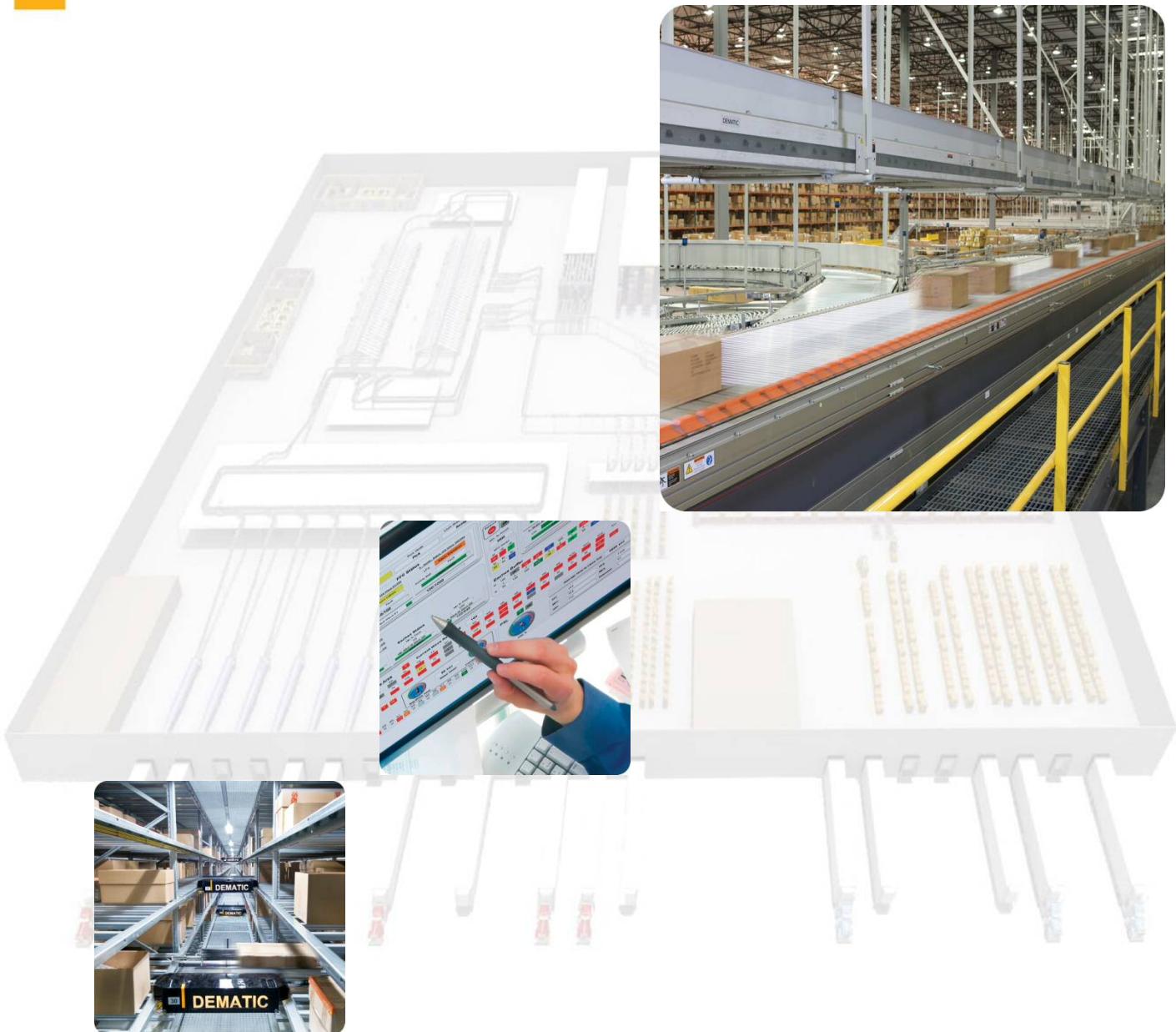


Amazon Robotics Semi Auto Workstation (ARSAW)

Operation and Maintenance Manual



Information in this document is subject to change without notice. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of Dematic Corp.

© 2016 Dematic Corp. All rights reserved
Confidential sensitive. Not for further distribution.

This document contains confidential information, trade secrets and/or know-how which is the property of Dematic Corp., and may not be disclosed to any third party without the written permission of Dematic Corp.

Product and company names herein may be the trademarks of their respective owners.

Hereinafter Dematic Corp. shall be written as Dematic.

Dematic Corp.
507 Plymouth Avenue
Grand Rapids, MI 49505
616-913-6200
800-530-9153
www.dematic.us

Contents

1	Safety	9
1.1	Danger/Warning/Caution Convention.....	9
1.2	General Safety	9
1.2.1	Personnel.....	10
1.2.2	Equipment.....	11
1.2.3	Operation	11
1.2.4	Instructions for Safe Clearing of Product Jams.....	11
1.2.5	Maintenance	12
1.3	Equipment Labels	12
2	Equipment Description	13
2.1	Overview.....	13
2.2	Description of Operation	15
2.2.1	De-stacker and Lift Details	15
2.2.2	Put Positions Details	16
2.2.3	Outbound Flow Lane Details	17
2.3	Safety Devices	19
2.3.1	Cabinet Disconnect Switch	19
2.3.2	Low Air Pressure.....	19
2.3.3	Emergency Stop	19
2.3.4	Jam Detection	22
2.4	Control Cabinet.....	23
2.5	Control Stations	24
2.5.1	Jam Reset Control Station	24
2.5.2	E-Stop Control Stations.....	24
2.6	Beacons and Alarm Horn	25
2.6.1	Jam Indicator	25
2.6.2	E-Stop Indicator	25
2.6.3	Totes Needed Status Indicator.....	26
2.6.4	Alarm Horn.....	26
2.7	ARSAW Conveyors.....	27
2.8	Recommended Spare Parts	28
3	ARSAW Operation	29
3.1	System Start and Stop	29
3.1.1	Requirements for Operation	29
3.1.2	ARSAW Station Start Procedure	29
3.1.3	ARSAW Station Stop Procedure	30
3.2	Product Flow and Operation.....	30
3.2.1	De-stacker and Multi-level Lift (OR+100030).....	30
3.2.2	Put Lanes.....	30
3.2.3	Full Tote Infeed to Lift	31
3.2.4	RSP Trunk Line Merge.....	31
3.2.5	Energy Management.....	31

4	Operator Procedures.....	33
4.1	Starting the ARSAW	33
4.2	Loading Empty Tote Stacks	33
4.3	Loading Empty Totes into Put Positions	34
4.4	Pick/Put Operations.....	34
4.5	Removing a Full Tote from a Put Position.....	34
4.6	Clearing a Jam	35
4.7	Activating an E-Stop.....	35
4.8	Stopping the ARSAW	36
5	Maintenance.....	37
5.1	General Safety and Maintenance	37
5.2	ARSAW Conveyors	37
5.3	Periodic Maintenance Schedule	38
5.3.1	Belt Driven Linear Actuator Scheduled Maintenance	39
5.4	Maintenance Procedures.....	39
5.4.1	Tote De-stacker/Lift Fault Recovery	39
5.4.2	De-energize and Clear the Tote De-stacker	40
5.4.3	ARSAW De-stacker Tote Lift Cylinder Adjustment.....	44
5.4.4	Amazon Robotics Semi-Automated Workstations (ARSAW) De-stacker Flow	45
6	Troubleshooting	47
6.1	ARSAW Conveyors	47
6.2	Lift Fault Troubleshooting	47
6.3	De-stacker Fault Troubleshooting	49
6.4	Status Indicators.....	50
6.4.1	De-stacker Position Status	50
6.4.2	De-stacker I/O Status	50
6.4.3	Lift Package Present Status	51
6.4.4	Lift Status	51
6.4.5	Lift Position Status.....	51
6.4.6	Trunk Line Status	52
6.4.7	De-stacker/Lift Photos Status	52
6.4.8	Lift Overtravel Status	52
6.4.9	I/O Communication Status.....	53
6.5	ARSAW Alarm Descriptions	54
7	Repair	59
7.1	ARSAW Conveyors	59
7.2	Belt Driven Linear Actuator, Servo Motor, Gear Reducer, MDR Lift Conveyor.....	60
7.3	Belt Driven Linear Actuator.....	63
7.3.1	Disassembly of Belt from Carriage	64
7.3.2	Removal of Pulleys.....	65
7.3.3	Eccentric Axle / Roller Adjustment.....	66
7.4	Tote Lift/Retainer Pneumatic Actuator	68
7.5	De-stacker Proximity Sensors	70
7.6	De-stacker Pneumatic Cylinder	71

7.7	Photo Sensors/Reflectors	74
7.8	Upper, Lower, and Home Limit Switches.....	75

Figures

Figure 1	ARSAW Overview	14
Figure 2	De-stacker and Lift Details.....	15
Figure 3	Put Positions Details.....	16
Figure 4	Outbound Flow Lane Details	17
Figure 5	Outbound Flow Lane Case Stop.....	18
Figure 6	MDR Lift Conveyor	27
Figure 7	MDR Tote De-stacker Infeed Conveyor	27
Figure 8	ARSAW Periodic Maintenance Schedule	38
Figure 9	Belt Driven Linear Actuator Scheduled Maintenance	39
Figure 10	Air Solenoid Block for De-stacker	40
Figure 11	De-stacker in Raised Position.....	41
Figure 12	Service Doors.....	42
Figure 13	Air Components.....	43
Figure 14	Tote Lift Cylinder Screws.....	44
Figure 15	Tote Lift Cylinder Spacing.....	44
Figure 16	Tote Lift Cylinder Gap.....	45
Figure 17	De-stacker Cylinder	46
Figure 18	Belt Driven Linear Actuator.....	60
Figure 19	Servo Motor Guard	62
Figure 20	Belt Driven Linear Actuator Components	63
Figure 21	Disassembly of Belt from Carriage	64
Figure 22	Removal of Pulleys.....	65
Figure 23	Belt Driven Linear Actuator Drive Assembly	66
Figure 24	Eccentric Axle / Roller Adjustment.....	68
Figure 25	Tote Lift/Retainer Pneumatic Actuators	69
Figure 26	De-stacker Proximity Sensors (Top Sensor Shown for Reference) ..	70
Figure 27	De-stacker Pneumatic Cylinder	72
Figure 28	Photo Sensor and Reflector Example	74
Figure 29	Limit Switches	76

Tables

Table 1	Figure 10 Items	40
Table 2	Lift Fault Troubleshooting.....	47
Table 3	De-stacker Fault Troubleshooting	49
Table 4	De-stacker Position Status	50
Table 5	De-stacker I/O Status.....	50
Table 6	Lift Package Present Status	51
Table 7	Lift Status.....	51
Table 8	Lift Position Status	51
Table 9	Trunk Line Status	52
Table 10	De-stacker/Lift Photos Status.....	52
Table 11	Lift Overtravel Status.....	52
Table 12	I/O Communication Status	53
Table 13	ARSAW System Manager Alarms	54

1 Safety

1.1 Danger/Warning/Caution Convention

This product is furnished with safety guards and warning labels. When this equipment is applied at your facility, additional guards and warnings may be required because specific applications might create residual hazards that could not be anticipated or eliminated when the equipment was designed. Therefore, examine your installation and provide any additional required safety measures. Danger, warning, and caution conventions are explained in the following table:

Symbol	Description
 DANGER	Danger statements indicate an imminently hazardous situation that if not avoided, WILL result in death or serious injury.
 WARNING	Warning statements indicate a potentially hazardous situation that if not avoided, COULD result in death or serious injury.
 CAUTION	Caution statements indicate a potentially hazardous situation that if not avoided, will result in minor or moderate injury. It may also be used to alert against unsafe practices.

1.2 General Safety



Never operate this equipment with missing, disabled, or inoperative safety devices. Operating equipment in this condition will result in serious injury or death. Immediately remove equipment in this condition from service.



Severe personal injury or damage to property may occur in the event of:

- Incorrect use or operation of the equipment, including allowing untrained personnel to interface with or come into contact with the equipment. Only properly trained and authorized personnel are to operate this equipment.**
- Incorrect or insufficient maintenance of the equipment. Only properly trained and authorized personnel are to service and maintain this equipment.**

⚠ WARNING

Do not perform adjustments, maintenance, clearing of jams, or other work on this equipment without following OSHA Lock-Out/Tag-Out requirements and state and local requirements. The purpose of this procedure is to protect all persons involved against unexpected restart. Personnel should be alerted to the hazard of stored energy which may exist after the power source is locked out. Refer to ANSI Z244.1 and OSHA 29 CFR 1910.147 for minimum requirements. Failure to follow these requirements may result in equipment damage, serious injury, or death.

⚠ WARNING

If any defects relating to operating safety and reliability are detected or if any damage occurs, affected parts of the system must be taken out of operation immediately. Failure to do so may result in serious injury or death

⚠ WARNING

Climbing, sitting, walking, or riding on equipment at any time may result in serious injury or death.

⚠ CAUTION

Under continuous operation, the external surface of various powered components might reach temperatures significantly above ambient temperature. Contact with unprotected skin may cause burns.

⚠ CAUTION

Exposure to elevated sound levels can damage hearing. The complete equipment operating environment should be reviewed and hearing protection provided if required.

1.2.1 Personnel

- Personnel must be informed about the location and operation of emergency stops and power disconnect points.
- Personnel must be alerted to potential hazards of entanglement in conveyors caused by such items as long hair, loose clothing, and jewelry. These hazards, if not avoided, could result in serious injury or death.
- Personnel must report to a supervisor all unsafe conditions or anything out of the ordinary that is observed prior to operating the system. Remove equipment in unsafe conditions from service immediately.

1.2.2 Equipment

- Use the equipment exclusively for appropriate conveyor loads that it is designed to handle safely.
- Do not perform any unauthorized conversion or modification of the system, equipment, or safety devices. Such modifications could degrade safety and expose personnel to risk of serious injury or death.
- Never connect or disconnect any electrical cables while power is applied to the equipment as this can result in damage to the equipment or serious injury or death resulting from electric shock. Lock-out/tag-out equipment prior to service.

1.2.3 Operation

- Prior to start up, operators are to visually confirm that all personnel are clear of the conveyor.
- During initial equipment startup, personnel must be notified prior to startup by the operator or via audible and/or visual indications followed by a delay.
- If safety devices are defective or if they do not function reliably, the equipment must not be put into operation. Notify your supervisor that equipment is not safe to operate and remove equipment from service.

1.2.4 Instructions for Safe Clearing of Product Jams

When the products being handled by the conveyor become lodged or jammed, the following instructions apply:

- Only authorized employees properly trained in the clearing of jammed products will be allowed to clear jams.
- Turn off and lock out the power to the conveyor before clearing the jam to prevent unintended motion of equipment. Take precautions to isolate all sources of energy including hydraulic, pneumatic, gravity, and other potential or stored energy.



DANGER

DO NOT climb on the conveyor at any time. Falling from the conveyor, especially from elevated heights, will cause serious injury or death.

- When unable to manually reach the jam with your hands from the walking surface, select an appropriate and safe method to access the jam. When a jam is above the walking surface or work level, a lift or ladder may be the safest method. Be sure to follow applicable manufacturer's instructions for safe use requirements and for any personal protection equipment required.
- Take precautions for stored energy of jammed packages, as releasing a jam may release potential energy.

- Realign product of good quality, and remove product of poor quality (for example, cartons that are broken, wet, or have open flaps).
- Remove any spilled materials from the conveyor and surrounding area before restarting conveyors.
- Observe the cause of the jam, and report it to the appropriate supervisor. Often, jams occur because the conveyables are of poor quality or are outside specifications, or because the equipment requires maintenance.
- By visual confirmation, be sure all personnel are clear of the conveyor before restarting.

1.2.5 Maintenance

- A routine safety inspection plan must be implemented before each shift change and startup of the equipment.
- Maintenance (other than observation) must not be performed while a conveyor is in operation or motion unless proper maintenance or service requires the conveyor to be in motion. In which case, personnel shall be made aware of all hazards and how the task may be safely accomplished.

1.3 Equipment Labels

Labels for partially-completed machinery being used in EU projects requiring CE conformity are applied after the equipment is incorporated into a conveyor system to become a complete machine.

Refer to project documentation for equipment label information.

