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30015 & 30022C4E 36021C4E



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Section
English

1



**Read the
separate
safety
manual
before
installing,
operating,
or servicing**

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Maintenance Guide— 30-series, Console-style Coin Washer-extractor and 36021C4E Coin Washer-extractor

Applicable Milnor® products by model number:

30010CGE 30015C4A 30015C4E 30015C4T 30015CGE 30022C4A 30022C4E
30022C4T 36021C4E

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Chapter 1

Machine Description, Identification, and Certification

BIUUUF01 (Published) Book specs- Dates: 20120523 / 20120523 / 20120525 Lang: ENG01 Applic: RMC RQN

1.1. About This Milnor[®] Machine—30-series, Console-style Coin Washer-extractor and 36021C4E Coin Washer-extractor

This manual applies to the Milnor products whose model numbers are listed inside the front cover and which are in the families of machines defined below.

1.1.1. Functional Description

Washer-extractors wash linen using water and nonvolatile chemicals and remove excess water by centrifugal force.

30-series, Console-style Coin Washer-extractor models are rigid mount, visible shell washer-extractors, with a cylinder diameter of 30 inches (762 mm), for use in coin laundries.

36021C4E Coin Washer-extractor is a rigid mount, visible shell washer-extractor, with a cylinder diameter of 36 inches (914 mm), for use in coin laundries.

1.1.2. Machine Identification

Find the model number and other data for your machine on the machine data plate affixed to the machine. See the figure that follows.

Figure 1: Machine Data Plate

View of Data Plate (English text shown)

The diagram shows a data plate with the following fields and callouts:

- 1:** Model number (indicated by a circle with '1' pointing to the 'MODEL' field).
- 2:** Data that uniquely identifies your machine (indicated by a circle with '2' pointing to the 'CODE' field).
- 3:** Cylinder maximum rotation speed in revolutions per minute (indicated by a circle with '3' pointing to the 'RPM' field).
- 4:** Cylinder volume in the units of measure shown (indicated by a circle with '4' pointing to the 'VOLUME' field).
- 5:** Piped utility requirements (indicated by a circle with '5' pointing to the 'STEAM' field).
- 6:** Hydraulic oil pressure, if applicable (indicated by a circle with '6' pointing to the 'HYDRAULIC OIL' field).
- 7:** Electrical requirements (indicated by a circle with '7' pointing to the 'MIN. WIRE AWG' field).
- 8:** Part number for multi-unit machine, if applicable (indicated by a circle with '8' pointing to the bottom-most field).

Legend

1. Model number. See inside the front cover of this manual.
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.

— End of BIUUUF01 —

Chapter 2

Safety

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2.1. Safety for Milnor[®] C4E Models

2.1.1. General Safety Requirements

Notice 1: This document contains both general and specific warnings. The general warnings include those described from [Section 2.1.1](#) through [Section 2.1.1.3](#). Warnings about specific hazards and information about safe operating procedures appear from [Section 2.1.2](#) to [Section 2.1.5.4](#), and elsewhere in this manual.

Incorrect installation, neglected preventive maintenance, abuse, and/or improper repairs, or changes to the machine can cause unsafe operation and personal injuries, such as multiple fractures, amputations, or death. The owner or his selected representative (owner/employee) is responsible for understanding and ensuring the proper operation and maintenance of the machine. The owner/employee must familiarize himself with the contents of all machine instruction manuals. The owner/employee should direct any questions about these instructions to a Milnor[®] dealer or the Milnor[®] Service department.

- 2.1.1.1. Personnel**—Train employee personnel what to do in case of emergencies. Inform personnel about hazard avoidance and the importance of care and common sense. Provide personnel with the safety and operating instructions that apply to them. Verify that personnel use proper safety and operating procedures. Verify that personnel understand and abide by the warnings on the machine and precautions in the instruction manuals.
- 2.1.1.2. Safety Devices**—Ensure that no one eliminates or disables any safety device on the machine or in the facility. Do not allow machine to be used with any missing guard, cover, panel or door. Service any failing or malfunctioning device before operating the machine.
- 2.1.1.3. Maintenance**—Inspect and service the machine as described in the preventive maintenance schedule, as described in manual MAP30C4EAE “Service—30015/30022 C4E.” Replace belts, pulleys, clutch plates, seals, etc. before they are severely worn. Immediately investigate any evidence of impending failure and make needed repairs (e.g., cylinder, shell, or frame cracks; drive components such as motors, bearings, etc., whining, grinding, smoking, or becoming abnormally hot; bending or cracking of cylinder, shell, frame, etc.; leaking seals, hoses, valves, etc.) Do not permit service or maintenance by unqualified personnel.

2.1.2. The Danger from a Rotating Cylinder

A tremendous amount of inertia is stored in the rotating cylinder of any washer-extractor, even at slow speeds. Washer-extractors are equipped with a **door interlock** designed to prevent opening the door if the cylinder is turning and to prevent starting the machine if the door is open.

The controller used on coin machine models in the Milnor® C4E line permits opening the door only during the first 60 seconds of the wash cycle, while the basket is turning in wash speed. If the door is opened, the drain valve opens immediately, the motor stops driving the basket, and—if the machine still has electric power—a brake is immediately applied to the basket. The wash program that was in progress when the door opened will resume where it was interrupted, and the door will lock after any time remaining on the door latch delay timer expires. The door locks immediately if the timer expires while the door is open and the door is subsequently closed.



DANGER [2]: 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 put any part of your body in the machine while the basket is moving.
- Do not operate the machine with the door open.
- 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 open the cylinder door with water in the cylinder.
- Do not tamper with or disable any safety device or operate the machine with a malfunctioning safety device. Request authorized service.
- Do not operate the machine with a malfunctioning door interlock.

2.1.3. The Danger from Processing with Flammable Materials

Washer-extractors are manufactured specifically for use with water, **not with any type of solvent nor with any other material that might be flammable**. They are not suitable for any type of solvent cleaning process.



DANGER [3]: 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 load machine with goods containing dry cleaning materials.
- Do not use the machine in the presence of solvent fumes.

2.1.4. The Danger from Operating with Guards or Covers Removed

Like other types of industrial equipment, Milnor® washer-extractors utilize **high voltage electrical power** to drive many **moving parts**. As previously stated, the washer basket acquires tremendous inertia during extract, which must be absorbed by the brake or permitted sufficient time to dissipate. **Every guard, side panel, and door on the machine exists to isolate energized or moving parts from personnel and must be securely in place for safe operation.**



DANGER [4]: Electrocutation and Electrical Burn Hazards—Contact with high voltage will electrocute or burn you. High voltage is present at the machine 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.
- Do not service the machine unless qualified and authorized. You must clearly understand the hazards and how to avoid them.
- Know the location of the main machine disconnect and use it in an emergency to remove all electric power from the machine.



