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**Operating Instructions for:
"Power Team - PosiLock®
Puller Sets"**

MANUAL & HYDRAULIC PULLERS

DESCRIPTION

These operating instructions must be read and thoroughly understood for the safe commissioning, operation, and maintenance of the Power Team – PosiLock® Manual and Hydraulic Pullers. The following procedures must be performed by qualified, trained personnel who are familiar with this equipment. While every attempt has been made to ensure clarity, the intent of this document is to provide basic guidance and it is the responsibility of the end user to review each application thoroughly for suitable usage. Users should utilize sound engineering judgment prior to, and during, product operation. Failure to comply may result in damage, injury, or death.

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Safety Precautions

⚠WARNING – SAFETY FIRST

Predicting or calculating the force required for every pulling job is an extremely challenging task, since multiple variables (size, shape, condition, etc.) are involved. The system capacity (for puller and accessories) is driven by the lowest tonnage rate component. These tools should only be used by trained personnel and SPX encourages users to strictly enforce the following precautions:

- **Wear approved eye protection, such as safety glasses or face shield.**
- **Use gloves and keep hands away from possible pinching points.**
- **Keep hands away from possible pinching points.**
- **Inspect puller for dents, cracks, or excessive wear before each use. Replace damaged or worn components.**
- **When using hydraulic pullers, inspect hoses and fittings for leaks or damaged areas. Avoid kinks in hoses.**
- **Do not exceed tool's capacity. Use the right size puller.**
- **Do not use power tools on pullers, since it can easily exceed max torque allowed.**
- **Apply force gradually.**
- **On hydraulically operated pullers, use hydraulic gauges to guarantee adequate pressure in the system.**
- **Always use a 3-jaw puller whenever possible, for a more secure grip and more pulling power.**
- **Cover application with a protective blanket before applying force. Since high force is applied on the part being pulled, breakage may occur and user may be exposed to flying parts.**

SELECTING THE RIGHT PULLER

1) "Reach" and "spread" dimensions must be measured in order to select the correct puller.

2) It is critical to add the thickness of the component being pulled to the length of the protruding shaft to calculate the reach.

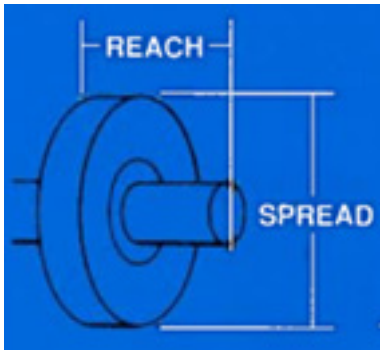

Figure 1

3) The area of resistance (see figure 2) varies with different jobs. It is recommended that for manual pullers, the diameter of the puller screw should be at least ½ the diameter of the shaft. For hydraulic pullers, a good start for the tonnage required should be around 8-10 times the diameter of the shaft. For example:

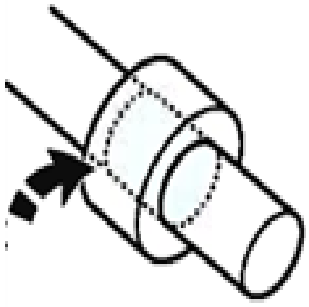

Figure 2

Shaft Dia	Ram Capacity
2"	20 Ton
3"	30 Ton
5"	50 Ton

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HYDRAULIC PULLER SETS– POSILOCK® CAGED MODELS

Operating instructions applicable to part numbers described below for hydraulically operated 2 or 3 jaw pullers.

2-Jaw Pullers

SPX PART #	Cap (Ton)	Puller weight lbs
PTPH-206	5	13
PTPH-208	10	14
PTPH-210	15	22
PTPH-213	25	47
PTPH-216	50	90

3-Jaw Pullers

SPX PART #	Cap (Ton)	Puller weight lbs
PTPH-106	5	14
PTPH-108	10	16
PTPH-110	15	25
PTPH-113	25	55
PTPH-116	50	100

1) Remove plastic thread protector from the cylinder. Also remove thread cap (saddle) to allow ram points to be setup in the cylinder (see figure 4). Please refer to Cylinder's operating instructions for proper use of the tool.

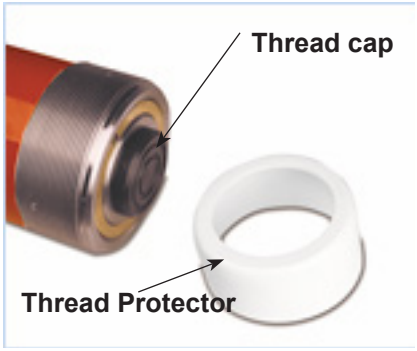

Figure 4

2) Position cylinder into the puller by threading collar threads clockwise into the jaw head assembly. Operator must check that the cylinder is fully and properly threaded into the jaw head assembly.

3) Select the ram point that can provide the maximum contact with the shaft.

4) Attach lift plate to the cylinder with provided bolts (see figure 5).

5) Turn T-Handle until jaws opening is set to fit the component to be pulled. Turn T-Handle clockwise to lock the jaws firmly onto the component.

6) Refer to pump and cylinder instructions for safety, connections, and operation of the hydraulic system.

7) Make sure the puller is square with the component to be pulled. Advance the plunger until the ram point contacts the shaft. Make any necessary adjustments to guarantee alignment between the ram point and the shaft.

