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Service & Mechanical Parts—

MP1A03CL, MP1A03CR, MP1A03L,MP1A03R

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

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

Please Read

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BIUUUM02 (Published) Book specs- Dates: 20060809 / 20060809 / 20060809 Lang: ENG01 Applic: UUU

About This Service Manual

1. This Is a Two-part Manual

This service manual is divided into two parts—**each with its own table of contents:**

1.1. Part 1: Standard Maintenance Procedures—These include:

- Safety procedures and hazard information for service personnel. **Read before attempting any servicing.**
- Routine maintenance such as scheduled, preventive maintenance and corrective maintenance procedures that can arise as a result of normal wear and operational errors.
- Mechanical troubleshooting, testing, and related servicing.

This part is subdivided into numbered sections (topics and sub-topics) that do not necessarily begin on a new page. **The table of contents for Part 1 references section numbers, not page numbers.**

1.2. Part 2: Mechanical Parts and Repair Procedures—These include:

- Parts documents that depict machine assemblies (sub-systems), identify their components, and in some cases, show how they are assembled or provide related service instructions.
- Procedures for certain types of repairs that may not be straightforward for the service technician.

This part is subdivided into sections corresponding to types of machine assemblies (e.g., housing, pneumatic, etc.) and within each section, documents that always begin on a new page. **The table of contents for Part 2 references page numbers.**

2. Where Other Service Information is Located

This manual provides information on mechanical servicing. Electrical servicing and parts information is provided in the separate **electrical schematic manual.** Many service procedures require service personnel to operate the machine manually. Instructions on manual operation are provided in the separate **reference manual.** A complete set of manuals is provided with the machine, either on CD or in printed form.

3. Contacting Milnor® [Document BIUUUK06]

Your first contact with any question should be your authorized Milnor dealer, but problems or special situations encountered in the field may require consultation with the Milnor factory. Written correspondence can be mailed to this address:

Pellerin Milnor Corporation
Post Office Box 400
Kenner, Louisiana 70063-0400
Telephone: 504-467-9591
http://www.milnor.com

3.1. Ordering Replacement Parts—In most cases your authorized Milnor dealer can provide any necessary parts for equipment you purchased from them. If your dealer is not available or able to help you acquire parts, contact the Milnor parts group.

Milnor Parts
Telephone: 504-467-2787
Fax: 504-469-9777
E-mail: parts@milnor.com

3.2. Customer Service and Technical Support—For your technical questions or comments about Milnor equipment, contact your Milnor dealer first. If your dealer is unable to respond, the Milnor customer service group has many years of collective experience with our equipment. These men and women will give you the best possible answer to your question.

Milnor Customer Service
Telephone: 504-464-0163
Fax: 504-469-9777
E-mail: service@milnor.com
www.milnor.com (Customer Service)

3.3. Service Seminars—Milnor offers service seminars to help train personnel in the maintenance and repair of Milnor equipment. These seminars are focused on various machine types and have been held in many locations. For information about upcoming seminars, contact the Milnor training group.

Milnor Training
Telephone: 504-712-7725
Fax: 504-469-9777
E-mail: training@milnor.com

3.4. Warranty Information—Your Milnor dealer can address most warranty claims. However, if you have concerns or questions beyond the scope of your dealer, please contact our warranty group.

Milnor Warranty Administrator
Telephone: 504-712-7735
Fax: 504-469-9777
E-mail: service@milnor.com (Attention: Warranty)

3.5. Equipment Manuals—If you have suggestions or questions about any part of this manual or any other documentation included with your machine, the Milnor technical publications group can assist you.

Milnor Technical Publications
Telephone: 504-712-7636
Fax: 504-469-1849
E-mail: techpub@milnor.com

— End of BIUUUM02 —

Part 1

Standard Maintenance Procedures

A table of contents follows this page. Locate information by section number, not page number.

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Chapter 1
Safety for Service Personnel

BIUUUS27 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

1.1. Safety—Single Stage Membrane Press

1.1.1. 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.

1.1.1.1. **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.

1.1.1.2. **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.

1.1.1.3. **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.

1.1.1.4. **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.

1.1.1.5. **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.

1.1.2. 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.

CAUTION 3: Crush and Entrap Hazards—The bell will crush your body or limbs if it descends while you are under it. Bell can descend with power off or on.

- Do not reach into the machine housing or frame.
- Use the factory supplied gaff-hook to move objects inside the housing.

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

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

CAUTION 4: Fall, Entangle, and Strike Hazards—Machine motion can cause you to fall or become entangled in or struck by nearby objects if you stand, walk, or ride on the machine. Shuttles and conveyor belts move automatically.

- Keep yourself and others off of machine.

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

1.1.4.1. Damage and Malfunction Hazards

1.1.4.1.1. Hazards Resulting from Inoperative Safety Devices

WARNING 5: 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 6: 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 7: 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.

1.1.4.1.2. Hazards Resulting from Damaged Mechanical Devices

WARNING 8: 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.

1.1.4.2. Careless Use Hazards

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

WARNING 9: Multiple Hazards—Careless operator actions can kill or injure personnel, damage or destroy the machine, damage property, and/or void the warranty.

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

CAUTION 10: Goods Damage and Wasted Resources—Entering incorrect cake data causes improper processing, routing, and accounting of batches.

- Understand the consequences of entering cake data.

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

WARNING 11: 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 12: 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.

CAUTION 13: Crush Hazards—The bell will crush your body or limbs if it descends while you are under it. Bell can descend with power off or on.

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

— End of BIUUUS27 —

BIPPMS01 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

1.2. Safe Servicing—Vital Information for Personnel Who Maintain and Service the Single Stage Press

This document supplements document BIUUUS27 “Safety—Single Stage Membrane Press” and the safety manual for service personnel. It provides important information regarding:

1. the normally guarded hazards that service personnel must protect themselves and others from in the course of their work and,
2. maintenance issues that can cause costly machine damage and down time.

Do not service the machine until you have read and understand this, and all referenced safety information.

1.2.1. Automated Laundering System Hazards

The press, which is part of an automated laundering system, is located within a protected (usually fenced) area (see safety manual and document BISUUI01 “Proximity Safeguarding for Automatic Shuttle Conveyers” in the installation manual). This enclosure protects personnel from the shuttle conveyor strike and crush hazards described in the safety manual. When you enter this area to perform maintenance, you are responsible to ensure that your work does not compromise the protections provided by the safety fencing.

1.2.2. Door Interlock Bypass Hazards

The press is equipped with a guarded key switch that permits you to operate the press with the normally interlocked access doors open. The bypass procedure, which exposes the normally guarded ram, can, and internal conveyor, is only for maintenance and must never be used during operation. Nor must operators be given access to the key. Use this procedure in strict compliance with document BICP1S01 “SAFETY ALERT for Owner/Managers and Maintenance Personnel: Using the Door Interlock Bypass Key Switch”, in the reference manual and ensure that all personnel understand the hazards associated with these powerful, moving components.

Safety supports are provided for working on the can and ram. Use these safety tools in accordance with document BIUUUS06 “How to Use the Safety Stands...”

WARNING 14: Crush and Sever Hazards—The can and ram move independently. During operation, these components move without warning. These components can also drift down with power off. Any of several closing gaps will crush or sever body parts.

- Proceed only if a qualified service technician, knowledgeable in press manual operation.
- Use the door interlock bypass key switch in strict compliance with the instructions.
- Install the safety supports and lockout/tagout power before reaching into, or working under the can or ram.
- Ensure that personnel and equipment are clear of the press before operating the machine.
- Be prepared to use emergency stop switches.

1.2.3. Top-of-press Hazards

Keep yourself and others off of the press top plate except as stated in the following safety alert message.

CAUTION 15: Multiple hazards—Various components above the press top plate move or become hot or energized. Hydraulic piping may leak. Working area is tight and may be slippery. When maintenance work necessitates getting on top of the press:

- Ensure only qualified service personnel perform top-of-press work.
- Identify and stand clear of components that move (such as the diaphragm rod) or become hot (such as the pump and motor).
- Use safe, appropriate equipment for getting on and off of the machine.
- Ensure solid footing and guard against slippery surfaces. Wash surfaces with detergent.

1.2.4. Hydraulic System Hazards

Milnor single stage presses employ a powerful, high pressure hydraulic system. Because such systems pose special hazards, only service technicians with an in-depth knowledge of hydraulics should service this system. Service technicians must be able to read and understand the hydraulic system explanation and schematic provided in document BIPPMF01 “How the single Stage Press Hydraulic System Works.”

WARNING 16: Crush and Machine Damage Hazards—Removing a drain plug or disconnecting certain piping will release oil and cause an unrestrained ram or can to fall.

- If you do not fully understand the consequences, do not tamper with hydraulic parts.
- Use safety supports.

WARNING 17: Puncture Wound and Poison Hazards—Oil leaking out under high pressure can puncture skin causing serious injury, gangrene or death.

- Do not touch hoses, pipes, or fittings, except in accordance with the service procedures.
- If injured, seek emergency medical help. Immediate surgery is required to remove oil.

CAUTION 18: Risk of costly damage—Hydraulic system servicing requires specialized knowledge and skills. Inexperienced handling of unanticipated problems can destroy the pressure pump or other components. Pressure pump must be primed before commissioning and following certain service work; otherwise, it will quickly burn out.

- Do not service or adjust hydraulic components without appropriate expertise.

1.2.5. Risks When Using *Manual* Mode

Virtually all service procedures require service personnel to operate the press manually. Do not try to learn manual operation as you go. Thoroughly familiarize yourself with these procedures, which are explained in the reference manual, so that you will be comfortable with them when performing press maintenance.

Many procedures require two technicians: one technician operates the controls while the other performs the servicing. These personnel must be able to clearly communicate and be aware of each other's activities at all times, to ensure safe working conditions. Manual operation bypasses certain safeguards.

Notice 19: For safety and convenience—Avoid manually loading goods.

- If the service procedure must be performed with goods in the machine, permit the press to accept a load of goods automatically, then take the machine off-line.
- If it becomes necessary to manually load or adjust goods, use extreme caution. Always follow the published safety precautions (see safety manual).

Notice 20: Risk of damage and misalignment—Moving the ram through the bottom of the can will cause the diaphragm to forcefully rub against the can, possibly causing damage. This does not occur in automatic operation.

- If the maintenance necessitates placing the can up and the ram down: 1) lower the can onto the press bed, 2) lower the diaphragm onto the press bed, 3) raise the can.
- If goods become jammed between the ram and can, withdraw the ram through the **top** of the can. Attempting to push the ram through the bottom will only jam the goods tighter.

1.2.6. Risks from Inattention to Maintenance or Alarms

The best way to avoid costly machine damage and downtime is to abide by the preventive maintenance schedule. The next best measure is to address the warning sign of an impending problem immediately. Educate operator and maintenance personnel to the warning signs addressed by the following:

CAUTION 21: Risk of Early Diaphragm Failure—The diaphragm will stretch too much or tear, reducing service life if it cannot properly conform to the goods. This occurs when it is contains the wrong amount of water. The diaphragm must be filled at minimum, every 40 hours of operation, but **more often if it shows signs of leaking.** See document BIPPMM10 “How to Fill and Maintain the Diaphragm” and reference card B2T2006011.

Notice 22: Attend to alarms—The hydraulic system is equipped with temperature, oil level, and filter pressure alarms

- To avoid damage and preserve the warranty, service machine as soon as an alarm occurs.

Notice 23: If the receiving chute and can assembly becomes “jammed,” STOP!—Before returning to normal operation, inspect for, and correct damage and/or misalignment. See document BIPPMM09 “Servicing a Misaligned ("Jammed") Can Assembly.”

— End of BIPPMS01 —

BICP1S01 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

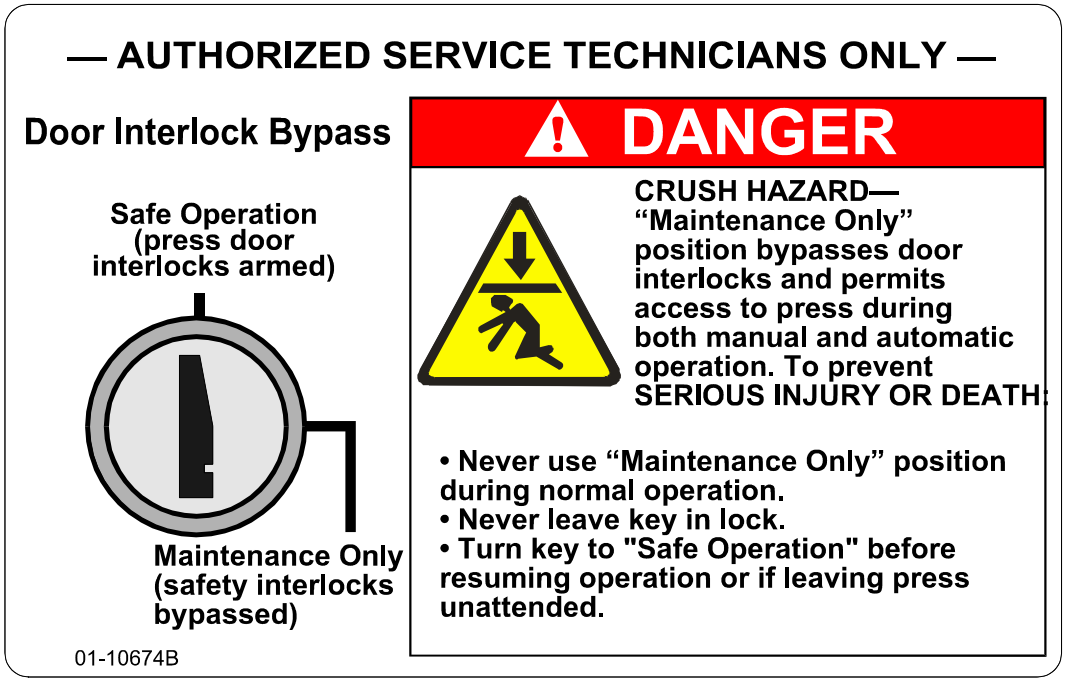
1.3. SAFETY ALERT for Owner/Managers and Maintenance Personnel: Using the Door Interlock Bypass Key Switch

The hand-operated access doors on this machine are equipped with safety lockout switches that disable the machine if a door is opened. The Door Interlock Bypass key switch permits bypassing this safety feature to allow access to certain moving parts during required maintenance procedures. This key switch, located inside the low voltage control box, is shown in Figure 1.

DANGER 24: Crush Hazard—The "Maintenance Only" position bypasses door interlocks and permits access to moving parts during both manual and automatic operation. **To prevent serious injury or death**, comply with, or ensure compliance with the following:

- **Never use the machine for normal operation with this switch in the "Maintenance Only" position.**
- **Never use this switch to clear faults or for any operational function.**
- **Use this switch *only* if you are a trained, authorized service technician**, and only when performing maintenance that requires immediate access to moving parts normally shielded by the doors.
- Always turn the switch to the "Safe Operation" position **and remove the key** before resuming normal operation or stepping away from the machine.
- Keep the Door Interlock Bypass key secured away from machine operators and all other personnel who do not fully understand the results of using it.
- Keep all electrical and control cabinets closed and securely latched. Keep control cabinet keys away from untrained employees.

Figure 1: Door Interlock Bypass Key Switch and Safety Placard



— End of BICP1S01 —

BIUUUS06 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

1.4. How To Use the Safety Stands and Safety Bars on Single-stage Press

These machines are provided with two safety stands and two safety hangar bars (painted red) for maintenance. After the ram is raised, the hangar bars are connected between the platen and the press top plate. After the can is raised, the stands are placed under the can (but not under the ram). Use the safety stands and safety bars to perform maintenance on the machine while the can and ram are raised. A location is provided on the machine for stowing the safety stands when not in use.

WARNING 25: Crush Hazard—The safety stands and bars provide protection against the un-powered drifting down of the can or ram during maintenance in the event of a leak in the hydraulic system. **They are not intended to restrain the can or ram from coming down under power.**

- Never work **under** the raised can and ram unless the safety bars and both safety stands are installed and power is locked out/tagged out. Do not work **near** the raised can and ram with power on unless the safety bars and both safety stands are installed, except where called for in the maintenance instructions.
- Do not attempt to rest the can on the safety stands by lowering it under power. Use care not to manually command the can or ram down with the stands or bars in place.
- When working near the installed safety stands use care not to knock the stands out of position.
- Install these safety components using the procedure prescribed in this document.
- Maintain these safety components in good condition.
- When not in use, stow the safety stands in the location provided on the machine and designate a convenient, secure location to stow the safety bars (see Note 1).

Note 1: You will probably want to designate a single storage area for all loose items supplied with the press, including the safety bars, the disk used when filling the diaphragm, the fill hoses, and the gaff hook.

Figure 2: Safety Stands for Single-stage Press Models

If the ram is to be secured in the full up position for the maintenance to be performed, do this first, as follows:

1. At the controls, use the *Manual* mode to lower the can, if it is up.
2. At the controls, use the *Manual* mode to raise the ram.
3. The safety bars attach between two eye bolts—one on the platten and one on the press top plate. Attach the safety bars as shown in Figure 3. Refer to the safety stands parts drawings for a more detailed depiction of the installed safety bars.
4. Depending on the type of maintenance, it may be necessary to move the can before locking out power to the press. However, **lock out/tag out power before working under the can and ram.**

Figure 3: Safety Bars for Single-Stage Press Models

Install the safety stands as follows:

1. At the controls, use the *Manual* mode to raise the can.
2. In this step, install the stands through the nearest door; do not reach across the bed. Referring to the first figure, place the safety stands on opposite sides of the can (180 degrees apart). Refer to the safety stands parts drawing for a more detailed depiction of the installed stands. Always use both stands. **Do not attempt to rest the can on the safety stands by lowering it under power** (even though it may drift down onto the stands).
3. Lock out/tag out power to the machine.

— End of BIUUUS06 —

Chapter 2
Routine Maintenance

BIPPMM05 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

2.1. Single Stage Press Preventive Maintenance

Notice 26: Understand the press servicing hazards—Before performing press maintenance, review document BIPPMS01 “Safe Servicing...”

2.1.1. Lubricant Specifications

Lubricants used on the press must adhere to the following:

Table 1: Lubricant Specifications

Component	Lubricant	Approximate Quantity			
		MP16xxxx Models		MP1Axxxx Models	
		Tank Only	Entire System	Tank Only	Entire System
Hydraulic system	Shell Tellus 68 or equivalent	55 gallons (208 liters)	70 gallons (265 liters)	98 gallons (371 liters)	115 gallons (435 liters)
Bearings	Shell Alvania LP	--			

2.1.2. Preventive Maintenance Schedule and Maintenance Locations

Table 2 and the figures following it (referred to in the table) describe the routine maintenance needed to keep the press functioning properly and to obtain normal service life. Some common maintenance procedures called for in the schedule are provided in the remainder of this document. Others are explained throughout the service manual. Some preventive maintenance must be performed with the machine running. However, **any maintenance that reqires access to normally guarded areas must be performed in compliance with the safety support and lockout/tagout requirements stated in the safety instructions.**

CAUTION 27: Machine Damage—Failure to perform the maintenance described herein will cause parts to wear prematurely and may void the warranty on these parts.

Table 2: Preventive Maintenance Schedule

Component	Action	See	Frequency
Hydraulic system	Check gauges on gauge cluster. See BIPPMT02 "Setting Single Stage Press Pressures" for proper values (see Note 2 and Note 5).	Figure 4 (items 1, 2, 3)	Daily
	Check oil level and oil temperature with ram up and can down: 140 F (60 C) maximum temperature.	Figure 4 (items 4, 5)	
	Check filter pressure gauge: 25 psi (1.76 Kg/cm sq.) maximum.	Figure 4 (item 7)	
	Look at oil condition (see Section 2.1.3 "About the Press Hydraulic Oil").	Figure 7	40 oper. hours
	Check hoses and connections for leaks, deterioration.		Weekly
	Change oil filter.	Figure 4 (item 6)	Every 500 operating hours
	Have oil sample tested by a reputable testing facility for: viscosity, the presence of insolubles, acid number and spectrographic wear analysis. Retain or replace oil as advised by the testing facility.		Every 2000 operating hours
	Replace system oil breather and moisture filter.	Figure 8	Annually
	Change recirculation oil filter (MP1Axxxx models only): pn#27E7112B	Figure 6	Every 500 operating hours
Screens	Inspect and clean out press screens.	Figure 10	Daily
Oil cooler air filter	Slide filter out and hose filter off. Direct the water stream opposite the air flow arrow stamped on filter.	Figure 7	Weekly (Note 4)
Goods conveyor	Hose off bed with water.	Figure 10	Daily
	Inspect belt condition, tension and tracking (see BIPPMM12 "Servicing the Integral Conveyor"). Inspect and grease bearing fittings (motor side), as necessary.	Figure 10	
Diaphragm	Refill diaphragm via the quick disconnect hoses (see document BIPPMM10 "How to Fill and Maintain the Diaphragm" and reference card B2T2006011).		Every 40 operating hours min. (see Note 3)
	Check diaphragm attachment bolts for tightness. Re-torque as necessary (see BIPPMM03 "Installing the Milnor Diaphragm...")		Weekly
	Check for rubbing against can (see next item)		
Receiving chute and can assy.	Verify that can descends flat and level on press bed. Adjust if required (see BIPPMM09 "Servicing a Misaligned (Jammed) Can Assembly").		Weekly
Discharge door	Check door pressure gauge: 22—25 Psi (1.54—1.75 Kg cm sq.)	Figure 9	Weekly
Prefill pilot	Check pressure gauge: 2000 Psi (139.9 Bar)	Figure 5	
Suppressor (optional)	Check pressure gauge: 2300 Psi (159 Bar). See Section 2.1.4 "Testing the Suppressor Pre-charge "	Figure 11	Annually
Belt brush	Hand wipe off lint and debris	Figure 10	Monthly

Note 2: System pressure is machine model and program-dependent.

Note 3: Diaphragm leaks are difficult to detect and are a leading cause of diaphragm failure. Topping off the diaphragm every 40 hours (or more frequently, if needed) can prevent premature diaphragm failure.

Note 4: Initially inspect weekly. Adjust cleaning schedule according to laundry lint load.

Note 5: Consult factory before ordering a replacement hydraulic pump from others. Pumps are modified at the factory for use in single stage presses. These modifications are not recorded on the pump data plate.

Figure 4: Primary Hydraulic Gauges

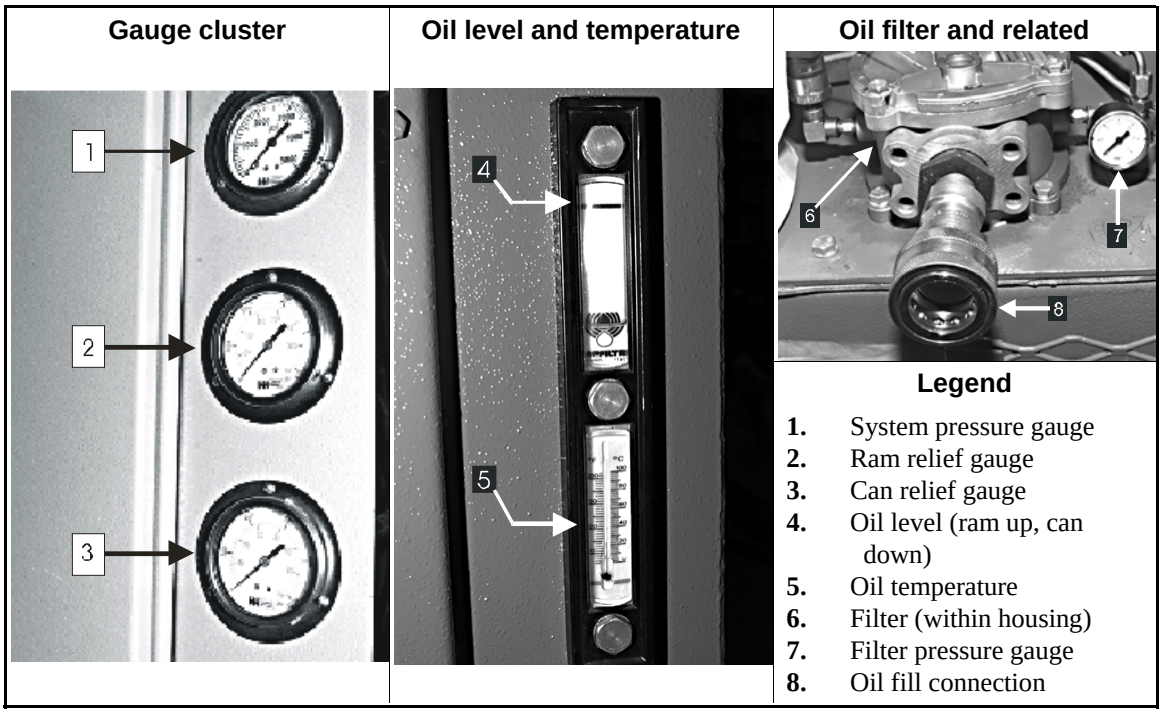


Figure 5: Prefill Pilot Pressure Gauge

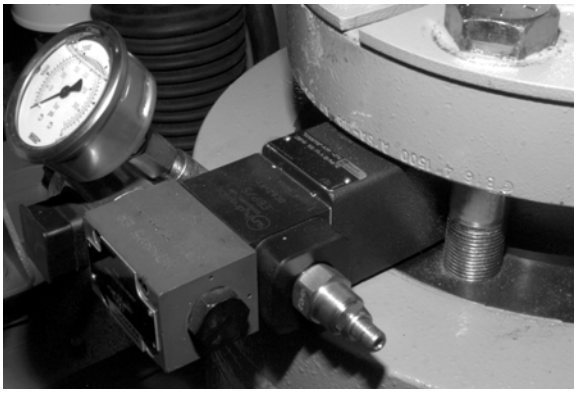


Figure 6: Recirculation filter (MP1Axxxx models)

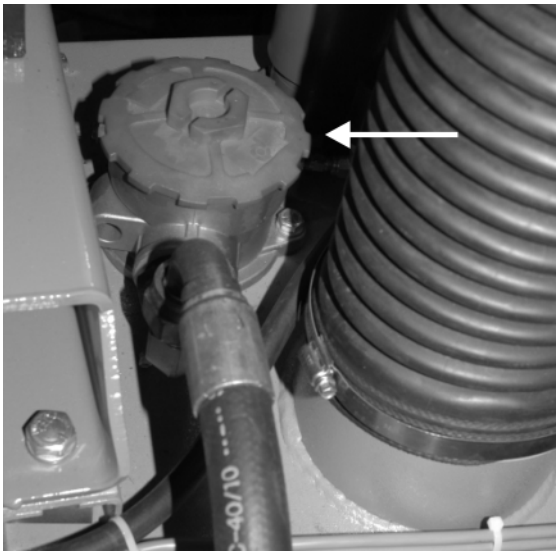
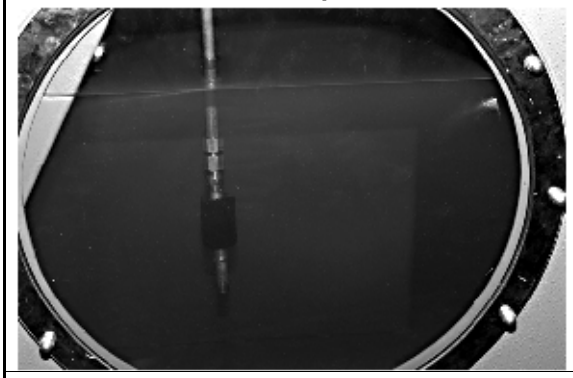
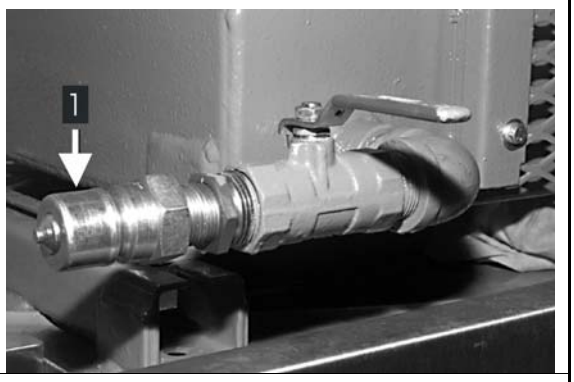


Figure 7: Miscellaneous hydraulic oil maintenance items

Oil view port



Tank drain valve



Oil cooler air filter

Legend

1. Oil quick disconnect in storage position

Figure 8: Breather/Moisture Filter

Figure 9: Discharge door pressure regulator, gauge

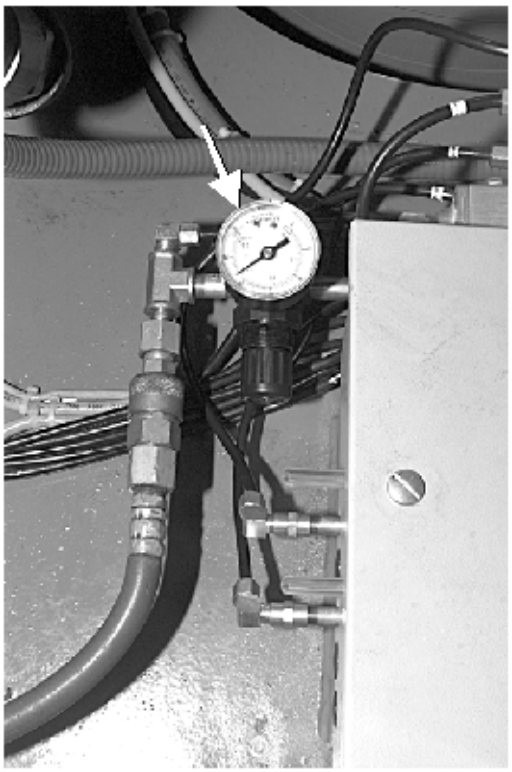
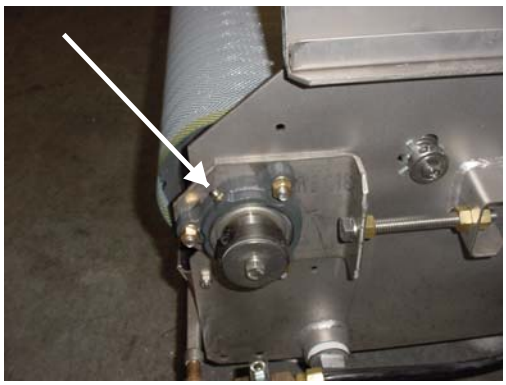


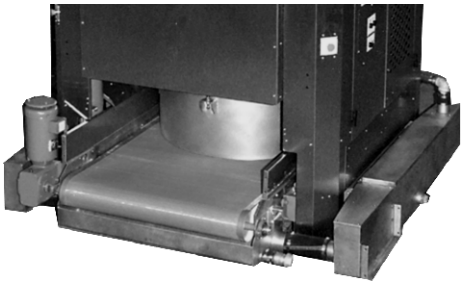
Figure 10: Conveyor maintenance items

Belt grease fitting

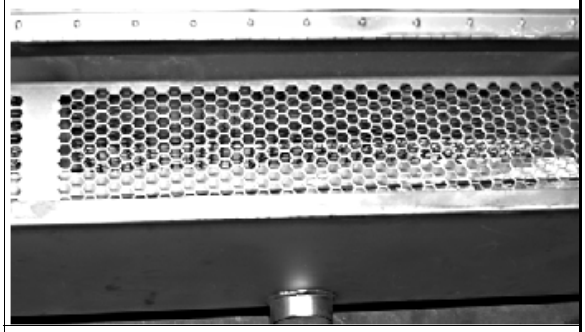


Belt brush

Press bed and conveyor belt



Press screens



Legend

1. Grease fitting

2.1.3. About the Press Hydraulic Oil

Obtaining normal service life from the press hydraulic components depends on maintaining hydraulic oil quality and quantity.

CAUTION 28: Burn Hazard—Hot oil can cause serious burns.

- Allow oil to cool before changing oil.

CAUTION 29: Machine Damage— Mixing different oil types and qualities can cause bearing and seal damage.

2.1.3.1. Inspect Oil—Visually inspect oil after the first forty hours of operation. Afterwards, inspect oil every eighty hours of operation. Evaluate oil quality and take appropriate action, as explained in Table 3, which follows:

Table 3: Assessing Oil Quality

Oil Appearance	Action or Comment
• Clean and clear with few deposits	Permissible to extend time between inspections.
• Slightly dark with no sediment	Oil is normal. Oil darkens with use.
• Very dark with sediment	Filter the oil.
• Contains floating or settled impurities	Filter the oil. Clean the system. Inspect the filter(s)
• Cloudy and discolored with visible water separation	Drain off water. Inspect oil morte frequently.
• Milky with air bubbles	See Section 2.1.3.2 "Air Leaks In the Hydraulic System "
• Dark with sediment and smells sour	Change oil immediately and clean the system.

2.1.3.2. Air Leaks In the Hydraulic System

2.1.3.2.1. Symptoms—Air leaks in the hydraulic system leads to oil leakage and reduced pump life. Although milky oil is a primary symptom of air leaks, some other symptoms are:

- Loud noises as the ram lifts after the pressing cycle. These noises can be best described as "marbles rolling down a pipe" instead of the normal sound of operation.
- Connections loosening and leaking.

2.1.3.2.2. Causes——Likely causes of air in the hydraulic system are:

A loose or leaking gooseneck pipe plug. Since this plug is on top of the gooseneck, air can be sucked in during operation without appearing to leak oil. Fix this by removing the plug, coating it with Loctite 569 ™ thread sealant (or equivalent), and re-installing the plug.

A loose or incorrectly seated gooseneck pre fill flange (machines produced after 5/1/1999 use back-up plates on the flange for additional clamping force). Loosen the flange bolts, step on the flange and use your body weight to center the flange, then tighten the bolts to the correct torque.

2.1.3.2.3. How to Test for Air Leaks—With no air leak, oil will remain in the gooseneck. After a several hour shutdown, remove the gooseneck pipe plug. If you do not detect a strong suction for several seconds as the oil drains to the tank, an air leak exists and must be repaired.

2.1.3.3. Oil Add and Change Procedure

CAUTION 30: Risk of oil spillage—If oil is "topped off" in the tank with the ram down, far too much oil will be added and the oil will overflow when the ram is raised.

- Change oil with ram raised and supported by diaphragm safety bars.
- If OIL LEVEL LOW appears during operation, add oil only until the message clears, then raise the ram and add oil until the tank gauge (Figure 4) indicates proper oil level.

Using the *Manual* mode, raise the ram and can fully, then install the diaphragm safety bars. After the ram and can are raised, and safety bars are in position, change the oil as follows:

1. Remove the oil quick disconnect from the oil tank (Figure 7). Use the tank drain valve to drain oil. Do not loosen hydraulic valves or hoses.
2. If the used oil contains debris, clean oil tank with lint free cloth. Do not use solvents, water, or soap to clean tank.
3. If the main oil filter is dirty, replace it. All oil added to the tank passes through the oil filter.

