
UnitSort[®] XV Sortation Conveyor Design Manual

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Read these documents thoroughly before attempting to perform installation, maintenance or repairs to the applicable Intelligrated equipment components or devices. Exercise extreme caution when working around moving and rotating equipment. Wear the proper clothing and safety equipment. DO NOT attempt to perform any maintenance until the equipment is de-energized, locked out and tagged out in accordance with established company procedures and OSHA/ANSI standards.

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Revision	Date	Initials	Description
Rev 0	4/27/11		Re-format entire manual. Update description of Mobile Synthetic lubricant - from SCH 630 to SHC 630.

Use of Manual

This manual contains important information. Please read this manual before attempting to operate or perform installation or maintenance on this Conveyor.

This manual is designed for operator personnel who have a substantial knowledge of mechanical operations and who have basic knowledge of typical mechanical operations. Failure to comply with the instructions and warnings contained in this manual, and the warnings posted on the Conveyor can result in serious injury to personnel and/or damage to the equipment.

Disclaimers

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This manual contains a generalized description of the Conveyor and its operation available at the time this manual was approved for printing. Intelligrated reserves the right to make changes in design and specifications and to make additions to, or improvements in, the product without imposing any obligations upon it to install them on previously manufactured products.

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1 General Description

Introduction

The UniSort XV consists of the following components:

- an in-feed belt section to accept cases from a 22, 28, or 34 inches (558.8mm, 711.2mm, or 863.6mm) transportation conveyor,
- an idler section (consisting of an idler and an intermediate section),
- intermediate sections (as required by the application) consisting of non-divert sections, and divert sections to divert cases to the left, right, or both sides of the sorter, a catenary section (for applications over 50 feet (15.2m) long), and
- a drive section.

Applications

High speed case sorting system for transportation conveyor systems.

UniSort XV - Product Summary

General

Product Handled

Inch Specification:

0.5 to 120 lbs. weight.

6 to 48 inches length - 1 to 36 inches width.

Consult factory for other sizes.

Cartons, bags, rolls, bound package, etc.

Metric Specification:

0.2kg to 54.4kg weight.

152mm to 1219mm length - 25mm to 915mm width.

Consult factory for other sizes.

Cartons, bags, rolls, bound package, etc.

Drive Medium

RC100 matched pair, single pin extension every other pitch, with carrier bearings.

Speeds

Inch Specification:

250 to 650fpm (feet per minute), in 50fpm increments - other speeds available with variable speed control.

Note: The maximum speed for a dual-sided sorter is 550fpm.

Metric Specification:

76 to 198mpm (meters per minute), in 15mpm increments - other speeds available with variable speed control.

Note: The maximum speed for a dual-sided sorter is 168mpm.

Sort Rate

50 to 350 cartons per minute.

Actual rate dependant on: product dimension, gap between product, and conveyor speed.

Tube Centers

Inch Specification:

Non-divert tubes - 2.5 inch centers.

Divert shoe tube - 5.0 inch centers.

Material -1.75 inch diameter, 12ga steel.

Metric Specification:

Non-divert tubes - 63.5mm centers.

Divert shoe tube - 127mm centers.

Material - 44.5mm diameter, 12ga steel.

Slat Centers**Inch Specification:**

Non-divert slats - 5.0 inch centers.

Divert shoe slats - 5.0 inch centers.

Material - Aluminum.

Metric Specification:

Non-divert slats - 127mm centers.

Divert shoe slats - 127mm centers.

Material - Aluminum.

Divert Characteristic

Divert centers - based on width - consult factory.

Number of diverts - Limited only by distance between sort lanes and/or conveyor pull requirements.

Divert angles - 16°/21°, 20° or 30°.

Divert switches - Left and right (electrical), or crossover (mechanical).

Delivery Rates

Table 1 1 shows the delivery rates based on uniform case lengths and a 12 inch (305mm) case gap. Actual rates will vary depending on case length mix, induction system thru-put and availability of product at induction system.

Table 1 1 Delivery Rates

Case Length In. (mm)	Cases Per Minute								
	250fpm (76 mpm)	300fpm (91mpm)	350fpm (106mp m)	400fpm (121mp m)	450fpm (136mp m)	500fpm (151mp m)	550fpm (166mp m)	600fpm (183mp m)	650fpm (198mp m)
6 (152)	167	200	233	267	300	333	367	400	433
9 (228)	143	171	200	229	257	286	314	343	371
12 (305)	125	150	175	200	225	250	275	300	325
16 (406)	107	129	150	171	193	214	236	257	279
18 (457)	100	120	140	160	180	200	220	240	260
24 (610)	83	100	117	133	150	167	183	200	216
30 (762)	71	86	100	114	129	143	157	171	186
36 (914)	63	75	88	100	113	125	138	150	162
42 (1067)	56	67	78	89	100	111	122	133	144
48 (1219)	50	60	70	80	90	100	110	120	130

Note: Gap length is dependant upon factors such as external control systems and product mix.

Finish

Intelligrated Gray.

In-Feed Belt Sections

Widths "W"

Inch Specification:

22, 28, 34 inches.

Metric Specification:

558.8mm, 711.2mm, 863.6mm.

Belt Widths

Inch Specification:

19, 25, 31 inches.

Metric Specification:

483mm, 635mm, 787mm.

Lengths

Inch Specification:

48 to 240 inches. Extended lengths available upon Engineering review.

Metric Specification:

1219mm to 6096mm. Extended lengths available upon Engineering review.

Idler Section (Idler Unit and First Intermediate Section)**Between Frame Widths (BF)**

Inch Specification:

22W - 43.5 inches, 28W - 49.5 inches, 34W - 55.5 inches.

Metric Specification:

22 inches W - 1104.9mm, 28 inches W - 1257.3mm, 34 inches W - 1409.7mm.

Lengths

20° LH Divert, RH Divert, and Dual Divert:

Inch Specification:

22W - 147.5 inches, 28W - 163.5 inches, 34W - 179 inches.

Metric Specification:

22 inches W - 3746.5mm, 28 inches W - 4152.9mm, 34 inches W - 4546.6mm.

30° LH Divert, RH Divert, and Dual Divert:

Inch Specification:

22W - 119 inches, 28W - 129.5 inches, 34W - 140 inches.

Metric Specification:

22 inches W - 3022.6mm, 28 inches W - 3289.3mm, 34 inches W - 3556.0mm.

Divert Angles - Direction

16°/21° - left or right.

20° - left or right.

30° - left or right.

Power Take-Off

Left or right side.

Divert Shoe Return

Left or right side.

Intermediate Sections

Between Frame Widths (BF)

Inch Specification:

22W - 43.5 inches, 28W - 49.5 inches, 34W - 55.5 inches.

Metric Specification:

22 inches W - 1104.9mm, 28 inches W - 1257.3mm, 34 inches W - 1409.7mm.

Lengths

0° Divert Sections:

Inch Specification:

22W, 28W, 34W inches = 12.0 to 120.0 inches, in 0.5 inch increments.

Metric Specification:

22W, 28W, 34W inches = 304.8 to 3048mm, in 12.7mm increments.

0° Divert Sections - w/IJD (Internal Jam Detector):

Inch Specification:

22W, 28W, 34W inches = 36.0 inches to 120.0 inches, in 0.5 inch increments.

Metric Specification:

22W, 28W, 34W inches = 914.4 to 3048mm, in 12.7mm increments.

16°/21° LH Divert and RH Divert:

Inch Specification:

22W - 116.4 inches, 28W - 132.0 inches, 34W - 144.0 inches.

Metric Specification:

22 inches W - 2956.6mm, 28 inches W - 3352.8mm, 34 inches W - 3657.6mm.

20° LH Divert, RH Divert, and Dual Divert Sections:

Inch Specification:

22W - 107.5 inches, 28W - 123.5 inches, 34W - 139.3 inches.

Metric Specification:

22 inches W - 2730.5mm, 28 inches W - 3136.9mm, 34 inches W - 3538.2mm.

30° LH Divert, RH Divert, and Dual Divert Sections:

Inch Specification:

22W - 79 inches, 28W - 89.5 inches, 34W - 100.0 inches.

Metric Specification:

22 inches W - 2006.6mm, 28 inches W - 2273.3mm, 34 inches W - 2540.0mm.

Divert Angles - Direction

0°

16°/21° - left or right.

20° - left, right, or crossover.

30° - left, right, or crossover.

Drive Sections**Between Frame Widths (BF)**

Inch Specification:

22W - 43.5 inches, 28W - 49.5 inches, 34W - 55.5" inches

Metric Specification:

22 inches W - 1104.9mm, 28 inches W - 1257.3mm, 34 inches W - 1409.7mm.

Length

Inch Specification:

60.0 inches.

Metric Specification:

1524.0mm.

Drive Medium

Sprocket - #100 Series - 48 tooth.

Drive Mounting

Overhead, left, or right.

Motor/Reducer**Motor**

Inch Specification:

5, 7.5, 10, 15, 20, 25, 30, 40, and 50hp.

3PH-60Hz.

Metric Specification:

4, 5.5, 7.5, 11, 15, 18.5, 22, 30, and 37kW

3PH-50Hz or 3PH-60Hz.

Reducer

Shaft mounted.

Drive Medium

Motor sheave - Two or three “V” groove.

Reducer sheave - Two or three “V” groove.

Belts - Two or three “V” belts.

Operating Environment

Inch Specification:

0°F to 120°F.

Metric Specification:

-18°C to 50°C.

2 Specifications

This chapter discusses the specifications and features of the UniSort XV mechanical/electrical and control hardware devices.

Mechanical and Electrical

Air

60psi (4bar) min. to 100psi (6.9bar) max., regulated to 10psi (.69bar) for chain oiler. Air is not required for divert switch operation.

Air Filter/Regulator

For chain oiler only: 1/4 inch NPT input at regulator, 5 micron filter, auto drain.

Air Pressure Switch

For chain oiler only: low pressure sensing relay.

Capacity/Size Of Product

Inch Specification:

0.5 to 120 lbs. weight.

6 inches to 48 inches length - 1 inch to 36 inches width.

Consult factory for other sizes.

Cartons, bags, rolls, bound package, etc.

Metric Specification:

0.2kg to 54.4kg weight.

152mm to 1219mm length - 25mm to 915mm width.

Consult factory for other sizes.

Cartons, bags, rolls, bound package, etc.

Carrying Chain

RC100 matched pair, single pin extension every other pitch, with carrier bearings.

Carrying Tubes

Inch Specification:

Non-divert tubes - 2.5 inch centers.

Divert shoe tube - 5.0 inch centers.

Material - 1.75 inch diameter, 12ga steel.

Metric Specification:

Non-divert tubes - 63.5mm centers.

Divert shoe tube - 127mm centers.

Material - 44.5mm diameter, 12ga steel.

Carrying Slats

Inch Specification:

Non-divert slats - 5.0 inch centers.

Divert shoe slats - 5.0 inch centers.

Material - Aluminum.

Metric Specification:

Non-divert slats - 127mm centers.

Divert shoe slats - 127mm centers.

Material - Aluminum.

Center Crossover Switch

Mechanical.

Chain Oiler (Program Controlled)

Pneumatic feed, electrically controlled.

Chain Track

Aluminum extrusion with UHMW wear strips and Novex belting for the carrier bearings.

Control Systems

Microprocessor based programmable control features allow complete sortation and induction control. Interfaces with main frames. PLC based system optional.

Divert Centers

Based on width - consult factory.

Divert Shoes

Located on 5.0 inch (127mm) centers. UHMW low friction slide guide. Top of shoe uses high impact nylon with snap-on high friction, non-marking pads. Hardened steel guide pin with precision ball bearing cam follower.

Divert Shoe Out Of Position

Limit switch activated if a shoe jumps across return guide track.

Divert Shoe Pin

0.375 inch (9.5mm) diameter hardened steel.

Divert Switch

Non-jamming design, activated by double acting brushless rotary actuator. Photo-eye senses exact shoe position and communicates with the divert control module for accurate left or right divert action timing.

Divert Switch Body

Nycast 6.

Divert Switch Trigger

Glass filled nylon.

Drive**Inch Specification:**

5 to 50hp (3.7 to 37.3kW), 3PH-60Hz

Shaft mounted reducer with torque arm and V-belt drive.

NEMA design "B" drive motor; 1750rpm; continuous duty; totally enclosed; fan cooled.

Metric Specification:

4, 5.5, 7.5, 11, 15, 18.5, 22, 30, and 37kW, 3PH-50Hz or 3PH-60Hz.

Drive Components

Shaft mounted reducer with variable speed controller. Catenary before drive.

Drive Reducer

Shaft mounted; helical gear with torque arm.

Drive Sprocket

RC100, 48 tooth, taper lock, "B" style hub, hardened.

End Pop-Up Safety Roller

Out of position detected by proximity switch (24Vdc).

Frame

Inch Specification

18 inch x 1.50 inch x 7ga.

Metric Specification

457mm x 38.1mm x 7ga.

Idler Section

Fixed idler with or without PTO for upstream belt.

Idler Sprocket

RC100, 32 tooth, taper lock, "B" style hub, hardened (1 keyed and 1 bushed).

Lengths

Infeed, intermediate, and drive section lengths based on sorter width. Fill sections accommodate layout requirements. Total sorter length determined by maximum effective pull limit per drive.

Minimum Elevation

30" (762mm) to top of slat.

Note: When applying a minimum elevation of 30 inches (762mm), provisions must be made at the location of catenary due to the 36 inches (915mm) depth of the catenary.

Number Of Diverts

Limited only by distance between sort lanes and/or conveyor pull requirements.

Overload Current Sensor

Adjustable instantaneous trip type or time delayed.

Paint

Intelligrated Gray.

Photo-Eyes

Required for determining product (case) length; determining case gap; indicating product jams; sort lane full conditions; recirculation/error lane full, etc.

Proximity Sensor

18mm (.7 inch) non shielded; 8mm (.3 inch) sensing range; 3 wire; current sourcing (PNP) mode; 9.6 to 55Vdc supply; 200mA maximum load current.

Side Switch Rotary Solenoid

120Vac input with divert control module.

Slat Centers

Divert shoes on 5.0 inch (127mm) centers - aluminum slat.

Speeds**Inch Specification:**

250 to 650fpm, in 50fpm increments - other speeds available with variable speed control.

Note: The maximum speed for a dual-sided sorter is 550fpm.

Metric Specification:

76 to 198mpm, in 15mpm increments - other speeds available with variable speed control.

Note: The maximum speed for a dual-sided sorter is 168mpm.

Sort Rate

50 to 400cpm - actual rate depends on product dimensions, gap between product, and conveyor speed.

Take-Away Conveyors

Table 2 1 shows the delivery rates based on uniform case lengths and a 12 inches (305mm) case gap. Actual rates will vary depending on case length mix, induction system thru-put and availability of product at induction system.

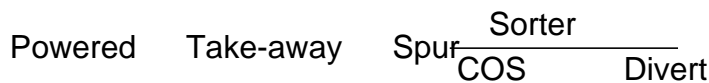
Table 2 1 Delivery Rates

Case Length In. (mm)	Cases Per Minute								
	250fpm (76mpm)	300fpm (91mpm)	350fpm (106mpm)	400fpm (121mpm)	450fpm (136mpm)	500fpm (151mpm)	550fpm (166mpm)	600fpm (183mpm)	650fpm (198mpm)
6 (152)	167	200	233	267	300	333	367	400	433
9 (228)	143	171	200	229	257	286	314	343	371
12 (305)	125	150	175	200	225	250	275	300	325
16 (406)	107	129	150	171	193	214	236	257	279
18 (457)	100	120	140	160	180	200	220	240	260
24 (610)	83	100	117	133	150	167	183	200	216
30 (762)	71	86	100	114	129	143	157	171	186
36 (914)	63	75	88	100	113	125	138	150	162
42 (1067)	56	67	78	89	100	111	122	133	144
48 (1219)	50	60	70	80	90	100	110	120	130

Note: Gap length is dependant upon factors such as external control systems and product mix.

*Powered take-away spur speeds must be set equal to, or greater than, the vector speed of the sorter.

Example:



Tube Centers**Inch Specification:**

Non-divert tubes - 2.5 inch centers.

Divert shoe tube - 5.0 inch centers.

