INSTALLATION, OPERATION, MAINTENANCE MANUAL

NBC™ Flat Belt

Narrow Belt Conveyor Accumulation with CRUZcontrol® & Transportation

1118140rev102213

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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 NBC Flat Belt 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.

If additional copies of this manual are needed or if you have any question concerning the conveyor, please contact your Business Partner or MHS Conveyor Lifetime Services at 231-798-4547 or Fax 231-798-4549.

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 or before the equipment has forty-one hundred (4100) hours of running use, whichever period is shorter, 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 or ten thousand (10,000) hours of running use, whichever period is shorter, 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.

IMPORTANT

All equipment and components not manufactured by MHS Conveyor carry only such warranty as given by the manufacturer thereof, which warranty MHS Conveyor will assign or otherwise make available to Purchaser without recourse to MHS Conveyor, provided that such warranty is assignable or may be made available.

For service on motors, reduction units, electrical components, controls, air or hydraulic cylinders, contact the local authorized sales and service representative of respective manufacturer. If none is available in your locality, contact the MHS Conveyor representative. MHS Conveyor will not be responsible for units that have been tampered with or disassembled by anyone other than the authorized representative of the respective manufacturer.

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 08/22/2011

Warnings and Safety Instructions

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

Your MHS Conveyor 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:

⚠ WARNING

- Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

- Indicates a situation which, if not avoided, could result in property damage.

NOTE

This is where you will be notified of helpful information.

⚠ 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 hair nets.
- 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 crew member 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.

⚠ WARNING

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

CEMA Safety Labels — *Placement Guidelines*

Product: Unit Handling

Equipment: Belt Driven Live Roller Conveyors - Center and End Driven

To be located on conveyors where there are exposed moving parts which must be unguarded to facilitate function, i.e. rollers, pulleys, shafts, chains, etc.

To be placed along both sides of these conveyors since these conveyors provide surfaces and profiles attractive, but hazardous, for climbing, sitting, walking, or riding.

To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards

"A"

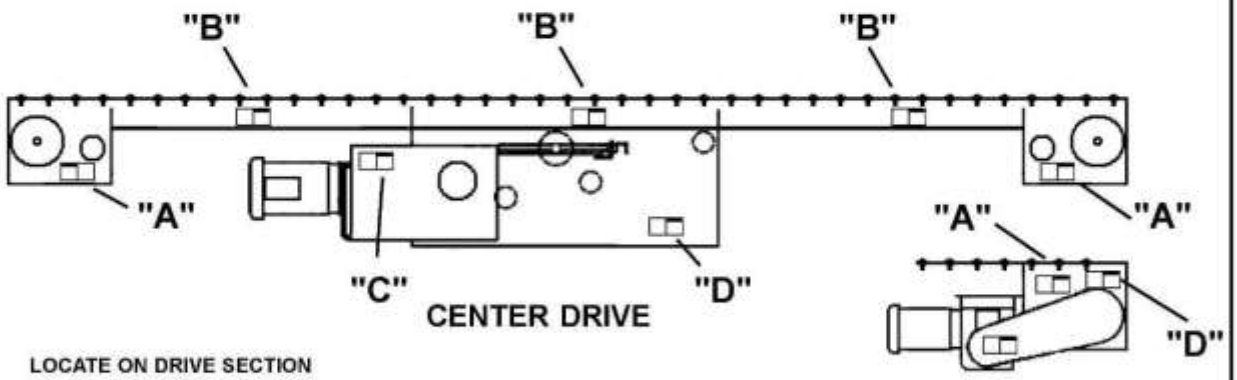
LOCATE AT TERMINAL ENDS (BOTH SIDES)

"B"

SPACE UP TO A MAXIMUM OF 20 FT. CENTERS (BOTH SIDES)

"C"

LOCATE ON DRIVE GUARDS AND CHAIN / BELT GUARDS



LOCATE ON DRIVE SECTION (BOTH SIDES)

"D"

General purpose label to warn maintenance personnel that conveyors should be shut off and locked out prior to servicing; Examples: drives, take-ups, lubrication points which require guard removal.

UH - 4

Package Conveyors

Do Not Climb, Sit, Stand, Walk, Ride, or Touch the Conveyor at Any Time

Do Not Perform Maintenance on Conveyor Until Electrical, Air, Hydraulic and Gravity Energy Sources Have Been Locked Out and Blocked

Operate Equipment Only With All Approved Covers and Guards in Place

Do Not Load a Stopped Conveyor or Overload a Running Conveyor

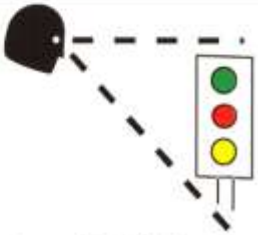
Ensure That All Personnel Are Clear of Equipment Before Starting

Allow Only Authorized Personnel To Operate or Maintain Material Handling Equipment

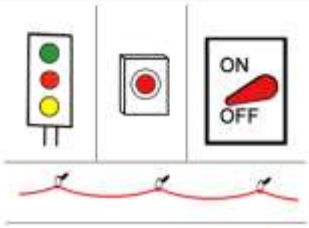
Do Not Modify or Misuse Conveyor Controls

Keep Clothing, Body Parts and Hair Away from Conveyors

Remove Trash, Paperwork and Other Debris Only When Power is Locked Out



Ensure That ALL Controls and Pull Cords are Visible and Accessible



Know the Location and Function of All Stop and Start Controls

Report All Unsafe Conditions

POST IN PROMINENT AREA

NBC Flat Belt Accumulation and Transportation Conveyor

NBC flat belt contact accumulation

Concept and Operation

NBC flat belt conveyor is offered in contact accumulation and transportation versions. The conveyor differences are as follows:

Contact Accumulation

The NBC contact accumulation zones are 4' long, but operate in such a manner as to allow mixed length product to dense pack accumulate. The products are allowed to touch and bump, but are at zero-pressure after they stop. The minimum speed for dense packing of product is 90 FPM for totes and 125 FPM for corrugated product.

The product-carrying rollers are driven by a 2" wide belt. This belt is held in contact with the underside of the carrying rollers by spring pressure roller channel assemblies, mounted on the conveyor side channels.

Accumulation begins when a product blocks the first sensor from the discharge end. The first product stops over the discharge sensor which “arms” the next sensor upstream while lowering the belt pressure roller channel in that zone.

When a zone accumulates, each spring pressure roller channel assembly in that zone lowers by the use of an air diaphragm. The belt is lowered away from the carrying rollers causing them to become non-powered. Products are conveyed to the zone; then coast as they enter the non-powered area and bump into the stopped downstream product. As accumulation takes place from zone-to-zone, the accumulated products are at zero-line-pressure.

NBC Logic Module Assembly

NBC Pressure Pan – spring-to-drive rollers, air-to-accumulate

Transportation

The NBC transportation has the same spring loaded pressure pans as the accumulation versions, but no air diaphragm to disengage the pressure pan. A plastic cam can be manually activated to lock the pressure pan in the down position for ease of belt installation. However, once the plastic cam is manually deactivated, the pressure pan always drives.

Air Transportation

Air transportation uses air diaphragms to retract the pressure assemblies rather than the plastic lockout cam. All the diaphragms are linked together to a central valve which is designed to disengage the entire line at once. There are no logic modules for individual zone accumulation.

NBC Application Selection

When to choose NBC

- Accumulation or transportation as required
- Product-to-product contact is allowed
- Single product release is not required
- Product weight: 1-75 lbs (50 lbs/ft)
- Product height: 1" minimum
- Product may be same size and weight, or mixed
- Ambient temperature is +50° to 120°F for the black belt and +35° to 120° for the red belt.
- Air supply is dry

Application Notes

- Conveyor operations before and after NBC are vital to proper application decisions.
- The conveyor downstream from progressive release NBC must run at a speed which is greater than or equal to the speed of the discharging NBC conveyor.
- There will not be a gap or means of detecting a specific product, directly at the end of NBC without a speed-up bed.
- When feeding sortation from NBC, use a split metering belt to singulate individual products when specific minimum gap is required.
- NBC cannot be fed from an upstream conveyor at a rate exceeding the NBC rate, especially from a curve.
- Convey all products along one side of NBC unless products are nearly the same width and closely match the conveyor width. Skewed roller beds are available to accomplish this.
- During accumulation, product density (packing) increases with product weight and speed.
- A discharge brake is not recommended for speeds over 129 FPM unless used with pivoting blade stop.
- NBC conveyor requires a QUIKmeld Tool Kit for splicing the black belt for 500 lb drives ONLY. These tool kits were developed by TGW and are available only from TGW.
- Limit the length of NBC conveyors to 150’. If you have a requirement beyond 150’ contact Sales Support.
- For temperatures BELOW 50° for the black belt and 35° for the red belt, contact Sales Support for details.
- Always locate the drive bed at the charge end of the primary conveyor.
- Totes may have up to a 2" taper on each end without affecting the function of the electronic sensors. Customers who have tapered totes may request TGW to perform a product test with test product supplied by the customer.
- Mechanical lacing is used for units up to 70’ with the 250 lb drive. Use the application calculation sheet to determine belt pull, horsepower and drive requirements.
- Due to the direct drive train, speeds may vary +/- 10% from stated speeds.
- For all applications over 250 lbs of belt pull, the black welded belt shall be used.
- Under no circumstances shall a mechanical lace be used with a black belt.

NBC Technical Applications

Release Rates

Product delivery (release) following accumulation is always an important application consideration. The product release rate depends on the release logic, conveyor speed, gaps between products, and the product length. **In all situations that require dense product packing, the conveyor should NOT run below 125 FPM for cartons and 90 FPM for totes**.

For applications with temperatures at or below 50° defined as cool applications, the minimum conveyor speed of 150 FPM is required. This increase speed is due to the increase in viscosity of the grease in the roller bearing which limits the rotation of the roller and minimizes the distance of product coastability during accumulation.

Release efficiency is the ratio between conveyor speed (feet per minute) and the product footage delivered (case feet per minute). One variable is the amount of gaps between products before release. These gaps are due to product coast when accumulating. (See Coastability) Additional gaps can occur at release dependent on the signal logic used.

Release Efficiencies

Overall release efficiency with a single continuous release may vary from:

Contact Accumulation
40% with Basic Logic (40% product / 60% air)
80% with Progressive Logic (80% product / 20% air)

Release efficiencies are dependent on whether there are mixed case sizes, weights and conveyor speed, and also whether Basic or Progressive logic is used, and the release operation is either singulate or slug release. When the speed to meet rate using Basic Logic is over 150 FPM, consider using Progressive Logic

Discharge Zone

A function module is provided for the discharge bed to control product release. If the NBC line is feeding another NBC line, a function module may not be required.

Horsepower Principles

The horsepower required for NBC conveyor is based on the effort (in pounds) to pull the belt through the conveyor (belt pull), turning all the rollers and moving the product at a given speed. Actual horsepower is based on "effective belt pull", which includes a factor for belt flexing, bending, and snubbing.

Coastability

Product coast is affected by many factors involving the product and conveyor. When one product does not coast up to the previous product, a gap occurs. Some gaps are likely within a zone. This is not a problem if considered when determining the conveyor speed. Factors determining coast are; product bottom - smoothness, firmness, straightness; product weight;

product weight distribution; product length relative to zone length; conveyor speed; roller bearing friction, rollers still turning from previous product movement or rollers which have stopped.

General Cautions on NBC

- Singulating individual product out of NBC requires a TGW application review. Consult Sales Support for available options.
- Do not pitch NBC either up or down. When product accumulates, the conveyor turns to gravity and product control is lost.
- Do not overfeed downstream conveyor with either Basic or Progressive release. This will create line pressure.
- The minimum package length is 9". The minimum package height is 1". The maximum product weight is 50 lbs/ft.
- Small light products that fit between a zone sensor and the end of the zone may rotate and/or accumulate side by side. Consult Sales Support for available options.
- Do not skew rollers without a skew pressure pan properly installed in that zone. Any NBC conveyor that has skewed rollers without proper installation will immediately and permanently VOID ALL TGW WARRANTIES.

Receiving and Site Preparation

General

NBC flat belt conveyors are 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 damaged 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.

Conveyor ready for shipment

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 are lost in it, or accidentally discarded. 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.

Parts Inventory and Identification

Each subassembly is shipped completely assembled except typical loose parts. Drive assemblies are shipped mounted to the appropriate drive bed frame. Segregate the conveyor subassemblies by types for inventory and ease of locating during installation.

An identification label is attached to one side channel or on a crossmember, close to one end of each conveyor bed and on all drive packages. This label contains: item number, description, job number /segment number, tag number (if specified), assembler's initials and date of manufacture. On 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. The illustrations in this manual and the part number stickers will assist you with your inventory.

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.

Identification labels

General Procedures

The following procedures are to be used as guidelines only. Specific installation methods will vary somewhat depending on available equipment on site and each installer's preferences based on past experience.

⚠ 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.

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 section in either direction as required.

Squaring Conveyor

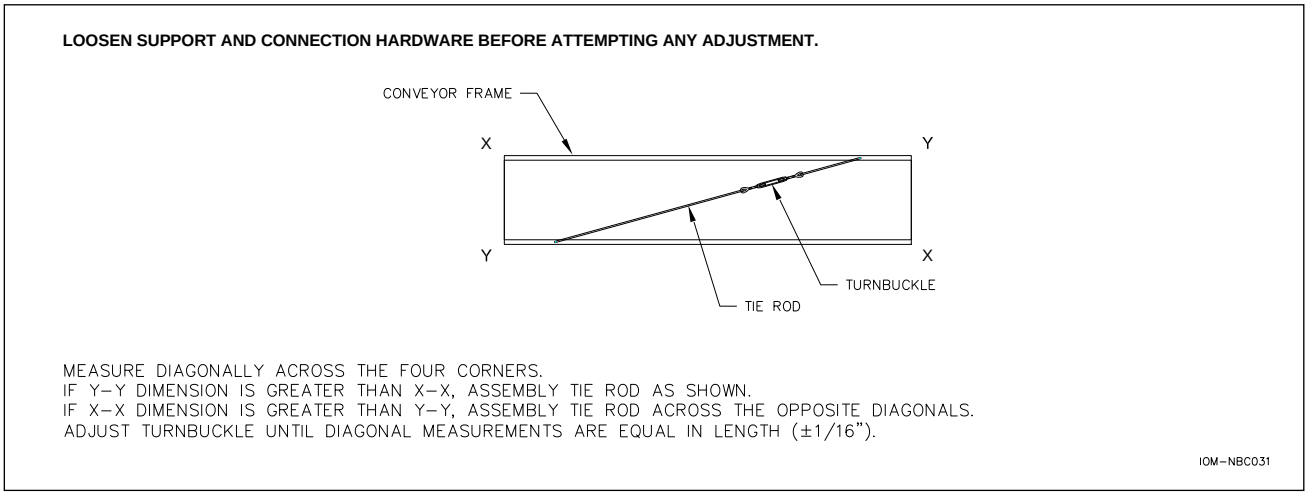
All conveyor sections must be checked for squareness prior to installation as “racked” or being knocked out of square may have occurred during shipping and handling. An out of square conveyor section is a leading cause of belt mistracking. Measure diagonally across the four corners of the conveyor frame to determine if frame is out of square. If the measurement is not equal between the two diagonals, the frame is not square. A “racked” conveyor will skew the rollers, causing the belt to wander off center.

The conveyor sections are joined together with welded butt plate connectors. If a conveyor section is determined to be out of square, adjustment must be made before proceeding to the next section. Correct the squareness of the conveyor frame by installing a tie rod along the longest diagonal dimension and adjusting the turnbuckle until the diagonal measurements are equal in length. It is important to loosen the support and connection hardware before attempting any adjustment.

If gaps appear between bed joints as a result of squaring the conveyor, take care not to “re-rack” the conveyor by pulling the sections together at the bed joints. Insert optional shim plates or washers to the required thickness to fill the gap before tightening the connection hardware. Verify the squareness of the conveyor after installation.

CAUTION

- An out of square conveyor section is a leading cause of belt mistracking.



Squaring conveyor

Elevations

All conveyor sections should be installed in accordance with the elevations shown on the drawings. In addition, they must be level across the frame width and length (if horizontal). Leveling of the frames is best done using a rotating laser level or 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. The new elevation will then become the reference from 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 the 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.

Component Orientation

Using your conveyor system layout drawing and the numbers on the I.D. tags of each component, position and orient the conveyor section.

You must know:

- The direction of product flow
- The elevation height
- How the drive is positioned
- 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 functions, create a hazardous condition, affect its useful life and /or void the warranty.

Installation Arrangements

Floor Supports

Install bolts used to attach the standhead to the conveyor side channels so the nut is on the bottom. Standhead bolts should be left finger tight while the conveyor is being assembled and aligned.

Floor supports are ordered by nominal height range, which is the dimension from the floor to top of the support. Conveyor elevations are shown on the layout by top-of-roller elevations. This difference must be recognized when setting the support elevations. NBC CRUZ®channel conveyor is 6-5/16" from top-of-support to top-of-rollers with a 7-1/2" deep frame channel. The C6, rollers high channel to the bottom of the channel is also 6-5/16" from the top of rollers.

It is important that conveyor frames be installed level. Floor supports will accommodate normal irregularities in the floor surface. Adjustment for elevation in floor supports is accomplished with metal-on-metal bolt clamping force. To achieve the support's stated load rating, it is necessary to tighten the elevation adjustment bolts (3/8" diameter) to 23 ft-lbs of torque.

Supports should always be installed in the vertical position, and any variations due to conveyor pitch or floor slope will be compensated for in the pivoting standhead of the support.

Anchoring

Anchoring in concrete floors is accomplished by drilling into the floor and inserting the suitable anchor bolt. The hole diameter and depth must be in accordance with the anchor bolt manufacturer's instructions.

Anchor intermediate floor supports with two anchor bolts, one through each support footplate using minimum 3/8" diameter anchor bolts. For floor supports over 5' high or when supporting drives, use 1/2" diameter anchor bolts.

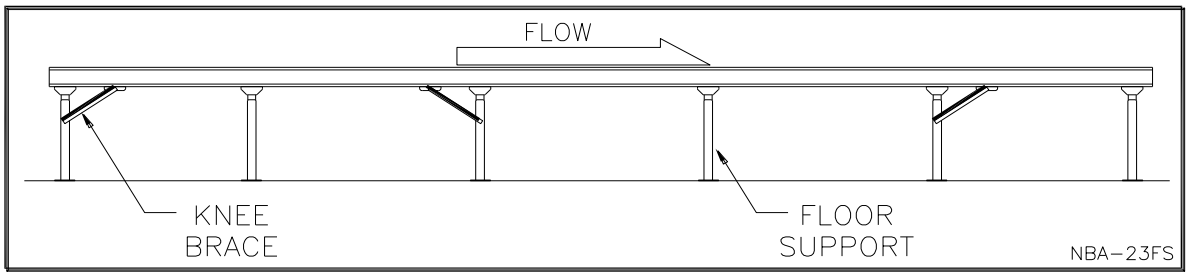
Stagger anchors from front hole on one side of the support, to rear hole on opposite side. Anchor bolts for equipment subject to impact loads should be a minimum of 1/2" diameter.

⚠ WARNING

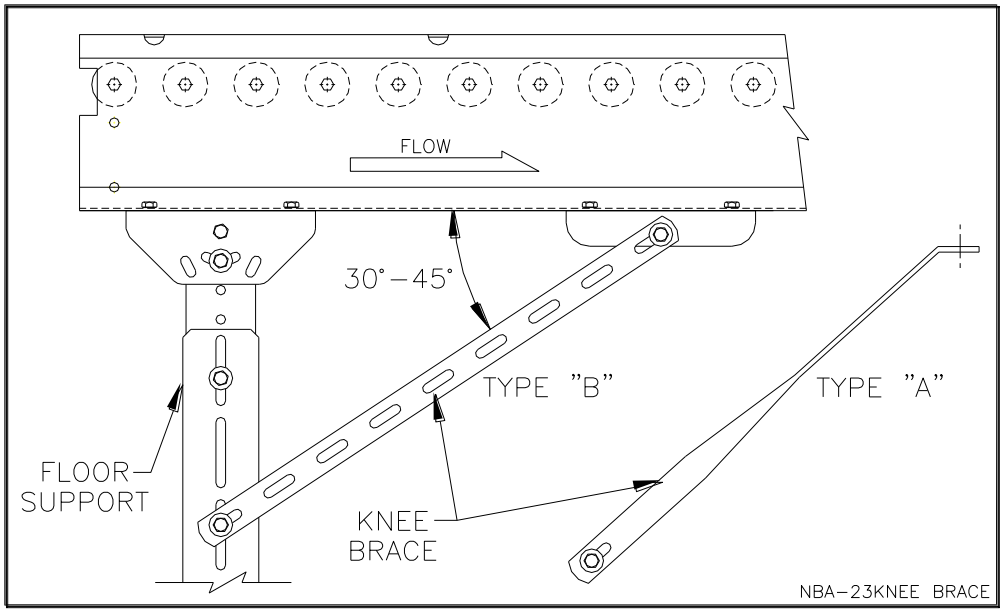
- Place a bolt through the frame and support immediately with finger tight nut. This will prevent the frame from falling off the support, if bumped, and causing injury.

Knee Braces

Stability along the conveyor length is achieved with knee braces. Braces resist stresses caused by direction of product flow, drives, stops and starts. Every support does not require bracing. Braces are used at the ends of straight runs and approximately every 30' in between. Braces should be located toward the discharge end (DOWNSTREAM) side putting them in tension. Starting the conveyor puts opposite stresses on the supports, which is resisted by installing a brace near the drive toward the receiving end (UPSTREAM).

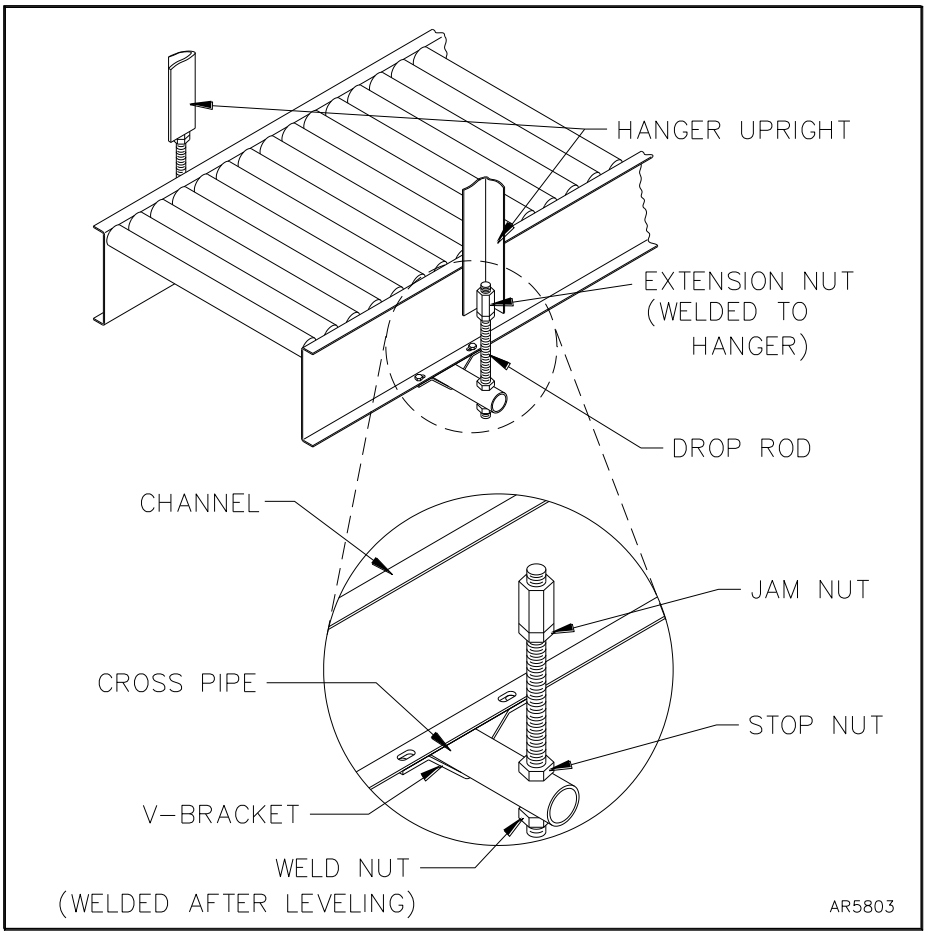


For best results the angle between the knee brace and frame should not exceed 45 degrees, or be less than 30 degrees. On short supports where a small angle results, the knee brace may need to be shortened.



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

Ceiling Hangers



Drop rods and nuts are optional equipment. The extension nut is welded into the angle hanger during installation.

⚠ WARNING

- Consult the building architect or a structural engineer regarding ceiling loading or structural limitations of the building for sizing header steel.

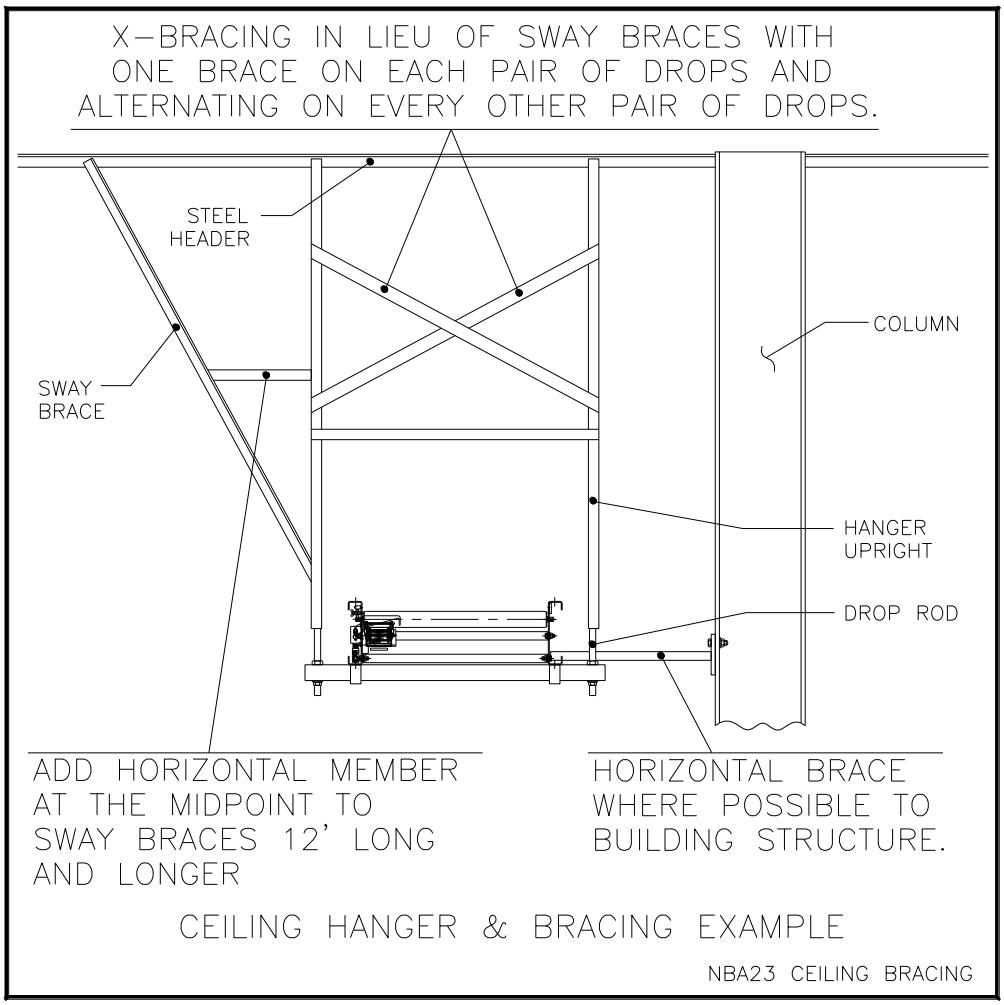
Cross pipes, V-brackets and flat strap connectors are provided with ceiling hangers. Threaded 3/4" rod and attaching nuts are available as an option. Tie rods for squaring the conveyor frame are recommended with all ceiling hanger applications.

If hanger uprights are field fabricated, they should be a minimum of 1-1/2" x 1-1/2" x 3/16" angle.

WARNING

- Consult your distributor or a structural engineer to determine what size hangers should be used to support your maximum anticipated load.

After hanger uprights are installed and the heavy extension nuts welded to angle hangers, thread the drop rods into the extension nuts. Thread the jam nuts and stop nuts on the drop rod far enough up the rods to allow installation and adjustment of the cross pipe.



Anchoring Ceiling Hangers

Open Building Steel

The following references are from the American Institute for Steel Construction manual (AISC).

- Welding of auxiliary steel (stringers or headers) to building steel is prohibited.
- Drilling and bolting to building steel is not recommended and will be done only with the customer's written permission.
- Clamping of stringers or headers to building trusses will normally be done only at panel points. Specific customer permission and load calculations by a qualified engineer are necessary to safely clamp between panel points.
- Headers when used for short spans, such as between roof purlins, will be securely clamped to building steel. Stringers, when used between headers, may be welded or bolted to the headers directly or with suitable angle clips.

Concrete Ceilings

Accomplish anchoring by drilling into the concrete ceiling and inserting suitable anchor bolts. The hole diameter and depth must be in accordance with the lag bolt manufacturer's instructions.

Anchor each hanger with four bolts (two per upright) minimum size 1/2" diameter. Consult your distributor or structural engineer to determine your needs.

⚠ WARNING

- Do not use explosive type anchors.
- For heavier concentrated loads like drives or points where movement or vibration can occur, use 5/8" diameter through bolts with backup plates.
- If this is not permissible or possible, then header steel must be installed using several anchor bolts to spread the load.

Wood Joists/Beams

Hangers may be attached directly to the joists providing the load rating of the building will permit. Attach hangers to the vertical side of the joist in two places, one above the other, on each hanger upright. Anchoring is accomplished by drilling through the joist in the upper position and using a 1/2" diameter through bolt with a backup plate or heavy washer. A 1/2" diameter lag screw may be used in the lower position.

When a header is required to support the load, it must bridge across two or more joists. This header will be attached to each joist in the manner specified in paragraph above. Hanger uprights should then be bolted or welded securely to the headers. Consult your distributor or structural engineer to determine which method should be used for your load requirements.

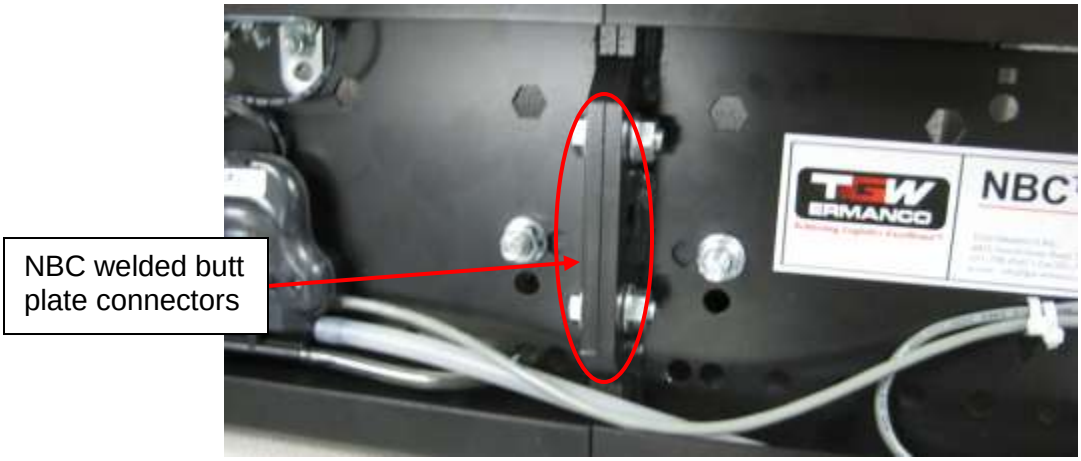
Concrete/Masonry Walls

Equipment may be supported from concrete walls through use of suitable bolts and anchors or by bolting through the wall if the condition of the wall or load dictates it. A 1/2" diameter through bolt should be used with a backing plate.

Ceiling-hung conveyor header steel should be installed well ahead of the conveyor frame installation to minimize congestion.

Connectors

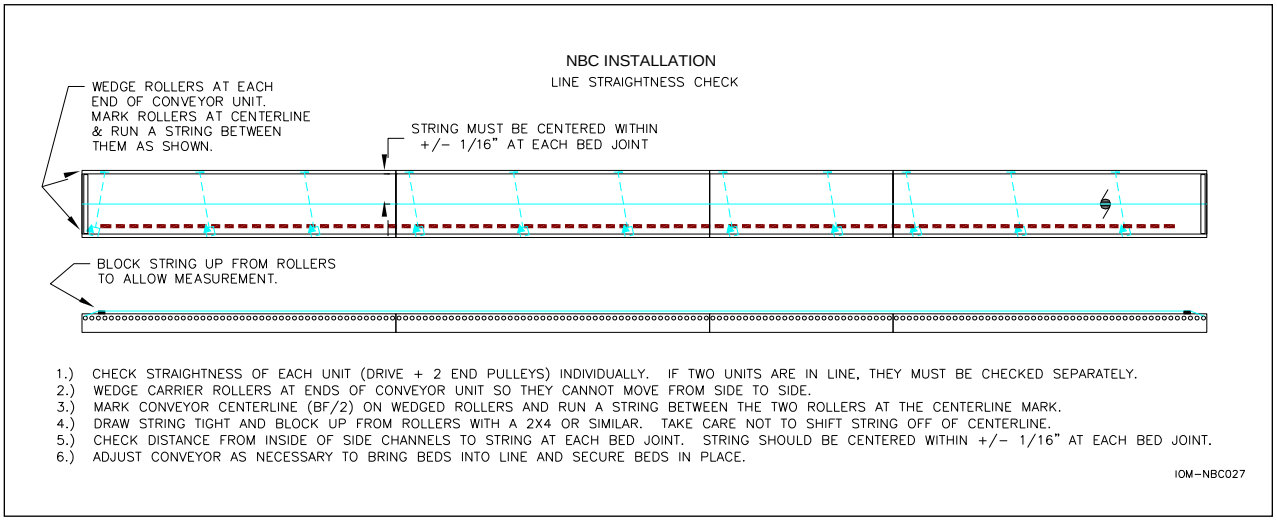
Adjoining NBC beds are connected using welded butt plates. For either ceiling hanging or floor mounting, supports may be placed anywhere under the bed section while maintain 12' maximum centers. The beds should be temporarily supported while the support and connectors are installed.



⚠ WARNING

- Do not extend support locations beyond 12' centers.

Line Straightness



CAUTION

- Line straightness must be maintained or belt will mis-track and result in damage to the conveyor.

Setting Logic Modules

After mechanical and electrical installation is complete and there is air to the system, the logic modules may need to be reset.

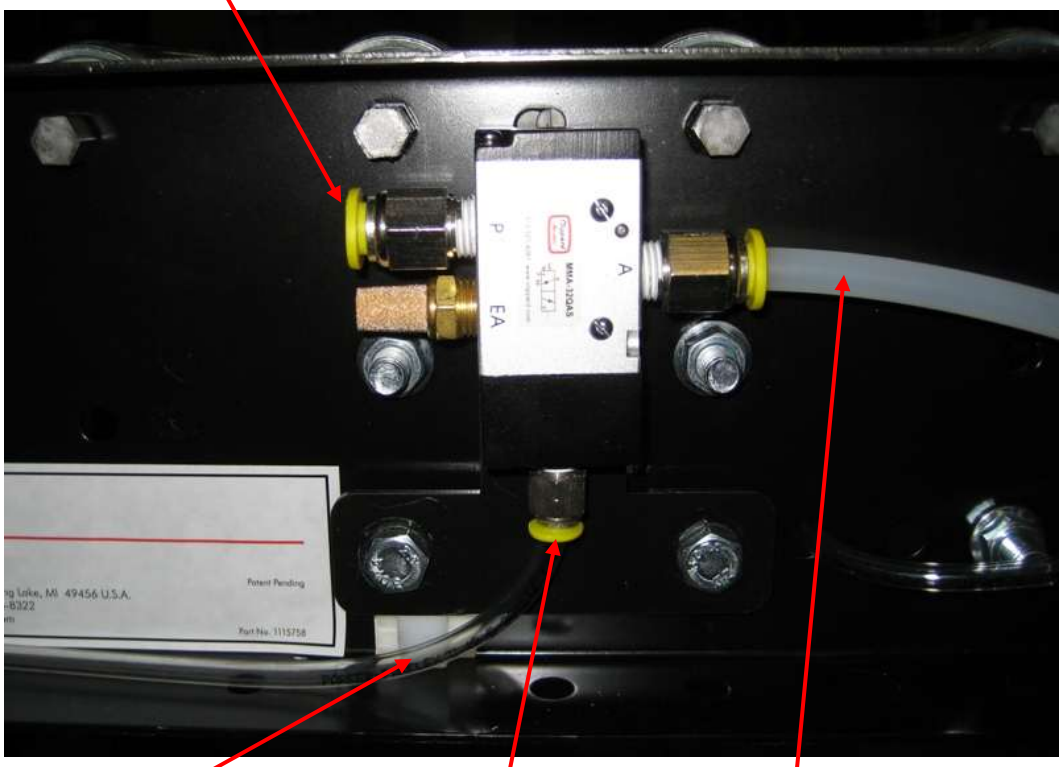
All logic modules are factory set in the basic mode indicated by the green light. This logic mode may be adequate for your conveyor system. However, if higher product throughput is required, some of the basic modules can be switched to progressive which is indicated by an amber light.

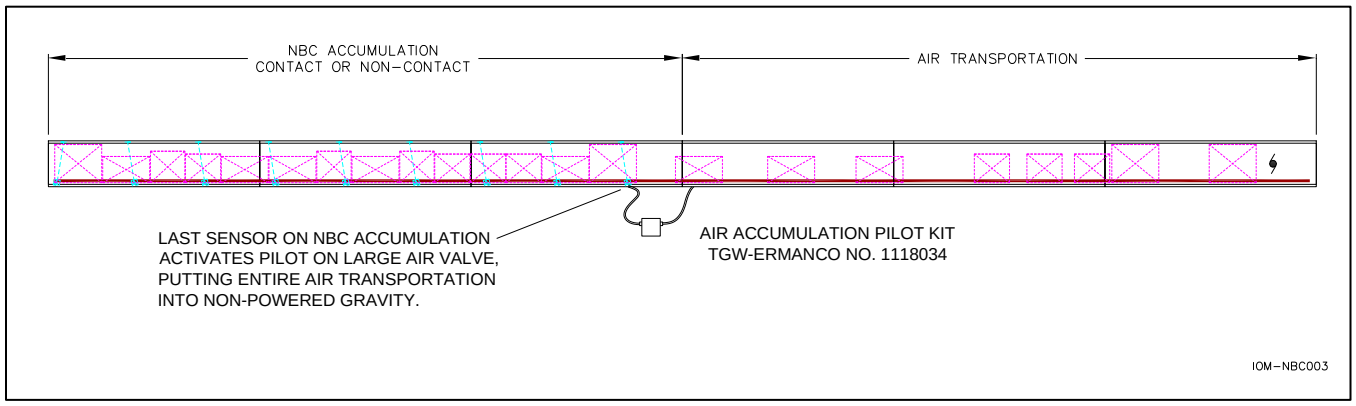
Never switch all the logic modules to progressive. For maximum product throughput, a pattern of 4 progressive modules and 1 basic module should be followed. See Index heading “Basic and Progressive Logic” for additional explanation.

