

# OPERATION AND MAINTENANCE MANUAL

for the

## HYDRAULIC LIFT CASTER SYSTEM

(H.L.C.S.)

P/N SERIES R17000

Operation and maintenance manual for the Tandemloc, Inc. Hydraulic Lift Caster System. Instruction manual P/N: R17004F-1MA for use with R17000 series lift casters.

**CAUTION:** READ THE FOLLOWING MANUAL COMPLETELY BEFORE USING THE H.L.C.S. FOR THE FIRST TIME.

**SCOPE:** Covers the complete operation for the H.L.C.S. From a stowed position to full use, and back to fully stowed. Maintenance schedules and a troubleshooting guide are also included.

**REVISION:** E

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**WARNING:** Failure to adhere to all of the following instructions could cause severe injury to personnel, damage to the H.L.C.S., and / or the lifted unit. Tandemloc, Inc. cannot warrant the system against failure, nor be held liable for loss of any kind, if any of the instructions in this manual are ignored, omitted or circumvented. Always wear protective eye-wear, headgear, and steel toed shoes or boots when using the H.L.C.S.. Never place any part of your body under the lifted unit at any time, or the H.L.C.S. when not fully supported. Use of the H.L.C.S. hereby implies the user fully understands all of these and the following instructions, and assumes all risks and / or liabilities if any instructions contained herein, are not correctly and completely followed.

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## **1.0 Introduction**

- The Tandemloc Hydraulic Lift Caster System (previously and hereafter referred to as H.L.C.S. (shown deployed in figure 1.0) is a portable mobilizing product designed to lift and move containers (or units with standard ISO 1161 corner fittings) on smooth paved surfaces. It has a combined capacity of 70,000 lb gross weight (provided the paved surface can support the load without deforming) and can lift a container up to 13.75" off of the ground. (This clearance is dependant upon many factors and therefore actual heights will vary slightly.)
- The H.L.C.S. can be installed (including lifting the container) by one person in as little as 45 minutes. However, it is recommended that two persons be used for economic reasons. With two persons, installation time is less than 20 minutes. (Note: installation time, with two persons, can easily be reduced to as little as 10 minutes using the optional electric-hydraulic pump in lieu of the supplied hand-hydraulic pumps.) Note: For safety reasons, a fork lift or trolley hoist is required when moving the individual Lift Caster Assemblies more than several feet, or over unpaved or inclined surfaces.
- The H.L.C.S. is made up of the following components: 4 x R17001F-1PA Lift Caster Assemblies, 2 x R17003F-100 Hand Pump Assemblies, and 4 x R17022F-1PA Hoist assemblies. It is also strongly recommended that a rigid towbar be used for moving the raised container, such as the AB42000A-2PA Tandemloc Towbar. Optional equipment includes: the R17008F-100 Electric pump assembly (which replaces the hand pump assembly (R17003F-100), and the R17005F-1PA Offset Adapter Assembly which allows for the H.L.C.S. to be installed inboard of the longitudinal envelope (or transverse) for close quarter mobilizing of the lifted unit.
- The H.L.C.S. has a very small footprint that allows it to be stored in an area less than 35 square feet, with a height of 56".
- The H.L.C.S.'s hand hydraulic pumps come equipped with pressure gauges, which may be used to determine an approximate gross weight of the lifted container. See section 3.2.1 and the tutorial section 4.3.
- At maximum capacity (70,000 lb gross weight) the H.L.C.S. can be towed at up to 5 mph. This speed may be increased proportionally to a decrease in weight, up to a maximum of 15 mph. **IMPORTANT:** The preceding statement assumes the prepared surface is smooth and free of surface defects, the surface can support the pressure under the casters, the towing vehicle is of adequate capacity to control the container at a given weight and speed, the towing vehicle operator is licensed and competent, and the unit is prevented from colliding with any external objects.

FIGURE 1.0 - H.L.C.S. DEPLOYED



## **2.0 COMPONENTS - General Discussion**

### **2.1 Lift Caster Assembly**

- Figure 2.1 is a photograph of the R17001F-1PA Lift Caster Assembly with all operational parts identified via balloons and defined in table 2.1. The Lift Caster Assembly can be moved individually on level, smooth, prepared surfaces, by rolling it on its own wheels. When traversing any distance more than several feet, or crossing unprepared or inclined surfaces, a fork lift or hoist must be used. The Lift Caster Assembly is the workhorse of the H.L.C.S. in that it provides the fundamental actions of lifting and moving the container. All four lift caster assemblies of the H.L.C.S. are identical and therefore completely interchangeable.

