



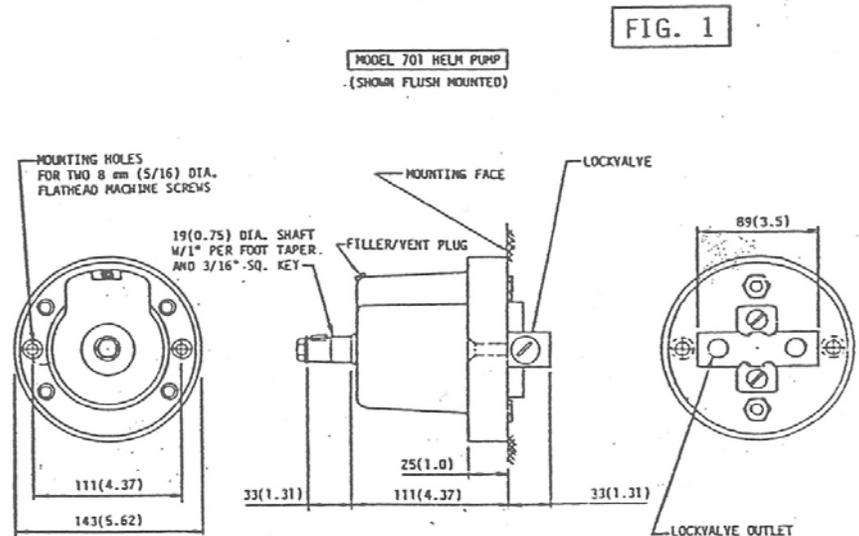
**WARNING: FAILURE TO OBSERVE THE CAUTIONS MENTIONED IN THESE INSTRUCTIONS MAY JEOPARDIZE THE SAFE OPERATION OF YOUR STEERING SYSTEM AND YOUR BOAT.**

INSPECT ALL MECHANICAL CONNECTIONS REGULARLY. Vibration and corrosion can cause nuts and bolts and other fasteners to fail if not properly installed or maintained. Loss of steering could result.

### MOUNTING THE HELM PUMP

FLUSH MOUNT (See FIG. 1) – the Model 701 helm pump is secured to the front of the mounting face with two 5/16" (8 mm) flathead machine screws, washers and nuts (not supplied).

TRIM RING - (Kit No. 130-0024) the model 701 helm pump is secured behind the mounting face with the trim ring in front of the mounting face to dress the edge of the cutout around the protruding, pump housing.



Determine the pump mounting method to be used and place the appropriate template on the panel where the helm pump is to be mounted. Cut the drill holes as indicated.

The helm pump may be mounted with the wheel shaft at any angle between horizontal and vertical. Each helm pump normally is supplied with a lockvalve as shown in FIG. 1 although in some installations a porting block may be mounted on the back of the pump and a lockvalve, requiring piping, supplied separately. Lockvalves have slotted inserts on the ends; porting blocks do not.

DO NOT use a steering wheel larger than 24" (600 mm) maximum diameter. (Wheels with external grips are measured tip-to-tip across the grips.)

## MOUNTING THE CYLINDER

Wagner manufactured the 700 Series cylinder in two stroke lengths, 7" and 9". Refer to FIGS. 2 and 3 and determine the dimensional characteristics of your cylinder BEFORE attempting to install it. Particular attention should be paid to the TILLER ARM length on FIG. 2. An incorrect TILLER ARM length will change the steering angle (LONGER - smaller angle, SHORTER - larger angle).

The rod end should be placed on TOP of the tiller arm, and they must be tightly secured together by a tiller bolt with a large washer under the head and a nut (not supplied). A positive mechanical method of preventing the tiller and nut from loosening, such as a cotter pin against a slotted or castle nut, or locking tabs against the nut is strongly recommended.