Switching logic modes with paper clip

Installing the NBC Air Transportation Pilot Valve

(For air transportation NBC beds ONLY)





NBC Belts

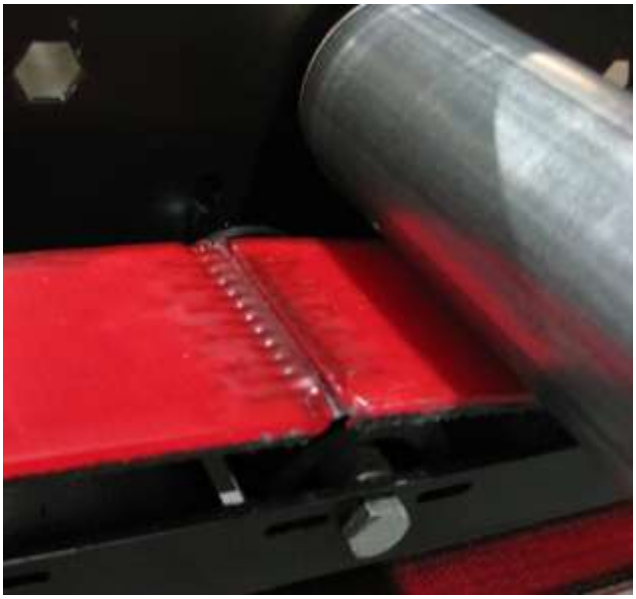
Red Belt

NBC has two different types of flat belts available. A red, urethane covered belt is used for shorter units with belt pull under 250 lbs.

NBC Red Belt Lace Kit
PN: 1117482

CAUTION

- This belt has Clipper U3-RHT lacing with a #2 points and a .093” dia. white Dura-stainless pin.
- Substitution of any other lacing and pin will cause premature failure.

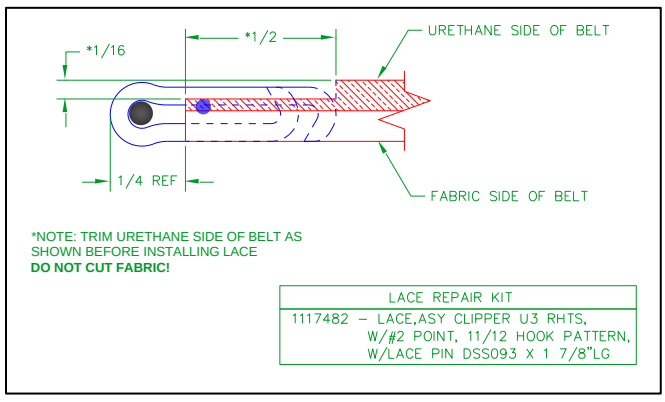


Red belt with laced end

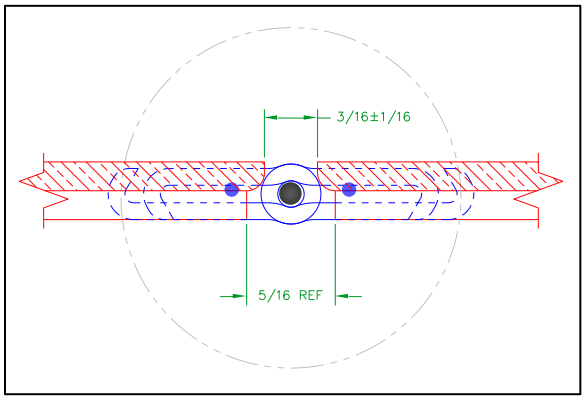
Field Installation For Clipper Lacing

To prepare the red belt for a new lace, follow these steps;

1. Cut the old lace from both ends of the belt. The cut must be straight and square across the belt end for the proper installation of the new lace.
2. Cut a 1/16” chamfer on each side of the belt ends.
3. Trim back the urethane side of the belt 1/16” in depth and ½” long on both ends of the belt. Make sure that you do not cut into the belt fabric. Reference the diagram below. (A hand-held right-angle grinder can easily and safely remove this material)
4. Install a U3-RHT lace with #2 points and twelve hooks centered on one belt end.
5. Install the other U3-RHT lace with eleven hooks centered on the other belt end. Reference TGW PN 1117482.
6. Follow belt installation procedure, detailed in this manual to re-install the red belt.
7. Bring the two red belt ends together and install the white .093” dia. Dura-stainless pin.

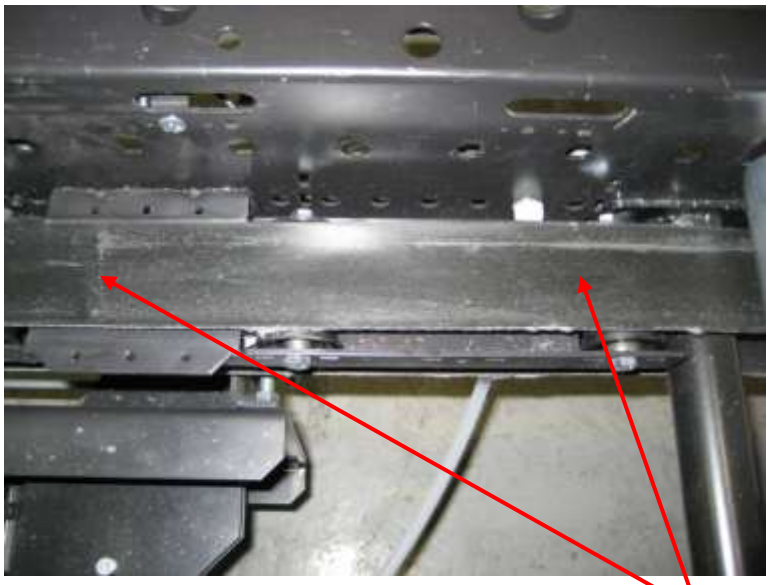


Field lace Repair Detail



Finished lace

Black Belt



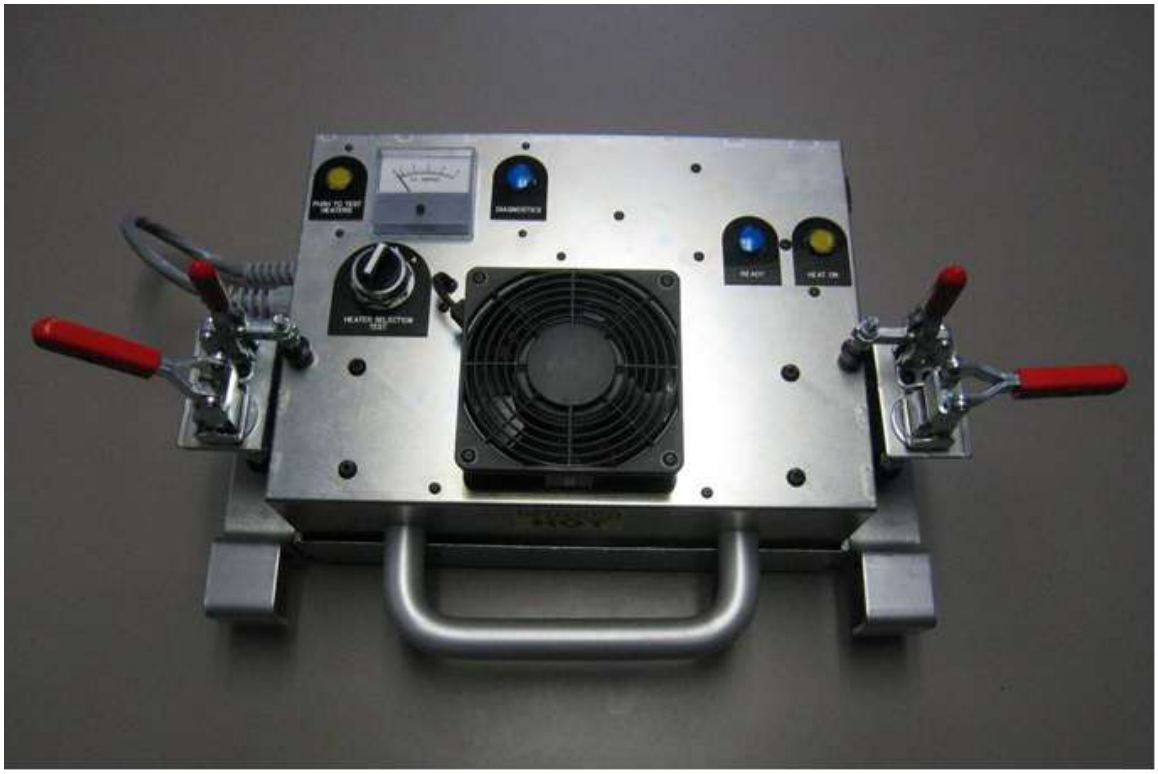
For longer units with higher belt pull, a black, PVC belt is supplied. This belt must be welded together with a MHS Conveyor supplied welding machine.

CAUTION

- Never field splice the black PVC belt with mechanical lacing as the belt fabric is not designed to hold lacing.

Black PVC hot welded NBC belt

See QUIKmeld® belt welding instruction manual for complete belt welding instructions



NBC QUIKmeld Unit

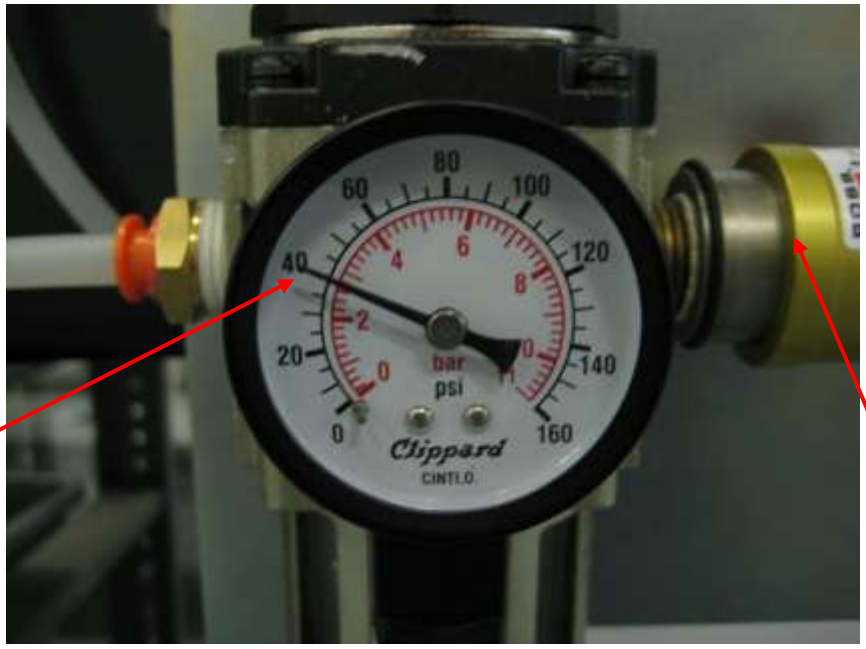
PN 1120200

Threading Belt in NBC Accumulation Conveyor

Step 1

The most important item in threading NBC belts is to **turn the system air ON with NO POWER to the logic modules**. This will depress the pressure pans and open up a belt path. Without air, all the rollers are engaged as NBC is a spring-to-drive system and it will be extremely difficult to thread the belt.

Note – Use the slide switch located at the take-up cylinder base to turn the air take-up OFF (500 lb & 250 lb-AT only).



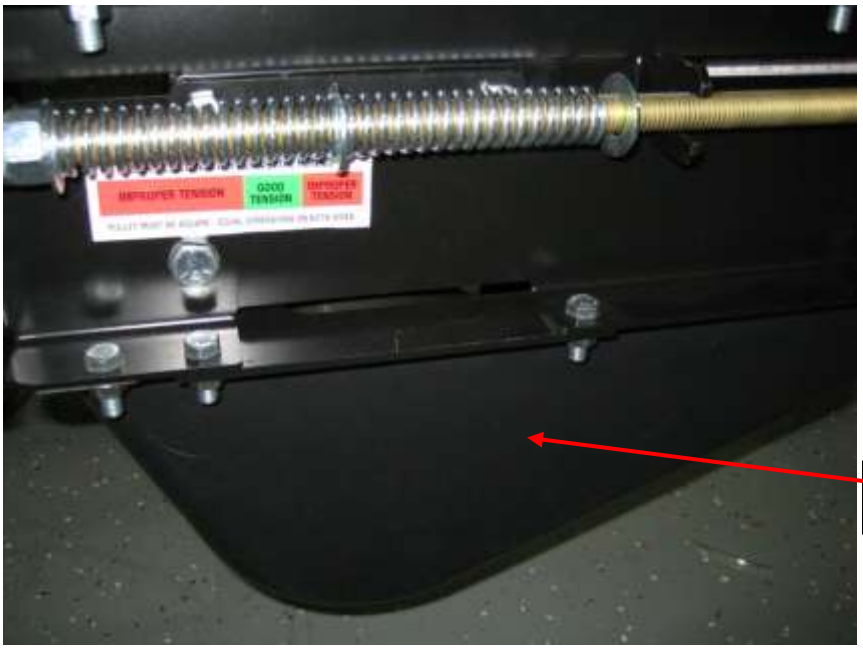
Primary Conveyor Regulator
PN E0034790

Step 2

Disconnect the power to ALL the logic modules (switch off SICK conveyor mounted power supplies). All logic modules lights should be OFF. This will depress the springs in the pressure plan creating a belt path.

Step 3

Remove bottom guard on drive to have access for belt threading (250 lb manual drive guard shown – the 500 lb and 250 lb-AT bottom guard is a flat plate).



Step 4

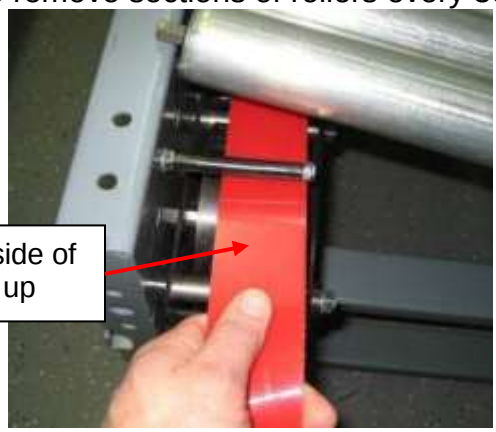
With the air pressure ON the logic and the logic module power OFF, attach a sheet metal splint (attached to each drive from factory) with tape to the end of the belt. These enhance the ability to thread the belt under the rollers without the ends curling.

NOTE

Do not put too much tape on as it will make it difficult to push the belt through the guide rollers.

Step 5

Remove rollers at each end and insert the splint with belt attached. The belt must be installed with the urethane side facing up to contact the carrier rollers. Push belt into conveyor. It will be necessary to remove sections of rollers every 30' or 40' to help pull / push the belt through.



Step 6

Remove bottom guard for end pulley. (Picture 1)
Push belt down between the stationary spacer and 6” dia. end pulley, and up and over the 6” flanged snubber pulley. (Picture 2)
Make sure belt passes between ball bearing belt guide. (Picture 3)

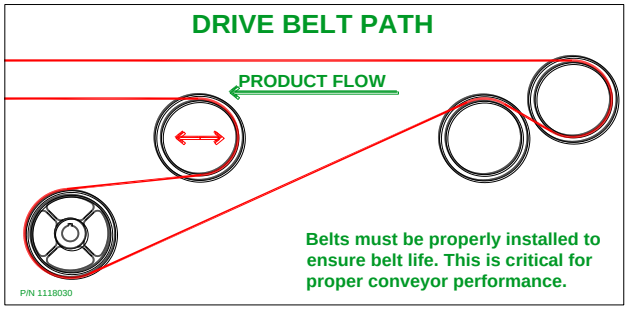


Step 7

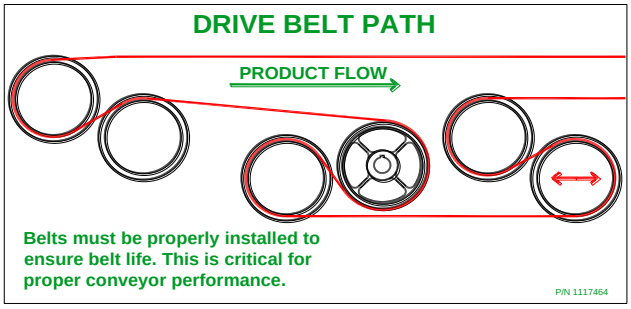
Pull belt through the bottom side of the conveyor. The belt must be on TOP of the return belt idlers. (Picture 4)
Wrap the belt end around the drive take-up pulley (250lb manual drive). (Picture 5)
Wrap the belt end around the drive idler pulley before the air take-up pulley in AT drives.


Step 8

Reference the belt path label on the side of the drive and pull the belt through.



250 lb Manual Spring

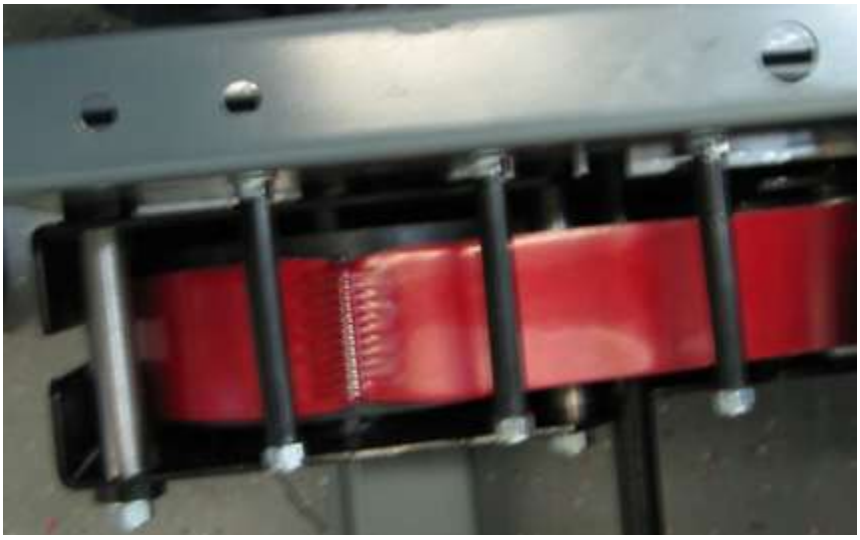


500 lb & 250 lb-Air Takeup

If the red belt is used, insert the white Dura-stainless .093” dia. lacing pin on the idler pulley.

NOTE

The lacing must be in perfect alignment to put the pin through. Be sure the pin is through ALL the lacing fingers.

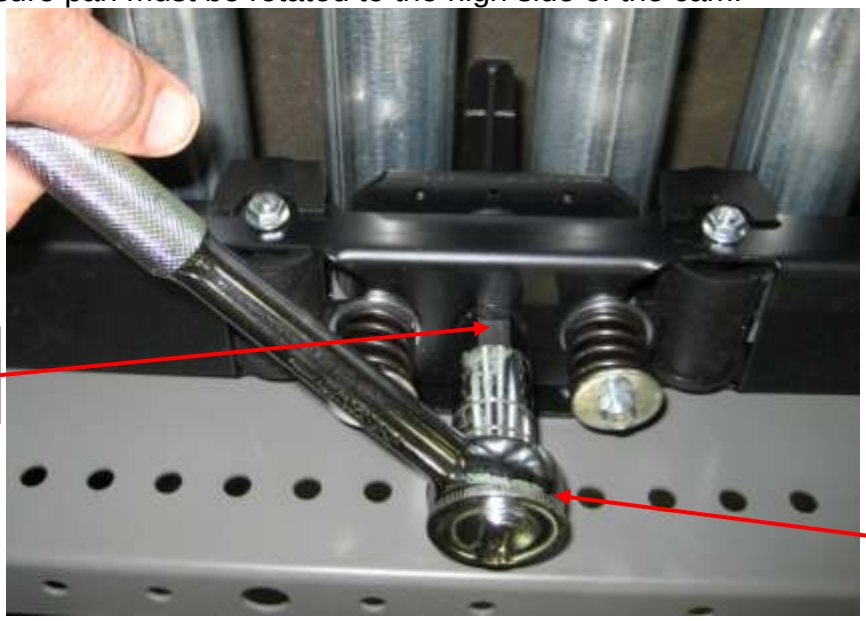


If the black belt is used, see the QUIKmeld® Instructions on belt splice for welding the belt on the top side of the conveyor at the charge/drive end.

Threading Belt in NBC Transportation Conveyor

Step 1

NBC transportation conveyor is spring to drive with no air. To open a belt path, two cams under each pressure pan must be rotated to the high side of the cam.



Step 2

Thread the belt as shown in steps 3 through 8 of the NBC accumulation conveyor.

Step 3

Rotate each cam back to the low side of the cam re-engaging the spring.

Belt Tensioning

After the belt is installed and laced or welded, the belt must be properly tensioned. The belt tensioning takes place on the drive and is performed as follows.

250 lb Drive Tensioning (Spring/Screw Take-up)

Step 1

Loosen jam nuts with two 15/16" open end wrenches.
Pull take-up pulley back until belt resistance is felt.

Step 2

Compress springs with nut, keeping both sides equal, until the end washer indicator is into the tight side of the red area. After the conveyor is running, RECHECK the belt tension. During initial operation the red belt typically loosens and must be retightened frequently until the belt stops stretching. The end washer indicator must be in the green during conveyor operation.

Step 3

Be sure the compression springs on both sides of the take-up are compressed to exactly equal lengths; then tighten jam nuts.

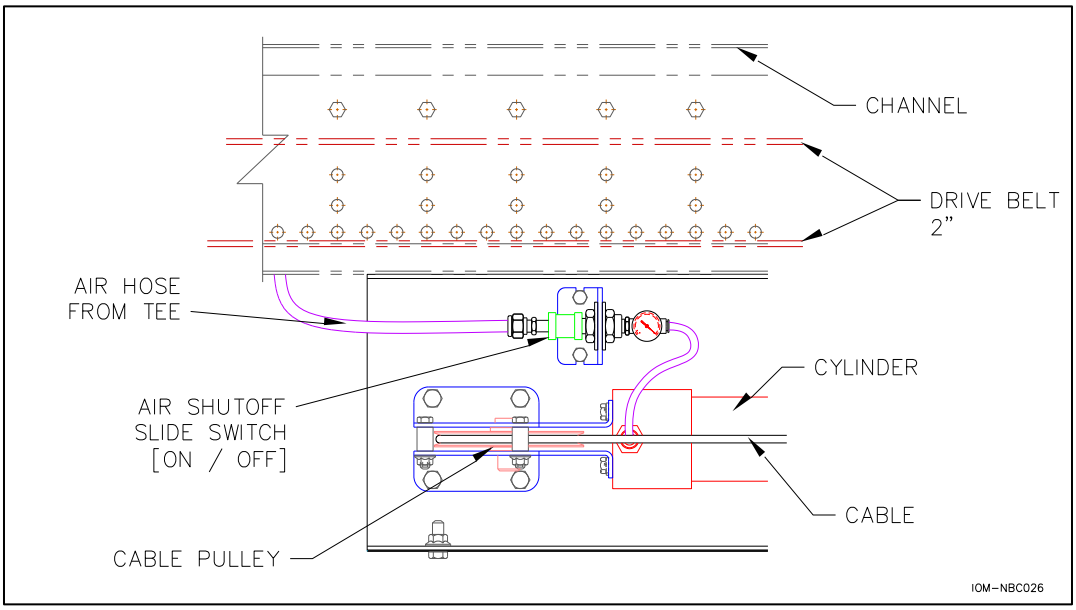
500 lb and 250 lb-AT Drive Tensioning (Air Take-up)

Step 1

Connect air to the fittings as shown. Air must be regulated to 30-40 PSI at the conveyor primary filter regulator. With primary air pressure on and belt installed, slide air shutoff switch forward to engage the air tension on the belt (shown). The belt tension will automatically adjust.

NOTE: FOR 250lb-AT DRIVE ONLY

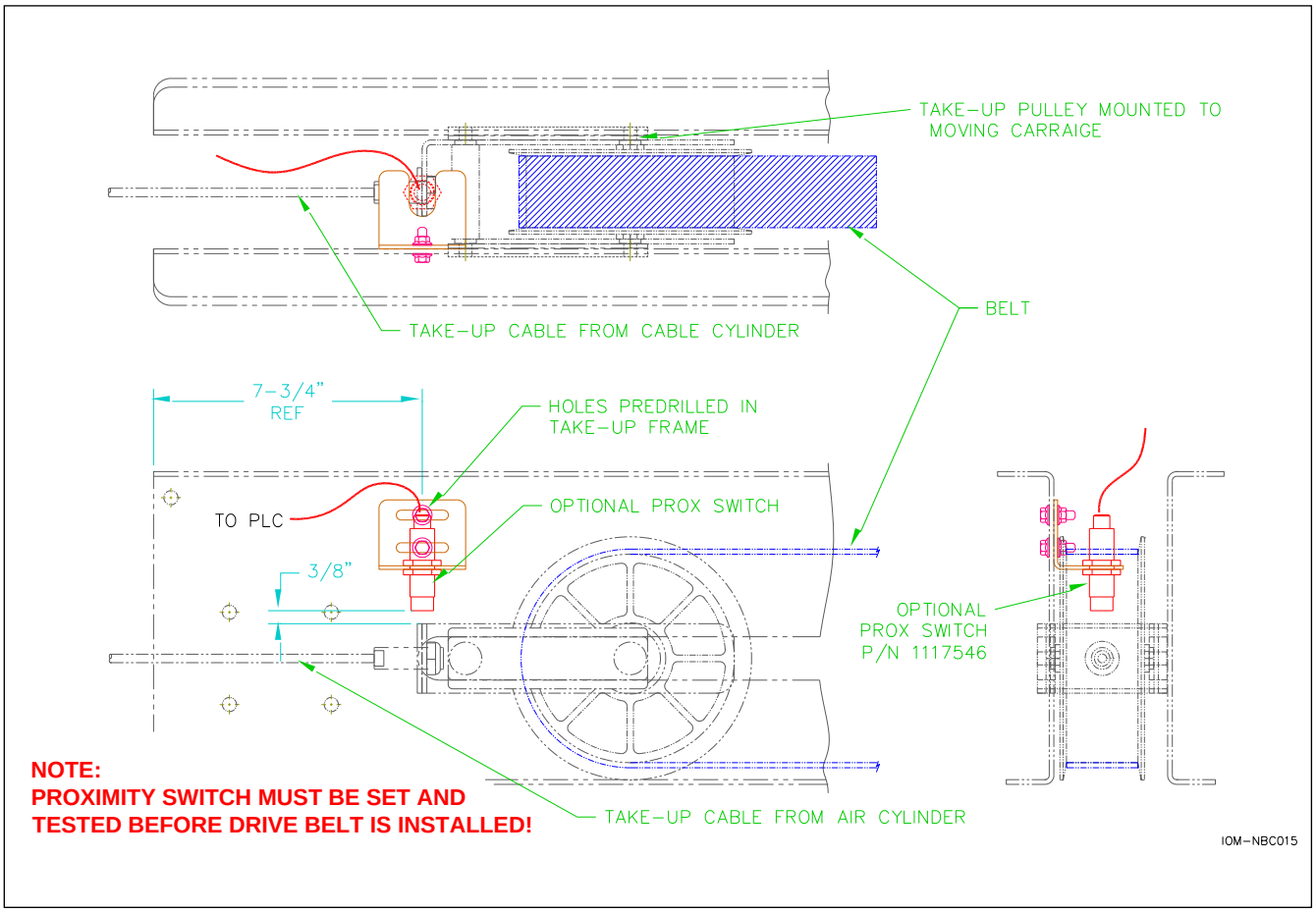
The 250 lb-AT drive has a regulator prior to the air shutoff slide sleeve.
The accumulation pressure from the conveyor filter regulator (40PSI) is reduced to 30 PSI.
The 250 lb-AT drive air take-up pressure should never exceed 30 PSI.



500 lb-AT Air Sleeve Valve Assembly

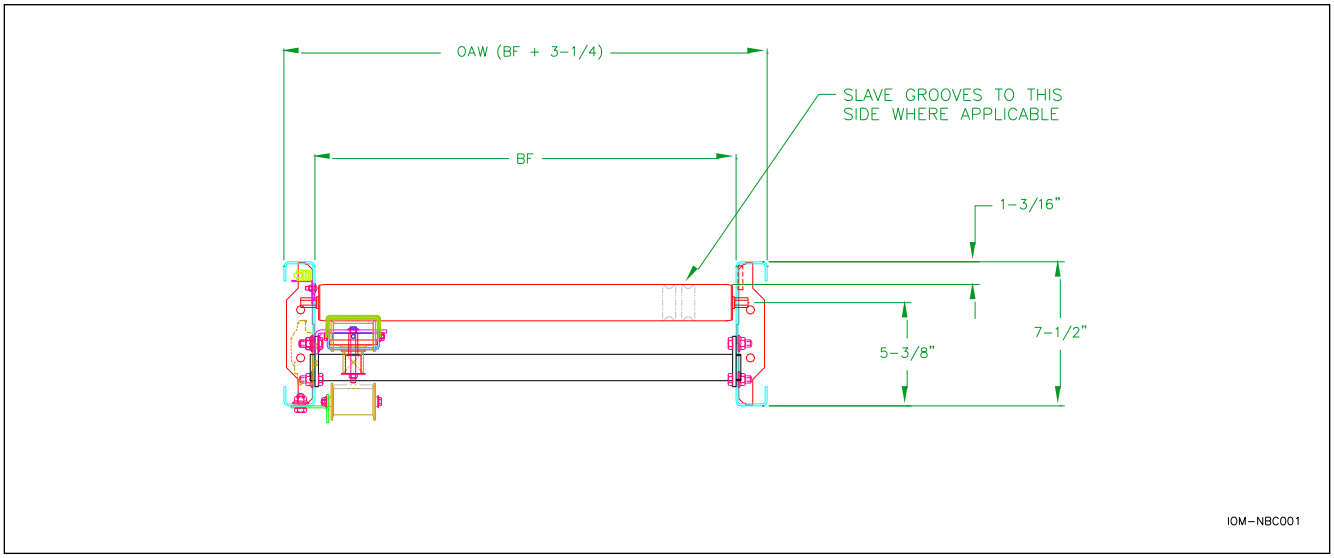
Wiring (Optional) Proximity Switch in the 500 lb & 250 lb-AT Drive Air Take-up

There is a location for wiring a proximity switch in the air take-up. This can be used to shut off the drive should the belt stretch to the point of bottoming out the take-up or if a belt would break.

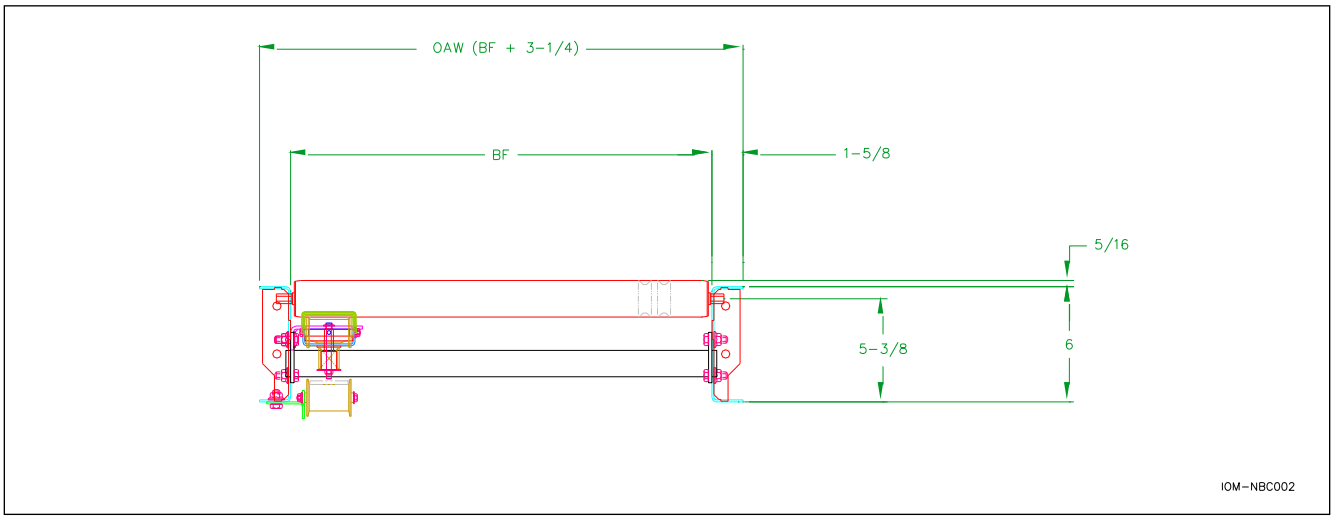


Wiring proximity switch location

NBC Cross Sections



NBC accumulation with CRUZchannel rollers low



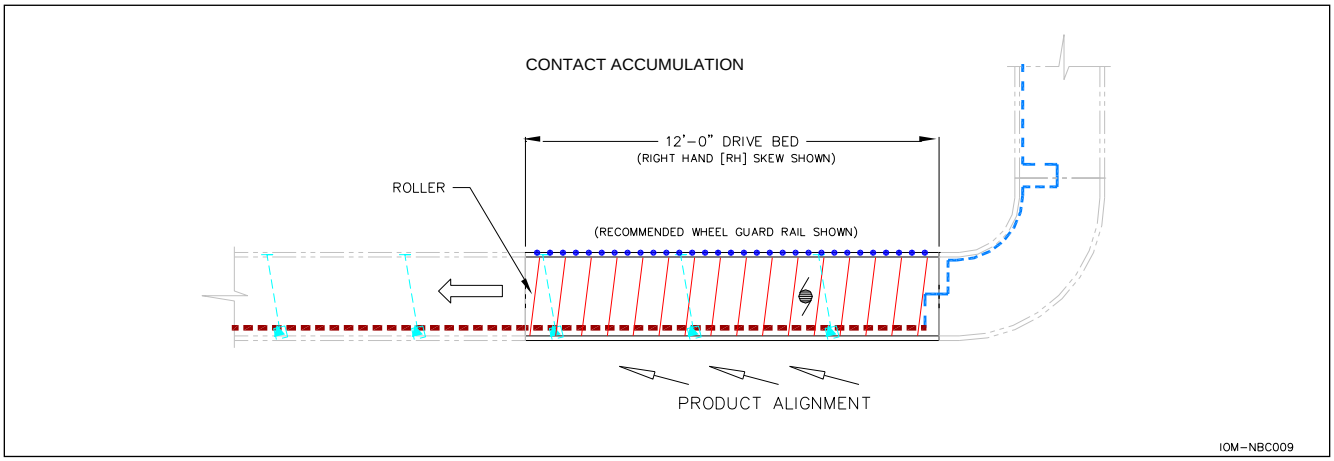
NBC transportation with C6 channel rollers high

Skewing NBC Rollers

Skewing rollers is required on NBC if you are using contact accumulation and if the between frame (BF) dimension of your conveyor is double the width of the smallest product. The normal method of skewing is to install a factory skew bed at the charge end of your conveyor. If your conveyor line is over 100' long and you have small product on it, you may want to add a maintenance skew bed midway down the conveyor to preserve the product alignment.

Factory Skew Charge Section

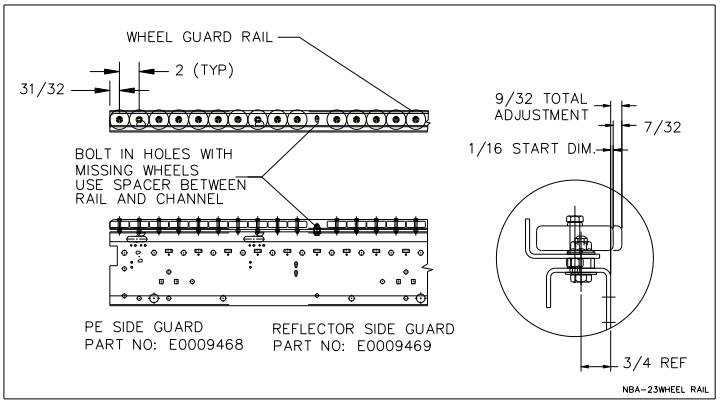
A standard 12' charge end skew bed is available with factory skewed rollers at 7 degrees. This bed is available in left or right hand and has a section of wheel guardrail included. This skewed bed will move products across the conveyor about 16" over the 12' length. This side movement is dependent on the bottom condition of the product.



12' Skew Bed Installation

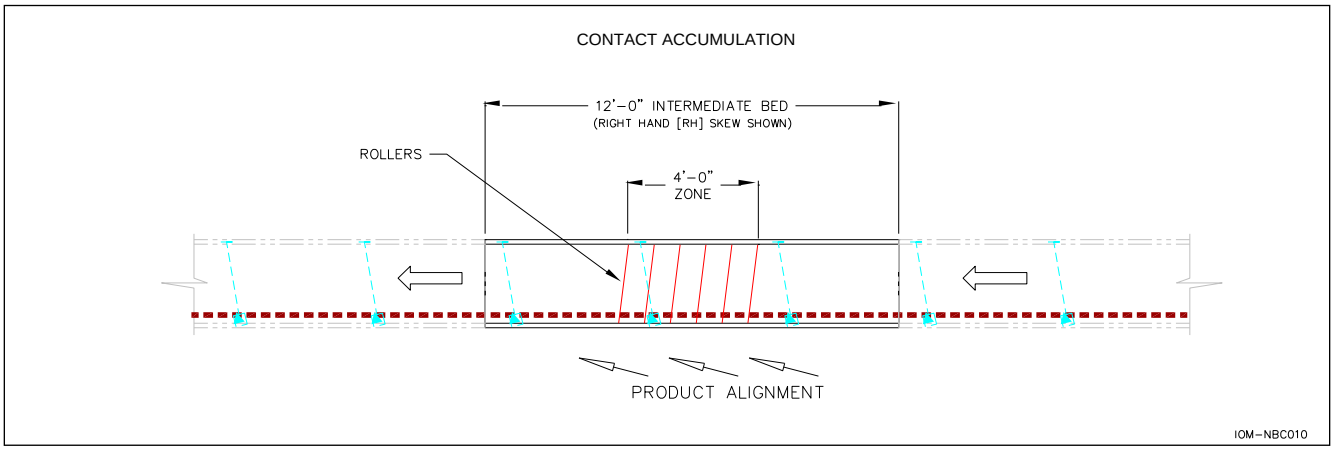
MHS Conveyor' dedicated 12' skew bed typically is installed as the first 12' bed section in a NBC conveyor line, starting from the charge end. The rollers are factory skewed to the requested side and the installation is the same as any other NBC intermediate bed section.

A 12' wheeled guardrail is recommended to prevent the stalling of product as it is forced against the side channel by the skewed rollers. The wheeled guardrail is shipped loose and must be field installed. These guards are not symmetrical and must be ordered correctly as either a photo-eye or reflector side wheel guard. To install, line up the bolt holes on the guard with the holes in the top flange of the 12' skew bed side channel. The end of the guard and the end of the conveyor bed should be in line.