DANGER [5]: 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.
- Do not operate a damaged or malfunctioning machine. Request authorized service.
- Do not service the machine unless qualified and authorized. You must clearly understand the hazards and how to avoid them.
- Ensure that all personnel are clear of the machine before starting it.

2.1.5. The Danger of Entrapment in a Coin Machine



DANGER [6]: Entrapment Hazard—A locking cylinder door can entrap anyone who enters the cylinder. The person can be killed or seriously injured.

Milnor C4E coin operated washer-extractors have a door interlock which, for safety, prevents opening the door after the first 60 seconds of a wash cycle. The effect of this door interlock system varies according to the machine status:

- When a wash cycle runs to completion without interruption, the door latch unlocks after the cycle ends **and** the safety delay time expires after the cycle ends. The safety delay allows time for the machine to coast to a complete stop before allowing the user to open the door and retrieve the goods inside.
- If power is lost during a wash cycle, the door latch unlocks to allow the user to open the door and retrieve the goods. Because power is required to lock the door closed, the door can be opened even if the machine does not have power.



CAUTION [7]: Entangle Hazard—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.

- The owner/employee must ensure that no user opens the door of a machine while the basket is turning.
- If power is lost and immediately restored during a wash cycle, a safety delay must expire before the door can be opened.

When power is restored and the door is closed, the customer can start the wash cycle from the beginning by inserting more coins, or the attendant can turn the *Attendant* switch to the horizontal position to allow starting the machine without coins.

In a tragic incident, a small child was placed, climbed, or was helped to climb into a front loaded coin machine and the door was then closed behind him. The door locked, the machine started running and the child was scalded to death.

The laundry owner/employee must guard against entrapping anyone in a washer-extractor by doing the following:

2.1.5.1. Install Disconnect Switches—The National Electric Code (article 430-112) requires a clearly marked electric disconnect switch in sight and no more than 50 feet from each machine. (Local codes may have additional requirements.) Make disconnect switches readily accessible, but not so accessible as to attract playful children.

You are urged to consult your licensed electrician and take immediate steps to comply if your installation does not now meet the National Electric Code requirement.

2.1.5.2. Inform the Customer—Post signs prominently in the laundry or use whatever additional effective means are available to inform the customer of the entrapment hazard, and how to minimize the hazard, including but not necessarily limited to the following:

1. that children must not be placed inside, nor be allowed to operate or play in or around any machine,
2. the location of the disconnect switch for each machine, and
3. what to do in the event of an emergency.

2.1.5.3. Test Door Interlock and Coin Counter Operation—Verify **daily** that the door interlock is functioning properly. This procedure is detailed in [Section 2.1.5.6 “Daily Test of Door Interlock”](#).

Verify **monthly** that the machine cannot be made to operate by any means other than by pressing the *Start* button with the door closed, and then only after inserting the proper number of coins or turning the *Attendant* switch to the horizontal position. The testing procedure for the coin acceptor is described in [Section 2.1.5.5 “How to Test the Coin Acceptor”](#).

2.1.5.4. Ensure Cycle Completion—After a power loss and subsequent restoration, verify that no machine in the facility starts running before the door is closed and the *Start* button is pressed.

2.1.5.5. How to Test the Coin Acceptor [Document BICEXS02]



Notice 8: Ensure Safe Operation—Confirm **daily**, the door interlock function. Confirm **monthly**, both the coin counter **and** the door interlock function.

- To test **only** the locking-type door interlock (daily), perform the tests described in [Section 2.1.5.6 “Daily Test of Door Interlock”](#).
 - To test the electronic coin counter **and** the locking-type door interlock (monthly), perform all the steps described in this document and in [Section 2.1.5.6 “Daily Test of Door Interlock”](#) in order. **Do not skip any step.**
1. Make sure that power is ON to your machine.
 2. Close the door. **Do not insert coins.**
 - a. If the machine starts, remove the machine from service until the cause of the malfunction is identified and corrected.

Note 1: Step 4 tests the possibility of a free wash simply by closing the door and Step 5 tests the possibility of a free wash when electric power is restored after a power interruption while the machine was **not** running.
 - b. If the machine does not start, proceed to the next step.
 3. Open the door. Verify that the value in the *coin count* window decreases by 1 as each coin is deposited. If the machine does not accept coins or if the accepted coins are not counted, **take it out of service, determine why, and fix whatever is wrong. Do not return the machine to service until it successfully passes all steps described herein.**

If the machine accepts and counts each coin, continue with the next step.

4. With the door open, manually operate the door switch actuator 100 times (Figure 2), pressing the Start button each time the door switch actuator is depressed. Operate the actuator for one second ON (depressed), then one second OFF (released). If the machine completed steps 1, 2, and 3 successfully, this tests if simply closing the door will permit a free wash or arm the Start button to begin a wash cycle without the required number of coins.
 - a. If the machine starts while the door switch actuator is depressed but the coin count window is not displaying “00” or if the Start button is not depressed, **immediately take your hand off the door switch actuator and take the machine out of service until the problem is diagnosed and repaired. Do not return the machine to service until it successfully passes all steps described herein.**
 - b. If the machine does not start, proceed to the next step.

Figure 2: Door Switch Actuator

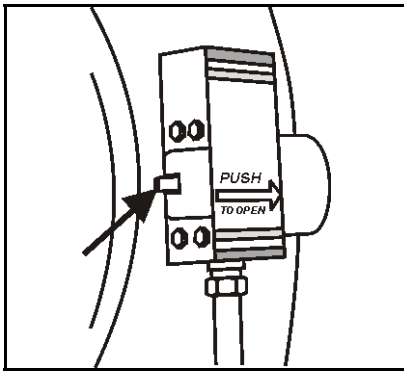
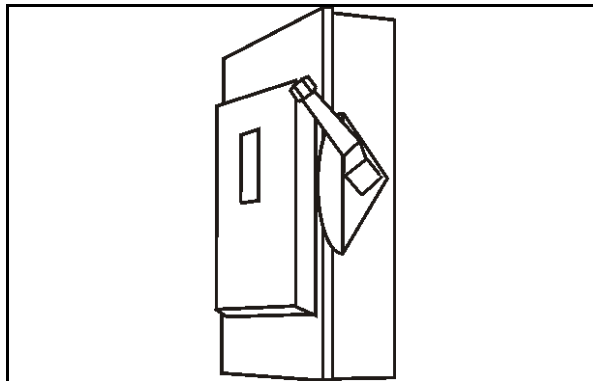


