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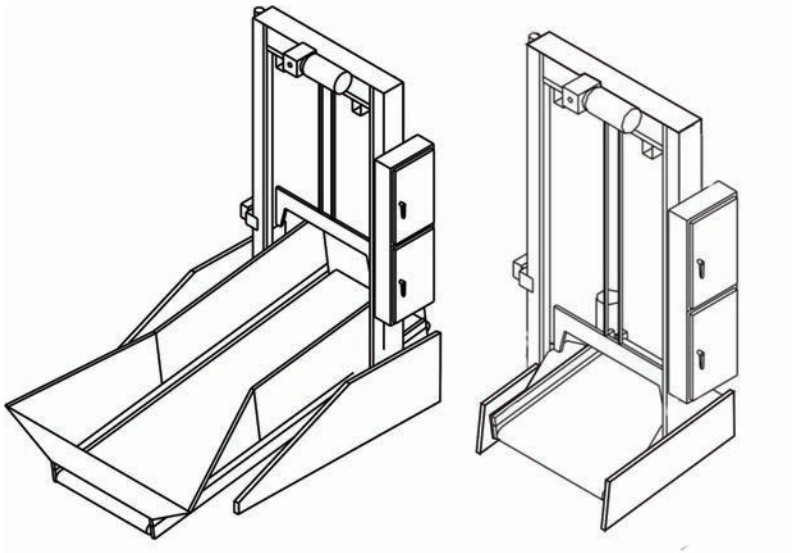

PELLERIN MILNOR CORPORATION **POST OFFICE BOX 400, KENNER, LOUISIANA 70063-0400, U.S.A.**

MKSLAH01U1/22456A

1. English

Maintenance Guide - Shuttle, Loose Goods, Cakes, Elevate, CA_, COELF_, COLF_ MKSLAH01EN/2021524A

English 1

Manual Number: MKSLAH01EN
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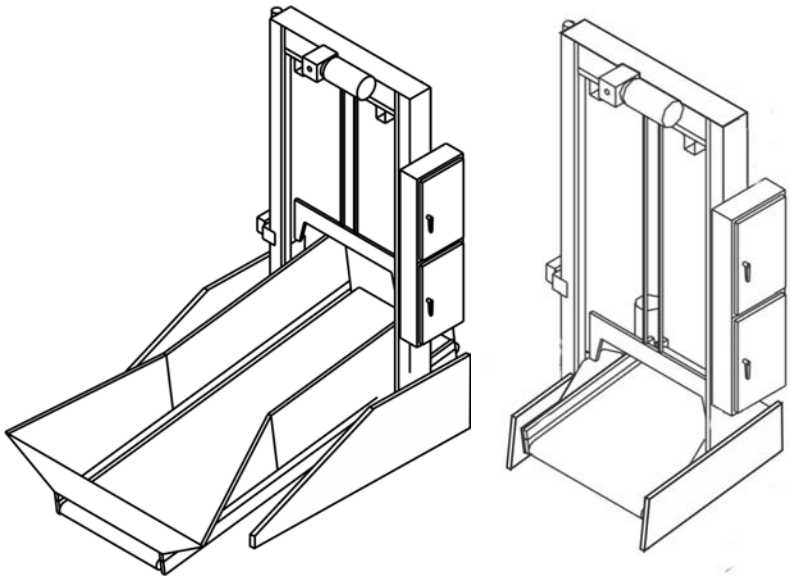
Maintenance Guide

Shuttle, Loose Goods, Cakes, Elevate, CA_, COELF_, COLF_



PELLERIN MILNOR CORPORATION Post Office Box 400, Kenner, Louisiana 70063–0400, U.S.A.

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1 Machine Description and Identification

1.1 About This Manual and Your Milnor® Machine

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This manual applies to two or more models that share the mechanical characteristics stated below. If you received this manual with your machine, your machine is one of the applicable models. However, before using this manual, verify that your machine does have these characteristics.

1.1.1 Description

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This product is a laundering system machine. Most such machines are fully automated. This machine is the specific type described below.

Shuttle, Loose Goods, Cakes, Elevate A machine of this type moves goods vertically from a lower, to a higher level, for example, from load station in front of a dryer to the dryer door. Some models move loose goods and some move cakes discharged from a press extractor. Depending on model and options, the machine will use a built inMilnor® hoist, a hook-mounted Demag® hoist, or another brand of hoist.

1.1.2 Machine Identification

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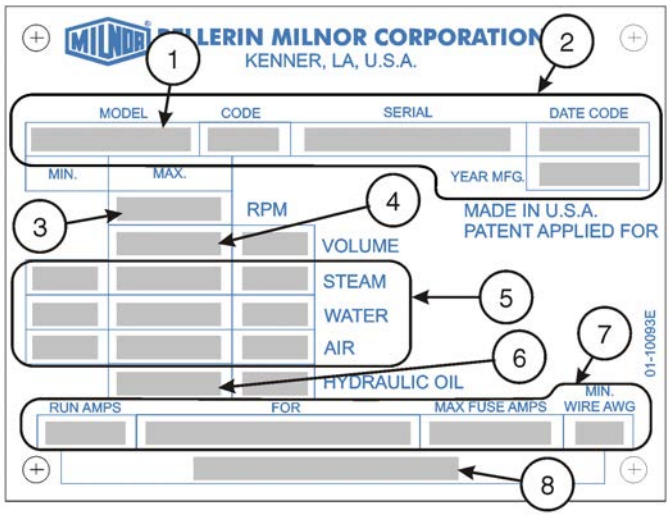
Machine Data Plate — Find the model number and other data for your machine on the machine data plate affixed to the machine and described below.

Figure 1. Machine Data Plate

View of Data Plate (English text shown)



Legend

1. Model number.
2. Data that uniquely identifies your machine
3. Cylinder maximum rotation speed in revolutions per minute, if applicable
4. Cylinder volume in the units of measure shown, if applicable
5. Piped utility requirements
6. Hydraulic oil pressure, if applicable
7. Electrical requirements
8. Part number for multi-unit machine, if applicable.

About Machines With Multiple Data Plates — Machines shipped as multiple units for assembly on site (example: CBW® tunnel washer) will have multiple data plates—one for each unit and a master plate for the complete machine, located on the primary unit. Although each unit can have a different model number, they will all share the same basic serial number. The basic serial number is usually 8 digits. Some of the units will have a two-digit suffix at the end of the serial number.

2 Safety

2.1 Safety — Shuttle Conveyors

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2.1.1 Safety Alert Messages—Internal Electrical and Mechanical Hazards

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The following are instructions about hazards inside the machine and in electrical enclosures.

WARNING: **Electrocution and Electrical Burn Hazards** — Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

- Do not unlock or open electric box doors.
- Do not remove guards, covers, or panels.
- Do not reach into the machine housing or frame.
- Keep yourself and others off of machine.
- Know the location of the main machine disconnect and use it in an emergency to remove all electric power from the machine.

WARNING: **Entangle and Crush Hazards** — Contact with moving components normally isolated by guards, covers, and panels, can entangle and crush your limbs. These components move automatically.

- Do not remove guards, covers, or panels.
- Do not reach into the machine housing or frame.
- Keep yourself and others off of machine.
- Know the location of all emergency stop switches, pull cords, and/or kick plates and use them in an emergency to stop machine motion.

2.1.2 Safety Alert Messages—External Mechanical Hazards

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The following are instructions about hazards around the front, sides, rear or top of the machine.

CAUTION: **Strike and Crush Hazards** — A traveling machine such as a shuttle can strike, crush, or entrap you if you ride on it or enter its path. Traveling machines or their components can move automatically in any direction. Placing a system machine on line by energizing the machine control may immediately summon a shuttle or other traveling machine.

- Keep yourself and others off of machine.
- Keep yourself and others clear of movement areas and paths.
- Understand the consequences of placing a system machine on line.
- Know the location of all emergency stop switches, pull cords, and/or kick plates and use them in an emergency to stop machine motion.
- Know the location of the main machine disconnect and use it in an emergency to remove all electric power from the machine.

CAUTION: **Crush and Entrap Hazards** — A traveling machine such as a shuttle can crush or entrap you if the bed or bucket descends while you are under it. The bed or bucket can descend with power off or on.

- Keep yourself and others clear of movement areas and paths.

WARNING: **Fall, Entangle, and Strike Hazards** — Machine motion can cause you to fall or become entangled in or struck by nearby objects if you stand, walk, or ride on the machine. Shuttles and conveyor belts move automatically.

- Keep yourself and others off of machine.

2.1.3 Safety Alert Messages—Unsafe Conditions

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2.1.3.1 Damage and Malfunction Hazards

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2.1.3.1.1 Hazards Resulting from Inoperative Safety Devices

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WARNING: **Multiple Hazards** — Operating the machine with an inoperative safety device can kill or injure personnel, damage or destroy the machine, damage property, and/or void the warranty.

- Do not tamper with or disable any safety device or operate the machine with a malfunctioning safety device. Request authorized service.

WARNING: **Electrocution and Electrical Burn Hazards —** Electric box doors—Operating the machine with any electric box door unlocked can expose high voltage conductors inside the box.

- Do not unlock or open electric box doors.

WARNING: **Entangle and Crush Hazards —** Guards, covers, and panels—Operating the machine with any guard, cover, or panel removed exposes moving components.

- Do not remove guards, covers, or panels.

2.1.3.1.2 Hazards Resulting from Damaged Mechanical Devices

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WARNING: **Multiple Hazards —** Operating a damaged machine can kill or injure personnel, further damage or destroy the machine, damage property, and/or void the warranty.

- Do not operate a damaged or malfunctioning machine. Request authorized service.

