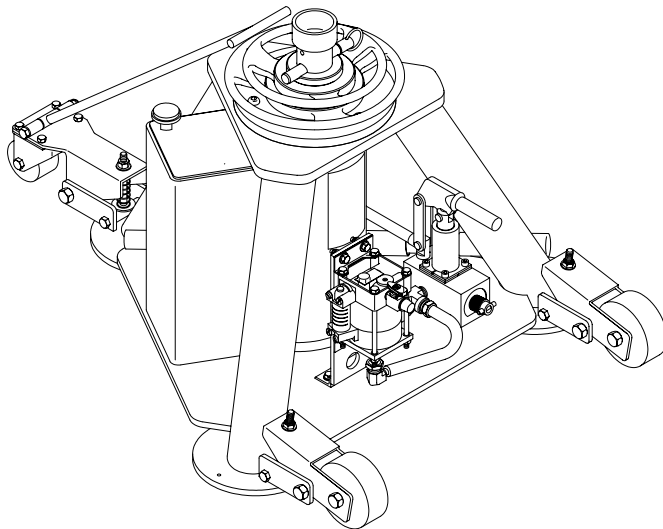




Operation & Service Manual



Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump

04/2007 – Rev. 05

Includes Illustrated Parts Lists

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**Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump**

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**Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump**

Revision	Date	Text Affected
04	11/2004	pg 2 5.1 Added warning and illustrations
05	04/2007	Modified Item 52 in Parts List

Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump

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

This Tronair Two Stage Jack incorporates the following quality features:

- Two-stage telescoping rams
- Powder Coated Steel Construction
- Mechanical ram lock speed nuts prevent lowering of jack under load
- Mechanical extension
- Single speed, manually operated pump with pressure relief
- Uses standard MIL-H-5606 hydraulic fluid.
- Spring loaded retractable wheels
- Pneumatic pump with one-fourth inch (¼") NPT air drive inlet
- Air Drive System Requirement: 10 scfm @ 100 psi (0.42 scm/min @ 6.9 bar)
- Maximum Pressure: 125 psi (8.6 bars)

2.0 USAGE

The purpose of the jack is to lift the aircraft for maintenance. See Specifications for capacity of jack.

3.0 SPECIFICATIONS

- Capacity: 20,000 lbs (9.07 metric ton)
- Mechanical Extension: 12 in (30.5 cm)
- Hydraulic Extension: 30 in (76.2 cm)
- Closed Height: 26 in (66.0 cm)
- Fully Extended: 68 in (172.7 cm)
- Weight: 300 lbs (136.1 kg)

4.0 ASSEMBLY INSTRUCTIONS

4.1 GENERAL INFORMATION

This product should be assembled and/or repaired using good workmanship practices and proper tools. Bolts and elastic stopnuts should be tightened to a torque not to exceed industry standards for Grade '5' bolts. The 3/8-24 bolts should be tightened to 35 ft-lbs (47.5 N-m).

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

4.2 PRE-USE CHECKS

Refer to the Parts Lists and Illustrations to identify and ensure that all parts are present.

- Generally check over unit to assure the tightness of all nuts, bolts and fittings.
- With rams completely collapsed, check hydraulic fluid level: correct level is three-quarter inch (¾"/1.9 cm) below vent, with the hydraulic ram fully retracted. Replenish with MIL-H-5606 fluid as required.

Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump

5.0 OPERATING INSTRUCTIONS

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



CAUTION!

1. **NEVER** put hands between aircraft and jack pad. Aircraft struts may hang up and allow aircraft to suddenly drop.
2. **NEVER** align jack under aircraft by pounding on jack legs. Dented legs may lead to jack collapse.
3. **ALWAYS** lower ram locking nut(s) as aircraft is raised. Be sure ram nut(s) is seated fully after jacking.
4. **ALWAYS** raise and lower jacks simultaneously so that aircraft remains level.
5. **ALWAYS** use a tail or nose stand for additional stability.

5.1 JACK INSTRUCTIONS

To Raise Aircraft:

1. Place jack on a hard, level surface.
2. Raise mechanical extension as close to aircraft jack pad as possible.
3. Close pump release valve and operate pump.

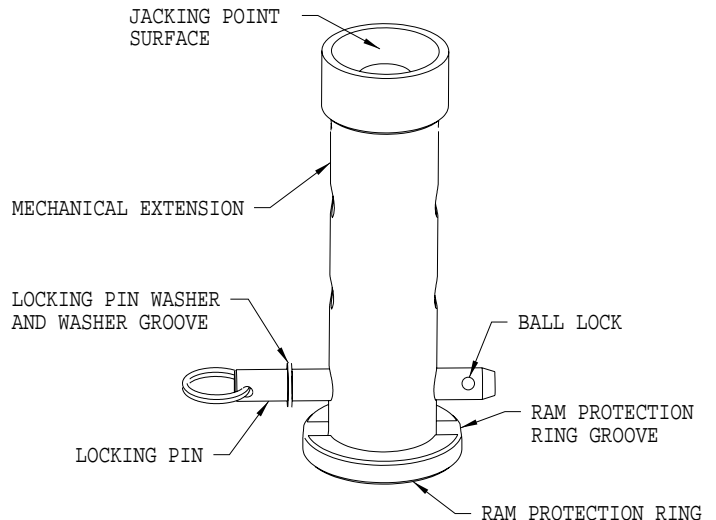
WARNING!



The locking pin **MUST** be placed in the ram protection ring groove and fully through the mechanical extension.

