



Published Manual Number/ECN: MKWHNH01U1/2022076A

- Publishing System: TPAS2
- Access date: 02/11/2022
- Document ECNs: Latest

# 48040M7K, 68036M5K and 72045MK5



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



# **MKWHNH01U1/22076A**

## **1. English**

Maintenance Guide - Washer-extractor, Bottom-suspended,  
Hydraulic Tilt, Manual Load, \_M5K, \_M7K

MKWHNH01EN/2021444



English

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Manual Number: MKWHNH01EN  
Edition (ECN): 2021444

# Maintenance Guide

## Washer-extractor, Bottom-suspended, Hydraulic Tilt, Manual Load, \_M5K, \_M7K



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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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Washer-extractors wash linen using water and non-volatile chemicals then remove excess water by centrifugal force. This washer-extractor is the mechanical type described below.

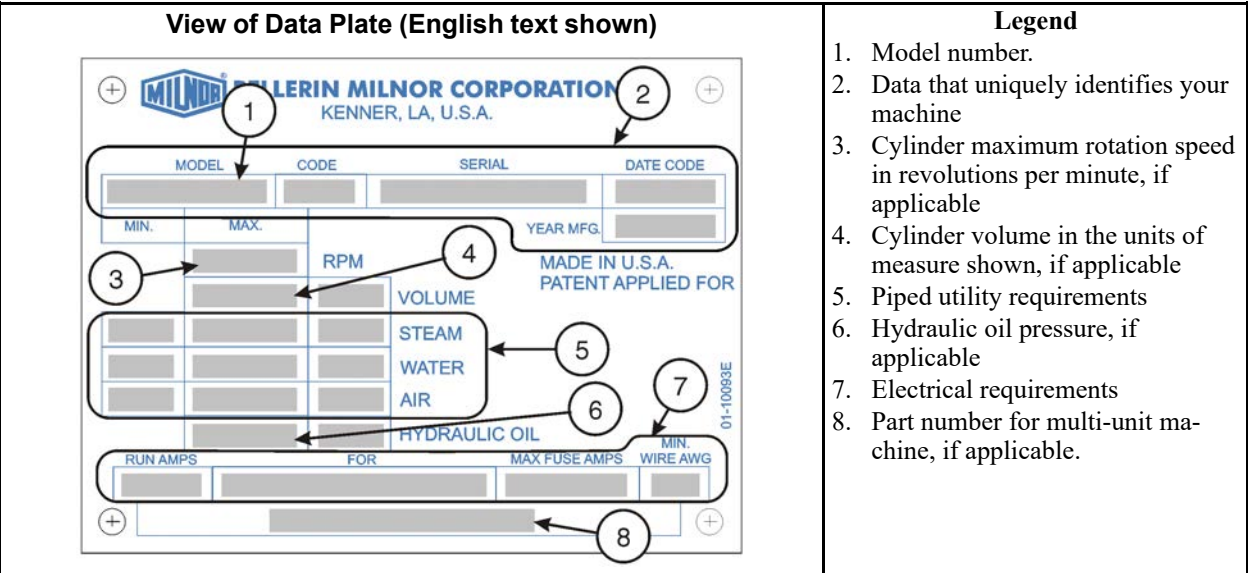
**\_M5K, \_M7K** A machine represented by one of these partial model numbers is a bottom-suspended (rubber springs), hydraulic tilt-to-load and unload washer-extractor with grease bearings and a mechanical (disc) brake. The capacity can be 275 lb (125 kg) to 700 lb (318 kg) depending on model.

### 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



## 2 Safety

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### 2.1 Tilting Washer Extractors

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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: Electrocutation 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.



**WARNING: Crush Hazards** — Tilting machines only—The machine housing will crush your body or limbs if it descends or falls while you are under it. Housing can descend with power off or on. Manual operation of tilting valves overrides safety interlocks. Improper operation of manual tilting valves may cause the housing to descend.



- ▶ Do not remove guards, covers, or panels.
- ▶ Do not reach into the machine housing or frame.

## 2.1.2 Safety Alert Messages—Cylinder and Processing Hazards

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The following are instructions about hazards related to the cylinder and laundering process.



**DANGER: Entangle and Sever Hazards** — Contact with goods being processed can cause the goods to wrap around your body or limbs and dismember you. The goods are normally isolated by the locked cylinder door.



- ▶ Do not attempt to open the door or reach into the cylinder until the cylinder is stopped.
- ▶ Do not touch goods inside or hanging partially outside the turning cylinder.

- ▶ Do not operate the machine with a malfunctioning door interlock.
- ▶ Open pocket machines only—Do not jog the cylinder and pull the goods at the same time.
- ▶ Open pocket machines only—Keep yourself and others clear of cylinder and goods during jogging operation.
- ▶ Do not operate the machine with malfunctioning two-hand manual controls.
- ▶ 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.



**WARNING: Crush Hazards** — Contact with the turning cylinder can crush your limbs. The cylinder will repel any object you try to stop it with, possibly causing the object to strike or stab you. The turning cylinder is normally isolated by the locked cylinder door.



- ▶ Do not attempt to open the door or reach into the cylinder until the cylinder is stopped.

- ▶ Do not place any object in the turning cylinder.
- ▶ Do not operate the machine with a malfunctioning door interlock.
- ▶ Open pocket machines only—Keep yourself and others clear of cylinder and goods during jogging operation.
- ▶ Do not operate the machine with malfunctioning two-hand manual controls.



**WARNING: Confined Space Hazards** — Confinement in the cylinder can kill or injure you. Hazards include but are not limited to panic, burns, poisoning, suffocation, heat prostration, biological contamination, electrocution, and crushing.



- ▶ Do not attempt unauthorized servicing, repairs, or modification.



**WARNING: Explosion and Fire Hazards** — Flammable substances can explode or ignite in the cylinder, drain trough, or sewer. The machine is designed for washing with water, not any other solvent. Processing can cause solvent-containing goods to give off flammable vapors.



- ▶ Do not use flammable solvents in processing.
- ▶ Do not process goods containing flammable substances. Consult with your local fire department/public safety office and all insurance providers.

## 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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**DANGER: Entangle and Sever Hazards** — Cylinder door interlock—Operating the machine with a malfunctioning door interlock can permit opening the door when the cylinder is turning and/or starting the cycle with the door open, exposing the turning cylinder.



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

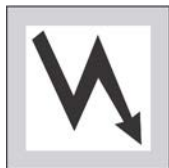


**WARNING: Multiple Hazards** — Operating the machine with an inoperative safety device can kill or injure personnel, damage or destroy the machine, damage property, and/or void the warranty.

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



**WARNING: Electrocutation 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.



**WARNING: Crush Hazards** — Down limit switches (machines with front and rear tilt cylinders)—Failure of both front or both rear limit switches allows the seated tilt wheels on a tilted machine to lift from their cradles. The housing will fall and lunge forward or rearward.

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

#### 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: Explosion Hazards** — Cylinder—A damaged cylinder can rip apart during extraction, puncturing the shell and discharging metal fragments at high speed.



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



**WARNING: Explosion Hazards** — Clutch and speed switch (multiple motor machines)—A damaged clutch or speed switch can permit the low speed motor to engage during extract. This will over-speed the motor and pulleys and can cause them to rip apart, discharging metal fragments at high speed.



- ▶ Stop the machine immediately if any of these conditions occur: • abnormal whining sound during extract • skidding sound as extract ends • clutches remain engaged or re-engage during extract

#### 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.

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

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**WARNING: Electrocuting 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 Hazards** — Tilting machines only—The machine housing will crush your body or limbs if it descends or falls while you are under it. Housing can descend with power off or on. Manual operation of tilting valves overrides safety interlocks. Improper operation of manual tilting valves may cause the housing to descend.



- ▶ Secure both red safety supports in accordance with the instructions furnished, then lock out and tag out power at the main machine disconnect before working under the tilted machine.
- ▶ Do not operate the manual tilt valves with anyone under the machine.
- ▶ Do not operate the tilt controls with anyone under the machine.



**WARNING: Crush Hazards** — Tilting machines with front and rear tilt cylinders—The housing will fall and lunge forward or rearward if the tilt wheels on the non-tilted end lift out of their cradles, even with safety supports in place.

- ▶ Understand the consequences of operating manually.



**WARNING: Confined Space Hazards** — Confinement in the cylinder can kill or injure you. Hazards include but are not limited to panic, burns, poisoning, suffocation, heat prostration, biological contamination, electrocution, and crushing.



- ▶ Do not enter the cylinder until it has been thoroughly purged, flushed, drained, cooled, and immobilized.

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## 2.2 Use the Red Safety Supports for Maintenance — 48040M7K, 68036M5K, 72044M5K

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### 2.2.1 What Safety Supports are Provided and Why

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These machines are provided with two, permanently attached safety stands that can be folded down from within a channel on the shell (drum) when the machine is in the wash position. If the machine has a load chute for automatic loading, it is also provided with a safety bar that can be inserted when the load chute is raised. The safety supports provide protection against the drifting down of the vertically moving portion of the machine during maintenance in the event of a leak in the hydraulic system. They are not intended to restrain the machine from coming down under power. 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

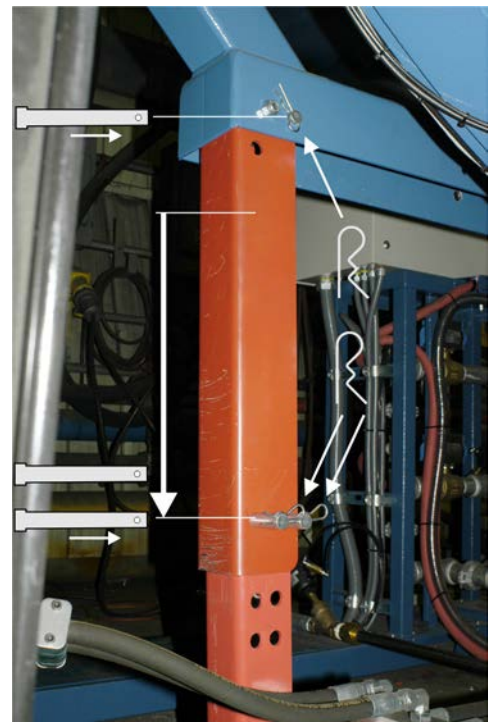
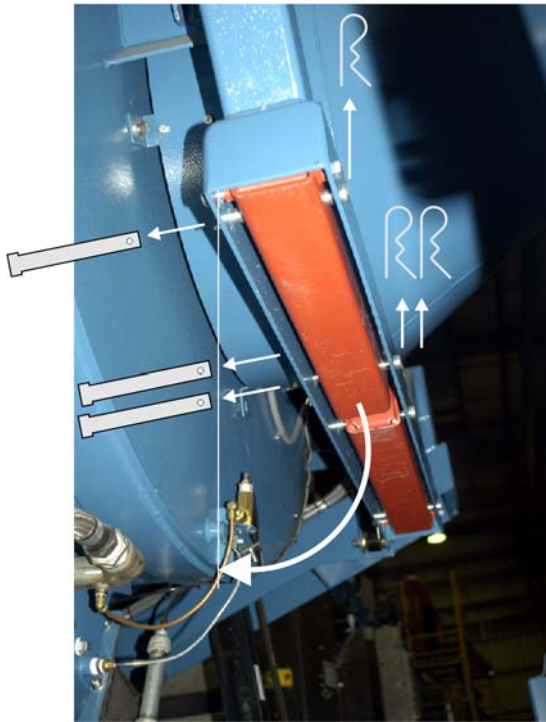
deployed.

- ▶ 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 Stands — 68036M5K, 72044M5K

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1. Use the Manual mode to put the machine in the wash position (shell is horizontal).
2. Remove the clevis pins and allow the stands to pivot down completely. See the illustration below left.

