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Service Procedures—

All Single Stage Press Models With a Gum Rubber-filled Diaphragm and Diaphragm Rotation

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

Applicable Milnor® products by model number:

MP1540CL	MP1540CR	MP1540L-	MP1540R-	MP1550CL	MP1550CR	MP1550L-
MP1550R-	MP1556CL	MP1556CR	MP1556L-	MP1556R-	MP1601CL	MP1601CR
MP1601LF	MP1601R-	MP1601RT	MP1602CL	MP1602CR	MP1602LF	MP1602RT
MP1603CL	MP1603CR	MP1603L-	MP1603R-	MP1604CL	MP1604CR	MP1604L-
MP1604R-	MP1640CL	MP1640CR	MP1640L-	MP1640R-	MP1656CL	MP1656CR
MP1656L-	MP1656R-	MP1A03CL	MP1A03CR	MP1A03L-	MP1A03R-	MP1A50CL
MP1A50CR	MP1A50L-	MP1A50R-	MP1A56CL	MP1A56CR	MP1A56L-	MP1A56R-

Preface

BIPPMM23 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

i. About the 1-Station Press Maintenance Manuals

This book is one of three manuals with mechanical maintenance information for the Milnor 1-station press:

Service Procedures manual—detailed service procedures and related information intended for the Milnor dealer specialist

Mechanical Parts manual—illustrations of mechanical assemblies, parts lists, and related information intended for the Milnor dealer specialist

Maintenance Guide—routine (preventive) maintenance schedule and related information intended for the 1-station press owner/operator

— End of BIPPMM23 —

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Chapter 1
Safety for Service Personnel

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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: 20161026 / 20161026 / 20161026 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: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

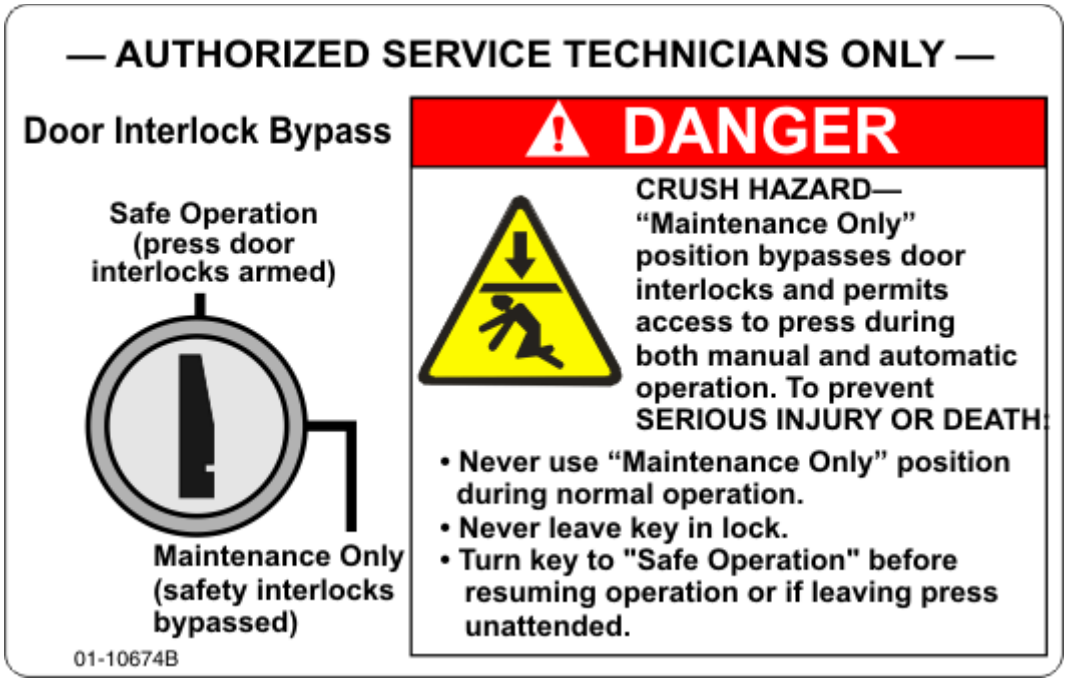
1.3. SAFETY ALERT for Owner/Managers and Maintenance Personnel: Using the Door Interlock Bypass Key Switch

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: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

1.4. How To Use the Red Safety Support(s) for Maintenance

1.4.1. What Safety Supports are Provided and Why

These machines are provided with two safety stands and two safety hangar bars. 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 support(s) whenever the maintenance to be performed requires you to place any part of your body in or near the path of the vertically moving portion of the machine. When not in use, stow the safety supports as explained herein.

Figure 2: Safety Bars for 1-station Press Models

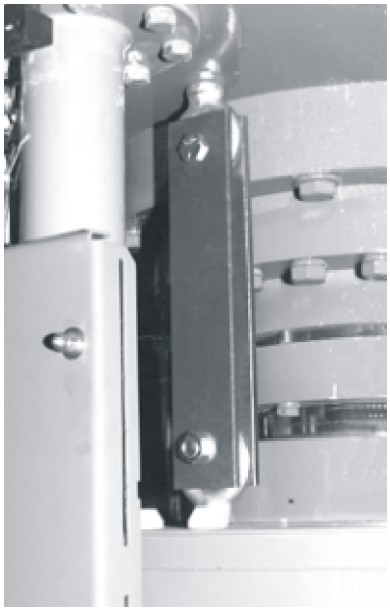
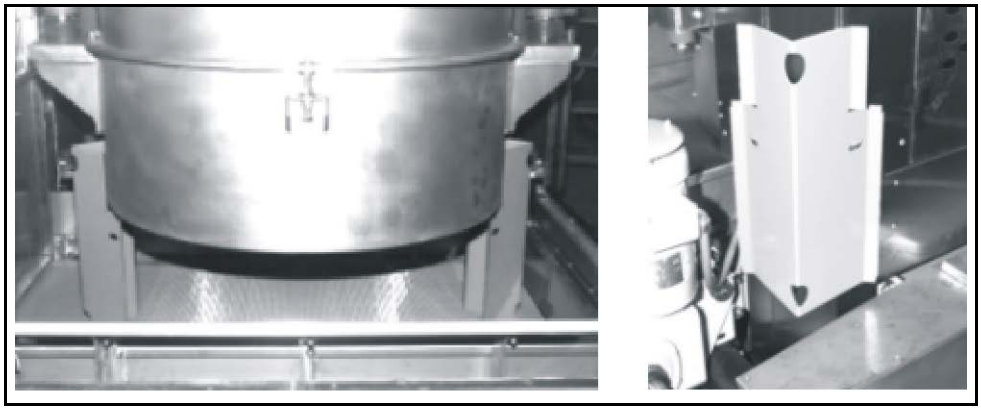


Figure 3: Safety Stands for 1-station Press Models (deployed shown at left, stowed shown at right)



WARNING 25: Crush Hazard—The safety supports provide protection against the drifting down of the vertically moving portion of the machine during maintenance in the event of a leak in the hydraulic system. They are not intended to restrain the machine from coming down under power.

- Never work in or near the path of the vertically moving portion of the machine unless the safety supports are deployed and power is locked out/tagged out.
- Do not attempt to rest the can on the safety stands by lowering it under power. Use care not to manually command the can down with the supports in place.
- When working near the installed safety stands use care not to knock the stands out of position.
- Maintain the safety support(s) in good condition.
- Where a pair of safety supports is provided, always use both safety supports.
- 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.

1.4.2. How to Deploy the Safety Support(s)

1.4.2.1. Secure the Ram Full Up

1. At the controls, use the *Manual* mode to lower the can, if it is up.
2. 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 2. 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.**

1.4.2.2. Put the Machine In Position to Accept the Safety Support(s)—At the controls, use the *Manual* mode to raise the can.

1.4.2.3. Put the Safety Support(s) in Position—In this step, install the stands through the nearest door; do not reach across the bed. Place the safety stands on opposite sides of the can (180 degrees apart). **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).

1.4.2.4. Secure the Safety Support(s) and the Machine—Lock out/tag out power to the machine.

— End of BIUUUS06 —

Chapter 2
General Procedures

BIPPMM17 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

2.1. The Installation and Replacement of the Diaphragm and Gum Rubber for the 1-Station Membrane Press

This document uses Simplified Technical English.
Learn more at http://www.asd-ste100.org.

NOTICE P1: "Remove power from the machine" means use the necessary safety procedure for your location. In the USA, this is the OSHA lockout/tagout (LOTO) procedure. More local requirements can also apply.

diaphragm (membrane)—the rubber component that pushes on the goods during operation

gum rubber—sheets of soft rubber that go in the diaphragm as an alternative to water

platen—the circular steel plate that the diaphragm attaches to

container (can)—the cylinder that the goods, the diaphragm, and the platen go into during operation

bed—the platform that the goods and the container are on during operation

rotation device (ratchet mechanism)—a mechanism on newer presses that causes the platen and diaphragm to turn a few degrees each time these components move up and down to increase diaphragm life

All models of the 1-station press made during and after November 2008 have diaphragms filled with gum rubber. If you have a 1-station press made before November 2008, you can fill the diaphragm with gum rubber as and alternative to water. This gives easier maintenance. The diaphragm does not change, only the material that fills it.

2.1.1. Get the necessary personnel and materials.

- Two approved technicians. The technicians must lift the diaphragm and operate the machine manually.
- The manuals for your machine. You will use the documents BMP050065 "Hydraulic Ram and Diaphragm Assembly" and BIUUUS06 "How to Use the Safety Stands..." You may also need BIPPMM22 "The Ratchet Mechanism to Turn the Diaphragm—Components and Adjustment." These are in the maintenance manual. If you do not know how to operate the machine manually, see the operator guide.
- Two tools to clean the holes in the diaphragm for the mounting bolts. The holes are 3/8 inch diameter and 16 threads/inch. The tools include:
  - » A short tool to clean the holes before you install the diaphragm—Milnor P/N 97C058T

  - » A long tool to clean the holes through the platen—Milnor P/N 97C058AT
- Gasket eliminator (cartridge) to apply to the top of the diaphragm—Milnor P/N 20C013B
- Anti-seize paste to apply to the threads on the diaphragm mounting bolts—Milnor P/N 20C510
- Diaphragm, gum rubber and mounting bolts. Table 1 shows the materials that you can get from Milnor. You can replace the diaphragm only, replace the gum rubber only, or replace the two. **Always replace the mounting bolts.** New bolts are supplied with the hardware kits listed in Table 1.
- A wrench and a torque wrench for the type of mounting bolts used on your machine—hex head and/or socket cap.

Table 1: The Components for the Replacement of the Diaphragm and Gum Rubber

Model Family	Diaphragm Diameter	Rotating Device	Hardware Kit	Diaphragm	Set of Gum Rubber Sheets
MP16_	39.5 inch (1003 mm)	no	KYSSPMRAAA	ACW10001	ACW10010A
		yes	KYSSPMRAAB		
MP1A03_	48 inch (1219 mm)	no	KYSSPMRABB	ACW10002	ACW10011A
		yes	KYSSPMRAAB		
MP15_	35.5 inch (900 mm)	no	KYSSPMRACC	ACW10003	ACW10012A
		yes	KYSSPMRAAB		

2.1.2. Remove the used diaphragm.

WARNING 27: Risk of death or serious injury—The container and diaphragm move independently. During operation, these components move without warning. These components can also move down with power off. Spaces can close and cut off your arm.

- Keep personnel not necessary for this maintenance clear of the machine.
- Use special caution when you use the key that bypasses the door guards for maintenance.
- Two qualified technicians are necessary. Each technician must hear the other's voice clearly.

1. Let the machine empty then put it in manual operation.
2. Move the automatic doors up. Hold them up with wood blocks.
3. Bypass the safety switches with the maintenance key. Obey the safety instructions. Open the side doors.
4. Lower the container fully. Lower the diaphragm fully. Move the container up fully. If you try to move the container up when the diaphragm is up, the bottom of the container will rub hard against the diaphragm. It is a tight fit. this can cause damage.
5. **Install the container safety stands.** ***Remove power from the machine (see Notice P1).***

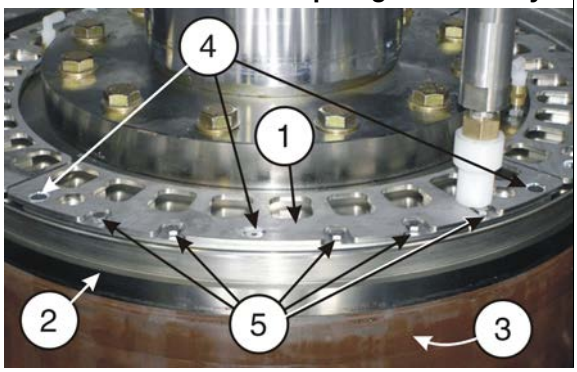
Tip: You will remove the 32 diaphragm bolts in the subsequent step. If your machine has a rotation device to turn the diaphragm, the diaphragm bolts also hold the four ratchet plates and related components. If you must use the push-off holes to remove the platen, it will be necessary to fully remove all of the diaphragm mounting bolts and the ratchet plates. But this is usually not necessary because the diaphragm's weight will pull it off. Loosen each bolt until it does not hold the diaphragm, but let it stay in the platen. This will hold the ratchet plates and related components in their positions. When you are prepared to attach the new diaphragm, remove one used bolt at a time and put in the new bolt. If you must put the

ratchet plates and related components in the correct positions, look at document BIPPMM22.

6. While the diaphragm is on the bed, loosen all 32 of the diaphragm bolts (Figure 4).
7. Supply electrical power to the machine.
8. Try one or more of these steps to remove the diaphragm. **Do not put your fingers below the diaphragm.**
   a. Move the platen up approximately three inches to allow the diaphragm to fall off.
   b. Remove the container safety stands. Move the container down until it either rubs against the diaphragm or reaches the bed. If there is friction between the container and the diaphragm, use the container to push the diaphragm off. If not, this technique will not work. In either case, raise the container. **Install the container safety stands.** ***Remove power from the machine (see Notice P1).***
   c. With power removed, remove all bolts and ratchet plates, then use the two push-off bolts. You will find a bolt with a spacer and a washer in each push-off hole. Remove the bolt, spacer, and washer. Replace the bolt and tighten it against the diaphragm. After the diaphragm is free, replace the bolt, spacer and washer.

Figure 4: Diaphragm Mounting Bolts and Related

View of Platen and Diaphragm Assembly



Legend

1. Ratchet plate. Two push-off holes are provided below, but are not usually needed.
2. Platen
3. Diaphragm
4. Diaphragm mounting bolts - counter-sunk
5. Diaphragm mounting bolts - hex head

9. After the diaphragm is free of the platen, apply power and move the platen up fully.
10. **Install the platen safety bars.** ***Remove power from the machine (see Notice P1).***
11. If you will not use this diaphragm again, move it from the bed. If you will use this diaphragm again, keep it in this position. If the diaphragm contains water, remove the water with a siphon.

2.1.3. Clean the holes in the diaphragm for the mounting bolts.

Use the short tool to clean the mounting bolt holes in the diaphragm. This will decrease the risk that a bolt will bind or break off during installation.

Tip: If the platen has a groove for an O-ring between the platen and the diaphragm, it is not necessary to install an O-ring.

If you kept the used diaphragm in its position to use it again, ignore Section 2.1.4. Go to Section 2.1.5.

2.1.4. Align the new diaphragm with the platen.

Tip: Do this procedure before you install the gum rubber. If you do not, it will be necessary to move the weight of the diaphragm and the gum rubber together.

1. Move the new diaphragm into its position. Approximately align the new diaphragm with the platen.
2. Supply power to the machine. Remove the platen safety bars.
3. Slowly lower the platen until it is approximately one inch (25 mm) from the diaphragm (Figure 5).
4. **Remove power from the machine (see Notice P1).**

Figure 5: The platen near the diaphragm

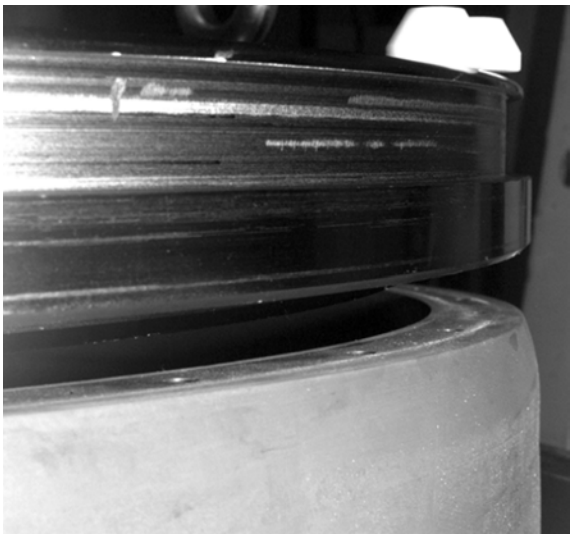
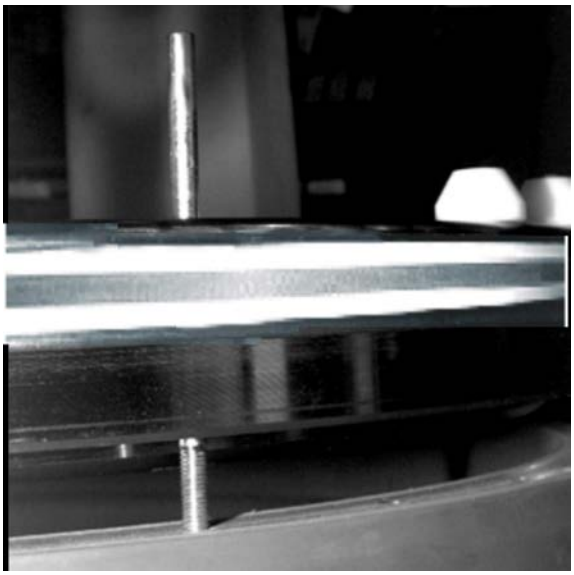


Figure 6: One rod installed



5. Put a rod with threads through one of the bolt holes in the platen. Four rods are supplied with the kit. Move the diaphragm until the rod aligns with a bolt hole in the diaphragm. Turn the rod into the bolt hole (Figure 6). Do this again with the three remaining rods at quarter points around the platen.
6. Supply electrical power to the machine.
7. Carefully lower the platen until it touches the diaphragm.
8. Fully install four mounting bolts at quarter points around the platen. Do not torque the bolts. Move the diaphragm if necessary.
9. Remove the bolts and rods.
10. Move the platen up fully.
11. **Install the platen safety bars.**
12. **Remove power from the machine (see Notice P1).**

2.1.5. Install the gum rubber in the diaphragm.

The gum rubber is a set of sheets of specified dimensions. The figures that follow show the gum rubber for three 1-station press model families. Refer to the figure that agrees with the diaphragm you have. If the diaphragm contains used gum rubber sheets, remove and discard them. Put the

new sheets in the diaphragm in the sequence shown in the figure. When the gum rubber is correctly installed:

- The sheets will be tight in the diaphragm.
- The sheets will agree with the inner shape of the diaphragm.
- No more adjustment will be necessary.

Do not use adhesive. When you put each sheet in, be careful not to move the diaphragm. If the edge of the sheet catches on the wall of the diaphragm, push down on that edge. Holes in the middle of the sheets release air caught between the sheets. Each sheet will fall flat against the sheet below it. **The top of the top sheet must be between 1/4 inch (6 mm) and 1/2 inch (13 mm) below the top edge of the diaphragm.**

Figure 7: Gum Rubber Installation for the Model Family MP16_

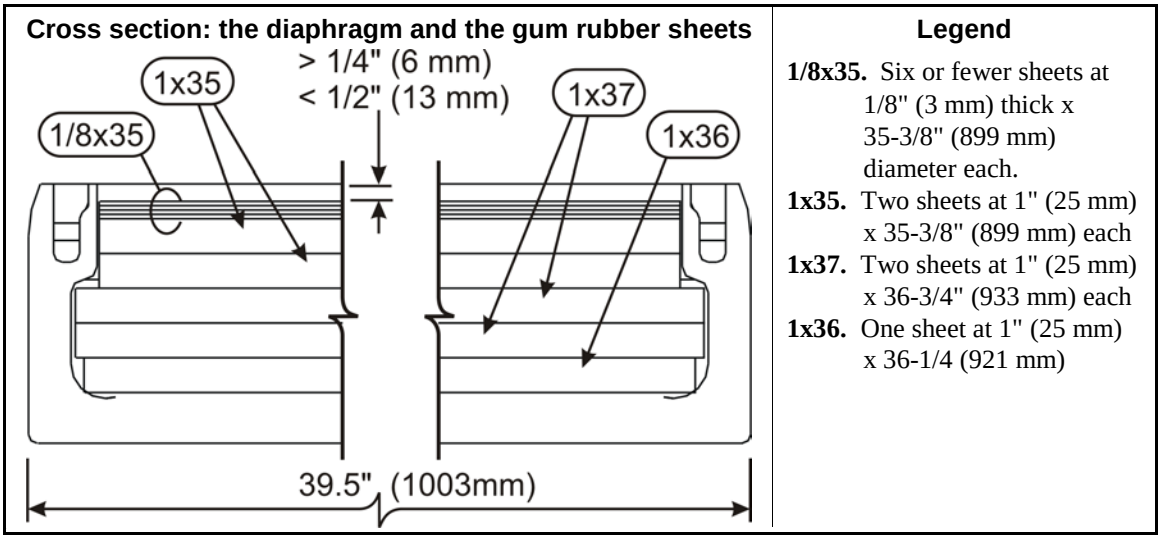


Figure 8: Gum Rubber Installation for the Model Family MP1A03_

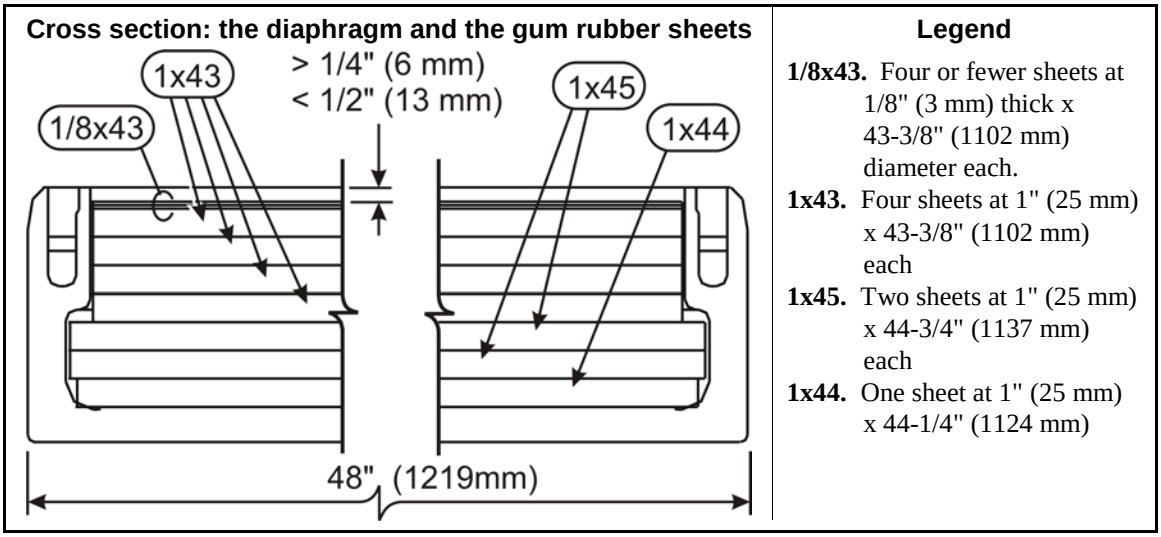
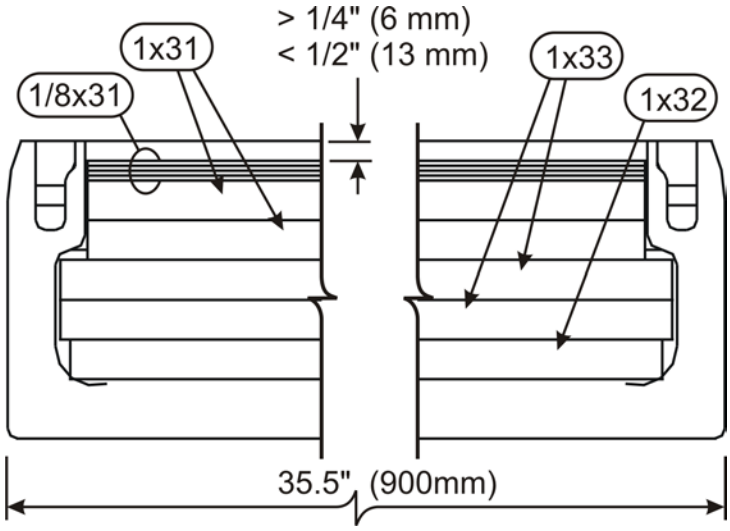


Figure 9: Gum Rubber Installation for the Model Family MP15_



2.1.6. Attach the diaphragm to the platen.

CAUTION 28: Risk of a malfunction—The used bolts are weak from tension. They can break easily.

- Use only the new bolts supplied with the kit, not the used bolts.

