



**TYPE N MANUAL HYDRAULIC STEERING**

Reference:  
P/N 190-0003

ISSUE:  
February/88

READ THESE INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING INSTALLATION

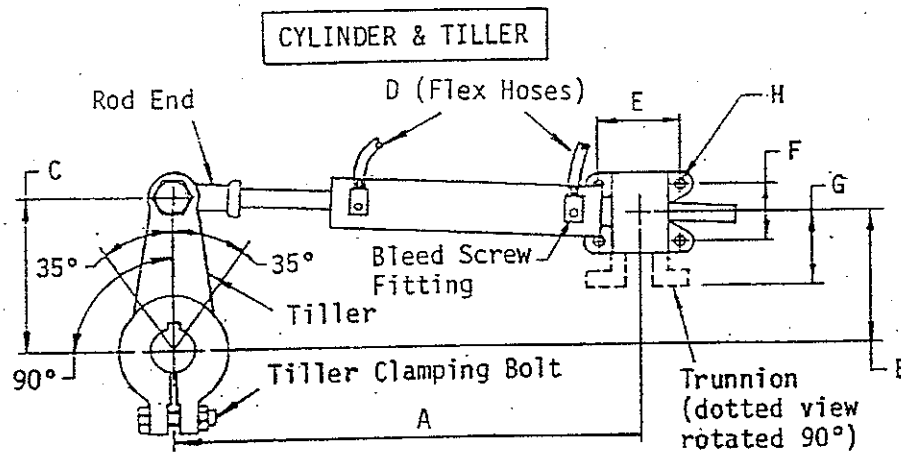
**MOUNTING THE TILLER**

The tiller may be mounted in any position around the rudder stock, but the proper relationship between the tiller and cylinder must be maintained. (Refer to the 'CYLINDER & TILLER' drawing below.)

When locating the tiller on the rudder stock, the cylinder flex hoses and the bleed screw fittings must be accessible and must not contact the deckhead, etc. Leave clearance below the tiller to adjust the rudder packing gland.

With the rudder stock key in place, tighten both of the tiller clamping bolts evenly and securely to ensure correct compression of the tiller on the rudder stock.

If the vessel has a spade rudder and is not equipped with a long radial bearing, it is recommended to mount a bearing above the tiller. This bearing may be adapted to carry the rudder weight also.



CYLINDER MODEL	DISPLACEMENT		OVERALL DIMENSIONS (mm)							H (BOLT DIA.)	
	cm <sup>3</sup>	in <sup>3</sup>	A	B	C	D	E	F	G	mm	inch
N40-120	127	7.7	402	85	104	3/8"	82	50	44	10	3/8
N40-190	200	12.2	507	135	165	3/8"	82	50	44	10	3/8
N50-190	314	19.1	542	135	165	3/8"	90	62	60	12	1/2
N50-300	495	30.2	707	214	261	3/8"	90	62	60	12	1/2
N80-190	802	49.0	645	135	165	1/2"	115	95	70	16	5/8
N80-300	1267	77.3	810	214	261	1/2"	115	95	70	16	5/8

25.4 mm = 1 inch

### MOUNTING THE CYLINDER

The cylinder must be mounted in the proper relationship with the tiller. (Refer to the 'CYLINDER & TILLER' drawing.) Dimensions A and B locate the centre of the trunnion ball from the centre of the rudder stock with the rudder (tiller) in midposition. The trunnion base may be rotated in any position around the ball, but it must be positioned so that the cylinder will swing in a relatively flat plane about the rudder stock without binding in the rod end or trunnion as the tiller arm is moved from hardover to hardover. The trunnion is self-lubricating but a light application of oil or grease will help overcome the initial tightness.

Four mounting bolts are required to secure the trunnion to the vessel. See the table under the 'CYLINDER & TILLER' drawing. The mounting surface should be rigid and preferably an integral part of the vessel's hull.

The rod end bolt is inserted down through the tiller and fastened underneath with the two nuts supplied: one for securing and one for locking, and they should hold the rod end and tiller tight together.