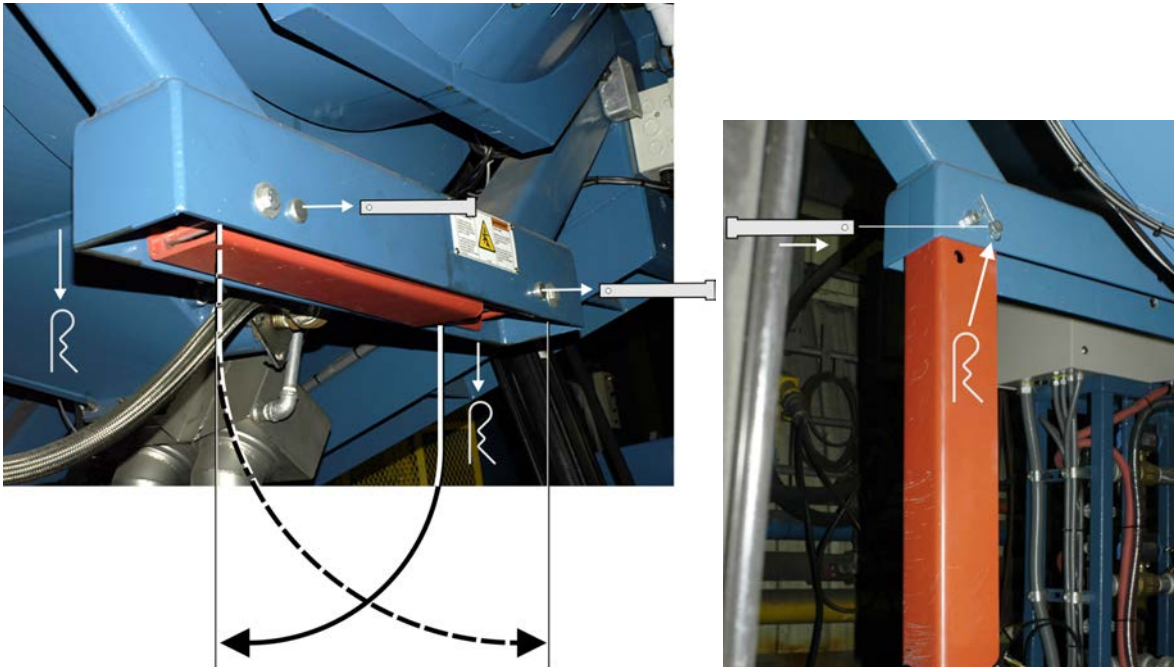


3. Extend the legs, insert the clevis pins and secure them with the cotter pins. See the illustration above right.
4. Remove electric power from the machine.

### 2.2.3 How To Deploy the Safety Stands — 48040M7K

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1. Use the Manual mode to put the machine in the wash position (shell is horizontal).
2. Remove the clevis pins and allow the stands to pivot down completely. See the illustration below left.

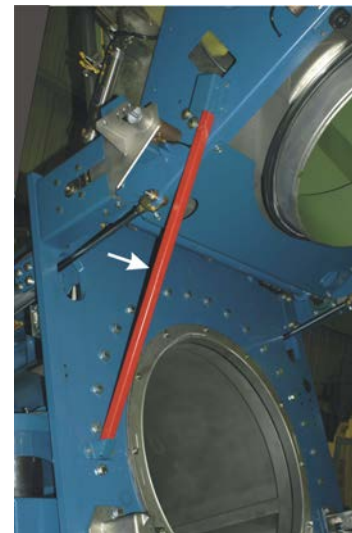


3. Insert the clevis pins and secure them with the cotter pins. See the illustration above right.
4. Remove electric power from the machine.

### 2.2.4 How to Deploy the Load Chute Safety Bar

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1. Use the Manual mode to raise the load chute completely.
2. See the illustration at right. Insert one end of the safety bar in the holding bracket on the load chute, then the other end in the bracket on the front of the machine.
3. Remove electric power from the machine.



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## 2.3 Prevent Damage from Chemical Supplies and Chemical Systems

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All Milnor® washer-extractors and CBW® tunnel washers use stainless steel with the ANSI 304 specification. This material gives good performance when chemical supplies are correctly applied. If chemical supplies are incorrectly applied, this material can be damaged. The damage can be very bad and it can occur quickly.

Chemical supply companies usually:

- supply chemical pump systems that put the supplies in the machine,
- connect the chemical pump system to the machine,
- write wash formulas that control the chemical concentrations.

The company that does these procedures must make sure that these procedures do not cause damage. **Pellerin Milnor Corporation accepts no responsibility for chemical damage to the machines it makes or to the goods in a machine.**

### 2.3.1 How Chemical Supplies Can Cause Damage

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**Dangerous Chemical Supplies and Wash Formulas** — Some examples that can cause damage are:

- a very high concentration of chlorine bleach,
- a mixture of acid sour and hypo chlorite,
- chemical supplies (examples: chlorine bleach, hydrofluosilicic acid) that stay on the stainless steel because they are not quickly flushed with water.

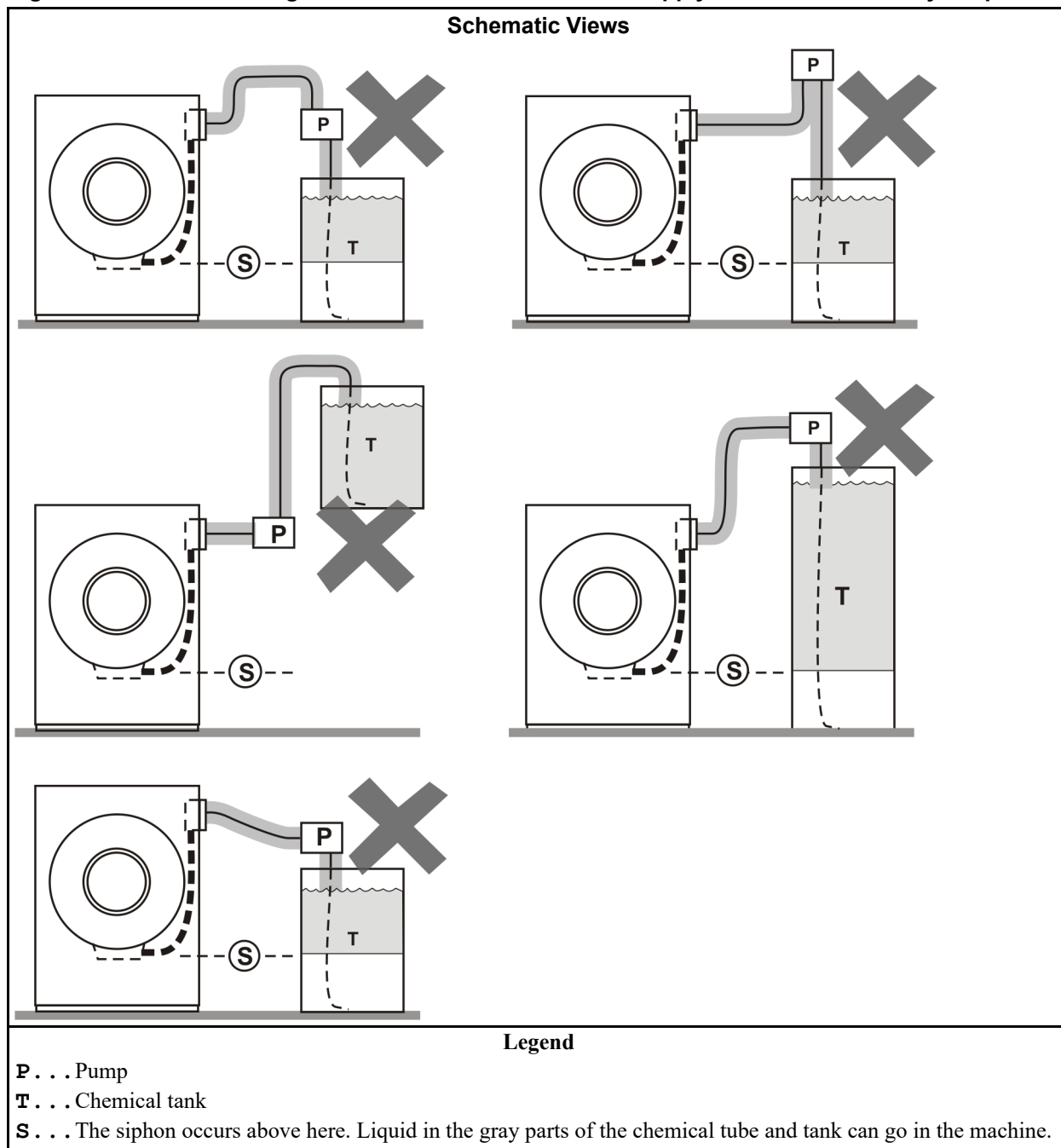
The book “Textile Laundering Technology” by Charles L. Riggs gives data about correct chemical supplies and formulas.

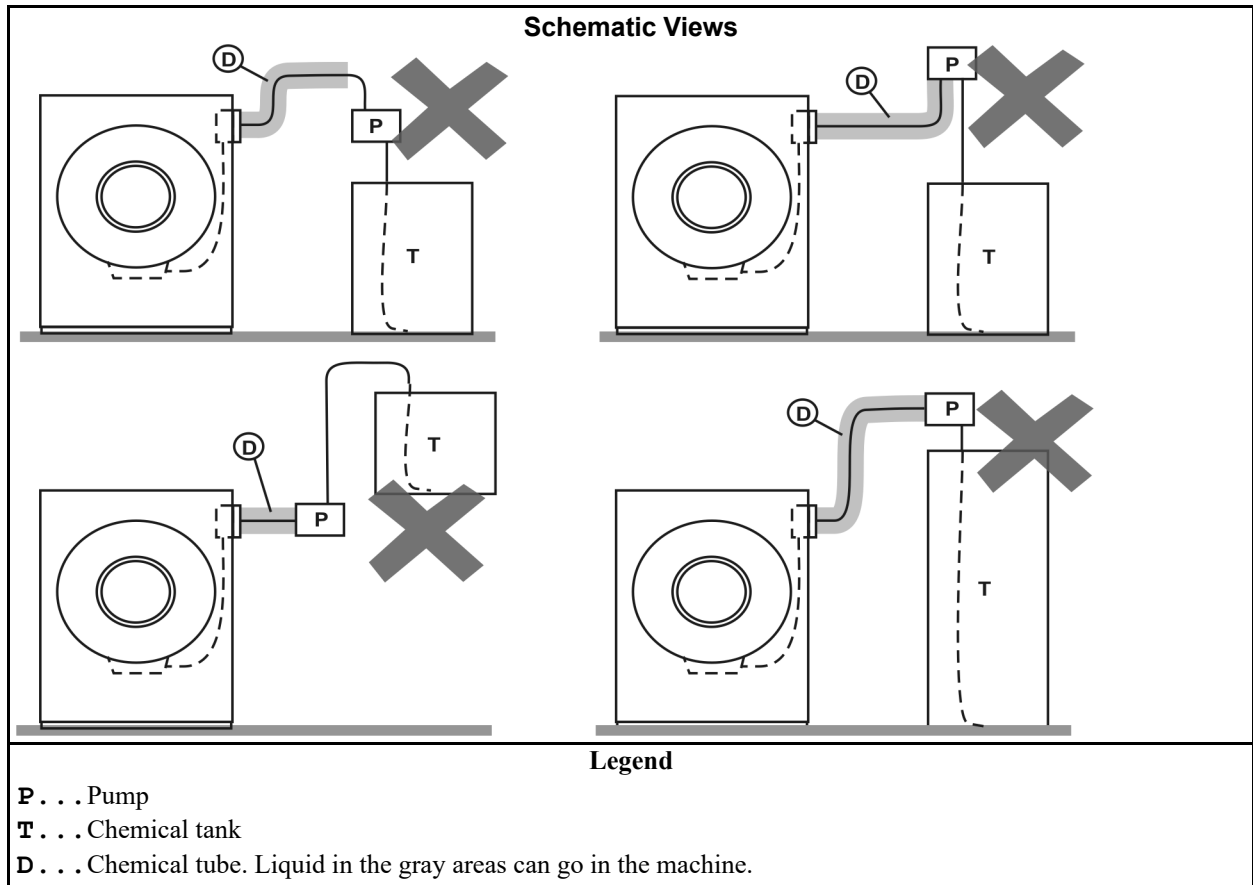
**Incorrect Configuration or Connection of Equipment** — Many chemical systems:

- do not prevent a vacuum in the chemical tube (for example, with a vacuum breaker) when the pump is off,
- do not prevent flow (for example, with a valve) where the chemical tube goes in the machine.