2 Equipment Description

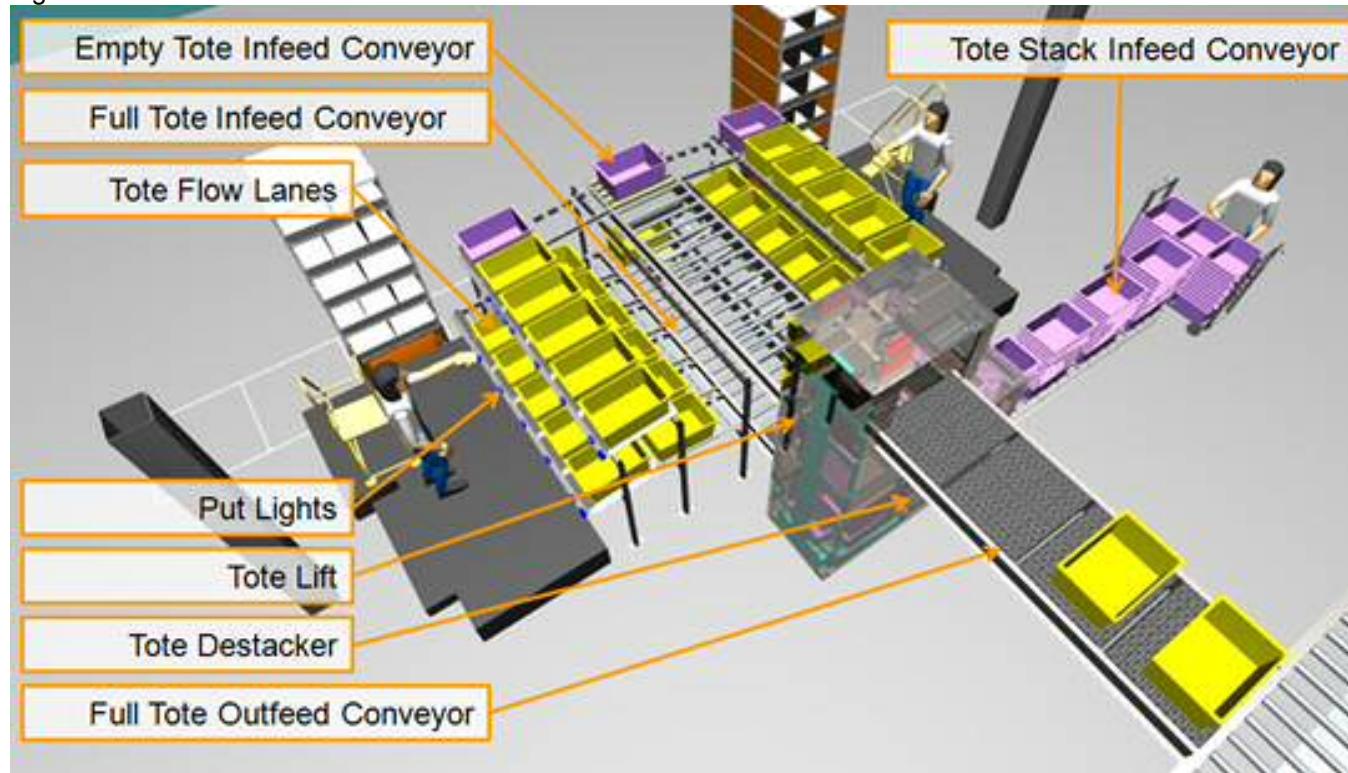
2.1 Overview

The Amazon Robotics Semi Auto Workstation (ARSAW) consists of:

- Tote Stack Infeed Conveyor (U100020)
- Tote De-stacker (U100030)
- Tote Lift (U100030)
- Empty Tote Infeed Conveyor (U100005)
- Empty Tote Right Angle Transfer To Accumulation (U100010)
- Tote Flow Lanes (U100035)
- Put Lights
- Full Tote Infeed Conveyor To Lift (U100015)
- Full Tote Outfeed Conveyor From Lift (U100025)

The ARSAW receives product from Amazon Robotics Systems™ Robots at the end of two pick cells (See Figure 1). It receives empty totes (empty totes are purple in the diagrams) in stacks (maximum of 12 totes) from an operator, de-stacks, and delivers individual totes to the pick lanes. After the operator has put the appropriate material into the tote and it is considered full (full totes are yellow in the diagrams), a manual push sends it to an outfeed lane where it will be conveyed to a main trunk line.

Figure 1 ARSAW Overview

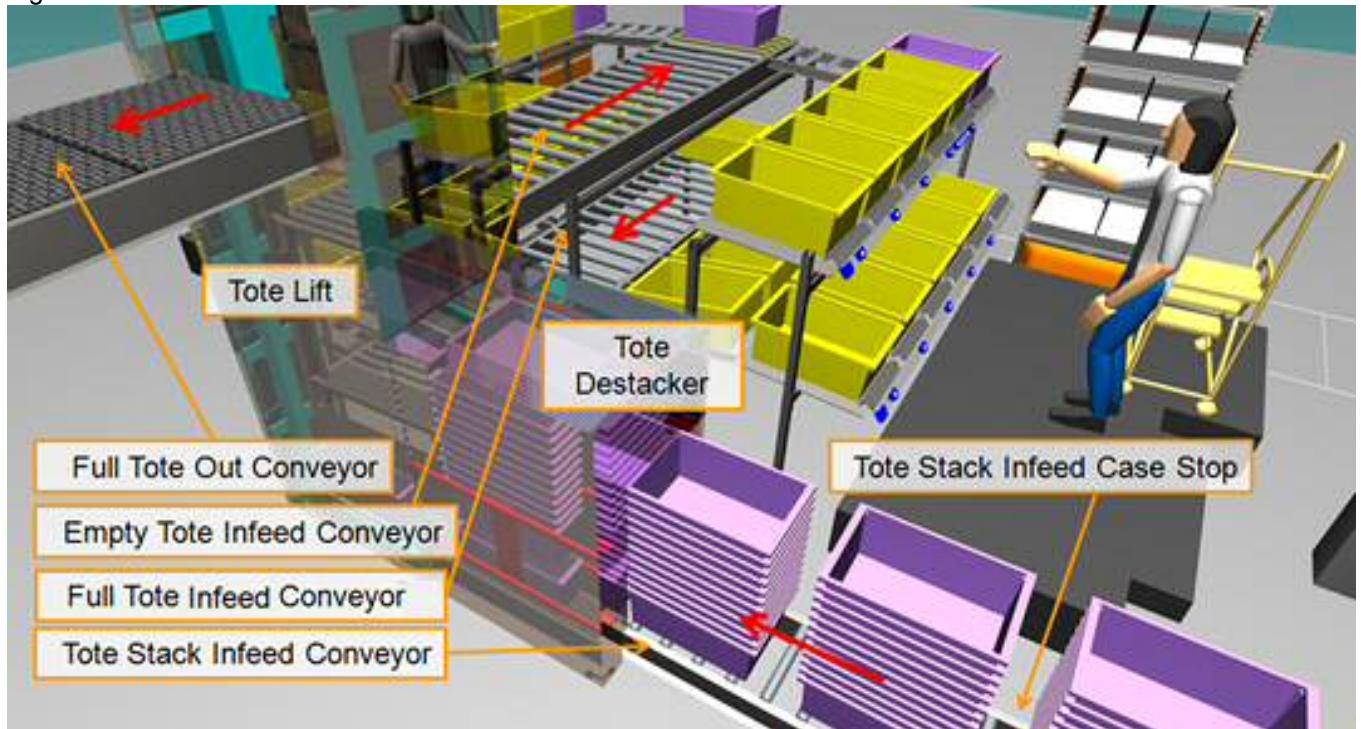


2.2 Description of Operation

2.2.1 De-stacker and Lift Details

1. Stacks of twelve (12) empty totes (purple) are conveyed into the de-stacker portion of the tote lift where the stack is lifted so that the bottom tote is singulated.
2. Each empty stack loaded will make contact with the Tote Stack Infeed Case Stop. This is to prevent the operator loading totes from pushing the stack of totes too far. Once the case stop zone photoeye has been blocked for the correct period of time the case stop will drop down and allow that single stack of empty totes through.
3. The empty tote will be held for retrieval.
4. The tote lift will retrieve the empty tote and eject it onto the empty tote infeed conveyor.
5. Full totes (yellow) will be held just before the tote lift for retrieval.
6. The tote lift will retrieve the full tote and eject it onto the full tote outfeed conveyor.

Figure 2 De-stacker and Lift Details

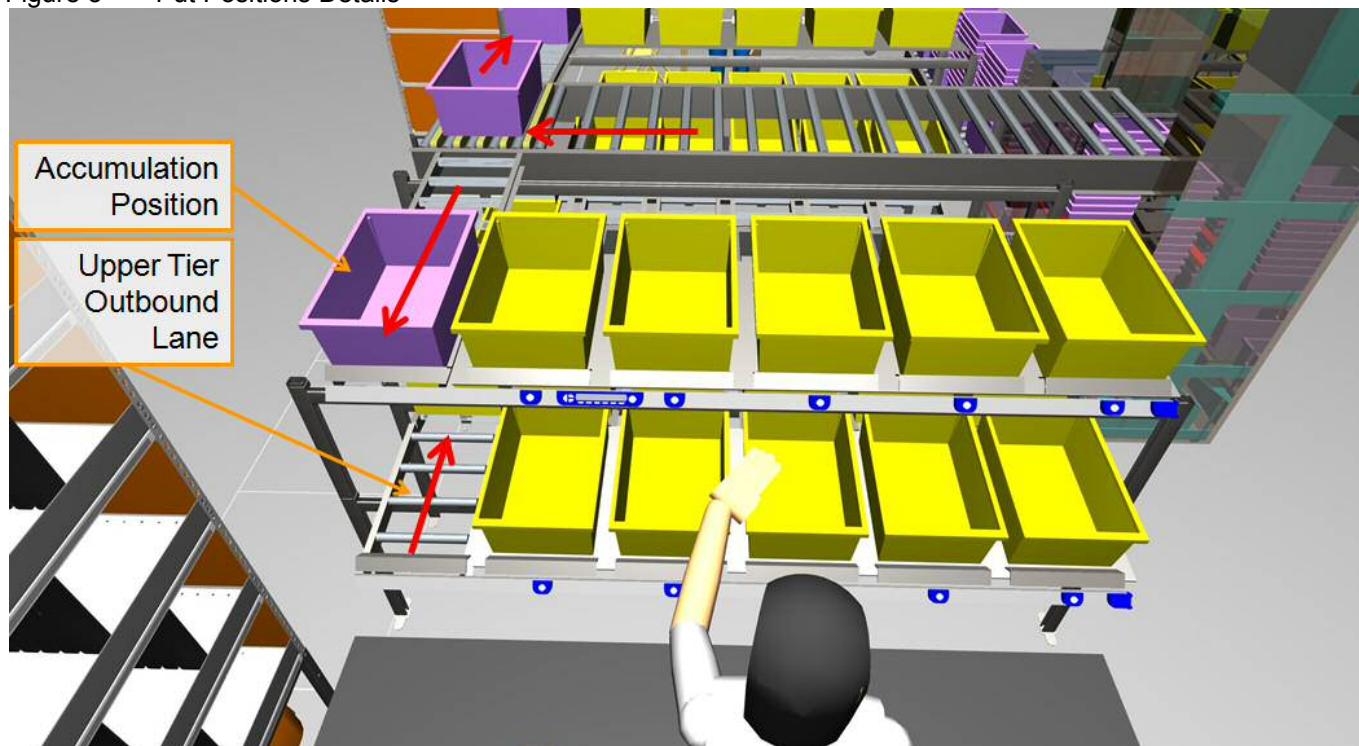


2.2.2 Put Positions Details

1. Empty totes (purple) convey to an infeed Right Angle Transfer (RAT) and divert in "keep full" fashion to a pair of opposing lanes.
2. Operators manually retrieve empty totes and place them into vacant put positions on either the upper or lower tier as directed by Amazon or Amazon Robotics controlled processes.

Disclaimer: The Pick/Put-to-Lights are for illustration only and may not accurately reflect placement by Amazon or Amazon Robotics.

Figure 3 Put Positions Details



2.2.3 Outbound Flow Lane Details

1. Full totes (yellow) are manually pushed away upon tote completion as described earlier.
2. Totes flow toward the full tote outfeed conveyor.
3. A case stop (see Figure 5) is used to stop the tote on the flow rack for 5 seconds to make sure that all totes on a side are present at the case stops before releasing and that there are no totes on the full tote infeed conveyor.

Figure 4 Outbound Flow Lane Details

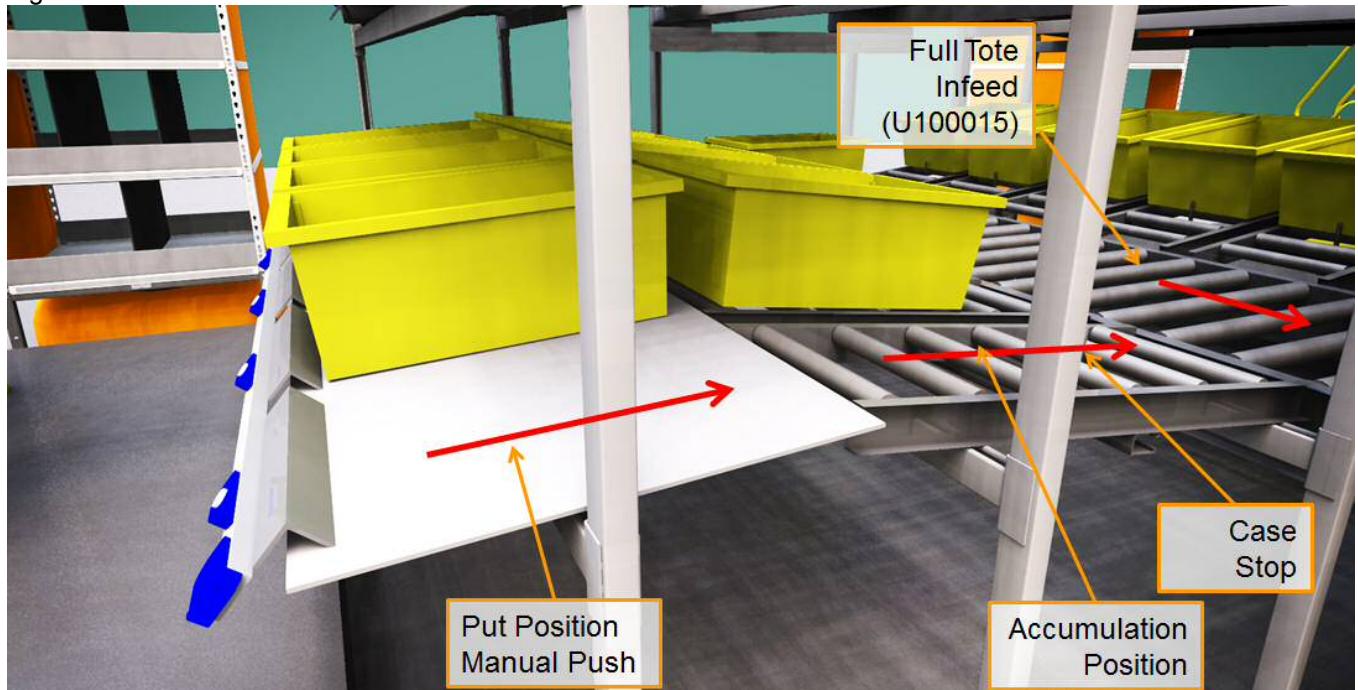
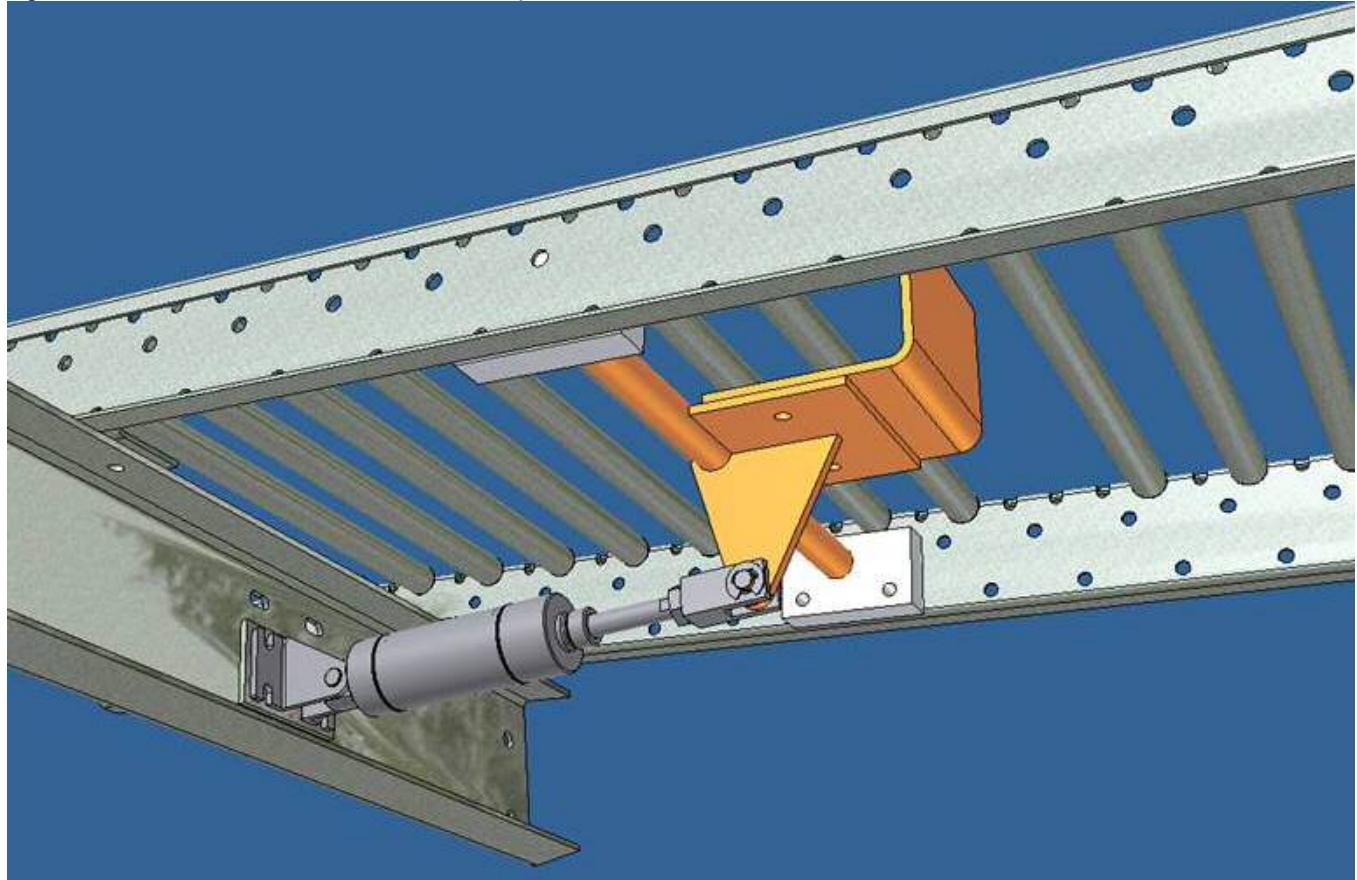


Figure 5 Outbound Flow Lane Case Stop



2.3 Safety Devices

2.3.1 Cabinet Disconnect Switch

Control Cabinet CC+122 contains a fused main disconnect switch operated by a handle through the door of the cabinet. The switch should be placed in the OFF position and locked out following lockout and tag-out procedures before any maintenance is performed on the conveyors associated with the cabinet. The handle has an interlock feature to prevent the door from being opened unless the switch is in the OFF position.

Control Cabinet CC+122 has an external, non-fused main disconnect switch operated by a lever on the side of the cabinet.

