



*LIGO Laboratory*

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*LIGO*

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HEPI PUMP STATION  
MAINTENANCE MANUAL

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Distribution of this document:  
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This is an internal working note  
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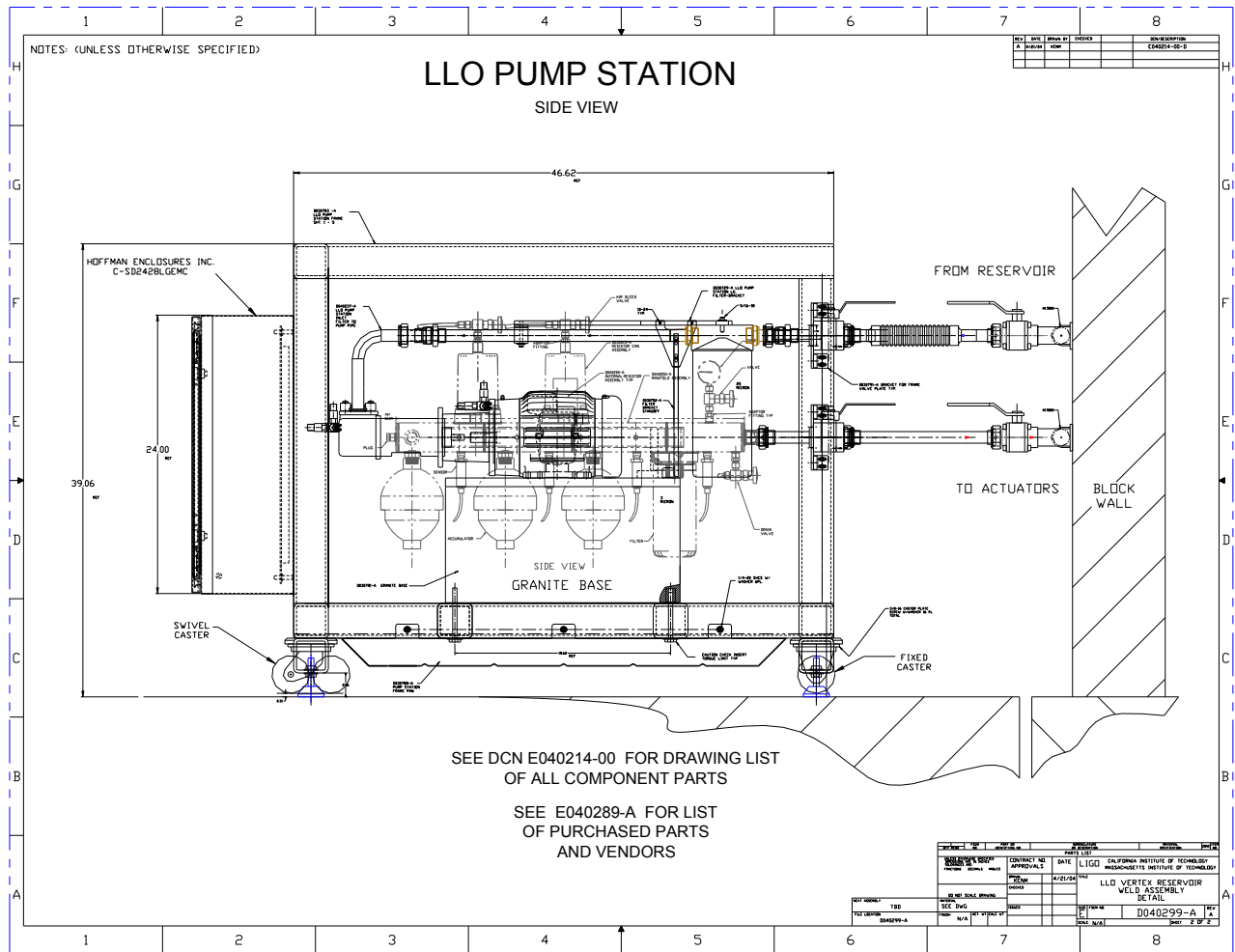
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# 1 INTRODUCTION

This document describes basic maintenance, and periodic service or replacement items contained in the LIGO Pump Station assemblies. This system is designed to run continuously.



## 2 FLUID

The fluid used in the system is HOUGHTO-SAFE 419TY a water/glycol mixture, rated food safe. Chemical analysis should be done every 3 months, send one pint of fluid to testing location requested by your local Houghton representative.