WARNING: **Crush Hazards —** Chain and hoist—A broken chain or a malfunctioning hoist can permit the belt/bucket assembly to fall or descend.

- Do not operate the machine with any evidence of damage or malfunction.

2.1.3.2 Careless Use Hazards

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2.1.3.2.1 Careless Operation Hazards—Vital Information for Operator Personnel (see also operator hazards throughout manual)

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WARNING: **Multiple Hazards —** Careless operator actions can kill or injure personnel, damage or destroy the machine, damage property, and/or void the warranty.

- Do not tamper with or disable any safety device or operate the machine with a malfunctioning safety device. Request authorized service.
- Do not operate a damaged or malfunctioning machine. Request authorized service.
- Do not attempt unauthorized servicing, repairs, or modification.
- Do not use the machine in any manner contrary to the factory instructions.
- Use the machine only for its customary and intended purpose.
- Understand the consequences of operating manually.

CAUTION: **Goods Damage and Wasted Resources —** Entering incorrect cake data causes improper processing, routing, and accounting of batches.

- Understand the consequences of entering cake data.

WARNING: **Strike and Crush Hazards —** Carelessly moving the machine with manual controls can cause it to strike, crush, entrap, or entangle personnel. You have total control of machine movement immediately after setting the Manual/Automatic switch to manual.

- Keep yourself and others clear of movement areas and paths.
- Understand the consequences of operating manually.

2.1.3.2.2 Careless Servicing Hazards—Vital Information for Service Personnel (see also service hazards throughout manuals)

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WARNING: **Electrocution and Electrical Burn Hazards —** Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

- Do not service the machine unless qualified and authorized. You must clearly understand the hazards and how to avoid them.
- Abide by the current OSHA lockout/tagout standard when lockout/tagout is called for in the service instructions. Outside the USA, abide by the OSHA standard in the absence of any other overriding standard.

WARNING: **Entangle and Crush Hazards —** Contact with moving components normally isolated by guards, covers, and panels, can entangle and crush your limbs. These components move automatically.

- Do not service the machine unless qualified and authorized. You must clearly understand the hazards and how to avoid them.
- Abide by the current OSHA lockout/tagout standard when lockout/tagout is called for in the service instructions. Outside the USA, abide by the OSHA standard in the absence of any other overriding standard.

WARNING: **Crush and Entrap Hazards —** A traveling machine such as a shuttle can crush or entrap you if the bed or bucket descends while you are under it. The bed or bucket can descend with power off or on.

- Secure both red safety pins in accordance with the instructions furnished, then lock out and tag out power at the main machine disconnect before working under bed or bucket.

WARNING: **Strike and Crush Hazards —** A traveling machine such as a shuttle can strike, crush, or entrap you if you ride on it or enter its path. Traveling machines or their components can move automatically in any direction. Placing a system machine on line by energizing the machine control may immediately summon a shuttle or other traveling machine.

- Lock out and tag out power to the traveling machine at the main machine disconnect if you must work in the path of the traveling machine.

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2.2 Use the Red Safety Supports for Maintenance — CA_, CG_, COEL_, COLF_, COSH_

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2.2.1 What Safety Supports are Provided and Why

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These machines are provided with two safety pins. After the bed is raised, the pins are inserted in holes in both sides of the frame. The safety pins provide protection against the unpowered descent of the bed during maintenance. A mechanical problem such as a broken chain can cause the bed to fall. Use the safety support(s) whenever the maintenance to be performed requires you to place any part of your body in or near the path of the vertically moving portion of the machine.

WARNING: **Incorrect use of the safety supports** — can cause the machine to descend and crush you.

- Never work near the path of the vertically moving portion of the machine unless the safety supports are deployed and power is removed from the machine.
- Do not use power to close a small gap between the machine and the safety supports. Use care not to lower the machine with the safety supports deployed.
- Where a pair of safety supports is provided, always use both supports.
- Maintain the safety support(s) in good condition.
- When not in use, stow the safety support(s) in the location(s) provided on the machine or in a convenient, designated location.

2.2.2 How to Deploy the Safety Pins

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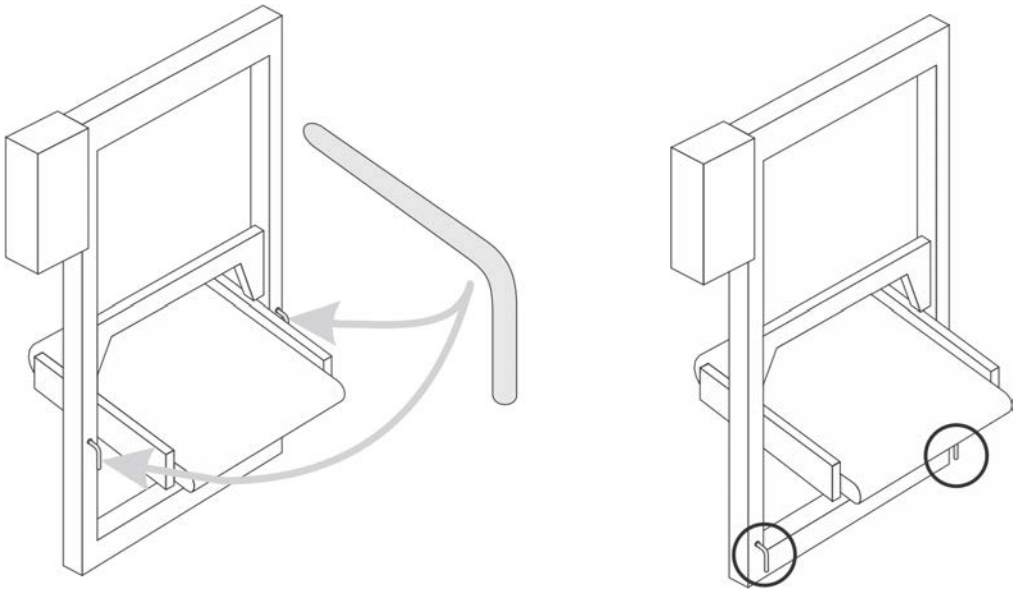
1. Use the Manual mode to raise the bed or bucket carrier only as far as needed to insert the pins at one of the receptacle holes.
2. The illustrations below show the safety pins deployed (at left) and stowed (at right). Install the safety pins into the receptacle holes in the frame.



3. Remove electric power from the machine.

3 Routine Maintenance

3.1 Routine Maintenance

Do the maintenance in Section 3.1.1 : Maintenance Summary, page 11 to make sure that the machine is safe, keeps the warranty, and operates correctly. This will also decrease repair work and unwanted shutdowns. Speak to your dealer or the Milnor® Service department if repairs are necessary.

WARNING: Mechanisms — can can pull in and mutilate body parts.

- Do not service the machine unless qualified and authorized. You must clearly understand the hazards and how to avoid them.
- Do not service the machine with power on except when explicitly called for in the service instructions. Use extreme care when working near moving components.
- Replace guards and covers that you remove for maintenance.

If you use software to keep the maintenance schedule for your plant, add the items in the following maintenance summary to that schedule. If not, you can put marks on a calendar that work with the tables in the maintenance summary. See Section 3.1.6 : How To Show the Maintenance On a Calendar, page 19

3.1.1 Maintenance Summary

Each of the following sections is for a type of maintenance. For example, the section “Guards and Related Components” says “Examine these items. If an item is damaged, missing, or has the wrong setting, correct this discrepancy immediately to prevent injury.” A table in each section identifies the applicable items and the frequency. The “More Data” column gives special instructions if necessary.

* If the machine operates more than 12 hours each day, do the “day” items two times each day. Do the other items at the given hours or on the days that you show on a calendar (see Section 1). **Do all items in all sections for the maintenance intervals that apply (for example, day, 40 to 60 hours, and 200 hours).**

TIP: The maintenance summary has many links to the sections that follow the summary. These sections give more information about the maintenance items. After you learn this information, it is only necessary to look at the summary to do the maintenance.

3.1.1.1 Guards and Related Components

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Examine these items. If an item is damaged, missing, or has the wrong setting, correct this discrepancy immediately to prevent injury.

Table 1. Guards and Related Components

Mark						Do this each	Component	More Data
1	2	3	4	5	6			
x						day*	guards, covers	Speak to your dealer or Milnor for replacement components.
x						day*	safety placards	
		x				200 hours	fasteners	Fasteners must be tight.
x						day*	safety stands, bars or pins (painted red)	Speak to your dealer or Milnor for replacement components. See the section “Use the Red Safety Supports for Maintenance...” in the Safety chapter.
		x				200 hours	anchor bolts and grout	Grout must be good. Bolts must be tight.
x						day*	emergency stop mechanism	See Section 3.2.4 , page 24. Do a test of the control.
	x					40 to 60 hours	safety circuit for the gates in the fence that goes around the path of the shuttle conveyor	See Section 3.2.5 , page 25. Do a test of the circuit. If it does not operate correctly, repairs are necessary. This circuit is provided by others.

3.1.1.2 Filters, Screens, and Sensitive Components

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Remove contamination from these items to prevent damage and unsatisfactory performance.

Table 2. Filters, Screens, and Sensitive Components

Mark						Do this each	Component	More Data. See also Section 3.1.2 , page 15
1	2	3	4	5	6			
The next item only applies if the conveyor or shuttle has an optional inverter.								
	x					40 to 60 hours	inverter fans, vents, filters	See Figure 3, page 21 . Keep good air flow.
			x			600 hours	motors	Keep good air flow.
					x	2400 hours	entire machine	Remove excessive dust and dirt.
				x		1200 hours	mufflers, quick exhaust valves	See Figure 6, page 23
x						day*	photoeyes	See Figure 7, page 24
					x	2400 hours	proximity switches	See Figure 8, page 24

3.1.1.3 Fluid Containers

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Examine these items. Add fluid if necessary and keep components clean to prevent damage.