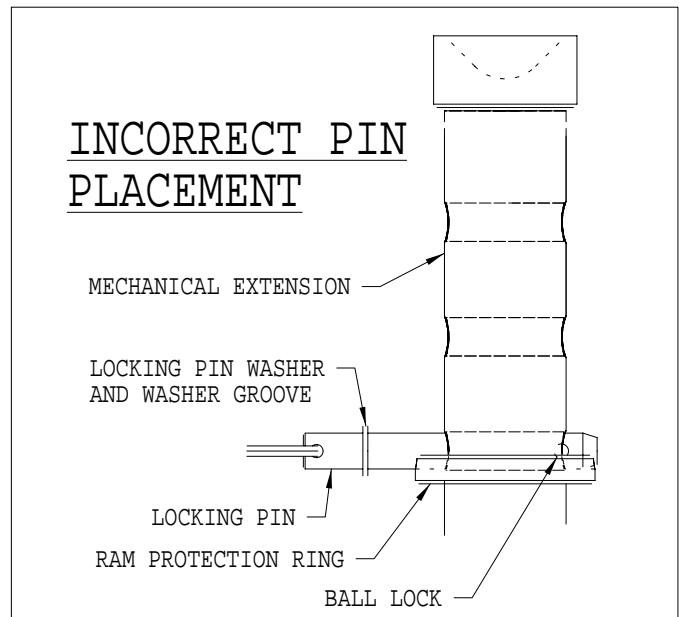
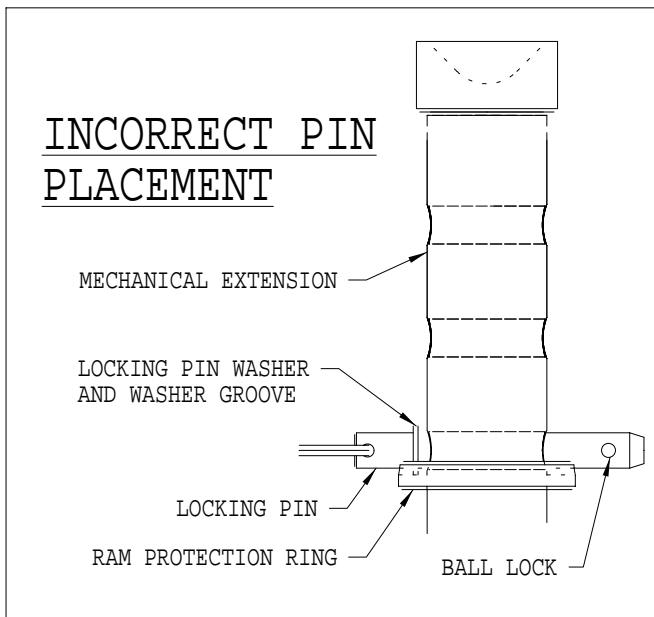
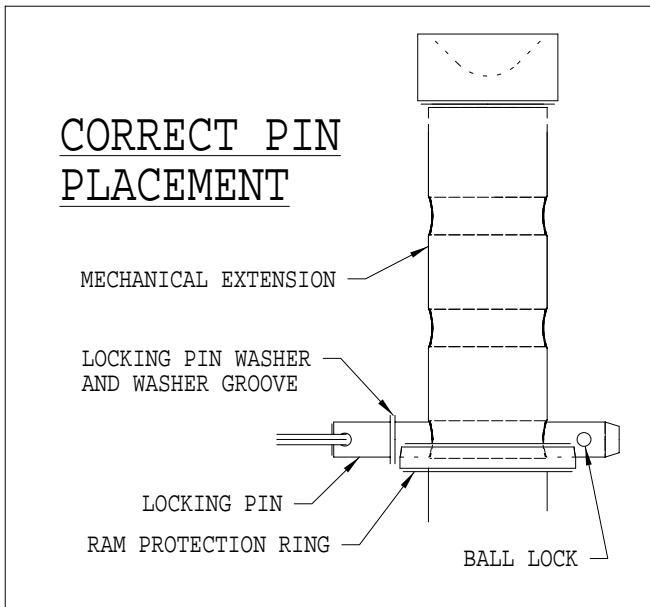
The locking pin washer and ball lock **MUST** be placed outside the ram protection ring.

- Do not place extra locking pins in any other hole on the mechanical extension.
- Insure mating surfaces to jack point are free of debris and damage.
- Under no conditions should the locking pin washer or washer groove be inside the ram protection ring groove.
- Under no conditions should the locking pin's ball lock be inside the ram protection ring groove.
- Never use the jack if the ram protection ring is not installed.
- Never use the locking pin without a locking pin washer.
- Never use a locking pin that has been damaged.
- Never use a ram protection ring that has been damaged or deformed.
- Failure to comply could result in premature failure below certified weight and could cause serious injury including death.



Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump

5.1 JACK INSTRUCTIONS (continued)



NOTE: Turning the pump relief valve counter-clockwise lowers the jack. Turning the pump release valve clockwise stops the jack's descent and allows it to be raised.

4. If air pump is to be used, be sure shop air needle valve is closed and attach shop air (125 psi/8.6 bars Maximum) to needle valve. Slowly open needle valve. Close needle valve when ram reaches required height.
5. Lower ram locknuts as aircraft is raised.

5.1 Jack instructions continued on following page.

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Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump

5.1 JACK INSTRUCTIONS *(continued)*



WARNING!

The ram locknuts are user operated safety devices. Failure to utilize these locknuts may result in personal injury or death.

To Lower Aircraft:

1. Lower all jacks simultaneously.
2. If ram locking nut(s) is tight, raise jack slightly to release nut(s).
3. Loosen pump release valve slightly to slowly lower aircraft. Raise locking nut(s) as jack ram(s) lower.

NOTE: *When using the jack during a washing or cleaning operation, the jack should be completely covered to protect it from cleaning solution, dirt and/or foreign material which might get on or between the ram and cylinder causing damage to the seals and O-rings.*

CAUTION!



- Do not place hands on top of jack near ram locknuts while lowering jack. Pinch points exist between top of jack and threads on ram.
- Always wear safety glasses while operating this equipment.

6.0 MAINTENANCE

6.1 GENERAL

- The jack should be stored with some type of cover to protect the jack from liquids (such as Skydrol or cleaning solutions) and other foreign matter that might get on or between ram and cylinder which will damage seals and O-rings.
- 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 both O-rings and backup rings once removed. Cut and damaged rings normally result in fluid leakage.
- If any cylinder bore is found to be rusty, they may be honed as follows:
 - First stage cylinder to a maximum diameter of 4.505 inches (11.443 cm)
 - Second stage ram to a maximum diameter of 3.379 inches (8.583 cm)
- Surface finish of all bores to be 16 micro inches. If the pitting in the bores cannot be removed by this process, the jack cylinder or ram in question must be replaced before the jack can be returned to service.
- At this time, flush old hydraulic fluid and dirt from overall system and replenish with new, clean hydraulic fluid.

Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump

6.0 MAINTENANCE *(continued)*

6.2 SERVICING JACK

90-Day Routine Maintenance

If jack is not being used on a regular basis, every 90 days the jack should be fully extended and retracted to exercise the seals and to prevent rust build up on the cylinder I.D. While ram is extended, clean the threads and spray with DoALL RPM, LPS, or equivalent that is water repellent and will not harm BUNA "N" O-rings.

To Disassemble Jack for Seal Replacement:

1. Raise first stage ram high enough to allow removal of the retaining snap ring.
2. Raise both first and second stage rams **together** to the point where this assembly can be lifted from the jack cylinder.

NOTE: *If the second stage ram is allowed to precede the first stage ram, it will fill with oil causing an oil spill when the assembly is removed from the cylinder.*

To Reassemble Jack:

1. Re-assemble in reverse order of above.
2. Spray I.D. of cylinder and O.D. of rams (Item 16, 59, 60) with DoALL RPM, LPS or equivalent water repellent that will not harm the Buna "N" O-rings to protect surfaces from rusting when not in use.

NOTE: *To minimize air entrapment under the rams, raise the oil level in the cylinder to chamfer of the cylinder prior to ram insertion.*

3. Lightly peen first thread on second stage ram to prevent nut removal after seal kit installation.

6.3 REMOVING AND SERVICING PUMP

NOTE: *If pump is found faulty, call the factory for replacement or replace seals as follows:*

1. Review Appendix I – HC-1752 Hand Pump (2,500 psi/172 bars) Parts List during the following steps.
2. Clamp suction (push on) hose and remove hose from pump.
3. Uncouple output hose from pump.
4. Remove two (2) pump mounting bolts. Remove pump.
5. Remove clevis pin assembly (Item 18).
6. Remove four (4) socket head cap screws.
7. Remove flanges.
8. Remove tube assembly (Item 16).
9. Replace O-rings and backup ring. (See Appendix I for kits available).
10. Re-assemble in reverse order.

6.4 JACK FUNCTION LOAD TEST

If function load testing of this jack is required:

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

6.5 PNEUMATIC PUMP

Reference Appendix II – Haskel MPL-20/46D information for complete parts list and repair information.

**Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump**

7.0 TROUBLE SHOOTING

JACK WILL NOT LOWER

PROBABLE CAUSE	CORRECTIVE ACTION
Ram lock nut not loosened	Rotate nut as ram is lowered
Broken pump release valve	Repair pump (See Appendix I Hand Pump Parts List for K-2783)
Bent ram	Replace suspected ram assembly
O-ring (pinched/rolled)	Replace packing. (See Parts List K-2025 & K-2026) Check cylinder and rams for rust and pitting on inside diameter walls. (Reference Section 6.0 Maintenance)

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 (See Parts List K-2025 & K-2026)
Leaky release valve	Tighten release valve (See Appendix I Hand Pump Parts List for K-2783)
Leaky pump O-ring packing	Repair pump (See Appendix I Hand Pump Parts List for K-1001)
Lack of oil	Refill reservoir with oil (MIL-H-5606). Check system for leaks
Sticking inlet check valve	Open release valve, pump rapidly to dislodge; Or repair pump
Air in hydraulic system	Bleed system. With rams fully retracted, open release valve. Pump rapidly and close release valve.

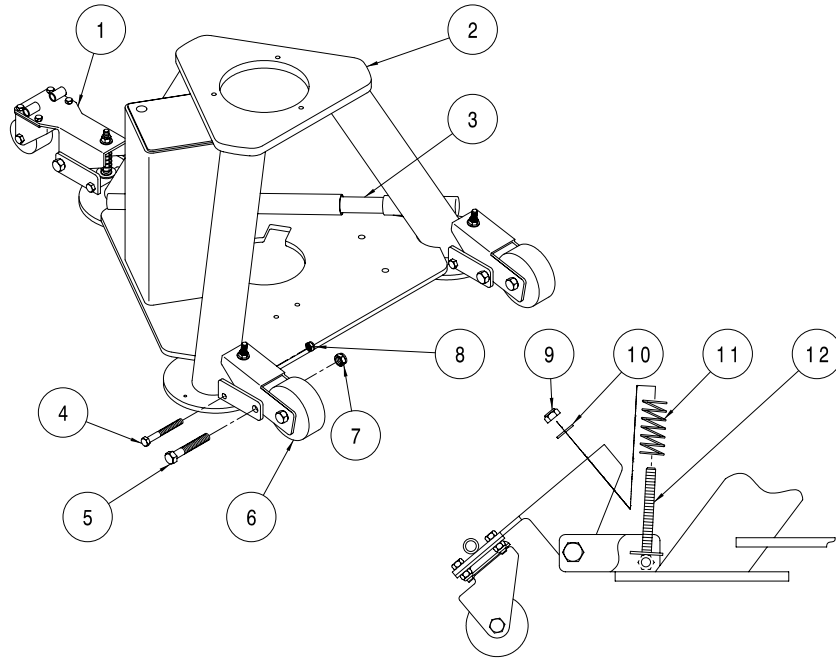
8.0 PARTS LISTS AND ILLUSTRATIONS

Reference Pages 7 to 11 for Replacement Parts and/or Kits.

Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump

Parts List

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

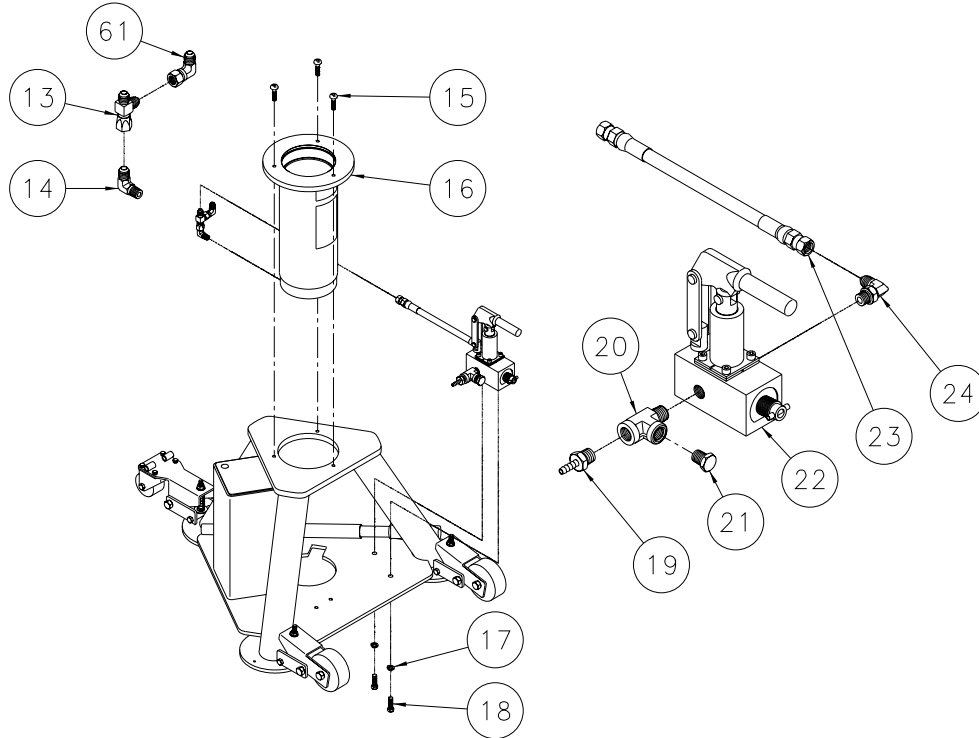


ITEM	PART NUMBER	DESCRIPTION	QTY
3.....	H-1009-01	Assembly, Pump Handle	1
	K-2024	Kit, Jack Weldment; consists of:	
2.....	Z-2323-01.....	Weldment, Jack (includes Labels)	1
	K-3072	Kit, Front Wheel; consists of:	
1.....	Z-2321	Assembly, Front Wheel	1
4.....	G-1100-107532	Bolt, Hex Head, Grade 5, 3/8-24 x 3¼" long	1
5.....	G-1100-109532	Bolt, Hex Head, Grade 5, 1/2-20 x 3¼" long	1
7.....	G-1203-1095	Jamnut, ½-20 Elastic.....	1
8.....	G-1203-1075	Jamnut, 3/8-24 Elastic.....	1
9.....	G-1202-1075	Stopnut, 3/8-24 Elastic	1
10.....	G-1250-1070N	Flatwasher, 3/8 Narrow	1
11.....	H-1766-07	Spring	1
12.....	Z-2302	Weldment, Pivot	1
	K-3073	Kit, Rear Wheel; consists of:	
4.....	G-1100-107532	Bolt, Hex Head, Grade 5, 3/8-24 x 3¼" long	1
5.....	G-1100-109532	Bolt, Hex Head, Grade 5, 1/2-20 x 3¼" long	1
6.....	Z-2322	Assembly, Rear Wheel.....	1
7.....	G-1203-1095	Jamnut, ½-20 Elastic.....	1
8.....	G-1203-1075	Jamnut, 3/8-24 Elastic.....	1
9.....	G-1202-1075	Stopnut, 3/8-24 Elastic	1
10.....	G-1250-1070N	Flatwasher, 3/8 Narrow	1
11.....	H-1766-07	Spring	1
12.....	Z-2302	Weldment, Pivot	1

