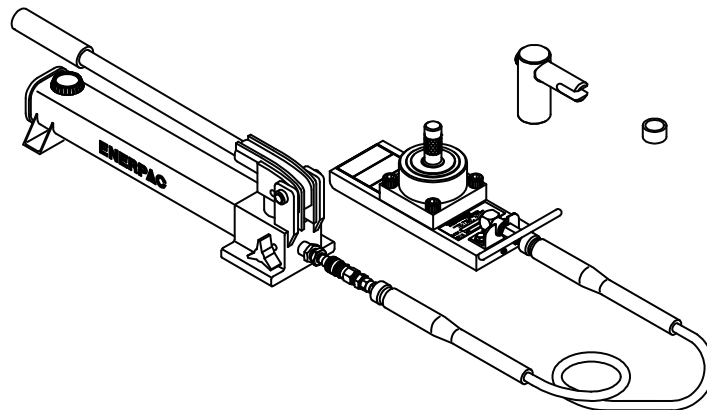




Operation & Service Manual



Model: 02-7834-0111
12 Ton (10.87 Metric Ton)
Axle Jack

11/2002 - AB - Rev. 03

Includes Illustrated Parts Lists

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Model: 02-7834-0111
12 Ton (10.87 Metric) Axle Jack

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APPENDIX	I	Energac Instruction & Repair Parts List
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Model: 02-7834-0111
12 Ton (10.87 Metric) Axle Jack

This product can not be modified without the written approval of Tronair, Inc. Any modifications done without written approval voids all warranties and releases Tronair, Inc., its suppliers, distributors, employees, or financial institutions from any liability from consequences that may occur.

1.0 DESCRIPTION

The Tronair Model 02-7834-0111 Hydraulic Axle Jack incorporates the following quality features:

- Steel construction
- Three-stage, telescoping rams
- Quick action mechanical extension
- Two speed, manually operated pump
- Uses standard MIL-H-5606 hydraulic fluid. (Reference Appendix III – MSDS MIL-H-5606)
- The jack is specifically designed for use on Learjet 45 aircraft.

2.0 USAGE

The purpose of this jack is to lift aircraft for maintenance. It has a maximum capacity of 12 tons (10.87 metric tons).

3.0 SPECIFICATIONS

- Vertical capacity: 24,000 lbs. (10,886 kg)
- Minimum closed height: 5.88 in (14.92 cm)
- Mechanical extension: 1.57 in (3.97 cm)
- Hydraulic extension: 5.75 in (14.61 cm)
- Maximum height obtainable: 13.13 in (33.34 cm)
- Weight: 37 lbs. (27.22 kg)
- BUNA 'N' Seals

4.0 ASSEMBLY INSTRUCTIONS

4.1 GENERAL INFORMATION

This product should be assembled and/or repaired using good workmanship practices and proper tools.

All replacement parts must be the same as or equal to the original parts supplied.

4.2 PRE-USE CHECKS

Reference the Illustrated Parts List and Figure 1 – Page 2 to identify and ensure that all parts are present.

- Generally check over unit to assure the tightness of all nuts, bolts and screws.
- With rams completely collapsed, check hydraulic fluid level; between 0.50 and 0.75 inches (1.27 and 1.91 cm) from top of reservoir fitting. Replenish with MIL-H-5606 fluid as required.

4.0 Assembly Instructions continued on following page.

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4.0 ASSEMBLY INSTRUCTIONS *(continued)*

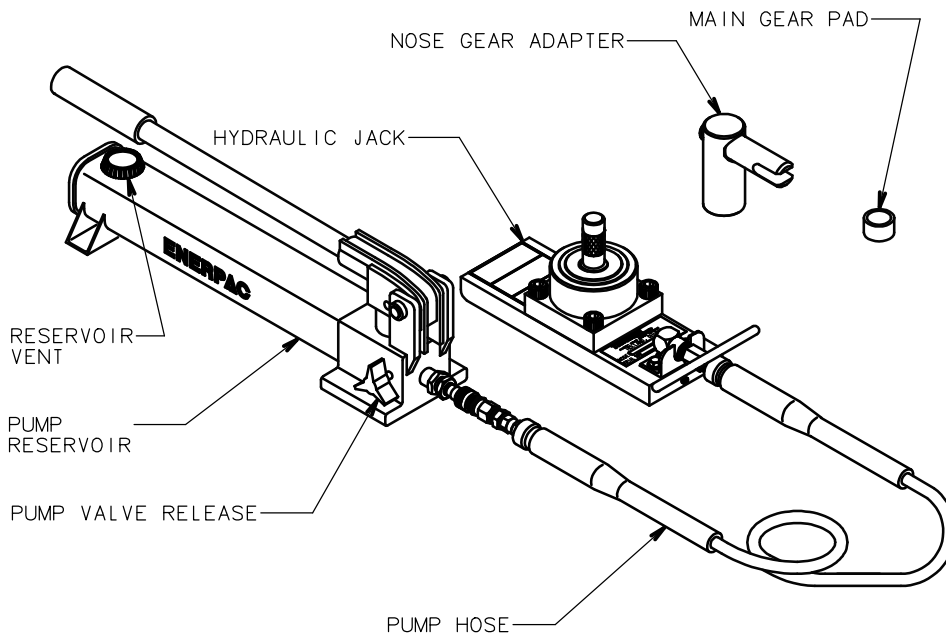


FIGURE 1

5.0 OPERATING INSTRUCTIONS

The user should be familiar with the following statements prior to using the jack(s).

CAUTION!



1. **Jacking adapters must be fully seated on mechanical extension.**
2. **Never put hands between aircraft and jack pad.**
3. **Always open reservoir vent screw before operating.**

5.1 JACK INSTRUCTIONS

To Raise Nose Gear:

1. Place jack on hard level surface.
2. Connect pump hose.
3. Open reservoir vent screw.
4. Screw out mechanical extension.
5. Place nose (Z-3275) adapter over mechanical extension. Reference **Figure 2**.
6. Align horizontal slot in pin with front axle by adjusting mechanical extension.
7. Slide pin into axle until pin shoulder rests against the axle.
8. Close pump release valve and operate pump.

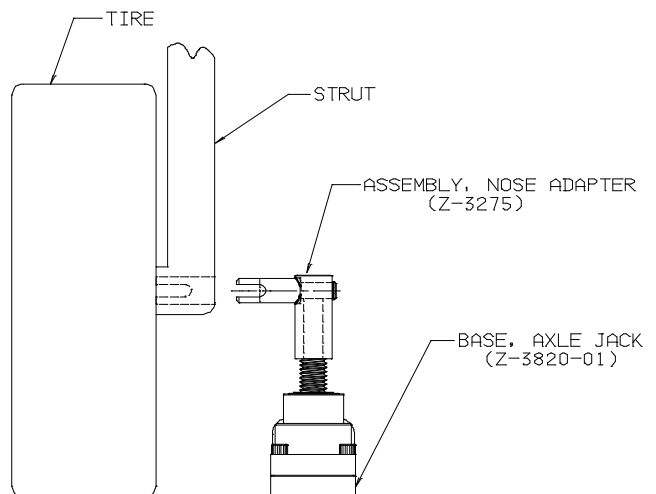


FIGURE 2

Model: 02-7834-0111
12 Ton (10.87 Metric) Axle Jack

5.1 JACK INSTRUCTIONS (*continued*)



WARNING!

This jack must be used with either a main gear pad or nose adapter. Damage may occur or aircraft may fall off if pad or adapter are not used.

