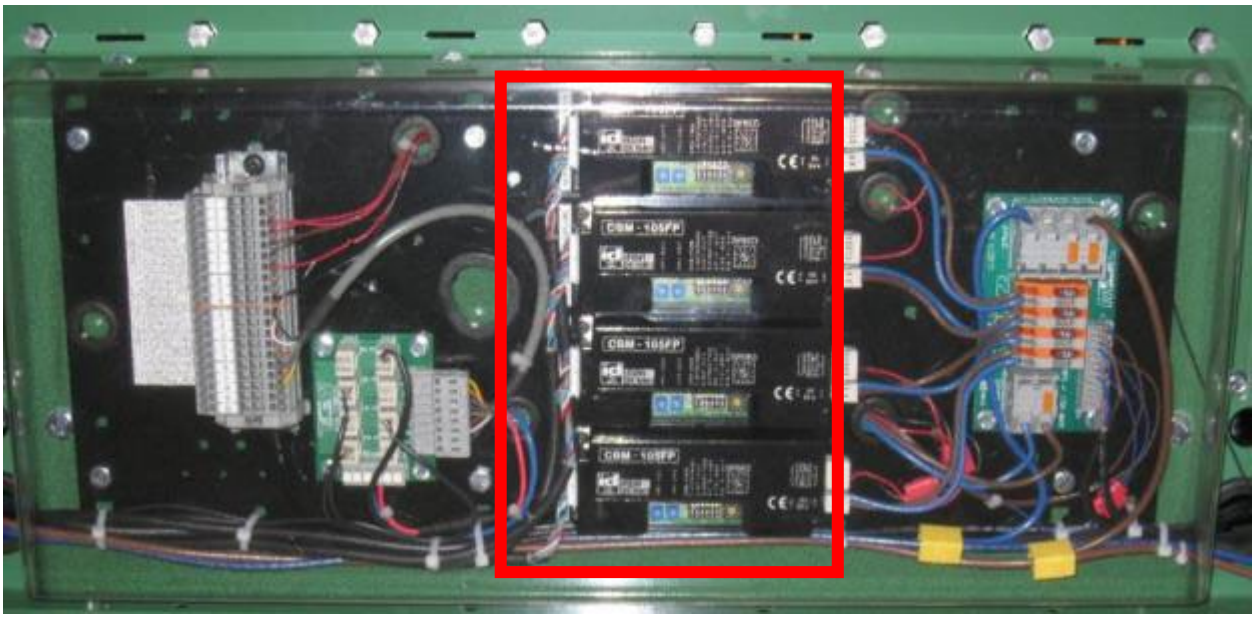
9 INSTALLATION ARRANGEMENTS

9.1 PZM GENERAL SIZE

The ITR Pick Zone Module has 3 standard sizes with the center bed being 22BF 28BF and 34BF. The Wing bed standard sizes are 16BF 22BF and 28BF. Special sizes may be available.

9.2 PZM DRIVER CARDS

The Driver Cards are mounted on a plate that's attached to the channel of each Wing Bed. All Driver Cards are pre wired and tested before shipping.



9.3 DRIVE / SLAVE BELT BREAK-IN TIME REQUIREMENTS

The roller to roller round drive belts are installed under tension with predetermined initial tension. After a time of static and running conditions, there is an initial tension drop in the belt.

9.4 COMMISSIONING OF EQUIPMENT

Commissioning of the equipment can best be defined as the final adjustments and test of the installed equipment required for its proper operation. The need for commissioning is inherent, since the individual components of equipment are brought together at the installation site to operate as a system.

Mechanical and electrical commissioning is most often carried out simultaneously. Commissioning must simulate the actual operation of the system as close as possible to demonstrate its ability to perform reliably at the specified rate in the prescribed operational sequence.

During the Commissioning Phase, it is necessary to load the equipment with product to be conveyed, which provides the means of detecting those areas requiring adjustment. Personnel will be required to support operational functions and may serve as part of operator training and familiarity with the system.

During the commissioning activity, special attention should be directed toward personnel safety. No unnecessary risks should be taken that would endanger the safety of any commissioning personnel. All personnel must familiarize themselves with all safety features of the system such as emergency stops and motor disconnects.

After commissioning, conduct operator training on all safety and operational aspects of the system. This must include systems start-up, location of emergency stops and familiarity with all operator controls.

9.5 PRECAUTIONS

ULTRAVIOLET RAYS of sunlight will weaken polyurethane slave belts.

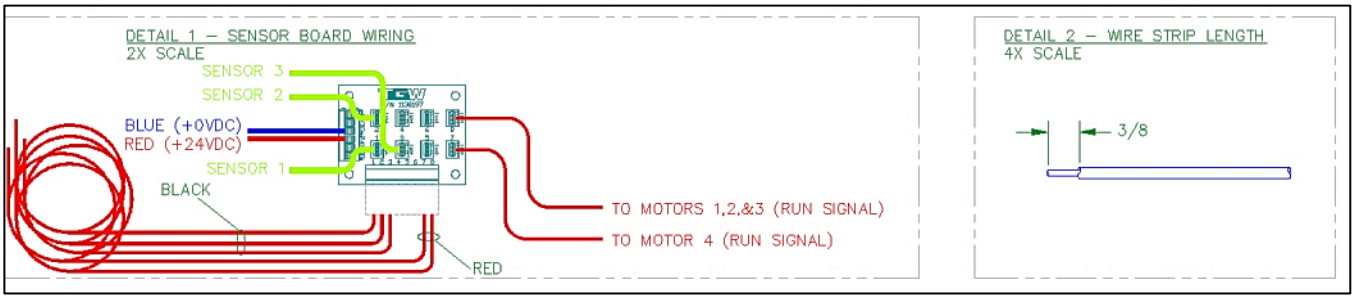
OILY OR WET CONDITIONS impair frictional drive characteristics between polyurethane slave belts and roller grooves.

CORROSIVE SUBSTANCES will adversely affect various components, voiding the warranty.

10 INDUCT BED FIELD CONNECTIONS

PCB Connector General Location on Induction Bed.

10.1 INDUCT BED SENSOR BOARD WIRING



11 ELECTRICAL AND MECHANICAL

11.1 GENERAL FEATURES AND CONCEPTS

The IntelliROL PZM product line is based on the following features and concepts: http://itohdenki.com/

- Itoh Denki motorized rollers and drivercards.
- Cables are pre-engineered with the appropriate connectors.
- Channels are designed to accommodate any of the electrical variations.
- All channels include welded connectors.
- AutoCAD blocks for the ITR product lines are available upon request.

12 ITR PZM VARIATIONS

12.1.1 PZM (Pick Zone Module) Pneumatic Construction

- ERS or Pick Zone Module transfer belt centers are standard 3.25”.
- ERS or Pick Zone Module transfers require 1.75 diameter carrier rollers.
- 3’-4” OAL is a standard.
- Side channels are 10ga construction with welded butt bolt bed connectors.
- PZM’s with sensors, PE’s (ZL) & reflectors are standard.
- PZM’s are made to order Bi-Directional, LH & RH.
- Run Signal - Each drivercard requires a signal to run. This signal is provided by the purchaser.
- Minimum product height is 2.5” due to photoeye location.
-

12.1.2 ITR PZM Electric Lift

- Drivercard IB-E03 standard drivercard for 24V electric pick zone module.
- EZ-24 drivercard (module) for pulse gear drive motors
- Run Signal - Each drivercard requires a signal to run. This signal is provided by the purchaser.
- Minimum product height is 2.5” due to photoeye location.
- ERS or Pick Zone Module transfer belt centers are standard 3.25”.
- ERS or Pick Zone Module transfers require 1.75 diameter carrier rollers.
- 3’-4” OAL is a standard.
- Side channels are 10ga construction with welded butt bolt bed connectors.
- PZM’s with sensors, PE’s (ZL) & reflectors are standard.
- PZM’s are made to order Bi-Directional, LH & RH.
- Run Signal - Each drivercard requires a signal to run. This signal is provided by the purchaser.
- Minimum product height is 2.5” due to photoeye location.

13 CBM-105 AND CB-016 DRIVERCARD

Push Bed Belted Information

The push bed comes with one or two belts, depending on the conveyor BF. These belts provide the positive tractions to move the product downstream away from the transfer module.

The belted zone transports the product from the rollers low position up to a rollers high position. This allows the product to be moved from the wing conveyor across the top of the CRUZ®channel to the center conveyor.

To maintain the integrity of the induction conveyor feeding the transfer module, product should always be moved across upstream of the induction.

Use the Speed Change Table for CBM-105 or CB-016 to determine the belt configuration based on the conveyor BF dimension.

13.1 ITR CB-016 & CBM-105 ELECTRICAL COMPONENTS

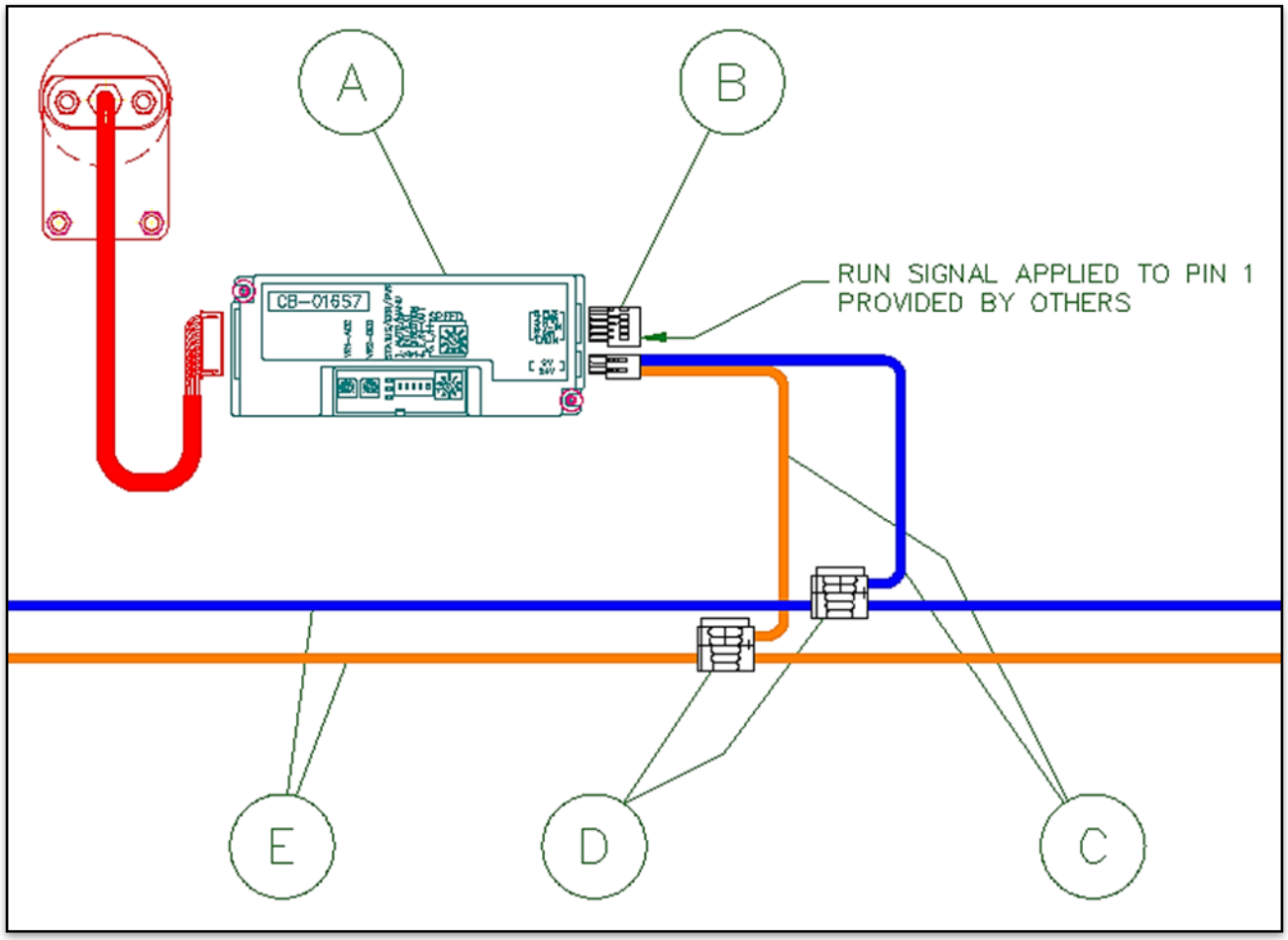


Figure 1 – CB-016 Drivercard

A. CB-016 and CBM-105 item (with hardware): 1139716 CB-016 / 1153930 CBM-105
B. 5-Pin connector (for run signal connection): 733105
C. Power tap cable (for short distances < 6”): 1139543
D. Scotchlok connectors (connect power tap to power harness): 3M567
E. Power harness – see power harness table

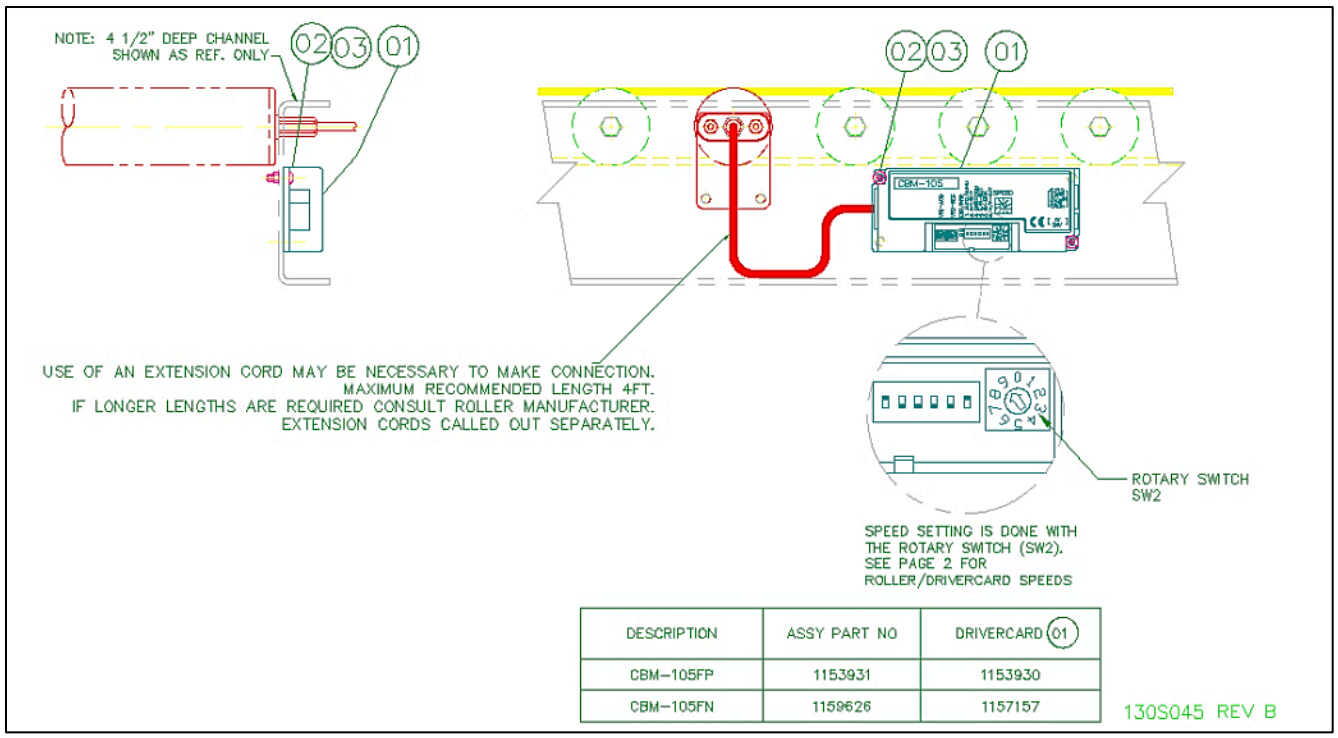
Table1: Power Harness

Item No.	Description
1129502	HARNESS,ITR-POWER-10AWG-12.5'
1102286	HARNESS,ITR-POWER-10AWG-10.5'
1102287	HARNESS,ITR-POWER-10AWG-8'
1102288	HARNESS,ITR-POWER-10AWG-5.5'
1102289	HARNESS,ITR-POWER-10AWG-3'

13.1.1 Replacement Parts for Motor extension cables

Item No.	Description	Description 2
1138704	CABLE, MOTOR EXTENSION,600MM	ITOH M-F-EXT 9-PIN-600mm
1138705	CABLE, MOTOR EXTENSION,1200MM	ITOH M-F-EXT 9-PIN-1200mm
1138706	CABLE, MOTOR EXTENSION,2700MM	ITOH M-F-EXT 9-PIN-2700mm

13.3 CBM-105 DRIVER CARD



DESCRIPTION	ASSY PART NO	DRIVERCARD (01)
CBM-105FP	1153931	1153930
CBM-105FN	1159626	1157157

130S045 REV B

13.4 CBM-105 SPEED CHART

CBM-105 DRIVERCARD / FE-__ ROLLER

ROLLER: FE-17			ROLLER: FE-60			ROLLER: FE-100			ROLLER: FE-140		
NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ±5% (fpm)	NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ±5% (fpm)	NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ±5% (fpm)	NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ±5% (fpm)
6	0	6.9	25	0	24.6	85	0	87.5	85	0	87.5
9	1	9.2	30	1	32.8	115	1	116.6	115	1	116.6
13	2	13.8	45	2	49.2	170	2	174.9	170	2	174.9
18	3	18.4	65	3	65.6	230	3	233.2	230	3	233.2
25	4	27.7	95	4	98.4		4	349.7/(285.7)	345	4	349.7
35	5	36.9	130	5	131.2		5			5	466.3/(408.2)
40	6	41.5	145	6	147.6	285	6			6	524.7/(408.2)
45	7	46.1	160	7	164.0		7	433.1/(285.7)	405	7	
50	8	50.7/(48.0)	180	8	180.4/(170.6)		8			8	566.2/(408.2)
	9	55.3/(48.0)		9	196.8/(170.6)		9			9	

Notes:
Speeds with two numbers are "NO-LOAD/(RATED)". Rated numbers are what the roller is capable of doing under a continuous duty full load condition.

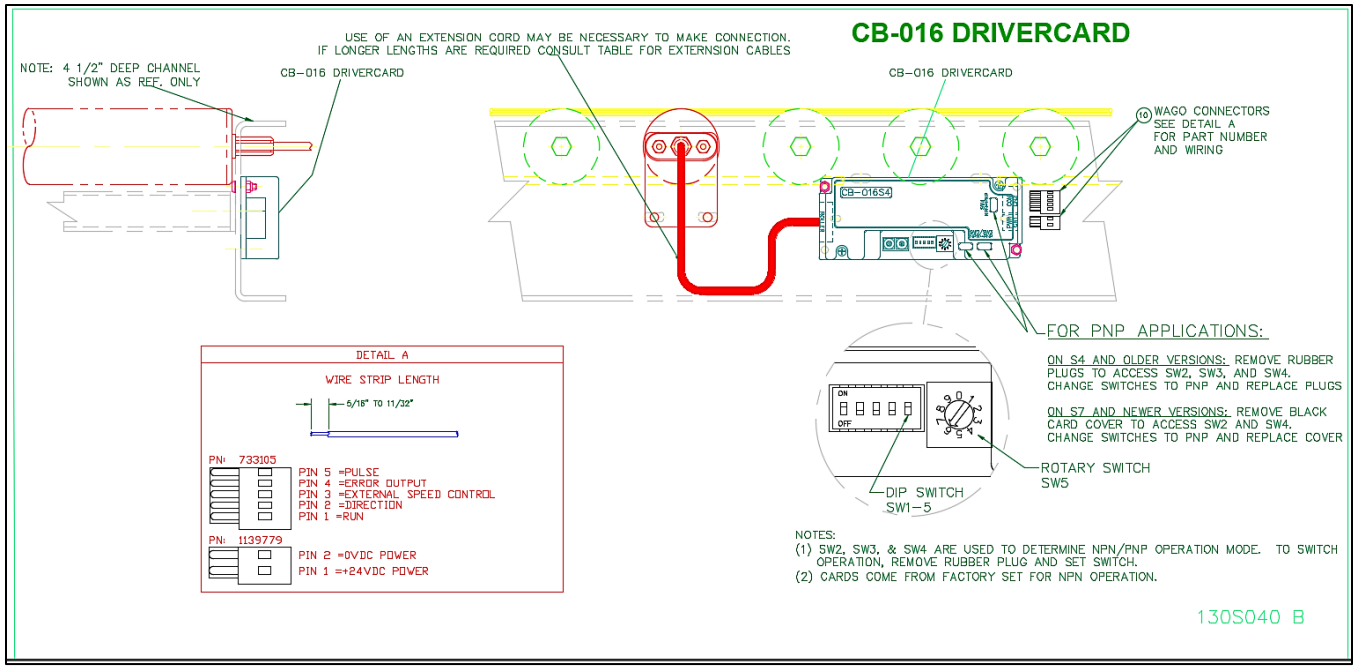
CBM-105 DRIVERCARD / FP-__ ROLLER

ROLLER: FP-55			ROLLER: FP-100			ROLLER: FP-140		
NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ±5% (fpm)	NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ±5% (fpm)	NOMINAL SPEED	ROTARY SWITCH	ACTUAL SPEED ±5% (fpm)
25	0	26.7	120	0	121.7	120	0	121.7
35	1	35.6	160	1	162.3	160	1	162.3
50	2	53.4	240	2	243.4	240	2	243.4
70	3	71.2		3	324.5/(306.3)	320	3	324.5
105	4	106.8		4			4	486.6/(470.7)
140	5	142.4		5			5	
160	6	160.2	305	6	446.0/(306.3)	470	6	
175	7	178.0/(175.5)		7			7	627.1/(470.7)
180	8	195.8/(175.5)		8			8	
	9	213.7/(175.5)		9			9	

Notes:
Speeds with two numbers are "NO-LOAD/(RATED)". Rated numbers are what the roller is capable of doing under a continuous duty full load condition.

130S045

13.5 CB-016 DRIVER CARD

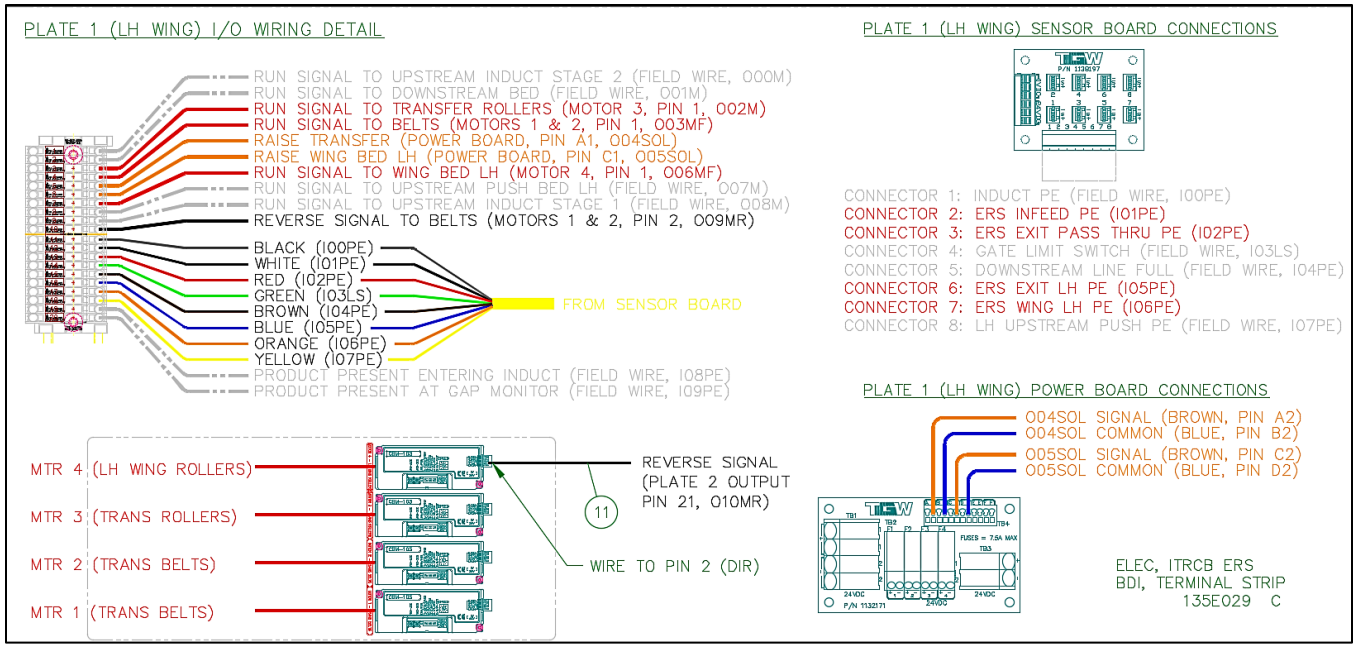


13.6 CB-016 DRIVER CARD SPEED CHANGE TABLE

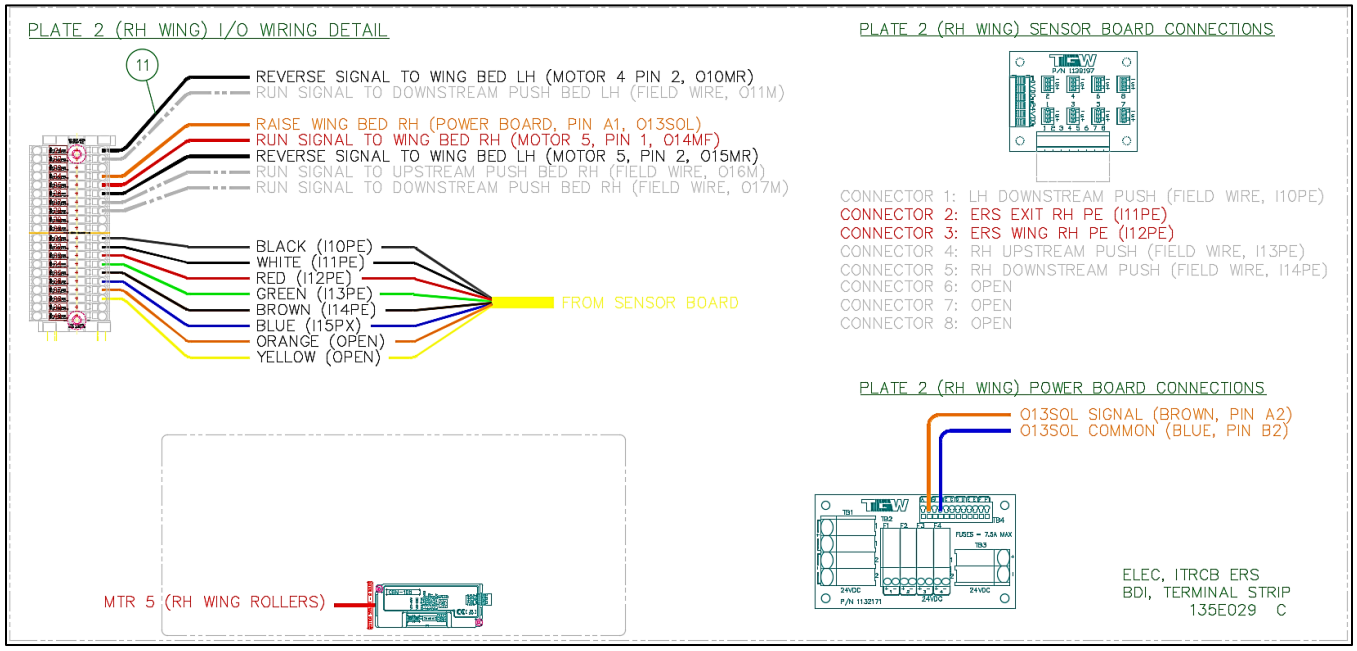
SPEED CHANGE TABLE										
20 DISCREET SPEED CHANGE STEPS FOR EXTERNAL CONTROL VIA 0-10V SIGNAL	20 DISCREET SPEED CHANGE STEPS FOR INTERNAL CONTROL VIA DIP SWITCH AND ROTARY SWITCH		FP ROLLERS (FPM)			FE ROLLERS (FPM)			FS ROLLERS (FPM)	
VOLTAGE INPUT	DIP SW1-5	ROTARY SW5	100,140 190,255	20,30, 45,55	5,8, 10,15	70,100,140 180,210	20,30,45 55,60	5,8,10, 15,17	20,30, 45,55	5,8, 10,15
9.55-9.95	ON	9	971.9	214.1	56.8	698.9	197.5	55.4	214.1	56.8
9.05-9.45	ON	8	890.9	196.3	52.1	640.6	181.0	50.8	196.3	52.1
8.55-8.95	ON	7	850.4	187.3	49.7	611.5	172.8	48.5	187.3	49.7
8.05-8.45	ON	6	809.9	178.4	47.3	582.4	164.5	46.2	178.4	47.3
7.55-7.95	ON	5	769.4	169.5	45.0	553.3	156.3	43.9	169.5	45.0
7.05-7.45	ON	4	728.9	160.6	42.6	524.1	148.1	41.6	160.6	42.6
6.55-6.95	ON	3	647.9	142.7	37.9	465.9	131.6	36.9	142.7	37.9
6.05-6.45	ON	2	607.4	133.8	35.5	436.8	123.4	34.6	133.8	35.5
5.55-5.95	ON	1	566.9	124.9	33.1	407.6	115.2	32.3	124.9	33.1
5.05-5.45	ON	0	526.4	116.0	30.8	378.5	106.9	30.0	116.0	30.8
4.55-4.95	OFF	9	485.9	107.0	28.4	349.4	98.7	27.7	107.0	28.4
4.05-4.45	OFF	8	445.4	98.1	26.0	320.3	90.5	25.4	98.1	26.0
3.55-3.95	OFF	7	404.8	89.2	23.7	291.1	82.3	23.1	89.2	23.7
3.05-3.45	OFF	6	364.3	80.3	21.3	262.0	74.0	20.8	80.3	21.3
2.55-2.95	OFF	5	324.0	71.4	18.9	233.0	65.8	18.5	71.4	18.9
2.05-2.45	OFF	4	283.5	62.5	16.6	203.9	57.6	16.2	62.5	16.6
1.55-1.95	OFF	3	243.0	53.5	14.2	174.8	49.4	13.9	53.5	14.2
1.05-1.45	OFF	2	202.5	44.6	11.8	145.6	41.1	11.5	44.6	11.8
0.55-0.95	OFF	1	162.0	35.7	9.5	116.5	32.9	9.2	35.7	9.5
0.05-0.45	OFF	0	121.5	26.8	7.1	87.4	24.7	6.9	26.8	7.1

