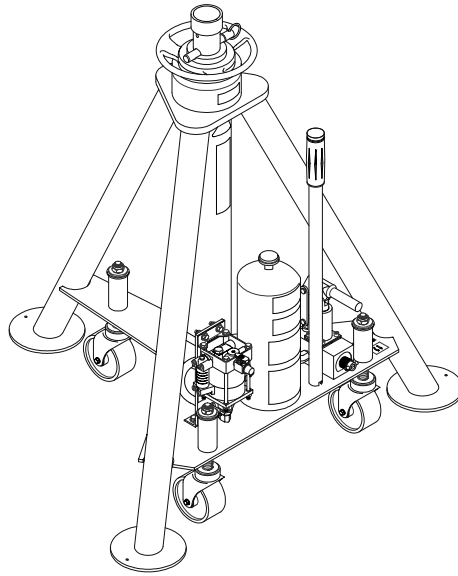




## Operation & Service Manual



### **Model: 02A1040-0111 10 Ton Single Stage Jack**

11/2004 - AA - Rev. 04

**Includes Illustrated Parts Lists**

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Model: 02A1040-0111  
10 Ton Single Stage Jack

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**Model: 02A1040-0111**  
**10 Ton Single Stage Jack**

REVISION	DATE	CHANGE MADE
03	12/2003	pg 6 Replacement Parts List: modified "Not Shown" part number
04	11/2004	pg 2 5.1 added warning and illustrations

**Model: 02A1040-0111**  
**10 Ton Single Stage 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 10 Ton Single Stage jack incorporates the following quality features:

- Steel Construction
- Mechanical ram lock nut that prevents lowering of jack under load
- Quick action mechanical extension
- Single speed, manually operated pump with pressure relief
- Uses standard MIL-H-5606 hydraulic fluid
- Pneumatic pump with a ¼ inch NPT air drive inlet

## **2.0 USAGE**

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

## **3.0 SPECIFICATIONS**

- Rated Capacity: 20,000 lbs.
- Minimum Closed Height: 38 inches
- Mechanical Extension: 14 inches
- Hydraulic Extension: 24 inches
- Maximum Height Obtainable: 78 inches
- Weight: 220 lbs.
- Pressure Relief Setting 2500+250/-0 psig
- BUNA 'N' Seals

## **4.0 ASSEMBLY INSTRUCTIONS**

### **4.1 GENERAL INSTRUCTION**

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.

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

### **4.2 PRE-USE CHECKS**

Refer to the Parts List 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; 1.5 inches below vent. Replenish with MIL-H-5606 fluid as required.

## 5.0 OPERATING INSTRUCTIONS

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

### CAUTION!



1. NEVER put hands between the aircraft and the jack pad; as after aircraft has been lowered, struts may have hung up.
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) after jack is under load. 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, as applicable, 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.

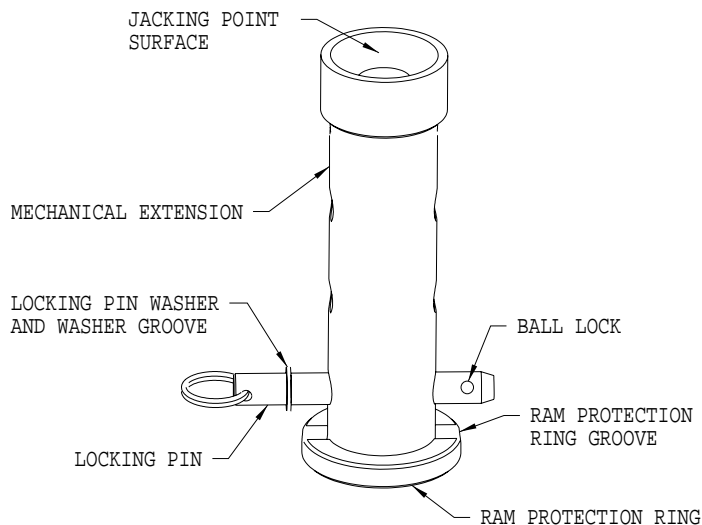
### WARNING!