1. Apply gasket eliminator to the top of the diaphragm.
2. Supply electrical power to the machine. Remove the platen safety bars.
3. Slowly move the platen down until it touches the diaphragm.
4. ***Remove power from the machine (see Notice P1).***
5. Replace each used mounting bolt with a new one as follows:
   a. Apply anti-seize paste to the threads on the new bolt.
   b. Install the bolt fully with the wrench, but do not torque it.
   c. If a bolt will not go in fully, remove it. Clean the bolt hole with the long tool. Install the bolt.
   d. Remove excess anti-seize paste.
6. Torque the mounting bolts to the value specified in the document BMP050065 (Hydraulic Ram and Diaphragm Assembly). Use a pattern that increases tension equally around the platen. Remove excess gasket eliminator from around the platen.
7. Attach the tag B2T2001042 (supplied with the kit) to the machine. This tag shows that it is necessary to tighten the bolts after one week (40 hours) of operation. Tell this to the person that operates the machine.
8. Supply electrical power to the machine. Remove the safety stands.
9. Remove the wood blocks and the maintenance key. Examine the machine for safe operation. Put the machine into operation.

2.1.7. Tighten the diaphragm after one week (40 hours).

CAUTION 29: Risk of a Malfunction—Diaphragm bolts can become loose and break the thread lock material in the first week of operation.

- Do this procedure after one week (40 hours) of operation.

1. Let the machine empty then put it in manual operation.
2. Move the automatic doors up. Hold them up with wood blocks.
3. Bypass the safety switches with the maintenance key. Obey the safety instructions. Open the side doors.
4. Lower the container fully. Lower the diaphragm fully. Move the container up fully. If you try to move the container up when the diaphragm is up, the bottom of the container will rub hard against the diaphragm. It is a tight fit. This can cause damage.
5. **Install the container safety stands.** ***Remove power from the machine (see Notice P1).***
6. Examine the diaphragm bolts for looseness. If a bolt is loose, do these steps:
   a. Remove the bolt.
   b. Clean the bolt threads. Clean the bolt hole with the long tool.
   c. Apply the anti-seize paste to the bolt threads.
   d. Install the bolt fully with the wrench.
   e. Torque the bolts to the value specified in the document BMP050065 (Hydraulic Ram and Diaphragm Assembly). Clean the thread lock compound from the platen.
7. Supply electrical power to the machine. Remove the safety stands.
8. Remove the wood blocks and the maintenance key. Examine the machine for safe operation. Put the machine into operation.

— End of BIPPMM17 —

BIPPMM13 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

2.2. Replacement of V-pack or U-cup Seals With V-pack Seals

NOTICE P1: "Remove power from the machine" means use the necessary safety procedure for your location. In the USA, this is the OSHA lockout/tagout (LOTO) procedure. More local requirements can also apply.

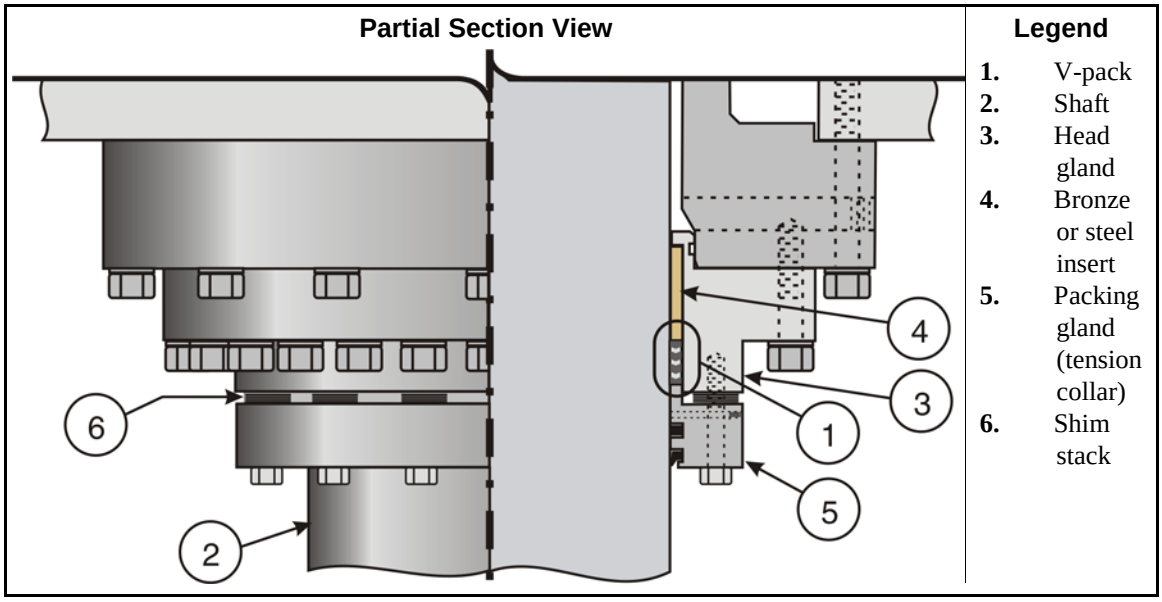
There are replaceable seals just above where the ram shaft comes out of the ram assembly. Usually a small quantity oil escapes past these seals. If the leakage becomes excessive, the seal(s) must be replaced. These seals can be either a V-pack or a single U-cup seal. Replacement with V-pack seals, explained here, is a relatively simple procedure because the seals are split to wrap around the shaft. V-pack kits are available from from the Milnor Parts department for each ram size. The U-cup seal is thought to be somewhat more effective, but it cannot be split for installation and requires removal of the platen from the shaft. This is a much more lengthy and difficult procedure. If you prefer to use a U-cup seal, speak to the Milnor Service department.

2.2.1. How the V-pack Works

Referring to Figure 10, the V-pack (1) is a stack of hard rubber seals that wrap around the shaft and fit together in a vee groove profile. Replacement seals can be split or endless. If they are endless, you can split them so that you can wrap them around the shaft. The V-pack fits into a cavity between the shaft (2) and the head gland (3). Most of this cavity is filled by a bronze or steel insert (4). The remaining space is for the seals. A packing gland (5), also called a tension collar, bolted to the head gland controls the V-pack fit. Shim stacks (6) at each bolt position

between the head gland and the packing gland must hold the V-pack at a zero clearance fit. The nominal height of the shim stack for a new V-pack for 14, 16, and 18 inch rams is 1/2" (23 mm). The nominal height for the 13 inch ram is 3/8" (9.5 mm). However, V-packs have a large manufacturing tolerance. It is necessary to determine the actual shim stack height based on measurement of your V-pack. Milnor recommends against removal of shims from the shim stack as a way to reduce oil leaks after a V-pack becomes worn. This method risks compression of the V-pack.

Figure 10: V-pack Installed



2.2.2. Precautions

This instruction gives the concept of seal replacement, but not a step-by-step procedure. The maintenance can be somewhat different for different field conditions. You must understand hydraulic equipment and be able to apply this information to your specific condition.

WARNING 30: Crush hazard—You can be crushed by the falling ram.

- Do this maintenance with the ram and the container (the can) fully down. The diaphragm and the container must rest on the press bed.
- Do this maintenance with power removed (see Notice P1).

CAUTION 31: Injury to eyes and skin—Hot hydraulic oil can splash on you

- Wear eye protection and use care when you open hydraulic lines and remove old seals.

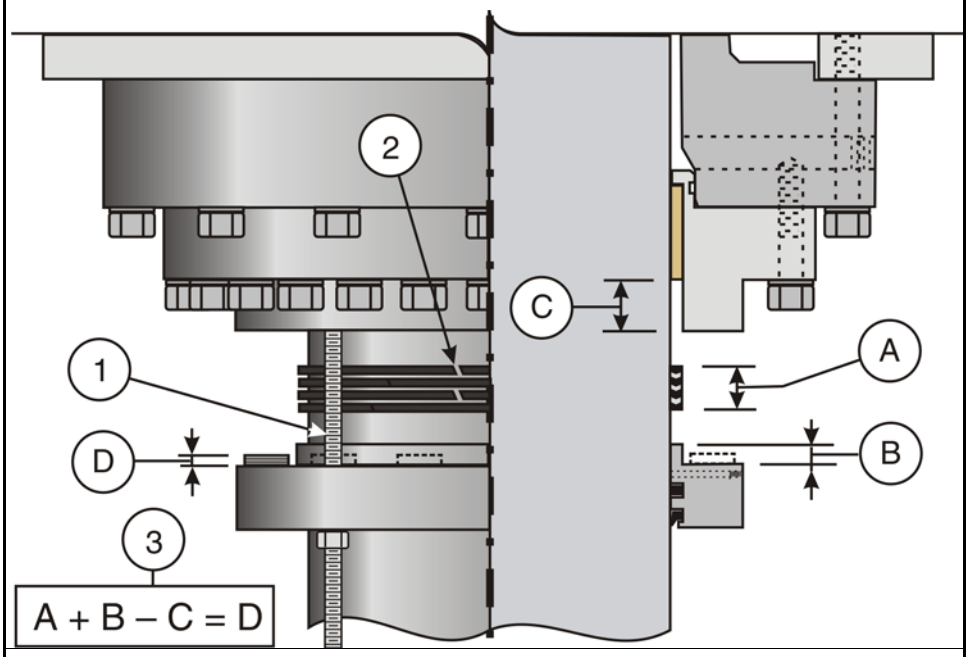
CAUTION 32: Risk of damage and hydraulic leaks—If the shaft is scored during, or as a result of this maintenance, costly repair or replacement of the ram shaft will be necessary.

- Avoid any procedure that can cause damage to the shaft surface.

2.2.3. Concept of V-pack Replacement

Study Figure 11 and the points given below the figure before you begin the maintenance.

Figure 11: V-pack Installation in Progress



Legend

1. One of two all-thread rods used to lower the packing gland (tension collar).
2. New V-pack wrapped around shaft. Stagger splits in adjacent seals 180° apart.
3. Formula to determine required height of shim stack. See A, B, C, and D, below.
A. Height of your V-pack.
B. Height of lip on packing gland.
C. Height of V-pack cavity.
D. Height of shim stack necessary for this V-pack to achieve a zero clearance fit.

Observe the following points when you do the maintenance:

- This maintenance is a two person job.
- Use two all-thread rods to lower the packing gland. On large rams, the packing gland weighs approximately 100 pounds (45 kg). Provide 8" (200 mm) minimum work clearance between the head gland and the packing gland.
- The safest way to remove the old seals is with air pressure. See Section 2.2.4.
- If the old seal is a U-cup, you will see a UHMW ring pushed out of the seal cavity with the U-cup seal above it. Cut the U-cup seal to remove it. The UHMW ring is already split.
- If the replacement seals are not pre-split, cut each one carefully at a 45 degree angle with a razor blade or similar tool to split it.
- Install the seals with the vee profile straight up, not inverted.
- Stagger the splits between adjacent seals 180 degrees apart to gain the longest oil path.
- Use the shim stack that gives the V-pack a zero clearance fit; that is, no gaps between seals and no seal compression. Gaps will permit excessive oil to leak. Compression can cause shaft damage and will inhibit ram free fall during operation. V-packs have a large manufacturing tolerance. Measure carefully, as shown in Figure 11, to determine the correct shim stack height to achieve a zero clearance fit. Table 2 gives the two shim sizes available from the Milnor Parts department.

- Some V-packs include a top-most plastic seal that has small protrusions (about 1/4" (6 mm) diameter by 1/4" (6 mm) tall) along the top surface. Include these protrusions in your measurement of the height of the V-pack.
- Push the new seals into the seal cavity slowly and carefully. Make sure that adjacent seals fit together correctly and that no portion of a seal becomes twisted.
- Use the same overall height (thickness) of shim stack at each bolt location to hold the V-pack uniformly around its entire circumference.
- When you re-attach the packing gland (tension collar), tighten the bolts using an alternating pattern. Tighten as specified in document BIUUUM04 “Fastener Torque Requirements” in the service manual.

Table 2: 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

2.2.4. Use air pressure to remove the old seals.

If you use tools to grab and pull the seals out, you risk costly damage to the ram shaft. It is much safer to push the seals out with air pressure. However, you must use care not to push the metal insert out also. In most presses, this insert is held in position by a thread-locker material that creates a bond between the insert and the head gland. But this bond can be broken. There is sufficient clearance between the insert and the shaft for air to pass. It takes more air pressure to push out the metal insert than to push out the seals, but not much more. The objective is to gradually increase the air pressure just until the seals come out.

When the ram was moved fully down (the diaphragm rests on the press bed), all but a small quantity of residual oil came out of the rod end of the ram cylinder. The cap shown in Figure 12 is on the rod end hydraulic line. Be prepared to catch residual oil in a bucket and remove this cap. Although you can set up a more robust air connection if desired, you can simply use a clean rag to form a partial seal and hold an air nozzle tightly in the pipe as shown in Figure 13.

One person with suitable eye and skin protection observes the old seals as they come out. Another person applies air pressure. Start with low air pressure and gradually increase until the seals come out. As soon as the seals come out fully, some residual oil will spray out of the seal cavity. **Replace the cap as soon as the seals are pushed out.**

Figure 12: Cap to Remove from Hydraulic Line

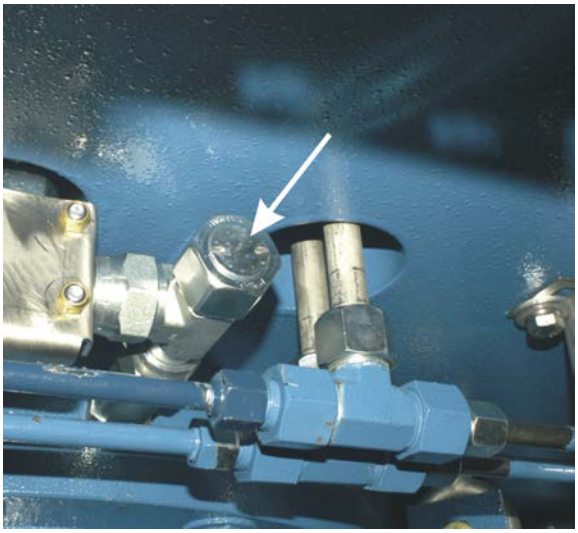


Figure 13: How To Apply Air Pressure to Seals

— End of BIPPMM13 —

BIPPMM15 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

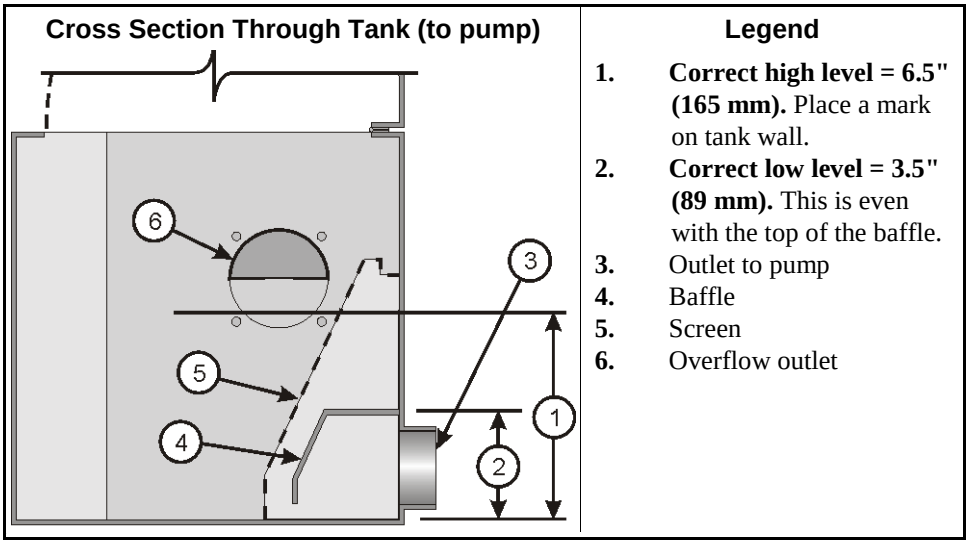
2.3. Understanding and Setting Press Water Levels

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.

2.3.1. 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 14. Level float components must be adjusted so that the low and high levels occur in this tank at the positions shown.

Figure 14: Correct Low and High Levels



2.3.2. How to Set the Levels Accurately and Avoid Overflow

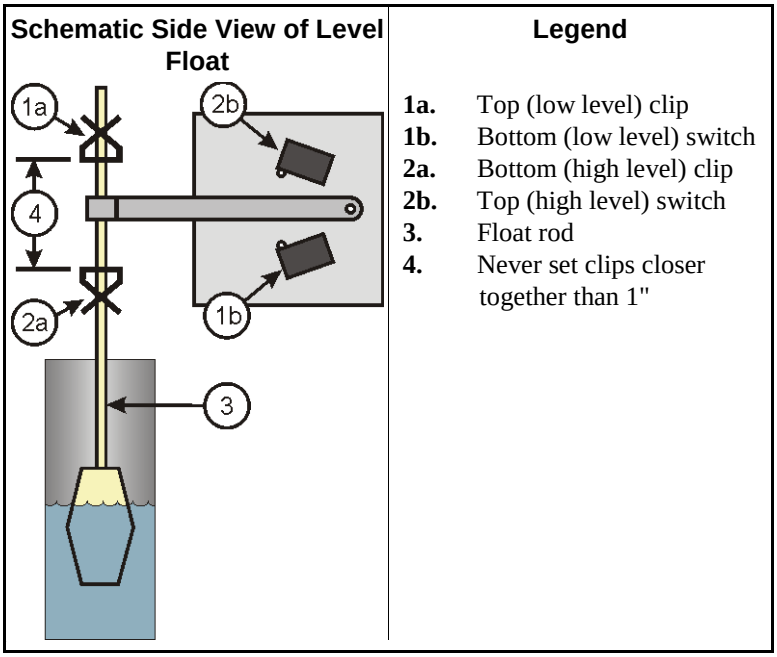
CAUTION 33: Risk of Overflow—If the pump loses its prime during operation, it can take a minute or more for the pump to self-prime, during which time water entering with an incoming load will likely overflow the tanks.

- 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 15 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 15: 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: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

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

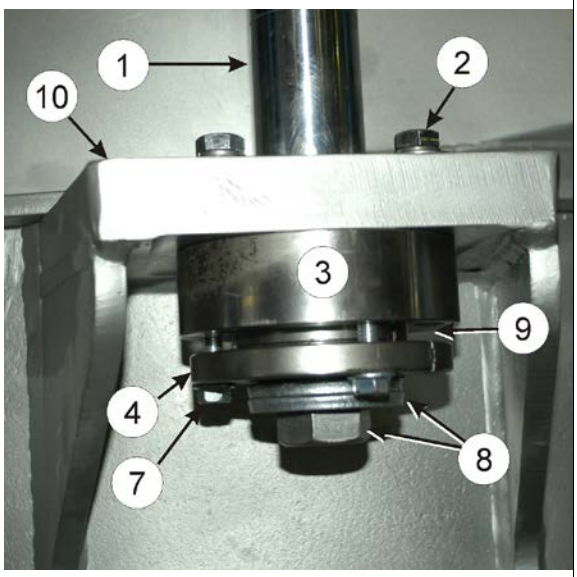
The receiving chute and can assembly (the can) is connected to the can cylinder rods with taper bushings (see Figure 16) that will slip upward on the rod, reducing the risk of damage, in the event that goods or other objects obstruct the can's descent and “jam” it out of alignment.

Notice 34: 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.

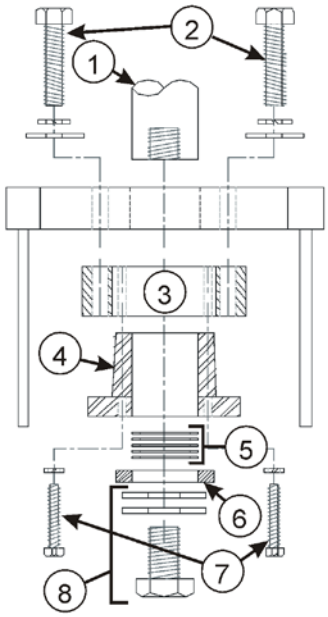
Notice 35: Understand press servicing hazards—Before performing press maintenance, review document BIPPMS01 "Safe Servicing..."

Figure 16: Can-To-Cylinder Rod Mounting Components

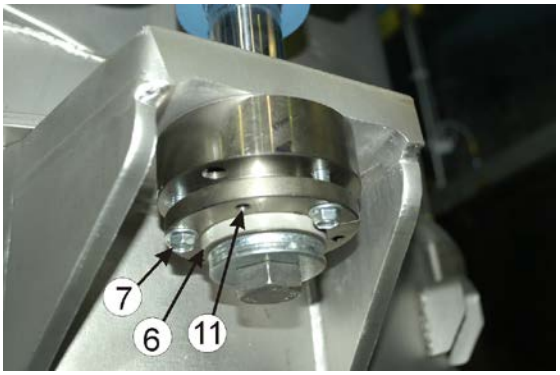
Side View (spacer not used)



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

2.4.1. 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 16, 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.

2.4.2. Dismounting the Can

WARNING 36: 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 16, 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 36 , carefully remove all three bushing bolts (Item 7).
   c. Thread bolts into the three bushing push-off holes (Item 11). Observing warning statement 36 , 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.

2.4.3. 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.

2.4.4. 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 1:** 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 16) 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 16, 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 16, 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 —

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2.5. 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”).

2.5.1. Conditions Requiring Servicing and Summary of Procedures

Section 2.5.1.1 through Section 2.5.1.5 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.

2.5.1.1. 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 2.5.1.3). 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 2.5.4. Once the problem is resolved, the “Taut Belt...” error clears automatically.

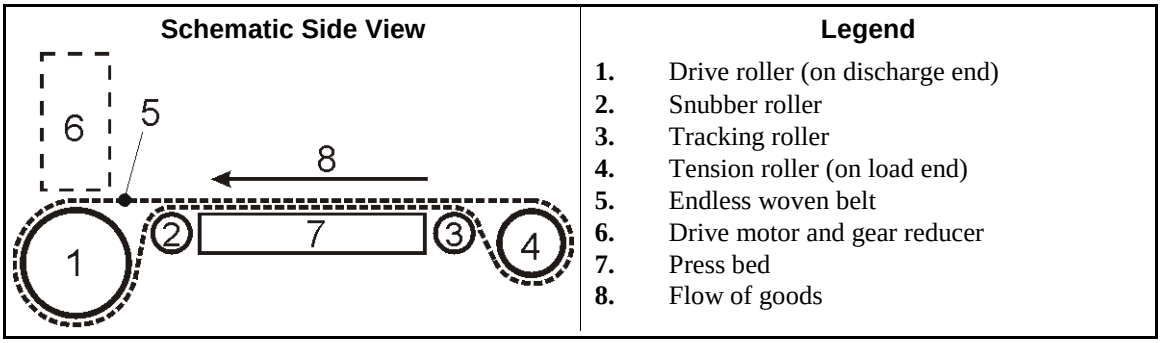
2.5.1.2. Belt Not Centered (Tracking Adjustment)—On the load end of the conveyor, pneumatic tracking controls compensate for minor left/right creeping of the belt. However, if these controls actuate frequently or are ineffective in centering the belt, tracking must be adjusted via the belt tracking adjustments explained in Section 2.5.5. 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 2.5.6.

2.5.1.3. 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 17, 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 17: Conveyor Belt and Rollers



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.

2.5.1.4. Belt Worn or Damaged—As shown in Figure 17, 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 2.5.3.1). 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.

2.5.1.5. 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.

2.5.2. Preparing the Press for Safe Conveyor Servicing

Notice 37: 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 18). 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 19).
8. Shut down the machine and lockout/tagout power at the external disconnect switch.

Figure 18: Wood Planks Under Raised Can

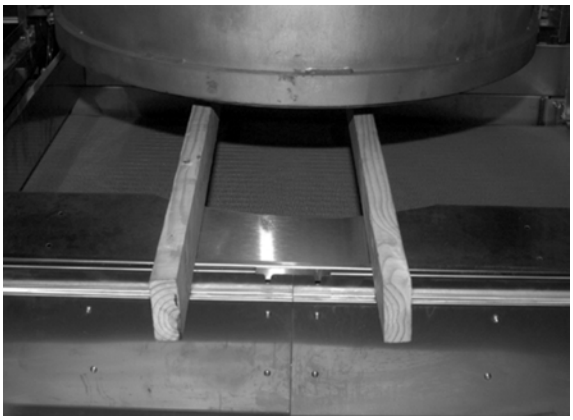


Figure 19: Securing the Door

2.5.3. 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.

