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**marol marine**

*NEXT GENERATION in CONTROLS*

**Outboard Steering System**

**H-6xx Helm Pump**

**MSB-38MZ Cylinder**

**MSB-38MZ-H Cylinder**

**MSB-38MZ-M Cylinder**

***Installation Instructions***

***Owner's Manual***

MEMBER  
**ABYC**<sup>®</sup>  
*Setting Standards for Safer Boating*

**Ver 1.00  
June 29, 2006**

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*NEXT GENERATION in CONTROLS*

## Reference

Thank you so much for your purchase of Marol Hydraulic Steering System.

This installation manual explains the installation method of Marol Hydraulic System.

To operate this equipment properly, please read and follow this manual carefully.

Keep this manual in a place where it will not be lost or damaged.

Always keep it onboard.

If you sell or transfer this equipment to a third party, please hand this manual over to the new owner.

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# Safety Precautions

Precautions when installing and operating Hydraulic Steering System are explained hereafter.



## Warning

**WARNING:** shows the following may lead to the possibility of death or serious injury.

- **Electrical storms**  
In the even of an electrical storm, do not touch any metal parts or equipment, shock may occur.
- **While operating, observe nautical laws and use precaution.**



## Caution

**CAUTION :** The following may lead to the possibility of injury and/or damage to equipment.

### Inspection prior to sailing

Confirm normal operation, Check oil level.

### Periodical Inspection

Inspect or maintain all the equipment periodically.

Inspection and maintenance should be done periodically in accordance with Installation Manual.

### Plumbing

Please use only an appropriate hose cutter. Cut hose at appropriate angle.

Please do not use a saw. After cutting the hose, wipe tubing clean and flush connectors. Not removing debris may cause poor operation.

### Helm Pump

Do not install helm pump where it may interfere with other parts or reduce visibility.

Apply caulking to fitting surface, if necessary.

### Actuator

Install actuator and tiller at the same height horizontally.

After installation or stroke adjustment, tighten locknuts on actuator securely to avoid disconnection of ball joint.

## Description

A MAROL Steering System is comprised of two basic elements; the helm unit and the cylinder.

The H-600 Series Helm Unit is a single component which consists of a hydraulic pump, pilot check valve assembly, relief valve and reservoir.

While rotating the ship's wheel, seven (7) pistons move in a rhythmic, but controlled pattern within the Helm Unit. These pistons, in turn, pump hydraulic fluid to the steering cylinder. Two pilot check valve assemblies are incorporated into the steering helm. These isolate each steering station from all others. They also lock the rudder and eliminate feed back from the rudder to the steering wheel.

Hydraulic fluid is maintained in a reservoir that is built into each H-600 Series Helm. The fluid is accessed by a fill plug in the front of the unit.

A relief valve has also been built into each Helm. It not only protects the hydraulic steering system, but it will protect the mechanical portion of the rudder in the event the rudder hits a solid object.

The relief valve is factory set at 1000 psi.

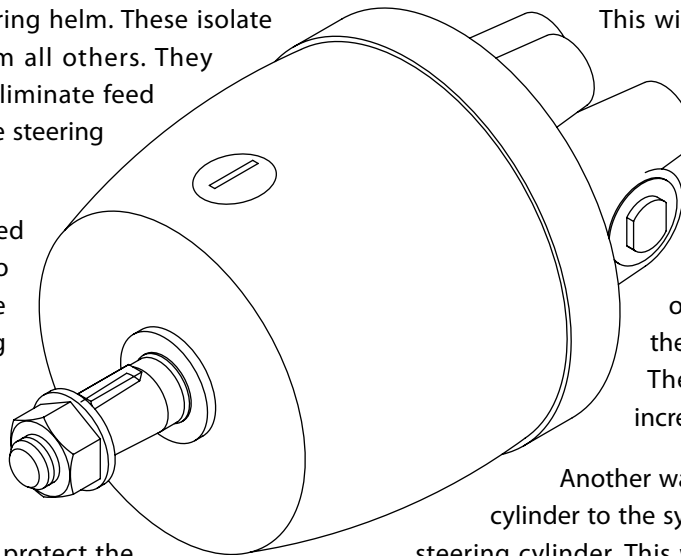
Steering cylinder assemblies are double acting, either double rod end, or single rod end types. The cylinder can be rigidly mounted or universally mounted. The cylinder rods are high strength, corrosion resistant stainless steel.

Manual hydraulic steering can be used on any boat which can be steered manually. The system has a standard torque efficiency, but when a greater torque on the rudder is required, it can be achieved in several ways:

The rudder arm length may be increased. This will increase the torque on the rudder while decreasing the total rudder arc.

A second method is to install a cylinder with a larger displacement. This will increase the system output force while keeping the rudder arm length the same. The number of helm turns will increase.

Another way is to add a second steering cylinder to the system, in parallel with the first steering cylinder. This will double both the turning torque on the rudder and the number of turns from hardover to hardover.



# 1 Helm Installation

## PREPARATION FOR INSTALLATION

Purging and Helm Installation Instructions have been included with the component. If the Instructions are missing, or you need additional help, contact MAROL or your MAROL distributor.

It is recommended that **all system components be mounted prior to running the system hose**. This allows the hose to be run port-to-port with less chance of a connection error.

If it is necessary for the hose to be installed first, a system of marking and matching the different hose runs to their proper connection points should be used. **All hose ends must be covered with tape or similar material to prevent any dirt or foreign material from entering the system.**

### NOTE

**Before beginning installation read all instructions thoroughly. Verify that a complete unit has been received and familiarize yourself with the contents of the Installation Package.**

### NOTE

**Contamination is the most common cause of system failure.**

## CAUTION

**Dry seal threads and high quality fittings are used throughout your MAROL system. DO NOT USE any lubricant or sealer on the flared tube fittings. DO NOT USE Teflon tape, Permatex, Formatek, or similar type thread sealants, on the pipe joints. Should these sealants be introduced into your system, a malfunction could result. The only sealant MAROL recommends for pipe threads is Loctite Thread Sealant #545 however, this sealant should be used sparingly and with care.**

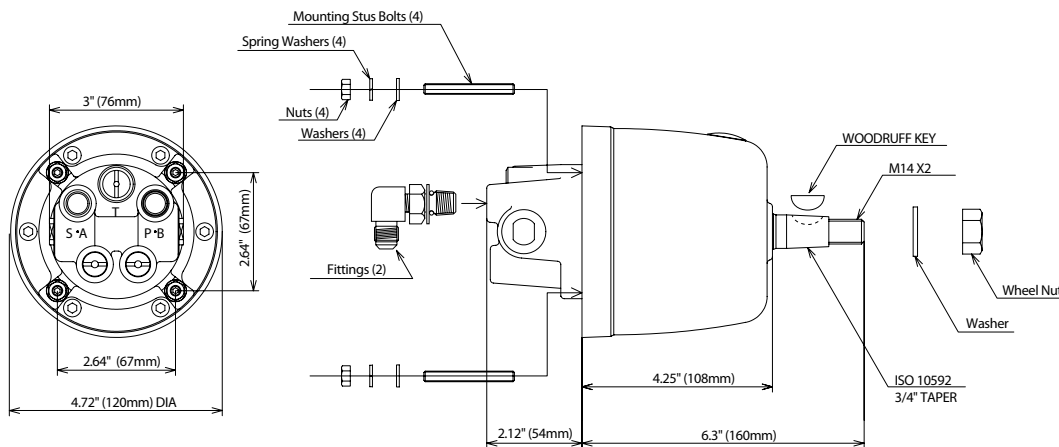
## MOUNTING THE HELM

All helm units are stamped with a part number and date code of manufacture. Shown below are descriptions of these codes for the 600 series helms.

H-6	XX
Helm Unit Model Number	Displacement
	18=1.1 cu-in (18cc)    30=1.8 cu-in (30 cc)
	23=1.4 cu-in (23.3 cc)    33=2.0 cu-in (33 cc)
	26=1.6 cu-in (26.3 cc)    39=2.4 cu-in (38.5 cc)

Helm units are to be mounted in front of the panel. Dimensions for the helm unit are shown in Figure 1. Proper installation of parts is shown in Figure 2.

Select a suitable mounting location capable of supporting the helm and a minimum load. Be sure nothing interferes with the helm, plumbing or steering wheel use.