Table 3. Fluid Containers

Mark 1	2	3	4	5	6	Do this each	Component	More Data. See also Section 3.1.3 : Lubricant Identification, page 16
						none	speed reducer (gear reducer)	Conveyor and shuttle gear reducers are sealed except Milnor hoist which is vented. No oil maintenance necessary.
			x			600 hours	air line lubricator for large air cylinders, if supplied.	See Figure 12, page 30. Add oil 23 (Table 9, page 16) if necessary.

3.1.1.4 Components that Become Worn

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Examine these items. Tighten or replace the item if necessary, to prevent shutdowns and unsatisfactory performance. Speak to your dealer for replacement parts.

Table 4. Components that Become Worn

Mark 1	2	3	4	5	6	Do this each	Component	More Data
x						day*	conveyor belts	If the belt has moved against the side of the bed, see Section 3.3.1 , page 31.
The next two rows apply to the heavy (J-rail) frame and the Milnor® hoist								
			x			600 hours	guide rollers and slides	See Figure 10, page 28.
					x	2400 hours	Milnor® hoist chain	See Figure 10, page 28. Examine the chain closely for damage, cracks, pitting, reduction in thickness of the links, increase in pitch and elongation. Replacement can be necessary for these conditions. Speak to your dealer or Milnor. This is not routine maintenance.
The next two rows apply to the light (tubular) frame and the hook-mounted hoist.								
			x			600 hours	guide rollers and slides	See Figure 11, page 29.
					x	2400 hours	Demag (hook-mounted) hoist chain	See Figure 11, page 29. Examine the chain closely for damage, cracks, pitting, reduction in thickness of the links, increase in pitch and elongation. Replacement can be necessary for these conditions. Speak to your dealer or Milnor.Speak to your dealer or Milnor.This is not routine maintenance.

3.1.1.5 Bearings and Bushings

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Unless the item is sealed, apply grease to prevent damage. See the next section for motors.

Table 5. Bearings and Bushings

Mark 1	2	3	4	5	6	Do this each	Component	More Data . See also Section 3.1.3 , page 16
			x			600 hours	motor bearings	See Section 3.1.5 : Procedures for Motors, page 17
		x				200 hours	conveyor roller bearings	See Figure 9, page 27. Add 0.12 oz. (3.54 mL) of grease EPLF2 (Table 9, page 16) at four places for each conveyor belt.
The next three items are for the Milnor® hoist, if applicable								
			x			600 hours	chain	See Figure 10, page 28. Apply spray lubricant FGL (Table 9, page 16).

Table 5 Bearings and Bushings (cont'd.)

Mark 1	2	3	4	5	6	Do this each	Component	More Data . See also Section 3.1.3 , page 16
			x			600 hours	sprocket shaft bearings	See Figure 10, page 28. Add 0.12 oz. (3.54 mL) of grease EPLF2 (Table 9, page 16) at two places
			x			600 hours	idler pulley	See Figure 10, page 28. Add 0.12 oz. (3.54 mL) of grease EPLF2 (Table 9, page 16) at one place.
The next item is for the Demag hoist, if applicable								
				x		1200 hours	hoist chain	See Figure 11, page 29. Apply grease DG68 (Table 9, page 16). See manufacturer manual provided with machine.

3.1.1.6 Motor Grease Schedule

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Use the data in Table 10: Motor Grease Intervals and Quantities, page 19 to complete this table.

Table 6. Motor Grease Schedule

Motor Identification (example: main drive)	Interval		Quantity		Dates When Grease is Added							
	Years	Hours	fl oz	mL								
									.			

3.1.1.7 Mechanisms and Settings

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Make sure mechanisms are serviceable and settings are correct to prevent unsatisfactory performance.

Table 7. Mechanisms and Settings

Mark 1	2	3	4	5	6	Do this each	Component	More Data
					x	2400 hours	controller circuitry	Examine wiring and connections in electrical boxes. Look for corrosion, loose connections. See Section 3.1.2 , page 15
			x			600 hours	compressed air mechanisms for large air cylinders, if applicable.	See Section 3.2.2 , page 21, Figure 12, page 30
					x	2400 hours	Demag hook-mounted hoist, if applicable	See Figure 11, page 29. Maintenance as told in the manufacturer manual provided with the machine. Contact Milnor or your dealer for assistance.

3.1.2 How To Remove Contamination

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Table 8. Contamination Types, Cleaning Agents, and Procedures

Material or Component	Usual Contamination	Example	Cleaning Agent	More Data
machine housing	dust, dirt	—	compressed air or shop vacuum	Air—no more than 30 psi (207 kpa). Do not push dust in mechanisms.
fins and vents on electrical components	dust	motors, inverters, braking resistors	shop vacuum, soft bristle brush, canned air for electrical components	Do not push dust in mechanisms.
electric box interior	dust	all electric boxes		
electrical connections	corrosion, varnish	spade connector, molex connector, plug-in relay	spray solvent for electrical components	Disconnect then connect it again. Use solvent if the bad connection continues.
electronic sensors	dust	photoeye lens, reflector, laser, proximity switch, temperature probe	none	Use a clean, soft, dry cloth.
	dirt		warm water with soap, then water flush	Use clean, soft cloths.
stainless steel	chemical spill	shell, supply injector	water	Use a hose to flush the chemical supply from the surface fully. Do not get water on electrical components or mechanisms.
300 series stainless steel	chemical corrosive attack	shell interior, cylinder	pickling and passivation	Speak to your dealer or Milnor. This is not routine maintenance.
painted metal, unpainted aluminum	dust, dirt, grease	frame members	warm water with soap, then water to flush	Use clean cloths. Do not get water in electrical components.
rubber	dirt, oil, grease	drive belts, hoses	warm water with soap, then water to flush	Use clean cloths. Flush fully. Oil or soap must not stay on drive belts. Make sure that drive belts are serviceable.
clear plastic, acrylic	discoloration (yellowing)	compressed air filter bowl, visual flow meter	warm water with soap, then water to flush, then acrylic cleaner. Do not use ammonia.	Use only the necessary cleaning agents. Wash and rinse with clean, soft cloths. Follow instructions on acrylic cleaner.
glass	discoloration (yellowing)	door glass, site glass	ammonia and water solution and water rinse then acetone	Use clean, soft cloths. Use only the necessary cleaning agents. If necessary, soak in cleaner.
soft air filter, lint filter,	dust, lint	on inverter electric box door, in air line filter bowl, in dryers	shop vacuum	Replace the used with a new filter when the vacuum cannot remove contamination.
rigid strainers, screens for water, steam	mineral particles	in water line, y-strainer	water	Use a rigid bristle brush. Flush with a flow of water.
rigid strainers, screens for oil	metal shavings	in hydraulic line	carburetor cleaner or equivalent solvent	Soak. Use a rigid bristle brush.
steel drive components	dirt, hardened lubricant	bearings, roller chains, sprockets, gears	carburetor cleaner or equivalent solvent	Soak. Use a cloth or soft bristle brush.

3.1.3 Lubricant Identification

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The table below identifies the lubricant for each lubricant code given in the maintenance summary. Get these or equivalent lubricants from your local lubricant supplier.

When you add grease, always use the procedures given in Section 3.1.4 : Grease Gun Procedures, page 16. When you add grease to motors, also use the procedures given in Section 3.1.5 : Procedures for Motors, page 17.

CAUTION: **Bad lubricant** — will decrease the life of components.

- Make sure that all equipment and fittings used to apply lubricants are clean.
- Use only the given lubricants or equivalent lubricants that have the same specifications.

Table 9. Lubricant Identification

Code	Type	Trademark Name	Application Example
EM	grease	Mobil Polyrex EM or as given on the motor nameplate	motor bearings
EPLF2	grease	Shell Alvania EP (LF) Type 2	drive shaft bearings and bushings, ball joints, chain drives
DG68	grease	Demag DG68 Gear Grease (Demag P/N 665 009 44). One tube provided with machine.	Demag hoist chain
FGL	spray	Lubriplate Super FGL-1. One can provided with machine.	Milnor hoist chain
23	oil	Shell Tellus 23	air line lubricator

3.1.4 Grease Gun Procedures

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CAUTION: **Hydraulic pressure** — can push out seals and push grease into unwanted areas (example: motor windings).

- Use a hand grease gun. A power grease gun gives too much pressure.
- Know the quantity of grease your grease gun gives each cycle (each stroke).
- Operate the grease gun slowly (10 to 12 seconds for one cycle).
- Add only the specified quantity. Stop if new grease come out of a drain port or other opening.
- Remove spilled grease from belts and pulleys.

The tables give grease quantities in fluid ounces (fl oz) and milliliters (mL). You can also use grease gun cycles (strokes). A cycle is each time that you pull the trigger. One cycle is usually approximately 0.06 fl oz (1.8 mL). Your grease gun can give more or less than this. Measure the output of your grease gun as follows:

- Make sure that the grease gun operates correctly.
- Operate the grease gun to put grease into a small container with fluid ounce or milliliter increments. Pull the trigger fully and slowly.
- Add a sufficient quantity of grease to measure accurately. Count the number of cycles of the grease gun (the number of times that you pull the trigger).
- Calculate the quantity for each cycle of the grease gun, as in the following examples.

