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Service—

30022Fxx and Jxx Washer-Extractors



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

Please Read

About the Manual Identifying Information on the Cover—The front cover displays pertinent identifying information for this manual. Most important, are the published manual number (part number) /ECN (date code). Generally, when a replacement manual is furnished, it will have the same published manual number, but the latest available ECN. This provides the user with the latest information applicable to his machine. Similarly all documents comprising the manual will be the latest available as of the date the manual was printed, even though older ECN dates for those documents may be listed in the table of contents.

When communicating with the Milnor factory regarding this manual, please also provide the other identifying information shown on the cover, including the publishing system, access date, and whether the document ECN's are the latest available or exact.

Best Available Information—This manual contains the most accurate and complete information available when Milnor shipped your machine/software. Products are occasionally released with the best available documentation, even though the device identification (model numbers, etc.) on the documentation does not explicitly include the delivered model. In such cases, use the documentation provided.

Although unlikely, incorrect manuals may have been shipped with your machine. If you believe you received the wrong manuals, or if you need specific information about any aspect of your machine not addressed in the provided documentation, contact the Milnor Customer Service group.

References to Yellow Troubleshooting Pages—This manual may contain references to “yellow pages.” Although the pages containing trouble-shooting procedures are no longer printed on yellow paper, troubleshooting instructions, if any, will be contained in the easily located “Troubleshooting” section. See the table of contents.

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for MAP30FXXBE/2007043A

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ABOUT THIS MANUAL

Scope—This instruction manual is intended to provide preventive maintenance procedures, service procedures and mechanical parts identification for all Milnor® 30022Fxx & 30022Jxx suspended washer-extractors. Measurements are in common US and metric units unless otherwise noted. Always use new fasteners when replacing or repairing parts. See the safety manual for safety instructions before installing, servicing, or operating this machine. See the installation guide for facility requirements, installation instructions, and assembly instructions. See the operator guide for operator instructions. See the reference manual for programming, operating, and trouble shooting instructions. See the schematic manual for electrical parts identification and electrical troubleshooting.

Manual Number/Date Code (When To Discard or Save)—The manual number/date code is located on the inside front cover, upper right corner just above the manual name. Whenever the manual is reprinted with new information, part of this number changes. **If the *date code* after the “/” changes, the new version applies to all machines covered by the old version, but is improved— thus the old version can be discarded. If the *manual number* before the “/” changes, the new manual covers only new machines.** Example: Discard MATMODELAE/8739**C**V when MATMODELAE/8739**D**V is received (minor improvements). Also, discard MATMODELAE/8739**D**V when MATMODELAE/8746**A**V is received (major improvements). But keep MATMODELAE/8746**F**V when MATMODEL**B**E/8815AV is received, since the new manual no longer applies to machines originally shipped with the old manual.

Documents and Change Bars—The individual documents comprising this manual use the same revision criteria as the manual. Text documents also display change bars. Example: When sectionMSOP0599AE/9135**B**V becomes MSOP0599AE/9135**C**V, change bars with the letter “C” appear next to all changes for this revision. For a major rewrite (e.g., MSOP0599AE/922**6**AV), all change bars are deleted.

For Assistance—Please call:

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We warrant to the original purchaser that MILNOR machines including electronic hardware/software (hereafter referred to as "equipment"), will be free from defects in material and workmanship for a period of one year from the date of shipment from our factory with no operating hour limitation. This warranty is contingent upon the equipment being installed, operated and serviced as specified in the operating manual supplied with the equipment, and operated under normal conditions by competent operators.

Providing we receive written notification of a warranted defect within 30 days of its discovery, we will – at our option – repair or replace the defective part or parts, FOB our factory. We retain the right to require inspection of the parts claimed defective in our factory prior to repairing or replacing same. We will not be responsible, or in any way liable, for unauthorized repairs or service to our equipment, and this warranty shall be void if the equipment is repaired or altered in any way without MILNOR's written consent.

Parts which require routine replacement due to normal wear – such as gaskets, contact points, brake and clutch linings and similar parts – are not covered by this warranty, nor are parts damaged by exposure to weather or to chemicals.

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How to order repair parts

Repair parts may be ordered either from the authorized dealer who sold you this machine, or directly from the MILNOR factory. In most cases, your dealer will have these parts in stock.

When ordering parts, please be sure to give us the following information:

1. Model and serial number of the machine for which the parts are required
2. Part number
3. Name of the part
4. Quantity needed
5. Method of shipment desired
6. In correspondence regarding motors or electrical controls, please include all nameplate data, including wiring diagram number and the make or manufacturer of the motor or controls.

All parts will be shipped C.O.D. transportation charges collect only.

Please read this manual

It is strongly recommended that you read the installation and operating manual before attempting to install or operate your machine. We suggest that this manual be kept in your business office so that it will not become lost.

PELLERIN MILNOR CORPORATION

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BMP720097R
72332A

Safety—Suspended, Open Pocket, Non-tilting Washer-Extractors

1. General Safety Requirements—Vital Information for Management Personnel [Document BIUUUS04]

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/user) is responsible for understanding and ensuring the proper operation and maintenance of the machine. The owner/user must familiarize himself with the contents of all machine instruction manuals. The owner/user should direct any questions about these instructions to a Milnor® dealer or the Milnor® Service department.

Most regulatory authorities (including OSHA in the USA and CE in Europe) hold the owner/user ultimately responsible for maintaining a safe working environment. Therefore, the owner/user must do or ensure the following:

- recognize all foreseeable safety hazards within his facility and take actions to protect his personnel, equipment, and facility;
- work equipment is suitable, properly adapted, can be used without risks to health or safety, and is adequately maintained;
- where specific hazards are likely to be involved, access to the equipment is restricted to those employees given the task of using it;
- only specifically designated workers carry out repairs, modifications, maintenance, or servicing;
- information, instruction, and training is provided;
- workers and/or their representatives are consulted.

Work equipment must comply with the requirements listed below. The owner/user must verify that installation and maintenance of equipment is performed in such a way as to support these requirements:

- control devices must be visible, identifiable, and marked; be located outside dangerous zones; and not give rise to a hazard due to unintentional operation;
- control systems must be safe and breakdown/damage must not result in danger;
- work equipment is to be stabilized;
- protection against rupture or disintegration of work equipment;
- guarding, to prevent access to danger zones or to stop movements of dangerous parts before the danger zones are reached. Guards to be robust; not give rise to any additional hazards; not be easily removed or rendered inoperative; situated at a sufficient distance from the danger zone; not restrict view of operating cycle; allow fitting, replacing, or maintenance by restricting access to relevant area and without removal of guard/protection device;
- suitable lighting for working and maintenance areas;
- maintenance to be possible when work equipment is shut down. If not possible, then protection measures to be carried out outside danger zones;
- work equipment must be appropriate for preventing the risk of fire or overheating; discharges of gas, dust, liquid, vapor, other substances; explosion of the equipment or substances in it.

- 1.1. **Laundry Facility**—Provide a supporting floor that is strong and rigid enough to support—with a reasonable safety factor and without undue or objectionable deflection—the weight of the fully loaded machine and the forces transmitted by it during operation. Provide sufficient clearance for machine movement. Provide any safety guards, fences, restraints, devices, and verbal and/or posted restrictions necessary to prevent personnel, machines, or other moving machinery from accessing the machine or its path. Provide adequate ventilation to carry away heat and vapors. Ensure service connections to installed machines meet local and national safety standards, especially regarding the electrical disconnect (see the National Electric Code). Prominently post safety information, including signs showing the source of electrical disconnect.
- 1.2. **Personnel**—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.
- 1.3. **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.
- 1.4. **Hazard Information**—Important information on hazards is provided on the machine safety placards, in the Safety Guide, and throughout the other machine manuals. **Placards must be kept clean so that the information is not obscured. They must be replaced immediately if lost or damaged. The Safety Guide and other machine manuals must be available at all times to the appropriate personnel.** See the machine service manual for safety placard part numbers. Contact the Milnor Parts department for replacement placards or manuals.
- 1.5. **Maintenance**—Ensure the machine is inspected and serviced in accordance with the norms of good practice and with the preventive maintenance schedule. Replace belts, pulleys, brake shoes/disks, clutch plates/tires, rollers, seals, alignment guides, 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, gear boxes, 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. **Safety Alert Messages—Internal Electrical and Mechanical Hazards** [Document BIUUUS11]

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



WARNING 1: Electrocution and Electrical Burn Hazards—Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

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



WARNING 2: 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.

3. Safety Alert Messages—External Mechanical Hazards [Document BIUUUS12]

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



WARNING 3: Crush Hazards—Suspended machines only—Spaces between the shell and housing can close and crush or pinch your limbs. The shell moves within the housing during operation.

- Do not reach into the machine housing or frame.
- Keep yourself and others clear of movement areas and paths.

4. Safety Alert Messages—Cylinder and Processing Hazards

[Document BIUUUS13]

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



DANGER 4: 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 5: 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 6: 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 7: 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.

5. Safety Alert Messages—Unsafe Conditions [Document BIUUUS14]

5.1. Damage and Malfunction Hazards

5.1.1. Hazards Resulting from Inoperative Safety Devices



DANGER 8: 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 9: 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 10: Electrocution and Electrical Burn Hazards—Electric box doors—Operating the machine with any electric box door unlocked can expose high voltage conductors inside the box.

- Do not unlock or open electric box doors.



WARNING 11: 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.

5.1.2. Hazards Resulting from Damaged Mechanical Devices



WARNING 12: 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 13: 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 14: 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

5.2. Careless Use Hazards

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



WARNING 15: 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.

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



WARNING 16: Electrocution and Electrical Burn Hazards—Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

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



WARNING 17: 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 18: 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.

Safety—Suspended, Open Pocket, Non-tilting Washer-Extractors

— End of BIUUUS27 —

About the Forces Transmitted by Milnor® Washer-extractors

Document BIWUUI02
Specified Date 20001108
As-of Date 20001108
Access Date 20001108

Applicability.....WUU

During washing and extracting, all washer-extractors transmit both static and dynamic (cyclic) forces to the floor, foundation, or any other supporting structure. During washing, the impact of the goods as they drop imparts forces which are quite difficult to quantify. Size for size, both rigid and flexibly-mounted machines transmit approximately the same forces during washing. During extracting, rigid machines transmit forces up to 30 times greater than equivalent flexibly-mounted models. The actual magnitude of these forces vary according to several factors:

- machine size,
- final extraction speed,
- amount, condition, and type of goods being processed,
- the liquor level and chemical conditions in the bath preceding extraction, and
- other miscellaneous factors.

Estimates of the maximum force normally encountered are available for each Milnor® model and size upon request. Floor or foundation sizes shown on any Milnor® document are only for on-grade situations based only on previous experience without implying any warranty, obligation, or responsibility on our part.

1. Rigid Machines

Size for size, rigid washer-extractors naturally require a stronger, more rigid floor, foundation, or other supporting structure than flexibly-mounted models. If the supporting soil under the slab is itself strong and rigid enough and has not subsided to leave the floor slab suspended without support, on grade installations can often be made directly to an existing floor slab if it has enough strength and rigidity to safely withstand our published forces without transmitting undue vibration. If the subsoil has subsided, or if the floor slab itself has insufficient strength and rigidity, a deeper foundation, poured as to become monolithic with the floor slab, may be required. Support pilings may even be required if the subsoil itself is “springy” (i.e., if its resonant frequency is near the operating speed of the machine). Above-grade installations of rigid machines also require a sufficiently strong and rigid floor or other supporting structure as described below.

2. Flexibly-mounted Machines

Size for size, flexibly-mounted machines generally do not require as strong a floor, foundation, or other supporting structure as do rigid machines. However, a floor or other supporting structure having sufficient strength and rigidity, as described in section 3, is nonetheless vitally important for these models as well.

3. How Strong and Rigid?

Many building codes in the U.S.A. specify that laundry floors must have a minimum live load capacity of 150 pounds per square foot (732 kilograms per square meter). However, even compliance with this or any other standard does not necessarily guarantee sufficient rigidity. In any event, it is the sole responsibility of the owner/user to assure that the floor and/or any other supporting structure exceeds not only all applicable building codes, but also that the floor and/or any other supporting structure for each washer-extractor or group of washer-extractors actually

has sufficient strength and rigidity, plus a reasonable factor of safety for both, to support the weight of all the fully loaded machine(s) including the weight of the water and goods, and including the published 360° rotating sinusoidal RMS forces that are transmitted by the machine(s). Moreover, the floor, foundation, or other supporting structure must have sufficient rigidity (i.e., a natural or resonant frequency many times greater than the machine speed with a reasonable factor of safety); otherwise, the mentioned 360° rotating sinusoidal RMS forces can be multiplied and magnified many times. It is especially important to consider all potential vibration problems that might occur due to all possible combinations of forcing frequencies (rotating speeds) of the machine(s) compared to the natural frequencies of the floor and/or any other supporting structure(s). A qualified soil and/or structural engineer must be engaged for this purpose.

Figure 1: How Rotating Forces Act on the Foundation

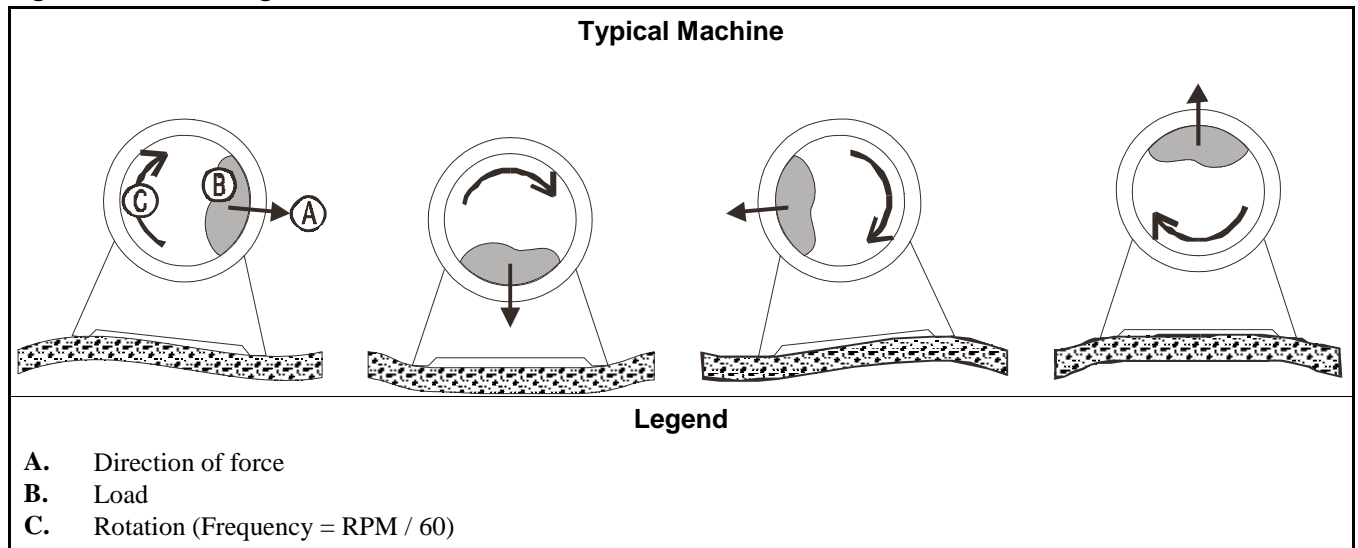


Figure 1 above is intended to depict both on-grade and above-grade installations and is equally applicable to flexibly-mounted washer-extractors, as well as to rigid models installed either directly on a floor slab or on a foundation poured integrally with the slab. Current machine data is available from Milnor® upon request. All data is subject to change without notice and may have changed since last printed. It is the sole responsibility of every potential owner to obtain written confirmation that any data furnished by Milnor® applies for the model(s) and serial number(s) of the specific machines.

Safety Placard Use and Placement 30022, 36030F8J, F8W & 42032F7J, F7W

BMP020113/2003286V
(Sheet 1 of 2)

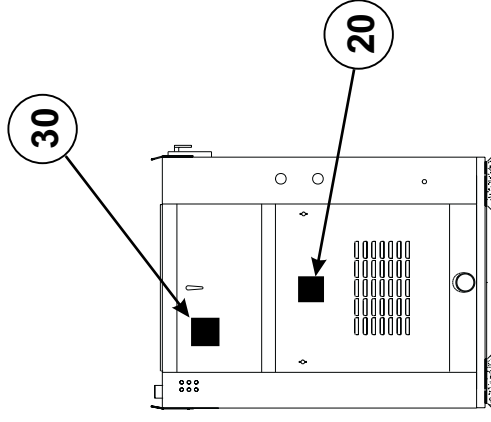


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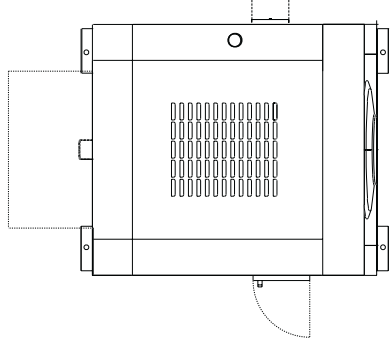
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Notes:

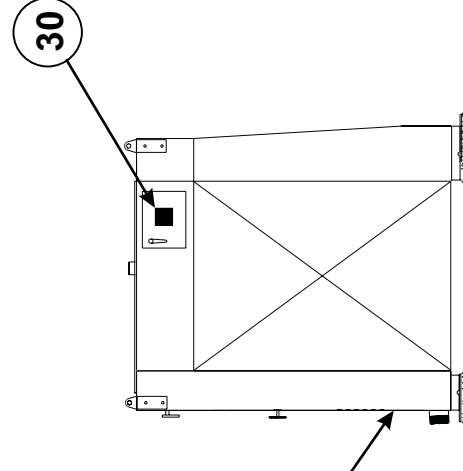
1. Replace placard immediately, if removed or unreadable.
2. Approximate locations of placards are shown. Mounting holes are provided on machine. Use #8 self-tapping screws.



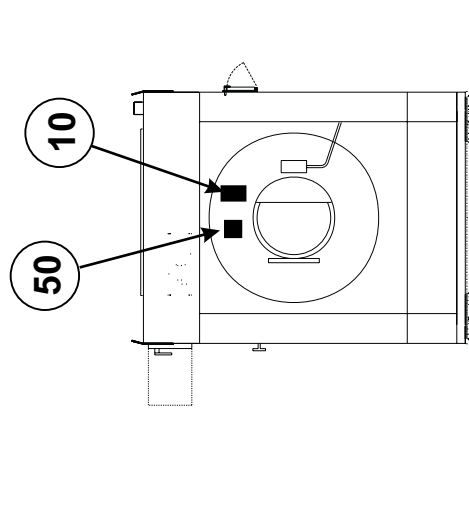
REAR VIEW



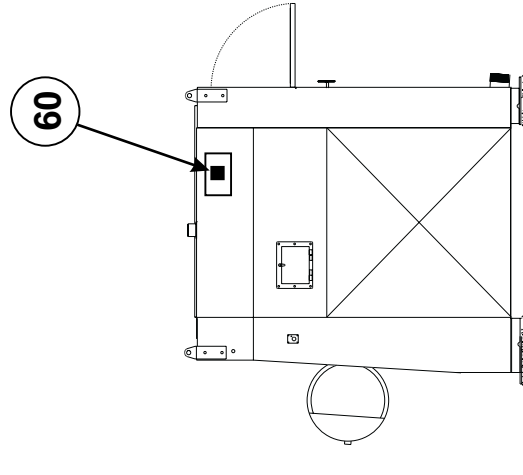
PLAN VIEW



LEFT VIEW



FRONT VIEW



RIGHT VIEW

40
ON STEAM PIPE
ONLY IF MACHINE
IS EQUIPPED WITH
STEAM



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P. O. Box 400, Kenner, LA 70063-0400

Litho in U.S.A.

Parts List—Safety Placard Placement

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
-----ASSEMBLIES-----				
none				
-----COMPONENTS-----				
All	10	01 10631A	NPLT:SHELL FRT WARN NOTILT-TCATA	STEAM INLET ONLY
All	20	01 10689A	NPLT:BELT HAZARD SM TCATA	
All	30	01 10377A	NPLT:ELEC HAZARD LG-TCATA	
All	40	01 10685A	NPLT:BURN HAZARD WARN-TCATA	
All	50	01 10699A	NPLT:SERV HZRD-PLYEST-TCATA	
All	60	01 10375B	NPLT:ELEC HAZARD SMALL-TCATA	

Safety Placard Use and Placement ISO 30022, 36030F8J, F8W & 42032F7J, F7W

BMP020114/2003286V
(Sheet 1 of 2)



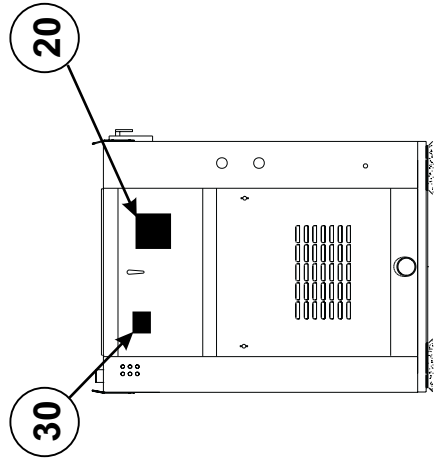
Pellerin Milnor Corporation
P. O. Box 400, Kenner, LA 70063-0400

Litho in U.S.A.

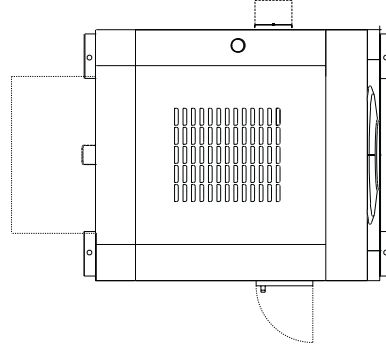
ISO Placards shown on this page

Notes:

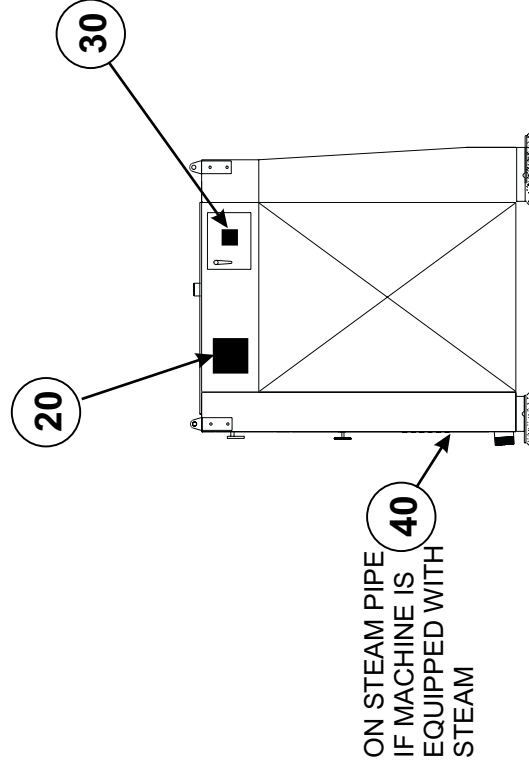
1. Replace placard immediately, if removed or unreadable.
2. Approximate locations of placards are shown. If Aluminum Placard Mounting holes are provided on machine. Use #8 self-tapping screws.



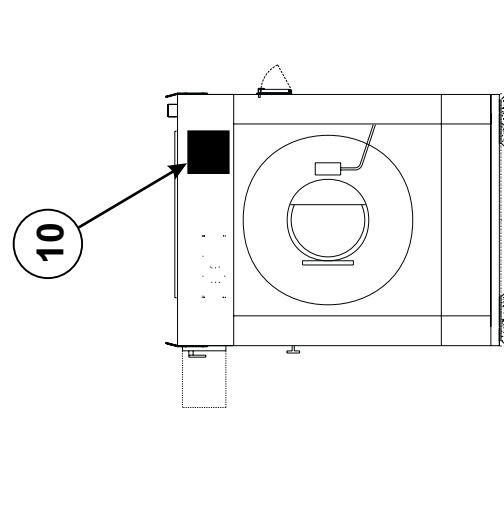
REAR VIEW



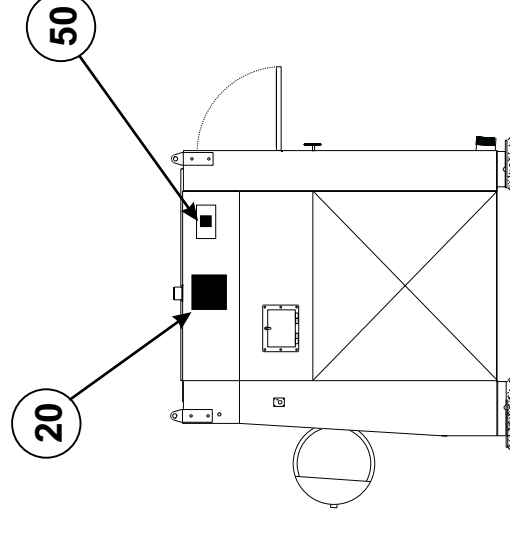
PLAN VIEW



LEFT VIEW



FRONT VIEW



RIGHT VIEW



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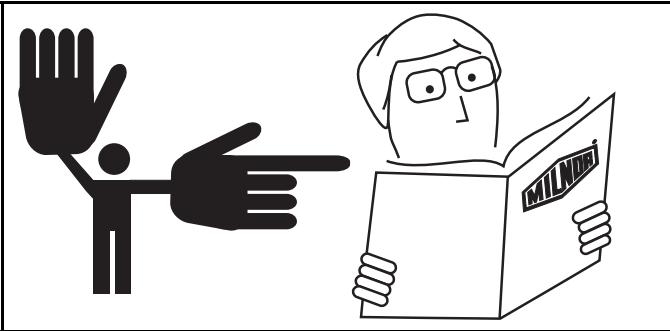
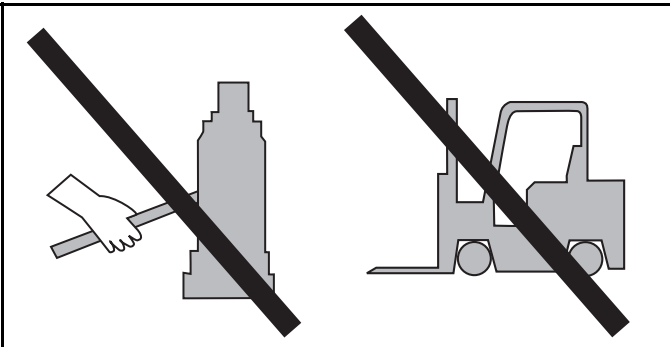
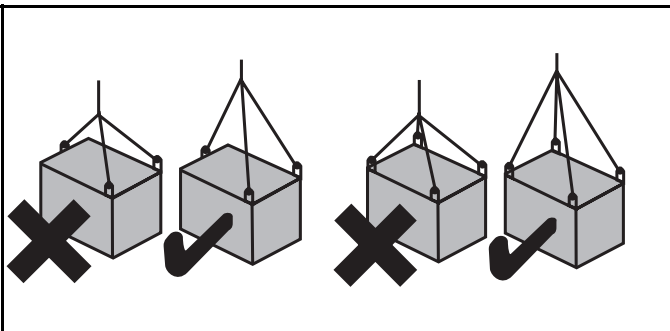
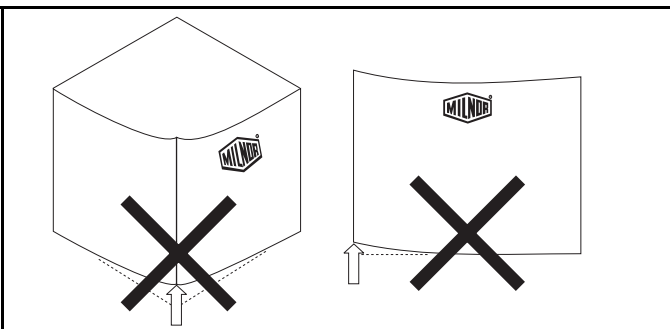
Parts List—Safety Placard Placement

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
-----ASSEMBLIES-----				
none				
-----COMPONENTS-----				
All	10	01 10631X	NPLT:WE1-NONTILT WARNGS FRT	
All	20	01 10628X	NPLT:NONTILT W/E WARNING SIDE	
All	30	01 10377	NPLTE:"WARNING" 4X4	
All	40	01 10649X	NPLT:HOT BEHIND CVR WARN-ISO	STEAM INLET ONLY
All	50	01 10375	NPLTE:"WARNING" 2X2	

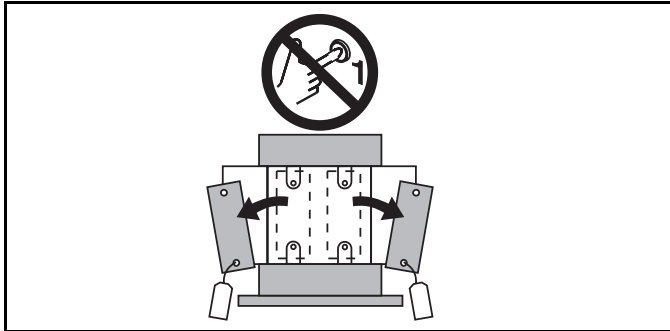
Glossary of Tag Illustrations— F-Style, Q-Style, 36" & 42" V-Style, and X-Style Washer-Extractors

MSIUUQTGAE/2003045V

Illustration	Explanation
	Stop! Read the manual first for complete instructions before continuing.
	Do not jack the machine here. Do not lift the machine here.
	Use three point or four point lifting as determined by the lifting eyes furnished. Rig the load using lifting cables of sufficient size and length to ensure cables are not over-stressed.
	Do not lift the machine from one corner or one side edge.

Illustration

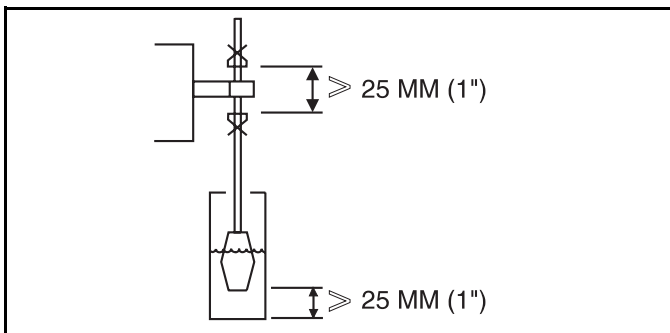
Explanation



Do not start this machine until the packing materials, lifting brackets, etc. with this tag attached or behind this panel are removed. These materials are painted red. Safety stands or brackets (also painted red) may be provided with this machine. Do not discard safety stands or brackets



Do not step or stand on this machine part.



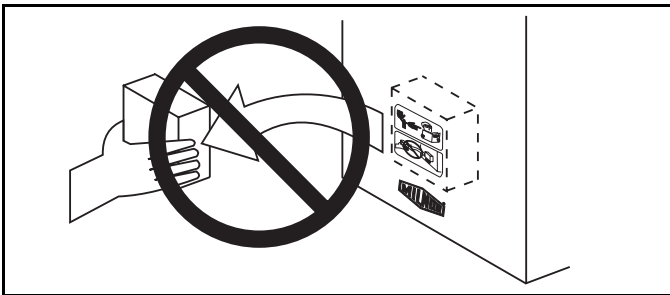
Maintain a 25 mm. (1") minimum clearance between float clips. Set "low level" so that the bottom of the float is always at least 25mm (1") above the bottom of the float tube.



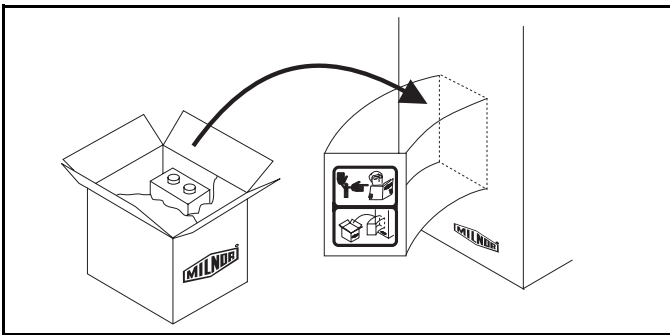
This motor or pump should rotate in the direction of the arrow.



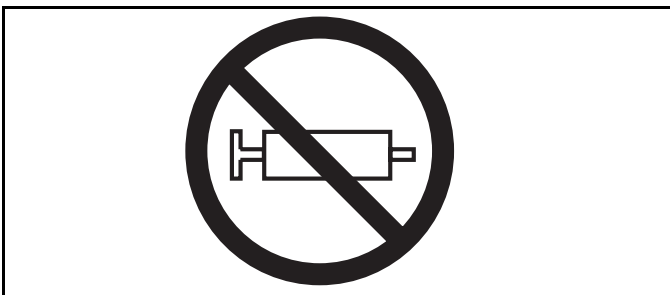
Do not start this machine until the part with this tag is installed on the machine.



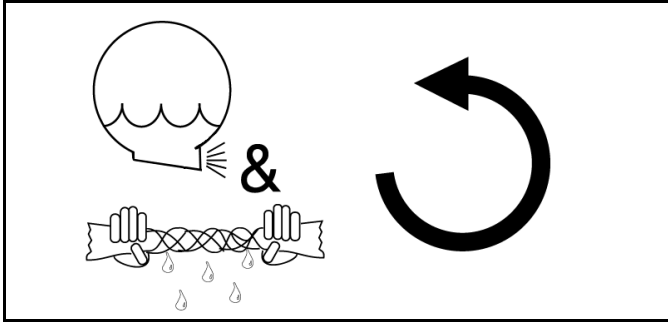
Do not remove this component from the machine.



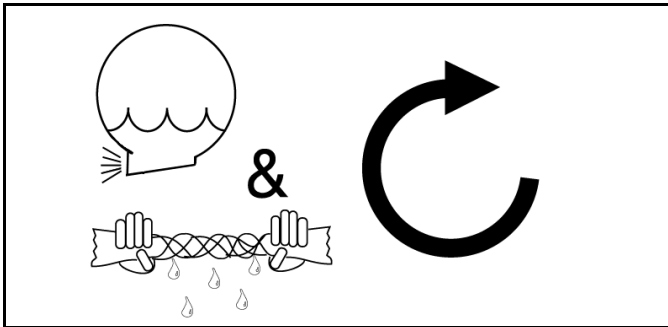
Install the appropriate part here before operating the machine.



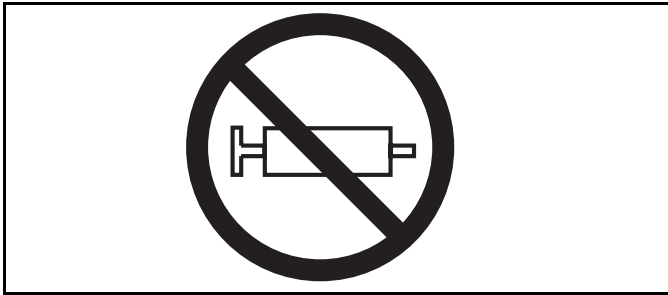
Do not pump grease here.



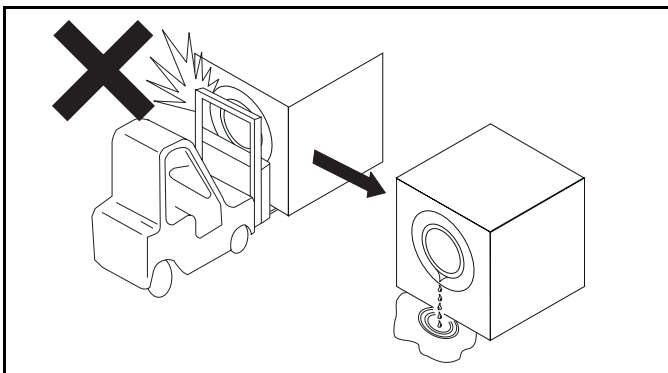
During drain and extract, the cylinder must rotate counterclockwise when viewed from here (rear of machine).



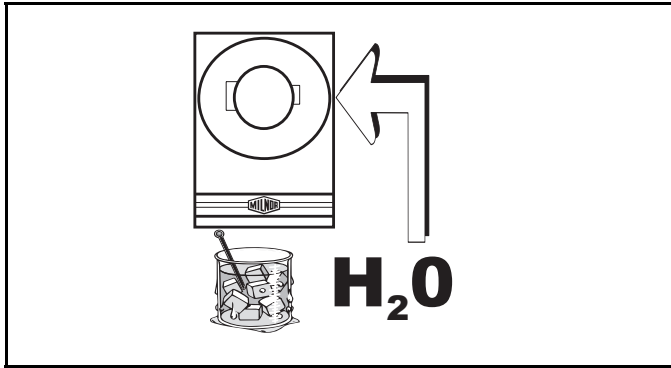
During drain and extract, the cylinder must rotate clockwise when viewed from here (front of machine).



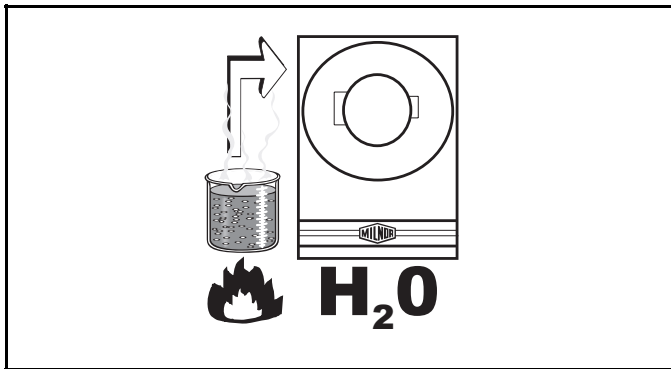
Do not pump grease here.



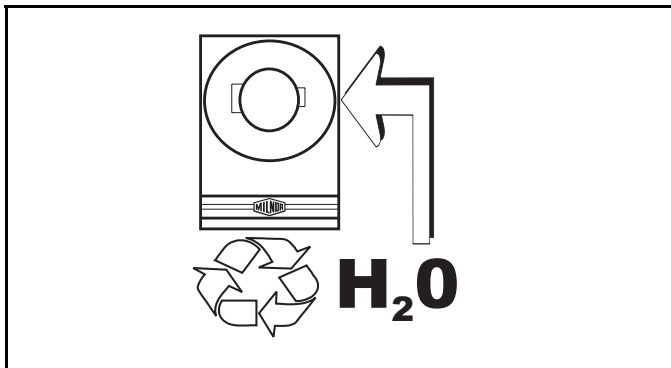
Do not strike shell front of washer-extractors during fork lifting. Striking shell front will cause door to leak.



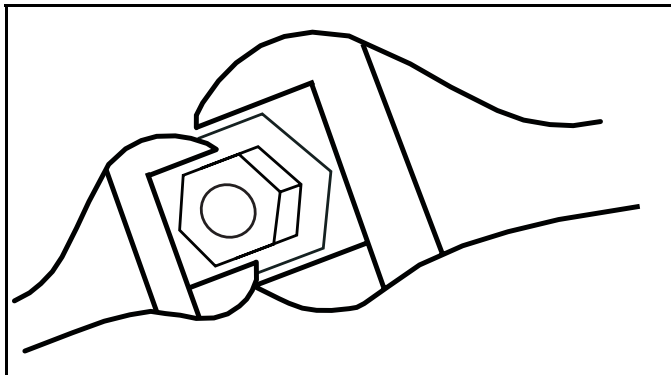
Make cold water connection here.



Make hot water connection here.



Make third (reuse) water connection here.



Hold the connection side of the valve with a wrench when connecting plumbing.

Avoiding Damage From Allied Remote Chemical Delivery Systems

Milnor® does not manufacture or supply remote chemical delivery systems and this document is meant only to illustrate some of the possible problems that can be minimized during installation of such systems by the chemical supply company. Milnor washer-extractors and CBW® batch washers (tunnels) are available with convenient inlets for such systems (see Figure 1). Most common of the types of systems currently used in commercial laundering operations are pumped chemical systems. Other types, such as constant pressure, re-circulating ring main systems have also been, and may continue to be used with Milnor equipment.

This document warns about some of the possible hazards posed by chemical systems and lists certain requirements needed to minimize those hazards. The procedures for interfacing with allied chemical systems and information pertinent to chemical use in general are provided elsewhere in the product manuals (see Note 1).

Figure 1: Pumped Chemical Inlets on CBW Batch Washer



Note 1: Misuse of laundering chemicals (such as injecting excessive concentrations of chlorine bleach or permitting acid sours to react with hypo chlorite) due to incorrect formulation can also be hazardous. Information pertinent to chemical use is provided elsewhere in the product manuals.

1. How a Chemical System Can Damage the Machine It Serves

Milnor has manufactured washer-extractors and tunnel washers with the same stainless steel specification since its founding. Every batch of steel used is certified and documented by the steel mill. Testing of samples damaged by corrosion have, in every case, proven the steel to be well within the AISI 304 specification.