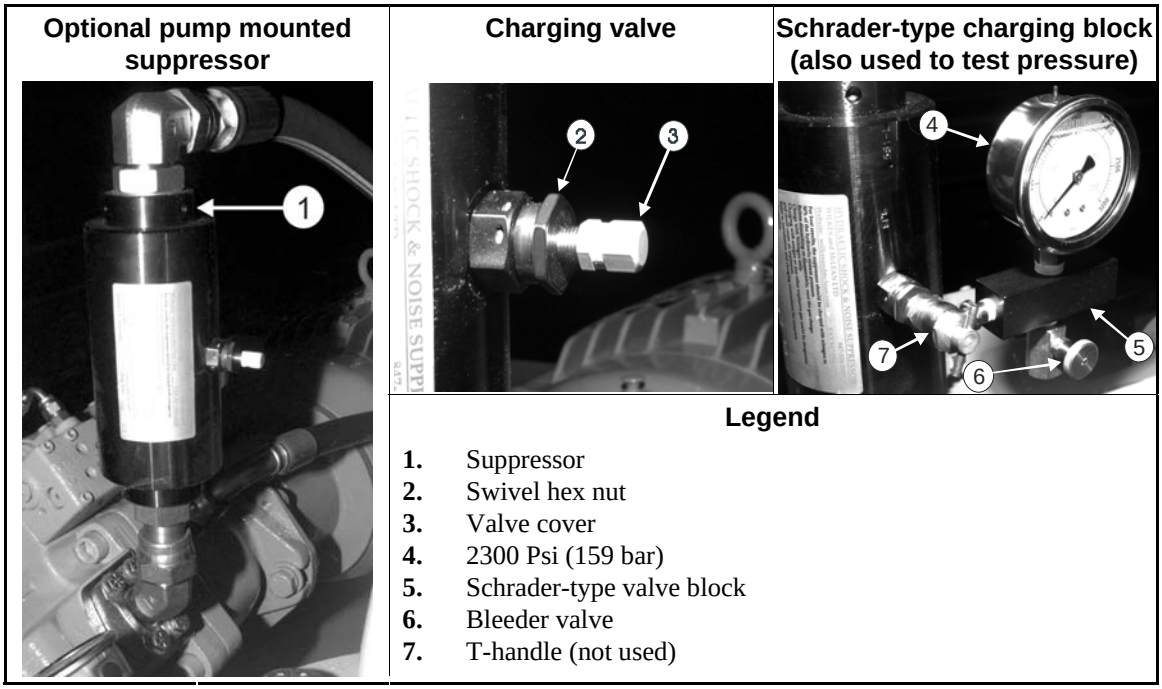
4. Using the provided oil quick disconnect (Figure 7), fill the tank (approximately 55 gallons, 208 liters) to within one inch (25.4 mm) of the top of the sight glass.
5. Reinstall oil quick disconnect on the tank drain. Installing the oil quick disconnect on the tank drain prevents oil spillage if the drain valve is accidentally opened.

2.1.4. Testing the Suppressor Pre-charge

The optional suppressor (Figure 11) uses a nitrogen charged screen and diaphragm to suppress noise and surges. Periodically check the pre-charge gas pressure inside the suppressor as follows:

1. Locate suppressor charging valve (Figure 11).
2. Remove the valve cover from the valve.
3. Prepare the Schrader-type charging valve block for use by removing the charging hose and installing 1/4" plug in its place. Otherwise, gas will fill the hose during the testing process, significantly reducing the charge inside of the suppressor.
4. Connect the Schrader-type block to the suppressor charging valve (Figure 11).
5. Make sure the gauge, 1/4" hole plug, bleeder valve and block connections are tight.
6. Turn the swivel hex nut counterclockwise approximately three turns. This opens the internal poppet.
7. Read the charge on the gauge. Pressure must be approximately 2300 psi (159 bar).
8. If the charge is low, see “Charging the Suppressor...BIPPMI03,” in the installation manual.
9. After reading the charge, turn the swivel hex nut clockwise approximately three turns to close the internal poppet.
10. Lock swivel hex nut (approximately 50-70 inch/pounds or 5.7-7.9 Newton/meters).
11. Remove the Schrader-type charging valve block and re-install valve cover.

Figure 11: Suppressor Charging and Pressure Testing Items



— End of BIPPMM05 —

BIPPMM10 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

2.2. How to Fill and Maintain the Diaphragm

This procedure applies to MP1Axxxx single stage press models and to MP16xxxx models manufactured after date code 99323 (see machine nameplate), which have a brown diaphragm manufactured by Milnor®. This document supersede previous versions of this document (English and Spanish), tag # B2T2003005, and the video file `Filling the diaphragm_2.wmv`.

2.2.1. About Diaphragm Water Volume

CAUTION 31: Risk of premature diaphragm failure—Operating with an under-filled or overfilled diaphragm will cause the diaphragm to quickly deteriorate and fail. Milnor only warrants the diaphragm against premature failure caused by a manufacturing defect.

- Maintain proper water volume. Do not under-fill or overfill.

2.2.1.1. Why Water Replenishment and Monitoring are Critical—The diaphragm must contain the correct amount of water for normal service life. All diaphragms lose some water, but if it has a puncture or a bad seal, it can become severely under-filled with no obvious indications.

2.2.1.2. How To Monitor and Compensate for Excessive Water Leakage—A reliable and simple method, provided as part of the filling ("topping-off") procedure, is as follows: Measure how long it takes from when you begin admitting water to when water begins flowing from the drain hose. If, for example, you measure 10 seconds on a new, but previously filled diaphragm, and after obtaining roughly the same duration on several subsequent fillings, you begin to measure 20 seconds, suspect an abnormal leak. In such case, increase filling frequency until you again, consistently measure the original norm (10 seconds in this example).

2.2.1.3. How Often to Fill (Top off) the Diaphragm—It is vital to perform the filling procedure at minimum, every 40 operating hours, to replenish normal water loss and monitor for abnormal leaking. Increase this frequency as needed to compensate for any increase in water loss.

Notice 32: Small uneven loads will reduce the life of a diaphragm. In these cases, diaphragm life can be lengthened by rotating the diaphragm 180° every 300 hours of operation.

2.2.2. Precautions and Preparations

Table 4: Equipment Needed for Diaphragm Filling Procedure

Qty.	Description	Supplied with press?	Part Number	
			MP16xxxx Models	MP1A03xx Models
2	Can safety stand	yes	07 30093	07 10385
1	Shaping disk	yes	X7 10055	X7 10055A
2	Fill/drain hose and fittings	yes	See parts document BMP050068	
1	Gaff hook	yes	27A900	
1	Straight edge	no	--	
1	Watch or stop watch (measure fill time)	no	--	

DANGER 33: Crush and Sever Hazards—The can and ram move independently. During operation, these components move without warning. These components can also drift down with power off. Any of several closing gaps will crush body parts.

- Proceed only if a qualified service technician, knowledgeable in press manual operation.

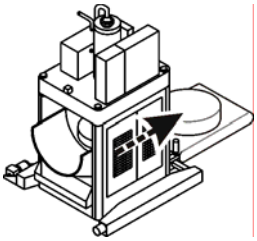
- Use the door interlock bypass key switch in strict compliance with the instructions.
- Install the safety supports **and** lockout/tagout power before reaching into, or working under the can or ram.
- Ensure that personnel and equipment are clear of the press before operating the machine.
- Be prepared to use emergency stop switches.

2.2.3. Diaphragm Filling (topping off) Procedure [Document BIPPMM14]

Tip: Once you are familiar with this procedure, use quick reference card B2T2006011.

2.2.3.1. Step 1: Set Up

a) Shut down the loading device (e.g., tunnel), allow the press to empty, then access *Manual* mode.

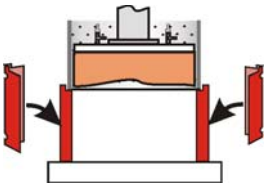


If you place the press in *Manual* mode (SKIP TO + MANUAL) as soon as it discharges, the can and ram will both be fully up.

A1: **b) Set the Door Interlock Bypass key switch to *Maintenance Only,* then open the access doors.**

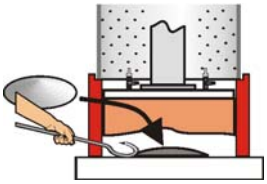
The Door Interlock Bypass key switch bypasses the press's normal operational safeguards. Ensure that bystanders cannot approach the press. See document BICP1S01 "SAFETY ALERT for Owners/Managers and Maintenance Personnel: Using the Door Interlock Bypass Key Switch."

A2: **c) Install the can safety stands.**



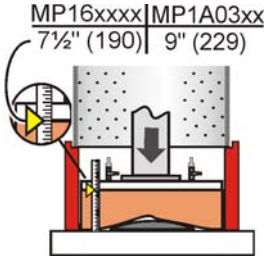
If the can is down, raise it using manual mode 03 to raise the can (0, 3, NEXT, ↑). Ensure that the can safety stands (not the ram safety bars) are properly installed and remain in place for the entire diaphragm filling procedure. See document BIUUUS06 "How To Use the Safety Stands and Safety Bars on Single-stage Press."

A3: **d) Move the diaphragm about 6" (25 mm) above the bed. With gaff hook, put shaping disk under center of diaphragm.**



Access manual mode 07 (0, 7, NEXT) and move the ram up/down with ↑/↓. **Do not place body parts under the diaphragm.** Use the gaff hook to push the shaping disk into position. Use care to center the disk under the diaphragm.

A4: **e) Lower the ram until you measure exactly as shown at right.**



Measure vertically from the press bed to the seam between the rubber diaphragm and metal platen. The bottom of the diaphragm should be just touching the bed. Use the dimension shown at left corresponding to your press model (see nameplate for model).

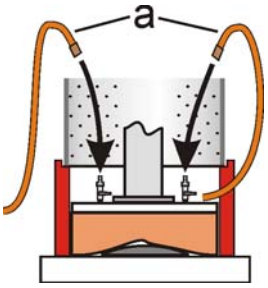
Go to "Step 2: Fill"

2.2.3.2. Step 2: Fill (top off)

With power locked out / tagged out...

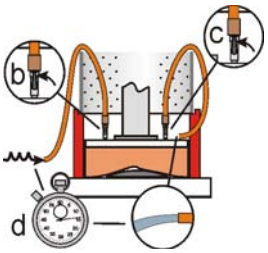
Press must be reliably disabled during this step.

A1: **a) Connect fill and drain hoses.**



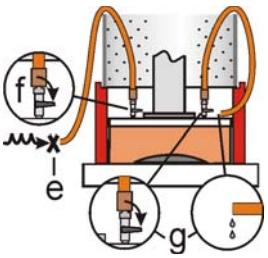
Each hose has a quick disconnect fitting for the diaphragm connection. Connect the fill hose to water but do not open the tap yet. Set the end of the drain hose on top of the platen, as shown.

A2: **b) Open fill valve, c) open drain valve, then d) while timing, run water until it drains steady and bubble-free.**



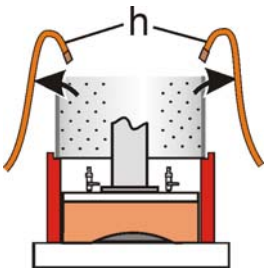
Begin timing when you open the water valve. As soon as water steadly streams from the hose (bubble-free), shut off the fill water and stop timing. Record the fill (top-off) time. You will use this information to determine how often to perform this procedure.

A3: **e) With water off, f) close fill valve, then g) when draining stops, close drain valve.**



After you close the fill valve, allow the diaphragm to continue draining until you observe that the flow has almost completely stopped.

A4: **h) Remove fill and drain hoses.**



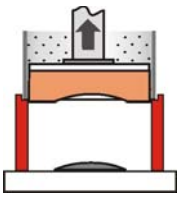
Go to “Step 3: Check”

2.2.3.3. Step 3: Check

With power and *Manual* mode restored...

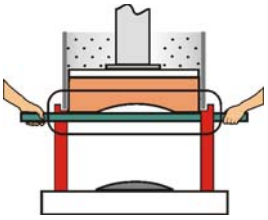
Access the *Manual* mode with SKIP TO + MANUAL.

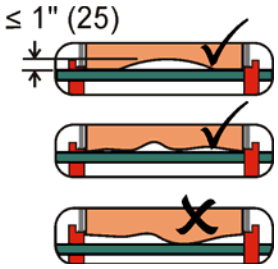
A1: **a) Raise the ram until bottom of diaphragm barely protrudes from bottom of can.**



Use manual mode 07 (0 , 7 , NEXT) to raise the ram (⬆)

A2: **b) Check diaphragm bottom shape with a straight edge held on the sides of, not under the diaphragm.**





A3: **Is the diaphragm properly shaped?**

NO → **Repeat procedure (return to step 1e).**

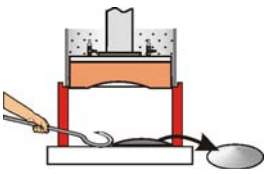
YES

Top two examples, above (✓), are acceptable as long as the indentation does not exceed about 1" (25 mm), estimated visually. The bottom example (χ) is overfilled and the filling procedure must be repeated.

Go to "Step 4: Finish."

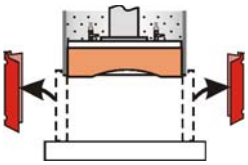
2.2.3.4. Step 4: Finish

a) With the gaff hook, remove shaping disk.



Do not reach under the diaphragm. Push the shaping disk out with the gaff hook.

A1: **b) Remove the can safety stands.**



A2: **c) Set the Door Interlock Bypass switch to *Safe Operation* and close the access doors.**

d) Return the press to serivce.

To return to automatic operation, select manual mode 00 (0 , 0 , NEXT).

— End of BIPPMM10 —

2.3. B2T2006011.cdr

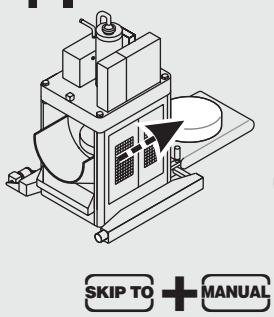
Please see document B2T2006011 , which is inserted behind this page.

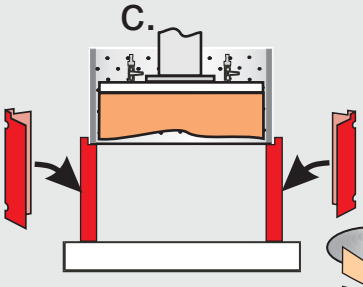
every 40 hours, minimum
ledere 40 uren minimum
chaque 40 heures, le minimum
Alle 40 Stunden Minimum
ogni 40 ore, il minimo

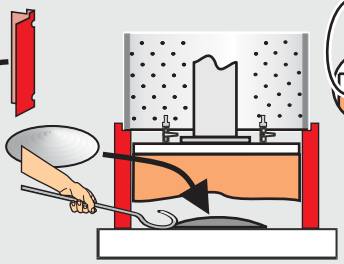
Każd& 40 godziny, minimalny
cada 40 horas, el mínimo
40時間毎に、最低
每 40 小时，最小值

1.

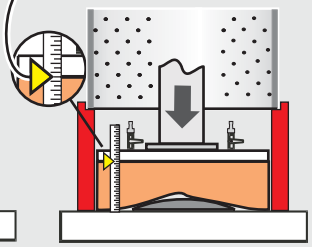
a. b. c. d. e.





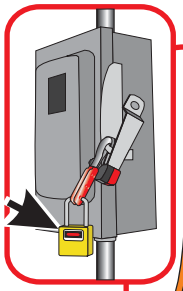


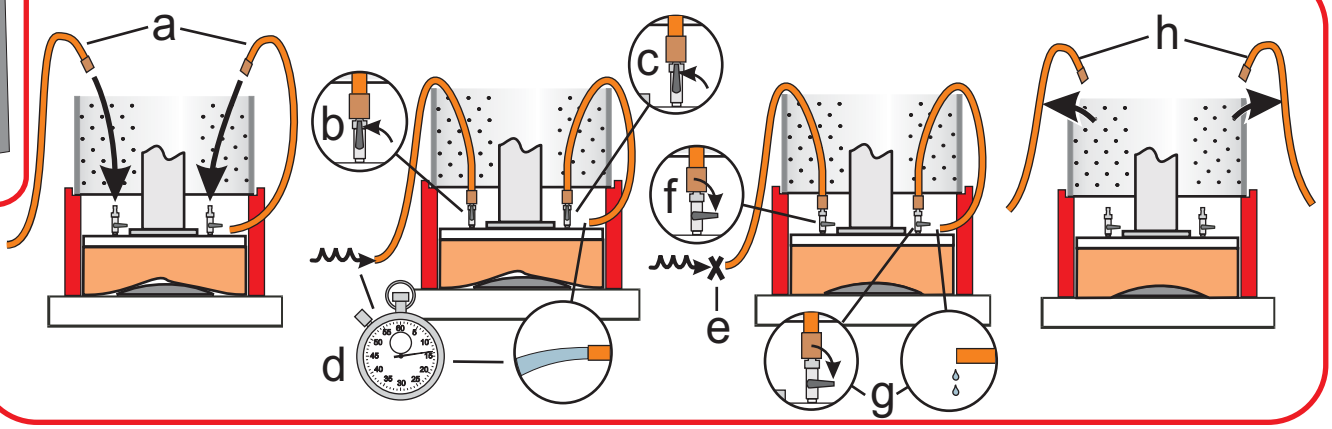
MP16xxxx | MP1A03xx
7½" (190) | 9" (229)



SKIP TO + MANUAL

2.





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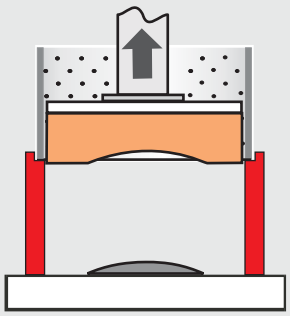

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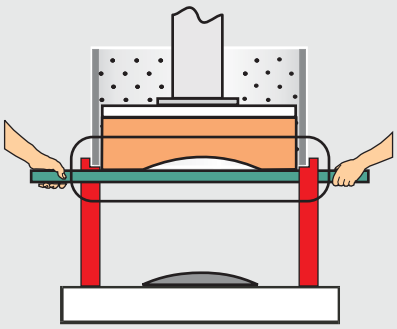

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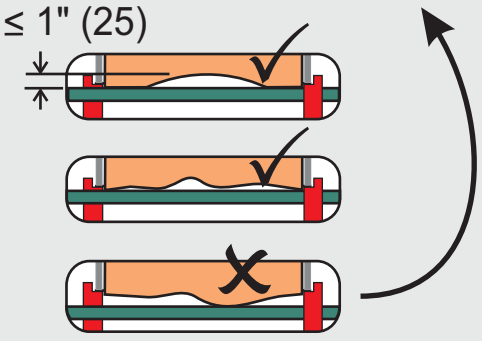

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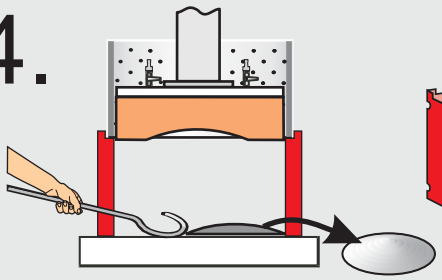

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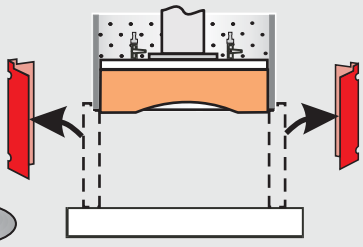

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BIPPMM03 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

2.4. Installing the Milnor® Diaphragm in the Single Stage Press

This document applies to models MP160Axx, MP1604xx, MP1603xx, MP1602xx single stage presses and any MP1601xx press manufactured after date code 99323 (see the machine nameplate). These presses are supplied with a brown diaphragm manufactured by Milnor. MP1601xx models manufactured on or before 99323 are equipped with white diaphragms manufactured by Passat and require document MSSM0953AE “Installing the Passat Diaphragm in the MP1601xx Single Stage Press”.

Notice 34: Understand the press servicing hazards—Before performing press maintenance, review document BIPPMS01 “Safe Servicing...”

WARNING 35: Crush and Sever Hazards—The can and ram move independently. During operation, these components move without warning. These components can also drift down with power off. Any of several closing gaps will crush or sever body parts.

- Proceed only if a qualified service technician, knowledgeable in press manual operation.
- Use the door interlock bypass key switch in strict compliance with the instructions.
- Install the safety supports and lockout/tagout power before reaching into, or working under the can or ram.
- Ensure that personnel and equipment are clear of the press before operating the machine.
- Be prepared to use emergency stop switches.

2.4.1. Preparations

2.4.1.1. Obtain a diaphragm replacement kit from Milnor.—For an MP1601xx, MP1602xx, MP1603xx, or MP1604xx, you will probably need kit KYSSPMRA01, or for an MP160Axx, kit KYSSPMRA02. These kits include a new diaphragm, bolts and washers, o-ring, sealant, Scotch-Brite™ pads, Loctite thread locker 242™, Loctite® Gasket Eliminator 515 (Loctite 518 optionally), Loctite Cleaner/Degreaser, Loctite Chisel Gasket Remover, Loctite Primer N and other necessary parts for installation. These kits have the necessary materials for newer style platens with hex head diaphragm bolts as well as older style platens with 16 recessed socket cap bolts. Other kits are also available, depending on the specific need. Contact the Milnor Parts department for more information.

Notice 36: Use Fresh Materials—Because it is necessary to establish a reliable seal between the platen and the diaphragm, all cleaning and sealing chemicals (provided with the kit) must be fresh. Do not obtain these materials far in advance of the work.

2.4.1.2. Have the necessary tools on hand.—These may include:

- 3/8 - 16 tap (available from Milnor as part number 97C058T)
- 3/8 - 16, extra long pulley tap (available from Milnor as part number 97C058AT)
- Socket wrench set, including a torque wrench for newer style platens with hex head bolts or a hex head wrench set, including a torque wrench for older style platens with socket cap bolts.

2.4.1.3. Have two service technicians on hand.—The diaphragm weighs 135 pounds (61.4 kg) or more, depending on model. It is advisable for two people to handle it. At least one technician must be familiar with the *Manual* mode (manual operation) as explained in the reference manual. Both must understand press safety, as explained in the safety manual and this instruction.

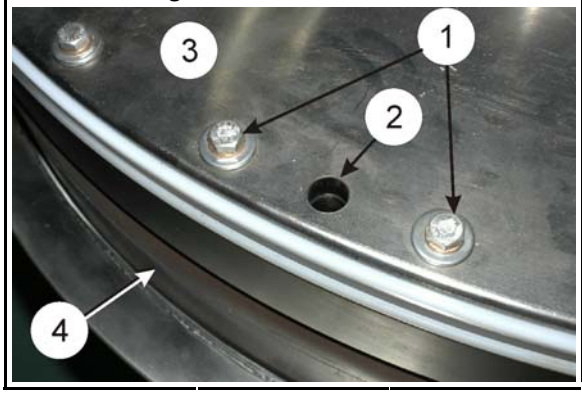
2.4.2. Removing the old diaphragm.

The press must be empty. If the press is operating, allow any goods to transfer out of the machine automatically, then take the machine off-line. Using the *Manual* mode (manual operation):

1. Raise the load/unload doors (if so equipped) and secure them in place. Open the side doors and use the door interlock bypass key switch (in strict compliance with its instructions) to enable operation with the side doors open.
2. Lower the can first, then the ram onto the press bed. Now raise the can fully. This sequence minimizes dragging between the can and ram.
3. Raise the diaphragm approximately two to three inches above the press bed. **Lockout/tagout power** at the external disconnect switch and **install the can safety stands.**
4. Making sure fingers are not under the diaphragm, remove all of the diaphragm bolts (Figure 12) and **discard them**. Two push-off holes that accept a 3/8 - 16 bolt are provided if diaphragm weight alone does not free the diaphragm from the platen.
5. After the diaphragm is free of the platen, restore power and raise the ram. With the ram fully up, **lockout/tagout power and install the diaphragm safety bars.**
6. Pull the old diaphragm free of the bed.
7. If this is the older style platen with recessed socket cap bolts, an o-ring is used between the platen and diaphragm mating surfaces. The o-ring is held in a channel on the the bottom of the platen. Remove the old o-ring.

Figure 12: Diaphragm Bolts and Push-off Hole

Looking Down onto Part of Platen



Legend

1. Diaphragm bolts (newer style platen with hex head bolts shown)
2. One of two push-off holes
3. Platen
4. Diaphragm

2.4.3. Cleaning the Platen and the New Diaphragm

The platen and diaphragm mating surfaces must be clean to form a reliable seal. The bolt holes must be clear of debris, such as Loctite or rubber.

1. Spray the platen sealing surface with a heavy coat of Loctite Chisel Gasket Remover and allow to foam for five minutes. Wipe off with a rag. Repeat as necessary. After cleaning, scrub the platen sealing surfaces and the diaphragm ring with the supplied Scotch-Brite pads to remove rust and other contaminants.
2. Clean the platen bolt holes of residual Loctite and debris before sliding the new diaphragm under the platen.
3. If this is an older style platen, install the new o-ring supplied with the kit.
4. Using the 3/8 - 16 tap, clean out the bolt hole threads in the new diaphragm. This will help prevent diaphragm bolts from seizing or shearing off during installation. **Do not run the tap deeper than 5/8" (16 mm) to avoid damaging the diaphragm material.**

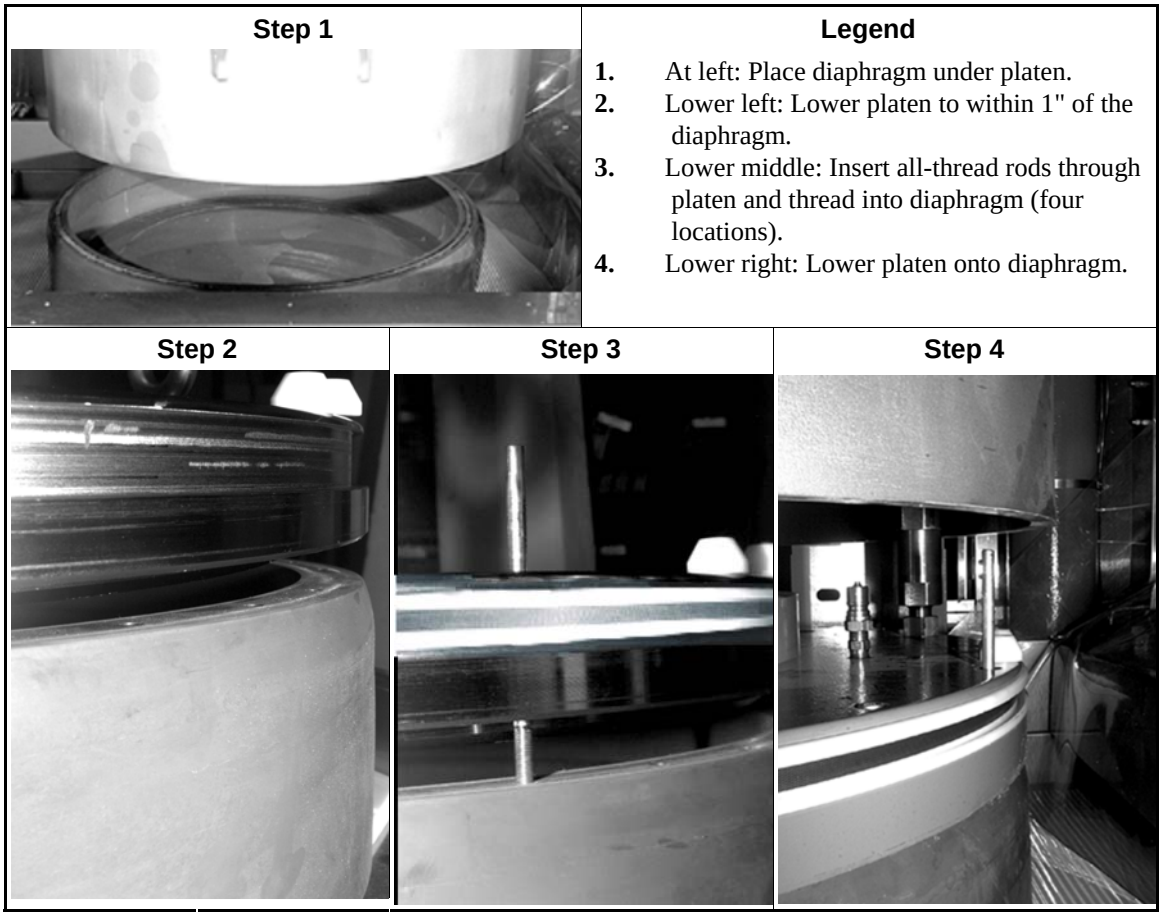
2.4.4. Aligning the Diaphragm with the Platen

Tip: Cover the press bed with paper or cardboard to make diaphragm and platen alignment easier.

Referring to Figure 13:

1. Slide the new diaphragm into place. Visually align the platen and the new diaphragm. Remove diaphragm safety bars and restore power to the machine.
2. Use the *Manual* mode to slowly lower the platen to within 1" (25 mm) of the diaphragm then **lockout/tagout power** to the machine.
3. Insert an all-thread rod (supplied with the kit) through one of the platen bolt holes, as a guide. Position the diaphragm so that the rod aligns with a bolt hole in the diaphragm and thread the rod into the diaphragm. Repeat this with the three remaining all-thread rods at quarter points around the platen.
4. Restore power and use the *Manual* mode to carefully lower the platen until it makes contact with the diaphragm.
5. Test-fit all diaphragm bolts (hex head bolts or socket cap bolts), adjusting the diaphragm position as needed.
6. Remove the diaphragm bolts and rods.
7. Raise the platen, **lockout/tagout power and install the diaphragm safety bars**.

Figure 13: Aligning the Diaphragm with the Platen



2.4.5. Prepare the platen and diaphragm sealing surfaces

1. Inspect and check the expiration dates on the supplied Loctite products. Replace any questionable materials with fresh product to ensure a reliable seal.
2. Spray the bolt areas of the platen and diaphragm with Loctite ODC-Free Cleaner/Degreaser then wipe off with a clean cloth. **Do not touch surfaces after cleaning.**
3. Spray the sealing surface on the underside of the platen with Loctite Primer N. Allow primer to dry for three to five minutes before continuing.
4. Apply a generous bead of Loctite 515 (Loctite 518 optionally) along the metal diaphragm ring (Figure 14). **Do not allow the Loctite 515 to enter bolt holes.** Excess Loctite 515 will squeeze out of the joint as the diaphragm bolts are tightened.

Figure 14: Loctite 515 Applied to Diaphragm Ring

2.4.6. Bolting the Diaphragm

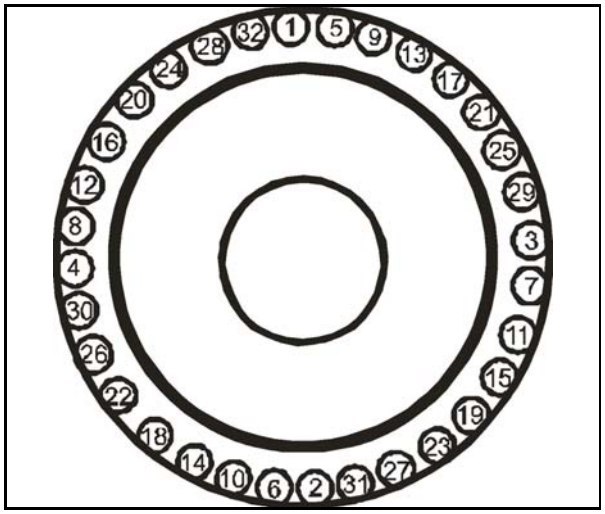
CAUTION 37: Risk of Bolt Failure—Use only the new diaphragm bolts provided with the kit, not the old bolts which have been stressed. In the case of the hex head bolts, the old bolts, which may be stainless steel, must be replaced with the chrome plated bolts supplied with the kit to meet the torque requirements herein.

1. Restore power and remove diaphragm safety bars. Using the *Manual* mode, slowly lower the platen until it touches the diaphragm, then **lockout/tagout power.**
2. Referring to Figure 15, apply Loctite 242 (or equivalent) to, and install each new diaphragm bolt (either the socket cap bolts for the older design or the hex head bolts and flat washers for the newer design). Add bolts in an alternating pattern such as that shown in Figure 16. Use a wrench just to fully seat the bolt. If a bolt starts to seize, remove it, clean the bolt hole with the pulley tap to avoid the risk of breaking, then re-install the bolt. Wipe off excess Loctite.
3. Torque all bolts to **10 foot-pounds** using the same alternating pattern as before. Wipe off excess Loctite.

4. Re-torque all bolts using the same alternating pattern, as follows:
   - Newer platen with hex head bolts—**44 foot-pounds**
   - Older platen with recessed socket cap bolts—**30 foot-pounds**
5. Insert the plastic buttons provided with the kit in the push-off holes and, if the older platen with socket cap bolts, the bolt hole recesses.
6. Apply tag B2T2001042 (provided with the kit) to the press as a reminder that the bolts need to be tightened after one week (40 hours) of operation, and explain this to the operator.
7. Wait one hour before filling the diaphragm. This allows Loctite to cure. Fill the diaphragm as explained in document BIPPMM10 “How to Fill and Maintain the Diaphragm”, then secure the press for operation and return the machine to service.

Figure 15: Applying Loctite 242 to Bolts

Figure 16: Typical Bolting and Torque Pattern



2.4.7. Re-tightening the Diaphragm Bolts After One Week (40 Hours)

CAUTION 38: Risk of Rapid Diaphragm Wear—Diaphragm bolts may loosen slightly during the first week of operation, resulting in leakage.

- Check and re-tighten all diaphragm bolts following one week (40 hours) of service.
- Perform the diaphragm filling procedure weekly per the preventive maintenance schedule.

The press must be empty. If the press is operating, allow any goods to transfer out of the machine automatically, then take the machine off-line. Using *Manual* mode (manual operation):

1. Raise the load/unload doors (if so equipped) and secure them in place. Open the side doors and use the door interlock bypass key switch (in strict compliance with its instructions) to enable operation with the side doors open.
2. Lower the can first, then the ram onto the press bed. Now raise the can fully. This sequence minimizes dragging between the can and ram.
3. **Lockout/tagout power** at the external disconnect switch and **install the can safety stands.**
4. Re-torque all bolts using an alternating pattern like that shown in Figure 16, as follows:
   - Newer platen with hex head bolts—**44 foot-pounds**
   - Older platen with recessed socket cap bolts—**30 foot-pounds**
5. Secure the press for operation and return the machine to service.

— End of BIPPMM03 —

BIPPMM13 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

2.5. Adjusting Ram Shaft Seal Tightness (and Free Fall Speed)

The ram shaft seals affect 1) oil retention, 2) un-powered drifting down of the ram, and 3) ram free-fall speed. These seals must be tight enough to prevent significant seepage of oil around the shaft and to minimize the drifting down of the ram when the machine is shut down, but loose enough that the seals do not impede ram "free-fall" during operation (see document BIPPMF01 "How the Single Stage Press Hydraulic System Works"). Seal tightness is adjusted at the Milnor factory but the seals tend to loosen over time. So it is likely that the seals will need periodic tightening. Unless the seals are inadvertently over-tightened when adjusted, they are not likely to need loosening. Shaft seal tightness can be adjusted with the ram in place. There is no need to disassemble ram components or drain hydraulic fluid for this adjustment.