**Figure 1**

H-600 Helm  
Dimensions

MODEL	H-618-D	H-623-D	H-626-D	H-630-D	H-633-D	H-639-D
DISPLACEMENT	1.1 cu-in (18 cc)	1.4 cu-in (23.3 cc)	1.6 cu-in (26.3 cc)	1.8 cu-in (30 cc)	2.0 cu-in (33 cc)	2.3 cu-in (38.5 cc)
RELIEF VALVE	1000 PSI (6.9MPa)					
TANK CAPACITY	21.5 cu-in (350 cc)					

## FRONT MOUNT INSTALLATION

Using the template, mark the 3-1/8" Dia. helm cutout and four 5/16" bolt mounting holes on dash panel. Cut the 3-1/8" Dia. helm mounting hole and drill four 5/16" diameter holes at the marked locations.

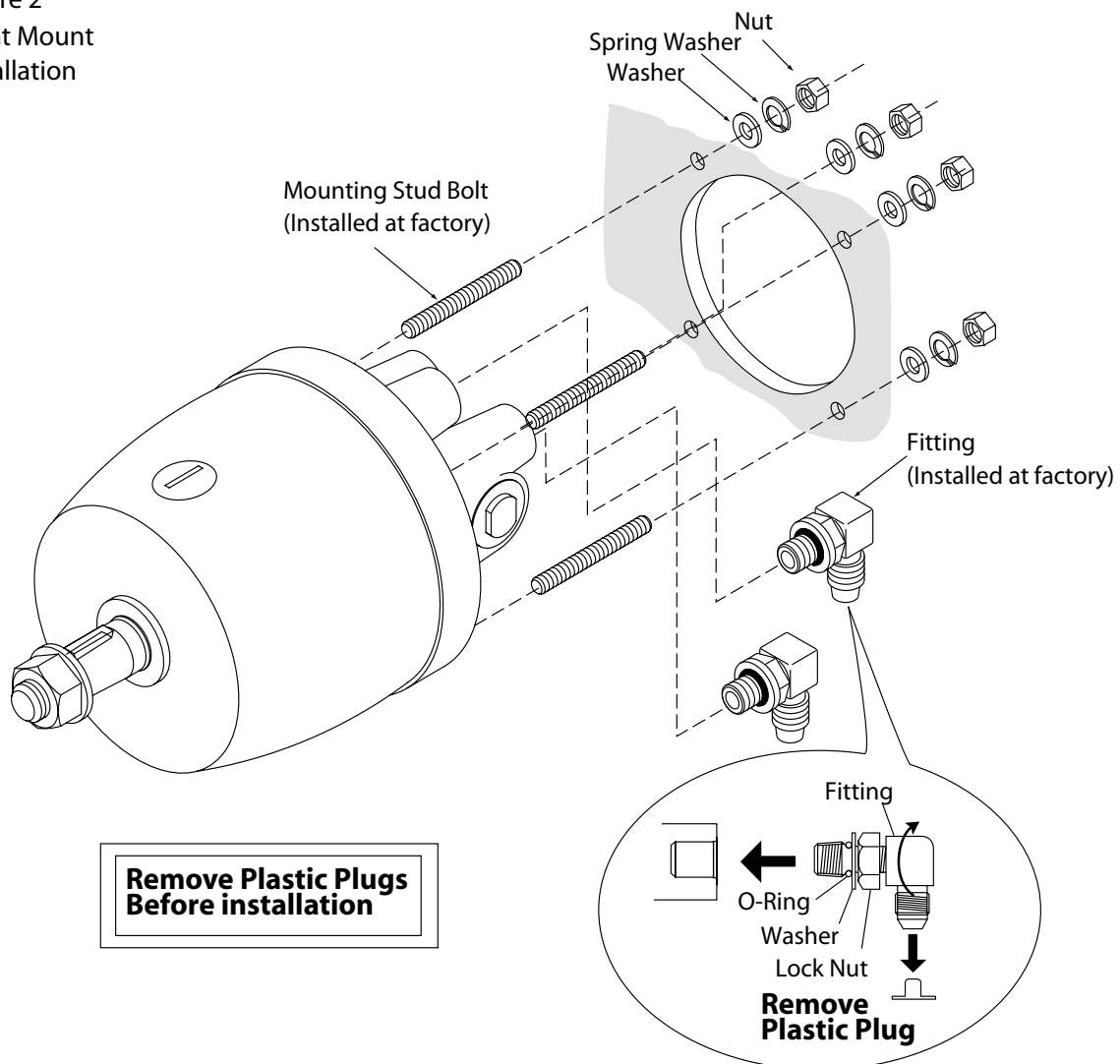
Remove the plastic plugs on the elbow fittings. (Elbow fittings installed at factory) Hydraulic hose direction may be selected freely. Screw-in the elbow until the O-ring is pressed tightly, determine the hydraulic hose direction, and tighten the lock nut. **See Figure 2.**

Mounting Stud Bolts installed at factory.

Install the Helm into the mounting hole (fill plug on top) inserting the four bolts into the corresponding bolt holes.

Install washers and nuts onto the bolts from back side of panel. See **Figure 2**. Tighten nuts firmly.

Figure 2  
Front Mount  
Installation

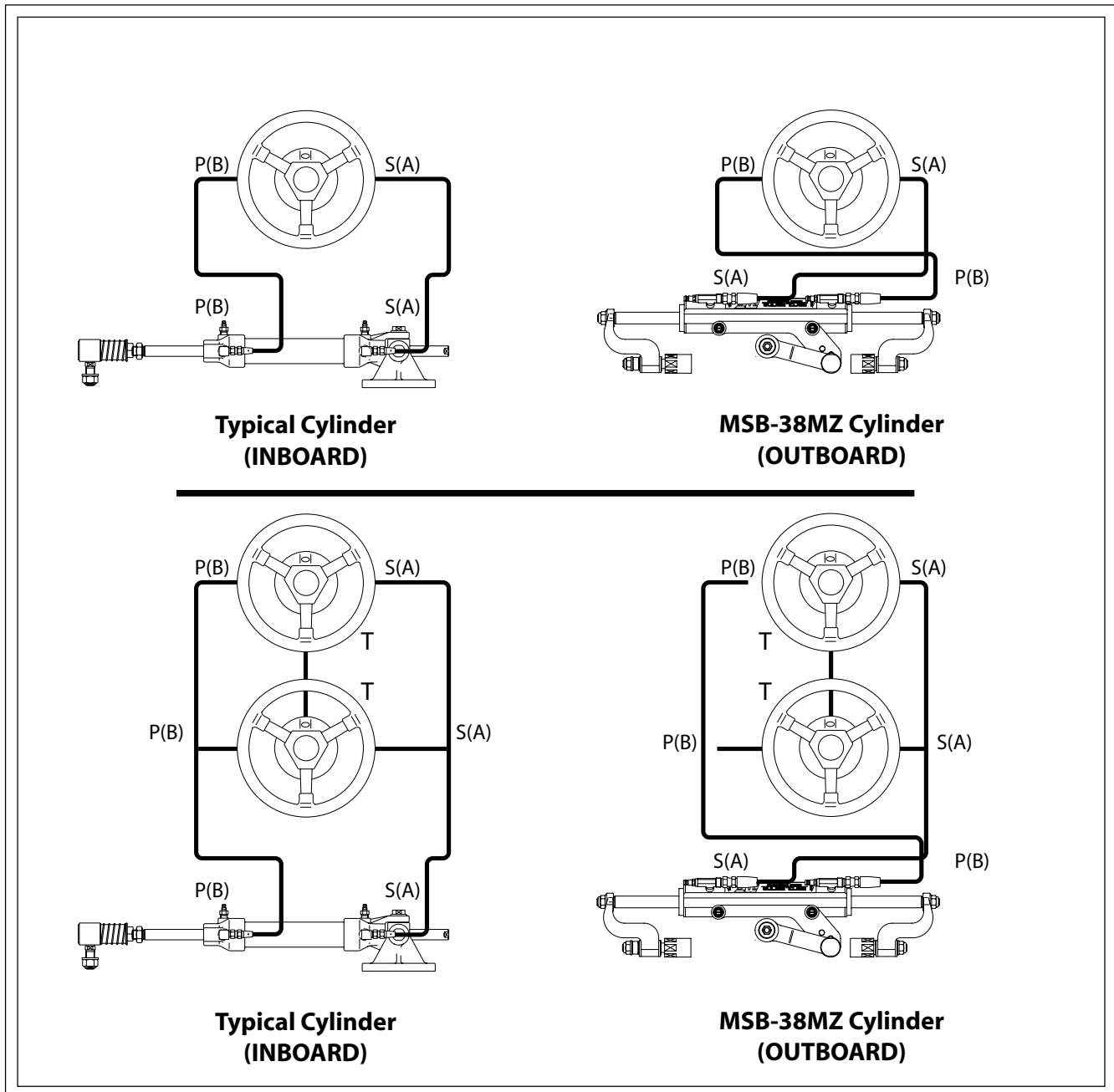


## PORTING INFORMATION

All helm ports are 1/4-BSPP (female) pipe threads. Suitable adapters for high pressure marine steering hose must be used. The "T" (center) port is plugged and will not be used on Single Station Systems. Adapters may be installed prior to helm installation. In a Dual

Station System, shown in Figure 3, the plugs in the "T", or center ports, of the helm units must be removed and replaced with suitable fittings and hose to connect the reservoirs in the helms.