Material - 1.75" diameter, 12ga steel.

Metric Specification:

Non-divert tubes - 63.5mm centers.

Divert shoe tube - 127mm centers.

Material - 44.5mm diameter, 12ga steel.

Variable Frequency Drive (VFD)

Sized per drive motor horsepower; 0-30 second acceleration time adjustment; 0-150% start torque adjustment with current overload protection.

Widths "W"

Inch Specification:

22, 28, 34 inches.

Metric Specification:

558.8mm, 711.2mm, 863.6mm.

Control Hardware Devices

Rotary Actuator

Located at each divert point. Actuates the divert switch which diverts product with the assigned shoe.

Divert Control Module

The control system outputs a signal to the DCM (Divert Control Module) to divert particular cartons. The DCM times the signal to the brushless rotary actuator to properly divert assigned shoes.

Current Sense Relay

Used to detect excessive drive motor current resulting from an electrical/mechanical drive fault/jam condition. It is wired between the motor disconnect switch and the motor starter.

When tripped, drive power is dropped. Relay contact status is supplied to the control system.

Divert Photo-Eye

A divert photo-eye is located at each divert point of the sorter and is used for sortation tracking and synchronizing the divert switching mechanism. The photo-eye detects the presence of a divert shoe by sensing the trailing edge of the shoe's bearing.

A photo-eye may also be used for verifying the UniSort XV's operating speed.

The divert photo-eyes can be interfaced to the control system.

Divert Shoe Pin Out Of Track Limit Switch

Used to detect a divert shoe out of position; located at the end of the UniSort XV and at approximately every 50' (15m) on an IJD section. Drive power is dropped if "pin out of track" is actuated. Switch status is supplied to control system.

Emergency Stop

Emergency stop push buttons and pull cords are used by the operator to effect an "emergency stop" drive power off condition. Contact status is supplied to control system.

End Pop-Up Roller Detection

A proximity switch or limit switch located on the drive end of the UniSort XV to detect the dislodging of the safety roller. Drive power should be dropped or inhibited when pop-out roller becomes dislodged. Input status to control system.

Motor Disconnect

A motor disconnect switch is used to apply power to the VFD and is located near the drive end of the UniSort XV. The contact status of this switch is supplied to the control system.

Motor Starter

Used to switch power to the drive motor via the motor disconnect switch and VFD. Contact status is supplied to the control system.

Photo-Eyes

The usage of photo-eyes depends on the particular UniSort XV sortation system configuration and control system architecture.

Application for photo-eyes include:

- Determining case (product) length; induction and sortation tracking.
- Detecting product jam conditions at the sorter's infeed, discharge ends; jams at sort lane(s); detecting sort lane full conditions; sensing recirculation and error lane full conditions; divert confirmation.
- Drive power to the sorter is dropped for any product jam conditions.

VFD (Variable Frequency Drive)

Used to effect a smooth start-up acceleration of the UniSort XV drive system. VFD is sized based on the drive motor's maximum current draw.

The VFD is located near the drive motor, or in a nearby panel, and is wired between the drive motor and a motor disconnect switch.

For first time start-up, the VFD time, torque, and current limit controls are set at mid-range before applying power. These controls are then fine-tuned per the VFD manufacturer's instructions to achieve a smooth acceleration of the UniSort XV. Improper adjustment may result in the sorter drive chain jumping a sprocket tooth when power is applied.

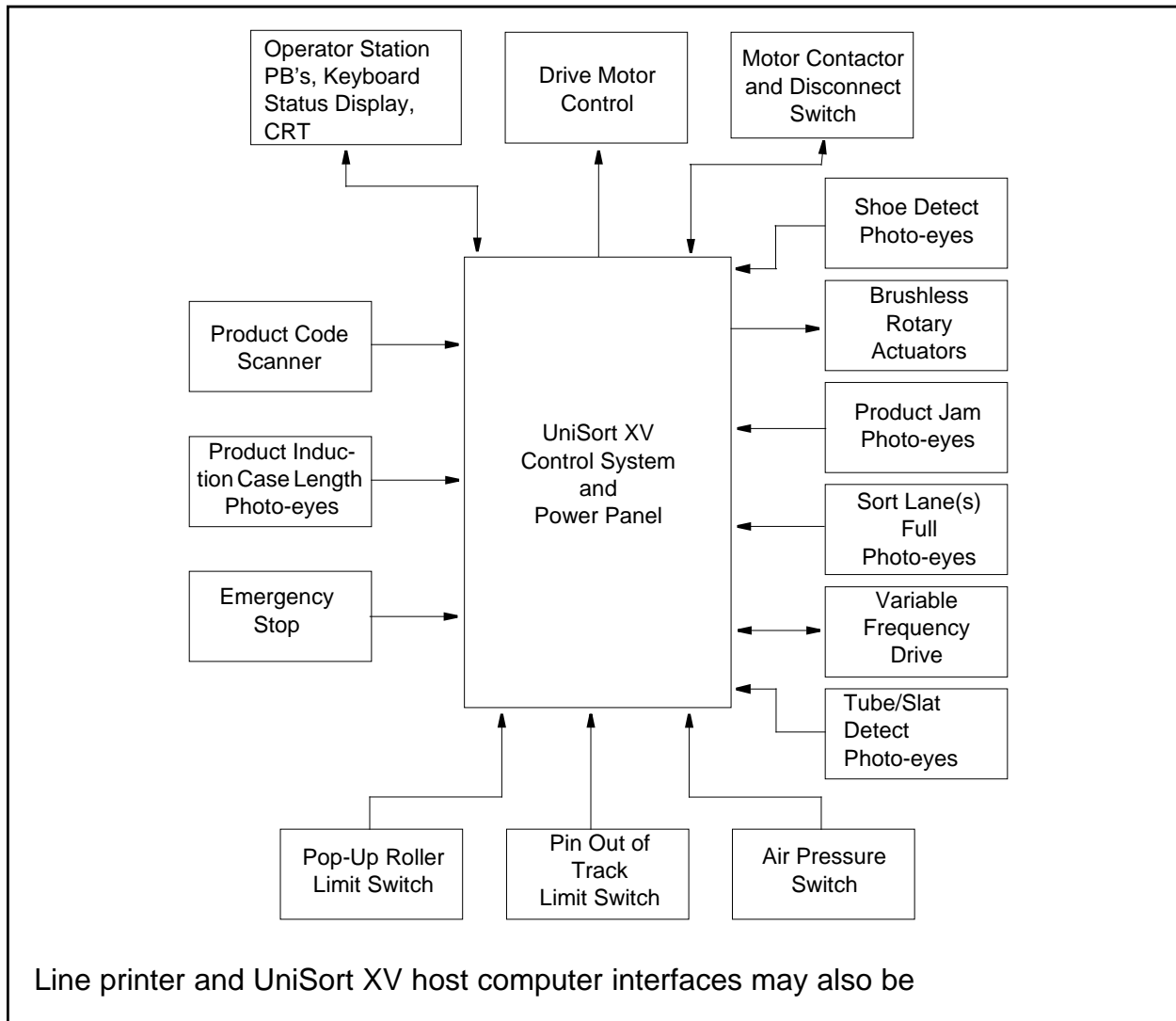


Figure 2 - 1 UniSort XV Basic Control Diagram

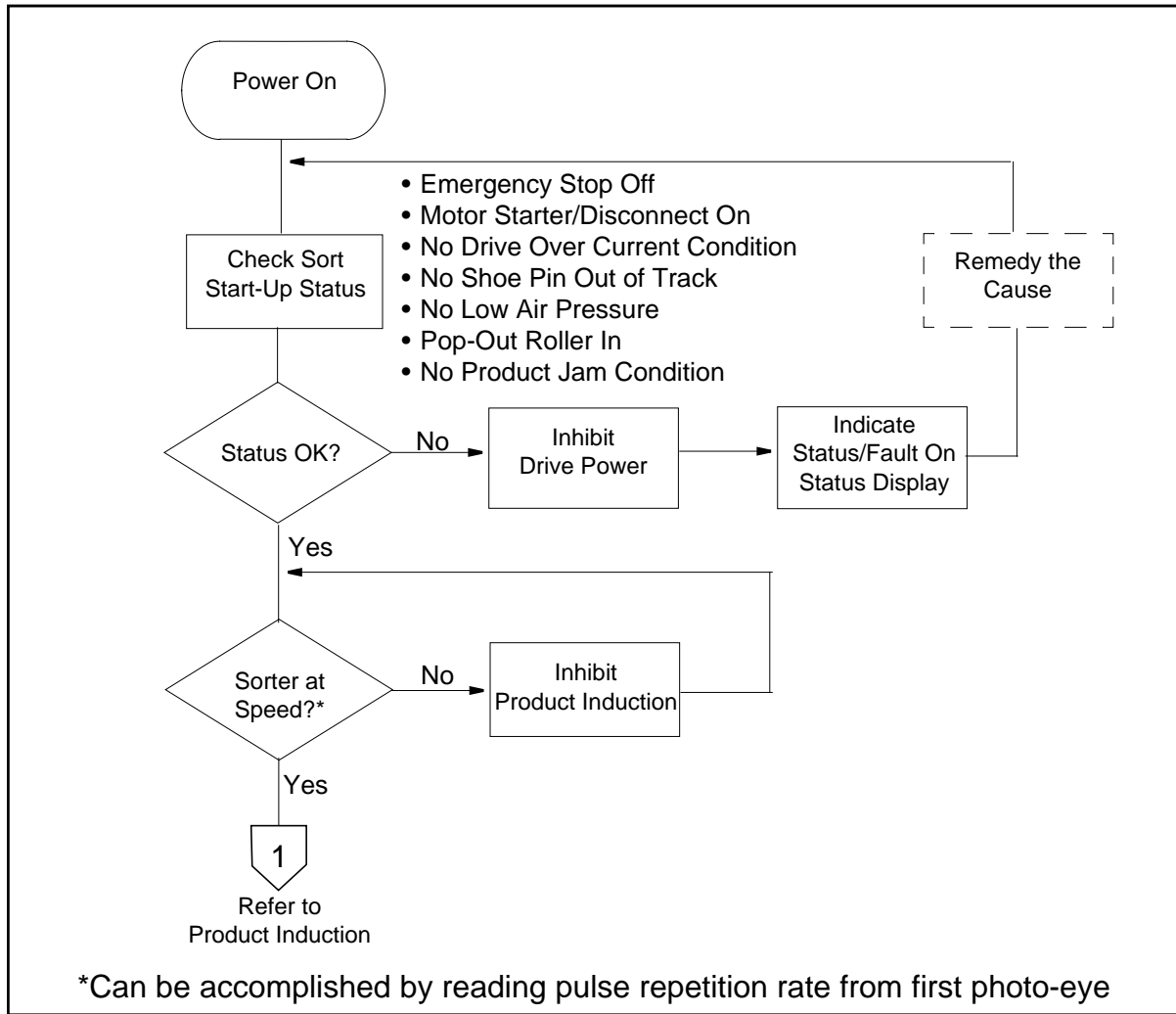


Figure 2 - 2 Sequence of Operation - Sorter Power-On Status

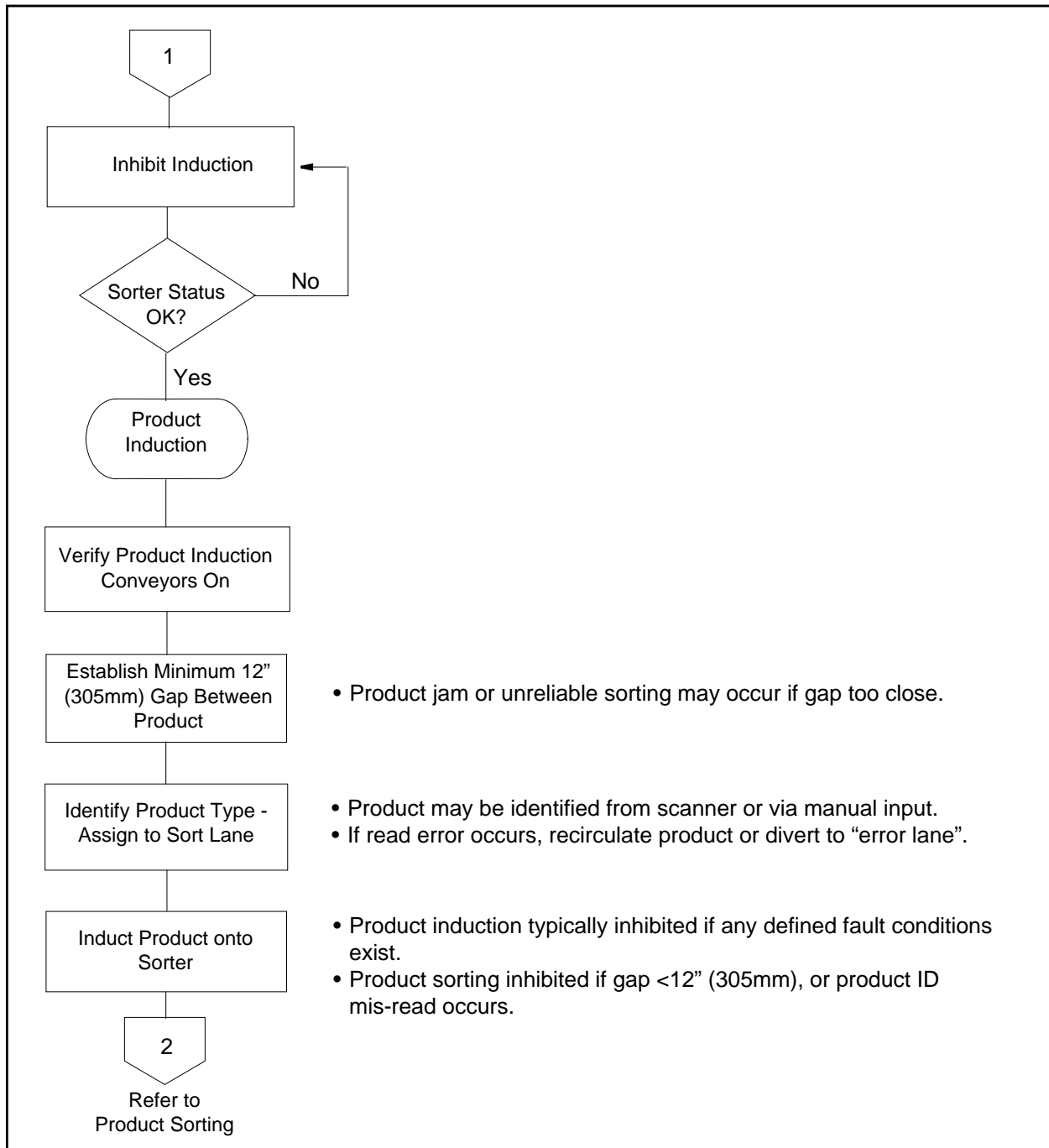


Figure 2 - 3 Sequence of Operation - Product Induction (Typical)