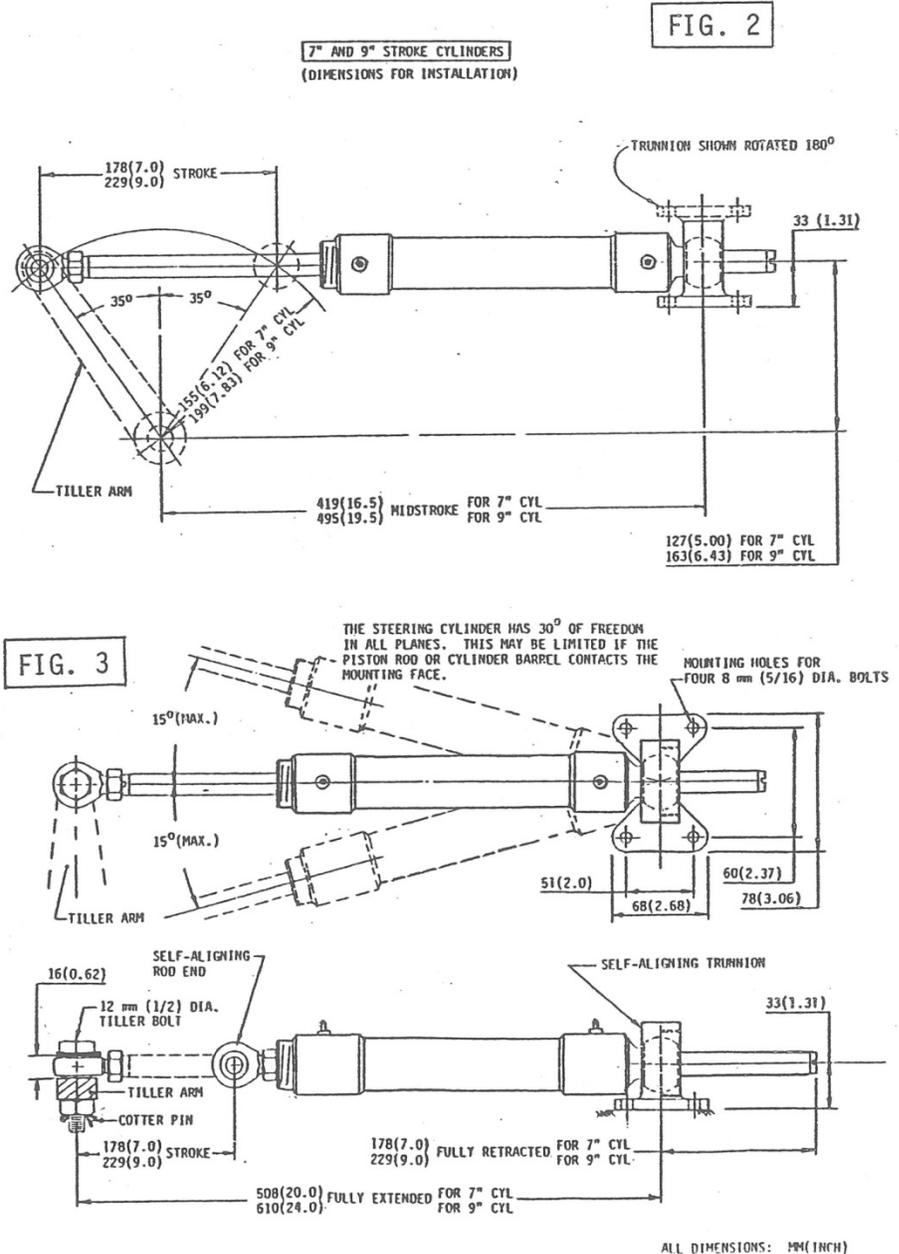
Locate the trunnion with the tiller arm and cylinder in midstroke (See FIG. 2). Note that the trunnion base may be rotated to any position, but it must be positioned so that the cylinder will swing without binding in the rod end or trunnion as the tiller arm is moved from hard over to hard over. The trunnion is self-lubricating but a light application of oil or grease will help overcome initial tightness.

Check for clearance when the piston rod is fully EXTENDED and RETRACTED (See FIG. 3).

Use four 5/16" (8 mm) bolts with washers (not supplied) to fasten the trunnion on a flat, rigid surface, preferably part of the hull.

If the cylinder is installed correctly, the piston will bottom in the cylinder and stop at the correct hard over angle on both sides of mid-stroke.

The cylinder ports are 1/4" NPT (tapered). Bleed fittings are located directly opposite the cylinder ports. The bleed fittings, preferably, should point upward, but they may also be installed pointing down if the cylinder port fitting or tubing interfere with mounting arrangements. Easy access to the bleed fittings is required to fit the plastic bleeder tubes supplied and turn the fitting with a wrench.



## INSTALLING THE TUBING

ALSO, see the following section describing the use of COMPRESSION FITTINGS.