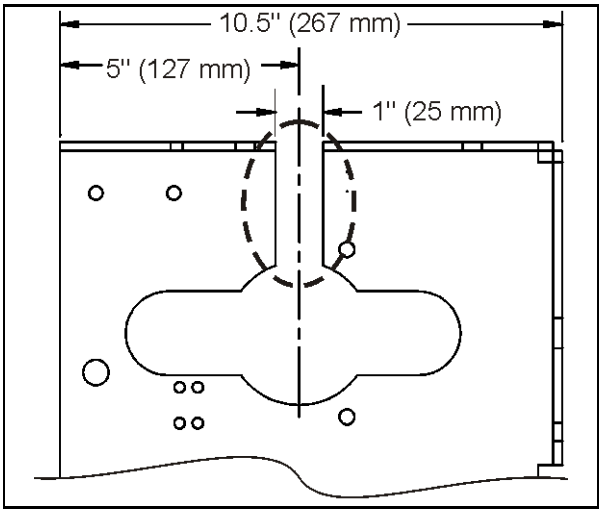
Notice 38: Malfunction risk—As you work, carefully note the arrangement of all hardware removed for proper replacement. This is especially important for washers, spacers, shaft collars and the like, that must be properly positioned for correct roller alignment and functioning. The conveyor parts documents for your machine will also assist in proper component positioning.

2.5.3.1. 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 20) through which the roller shaft can be withdrawn upward. If your machine has this slot, proceed to Section 2.5.3.2. Otherwise, your press has an older design. You have the choice of cutting a slot similar to the current design (see Section 2.5.3.1.1), or removing the tension roller by performing additional disassembly (see Section 2.5.3.1.2).

2.5.3.1.1. 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 21. Once this is done, you can follow the instructions in Section 2.5.3.2.

Figure 20: Tank Left Side Wall With Slot

Figure 21: Tank Left Side Wall—Slot Dimensions



2.5.3.1.2. 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:

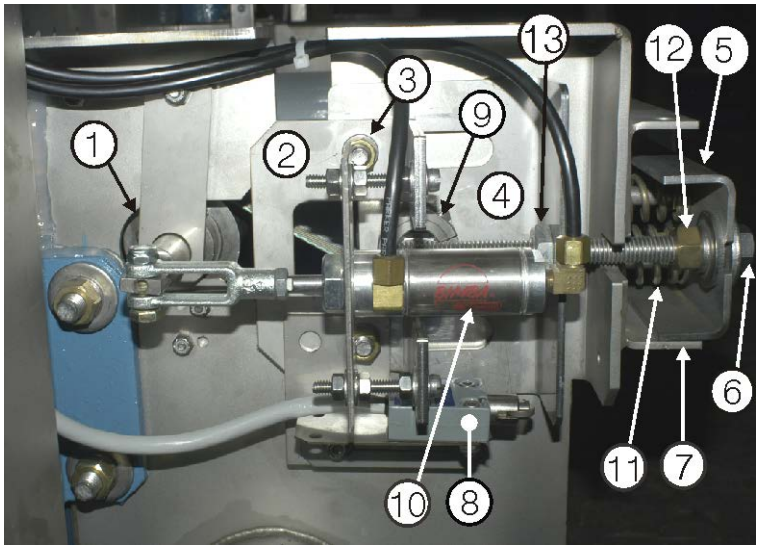
- Although your press may have a hole in the side wall of the tank large enough to withdraw the roller sideward, you would need to remove the side water tank for clearance. You can remove the roller upward more easily.
- You will need to loosen/remove the locking collars on both sides of the tension 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 2.5.3.2.

2.5.3.2. 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 22.

Figure 22: 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 23. 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 22, 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 24).

Figure 23: Tracking Bracket and Related Components Hanging from Tracking Roller

Figure 24: 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 2.5.4 and Section 2.5.5. For complete belt replacement, proceed to Section 2.5.3.3.

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

—Referring to Figure 25, 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 **39**) 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 39: 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.

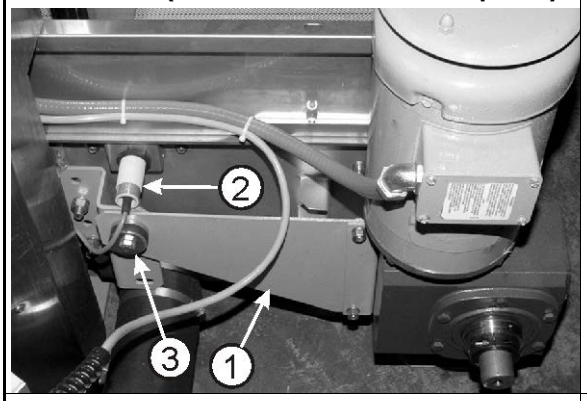
- Support the gear box on blocking before disconnecting the torque arm.
- Observe all precautions herein.

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 25 for the item numbers listed in these steps:

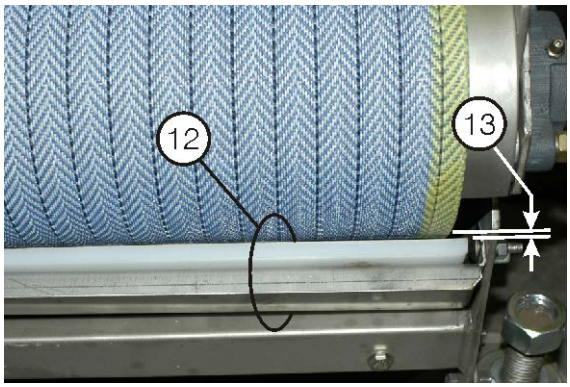
1. If your machine has a belt scraper assembly (item 12), remove it for clearance. **On re-assembly, set the blade-to-belt clearance as shown in item 13.**
2. Remove the drive-side photoeye (item 2) to protect it from damage and provide clearance.
3. Place wood blocking under the gear box. This blocking 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 25: Components Used in Partially Removing Drive Roller (your press may be opposite hand)

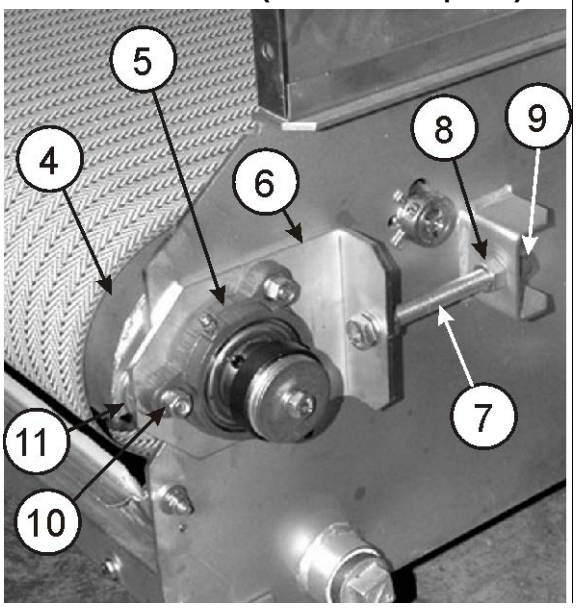
Drive Side (can be on either side of press)



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 2.5.6.**

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.

2.5.4. Restoring Proper Belt Tension

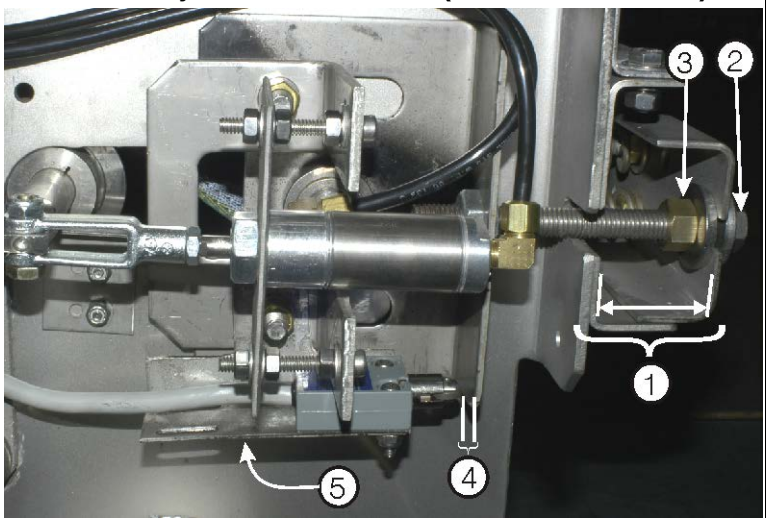
There are two pair of adjustments (each adjustment is done on both sides of the conveyor) involving belt tension. Each adjustment has a required setting (a specified distance between components), as shown in Figure 26. Check these measurements and if they have changed, restore them to the required values. Referring to Figure 26, 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 26: 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)

2.5.5. 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.

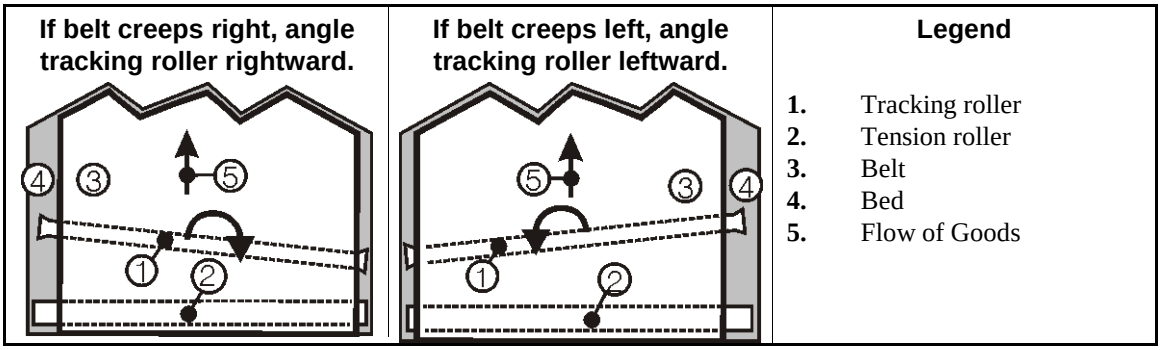
Supplement 1

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 17) 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 27 shows how the tracking roller must be angled to compensate for left/right creeping.

Figure 27: How to Angle the Tracking Roller to Correct Belt Creeping



Adjustments are made with the components shown in Figure 28. 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. The belt will tend to track to the looser side.
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**, make the left side looser, as follows:

   1. Adjust the left side air cylinder mounting bracket so it is 1/16" (0.4 mm) farther away from the load end of the conveyor.
   2. Adjust the right side air cylinder mounting bracket 1/16" (0.4 mm) closer to the load end.

6b. If the belt creeps to the **left**, make the right side looser, as follows:

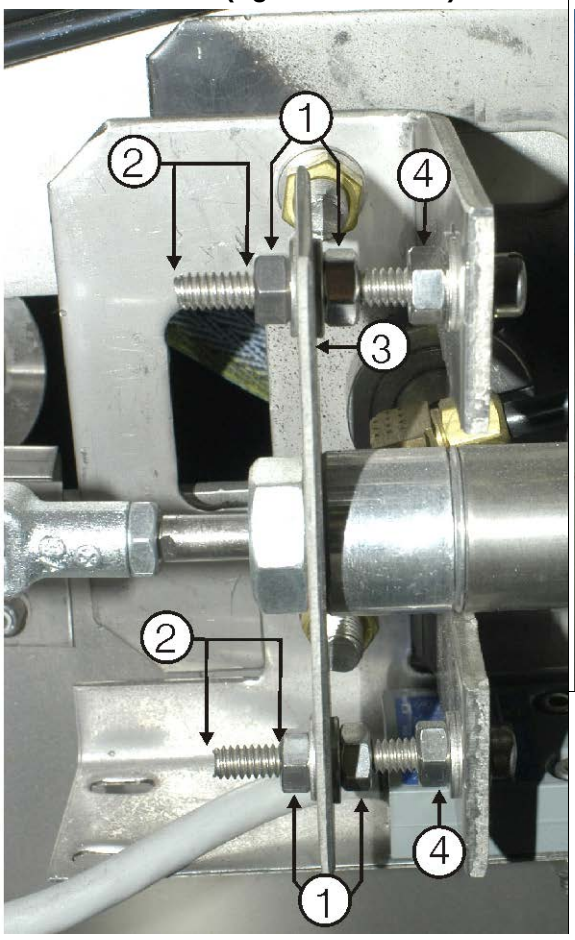
   1. Adjust the right side air cylinder mounting bracket 1/16" (0.4 mm) farther away from the load end of the conveyor.

2. Adjust the left side air cylinder mounting bracket 1/16" (0.4 mm) closer to the load end.

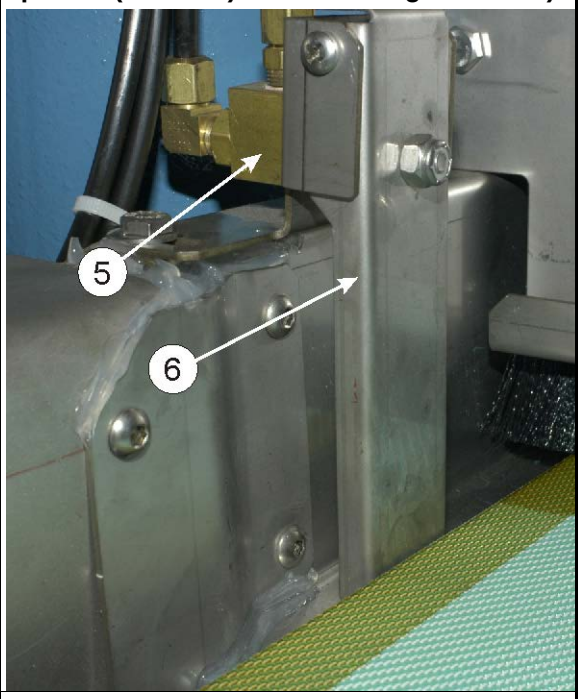
7. The pneumatic switches are properly adjusted when the paddles (item 6) are touching the belt and the the air valve (item 5) will open if the belt moves 1/8" (3 mm) closer to the switch. These switches should not need to be removed or adjusted when performing the servicing described herein. However, 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 28: 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)

2.5.6. 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 25 (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: 20161026 / 20161026 / 20161026 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 40: Understand the press servicing hazards—Before performing press maintenance, review document BIPPMS01 “Safe Servicing...”

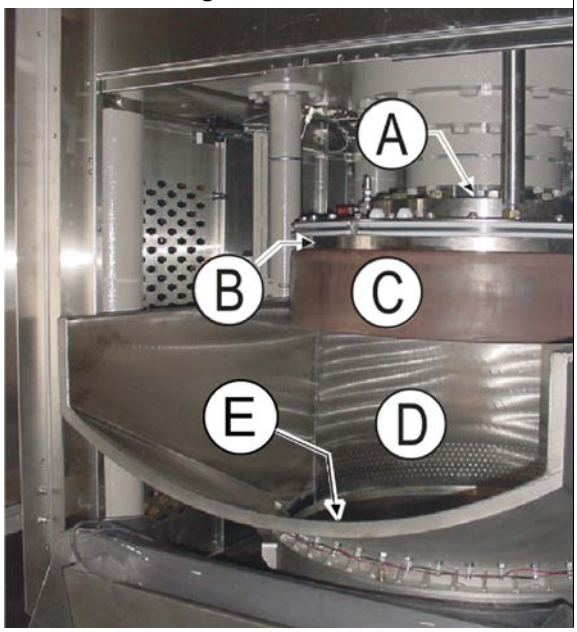
single stage press—a press extractor that squeezes water from successive batches of wet goods at one pressing position (versus a two stage press that first lightly presses the goods at one position, then fully presses them at another). Pressing leaves the batch of goods compressed into a “cake” that 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 29.

Figure 29: 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 30 and include:

variable displacement piston pump (see Notice **41** **)**—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.

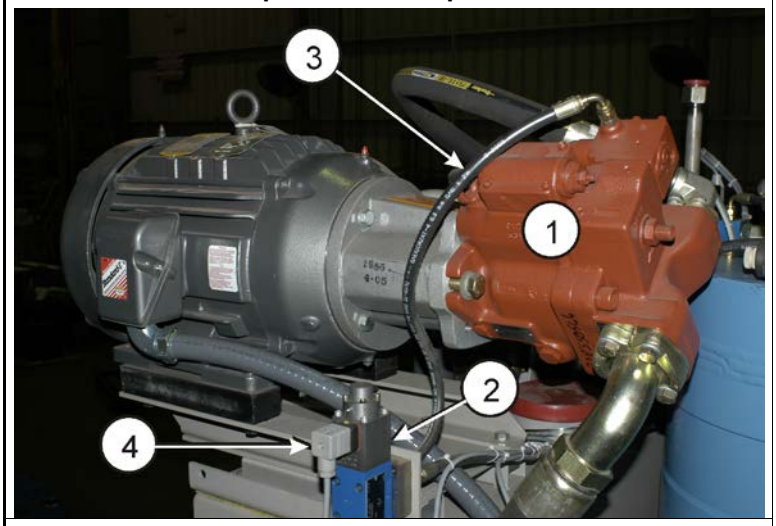
DBET card—an electronic circuit board that interprets data from the machine's microprocessor controller (through a D/A peripheral board) to produce a variable voltage. The microprocessor controller uses a pressure transducer to monitor actual hydraulic pressure.

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 41: 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 30: 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

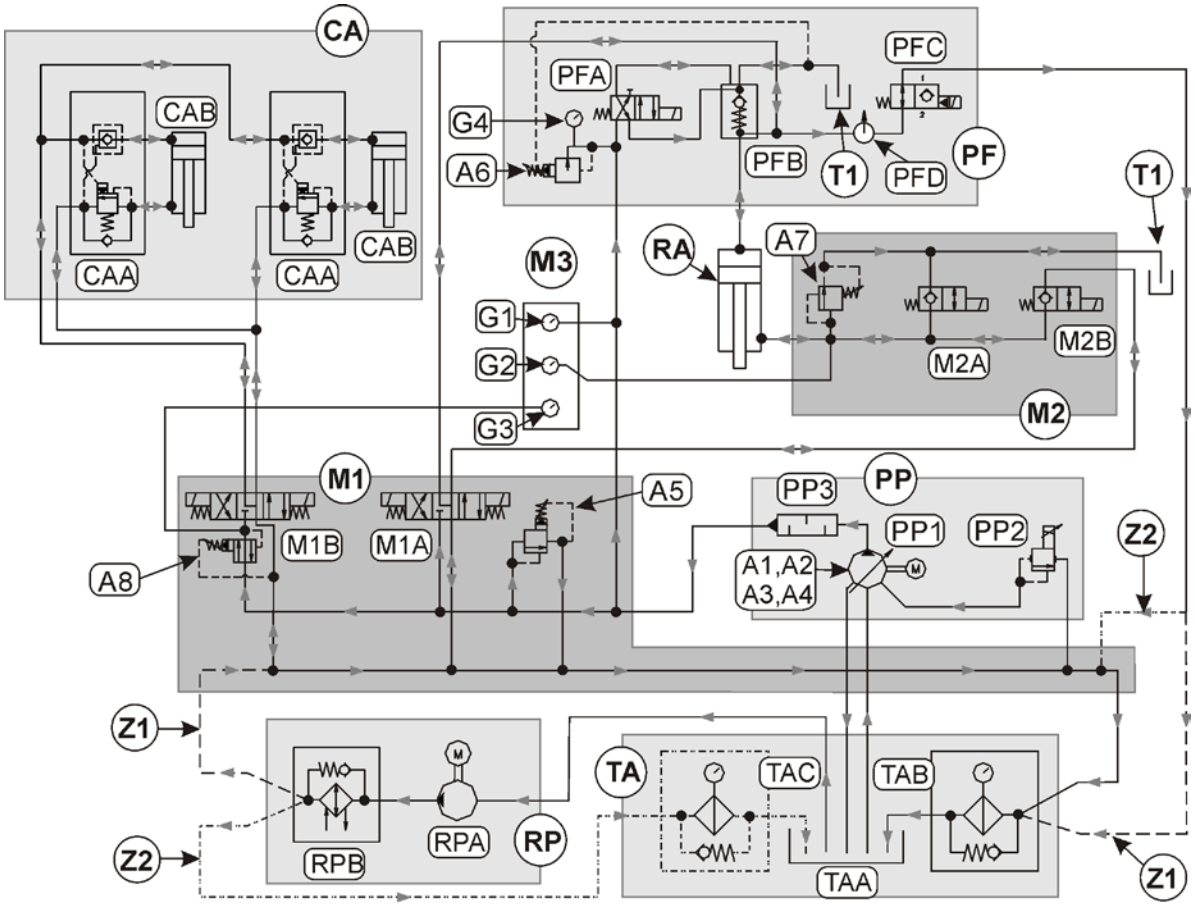
DBET Card in Control Box

3.1.2. The Hydraulic System and How It Functions During Operation

The single stage press hydraulic schematic is shown in Figure 31. 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 31: 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 **42**). The small volume of oil flowing from the pump returns directly to the tank (TAA) via the pump's case drain (see Note 2).
- The ram is up (confirmed by the ram full up proximity switch— Figure 32).
- The can rests on the press bed (confirmed by the can at bottom proximity switches— Figure 32), 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.

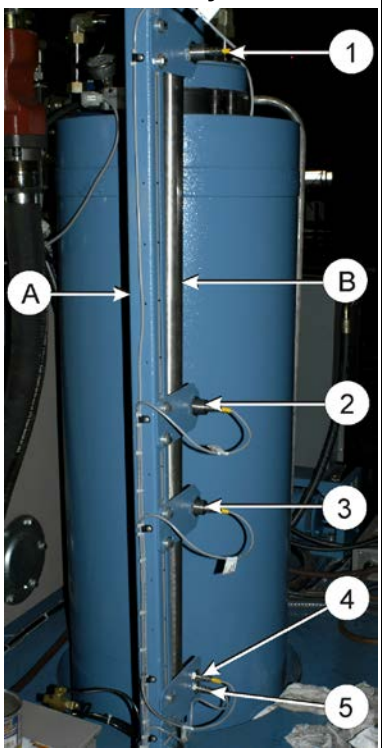
Note 2: The pressure pump has two oil lines to the tank—a large suction line and a small case drain return.

CAUTION 42: 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.

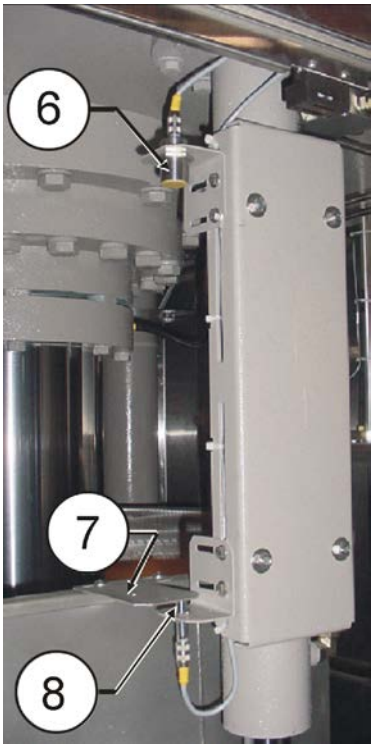
- Do not attempt to change hydraulic pressure settings except in strict compliance with document BIPPMT02 “Setting Single Stage Press Pressures.”

Figure 32: 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 29. 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 42). 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.

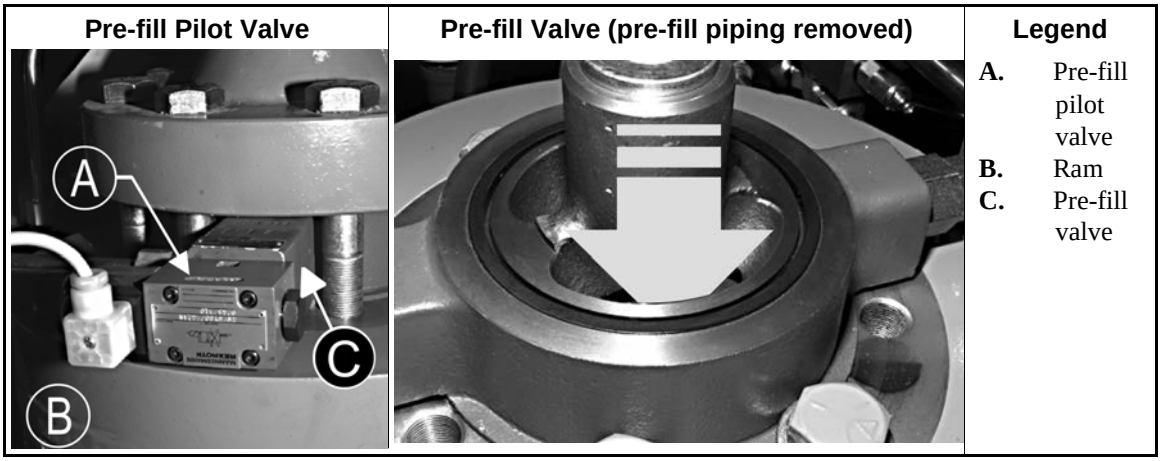
3.1.2.3. Ram "Free-fall"—Following the configured *loading time* delay, the ram descends by gravity, lowering the diaphragm into the can (see Note 4). The following conditions permit this:

- 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 33) 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 33).
- Both electrically operated poppet valves (M2A and M2B—see Note 3) 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 3: 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 4: 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 33: Pre-fill Pilot Valve and 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 32 and Note 5), 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 5), 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 5:** 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 6 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 6:** 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 32), 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 32), 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 **42**). 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 32). 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 **42**) 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 43: 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 —

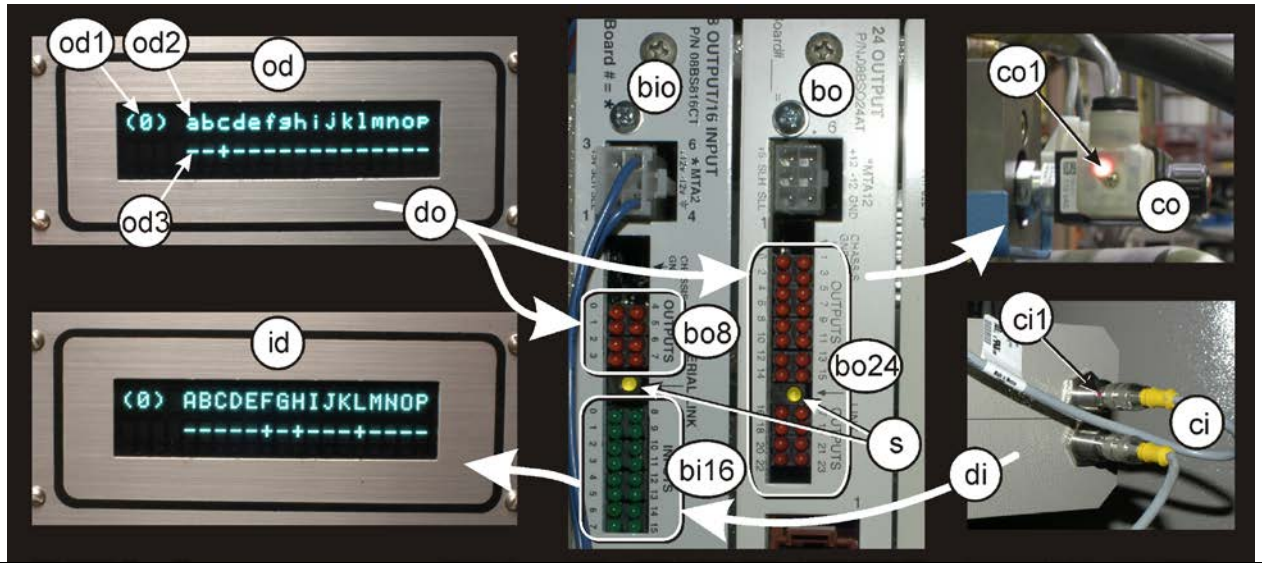
BIUUUT04 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

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 34, 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 34: 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:

3.2.1.1. **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 34 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).