Chemical products commonly found in the laundry industry, when used in **established** dosages and proper operating parameters, under the auspices of an experienced chemical specialist, should produce satisfactory results, with no consequential detrimental effects. The industry has published standards in Riggs and Sherrill, “Textile Laundering Technology”. However, the stainless steel can be damaged and even destroyed by **abnormal** contact with chlorine bleach, hydrofluosilicic acid and other commonly used chemicals, as will occur if chemicals are unintentionally leaked into the machine, particularly when it is no longer in use and especially when machine surfaces are dry.

Some chemical systems have been found to permit chemicals to dribble from the supply lines, or worse, to siphon from the supply tank into the machine, during operation and long after the system is shut down—as after working hours and during weekends. If this occurs, **deterioration (rusting) of the stainless steel and damage to any textiles therein will inevitably result. If this condition goes undetected, machine damage is likely to be catastrophic.** No machine is immune to such damage.



CAUTION [1]: Equipment and Textile Damage Hazards—Chemicals leaked into the machine, particularly when it is idle can destroy machine components and textiles left in the machine. **Pellerin Milnor Corporation accepts absolutely no responsibility for damage to its equipment or to textiles therein from abnormal contact with chemicals.**

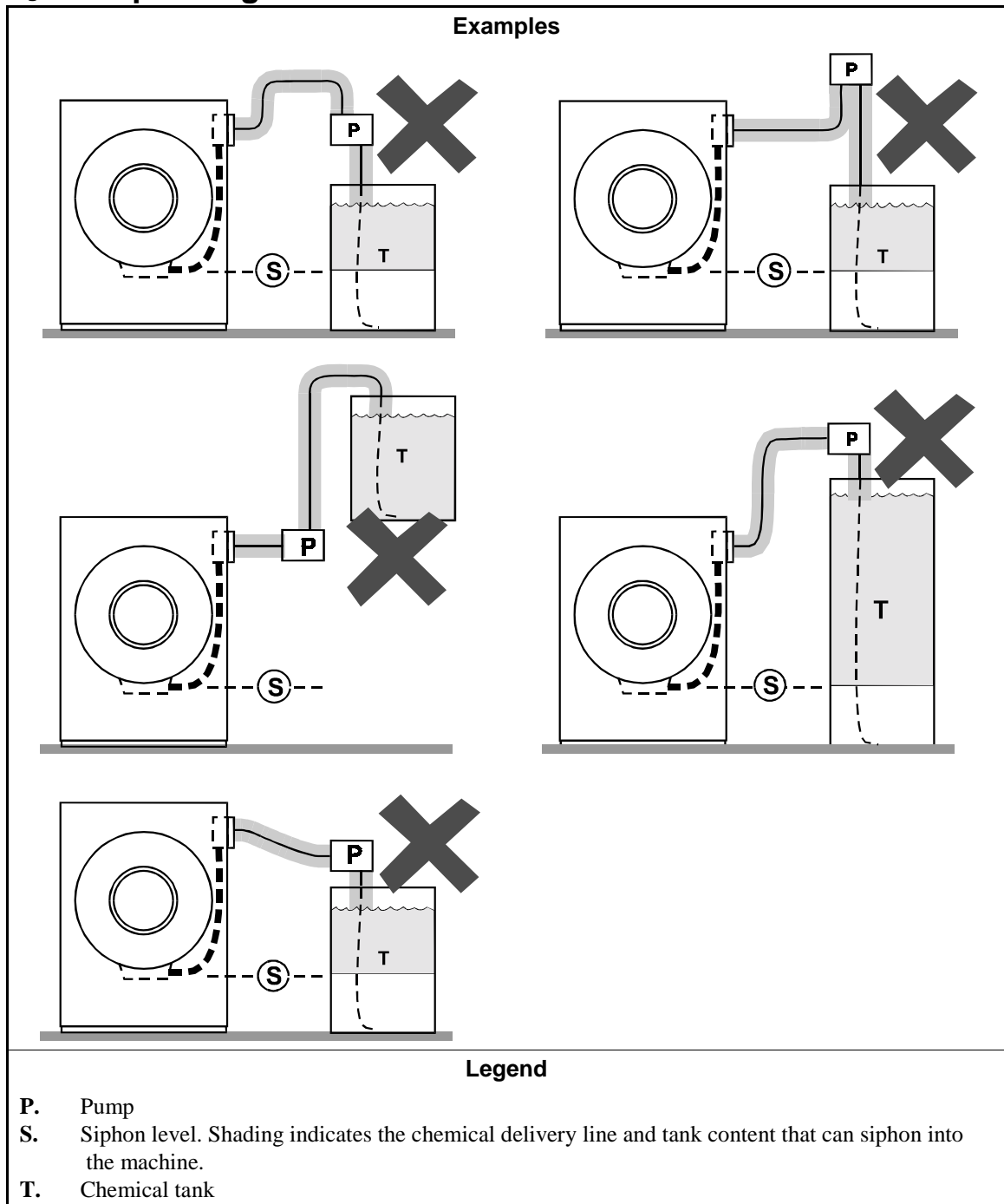
- Ensure that the chemical system prevents unintentional release of chemicals.
- Inspect regularly for proper operation and evidence of damage.

2. Requirements for Chemical Systems Used With Milnor Machines

It is the responsibility of the chemical system manufacturer and supplier to ensure that their system is safe for personnel and equipment. Some important points are described below.

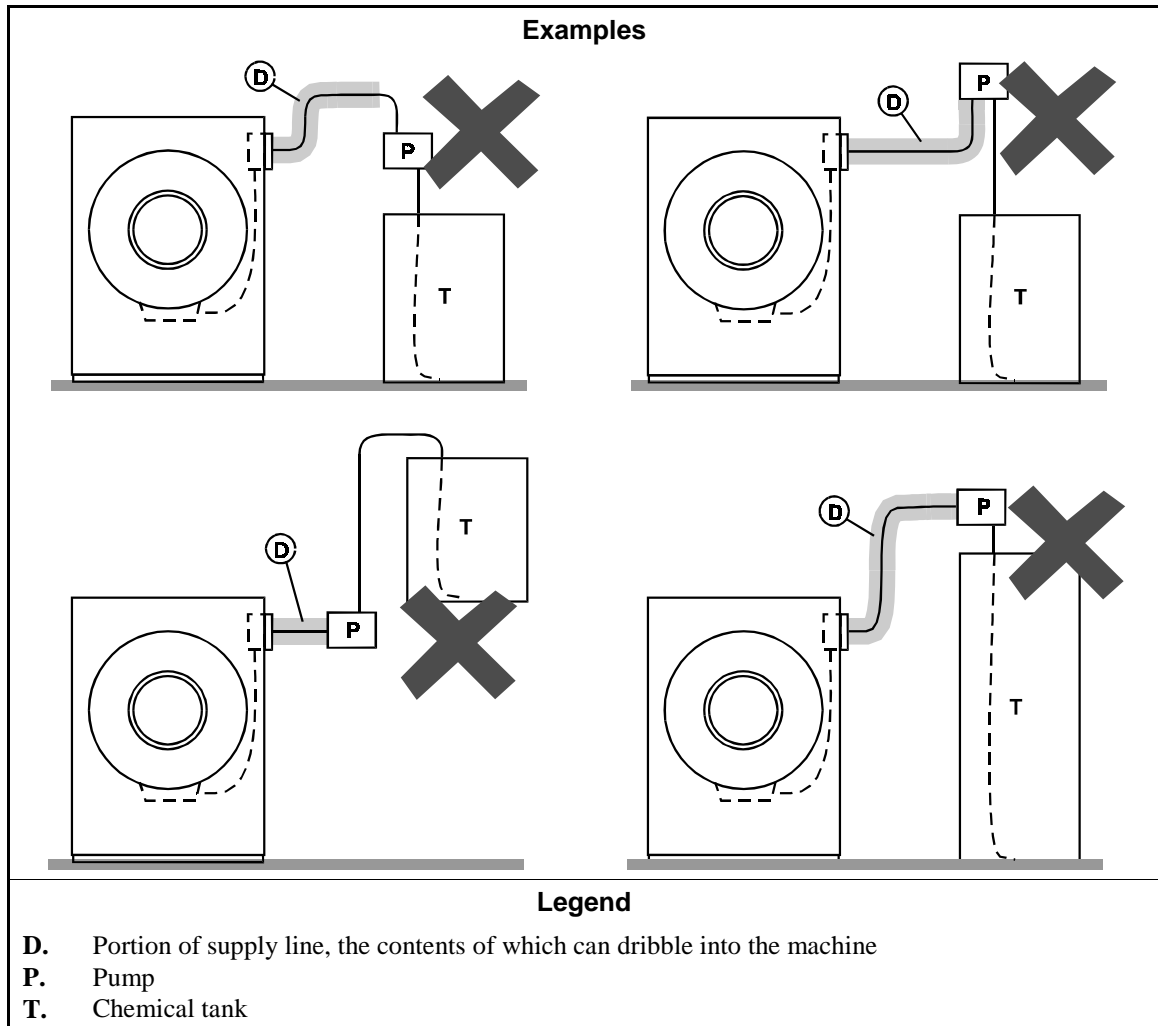
- 2.1. **Ensure the System Cannot Siphon.**—The supply system must be designed to counteract any siphoning that could occur as a result of having a sealed supply line between the bottom of the chemical tank and the internal machine connection at the drain trough. As shown in the Figure 2 examples, if the pump (P) and/or the valving does not provide positive closure and there is no vacuum breaker protection, siphoning is likely to occur. In each of the Figure 2 illustrations, the volume of chemical in the tank above the siphon level (S), and indicated by shading, will flow into the machine.

Figure 2: Siphoning From the Chemical Tank into the Machine



2.2. **Ensure the Chemical Lines Cannot Dribble**—The pumped chemical system may provide a means of positively closing the chemical line at the pump location, but not at the injection site. Hence, any concentrated chemical that remains in the injection line between the pump and the machine is free to flow into the machine. Some examples of this are shown in Figure 3.

**Figure 3: Dribbling From Chemical Supply Line Into Machine
(assumes positive closure at the pump)**



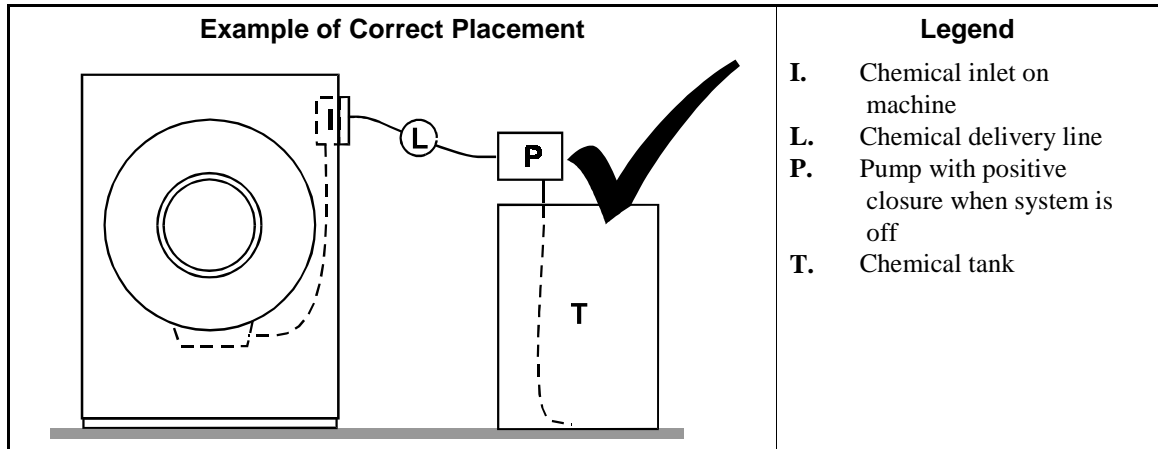
3. Design and Installation Recommendations

It is the responsibility of the chemical system manufacturer and supplier to use whatever measures are necessary to ensure that their system is safe for personnel and equipment. The following are some of the possible methods the manufacturer or supplier may wish to use, as appropriate.

- 3.1. **Siphoning: Positively close the line.**—If the pump does not provide positive closure when the system is off, employ a shutoff valve in the line to serve this purpose.
- 3.2. **Siphoning: Break the siphon.**—Provide an air gap or vacuum breaker in the chemical delivery line. This must be located above the “full” line of the tank.
- 3.3. **Dribbling: Flush the entire chemical delivery line.**—If any concentrated chemical that remains in the injection line between the pump and the machine is free to flow into the machine, employ a system that flushes the entire line between the pump and the injection point with fresh water after each injection.

- 3.4. **Dribbling: Locate the entire chemical line below the machine inlet.**— Assuming the chemical system does not retain any line pressure and that the pump provides positive closure when the system is off, locate the entire chemical delivery line below the level of the chemical inlet. An example of this is shown in Figure 4.

Figure 4: Locating a Pumped Chemical System With Positive Closure To Protect Against Machine Damage



4. Guarding Against Leaks

All personnel who may work with the chemical system (e.g., chemical system manufacturer, chemical system supplier, chemical supplier, operator, maintenance personnel) should be vigilant in observing for leaks in the system. When connecting, or reconnecting chemical lines, whether at installation, after taking samples, or when replacing components, at a minimum ensure that:

1. the proper components are used,
2. all connections are the proper fit, and
3. all components are securely connected.



CAUTION [2]: Injury and Damage Hazards—Chemicals leaking from a chemical system may be corrosive or toxic. Such chemicals can injure personnel and damage equipment.

- Use care when connecting chemical lines.
- Inspect regularly for leaks.

— End of BIWUUI03 —

Section

1

Service and Maintenance

BIIFUM01 (Published) Book specs- Dates: 20030311 / 20030311 / 20030311 Lang: ENG01 Applic: IFB

Preventive Maintenance

As required by the warranty and to achieve optimum performance and service life from Milnor washer-extractors, the schedules, instructions and precautions herein must be strictly followed.



WARNING [1]: Entangle and Crush Hazards—Guards, covers, and panels—Operating the machine with any guard, cover, or panel removed exposes moving components.

- Lock out and tag out power at the main machine disconnect before servicing, or in accordance with factory service procedures.
- Do not service machine unless qualified and authorized.



CAUTION [2]: Pinch Hazard—Suspended machines only—Spaces between the shell and housing can close and crush or pinch your limbs. The shell moves within the housing during operation.

- NEVER place fingers in gap between shell and frame.

1. Lubrication Precautions [Document BIUUUM01]



CAUTION [3]: Machine Damage Hazard—Improper lubrication can damage machine components and cause the machine to malfunction.

- Do not mix petroleum and synthetic based lubricants.
- Do not use an unspecified lubricant without consulting the lubricant manufacturer.
- Do not apply grease with a pneumatic grease gun. Use only a hand-operated grease gun.
- Do not over-lubricate.
- Always clean grease fittings before adding grease. Clean off excess grease.
- Ensure that lubricants do not drip onto belts, brake shoes or drums.



WARNING [4]: 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.

- Lock out and tag out power at the main machine disconnect before servicing, or in accordance with factory service procedures.
- Do not service machine unless qualified and authorized.

1.1. Pumping Grease—Pump grease slowly, taking 10-12 seconds to complete each stroke. A grease gun can build up extremely high pressure which will force seals out of position and cause them to leak.

1.2. Grease Quantity—Apply the quantity of grease called for in the checklist. Over-lubrication can be as damaging as under-lubrication. Where quantities are stated in strokes, one stroke of the grease gun is assumed to provide .0624 fluid oz. (1.77 grams) (by volume) of grease. Therefore, one fluid ounce (28.3 grams) of grease would be provided by 16 strokes of the grease gun. Determine the flow rate of your grease gun by pumping one ounce into a calibrated container. If fewer than 16 strokes are required, all quantities in strokes in the chart should be reduced accordingly, and if more than 16 strokes are required, the number of strokes should be increased. Before starting lubrication, make sure your grease gun is working and that you get a full charge of grease with every stroke.

- 1.3. Lubricant Specifications**—Lubricant specifications are provided in the preventive maintenance checklist. Lubricants should be purchased locally. If a specified lubricant is not available locally, it is permissible to substitute a product that has been specified as equivalent by the lubricant manufacturer. If you cannot obtain either the specified lubricant or a valid equivalent locally, contact the Milnor Service Department for assistance.

2. Main Bearing Housing Preventive Maintenance

1. Lock out and tag out power at the main machine disconnect.
2. Remove the rear panel.
3. Remove the drain plug on the bottom of the main bearing housing and allow the bearing housing to drain completely. Inspect the leak-off, drained oil, and magnetic drain plug for water and/or metal particles. Water and/or metal particles can indicate worn or damaged seals and bearings. Reinstall the drain plug.
4. After locating the oil fill plug, refill the bearing housing following lubrication specifications.
5. Reinstall the fill plug and clean excess lubricant from the machine.

3. Greasing Water Seals



WARNING 5: Entangle and Crush Hazards—Guards, covers, and panels—Operating the machine with any guard, cover, or panel removed exposes moving components.

- Power is ON and cylinder is turning during the following procedure. Permit only qualified maintenance personnel to perform this procedure.

Grease the water seals as follows:

1. Remove side panels.
2. Restore power to machine.
3. Locate the water seal grease fitting (Figure 1).
4. Place the machine in a wash step.
5. With the cylinder turning, grease seals as called for on the “Preventive Maintenance Checklist” and “Lubrication Precautions.”
6. Re-install side and rear panels.

4. Preventive Maintenance

Table 1: Preventive Maintenance Checklist

Components		Action	Frequency	Specifications/References/Figures
Main Bearing Housing	Bearings	Change lubricant, 22 ounces (.65 liter)	Every four months	Shell Morlina ISO 220 (SAE 50) or equivalent (See "30022Fxx Bearing Housing Maintenance Points")
	Water seals	Slowly grease, 2 strokes - 0.12 fluid ounces (3.54 grams) at one location.	Monthly	Shell Alvania EP (or equivalent). (See "30022Fxx Bearing Housing Maintenance Points" and BMP980022)
Drive Train	Drive belts	Check belt tension and wear. Check pulleys for wear.	Every four months	See "Drive Belt Service" in this section
	Inverter fans and vents	Verify fan operation and vacuum out vents.	Monthly	See "30022Fxx Drive Train Maintenance Points"
Suspension	Rubber springs	Check for cracks and deterioration.	Monthly	See "30022Fxx Suspension Maintenance Points"
	Shocks	Check for leaks, replace as required.	Every four months	
Foundation	Bolts	Check bolts for tightness and wear. Tighten or replace as necessary.	Every four months	Dimensional drawings
Chemical Supply (if so equipped)	Supply hoses	Check for leaks, observe operation.	Every four months	See "Service Notes" in this section.
	Flushing supply injector valve strainers (if so equipped)	Inspect and clean the strainers in supply injector valves and clean out each compartment.		
Steam	Steam strainer (if so equipped)	Inspect and clean strainer	Every four months	

5. Drive Belt Service

Note 1: Do not refer to instruction sheet provided with tension testing tool. Use the "Initial tension" column when adjusting belts that have never been used. Use the "Final tension" column when adjusting belts that have been used.

Check belt tension when replacing and adjusting drive tension components. A belt tension testing tool (Milnor part number 30T001), straight edge, and Belt Tension Specification table is required when setting belt tension. Check tension for new belts according to the following schedule.

- **After 24 hours operation (three eight-hour shifts)**
- **After 80 hours operation (ten eight-hour shifts)**
- **After 160 hours operation (twenty eight-hour shifts)**

Set belt tension as follows:

1. Move upper O-ring on tension testing tool to uppermost position (resting against bottom edge of sliding cap).

2. Determine belt deflection for the tested belt (see “30022Fxx Bearing Housing Maintenance Points” and Table below for the location and setting). Move lower O-ring to the correct setting (inches or centimeters) on scale. Read the bottom edge of the O-ring.
3. Place a straight edge along the top edge (pulley to pulley) of the belt to be tested. Depress the tension testing tool by sliding the cap against the middle of the belt span until the bottom edge of the lower O-ring aligns with the straight edge as shown in Figure 2.
4. Read the top of the upper O-ring position and determine if it is within specified range
 - See specifications in the “Initial tension” column for belts that have never been used.
 - See specifications in the “Final tension” column for belts that have been used.
5. If reading is below specified range, belt must be tightened. If reading is above specified range belt must be loosened. Adjust belt and repeat Steps 1 through 4 until tension is within specified range.

Table 2: Belt Tension Specification Table

Belt	Belt deflection in inches (millimeters)	Hertz	Initial tension pounds (kilograms)	Final tension pounds (kilograms)
Drive	24/64 (9.5)	All	6.7 - 9.8 (3.0 - 4.4)	5.2 - 7.6 (2.4 - 3.4)

6. Service Notes

Note 2: All V-belts are not alike. So-called “Super” or “High Capacity” belts frequently have considerably higher capacities than “Standard” belts. Sometimes a particular manufacturer’s V-belts will be more suitable for a certain application and another manufacturer’s V-belts may be suitable for a different application. This may occur in spite of the fact that both manufacturer’s V-belts are reputedly “interchangeable.” Because of this, it is always best to purchase replacement belts from the original manufacturer of the equipment. If you do not wish to do this, we suggest that when you replace the belts, you purchase the exact style and type belts with which the machine was originally equipped. This is the best way to achieve belt life on your replacement belts equal to the life of the original set. If you are not satisfied with the life of the original set, you should ask our factory if a better belt has been developed for the specific application.

Note 3: Dry bleaches may cause the inside of the supply injector to show evidence of mild rusting. If this occurs, carefully clean away rusting at least once a week. Always inject dry bleach from the cup or scoop. Never allow dry bleach to come into direct contact with the stainless steel components of the supply injector.

7. Service Points

Figure 1: 3002Fxx Bearing Housing Maintenance Points

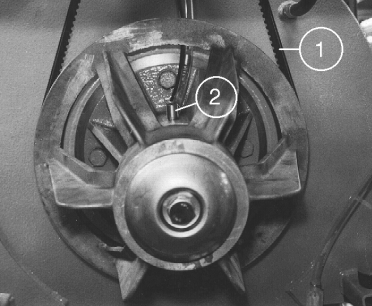
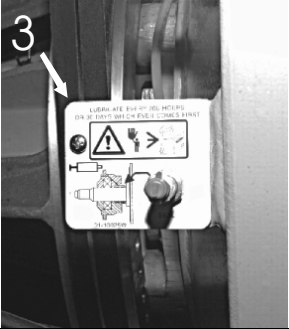

<p>Bearing Housing Maintenance Points</p> 	<p>Water Seal Grease Point</p> 
<p>Water Seal Grease Relief</p> 	<p>Legend</p> <ol style="list-style-type: none">1. Drive belt2. Bearing lubricant fill tube3. Water seal grease fitting location4. Seal grease relief

Figure 2: 3002Fxx Drive Train Maintenance Points

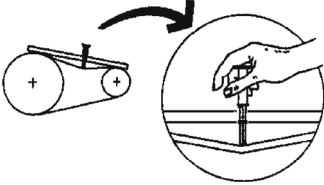
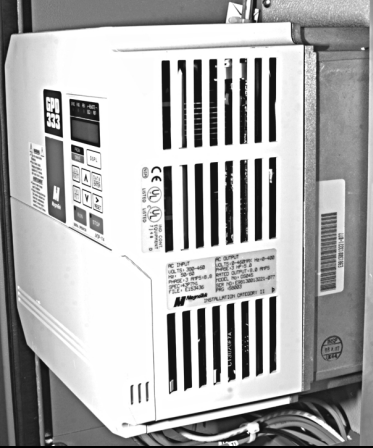
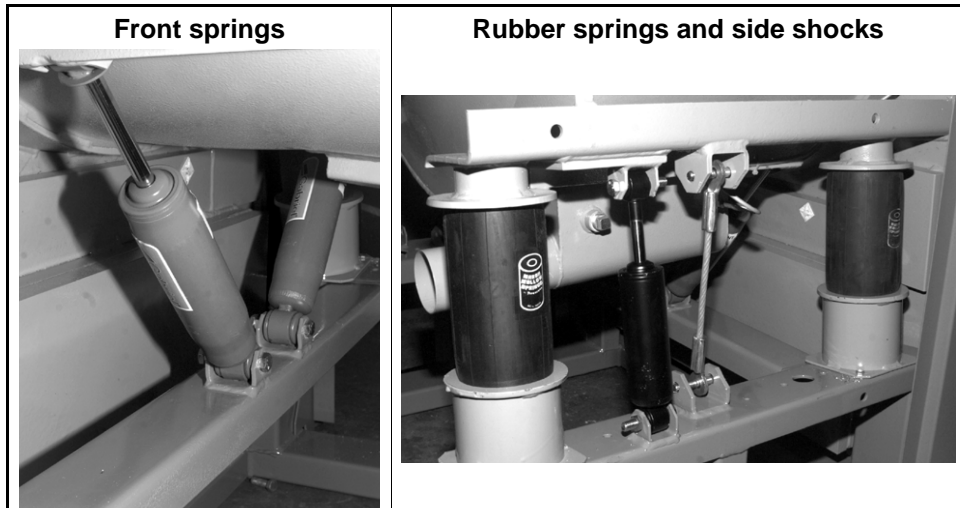
<p>Testing Belt Tension</p> 	<p>Inverter</p> 
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Figure 3: 3002Fxx Suspension Maintenance Points



— End of BIIFUM01 —

REPLACING 30Fxx MAIN BEARINGS

⚠ DANGER ⚠



ELECTROCUTION HAZARD—High voltage is present inside electrical boxes, motors, and many other components, even when Master switch is *off* and/or any emergency stop is *off*. You can be killed or seriously injured on contact with high voltage.

- ☞ **Lock OFF and tag out power at the wall disconnect before servicing.**
- ☞ **Maintenance must be performed only by qualified, authorized service personnel.**

NOTE: A cylinder puller kit (P/N PK33-008) is available from Milnor[®] on a rental basis.

Maintenance procedures require:

- The proper cylinder puller
- The specified lubricant
- Loctite 271, anti-seize, Loctite silicone sealant, Loctite PST stainless steel pipe sealant and Permatex 2 adhesive (or their equivalents).

Oil or water dripping from the leak-off, or water in the bearing oil indicates leaking seals. Metal particles in the bearing oil indicates damaged bearings. Ordinarily, only the shell front and cylinder need to be removed to replace seals and bearings.

Removing the Shell Front and Cylinder

1. Remove the door interlock housing cover. Mark the terminal position of the wires and remove the wires from the *interlock switch*. Loosen the two conduit connections and move the conduit so the shell front can be removed.
2. Remove all shell front attachments including pipes, hoses, and optional equipment. Drain the oil from the bearing housing and inspect.
3. Remove the shell mount ring clip guard located on the top of the shell clamp ring, then mark the position of the shell front with respect to the shell.
4. Support the shell front and remove the bolts, shell clamp ring, rubber extrusion, and shell front.
5. Remove the shaft retainer bolt, cover, spacer, and the two screws covering the puller mounting holes. Mount puller and remove the cylinder.

Replacing Seals, Bearings, and Bearing Housing

NOTE: See FIGURE 1 during the following procedures.

Replacing Seals—If no water or metal particles are present in drained oil, replace seals and O-rings as follows. If bearing oil contains water or metal particles, see “Replacing Bearings” in this section.

1. Remove the front shaft seal holder.
2. Inspect the shaft seal sleeve for nicks, gouges, or excessive wear. If replacement is necessary, heat and tap the damaged sleeve off of the shaft. Before installing the new sleeve, ensure shaft and sleeve are clean and free from oil. Apply Loctite 271 to the inside of the sleeve, then tap sleeve on the shaft, and remove excess Loctite.
3. Replace the seals and O-rings. Ensure that the new seals are parallel within the shaft seal holder.

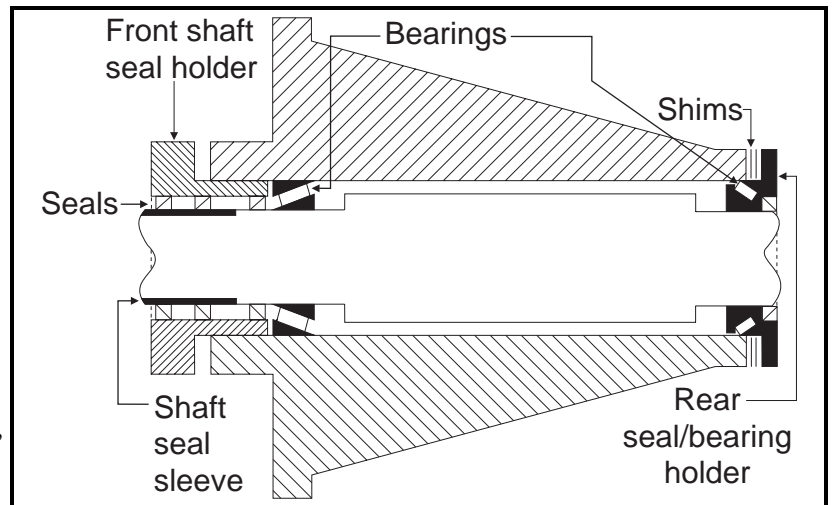


FIGURE 1 (MSSM0261BE)
Bearing Housing Components

Reinstalling the Seal Holder

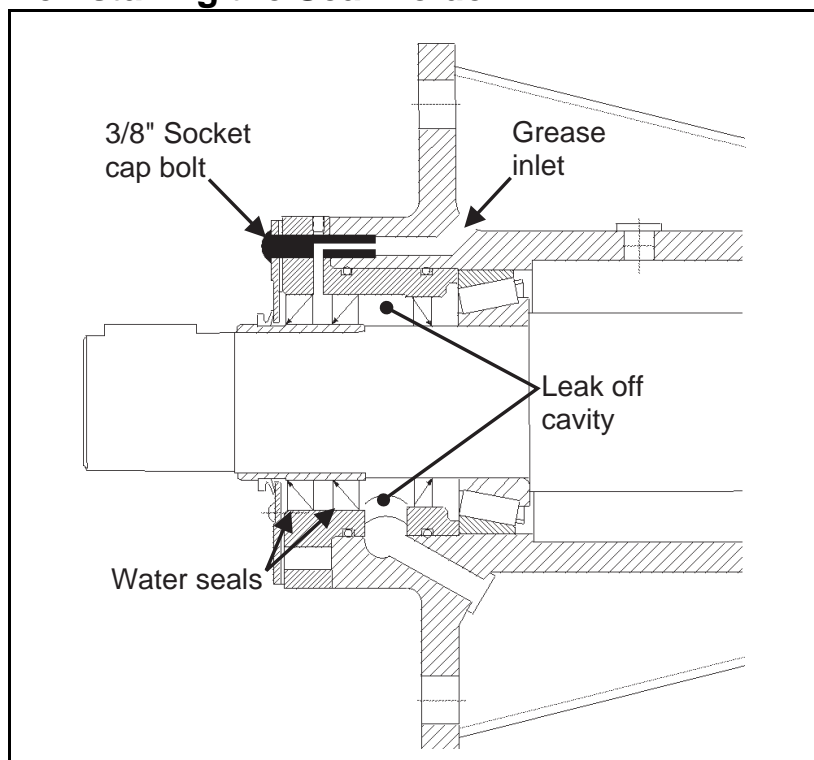


FIGURE 2 (MSSM0261BE)
Seal Holder Details

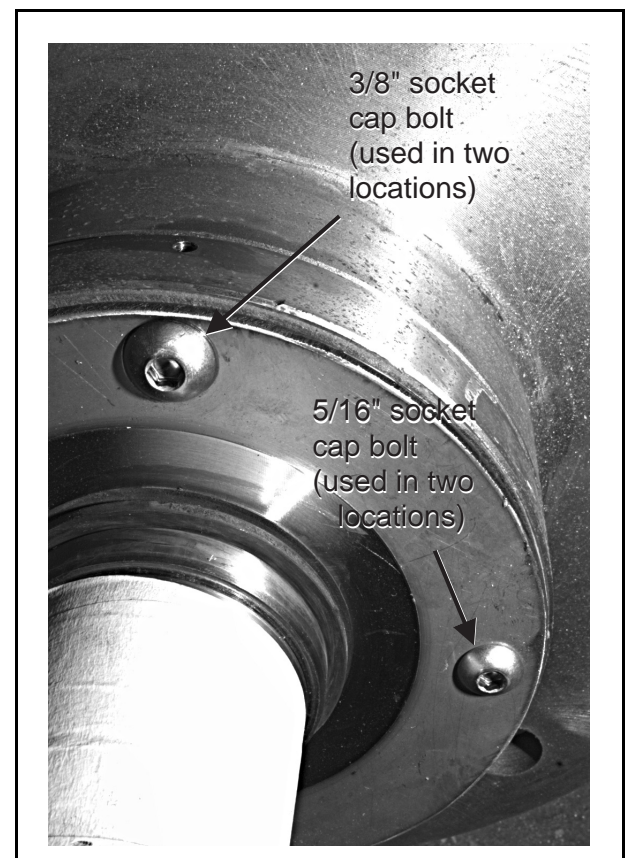


FIGURE 3 (MSSM0261BE)
Installed Socket Cap Bolts

NOTICE

Bolts can break off and the seal holder can leak or loosen.

- ☞ **Follow seal holder installation instructions carefully.**
- ☞ **Do not over tighten bolts.**

NOTE: The two 3/8" socket cap bolts are drilled to facilitate greasing the water seals (see BMP980022, FIGURE 2, and FIGURE 4).

Initially, grade 8 hex head bolts are used to seat the seal holder, clamping it in place. After these bolts are torqued to specifications, the hex head bolts are replaced one at a time with socket cap bolts (FIGURE 2 and 3). Use anti-seize instead of threadlocker on the socket cap bolts during installation, since these bolts use a nylon insert as a threadlocker.

1. Reinstall seal holder using hex head 3/8" and 5/16" bolts. Torque bolts to the torque values provided in MSSM0101AE.
2. Remove one of the 5/16" hex head bolts. Using anti-seize, install a new 5/16" socket cap bolt, then tighten to 80 inch-pounds. **Do not use the torque values listed in MSSM0101AE.** Remove other 5/16" bolt and repeat the step.
3. Remove one of the 3/8" hex head bolts. Using anti-seize, install a new 3/8" socket cap bolt. Tighten this bolt to 150 inch-pounds (16.9 Newton meters). Remove other 3/8" bolt and repeat procedure.

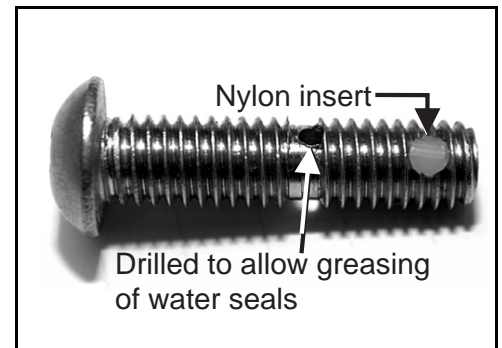


FIGURE 4 (MSSM0261BE)
Details of 3/8"
Socket Cap Bolts

Replacing Bearings

NOTE: Set bearing clearance only if major components of the original bearing housing (front shaft seal holder, rear seal/bearing holder, shaft, or shims) are replaced. See "Setting Bearing Clearances" in this section after replacing major components.

The bearing housing does not need to be removed to change the bearings. Remove the bearing housing only if insufficient room exists for the following procedures, or if the bearing housing (or a major housing component) must be replaced.

1. Remove the front shaft seal holder and rear seal/bearing holder (containing the rear bearing). Note the position and number of the shims between the rear seal/bearing holder and bearing housing. **The shims must be installed exactly as removed.**
2. Remove the shaft, bearing cup, and bearing through the front of the bearing housing. Remove and discard used bearings, cups, seals, and O-rings.
3. Install a new seal, bearing, and cup in the rear seal/bearing holder. Install the shims and the rear seal/bearing holder.
4. Press a new front bearing on the shaft, then guide shaft into the rear seal/bearing holder. **Do not scrape the new bearings against the inside of the bearing housing.**

- Center the shaft within the housing, then gently tap in the front bearing cup. Install the front shaft seal holder.
- The shaft should turn in the housing.

Setting Bearing Clearances

NOTE: This procedure is required only if a major bearing housing component is replaced. See “Replacing Bearings” in this section.

- Set the clearance by removing all shims from the rear seal/bearing holder. Install the rear seal/bearing holder. Leave a small gap between the bearing housing and rear seal/bearing holder.
- Insert a lead wire in the gap between flanges. Tighten each bolt slowly while turning the shaft. Stop tightening when the shaft just begins to drag or bind. Remove the rear seal/bearing holder, being careful not to mark or damage the lead wire.
- Using a micrometer, measure the thickness of the lead wire.
- Add shims to the thickness of the lead wire to obtain a total thickness of 0.004" - 0.005" (0.102 - 0.127 millimeters). Install the rear seal/bearing holder using this amount of shims.
- The shaft should turn in the housing.

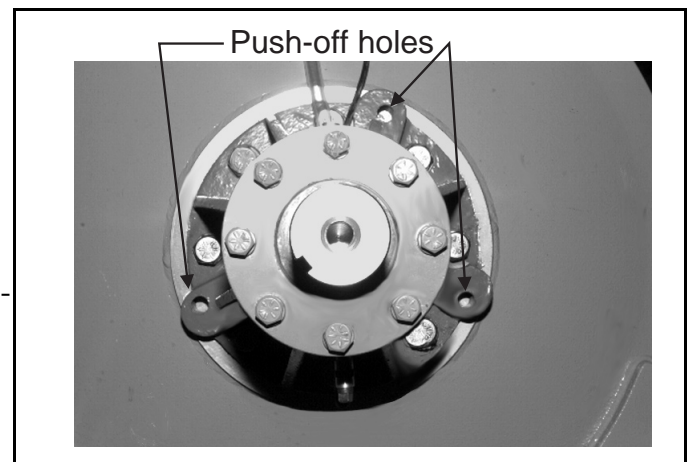


FIGURE 5 (MSSM0261BE)
Push-off Holes
(Pulley Removed for Clarity)

Removing the Old Bearing Housing

Remove all fittings and connections from the bearing housing. Tighten three 1/2 - 20 x 2 inch (50) long bolts evenly into the push-off holes to separate the bearing housing from the shell.

Installing the New Bearing Housing

NOTE: Use new bolts when reassembling the machine.

After determining that the shell is clean and free from old adhesives and sealants, install the bearing housing, using Loctite 271 and Loctite silicone sealant on bearing housing mounting surface (as shown in FIGURE 6). Remove any excess compounds from machine. Install all of the original lubrication fittings and connections.

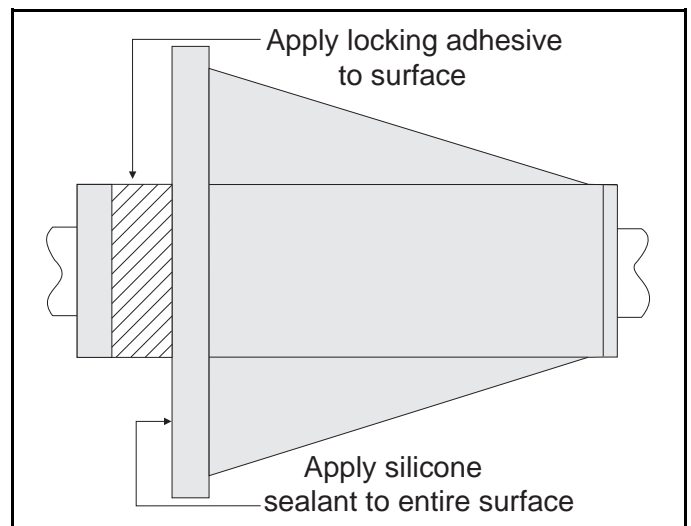


FIGURE 6 (MSSM0261BE)
Bearing Housing Installation

Reinstalling the Cylinder and Shell Front

1. Screw two new allen screws into the puller mounting holes.
2. Determine that the main shaft is clean and free from any foreign materials and that the main shaft key is properly seated on the shaft.
3. Slide the cylinder onto the shaft, and install a new 3/4" inch long 3/4-10 grade 8 zinc plated bolt and washer. Carefully tighten this bolt, using it to pull the cylinder up the tapered main bearing shaft. After cylinder is in place, torque the bolt to 282 foot pounds (382 Newton meters).

Remove the grade 8 bolt and replace with a new 3/4" inch 18-8 stainless steel retainer bolt and washer with the original cover and spacer. Torque the retainer bolt to 150 foot pounds.

4. Determine that the shell front and the front lip of the shell are clean and free from burrs, sharp edges, and sealants.

▲ CAUTION ▲

Do not use a metal hammer to seat the shell front or install the ring.

☞ **A metal hammer can crack stainless steel components.**

5. Using clamps, mount and support the shell front in place (align it with the mark made before it was removed). If necessary, use a rubber or rawhide maul to strike the shell front so it seats within the shell. After the shell front is seated properly on the shell, check the gap between the shell front and the lip on the shell. If necessary, use a rubber maul or rawhide maul on the shell lip to close the gap.
6. Pack a small amount of Permatex 2 adhesive (or similar) into the top center gap of the shell front and shell, along two inches on both sides of the shell weld.
7. Install the new rubber extrusion starting at the 10 o'clock position. Trim any excess.
8. Install the shell clamp ring on the shell front with the ring gap at the top center of the shell. Tap around the ring (bottom to top) with a rubber maul until a clamp can be installed on the ends of the shell clamp ring. Repeat this procedure and tighten the clamp until the bolt can be installed. Tap around the ring again, and tighten the bolt. Install the shell mount ring clip guard.
9. Reconnect door interlock conduit and wires.
10. Lubricate machine as described in "PREVENTIVE MAINTENANCE . . ." (see Table of Contents).