2.3.2 Low Air Pressure

Air pressure switches are used to monitor the main air pressure for the ARSAW. System air pressure is monitored via an air pressure switch wired to the PLC control cabinet. If the system air pressure drops below the required level, the air pressure switch will sense the low air pressure and each PLC will stop its associated conveyors. The LOW AIR PRESSURE light on the cabinet door will illuminate. When the air pressure is restored, the LOW AIR PRESSURE light flashes. Follow ARSAW start-up procedures to restart the system.

Low air pressure conditions are annunciated on Visualization.



CAUTION

The air pressure switches may not detect loss of air pressure due to operation of manual shut-off valves. Damage to equipment may occur if conveyors are run when air is turned off at local shut-off valves.

EMERGENCY STOP devices are not intended to disable equipment to provide protection for personnel in potentially hazardous contact with such equipment. For example, maintenance, jam clearing and/or other similar activities that require adherence to lockout procedures.

2.3.3 Emergency Stop

2.3.3.1 Emergency-Stop Push/Pull Buttons

Emergency Stop pushbuttons are located on the control cabinet door, in each operator area, and at the charge end of the tote stack infeed conveyor. When pushed, the START lights will extinguish and all conveyors controlled by the control cabinet will stop. See section 2.3.3.5 for definition of the E-Stop devices and zones. The button will illuminate when actuated. A red beacon associated with the E-Stop switch will flash. The E-STOP ACTUATED pilot light on the control cabinet will also illuminate.

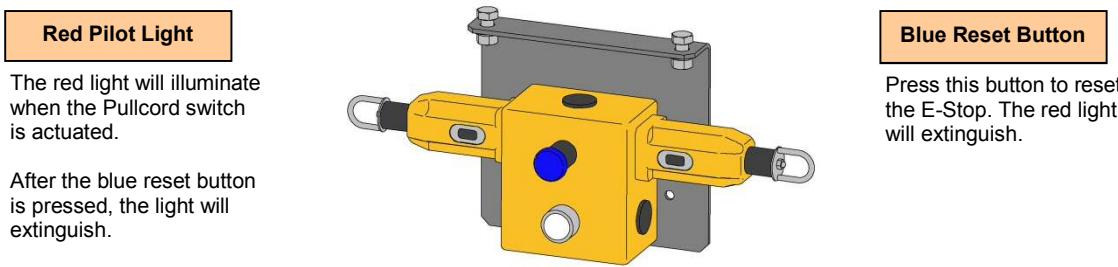
The EMERGENCY STOP button remains actuated until reset. To reset the EMERGENCY STOP button, ensure that all conditions causing the E-Stop have

been cleared and then pull the button out to its normal position. The red pilot light within the button, the red beacon, and the E-STOP ACTUATED pilot light on the control cabinet will extinguish.

2.3.3.2 Emergency Stop Pullcord Switches

Emergency Stop Pullcord switches are provided on the conveyors in each of the ARSAW. The Line Strong, or taut cord switches are failsafe devices that are actuated by pulling on the cord, or if the cord is accidentally cut or damaged. When actuated, the conveyors in the associated E-Stop zone will stop. (See section 2.3.3.5 for definition of the E-Stop zones.) A red pilot light on the actuated E-Stop switch will illuminate. A red beacon associated with the E-Stop switch will flash. The E-STOP ACTUATED pilot light on the control cabinet will also illuminate.

The Emergency Stop Pullcord switch will stay actuated until it is manually reset. To reset, press the blue reset button on the switch. The red pilot light on the E-Stop Pullcord switch, the red beacon, and the E-STOP ACTUATED pilot light on the control cabinet will extinguish. The conveyors must be restarted by ARSAW system start procedures.



2.3.3.3 Guard Panel Safety Switches

On the ARSAW there are two yellow gated guards capable of being opened. One is on the lift and the other is on the de-stacker units. On both of the guards that can be opened, there is an electrical safety switch which acts as an emergency stop and should be treated as such. The entire ARSAW will shut down upon opening one of these guards.



WARNING

Guard Panel Safety Switches are not intended to disable equipment to provide protection for personnel in potentially hazardous contact with such equipment. For example, maintenance, jam clearing and/or other similar activities that require adherence to lockout procedures.

2.3.3.4 E-Stop Fault

An E-Stop Fault is caused when a wiring problem or a device failure is detected by the PLC. The conditions that will cause an E-Stop fault are:

- The local E-Stop relay is energized, but one or more E-Stop devices in the zone have been actuated.
- The local E-Stop relay is not energized and no E-Stop devices in the zone have been actuated.

2.3.3.5 Emergency Stop Zones

E-Stop Zone	E-Stop Devices	Interlocked with Cabinets	Area Affected	Restart at
(Zone 1)	CC122_PBLT_ES CC122CS1_PBLT_ES CC122CS2_PBLT_ES CC122CS4_PBLT_ES SB+100025_PC_ES1 SB+100025_PC_ES2	No Interlocks	Entire ARSAW	CC+123



WARNING

EMERGENCY STOP devices are not intended to disable equipment to provide protection for personnel in potentially hazardous contact with such equipment. For example, maintenance, jam clearing and/or other similar activities that require adherence to lockout procedures.



CAUTION

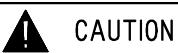
EMERGENCY STOP devices should be used only in the event of an actual emergency. Normal stopping of the conveyors should be done by using the appropriate STOP pushbutton.

2.3.4 Jam Detection

Jams are detected using the Jam Photoeyes and Package Present Photoeyes.

If the photoeye is continuously blocked for a period of time then the conveyor is considered jammed.

When a jam is detected, the conveyor on which the jam occurred and any non-accumulating conveyors upstream will stop. The associated jam beacon will flash and the JAM RESET pushbutton on the control cabinet will illuminate.



CAUTION

After clearing a jam/fault, remember to inspect the area in and around the lift and de-stacker to ensure there are no obstructions that would impair equipment movement upon restart.

After the jam has been physically cleared, it can be reset by pressing one of the following:

- The associated local JAM RESET pushbutton.
- The JAM RESET pushbutton on the control cabinet.

When the jam has been reset, the amber beacon will extinguish. The warning horn (SB+100025_AH) will sound for 5 seconds. When the horn silences the stopped conveyors will restart.

Jam conditions will be annunciated on Visualization.



WARNING

Conveyors will start and stop without warning in flow control situations.

2.4 Control Cabinet

The following operators are located on the door of the control cabinet.

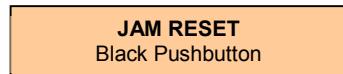
MOTOR FAULT RESET Red Illuminated Pushbutton	JAM RESET Amber Illuminated Pushbutton	LOW AIR PRESSURE Blue Pilot Light	DE-STACKER RESET Amber Illuminated Pushbutton
Illuminates when any motor controlled by this cabinet has a fault condition. The conveyor with the motor fault and all upstream conveyors will stop. After the cause of the fault has been corrected, press this pushbutton to restart the conveyors. The light will extinguish.	Illuminates when there is a jam on any conveyor controlled by this cabinet. The conveyor with the jam and all upstream conveyors will stop. After the jam is cleared press this pushbutton to reset the jam and restart the conveyors. The light will extinguish.	Illuminates when the air pressure for the system associated with this control cabinet has dropped below the minimum requirement. All associated conveyors will stop. When the air pressure has returned to an acceptable level, the light will flash. Pressing the START pushbutton will extinguish the light and restart the conveyors.	Illuminates when there is a fault in the de-stacker unit. A fault of this type will stop the de-stacker unit. After the cause of the fault has been corrected, press this pushbutton to reset the de-stacker unit. The De-stacker will need then to be homed by pressing the button again. The light will extinguish. Pressing the De-stacker reset button (when station not started) will start the homing sequence for the De-stacker.
POWER ON White Pilot Light	POWER ON ACTIVE WHEN FLASHING	MOTOR FAULT RESET	JAM RESET
Illuminates when power is supplied to this cabinet.			
E-STOP ACTUATED Red Pilot Light	E-STOP ACTUATED	START	LOW AIR PRESSURE
Illuminates when any EMERGENCY STOP device associated with the control cabinet has been actuated. Flashes at 1/2 second intervals to indicate an E-Stop/safety relay fault.			
EMERGENCY-STOP Red Illuminated Push-Pull Button	EMERGENCY STOP PUSH TO STOP PULL TO RESET	STOP	Active When Flashing Green Pilot Light
Pressing this pushbutton immediately shuts down all conveyors controlled by this cabinet and illuminates the pushbutton, the E-STOP ACTUATED pilot light. To reset, pull the button out to its normal position. All associated lights will extinguish.			Flashes when PLC is ready for operation after the cabinet has been powered up.
JOG LIFT Keyed Switch	STOP Red Extended Pushbutton	LIFT RESET Amber Illuminated Pushbutton	START Green Illuminated Pushbutton
Used to manually run the lift at low speed for maintenance purposes	Pressing this pushbutton will stop all conveyors controlled by this cabinet. The START pushbutton light will extinguish. The lift and de-stacker will complete any movements that were already in progress before coming to a stop.	Illuminates when there is a fault in the lift unit. Flashes for an over-travel fault in the lift unit. The lift has to be jogged off of the over travel limit switch in order to reset an over travel fault using this button Pressing the lift reset button for 5 seconds (when station not started) will start the homing sequence for the lift.	Pressing this pushbutton will initiate the start sequence for all conveyors controlled by this cabinet. The START pushbutton remains illuminated while the conveyors are running. Flashes at 1/2 second intervals when the KSAW has stopped due to energy management Flashes rapidly at 0.128 second intervals when the lift and/or de-stacker are not started. Pressing this pushbutton will also start the attached trunkline conveyor (if not already started).

2.5 Control Stations

In addition to the operators on the control cabinet door, control stations are located on the ARSAW for local operator control.

2.5.1 Jam Reset Control Station

Control Station 3CS+122 is located where the ARSAW outbound conveyor merges with the RSP trunk line and contains the following operator.



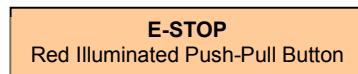
Pressing this pushbutton will reset the jam condition at the ARSAW trunk line merge once the jam photoeye (TRUNK_PE_J) has been cleared. The stopped conveyors will restart.

The Jam beacon (TRUNK_BC_J) will be extinguished.



2.5.2 E-Stop Control Stations

Control Stations 1CS+122 and 2CS+122 are located, one on either side of the ARSAW for access by the associates. Control Station 4CS+122 is located on the stacked tote infeed fencing on a vertical support. These Control Stations contain the following operator.



Pressing this pushbutton immediately shuts down all conveyors controlled by this cabinet and illuminates the pushbutton, the E-STOP ACTUATED pilot light and the E-Stop Beacon.

To reset, pull the button out to its normal position. E-STOP ACTUATED pilot light and the E-Stop Beacon (U100020_BC_ES) will extinguish.



2.6 Beacons and Alarm Horn

In addition to the indicators located on the door of the control cabinet, there are beacons and an alarm horn mounted on the full tote outbound of the ARSAW (SB+100025) for indication of conveyor faults and status.

2.6.1 Jam Indicator

An amber beacon (SB+100025_BC_J) is used to indicate a jam condition within the associated ARSAW. Another amber beacon (TRUNK_BC_J) is used to indicate a jam condition at the trunk line merge.

JAM INDICATOR
Amber Strobe Beacon

Flashes to indicate a jam in the associated ARSAW.

Press the JAM RESET pushbutton on the cabinet door to reset the jam and restart the conveyors. The beacon will stop flashing.



2.6.2 E-Stop Indicator

A flashing red beacon indicates an E-Stop condition.

E-STOP INDICATOR
Red Strobe Beacon

Flashes when any E-Stop device in the associated ARSAW is actuated.

When the E-Stop device is reset, the beacon will stop flashing.



2.6.3 Totes Needed Status Indicator

A blue beacon (SB+100025_BCS) is used to indicate that the stacked tote infeed line is empty or near empty and requires more totes. In addition it is used to indicate when the infeed gate is open.

**Totes Needed
Blue Beacon**

Flashes when ARSAW's stacked tote infeed line is empty (not including de-stacker).

Illuminates when the ARSAW's stacked tote infeed line has only one stack of totes remaining (not including the de-stacker).

Flashes rapidly at half second intervals when the ARSAW's tote infeed line gate is opened. This condition will extinguish when the gate is closed and the gate start pushbutton has been pressed.



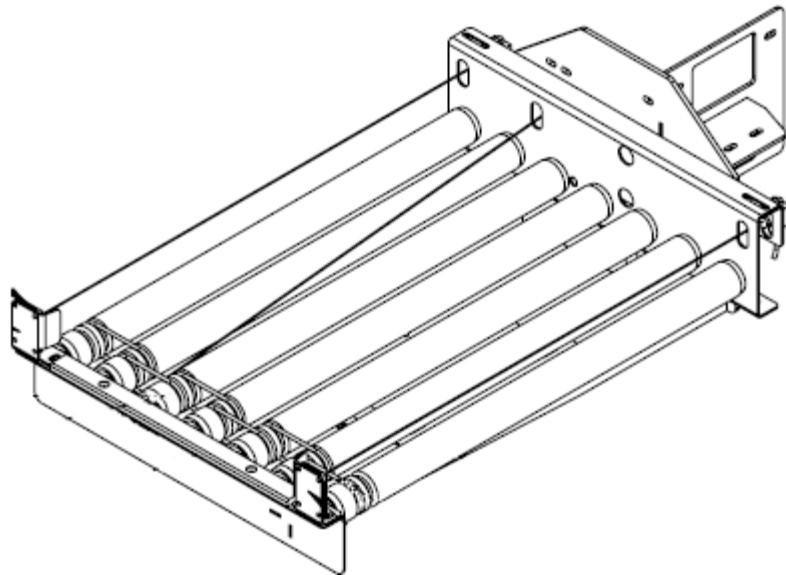
2.6.4 Alarm Horn

There is an alarm horn (SB+100025_AH) on the same stack as the beacons. The alarm horn will sound for five seconds prior to any movement within the ARSAW.

2.7 ARSAW Conveyors

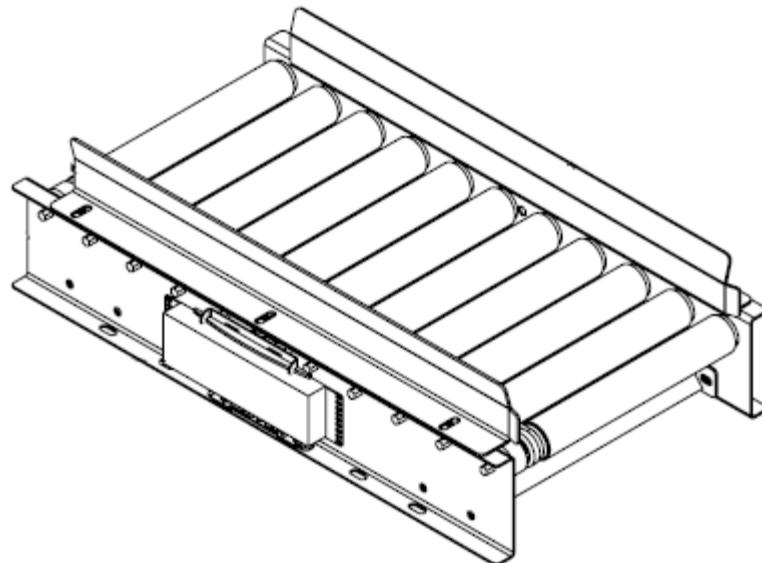
- For the **MDR Lift Conveyor**, reference the *MCS 8100 Series Service Manual* and the *MCS Dual Motor Controller Service Manual*.

Figure 6 MDR Lift Conveyor



- For the **MDR Tote De-stacker Infeed Conveyor**, reference the *MCS 8100 Series Service Manual* and the *MCS Dual Motor Controller Service Manual*.

Figure 7 MDR Tote De-stacker Infeed Conveyor



- For the **Tote Stack Infeed Conveyor**, reference the *MCS 8100 Series Service Manual* and the *MCS Dual Motor Controller Service Manual*.
- For the **Empty Tote Infeed Conveyor**, reference the *MCS 8100 Series Service Manual* and the *MCS Dual Motor Controller Service Manual*.
- For the **Velocity Transfer**, reference the *MCS Model 8100 Series ODR Conveyor Service Manual*.
- For the **Empty Tote Infeed Right Angle Transfer**, reference the *MCS Model 2467 RAT Service Manual* and the *MCS Dual Motor Controller Service Manual*. RAT are still used on gen 1, 2, and 2.1. For GEN3 ARSAW the RAT is replaced with a velocity transfer (perpendicular 8100 ODR bed).
- For the **Full Tote Infeed Conveyor** to the lift, reference the *MCS 8100 Series Service Manual*, and the *MCS Dual Motor Controller Service Manual*.
- For the **Full Tote Outfeed Conveyor** from the lift, reference the *MCS 8100 Series Service Manual*, the *MCS 8300 Series Service Manual*, and the *MCS Dual Motor Controller Service Manual*.

2.8 Recommended Spare Parts

The recommended spare parts list (RSPL) for the ARSAW is contained in the *System Operation and Maintenance (O&M) Manual*.

3 ARSAW Operation

3.1 System Start and Stop

3.1.1 Requirements for Operation

In order to start the ARSAW, both the main disconnect switch operated by a handle through the door of the cabinet and the main disconnect switch operated by a lever on the side of the cabinet must be in the ON position and all E-Stops must be reset. Once the cabinet has been powered up, the “Active When Flashing” indicator, on the cabinet door, will flash to indicate when the PLC is ready for operation.

3.1.1.1 Homing

After the initial installation and anytime the motor and/or gearbox is removed or replaced, the homing sequence will have to be performed. This will allow the lift to recalibrate its positioning system.

Pressing the LIFT RESET button for 5 seconds (when station is not started) will start the homing sequence for the lift. The horn will also sound for five seconds before the lift starts moving. The lift must be above both lower limit switches to be homed. If the lift is tripping either of the lower limit switches the jog selector switch can be used to raise the lift.

In the event of a fault in the de-stacker, the de-stacker also needs to be homed after the fault is identified and cleared. Pressing and holding the de-stacker reset button (when station not started) will start the homing sequence for the de-stacker (make sure the de-stacker is all the way down before releasing the button).