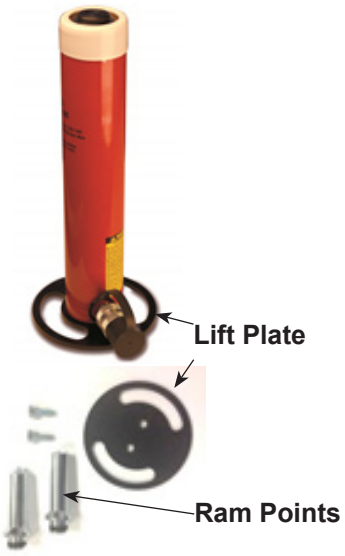

Figure 5

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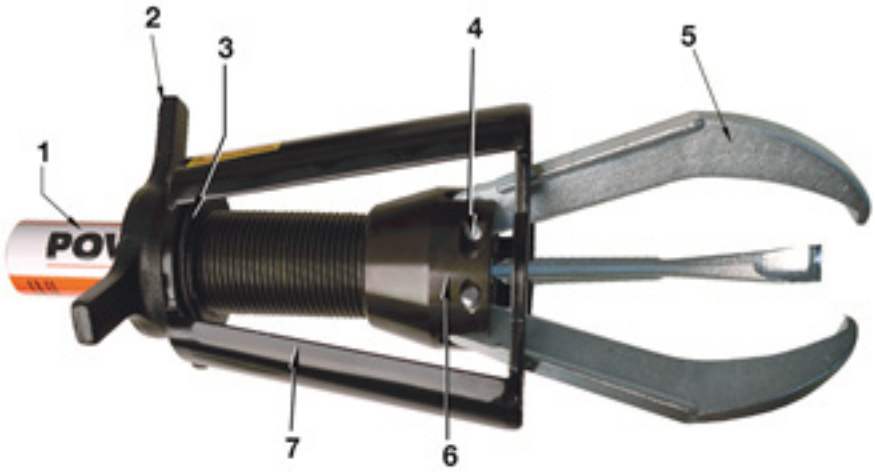
8) Cover application with a protective blanket.

9) Apply the hydraulic pressure to complete the pulling job. Never exceed the maximum capacity of the components.



Part #	Description
1	Hyd Cylinder
2	T-Handle
3	Snap Ring
4	Spring Pin
5	Jaw
6	Jaw Head
7	Cage Assy

Table 2: Hydraulic Pullers Parts & Accessories

Puller Model	Cage (7)	Jaw (5)	Jaw Head Assembly (6)	Pin (4)	T-Handle (2)	Snap Ring (3)	Lift Plate	Ram Point Set	Long Jaws
PTPHA-106	PTPH-10653	PT10654	PTPH-10655	PT11056	PTPH-10657	PT11659	PTPH-10652	PTPH-5-3	
PTPHA-108	PTPH-10853	PTPH-10854	PTPH-10855	PTPH-10856	PTPH-10857	PTPH-10859	PTPH-11052	PTPH-15-5	PT11054
PTPHA-110	PTPH-11053	PTPH-11054	PTPH-11055	PTPH-11056	PTPH-11057	PTPH-11059	PTPH-11052	PTPH-15-5	PTPH-11054L
PTPHA-113	PTPH-11353	PT11354	PTPH-11355	PT11356	PTPH-11357	PTPH-11359	PTPH-11352	PTPH-25-7	PT11354L
PTPHA-116	PTPH-11653	PTPH-11654	PTPH-11655	PTPH-11656	PTPH-11657	PTPH-11659	PTPH-11652	PTPH-50-8	PTPH-21654*
PTPHA-206	PTPH-20653	PT10654	PTPH-20655	PT11056	PTPH-10657	PT11659	PTPH-10652	PTPH-5-3	
PTPHA-208	PTPH-20853	PTPH-10854	PTPH-20855	PTPH-10856	PTPH-10857	PTPH-10859	PTPH-11052	PTPH-15-5	PT11054
PTPHA-210	PTPH-21053	PTPH-11054	PTPH-21055	PTPH-11056	PTPH-11057	PTPH-11059	PTPH-11052	PTPH-15-5	PTPH-11054L
PTPHA-213	PTPH-21353	PT11354	PTPH-21355	PT11356	PTPH-11357	PTPH-11359	PTPH-11352	PTPH-25-7	PT11354L
PTPHA-216	PTPH-21653	PTPH-11654	PTPH-21655	PTPH-11656	PTPH-11657	PTPH-11659	PTPH-11652	PTPH-50-8	PTPH-21654*

***For long jaws use pin PTPH-21656**

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SINGLE ACTING CYLINDERS

SAFETY EXPLANATIONS

Two safety symbols are used to identify any action or lack of action that can cause personal injury. Your reading and understanding of these safety symbols is very important.

⚠ DANGER - Danger is used only when your action or lack of action will cause serious human injury or death.

⚠WARNING - Warning is used to describe any action or lack of action where a serious injury can occur.

IMPORTANT - Important is used when action or lack of action can cause equipment failure, either immediate or over a long period of time.

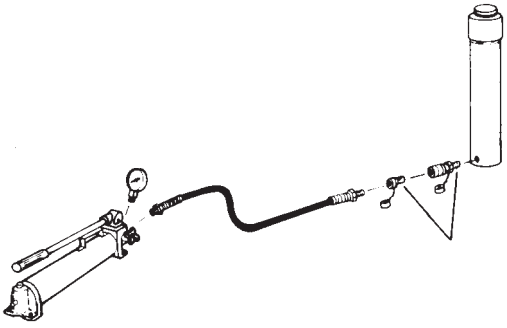
WARNING: It is the operator's responsibility to read and understand the following safety statements,

- Only qualified operators should install, operate, adjust, maintain, clean, repair, or transport this machinery.
- These components are designed for general use in normal environments. These components are not specifically designed for lifting and moving people, agri-food machinery, certain types of mobile machinery or special work environments such as: explosive, flammable or corrosive. Only the user can decide the suitability of this machinery in these conditions or extreme environments. Power Team will supply information necessary to help make these decisions.

SINGLE-ACTING HYDRAULIC SYSTEMS

A basic single-acting hydraulic system consists of a manual or power pump that moves the hydraulic fluid, a hydraulic hose that carries the fluid, and a cylinder or ram that the fluid moves to do a job.

TYPICAL INSTALLATION



Since the single-acting cylinders have only one hose going to the cylinder, the cylinder can only apply force to extend its rod. The return stroke is accomplished by gravity or spring force.

- The user must be a qualified operator familiar with the correct operation, maintenance, and use of the cylinder(s). Lack of knowledge in any of these areas can lead to personal injury.
- Read and understand all safety and warning decals and instructions.
- Use only approved accessories and approved hydraulic fluid. Hoses, seals and all components used in a system must be compatible with the hydraulic fluid used.
- Do not exceed the rated capacities of the cylinders. Excess pressure can result in personal injury.
- Inspect each cylinder and coupler before each shift or usage to prevent unsafe conditions from developing.
- Do not use cylinders if they are damaged, altered or in poor condition.
- Do not use cylinders with bent or damaged couplers or damaged port threads.