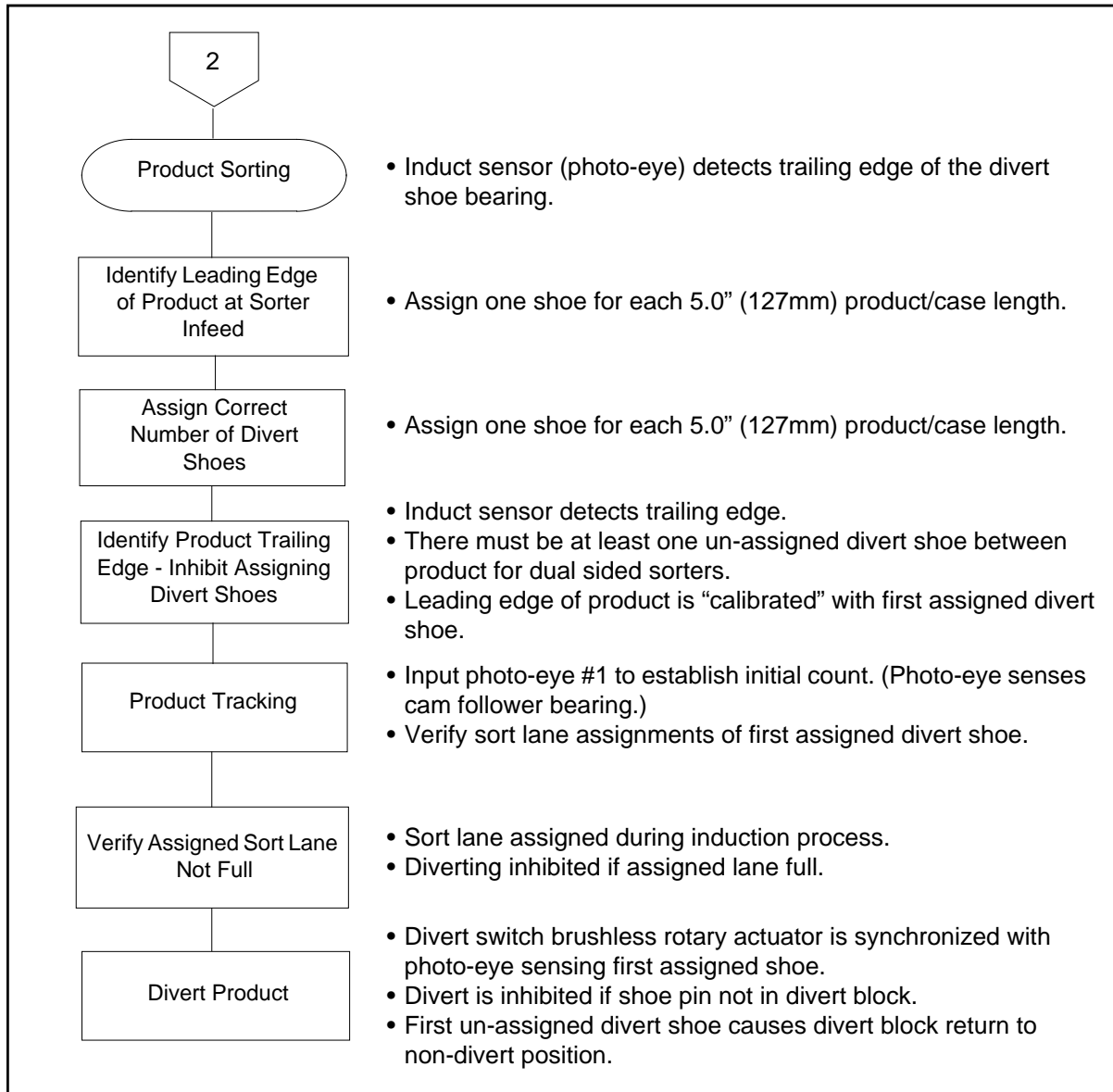


Figure 2 - 4 Sequence of Operation - Product Sorting



3 Engineering Data

Preparing the Site Layout Drawing

Prepare a layout drawing for all applications. The drawing will identify the required equipment elements and will show clearance requirements for building structures, aisles, tie-ins with adjoining conveyors, equipment, etc. The drawing should be drawn to scale and must be accurate.

The UniSort XV site layout should be drawn in AutoCad format. Contact Engineering to obtain AutoCad drawings that may be needed to prepare the site layout.

Chain Pull and Required Horsepower

Consult manufacturer's Engineering Department.

Establishing Speed and Gap

To properly determine the speed of the system and the gap between cases, the following items must be defined.

1. New equipment or interfacing with existing.
2. Is an interface required with peripheral equipment.
3. Product to be handled.
 - Type, length, width, height, and weight of the product.
 - Description and same if available.
 - Maximum number of cases and minimum number of product.
 - Condition of top and bottom of product.
 - Vertical or tapered product sides.

-
4. Rate of handling.
 - Maximum number of units per minute.
 - Minimum number of units per minute.
 - Average number of units per minute.
 - Peak number of units per minute.
 - Breakdown of handling by area: Replenishment, picking, sortation, shipping.
 - Type of loading required: Palletized, direct load, load on carts, etc.
 - Rate of machines required to sort: Palletizers, case sealers, packaging equipment etc.
 5. Description of operation - if available; if no, understand the operation and formulate your understanding of the operation in writing.
 6. Type of operation - intermittent, constant.
 7. Duty cycle - hours per day.
 8. Operating environment.
 9. Operating temperatures.

4 Layout Dimensions

Layout/Installation Drawings

The UniSort XV layout/installation drawings contain information that identify and show the placement of the:

- Idler Section,
- Intermediate Section(s),
- Catenary Section, and
- Drive Section.

Each conveyor section is identified by a label affixed to the unit at the factory. The information printed on these labels is useful for identifying the different sections as shown by the layout/installation drawings.

The following illustrations show the various sections and assemblies that can be included in a UniSort XV application.

Idler Sections

Idler Unit/Intermediate Section

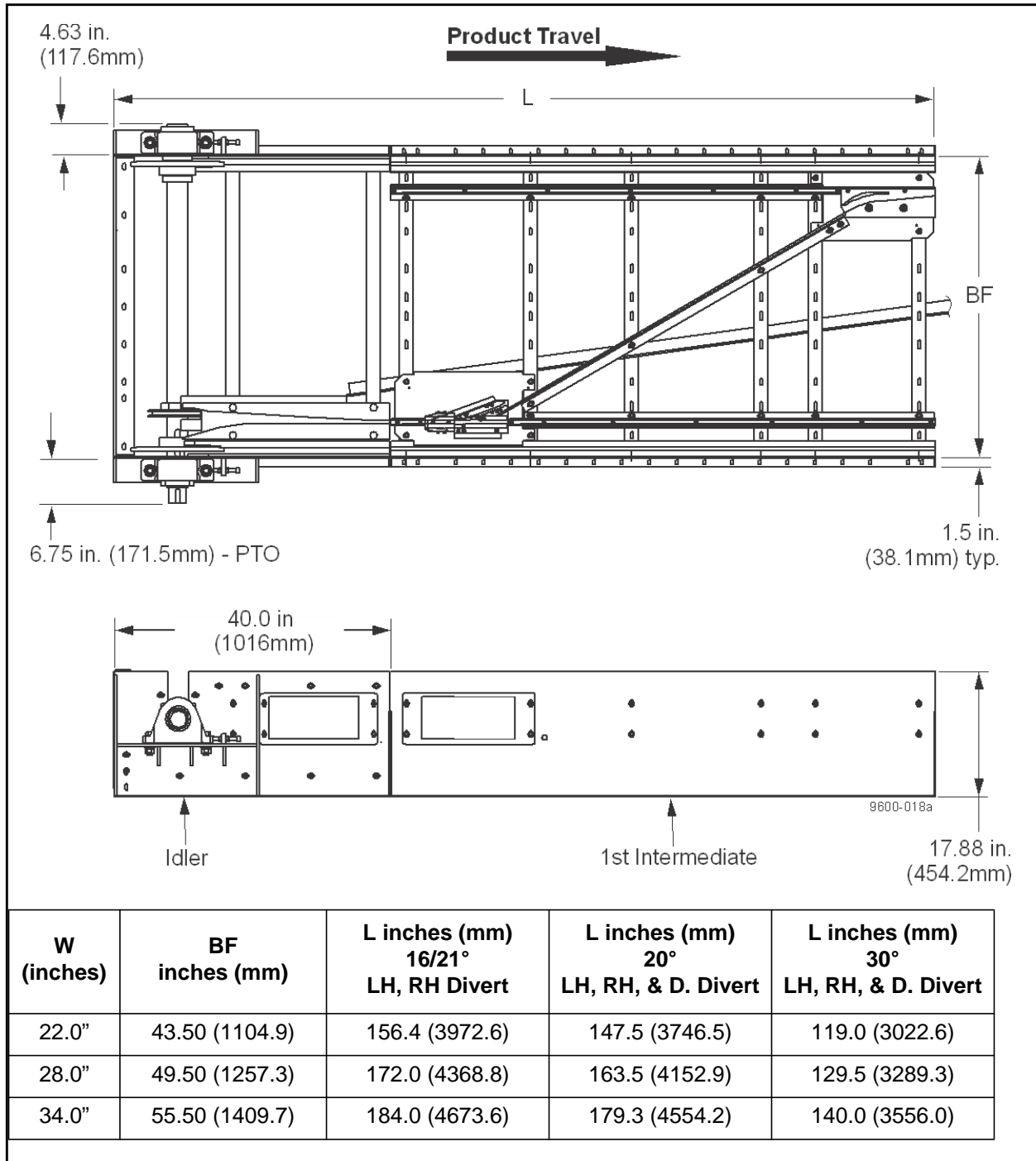


Figure 4 - 1 Idler Unit/Intermediate Section - S-Sided Divert, Single-Sided Return (shown)

Idler Unit (only) - Single-Sided RH Divert/LH PTO

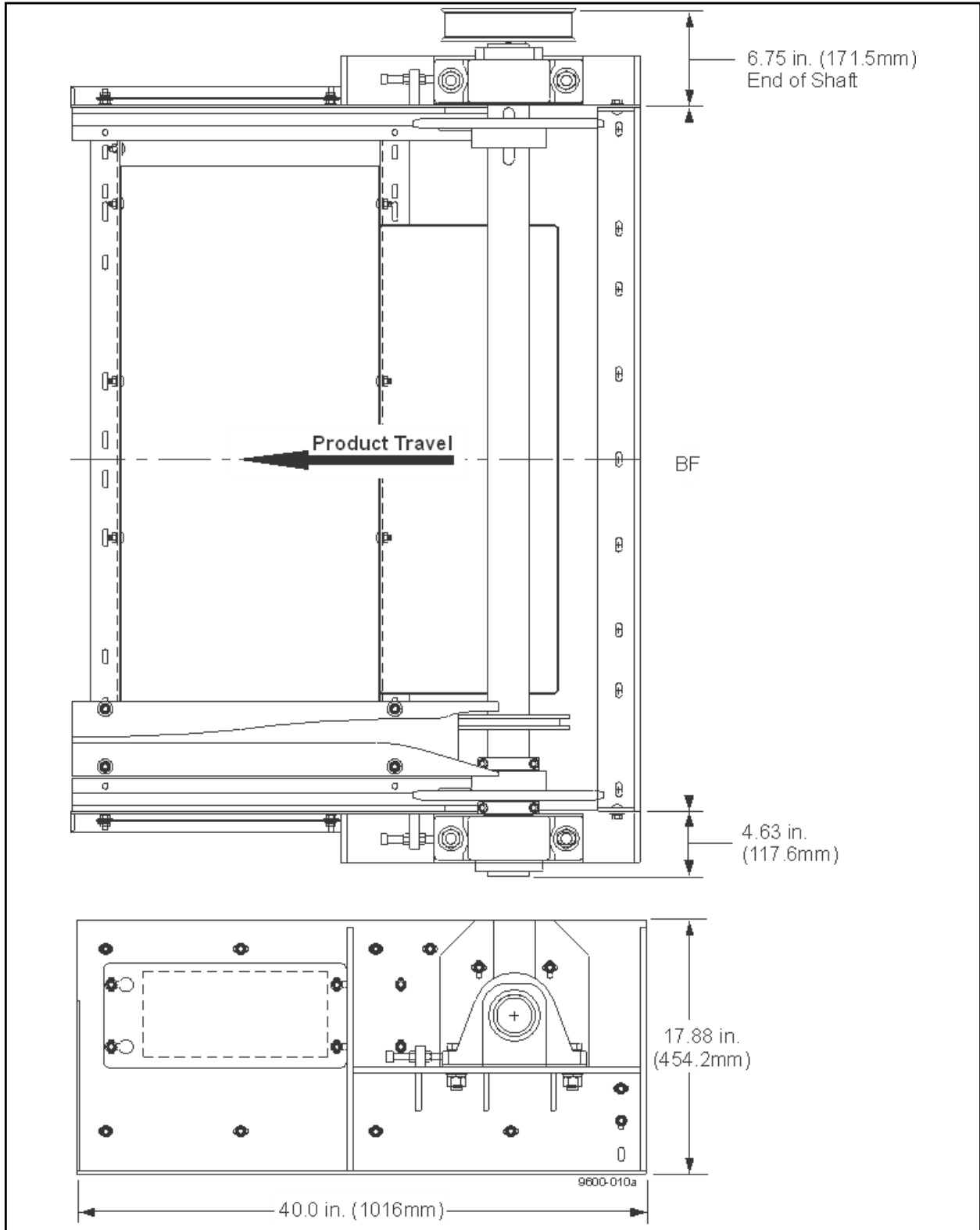


Figure 4 - 2 Idler Unit (only) - Single-Sided Divert (shown)

Intermediate Sections

Dual-Sided Divert

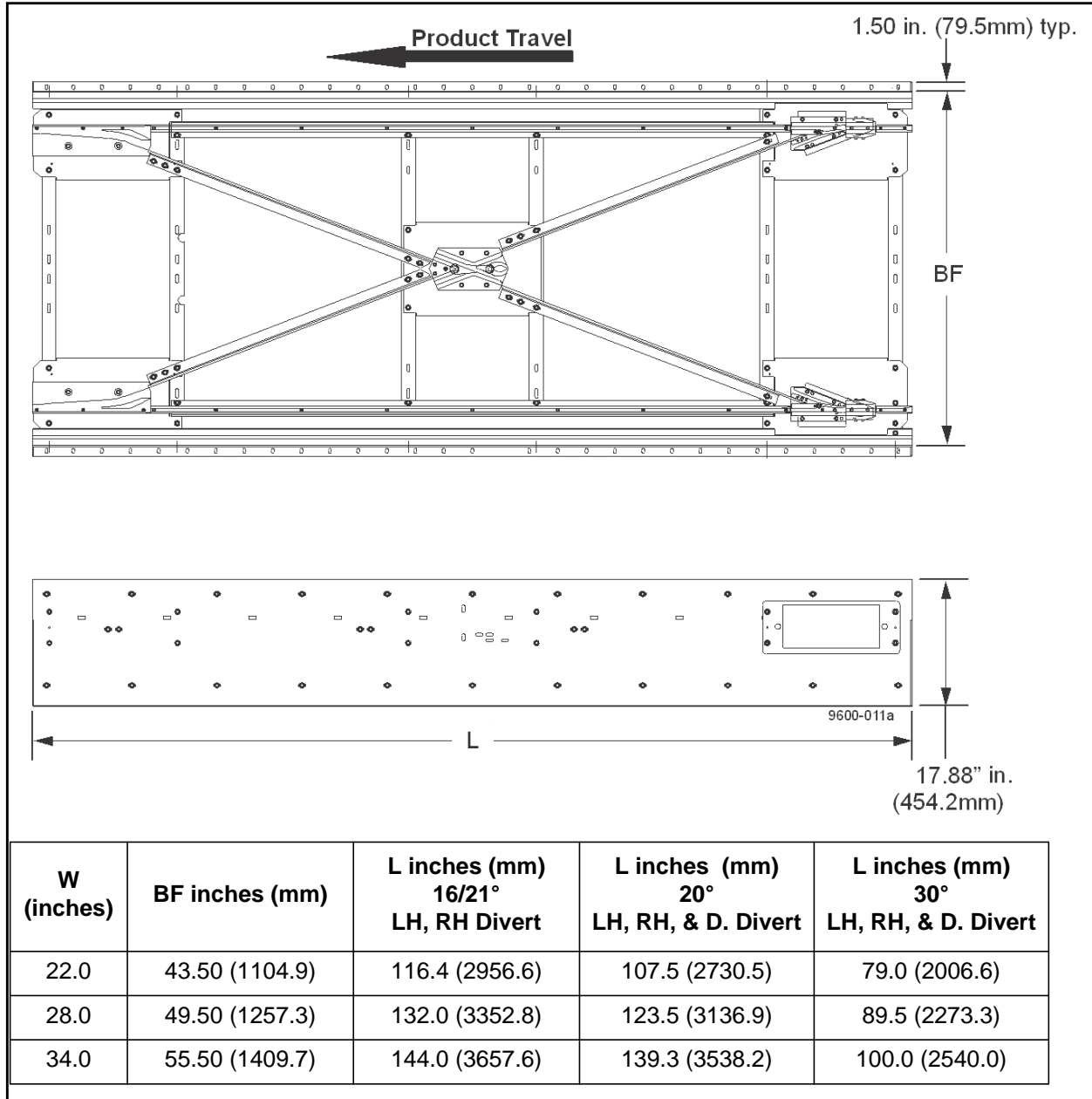


Figure 4 - 3 Intermediate Section - Dual-Side 20° Divert (shown)