**Caution!!!** When rolling the individual unit on its own wheels, the lock pins must be inserted (with the hydraulic cylinder fully retracted), and the swivel locks on both large wheels must be engaged with the casters oriented as shown in figure 2.1. Never attempt to roll the individual unit on anything other than a level, smooth, prepared surface. Never attempt to travel more than several feet. For greater distances, or unprepared or inclined surfaces, use the R17022F-1PA hoist assembly in conjunction with a forklift or hoist. When the lift caster assemblies are not in use (and not connected to a container), always keep the swivel locks on the large casters engaged, with all casters oriented as shown in figure 2.1., and the lock pins inserted at the lowest setting (hydraulic cylinder fully retracted.) **Failure to heed these cautions could result in severe injury and / or property damage!!!**

### **2.2 Hoist Assembly**

- The R17022F-1PA Hoist Assembly consists of two forklift pockets and a hoist bar. It assembles to the top of the Lift Caster Assembly via two ½" diameter hex bolts and nuts as shown in figure 2.1. Its only purpose is for transporting the individual Lift Caster Assemblies via forklift or hoist, under conditions described in section 2.1 above. The Hoist Assembly is not needed during container transport and may be removed if an interference condition exists.

### **2.3 Retractable Front Casters**

- The retractable front casters are located on either side of the lift assembly. They are retracted by pulling on the handles in an outboard direction. Their main purpose is to allow the Lift Caster Assembly's hydraulic cylinder to be raised and lowered without the Lift Caster Assembly being attached to a container. (e.g. When a container is resting on blocks and the corner fittings are not flush with the ground.)

Figure 2.1 - Lift Caster Assembly



Table 2.1 - Lift Caster Assembly

Item	Description	Item	Description
1	Lift Assembly	8	Handle Bars
2	Base Assembly	9	Hoist Assembly
3	Rotating Toe Lift Lug	10	Protective Bellows
4	Lock Pins	11	Bellows Clamp
5	Front Casters (Small)	12	Grease fitting Locations
6	Rear Casters (Large)	13	Hydraulic Quick Disconnect
7	Swivel Locks	14	Shock Bars

## 2.4 Hydraulic Hand Pump Assembly

- Figure 2.4 is a photograph of the Hydraulic Hand Pump Assembly, with all operational parts identified via balloons and defined in table 2.4. This assembly is used for raising and lowering the container. It also can act as a makeshift scale, providing the user with an approximate weight of the lifted object. See section 4.3 for details.

Figure 2.4 - Hydraulic Hand Pump Assembly



Table 2.4 - Hydraulic Hand Pump Assembly

Item	Description
1	Pump Handle
2	Raise / Lower Pressure Valve
3	Air Vent / Hydraulic Fill
4	Pressure Gauge

## **3.0 INSTALLATION AND USE - DETAILED USE DISCUSSIONS**

**Note:** The following is a detailed discussion of the H.L.C.S, and contains information which may not be required for day to day use. However, users should read and understand all of the information presented in this chapter before using the H.L.C.S. for the first time. For a quick step by step use guide, see the system tutorial in chapter 4.0.

### **3.1.0 LIFT CASTER ASSEMBLY**

- The Lift Caster assembly is shown in figure 2.1. It consists of 2 major sub-assemblies. They are: the lift and the base assemblies.

#### **3.1.1 Lift Caster Assembly Component: Lift Assembly**

##### **3.1.1.0 Lift Assembly: General**

- The lift assembly (see figure 2.1) connects to the container at the bottom corner fitting and raises and lowers to lift the container.