CB-016 DRIVERCARD

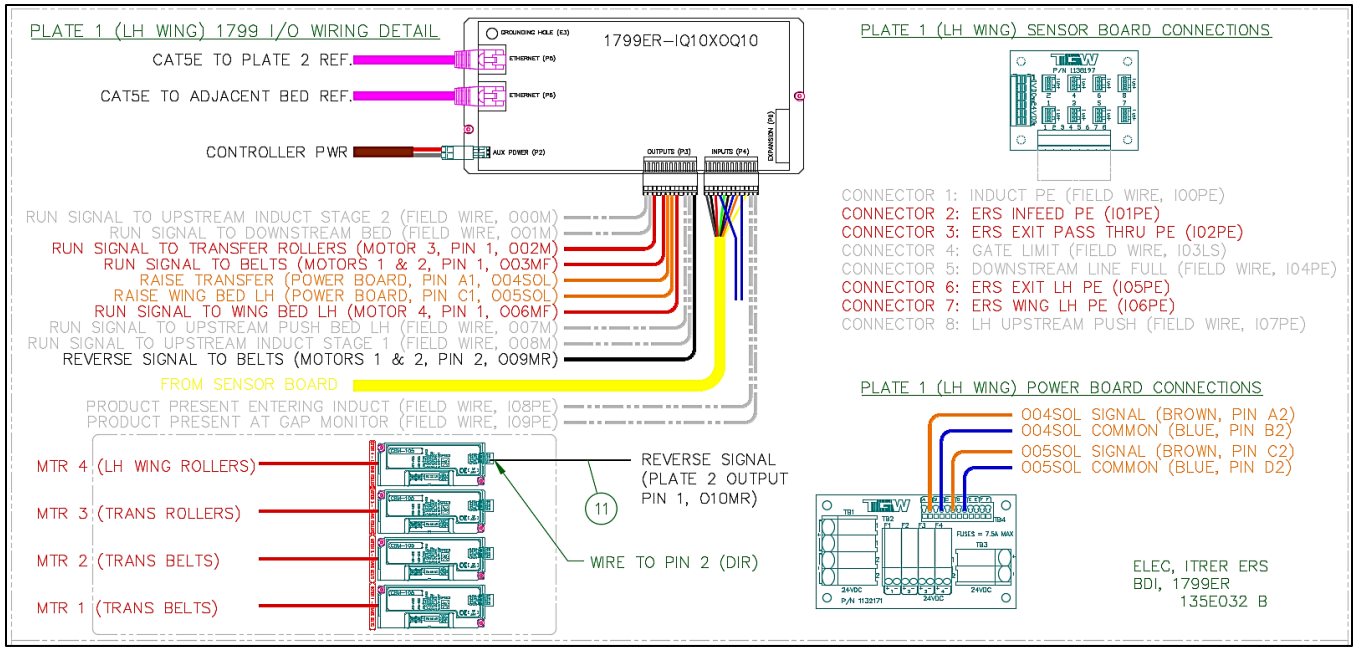
13.7 ELECTRICAL PLATE 1(LH WING) I/O WIRING DETAIL TERMINAL STRIP



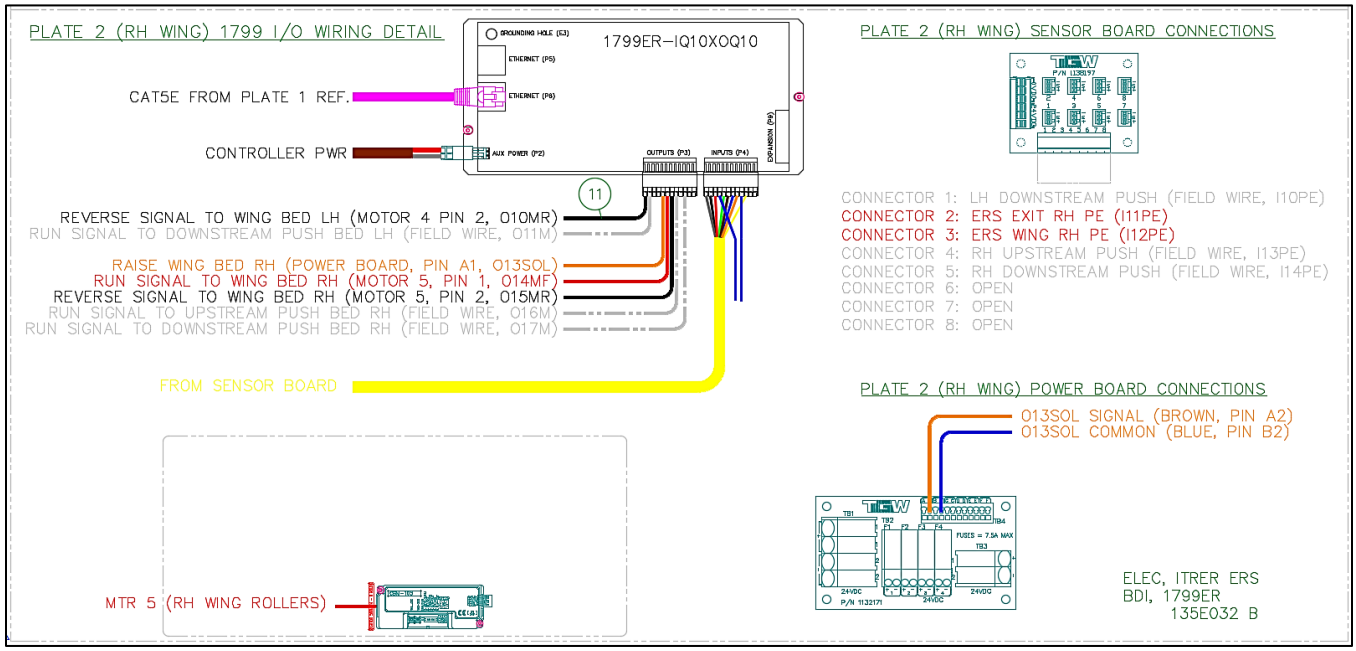
13.8 ELECTRICAL PLATE 2 (RH WING) I/O WIRING DETAIL TERMINAL STRIP



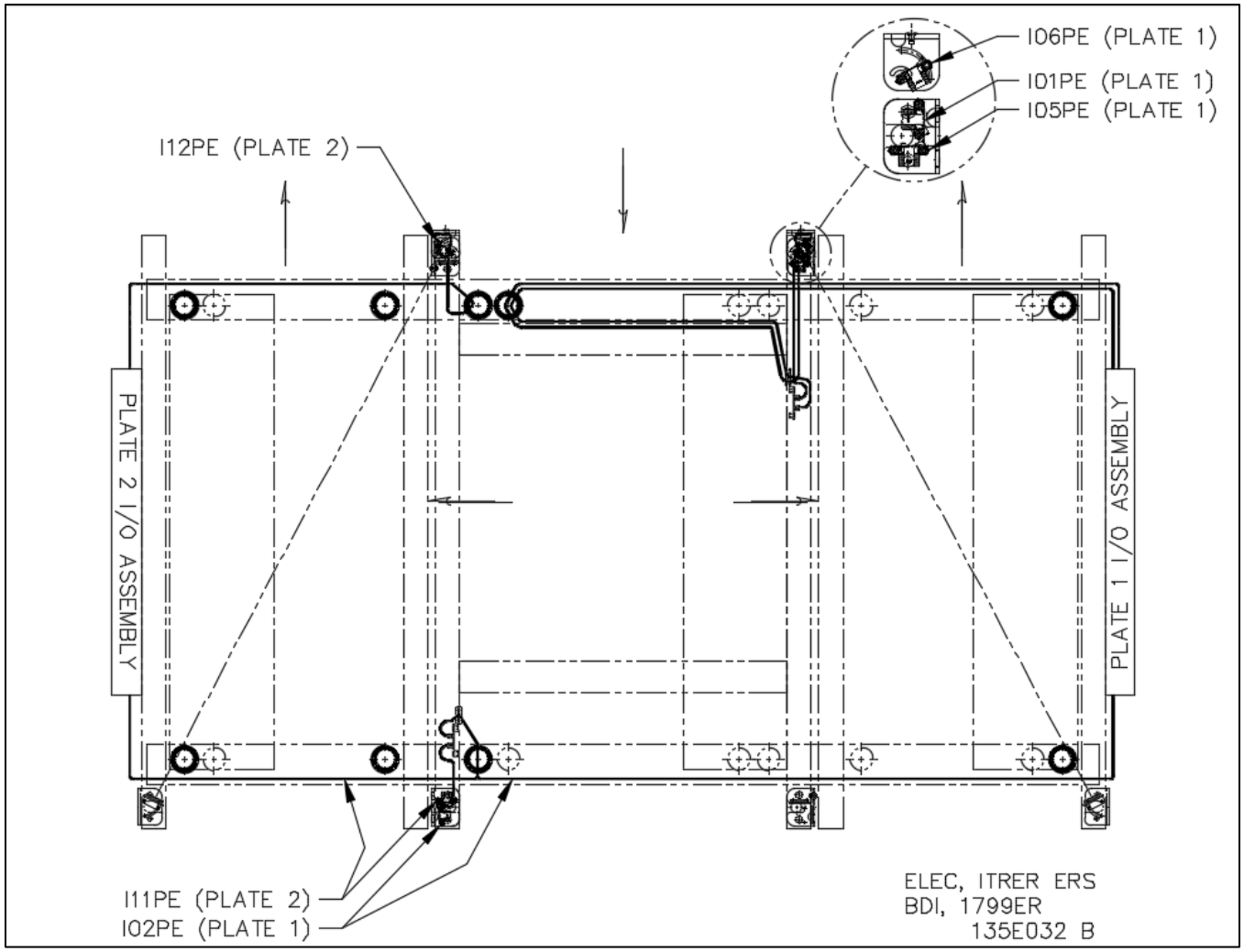
13.9 PLATE 1 (LH WING) 1799 I/O WIRING DETAILS



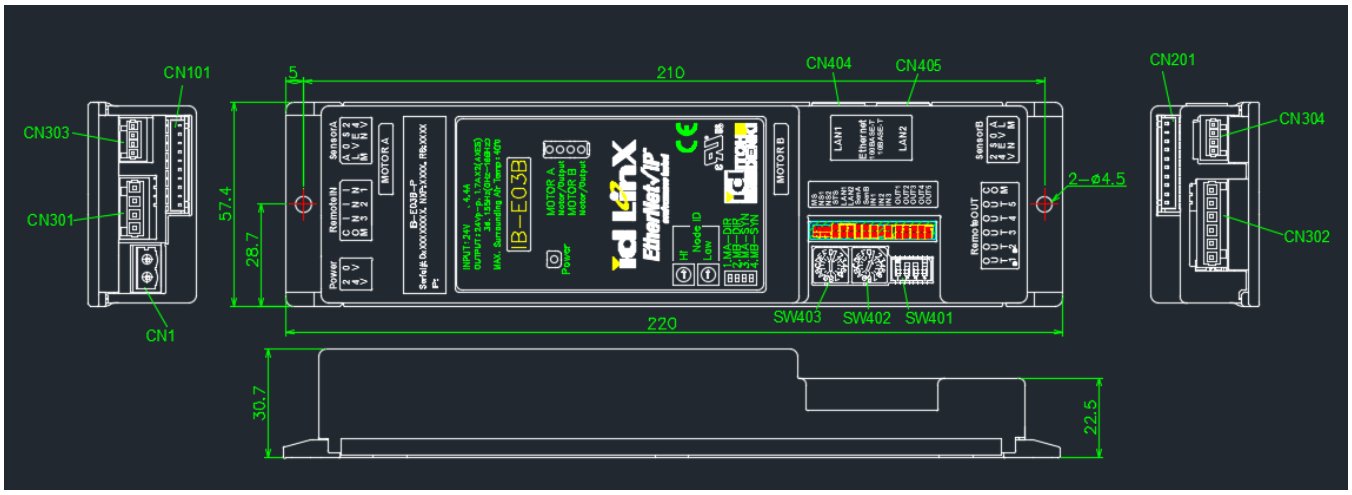
13.10 PLATE 2 (RH WING) 1799 I/O WIRING DETAILS



13.11 PHOTO EYE LOCATIONS



14 ITOH DENKI IB-E DRIVERCARD



14.1 GENERAL NOTES:

The IB-E is a dual 24V brushless DC motor driver module that is compact, network-ready, configurable, and programmable.

14.2 FEATURES

- For transportation and accumulation conveyor segments
- Two brushless DC motor drivers
- IB-E03B: 4A max per driver
- Built-in motor overload protections
- Two powered connections for sensors
- Three isolated auxiliary inputs
- Five isolated auxiliary outputs, two at 1A (max) each
- Motor lifetime data
- DLR (device level ring) applicable
- 2-port built-in Ethernet switch (based on RA switch technology)
- All beds factory tested for flow direction, speed, and proper plug-in connections.

See Itoh-Denki IB-E and ICE Manual for additional information: http://itohdenki.com/

14.3 OPERATING ENVIRONMENT

Conditions		Notes
Ambient temperature	-20 to 40°C (-4 to 104°F)	No condensation, water, frost, or ice
Humidity	≤ 90% Relative Humidity	
Atmosphere	No corrosive gas	
Vibration	≤ 1.0G	
Installation	Indoor	
Pollution level	2	Conforming to IEC60640-1 and UL840
Overvoltage category	2	

14.4 POWER REQUIREMENTS

Item	Specification
Input Power	24V DC (+/- 5%)
Typical Loaded Current Draw Per Motor* for IB-E01 and IB-E03B	2 ~ 3A – Motor A 2 ~ 3A – Motor B
Maximum Current Draw Per Motor For IB-E01 and IB-E03B	4A – Motor A 4A – Motor B
Typical Loaded Current Draw Per Motor* for IB-E04F	3 ~ 4A – Motor A 3 ~ 4A – Motor B
Maximum Current Draw Per Motor for IB-E04F	7A – Motor A 7A – Motor B
Maximum Current Draw Per Remote (Auxiliary) Output	1A – Remote output 1 1A – Remote output 2 20mA – Remote output 3 20mA – Remote output 4 20mA – Remote output 5

** Actual current draw is dependent on load (size and weight) and motorized roller model used.*

Note: The Remote (Auxiliary) Outputs are isolated from the IB-E power. Therefore, a separate 24V DC power source may be used. If not, the Remote Output current draw should be factored into the IB-E's overall current draw when used.

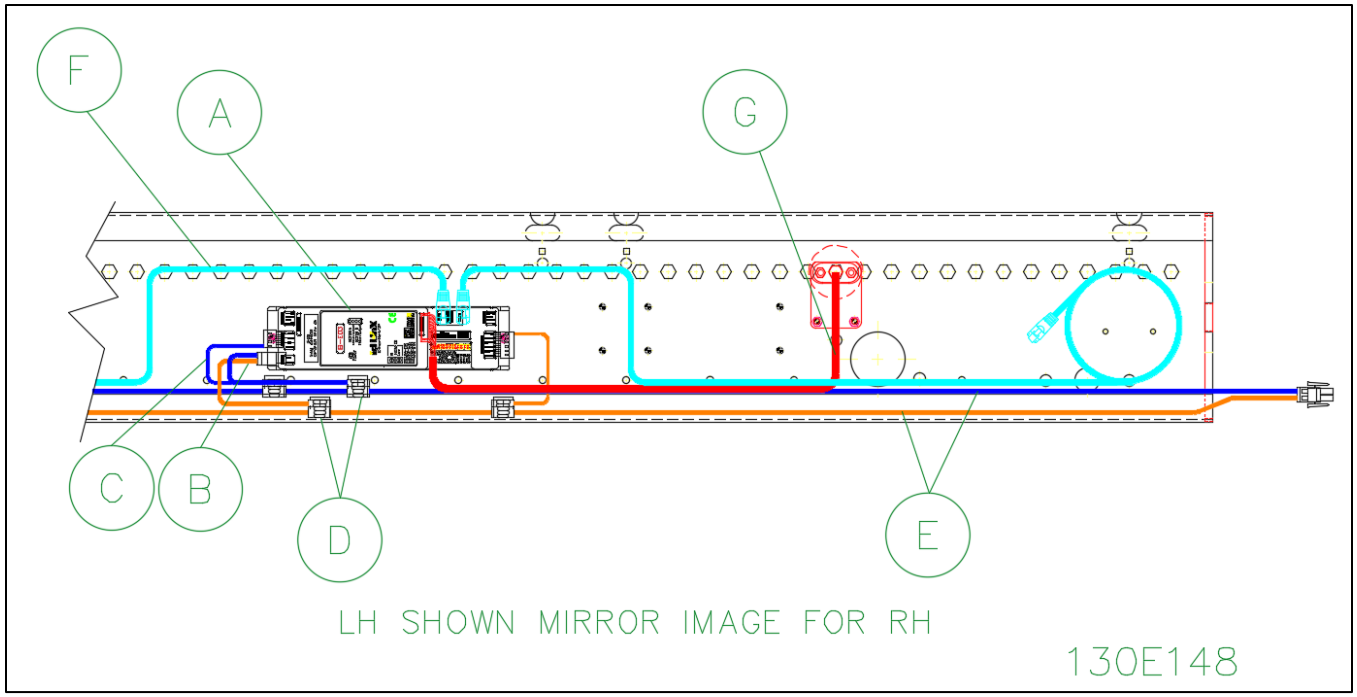
14.5 APPLICABLE POWER ROLLERS (MOTORIZED ROLLERS)

14.5.1 IB-E01 and IB-E03B

Standard*	With Brake Option
PM486FE	PM486FE-BR
PM486FS	PM486FS-BR
PM486FP	PM486FP-BR
PM570FE	PM570FE-BR
PM605FE	PM605FE-BR
PM635FS	PM635FS-BR

* IB-E01 and IB-E03B are designed to work with both our standard models and brake models. The (mechanical) brake option requires a 10th pin for the brake coil. Therefore, standard model rollers will need to have either a 10-pin connector on the motor cable or a 9-to-10-pin extension cable.

14.6 ITR IB-E ELECTRICAL COMPONENTS



A. IB-E03 driver card (includes hardware no connectors): 1166288
B. Cable Power IB-E(for short distances < 6"): 1165236
C. Cable Remote in IBE, X 9” 16GA blue wire: 1165238
D. Scotchlok Connectors (connect power tap to power harness): 3M567
E. Power Harness: See Table 1.
F. Cat5E Communication Cable: See Table 2.
G. Cable, Motor Extension: See Table 3.

Table 1 IB-E Power Harness

Item No.	Description
1129502	HARNESS,ITR-POWER-10AWG-12.5'
1102286	HARNESS,ITR-POWER-10AWG-10.5'
1102287	HARNESS,ITR-POWER-10AWG-8'
1102288	HARNESS,ITR-POWER-10AWG-5.5'
1102289	HARNESS,ITR-POWER-10AWG-3'

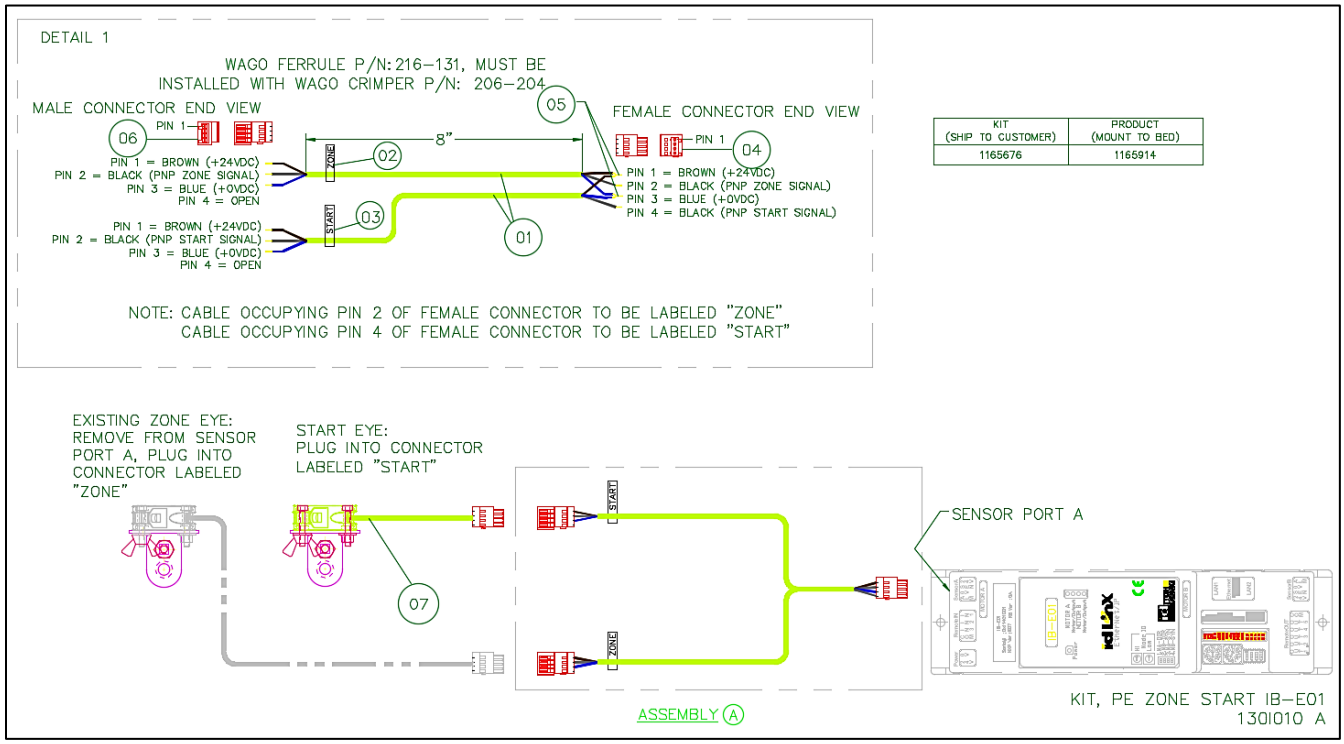
Table 2 Communication Cables

Item No.	Description
E0034025	CABLE,CTRLS-CAT5E-3'-GRAY
E0034026	CABLE,CTRLS-CAT5E-5'-GRAY
E0034027	CABLE,CTRLS-CAT5E-7'-GRAY
E0030796	CABLE,CTRLS-CAT5E-10'-GRAY
E0009905	CABLE,CTRLS-CAT5E-14'-GRAY
E0009904	CABLE,CTRLS-CAT5E-25'-GRAY

Table 3 – Cable Motor Extensions

Item No.	Description
1135339	CABLE,MOTOR EXTENSION,600MM ITOH M-F-EXT-10PIN-600 **USE W/ IB-N03/IB-E/HBM-604/BRAKE**
1135340	CABLE,MOTOR EXTENSION,1200MM ITOH M-F-EXT-10PIN-1200 **USE W/ IB-N03/IB-E/HBM-604/BRAKE**
1135341	CABLE,MOTOR EXTENSION,1200MM ITOH M-F-EXT-10PIN-1200 **USE W/ IB-N03/IB-E/HBM-604/BRAKE**