**ADAPTER P/N:MF-4003**

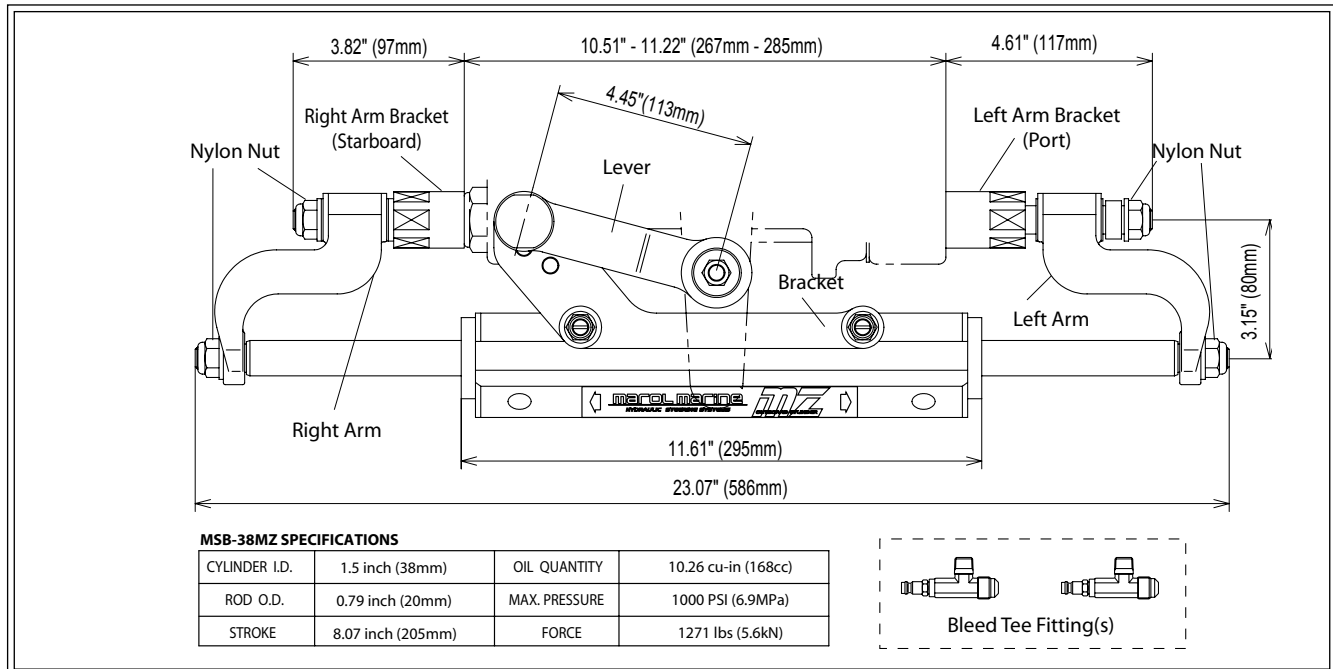


**Figure 3**

## 2 Cylinder Installation

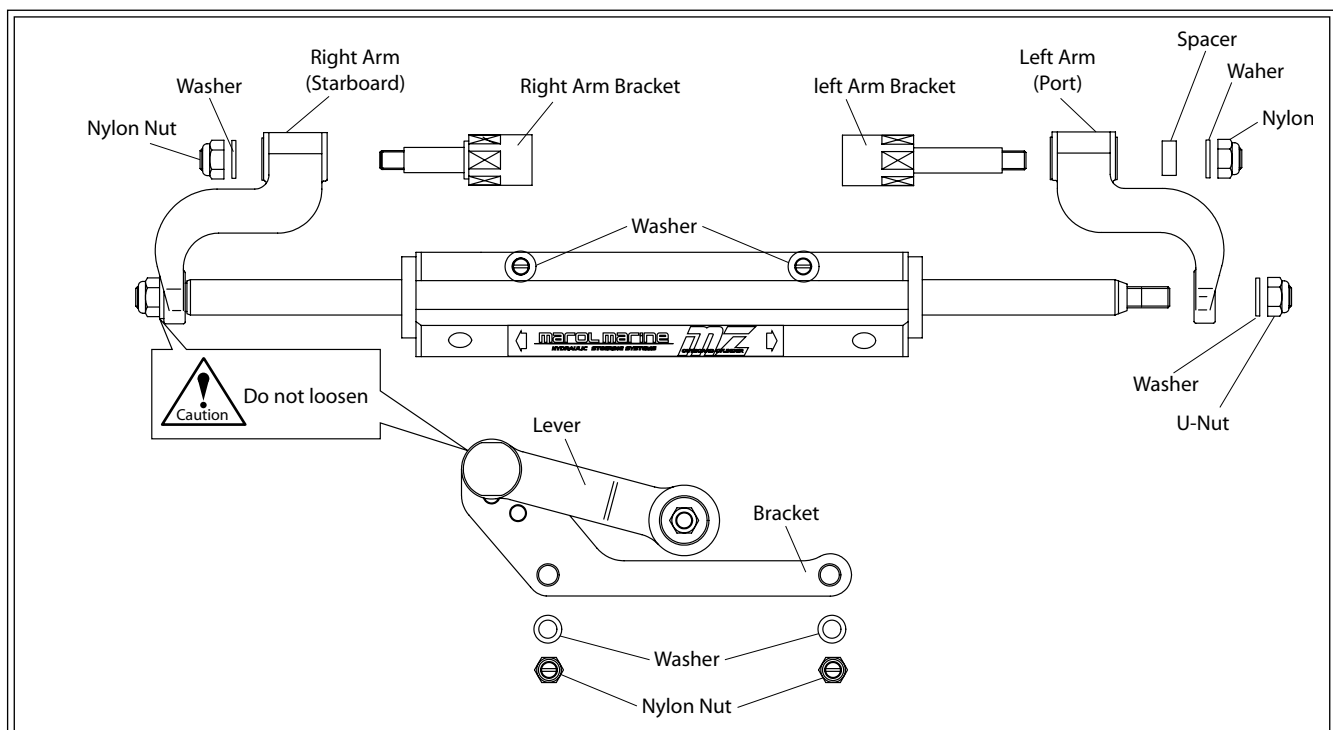
### CONTENTS OF THE CYLINDER ASSEMBLY

The cylinder has been pre-assembled at the factory.



### DISASSEMBLY

Remove the pre-assembled Right Arm Bracket, Left Arm Bracket, Bracket/Lever and Left arm from the cylinder assembly as shown in the illustration below.