##### **3.1.1.1 Lift Assembly: Rotating toe lift lug**

- At the base of the lift assembly is the rotating toe lift lug which is inserted into either the side or end hole of a standard bottom corner fitting and twist-locked into place. To insert the lift lug, rotate the oblong handle (see figures 3.1.1.1a and 3.1.1.1b) so the longer dimension of the handle is vertical, insert the lug and then turn the handle 90° to lock (the longer dimension of the handle will now be horizontal). Before the container is lifted, the lift lug fits loosely into the corner fitting. This is to facilitate ease of installation (no tools are required). However, as the lift assembly is raised, (by operating the hand-hydraulic pump or the optional electric-hydraulic pump) the lift lug automatically draws back, making an extremely tight connection with the bottom corner fitting. This tight connection cannot be loosened without lowering the container to the ground. This provides a positive, safe connection between the jack assembly and the container. Thus preventing any possibility of accidental disengagement while the container is lifted.

Figure 3.1.1.1a - Lug Unlocked



Figure 3.1.1.1b - Lug Locked





### 3.1.1.2 Lift Assembly: Lock Pins

- The lock pins are used to prevent shock loads from ever affecting the hydraulic system. See figure 2.1. There are six separate locations where the lock pins may be engaged. Fully lowered (0"), fully raised (14.25"), and 4 evenly divided spaces in between (2.85" increments). As the Lift Assembly is raised, a reference line will appear on the hydraulic cylinder to show approximately where the lock pins will engage. As the lift assembly is raised the lock pins will automatically engage and disengage from each hole pair. Adjust the height of the lift assembly with the hydraulic pump until both the desired height is reached and both lock pins are fully engaged. Be sure to allow the handle of each pin to retract fully into the horizontal slot of the lock pin housing. If the lock pin handle doesn't travel all the way into the slot, either raise or lower the lift assembly slightly until this occurs. If one pin engages and the other does not, simply continue raising or lowering the lift assembly until both pins engage. Once **both** pins engage, relieve the pressure in the hydraulics, (move pump valve handle to the "lower" setting) to protect the cylinder from shock during container transport. The load will now be completely supported by the lock pins, with no pressure in the hydraulic line. The hydraulic line may now be removed from the quick disconnect.

To lower, reattach the hydraulic line, and pressurize the hydraulics to relieve the load off of the lock pins, allowing them to be retracted and then rotated 90° to put them in the unlocked position. (The handles should now be vertical). The container may now be lowered to its new height. If lowering the unit to disengage the H.L.C.S., be sure to reinsert the lock pins at the 0" setting to provide safe transport of the individual Lift Caster Assemblies.

#### \*\*\*\*\*EXTREMELY IMPORTANT CAUTIONS\*\*\*\*\*

**NEVER!!!** attempt to remove the hydraulic line from the quick disconnect while there is pressure in the hydraulic line, severe injury could result.

**NEVER!!!** attempt to move a container with pressure in any of the four separate hydraulic cylinders. Cylinder damage will result and void the warranty.

### **3.1.2.0 Lift Caster Assembly Component: Base Assembly**

- The Base assembly (figure 2.1) provides mounting for the hydraulic cylinder, the Lift Assembly, the Hoist Assembly, and the front and rear casters.

### **3.1.2.1 Base Assembly: Hydraulic Cylinder**

- The hydraulic cylinder is located at the center of the Base Assembly. It is a 25 ton ultimate capacity cylinder (at 9,694 psi) and a maximum stroke of 14.25".

### **3.1.2.2 Base Assembly: The Hoist Assembly**

- The Hoist assembly consists of two fork pockets, (6.25" X 3.25" opening) on 25" centers, and a hoist bar with a 4" long space for a hook or web. See figure 2.2. Each unit can safely lift 700 lb. The Hoist Assembly is used for moving individual Lift Caster Assemblies distances greater than several feet, or over rough or uneven terrain. The Hoist Assembly mounts to the top of the Base Assembly (at the top of the two outer vertical tubes) via two 1/2" diameter hex head bolts and nuts. It may be removed if an interference condition exists during container transport.