Damage will occur if a chemical supply can go in the machine when the chemical system is off. Some configurations of components can let the chemical supplies go in the machine by a siphon ([Figure 2, page 14](#)). Some can let chemical supplies go in the machine by gravity ([Figure 3, page 15](#)).

**Figure 2. Incorrect Configurations That Let the Chemical Supply Go In the Machine by a Siphon**

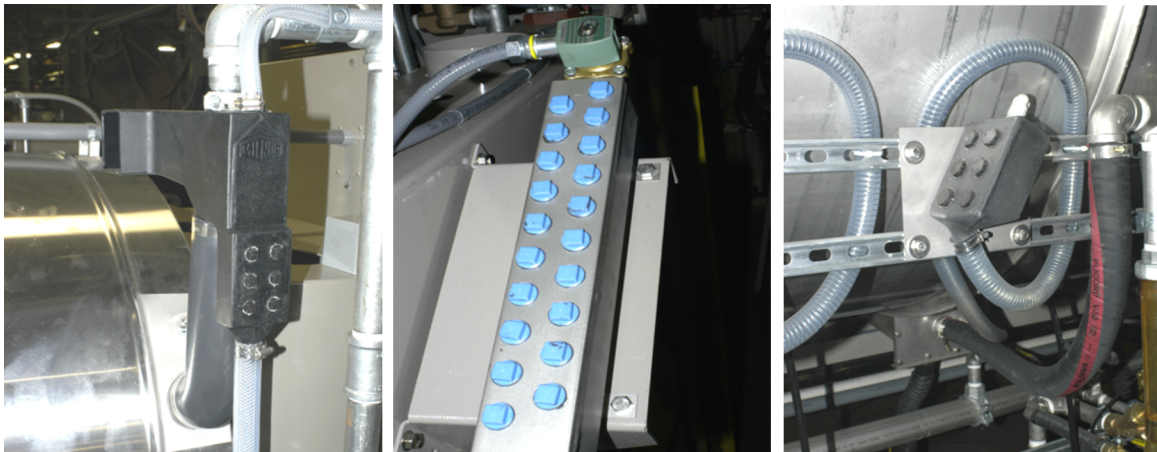


**Figure 3. Incorrect Configurations That Let the Chemical Supply Go In the Machine by Gravity**

## 2.3.2 Equipment and Procedures That Can Prevent Damage

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**Use the chemical manifold supplied.** — There is a manifold on the machine to attach chemical tubes from a chemical pump system. The manifold has a source of water to flush the chemical supplies with water.

**Figure 4. Examples of Manifolds for Chemical Tubes. Your equipment can look different.**

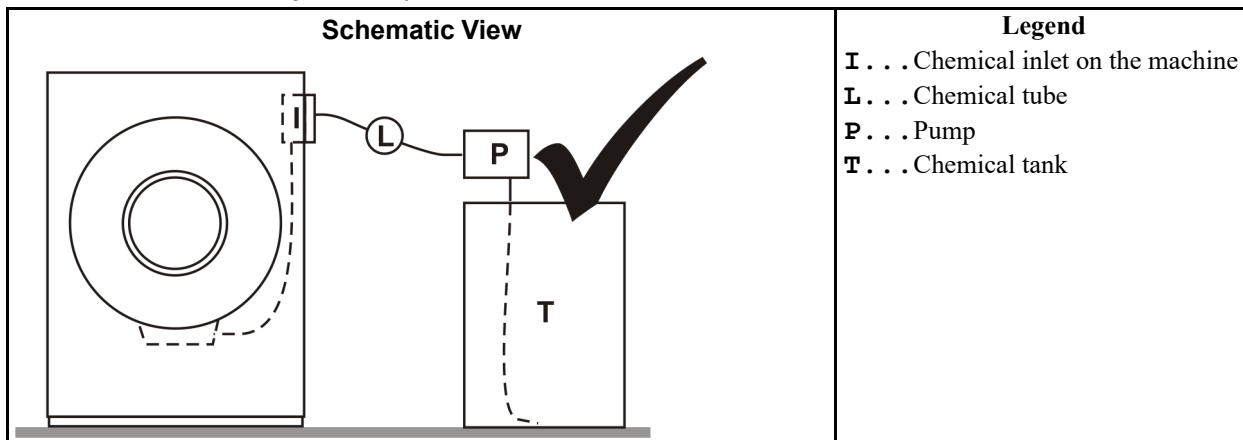
**Close the line.** — If the pump does not always close the line when it is off, use a shutoff valve to do this.

**Do not let a vacuum occur.** — Supply a vacuum breaker in the chemical line that is higher than the full level of the tank.

**Flush the chemical tube with water.** — If the liquid that stays in the tube between the pump and the machine can flow in the machine, flush the tube with water after the pump stops.

**Put the chemical tube fully below the inlet.** — It is also necessary that there is no pressure in the chemical tube or tank when the system is off.

**Figure 5. A Configuration that Prevents Flow in the Machine When the Pump is Off (if the chemical tube and tank have no pressure)**



**Prevent leaks.** — When you do maintenance on the chemical pump system:

- Use the correct components.
- Make sure that all connections are the correct fit.
- Make sure that all connections are tight.

# 3 Routine Maintenance

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## 3.1 Routine Maintenance

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Do the maintenance in [Section 3.1.1 : Maintenance Summary, page 17](#) 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 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 3.1.7 : How To Show the Maintenance On a Calendar, page 26](#)

### 3.1.1 Maintenance Summary

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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*	door interlock	If the machine operates with the door open: <ul style="list-style-type: none"> <li>• Immediately remove power.</li> <li>• Do not permit operation.</li> <li>• Speak to your dealer or Milnor.</li> </ul>
x						day*	emergency stop button (optional on some washer-extractors)	See <a href="#">Section 3.2.7</a> , page 35. Do a test of the control.
			x			600 hours	mechanical brake	See <a href="#">Section 3.3.3</a> , page 38. Do a test of the mechanical brake. If it does not operate correctly, repairs are necessary. Speak to your dealer or Milnor. This is not routine maintenance.

### 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 <a href="#">Section 3.1.2</a> , page 21
1	2	3	4	5	6			
	x					40 to 60 hours	inverter fans, vents, filters	See <a href="#">Figure 9</a> , page 29. Keep good air flow.
			x			600 hours	motors	Keep good air flow.
					x	2400 hours	entire machine	Remove excessive dust and dirt.
x						day*	chemical inlet areas	Some chemical supplies that stay on machine surfaces will cause corrosion damage. See <a href="#">Section 3.2.3</a> , page 29 and <a href="#">Section 3.1.2</a> , page 21. See also, <a href="#">Section 2.3</a> , page 13 for background information.
x						day*	self-purging filter (and regulator) for compressed air	See <a href="#">Figure 16</a> , page 33. Make sure the bowl drains automatically.
		x				200 hours	filter element for the filter (and regulator)	Replace the filter if you cannot remove contamination.
				x		1200 hours	mufflers, quick exhaust valves	See <a href="#">Figure 17</a> , page 34

**Table 2 Filters, Screens, and Sensitive Components (cont'd.)**

Mark						Do this each	Component	More Data. See also <a href="#">Section 3.1.2</a> , <a href="#">page 21</a>
1	2	3	4	5	6			
		x				200 hours	strainer(s) for air inlet	See <a href="#">Figure 15, page 32</a>
					x	2400 hours	strainer in water regulator for optional supply injector and pumped chemicals on some models.	See <a href="#">Figure 11, page 30</a>
		x				200 hours	strainer for steam inlet. (Steam is optional on some models.)	See <a href="#">Figure 14, page 32</a>
		x				200 hours	speed sensor photoeye. Optional on some models.	See <a href="#">Figure 18, page 35</a>
					x	2400 hours	proximity switches	See <a href="#">Figure 19, page 35</a>
				x		1200 hours	oil filter for hydraulic tank	See <a href="#">Figure 25, page 41</a> . Replace the used with a new one. Speak to your dealer or Milnor.

### 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						Do this each	Component	More Data. See also <a href="#">Section 3.1.3 : Lubricant Identification, page 22</a>
1	2	3	4	5	6			
x						day*	hydraulic tank	See <a href="#">Figure 25, page 41</a> and <a href="#">Section 3.4.1</a> , <a href="#">page 41</a> . Examine the oil level and temperature. Add oil 68 ( <a href="#">Section 3.4.1</a> , <a href="#">page 41</a> ) if necessary. If the temperature is higher than 130° F (54° C) or the oil is contaminated, maintenance can be necessary. Speak to your dealer or Milnor.
			x			600 hours		See <a href="#">Section 3.4.2</a> , <a href="#">page 42</a> . Examine the oil for contamination. Remove the used oil from the tank and add oil 68 ( <a href="#">Table 9, page 23</a> ) if necessary.
					x	2400 hours		Remove used oil from the tank. Add oil 68 ( <a href="#">Table 9, page 23</a> ).
		x				200 hours	Disc brake reservoir	See <a href="#">Figure 23, page 39</a> . Examine the oil level and quality. Add oil Dot3 ( <a href="#">Table 9, page 23</a> ) if necessary. If the oil is contaminated, it is necessary to bleed the brake system. Speak to your dealer or Milnor. This is not routine maintenance.
						none	gear reducer — CO-BUDHFA, COBUD-E, COBUD-H	Sealed. No oil maintenance 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						Do this each	Component	More Data
1	2	3	4	5	6			
		x				200 hours	drive belts and pulleys	See <a href="#">Section 3.2.1</a> , page 27
		x				200 hours	tubes and hoses (non-hydraulic)	Examine hoses and hose connections for leaks.
		x				200 hours	hydraulic hoses	See <a href="#">Section 3.4.3</a> , page 42
				x		1200 hours	door bumpers	Replace if damaged.
		x				200 hours	rubber springs	See <a href="#">Figure 24</a> , page 40
		x				200 hours	shock absorbers	See <a href="#">Section 3.3.4</a> , page 40
				x		1200 hours	tilt bumpers	See <a href="#">Figure 22</a> , page 38 Examine. Replace if damaged or worn.