SAFETY PRECAUTIONS

- Use extreme caution when disassembling a spring return cylinder. All springs can store energy which can be released suddenly and cause personal injury. Mechanically restrain the gland nut or end cap when disassembling any compressed or extended cylinders which have an internally compressed spring. Consult the parts list to determine the type of spring loading. Observe all warnings and cautions.
- The guide cannot cover every hazard or situation so always do the job with SAFETY FIRST.

IMPORTANT:

- Keep the cylinder clean at all times.
- Use an approved, high-grade pipe thread sealant to seal all hydraulic connections. PTFE tape can be used if only one layer of tape is used and it is applied carefully (two threads back) to prevent the tape from being pinched by the coupler and broken off inside the pipe end. Any loose pieces of tape could travel through the system and obstruct the flow of fluid or cause jamming of precision-fit parts.
- Always use protective covers on disconnected quick couplers.
- Limiting the stroke on spring return cylinders will prolong spring life.
- Limiting the stroke and pressure on all cylinders will prolong their life.

SYSTEM EVALUATION: Your cylinder, hose(s), couplings and pump all must be rated for the same maximum operating pressure, correctly connected and compatible with the hydraulic fluid used. An improperly matched system can cause the system to fail and possibly cause serious injury. If you are in doubt, consult your nearest Power Team facility.

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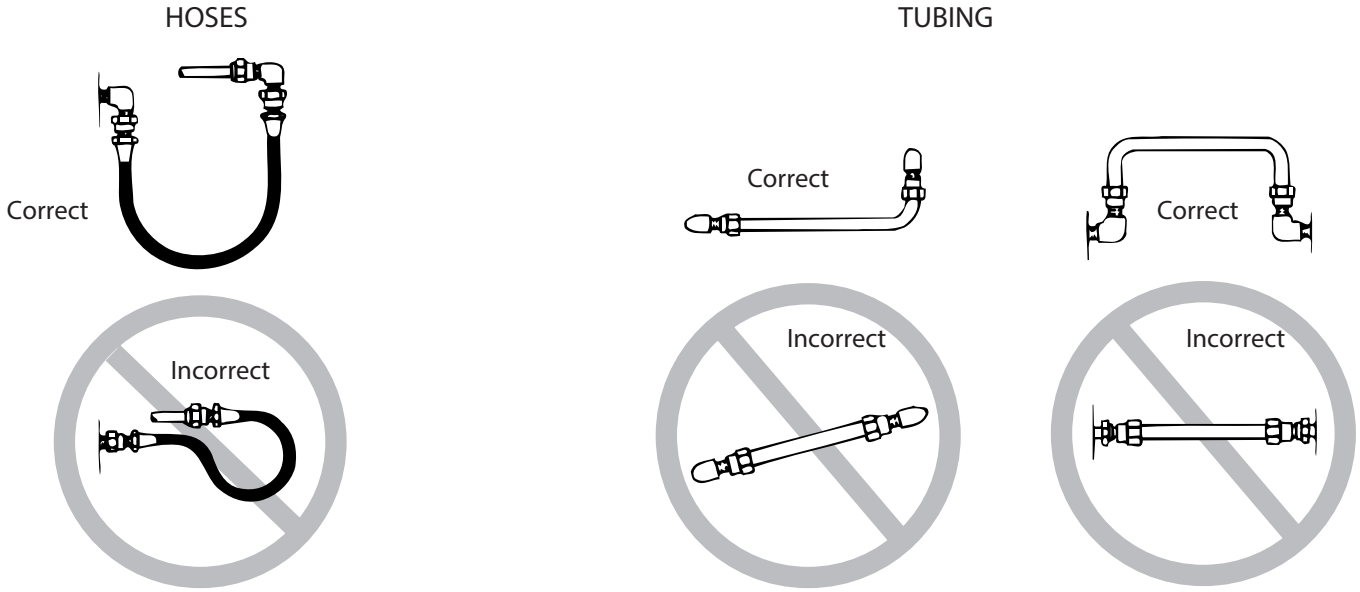
SET-UP

HYDRAULIC CONNECTIONS

Remove the thread protectors or dust covers from the hydraulic ports if applicable. Clean the areas around the fluid ports of the pump and cylinder. Inspect all threads and fittings for signs of wear or damage, and replace as needed. Clean all hose ends, couplers and union ends. Connect all hose assemblies to the pump and cylinder. Use an approved, high-grade pipe sealant (such as Power Team HTS50) to seal all hydraulic connections. Tighten securely and leak-free but do not overtighten.

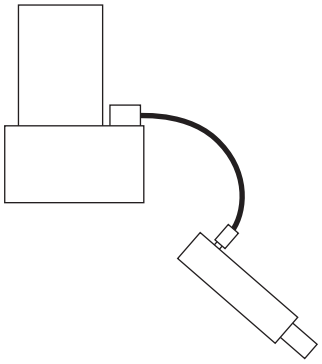
Hydraulic lines and fittings can act as restrictors as the cylinder or ram retracts. The restricting or slowing of the fluid flow causes back pressure that slows the cylinder's or ram's return. Return speed also varies because of the application, condition of the cylinder or ram, inside diameter of hose or fitting, length of the hose, and the temperature and viscosity of the hydraulic fluid.



BLEEDING THE SYSTEM

After all connections are made, the hydraulic system must be bled of any trapped air. Refer to the diagrams below.

With no load on the system and the pump vented and positioned higher than the cylinder, cycle the system several times. If you are in doubt about venting your pump, read the operating instructions for your pump. Check the reservoir for possible low fluid level and fill to proper level with approved, compatible hydraulic fluid as necessary.



System with a single-acting cylinder

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INSPECTION

Before each use, visually inspect for the following items:

1. Cracked or damaged cylinder
2. Excessive wear, bending, damage, or insufficient thread engagement
3. Leaking hydraulic fluid
4. Scored or damaged piston rod
5. Improperly functioning swivel heads and caps
6. Loose bolts
7. Damaged or improperly assembled accessory equipment
8. Modified, welded, or altered equipment
9. Bent or damaged couplers or port threads

Preventive Maintenance (yearly or sooner, if the cylinder condition suggests damage) - Visual examination by the operator or other designated personnel with a dated and signed equipment record.