### **3.1.2.3 Base Assembly: Rear Casters (large)**

- The Rear Casters are the main load carrying casters and have a capacity of 8,800 lb. each (for a total of 17,600 lb per Lift Caster Assembly). See Figure 2.1. They are 12" diameter x 5" wide urethane on iron casters ideally suited for travel over smooth paved surfaces such as concrete. They should never be used on rough uneven terrain. At maximum load the casters have a maximum recommended speed of 5 mph. However, as the load is reduced this speed may be increased proportionally, up to 15 mph. This is of course true only when the towing vehicle, driver and road conditions / local laws, permit for safe operation at a given speed. Each caster swivels 360° and is equipped with a 4 position (90° increments) swivel lock. Each caster is self steering. When one towing vehicle is used, a rigid towbar, such as the Tandemloc R13000A-1PA towbar must be used, and the rear-most (opposite the towed end) caster's swivel lock must be engaged in the desired direction of travel to provide stability to the lifted container. All swivel locks may be left free to rotate when more than one towing vehicle is used (i.e. front and back), or temporarily left free, if a very tight change in direction is required.

### **3.1.2.4 Base Assembly: Front Casters (small)**

- Adjacent to either side of the Rotating Toe Lift Lug, are the retractable front casters. Fig 2.1. These casters are provided to simplify insertion of the lift lug into corner fittings. They also allow for limited manual travel of the individual Lift Caster Assembly (i.e. not attached to a container) over smooth, paved, level surfaces. This method of travel is intended for short distances only (several feet, max.). For travel over greater distances, or over rough or inclined terrain, use the Hoist Assembly along with a forklift or hoist. When the corner fittings of a container are not resting on the

ground, the casters allow the lift assembly to be raised to the appropriate height for toe insertion. After the toe is locked, retract the casters by pulling each handle outboard 90°.

- The retractable front casters are used to raise and lower the lift assembly when the Lift Caster is not mounted to a container. Without them, the Lift Caster Assembly would simply fall forward as the lift assembly is raised. **Caution:** without the casters in the down position, an individual (i.e., one not attached to a container) Lift Caster Assembly will fall forward if the hydraulic cylinder is raised. **Never raise the hydraulic cylinder of an individual Lift Caster Assembly unless either suspended from a fork lift or hoist (via the Hoist Assembly), or the front casters are down. Do not allow anything to bump into the Lift Caster Assembly when not attached to a container, or it could tip over.**

### 3.2.0 Hand Hydraulic Pump Assembly

- The hand-hydraulic pump is used to raise and lower the lift assembly and thus, the container as well. See figure 2.4. To raise (apply pressure) turn the pump valve to the raise (ADV) position, and pump the long handle up and down (figure 3.2). **NOTE: ALWAYS RAISE AND LOWER LIFT CASTER ASSEMBLIES IN PAIRS (ONE END AT A TIME). NEVER TRY TO RAISE OR LOWER THE CONTAINER ONE LIFT CASTER ASSEMBLY AT A TIME.** To lower (relieve pressure), turn the pump valve to the lower (RET) position. **Note:** When lowering a container, you will first have to raise the container slightly to remove pressure from the lock pins. Then, disengage the lock pins by pulling the handles and rotating them 90°. You may then throw the pump valve to the "lower" position to lower the container. If the pump fails to raise or lower the lift assembly, try opening the small air vent valve until the hissing stops, and re-close it. If it still won't move, refer to the trouble shooting guides in the appendix.

### 3.2.1 Hand Pump Assembly: Pressure Gauge (container weight scale)

- The Hand Pump Assemblies are equipped with a pressure gauge to help determine if an overload condition exists. The hand pumps are equipped with a pressure relief set at 6800 psi (equivalent to a load of about 35000 lbs). This prevents the hydraulic cylinder from severely overloading the Lift Caster Assemblies. (e.g. attempting to lift too heavy a container, or an unevenly loaded container.) In the event of an overload while pumping, the hydraulic fluid will simply drain back into the pump until the pressure is below 6800 psi.

A side benefit of the pressure gauge is the ability to use the H.L.C.S as a scale to closely approximate a lifted container's weight. To do so, follow the steps outlined in the tutorials section 4.3 below.

Figure 3.2 - Using the hand pump



#### **4.0 TUTORIALS - H.L.C.S**

- The following tutorial takes the user through the entire process of mobilization. It is a step by step guide that must be followed exactly to correctly utilize the H.L.C.S. and prevent damage to the unit and/or injury to personnel. Of course, individual circumstances may add additional steps to these tutorials. However, under no circumstances should any steps (outlined anywhere in this manual) be ignored, omitted or circumvented.
- All of the steps in the tutorials of this manual shall be preceded by the following assumptions: This entire manual has been read and understood by all current operator's of the H.L.C.S.; All maintenance procedures have been followed and the H.L.C.S. equipment is in good operating condition; The lifted container is rated for its current gross weight, that weight does not exceed 70,000 lb., and is evenly distributed; the towing vehicle is in good operating condition, is rated for the current load, and will be operated by a competent, licensed tractor/trailer driver.