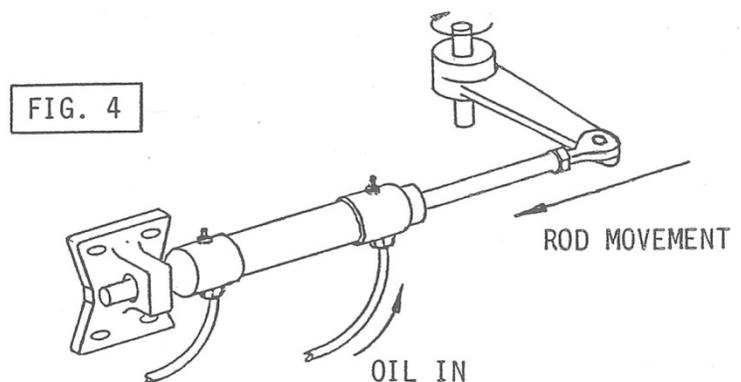
Keep working conditions as clean as possible. Contamination of any form must be prevented from entering the system. It is essential that all hydraulic tubing is clean inside before starting the installation.

It is not encouraged to use any type of plastic tubing for steering lines. Material and size specification can vary widely from one manufacturer to another. Some types are superior to others. The only real advantages offered are generally easier installation and corrosion resistance. Copper tubing offers greater steering performance. HOWEVER, if plastic tubing has been specified for steering lines with no substitute, NOTE THE FOLLOWING:

1. A 3/8" outside diameter is required, rated at 2500 psi (17 ~500 kPa) BURST PRESSURE. It usually has a 0.225 inches INSIDE diameter.
2. A tubing INSERT must be used (See FIG. 7).
3. Protect the tubing from kinking and impact damage.
4. Do not run plastic tubing through areas of elevated temperature as this may soften the tubing, reducing its bursting strength. (In very cold temperatures, it may crack.)
5. Prolonged exposure to sunlight may cause the tubing to deteriorate. This will reduce its bursting strength. Keep the tubing covered where possible, and replace the tubing if deterioration is apparent.
6. Install the correct length. Extra lengths of plastic tubing increase hydraulic friction and will reduce overall steering performance.

3/8" outside diameter soft copper tubing, rated at a minimum WORKING pressure of 700 kPa (1000 psi), is recommended with flare-type fittings for problem-free connections. 1/4" NPT FLEX HOSES should be used to connect the tubing to the cylinder ports. The tubing must be held rigidly where it connects to the flex hose.

Install the tubing with a gradual rise forward to the lockvalve outlet ports to provide self-venting. Ensure that the tubing connections are not REVERSED. (When standing in front of the wheel, turning a helm pump CLOCKWISE pumps oil out of the RIGHT side of the pump and should give steering to the RIGHT.) Oil pumped into the tiller end of the cylinder

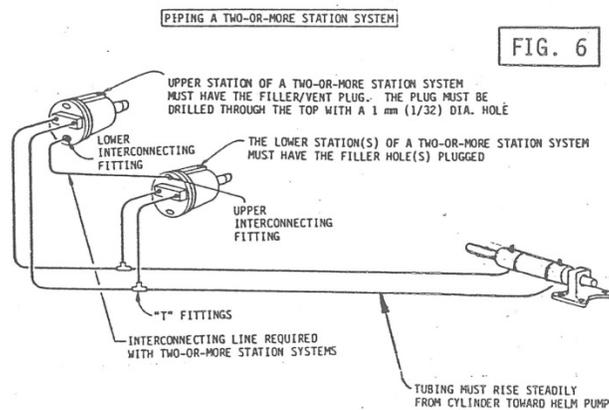
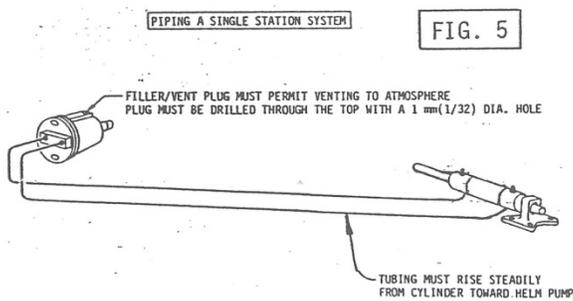


will RETRACT the piston rod. .  
 In a two-or-more station system,  
 all helm pumps are connected to  
 the tubing leading to the cylinder  
 in an identical manner (See FIG. 6).

Goosenecks (a vertical bend resembling an inverted letter "U") and dips in the lines  
 must be avoided, if possible, otherwise vent plugs must be installed at the high  
 point of the bend to provide a means for removing entrapped air.