The cylinder is supplied with plastic plugs to prevent contamination from entering the cylinder ports during shipping and storage. These plugs should be removed when extending the cylinder rod for installation alignment, and then replaced until the piping is connected to the cylinder. The ports must be at the top of the cylinder to allow automatic venting of air as well as permitting use of the bleed fittings when filling the system.

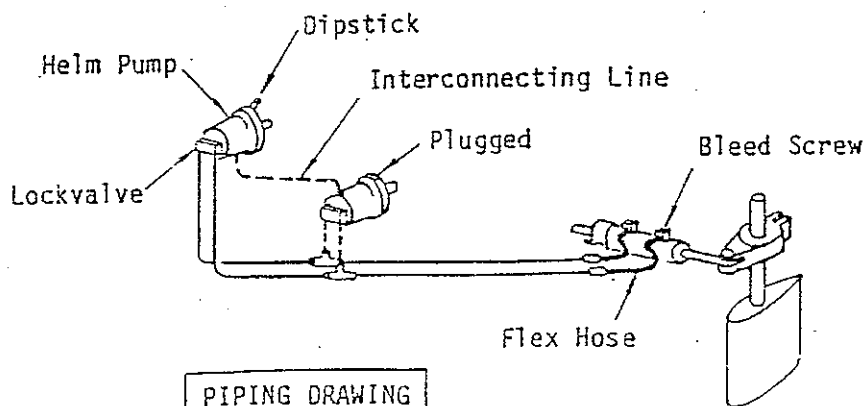
If the cylinder is installed correctly, the piston will bottom in the cylinder and stop the rudder at the correct hardover angle on both sides of midships. On commercial vessels it is recommended to install mechanical rudder stops to hit the tiller arm just before the cylinder piston bottoms.