3.2.1.2. **IO Boards**—The boards (center of Figure 34) 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.

Supplement 3

About the Yellow Light and Serial Communication

This light tells much about the status of serial communication and the related hardware. Consider three possible conditions: 1) the light blinks, 2) the light remains off, or 3) the light is steady on.

blinks—serial data is passing between this board and its central processor. This board is probably good. However, this condition says nothing about the quality of the serial data. It does not ensure that the data is uncorrupted by, for example, electromagnetic interference (EMI).

steady off—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 and give each board the address of the board it replaces. If the light that was not blinking is still not blinking (if the problem moved with the board), the board is bad. If the light on the board that now occupies the problem position is not blinking, it is likely that there is an open in the serial link wiring.

steady on—this board is bad **and** the board is interfereing with serial communication throughout the serial link. Replace the board.

3.2.1.3. **Electrical Components**—As shown on the right side of Figure 34, 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 —

BIPPMM21 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

3.3. About the Ram Proximity Switches, the Switch Post, and the Switch Operation Rod

This document uses Simplified Technical English.
Learn more at http://www.asd-ste100.org.

NOTICE P1: "Remove power from the machine" means use the necessary safety procedure for your location. In the USA, this is the OSHA lockout/tagout (LOTO) procedure. More local requirements can also apply.

Notice 45: This document applies to Milnor® 1-station press models made after August, 2009. It also applies to machines made before this date that have a ratchet mechanism installed. This mechanism turns the diaphragm. For machines with no ratchet mechanism, see document BIPPMM02 “About the Ram Proximity Switches, Mounting Post, and Guide Rod.”

Notice 46: The diaphragm must be correctly filled before you do this procedure. Refer to the document that applies to your machine: BIPPMM10 “How to Fill and Maintain the Diaphragm” or BIPPMM17 “The Installation and Replacement of the Diaphragm and Gum Rubber for the 1-Station Membrane Press.”

WARNING 47: Risk of death or serious injury—The container and ram move independently. During operation these components move without warning. These components can also move down with power off. Spaces can close and cut off your arm.

- Keep personnel not necessary for this maintenance clear of the machine.
- Use special caution when you use the key that bypasses the door guards for maintenance.
- Two qualified technicians are necessary. Each technician must hear the other's voice clearly.

You must examine and adjust the ram proximity switches when you install the machine or replace related components, or if the ram does not move correctly. Two technicians are necessary for switch adjustment. One technician operates the press controls in the *Manual* mode (manual operation) as told in the reference manual. The other examines and adjusts the switch positions. The two technicians must know and obey the safety requirements for this machine.

diaphragm (membrane)—the rubber component that pushes on the goods during operation

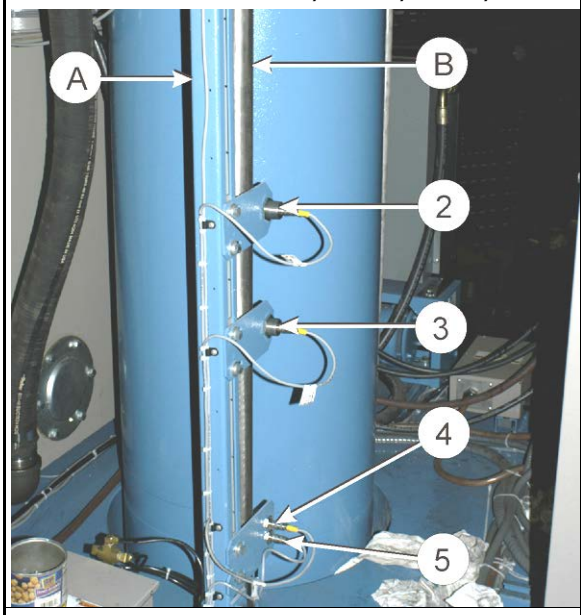
container (can)—the cylinder that the goods, the diaphragm, and the platen go into during operation

switch operation rod (guide rod)—a vertical rod that moves up and down with the movement of the ram. On 1-station presses made after August, 2009, this component is the target for four ram proximity switches, but is not attached to the platen. On machines made before this date, this component is the target for all five ram proximity switches. On these machines, the platen and diaphragm cannot turn because the rod is attached to the platen.

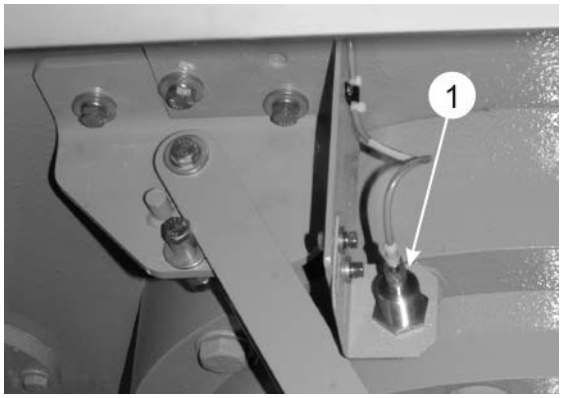
Look at Figure 35. Four of the five ram proximity switches are attached to the switch post above the top plate near the switch operation rod. One switch is attached to the ratchet assembly below the top plate. You install the switch post and the switch operation rod as a part of machine installation. Each ram proximity switch has a name related to its function (example: PXST). This name identifies this component on related electrical schematics.

Figure 35: Ram Proximity Switches, Related Components, and Switch Functions

Switch Post with PXSM, PXSU, PXSL, PXSB



Ratchet Assembly with PXST



Legend

A. Switch post
B. Switch operation rod
1. PXST “The ram is up fully”—The ram is approximately at its upper mechanical limit of travel.
2. PXSM “The ram is in the container”—This is when the diaphragm is in the descent by gravity and starts to go into the full circle of the receive chute.
3. PXSU “The ram is at the discharge position”
  a. For pressing—The diaphragm parks in the full circle of the container. Here, the ram starts to apply pressure to the goods.
  b. For discharge—The cake has clearance, but if the cake bonds to the container, the ram will push the cake out when the container goes up.
4. PXSL “The ram is low”—The ram moved down more than it could if the container had a full load of goods. The controller decreases pressure, which is correct for a small load.
5. PXSB “The ram is down fully”—The diaphragm is approximately one inch above the bed. This is as low as the ram can go in automatic operation without a risk of component damage.

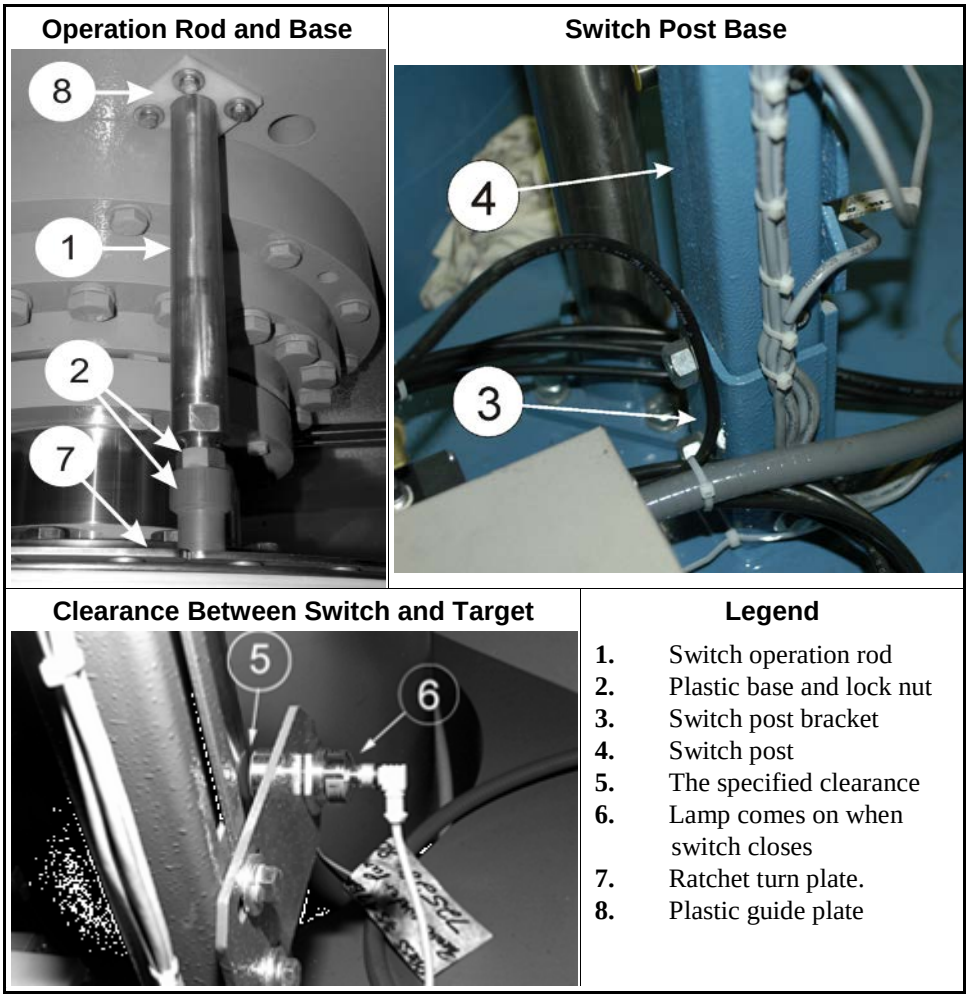
3.3.1. Install the switch operation rod and the switch post, if necessary

Do this work with electrical power removed (see Notice P1).

Refer to Figure 36. The switch operation rod goes through a hole in the press top plate. Plastic guide plates are attached to the top and bottom of this hole. When you move the rod, make sure that you hold it tightly and that the surface does not become damaged. From above the press top plate, put the end of the rod with the plastic base through the hole. Let it go down slowly until the base is on the ratchet turn plate (which is attached to the platen). During operation, the plastic base will move across the ratchet turn plate while the diaphragm turns.

Put the switch post in its bracket on the top plate as shown in Figure 36. Tighten the post in the bracket.

Figure 36: Installation of the Switch Operation Rod and Switch Mounting Post



3.3.2. Examine the clearance between each switch and its target

Do this work with electrical power removed (see Notice P1).

The target for the switches on the switch post is the operation rod. The target for PXST is the ratchet arm. Make sure that each of the four switches on the switch post horizontally aligns with the switch operation rod. Examine the clearance between each switch and its target (Figure 36, Item 5). Adjust if necessary. The clearance must be approximately:

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

3.3.3. Examine each switch vertical position

You start each of the switch adjustments with electrical power on. You do some steps with electrical power off, as told in the instructions.

Slots on the switch bracket or on the component it attaches to let you vertically adjust the position of each proximity switch. The press must have a properly filled diaphragm before you examine and adjust the vertical position of the proximity switches (see Notice 46).

3.3.3.1. PXST "The ram is up fully" —This switch is on the ratchet assembly below the top plate (see Figure 35). This is the only ram proximity switch that operates in the *Manual* mode. The switch must close immediately before the ram touches the top mechanical limit of travel.

The container must stay down during this procedure. Use special caution because one technician will be in the path of container movement while the other operates the controls.

1. Move the PSXT switch bracket as high as it will go and tighten the bracket with your hand.
2. The PXST lamp will be off. One technician operates the controls to hold the ram against the top mechanical stop. While this occurs, the other technician slowly moves the switch down until the switch circuit closes (lamp on). Tighten the switch bracket with your hand.
3. **Remove power from the machine (see Notice P1).**
4. Tighten the switch bracket with tools.

3.3.3.2. PXSM "The ram is in the container" and PXSU "The ram is at the discharge position"—These switches are on the switch post. The adjustment procedures are almost the same for each. Start with the container down and the ram up. To adjust PXSM:

1. The PXSM lamp will be on. One technician looks at PXSM and tells the other technician to stop when the switch circuit opens (lamp off). The other technician slowly moves the ram down and stops ram movement when told.
2. Examine the diaphragm position. If the bottom edge of the diaphragm is one inch (25 mm) below the center of the receive chute, (Figure 37), the switch position is correct. If not:
   a. Move the ram to the position shown in Figure 37.
   b. Move the switch up on the post. The switch lamp will be on.
   c. Slowly lower the switch until the switch lamp goes off.
   d. Tighten the switch bracket with tools.

Figure 37: Diaphragm is Safely in Container (PXSM)

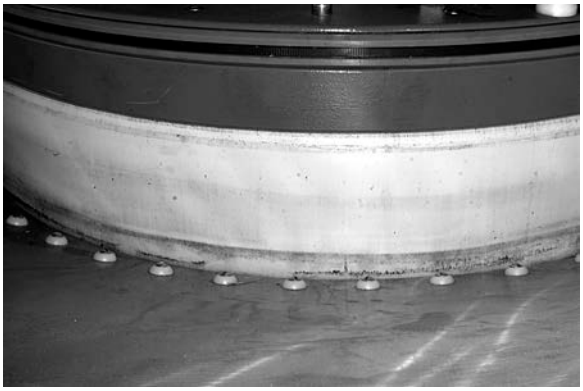


Figure 38: Where to Park the Ram (PXSU)

Examine the PXSU switch. This switch must stop ram movement when the top of the platen is aligned with the center of the receive chute as shown in Figure 38. Use the same general procedure that you used to adjust PXSM.

3.3.3.3. **PXSL "The ram is low" and PXSB "The ram is down fully"**—These switches are on the switch post. Adjust switch PXSB first then put PXSL immediately above PXSB (switch brackets touch as shown in Figure 39).

CAUTION 48: Risk of diaphragm damage and unsatisfactory extraction—If the PXSB position is too low, this can decrease diaphragm life. If the PXSB position is too high, this can decrease the extraction. Small loads or an incorrectly filled diaphragm will make these problems worse.

- Do this procedure accurately.
- Fill the diaphragm correctly (see Notice 46).

CAUTION 49: Risk of machine damage—You can bend machine components if you push the expanded diaphragm through the bottom of the container with force.

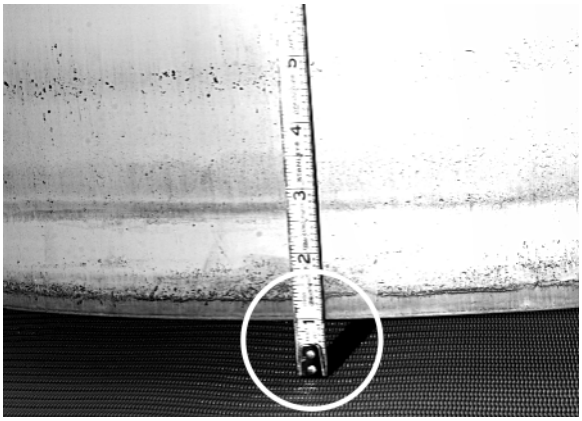
- The correct sequence to put the ram down and the container up is 1) container down, 2) diaphragm down, 3) container up. The correct sequence to put the container and ram in their usual positions is 1) ram up, 2) container down.

To adjust PXSB:

1. Put the ram down and the container up (see caution statement 49). Install the container safety stands.
2. Move the ram up approximately six inches (150 mm).
3. The PXSB lamp will be on. One technician looks at PXSB and tells the other technician to stop when the switch circuit opens (lamp off). The other technician slowly lowers the ram and stops when told.
4. **Remove power from the machine (see Notice P1).**
5. Measure the clearance between the diaphragm and the bed. If this measures one inch (25 mm) as shown in Figure 40, the switch is adjusted correctly. If not:
   a. Connect electrical power. Put the diaphragm on the press bed.
   b. Move the PXSL switch up approximately six inches (150 mm).
   c. Move the PXSB switch to a position one inch (25 mm) above where the top of the switch operation rod is at this time.
   d. Tighten the switch bracket with your hand.
   e. Do Item 2 through Item 5 again to make sure that this switch position is correct. Adjust the switch position if necessary.
6. When PXSB is in the correct position, tighten the switch bracket with tools.
7. Move the PXSL switch down until the PXSB and PXSL brackets touch, as shown in Figure 39. Tighten with tools.

Figure 39: PXSL and PXSB With Brackets Together

Figure 40: Correct Clearance—PXSB Adjustment



— End of BIPPMM21 —

BIPPMT01 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

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 50: 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 3 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 3: 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.																	

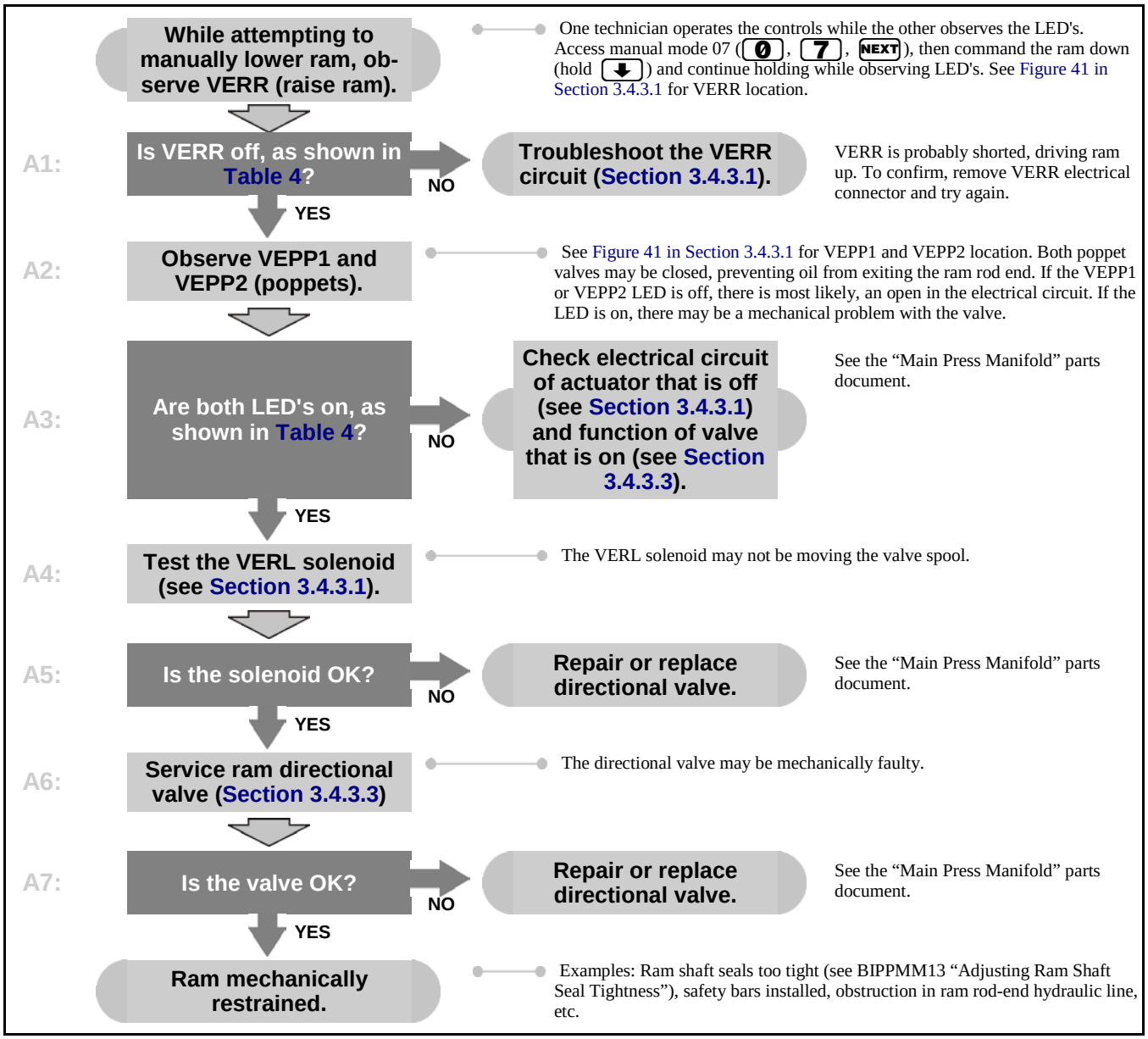
3.4.2.1. Ram Will Not Go Down or Goes Down Slowly

—Table 4, referenced in the charts below it, shows the on/off state of the electrically operated hydraulic valves during ram descent.

Table 4: Valve Actuation Sequence for Ram DOWN (observe LED's on actuators)

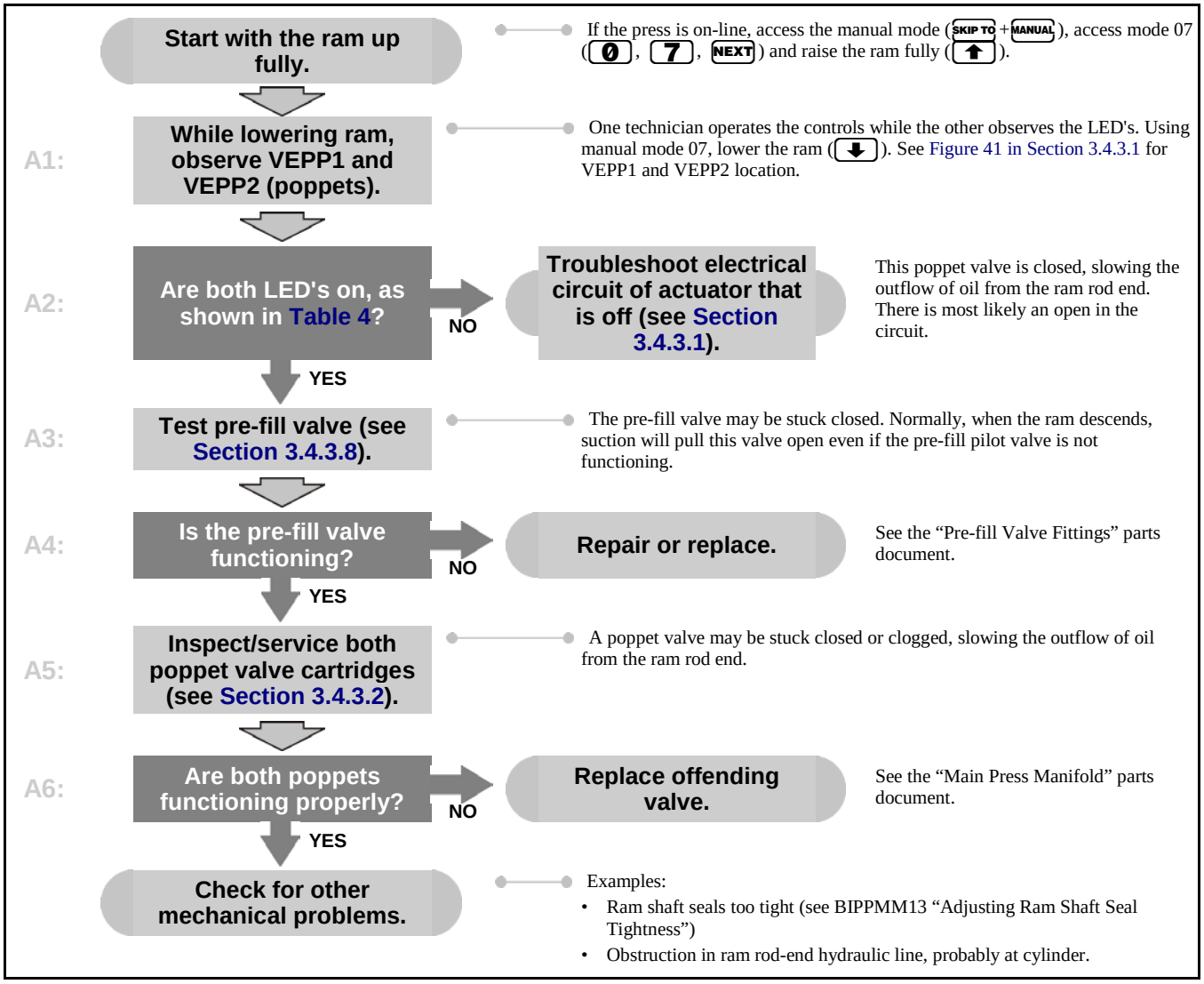
When During Travel	VERDB "ram down bypass"*	VERS pre-fill	VERL lower ram	VERR raise ram	VEPP1 poppet #1"	VEPP2 poppet #2
1. Start (full up)	off	on	on	off	on	on
2. Ram in can (1/2 down)	off	off	on	off	on	on
3. Ram at unload (2/3 down)	on	off	on	off	on	on
4. End (lowest position)	on	off	on	off	on	on
*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

Chart 1: 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 2: Ram Goes Down Slowly (two technicians required)



3.4.2.2. Ram Will Not Go Up or Goes Up Slowly—Table 5, referenced in the charts below it, shows the on/off state of the electrically operated hydraulic valves during ram ascent.