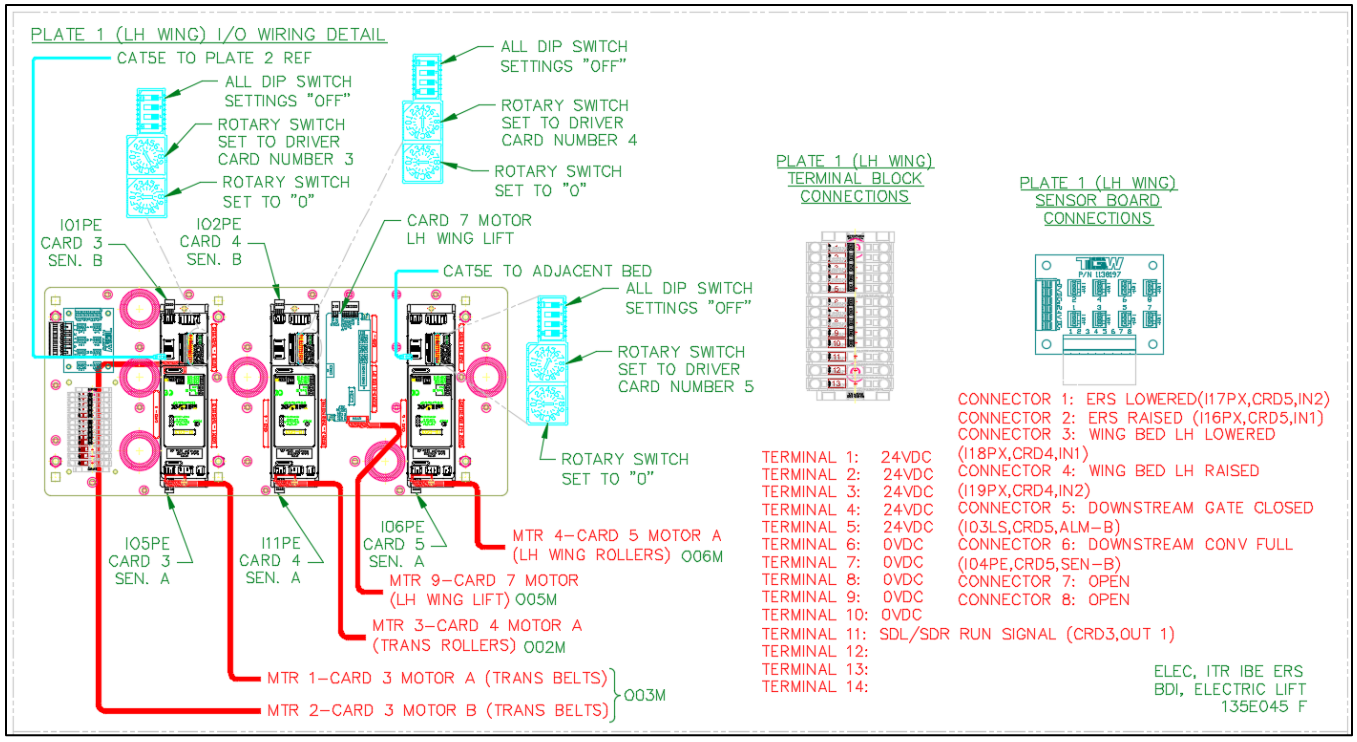
14.6.1 IB-E Photoeye Cable Kit



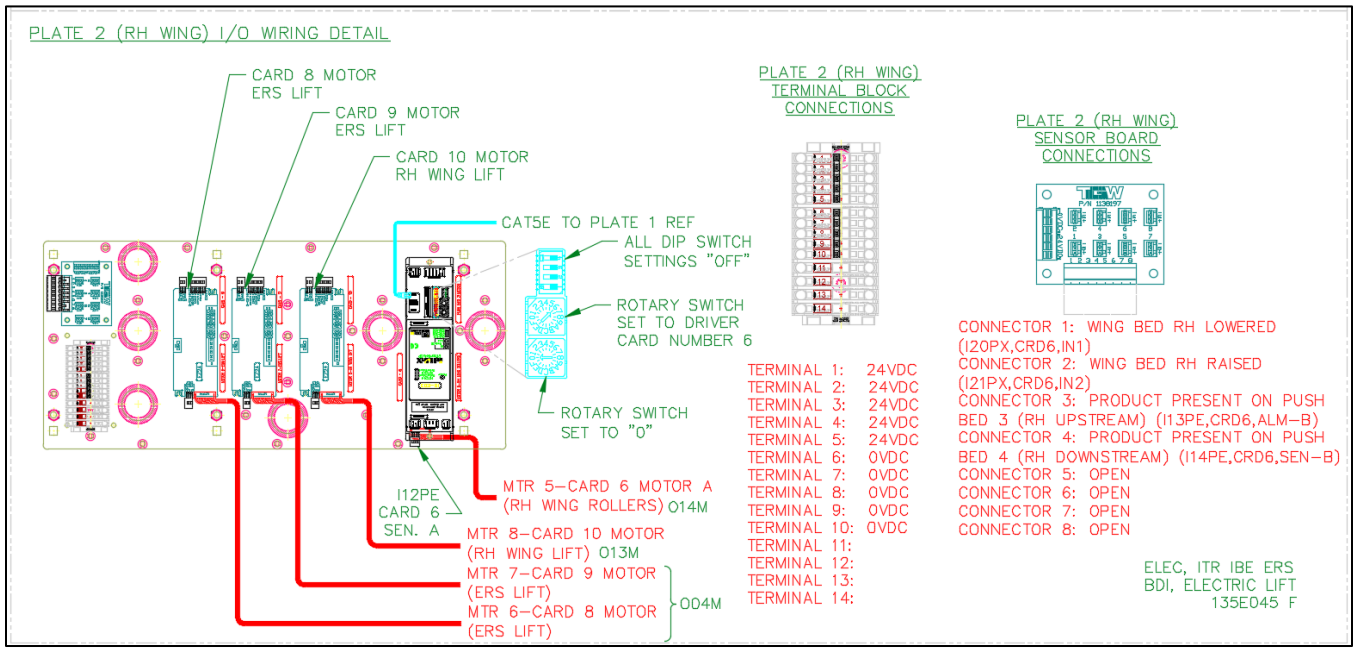
14.6.2 Replacement Parts – IB-E Photoeye Kit

General Photoeye Cables & Kit				
Balloon	**Item #**	**Description**	**Mounted**	**DWG #**
1 - 6	1165676	KIT,CTRLS-PE ZONE START-**IBE**	FIELD MOUNTED	1301010

14.7 ELECTRICAL PLATE 1(LH WING) I/O WIRING DETAIL

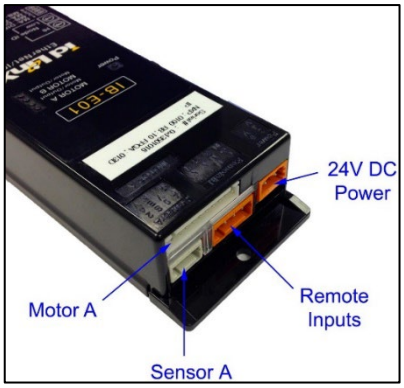


14.8 ELECTRICAL PLATE 2 (RH WING) I/O WIRING DETAIL



14.9 HARDWARE CONNECTIONS

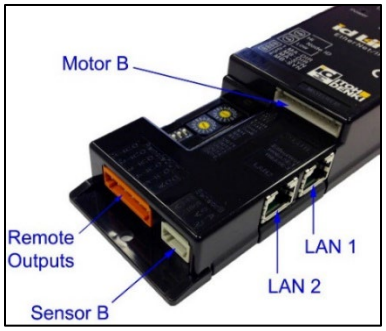
14.9.1 Left ("A") Side

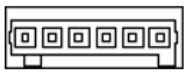
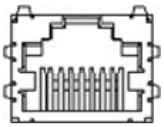


Connection	Pin Outs	Description
Motor A	 1 10	Brushless DC Driver When configured as a discrete output (**NPN**, sinking, only): 3 – Discrete output U (IB-E04F pins 3 & 4) 4 – Discrete output V (IB-E04F pins 5 & 6) 5 – Discrete output W (IB-E04F pins 7 & 8) See "Precaution: Motor Port Discrete Output Wiring" below. Connector for wiring: **JST XHP-10** (IB-E04F XHP-12) Included with motorized roller
Sensor A	 1 4	1 – 24V DC (550mA max) 2 – Sensor input (35mA max) 3 – 0V 4 – Sensor alarm input (35mA max) IB-E01: Inputs are auto-sensing, responding to either PNP (+24V DC) or NPN (0V) signals. In the normal state, the input pins have a **+12V DC reference**. **IB-E03B and IB-E04F**: Signal types are **set** as PNP or NPN from factory. Noted as a "-P" or "-N", respectively (e.g. IB-E03B-P) Connector for wiring: **WAGO 733-104**
Remote Inputs (Auxiliary)	 1 4	1 – Remote input 1 2 – Remote input 2 3 – Remote input 3 4 – Common (24V DC for NPN or 0V for PNP) Connector for wiring: **WAGO 734-204**

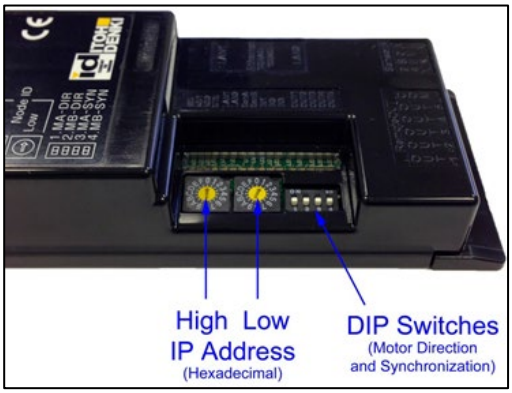
24V DC Power	 1 2	Input Power 1 – 0V 2 – 24V DC Connector for wiring: **WAGO 231-302/026-000**

14.9.2 Right ("B") Side



Connection	Pin Outs	Description
Motor B	 1 10	Brushless DC Driver When configured as a discrete output (**NPN**, sinking, only): 3 – Discrete output U (IB-E04F pins 3 & 4) 4 – Discrete output V (IB-E04F pins 5 & 6) 5 – Discrete output W (IB-E04F pins 7 & 8) See "Precaution: Motor Port Discrete Output Wiring" below. Connector for wiring: **JST XHP-10** (IB-E04F XHP-12) Included with motorized roller
Sensor B	 1 4	1 – 24V DC (550mA max) 2 – Sensor input (35mA max) 3 – 0V 4 – Sensor alarm input (35mA max) IB-E01: Inputs are auto-sensing, responding to either PNP (+24V DC) or NPN (0V) signals. In the normal state, the input pins have a **+12V DC reference**. **IB-E03B and IB-E04F**: Signal types are **set** as PNP or NPN from factory. Noted as a "-P" or "-N", respectively (e.g. IB-E03B-P) Connector for wiring: **WAGO 733-104**
Remote Outputs (Auxiliary)	 1 6	1 – Remote output 1, 1A max 2 – Remote output 2, 1A max 3 – Remote output 3, 20mA max 4 – Remote output 4, 20mA max 5 – Remote output 5, 20mA max 6 – Common (24V DC for PNP or 0V for NPN) Connector for wiring: **WAGO 734-206**
LAN (1 & 2)	 8 1	1 – Tx + 2 – Tx - 3 – Rx + 4 – n/a 5 – n/a 6 – Rx - 7 – n/a 8 – n/a Connector for wiring: **RJ-45**

14.9.3 Rotary Switches and DIP Switches



Switch	Position	Description
IP Address High Byte	0 ~ F	Hexadecimal setting of IP address' last octet. 192.168.1.xxx Example 1: High Byte: "0" Low Byte: "1" Hexadecimal value "01" = 1 (decimal) IP Address: 192.168.1.1 Example 2: High Byte: "A" Low Byte: "7" Hexadecimal value "A7" = 167 (decimal) IP Address: 192.168.1.167
IP Address Low Byte	0 ~ F	
DIP 1	OFF	Default
	ON	Motor A's direction is opposite of configuration, reversed
DIP 2	OFF	Default
	ON	Motor B's direction is opposite of configuration, reversed
DIP 3	OFF	Default
	ON*	Motor A operates when Motor B operates, synchronized
DIP 4	OFF	Default
	ON*	Motor B operates when Motor A operates, synchronized

* If both DIP switch 3 and 4 are ON, the IB-E is set to factory reset mode. Refer to troubleshooting section for more information.

14.10 IP ADDRESS SUBNET

Default: 192.168.1.xxx

If a different subnet for the IP address is needed, different from the default 192.168.1.xxx, it can be changed using the Itoh Configurator for EtherNet/IP (ICE).

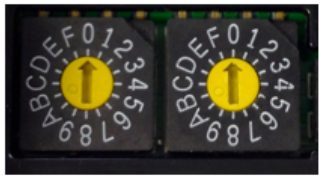
IP Address Setting (Last Octet)

The rotary switches set the last octet of the IB-E's IP address. There are 16 positions (hexadecimal base) for each rotary switch.

The following table is available to assist in determining the decimal equivalent of the hexadecimal rotary switch positions.

High Byte			Low Byte	
Position	Base Decimal Value		Position	Base Decimal Value
0	0		0	0
1	16		1	1
2	32		2	2
3	48		3	3
4	64		4	4
5	80	+	5	5
6	96		6	6
7	112		7	7
8	128		8	8
9	144		9	9
A	160		A	10
B	176		B	11
C	192		C	12
D	208		D	13
E	224		E	14
F	240		F	15

Using the decimal values, the last octet can be calculated.

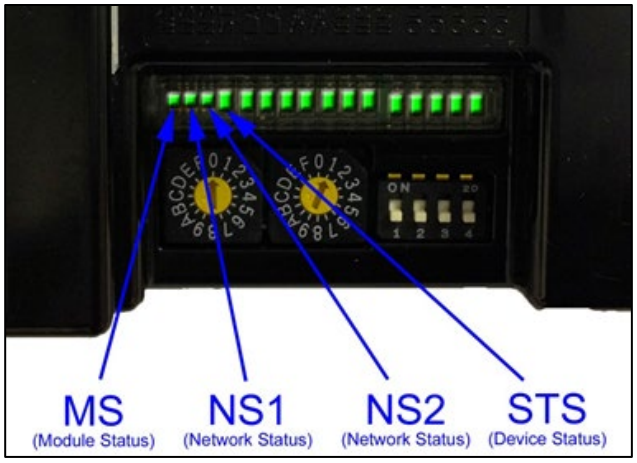


Base	High Byte		Low Byte		Last Octet
Hexadecimal	C	+	A	=	CA
Decimal	192		10		202

14.10.1 LED Indicators

See troubleshooting error statuses.

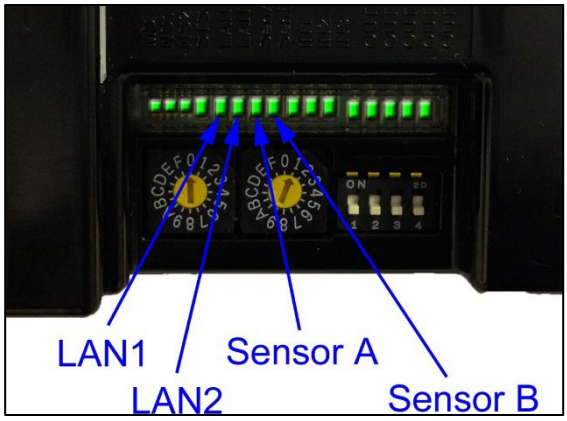
14.11 MODULE STATUS INDICATORS



LED	LED indication pattern		Description
	Green	Red	
MS	OFF	OFF	No network power
	ON	OFF	Normal operation
	ON	Flash (1Hz)	No setting on device
	OFF	Flash (1Hz)	Network error at LAN 1 or LAN 2
	OFF	ON	Network error at LAN 1 and LAN 2
	Flash (1Hz)	Flash (1Hz)	Boot up sequence
NS1 & NS2*	OFF	OFF	No communication
	Flash (1Hz)	OFF	Normal operation
	ON	OFF	I/O connection
	OFF	Flash (1Hz)	I/O connection timeout error
	OFF	ON	Duplicate IP address error
	Flash (1Hz)	Flash (1Hz)	Boot up sequence
STS	ON	-	Power ON on Network PCB
	Flash (6Hz)	-	Low voltage (< 20V DC) error
	Flash (1Hz)	-	Firmware updating
	OFF	-	No power on network PCB

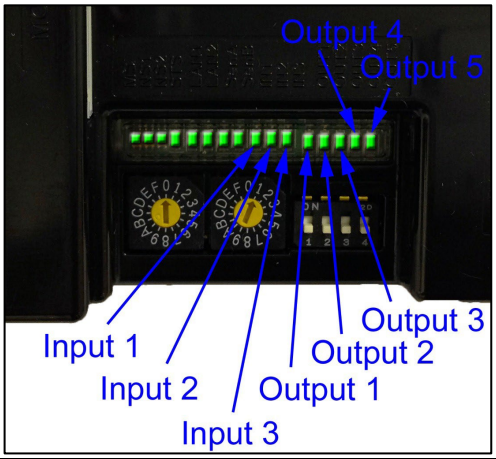
** NS2 is only on the IB-E01*

14.12 LAN AND SENSOR STATUS INDICATORS



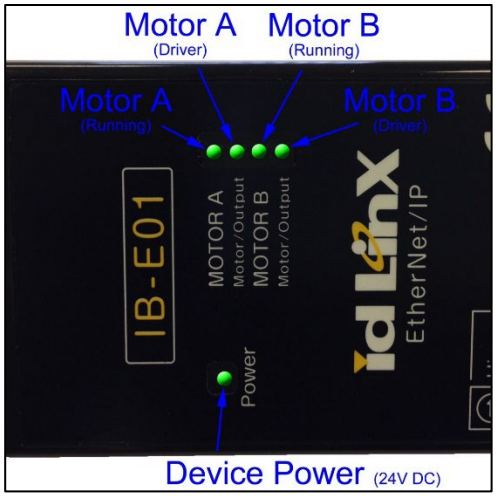
LED	LED indication pattern		Description
	Green	Red	
LAN1 & LAN2	Flash	-	Active LAN communication
	OFF	-	No LAN communication
SenA & SenB	ON	-	Sensor input is active
	OFF	-	No sensor input

14.13 REMOTE (AUXILIARY) I/O STATUS INDICATORS



LED	LED indication pattern		Description
	Green	Red	
IN1 ~ IN3	ON	-	Remote input is active
	OFF	-	No remote input
OUT1 ~ OUT5	ON	-	Remote output is active
	OFF	-	No remote output

14.14 MOTOR ACTIVITY AND FUNCTION INDICATORS



LED	LED indication pattern		Description
	Green	Red	
Power	ON	-	Normal, power is on
	OFF	-	No power to device
Motor/Output	ON	-	24V brushless DC driver
	OFF	-	Discrete outputs
MOTOR A & MOTOR B	OFF	OFF	Motor is not running
	Flash (1Hz)	OFF	Motor is running, CW
	ON	OFF	Motor is running, CCW
	OFF	Flash (6Hz)	Low voltage error
	OFF	Flash (1Hz)	Motor unplugged error
	ON	Flash (1Hz)	Motor lock error
	OFF	ON	Thermal error
	ON	2 x Flash (0.6Hz)	Back EMF error
	Alternating (1Hz)		JAM error*
	Alternating (6Hz)		Sensor Timer error*

15 TROUBLESHOOTING – IB-E MOTOR DRIVER

Error Type	Priority	Suspected Cause	Suggested Solution	Reset Method	IB-E Logic	Motor
Low Voltage	1	Supply voltage < 20V DC	Maintain supply voltage ≥ 20V DC	Automatic	Stop	Stop
Fuse blown		Fuse is blown	Replace IB-E	-	Run	
Motor Disconnected	2	Motor is not connected	Connect motor	Automatic or Manual		
Motor Stalled	3	Motor does not turn (stalled)	Clear the issue which prevents the motorized roller from turning	Automatic* or Manual		
PCB Thermal	4	High temperature on circuit board	Allow circuit board to cool	Automatic or Manual		
Motor Thermal	5	High temperature in motor	Allow motor to cool	Automatic or Manual		
Back EMF (Over speeding)	6	Generated voltage from motor ≥ 60V DC, at least 0.1 second or ≥ 40V DC, at least 2 seconds	Remove the cause of over speeding, then reset the error from the controller or by cycling 24V DC power	Manual		
Motor port (discrete output) current limit		≥ 4A, at least 0.1 second	Remove the cause for the high current draw	Manual		
Jam	7	ICE logic element output is active	Remove the cause of error or review ICE logic for output conditions	Based on logic conditions		Based on logic conditions
Sensor Timer	8					
Sensor Alarm	9	Occurs when the (sensor) Alarm signal is active	Check the sensor or wiring of the sensor connection	Automatic		

"Automatic" reset from a motor stalled error requires the motorized roller to be turned by hand (manually).

Error Reset

Refer to - Error Information to reset error status using ICE.

15.1 PHYSICAL BEHAVIOR

The motorized roller is not running at the set (linear/surface) speed.

- Check the "Motor" tab under properties for the following:
  - Gear Reduction setting matches the correct motorized roller model
  - Speed setting is for the correct time base
  - Roller Diameter is set correctly for millimeters
  - Roller Speed(s) are set correctly and that the logic is using the correct speed setting output
- Check input power (refer to Chapter 1 – Power Requirements)
- Make sure the motorized roller is mounted properly

The motorized roller is running in the wrong direction.

- Check "Motor" tab under properties for the following:
  - Motor Type setting matches the correct roller model
  - Direction is set for the correct default motor direction
- Check DIP switch 1 and/or 2 (refer to Chapter 1 – Rotary Switches and DIP Switches)
- Check that the logic is using (or not using) the motor direction output

The motorized roller does not run.

- Make sure "Motor Port Setting" in the "Motor" tab under properties is set as "Motor"
- Check that the logic is using the correct motor output
- Check the status LEDs on the IB-E (refer to Chapter 1 – LED Indicators)
- Check DIP switch 3 and/or 4 (refer to Chapter 1 – Rotary Switches and DIP Switches)
- Make sure the motorized roller is mounted properly

There is no response to the sensor input.

- Make sure the sensor is powered
- Make sure the sensor is wired correctly (refer to Chapter 1 – Hardware connections)
- Check the status LEDs on the IB-E (refer to Chapter 1 – LED Indicators)
- Check the logic for the correct sensor input

There is no response to the remote (auxiliary) input.

Make sure the input (device) and common are wired correctly (refer to Chapter 1 – Hardware connections and Chapter 2 – General Wiring and Precautions)

- Check the status LEDs on the IB-E (refer to Chapter 1 – LED Indicators)
- Check the logic for the correct remote input

The remote (auxiliary) output does not turn on.

- Make sure the output (device) and common are wired correctly (refer to Chapter 1 – Hardware connections and Chapter 2 – General Wiring and

Precautions)
- Check the status LEDs on the IB-E (refer to Chapter 1 – LED Indicators)
- Check the logic for the correct remote output

The Discrete Output from the motor port does not work.

- Make sure "Motor Port Setting" in the "Motor" tab under properties is set as "Port(Nch)"
- Make sure the output is wired correctly (refer to Chapter 1 – Hardware connections and Chapter 2 – General Wiring and Precautions)
- Check the status LEDs on the IB-E (refer to Chapter 1 – LED Indicators)
- Check the logic for the correct discrete motor port output

15.2 SOFTWARE ISSUES

Read/write (configuration or logic) failure

- Check the IP address settings on the IB-E (refer to Chapter 1 – Rotary Switches and DIP Switches)
- Check the IP address setting in ICE (refer to Chapter 5 – Project Tree)
- Check the PC's IP address (refer to Chapter 6 – Property Setting)
- Check the PC's firewall settings (refer to Chapter 4 – Windows Firewall)
- Make sure the IB-E has had enough time to reboot between consecutive writes/downloads.

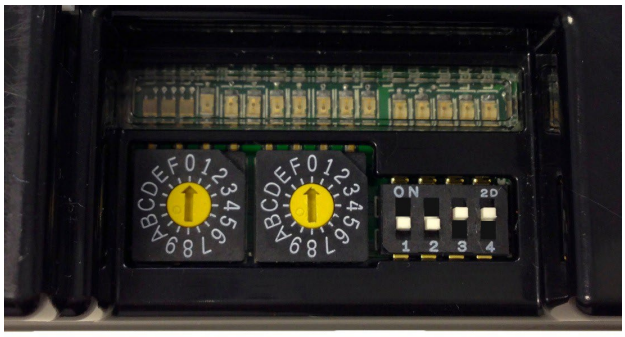
Monitor not responding to status changes

- Check the IP address settings on the IB-E (refer to Chapter 1 – Rotary Switches and DIP Switches)
- Check the IP address setting in ICE (refer to Chapter 5 – Project Tree)
- Check the PC's IP address (refer to Chapter 6 – Property Setting)
- Check the PC's firewall settings (refer to Chapter 4 – Windows Firewall)
- Make sure the IB-E has had enough time to reboot between consecutive writes/downloads.

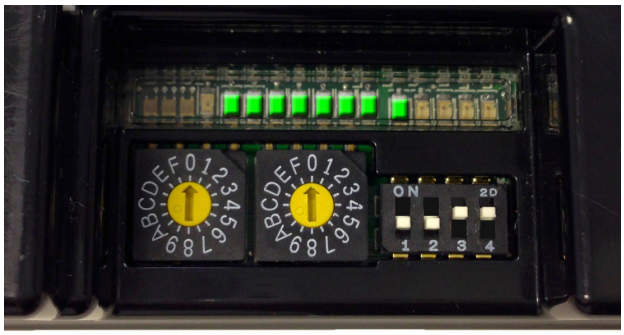
15.3 MODULE RESET

The module can be reset to factory defaults. Normally, this is not necessary.

1. Power OFF the IB-E, set both rotary switches to “0”, set DIP switches 1 and 2 to the OFF position, and set DIP switches 3 and 4 to the ON position.



2. Power ON the IB-E and wait for the central LED indicators to light up.



3. Power OFF the IB-E and set the rotary switches and the DIP switches to the previous (or other operational) settings.
4. Power ON the IB and use as normal.

See Itoh-Denki IB-E and ICE Manual for additional information: http://itohdenki.com/

16 ELECTRICAL SAFETY GUIDELINES

WARNING	
	• All electrical controls must be installed, wired and connected by a licensed electrician only. • All motor controls and wiring must conform to the National Electrical Code as published by the National Fire Protection Association and approved by the American National Standards Institute, Inc. Since specific electrical codes vary from one area to another, be sure to check with proper authorities before starting.