### 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						Do this each	Component	More Data . See also <a href="#">Section 3.1.3</a> , page 22
1	2	3	4	5	6			
Grease plate 01 10025Y for bearing housing. Use this data if your machine has this grease plate. See <a href="#">Figure 20</a> , page 37 and <a href="#">Section 3.1.5</a> , page 24. It is necessary to remove a side panel on some models, to access this grease plate.								
		x				200 hours	seal	Add 0.12 oz. (3.6 mL) of grease EPLF2 ( <a href="#">Table 9</a> , page 23)
		x				200 hours	rear bearing	Add 0.3 oz. (9 mL) of grease EPLF2
		x				200 hours	front bearing	Add 0.3 oz. (9 mL) of grease EPLF2
Other Grease Ports								
		x				200 hours	hydraulic door bushings	<a href="#">Figure 21</a> , page 37. Add 0.06 oz. (1.8 mL) of grease EPLF2 ( <a href="#">Lubricant Identification</a> )
		x				200 hours	door hinge	<a href="#">Figure 21</a> , page 37. Add 0.12 oz (3.6 mL) of grease EPLF2 ( <a href="#">Table 9</a> , page 23).
		x				200 hours	door latch plunger	<a href="#">Figure 21</a> , page 37. Apply stick DE3 ( <a href="#">Table 9</a> , page 23) to surface.
		x				200 hours	door open plunger	<a href="#">Figure 21</a> , page 37. Apply stick DE3 ( <a href="#">Table 9</a> , page 23) to surface.
		x				200 hours	lower pivot for hydraulic cylinders—one place, each side	<a href="#">Figure 22</a> , page 38. Add 0.06 oz. (1.8 mL) of grease EPLF2 ( <a href="#">Table 9</a> , page 23).
						none	upper pivot for hydraulic cylinders	<a href="#">Figure 22</a> , page 38. No grease maintenance necessary.
						none	front tilt pivot	
			x			600 hours	motor and pump bearings	See <a href="#">Section 3.1.6 : Procedures for Motors</a> , page 24

### 3.1.1.6 Motor Grease Schedule

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Use the data in [Table 10: Motor Grease Intervals and Quantities](#), page 26 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						Do this each	Component	More Data
1	2	3	4	5	6			
					x	2400 hours	controller circuitry	Examine wiring and connections in electrical boxes. Look for corrosion, loose connections. See <a href="#">Section 3.1.2</a> , page 21
		x				200 hours	water pressure regulator for optional supply injector	See <a href="#">Figure 11</a> , page 30. Value: 28 PSI (193 kPa).
		x				200 hours	water pressure regulator for chemical flush	See <a href="#">Figure 13</a> , page 31. Value: 28 PSI (193 kPa).
		x				200 hours	compressed air mechanisms	See <a href="#">Section 3.2.5</a> , page 32
		x				200 hours	bath level sensor that uses air pressure	Examine the air tube and connections. See <a href="#">Figure 12</a> , page 31
		x				200 hours	air pressure for bearing housing	See <a href="#">Figure 16</a> , page 33 Value: 10 PSI (69 kPa)
		x				200 hours	hydraulic line pressure	See <a href="#">Figure 25</a> , page 41. Approximate maximum pressure in operation = 700 PSI (48 bar).

### 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		

**Table 8 Contamination Types, Cleaning Agents, and Procedures (cont'd.)**

Material or Component	Usual Contamination	Example	Cleaning Agent	More Data
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

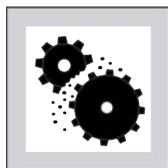
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The table below identifies the lubricant for each lubricant code given in the maintenance summary. Get these or equivalent lubricants from your local lubricant supplier.

When you add grease, always use the procedures given in [Section 3.1.4 : Grease Gun Procedures, page 23](#). When you add grease to motors, also use the procedures given in [Section 3.1.6 : Procedures for Motors, page 24](#).



**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**

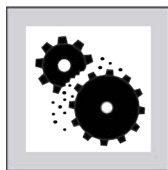
Code	Type	Trademark Name	Application Example
EM	grease	Mobil Polyrex EM or as given on the motor nameplate	motor bearings
EPLF2	grease	Shell Alvania EP (LF) Type 2	drive shaft bearings and bushings, ball joints, chain drives
DOT3	oil	NAPA SuperHeavy Duty Brake Fluid DOT 3	disk brakes
23	oil	Shell Tellus 23	air line lubricator
1030	oil	Shell Rotella T 10W30	Hydro-cushion™ cylinders
68	oil	Shell Tellus 68	hydraulic system
DE3	stick	AGS Door-Ease DE-3	door latch plunger

### 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 Bearing Components Connected to a Grease Plate

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Your machine has a grease plate on the machine housing or the shell. You add grease to components of the bearing housing at this location. The correct procedure is to add grease when the cylinder turns at wash speed, but obey these precautions:

- For all other grease maintenance, add grease with power removed from the machine.
- If the grease plate on your machine is not serviceable (if you must add grease at a different location), add grease with power removed from the machine.
- If you must remove a guard to get access to the grease plate, prevent access to the machine by other personnel.

If you obey these precautions, use the **Manual** mode to operate the machine at wash speed. Then add grease at the grease plate.

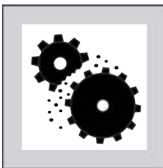
### 3.1.6 Procedures for Motors

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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 26](#) 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 21](#) to record the data for the motors on your machine.

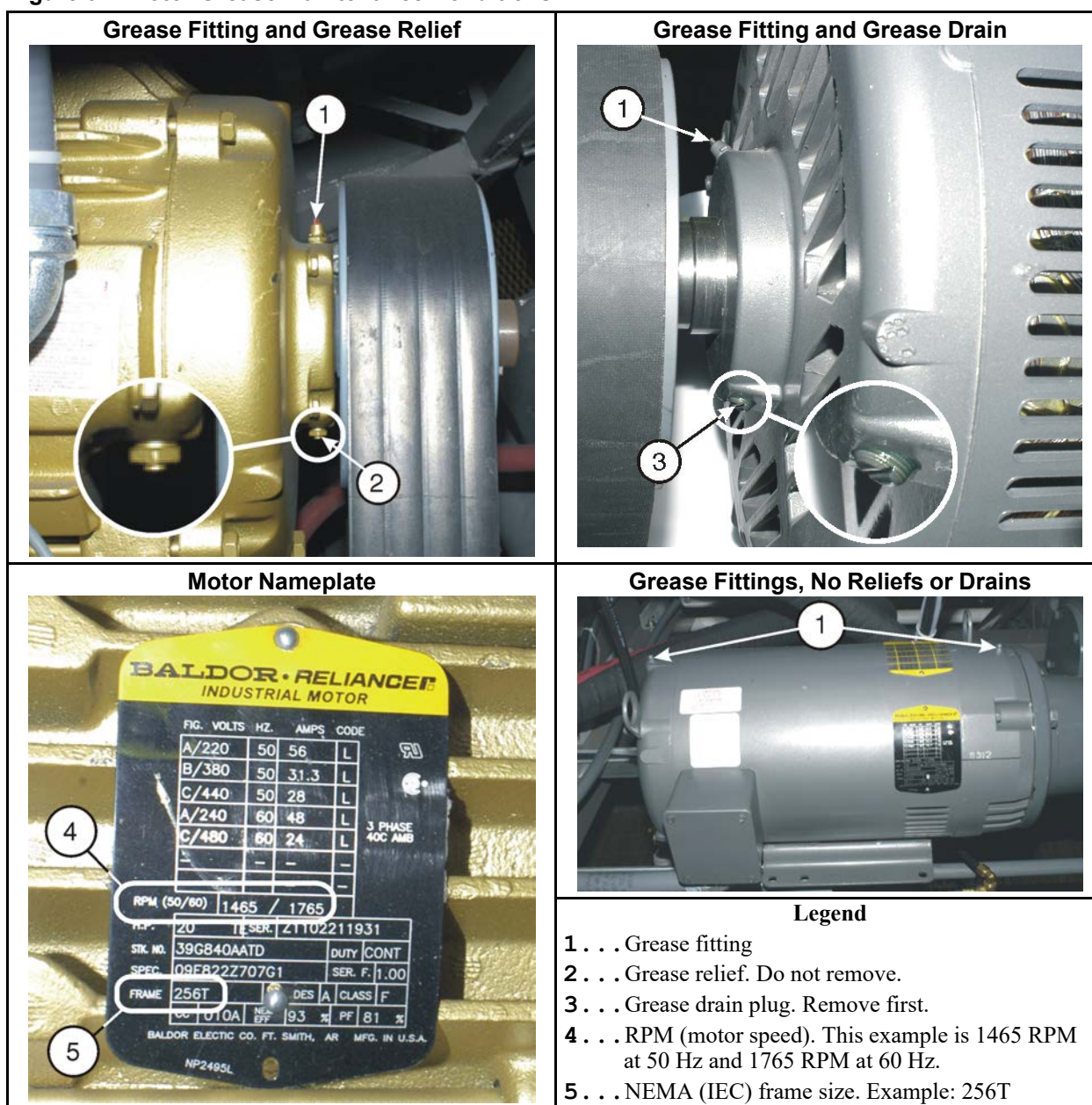


**CAUTION:** Failure to remove grease drain plugs — can cause grease to enter the windings and burn out the motor.



- 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 6. Motor Grease Maintenance Conditions



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 23](#)) 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 <a href="#">Figure 6: Motor Grease Maintenance Conditions</a> , page 25 )		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		

### 3.1.7 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 17. 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 17.

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 17. 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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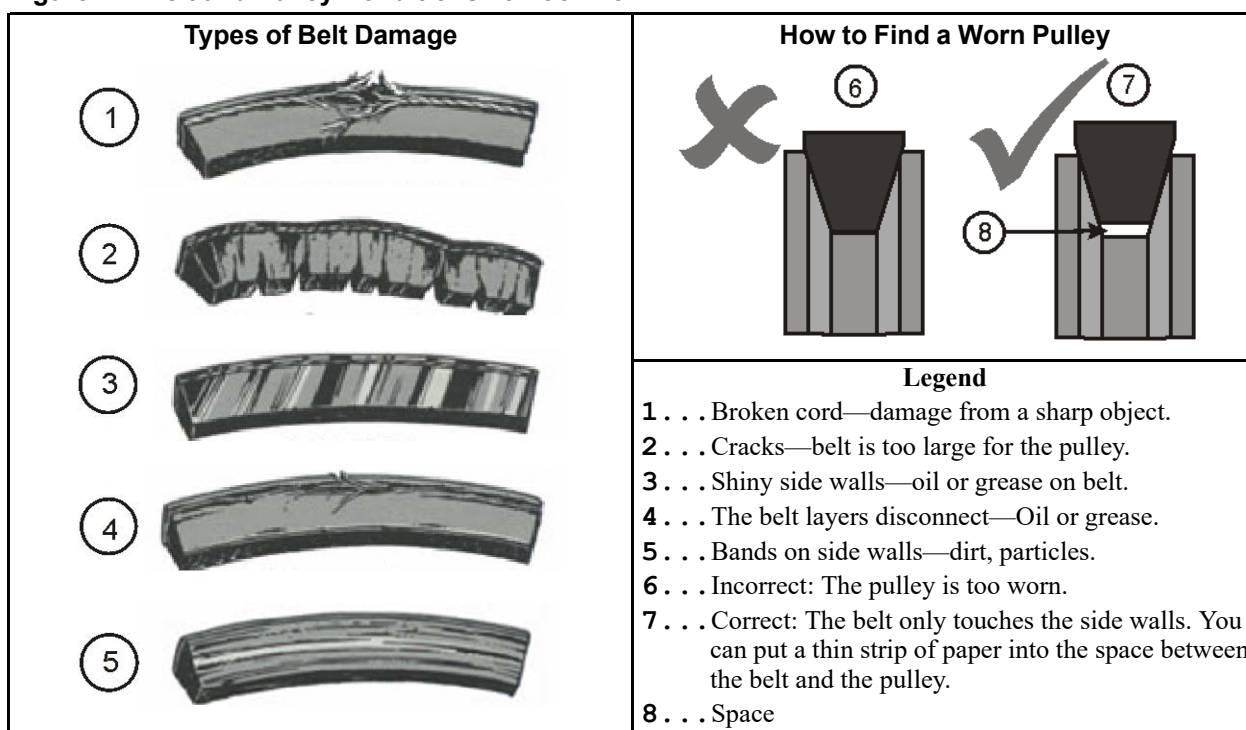
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## 3.2 Maintenance Components—Machines and Controls Group

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### 3.2.1 How to Examine V-belts and Pulleys

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**Figure 7. Belt and Pulley Conditions To Look For**

#### With power removed:

- Look for dirt, dust, oil, and grease. Remove contamination.

- Look for belt damage as shown in the figure above.
- Look for worn pulleys as shown in the figure above.