CYLINDER MAINTENANCE

- Always use clean, approved hydraulic fluid and change as needed.
- Any exposed threads (male or female) must be cleaned and lubricated regularly, and protected from damage.
- If a cylinder or ram has been exposed to rain, snow, sand, grit-laden air, or any corrosive environment it must be cleaned, lubricated, and protected immediately after exposure.

PERIODIC CLEANING

A routine should be established to keep the hydraulic system as free from dirt as possible. All unused couplers must be sealed with dust covers. All hose connections must be free of dirt and grime. Any equipment attached to the cylinder must be kept clean. Use only Power Team hydraulic fluid and change as recommended or sooner if the fluid becomes contaminated (never exceed 300 hours).

STORAGE

Single-acting

Single-acting should be stored in a vertical position with the rod end down in a dry, well-protected area where they will not be exposed to corrosive vapors, dust or other harmful elements.

When a single-acting cylinder has not been used for a period of three (3) months it should be connected to a pump and be fully extended and then retracted. This cycle will lubricate the cylinder walls thereby reducing the potential for rust formation on the cylinder walls.

TROUBLE-SHOOTING GUIDE

IMPORTANT:

- The following trouble-shooting and repair procedures should be performed by qualified personnel familiar with this equipment. Use the proper equipment when trouble-shooting!

NOTE:

- All the following statements may not apply to your particular model of cylinder. Use the guide as a general reference for trouble-shooting.

PROBLEM	CAUSE	SOLUTION
Erratic action	1. Air in system or pump cavitation 2. Internal leakage in double-acting cylinders or external leakage in single-acting cylinders 3. Cylinder sticking or binding	1. Add fluid, bleed air and check for leaks 2. Replace worn packings. Check for excessive contamination or wear. Replace contaminated fluid as necessary. 3. Check for dirt or leaks. Check for bent, misaligned, worn parts or defective packings.
Cylinder does not move	1. Loose couplers 2. Faulty coupler 3. Improper valve position 4. Low or no hydraulic fluid in pump reservoir 5. Air-locked pump 6. Pump not operating 7. Load is above the capacity of the system	1. Tighten couplers 2. Verify that female coupler is not locked up (ball wedged into seat). Replace both female and male couplers. 3. Close release valve or shift to new position 4. Fill and bleed the system 5. Prime pump per pump operating instructions 6. Check pump's operating instructions 7. Use the correct equipment
Cylinder extends only partially	1. Pump reservoir is low on hydraulic fluid 2. Load is above the capacity of the system 3. Cylinder piston rod binding	1. Fill and bleed the system 2. Use the correct equipment 3. Check for dirt or leaks. Check for bent, misaligned, worn parts or defective packings.
Cylinder moves slower than normal	1. Loose connection or coupler 2. Restricted hydraulic line or fitting 3. Pump not working correctly 4. Cylinder seals leaking	1. Tighten 2. Clean and replace if damaged 3. Check pump operating instructions 4. Replace worn seals. Check for excessive contamination or wear

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TROUBLE-SHOOTING GUIDE (CONTINUED)

PROBLEM	CAUSE	SOLUTION
Cylinder moves but does not maintain pressure	1. Leaky connection 2. Cylinder seals leaking 3. Pump or valve malfunctioning	1. Clean, reseal with thread sealant and tighten connection 2. Replace worn seals. Check for excessive contamination or wear. Replace contaminated fluid as necessary. 3. Check pump or valve operating instructions
Cylinder leaks hydraulic fluid	1. Worn or damaged seals 2. Loose connections	1. Replace worn seals. Check for excessive contamination or wear. Replace contaminated fluid as necessary. 2. Clean, reseal with thread sealant and tighten connection
Cylinder will not retract or retracts slower than normal	1. Pump release valve closed 2. Loose couplers 3. Blocked hydraulic lines 4. Weak or broken retraction springs 5. Cylinder damaged internally 6. Pump reservoir too full	1. Open pump release valve 2. Tighten couplers 3. Clean and flush 4. Send to service center for repair 5. Send to service center for repair 6. Drain hydraulic fluid to correct level

TWO-STAGE
HYDRAULIC HAND PUMP
Max. Pressure: See Pump Data Plate

Definition: A hydraulic hand pump delivers hydraulic fluid under pressure by directly applied manual effort.

Note: Illustrations depict general pump configurations.

SAFETY EXPLANATIONS

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Pictogram Definition

Do not remove this component. For service only. Pressure must be released.

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- Do not use equipment if damaged, altered, or in poor condition.
- All safety decals must be replaced when unreadable.

These instructions are intended for end-user application needs. Most problems with new equipment are caused by improper operation or installation. Detailed service repair instructions or parts lists can be obtained from your nearest Power Team facility.

SAFETY PRECAUTIONS

WARNING: To help prevent personal injury,

- Before operating the pump, all hose connections must be tightened with the proper tools. Do not overtighten. Connections need only be tightened securely and leak-free. Overtightening may cause premature thread failure or high pressure fittings to split at pressures lower than their rated capacities.
- Should a hydraulic hose ever rupture, burst, or need to be disconnected, immediately shut off the pump and shift the control valve twice to release all pressure. Never attempt to grasp a leaking hose under pressure with your hands. The force of escaping hydraulic fluid could cause serious injury.
- Do not subject the hose to any potential hazard such as fire, extreme heat or cold, sharp surfaces, heavy impact. Do not allow the hose to kink, twist, curl, or bend so tightly that the fluid flow within the hose is blocked or reduced. Periodically inspect the hose for wear because any of these conditions can damage the hose and result in personal injury.
- Do not use the hose to move attached equipment. Stress may damage the hose and fittings which could cause personal injury.
- Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive materials such as creosote-impregnated objects and some paints. Consult the manufacturer before painting a hose. Never paint the couplers. Hose deterioration due to corrosive materials may result in personal injury.
- All components in the hydraulic system must match the maximum pressure rating of the pump.