Maintenance Skew Section

Other than the charge end skew bed, all standard 12' beds have a 4' skew zone designed for the center of the bed. Hole punching in the side channel allow for a ¾" offset of the rollers over the width of the bed. Note that this means wider beds have less of a skew angle than narrow beds and produce a less aggressive skew. **About 2" of movement across the conveyor can be expected per 4' maintenance skew zone on 16" BF conveyor, and 1" of movement on 34" BF conveyor.**



Maintenance skew beds are typically used in contact accumulation NBC lines over 80' which have small product on them. After initial alignment by a charge skew bed, maintenance skew beds keep products aligned. If an NBC conveyor requires maintenance skewing after installation, field skewing of the middle section of a 12' bed is possible. The required skew pressure pan is already included in the middle zone of the standard 12' bed.

The steps for field skewing these zones are listed on the following page.

CAUTION

- Never skew rollers without a skew pressure pan installed. Belt damage will result and warranty will be voided.

Installation Steps for Field Installed Skewed Maintenance Pressure Assemblies

NOTE

The required parts and instructions to add a maintenance skew zone are included in zippered bag attached to conveyor side channel.

2" Roller Centers

Step 1

Select the conveyor section in which the rollers are to be skewed. Determine the direction of skew desired and remove one roller from discharge end of the center zone.

NOTE

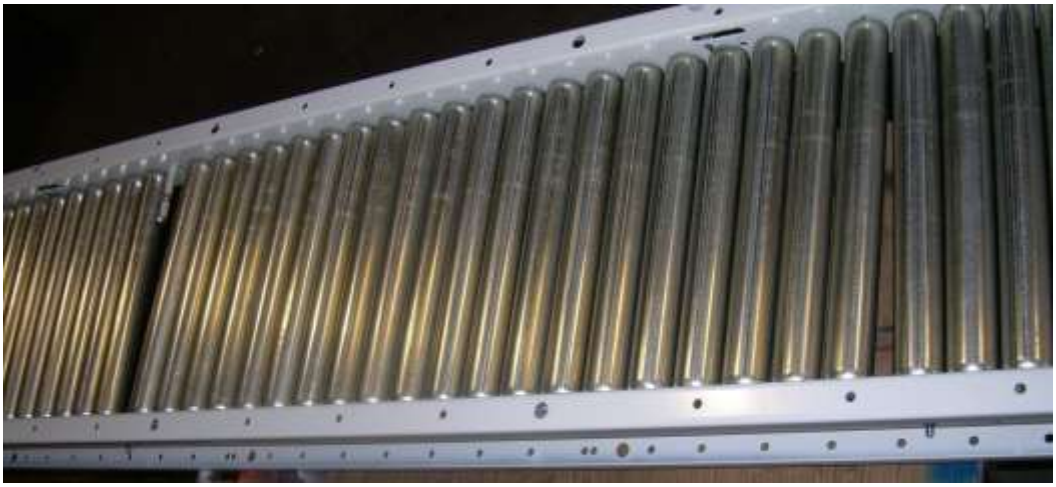
The bed 4’ center zone is the only zone that can be skewed.

Step 2

Install belt guard in 9/32" dia. hole provided. Belt guard provides support of small product at the formation of the skewed zone.

Step 3

Skew rollers 3/4" to direct the product to the alignment side.



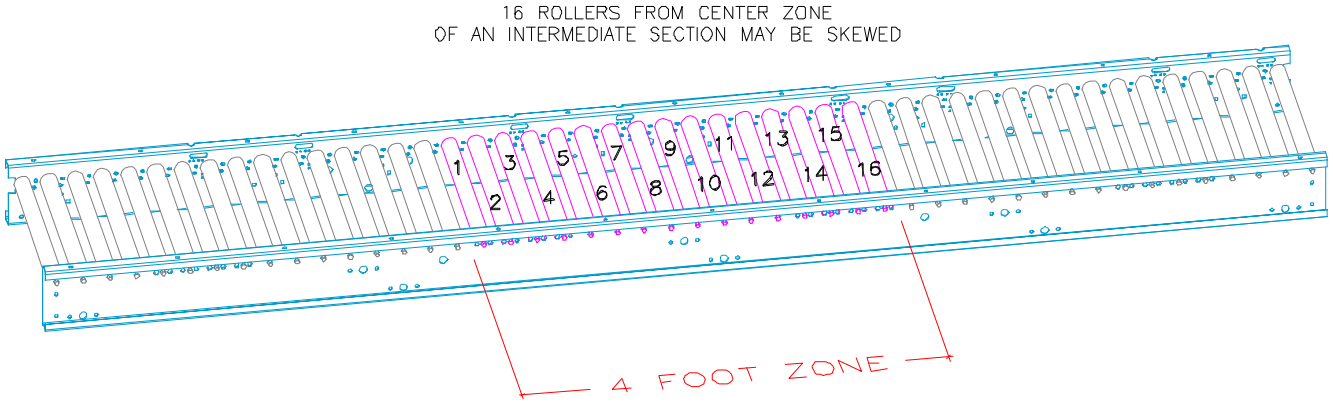
Right Hand Skew Shown Traveling from Right to Left

NOTE
Rollers may only be skewed a maximum of 3/4" in either direction.

3" Roller Centers

Step 1

Select the conveyor section in which the rollers are to be skewed. Determine the direction of skew desired. All rollers in the middle zone are used for skewing.

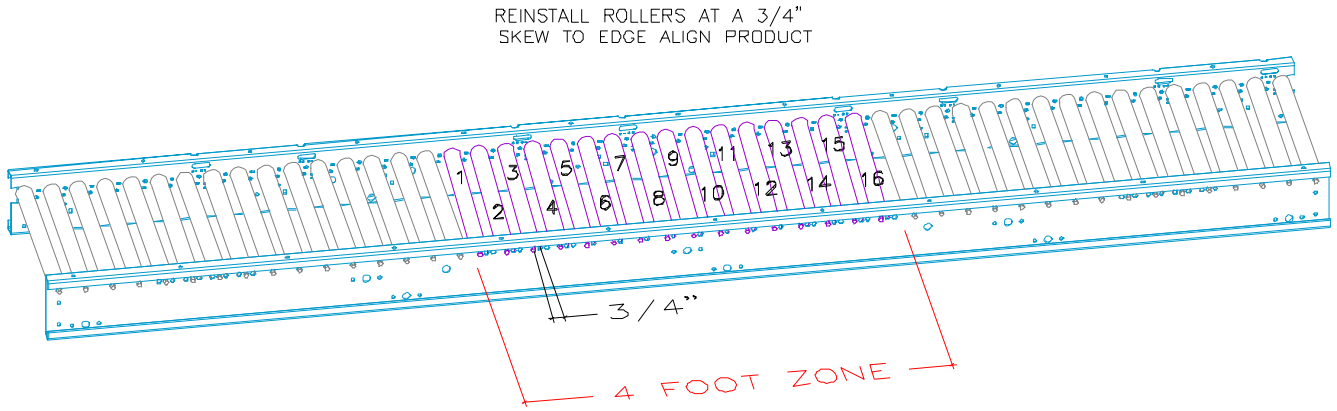


IOM-NBC030

NOTE
The bed center 4’ zone is the only zone that can be skewed.

Step 2

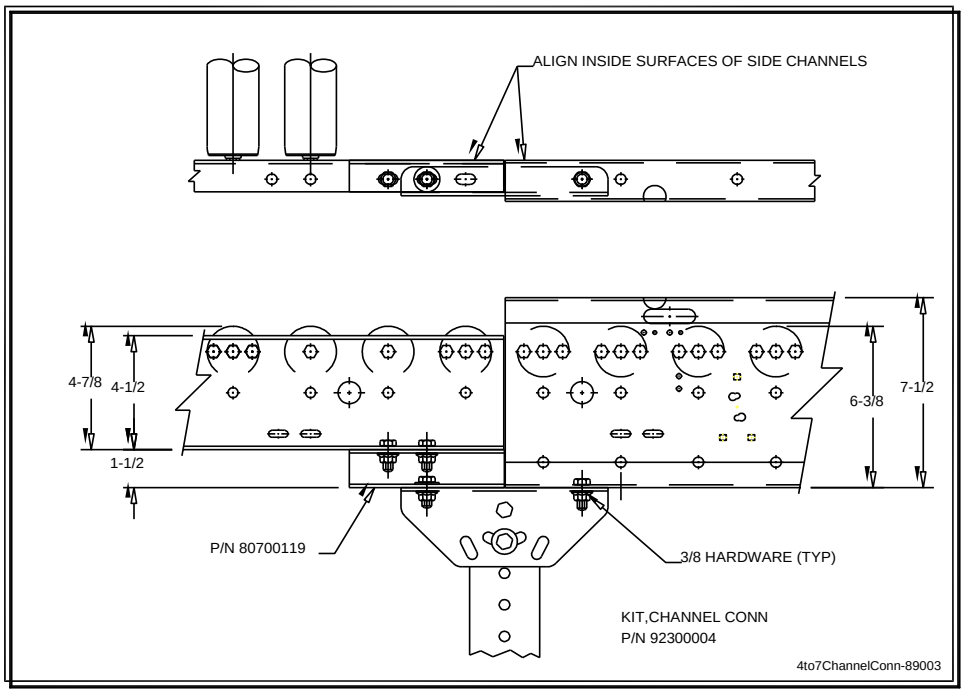
Skew rollers 3/4" to direct the product to the alignment side.

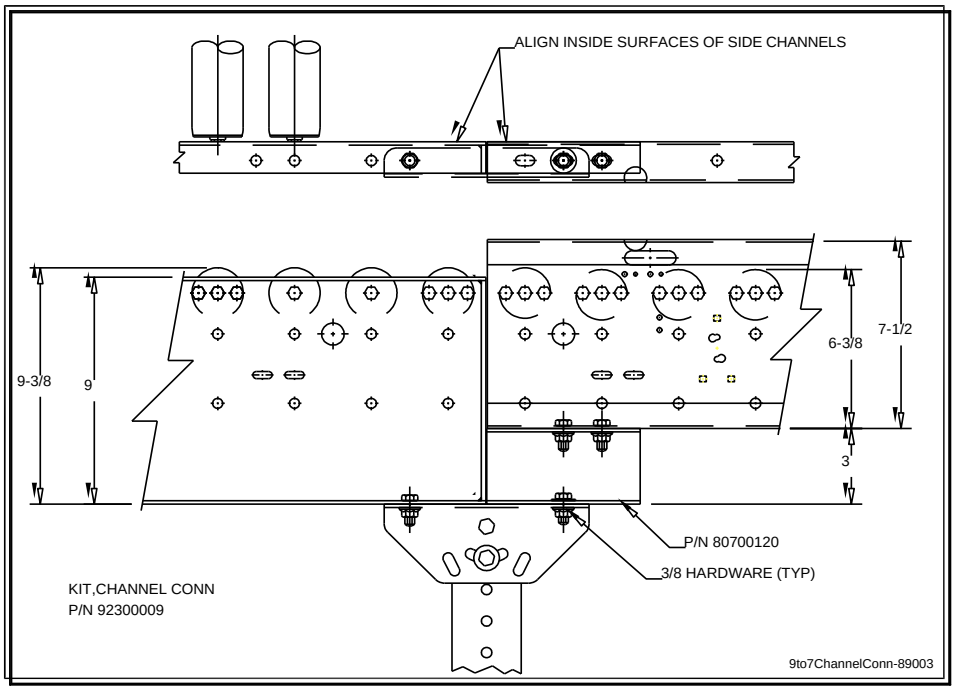


IOM-NBC030a

NOTE
Rollers may only be skewed a maximum of 3/4" in either direction on the side channel opposite the drive belt.

CRUZ®channel to XenoROL® Channel Connections



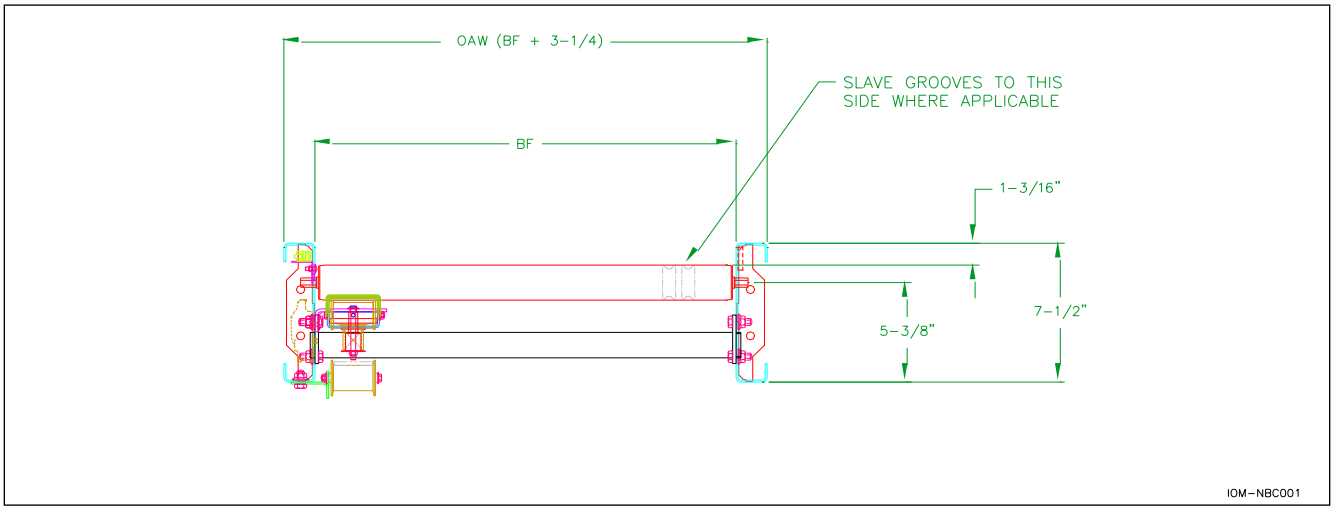


NOTE

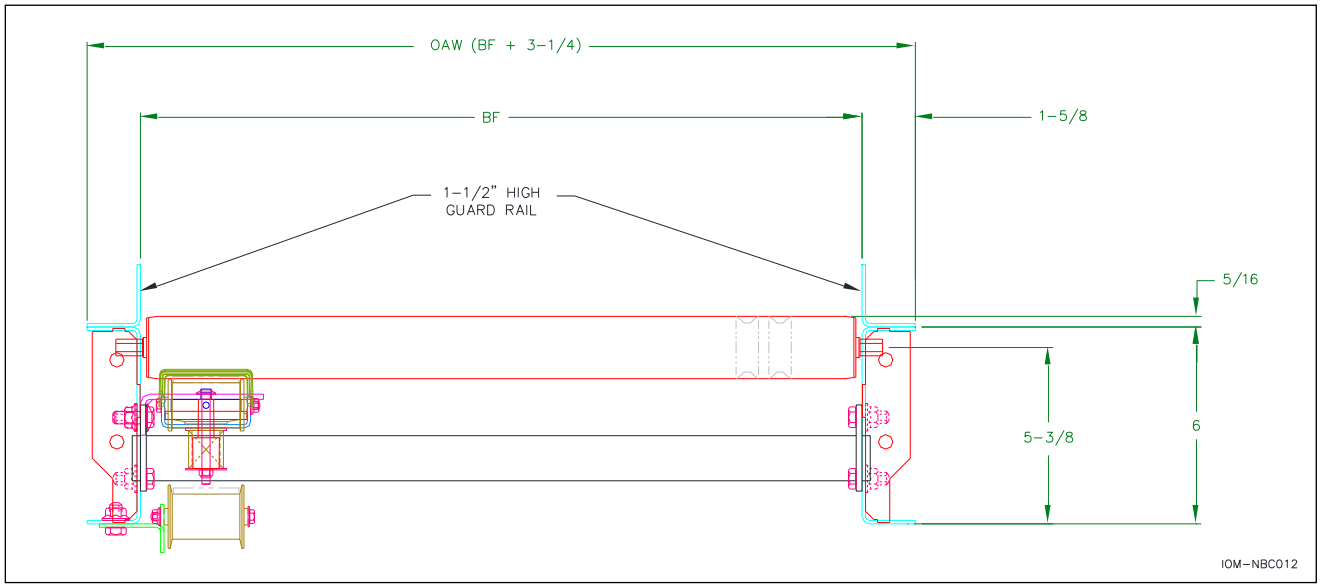
C6 Channel uses the exact same connections when mounted to XenoROL.

Guardrail Mounting on NBC

NBC can be supplied with rollers low which uses the CRUZ side channel as a low guardrail. If C6 channel is supplied, 1-1/2" high angle guardrail can be used as a low guard.

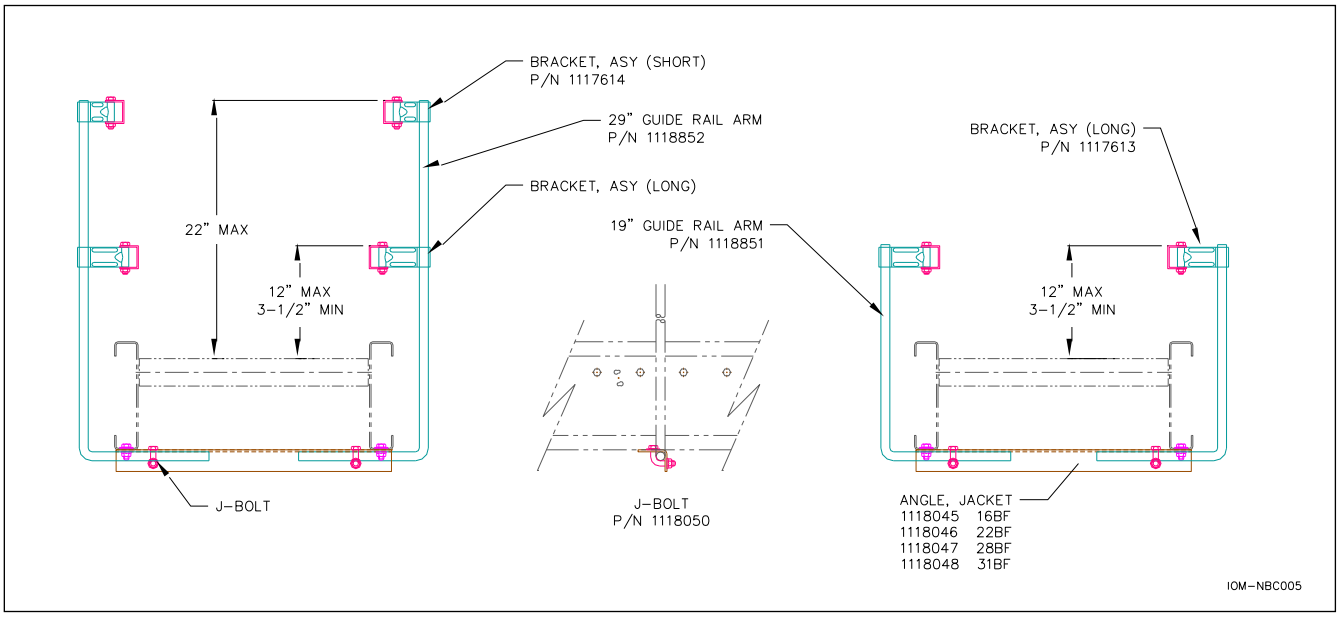


CRUZchannel side frame acts as a guardrail



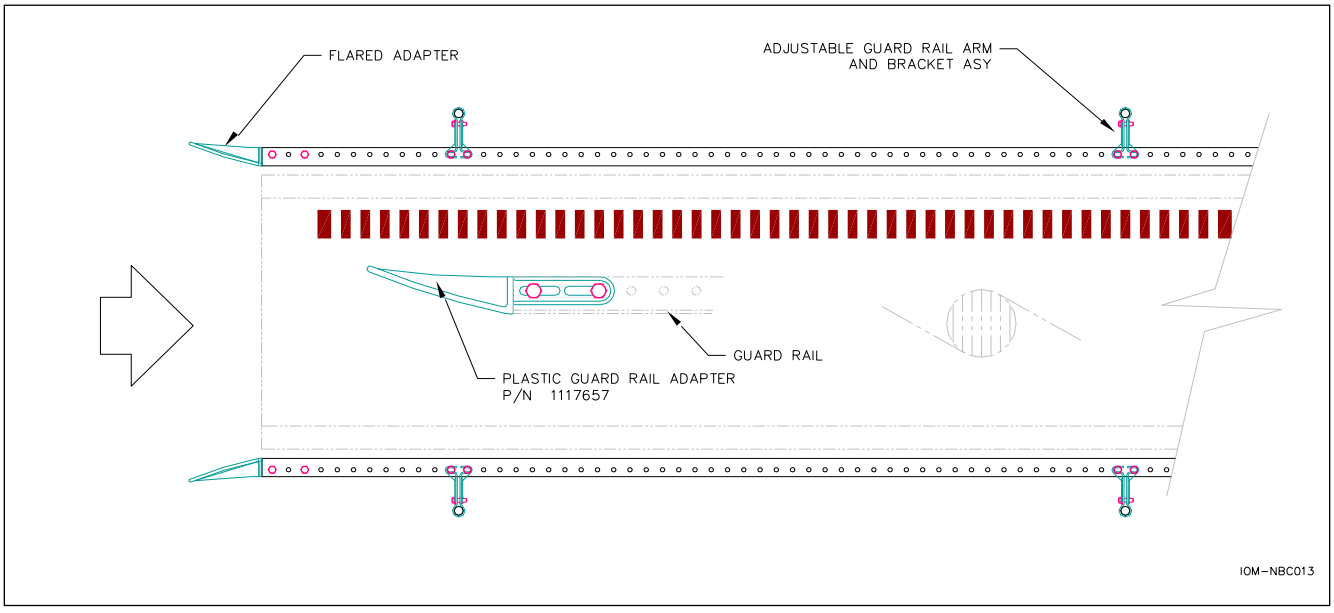
Use 1-1/2" angle for low C6 channel guardrail

For all elevations requiring high guardrail, the NBC is designed to use adjustable guardrail. The configurations and associated part numbers are shown below.



Adjustable guard single high and double high

Flared lead-in section for adjustable channel guardrail.



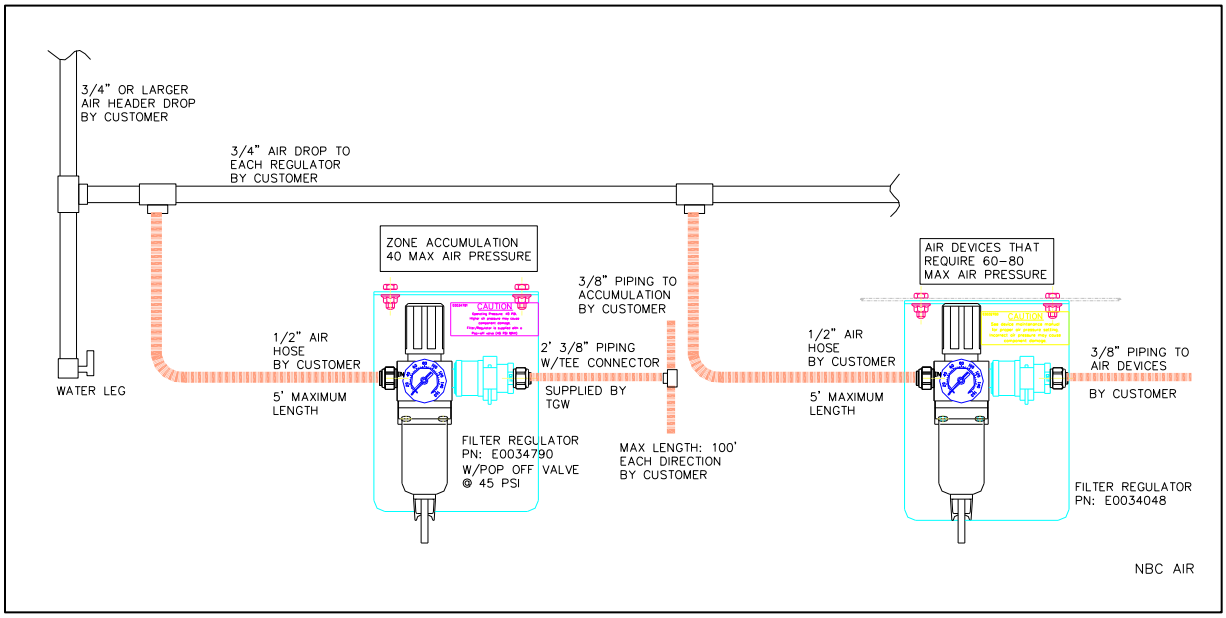
Use part #117657 at the entrance of all adjustable channel guardrail

CRUZchannel to C6 Nose Piece

A CRUZchannel to C6 nosepiece provides a smooth transition for products moving from rollers high conveyor to rollers low conveyor.

C6 to CRUZ nosepiece

Air Supply Requirements



General

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

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.

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.

NOTE
The pneumatic system for NBC installations does not require lubrication. Lubrication may affect the valving operation and cause sluggish or erratic operation.

CAUTION

- All factory air-lines must be thoroughly blown out to clear all debris.
- The regulator must be set at 30 - 40 PSI prior to connecting air to NBC.
- 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 valving.

Low Pressure Switch

CAUTION

- Loss of conveyor control will occur if air pressure is not maintained.
- A pressure switch is required to be installed into the pneumatic circuit feeding an NBC conveyor system to detect a drop in air pressure below operating limits.
- Conveyor system must be shut-off if low pressure is indicated.

Pneumatic Requirements

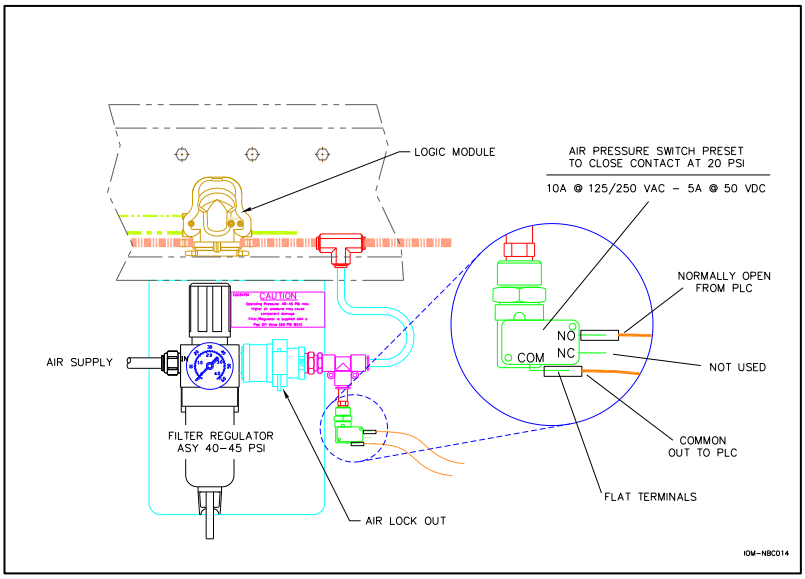
1. MHS Conveyor supplied pressure regulator is required. (PN E0034790)
2. Regulator pressure set at 30 - 40 PSI.
3. Maximum conveyor length each way from regulator is 100'.
   Locate the regulator in center of conveyor for minimum air pressure drop.
4. Low pressure switch to be set to indicate a pressure drop below 20 PSI.
5. In high humidity or low temperature, use an air dryer.
6. Use 5 micron filter.
7. Lockout/shutoff valve to be provided by air system installer for factory high pressure line before regulator.
8. Low pressure switch is recommended.

Other:

1. Compressor HP = total CFM ÷ 3.55
2. Air tank size = approx. 1 gallon per CFM

The formulas to determine air consumption follows:

SCFM = .0012 x number of zones x releases per minute for NBC contact accumulation.



CRUZcontrol®

CRUZcontrol is MHS Conveyor accumulation logic package. It utilizes a simple electronic sensor control system providing features that accommodate all accumulation control requirements. This cost-effective logic package is a standard feature of NBC.

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 featuring CRUZcontrol Logic.

This section of the manual describes basic installation practices, assembly arrangements, preventive maintenance and assists in replacement parts identification. It 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 information is to be used as a guide only.

CAUTION

- Add a soft start to all NBC conveyors for speed of 180 FPM and above. A controlled speed start-up prolongs belt lacing life at all speeds.

Definition of Terms

Logic Assembly
The logic assembly is used to setup the type of automatic accumulation of product on the conveyor.

ATB
Air-to-brake (Type of Logic assembly used in NBC conveyors – Normally Open Valve)

Function Module
The function module provides electrical isolation for external signals used to control a CRUZcontrol system.

Downstream or Upstream
In this manual, it is always in reference to product conveyor flow.

OFF
Off indicates a logical low signal and/or no power. For example if a logic line is OFF, there is no power on the logic line.

ON
On indicates a logical high signal and/or powered. For example if a slug line is ON, then there is power on the slug line.

Zone status
The zone is considered full if the local zone's sensor detects a package. The zone is empty if it does not detect a package

JP#, #-#
JP stands for "jumper terminal" and the number indicates which jumper terminal is being referenced. The "**#-#**" refers to the pins that are connected by the actual jumper. NC means the jumper is not connected to any terminal.
Ex. jumper terminal #1 pins 1 & 2 (JP1, 1-2)

TB#, #-#
TB stands for "terminal block" and the number indicates which terminal block is being referenced. The "**#-#**" refers to the pins that are being used on that terminal block.
Ex. terminal block #1 pins 1 & 2 (TB1, 1-2)

CRUZcontrol Concepts

The CRUZcontrol product line is a set of off the shelf components used to setup accumulation and discharge on NBC conveyor. It consists of logic modules that detect product which control accumulation, function modules that release product, and 24 VDC power supplies. There are also accessories such as sensors and cables to ease installation and interfacing.

CRUZcontrol is a 24 VDC system that will automatically start accumulation when product reaches the end of an accumulation line. When a release signal is applied to a function module that is installed at the discharge end of an accumulation line, the product will begin to release. Product will continue to release until the signal is removed. The type of accumulation that occurs is based on the mode that the logic assembly has been configured for. The type of product release is based on logic assembly mode and function module setup.

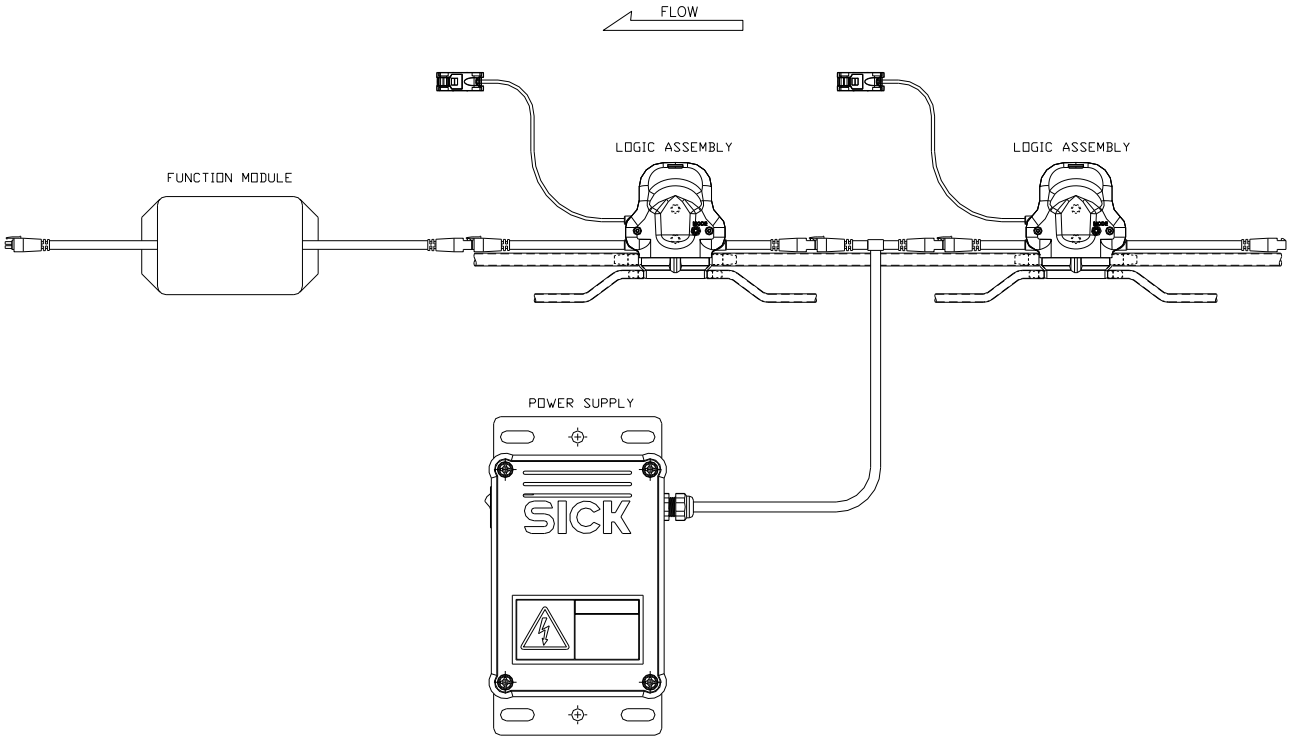


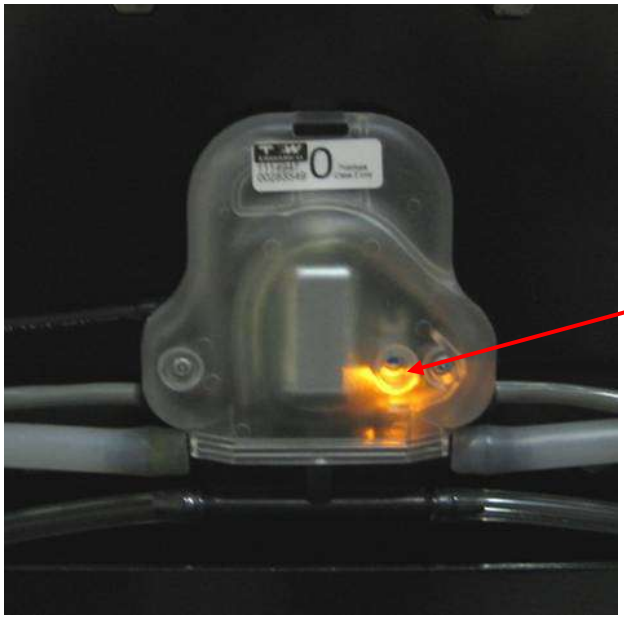
Figure 1: Basic Concept Layout

Basic and Progressive Logic

Every NBC accumulation conveyor is equipped with logic modules that can be switched from basic to progressive logic with a manually activated toggle switch. A green light indicates basic mode and an amber light progressive mode.

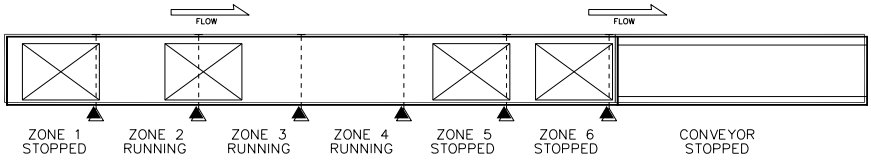
The manner in which basic and progressive logic modes change accumulation and release are explained in the following pages.

Green light indicates basic mode



Amber light indicates progressive mode

Basic Logic



Basic Logic Operation

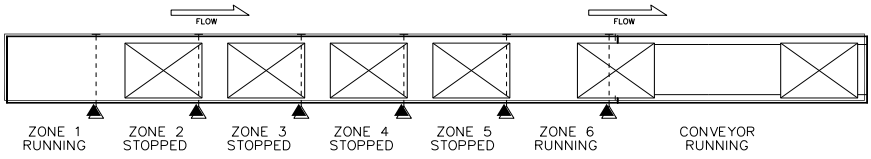
Basic Logic functions such that when any two successive photoelectric sensors are blocked, the upstream zone is set to accumulate (stop driving).

In the above example:

- The discharge zone, Zone 6, is shown stopped, signifying that release from the zone is being inhibited and the Zone 6 sensor is blocked.
- When the Zone 6 sensor AND the Zone 5 sensor is blocked Zone 5 will stop running.
- Zone 4 and Zone 3 sensors are not blocked, and the zones are running.
- Zone 2 sensor is blocked, but the zone is running because the Zone 3 sensor is NOT blocked.
- Zone 1 is not driving because both Zone 1 AND Zone 2 sensors are blocked.

NOTE

(Basic Logic) Products being transported on accumulation conveyor are separated by a gap of one zone length upon release. This will reduce the transportation throughput capacity of the conveyor. The rate at which product is introduced onto an accumulation conveyor of this type must not exceed the transportation rate of the conveyor.



Discharge from Basic Logic

A release signal given to the Zone 6 Logic Assembly releases product from that zone. As released product clears the electronic sensor, the product stopped at the next upstream zone is driven forward.

This will create a one-zone length gap between all released products, assuming conveyor speeds (accumulation conveyor and downstream conveyor) are identical.

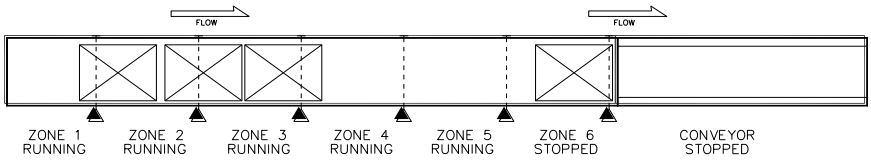
NOTE

If the accumulation logic is set to Slug Release instead of Singulation Release, all affected zones will run, resulting in the release of product with little or no gaps. This overrides the normal Basic Logic function.

Progressive Logic

Progressive Logic Operation

Progressive accumulation functions such that no zones are set to accumulate unless ALL the downstream electronic sensors are blocked, meaning that all downstream zones hold accumulated product.

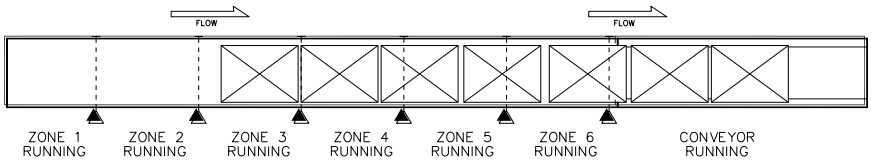


In the above example, the discharge zone, Zone 6, is shown stopped which is the result of the release from the zone being inhibited (receiving conveyor is stopped) and the Zone 6 sensor being blocked.

Zone 5 sensor not being blocked results in all upstream zones, Zone 1 through Zone 5, running.

NOTE

(Progressive Logic) Products being transported on accumulation conveyor can remain tightly packed, without any gaps being created. The transportation throughput capacity of the conveyor is not reduced due to zoned accumulation.



Discharge from Progressive Logic

When the discharge zone, Zone 6, is provided a release signal, all upstream zones also release.

There is no gap between released products, assuming conveyor speeds (accumulation conveyor and downstream conveyor) are identical.

The Progressive Logic discharge functions the same as a Slug Release. Initiating the Slug Release will also result in all products releasing, regardless of zone conditions.

CAUTION

- CRUZcontrol Logic Assemblies are designed to be fail-safe.
- A loss of module power, a disconnected or severed cable, or a dirty or failed photoelectric sensor will all result in the stopping of a zone, initiating accumulation beginning from the affected zone assuming that air pressure is present.
- With Progressive Logic, failure of a Logic Assembly to function properly could possibly result in product accumulating with zones not stopping as required.
- While this should be unlikely due to the fail-safe nature of the Logic Assembly, the effects of such a failure should be considered. This type of failure could result in excessive line pressure, eventually causing product to push through the discharge zone of the conveyor. Jam detection sensors should be used as appropriate to minimize the effects of such a failure.
- A pressure switch should disconnect conveyor motors from running in a low or no air pressure situation.

