



## **INSTALLATION AND MAINTENANCE MANUAL ALPHA POWER JET 420 H**

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### **SECTION 1: Foreword**

The basic principle of a hydrojet is to propel a boat by means of the thrust produced with the violent ejection of water.

In fact, water is draw through a dynamic water intake, accelerated by the impeller, and expelled at high speed through the nozzle at the boat's stern.

The 420 Alpha Power Jet propulsor can be coupled to any type of engine, with power ratings from 200 to 600 HP, in accordance with boat's potential speed and its displacement.

## **SECTION 2: Technical characteristics**

### **2.1 STANDARD EQUIPMENT**

All stainless steel, elliptically shaped water intake flange, with inboard inspection cover;

Stainless steel protected shaft;

Splined stainless steel impeller with built-in impeller puller system;

Stainless steel Balanced steering nozzle with stainless steel self-aligning bearing;

Stainless steel reverse deflector with stainless steel self-aligning bearing;

Stainless steel pump housing;

Oil lubricated factory pre-set thrust bearing;

Oil lubricated tail bearing;

Precision mechanical face-seal;

1610 type input flange.

### **2.2 Optional equipment**

5 vaned intake grill;

Balanced steering cylinder with chromed stainless steel pushrods and attachments;

Balanced reverse deflector cylinder with chromed stainless steel pushrod and attachments;

Gear driven hydraulic piston pump system including :

pump and manifold

manual relief valve

pressure gauge

energy accumulator

oil tank and strainer

filter, hose and brackets;

33C style hydro-mechanical follower control system for reversing deflector with hoses;

## **SECTION 3: Performance**

Water jets can have a propulsive efficiency equivalent to other propulsion drive at speeds over 18 knots.

At lower speeds water jets have the advantage of shallow draught, excellent manoeuvrability and the ability to deliver more thrust than a fast propeller driven boat at low speed without overloading the motor.

This performance is achieved through the use of a special impeller profile developed by Alpha Power Jet, which is more resistant to low-speed cavitation than other impeller designs. It allows the Alpha Power Jet to produce higher thrust at lower speeds, as compared to conventional water jets. This high-thrust jet is a direct drive design, saving weight, initial cost and maintenance expenses. With 10 to 15 percent higher operating speed under load, the benefits are obvious.

This new jet offers several exclusive benefits; in particular, a unique system of adjusting the impeller blade pitch and the jet nozzle vortex to achieve the best performance, whether operating under light or full loads. As a result, an optimum performance curve is achievable for various hull configurations and engine power outputs.

### **Other benefits of this hydro-jet included:**

All stainless steel construction;

Fully hydraulic controls;

Permanently lubricated bearings throughout;

Faster, less expensive installation time ("Plug and Play" design);

Adaptable to very flat bottomed hulls as typically used in Maine's lobster fishing boats.

## **SECTION 4: Installation**

### **4.1 Water jet installation**

1. Cut the hull and transom according to the "installation drawings" in section 11;
2. Use the water jet as a drilling guide to fit the opening;
3. Install 1/16 shim stock between the hull and the water jet. Drill 5/16 holes for the attachment bolts.
4. Remove the water jet and 1/16 shim;
5. Resize all 5/16 hole in the hull with a 11/32 drill;

6. Clean the hull and water jet with acetone;
7. Apply 1/4 of polyurethane scellant around the water jet flange;
8. In a metal hull plastic insulation should be put in each hole;
9. Install the water jet with 5/16 stainless steel bolts and nuts;
10. Torque the 5/16 bolts and nuts to 11-13 Nm (8-10 ft.lbs.);
11. Clean excess polyurethane scellant from the jet flange inside and outside;
12. Check the tightness on all hoses and fittings;
13. Install the control cable or the hose or the harness according to the appropriate option drawings;
14. Fill the gear box with "Petro-Canada Ultima AP68" gear oil or equivalent;
15. Fill the hydraulic tank (option) with "Petro-Canada Harmony AW32" hydraulic oil or equivalent;
16. Run the hydraulic steering hose to the steering cylinder and connect.