#### **4.1 Lifting the container - Standard Configuration**

- The standard configuration is defined as mounting one Lift Caster Assembly at each corner of a standard ISO freight container. They are mounted to the side holes of the ISO 1161 bottom corner fittings. A rigid towbar (such as Tandemloc's AB42000A-2PA towbar) is used for towing and is attached to one end of the container via the end holes of the ISO 1161 bottom corner fittings. The surface to be traversed is smooth concrete, free of surface defects.

1. Using the Hoist assembly, bring all H.L.C.S. equipment near the container to be lifted. Be sure the front casters are in the down position See figure 4.1.1
2. Roll a Lift Caster Assembly to one corner of the container, facing a longitudinal side. See figure 4.1.2
3. If the corner fittings are resting on the ground skip to step 4. If the corner fittings are not resting on the ground, adjust the height of the lift assembly (via the hand hydraulic pump) so that the rotating toe lift lug is the same height as the hole in the bottom corner fitting. Ref: section 3.1.2.4
4. Check to make sure the rotating toe is in the unlocked position, with the longer dimension of the handle vertical. Ref: section 3.1.1.1
5. Insert the lug into the bottom corner fitting side hole. See figure 4.1.5
6. Rotate the rotating toe lift lug 90° to lock it. The longer dimension of the handle will be horizontal. Ref: section 3.1.1.1

7. Retract both front casters by pulling their handles 90° outboard. Ref: sections 3.1.1.2 & 3.1.2.4 See fig 4.1.7
8. Repeat steps 2 through 7 for the remaining jacks.
9. Assemble the towbar at the desired end of the container. See figure 4.1.9
10. Engage one, **and only one** swivel lock on **one** rear-most (large) caster, furthest from the towbar, so that the wheel is locked in the desired direction of pull. All other caster's wheels should be left free to rotate. It's also helpful, but not necessary, to rotate all large casters in the general desired direction of pull. Ref: section 3.1.2.3
11. At the two Lift Caster assemblies nearest the towbar, engage the two hydraulic hand pump assemblies' hoses to the hydraulic quick-disconnect fitting protruding from the center of the base assembly.
12. Rotate the hand hydraulic pump valves to the "ADV" or raise position. Briefly open the small air vent valve on top of each pump and re-close. Ref: section 3.2.0
13. **In pairs of Lift Caster Assemblies** (one transverse end of the container at a time), begin pumping the hand hydraulic pumps to raise the lift assemblies (and the container). If only one person is doing the installation, pump a jack 50 times, then switch to the opposite jack, pump it 50 times, alternating until that transverse end of the container is at the desired height. Ref: section 3.2.0 See figure 4.1.13
14. When a reference line appears on the hydraulic cylinder at the approximate desired height, stop pumping. (if the pin doesn't fully engage, continue to slightly raise or lower the container until the pin pops in and the handle is fully seated into the horizontal slot), then **release** the hydraulic pressure by moving the hand hydraulic pump valve to the "RET" or lower position. The Lift Caster should settle against the lock pins with no pressure in the hydraulic line. Try to pull the lock pins, they should be impossible to move. If they are loose: be sure the pump valve is in the "lower" position; open the air vent valve briefly; and re-close. If the lock pins are still loose, refer to the troubleshooting guide in the appendix. Ref: section 3.1.1.3
15. **IMPORTANT:** Attach the towing vehicle to the towbar and engage its brakes.
16. Repeat steps 11 thru 14 on the other end of the container.
17. Once all four Lift Casters are up, lock pins engaged and immobile, hydraulic

pressure relieved and hoses removed, the H.L.C.S. is ready to move. See figure 4.1.17