Application – CRUZ®logic

Logic Modules and Release Rates

Your NBC conveyor comes with a field switchable logic module for every zone. All the logic modules are shipped in the basic mode. This will be indicated by a green light when the 24VDC power is activated.

Basic Release

In the basic release mode, all logic modules are set to basic. The release efficiency will generally be 40% to 50% depending on the conveyor speed and the type of release at the discharge of the unit. A timed pulse release is generally more efficient than a one time “flush” type of release.

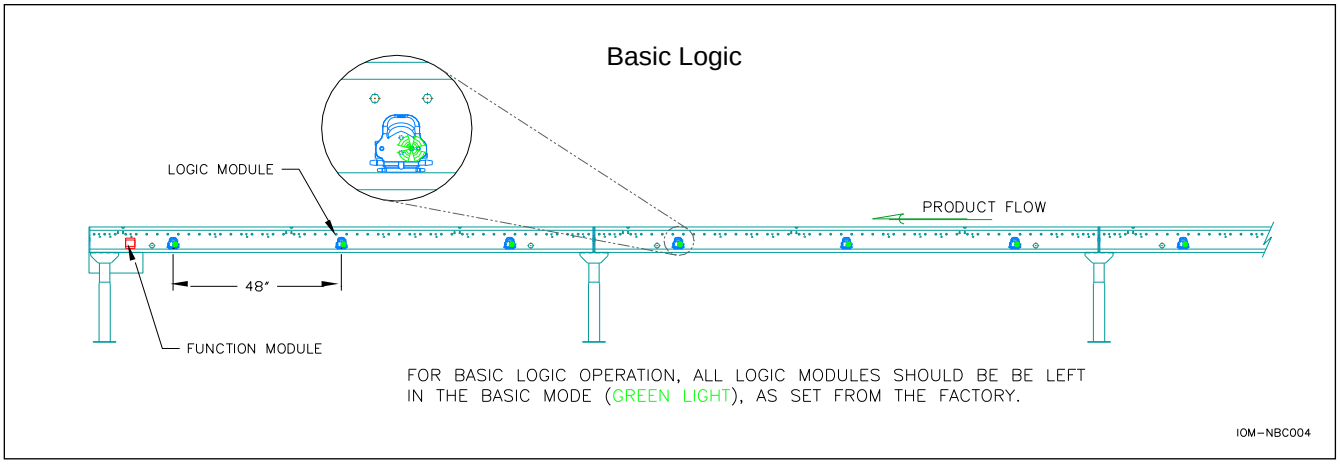
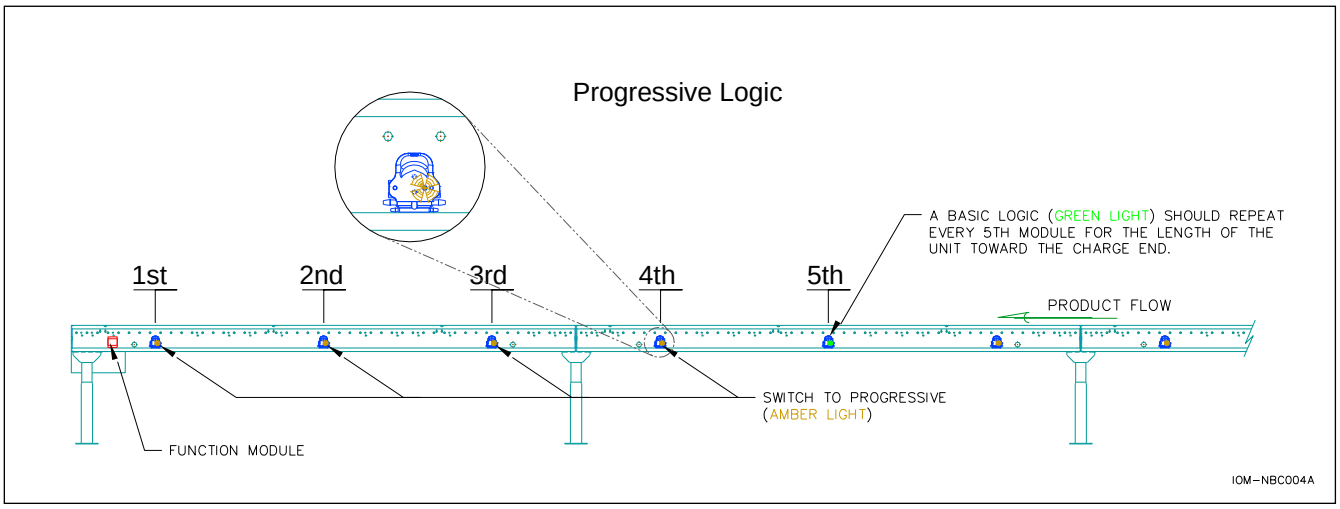


Diagram of conveyor modes are all set to basic

Progressive Release

Conveyors should not be operated with 100% of the logic modules switched to the progressive mode in the contact accumulation mode. This could cause line pressure issues if there is a jam since in the release mode, progressive ignores the photo sensors and dumps all the zones at once, in the same way slug discharge operates. **In the progressive release mode for contact accumulation, it is extremely important to set every 5th logic module to basic. Do not set all logic modules to progressive unless your line is under 20' long.** This limits a product jam condition line pressure to 16' of conveyor. Failure to set every fifth logic module to basic can result in extreme line pressures that can damage your conveyor, product and could cause injury.

Release efficiencies in progressive mode (every fifth logic module set to basic) are in the 70% to 90% range depending on speed and type of release at the discharge of the unit.



Application – NBC Releasing Accessories

Two items are always required at the discharge end of an NBC accumulation conveyor:

1. A signal to release or accumulate product
2. A method of stopping coasting product (contact accumulation only)

Release function module at discharge end of NBC conveyor

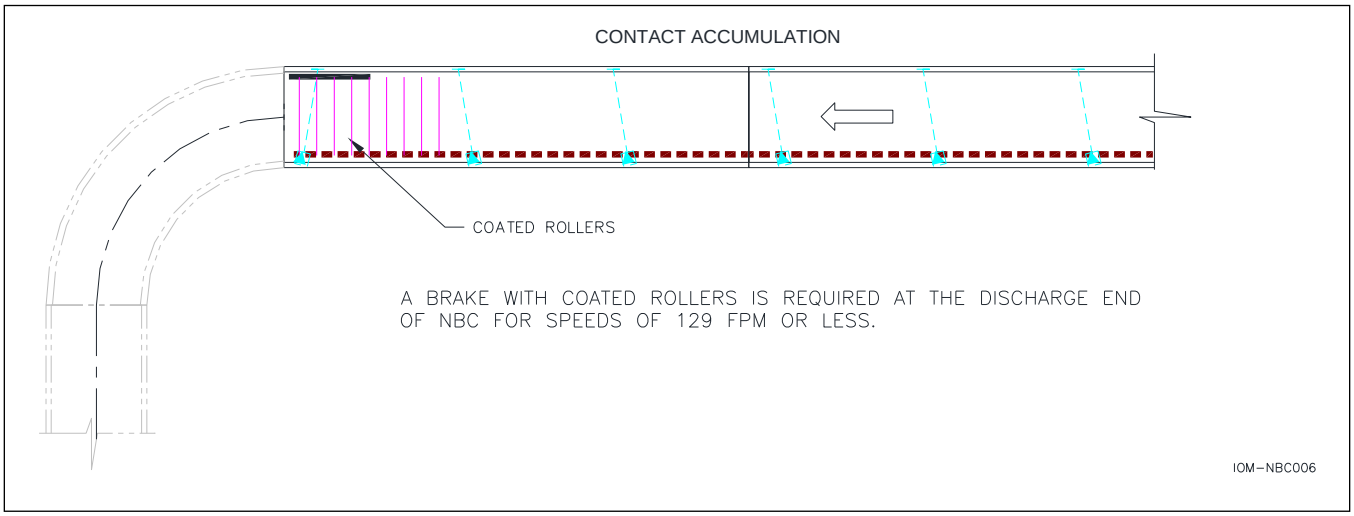
A Signal to Release or Accumulate Product

This is normally a 24VDC signal from the system PLC to the release Function Module on the NBC. Part numbers and complete wiring descriptions for release function modules are explained in the CRUZcontrol in this section.

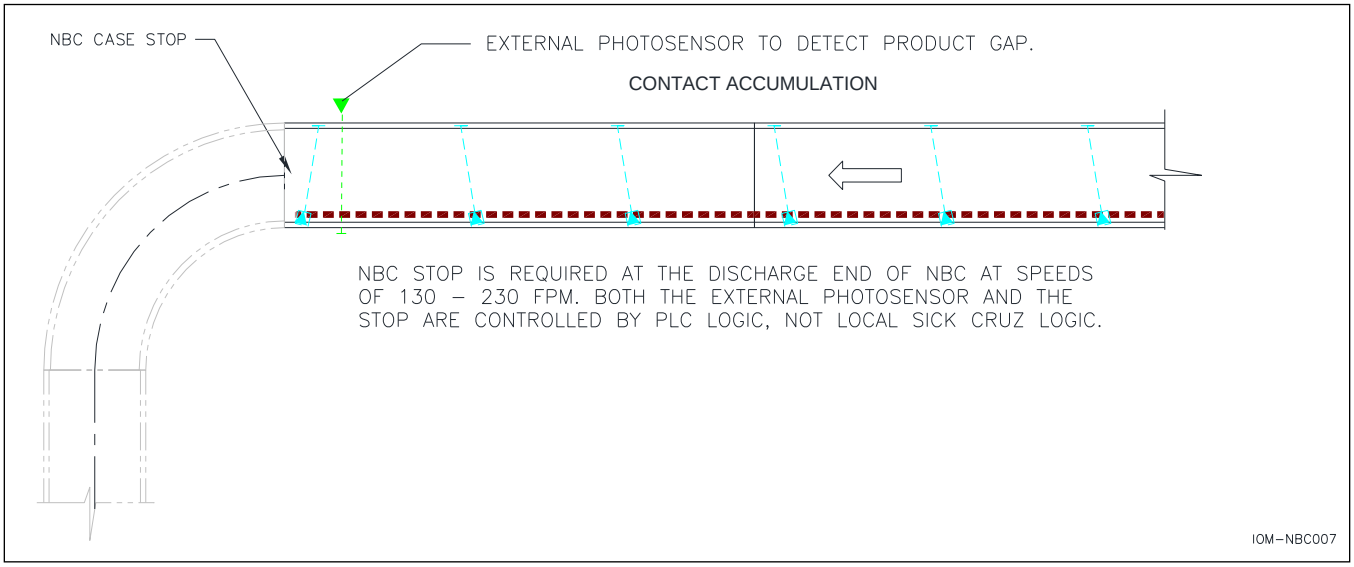
Exercise extreme caution in activating the slug release line (TB-2) instead of the singulation logic line (TB-1). If used at all, it should be limited to the discharge 20' or less of conveyor. A slug interrupt cable (item number 1117382) can be used to break this signal where you want the slug release to stop. It should be noted that the same result can be accomplished by switching the discharge logic modules from basic to progressive instead of using the slug release input. Using the slug release input will override the basic/progressive release settings of all logic modules.

A Method of Stopping the Coasting Product

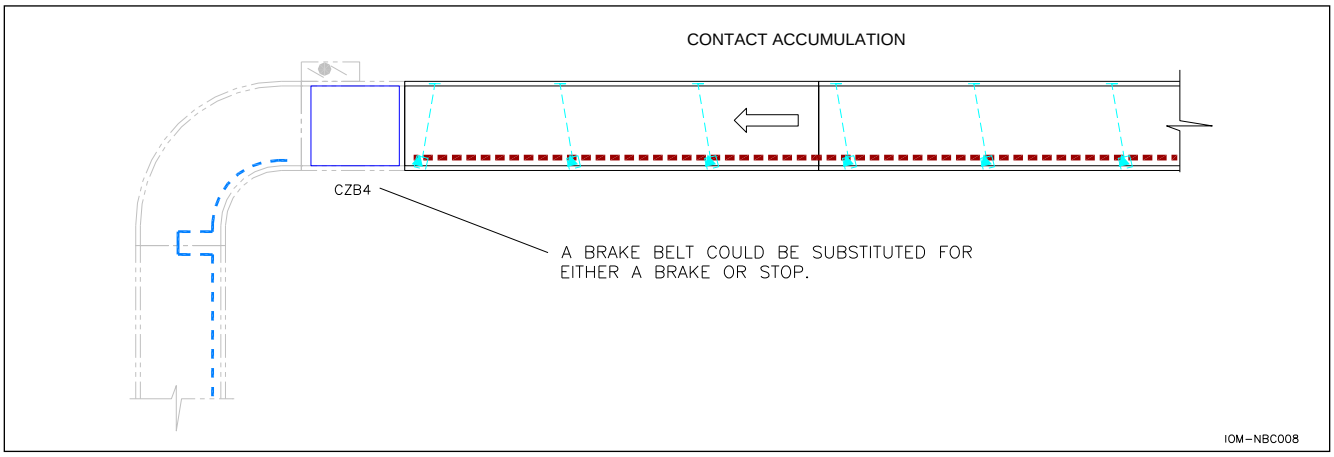
The following diagrams describe three different methods of stopping coasting products.



For speeds up to 129 FPM, a brake with six coated rollers is sufficient. Standard brake kits are available for NBC.



For speeds from 130 FPM to 230 FPM, a stop is recommended at the discharge end of NBC to stop the coasting product and begin accumulation. Standard stop assemblies are available for NBC. Please note that a stop cannot be allowed to come up under a product. An external PLC controlled sensor must be used to detect a gap and then activate a solenoid to raise the stop.



A belt unit downstream can be used in place of either a brake or a stop. If this belt option is selected, use the CRUZ®belt 4 series.

CRUZcontrol Components

CRUZcontrol Logic Assembly

The CRUZcontrol Logic Assembly consists of a polarized retro-reflective type photoelectric sensor, pneumatic valve and logic module integrated into one assembly.

The photoelectric sensor will function reliably on conveyor widths up to 34" between frames. The sensor is polarized, and is not affected by shiny surfaces. On NBC applications, the reflector is mounted with a 6 inch offset from the photoelectric sensor, so that the sensor scans across the conveyor on a slight angle.

The sensor bracket as provided allows for easy adjustment of the sensor. An amber LED output indicator on the back of the sensor aids in the adjustment of the sensor. The LED is off if the sensor is not aligned, flashes if functional but marginally aligned, and is on steady if properly aligned. A green LED indicates power on status.

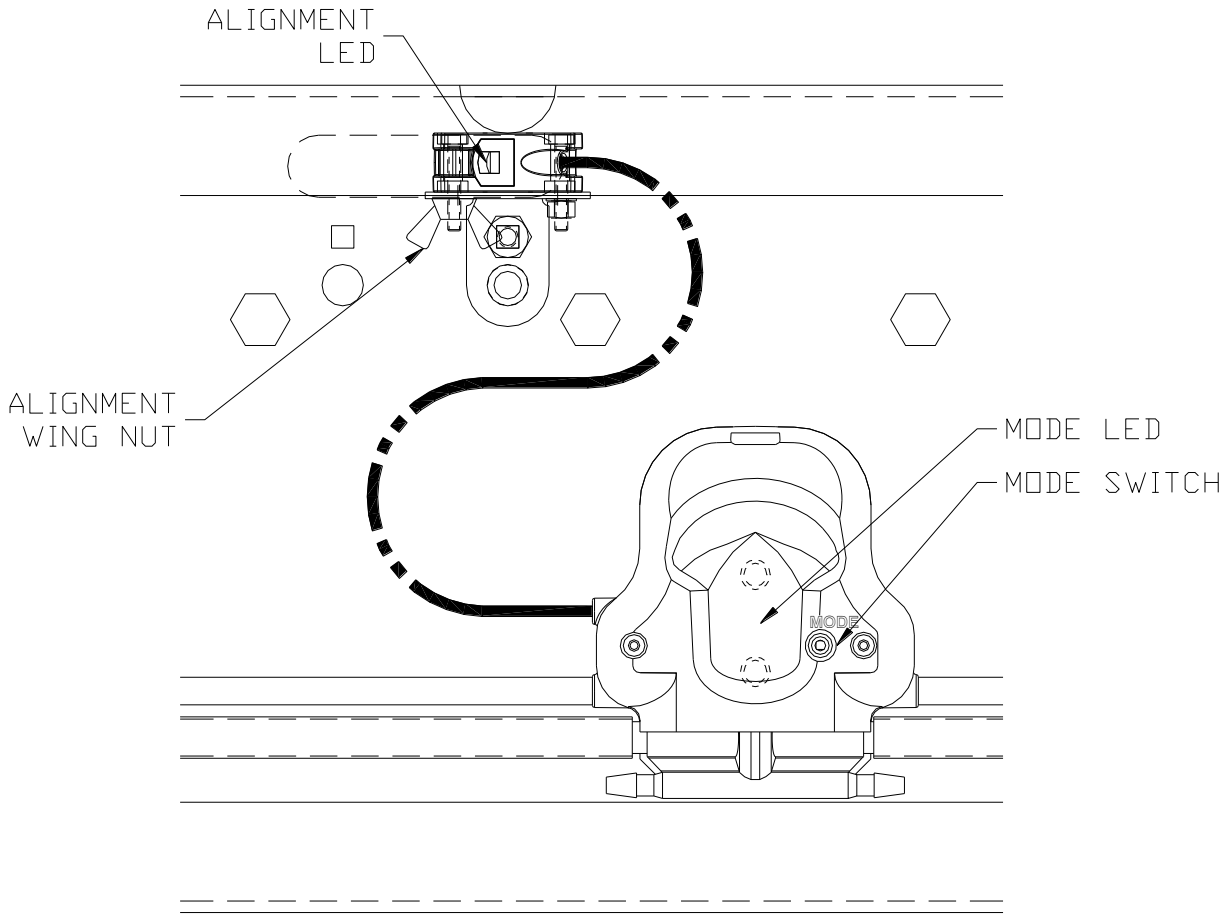


Figure 2: Logic Assembly Mode & Alignment

Logic Assembly Types

The CRUZcontrol Logic Assembly 1114947 provides an “air to brake” logic output utilizing a normally open pneumatic valve. The pneumatic valve is energized for a zone to be running.

Logic Assembly Functions

The CRUZcontrol Logic Assembly comes with a momentary button on the front of the housing allowing for selection of either Basic Logic or Progressive Logic mode. A Mode LED indicates either Basic (green) or Progressive (amber) has been selected. Pressing and then releasing the button toggles between the two modes.

Table 1: Logic Assemblies Functions

Function	Basic Logic	Progressive Logic
Single Accumulate	Yes	No
Slug Accumulate	No	Yes
Single Release	Yes	No
Slug Release	Yes	Yes

Logic Assembly Part Numbers

Table 2: Logic Assemblies Part Numbers

Part Number	Description	Used with
1114947	Basic/Progressive Logic Module, Air to Brake,	NBC straight conveyor

Function Modules

The Function Module provides electrical isolation for external controls and creates controllable zones to facilitate CRUZcontrol applications.

Function Module Types

There are two different Function Modules, each providing a set of functions: Full Function Module (1116731) and Release Function Module (1116732).

Table 3: Function Module Types

	Single Release	Slug Release	Pulsed Release	Zone Stop	Zone Delay	Logic Interrupt	Slug Interrupt	Zone Status
Full Function Module	x	x	x	x	x	x	x	x
Release Function Module	x	x		x		x	x	

Function Module Functions

All directions of upstream and downstream are given with respect to the Function Module. All jumper terminals are on pins 1-2 unless noted otherwise.

Table 4: Function Module Functions

Single Release	
Definition	Upstream logic line is turned on. The upstream Logic Assembly will release regardless of zone status.
Configuration	When using TB1; JP3,1-2 to release the upstream Logic Assembly. When using TB4; JP4,1-2 to release the upstream Logic Assembly
User Action	Apply a high (24VDC/115VAC) signal to TB1,1-2 if using isolated inputs. Or Apply a high (24VDC) signal to TB4, 3 if using a non-isolated input.

Slug Release	
Definition	The slug line is turned on. All Logic Assemblies that are connected in one continuous string will release at the same time regardless of zone status.
Configuration	When using TB2; JP1,1-2 and JP2,1-2 to release all Logic Assemblies.
User Action	Apply a high (24VDC/115VAC) signal to TB2,1-2 if using isolated inputs.

Pulse Release	
Definition	Upstream Logic Assembly releases for a length of time set by the ZS ON potentiometer (0-20s) and then accumulates for length of time set by the ZS OFF potentiometer (0-20s).
Configuration	When using TB1; JP3,NC to oscillate the release of the upstream Logic Assembly. Adjust ZS ON and ZS OFF potentiometers from 0 to 20 seconds.
User Action	Apply a high (24VDC/115VAC) signal to TB1,1-2 if using isolated inputs.

Logic Interrupt	
Definition	Upstream logic line is turned off. The upstream Logic Assembly is forced to accumulate when it detects a package regardless of the downstream zone status.
Configuration	When using TB1; JP3,2-3 to accumulate the upstream Logic Assembly. When using TB4; JP4,2-3 to accumulate the upstream Logic Assembly.
User Action	Apply a high (24VDC/115VAC) signal to TB1,1-2 if using isolated inputs. Or Apply a high (24VDC) signal to TB4, 3 if using a non-isolated input.

Zone Delay	
Definition	Delays turning on the upstream logic line. After the downstream zone clears, the upstream Logic Assembly releases, but only after a length of time set by LOGIC potentiometer (0-20s).
Configuration	Adjust LOGIC potentiometer from 0 to 20 seconds.
User Action	No action required.

Slug Interrupt Downstream	
Definition	Downstream slug line is disconnected. Logic Assemblies downstream will not slug release when the Slug Release signal goes high.
Configuration	JP1, 2-3 all other jumper terminals should be on pins 1-2.
User Action	No action required.

Slug Interrupt Upstream	
Definition	Upstream slug line is disconnected. Logic Assemblies upstream will not slug release when the Slug Release signal goes high.
Configuration	JP2, 2-3 all other jumper terminals should be on pins 1-2.
User Action	No action required.

Zone Status Indication	
Definition	Indicates full or empty status of the downstream zone on TB3.
Configuration	JP4, 1-2 and JP5, 1-2 for logic status or 2-3 for sensor status, all other jumper terminals should be on pins 1-2.
User Action	Connect to TB3 for zone status. The output transition of the Zone Status from OFF to ON or ON to OFF can be delayed by the Zone Status ON and Zone Status OFF Delay potentiometers. This is typically used to indicate a zone is full only after a product is detected for period of time.

Terminal Block Descriptions

Table 5: Terminal Block Descriptions

Terminal Descriptions	
TB1	Single release, Logic interrupt, Pulse release.
	This terminal is an isolated input; it must be used when signal voltage is from a supply that is different than the supply powering CRUZcontrol logic assemblies. It can be used when signal voltage is from same power supply that is powering CRUZcontrol logic assemblies.
TB2	Slug release.
	This terminal is an isolated input; it must be used when signal voltage is from a supply that is different than the supply powering CRUZcontrol logic assemblies. It can be used when signal voltage is from same power supply that is powering CRUZcontrol logic assemblies.
TB3	Zone Status (TB3 only available on full function module)
	This terminal is an isolated output; it must be used when signal voltage is from a supply that is different than the supply powering CRUZcontrol logic assemblies. It can be used when signal voltage is from same power supply that is powering CRUZcontrol logic assemblies.
TB4	Inputs
	This terminal is a non-isolated input; it must be used when signal voltage is from same power supply that is powering CRUZcontrol logic assemblies.
TB5	Outputs
	This terminal is a non-isolated outputs; output signal voltage is from same power supply that is powering CRUZcontrol logic assemblies.

Jumper Descriptions

Table 6: Jumper Descriptions

Jumper Descriptions	
JP1	Downstream slug control
	Pins 1-2 = slug pass through Pins 2-3 = slug interrupt Pins 3-4 = slug interrupt Pins 4-5 = singulation to slug crossover Pins NC = slug interrupt
JP2	Upstream slug control
	Pins 1-2 = slug pass through Pins 2-3 = slug interrupt Pins NC = slug interrupt
JP3	Release control at TB1
	Pins 1-2 = single release Pins 2-3 = logic interrupt Pins NC = pulsed released
JP4	Release control at TB4
	Pins 1-2 = single release Pins 2-3 = logic interrupt Pins NC = zone status input (determined by JP5)
JP5	Zone Status control (JP5 only available on full function module)
	Pins 1-2 or NC = downstream logic status Pins 2-3 = downstream sensor status

Use of 115 VAC Controls

Important information regarding the use of 115 VAC controls:

These Function Modules will accept 115 VAC level control inputs. There are some cautions that must be observed to avoid Function Module hardware failure.

Function Module signal inputs are protected against 500 volt spikes. 115 VAC control signal wiring run in conduit along with higher voltage motor wiring could experience voltage spikes that exceed the 500 volt limit. This can be prevented by running control wiring in separate conduit from motor wiring. Additional protection for the Function Module inputs can be achieved by using an MOV (metal oxide varistor) placed across the input terminals within the Function Module. Suggestions of suitable MOV's would include Panasonic ERZV07D241 or Littlefuse V250LA2.

Long conduit runs with motor wiring for multiple motors, and the use of variable frequency drives, all contribute to electrical noise, with a good potential for high voltage spikes. If there is any doubt, the control signals to the Function Modules should be run in conduits separate from motor wiring.

The Function Module signal inputs have high impedance. When connected to some output devices, such as some PLC triac outputs, the inputs could sense an "on" state even if the output connected to it is not on. This can be corrected by adding additional loading to the output. This can be done by adding a loading resistor, placed across the output terminals. Do not put this resistor inside of the Function Module. The size and wattage rating of the resistor would depend on the output characteristics of the PLC card. A typical value would be 10,000 ohms (10K ohms) and 2 watts. The resistor must be able to dissipate 1.32 watts at 115 VAC, so it will get warm.

Function Module Part Numbers

Table 7: Function Module Part Numbers

Part Number	Description
1116731	Full Function Module
1116732	Release Function Module

Figure 3: Function Modules

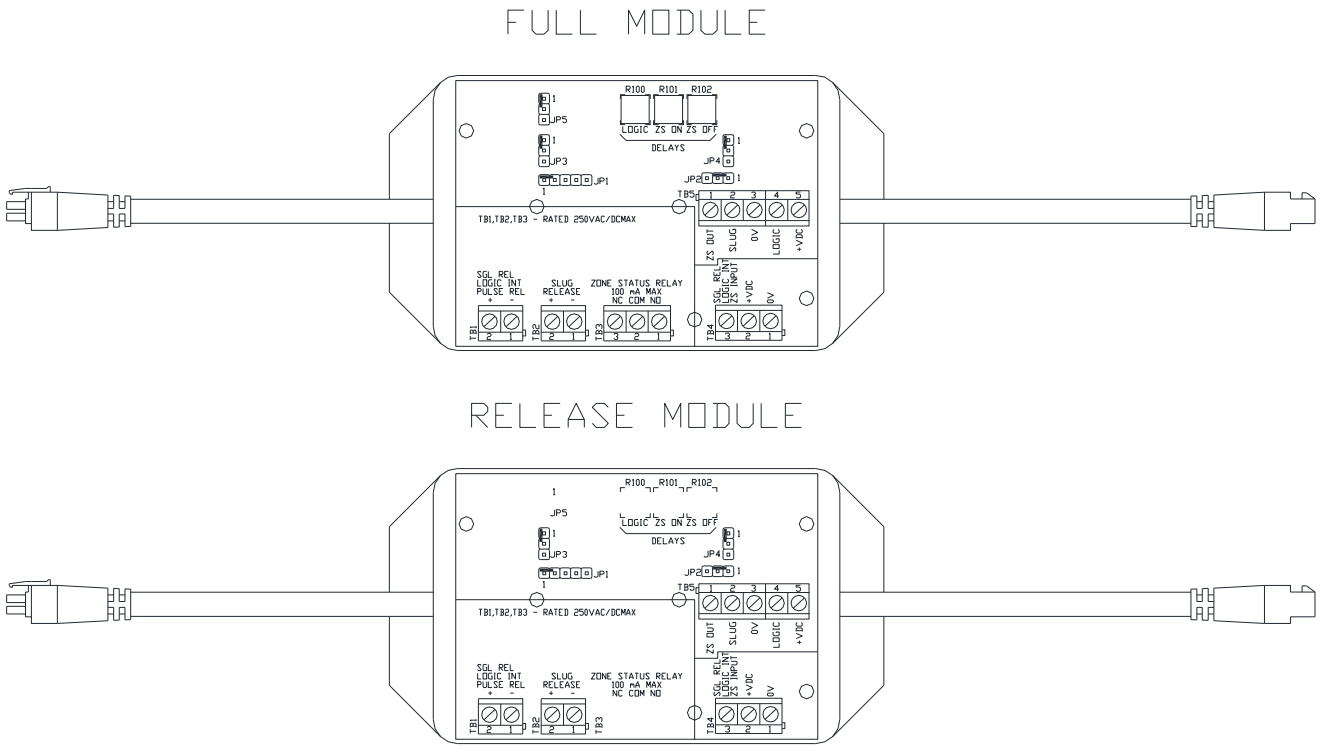


Figure 4: Full Function Module Board Layout

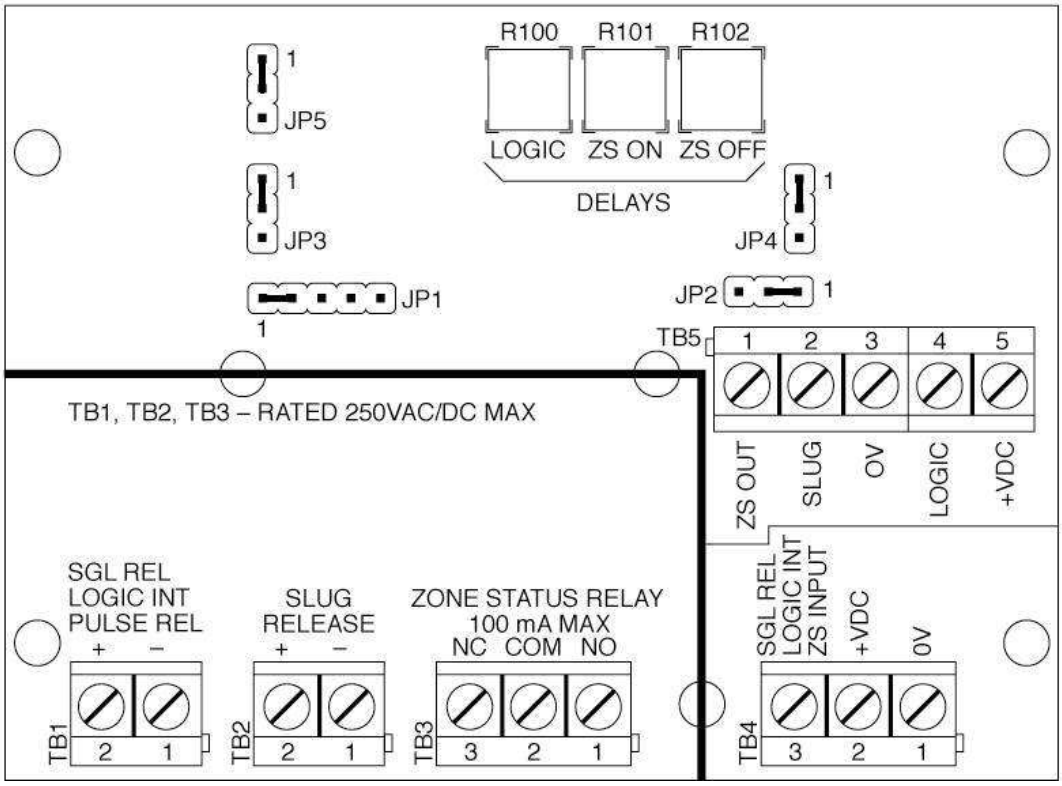


Figure 5: Full Function Module Circuit

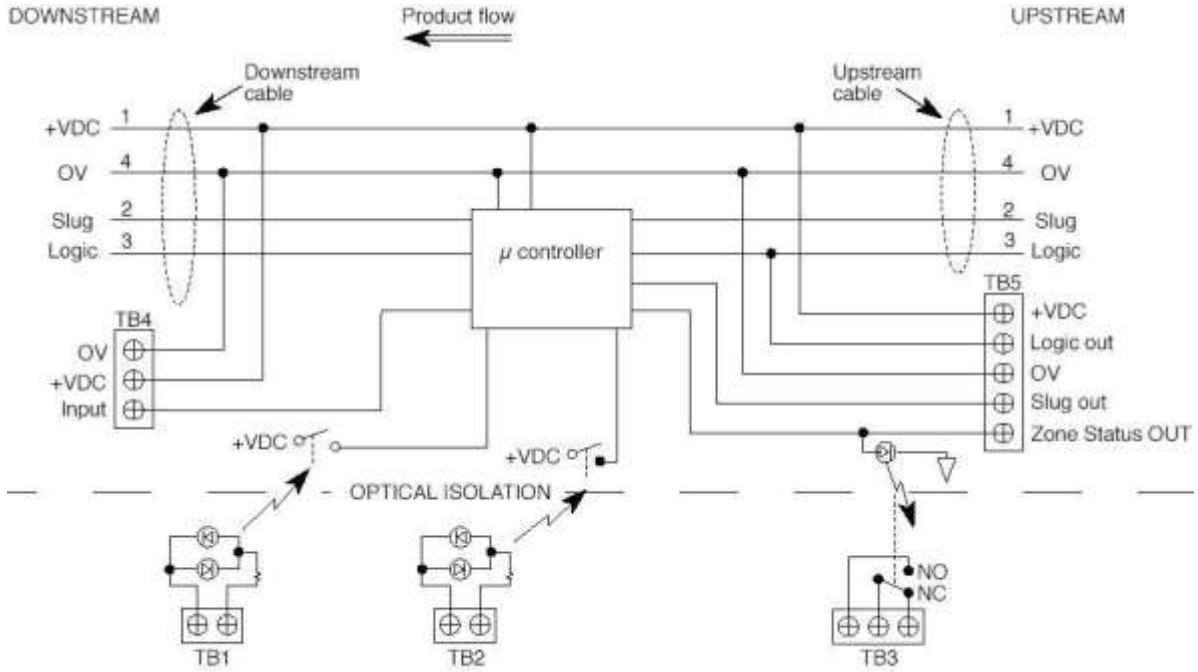


Figure 6: Release Function Board Layout

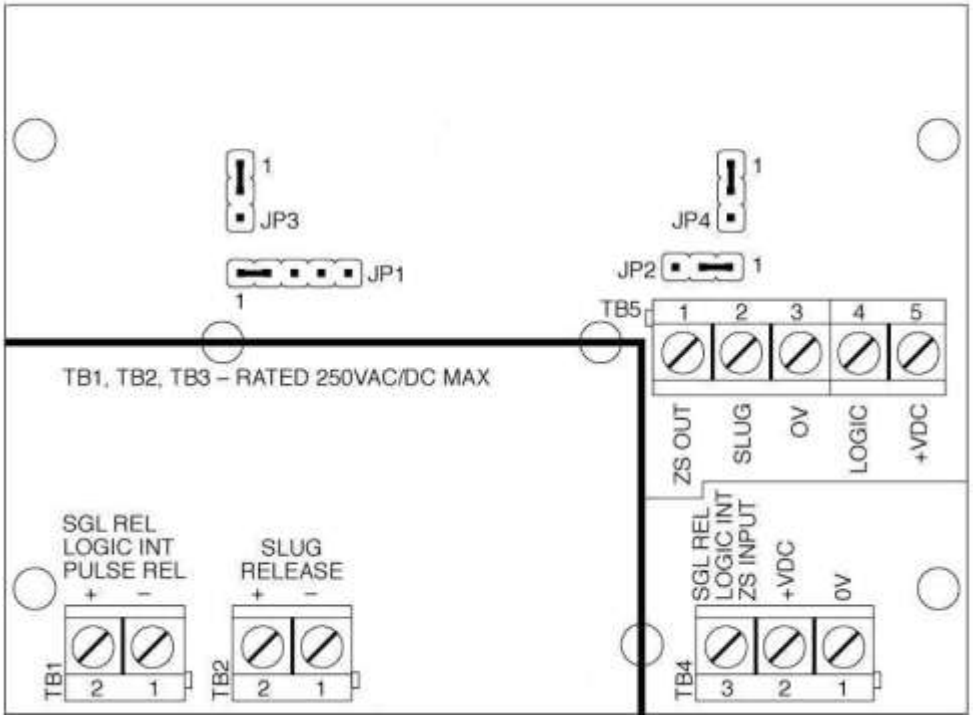
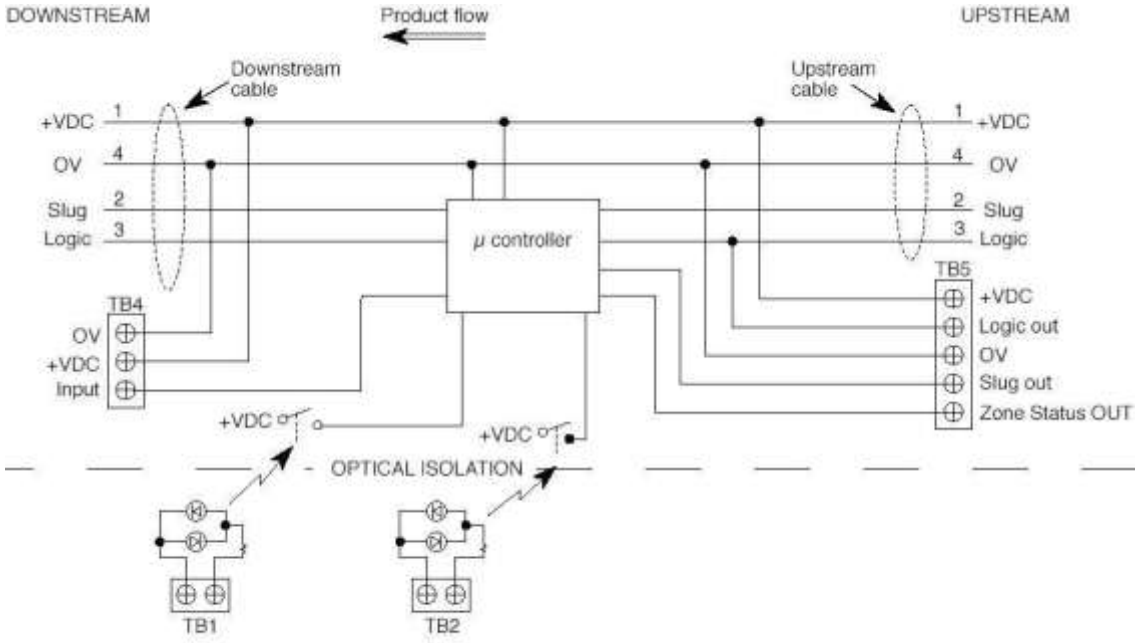


Figure 7: Release Function Module Circuit



Power Supplies

A 24 VDC power supply is needed to power the logic assemblies and the function modules. One power “T” cable is prewired to each power supply. Power supplies is available in 120 VAC or 480 VAC input versions.

Power Supply Requirements

CRUZcontrol operates from a Class 2 power supply voltage of 24 VDC. This limits the total number of CRUZcontrol Logic Assemblies that can be connected to one power supply. There is also a limit on the maximum number of Logic Assemblies that can be in one continuous string, based on the cable length and power requirement of Logic Assemblies. More than one string of Logic Assemblies can be connected to a power supply, as long as the power supply output rating isn’t exceeded.