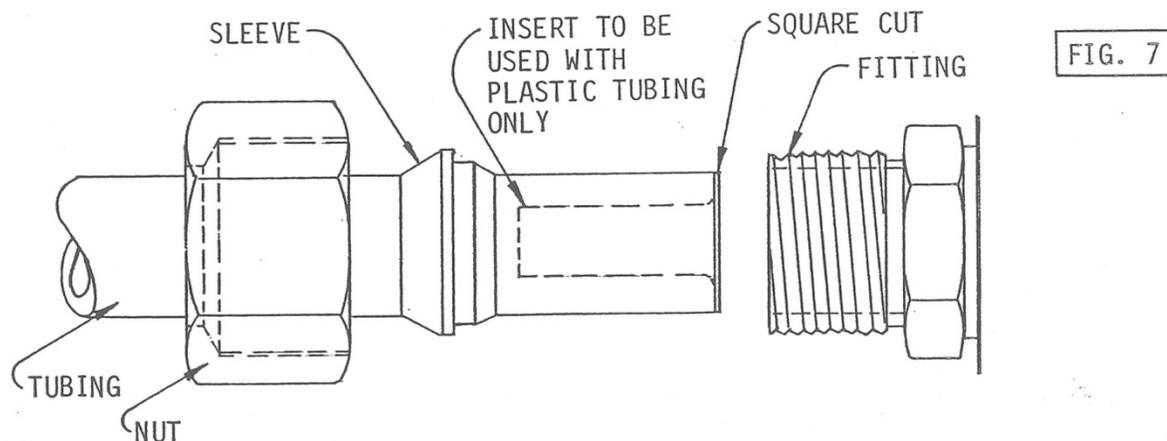
Interconnecting tubing, required between the helm pump housings of a two-or-more  
 station system, must be installed in the same manner as the steering lines. If  
 an autopilot pumpset is installed, its reservoir fitting must be interconnected  
 to the next higher helm pump housing and its output ports connected to the  
 steering lines by "T" fittings. (See the instructions supplied with the  
 autopilot and pumpset.)

Tubing clamps should be installed about 3 feet (1 metre) apart. Care must be  
 taken not to crush, puncture, or kink the tubing when securing it.

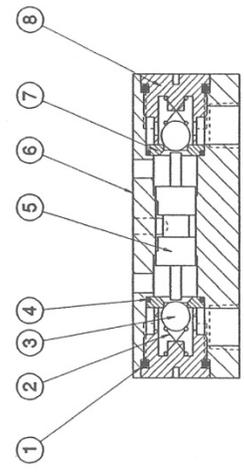
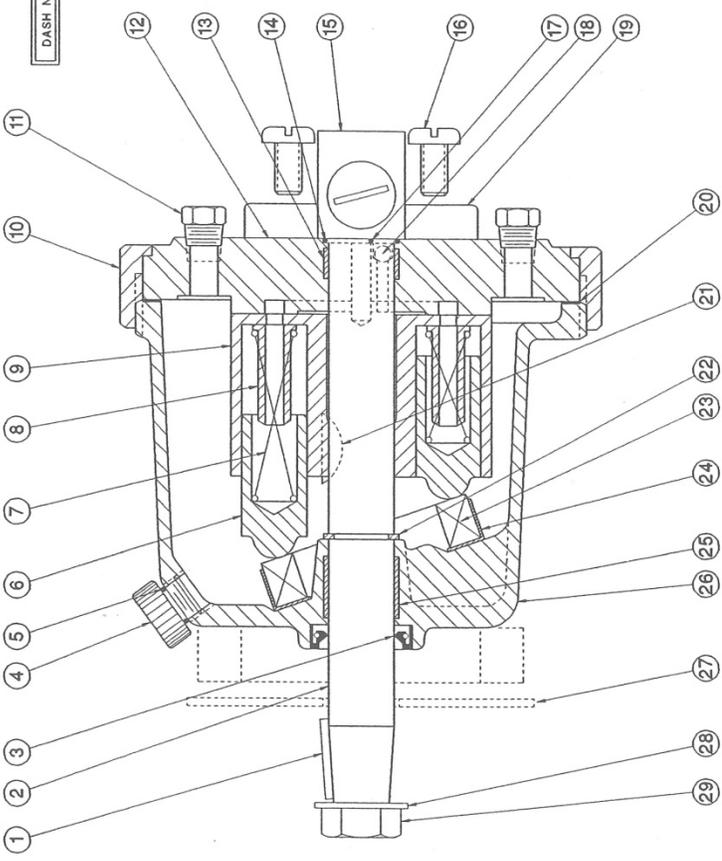


## CONNECTION OF TUBING USING COMPRESSION FITTINGS

FLARE-type fittings are not discussed specifically here. If information is required  
 on connecting FLARE-type fittings, please contact a fitting supplier.