Example: 2 fl oz / 64 cycles = 0.031 fl oz for each cycle

Example: 59 mL / 64 cycles = 0.92 mL for each cycle

3.1.5 Procedures for Motors

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NOTICE: Motor warranties and the maintenance procedures necessary to maintain the motor warranty are given by the original manufacturer, not by Milnor®. Consult the motor nameplate and manufacturer's manual. Where the following information does not conflict with the manufacturer's instructions, you can use it to develop a lubrication schedule for motors that require lubrication.

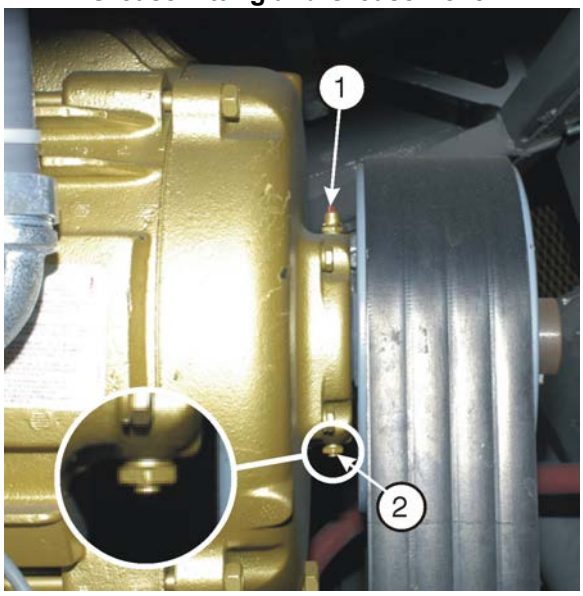
If a motor on your machine does not have grease fittings, no grease maintenance is necessary. If a motor on your machine has grease fittings, it is necessary to add grease. But the interval is usually longer than for other maintenance. Table 10: Motor Grease Intervals and Quantities, page 19 gives motor grease intervals and quantities for motors with specified frame sizes and speeds. You get this data from the motor nameplate. Use Table 6: Motor Grease Schedule, page 14 to record the data for the motors on your machine.

CAUTION: **Failure to remove grease drain plugs —** can cause grease to enter the windings and burn out the motor.

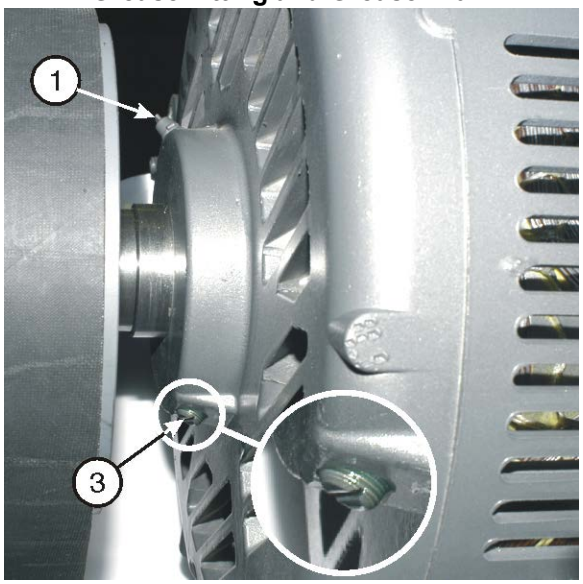
▶ If the motor has grease drain plugs, remove them before you add grease. If the motor has grease relief fittings, it is not necessary to remove them.

Figure 2. Motor Grease Maintenance Conditions

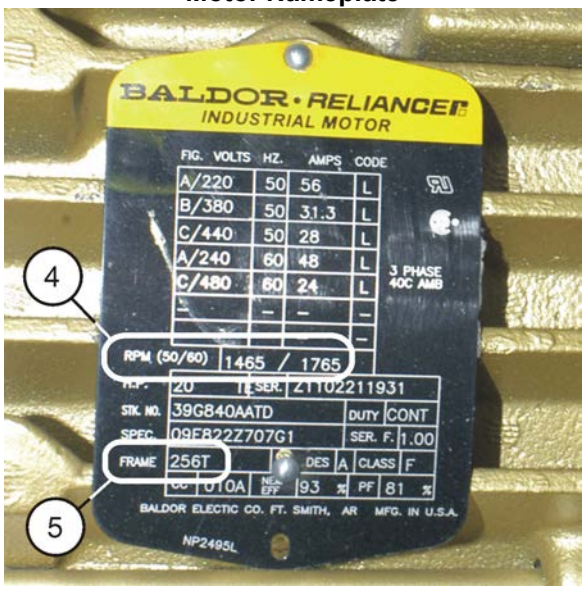
Grease Fitting and Grease Relief



Grease Fitting and Grease Drain



Motor Nameplate



Grease Fittings, No Reliefs or Drains

Legend

1 . . . Grease fitting
2 . . . Grease relief. Do not remove.
3 . . . Grease drain plug. Remove first.
4 . . . RPM (motor speed). This example is 1465 RPM at 50 Hz and 1765 RPM at 60 Hz.
5 . . . NEMA (IEC) frame size. Example: 256T

Apply grease as follows:

1. Operate the machine or use manual functions to operate the motor until it is warm.
2. Remove power from the machine.
3. If the motor has grease drain plugs, remove them. See the caution statement above..
4. Add grease EM (Table 9: Lubricant Identification, page 16) with the motor stopped. If the motor with the nameplate in the above figure operates at 60 Hz, the specified grease quantity for each grease fitting is 0.65 fl oz (18.4 mL).

5. If the motor has a grease drain plugs, operate the machine or use manual functions to operate the motor for two hours. Replace the drain plug.

Table 10. Motor Grease Intervals and Quantities

On Motor Nameplate (see Figure 2: Motor Grease Maintenance Conditions, page 18)		Interval		Quantity	
NEMA (IEC) Frame Size	**RPM Less Than or Equal To**	**Years**	**Hours**	**Fluid Ounces**	**mL**
Up to 210 (132)	900	5.5	11000	0.34	9.5
	1200	4.5	9000		
	1800	3	6000		
	3600	1.5	3000		
>210 to 280 (132 to 180)	900	4.5	9000	0.65	18.4
	1200	3.5	7000		
	1800	2.5	5000		
	3600	1	2000		
>280 to 360 (180 to 200)	900	3.5	7000	0.87	24.6
	1200	3	6000		
	1800	2	4000		
	3600	0.5	1000		
>360 to 5000 (200 to 300)	900	2.5	5000	2.23	63.2
	1200	2	4000		
	1800	1	2000		
	3600	0.5	1000		

3.1.6 How To Show the Maintenance On a Calendar

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You can put marks on a calendar that work with the tables in Section 3.1.1 , page 11. The marks are the numbers 2, 3, 4, 5, and 6. It is not necessary to show the number 1 (items you do each day) on the calendar. The number 2 = items you do each 40 to 60 hours, 3 = each 200 hours, 4 = each 600 hours, 5 = each 1200 hours, and 6 = each 2400 hours. These are the "Mark" numbers at the top of the narrow columns on the left of each table in Section 3.1.1 , page 11.

The table below shows where to put the marks on a calendar. For example, if your machine operates between 41 and 60 hours each week, the first three marks are 2, 2, and 3. Put these marks on the first, second, and third weeks after the machine starts operation. If you do routine maintenance on a given day of the week, put the mark on that day of each week. Continue to put marks on the subsequent weeks. **It can be necessary to do the 40 to 60 hour (2) maintenance more than one time each week.** If the machine operates between 61 and 100 hours, put a 2 on two days of the week. If the machine operates 101 or more hours, put a 2 on three days of the week.

On each date with a 3, do the items with an x in the 3 or the 2 column of each table in Section 3.1.1 , page 11. On each date with a 4, do the items with an x in the 4, 3, or 2 column. Continue this pattern.

Table 11. Where to Put Marks On a Calendar

Hours / Week	Week Number																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Up to 40	2	2	2	2	3	2	2	2	2	3	2	2	2	2	4	2	2	2	2	3	2	2	2	2	3	2	2	2	2	5
41 - 60	2	2	3	2	2	2	3	2	2	4	2	2	3	2	2	2	3	2	2	5	2	2	3	2	2	2	3	2	2	4
61 - 80	2	2	3	2	3	2	4	2	2	3	2	2	3	2	5	2	3	2	2	3	2	4	2	2	3	2	2	3	2	6
81 - 100	2	3	2	3	2	4	2	3	2	3	2	5	2	3	2	3	2	4	2	3	2	3	2	6	repeat					
101 - 120	2	3	2	3	4	2	3	2	3	5	2	3	2	3	4	2	3	2	3	6	repeat									
121 - 140	2	3	2	3	4	3	2	3	5	2	3	2	3	4	3	2	3	6	repeat											

Hours / Week	Week Number, continued																													
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Up to 40	2	2	2	2	3	2	2	2	2	3	2	2	2	2	4	2	2	2	2	3	2	2	2	2	3	2	2	2	2	6
41 - 60	2	2	3	2	2	2	3	2	2	6	repeat																			

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3.2 Maintenance Components—Machines and Controls Group

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3.2.1 Inverters

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CAUTION: **Insufficient airflow** — will cause the inverter to burn out.

- Keep fans, filter, vents, and braking resistors clean.