FASTENER TORQUE REQUIREMENTS

The specifications in this section apply to 1/4 inch and larger Unified National fine and coarse fasteners used on Milnor[®] machines. This information is to be used only when torque specifications are not stated in the installation or service instructions.

When tightening applicable fastener, abide by the following precautions:

1. Always use new fasteners. Replace bolts, nuts, flat washers, and lock washers in the order shown on the parts drawing.
2. Unless otherwise specified, use:
 - Loctite[®] 271 threadlocker or equivalent for bearing housing mounting bolts from one half to one inch in diameter.
 - Loctite[®] 277 threadlocker or equivalent for bearing housing mounting bolts of one inch diameter or larger.
 - Loctite[®] 242 threadlocker for all other fasteners requiring thread locking compound.
3. Use a torque wrench to assure proper tightness.
4. Never lubricate fasteners. The values specified herein are maximum recommended torques and are calculated from published ASTM and SAE data. Actual allowable torques are application dependent and can vary for many reasons, (joint types, gaskets, etc.). Use these values as a guide.
5. Although FIGURE 1 depicts hex head bolts, the table applies to all head types.

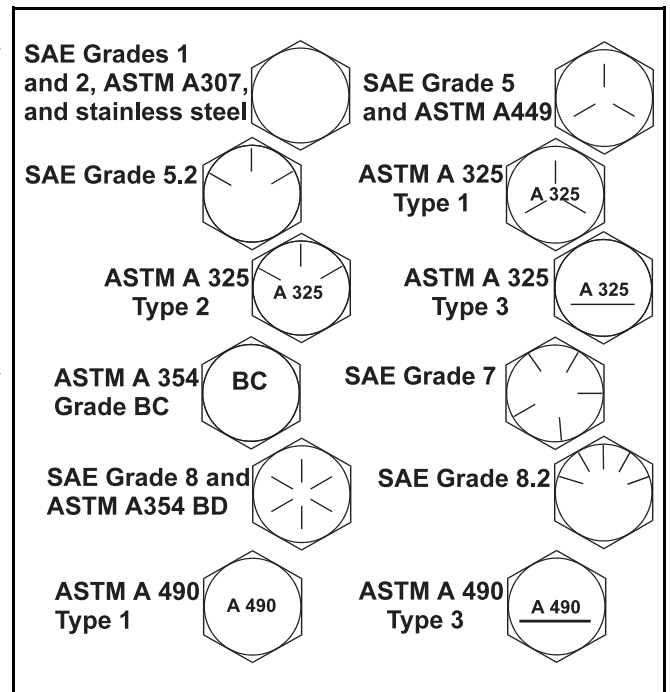


FIGURE 1 (MSSM0101CE)
Fastener Grade Markings

Fasteners and Threadlocker

How Fasteners Loosen—Standard threaded fasteners are manufactured with a clearance fit for easy assembly. With the fastener at the proper torque, 85% of the tightening torque is absorbed in the threads and under the fastener head. The remaining 15% provides the friction that prevents the thread from slipping. When this friction is overcome (by bending, thermal expansion, internal pressures, functional loads, or impact) the thread slips and loosens. Although higher torques reduce the likelihood of thread slippage, if slippage occurs, the threads unwind and the fastener loosens. Once thread slippage begins, vibration increases the rate of loosening.

Preventing Loosening—The most effective way to prevent loosening of threaded parts is by proper application of a threadlocking compound. Threadlocker provides lubrication during assembly, then hardens to seal the threads against corrosion and provide resistance to thread slippage.

Applying Threadlocker

NOTE: The following threadlocker information and illustrations are excerpts from the Loctite® User's Guide and are used with permission.

For maximum strength, threadlocker must fill the thread voids completely, as shown in FIGURE 2. Organic or petroleum solvent will remove excess uncured adhesive from joints. Consult information below for the specific fastener application.

Bolts and Nuts—See FIGURE 3.

1. Clean all threads (bolt and nut) with cleaning solvent.
2. Spray all threads with Loctite® Primer N. Allow to dry.
3. Insert bolt into through hole assembly.
4. Apply several drops of threadlocker onto bolt engagement area.
5. Assemble and tighten nut to correct torque for the threadlocker.

Blind Holes—See FIGURE 4.

1. Clean all threads (bolt and nut) with cleaning solvent.
2. Spray all threads with Loctite® Primer N. Allow to dry.
3. Squirt several drops down female threads into bottom of hole.
4. Apply several drops to bolt.
5. Tighten to correct torque for the threadlocker.

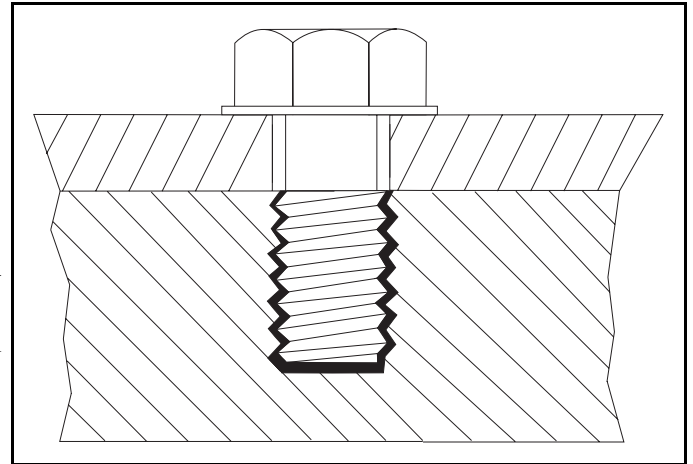


FIGURE 2 (MSSM0101CE)
Correct Threadlocker Use

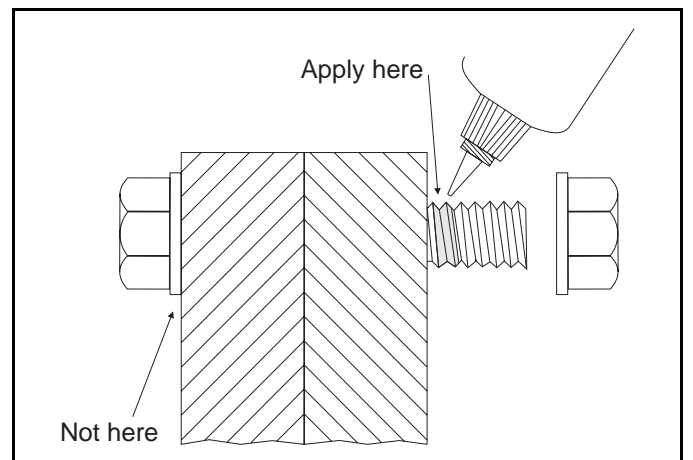


FIGURE 3 (MSSM0101CE)
Applying Threadlocker to Through Hole

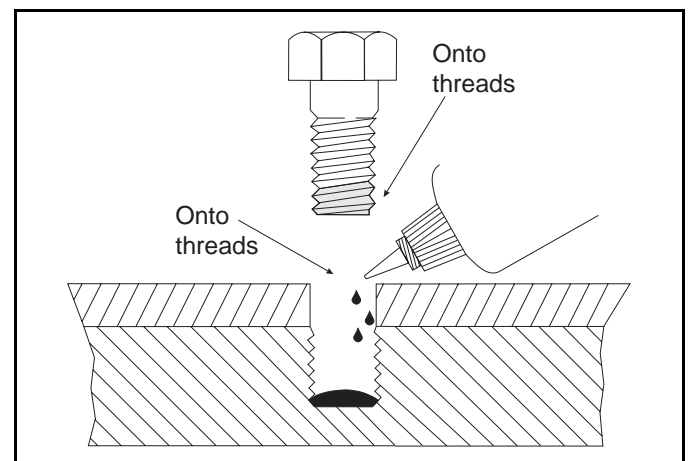


FIGURE 4 (MSSM0101CE)
Applying Threadlocker to Blind Holes

Removing Fasteners

High strength threadlockers like Loctite[®] 271 (or equivalent) may be weakened by heating to at least 500° F (260° C) as follows.

1. Apply localized heat to fastener as shown in FIGURE 5.
2. Disassemble while hot. Once disassembled, the cured adhesive can be removed with Loctite[®] Gasket Remover #790 (or equivalent).

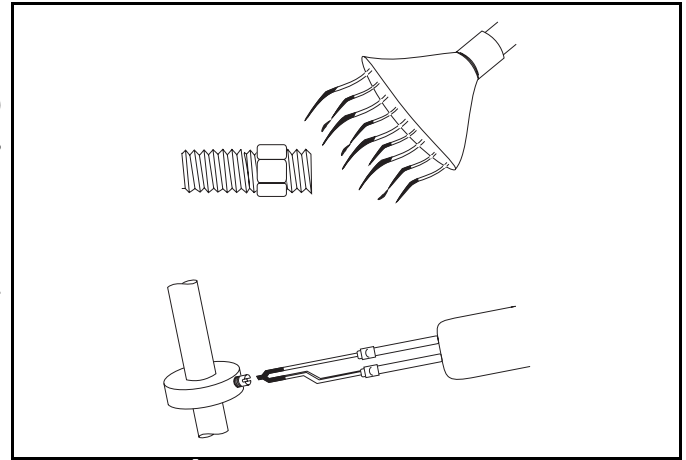


FIGURE 5 (MSSM0101CE)
Removing High Strength Threadlocker

Carbon Steel Fasteners

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1/4 - 20	SAE Grade 1 ASTM A307	2.5 (3.39)	3.0 (4.06)	3.3 (4.47)	3.6 (4.88)	4.6 (6.23)	4.3 (5.83)	3.3 (4.47)
	SAE Grade 2	4.1 (5.56)	4.9 (6.64)	5.5 (7.45)	6.0 (8.13)	7.7 (10.44)	7.1 (9.63)	5.5 (7.46)
	SAE Grade 4	4.8 (6.50)	5.8 (7.86)	6.4 (8.67)	7.0 (9.49)	9.0 (12.20)	8.3 (11.25)	6.4 (8.67)
	SAE Grade 5 ASTM A449	6.3 (8.54)	7.6 (10.3)	8.4 (11.38)	9.3 (12.60)	11.8 (15.99)	11.0 (14.91)	8.4 (11.39)
	SAE Grade 7	7.9 (10.7)	9.4 (12.7)	10.5 (14.23)	11.5 (15.59)	14.7 (19.93)	13.6 (18.44)	10.5 (14.23)
	SAE Grade 8 ASTM A354 Grade BD	8.9 (12.0)	10.7 (14.5)	11.9 (16.13)	13.1 (17.76)	16.6 (22.50)	15.4 (20.88)	11.9 (16.13)
	ASTM A354 Grade BC	7.9 (10.7)	9.4 (12.7)	10.5 (14.23)	11.5 (15.59)	14.7 (19.93)	13.6 (18.44)	10.5 (14.23)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1/4 - 28	SAE Grade 1 ASTM A307	2.8 (3.80)	3.4 (4.61)	3.8 (5.15)	4.1 (5.56)	5.3 (7.18)	4.9 (6.64)	3.8 (5.15)
	SAE Grade 2	4.7 (6.37)	5.6 (7.60)	6.3 (8.54)	6.9 (9.36)	8.8 (11.93)	8.1 (10.98)	6.3 (8.54)
	SAE Grade 4	5.5 (7.46)	6.6 (8.95)	7.3 (9.90)	8.1 (10.98)	10.3 (13.96)	9.5 (12.88)	7.3 (9.90)
	SAE Grade 5 ASTM A449	7.3 (9.90)	8.7 (11.80)	9.7 (13.15)	10.7 (14.50)	13.6 (18.44)	12.6 (17.08)	9.7 (13.15)
	SAE Grade 7	8.9 (12.07)	10.7 (14.50)	11.9 (16.13)	13.1 (17.76)	16.6 (22.51)	15.4 (20.88)	11.9 (16.13)
	SAE Grade 8 ASTM A354 Grade BD	10.2 (13.83)	12.2 (16.54)	13.6 (18.44)	15.0 (20.34)	19.0 (25.76)	17.7 (23.99)	13.6 (18.44)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
5/16 - 18	SAE Grade 1 ASTM A307	5.1 (6.91)	6.2 (8.40)	6.8 (9.22)	7.5 (10.17)	9.6 (13.02)	8.9 (12.07)	6.8 (9.22)
	SAE Grade 2	8.5 (11.52)	10.2 (13.83)	11.3 (15.32)	12.5 (16.95)	15.9 (21.56)	14.7 (19.93)	11.3 (15.32)
	SAE Grade 4	10.0 (13.56)	12.0 (16.27)	13.3 (18.03)	14.6 (19.79)	18.6 (25.22)	17.3 (23.46)	13.3 (18.03)
	SAE Grade 5 ASTM A449	13.0 (17.63)	15.6 (21.15)	17.4 (23.60)	19.1 (25.90)	24.3 (32.95)	22.6 (30.64)	17.4 (23.60)
	SAE Grade 7	16.1 (21.83)	19.3 (26.17)	21.5 (29.15)	23.6 (31.99)	30.1 (40.81)	27.9 (37.83)	21.5 (29.15)
	SAE Grade 8 ASTM A354 Grade BD	18.5 (25.08)	22.1 (29.96)	24.6 (33.35)	27.1 (36.74)	34.5 (46.78)	32.0 (43.39)	24.6 (33.35)
	ASTM A354 Grade BC	16.1 (21.83)	19.3 (26.17)	21.5 (29.15)	23.6 (31.99)	30.1 (40.81)	27.9 (37.83)	21.5 (29.15)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
5/16 - 24	SAE Grade 1 ASTM A307	5.6 (7.59)	6.7 (9.08)	7.4 (10.03)	8.2 (11.12)	10.4 (14.10)	9.6 (13.01)	7.4 (10.03)
	SAE Grade 2	9.4 (12.74)	11.3 (15.32)	12.5 (16.94)	13.8 (18.71)	17.5 (23.73)	16.3 (22.09)	12.5 (16.94)
	SAE Grade 4	11.0 (14.91)	13.2 (17.90)	14.6 (19.79)	16.1 (21.83)	20.5 (27.79)	19.0 (25.76)	14.6 (19.79)
	SAE Grade 5 ASTM A449	14.4 (19.52)	17.2 (23.32)	19.1 (25.90)	21.1 (28.60)	26.8 (36.35)	24.9 (33.76)	19.1 (25.90)
	SAE Grade 7	17.9 (24.27)	21.4 (29.01)	23.8 (32.27)	26.2 (35.52)	33.4 (45.28)	31.0 (42.03)	23.8 (32.27)
	SAE Grade 8 ASTM A354 Grade BD	20.4 (27.66)	24.4 (33.08)	27.1 (36.74)	29.9 (40.54)	38.0 (51.52)	35.3 (47.86)	27.1 (36.74)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
3/8 - 16	SAE Grade 1 ASTM A307	9.0 (12.20)	10.8 (14.64)	12.0 (16.27)	13.1 (17.76)	16.7 (22.64)	15.5 (21.01)	12.0 (16.27)
	SAE Grade 2	14.9 (20.20)	17.9 (24.27)	19.9 (26.98)	21.9 (29.69)	27.9 (37.83)	25.9 (35.11)	19.9 (26.98)
	SAE Grade 4	17.8 (24.13)	21.3 (28.88)	23.7 (32.13)	26.0 (35.25)	33.1 (44.87)	30.8 (41.76)	23.7 (32.13)
	SAE Grade 5 ASTM A449	23.2 (31.45)	27.8 (37.69)	30.9 (41.89)	34.0 (46.09)	43.3 (58.70)	40.2 (54.50)	30.9 (41.89)
	SAE Grade 7	28.7 (38.91)	34.4 (46.64)	38.2 (51.79)	42.0 (56.94)	53.5 (72.54)	49.7 (67.39)	38.2 (51.79)
	SAE Grade 8 ASTM A354 Grade BD	32.7 (44.33)	39.2 (53.15)	43.6 (59.11)	48.0 (65.08)	61.0 (82.70)	56.7 (76.87)	43.6 (59.11)
	ASTM A354 Grade BC	28.7 (38.91)	34.4 (46.64)	38.2 (51.79)	42.0 (56.94)	53.5 (72.54)	49.7 (67.39)	38.2 (51.79)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
3/8 - 24	SAE Grade 1 ASTM A307	10.2 (13.83)	12.2 (16.54)	13.6 (18.44)	15.0 (20.33)	19.0 (25.76)	17.7 (24.00)	13.6 (18.44)
	SAE Grade 2	16.9 (22.91)	20.3 (27.52)	22.5 (30.52)	24.8 (33.62)	31.5 (42.70)	29.3 (39.73)	22.5 (30.50)
	SAE Grade 4	20.0 (27.11)	24.0 (32.54)	26.7 (36.20)	29.4 (39.86)	37.4 (50.70)	34.7 (47.04)	26.7 (36.20)
	SAE Grade 5 ASTM A449	26.2 (35.52)	31.4 (42.57)	34.9 (47.32)	38.4 (52.06)	48.9 (66.30)	45.4 (61.55)	34.9 (47.32)
	SAE Grade 7	32.3 (43.79)	38.8 (52.60)	43.1 (58.44)	47.4 (64.26)	60.4 (81.89)	56.1 (76.06)	43.1 (58.43)
	SAE Grade 8 ASTM A354 Grade BD	36.9 (50.02)	44.3 (60.06)	49.2 (66.70)	54.1 (73.35)	68.9 (93.41)	64.0 (86.77)	49.2 (66.70)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
7/16 - 14	SAE Grade 1 ASTM A307	14.0 (18.98)	17.0 (23.04)	19.14 (25.95)	21.0 (28.47)	27.0 (36.60)	25.0 (33.89)	19.0 (25.76)
	SAE Grade 2	24.0 (32.54)	28.8 (39.05)	32.0 (43.39)	35.2 (47.72)	44.8 (60.74)	41.6 (56.40)	32.0 (43.39)
	SAE Grade 4	28.3 (38.37)	34.0 (46.10)	37.7 (51.11)	41.5 (56.27)	52.8 (71.59)	49.1 (66.57)	37.7 (51.11)
	SAE Grade 5 ASTM A449	37.1 (50.30)	44.5 (60.33)	49.5 (67.11)	54.4 (73.76)	69.3 (93.96)	64.3 (87.18)	49.5 (67.11)
	SAE Grade 7	45.9 (62.23)	55.1 (74.70)	61.3 (83.11)	67.4 (91.38)	85.8 (116.33)	79.6 (107.92)	61.3 (83.11)
	SAE Grade 8 ASTM A354 Grade BD	52.5 (71.18)	63.0 (85.41)	70.0 (94.90)	77.0 (104.40)	98.0 (132.87)	91.0 (123.38)	70.0 (94.90)
	ASTM A354 Grade BC	45.7 (61.96)	54.9 (74.43)	61.0 (82.70)	67.1 (90.97)	85.4 (115.79)	79.3 (107.52)	61.0 (82.70)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
7/16 - 20	SAE Grade 1 ASTM A307	16.0 (21.70)	19.2 (26.03)	21.3 (28.88)	23.5 (31.86)	29.9 (40.54)	27.7 (37.56)	21.3 (28.88)
	SAE Grade 2	26.9 (36.48)	32.2 (43.66)	35.8 (48.54)	39.4 (53.42)	50.1 (67.93)	46.6 (63.18)	35.8 (48.54)
	SAE Grade 4	31.6 (42.84)	37.9 (51.39)	42.1 (57.08)	46.3 (62.77)	59.0 (79.99)	54.7 (74.16)	42.1 (57.08)
	SAE Grade 5 ASTM A449	41.4 (56.13)	49.7 (67.38)	55.2 (74.84)	60.8 (82.43)	77.3 (104.80)	71.8 (97.35)	55.2 (74.84)
	SAE Grade 7	51.3 (69.55)	61.5 (83.38)	68.4 (92.74)	75.2 (101.96)	95.7 (129.75)	88.9 (120.53)	68.4 (92.74)
	SAE Grade 8 ASTM A354 Grade BD	58.2 (78.90)	69.9 (94.77)	77.7 (105.35)	85.4 (115.78)	108.7 (147.37)	101.0 (136.94)	77.7 (105.35)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1/2 - 13	SAE Grade 1 ASTM A307	22.0 (29.83)	26.0 (35.25)	29.38 (39.83)	32.0 (43.39)	41.0 (55.59)	38.0 (51.52)	29.0 (39.32)
	SAE Grade 2	36.6 (49.62)	43.9 (59.52)	48.8 (66.16)	53.6 (72.67)	68.3 (92.60)	63.4 (85.96)	48.8 (66.16)
	SAE Grade 4	43.1 (58.44)	51.8 (70.23)	57.5 (77.96)	63.3 (85.82)	80.5 (109.14)	74.8 (101.42)	57.5 (77.96)
	SAE Grade 5 ASTM A449	56.7 (76.87)	68.1 (92.33)	75.6 (102.5)	83.2 (112.80)	105.9 (143.58)	98.3 (133.27)	75.6 (102.50)
	SAE Grade 7	69.8 (94.64)	83.8 (113.62)	93.1 (126.23)	102.4 (138.84)	130.4 (176.80)	121.1 (164.19)	93.1 (126.23)
	SAE Grade 8 ASTM A354 Grade BD	79.7 (108.05)	95.6 (129.62)	106.3 (144.12)	116.9 (158.50)	148.8 (201.75)	138.1 (187.24)	106.3 (144.12)
	ASTM A354 Grade BC	69.8 (94.64)	83.8 (113.62)	93.1 (126.23)	102.4 (138.84)	130.4 (176.80)	121.1 (164.19)	93.1 (126.23)

All values in foot pounds and (Newton meters)

Nominal bolt size	Standard and Grade Designation	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1/2 - 20	SAE Grade 1 ASTM A307	24.8 (33.62)	29.8 (40.40)	33.1 (44.88)	36.4 (49.35)	46.4 (62.91)	43.1 (58.44)	33.1 (44.88)
	SAE Grade 2	41.3 (56.00)	49.5 (67.11)	55.0 (74.57)	60.5 (82.02)	77.0 (104.40)	71.5 (96.94)	55.0 (74.57)
	SAE Grade 4	48.8 (66.16)	58.5 (79.32)	65.0 (88.13)	71.5 (96.94)	91.0 (123.38)	84.5 (114.57)	65.0 (88.13)
	SAE Grade 5 ASTM A449	63.8 (86.50)	76.5 (103.72)	85.0 (115.24)	93.5 (126.77)	119.0 (161.34)	110.5 (149.82)	85.0 (115.24)
	SAE Grade 7	78.8 (106.84)	94.5 (128.12)	105.0 (142.36)	115.5 (156.60)	147.0 (199.30)	136.5 (185.07)	105.0 (142.36)
	SAE Grade 8 ASTM A354 Grade BD	90.0 (122.02)	108.0 (146.43)	120.0 (162.70)	132.0 (179.00)	168.0 (277.78)	156.0 (211.51)	120.0 (162.70)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
9/16 - 12	SAE Grade 1 ASTM A307	32.0 (43.39)	38.0 (51.52)	42.19 (57.20)	46.0 (62.37)	59.0 (80.00)	55.0 (74.57)	42 (56.94)
	SAE Grade 2	52.7 (71.45)	63.3 (85.82)	70.3 (95.31)	77.3 (104.80)	98.4 (133.41)	91.4 (123.92)	70.3 (95.31)
	SAE Grade 4	62.2 (84.33)	74.7 (101.28)	83.0 (112.53)	91.3 (123.79)	116.2 (157.55)	107.9 (146.30)	83.0 (112.53)
	SAE Grade 5 ASTM A449	81.7 (110.77)	98.1 (133.00)	109.0 (147.78)	119.9 (162.56)	152.6 (206.90)	141.7 (192.17)	109.0 (147.78)
	SAE Grade 7	100.7 (136.53)	120.9 (163.92)	134.3 (182.09)	147.7 (200.25)	188.0 (254.89)	174.6 (236.73)	134.3 (182.09)
	SAE Grade 8 ASTM A354 Grade BD	115.0 (155.92)	138.0 (187.10)	153.3 (207.85)	168.6 (228.59)	214.6 (290.96)	199.3 (270.21)	153.3 (207.85)
	ASTM A354 Grade BC	100.7 (136.53)	120.9 (163.92)	134.3 (182.09)	147.7 (200.25)	188.0 (254.89)	174.6 (236.73)	134.3 (182.09)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
9/16 - 18	SAE Grade 1 ASTM A307	35.3 (47.86)	42.4 (57.49)	47.1 (63.86)	51.8 (70.23)	66.0 (89.48)	61.2 (82.98)	47.1 (63.86)
	SAE Grade 2	59.1 (80.13)	70.9 (96.13)	78.8 (106.84)	86.6 (117.41)	110.3 (149.55)	102.4 (138.84)	78.8 (106.84)
	SAE Grade 4	69.6 (94.36)	83.5 (113.21)	92.8 (125.82)	102.1 (138.43)	129.9 (176.12)	120.7 (163.65)	92.8 (125.85)
	SAE Grade 5 ASTM A449	91.2 (123.65)	109.5 (148.46)	121.6 (164.87)	133.8 (181.40)	170.3 (230.90)	158.1 (214.36)	121.6 (164.87)
	SAE Grade 7	112.3 (152.26)	134.8 (182.76)	149.8 (203.10)	164.7 (223.30)	209.7 (284.32)	194.7 (263.98)	149.8 (203.10)
	SAE Grade 8 ASTM A354 Grade BD	128.7 (174.61)	154.4 (209.34)	171.6 (232.66)	188.7 (255.84)	240.2 (325.67)	223.0 (302.35)	171.6 (232.66)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
5/8 - 11	SAE Grade 1 ASTM A307	44 (59.66)	52 (70.50)	58.2 (78.90)	64 (86.77)	81 (109.82)	76 (103.04)	58 (78.64)
	SAE Grade 2	72.7 (98.57)	87.2 (118.23)	96.9 (131.38)	106.6 (144.53)	135.6 (183.85)	125.9 (170.70)	96.9 (131.38)
	SAE Grade 4	86.1 (116.74)	103.4 (140.19)	114.8 (155.65)	126.3 (171.24)	160.8 (218.02)	149.3 (202.42)	114.8 (155.65)
	SAE Grade 5 ASTM A449	112.5 (152.53)	135.0 (183.04)	150.0 (203.37)	165.0 (223.71)	210.0 (284.72)	195.0 (264.38)	150.0 (203.37)
	SAE Grade 7	138.9 (188.32)	166.6 (225.88)	185.2 (251.10)	203.7 (276.18)	259.2 (351.43)	240.7 (326.35)	185.2 (251.10)
	SAE Grade 8 ASTM A354 Grade BD	158.8 (215.30)	190.5 (258.28)	211.7 (287.03)	232.9 (315.77)	296.4 (401.86)	275.2 (373.12)	211.7 (287.03)
	ASTM A354 Grade BC	139.2 (188.73)	167.0 (226.42)	185.5 (251.50)	204.1 (276.72)	259.8 (352.24)	241.2 (327.02)	185.5 (251.50)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
5/8 - 18	SAE Grade 1 ASTM A307	49.5 (67.11)	59.4 (80.54)	66.0 (89.48)	72.6 (98.43)	92.4 (125.27)	85.8 (116.33)	66.0 (89.48)
	SAE Grade 2	82.6 (112.00)	99.1 (134.36)	110.2 (149.41)	121.2 (164.33)	154.2 (209.07)	143.2 (194.15)	110.2 (149.41)
	SAE Grade 4	97.3 (131.92)	116.7 (158.22)	129.7 (175.85)	142.7 (193.48)	181.6 (246.22)	168.6 (228.59)	129.7 (175.85)
	SAE Grade 5 ASTM A449	127.7 (173.14)	153.3 (207.85)	170.3 (230.90)	187.3 (253.95)	238.4 (323.23)	221.4 (300.18)	170.3 (230.90)
	SAE Grade 7	157.6 (213.68)	189.1 (256.39)	210.2 (285.00)	231.2 (313.47)	294.2 (398.88)	273.2 (370.41)	210.2 (285.00)
	SAE Grade 8 ASTM A354 Grade BD	179.9 (243.91)	215.9 (292.72)	239.8 (325.13)	263.8 (357.66)	335.8 (455.28)	311.8 (422.74)	239.8 (325.13)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
3/4 - 10	SAE Grade 1 ASTM A307	77 (104.40)	93 (126.09)	103.1 (139.78)	113 (153.20)	144 (195.24)	134 (181.68)	103 (139.65)
	SAE Grade 2	129.4 (175.44)	155.3 (210.55)	172.5 (233.88)	189.8 (257.33)	241.5 (327.43)	224.3 (304.11)	172.5 (233.88)
	SAE Grade 4	152.6 (206.90)	183.1 (248.25)	203.4 (275.77)	223.8 (303.43)	284.8 (386.14)	264.5 (358.61)	203.4 (275.77)
	SAE Grade 5 ASTM A449	199.7 (270.76)	239.6 (324.85)	266.3 (361.05)	292.9 (397.12)	372.8 (505.45)	346.1 (469.25)	266.3 (361.05)
	SAE Grade 7	246.8 (334.62)	296.2 (401.60)	329.1 (446.20)	362.0 (490.13)	460.7 (624.63)	427.8 (580.02)	329.1 (446.20)
	SAE Grade 8 ASTM A354 Grade BD	282.0 (382.34)	338.3 (458.67)	375.9 (509.65)	413.5 (560.63)	526.3 (713.57)	488.7 (662.59)	375.9 (509.65)
	ASTM A354 Grade BC	246.4 (334.07)	295.7 (400.92)	328.6 (445.53)	361.5 (490.13)	460.0 (623.67)	427.2 (579.20)	328.6 (445.53)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
3/4 - 16	SAE Grade 1 ASTM A307	86.5 (117.28)	103.8 (140.73)	115.3 (156.33)	126.8 (171.92)	161.4 (218.83)	149.9 (203.24)	115.3 (156.33)
	SAE Grade 2	144.1 (195.37)	173.0 (234.56)	192.2 (260.59)	211.4 (286.62)	269.1 (364.85)	249.8 (338.68)	192.2 (260.59)
	SAE Grade 4	170.2 (230.76)	204.2 (276.86)	226.9 (307.64)	249.6 (338.41)	317.6 (430.61)	294.9 (399.15)	226.9 (307.64)
	SAE Grade 5 ASTM A449	222.9 (302.21)	267.5 (362.68)	297.2 (402.95)	326.9 (443.22)	416.1 (564.16)	386.3 (523.75)	297.2 (402.95)
	SAE Grade 7	275.6 (373.66)	330.8 (448.50)	367.5 (498.26)	404.3 (548.16)	514.5 (697.57)	477.8 (647.81)	367.5 (498.26)
	SAE Grade 8 ASTM A354 Grade BD	315.0 (427.08)	378.0 (512.50)	420.0 (569.44)	462.0 (626.39)	588.0 (797.22)	546.0 (740.28)	420.0 (569.44)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
7/8 - 9	SAE Grade 1 ASTM A307	124.7 (169.07)	149.6 (202.83)	166.3 (225.47)	182.9 (247.98)	232.8 (315.63)	216.1 (293.0)	166.3 (225.47)
	SAE Grade 2	124.7 (169.07)	149.6 (202.83)	166.3 (225.47)	182.9 (247.98)	232.8 (315.63)	216.1 (293.00)	166.3 (225.47)
	SAE Grade 4	246.1 (333.67)	295.3 (400.37)	328.1 (444.84)	360.9 (489.32)	459.4 (622.86)	426.6 (578.40)	328.1 (444.84)
	SAE Grade 5 ASTM A449	322.4 (437.11)	386.9 (524.57)	429.8 (582.73)	472.8 (641.03)	601.8 (815.93)	558.8 (757.63)	429.8 (582.73)
	SAE Grade 7	397.9 (539.48)	477.4 (647.27)	530.5 (719.26)	583.5 (791.12)	742.7 (1007.00)	689.6 (935.00)	530.5 (719.26)
	SAE Grade 8 ASTM A354 Grade BD	454.5 (616.22)	545.3 (739.33)	605.9 (821.49)	666.5 (903.65)	848.3 (1150.14)	787.7 (1067.98)	605.9 (821.49)
	ASTM A354 Grade BC	397.9 (539.48)	477.4 (647.27)	530.5 (719.26)	583.5 (791.12)	742.7 (1007.00)	689.6 (935.00)	530.5 (719.26)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
7/8 - 14	SAE Grade 1 ASTM A307	137.8 (186.83)	165.4 (224.25)	183.8 (249.20)	202.1 (274.01)	257.3 (348.85)	238.9 (323.90)	183.8 (249.20)
	SAE Grade 2	137.8 (186.83)	165.4 (224.25)	183.8 (249.20)	202.1 (274.01)	257.3 (348.85)	238.9 (323.90)	183.8 (249.20)
	SAE Grade 4	271.5 (368.11)	325.8 (441.73)	362.0 (490.80)	398.2 (539.89)	506.8 (687.13)	470.6 (638.05)	362.0 (490.80)
	SAE Grade 5 ASTM A449	355.2 (481.59)	426.2 (577.85)	473.6 (642.12)	521.0 (706.38)	663.0 (898.91)	615.7 (834.78)	473.6 (642.12)
	SAE Grade 7	438.0 (593.85)	525.7 (712.75)	584.1 (791.93)	642.5 (871.11)	817.7 (1108.65)	759.3 (1029.47)	584.1 (791.93)
	SAE Grade 8 ASTM A354 Grade BD	501.2 (679.54)	601.5 (815.53)	668.3 (906.09)	735.1 (996.66)	935.6 (1268.50)	868.8 (1177.94)	668.3 (906.09)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for:					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1 - 8	SAE Grade 1 ASTM A307	187.5 (254.22)	225.0 (305.06)	250.0 (338.95)	275.0 (372.85)	350.0 (474.54)	325.0 (440.64)	250.0 (338.95)
	SAE Grade 2	187.5 (254.22)	225.0 (305.06)	250.0 (338.95)	275.0 (372.85)	350.0 (474.54)	325.0 (440.64)	250.0 (338.95)
	SAE Grade 4	369.4 (500.84)	443.3 (601.03)	492.5 (667.74)	541.8 (734.58)	689.5 (934.84)	640.3 (868.13)	492.5 (667.74)
	SAE Grade 5 ASTM A449	482.8 (654.59)	579.4 (785.56)	643.8 (872.88)	708.1 (960.05)	901.3 (1222.00)	836.9 (1134.69)	643.8 (872.88)
	SAE Grade 7	596.3 (808.47)	715.5 (970.09)	795.0 (1077.88)	874.5 (1185.66)	1113.0 (1509.03)	1033.5 (1401.24)	795.0 (1077.88)
	SAE Grade 8 ASTM A354 Grade BD	681.6 (924.13)	817.9 (1108.92)	908.8 (1232.17)	999.6 (1355.28)	1272.3 (1725.00)	1181.4 (1601.77)	908.8 (1232.17)
	ASTM A354 Grade BC	596.7 (809.01)	716.1 (970.90)	795.6 (1078.69)	875.2 (1186.61)	1113.9 (1510.25)	1034.3 (1402.32)	795.6 (1078.69)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1 - 12	SAE Grade 1 ASTM A307	205.3 278.35	246.4 (334.07)	273.8 (371.22)	301.1 (408.24)	383.3 (519.69)	355.9 (482.54)	273.8 (371.22)
	SAE Grade 2	205.3 (278.35)	246.4 (334.07)	273.8 (371.22)	301.1 (408.24)	383.3 (519.69)	355.9 (482.54)	273.8 (371.22)
	SAE Grade 4	404.1 (547.88)	484.9 (657.44)	538.8 (730.52)	592.6 (803.46)	754.3 (1022.70)	700.4 (949.62)	538.8 (730.52)
	SAE Grade 5 ASTM A449	528.8 (716.96)	634.5 (860.27)	705.0 (955.85)	775.5 (1051.44)	987.0 (1338.19)	916.5 (1242.61)	705.0 (955.85)
	SAE Grade 7	652.5 (884.67)	783.0 (1061.60)	870.0 (1179.56)	957.0 (1297.52)	1218.0 (1651.39)	1131.0 (1533.42)	870.0 (1179.56)
	SAE Grade 8 ASTM A354 Grade BD	746.3 (1011.85)	895.5 (1214.14)	995.0 (1349.04)	1094.5 (1483.49)	1393.0 (1888.66)	1293.5 (1753.73)	995.0 (1349.04)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1 - 14	SAE Grade 1 ASTM A307	210.0 (284.72)	252.0 (341.66)	280.0 (379.63)	308.0 (417.60)	392.0 (531.48)	364.0 (493.52)	280.0 (379.63)
	SAE Grade 2	210.0 (284.72)	252.0 (341.66)	280.0 (379.63)	308.0 (417.60)	392.0 (531.48)	364.0 (493.52)	280.0 (379.63)
	SAE Grade 4	413.4 (560.50)	496.1 (672.62)	551.3 (747.46)	606.4 (822.17)	771.8 (1046.42)	716.6 (971.58)	551.3 (747.46)
	SAE Grade 5 ASTM A449	540.9 (733.36)	649.1 (880.06)	721.3 (977.95)	793.4 (1075.70)	1009.8 (1369.10)	937.6 (1271.22)	721.3 (977.95)
	SAE Grade 7	668.4 (906.23)	802.1 (1087.50)	891.3 (1208.44)	980.4 (1329.25)	1247.8 (1691.79)	1158.6 (1570.85)	891.3 (1208.44)
	SAE Grade 8 ASTM A354 Grade BD	764.1 (1035.98)	916.9 (1243.15)	1018.8 (1381.31)	1120.6 (1519.33)	1426.3 (1933.80)	1324.4 (1795.65)	1018.8 (1381.30)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-1/8 • 7	SAE Grade 1 ASTM A307	265.8 (360.37)	318.9 (432.37)	354.4 (480.50)	389.8 (528.50)	496.1 (672.62)	460.7 (624.63)	354.4 (480.50)
	SAE Grade 2	265.8 (360.37)	318.9 (432.37)	354.4 (480.50)	389.8 (528.50)	496.1 (672.62)	460.7 (624.63)	354.4 (480.50)
	SAE Grade 4	523.1 (709.23)	627.8 (851.18)	697.5 (945.68)	767.3 (1040.32)	976.5 (1323.96)	906.8 (1229.46)	697.5 (945.68)
	SAE Grade 5 ASTM A449	595.9 (807.93)	715.1 (969.55)	794.5 (1077.20)	874.0 (1184.99)	1112.3 (1508.07)	1032.9 (1400.43)	794.5 (1077.20)
	SAE Grade 7	844.8 (1145.40)	1013.8 (1374.53)	1126.4 (1527.20)	1239.0 (1679.86)	1577.0 (2138.13)	1464.3 (1985.33)	1126.4 (1527.20)
	SAE Grade 8 ASTM A354 Grade BD	966.1 (1309.86)	1159.3 (1571.80)	1288.1 (1746.43)	1416.9 (1921.06)	1803.4 (2445.08)	1674.6 (2270.46)	1288.1 (1746.43)
	ASTM A354 Grade BC	844.8 (1145.40)	1013.8 (1374.53)	1126.4 (1527.20)	1239.0 (1679.86)	1577.0 (2138.13)	1464.3 (1985.33)	1126.4 (1527.20)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-1/8 • 12	SAE Grade 1 ASTM A307	297.4 (403.22)	356.9 (483.89)	396.6 (537.72)	436.2 (591.40)	555.2 (752.75)	515.5 (698.93)	396.6 (537.72)
	SAE Grade 2	297.4 (403.22)	356.9 (483.89)	396.6 (537.72)	436.2 (591.40)	555.2 (752.75)	515.5 (698.93)	396.6 (537.72)
	SAE Grade 4	586.4 (795.05)	703.7 (954.09)	781.9 (1060.12)	860.1 (1166.14)	1094.6 (1484.08)	1016.4 (1378.06)	781.9 (1060.12)
	SAE Grade 5 ASTM A449	667.6 (905.14)	801.1 (1086.15)	890.2 (1206.95)	979.2 (1327.62)	1246.2 (1689.62)	1157.2 (1568.95)	890.2 (1206.95)
	SAE Grade 7	948.2 (1285.58)	1137.8 (1542.65)	1264.2 (1714.02)	1390.6 (1855.40)	1769.9 (2399.66)	1643.5 (2228.30)	1264.2 (1714.02)
	SAE Grade 8 ASTM A354 Grade BD	1083.2 (1468.62)	1299.8 (1762.30)	1444.2 (1958.07)	1588.6 (2153.85)	2021.9 (2741.33)	1877.5 (2545.55)	1444.2 (1958.07)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-1/4 • 7	SAE Grade 1 ASTM A307	375.0 (508.43)	450.0 (610.11)	500.0 (677.91)	550.0 (745.70)	700.0 (949.07)	650.0 (881.28)	500.0 (677.91)
	SAE Grade 2	375.0 (508.43)	450.0 (610.11)	500.0 (677.91)	550.0 (745.70)	700.0 (949.07)	650.0 (881.28)	500.0 (677.91)
	SAE Grade 4	738.3 (1001.00)	885.9 (1201.12)	984.4 (1334.67)	1082.8 (1468.08)	1378.1 (1868.45)	1279.7 (1735.04)	984.4 (1334.67)
	SAE Grade 5 ASTM A449	840.2 (1139.16)	1008.3 (1367.07)	1120.3 (1518.93)	1232.3 (1670.78)	1568.4 (2126.47)	1456.4 (1974.62)	1120.3 (1518.93)
	SAE Grade 7	1191.8 (1615.87)	1430.2 (1939.09)	1589.1 (2154.53)	1748.0 (2369.97)	2224.7 (3016.30)	2065.8 (2800.85)	1589.1 (2154.53)
	SAE Grade 8 ASTM A354 Grade BD	1362.9 (1847.85)	1635.5 (2217.44)	1817.2 (2463.80)	1998.9 (2710.15)	2544.1 (3449.34)	2362.3 (3202.85)	1817.2 (2463.80)
	ASTM A354 Grade BC	1192.4 (1616.68)	1430.9 (1940.04)	1589.8 (2155.48)	1748.8 (2371.05)	2225.8 (3017.78)	2066.8 (2802.20)	1589.8 (2155.48)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-1/4 • 12	SAE Grade 1 ASTM A307	414.8 (562.40)	497.8 (674.93)	553.1 (749.90)	608.4 (824.88)	774.4 (1049.95)	719.1 (974.97)	553.1 (749.90)
	SAE Grade 2	414.8 (562.40)	497.8 (674.93)	553.1 (749.90)	608.4 (824.88)	774.4 (1049.95)	719.1 (974.97)	553.1 (749.90)
	SAE Grade 4	816.8 (1107.43)	980.2 (1328.97)	1089.1 (1476.62)	1198.0 (1624.27)	1524.7 (2067.22)	1415.8 (1919.57)	1089.1 (1476.62)
	SAE Grade 5 ASTM A449	930.5 (1261.60)	1116.6 (1513.90)	1240.6 (1682.03)	1364.7 (1850.29)	1736.9 (2354.92)	1612.8 (2186.66)	1240.6 (1682.03)
	SAE Grade 7	1320.7 (1790.63)	1584.8 (2148.70)	1760.9 (2387.46)	1937.0 (2626.22)	2465.3 (3342.50)	2289.2 (3103.74)	1760.9 (2387.46)
	SAE Grade 8 ASTM A354 Grade BD	1509.4 (2046.47)	1811.3 (2455.80)	2012.5 (2728.59)	2213.8 (3001.51)	2817.5 (3820.02)	2616.3 (3547.23)	2012.5 (2728.58)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-3/8 • 6	SAE Grade 1 ASTM A307	491.1 (665.84)	589.4 (799.12)	654.8 (887.79)	720.3 (976.60)	916.8 (1243.00)	851.3 (1154.21)	654.8 (887.80)
	SAE Grade 2	491.1 (665.84)	589.4 (799.12)	654.8 (887.79)	720.3 (976.60)	916.8 (1243.00)	851.3 (1154.21)	654.8 (887.80)
	SAE Grade 4	968.1 (1312.57)	1161.7 (1575.06)	1290.8 (1750.10)	1419.9 (1925.13)	1807.1 (2450.10)	1678.0 (2275.07)	1290.8 (1750.09)
	SAE Grade 5 ASTM A449	1102.1 (1494.25)	1322.6 (1793.20)	1469.5 (1992.38)	1616.5 (2191.68)	2057.3 (2789.33)	1910.4 (2590.16)	1469.5 (1992.38)
	SAE Grade 7	1563.6 (2119.96)	1876.4 (2544.06)	2084.8 (2826.61)	2293.3 (3109.30)	2918.8 (3957.37)	2710.3 (3674.68)	2084.8 (2826.61)
	SAE Grade 8 ASTM A354 Grade BD	1786.6 (2422.30)	2144.0 (2906.88)	2382.2 (3229.83)	2620.4 (3552.79)	3335.1 (4521.80)	3096.8 (4198.70)	2382.2 (3229.83)
	ASTM A354 Grade BC	1563.6 (2119.96)	1876.4 (2544.06)	2084.8 (2826.61)	2293.3 (3109.30)	2918.8 (3957.37)	2710.3 (3674.68)	2084.8 (2826.61)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-3/8 • 12	SAE Grade 1 ASTM A307	559.5 (758.58)	671.3 (910.16)	745.9 (1011.30)	820.5 (1112.45)	1044.3 (1415.88)	969.7 (1314.74)	745.9 (1011.30)
	SAE Grade 2	559.5 (758.58)	671.3 (910.16)	745.9 (1011.30)	820.5 (1112.45)	1044.3 (1415.88)	969.7 (1314.74)	745.9 (1011.30)
	SAE Grade 4	1102.1 (1494.25)	1322.6 (1793.21)	1469.5 (1992.38)	1616.5 (2191.68)	2057.3 (2789.33)	1910.4 (2590.16)	1469.5 (1992.38)
	SAE Grade 5 ASTM A449	1254.3 (1700.60)	1505.1 (2040.64)	1672.3 (2267.34)	1839.6 (2494.16)	2341.3 (3174.38)	2174.0 (2947.55)	1672.3 (2267.34)
	SAE Grade 7	1780.2 (2413.63)	2136.2 (2896.30)	2373.6 (3218.17)	2611.0 (3540.04)	3323.0 (4505.39)	3085.7 (4183.65)	2373.6 (3218.17)
	SAE Grade 8 ASTM A354 Grade BD	2034.1 (2757.87)	2441.0 (3309.56)	2712.2 (3677.25)	2983.4 (4044.95)	3797.1 (5148.18)	3525.8 (4780.35)	2712.2 (3677.25)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-1/2 • 6	SAE Grade 1 ASTM A307	652.5 (884.67)	783.0 (1061.60)	870.0 (1179.56)	957.0 (1297.52)	1218.0 (1651.39)	1131.0 (1533.43)	870.0 (1179.56)
	SAE Grade 2	652.5 (884.67)	783.0 (1061.60)	870.0 (1179.56)	957.0 (1297.52)	1218.0 (1651.39)	1131.0 (1533.43)	870.0 (1179.56)
	SAE Grade 4	1283.9 (1740.74)	1540.7 (2088.91)	1711.9 (2321.03)	1883.1 (2553.14)	2396.6 (3249.36)	2225.4 (3017.24)	1711.9 (2321.03)
	SAE Grade 5 ASTM A449	1462.5 (1982.88)	1755.0 (2379.46)	1950.0 (2643.85)	2145.0 (2908.23)	2730.0 (3701.39)	2535.0 (3437.00)	1950.0 (2643.85)
	SAE Grade 7	2074.2 (2812.24)	2489.1 (3374.77)	2765.6 (3749.66)	3042.2 (4124.67)	3871.9 (5249.60)	3595.3 (4874.58)	2765.6 (3749.66)
	SAE Grade 8 ASTM A354 Grade BD	2370.9 (3214.51)	2845.1 (3857.44)	3161.3 (4286.15)	3477.4 (4714.73)	4425.8 (6000.58)	4109.6 (5571.88)	3161.3 (4286.15)
	ASTM A354 Grade BC	2074.9 (2813.20)	2489.9 (3375.85)	2766.6 (3751.01)	3043.2 (4126.03)	3873.2 (5251.36)	3596.5 (4876.20)	2766.6 (3751.01)