1/4" LOCKVALVE (PART NO: 400-0001)

ITEM	QTY	PART NO.	DESCRIPTION
1	2	11-08114	O-RING
2	2	31-00003	SPRING
3	2	21-30010	CHECK BALL
4	2	11-08015	O-RING
5	1	410-0001	PISTON ASSEMBLY
6	1	420-0003	BODY
7	2	420-0002	BALL SEAT
8	2	420-0004	END INSERT

DASH NO.	QTY	ITEM	PART NO.	DESCRIPTION	MAT'L
-1	1	1	51-100001	SQUARE KEY	BRASS
-1	1	2	320-0010	SHAFT (701 HELM PUMP)	BRASS
-1	1	2	320-0148	SHAFT (702 HELM PUMP)	BRASS
-1	1	3	10-500013	SHAFT SEAL	SYN
-1	1	4	41-128003	PLASTIC PLUG	PLAST
-1	1	5	11-108111	O-RING	BUNA
-1	6	6	320-0012	PISTON	D.I.
-1	6	7	31-100084	SPRING	STL
-1	6	8	92-981001	PISTON INSERT	ALUM
-1	1	9	320-0011	ROTOR	D.I.
-1	1	10	320-0115	END NUT	ALUM
-1	2	11	41-102007	BRASS PLUG	BRASS
-1	1	12	320-0177	BACKPLATE	D.I.
-1	1	13	320-0190	BEARING	SYN
-1	1	14	11-106018	O-RING	BUNA
-1	1	15	400-0001	LOCKVALVE (SEE ASSEMBLY BELOW)	ALUM
-1	2	16	51-279003	CAPSCREW	STL
-1	2	17	11-106016	O-RING	BUNA
-1	2	18	21-300004	CHECK BALL	STL
-1	2	19	92-991002	CLAMP BAR	ZN
-1	1	20	10-300012	GASKET	CORK
-1	1	21	51-110004	WOODRUFF KEY	STL
-1	1	22	51-300014	SNAP RING	STL
-1	1	23	21-100004	BEARING	STL
-1	1	24	91-990002	BEARING CAGE	STL
-1	1	25	320-0189	BEARING	SYN
-1	1	26	320-0116	HOUSING (701 HELM PUMP)	ALUM
-1	1	27	320-0151	HOUSING (702 HELM PUMP)	ALUM
-1	1	28	51-403001	TRIM PLATE (702 HELM PUMP)	S.S.
-1	1	28	51-403001	WASHER	STL
-1	1	29	51-219001	CAPSCREW	S.S.

MODELS 701 AND 702 HELM PUMP SEAL KIT PART NUMBER: 118-0002

DASH NO.	ASSEMBLY PART NUMBER	DESCRIPTION
-1	300-0007	701 HELM PUMP ASSEMBLY
-2	300-0041	702 HELM PUMP ASSEMBLY

WAGNER MODELS 701 AND 702 HELM PUMP ASSEMBLY DRAWING



MANUFACTURERS OF HYDRAULIC STEERING

CHECKED BY: M.L.G.  
 DRAWN BY: L.A.M.  
 SCALE: 1/4" = 1"  
 DATE: MAY 1937  
 REV. NO. C-3-313  
 REF. NO.

DO NOT OVER-TIGHTEN FITTING NUTS. An over tightened nut may cause a fitting to leak, resulting in loss of steering. Firmly hand tighten fitting nuts. Then continue tightening with a wrench an additional 1-1/2 turns ONLY. Before performance testing the steering system with the vessel under power, turn the steering wheel to both hard over positions and apply heavy turning force. No oil leakage must be caused by this test.

### RECOMMENDED OILS

Any oil suitable for hydraulic winch drives is acceptable but the following oils are preferred due to their superior qualities:

ESSO Nuto A10.  
GULF Harmony 10.  
SHELL Tellus 10.

### DO NOT USE BRAKE FLUID.

CHECK THE OIL LEVEL IN EACH HELM PUMP every 3 to 4 months and fill if necessary.

### FILLING A SINGLE STATION SYSTEM

Ensure that all fittings and plugs are tight as this filling procedure must develop a vacuum in the steering lines.

Remove the vent/filler plug from the helm pump and fill the helm pump housing with oil.

1) Screw the plastic seal plug (on the clear filler tube supplied in the hardware kit) into the helm pump tightly against the O-Ring. Place the free end of the filler tube into a container of oil and support the container at or above the pump level. The end of the tube must continually remain below oil level. THIS IS VERY IMPORTANT.