Figure 3: Wall Mounted Power Disconnect Switch



5. With the door closed and the machine still in the “unarmed” condition (it has not yet accepted coins), turn the power ON and OFF 25 times at the wall-mounted power disconnect switch (Figure 3) or external circuit breaker. Turn power ON for five seconds, then OFF for five seconds). Observe if the machine starts or if the value in the *coin count* window changes at any time the power is turned ON. This tests if the coin counter will give a free or discounted wash when electric power is restored after power interruption while the machine was **not** running.
 - a. If the machine starts without pressing the Start button at any time as power is turned ON, **take the machine out of service until the problem is diagnosed and repaired. Do not return the machine to service until it successfully passes all steps described herein.**
 - b. If the machine does not start without coins at any time power was turned ON and OFF 25 times, you probably have a good coin counter and start circuit. Proceed to the next step.
6. Insert the proper number of coins. Verify that each coin is accepted by the coin counter and that the machine starts only after the value in the *coin count* window reaches “00.”
 - a. If the machine starts before the last coin is accepted, **take the machine out of service until you determine and fix what is wrong. Do not return the machine to service until it successfully passes all steps described herein.**
 - b. If the coin counter functions properly and the machine starts, **wait a full 2.5 minutes**, then begin the procedure described in Section 2.1.5.6 “Daily Test of Door Interlock”.

2.1.5.6. Daily Test of Door Interlock [Document BICEXS03]—The door interlock on Milnor® C_E models is designed to lock the door after the machine runs for approximately 60 seconds with the door closed. Test this vital safety mechanism daily to verify that it is functioning properly.

Notice 9: **Daily test of coin counter not required.**—This test, referred to in safety placards used on some older coin-operated models, is not required on current Milnor® C_E models. Current models require only the daily door interlock test.



CAUTION 10: Scald Hazards—Contact with hot bath liquor can scald you.

- During the following test, hold the door firmly closed as shown in [Figure 4](#) to prevent the door from springing open if the latch retracts during this test.

Figure 4: Hold Door Shut when Testing the Door Latch Interlock



Use this procedure to verify that the door lock is working correctly:

1. Permit the wash program to progress for 90 seconds, but not much longer.
2. Holding the door closed, attempt to depress the door latch handle.
 - a. If the latch retracts (if the door unlocks), **remove the machine from service until the problem is identified and corrected.**
 - b. If the latch does **not** retract (if the door is locked), and assuming no other evidence of safety problems exists, return the machine to normal operation.

— End of BICEXS01 —

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2.2. 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 AISI 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.**

2.2.1. How Chemical Supplies Can Cause Damage

2.2.1.1. 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.

2.2.1.2. 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 5). Some can let chemical supplies go in the machine by gravity (Figure 6).

Figure 5: Incorrect Configurations That Let the Chemical Supply Go In the Machine by a Siphon