#### **4.2 Twin installation**

1. Measure and cut the transfer tie-rod tube and weld the supplied 5/8 UNF nut;
2. Attach transfer tie-rod and steering levers on port and starboard water jet with supplied 5/8 UNC bolt and nylon jamb nut;
3. Torque 5/8 bolt and nut to 100 - 110 Nm (70 - 75 ft.lbs.);
4. Run the 2 supplied 1/2 hose from the transom and connect to the port and starboard reverse control valve (see option drawings).

**Note: For measuring the tie-rod tube, put steering nozzles at the dead center position.**

#### **4.3 Extracting the impeller**

1. Remove all screws #40 fig. 12.1.2;
2. Remove the rear section of the jet screw #38 at the bolts fig. 12.1.2;
3. Extract the whole removable rear section of the jet drive;
4. Loosen the impeller retainer screw #32 fig. 12.1.3 using the opposite spanner #24 and remove the impeller.

5. If the edge of the impeller blades should become damaged, round it off with a file.

**To assemble:**

1. Clean the spline on the shaft and impeller carefully, put anti-seize on spline;
2. Engage the impeller on spline, screw and tighten (25 - 30 ft.lbs.);
3. Reassemble the rear section of the jet (make sure there is no contact between impeller and any part of the jet casing, i.e. pump #2 fig. 12.1.2 or nozzle #3 fig. 12.1.2);
4. If necessary use a file to correct imperfections, but never on the impeller blade;
5. Make sure the impeller and the controls are running freely.
6. One method is to turn the shaft manually and check that there is no contact anywhere.

**SECTION 5: Start-up**

The Alpha Power Jet can run dry for up to fifteen minutes. We suggest for the initial start-up, to run the engine and jet briefly to check over all functions.

**Before start-up:**

1. Check all oil levels;
2. Check impeller, reversing deflector and steering nozzle readiness and clear all debris;
3. Start the engine and run it at low speed;
4. Correct hydraulic oil levels if they have changed;
5. Check for any oil leakage;
6. Check hydraulic oil pressure (1900 to 2000 psi);
7. Move the lever to all positions and make sure forward position (deflector up) and reverse position (deflector down) correspond with the lever control;
8. Move the steering wheel to all positions and make sure steering deflector corresponds with steering wheel;
9. Check and correct hydraulic oil levels again.

**SECTION 6: Operation**

**6.1 Notes**

The reverse deflector is powered by a hydraulic system;

The hydraulic system consist of a gear pump system and a hydraulic accumulator;

The hydraulic accumulator produces an up or down movement of the reverse deflector, through the reverse deflector lever;

After long periods of rest; it is possible that pressure in hydraulic accumulator is insufficient to move the reverse deflector until the pressure builds up again.

## **6.2 Start-up of a single installation**

We recommended before starting the engine to:

Put the steering at the center position;

Put the reverse deflector control lever in neutral position;

Start engine.

**Note: If it is impossible to move the reverse deflector lever because the hydraulic pressure is low, move it at the same time as you start.**

## **6.3 Start-up of a twin installation**

1. Start the port side engine using the same procedure used in section 6.2
2. With the port side engine running, move the starboard deflector control lever to the neutral position;
3. Start the starboard engine.

## **6.4 Operation and docking**

1. The bow of the vessel always turns in the same direction of the wheel position in (forward, neutral, reverse).
2. The steering effect is proportional to the engine RPM.
3. For slow speed manoeuvrability the engine should be set to around 1000 RPM which will give a sufficiently jet reaction to ensure good thrust and responsive steering. Boat speed is controlled with the reverse deflector control lever. Moving it forward increases speed or backward decreases speed.
4. For most slow speed and docking manoeuvres, the operator will have one hand on the steering wheel and one hand on the reverse deflector control lever.
5. In a strong wind or tidal condition the engine speed can be raise to increase the reaction as requested.