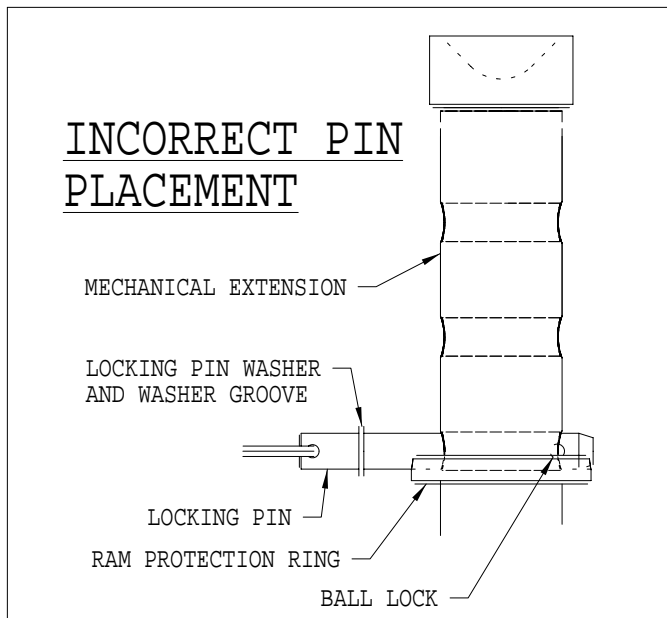
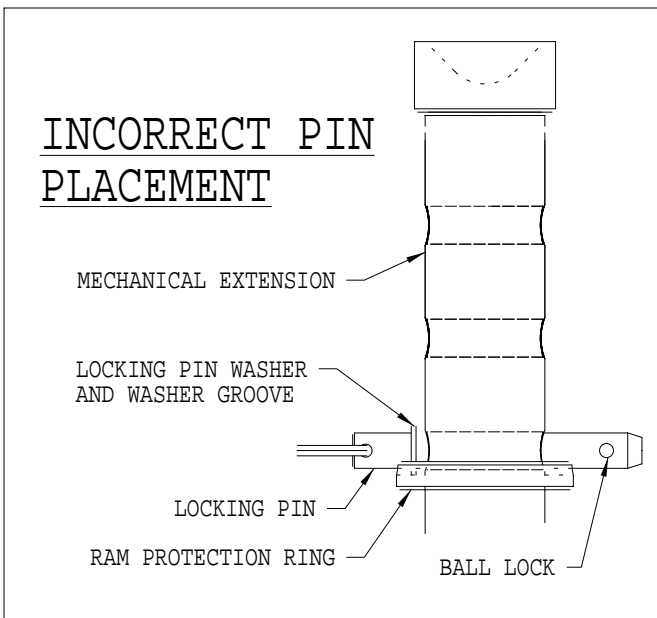
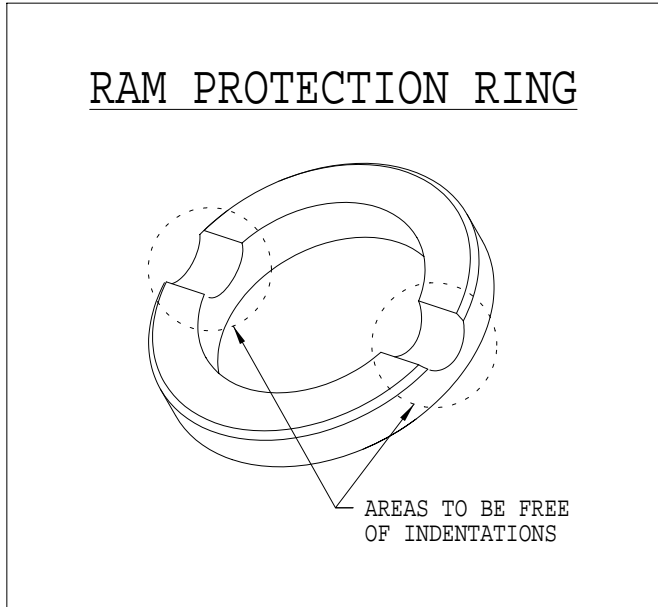
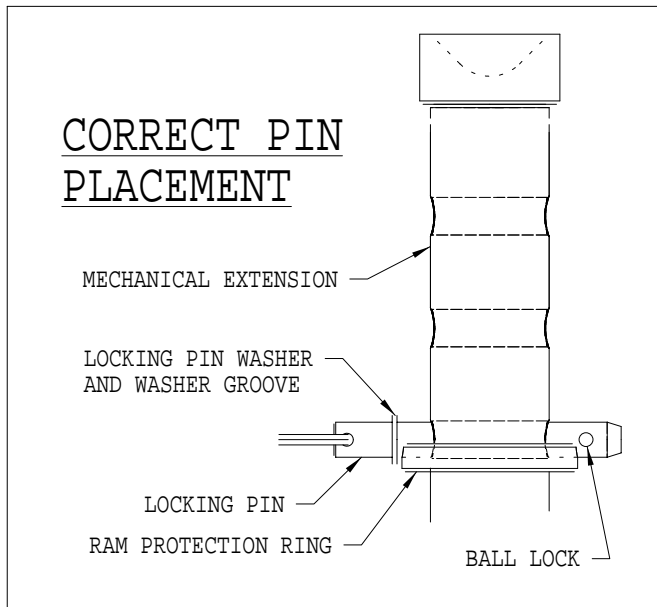
The locking pin **MUST** be placed in the ram protection ring groove and fully through the mechanical extension.

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.



5.1 JACK INSTRUCTIONS (continued)



3. Close pump release valve and operate pump.

**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 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.

Model: 02A1040-0111  
10 Ton Single Stage Jack

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

- 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 back-up rings once removed. Cut and damaged O-rings normally result in fluid leakage.
- If cylinder bore is found to be rusty, it may be honed to a maximum diameter of 3.257 inches and a surface finish of 16 micro inches. If pitting in the bore cannot be removed by this process, the jack cylinder 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.

**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 inside diameter. 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.

6.2 SERVICING JACK

**To Disassemble Jack:**

1. Remove mounting plate (Item 40) by unscrewing four (4) socket head cap screws (Item 39).
2. Raise ram assembly (Item 42) to the point where it can be lifted from the jack cylinder.



**Model: 02A1040-0111**  
**10 Ton Single Stage Jack**

6.2 SERVICING JACK *(continued)*

**To Re-assemble Jack:**

1. Re-assemble in reverse order of above.

**NOTE:** *Torque four (4) socket head cap screws (Item 39) to 44 ft-lbs.*

2. Spray inside diameter of cylinder and outside diameter of ram (Items 1 & 42) 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 ram, raise the oil level in the cylinder to chamfer of the cylinder prior to ram insertion.*

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 Parts List during the following procedure.
2. Clamp suction (push-on) hose and remove hose from pump.
3. Uncouple fitting of hydraulic hose from pump.
4. Remove pump from jack.
5. Remove cotter pin (Item 18) from clevis pin.
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: HC-1752 Hand Pump Parts List for kits available.)
10. Re-assemble in reverse order.