The Function Modules require 10mA of current at 24 VDC. This needs to be considered, as it will reduce the total number of Logic Modules that can be connected to one Class 2 power supply to a quantity less than stated in Table 8.

Table 8: Maximum Number of Logic Modules per String – 100-240 VAC

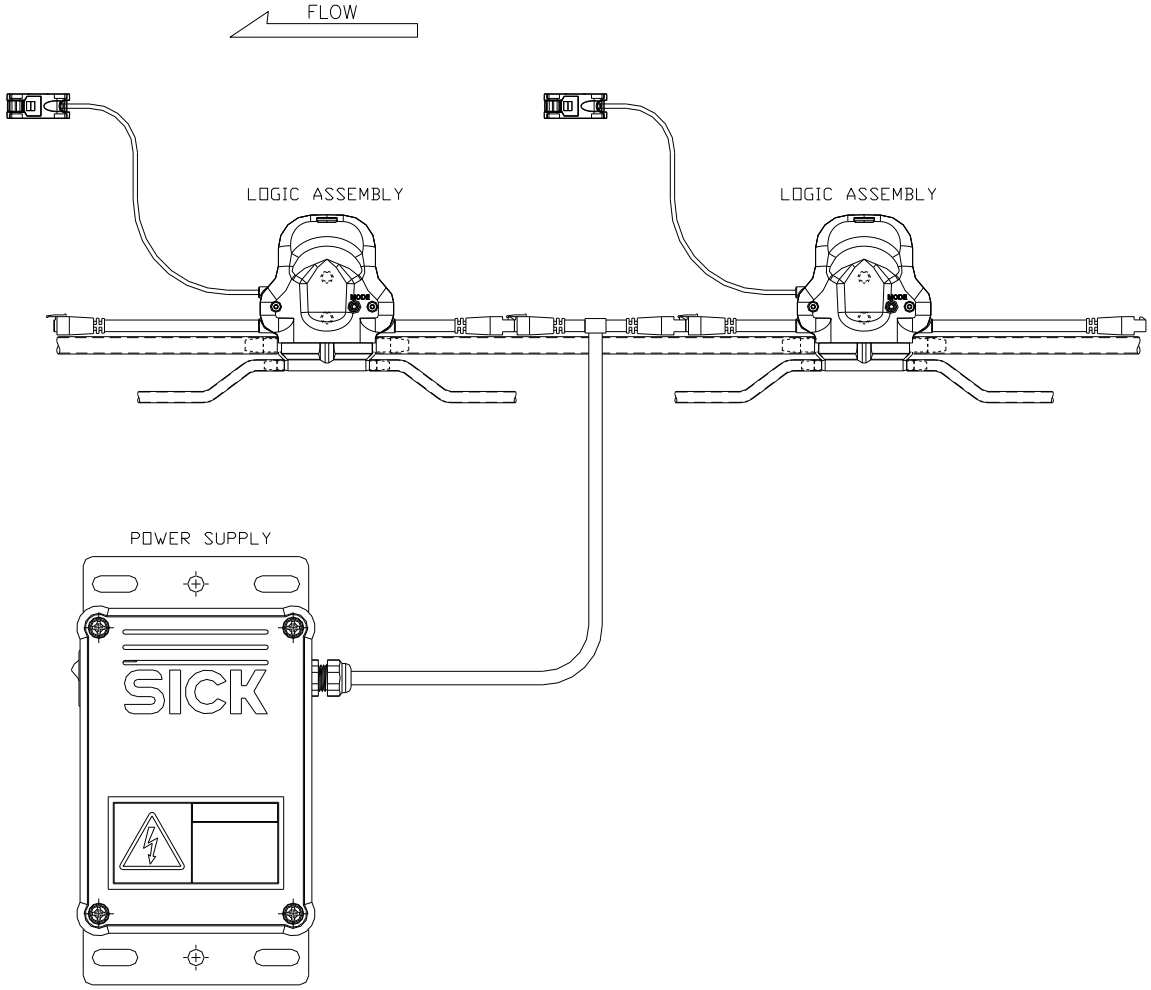
Number of Zones	Zone Length	Number of Zones
End Tap (24VDC) 100-240VAC	4 ft. zones	27
Center Tap (24VDC) 100-240VAC	4 ft. zones	52
End Tap (24VDC) 380-480VAC	4 ft. zones	27
Center Tap (24VDC) 380-480VAC	4 ft. zones	50

Power Supply Wiring

Connection made between two Logic Assemblies using a T Cable

This drawing illustrates a power connection made between two intermediate accumulation zones making use of a “T” Cable. Note that all power and control signals, including the Slug and Logic Signals, pass through the “T” Cable uninterrupted.

Figure 8: Two Logic Assemblies using a T Cable



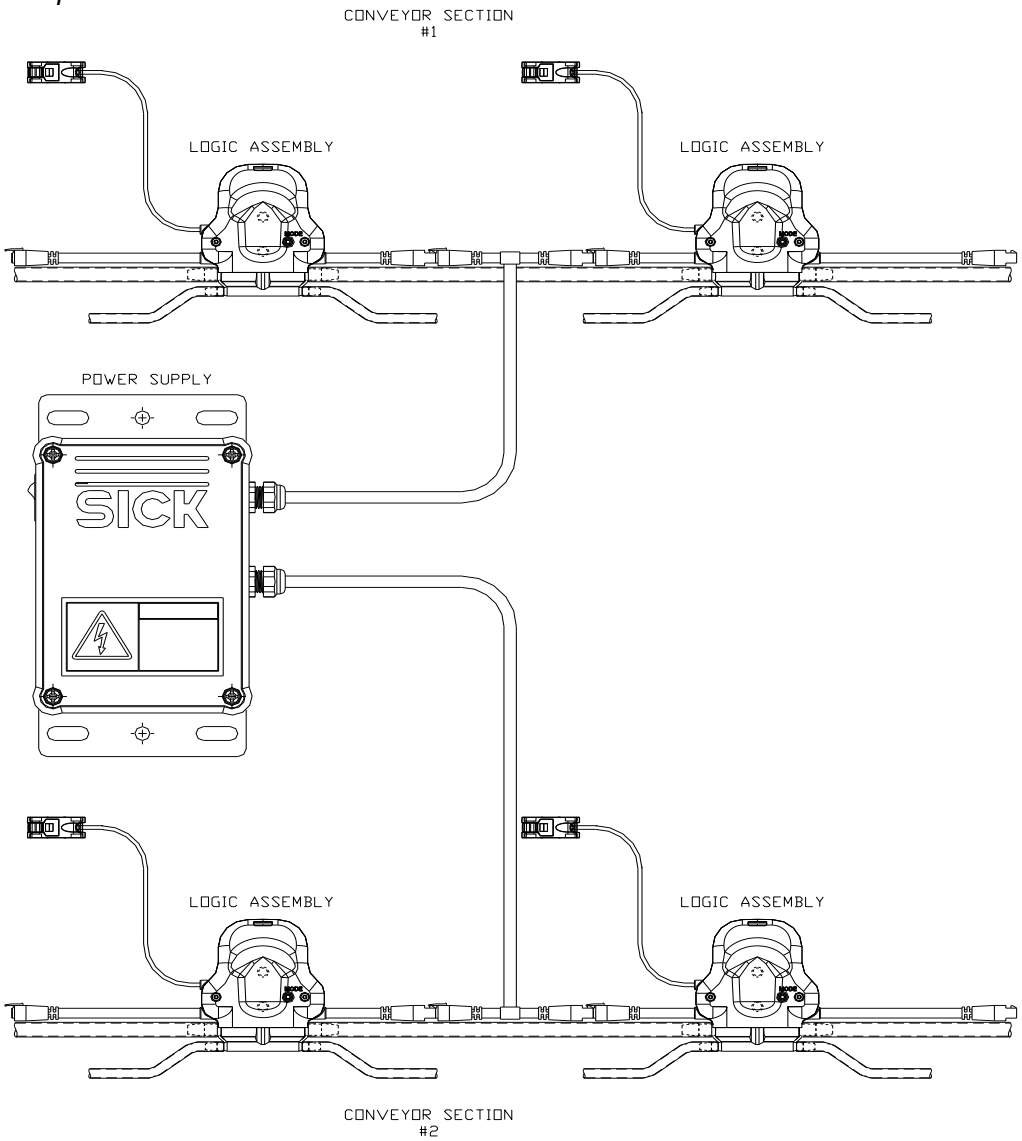
One Power Supply used to power two separate CRUZcontrol sections

This drawing illustrates the use of one power supply to power two separate, short CRUZcontrol sections on two different conveyors. This can be done to make better use of the full capacity of a power supply.

It could be necessary to extend the T Cable leads to reach the power supply location. This should be done with a wire gauge large enough to prevent noticeable voltage drop. The number of CRUZcontrol zones that can be connected per string must also be reduced based on the voltage drop of the wire used.

The brown lead on the “T” Cable connects to +24 VDC on the power supply. The blue lead on the “T” Cable connects to 0 VDC on the power supply.

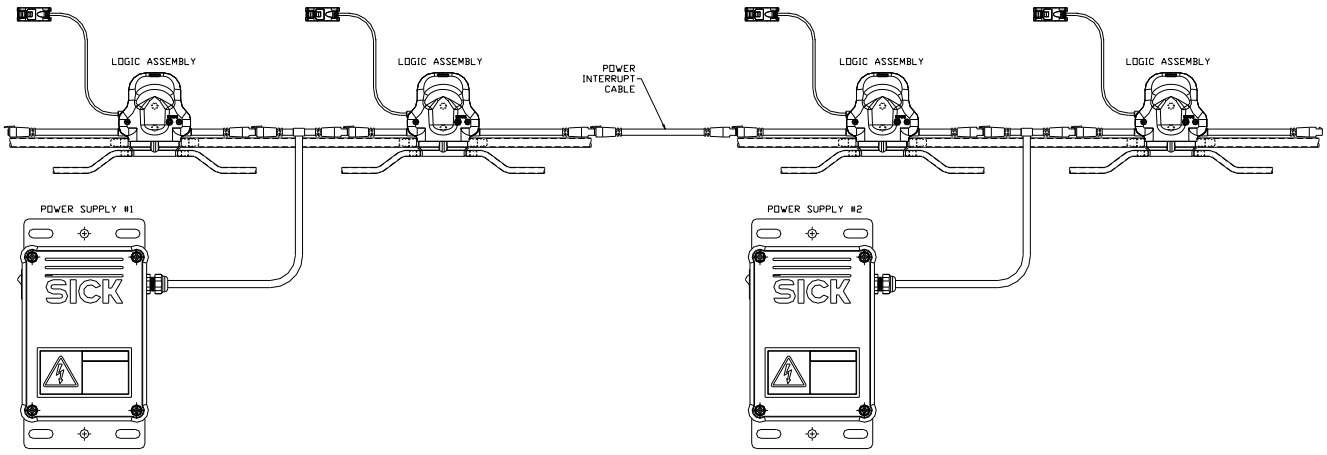
Figure 9: Two Separate CRUZcontrol Sections



Using two Power Supplies to power one extended CRUZcontrol section

A CRUZcontrol string with more than 54 Logic Assemblies would require the use of more than one power supply. This can be done, but it requires that the power supplies be isolated from each other at the +24 volt line. This drawing illustrates how to isolate the two strings making use of a Power Interrupt Cable. The + VDC line is not passed through, while the Slug Release and Singulation Release Signals as well as 0VDC are connected to pass the signals through uninterrupted.

Figure 10: One CRUZcontrol Section with Two Power Supplies



Power Supply Part Numbers

Table 9: Power Supply Part Numbers

MHS Conveyor Part Number		Description
Kit Part Number 1117431	1117972	100-120/220-240 VAC input Power Supply and T cable
	1117937	Mounting Bracket
	1117379	“T” cable
Kit Part Number 1117432	1107030	380-480 VAC 2 phase input Power Supply and T cable
	1117937	Mounting Bracket
	1117379	“T” cable
	1117380	Power Interrupt Cable, 8 inches long

Accessories

Auxiliary Photoelectric Sensor

There is often a need to sense product presence on a CRUZcontrol equipped conveyor, with the sensors connected to a control system other than CRUZcontrol. To allow for this, adequate space has been provided alongside of the CRUZcontrol photoelectric sensors to allow for the mounting of a second independent photoelectric sensor, sharing the same holes through the conveyor side channels and the same reflector. Appropriate holes are provided for the photoelectric sensor mounting bracket. The discharge end of NBC conveyor is also provided with an additional mounting location for a photoelectric sensor and reflector.

The following kits are available, which include the photoelectric sensor and appropriate bracket. Even though not normally needed, an extra reflector and adhesive mounting tape is also included with each kit.

The 10-30 VDC photo sensors are similar to the CRUZcontrol sensors. They are light operate, with a 50 mA maximum output current, and come with a 27" cable (no connector).

Table 10: Photoelectric sensor

Part Number	Description
1117727	Photoelectric sensor with bracket, 10-30 VDC PNP output

Reflector

Replacement reflectors can be ordered with the following part number.

Table 11: Reflector

Part Number	Description
400004	Reflector
50005427	Tape, double sided, 1” square (2 needed per reflector)

Sensor Valve Assemblies

A Sensor Valve Assembly is used for applications not requiring accumulation logic, (controlling the zone with a PLC) but the solenoid valve and photoelectric sensor configuration as used in the CRUZcontrol channel is still desired.

Table 12: Sensor Valve Assembly

Part Number	Description
1116736	Sensor Valve Assembly

Extension Cables

The following extension cables are available to meet application requirements where longer zone lengths or skipped zones must be accommodated. Each cable has 4 conductors, with male and female 2X2 connector ends.

Table 13: Extension Cables

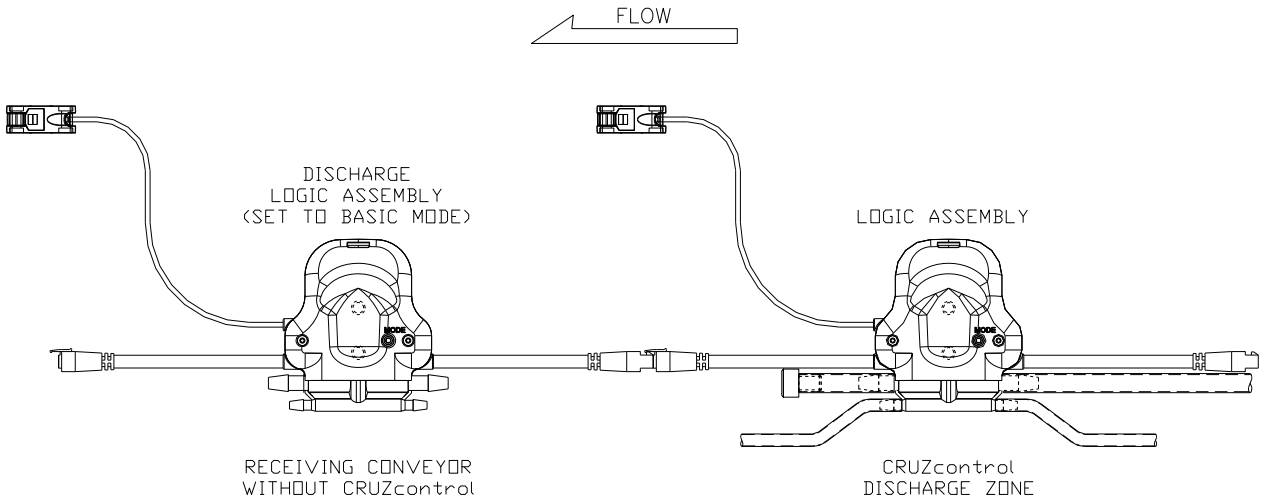
Part Number	Description
1117372	Extension Cable (39 inches)
1117373	Extension Cable (78 inches)
1117374	Extension Cable (156 inches)

Discharge Logic Control

Discharge Logic Control refers to using a standard Logic Assembly set to Basic Logic mode to control the release from the last discharge zone of a length of CRUZcontrol. This is typically done when CRUZcontrol conveyor (of any kind) feeds non-CRUZcontrol conveyor. There are no air connections made to the valve section of the Logic Assembly. When used this way, the added Logic Assembly is known as the Discharge Logic Assembly (DLA).

The Discharge Logic Assembly is mounted on the charge end of the conveyor immediately downstream of the last (discharge) zone of a length of CRUZcontrol accumulation conveyor. It is connected to the Logic Assembly of the discharge zone as shown. There is no need for a Function Module to be attached to it. The DLA does not need to be given a release signal. Product blocking that photoelectric sensor will stop release from the CRUZcontrol discharge zone, until the photoelectric sensor clears again. This operation can usually be left enabled and ready to function regardless of whether the receiving conveyor is running or off. There would be no need to interface the CRUZcontrol operation with the receiving conveyor operation, since the functioning of it is based solely on product movement.

Figure 11: Discharge Logic Control



The following hardware listing is for two Discharge Logic Assembly kits consisting of the Discharge Logic Assembly, a reflector, and mounting brackets. The mounting brackets provide for the mounting of the Discharge Logic Assembly and reflector either ½" or 3" above a standard CRUZ side channel. Since every application is different, there will usually be a need to drill mounting holes for the brackets.

Table 14: Discharge Logic Assembly

Part Number	Description
1117859	Discharge Logic Assembly Kit, ½ inch above rollers scan height
1117860	Discharge Logic Assembly Kit, 3 inch above rollers scan height

CRUZcontrol On Site Installation

Pre-installed on the conveyor

- The CRUZcontrol Logic Assemblies are installed on the side channel of the conveyor bed.
- The air supply tubing (3/8” OD X ¼” ID) for the conveyor is plumbed along the length of the conveyor bed, passing through each Logic Assembly.
- The zone control air is plumbed (1/4” OD X .160” ID) from the Logic Assembly to the zone air pucks or cylinders.
- The photoelectric sensors are mounted for each zone, along with the reflector across the conveyor bed. The photoelectric sensors are tested to insure proper alignment with the reflectors, as well as proper functioning of the Logic Assemblies.

Field Installation

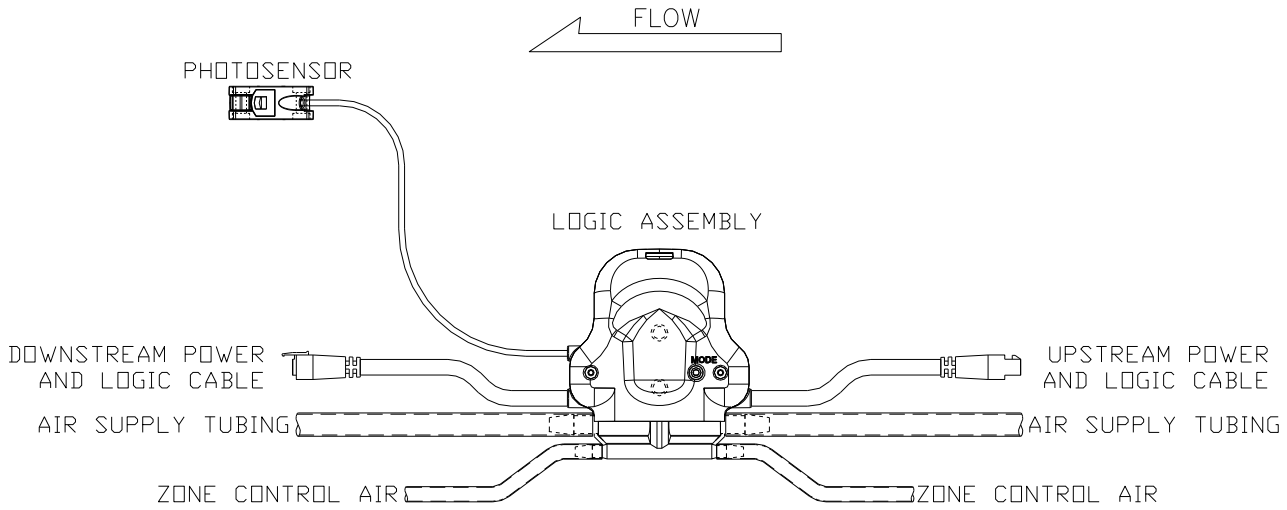
Bed to bed connections

- Connection of air supply tubing between conveyor beds, terminating the ends of the air supply tubing
- Connection of the Logic Assembly upstream or downstream cable from the last zone of a conveyor bed to the first zone in the next upstream conveyor bed

System connections

- Connecting the air supply to the conveyor
- Connecting a power supply into the string of Logic Assemblies
- Adding extension, power interrupt, or adapter cables if needed
- Adding auxiliary photoelectric sensors as required for lead zone and “line full” conditions
- Providing a release signal to the function module at the discharge zone

Figure 12: Logic Assembly



Conveyor Flow

The logic assembly wiring is “in-line” for left hand flow conveyors; for right hand flow conveyors the wiring direction will be reversed.

Figure 13: Left Hand Flow Conveyor Bed

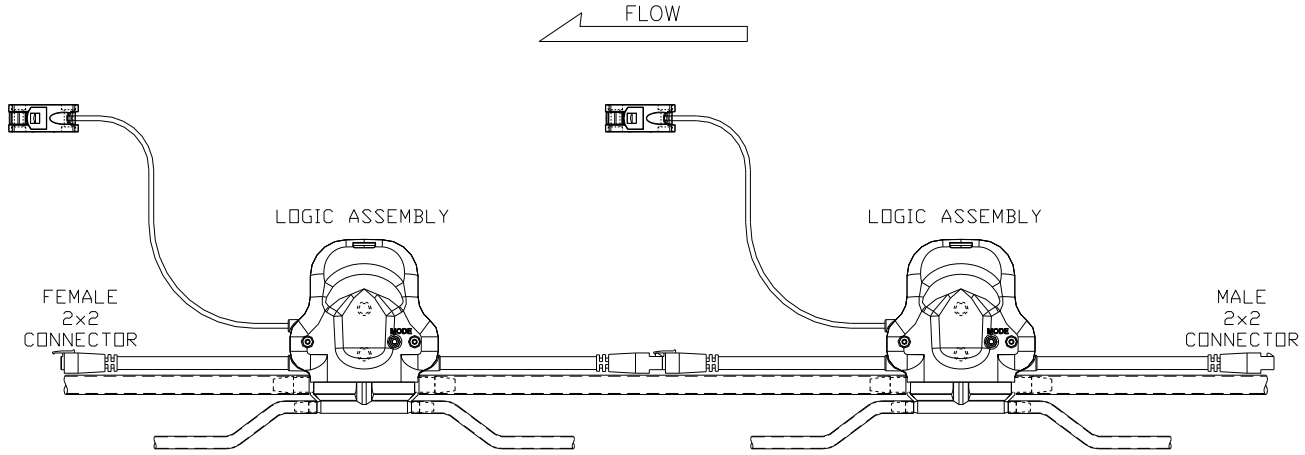
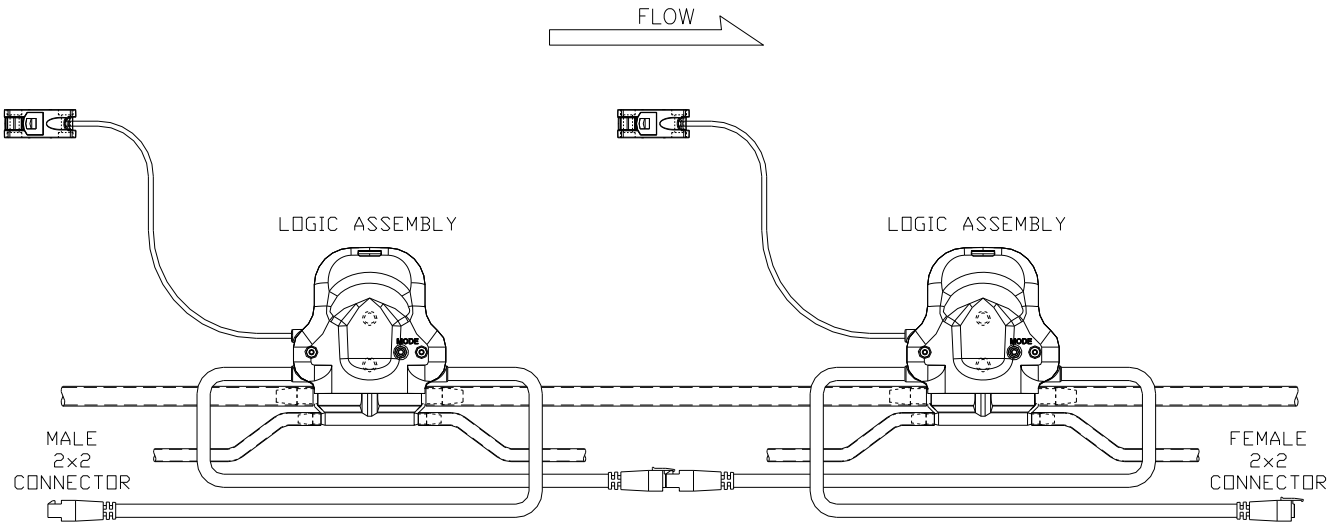


Figure 14: Right Hand Flow Conveyor Bed



Examples

This guideline provides various suggestions on how to apply CRUZcontrol to meet some specific control requirements.

Example 1: Applying Progressive CRUZcontrol

CRUZcontrol Logic Assemblies are designed to be fail-safe. A loss of module power, a disconnected or severed cable, or a dirty or failed photoelectric sensor will all result in the stopping of a zone, initiating accumulation beginning from the affected zone.

With Progressive Logic mode, failure of a Logic Assembly to function properly could possibly result in product accumulating with zones not stopping as required. While this should be unlikely due to the fail-safe nature of the Logic Assembly, the effects of such a failure should be considered. This type of failure could result in excessive line pressure, eventually causing product to push through the discharge zone of the conveyor. Jam detection sensors should be used as appropriate to minimize the effects of such a failure.

A product jam on the conveyor, stopping the free flow of product, could also create a situation where Progressive Logic mode CRUZcontrol can't function properly due to product not blocking one or more of the downstream photoelectric sensors. This would probably be the most common cause of excessive line pressure resulting from the use of Progressive Logic mode CRUZcontrol.

A solution to this problem is to provide one Basic Logic mode zone at the discharge end of every 12-foot bed of conveyor. This would limit the length of conveyor that could possibly be driving product against a jam point to 12 feet.

The use of one Basic Logic mode zone on every 12-foot bed will disrupt the flow of product to some degree, but with adequate speed and product weight the flowing product should coast through the basic zones without any noticeable effect on the throughput rate. One exception is at the charge and discharge ends of a length of NBC accumulation conveyor, where the effects of using Basic Logic mode on the throughput rate needs to be considered. If there is a need to maximize throughput rates, the use of all Progressive Logic mode zones should be retained in those locations.

CRUZcontrol does provide an option for slug release. Both the Basic and Progressive Logic modes of accumulation will release at the maximum possible discharge rate when slug release is used in the function module (TB-2). It will also create a situation where a product jam could result in excessive line pressure buildup. If the slug release feature is used, it should be used with caution, and for a limited number of successive accumulation zones.

Example 2: Progressive Logic Accumulation Release Control

CRUZcontrol Logic Assemblies set to Progressive Logic mode provide for high throughput rates and efficient release, compared to Basic Logic mode. In simple terms, Basic Logic tries to create zone length gaps in the flow of product, whereas Progressive Logic allows product to flow without creating gaps.

The product throughput rate for Progressive Logic, measured in case-feet per minute, can equal the conveyor speed. This can create problems. If, for example, an NBC conveyor running at 180 FPM is feeding product to an induction belt conveyor running at 100 FPM, the belt conveyor will be overrun, meaning that excessive line pressure will build up at the discharge end of the NBC.

There are several possible solutions to handle this situation:

1. The speed of the accumulation conveyor could be set at less than the speed of the next conveyor down-stream. In the example mentioned, if the NBC were running at 100 FPM, there wouldn't be an issue. This is not often possible. If the accumulation conveyor needed to receive product at a higher input rate, the speed would have to be higher. If densely packed accumulation were desired, that would also require the speed to be above 100 FPM.
2. The release of product from the accumulation conveyor could be logically controlled so as to limit the release rate. If the NBC running at 180 FPM were to be given a Singulation Release signal for 3.3 seconds, and then kept off for 2.7 seconds, with that sequence repeating, the theoretical release rate should be close to 100 product-feet per minute (180 FPM x 3.3 sec. / (3.3 sec. + 2.7 sec.)). The actual release rate could be more, with product coast and shorter than zone length product lengths allowing more product than expected to progress past the release point. Assuming that the release signal is PLC controlled, an advantage to this approach is that the release sequence timing could be easily altered to increase or decrease the release rate.

The CRUZcontrol Logic Assembly at the final discharge zone could be set to Basic Logic mode, with all other upstream Logic Assemblies set to Progressive Logic mode. This would reduce the NBC release rate while still retaining the infeed and throughput rate benefits of Progressive Logic mode. The release rate would be a function of the speed of the accumulation conveyor, the speed of the receiving conveyor, and also the size and weight characteristics of the conveyed product. If the NBC running at 180 FPM had a Logic Assembly set to Basic Logic mode at only the discharge end, the release rate would be closer to the 100 product-feet per minute capacity of the downstream induction belt conveyor.

Example 3: Releasing from CRUZcontrol

Releasing from CRUZcontrol	
Problem	Releasing Accumulated Product
Solution	When using CRUZcontrol the product will automatically accumulate. A signal must be given to the function module to get it to release.
Configuration	Plug Function module into discharge zone. All jumpers are set to pins 1-2. Give function module a release signal either through the isolated input as shown in Figure 15 or through the non-isolated inputs as shown in Figure 16.
Operation	Product will release for as long as the release signal is given.

Figure 15: Isolated Input Single Release

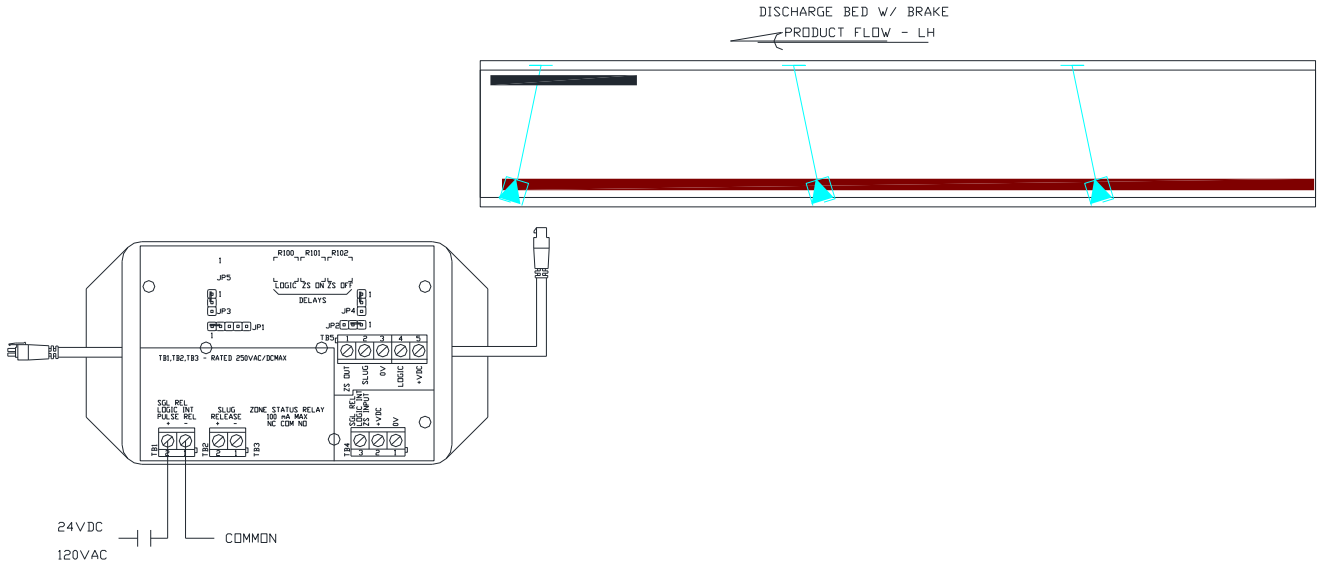
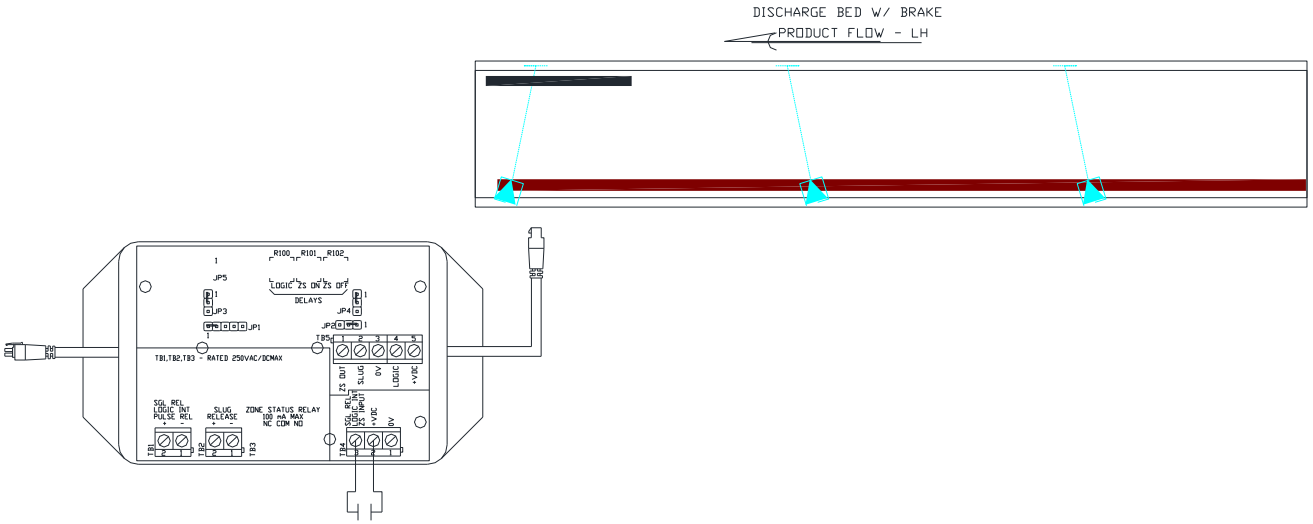


Figure 16: Non-Isolated Input Single Release

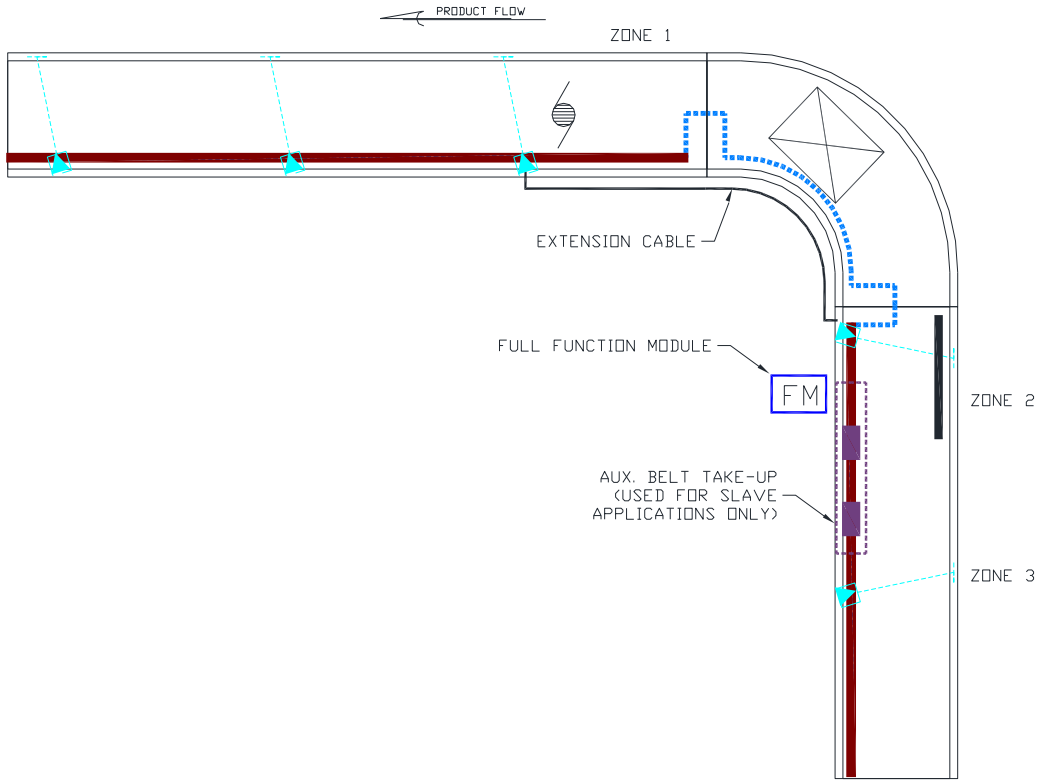


Example 4: CRUZcontrol around a curve. (Low rate)

CRUZcontrol around a curve – Low Rate	
Problem	Product releasing into a curve then not having a zone to occupy. This situation occurs because it takes longer for product to go from zone 2 to zone 1 than it does for product to go from zone 3 to zone 2.
Solution	Delay zone 3 releasing until product has reached zone 1 This example will only work if the throughput rate is low.
Configuration	Set CRUZcontrol Logic Assemblies to Basic Logic mode. Plug full function module between zones 2 and 3. Set the logic delay R100 potentiometer to delay the release signal from zone 2 to 3 until product has reached zone 1.
Operation	Carton flow from zone 3, to zone 2, to zone 1, occurs as normal. When a carton first clears the zone 2 photoelectric sensor, the release of the next carton from zone 3 is inhibited by the setting of the logic delay relay in the full function module. No external logic signals are require. The release will need to be delayed until the carton released from zone 2 reaches zone 1.

The release delay is not retained in the event of a system shut down. If a carton is flowing around the curve and the system is shut down, upon start up a second carton could be released from Zone 2 to the curve before the first carton has had the chance to clear the curve. In that event, manual intervention might be required to clear the curve of the extra carton.

Figure 17: CRUZcontrol around a curve (low rate)



Example 5: CRUZcontrol around a curve. (High rate)

CRUZcontrol around a curve – High Rate	
Problem	Product releasing into a curve then not having a zone to occupy. This situation occurs because it takes longer for product to go from zone 5 to zone 4 than it does for product to go from zone 6 to zone 5.
Solution	Stop zone 5 releasing if line full photoelectric sensor is block for a predetermined time period or if logic assembly in zone 4 is blocked due to accumulation.
Configuration	Plug full function module between zones 4 and 5. Jumper JP3, 2-3 (logic interrupt) Jumper JP4 not connected (zone status) Set ZS on (R101) and ZS off (R102) potentiometers. Range is from 0-20seconds. A normal operating range would be about 3 seconds each depending on the speed of the conveyor. Wire photoelectric sensor to TB4. Blue wire TB4, 1 (0VDC) Brown wire TB4, 2 (+VDC) Black wire TB4, 3 (ZS INPUT) Wire function module for time delay. TB4, 1 (0VDC) to TB1, 1 (-) TB4, 2 (+VDC) to TB3, 2 (COM) TB3, 1 (NO) to TB1, 2 (+)
Operation	The Full Function Module is connected as shown just downstream of the last accumulation zone prior to the curve. Release from that zone is stopped if the Auxiliary Photo Sensor senses full accumulation (blocked for a time delay period), or if the Logic Assembly just downstream of the curve stops the upstream release due to being accumulated. If the Logic Assembly just downstream of the curve is set to Basic Logic mode, the release rate into the curve would be affected. The use of Progressive Logic mode after the curve would allow for higher rates. Note that stopping the release of product as done in this example could result in a product left partially on the powered curve with the trailing end on the stopped discharge end of the accumulation conveyor. If this is a concern, a photo sensor should be added to the discharge zone, with appropriate logic to insure that no products are stopped partially released. This could require the addition of PLC based logic.