**If there is no power to the Alpha Power Jet, there is no steering effect.**

## **6.5 Fouled intake grill**

**A fouled intake grill can be clean by either:**

Removing the inspection cover on the intake casing which provides access to the intake grill. Ensure that the cover is above the waterline before removing it.

Select the reverse position on the engine marine gear selector (if fitted) and giving a 2-3 seconds burst power. This will blow obstructions away from the grill.

## **6.6 Caution notes**

With a light boat moving at speed under power, selecting reverse on the control head will cause the boat to decelerate very rapidly. This procedure should be use only in an emergency.

If the boat is in shallow water avoid using high RPM when manoeuvring, to prevent stones from being draw through the intake grill and causing damage to the impeller.

## **6.7 Remember**

If there is no power to the Alpha Power Jet, there is no steering effect.

# **SECTION 7: Corrosion protection**

## **7.1 Corrosion protection**

The Alpha Power Jet has been manufactured of 316L in stainless steel plate and provides an excellent resistance to corrosion;

Anodes have been incorporated to provide additional sacrificial protection to galvanic corrosion. When the anodes are showing signs of deterioration they are providing protection;

If the anodes have been eaten away to 50% or more of their original volume, they should be replaced with new ones;

The anodes fitted to the Alpha Power Jet are only for the protection of the jet unit. Additional anodes should be fitted to the hull for protection of the vessel itself;

Do not paint anodes.

## **7.2 Electrical system**

Stray currents generated by the boat electrical systems can often cause considerable corrosion to metal parts over a period of time;

A bonding strip with a reasonable cross section area (to keep the resistance as low as possible) should be connected to all major metal components and hull anodes.

**Major items should include:**

Main engine;

Water jet casing;

Ship service engine;

AC generator (frame only);

Etc.

**Note: The water jet should not be used to ground any electrical equipment. The bonding system must be independent of the electrical grounding system.**

**SECTION 8: Trouble shooting**

	<b>Symptoms</b>	<b>Causes</b>	<b>Solutions</b>
<b>8.1</b>	<b>Noisy water jet</b>	Intake blocked	Clear intake
	<b>Lost of thrust</b>	Damaged impeller blade	Inspect impeller condition and repair
	<b>Excessive engine speed</b>	Increased tip clearance due to wear	Check impeller tip clearance and repair
		Intake blocked	Clear intake
<b>8.2</b>	<b>Excessive vibration</b>	Damaged impeller blade	Inspect impeller blade and repair
		Worn drive shaft joints	Inspect joints and shaft, and repair
<b>8.3</b>	<b>Low or high gear box oil level</b>	Worn water jet bearing	Inspect and replace
		Faulty input flange oil seal	Strip and replace
<b>8.4</b>	<b>Low hydraulic oil level</b>	Faulty mechanical seal	Strip and replace
		Hose leakage	Change hose
<b>8.5</b>	<b>Hard steering wheel or faulty reverse</b>	Cylinder leakage	Repair cylinder
		Debris obstructing the operation	Clear debris



	<b>deflector operation</b>	Operating linkage not moving freely	Inspect and repair
<b>8.6</b>	<b>Low speed operation of reverse deflector at Low RPM</b>	Low oil level	Check oil level and refill
		Damaged hydraulic accumulator	Repair or replace hydraulic accumulator
		Low hydraulic oil level	Check oil level and refill
<b>8.7</b>	<b>No reverse deflector control or no steering control</b>	Low hydraulic oil pressure	Replace hydraulic filter
			Check strainer and clean
			Check hydraulic pump and repair

## **SECTION 9: Service instructions**

### **9.1 10 hours (or daily) inspection**

#### **Check level and colour of the gear oil:**

If level is low, add oil;

If colour is changed, change gear oil with "Petro-Canada Ultima EP 68" gear oil;

#### **Check level and colour of the hydraulic oil:**

If level is low, add oil;

If colour is changed, change filter and hydraulic oil with "Petro-Canada Harmony AW32" hydraulic oil;

Clean all debris in deflectors and grill.