2) Push the two short lengths of clear plastic tubing firmly onto the cylinder bleed fittings. Place the free ends into a container to catch any oil carried with expelled air.

3) Trace the line from the right rear of the helm pump (viewed from the steering wheel side) down to the cylinder port and open the bleed fitting at that same end of the cylinder one turn. Pull the piston rod fully out of this same end of the cylinder. Turn the steering wheel CLOCKWISE at about one revolution per second until the system begins to feel steady and solid. (The piston rod will move back into the cylinder.) Close the bleed fitting.

4) Open the opposite cylinder bleed fitting one turn and turn the steering wheel COUNTER CLOCK WISE until the system feels solid. Close the bleed, fitting.

The system is now usable and remaining air will be purged naturally through use of the vessel. The vent/filler plug MUST have a 1/32" (1 mm) hole through the top. Remove the plug from the pump before drilling to avoid contaminating the oil in the pump. (See FIG. 5)

## FILLING A-TWO-OR-MORE STATION SYSTEM

Ensure that all fittings and plugs are tight as this filling procedure must develop a vacuum in the steering lines.

Fill all helm pump housings with oil starting at the lowest and progressing to the highest. Plug each housing tightly after it is filled except the highest.

Follow 1,2,3 and 4 as previously described for FILLING A SINGLE STATION SYSTEM.

Starting at the lowest helm pump and progressing to the highest, apply first light, then heavier wheel pressure alternately at both hard over positions. The cylinder bleed fittings at the alternately pressurized ends of the cylinder should be opened several times as each pump is pressurized. ENSURE THAT THE OIL LEVEL IN THE CONTAINER AT THE HIGHEST HELM PUMP DOES NOT DROP BELOW THE END OF THE TUBE.

The system is now usable and will be smoothly responsive unless a fair amount of air is still in the system.

Remove the plastic seal plug from the highest helm pump and install the vent/filler plug. The vent/filler plug MUST have a 1/32" (1 mm) hole through the top. Drill this hole before installing the plug in the pump to avoid contaminating the oil in the pump. (See FIG . 6 )

## FILLING A SYSTEM WITH AN AUTOPILOT PUMPSET INSTALLED

Follow the previous instructions for "filling a system" using the method determined by the number of steering stations.

The pumpset should not be operated until it is determined that the pump itself is filled with oil. If the pumpset is a WAGNER "PV" type, open the plastic plug on the side of the pump housing until oil steadily flows out. If the pumpset is not a WAGNER "PV" type, the interconnecting or "header" line fitting at the pump must be "cracked" until oil steadily flows out. A wiping rag should be placed around the pump to contain the expelled oil during this procedure.

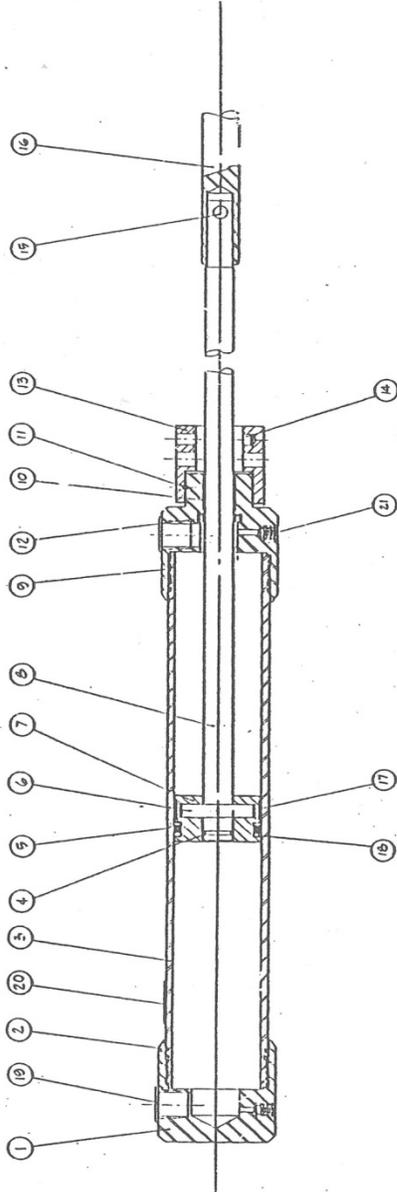
"Pulse" the pumpset to port and back to starboard a few times. If the pumpset seems extremely noisy, continue to "pulse" it until the flow evens out. If the pump operates without oil, it will likely be damaged. If the noise persists, check again that oil is in the pump.