To Raise Main Gear:

1. Place jack on hard level surface.
2. Connect the pump hose.
3. Open the reservoir vent screw.
4. Place main gear pad (Part Number: R-1820) over mechanical extension.
5. Adjust mechanical extension so the pad is approximately one-quarter inch (0.25 in/0.63 cm) below the bottom of the jack pad on the aircraft.
6. Place the jack between the tires and check the clearance between the mechanical extension and the bottom of the jack pad. Measurement should be approximately one-quarter inch (0.25 in/0.63 cm).
7. Close pump release valve and slowly begin to pump the jack to raise the aircraft wheel. Verify that there is clearance between the jack cylinder assembly and the brake casting.

6.0 MAINTENANCE

6.1 GENERAL

- All maintenance and/or repair work should be done using good workmanship practices and proper tools.
- The work area should be clean and free of dirt.
- When O-rings and backup rings are removed, every effort should be made to avoid the contact of tools with the critical surfaces of parts. Surface deformities could cause degradation of seals and failure.
- It is good practice to replace all O-rings and backup rings once removed. Cut and damaged rings normally result in fluid leakage.
- At this time flush old hydraulic fluid and dirt from overall system and replenish with new, clean MIL-H-5606A hydraulic fluid.

6.2 SERVICING JACK

To Disassemble Jack:

1. Collapse jack ram.
2. Remove cap screws (Item 4) surrounding jack cylinder, then remove retaining ring, (Item 3).
3. Lift cylinder from axle jack base weldment (Item 2). Operate jack hand pump to help remove cylinder. Separate rams by removing internal rings (Items 9, 10 & 11).

To Re-assemble Jack:

1. Replace all seals including internal rings.
2. Re-assemble in reverse order of above.
3. Torque each cap screw (Item 4) to between 75 – 85 ft-lbs (101.69 – 115.24 N-m), using standard cross torque procedure.

To Bleed Jack for Air:

1. Open reservoir vent screw on hand pump.
2. Pump unit to fully extended position.
3. Turn jack upside down.
4. Push jack back to fully collapsed position.

6.0 Maintenance continued on following page

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Model: 02-7834-0111
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6.0 MAINTENANCE *(continued)*

6.3 JACK FUNCTION LOAD TEST

1. Take all necessary precautions to prevent injury.
2. Always jack against a load and never against the jack itself.
3. Apply a test load equal to the jack rated capacity plus 10%. Do not exceed this load.

7.0 TROUBLE SHOOTING

Ram will not rise or rises erratically

PROBABLE CAUSE	CORRECTIVE ACTION
High pressure leaks (at joint, plugs or tubing)	Re-tighten or repair
Leaky discharge check valve	Open release valve, pump rapidly to dislodge; Or repair pump
Leaky ram O-ring packing	Replace packing
Leaky release valve	Tighten release valve
Leaky pump O-ring packing	Repair pump
Lack of oil	Refill reservoir check system for leaks
Sticking inlet check valve	Open release valve. Pump rapidly to dislodge; Or repair pump
Closed air vent	Open air vent
Air under ram	Bleed system

Jack will not lower

PROBABLE CAUSE	CORRECTIVE ACTION
Closed air vent or release valve	Open air vent or release valve
Broken pump release valve	Repair release valve
Bent ram	Replace suspected ram assembly

8.0 PARTS LIST AND ILLUSTRATIONS

Reference Pages 6 – 8 for ordering information of Replacement Parts and Kits.

Model: 02-7834-0111
12 Ton (10.87 Metric) Axle Jack

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Model: 02-7834-0111
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Parts List

When ordering Replacement Parts/Kits, please specify Model & Serial Number of your product.

Reference Illustration on Page 7.

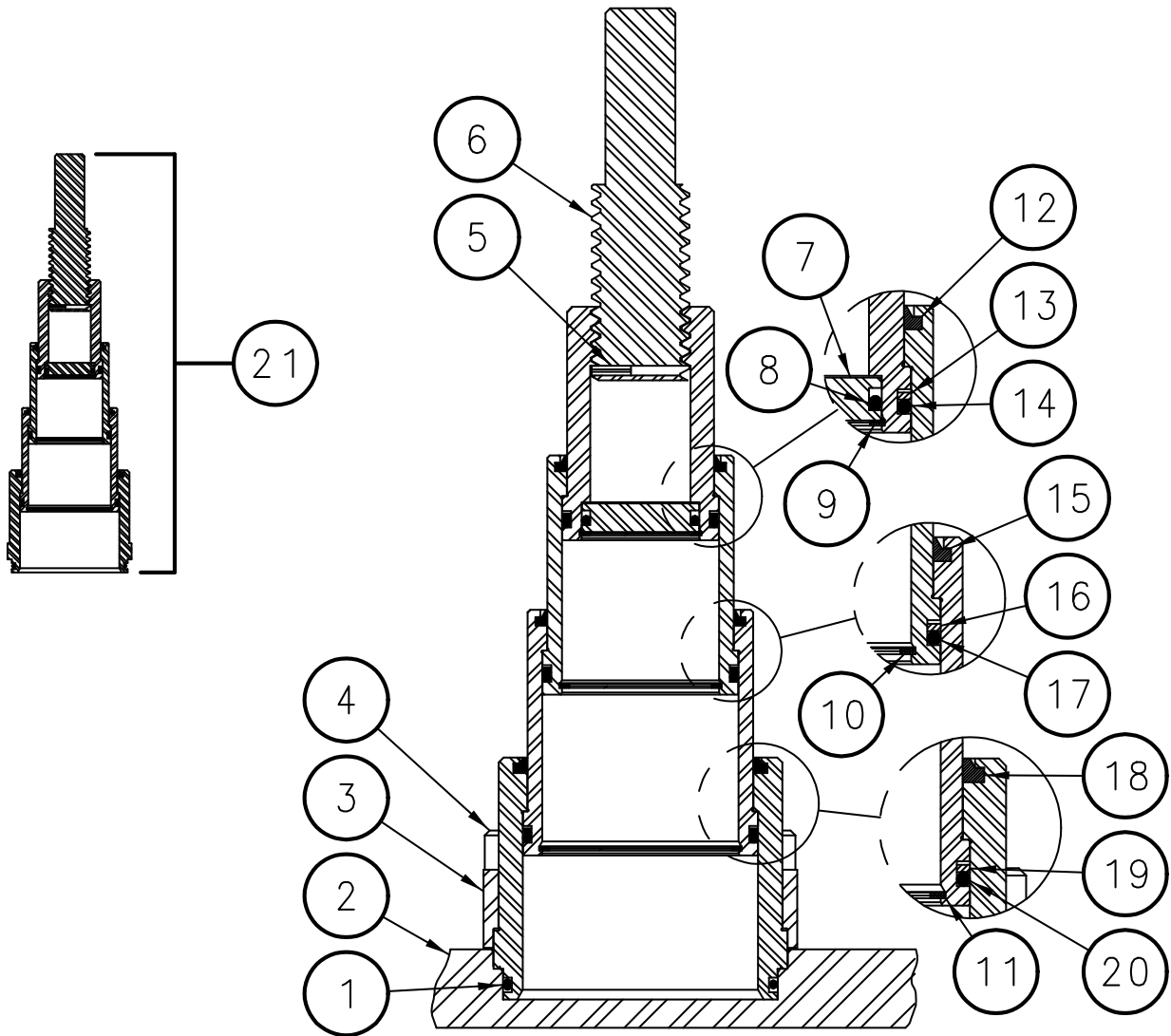
ITEM	PART NUMBER	DESCRIPTION	QTY
1	HC-2008-236	O-Ring	1
2	<i>Reference K-2888 Axle Jack Base Kit</i>		
3	J-2351	Ring, Retaining	1
4	G-1151-109716	Screw, Socket Head Cap, 1/2-20 x 1 3/4" long	4
5	G-1300-13040	Pin, 1/4" diameter x 1/2" long, Roll	1
6	R-1678	Extension, Mechanical	1
7	R-1716	Plug, End	1
8	HC-2000-218	O-Ring	1
9	G-1398-150	Internal Ring	1
10	G-1398-200	Internal Ring	1
11	G-1398-250	Internal Ring	1
12	HC-1697-20	Ring Wiper	1
13	HC-2023-224	Backup Ring	1
14	HC-2000-224	O-Ring	1
15	HC-1697-24	Ring Wiper	1
16	HC-2023-228	Backup Ring	1
17	HC-2000-228	O-Ring	1
18	HC-1697-28	Ring Wiper	1
19	HC-2023-232	Backup Ring	1
20	HC-2000-232	O-Ring	1
21	Z-5545	Assembly, Cylinder	1
	K-2888	Kit, Replacement Axle Jack Base; consists of:	
2	Z-3820-01	Weldment, Base Plate (Includes Labels)	1
29	N-2228-12-S-B	Elbow, Female Pipe	1
30	A-1155-01	Angle, Hose Support	1
31	HC-1551	Link, 4 gpm Fusible	1
32	N-2205-02-S	Plug, Hollow Hex	1
33	G-1100-105504	Bolt, Hex Head, Grade 5, 1/4-28 x 1/2" long	2
34	G-1250-1050N	Flatwasher, 1/4 Narrow	2