Figure 18: CRUZcontrol around a curve. (High rate)

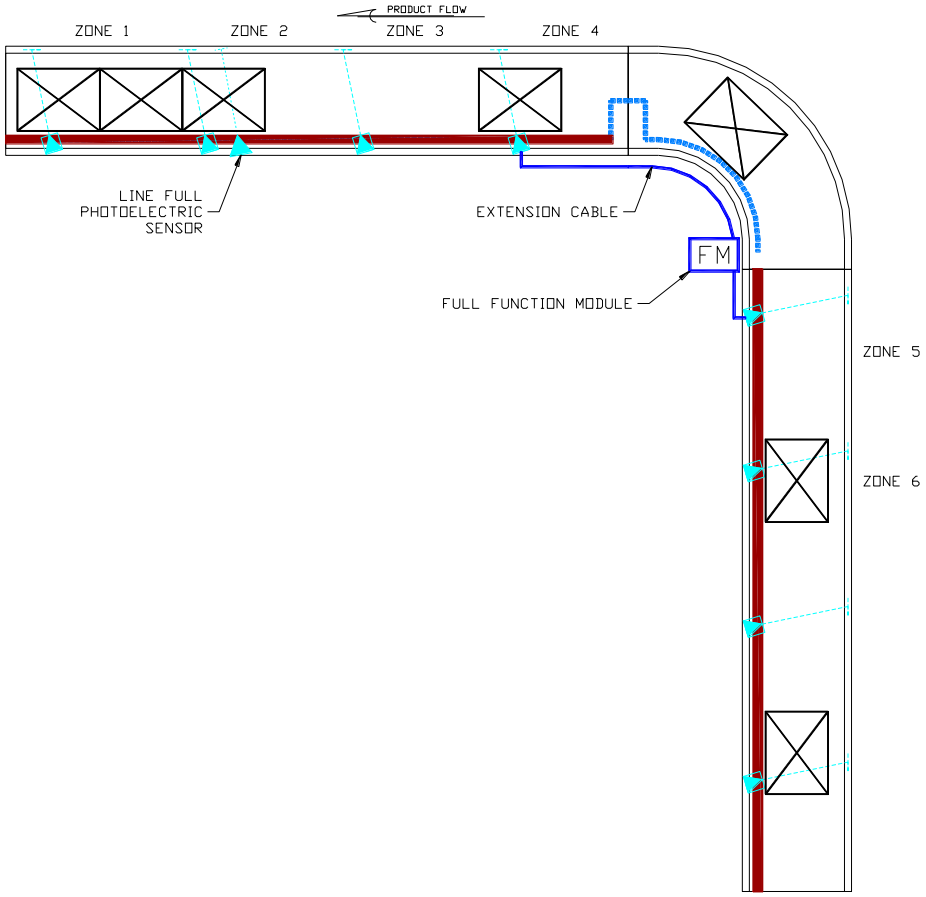
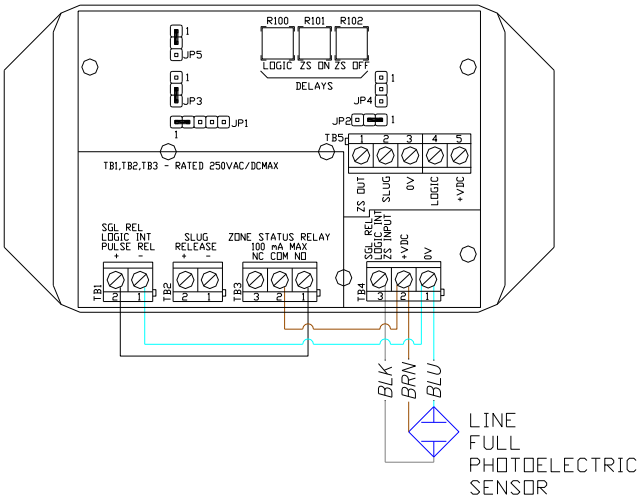


Figure 19: Function Module Wiring



Example 6: Creating a work zone

Creating a work zone	
Problem	Creating a work zone in the middle of a section of CRUZcontrol
Solution	Use the release function module and interrupt the downstream logic to start accumulation.
Configuration	When using TB1 to interrupt the logic set jumper terminal JP3, 2-3 When using TB4 to interrupt the logic set jumper terminal JP4, 2-3
User Action:	Apply a high signal to TB1 (24Vdc/120Vac) or TB4 (24Vdc)
Operation	All product stops at a specific accumulation zone, when the contact is closed and is released when the contact is opened.

Figure 20: Work Zone

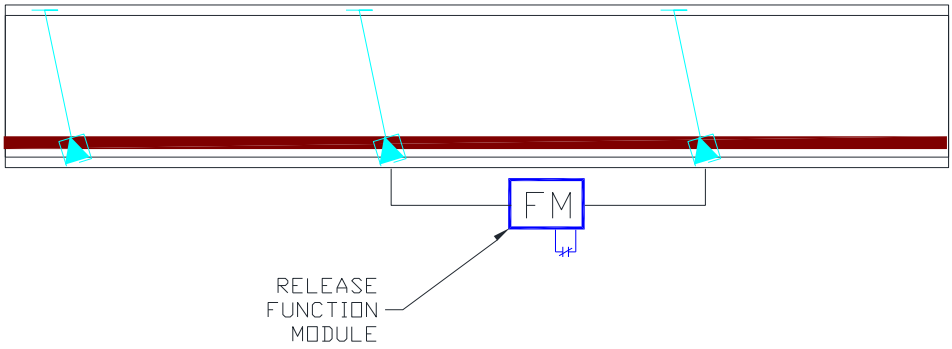


Figure 21: Work Zone Using TB1

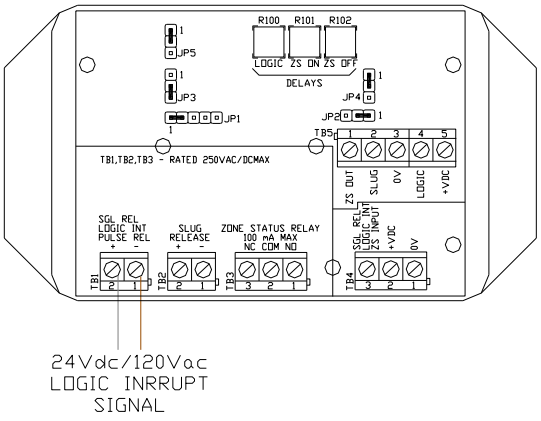
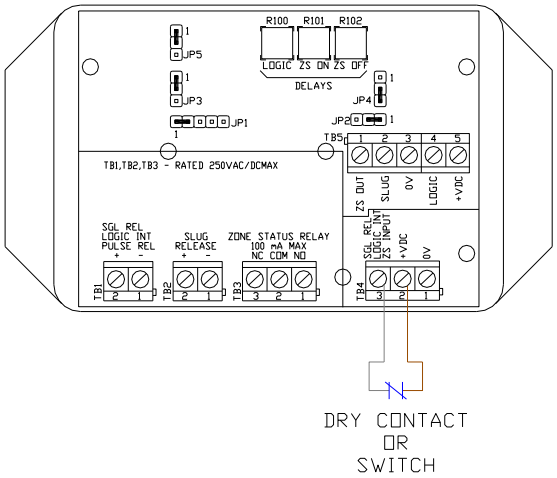


Figure 22: Work Zone Using TB4



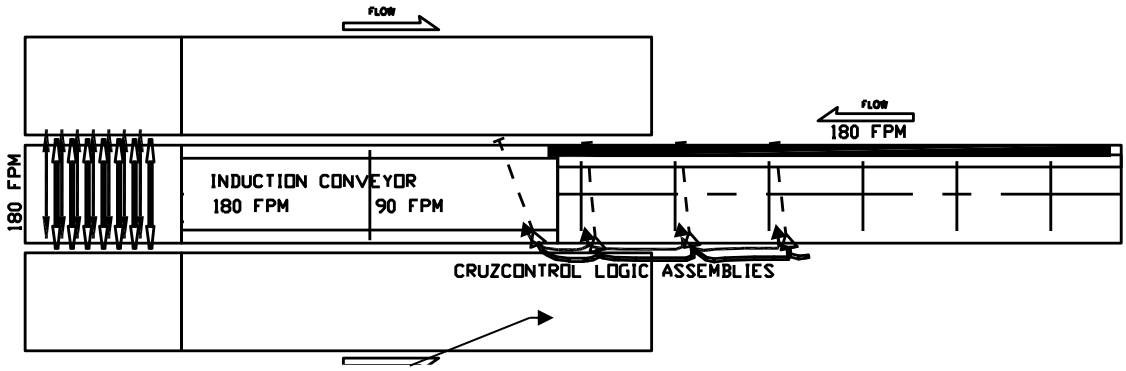
Example 7: NBC accumulation release to conveyor

NBC-C accumulation release to feed induction conveyor	
Problem	Creating line pressure when feeding a slower conveyor
Solution	Use logic assembly as a discharge logic assembly
Configuration	Place Discharge Logic Assembly (DLA) downstream of conveyor discharge zone. Set mode to basic. Do not plumb air line to logic assembly.
User Action:	None needed.
Operation	The Discharge Logic Assembly is connected to the Logic Assembly at the discharge end of the NBC conveyor. There is no need for a Function Module to be attached to it. The DLA does not need to be given a release signal. Product blocking that photoelectric sensor will stop release from the NBC discharge zone, until the photoelectric sensor clears again. This operation is left enabled and ready to function regardless of whether the induction conveyor is running or off. There is no need to interface the CRUZcontrol operation with the induction conveyor operation, since the functioning of it is based solely on product movement.

NBC conveyor, when accumulating and subsequently releasing accumulated product, will result in some amount of line pressure at the discharge end of the conveyor. This is caused by the momentum of moving product coasting to a stop as it accumulates.

Example
The NBC is running at 180 FPM, feeding the induction conveyor section prior to a pick zone module diverter. Without proper control of the discharge from the NBC, cartons released to the induction conveyor could possibly overdrive it and push past the 90 FPM section onto the 180 FPM section, not permitting product gapping to occur as required for the diverter to function properly.

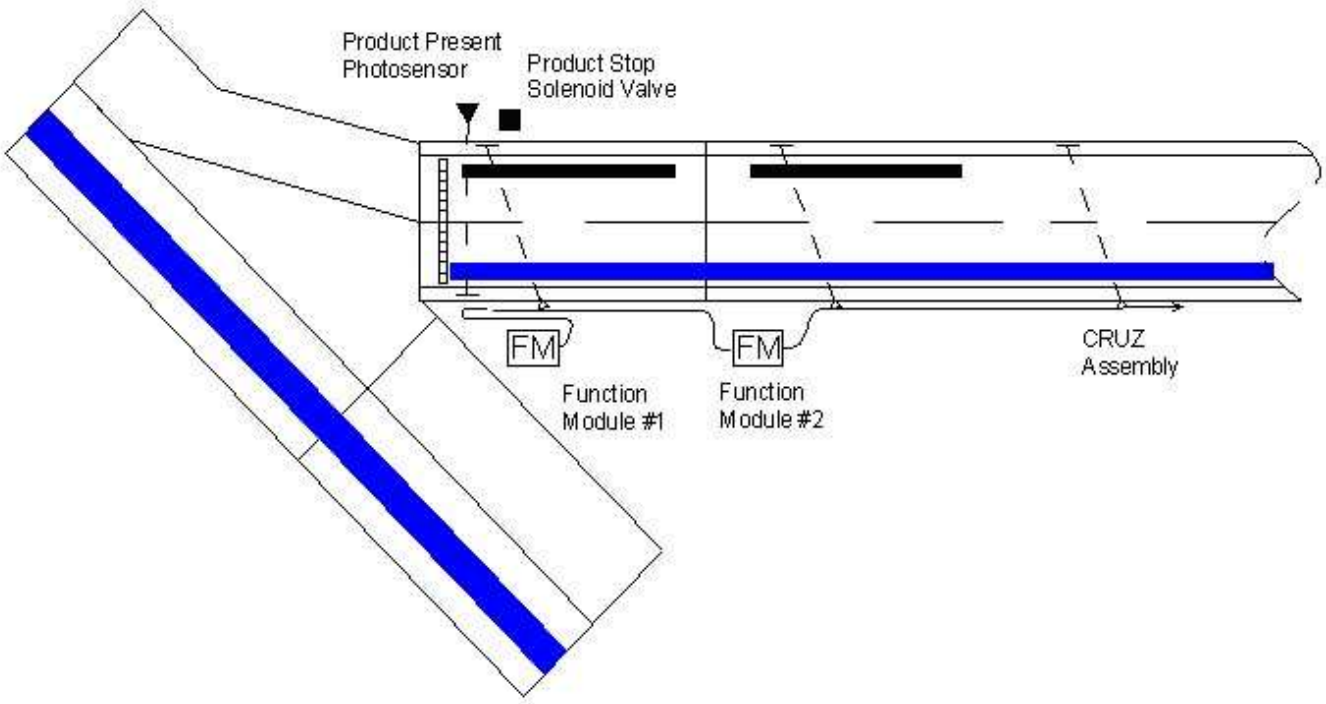
The mounting location of the Discharge Logic Assembly photoelectric sensor and the reflector will determine release performance. A good starting point would be to locate the photoelectric sensor 12" downstream from the charge end of the induction conveyor, and the reflector 18" downstream from the charge end. The final locations should be determined based on system performance.



Example 8: Product Gapping

The following describes a technique, using CRUZcontrol, which creates a gap in a train of moving product. In the situation described, the gap is used to allow for the raising of a product stop. This would apply primarily to the progressive mode of accumulation control, which accumulates and discharges from accumulation with only very minimal gaps between products.

The following illustrates an NBC accumulation lane used to release product to a merge conveyor. A Product Stop is located at the end of the accumulation lane, controlled by the solenoid valve as shown. The last two accumulation zones are also provided with brakes, as shown. These brakes are controlled by the CRUZcontrol Logic Assemblies that also control the zone drive. Also shown just prior to the Product Stop is a Product Present Photosensor.



Operation

The Product Present Photosensor is connected to a PLC (programmable logic controller). The Photosensor is used to sense if product is accumulated behind the Product Stop, ready to be released. The Photosensor is also used to sense a gap in the flow of product adequate enough to raise the Product Stop after releasing product from the lane.

The Product Stop is solenoid activated, and controlled by the PLC. The stop is lowered by energizing the solenoid.

Function Module #1 (a Release Function Module) is configured and wired for Singulation Release operation. (Refer Table 4). The signal provided to the Product Stop solenoid is also connected to Function Module #1.

When the Product Stop is raised (solenoid and Function Module not energized), product blocking the Photosensor of the CRUZcontrol Logic Assembly will result in the conveyor zone going into accumulation and the zone brake being activated. This in turn enables accumulation beginning with the next upstream accumulation zone, once the photosensor in that zone is blocked.

Function Module #2 (also a Release Function Module) is configured and wired for Logic Interrupt operation (Refer to Table 4). When it receives a signal (from the PLC), it passes the logic signal from the downstream accumulation zone to the upstream accumulation zone. Accumulation and release function normally, as if there no Function Module installed.

To create a gap in the flow of product, the PLC signal to Function Module #2 is turned off. This puts the zone upstream of Function Module #2 into accumulation mode, once its Photosensor is blocked. The brake in the zone is also set whenever the zone is set to accumulate.

Overview – TGW CRUZcontrol Logic Module

This section describes the development requirements for the TGW CRUZcontrol logic module to be used with NBC. The new modules will be a complete solution that controls product flow through either “basic” and “progressive” accumulation with single or slug release. “Basic” accumulation may also be described as single accumulate where product detection in two consecutive zones will cause the upstream zone to accumulate. “Progressive” accumulation is also known as slug accumulate, which stops flow at the furthest downstream zone when product is detected.

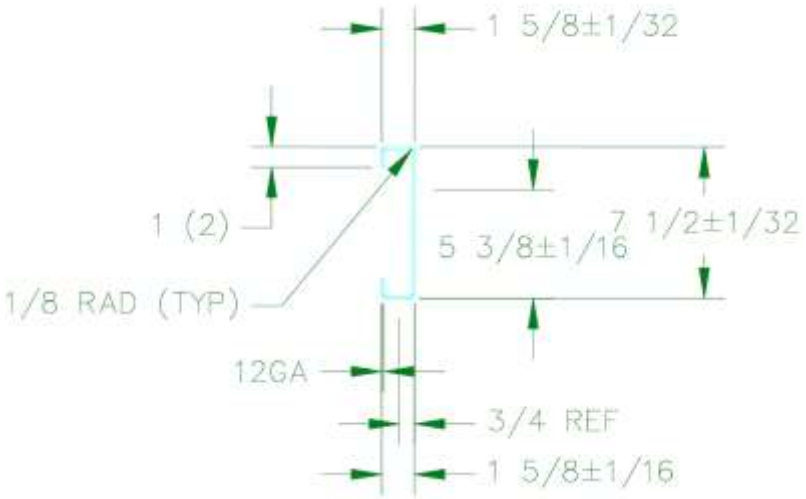
A CRUZcontrol module will be mounted at each conveyor zone and connected in series with the neighboring upstream and downstream zones. The CRUZcontrol module will be comprised of a retro-reflective sensor, logic module with integrated pneumatic valve, and daisy chain connections. The retro-reflective sensor attached to the CRUZcontrol module will be located in the same zone (local zone) as the CRUZcontrol module and the valve will control the local zone.

Conveyor Details

Table 15: Conveyor Specification

Width (BF)	16 in. (400mm), 22 in. (550m), 28 in. (700mm), 34 in. (850mm)
Zone Length	48 in. (1219mm)
Roller Diameter	1.9 in. (48mm)
Roller Pitch	2.0 in. (76 mm), center to center, 3.0 in. (114 mm) center to center
Reflector Hole Size	13/16 in. x 1-9/16 in. slot
Sensor Skew	6.0 in. (150mm), maximum
Steel Thickness	12 Gauge
Pneumatic Type	Air to Brake
Working Air Pressure	40 PSI, maximum
# of Pucks per Zone	2
Minimum Product Height	0.5 in. (12.7mm)

Figure 23: TGW Conveyor C-Channel



Photoelectric Sensor

The photoelectric sensor will be a polarized retro-reflective (reflex) style based on the ZL2 platform. It shall meet the following requirements:

- Connected directly to the module housing with proper strain relief.
- Sensor and bracket must accommodate blind adjustment on two axes.
- Course alignment between sensor and reflector must be achieved by mounting while still accommodating fine alignment adjustment.
- Maintain an excess gain of one (1) or more for all BF distances with a maximum skew of six inches.

Figure 24: Sensor Dimensional Data for 25° Cable Exit

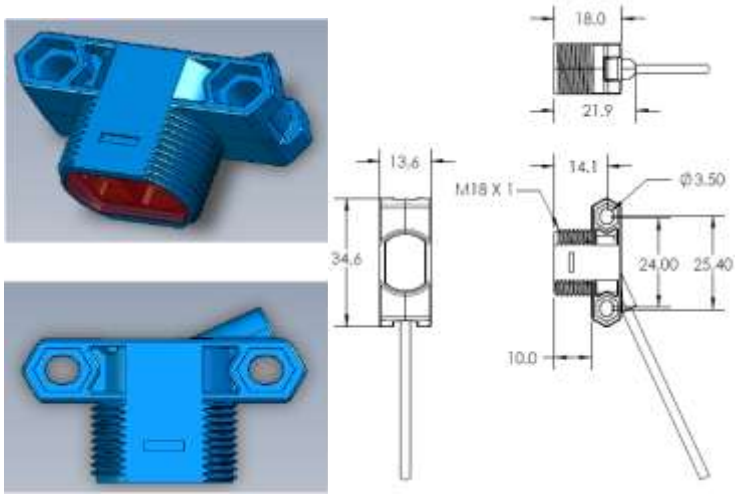


Table 16: Sensor Optical Specification

Sensor Model	ZL2-P2400S04
Sensor Part Number	2048176
Sensor Type	Reflex, Polarized
Switching Logic	Light Operate
Light Source	Red LED
Output Indicator	Amber
Power Indicator	Green
Life Expectancy	100,000 hours @ 77°F (25C)
Light Spot Diameter	4.9 in. x 4.9 in. at 39.4 in. (125mm x 125mm at 1000mm)
Housing Material	ABS
Enclosure Rating	IP67

Table 17: Sensor Electrical Specification

Supply Voltage	10…30 VDC
Ripple	<5 V_{ss}
Current Consumption	<20 mA (without load)
Output Current Max.	50 mA
Response Time	<1.25 ms
Switching Frequency	400 Hz
Cable Length	28 in. (711mm), ±1 in.
Connection to Logic Module	Hard-wire on the Downstream side
Ambient Temperature – Operating	-13…122°F (-25…+50C)
Ambient Temperature – Storage	-40…158°F (-40…+70C)

Standard Logic Module

The standard logic module is to be an “all-in-one” integrated solution. The valve, logic module, and interconnection shall all be assembled in a single housing and satisfy the following requirements:

- A switch for adjusting between “basic” and “progressive” logic shall be located on the housing (factory set to basic).
- Visible indication of the selected logic function.
- Logic selection switch must be easily accessible when mounted on the conveyor, but requires a simple standard tool to make adjustment.
- Barbed tube fittings on the air supply and air outlet that are easily accessible for assembly.
- Daisy chain cables of equal length with 2x2 overmolded connectors.
- Preferred sensor connection location is on the upstream side.
- Same twin keyhole slot mounting as current module.
- Must be electrically and logically compatible with current CRUZcontrol modules.
- Optional - a momentary manual override switch that toggles the valve to its non-normal state.

Figure 25: Final TGW Logic Module Mechanical Design

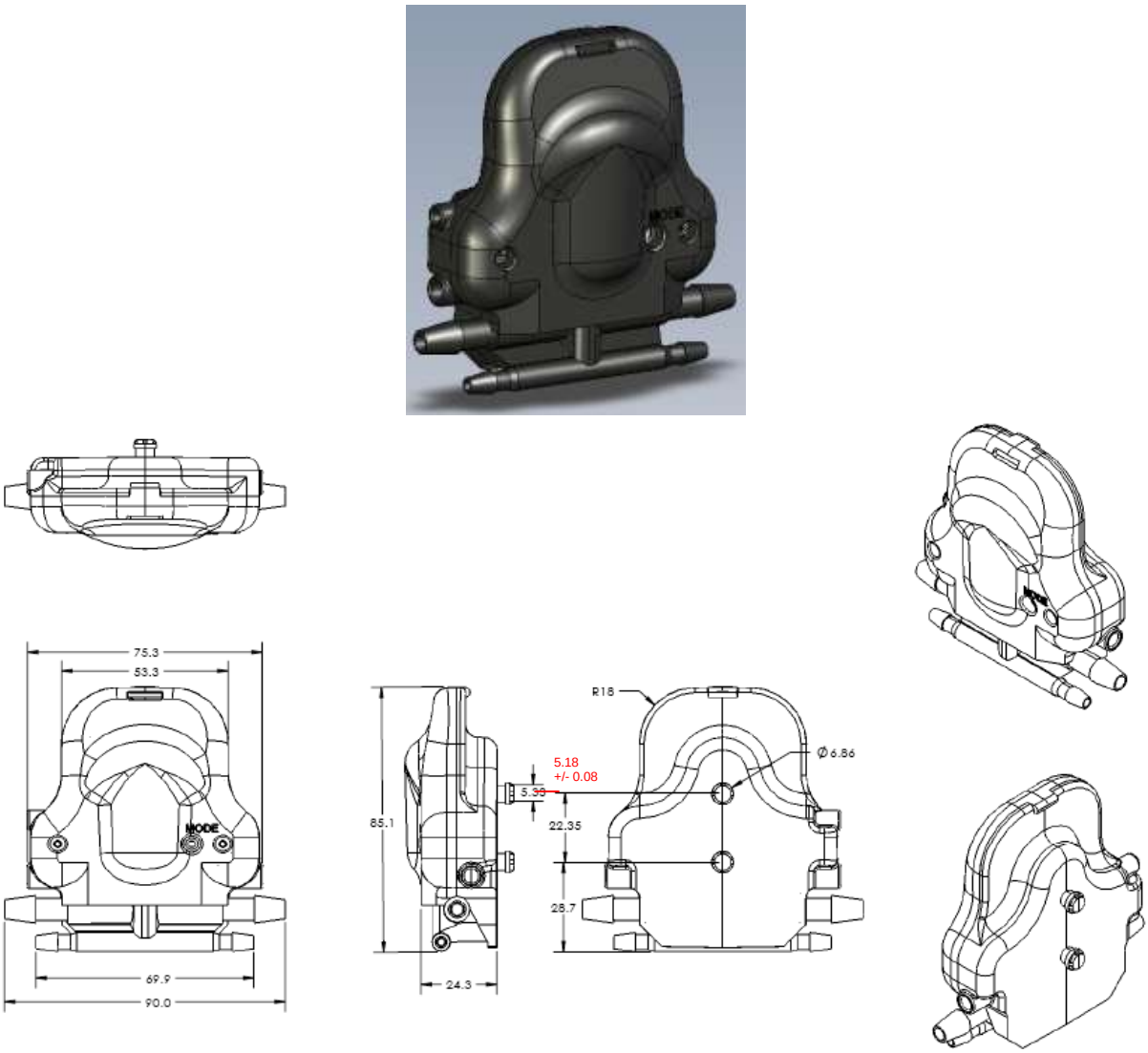


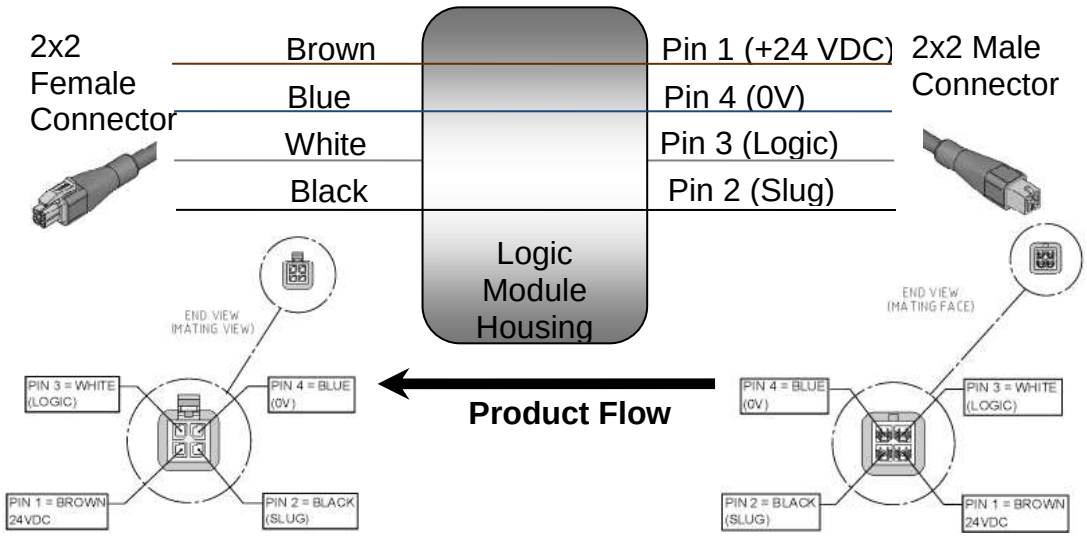
Table 18: Logic Module Mechanical Specification

Maximum Height	3.35 in. (85.1 mm)
Maximum Width	2.5 in. (63.5 mm)
Maximum Depth	1.25 in. (32 mm)
Daisy Chain Cable Length	Downstream - 28 in. (711 mm), Upstream - 28 in. (711 mm) ±1 in.
Daisy Chain Wire Gauge	22 AWG
Daisy Chain Connection Type	Overmolded 2x2; Downstream - Female, Upstream - Male
Sensor Cable Length	28 in. (711mm) ±1 in.
Input Air Connection	Barbed tube fitting for 3/8 in. O.D., 1/4 in. I.D. tubing
Output Air Connection	Barbed tube fitting for 1/4 in. O.D., 0.160 in. I.D. tubing
Enclosure Rating	IP20
Housing Material	ABS plastic
Color	Back cover and manifold - Black; Front cover - PMS 420
Mounting	Twin Keyhole (same as current module)
Ambient Temperature – Operating	+14…122°F (-10…+50C)
Ambient Temperature – Storage	-40…158°F (-40…+70C)

Table 19: Logic Module Electrical Specification

Supply Voltage	24 VDC (-20%/+15%)
Voltage Drop	19 mV
Current Consumption	68 mA
Maximum Logic Output Current	100 mA
Response Time	<2.5 ms
Switching Frequency	200 Hz
Maximum # of Logic Modules per String	End Tap (95W, 24V_s) - 4 ft. zones = 27 Center Tap (95W, 24V_s) - 4 ft. zones = 52 End Tap (90W, 24V_s) - 4 ft. zones = 27 Center Tap (90W, 24V_s) - 4 ft. zones = 52
Approvals	CE, UL Listed, NFPA 70, NEC

Figure 26: Logic Module Wiring for Overmolded 2x2 Daisy Chain Cables



Description of Logic

Two accumulate modes will be selectable on the module and two release modes will be available via wiring. Their operation is described below. Note that both single and slug release is available in basic mode while progressive mode will only slug release due to the logic (refer to Table 20).

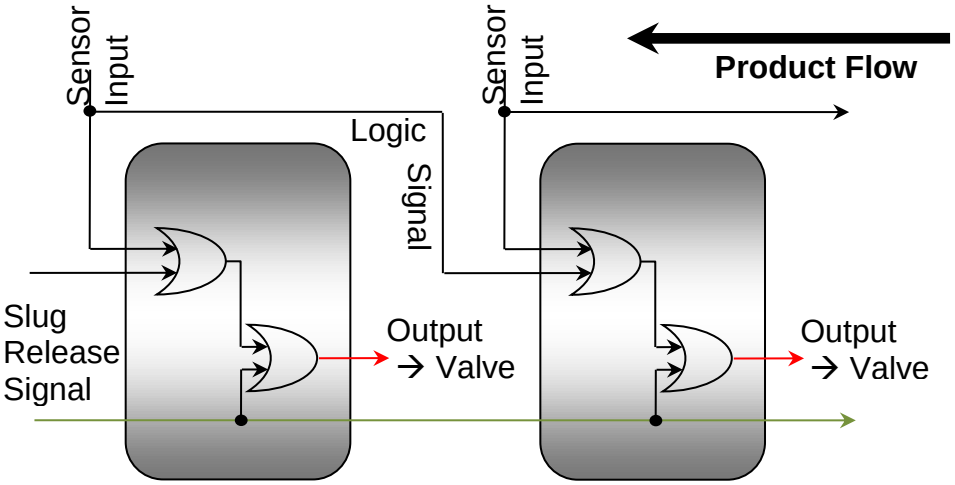
Table 20: Logic Function

Function	Basic Logic	Progressive Logic
Single Accumulate	Yes	No
Slug Accumulate	No	Yes
Single Release	Yes	No
Slug Release	Yes	Yes

Basic Accumulation Module

In accumulation, any two consecutive sensors detecting product will cause the upstream zone of the two consecutive zones to deactivate until the downstream zone is no longer detecting product. The logic signal is passed upstream on Pin 2.

Figure 27: Basic Accumulation Logic



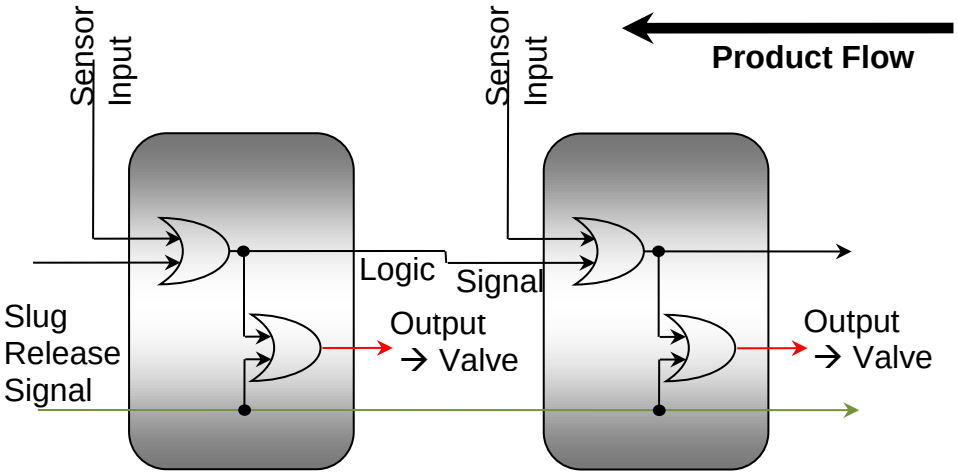
For single release, a given zone will release once the sensor in the downstream zone is clear of product. This may be done by removing product or applying an electrical release signal (+VDC) to PIN 2 and this also applies to the discharge zone.

When using slug release, all zones to which the slug line is connected will be activated simultaneously. This is initiated by applying supply voltage to PIN 4.

Progressive Accumulation Module

In accumulation, a zone will not deactivate until the furthest downstream sensor is detecting product and deactivates. The next upstream zone will then become the furthest downstream zone and deactivate when the sensor is blocked. The logic signal is passed upstream on PIN 2.

Figure 28: Progressive Accumulation Logic



Progressive mode only allows slug release. All zones to which the slug line is connected will be activated simultaneously. This is initiated by applying supply voltage to PIN 4. The same effect may be achieved by applying an electric release signal (+VDC) to PIN 2.

Pneumatic Valve

The pneumatic valve shall be embedded in the logic module housing and satisfy the requirements outlined in Table 21.

Table 21: Pneumatic Valve Specification

Operating Pressure Range	0-40 PSI (0-2.75 bar)
Flowrate Capacity	≥ 0.04 Cv (40 Nl/m)
Ventilation Capacity	≥ 0.04 Cv (40 Nl/m)
Power Consumption	1W
Minimum Supply Voltage	19.2 VDC
Maximum Supply Voltage	27.6 VDC
Duty Cycle	100%
Life Expectancy	100 million cycles
Input Air Connection	3/8 in. (9.5mm) barbed fitting
Output Air Connection	1/4 in. (6mm) barbed fitting
Operating Mode	N.O. (Air to Brake)
Air supply	Non-lubricated, 5 micron or less

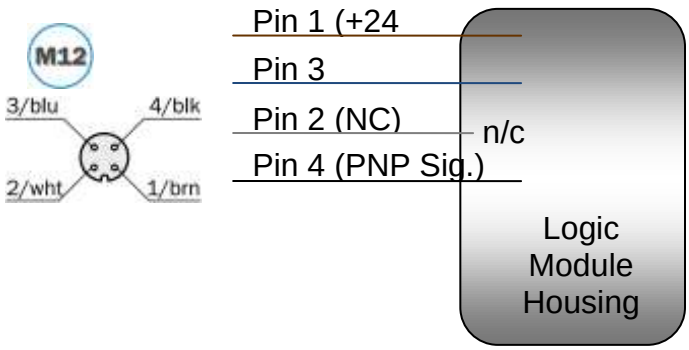
Sensor/Valve Assembly

The Sensor/Valve Assembly module differs from the standard module in that it does not have a female cable connection, does not connect to a neighboring module, does not contain logic, and has a unique wiring scheme on the male connection. This module may be simply described as a junction box with connection to provide +VDC to the sensor and valve, sensor output to the PLC, and valve input from the PLC. The male connection interface will be a cable with flying leads and have two meter (2m) length. The jacket shall be stripped and conductors perforated. See the current Sensor/Valve Assembly, E0006229, for reference.

M12 Sensor Connection used with WTR style sensors

The M12 Sensor Connection module differs from the standard module in that it does not have the sensor hard wired to the module. Instead, a cable with female M12 connector will be provided for connection with standard sensors (i.e. WTR style sensors). This connection will have a 28 in. (711mm) length and right angle connector. The module requires a PNP sensor input signal that is either Light Operate from a retro-reflective sensor or Dark Operate from a proximity sensor. Pin-out may be found in Figure 30.

Figure 29: M12 Sensor Connection Pin-out



Adaptor Cable for M12 Connector

To connect the M12 logic module or M12 WTR sensor, a conversion cable is required. The adaptor cable allows the M12 connector to plug into the 2x2 connector. See Table 22 for types.

Power Supply

A variant of the CRUZcontrol power supply shall be developed with 2x2 connectivity and be UL Listed as Class II. Two input power options will be available:

- 115/230 VAC, single-phase
- 480 VAC, two (2)-phase supply

Cables

Application specific cables will be necessary in certain cases. A list of necessary components may be found below, note that male refers to a male housing on 2x2 connections while female refers to a female housing:

Table 22: Interconnection Types and Lengths

1117370	Male Cordset, 2x2	78 in. (2m)
1117371	Female Cordset, 2x2	78 in. (2m)
1117372 1117373 1117374	Extension Cable, 2x2, male-female Extension Cable, 2x2, male-female Extension Cable, 2x2, male-female	39 in. (1m) 78 in. (2m) 157 in. (4m)
1117375	2x2-M12 Adapter, female-female	6 in. (150mm)
1117376	2x2-M12 Adapter, male-male	6 in. (150mm)
1117377	2x2-M12 Adapter, female-male	6 in. (150mm)
1117378	2x2-M12 Adapter, male-female	6 in. (150mm)
1117379	T-Cable (with flying leads), 2x2	79 in. (2000mm)
1117380	Power Interrupt Cable, 2x2	6 in. (150mm)
1117381	Logic Interrupt Cable, 2x2	6 in. (150mm)
1117382	Slug Interrupt Cable, 2x2	6 in. (150mm)

Figure 30: "T"-Cable Wiring

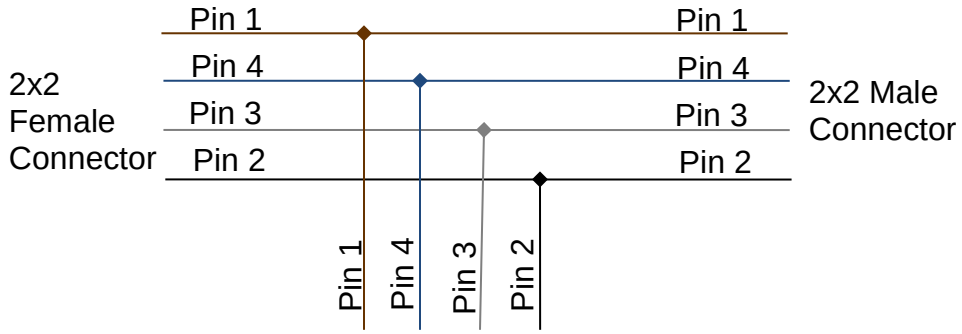


Figure 31: Power Interrupt Wiring

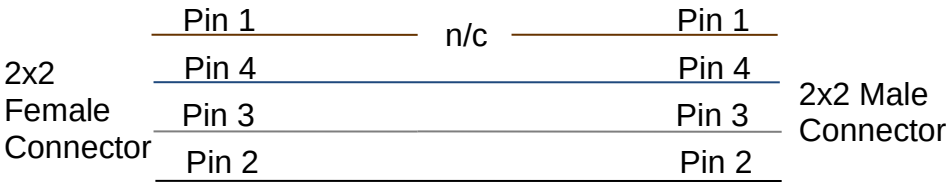


Figure 32: Logic Interrupt Wiring

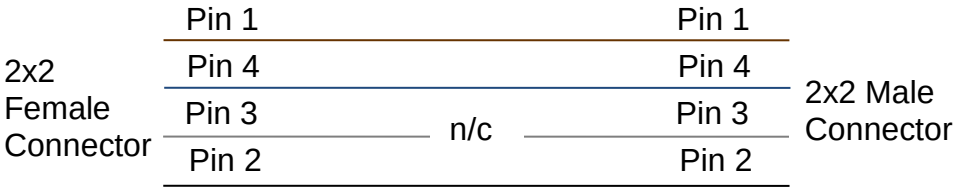
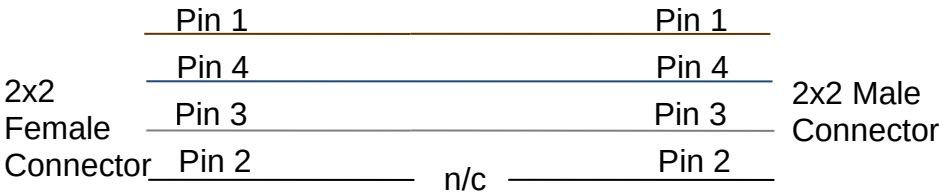


Figure 33: Slug Interrupt Wiring



Conveyor Power Supply

TGW's power supplies feature a compact housing design that is designed specifically for use with CRUZcontrol logic modules.