If air is introduced to the steering lines during the pumpset operation, at the next higher helm pump apply first light, then heavier wheel pressure alternately at both hard over positions. The cylinder bleed fittings at the alternately pressurized ends of the cylinder should be opened several times.

**CHECK THE OIL LEVEL IN THE HIGHEST HELM PUMP.**

ASSEMBLY PART NO. 700-0034

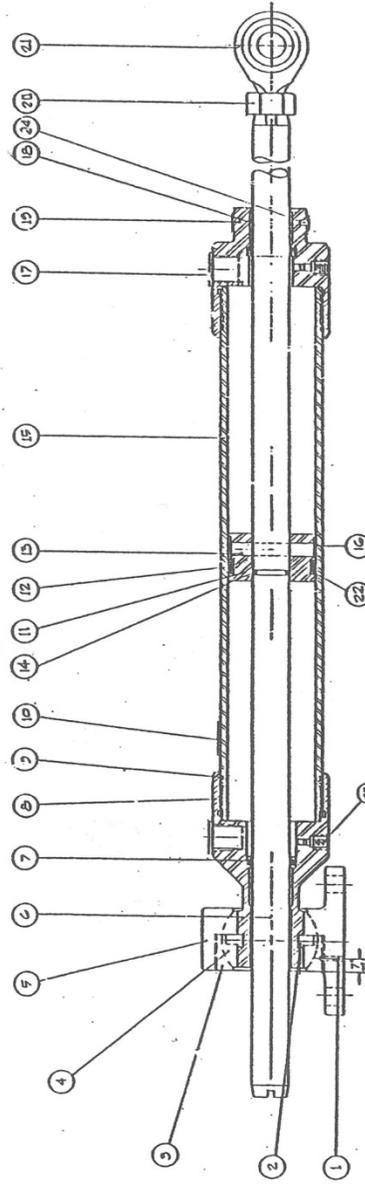
ITEM	QTY	PART NO.	DESCRIPTION
1	1	760-0034	CYLINDER TAIL
2	1	11-106030	O-RING
3	1	760-0033	BARREL
4	1	11-104012	O-RING
5	1	11-106218	O-RING
6	1	51-170005	PIN
7	1	760-0032	PISTON
8	1	760-0064	PISTON ROD
9	1	760-0053	CYLINDER HEAD
10	1	760-0062	BUSHING
11	1	760-0039	RETAINER CLIP
12	1	11-208037	U-CUP
13	1	760-0040	ADAPTOR
14	1	91-998011	LOCK PLUG
15	1	760-0048	TILT TUBE ROD PIN
16	1	760-0051	TILT TUBE
17	1	760-0050	PISTON WEAR STRIP
18	2	10-800022	BACK-UP WASHER
19	2	41-133008	CAP PLUG
20	1	660-035	LABEL
21	2	760-0061	BLEED FITTING



1 1/4" x 9" SINGLE ENDED WITH TILT TUBE ADAPTOR PART NO. 700-0034

ASSEMBLY PART NO. 700-0028

ITEM	QTY	PART NO.	DESCRIPTION
1	1	600-048	ROLL PIN
2	2	92-991003	SPLIT RING
3	1	760-0019	TRUNNION NUT
4	2	91-998001	BALL
5	1	760-0017	TRUNNION HOUSING
6	1	760-0002	PISTON ROD
7	2	11-209009	U-CUP
8	1	760-0035	CYLINDER TAIL
9	2	11-106030	O-RING
10	1	660-035	LABEL
11	1	760-0012	PISTON
12	1	11-106218	O-RING
13	1	51-170005	PIN
14	1	11-106014	O-RING
15	1	760-0050	PISTON WEAR STRIP
16	2	41-133008	CAP PLUG
17	2	760-0063	BUSHING
18	1	760-0035	HEAD
19	1	51-509001	LOCK NUT
20	1	21-60002	BALL JOINT
21	2	10-800022	BACK-UP WASHER
22	1	760-0061	BLEED FITTING
23	1	91-998011	PLUG