LH and RH Single-Sided Diverts

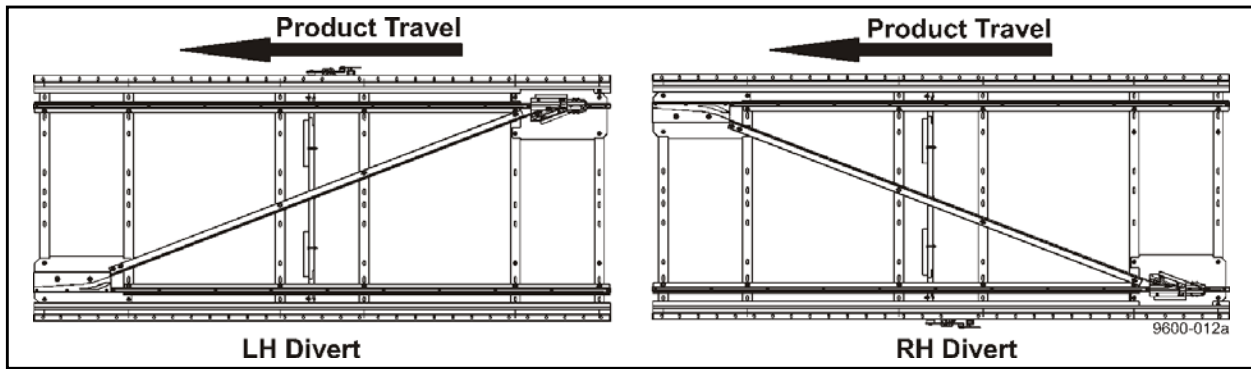


Figure 4 - 4 Intermediate Section - LH and RH Single-Side 20° Diverts (shown)

Non Diverts

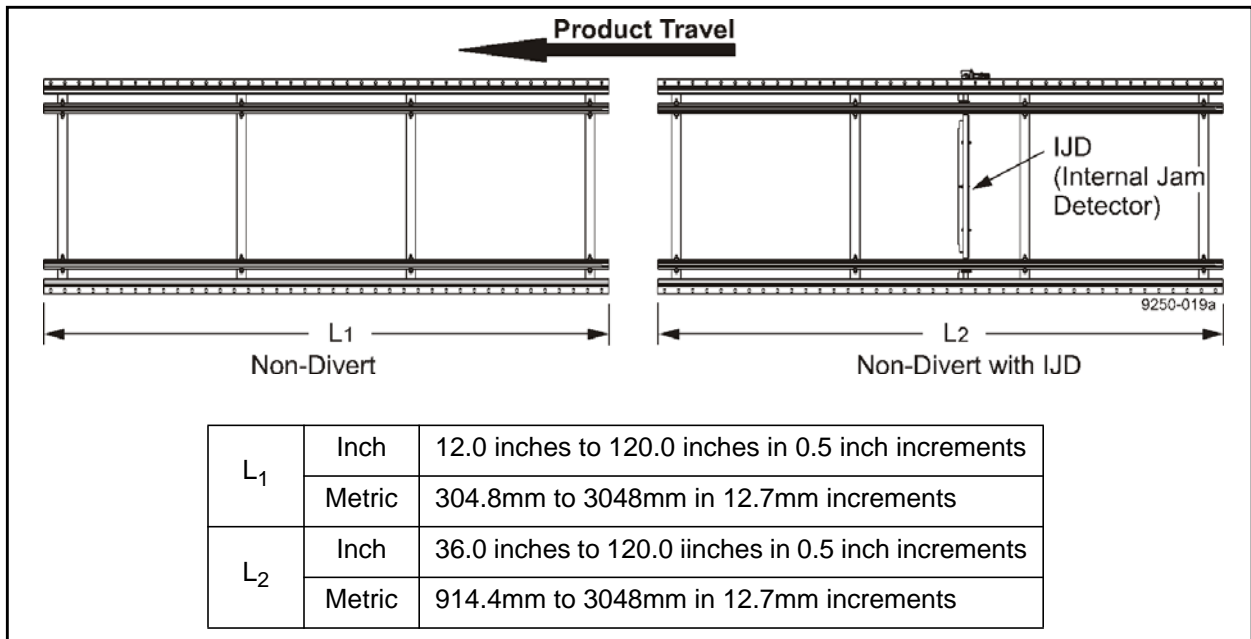


Figure 4 - 5 Intermediate Section - Non Diverts

Takeaway Conveyor Location Layout

Figure 4 - 6 shows the dimension to locate the takeaway conveyors. Dimension “X” is the distance from the infeed edge of the UHMW re-entry block to the inside of the junction short rail. The divert line is also shown.

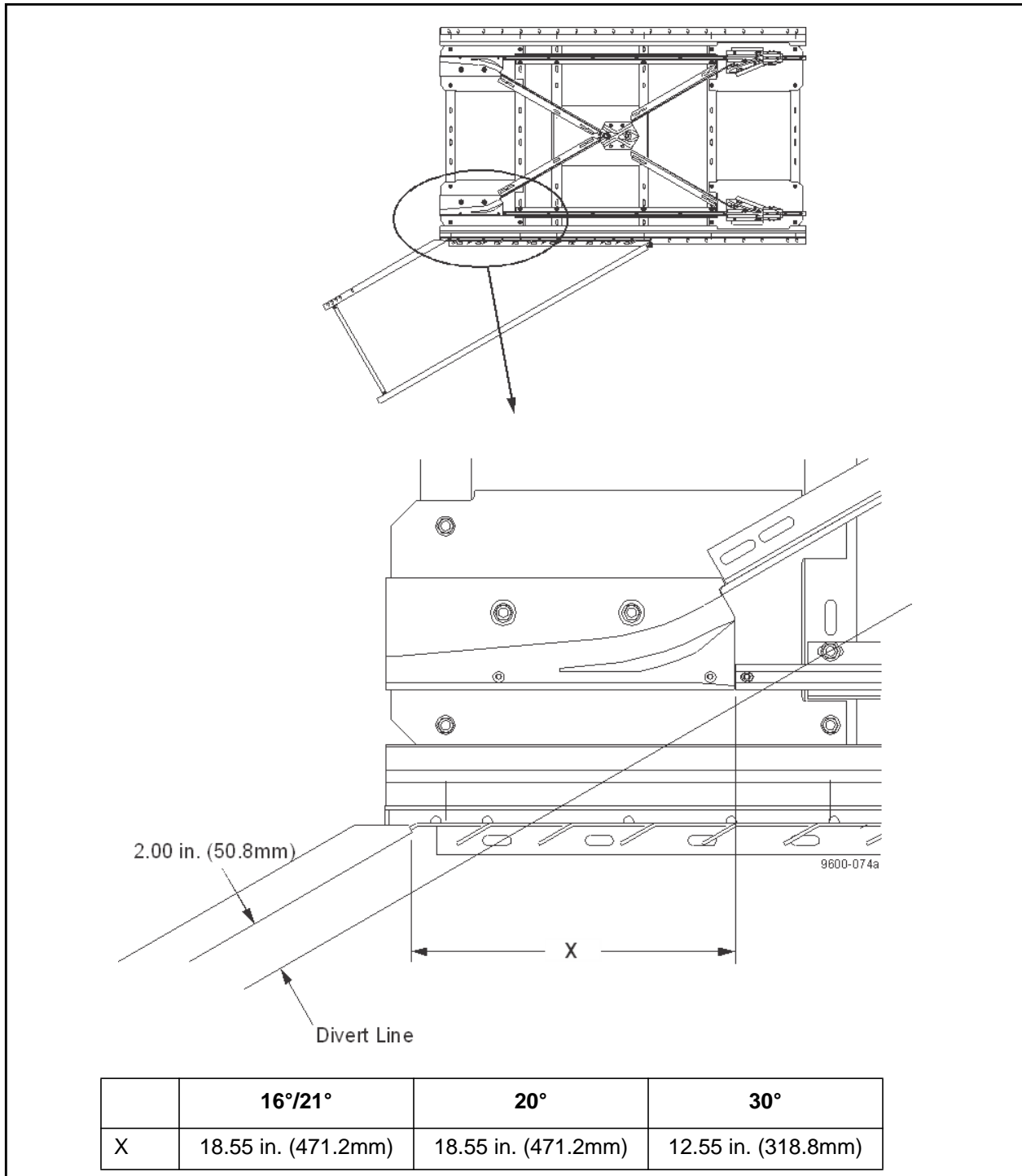


Figure 4 - 6 Divert Takeaway Layout

Takeaway Conveyor Locations

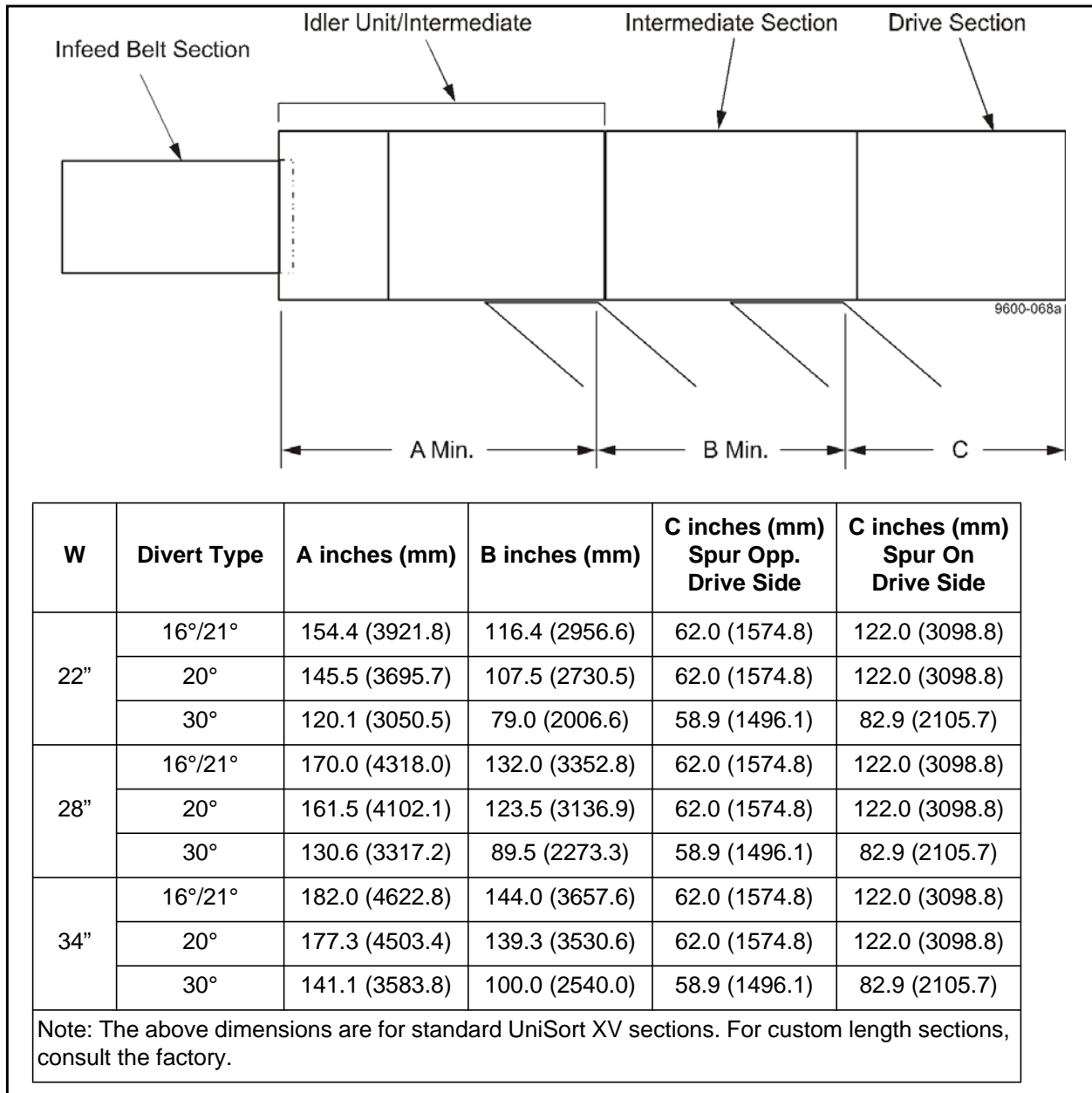


Figure 4 - 7 Takeaway Conveyor Locations

Catenary Section

The catenary section is unique to the UniSort XV application and is typically made up of intermediate sections. Figure 4 - 8 shows the catenary section using two non-divert intermediates. LH or RH divert intermediate sections may also be used.

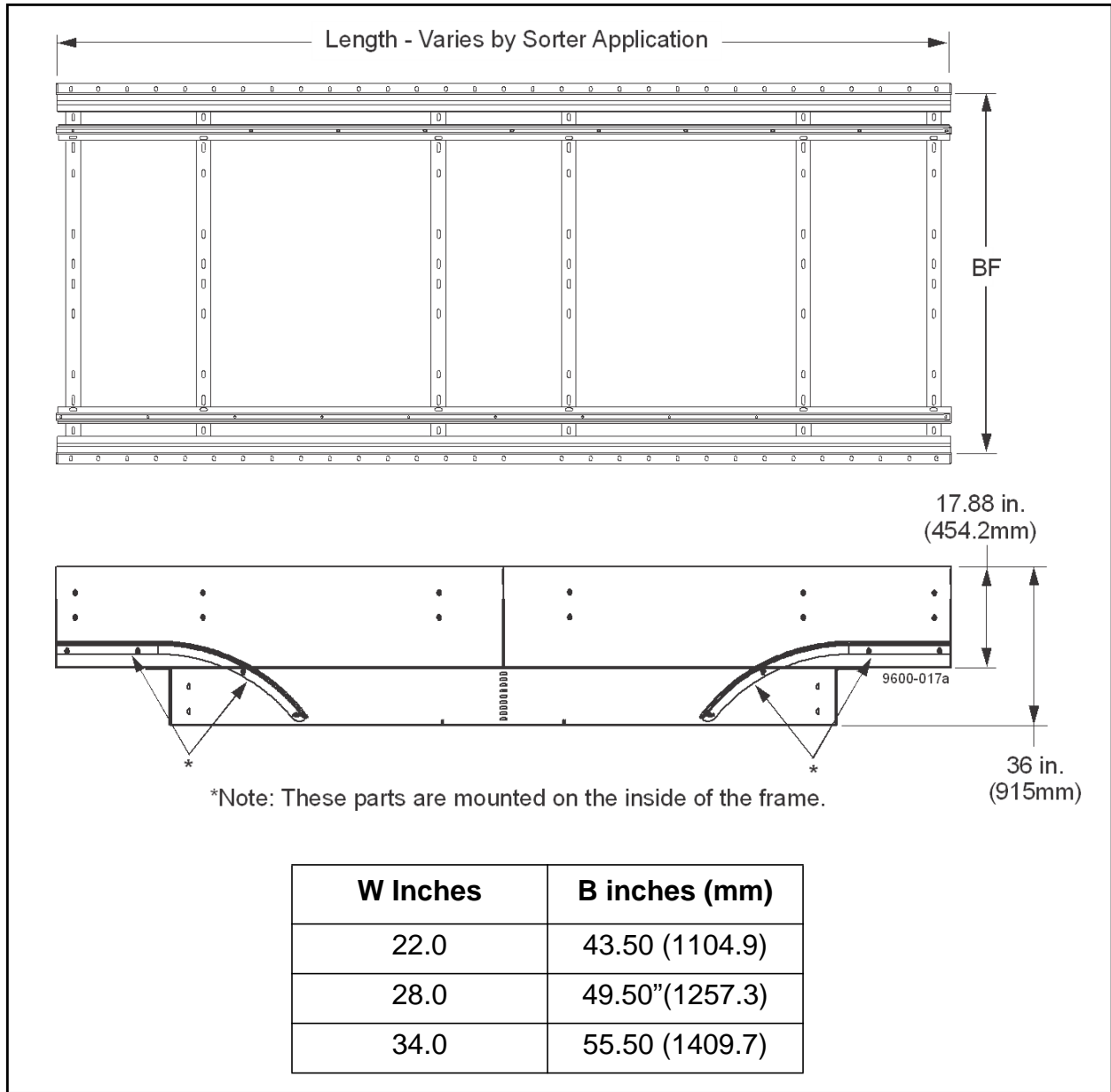


Figure 4 - 8 Catenary Section

Drive Section- Layouts

Drive section layouts are shown in the following Figures:

Top View, Figure 4 - 9 on page 4 - 10,

Side View, Figure 4 - 10 on page 4 - 11, and

End View, Figure 4 - 11 on page 4 - 12.