## ATTACHING ON THE STEERING ARM

### NOTE

**For MERCURY outboard and HONDA outboards, the following Steering Arm Adapters required.**

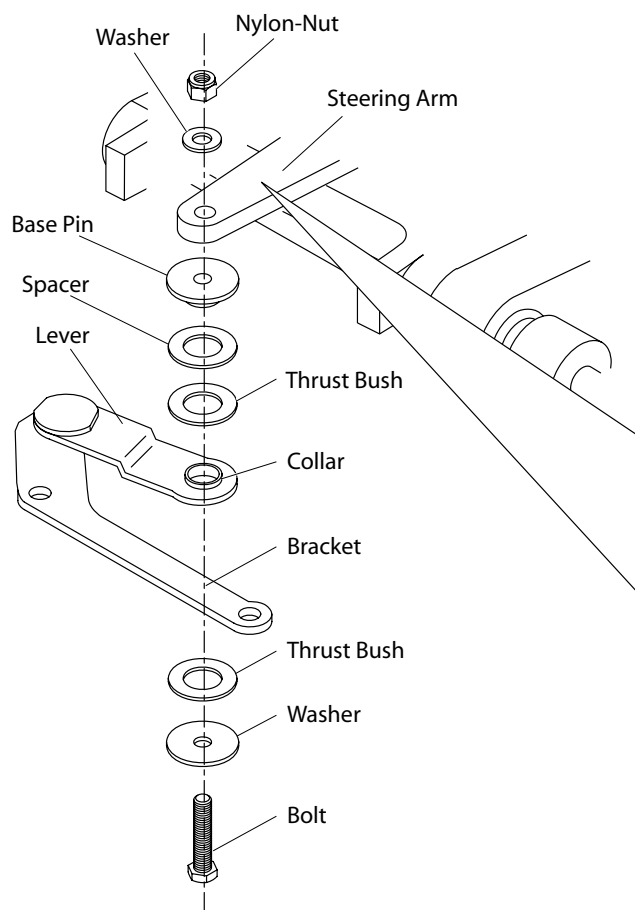
**For MERCURY outboard P/N : STP-30MX-M**

**For HONDA outboard P/N : STP-30MX-H**

1. Attach Bracket/Lever to the steering arm using the Bolt, Washers(s), Thrust Bush(s), Spacer, Base Pin and Nylon Nut as shown in the illustration on the right.

**Tightening torque : 186 in-lbs (21 N-m)**

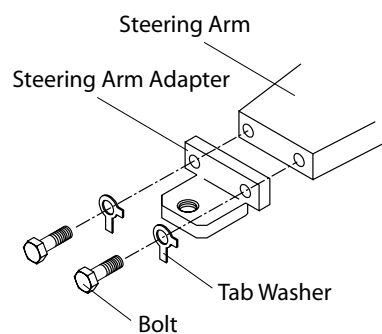
2. Make an adjustment so that the outboard motor and the cylinder are set in the neutral steering position relative to the boat.



### STEERING ARM ADAPTER KIT

Steering Arm Adapter Kit for Mercury  
(P/N : STP-30MX-M)

Steering Arm Adapter Kit for Mercury  
(P/N : STP-30MX-H)



### CAUTION

The tab washre(s) must be vent correctly  
for purpose of locking.

## CYLINDER INSTALLATION

### NOTE

**For MERCURY outboard and HONDA outboards, the following Left Arm Brackets required.**

**For MERCURY outboard P/N : ADP-30MX-M (Thread size 1-14 UNS)**

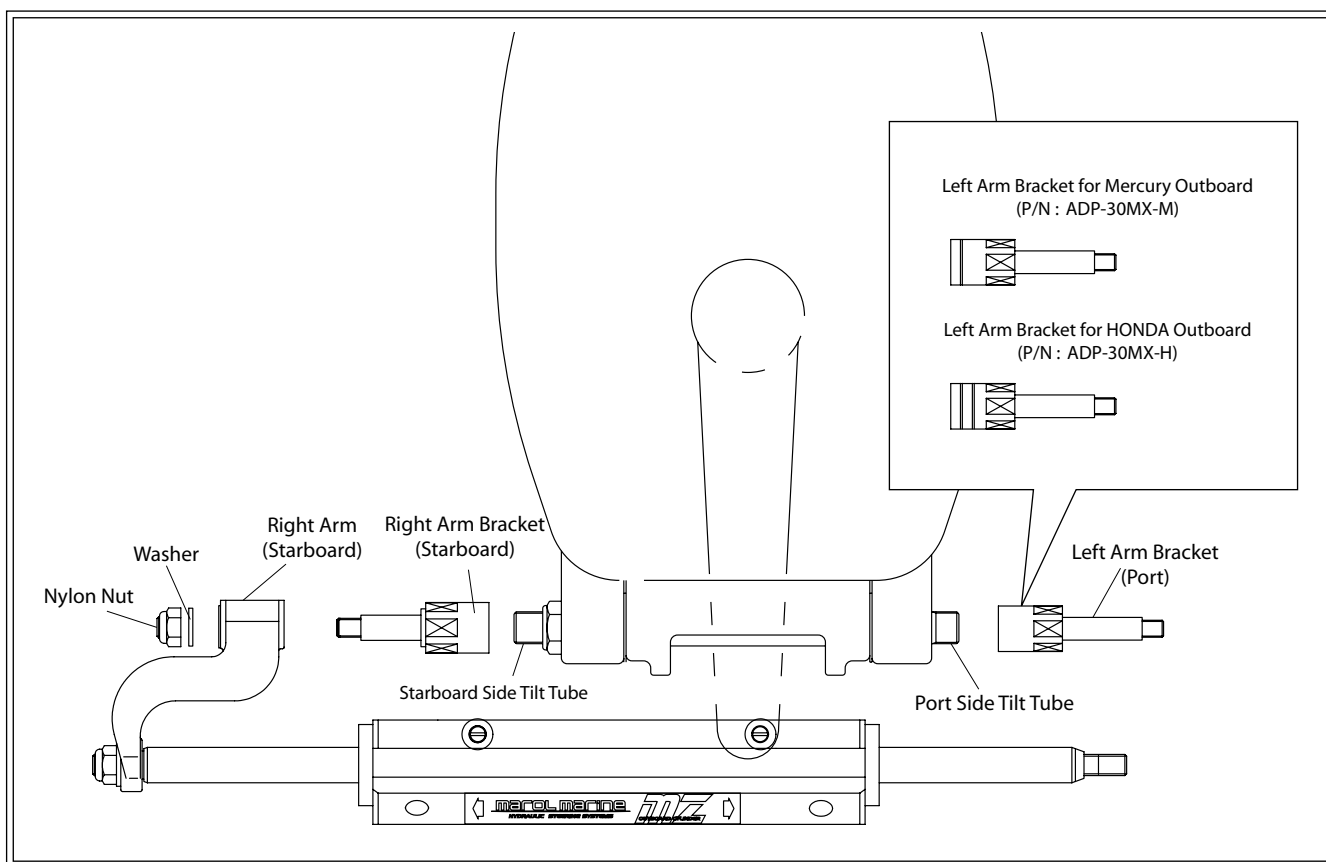
**For HONDA outboard P/N : ADP-30MX-H (Thread size M25 X 2.0)**

1. Install the Right Arm Bracket to the starboard side tilt tube on the outboard.
2. Insert the Right Arm into the Right Arm Bracket, insert the Washer and Nylon Nut, and tighten the Nylon Nut firmly.

**Tightening torque : 347 in-lbs (39.2 N-m)**

3. Install the Left Arm Bracket to the port side tilt tube on the outboard.

**Tightening torque : 347 in-lbs (39.2 N-m)**



### CAUTION

**Tighten the bolts and nuts on the cylinder firmly to the specified tightening torque. Inadequate tightening may cause free play in the cylinder structure, resulting in possible damage to the manual hydraulic steering system.**