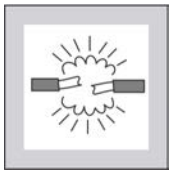
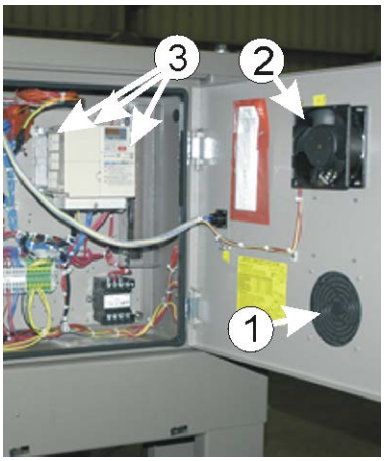
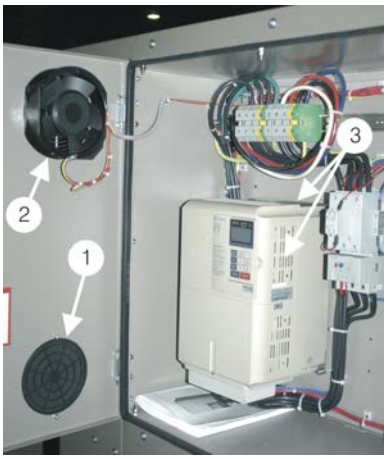
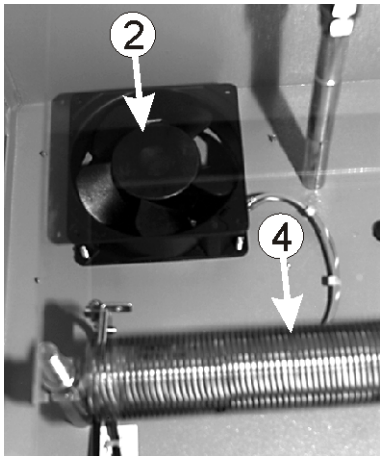


Figure 3. Electric Box and Inverter. These are examples. Your machine can look different.

30022X_ Washer-extractor	48040F_ Washer-extractor	76039 CBW® Tunnel Washer
		

Legend

1 . . . Air filter
2 . . . Fan on electric box door. Tip: Put streamers in front of the fan to make sure the fan operates.
3 . . . Inverter cooling vanes and vents. See caution statement below.
4 . . . Braking resistor, if applicable

3.2.2 How to Examine Compressed Air Mechanisms

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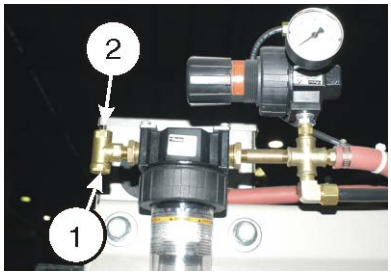
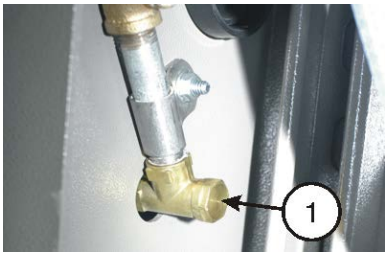
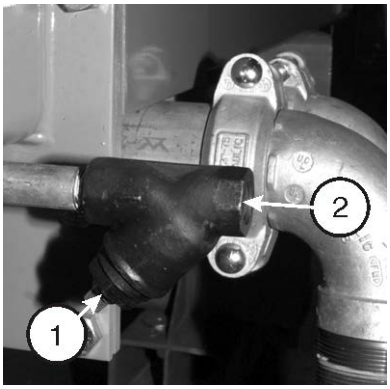
CAUTION: **Compressed air pressure —** can cause components to fly apart forcefully.

▶ Close the external shutoff valve and release remaining pressure before you do maintenance.

Figure 4. Compressed Air Inlet Strainers. These are examples. Your machine can look different.

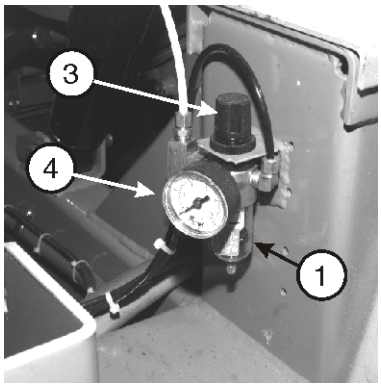
T-Strainer. Outside machine frame on some models.	T-Strainer. Inside machine frame on some models.	Y-strainer. Used on some models
		

Legend

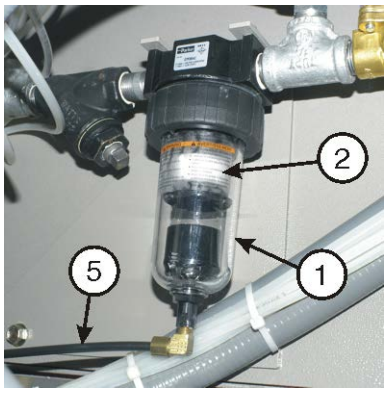
1 . . . See caution statement below. Remove plug to remove strainer.
2 . . . Compressed air in.

Figure 5. Self-purging Air Line Filter to Remove Moisture and Other Contamination. These are examples. Your machine can look different.

Filter/regulator—68036F5N Washer-extractor



Filter—5040TG2_ Dryer



Legend

1 . . . Filter bowl. See caution statement below. Do maintenance if water does not drain automatically.

2 . . . Filter element

3 . . . Pressure adjustment knob

4 . . . Air pressure gauge

5 . . . Drain tube

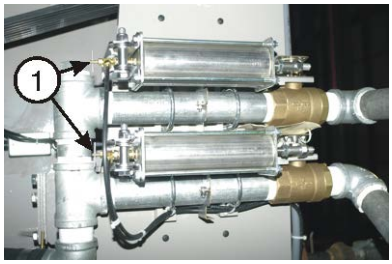
Your machine has one or more mechanisms that use compressed air for movement. Figure 6, page 23 shows some examples. See the related figure in document BNVUUH01. To examine a compressed air mechanism, look at the mechanism and listen to it in operation. **Do not touch the mechanism or put your hand in the machine.** Usually you can see movement directly or on a position indicator. Frequently, you can hear a valve open and close. When a signal from the controller to operate the mechanism occurs, the air pressure must increase sufficiently before movement occurs. When the signal stops, the system must release the compressed air. You can usually hear the sound of the exhaust air for a short time.

When a compressed air mechanism operates correctly, its time of movement is usually less than two seconds. The movement is smooth. It does not shake, change speed, or stop in the middle of travel. A mechanism that does not operate correctly will cause unsatisfactory performance. If the mechanism does not operate correctly and you cannot repair the problem, speak to your dealer or Milnor®. Possible causes are as follows:

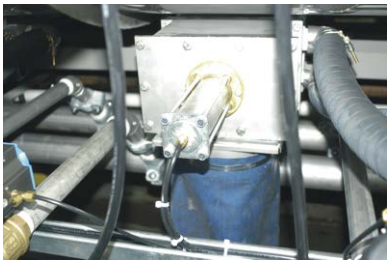
- a blockage or a leak in the air tube,
- a worn pilot air valve,
- worn components in the mechanism,
- air pressure supplied to the machine is not sufficient,
- a component used to remove contamination from the air line is clogged,
- a quick exhaust valve or muffler is clogged,
- on machines with an air line lubricator, a malfunction or incorrect adjustment prevents sufficient lubrication.

Figure 6. Compressed Air Mechanisms These are examples. Your machine can look different.

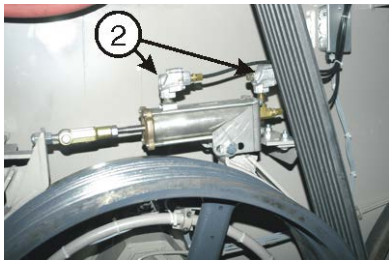
Air Operated Water Valves - Milnor® Air Cylinder Type



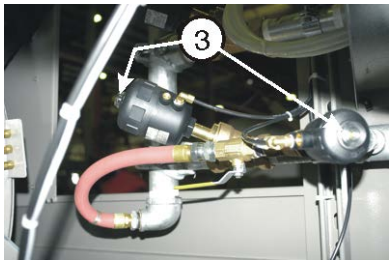
Air Operated Drain Valve - Milnor® Air Cylinder Type



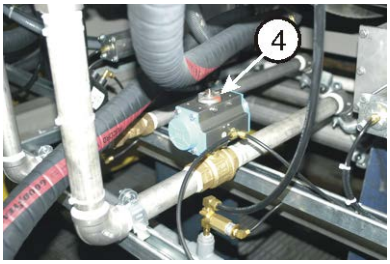
Air Operated Band Brake - Milnor® Air Cylinder Type



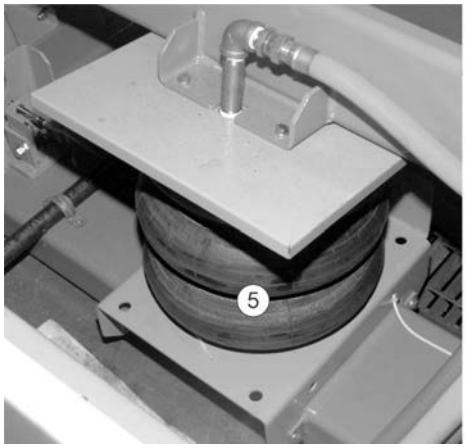
Air Operated Water and Steam Valves - Angle Type

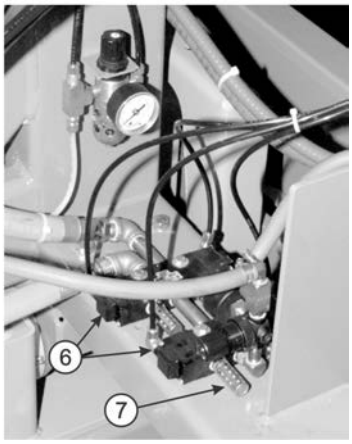


Air Operated Water Valve - Ball Valve Type



Air Tilt Components





Legend

1 . . . Factory-set needle valves to cause two air cylinders to move together. Do not adjust.
2 . . . Quick exhaust valves
3 . . . Position indicator. Yellow when valve is open.
4 . . . Arrow position indicator
5 . . . Tilt air bag
6 . . . Air valve
7 . . . muffler

3.2.3 Photoeyes and Proximity Switches

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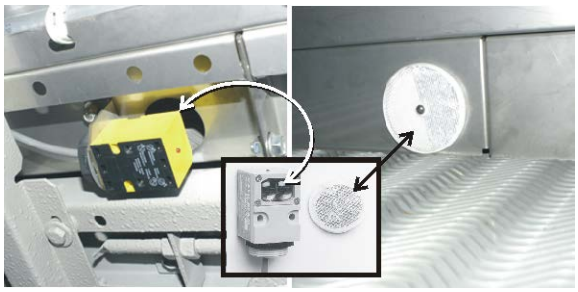
Figure 7. Photoeyes. These are examples. Your machine can look different.