The electrical voltage of motorized rollers will be stamped on a metal name plate affixed to one end of the roller. This voltage should be checked to see that it matches the output voltage of your power supply. Consult the appropriate MHS Conveyor wiring diagram for the proper connections. If a single speed three phase motorized roller runs the wrong direction, two leads must be switched to reverse rotation.

WARNING	
	• Do not connect the driver card to any other voltage than the one listed on its name plate.

NOTE:

All controls equipment is covered by the original manufacturer's equipment warranty.

WARNING	
	• All safety devices, including wiring of electrical safety devices, shall be arranged to operate in a “fail safe” manner. That is, if power failure or failure of the device itself would occur, a hazardous condition must not result.

17 CONVEYOR CONTROLS - SAFETY GUIDELINES

The following are basic conveyor controls safety guidelines for common controls equipment.

START-UP WARNING HORN - If all conveyors being started cannot be seen from the start pushbutton location, then an audible warning device is required. It could be a horn, buzzer or bell. It must be loud enough to be heard at any point on the conveyor being started. It should sound for the duration of five seconds after the start pushbutton is pushed, prior to the conveyor starting. Any auxiliary equipment such as vertical lifts, turntables, etc. must be included in the warning circuitry.

START PUSHBUTTON - Start pushbutton should be the flush type or guarded such that inadvertently leaning against them will not actuate them. They should be provided with a legend plate clearly defining which conveyors will be started.

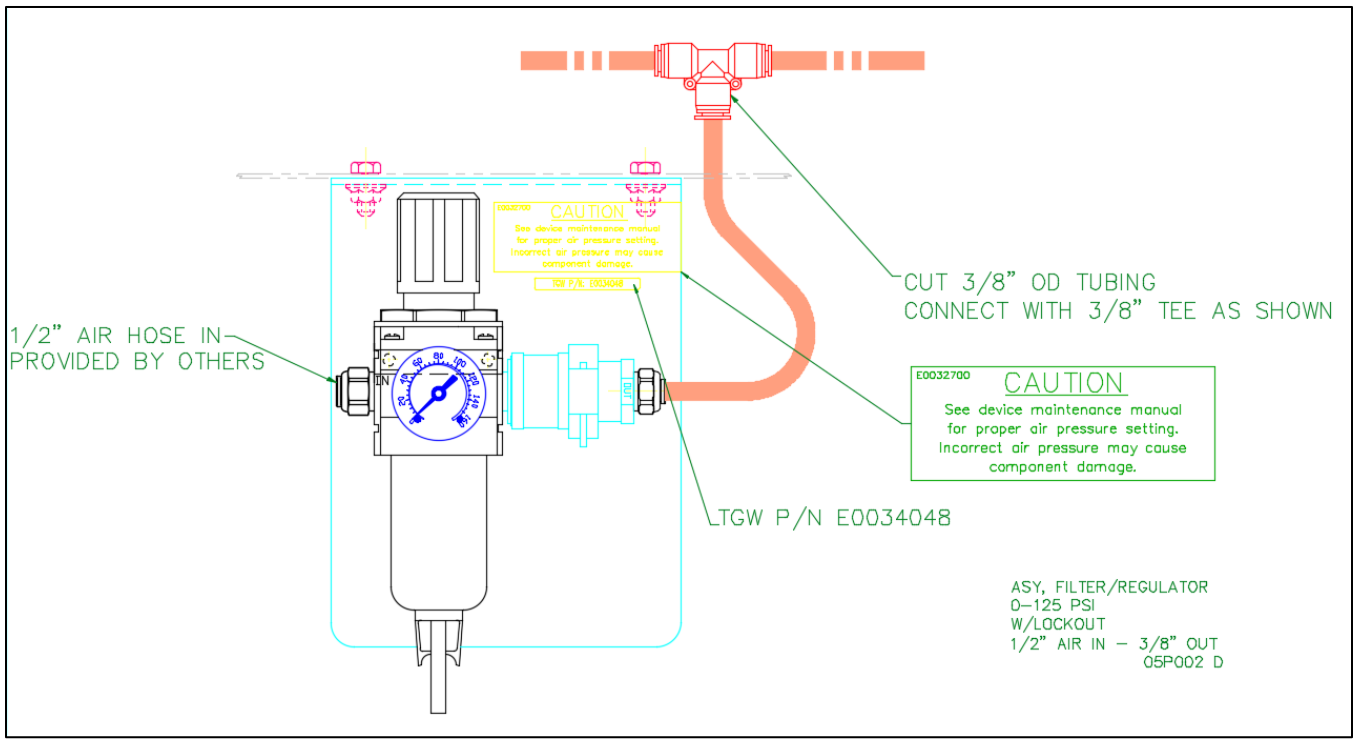
STOP PUSHBUTTON - Stop pushbutton should be the extended type such that any contact with it is sufficient to stop the conveyor. They should have a legend plate defining which conveyors will be stopped.

EMERGENCY STOPS - All locations where high voltage motors are used and an operator is working must be protected by an emergency stop.

Emergency stop devices should also protect high pedestrian areas where high voltage motors are used. Actuating an emergency stop must dropout the start circuit and all electrical power, requiring restarting the system using the start pushbutton provided.

All locations where low voltage motors are used (under 50 volts) and an operator is working all require an emergency stop circuit. This requirement also applies to high pedestrian areas.

18 AIR SUPPLY REQUIREMENTS



18.1 GENERAL GUIDE

Every conveyor system is unique, with its own specific requirements. Therefore, the following is a general guide.

18.2 MAIN FEEDER

Air velocity through the main feeder piping can be kept smooth with lower losses using large diameter pipe with minimum bends and restrictions. Standard weight black pipe or copper is suitable for plumbing the compressed air overhead to all points of use.

18.3 AIR DROPS

MHS Conveyor recommends using 3/4" pipe on air drops for high flow and low pressure loss. The drop is terminated with a drain at the bottom. A tee located prior to the drain branches off to the conveyor. This branch line must contain a lockout/shutoff. A shutoff must also be located in the drop before the branch tee. OSHA Rule 29, CFR1910.147 requires energy sources (air drops) be turned off and capable of being locked or labeled with a warning tag.

IMPORTANT! If your air compressor uses synthetic oil, a coalescing filter plus a regular filter of 5 micron is required. Synthetic oils will shrink the seals in pneumatic devices and valves.

18.4 LOW PRESSURE SWITCH

An air pressure switch is recommended to be installed into the pneumatic circuit to detect a drop in air pressure below required levels. If pressure drops below 40 PSI, the conveyor system should shut off.

18.5 PNEUMATIC REQUIREMENTS

- Maximum conveyor length each way from the regulator is 100'. Locate regulator in center of conveyor.
- **Recommended operating pressure set at**: 40 - 45 PSI
  - **Low Pressure Switch** set below operating pressure of 40 PSI (Typical range: 35-39 PSI)
  - **Pressure Relief Valve** set above 45 PSI (Typical range: 46-50 PSI).
- In high humidity or low temperature, use an air dryer.
- Use 5 micron filter.
- Lockout/shutoff valve, to be provided by the air system installer.

⚠ WARNING	
	• Whip restraints must be installed on flexible hosing. Cable ties removed from pneumatic hosing must be replaced

19 PREVENTIVE MAINTENANCE

19.1 GENERAL PM

Preventive maintenance will save expensive downtime, wasted energy costs and increase life of components. An accurate record keeping system will track component servicing history.

Periodic maintenance intervals may vary with load, speed, hours of operation, ambient temperature, humidity, etc. Intervals can be established by fairly frequent maintenance at first, and then lengthens the intervals as justified by observation of need based on history. The following schedule is based on 5 days per week, 8 hours per day operation under normal conditions.

19.2 DAILY

- Listen to everything for unusual noises or vibration.
- Visually inspect to see that conveyor sections are clear and free of debris.
- Check to see that all safety guards are in place.
- Check for loose bolts or parts.
- Listen for air leaks.

19.3 WEEKLY

- Check for proper PSI on air regulators.
- Check air filter bowls for accumulated water.

⚠ WARNING

- Prohibit walking or riding on conveyor by anyone.
- Care should be taken when servicing any conveyor to prevent accidental injury.
- All moving parts are potentially dangerous.

19.4 AIR SYSTEMS

The best preventive maintenance for any air operated device is clean air. Dirty air will make pneumatic devices sticky, and they will not operate properly. To ensure the continued performance of filters, monitor filter / regulator bowl drain every week. To manually drain the bowl, push the push button at the bottom of the bowl. Let all accumulated liquid drain until you hear air escaping.

WARNING

- Do not perform maintenance on the conveyor until the start-up controls, including motor safety switches, are locked out and cannot be turned by any person other than the one performing the maintenance.
- If more than one member of a crew is working on the conveyor, EACH CREW MEMBER MUST HAVE A LOCK ON THE POWER LOCK OUT. The air pressure must be turned off to the work area. All pneumatic devices must be de-energized to prevent accidental cycling of the device.
- Check the loosened parts have been retightened and all guards reinstalled.
- Make sure personnel are clear of all conveyor equipment before restarting the system.

20 PZM TROUBLESHOOTING GUIDE

IntelliROL Troubleshooting Guide			
#	Problem	Possible Cause	Remedy
1	Power Roller does not turn	ITR roller not properly installed	Check that the Power Moller is properly inserted into the frame. Adjust as necessary
			Check the tube and end caps are not contacting the frame, side rails or other parts. Power Moller should be allowed to move freely
		Too many slave rollers connected to drive roller	Inspect MDR zone to ensure proper number of idlers is adequate related to the Powered Roller. Refer to IOM Manual for additional information
		Power Cable extensively twisted	Inspect cable for kinks or cracks in wiring.
		Check that the Power Moller's shafts are properly mounted with the applicable bracket(s). Proper mounting is required for tube rotation.	For FE series motors one bracket securing the cable side shaft.
			For FS / FP / FH series motors two brackets securing both cable side and spring loaded shafts
		When slave driving idler rollers check that the number of idlers driven is adequate for the particular model of Power Moller being used.	Check air pressure on take up assembly. Make sure belt tension is proper.
		Check that the power cable is in good condition, with no twisting or severe kinks in the cable that would indicate broken wires. Also check for any cuts in the power cable or wires near the connector end.	Locate and correct interference
			Install belt properly
2	LED status	Red LED OFF,	Check that the power supply is on.
		Green LED OFF,	Check that the card is correctly wired. Reference IOM manual.
		Orange LED OFF	Measure the voltage, stable 24V DC is required.
		Red LED ON,	Check that the motor connector is properly plugged into the card then cycle the run / sensor signal.
		Green LED ON,	
		Orange LED ON	
		If sensor is blocked	Thermal protection active – motor or card reached thermal limit, motor will not operate until one minute after the card or motor has cooled down below thermal limit. Consider possible causes of why the Power Moller is reaching thermal limit; cycle times, ambient temperature, load changes, roller not turning freely, etc. Do not remove power to the card to reset the error, damage may occur
		Red LED OFF,	Check that the sensor is properly wired in the correct position and is the proper voltage. Reference IOM manual.
		Green LED ON,	If the run signal is coming from a device on a separate power supply check that the 0V lines are connected between the device's power supply and the driver cards power supply.
		Orange LED ON	If using a run signal check the wiring to CN2 is in the correct position and wired correctly, see page 4 of the manual. Also check that dip switch 2-8 is ON for run.
		If sensor is blocked	If card is set to zone begin, dip switch 2-6 ON and the downstream zone is stopped and occupied then the roller will not run. If card is set to zone end, dip switch 2-6 OFF, zone will accumulate product at the sensor. Reference IOM manual.
			Replace roller
3	Flashing LED	Many options	Refer to IOM Manual for detailed information OR refer to appropriate ITOH Denki driver card manuals for additional options.
4	Rollers "dancing" or spinning uncontrollably	Too many zones on one ITR control circuit	Set direction blocking dip switch setting. Refer to IOM Manual for additional information.
		Power Supply not centered within the string of zones	Locate and Adjust Power Supply to correct current supply issue
		Supply of power not equally distributed	Set card to Basic Accumulation. Refer to IOM Manual for additional information.
		Mixture of driver cards	Within the ITR transportation product line you can only use FP or FN cards within a string. Reference IOM Manual for additional information
		Power Supply Issue	If power supply is not purchased from TGW, please consult manufactures operation directions.
		Multiple connected Power Supply units	0V line of all power supplies connected within a conveyor "unit" need to be connected. Reference IOM for additional detailed information

20.1 TROUBLESHOOTING GUIDE CONTINUED

IntelliROL Troubleshooting Guide			
#	Problem	Possible Cause	Remedy
5	Infeed zone not activating or running	Need input signal	Install TGW start eye kit, or provide 24V run signal
		Loose connection between driver cards	Inspect, and adjust, connection cables as necessary
6	Discharge zone not releasing	Down flow sending not providing “release” signal	Make sure photo eye and reflector are in alignment
		No “release” signal being provided	Use PLC connection, or Photo Eye & Reflector to provide zone with discharge open signal.
7	One Zone not turning	Loose wire connection	Check all stranded wires to ensure they are inserted properly
		Loose connector cable	Check all quick connection within power harness to ensure they are properly connected.
8	Driver Card continuously faulting	Poor supply of power	Inspect to see if power supply is transmitting correct voltage
		Power Supply unit not wired correctly to the 24V supply line	Inspect termination points to ensure proper wiring. Adjust accordingly. Reference IOM Manual for additional information.
		Bad bearing in wheel bracket or slave roller	Replace worn out component to relieve the extra stress on ITR roller.
9	Rollers are turning slowly	Too many zones are connected to the Power Supply unit	Consult IOM Manual to ensure the proper configuration between Driver Cards and Power Supply unit.
		Wrong dip switch setting on driver card	Check dip switch setting of 1-6 is properly set to OFF for internal speed (rotary switch control) Refer to IOM Manual for additional settings.
10	Driver cards faulting regularly in UBT	Programming issue. Transfer belt rollers running 24/7	ITR rollers driving the transfer bands only need to run when signal is provided to UBT to divert product.
11	Thermal Limit reached	Driver Card or Roller are over heating	Check the ambient temperature. Consult IOM Manual for acceptable temperature ranges
		Back plate of driver card not touching conveyor frame	Inspect mounting plate/conveyor surface to ensure complete surface connection for maximum heat dissipation.
		Excess friction or drag on motorized roller	Inspect area around roller to ensure nothing is rubber or lodged by the roller causing extra friction.

21 REPLACEMENT PARTS IDENTIFICATION

This section is used to identify parts that may require replacement during the life of the conveyor. Parts, which specifically pertain to MHS Conveyor conveyors, are included with illustrations. A "Recommended Spare Parts List" is published for all conveyor orders of $20,000. This spare parts list is sent to the purchaser approximately (2) weeks after the order is received. It includes part numbers, description, pricing and recommended quantities to be kept on hand for maintenance. If you are unable to locate this document, another may be obtained by contacting the MHS Conveyor Lifetime Services at 231-798-4547.

21.1 SPARE PARTS PRIORITY LEVEL EXPLANATIONS

Level #1

Failure of a priority level #1 spare part ("A" level part) may cause major disruption of system performance.

Priority level 1 spare parts must be on-hand, and available to be replaced in the event of a component failure that could shut down a critical function of a conveyor system.

Priority level 1 spare parts include motors, gear reducers, gearmotor, motorized rollers, air solenoid valves, and related components. The majorities of these parts are purchased from MHS Conveyor vendors and carry their own warranties through these vendors. For more warranty information, see MHS Conveyor Equipment Warranty.

Level #2

Failure of a priority level #2 spare parts ("B" level part) usually is gradual and should not cause a major system disruption.

Priority level 2 spare parts are parts required for smooth system operation and preventative or regular mechanical maintenance.

Priority level 2 spare parts include roller chain, sprockets, belt pulleys, rollers, air cylinders, and other related parts whose failure should not stop a conveyor system suddenly. These parts tend to wear out gradually and are not know to fail suddenly.

Level #3

Priority level #3 parts ("C" level part) rarely fails and are easily obtainable.

Priority level 3 spare parts are parts that rarely fail or maybe optionally used by the customer.

21.2 DRIVE AND SLAVE O-RINGS FOR THE ITR PICK ZONE MODULE

Driver & Slave O-Rings for ITR Pick Zone		
ITEM #	**DESCRIPTION**	**Application**
1148786	ORING 3/16 DIA X 22-3/16	
1136169	ORING 3/16 DIA X7-1/2	Straight Slave
1144848	ORING 3/16 DIA X 9-1/2 HT BLUE	Straight Slave

21.3 COMMUNICATION CABLES

DRIVER CARD COMMUNICATION CABLE (CAT5E)		
Item No.	**Description**	**Application**
E0034025	CABLE,CAT5E 3' GRAY	COMM. CABLE BETWEEN
E0034026	CABLE,CAT5E 5' GRAY	COMM. CABLE BETWEEN
E0034027	CABLE,CAT5E 7' GRAY	COMM. CABLE BETWEEN
E0030796	CABLE,CAT5E 10' GRAY	COMM. CABLE BETWEEN
E0009905	CABLE,CAT5E 14' GRAY	COMM. CABLE BETWEEN
E0009904	CABLE,CAT5E 25' GRAY	COMM. CABLE BETWEEN

21.4 POWER HARNESS

INTELLIROL 24VDC POWER HARNESS		
Item No.	**Description**	**Application**
1129502	HARNESS,ITR-POWER-10AWG-12.5'	24VDC POWER CABLE TO DRIVER CARDS
1102286	HARNESS,ITR-POWER-10AWG-10.5'	24VDC POWER CABLE TO DRIVER CARDS
1102287	HARNESS,ITR-POWER-10AWG-8'	24VDC POWER CABLE TO DRIVER CARDS
1102288	HARNESS,ITR-POWER-10AWG-5.5'	24VDC POWER CABLE TO DRIVER CARDS
1102289	HARNESS,ITR-POWER-10AWG-3'	24VDC POWER CABLE TO DRIVER CARDS
1143291	HARNESS,ITR-POWER-10AWG-10'-MALE-PIGTAIL	POWER CABLE W/ MALE CONNECT ONLY
1145665	HARNESS,ITR-POWER-10AWG-10'-FEMALE-PIGTAIL	POWER CABLE W/ FEMALE CONNECT ONLY
1161502	HARNESS,ITR-PWR INTRPT-10AWG-4"-COMMON CONDUCTOR	USED BETWEEN POWER SUPPLIES TO CONNECT COMMONS
1138166	HARNESS,ITR-POWER-10AWG-33'-(10 METER)	24VDC POWER CABLE TO DRIVER CARDS
3M567	CONNECTOR, POWER SPLICE 10 AWG	----
MALE/MALE POWER HARNESS		
1141545	HARNESS,ITR-POWER-10AWG-4"-MALE/MALE CONN	USE TO CHANGE POWER FLOW
1134347	HARNESS,POWER,10AWG,1' MALE CONN BOTH ENDS, GENDER BENDER	USE TO CHANGE POWER FLOW
1134348	HARNESS,POWER,10AWG,3'-MALE CONN BOTH ENDS-GENDER BENDER	USE TO CHANGE POWER FLOW
1134349	HARNESS,POWER,10AWG,5.5' MALE CONN BOTH ENDS, GENDER BENDER	USE TO CHANGE POWER FLOW
FEMALE/FEMALE POWER HARNESS		
1141549	HARNESS,ITR-POWER-10AWG-4"-FEMALE/FEMALE CONN	USE TO CHANGE POWER FLOW
1134344	HARNESS,POWER,10AWG,1' FEMALE CONN BOTH ENDS, GENDER BENDER	USE TO CHANGE POWER FLOW
1134345	HARNESS,POWER,10AWG,3' FEMALE CONN BOTH ENDS, GENDER BENDER	USE TO CHANGE POWER FLOW
1134346	HARNESS,POWER,10AWG,5.5' FEMALE CONN BOTH ENDS, GENDER BENDER	USE TO CHANGE POWER FLOW

21.5 MOTOR CABLES USED WITH CBM-105, CB-016 OR HB-510

CABLE,MOTOR EXTENSION USED WITH CB-016 OR HB-510	
Item No.	**Description**
1138704	CABLE,MOTOR EXTENSION,600MM ITOH M-F-EXT-9PIN-600 **USE W/ CB-016 OR HB-510**
1138705	CABLE,MOTOR EXTENSION,1200MM ITOH M-F-EXT-9PIN-1200 **USE W/ CB-016 OR HB-510**
1137706	CABLE,MOTOR EXTENSION,2700MM ITOH M-F-EXT-9PIN-2700 **USE W/ CB-016 OR HB-510**

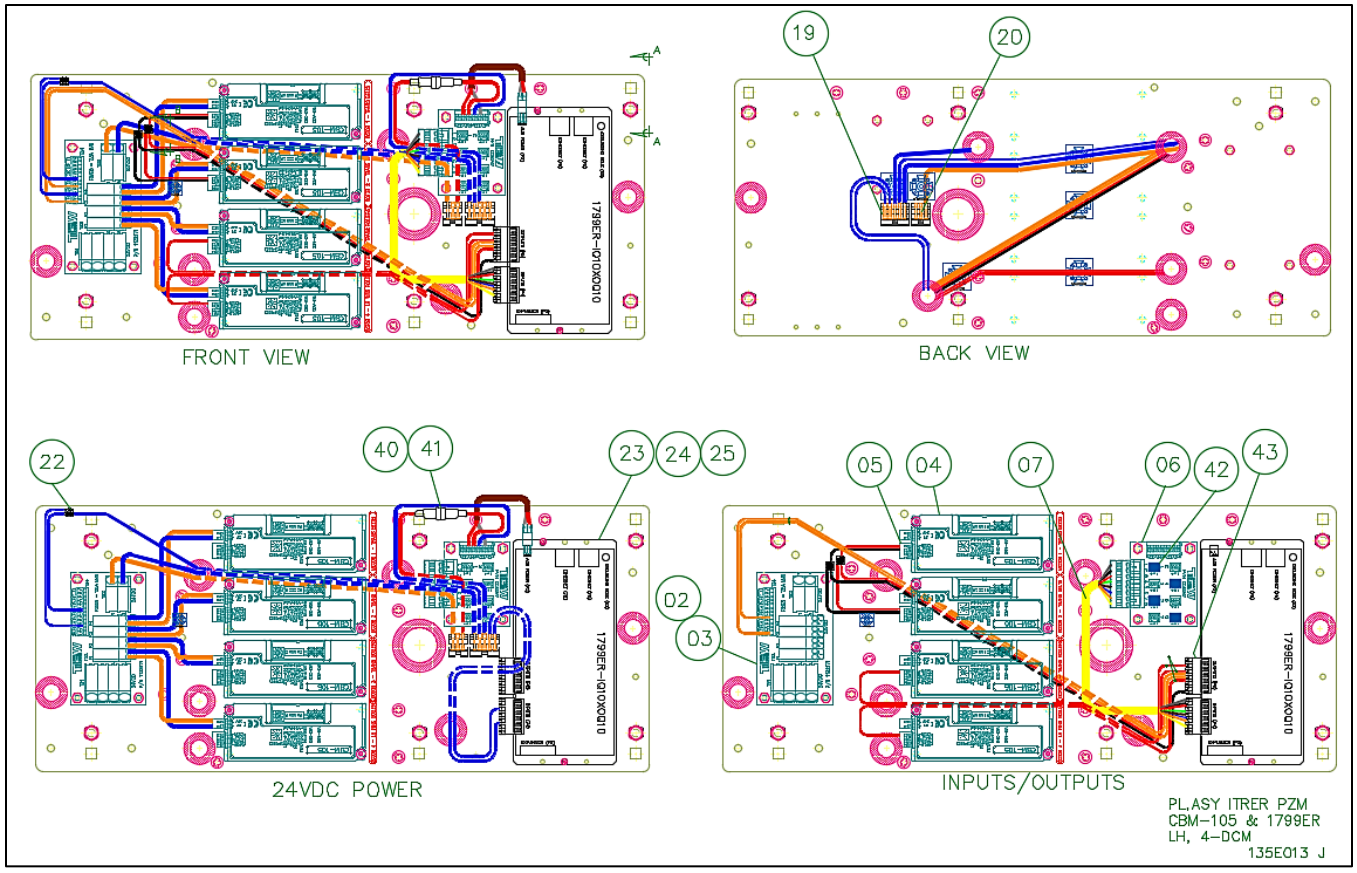
21.6 MOTOR CABLES USED WITH IB-E03

CABLE,MOTOR EXTENSION USED WITH IB-E03	
Item No.	**Description**
1135339	CABLE,MOTOR EXTENSION,600MM ITOH M-F-EXT-10PIN-600 **USE W/ IB-N03/IB-E/HBM-604/BRAKE**
1135340	CABLE,MOTOR EXTENSION,1200MM ITOH M-F-EXT-10PIN-1200 **USE W/ IB-N03/IB-E/HBM-604/BRAKE**
1135341	CABLE,MOTOR EXTENSION,2700MM ITOH M-F-EXT-10PIN-2700 **USE W/ IB-N03/IB-E/HBM-604/BRAKE**

21.7 COATED ROLLERS

COATED ROLLERS	
Item No.	**Description**
Non-Motorized Roller	
1134693	ROLLER,18ITR 1.9CTD PRBG-1/8"BLK URE SLV (16BF)
1132204	ROLLER,24ITR 1.9CTD PRBG-1/8"BLK URE SLV (22BF)
1131724	ROLLER,30ITR 1.9CTD PRBG-1/8"BLK URE SLV (28BF)
1140369	ROLLER,36ITR 1.9CTD PRBG-1/8"BLK URE SLV (34BF)
Motorized Roller	
1140375	ROLLER,ITR 16BF 2G CTD ITOH-PM486FE-60-391-D-24-P2-KF-1/8"BLK URE SLV
1140376	ROLLER,ITR 22BF 2G CTD ITOH-PM486FE-60-544-D-24-P2-KF-1/8"BLK URE SLV
1140377	ROLLER,ITR 28BF 2G CTD ITOH-PM486FE-60-696-D-24-P2-KF-1/8"BLK URE SLV
1140378	ROLLER,ITR 34BF 2G CTD ITOH-PM486FE-60-849-D-24-P2-KF-1/8"BLK URE SLV