### CAUTION

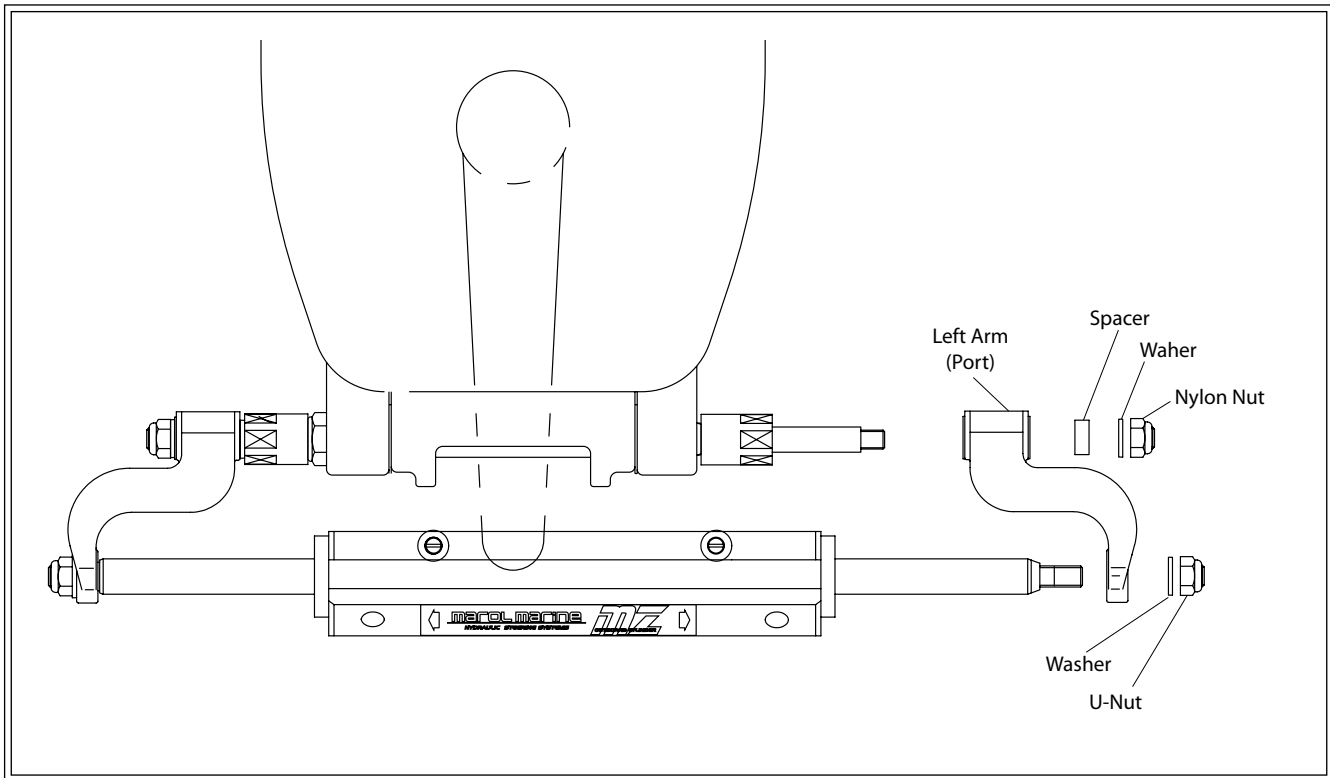
**Thread Sealant has been applied to the Right and Left Arm Brackets. Once removed, Thread Sealant will be required.**

4. Insert the Left Arm into the Left Arm Bracket, insert the Washer and Nylon Nut on the cylinder rod and tighten the Nylon Nut firmly.

**Tightening torque : 347 in-lbs (39.2 N-m)**

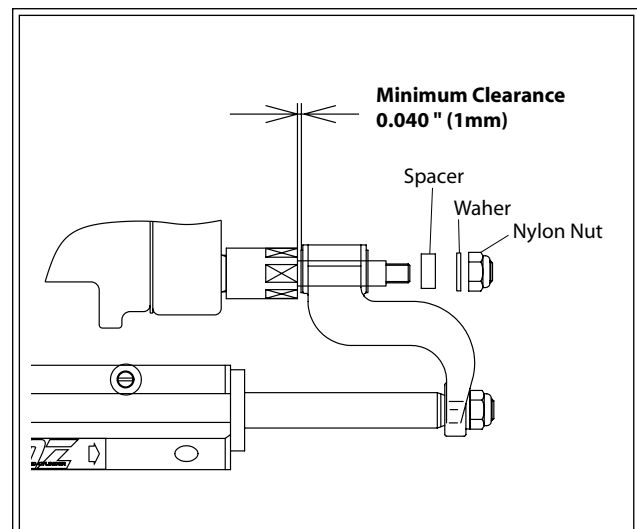
5. Insert Spacer, Washer and Nylon Nut into the Left Arm Bracket and tighten the Nylon Nut firmly.

**Tightening torque : 347 in-lbs (39.2 N-m)**



**CAUTION**

**Make sure that minimum clearance left arm bracket to left arm is 0.040 " (1mm) .**

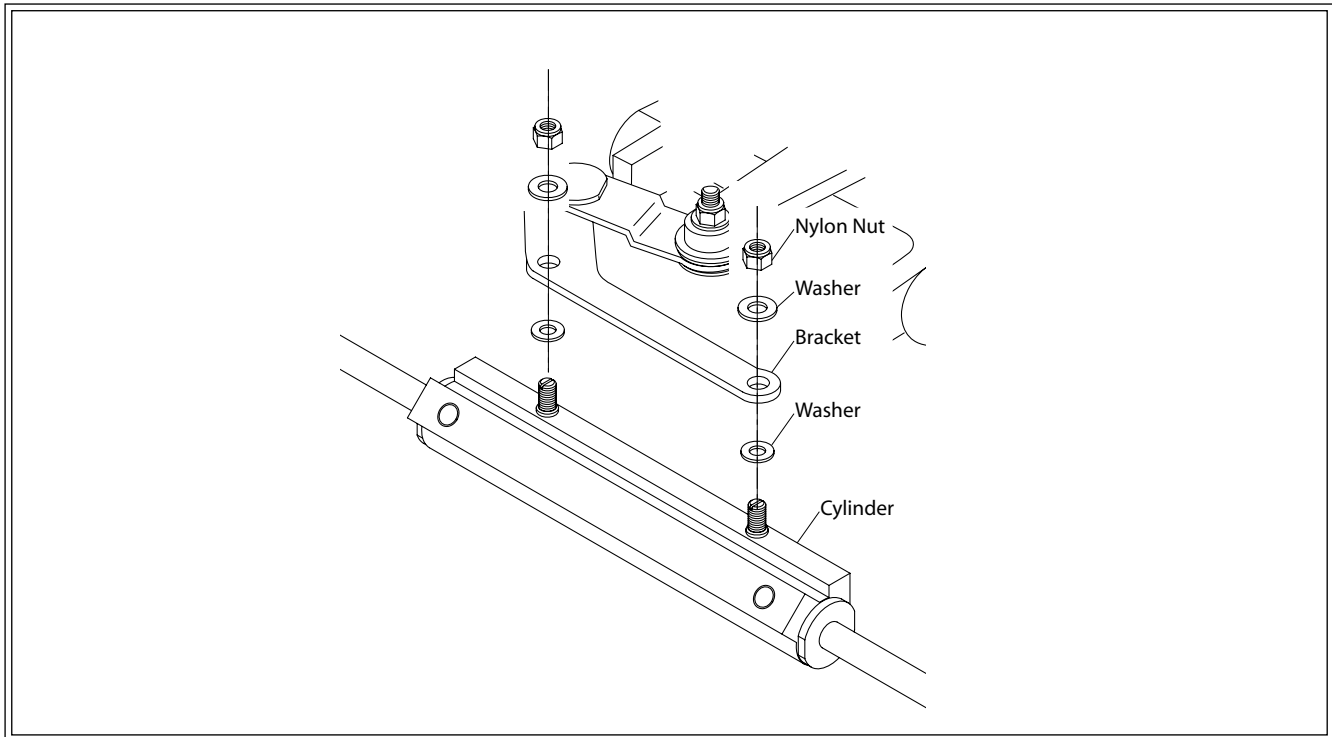


## ATTACHING ON THE CYLINDER

1. Attach Cylinder to the Bracket/Arm using the Washers(s) Thrusut Bush(s) and Nylon Nut as shown in the illustration on the right.

**Tightening torque : 186 in-lbs (21 N-m)**

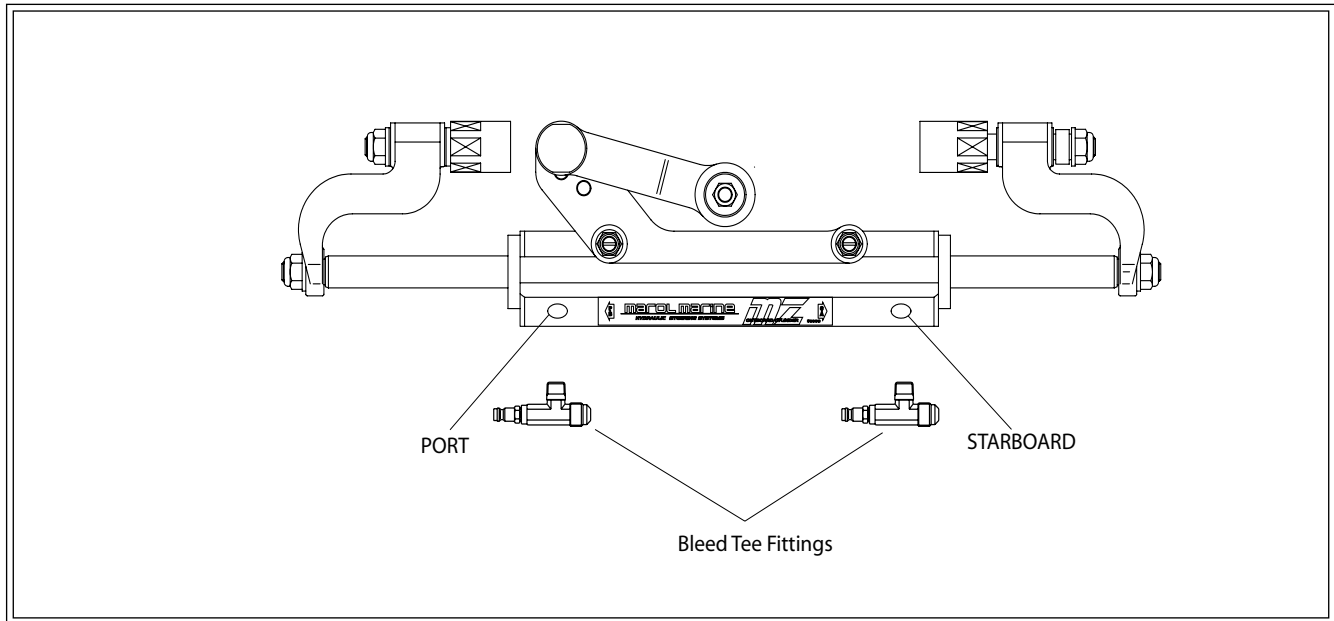
2. Make an adjustment so that the outboard motor and the cylinder are set in the neutral steering position relative to the boat.