Houghton International Inc.  
BOX 860, Carrollton, GA. 30112  
770-832-3507  
FAX 770 830 0114  
[www.houghtonintl.com/](http://www.houghtonintl.com/)

## 3 MOTOR

### 3.1 DESCRIPTION

The motors are precision balanced, after purchase. The 6800 gram rotors are balanced to within .05 gram-inches, with machine calibrations in accordance with ISO 10012-1 (Ref. the unbalanced rotors have registered 1.75g/in)

PART #CEM3587T, REF. Baldor Motor, TEFC 2 hp. 3phase - 230/460 volt / 1750 rpm

Industrial Balancing Inc.  
1515 N. Kraemer BL.  
Anaheim, CA 92806-1404  
1-714-632-6888

### 3.2 LUBRICATON

The motor is a ball bearing type with two zerK fittings on the housing at the front and rear.

Recommended grease for standard service conditions is Polyrex EM (Exxon Mobile) others equivalent and compatible greases include Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

The lube recommended interval at a 1725 rpm operation is 12,500 hours. Or about 16 months, at lower rpm adjust the hours between lube intervals by dividing the rpm into 1725 and multiplying the 12,500 hour interval. (Average of 40Hz on our motors, 40Hz=1166.67rpm. This gives us 5.5 months extra time on the schedule.)

The amount of grease needed at for lubrication is .3 oz., or 8.4 grams by weight or .6 cu in, or 2 teaspoons by volume.

### 3.3 LUBRICATION PROCEDURE:

The grease can be added while the motor is running or stopped.

Clean the grease fitting by wiping with a clean cloth then attach the grease gun tool and add the required amount of compatible grease slowly. Do not install more grease than the recommended amount. If grease is added sooner than the recommended time interval, reduce the amount accordingly. The grease fitting should be removed and the motor ran for 15 minutes to allow any excess to spill out. Then clean the area and reinstall the grease fitting.

## 4 PUMP

### 4.1 DESCRIPTION

The pump is an IMO # AA3GNVPMCE095SC Screw Pump. The pump has a housing mounted over pressure valve and is factory pre-set at 210 psi. The pump does not require periodic maintenance; it is lubricated by the fluid and is smooth running. If any internal metallic sound or vibration is observed the pump should be replaced ASAP.

IMO Pump (Colfax Corp.)  
1710 Airport Road  
Monroe, NC. 28111-5020  
704-289-6511  
FAX# 704-289-9273  
www.imo-pump.com  
Email: imo.pump@colfaxcorp.com

## 5 PUMP COUPLING

The pump coupling consists of three parts the Motor hub the Pump hub and the Drive spider. The spider is Buna-N elastomer and over time will wear due to compression flexing of the spider arms due to the pump pressure pulse resistance. If Buna-N material is seen building up around the base of the coupling or rumbling sound or vibration is noticed in the coupling area the spider should be replaced.

### Ref part numbers

Lovejoy Spider Style  
Part Material: Aluminum  
ALO90 with .50" BORE (pump side)  
ALO90 with .875 BORE (motor side)  
Sox Solid (BUNA-N) Spider

## PUMP STATION MOTOR/PUMP COUPLING



### INSTALLATION:

1. Center the spider over the gap between the motor and pump shaft.
2. Bring the two halves together touching the center BUNA-N spider.
3. Lock the setscrews over the shaft keys, Torque to 144 inch pounds. Per <http://www.lovejoy-inc.com/products/jaw-type-couplings/al-type.aspx> .

### 5.1 COUPLING SPIDER CHANGE PROCEDURE

The motor must be turned off, the clear plastic adaptor port cover removed for access to the coupling.

The hub set screws loosened to allow the hubs to slide apart on the shafts; it may be possible to change out the spider without removing the motor base hold down screws.

If enough clearance to remove the spider is not available by sliding the hubs, the motor base and adaptor spacer screws must be removed and the motor moved to provide clearance to install a new spider.

After installing a new spider reattach the adaptor and reinstall the motor and base screws. Move the coupling hubs together until they touch the spider, the hubs should be centered over the gap between the pump and motor shaft, tighten the set screws in both hubs.

The motor and pump are aligned automatically when assembled due to the location bores on the mounting adaptor.