6.4 JACK FUNCTION LOAD TEST

**NOTE:** *If function load testing 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

See APPENDIX II - Haskel Pump information for complete parts list and repair information.

**Model: 02A1040-0111  
10 Ton Single Stage Jack**

**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	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	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
Ram lock nut in correct position	Rotate nut to top of ram
Broken pump release valve	Repair pump
Bent ram	Replace suspected ram assembly

## Parts List Index

<u>Description</u>	<u>Page</u>
Replacement Parts .....	7
Replacement Kits .....	7 - 8
Illustrations .....	9 - 11

## Parts List

When ordering replacement parts/kits, please specify Model, Serial Number & color (if applicable) of your product.

Reference Illustrations on Pages 9 - 11.

### REPLACEMENT PARTS

ITEM	PART NUMBER	DESCRIPTION	QTY
2	H-1009-01	Handle, Hydraulic Pump	1
5	H-1128-02	Spring	3
9	TF-1043-06*18.0	Assembly, Hose	1
14	N-2016-05-S	Tee, Swivel Nut Run	1
15	N-2004-15-S	Elbow, Extra Long 90° Male	1
37	HJ-553	Ring, Ram Protection	1
38	H-2331	Stopnut, Ram	1
39	G-1151-107206	Screw, Hex Socket Head Cap, 3/8-16 x 3/4" long	4
40	TR-1756	Plate, Mounting	1
42	HJ-586-03	Assembly, Ram	1
43	TR-1505	Stop, Jack	1
44	HJ-557	Pad, Jack	1
45	G-1300-25200	Pin, 1/4 x 2", Roll	1
46	HJ-225-04	Shaft, Extension	1
47	G-1318-1033	Pin, 5/8 x 3.3" Model "D"	1
Not Shown	50866	Lubricant, Haskel Seal ..... (Reference Haskel Literature)	

*All other parts available in Replacement Kits only.*

### REPLACEMENT KITS

ITEM	PART NUMBER	DESCRIPTION	QTY
	<b>K-1050</b>	<b>Kit, Ram Seal Replacement; consists of:</b>	
41	HJ-554	Ring, Guide	1
48	HC-2020-336	Ring, Backup	1
49	HC-2000-336	O-ring	1
	<b>K-1685</b>	<b>Kit, Repair Fluid Seal</b> (Reference Haskel Literature)	
	<b>K-1686</b>	<b>Kit, Repair Air Seal</b> (Reference Haskel Literature)	
	<b>K-1987</b>	<b>Kit, Pump Replacement; consists of:</b>	
8	N-2410-11	Elbow, 90° Male	1
10	N-2001-08-S-B	Elbow, 90° Male	1
11	HC-1752	Pump, Hydraulic Hand	1
12	G-1251-1070R	Lockwasher, 3/8 Regular	2
13	G-1100-107010	Bolt, Hex Head, Grade 5, 3/8-16 x 1" long	2
20	TF-1047-01*05.5	Hose, Push-on	1

Replacement Kits continued on following page.

## Parts List

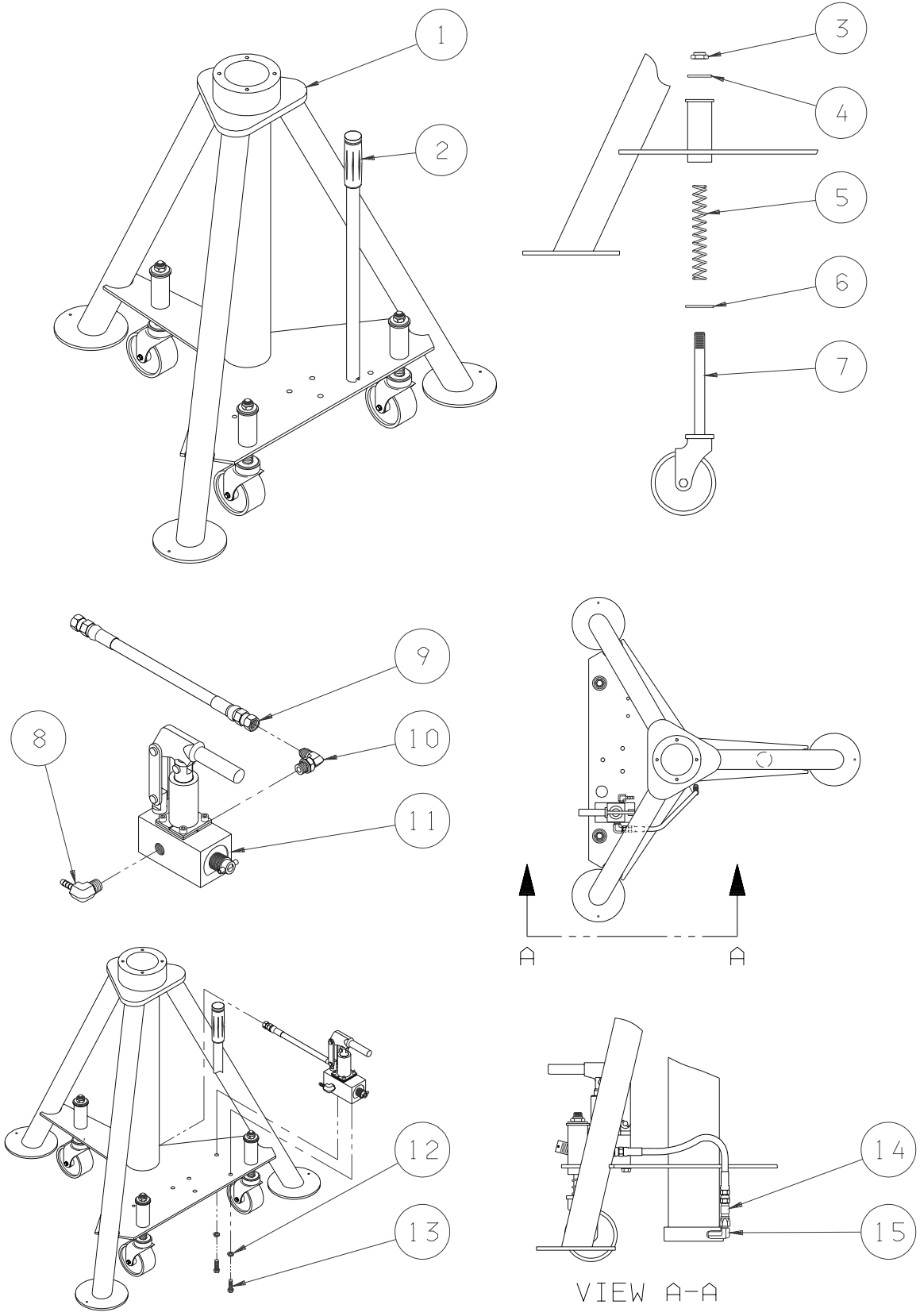
When ordering replacement parts/kits, please specify Model, Serial Number & color (if applicable) of your product.