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SAFETY PRECAUTIONS

Pump

- Do not exceed the PSI rating noted on the pump nameplate or tamper with internal high pressure relief valve. Creating pressure beyond rated capacities may result in personal injury.
- Before adding hydraulic fluid, retract the system to prevent overfilling the pump reservoir. An overfill may cause personal injury due to excess reservoir pressure created when cylinders are retracted. Only connect, or disconnect fully retracted cylinders to the pump.
- The load must be under operator control at all times.
- Do not connect pump to hydraulic system powered by another pump.

SET-UP

Hydraulic Connections

IMPORTANT: Seal all hydraulic connections with a high grade, nonhardening thread sealant. PTFE tape may also be used to seal hydraulic connections if only one layer of tape is used. Apply the tape carefully, two threads back, to prevent it from being pinched by the coupler and broken off inside the pipe end. Any loose pieces of tape could travel through the system and obstruct the flow of fluid or cause jamming of precision-fit parts.

1. Clean all areas around the fluid ports of the pump and cylinder. Clean all hose ends, couplers, and union ends. Remove thread protectors from the hydraulic fluid outlets, and connect the hose assembly. Couple hose to cylinder, making sure couplers are fully engaged.

2. The use of a hydraulic pressure or tonnage gauge (included) is strongly recommended. Remove the pipe plug from the gauge port of the valve, thread the gauge into this port and seal as noted above.

WARNING: To help prevent personal injury,

- The gauge must have the same pressure rating as the pump and cylinder. Personal injury can result if the wrong gauge is used.
- Release hydraulic pressure BEFORE removing or tightening hose couplings.

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OPERATION

Hand pumps can be operated in a horizontal position or in a vertical position with head pointing downward.

IMPORTANT: Figure 1 illustrates the normal drop of handle effort experienced when two-stage pumps shift from low pressure stage to high pressure stage.

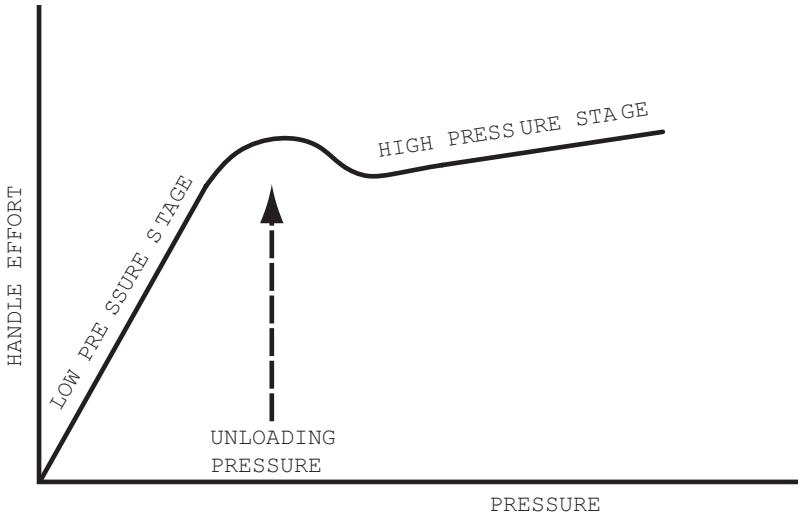

Figure 1

Two-way Valve

Pumps with a two-way valve are for use with single-acting cylinders.

1. To extend the cylinder, turn the valve knob counterclockwise to a closed (seated) position. Note: Hand tight only! Work the pump handle up and down to build pressure.
2. To release pressure, open the valve slowly by turning the knob clockwise to control the load.

WARNING: The operator should always release the pressure slowly.

PREVENTIVE MAINTENANCE

IMPORTANT: Any repair or servicing that requires dismantling the pump must be performed in a dirt-free environment by a qualified technician.

Lubrication

Apply lubricant regularly to all pivot and rubbing points.
Use a good grade of No. 10 motor oil or grease. Do not use dry lubricants.

Bleeding Air From the System

Air can accumulate in the hydraulic system during the initial set-up or after prolonged use, causing the cylinder to respond slowly or in an unstable manner. To remove the air:

1. Position the cylinder at a lower level than the pump, and turn the cylinder rod end down.
2. Extend and retract the cylinder several times without putting a load on the system. Air will be released into the pump reservoir. Follow the fluid level instructions for your reservoir type to release the air from the reservoir and top off the fluid supply.

Bleeding Air From The Pump

When the pump is first put into use, or after refilling the pump's reservoir it may be necessary to bleed any trapped air from the pump. If this is not done the pump will not function properly (will not build pressure or has very spongy operation).
To bleed air from the pump, turn the pressure control knob counterclockwise (CCW) (open position) and operate the pump handle up and down approximately twenty times. Turn the pressure control knob clockwise (CW) (closed position) to its full stop position. The pump should now be bled of air and ready to use.

PREVENTIVE MAINTENANCE -CONTINUED

Hydraulic Fluid Level

WARNING: Cylinder(s) connected to the pump must be fully retracted before checking the fluid level. Release all system pressure before breaking any hydraulic connection in the system. Check the hydraulic fluid level in the reservoir periodically. Use a funnel with a filter to add hydraulic fluid if needed.

- Remove the filler cap. The fluid level should come to the bottom edge of the filler hole when the pump is level and resting horizontally on its base and the cylinders are retracted (see Figure 1).

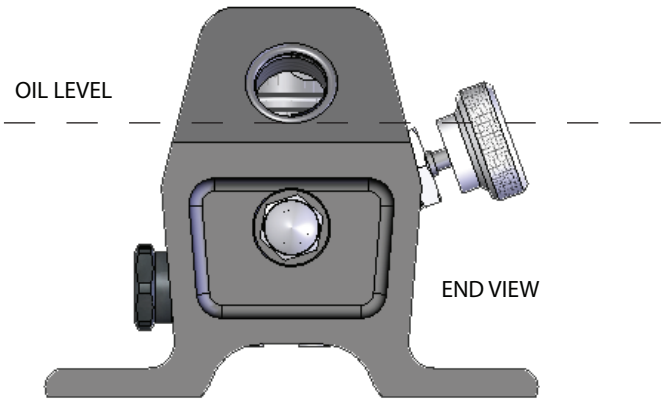

Figure 1

Draining And Flushing The Reservoir

Drain, clean and replenish the reservoir with high-grade, approved Power Team hydraulic fluid yearly or more often if necessary. The frequency of fluid change will depend upon the general working conditions, severity of use and overall cleanliness and care given the pump.