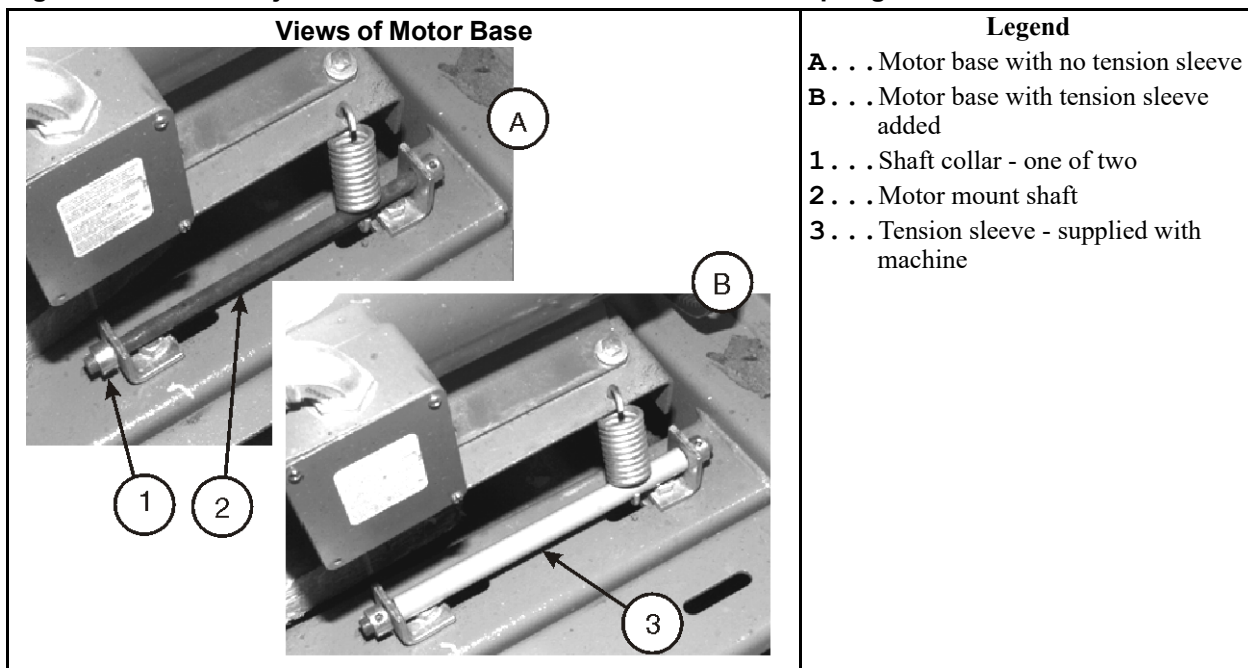
**With the machine in operation—Do not touch the machine.** Look and listen:

- A belt can have some vibration and not cause damage. It is necessary to correct this condition only if the vibration is large.
- A belt must have sufficient tension that there is no slippage on the pulley during operation. If slippage occurs, you can usually tell from the noise.

**About Component Replacement and Tension Adjustment**—Correct adjustment is very important to the service life of components and operation of the machine. Your Milnor® dealer can do this work. If you know how to do this work (for example, correctly align belts and pulleys), and you want to do it, speak to your dealer or Milnor® for part numbers. Replace worn components before you make tension adjustments.

- Machines that use rods with full threads and nuts to hold the position of the motor base—Turn the nuts on the rods as necessary to adjust tension. Tighten the nuts.
- Machines that use a spring to hold tension on the motor base—Use the belt tension sleeve supplied with the machine. Put the sleeve on the rod that the spring is attached to or remove the sleeve to increase or decrease tension (see the figure below). Replace the spring if necessary.

**Figure 8. How to Adjust Belt Tension On a Machine That Uses Spring Tension**



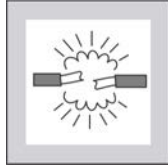
### 3.2.2 Inverters

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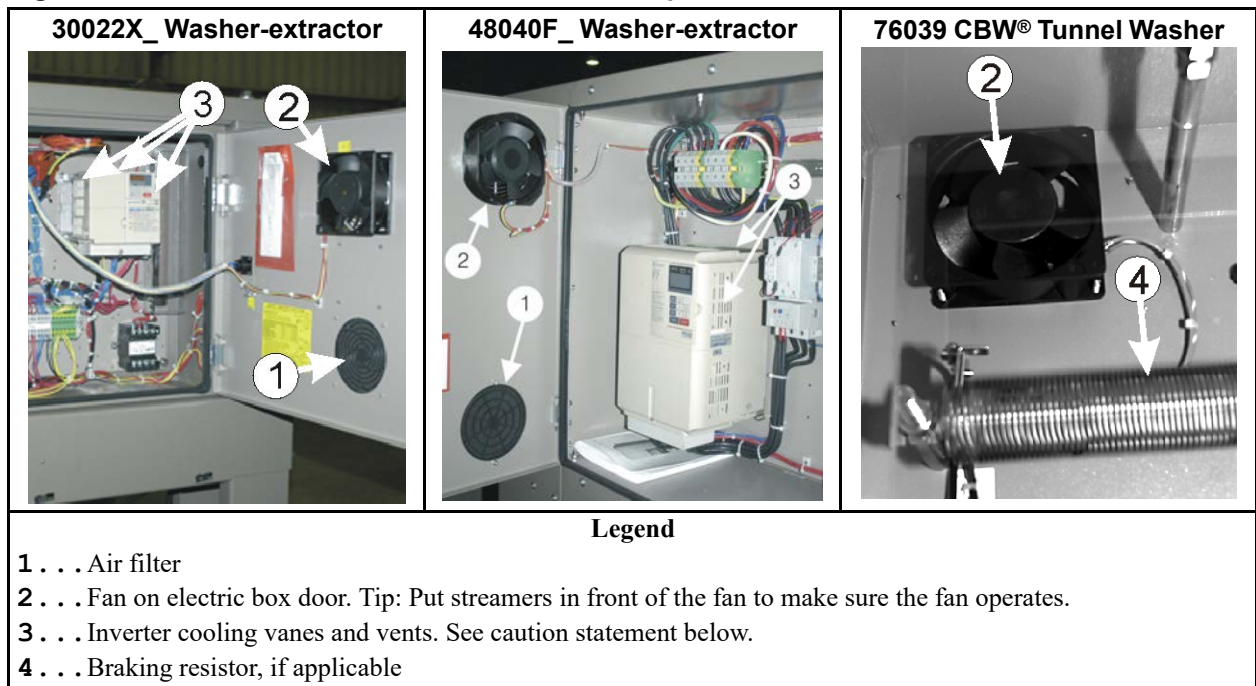


**CAUTION:** **Insufficient airflow** — will cause the inverter to burn out.

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



**Figure 9. Electric Box and Inverter.** These are examples. Your machine can look different.



### 3.2.3 Chemical Devices

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**CAUTION:** **Chemical corrosion** — can damage the machine and the goods.

- ▶ Connect chemical tubes only to chemical manifold inlets.
- ▶ Stop leaks. Remove leaked supplies from surfaces.
- ▶ Speak to your dealer or Milnor® if you see corrosion damage.

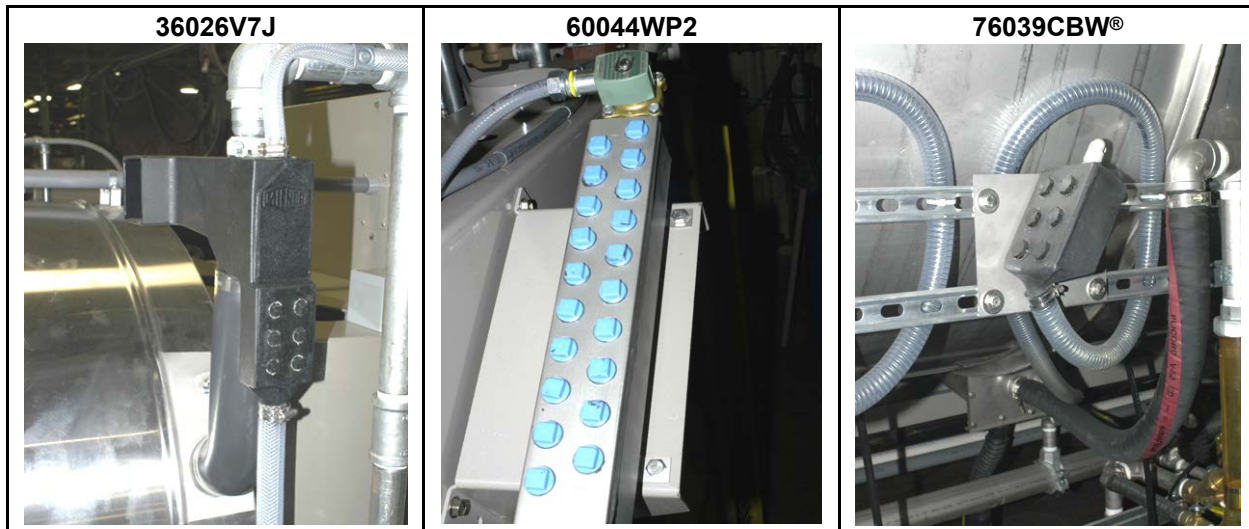


**CAUTION:** **High water pressure** — can cause laundering chemicals to splash on personnel and machine surfaces.

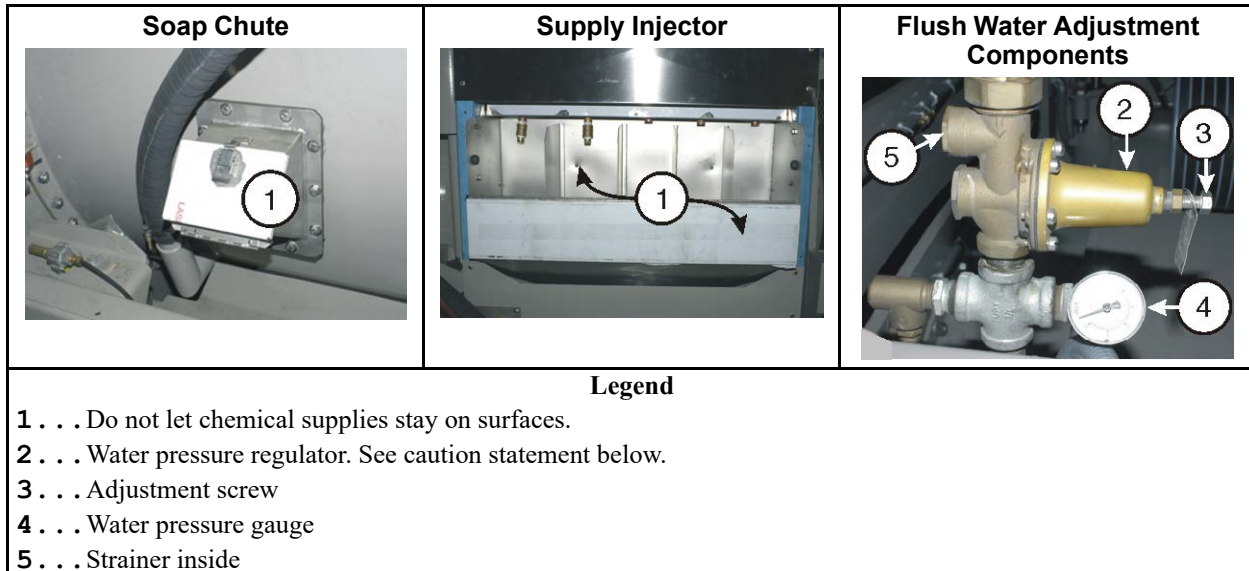
- ▶ Make sure the pressure is set as told in the maintenance summary.