Reference Illustrations on Pages 9 - 11.

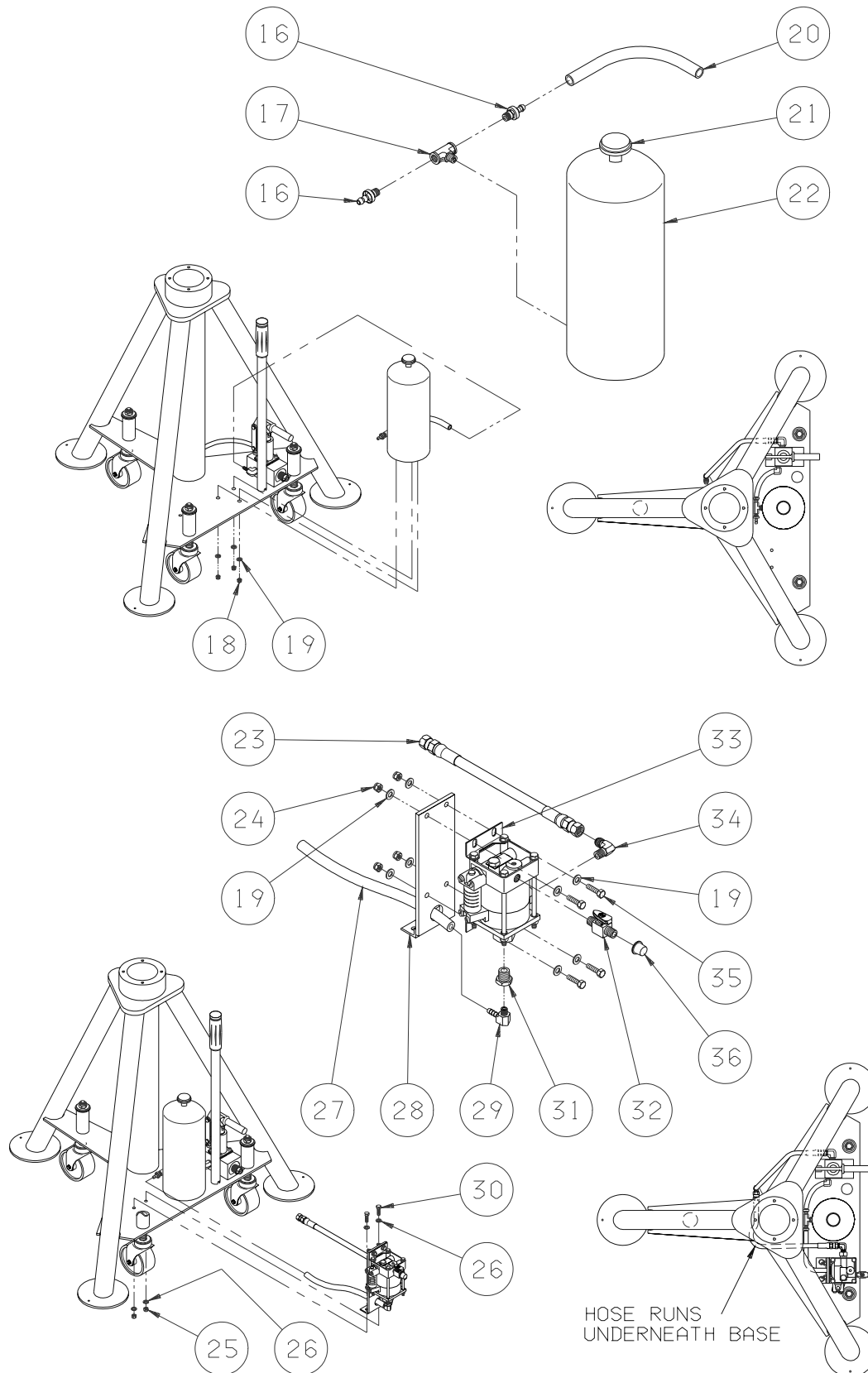
### REPLACEMENT KITS

ITEM	PART NUMBER	DESCRIPTION	QTY
	<b>K-2788</b>	<b>Kit, Reservoir Replacement; consists of:</b>	
16	N-2412-04	Connector, Barbed Hose	2
17	N-2208-01-S	Tee, Male Branch	1
18	G-1202-1050	Stopnut, 1/4-20 Elastic	3
19	G-1250-1050N	Flatwasher, 1/4 Narrow	3
20	TF-1047-01*05.5	Hose, Push-on	1
21	H-1045	Breather	1
22	Z-1539-02-01	Weldment, Reservoir (includes Labels)	1
	<b>K-2800</b>	<b>Kit, Caster Replacement; consists of:</b>	
3	G-1203-1105	Jamnut, 5/8-18 Elastic	1
4	G-1250-1100N	Flatwasher, 5/8 Narrow	1
6	G-1250-1110W	Flatwasher, 3/4 Wide	1
7	U-1053	Caster, Swivel	1
	<b>K-3231</b>	<b>Kit, Air Pump Replacement; consists of:</b>	
19	G-1250-1050N	Flatwasher, 1/4 Narrow	8
23	TF-1043-03*23.0	Assembly, Hose, 23" long	1
24	G-1202-1055	Stopnut, 1/4-28 Elastic	4
25	G-1202-1065	Stopnut, 5/16-24 Elastic	2
26	G-1250-1060N	Flatwasher, 5/16 Narrow	4
27	TF-1047-01*10.0	Hose, 1/4" Push-on x 10" long	1
28	J-3415-01	Bracket, Air Pump	1
29	N-2410-01	Elbow, 90° Male	1
30	G-1100-106512	Bolt, Hex Head, Grade 5, 5/16-24 x 1-1/4" long	2
31	N-2210-04-S	Reducer	1
32	H-1173	Valve, Plug	1
33	H-1174	Pump, Air	1
34	N-2005-08-S	Elbow, 90° Male	1
35	G-1100-105510	Bolt, Hex Head, Grade 5, 1/4-28 x 1" long	4
36	H-1536-19	Caplug, Tapered	1
	<b>K-3465</b>	<b>Kit, Jack Weldment Replacement; consists of:</b>	
- Item 1	Z-5118-01	Weldment, Jack (includes Labels)	1