3.1.2 ARSAW Station Start Procedure

The entire ARSAW can be started by pressing the start button on the control cabinet assuming the requirements for operation have been met. When this start button is pressed, the alarm horn (SB+100025_AH) will sound for 5 seconds. After the horn silences, all conveyors will start. While the horn is sounding and while any part of the station is running, the green start pushbuttons on the cabinet will be illuminated. Pressing the start PB on the ARSAW will also start the trunk line if it is not already running.

3.1.3 ARSAW Station Stop Procedure

The entire system can be stopped by pressing the stop button on the control cabinet. When this stop button is pressed, all conveyors will stop and the illuminated start pushbutton will be extinguished only after the lift and de-stacker have completed any motion that was in progress.

3.2 Product Flow and Operation

3.2.1 De-stacker and Multi-level Lift (OR+100030)

Up to four stacks of a maximum 12 empty totes are conveyed into the de-stacking unit via the stacked tote infeed line (OR+100020). Each empty stack loaded will make contact with a case stop. This is to prevent the operator loading totes from pushing the stack of totes into the de-stacker. Once the case stop zone photoeye has been blocked for one second, the case stop will drop down and allow that single stack of empty totes through.

The de-stacker unit then lifts the top of the stack while it simultaneously holds the bottom tote to be fed to the lift. The singulated empty tote will then be transported to the tote lift. Once the lift retrieves the empty tote, it will eject it onto the empty tote infeed conveyor (OR+100005). After the singulated empty tote has been transported to the lift, the de-stacker unit will lower the stack of empty totes to the conveyor and repeat the empty tote singulating process.

Full totes will be held just before the lift for retrieval in normal accumulation fashion on the full tote outfeed lane (OR+100015 and SB+100015). The lift will retrieve a full tote and eject it onto the second part of the full tote outfeed conveyor (SB+100025) where it will wait in normal accumulation fashion for a release signal from the connected conveyor.

3.2.2 Put Lanes

Empty totes convey from the lift unit to a Velocity Transfer unit which diverts in keep full fashion to a pair of opposing lanes. Once an empty tote is fed into the keep full line, the operator can manually retrieve the empty tote and place it into a vacant put position.

Amazon software marries tote to lane moves, executes picks via terminal, puts via Amazon supplied put lights, and instructs the operator to discharge the tote when complete.

A tote considered full by Amazon software is manually pushed down gravity conveyor where it is held by a case stop before going to the full tote outfeed lane (OR+100015 and SB+100015) when the PLC sends the signal to merge.

3.2.3 Full Tote Infeed to Lift

Upon receiving notice from Amazon software to discharge a tote, a manual push is required to move the tote to the full tote infeed lane. Sensors looking for interferences on the full tote infeed to lift (OR+100015 and SB+100015) will determine if the case stop is actuated in the merge lane. An actuated case stop will not allow that merge lane's product to leave until the interferences are clear. The PLC program will release all lanes on one side of the ARSAW at a time and wait for the lift to output them to the appropriate level to be ejected to the RSP Trunk Line.

3.2.4 RSP Trunk Line Merge

After the lift ejects the full tote onto the full tote accumulation conveyor (SB+100025), the totes will release as possible based on gaps between totes upstream on the RSP Trunk Line. If the totes are unable to release immediately, they will be held in normal accumulation fashion until a gap is detected on the RSP trunk line.

3.2.5 Energy Management

Photoeyes are used to detect the presence (or absence) of totes or cartons on the conveyor system. Energy Management uses these sensors to determine whether or not there is activity on the conveyors. A lack of activity is defined as no product blocking any of the photoeyes.

If a lack of activity is detected for a pre-determined amount of time (default is 30 minutes), the area in question will shut down. The appropriate START pushbuttons will flash to indicate the Energy Management condition. The conveyor can be restarted using ARSAW startup procedures.

The Energy Management condition(s) will be displayed on System Manager.

4 Operator Procedures

4.1 Starting the ARSAW

To start the operation of an ARSAW:

1. Press the green START button on the control cabinet.

INFO Assuming the requirements of operation have been met the alarm horn will sound for 5 seconds. After the horn silences, all conveyors will start. While the horn is sounding and while any part of the station is running, the green Start pushbutton on the cabinet will be illuminated.

4.2 Loading Empty Tote Stacks

If the Blue Beacon is flashing, the ARSAW requires additional empty tote stacks to avoid running out. To load empty tote stacks into the ARSAW:

1. Retrieve an empty stack of no more than 12 totes
2. Open the access gate; the de-stacker will stop.
3. Place the stack of empty totes squarely on the charge end of the tote stack infeed conveyor.
4. After that tote stack is conveyed downstream, continue to load tote stacks at on the charge end of the tote stack infeed conveyor until the line is full. If the tote de-stacker and the line are completely empty, a total of 5 tote stacks can be loaded onto the tote stack infeed conveyor (1 in the de-stacker, 2 downstream of the case stop, and 2 upstream of the case stop).
5. When the infeed line is full, close the gate and press the start pushbutton at the gate, and the de-stacker will restart.



CAUTION

Empty tote stacks must be placed squarely on the tote stack infeed conveyor to avoid an empty tote jam.



CAUTION

Assuming there are totes in the tote de-stacker, DO NOT try to place more than 4 stacks of empty totes on the tote stack infeed conveyor. Doing so will likely result in a jam on the tote stack infeed conveyor.

4.3 Loading Empty Totes into Put Positions

To load an empty tote into a vacant put position:

1. Manually remove the empty tote in accumulation position 1 (see Figure 3).
2. Place the empty tote into a vacant put position on either the upper or lower tier.

4.4 Pick/Put Operations

Follow the pick instructions supplied via the terminal and place the picked product into the appropriate tote in the put positions as directed by the put lights.

When pick/put operations are complete for a given tote the system will indicate the tote is complete and maybe removed (see section 4.5).

4.5 Removing a Full Tote from a Put Position

To remove a full tote from a put position:

1. For upper tier full totes, manually remove the full tote from the put position and place it in the Upper Tier Outbound Lane (see Figure 3) and push it towards the full tote outfeed conveyor.
2. For lower tier full totes, manually push the full tote from the put position towards the full tote infeed conveyor. Note that the tote will be automatically stopped by a case stop to avoid collisions with other full totes. When the conveyor is clear, the case stop will be lowered and the full tote will convey onto the full tote infeed conveyor.



CAUTION

To avoid jams DO NOT push more than one tote at a time towards the full tote infeed conveyor. Make sure the tote has been fully conveyed onto the full tote infeed conveyor before pushing another tote towards the infeed conveyor.

4.6 Clearing a Jam

If the Amber Beacon SB+100025_BC_J is flashing, there is a jam in the ARSAW. To clear the jam and restart the ARSAW:

1. Determine the location and cause of the jam.
2. Verify that it is safe to clear the jam (see section 1.2.4).
3. Clear the jam. If necessary, contact the appropriate personnel to de-energize the de-stacker (see section 5.4.2).



CAUTION

After clearing a jam/fault, remember to inspect the area in and around the lift and de-stacker to ensure there are no obstructions that would impair equipment movement upon restart.

4. After the jam has been physically cleared, reset the ARSAW by pressing one of the following:
 - The associated local JAM RESET pushbutton.
 - The JAM RESET pushbutton on the control cabinet.

INFO When the jam has been reset, the Amber Beacon will extinguish. The warning horn will sound for 5 seconds. When the horn silences the stopped conveyors will restart.

INFO There is also an Amber Beacon TRUNK_BC_J that flashes to indicate a jam condition at the trunk line merge.

4.7 Activating an E-Stop



WARNING

EMERGENCY STOP devices are not intended to disable equipment to provide protection for personnel in potentially hazardous contact with such equipment. For example, maintenance, jam clearing and/or other similar activities that require adherence to lockout procedures.



CAUTION

EMERGENCY STOP devices should be used only in the event of an actual emergency. Normal stopping of the conveyors should be done by using the appropriate STOP pushbutton.

In the event of an actual emergency:

1. Press the nearest EMERGENCY-STOP push/pull buttons or pull on the nearest Emergency-Stop pull-cord.

INFO When an E-Stop is actuated, the green START light will extinguish and all conveyors, controlled by the control cabinet, will stop.

2. Immediately notify the appropriate personnel that an E-Stop has been actuated.

4.8 Stopping the ARSAW

To stop the operation of an ARSAW:

1. Press the red STOP button on the control cabinet.

INFO When this stop button is pressed, all conveyors will stop and the illuminated green START pushbutton will be extinguished.

5 Maintenance

5.1 General Safety and Maintenance



WARNING

Do not perform adjustments, maintenance or other work on this equipment without following OSHA Lock-Out/Tag-Out requirements and state and local requirements. The purpose of this procedure is to protect all persons involved against unexpected restart. Personnel should be alerted to the hazard of stored energy which may exist after the power source is locked out. Refer to ANSI Z244.1 and OSHA 29 CFR 1910.147 for minimum requirements. Failure to follow these requirements may result in equipment damage, serious injury, or death.

Proper maintenance of this unit will ensure proper operation and promote operating personnel safety.

INFO See individual manufacturer's product literature for more information.



WARNING

Refer to and be familiar with all of the proper safety precautions and procedures outlined in the safety section of this manual before performing maintenance. Only properly trained and authorized personnel are to perform maintenance on this equipment.



WARNING

Climbing, sitting, walking, or riding on equipment at any time may result in serious injury or death.

1. Replace broken or worn parts as soon as they are detected.
2. Safety guards must be properly attached to the unit before and while operating the equipment. Do not operate equipment with missing guards.
3. Keep all **CAUTION**, **WARNING**, and **DANGER** safety labels clean and in plain sight. Replace all missing or damaged safety labels.
4. Do not operate equipment with missing or inoperable safety devices. Immediately remove such equipment from service.

5.2 ARSAW Conveyors

INFO For maintenance information on the conveyors used in the ARSAW, refer to section 2.7.

5.3 Periodic Maintenance Schedule

The following schedule contains the periodic inspections and services required to keep this equipment in top operating condition and minimize breakdowns. The schedule groups inspections and services by component and gives the frequency at which each inspection/service should occur.

You can adjust inspection and service frequencies as required based on any of the following conditions: speed, load, hours of operation (continuous versus intermittent), surrounding temperatures, humidity, etc. It is recommended that preventive maintenance be performed at shorter intervals in extreme environmental conditions and when operating hours increase.

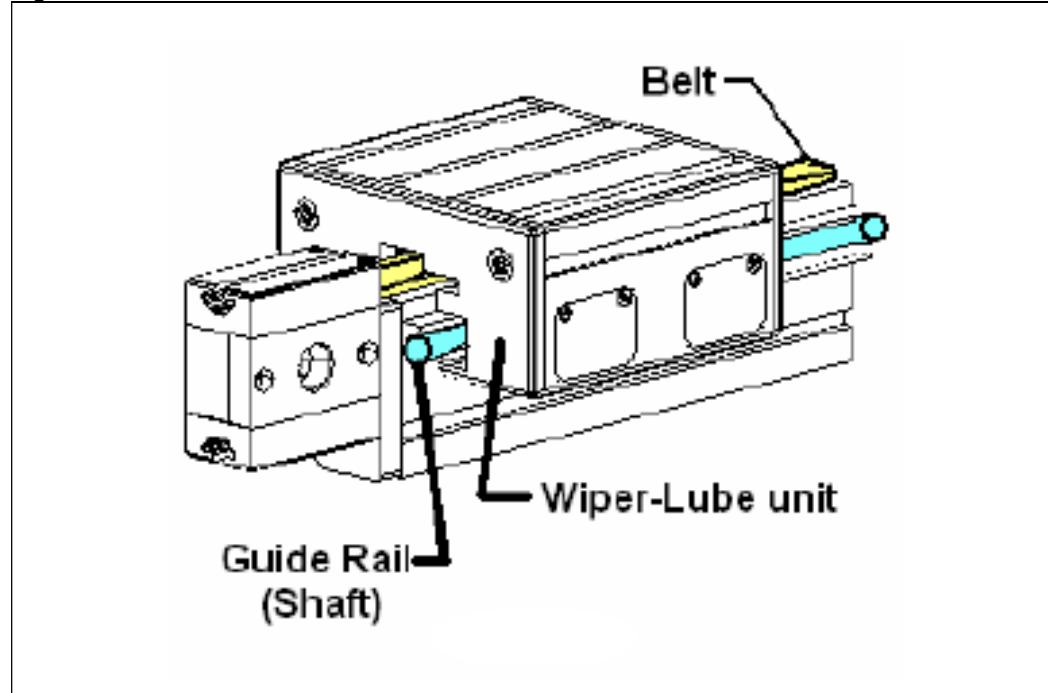
Figure 8 ARSAW Periodic Maintenance Schedule

Component	Suggested Action	Weekly	Monthly	Quarterly
All	Clean			
	Check for loose fasteners			
	Check for physical damage			
Motor	Check for noise			
	Check mounting bolts			
Air Actuators	Check for noise			
	Check mounting bolts			
	Check airlines			
Gear Reducer	Check for noise			
	Check mounting bolts			
Structural	Check for loose fasteners			
	Check for physical damage			
Rollers	Check for noise			
	Check for wear			
Guide Rollers	Check for noise			
	Check mounting bolts			
UHMW Guides	Check for wear			
	Check for loose fasteners			
Pneumatic System	Check for leaks			
Belts	Check for physical damage			

5.3.1 Belt Driven Linear Actuator Scheduled Maintenance

1. Periodic Inspection – Monthly or as required by frequency of actuator cycle time.
 - a. Inspect Guide Rails for rust or uneven wear.
 - b. Felt Pad in Wiper –Lube Unit are moist with #2 Way Oil, or synthetic food grade lubricant for stainless applications.
 - c. Insect belt for uneven wear.
2. Replacement of Wiper-Lube units is recommended every 6 months or after 2000 hours of operation – as required by frequency of actuator cycle time.

Figure 9 Belt Driven Linear Actuator Scheduled Maintenance



5.4 Maintenance Procedures

5.4.1 Tote De-stacker/Lift Fault Recovery

1. Determine if a tote jam is causing the fault
 - a. If YES, see section 5.4.2.
2. Press the appropriate CC+122 fault pushbutton to reset the fault.
3. Return the ARSAW to operation.

5.4.2 De-energize and Clear the Tote De-stacker

5.4.2.1 Air Solenoid Block Details

For maintenance, repair, or clearing of tote jams it may be necessary to de-energize the tote de-stacker by removing air pressure from the cylinders.

The air solenoid block (see Figure 10) can be used to actuate the three different types of air cylinders used in the tote de-stacker (see Figure 11). To actuate the solenoids a small punch can be used to press the button (buttons are in small holes where the arrows are pointing in Figure 10), hold down until the air cylinder is at the desired position.