Table 5: Valve Actuation Sequence for Ram UP (observe LED's on valve actuators)

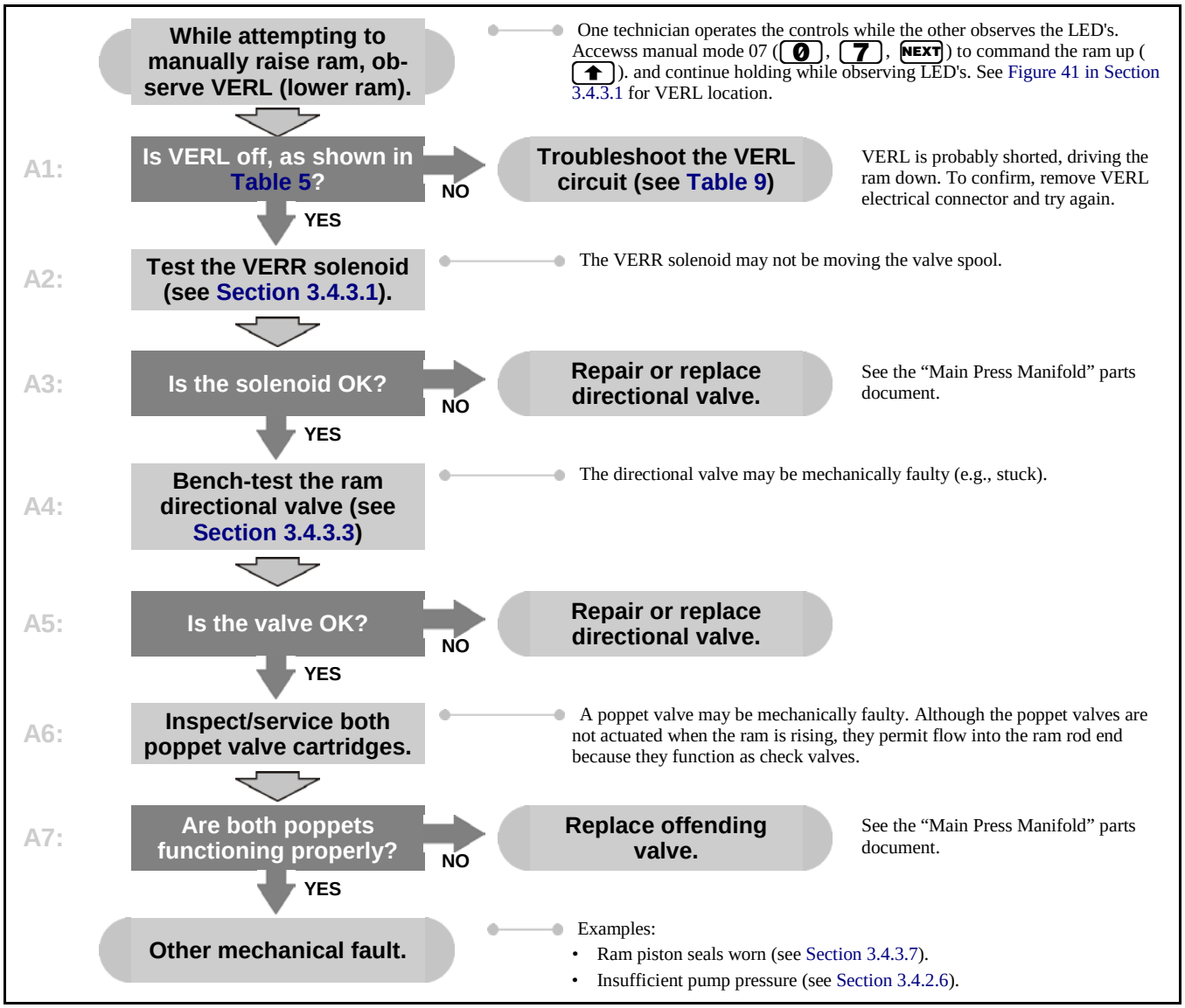
When During Travel	VERDB ram down bypass*	VERS pre-fill	VERL lower ram	VERR raise ram	VEPP1 poppet #1***	VEPP2 poppet #2***
1. Start (lowest position)	off	on**	off	on	off	off
2. Ram at unload (1/3 up)	off	on	off	on	off	off
3. End (full up)	off	off	off	off	off	off

* 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.

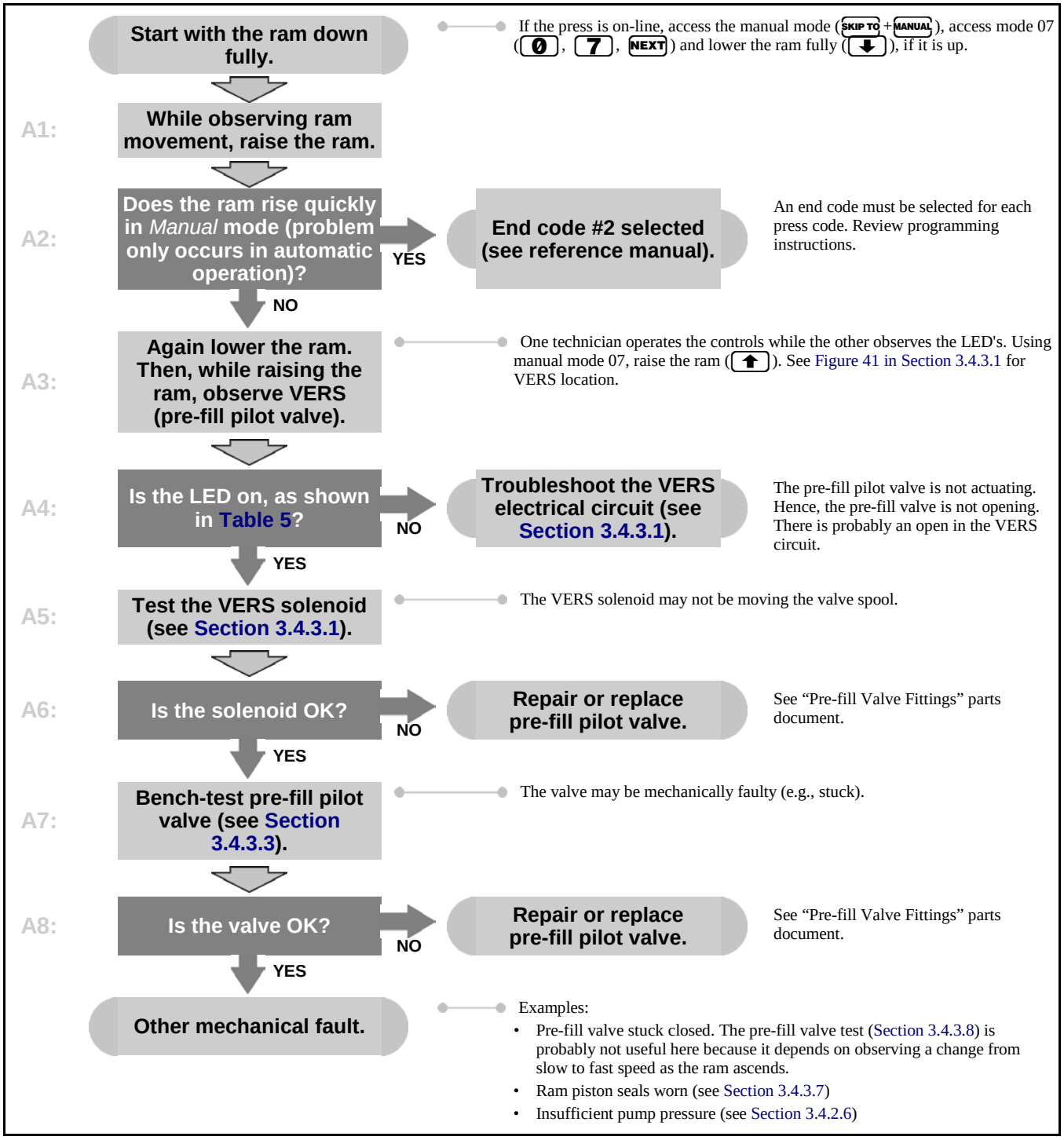
*** Although the poppet valves remain off during ram up, they permit oil to enter the ram rod side because they are always open in this direction.

Chart 3: 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 4: Ram Goes Up Slowly (two technicians required)

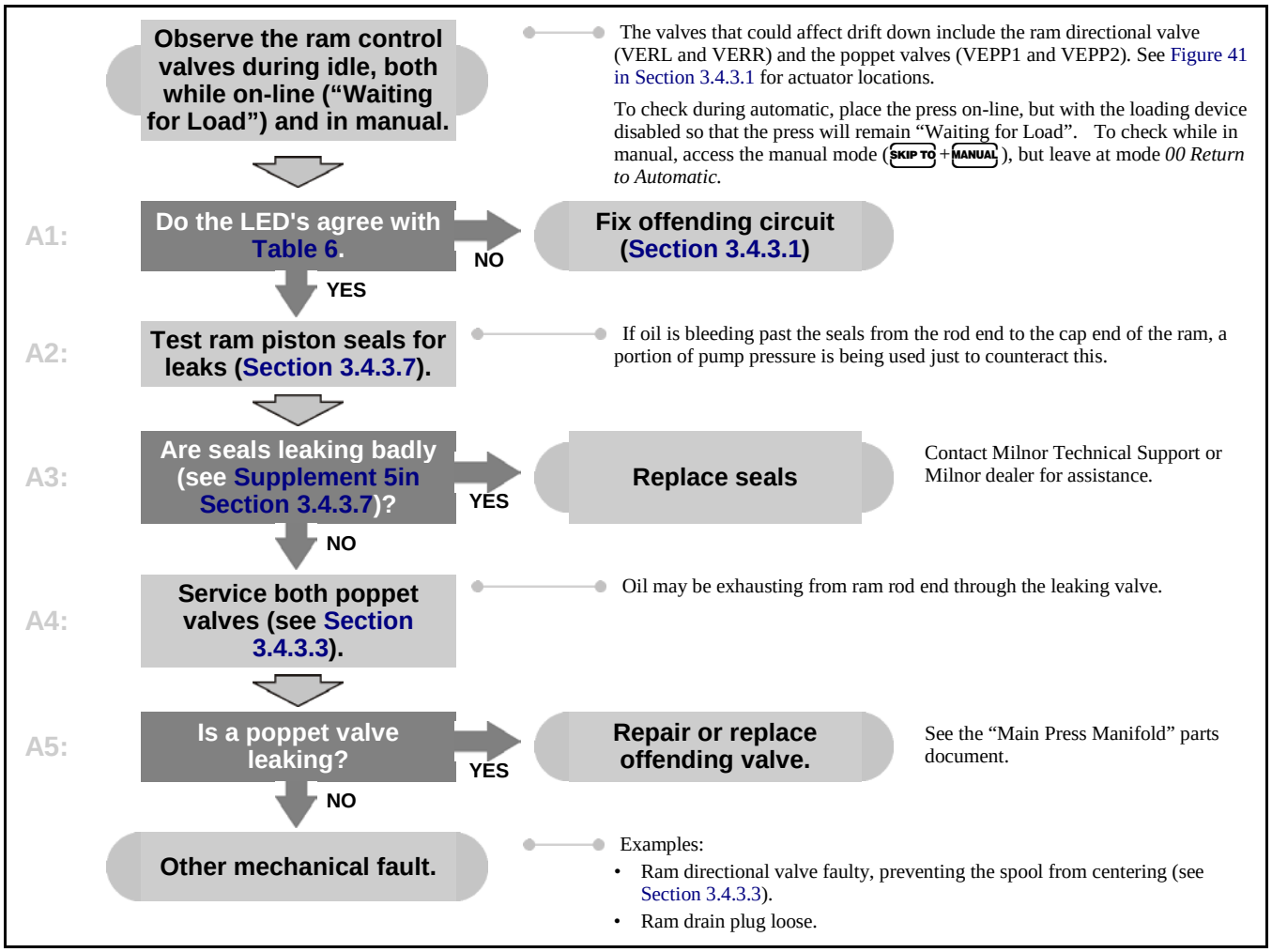


3.4.2.3. Ram Drifts Down at Idle—Referring to Table 6, when the press is idling in manual mode, all ram control valves are off. When it is idling in automatic and "Waiting for Load", all except VERR are off. In the latter case, VERR holds the ram directional valve in the "raise ram" position so that idle pressure will help counteract any tendency to drift down.

Table 6: Valve State During Idle

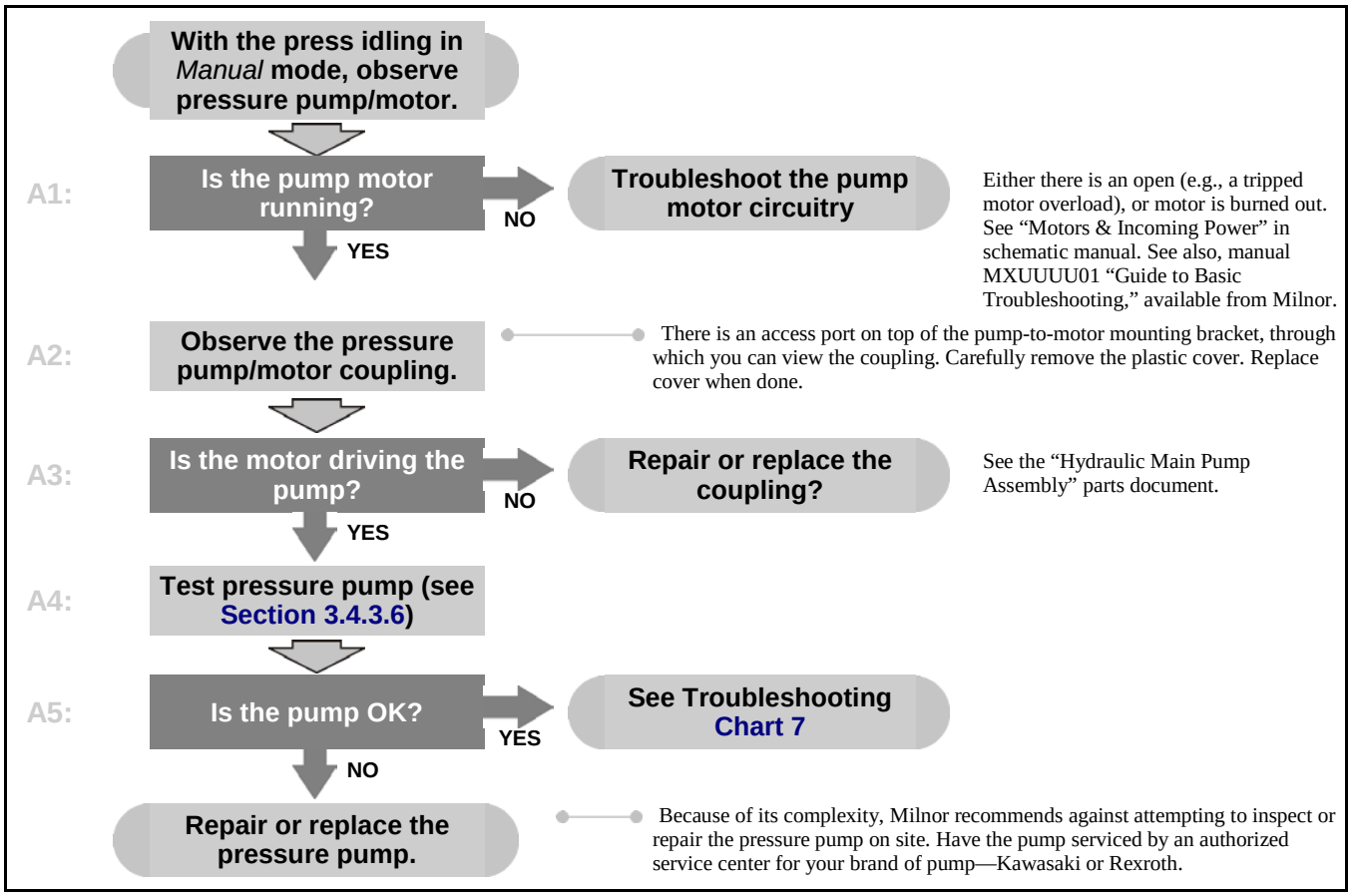
Type of Idle	VERDB "ram down bypass"*	VERS pre-fill	VERL lower ram	VERR raise ram	VEPP1 poppet #1"	VEPP2 poppet #2
Automatic ("Waiting for Load")	off	off	off	**on**	off	off
Manual	off	off	off	off	off	off
* The ram down bypass valve is open whrn VERDB is off and closed when on.						

Chart 5: 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 6: 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 7: 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 7: Little or No Extraction (two technicians required)

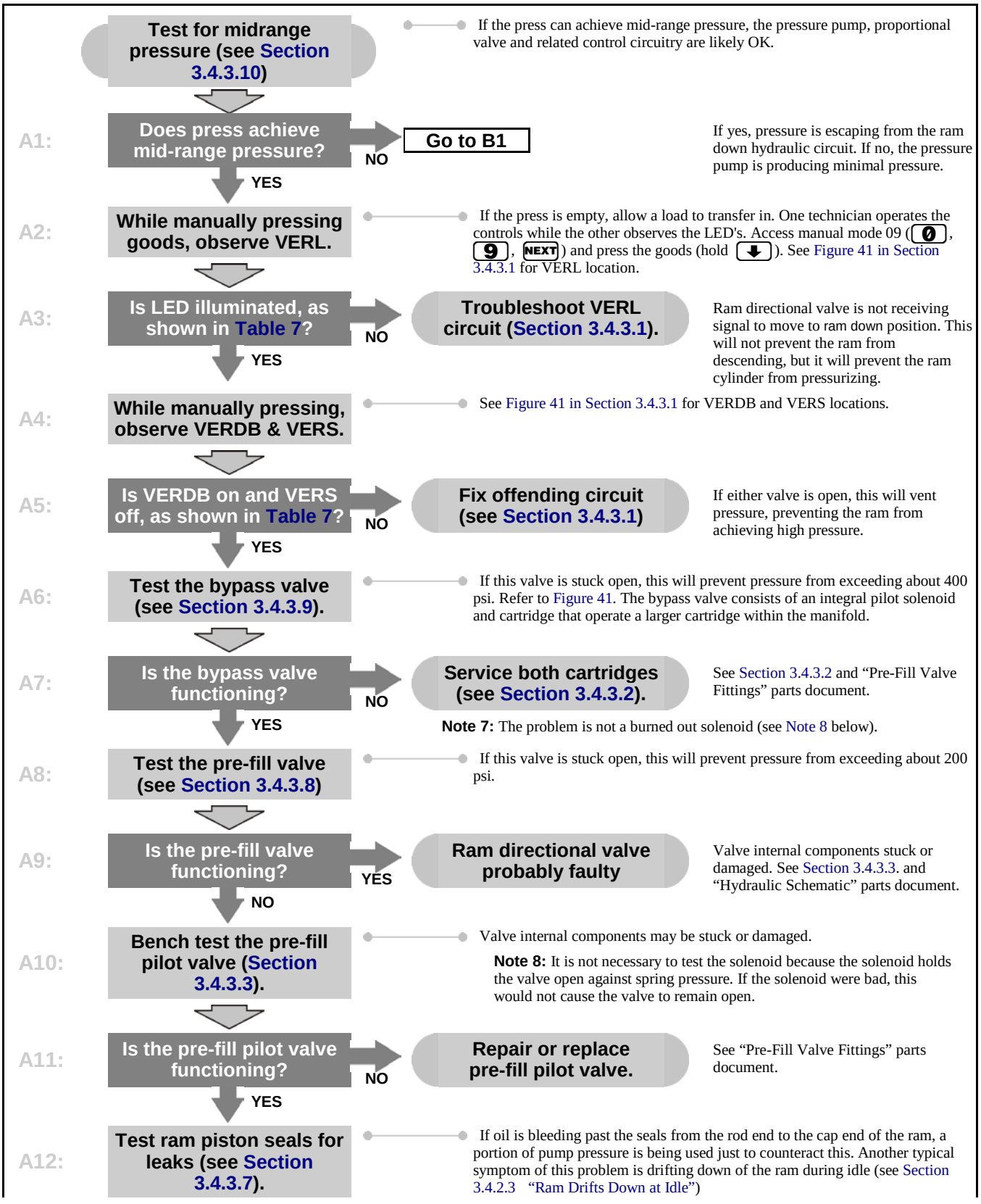
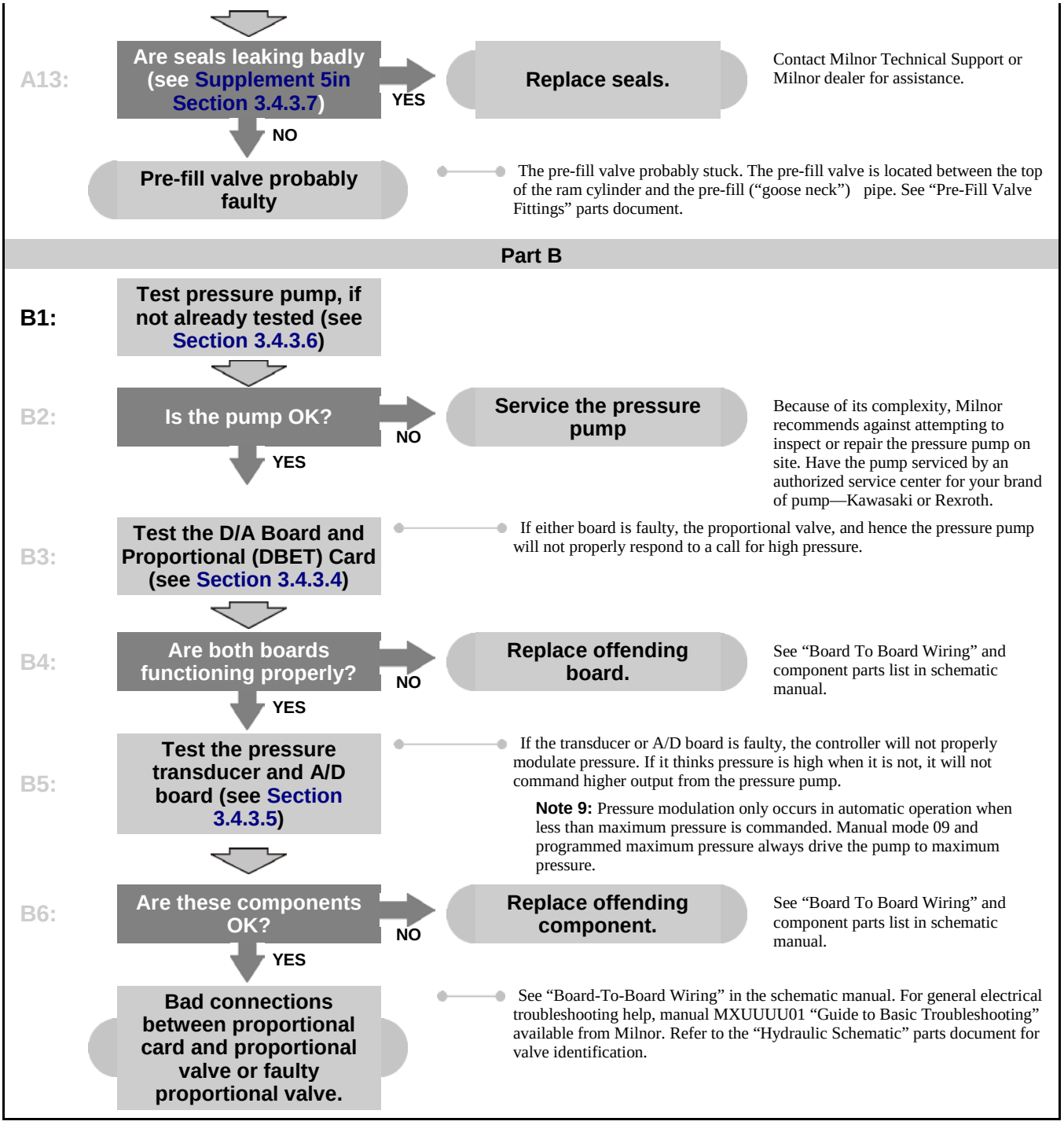


Chart 7: Little or No Extraction (two technicians required)



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 8 below), or takes significnatly longer to achieve pressure (see also Supplement 4 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 8: 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 4

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.