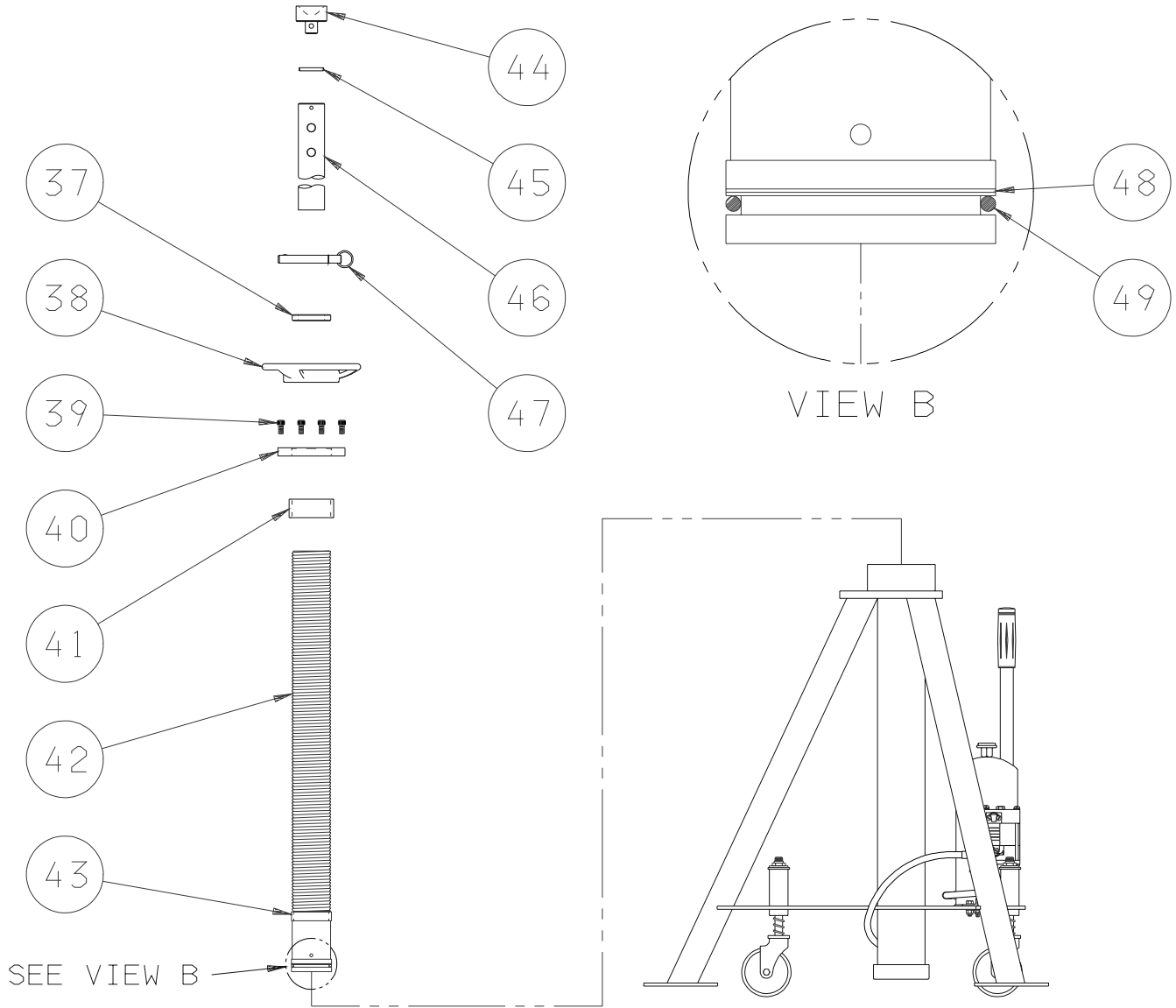
### Parts List Illustrations



## Parts List Illustrations



### Parts List Illustrations









## **APPENDIX I**

**HC-1752  
2,500 psi  
Hand Pump  
Parts List**





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

**\*\*\***

**Illustrated Parts List**

08/2001 – Rev. OR

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**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
<b>K-1001</b>		
<b>Kit, Seal Replacement; consists of:</b>		
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
<b>K-1068</b>		
<b>Kit, Linkage Replacement; consists of:</b>		
13.....	Pivot.....	1