Parts List

When ordering Replacement Parts/Kits, please specify Model & Serial Number of your product.

Reference Parts List on Page 6.

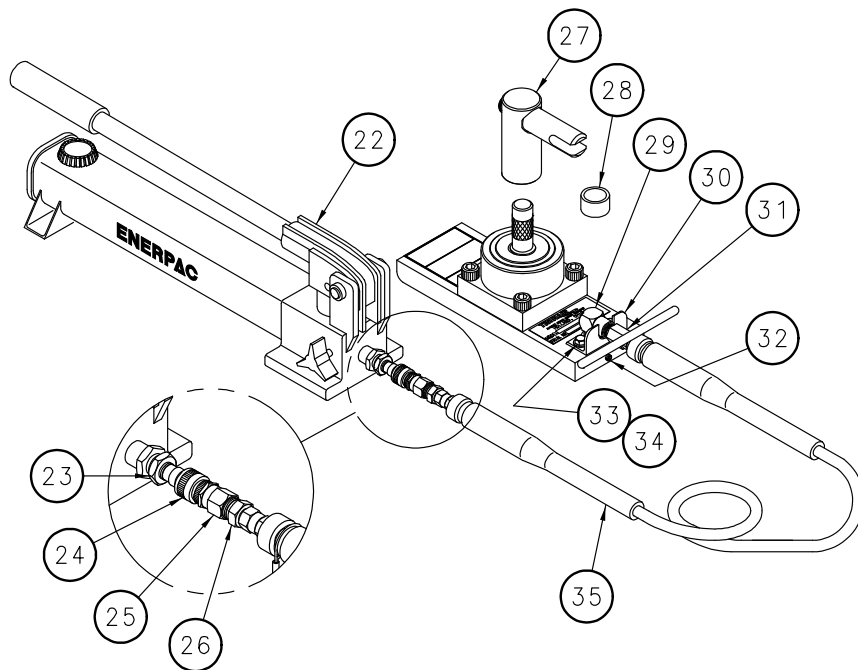
NOTE: It is recommended that cylinders be replaced as a package for proper jack operation.



Model: 02-7834-0111
 12 Ton (10.87 Metric) Axle Jack

Parts List

When ordering Replacement Parts/Kits, please specify Model & Serial Number of your product.

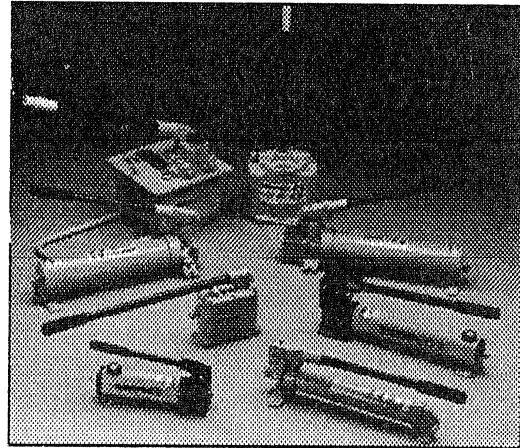


ITEM	PART NUMBER	DESCRIPTION	QTY
22		(Reference K-3772 Hand Pump Kit below)	
23	N-2203-06-S	Nipple, Pipe	1
24	N-2713	Nipple, Hydraulic (Male)	1
25	N-2712	Coupler, Hydraulic (Female)	1
26	N-2009-08-S	Connector, Male	1
27	Z-3275	Adapter, Nose Gear	1
28	R-1820	Pad, Main Gear	1
29	N-2228-12-S-B	Elbow, Female Pipe	1
30	A-1155-01	Angle, Hose Support	1
31	HC-1551	Link, 4 gpm Fusible	1
32	N-2205-02-S	Plug, Hollow Hex	1
33	G-1100-105504	Bolt, Hex Head, Grade 5, 1/4-28 x 1/2" long	2
34	G-1250-1050N	Flatwasher, 1/4 Narrow	2
35	TF-1104-01*31.0	Assembly, Hose (#4 Mineral Base)	1
Not Shown	Z-3928	Assembly, Lear Box	1
Not Shown	HK-1508	Kit, Hydraulic Pump Seal	1
		(This kit includes all soft seals, wipers and gaskets required to reseal the pump.)	
	K-3772	Kit, Replacement Hand Pump; consists of:	
22	H-1595-09	Hand Pump (Includes Labels)	1
23	N-2203-06-S	Nipple, Pipe	1
24	N-2713	Nipple, Hydraulic (Male)	1



APPENDIX I

**Enerpac
Instruction
&
Repair Parts List**



1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is **not** covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES



Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.



WARNING: Wear proper personal protective gear when operating hydraulic equipment.



WARNING: Stay clear of loads supported by hydraulics. A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.



WARNING: USE ONLY RIGID PIECES TO HOLD LOADS. Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.



DANGER: To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.



WARNING: Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 700 bar [10,000 psi]. Do not connect a jack or cylinder to a pump with a higher pressure rating.



Never set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury.



WARNING: The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system.




CAUTION: Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.





Do not drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.





IMPORTANT: Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.

 **CAUTION:** Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 65°C [150°F] or higher. Protect hoses and cylinders from weld spatter.

 **DANGER:** Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.

 **WARNING:** Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.

 **WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD.** Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.

 **Avoid situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.**



Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.



IMPORTANT: Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.



WARNING: Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.



CAUTION: Always use the handle to carry the pump. Carrying the pump by the hose may damage the hose and/or the pump.