Photoeye protected by a site glass, each side of the CBW® load chute

Photoeye and reflector on extractor discharge conveyor



Legend

→. . . Exposed surfaces that must be clean. Remove contamination with a soft cloth. If the surface is hard to reach, use a cloth on the end of a wood dowel or metal rod. If necessary, use a safe cleaning agent.

Figure 8. Proximity Switches These are examples. Your machine can look different.

1 Station Press

Centrifugal Extractor

Shuttle Conveyor

Typical Proximity Switch

Legend

→. . . Area that must be clean. Remove contamination with a soft cloth. If the area is hard to reach, use a cloth on the end of a wood dowel or metal rod. If necessary, use a safe cleaning agent.

3.2.4 How to Do a Test of Emergency Stop Mechanisms

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This test applies to machines that have one or more stop mechanisms in addition to the Stop button (⓪). Do this test at the intervals given in the maintenance summary.

Definitions:

3-wire circuit a series electrical circuit on a Milnor® machine that must close before the machine can operate. If a switch in the circuit opens, machine movement stops and the operator alarm (a buzzer and a display message) comes on. When you push the start button (①), this closes the 3-wire circuit, which stops the operator alarm and lets the machine operate.

emergency stop mechanism a manual control that opens the 3-wire circuit when a person or object operates the control. Examples - emergency stop button, kick plate, pull cord.

emergency stop button a red push button on a yellow field that locks when a person pushes it (the electrical contacts stay open). It is necessary to turn the button clockwise to unlock it. A machine can have zero or more emergency stop buttons.

kick plate a metal plate on a shuttle conveyor that operates a switch when an object applies sufficient force to the plate. The kick plate is usually the first component of the shuttle to hit an object in the shuttle path. All Milnor® shuttles that go left/right on a path have kick plates on the two sides of the machine.

WARNING: — You can be killed or severely injured if a shuttle strikes you even if you come in contact with the kick plate first.

- Never do a test of the kick plate when the shuttle operates.

pull cord a wire on a conveyor that operates a switch when a person pulls the wire. All Milnor® free-stand conveyors (a conveyor that is not a component of a larger machine) have pull cords on the two sides of the conveyor.

Do a test of all emergency stop mechanisms on the machine as follows:

1. Apply power to the machine (⏲).
2. Push the start button (①). **Do not cause the machine to operate.** For example, do not start a formula or operate the machine manually. It is not necessary to do the test when the machine operates.
3. Operate an emergency stop mechanism (examples - button, kick plate, pull cord). If the mechanism operates correctly, the operator alarm comes on. Did this occur?
   - Yes—Release the emergency stop mechanism if necessary. For example, if this is an emergency stop button, turn the button clockwise to unlock it. Push the start button (①). Do the test on a different emergency stop mechanism. Continue until you do the test on all emergency stop mechanisms on the machine.
   - No—An electrical component is defective. Shut down the machine. Do not let the machine operate until you correct the problem.

3.2.5 How to Do a Test of a Perimeter Safe-guarding System

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This test applies to machines that must have perimeter safe-guarding. Do this test at the intervals given in the maintenance summary.

Definitions:

perimeter safe-guarding system a system that causes the movement of machines to stop if a person goes in the perimeter. This area includes the full shuttle path. A typical system is a fence with gates that have gate interlock switches. If a gate opens, the 3-wire circuits on the machines open.

machines that must have perimeter safe-guarding Milnor® 1- and 2-station presses, centrifugal extractors, elevators, and shuttles. These types of machines have an electrical connection

point to add external switches (example - gate interlock switches) to the machine's 3-wire circuit.

other machines that can be in the perimeter tunnel washers, dryers, and conveyors. Often, these types of machines are also enclosed because of the laundering system layout.

General rules:

- Know which machines to include in the test (machines that must have perimeter safe-guarding) and which machines to not include (other machines that can be in the perimeter).
- Do the test when the laundering system is not in operation.

Do a test of all gates as follows:

1. Make sure that all gates are closed.
2. On all machines that are in the test, apply power (⏲) and push the start button (①).
3. Open a gate. If the circuit operates correctly, the operator alarms on all machines come on. Did this occur?
   - **Yes**—Close this gate. On all machines, push the start button (①). Open a different gate. Continue until you do the test on all gates.
   - **No**—An electrical component is defective. Shut down the laundering system. Do not let the system operate until you correct the problem.

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3.3 Maintenance Components—Conveyor and Shuttle Group

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Figure 9. Grease Ports for End Roller Bearings. These are examples. Your machine can look different. All conveyor belts have four end roller bearings with grease ports.

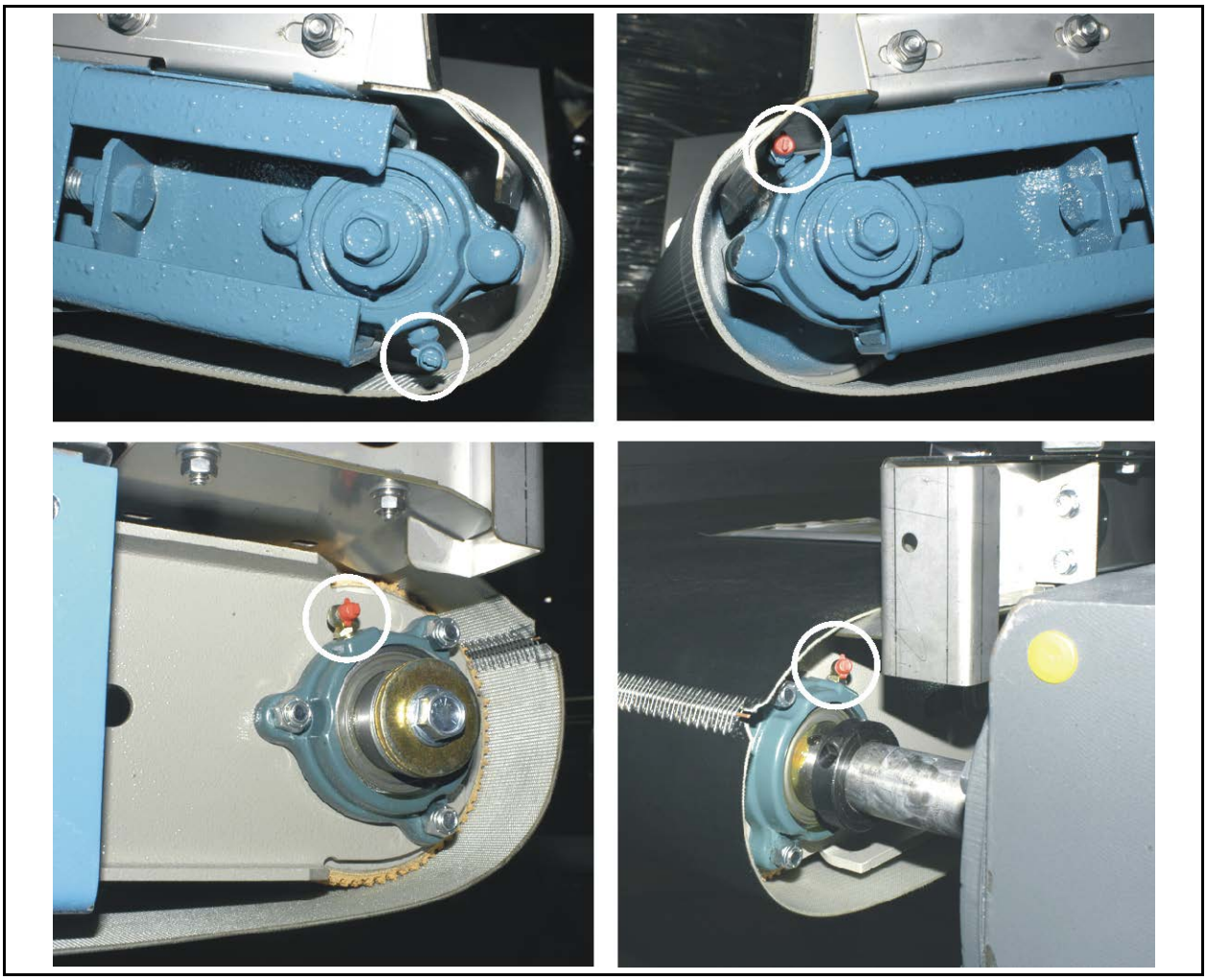
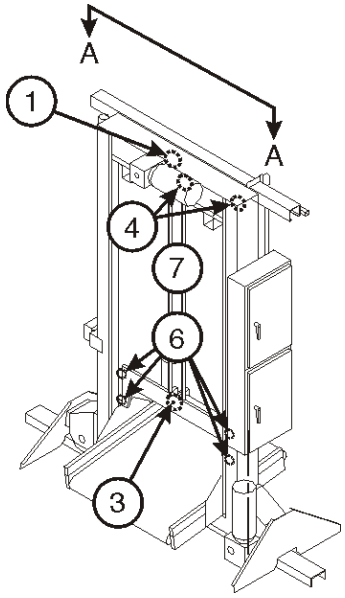
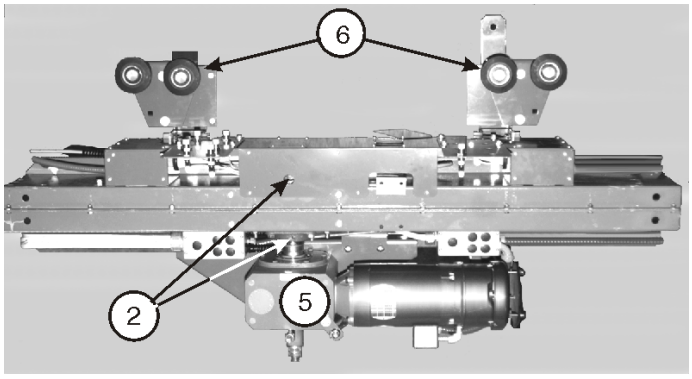