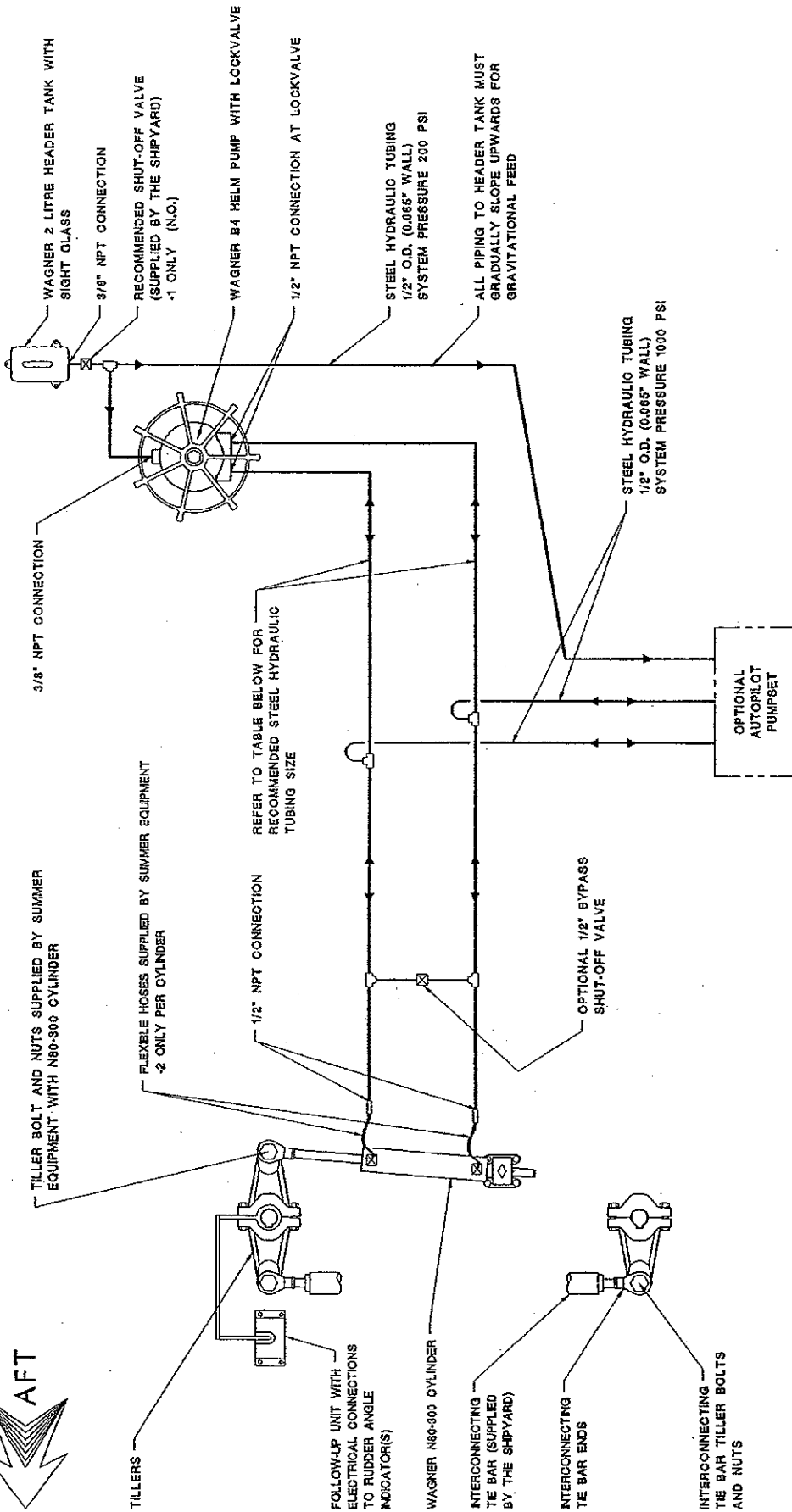
### MOUNTING THE HELM PUMP

The helm pump may be mounted with the wheel shaft at any angle between horizontal and vertical. Each helm pump normally has a lockvalve mounted directly on the back although in some installations a helm pump may have a "porting block" on the back and be supplied with a lockvalve requiring separate piping. Lockvalves have slotted inserts on the sides, porting blocks do not.

Lockvalves on Models B1 and B2 helm pumps have 3/8 NPT outlet ports. Lockvalves on Models B3 and B4 helm pumps have 1/2 NPT outlet ports. All other piped connections on the pumps are 3/8 NPT. All pumps have a 1 inch (25.4 mm) dia. wheel shaft and require two 1/2 inch (12 mm) dia. mounting bolts.

All pump models are labelled on the side of the housing. Model numbers are also stamped into the wheel shaft bearing support projecting from the front of the housing. The numeral '2' indicates Model B2, etc.





PIPING DIAGRAM FOR WAGNER  
NB1-630-36-A00 STEERING SYSTEM

**SUMMER**  
EQUIPMENT LTD.

MANUFACTURERS OF WAGNER HYDRAULIC STEERING

DRAWN BY: B.B.O.  
SCALE: N.T.S.  
DATE: FEB. 1988  
REF NO.:

CHECKED BY: M.L.G.

DRAWING NO. **C-14-939**  
REV.

RECOMMENDED SIZE OF STEEL HYDRAULIC TUBING	SIZE OF STEEL HYDRAULIC TUBING REQUIRED
LENGTH OF TUBING BETWEEN HELM PUMP AND CYLINDER	UP TO 50 FEET (15 METRES)
UP TO 50 FEET (15 METRES)	5/8" O.D. (0.065" WALL)
50 TO 95 FEET (15 TO 20 METRES)	3/4" O.D. (0.065" WALL)
95 TO 100 FEET (20 TO 30 METRES)	1" O.D. (0.065" WALL)

- NOTES**
1. ALL STEEL HYDRAULIC TUBING AND FITTINGS ARE TO BE SUPPLIED BY THE SHIPYARD.
  2. ALL FLEXIBLE HOSES ARE TO BE SUPPLIED BY THE SHIPYARD UNLESS OTHERWISE INDICATED.
  3. AVOID GOOSENECKS IN THE PIPING SYSTEM.
  4. (N.O.) = SHUT-OFF VALVE NORMALLY OPEN.
  5. HYDRAULIC TUBING MUST BE HELD RIGID WHERE IT CONNECTS TO ANY FLEXIBLE HOSES.
  6. CLEAN THE INSIDE OF ALL HYDRAULIC TUBING BEFORE INSTALLATION.