SPECIFICATIONS – Use this instruction sheet for the following hand pump models.						
Hand Pump Specifications						
Model	Type (Speed)	Maximum Pressure Rating psi [bar]		Oil Volume per Stroke in ³ [cm ³]		Usable Oil Capacity in ³ [cm ³]
EHF-65	1	6,500 [440]		.16 [2.62]		22 [360]
P-18	1	2,850 [200]		.16 [2.62]		22 [360]
P-25	1	2,500 [170]		.58 [9.51]		231 [3786]
P-39, 1003	1	10,000 [700]		.16 [2.62]		43 [705]
P-50	1	5,000 [340]		.29 [4.75]		231 [3786]
P-51	1	3,000 [210]		.25 [4.09]		50 [820]
P-141, 1001	1	10,000 [700]		.055 [.90]		20 [328]
P-391, 1004	1	10,000 [700]		.151 [2.47]		55 [900]
		Stage 1	Stage 2	Stage 1	Stage 2	
P-80, 1006	2	350 [25]	10,000 [700]	.99 [16.23]	.15 [2.46]	140 [2295]
P-84	2	350 [25]	10,000 [700]	.99 [16.23]	.15 [2.46]	140 [2295]
P-142, 1002	2	200 [14]	10,000 [700]	.221 [3.62]	.055 [.90]	20 [328]
P-142AL	2	200 [14]	10,000 [700]	.221 [3.62]	.055 [.90]	9.0 [148]
P-202	2	200 [14]	10,000 [700]	.221 [3.62]	.055 [.90]	55 [900]
P-392, 1005	2	200 [14]	10,000 [700]	.687 [11.26]	.151 [2.47]	55 [900]
P-392AL	2	200 [14]	10,000 [700]	.687 [11.26]	.151 [2.47]	55 [900]
P-462	2	200 [14]	10,000 [700]	7.69 [126.00]	.29 [4.75]	462 [7572]
P-464	2	200 [14]	10,000 [700]	7.69 [126.00]	.29 [4.75]	462 [7572]
P-801	2	350 [25]	10,000 [700]	.99 [16.23]	.15 [2.46]	250 [4095]
P-802	2	400 [28]	10,000 [700]	2.40 [39.34]	.15 [2.46]	155 [2540]
P-842	2	400 [28]	10,000 [700]	2.40 [39.34]	.15 [2.46]	155 [2540]

3.0 DESCRIPTION

3.1 Models P-141, 1001; P-142, 1002; P-202; P-391, 1004; P-392, 1005; P-802; P-842

Figure 1 and the corresponding table show the main components of hand pump models P-141, P-142, P-202, P-391, P-392, P-802, and P-842. The dual-purpose vent/fill cap acts as a pressure relief valve in case of accidental reservoir pressurization. To provide an access port at the rear of the reservoir for remote valves, use a return-to-tank kit. See the Table 1 for kit model numbers.

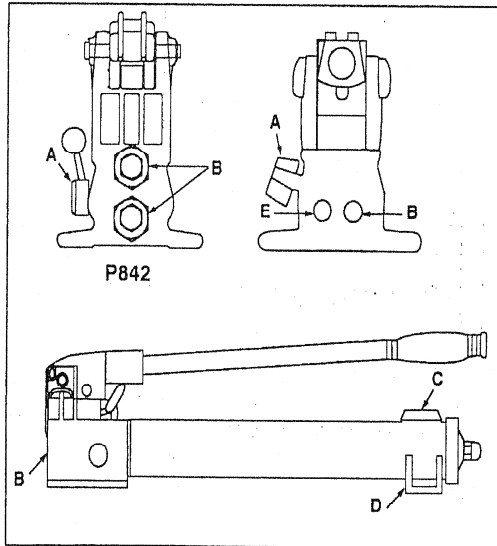


Figure 1

3.2 Models P-18/P-39, 1003/P-80, 1006/P-84/P-801

Figure 2 and the corresponding table below show the main components of these hand pump models. Model P-84 is equipped with a 4-way, 3-position valve for use with double-acting cylinders. To convert models P-18 or P-39 to foot operation, order Kit PC-10.

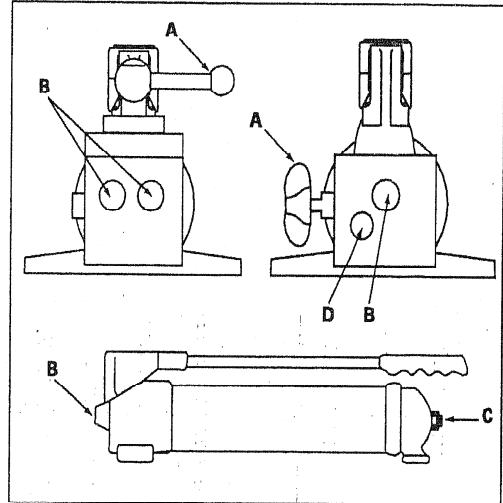


Figure 2

WARNING: These pumps are operated with a non-vented reservoir. If the reservoir is subjected to high pressure, the casing may rupture, causing personal injury and/or equipment damage. NEVER attempt to return more oil to the reservoir than it is capable of holding.

Fig. 1	P-141, 1001	P-142, 1002	P-202	P-391, 1004	P-392, 1005	P-802	P-842
A	Release Valve	Release Valve	Release Valve	Release Valve	Release Valve	Release Valve	4-Way Valve
B	1/4 NPTF Outlet Port	1/4 NPTF Outlet Port	1/4 NPTF Outlet Port	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port
C	Vent/Fill Cap	Vent/Fill Cap	Vent/Fill Cap	Vent/Fill Cap	Vent/Fill Cap	Vent/Fill Cap	Vent/Fill Cap
D	—	Mounting Slots	—	—	—	Mounting Slots	Mounting Slots
E	—	—	—	—	—	Return-to-Tank Port	—
Return-to-Tank Kit	PC-20	PC-20	PC-25	PC-25	PC-25	—	—

Fig. 2	P-18	P-39, 1003	P-80, 1006	P-84	P-801
A	Release Valve	Release Valve	Release Valve	Release Valve	Release Valve
B	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port
C	Fill Plug	Fill Plug	Fill Plug	Fill Plug	Fill Plug
D	—	—	1/4 NPTF Return-to-Tank Port	—	1/4 NPTF Return-to-Tank Port

3.3 Models P-462 and P-464

Figure 3 and the table below show the main features of hand pump models P-462, for use with single-acting cylinders, and P-464, for use with double-acting cylinders.

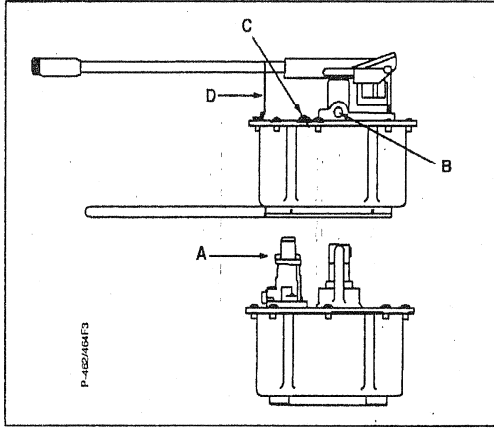


Figure 3, Models P-462, P-464

Table 3		
Fig. 3	P-462	P-464
A	3-Way 2-Position Valve	4-Way 3-Position Valve
B	3/8 NPTF Outlet Port	3/8 NPTF Outlet Port
C	Vent/Fill Plug	Vent/Fill Plug
D	Handle Clip	Handle Clip

3.4 Models P-25, P-50, and P-51

Figure 4 shows hand pump models P-25 and P-50, both of which are equipped with a handle that operates in both directions. Figure 5 shows the P-51 hand pump. The main components of these pumps are listed in the table below.