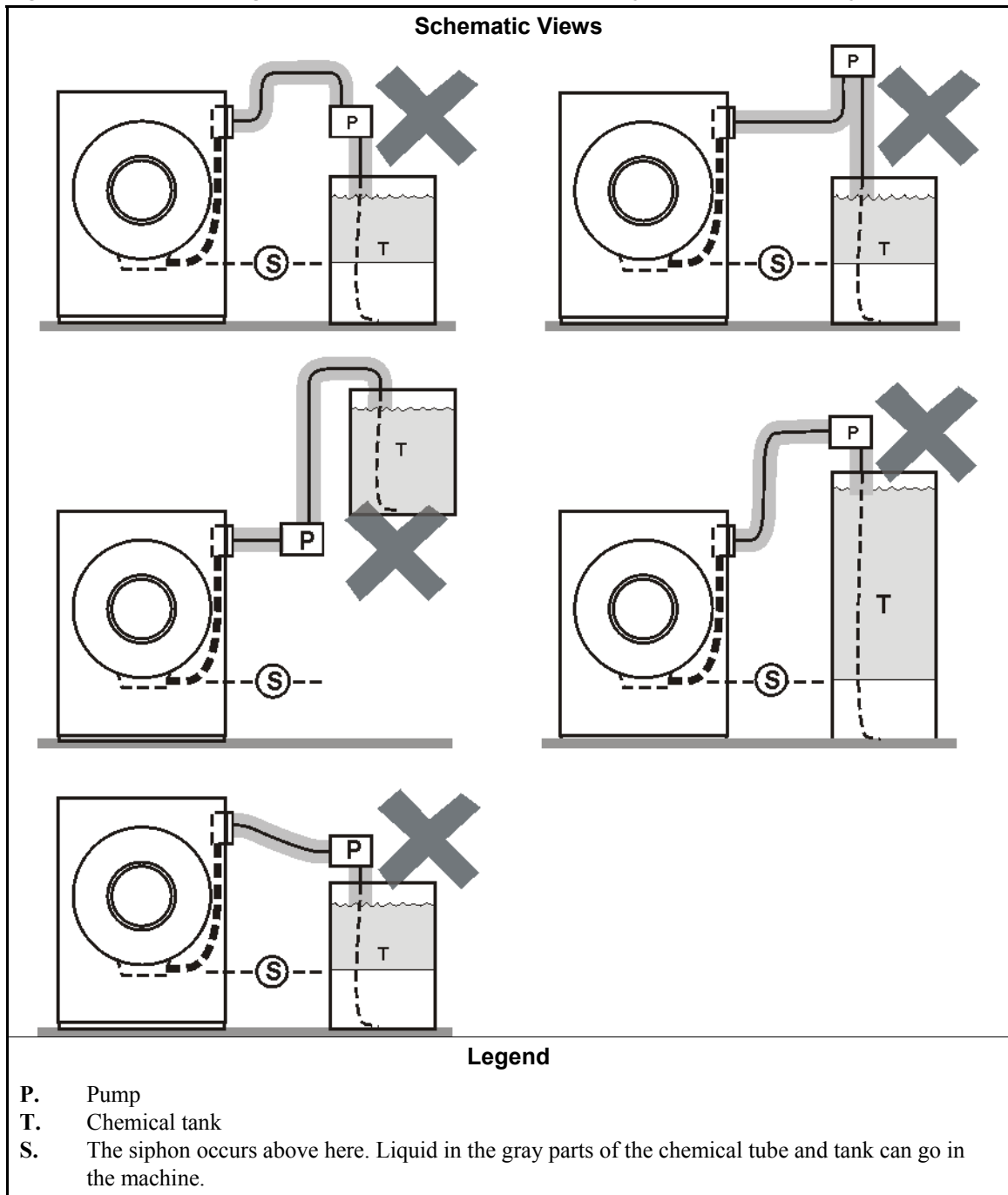
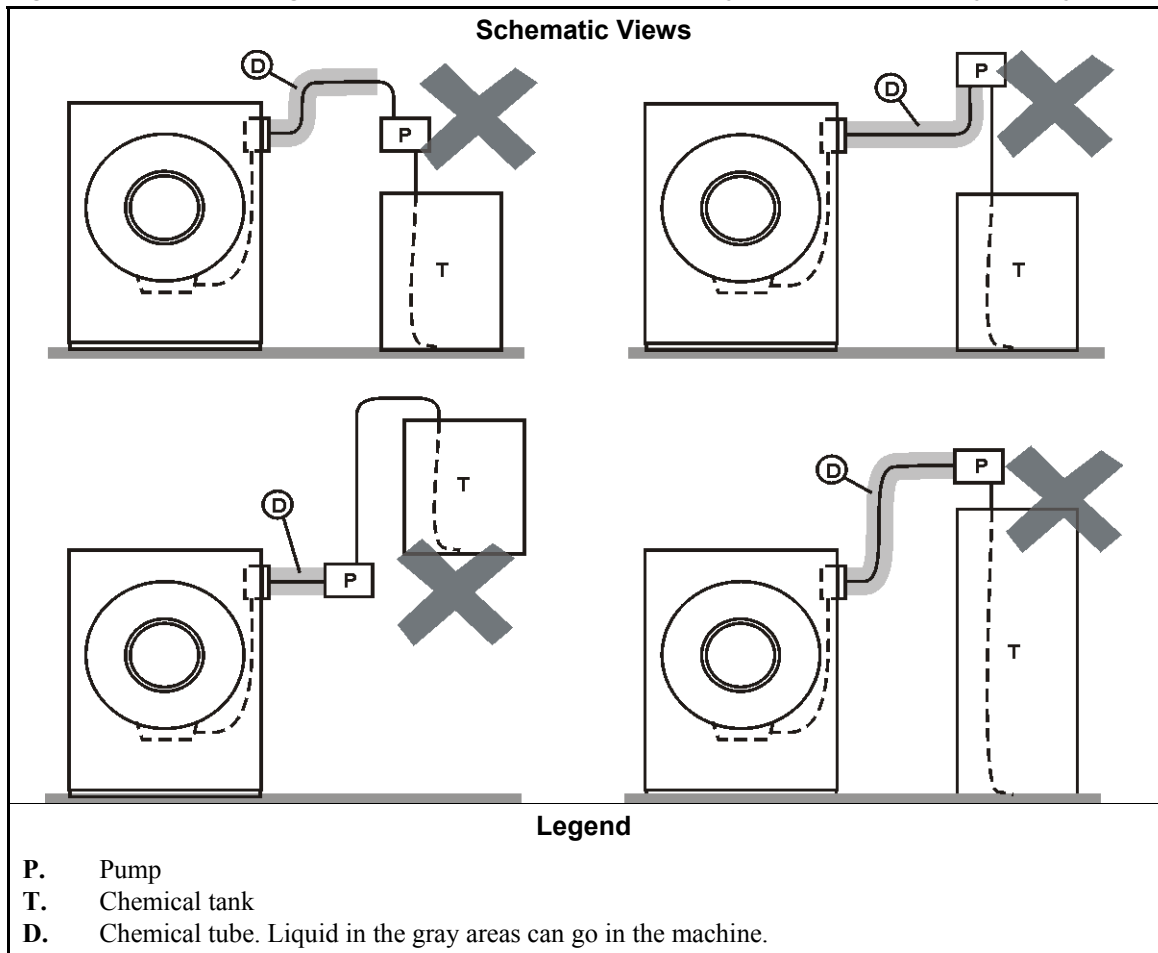


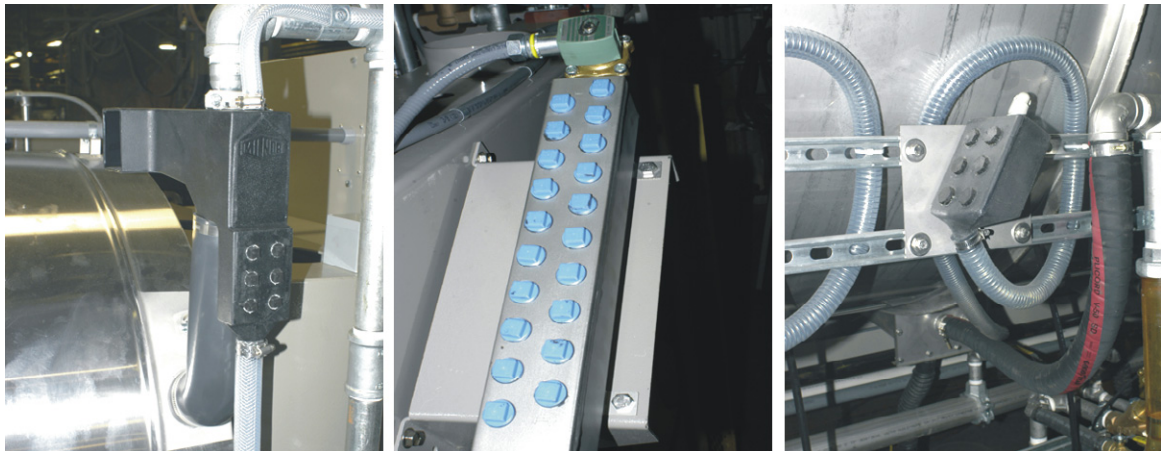
Figure 6: Incorrect Configurations That Let the Chemical Supply Go In the Machine by Gravity