These units meet the latest NEC Class II requirements in accordance with UL, EN, IEC standards. Installation is fast and easy due to slotted holes in a durable mounting plate that mounts directly to the side of the conveyor.

The power supplies are also capable of buffering brief power failure conditions at rated voltage (e.g. 20 ms at 120 VAC) in accordance with EN 60204-1. Global acceptance is also achieved by conformance with cULus standards (North American compliance) and CE standard requirements (European compliance).

Power Supply Features

- Adjustable output voltage up to 24…28 VDC
- 115/230 VAC or 480 2 phase VAC input
- State-of-the-art design
- Type 1 enclosure, IP 20
- Bolt on mounting

Figure 34: TGW PN 1117432 Dimensional Diagrams

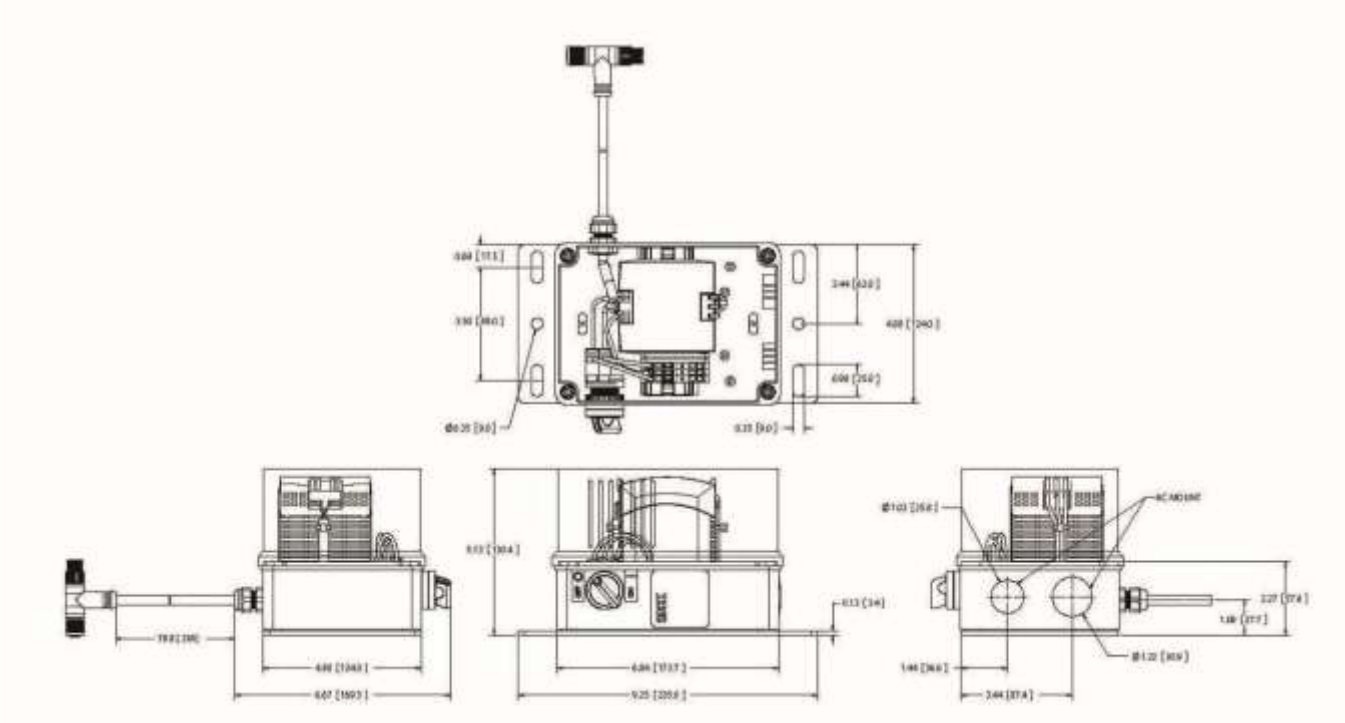


Figure 35: TGW PN 1117432 Connection Diagrams

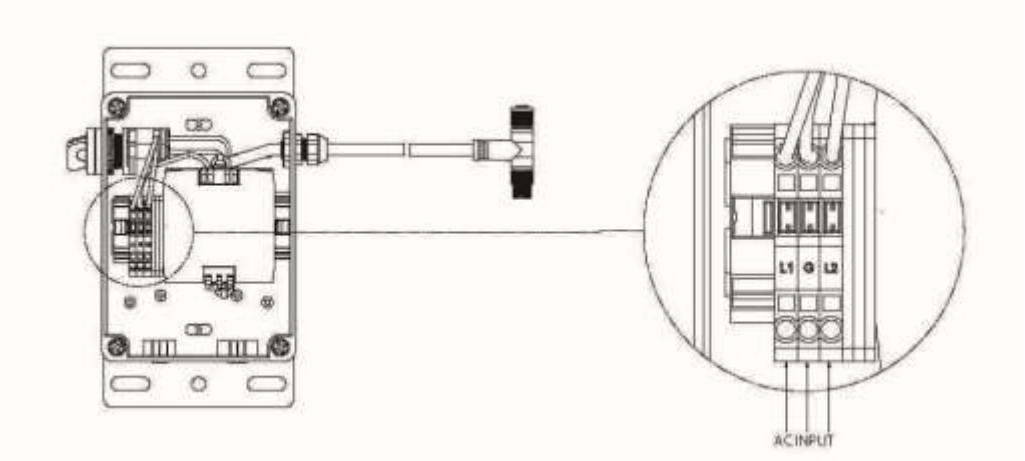


Figure 36: TGW PN 1117431 Dimensional Diagram

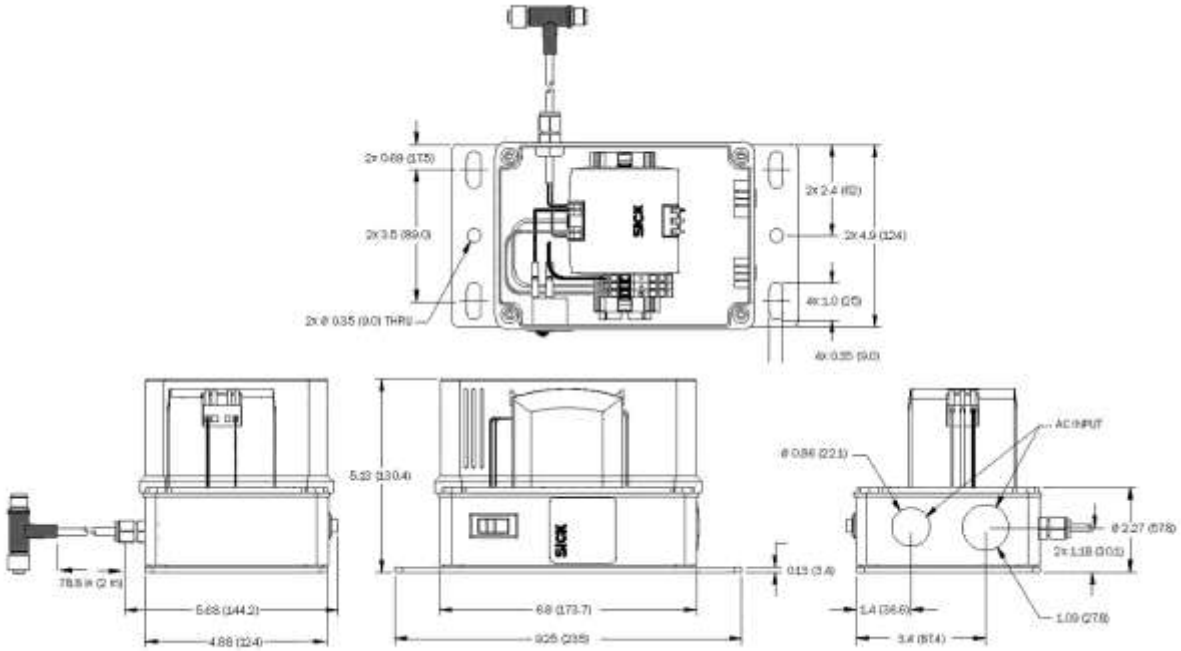
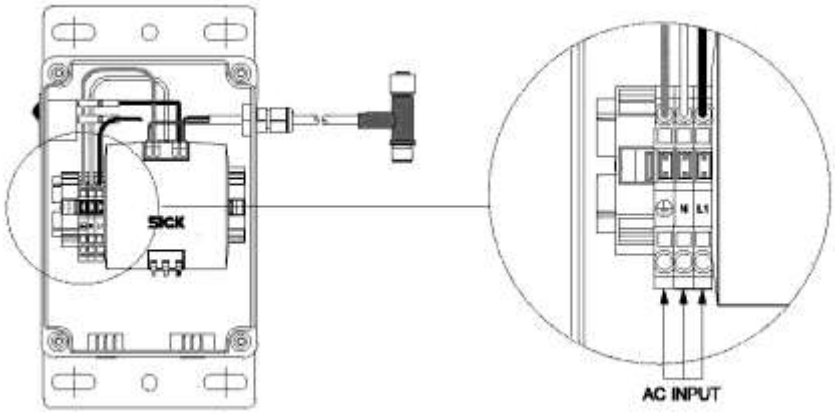


Figure 37: TGW PN 1117431 Connection Diagram



Power Supply Technical Data

Technical Data	PN 1117431	PN 1117432
Input Parameters		
Input Voltage Range V AC (nominal)	100…120/220…240 V	380…480 V (2 phase)
Input Voltage Range V AC (continuous)	85…132/1184…264 V	323…552 V (2 phase)
Input Frequency	47…63 Hz	47…63 Hz
Phase	1	2
Input Voltage Range V DC (see derating requirements)	220…375 V	consult factory
Input Rated Current	< 2.0 A (100 V AC)	< 0.42 A (400 V AC)
	< 0.95 A (196 V AC)	< 0.36 A (480 V AC)
Transient Immunity Over Entire Load Range		Consult factory
Output Parameters		
Output Voltage	24…28 V DC	24…28 V DC
Output Voltage Preset	24.5 V DC ±0.5%	24.5 V DC ± 0.5%
Ripple/Noise @ 20 MHz, 50 Ohm	< 50 m Vpp	< 50 m Vpp
Output Voltage Regulation Accuracy	0.5% Vout static	± 200 mV static
	±1.5% Vout dynamic	Dynamic not available
Output Rated Current	3.9 A (at 24 V)	3.75 A (at 24 V)
	3.2 A (at 28 V)	3.2 A (at 28 V)
Hold Up Time	> 20 ms (196 V AC, 24.5V/3.9 A)	Typ. 52 ms (at 400 V)
	> 20 ms (100 V AC, 24.5 V/3.9A)	Typ. 93 ms (at 480 V)
General Device Parameters		
Operating Temperature Range (Tamb) - Full Load	14…140°F (-10…60 C)	14…140°F (-10…60 C)
Operating Temperature Range (Tamb) - Derated	122…140°F (50…60 C)	122…140°F (50…60 C)
Storage Temperature	-13…185°F (-25…85 C)	-13…185°F (-25…85 C)
Humidity (Do not energize when condensation is present)	< 93%	< 95%
Input Cable Access	3/4 or 1/2 in. hole for conduit	
AC Connection Wires		
Stranded cable	0.3…2.5 mm2 / AWG 28-12	≥ 2,5 mm2 , AWG 26-12
Solid cable	0.3…4 mm2 / AWG 28-12	≥ 2,5 mm2 , AWG 26-12
Stripping at wire end	6 mm	6 mm
Note: secure wires from strain		
AC External Protection/Fusing	20A Max	30A Max
Output Connector Cables	M12 4-pin "T" cable	M12 4-pin "T" cable
Efficiency	90% (typical at 230 V AC, 3.9A)	89.5% (at 400 V)
		89.0% (at 480 V)
Protection Class - Type 1 Enclosure	IP 20 (DIN/IEC 60 529)	IP 20 (DIN/IEC 60 529)
MTBF	500,000 h @ 40C SN 29500	1.5 Mio h @ 40C SN 29500
	Not tested at MIL 217 GP40	482,000 h @ MIL 217 GP40
Dimensions	9.25 x 5.67 x 5.13	9.25 x 5.67 x 5.13
	(235 x 144 x 130.4 mm)	(235 x 144 x 130.4 mm)
Weight	3.9 lbs (1.8 kg)	4.4 lbs (2.0 kg)
Cover Screw Torque Rating (in-lb)	4±1	4±1
Mounting	Vertical mounting only. AC input enters from the bottom	
Clearance	Keep 4 in. clearance from ventilating slots in cover	
Applicable Standards		
EN 60 950-1, IEC 60 950	Yes	Yes
EN 60 204-1, EN 50 178	Yes	Yes
Third Party Approvals		
UL 508 Listing (US and Canada)	Multiple Listing	Multiple Listing
UL 60 950-1 Recognition (US and Canada)	Multiple Listing	Multiple Listing
NEC Class 2 According to UL 1310	Multiple Listing	Multiple Listing

Part Number Listing

Table 23: Logic Module w/Sensor and 2x2 Daisychain

TGW Part #	Description
1114947	Basic/Progressive, AtoB
1116736	Sensor/Valve Assembly, N.O. Valve
1116737	Basic/Progressive, AtoB, M12 Sensor Connection

Table 24: Accessories w/2x2 Connections

TGW Part #	Description
1117370	Male Cordset
1117371	Female Cordset
1117372 1117373 1117374	Extension Cable, male-female, 1m Extension Cable, male-female, 2m Extension Cable, male-female, 4m
1117375	2x2-M12 Adapter, female-female
1117376	2x2-M12 Adapter, male-male
1117377	2x2-M12 Adapter, female-male
1117378	2x2-M12 Adapter, male-female
1117379	T-Cable (with flying leads), 2m
1117380	Power Interrupt Cable
1117381	Logic Interrupt Cable
1117382	Slug Interrupt Cable
1116731	Function Module, Full
1116732	Function Module, Release
1116733	Function Module, Zone Status

Table 25: Logic Module w/MHL1 Sensor and M12 Daisychain for CRUZcontrol

TGW Part #	Description
E0001900A	Basic, AtoB
E0001901A	Basic, AtoD
E0001904A	Progressive, AtoB
E0001905A	Progressive, AtoD
E0005546	Basic, No Valve
E0006229	Sensor/Valve Assembly, N.O. Valve

Table 26: Accessories w/M12 Connections for CRUZcontrol

TGW Part #	Description
ZPI-P1	Power Isolation Cable
ZLSI-P4	Slug Interrupt Cable
E0006304	Function Module, Full
E0006305	Function Module, Release
E0003613	Singulation Interrupt Cable

Maintenance Schedule

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

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 any oil leakage.
- Check for loose bolts or parts.
- Check air filter bowls for accumulated water.
- Listen for air leaks.

Weekly

- Inspect bearings and gearmotors for excessive noise or heat.
- Check operation of all electrical controls.
- Check for proper PSI on air regulators.

⚠ WARNING

- Prohibit riding on conveyor by anyone.
- Think before making any adjustments. It may prevent an injury. Remember, all moving components are potentially dangerous.
- Protect yourself from unexpected starts when working on a stopped unit by locking and tagging the control panel or disconnect switch that supplies power to the unit.

Monthly

- Check air filters for cleanliness.
- Check drive unit for leaking seals and oil level in gearcase (if applicable), unusual noises, vibration and stress cracks.

Semi-Yearly

- Inspect and clean motor control centers.
- Grease regreaseable bearings.
- Check black PVC belt welded splice for signs of early failure.

Yearly

- Inspect oil in gearboxes.
- Inspect tightness of all nuts and bolts on units. Re-adjust and, if necessary, re-tighten.
- Check for plumb and level. Shims have been known to vibrate out from under supports in isolated incidents.
- Touch up paint that has been chipped. Unpainted surfaces will rust.
- Inspect for stress/fatigue cracks in frame and supports.

Belt Splice Inspection

- Belt splice should be inspected every 2,000 hours.
- If belt splice is cracked or coming apart it should be scheduled as soon as possible for a new belt splice to replace the old belt splice.

NOTE

Never re-weld over old belt splice. This makes the belt splice weak and brittle.

CAUTION

- Check to confirm tools and foreign objects have not been left on or inside the conveyor.
- Check to confirm all loosened parts have been retightened.
- Check to confirm all guards have been installed.

Gearmotors

- NBC drive units use gearmotors which are properly filled at the factory with sufficient lubrication for their mounting position.
- A synthetic lube is the standard lube supplied. Refer to manufacture for details.

Disassembly/assembly procedure as follows

1. Remove necessary guards to access maintenance areas.
2. Disconnect any electrical connection.
3. Remove gearmotor.
4. Perform required maintenance.
5. Reverse procedures for assembly.
6. Replace all guards.

Regularly inspect all gearmotors to guarantee maximum performance.

1. Tightness of bolts and screws.
2. No major oil leaks.
3. No excessive heating.
4. No unusual vibration or noise.

WARNING

- Do not perform maintenance on the conveyor until the startup controls are locked out and cannot be turned on 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.

Solenoid Valves

In order to minimize downtime, it is normally not feasible to repair malfunctioning electrical or valve components while leaving the conveyor unusable. Spare components should be kept in stock for emergency replacement. If feasible, the part may be repaired later to replace maintenance stock. Items which cannot be readily repaired or are questionable should be replaced. Components under warranty should not be repaired except in an emergency.

WARNING

- Before removing a valve or other pneumatic component, shut off and exhaust the entire pneumatic circuit and shut off and lockout electrical supply.

Sensing Switches

Sensing switches are of two types:

- retroreflective photoeye
- proximity switch

Adjust the retroreflective type as follows

1. Determine what sizes of target the photoeye must sense
2. Adjust for the worst case, usually smallest item, by loosening photoeye mounting nut and aligning while making sure photoeye has unobstructed view of reflector.
3. Move the target in and out of the field of detection to ensure that the photoeye energizes and de-energizes.

Adjust the proximity type as follows

1. Loosen proximity switch mounting bolt and adjust sensing switch so that the product passes directly in front of the switch face, as close to the switch face as possible without making contact.
2. Check that the proximity switch energizes and de-energizes as the product passes in front of the switch face
3. Tighten the mounting bolt

Parts Identification

This section is used to identify parts that may require replacement during the life of the equipment.

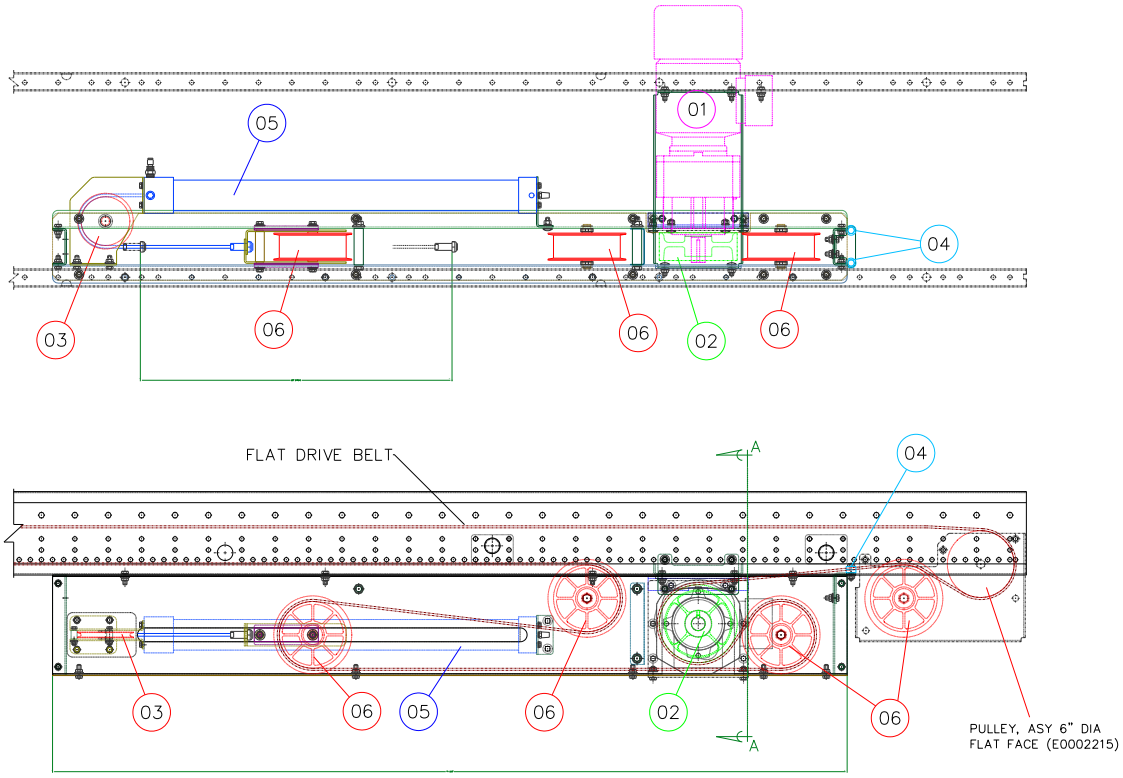
Parts which specifically pertain to NBC are included with illustrations.

A "Recommended Spare Parts List" is published for all conveyor orders of $20,000 or more. It includes part numbers, description, pricing and recommended quantities to be kept for maintenance.

If you are unable to locate this document (or the order is under $20,000) another may be obtained by contacting TGW Systems Lifetime Services at 231-798-4547 or Fax 231-798-4549.

To identify a part and its part number, refer to the assemblies and devices on the following pages. Determine the balloon number for the required part and reference the composite parts list.

NBC 500 lb Drive Train

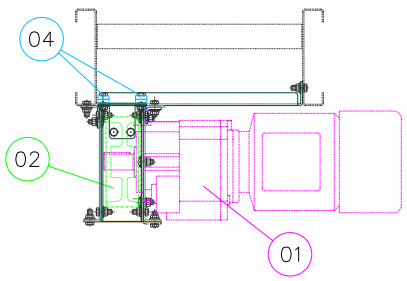


Replacement Part Numbers and Quantities for NBC 500 LB DRIVE			
BALLOON	ITEM #	DESCRIPTION	QTY
01	SEE CHART	GEARMOTOR	1
02	SEE CHART	DRIVE PULLEY	1
03	1121143	PULLEY,CABLE 1/4" WIDE X 5" OD	1
04	90050111	BEARING, R6ZZ C3	4
05	1103837	CYLINDER,2.5" BORE X 28" STROKE	1
06	E0002214	PULLEY, ASY 6" W/FLANGE	1

IOM-NBC017

NBC 500# DRIVE TRAINS

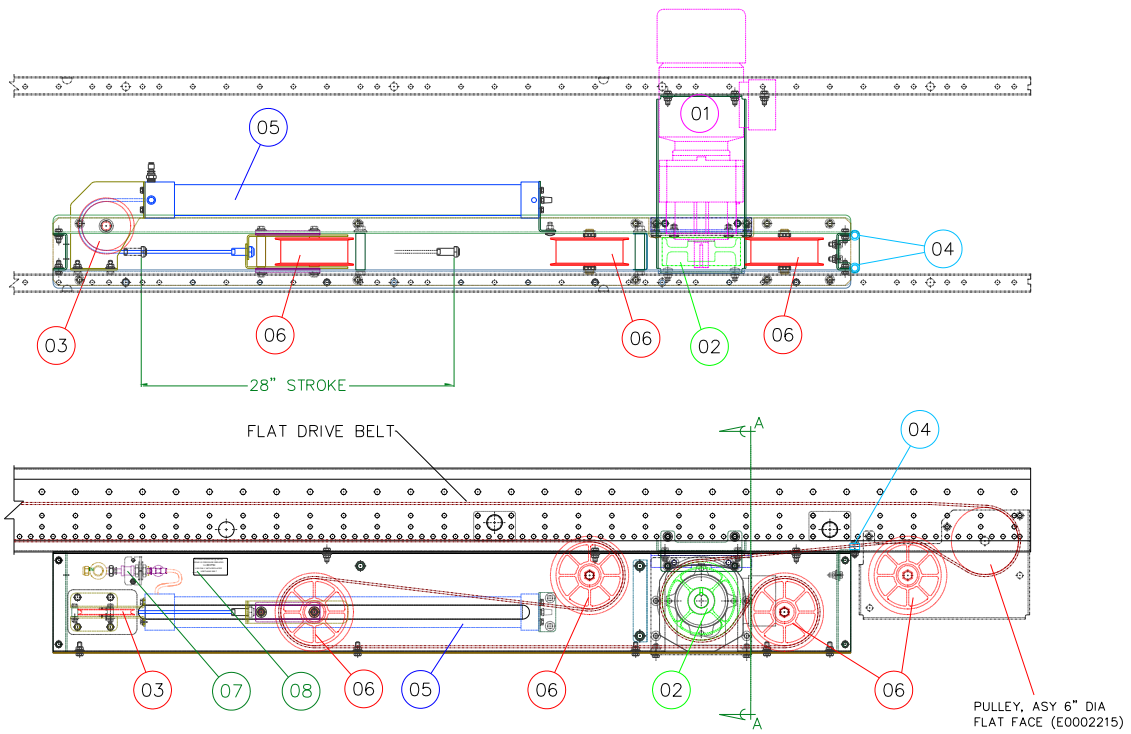
NOMINAL FPM	DRIVE TRAIN 01	GEAR MOTOR	MOTOR HP	SHAFT DIA. 02	PULLEY 02
65	1117666	1117632	3/4	1"	1115932
65	1117667	1117633	1	1-1/4"	1115931
80	1117668	1117634	3/4	1"	1115932
80	1117669	1117635	1	1"	1115932
85	1117670	1117636	1 1/2	1-1/4"	1115931
100	1117671	1117637	3/4	1"	1115932
100	1117672	1117638	1	1"	1115932
100	1117673	1117639	1 1/2	1-1/4"	1115931
115	1117674	1117640	1	1"	1115932
115	1117675	1117641	1 1/2	1"	1115932
120	1117676	1117642	2	1-1/4"	1115931
130	1117677	1117643	1	1"	1115932
130	1117678	1117644	1 1/2	1"	1115932
135	1117679	1117645	2	1-1/4"	1115931
145	1117680	1117646	1 1/2	1"	1115932
155	1117681	1117647	2	1-1/4"	1115931
145	1117682	1117648	3	1-1/4"	1115931
160	1117683	1117649	1 1/2	1"	1115932
160	1117684	1117650	2	1"	1115932
160	1117685	1117651	3	1-1/4"	1115931
200	1117686	1117652	1 1/2	1"	1115932
200	1117687	1117653	2	1"	1115932
200	1117688	1114134	3	1-1/4"	1115931
230	1117689	1117654	1 1/2	1"	1115932
230	1117690	1117655	2	1"	1115932
230	1117691	1117656	3	1-1/4"	1115931



SECTION A-A FACING PAGE

IOM-NBC017A

NBC 250 lb Drive Train

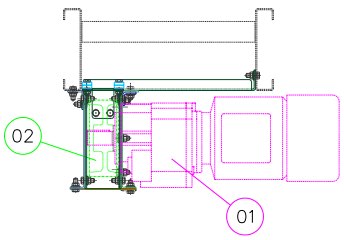


Replacement Part Numbers and Quantities for NBC 250 LB DRIVE			
BALLOON	ITEM #	DESCRIPTION	QTY
01	SEE CHART	GEARMOTOR	1
02	SEE CHART	DRIVE PULLEY	1
03	1121143	PULLEY,CABLE 1/4" WIDE X 5" OD	1
04	90050111	BEARING, R6ZZ C3	4
05	1103837	CYLINDER,2.5" BORE X 28" STROKE	1
06	E0002214	PULLEY, ASY 6" W/FLANGE	3
07	1135086	ASY,FIXED 30PSI REGULATOR	1
08	1135077	LABEL,PRESSURE REDUCED TO 30PSI	2

IOM-NBC017-250

NBC 250# DRIVE TRAINS

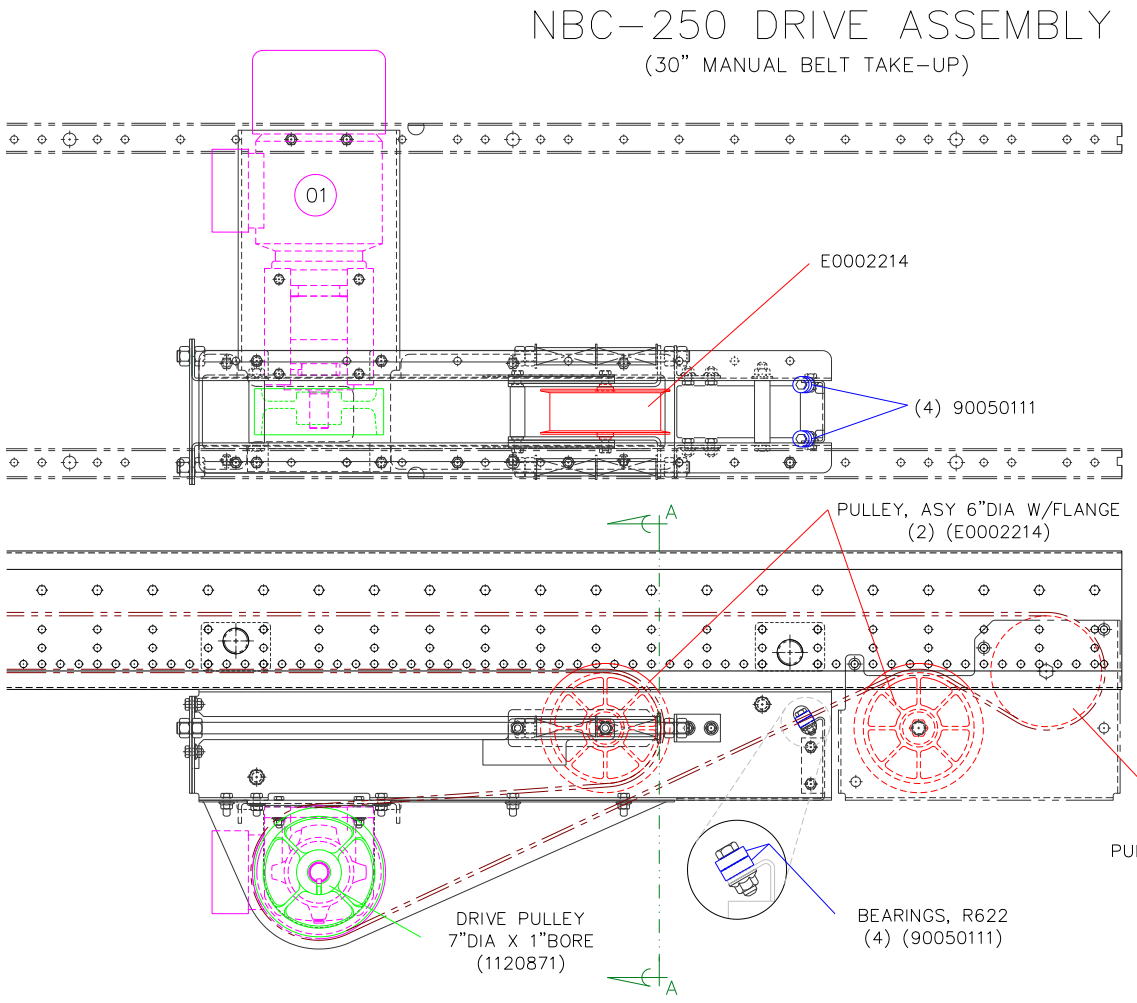
NOMINAL FPM	DRIVE TRAIN (01)	GEAR MOTOR	MOTOR HP	SHAFT DIA. (02)	PULLEY (02)
70	1117768	1117784	3/4	1"	1120871
85	1117769	1117785	3/4	1"	1120871
105	1117770	1117786	3/4	1"	1120871
125	1117771	1117787	3/4	1"	1120871
125	1117772	1117788	1	1"	1120871
140	1117773	1117789	3/4	1"	1120871
140	1117774	1117790	1	1"	1120871
155	1117775	1117791	3/4	1"	1120871
155	1117776	1117792	1	1"	1120871
155	1117777	1117793	1 1/2	1"	1120871
175	1117778	1117794	1	1"	1120871
175	1117779	1117795	1 1/2	1"	1120871
220	1117780	1117796	1	1"	1120871
220	1117781	1117797	1 1/2	1"	1120871
250	1117782	1117798	1 1/2	1"	1120871
250	1117783	1117798	2	1"	1120871



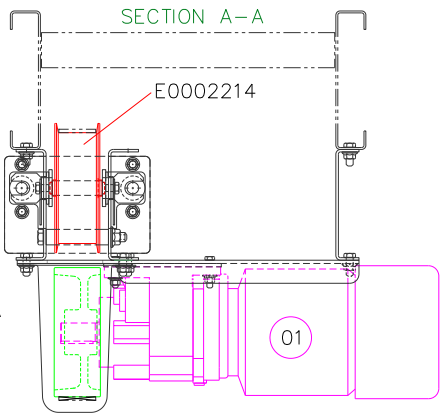
SECTION A–A FACING PAGE

IOM–NBC017A–250

NBC 250 lb Manual Take-up and Drive Train

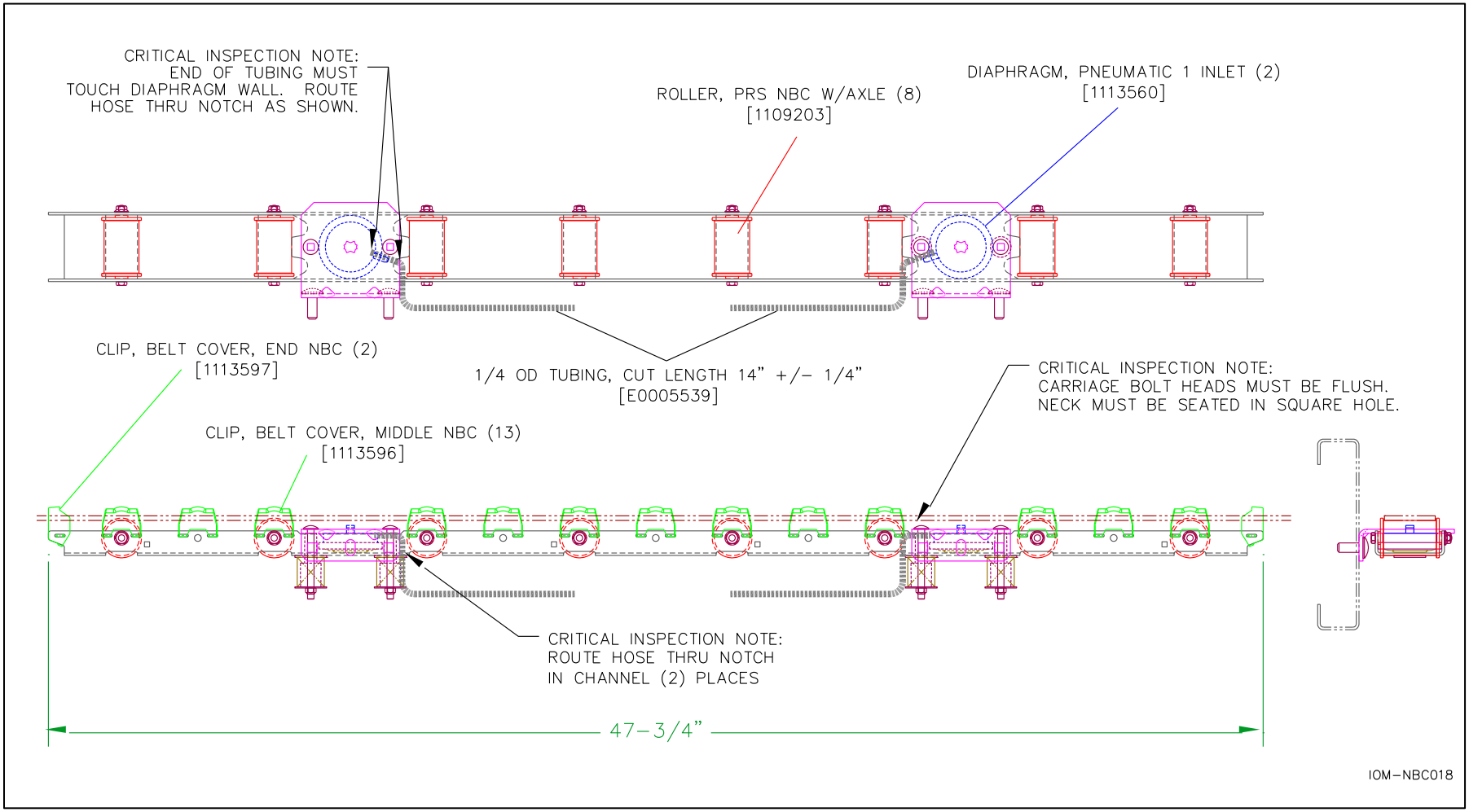


NOMINAL FPM	DR–TRAIN (01)	GEAR MOTOR	MOTOR HP
65	1117768	1117784	3/4
80	1117769	1117785	3/4
100	1117770	1117786	3/4
120	1117771	1117787	3/4
115	1117772	1117788	1
130	1117773	1117789	3/4
130	1117774	1117790	1
150	1117775	1117791	3/4
145	1117776	1117792	1
145	1117777	1117793	1 1/2
160	1117778	1117794	1
160	1117779	1117795	1 1/2
200	1117780	1117796	1
200	1117781	1117797	1 1/2
230	1117782	1117798	1 1/2
230	1117783	1117799	2