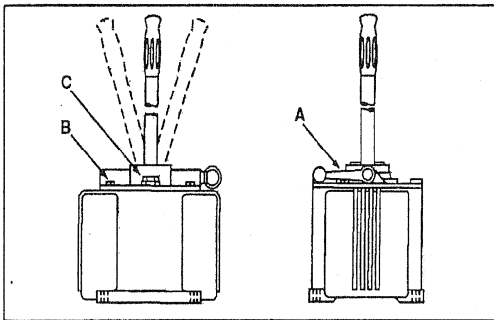


Figure 4, Models P-25 and P-50

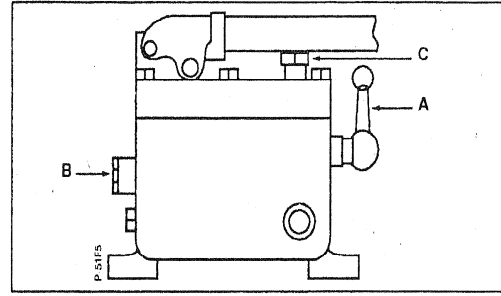


Figure 5, Model P-51

Table 4 and 5			
Fig. 4 & 5	P-25	P-50	P-51
A	Release Valve	Release Valve	Release Valve
B	1/4 NPTF Outlet Port	1/4 NPTF Outlet Port	1/4 NPTF Outlet Port
C	Vent/Fill Cap	Vent/Fill Cap	Vent/Fill Cap

4.0 INSTALLATION

4.1 Connecting the Pump

1. Thread hose into pump outlet. Use 1 1/2 wraps of Teflon tape (or suitable thread sealant) on hose fitting, leaving the first complete thread free of tape to ensure that tape does not shed into hydraulic system, causing damage. Trim loose ends.
2. Install a pressure gauge in-line from the pump for added safety and better control.
3. Connect the hose(s) to your cylinder or tool.

NOTE: For single-acting cylinders, connect one hose from the pump to the cylinder. For double-acting cylinders, connect two hoses. Connect one hose from the pressure port of the pump to the pressure port of the cylinder. Connect another hose from the retract port of the pump to the retract port of the cylinder.

4.2 Pump Venting

See table below to determine if your pump should be operated with a vented or non-vented reservoir. Vented pumps provide slightly better performance. For pumps with nylon reservoir, turn vent/fill cap 1/4 turn counter-clockwise to vent. For other pumps, see decal on pump. Close vent prior to transporting pump to prevent oil leakage.

VENTING OPTIONS	
EHF-65.....non-vented	P-142AL.....non-vented
P-18.....non-vented	P-202.....either
P-25.....either	P-391, 1004.....either
P-39, 1003.....non-vented	P-392, 1005.....either
P-50.....either	P-392AL.....vented
P-51.....vented	P-462.....vented
P-80, 1006.....non-vented	P-464.....vented
P-84.....non-vented	P-801.....non-vented
P-141, 1001.....either	P-802.....either
P-142, 1002.....either	P-842.....either

4.3 Pump Position

See table below to determine the correct operating position for your pump, horizontal or vertical.

OPERATING POSITION

EHF-65.....either	P-142AL.....either
P-18.....either	P-202.....either
P-25.....horizontal only	P-391, 1004.....either
P-39, 1003.....either	P-392, 1005.....either
P-50.....horizontal only	P-392AL.....either
P-51.....horizontal only	P-462.....horizontal only
P-80, 1006.....either	P-464.....horizontal only
P-84.....either	P-801.....either
P-141, 1001.....either	P-802.....either
P-142, 1002.....either	P-842.....either

NOTE: When operating the pump in the vertical position, the hose end must be pointed down, or the pump will pick up air and will not build pressure properly.

5.0 OPERATION

5.1 Before Using the Pump

1. Check all system fittings and connections to be sure they are tight and leak free.
2. Check oil level in reservoir before operating pump. See "Adding Oil to the Pump" on page 7.



CAUTION: NEVER add extensions to pump handle. Extensions cause unstable pump operation.



WARNING: In certain situations the pump handle can "kick back". Always keep your body to the side of the pump, away from the line of force of the handle.

NOTE: To reduce handle effort at high pressure, take short strokes. Maximum leverage is obtained in the last 5° of stroke.

5.2 Using Two-Speed Pumps

These pumps provide 2-stage flow. Under no-load, the pump operates in the high flow first stage for rapid advance. When the load is contacted, the pump automatically shifts to the second stage for building pressure. For **P-462 or P-464 models**, when pump pressure reaches approximately 200 psi [14 bar], you must momentarily stop pumping and raise the handle to shift to the high pressure stage. For **P-802 or P-842 models**, when pump pressure reaches approximately 400 psi [28 bar], you must momentarily stop pumping and raise the handle to shift to the high pressure stage. After the pump shifts, pumping takes less effort.

NOTE: For best performance, operate pump handle at moderate speed during the high flow first stage. Rapid handle speed in the first stage will prevent the pump from delivering full volume of oil.

5.3 Single-Acting Applications with Release Valve

1. Close release valve by turning clockwise, as shown in Figure 6.

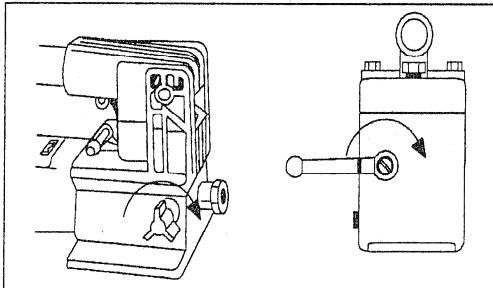


Figure 6



CAUTION: Close release valve finger tight ONLY. Using tools on release valve can damage it and cause the pump to malfunction.

2. Operate pump handle to deliver hydraulic power to system. Pressure will be maintained until release valve is opened.
3. Open release valve (turn counter-clockwise) to release pressure, allowing oil to flow back to the reservoir.

5.4 Single-Acting Applications with 3-Way, 2 Position Manual Valve

1. Shift valve handle to position 1 as shown in Figure 7.
2. Operate pump handle to deliver hydraulic power to the system. Pressure will be maintained until the valve is shifted.
3. To allow oil to return to the reservoir, shift valve handle to position 2.

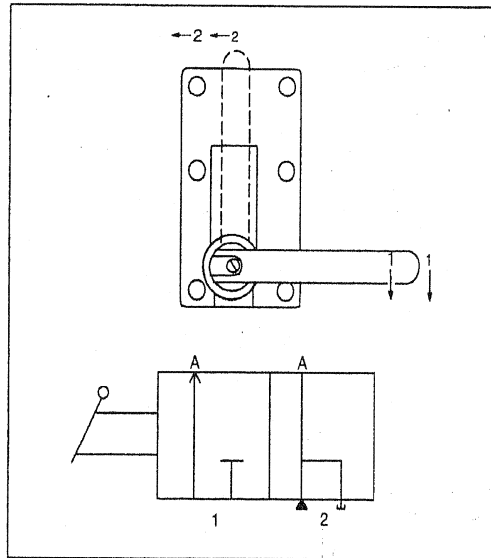


Figure 7

5.5 Double-Acting Applications with 4-Way, 3 Position Manual Valve

Pumps with 4-way control valves are designed to operate double-acting cylinders. See Figure 8 for valve positions.