2.2.2. Equipment and Procedures That Can Prevent Damage

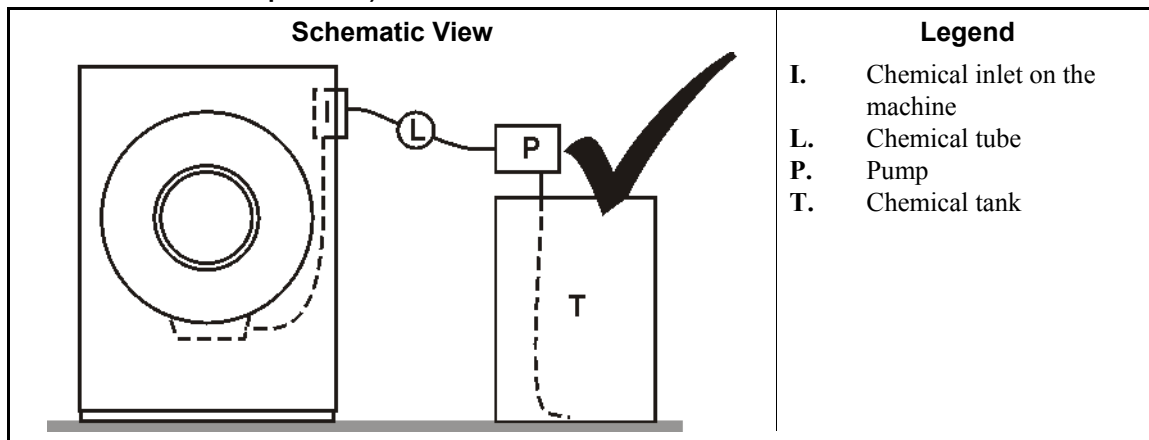
2.2.2.1. Use the Chemical Manifold Supplied.—There is a manifold on the machine to attach chemical tubes from a chemical pump system. Figure 3 shows examples. The manifold has a source of water to flush the chemical supplies with water.

Figure 7: Examples of Manifolds for Chemical Tubes. Your equipment can look different.



- 2.2.2.2. Close the line.**—If the pump does not always close the line when it is off, use a shutoff valve to do this.
- 2.2.2.3. Do not let a vacuum occur.**—Supply a vacuum breaker in the chemical line that is higher than the full level of the tank.
- 2.2.2.4. 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.
- 2.2.2.5. Put the chemical tube fully below the machine inlet.**—It is also necessary that there is no pressure in the chemical tube or tank when the system is off. [Figure 8](#) shows this configuration.

Figure 8: A Configuration that Prevents Flow in the Machine When the Pump is Off (if the chemical tube and tank have no pressure)



- 2.2.2.6. 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.

— End of BIWUUI06 —

Chapter 3

Routine Maintenance

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3.1. Routine Maintenance—30-series, Console-style Coin Washer-extractor and 36021C4E Coin Washer-extractor



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Learn more at <http://www.asd-ste100.org>.

Do the maintenance in [Section 3.1.2 “Maintenance Summary”](#) 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 Milnor if repairs are necessary.



WARNING **13**: **Risk of severe injury**—Mechanisms can pull in and mutilate your body.

- You must be approved by your employer for this work.
- Use extreme care when you must examine components in operation. Remove power from the machine for all other work. Obey safety codes. In the USA, this is the OSHA lockout/tagout (LOTO) procedure. More local requirements can also apply.
- Replace guards and covers that you remove for maintenance.

3.1.1. How To Show the Maintenance On a Calendar

If you use software to keep the maintenance schedule for your plant, add the items in [Section 3.1.2](#) to that schedule. If not, you can put marks on a calendar that work with the tables in [Section 3.1.2](#). 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 3.1.2](#).

[Table 1](#) 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 3.1.2](#). On each date with a 4, do the items with an x in the 4, 3, or 2 column. Continue this pattern.

Table 1: 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	6	
41 - 60	2	2	3	2	2	2	3	2	2	6	repeat																			

3.1.2. Maintenance Summary

The tables in this section give the routine maintenance items for your machine. Each table is for one type of procedure (example: apply grease to bearings and bushings). The top of the table gives the general procedure. 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 tables for the maintenance intervals that apply (for example, day, 40 to 60 hours, and 200 hours).**

Tip: The sections that follow the maintenance summary give more data about the maintenance items. After you know this data, it is only necessary to look at the summary to do the maintenance.

Table 2: Guards and Related Components

Examine. If a component is damaged, missing, or not set, correct this immediately to prevent injury.								
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					200 hours	anchor bolts and grout	Grout must be good. Bolts must be tight.
x						day*	door interlock	See instruction on daily test of door interlock.

Table 3: Filters, Screens, and Sensitive Components

Remove contamination from these components to prevent damage and unsatisfactory performance.								
Mark						Do this each	Component	More Data. See also Section 3.1.3 "How to Remove Contamination"
1	2	3	4	5	6			
	x					40 to 60 hours	inverter fans, vents, filters	See Figure 11. Keep good air flow.
			x			600 hours	motors	Keep good air flow.
				x		2400 hours	entire machine	Remove excessive dust and dirt.
					x	2400 hours	water inlet strainers if supplied by others	Remove strainers from incoming water lines and flush with water.

Table 4: Fluid Containers

Examine. Add fluid if necessary and keep components clean to prevent damage.										
Mark						Do this each	Component	More Data. See also Section 3.1.4 “Lubricant Identification and Procedures”		
1	2	3	4	5	6					
			x			600 hours	bearing housing	remove used oil. Add 22 ounces (650 ml) of oil 30 (Table 10). See Figure 14		

Table 5: Components that Become Worn

Examine. Tighten or replace if necessary, to prevent shutdowns and unsatisfactory performance. Speak to your dealer for replacement parts										
Mark						Do this each	Component	More Data		
1	2	3	4	5	6					
		x				200 hours	drive belts and pulleys	See Supplement 1 and Figure 10		
		x				200 hours	tubes and hoses	Examine hoses and hose connections for leaks.		

Table 6: Bearings and Bushings. See [Table 7](#) for Motors.

Apply grease to these components to prevent damage.										
Mark						Do this each	Component	More Data. See also Section 3.1.4 “Lubricant Identification and Procedures”		
1	2	3	4	5	6					
			x			600 hours	bearing housing	The bearing assembly is oil-filled. No routine grease maintenance is required. Grease is added to the seal grease cavity at assembly. Examine the grease cavity drain tube (Figure 14). If a large quantity of contamination or water flows from the tube, maintenance can be necessary. Speak to your dealer or Milnor. This is not routine maintenance.		

Table 7: Motor Grease Schedule. Use the data in [Section 3.1.4.2](#) to complete this table.

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

Table 8: Mechanisms and Settings

Make sure mechanisms are serviceable and settings are correct to prevent unsatisfactory performance.								
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 Section 3.1.3
		x				200 hours	bath level sensor that uses air pressure	Examine the air tube and connections. See Figure 13

3.1.3. How to Remove Contamination

Table 9: 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.
fans 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.

3.1.4. Lubricant Identification and Procedures

Table 10 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 3.1.4.1](#). When you add grease to motors, also use the procedures given in [Section 3.1.4.2](#).