IOM–NBC016

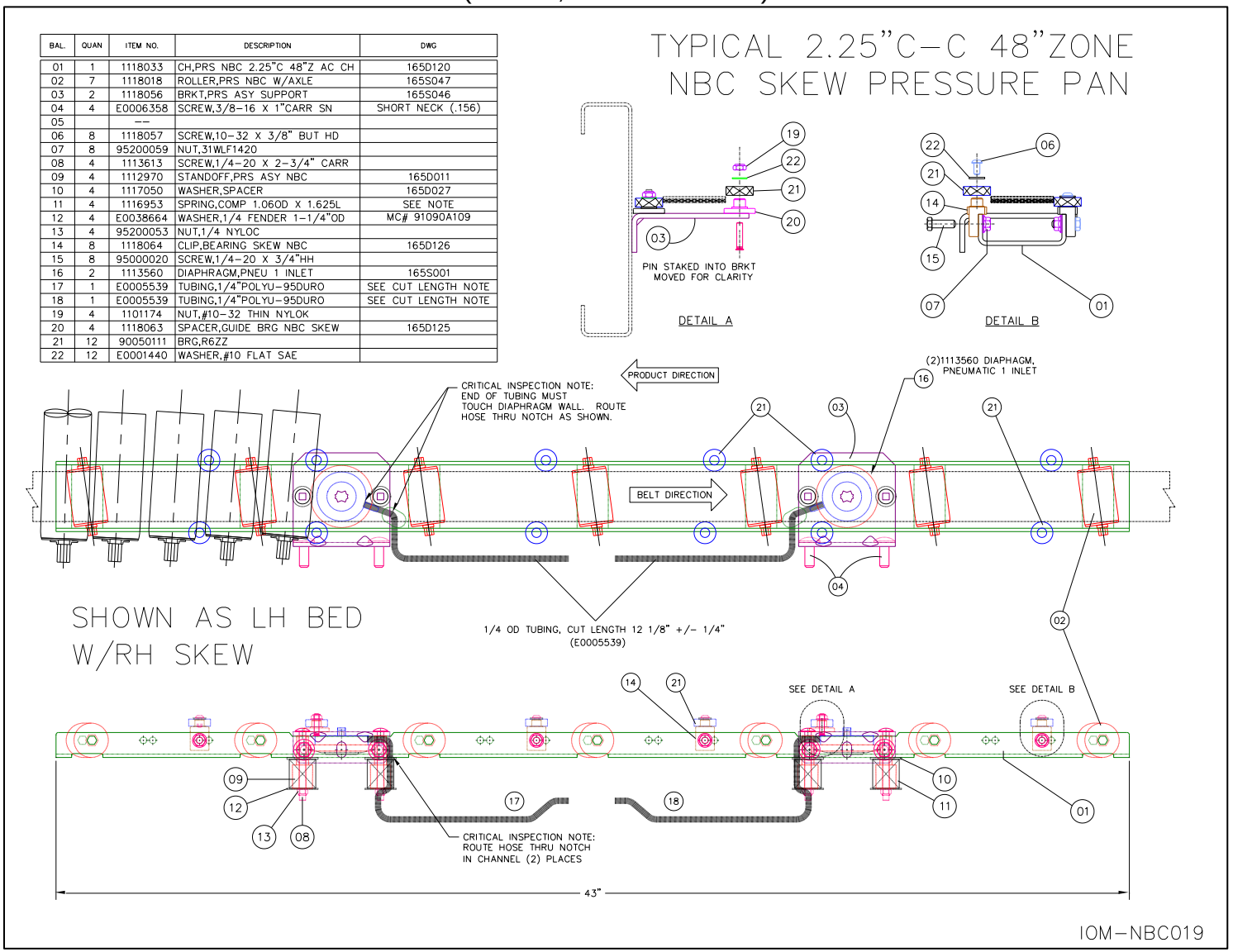
NBC Pressure Assembly



NBC Skewed Pressure Pan Assembly

(LH bed, RH skew shown)

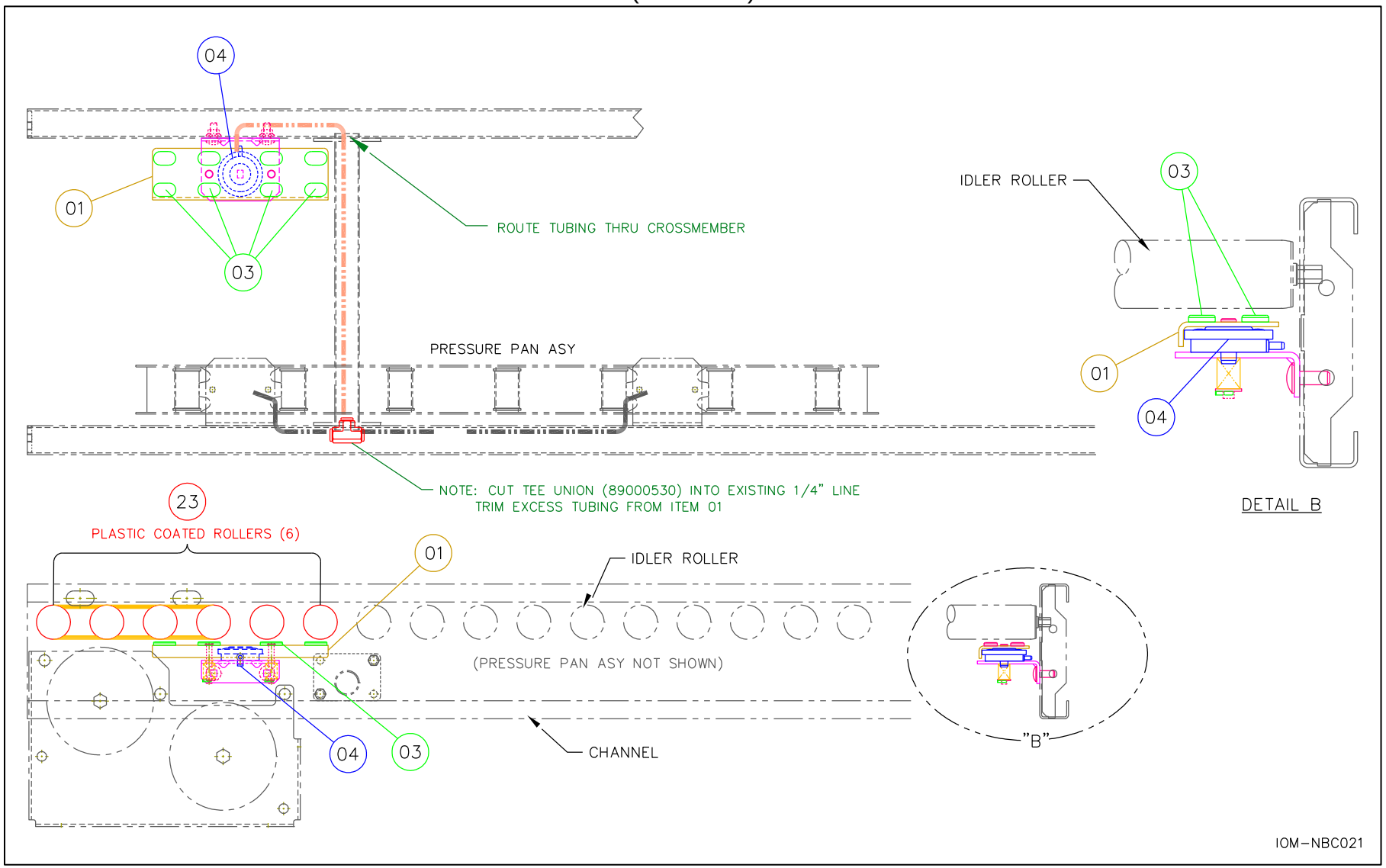
BAL.	QUAN	ITEM NO.	DESCRIPTION	DWG
01	1	1118033	CH,PRS NBC 2.25"C 48"Z AC CH	165D120
02	7	1118018	ROLLER,PRS NBC W/AXLE	165S047
03	2	1118056	BRKT,PRS ASY SUPPORT	165S046
04	4	E0006358	SCREW,3/8-16 X 1"CARR SN	SHORT NECK (.156)
05		---		
06	8	1118057	SCREW,10-32 X 3/8" BUT HD	
07	8	95200059	NUT,31WLF1420	
08	4	1113613	SCREW,1/4-20 X 2-3/4" CARR	
09	4	1112970	STANDOFF,PRS ASY NBC	165D011
10	4	1117050	WASHER,SPACER	165D027
11	4	1116953	SPRING,COMP 1.060D X 1.625L	SEE NOTE
12	4	E0038664	WASHER,1/4 FENDER 1-1/4"OD	MC# 91090A109
13	4	95200053	NUT,1/4 NYLOC	
14	8	1118064	CLIP,BEARING SKEW NBC	165D126
15	8	95000020	SCREW,1/4-20 X 3/4"HH	
16	2	1113560	DIAPHRAGM,PNEU 1 INLET	165S001
17	1	E0005539	TUBING,1/4"POLYU-95DURO	SEE CUT LENGTH NOTE
18	1	E0005539	TUBING,1/4"POLYU-95DURO	SEE CUT LENGTH NOTE
19	4	1101174	NUT,#10-32 THIN NYLOK	
20	4	1118063	SPACER,GUIDE BRG NBC SKEW	165D125
21	12	90050111	BRG,R6ZZ	
22	12	E0001440	WASHER,#10 FLAT SAE	



Replacement Part Numbers for NBC Skewed Pressure Pan Assembly			
BALLOON	**ITEM #**	**DESCRIPTION**	**QTY**
02	1118018	ROLLER,PRESSURE 1.375" X 2.5" BF SKEW NBC	7
06	1118057	SCREW, 10-32 X 3/8" BUTTON HEAD NYLON PATCH	8
14	1118064	CLIP, BEARING SKEW NBC	8
19	1101174	NUT, #10-32 THIN NYLOC	4
20	1118063	SPACER, GUIDE BRG NBC SKEW	4
21	90050111	BEARING, R6ZZ	12
22	E0001440	WASHER, #10 FLAT SAE	12

NBC Discharge Brake Assembly

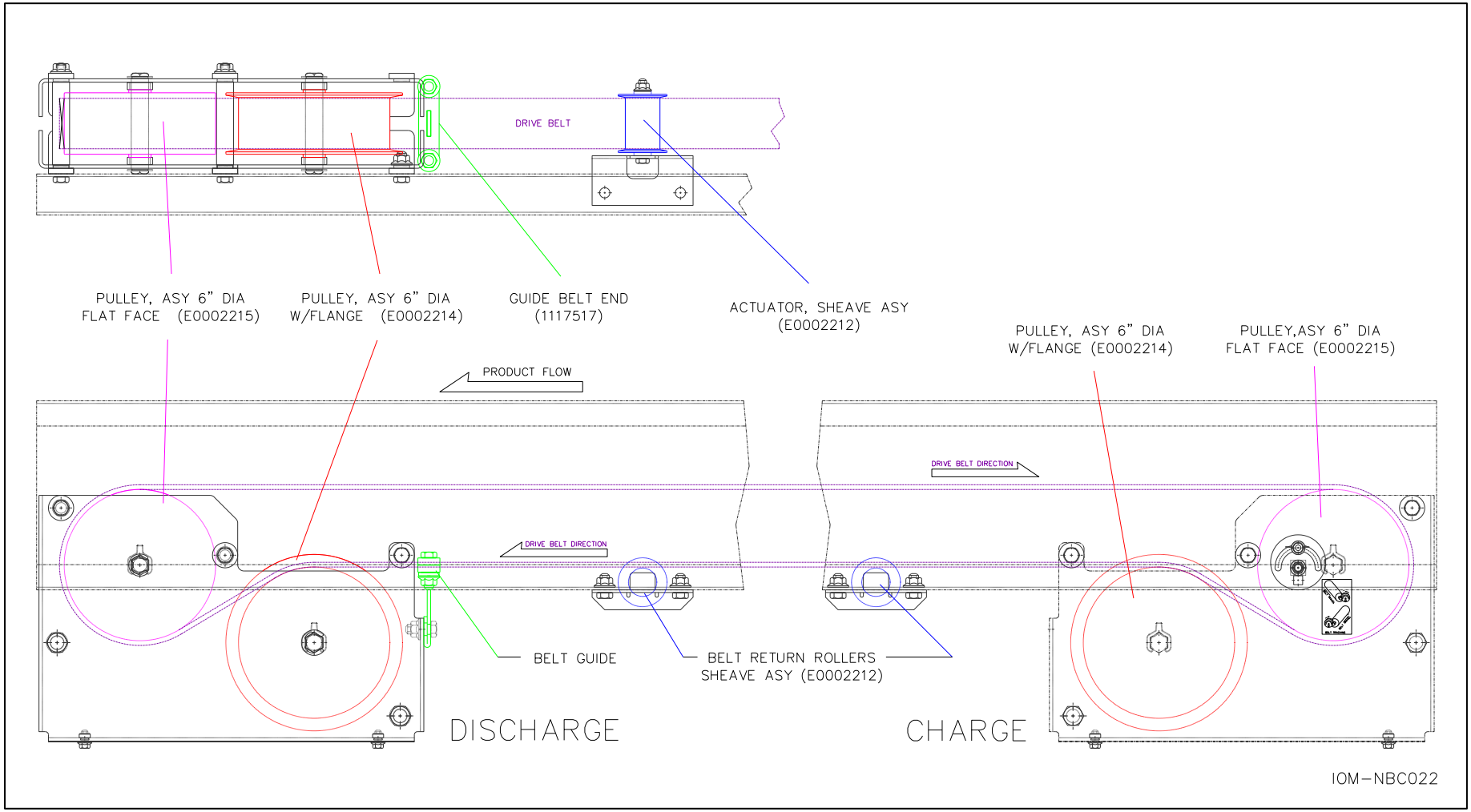
(LH shown)



Replacement Part Numbers and Quantities for NBC Brake Assembly							
				16BF	22BF	28BF	34BF
BALLOON	ITEM #	DESCRIPTION	QTY				
01	1117955	BRAKE ASSEMBLY	1				
03	1113368	BUMPER, BRAKE PAD	8				
04	1113560	DIAPHRAGM, ASY PNEUMATIC SINGLE INLET	1				
23	E0001530	ROLLER, PLASTIC COAT 2D GRVS 1.9CTD	6	1117982	1117983	1117975	1117984
		BRAKE KIT ASY, INCLUDES ROLLERS		1118098	1118099	1118100	1118101

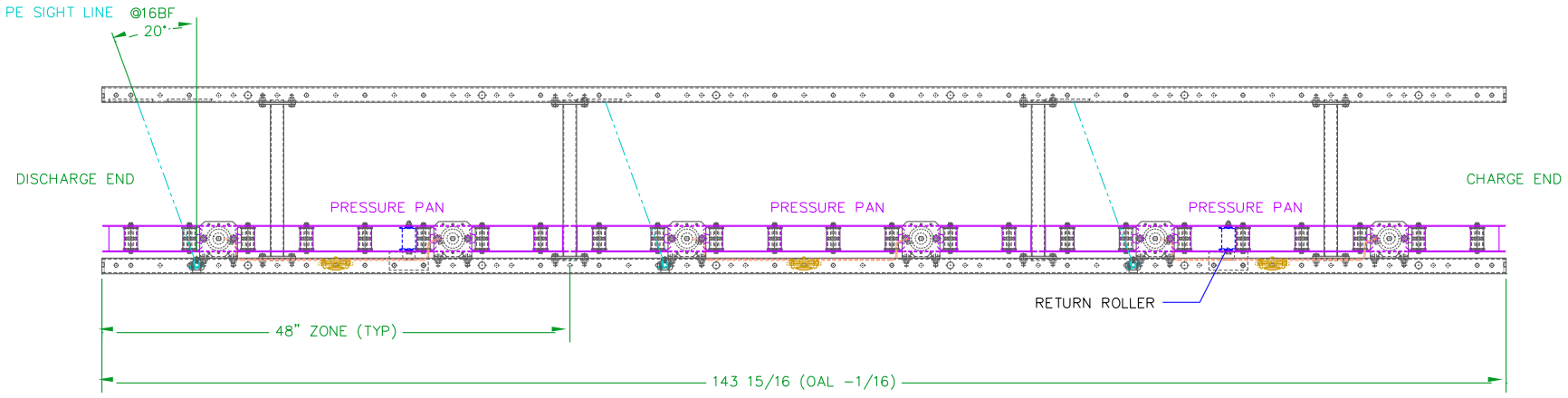
NBC End Pulley Assembly

(Charge / Discharge)

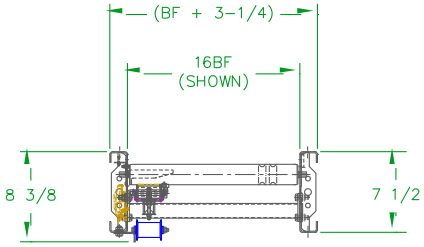


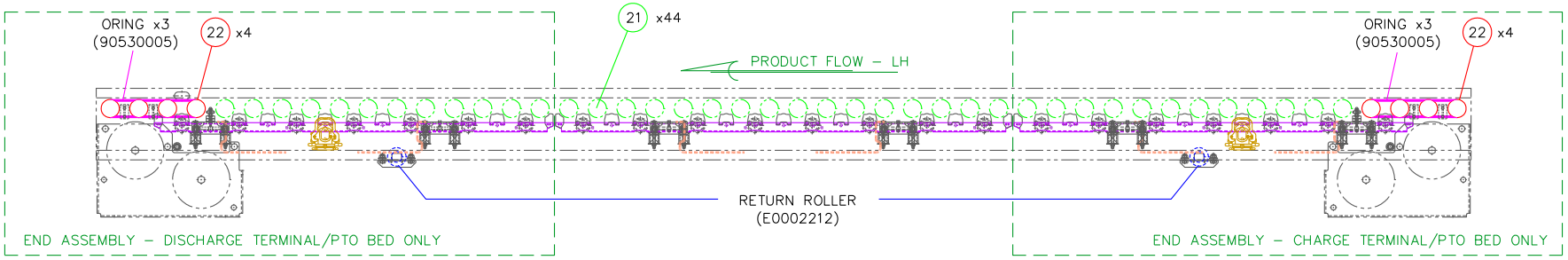
NBC 12 ft Contact Accumulation

(LH bed shown)



PART NO.	16BF	22BF	28BF	34BF
21	60218009	60218009	60218009	60218009
22	E0005254	E0005354	E0005454	E0005554

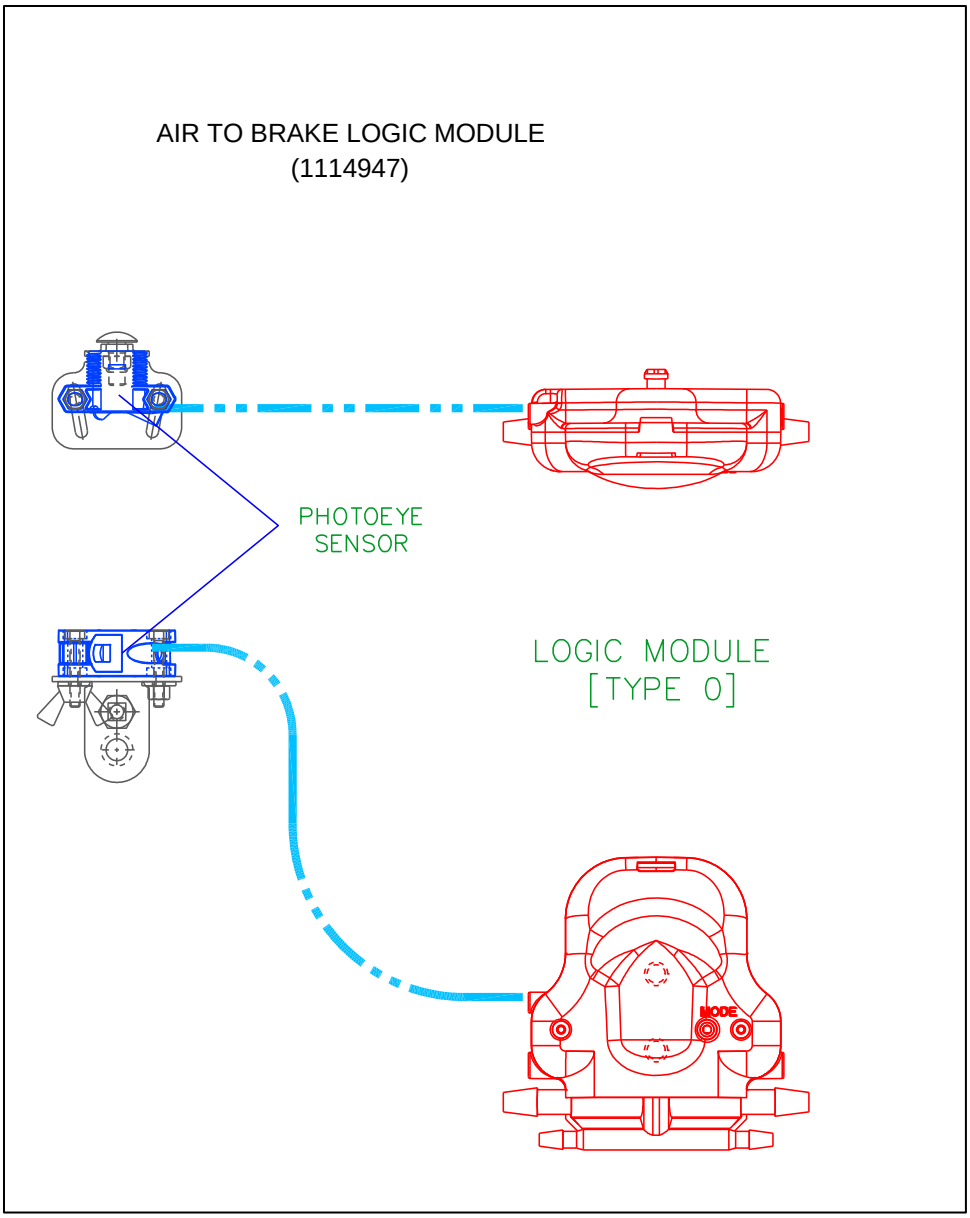




IOM-NBC023

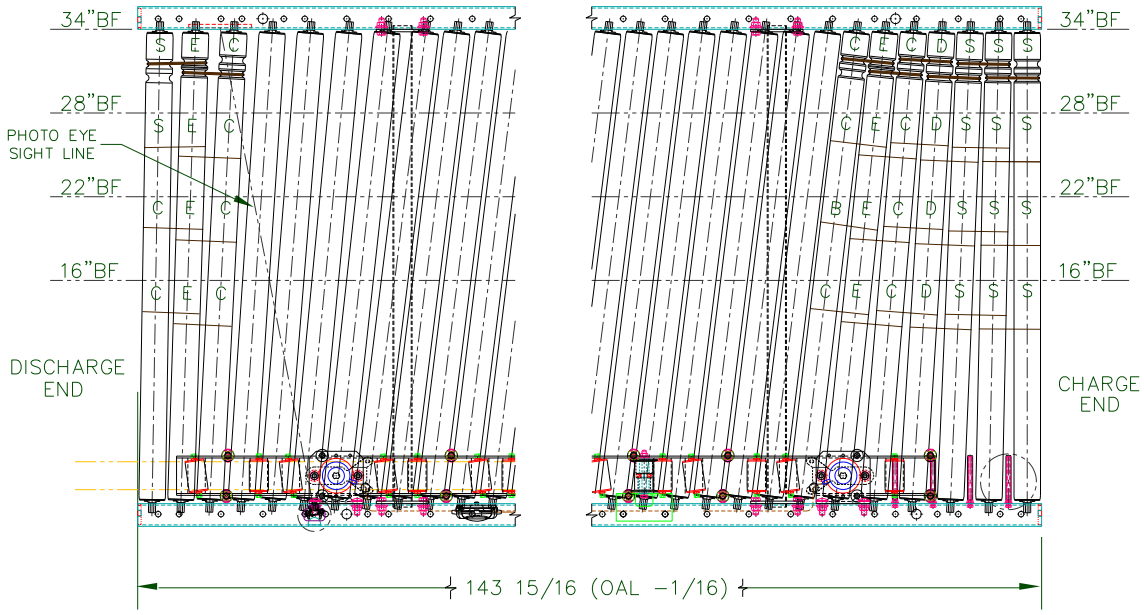
NBC Logic Module Component

Straight Beds

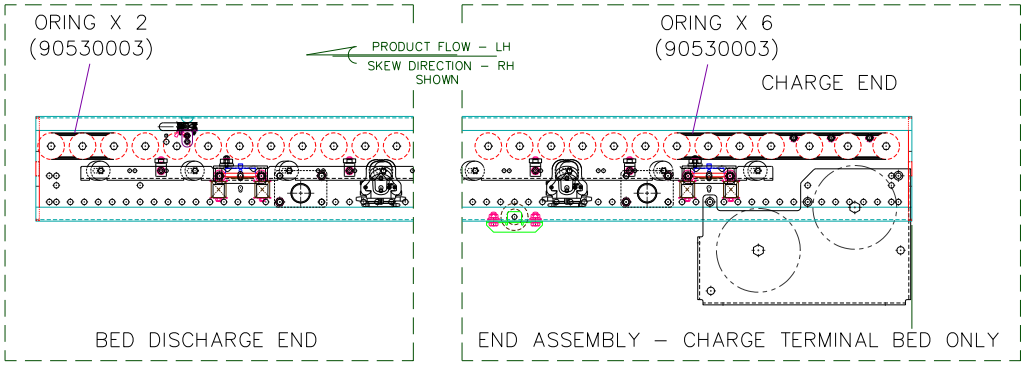


NBC 12 ft Contact Accumulation Skewed Rollers

(LH Bed with RH Skew shown)



ROLLER	16BF	22BF	28BF	34BF
NO GRVS	(53) 60218009	(53) 60224009	(53) 60228009	(53) 60236009
S	(3) E0005252	(3) E0005253	(4) E0005254	(4) E0005255
B	- - -	(1) 1121728	- - -	- - -
C	(4) 1118554	(3) 1121729	(3) 1118079	(3) 1119832
D	(1) 1118555	(1) 1121730	(1) 1118080	(1) 1119833
E	(2) 1118557	(2) 1121731	(2) 1118086	(2) 1119834



IOM-NBC025

Appendix

Troubleshooting Guide – Mechanical/Electrical

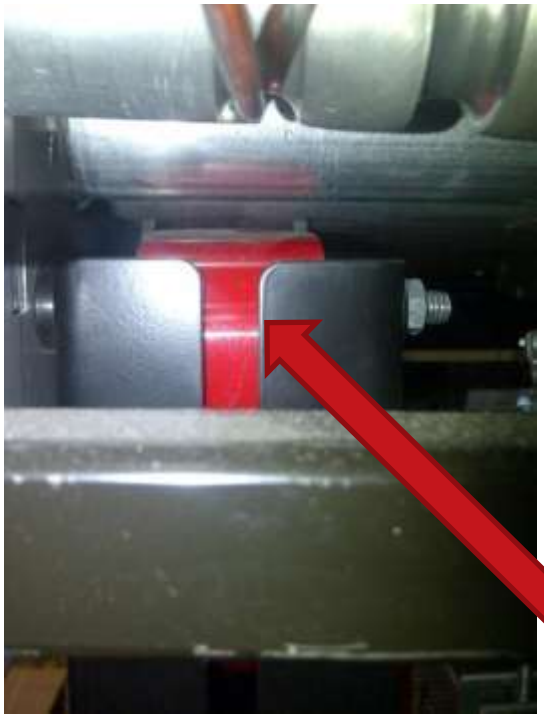
Mechanical Problem	Possible Cause	Remedy
Insufficient drive	Rollers not turning consistently	Check alignment of pressure pan
	Poor bottom on product	Improve product conveyability
	Overloading of product	Remove overload
	Belt slippage	Check air pressure on take up assembly. Make sure belt tension is proper.
	Drive belt interference with structure	Locate and correct interference
	Red belt installed upside down	Install belt properly
Rollers not turning/turning slowly	Belt not engaged with roller	Check alignment of pressure pan
	Zone not active	Check alignment of downstream photo eye
	Interference with roller or belt	Locate and correct interference
	Bent roller	Replace roller
Excessive Belt Wear	Poor routing of belt	Correct route of belt, insure belt is woven through drive and end terminals correctly
	Interference within route of belt	Locate and correct interference issue
Belt out of groove Or weakening of belt	High speed	Excessive speed in short conveyor units (under 70 linear feet) increases weld fatigue
	Maintenance Skew Section	If 4-foot middle section of intermediate bed is skewed in field, insure belt is properly placed within pressure pan before roller installation (only section skewing allowed)

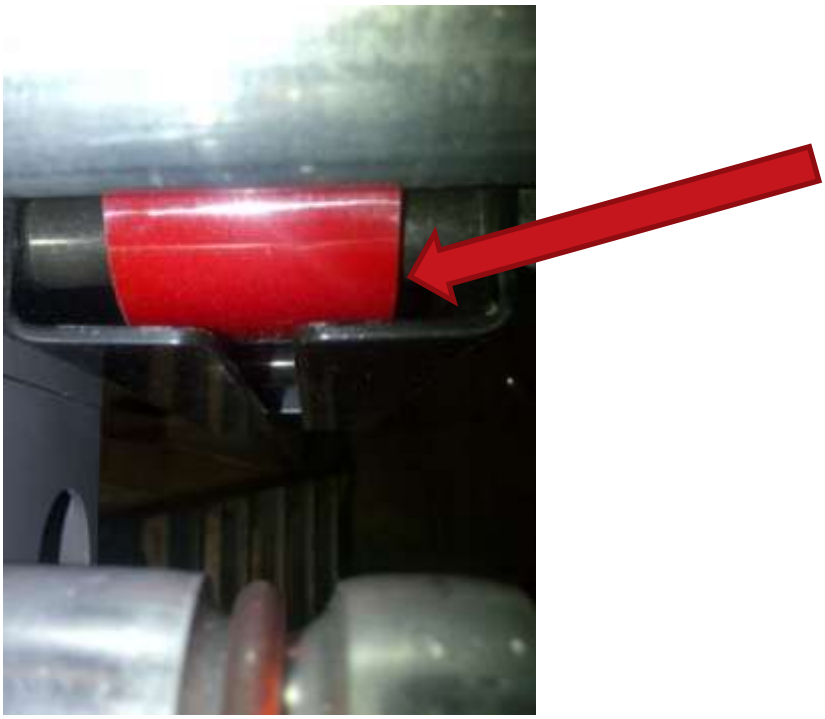
Mechanical Problem	Possible Cause	Remedy
Items not accumulating	Lack of power	Insure power supply is functioning properly
	Improper wiring of T-cable to power supply	Only the brown and blue wires of the T-cable are used to connect with the Power Supply. If the white and black wires connect in any way… the logic is turn into progressive mode out of singulation, and all function module settings are overridden
	Broken logic module	Located module and replace with new component
	Lack of air	Insure Filter Regulator is functioning properly, and is set at proper setting. (40psi)
Zones not releasing	Cable connector issue	Insure proper connection, check for damage.

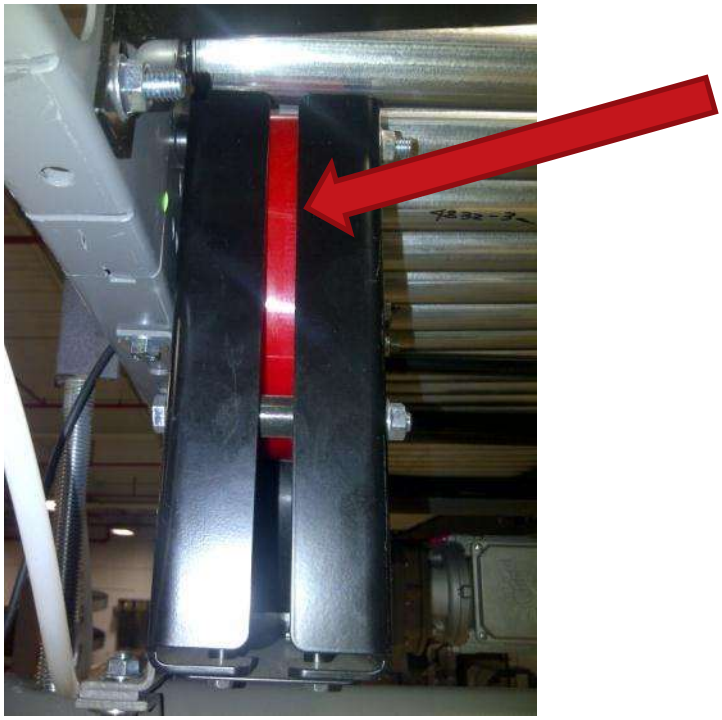
NBC Belt Routing Troubleshooting Guidelines

Belt is routed thorough terminal end section correctly, as you can see the spacers inside the protective guarding.

Belt is NOT routed thorough terminal end section correctly, as you cannot see the spacers inside the protective guarding.

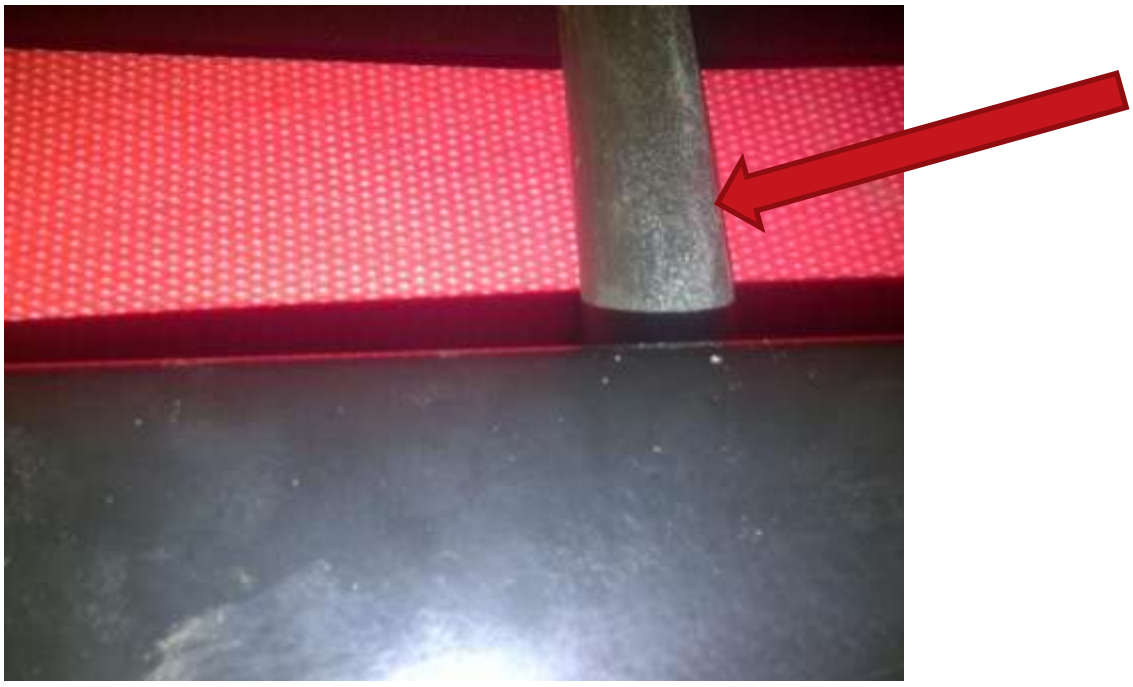




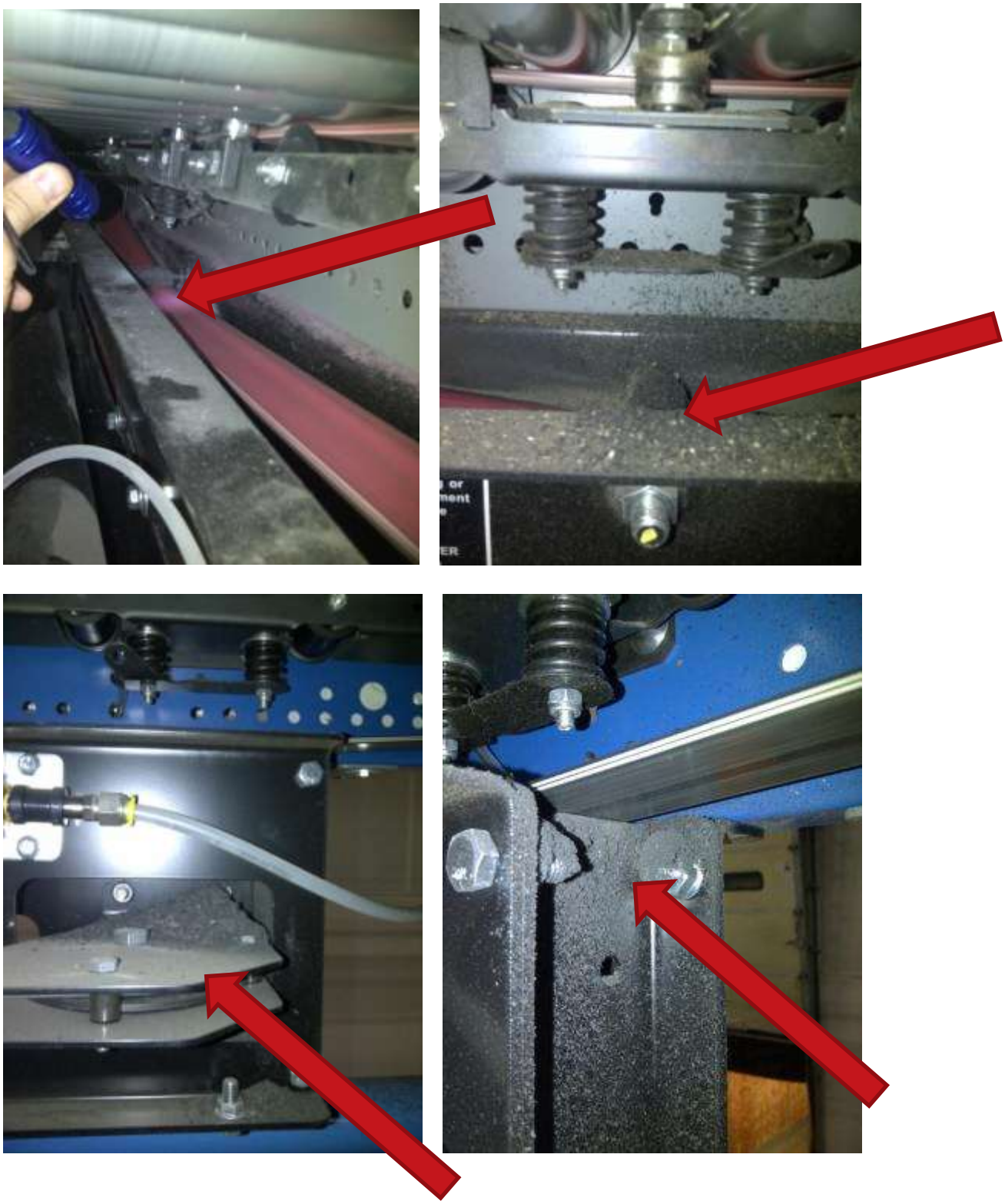


Belt is routed thorough Drive and Take-Up section correctly, as you can see the belt is ABOVE the top of the protective guarding, and ABOVE spacer.

Belt is NOT routed thorough Drive and Take-Up section correctly, as you can see the belt is BELOW the top of the protective guarding, and UNDER the spacer. (Under space is NOT correct.)



Pictures of results from poor belt routing.



Mission

To meet or exceed all customer expectations by providing the highest quality products and services, on time, at exceptional value, in an environment which promotes safety and personal development.

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