Model: 02A7815-0110
 10 Ton (9.07 Metric)
 Two Stage Jack with Air Pump

Parts List

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

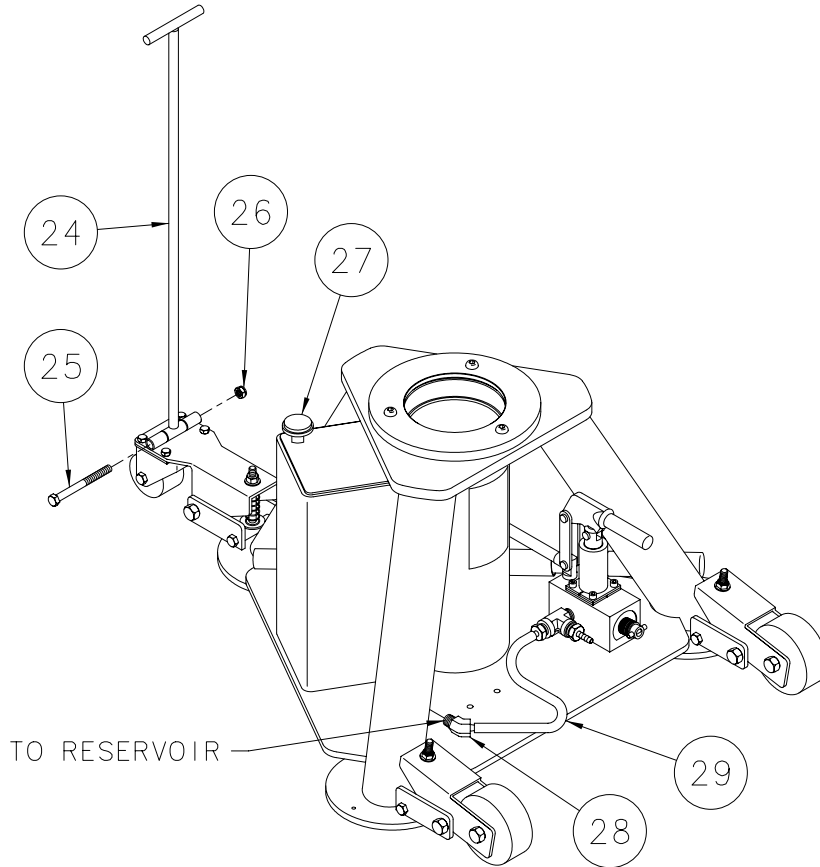


ITEM	PART NUMBER	DESCRIPTION	QTY
15	G-1154-107214	Capscrew, Socket Button Head	1
22	TF-1043-06*18.0	Assembly, Hose, 18" long	1
61	N-2002-05S	Elbow, Swivel Nut, 3/8" O.D. – JIC 37°	1
	K-2027	Kit, Hydraulic Pump; consists of:	
17	G-1251-1070R	Lockwasher, 3/8 Regular	2
18	G-1100-107010	Bolt, Hex Head, Grade 5, 3/8-16 x 1" long	2
19	N-2412-11	Connector, Male, 3/8 Hose x 3/8 NPT	2
20	N-2209-06-S	Tee, Street, 3/8 NPT	1
21	HC-1752	Hand Pump, Hydraulic	1
23	N-2001-08-S-B	Elbow, 90° Male, SAE #6 x 3/8" O.D. – JIC 37°	1
29	TF-1047-04*07.0	Hose, 3/8" Push-on x 7" long	1
	K-3308	Kit, Tube/Base Weldment; consists of:	
13	N-2016-05-S	Tee, Run, Swivel Nut, 3/8" O.D. – JIC 37°	1
14	N-2005-08-S	Elbow, 90° Male, SAE #6 x 1/4 NPT	1
16	Z-2259-02-01	Weldment, Tube/Base (includes Labels)	1

Model: 02A7815-0110
 10 Ton (9.07 Metric)
 Two Stage Jack with Air Pump

Parts List

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

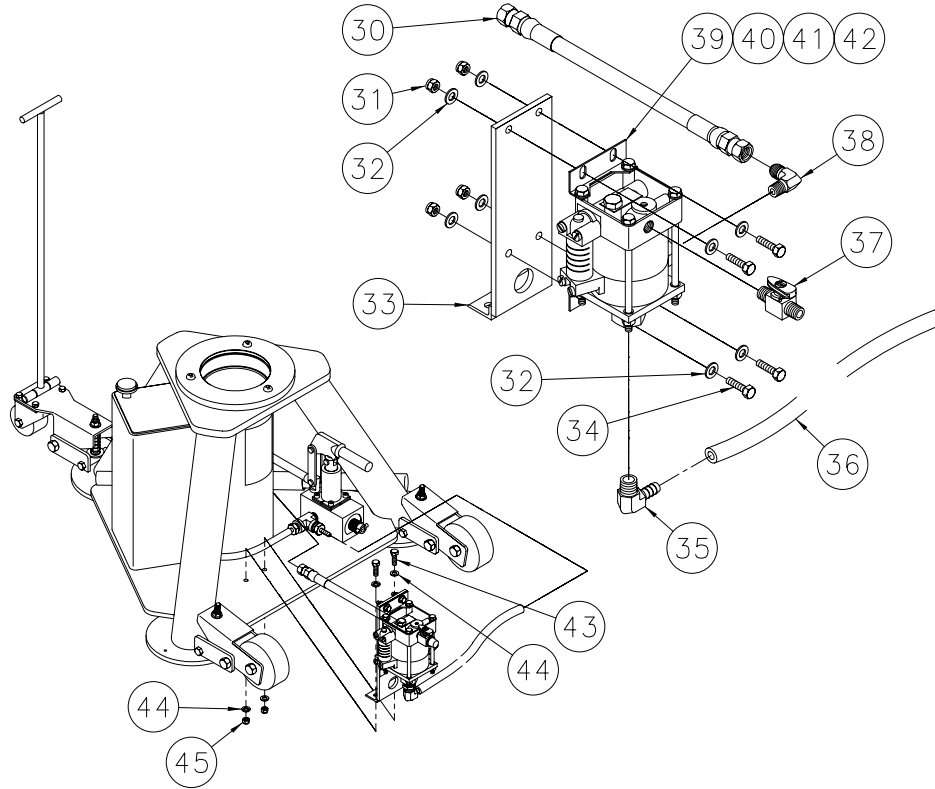


ITEM	PART NUMBER	DESCRIPTION	QTY
27	H-1045	Breather	1
28	N-2409-06	Elbow, 45° Male, 3/8 Hose x 1/8 NPT	1
29	TF-1047-04*07.0	Hose, 3/8" Push-on x 7" long	1
	K-3078	Kit, Handle; consists of:	
24	Z-2301-02	Weldment, Handle	1
25	G-1100-107540	Bolt, 90° Male SAE #6 x 1/4 NPT	1
26	G-1203-1075	Jamnut, 3/8-24 Elastic	1