## BLEED TEE FITTING INSTALLATION

1. Remove the plastic plugs from both cylinder ports.
2. Install the bleed tee fittings in both ports.

**(Sealing compound has already been applied to the thread of bleed tee fittings.)**



### CAUTION

Confirm the hydraulic hose routing direction when tightening bleed tee fittings.  
Adjust the direction while tightening the fitting.  
Loosening the tightened fitting will cause the sealing compound to peel off, and oil leakage may take place.  
Do not install the air bleed tee fitting vertically to avoid interference of the hydraulic hose with the motorwell.

### 3 Oil Filling & Air Purging

#### PREPARATION FOR FILLING & PURGING

This section pertains to purging a single station system. This procedure may require two people, as one person may not be able to remove all air from the system resulting in spongy, unresponsive steering.

#### CAUTION

**The steps for purging must be followed in the order in which they appear.**

Prepare for purging by setting up the CYLINDER and the HELM as described in the following instructions.

#### HYDRAULIC FLUID

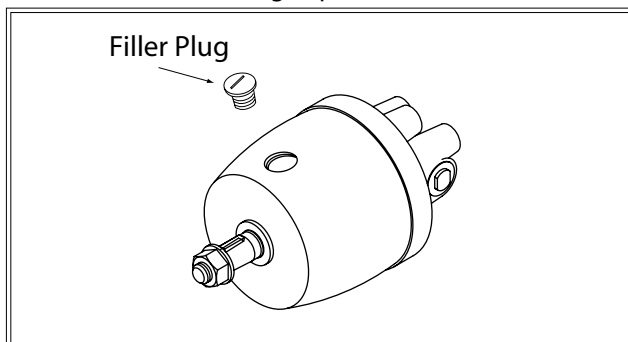
Approved hydraulic fluids are : **US MIL SPEC H-5606**  
**ISO VG #15**

#### CAUTION

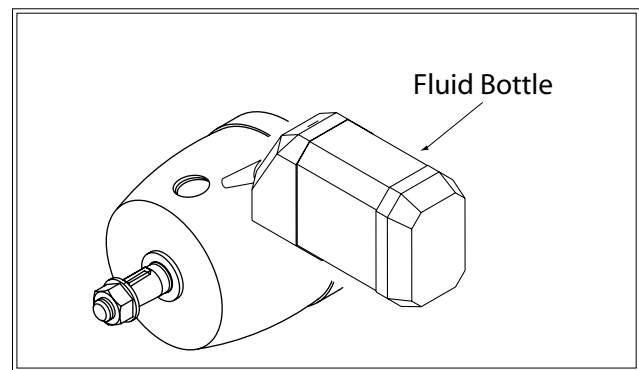
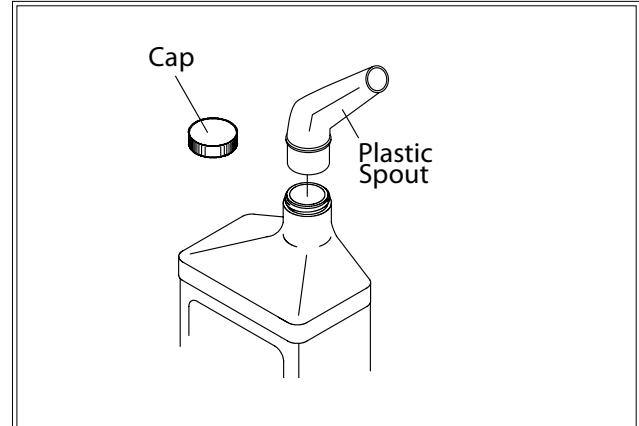
**Any non-approved fluid may cause irreparable damage and / or loss of steering. Never use brake fluid.**

#### SETTING UP THE HELM

- Remove the Filler Plug Cap.



- Remove the cap from the hydraulic steering fluid bottle and replace it with the plastic spout. Make sure the plastic spout is clean.
- Hold the hydraulic steering fluid bottle above the helm, invert container, and allow the helm to fill with the hydraulic steering fluid.

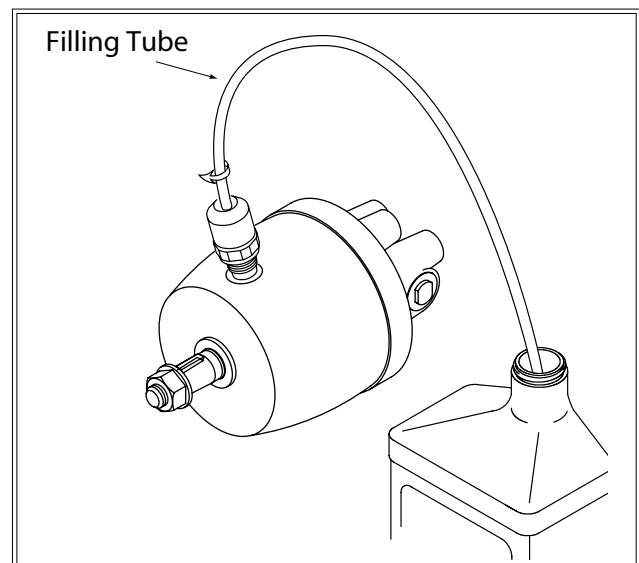


#### NOTE

**Filling the helm can be done faster if fluid is poured into helm before connecting purge tube.**

- Install the filling tube (P/N VT-2) (hand tighten), slide other end onto the fluid bottle.