## PIPING THE SYSTEM

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.

Teflon tape or pipe fitting compounds, commonly used to seal threaded joints, must be used sparingly and applied to the male threads only. The first two threads of the fitting should not be covered. If it is necessary to remove a fitting for any reason, the female thread must be cleaned before reinstalling the fitting.

Steel or soft refrigeration-type tubing rated at a minimum working pressure of 7000 kPa (1000 psi) is recommended. Flexible hose must not be used in place of the recommended tubing (other than the two short lengths supplied) as it will adversely affect the performance of the system.

The tubing should be installed with lengths as straight as possible. Bends should be as gradual as possible. All lines should have a gradual rise toward the helm pump(s) to provide self-venting. Goosenecks (a vertical bend resembling an inverted letter "U") 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.

The tubing must be held rigidly where it connects to the cylinder flex hose.

Flare-type fittings are recommended for problem-free connections rather than compression-type fittings.

In a multiple station system, all helm pumps are connected in an identical manner to the hydraulic lines leading to the steering cylinder. (Refer to the PIPING DRAWING.) The pump reservoirs must be interconnected to create a continuous flow path. That is, connect the bottom of the highest pump to the top of the next highest, etc. This interconnection is required to fill and vent the system. All other connection ports on the pump housings must be plugged. The dipstick tube supplied must be installed in the top of the highest helm pump. The design of this dipstick fitting also allows the system to vent. **DO NOT PLUG.**

When connecting the steering lines to the cylinder, be certain that the rudder will move in the correct direction. (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 right rudder.)

If the vessel requires an "inspection approval", a bypass valve to allow emergency mechanical steering may have to be connected between the cylinder ports.

HELM PUMP MODEL	LENGTH OF TUBING BETWEEN PUMP & CYLINDER					
	Up to 15 metres		15 to 20 metres		20 to 30 metres	
	mm	inch	mm	inch	mm	inch
B1	12	1/2	16	5/8		
B2	16	5/8	16	5/8	16	5/8
B3	16	5/8	16	5/8	20	3/4
B4	16	5/8	20	3/4	25	1

TUBING SIZES FOR  
MAIN STEERING LINES

(specified by  
outside diameter)

The use of tubing larger than specified will not adversely affect steering performance.

TUBING SIZES FOR INTERCONNECTING LINES (specified by outside diameter):

If HELM PUMP MODEL is B1 - use 10 mm or, 3/8 inch
If HELM PUMP MODEL is B2 - use 12 mm or, 1/2 inch

## RECOMMENDED OILS

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

CHEVRON: AW Machine 32, EP Hydraulic MV  
ESSO : Nuto H32  
GULF : Harmony AW32, Harmony HVI 36  
MOBIL : DTE 24, DTE 13  
SHELL : Tellus 32, Tellus T37  
TEXACO : Rando HD32, Rando HD AZ

DO NOT USE BRAKE FLUID

## FILLING THE SYSTEM

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

Connect the two identical lengths of clear plastic tubing to the bleed fittings on the steering cylinder (just above the flex hose). Place the free ends into a container (about one litre capacity) to catch any oil carried with the expelled air. Determine which steering line and bleed screw fitting will be pressurized when turning a steering wheel CLOCKWISE. (See PIPING THE SYSTEM.) Open the bleed screw at this fitting 2 turns. The other must remain tight. If a cylinder bypass valve is installed, it must be closed.