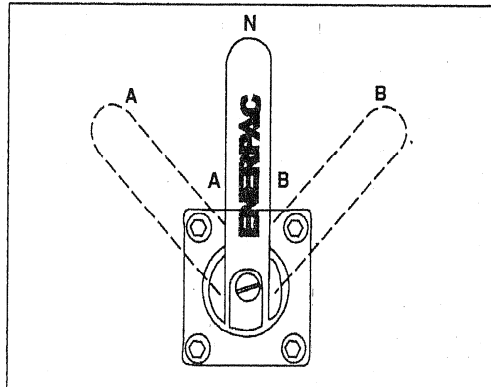


Figure 8a

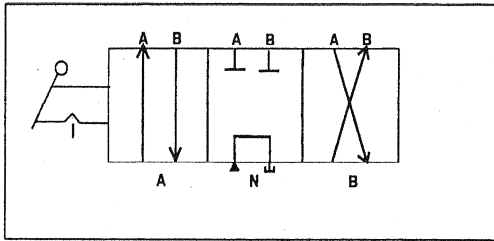


Figure 8b

1. Position lever on 4-way valve to select function as follows:
 (A) Flow to Port "A"; port "B" returns flow to the reservoir
 (N) Neutral; ports "A" and "B" are blocked
 (B) Flow to port "B"; port "A" returns flow to the reservoir

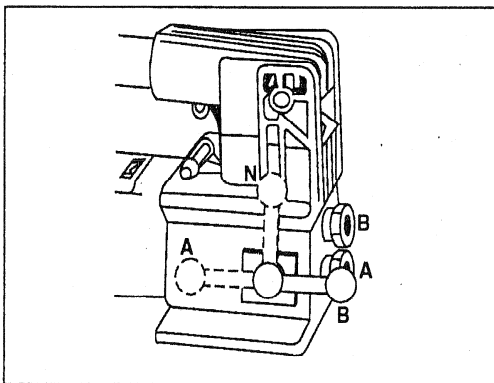


Figure 8c

2. Operate pump to perform work.
3. Change valve positions as needed.

WARNING: Operate double-acting cylinder only when both hoses are connected to the pump. If one coupler is left unconnected, high pressure will build behind the coupler which could cause personal injury and/or equipment damage.

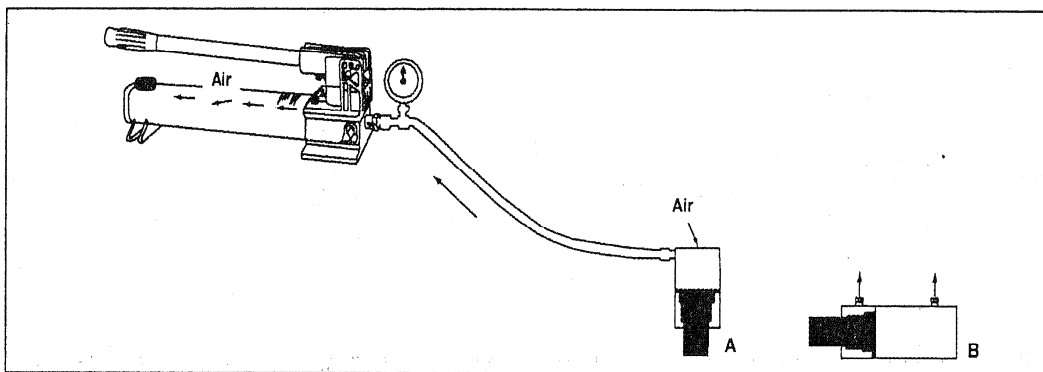


Figure 9

5.6 Relief Valve Adjustment

All pumps contain a factory set relief valve to prevent over-pressurization of the system. Lower pressure settings can be obtained. Contact your Authorized Enerpac Service Center.

6.0 AIR REMOVAL

Removing air from the hydraulic system will help the cylinder to advance and retract smoothly (see figure 9).

6.1 Pump With Single-Acting Cylinder (A)

1. Vent pump reservoir (for vented pumps only) and close release valve.
2. Position pump at higher elevation than cylinder.
3. Position cylinder with the plunger end down (up if using pull cylinder). See Figure 9 below.
4. Operate pump to fully extend the cylinder (retract if using pull cylinder).
5. Open release valve to retract cylinder (extend if a pull cylinder). This will force the trapped air to move up to the pump reservoir.
6. Repeat the above steps as necessary.
7. Add oil if necessary. See page 7.
8. Return vent/fill cap to operating position.

6.2 Pump With Double-Acting Cylinder (B)

1. Vent pump reservoir (for vented pumps only).
2. Position pump at higher elevation than cylinder.
3. Put cylinder in horizontal position with ports up. See Figure 9.
4. Fully advance and retract the cylinder 2 to 3 times.
5. Repeat the above steps as necessary.
6. Add oil if necessary. See page 7.
7. Return vent/fill cap to operating position.

7.0 MAINTENANCE

Use only Enerpac hydraulic oil with these pumps to promote long pump life and to protect your warranty. Viton and EPR seal kits are available for some hand pumps. Contact your Enerpac representative for more information on these products and their applications.

7.1 Adding Oil to the Pump

Check oil level regularly.



WARNING: Always add oil with cylinders fully retracted (extended if pull cylinders) or the system will contain more oil than the reservoir can hold.

1. Remove vent/fill cap from reservoir.
2. Fill reservoir only to level mark shown on pump.
3. Remove air from system if necessary. See page 6. Recheck oil level after removing air.
4. Return vent/fill cap to proper position.

NOTE: Non-vented hand pumps require air in the reservoir to function properly. If the reservoir is completely filled, a vacuum will form preventing oil from flowing out of the pump.

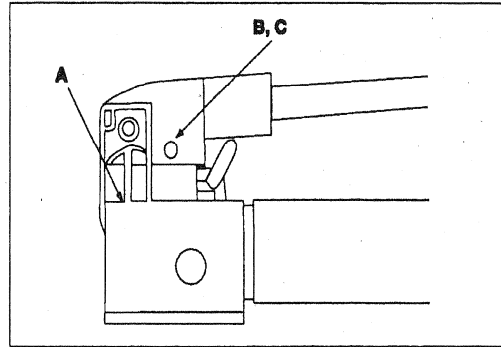


Figure 10

7.2 Keeping Oil Lines Clean

When coupler halves are disconnected, always screw on dust caps. Use every precaution to guard unit against entrance of dirt because foreign matter may cause pump, cylinder, or valve failure.

7.3 Lubricating the Pump

To extend pump life and improve performance, lubricate the beam pin (A), cross pin (B), and piston head (C) regularly, using roller bearing grease. See Figure 10.

7.4 Changing the Oil

1. Drain all oil and refill with clean Enerpac oil every 12 months. If pump is used in dirty environments, change the oil more often.
2. Remove vent/fill cap or plug from reservoir.
3. Tilt pump to drain out old oil.
4. Fill reservoir only to level mark shown on pump.
5. Replace the vent/fill cap or plug.
6. Dispose of used oil properly.

8.0 TROUBLESHOOTING GUIDE

The following information is intended as an aid in determining if a problem exists. For repair service, contact the Authorized Enerpac Service Center in your area.

TROUBLESHOOTING		
Problem	Possible Cause	Solution
Cylinder does not advance, advances slowly, or advances in spurts.	<ol style="list-style-type: none"> 1. Oil level in pump reservoir is low. 2. Release valve open. 3. Loose hydraulic coupler. 4. Load is too heavy. 5. Air trapped in system. 6. Cylinder plunger binding. 	<ol style="list-style-type: none"> 1. Add oil according to the Maintenance instructions on page 6. 2. Close the release valve. 3. Check that all couplers are fully tightened. 4. Do not attempt to lift more than rated tonnage. 5. Remove air according to the instructions on page 6. 6. Check for damage to cylinder. Have cylinder serviced by a qualified hydraulic technician.
Cylinder advances, but does not hold pressure.	<ol style="list-style-type: none"> 1. Leaking connection. 2. Leaking seals. 3. Internal leakage in pump. 	<ol style="list-style-type: none"> 1. Check that all connections are tight and leak free. 2. Locate leak(s) and have equipment serviced by a qualified hydraulic technician. 3. Have pump serviced by a qualified hydraulic technician.
Cylinder does not retract, retracts part way, or retracts more slowly than normal.	<ol style="list-style-type: none"> 1. Release valve closed. 2. Pump reservoir is over-filled. 3. Loose hydraulic coupler. 4. Air trapped in system. 5. Hose I.D. too narrow. 6. Cylinder retraction spring broken or other cylinder damage. 	<ol style="list-style-type: none"> 1. Open release valve. 2. Drain oil level to full mark. See page 7 instructions for adding oil. 3. Check that all couplers are fully tightened. 4. Remove air according to the instructions on page 6. 5. Use larger diameter hydraulic hose. 6. Have cylinder serviced by a qualified hydraulic technician.