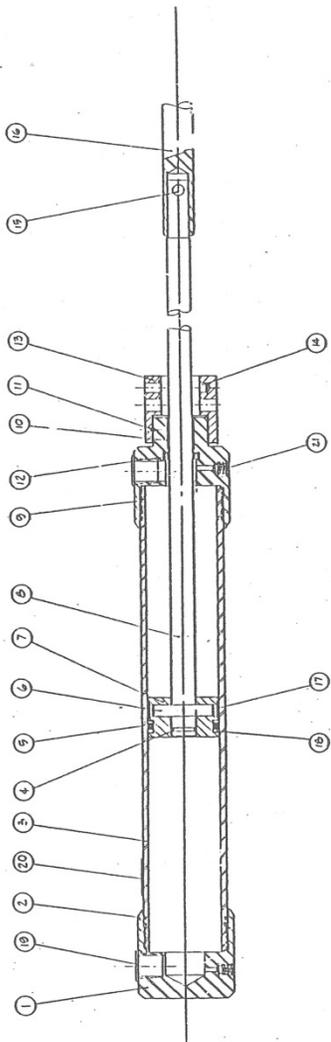


1 1/4" x 7" DOUBLE ENDED ANODIZED CYLINDER PART NO. 700-0028

WAGNER  
 1/2" x 7" DOUBLE ENDED  
 1/2" x 9" SINGLE ENDED WITH ADAPTOR  
 CYLINDER ASSEMBLY  
 QUOTE NO. D-2-708 D  
 DRAWING NO. REV.

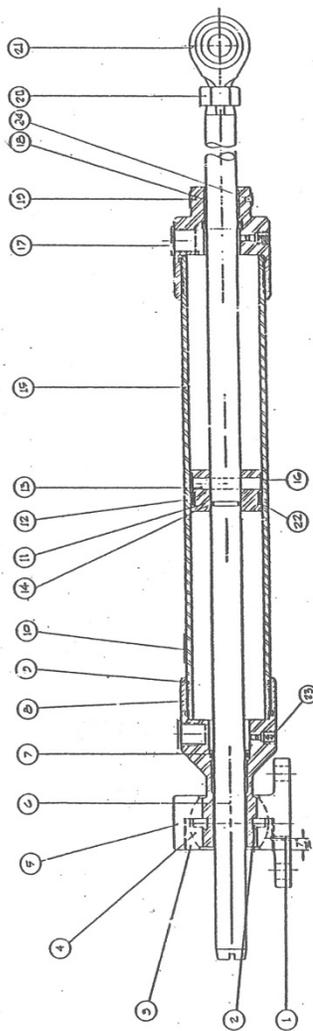
ASSEMBLY PART NO. 700-0034

ITEM	QTY	PART NO.	DESCRIPTION
1	1	760-0034	CYLINDER TAIL
2	1	11-10630	O-RING
3	1	760-0035	BARREL
4	1	11-104012	O-RING
5	1	11-106218	O-RING
6	1	31-170003	PISTON
7	1	760-0032	PISTON ROD
8	1	760-0033	CYLINDER HEAD
9	1	760-0062	BUSHING
10	1	760-0039	RETAINER CLIP
11	1	11-108037	U-CUP
12	1	760-0040	ADAPTOR
13	1	760-0041	WASHER
14	1	760-0042	WASHER
15	1	760-0043	TILT TUBE ROD PIN
16	1	760-0051	TILT TUBE
17	1	760-0050	PISTON WEAR STRIP
18	2	10-800022	BACK-UP WASHER
19	2	41-133008	CAP PLUG
20	1	860-0033	LABEL
21	2	760-0061	BLEED FITTING



ASSEMBLY PART NO. 700-0028

ITEM	QTY	PART NO.	DESCRIPTION
1	1	600-004	ROLL PIN
2	2	91-991003	SPRIT RING
3	1	760-0013	TOUNSON NUT
4	2	91-998001	BALL
5	1	760-0017	TELESCOPIC HOUSING
6	1	10-80009	U-CUP
7	1	760-0015	CYLINDER TAIL
8	2	11-104030	O-RING
9	1	860-0035	LABEL
10	1	760-0012	PISTON
11	1	11-10630	O-RING
12	1	11-170003	PISTON
13	1	11-104034	O-RING
14	1	760-0050	PISTON WEAR STRIP
15	2	41-133008	CAP PLUG
16	2	760-0063	BUSHING
17	1	760-0030	WASHER
18	1	760-0031	WASHER
19	1	21-68002	BALL JOINT
20	2	10-800022	BACK-UP WASHER
21	2	760-0064	BLEED FITTING
22	1	91-998011	PLUG



1 1/2" x 9" DOUBLE ENDED AMBIDEX CYLINDER

PART NO. 700-0028

WAGNER  
 1 1/2" x 9" DOUBLE ENDED AMBIDEX CYLINDER  
 1 1/2" x 9" SINGLE ENDED ADAPTOR  
 7/17/8  
 DRAWING NO. REV. D  
 D-2-708