### **9.2 250 hours (or monthly) inspection**

Check anodes and replace if necessary.

### **9.3 1000 hours (or annually) inspection**

Check anodes and replace if necessary;

Replace hydraulic oil filter;

Replace hydraulic oil with "Petro-Canada Harmony AW32" oil;

Replace gear oil with "Petro-Canada Ultima EP68" oil;

Clean hydraulic oil strainer;

Clean gear oil magnetic plug;

Inspect unit for damage;

Inspect all control, bearings and linkage.

## **SECTION 10: Warranty**

### **10.1 Certificate of warranty**

The shipyard, retailer or importer should fill out the certificate of Warranty in the Buyer's presence, and return it to Alpha Power Jet within **10 days** of the date of delivery of the unit to of the customer.

The return of this certificate is compulsory to assure the validity of the Warranty.

**Alpha Power Jet number :**

**Shipyard:**

**Customer name:**

**Vessel name:**

**Delivery date:**

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**Alpha Power Jet number:**

**Shipyard Name:**

**Address:**

**Customer Name:**

**Address:**

**Vessel name:**

**Delivery date:**

## **10.2 Limited warranty**

### **Duration**

Alpha Power Jet guarantees their products for a period of 12 months from the date of delivery to the Titular; however, the warranty ceases to be applicable 18 months after the date of shipment from Alpha Power Jet.

The warranty is limited to the first Owner/User, and commits Alpha Power Jet to replace or repair such parts as should be acknowledged unfit because of defective material or manufacturing.

### **Terms**

The guarantee includes the free supply of replacements for the parts under warranty, and for labour for their substitution as per labour schedule issued by Alpha Power Jet.

Any expenses that should possibly derive for the removal and re-installation of the boat's engine, with regard both to labour and to the use of cranes or other equipment, are at

customer 's expense.

Travel and living expenses for personnel, as well as the necessary commonly used materials (lubrication oil, filter cartridges, belts, impellers, etc.) are not covered by this warranty.

The acknowledgement of warranty is to be determined solely by Alpha Power Jet, after examination of the parts that have been replaced by their engineers.

Warranty work must be conducted only by an authorized workshop, in accordance with the dealership agreement.

**The guarantee is understood to be invalidated by, or not applicable in the following cases:**

- Failure to carry out within the scheduled times the operations listed in the control coupon, if any;
- Damages incurred during transportation;
- Incorrect installations or repairs;
- Incorrect use (insufficient lubrication, use of spare parts other than original ones);
- The use of the jet in competitive events or for rental purposes;
- Normal wear;
- Failure to follow the instructions listed in the operation and maintenance manual;
- Modifications that, in the Manufacturer's judgement, may alter the original characteristics of the product; or
- Change of settings, or removal of seals and components.

Furthermore, the guarantee does not cover commonly used materials such as lubricants, filters, belts, injectors, impellers for water pump, impellers for the jet.

Concerning components and accessories supplied as original equipment, such as accumulator, hydraulic pump, instrumentation etc., the guarantee clauses of their respective Manufacturers will apply.

The warranty issued by Alpha Power Jet is the only one valid and applicable to the products of their own manufacture.

Alpha Power Jet does not take any responsibility for potential damage that could be caused directly or indirectly by defects in the product, nor do they authorize any third party to take responsibilities in their name.

Alpha Power Jet is neither directly nor indirectly responsible for losses, damages or injuries caused by defective construction, material, or installation of the product.