**Filling Tube P/N : VT-2**



### STEP 1

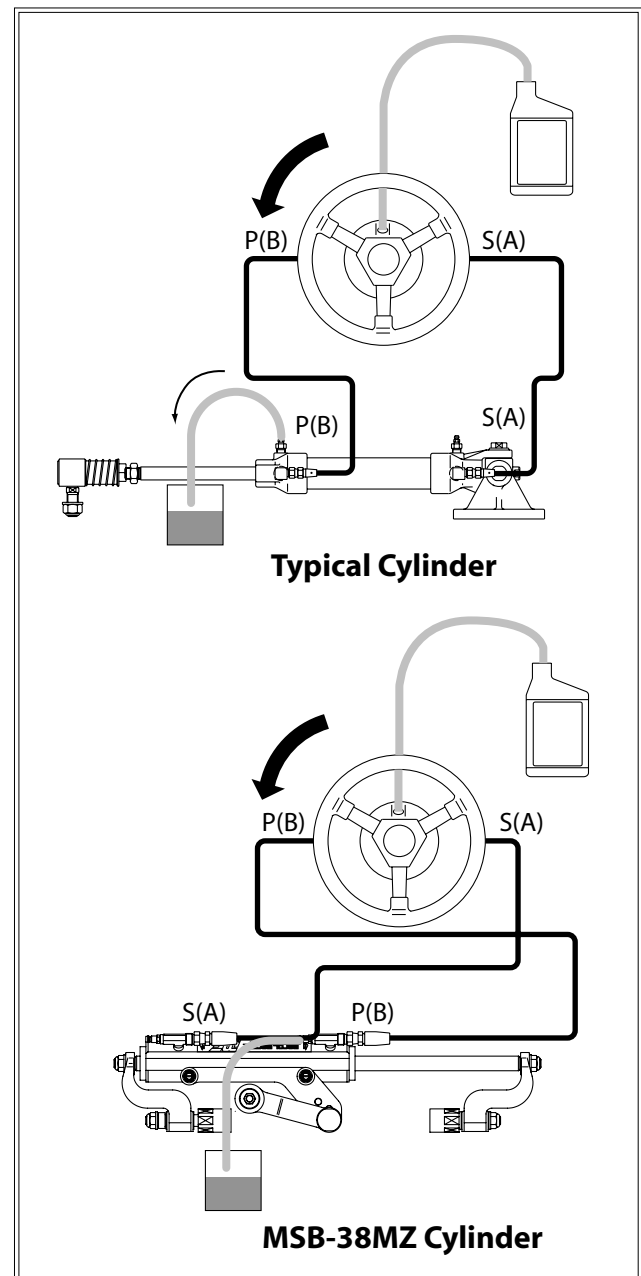
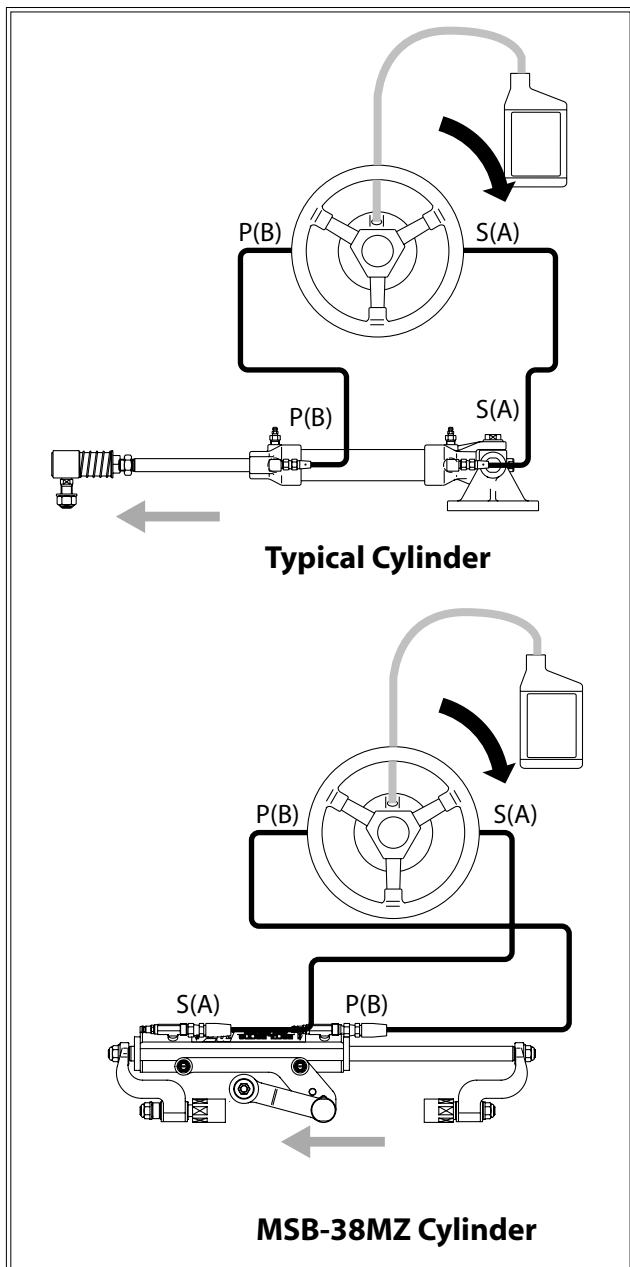
- Turn the steering wheel clockwise slowly (about one second per revolution) until the cylinder rod is fully extended on PORT side of the cylinder.

#### NOTE

**As you turn the wheel, fluid will be drawn from the bottle into the steering system.**

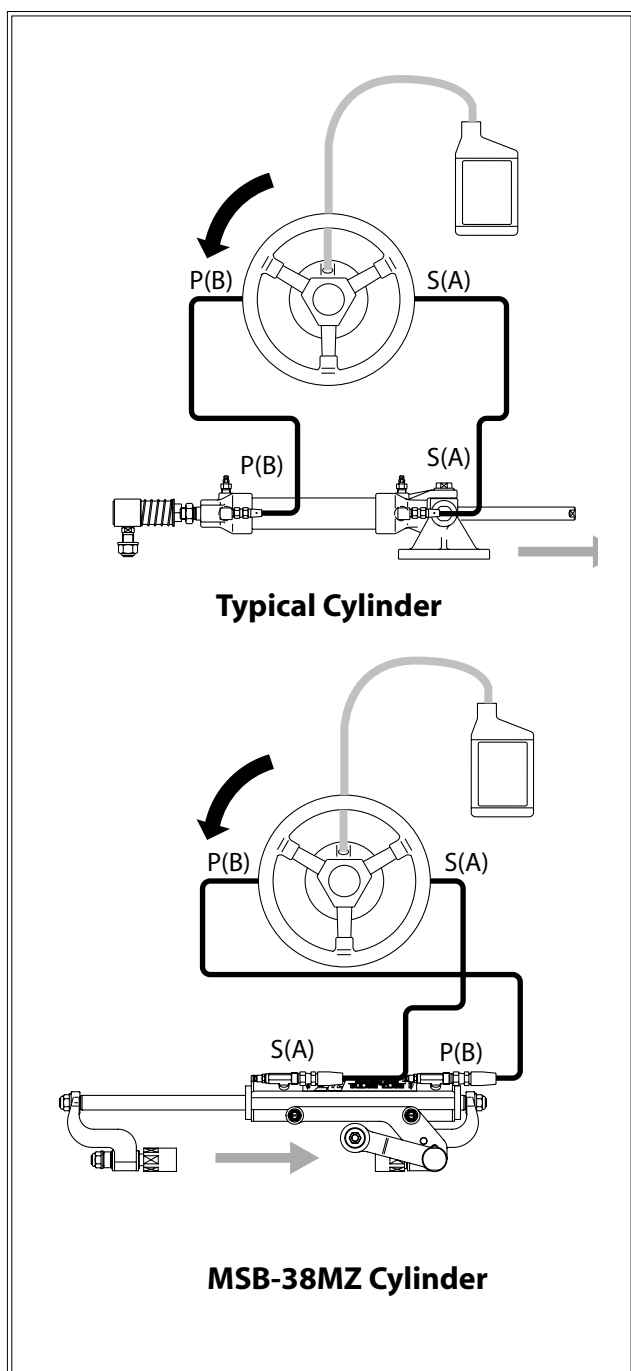
### STEP 2

- Prepare a clean container (for draining the fluid) and purge tube. **Purge Tube P/N :VT-1**
- Slide purge tube onto the Bleed Fitting Nipple at the PORT side and place other end into container. Open Bleed Fitting, 1/2 turn, at the PORT side.
- Hold the cylinder rod or cylinder tube (so it does not move back into the cylinder) and slowly turn the steering wheel counter-clockwise until a bubble-free stream of fluid flows from purge tube.