18. Move the container to the new desired position and follow tutorial 4.2 to lower into place.

**Figure 4.1.1 - Move the Lift Caster into position**



**Figure 4.1.2 - Lift Caster facing longitudinal side**



Figure 4.1.5 - Insert Lug



Figure 4.1.7 - Lock Pins





Figure 4.1.9 - Connect Towbar



Figure 4.1.13 - Pump one end at a time



Figure 4.1.17 - H.L.C.S. Ready to move



## 4.2 Lowering the Container - Standard Configuration (defined in section 4.1)

1. Engage the brakes on the towing vehicle.
2. Starting at the end opposite the towbar, attach the two Hand Pump assemblies' hoses to the quick disconnects of the two Lift Caster Assemblies.
3. Check to see that the hand-hydraulic pump's valve is set to the "ADV" position. Open the small air vent briefly and close when the hissing stops. Pump the hand-hydraulic pump handle to raise the lift assembly until the load is off the lock pins.
4. Pull the lock pins and rotate 90° to unlock. The handles should be vertical.
5. Move the hydraulic hand pump's valve to the "RET" position (**do two jack's, at one transverse end, at a time**) to lower the container to the ground.
6. Reinsert the lock pins into the fully lowered position. You may need to shake the Lift Caster and pull back on the hoist bar to get the lift assembly fully lowered.
7. Set both retractable casters in the down position by rotating them 90° inboard.
8. Disconnect the hoses and reconnect them to the Lift Caster Assemblies at the towbar end.
9. Disconnect the towing vehicle and the towbar.
10. Repeat steps 3 thru 8 for the other Lift Caster Assemblies.
11. Rotate the handles of the rotating lift lugs until the longer dimension of the handles are vertical.
12. Pull each Lift Caster Assembly away from the container.

### 4.3 Using the H.L.C.S. as a weight scale

1. Follow the steps in section 4.1 to attach the Lift Caster Assemblies to the desired container.
2. Start lifting the first end. Stop pumping just after the container gets off the ground. Make a note of the pressure reading off of each pumps' pressure gauge.
3. Continue to lift the container to the desired height.
4. Start raising the other end, stop when the container is level with the previously lifted end.
5. Make a note of the pressure readings off of each pumps' pressure gauge.
6. Add all pressure readings together, divide by **9694** and multiply x **50000**. The result is the approximate weight of the lifted container + the 4 lift assemblies. Subtract **900 lb** to account for the 4 lift assemblies.

## APPENDIX A - Troubleshooting: H.L.C.S

Problem	Solution(s)
Can't move individual Lift Caster Assembly.	<ul style="list-style-type: none"> <li>• Only roll on smooth paved surfaces.</li> <li>• Grease all fittings</li> </ul>
Front lift assembly not raising, pump not working.	<ul style="list-style-type: none"> <li>• Check that the position of the pump valve is set to "raise".</li> <li>• Briefly open the small air vent valve on the pump, wait until the hissing stops, and reclose.</li> <li>• Check the hydraulic line and fittings for proper connection and (or) leaks.</li> <li>• Check hydraulic fluid level in pump.</li> <li>• Try a different pump on jack to verify (rule out) pump failure.</li> <li>• Try this pump on different jack to verify (rule out) cylinder failure.</li> <li>• Follow the procedure in appendix C for bleeding the hydraulic system.</li> </ul>
Can't rotate the rotating toe lift lug.	<ul style="list-style-type: none"> <li>• The toe must be fully inserted in the corner fitting, with no load on it, to rotate.</li> <li>• Grease the toe lug assembly per appendix B.</li> <li>• <b>Shake and pull back on the Hoist assembly to fully retract hydraulic (pump return must be left open) cylinder and release tension load on the toe lift lug after lowering a lifted container.</b></li> </ul>
Lift assembly will not lower, container stuck in raised position.	<ul style="list-style-type: none"> <li>• Be sure to lower two Lift Casters at once (at one end of the container).</li> <li>• Be sure all lock pins are pulled out and the handles are vertical.</li> <li>• Briefly open small air vent valve and reclose.</li> <li>• Be sure pump valve is set to lower.</li> <li>• Be sure to maintain proper lubrication per appendix B.</li> <li>• Move the container to a more level surface.</li> <li>• See troubleshooting solutions for "Lift assembly not raising, pump not working".</li> </ul>