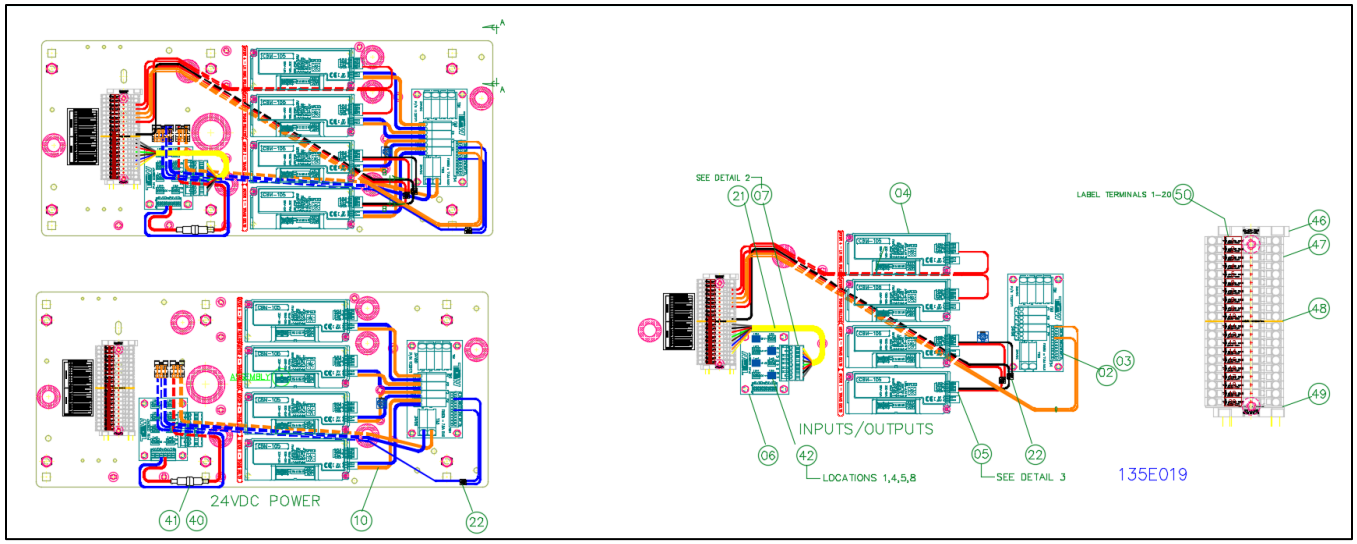
21.8 ITR DRIVER CARDS WITH 1799 I/O CARD



21.8.1 Replacement Parts - ITR Driver Cards with CBM-105 & 1799 I/O Card

REPLACEMENT PARTS - 1799 Driver Card				
		Width & Item #		
Balloon	Description	16 BF	22 BF	28 BF
02	PCB, DB, FUSED, 10A FOR HB510/CB016	1132171	1132171	1132171
03	FUSE, 7.5A,32V, ATO MINI BLADE	1132721	1132721	1132721
04	DRIVERCARD,ITOH CBM-105FP	1153930	1153930	1153930
05	CONN,FEMALE 5 POLE PIN 20-28AWG	733105	733105	733105
06	PCB, DB, PE, 4A 8 STATION	1138197	1138197	1138197
07	CABLE,ADAPTER,9IN,1799 TO WAGO 231 8-POLE	1144918	1144918	1144918
10	CABLE,POWER,CB-016 PZM 14GA,ITR	1144897	1144897	1144897
19	CONN, 5 COND, W/LEVERS 28 - 12 AWG	1137437	1137437	1137437
20	CONN, 3 COND, W/LEVERS 28 - 12 AWG	1102816	1102816	1102816
21	CABLE,POWER,8IN,ITR,1799	1144899	1144899	1144899
22	CONNECTOR,IDC SCOTCHLOK 558 16-22AWG RUN,16-22AWG	1120174	1120174	1120174
25	MODULE,I/O 10IN/10OUT, 1799	1142334	1142334	1142334
40	FUSE,4A,125V,CARTRIDGE,GMA	1102221	1102221	1102221
41	FUSE,HOLDER IN-LINE,CARTRIDGE	1102222	1102222	1102222
42	CONN,FEMALE 3 POLE PIN	1139780	1139780	1139780
43	CONNECTOR,12 PIN,2.5MM	1140805	1140805	1140805
				Reference Dwg: 130E013

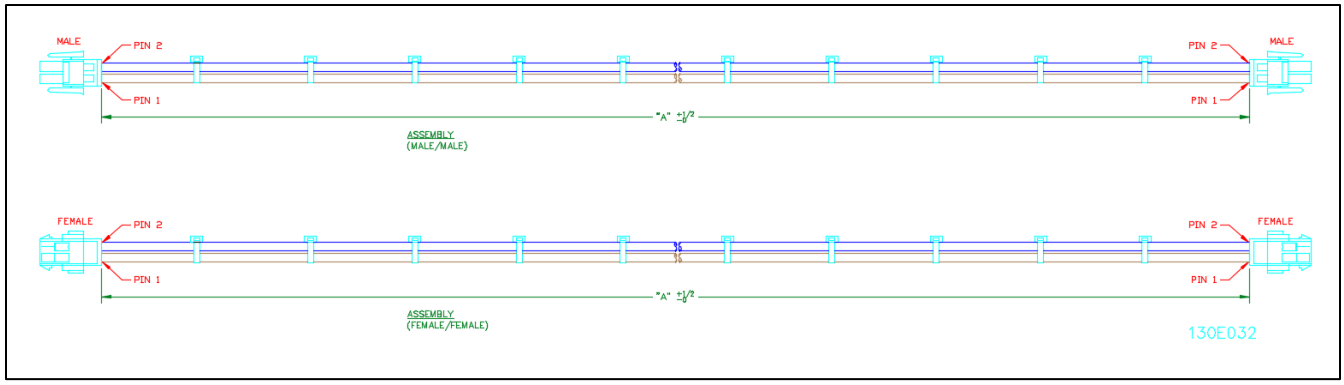
21.9 ITR DRIVER CARDS WITH TERMINAL STRIP



21.9.1 Replacement Parts - ITR Terminal Strip

REPLACEMENT PARTS - ITR TERMINAL STRIP				
		Width & Item #		
Balloon	Description	16 BF	22 BF	28 BF
02	PCB, DB, FUSED, 7.5A	1132171	1132171	1132171
03	FUSED, 7.5A, 32V, ATO	1132721	1132721	1132721
04	DRIVERCARD, ITOH CBM-105	1153930	1153930	1153930
06	PCB, DB,PE, 4A, 8 STATION WAGO	1138197	1138197	1138197
07	CONN., WAGO 231-108 / 026-000	1138668	1138668	1138668
10	CABLE, POWERT, CB-016 PZM	1144897	1144897	1144897
20	CONN., 3 COND, W / LEVERS	1102816	1102816	1102816
21	CABLE, BELDEN 9421 OR EQUIV.	1140038	1140038	1140038
22	CONNECTOR, IDC SCOTCHLOK 558 (RED)	1120174	1120174	1120174
40	FUSE, 4A, 125V, CARTRIDGE, GMA	110221	110221	110221
41	FUSE, HOLDER IN-LINE, CARTRIDGE	1102222	1102222	1102222
42	CONN., FEMALE 3 POLE PIN	1139780	1139780	1139780
46	TERM, END STOP WAGO 249-116	1132919	1132919	1132919
47	TERM 2 COND, WAGO 2002-1201	1114381	1114381	1114381
48	TERM, INTRMED PLT, WAGO 2002-1292	1132918	1132918	1132918
49	TERM, INTRMED PLT, WAGO 2002-1291	1114382	1114382	1114382
50	WMB-MLTI-MARK 1-50, WAGO 793-666	1142173	1142173	1142173
				Reference Dwg: 135E019

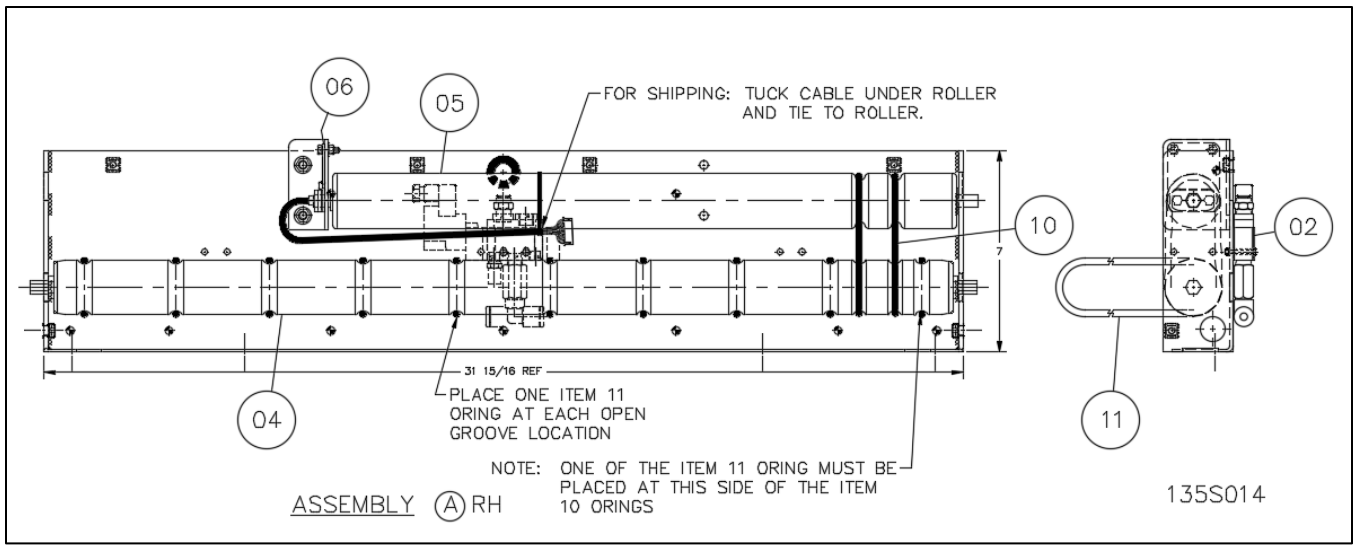
21.10 HARNESS, GENDER CHANGING



21.10.1 Replacement Parts – Harness, Gender Changing

MALE/MALE POWER HARNESS	
Item No.	**Description**
1141545	HARNESS, POWER, 10AWG, 0' 4"
1134347	HARNESS, POWER, 10AWG, 1'-0"
1134348	HARNESS, POWER, 10AWG, 3'-0"
1134349	HARNESS, POWER, 10AWG, 5'-6"
FEMALE/FEMALE POWER HARNESS	
1141549	HARNESS, POWER, 10AWG, 0' 4"
1134344	HARNESS, POWER, 10AWG, 1'-0"
1134345	HARNESS, POWER, 10AWG, 3'-0"
1134346	HARNESS, POWER, 10AWG, 5'-6"
130E032	

21.11 PAN, BOTTOM ITR ERS

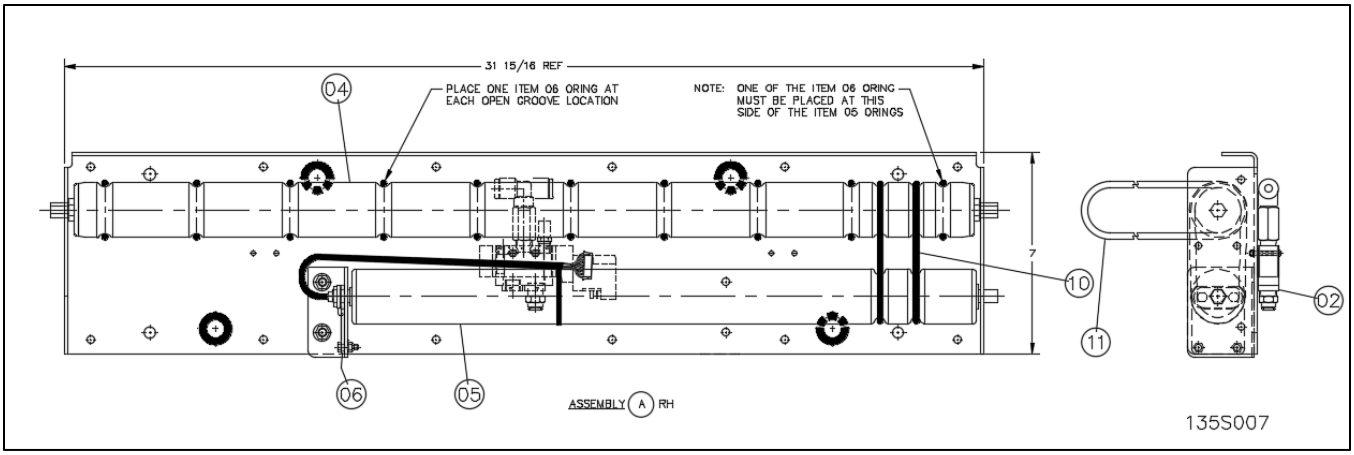


21.11.1 Replacement Parts - Pan Bottom ITR ERS LH & RH

REPLACEMENT PARTS - PAN ASY BOTTOM ITR ERS LH & RH				
		Width & Item #		
Balloon	Description	16 BF	22 BF	28 BF
02	VALVE,SMC 4WAY 24VDC W/FITT & DIN CORD	1139102	1139102	1139102
04	ROLLER,CARRIER DRIVE,	1132732	1132732	1132732
05	ROLLER,ITR 22BF 2G ITOH **(9 PIN)**	1138723	1138723	1138723
05	ROLLER,ITR 22BF 2G ITOH **(10 PIN)**	1163472	1163472	1163472
06	BRKT,MOUNTING ITOH,FLATS UP	1132447	1132447	1132447
10	ORING,1/4"DIA X 9.5" HT BLUE	1144848	1144848	1144848
11	ORING,83A ST TRNS 3/16X22-3/16	1148786	1148786	1148786
				Dwg# 135S014

Ref Part Number 1139098

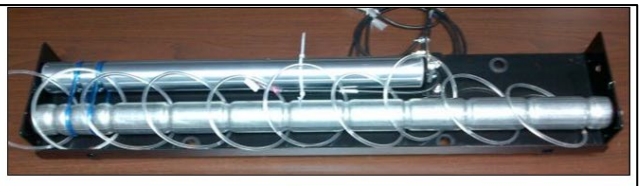
21.12 PAN BOTTOM ITR ERS WING (FE & FP ROLLER)



21.12.1 Replacement Parts - Pan Assembly

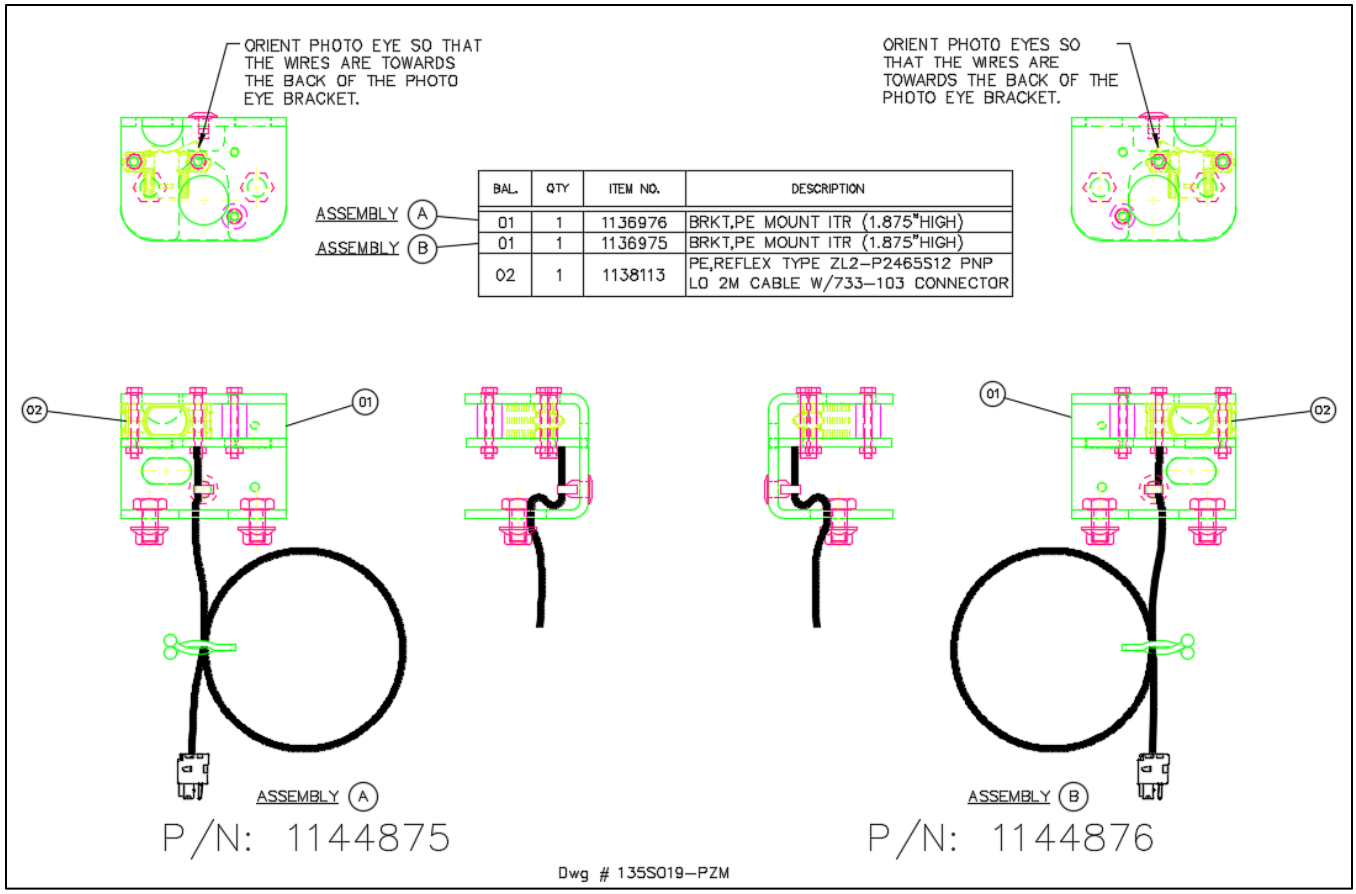
REPLACEMENT PARTS - PAN ASY BOTTOM ITR ERS WING (FE ROLLER) LH & RH				
		Width & Item #		
Balloon	**Description**	**16 BF**	**22 BF**	**28 BF**
02	VALVE,SMC 4WAY 24VDC W/FITTS & DIN CORD	1139102	1139102	1139102
04	ROLLER,CARRIER DRIVE,	1132732	1132732	1132732
05	ROLLER,ITR 22BF 2G ITOH **FE-60 (9 PIN)**	1138723	1138723	1138723
05	ROLLER,ITR 22BF 2G ITOH **FP-55 (9 PIN)**	1135782	1135782	1135782
05	ROLLER,ITR 22BF 2G ITOH **FE-60 (10 PIN)**	1163472	1163472	1163472
05	ROLLER,ITR 22BF 2G ITOH **FP-55 (10 PIN)**	--	--	---
06	BRKT,MOUNTING ITOH,FLATS UP	1132447	1132447	1132447
10	ORING,1/4"DIA X 9.5" HT BLUE	1144848	1144848	1144848
11	ORING,83A ST TRNS 3/16X15-7/32	1148787	1148787	1148787
				Dwg# 135S007

Ref Part Number 1138811

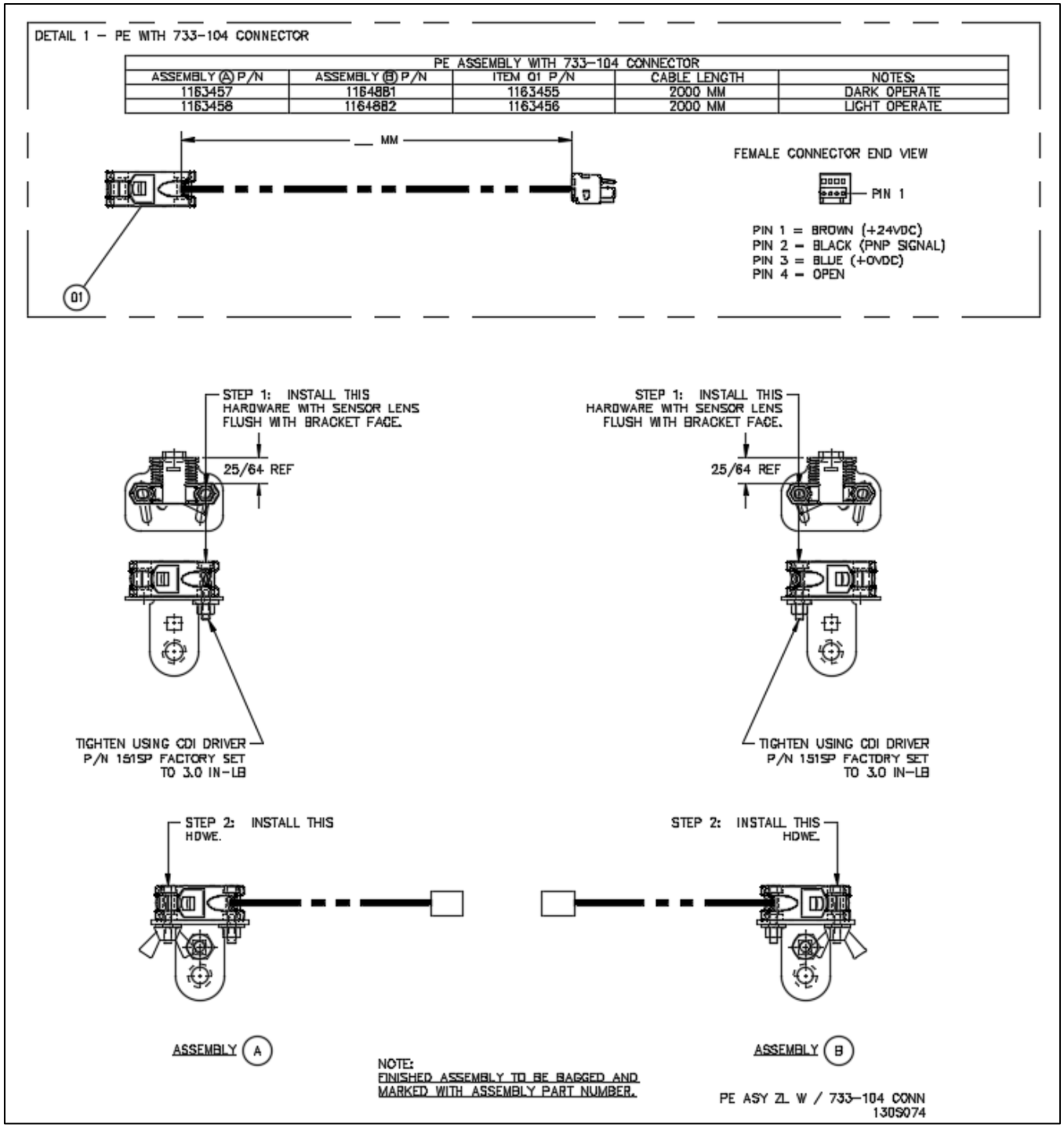


Ref Part Number 1138810

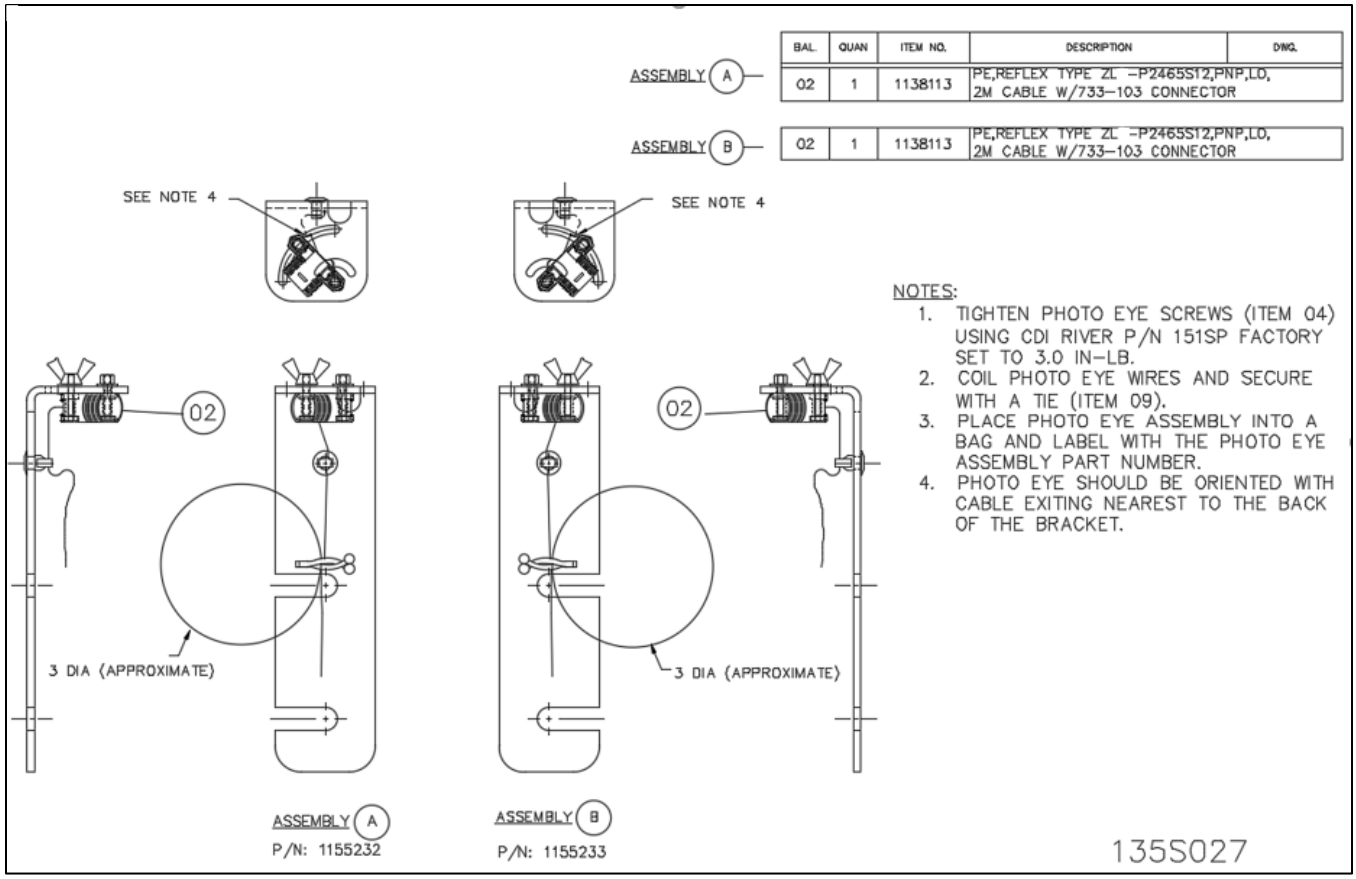
21.13 REPLACEMENT PARTS - PHOTOEYE ASSEMBLIES