IMPORTANT: Clean the exterior of the pump first. After draining and flushing the reservoir, drain and clean the other hydraulic system components (hoses, cylinders, etc.) before connecting them to the pump again. This will help prevent contaminated fluid from entering the pump.

1. Remove the filler cap. Drain the hydraulic fluid through filler hole.

2. Remove the nut from the tie rod. Separate the reservoir from the pump body. Clean the reservoir and filter.

   IMPORTANT: Removing the filter from the pump assembly could result in its breakage. Attempt to clean it as well as possible with it installed.

3. Reassemble and fill the reservoir with Power Team hydraulic fluid. Replace the filler cap.

TROUBLESHOOTING GUIDE

WARNING: To help prevent personal injury, always release pump pressure and disconnect hoses(s) from pump before making repairs.

Refer to the appropriate pump parts list during trouble-shooting. Repairs must be performed in a dirt-free environment by qualified personnel familiar with this equipment.

PROBLEM	CAUSE	SOLUTION
Pump losing pressure	1. System components leaking	1. Repair or replace as necessary
	2. Directional control valve leaks or not adjusted properly	2.* Reseat, repair, or replace directional control assembly and correctly adjust
	3. Fluid leaking past outlet check seat(s)	3.* Check for dirt. Reseat pump body and/or replace poppet(s) or ball(s)
Handle rises after each stroke	1. Fluid leaking past outlet check seat(s)	1.* Check for dirt. Reseat pump body and/or replace poppet(s) or ball(s)
Pump not delivering fluid	1. Low fluid level in reservoir	1. Check fluid level per instructions
	2. Intake filter is dirty	2. Remove reservoir and clean
	3. Seats worn and not seating properly	3.* Repair seats or replace pump body
Pump does not reach full pressure	1. Low fluid level in reservoir	1. Check fluid level per instructions
	2. System components leaking	2. Repair or replace as necessary
	3. Directional control valve leaks or not adjusted properly	3.* Reseat, repair, or replace directional control assembly and correctly adjust
	4. Improperly adjusted relief valve	4.* Readjust
	5. Fluid leaking past inlet or outlet checks or high pressure piston seal damaged	5.* Reseat or repair inlet or outlet checks or replace high pressure piston seal
Pump handle can be pushed down (slowly) without raising the load	1. Inlet checks are not seating	1.* Check for dirt and/or reseat valve seats
	2. Damaged piston assembly or piston seals leaking	2.* Replace piston assembly and/or piston seals
Pump handle operates with a spongy action	1. Air trapped in system	1. Position cylinder lower than pump. Extend and return cylinder several times. Follow bleeding instructions.
	2. Too much fluid in reservoir	2. Check fluid level per instructions
Pump handle effort drops significantly after some pressure has been obtained	1. This is normal operation on most two-stage hand pumps	

*Power Team recommends these hand pump repairs be performed by an Authorized Hydraulic Service Center.

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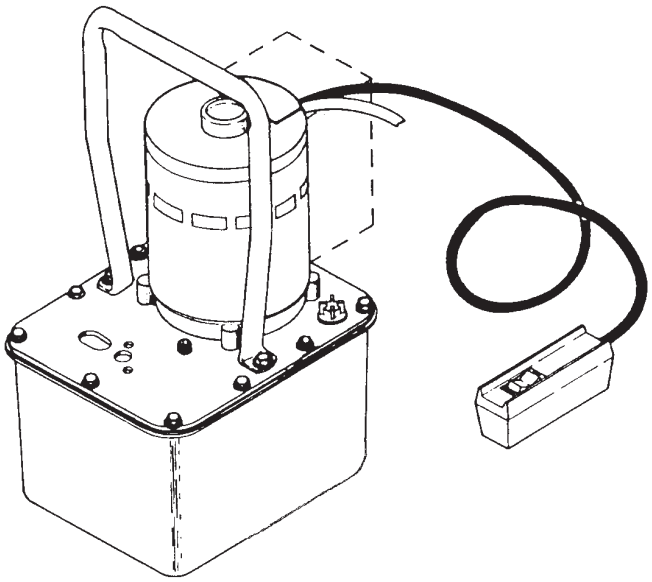
TWO STAGE

HYDRAULIC PUMP



SAFETY PRECAUTIONS

WARNING

•All WARNING statements must be carefully observed to prevent personal injury.

General Operation

- Before operation the pump, all hose connections must be tightened with proper tools. Do not overtighten. Connections need only be tightened securely and leak-free. Overtightening may cause premature thread failure or may cause high pressure fittings to split at pressures lower than their rated capacities.
- Should a hydraulic hose ever rupture, burst, or need to be disconnected, immediately shut off the pump and shift the control valve twice to release all pressure. Never attempt to grasp a leaking hose under pressure with your hands. The force of escaping hydraulic fluid could cause serious injury.
- Do not subject the hose to potential hazard such as fire, extreme heat or cold, sharp surfaces, or heavy impact. Do not allow the hose to kink, twist, curl, or bend so tightly that the oil flow within the hose is blocked or reduced. Periodically inspect the hose for wear because any of these conditions can damage the hose and possibly result in personal injury.
- Do not use the hose to move attached equipment. Stress may damage the hose and possibly cause personal injury.
- Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive materials such as creosote-impregnated objects and some paints. Consult the manufacturer before painting a hose. Never paint the couplers. Hose deterioration due to corrosive materials may result in personal injury.

Pump

- Do not exceed the PSI hydraulic pressure rating noted on the pump name plate or tamper with the internal high pressure relief valve. Creating pressure beyond rated capacities may result in personal injury.
- Before replenishing the oil level, retract the system to prevent overfilling the pump reservoir. An overfill may cause personal injury due to excess reservoir pressure created when cylinders are retracted.