Notice 39: Understand the press servicing hazards—Before performing press maintenance, review document BIPPMS01 "Safe Servicing..."

2.5.1. How the Ram Shaft Seals Work

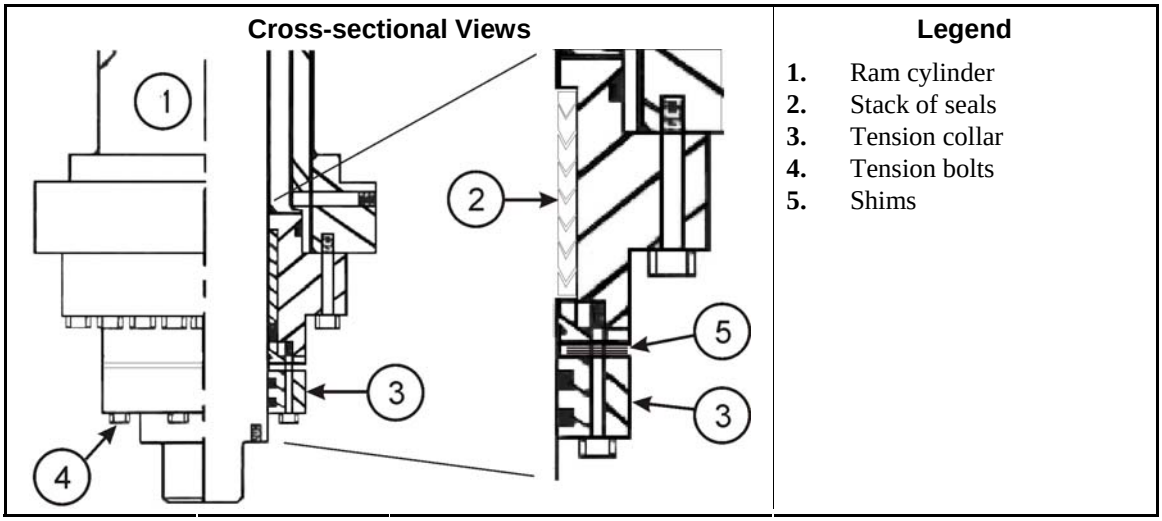
Referring to Figure 17, the ram shaft seal assembly consists of a stack of alternating soft and hard seals that wrap around the shaft at the bottom of the ram cylinder. A seal tension collar bolted to the bottom of the ram cylinder controls seal tightness. Tightening the collar compacts the seals, pushing the soft seals against the ram shaft (i.e., a tighter fit).

The collar must be uniformly tight around its entire circumference. To ensure this, the collar is tightened against shims—not merely against the seals. The same number and thickness of shims must be used at each bolt location. When tightening is needed, the same thickness shim(s) is removed from each bolt location. The two shim thicknesses listed in Table 5, are available. However, the machine is shipped with thick shims only. Thin shims are available from from the Milnor parts department.

Table 5: Shims Used on Shaft Seal Tension Collar

Type	Milnor Part Number	Thickness	
		Inch	Metric
Thick	15U314C	0.073	1.85 mm
Thin	07-10237	0.05	1.27 mm

Figure 17: Shaft Seals and Related Components



2.5.2. Seal Tightness Adjustment

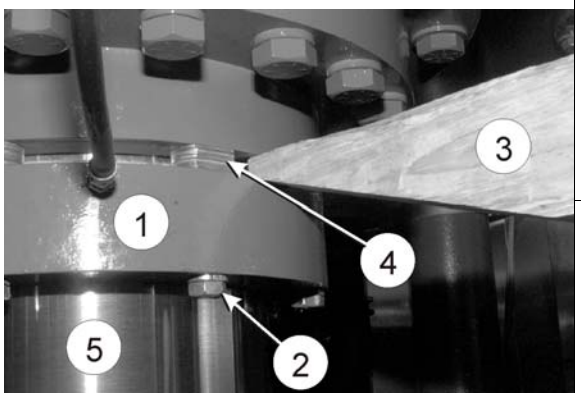
CAUTION 40: Risk of Costly Machine Damage—A nick or dent in the ram shaft will likely abrade seals and cause the ram to leak oil. The ram shaft may require replacement.

- Use care not to hit the shaft with tools when working close by.

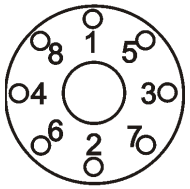
1. Permit the press to empty of goods.
2. use the *Manual* mode to fully lower the can and ram. With the can and ram (diaphragm) resting on the bed, **lockout/tagout power** at the external disconnect switch.
3. Referring to Figure 18, tighten the shaft seals as follows (power locked out / tagged out):
   a. Loosen all of the seal tension collar bolts. Do not remove any bolts yet.
   b. Using a wooden wedge as shown in Figure 18, tap the seal tension collar downward.
   c. Remove one tension bolt, remove a thick shim (see Table 5) from the shim stack above that bolt, then reinstall the bolt.
   d. Repeat Item 3.c , removing one thick shim per stack, until all eight bolts are done.
   e. Tighten the bolts using an alternating bolt tightening pattern as shown in Figure 18. Tighten to the torque specified for this type of bolt in “Fastener Torque Specifications”.
4. Restore power and return to automatic operation. Observe press operation to ensure that ram “free fall” speed is acceptable. If the ram descends too slowly, It will be necessary to repeat this procedure, slightly increasing shim thickness. Use whatever combination of thin and thick shims provides an overall thickness between that before and after the adjustment just made.

Figure 18: Seal Tightness Adjustments

Loosening the Tension Collar



Typical Alternating Bolt Tightening Pattern



Legend

1. Tension collar
2. Tension bolts
3. Wooden wedge
4. Shims
5. Ram cylinder shaft

— End of BIPPMM13 —

BIPPMM15 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

2.6. Understanding and Setting Press Water Levels

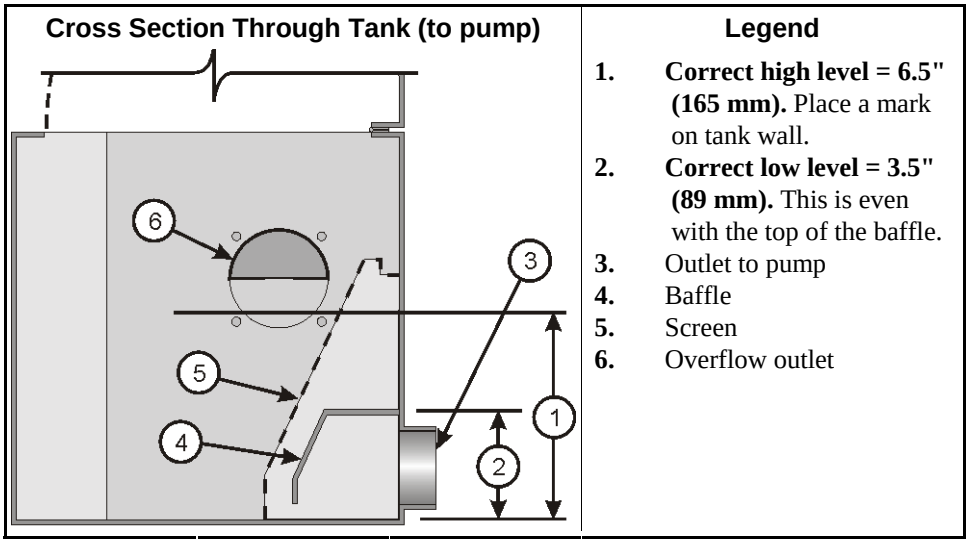
A large amount of reusable water is collected by the Milnor® single stage press during transfer and extraction. The water is held in four water tanks—one on each side and end of the press bed. The water flows from the bed into the two end tanks and from there to the inter-connected side tanks. After the initial in-rush of water at each transfer, the water eventually settles to the same (absolute) level in all four tanks. Water is removed from the tanks through the press return pump, which pumps it to the tunnel washer. A level float assembly with two level settings (commonly

used on Milnor machines) provides input to the microprocessor which controls pump operation to prevent overflow and prevent the pump from losing its prime. This requires that levels are set as explained herein when the machine is commissioned. Subsequently, if the tanks overflow, suspect improper levels. Check and adjust accordingly.

2.6.1. Required Levels

In current production machines, the pump outlet and the level float are both located on the larger of the two side tanks. Some older presses have a different arrangement. Although all four tanks share the same absolute level, the water depth can vary from tank to tank. **Regardless of the machine's vintage, always measure levels in the tank that the pump is connected to.** Lift the tank lid and observe the components shown in Figure 19. Level float components must be adjusted so that the low and high levels occur in this tank at the positions shown.

Figure 19: Correct Low and High Levels



2.6.2. How to Set the Levels Accurately and Avoid Overflow

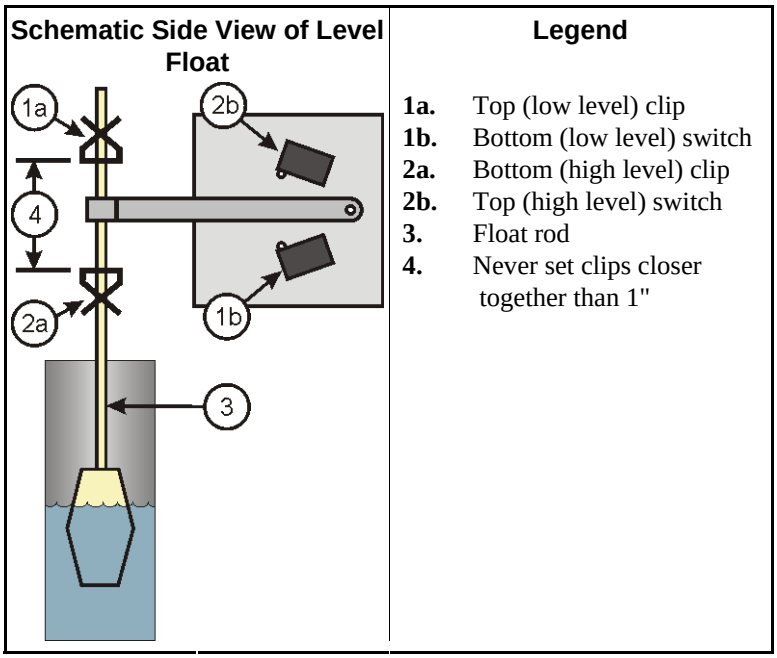
CAUTION 41: Risk of Overflow—If the pump loses its prime during operation, it can take a minute or more for the pump to self-prime, during which time water entering with an incoming load will likely overflow the tanks.

- Do not allow the pump to suck air. Maintain the specified low level setting.

It is very difficult to achieve accurate settings unless the water is calm and the level remains static. For accuracy and to avoid overflow, do not attempt to adjust levels during operation. Shut the machine down and use a garden hose to fill (or siphon out) the tanks to the specified level.

Figure 20 shows the level float assembly schematically and the relationship between levels, switches, and clips. With the tanks filled to the specified level (low or high), adjust the position of the corresponding clip on the float rod so that the switch contacts make (or break) at that level. If you can hear the switch “click”, adjust levels with power off. Otherwise, run the press at idle but disable the pump by setting the *Press Return Pump* switch *off*. You can then have an assistant observe the switch inputs on the display (see reference manual) and announce when the input changes state (the display changes between + and -). This avoids having the level change due to pump operation. For low level, you should listen for the click (or watch for the display to change) when the float rod is **descending.** For high level, it should be when the rod is **rising.**

Figure 20: Level Float Components Important in Setting Levels



Set **low** level as follows:

1. Fill (or drain) the tanks precisely to low level.
2. Lower the bottom (high level) clip so that is does not interfere with this setting procedure.
3. The setting will be made with the **top** clip. Set this clip so that it is just high enough on the float rod to permit the rod to float.
4. Lift the float rod slightly with your finger, then permit it to slowly descend until either the bottom (low level) switch actuates or the rod floats. If the rod floats before actuating the switch, lower the clip about 1/16" (2 mm) and try again. Repeat this process until the switch actuates when the rod descends.

Set **high** level as follows:

1. Fill the tanks precisely to high level.
2. The setting will be made with the **bottom** clip. Set this clip so that it is just low enough on the float rod that the rod floats unrestrained.
3. Push down on float rod (push the float into the water) slightly, then permit it to slowly rise until either the top (high level) switch actuates or the rod stops rising. If the rod stops rising before actuating the switch, raise the clip about 1/16" (2 mm) and try again. Repeat this process until the switch actuates when the rod rises.

— End of BIPPMM15 —

BIPPMM09 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

2.7. Servicing a Misaligned (“Jammed”) Can Assembly

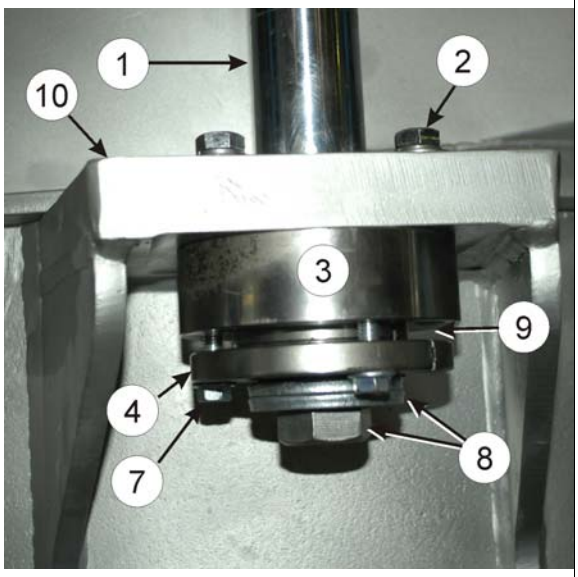
The receiving chute and can assembly (the can) is connected to the can cylinder rods with taper bushings (see Figure 21) that will slip upward on the rod, reducing the risk of damage, in the event that goods or other objects obstruct the can's descent and “jam” it out of alignment.

Notice 42: When the receiving chute and can assembly becomes “ jammed”, STOP!—Before returning to normal operation, inspect for, and correct damage and/or misalignment, as explained herein.

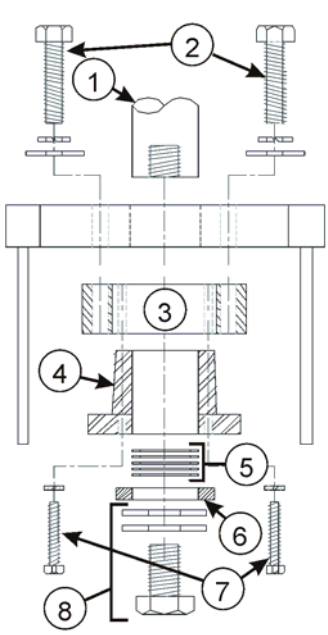
Notice 43: Understand press servicing hazards—Before performing press maintenance, review document BIPPMS01 “Safe Servicing...”

Figure 21: Can-To-Cylinder Rod Mounting Components

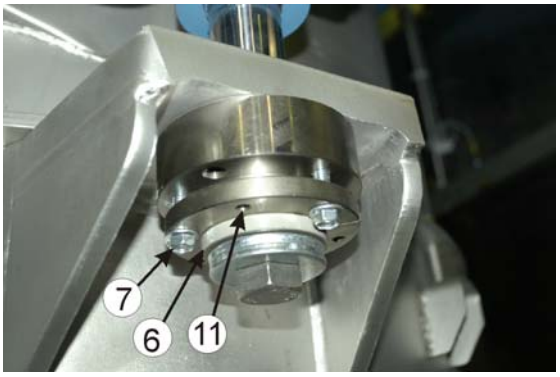
Side View (spacer not used)



Exploded View



View From Below (spacer used)



Legend

1. Cylinder rod
2. Hub mounting bolts
3. Hub
4. Taper bushing
5. Shims
6. Spacer (if used)
7. Bushing bolts
8. Large flat washers and rod end bolt
9. Bushing-to-hub air gap
10. Can mounting ear
11. Push-off holes

2.7.1. Inspecting the Can After a “Jam”

Visually inspect the can and the cylinders and rods for damage and misalignment. If the can appears operable, use the *Manual* mode to move the can up and down, observing it carefully. Referring to Figure 21, some problem signs include:

- The spacer (Item 6.) or washers (Item 8.) are no longer pressed against the bottom of the bushing (Item 4.), indicating the bushing has slipped upward on the cylinder rod (Item 1.).
- The lowered can assembly does not rest flat against the press bed.
- The can rubs against the ram or other components or moves with a jerking motion. This may indicate a bent cylinder rod (Item 1.).
- Can cylinder(s) leak oil.

If the can appears in good working order, return the machine to service. Otherwise, continue.

2.7.2. Dismounting the Can

WARNING 44: Crush and Strike Hazards—A can assembly that is temporarily twisted as a result of a "jam" will forcefully spring back to its original shape when bolts are loosened.

- Disassemble cautiously.

1. Using *Manual* mode, raise the ram and secure it with the safety bars (see safety support instructions). Leave the safety bars in place until the procedures call for removing them.
2. Lower the can onto the press bed. Lock out/tag out power to the machine.
3. Referring to Figure 21, remove the mounting components on **each** side of the can as follows:
   a. Remove the rod-end bolt and attached shims, spacer and washers (Item 6. and Item 8.).
   b. Observing warning statement 44 , carefully remove all three bushing bolts (Item 7.).
   c. Thread bolts into the three bushing push-off holes (Item 11.). Observing warning statement 44 , alternately tighten bolts until the bushing and hub separate.
   d. Restore power. Using *Manual* mode, raise the can cylinder rods until they clear the can mounting ears. Lockout/tagout power.
   e. Unbolt and remove the hub (Item 3.).
   f. Clean the bushing, hub and cylinder rod with Loctite Primer N™ (Milnor P/N 20C006P) or an equivalent product.

2.7.3. Replacing Can Cylinder(s), If Required

If a cylinder rod is bent or the cylinder leaks oil, the can cylinder must be replaced with a new or rebuilt one. If the cylinder to be replaced is directly behind the press discharge door (discharge left or discharge right), the discharge door must be removed to provide working room. **Perform this work with the ram secured up with the safety bars, the can dismounted and resting on the press bed, and power locked out/tagged out.** Disassembly and re-assembly are straightforward for the competent technician and not explained here. Refer to the "Receiving Chute and Can" and "Safety Unload Door Assembly" parts documents for more information.

2.7.4. Remounting and Positioning the Can

The can must be mounted on the can cylinder rods so that each rod reaches its internal stop just as the can touches the press bed. The mounting hardware (hub, bushing, bolts, etc.) must be those specified on the "Receiving Chute and Can" parts document for proper strength and fit.

> **Note 6:** The current design uses a hub manufactured by Milnor, attached with 1/2" x 2-1/2", grade 8, chrome-plated mounting bolts, stainless steel flat and lock washers. The bushing is purchased by Milnor, but mounted with 1 3/4" (4.4 cm) flange bolts (not the bolts supplied by the bushing manufacturer).

1. Disconnect the electrical feed to both of the can at bottom (lower) can proximity switches.
2. The can must be resting on the sheet of cardboard on the press bed and positioned so that the cylinder rods (Item 1. in Figure 21) are directly above the can mounting ears (Item 10.), so that they will enter the mounting ears. Restore power to the machine and, using *Manual* mode, carefully extend the cylinder rods into the mounting ears fully (until the cylinders "bottom out"). Lockout/tagout power.
3. Referring to Figure 21, install the mounting components on **each** side of the can as follows:

a. Reinstall the hub. Tighten the mounting bolts only enough to hold the hub snug against the mounting ear. The bolts will be tightened later, but for now, the hub must be able to move slightly, from side to side.

b. Install the bushing and torque the bushing bolts to **360 inch-pounds.** After tightening, a gap must exist between the bushing and hub (Item 9.). If not, replace the hub and bushing.

4. Reconnect the electrical feed to the two can at bottom proximity switches.

5. Restore power then, using *Manual* mode, move the can up and down, looking for signs of improper positioning of the can on the cylinder rods, such as:
   - The can cylinders fail to “bottom out” as the can touches the bed.
   - The can presses into the conveyor belt with enough force to leave an indentation.
   - The can twists as it reaches bottom.
   - Daylight is visible between the fully lowered can and the press bed.
   - An object the thickness of a credit card slides easily under the can. It should be very difficult or impossible to insert the object anywhere around the can.

6. If necessary, readjust mounting components (with power locked out/tagged out), as necessary until the above checks indicate the can is properly positioned.

7. The rod-end bolt, shims, spacer, and washers must be reinstalled onto the end of each cylinder rod, which may be slightly inside of, or protruding from the bottom of the bushing. The bolt, washers and spacer (if used) ensure that the bushing cannot slip off the end of the rod. The shims ensure that the rod-end bolt can be tightened securely without moving the position of the bushing on the rod. Referring to Figure 21, install these components on **each** side of the can, as follows:

   a. If the rod end protrudes from the bushing, install the spacer against the bushing. Otherwise, the spacer is not needed.

   b. Install the number of 1/16" (1.7 mm) shims needed to fill any gap between the rod end and the bottom of the bushing or spacer.

   c. Install the large washers and rod-end bolt. Tighten the bolt.

8. Remove the safety bars that secure the ram then restore power to machine. Fully lower the ram into the can. This will ensure that the can is aligned with the ram when the hub bolts are tightened. Lockout/tagout power to the machine.

9. Tighten the hub mounting bolts left loose in Item 3.a . **Torque bolts to 78 foot-pounds.**

10. Restore power and using *Manual* mode, raise the ram.

11. The bushing bolts will normally loosen after operation. **Repeat the following tightening procedure daily, over the next five operating days.** An assistant is required for this:

    a. Allow a normal load of goods to transfer to the press, or at minimum, place a sufficient quantity of goods in the can so that the ram will not reach the ram full down proximity switch, preventing full pressing pressure from being achieved. This requires about 50 to 60 pounds (23 to 27 kilograms) of goods.

    b. Using *Manual* mode, the assistant lowers the ram and maintains *ram down* pressure by holding the *down* button while bolt torque is checked (next step).

    c. While full pressing pressure is achieved, torque the bushing bolts (to 360 inch-pounds) and the hub mounting bolts (to 78 foot-pounds).

    d. The assistant raises the ram (not the can).

    e. Repeat Item 11.b through Item 11.d two more times.

— End of BIPPMM09 —

BIPPMM12 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

2.8. Servicing the Integral Conveyor

Milnor has continually improved the single stage press integral conveyor to reduce and simplify maintenance, through the following features (listed from most recent to earliest):

- improved belt material with minimal longitudinal shrinkage due to press pressure
- taut belt switches to sense when the belt is too tight and alert the operator, via the “Taut belt - Check belt rollers” error message and the signal lamp.
- a support bracket design that eases removal and replacement of the tension roller
- heftier bearings to help withstand the corrosive environment and severe load conditions
- a plastic scraper on the drive roller that minimizes wrapping of goods around the rollers

This instruction applies to machines that have taut belt switches (presses manufactured after date code 04436, with software version 20006D/WUMILSSPA or later). However, it also, in large part, accommodates older presses with only some or none of the above features. This document supersedes document BIPPMM07 “Installing the Endless, Woven Style Press Belt...” as well as previous versions of this document (titled “Clearing Taut Belt Errors”).

2.8.1. Conditions Requiring Servicing and Summary of Procedures

Section 2.8.1.1 through Section 2.8.1.5 describe the problems that are most likely to require conveyor servicing and summarize their corrective procedures. Detailed instructions follow these sections. All conveyor servicing described herein must be performed with:

1. the ram up and secured with the safety bars,
2. the can up and secured with wood blocking,
3. the discharge door up and secured with a metal rod such as a screwdriver shaft, and
4. the manually-lifted access doors open.

All servicing except for parts of the tracking adjustments must be performed with power locked out/tagged out.

2.8.1.1. Belt Too Tight Causing “Taut Belt...” Error (Tension Adjustment)—The “Taut Belt...” error indicates that the belt is too tight. The controller only monitors the taut belt switches when the belt stops moving (to minimize nuisance trips). Typically a taut belt condition is caused either by goods wrapped around a roller (which the drive roller plastic scraper minimizes) or belt shrinkage (which the improved belt material minimizes). In the first situation, the belt must be partially removed, the roller freed of foreign material and the belt re-installed (see Section 2.8.1.3). In both cases, proper belt tension and taut belt detection sensitivity must be restored via the pre-load and taut belt switch clearance adjustments explained in Section 2.8.4. Once the problem is resolved, the “Taut Belt...” error clears automatically.

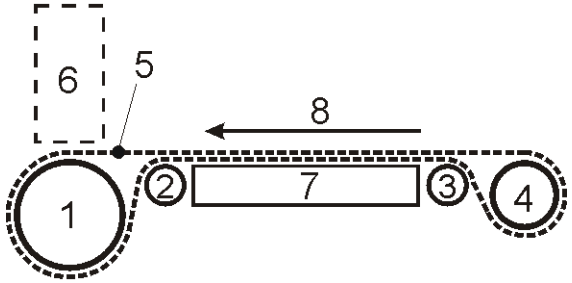
2.8.1.2. Belt Not Centered (Tracking Adjustment)—On the load end of the conveyor, pneumatic tracking controls compensate for minor left/right creeping of the belt. However, if these controls actuate frequently or are ineffective in centering the belt, tracking must be adjusted via the belt tracking adjustments explained in Section 2.8.5. The preventive maintenance schedule calls for checking this tracking daily. Selection 10 “Track Belt”, in *Manual* mode is a convenient way to observe belt tracking. Belt tension and tracking must also be checked and adjusted whenever the belt is removed for roller cleaning or the belt is replaced.

There is also a tracking adjustment on the unload end of the conveyor. Once adjusted at the Milnor factory, this tracking should not need subsequent adjustment unless the setting is inadvertently changed. In such case, refer to Section 2.8.6.

2.8.1.3. Foreign Material (Goods) Wrapped Around Rollers—If goods wrap around a conveyor roller, this effectively increases the roller diameter. This can severely increase belt tension and the load on the roller bearings. If this condition is addressed soon enough, goods can be cut and unwrapped from the roller fairly easily. But the longer such a problem is left unresolved, the harder it will be to free the roller of the foreign material, and the more likely that the belt and roller bearings will be damaged. Correct the problem when it first arises. Milnor is not responsible for components damaged through neglect.

Referring to Figure 22, goods wrapping is more likely to occur at the drive roller, but it can occur with any of the four rollers. To gain access to the rollers, the technician first removes the tension roller (load end of a straight-in press). Then, on the discharge end (drive roller end) of the machine, he pulls the belt out of the machine, exposing all of the rollers. This procedure is also used in belt replacement.

Figure 22: Conveyor Belt and Rollers



Legend

1. Drive roller (on discharge end)
2. Snubber roller
3. Tracking roller
4. Tension roller (on load end)
5. Endless woven belt
6. Drive motor and gear reducer
7. Press bed
8. Flow of goods

When cleaning rollers, use care not to damage the roller surface, especially the grip surface on the drive roller. No other procedures are provided herein for roller cleaning.

2.8.1.4. Belt Worn or Damaged—As shown in Figure 22, the conveyor uses an endless belt. When replacement is necessary, the tension roller on the load end of the conveyor (the load end of a straight-in press) is removed and the drive roller on the discharge end, partially removed. With the tension roller removed, the old belt is then pulled out of the machine from the discharge end and slipped off of the partially removed drive roller. The new belt is installed in the reverse order. Tension roller removal is made easier by the modified tension roller bracket design (see Section 2.8.3.1). The bracket on older presses can be so modified on site without removing it. After replacement, the new belt must be properly tensioned and the tracking adjusted.

2.8.1.5. Hardware Deteriorated—All conveyor components are susceptible to deterioration from the corrosive and high load environment typically present in this application. Whenever the need arises to remove or replace the belt, the technician may find that related hardware such as bolts, nuts, bracketry, and bearings have deteriorated to the point where they should not be returned to service. It is advisable to assess the condition of this hardware before belt removal or replacement and have any needed replacement parts on hand. Refer to the conveyor parts documents for your machine for part numbers.

2.8.2. Preparing the Press for Safe Conveyor Servicing

Notice 45: Understand the press servicing hazards—Before performing press maintenance, review document BIPPMS01 “Safe Servicing...”

1. Make sure the press is empty of goods and access the *Manual* mode.

2. Set the door interlock bypass key switch to the *Maintenance Only* position and open the press access doors in strict compliance with the safety instructions.
3. Raise the can, then the diaphragm to full up.
4. **Secure the raised ram with the safety bars.** Remember that the unrestrained ram can drift down even with power off.
5. Using two, 2 x 6 inch (minimum) wood planks, lay the planks on end, across the top of the splash guards (Figure 23). Although the can hydraulic cylinders have check valves intended to prevent the can from drifting down, the wood planks protect against drifting down of the can resulting from a hydraulic leak.
6. Raise the discharge door.
7. Secure the discharge door up by inserting a screwdriver through the hole provided in the upper left of the door frame (Figure 24).
8. Shut down the machine and lockout/tagout power at the external disconnect switch.

Figure 23: Wood Planks Under Raised Can

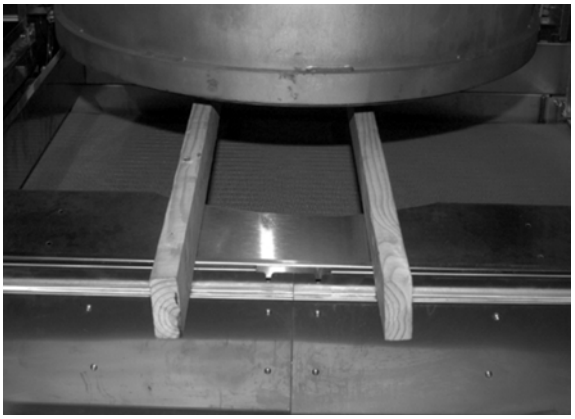


Figure 24: Securing the Door

2.8.3. Belt Removal and Installation (for access to rollers or belt replacement)

The major tasks in belt removal and installation are explained under this section. The specific tasks and the order they are to be done varies with the objective (e.g., belt replacement, roller cleaning, etc.). Hence, you may need to perform only certain tasks and not necessarily in the order presented here.

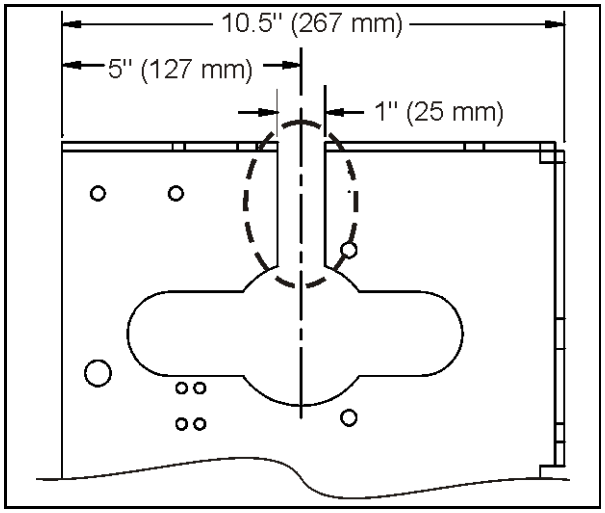
Notice 46: Malfunction risk—As you work, carefully note the arrangement of all hardware removed for proper replacement. This is especially important for washers, spacers, shaft collars and the like, that must be properly positioned for correct roller alignment and functioning. The conveyor parts documents for your machine will also assist in proper component positioning.

2.8.3.1. Facilitating Tension Roller Removal On Older Presses—The tension and tracking rollers and related hardware mount to the side wall of the load-end water tank. The current design has a slot in the side wall (see Figure 25) through which the roller shaft can be withdrawn upward. If your machine has this slot, proceed to Section 2.8.3.2. Otherwise, your press has an older design. You have the choice of cutting a slot similar to the current design (see Section 2.8.3.1.1), or removing the tension roller by performing additional disassembly (see Section 2.8.3.1.2).

2.8.3.1.1. Cutting a Slot for Roller Removal—Although the current design provides slots on both tank side walls (both ends of the roller), you need only cut a slot on one side (the most convenient side for your situation). With hardware removed as needed, cut the slot as shown in Figure 26. Once this is done, you can follow the instructions in Section 2.8.3.2.

Figure 25: Tank Left Side Wall With Slot

Figure 26: Tank Left Side Wall—Slot Dimensions



2.8.3.1.2. Performing Additional Disassembly—Step-by-step instructions for removing/replacing the tension roller on older presses (without the slot) varies somewhat with the age (specific design) of your press and is not covered here. However, a capable technician should be able to determine this, observing the following points:

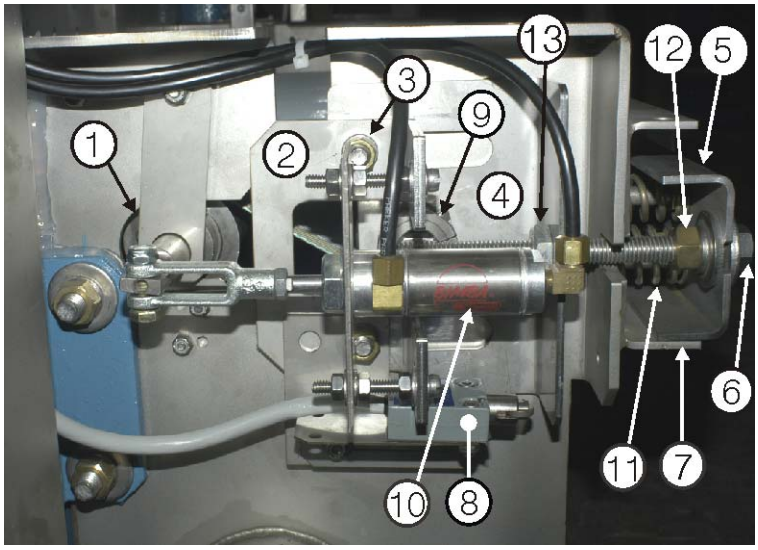
- Although your press may have a hole in the side wall of the tank large enough to withdraw the roller sideward, you would need to remove the side water tank for clearance. You can remove the roller upward more easily.
- You will need to loosen/remove the locking collars on both sides of the tension roller. The ease of roller removal depends on the extent to which you can move the shaft and bearings (one on each end) within the roller. These components may be corroded.
  - » If you can completely remove the tension roller shaft and bearings from within the roller, you should be able to lift the roller out. On older style tension rollers, the roller bearings (one on each end) are held in with set screws. On the newer style roller, the bearings are press fit both around the shaft and within the roller. Using care not to damage components, you should be able to separate these components with a rubber hammer.
  - » Even if you cannot remove the tension roller bearings, you will still need to slide the shaft a small amount in and out of the roller as you work. You will also need to remove the tracking roller to make room for tension roller removal.
- Some aspects of tension roller removal/replacement are the same on older designs as on the current design explained in Section 2.8.3.2.

2.8.3.2. Removing/Replacing the Tension Roller (Current Design)—The following are the steps in order of removal. Replace components in the reverse order.