**Figure 10. Chemical Inlet Manifolds for Chemical Pump Systems. See caution statement below. These are examples. Your machine can look different.**



**Figure 11. Soap Chute and Optional 5-compartment Supply Injector. These are examples. Your machine can look different.**

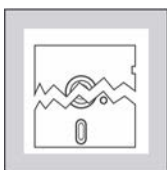


### 3.2.4 Water and Steam Devices

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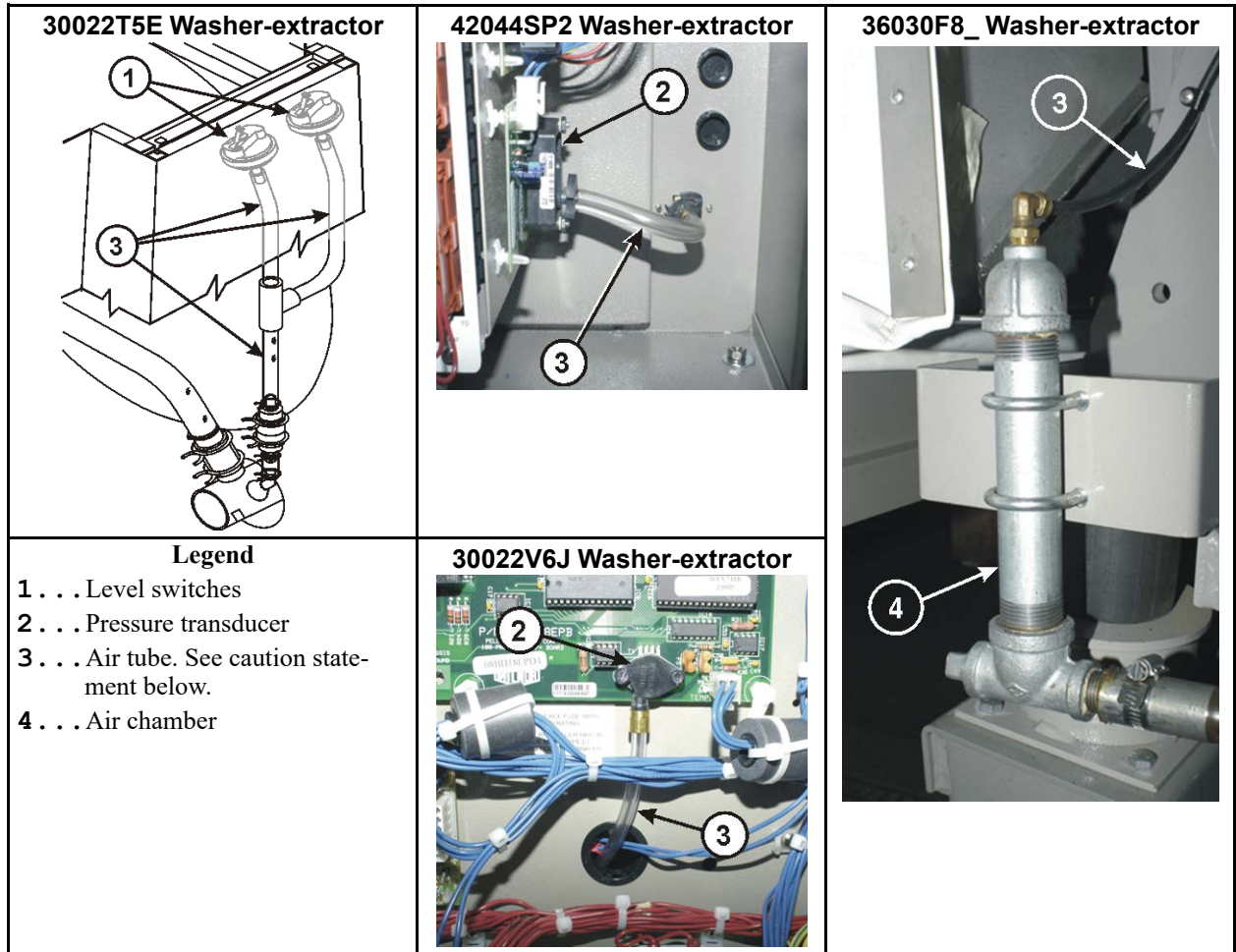


**CAUTION:** **Restricted air flow** — can cause incorrect level readings.

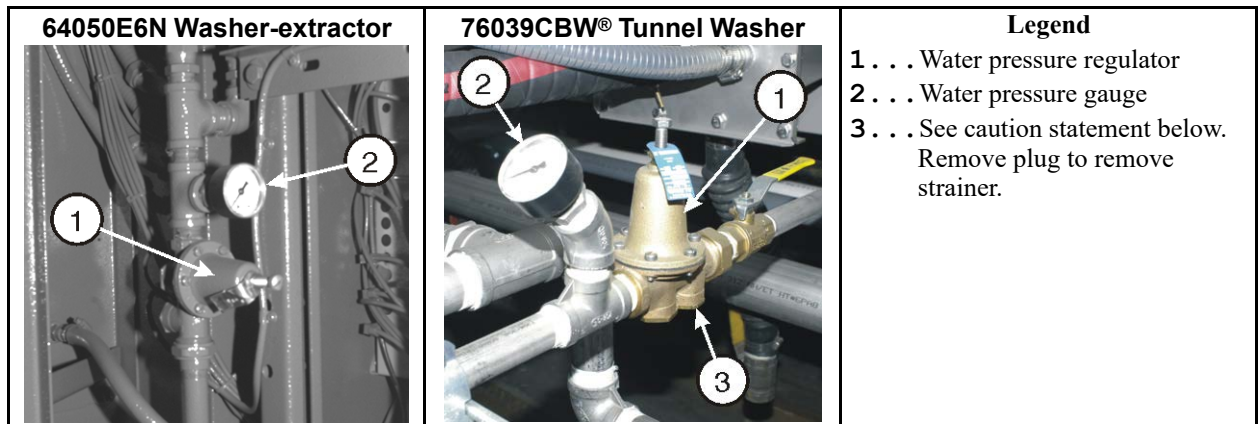


- ▶ Keep the connecting tube or hose free of blockages and leaks.
- ▶ Make sure that the connections are tight.

**Figure 12. Air Tube for the Water Level Sensor. These are examples. Your machine can look different.**



**Figure 13. Water Pressure Regulator for Chemical Flush. These are examples. Your machine can look different.**





**CAUTION:** Release of pressurized steam — can severely burn you.



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

**Figure 14. Steam Inlet Strainer. These are examples. Your machine can look different.**

42044SP2 Washer-extractor	76039CBW® Tunnel Washer	Legend
		<p>1 . . . Steam strainer. Remove steam pressure before you remove the plug. See warning statement below.</p> <p>2 . . . Steam valve can burn</p>

### 3.2.5 How to Examine Compressed Air Mechanisms

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

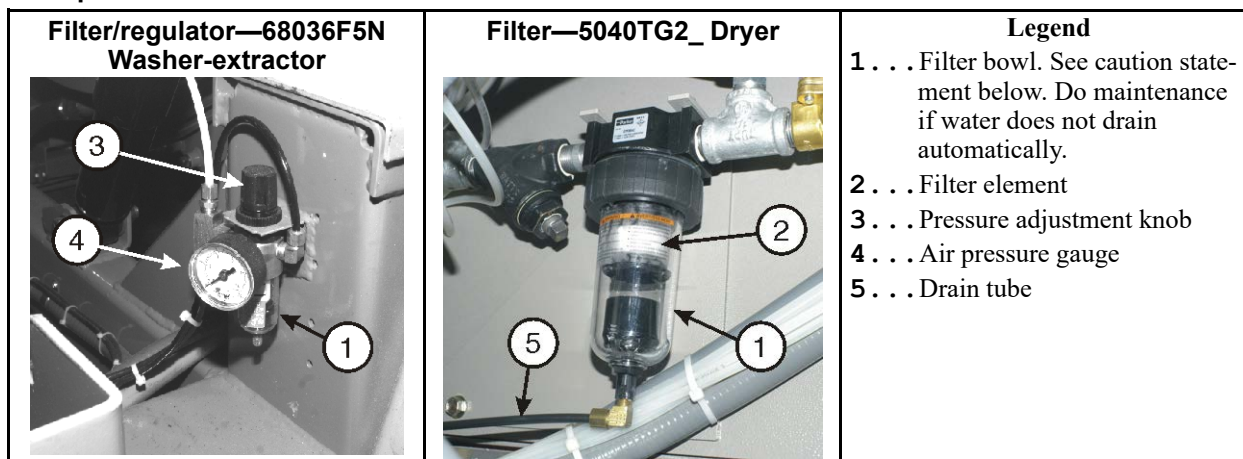


- ▶ Close the external shutoff valve and release remaining pressure before you do maintenance.

**Figure 15. 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
<p style="text-align: center;"><b>Legend</b></p> <p>1 . . . See caution statement below. Remove plug to remove strainer.</p> <p>2 . . . Compressed air in.</p>		

**Figure 16. Self-purging Air Line Filter to Remove Moisture and Other Contamination. These are examples. Your machine can look different.**

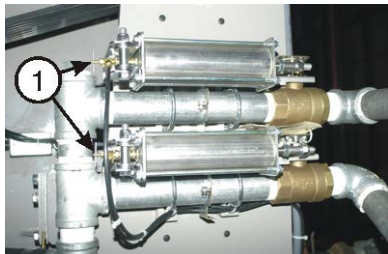

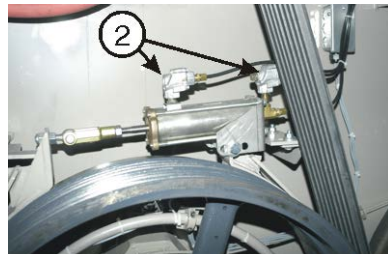
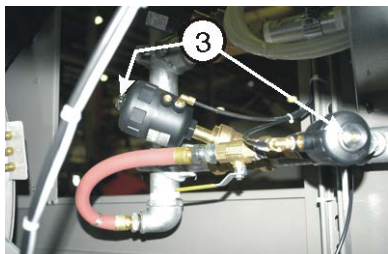

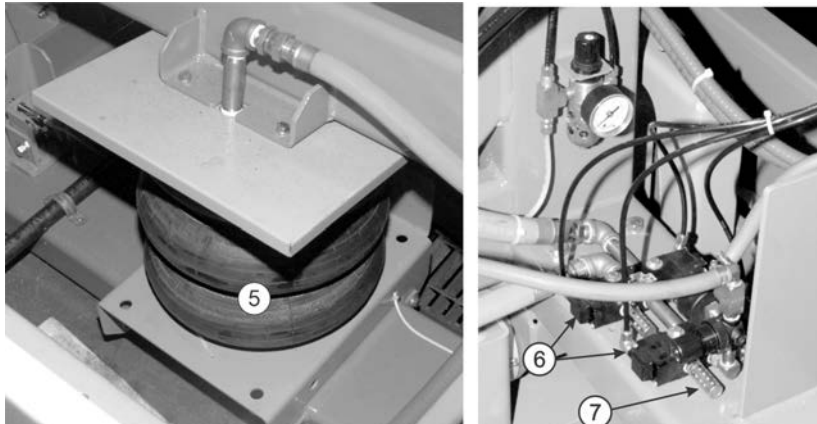


Your machine has one or more mechanisms that use compressed air for movement. [Figure 17, page 34](#) shows some examples. See the related figure in document BNVUUH01. To examine a compressed air mechanism, look at the mechanism and listen to it in operation. **Do not touch the mechanism or put your 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.