21.14 REPLACEMENT PARTS – PHOTOEYE ASSEMBLY ZL W / CONN

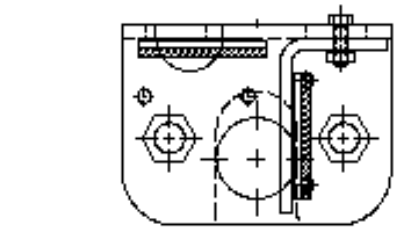


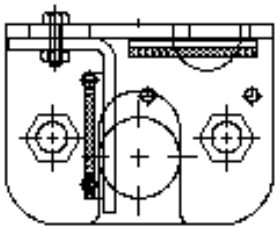
21.15 REPLACEMENT PARTS - PHOTOEYE

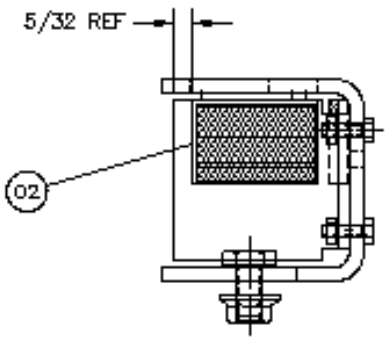


21.16 REPLACEMENT PARTS - REFLECTOR ASSEMBLY

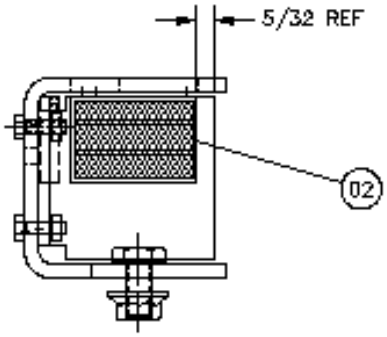
	BAL.	QUAN	ITEM NO.	DESCRIPTION	DWG.
ASSEMBLY (A)	02	2	1136359	PE,REFLECTOR 20MM X 30MM	
ASSEMBLY (B)	02	2	1136359	PE,REFLECTOR 20MM X 30MM	







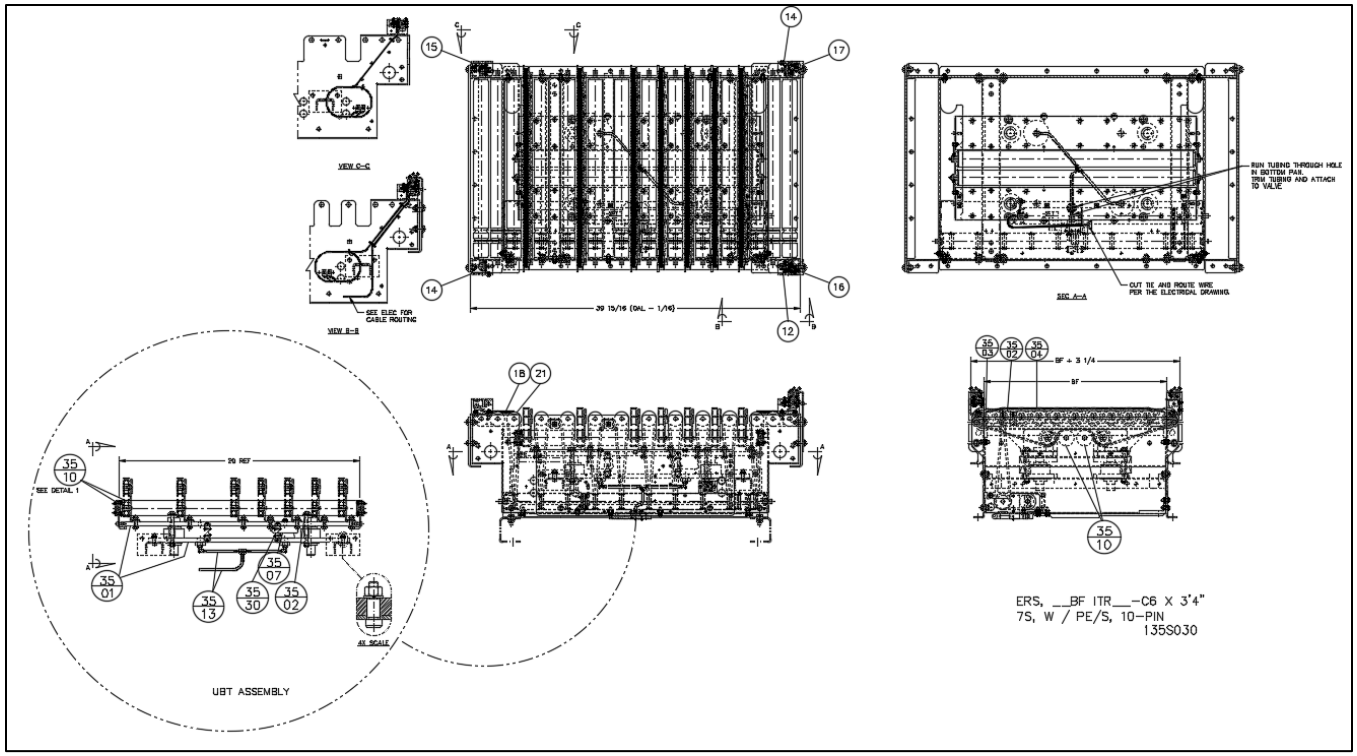
ASSEMBLY (A)
P/N: 1136982



ASSEMBLY (B)
P/N: 1136983

130S008

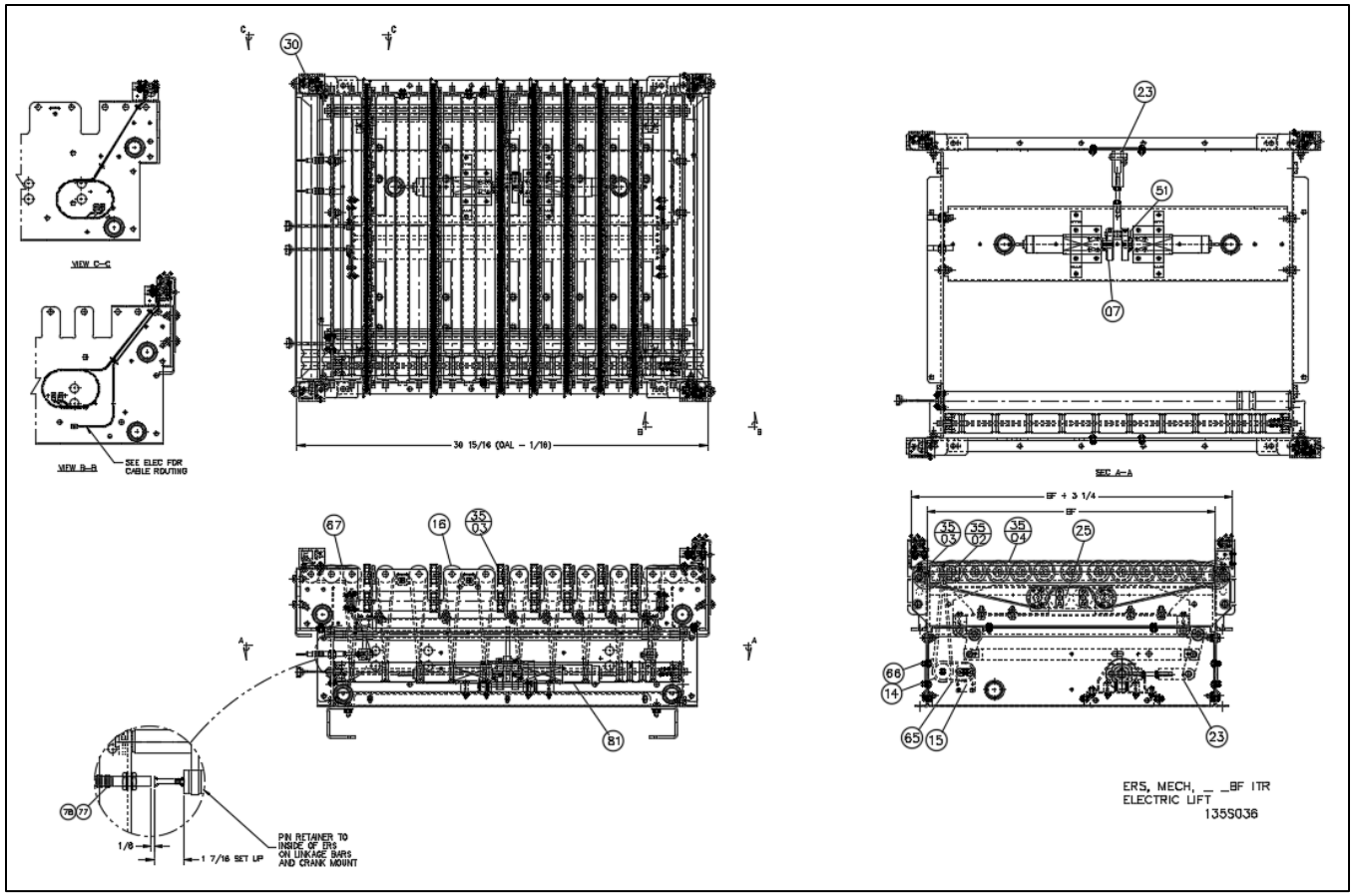
21.17 ITR ERS (PNEUMATIC LIFT) – MECHANICAL COMPONENTS



21.17.1 Replacement Parts – ITR ERS (Pneumatic Lift) – Mechanical Components

REPLACEMENT PARTS - ITR ERS Mechanics - Pneumatic Lift				
ERS,_ _BF ITR-C6 X 3'4" 7S		**Width & Item #**		
Balloon	**Description**	**22 BF**	**28 BF**	**34 BF**
----	**PE,ASY ITR UBT/ERS**	**----**	**----**	**-----**
12, 15, 16 or 17	PE,REFLEX TYPE ZL, PNP,LIGHT OPERATE,2M CABLE, W/733-104 CONNECTOR	1163456	1163456	1163456
----	**REFLECTOR,ASY ITR UBT/ERS, ASSEMBLY B (1.875"HIGH)**	**----**	**----**	**-----**
14	PE,REFLECTOR 20MM X 30MM, (1.875" HIGH)	1136359	1136359	1136359
18	ORING,83A3/16 X 7-1/2	1136169	1136169	1136169
21	ROLLER,ITR __BF 1.75D PRBG 2D	1135966	1135967	1135968
35	**ERS,ASY _ _BF ITR FP-55**	**----**	**----**	**----**
35/10	ROLLER,ITR 29BF NG ITOH PM486FP-55-722-D-24-JR-KF **(CB, 9 PIN)**	1151379	1151379	1151379
35/10	ROLLER,ITR 29BF NG ITOH PM486FP-55-722-D-24-JR-Z060-KF **(IBE, 10 PIN)**	1214886	1214886	1214886
35/13	TUBING,1/4"POLYU-95DURO.160ID	E0005539	E0005539	E0005539
35/01	LIFTTABLE,ASY A&B ITR2 UBT PER PRINT	1135913	1135913	1135913
35/07	AIRBAG,FIRESTONE #W02-358-3000	90000025	90000025	90000025
35/30	SPRING,EXT 3/4OD X 2"LG .075W	90800263	90800263	90800263
----	**WHEEL BRKT,ASY ITR UBT __"BF**	**----**	**----**	**----**
35/02	IDLER,ASY FLAT FACE ITR UBT	1132379	1132379	1132379
35/03	IDLER,ASY FLANGED ITR UBT	1159961	1159961	1159961
35/04	BELT,83A .188 X .468 X _ _"	1132755	1132756	1132757
				Reference Dwg: 135S030

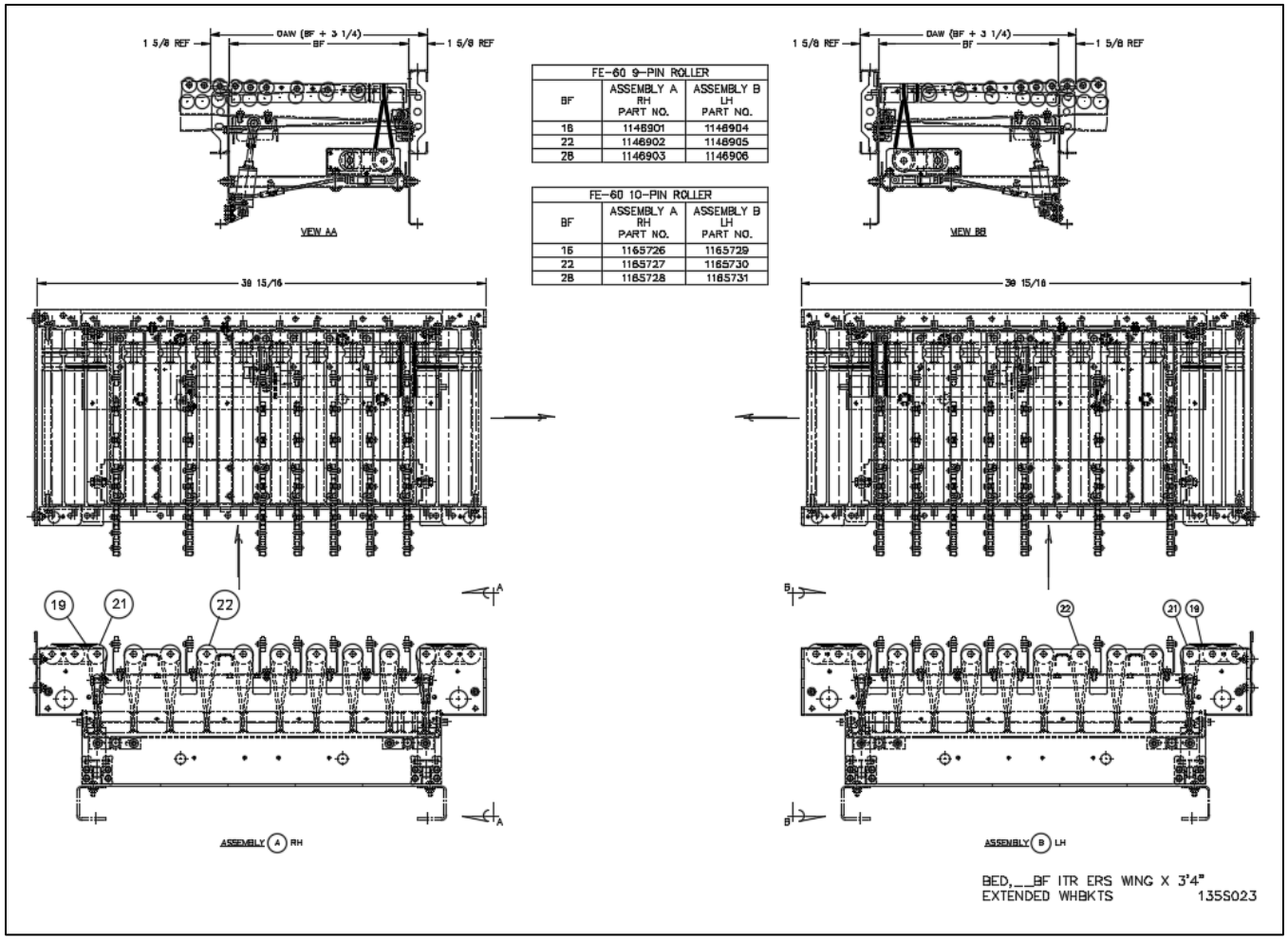
21.18 ITR ERS (ELECTRIC LIFT) – MECHANICAL COMPONENTS



21.18.1 Replacement Parts – ITR ERS (Electric Lift) – Mechanical Components

REPLACEMENT PARTS - ERS MECHANICS ELECTRIC LIFT				
ERS,_ _BF ITR-C6 X 3'4" 7S BDI FE-60,W/PE'S		Width & Item #		
Balloon	**Description**	**22 BF**	**28 BF**	**34 BF**
7	CAM, DRIVE ELECTRIC LIFT UBT,ERS,WING BED	1196464	1196464	1196464
14	ROLLER,CARRIER DRIVE ITR 2 UBT 3-1/4"C,7-STRAND LOCO DRIVE	1196871	1196871	1196871
15	ROLLER,ITR 34BF 2G ITOH PM 486 FE-60 (1.25" GROOVE SPACING)	1184858	1184858	1184858
16	ROLLER,ITR __BF 1.75D PRBG 2D	1196875	1196875	1196876
23	ASY, DRIVE LINKAGE ELECTRIC LIFT	1196442	1196442	1196442
25	ROLLER,ITR 29BF NG ITOH PM486FP-55-722-D-24-JR-Z060-KF **(IBE, 10 PIN)**	1214888	1214888	1214888
30	PE,REFLEX TYPE ZL	1163456	1163456	1163456
30	REFLECTOR 20X30X4-SELF-ADHESIVE	00203650	00203650	00203650
35/02	IDLER,ASY FLAT FACE ITR UBT MID	1132379	1132379	1132379
35/03	IDLER,ASY FLANGED ITR UBT END	1159961	1159961	1159961
35/04	BELT,83A .188 X .468 X __" __BF ITR2 UBT	1132755	1132756	1132757
51	PIN,HEAD TYPE,SET SCREW FLAT	1184947	1184947	1184947
65	ORING,3/16DIA X 8-1/4" HT BLUE	E0034023	E0034023	E0034023
66	ORING,83A ST TRNS 3/16X21-3/8	1149850	1149850	1149850
67	ORING,83A3/16 X 7-1/2	1136169	1136169	1136169
77	SWITCH,PROX,12MM DIA	1184770	1184770	1184770
78	CABLE, M12 TO WAGO 733-103	1198538	1198538	1198538
81	DRIVE,KYOWA 24VDC PULSE GEAR	1177986	1177986	1177986
				Reference Dwg: 135S036

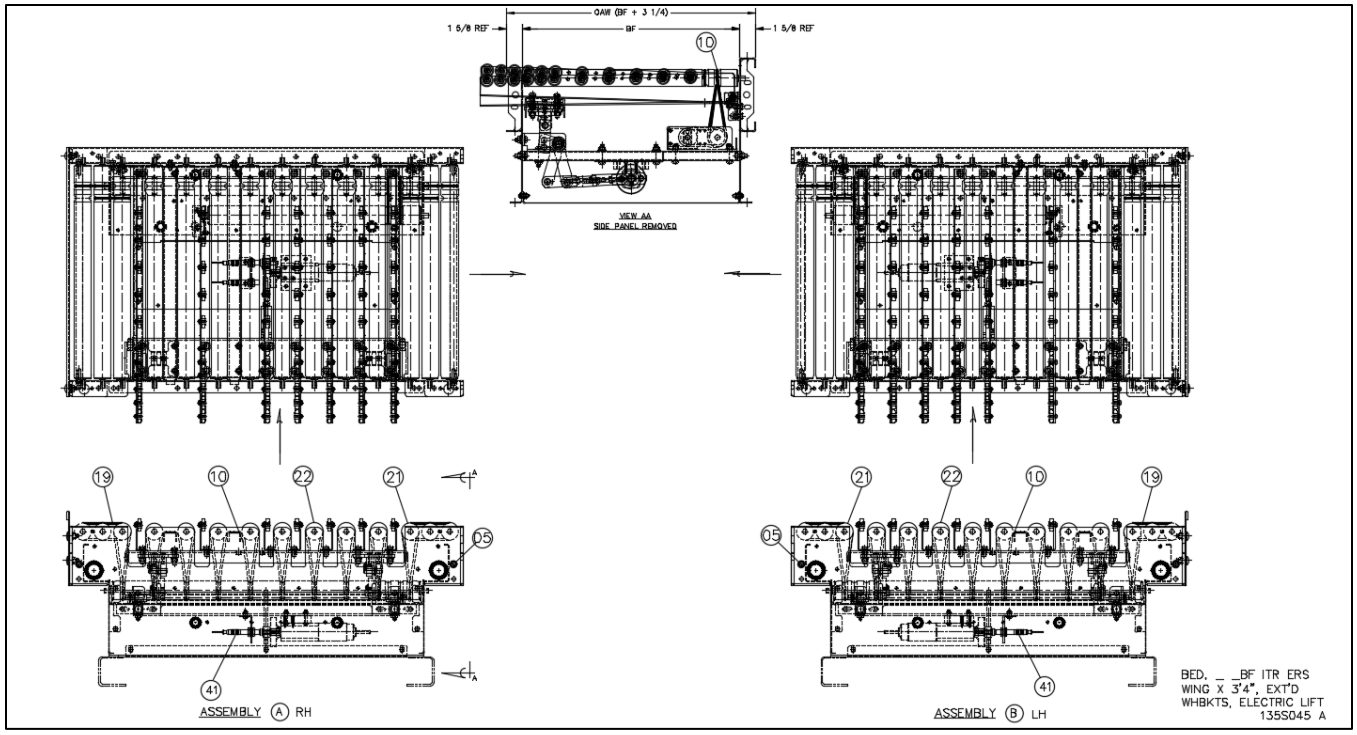
21.19 WING BED, ITR ERS – (PNEUMATIC LIFT)



21.19.1 Replacement Parts – Wing Bed ERS – (Pneumatic Lift)

REPLACEMENT PARTS - ERS PNEUMATIC LIFT				
BED,28BF ITR ERS WING X 3'4"LH OR RH EXTENDED WHBKTS		**Width & Item #**		
Balloon	**Description**	**16 BF**	**22 BF**	**28 BF**
19	ORING,83A3/16 X 7-1/2	1136169	1136169	1136169
21	ROLLER,ITR 28BF 1.75D PRBG 2D	1135966	1135967	1135968
22	ROLLER,ITR 28BF 1.75D PRBG 1D	1136161	1136162	1136163
				Ref Dwg# 135S023

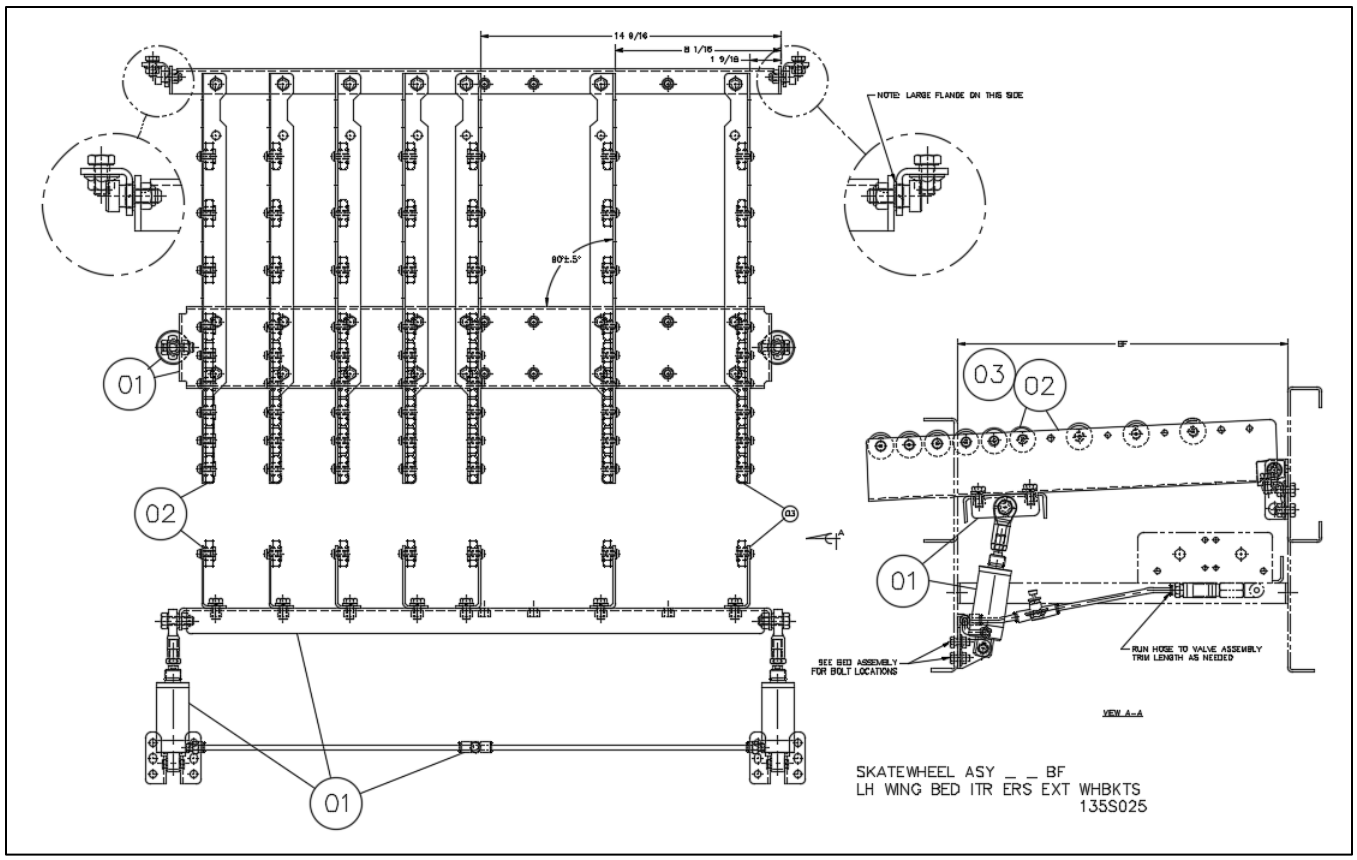
21.20 WING BED, ITR ERS – (ELECTRIC LIFT)



21.20.1 Replacement Parts – ERS Wing Bed – (Electric Lift)

REPLACEMENT PARTS - ITR ERS WING BED - ELECTRIC LIFT				
BED,_ _BF ITR ERS WING X 3'4"LH/RH		**Width & Item #**		
Balloon	**Description**	**16 BF**	**22 BF**	**28 BF**
4	ROLLER,CARRIER DRIVEITR ERS 3.25"C	1132732	1132732	1132732
5	ROLLER,ITR 22BF 2G ITOH PM 486 FE-60 600MM MOTOR CABLE W/ 10 PIN CONN	1163472	1163472	1163472
10	ORING,1/4"DIA X 9.5" HT BLUE	1144848	1144848	1144848
11	ORING,83A ST TRNS 3/16X15-7/32	1148787	1148787	1148787
19	ORING,83A3/16 X 7-1/2	1136169	1136169	1136169
21	ROLLER,ITR _ _BF 1.75D PRBG 2D	1135967	1135967	1135968
22	ROLLER,ITR _ _BF 1.75D PRBG 1D	1136163	1136162	1136162
3	SKATEWHEEL,ASY 6002 W/ADAPTER	1138618	1138618	1138618
17	ASY, DRIVE LINKAGE ELECTRIC LIFT	1196442	1196442	1196442
20	CAM, DRIVEELECTRIC LIFTUBT,ERS,WING BED	1196464	1196464	1196464
32	PIN,HEAD TYPE,SET SCREW FLAT	1196950	1196950	1196950
39	DRIVE,KYOWA 24VDC PULSE GEAR	1177986	1177986	1177986
40	SWITCH,PROX,12MM DIA	1184770	1184770	1184770
41	CABLE, M12 TO WAGO 733-103	1198538	1198538	1198538
				Reference Dwg: 135S045