All values in foot pounds and (Newton meters)

Nominal bolt size	Grade Designation and Standard	Zinc or Cadmium Plated	If instructions call for :					
			Loctite 222 or 262	Loctite 242	Loctite 271	Loctite 272	Loctite 277	Bare
1-1/2 • 12	SAE Grade 1 ASTM A307	734.1 (995.30)	880.9 (1194.34)	978.8 (1327.07)	1076.6 (1459.67)	1370.3 (1857.88)	1272.4 (1725.14)	978.8 (1327.07)
	SAE Grade 2	734.1 (995.30)	880.9 (1194.34)	978.8 (1327.07)	1076.6 (1459.67)	1370.3 (1857.88)	1272.4 (1725.14)	978.8 (1327.07)
	SAE Grade 4	1445.6 (1959.97)	1734.8 (2352.07)	1927.5 (2613.34)	2120.3 (2874.33)	2698.5 (3658.68)	2505.8 (3397.41)	1927.5 (2613.34)
	SAE Grade 5 ASTM A449	1645.3 (2230.73)	1974.4 (2676.93)	2193.8 (2974.40)	2413.1 (3271.73)	3071.3 (4164.13)	2851.9 (3866.66)	2193.8 (2974.40)
	SAE Grade 7	2334.4 (3165.02)	2801.3 (3798.06)	3112.5 (4219.99)	3423.8 (4642.05)	4357.5 (5907.98)	4046.3 (5486.05)	3112.5 (4219.99)
	SAE Grade 8 ASTM A354 Grade BD	2667.7 (3616.92)	3201.2 (4340.25)	3556.9 (4822.51)	3912.6 (5304.78)	4979.6 (6751.44)	4623.9 (6269.17)	3556.9 (4822.51)
	ASTM A354 Grade BC	—	—	—	—	—	—	—

Other Fastener Torque Specifications

All values in foot-pounds and (Newton-meters)

Nominal bolt size	18 - 8 Stainless Steel	316 Stainless Steel	Brass	Aluminum 2024 - T4
1/4 - 20	6.3 (8.54)	6.6 (8.95)	5.1 (6.91)	3.8 (5.15)
1/4 - 28	7.8 (10.57)	8.3 (11.25)	6.4 (8.67)	4.8 (6.50)
5/16 - 18	11.0 (14.90)	11.5 (15.60)	8.9 (12.06)	6.7 (9.08)
5/16 - 24	11.8 (16.00)	12.3 (16.67)	9.7 (13.15)	7.2 (9.76)
3/8 - 16	19.7 (26.71)	20.6 (27.93)	16.0 (21.70)	11.9 (16.13)
3/8 - 24	21.6 (29.28)	22.6 (30.64)	17.7 (24.00)	13.1 (17.76)
7/16 - 14	31.3 (42.44)	32.8 (44.47)	26.4 (35.80)	19.0 (25.76)
7/16 - 20	33.3 (45.15)	34.8 (47.18)	27.3 (37.00)	20.2 (27.38)
1/2 - 13	43.1 (58.43)	45.2 (61.28)	35.2 (47.72)	26.1 (35.38)
1/2 - 20	45.1 (61.14)	47.1 (63.86)	36.9 (50.00)	27.3 (37.00)
9/16 - 12	56.8 (77.00)	59.4 (80.53)	46.5 (63.04)	34.4 (46.64)
9/16 - 18	62.7 (85.00)	65.6 (88.94)	51.3 (69.55)	38.0 (51.52)
5/8 - 11	92.5 (125.41)	96.7 (131.10)	75.6 (102.50)	59.6 (80.80)
5/8 - 18	103.7 (140.60)	108.4 (146.97)	84.7 (114.84)	66.5 (90.16)
3/4 - 10	127.5 (172.86)	131.8 (178.70)	104.1 (141.14)	81.7 (110.77)
3/4 - 16	124.2 (168.39)	129.8 (175.98)	101.7 (137.88)	79.8 (108.19)

Other Fastener Torque Specifications

All values in foot-pounds and (Newton-meters)

Nominal bolt size	18 - 8 Stainless Steel	316 Stainless Steel	Brass	Aluminum 2024 - T4
7/8 - 9	194.0 (263.03)	202.5 (274.55)	158.8 (215.30)	124.6 (168.93)
7/8 - 14	193.2 (261.94)	201.7 (273.47)	157.9 (214.08)	124.2 (168.40)
1 - 8	286.7 (388.71)	299.6 (406.20)	234.6 (318.07)	183.8 (249.20)
1 - 14	259.2 (351.43)	270.8 (367.16)	212.1 (287.57)	166.3 (225.47)
1-1/8 • 7	413.0 (559.95)	432.0 (585.71)	337.0 (456.91)	265.0 (359.29)
1-1/8 • 12	390.0 (528.77)	408.0 (553.17)	318.0 (431.15)	251.0 (340.31)
1-1/4 • 7	523.0 (709.09)	546.0 (740.28)	428.0 (580.30)	336.0 (455.55)
1-1/4 • 12	480.0 (650.80)	504.0 (683.33)	394.0 (534.19)	308.0 (417.60)
1-1/2 • 6	888.0 (1203.97)	930.0 (1260.91)	727.0 (985.68)	570.0 (772.82)
1-1/2 • 12	703.0 (953.14)	732.0 (992.46)	575.0 (779.60)	450.0 (610.12)

Section

2

**Covers, Safety and Shipping
Brackets**

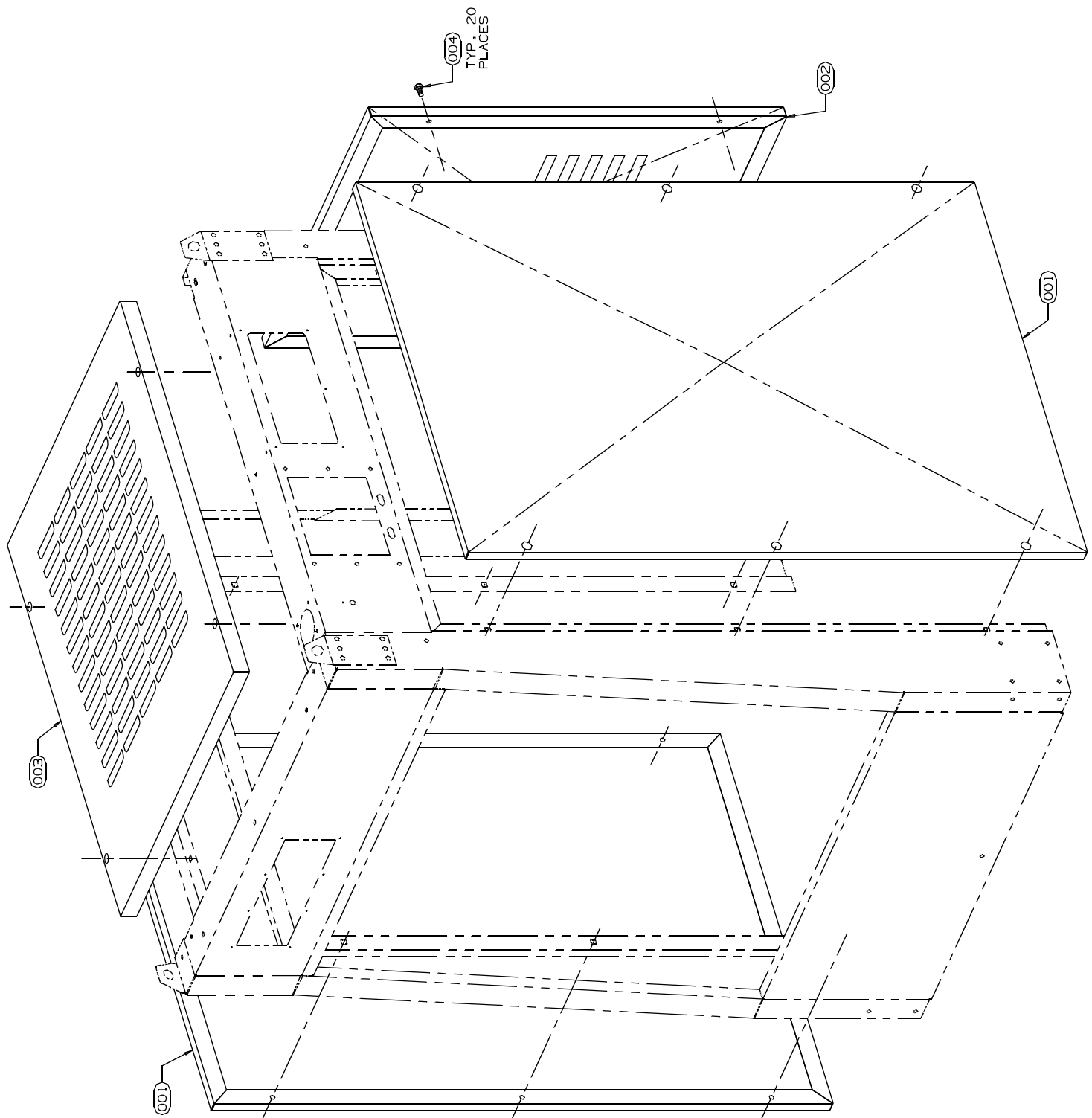


DRAWING AND PARTS LIST
 (See other page for more,
 if applicable.)

INSTALLATION GUARDS & COVERS
3022F8J/F8P/F8W

BMP940036/94177V (Page 1)

ITEM	PART NUMBER	DESCRIPTION	HOW PART IS USED IN ASSEMBLY (Only if pertinent)
00A	GGS30201	94253D INSTALL=3022F8 GUARDS&COVERS	REFERENCE ASSEMBLY
001	02 03862	94214D COSM=SIDE COVER 3022F	
002	02 03864	94211D COSM=REAR COVER 3022F	
003	02 03866	94211D COSM=TOP COVER 3022F	
004	15K083V	BUTSOKCAPSCR 3/8-16X3/4 SS18-8 ***** END OF PARTS LIST *****	



How to Read Parts List

Reference Item Numbers—Items 00A, 00B, 00C, etc., or 00X, 00Y, 00Z, etc., appearing at the top of some parts lists, are for reference and provide:

1. The part number for the entire assembly depicted in the drawing or a major sub-assembly thereof, and/or
2. The range of machine models this drawing applies to.

If more than one reference item appears, this usually means this drawing applies to more than one assembly (and thus to more than one range of machines).

Component Item Numbers—For any item on the drawing (e.g., item ①), there may be several corresponding items on the parts list (e.g., 001A, 001B, 001C, etc.) which are similar components on different assemblies. “How Part Is Used In Assembly” identifies which components apply to your machine, by listing either the machine model, or the reference item number from the top of the parts list (e.g., 00A, 00B, 00C, etc.), or a particular characteristic (e.g., bronze or stainless steel), or special ordering information, such as a repair kit number.

Shipping Bracket Installation

30022F8J, F8W

BMP010031/2002076V
(Sheet 1 of 1)



Pellerin Milnor Corporation
P. O. Box 400, Kenner, LA 70063-0400

Litho in U.S.A.



Parts List—Shipping Bracket Installation
Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
	A	APC30201	ASSEMBLIES ASSY=ISOLATOR SHIPBRKT 3022F	
			COMPONENTS	
all	1	W2 03851	SHIP BRKT=RT MNTNG PLATE WLDMT	
all	2	W2 03851A	SHIP BRKT=LF MNTNG PLATE WLDMT	
all	3	02 03852	REAR=SHIPPING BRACKET	
all	4	15K162	HXCAPSCR 1/2-13UNC2AX1.5 GR5 P	
all	5	15U280	FL+WASHER(USS STD)1/2 ZNC PL+D	
all	6	15G234N	HXLOCKNUT NYL 1/2-13UNC2 STL/Z	

Section

3

Frame and Housing Assemblies



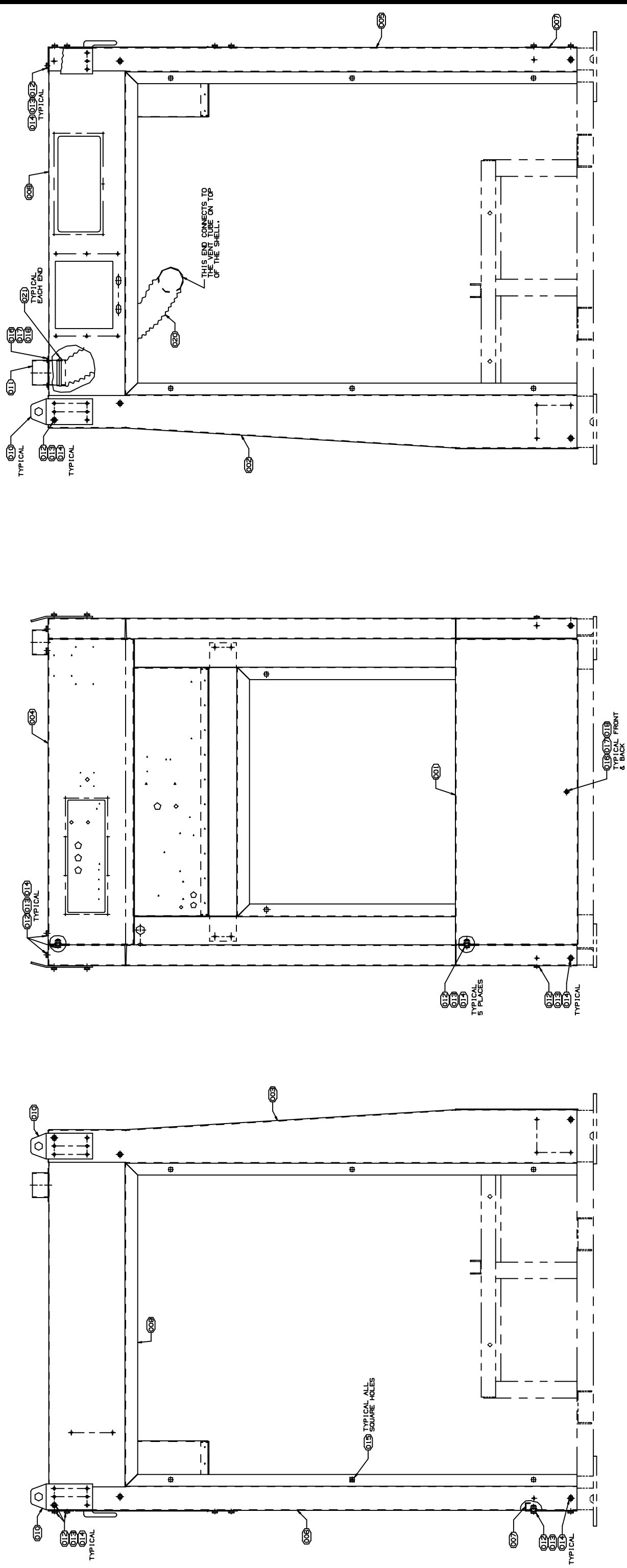
PELLERIN MILNOR CORPORATION
700 JACKSON STREET/POST OFFICE BOX 400
KENNER, LOUISIANA 70063-0400 USA

DRAWING

(See other page for parts list,
if applicable.)

HOUSE & SHELL VENT INSTALLATION
30022F8/J/F8P/F8W

BMP940043/94201V (Page 1)





PELLERIN MILNOR CORPORATION
 700 JACKSON STREET/POST OFFICE BOX 400
 KENNER, LOUISIANA 70063-0400 USA

PARTS LIST

(See other page for drawing.)

HOUSE & SHELL VENT INSTALLATION

30022F8J/F8P/F8W

BMP940043/94201V (Page 2)

ITEM	PART NUMBER	DESCRIPTION	HOW PART IS USED IN ASSEMBLY (Only if pertinent)
			REFERENCE ASSEMBLY
00A	GHG30201	94201E INSTL=3022F8 GEN HOUSE ASSY	
001	02 03850	93396C COSM=LOWER FRONT PANEL 3022F	
002	W2 03853	94062#*WLMT=FRNT RT CRNR POST 3022F	
003	W2 03854	94062#*WLMT=FRNT LF CRNR POST 3022F	
004	02 03855A	94156D COSM=3022F UPPER FRONT PANEL	
005	02 03856	94127D COSM=REAR RT CRNR POST 3022F	
006	02 03857	94153D COSM=REAR LF CRNR POST 3022F	
007	02 03858	94153D COSM=LOWER REAR PANEL 3022F	
008	02 03860	94127D COSM=TOP SIDE RAIL RT 3022F	
009	02 03861	94143D COSM=TOP SIDE RAIL LF 3022F	
010	02 03863	93151B HOUSE=CRNR LIFT BRKT 3022F	
011	W2 03846	93172B*WLMT=VENT TUBE MOUNTING	
012	15K095	HEXCAPSCR 3/8-16UNC2AX1"GR5 ZNC/CAD	
013	15G205	HXNUT 3/8-16UNC2B ZINC GR2	
014	15U240	FLATWASHER(USS STD) 3/8" ZNC PLT	
015	17N070P	01Z RETAIN NUT#S10100-27	
016	15K039	HXCAPSCR 1/4-20UNC2AX3/4 GR5 ZNC/CD	
017	15G165	HXNUT 1/4-20UNC2BSAE ZC GR2	
018	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	
020	02 03846A	93436B FLEX TUBE=SPRG MNT DRN 18"	
021	27A082	HOSECLAMP,2+9/16-3.5" CADSCR HS-48 ***** END OF PARTS LIST *****	

How to Read Parts List

Reference Item Numbers—Items 00A, 00B, 00C, etc., or 00X, 00Y, 00Z, etc., appearing at the top of some parts lists, are for reference and provide:

1. The part number for the entire assembly depicted in the drawing or a major sub-assembly thereof, and/or
 2. The range of machine models this drawing applies to.
- If more than one reference item appears, this usually means this drawing applies to more than one assembly (and thus to more than one range of machines).

Component Item Numbers—For any item on the drawing (e.g., item ①), there may be several corresponding items on the parts list (e.g., 001A, 001B, 001C, etc.) which are similar components on different assemblies. "How Part Is Used In Assembly" identifies which components apply to your machine, by listing either the machine model, or the reference item number from the top of the parts list (e.g., 00A, 00B, 00C, etc.), or a particular characteristic (e.g., bronze or stainless steel), or special ordering information, such as a repair kit number.

Section
Suspension

4

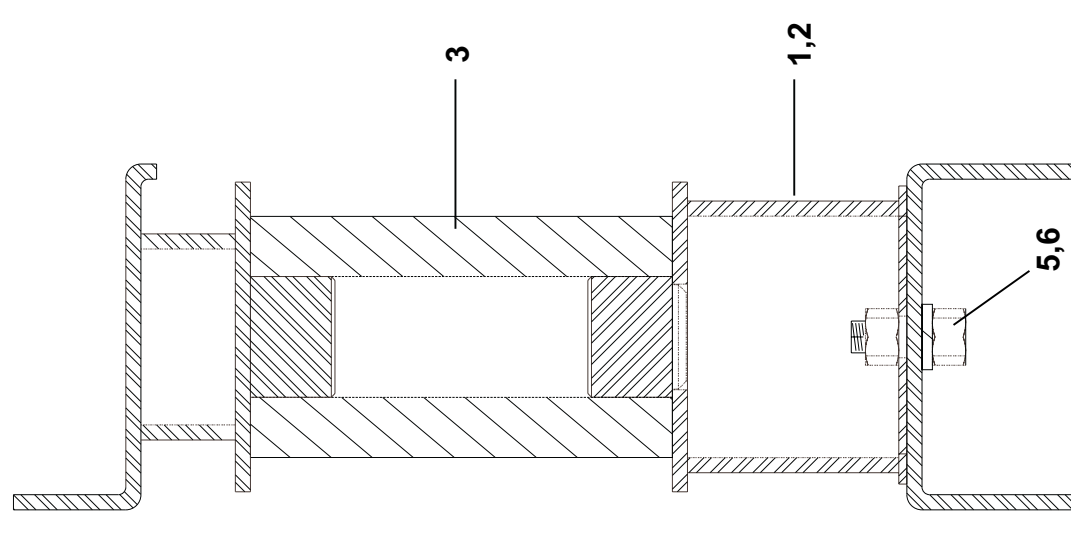
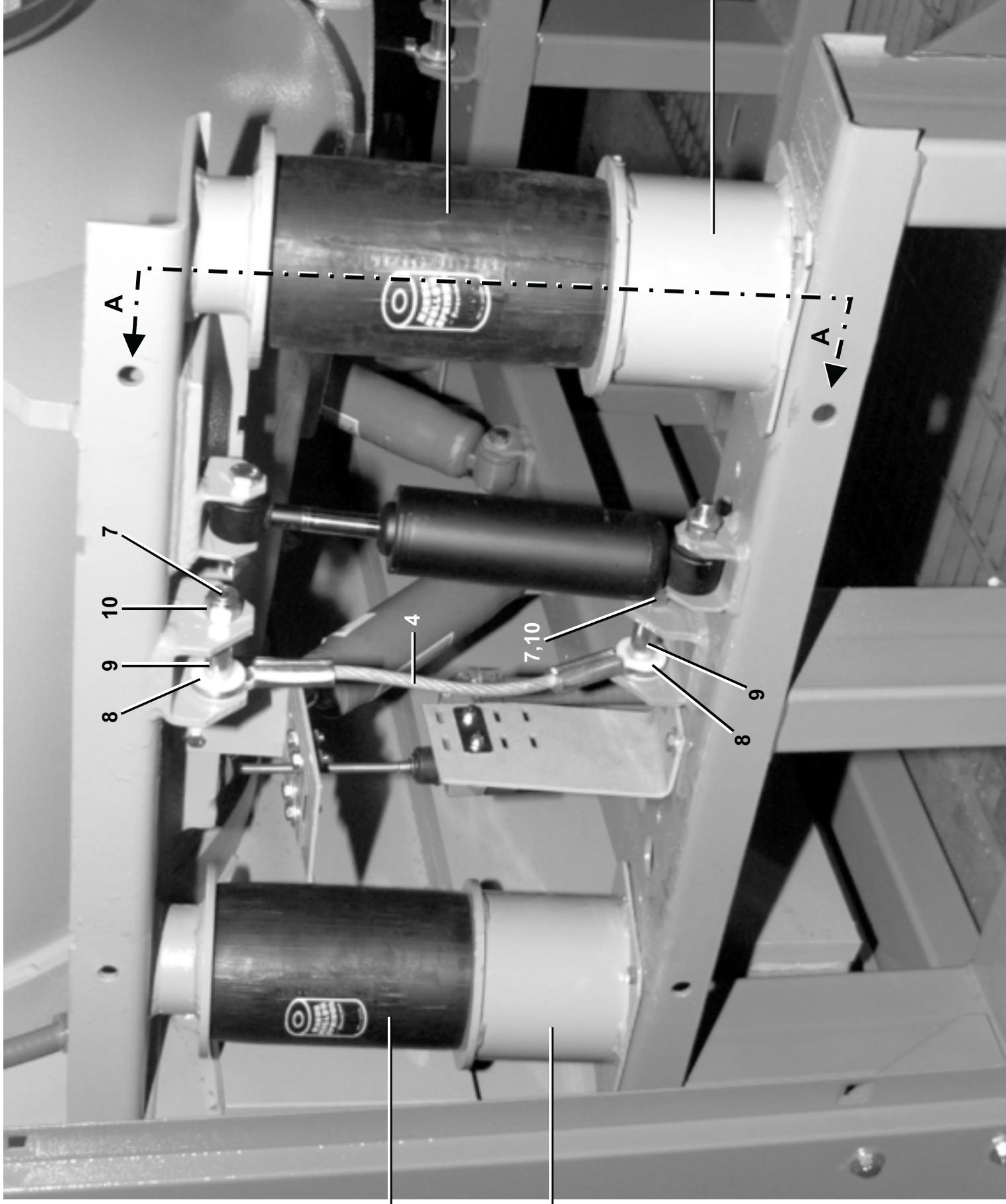
Marshmallow Spring Suspension 30022F8J,F8W

BMP010029/2002076V
(Sheet 1 of 2)



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Litho in U.S.A.



VIEW A-A
4 PLACES



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Parts List—Marshmallow Spring Suspension

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
			-----ASSEMBLIES-----	
	A	GMS30201	INST=M-SPRING SUSPENSION,3022	
			-----COMPONENTS-----	
all	1	W2 03143	WLMT=REAR M-SPRING MNT, 3022F	
all	2	W2 03142	WLMT=FRNT M-SPRING MNT, 3022F	
all	3	60B131	MM SPRG 4X2X7.5 F#W223580603	
all	4	27A969	CABLE ASSY SAVA#	
all	5	15K223A	HEXCPSCR 5/8-11UNC2X2 GR8 Z	
all	6	15U315	LOKWASHER MEDIUM 5/8 ZINCPL	
all	7	15K198A	HEXCAPSCR 1/2-13UNC2AX3 GR8 ZI	
all	8	15U348A	FLTWASH NYLON 1+1/4"ODX1/2"ID	
all	9	27B250	SPCROLL.5ID1.5L.062T STLZNC	
all	10	15G230	HXNUT 1/2-13UNC2B SAE ZINC GR2	
all	11	15K037	HEXCAPSCR 1/4-20UNC2A X5/8 GR5	
all	12	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	
all	13	15G165	HXNUT 1/4-20UNC2BSAE ZC GR2	

Shock Absorber Installation

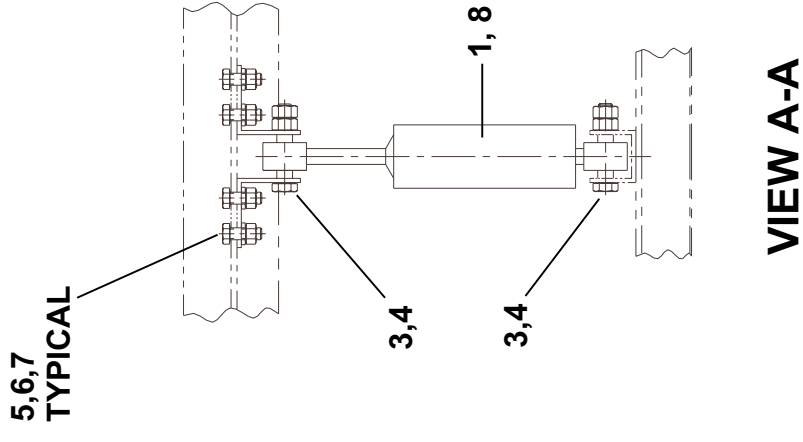
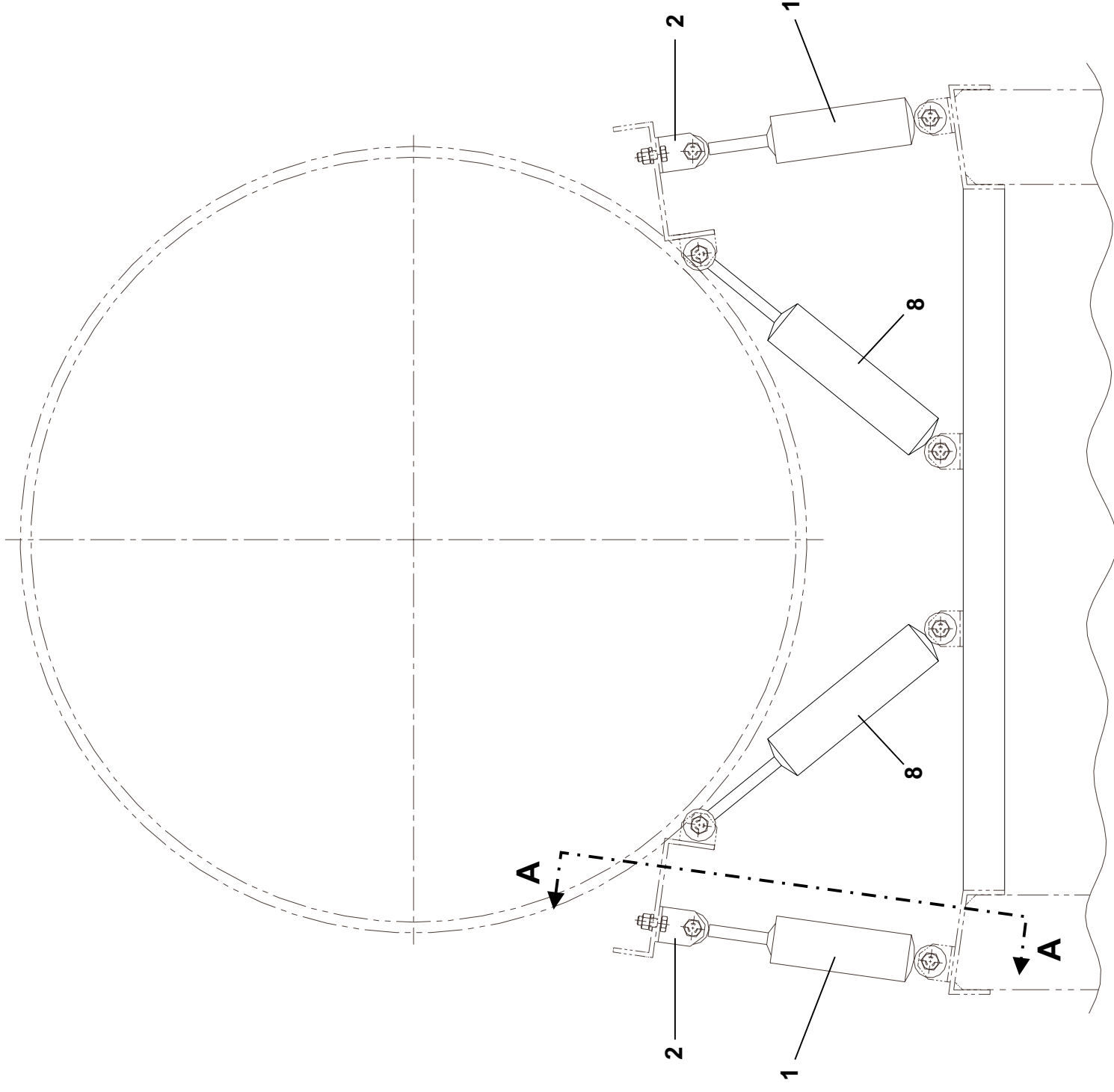
30022F8J, F8W

BMP010030/2002076V
(Sheet 1 of 2)



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Shock Absorber Installation

30022F8J, F8W

BMP010030/2002076V
(Sheet 2 of 2)



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Parts List—Shock Absorber Installation
Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
	A	GIC30202	INSTALL=SHOCK ABSORBER 3022F	
			-----ASSEMBLIES-----	
			-----COMPONENTS-----	
all	1	60BS6836	SHOCK G#65480540E ERING EA END	
all	2	02 03970	BRKT=TOP SHOCK MOUNT 3022F	
all	3	15K144C	HEXCAPSCR 7/16-14UNC X 2.5 GR	
all	4	15G222	HXFINJAMNUT 7/16-14UNC2B ZINC	
all	5	15G205	HXNUT 3/8-16UNC2B ZINC GR2	
all	6	15K095	HXCPCSCR 3/8-16UNC2AX1 GR5 ZINC	
all	7	15U255	LOCKWASHER MEDIUM 3/8 ZINCPL	
all	8	60BS6838	SHOCK ABSORBER A#078051	

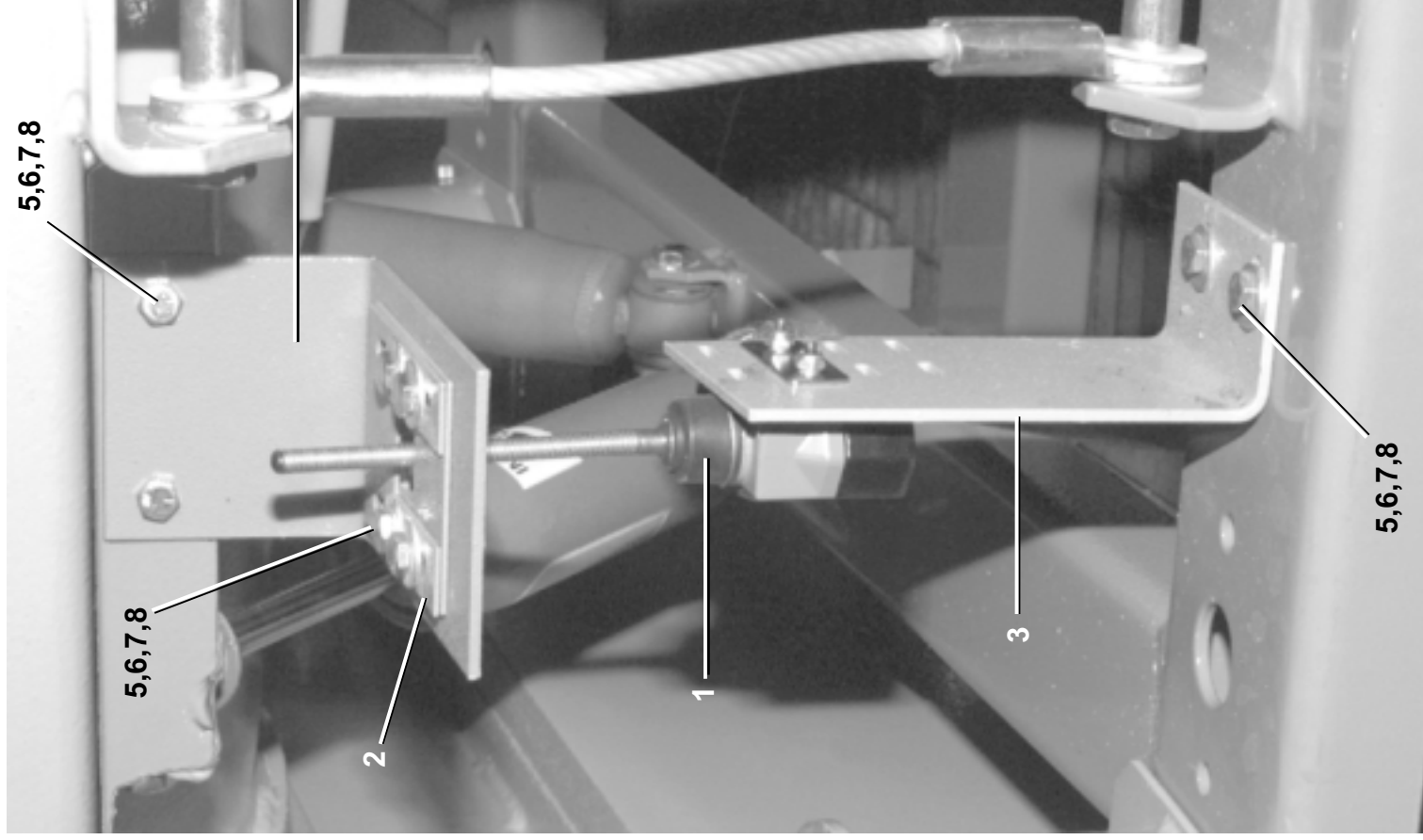
Excursion Switch 30022F8J, F8W

BMP940035/2002076V
(Sheet 1 of 1)



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Litho in U.S.A.