Figure 10. Elevator Maintenance—Milnor® Hoist

Shuttle with Milnor® Hoist



View A-A



Legend

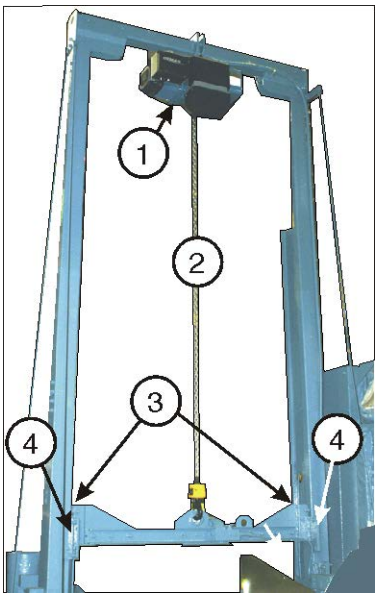
1 . . . Hoist sprocket. See Item 2.
2 . . . Grease ports for sprocket shaft bearings
3 . . . Grease port for idler pulley
4 . . . Plastic idler pulleys. No grease maintenance.
5 . . . Sealed speed reducer. No oil maintenance.
6 . . . Guide rollers. No grease maintenance.
7 . . . Chain. See warning statement below.

WARNING: **Chain release and fall** — will occur if you continue to operate the hoist motor after the bed is at the bottom of the machine.

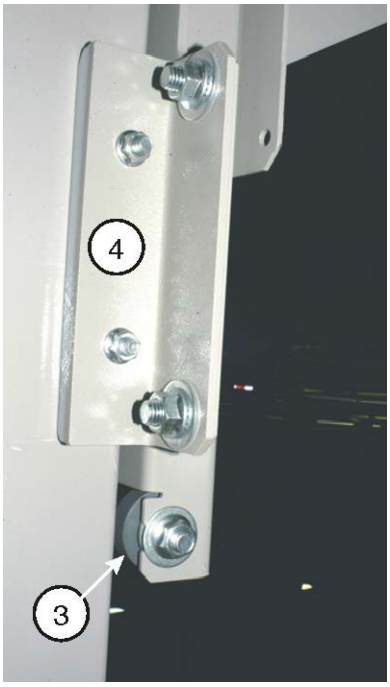
- Make sure all personnel are away from the machine when you manually operate it.
- When you lower the bed to apply lubricant to the chain, stop when the bed is at the bottom of the machine.

Figure 11. Elevator Maintenance—Demag Hoist

Shuttle with Demag Hoist



Lower Slide and Guide Wheel



See Item 5

Legend

1 . . . Demag hoist.

2 . . . Chain. Maintenance summary tells quantity.

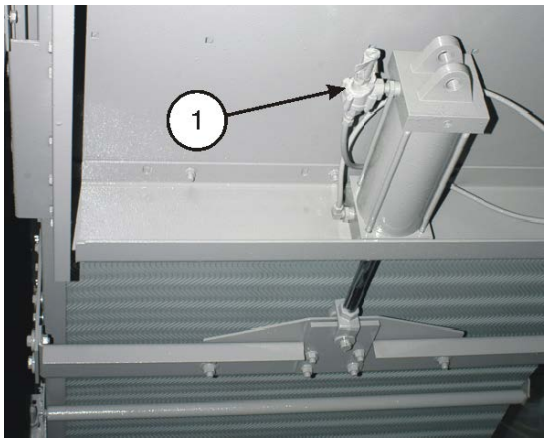
3 . . . Guide rollers. No grease maintenance

4 . . . Plastic slides

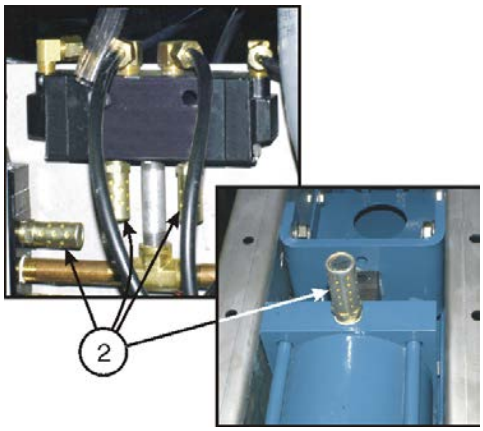
5 . . . Demag manual and grease supplied with machine

Figure 12. Compressed Air Mechanisms on Wet Goods Shuttles and Some Loose Goods Shuttles.

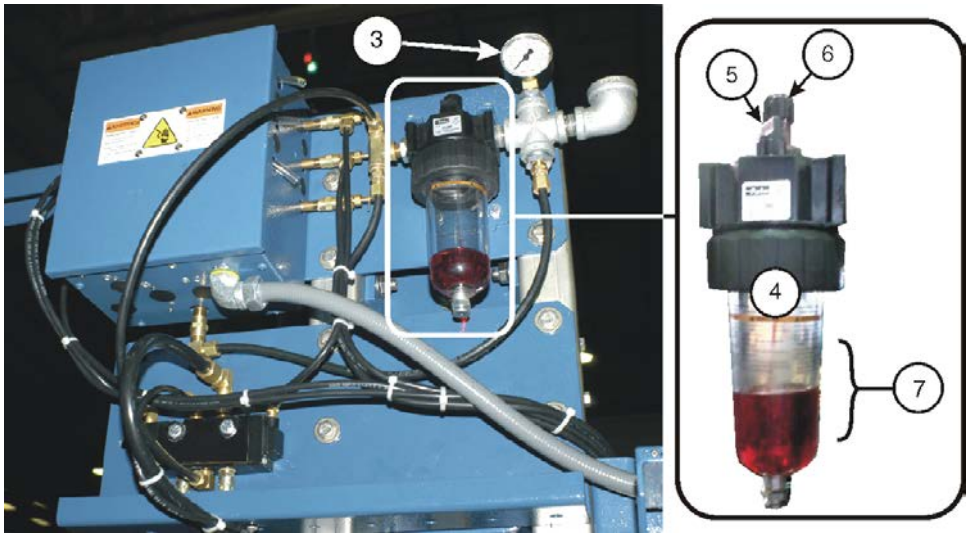
Example of an Extend Air Cylinder



Examples of Components with Mufflers



Air Line Lubricator Maintenance



Legend

1 . . . Keep quick exhaust valves clean.

2 . . . Keep mufflers clean.

3 . . . Air pressure gauge. Pressure given in the maintenance summary is necessary for correct operation.

4 . . . Air line lubricator. See the related table in document BNUUUH01 for oil type.

5 . . . Oil fill port. Open slowly.

6 . . . Site glass and oil adjustment knob. The oil flow is set at the factory but field adjustment can be necessary. If oil comes out of mufflers and other air exhaust ports, oil flow is too high. If you see no oil in the site glass, oil flow is too low. Turn knob clockwise for less oil and counterclockwise for more oil. Make small (1/8 turn) adjustments. When oil flow is correct, it will not be necessary to add oil for a year or more.

7 . . . Keep oil level in this range.

3.3.1 How to Adjust Conveyor Belt Tension and Prevent Side Movement

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This instruction is for conveyor belts in flat bed conveyors, CBW® load conveyors, extractor conveyors, and pivot conveyors. It is also for belts in shuttles and elevators. But shuttle and elevator belts have a bead in the center of the belt that goes in a groove in the end rollers. This causes the belt to stay in the center of the bed unless an incorrect condition is very bad.

A conveyor belt refers to one belt loop and two end rollers. Many machines have more than one conveyor belt. The conveyor belts can be one above the other or in a line.

A belt must have sufficient tension that there is no slippage on the rollers when it has a full load. In time the belt length will increase because of operation. It can become necessary to adjust the position of the rollers to put more tension on the belt. When this occurs, it is also necessary to adjust the rollers to keep the belt at the center of the bed.

If a conveyor belt starts to move away from the center of the bed, do not adjust the rollers first. This can make the condition worse. Look for the cause of the incorrect condition. Some possible causes are:

- a piece of goods wound around a roller
- a damaged belt
- a twisted conveyor bed (for example, the conveyor legs do not give equal support)

If you replaced conveyor belt components, some other possible causes are:

- The ends of the belt that attach together are not cut straight or they are not perpendicular to the belt centerline.
- Brackets that were removed (example: idler roller brackets) were not attached at the same position on each side of the bed.