Table 4-1 BF and Max Width Dimension for Figure 4 - 9 on page 4 - 10

W inches	BF inches (mm)	Max Width inches (mm)
22.0	43.50 (1104.9)	72.26 (1835.4)
28.0	49.50 (1257.3)	78.76 (2000.5)
34.0	55.50 (1409.7)	84.26 (2140.2)

Dual-Side Return Drive Section

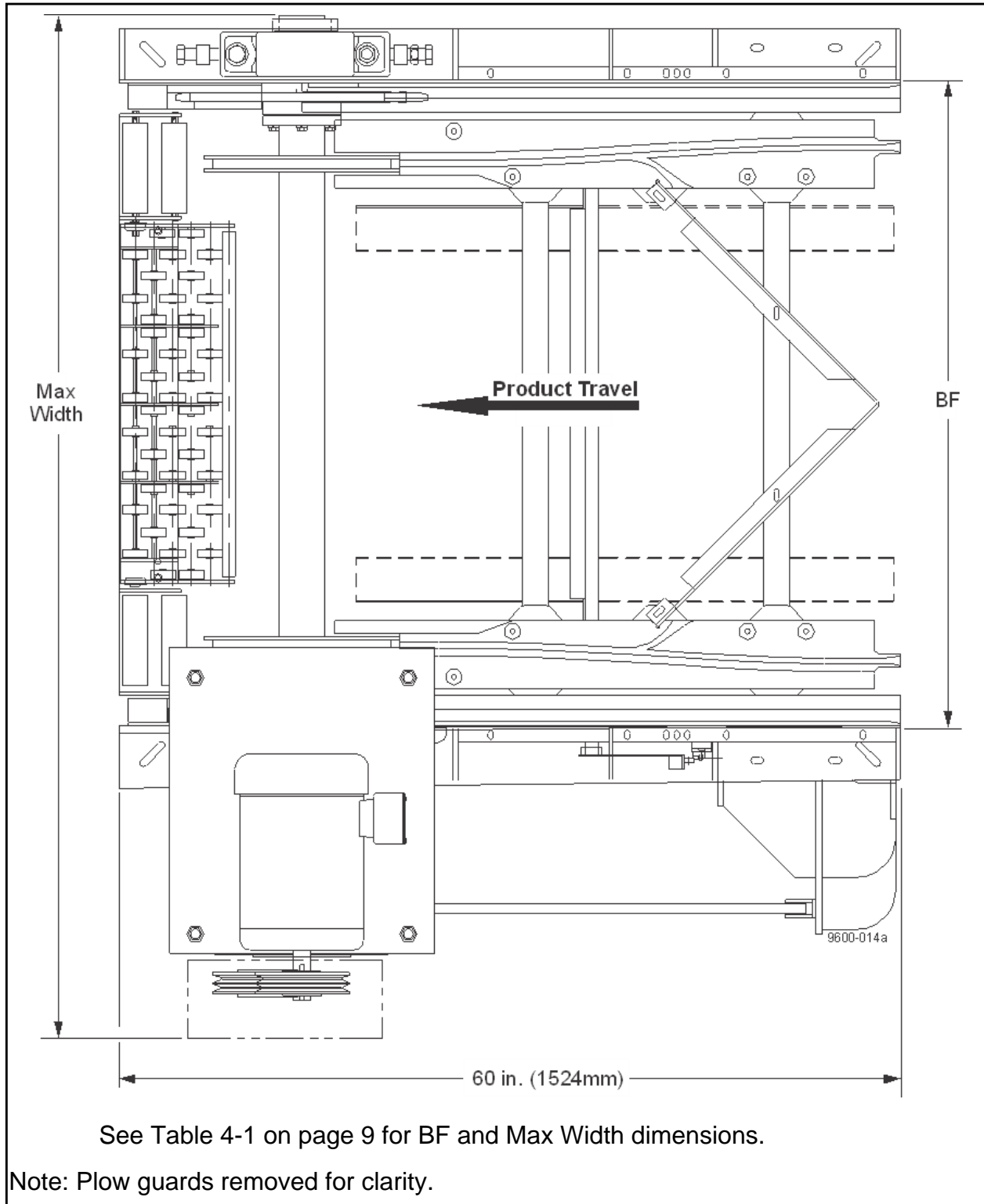


Figure 4 - 9 Drive Section - Dual Sided Return, Top View (shown)

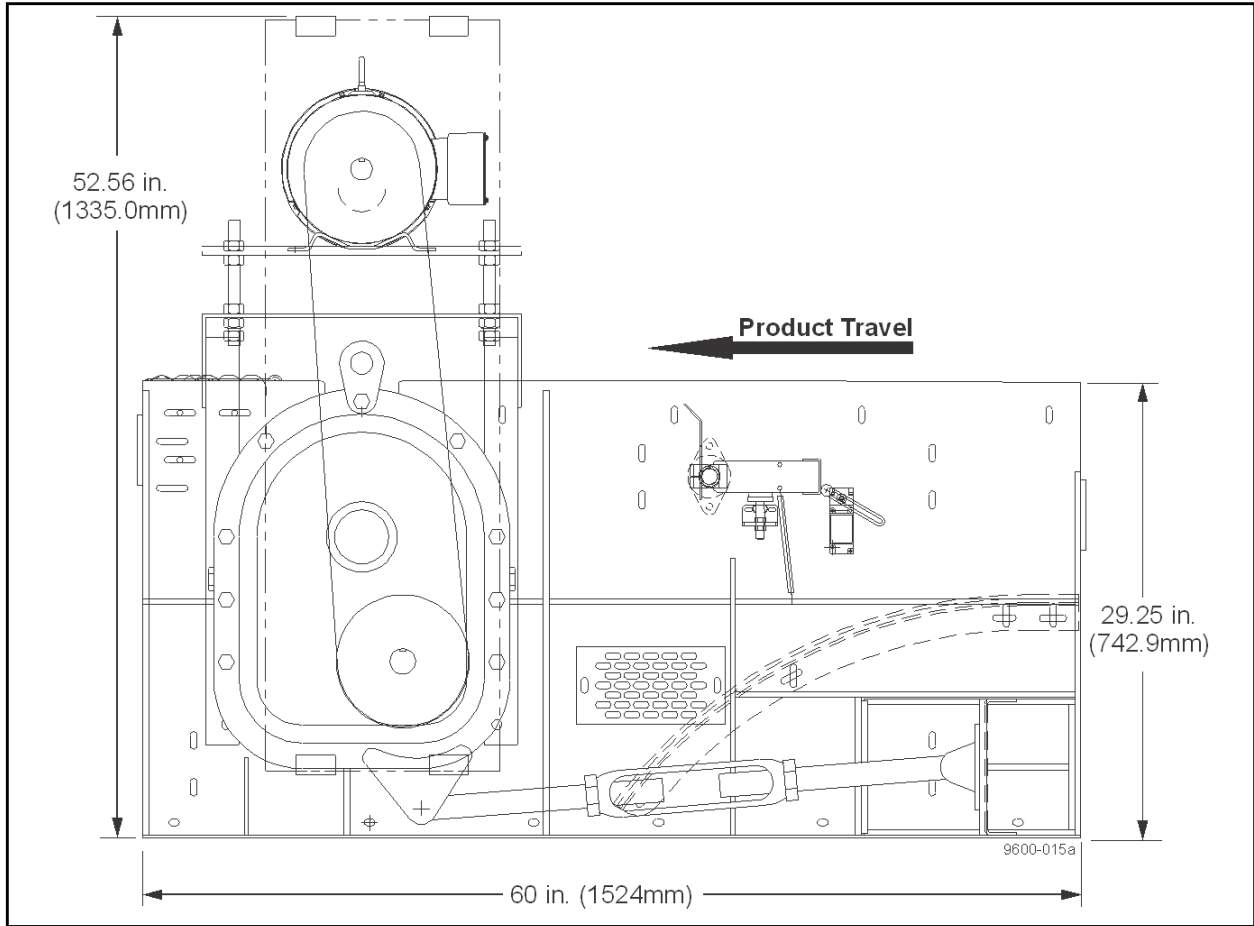


Figure 4 - 10 Drive Section - Dual Sided Return, Side View (shown)

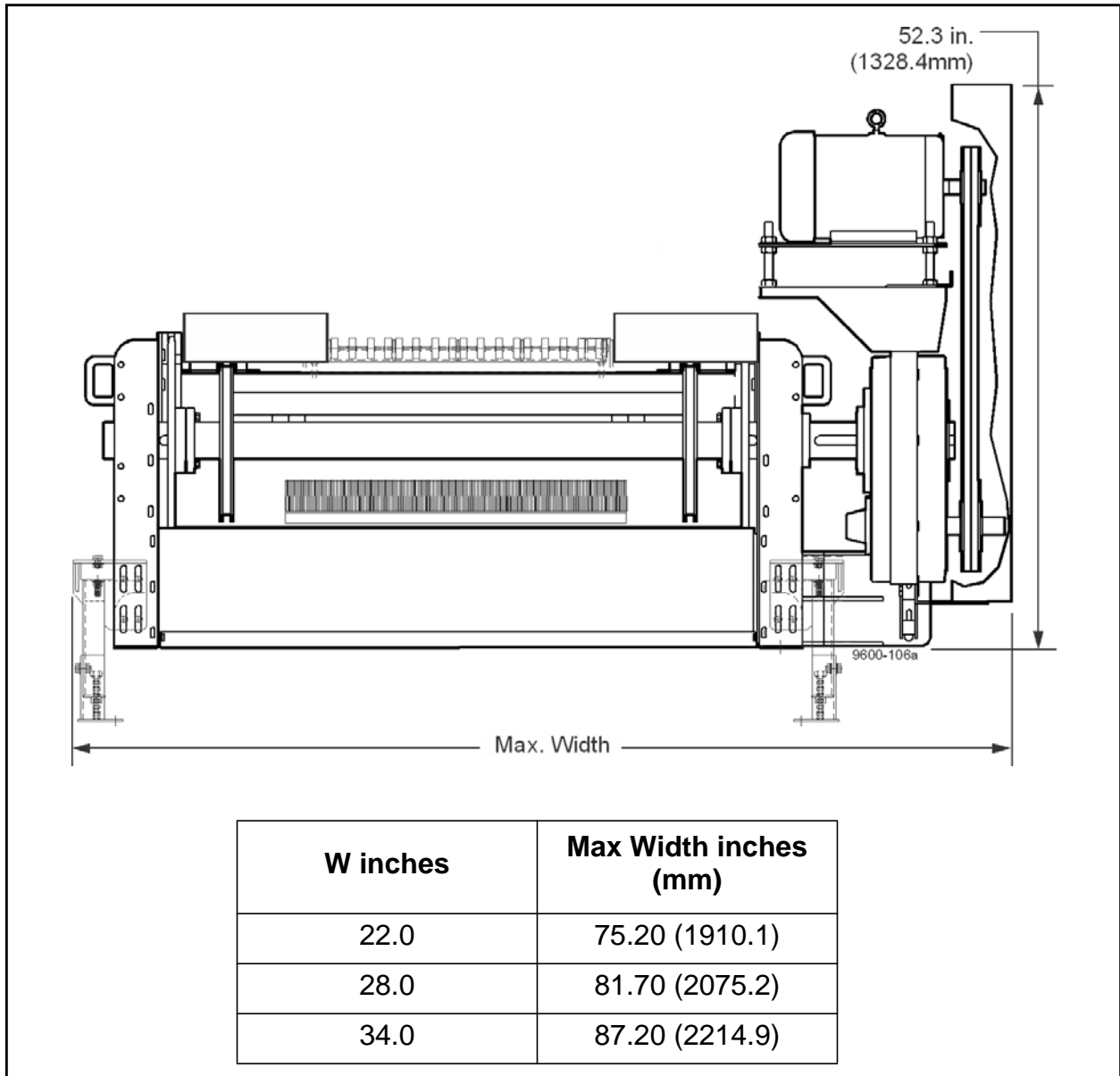


Figure 4 - 11 Drive Section - Dual Sided Return, End View (shown)

5 Application Guidelines

Product Description

A UniSort XV sortation conveyor application consists of an infeed belt section that is used to connect the UniSort XV conveyor to a product induction conveyor, an idler section (consisting of an idler unit and the first intermediate section), application dependant intermediate sections, a catenary section for applications longer than 50 feet (15m), and a drive section, see example in Figure 5 - 1.

The idler is the terminal end of the UniSort XV conveyor. The primary function of the idler is to return the carrying tubes/slats to the top of the conveyor. The first intermediate section is typically the first divert section and stages the divert shoes for downstream intermediate sections. The number of downstream intermediate sections is application dependant and can be of the type: non-divert, left- or right-handed divert, or dual-divert sections. The drive section contains the conveyor drive motor and reducer.

The conveying surface of the UniSort XV can be either a carrying tube or carrying slat. The tubes (or slats) are attached to a matched pair of RC-100 Series roller chains, with carrier bearings, that ride on Novex wear strips in the chain track. The carrying tube (or slat) utilizes a sliding shoe to divert the product. The conveyor requires a 12 inch (305mm) product gap and is capable of operating up to speeds of 650fpm (198mpm).

Divert shoes can be either left-handed, right-handed, or dual-handed and are installed between each pair of carrying tubes (or slats) and are free to slide at the angle of the intermediate section. Tubes (or slats) are installed perpendicular to the direction of travel and function to transport product for diverting.

Divert shoes travel along the opposite side to which product is to be diverted. The system controller signals the divert switch DCM (Divert Control Module) to direct the correct number of shoes to divert the product onto a take-away conveyor. Take-away conveyors are located at the fixed divert points along the side (or sides) of the UniSort XV.

As the conveying surface returns, all shoes remain on the sides of the tube (or slat). Returning shoes are maintained in this position until they reach the idler where their position is set for diverting.

NOTE: Refer to Chapter 2 - “Standard Specifications and Features” for details regarding the specifications for the different UniSort XV sections discussed in this chapter.

Divert Angle Rules

Sorter Speed fpm (mpm)	Divert Angle	Divert Angle Notes
Above 500 (152.4)	16° / 21° Compound Angle	When critical carton alignment is required.
Above 550 (167.6)	16° / 21° Compound Angle	Required. See *Note below.
250 - 500 (76.2 - 152.4)	20°	
250 - 350 (76.2 - 106.7)	30°	

*Note: Product must be aligned to the switch side (non-divert) of the sorter infeed.

This allows the divert shoe to contact the product on the 16° portion of the divert angle and prevent carton spinning.

**Note: Lightweight square cartons.

Limit cross shoe impact to 125fpm (38mpm) for very lightweight, short, and almost square cartons; specifically in applications where downstream product placement is critical (i.e. palletizing operation). See calculation below.