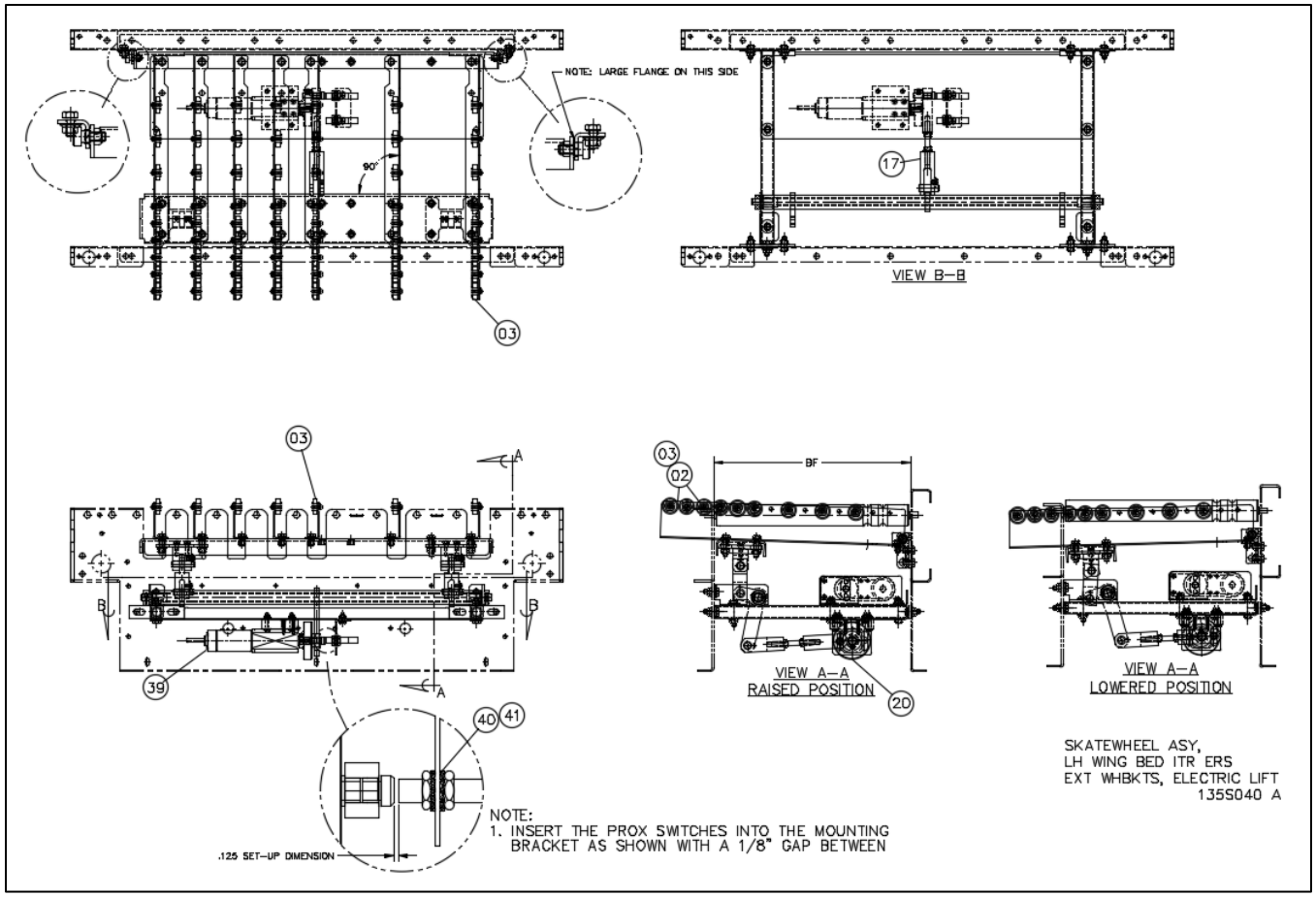
21.21 SKATE WHEEL WING BED – (PNEUMATIC LIFT)



21.21.1 Replacement Parts – Skate Wheel Wing Bed – (Pneumatic Lift)

REPLACEMENT PARTS - SKATE WHEEL WING BED – PNEUMATIC LIFT				
SKATEWHEEL,ASY 28BF LH OR RH		Width & Item #		
Balloon	Description	16 BF	22 BF	28 BF
02	CYL,ASY 1.5"B X 1"S S.A.,SPRING RET W/1 1/4"TUBE CONN	1138774	1138774	1138774
01	CYL,AIR 1.5"B X 1"S S.A.,SPRING RET	1136155	1136155	1136155
03	SKATEWHEEL,ASY 6002 W/ADAPTER,	1138618	1138618	1138618
				Ref Dwg# 135S025

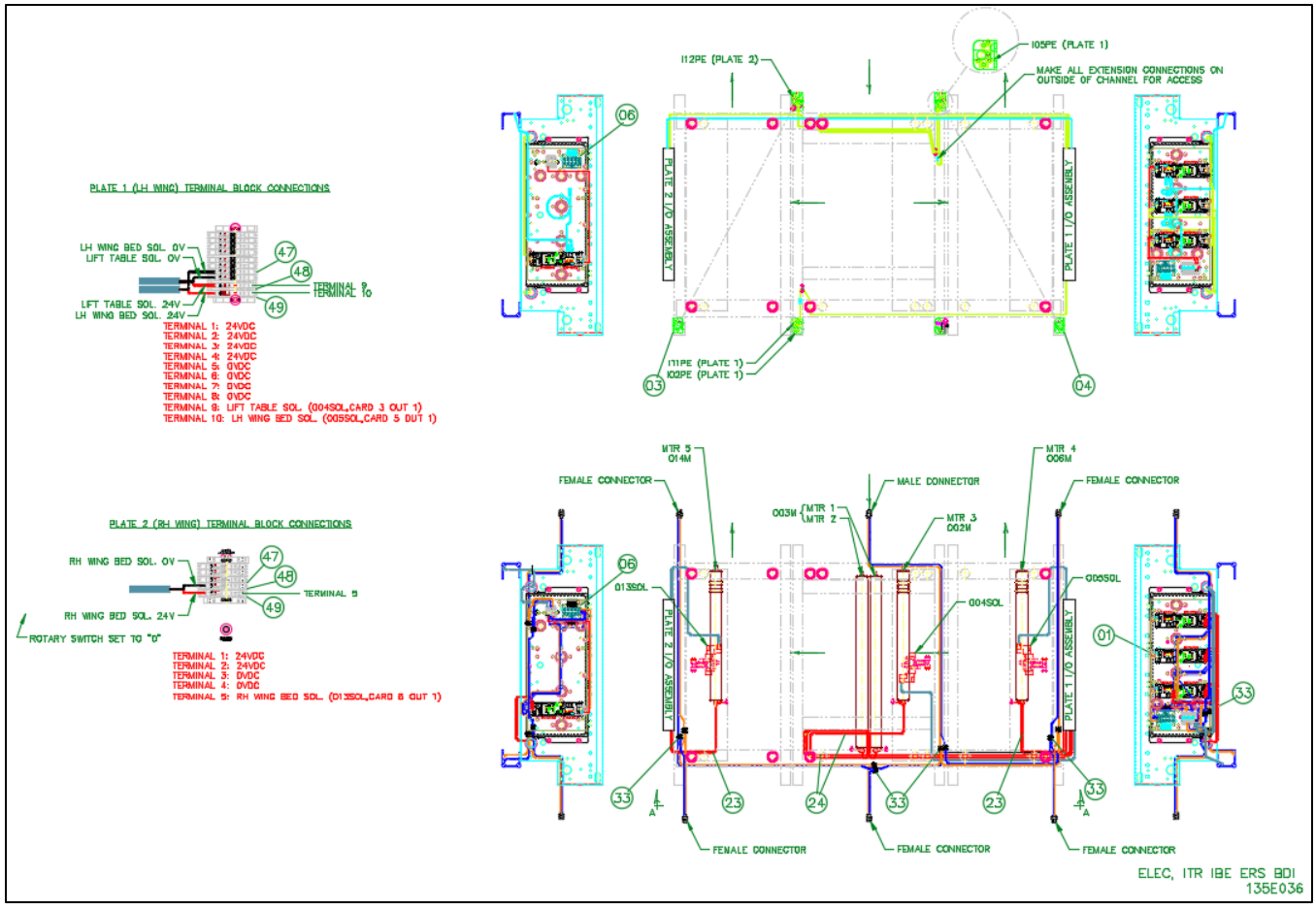
21.22 SKATE WHEEL WING BED – (ELECTRIC LIFT)



21.22.1 Replacement Parts – Skate Wheel Wing Bed – (Electric Lift)

REPLACEMENT PARTS - SKATEWHEEL, ASY - ELECTRIC LIFT				
SKATEWHEEL,ASY _ _BF LH		Width & Item #		
Balloon	Description	16 BF	22 BF	28 BF
3	SKATEWHEEL,ASY 6002 W/ADAPTER	1138618	1138618	1138618
17	ASY, DRIVE LINKAGEELECTRIC LIFT	1196442	1196442	1196442
20	CAM, DRIVEELECTRIC LIFTUBT,ERS,WING BED	1196464	1196464	1196464
32	PIN,HEAD TYPE,SET SCREW FLAT 3	1196950	1196950	1196950
39	DRIVE,KYOWA 24VDC PULSE GEAR	1177986	1177986	1177986
40	SWITCH,PROX,12MM DIA,	1184770	1184770	1184770
				Reference Dwg: 135S040

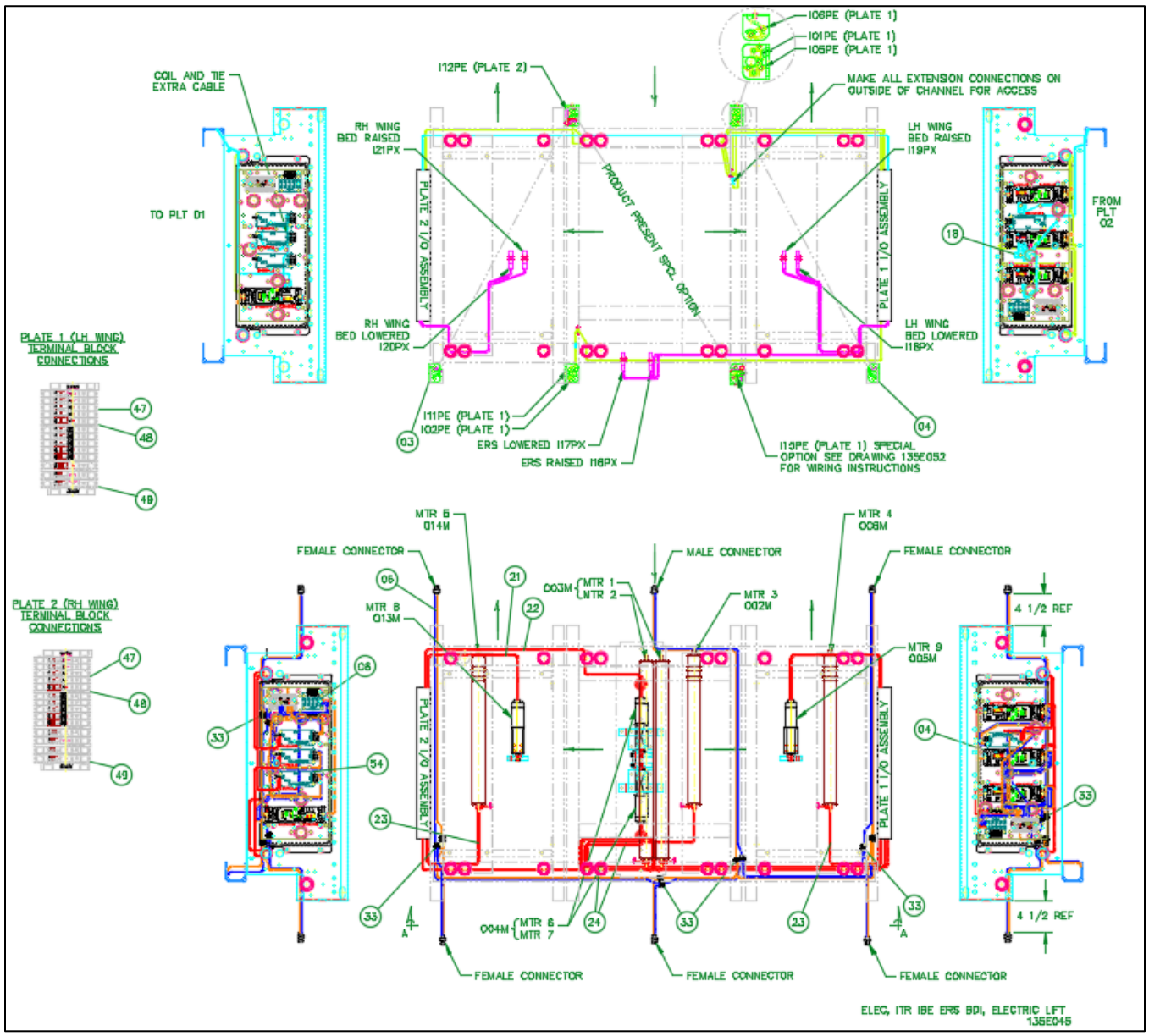
21.23 ITR ERS (PNEUMATIC LIFT) – ELECTRICAL COMPONENTS



21.23.1 Replacement Parts – ITR ERS (Pneumatic Lift) – Electrical Components

REPLACEMENT PARTS - ELEC, ITR IBE ERS BDI - (PNEUMATIC LIFT)				
ELEC,ASY ITR IBE ERS BDI IB-E03, ERS MOUNTED WING PE		Width & Item #		
Balloon	Description	22 BF	28 BF	34 BF
01	DRIVERCARD,ITOH IB-E03BP	1166286	1166286	1166286
03 & 04	PE,REFLECTOR 20MM X 30MM	1136359	1136359	1136359
05	CONN, WAGO 231-302/026-000	1162204	1162204	1162204
06	PCB, DB, PE, 4A	1138197	1138197	1138197
18	CABLE,CTRLS-CAT5E-3'-GRAY	E0034025	E0034025	E0034025
21	FUSE,4A,125V,CARTRIDGE,GMA	1102221	1102221	1102221
22	FUSE,HOLDER IN-LINE,CARTRIDGE	1102222	1102222	1102222
23	CABLE,MOTOR EXTENSION,600MM	1135339	1135339	1135339
24	CABLE,MOTOR EXTENSION,2700MM	1135341	1135341	1135341
33	CONNECTOR,IDC SCOTCHLOK 562	3M562	3M562	3M562
47	TERM, BLOCK, 2-COND, 20-10AWG	1145413	1145413	1145413
48	TERM,SEPARATOR,ORANGE, 2mm	1180509	1180509	1180509
49	TERM, END BARRIER, GRAY, 1mm	1145415	1145415	1145415
				Reference Dwg: 130E036

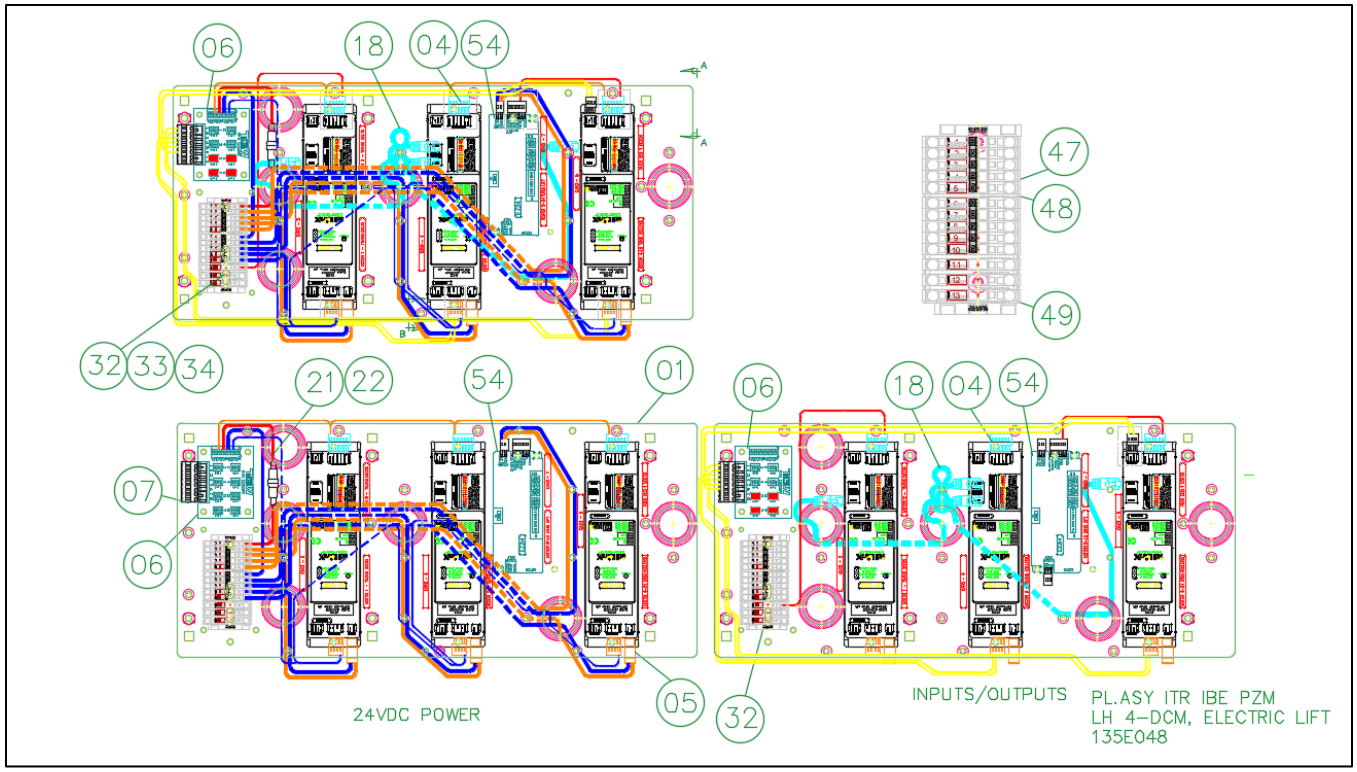
21.24 ITR ERS (ELECTRIC LIFT) – ELECTRICAL COMPONENTS



21.24.1 Replacement Parts – ITR ERS (Electrical Lift) – Electrical Components

REPLACEMENT PARTS - ELEC, ITR IBE ERS BDI - (ELECTRIC LIFT)				
ELEC,ASY ITR IBE ERS BDI IB-E03, ELEC LIFT		Width & Item #		
Balloon	Description	22 BF	28 BF	34 BF
4	DRIVERCARD,ITOH IB-E03BP	1166286	1166286	1166286
3	PE,REFLECTOR 20MM X 30MM	1136359	1136359	1136359
5	CONN, WAGO 231-302/026-000	1162204	1162204	1162204
6	PCB, DB, PE, 4A	1138197	1138197	1138197
18	CABLE,CTRLS-CAT5E-3'-GRAY	E0034025	E0034025	E0034025
21	FUSE,4A,125V,CARTRIDGE,GMA	1102221	1102221	1102221
21	CABLE,MOTOR EXTENSION,1200MM	1138705	1138705	1138705
22	FUSE,HOLDER IN-LINE,CARTRIDGE	1102222	1102222	1102222
22	CABLE,MOTOR EXTENSION,2700MM	1138706	1138706	1138706
23	CABLE,MOTOR EXTENSION,600MM	1135339	1135339	1135339
24	CABLE,MOTOR EXTENSION,2700MM	1135341	1135341	1135341
33	CONNECTOR,IDC SCOTCHLOK 562	3M562	3M562	3M562
47	TERM, BLOCK, 2-COND, 20-10AWG	1145413	1145413	1145413
48	TERM,SEPARATOR,ORANGE, 2mm	1180509	1180509	1180509
49	TERM, END BARRIER, GRAY, 1mm	1145415	1145415	1145415
54	DRIVERCARD,INSIGHT EZ24HTBS	1173108	1173108	1173108
				Reference Dwg: 130E045

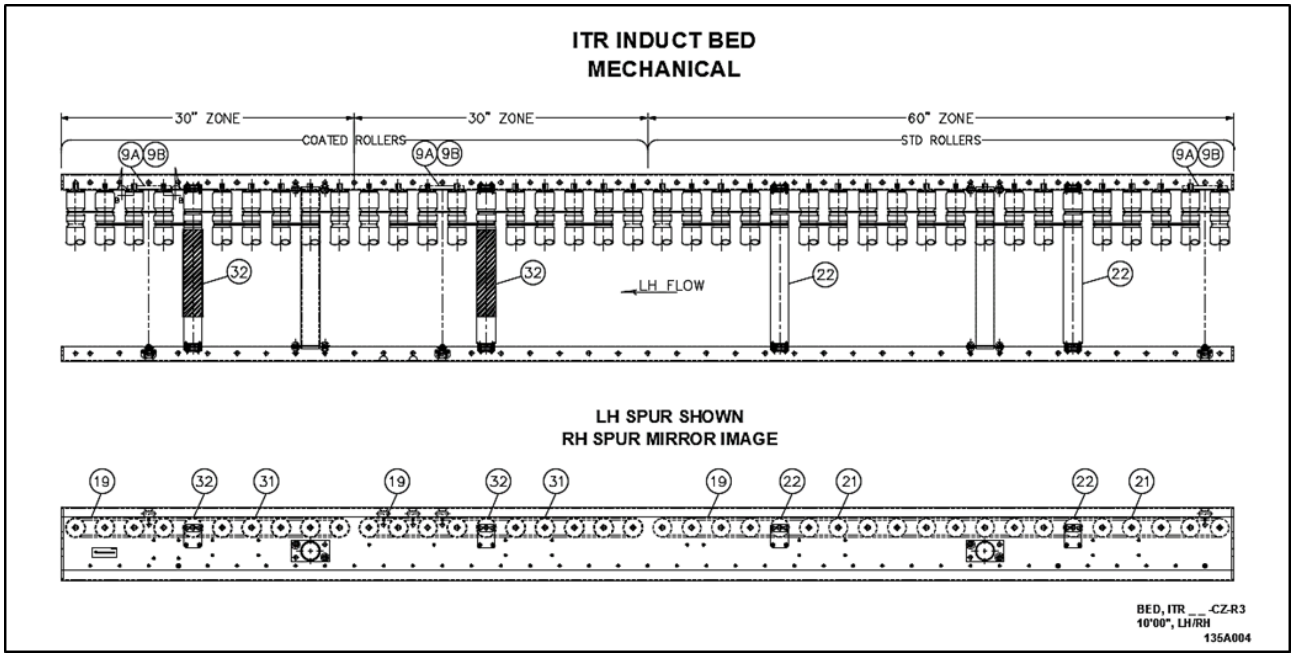
21.25 ITR DRIVER CARDS WITH IB-E03 & EZ24 - (ELECTRIC LIFT)



21.25.1 Replacement Parts - IB-E03 & EZ24 Driver Cards - (Electric Lift)

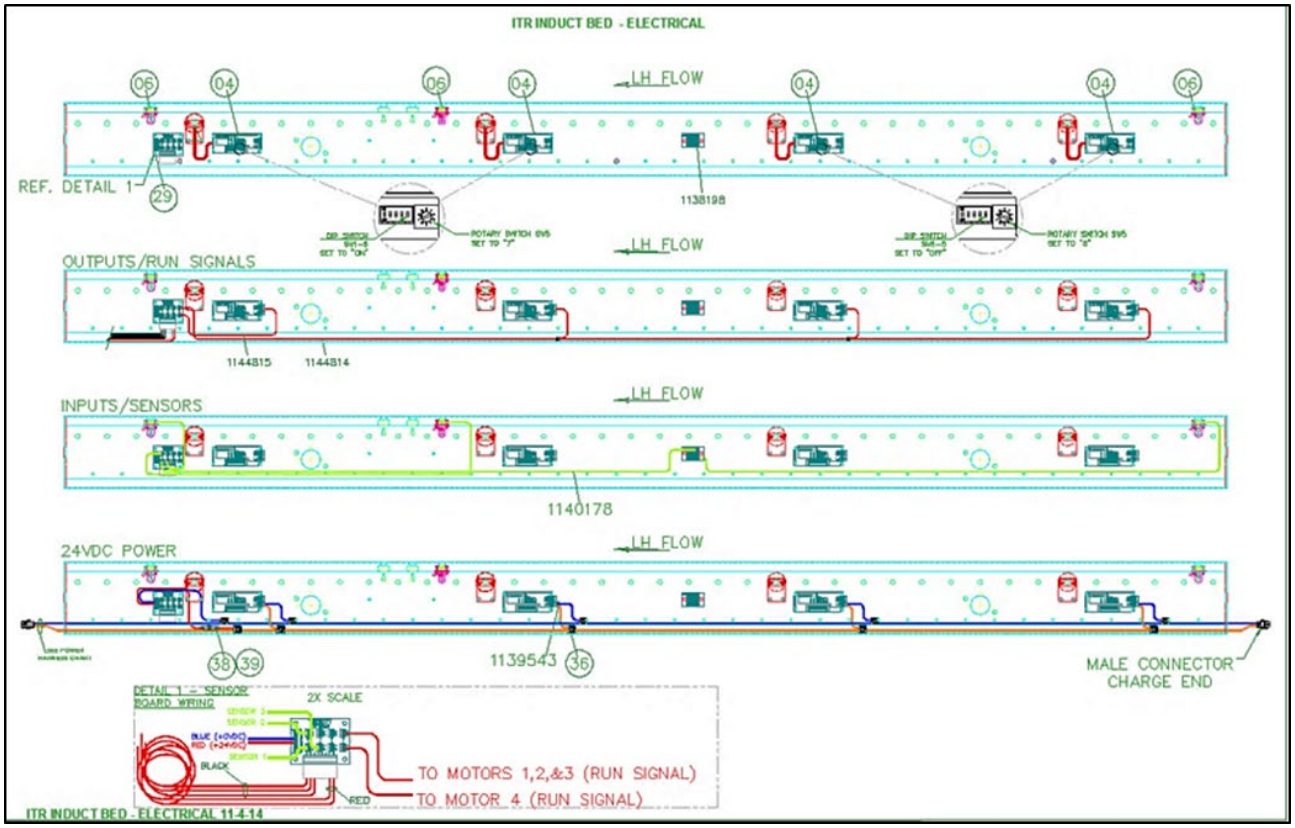
REPLACEMENT PARTS - ELEC, ASY ITR IBE ERS BDI - (ELECTRIC LIFT)				
PL,ASY ITR IB-E03 PZM LH or RH 4-DCM,ELECTRIC LIFT		**Width & Item #**		
Balloon	**Description**	**16 BF**	**22 BF**	**28 BF**
4	DRIVERCARD,ITOH IB-E03BP	1166286	1166286	1166286
3	REFLECTOR 20X30X4-SELF-ADHESIVE	00203650	00203650	00203650
5	CONN, WAGO 231-302/026-000	1162204	1162204	1162204
6	PCB, DB, PE, 4A8 STATION	1138197	1138197	1138197
18	CABLE,CTRLS-CAT5E-_'-GRAY	**REFERENCE Cat5E COMMUNICATION CABLE**		
21	FUSE,4A,125V,CARTRIDGE,GMA5 X 20MM BUSSMANN,GMA-4A	1102221	1102221	1102221
21	CABLE,MOTOR EXTENSION,1200MMITOH M-F-EXT-9PIN-1200 USE W/ CB-016 OR HB-510	1138705	1138705	1138705
22	FUSE,HOLDER IN-LINE,CARTRIDGE 5X15MM AND 5X20MM BUSSMANN HHT, #16AWG LEADS	1102222	1102222	1102222
22	CABLE,MOTOR EXTENSION,2700MMITOH M-F-EXT-9PIN-2700 USE W/ CB-016 OR HB-510	1138706	1138706	1138706
----	CABLE,MOTOR EXTENSION,600MMITOH M-F-EXT-10PIN-600 USE W/ IB-N03/IB-E/HBM-604/BRAKE	1135339	1135339	1135339
----	CABLE,MOTOR EXTENSION,2700MMITOH M-F-EXT-10PIN-2700 USE W/ IB-N03/IB-E/HBM-604/BRAKE	1135341	1135341	1135341
----	CONNECTOR,IDC SCOTCHLOK 56210-12AWG RUN,10-12AWGYELLOW	3M562	3M562	3M562
47	TERM, BLOCK, 2-COND, 20-10AWG600V, 30A, GRAY, 6.2mm	1145413	1145413	1145413
48	TERM,SEPARATOR,ORANGE, 2mm	1180509	1180509	1180509
49	TERM, END BARRIER, GRAY, 1mm	1145415	1145415	1145415
54	DRIVERCARD,INSIGHT EZ24	1173108	1173108	1173108
				Reference Dwg: 130E048

21.26 ITR INDUCT BED CBM-105



The IntelliROL Pick Zone Module starts with the Induction Bed. The Induct Bed gaps the product so it can be transferred.