## **SECTION 11: Drawings**

## **SECTION 12: Schedule of parts**

### **12.1 Basic unit parts**

#### 12.1.1 Schedule of basic unit parts

<b>Unit number</b>	<b>Description</b>	<b>Quantity</b>	<b>per unit</b>
<b>1</b>	Intake		<b>1</b>
<b>2</b>	Pump		<b>1</b>
<b>3</b>	Nozzle		<b>1</b>
<b>4</b>	Steering deflector		<b>1</b>
<b>5</b>	Reverse deflector		<b>1</b>
<b>6</b>	Reverse hydraulic cylinder		<b>1</b>
<b>7</b>	Steering hydraulic cylinder		<b>1</b>
<b>8</b>	Transfer tie rod for a twin installation		<b>1</b>
<b>9</b>	Steering tie rod		<b>1</b>
<b>10</b>	Reverse tie rod		<b>1</b>
<b>11</b>	Steering lever		<b>1</b>
<b>12</b>	Bottom steering cap		<b>1</b>
<b>13</b>	Inspection cover		<b>1</b>
<b>14</b>	Gear box cover		<b>1</b>
<b>15</b>	Propeller shaft		<b>1</b>
<b>16</b>	Output drive blank cover		<b>1</b>
<b>17</b>	Input flange		<b>1</b>
<b>18</b>	Spacer shaft		<b>1</b>
<b>19</b>	Thrust ring		<b>1</b>
<b>20</b>	Thrust bearing housing		<b>1</b>

<b>21</b>	Thrust bearing flange	<b>1</b>
<b>22</b>	Pilot bearing housing	<b>1</b>
<b>23</b>	Impeller	<b>1</b>
<b>24</b>	Impeller puller plate	<b>1</b>
<b>25</b>	Tail jet corrector	<b>1</b>
<b>26</b>	Nozzle corrector	<b>1</b>
<b>28</b>	Wing screw 3/8 U.N.C. x 1"	<b>2</b>
<b>31</b>	Hex. socket flat. head screw 3/8 U.N.C. x 1 "	<b>4</b>
<b>32</b>	Hex. socket flat. head screw U.N.C. x 1"	<b>1</b>
<b>34</b>	Hex. head screw 5/16 U.N.C. x "	<b>3</b>
<b>36</b>	Hex. head screw 3/8 U.N.C. x 1 "	<b>6</b>
<b>37</b>	Hex. head screw 3/8 U.N.C. x 1 "	<b>16</b>
<b>38</b>	Hex. head screw U.N.C. x 1 "	<b>8</b>
<b>39</b>	Hex. head screw U.N.C. x 4 "	<b>4</b>
<b>40</b>	Hex. head screw 5/8 U.N.C. x 2"	<b>3</b>
<b>41</b>	Hex. head screw U.N.C. x 2 "	<b>2</b>
<b>43</b>	Hex. socket head cap screw U.N.C. x 1"	<b>6</b>
<b>44</b>	Hex. socket head cap screw 3/8 U.N.C. x 2"	<b>1</b>
<b>45</b>	Hex. socket head cap screw 3/8 U.N.C. x 1"	<b>16</b>
<b>46</b>	Hex. socket head cap screw U.N.C. x 1 "	<b>2</b>
<b>49</b>	Hex. nut 3/8 U.N.C.	<b>30</b>
<b>50</b>	Hex. nut U.N.C.	<b>16</b>
<b>51</b>	Hex. nylon nut U.N.C.	<b>2</b>
<b>52</b>	Hex. nylon nut 5/8 U.N.C.	<b>2</b>
<b>53</b>	Hex. jam nut 5/8 U.N.F.	<b>3</b>
<b>54</b>	Hex. nylon nut U.N.C.	<b>2</b>
<b>55</b>	Hex. nut 1 "-12	<b>1</b>
<b>57</b>	Flat washer 5/16	<b>3</b>