Calculation:

Tangent of the angle = $X \div Y$

Where angle = divert angle

Y = sorter speed

X = cross-shoe speed

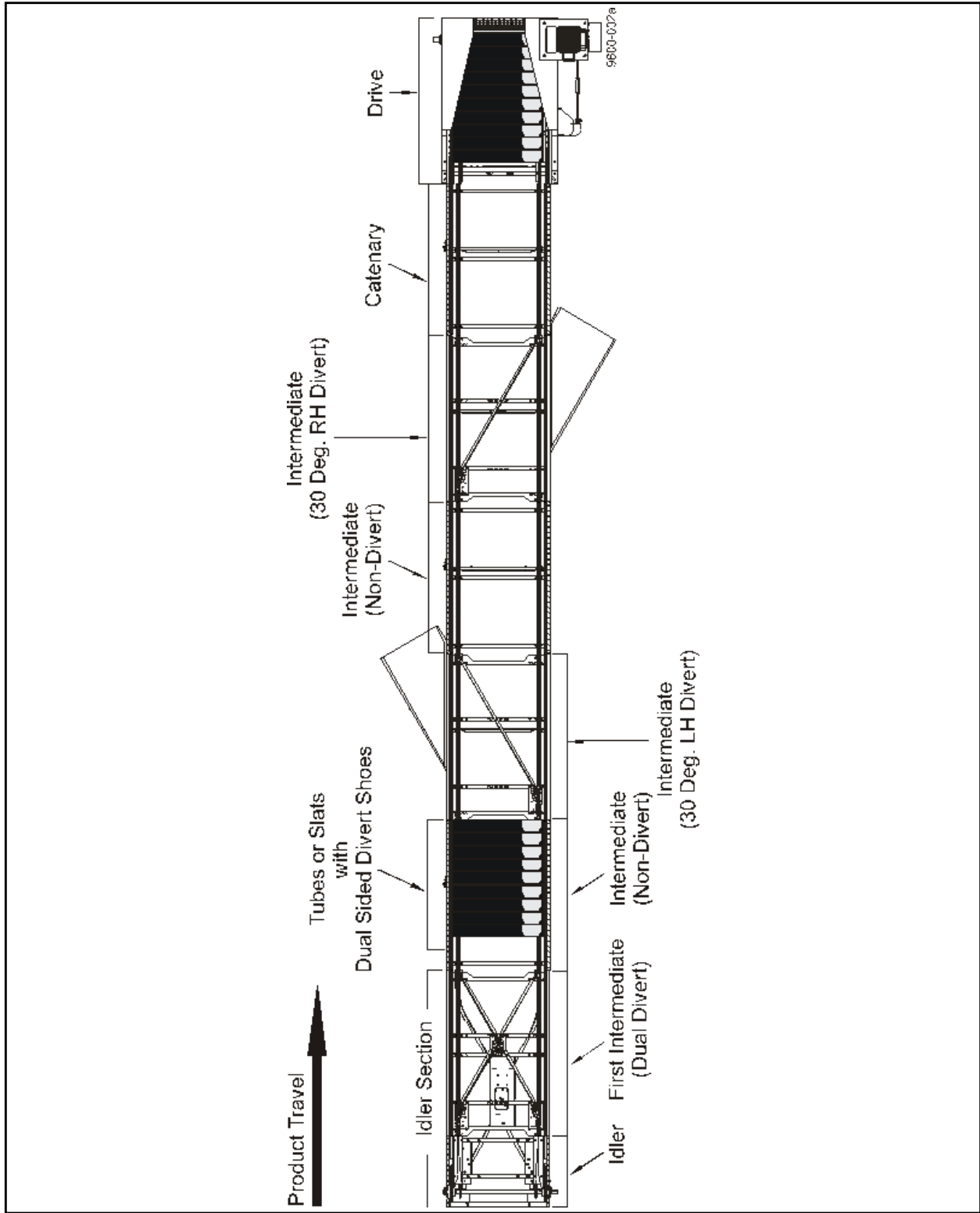


Figure 5 - 1 UniSort XV Conveyor Layout Example

Infeed Belt Conveyor

The infeed belt conveyor connects the UniSort XV sortation conveyor to a product induction conveyor system.

The induction conveyor, infeed belt conveyor, and idler section share the same centerline, see Figure 5 - 2.

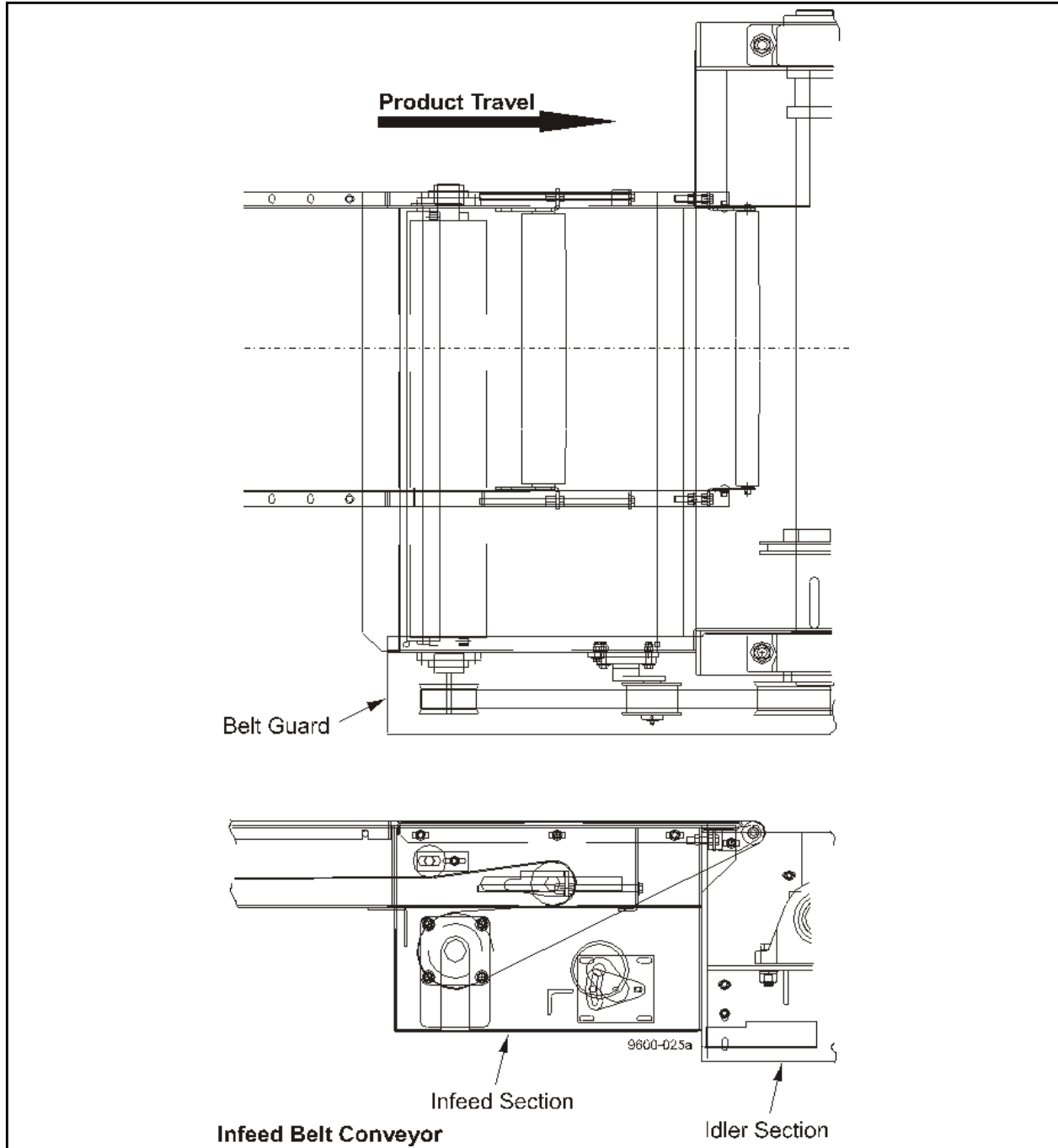


Figure 5 - 2 Infeed Belt Conveyor (Top and Side View)

Minimum Infeed Belt Conveyor Lengths - Dual-Sided Sorters (Only)

Figure 5 - 3 shows distance “A” which represents the minimum distance from the discharge end of the infeed belt conveyor to the centerline of the set-up photo-eye. Distance “A” is a variable depending on the infeed belt conveyor width and must be taken into consideration when selecting the infeed belt conveyor used with a UniSort XV dual-sided idler unit/intermediate section.

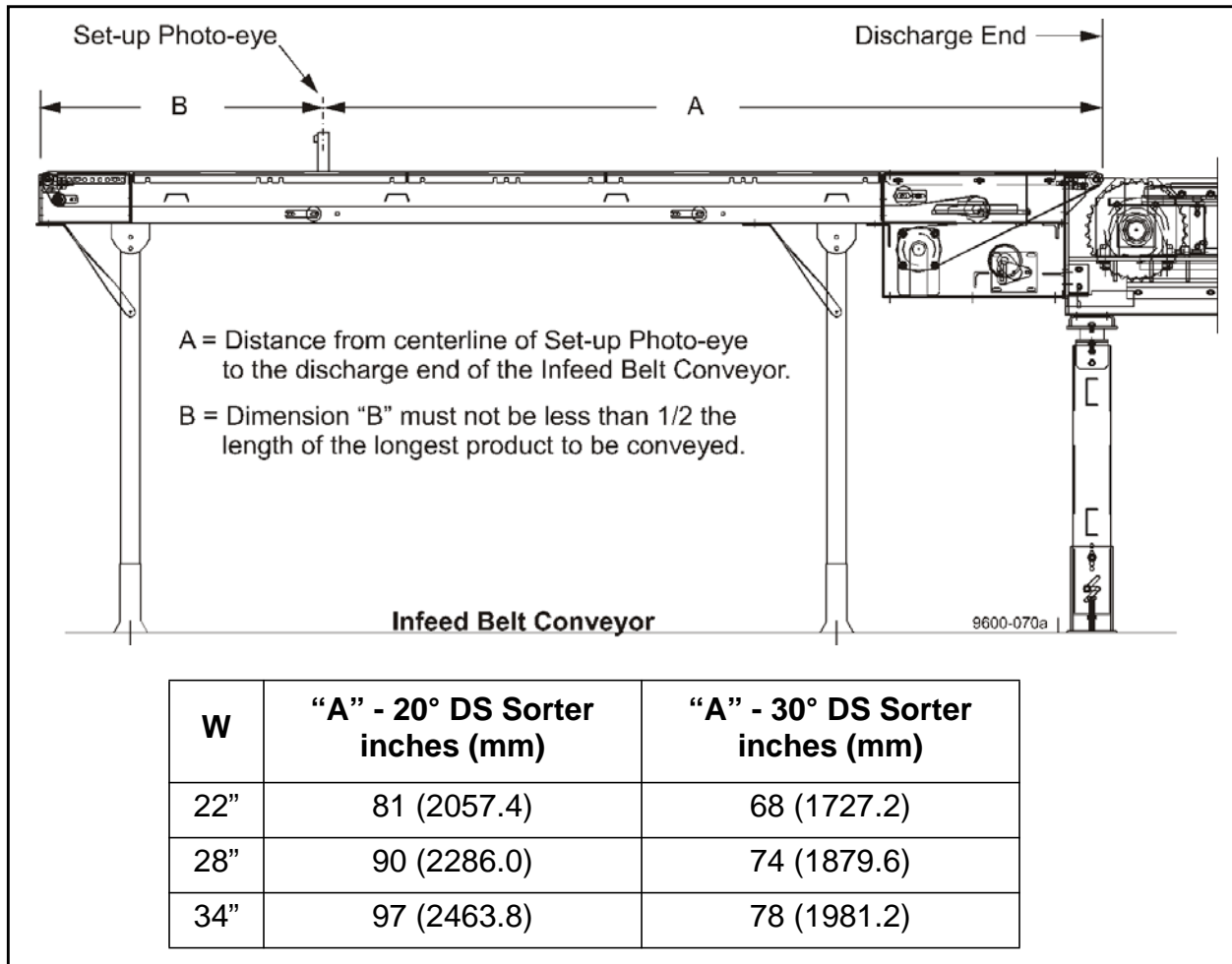


Figure 5 - 3 Infeed Belt Conveyor Lengths - Dual-Sided Sorters

NOTE: The maximum speed for a dual-sided sorter is 550fpm (168mpm).

Idler Section - Single and Dual Sided Diverting

The idler section consists of an idler unit and the first intermediate section and is located at the infeed end of the conveyor. Besides functioning as a terminal end, the intermediate section typically contains the first divert position. Figure 5 - 4 shows the major components of the idler section.

The carrying chains travel up and around the two idler sprockets that are mounted on the idler shaft. The divert shoes are guided around the idler by divert shoe guides also mounted on the idler shaft.

Pin guide tracks are mounted on the intermediate section to maintain the correct divert shoe position as they travel between divert points.

For single-sided diverts, divert shoe staging is performed by the guide return rail mounted to the underside of the intermediate section, see Figure 5 - 4. For dual-sided diverts, divert shoe staging is performed by the justifier switch to return the shoes to the right or left as they travel to the top of the idler section, see Figure 5 - 5.

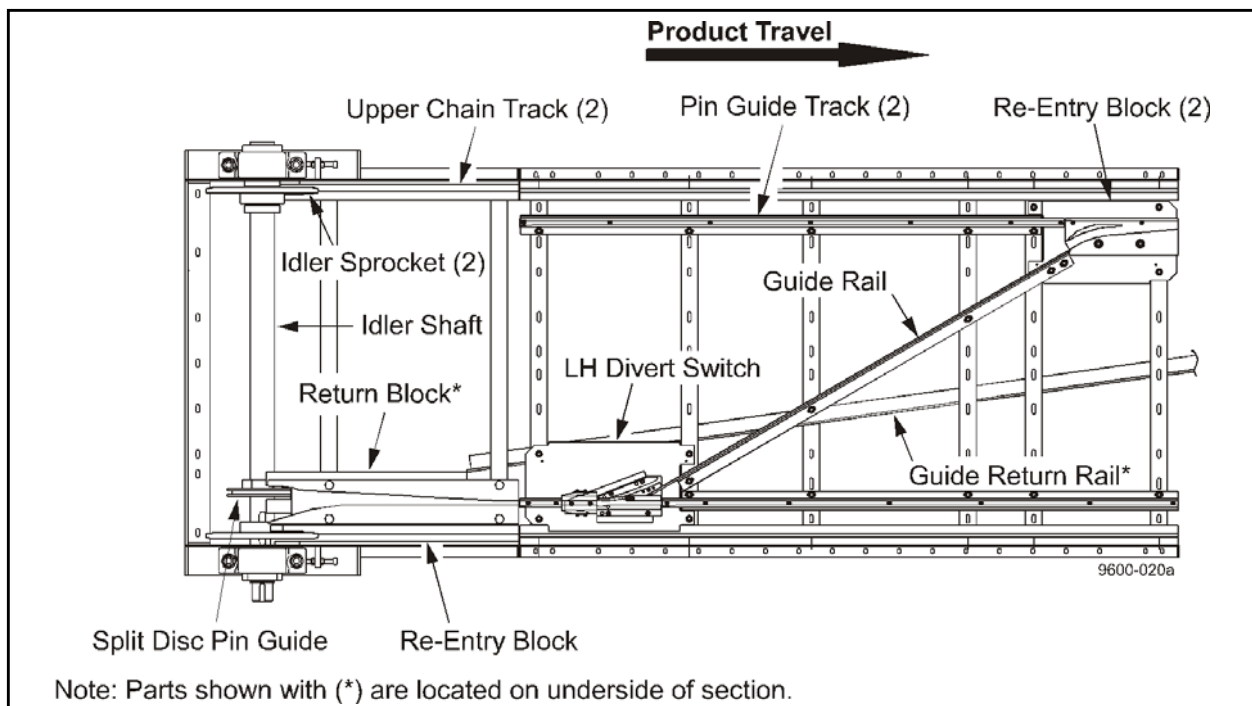


Figure 5 - 4 Idler Section - Single-Sided 20° LH Divert (shown)

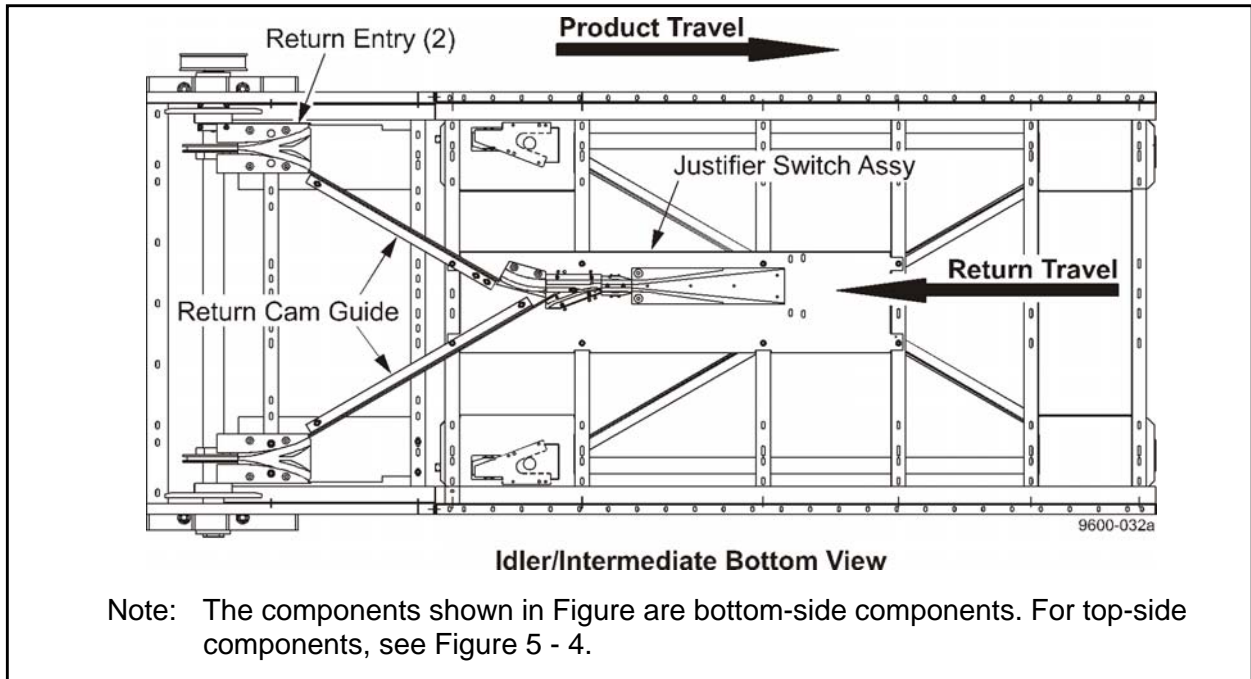


Figure 5 - 5 Idler Section - Dual-Sided Divert (shown)

Intermediate Sections

Intermediate sections immediately follow the idler section in the UniSort XV sortation conveyor application. Intermediate section types include: non-, single- (left- and right-hand), and dual-sided divert. Figure 5 - 6 shows a dual-sided divert intermediate and the major components of intermediate sections.