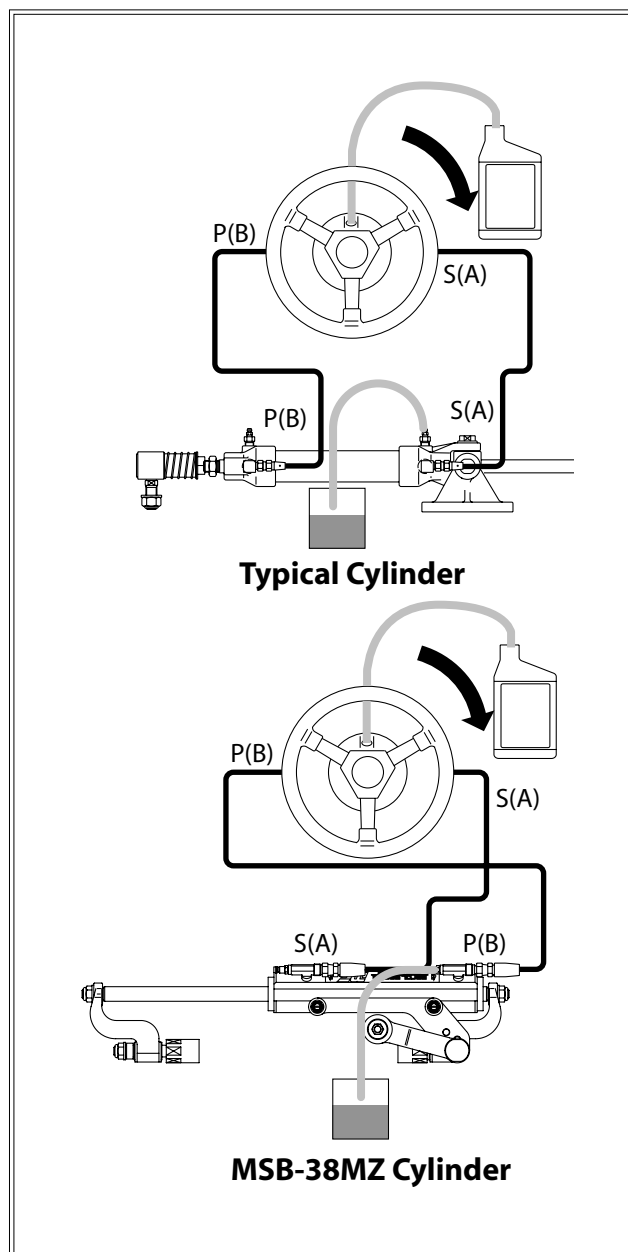
### STEP 3

- While continuing to turn the steering wheel counter-clockwise, close the PORT-SIDE Bleeder Nut and release the cylinder rod.
- Continue turning the steering wheel counter-clockwise until the cylinder rod is fully extended on the Starboard side of the cylinder.



### STEP 4

- Remove purge tube from the PORT side and slide onto the Bleed Fitting Nipple at the STARBOARD side. Place container under free end of tube to catch oil then open Bleed Fitting 1/2 turn at STARBOARD side.
- Hold the cylinder rod or cylinder tube (so it does not move back into cylinder) and slowly turn the steering wheel clockwise until a bubble-free stream of fluid flows from the bleeder.
- Continue turning the steering wheel clockwise then close the Bleed Fitting at STARBOARD side and release the cylinder rod.





## STEP 5

- Hold the steering fluid container lower than the helm allowing oil from the tube to drain back into the container.
- Adjust the proper fluid level in the helm, by opening the STARBOARD Bleed Fitting 1/2 turn and turning the steering wheel one full turn clockwise. The fluid level should now be slightly lower than bottom of Filler Cap cavity.
- Close the Bleed Fitting.
- Remove the Filling Tube from the helm unit and reinstall the original Filler Plug Cap.
- Remove the Purge Tube from the Bleed Fitting Nipple. (a rag or paper towel may be needed to catch excess oil that drains from the tube, and to wipe fittings dry).
- Check for leaks at all fittings. If there are no leaks, the system is ready for use.

### NOTE

**Fluid collected in the clean container during the purging process may be used again if it is first filtered through a paper coffee filter.**

## Limited Warranty Policy HYDRAULIC PRODUCTS

MAROL warrants that Hydraulic Products manufactured by MAROL Co., LTD.-Kobe Japan shall be free from defects in materials and workmanship for a period of three years (36 months) from the date of sale to end user, or 42 months from date of original manufacture-whichever expires first.

MAROL will rebuild or replace, at its option, all products of its manufacture proven to its satisfaction to be defective within such warranty period and returned to MAROL's designated place in the USA, transportation charges prepaid. MAROL's sole obligation, and buyer's exclusive remedy hereunder, is limited to such rebuilding or replacement.

No products may be returned to any MAROL's designated place in the USA unless the prior consent for said return shall have been obtained from the MAROL designated exclusive distributor in the USA (Mitsui Lifestyle USA Inc.). This Limited Warranty does not cover shipping costs to the MAROL's designated place in the USA, any costs for labor or otherwise related to product removal or replacement, or any other costs of any nature without prior consent by MAROL-Kobe Japan.

Parts, products and accessories made by others are warranted only to the extent of the original manufacturer's warranty to MAROL.

This warranty shall not apply to acts of God, war or civil insurrection, nor shall it apply to products which, in the sole judgment of MAROL, have been subject to negligence, abuse, sanctioned racing events, accident, misapplication, tampering, alteration; nor due to improper installation, operation, maintenance or storage; nor to other than normal application, use of service, including but not limited to, operational failures caused by foreign materials in the system, or operation at pressures in excess of recommended maximums.

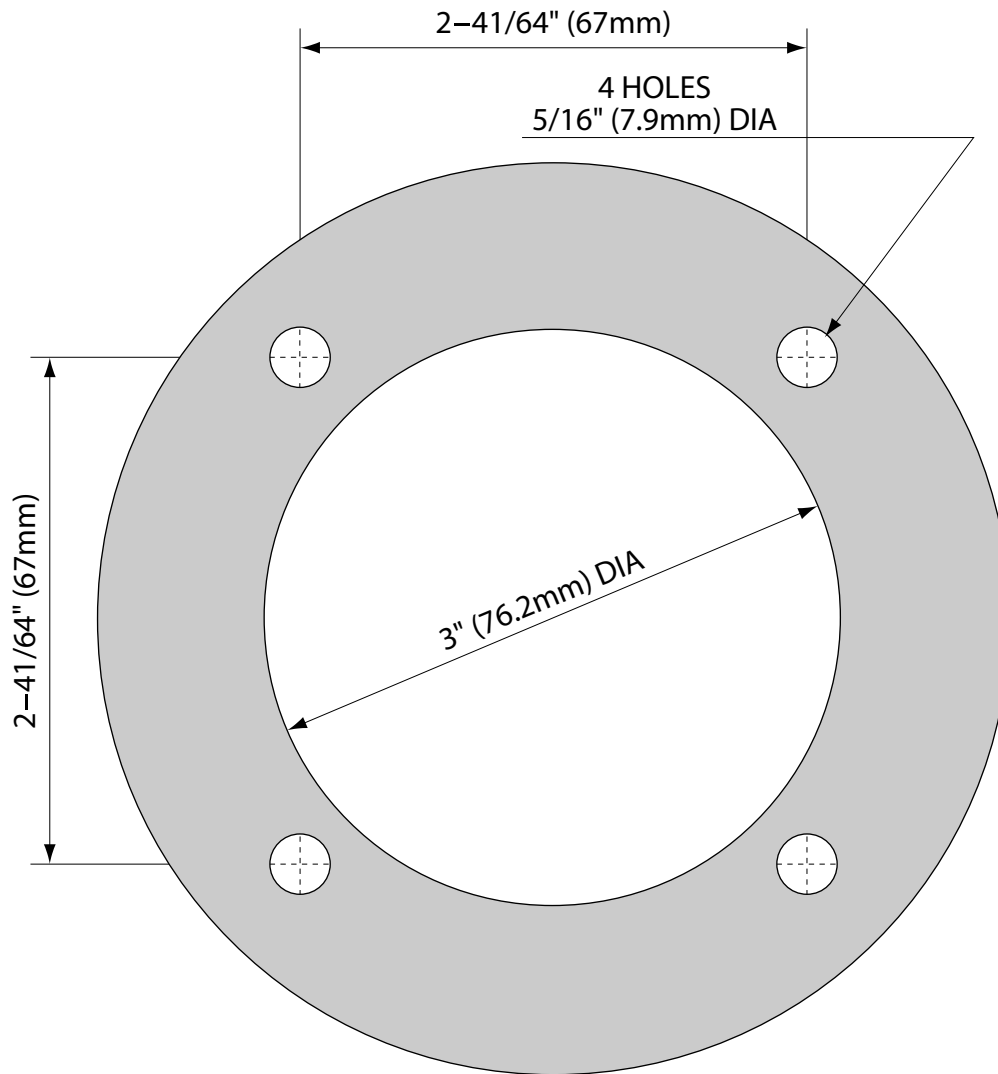
Purchaser shall be solely responsible for determining suitability for use of MAROL hydraulic products. MAROL shall not, in any event whatsoever, have any liability with respect to such determination.

The foregoing warranty is exclusive and in lieu of all other warranties, express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. MAROL shall not be liable for any consequential, incidental or contingent damages whatsoever.

Note to consumers: this limited warranty is extended to the commercial customers, dealers, and installers of MAROL hydraulic products only the supplier/installer will extend warranty coverage to you which covers MAROL hydraulic products. MAROL's warranty to such customers, dealers, and installers is intended to support the warranty extended to the consumer.



## FRONT MOUNT TEMPLATE



**THIS DRAWING IS NOT TO SCALE.**





# **marol marine**

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***NEXT GENERATION in CONTROLS***

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