14.....	Assembly, Linkage Pin.....	2
17.....	Strap .....	2
18.....	Assembly, Clevis Pin.....	1
19.....	Bracket, Pump Handle .....	1
<b>K-1069</b>		
<b>Kit, Internal Parts Replacement; consists of:</b>		
◆ 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.

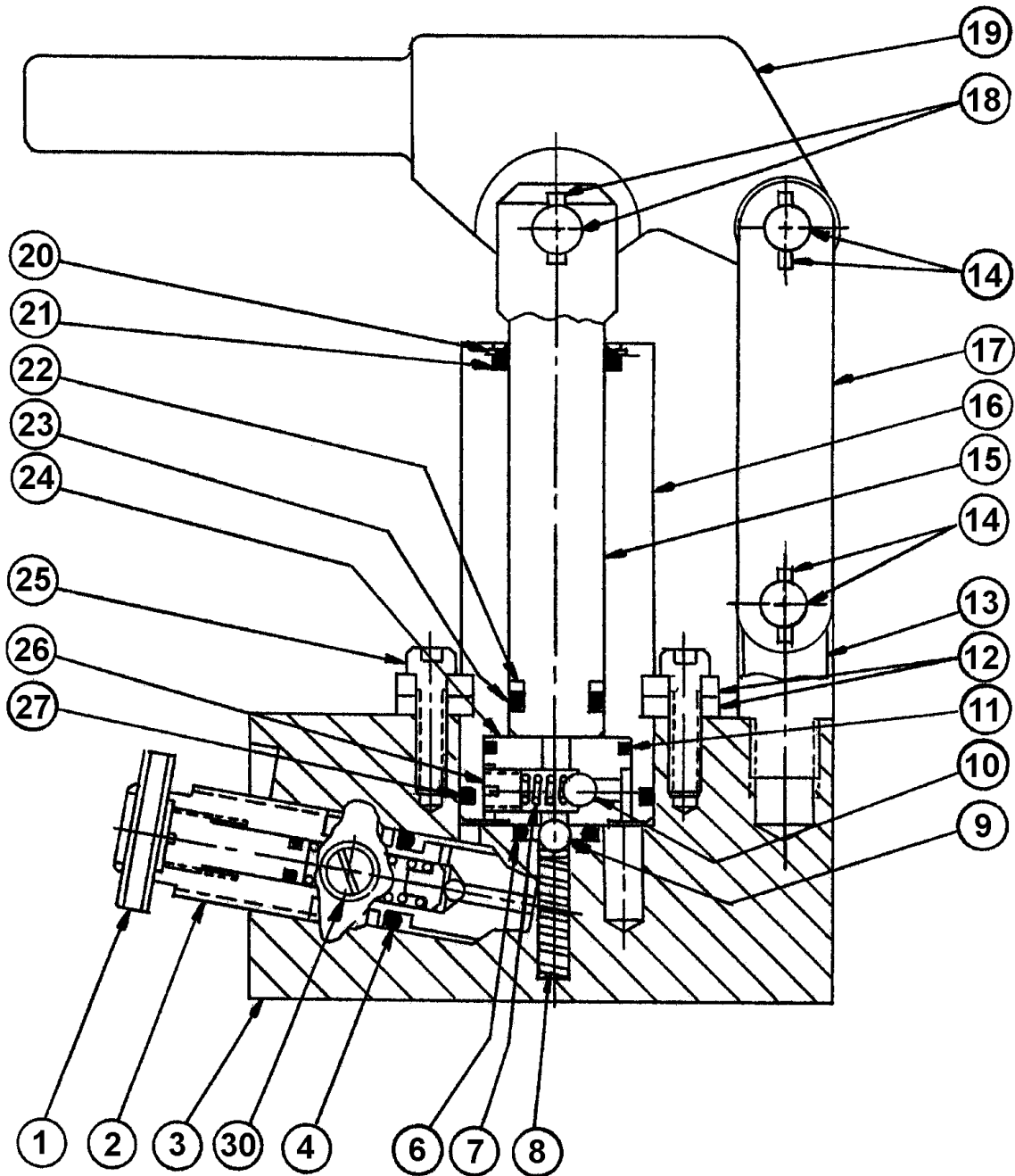
**REPLACEMENT KITS**

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

**TRONAIR**

08/2001 - Rev. OR







## **APPENDIX II**

**Haskel  
MLP-20/46D  
Technical Specifications  
&  
Performance Data  
&  
Drawings 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, CO<sub>2</sub>, 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