1. Remove the top and both side cover plates from the load-end water tank.
2. On your machine, identify the components shown in Figure 27.

Figure 27: Left Side, Load End Roller Hardware (right side similar)

Left Side View with Cover Removed



Legend

1. Tracking roller
2. Tracking bracket
3. Bracket retaining nut
4. Tension adjustment bracket
5. Tension bar (channel)
6. Tension bolt (hex tap bolt)
7. Bar support channel
8. Taut belt switch
9. Locking collar on tension roller shaft
10. Air cylinder for automatic tracking
11. Tension springs
12. Tension bolt lock nut
13. Tension bolt clinch nut

3. On both sides of the machine, loosen the tension bolt lock nut (item 12) and relieve belt tension (turn the tension bolt (item 6) counterclockwise) to the point where you can remove the clinch nut (item 13) from the bolt.
4. Remove the tension bar (item 5) with its tension springs (item 11).
5. The tension roller and tension adjustment brackets (item 4) move together. Push these toward the unload end of the conveyor to loosen the belt.
6. Remove the outermost locking collar (item 9) from the tension roller shaft. This is the collar on the outside of the tank side wall, that is only used on one side of the roller. On the current design, the two inner locking collars (the ones on the inside of the tank side walls) do not need to be loosened or removed for roller removal. **On re-assembly, don't forget to re-install this collar.**

Tip: On the current design, the following two steps need only be done on one side of the conveyor (the most convenient side for your situation).

7. Remove the bracket retaining nuts (item 3) and tracking bracket (item 2) with all connected components. Let these hang from the end of the tracking roller shaft as shown in Figure 28. It is not necessary to disconnect the air cylinder pneumatic tubing, but the cut tie wraps from around the tubing as needed for ease of work.
8. Remove the tension adjustment bracket (Figure 27, item 4), taking note of the number and position of the bronze washers on the studs the retaining nuts were removed from. **On re-assembly, don't forget to replace the washers and verify that the tension adjustment bracket still slides freely after the retaining nuts are tightened.**
9. On the free end of the roller, guide the roller shaft upward through the slot in the tank side wall. When the roller is clear of the side wall, withdraw the roller shaft from its retaining bracketry on the other side and withdraw the roller from the belt.
10. On the discharge end, pull the belt through the press and clear of the bed (Figure 29).

Figure 28: Tracking Bracket and Related Components Hanging from Tracking Roller

Figure 29: Pulling Belt Through Press from Unload End

If the work was done for roller cleaning, you can clean the rollers (even the drive roller) without removing the belt completely, provided you use the necessary care not to damage the belt. After re-installing the belt, adjust belt tension and tracking as explained in Section 2.8.4 and Section 2.8.5. For complete belt replacement, proceed to Section 2.8.3.3.

2.8.3.3. Partially Removing/Replacing the Drive Roller (for belt replacement)—

Referring to Figure 30, the drive roller is supported by self-aligning flange bearings (item 5) mounted to the side walls of the unload end water tank. The belt is driven by a motor and gear reducer, which are braced by a torque arm (item 1). With the torque arm loosened or removed (see caution statement **47**) and the bearing on the non-drive end of the drive roller un-mounted, you can pivot that end of the roller away from the machine enough to slip the belt off or onto the roller. Normally, no other disassembly is required.

CAUTION 47: Risk of Injury and Damage—With the torque arm bushing removed, the weight of the gear box/motor will cause it to swing around the shaft, if not otherwise supported.

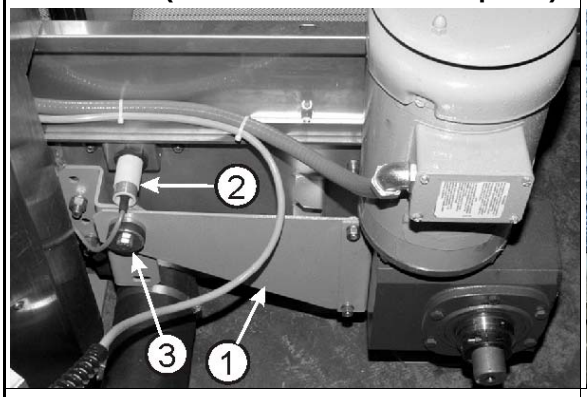
- Support the gear box on blocking before disconnecting the torque arm.
- Observe all precautions herein.

Refer to the “Unload End Drive Assembly” parts document for your machine for part identification and assembly details. The steps in freeing the drive roller for belt replacement follow. Re-assembly is performed in the reverse order. Refer to Figure 30 for the item numbers listed in these steps:

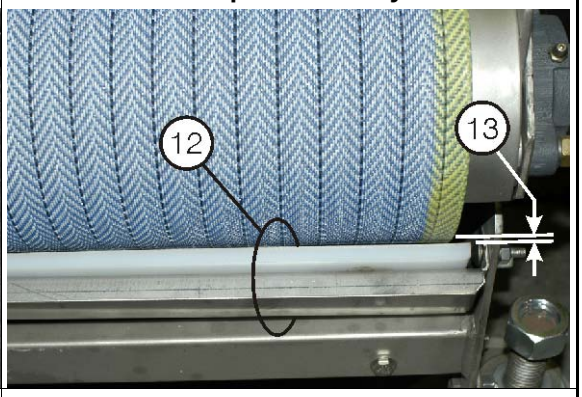
1. If your machine has a belt scraper assembly (item 12), remove it for clearance. **On re-assembly, set the blade-to-belt clearance as shown in item 13.**
2. Remove the drive-side photoeye (item 2) to protect it from damage and provide clearance.
3. Place wood blocking under the gear box. This blocking must prevent the gear box from rotating on the roller shaft once the torque arm is disconnected.
4. Unbolt and remove the torque arm bushing components (item 3), taking note of how they are assembled (see also your “Unload End Drive Assembly” parts document). Also loosen the torque arm mounting bolts. This will free the gear reducer and motor to move when the drive roller is pivoted outward.

Figure 30: Components Used in Partially Removing Drive Roller (your press may be opposite hand)

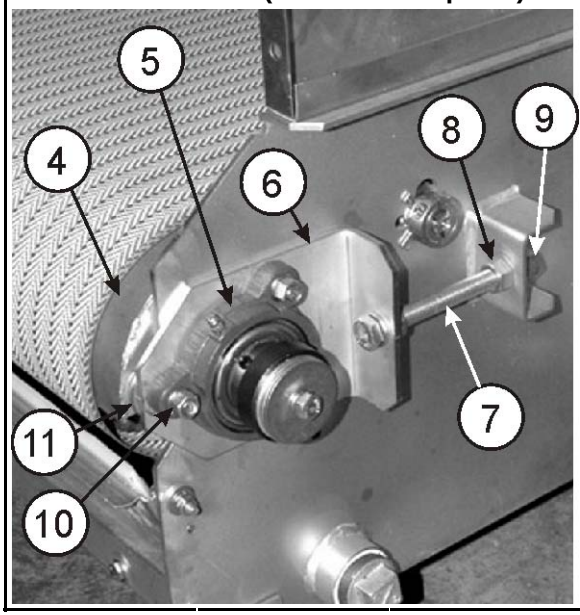
Drive Side (can be on either side of press)



Scraper Assembly



Non-drive Side (either side of press)



Legend

1. Torque arm
2. Photoeye
3. Torque arm bushing
4. Fender
5. Bearing
6. Tracking adjustment bracket
7. Adjustment bolt
8. Nut used to hold adjustment
9. Outermost nut
10. Mounting bolt closest to unload end
11. Spacers—this bolt only
12. Scraper assembly
13. Blade-to-belt clearance = 1/16" to 1/8" (2 to 3 mm)

Tip: In the next step, you will free the non-drive end of the drive roller so that this end of the roller can pivot outward. Two techniques will save time and possible trouble in re-assembly, if conditions on your machine permit:
1. Do not loosen or remove the bearing, shaft collars or spacers from the roller shaft.
2. Disconnect the roller alignment bracket such that it retains its setting when reassembled

5. On the non-drive end, remove either all three, or only two bearing mounting bolts, depending on whether your machine has fenders (item 4) at the ends of the drive roller, as follows:

   Fenders provided (newer, and retrofitted models)—The bearing mounting bolts also hold the fenders in place. Remove all three bolts, but on the bolt closest to the unload end (item 10), be sure to retrieve all spacers. **These must be replaced on re-assembly.**

   No fenders (older models)—Remove only the two bolts farthest from the unload end.

6. If your machine has fenders, remove the fender on this end of the roller.
7. The roller should now be held only by the tracking adjustment bracket (item 6) and its adjustment bolt (item 7). The adjustment bolt is fastened to a welded bracket with two nuts whose position on the bolt establishes the alignment setting. Wrap tape around the innermost of these two nuts (item 8) to hold its position on the bolt, then remove the outermost nut (item

9) and lock washer. **On re-assembly, the adjustment bolt must be reattached such that this setting is retained. Otherwise, realign the drive roller as explained in Section 2.8.6.**

8. Carefully pull the free end of the drive roller only far enough away from the conveyor bed to be able to slip the belt off of, or onto the roller. As the roller and shaft pivot about the drive-side bearing, make sure that nothing restricts the gear reducer and motor from moving the short distance needed and that they remain supported by the blocking.
9. Remove the old, and install the new belt on the drive roller. If the belt has arrows printed on it to indicate direction of travel, be sure to orient it properly.

2.8.4. Restoring Proper Belt Tension

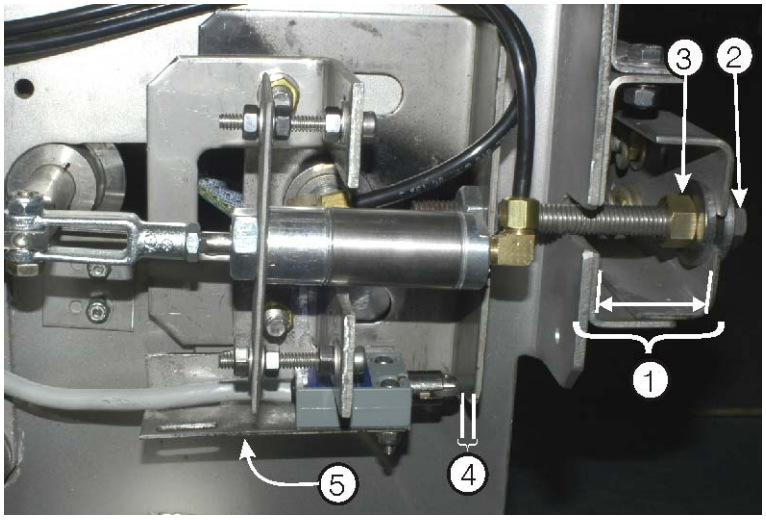
There are two pair of adjustments (each adjustment is done on both sides of the conveyor) involving belt tension. Each adjustment has a required setting (a specified distance between components), as shown in Figure 31. Check these measurements and if they have changed, restore them to the required values. Referring to Figure 31, the adjustments are:

Pre-load—sets the amount of compression of the belt tension springs (belt tension) with no dynamic load on the conveyor. Measure the horizontal distance between the inside faces of the tension bar support channel and tension bar channel, as shown in item 1. This is the compressed spring length. Belt shrinkage will cause this distance to shorten, causing the springs to compress too much. Regaining the specified dimension restores proper belt tension. Make the adjustment by loosening the lock nut (item 3) and turning the hex tap bolt (item 2).

Taut belt switch clearance—determines the sensitivity of *Taut Belt* error detection; it does not control belt tension. Measure the the gap between the bracket and the switch actuator (item 4). This is distance the tension roller must travel before the tension roller bracket touches the switch actuator. The switch bracket has a slotted mounting hole (item 5) for adjusting the switch position.

Figure 31: Belt Tension Required Settings

Where Adjustments Are Made (on one of two sides)



Legend

1. Pre-load = 1 5/8" (41 mm)
2. Hex tap bolt (adjusting bolt)
3. Locking nut
4. Taut belt switch clearance = 1/16" to 1/8" (1.5 to 3 mm)
5. Slotted mounting hole in switch bracket (not seen in this view)

2.8.5. Adjusting Belt Tracking On the Load End

Ideally, the conveyor belt should remain centered on the press bed during operation. Pragmatically, it is likely to creep right or left. The pneumatic tracking system assists in keeping the belt centered. This system consists of a pair of pneumatic switch assemblies (air valve, paddle actuator and hardware) and air cylinders—one set on each side of the belt. When the belt creeps

left or right and pushes on a paddle, that air valve opens, actuating the air cylinder, which changes the angle of the tracking roller slightly, moving the belt away from that side of the bed. If the tracking system actuates frequently or cannot successfully center the belt, adjust belt tracking as explained herein.

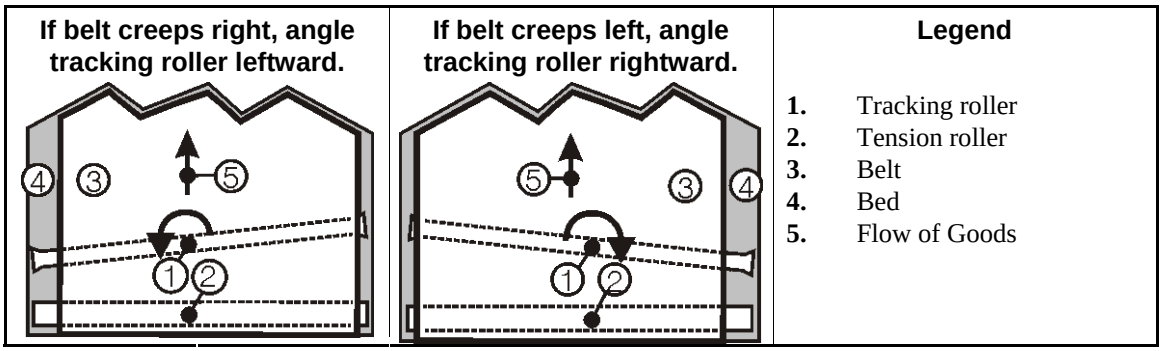
Supplement 1

Understanding Left/Right Terminology

When this instruction refers to the conveyor's left side or right side, this means when viewed **in the direction of the flow of goods.** This would be your left or right if you were standing at the load end of the conveyor (the end with the tension roller—see Figure 22) and facing the press. This is physically possible only if you have a left-turning or right-turning press. With a straight-through press, you would be standing where the loading device (e.g., the tunnel washer) is. Although it may not be possible to view the conveyor on your press from this vantage point, imagine it whenever this instruction uses the terms “left” or “right.”

Figure 32 shows how the tracking roller must be angled to compensate for left/right creeping.

Figure 32: How to Angle the Tracking Roller to Correct Belt Creeping



Adjustments are made with the components shown in Figure 33. Referring to this figure, adjust the tracking as follows:

1. Initially, adjust the tracking roller so that it is perpendicular to the press bed. To do so, adjust the air cylinder bracket lock nuts (item 1), on both sides of the conveyor so that there is 1/2" (13 mm) of thread behind the last lock nut, as shown in item 2.
2. Restore power to the machine.
3. Using *Manual* mode and selection 10 “Track Belt”, run the belt and observe how it tracks.
4. Lockout/tagout power to the machine.
5. To reposition the tracking roller, you will use the air cylinder bracket lock nuts (item 1) to move the air cylinder mounting bracket (item 3) closer to, or farther away from the load end of the conveyor. **Do not loosen the adjusting bolt lock nuts (item 4).** Use Step 6a or 6b, as appropriate, to adjust the angle of the tracking roller in small increments.

6a. If the belt creeps to the **right**:

   1. On the **left** side of the conveyor, use the air cylinder bracket lock nuts to move the air cylinder mounting bracket 1/16" (0.4 mm) closer to the load end of the conveyor.
   2. On the **right** side, use the air cylinder bracket lock nuts to move the air cylinder mounting bracket 1/16" (0.4 mm) farther away from the load end of the conveyor.

6b. If the belt creeps to the **left**:

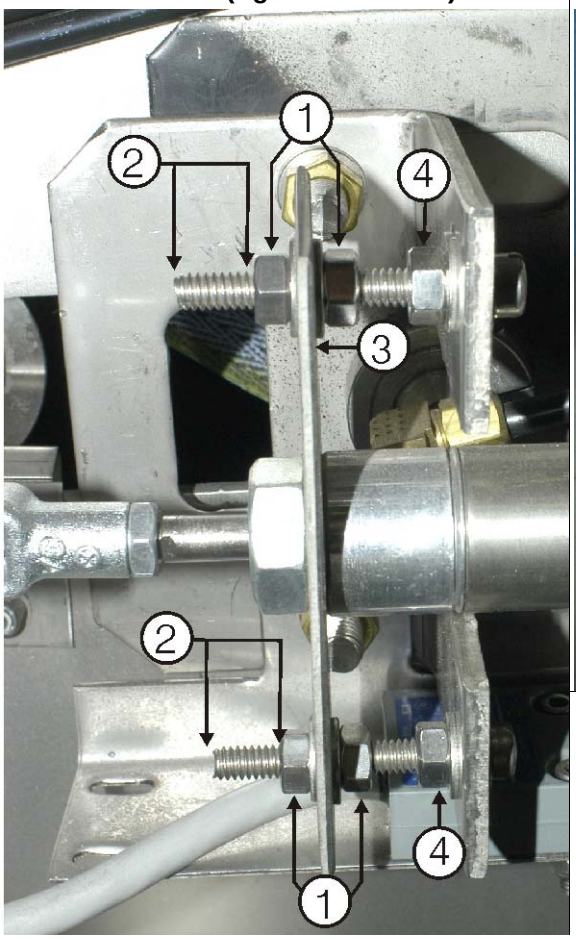
   1. On the **right** side of the conveyor, use the air cylinder bracket lock nuts to move the air cylinder mounting bracket 1/16" (0.4 mm) closer to the load end of the conveyor.

2. On the **left** side, use the air cylinder bracket lock nuts to move the air cylinder mounting bracket 1/16" (0.4 mm) farther away from the load end of the conveyor.

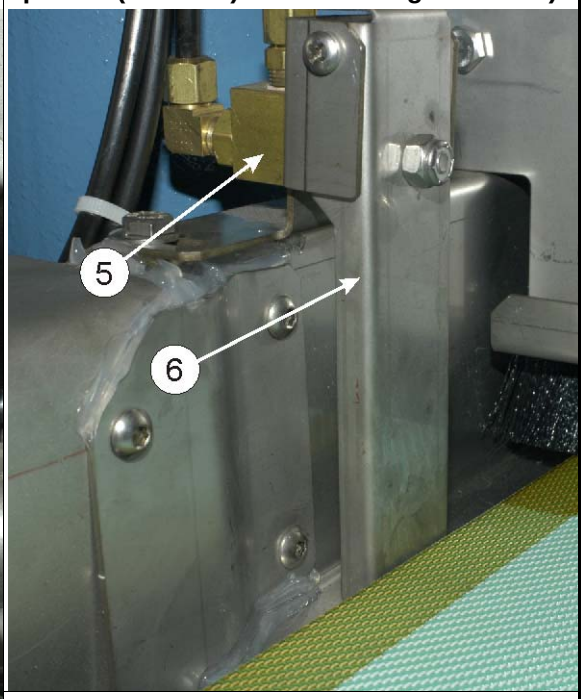
7. The pneumatic switches are properly adjusted when the paddles (item 6) are touching the belt and the the air valve (item 5) will open if the belt moves 1/8" (3 mm) closer to the switch. These switches should not need to be removed or adjusted when performing the servicing described herein. However, if this hardware is removed (as to replace components), adjust the switch assemblies as follows:
   a. Make sure the belt is precisely centered on the bed.
   b. With air on and the assembly mounting bolt loose, move the switch assembly toward the belt just until the air valve opens (as determined by the sound of air flowing), then back the assembly away from the belt 1/8" (3 mm) and tighten the mounting bolt.

Figure 33: Load End Belt Tracking Adjustments

Tracking Roller Adjustment Components On Left Side (right side similar)



Pneumatic Switch Assembly (air valve, paddle (actuator) and mounting hardware)



Legend

1. Air cylinder bracket lock nuts
2. Initial setting = 1/2" (13 mm) exposed thread
3. Air cylinder mounting bracket
4. Bracket lock nuts (do not loosen)
5. Air valve
6. Paddle (actuator)

2.8.6. Adjusting Belt Tracking On the Unload End

Unload end tracking is set at the Milnor factory and should not need subsequent adjustment. However, the setting can be lost in the process of belt replacement or other servicing, if not performed carefully.

Unload end tracking is adjusted by moving the non-drive end of the drive roller in or out with the adjustment components shown in Figure 30 (items 6 through 9). The unload end adjustment is correct when the drive roller is exactly perpendicular to the longitudinal centerline of the bed, but because there is no convenient feature of the bed to measure this from (as, for example, with a carpenter's square), adjust the tracking as follows:

1. Visually align the roller with the unload-end water tank. This tank may not be perpendicular to the bed centerline, but it should be close.
2. Run the belt and observe the tracking. If the belt creeps to either side on the unload end, angle the drive roller so that the end of the roller on the side the belt favors extends farther from the machine relative to the other end of the roller. Continue observing and adjusting the tracking until the belt remains centered.

— End of BIPPMM12 —

Chapter 3
Hydraulic System Troubleshooting

BIPPMF01 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

3.1. How the Single Stage Press Hydraulic System Works

The focus of this document is single stage press hydraulic circuitry and how the hydraulic components function during the various parts of the operating cycle. Refer to the electrical schematic manual—particularly the schematics on microprocessor inputs and electrical valves, and to the programming and operating information in the reference manual for a better understanding of the control logic.

Notice 48: Understand the press servicing hazards—Before performing press maintenance, review document BIPPMS01 “Safe Servicing...”

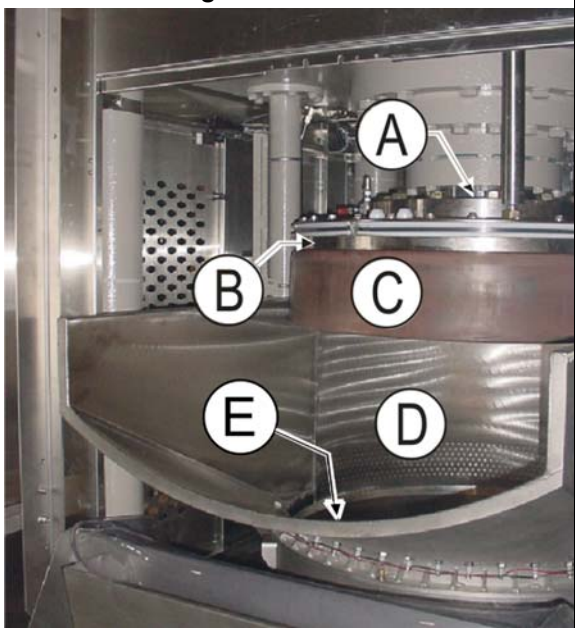
single stage press—a press extractor that squeezes water from successive batches of wet goods at one pressing position (versus a two stage press that first lightly presses the goods at one position, then fully presses them at another). Pressing leaves the batch of goods compressed into a “cake” that must be subsequently broken apart by basket rotation in a dryer.

cake—a load of goods in a batch laundering system (typically a tunnel system) that has been compacted together by a press extractor into a cake shape. Cakes are moved from the press to dryers via shuttle conveyors designed especially to move (and possibly store) such cakes.

press code—a programmable sequence of one or more operating steps that the press uses to process a particular type of goods. Pressing characteristics that can be specified for a step include pressure, how long the pressure is applied, maximum step duration (regardless of programmed pressure) and whether the ram rises at the end of a step. The press code also provides a choice of motions the press will use to dislodge the cake at the end of the cycle.

The major components used to press the goods and shape the cake are shown in Figure 34.

Figure 34: Major Press Components

Viewing Load End of Press	Legend
	**A.** Ram—large hydraulic cylinder that provides the pressing force. **B.** Platen—round plate attached to the ram cylinder rod. **C.** Diaphragm—flexible, water-filled rubber membrane attached to the platen. In this view, the ram, platen and diaphragm are in the up position. **D.** Receiving chute and can—a metal assembly that moves down and up hydraulically (shown in the down position) and is used to guide the incoming wet goods into the press and shape the cake. **(E).** Not seen are the press bed on which the cake is formed and integral conveyor, which moves the cake out of the press once the can and ram are raised out of the way.

3.1.1. The Pumps and Related Components

The machine uses two hydraulic pumps: a recirculation pump and a pressure pump. The recirculation pump is part of the oil cooling and filtering system. Pressure for can and ram operation is provided by the pressure pump. The pressure pump and its related control components are shown in Figure 35 and include:

variable displacement piston pump (see Notice **49** **)**—a hydraulic pump with multiple pumping pistons whose displacement (stroke), and consequently, output, vary with the back pressure applied to a control port on the pump. This back pressure is determined by the valve position of the external proportional valve.

proportional valve—an electrically operated, modulating hydraulic valve used to vary the oil pressure in a small hydraulic line in proportion to a varying voltage. The voltage read by this valve is produced by a microprocessor controller peripheral board called a DBET card.

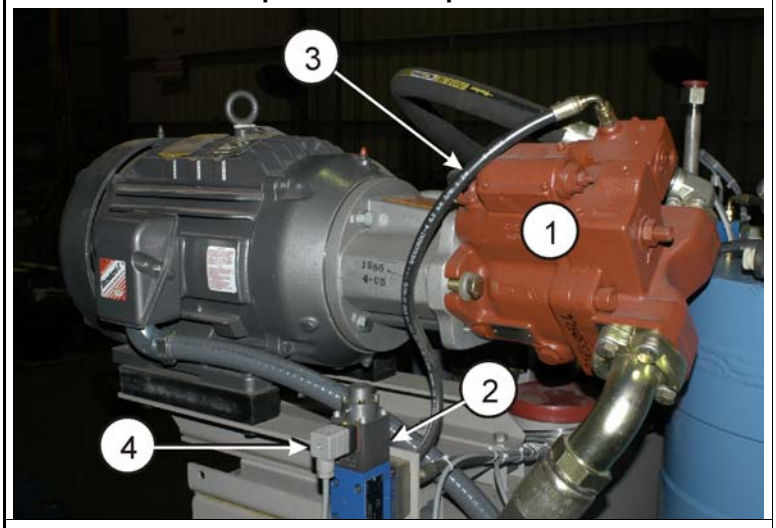
DBET card—an electronic circuit board that interprets data from the machine's microprocessor controller (through a D/A peripheral board) to produce a variable voltage. The microprocessor controller uses a pressure transducer to monitor actual hydraulic pressure.

pressure transducer—a sensing device that produces variable voltage in proportion to pressure. This voltage is converted to digital data that the controller interprets as a pressure value.

Notice 49: Pressure pump should not be field-repaired—Because of its complexity, service personnel are advised not to attempt internal repairs to the pressure pump. Take the pump to an authorized service center for your brand of pump (Kawasaki or Rexroth).

Figure 35: Pressure Pump and Related Control Components

Components on Top of Press



Legend

1. Pressure pump (variable displacement piston pump)
2. Proportional valve
3. Hydraulic line from proportional valve to pump control port
4. Electrical feed from DBET card

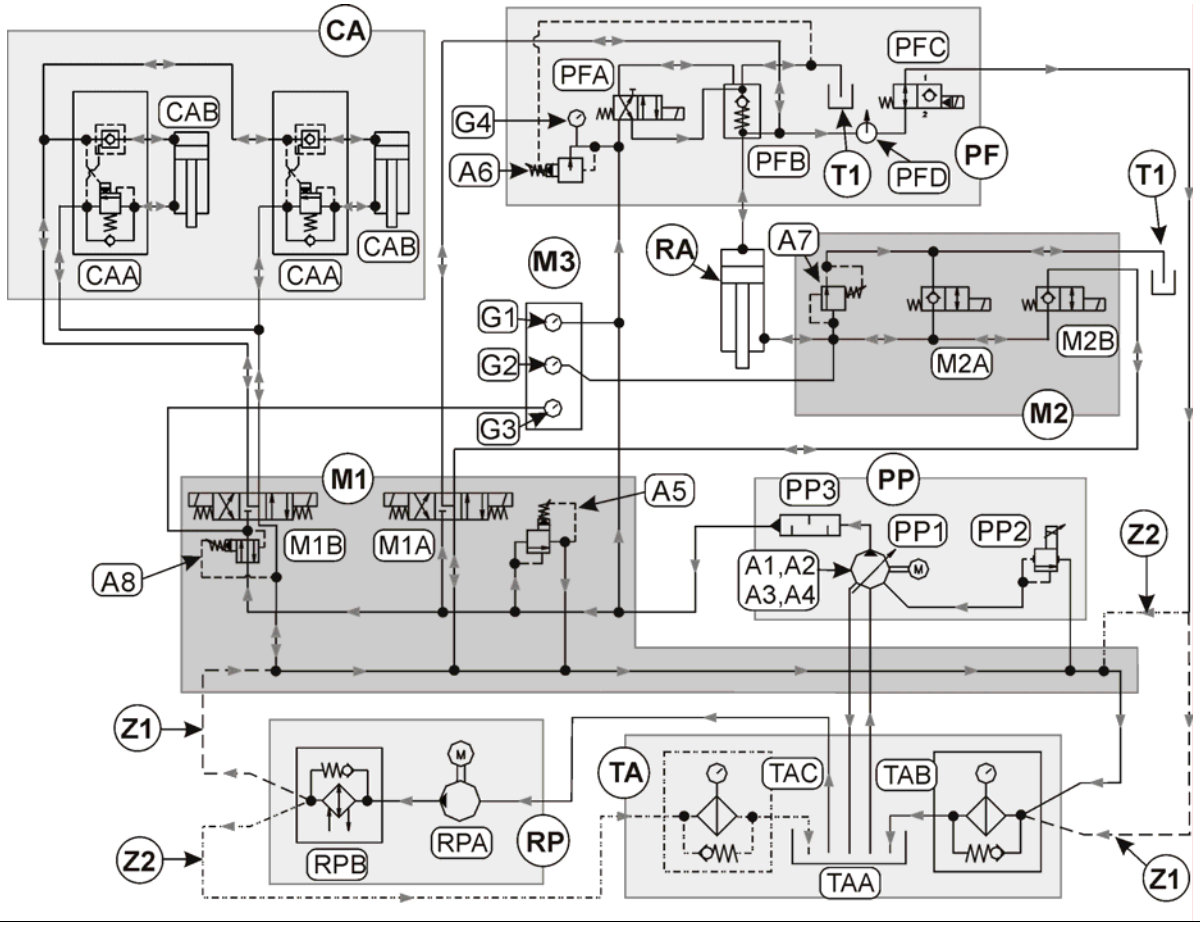
DBET Card in Control Box

3.1.2. The Hydraulic System and How It Functions During Operation

The single stage press hydraulic schematic is shown in Figure 36. Following the schematic are descriptions of the various parts of the operating cycle and what the hydraulic system does during each part. Items referenced in the explanations are those shown on the schematic.

Figure 36: Single Stage Press Hydraulic Schematic

Schematic



Legend

CA. Can hydraulics below top plate: counter-balance valves (CAA) and can cylinders (CAB)—See BMP980017 "Counterbalance Valves and Fittings" and BMP010009 "Receiving Chute and Can" for parts information.

M1. Manifold with ram directional valve (M1A), can directional valve (M1B), system relief valve (A5) and can pressure regulator (A8)—See BMP010006 "Main Press Manifold" for parts information.

M2. Manifold with poppet valves 1 (M2A) and 2 (M2B) and ram relief valve (A7)—See BMP010006 "Main Manifold."

M3. Gauge cluster with system pressure gauge (G1), ram pressure gauge (G2) and can pressure gauge (G3).

PF. Pre-fill pilot valve (PFA), pre-fill valve (PFB), bypass valve (PFC), pre-fill pressure regulator (A6) and pre-fill pressure gauge (G4)—See BMP010004 "Pre-fill Valve Fittings" for parts information.

PP. Pressure pump (PP1), proportional valve (PP2), optional suppressor (PP3) and pump adjustments, including idle pressure (A1), compensator (A2), stage 1 horsepower (A3) and stage 2 horsepower (A4)—See BMP010003 "Hydraulic Main Pump Assembly" and BMP010001 "Proportional Valve" for parts information.

RP. Recirculation pump (RPA) and oil cooler (RPB)—See BMP010008 "Oil Recirculation Cooler and Fittings."

RA. Hydraulic ram—See BMP010011 "Hydraulic Ram and Diaphragm" for parts information.

TA. Tank (TAA) and filter (TAB). Additional filter–MP1Axxxx models only (TAC)—See BMP010005 "Hydraulic Tank Assembly." for parts information.

T1. To tank (not through filter)

Z1. This piping applies to models with prefix MP16 only.

Z2. This piping applies to models with prefix MP1A only

While the machine is running (idling and operating), the recirculation pump (RPA) and oil cooler (RPB) run to keep the hydraulic oil cool and filtered. The path that oil takes when recirculating

varies with model type (MP16xxxx (Z1) or MP1Axxxx (Z2)). This, and the extra oil filter (TAC) used by MP1Axxxx models, are the only schematic differences between these models.

3.1.2.1. Idling (waiting to load)—While the press, with power on, is waiting for a load, it remains at idle pressure (minimum system pressure) with these conditions in effect:

- The pressure pump (PP1) runs, providing approximately 400 psi (28 bar) pressure (idle pressure) as controlled by the idle pressure adjustment (A1—see caution statement **50**). The small volume of oil flowing from the pump returns directly to the tank (TAA) via the pump's case drain (see Note 7).
- The ram is up (confirmed by the ram full up proximity switch— Figure 37).
- The can rests on the press bed (confirmed by the can at bottom proximity switches— Figure 37), but the can cylinders are not pressurized.
- The can directional valve (M1B) is centered, so no oil flows to the can cylinders, but the ram directional valve (M1A) is spooled to the raise ram position so that idle pressure will help hold the ram up.

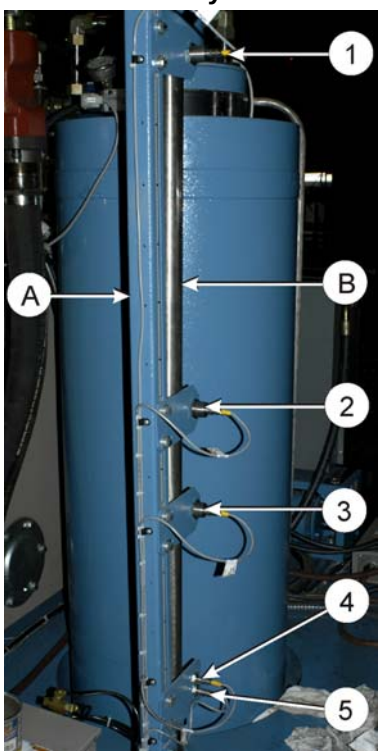
Note 7: The pressure pump has two oil lines to the tank—a large suction line and a small case drain return.

CAUTION 50: Risk of machine malfunctions and damage—The various pressure adjustments (items with prefix “A” in the hydraulic schematic) are set at the Milnor factory. Indiscriminate changes to these settings will likely result in impaired performance, malfunctions and/or damage and can void the warranty.