REF. The coupling halves are balanced by the same vendor as the motor. (see 3.1 above; this balance is done on a best efforts basis)

## 6 STATION FLUID FILTERS

The pump station has two filters both the screw on type. The pre-pump filter is a 25 micron filter part # ZLE-25 this filter is large and will not need replacing until the differential pressure across the filter is 6 psi or greater (Note: There is no way to monitor this pressure drop without modifications to the pump cart). This pressure drop may take

several years to reach due to the clean environment and the large size of the filter. A more conservative change interval may be set at approx. 2 years, however it is recommended by the manufacture to change them more frequently.

The line filter down stream of the pump is a 3 micron filter part # ZHE-03L this filter is large and will not need replacing until the differential pressure across the filter is 14 psi or greater, at 3.5 gpm. This drop should also take years and a conservative 2 year interval for change may be established. The pressure transducers on either side of the filter should be monitored.

## **6.1 FLUID FILTER CHANGE PROCEDURE**

In the changing of either filter the seal gasket must be lubricated with fluid prior to screwing on and seating the filter seal. Installing the large [25 micron] filter can, tighten with a strap wrench attaching it near the bottom of the filter to prevent crushing the can. Tighten approx. 1 turn after the first contact of the filter seal and head seal boss.

Install the 3 micron filter by hand tightening approx. ½ turn after first contact of the rubber seal with the head seal boss.

Zinga Industries Inc.

2400 Zinga Dr.

Reedsburg, WI 53959

T: (608) 524-4200 (8am-5pm CDT)

F: (608) 524-4220

<http://www.zinga.com>

## **7 ACCUMULATOR**

### **7.1 DESCRIPTION**

The pump station assembly has 3 accumulators these should be charged with nitrogen initially to a pressure of about 93% of the lowest operating line pressure adjacent to the accumulator. This setting will vary in each accumulator depending on its location in the system.

The minimum pressure in the accumulator should not be less than 60% of the line pressure adjacent to the accumulator.

The accumulators have a hybrid valve consisting of a tire type Schrader valve and a military metal to metal positive shut off.

The Accumulators were rebuilt at with a stainless steel housing (D1100817). The factory housing was an alloy and caused some corrosion issues in the past.

## 7.2 ACCUMULATOR CHARGING PROCEDURE

To charge the accumulator the line pressure must be known and the system shut off for accumulator nitrogen charging to take place with zero pressure in the line.

Use a socket to turn open the military valve closure hex, and this will allow the tire type Schrader valve to function, and using a tire type filler nozzle to mate, fill the bladder to the designed pressure for that location approx. .93 of the line pressure.

When the pressure in the accumulator bladder is set, the military closure hex is rotated with a socket tool to 45-65 in-lbs of torque.

Accumulator rebuild notes - <https://dcc.ligo.org/DocDB/0070/L1100207/001/L1100207.pdf>

Accumulator care - <https://dcc.ligo.org/LIGO-D040454>

Stainless Steel Housing Drawing - <https://dcc.ligo.org/LIGO-D1100817>

Part: S421AM453 (45 cu" 'AccuMIGHT' Accumulator)

SPECIAL VALVE AI-S3-309

BUNA-N Bladder

Accumulators Inc.

Houston, TX

Phone: 713-465-0202

Fax 713-468-1618

[www.accumulators.com](http://www.accumulators.com)