CAUTION 14: Risk of damage—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 10: 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
30	oil	High quality SAE 30, 40, or 50 weight motor oil (non-detergent, if available)	small bearing housings

3.1.4.1. Grease Gun Procedures



CAUTION 15: Risk of damage—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:

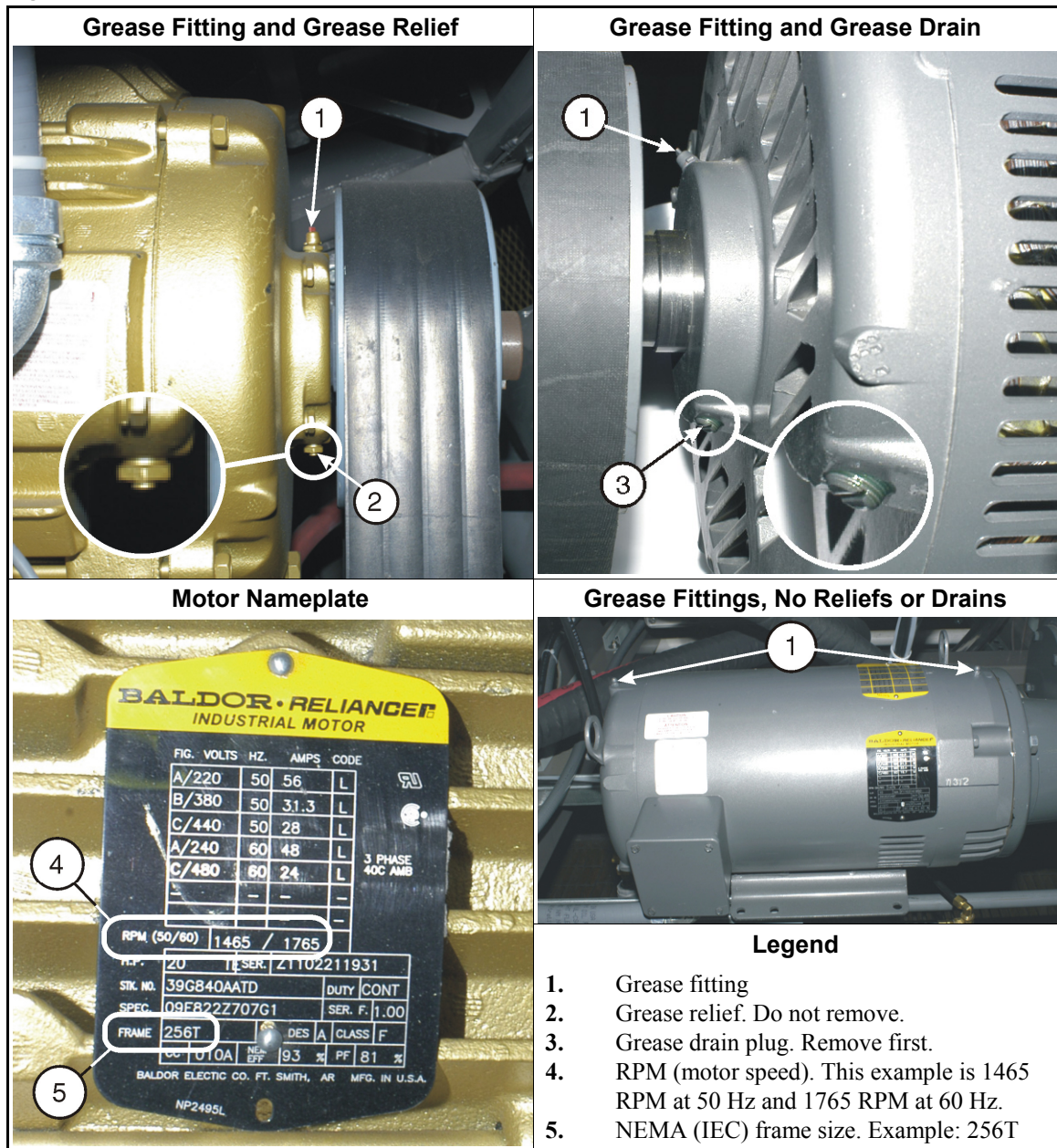
1. Make sure that the grease gun operates correctly.
2. Operate the grease gun to put grease into a small container with fluid ounce or milliliter increments. Pull the trigger fully and slowly.
3. Add a sufficient quantity of grease to measure accurately. Count the number of cycles of the grease gun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

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

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

3.1.4.2. Procedures for Motors—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 11](#) gives motor grease intervals and quantities for motors with specified frame sizes and speeds. You get this data from the motor nameplate. Use [Table 7](#) in [Section 3.1.2](#) to record the data for the motors on your machine.

Figure 9: Motor Grease Maintenance Conditions



CAUTION 16: Risk of damage—You can push grease into the windings and burn out the motor if you fail to remove the grease drain plugs.

- 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.

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 [caution statement 16](#) .

4. Add grease EM (Table 10) with the motor stopped. If the motor with the nameplate in Figure 9 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 11: Motor Grease Intervals and Quantities. Use grease EM (Table 10)

On Motor Nameplate (see Figure 9)		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		

3.1.5. Maintenance Components—Machines and Controls Group

[Document BIUUUM10]

Supplement 1

How to Examine Belts and Pulleys

Examine belts and pulleys as explained below.

With power removed:

- Look for dirt, dust, oil, and grease. Remove contamination.
- Look for belt damage as shown in Figure 10.
- Look for worn pulleys as shown in Figure 10.

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 metal tube supplied with the machine. Put the tube on the rod that the spring is attached to or remove the tube to increase or decrease tension. Replace the spring if necessary.

Figure 10: Belt and Pulley Conditions To Look For. See Supplement 1.