Model: 02A7815-0110
 10 Ton (9.07 Metric)
 Two Stage Jack with Air Pump

Parts List

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

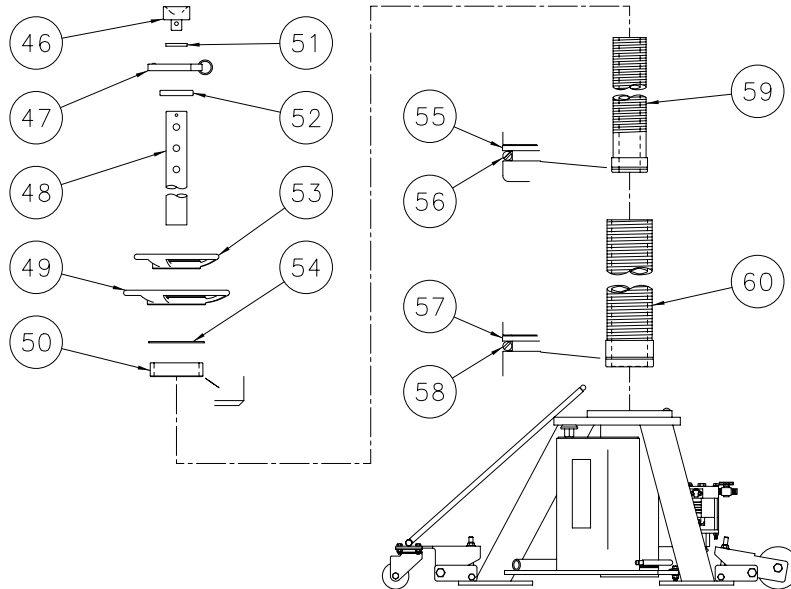


ITEM	PART NUMBER	DESCRIPTION	QTY
40	K-1685	Kit, Repair Fluid Seal..... <i>Ref. Haskel MLP-20/46D</i>	
41	K-1686	Kit, Repair Air Seal <i>Ref. Haskel MLP-20/46D</i>	
42	50866	Lubricant, Haskel Seal <i>Ref. Haskel MLP-20/46D</i>	
	K-3746	Kit, Air Pump; consists of:	
30	TF-1043-06*18.0	Assembly, Hose, 18" long	1
31	G-1202-1055	Stopnut, 1/4-28 Elastic	4
32	G-1250-1050N	Flatwasher, 1/4 Narrow	8
33	J-3415-01	Hose, 3/8" Push-on x 7" long	1
34	G-1100-105510	Bracket, Air Pump	4
35	N-2410-05	Elbow, 90° Male, 3/8" Hose x 3/8 NPT	1
36	TF-1047-04*07.0	Bolt, Hex Head, Grade 5, 1/4-28 x 1" long	1
37	H-1173	Valve, Plug	1
38	N-2005-08-S	Elbow, 90° Male, 3/8" O.D. – 37° JIC x 1/4 NPT	1
39	H-1174	Air Pump	1
43	G-1100-106512	Bolt, Hex Head, Grade 5, 5/16-24 x 1 1/4" long	2
44	G-1250-1060N	Flatwasher, 5/16 Narrow	4
45	G-1202-1065	Stopnut, 5/16-24 Elastic	2

**Model: 02A7815-0110
10 Ton (9.07 Metric)
Two Stage Jack with Air Pump**

Parts List

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



ITEM	PART NUMBER	DESCRIPTION	QTY
46	H-557	Pad, Jack	1
47	G-1318-1033	Pin, Model "D", 5/8" diameter x 3.3" long	1
48	R-1341-02	Shaft, Extension	1
49	H-2330	Lock Nut, First Stage	1
50	TR-1317-01	Tube, Stop	1
51	G-1300-25200	Pin, Roll, 1/4" diameter x 2" long	1
52	TR-1994	Ring, Ram Protection	1
53	H-2333	Lock Nut, Second Stage	1
59	Z-2256-02	Ram, Second Stage	1
60	Z-2294-02	Ram, First Stage	1
	K-3860	Kit, Ram Seal; consists of:	
54	G-1396-71	Ring, Retaining	1
55	HC-2020-337	Ring, Backup	1
56	HC-2033-337	O-ring, Series 2	1
57	HC-2020-346	Ring, Backup	1
58	HC-2033-345	O-ring, Series 2	1



APPENDIX I

**HC-1752
2,500 psi (172 bars)
Hand Pump
Parts List**



**Model: HC-1752
2,500 PSI Hand Pump**

Illustrated Parts List

08/2001 – Rev. OR

Tronair, Inc.

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Fax: (419) 867-0634

Web Site: www.tronair.com E-mail: sales@tronair.com

**HC-1752
2,500 PSI Hand Pump**

Parts List

- This pump is compatible with MIL-H-5606 / MIL-H-83282 Hydraulic Fluids only.

Reference Parts List Illustration on Page 3.

REPLACEMENT PARTS

ITEM	PART NUMBER	DESCRIPTION	QTY
3	5M1-000-001	Body, Pump	1
12	506-000	Half, Flange	4
25	518-000	Screw, Socket Head Cap	4
Not Shown	H-1009-01	Handle	1

REPLACEMENT KITS

ITEM	PART NUMBER	DESCRIPTION	QTY
	K-1001	Kit, Seal Replacement; consists of:	
4		O-ring, Release Screw	1
6		O-ring, Outlet Check	1
11		O-ring, Valve Body	1
21		Wiper, Rod	1
22		Ring, Backup	1
23		O-ring, Piston	1
27		O-ring, Tube Seal	1
◆ Not Shown		O-ring, Inlet Check	1
◆ Not Shown		O-ring, Guide Shoe	2
◆ Not Shown		Shoe, Piston Guide	1
	K-1068	Kit, Linkage Replacement; consists of:	
13		Pivot	1
14		Assembly, Linkage Pin	2
17		Strap	2
18		Assembly, Clevis Pin	1
19		Bracket, Pump Handle	1
	K-1069	Kit, Internal Parts Replacement; consists of:	
◆ Not Shown		Ball, Release	1
7		Spring, Inlet Check	1
8		Spring, Outlet Check	1
9		Ball, Outlet Check	1
10		Ball, Inlet Check	1

- ◆ Although this item is listed in its particular kit, it is not used on HC-1752 pump. These items may be discarded.



**HC-1752
2,500 PSI Hand Pump**

Parts List

Reference Parts List Illustration on Page 3.