<b>58</b>	Flat washer 3/8 I.D. O.D.	<b>1</b>
<b>59</b>	Flat washer 3/8	<b>30</b>
<b>60</b>	Flat washer	<b>20</b>
<b>61</b>	Flat washer 5/8	<b>2</b>
<b>62</b>	Flat washer 1 "	<b>1</b>
<b>63</b>	Impeller flat washer	<b>1</b>
<b>65</b>	Lock washer 5/16	<b>3</b>
<b>66</b>	Lock washer 3/8	<b>30</b>
<b>67</b>	Lock washer	<b>16</b>
<b>69</b>	Threaded pin U.N.C. x 2"	<b>8</b>
<b>71</b>	Rod end HME-10	<b>3</b>
<b>73</b>	Clavis 5/8 x 1 5/8	<b>2</b>
<b>74</b>	Cutter pin 5/32 x 1	<b>2</b>
<b>75</b>	Dowel pin	<b>1</b>
<b>76</b>	Bushing BRONZ L= I.D.=5/8 O.D.=1	<b>2</b>
<b>78</b>	Spacer L=5/16 I.D.= O.D.=	<b>2</b>
<b>79</b>	Spacer L=7/16 I.D.= O.D.=1 1/8	<b>2</b>
<b>80</b>	Spacer L=1/8 I.D.= O.D.=1 1/8	<b>2</b>
<b>82</b>	Reverse deflector bearing housing	<b>2</b>
<b>84</b>	Pilot bearing	<b>1</b>
<b>85</b>	Thrust bearing	<b>1</b>
<b>86</b>	Steering deflector bearing	<b>2</b>
<b>87</b>	Reverse deflector bearing	<b>2</b>
<b>89</b>	Input Flange oil seal	<b>1</b>
<b>90</b>	Mechanical seal	<b>1</b>
<b>92</b>	"O"ring 2-136	<b>1</b>
<b>93</b>	"O"ring 2-152	<b>1</b>
<b>94</b>	"O"ring 2-369	<b>1</b>

<b>96</b>	Anode	<b>6</b>
<b>100</b>	Dip stick	<b>1</b>
<b>101</b>	Feeder cap	<b>1</b>
<b>102</b>	Magnetic drain plug	<b>1</b>
<b>103</b>	Drain plug	<b>1</b>
<b>104</b>	767 anti-seize	<b>1</b>
<b>105</b>	242 lock tight	<b>1</b>
<b>106</b>	262 lock tight	<b>1</b>
<b>107</b>	518 lock tight gasket	<b>1</b>
<b>108</b>	RTV silicon gasket	<b>1</b>

## **12.2 Hydraulic arrangement**

### 12.2.1. Schedule of the “A” arrangement parts

<b>Unit number</b>	<b>Description</b>	<b>Quantity</b>	<b>per unit</b>
<b>150</b>	Reverse deflector control valve		<b>1</b>
<b>151</b>	Hex. screw 5/16 x 2		<b>2</b>
<b>152</b>	Flat washer 5/16		<b>2</b>
<b>154</b>	Lock washer 5/16		<b>2</b>
<b>155</b>	Cable attachment ass.		<b>1</b>
<b>156</b>	Hydraulic oil filter (assembly)		<b>1</b>
<b>156a</b>	Housing 1		
<b>156b</b>	Spin on filter element 1		
<b>157</b>	Hydraulic tank		<b>1</b>
<b>158</b>	Hex. screw 3/8 U.N.C. x 1"		<b>4</b>
<b>159</b>	Flat washer 3/8		<b>4</b>
<b>160</b>	Lock washer 3/8		<b>4</b>
<b>161</b>	Level eye		<b>1</b>