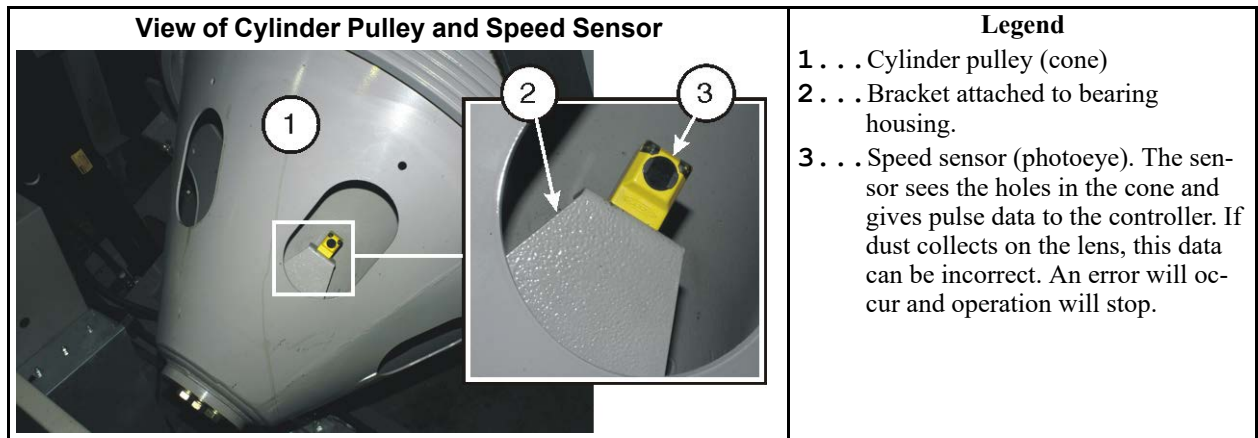
**Figure 17. Compressed Air Mechanisms** These are examples. Your machine can look different.

<p><b>Air Operated Water Valves - Milnor® Air Cylinder Type</b></p> 	<p><b>Air Operated Drain Valve - Milnor® Air Cylinder Type</b></p> 	<p><b>Air Operated Band Brake - Milnor® Air Cylinder Type</b></p> 
<p><b>Air Operated Water and Steam Valves - Angle Type</b></p> 	<p><b>Air Operated Water Valve - Ball Valve Type</b></p> 	<p><b>Legend</b></p> <p>1 . . . Factory-set needle valves to cause two air cylinders to move together. Do not adjust.</p> <p>2 . . . Quick exhaust valves</p> <p>3 . . . Position indicator. Yellow when valve is open.</p> <p>4 . . . Arrow position indicator</p> <p>5 . . . Tilt air bag</p> <p>6 . . . Air valve</p> <p>7 . . . muffler</p>
<p><b>Air Tilt Components</b></p> 		

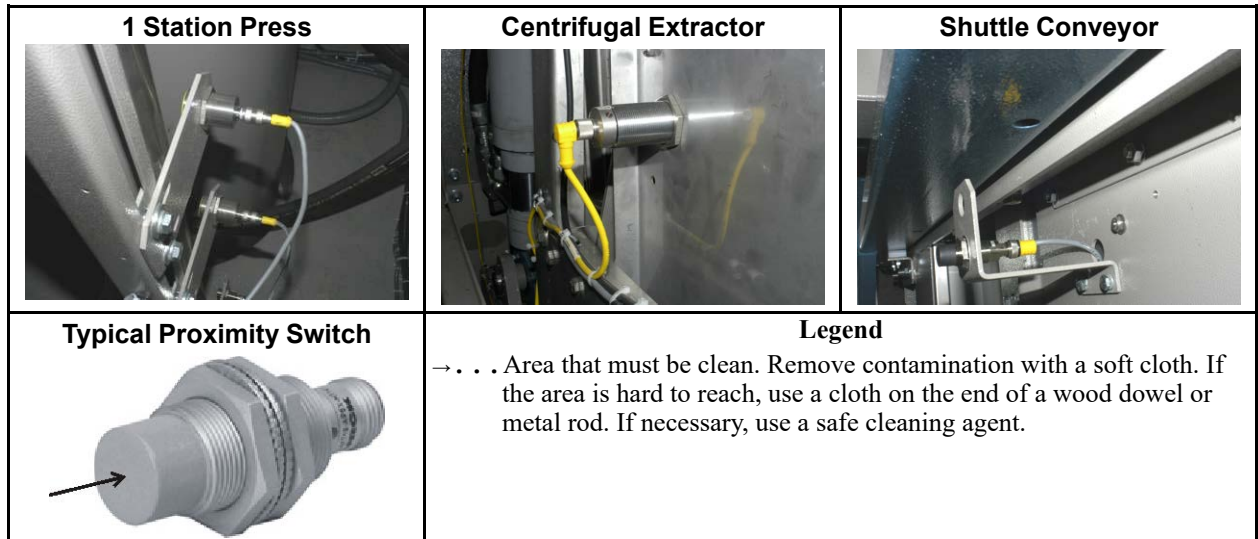
### 3.2.6 Photoeyes and Proximity Switches

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**Figure 18. Speed Sensor (photoeye) on Some Machines**



**Figure 19. Proximity Switches These are examples. Your machine can look different.**



### 3.2.7 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.

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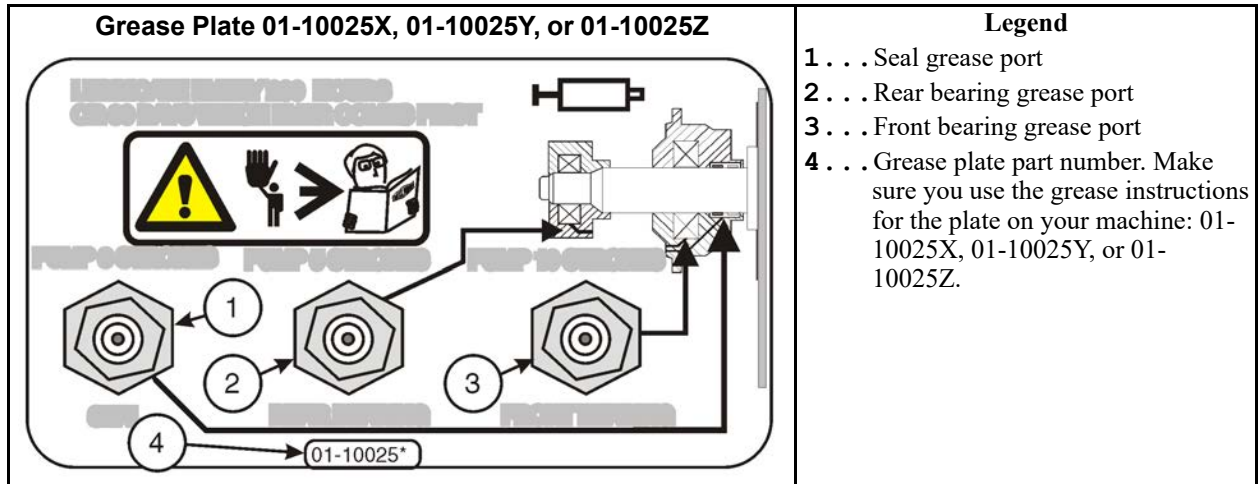
## 3.3 Maintenance Components—Large Extractors

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### 3.3.1 Lubricant Maintenance for Grease-filled Drive Bearings

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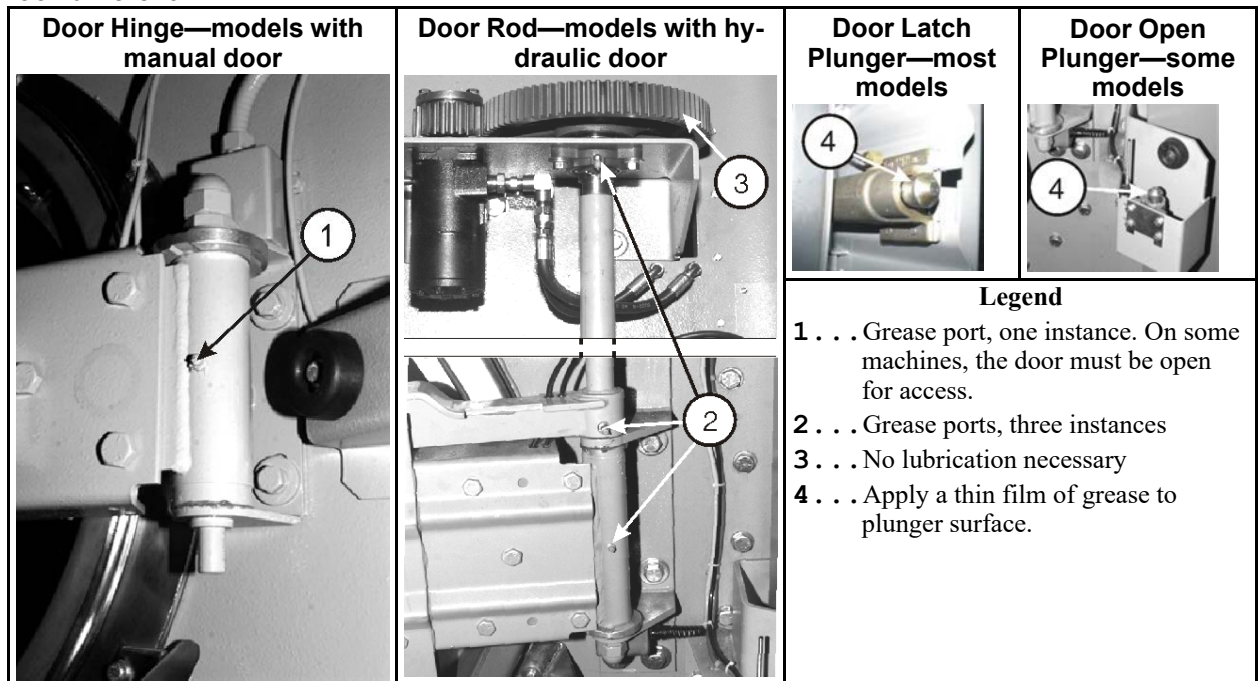
Figure 20. Grease Ports for Grease-only Bearing Assembly



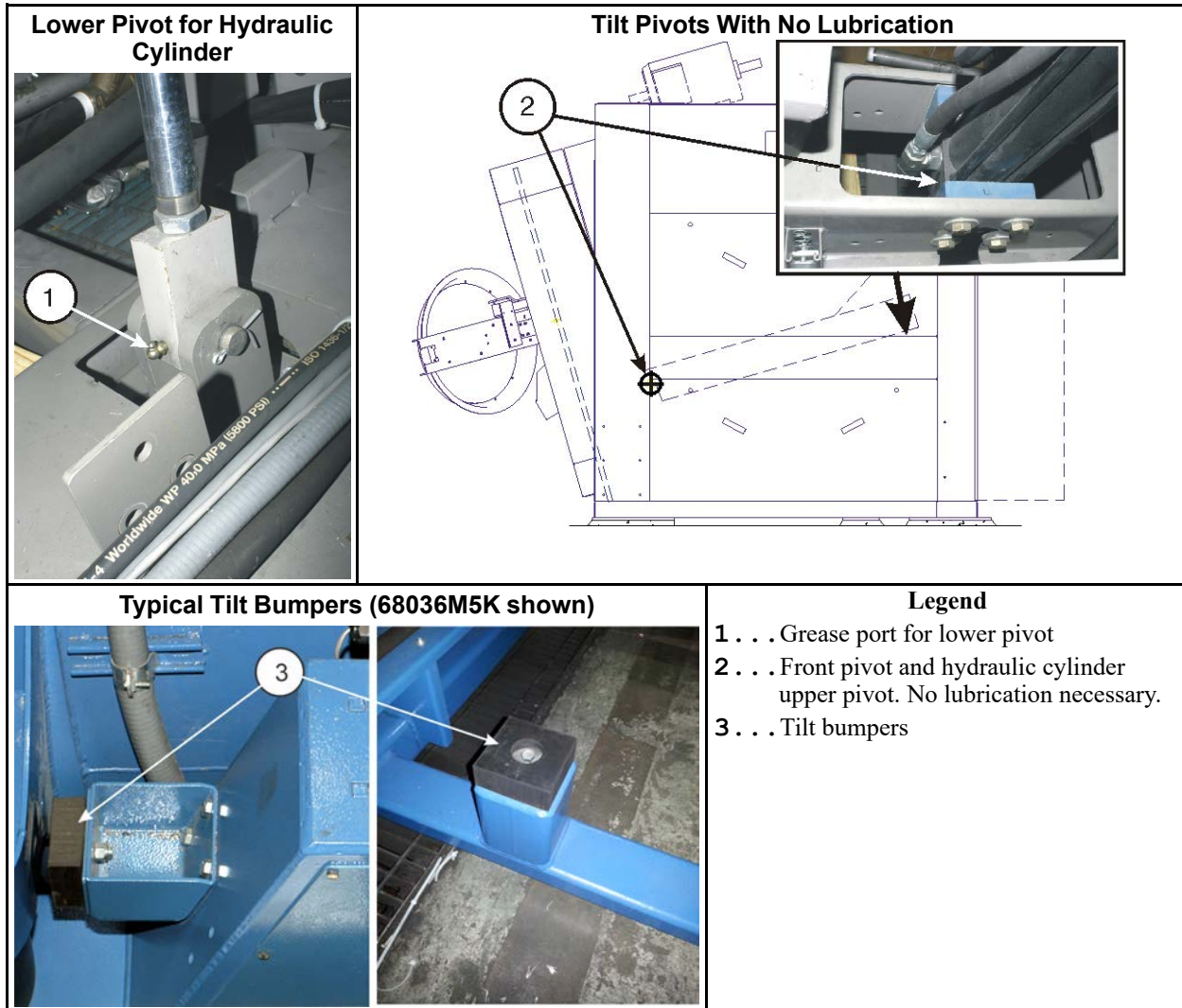
### 3.3.2 Lubricant Maintenance for Non-drive Components