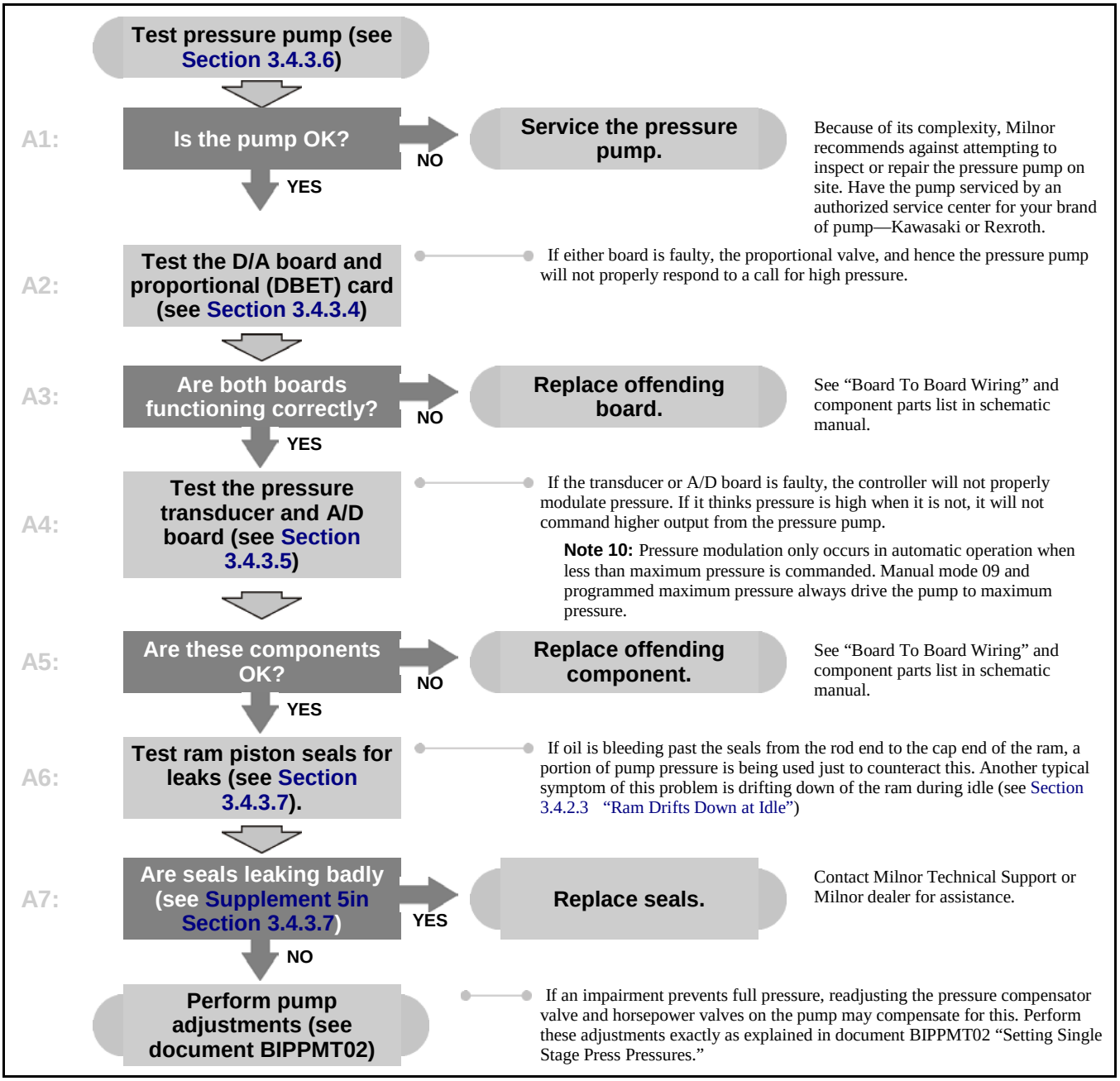
Impaired pressing can only be determined from an accurate pressure reading. Neither reduced operating performance nor increased drying times necessarily indicate a pressure problem. These can result from numerous causes such as changes in goods types, load sizes, and/or press codes, none of which relate 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 8: 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 41. Useful information about the actuator electrical circuits is provided in Table 9.

Figure 41: Ram Electrically Operated Hydraulic Valves

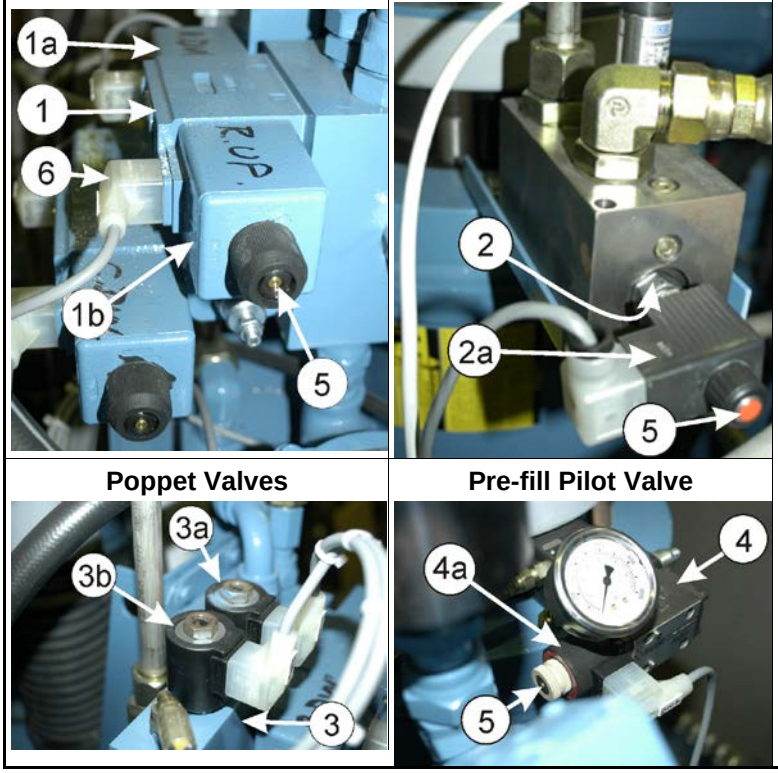


Table 9: Digital Outputs for Ram Functions (electric valves)

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 41). 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 **51** , 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 51: Crush Hazards—Hydraulic valve mechanical actuators bypass the safety of the electrical controls. Depressing a mechanical actuator may cause immediate movement.

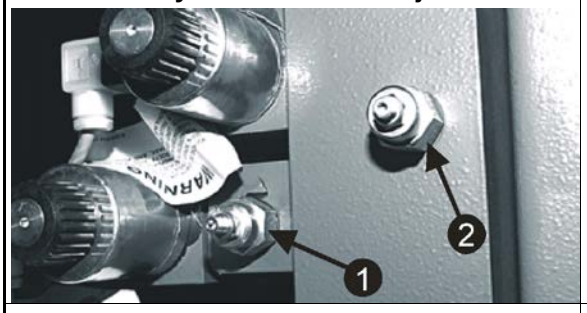
- Use extreme caution when operating a hydraulic valve mechanically.

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 42. 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 42: Pressure Relief Valves and Regulators

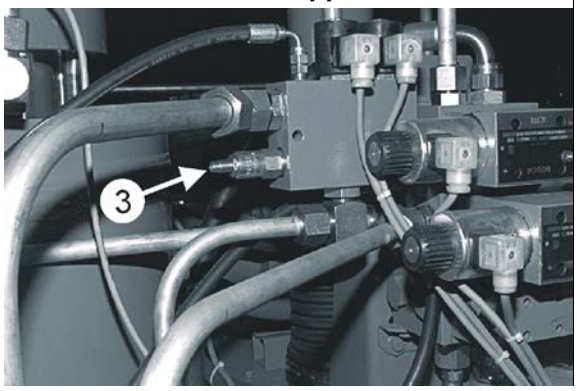
Can and System Pressure Adjustments



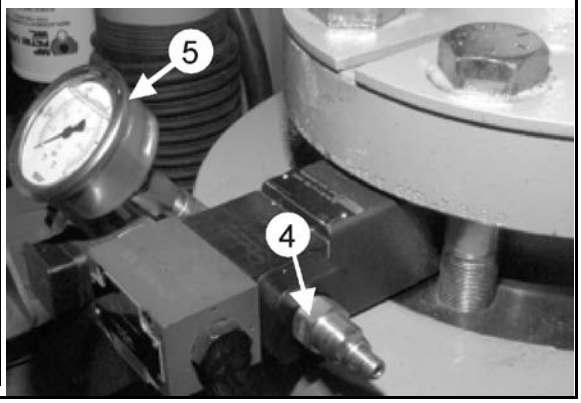
Legend

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 43) 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 43: Operating Valve Cartridge

Figure 44: 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 44) 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.

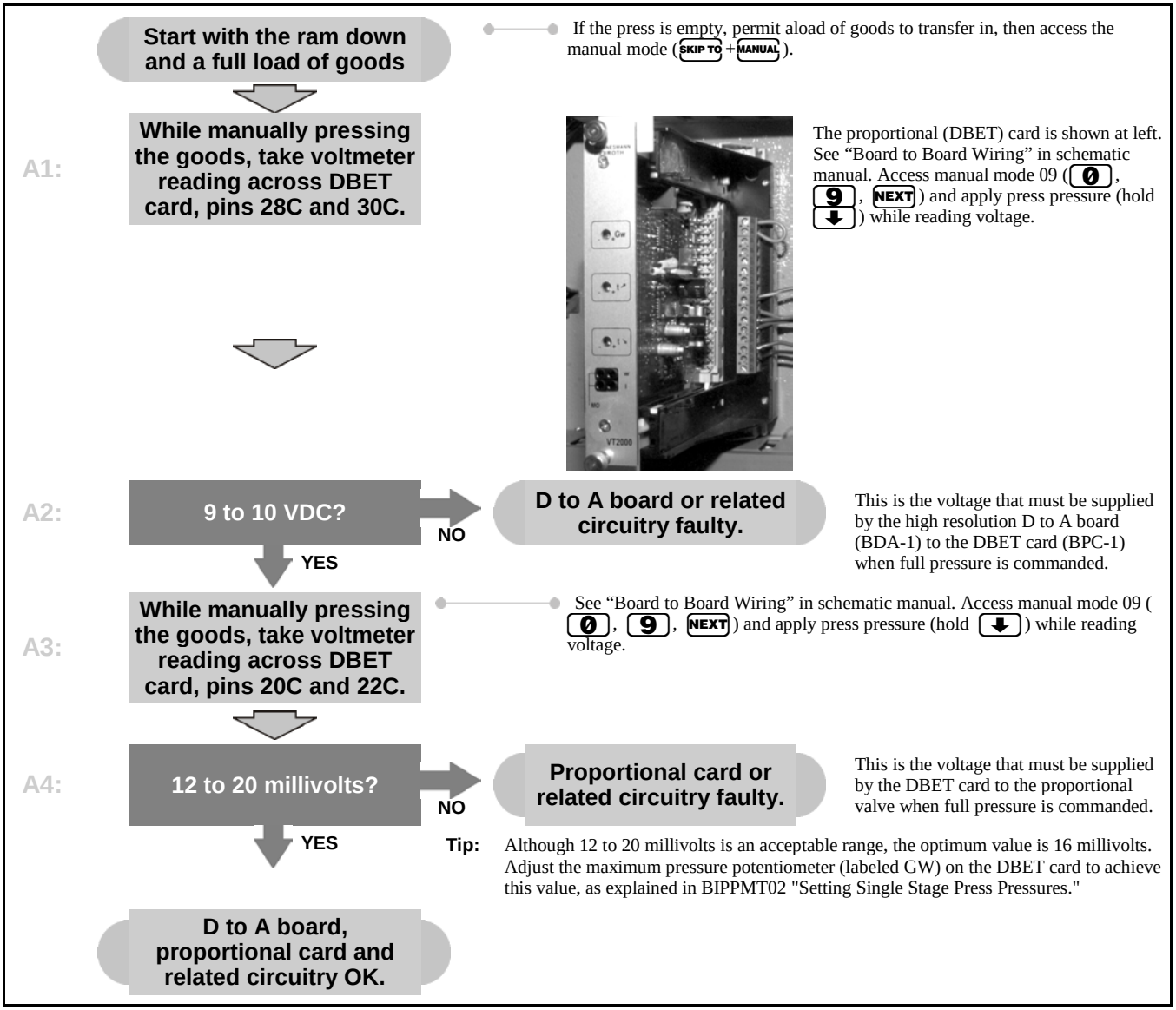
3.4.3.4. How to Test the D/A Board and Proportional (DBET) Card Analog Output

—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 8 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 10.

Table 10: 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 9: 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 11). 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 12), is shown in Table 11.

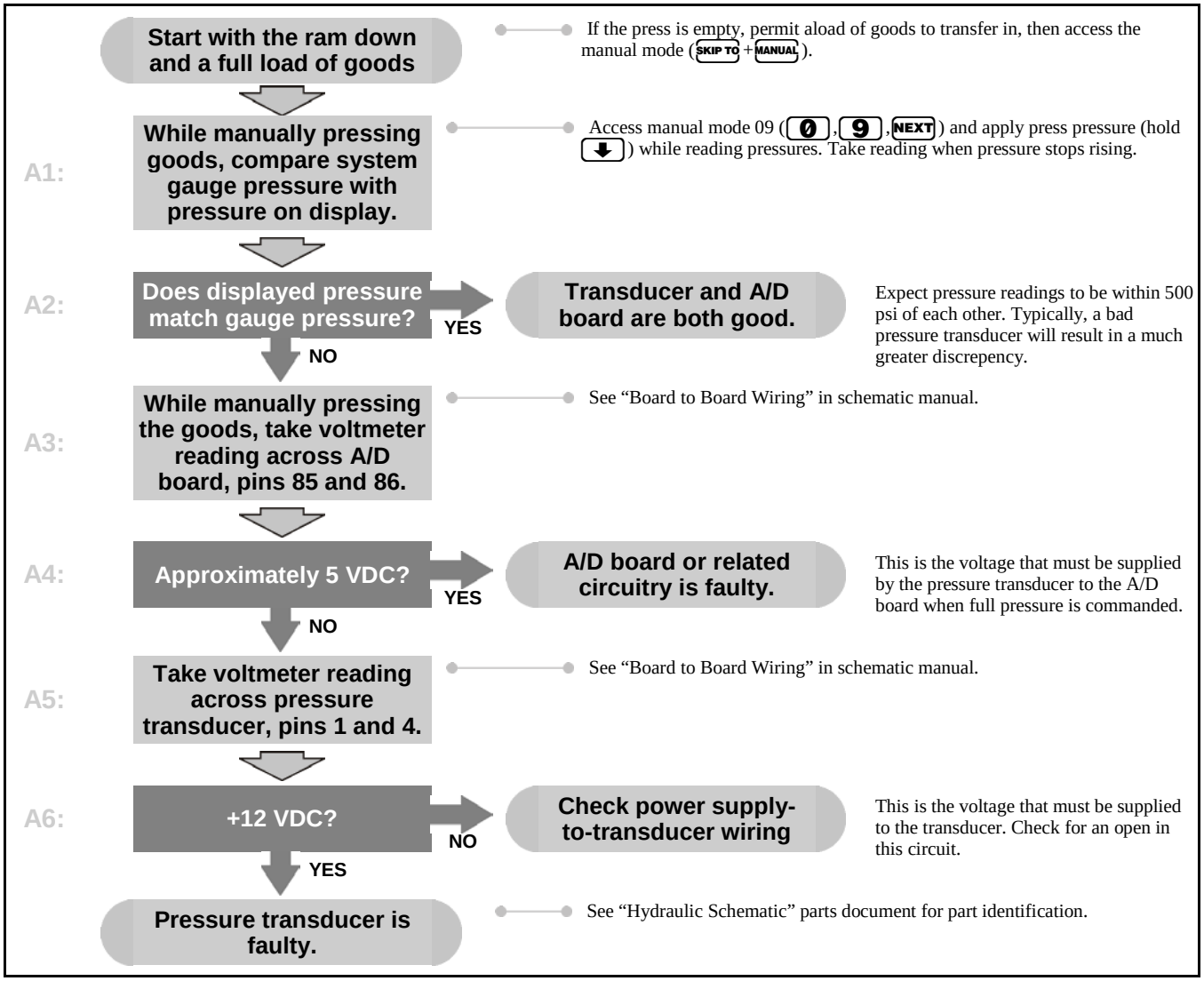
Note 11: The pressure transducer is in the ram down circuit so it only supplies data during ram descent and pressing. Commanding full pressure with manual mode *09*, drives the pump to maximum (no modulation).

Note 12: 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 11: 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 10: 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 11: Pressure Pump Test

Lockout/tagout power.

A1: **Plug the pressure pump control port.**

The port to be plugged is circled at left. Use a -4 (1/4") o-ring base plug (supplied in kit KYSSTRBLSH). It is not necessary to cap the hose end, but tape over it for cleanliness. This simulates a fully closed proportional valve.

A2: **Restore power and start machine (⟲, ①)**

Allow the machine to remain in *Manual* mode, selection *00 Return to Automatic*. The system should immediately go to full pressure without the need to press a load.

A3: **Compare system pressure with rated pressure.**

Observe the system pressure gauge (top gauge on gauge cluster). See Table 8 "Applicable Milnor® Single Stage Press Models and Pressure Ratings" in Section 3.4.2.6 for the rated pressure for your machine.

A4: **Is rated pressure achieved?**

YES → **Pump OK. Lockout/tagout power. Reconnect hose. Done**

NO

A5: **Service the system relief valve per Section 3.4.3.2 then recheck pressure.**

This ensures that the system relief valve is functioning properly, in the event that it is contaminated or damaged. This is very unlikely because, with proper adjustment, this valve never opens.

A6: **Is rated pressure achieved?**

YES → **Pump OK. Lockout/tagout power. Reconnect hose. Done.**

NO

A7: **Set system relief valve to maximum (5000 psi) then recheck pressure.**

This ensures that the system relief valve is not venting pressure before the full pressure is achieved. It is very difficult to open the valve (turn clockwise) under pressure, but easy to close (turn counterclockwise) under pressure. Stop machine (⓪), turn adjustment screw full clockwise, then start machine (①). See also document BIPPMT02 "Setting Single Stage Press Pressures".

A8: **Is rated pressure achieved?**

NO → **Pressure pump needs servicing.**

YES

A9: **Reset system relief valve**

With the machine running (①), one person turns the adjustment screw counterclockwise while another watches the system pressure gauge. Turn just until pressure falls below rated. With the machine stopped (⓪), make 1/2 clockwise turn of the adjustment screw then tighten the locking nut.

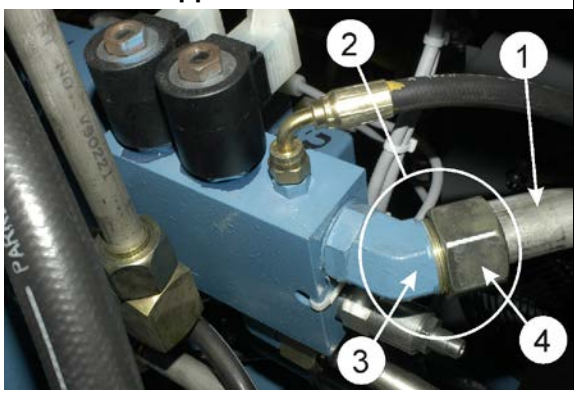
Pump OK. Lockout/tagout power. Reconnect hose. Done

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 45, 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 5.
6. Lockout/tagout power and restore the permanent connections.

Figure 45: 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 5

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.

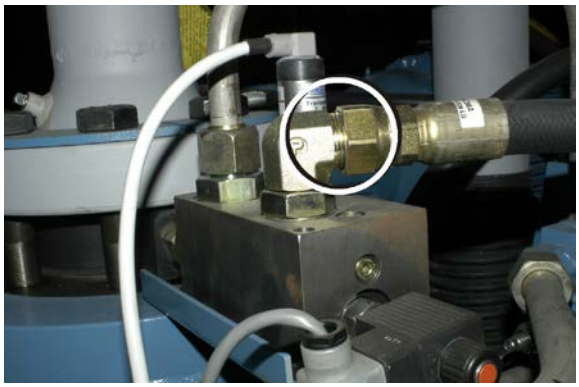
3.4.3.8. How to Test the Pre-fill Valve—In a properly functioning press, when the ram rises, the pre-fill valve opens to speed ascent by permitting a large volume of oil to exhaust through the large pre-fill pipe. If the pre-fill valve closes in mid-ascent, the ram will slow down considerably. The following 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 46. 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 46: 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: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

3.5. Set Standard and Booster Pump Pressures—1-station Press

Notice 52: Understand the press servicing hazards—

- Do this procedure only if you understand and work with hydraulic systems.
- "Remove power from the machine" means use the necessary safety procedure for your location. In the USA, this is the OSHA lockout/tagout (LOTO) procedure. More local requirements can also apply.
- Review Section 1.2. “Safe Servicing—Vital Information for Personnel Who Maintain and Service the Single Stage Press”.

Table 12: List of Settings

Setting	Description
Standard settings (see Note 13)	
Full system pressure (no single adjustment)	Maximum programmable pressing pressure for machines with no booster pump or a disabled booster pump (see Note 13).
Idle pressure	Minimum system pressure when the machine is at idle. Also called stanby pressure. On machines with the Ram Command option, this is the pressure for Timer C.
*** Pump compensation pressure**	A set point that limits full system pressure.
1st and 2nd stage horsepower (torque limiter)	The maximum pump motor torque for each of two predetermined stages of operation: mid-range pressure (1st stage) and high pressure (2nd stage) (see Note 14).
*** System relief pressure**	A relief setting that limits full system pressure.
Pre-fill pilot pressure	The regulated pressure at which the pre-fill pilot valve operates.
Ram up relief pressure	A relief setting that limits the pressure on rod end of ram cylinder.
Can pressure	The regulated pressure for the container (can) cylinders.
*** Proportional valve maximum pressure**	An electrically (potentiometer) controlled pressure that makes sure the proportional valve closes fully.
Proportional valve ramp up speed	The speed (set on a potentiometer) that the proportional valve closes (that the swash plate moves to increase output).
Proportional valve ramp down speed	The speed (set on a potentiometer) that the proportional valve opens (that the swash plate moves to decrease output).
Booster pump models only	
Booster pump pressure	The maximum programmable pressing pressure (see Note 13).
Machines with the Ram Command™ (soft squeeze) option only	
Timer A and Timer B pressures	The first two of three low pressures that occur when a press code calls for them. The third pressure (Timer C) is idle pressure.

Note 13: The standard settings are the same whether or not the machine has a booster pump. On a booster pump model, you must disable the booster pump to make the standard settings then re-connect the booster pump to set the booster pump pressure.

Note 14: The horsepower adjustments let the pump motor operate at full load amperage during destroke when flow decreases and pressure increases. The pump achieves full pressure and the motor does not stall.

Table 13: Hydraulic Pressure Specifications for Model Families MP1540_, MP1556_, MP1640_, MP1650_, MP1656_, and MP1A50_

Model Family >	**MP1540**		**1556**	**1640**		**1650**	**1656**	**1A50**	
Bar rating >	**40**	**40**	**56**	**40**	**40**	**50**	**56**	**50**	
Ram bore (inch) >	**13****	**14**	**14**	**13****	**14**	**16**	**16**	**17**	
Adjustment Type	**Setting**								**Means of Measuring**
Full system pressure (psi)	4332	3736	4600	4600	4600	4430	4300	4600	See four adjustments with an asterisk (*) below
Idle pressure - no Ram Command	400 psi								Observe system pressure (top) gauge
Idle pressure - Ram Command option	n.a.	n.a.	n.a.	n.a.	400 psi	n.a.	500 psi	n.a.	
*Pump compen-sation pressure (psi)	4332	3740	4600	4600	4600	4432	4600	4600	
1st stage horsepower (amperage draw)	Achieve full load amperage rating on motor nameplate (+/- 3%) while ram up relief pressure is (psi):								Ammeter measurement while ram relief pressure is lowered to value shown
for 60 Hertz	900	900	900	900	900	825	825	900	
for 50 Hertz	1080	1080	1080	1080	1080	990	990	1080	
* 2nd stage horsepower (amperage 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 (psi)	1200 (Howe prefill valve) 2000 (Rexroth prefill valve)								Observe pre-fill pressure gauge (near valve)
Ram up relief pressure - no Ram Command	for 60 Hertz: 1200 psi for 50 Hertz: 1300 psi							1500 psi	Observe ram relief pressure (middle) gauge
Ram up relief pressure - Ram Command option	n.a.	n.a.	n.a.	n.a.	950	n.a.	950	n.a.	
Can maximum pressure (psi)	800								Observe can relief pressure (bottom) gauge
* Proport. valve max. pressure	4432	3740	4600	4600	4600	4432	4600	4600	Observe system pressure gauge
Booster pump models only									
Booster pump pressure (psi)	n.a.	n.a.	5230	5370	n.a.	n.a.	4960	5800	Observe booster pump pressure gauge
Machines with Ram Command option only									
Factory setting for Timer A (psi)	n.a.	n.a.	n.a.	n.a.	200	n.a.	200	n.a.	See Section 3.6.
Factory setting for Timer B (psi)	n.a.	n.a.	n.a.	n.a.	400	n.a.	300	n.a.	
** The 13" bore ram has been discontinued.									