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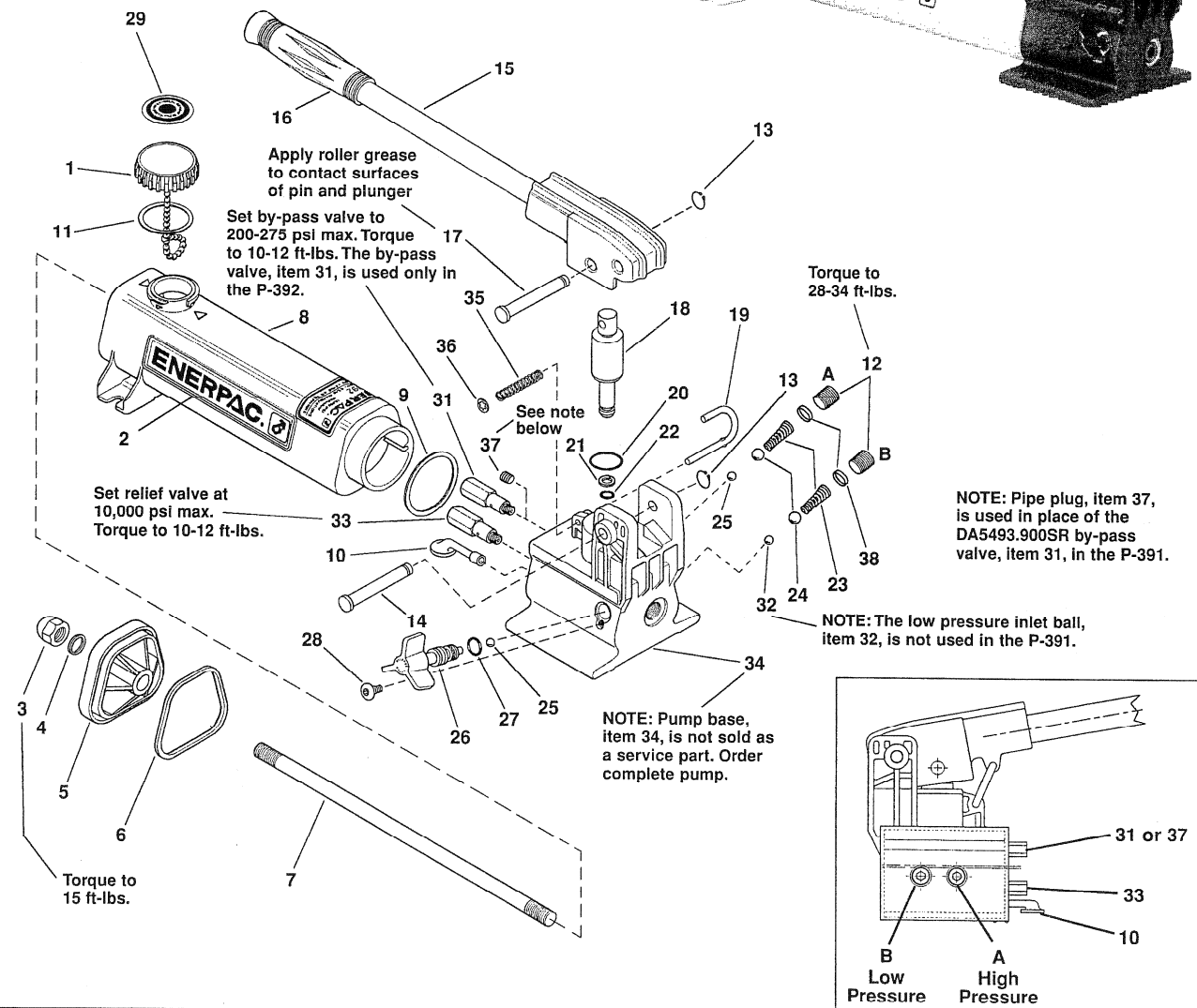
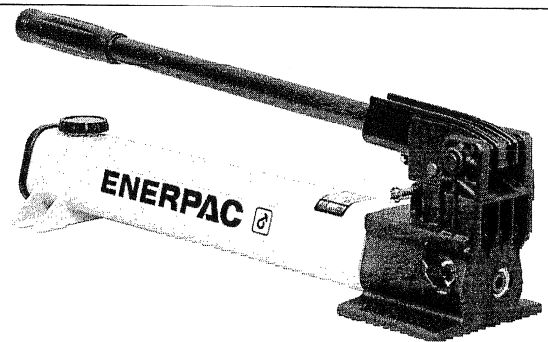
All Enerpac products are guaranteed against defects in workmanship and materials for as long as you own them.
For your nearest authorized Enerpac Service Center, visit us at www.enerpac.com

To Protect Your Warranty, Use Only ENERPAC Hydraulic Oil.

Enerpac recommends that all kit components be installed to insure optimum performance of the repaired product.

WARNING:

To ensure that the internal relief valve setting is correct, check the model number when servicing the product. The setting may require adjustment based on the pressure setting designated by the dash code (-XXXX) of the model number.



Repair Parts List for Figure 1

Item	Part No.	Qty.	Description	Item	Part No.	Qty.	Description
1	CN766950SR	1	Vent Cap Assembly (incl. item 11,29)	19	CM927061SR	1	Locking Pin (incl. item 35,36)
2	★	1	Enerpac Decal	20	★	1	O-Ring
3	CL341055	1	Acorn Nut	21	★	1	Back-Up Ring
4	★	1	Gasket	22	★	1	O-Ring
5	CN814020SR	1	End Cap (incl. item 3,4,6)	23	★	2	Spring
6	★	1	Gasket O-Ring	24	★	2	5/16" Ball
7	CL127149	1	Tie Rod	25	★	2	7/32" Ball
8	CR72025SR	1	Reservoir (yellow incl. item 2,3,4,6,9,11)	26	CL913900SR	1	Spindle Assembly (incl. item 25,27,28)
	S95032025	1	Reservoir (red incl. item 2,3,4,6,9,11)	27	★	1	O-Ring
9	★	1	Gasket	28	★	1	Screw
10	DA3729900SR	1	Oil Filter	29	★	1	Vent Cap Decal
11	★	1	Gasket	31	DA5493900SR	1	Bypass Valve (P392 Only)
12	CN815006	2	Pipe Plug	32	★	1	7/32" Inlet Check Ball (P392 Only)
13	★	2	Retaining Ring	33	DA8802900SR	1	Relief Valve
14	★CR214061SR	1	Beam Pin (incl. item 13)	34	Order complete pump	1	Base (not available as service item)
15	CL918900SR	1	Beam and Handle Assembly	35	★	1	Spring
16	CL343550	1	Handle Grip	36	★	1	Retaining Ring
17	DC106061SR1	1	Cross Pin	37	A1006245	1	Pipe Plug (P391 Only)
18	CR333040SR	1	Plunger Assembly (incl. item 13,17,21,22)	38	★	2	Spring Cap

★ Indicates items included in, and available only as part of Repair Kit P391K2

NOTE: Bypass Valve, Item 31, and Inlet Check Ball, Item 32, are not used in the single-speed P391 model Pump.
Use Item 37 in place of Item 31.