Each intermediate section contains a continuation of the pin guide and carrying chain tracks. Depending on the application, the intermediate section may also contain the appropriate divert switch assembly(s) and divert shoe pin guide rails to meet the divert requirements of the application.

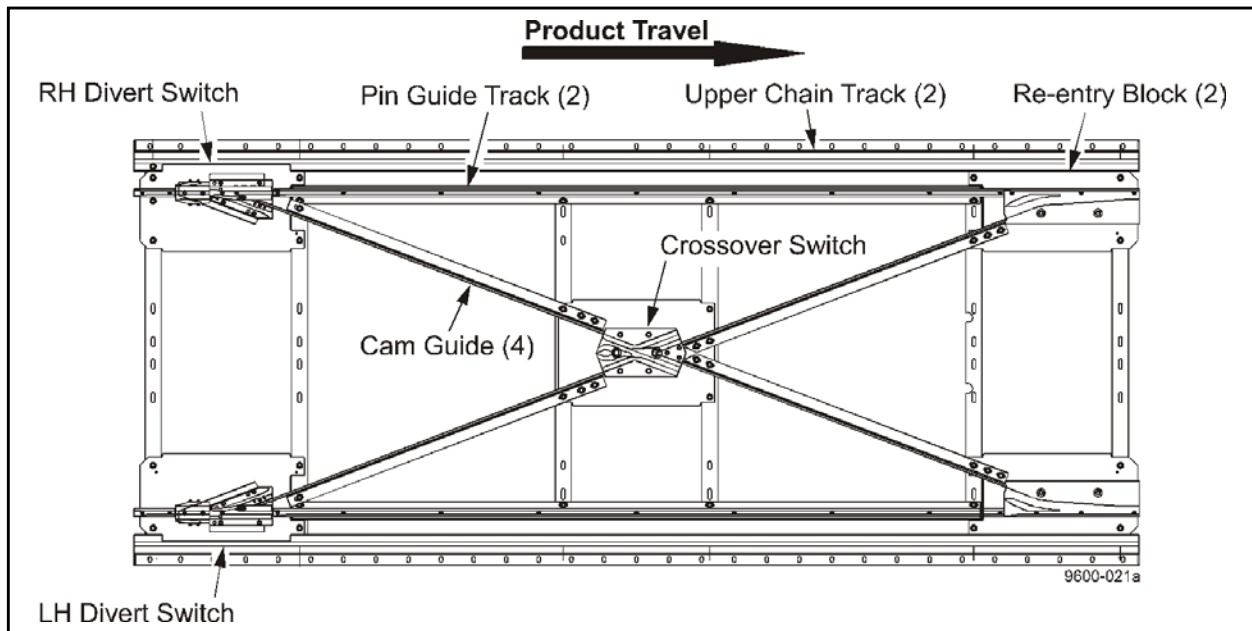


Figure 5 - 6 Intermediate Section - Dual-Sided 20° Divert (shown)

Compound Angle (16°/21°) LH and RH Divert Intermediate Sections

The compound angle divert intermediates are used for UniSort XV applications above 550fpm (167.6mpm). These intermediates are available only as single-sided LH or RH diverts. Due to product alignment requirements, dual-sided diverts are not available.

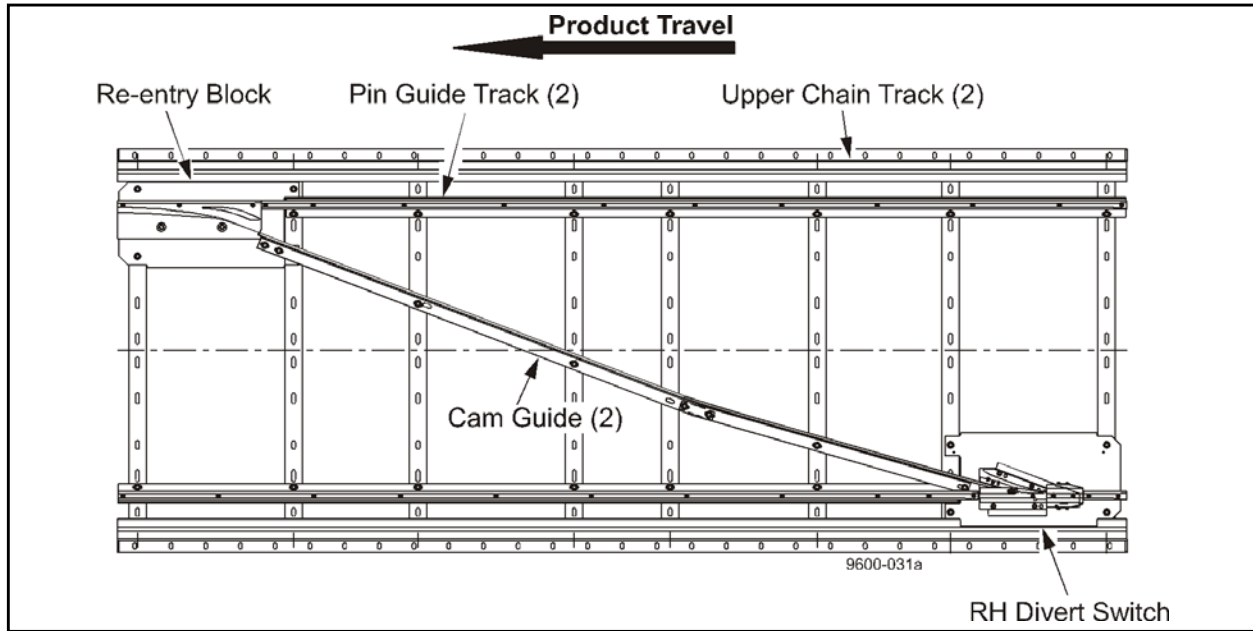


Figure 5 - 7 Compound Angle (16°/21°) RH Divert Intermediate (shown)

Non-Divert Intermediate Sections

The non-divert intermediate sections do not contain divert switches. This type of intermediate simply has continuations of the pin guide and chain tracks to allow the divert shoes to remain in their current position while travelling downstream to the next sorter section.

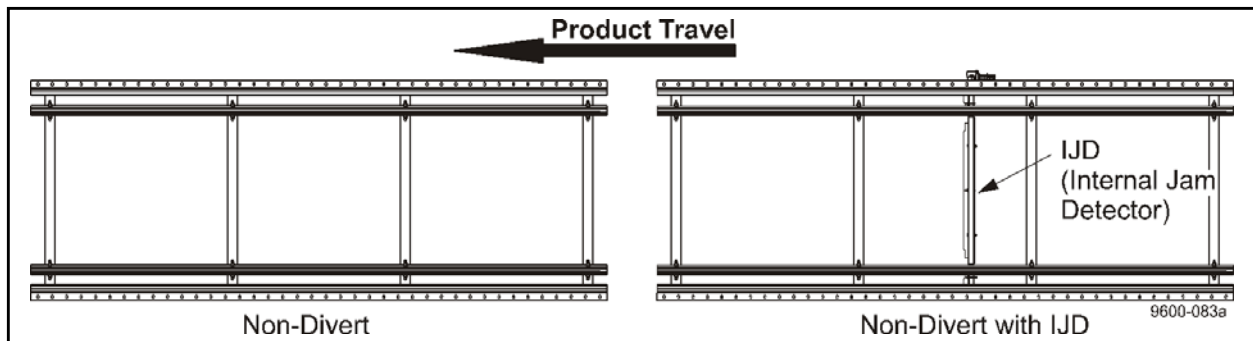


Figure 5 - 8 Non-Divert Sections with/without Internal Jam Detector

Single-Side (LH and RH) Divert Intermediate Section Switch Operation

Single-sided divert switch assemblies are located on the side opposite the divert point. Non-diverted shoes travel down this side to the next downstream sorter section. The guide pin of each divert shoe moves within the pin guide track.

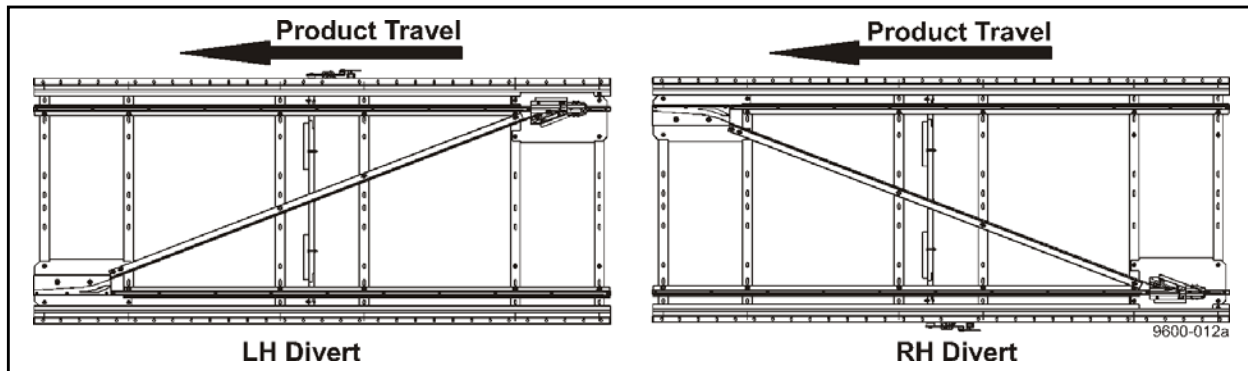


Figure 5 - 9 Single-Sided Divert Intermediate Sections (20° Divert shown)

The divert switch assembly also contains a continuation of the pin guide track. A brushless rotary actuator controlled divert trigger is located following this pin guide track. In the non-divert position, the switch allows the divert shoe to pass straight through the divert switch and continue down the non-divert side.

When diverting is to take place:

- The system controller signals the DCM (Divert Control Module) to switch the divert trigger to the divert position.
- This allows the divert shoe pin to start down the divert path and the divert shoe cam guide follower to contact the cam guide and travel to the divert point.
- The diverted shoes then travel down the divert side.

One divert shoe is assigned for each 5 feet (127mm) of product length with the leading edge of the divert shoe calibrated to the leading edge of the product to be diverted. This calibration process takes place during product induction using photo-eyes to sense the leading and trailing edges of the product.

The divert switch contains a thru beam photo-eye to actuate the divert trigger. The photo-eye beam is broken by the divert shoe cam guide follower. If the divert shoe is to be diverted, the divert trigger is switched to the divert position. After the appropriate number of shoes is diverted, the divert trigger is switched back to the non-divert, “home”, position. If the divert shoe is not to be diverted, the divert trigger is not actuated. The signals received from the product sensing photo-eye and the divert switch photo-eye are used by the DCM to synchronize the switching action.

Dual-Sided Divert Intermediate Section Switch Operation

The dual-sided intermediate section, with the divert shoes located down the side, uses two divert switches (a left- and a right-hand divert switch) and a crossover switch located in the approximate center of the intermediate to effect dual-sided product sorting, see Figure 5 - 10.

The left- and right-handed divert switches used in dual-sided intermediate are the same switches as used in a single-sided intermediate. Operation of these divert switches is also the same as described for the single-sided divert intermediate, described above.

The crossover switch has mechanically operated divert triggers located at the crossover point of the two diagonal cam guide rails. The divert triggers are actuated by the divert shoe pin. This allows shoes on the right side to divert product to the left and shoes located on the left side to divert product to the right. The crossover switch requires no electrical or pneumatic control.

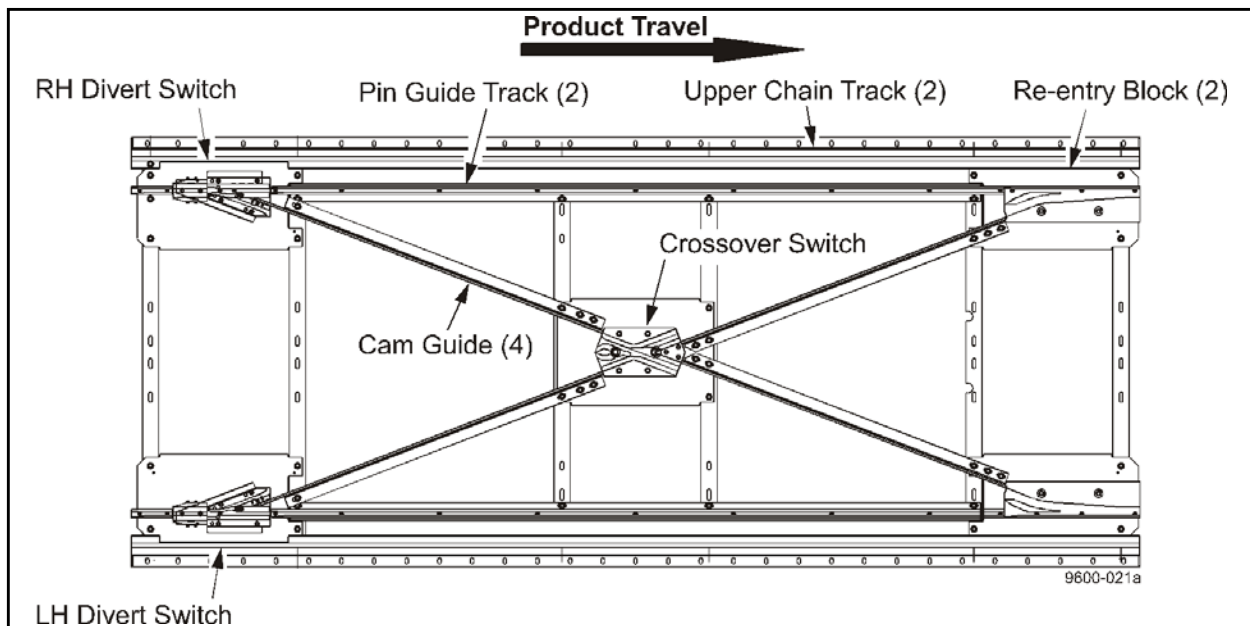


Figure 5 - 10 Dual-Sided Divert Intermediate

Catenary Section

The catenary is used to provide chain take-up on the UniSort XV conveyor.