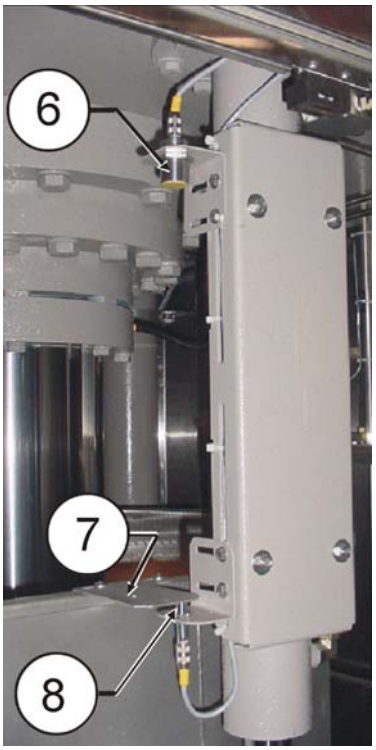
- Do not attempt to change hydraulic pressure settings except in strict compliance with document BIPPMT02 “Setting Single Stage Press Pressures.”

Figure 37: Ram and Can Proximity Switches

Ram Proximity Switches



Can Proximity Switches



Legend

A. Proximity switch mounting post
B. Ram guide rod (serves as switch target)
1. PXST “Ram full up”
2. PXSM “Ram inside can”
3. PXSU “Ram at unload”
4. BXSL “Ram at low”
5. PXSB “Ram full down”
6. PXCT “Can at top”
7. Proximity switch target
8. One of two switches: PXCB1 and PXCB2 “Can at bottom”

3.1.2.2. **Loading**—The empty press is ready to receive a load when the ram is fully up and the can is fully down, as in Figure 34. During loading, a batch of goods discharged from the washer slides down the receiving chute and into the can. Now, and throughout processing, the can must be held firmly against the bed to prevent the load from causing the can to shift. This occurs as follows:

- The proportional valve opens the amount specified by the *can valve setting* configure decision to produce about 800 psi (55 bar) on the pump side of the directional valves.
- The can directional valve (M1B) spools to the can down position (coil B energized), providing oil to the can cylinders (cap end) and **remains in this position throughout loading and pressing.** As pressure on the pump side of the proportional valves rises during pressing, pressure not exceeding 800 psi is maintained in the can down hydraulic circuit by the can pressure regulator (A8—see caution statement **50**). The regulator valve, along with a check valve within each can counterbalance valve assembly (CAA), also prevents oil pressure within the can cylinders from escaping back through the can down circuit.

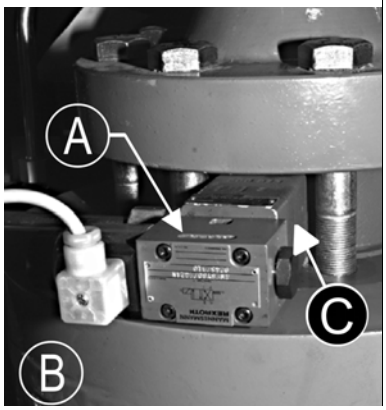
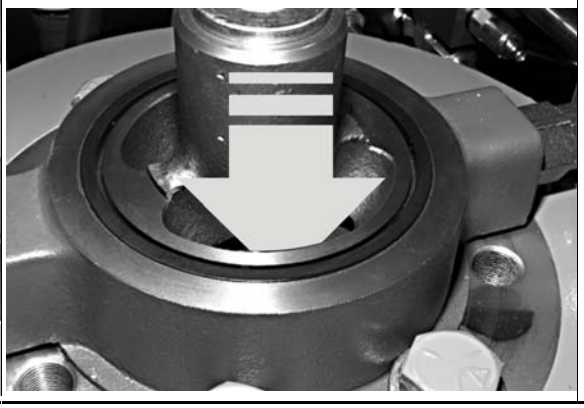
3.1.2.3. **Ram "Free-fall"**—Following the configured *loading time* delay, the ram descends by gravity, lowering the diaphragm into the can (see Note 9). The following conditions permit this:

- The ram directional valve (M1A) spools to the ram down position (coil B energized), permitting oil to flow into the ram cylinder (cap end). Although this does not account for the majority of oil filling the cylinder, some oil is pumped in at this time.
- The pre-fill pilot valve (PFA and Figure 38) energizes (valve opens) providing oil pressure to the pre-fill valve actuator. This opens the pre-fill valve (PFB), if it was not already pulled open by suction. The falling ram draws a large volume of oil directly from the tank into the cylinder by suction, through the pre-fill piping and pre-fill valve (see Figure 38).
- Both electrically operated poppet valves (M2A and M2B—see Note 8) energize, permitting oil pushed from the rod end of the ram to quickly return to the tank. Poppet valve #2 (M2B) returns oil through the ram directional valve while valve #1 (M2A) goes directly to the tank.
- The normally open bypass valve (PFC) remains open, acting as a pressure regulator to prevent ram pressure from exceeding about 200 psi (14 bar) during most of the ram's descent. This protects against the rare instance when the diaphragm meets with resistance before it is fully contained by the can (usually the result of an accidental double load).

Note 8: The poppet valves have two positions: When de-energized, the valve permits oil to flow into, but not from the ram cylinder rod end. When the valve is energized, oil can flow in either direction.

Note 9: For proper "free-fall", a set of ram cylinder seals must be maintained at the correct tightness, as explained in BIPPMM13 "Adjusting Ram Shaft Seal Tightness."

Figure 38: Pre-fill Pilot Valve and Pre-fill Valve

Pre-fill Pilot Valve	Pre-fill Valve (pre-fill piping removed)	Legend
		**A.** Pre-fill pilot valve **B.** Ram **C.** Pre-fill valve

3.1.2.4. Preparing to press (pre-fill valve closed, bypass valve permitted to close)—The pre-fill valve and bypass valve must both close, as follows, to permit additional pressure:

- When the diaphragm descends below the ram inside can proximity switch (see Figure 37 and Note 10), this causes the pre-fill **pilot** valve to close. However, the pre-fill valve is held open by the flow of oil through it, so it does not necessarily close immediately.
- The pre-fill valve closes when the ram meets resistance from the goods and the flow of oil into the cylinder slows sufficiently.
- When the diaphragm descends past the ram at unload proximity switch (see Note 10), the bypass valve is permitted to close. As long as the diaphragm is below ram at unload, this valve will close when pressing pressure is commanded and open when pressure is released.

> **Note 10:** If the descending ram is jammed by goods that did not slide completely into the can, the ram inside can proximity switch will not make, and the pre-fill valve will remain open. This protects against further damage by venting pressure to the tank.

3.1.2.5. Processing (extracting)—All of the hydraulic valves that enable high pressure in the ram function according to the press code (see definition at the front of this document and Note 11 below) and the pressure transducer that provides actual pressure data to the microprocessor. These valves include the proportional valve (PP2), ram directional valve (M1A), bypass valve (PFC), and poppet valves (M2A and M2B).

> **Note 11:** If the *Check for ram at low position?* configure decision is affirmed and the ram descends to the ram at low proximity switch (see Figure 37), the pressure specified in the *Max bar at ram low position* configure decision overrides that specified by the press code. If the current press code is not an "empty load" and the ram descends to the ram full down switch (see Figure 37), pressure ceases and an error occurs.

Maximum system pressure, which varies with model, is limited by the pump compensation pressure adjustment (A2), the system relief valve (A5) and other factors (see caution statement **50**). As the ram pressurizes, the diaphragm must distribute the pressure by conforming to the shape of the goods. During processing, the following conditions exist:

- The pre-fill valve remains closed.
- The can down circuit remains pressurized, holding the can against the bed.

3.1.2.6. Discharging—During discharge, both the can and the ram eventually rise to fully up (as confirmed by the can at top and ram full up proximity switches (see Figure 37). How they move depends on which of two end codes is programmed for the current press code: One end code moves the can and ram more forcefully to dislodge the cake; the other moves them more gently to preserve the cake shape, as appropriate for goods type (see reference manual for more on end codes). The following functions occur at various times, depending on end code:

- The bypass valve, which opened when pressing ceased, remains open, ensuring minimum pressure in the ram cylinder (cap end).
- The ram directional valve (M1A) spools to the ram up position (coil A energized), permitting oil to flow through the check valve of de-energized poppet valve #2 (M2B) and into the rod end of the ram cylinder.
- The pre-fill pilot valve (PFA) energizes (valve opens), providing oil pressure to the pre-fill valve actuator and opening the pre-fill valve (PFB). This allows a large volume of oil to flow quickly from the ram through the pre-fill valve and piping, directly to the tank. When this occurs depends on the end code.
- The can directional valve spools to the can up position (coil A energized) permitting oil to flow through the counterbalance valves and into the rod end of the can cylinders (see Supplement 2). Depending on end code, the ram will rise slowly to fully up, or rise quickly to the ram at unload proximity switch position.

- The pressure pump and proportional valve function to pressurize the rod end of the ram (ram up circuit) to a pressure not exceeding 1500 psi (103 bar), as limited by the ram relief valve (A7—see caution statement **50**) and the rod end of the can cylinders (can up circuit) to a pressure not exceeding 800 psi (55 bar), as limited by the can pressure regulator (A8).

Once the can is fully up and the ram is either fully up or at least at the unload position (depending on end code), the cake is discharged in the following sequence:

1. The discharge door opens.
2. The belt runs forward until the discharge end photo eye is blocked and cleared, plus the greater of either two seconds or the configured *belt run time after discharge* value.
3. The discharge door closes.
4. The can is lowered to the bed.

The press is ready for the next load when the can is fully down and the ram is fully up.

Supplement 2

How the Can Assembly is Susceptible to Damage

The can is susceptible to damage primarily from three conditions: 1) some part of the load chute and can assembly meets an obstruction, 2) the diaphragm is manually lowered through the raised can, 3) the can cylinders are not functioning in unison.

The first condition typically results when goods become jammed between the can and ram or between the can and press bed. The machine provides two forms of protection for this:

- If the microprocessor sees more than a three second delay between the two can at bottom proximity switch inputs, it will stop the machine and issue an error.
- The bushings that connect the load chute and can assembly to the can cylinder rods are designed to slip on the rod in the event of a severe jam. Should this occur, the bushings must be re-seated and the bolts properly torqued, as explained in document BIPPMM09 “Servicing a Misaligned (“Jammed”) Can Assembly.”

The second condition, which can also damage the diaphragm, applies to manual operation and is addressed by the following precaution for operators and service technicians.

Notice 51: Risk of Damage and Misalignment—Moving the ram through the bottom of the can will cause the diaphragm to forcefully rub against the can, possibly causing damage. This does not occur in automatic operation.

- If the maintenance work necessitates placing the can up and the ram down: 1) lower the can onto the press bed, 2) lower the diaphragm onto the press bed, 3) raise the can.
- If goods become jammed between the ram and can, withdraw the ram through the **top** of the can. Attempting to push the ram through the bottom will only jam the goods tighter.

If can misalignment does occur, the corrective action is the same as for condition 1, above.

The counterbalance valves (CAA) address the third condition. These valves are intended to ensure that the can remains level as it travels. They are adjusted at the factory and do not normally need subsequent adjustment. However, if the can appears to travel in a jerky, or uneven motion, and can misalignment, as explained above is ruled out, these valves may need adjustment. Contact Milnor Technical Support.

— End of BIPPMF01 —

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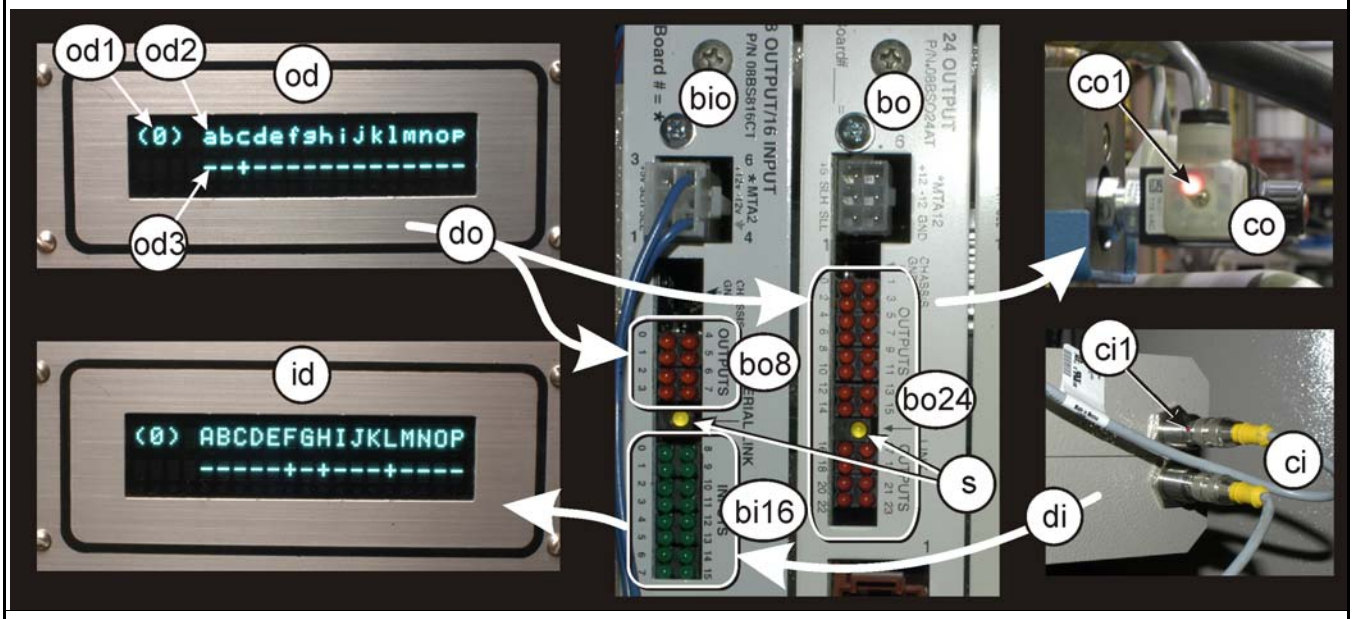
3.2. Onboard Troubleshooting Aids for Digital Outputs and Inputs

Milnor machines with Mark V microprocessor controllers and 2-line displays provide visual aids such as those shown in Figure 39, for troubleshooting digital (on/off) output and input circuits. Milnor machines with other types of controllers and displays provide similar features. These aids indicate the current on/off state at various locations in the circuit.

Figure 39: Troubleshooting Aids

On/Off State Indicators



Legend

bio. Input/output board. These are designated BIO-1, BIO-2, etc., for the first, second, etc. I/O board on the machine.
bi16. Sixteen (16) green LED's (zero (0) through 15)–one per input. LED illuminates when input is made.
bo. Output board. These are designated BO24-1, BO24-2, etc., for the first, second, etc. output board on the machine.
bo8. Eight (8) red LED's (zero (0) through 7)–one per output. LED illuminates when output relay is energized.
bo24. Twenty four (24) red LED's–one per output on this board. The outputs are numbered zero (0) through 23.
ci. Electrical components that provide input signals (proximity switches shown).
ci1. LED on proximity switch–illuminates while switch contacts are made. Only certain components provide an LED.
co. Electrical component controlled by an output signal (electrically operated valve shown).
co1. LED on electric valve actuator–illuminates while valve is actuated. Only certain components provide an LED.
di. Direction of input signals.
do. Direction of output signals
id. Input display on controller–shows 16 inputs (identified with upper case letters A through P)
od. Output display on controller–shows 16 outputs (identified with lower case letters a through p)
od1. Display page number. Additional outputs will be on page 1, 2, etc.
od2. Output “a” (on this page)
od3. Output “a” on/off value. A dash (-) means not actuated. A plus sign (+) means actuated.
s. Yellow serial link light–Must blink when machine is on. Otherwise, board is not communicating with processor.

3.2.1. How To Use the Troubleshooting Aids

Use these aids as a quick check of circuit function and integrity. **Observing proper safety precautions** (see safety manual) you can monitor outputs and inputs while the machine is operating or test outputs in *Manual* mode. Observe circuit function at the following locations:

1. **microprocessor display**—See the reference manual for instructions on viewing inputs and outputs, and on testing. When you invoke this capability, data similar to that shown on the left side of Figure 39 will appear on the display. Confirm that an output occurs at the expected time. Confirm that an input signal from a component on the machine reaches the controller (e.g., test for an open) or that an input is not seen at the wrong time (e.g., test for a short).
2. **I/O boards**—The boards (center of Figure 39) are typically located in the machine's low-voltage control cabinet. The machine will have whatever combination of boards is needed to handle all digital outputs and inputs. Tags inside the cabinet door identify each board and the circuit functions assigned to the numbered outputs and inputs (numbers printed next to the LED's) on each board. Confirm that an output signal from the controller actuates the output relay on the board. Confirm that an input signal from a component on the machine reaches the board or that an input is not seen at the wrong time. The yellow serial link light is also very useful. If it ceases to blink, the board has lost serial communication with the processor. If the machine contains at least two boards of this type, make a note of the board addresses, as set on the rotary switches on the boards. Then swap the boards, giving each board the address of the board it replaces. If the problem (the LED that's not blinking) moved with the board, the board is bad. Otherwise, there is a problem with the board to board connections.
3. **electrical components**—As shown on the right side of Figure 39, electrical components that provide input signals to the microprocessor, such as proximity switches, may have an LED on the component to indicate it's on/off state. Verify that components are functioning. Similarly, components controlled by digital outputs, such as electrically operated valves, may have an LED to indicate whether the component is energized. Verify that an output signal from the controller reaches the component.

3.2.2. Caveats

These troubleshooting aids have the following characteristics and limitations:

- You cannot determine the position of an output or input on an I/O board from its position on the controller display, or the reverse. Nor do these positions correlate to circuit connector and pin numbers, wire numbers, etc. Ensure that you know which display page/position and board/LED the circuit to be checked corresponds to, as follows:

  Display page and position—Tables in the reference manual (usually under troubleshooting) list outputs and inputs and their positions on these displays.

  Board location in card cage—This is shown on a tag inside electric box door (tag also shown in schematic manual).

  Position on board—This is shown on a tag inside electric box door (tag also shown in schematic manual).

  Circuit description—Circuit logic, connector and pin numbers, wire numbers, etc. are provided in the schematic manual.

- Some input circuits connect to the controller directly on the processor board (direct inputs). Currently processor boards do not provide LED's for these inputs. If you cannot find an input listed on the electric box tag that identifies the I/O board positions, suspect that this is a direct input. Verify this on the electric schematic for this circuit. Any such input will connect to the processor board via a connector designated 1MTA38 or 1MTA39.
- The troubleshooting aids do not fully replace traditional electrical troubleshooting. For example, if you suspect there is a problem with a proximity switch, you can quickly deduce from the LED's that there is an open in the wiring between the switch and the I/O board. However, you will need to use traditional means to pinpoint the break. “Milnor's Guide to Basic Troubleshooting” (MXUUUU01) provides guidance on using test equipment.

— End of BIUUUT04 —

BIPPMM02 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

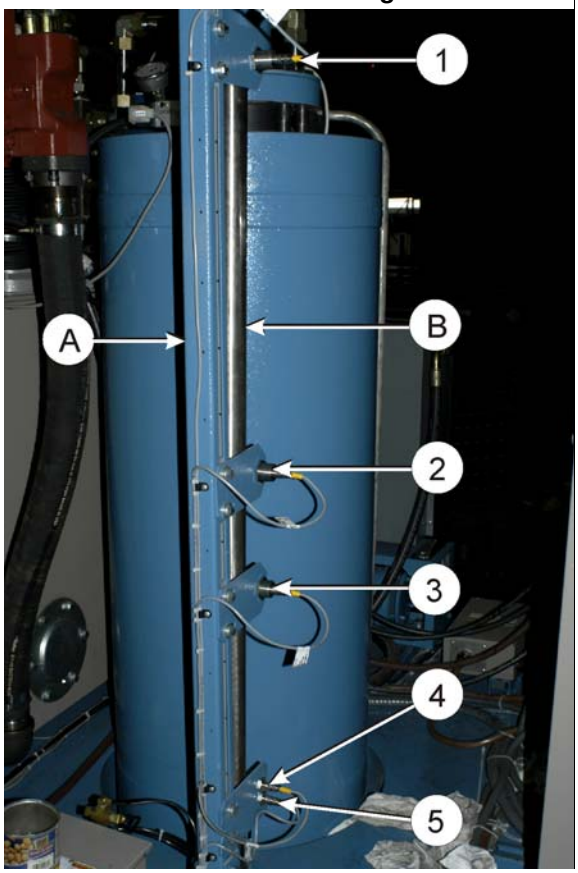
3.3. About the Ram Proximity Switches, Mounting Post, and Guide Rod

Milnor® single stage press models use several proximity switches to detect and report to the microprocessor controller, the position of moving components such as the can and ram. The switch positions are set at the factory and, with the exception of the five proximity switches that detect ram position, do not normally need to be field checked. The ram proximity switches are located on a mounting post on top of the machine next to the ram guide rod, which serves as the switch target (see Figure 40). Both the switch mounting post and the guide rod are removed for shipment and must be re-installed on site. These components must be properly positioned and the switches tested to ensure proper function.

In Figure 40, the ram proximity switches (items 1 through 5) are identified by their functional labels (see “Inputs” in the schematic manual) and the operational conditions they are associated with.

Figure 40: Ram Proximity Switches, Related Components and Switch Functions

Switches on Mounting Post



Legend

A. Proximity switch mounting post
B. Ram guide rod (serves as switch target)
1. PXST “Ram full up”—The ram is approximately at its upper mechanical limit of travel.
2. PXSM “Ram inside can”—The descending diaphragm has started to enter the full circle of the receiving chute where the free-falling ram must now begin to apply pressing pressure.
3. PXSU “Ram at unload”—The diaphragm is just completely inside the full circle of the receiving chute. At discharge, the ram parks at this position so that the discharging cake has clearance, but if the cake is stuck in the can, the ram will push it out when the can rises.
4. PXSL “Ram at low”—The ram has descended farther than it could have if the press had a full load. Hence, the controller assumes a partial load and reduces pressing pressure.
5. PXSB “Ram full down”—The diaphragm is approximately one inch above the bed; the lowest position the ram can travel in automatic operation without risking component damage.

This procedure uses the *Manual* mode (manual operation) as explained in the reference manual. It requires two technicians—one to check and adjust the switch positions and the other to operate the press controls. Both technicians must understand press safety and be able to clearly communicate with each other.

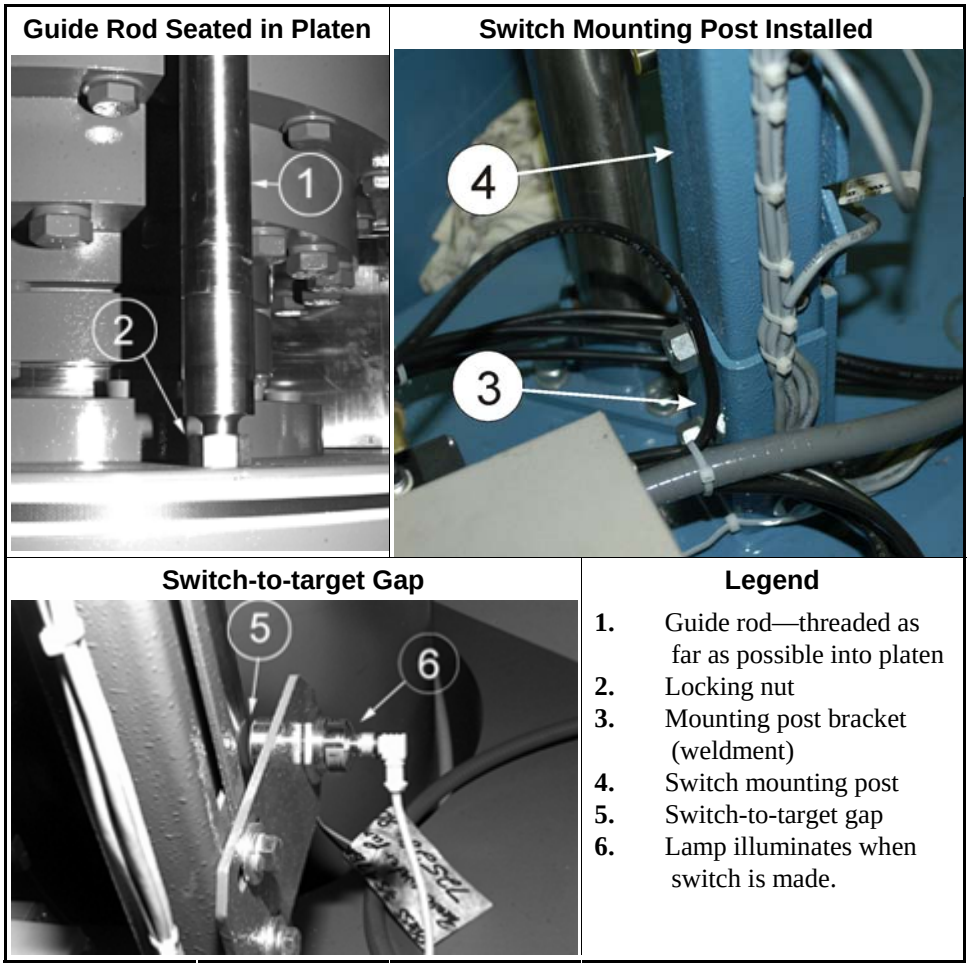
3.3.1. Installing the Guide Rod and Switch Mounting Post and Setting the Switch-to-target Gap

When the guide rod is installed at the factory for testing, it is threaded as far as possible into the platen. Repeat this on site, as shown in Figure 41, to avoid any change in switch actuation resulting from the rod protruding slightly farther.

Install the switch mounting post in its bracket (weldment) as shown in Figure 41 and tighten down. The post has fairly negligible play within the bracket. However, make sure that each switch horizontally aligns with the target (guide rod) and the switch-to-target gap is approximately:

PXST, PXSM, and PXSU (larger switches) = 0.2" (5 mm)
PXSL and PXSB (smaller switches) = 0.13" (3 mm)

Figure 41: Installing the Guide Rod and Switch Mounting Post



3.3.2. Checking and Setting the Switch Vertical Positions

Whether the press is newly installed or has been in operation, the press must be functional and have a properly filled diaphragm (see Note 12) before the proximity switch vertical positions can be checked. These checks and adjustments require two technicians: one works on top of the machine to make the adjustments and the other operates the controls in *Manual* mode.

Note 12: Refer to documents BIPPMM03, “Installing the Milnor Diaphragm in the Single Stage Press” and BIPPMM10 “How to Fill and Maintain the Diaphragm” for diaphragm instructions.

WARNING 52: Crush and Sever Hazards—The can and ram move independently. During operation these components move without warning. These components can also drift down with power off. Any of several closing gaps will crush or sever body parts.

- Proceed only if a qualified service technician, knowledgeable in press manual operation.
- Use the door interlock bypass key switch in strict compliance with the instructions.
- Install the safety supports and lockout/tagout power before reaching into, or working under the can or ram.
- Ensure that personnel and obstructing equipment are clear of the press before operating it or returning to manual operation.
- Ensure that personnel and equipment are clear before operating the machine.
- Be prepared to use emergency stop switches.

CAUTION 53: Multiple Hazards—Various components above the press top plate move or become hot or energized. Hydraulic piping may leak. Working area is tight and may be slippery. When maintenance work necessitates getting on top of the press:

- Ensure only qualified service personnel perform top-of-press work.
- Identify and stand clear of components that move (such as the diaphragm rod) or become hot (such as the pump and motor).
- Use safe, appropriate equipment for getting on and off of the machine.
- Ensure solid footing and guard against slippery surfaces. Wash surfaces with detergent.

Notice 54: Risk of Damage and Misalignment—Moving the ram through the bottom of the can will cause the diaphragm to forcefully rub against the can, possibly causing damage. This does not occur in automatic operation.

- If the maintenance work necessitates placing the can up and the ram down: 1) lower the can onto the press bed, 2) lower the diaphragm onto the press bed, 3) raise the can.
- If goods become jammed between the ram and can, withdraw the ram through the top of the can. Attempting to push the ram through the bottom will only jam the goods tighter.

3.3.3. PXST “Ram full up”

This is the only ram proximity switch that is functional in *Manual* mode; that is, the switch stops ram travel even if commanded up manually. The switch is properly set if it stops ram movement just as the ram reaches it's upper mechanical limit. If this occurs before the upper mechanical limit is reached, you cannot tell by sound or movement, how far away the ram is from it's mechanical limit. However, assuming the switch bracket is near the top of the post, it is sufficient to verify that the ram does not reach its upper mechanical limit without actuating the switch.

Start with the can down and the ram up.

1. Lower the ram a few inches.
2. While one technician observes PXST, the other slowly raises the ram.
3. If the switch lamp illuminates, the switch is properly set. If the ram mechanically stops without actuating the switch:
   a. Move the switch as far up the switch post as possible.
   b. While one technician commands the ram up to hold it against its mechanical stop, the other slowly moves PXST down just until the switch lamp illuminates.

c. Secure the switch at this position.

3.3.4. PXSM “Ram inside can” and PXSU “Ram at unload”

These two switches are checked and set is similar fashion. Start with the can down and the ram up. To adjust PXSM:

1. One technician observes PXSM and signals the other technician when the switch lamp extinguishes. The other technician slowly lowers the ram and stops when signaled.
2. Observe the diaphragm position. If the bottom edge of the diaphragm is one to two inches (25 to 51 mm) inside the full circle of the receiving chute, as shown in Figure 42, the switch is properly set. If not:
   a. Move the ram to the position shown in Figure 42.
   b. Move the switch up on the post then slowly lower it just until the switch lamp extinguishes.
   c. Secure the switch at this position.

Figure 42: Where Ram Should Begin to Apply Power (PXSM)

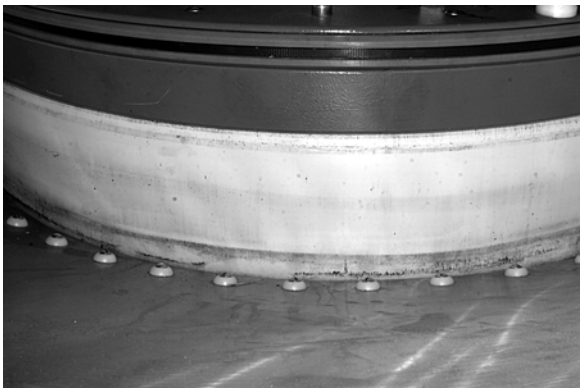
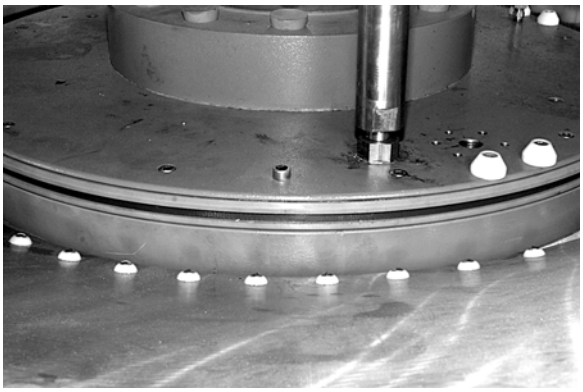


Figure 43: Where Ram Should Park for Unload (PXSU)



Use the same technique to check and set PXSU. The proper diaphragm position is when the diaphragm is just fully inside the full circle of the receiving chute, as shown in Figure 43.

3.3.5. PXSL “Ram at low” and PXSB “Ram full down”

PXSL and PXSB are set at the same time because their mounting brackets abut each other, as shown in Figure 44. PXSB is set first, then PXSL is simply placed above PXSB, with their brackets touching.

PXSB is properly set if, when the ram descends, this switch de-actuates (switch lamp extinguishes) when the diaphragm is one inch (25 mm) above the press bed, as shown in Figure 45.

CAUTION 55: Risk of diaphragm damage and poor extraction—The PXSB (“Ram full down”) setting and the diaphragm water level, together, greatly affect both diaphragm life and machine performance. PXSB set too low and/or an overfilled diaphragm is likely to severely shorten diaphragm life. PXSB set too high and/or an under-filled diaphragm will impede extraction, especially with partial loads.

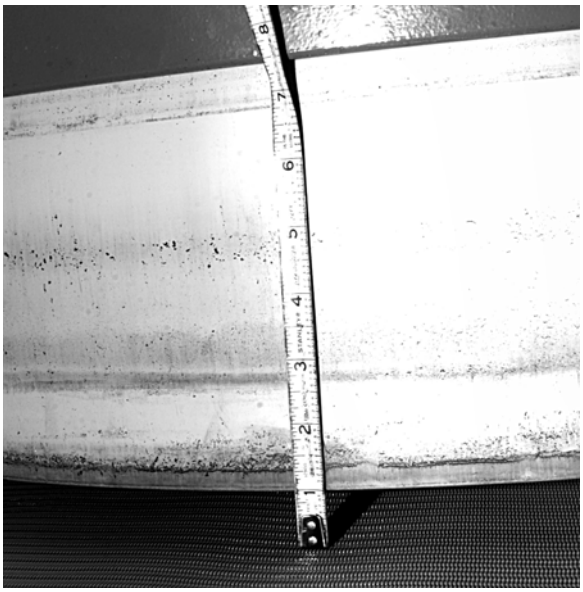
- Maintain the specified diaphragm-to-bed clearance.
- Maintain a properly filled diaphragm (see Note 12).

Start with the can up (safety stands installed) and the ram down.

1. Raise the ram about six inches (about 150 mm).
2. One technician observes PXSB and signals when the switch lamp extinguishes. The other technician slowly nudges the ram down and stops when signaled.
3. Lockout/tagout power and measure the diaphragm-to-bed gap. If this measures one inch (25 mm) as shown in Figure 45, the switch is properly set. If not:
   a. Lower the diaphragm onto the press bed and release the controls.
   b. Move PXSL out of the way by raising it about six inches (about 150 mm).
   c. Move PXSB to a position exactly one inch (25 mm) above where the top of the guide rod is currently.
   d. Secure the switch at this position.
   e. Test this position by repeating Item 1 through Item 3 several times. Adjust the switch position if necessary.
   f. Once PXSB is secured, move PXSL down until the PXSB and PXSL brackets are touching and secure it in this position.

Figure 44: PXSL and PXSB With Abutting Brackets

Figure 45: PXSB Diaphragm-to-Bed Clearance



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3.4. Troubleshooting Ram Malfunctions

This document applies to Milnor® single stage press models with prefixes MP1603, MP1604, MP1A03, and in part, to older MP1601 and MP1602 models. Use this guide if your machine exhibits one of the following symptoms **for no apparent reason** (e.g, the problem cannot be associated with recent servicing):

- Ram will not go down or goes down slowly
- Ram will not go up or goes up slowly
- Ram drifts down at idle
- Neither ram nor can will move

- Little or no extraction
- Commanded pressure not achieved or achieved slowly

Notice 56: Understand the press servicing hazards—Before performing press troubleshooting, review document BIPPMS01 “Safe Servicing...”