## APPENDIX B - MAINTENANCE: H.L.C.S.

Every time the H.L.C.S. is used.	<ul style="list-style-type: none"><li>• Visually inspect all equipment for proper operation and any signs of damage. Repair, or replace as required.</li></ul>
Every three months	<ul style="list-style-type: none"><li>• Grease the tubes (inside the rubber bellows), using white lithium grease. Loosen the bellows clamps and use a grease gun and stick it between the bellows and the tube and spread it around circularly.</li><li>• Check hydraulic fluid level in pumps.</li></ul>
Every six months	<ul style="list-style-type: none"><li>• Grease all grease fittings. They are located in the under side of the swivel bearing on top of the casters, at the caster bearings, at each lock pin, and on to of the rotating toe lift lug assembly.</li><li>• Check hydraulic lines, fittings for leaks, wear.</li></ul>
Once a year	<ul style="list-style-type: none"><li>• Change hydraulic fluid (see Appendix C), carefully inspect all load bearing parts for cracks, bends or other signs of damage.</li></ul>

## APPENDIX C - MAINTENANCE: HAND-HYDRAULIC PUMP

### **Air Removal:**

Removing air from the hydraulic system will help the cylinder to advance and retract smoothly, and prevent the cylinder from locking up.

1. Disconnect hydraulic line at quick disconnect.
2. Using proper lifting equipment, turn entire Lift Caster Assembly upside down, and leave lift assembly free to move.
3. Reconnect the pump to the hydraulic line.
4. Vent pump reservoir (open butterfly valve) close release valve.
5. Position pump at higher elevation than cylinder.
6. Operate pump to fully extend the lift assembly.
7. Open release valve to retract the lift assembly. You will need to push the lift assembly to retract it. This will force the trapped air to move up to the pump reservoir.
8. Repeat the above steps as necessary.
9. Add oil if necessary. See below.
10. Return (close) vent/fill cap to operating position.
11. Return the Lift Caster Assembly to its original condition.

### **MAINTENANCE - Hand hydraulic pump**

Use only hydraulic oil with the hand-hydraulic pump to promote long pump life. Check oil level regularly.

#### **WARNING:**

**Always add oil with cylinders fully retracted or the system will contain more oil than the reservoir can hold.**

#### **Adding oil to the pump:**

1. Remove vent/fill cap from reservoir.
2. Fill to 1/2" below top of reservoir.
3. Remove air from system if necessary. See above. Recheck oil level after removing air.
4. Return vent/fill cap to proper position.

#### **Keep Oil Lines Clean**

Use every precaution to guard unit against entrance of dirt because foreign matter may cause pump, cylinder, or valve failure.

#### **Changing the Oil**

1. Drain all oil and refill with clean oil every 12 months. If pump is used in dirty environments, change the oil more often.
2. Remove vent/fill cap or plug from reservoir.
3. Tilt pump to drain out old oil.

4. Fill reservoir to 1/2" below full.
5. Replace the vent/fill cap or plug.
6. Dispose of used oil properly.



## TROUBLESHOOTING GUIDE - Hand hydraulic pump

The following information is intended as an aid in determining if a problem exists.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Cylinder does not advance, advances slowly, or advances in spurts.	Oil level in pump reservoir is low.	Add oil according to maintenance instructions.
	Release valve open.	Close the release valve.
	Loose hydraulic coupler or fitting.	Check that all fittings are tight.
	Load is too heavy.	Do not attempt to lift more than rated load.
	Air trapped in system.	Remove air according to instructions.
	Cylinder plunger binding.	Check for damage to cylinder. Service if required.
Cylinder advances, but does not hold pressure.	Leaking connection.	Check that all connections are tight and leak free.
	Leaking seals.	Locate leak(s) and have equipment serviced by a qualified hydraulic technician.
	Internal leakage in pump.	Have pump serviced by a qualified hydraulic technician.
Cylinder does not retract, retracts part way, or retracts more slowly than normal.	Release valve closed	Open release valve.
	Pump reservoir is over-filled.	Open butterfly vent to allow excess oil to drain.
	Loose hydraulic coupler or fitting.	Check that all fittings and couplers are tight.
	Air trapped in system.	Remove air according to instructions.
	Cylinder retraction spring broken, or other cylinder damage.	Have cylinder serviced by a qualified hydraulic technician.