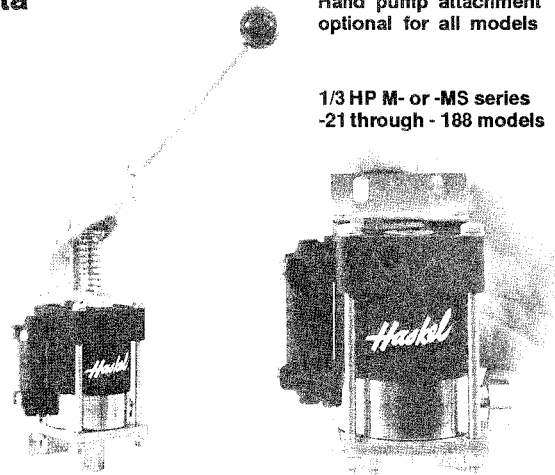
**Note:** Inlet fluid supply piping should not be less than 1/4" I.D. restricting the fluid supply will result in lower outlet flow rates and cause pump to cavitate.

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.

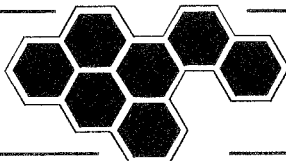
### OPERATION

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.

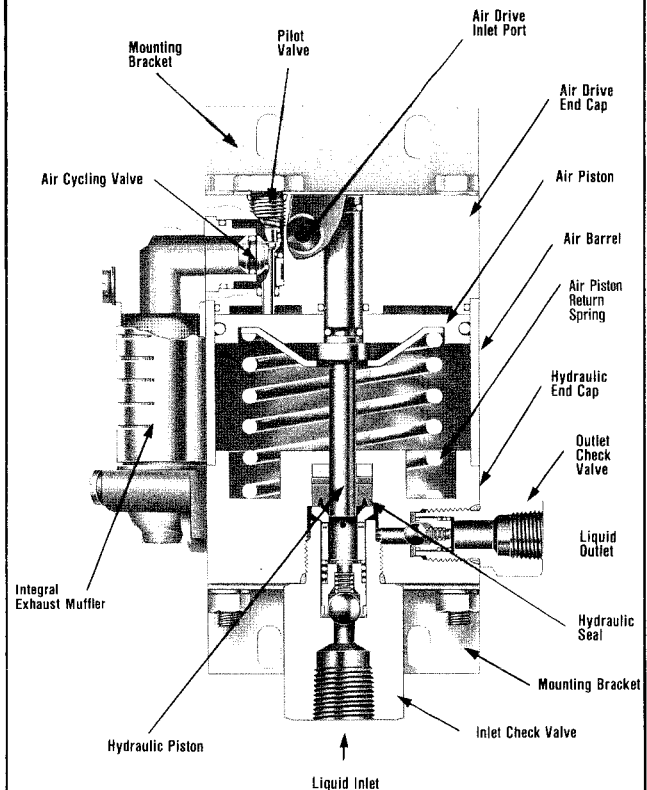
### Pump cycles without pumping or does not stall.

- 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

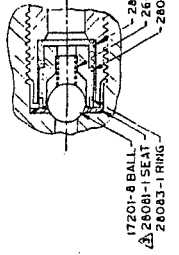
North East Asia Sales Office: Toowong, Qld. 4066 \* Australia

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

Australia Sales Office: Toowong, Qld. 4066 \* Australia

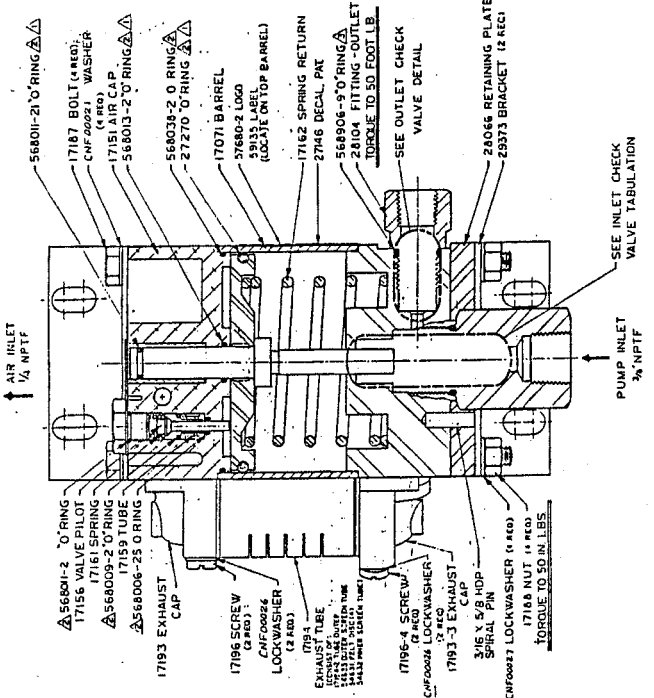
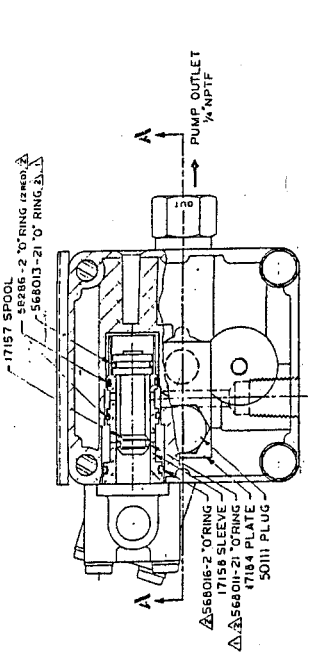
Tel: 61-7-3277-9118 Fax: 61-7-3277-6129