3.4.1. What You Should Know Before Troubleshooting

1. These procedures are intended only for qualified service technicians with a knowledge of hydraulic systems. For safety and, in most cases, necessity, two technicians are required.
2. If you are not thoroughly familiar with the press hydraulic system, review document BIPPMF01 “How the Single Stage Press Hydraulic System Works,”.
3. For convenience, kit KYSSTRBLSH is available from Milnor. This provides fittings and other components for use in the test procedures explained in Section 3.4.3 “Functional Tests”.
4. The press has several pressure adjustments which are set at the Milnor factory and not normally readjusted on site. With the few exceptions mentioned herein, pressure adjustments are not a solution when troubleshooting these symptoms. For those few exceptions, comply carefully with document BIPPMT02 “Setting Single Stage Press Pressures.”
5. Often, the first indication of a ram problem will be an error condition and accompanying message such as “E03 Ram Not Fully Raised”. Consult “Troubleshooting” in the reference manual for more information, such as which proximity switch caused the error.

3.4.2. Troubleshooting Procedures

For an overview of symptoms, components and possible causes of ram malfunctions, see Table 6 on the next page. Experienced troubleshooters may wish to use this table as a quick reference. Detailed troubleshooting steps for each symptom follow the table. Some troubleshooting steps require test procedures to be performed. These tests, which are provided in Section 3.4.3, are also helpful for general servicing and preventive maintenance.

Table 6: Ram Symptoms and Causes Cross-reference

Symptom									Possible Cause								
Pressure not achieved or achieved slowly ⇓									⇓ Stuck valve								
Little or no extraction ⇓									⇓ Clogged/dirty								
Neither ram nor can will move ⇓									⇓ Worn/leaking								
Ram drifts down at idle ⇓									⇓ Open circuit (never on)								
Ram goes up slowly ⇓									⇓ Short (never off)								
Ram will not go up ⇓									⇓ Internal damage								
Ram goes down slowly ⇓									⇓ Mis-adjusted								
Ram will not go down ⇓									⇓ Bad coil								
Functions and Related Components*																	**Comments**
Pressurize system																	
• Pressure pump						o	o	o						o	o		
• Pressure pump motor						o						o		o			
• System relief valve								o							o		
Control pressure																	
• Proportional valve							o	o	o			o		o			
• Proportional (DBET) card							o	o				o		o	o		
• High resolution D/A board							o	o				o		o			
Sense pressure																	
• Pressure transducer							o	o				o	o	o			
• A/D board							o	o				o		o			
Enable ram rod-side flow																	
• VEPP1 poppet 1 actuator	o	o										o				o	
					o								o				
• Poppet valve 1	o	o	o		o				o	o	o			o			
• VEPP2 poppet 2 actuator	o	o										o				o	
					o								o				
• Poppet valve 2	o	o	o		o				o	o	o			o			
• Ram relief valve			o	o						o	o				o		
Enable ram pressurization																	
• VERDB bypass actuator							o						o				
• Bypass valve							o		o	o	o			o			
• Ram piston seals			o	o	o		o	o			o						
• Ram shaft seals	o	o													o		
Enable ram direction																	
• VERL lower ram (coil B)	o						o					o				o	
			o										o				
• VERR raise ram (coil A)			o		o							o				o	
	o												o				
• Ram directional valve	o		o				o		o					o			
Enable quick fill and exhaust																	
• VERS pre-fill pilot actuator				o			o						o				
• Pre-fill pilot valve		o					o		o					o			
• Pre-fill valve		o		o			o		o					o			

** This column groups related electrical and mechanical components under the function they collectively perform.

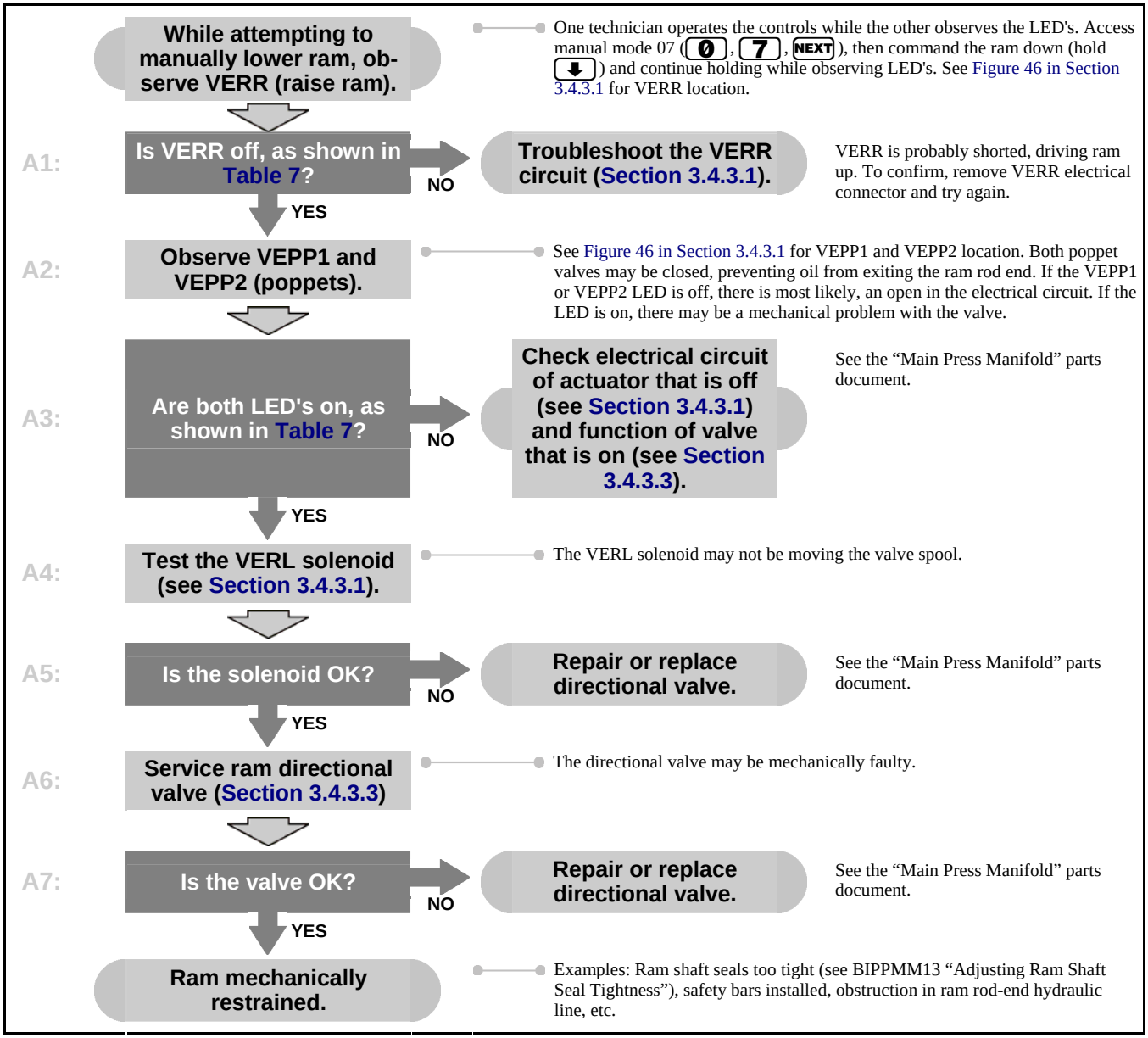
3.4.2.1. Ram Will Not Go Down or Goes Down Slowly

—Table 7, referenced in the charts below it, shows the on/off state of the electrically operated hydraulic valves during ram descent.

Table 7: Valve Actuation Sequence for Ram DOWN (observe LED's on actuators)

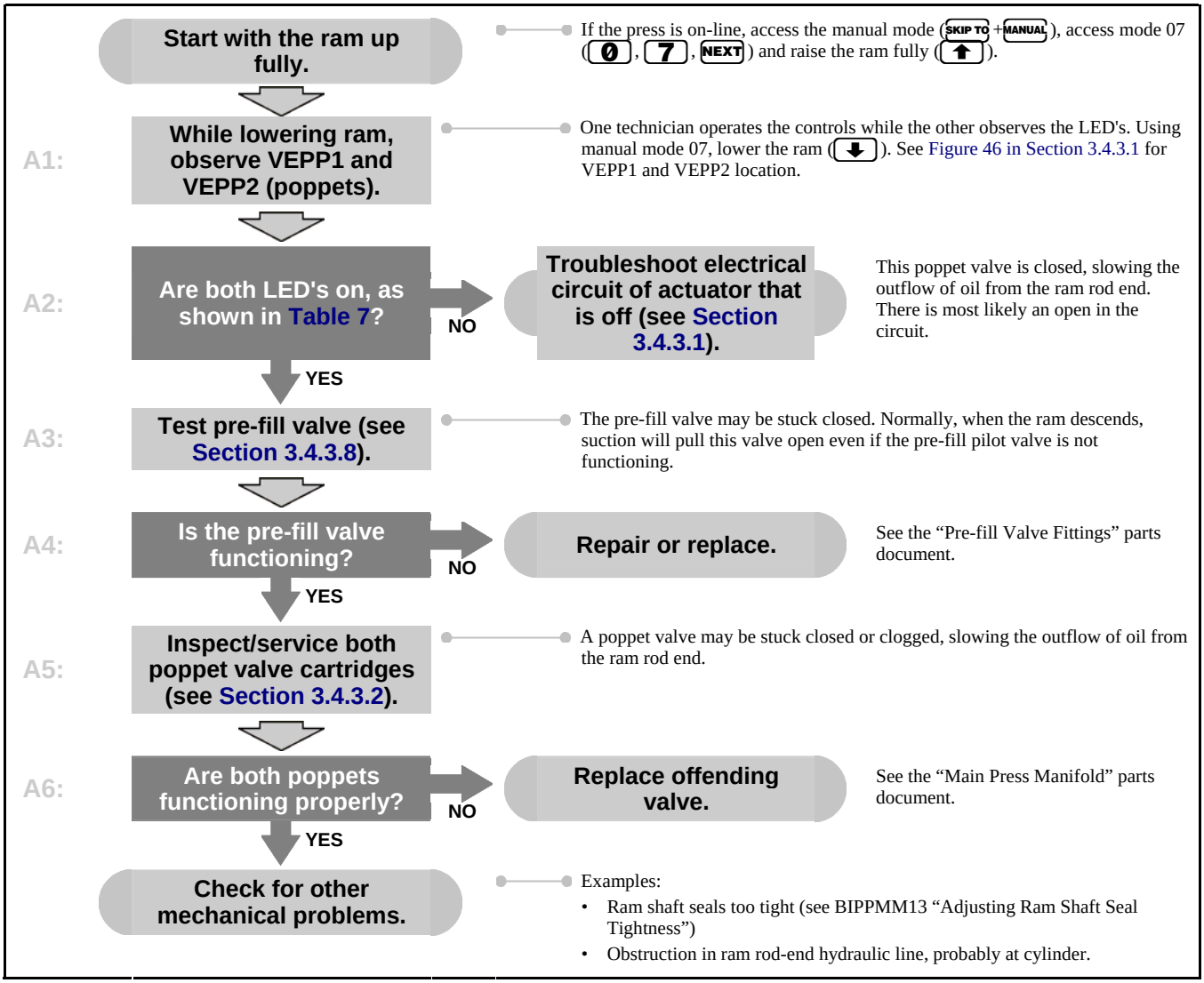
When During Travel	VERDB "ram down bypass"*	VERS pre-fill	VERL lower ram	VERR raise ram	VEPP1 poppet #1"	VEPP2 poppet #2
1. Start (full up)	off	on	on	off	on	on
2. Ram in can (1/2 down)	off	off	on	off	on	on
3. Ram at unload (2/3 down)	on	off	on	off	on	on
4. End (lowest position)	on	off	on	off	on	on
* The ram down bypass valve is open when VERDB is off and closed when on.						

Chart 5: Ram Will Not Go Down (two technicians required)



Perform the following troubleshooting if the ram descends significantly slower than it did previously, resulting in longer cycle times.

Chart 6: Ram Goes Down Slowly (two technicians required)



3.4.2.2. Ram Will Not Go Up or Goes Up Slowly—Table 8, referenced in the charts below it, shows the on/off state of the electrically operated hydraulic valves during ram ascent.

Table 8: Valve Actuation Sequence for Ram UP (observe LED's on valve actuators)

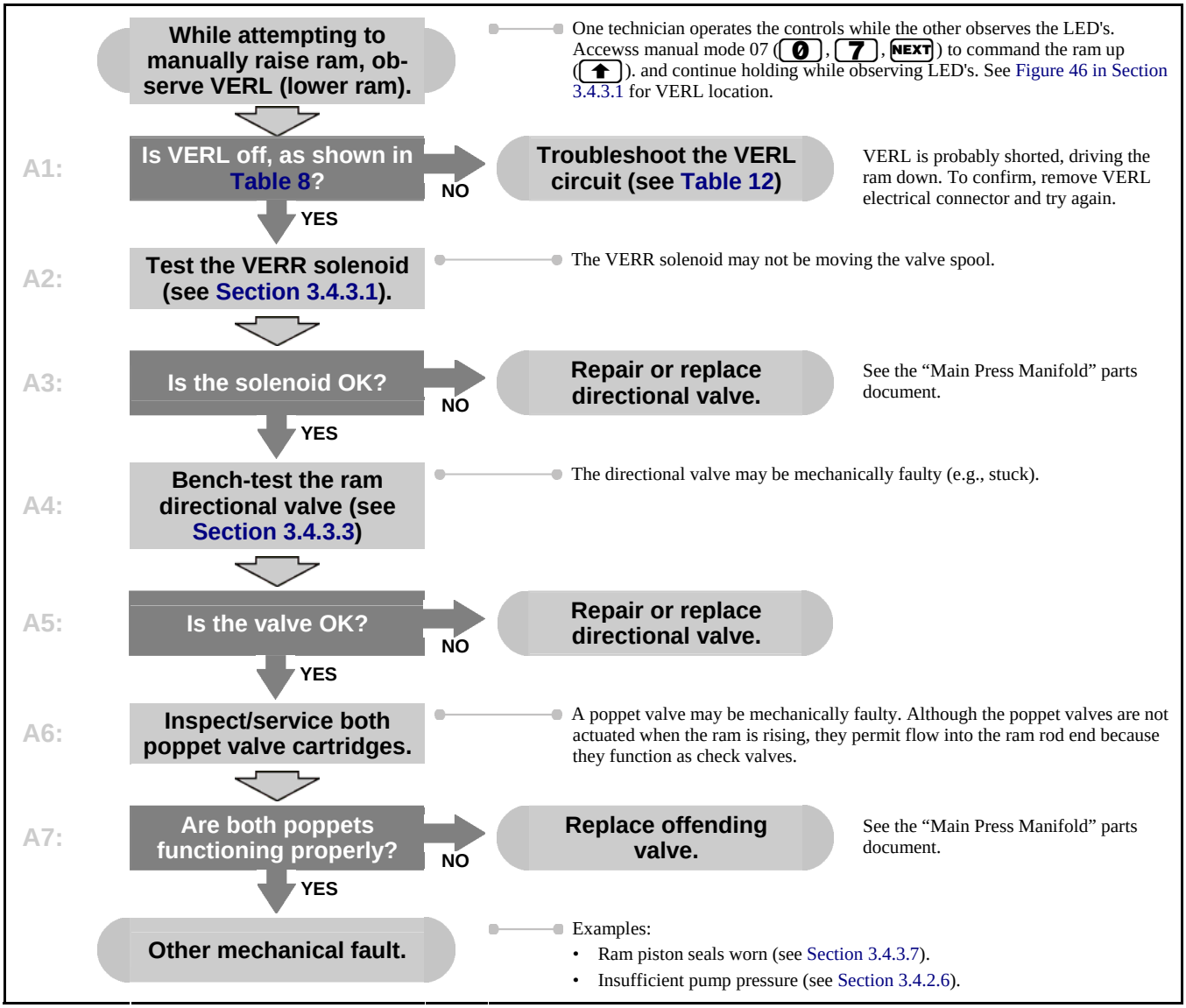
When During Travel	VERDB ram down bypass*	VERS pre-fill	VERL lower ram	VERR raise ram	VEPP1 poppet #1***	VEPP2 poppet #2***
1. Start (lowest position)	off	on**	off	on	off	off
2. Ram at unload (1/3 up)	off	on	off	on	off	off
3. End (full up)	off	off	off	off	off	off

* The ram down bypass valve is open when VERDB is off and closed when on.

** When the ram is manually raised, this valve is on at this time. In automatic operation, the timing of valve operation depends on the end code used.

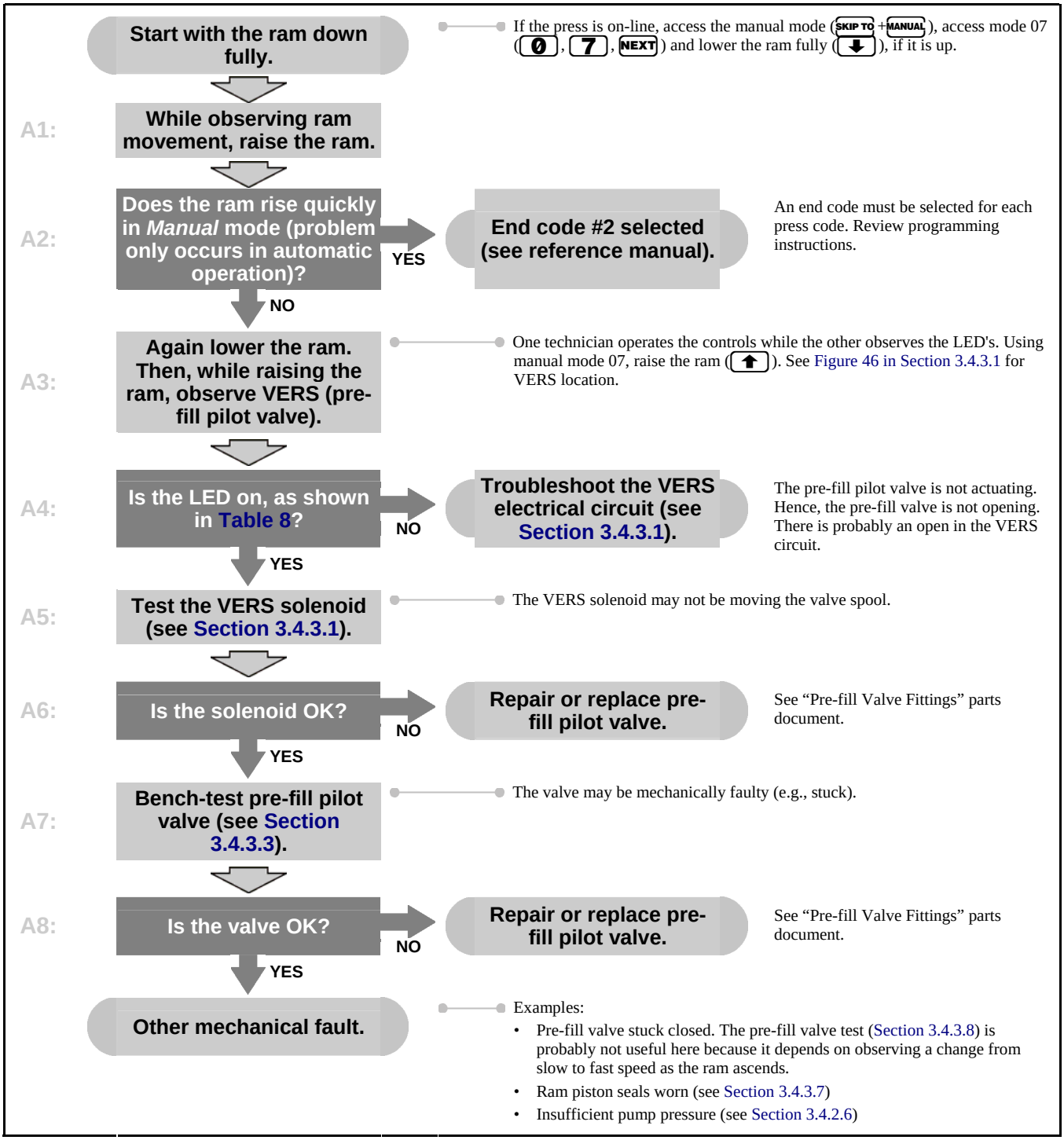
*** Although the poppet valves remain off during ram up, they permit oil to enter the ram rod side because they are always open in this direction.

Chart 7: Ram Will Not Go Up (two technicians required)



Perform the following troubleshooting if the ram ascends significantly slower than it did previously, resulting in longer cycle times.

Chart 8: Ram Goes Up Slowly (two technicians required)

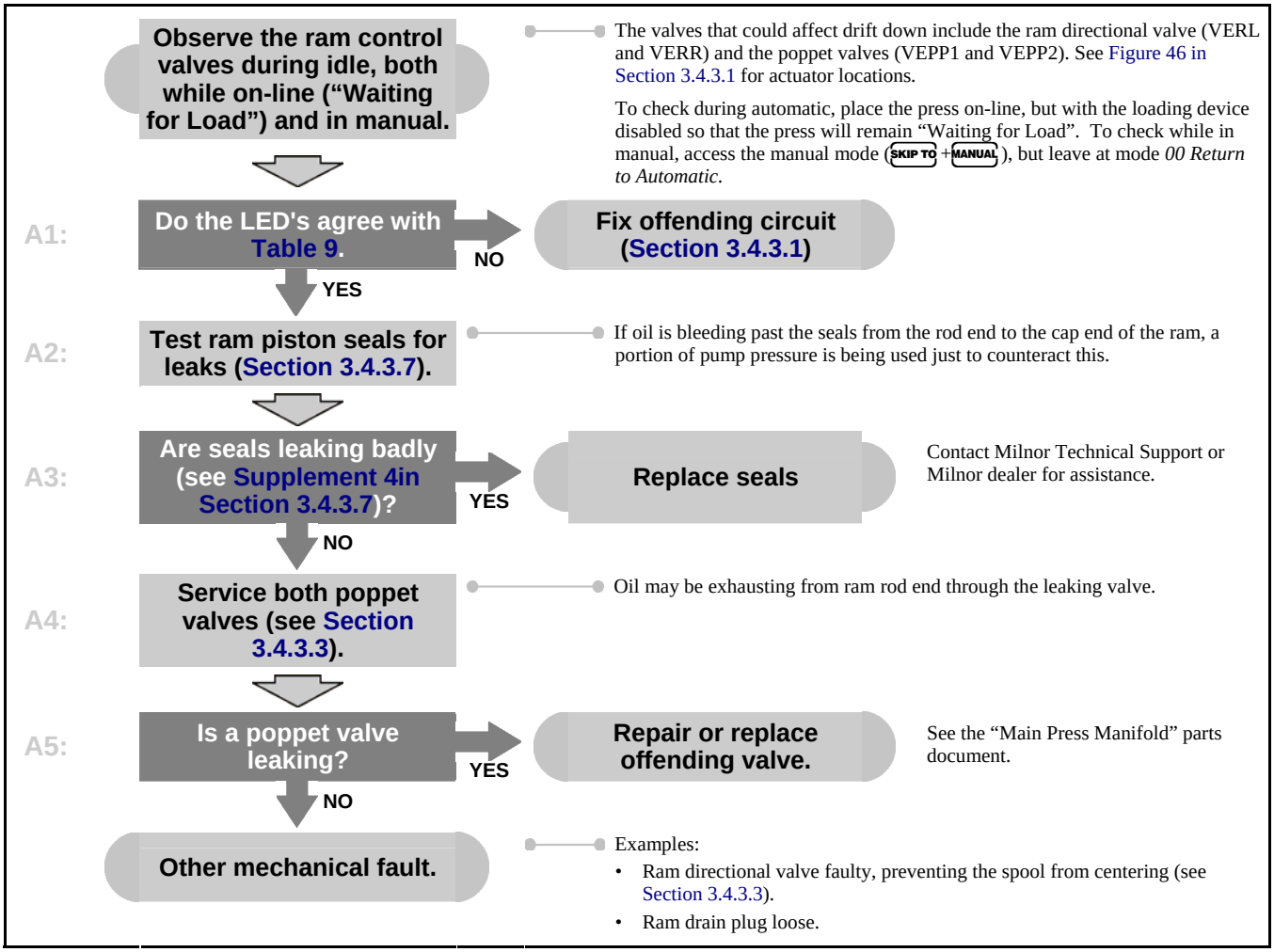


3.4.2.3. Ram Drifts Down at Idle—Referring to Table 9, when the press is idling in manual mode, all ram control valves are off. When it is idling in automatic and "Waiting for Load", all except VERR are off. In the latter case, VERR holds the ram directional valve in the "raise ram" position so that idle pressure will help counteract any tendency to drift down.

Table 9: Valve State During Idle

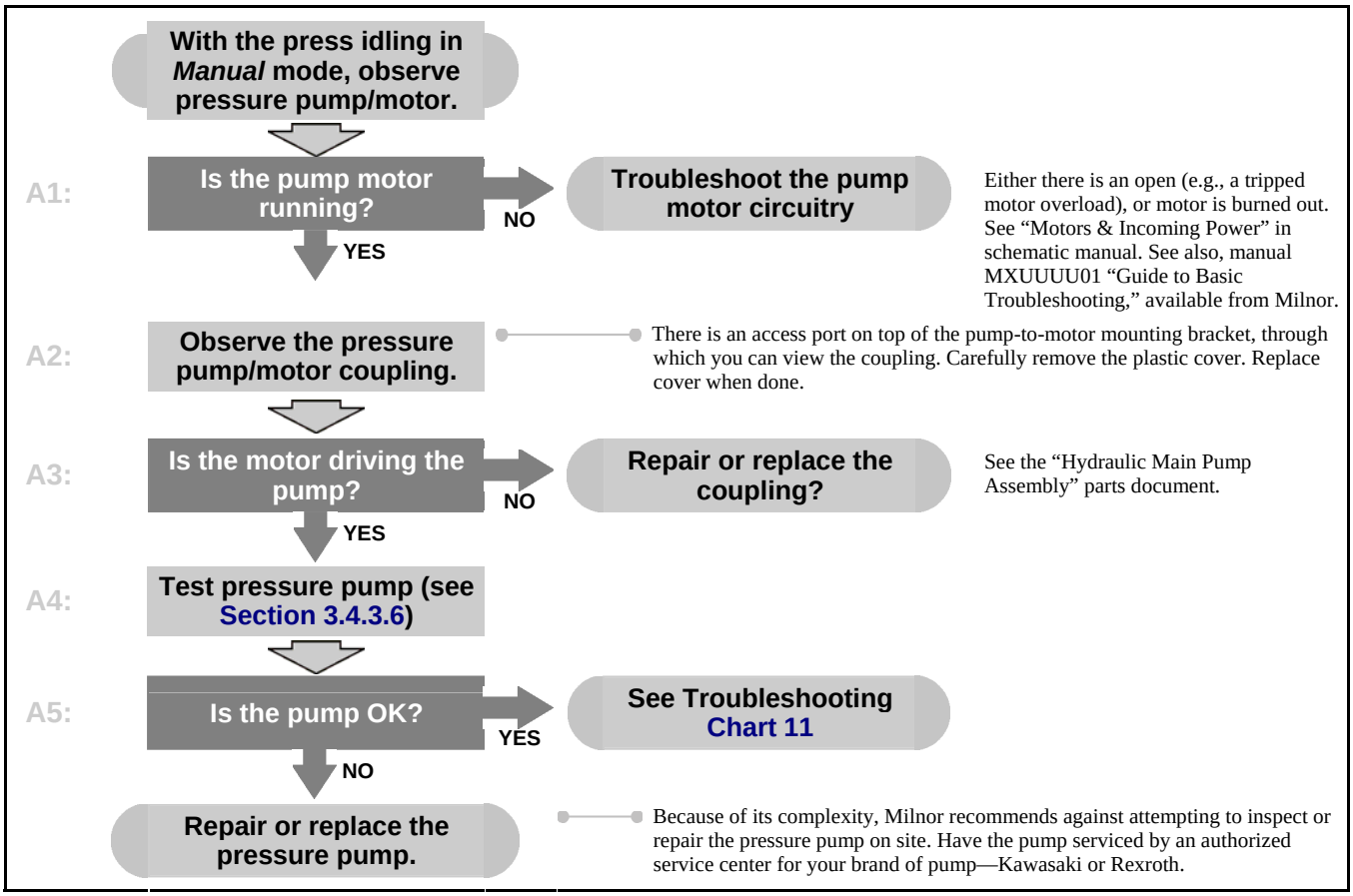
Type of Idle	VERDB "ram down bypass"*	VERS pre-fill	VERL lower ram	VERR raise ram	VEPP1 poppet #1"	VEPP2 poppet #2
Automatic ("Waiting for Load")	off	off	off	**on**	off	off
Manual	off	off	off	off	off	off
* The ram down bypass valve is open whrn VERDB is off and closed when on.						

Chart 9: Ram Drifts Down at Idle



3.4.2.4. Neither the Ram Nor Can Will Move—When functioning properly, the pressure pump will begin producing approximately 400 psi as soon as the *Start* switch (①) is pressed and while idling. Idle pressure is sufficient to raise/lower the can and ram. If neither the ram nor can can be made to move in *Manual* mode (other than ram descent), this likely indicates that the pressure pump is producing llittle or no pressure.

Chart 10: Neither the Ram Nor Can Will Move



3.4.2.5. Little or No Extraction—Perform this troubleshooting if the press cycles successfully, but extraction substantially does not occur, as indicated by:

- press cycle time increases to maximum, causing tunnel hold time to increase
- drying times increase drastically
- cakes appear wet or can be pulled apart easily and pieces feel wet

Table 10: Valve States During Pressing (observe LED's on valve actuators)

When	VERDB ram down bypass*	VERS pre-fill	VERL lower ram	VERR raise ram	VEPP1 poppet #1	VEPP2 poppet #2
While manually pressing	on	off	on	off	on	on
During automatic operation (during production)	**	off	**	**	**	**
* The ram down bypass valve is open when VERDB is off and closed whrn on.						
** These valves open and close according to the press code.						

Chart 11: Little or No Extraction (two technicians required)

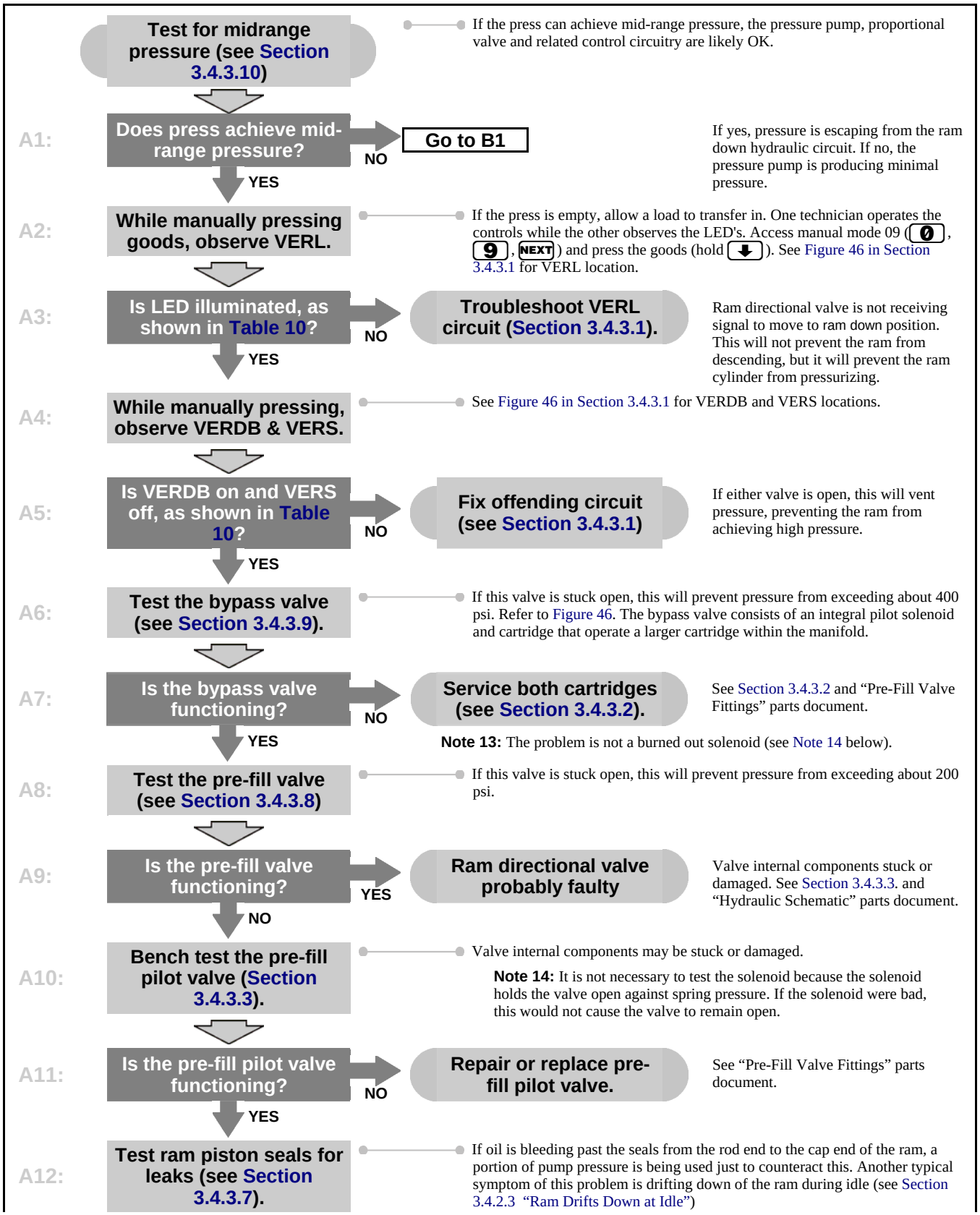
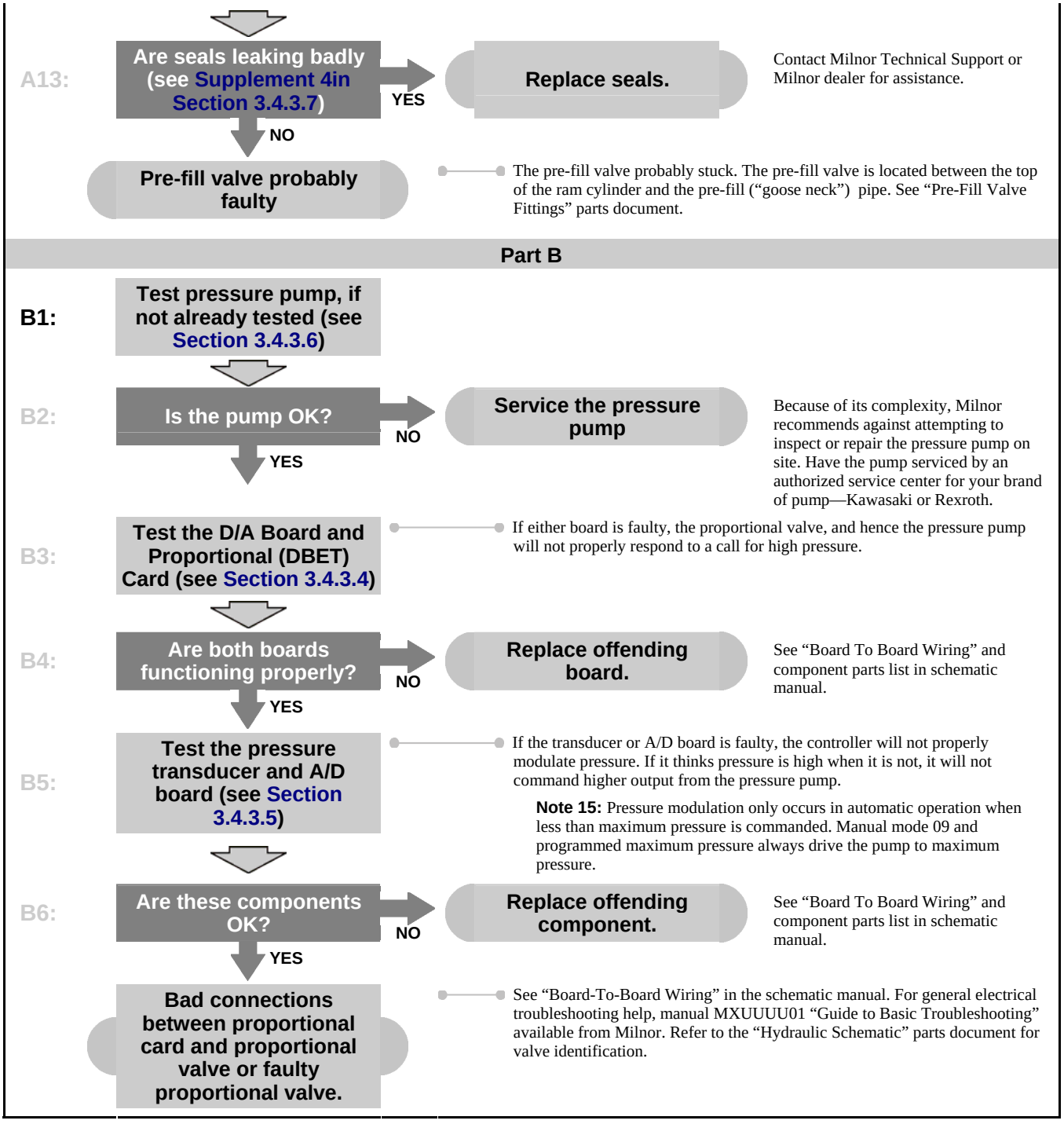


Chart 11: Little or No Extraction (two technicians required)



3.4.2.6. Commanded Pressure Not Achieved or Achieved Slowly—Perform the following troubleshooting if the press approaches, but cannot achieve the pressure(s) called for by the press codes (up to rated pressure, as listed in Table 11 below), or takes significnatly longer to achieve pressure (see also Supplement 3 below). This is usually accompanied by an increase in press cycle time, which causes tunnel hold time to increase. If pressure is not achieved, drying times will likely increase.