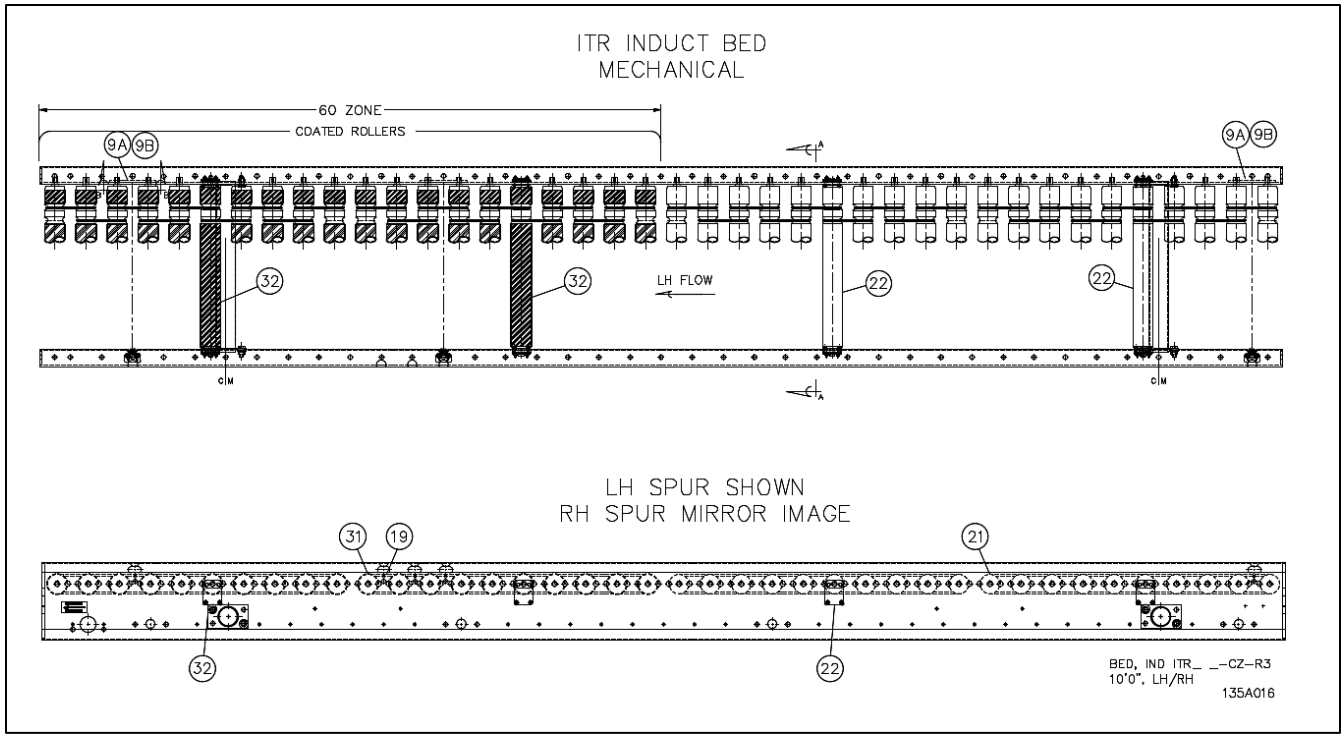
21.26.1 Induct Bed CBM-105 Electrical Components



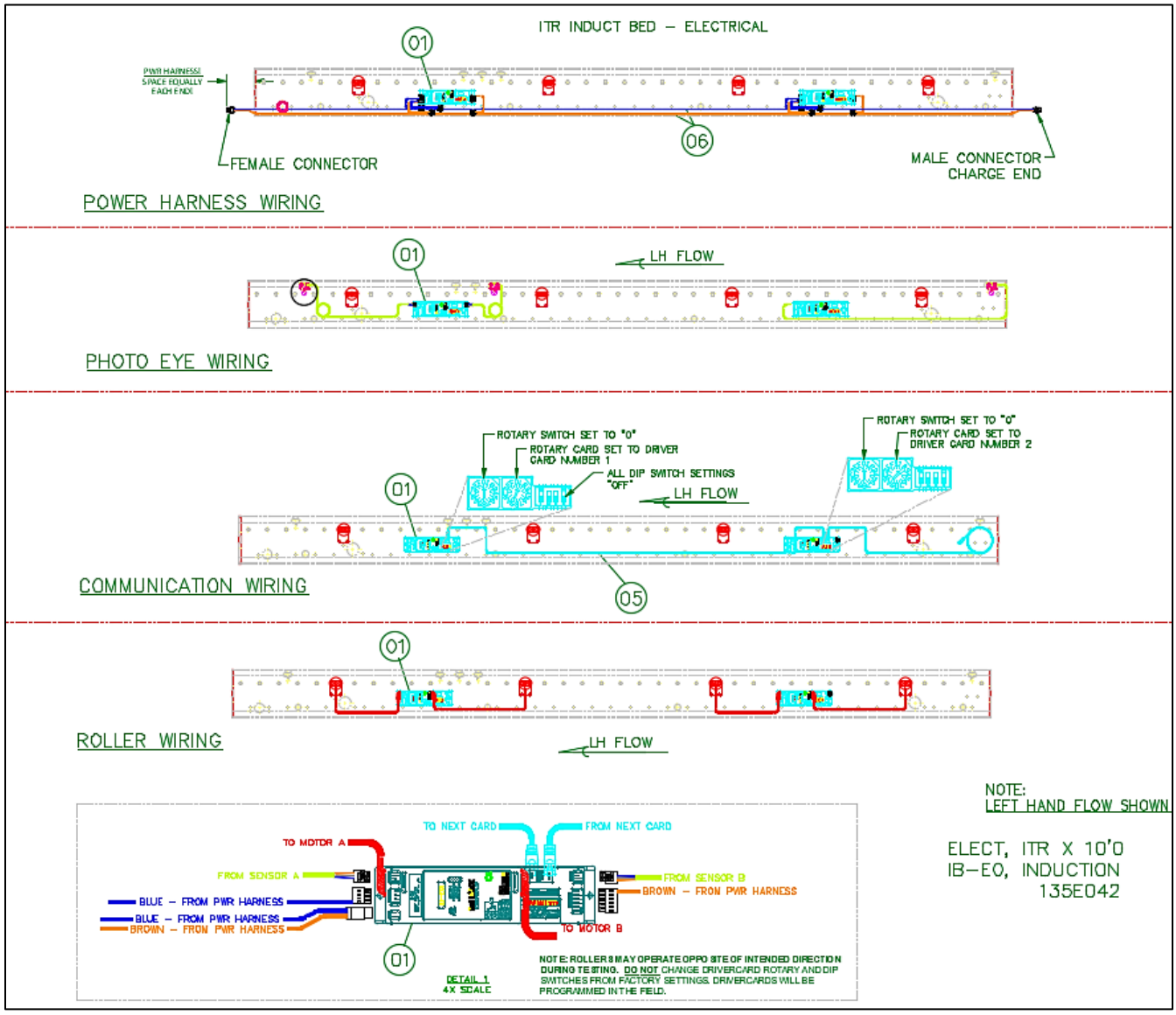
21.26.2 Replacement Parts - Induct Bed CBM-105

REPLACEMENT PARTS - ITR INDUCT BED, CBM-105					
		Width & Item #			
Balloon	**Description**	**16 BF**	**22 BF**	**28 BF**	**34 BF**
04	DRIVERCARD,ITOH **CBM-105FP**	1153930	1153930	1153930	1153930
36	CONNECTOR,IDC SCOTCH LOK 567 10-12AWG RUN,14-18AWG-BROWN	3M567	3M567	3M567	3M567
38	FUSE,HOLDER IN-LINE,CARTRIDGE	1102222	1102222	1102222	1102222
39	FUSE,4A,125V CARTRIDGE	1102221	1102221	1102221	1102221
---	HARNESS,POWER BROWN & BLUE 10AWG WITH MALE/FEMALE CONN **(NOT BF SPECIFIC)**	**REFERENCE POWER HARNESS TABLE**			
---	CABLE,MOTOR EXTENSION, 600,1200,OR 2700 MM LONG	**REFERENCE MOTOR EXTENSION CABLE TABLE**			
06	PE,REFLEX TYPE ZL-P2465S12 PNP LIGHT OPERATE 2M CABLE	1138113	1138113	1138113	1138113
9A	PE,REFLECTOR 4-3/8" X 1-1/8"	400004	400004	400004	400004
9B	TAPE,FOAM DBL SIDED 1" SQUARE	E0005429	E0005429	E0005429	E0005429
11	CONNECTOR,IDC SCOTCH LOK 55816-22AWG RUN,16-22AWG	1120174	1120174	1120174	1120174
19	ORING,3/16 DIA X 9.5" HT BLUE ITR **3"CTR**	E0005536	E0005536	E0005536	E0005536
21	ROLLER,__ITR 1.9" DIA PLTD (__BF)	E0002412	E0002413	E0002414	E0006220
22	ROLLER,ITR __BF 2G ITOH FE-60	1138722	1138723	1138724	1138725
----	PCB, DB, PE, EXTENSION	1138198	1138198	1138198	1138198
29	PCB DB PE 4Amp 8 STATION	1138197	1138197	1138197	1138197
31	ROLLER,36ITR 1.9CTD PRBG-1/8"BLK URE SLV	1134693	1132204	1131724	1140369
32	ROLLER,ITR BF 2G CTD ITOH	1140375	1140376	1140377	1140378
		Reference Dwg: 135A004 & 135E006			

21.27 INDUCT BED IB-E



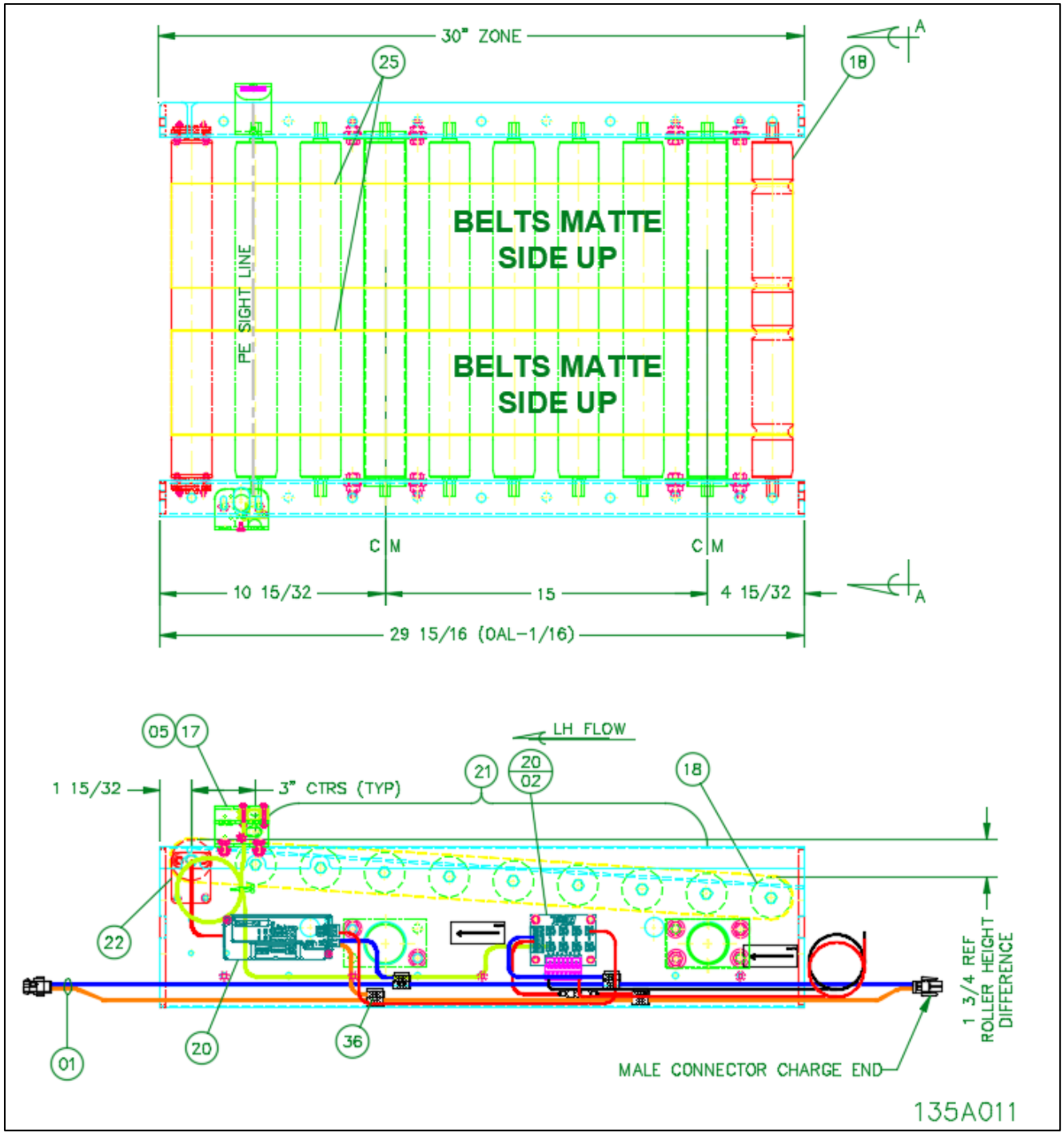
21.27.1 Induct Bed IB-E Electrical Components



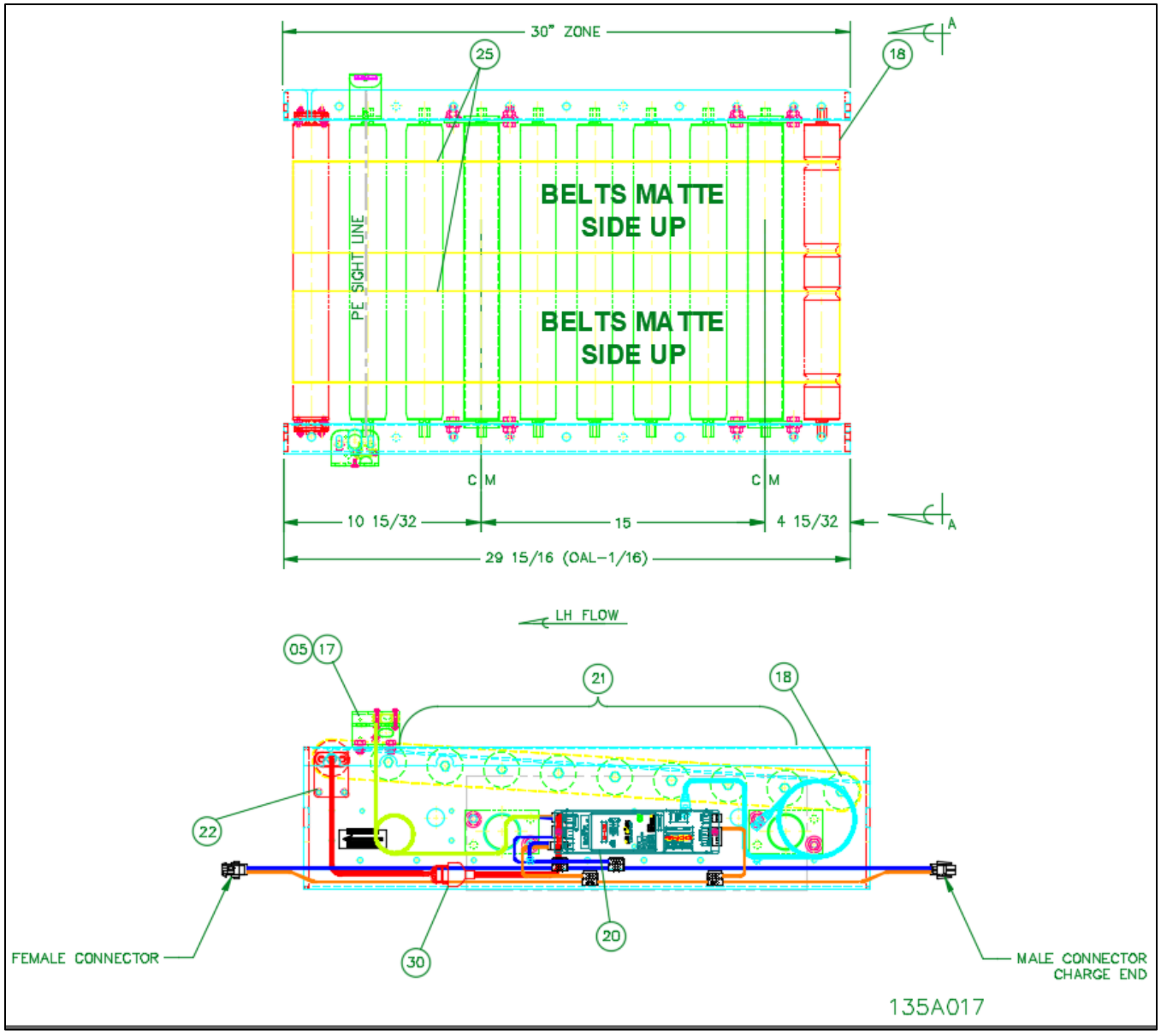
21.27.2 Replacement Parts - Induct Bed IB-E

REPLACEMENT PARTS - ITR INDUCT BED, IBE					
		Width & Item #			
Balloon	Description	16 BF	22 BF	28 BF	34 BF
01	DRIVERCARD,ITOH **IB-E03BP**	1166286	1166286	1166286	1166286
----	PE,REFLEX TYPE ZL-P2465S14	1163456	1163456	1163456	1163456
9A	PE,REFLECTOR 4-3/8" X 1-1/8"	400004	400004	400004	400004
9B	TAPE,FOAM DBL SIDED 1" SQUARE	E0005429	E0005429	E0005429	E0005429
05	CABLE,CTRLS-CAT5E-_'-GRAY	**REFERENCE Cat5E COMMUNICATION CABLE**			
06	HARNESS,POWER BROWN & BLUE14 AWG WITH MALE/FEMALE CONN **(NOT BF SPECIFIC)**	**REFERENCE POWER HARNESS TABLE**			
---	CABLE,MOTOR EXTENSION, 600,1200,OR 2700 MM LONG	**REFERENCE MOTOR EXTENSION CABLE TABLE**			
19	ORING,3/16 DIA X 9.5" HT BLUE ITR **3"CTR**	E0005536	E0005536	E0005536	E0005536
21	ROLLER,_ _ITR 1.9" DIA PLTD (_ _BF)	E0002412	E0002413	E0002414	E0006220
22	ROLLER,ITR _ _BF 2G ITOH PM 486 **FE-60** 600MM MOTOR CABLE W/10 PIN CONN	1163471	1163472	1163473	1163474
31	ROLLER,36ITR 1.9CTD PRBG-1/8"BLK URE SLV	1134693	1132204	1131724	1140369
32	ROLLER,ITR _ _BF 2G ITOHPM 486 **FE-60** 600MM MOTOR CABLE W/ 10 PIN CONN	1204326	1195028	1203061	----
Reference Dwg: 135A016 & 135E042					

21.28 ITR PUSH BED & ROLLERS

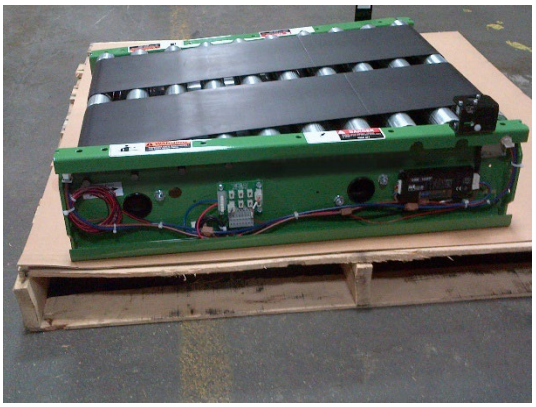


21.29 ITR PUSH BED & ROLLERS



21.29.1 Replacement Parts - ITR CBM-105 Push Bed

REPLACEMENT PARTS - ITR PZM CBM-105 PUSH BED				
BED,ITR-_ _BF-PUSH-CB-CZ-LH OR RH -2'6"-FE60-_MR				
BALLOON	**DESCRIPTION**	**16BF**	**22BF**	**28BF**
20/02	PCB, DB, PE, 4A8 STATION	1138197	1138197	1138197
17	PE,REFLEX TYPE ZL-P2465S12PNP,LIGHT OP,2M CABLEW/733-103	1138113	1138113	1138113
05	PE,REFLECTOR 20MM X 30MMADHESIVE BACKED	1136359	1136359	1136359
20	DRIVERCARD,ITOH CBM-105FP	1153930	1153930	1153930
36	CONNECTOR,IDC SCOTCHLOK 56710-12AWG RUN,14-18AWG BROWN	3M567	3M567	3M567
01	HARNESS,POWER BROWN & BLUE 10AWG WITH MALE/FEMALE CONN **(NOT BF SPECIFIC)**	**REFERENCE POWER HARNESS TABLE**		
----	FUSE,HOLDER IN-LINE,CARTRIDGE5X15MM AND 5X20MM	1102222	1102222	1102222
----	FUSE,4A,125V,CARTRIDGE,GMA5 X 20MM BUSSMANN,GMA-4A	1102221	1102221	1102221
18	ROLLER,_ _BF ITR1.9PLTD PRBG W/TRACKING GRVS12GA	1135830	1138664	1139691
21	ROLLER,_ _"GRAV 1.9 PLTD PRBG(16BF)	60218009	60224009	60230009
3	ROLLER,ITR _ _BF NG ITOHPM486FE-60-391-D-24-KF	1138739	1138740	1138741
25	BELT,TRACTION 11"X58.75"X.06383A, BLACK, 2.4 STRETCH30" ZONE (27"ROLLER TO ROLLER)	1135832	1134004	1135832
				Ref Dwg 135A011 REV A



21.29.2 Replacement Parts - ITR IB-E03 Push Bed

REPLACEMENT PARTS - ITR PZM IBE PUSH BED				
BED,ITR-_ _BF-PUSH-IBE-CZ-LH OR RH -2'6"-FE60-_MR				
BALLOON	**DESCRIPTION**	**16BF**	**22BF**	**28BF**
20	DRIVERCARD,ITOH IB-E03BP	1166286	1166286	1166286
17	PE,REFLEX TYPE ZL-P2465S14 PNP,LIGHT OPERATE,2M CABLE	1163456	1163456	1163456
5	CABLE,CTRLS-CAT5E-7'-GRAY	E0034027	E0034027	E0034027
----	CONN, WAGO 231-302/026-000	1162204	1162204	1162204
-----	CONNECTOR,IDC SCOTCHLOK 567 10-12AWG RUN,14-18AWG BROWN	3M567	3M567	3M567
----	PE,REFLECTOR 20MM X 30MM	1136359	1136359	1136359
----	CABLE,CTRLS-CAT5E-_'-GRAY	**REFERENCE Cat5E COMMUNICATION CABLE**		
-----	HARNESS,POWER BROWN & BLUE14 AWG WITH MALE/FEMALE CONN **(NOT BF SPECIFIC)**	**REFERENCE POWER HARNESS TABLE**		
18	ROLLER,_ _BF ITR 1.9PLTD PRBG W/TRACKING GRVS 12GA	1135830	1138664	1139691
21	ROLLER, "GRAV 1.9 PLTD PRBG	60218009	60224009	60230009
3	ROLLER,ITR _ _BF NG ITOH PM 486 FE 600MM MOTOR CABLE W/ 10 PIN CONN	1163480	1163481	1163482
25	BELT,TRACTION 11"X58.75"X.063 83A, BLACK, 2.4 STRETCH 30" ZONE(27"ROLLER TO ROLLER)	1135832	1134004	1135832
30	CABLE,MOTOR EXTENSION,600MM ITOH M-F-EXT-10PIN-600 USE W/ IB-N03/IB-E/HBM-604/BRAKE **(RH)**	1135339	1135339	1135339
				Ref Dwg 135A017 REV A

INTELLIROL PZM REVISION HISTORY

Revision Date	Chapter and Description	Initials
04/16/2021	Add 9 pin or 10 pin part numbers to PAN BOTTOM ITR ERS WING (FE & FP ROLLER)	TE
4/16/2021	**Pneumatic Requirements** 1. A more accurate name for pop-off is pressure-relief. 2. This is not a switch but a valve (just vents to atmosphere) 3. Pressure settings above and below operating range are general recommendations, subject to the accuracy of the devices. 4. Pneumatic actuators used in ITR product line are rated for high pressure, 45 psi pressure-relief valve could be considered unnecessary.	CN /SL
04/16/2021	New Spanish IOM available	AB / MD
09/28/2021	Added MHS Conveyor, logo, and format	MD AB
12/08/2021	Add coated roller chart & updated Induction bed parts list	DG / AB
08/08/2022	Updated Description of Operations	TE
04/06/2023	MHS Conveyor Controls Safety Guidelines – Updated Emergency stop	SM, AB

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