Parts List—Excursion Switch

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
	A	GES30201	INST=3022F EXCURSION SWITCH	
			ASSEMBLIES	
			COMPONENTS	
all	1	09R008ASTD	* 09R008A+MOUNTING HDWRE+INST	
all	2	07 21015	ACTUATOR ADJUSTING BRKT	
all	3	02 03884	PLATE=EXCURSION SWITCH MTG	
all	4	02 03885	BRKT=EXCURSION SWITCH SHELL	
all	5	15K039	HXCAPSCR 1/4-20UNC2AX3/4 GR5 Z	
all	6	15U185	FLATWASHER(USS STD) 1/4" ZNC P	
all	7	15G165	HXNIUT 1/4-20UNC2BSAE ZC GR2	
all	8	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	

Section
Drive Assemblies

5

Drive Chart

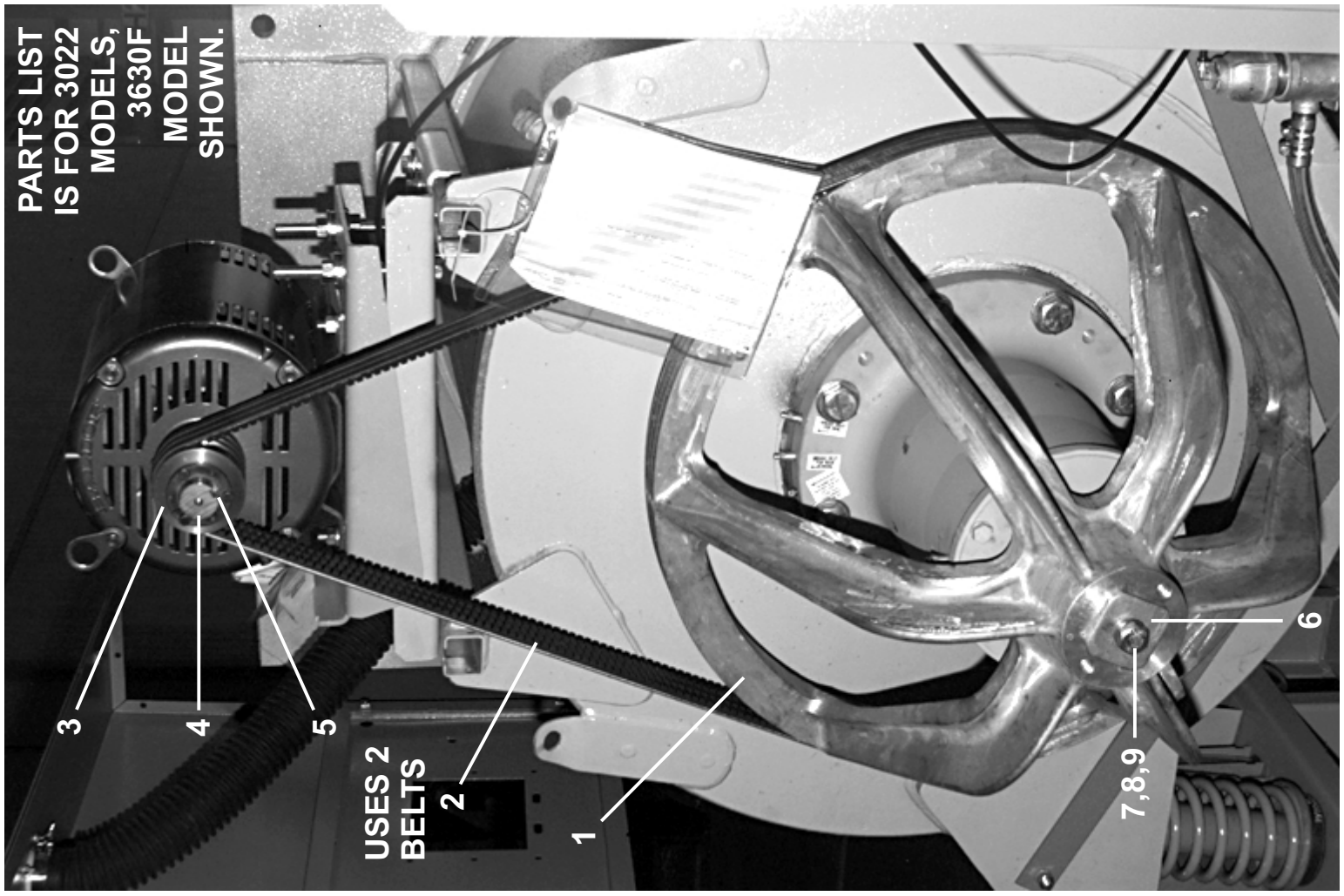
3022F8J,F8W,J8P



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BMP050026/05135V
(Sheet 1 of 1)

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PARTS LIST IS FOR 3022 MODELS, 3630F MODEL SHOWN.

Parts List—Drive Chart
Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
	A	D33 02950	93000Z DRIVE CHART=3022F8 VSP 50/60	
			ASSEMBLIES	
			COMPONENTS	
all	1	X2-03830	98496# MACH=MAIN BEARING PULLEY	
All	2	56VB081X	VBELT BX81 RAWEDGE COG	
All	3	56030B2H	VPUL 2B3.0/A2.6 2BK32H R EQUAL	
all	4	56Q1CH	1+1/8" BUSH VPUL TYP H,D,OR QT	
all	5	15E230	STRMACHKEY 3/8SQX2+1/2 TOL.+0	
all	6	02-14359A	93261B SHAFT RETNR SPACER 2+3/4" SQ	
all	7	15U321H	2001333A FLTWASH 3/4 HARD ASTM F436	
all	8	15K232A	HXCPSC 3/4-10X2 GR8 ZC	
all	9	20C008C	THDLKSEAL LCT24241 RMUBL250CC	



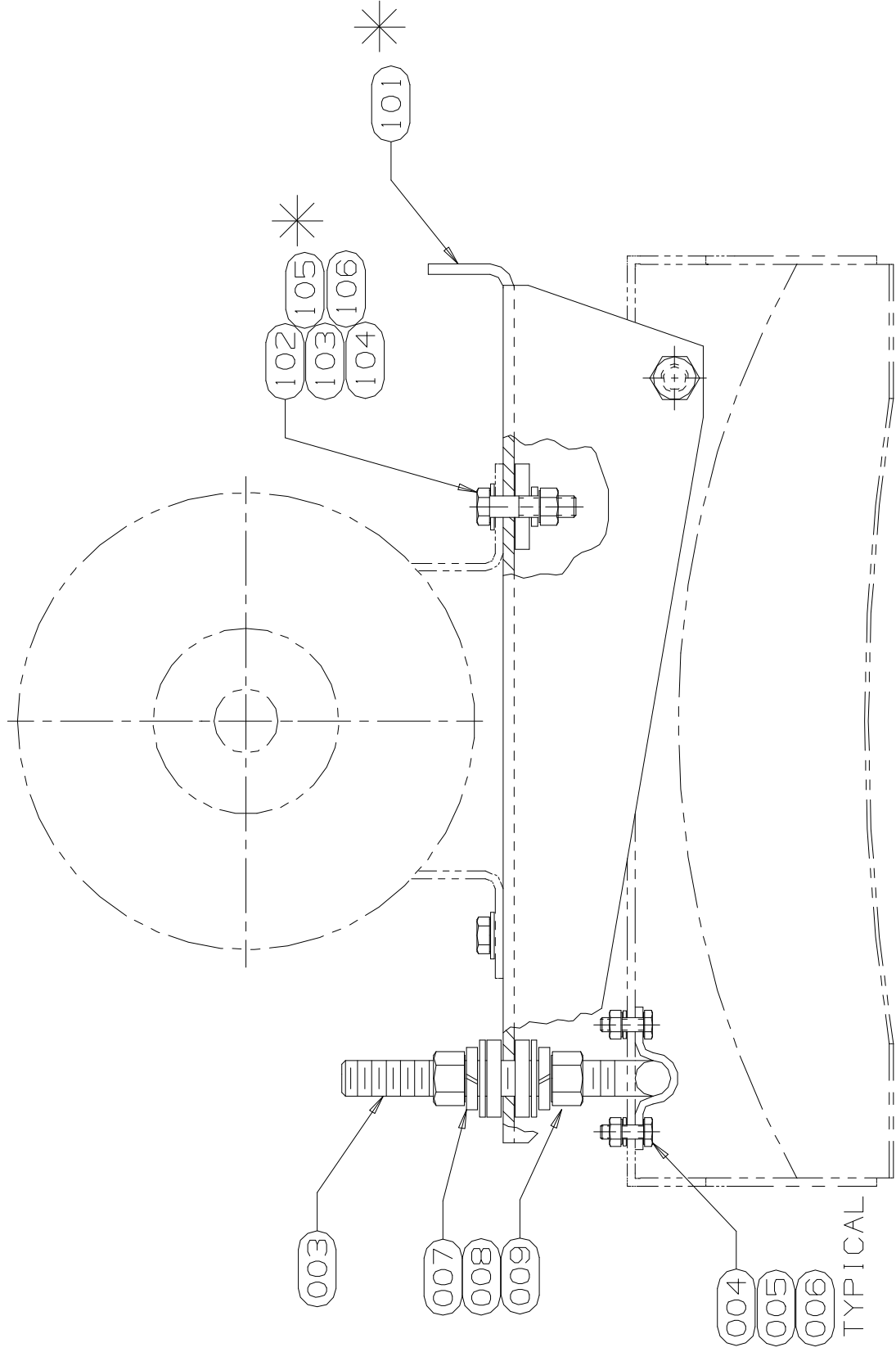
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 KENNER, LOUISIANA 70063-0400 USA

DRAWING

(See other page for parts list,
 if applicable.)

INSTALLATION DRIVE BASE ASSEMBLY
30022F8/J/F8P/F8W

BMP940034/94177V (Page 1)



* DENOTES GDB30201 (INSTALLATION) .



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PARTS LIST

(See other page for drawing.)

INSTALLATION DRIVE BASE ASSEMBLY

30022F8J/F8P/F8W

BMP940034/94177V (Page 2)

ITEM	PART NUMBER	DESCRIPTION	HOW PART IS USED IN ASSEMBLY (Only if pertinent)
00A	GDB30201	94177# INST=MOTOR MOUNT 3022F8	REFERENCE ASSEMBLY
00B	ADB30201	94177C ASSY=MOTOR MOUNT 3022F8	REFERENCE ASSEMBLY
001	02 03839	93051D BASE=MOTOR MOUNT PLATE 3022F	00B
002	02 03828	93213B STRAP=MOTOR MNT TEEBOLT	00B
003	02 03829	94142B TEEBOLT=MTR MNT ADJ 3022F8	00B
004	15K039	HXCAPSCR 1/4-20UNC2AX3/4 GR5 ZNC/CD	00B
005	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	00B
006	15G177	HXNUT 1/4-28UNF2B SAE ZINC GR2	00B
007	15G236C	HXFINJAMNUT 5/8-11UNC2B ZINC GR2	00B
008	15U315	LOKWASHER MEDIUM 5/8 ZINCPL	00B
009	17W030	01Z SPHERICAL WASHER SET 5/8 M/F	00B
010	15U312	FLAWASHER 3/4ODX33/64IDX11GA ZINCPL	00B
011	15K162	HXCAPSCR 1/2-13UNC2AX1.5 GR5 PLATED	00B
012	15G230	HXNUT 1/2-13UNC2B SAE ZINC GR2	00B
013	15U300	LOKWASHER REGULAR 1/2 ZINC PLT	00B
014	15K110	HEXCAPSCR 3/8-16UNC2AX1.5 GR5-PLTD	00B
015	15U255	LOCKWASHER MEDIUM 3/8 ZINCPL	00B
017	15G205	HXNUT 3/8-16UNC2B ZINC GR2	00B
018	15U240	FLATWASHER(USS STD) 3/8" ZNC PLT	00B
101	ADB30201	94177C ASSY=MOTOR MOUNT 3022F8	00A
102	15K110	HEXCAPSCR 3/8-16UNC2AX1.5 GR5-PLTD	00A
103	15U240	FLATWASHER(USS STD) 3/8" ZNC PLT	00A
104	15G205	HXNUT 3/8-16UNC2B ZINC GR2	00A
105	15U255	LOCKWASHER MEDIUM 3/8 ZINCPL	00A
106	15U241SZ	FLATWASHER 1.5 ODX.406 IDX.25TH SZN ***** END OF PARTS LIST *****	00A

How to Read Parts List

Reference Item Numbers—Items 00A, 00B, 00C, etc., or 00X, 00Y, 00Z, etc., appearing at the top of some parts lists, are for reference and provide:

1. The part number for the entire assembly depicted in the drawing or a major sub-assembly thereof, and/or
 2. The range of machine models this drawing applies to.
- If more than one reference item appears, this usually means this drawing applies to more than one assembly (and thus to more than one range of machines).

Component Item Numbers—For any item on the drawing (e.g., item ①), there may be several corresponding items on the parts list (e.g., 001A, 001B, 001C, etc.) which are similar components on different assemblies. "How Part Is Used In Assembly" identifies which components apply to your machine, by listing either the machine model, or the reference item number from the top of the parts list (e.g., 00A, 00B, 00C, etc.), or a particular characteristic (e.g., bronze or stainless steel), or special ordering information, such as a repair kit number.

Main Bearing Installation

3022F8J/F8P/F8W

BMP940032/98053V
(Sheet 1 of 2)



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BMP940032/98053V (1 of 2)

Litho in U.S.A.

NOTES:

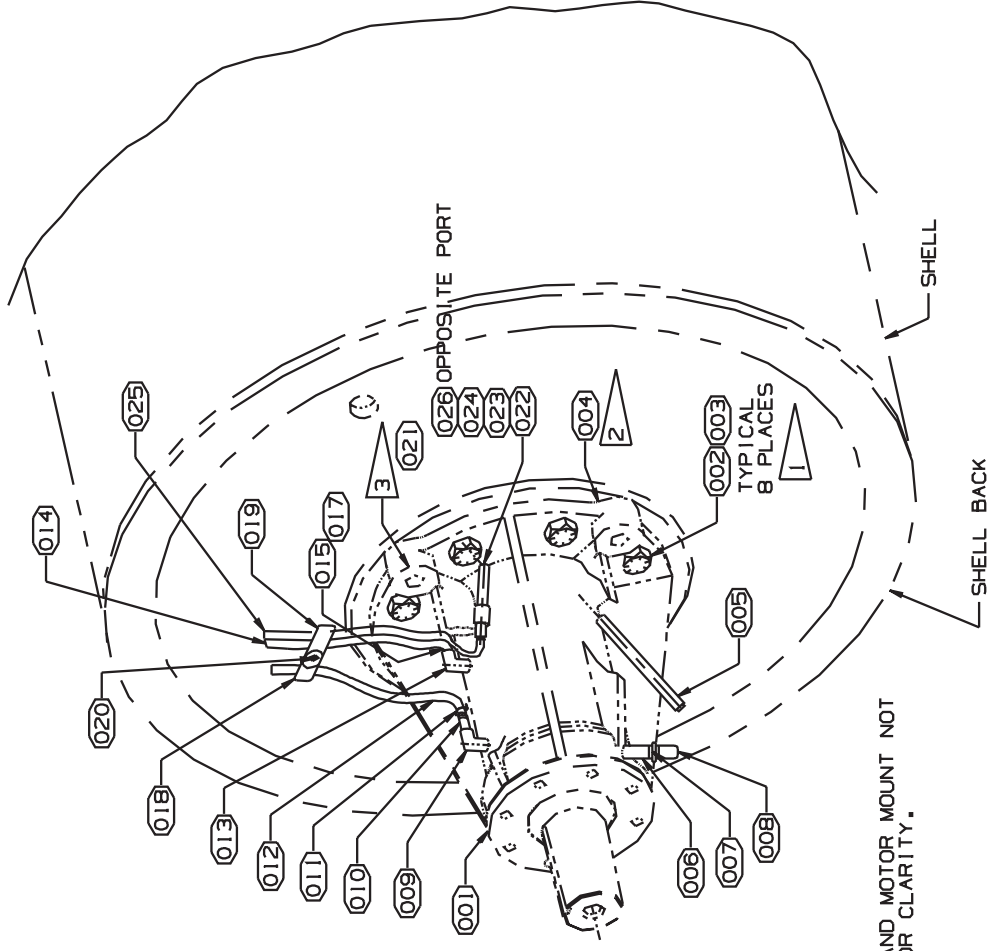
1 TORQUE ITEM 002 (BOLTS)
TO 320 FT. LBS..

2 APPLY ITEM 004 (SILICONE)
TO FACE OF BEARING HOUSING
PRIOR TO INSTALLATION.

3 USE ITEM 021 AS PUSH-OFF
BOLTS, 3 PLACES, FOR BACKING
OUT BEARING ASSEMBLY.



Oil Fill Tube



NOTE : PULLEY AND MOTOR MOUNT NOT
SHOWN FOR CLARITY.

14
12
25
18





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BMP940032/98053V (2 of 2)

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Parts List—Main Bearing Installation
Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
	A	GBM30201	97461C INSTALL=MAIN BRG ASSY 3022F8	
	1	ABM33002	98043D*MAIN BEARING ASSY=3022F8P	
	2	15K231	04Z HXCPCSC-3/4-16X1+1/2 GR8 ZINC	
	3	15U340	LOCKWASH MEDIUM 3/4 ZINCPL	
	4	20C040B	SILSEAL RTV CLR10.2 OZ #59575	
	5	5N0E05AG42	NPT NIP 1/4X5 TBE GALSTL SK40	
	6	5N0E01KBE2	NPT NIP 1/4X1.5 TBE BRASS STD.	
	7	5SCC0EBE	NPT COUP 1/4 BRASS 125# #103	
	8	5SP0EFFSSM	NPT PLUG 1/4 SQSLDMAGNET BLKST	
	9	5SL0EBEC	NPT ELB 90DEG STRT 1/4 BRASS125	
	10	51E507N	HOSESTEM NYLON 1/4MPX1/2 HOSEID	
	11	27A043A	HOSECLAMP.562"DIA.SPRINGTY #Hc9	
	12	60E005P	04ZPVC TUBING 1/2" ID X 5/8" OD	
	13	53A008B	BODYMALECON .25X.25 COMP #B68A-4B	
	14	53A059AB	1/4" COMP. NUT PARKER #4BZ-B	
	15	53A059	SLEEVE 1/4" BRASS PH#60C-4	
	17	60E004NTN	01ZTUBING NYL (NAT) 1/4" ODX.127ID	
	18	12P014KK	01Z CABLE CLMP NONMTL 1/2 IDX1/2 WIDE	
	19	12P014HH	CABLE CLMP NONMTL 7/16 ID	
	20	15P010	12Z PHILPAN TRDCUTSCTRYP10-24X1/2SS	
	21	20C005	021398 ADH.SEAL #271-31-50CC	
	22	5N0C01KG42	NPT NIP 1/8X1.5 TBE GALSTL S40	
	23	5SCC0CBE	NPT COUP 1/8 BRASS 125# 103A-A	
	24	53A005B	BODYMALCON1/4X1/8 COMP #B68A-4A	
	25	54M021	GRSFIT 1/8PIPE X 1/4 STR 1607-B	
	26	54M030	RELIEFFIT 1/8 ST ALEMITE 317400	

Main Bearing

30022F8P, H7x, H8x, X8J

BMP980022/2003066V
(Sheet 1 of 2)

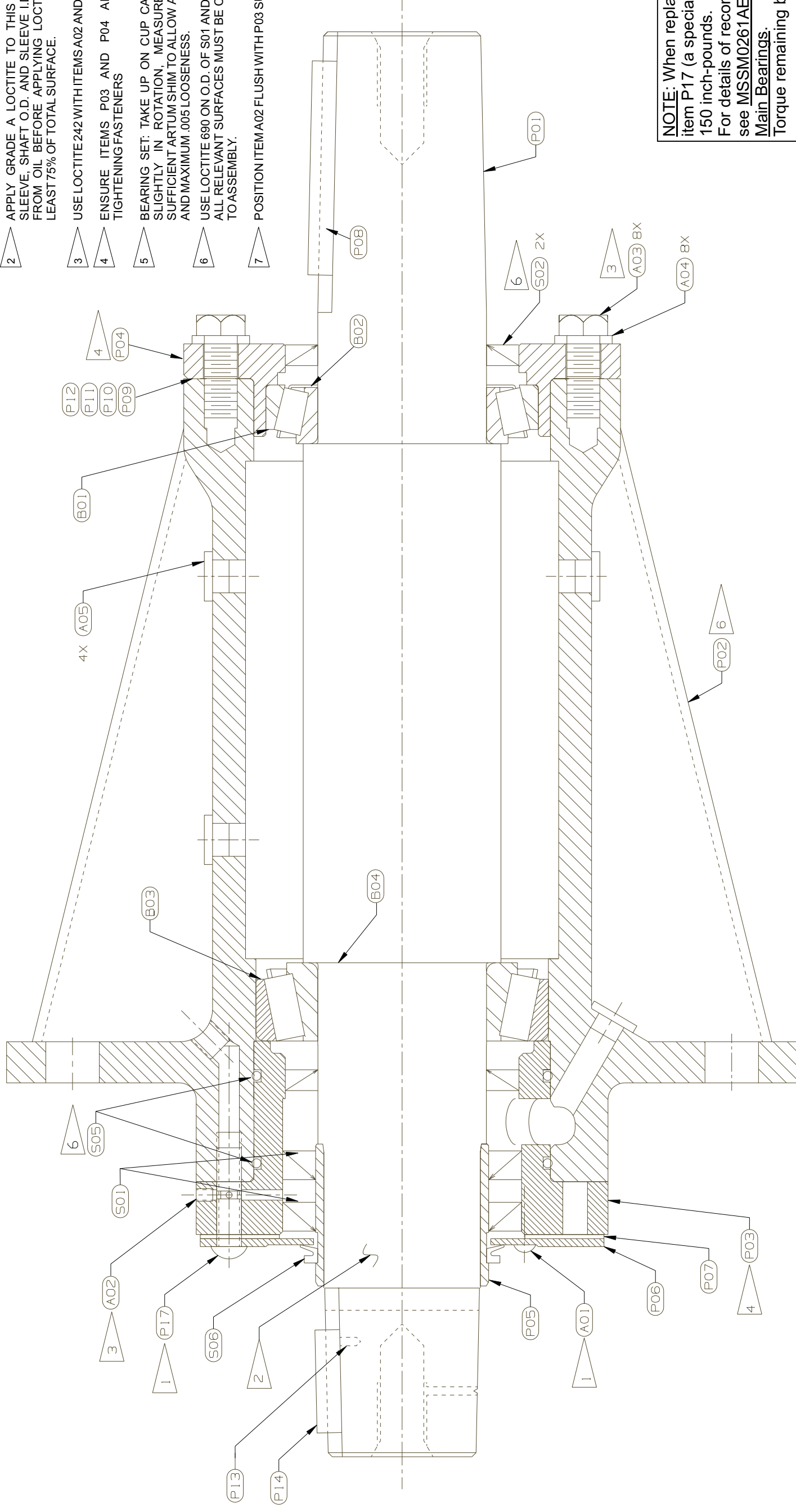


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NOTES:

- 1 USE LOCTITE ANTI-SEIZING COMPOUND.
- 2 APPLY GRADE A LOCTITE TO THIS SURFACE BEFORE APPLYING SLEEVE, SHAFT O.D. AND SLEEVE I.D. MUST BE CLEAN AND FREE FROM OIL BEFORE APPLYING LOCTITE. INSURE BONDING ON AT LEAST 75% OF TOTAL SURFACE.
- 3 USE LOCTITE 242 WITH ITEMS A02 AND A03
- 4 ENSURE ITEMS P03 AND P04 ARE FULLY SEATED BEFORE TIGHTENING FASTENERS
- 5 BEARING SET: TAKE UP ON CUP CARRIER UNTIL BEARINGS BIND SLIGHTLY IN ROTATION, MEASURE SHIM GAP AND PROVIDE SUFFICIENT ARTUM SHIM TO ALLOW A MINIMUM OF .004 LOOSENESS AND MAXIMUM .005 LOOSENESS.
- 6 USE LOCTITE 690 ON O.D. OF S01 AND S02. ALLOW 24 HRS FOR CURE. ALL RELEVANT SURFACES MUST BE CLEAN & FREE FROM OIL PRIOR TO ASSEMBLY.
- 7 POSITION ITEM A02 FLUSH WITH P03 SURFACE.



NOTE: When replacing seal holder, torque item P17 (a specially modified bolt) to 150 inch-pounds.
For details of recommended procedure, see MSSM0261AE - Replacing 30Fxx Main Bearings.
Torque remaining bolts to standard torque.

Used In		Item	Part Number	Description	Comments
<p>Parts List—Main Bearing Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.</p>					
				ASSEMBLIES	
	00A	ABM33002	98043D*MAIN BEARING ASSY=3022F8P		3022F8J
	00B	ABM30211	98353#MAIN BEARING ASSY=3022H7		3022X8J, 3022H7J
-----COMPONENTS-----					
ALL	A01	15K071B	01Z BUTSKPCSCR5/16-18X1.5NYLPSS		
ALL	A02	15Q068A	SOKSETSCR CUP10 - 32 X 1/4 SS		
ALL	A03	15K154A	HEXCPSR 1/2-13 UNC2 X1.5 GR8 ZINC		
ALL	A04	15U317A	LOCK WASHER 1/2 ZINC PLATED GR 8		
ALL	A05	27A253	PLUG FOR 1/2 BOLT HOLE CAPLUG #4		
ALL	B01	54A915	CONE TIMKN#JLM710949C 1/BX		
ALL	B02	54A916	CUP TIMKN#JLM710910 1/BX + PT#		
ALL	B03	54A593	CUP TIMKEN #39521 BRG.		
ALL	B04	54A594	CONE TIMKEN #39586 BRG.		
A	P01	X2-03833	97333DMACH=SHAFT-3022F BRG ASSY		30022F8X ONLY
B	P01	X2-03232	98262D MACH=SHAFT, 3022H7 BRG		30022H7X ONLY
A	P02	X2-03840	97461#MACH=MAIN BEARING HOUSING		30022F8X ONLY
B	P02	X2-03840H	98353#MACH=MAIN BRNG HOUSING, 3022H		30022H7X ONLY
ALL	P03	X2-03831	97461#MACH=FRONT SEAL HOLDING 3022F		
ALL	P04	X2-03832	94043#MACH=REAR SEAL HOLDER 3022F		
ALL	P05	02-03825	95103B SLEEVE=BEARING SHAFT 3022F		
ALL	P06	02-03826	97461 CCOVER=V-RING SEAL 3022F		
ALL	P07	02-03823A	97461 BGASKET=3022F V-RING SEAL		
A	P08	15E233	SQMACHKEY 3/8X3/8X3 1/4"		30022F8X ONLY
B	P08	15E235	SQMACHKEY 1/2X1/2X2"		30022H7X ONLY
ALL	P09	02-03818J	96522B SHIM=.003 CRS GREEN		
ALL	P10	02-03818K	96522# SHIM=.005 CRS BLUE		
ALL	P11	02-03818L	96522#SHIM=.0075 CRS BLACK		
ALL	P12	02-03818M	96522#SHIM=.010 CRS RED		
ALL	P13	15H089S	SPRINGPIN 1/8" DIA X 5/8" LONG S/S		
ALL	P14	02-02294A	87477B SHAFT KEY 3/8 X 3/8		
ALL	P15	02-03818N	96522# SHIM-.020 CRS. WHITE		
ALL	P16	02-03818P	96522#SHIM-.050 CRS WHITE		

Parts List, cont.—Main Bearing

Used In	Item	Part Number	Description	Comments
ALL	P17	15K106FA	97461BGREASE FITTING	
ALL	S01	24S053	03ZSEAL 2.625X3.625X.437#10050LUP	
ALL	S02	24S052A	06Z SEAL 2.559X3.55X.315 CR # 25430	
ALL	S05	60C151A	ORING 4+1/4" IDX1/8CS BJUNA-N 70 #244	
ALL	S06	24S105FN	01ZSEAL 2.48-2.68X2.28X.20 V65A	

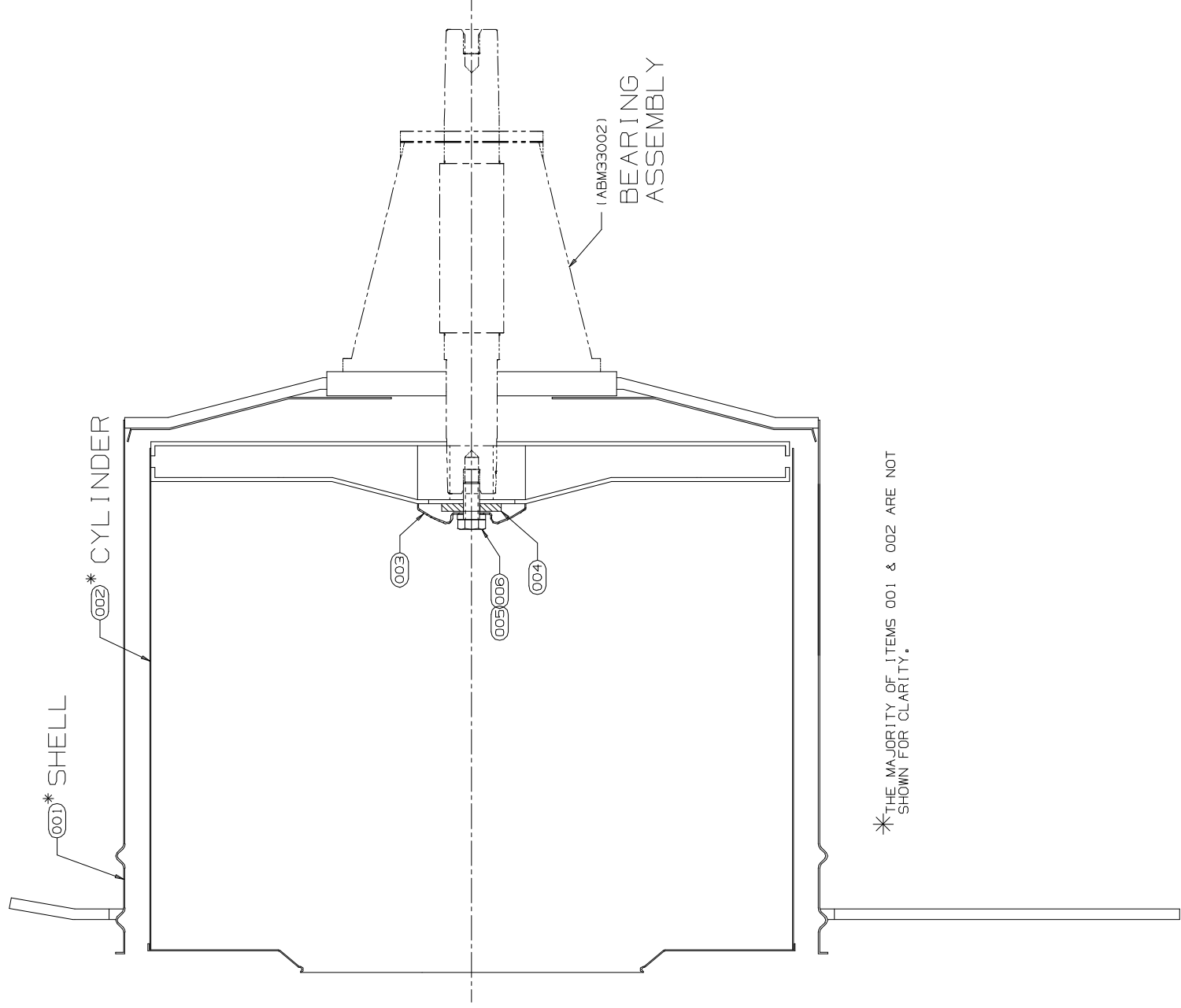


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DRAWING AND PARTS LIST
 (See other page for more,
 if applicable.)

CYLINDER INSTALLATION
30022F8/J/F8P/F8W

BMP940033/94162V (Page 1)



ITEM	PART NUMBER	DESCRIPTION	HOW PART IS USED IN ASSEMBLY (Only if pertinent)
00A	GSC30201	94176D INSTALL=3022F8 CYLINDER	REFERENCE ASSEMBLY
001	W2 03801A	94173E*WLMT=3022F8 SHELL ASSEMBLY	
002	ACA3022F8	93206D*ASSY=CYLINDER 3022 F8J/G/P	
003	02 11196	92567B COVER=SHAFT RETAINER=304S/S	
004	02 14359A	93261B SHAFT RETNR SPACER 2+3/4" SQ	
005	15B200	HEXCAPSCR 3/4-10X1+3/4 SS18-8	
006	15U350	LOCKWASHER 3/4 MED SS18-8 ***** END OF PARTS LIST *****	

How to Read Parts List

Reference Item Numbers—Items 00A, 00B, 00C, etc., or 00X, 00Y, 00Z, etc., appearing at the top of some parts lists, are for reference and provide:

1. The part number for the entire assembly depicted in the drawing or a major sub-assembly thereof, and/or
2. The range of machine models this drawing applies to.

If more than one reference item appears, this usually means this drawing applies to more than one assembly (and thus to more than one range of machines).

Component Item Numbers—For any item on the drawing (e.g., item ①), there may be several corresponding items on the parts list (e.g., 001A, 001B, 001C, etc.) which are similar components on different assemblies. "How Part Is Used In Assembly" identifies which components apply to your machine, by listing either the machine model, or the reference item number from the top of the parts list (e.g., 00A, 00B, 00C, etc.), or a particular characteristic (e.g., bronze or stainless steel), or special ordering information, such as a repair kit number.

Section

6

Shell and Door Assemblies



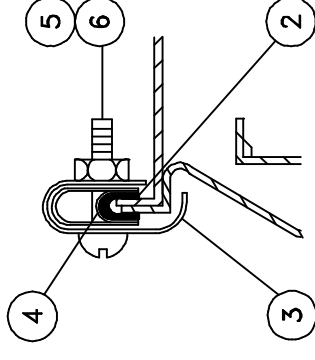
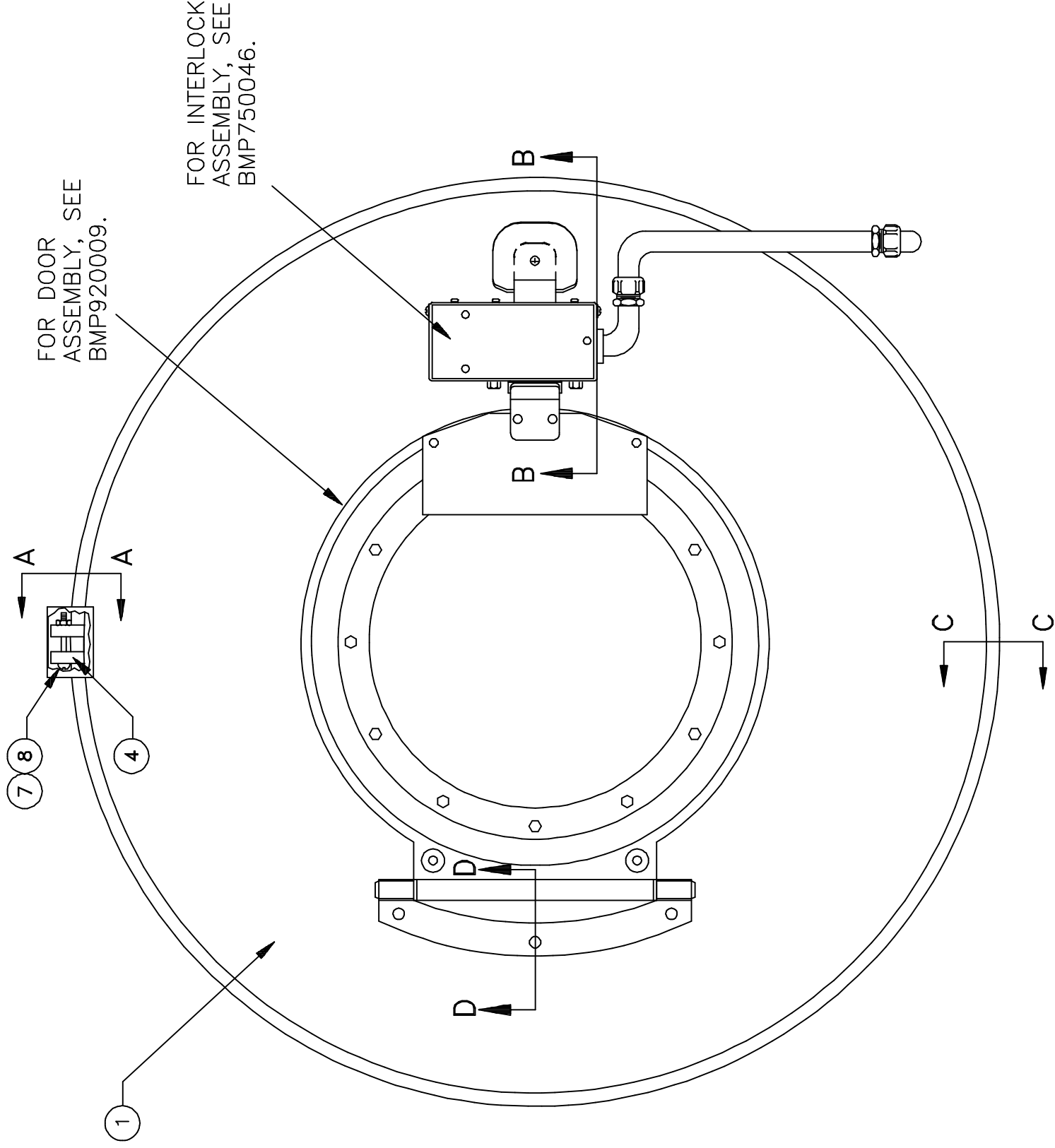
DRAWING

(See other page for parts list, if applicable.)

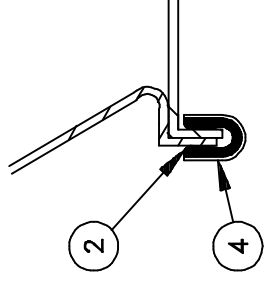
INSTALLATION SHELLFRONT

30022F8/J/F8P/F8W

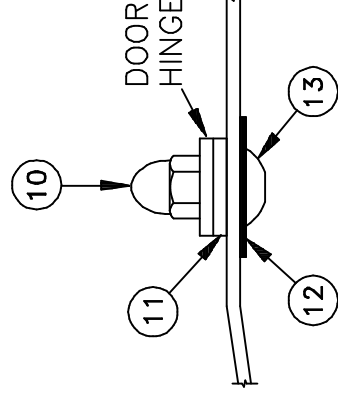
BMP940046/94223V (Page 1)



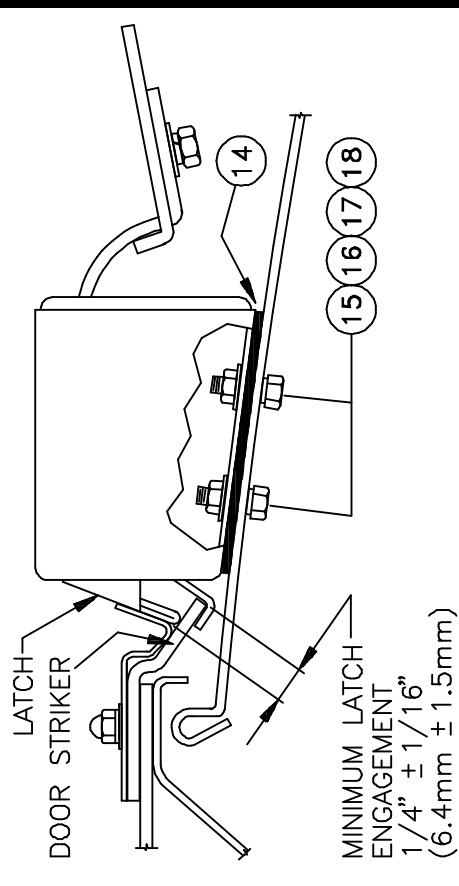
VIEW "A-A"



VIEW "C-C"



VIEW "D-D"



VIEW "B-B"

ADJUSTMENTS:

1. ADJUST DOOR STRIKER SO THAT IT TOUCHES THE LATCH SQUARELY AND EVENLY.
2. ADJUST THE LATCH SO THAT THE MINIMUM ENGAGEMENT WITH THE DOOR FULLY CLOSED EQUALS 1/4" ± 1/16" (6.4mm ± 1.5mm).