REV	DESCRIPTION	DATE	BY	CHKD
1	ASSEMBLY DRAWING			
2	REVISED TO INCLUDE PARTS LIST			
3	REVISED TO INCLUDE TORQUE FITTING TO 50 FOOT LB			
4	REVISED TO INCLUDE TORQUE FITTING TO 125 FOOT LB			



OUTLET CHECK VALVE

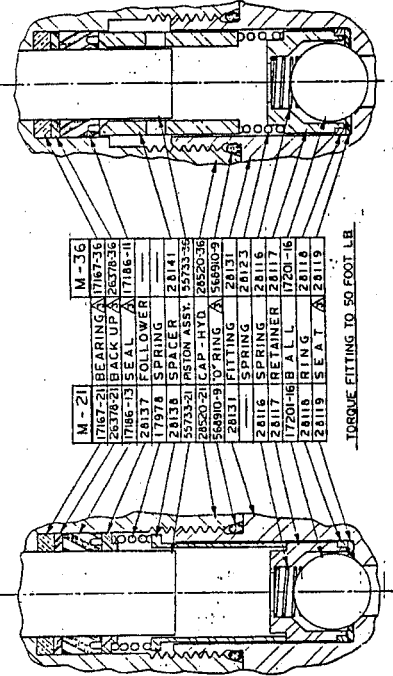
28550



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

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

M-21		M-36	
17167-7	BEARING	17167-7	BEARING
26376-2	BACK UP	26376-2	BACK UP
17185-3	SEAL	17185-3	SEAL
17186-11	SEAL	17186-11	SEAL
17178	SPRING	17178	SPRING
28137A	SPACER	28141	SPACER
55733-21	PISTON ASSY.	55733-36	PISTON ASSY.
28520-21	CAP - HYD.	28520-36	CAP - HYD.
56810-9	O RING	56810-9	O RING
28131	FITTING	28131	FITTING
28116	SPRING	28116	SPRING
28117	RETAINER	28116	RETAINER
17201-10	AV L	28116	RETAINER
28119	SEAL	28119	SEAL
		28119	SEAL

TORQUE FITTING TO 50 FOOT LB

M-71		M-110		M-188	
17167-7	BEARING	17167-7	BEARING	17167-7	BEARING
26376-2	BACK UP	26376-2	BACK UP	26376-2	BACK UP
17185-3	SEAL	17185-3	SEAL	17185-3	SEAL
17186-11	SEAL	17186-11	SEAL	17186-11	SEAL
17178	SPRING	17178	SPRING	17178	SPRING
28137A	SPACER	28141	SPACER	28141	SPACER
55733-21	PISTON ASSY.	55733-110	PISTON ASSY.	55733-188	PISTON ASSY.
28520-71	CAP - HYD.	28520-110	CAP - HYD.	28520-188	CAP - HYD.
56810-9	O RING	56810-9	O RING	56810-9	O RING
28131	FITTING	28131	FITTING	28131	FITTING
28116	SPRING	28116	SPRING	28116	SPRING
28117	RETAINER	28116	RETAINER	28116	RETAINER
17201-10	AV L	28116	RETAINER	28116	RETAINER
28119	SEAL	28119	SEAL	28119	SEAL
28083-1	SEAL	28083-1	SEAL	28083-1	SEAL
28081-3	SEAL	28081-3	SEAL	28081-3	SEAL

TORQUE FITTING TO 125 FOOT LB

CONTROL COPY  
LOCATION # 1

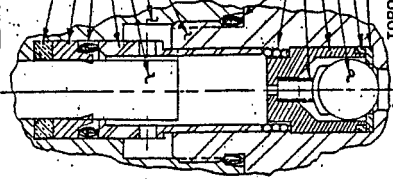
REV	DESCRIPTION	DATE	BY	CHKD
1	ASSEMBLY DRAWING			
2	REVISED TO INCLUDE PARTS LIST			
3	REVISED TO INCLUDE TORQUE FITTING TO 50 FOOT LB			
4	REVISED TO INCLUDE TORQUE FITTING TO 125 FOOT LB			

ASSEMBLY DRAWING  
MODEL M PUMP  
E 81400 28550

REVISIONS	
1	ASSEMBLY
2	DESIGN
3	ENGINEERING
4	MANUFACTURING
5	SALES
6	MARKETING
7	GENERAL
8	OTHER

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

HASTEL 1000 W. 10th St. Des Moines, IA 50319	HASTEL, INC. 1000 W. 10th St. Des Moines, IA 50319
PART NO. 28550 REV. 1 DATE 10/1/80	ASSEMBLY DRAWING MODEL "M" PUMP
DRAWN BY: J. L. HASTEL CHECKED BY: J. L. HASTEL APPROVED BY: J. L. HASTEL	PART NO. 28550 REV. 1 DATE 10/1/80



## **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/m<sup>3</sup>(as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m<sup>3</sup> (as oil mist)  
- ACGIH Short Term Exposure Limit (STEL), 5 mg/m<sup>3</sup> (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.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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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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Environmental Health and Safety Department, Clinton, USA