Table 11: Applicable Milnor® Single Stage Press Models and Pressure Ratings

Model Prefix	Rated (Maximum System) Pressure - psi (bar)	
	Pump (Gauge) Pressure	Diaphragm Pressure
MP1603	4600 (317)	508 (35)
MP1604	4350 (300)	725 (50)
MP1A03	4600 (317)	580 (40)

Supplement 3

About Impaired Pressing

Impaired pressing—the inability of the press to achieve, or quickly achieve **rated** pressure.

Impaired pressing should be rectified if it is serious enough to affect the machine's operating performance (see reference manual) or increase drying times. A small reduction in the maximum achievable pressure will do neither if the pressures specified in all press codes are below the pressure at which the problem is evident. If the machine can quickly achieve any **programmed** pressure, correcting a minor impairment is not likely to provide useful benefits.

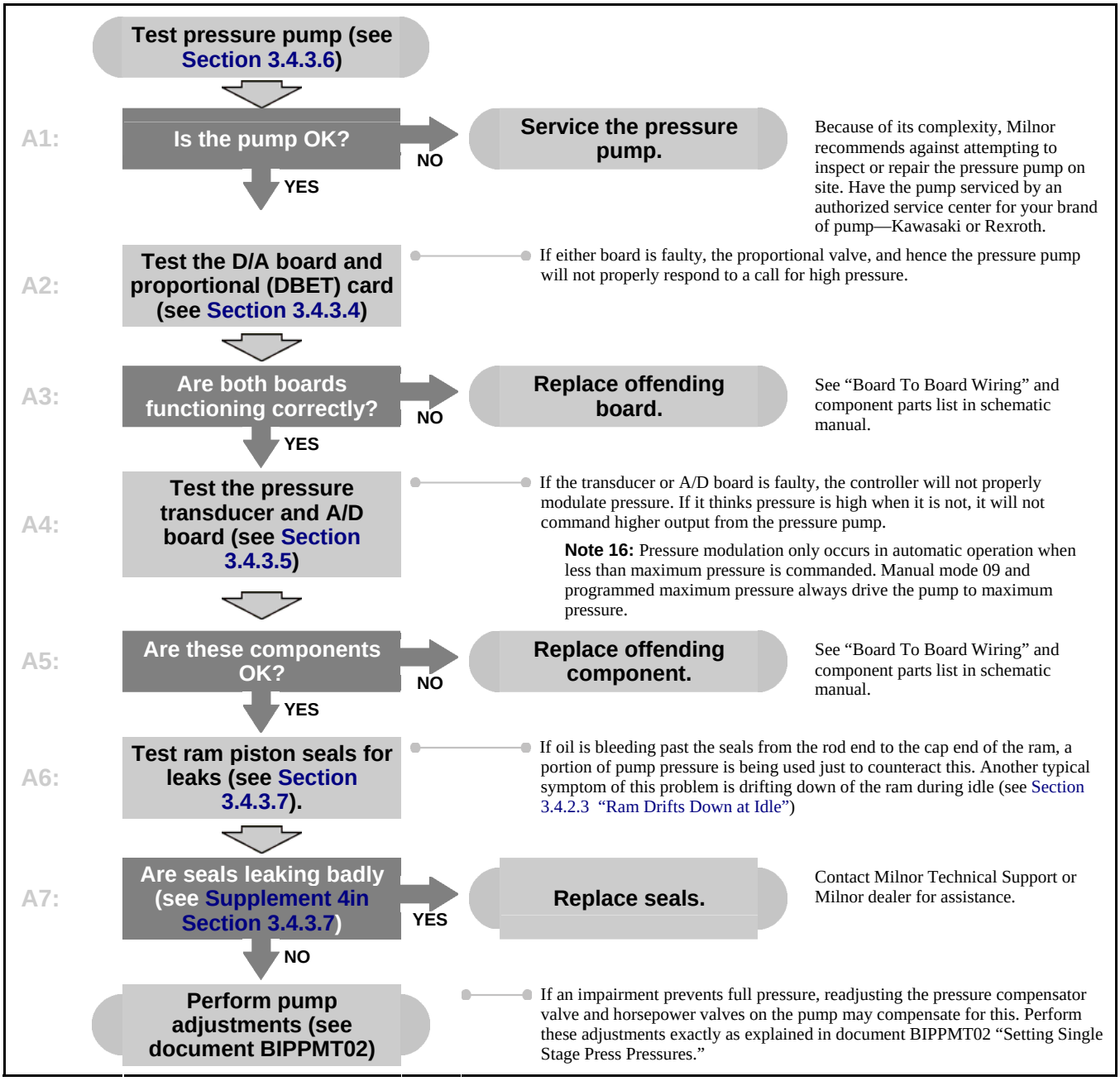
Impaired pressing can only be determined from an accurate pressure reading. Neither reduced operating performance nor increased drying times necessarily indicate a pressure problem. These can result from numerous causes such as changes in goods types, load sizes, and/or press codes, none of which relate to the machine's ability to achieve pressure. Nor is there an error condition that signals impaired pressing. If the pressure called for by the press code is not achieved, the step will end at the programmed maximum time (see reference manual) and processing will continue.

For the most accurate pressure reading, observe the system pressure gauge (top gauge on the gauge cluster). The three displays that show pressure (normal run display, viewing analog input..., and manual function 09 *Pressurize Ram*, which get their data from the pressure transducer, are approximate, and the first two display diaphragm pressure. Only manual function 09 displays approximate pump pressure.

Pressing can be impaired by a malfunctioning component or bad pressure setting. If it can be determined at the outset that a pressure setting is the likely cause, do not perform these procedures. Instead, refer to document BIPPMT02, “Setting Single Stage Press Pressures.” Two situations that can cause pressure settings to fall out of adjustment are:

1. **“breaking in” a new press**—The maximum achievable pressure may **gradually** decline during the first few months of operation, as hydraulic components such as seals are “broken in.” In this instance, adjust the pressure settings to restore full pressing capability.
2. **major hydraulic component replacement**—This is especially true for the pressure pump. Four adjustments are located on the pump itself and may be mis-adjusted on the replacement pump. Always check pressures in accordance with document BIPPMT02 following this type of servicing.

Chart 12: Commanded Pressure Not Achieved or Achieved Slowly



3.4.3. Functional Tests

3.4.3.1. How to Check Electric Valve Actuator Circuits and Test the Solenoids—The six electrically operated, ram hydraulic valves and their actuators are identified in Figure 46. Useful information about the actuator electrical circuits is provided in Table 12.

Figure 46: Ram Electrically Operated Hydraulic Valves

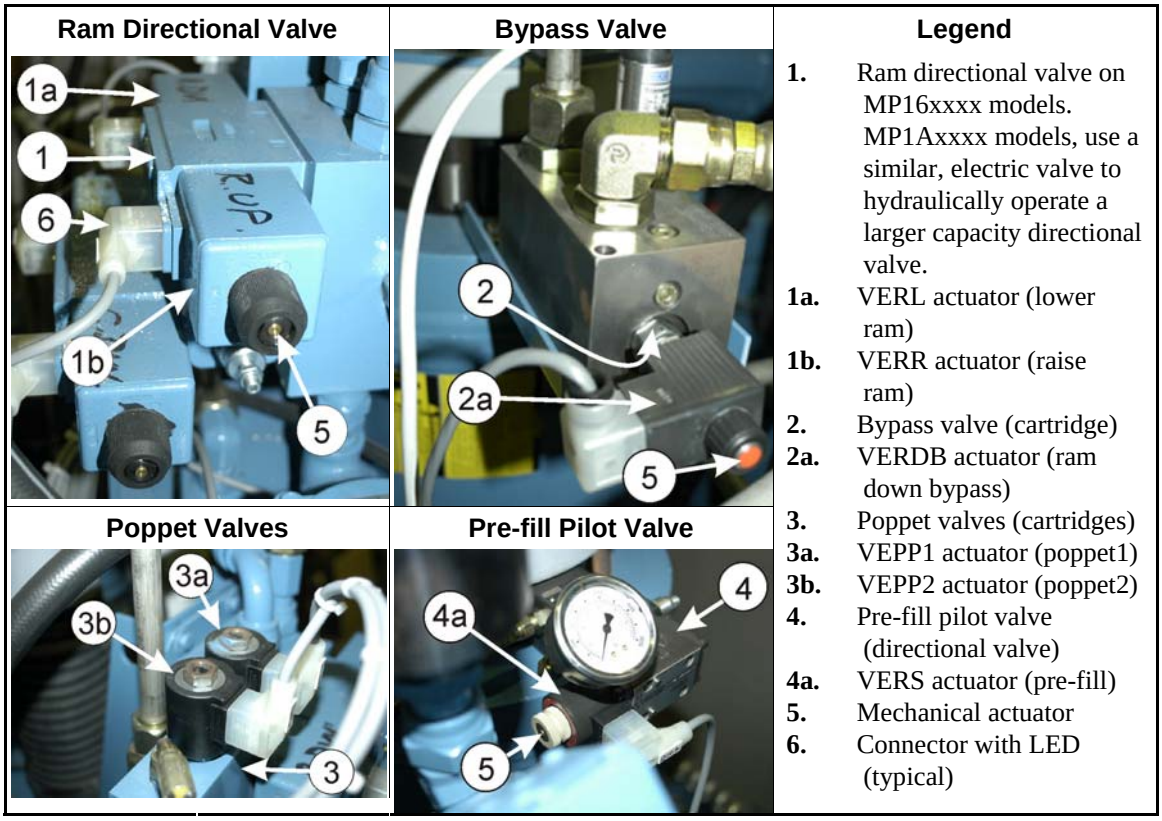


Table 12: Digital Outputs for Ram Functions (electric valves)

Function	Output Display		I/O Board				Wire #	Controlled Components	
	Page	Position	Board #	LED #	Connector	Pins		Actuator	Valve
Lower ram	0	c	BIO-1	2	1MTA5	17-8	30	VERL (lower)	Ram directional valve (coil B)
Raise ram	0	d	BIO-1	3	1MTA5	16-7	31	VERR (raise)	Ram directional valve (coil A)
Pre-fill	0	a	BIO-1	0	1MTA5	19-10	28	VERS	Pre-fill pilot valve
Poppet #1*	0	h	BIO-1	7	1MTA5	11-1	37	VEPP1	Poppet valve #1
Poppet #2*	1	b	BO24-1	9	1MTA13 1MTA14	10 1	38	VEPP2	Poppet valve #2
Ram down bypass	1	f	BO24-1	13	1MTA14	14-4	27	VERDB	Bypass valve
*** The poppet valves, which operate simultaneously, open to allow flow into and out of the ram rod end.**									

Check circuit function by observing the on/off state of any actuator at three locations: the output displays, the LED's on the I/O boards, and the LED's on the actuator electrical connector (see also BIUUUT04 “Onboard Troubleshooting Aids for Digital Outputs and Inputs”).

All of the electrically operated hydraulic valves except the poppet valves have mechanical actuators (see Figure 46). Assuming you have determined that the electrical circuit is functioning properly (the LED on the valve actuator illuminates when it should), use the mechanical actuator to determine if the problem with a valve is due to a non-functioning solenoid. Observing warning statement **57** , carefully press the mechanical actuator (with a tool, if necessary) when you see the LED illuminate. If the valve functions properly, the problem is with the solenoid.

WARNING 57: Crush Hazards—Hydraulic valve mechanical actuators bypass the safety of the electrical controls. Depressing a mechanical actuator may cause immediate movement.

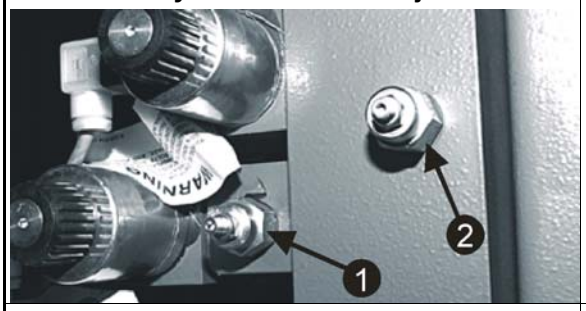
- Use extreme caution when operating a hydraulic valve mechanically.

The bypass valve and poppet valves use removable cartridges that can be inspected and serviced as explained in Section 3.4.3.2, below. The directional valves can be removed and bench tested, as explained in Section 3.4.3.3.

3.4.3.2. How to Inspect and Service Hydraulic Valve Cartridges—Several easily removable hydraulic valve cartridges are used on the press. These are of various designs, depending on their function: operational valve, pressure relief valve, or pressure regulator. The pressure relief valves and pressure regulators are identified in Figure 47. A cartridge can malfunction as a result of contamination (e.g., metal shaving) in the hydraulic fluid, or damage (e.g., worn seals). Additionally, a relief valve or pressure regulator can be improperly adjusted. Cartridges are designed to be inspected, cleaned, and seals replaced, but not rebuilt. With care, pressure relief and pressure regulator cartridges can often be removed, serviced and replaced without changing their adjustment.

Figure 47: Pressure Relief Valves and Regulators

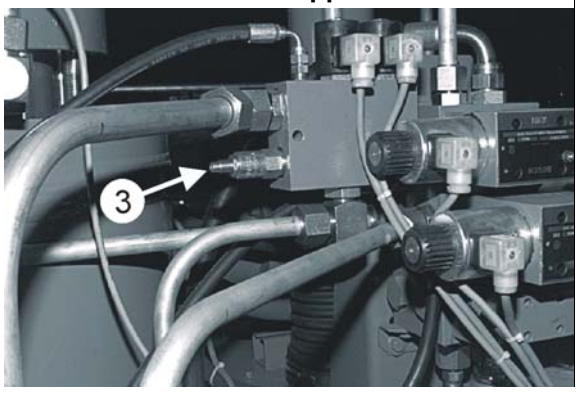
Can and System Pressure Adjustments



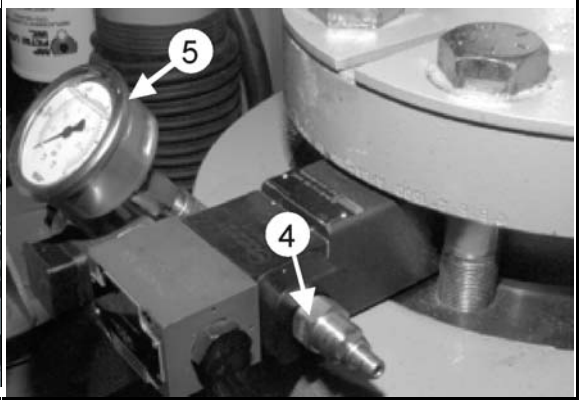
Legend

1. Can pressure regulator
2. System relief valve
3. Ram relief valve
4. Pre-fill pilot pressure regulator
5. Pre-fill pressure gauge

Ram Relief Valve on Poppet Valve Manifold



Pre-fill Pilot Valve and Related



1. Secure the can and ram by lowering them completely or installing the safety stands/bars. Then lockout/tagout power.

2. Each cartridge has a large integral mounting nut. Additionally, pressure relief/regulator cartridges have a smaller lock nut for locking down the setting and a hex socket (Allen) screw for adjusting the pressure setting. Remove the cartridge by turning the mounting nut only.
3. Inspect the cartridge for dirt and wear. If components such as seals appear worn or damaged, Milnor recommends replacing the cartridge. A seal kit may be available from a third party, but this can be done afterward and the old cartridge retained as a spare. If the cartridge appears serviceable, clean it as follows:
   a. Carefully remove obvious particles then submerge the cartridge in clean mineral spirits.
   b. Through the nose of the cartridge, manually operate the working parts several times. Use a piece of plastic tubing (see Figure 48) to avoid damaging sensitive components such as screens. If possible, do this with the cartridge submerged in the mineral spirits.
   c. **Pressure relief/regulators only:** If you must back off on the adjustment screw for effective cleaning, hold the cartridge in a vice, loosen the lock nut, and turn the adjustment screw with a hex head (Allen) screw. **However, once you change the pressure setting, you will need to reestablish the proper setting using the procedures in document BIPPMT02 "Setting Single Stage Press Pressures", after re-installing.**
   d. Use clean (filtered) compressed air to blow dry the cartridge.
4. Dip the dry cartridge in clean hydraulic oil then reinstall.

Figure 48: Operating Valve Cartridge

Figure 49: Bench-testing a Directional Valve

3.4.3.3. How to Bench Test Directional Valves—Assuming you have determined that the valve actuator circuit is functioning properly (the LED on the actuator illuminates when it should), you can bench test a directional valve as follows:

1. **Secure the can and ram by lowering them completely or installing the safety stands/bars. Then lockout/tagout power.**
2. Remove the valve actuator electrical connector(s). Make sure to mark connectors as needed for proper replacement.
3. Remove the valve housing by removing the four mounting bolts.
4. Allow oil to drain from the valve. Remove any seals or o-rings that might otherwise fall off.
5. Carefully clamp the valve to a bench or hold in a vice for inspection. You can:
   - Visually inspect for damage, contaminants, worn seals, etc.
   - Check valve functioning. Press the mechanical actuator(s), looking for spool movement.
   - Blow air into the "P" port (see Figure 49) and, while depressing the actuator, verify that the air exits the proper port ("A," "B," or "T"), or at least moves from port to port.
6. When re-installing the valve, use care to keep the valve clean, replace all seals, and match up electrical connectors properly.

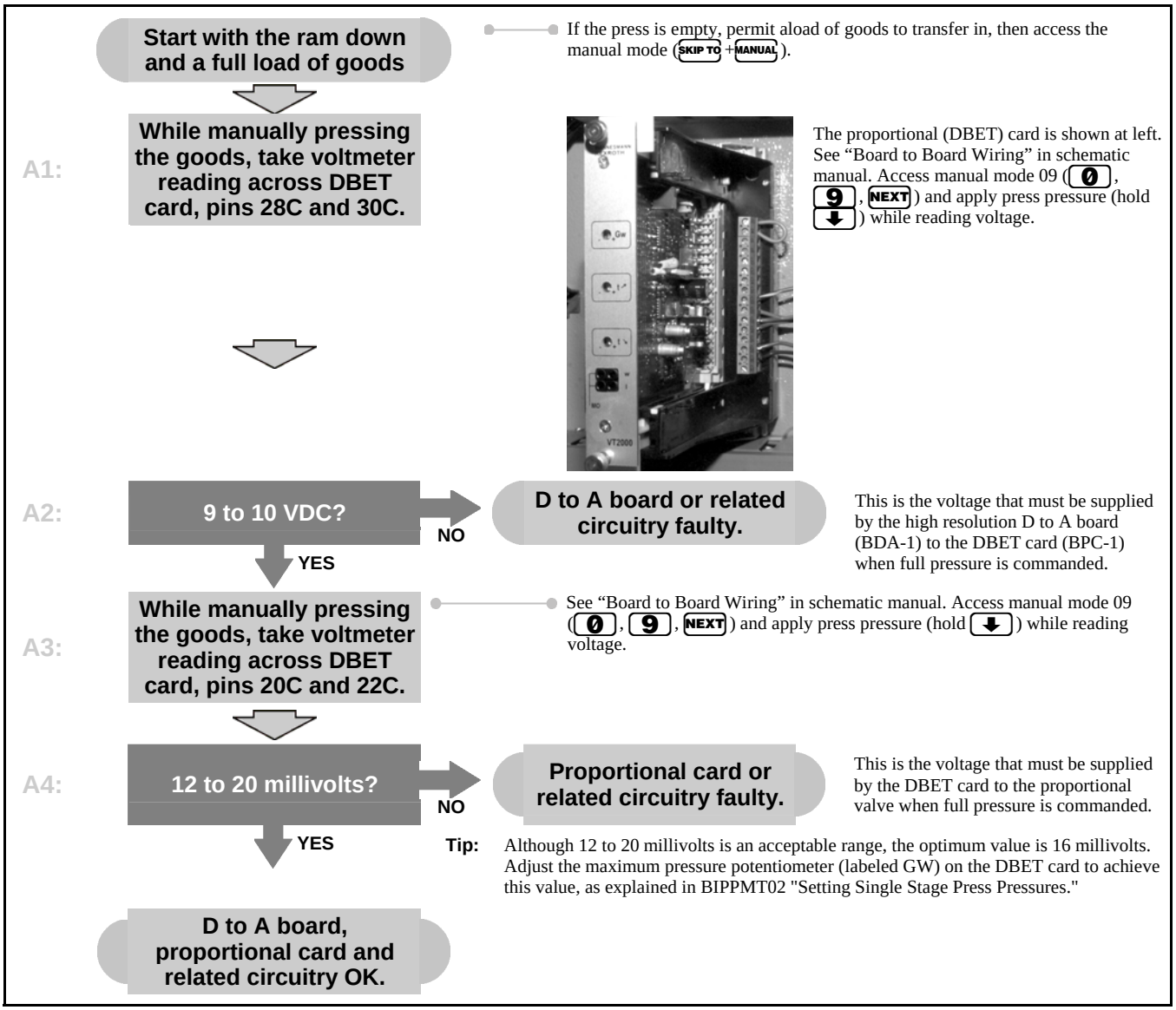
3.4.3.4. How to Test the D/A Board and Proportional (DBET) Card Analog Output—

The pressure pump sends oil to the proportional valve via a small hydraulic control line. When the proportional valve is fully open (maximum oil flow through the control line), the pump produces **minimum** pressure; that is, about 400 psi (idle pressure). When the proportional valve is fully closed (no oil flow through the control line), the pump produces **maximum** pressure; that is, full rated pressure as listed in Table 11 in Section 3.4.2.6. As the voltage supplied by the proportional (DBET) card to the proportional valve **increases**, the valve **closes.** The proper relationship among output board values, valve position and pump output at each end of the range is summarized in Table 13.

Table 13: Relationships Among Pump Control Components at Each End of Range

D/A Board (digital counts)	D/A Board Output (VDC)	Proportional (DBET) Card Output (millivolts)	Proportional Valve Position	Pressure Pump Output
0000	0 (zero) VDC	0 (zero) millivolts	fully open	minimum (idle pressure)
4095	10 VDC	16 millivolts	fully closed	maximum (rated pressure)

Chart 13: How to Test the D to A Board and Proportional (DBET) Card Analog Output



3.4.3.5. How to Test Pressure Transducer and A/D Board Analog Input—The pressure transducer data is used by the controller 1) to show pressure on the controller display and 2) to maintain (modulate) programmed pressure (see Note 17). If you manually press a load of goods using manual mode *09 Pressurize Ram*, displayed pressure should match system gauge pressure. The proper relationship among transducer, A/D board, and pressure values, at each end of the range, for the two types of transducers in current use (see Note 18), is shown in Table 14.

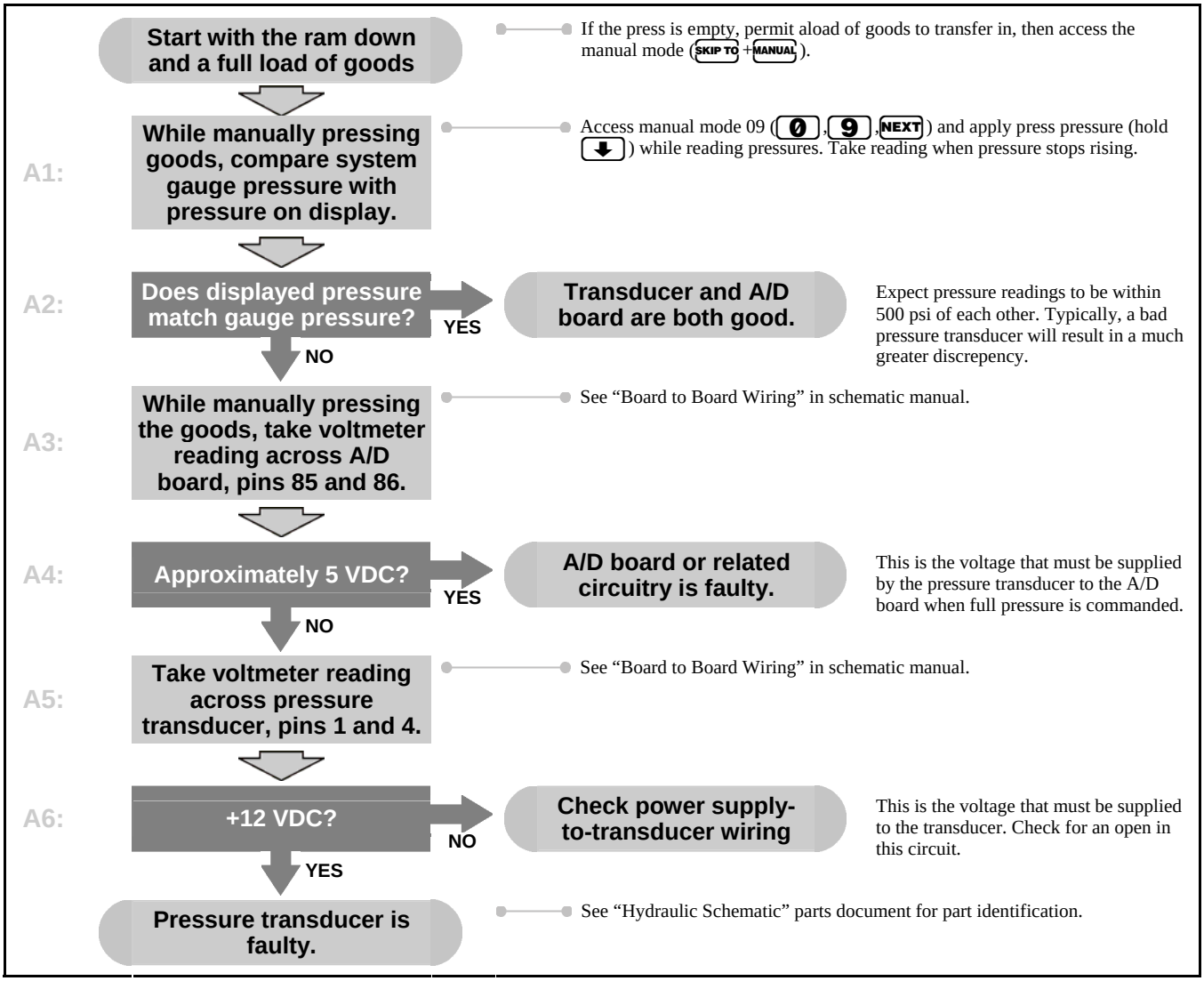
Note 17: The pressure transducer is in the ram down circuit so it only supplies data during ram descent and pressing. Commanding full pressure with manual mode *09*, drives the pump to maximum (no modulation).

Note 18: The *Pressure Sensor Zero Offset* configure decision adjusts for the type transducer installed. Do not use this configure value to attempt to "calibrate" displayed pressure with gauge pressure.

Table 14: Relationships Among Pressure Sensing Components at Each End of Range

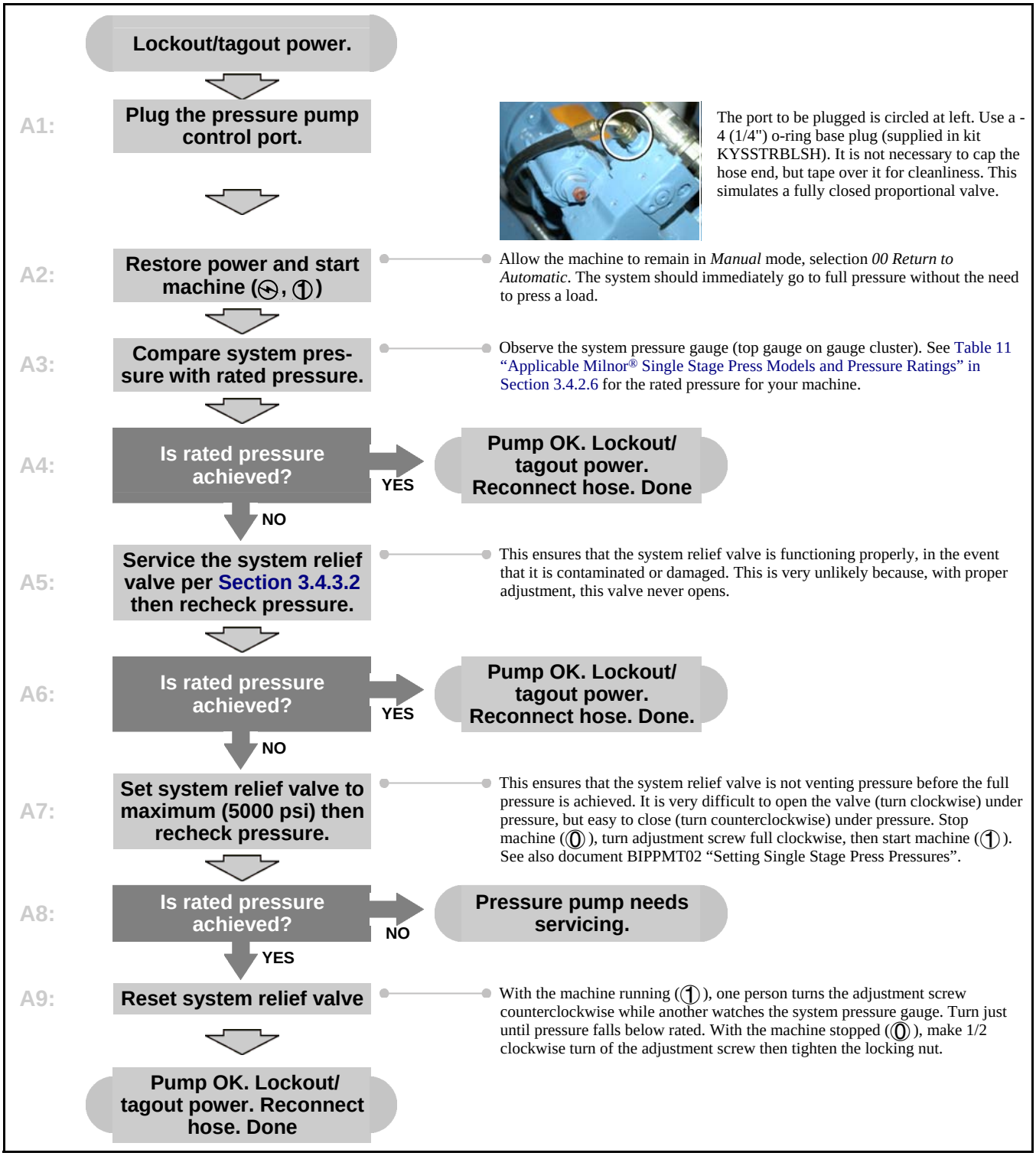
Pressure Transducer Output (VDC)		A/D Board (digital counts)	System Pressure (psi)
0 (zero)-based type	0.1 (zero)-based type		
0 VDC	0.1 VDC	0000	0 (zero) psi
5 VDC	5.1 VDC	4095	5000 psi

Chart 14: How to Test Pressure Transducer and A/D board Analog Input



3.4.3.6. How to Test the Pressure Pump—For the press to achieve and maintain commanded pressure while pressing goods, the pressure pump, **along with several other components**, must function properly. Some of the other components are the proportional valve and related electronics, the pressure transducer and related electronics, and the ram piston seals. Use this procedure to test the pressure pump independent of all other components.

Chart 15: Pressure Pump Test

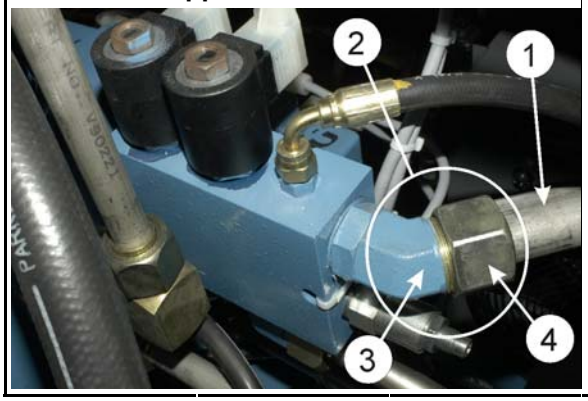


3.4.3.7. How to Test the Ram Piston Seals—As the ram begins pressing a load of goods, the goods compress, and the ram piston moves down slightly, oil in the rod side of the ram exits through the rod-side tubing. As the goods are compacted and ram movement decreases, this flow of oil should decrease. If the flow increases, this indicates that a significant amount of oil is leaking past the piston seals as pressing pressure increases. Test this as follows:

1. Permit a load of goods to transfer into the press, but immediately take the the machine off line. The can will be down and the ram up.
2. Lower the ram (*manual mode 07*) just until the diaphragm is resting on the goods.
3. Lockout/tagout power to the machine.
4. Referring to Figure 50, modify piping as follows (cap and hose are provided in kit KYSSTRBLSH):
   a. Disconnect the ram rod-end (ram up) tubing at the poppet valve manifold.
   b. Cap the manifold connector.
   c. Connect a hose to the disconnected tubing. Run the other end of the hose into a bucket.
5. Restore power and, while observing the flow of oil into the bucket, call for pressure (*Manual mode 09*). If flow decreases as the goods are pressed, the piston seals are good. If it increases, the seals may need to be replaced. However, see Supplement 4.
6. Lockout/tagout power and restore the permanent connections.