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PARTS LIST

(See other page for drawing.)

INSTALLATION SHELLFRONT

30022F8J/F8P/F8W

BMP940046/94223V (Page 2)

ITEM	PART NUMBER	DESCRIPTION	HOW PART IS USED IN ASSEMBLY (Only if pertinent)
00A	GSF30201	94037C INSTALL=3022F8 SHELLFRONT	REFERENCE ASSEMBLY
001	A33 10200D	93207# ASSY=SHELL FRONT 3022F8	
002	02 02087C	EXTRUS*ION-SHELL=30" MACHINES (8.5FT	
003	02 02181	85332B GUARD=SHELL MOUNT RING CLIP	
004	Y2 02059	70256A*SHELL CLAMP RING=30" MACHINE	
005	15N146	RDMACHSCR 10-24UNC2X1 SS18-8	
006	15G130	HEXMACHSCRNUT 10-24UNC2 SS18-8	
007	15K046S	HEXCAPSCR 1/4-20UNC2A X 2.25 SS18-8	
008	15G170	HEXNUT 1/4-20UNC2 SS18-8	
010	15G200C	01Z HXCPNUT HI 3/8-16 BRASS NIK PLT	
011	02 02819B	84383C SPACER HINGE S/S	
012	02 02293	93402A DOOR HANDLE NUT GASKET	
013	15K084	85196B TRUSS HXSOK 3/8-16 X 23/32SS	
014	02 03669	93123A GASKET=INTRLK HOUSING	
015	15N174	HXCAPSCR 1/4-20UNC2X5/8SS18-8	
016	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	
017	24G020N	ROLLED WASHER .252"ID NYLTITE #25W	
018	15G168	SQNUIT 1/4-20UNC2 SS18-8	
		***** END OF PARTS LIST *****	

How to Read Parts List

Reference Item Numbers—Items 00A, 00B, 00C, etc., or 00X, 00Y, 00Z, etc., appearing at the top of some parts lists, are for reference and provide:

1. The part number for the entire assembly depicted in the drawing or a major sub-assembly thereof, and/or
 2. The range of machine models this drawing applies to.
- If more than one reference item appears, this usually means this drawing applies to more than one assembly (and thus to more than one range of machines).

Component Item Numbers—For any item on the drawing (e.g., item ①), there may be several corresponding items on the parts list (e.g., 001A, 001B, 001C, etc.) which are similar components on different assemblies. "How Part Is Used In Assembly" identifies which components apply to your machine, by listing either the machine model, or the reference item number from the top of the parts list (e.g., 00A, 00B, 00C, etc.), or a particular characteristic (e.g., bronze or stainless steel), or special ordering information, such as a repair kit number.

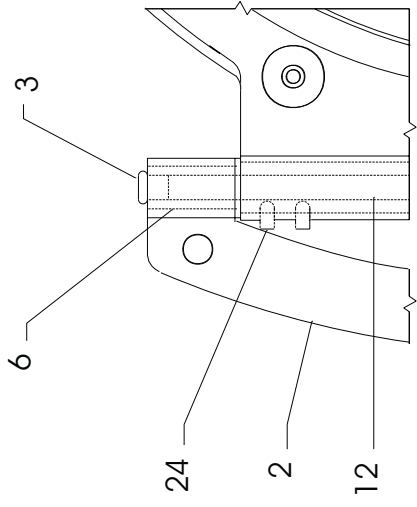
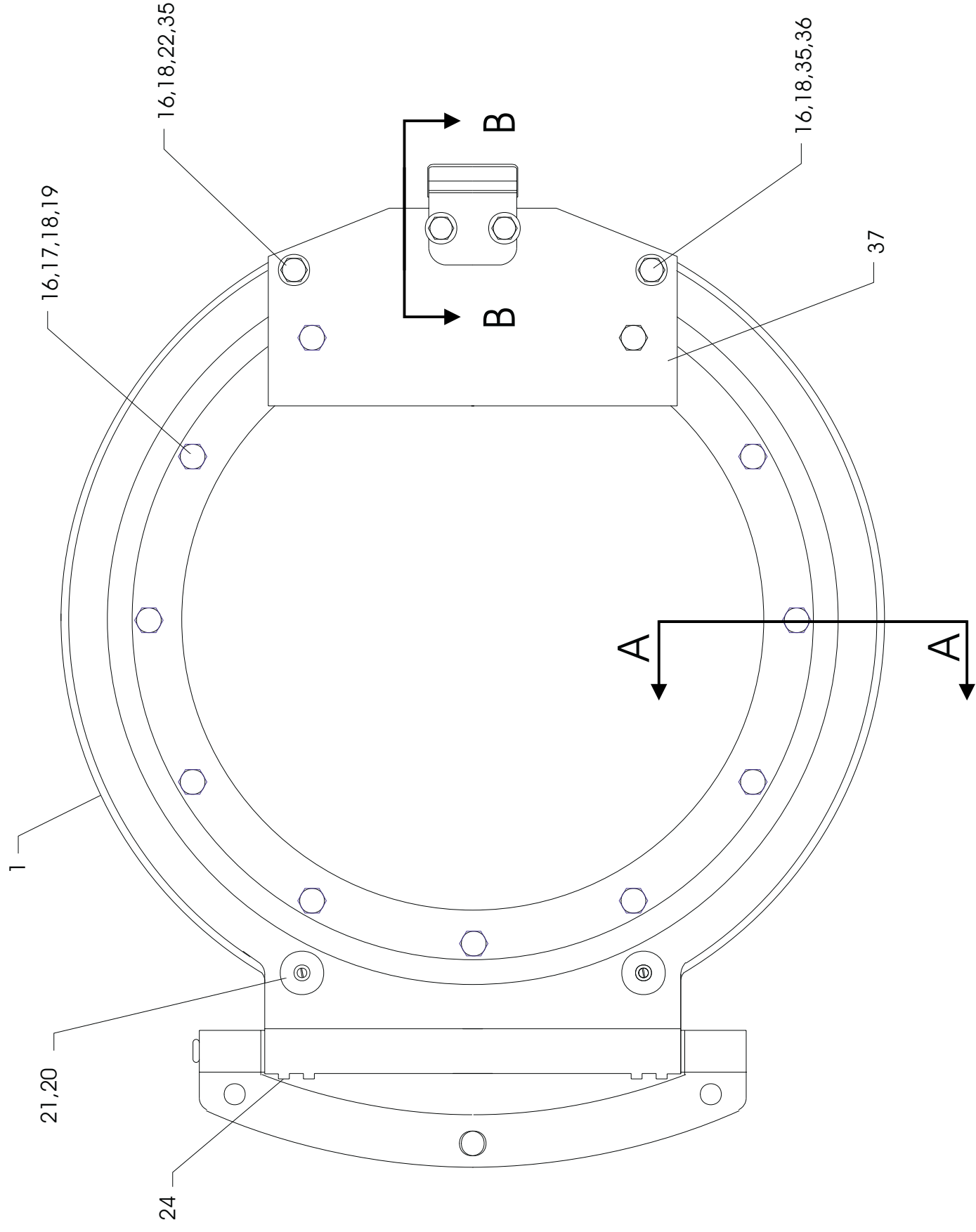
**Door Assembly
30015 & 30022 Rigid Mount**

BMP920009/2001036V
(Sheet 1 of 2)

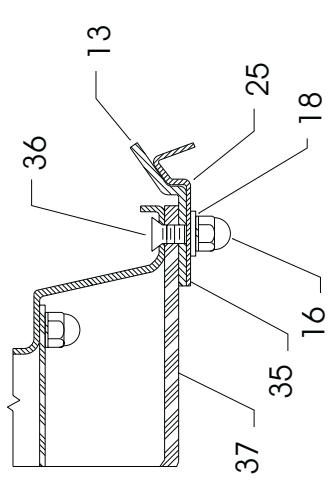


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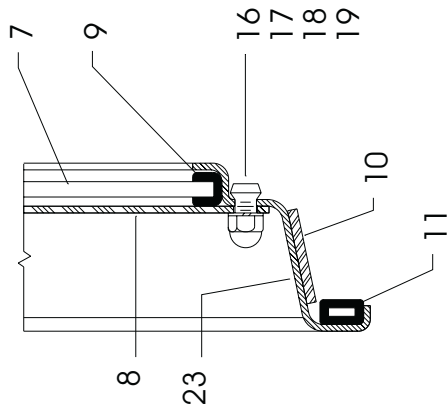
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HINGE DETAIL



VIEW B-B



VIEW A-A



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Parts List—Door Assembly

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
-----ASSEMBLIES-----				
	A	A33 07100C	*DRASSY(INDNT)LK,LOGO N4,5,6P	30015V7J,T5J,T5E 3022V6J,T5J,T5E 3015V7G/V7J;3022V7G/V7J 3015M4G/J/P,M6J,D4A 3022M5G/J 3022S4J,S4G,S5J 3015K4A,S4J,S5G,S5J
	B	A33 07100H	DOOR ASY 3015/3020M4A	30015M4A+30020M4A ONLY
	C	A33 06900F	ASSY=DOOR W/MLOGO DKRED 3022	3022F8J/F8P/F8W
-----COMPONENTS-----				
all	1	X2 02814C	DOOR=SHELL W/1LOK-3020	
all	2	02 02819	HINGE=STAMPED DOOR 25#	
all	3	12P1AGHP1	HOLEPLUG 3/8"BLACK LPE	
all	6	02 02817	FLANGE BRG=DOOR HINGE-NYLON	
A	7	02 09215D	DR GLASS=N4,5,6P W/MIL LOGO	
B	7	02 09215A	DORGLAS=DRAW W/MILNOR LOGO	
C	7	02 09215E	DOOR GLASS W/MIL LOGO (RED)	
all	8	02 09021	RING=DOOR GLASS PRESSURE	
all	9	02 02366	GASKET DOORGLAS GTR52-5220-3	
all	10	02 10545	EXTR BAND-STAMPED SS CYLDOOR	
all	11	02 10342A	GASKET=15" DOOR	
all	12	02 02764	HINGEPIN=SHELLDOOR L=10+5/8"	
all	13	03 01420C	DOOR STRIKER=ILOC	
all	16	15G140	HXCPNT 1/4-20 #C250=20 NKLPLT	
all	17	15K031	BUTSOKCAPSCR 1/4-20X1/2 SS18-8	
all	18	15U181	LOCKWASHER MEDIUM 1/4 SS18-8	
all	19	24G020N	ROLLED WASH.252ID NYLTITE 25W	
all	20	60C080	RECESS BUMPER RUBBERLAVELLE #7	
all	21	15P103	TRDCUT-F RDHDSLOT 8-32UNCX1/2	
all	22	15N173A	FLTMACSCR 1/4-20 UNCX5/8 UCUTS	
all	23	20C044	ADHESIVE 3M EC-1300 IN PINT CO	
all	24	15Q077	SOKSETSCR 1/4-20X1/4 ZINC ALLE	
all	25	03 01423C	LATCH GUARD ILOC 3015-20	
all	35	15U188	FLTWASH 1/4 STD COMM SS18-8	
all	36	15N191	FLATMACHSCR 1/4-20X7/8 SS18-8	
all	37	03 01420D	DOOR HANDLE=ILOC 3015-20	

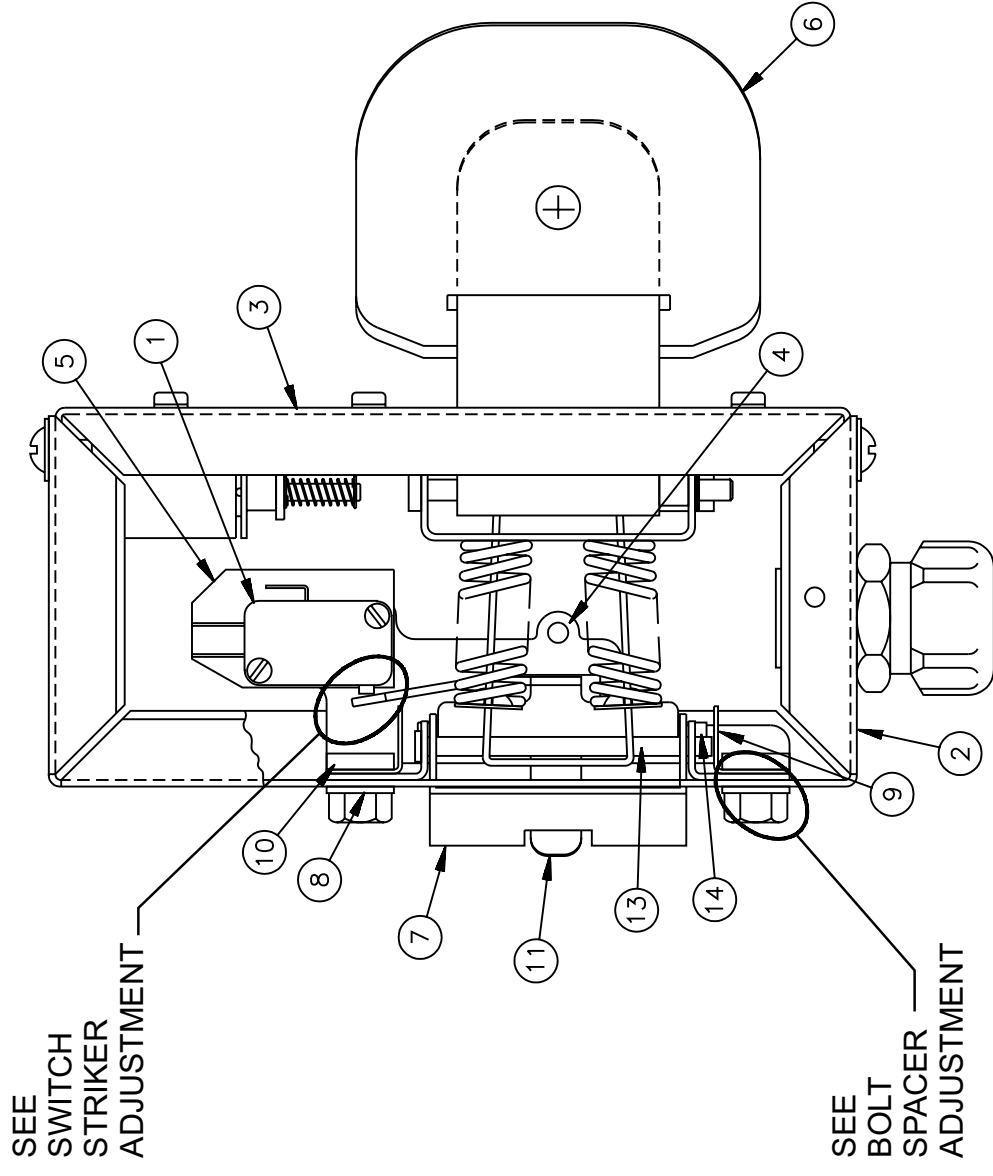
Interlock Assembly

BMP750046/2001036V
(Sheet 1 of 2)



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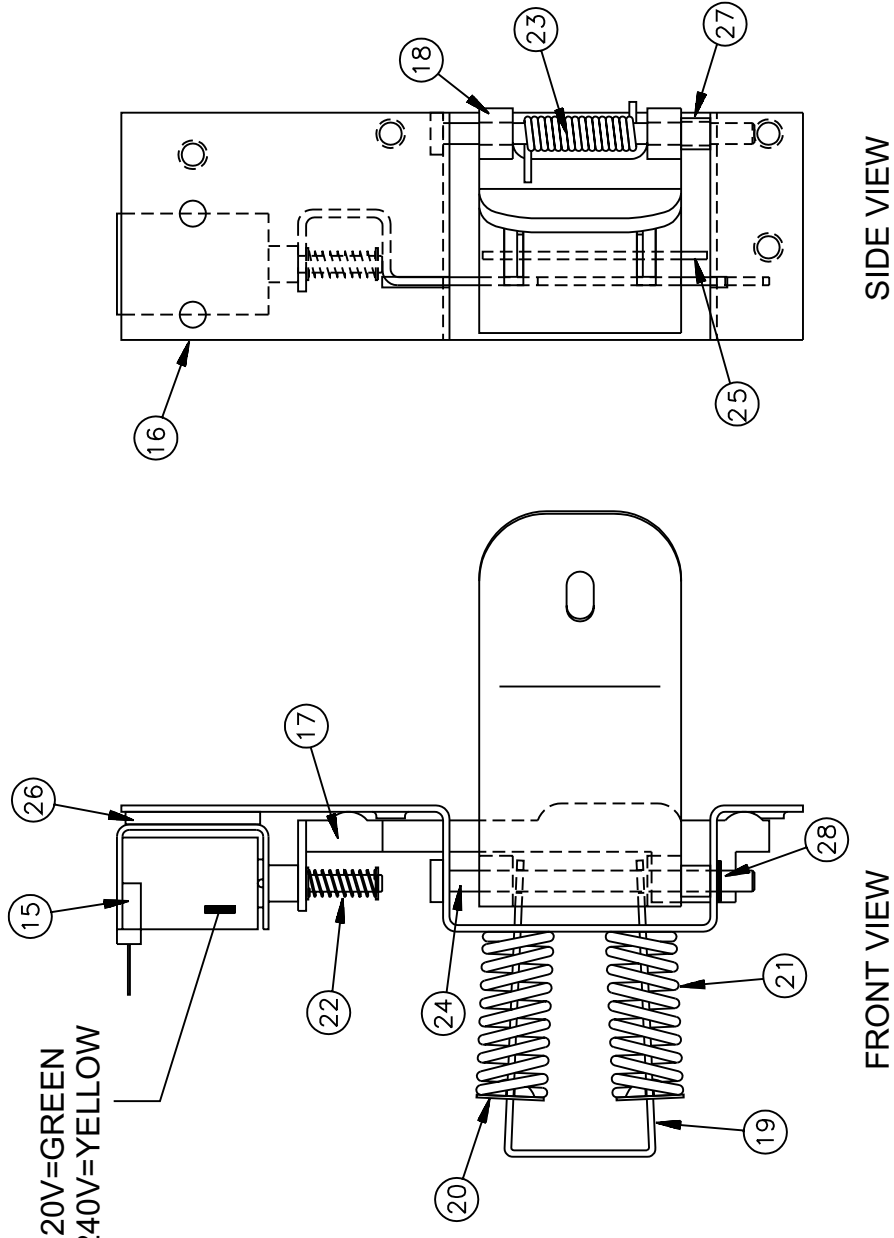
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SEE SWITCH STRIKER ADJUSTMENT

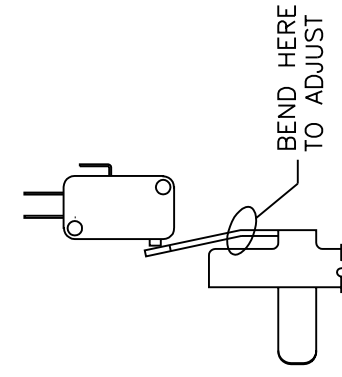
SEE BOLT SPACER ADJUSTMENT

110V-120V=GREEN
220V-240V=YELLOW



ASSEMBLIES 00AA,00BB,00CC,00DD

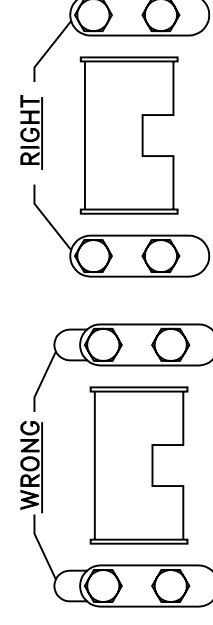
SWITCH STRIKER ADJUSTMENT



Adjust the switch striker arm by bending as shown so that :

- 1) The switch is activated when the door is closed
- 2) The switch does not actuate when the unlatching lever is fully depressed with the door open
- 3) The arm does not over travel and hit the switch housing when the door is closed and the switch is actuated.

BOLT SPACER ADJUSTMENT



Bolt Spacer Adjustment

- 1) On a new machine the slots on the front housing should not show a gap past the bolt spacers.
- 2) The spacers should be installed with the long side toward the shellfront



Used In	Item	Part Number	Description	Comments
			ASSEMBLIES	
A	EDL00171		88093# INTRLKHSG ASSY=N/UNLOCK 240V	30015V7J,T5J,T5E 3015/20/22 Mxx,Cxx,Vxx USED ON 00A (CONTAINS ITEMS 15-28)
AA	EDL00171A		93207@ RR PIVOT PL ASSY=N/UNLOCK240V	
B	EDL00221		96411 INTRLKHSG ASSY=N/LOCK 220V	3022F8J/PW 3630F8J/PW/S
BB	EDL00271A		93207#*RR PIVOT PL ASSY=N/LOCK 220V	USED ON 00B (CONTAINS ITEMS 15-28)
C	EDL00337		88093#*INTRLKHSG ASSY=N/LOCK 120V	36&42QXX,BWP 3015D4A 36021V6J, 36026V5J 36026V7J, 42026V6J
CC	EDL00337A		93207# RR PIVOT PL ASSY=N/LOCK 120V	USED ON 00C (CONTAINS ITEMS 15-28)
D	EDL00371		94000Z INTERLKHSG=N/LOCK+SWITCH240V	3022V6J,T5J 3022S4J,S4G,S5J 3015K4A,S4J,S5G,S5J
DD	EDL00271A		93207#*RR PIVOT PL ASSY=N/LOCK 220V	USED ON 00D & 00E (CONTAINS ITEMS 15-28)
E	EDL00271		88093#INTRLKHSG ASSY=N/LOCK 220V	30022T5E
			COMPONENTS	
all	1	09R014A	05ZMIMI-SW SPDT STAKON #V15G1C26K	
all	2	03 01426	77201D HOUSING=FRONT=ILOC	
D only	2	03 01426A	94186D HOUSING=FRONT= ILOC W/UNLATCH	
all	3	03 01427A	77181C HOUSING=REAR=ILOC (C-7)	
D only	3	03 01427B	94186D HOUSING=REAR=ILOC W/UNLATCH	
all	4	03 01429	75479C PLATE=FNT PIVOT=ILOC	
all	5	03 01335	INSULATOR=AUTOSPOT	
all	6	03 01425A	92683C DOOR HANDLE EXTENSION	
all	7	03 01423	75736B LATCH = INTERLOCK	
all	8	03 01417	75100B PLATE=SPACER=ILOC	
all	9	03 01418B	75194B KEEPER=LATCH PIN/NOTCH	
all	10	03 01418	75100B TAP STRIP=ILOC	

Parts List, cont.—Interlock Assembly				
Used In	Item	Part Number	Description	Comments
all	11	03 01424A	90501B STRIKER=SWITCH=LONG TAB	
all	12	03 01442	92697B SOLENOID INSULATION=DR INTRK	(NOT SHOWN)
all	13	03 01443	84251AFLATHDRIVET 5/32X2+5/16 ZINC	
all	14	15H091	01Z STRGHTPIN 5/32"X2.25 LG ZINC	
AA,BB,DD	15	09K062B71	04Z SOLENOID 240/60--220/50 = ILOC	
CC	15	09K062B37	03Z SOLENOID(C-7)120/60--110/50	
all	16	03 01428A	93207C PLATE=REAR PIVOT=ILOC (C-7)	
AA	17	03 01421B	93207B SLIDE=NORMALLY OPEN(C7 SOL)	
BB,DD	17	03 01421A	75736B SLIDE=NORMALLY LOCKED=ILOC	
CC	17	03 01421D	77341B SLIDE=NORMALLY LOCKED(C7-S)	
all	18	03 01425	75479B HANDLE=ILOC	
all	19	03 01422	94256C KEEPER=SPRING=ILOC	
all	20	03 01444A	77503B SPRING CUP = ILOC	
all	21	03 01444	82293ASPRING .51/1.69/46+CADPL	
all	22	03 01445	88481ASPRING .2/.625/.319+CADPL	
all	23	03 01445B	75935B TORQUE SPRING (.53 IN#)CDPL	
all	24	03 01443	84251AFLATHDRIVET 5/32X2+5/16 ZINC	
all	25	15H090I	STRAIGHT PIN 5/32"DIA X1.75"LG ZINC	
AA only	26	03 S1X1	88172B SHIM:DOOR INTLK SOLENOID N4P	
all	27	27B205080Z	SPCROLL.177ID.218L.027T STLZC	
B	27	27B205080E	01ZSPCRRROLL.177ID.25L.027TK CSZNC	
BB,CC,DD	28	03 01418C	75736B KEEPER=NORMLOCKED SLIDE=ILOC	

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Section

7

**Water and Steam Piping
and Assemblies**

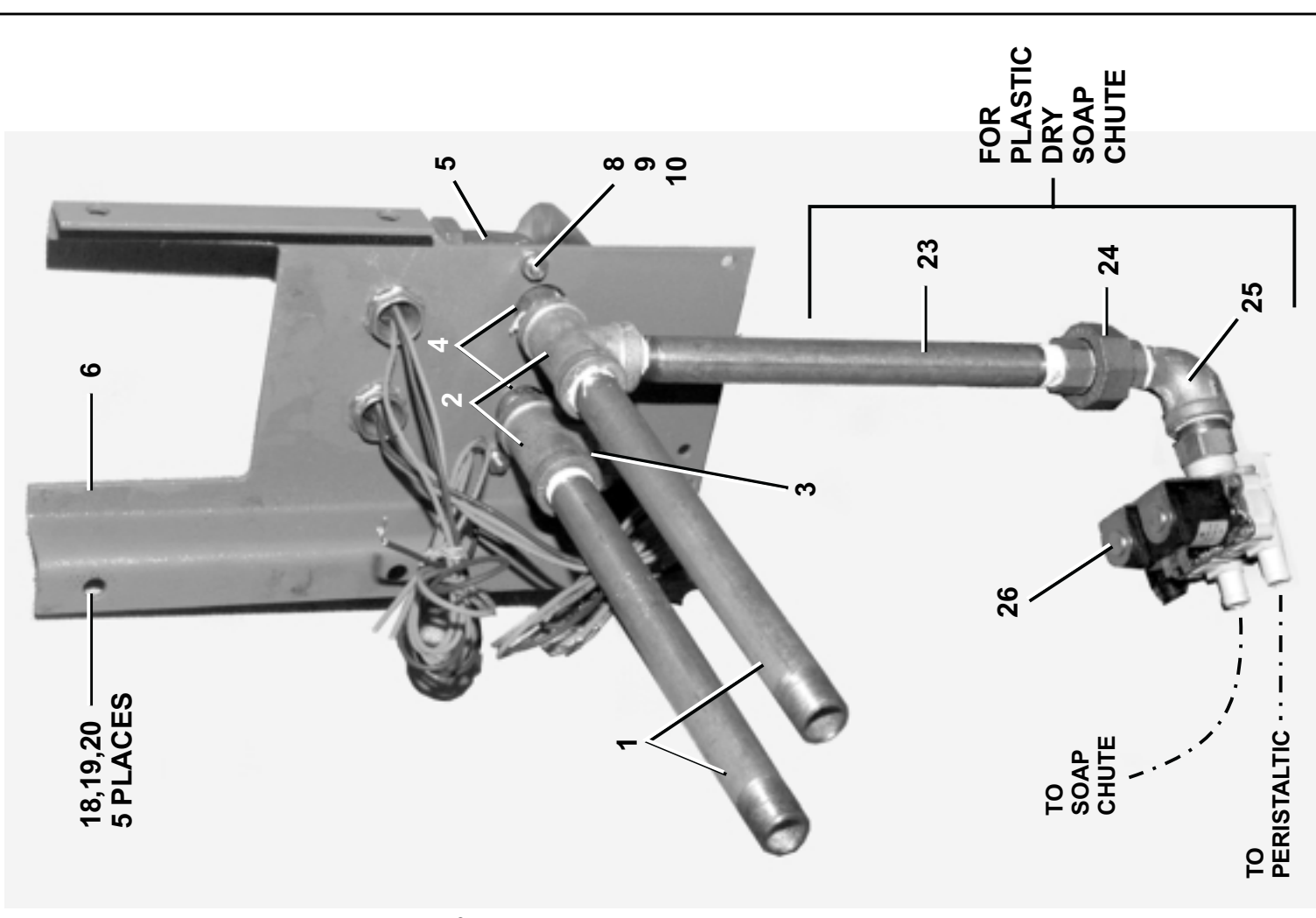
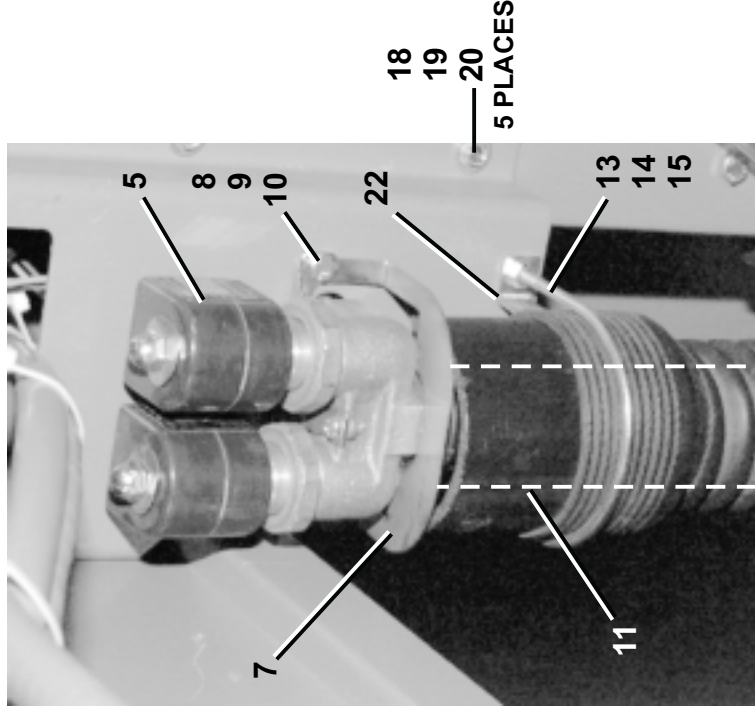
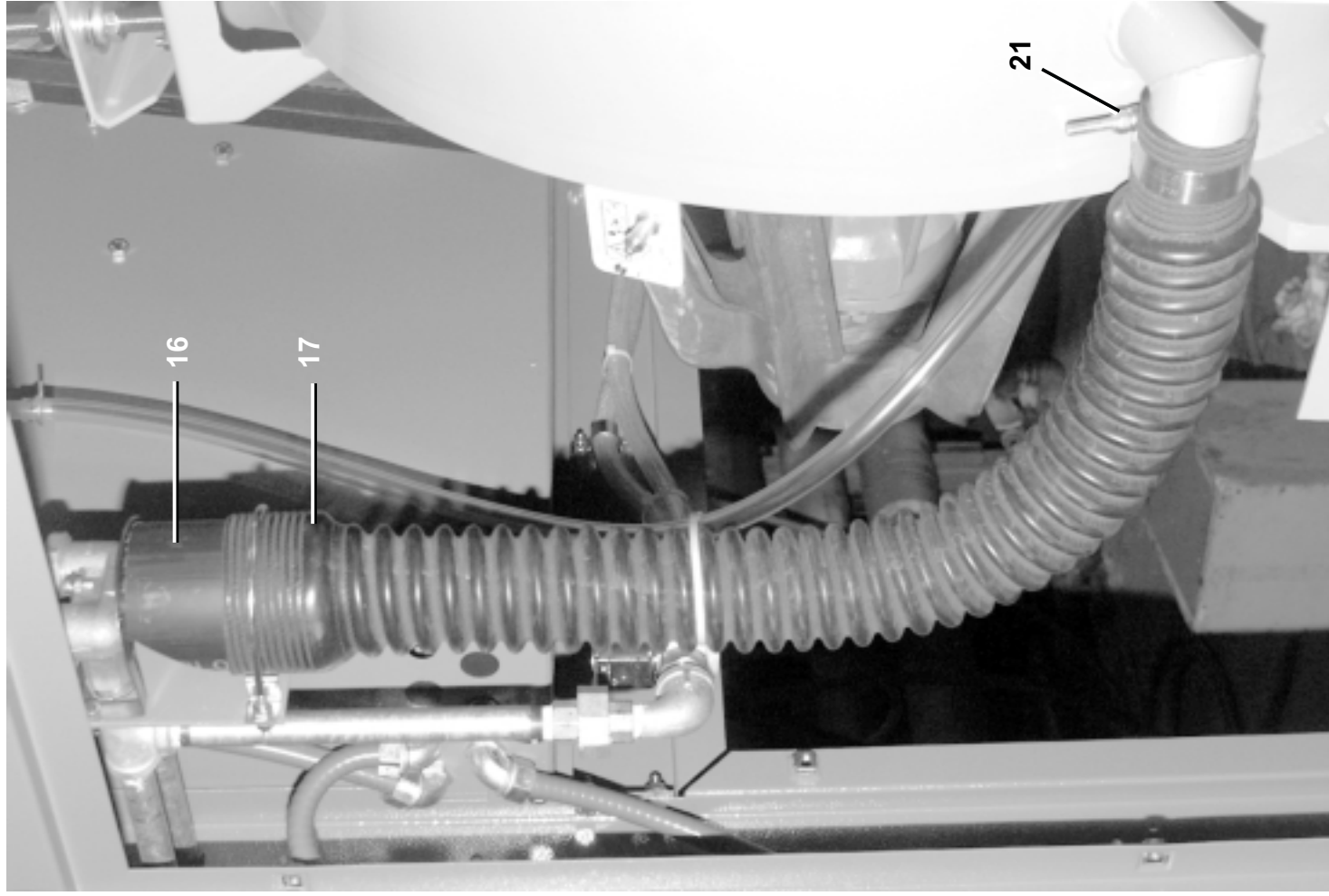
Water Inlet Assembly 30022F8J,F8W

BMP010032/2002076V
(Sheet 1 of 2)



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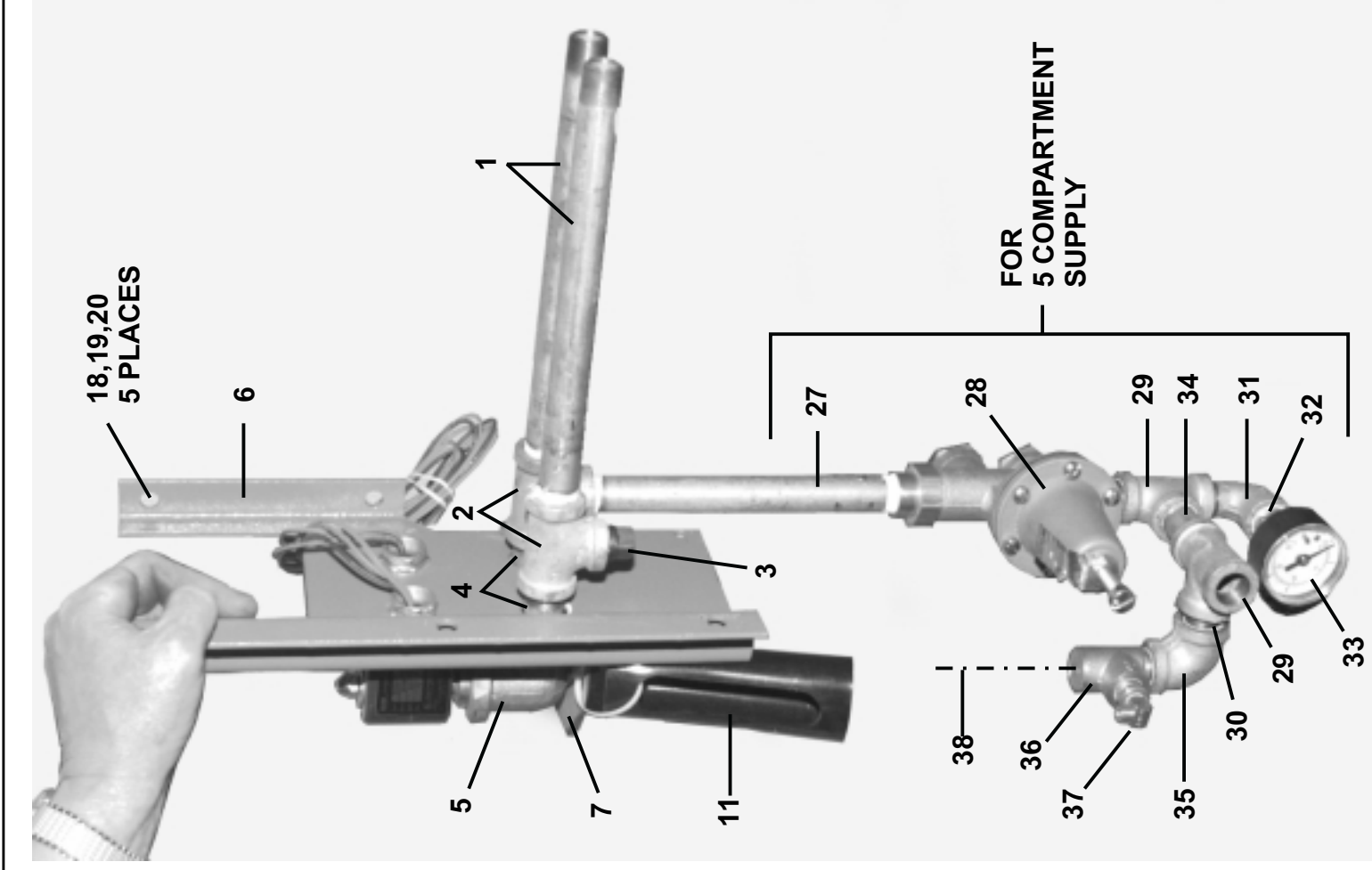
Water Inlet Assembly 30022F8J,F8W



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BMP010032/2002076V
(Sheet 2 of 3)

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Parts List—Water Inlet Assembly
Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
			ASSEMBLIES	
	A	AVW30202A	ASSY=WATER INLET PLSTIC SOAP	
	B	GVW30202	INST=WATER INLET ASSY 3022F	
	C	GWS30201A	INST=DRY SOAP CHUTE PLASTIC	
	D	GWS30203	INSTAL=3022F8 5COMPSUPPLY ASY	
			COMPONENTS	
all	1	5N0K10AG42	NPT NIP 1/2X10 TBE GALSTL SK40	
all	2	5S0KNFA	NPT TEE 1/2" GALMAL 150#	
all	3	5SP0KGFSS	NPT PLUG 1/2 SOSOLID GALSTL	
all	4	5N0K02AG42	NPT NIP 1/2X2 TBE GALSTL SK40	
all	5	96P016A71	1/2"DUOVAL 240V HAYS4-3108-240	
All	6	02 03872	WATER VALVE MNT BRKT-3022F	
all	7	02 03723	SPLASHSHIELD=CWU INLET	
all	8	15K039	HXCAPSCR 1/4-20UNC2AX3/4 GR5 Z	
all	9	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	
all	10	15G165	HXNUT 1/4-20UNC2BSAE ZC GR2	
all	11	02 03469A	TUBE = DEFLECTOR	
all	12	60E085C54A	HOSE ASSY=1/2" X 54"LG	
all	13	27A034	UBOLT3.625BETWN LEGS 3INC	
all	14	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	
all	15	15G165	HXNUT 1/4-20UNC2BSAE ZC GR2	
all	16	02 03469	3"NOZZLE-INLET HOSE = CWU	
all	17	02 03869	FLEXTUBE=2"IDx3.47ID X 30"LG	
all	18	15K095	HXCPCSCR 3/8-16UNC2AX1 GR5 ZINC	
all	19	15U255	LOCKWASHER MEDIUM 3/8 ZINCPL	
all	20	15G205	HXNUT 3/8-16UNC2B ZINC GR2	
All	21	27A072	T-BOLT HOSECLAMP2.16-2.47SSSCR	
all	22	02 03487	FILL PIPE SADDLE + CAD	
all	23	5N0K10AG42	NPT NIP 1/2X10 TBE GALSTL SK40	
all	24	5S0UKNF	NPT UNION 1/2" GALMAL 150#	
all	25	5S0PNFA0K	NPT ELB 90DEG 3/4X1/2 GALMAL 15	
all	26	96P053D71	3/4"INLET 1/2"DUOHOSEOUT 220V	
all	27	5N0K08AG42	NPT NIP 1/2X8 TBE GALSTL SK40	
all	28	96J030D	1/2"PRESSREG SET28# FEMXUN	
all	29	5S0KNFA	NPT TEE 1/2" GALMAL 150#	
all	30	5N0KCLSG42	NPT NIP 1/2XCLS TBE GALSTL SK40	
all	31	5S0PNFA0K	NPT ELB 90DEG 3/4X1/2 GALMAL 15	
all	32	5S0K0CDEO	NPT HEXBUSH 1/2X1/8 GALCI 125#	
all	33	30N100	PRESSGAUGE 1/8"BACKCN.0-30PSI	
all	34	5N0K02AG42	NPT NIP 1/2X2 TBE GALSTL SK40	
all	35	5S0LKNFA	NPT ELB 90DEG 1/2 GALMAL 150#	
all	36	96M001	1/2X3/8" RELIEF VALVE SET31#	
all	37	53A031B	BODY-EL90MALE.25X1/8 #269C-42B	
all	38	60E085C54A	HOSE ASSY=1/2" X 54"LG	