Table 14: Hydraulic Pressure Specifications for Model Families MP1603_, MP1604_, and MP1A03_ with Kawasaki pump

Model family >	MP1603_		MP1604_	MP1A03_	
Bar rating >	35		50	40	
Flow type >	low flow	high flow	n.a.	n.a.	
Adjustment Type	**Setting**				**Means of Measuring**
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:				Ammeter measurement while ram relief pressure is lowered to value shown
	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	
*** 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	1200 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

3.5.1. Materials and Preparations

3.5.1.1. Tools

- Ammeter and voltmeter
- Small, flat blade screwdriver
- Hex head (Allen) wrench set
- Closed-end wrench set
- A safe ladder or platform to work above the top plate
- 1/4"#4 base plug with O-ring to temporarily plug the pump control port (see Section 3.5.4).

3.5.1.2. Related Data

- See Section 3.4. “Troubleshooting Ram Malfunctions” for detailed troubleshooting if necessary.

- You must know the pump motor full rated amperage when you set the motor horsepower (amperage draw). Find this data on the motor nameplate and write it down.
- For machines with the Ram Command (also called soft squeeze) option, see Section 3.6. "Set Optional Ram Command™ Pressures—1-station Press".

3.5.1.3. **Two personnel are necessary.**—One person (referred to as the operator) operates the controls and observes the pressure gauges. The other person (referred to as the technician) makes the adjustments on top of the machine. The personnel must be able to clearly communicate with each other. Review this instruction and understand the necessary coordination between the operator and the technician.

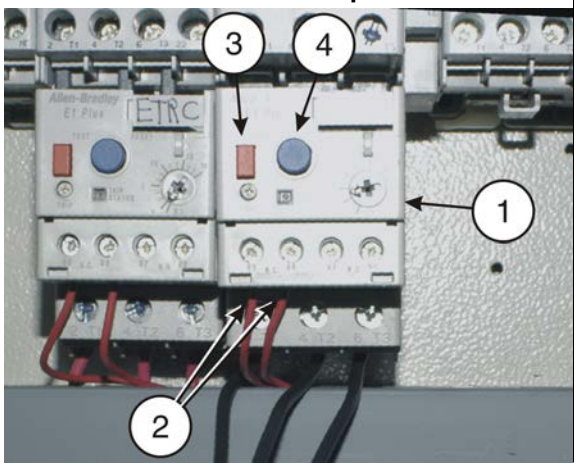
CAUTION 53: Burn, crush, slip, fall hazards—The technician must stand on the top plate.

- Stay clear of components that move (e.g, diaphragm rod) or get hot (e.g, pump motor).
- Use safe, appropriate equipment to get on and off of the machine.
- Wash slippery surfaces with detergent.

3.5.1.4. **Disable or enable the booster pump as necessary.**—On machines with a booster pump, most adjustments are done with the booster pump disabled. Technician: Remove power from the machine (see Notice 52) then refer to Figure 47 to disable or enable the booster pump.

Figure 47: How To Disable or Enable the Booster Pump

View of Booster Pump Overload

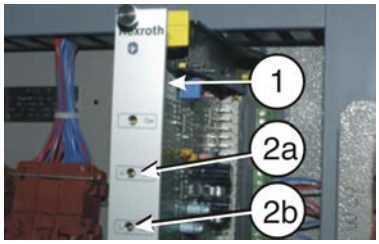


Legend

1. Booster pump overload
2. The two red wires are part of the 3-wire circuit. When you disable the booster pump, remove these wires and jump them together to temporarily bypass this component in the 3-wire circuit. When you enable the booster pump, replace these wires in the overload to include this component in the 3-wire circuit.
3. Test button (red). To disable the booster pump, press this button.
4. Reset button (blue). To enable the booster pump, press this button.

3.5.1.5. **Make sure ramp rates are at minimum.**—The ramp rates are electrical adjustments for the proportional valve. Technician: Before you begin the adjustments, use the method explained in Figure 48 to verify that both ramp rates are set to the minimum value. This makes sure that the ramp rates do not affect valve or pump operation.

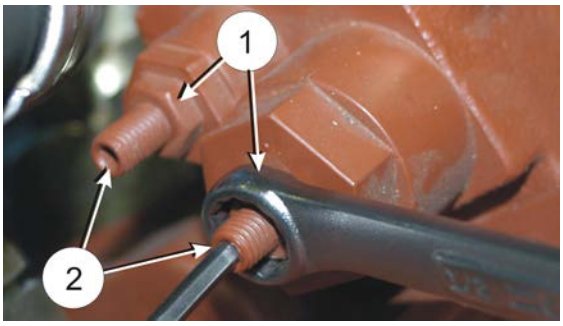
Figure 48: How to Verify Minimum Ramp Rates

View of DBET Card	Legend
	**1.** DBET card in the control box. **2_.** Potentiometers for ramp rates. The adjustment screws have no mechanical limits of travel. Turn each adjustment screw counter-clockwise twenty times to make sure the rate is set to minimum. **2a.** Potentiometer for ramp up rate. **2b.** Potentiometer for ramp down rate.

3.5.1.6. **Load or unload the machine as necessary.**—Some adjustments are done with a full load of wet goods, one adjustment with the machine empty, and the remaining adjustments with the machine loaded or empty. Operator: When a load is necessary, allow the press to take a load automatically, if available. If not, it will be necessary to load and wet down a batch of goods by any safe means.

3.5.2. Overview

Figure 49: How To Make Pressure Adjustments

Typical Adjustment Components	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: Check first for correct adjustment before you change a setting. You can make most pressure adjustments with pressure applied. When you turn the adjustment screw, the pressure gauge moves immediately. An exception is the system pressure relief valve. You can open this valve (turn counter-clockwise) to lower the pressure with pressure applied, but it is very difficult to close the valve (turn clockwise) to raise the pressure with full pressure applied.

You read all pressures except pre-fill pilot pressure, the booster pump pressure (if applicable) and the first two Ram Command pressures (if applicable) on the pressure gauges shown in Figure 50. All pressure specifications are in pounds per square inch (abbreviated psi herein).

Figure 50: Where to Read Most Pressures

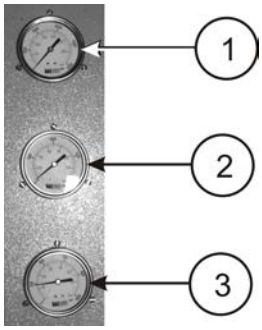
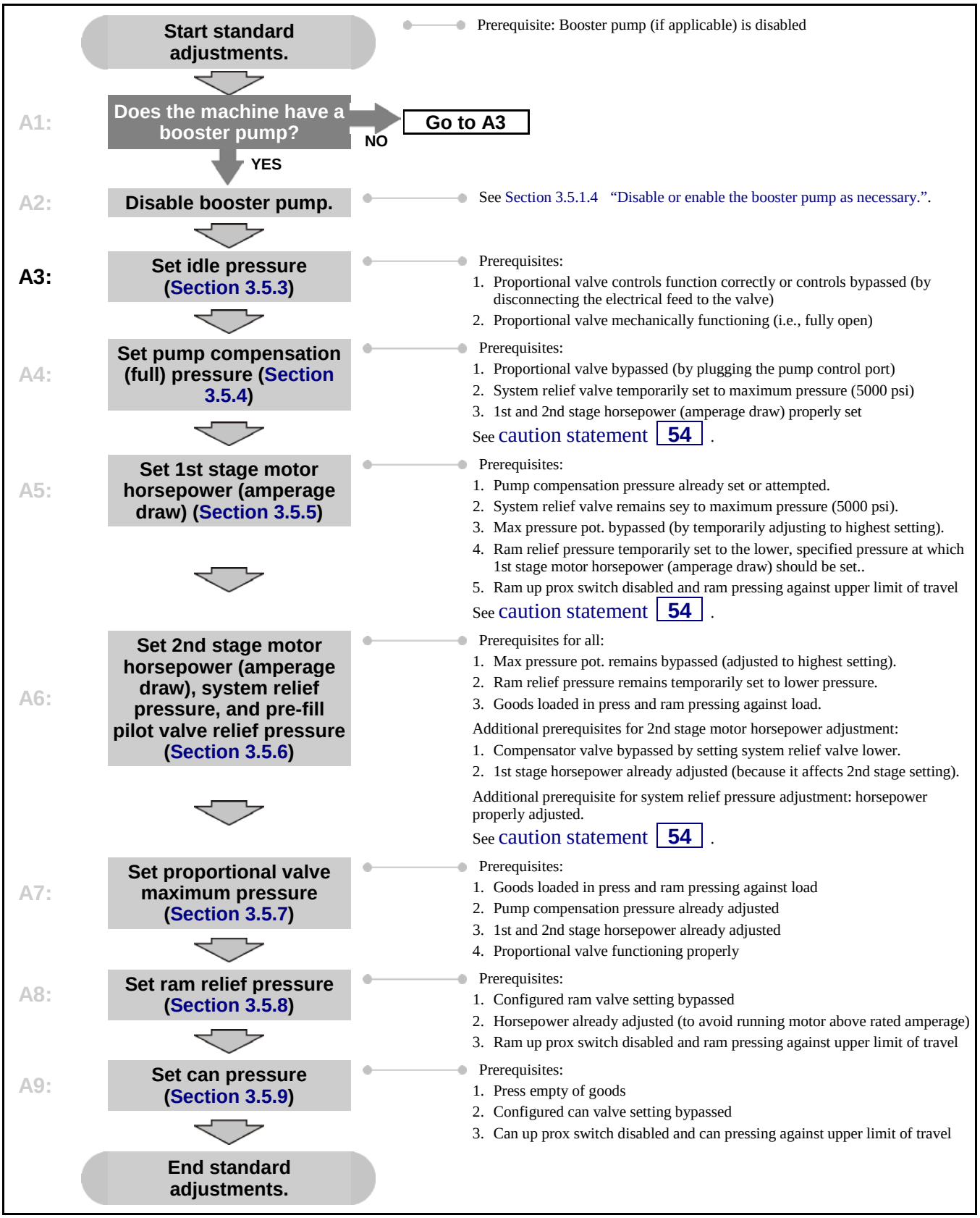
Gauge Cluster	Legend
	**1.** **System pressure gauge**—use to adjust idle pressure, pump compensation pressure, 1st and 2nd stage motor horsepower (amperage draw), proportional valve maximum pressure, and system relief pressure. **2.** **Ram relief pressure gauge**—use to adjust ram relief pressure and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

Chart 12 gives a summary of the standard adjustments in the correct order. Chart 13 gives a summary of the special adjustments, if applicable. If you skip an adjustment or change the order, the adjustments can be incorrect. A flow chart explains each adjustment procedure. Read the left side of the chart for an overview. The right side provides details.

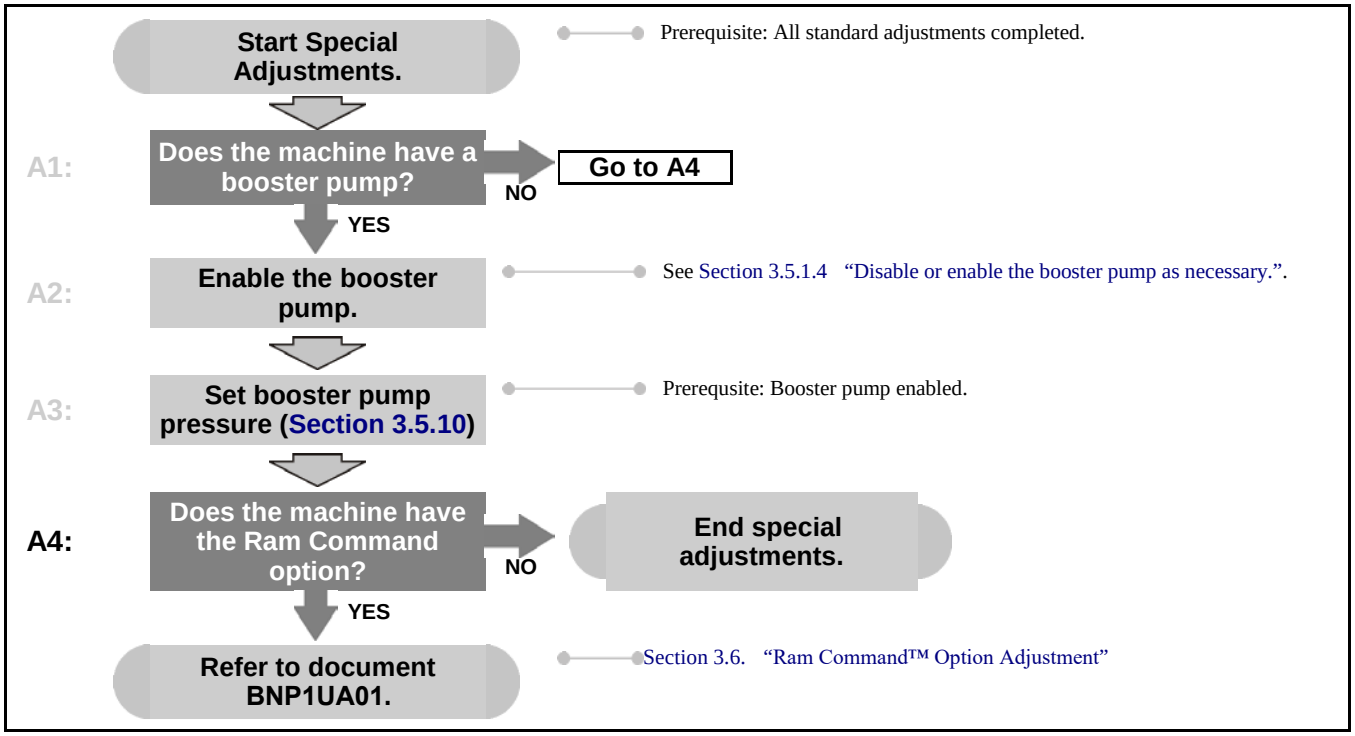
Chart 12: Summary of Standard Adjustments (all machines)



CAUTION 54: Risk of damage—Pump compensation pressure and horsepower are interdependent. It can be necessary to work between these adjustments until you achieve the specified values. However, large changes to a setting can cause the other settings to get significantly out of adjustment, the motor can stall or overheat.

- Make small adjustments.
- If the motor stalls or overheats, shut it down immediately.

Chart 13: Summary of Special Adjustments (if applicable)



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 13).**

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. 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: **Plug the pump control port that sends oil to the proportional valve to bypass this valve.**

The port to be plugged is circled at left. Plug this port to simulate a fully closed proportional valve (maximum pressure) and facilitate adjustment of the compensator valve. This bypasses possible problems with the proportional valve and—because it is not necessary to pressurize the ram cylinder—it also bypasses possible problems with the pre-fill valve and cylinder (example: seal leaks).

Put tape over the hose end for cleanliness.

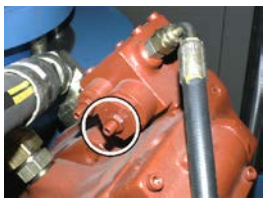
A2: **Temporarily set the system relief valve to maximum (5000 psi)**

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 13)**



The pump pressure compensator valve adjustment, located on the pump, is circled at left. Loosen the locking nut then turn the adjustment screw. Observe the system pressure gauge to determine which direction to turn the screw. See Table 13 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, an incorrect 2nd stage horsepower setting can be interfering with this setting. If necessary, repeat these inter-dependent adjustments until you achieve the correct values.

YES

A6: **Lock down the compensator setting**

When the compensator valve is correctly 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 55: Troubleshooting can be required.—You will make the remaining adjustments with proportional valve function restored and ram cylinder (or can cylinders) pressurized. You can only achieve the specified settings if the machine is otherwise functioning properly. Some possible impediments to correct 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 you to sustain pressure as long as the ram is pressing against its upper mechanical limit.

A2: **Start machine (⊙, ⏻). Set the proportional valve max. pressure pot. to maximum to bypass it.**

The proportional valve maximum pressure adjustment, located on the DBET card, is circled at left. The adjustment has no mechanical limits of rotation. 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**

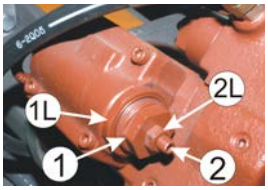
YES

Observe the system pressure gauge. System pressure should be substantially higher than the specified idle pressure.

A5: **While maintaining *Ram Up*, set ram up relief pressure as specified for setting 1st stage horsepower (Table 13)**

The ram up 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 13 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 13)**



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.

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 3.5.1.6 "Load or unload the machine as necessary."). 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?

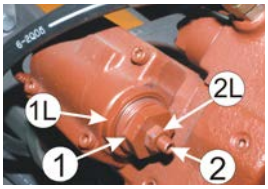
NO → **Go to B1**

YES

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

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 13)



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 13) and lock down.

Release ⬇ . Turn the adjustment screw 1/2 clockwise turn (as specified in Table 13) then tighten the locking nut.

A8: While pressing, set pre-fill pilot pressure to the specified value (see Table 13).

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.

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 13).**

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 13 for the specified value). Turn the adjustment screw clockwise just until the system pressure, as displayed on the machine controller, is at full system pressure, as given in Table 13)

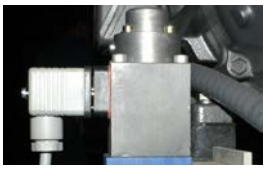
A3: **Does max. pressure pot respond to adjustment?**

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 correct 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 up relief pressure.

Notice 56: 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 on site, leave the goods in the machine for this adjustment.

Chart 19: Set ram up relief pressure.

Power off (⊗)

The ram relief pressure adjustment can 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 post. Disconnect the screw-type electrical connector, as shown at left.

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

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. You will returned these 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 up relief pressure to the specified value (see Table 13)**

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 57: Risk of damage to machine or goods—You will do this adjustment with the can up. If goods remain in the machine, this will not prevent the can from being raised in *Manual* mode, but damage can occur when the can is lowered again.

- Place the machine on-line so that the machine can complete the 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 20: 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 the 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 the specified value (see Table 13)**

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).

Proceed to the next adjustment if applicable.

3.5.10. Set booster pump pressure, if applicable.

With the booster pump enabled...

The booster pump must be enabled for this procedure. See Section 3.5.1.4.

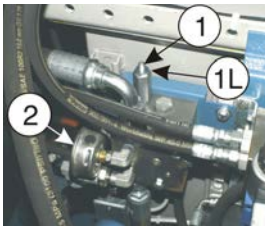
A1: **Load wet goods (full load)**

Machine safeties will not permit pressing without a load. If the press is not already loaded, load it now (see Section 3.5.1.6 "Load or unload the machine as necessary.").

A2: **Apply and maintain pressing pressure.**

In *Manual* mode, lower the ram (9 , ⬇). **Maintain pressure by holding ⬇ during this adjustment.**

A3: **While pressing, set booster pump pressure to the specified value (see Table 13).**



The booster pump adjustment, located on the booster pump manifold, is shown at left. Loosen locking nut 1L. While looking at pressure gauge 2, turn adjustment screw 1 until the booster pump produces the specified pressure. Tighten locking nut 1L.

Proceed to the next adjustment, if applicable.

— End of BIPPMT02 —

BIPPMM24 (Published) Book specs- Dates: 20161026 / 20161026 / 20161026 Lang: ENG01 Applic: PPM

3.6. Set Optional Ram Command™ Pressures—1-station Press

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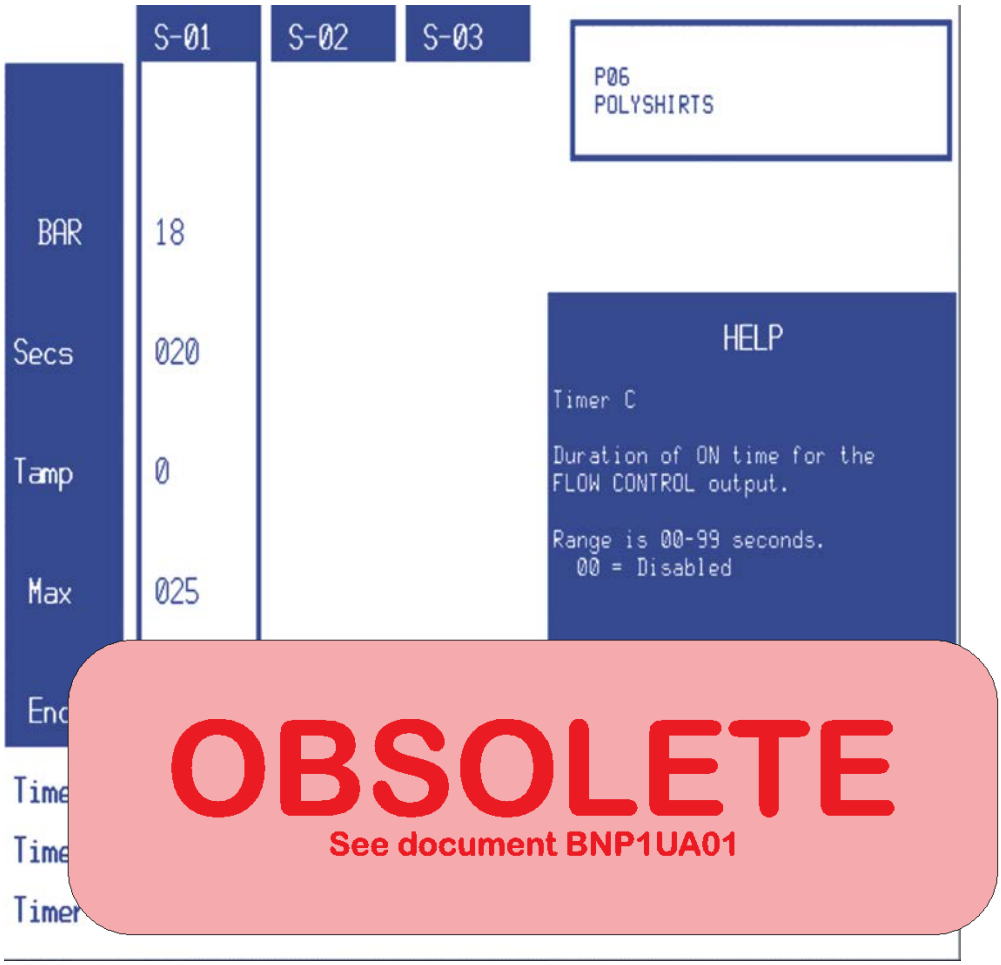
OBSOLETE
See document BNP1UA01

3.6.1. Overview

When you apply Ram Command to a press code, the pressing cycle begins with a sequence of three low, but increasing pressures. The press code controls the length of time that each low pressure will occur, but not the pressures themselves. The times appear on the press code screen as Timers A, B and C (see Figure 51). You can specify up to 99 seconds for each timer. A value of 00 for any timer causes the machine to skip that pressure and proceed to the next pressure.

Figure 51: Enter time values in the fields for Timers A, B, and C at the bottom left of the screen.



There are three factory-set pressures for Ram Command. If you replace pressure components, it can be necessary to re-establish all hydraulic pressures, including the Ram Command pressures on site. If you wish to use pressure values different from the factory settings, you can change the first two Ram Command pressures without affecting the other (standard) pressures provided you abide by these guidelines:

- Timer A pressure is lower than Timer B pressure.
- The pressures do not exceed idle pressure.

This instruction tells how to set the first two pressures (for Timers A and B). The third pressure (for Timer C) is idle pressure, which is a standard pressure. The procedure to set idle pressure is explained in Section 3.5. “Set Standard and Booster Pump Pressures—1-station Press”.

You adjust the pressures for Timers A and B on the relief valves associated with the electrically operated hydraulic valves VE100 and VE250 (see Figure 52). You must do these pressure adjustments with goods in the machine and a press code running in automatic, and you must do each adjustment during the programmed time that that valve is open. For this reason, it is useful to temporarily set the Timer A and Timer B durations to the maximum value (99 seconds) in the press code that you will use to make these adjustments.

Table 15 gives the factory settings for the first two pressures. As of this writing, the Ram Command option is only implemented on the MP1640_ and MP1656_ model families.