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Figure 21. Grease ports for Door—Open Pocket Models. These are examples. Your machine can look different.



**Figure 22. Other Routine Maintenance Items on Each Side of M\_K Hydraulic Tilt Washer-extractor Models**



### 3.3.3 How to Do a Test of the Mechanical Brake

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**WARNING:** A moving cylinder and goods — can crush or sever body parts when a person reaches in the door to load or unload.



- ▶ Do not let the machine operate with a defective mechanical brake.

The disk or band brake holds the cylinder while the operator puts goods in, or removes goods from the machine. Although the mechanical brake does not usually stop the cylinder during operation (the second note below tells more), it can do so if an unusual condition occurs. Examples

are when electrical power is removed and when a stop switch is pushed. To make sure the machine operates safely, do this test at the intervals given in the maintenance schedule:

1. If the machine contains goods, remove them.
2. Start a wash formula. Move forward in the sequence to a drain (see the first note below). You must do the test when the cylinder turns at drain speed. Wash speed is too slow. Extract speed will cause deterioration of the brake components that is not necessary.
3. Look at the cylinder through the door glass or site glass.
4. Push the *Emergency Stop* switch (⓪). Confirm that the cylinder stops in the time appropriate for the type of machine:
  - Divided cylinder and Staph Guard®—4 seconds.
  - Open cylinder—10 seconds

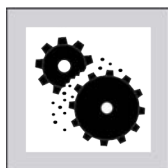


**NOTE:** On most machines, there is no manual output for drain speed. If your machine has a drain speed output in **Manual Mode**, use it instead of a formula.

If the cylinder does not stop in the given time, repairs are necessary. Speak to your dealer or Milnor®. This is not routine maintenance.



**CAUTION:** **Misuse of the mechanical brake during automatic operation** — will cause brake components to wear out quickly.

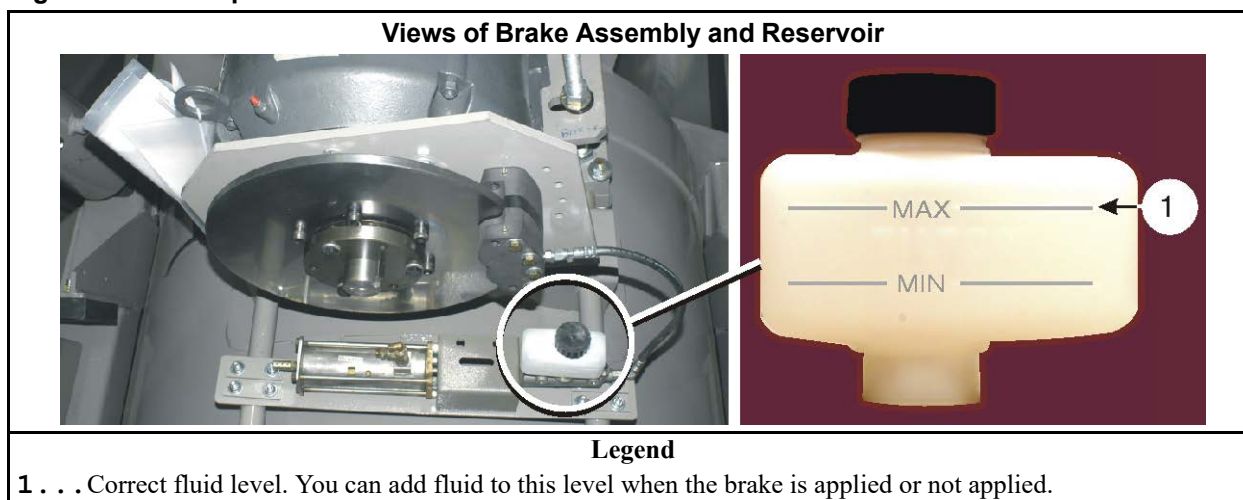


- ▶ During operation, always permit the cylinder to stop automatically.



**NOTE:** In automatic operation, the drive motor, inverter, and resistors stop the cylinder. If the cylinder does not stop in the correct length of time, an error message occurs. If this condition continues, repairs are necessary. Speak to your dealer or Milnor®. This is not routine maintenance.

**Figure 23. Example of Disk Brake. Your machine can look different.**



### 3.3.4 About the Shock Absorbers

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Milnor® washer-extractors with a rubber spring suspension also have shock absorbers. The shock absorbers have a different type of connection than those for automobiles. It is not necessary to replace the shock absorbers at specified intervals. It is only necessary to replace them if there is an indication that they are damaged or very worn.

Examine the shock absorbers at the intervals given in the maintenance summary. It is necessary to replace a shock absorber if you see oil come out from the mechanism (see the figure that follows). This shows that seals are worn. It is also necessary to replace the shock absorber if the rubber in a connector is very worn or missing.

Bad shock absorbers will let the shell move too much when the machine operates. If severe movement occurs and you are not sure of the cause, you can do a test of the shock absorbers as follows:

1. Remove the shock absorber from the machine.
2. With your body weight, compress the length of the shock absorber against a hard surface. A serviceable shock absorber compress slowly. It will also expand slowly to its initial length when you release it. If it compresses or expands quickly, the shock absorber is bad.

**Figure 24. Suspension Components on Each Side of Rubber Spring-resting Washer-extractor (see Section 3.3.4 : About the Shock Absorbers, page 40)**



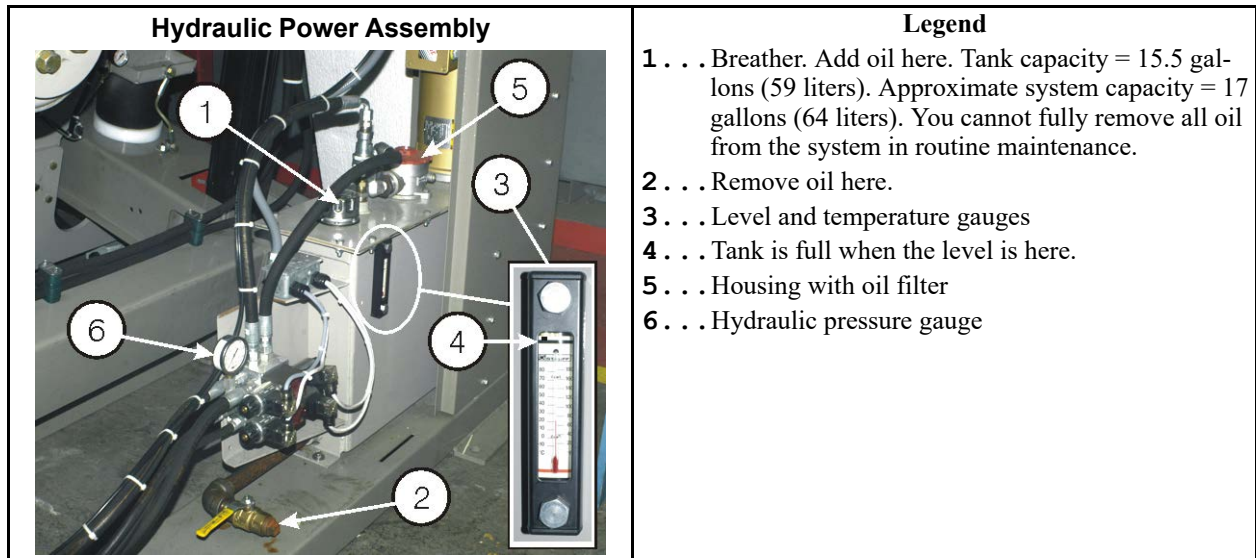
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## 3.4 Maintenance Components—Hydraulic Power Group

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**Figure 25. Hydraulic Power Components and System Oil Capacity**



### 3.4.1 How to Replace the Hydraulic Oil or Add Oil to the Full Mark

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If the drain and/or the fill pipe on the tank has a quick disconnect fitting, remove it if necessary to connect a hose. After you complete the work, put the fitting or a cap on the pipe.

#### To remove the used oil—

1. Make sure the valve on the drain pipe is closed.
2. Install the hose between the drain pipe and the container you will use to collect the used oil. Remove the quick disconnect fitting from the drain pipe if necessary.
3. Operate the manual valve to let the oil flow. Close the valve when the tank is empty.
4. Remove the hose and put a cap on the pipe.

#### To add oil when the oil level is very low or after you remove the used oil—

1. Install the hose between the fill pipe on the tank (Item 1 in , ) and the pump on the container with the new oil. It can be necessary to remove the fitting from the pipe.
2. Add oil until the level is at the full mark on the level gauge.
3. Remove the hose and put a cap on the fill pipe.

### 3.4.2 How to Make Sure That the Hydraulic Oil is Serviceable

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Two types of deterioration can occur with the hydraulic oil: contamination and chemical change. You can usually remove contamination with special filters. To prevent damage to components (example: rust), it is necessary to replace the oil if a chemical change occurs.

Visually examine the oil through the view port. Put approximately one pint (one half kilogram) of oil from the drain pipe on the tank in a cup. When the oil is new, it is transparent, has an amber color and has no contamination. When the machine operates correctly, the oil can get a brown color. This condition is satisfactory. Speak to your local hydraulic maintenance company if one or more of these oil conditions occur:

- not transparent
- a brown to black color
- a gray to white color
- particles or bubbles
- a sour or burned odor

Give the hydraulic company a sample of the oil to examine. They can identify the type of deterioration and tell you the correct procedure. If it is possible to use special filters to remove the contamination, they can supply the necessary equipment.

### 3.4.3 How to Examine the Hydraulic System for Leaks

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**WARNING:** Contact with a hydraulic oil leak — can inject hydraulic oil in your body, and kill you.



- ▶ Do not use your fingers to examine components for hydraulic leaks.

A leak in the hydraulic system can be an oil leak or an air leak. If oil comes out with pressure, you will usually see an oil stain or an area where oil collects on a machine surface. The usual symptoms of an air leak are:

- The oil in the tank will have air bubbles.
- The machine will make the sound of ball bearings in a pipe when the hydraulic system operates.

It is necessary to repair a hydraulic leak. Speak to your dealer or Milnor®. This is not routine maintenance.