Hays Electric Inlet Valves

BMP700710/96081V
(Sheet 1 of 2)

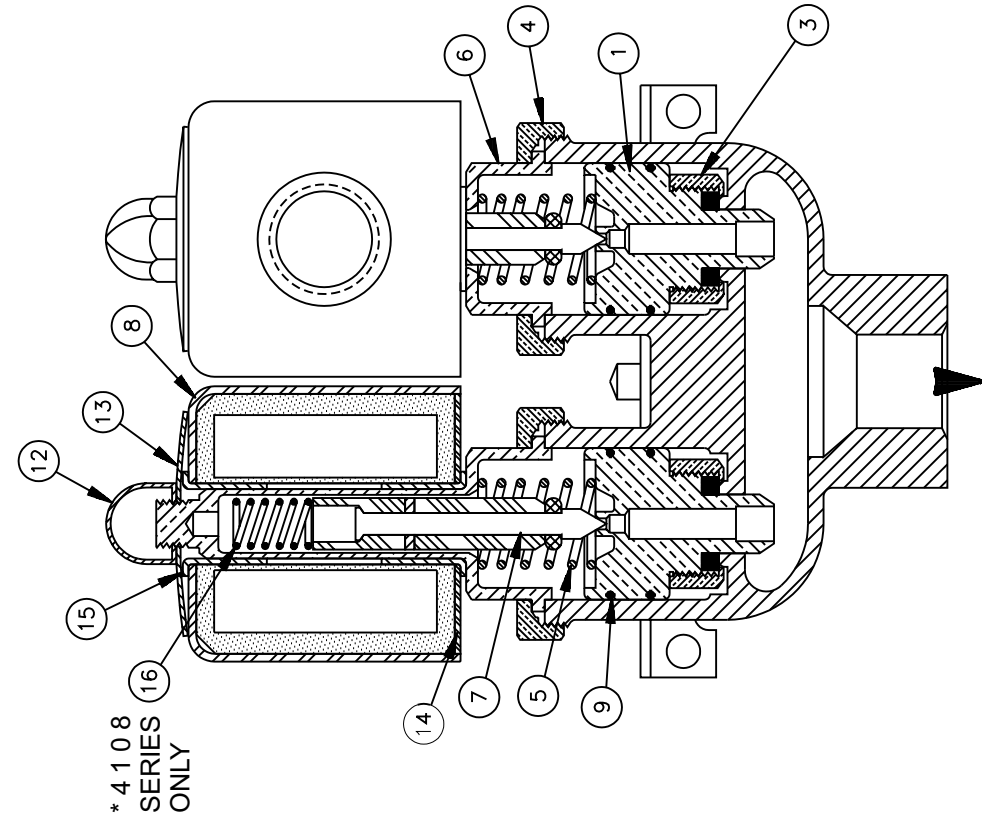


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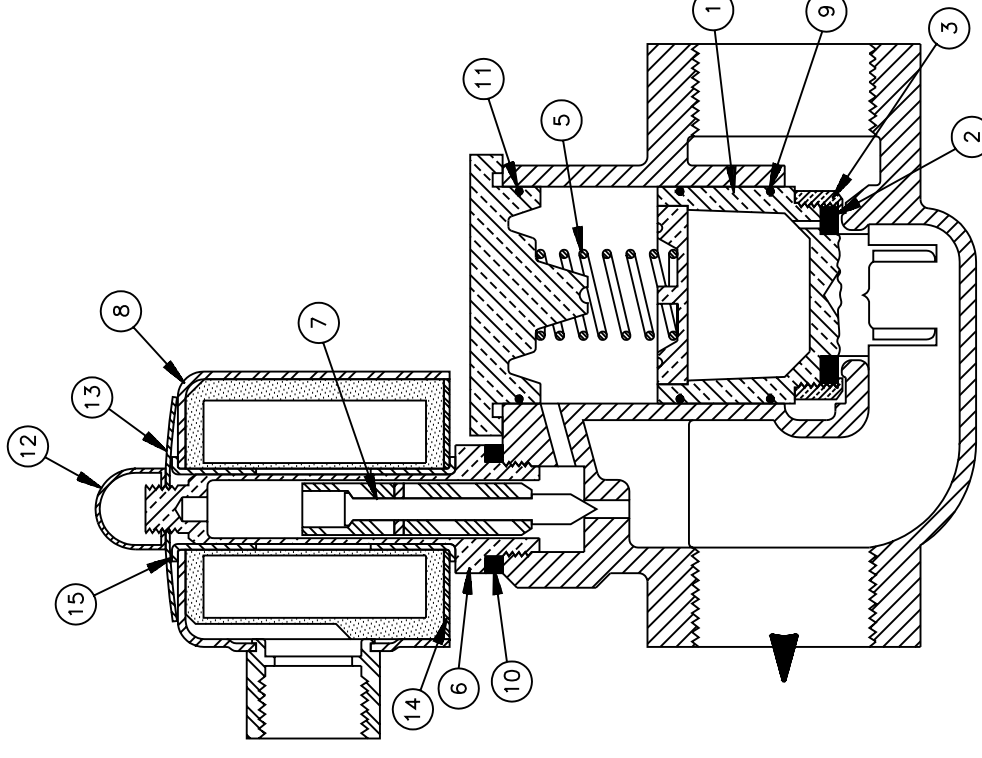
BMP700710/96081V (1 of 2)

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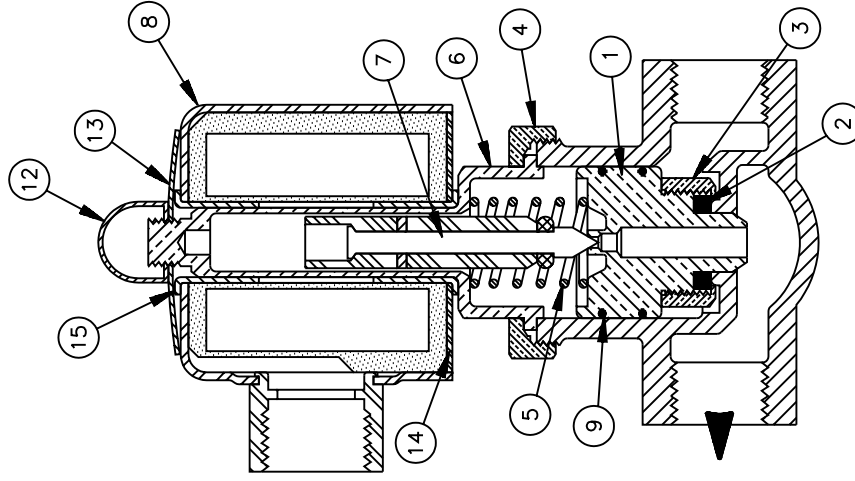
NOTE:
HAYS 4108 SERIES DUOVALVE IS
REPLACED BY THE 3108 SERIES(SHOWN).
IF REPLACEMENT PARTS ARE NEEDED FOR
THE OBSOLETE 4108 SERIES SEE PARTS
LIST ON REVERSE SIDE.



00T,00U,00V
1/2" DUO VALVES



00Y,00Z,00ZZ
1-1/4" VALVES



00S,00W,00X,00XX
3/8" BALANCING & 3/4" VALVES

GENERAL MAINTENANCE:

- 1) THOSE VALVES WITH COUPLING NUTS MUSTY NOT BE EXCESSIVELY TIGHTENED. USE A STEADY PULL WITH A 14" OR SMALLER WRENCH. DO NOT HAMMER ON NUT OR WRENCH. LIMIT MAXIMUM TORQUE ON COUPLING NUT TO 600 LB/INCH. EXCESSIVE TIGHTENING OF COUPLING NUT WILL DISTORT VALVE BODY CAUSING THE PISTON BODY TO JAM AND THE VALVE WILL NOT SHUT OFF.
- 2) IF THE VALVE LEAKS BETWEEN THE BODY AND BONNET, LOOSEN THE COUPLING NUT AND TURN THE BODY SLIGHTLY, THEN TIGHTEN THE COUPLING NUT. IF THE VALVE STILL LEAKS, REPEAT THE OPERATION. IN NO CASE MUST THE NUT BE TIGHTENED EXCESSIVELY.



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BMP700710/96081V (2 of 2)

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BMP700710/96081V
(Sheet 2 of 2)

Parts List—Hays Electric Inlet Valves			
Used In	Item	Part Number	Description
<p>Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.</p>			
			ASSEMBLIES
S		96P014	02Z 3/8" VALVE 120V HAYS 2195-0055
T		96P016	10Z 1/2" DUOVAL 120V HAYS3108-6021
U		96P016A24	08Z 1/2" DUOVAL 24V HAYS3108-6421
V		96P016A71	05Z 1/2" DUOVAL 240V HAYS3108-6121
W		96P053	05Z 3/4"VAL 24V HAYS 2110-6421IS
X		96P053A37	06Z 3/4"VAL 110V HAYS #2110-6021IS
XX		96P053A71	3/4" HAYS VALVE 240V60/50C FACTMADE
Y		96P151	09Z 1+1/4" VAL 24V HAYS 2110-6421IS
Z		96P151A37	05Z 1+1/4" VAL 110V HAYS2110-6021IS
ZZ		96P151A71	1.25" HAYSVALVE 240V60/50C FACTMADE
COMPONENTS			
S	1	96V245	PISTON ASSY HAYS #7735505
T-V	1	96V216	PISTON-TEFLON FOR HAYS STYLE 3108
W-XX	1	96V222	PISTON ASSY HAYS 7730004 FOR 96P053
Y-ZZ	1	96V224B	PISTON ASSY HAYS #7643101=96P151
all	1	96V216A	PISTON-TEFLON FOR HAYS STYLE 4108
S-V,	2	96V247	SEATWASHER HAYS #8222301 96P014+16
W-XX	2	96V225	SEAT WASHER HAYS #8249801
Y-ZZ	2	96V225A	SEAT WASHER HAYS #84048 FOR 96P151
S-V,	3	96V248	SEATWASHER NUT HAYS#82222 96P014+16
W-Z	3	96V226	SEAT WASHER NUT HAYS #86030 =96P053
S-V	4	96V246	COUPLING NUT HAYS #76303 96P014+16
W-Z	4	96V254	COUPLING NUT HAYS #76028 = 96P053
S-V,Y-ZZ	5	96V244	PISTON SPRING FOR HAYS STYLE 3108
W-XX	5	96V222A	PISTON SPRING HAYS 82488
all	5	96V244A	PISTON SPRING HAYS 4108 HAYS #88108
S-V	6	96V242	BONNET FOR HAYS 3108 HAYS#83021
W-XX	6	96V258	BONNET HAYS #73026 FOR 96P053
Y-Z	6	96V260	BONNET HAYS #83192 FOR 96P151
S only	7	96V243	PLUNGER ASSY TEFLON TIP HAYS #74327
T-ZZ	7	96V223	PLUNGER HAYS #7319503
all	7	96V223A	PLUNGER ASSY FOR HAYS STYLE 4108

Parts List, cont.—Hays Electric Inlet Valves					
Used In	Item	Part Number	Description	Comments	
S-T,X,Z	8	96V211	COIL 120V50/60C FOR HAYS STYLE 3108		
U,W,Y,ZZ	8	96V210	COIL 24V50/60C FOR HAYS STYLE 3108		
V,XX	8	96V212	COIL 240V50/60C FOR HAYS STYLE 3108		
S-V,	9	96V217	TEFLON SPLIT RING 1/2" HAYS#8502901	OBSOLETE 4108 DUOVALVE ALSO	
W-XX	9	96V222T	TEFLON SPLIT RING HAYS #8503002		
Y-ZZ	9	96V224T	TEFLON SPLITRING 1 1/4"HAYS#8503102		
Y-ZZ only	10	96V229	BONNET GASKET HAYS #82224= 96P151		
Y-Z only	11	96V261	O-RING (SEAL CAP) HAYS#87407=96P151		
all	12	96V250	PALNUT HAYS #3069-PC		
all	13	96V251	SPRING WASHER HAYS #83600		
all	14	96V264	BOTTOM PLATE (COIL) HAYS#8223601		
all	15	96V262	FERRULE (COIL SLEEVE) HAYS #82239		
all	16	96V244PS	PLUNGER SPRING FOR HAYS STYLE 4108	OBSOLETE 4108 DUOVALVE ONLY	
all	17	96V250A	COIL RETAINER HAYS4108 HAYS #82958	(NOT SHOWN) OBSOLETE 4108 DUOVALVE	

Pressure Regulators

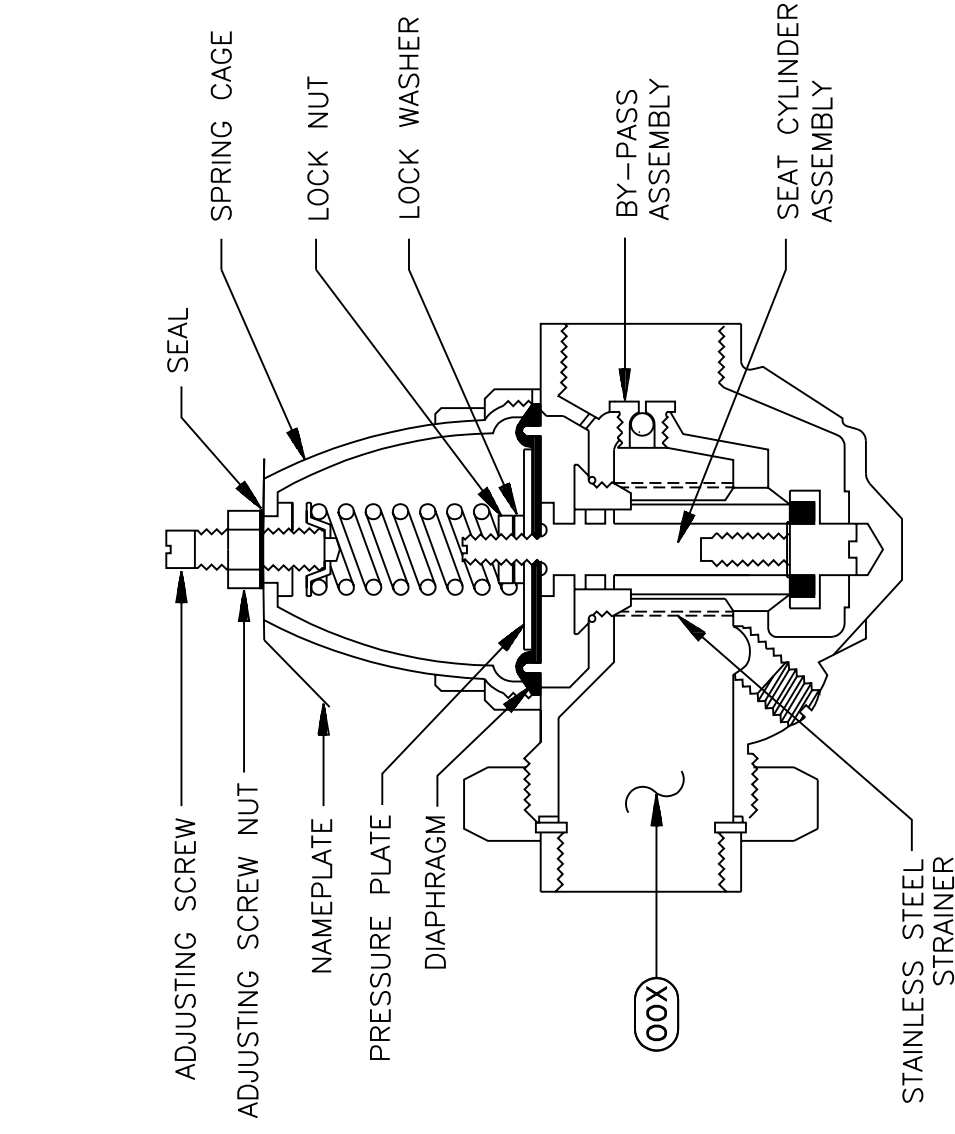
BMP900031/96081V
(Sheet 1 of 2)



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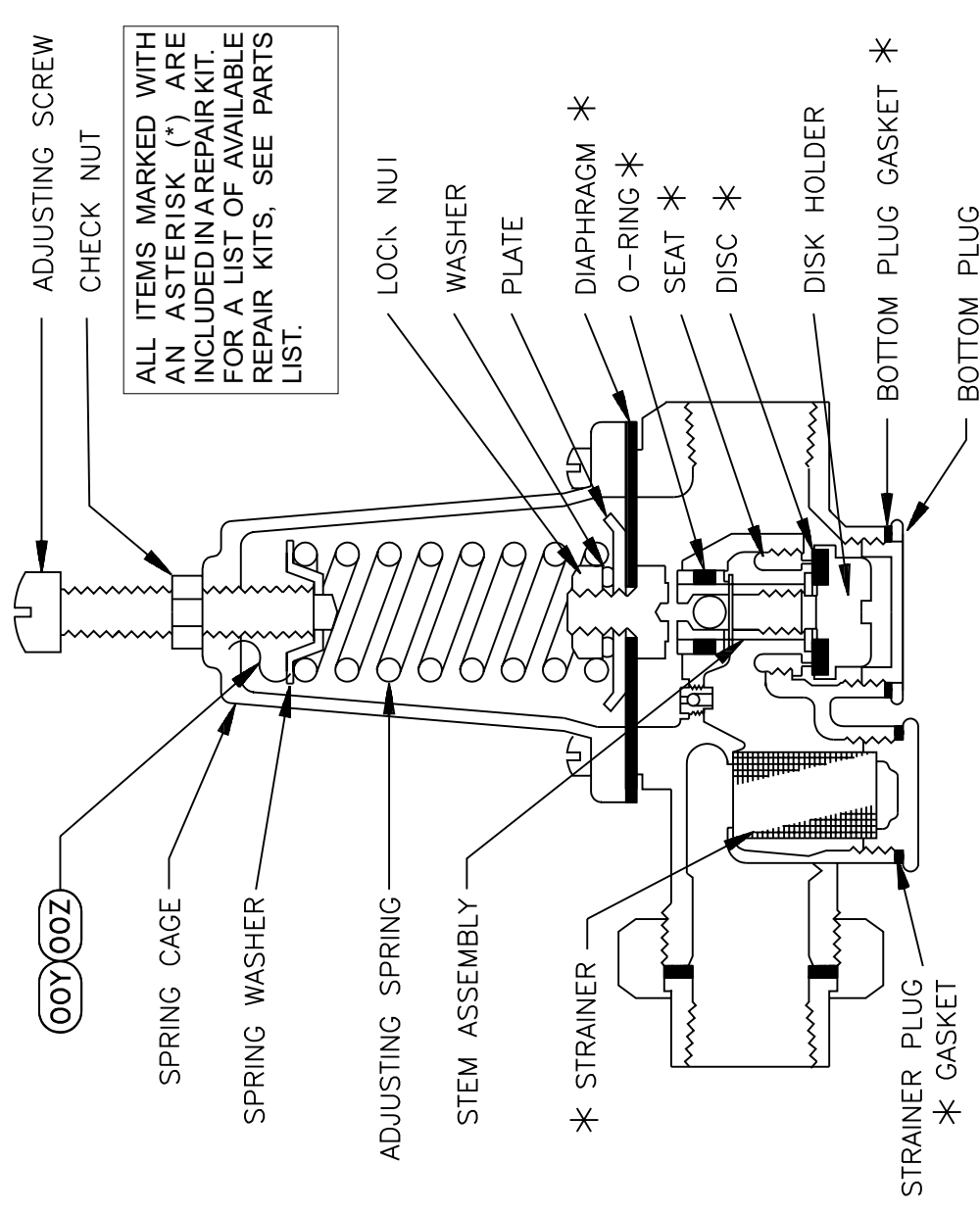
BMP900031/96081V (1 of 2)

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TO CLEAN OR REPLACE PARTS:

1. Remove spring cage and all parts above diaphragm.
2. Loosen and remove diaphragm lock nut, lock washer, pressure plate, and diaphragm from valve stem.
3. Unscrew seat cylinder from body and remove entire assembly.
4. While disassembled open gate valve to flush out collected sediment.



TO CLEAN OR REPLACE PARTS:

1. Remove bottom plug and gasket.
2. Loosen disc holder with screwdriver or socket wrench.
3. Inspect disc and clean or replace.
4. Seat can be removed, if necessary, with an allen wrench or socket wrench.
5. Unscrew and remove adjusting screw, check nut, and spring cage screws. Lift off spring cage, spring washer and adjusting spring.
6. Loosen and remove lock nut, washer, plate, and diaphragm.
7. Lift stem assembly upwards to remove from body.
8. To reassemble valve follow above instructions in reverse. Tighten or loosen adjusting screw for the required pressure of 28 P.S.I.



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Parts List—Pressure Regulators

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
-----ASSEMBLIES-----				
	X	96J030FF	01Z 1/2"PRESS REG SET 28# FEM X FEM	(NO REPAIR KIT)
	Y	96J030D	01Z 1/2" PRESREGULTR SET 28# FEM-UN	(FOR KIT, SEE BELOW)
	Z	96J031D	01Z 3/4" PRESREGULTR SET 28# FEM-UN	(FOR KIT, SEE BELOW)
-----COMPONENTS-----				
all	1	96V158B	REPAIRKIT #14510=1/2 PRESSREG EB86	(KIT/DISCONT.VLV1/2 EB72)
all	2	96V158C	REPAIRKIT #10341 FOR E24U (96J030C)	(KIT/DISCONT.VLV1/2 E24U)
Y	3	96V158D	REP.KIT #14649FOR 1/2"E72U& E86U	
all	4	96V159B	REPAIRKIT C/A#14511=3/4PRESREG EB72	(KIT/DISCONT.VLV3/4 EB72)
Z	5	96V159D	REP KIT #14648 FOR 3/4"E72U +E86U	

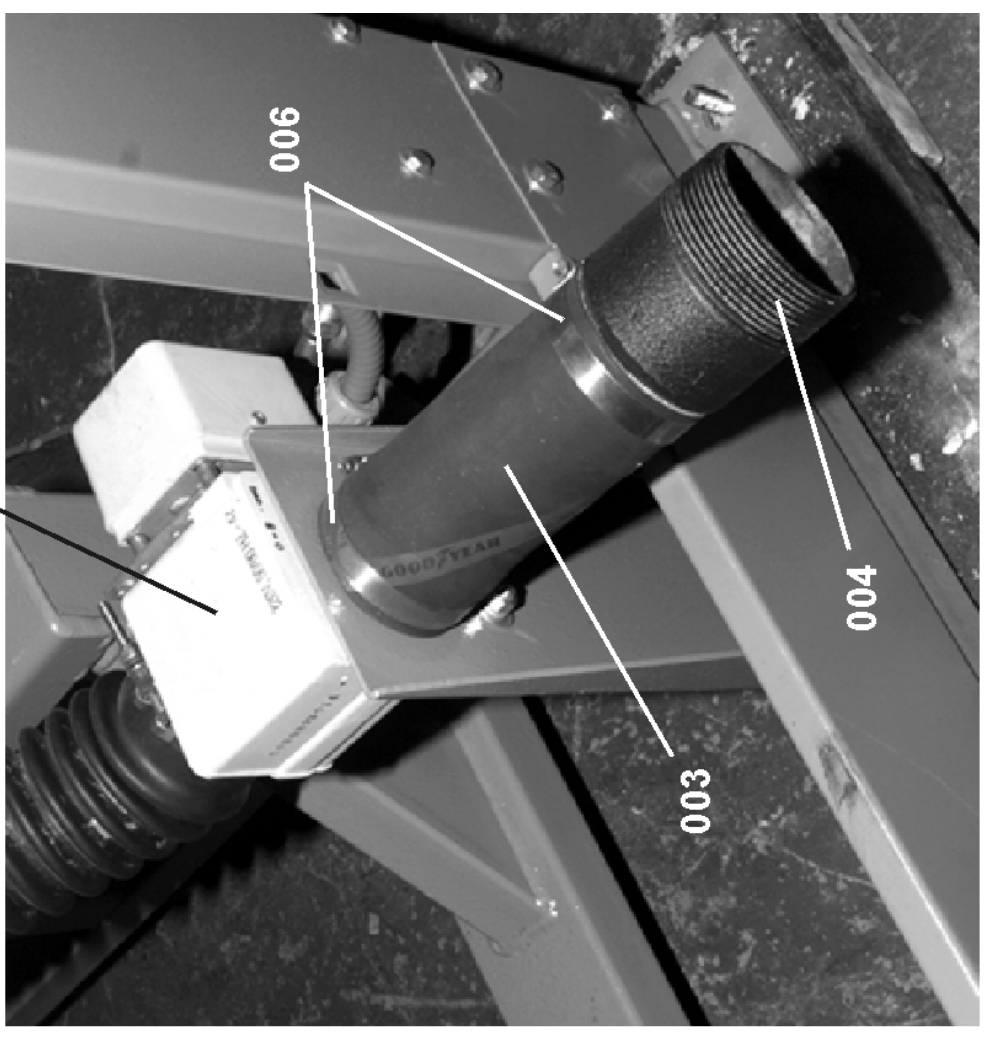
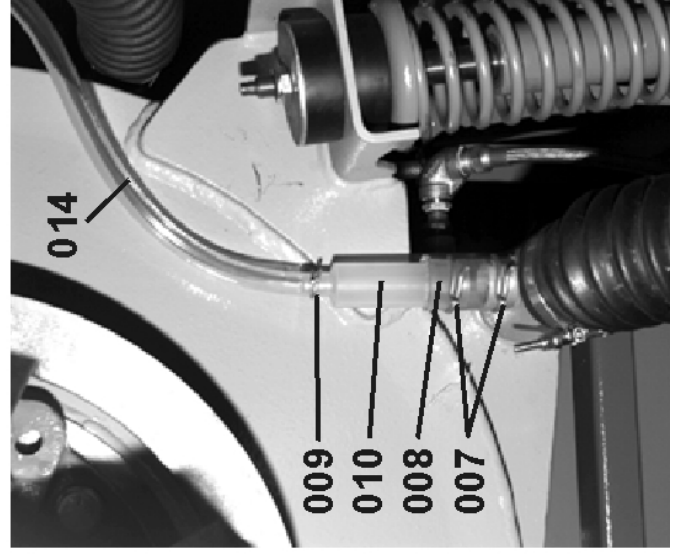
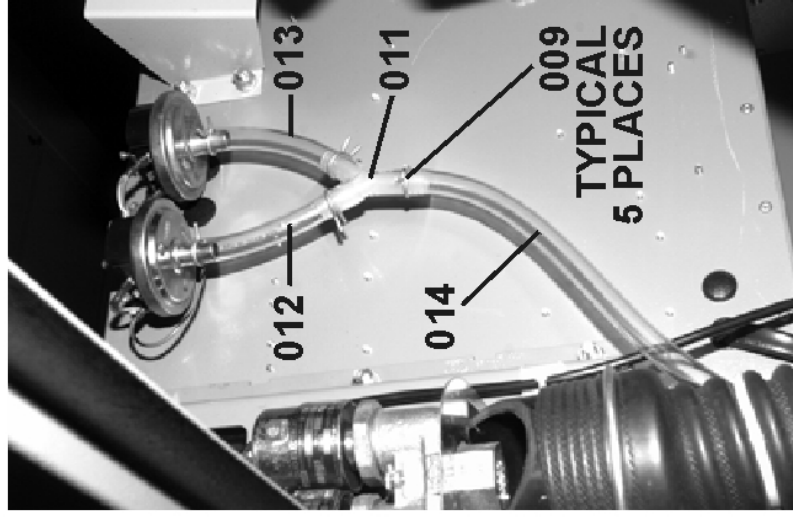
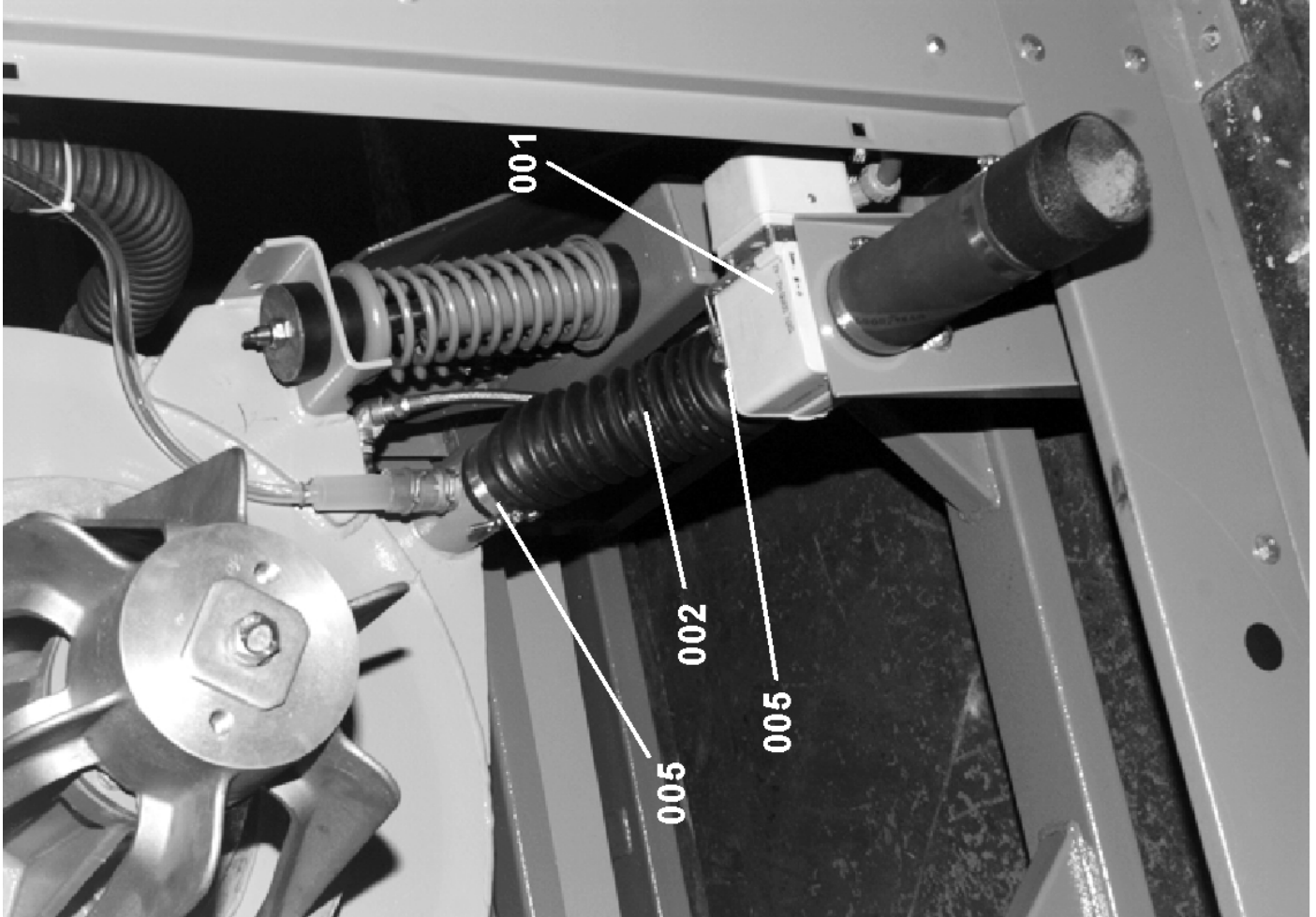


DRAWING

(See other page for parts list,
if applicable.)

INSTALLATION DRAIN ASSEMBLY
30022F8J/F8P/F8W

BMP940055/94212V (Page 1)



SEE BMP920017



PARTS LIST

(See other page for drawing.)

INSTALLATION DRAIN ASSEMBLY
30022F8J/F8P/F8W

BMP940055/94212V (Page 2)

ITEM	PART NUMBER	DESCRIPTION	HOW PART IS USED IN ASSEMBLY (Only if pertinent)
00A	GVW30201	93392B INSTALL=DRAIN ASSY 3022F	REFERENCE ASSEMBLY
001	96D350A71	06Z DRAINVAL 3"MTDRIVE 240V 50/60C	
002	02 03846D	93436# FLEX TUBE=SPRG MNT DRN 9"	
003	60E303A07A	92597N HOSE=3"ID X 7" LG.	
004	W2 03329	92486B*DRAIN PIPE 3"NPT X 3" TUBE	
005	27A075A	T-BOLT HOSECLAMP 3.03"T03.34"	
006	27A082	HOSECLAMP,2+9/16-3.5" CADSCR HS-48	
007	27A052	HOSECLAMP 1.5"DIA SPRINGTYPE #R24HC	
008	60E014	TUBING VINYL 1.25"ID X 1.5"OD *	
009	27A044A	HOSECLAMP .687D ROTORCLIP#HC-11ST-R	
010	02 03332C	78361B AIRCHAMBER=PRESSWITH-CWU	
011	51E509Y	Y-CONN 1/2"HOSEBARB PLAS. IND#64017	
012	60E005P	04Z PVC TUBING 1/2"ID X 5/8"OD *	5 INCHES(127MM)
013	60E005P	04Z PVC TUBING 1/2"ID X 5/8"OD *	5 INCHES(127MM)
014	60E005P	04Z PVC TUBING 1/2"ID X 5/8"OD *	48 INCHES(1219MM)
		***** END OF PARTS LIST *****	

How to Read Parts List

Reference Item Numbers—Items 00A, 00B, 00C, etc., or 00X, 00Y, 00Z, etc., appearing at the top of some parts lists, are for reference and provide:

1. The part number for the entire assembly depicted in the drawing or a major sub-assembly thereof, and/or
 2. The range of machine models this drawing applies to.
- If more than one reference item appears, this usually means this drawing applies to more than one assembly (and thus to more than one range of machines).

Component Item Numbers—For any item on the drawing (e.g., item ①), there may be several corresponding items on the parts list (e.g., 001A, 001B, 001C, etc.) which are similar components on different assemblies. "How Part Is Used In Assembly" identifies which components apply to your machine, by listing either the machine model, or the reference item number from the top of the parts list (e.g., 00A, 00B, 00C, etc.), or a particular characteristic (e.g., bronze or stainless steel), or special ordering information, such as a repair kit number.

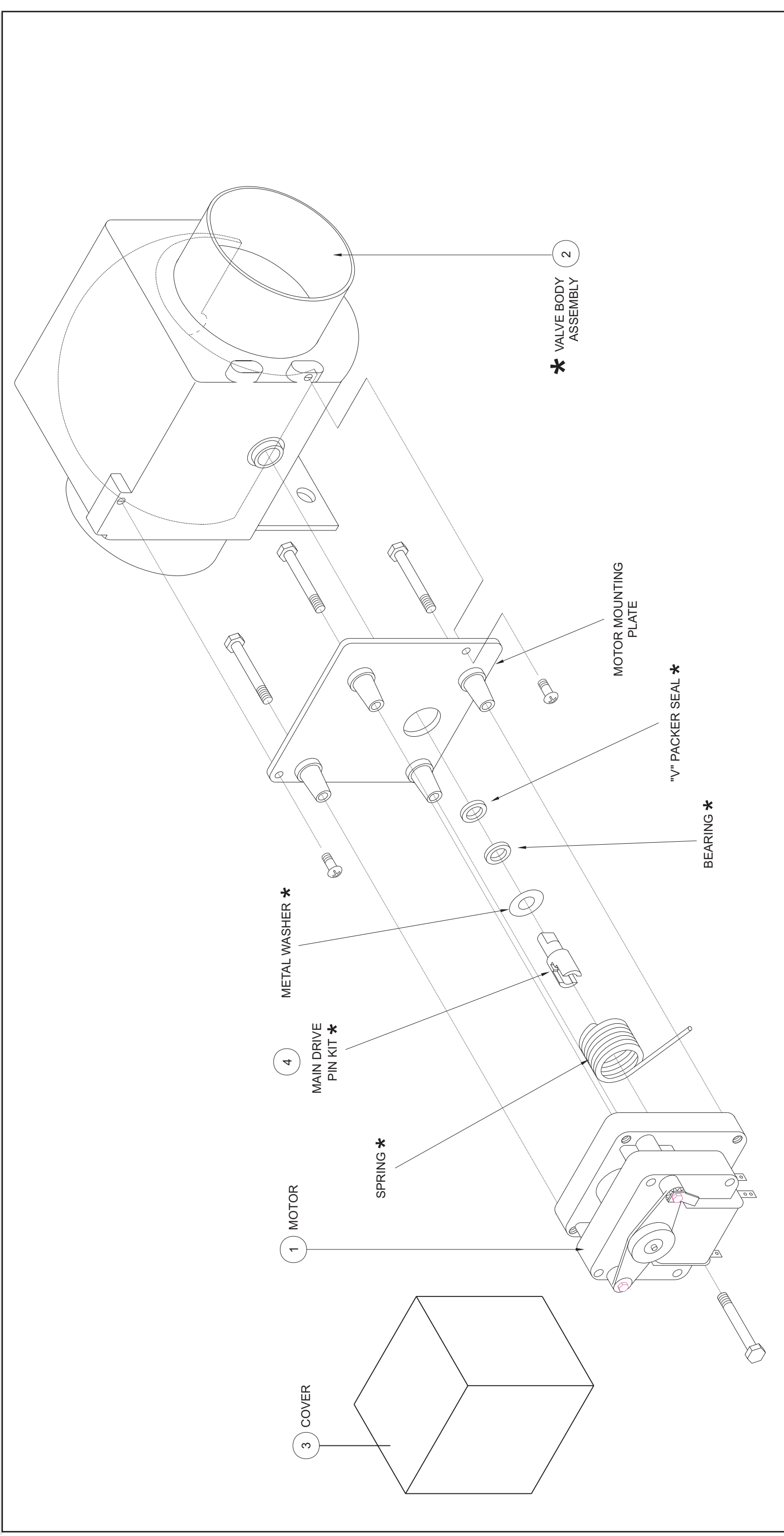
3" Electric Drain Valve

BMP920017/2006214B
(Sheet 1 of 2)



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Parts List—3” Electric Drain Valve

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
-----ASSEMBLIES-----				
	A	96D350A37	DRINVAL 3"N/O MTRDR120V 50/60C	
	B	96D350A71	DRINVAL 3"N/O MTRDR240V 50/60C	
	C	96D350B71	DRINVAL 3"N/C MTRDR240V 50/60	
-----COMPONENTS-----				
A	1	96D35MTR37	120V 50/60CMTR FOR 3"DRAINVAL	
B	1	96D35MTR71	240V 50/60CMTR FOR 3"DRAINVAL	
all	2	96D35B0D	BODY & BALL FOR 3" DRAIN VALVE	
all	3	96D35C0V	MTRCOVER 2-PCFOR 3"DRAINVAL	
A,B	4	96D35PIN	DRIVE PIN KIT FOR 3" DRAIN VAL	