Figure 10 Air Solenoid Block for De-stacker

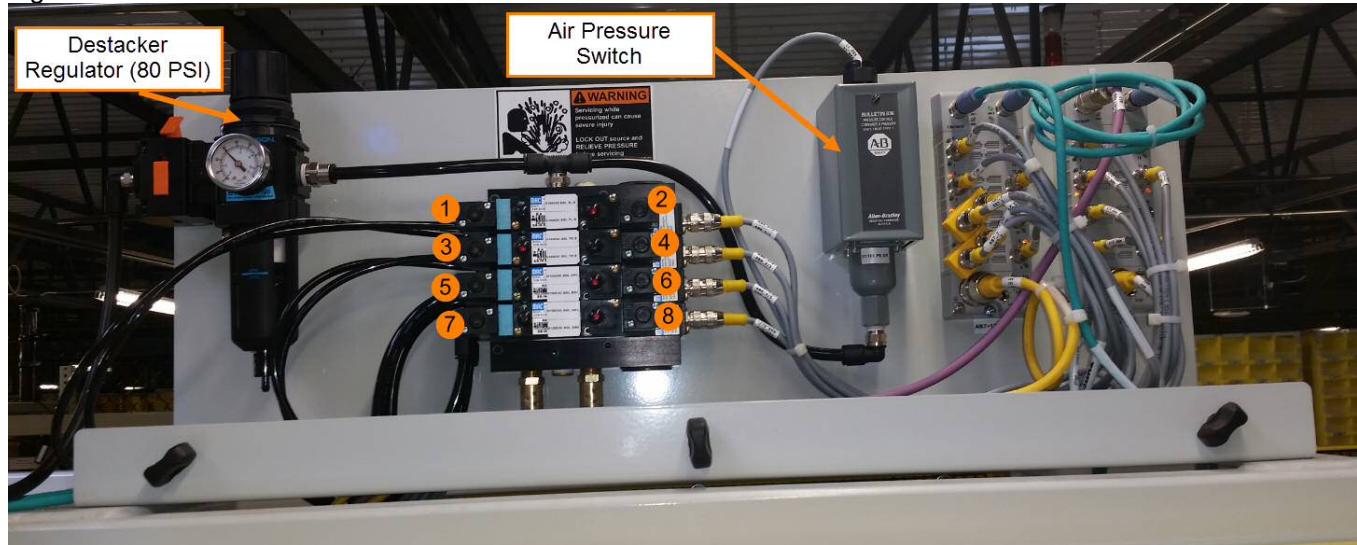


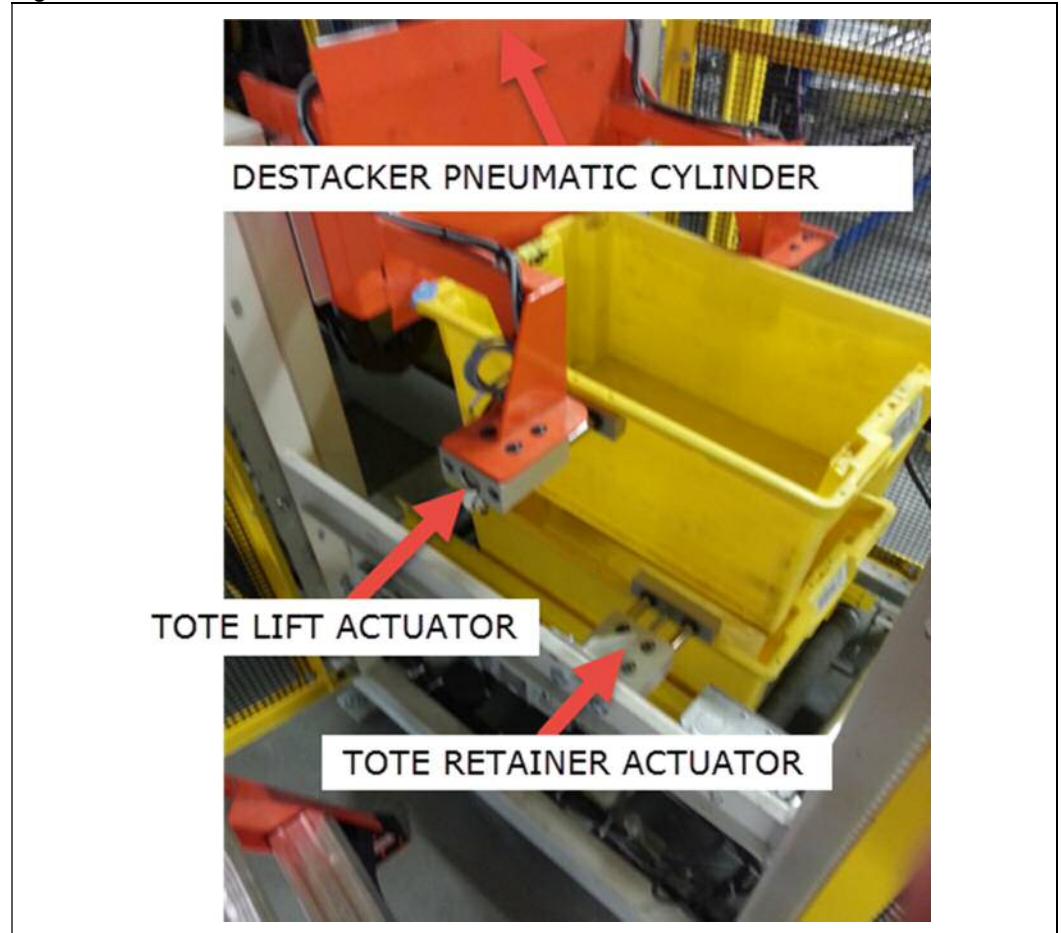
Table 1 Figure 10 Items

Item	Air Solenoid Block Button Description
1	Tote Lift In
2	Tote Lift Out
3	Tote Retainer In
4	Tote Retainer Out
5	De-stacker Pneumatic Cylinder Down (this is a two stage cylinder)
6	De-stacker Pneumatic Cylinder Up (this is a two stage cylinder)
7	De-stacker Pneumatic Cylinder Down (this is a two stage cylinder)
8	De-stacker Pneumatic Cylinder Up (this is a two stage cylinder)

5.4.2.2 De-energize and Clear Procedure

If the tote de-stacker faults out in a raised position as shown in Figure 11, use the following procedure to de-energize and clear the de-stacker.

Figure 11 De-stacker in Raised Position



To de-energize and clear the tote de-stacker:

1. Press the CC+122 cabinet STOP pushbutton.
2. De-energize and Lock Out/Tag Out the cabinet using the external disconnect switch.
3. De-energize and Lock Out/Tag Out the de-stacker air pressure regulator.

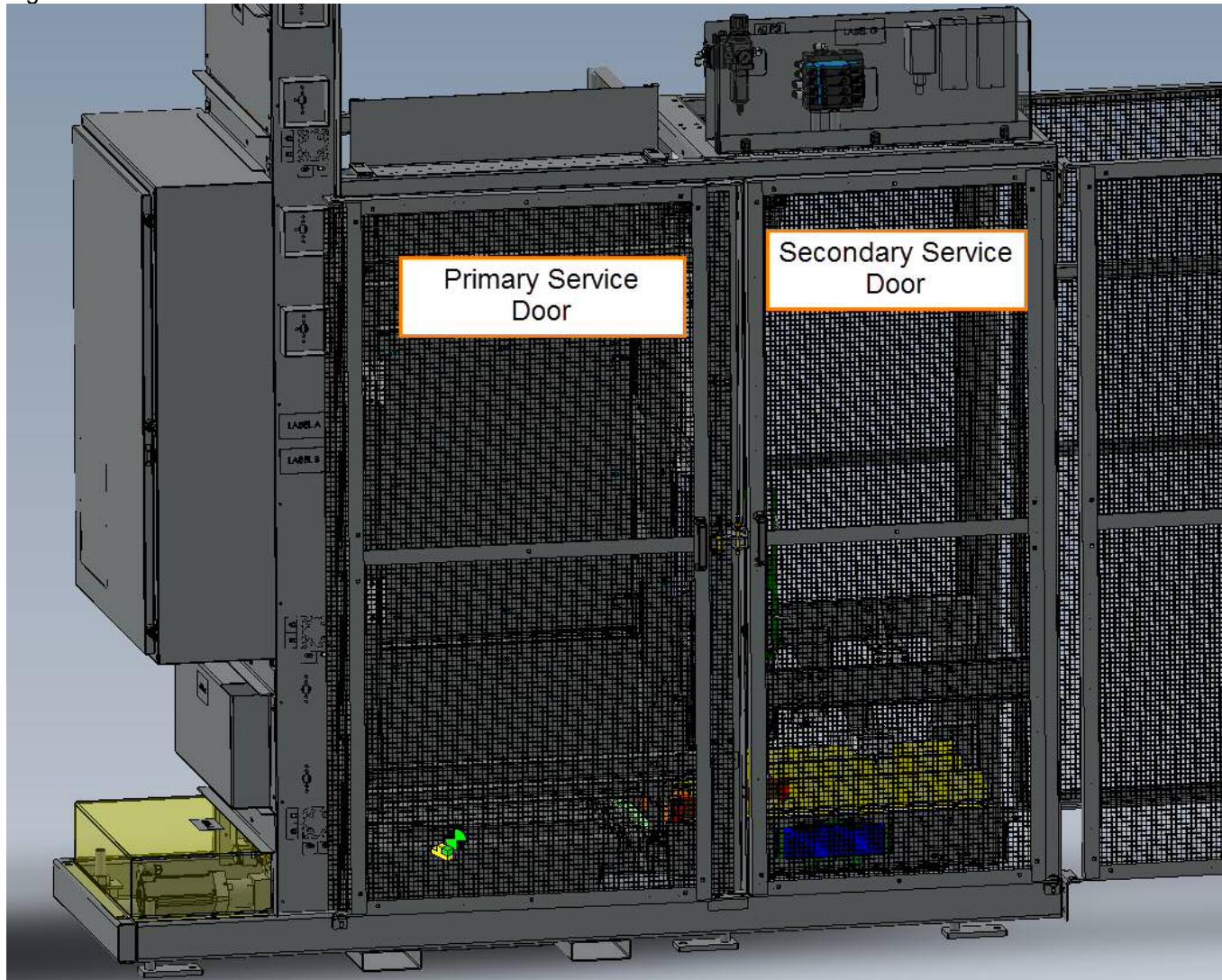


WARNING

You **MUST** turn off and lock out/ tag out the appropriate PDP or power disconnect point BEFORE continuing. Make sure all forms of energy are isolated.

4. Open the secondary service door.

Figure 12 Service Doors



5. Remove the yellow guard covering the air regulator, solenoid block, and pressure switch.

Figure 13 Air Components



6. Actuate the "Tote Retainer In" (Button 3) until both Tote Retainer cylinders are fully retracted
7. Remove the tote and anything under De-stacker
8. Actuate the "De-stacker Pneumatic Cylinder Down" (Buttons 5 and 7) until the remaining tote stack is resting on the conveyor below.
9. Actuate the "Tote lift In" (Button 1) until they are both fully retracted.
10. Remove remaining totes in de-stacker.
11. Install the yellow guard covering the air regulator, solenoid block, and pressure switch.
12. Close and secure the secondary service door.
13. Remove the Lock Out/Tag Out on the de-stacker air pressure regulator and energize the regulator.
14. Remove the Lock Out/Tag Out on the cabinet using and re-energize using the external disconnect switch.
15. The system will take approximately 30 seconds to come back online, afterwards clear any Jam or Fault indications.
16. Return the ARSAW to operation.

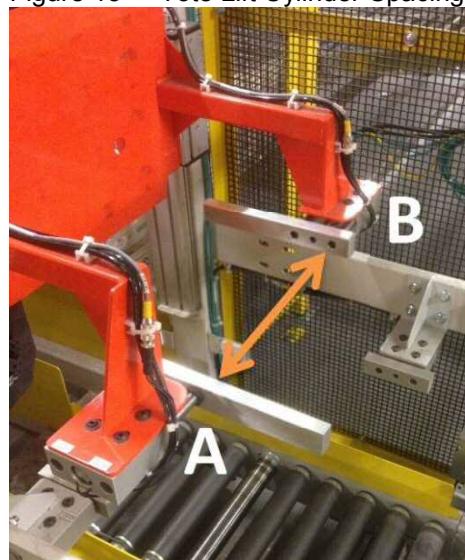
5.4.3 ARSAW De-stacker Tote Lift Cylinder Adjustment

1. Set 4 totes on the Empty Tote Infeed line (Unit 100020).
2. Let the Tote Retainer and Tote Lift cylinders extended and raise the tote stack up.
3. Stop ARSAW, by opening the Secondary Service door.
4. Then with the Tote Lifter cylinders extended, loosen the 4 mounting screws on each cylinder (Figure 14) and adjust the distance between the face plates (face plates may look different on each generation) of the extended cylinders to 14-1/4" (see Figure 15).

Figure 14 Tote Lift Cylinder Screws



Figure 15 Tote Lift Cylinder Spacing



5. Tighten the 8 screws (4 on each cylinder) and close the door.
6. Verify 1/8" gap on each side of the tote (Figure 16).

Figure 16 Tote Lift Cylinder Gap



5.4.4 Amazon Robotics Semi-Automated Workstations (ARSAW) De-stacker Flow

Setting the De-stacker Cylinder Speed/Flow Adjustment:

The de-stacker has 4 air lines that go to the main de-stacker cylinder (see Figure 17). Where they connect to the cylinder they have 90 degree fittings. These fittings have either a knob or a screw that controls the air flow.

To adjust the speed of the de-stacker, you will need to turn these screws or knobs all the way in (clockwise). Then back them out. Start with 8 full turns out (counterclockwise). At this point I would test the detached with running some totes in it. The cylinder needs to complete the stroke from position 2 (picks up totes) to position 3 (tote stack all the way up, cylinder all the way retracted). If it seems too slow or it faults out you will need to back the screws or knobs out more. If it is too fast turn the screw or knobs in.

Remember there are 4 flow control valves and they all need to be adjusted the exact same.

Figure 17 De-stacker Cylinder



6 Troubleshooting

The following troubleshooting tables are provided to assist you in diagnosing and resolving symptoms that might occur during the normal operation of this conveyor system.

INFO See individual manufacturer's product literature for more information.

To use a troubleshooting table:

1. Identify the symptom in the left most column in the table.
2. Identify the most likely possible cause in the center column.
3. Apply the solution outlined in the far right column.

6.1 ARSAW Conveyors

INFO For troubleshooting information on the conveyors used in the ARSAW, refer to section 2.7.

6.2 Lift Fault Troubleshooting

INFO The following faults are listed on the ARSAW STATUS visualization screen.

Table 2 Lift Fault Troubleshooting

Symptom	Description
Physical Axis Fault	If the Physical Axis Fault bit is set, it indicates that one or more fault conditions have been reported by the physical axis. The specific fault conditions can then be determined through access to the axis data type specific fault attributes of the associated physical axis. For Servo axis data types, Physical Axis Faults map to the Servo Faults attribute. For Servo Drive axis data types Physical Axis Faults map to the Drive Faults attribute. For CIP Drive axis data types Physical Axis Faults map to the standard CIP Axis Faults attribute or manufacturer specific CIP Axis Faults – Rockwell Automation, and CIP Axis Fault – Mfg attributes.
Module Fault	The Module Fault bit attribute is set when one or more faults have occurred related to the 1756-EnxT module associated with the selected axis. The specific fault conditions can then be determined through access to the Module Fault Attribute of the associated axis. Usually a module fault affects all axes associated with the 1756-EnxT module. A module fault generally results in the shutdown of all associated axes. Reconfiguration of the 1756-Enxt module is required to recover from a module fault condition.

Table 2 Lift Fault Troubleshooting

Symptom	Description	
Group Fault	The Group Fault bit attribute is set when one or more faults have occurred related to the motion group associated with the selected axis. The specific fault conditions can then be determined through access to the Group Fault attribute of the associated motion group. Usually a group fault affects all axes associated with the motion group. A group fault generally results in the shutdown of all associated axes. Reconfiguration of the entire motion subsystem is required to recover from a group fault condition	
Guard Fault	If the Guard Fault bit is set, it indicates that one or more fault conditions have occurred related to the Guard Motion Safety function. The specific Fault conditions can then be determined through access to the Guard Motion attribute of the associated axis. Guard Faults are only applicable if the drive device is equipped with Guard Safety functionality.	
Initialization Fault	The Initialization Fault bit is set when initialization of the CIP Motion drive fails for any reason. Specific information concerning the Initialization Fault may be found in the standard CIP Initialization attribute or manufacturer specific CIP Initialization Fault – Rockwell Automation, and CIP Initialization Fault – Mfg attributes associated with the CIP Drive axis data types.	
Symptom	Possible Cause	Solution
APR Fault	This fault means the Absolute Position Reference (APR) has been lost.	<ol style="list-style-type: none"> “Home” the servo drive.
Empty Tote Not Clear Fault	The lift was discharging an empty tote onto the upper empty tote conveyor (U100005). The tote did not pass the Lift Package Present Photo #3 (U100030_PE_P3) in less than the expected amount of time.	<ol style="list-style-type: none"> Clear the photoeye by either removing the tote or moving it on to U100005. (Do not push the tote back onto the lift.). Press the Jam Reset pushbutton on the control cabinet to reset the jam.
Empty Tote Entry Jam	The tote did not pass from the de-stacker all the way onto the lift, or something blocked the U100030_PE_C photoeye when it was not expected (not transferring a tote at the time).	<ol style="list-style-type: none"> Clear the photoeye by removing the tote. Press the Jam Reset pushbutton on the control cabinet to reset the jam.
Full Tote OH Jam	A tote exceeding the maximum allowable height (approx. 16") was detected at the discharge end of zone 3 of U100015.	<ol style="list-style-type: none"> Remove the tote from U100015. Do not push it into the lift and do not put it back onto the system without correcting the over-height condition. Then press the Jam Reset pushbutton on the control cabinet to reset the jam.
Full Tote Entry Jam	A full tote was entering the lift. The tote did not pass the Lift Package Present Photo #3 (U100030_PE_P3) in less than the expected amount of time.	<ol style="list-style-type: none"> Clear the photoeye by either removing the tote. (Do not push the tote onto the lift.). Press the Jam Reset pushbutton on the control cabinet to reset the jam.
Full Tote Not Clear Jam	The lift was discharging a full tote onto the upper full tote conveyor (U100025). The tote did not pass the U100030_PE_P4 photoeye in less than the expected amount of time.	<ol style="list-style-type: none"> Clear the photoeye by either removing the tote or moving it on to U100025. (Do not push the tote back onto the lift.) Press the Jam Reset pushbutton on the cabinet to reset the jam.

Table 2 Lift Fault Troubleshooting

Symptom	Description	
Lift Not Clear Jam	Caused when one of the following photoeyes has jammed: <ul style="list-style-type: none">• Lift Clear Photo (U100030_PE_C)• Lift Package Present Photo #3 (U100030_PE_P3)• Lift Package Present Photo #4 (U100030_PE_P4)• SB+100015 Over Height Photo (U100015_PE_OH)• SB+100015 Clear Photo U100015_PE_C	<ol style="list-style-type: none">1. Clear blocked photoeye.2. Reset jam condition using the Jam Reset pushbutton on the control cabinet door.3. Reset lift fault condition using the Lift Fault reset pushbutton on the control cabinet door.4. Start cabinet using the START pushbutton on the control cabinet door.

6.3 De-stacker Fault Troubleshooting

INFO The following faults are listed on the ARSAW STATUS visualization screen.

Table 3 De-stacker Fault Troubleshooting

Symptom	Possible Cause	Solution
Extend Lifters Fault	• Lift/Retainer Actuator Failure	1. Verify that the lift/retainer actuators are in the intended position. If they are, check the sensors. Adjust/replace sensors as necessary (see section 7.7).
Extend Retainers Fault	• Solenoid Failure	2. If the lift/retainer actuators are not in the intended position, manually fire the appropriate solenoid by pressing the test button on the solenoid (see section 5.4.2.1). If that does not work, check airlines and lift/retainer actuators. Adjust/replace as necessary (see section 7.3).
Move to Drop (Home) Position Fault	• Armorblock Failure	3. If manually firing the solenoids works, use the I/O Test Routine in the PLC to turn on the outputs to the solenoid(s) in question. Check the corresponding output light on the Armorblock and the indicator light on the solenoid. Replace the Armorblock, I/O Cable, or solenoid as necessary.
Move to Pick Position Fault	• Sensor Failure	
Move to Clear Position Fault		
Retract Lifters Fault		
Retract Retainers Fault		
Retainers Cylinder and/or Sensors Fault		
Lifters Cylinder and/or Sensors Fault		
Position Cylinder and/or Sensors Fault		

6.4 Status Indicators

INFO The following status indicators are listed on the ARSAW STATUS visualization screen.

6.4.1 De-stacker Position Status

Table 4 De-stacker Position Status

Status	Description
De-stacker at Drop (Home) Position	Indicates that the de-stacker is at the Drop (Home) Position.
De-stacker at Pick Position	Indicates that the de-stacker is at the Pick Position.
De-stacker at Clear Position	Indicates that the de-stacker is at the Clear Position.
De-stacker at Charge Enable	Indicates that the de-stacker is at the Charge Enable Position.