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All Enerpac products are guaranteed against defects in workmanship and materials for as long as you own them.
For your nearest authorized Enerpac Service Center, visit us at www.enerpac.com



APPENDIX II

MSDS

**Hydraulic Fluid
(MIL-H-5606)**

TRONAIR MSDS-1029



490110-00 MOBIL AERO HFA
MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL AERO HFA
SUPPLIER: EXXONMOBIL OIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037

24 - Hour Health and Safety Emergency (call collect): 609-737-4411

24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296

Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: <http://emmsds.ihssolutions.com/>

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: PET. HYDROCARBONS AND ADDITIVES

GLOBALLY REPORTABLE MSDS INGREDIENTS:

None.

OTHER INGREDIENTS:

Substance Name	Approx. Wt%
HYDROTREATED LIGHT NAPHTHENIC DISTILLATE (PETROLEUM) (64742-53-6)	85-95

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

This product is considered hazardous according to regulatory guidelines
(See Section 15).

EMERGENCY OVERVIEW: Red Liquid. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Low viscosity material-if swallowed may

enter the lungs and cause lung damage. Prolonged repeated skin contact with low viscosity materials may defat the skin resulting in possible irritation and dermatitis.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. Discard shoes if material has penetrated to inside surfaces. High pressure accidental injection through the skin requires immediate medical attention for possible incision, irrigation and/or debridement.

INHALATION: Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance and call a physician. If breathing has stopped, use mouth to mouth resuscitation.

INGESTION: Get medical assistance and call a physician immediately. Do not induce vomiting or give anything by mouth to an unconscious person.

NOTE TO PHYSICIANS: Material if ingested may be aspirated into the lungs and can cause chemical pneumonitis. Treat appropriately.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.

SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None.

COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.

Flash Point C(F): > 105(221) (ASTM D-93).

Flammable Limits (approx.% vol.in air) - LEL: NE, UEL: NE

NFPA HAZARD ID: Health: 1, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills as required to appropriate authorities. U. S. Coast Guard regulations require immediate reporting of spills that could reach any waterway including intermittent dry creeks. Report spill to Coast Guard toll free number (800) 424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: Eliminate all ignition sources. Ventilate area. Adsorb on fire retardant treated sawdust, diatomaceous earth, etc. Shovel up with spark-resistant

shovel and remove to appropriate waste disposal facility in accordance with current applicable laws and regulations.
ENVIRONMENTAL PRECAUTIONS: Prevent spills from entering storm sewers or drains and contact with soil.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: Avoid prolonged repeated skin contact. Avoid inhalation of vapors or mists. Wash thoroughly after handling. High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention.

STORAGE: Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Store in a cool, dry, well ventilated area away from heat.

SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.

EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS: When mists/aerosols can occur, the following are recommended: 5 mg/m³(as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m³ (as oil mist)

- ACGIH Short Term Exposure Limit (STEL), 5 mg/m³ (as oil mist) - OSHA Permissible Exposure Limit (PEL)

VENTILATION: Use in well ventilated area. If mechanical ventilation is necessary, equipment should be explosion proof.

RESPIRATORY PROTECTION: Approved respiratory protective equipment must be used when vapor or mists concentrations exceed applicable standards. No special requirements under ordinary conditions of use and with adequate ventilation.

EYE PROTECTION: Normal industrial eye protection practices should be employed.

SKIN PROTECTION: If prolonged or repeated skin contact is likely, impervious gloves should be worn. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid

COLOR: Red

ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): NE
MELTING POINT C(F): NA
FLASH POINT C(F): > 105 (221) (ASTM D-93)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: NE
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.85
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: NE
VISCOSITY AT 40 C, cSt: 13.8
VISCOSITY AT 100 C, cSt: 5.3
POUR POINT C(F): -70 (-94)
FREEZING POINT C(F): NE
VOC: < 80.00 (Wt. %); 5.669 lbs/gal
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Heat, sparks, flame and build up of static
electricity. Protect from direct sunlight.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at
ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000
mg/kg). ---Based on testing of similar products and/or the
components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than
2000 mg/kg). ---Based on testing of similar products and/or the
components.
INHALATION TOXICITY (RATS): Not established
EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score:
greater than 6 but 15 or less). ---Based on testing of similar
products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary
Irritation Index: greater than 0.5 but less than 3). ---Based
on testing of similar products and/or the components.

---SUBCHRONIC TOXICOLOGY (SUMMARY)---

Severely solvent refined and severely hydrotreated mineral base oils
have been tested at Mobil Environmental and Health Sciences
Laboratory by dermal application to rats 5 days/week for 90 days

at doses significantly higher than those expected during normal industrial exposure. Extensive evaluations including microscopic examination of internal organs and clinical chemistry of body fluids, showed no adverse effects.

---CHRONIC TOXICOLOGY (SUMMARY)---

The base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as the Mobil Modified Ames Test and IP-346.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS: This environmental assessment was conducted using information on the individual components as no test data was available for this specific formulation.

ECOTOXICITY: This material is not expected to be harmful to aquatic organisms.

MOBILITY: Dissolution of the higher molecular weight hydrocarbon components in water will be limited, but losses through sediment adsorption may be significant.

PERSISTENCE AND DEGRADABILITY: The majority of the components in this product are expected to be inherently biodegradable.

BIOACCUMULATIVE POTENTIAL: This product contains components with the potential to bio-accumulate.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value or disposal by supervised incineration. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.

RID/ADR: NOT REGULATED BY RID/ADR.

IMO: NOT REGULATED BY IMO.

IATA: NOT REGULATED BY IATA.

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined to be hazardous.

EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives.

Symbol: Not applicable.

Risk Phrase(s): Not applicable.

Safety Phrase(s): S24-62.

Avoid contact with skin. If swallowed, do not induce vomiting:
seek medical advice immediately and show this container or label.

Contains: Low Viscosity Oil.

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, METI, and DSL.

U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".

SARA (311/312) REPORTABLE HAZARD CATEGORIES:
CHRONIC ACUTE

This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
TRIPHENYL PHOSPHATE (0.15%)	115-86-6	22

--- REGULATORY LISTS SEARCHED ---

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

Code key: CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: AVIATION HYDRAULIC FLUID

NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES ARE NOT FORMULATED TO CONTAIN PCBS.

Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:

INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

Precautionary Label Text:

CONTAINS LOW VISCOSITY OIL

CAUTION!

LOW VISCOSITY MATERIAL-IF SWALLOWED, MAY BE ASPIRATED AND CAN CAUSE SERIOUS OR FATAL LUNG DAMAGE. MAY CAUSE NOSE, THROAT AND LUNG IRRITATION, DIZZINESS, NAUSEA, LOSS OF CONSCIOUSNESS.

PROLONGED, REPEATED SKIN CONTACT MAY CAUSE IRRITATION.

Keep away from heat, sparks, and flame. Avoid breathing vapor. Avoid contact with skin or clothing. Keep container closed. Use with adequate ventilation.

FIRST AID: If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician immediately. In case of contact, wash skin with soap and water. Remove contaminated clothing. Call a physician if irritation persists. Wash or dispose of contaminated clothing. If swallowed, seek immediate medical attention. Do not induce vomiting. Only induce vomiting at the instruction of a physician.

For industrial use only. Not intended or suitable for use in or around a household or dwelling.

Empty container may contain product residue, including flammable or explosive vapors. Do not cut, puncture, or weld on or near container. All label warnings and precautions must be observed until container has been thoroughly cleaned or destroyed.

Refer to product Material Safety Data Bulletin for further safety and health information.

For Internal Use Only: MHC: 1* 1* NE 1* 1*, MPPEC: C, TRN: 490110-00,
ELIS: 400275, CMCS97: 970584, REQ: MIAMI, SAFE USE: C
EHS Approval Date: 12AUG2003

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