Section

8

Chemical Supply Devices

Soap Chute

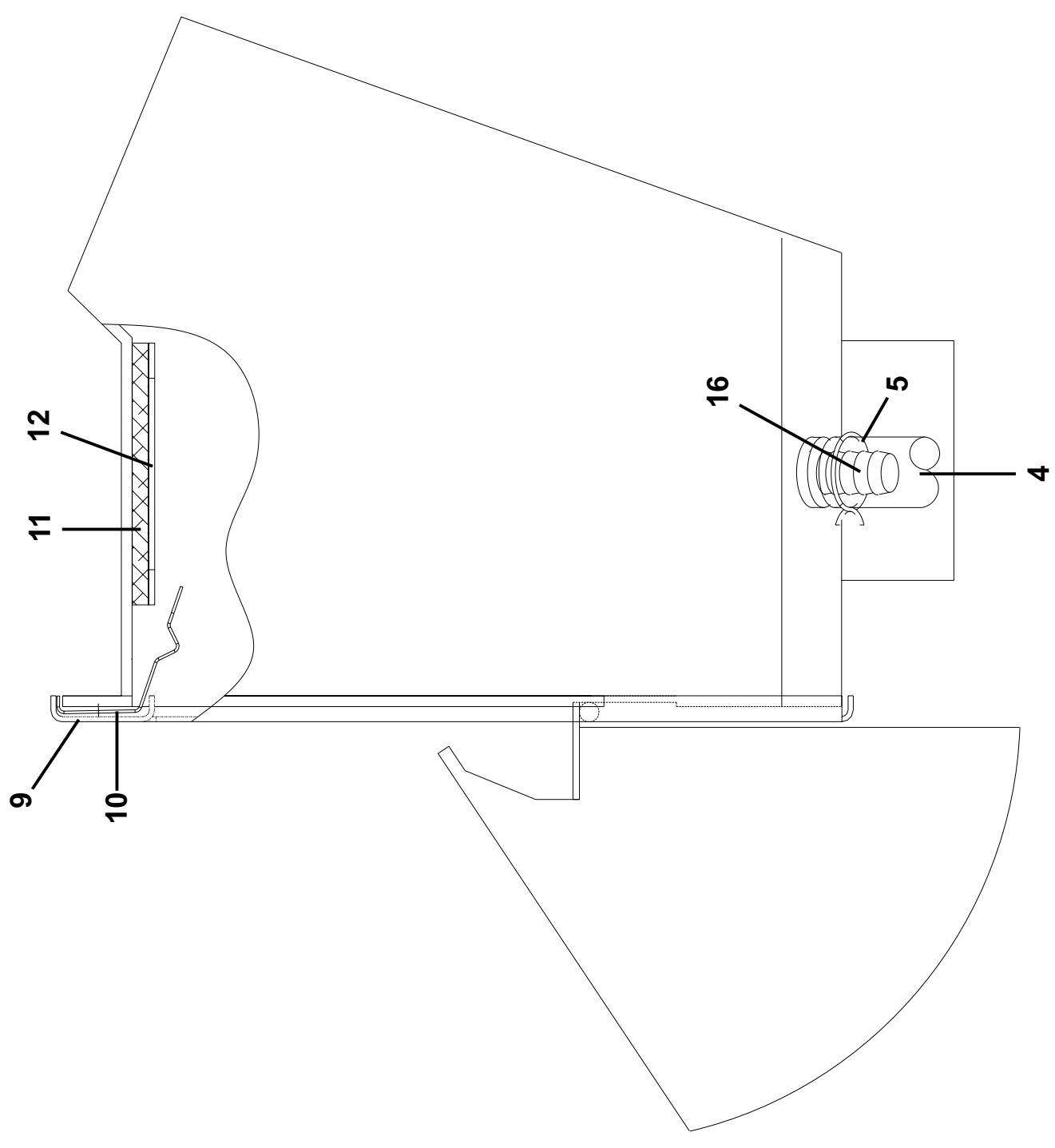
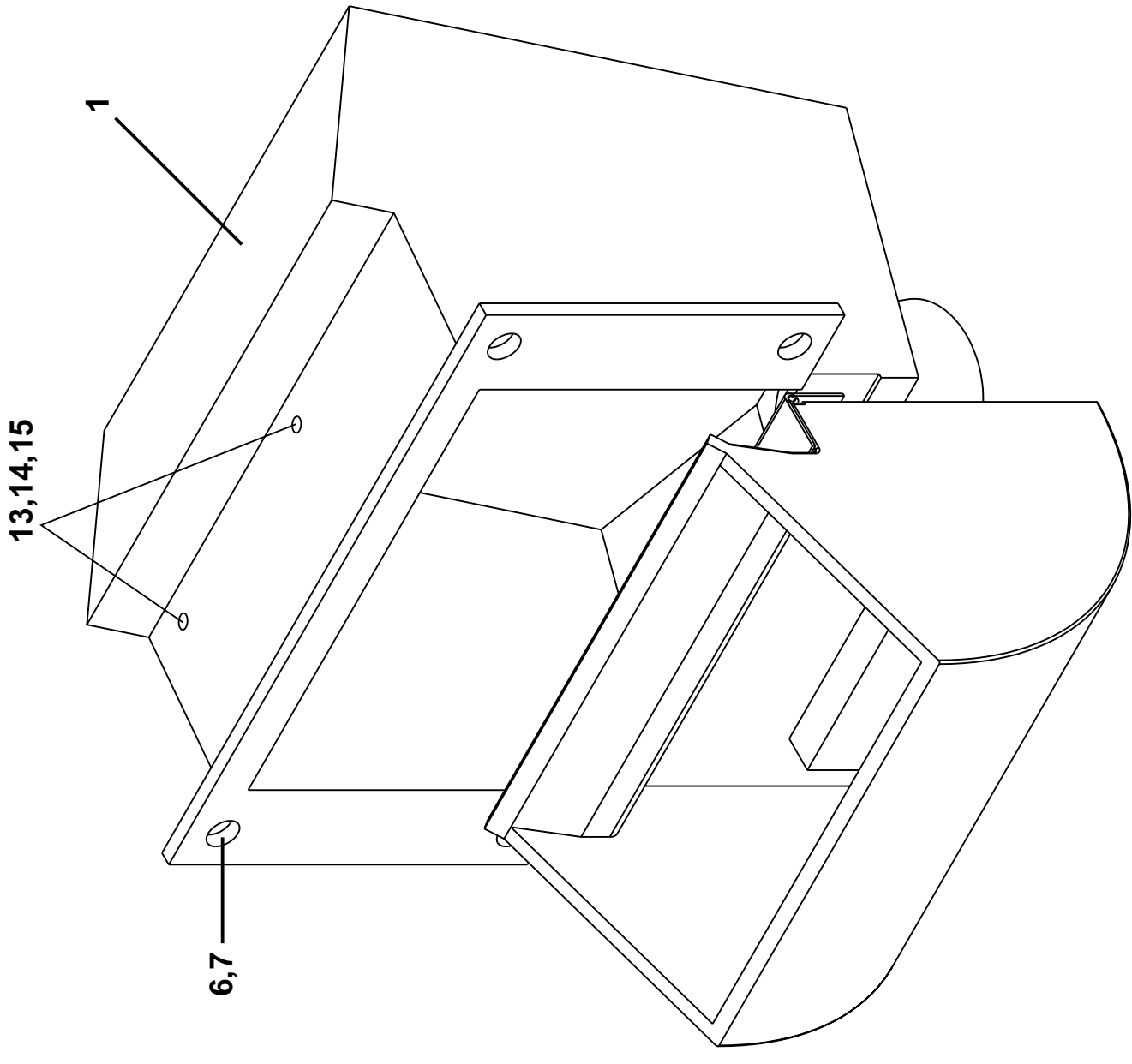
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3626X8J,X8W 4226X7J,X7W 4232X7J,X7W

BMP010023/2006175B
(Sheet 1 of 2)



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Soap Chute

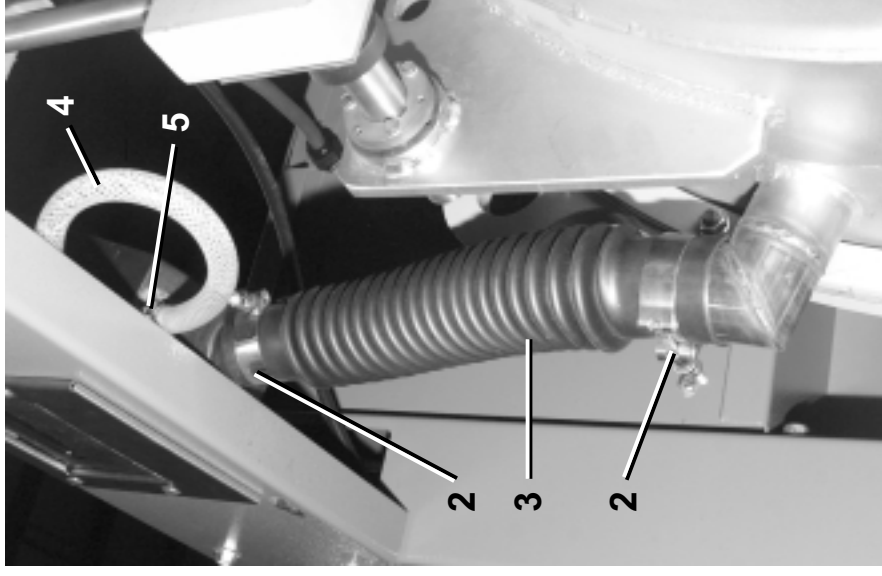
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3626X8J,X8W 4226X7J,X7W 4232X7J,X7W

BMP010023/2006175B
(Sheet 2 of 2)



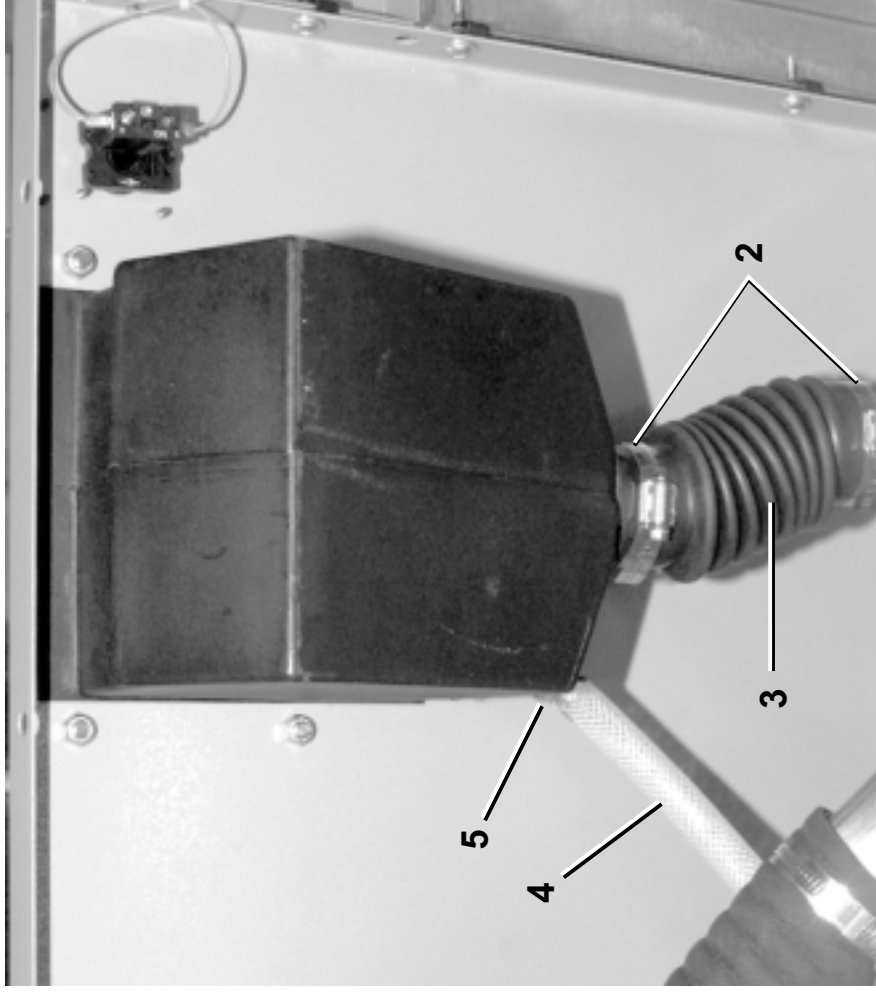
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30022X8J SHOWN

30022H8J SHOWN



Parts List—Soap Chute

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
			ASSEMBLIES	
A		GWS3022H8	INSTL=SOAP CHUTE LC, 3022H8	30022H8J
B		GWS30201A	INST=DRY SOAP CHUTE PLASTIC	30022F8J,F8W,F8P
C		GWS42001B	2001000Z INST=PLASTIC SOAP CHUTE 4232F	42032F7J,F7P,F7W
D		GWS3022X8	INST=SOAP CHUTE ASSY 3022X8J	3022X8J
E		GWS3626X7	20003000Z INST=SOAP CHUTE ASSY 3626X	3626X8J,X8W
F		GWS4226X	2003000Z INST=SOAP CHUTE ASSY 4226X	4226X7J,X7W
G		GWS4232X	2003000Z INST=SOAP CHUTE ASSY 4232X	4232X7J,X7W
H		GWS35001A	INST=PLASTIC SOAP CHUTE	3630F8J,F8W
J		GWS35001C	INST=PLASTIC SOAP CHUTE 3630SG RT	3630F8R,F8S
K		GWS42001C	INST=PLASTIC SOAP CHUTE RT LD	4232F7R,F7S
			COMPONENTS	
all	1	AWS30211A	PLASTIC SOAP ASSY	
all	2	27A070	T-BOLT HOSECLAMP 1.94"-2.25"	
A	3	02 03870C	FLEXTUBE=2"ID X 8"LG.W/CUFFS	
B,F,G,K	3	02 03870	FLEXTUBE=SOAPCHUTE 2"IDX24LG	
C,E,H,J	3	02 03870D	FLEXTUBE=2"ID X 14"LG W/CUFFS	
all	4	60E006C	PVC TUBING NYL.REINF.5IDX.750D	
all	5	27A045	HOSECLAMP .750"DIA SPRINGTYPE	
all	6	15K053	BUTSOKCAPSCR 5/16-18X3/4 SS18-	
all	7	15G188	HEXLOKNUT 5/16-18 BRASS	
all	9	02 04215	PLASTIC SOAP CHUTE BEZEL	
all	10	02 04217	PLASTIC SOAP CHUTE LATCH	
all	11	02 04216	SOAP CHUTE SPLASH GUARD	
all	12	98A002AT	PAD 6"X9"REG.DUTY,TURCO#A90551	
all	13	15G105	HEXMACSCRNUT 8-32UNC2 SS18-8	
all	14	15N095	RDMACSCR 8-32UNC2X3/4 SS18-8	
all	15	15U120B	LOCKWASHER MEDIUM #8 SS18-8	
all	16	51BB0KN00B	BULKHD FITT 1/2"BARBED,POLYPRO	

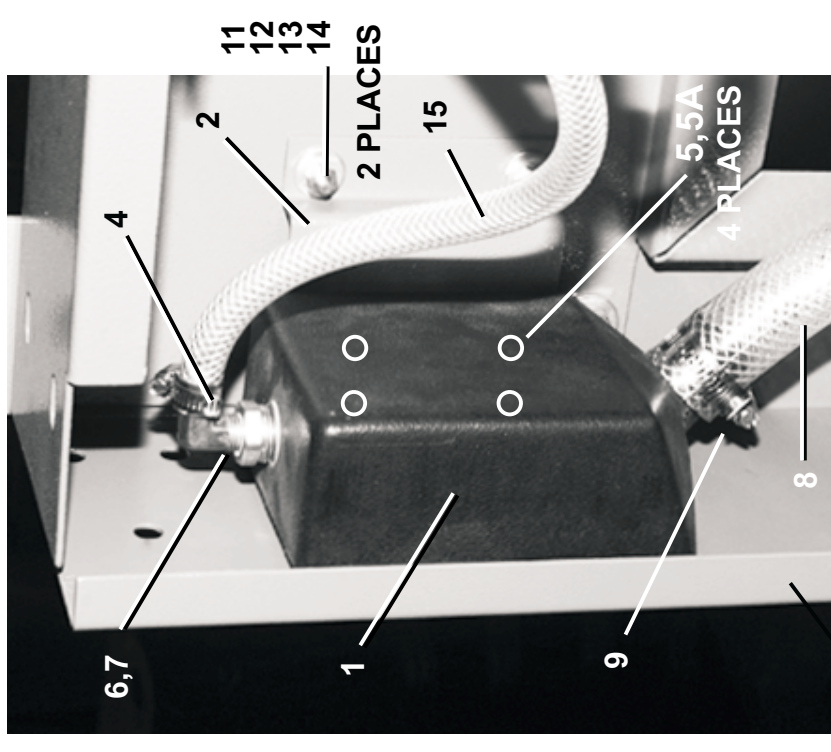
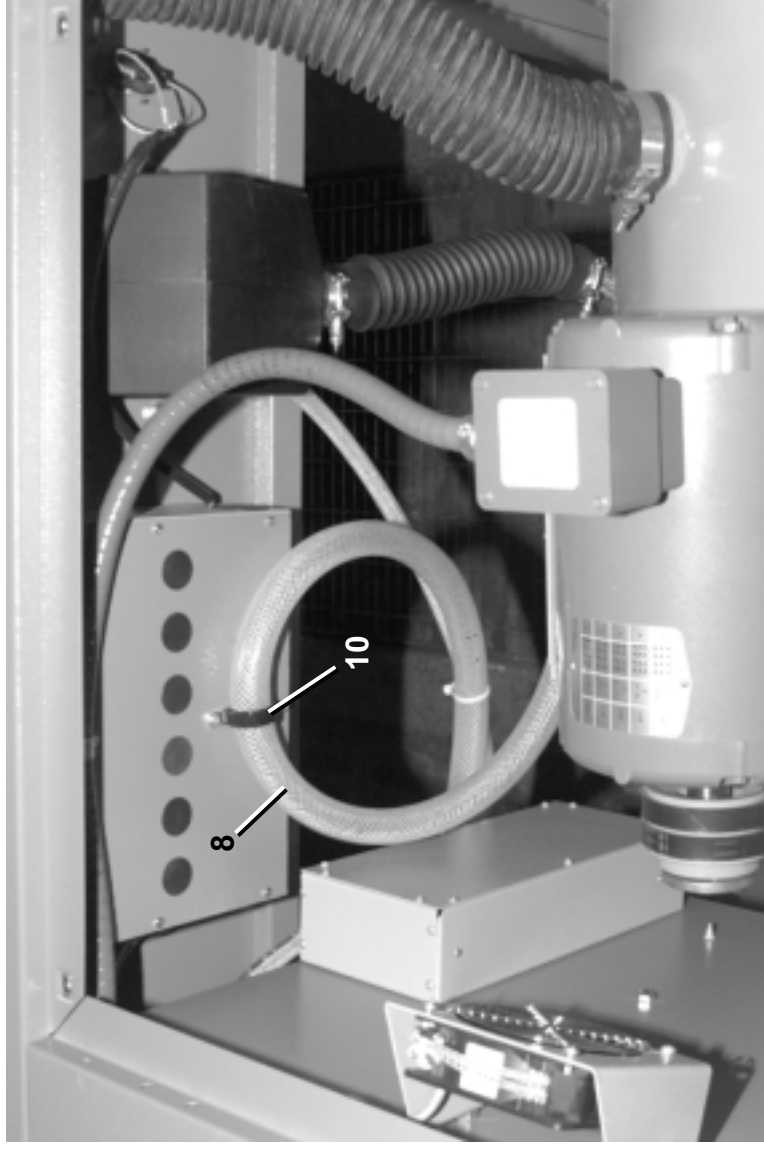
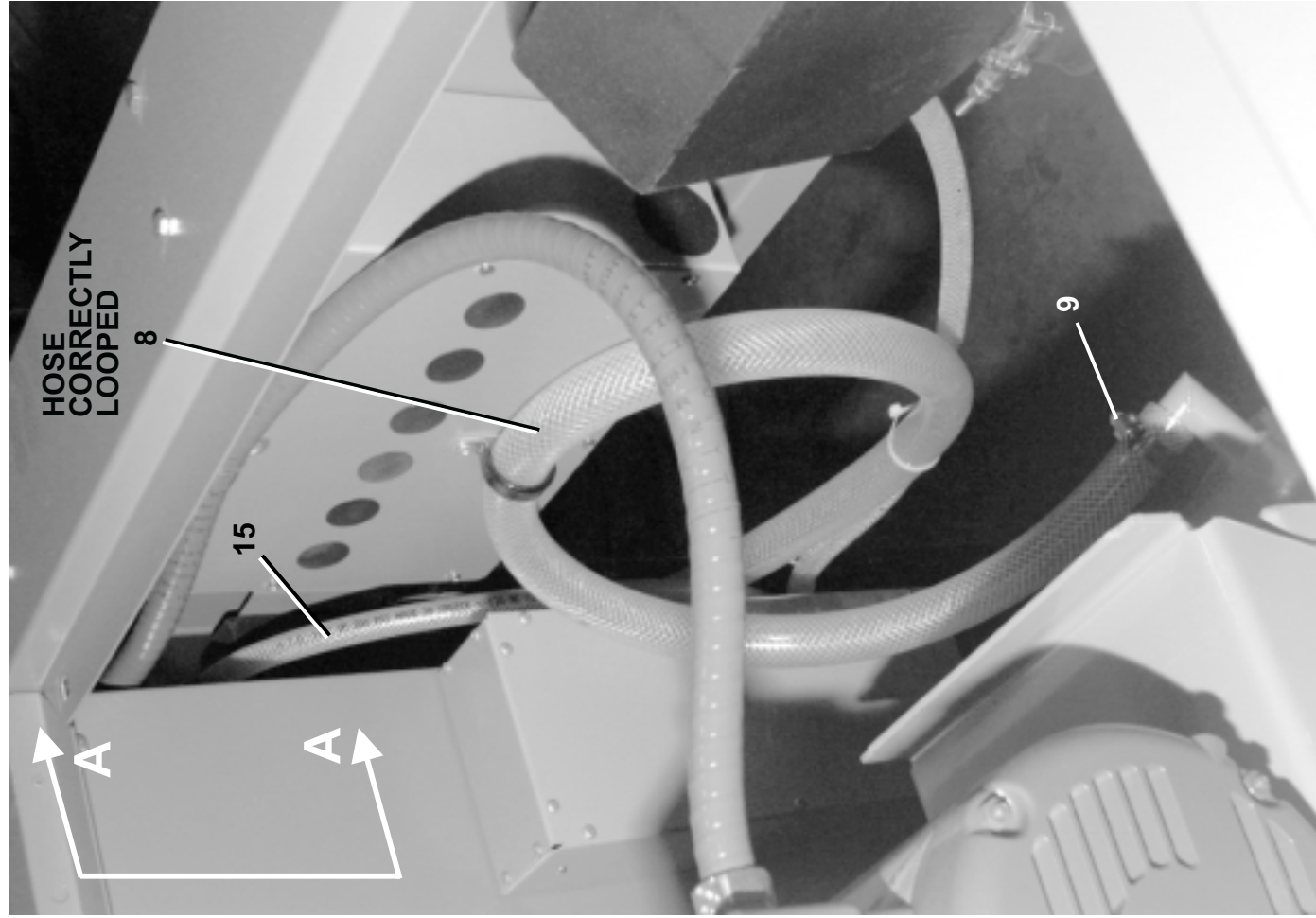
**Peristaltic Soapchute
30020F8J, F8W**

BMP940050/2002076V
(Sheet 1 of 2)



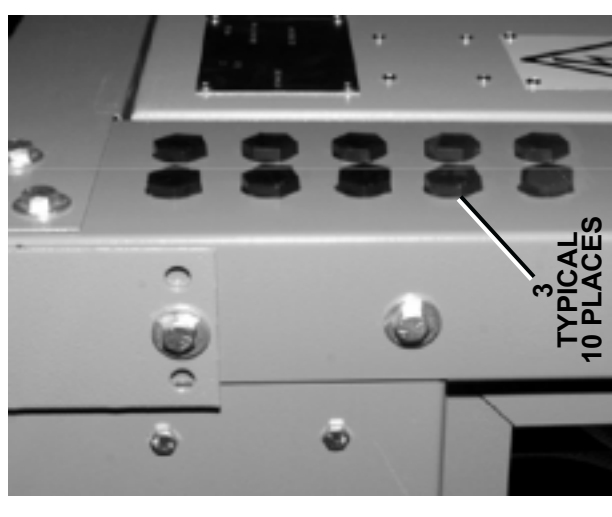
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DETAIL A-A

RIGHT
REAR
VERTICAL
SUPPORT





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Parts List—Peristaltic Soapchute

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
			-----ASSEMBLIES-----	
	A	GWL30201	INST=PERISTALTIC SOAPCHUTE	
			-----COMPONENTS-----	
all	1	02 03589O	MOLDED LIQ SUPPLY MANFOLD=10	
all	2	02 03966	BRKT=3022F PERISTALTIC BOX	
all	3	5SP0KXFHS	HEX HEAD PIPE PLUG 1/2"	
all	4	27A040	HOSE CLAMP 5/16-7/8 SS SCR	
all	5	15K032	BUTSOKCAPSCR 1/4-20X3/8 SS18-8	
all	5A	15U181	LOCKWASHER MEDIUM 1/4 SS18-8	
all	6	5SB0K0EBEO	NPTHEXBUSH 1/2X1/4 BRASS 125#	
all	7	51E504EB	ELB HOSESTEM 3/8HX1/4NPT BRASS	
all	8	60E010	TUBINGPOLYBRAID 1"X1.312	
all	9	27A090	HOSECLAMP 13/16-1.5"CADSC#HS16	
all	10	12P019A	CABLE CLAMP 1.25DIPPD #NE-20	
all	11	15K039	HXCAPSCR 1/4-20UNC2AX3/4 GR5 Z	
all	12	15G165	HXNUT 1/4-20UNC2BSAE ZC GR2	
all	13	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL	
all	14	15U185	FLATWASHER(USS STD) 1/4" ZNC P	
All	15	60E085C54A	94051N HOSE ASSY=1/2" X 54"LG	

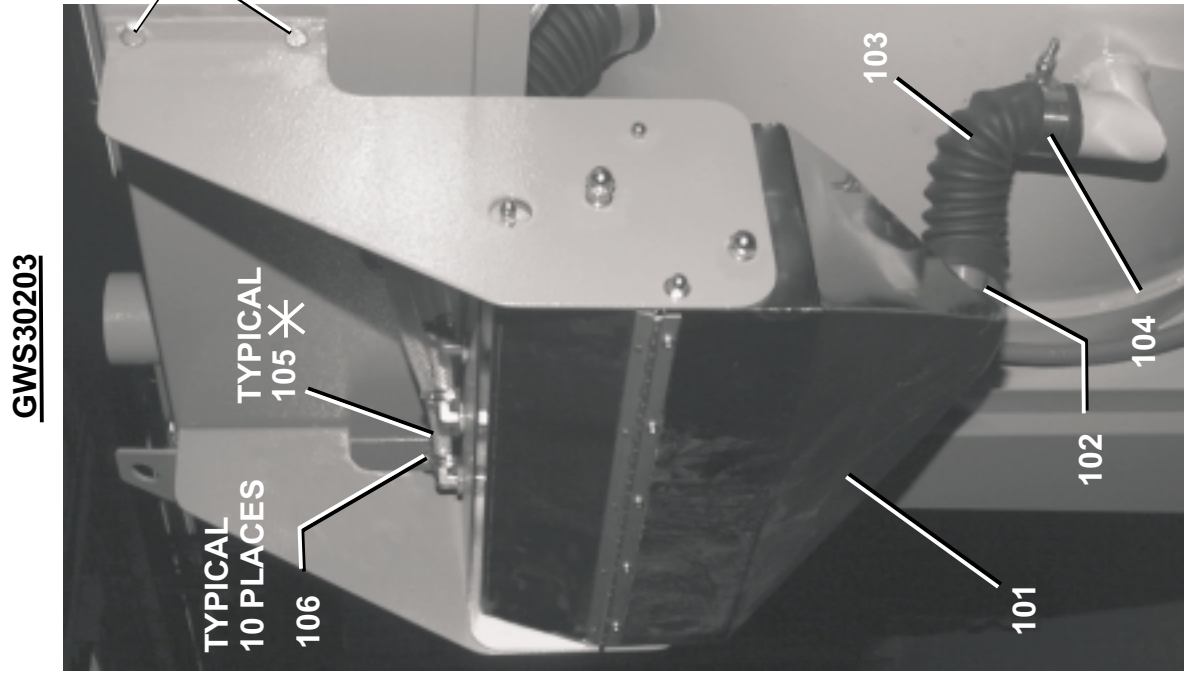
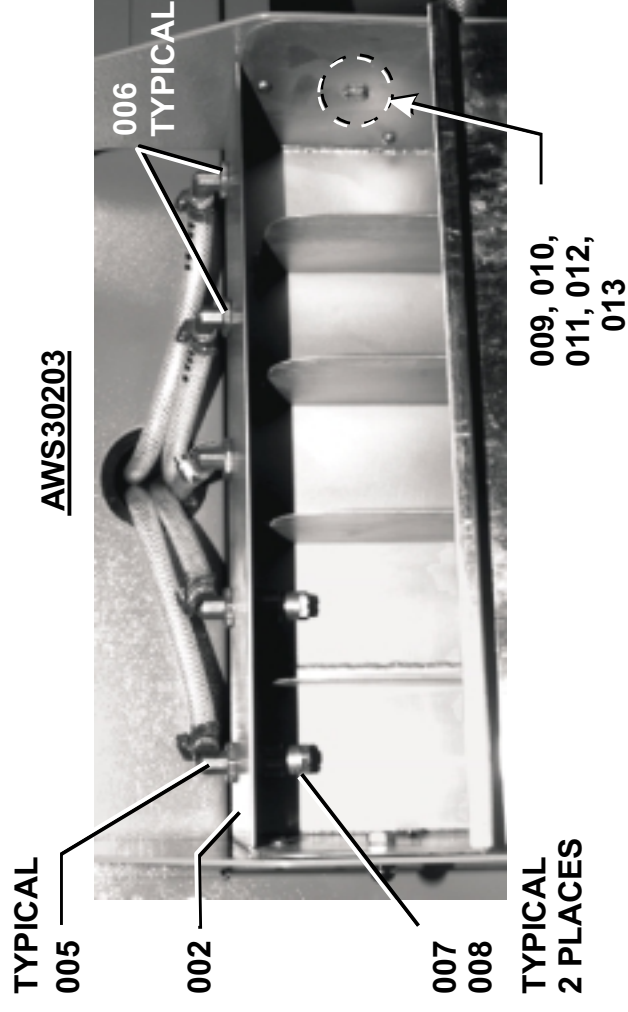
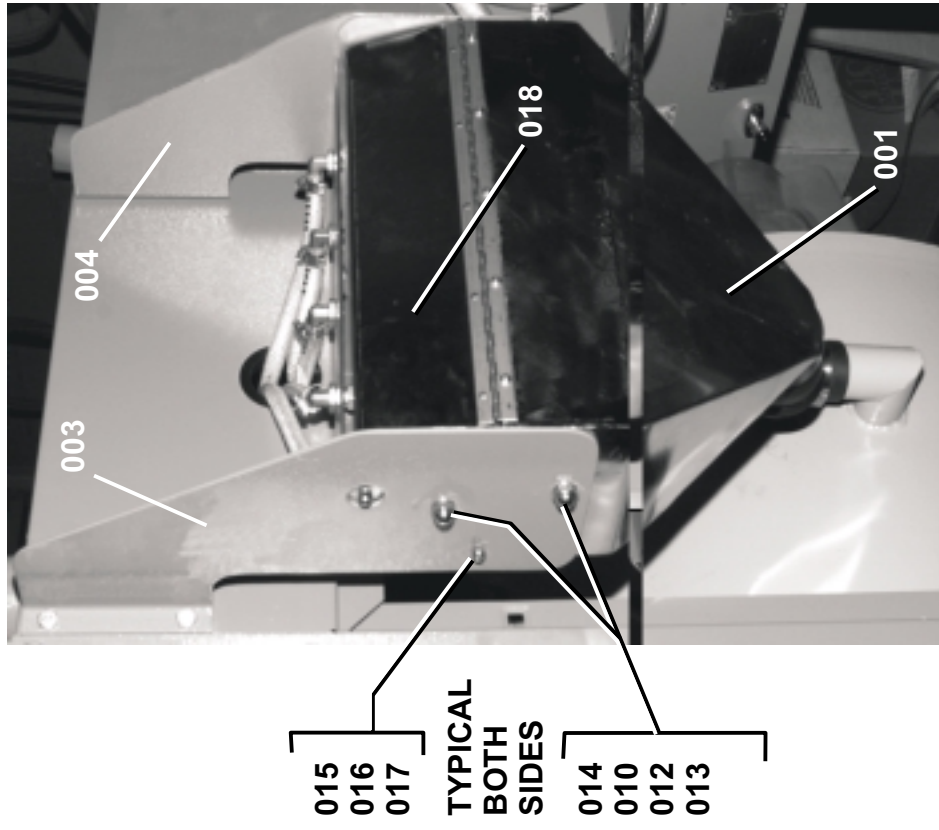
5 Compartment Dry Supply
3022F8J/F8P/F8W

BMP940053/2006422B
 (Sheet 1 of 2)



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GWS30203



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Litho in U.S.A.

Parts List - 5 Compartment Dry Supply

Find the correct assembly first, then find the needed components. The item letters (A, B, C, etc.) assigned to assemblies are referred to in the "Used In" column to identify which components belong to an assembly. The item numbers (1, 2, 3, etc.) assigned to components relate the parts list to the illustration.

Used In	Item	Part Number	Description	Comments
-----ASSEMBLIES-----				
	A	GWS30203	INSTAL=3022F8 5COMPSUPPLY ASY	
	B	AWS30203	ASSY=3022F8 5COMP SUPPLY	
-----COMPONENTS-----				
B	1	W2 03611	* SUP-CHUTE 5-FLUSH=30"C456M	
B	2	02 03996	LID=3022F8 5COMP. SUPPLY	
B	3	02 03997	3022 5COMP FRONT MOUNT PLATE	
B	4	02 03998	3022 5COMP REAR MOUNT PLATE	
B	5	51E504EB	ELB HOSESTEM 3/8HX1/4NPT BRASS	
B	6	17N200B	1/4 NPT HEX LOCKNUT X1/4THICK	
B	7	5SR0G0EBF	NPT RED 3/8X1/4 BRASS 125#	
B	8	27A002	NOZZLE BRASS 3/8" SPRAYSYSTEMS	
B	9	15K096A	HXCPSCR.3/8-16X1SS18-8.123HD.H	
B	10	24G030N	ROLLED WASH.379ID NYLTITE 37W	
B	11	15G206	HEXNUT 3/8-16 UNC2 SS 18-8	
B	12	15U260	LOCKWASHER MEDIUM 3/8 SS18-8	
B	13	15G211	HXCPNUT 3/8-24 UNF2 SS18-8	
B	14	15K086B	HEXCAPSCR 3/8-24X1 SS18-8	
B	15	15N130	RDMACSCR 10-24UNC2A X 1/2 SS18	
B	16	15G121	HXCAPNUT 10-24UNC2 #3266BR NKL	
B	17	24G018N	ROLLED WASH.194ID NYLTITE 10W	
B	18	SA 02 066	*COVER ASSY=SUPPINJ	
A	101	AWS30203	ASSY=3022F8 5COMP SUPPLY	
A	102	27A082	HOSECLAMP 2.5625-3.5CADSC#HS48	
A	103	02 03870B	FLEXTUBE=5COMP 2.5"ID X 8"LG	
A	104	27A070	T-BOLT HOSECLAMP 1.94"-2.25"	
A	105	60E006B	PVC TUBING (BRAID)3/8IDX.60D	
A	106	27A057	HOSECLAMP 1/2"-.9062"CADPLSCR.	
A	107	15K105	HXCAPSCR 3/8-16UNC2A1.25 GR5 P	
A	108	15G205	HXNUT 3/8-16UNC2B ZINC GR2	
A	109	15U255	LOCKWASHER MEDIUM 3/8 ZINCPL	

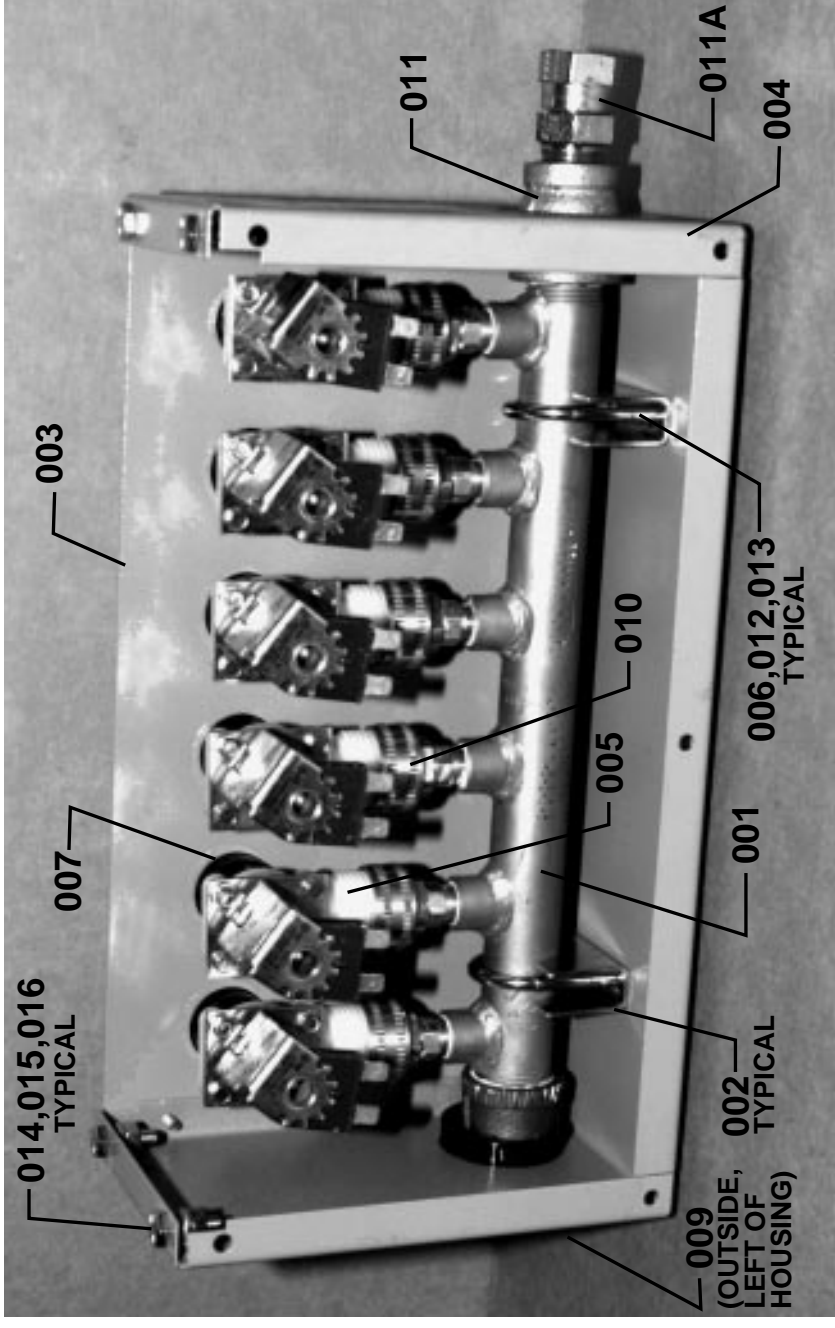


DRAWING

(See other page for parts list,
if applicable.)

ASSEMBLY 6 VALVE SOAP MANIFOLD
30022F8J/F8P/F8W

BMP940052/94202V (Page 1)



THIS MANIFOLD IS LOCATED IN THE TOP, RIGHTHAND, UPPER CROSS BRACE



PELLERIN MILNOR CORPORATION
 700 JACKSON STREET/POST OFFICE BOX 400
 KENNER, LOUISIANA 70063-0400 USA

PARTS LIST

(See other page for drawing.)

ASSEMBLY 6 VALVE SOAP MANIFOLD
30022F8J/F8P/F8W

BMP940052/94202V (Page 2)

ITEM	PART NUMBER	DESCRIPTION	HOW PART IS USED IN ASSEMBLY (Only if pertinent)
00A	AWS30202A	94087B ASSY=6VLV SOAPMFLD 3022F8J	REFERENCE ASSEMBLY
001	W2 03990A	93361B*WLMT=MANIFOLD SUPPLYINJ 6VLV	
002	02 11954	87142B BKT-3/4" PIPE SUPPORT	
003	02 03991	93191B MANIFOLD HOUSING COVER PLATE	
004	02 03992	93406C HOUSING=SUPPLY MANIFOLD 3022	
005	96P013G71	01Z 3/4" 2WAY PLAS-VAL 240V/60C	
006	27A030B	U-BOLT 3/4 PIPE 1/4-20 THD	
007	12P11CSB	SNAPBUSH 1.125MHX.94ID HEYCO #2166	
008	5SCA0PBE	NPT CAP 3/4 BRASS 125#	
009	12P11PHP	HOLEPLUG LPE BLK 1-3/4" HEYCO #2773	
010	53A060H	KNURLED HOSE NUT 3/4-HOSE PH#94GH-12	
011	5SR0P0KNF	NPT RED 3/4X1/2 GALMAL 150#	
011A	51X017	UNION STRADAPT 1/2" PH#0107-8-8	
012	15G164	01Z HX THIN LOCKNUT NYL1/4-20 SS	
013	15U185	FLATWASHER(USS STD) 1/4" ZNC PLT	
014	15K030	HEXCAPSCR 1/4-20UNC2X1/2 GR5 ZINC	
015	15G165	HXNUT 1/4-20UNC2BSAE ZC GR2	
016	15U180	LOCKWASHER MEDIUM 1/4 ZINCPL ***** END OF PARTS LIST *****	

How to Read Parts List

Reference Item Numbers—Items 00A, 00B, 00C, etc., or 00X, 00Y, 00Z, etc., appearing at the top of some parts lists, are for reference and provide:

1. The part number for the entire assembly depicted in the drawing or a major sub-assembly thereof, and/or
 2. The range of machine models this drawing applies to.
- If more than one reference item appears, this usually means this drawing applies to more than one assembly (and thus to more than one range of machines).

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