Table 15: Ram Command Factory Specifications

Model Family	MP1540	1556	1640	1650	1656	1A50	1A56	
Bar Rating	40	56	40	50	56	50	56	
Ram Bore (inch)	14	14	14	16	16	17	19	**Means of Measuring**
Settings (PSI)								
Standby (Timer C)	500	500	500	400	400	*	*	Pressure gauge
Ram Down Relief	950	950	950	950	950	*	*	
Valve A (VE100) (Timer A)	220	220	250	200	200	*	*	
Valve B (VE250) (Timer B)	320	320	400	300	300	*	*	
*** Not yet implemented**								

3.6.2. Necessary Materials and Preparations

Tools—Each relief valve has a locknut and an adjustment screw. Provide a 9/16" crescent wrench for the locknut and a 5/32" Allen wrench for the adjustment screw. Also provide a safe platform to work at the location of the valves.

Two personnel—One person (referred to herein as the **operator**) starts and stops the press code at the operator controls. The other person (referred to herein as the **technician**) makes the adjustme each other. Revie tor and the te

Adjustm ting press code t code is the Ti ds). See the 1-

Press loa will be necessar

Tip: Refer to electrical schematics W6PM1SSQ and W6PM1SVSB in the 1-Station press schematic manual if troubleshooting of the Ram Command circuitry becomes necessary.

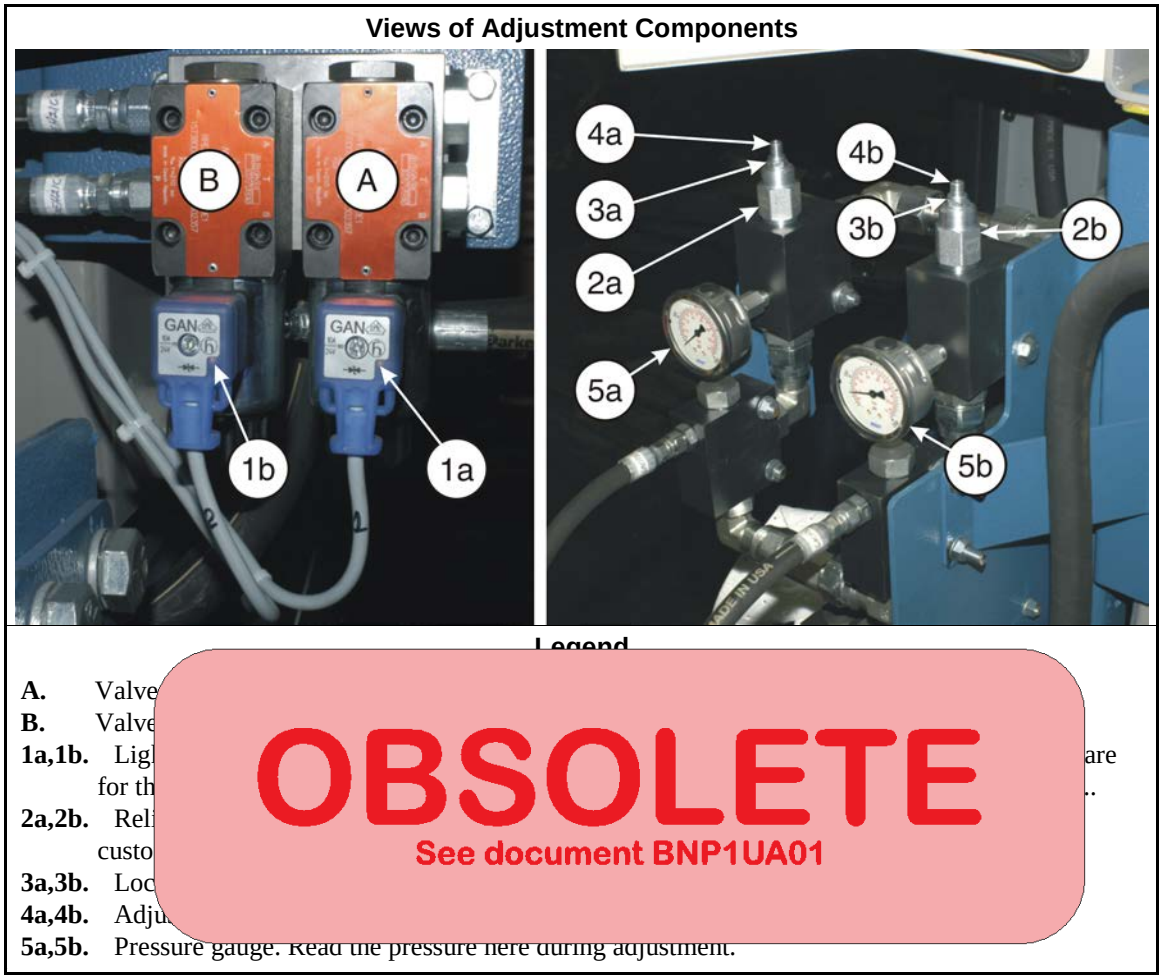
3.6.3. Operator Procedure

This is a brief explanation. Review the 1-station press reference manual if necessary.

1. When a suitable batch is in the press, put the tunnel in hold to suspend production.
2. Set the press to Manual mode then return it to Automatic mode to initiate the sequence of operator prompts. Respond to the prompts as appropriate. In particular:
   a. Answer yes to "Does press have a cake?"
   b. At the Cake Data screen, leave all data as displayed except for the press code. Take note of the press code assigned to this batch then change it to the adjustment press code.
   c. When the technician is ready, answer no to "Discharge cake in can?" The machine will operate and permit the technician to do the adjustments explained in Section 3.6.4.
3. When valve VE250 closes (which ends the available adjustment time) and before the press code is complete, set the machine to Manual mode then return it to Automatic mode. If the adjustments are not complete, respond to the prompts the same way as before to restart the adjustment press code. Otherwise, respond as appropriate to resume production and permit this batch to process according to its correct press code.

3.6.4. Technician Procedure

Figure 52: Ram Command Hydraulic Components (left rear of machine above top plate)



Notice 59: These adjustments are done with the machine in automatic operation.

- Do not use the maintenance key to set the machine to Maintenance mode.

Refer to Figure 52. The lowest pressure adjustment is the relief pressure for valve A (VE100). This is the Timer A pressure. The adjustment components are those with "_a" item numbers in Figure 52. Adjust as follows:

1. When the operator starts the adjustment press code, observe light 1a. Wait for the light to go out to indicate that valve VE100 is open. This will occur when the descending ram clears the PXSM proximity switch (ram in container).
2. Loosen locknut 3a. Observe pressure gauge 5a and turn adjustment screw 4a until the gauge displays the pressure that you previously determined. If you cannot complete the adjustment in the 99 seconds that valve VE100 is open (that the light is off), have the operator repeat the adjustment press code.
3. When the relief valve is correctly adjusted, tighten locknut 3a.

The second lowest pressure adjustment is the relief pressure for valve B (VE250). This is the Timer B pressure. Adjust this pressure the same way as above. The adjustment components are those with "_b" item numbers in Figure 52.

— End of BIPPMM24 —

Ram Command™ Option Adjustment

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This document addresses two activities involving the Ram Command™ option (also called soft squeeze) for 1-station press models:

- Set pressures either to use different pressures than those set at the factory or because components were replaced.
- Disable the Ram Command™ option to make it easier to troubleshoot the hydraulic system.

This document, which covers all versions of the 1-station press, replaces document BIPPMM24, which only covers multi-manifold versions.

NOTICE: Understand the press servicing hazards

- Do this procedure only if you understand and work with hydraulic systems.
- Review the press safety guide and the safety information in the parts and service manual.

1. Concept of Operation

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In summary, the Ram Command™ system applies a very gradual build-up of pressure, which gives sensitive goods time to release water without damage. This system pressurizes the ram in a timed sequence of low, but increasing pressure steps. The factory-set pressures can be reset by the customer. The step durations are specified in programmable press codes.

The system uses two electrically operated valves, each with an associated, adjustable relief valve. Each combination of valve and relief valve limits ram pressure and allow excess fluid to drain to the tank. The electrically operated valves are named VE100 and VE250 in the electrical schematic manual. VE100 and VE250 are normally open. If the electric circuit for either valve is closed, the light on the valve is illuminated and the valve is closed. When a Ram Command™ press code is not in effect, VE100 and VE250 must both be closed so that the press will operate at standard pressures. When the electric circuit for either valve opens, the light on the valve goes out and the valve opens. When this occurs, ram pressure cannot exceed the pressure set on the associated relief valve. The amount of time that a valve remains open is controlled by a programmable software timer. There are three timers, referred to as timers A, B, and C.

The Ram Command™ system builds up pressure in a four step sequence, as follows:

1. VE100 (the lowest pressure) opens for the Timer A duration then closes.
2. VE250 (the next lowest pressure) opens for the Timer B duration then closes.
3. The ram remains at standby pressure (see : Ram Command™ Factory Specifications, page 2) for the Timer C duration.
4. The Ram Command™ sequence ends and standard pressures take effect.

NOTE: On machines with the Ram Command™ option, the standard ram up relief pressure is permanently set to 950 psi. This pressure is set to 1500 psi on machines without the option. Although this setting is determined by whether or not the machine has the Ram Command™ option, it is otherwise, independent of the Ram Command™ system.

2. How Ram Command™ Press Codes Work

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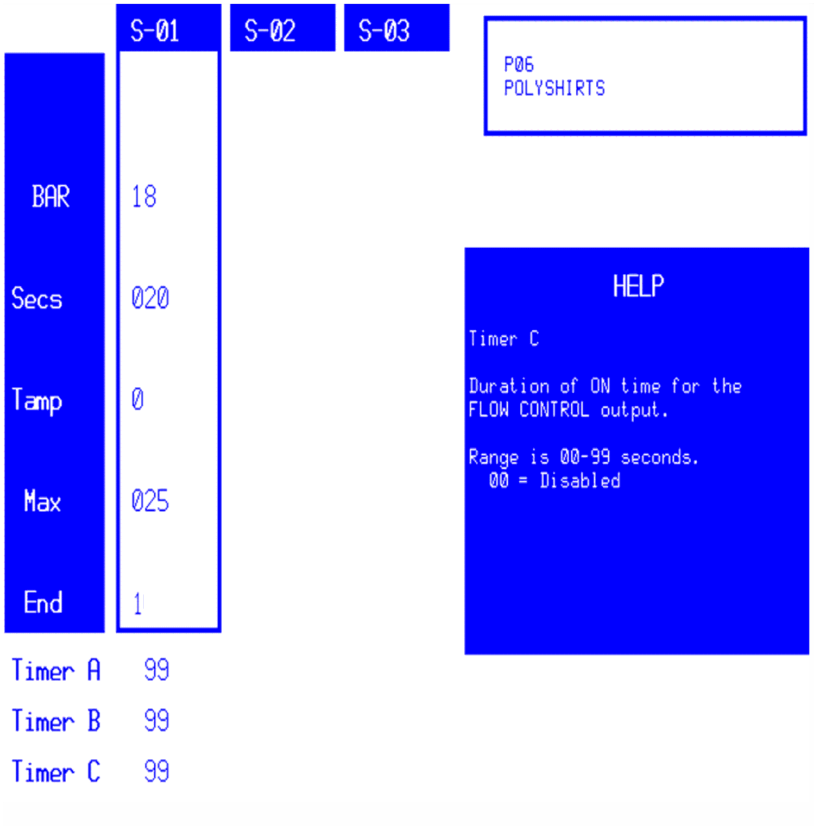
When you apply the Ram Command™ function to a press code, the pressing cycle begins with a sequence of three low, but increasing pressure steps. The press code controls the length of time that each pressure will occur, but not the pressures themselves. The times appear on the press code screen as Timers A, B and C, shown at the bottom left of the figure below. You can specify up to 99 seconds for each timer. A value of 00 for any timer causes the machine to skip that pressure step and proceed to the next pressure.

Figure 1. Enter time values in the fields for Timers A, B, and C at the bottom left of the screen.



3. Pressure Adjustment Preparations

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When To Adjust Pressures — If you replace pressure components, it can be necessary to re-establish all hydraulic pressures, including the Ram Command™ pressures on site. If you wish to use pressure values different from the factory settings, you can change the Timer A and Timer B pressures without affecting the standard pressures.

Pressure Adjustment Rules

- Timer A pressure must be lower than Timer B pressure.
- The Timer A and Timer B pressures must not exceed standby pressure (400 or 500 psi, depending on model).

Requirements

Tools Each relief valve has a locknut and an adjustment screw. Provide a 9/16" crescent wrench for the locknut and a 5/32" Allen wrench for the adjustment screw. Also provide a safe platform to work at the location of the valves. on newer press models, the pressure gauges are not permanently attached; however, the necessary pressure gauges are provided with the machine. Make sure these gauges are on hand.

Two personnel One person (referred to herein as the **operator**) starts and stops the press code at the operator controls. The other person (referred to herein as the **technician**) makes the adjustments at the valves. The personnel must be able to clearly communicate with each other. Review this instruction to understand the necessary coordination between the operator and the technician.

Adjustment press code Create a dedicated press code or temporarily modify an existing press code that you will use to make the adjustments. **You must do these pressure adjustments with goods in the machine** and a press code running in automatic, and you must do each adjustment during the programmed time that the valve is open. For this reason, temporarily set the Timer A and Timer B durations to the maximum value (99 seconds). The only important part of this press code is the Timer A and Timer B values. See the 1-station press reference manual for general programming information.

Press loaded If you cannot do these procedures with an actual load of goods while production is paused, load and wet down a batch of goods in the press by any safe means.

TIP: Electrical schematics W6PM1SSQ and W6PM1SVSB in the 1-Station press schematic manual and parts document BPP1UH01 “Delicate Goods Option (Ram Command™ Ram Control)” in the parts and service manual can assist with troubleshooting the Ram Command system.

Ram Command™ Factory Specifications

Model Family	MP1540	1556	1640	1650	1656	1A50	1A56	Means of Measuring
Bar Rating	40	56	40	50	56	50	56	
Ram Bore (inch)	14	14	14	16	16	17	19	
Settings (PSI)								
Standby** (Timer C)	500	500	500	400	400	525	*	Pressure gauge
Ram Up Relief	950	950	950	950	950	950	*	
Valve A (VE100) (Timer A)	220	220	250	200	200	275	*	
Valve B (VE250) (Timer B)	320	320	400	300	300	400	*	

Model Family	MP1540	1556	1640	1650	1656	1A50	1A56
* Not yet implemented							
** Standby pressure is also referred to as idle pressure or ram down relief pressure.							

4. Pressure Adjustment Operator Procedure

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This is a brief explanation. Review the 1-station press reference manual if necessary.

1. When a suitable batch is in the press, put the tunnel in hold to suspend production.
2. Set the press to Manual mode then return it to Automatic mode to initiate the sequence of operator prompts. Respond to the prompts as appropriate. In particular:
   a. Answer yes to "Does press have a cake?"
   b. At the Cake Data screen, leave all data as displayed except for the press code. Take note of the press code assigned to this batch then change it to the adjustment press code that you prepared.
   c. When the technician is ready, answer no to "Discharge cake in can?" The machine will operate and permit the technician to do the adjustments explained in Section 5 : Pressure Adjustment Technician Procedure, page 4 .
3. When valve VE250 closes (which ends the available adjustment time) and before the press code is complete, set the machine to Manual mode then return it to Automatic mode. If the adjustments are not complete, respond to the prompts the same way as before to restart the adjustment press code. Otherwise, respond as appropriate to resume production and permit this batch to process according to its actual press code.

5. Pressure Adjustment Technician Procedure

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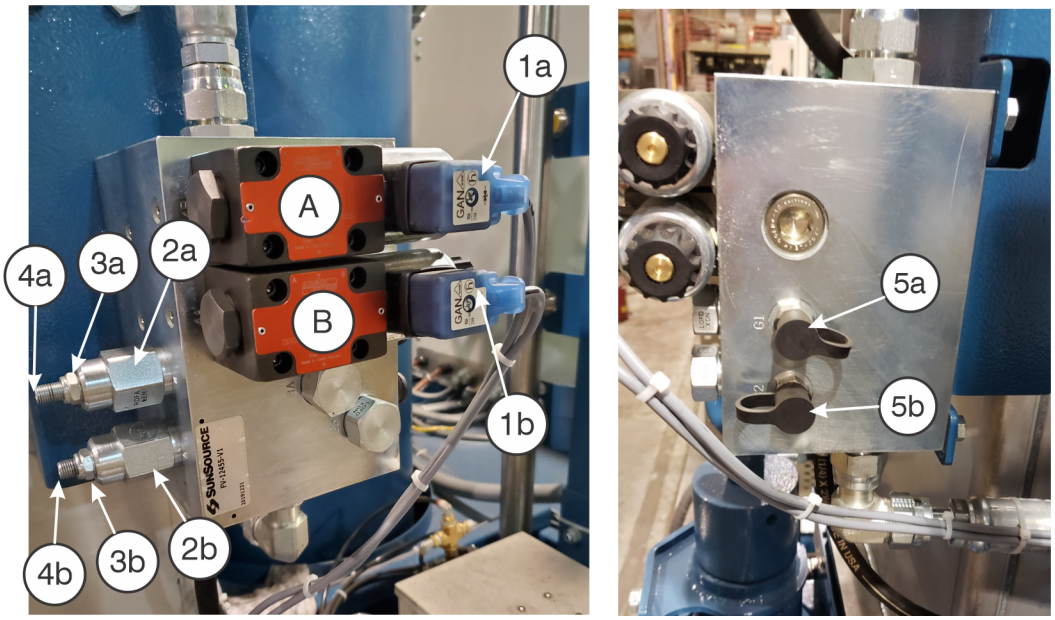
This instruction tells how to set the first two pressures (for Timers A and B). The third pressure (for Timer C) is idle (standby) pressure, which is a standard pressure. The procedure to set idle pressure is explained in document BIPPMT02 “Set Standard and Booster Pump Pressures—1-station Press”.

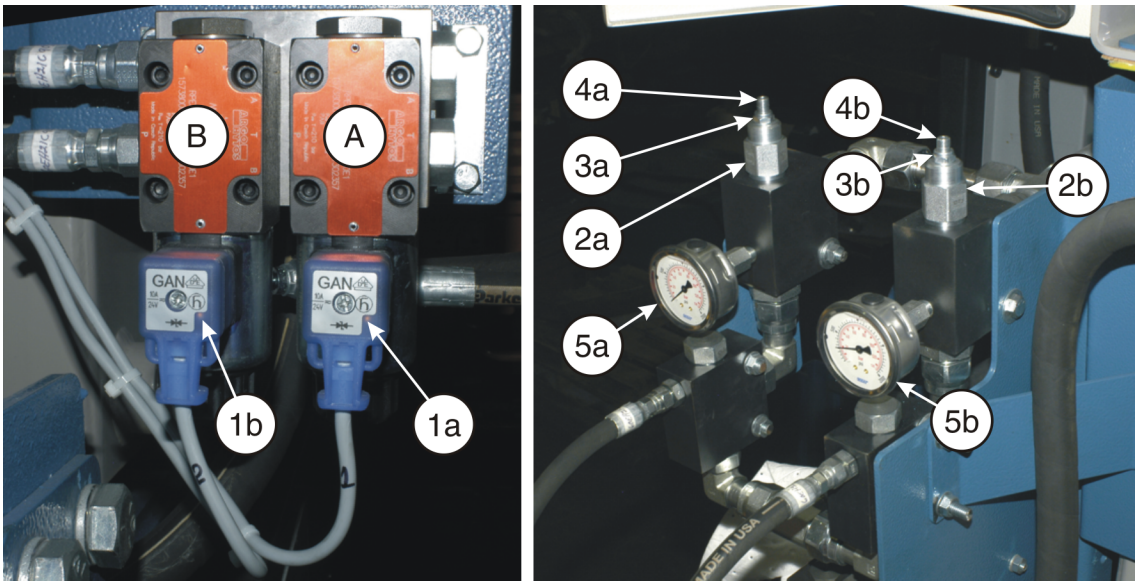
You adjust the pressures for Timers A and B on the relief valves associated with the electrically operated hydraulic valves VE100 and VE250 (see the figure below).

Figure 2. Ram Command™ System Hydraulic Adjustment Components

Views of Adjustment Components on Single-manifold Presses



Views of Adjustment Components on Multi-manifold Presses



Legend

A	Valve VE100 (electrically operated hydraulic valve for Timer A pressure).
B	Valve VE250 (electrically operated hydraulic valve for Timer B pressure).
1a,1b	Light on electric connector. **Light on=valve closed**. **Light off=valve open**. All "_a" items are for the Timer A pressure adjustment. All "_b" items are for the Timer B pressure adjustment.
2a,2b	Relief valve that must be adjusted for the factory pressure specified in : Ram Command™ Factory Specifications, page 2 or the customer-defined pressure.
3a,3b	Lock nut (9/16" hex)
4a,4b	Adjustment screw (5/32" Allen)
5a,5b	Pressure gauge connection point or pressure gauge. Read the pressure here during adjustment.

NOTICE: These adjustments are done with the machine in automatic operation.

- Do not use the maintenance key to set the machine to Maintenance mode.

Refer to Figure 2 . The lowest pressure adjustment is the relief pressure for valve A (VE100). This is the Timer A pressure. The adjustment components are those with "_a" item numbers in Figure 2 . Adjust as follows:

1. When the operator starts the adjustment press code, observe light 1a. Wait for the light to go out to indicate that valve VE100 is open. This will occur when the descending ram clears the PXSM proximity switch (ram in container).
2. Loosen locknut 3a. Observe pressure gauge 5a and turn adjustment screw 4a until the gauge displays the pressure that you previously determined. If you cannot complete the adjustment in the 99 seconds that valve VE100 is open (that the light is off), have the operator repeat the adjustment press code.
3. When the relief valve is correctly adjusted, tighten locknut 3a. The second lowest pressure adjustment is the relief pressure for valve B (VE250). This is the Timer B pressure. Adjust this pressure the same way as above. The adjustment components are those with "_b" item numbers in Figure 2 .

6. Disconnect the Ram Command™ System for Ease of Troubleshooting

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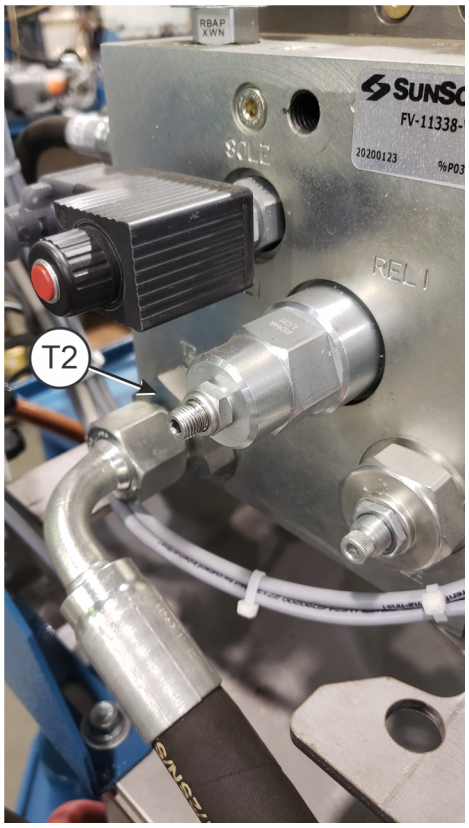
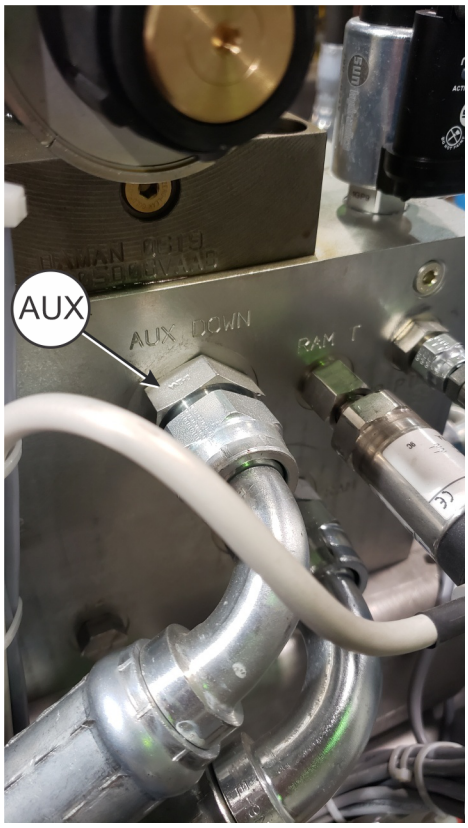
If it is necessary to troubleshoot the press hydraulic system, it can help to isolate the Ram Command™ manifold from the rest of the system. This is done by installing plugs at two hydraulic line connection points on the main manifold. The plugs are available from the Milnor® Parts department. The plug locations and part numbers are given in the figure below.

Figure 3. Plug Locations on the Main Manifold





Legend

T2 . . Disconnect and plug port T2. Use 1.25” hex plug (p/n 52PY0GR004)

AUX . Disconnect and plug port AUX DOWN. Use 1” hex plug (p/n 52PY1AR001)

End of document: BNP1UA01