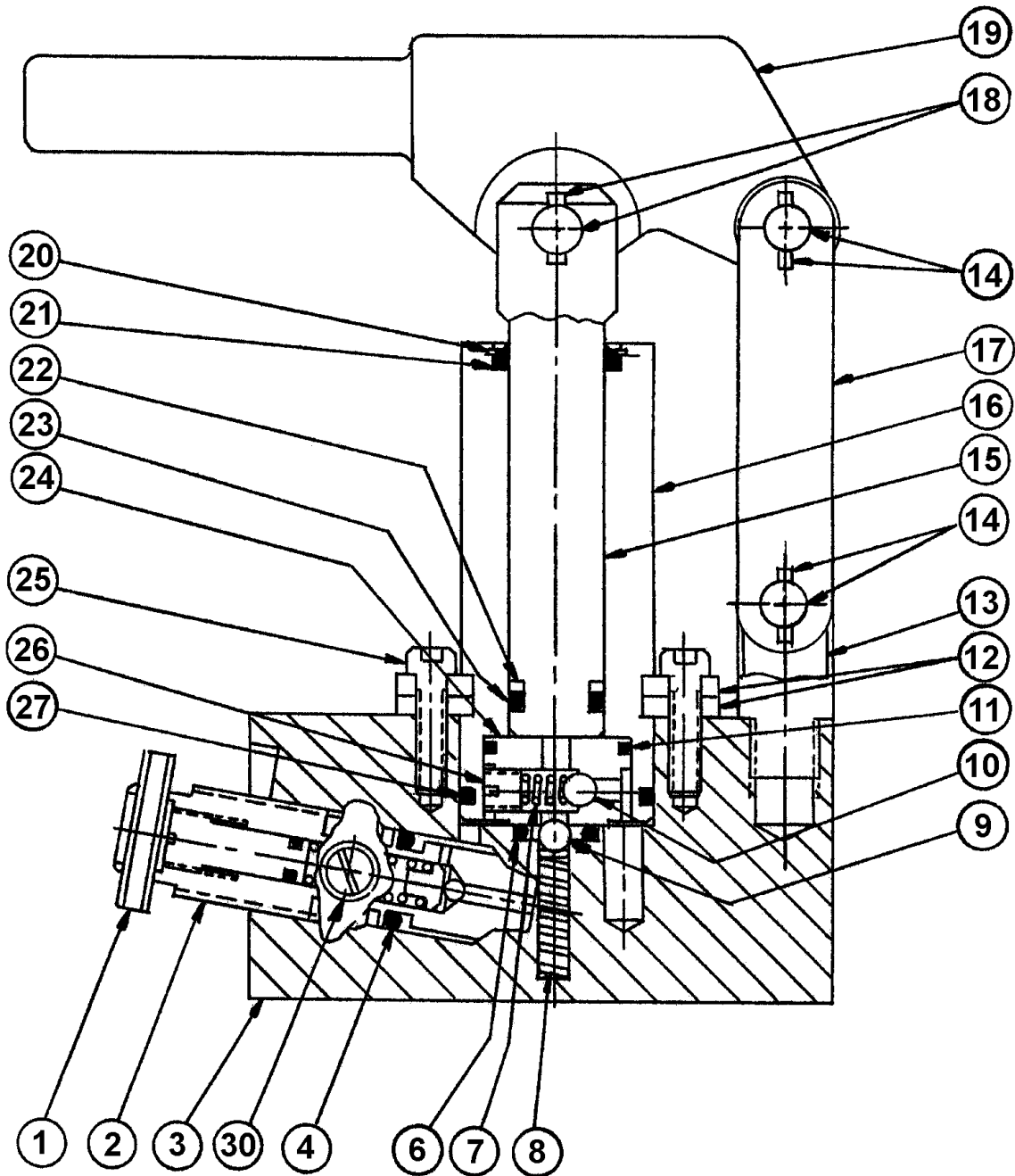
REPLACEMENT KITS

ITEM	PART NUMBER	DESCRIPTION	QTY
	K-1778	Kit, Piston/Cylinder Replacement; consists of:	
15.....		Piston.....	1
16.....		Tube	1
20.....		Retainer, Wiper	1
24.....		Assembly, Valve Body (Includes Items 7, 10, 24, 26)	1
	K-1906	Kit, Piston/Seal Replacement; consists of:	
15.....		Piston.....	1
22.....		Ring, Backup	1
23.....		O-ring, Piston	1
	K-2783	Kit, Release Screw Replacement; consists of:	
2.....		Screw, Release	1
30.....		Retainer, Screw.....	1

NOTE: Entire pump assembly can be purchased as a kit. See Hydraulic Jack Parts list.

HC-1752
2,500 PSI Hand Pump

Parts List Illustration



WARNING!

Item 2 is a preset relief valve. Do not disassemble this valve. Replacement parts are available as a preset relief valve assembly.

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08/2001 - Rev. OR



APPENDIX II

**Haskel
MLP-20/46D
Technical Specifications
&
Performance Data
with
Drawing 28550**

Haskel

Technical Specifications & Performance Data

1/3 HP PUMP SERIES

M, MS, MCPV, MDSTV, 29723 models

INTRODUCTION

This brochure should be read in conjunction with Catalog MLP-46 and the assembly drawings when supplied as part of the O/M manual with a pump.

INSTALLATION

The Haskel pump can be mounted in any position and be secured by the two mounting brackets. Alternatively, the hydraulic inlet can be directly mounted to a tank top. However, models with separation chamber construction (all MD, MCPV and 29723 models) should be mounted vertically so that any fluid leakage from the chamber vent port will not migrate into the air drive section. Pump can be mounted in a horizontal position providing the vent port is facing down. Do not pipe vent port back to fluid source.

AIR DRIVE SYSTEM

Other gases such as Nitrogen, CO₂, Natural Gas – even Sour Gas can be used as alternatives to compressed air when properly modified.

The air drive requires a minimum pressure of 25 psi (1.72 bar) to actuate the air cycling valve spool. However, 40 psi is the recommended minimum for long term reliable operation. The maximum air drive pressure is 125 psi (8.6 bar). It is not necessary or desirable to use an airline lubricator. The air drive section of all Haskel liquid pumps are prelubricated at the time of assembly with Haskel lubrication 28442. The air drive requires no other means of lubrication. Install an air line filter and pressure regulator with a minimum of 1/4" npt port size. Also review air system upstream and eliminate any restrictions to provide 1/4" minimum inside diameter. Install a shut-off/speed control valve, 1/4" npt, at pump inlet port.

HYDRAULIC SYSTEM

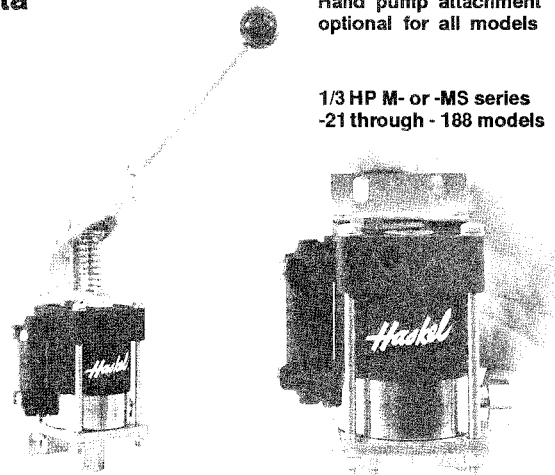
Note: Inlet fluid supply piping should not be less than 1/4" I.D. restricting the fluid supply will result in lower outlet flow rates and cause pump to cavitate.

Larger piping should be used with heavy fluids or if suction lift is over 3 feet.

Caution: Do not loosen liquid inlet or liquid outlet fittings of pump to facilitate make up of piping connections. These fitting must be tight to avoid leakage or damage. A suction filter must be installed in liquid inlet line. 100 x 100 mesh in normally ample to protect the pump seals and check valves.

Hand pump attachment
optional for all models

1/3 HP M- or -MS series
-21 through -188 models



PRIMING

Install a valve of suitable working pressure to the pump outlet that is capable of being used as an air bleed to start up. Open air control valve slowly. Allow pump to cycle for approximately fifteen seconds pumping fluid through the valve. If adequately primed, close the valve. The pump will cycle slower and then stall due to increase in output resistance. If pump does not stall, open the valve and repeat the procedure.

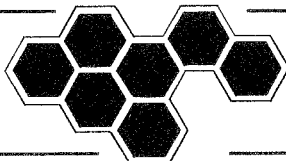
OPERATION

The pump model number indicates the ratio between the area of the of the air piston and the liquid piston.

The liquid outlet pressure can be controlled quite accurately by regulating the air drive pressure. The pump will cycle rapidly initially and as it approaches an output pressure equal to the ratio times the air drive pressure, it will gradually slow down and finally "stall".

Where it is necessary to obtain maximum outlet flow rates up to a predetermined pressure, a Haskel Air Pilot Switch should be installed at the pump outlet to automatically stop the pump at the final pressure. The airline regulator should be set at 125 psi (8.6 bar). A Haskel relief valve to prevent over pressurization should also be fitted as a safety precaution.