## 8 RESISTOR

### 8.1 DESCRIPTION

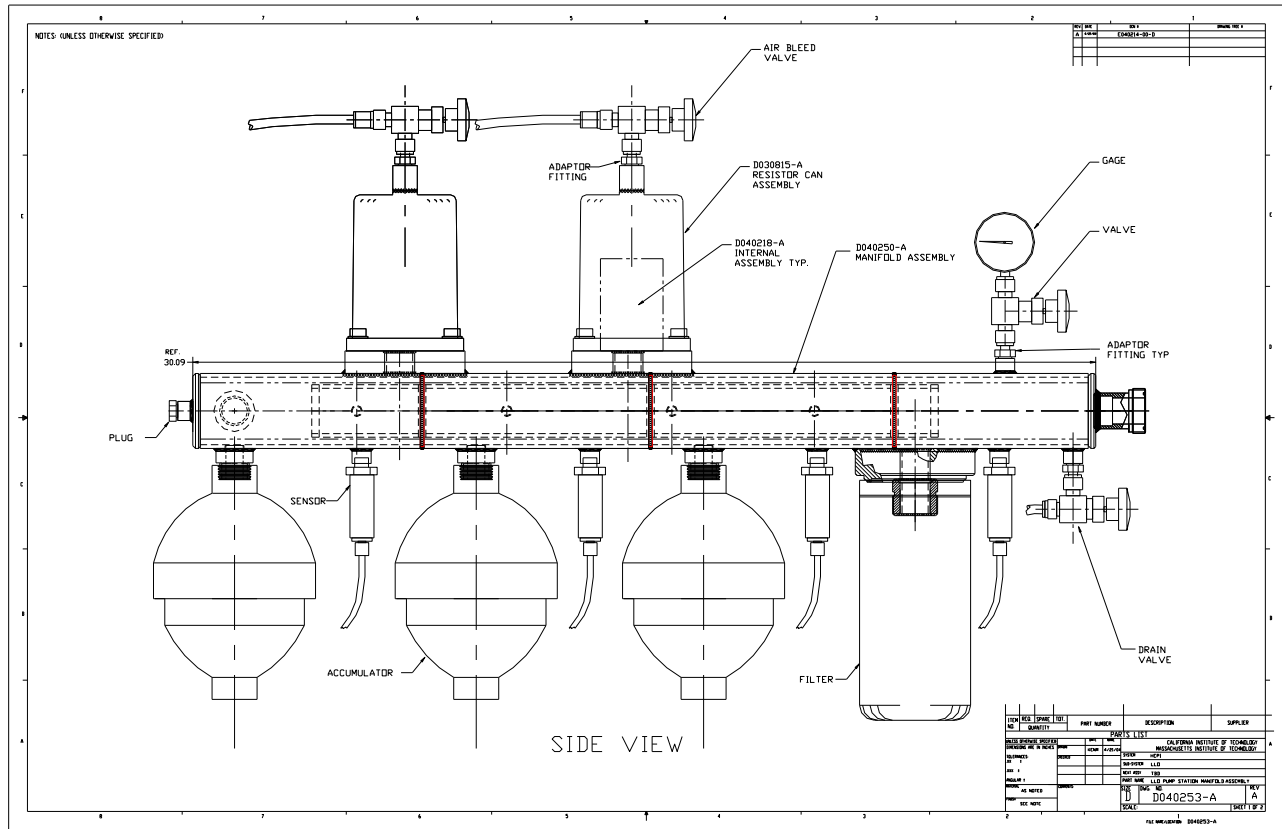
There are two black cylindrical resistor stacks located on the topside of the main pressure manifold.

These two resistors have valves located on the top. Their purpose is to allow trapped air to be removed from the system by migrating to this, "High point". The air can escape when the valve is opened slightly and flow thru a translucent tube into a holding container. This purge operation should be done frequently every two days at start up and then every week for the first two months after startup. When no air is seen entering the translucent tube when the resistor valve is opened, it can be assumed there is no entrained air in the fluid.

This procedure should be followed when the system is opened and serviced or filters are changed or any operation that allows air to enter the system at any point.



### 9 MANIFOLD SIDE VIEW



### 10 MANIFOLD DRAIN

There is a manifold drain valve located near the end of the manifold, opposite the manifold pressure analog dial gauge, on the bottom side. This valve allows fluid in the resistor cover cans and the manifold to be drained, also most of the fluid in the pump supply circuit can be drained by opening this valve, and manually rotating the pump.

### 11 RELIEF VALVE

At the vertex station are two pressure relief valves in the local line plumbing, and one at each end station. This relief valve has a pressure adjustment thimble with a numbered index around the thimble base for setting a pop off pressure setting. Vendor: McMaster Carr

## 12 ANALOG DIAL PRESSURE GAUGE

For convenience there is an analog 0-160 psi dial gauge located at the exit end of the manifold. This gauge is in an assembly with a shut off valve, if the gauge needs to be changed the fluid flow can be shutoff by this valve, and the gauge replaced.

## 13 LLO VERTEX PUMP STATIONS

Pumps are designed to have three in continuous operation one as backup and one at each end station.



LLO VERTEX PUMP STATIONS

## **13.1 Maintenance Schedule**

### **Daily**

Purge resistors for two weeks after any maintenance that could allow air to enter system.

### **Weekly**

Check reservoir levels, system pressures.

### **Monthly**

Record all pressures, visual check all VEA areas and pump carts for leaks.

### **Quarterly**

Sample fluid from each system for analysis and check and adjust accumulator pressures.

### **Yearly**

Grease motors.

### **Case by case**

Motors, pumps, filters and fluid should be dealt with on a case-by-case basis, allowing each component and system to drive the life span of maintenance period.