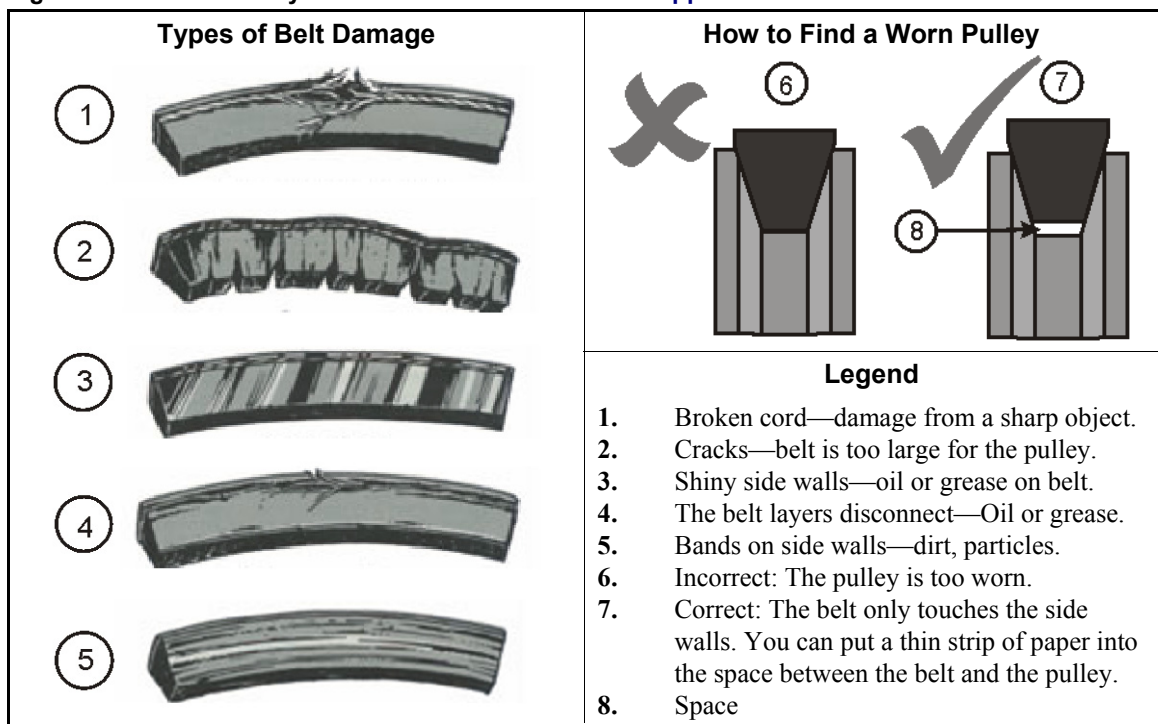
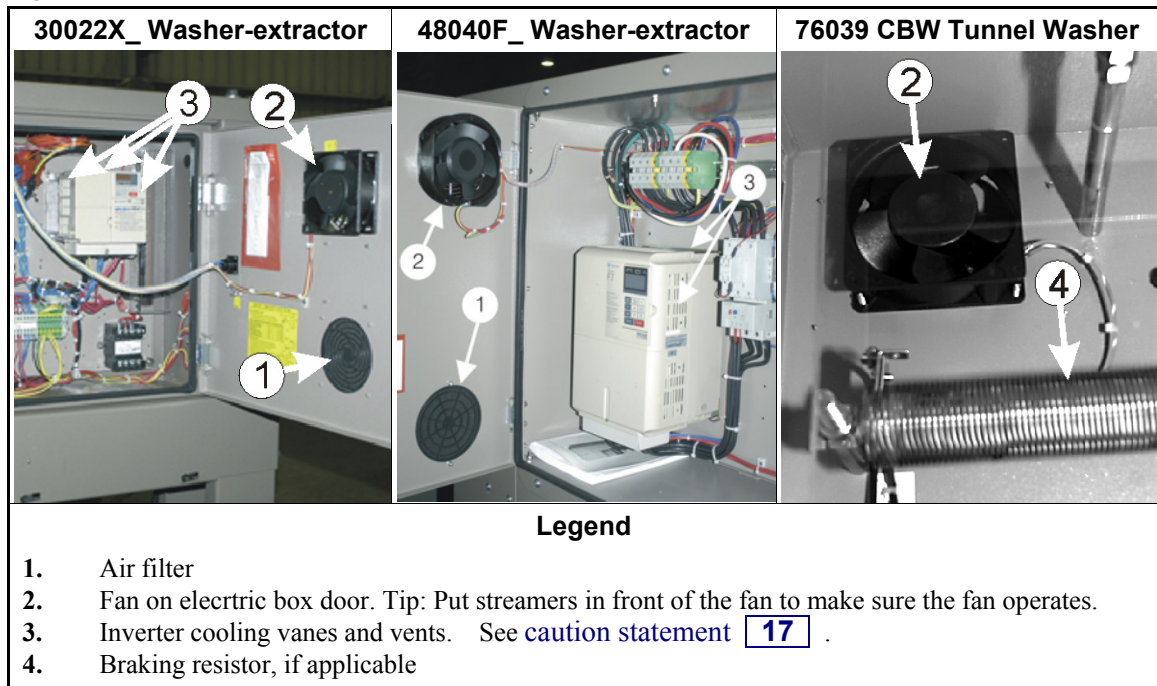


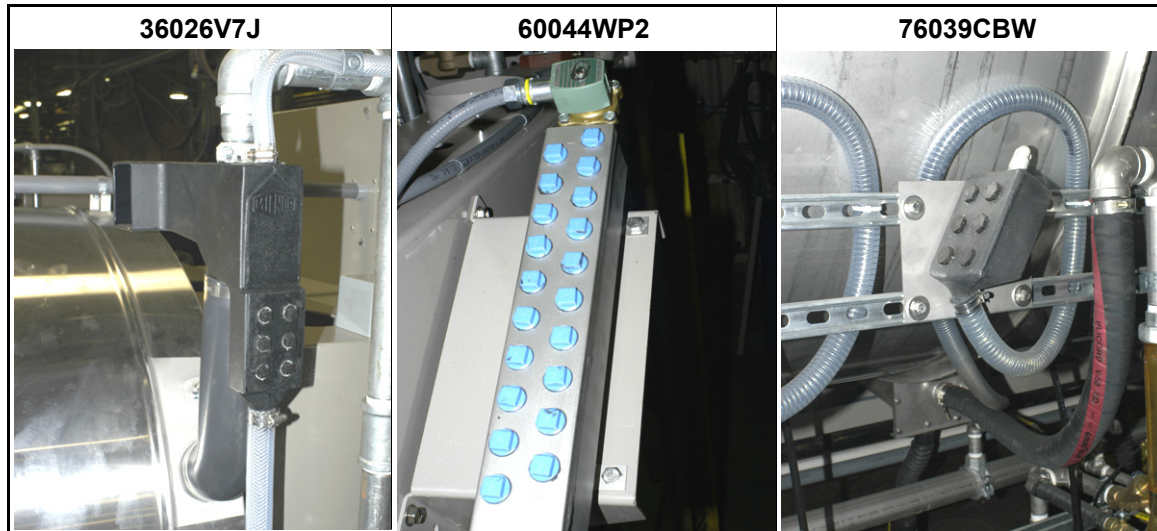
Figure 11: Electric Box and Inverter. These are examples. Your machine can look different.



CAUTION 17: Risk of damage—The inverter will burn out without sufficient airflow.