6.4.2 De-stacker I/O Status

Table 5 De-stacker I/O Status

Status	Description
De-stacker Pos 1 Prox	De-stacker is at position 1.
De-stacker Pos 2 Prox	De-stacker is at position 2.
De-stacker Pos 3 Prox	De-stacker is at position 3.
Tote Lifters Ret Prox 1	De-stacker tote lifter cylinder 1 is fully retracted.
Tote Lifters Ret Prox 2	De-stacker tote lifter cylinder 2 is fully retracted.
Tote Retainers Ret Prox 1	De-stacker tote retainer cylinder 1 is fully retracted.
Tote Retainers Ret Prox 2	De-stacker tote retainer cylinder 2 is fully retracted.
Tote Lifter Ext. Prox 1	De-stacker tote lifter cylinder 1 is fully extended.
Tote Lifter Ext. Prox 2	De-stacker tote lifter cylinder 2 is fully extended.
Tote Retainers Ext. Prox 1	De-stacker tote retainer cylinder 1 is fully extended.
Tote Retainers Ext. Prox 2	De-stacker tote retainer cylinder 2 is fully extended.
Lower De-stacker Sol 1	De-stacker lower solenoid 1 has been actuated.
Lower De-stacker Sol 2	De-stacker lower solenoid 2 has been actuated.
Raise De-stacker Sol 1	De-stacker raise solenoid 1 has been actuated.
Raise De-stacker Sol 2	De-stacker raise solenoid 2 has been actuated.
Extend Retainers Sol	De-stacker tote retainer extend solenoid has been actuated.
Extend Lifters Sol	De-stacker tote lifter extend solenoid has been actuated.
Retractor Retainers Sol	De-stacker tote retainer retract solenoid has been actuated.
Retractor Lifters Sol	De-stacker tote lifter retract solenoid has been actuated.

6.4.3 Lift Package Present Status

Table 6 Lift Package Present Status

Status	Description
Empty	No tote present on lift.
Occupied Empty Tote	Empty tote is present on the lift.
Occupied Full Tote	Full tote is present on the lift.
Occupied Unknown	An unknown tote is present on the lift

6.4.4 Lift Status

Table 7 Lift Status

Status	Description
Idle	Lift is at an idle state (no command given to move).
Load Empty Tote	Loading an empty tote.
Unload Empty Tote	Unloading an empty tote.
Load Full Tote	Loading a full tote.
Unload Full Tote	Unloading a full tote.
Move to Empty Tote Load	Move lift to load an empty tote.
Move to Full Tote Load	Move lift to unload an empty tote.
Move to Empty Tote Unload	Move lift to load a full tote.
Move to Full Tote Unload	Move lift to unload a full tote.
Initialize	Initialize lift.
Faulted	Lift faulted.
Inactive (Disabled)	Lift disabled.

6.4.5 Lift Position Status

Table 8 Lift Position Status

Status	Description
Unknown	Lift at unknown position.
At Empty Tote Load	Lift at empty tote load position.
At Full Tote Load	Lift at full tote load position.
At Empty Tote Unload	Lift at empty tote unload position.
At Full Tote Unload	Lift at full tote unload position.

6.4.6 Trunk Line Status

Table 9 Trunk Line Status

Status	Description
Trunk Line Running	Trunk line conveyor is running.
ARSAW OK to REL DWNSTRM	ARSAW is OK to release totes onto the trunk line.

6.4.7 De-stacker/Lift Photos Status

Table 10 De-stacker/Lift Photos Status

Status	Description
De-stacker to Lift Clear	Conveyance from de-stacker to lift is clear.
De-stacker to 1 st Tote Present	Tote present in the de-stacker.
De-stacker to 2 nd Tote Present	More than one tote present in de-stacker.
De-stacker Overheight	Tote stack too tall to enter de-stacker.
Lift Pack, Present #3	Tote is not centered on lift (overhanging towards trunk line).
Lift Pack, Present #4	Tote is present on lift.
Lift Pack, Present #5	Tote is not centered on lift (overhanging towards flow racks).
Full Tote Overheight	Full tote contents too tall to enter lift.
Full Tote Overhang	Full tote contents hanging out of tote.

6.4.8 Lift Overtravel Status

Table 11 Lift Overtravel Status

Status	Description
Upper Overtravel Limit	Lift has actuated the upper over travel limit switch.
Lower Overtravel Limit	Lift has actuated the lower over travel limit switch.

6.4.9 I/O Communication Status

Table 12 I/O Communication Status

Status	Description
Armor Block #1	Armor Block #1 is communicating with ARSAW PLC.
Armor Block #2	Armor Block #2 is communicating with ARSAW PLC
Armor Block #3	Armor Block #3 is communicating with ARSAW PLC.
Armor Block #4	Armor Block #4 is communicating with ARSAW PLC.
Armor Block #5	Armor Block #5 is communicating with ARSAW PLC.
Armor Block #6	Armor Block #6 is communicating with ARSAW PLC.
Armor Block #7	Armor Block #7 is communicating with ARSAW PLC.
Armor Block #8	Armor Block #8 is communicating with ARSAW PLC.
Armor Block #9	Armor Block #9 is communicating with ARSAW PLC.
Servo	ARSAW servo drive is communicating with ARSAW PLC.
Trunk Line PLC	Trunk line PLC is communicating with ARSAW PLC.

6.5 ARSAW Alarm Descriptions

See Table 13 for ARSAW System Manager Alarm Descriptions.

Table 13 ARSAW System Manager Alarms

Alarm Text	Description
CC122 ARSAWxyz LOW AIR PRESSURE	This alarm is caused when the air pressure drops below the minimum requirement.
CC122 ARSAWxyz AREA E-STOP FAULT	This alarm is caused when the E-Stop circuit and the E-Stop devices are not corresponding properly. For example, there is an E-Stop pushbutton input active but the E-Stop circuit did not trip. Used to help detect incorrect wiring of the E-Stop circuit
CC122 ARSAWxyz OVER VOLTAGE FAULT	This alarm is caused when 0180PDM senses 10% or more voltage than expected.
CC122 ARSAWxyz E-STOP PUSHBUTTON	This alarm is caused when the E-Stop pushbutton on the front of the control cabinet is activated.
CC122 ARSAWxyz UNDER VOLTAGE FAULT	This alarm is caused when 0180PDM senses 5% or less voltage than expected.
OR+ 100005 ARSAWxyz EMPTY TOTE OUTBOUND PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when photoeye U100005_DMC2_PE2 is blocked for too long.
OR+ 100005 ARSAWxyz EMPTY TOTE OUTBOUND MOTOR FAULT	This alarm is caused when there is a motor fault detected on one of the DMC's that control the MDR on unit OR+100005
RX+ 100010 ARSAWxyz RAT PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when photoeye U100010_PE_P is blocked for too long.
RX+ 100010 ARSAWxyz RAT TRANSFER MOTOR FAULT	This alarm is caused by a fault condition on the U100010_DMC1.
RX+ 100010 ARSAWxyz RAT TRANSPORT MOTOR FAULT	This alarm is caused by a fault condition on the U100010_DMC1.
OR+ 100015 ARSAWxyz FULL TOTE OVERHEIGHT JAM PHOTO BLOCKED	This alarm is caused when U100015_PE_OH is blocked.
OR+100015 ARSAWxyz FULL TOTE CLEAR PHOTO BLOCKED	This alarm is caused when U100015_PE_C is blocked for too long or at the wrong time.
OR+ 100015 ARSAWxyz ZONE1 FULL TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100015_DMC1_PE1 is blocked for too long.
OR+ 100015 ARSAWxyz ZONE1 FULL TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100015_DMC1.
OR+ 100015 ARSAWxyz ZONE2 FULL TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100015_DMC2_PE1 is blocked for too long.
OR+ 100015 ARSAWxyz ZONE2 FULL TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100015_DMC2.
OR+ 100015 ARSAWxyz ZONE3 FULL TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100015_DMC2_PE2 is blocked for too long.

Table 13 ARSAW System Manager Alarms

Alarm Text	Description
OR+ 100015 ARSAWxyz ZONE3 FULL TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100015_DMC2.
OR+ 100015 ARSAWxyz ZONE4 FULL TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100015_DMC3_PE1 is blocked for too long.
OR+ 100015 ARSAWxyz ZONE4 FULL TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100015_DMC3.
OR+ 100020 ARSAWxyz ZONE1 EMPTY TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100020_PE_P1 is blocked for too long.
OR+ 100020 ARSAWxyz ZONE1 EMPTY TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100020_DMC1.
OR+ 100020 ARSAWxyz ZONE2 EMPTY TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100020_PE_P2 is blocked for too long.
OR+ 100020 ARSAWxyz ZONE2 EMPTY TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100020_DMC1.
OR+ 100020 ARSAWxyz ZONE3 EMPTY TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100020_PE_P3 is blocked for too long.
OR+ 100020 ARSAWxyz ZONE3 EMPTY TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100020_DMC2.
OR+ 100020 ARSAWxyz ZONE4 EMPTY TOTE INBOUND JAM PHOTO BLOCKED	This alarm is caused when U100020_PE_P4 is blocked for too long.
OR+ 100020 ARSAWxyz ZONE4 EMPTY TOTE INBOUND MOTOR FAULT	This alarm is caused by a fault condition on the U100020_DMC2.
SB+ 100025 ARSAWxyz ACCUMULATION ZONE MOTOR FAULT	This alarm is caused by a fault condition on the U100025_DMC1 or any of the DMCN's.
SB+ 100025 ESTOP PULLCORD #1 ACTUATED	This alarm is caused when U100025_PC_ES1 is actuated.
SB+ 100025 ESTOP PULLCORD #2 ACTUATED	This alarm is caused when U100025_PC_ES2 is actuated.
SB+ 100025 ARSAWxyz CONSTANT SPEED BELT MOTOR FAULT	This alarm is caused by a fault condition on the U100025_DMCY.
SB+ 100025 ARSAWxyz CONSTANT SPEED JAM PHOTO BLOCKED	This alarm is caused when U100025_PE_J is blocked for too long.
DE-STACKER+ 100030 ARSAWxyz DE-STACKER TOTE BOUNCE BACK JAM PHOTO BLOCKED	This alarm is caused when U100030_PE_C is blocked for too long or at the wrong time.
DE-STACKER+ 100030 ARSAWxyz DE-STACKER OVERHEIGHT JAM PHOTO BLOCKED	This alarm is caused when U100030_PE_OH is blocked.
DE-STACKER+ 100030 ARSAWxyz DE-STACKER PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100030_PE_P1 is blocked for too long.

Table 13 ARSAW System Manager Alarms

Alarm Text	Description
DE-STACKER+ 100030 ARSAWxyz DE-STACKER MOTOR FAULT	This alarm is caused by a fault condition on U100030_DMC1.
LIFT+ 100030 ARSAWxyz LIFT JAM PHOTO BLOCKED	This alarm is caused when U100030_PE_P5 is blocked for too long.
LIFT+ 100030 ARSAWxyz LIFT P3 PHOTO BLOCKED	This alarm is caused when U100030_PE_P3 is blocked for too long.
LIFT+ 100030 ARSAWxyz LIFT P4 PHOTO BLOCKED	This alarm is caused when U100030_PE_P4 is blocked for too long.
LIFT+ 100030 ARSAWxyz LIFT MOTOR FAULT	This alarm is caused by a fault condition on U100030_DMC2.
RG+100035 ESTOP PUSHBUTTON #1 ACTUATED	This alarm is caused when 1CS+122 E-Stop Pushbutton is actuated.
RG+100035 ESTOP PUSHBUTTON #2 ACTUATED	This alarm is caused when 2CS+122 E-Stop Pushbutton is actuated.
RG+100035 ARSAWxyz CASE STOP1 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P1 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP10 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P10 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP11 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P11 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP12 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P12 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP2 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P2 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP3 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P3 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP4 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P4 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP5 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P5 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP6 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P6 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP7 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P7 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP8 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P8 is blocked for too long.
RG+100035 ARSAWxyz CASE STOP9 PACKAGE PRESENT PHOTO BLOCKED	This alarm is caused when U100035_PE_P9 is blocked for too long.
RG+100035 ARSAWxyz SIDE-A LONG RANGE JAM PHOTO BLOCKED	This alarm is caused when U100035_PE_JLR1 is blocked for too long.
RG+100035 ARSAWxyz SIDE-B LONG RANGE JAM PHOTO BLOCKED	This alarm is caused when U100035_PE_JLR2 is blocked for too long.

Table 13 ARSAW System Manager Alarms

Alarm Text	Description
ARSAWxyz ARMOR BLOCK #1 ETHERNET OFFLINE	This alarm is caused when Armor Block 1 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #2 ETHERNET OFFLINE	This alarm is caused when Armor Block 2 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #3 ETHERNET OFFLINE	This alarm is caused when Armor Block 3 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #4 ETHERNET OFFLINE	This alarm is caused when Armor Block 4 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #5 ETHERNET OFFLINE	This alarm is caused when Armor Block 5 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #6 ETHERNET OFFLINE	This alarm is caused when Armor Block 6 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #7 ETHERNET OFFLINE	This alarm is caused when Armor Block 7 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #8 ETHERNET OFFLINE	This alarm is caused when Armor Block 8 is not communicating with the PLC.
ARSAWxyz ARMOR BLOCK #9 ETHERNET OFFLINE	This alarm is caused when Armor Block 9 is not communicating with the PLC.
OR+ 100020 ESTOP PUSHBUTTON ACTUATED	This alarm is caused when 4CS+122 E-Stop pushbutton is actuated.
ARSAWxyz DE-STACKER+ 100030 LIFTERS FAULT (CYLINDER AND/OR SENSOR)	This alarm is caused when the U100030_PRX_TL_E1, U100030_PRX_TL_E2, U100030_PRX_TL_R1, and U100030_PRX_TL_R2 are not sensing the lifter cylinder positions to where they are expected to be.
ARSAWxyz DE-STACKER+ 100030 POSITION FAULT (CYLINDER AND/OR SENSOR)	This alarm is caused when the U100030_PRX_P1, U100030_PRX_P2, and U100030_PRX_P3 are not sensing the expected cylinder position.
ARSAWxyz DE-STACKER+ 100030 RETAINERS FAULT (CYLINDER AND/OR SENSOR)	This alarm is caused when the U100030_PRX_TR_E1, U100030_PRX_TR_E2, U100030_PRX_TR_R1, and U100030_PRX_TR_R2 are not sensing the retainer cylinder positions to where they are expected to be.
ARSAWxyz DE-STACKER+ 100030 EXTEND LIFTERS FAULT	This alarm is caused when the lifters cylinders are extended and do not reach their intended destination.
ARSAWxyz DE-STACKER+ 100030 EXTEND RETAINERS FAULT	This alarm is caused when the retainers cylinders are extended and do not reach their intended destination.
ACCESS GATE SWITCH #1 OPEN	This alarm is caused when the U100030_DI_ES1 Door Interlock is open.
ACCESS GATE SWITCH #2 OPEN	This alarm is caused when the U100030_DI_ES2 Door Interlock is open.
ARSAWxyz LIFT APR FAULT (SEE ROCKWELL MANUAL)	This alarm is caused when the servo has lost its absolute position reference. Needs to be re-homed.

Table 13 ARSAW System Manager Alarms

Alarm Text	Description
ARSAWxyz LIFT LOWER OVERTRAVEL SWITCH FAULT	This alarm is caused when the lower overtravel limit switch U100030_LS_OT_L is actuated.
ARSAWxyz LIFT MODULE FAULT (SEE ROCKWELL MANUAL)	This alarm is caused when a serious fault has occurred with the motion module associated with the selected axis.
ARSAWxyz LIFT NOT CLEAR (OVERHANG PHOTOS)	This alarm is caused when the lift is commanded to move and one of the following sensors is blocked. U100030_PE_C, U100030_PE_P3, U100030_PE_P4, U100015_PE_C.
ARSAWxyz LIFT FAULTED STATE	This alarm is caused when the lift is a faulted state.
ARSAWxyz LIFT UPPER OVERTRAVEL SWITCH FAULT	This alarm is caused when the upper overtravel limit switch U100030_LS_OT_U is actuated.
ARSAWxyz DE-STACKER+ 100030 LOWER TO DROP(HOME) POSITION FAULT	This alarm is caused when the de-stacker does not reach the home position (down).
ARSAWxyz DE-STACKER+ 100030 MOVE TO PICK POSITION FAULT	This alarm is caused when the de-stacker does not reach the pick position (middle).
ARSAWxyz DE-STACKER+ 100030 RAISE TO CLEAR POSITION FAULT	This alarm is caused when the de-stacker does not reach the clear position (top).
ARSAWxyz DE-STACKER+ 100030 RETRACT LIFTERS FAULT	This alarm is caused when the lifters cylinders are retracted and do not reach their intended destination.
ARSAWxyz DE-STACKER+ 100030 RETRACT RETAINERS FAULT	This alarm is caused when the retainers cylinders are retracted and do not reach their intended destination.
ARSAWxyz SERVO ETHERNET OFFLINE	This alarm is caused when 0120SERVO is not communicating with the PLC.
ARSAWxyz TRUNKLINE JAM PHOTO BLOCKED	This alarm is caused when TRUNK_PE_J is blocked for too long.
ARSAWxyz PLC TO PLC COMM FAULT	This alarm is caused when the ARSAW PLC is not communicating to the associated RSP Trunkline PLC.

7 Repair

This section provides removal and replacement procedures for replaceable parts and assemblies. As you follow the removal steps to reach the part that is to be replaced, you might have to remove other parts. Inspect these parts for wear or other problems and replace them at this time if necessary.

INFO Use care not to damage good parts when trying to reach a particular part.

The heading for each procedure references the part or parts to replace. The reference following the part name [Figure X - Item (XX)] directs you to the illustration containing that part for a visual reference.

In the procedure, when applicable, the number adjacent to the part referenced in that step refers to a Figure and Item number, as in Figure 5-(9). If the figure number is not listed, the item number refers to the last figure that was referenced.



WARNING

Do not perform adjustments, maintenance or other work on this equipment without following OSHA Lock-Out/Tag-Out requirements and state and local requirements. The purpose of this procedure is to protect all persons involved against unexpected restart. Personnel should be alerted to the hazard of stored energy which may exist after the power source is locked out. Refer to ANSI Z244.1 and OSHA 29 CFR 1910.147 for minimum requirements. Failure to follow these requirements may result in equipment damage, serious injury, or death.