Note: A hand pump attachment can be fitted (for precision control or use without compressed air power) on all models.



Our products are backed by outstanding technical support, an excellent reputation for reliability, and world-wide distribution.

MAINTENANCE (Continued from page 1)

Disconnect pump from system and remove to a clean, well lit work bench with access to vice, tools, seal kits and spares. All parts removed for inspection should be washed in a suitable de-greasing agent such as Stoddard solvent or equivalent. Inspect all moving parts for wear or scratches. Damaged parts should be replaced. It is recommended that all seals and O-rings are replaced. Specially packed seal kits are available for:

Air Drive P/N 17178 (common to all standard models)

HYDRAULIC SECTION	Model No.
P/N 17179 (plus ratio no.)	M-21 thru -188
P/N 26410 (plus ratio no.)	MS-21 thru -188
P/N 28247 (plus ratio no.)	MCPV-21 thru -110
P/N 51104 (plus ratio no.)	29723-21 thru -110
P/N 27901	MDTV-5, MDSTV-5
P/N 53694	M-5
P/N 28696	M-7
P/N 28695	M-12
P/N 51239	MS-7
P/N 51240	MS-12

Air Drive Section

The air piston has a spring return. Care should be taken when dismantling to prevent the spring from causing the top cap to fly off. The most common cause of air drive malfunction is O-ring 568011-21 on the end of spool 17157. Inspect this first and replace if necessary prior to retesting before further disassembly of air drive. Spool 17157 is most easily removed by removing the muffler upper cap and carefully opening the air drive valve to push the spool and sleeve assembly out with compressed air. The spool and sleeve can be contained by holding a cloth over the exhaust port. The air piston, air barrel, cycling valve and sleeve should be relubricated on assembly with Haskel Silicone Grease P/N 28442. Torque the tie rod nuts evenly to 50 in. lbs.

Hydraulic Section

If dismantled for inspection and parts replacement use following torque values on re-assembly.

Inlet check valve — ratios -7, -12 to 95 ft. lbs.

Inlet check valve — ratios -21, -36 to 50 ft. lbs.

Inlet check valve — ratios -71, -110, -188 to 125 ft. lbs.

Outlet check valves — all ratios to 50 ft. lbs.

When ordering spare parts advise pump serial no., model no., spare part no., and description.

TROUBLE SHOOTING GUIDE

Pump will not cycle, pump bypasses air.

- Inadequate air
 - a. See comments on: Air drive systems, page 1 and air drive section, on this page.
- Contaminated air system
 - b. Remove sleeve and cycling spool (under upper cap of

muffler). Clean, inspect and lubricate with Haskel Lubricant 28442.

False cycle, leak from pilot exhaust (top center of cap).

- Leakage of pilot system.
 - Install new air section seal kit.

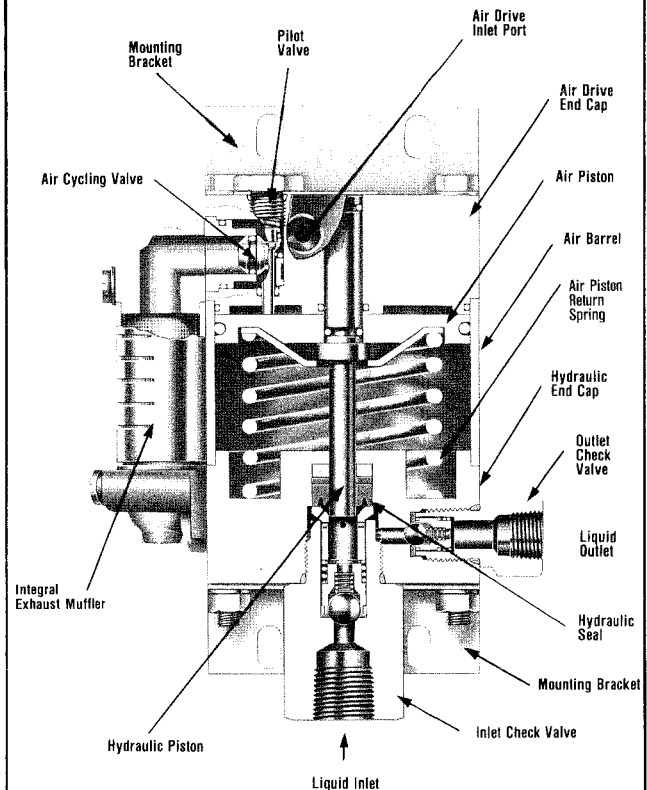
Pump cycles without pumping or does not stall.

- Check valve(s) not seating or leak in system.
 - Inspect check valve(s). First inlet check and then outlet check.

Pump fluid appears at muffler (or vent port on separation models).

- High pressure seal leakage.
 - Install new liquid section seal kit.

Cross section of Haskel M- and MS- Series Pump



LIMITED WARRANTY

Haskel manufactured products are warranted free of original defects in material and workmanship for a period of one year from date of shipment to first user. This warranty does not include packings, seals, nor failures caused by lack of proper maintenance; incompatible fluids; foreign materials in the driving media; in the pumped media; or application of pressures beyond catalog ratings. Products believed to be originally defective may be returned, freight prepaid, for repair and/or replacement to the distributor, authorized service representative, or to the factory. If upon inspection by the factory or authorized service representative, the problem is found to be originally defective material or workmanship, repair or replacement will be made at no charge for labor or materials, F.O.B. the point of repair or replacement. Permission to return under warranty should be requested before shipment and include the following: the original purchase date, purchase order number, serial number, model number, or other pertinent data to establish warranty claim, and to expedite the return or replacement to the owner.

If pump has been disassembled and reassembled in a facility other than Haskel, warranty is void if it has been improperly reassembled or substitute parts have been used in place of factory manufactured parts.

Any modification to any Haskel product which you have made or may make in the future has been and will be at your sole risk and responsibility, and without Haskel's approval or consent. Haskel disclaims any and all liability, obligation, or responsibility for the modified product; and for any claims, demands, or causes of action for damage or for personal injuries resulting from the modification and/or use of such a modified Haskel product.

HASKEL'S OBLIGATION WITH RESPECT TO ITS PRODUCTS SHALL BE LIMITED TO REPLACEMENT, AND IN NO EVENT SHALL HASKEL BE LIABLE FOR ANY LOSS OR DAMAGE, CONSEQUENTIAL OR SPECIAL, OF WHATEVER KIND OR NATURE, OR ANY OTHER EXPENSE WHICH MAY ARISE IN CONNECTION WITH OR AS A RESULT OF SUCH PRODUCTS OR THE USE OR INCORPORATION THEREOF IN A JOB. THIS WARRANTY IS EXPRESSLY MADE IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NO EXPRESS WARRANTIES AND NO IMPLIED WARRANTIES WHETHER OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, OTHER THAN THOSE EXPRESSLY SET FORTH ABOVE, SHALL APPLY TO HASKEL PRODUCTS.