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

Figure 12: Chemical Inlet Manifolds for Chemical Pump Systems. See [caution statement 18](#). These are examples. Your machine can look different.



CAUTION 18: Risk of corrosion damage to the machine and the goods—

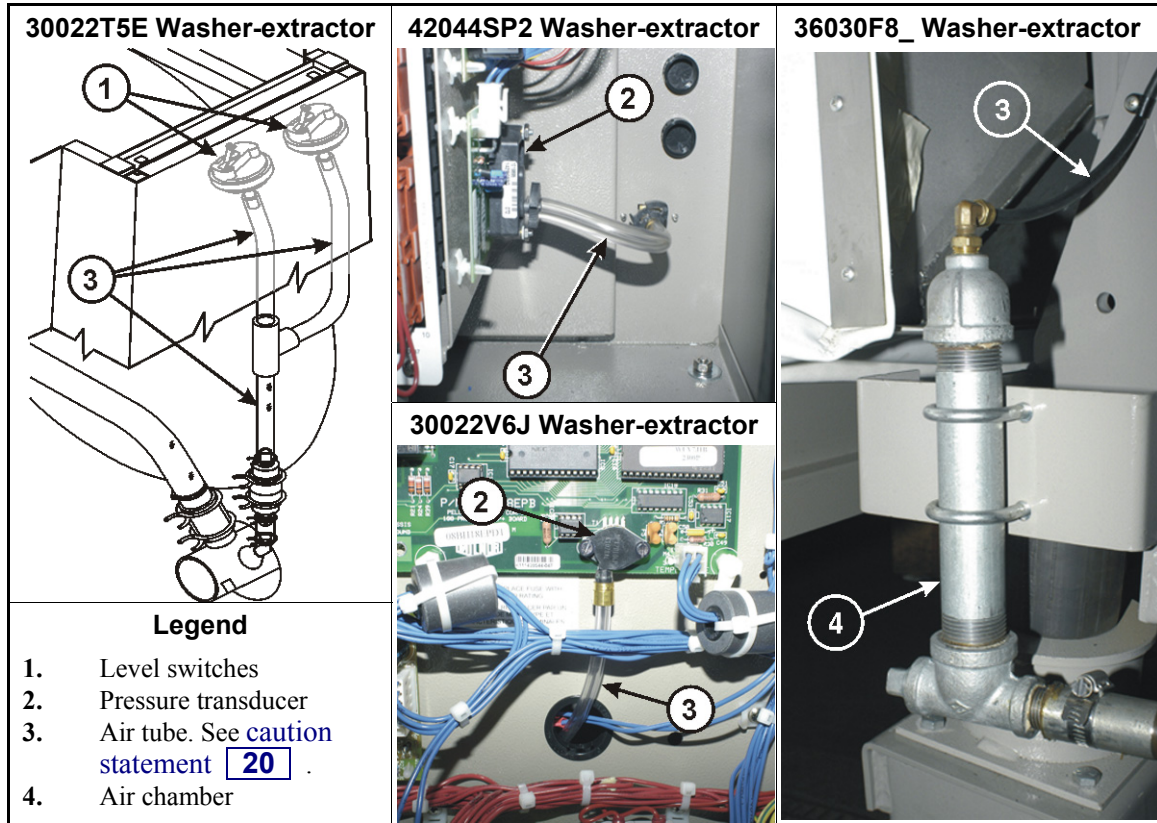
- Connect chemical tubes only to chemical manifold inlets.
- Stop leaks. Remove leaked supplies from surfaces.
- Speak to your dealer or Milnor if you see corrosion damage.



CAUTION 19: Risk of injury and damage—Chemical supplies can splash on personnel and machine surfaces if water pressure is too high.

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

Figure 13: Air Tube for the Water Level Sensor. These are examples. Your machine can look different.

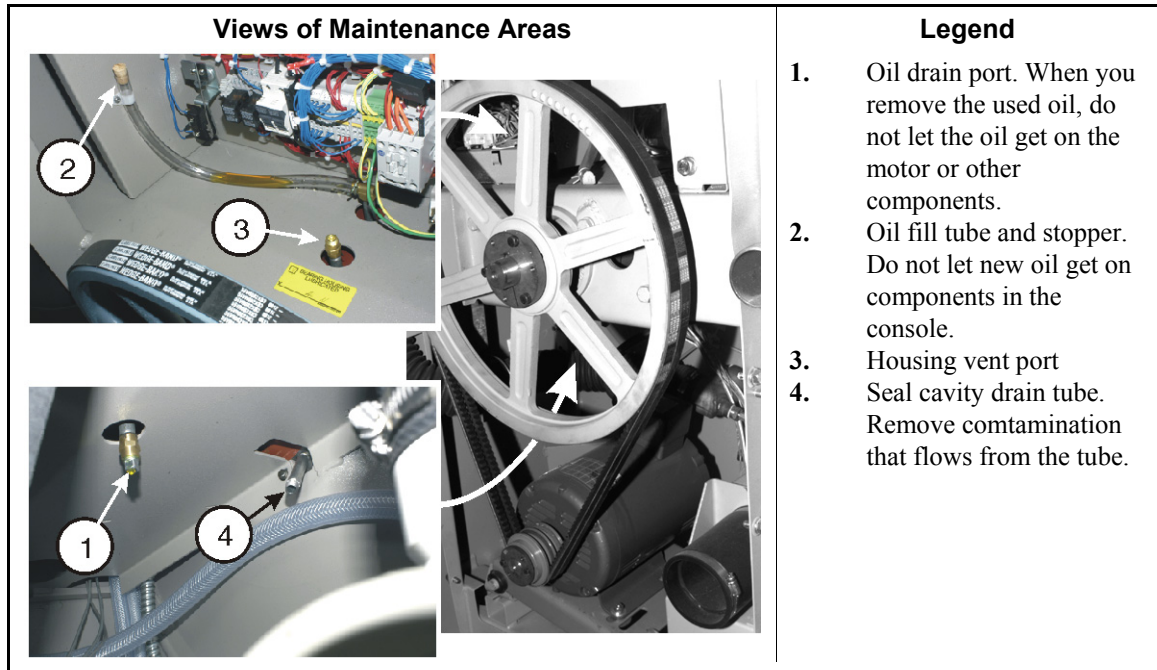


CAUTION 20: Risk of malfunction—The level sensor must give correct data.

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

3.1.6. Maintenance Components—Large Extractors [Document BIUUM03]

Figure 14: Oil Maintenance Areas for Bearing Assembly. A 30022T5E is shown. Your machine can look different.



— End of BIUUM09 —