Follow standard shop practices and safety procedures whenever you remove or replace parts.

1. Make certain the system is locked out and all sources of energy are isolated before performing any maintenance activities.
2. Secure all hardware during installation.
3. Clean parts and assemblies after installation.
4. Before starting the conveyor, install all guards and covers removed during maintenance or repair activities.

7.1 ARSAW Conveyors

INFO For repair information on the conveyors used in the ARSAW, refer to section 2.7.

7.2 Belt Driven Linear Actuator, Servo Motor, Gear Reducer, MDR Lift Conveyor

Removal

Belt Driven Linear Actuator [Figure 18 – Item (1)]

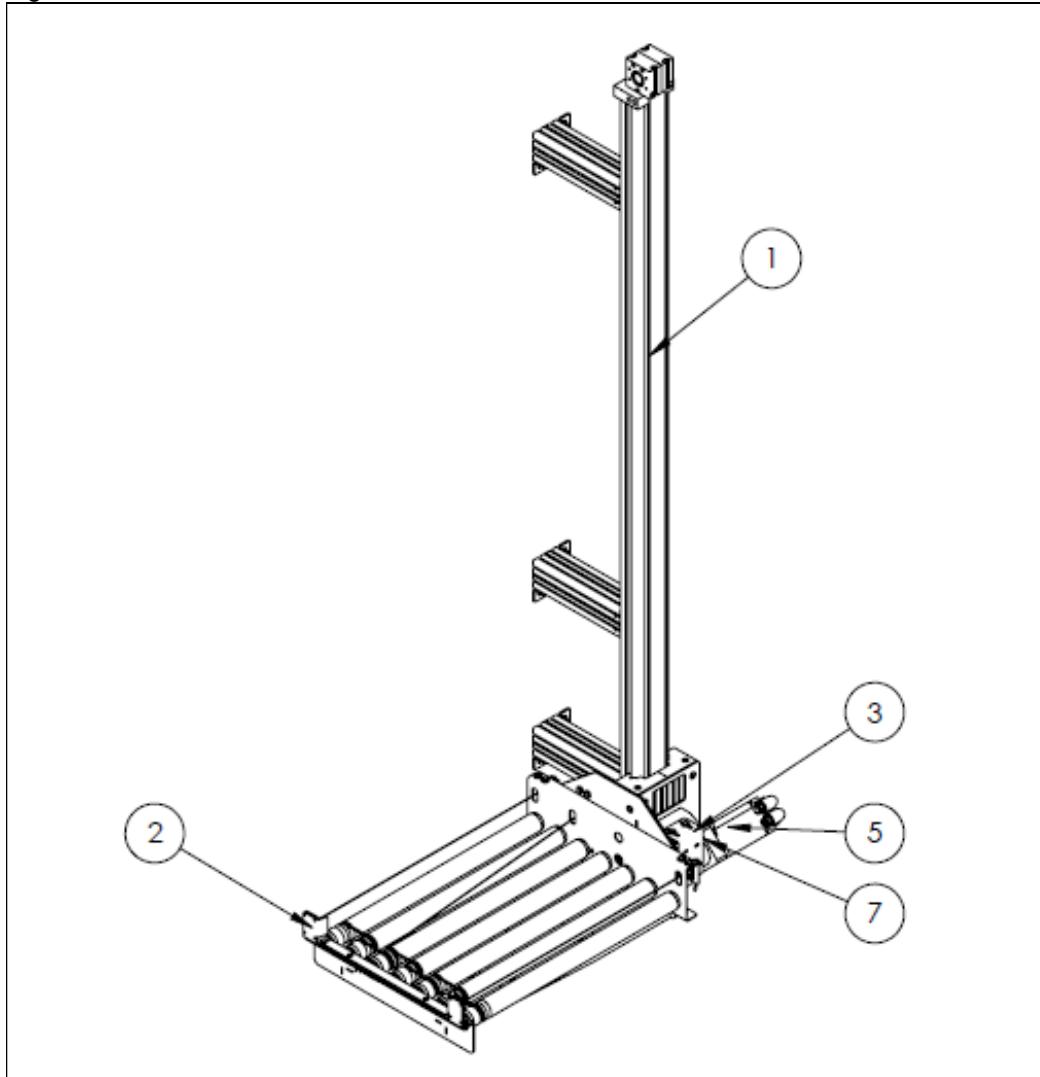
Servo Motor [Figure 18 – Item (5)]

Gear Reducer [Figure 18 – Item (7)]

MDR Lift Conveyor [Figure 18 – Item (2)]

If any component on the Belt Driven Linear Actuator (Figure 18 – (1)) needs repair, it is recommended that the entire Belt Driven Linear Actuator including the MDR Lift Conveyor carrier be removed from the ARSAW and replaced with spare Belt Driven Linear Actuator. The Belt Driven Linear Actuator may then be bench repaired (see section 7.3).

Figure 18 Belt Driven Linear Actuator



1. Verify that the MDR Lift Conveyor is in the low position.
2. Press the CC+122 cabinet STOP pushbutton.
3. De-energize and Lock Out/Tag Out the cabinet using the external disconnect switch.
4. De-energize and Lock Out/Tag Out the de-stacker air pressure regulator.

⚠️ WARNING

You MUST turn off and lock out/ tag out the appropriate PDP or power disconnect point BEFORE continuing. Make sure all forms of energy are isolated.

5. Open the service door (see Figure 12).
6. Remove the 8 bolts from the 2 cross members to remove the entire backstop.



7. Remove the servo motor guard.

Figure 19 Servo Motor Guard



8. Noting their locations, disconnect all wiring to the servo motor and MDR Lift Conveyor.
9. Unbolt and remove the MDR Lift Conveyor assembly (2) from the Belt Driven Linear Actuator (1) and remove it from the structural frame.
10. Remove the servo motor (5) and gear reducer (7) from the bottom pulley on the Belt Driven Linear Actuator (1) (also see Figure 20).
11. Unbolt and remove the Belt Driven Linear Actuator from the structural frame.

Replacement

Belt Driven Linear Actuator [Figure 18 – Item (1)]

Servo Motor [Figure 18 – Item (5)]

Gear Reducer [Figure 18 – Item (7)]

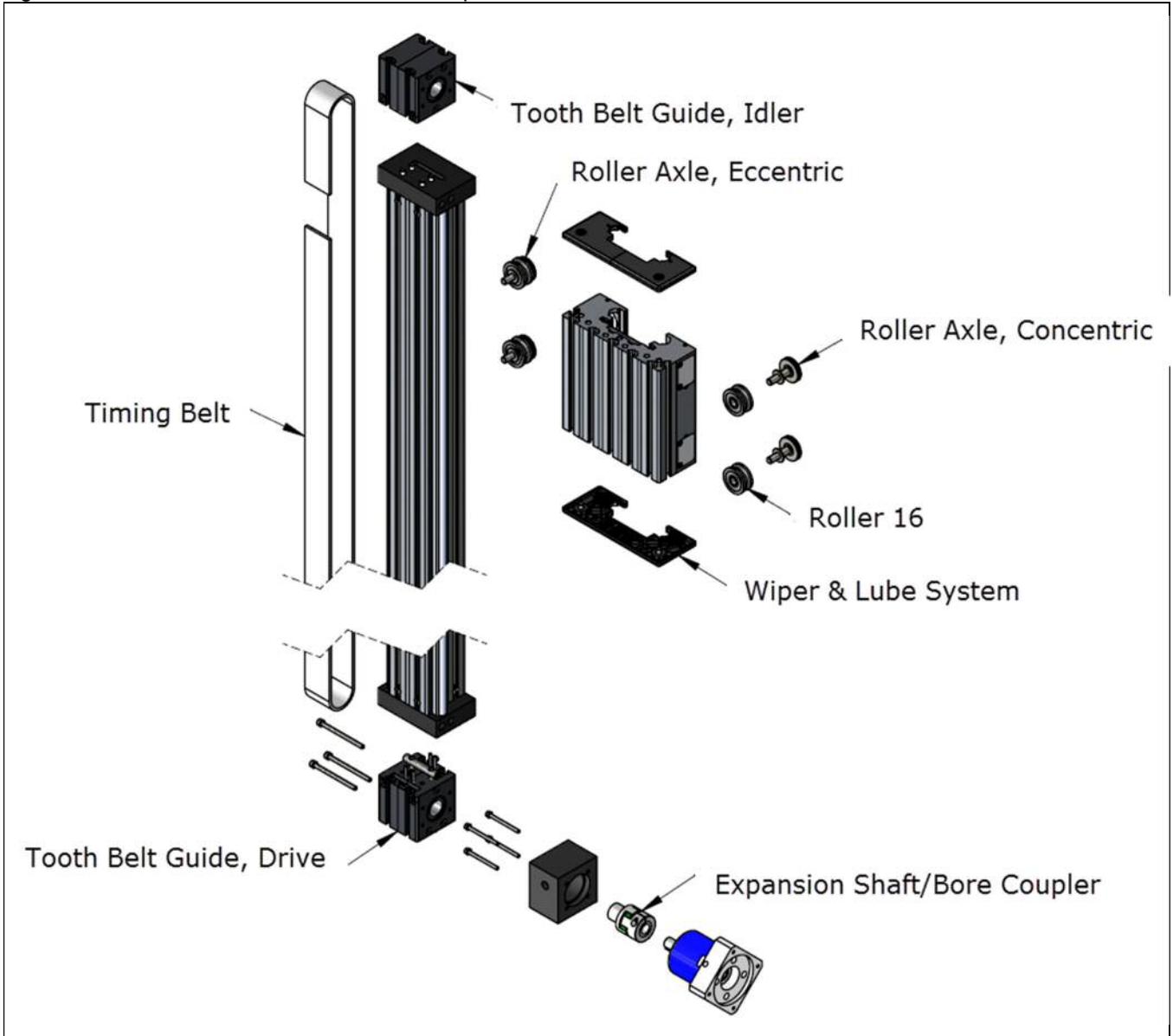
Lift MDR Conveyor [Figure 18 – Item (2)]

1. Position the Belt Driven Linear Actuator inside the structural frame and bolt in place.
2. Install the servo motor and gear reducer onto the Belt Driven Linear Actuator.
3. Install the MDR Lift Conveyor onto the Belt Driven Linear Actuator carrier.
4. Install the servo motor guard.
5. Install the structural supports in the service door opening.
6. Close and secure the service door.

7. Remove the Lock Out/Tag Out on the de-stacker air pressure regulator and energize the regulator.
8. Remove the Lock Out/Tag Out on the cabinet using and re-energize using the external disconnect switch.
9. Return the ARSAW to operation and ensure that the lift is properly homed.

7.3 Belt Driven Linear Actuator

Figure 20 Belt Driven Linear Actuator Components



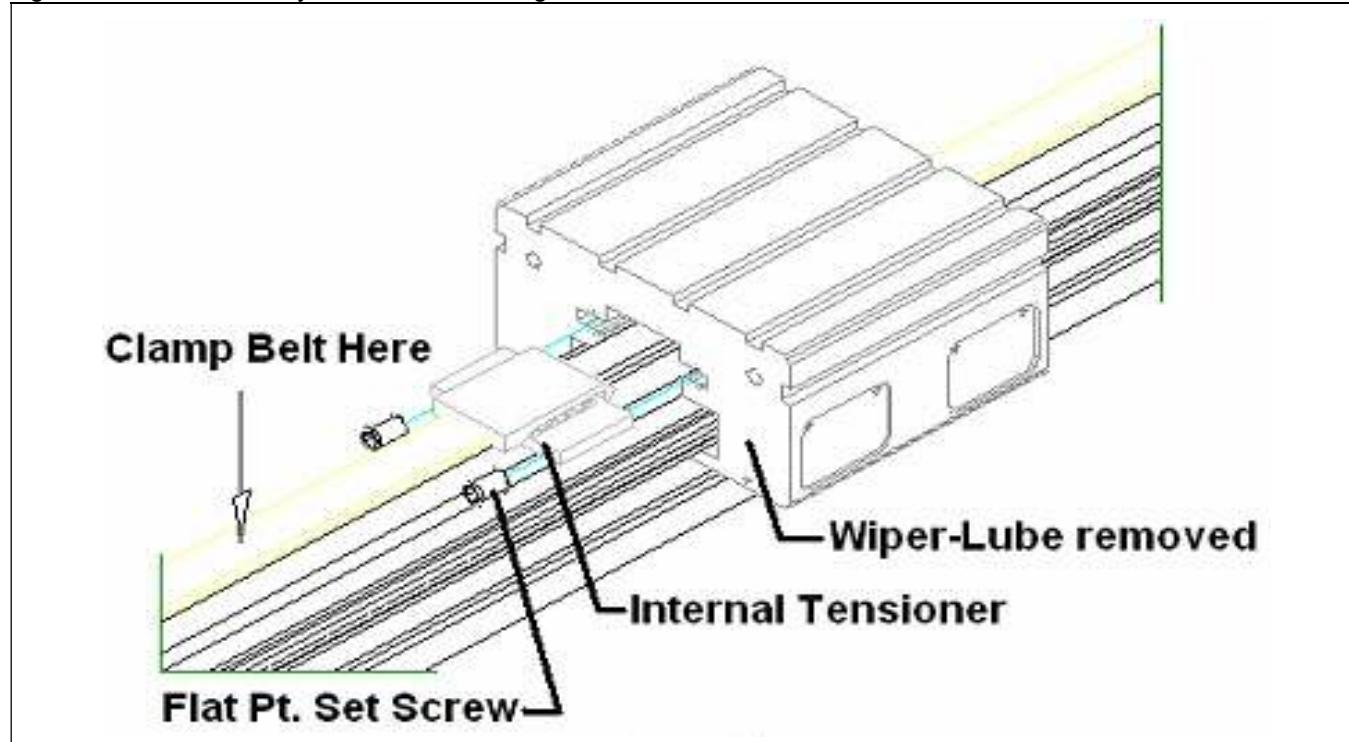
7.3.1 Disassembly of Belt from Carriage

See Figure 21.

1. Remove Wiper-Lube cover.
2. Clamp belt to track profile in order to prevent belt from moving.
3. Remove set screws from belt tensioner.
4. Use a rubber mallet on face of carriage to extract tensioner from the carriage body.
5. In extracting the tensioner, be careful not to mar the carriage face.
6. Remove belt from tensioner by pushing through the side. DO NOT PRY THE TENSIONER TO SPREAD APART.

INFO Most actuators are shipped with the pulleys and belts centered in the tensioner. There are some units that require the pulley and belt to be mounted to one side of the profile. For those units when the belt is not centered on the tensioner, a mark should be made on the tensioner to note where the belt should sit before disassembly.

Figure 21 Disassembly of Belt from Carriage



7.3.2 Removal of Pulleys

See Figure 22 and Figure 23.

1. Prior to removal of the pulleys, the motor/gearbox unit that is coupled to the pulley must first be removed (see section 7.2).
2. The pulley housing can now be removed from the tack profile by releasing the central fastener (4mm Allen wrench) or cap screws.
3. After reassembly of the pulleys, the motor/gearbox must be coupled to the pulley (see section 7.2). Verify that the coupling screws are tightened to the correct torque settings of the coupling (see Figure 23).