HASKEL INTERNATIONAL INC., INDUSTRIAL TECHNOLOGIES DIVISION

Headquarters: Burbank, California 91502 USA

Tel: 818-843-4000 Fax: 818-556-2549

South East Asia Sales Office: Singapore 188720

Tel: 65-334-7079 Fax: 65-334-5072

North East Asia Sales Office: Toowong, Qld. 4066 * Australia

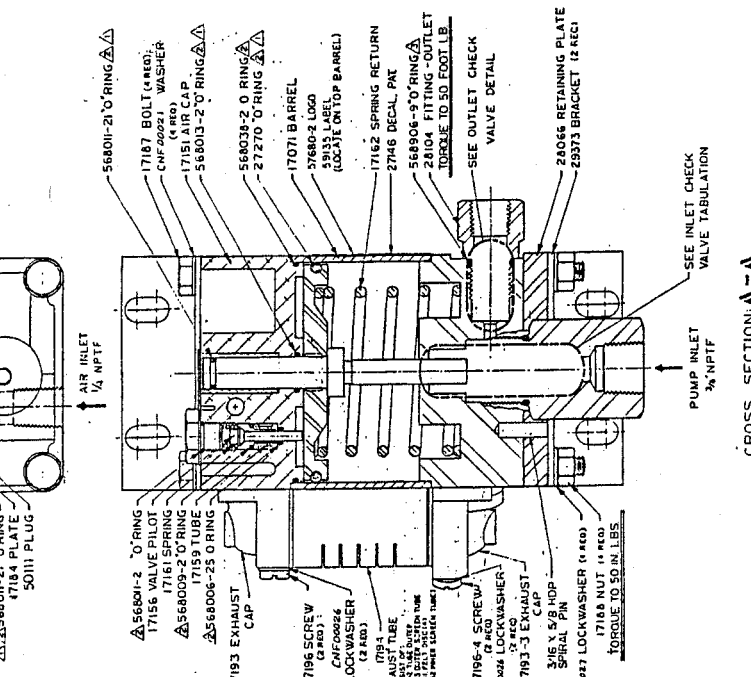
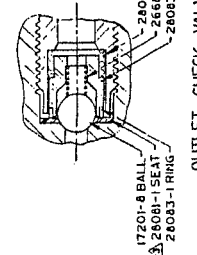
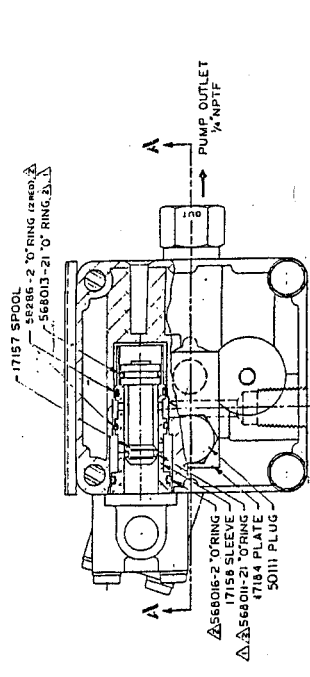
Tel: 61-7-3277-9174 Fax: 61-7-3277-9121

Australia Sales Office: Toowong, Qld. 4066 * Australia

Tel: 61-7-3277-9118 Fax: 61-7-3277-6129

FOR INFORMATION OF THE USER, THE DRAWING IS THE PROPERTY OF THE MANUFACTURER. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE MANUFACTURER.

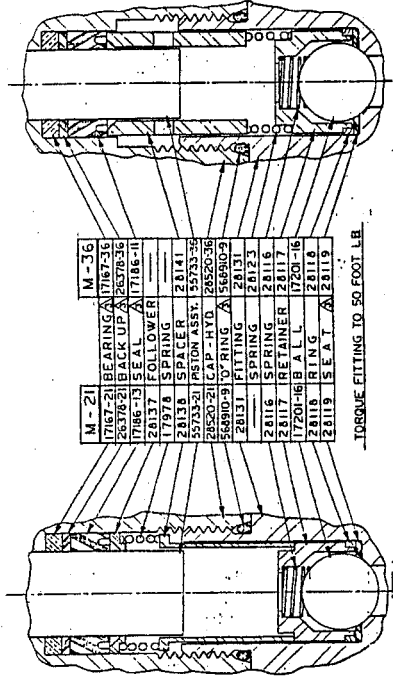
28550



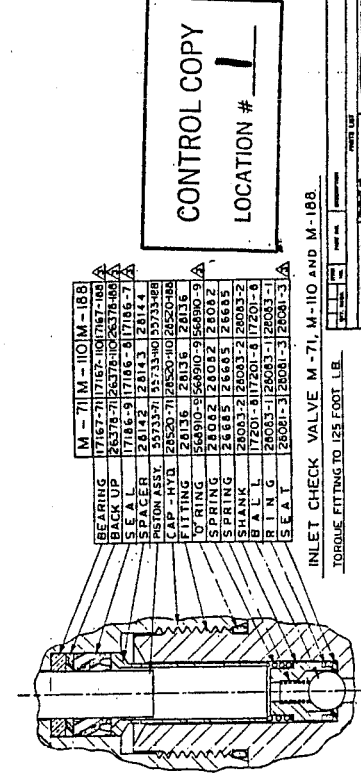
CROSS SECTION A-A

- 55763-XX TOOL MAY BE USED TO INSTALL NPTD SEAL.
- THESE PARTS ARE INCLUDED IN 17179-XX HYDRAULIC SECTION SEALS KIT.
- THESE PARTS ARE INCLUDED IN 17178 AIR DRIVE SEALS KIT.
- APPLY VERY LIGHT COATING OF HASKEL LUBRICANT PN 50866 TO DYNAMIC SEALS IN AIR DRIVE SECTION.

NOTE



INLET CHECK VALVE M-21 AND M-36



CONTROL COPY
LOCATION # 1

INLET CHECK VALVE M-71, M-110 AND M-188

DATE	NO.	REV.	BY	CHKD.

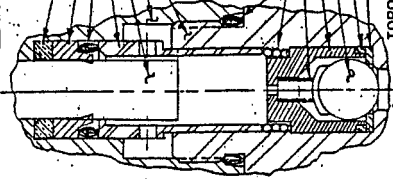
ASSEMBLY DRAWING
MODEL "M" PUMP

E 81400 28550

REVISIONS	
1	ASSEMBLY
2	DESIGN
3	ENGINEERING
4	MANUFACTURING
5	TESTING
6	INSPECTION
7	SALES
8	MARKETING
9	LEGAL
10	FINANCE
11	GENERAL

28550

INLET CHECK VALVE
M-50



BEARING A	M-50
SEAL A	57638
O RING A	56740-00
SPACER	56811-2
PSTON ASSY	55733-50
CAP HYD.	51892-50
FITTING	50729
O RING A	56810-9
SPRING	56788
SPRING	56685
CAGE	56785
BALL	26130-12
RING	56733
SEAT A	56741

TORQUE FITTING TO 70 FT/LB.

CONTROL COPY
LOCATION # 1

<p><i>Hydral</i></p> <p>HYDRAULIC PUMPS & VALVES</p> <p>ASSEMBLY DRAWING</p> <p>MODEL "M" PUMP</p>	
<p>DATE: 11/15/50</p> <p>BY: J. H. ...</p> <p>CHECKED: ...</p> <p>APPROVED: ...</p>	<p>FIG. NO. 28550</p> <p>REV. NO. 1</p> <p>SCALE: 1" = 1"</p> <p>PROJ. NO. ...</p>



APPENDIX III

**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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Prepared by: ExxonMobil Oil Corporation
Environmental Health and Safety Department, Clinton, USA