Safety Precautions (Continued)

Electrical Supply

- Do not use an ungrounded (two-prong) extension cord.
- Avoid conditions which could create an electrical hazard.
- If the power cord is damaged or wiring exposed, replace or repair immediately.
- Check the voltage rating on the pump motor name plate to be certain the outlet you are using is of the proper voltage.
- Correct voltage is required for pump to operate properly.
- Low voltage may cause the following: overheated motor; motor fails to start under load; motor surging when trying to start; motor stalls before maximum pressure is reached.
- Always check the voltage at the motor with the pump running at full pressure.
- Never run the motor on long, light gauge extension cords.
- Low voltage = 10% less than name plate voltage.

SET-UP AND OPERATION

Electric Motor

WARNING: To help avoid possible personal injury,

- Any electrical work must be done by a qualified electrician.
- Disconnect the power supply before removing the motor casing cover or performing repairs or maintenance.
- Changing the voltage on this unit is an involved, and if improperly performed, hazardous procedure. Consult the manufacturer for specific information before attempting any rewiring.

Hydraulic Set-up

1. Clean the areas around the oil ports of the pump and hydraulic cylinders.
2. Inspect the threads and fittings for signs of wear or damage and replace as needed. Clean all hose ends, couplers, and union ends.
3. Remove the plastic thread protectors from the hydraulic outlets. Connect the hose assembly to the valve and couple the hose to the cylinder.
4. Seal all pipe connections with pipe sealant. PTFE tape can be used to seal hydraulic connections provided only one layer of tape is used. Apply the tape carefully to prevent it from being pinched by the coupler and broken off inside the pipe end. Any loose pieces of tape could travel through the system and obstruct the flow of oil or cause jamming of precision-fit parts.

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Filling the Reservoir

NOTE: The pump is shipped without oil in the reservoir. Oil is included in a separate container.

1. Thoroughly clean the area around the filler cap with a clean cloth to prevent contamination of the oil by foreign particles.
2. Remove the filler cap and insert a clean funnel with filter. Reservoir may be filled to within 1” of the top cover with all cylinders retracted. Replace filler cap and check to see that the breather-hole in the cap is open. Note: If oil foaming becomes a problem, reduce the oil level to 2” below the cover plate.

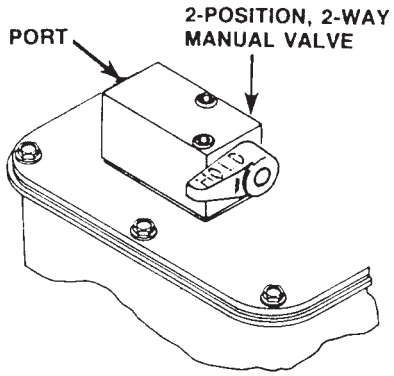

FIGURE 1

Valve Operation

2-Position, 2-Way Manual Valves used with Single-acting Cylinders

1. To build pressure, turn the valve control handle counterclockwise (CCW).
2. Start the pump by pressing the remote motor control ON/OFF switch. NOTE: Oil advances the cylinder when the unit is activated.
3. When the cylinder has advanced to the desired position, release the remote motor control ON/OFF switch.
4. To retract the cylinder, turn the valve control clockwise (CW).

NOTE: The valve works the same as the manifold if the pump is operated with the valve in the RETURN position. In this position, the cylinder advances when the pump is running and retracts when the motor is stopped.

- When the valve is in the HOLD position, the cylinder advances when the pump is running and holds when the motor is stopped. The cylinder can be retracted by moving the valve to the RETURN position.

PREVENTIVE MAINTENANCE

WARNING: To help avoid possible personal injury,

- Disconnect the pump from the poser supply before performing maintenance or repair procedures.
- Repairs and maintenance should be performed in a dust-free area by a qualified technician.

Bleeding Air from the System

Air can accumulate in the hydraulic system if the reservoir oil level has been permitted to get too low. This air causes the cylinder to respond in an unstable or slow manner. To remove the air:

1. Position hydraulic cylinder(s) on their sides with the couplers located upward and at a lower level than the pump.
2. Remove any load from the cylinder(s), and cycle the hydraulic system through several cycles (fully extend and retract the cylinders).

Hydraulic Fluid Level

1. Check the oil level in the reservoir after each 10 hours of use. Due to the very limited amount of oil required by the typical hydraulic cylinder(s) used with this pump, the oil level is considered adequate when the reservoir is partially full. Maximum capacity is when the oil is 1-1/2" below the cover plate with all cylinders retracted.
2. When adding oil, use an approved, high-grade hydraulic oil (215 SSU @ 100°F). Retract the cylinders and disconnect the power supply. Clean the area around the filler plug, remove the plug, and insert a clean funnel with filter.
3. The frequency of oil changes will depend upon the general working conditions, severity of use, and overall cleanliness and care given the pump. Three hundred hours of use under general shop conditions is considered a standard change interval. Drain, flush, and refill the reservoir with an approved, high-grade hydraulic oil (215 SSU @ 100°F).

Draining and Flushing the Reservoir

IMPORTANT: Clean the pump exterior before the pump interior is removed from the reservoir.

1. Remove the ten screws that fasten the motor and pump assembly to the reservoir.

IMPORTANT: Do not damage the gasket or bump the filter or pressure regulating valves when lifting the pump and motor off the reservoir. See Figures 4 & 5.

2. Drain oil and clean the inside of the reservoir. Fill with a suitable nonflammable flushing oil. Rinse the filter clean.
3. Place the pump and motor assembly back onto the reservoir and secure with four of the ten screws. Assemble the screws in opposite corners of the housing.

IMPORTANT: Connect a hose to the advance/retract port of the pump manifold. Place the other end of the hose into the oil filler plug hole.

4. Run the pump for several minutes. Then disconnect the motor and pump assembly, and drain and clean the inside of the pump reservoir.
5. Fill the reservoir to 1-1/2" below the cover plate with an approved, high-grade hydraulic oil. Place the pump and motor assembly (with gasket) onto the reservoir. Thread in ten screws and tighten securely and evenly.