Figure 22 Removal of Pulleys

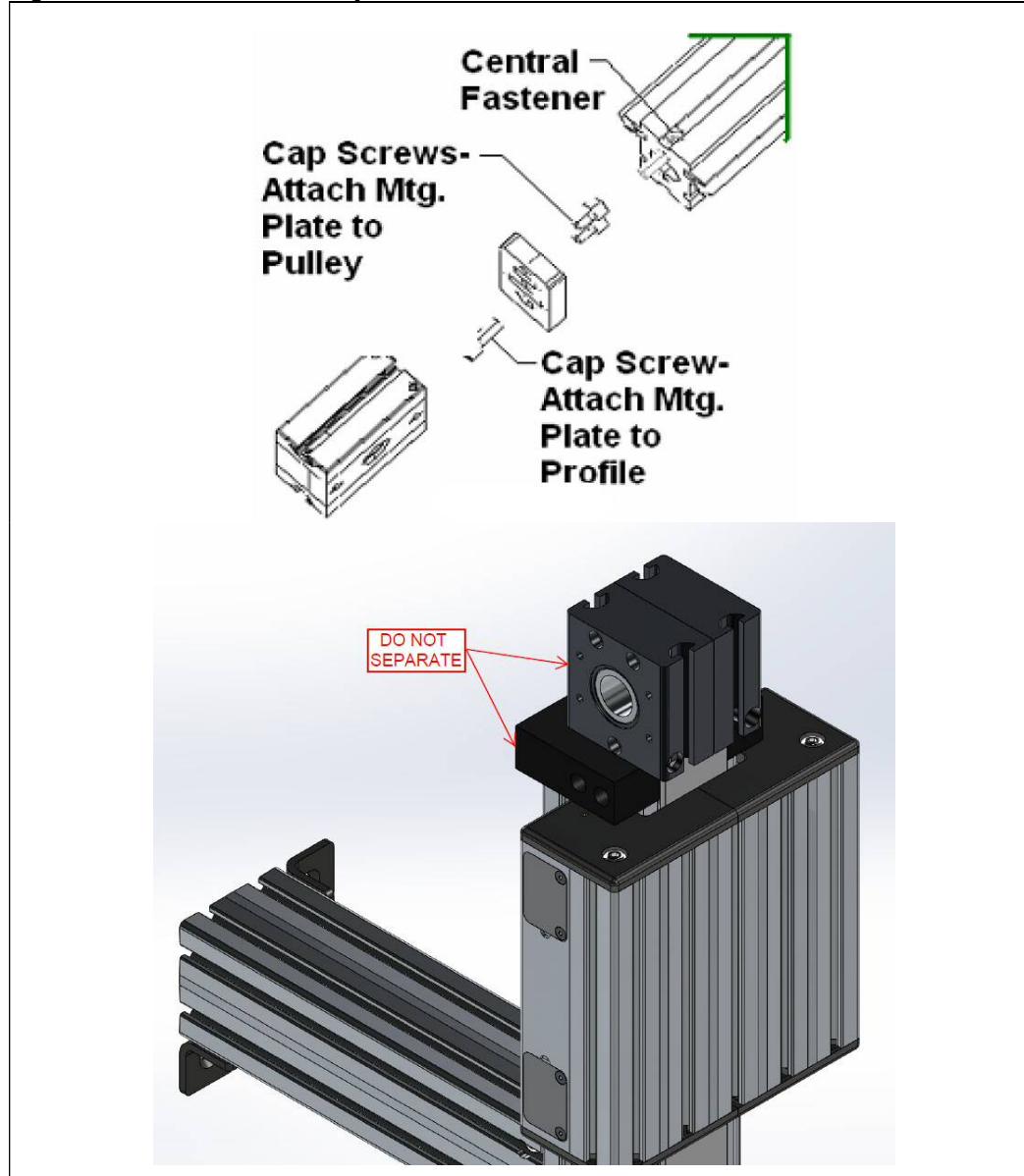
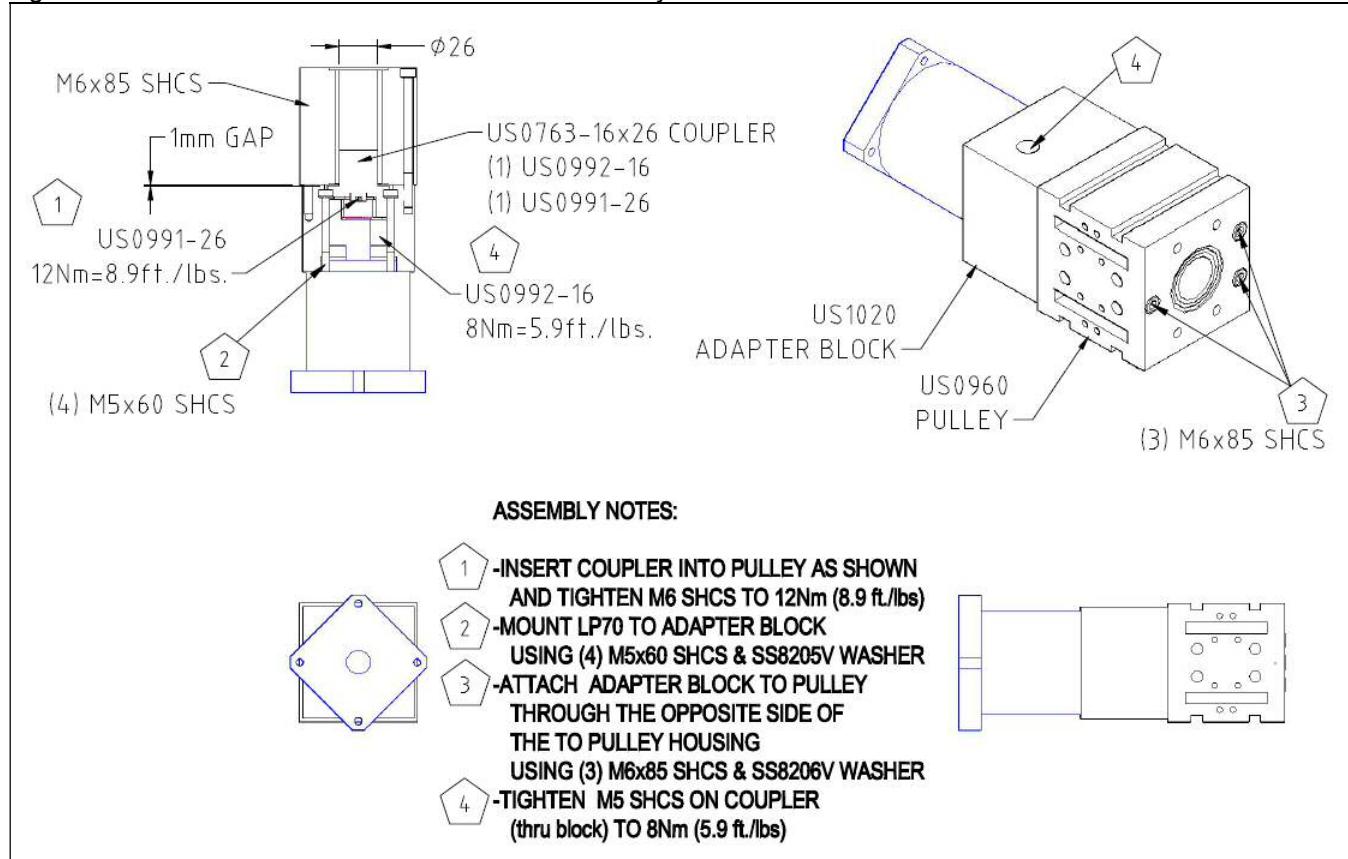


Figure 23 Belt Driven Linear Actuator Drive Assembly



7.3.3 Eccentric Axle / Roller Adjustment

See Figure 24.

1. Identify Eccentric axle. The eccentric axles will be stamped on the underside of the carriage with a capital 'E.' The concentric side will be stamped with a capital 'Z,' from the German for 'Zentric.'
2. Remove Wiper-Lube (WL) (5 mm Allen wrench required). WLs are the black plastic plates that hold the spring loaded felt pad. Part numbers are typically: SL0162S and SL0164S. A pair of M8 Button Head Cap Screws (BHCS) holds the wiper and lubricator to the carriage. Typically, these wiper and lubricators are pinned together.

INFO If the halves of the WL are not pinned together, it is only required to remove the WL halves that are on the eccentric side of the carriage.

3. Loosen set screw in the end of the carriage. This set screw holds the jam nut that holds the Axle (3 mm Allen wrench required).

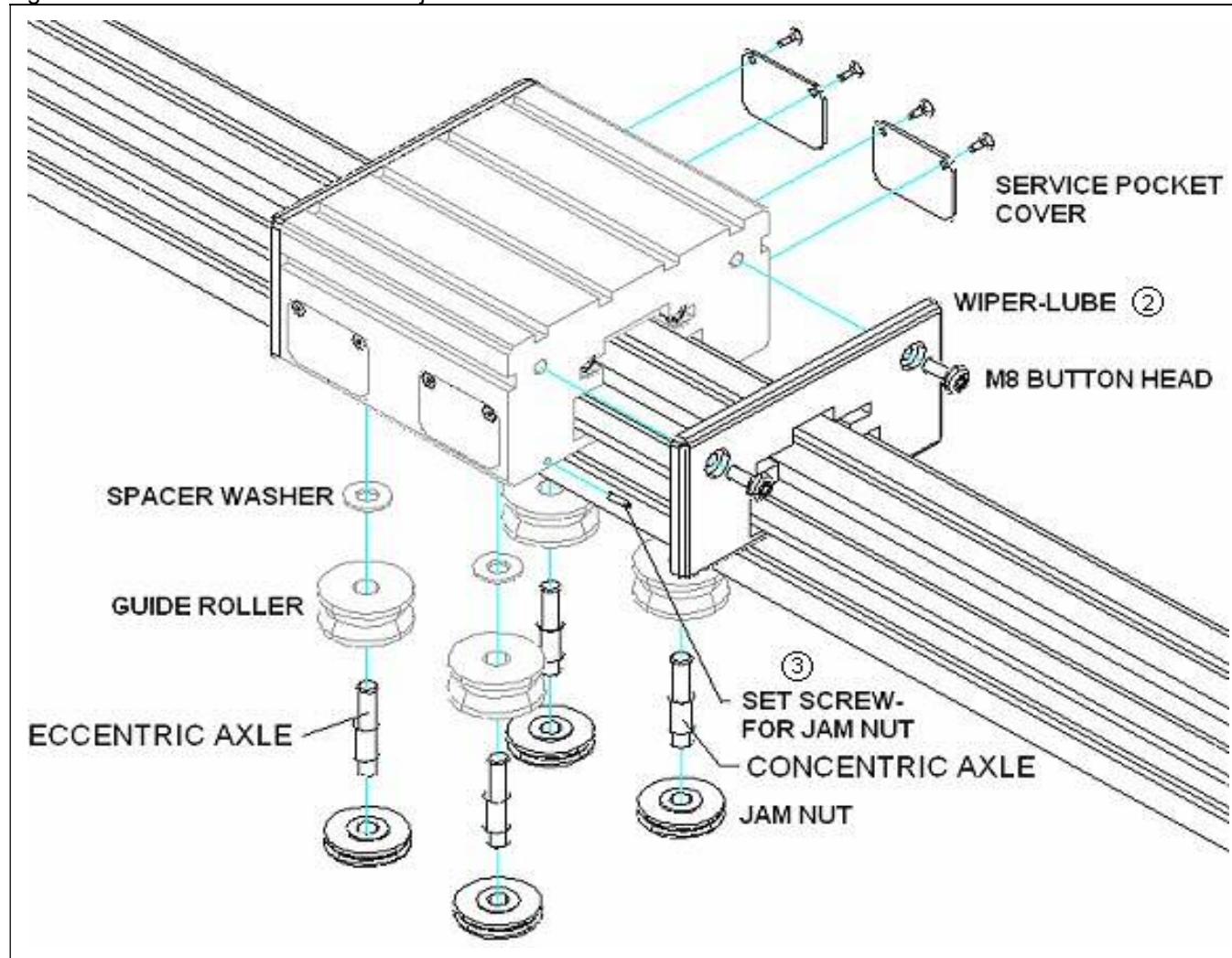


CAUTION

If this set screw is not loosened, further adjustment may damage carriage and void warranty.

4. Hold axle and then loosen jam nut (5 mm Allen wrench and 17 mm offset box end wrench or thru style ratchet required).
 - a. Using Allen wrench, hold axle fixed while loosening jam nut with offset box end wrench or thru style ratchet.
 - b. Once the jam nut has been loosened, the eccentric axle can be rotated to set the position of the guide roller. The axle can be turned in both clockwise and the counterclockwise directions to achieve the adjustment. It is recommended that the roller position be achieved by turning the axle clockwise. However, if the axle bottoms out before reaching the desired roller position, then the axle must be turned counterclockwise to achieve the desired roller position.
 - c. Rotate the eccentric axles until all the play is gone between the rollers and the shaft. Do not over-tighten; this could lead to bearing failure.
5. Hold axle and tighten jam nut (5 mm Allen wrench and 17 mm offset box end wrench or thru style ratchet required).
6. Make sure that the axle does not turn when tightening the jam nut.
7. Tighten set screw onto jam nut (3 mm Allen wrench required). Tighten set screw just to the point that the aluminum bulges slightly. This deformation ensures that the set screw has some preload on it. Do not over tighten.
8. Attach wiper and lubricator (5 mm Allen wrench required).
9. Cycle unit twice by hand to ensure proper operation.

Figure 24 Eccentric Axle / Roller Adjustment



7.4 Tote Lift/Retainer Pneumatic Actuator

Removal

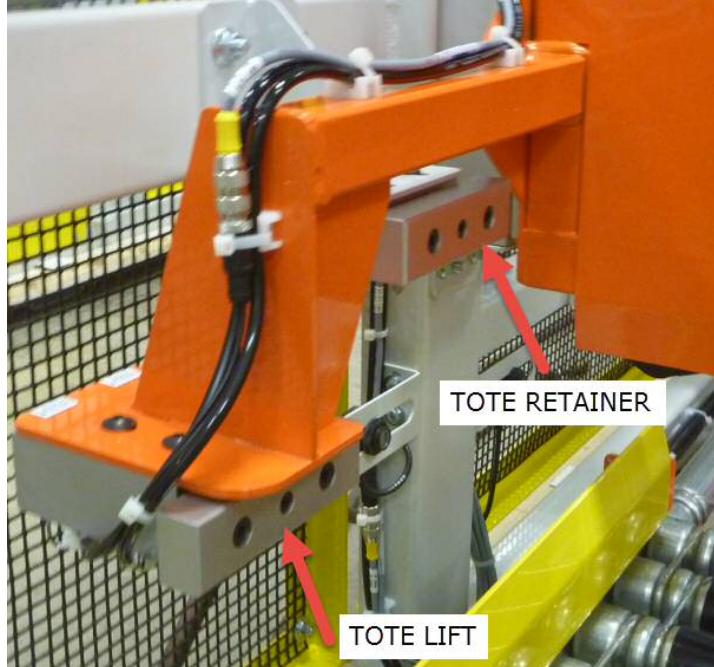
1. Press the CC+122 cabinet STOP pushbutton.
2. De-energize and Lock Out/Tag Out the cabinet using the external disconnect switch.
3. De-energize and Lock Out/Tag Out the de-stacker air pressure regulator.

⚠ WARNING

You **MUST** turn off and lock out/ tag out the appropriate PDP or power disconnect point **BEFORE** continuing. Make sure all forms of energy are isolated.

4. Open the secondary service door (see Figure 12).
5. Noting their locations, disconnect the wiring and air tubing to the failed lift or retainer pneumatic cylinder (see Figure 25).
6. Unbolt the actuator from its mounting bracket.

Figure 25 Tote Lift/Retainer Pneumatic Actuators



Replacement

1. Install the lift or retainer actuator on its mounting bracket.
2. Reconnect air tubing and wiring and dress the wiring harness as necessary.
3. Close and secure the secondary service door.
4. Remove the Lock Out/Tag Out on the de-stacker air pressure regulator and energize the regulator.
5. Remove the Lock Out/Tag Out on the cabinet using and re-energize using the external disconnect switch.
6. Return the ARSAW to service.

7.5 De-stacker Proximity Sensors

Removal

1. Verify that the de-stacker lift weldment is in the low position.
2. Press the CC+122 cabinet STOP pushbutton.
3. De-energize and Lock Out/Tag Out the cabinet using the external disconnect switch.
4. De-energize and Lock Out/Tag Out the de-stacker air pressure regulator.

⚠ WARNING

You **MUST** turn off and lock out/ tag out the appropriate PDP or power disconnect point **BEFORE** continuing. Make sure all forms of energy are isolated.

5. Open the secondary service door (see Figure 12).
6. Mark the location of the proximity sensor on the mounting bracket.
7. Disconnect the proximity sensor cable and remove the sensor from the mounting bracket.

Figure 26 De-stacker Proximity Sensors (Top Sensor Shown for Reference)



Replacement

1. Install the proximity sensor in the same location using the removal marks.
2. Reconnect the sensor's cable.
3. Close and pin the service door.
4. Return the ARSAW to operation and ensure that empty tote de-stacker is working properly.

7.6 De-stacker Pneumatic Cylinder

Removal

1. Verify that the de-stacker lift weldment is in the low position.
2. Press the CC+122 cabinet STOP pushbutton.
3. De-energize and Lock Out/Tag Out the cabinet using the external disconnect switch.
4. De-energize and Lock Out/Tag Out the de-stacker air pressure regulator.



WARNING

You MUST turn off and lock out/ tag out the appropriate PDP or power disconnect point BEFORE continuing. Make sure all forms of energy are isolated.

5. Open the service door (see Figure 12).

6. Disconnect the air tubing from the de-stacker pneumatic cylinder (see Figure 27).

Figure 27 De-stacker Pneumatic Cylinder



7. Disconnect the cylinder shaft from the de-stacker lift weldment. Use caution as the weldment will travel downward slightly till it reaches the end of the guide tracks and bottoms out.



8. Remove the cotter pin and mounting pin from the top of the cylinder and remove the cylinder.



Replacement

1. Install the pneumatic cylinder
2. Reconnect the air tubing.
3. Close and pin the service door.
4. Remove the Lock Out/Tag Out on the de-stacker air pressure regulator and energize the regulator.
5. Remove the Lock Out/Tag Out on the cabinet using and re-energize using the external disconnect switch.
6. Return the ARSAW to operation and ensure that empty tote de-stacker is working properly.

7.7 Photo Sensors/Reflectors

Removal

If a photo sensor or reflector (see Figure 28) has been damaged or has failed:

1. Press the CC+122 cabinet STOP pushbutton.
2. De-energize and Lock Out/Tag Out the cabinet using the external disconnect switch.
3. De-energize and Lock Out/Tag Out the de-stacker air pressure regulator.
4. Open the service or secondary service door as necessary (see Figure 12).
5. Disconnect the photo sensor from the wiring harness.
6. Mark the location of the photo sensor/reflector if installed on an adjustable mounting bracket.
7. Remove the photo sensor/reflector.



You MUST turn off and lock out/ tag out the appropriate PDP or power disconnect point BEFORE continuing. Make sure all forms of energy are isolated.

Replacement

1. Install the photo sensor/reflector using any marks made during removal.
2. Align the photo sensor.
3. Close and secure the service or secondary service door as necessary.
4. Remove the Lock Out/Tag Out on the de-stacker air pressure regulator and energize the regulator.
5. Remove the Lock Out/Tag Out on the cabinet using and re-energize using the external disconnect switch.
6. Return the ARSAW to operation.

Figure 28 Photo Sensor and Reflector Example



7.8 Upper, Lower, and Home Limit Switches

Removal

If an upper, lower or home limit switch (see Figure 29) has been damaged or has failed:

1. Press the CC+122 cabinet STOP pushbutton.
2. De-energize and Lock Out/Tag Out the cabinet using the external disconnect switch.
3. De-energize and Lock Out/Tag Out the de-stacker air pressure regulator.



WARNING

You MUST turn off and lock out/ tag out the appropriate PDP or power disconnect point BEFORE continuing. Make sure all forms of energy are isolated.

4. Open the service door (see Figure 12).
5. Remove the servo motor guard (see Figure 19).
6. Disconnect the limit switch from the wiring harness.
7. Remove the limit switch from its mounting bracket.

Replacement

1. Adjust the limit switch so that it is the same as the one removed.
2. Install the limit switch to its mounting bracket.
3. Install the servo motor guard.
4. Close and secure the service door.
5. Remove the Lock Out/Tag Out on the de-stacker air pressure regulator and energize the regulator.
6. Remove the Lock Out/Tag Out on the cabinet using and re-energize using the external disconnect switch.
7. Return the ARSAW to operation and verify the lift is operating correctly.

Figure 29 Limit Switches