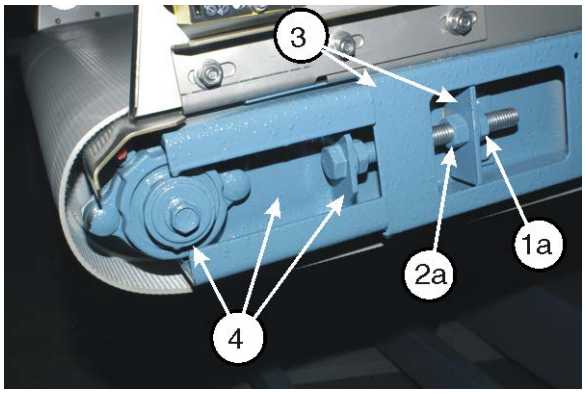
If there are no other causes and the belt continues to move away from the center of the bed, adjust the rollers. The rules of belt adjustment to prevent side movement are:

- The belt will move to the loose side (the side with less belt tension).
- The best condition is when the two end rollers are perpendicular to the bed centerline.
- Make small adjustments. Adjust the two sides of the roller to keep the tension at the center of the belt the same. (Increase tension on one side and decrease tension on the other side.)
- Some belts go in the two directions at different times when the machine operates automatically. It is not necessary to get the belt to stay in the center of the bed in the two directions, only in the primary direction.

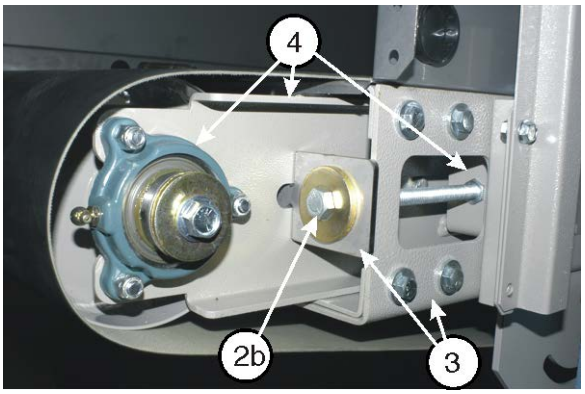
Before you adjust belt tension, examine the tension mechanisms on your machine and know how they operate. Figure 13, page 32 shows some typical mechanisms, but these are not the only ones that you will find on Milnor® conveyor belts.

Figure 13. Conveyor Belt Tension Adjustment. These are examples. Your machine can look different.

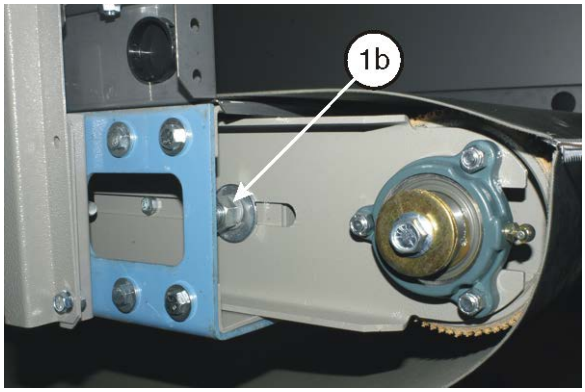
A Mechanism on a Shuttle



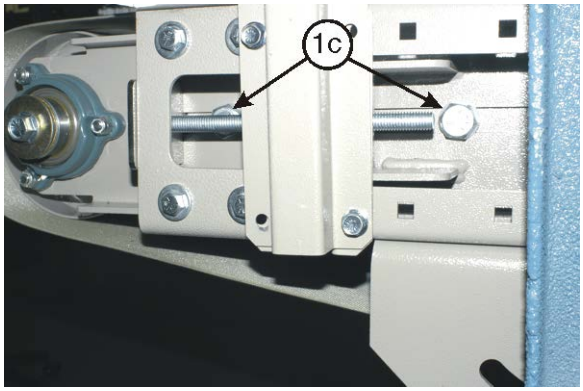
A Mechanism on a Conveyor



The Motor End of a Conveyor



The Non-motor End of a Conveyor



Legend

1... Examples of components that hold the bearing bracket in its position after adjustment
1a.. Hex nut. Loosen and move away from bracket before adjustment. Tighten after adjustment.
1b.. Bolt, lock washer, and flat washer. Loosen this bolt before adjustment. Tighten after adjustment.
1c.. Bolts with nylon washers. Do not loosen or tighten these bolts for adjustment.
2... Examples of components that you turn to adjust belt tension
2a.. Hex nut. Turn clockwise to increase belt tension. The bolt pushes the bearing bracket.
2b.. Hex head of bolt. Turn clockwise to increase belt tension. The bolt pulls the bearing bracket.
3... Components of the bed. The bed does not move.
4... Components of the bearing bracket assembly. The bearing bracket assembly moves.

3.3.2 Elevator Malfunctions That You Can Possibly Correct Immediately

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Crush and fall hazards —

- Use a suitable, self-supporting platform when you do work on shuttle components.
- Do not stand or ride on the shuttle bed. Use the safety pins.
- Keep away from the machine when it operates manually or automatically.

Given here are conditions caused by mechanical malfunctions that you can possibly correct without replacement parts. Speak to your dealer or Milnor® if you cannot identify the cause or correct the condition. Speak to your dealer or Milnor® if you do not have safe equipment to do maintenance at the necessary height.

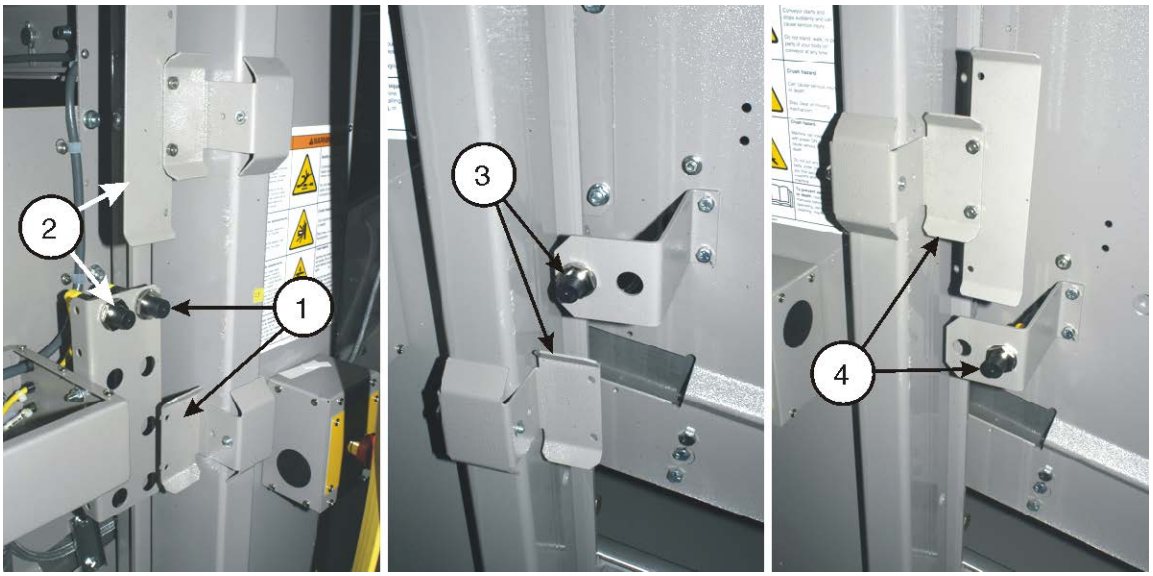
Bed assembly goes to top limit of travel and stops On machines with the Milnor® hoist, a *taut chain* error occurs. On machines with the Demag hoist, no error occurs, but the machine can stop operation. **Cause:** The controller looked for a level (load or discharge) and the proximity switch for that level did not find a target. **Components to examine:** It is possible that the proximity switch and target are not aligned. See Figure 14, page 34. When the switch is behind the target, the correct clearance is approximately 5/16 inch (8 mm). If the clearance is different each time that the photoeye goes behind the target, examine the bed assembly and frame for damage. The bed assembly can have too much side-to-side movement in the frame. See the condition that follows. **Recovery:** See the data in the dryer/shuttle operator guide for the *taut chain* error.

Bed assembly stops in the middle of travel On machines with the Milnor® hoist, a *taut chain* error occurs. On machines with the Demag hoist, the slip clutch disengages the hoist motor when the chain tension is more than the hoist maximum capacity. **Cause:** The bed assembly twisted in the frame. **Components to examine:** One or more components of the bed assembly (example: a guide roller) are damaged or bent. **Recovery:** See the data in the dryer/shuttle operator guide for the *taut chain* error.

The bed goes down by gravity This condition usually prevents transfer which will cause an error that stops operation. **Cause:** Too much weight is on the bed. This condition can also occur if the brake pads in the hoist motor are worn (usually as a result of too heavy loads). **Components to examine:** Load weight. If the bed goes down with the correct load weight, it is necessary to adjust or replace the brake pads. Speak to your dealer or Milnor®. This is not routine maintenance. **Recovery:** See the data in the dryer/shuttle operator guide for the error that occurred.

Figure 14. Elevator Proximity Switches and Targets

Switch and Target Types (not applicable to optional level counting)



Legend

1 . . . Proximity switch and target for primary load level. On most Milnor® machines, a separate proximity switch is necessary for each load or discharge level. On machines with optional *level counting,* one proximity switch detects all load and discharge levels (targets).

2 . . . Proximity switch and target for primary discharge level.

3 . . . Proximity switch and target for one more load level.

4 . . . Proximity switch and target for one more discharge level.