Figure 50: Where to Disconnect Tubing to Test Ram Piston Seals

Poppet Valve Manifold



Legend

1. Hydraulic line to ram cylinder rod end
2. Disconnect here.
3. Cap this side.
4. Connect hose this side.

Supplement 4

About Ram Piston Seal Replacement

A certain amount of seal leakage is normal. Ram piston seal replacement is a major service procedure requiring expertise and heavy lifting equipment. Before proceeding with this servicing, evaluate the costs and benefits. As a general rule, avoid this servicing until:

1. all other possible causes are ruled out, and
2. maximum achievable pressing pressure is unacceptable.

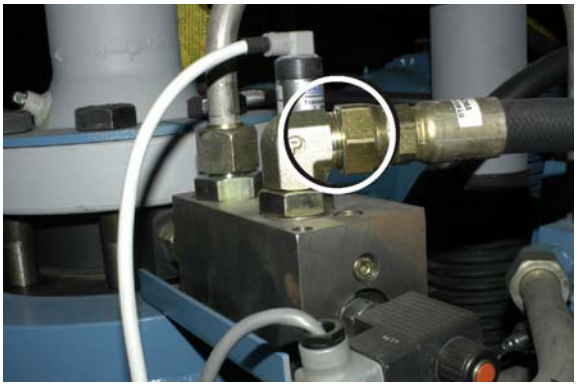
3.4.3.8. How to Test the Pre-fill Valve—In a properly functioning press, when the ram rises, the pre-fill valve opens to speed ascent by permitting a large volume of oil to exhaust through the large pre-fill pipe. If the pre-fill valve closes in mid-ascent, the ram will slow down considerably. The following procedure uses this observation to verify that the prefill valve is working:

1. Unscrew the electrical connector for the pre-fill pilot valve actuator (VERS), so that it can be quickly unplugged, but leave it electrically connected.
2. Lower the ram and can fully if they are up (*Manual mode 02*).
3. Call for ram up (*Manual mode 07*).
4. While the ram is rising, unplug the VERS connector. If the ram's speed slows noticeably, the pre-fill valve, and indeed, the pre-fill hydraulic circuit and the pre-fill pilot valve are working. If not, there is a problem with this system.
5. Replace and secure the VERS connector.

3.4.3.9. How to Test the Bypass Valve —The bypass valve remains open except when pressing pressure is called for to prevent ram pressure from exceeding about 200 psi at all other times. If this valve is stuck open, the ram cannot pressurize. If you have determined that the bypass valve electrical circuit is functioning properly by observing the LED on VERDB (VERDB actuates to **close** this normally open valve), you can test this valve for a mechanical problem as follows:

1. Lockout/tagout machine power.
2. Disconnect the bypass valve-to-tank return line at the fittings indicated in Figure 51. Cap the valve side and plug the hose end to simulate a closed bypass valve (cap and plug are provided in kit KYSSTRBLSH).
3. Restore power. If there are no goods in the press, permit a load of goods to transfer to the machine then take the machine off line.
4. Attempt to press the goods using *Manual Mode 09*. If high pressure is achieved (as indicated by the system pressure gauge), the bypass valve is not functioning properly.
5. Lockout/tagout power and reconnect the permanent hose connection.

Figure 51: Bypass Valve: Where to Disconnect Hose



3.4.3.10. How to Test for Mid-range Pressure—This test is part of troubleshooting "Little or No Extraction (no error)," but may be helpful in other situations as well. If the ram is permitted to drive against its upper mechanical limit of travel, ram relief pressure (displayed on the middle gauge on the gauge cluster) should rise to that set on the ram relief valve.

1. Lower the diaphragm onto the press bed.
2. Disconnect the electrical cable to the ram up proximity switch. This is the top switch on the proximity switch mounting plate (see document BIPPMM02 “About the Ram Proximity Switches...”)
3. Raise the ram fully and continue to command ram up once the ram stops at its upper limit.

4. While continuing to command ram up, observe the ram pressure gauge (middle gauge on the gauge cluster).
5. After reading the pressure, lower the ram (diaphragm to the press bed and reconnect the ream up proximity switch.

The specified ram relief valve setting is 1500 psi. If a ram pressure gauge reading of 1200 psi or higher is obtained, it is unlikely that "Little or No Extraction..." is caused by faulty pressure pump.

— End of BIPPMT01 —

BIPPMT02 (Published) Book specs- Dates: 20060905 / 20060905 / 20060927 Lang: ENG01 Applic: PPM

3.5. Setting Single Stage Press Pressures

This document supersedes document IIFUUC02 for all single stage press models with the Kawasaki pump (see IIFUUC02 for the older Rexroth pump). Once set at the factory, pressures do not normally need readjustment unless a major component (e.g., pressure pump) is replaced.

Although these procedures are straightforward, unanticipated problems resulting in costly damage can arise. Personnel must have an in-depth knowledge of hydraulic systems and be familiar with manual operation of the press.

Notice 58: Understand the press servicing hazards—Before performing press maintenance, review document BIPPMS01 “Safe Servicing...”

Table 15, which follows, describes the components that may need adjusting. Table 16, following it, specifies the values to be used. The rows in Table 15 correspond to those in Table 16.

Table 15: List of Adjustments

Adjustment Component	What It Does	Means of Adjusting
Full system pressure (no single adjustment)	Determines maximum programmable pressing pressure.	See four items with asterisk (*) below.
Idle pressure valve	Controls idle (also called standby or minimum) pressure (system pressure while the operating press is idle)	Hex socket screw and locking nut on pump
*** Pump pressure compensator valve**	Limits system pressure once its set point (full system pressure) is achieved.	Hex socket screw and locking nut on pump
1st stage horsepower valve (torque limiter)	Limits motor amperage draw at predetermined midrange (1st stage) and high (2nd stage) pressures by adjusting pump operating characteristics (see Note 19).	Adjustment nut and locking nut on pump
*** 2nd stage horsepower valve (torque limiter)**		Hex socket screw and locking nut on pump
*** System relief valve**	Bleeds off pressure exceeding permissible full system pressure.	Hex socket screw, locking nut on manifold
Pre-fill pilot pressure regulator	Regulates pressure exceeding that permitted for the pre-fill pilot valve.	Hex socket screw, locking nut on valve
Ram relief valve	Bleeds off pressure exceeding that permitted on rod end of ram cylinder.	Hex socket screw, locking nut on manifold
Can pressure regulator	Regulates pressure exceeding that permitted for can cylinders.	Hex socket screw, locking nut on manifold
*** Proportional valve maximum pressure pot.**	Calibrates the DBET card with proportional valve to ensure full valve closure.	Adjustable pot on DBET card
Proportional valve ramp up potentiometer	Sets how fast the proportional valve closes (swash plate moves to increase output).	Adjustable pot on DBET card
Proportional valve ramp down potentiometer	Sets how fast the proportional valve opens (swash plate moves to decrease output).	Adjustable pot on DBET card

Note 19: The horsepower adjustments enable the pump to maintain the maximum permissible load on the motor (full load amperage) as flow decreases and pressure increases (destroke), to ensure that the motor does not stall, but full pressure is achieved.

Table 16: Adjustment Specifications

Adjustable Condition	Specification (Kawasaki pump only)				Means of Measuring
	MP1603 (35 bar)		MP1604 (50 bar)	MP1A03 (40 bar)	
	low flow	high flow			
Full system pressure	4600 psi	4600 psi	4350 psi	4600 psi	See four adjustments with an asterisk (*) below
Idle pressure	400 psi				Observe system pressure (top) gauge
***Pump compensation pressure**	4600 psi	4600 psi	4350 psi	4600 psi	
1st stage horsepower (amperage draw)	Achieve full load amperage rating on motor nameplate (+/- 3%) while ram relief pressure at: 1200 psi @ 60 Hz / 1350 psi @ 50 Hz / 625 psi @ 60 Hz / 750 psi @ 50 Hz / 825 psi @ 60 Hz / 985 psi @ 50 Hz / 880 psi @ 60 Hz / 1060 psi @ 50 Hz				Ammeter measurement while ram relief pressure is lowered to value shown
*** 2nd stage horsepower (amp. draw)**	Achieve full load amperage rating on motor nameplate (+ 5% / -0%) while system pressure is 300 to 400 psi below rated full system pressure.				Ammeter measurement while system pressure is lowered to value shown
*** System relief pressure**	Rated full system pressure plus 1/2 clockwise turn of the adjustment screw				Observe system pressure gauge then 1/2 CW turn
Pre-fill pilot max. pressure	2000 psi				Observe pre-fill pressure gauge (near valve)
Ram relief pressure	1500 psi				Observe ram relief pressure (middle) gauge
Can maximum pressure	800 psi				Observe can relief pressure (bottom) gauge
*** Proport. valve max. pressure**	4600 psi	4600 psi	4350 psi	4600 psi	Observe system pressure gauge
Proport. valve ramp up rate	minimum setting (This control must have no effect on valve or pump operation.)				Measurement not needed
Proport. valve ramp down rate					

3.5.1. Preparations, Precautions and Tips

3.5.1.1. Two technicians are needed.—One technician operates the controls and monitors the pressure gauges. The other performs the adjustments, which are located on top of the machine.

CAUTION 59: Multiple hazards—Various components above the top plate move or become hot or energized. Hydraulic piping may leak. Working area is tight and may be slipery. When maintenance work necessitates getting on top of the press:

- Ensure that only qualified service personnel perform top-of-press work.
- Identify and stand clear of components on top of the machine that move (such as the diaphragm rod) or become hot (such as the pump and motor).
- Use safe, appropriate equipment for getting on and off of the machine.
- Ensure solid footing and guard against slippery surfaces. Wash surfaces with detergent.

3.5.1.2. **Be prepared to load goods.**—Several adjustments, starting with the 2nd stage horsepower adjustment, must be done with a full load of wet goods in the machine. All other adjustments except for the last (set can pressure), which should be done with the machine empty, may be done with the machine loaded or empty.

Notice 60: For safety and convenience—Avoid manually loading goods.

- If the service procedure must be performed with goods in the machine, permit the press to accept a load of goods automatically, then take the machine off-line.
- If it becomes necessary to manually load or adjust goods, use extreme caution. Always follow the published safety precautions (see safety manual).

3.5.1.3. **Have needed materials on hand.**—Tools will likely include:

- Ammeter and voltmeter
- Small, flat blade screwdriver
- Hex head (Allen) wrench set
- Closed-end wrenches (various sizes)
- -4 (1/4") O-ring base plug (for the pump control port)

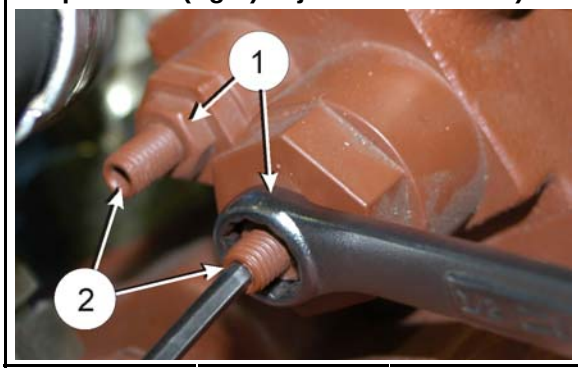
Notice 61: Troubleshooting, not covered here, may be required—This procedure provides minimal troubleshooting and assumes that, aside from the need for adjustment, the press pressure components are functioning properly. If you encounter problems not covered here, refer to the detailed troubleshooting procedures, elsewhere, or contact Milnor technical support. Additional equipment will be needed if more in-depth troubleshooting is required.

Tip: You will need to refer to the pump motor full rated amperage when setting motor horsepower (amperage draw). Write down this value as stated on the motor nameplate.

3.5.1.4. **Get the gist of the procedure.**—The overall procedure is summarized in Section 3.5.2. Each adjustment is explained in a flow chart. Read the left side of the chart for an overview of the adjustment steps. The right side provides details.

All pressure adjustment components are similar to those shown in Figure 52 below.

Figure 52: How Pressure Adjustments Are Made

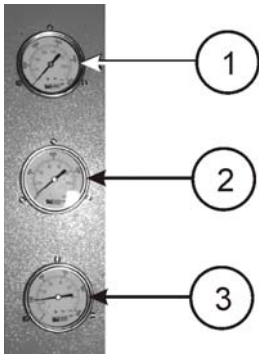
Typical Adjustment Components (idle pressure (left) and pump compensation pressure (right) adjustments shown)	Legend
	**1. Locking nut**—Turn counterclockwise to unlock before adjustment; turn clockwise to lock after adjustment. **2. Adjustment screw (hex socket (Allen) screw)**—Turn counterclockwise to lower pressure; turn clockwise to raise pressure.

Tip: Most pressure adjustments can be made with pressure applied, so that when an adjustment screw

is turned, the pressure gauge moves dynamically. An exception is the system pressure relief valve. This valve can be opened (turn counterclockwise) to lower the pressure with pressure applied, but it is difficult, if not impossible, to close (turn clockwise) to raise the pressure with full pressing pressure applied.

All pressures (except pre-fill pilot pressure) are read on the pressure gauges shown in Figure 53. All pressure specifications are in pounds per square inch (abbreviated psi herein).

Figure 53: Where Most Pressures are Read

Gauge Cluster	Legend
	**1.** **System pressure gauge**—used in setting idle pressure, pump compensation pressure, 1st and 2nd stage motor horsepower (amperage draw), proportional valve maximum pressure, and system relief pressure. **2.** **Ram relief pressure gauge**—used in setting ram relief pressure and 2nd stage horsepower (amperage draw) **3.** **Can relief pressure gauge**—used in setting can relief pressure

Tip: It is likely that certain components will already be correctly adjusted. Check first for proper adjustment before changing the adjustment.

3.5.1.5. **Adhere to the adjustment order.**—This procedure explains the adjustments in the most efficient order. Each subsequent adjustment assumes that certain conditions were verfied and settings were made in previous adjustments. All adjustments should be done, and they should be performed in the order listed.

Tip: Performing only certain adjustments or changing the adjustment order risks leaving certain components improperly adjusted. If you must perform the adjustments differently than presented here, see the prerequisites for each adjustment listed in Section 3.5.2 “Summary of Adjustments”.

3.5.1.6. **Ensure minimum ramp rates**—These are not part of the adjustment procedure, but it is important to ensure that they are set to the minimum value, as explained below.

Chart 16: Ensure Minimum Ramp Rates

Power on (⊘). Remain in *Manual*.

↓

A1: **Ensure proportional valve ramp rates are at minimum (see Table 16).**

↓

Done

All mechanical adjustments will be performed with the machine in *Manual* mode.

The proportional valve ramp up and ramp down potentiometers on the DBET card, are circled at left. The adjustment screws have no mechanical limits of travel. Turn each screw twenty (20) turns **counter**clockwise. This ensures that these controls have no effect on valve or pump operation.

3.5.2. Summary of Adjustments

With preparations completed...

Prerequisites for all adjustments: Pump and motor functioning properly

A1: Set idle pressure (Section 3.5.3)

Prerequisites:
1. Proportional valve controls functioning properly or controls bypassed (by disconnecting the electrical feed to the valve)
2. Proportional valve mechanically functioning (i.e., fully open)

A2: Set pump compensation (full) pressure (Section 3.5.4)

Prerequisites:
1. Proportional valve bypassed (by plugging the pump control port)
2. System relief valve temporarily set to maximum pressure (5000 psi)
3. 1st and 2nd stage horsepower (amperage draw) properly set

Notice 62: The horsepower adjustments are factory-set and not likely to need major adjustment. On this assumption, pump compensation pressure is set first. However:

- **be aware that if the horsepower settings are significantly out of adjustment, the motor may quickly stall or overheat, in which case, it should be shut down immediately.**
- **the pump compensation pressure and horsepower adjustments are interdependent and may need to be repeated until the specified settings are achieved.**

A3: Set 1st stage motor horsepower (amperage draw) (Section 3.5.5)

Prerequisites:
1. Pump compensation pressure already set or attempted.
2. System relief valve remains sey to maximum pressure (5000 psi).
3. Max pressure pot. bypassed (by temporarily adjusting to highest setting).
4. Ram relief pressure temporarily set to the lower, specified pressure at which 1st stage motor horsepower (amperage draw) should be set..
5. Ram up prox switch disabled and ram pressing against upper limit of travel

A4: Set 2nd stage motor horsepower (amperage draw), system relief pressure, and pre-fill pilot valve relief pressure (Section 3.5.6)

Prerequisites for all:
1. Max pressure pot. remains bypassed (adjusted to highest setting).
2. Ram relief pressure remains temporarily set to lower pressure.
3. Goods loaded in press and ram pressing against load.

Additional prerequisites for 2nd stage motor horsepower adjustment:
1. Compensator valve bypassed by setting system relief valve lower.
2. 1st stage horsepower already adjusted (because it affects 2nd stage setting).

Additional prerequisite for system relief pressure adjustment: horsepower properly adjusted.

A5: Set proportional valve maximum pressure (Section 3.5.7)

Prerequisites:
1. Goods loaded in press and ram pressing against load
2. Pump compensation pressure already adjusted
3. 1st and 2nd stage horsepower already adjusted
4. Proportional valve functioning properly

A6: Set ram relief pressure (Section 3.5.8)

Prerequisites:
1. Configured ram valve setting bypassed
2. Horsepower already adjusted (to avoid running motor above rated amperage)
3. Ram up prox switch disabled and ram pressing against upper limit of travel

A7: Set can pressure (Section 3.5.9)

Prerequisites:
1. Press empty of goods
2. Configured can valve setting bypassed
3. Can up prox switch disabled and can pressing against upper limit of travel

Done

3.5.3. Set Idle Pressure

Start the machine (①)

In a properly functioning machine, idle pressure is controlled by the idle pressure valve. However, a malfunctioning proportional valve will typically prevent the system from falling to idle pressure.

A1: **Is the pump motor energized (running)?**

NO → **Go to B1**

YES ↓

A2: **Adjust the idle pressure valve to 400 psi (see Table 16).**

The idle pressure valve adjustment, located on the pump, is circled at left. To adjust, loosen the locking nut then turn the adjustment screw. Observe the system pressure gauge to determine which direction to turn the screw.

A3: **Is idle pressure achievable?**

YES → **Lock down setting. Stop machine (⓪). Go to next adjustment.**

To lock down the valve setting, tighten the locking nut.

NO ↓

A4: **Bypass the proportional valve electrical controls by disconnecting the electrical feed to the valve. Try again to adjust the idle pressure valve.**

Unscrew and remove the proportional valve electrical connector, as shown at left. In a properly functioning system, as voltage to the proportional valve increases (from zero to 16 millivolts), the valve closes and the pump swash plate tilts away from vertical. Hence, zero voltage (open circuit) opens the valve completely, returning the swash plate to vertical and minimizing pump pressure.

A5: **Is idle pressure achievable?**

NO → **Go to C1**

YES ↓

A6: **Troubleshoot proportional valve controls.**

If a disconnected electrical feed achieves idle pressure, the problem is with the proportional valve controls. Refer to detailed troubleshooting elsewhere. Typical problems are:

1. Incorrect wiring between DBET card and valve.
2. Bad DBET card.

Go to A2

Part B

B1: **Troubleshoot the motor control circuitry.**

If the motor does not energize when *Start* (①) is pressed, a replacement motor or component of the motor control circuitry was improperly wired or it is bad. Refer to detailed troubleshooting elsewhere.

Go to A2

Part C

C1: **Troubleshoot the proportional valve and motor/pump.**

If a disconnected electrical feed does not achieve idle pressure, the problem is probably mechanical. Refer to detailed troubleshooting elsewhere. Some possible problems are:

1. Stuck proportional valve.
2. Motor running backwards (replacement motor improperly phased in).
3. Malfunctioning pump.

Go to A2

3.5.4. Set Pump Compensation (Full System) Pressure

Lockout/tagout power

This procedure will set the first of four components that affect full pressure:

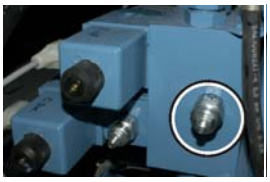
1. **Pump pressure compensator valve**—Adjusted here.
2. **2nd stage horsepower valve**—Adjusted later, but may affect this setting.
3. **System relief valve**—Adjusted later. Bypassed here.
4. **Proportional valve max. pressure potentiometer**—Adjusted later. Bypassed here.

A1: **Bypass the proportional valve by plugging the pump port that sends oil to this valve**

The port to be plugged is circled at left. Plugging this port simulates a fully closed proportional valve (maximum pressure) and facilitates adjustment of the compensator valve. It bypasses any possible problems with the proportional valve and—because it is not necessary to pressurize the ram cylinder—it also bypasses any possible problems with the pre-fill valve and cylinder (e.g., leaking seals).

It is not necessary to plug the hose end, but tape over it for cleanliness.

A2: **Temporarily set the system relief valve to maximum (5000 psi)**



The system relief pressure adjustment is circled at left. Loosen the locking nut then turn the adjusting screw full clockwise. This sets the pressure-limiting effect of this valve far above any other adjustments it could otherwise affect.

A3: **Restore power and start machine (⊘, ①)**

The system immediately goes to full pressure without the need to press a load.

A4: **Adjust pump compensation pressure as needed to achieve specified full system pressure (see Table 16)**

The pump pressure compensator valve adjustment, located on the pump, is circled at left. To adjust, loosen the locking nut then turn the adjustment screw. Observe the system pressure gauge to determine which direction to turn the screw. See Table 16 for the specified full system pressure value.

A5: **Is full system pressure achievable?**

NO → **Continue at left, but repeat this adjustment after setting 2nd stage horsepower (Section 3.5.6)**

Observe the system pressure gauge. If full pressure is not achieved, 2nd stage horsepower may be improperly set, interfering with this setting. These inter-dependent adjustments must be repeated until the proper settings are achieved.

YES

A6: **Lock down the compensator setting**

With the compensator valve adjustment screw properly set, tighten the locking nut.

Lockout/tagout power, reconnect hose then restore power. Proceed to the next adjustment.

Leave the system relief valve set to maximum pressure for the next adjustment.

Notice 63: Troubleshooting May Be Required—The remaining adjustments will be made with proportional valve function restored and ram cylinder (or can cylinders) pressurized. The specified settings can only be achieved if the machine is otherwise, functioning properly. Some possible impediments to proper adjustment are covered herein. If you encounter a problem not explained here, refer to detailed troubleshooting elsewhere.

3.5.5. Set 1st Stage Horsepower (amperage draw)

Power off (⊗)

A1: **Disable the ram up proximity switch**

This is the top switch on the prox switch mounting post. Disconnect the screw-type electrical connector (see at left). This permits pressure to be sustained as long as the ram is pressing against its upper mechanical limit.

A2: **Start machine (⟲, ⏻). Bypass the proportional valve max. pressure pot. by setting it to maximum**

The proportional valve max. pressure adjustment, located on the DBET card, is circled at left. The adjustment has no mechanical limits of rotation. To ensure the maximum value, turn the screw twenty (20) clockwise turns.

A3: **Command and maintain *Ram Up***

In *Manual* mode, raise the ram (7 , ⬆). Maintain ram up force by holding ⬆ even after the ram reaches its upper mechanical limit, **and for the following adjustment, except where stated otherwise.**

A4: **Is system pressure higher than idle?**

NO → **Go to B1**

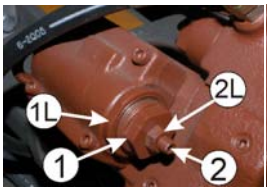
YES

Observe the system pressure gauge. System pressure should be substantially higher than 400 psi (idle pressure).

A5: **While maintaining *Ram Up*, set ram relief pressure as specified for setting 1st stage horse-power (see Table 16)**

The ram relief valve adjustment is circled at left. Loosen the locking nut then turn the adjustment screw. Observe the ram relief pressure gauge (middle gauge on the gauge plate) to determine which direction to turn the screw. See Table 16 for the specified value. Re-tighten locking nut to lock down setting.

A6: **While maintaining *Ram Up*, adjust 1st stage horsepower to the motor's rated amperage (see motor and Table 16)**



The horsepower adjustment, located on the pump, is shown at left. Loosen outermost locking nut 1L then turn adjustment nut 1. (Items 2 and 2L are for 2nd stage adjustment.) One person measures the motor amperage while the other turns the adjustment nut. Re-tighten locking nut to lock down setting.

A7: **Power off (⏻, ⊗). Restore ram up prox switch function, then restore power (⟲).**

To restore prox switch function, reconnect the switch wiring.

Leave the proportional valve max. pressure adjustment at maximum and ram relief pressure at the lower setting.

Proceed to the next adjustment

Part B

B1: **Release *Ram Up* and troubleshoot the proportional valve**

If system pressure remains at or near idle pressure, there is a problem with the proportional valve or related hardware. Some possible problems:

1. Max pressure potentiometer not set properly (to maximum)
2. Incorrect wiring between the DBET card and valve
3. Bad DBET card
4. Proportional valve stuck open

Go to A5

3.5.6. Set 2nd Stage Horsepower (amperage draw), System Relief Pressure and Pre-fill Pilot Pressure

Chart 21: Set 2nd Stage Horsepower (amperage draw), System Relief Pressure and Pre-fill Pilot Relief Pressure

Load wet goods (full load)

Machine safeties will not permit pressing without a load. If the press is not already loaded, load it now (see Section 3.5.1.2 "Be prepared to load goods."). The press must be loaded for most of the remaining procedures.

A1: Apply and maintain pressing pressure

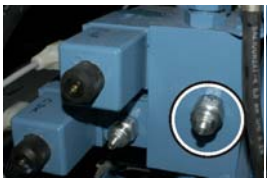
In *Manual* mode, lower the ram (9 , ⬇). **Maintain pressure by holding ⬇ throughout the following adjustments, except where stated otherwise.**

A2: Is system pressure at or near specified full pressure?

NO → **Go to B1**

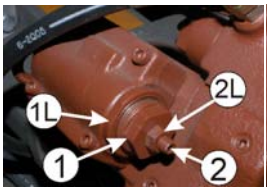
YES

A3: While pressing, bypass the pump pressure compensator valve by lowering system relief pressure to 400 psi below full pressure.



The system relief pressure adjustment, which was previously set to its highest setting, is circled at left. For example, if full pressure for your machine is 4600 psi, lower to 4200 psi (observe system pressure gauge). Turn the adjustment screw counterclockwise to lower pressure. If you overshoot, release pressure, turn clockwise, then, with pressure applied (⬇) continue turning counterclockwise.

A4: While pressing, adjust 2nd stage horsepower to the motor's rated amperage (see motor nameplate and Table 16)



The horsepower adjustment, located on the pump, is shown at left. Loosen small locking nut 2L then turn adjustment screw 2. (Items 1 and 1L are for 1st stage adjustment.) One person measures motor amperage while the other turns the adjustment screw. Re-tighten the locking nut to lock down the setting.

A5: With pressure released, return system relief pressure to maximum

Release ⬇ . Loosen the system relief valve locking nut, then turn the adjustment screw full clockwise.

A6: While pressing, lower system relief pressure just until it matches full system pressure.

While holding ⬇ , slowly open the system pressure relief valve (turn counterclockwise) just until system pressure begins to drop, then release pressure. Remember that it is possible to open this valve (turn counterclockwise) while maintaining pressure, but not to close it.

A7: With pressure released, set system relief pressure 1/2 CW turn above full pressure (see Table 16) and lock down.

Release ⬇ . Turn the adjustment screw 1/2 clockwise turn (as specified in Table 16) then tighten the locking nut.

A8: While pressing, set pre-fill pilot pressure to 2000 psi (see Table 16)

The pre-fill pilot pressure gauge (1) and adjustment (2) are shown at left. Loosen the locking nut then turn the adjustment screw. Observe the gauge to determine which direction to turn the screw. Tighten the locking nut to lock down the setting.

Chart 21: Set 2nd Stage Horsepower (amperage draw), System Relief Pressure and Pre-fill Pilot Relief Pressure

Proceed to the next adjustment.

Leave the proportional valve max. pressure adjustment at maximum and ram relief pressure at the lower setting for the next adjustment.

Part B

B1: **Troubleshoot the ram hydraulic circuitry and components.**

If the system does not approach full pressure, refer to detailed troubleshooting elsewhere. Some possible problems are:

- Bypass valve not closing. LED on valve must be illuminated, as shown at left.
- Pre-fill valve stuck open
- Pre-fill pilot valve not functioning.
- Ram cylinder seals leaking.

Go to A3

3.5.7. Set Proportional Valve Maximum Pressure

With the machine running (①)...

Goods remain in the machine from the previous procedure. Machine safeties will not permit pressing without a load. Also, the proportional valve max. pressure adjustment remains at maximum and ram relief pressure at the lower setting, from previous procedures.

A1: **Apply and maintain pressing pressure.**

In *Manual* mode, lower the ram (9 , ⬇). **Maintain pressure by holding ⬇ throughout the following adjustment, except where stated otherwise.**

A2: **Lower proportional valve max. pressure just until it matches full system pressure (see Table 16).**

Previously, the max. pressure pot, circled at left, was adjusted to its highest setting. Carefully turn the adjustment screw counterclockwise just until system pressure begins falling below full pressure (see Table 16 for the specified value).

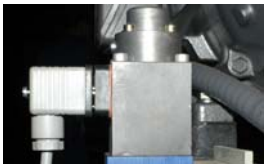
A3: **Does max. pressure pot respond to adjustment?**

YES → **Stop machine (⓪). Go to next adjustment.**

Leave the ram relief pressure at the lower setting for the next adjustment.

NO

A4: **Look for 16 millivolts across proportional valve coil**



Separate the electrical connector from the valve, as shown at left, just enough to provide a gap for the voltmeter leads. **Reading must be taken with the coil in the circuit.** Read the voltage across the left and right prongs.

A5: **Is the proper voltage achievable?**

NO → **Go to B1**

YES → **Go to C1**

Part B

B1: **Troubleshoot valve electrical controls.**

If you cannot achieve 16 millivolts across the coil, the problem is electrical. Refer to detailed troubleshooting elsewhere. Some possible problems:

- Faulty wiring between the DBET card and the valve.
- Bad DBET card

Go to A3

Part C

C1: **Troubleshoot proportional valve.**

If you read 16 millivolts across the coil, the problem is mechanical. Refer to detailed troubleshooting elsewhere. Some possible problems:

- Proportional valve seals leaking.
- Proportional valve stuck open.

Go to A3

3.5.8. Set Ram Relief Pressure

Notice 64: Goods remain in the machine from the previous procedure. These are not needed for the remaining adjustments and may be removed. However, if this procedure is being done in the field, leave the goods in the machine for this adjustment.

Chart 23: Set Ram Relief Pressure

Power off (⊗)

The ram relief pressure adjustment may be performed with goods in the machine or with the machine empty.

A1: **Disable the ram up proximity switch**

This permits pressure to be sustained as long as the ram is pressing against its upper mechanical limit of travel. The ram up prox switch is the top switch on the prox switch mounting plate. Disconnect the screw-type electrical connector, as shown at left.

A2: **Restore power (⊗). Record, then bypass the can and ram valve configure values by temporarily setting them to 4095 (maximum)**

In *CONFIGURE* (this is selection 3 on the *Program* menu—see reference manual), go to the *CAN VALVE SETTING* decision, **write down its current value,** then change the value to 4095 (maximum = fully open). Do the same for the *RAM VALVE SETTING* decision. These will be returned to their previous values at the completion of the adjustments. This change bypasses these settings when making the following adjustments. In normal operation, the configure values control how fast the can or ram travels.

A3: **Start machine (⏻). Command and maintain Ram Up**

In *Manual* mode, raise the ram (7 , ⬆). Maintain ram up force by holding ⬆ even after the ram reaches its upper mechanical limit, **and for the following adjustment.**

A4: **While maintaining Ram Up, adjust ram relief pressure to 1500 psi (see Table 16)**

The ram relief pressure adjustment is circled at left. Loosen the ram relief valve locking nut then turn the adjustment screw. Previously, this component was set to a lower pressure and will probably need to be raised, but observe the ram relief pressure gauge (middle gauge) to determine which direction to turn the screw. Re-tighten the locking nut to lock down the setting.

A5: **Power off (⏻, ⊗), restore ram up prox switch function, then restore power (⊗).**

To restore prox switch function, reconnect the switch wiring.

Proceed to the next adjustment

Leave the can and ram valve configure values at their temporary settings.

3.5.9. Set Can Pressure

CAUTION 65: Risk of damage to machine or goods—This adjustment will be done with the can up. If goods remain in the machine, this will not prevent the can from being raised in *Manual* mode, but damage may occur when the can is lowered again.

- Place the machine on-line so that the machine can complete processing of this load. When this load is discharged from the press and before the next load enters, take the machine off-line (return to *Manual* mode) and perform the last adjustment, which follows.
- Never manually lower the can onto a load of goods.

Chart 24: Set Can Pressure

Power off (⊗)

The can pressure adjustment should be performed with the machine empty of goods.

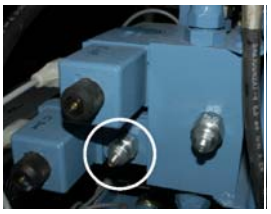
A1: **Disable the can up proximity switch**

The can up prox switch, located adjacent to one of the can cylinders, is shown at left. The prox switches have screw-type electrical connectors. Unscrew the connector. This permits pressure to be sustained as long as the the can is pressing against its upper mechanical limit of travel.

A2: **Restore power and start machine (⊗, ①). Command and maintain *Can Up***

In *Manual* mode, raise the can (3, ⬆). Maintain can up force by holding ⬆ even after the can reaches its upper mechanical limit, **and for the following adjustment.**

A3: **Adjust can pressure to 800 psi (see Table 16)**



The can pressure valve adjustment is circled at left. Loosen the locking nut then turn the adjustment screw. Observe the can relief pressure gauge (bottom gauge) to determine which direction to turn the screw. Re-tighten the locking nut to lock down the setting.

A4: **Stop the machine and power off (⓪, ⊗). Restore can up prox switch function, then restore power (⊗).**

To restore prox switch function, reconnect the switch wiring.

A5: **Restore the can and ram valve configure values to their previous settings.**

In *Configuration* return the *CAN VALVE SETTING* and *RAM VALVE SETTING* configure decisions to their previous values (the values you wrote down).

If this procedure is being performed in the field, the machine may now be placed on-line (returned to normal, automatic operation).

Done

— End of BIPPMT02 —