<b>162</b>	Hydraulic manifold (assembly)	<b>1</b>
<b>162a</b>	Manifold 1	
<b>162b</b>	Manual relief valve 1	
<b>162c</b>	Directional check valve 1	
<b>162d</b>	Pressure gage 1	
<b>166</b>	Hydraulic oil strainer	<b>1</b>
<b>168</b>	Hydraulic oil pump	<b>1</b>
<b>169</b>	Hydraulic accumulator	<b>1</b>
<b>170</b>	Hydraulic accumulator clamp	<b>2</b>
<b>180</b>	Tank to hydraulic pump suction hose	<b>1</b>
<b>181</b>	Tank suction fitting	<b>1</b>
<b>183</b>	Pump suction fitting	<b>1</b>
<b>184</b>	Pump to tank vent tube	<b>1</b>
<b>185</b>	Tank vent tube fitting	<b>1</b>
<b>186</b>	Pump vent fitting	<b>1</b>
<b>187</b>	Pump to manifold pressure hose	<b>1</b>
<b>188</b>	Pressure hose pump fitting	<b>1</b>
<b>189</b>	Pressure hose manifold fitting	<b>1</b>
<b>190</b>	Manifold to tank relief valve tube	<b>1</b>
<b>191</b>	Manifold fitting	<b>1</b>
<b>192</b>	Tank fitting	<b>1</b>
<b>193</b>	Manifold to accumulator hose	<b>1</b>
<b>195</b>	Manifold fitting	<b>1</b>
<b>196a</b>	Filter elbow fit. (w/o PWR steering)	<b>1</b>
<b>196b</b>	Filter tee fit. (w. PWR steering)	<b>1</b>
<b>197</b>	Control valve to filter return hose	<b>1</b>
<b>198</b>	Control valve return fitting	<b>1</b>
<b>199</b>	Accumulator adapter fitting	<b>1</b>

<b>200</b>	Accumulator tee fitting	<b>1</b>
<b>201</b>	Accumulator to control valve hose	<b>1</b>
<b>202</b>	Pressure port control valve fitting	<b>1</b>
<b>204</b>	Control valve fitting	<b>2</b>
<b>205</b>	Cylinder fitting	<b>2</b>
<b>206</b>	Control valve to cylinder hose ("A" port)	<b>1</b>
<b>207</b>	Control valve to cylinder hose ("B" port)	<b>1</b>
<b>211</b>	Port to starboard hydraulic hose (w. twin installation)	<b>2</b>
<b>212</b>	Hose end fitting (w. twin installation)	<b>2</b>
<b>213</b>	Port cont. valve fitting (w twin installation)	<b>2</b>
<b>214</b>	Starboard cont. valve fitting (w twin installation)	<b>2</b>
<b>220</b>	Steering helm pump (option)	<b>1</b>

### **12.3 Hydraulic piston and pump arrangement**

#### 12.3.1 Schedule of Hydraulic pump parts

<b>Unit number</b>	<b>Description</b>	<b>Quantity per unit</b>
<b>1</b>	Hydraulic piston pump	<b>1</b>
<b>2</b>	Hydraulic pump drive shaft	<b>1</b>
<b>3</b>	Bearing pump housing	<b>1</b>
<b>4</b>	Drive out gear	<b>1</b>
<b>5</b>	Drive in gear	<b>1</b>
<b>6</b>	Ball bearing pump	<b>1</b>
<b>7</b>	Hex. head screw 5/16 U.N.C. x 1" steel	<b>4</b>
<b>8</b>	Hex. head screw 3/8 U.N.C. x " steel	<b>4</b>
<b>9</b>	Hex. head screw 3/8 U.N.C. steel	<b>2</b>
<b>10</b>	Hex. socket flat head screw 3/8 U.N.C. x 1 " steel	<b>2</b>
<b>11</b>	Lock washer 3/8	<b>2</b>

<b>12</b>	Flat washer 3/8	<b>2</b>
<b>13</b>	Retaining ring N1300-0244	<b>1</b>
<b>14</b>	Retaining ring N1460-0118	<b>1</b>
<b>15</b>	262 Loctite	<b>1</b>
<b>16</b>	518 Loctite gasket	<b>1</b>