The catenary section is unique to the UniSort XV application and is typically made up of divert sections. Figure 5 - 11 shows the catenary section using two non-divert intermediates. LH-, RH-, or Dual-Sided divert intermediate sections may also be used.

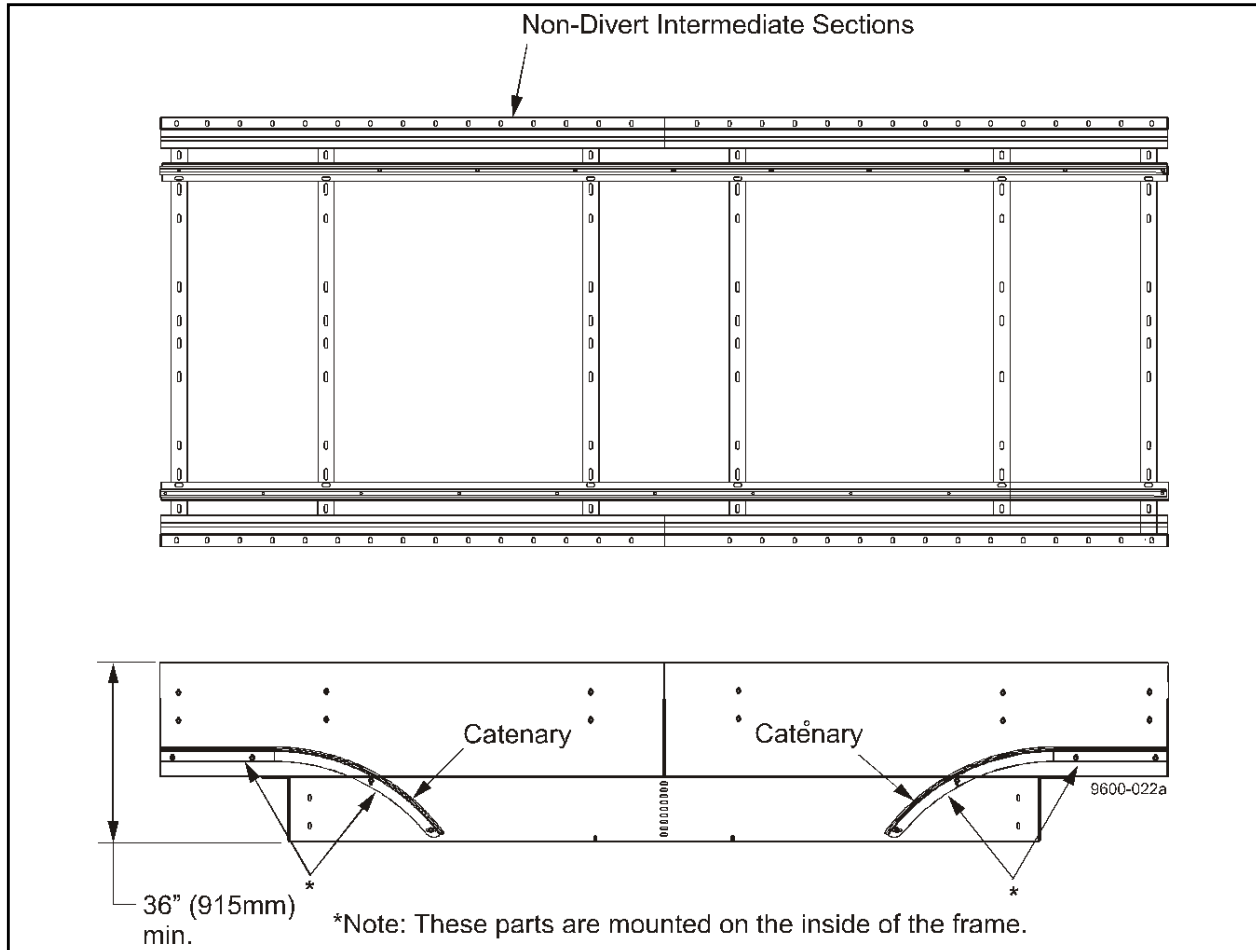


Figure 5 - 11 Catenary Section

Elevation Drawing

Figure 5 - 12 shows the minimum height requirement to accommodate the catenary section. When a 30 inches (762mm) minimum is required for the application, provisions must be made in the supporting structure at the catenary section to accommodate the catenary's 36 inches (915mm) minimum.

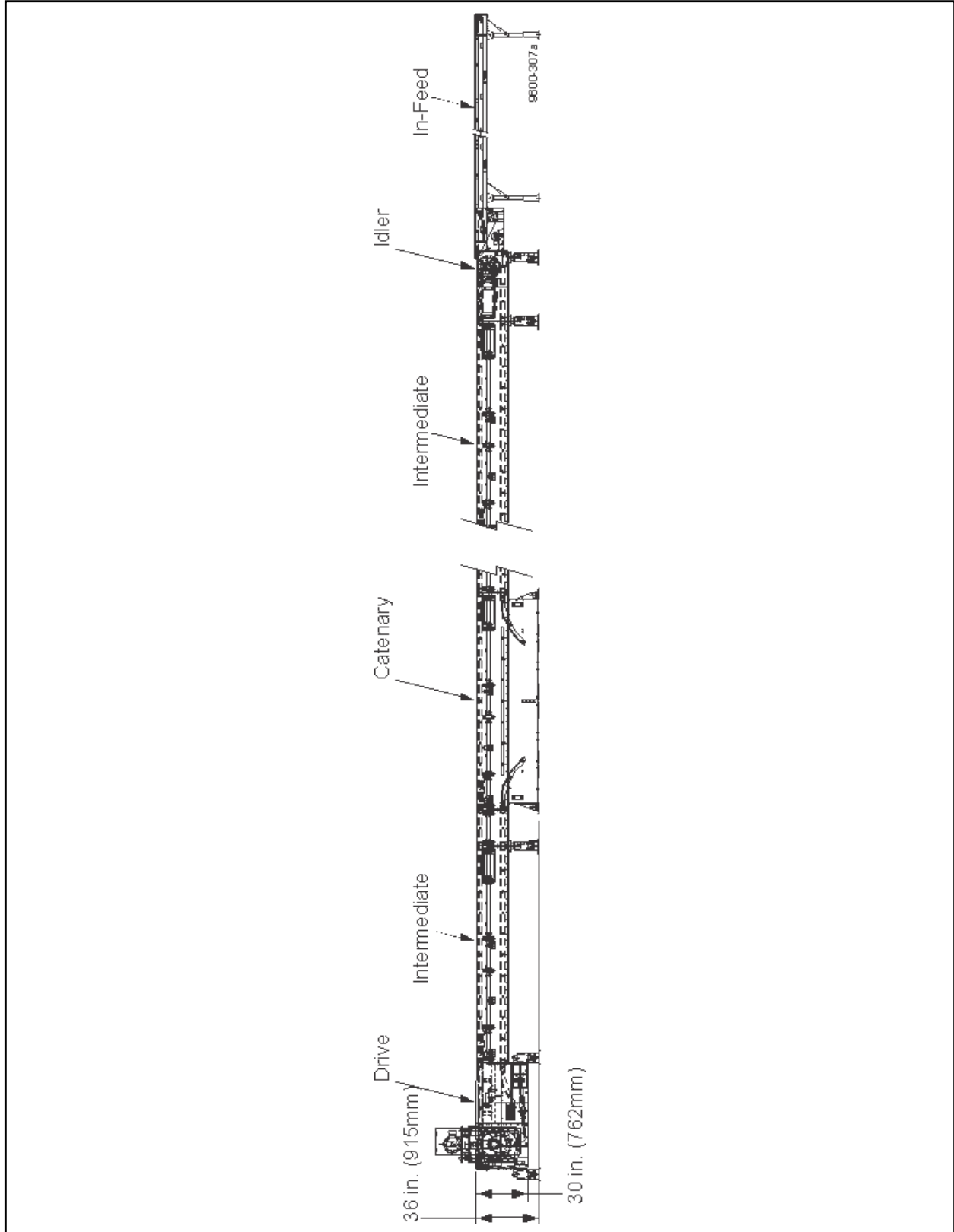


Figure 5 - 12 Elevation DRawing - 36 Inches Minimum for Catenary

Drive Section and Motor/Reducer

The drive section with the motor and reducer provides the required carrying chain pull and speed, see Figure 5 - 13 for the Top View and Figure 5 - 14 for the End View. Drive sections include: LH and RH single-sided and dual-sided diverts.

Between Frame Widths (BF)

22W (BF) = 43.50" (1104.9mm).

28W (BF) = 49.50" (1257.3mm).

34W (BF) = 55.50" (1409.7mm).

The constant speed (TEFC) overhead AC motor drives the reducer by "V" belts. The shaft mounted reducer powers the drive shaft which contains two chain sprockets for driving the carrying chains. The drive shaft also contains two divert shoe guides, see Figure 5 - 14.

Carrying chains ride on Novex wear strips in the UHMW blocks mounted on both sides of the drive section.

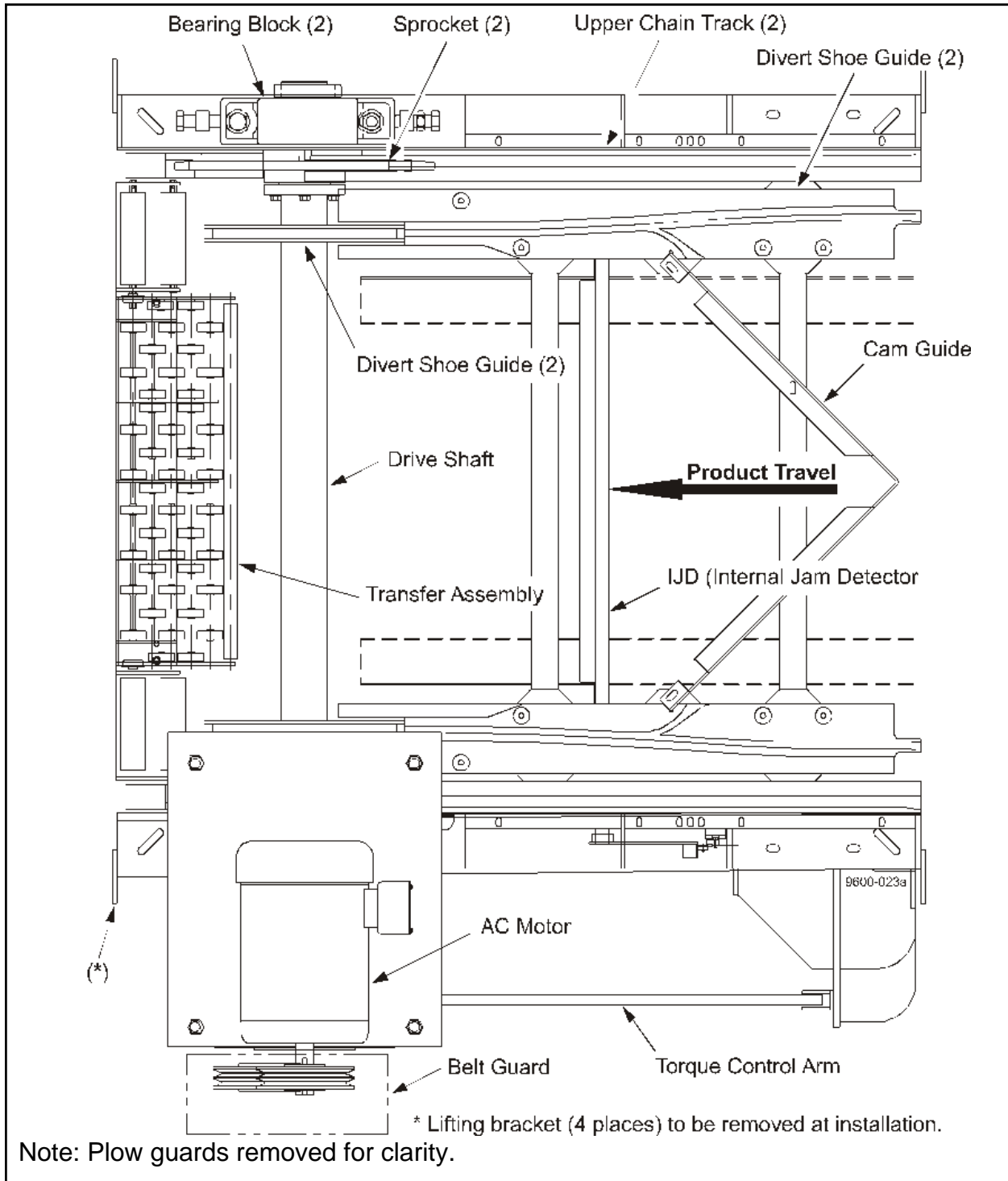


Figure 5 - 13 Drive Section and Power Unit - Top View

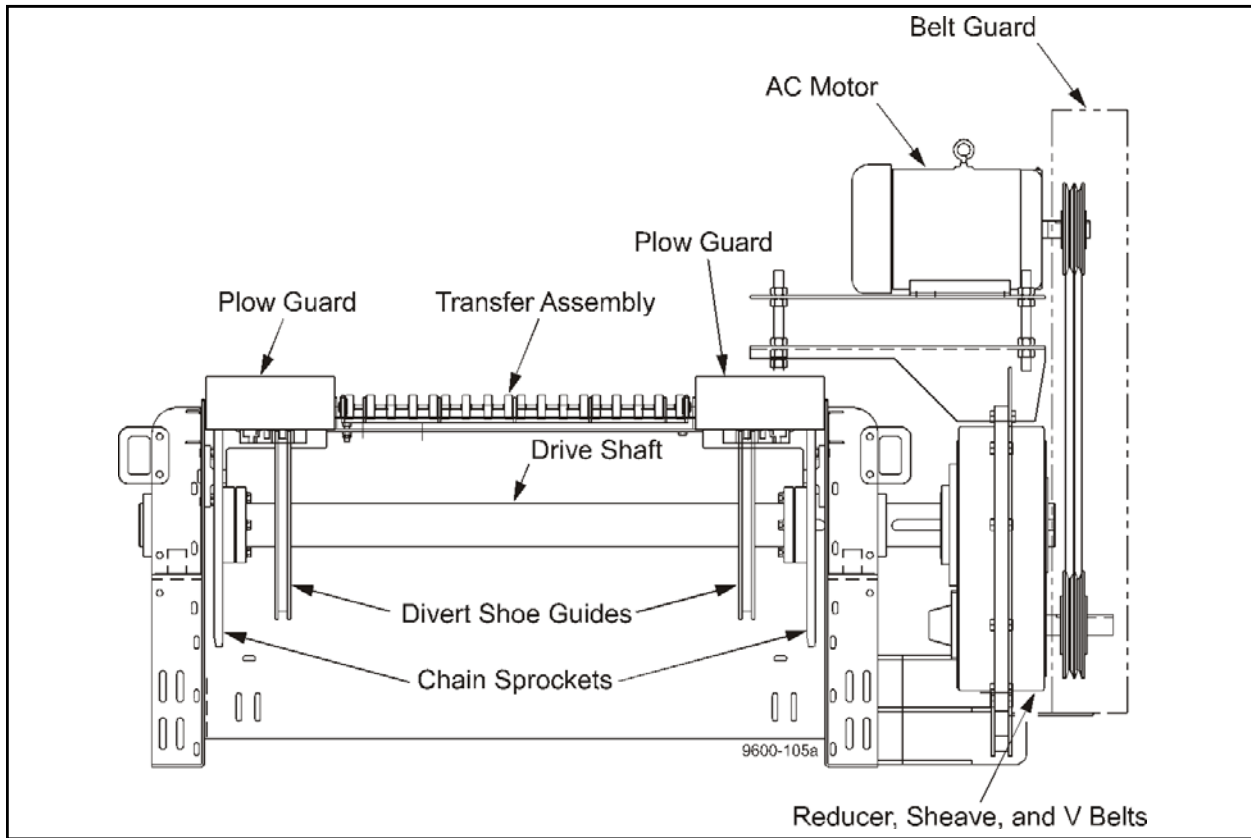


Figure 5 - 14 Drive Section and Power Unit - End View