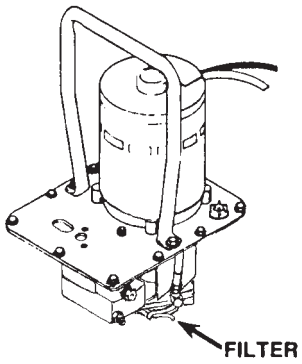

FIGURE 4

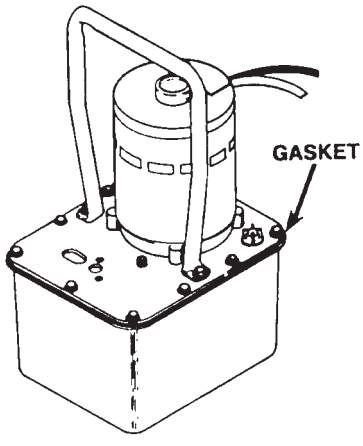

FIGURE 5

Maintenance and Cleaning

1. Keep the pump's outer surface as free from dirt as possible.
2. Seal all unused couplers with thread protectors.
3. Keep all hose connections free of dirt and grime.
4. The breather-hole in the filler cap must be clean and unobstructed at all times.
5. Equipment connected to the pump must be kept clean.
6. Use only an approved, high-grade hydraulic oil in this pump. Change as recommended (approx. every 300 hours).
7. Periodically lubricate the electric pump motor.

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TROUBLE-SHOOTING GUIDE

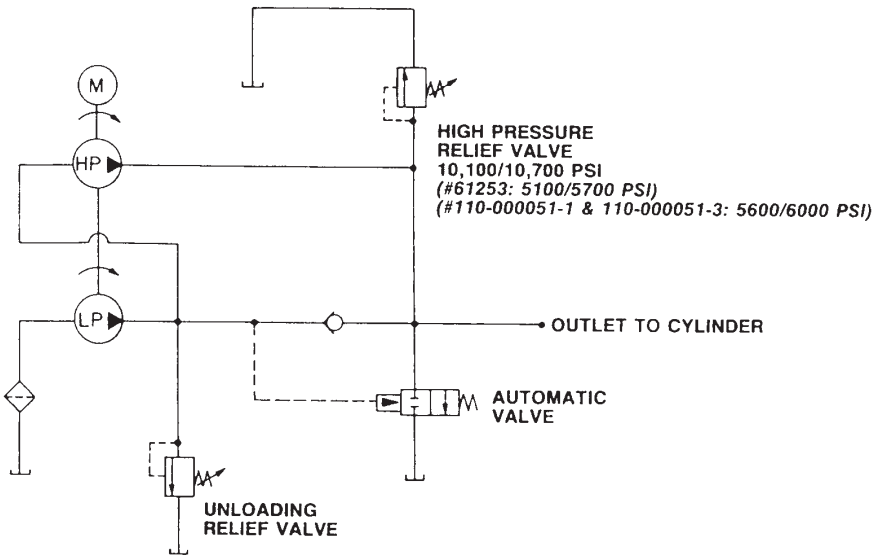
WARNING: To help avoid possible personal injury,

- All repair work or trouble-shooting must be done by qualified personnel familiar with this equipment.
- Use the proper gauges and equipment when trouble-shooting.

NOTE:

- Depending on the type of pump, it is often best to check for leaks by using a hand pump and applying pressure to the suspect area without the motor running. Watch for leaking oil and follow it back to its source.
- Plug the outlet ports of the pump when checking for leakage to determine if the leakage is in the pump or if it is in the cylinder or tool.
- Refer to your pumps parts list and the following hydraulic schematic when using this trouble-shooting guide.

HYDRAULIC SCHEMATIC



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PROBLEM	CAUSE	SOLUTION
Motor does not run	1. Unit is not plugged in. 2. No voltage supply. 3. Broken lead wire or defective power cord plug. 4. Defective motor.	1. Plug in unit. 2. Check line voltage. 3. Replace defective parts. 4. Replace or repair motor.
Pump is not delivering oil or delivers only enough oil to advance cylinder(s) partially or erratically	1. Oil level too low. 2. Air in system. 3. Dirt is in pump or filter is plugged. 4. Cold oil or oil is too heavy (hydraulic oil is of a higher viscosity than necessary). 5. Relief valve or low pressure unloading valve out of adjustment. 6. Sheared drive shaft key(s). 7. Motor rotating in wrong direction.	1. Fill reservoir to 1-1/2” below the cover plate, maximum. 2. Bleed the system. 3. Pump filter should be cleaned and, if necessary, pump should be dismantled and all parts inspected and cleaned. 4. Change to lighter oil. 5. Readjust as needed. 6. Replace. 7. Reverse rotation.
Pump will not build full pressure	1. Faulty pressure gauge. 2. Check for external leakage. 3. Inspect the pump for internal leakage. 4. Sheared key(s). 5. High pressure pump inlet or outlet ball checks in the pump are leaking. 6. Inadequate air pressure (air motor only).	1. Calibrate gauge. 2. Seal any faulty pipe fittings with pipe sealant. 3. Same procedure as above but for leaks around the entire inner mechanism. If there are no visible leaks the low-to-high pressure ball check may be leaking. Remove all parts. Inspect the check body for any damage to the seat areas. Clean and reseat if necessary. Inspect the ball for damages and replace if necessary, then reassemble. 4. Replace. 5. Reseat or replace valve head. 6. Increase air pressure.
Electric motor cuts out	1. Extension cord is too long and/or not of sufficient gauge. 2. Faulty motor. 3. Overheated motor can trip circuit breaker in shop power panel.	1. Replace. 2. Replace and repair. 3. Allow motor to cool, reset circuit breaker located in shop power panel.

PROBLEM	CAUSE	SOLUTION
Foaming oil	1. Oil being splashed by counterweight.	1. Lower oil level to approximately 1-1/2” below the cover plate.
Cylinder(s) will not retract	1. Check the system pressure; if the pressure is zero, the control valve is releasing pressure and the problem may be in the cylinder(s), mechanical linkage connected to cylinder(s), or quick-disconnect couplings. 2. Inadequate air pressure (air motor only).	1. Check the cylinders for broken return springs and check couplers to ensure that they are completely coupled. Occasionally couplers have to be replaced because one check does not stay open in the coupled position. 2. Increase air pressure.
Pump delivers excess oil pressure	1. Pressure gauge is not accurate. 2. Relief valve not properly set.	1. Calibrate gauge. 2. Reset the relief valve.