Next, fill all helm pump housings starting at the lowest and progressing to the highest. Plug each pump tightly after it is filled except the highest (or only) which is also the filler/vent for the system and it must be fitted with the dipstick tube.

Screw the black plastic fitting with the center hole, into the end of the dipstick tube (where the dipstick is normally inserted) until it seats tightly against the O-Ring on the fitting. This fitting will self-thread into the tube. Push the 18" long clear tubing tightly into the center hole of the black plastic plug. Place the free end of this (filling) tube into a container of oil and hold the container at, or above, the pump level. The end of the tube must continually remain below the oil level. THIS IS VERY IMPORTANT!

Turn the steering wheel CLOCKWISE on this pump only at about one revolution per second. Oil will be drawn into the pump after about 20 revolutions. A mixture of air and oil will be expelled from the bleed fitting on the cylinder. After most of the air is expelled, the system will begin to feel steady and solid. Close the bleed screw tightly and open the opposite bleed screw 2 turns.

Now turn the steering wheel COUNTER CLOCKWISE until most of the air is expelled. Close the bleed screw and apply light pressure at both hardover positions.

Remove the black plastic fitting and filling tube assembly. Ensure that the oil level in this pump just shows on the dipstick. Wrap a wiping rag around the dipstick tube. (It is advisable to keep this rag in place for the first week as any air remaining in the system may foam the oil as it naturally vents.)

Starting at the lowest helm pump and progressing to the highest, apply first light, then heavier wheel pressure alternately at both hardover positions. The bleed screws at the alternately pressurized ends of the cylinder should be opened several times as each pump is pressurized. KEEP THE SYSTEM FULL OF OIL!

The system is now usable but it will not be smoothly responsive until the air is expelled.

If the plastic tubing assembled with a black plastic fitting is not available, the oil must be poured slowly into the dipstick tube. The rest of the procedure is the same, but the oil level in the highest (or only) helm pump must be maintained to prevent pumping air into the system.

## MAINTENANCE

The oil level should be checked periodically to make sure no leaks have developed. An external inspection of the system components is also suggested to ensure that leakage or other problems are not developing. Normally, no routine maintenance will be required on a properly installed system. All seals are designed for long life in normal service.

The following descriptions of problems and their most likely causes are listed to assist owner field servicing. If a problem cannot be resolved, refer to the factory.

1. If the steering wheel is stiff to turn, check the following:
  - a) The rudder stock turns easily in its bearings.  
Remove the cylinder rod end bolt and operate the wheel. If the cylinder operates easily, the rudder stock very likely has too much friction. If the cylinder does not move, and the wheel is still hard to turn, check:
  - b) The system is free of entrapped air.
  - c) The system is piped using only the two short lengths of flex hose supplied for the cylinder connection.
  - d) The hydraulic oil is one of the types recommended, that is, not more viscous (thicker) than automatic transmission fluid.
  - e) The tubing used is at least the size recommended.
2. If the steering wheel continues to turn easily and the cylinder does not feel like it reaches hardover, check the following:
  - a) The cylinder bypass valve (if installed) is in the closed (normal) position.
  - b) All system fittings are tight.
  - c) The system is free of entrapped air. If air is in the system, the wheel will spring back when turned and released.
  - d) A lockvalve on another helm pump is not contaminated. Contamination is indicated by the wheel turning at that station. That lockvalve must be disassembled and cleaned. When removing the slotted lockvalve inserts, take care not to lose the retained spring and steel ball or to damage the seals.
  - e) The cylinder piston seals are not damaged. All of the above should be checked and determined to be satisfactory first. Remove the cylinder rod end bolt and attempt to stroke the cylinder rod fully back and forth by hand. If the rod moves, the piston seals must be replaced. Oil leaking along the cylinder rod from either end of the cylinder indicates the rod seals are defective and must be replaced.

Cylinder seal kits are available and may be ordered from the Wagner factory or representative.

Kit No. 119-0082 for N40-120 and N40-190 cylinders

Kit No. 119-0083 for N50-190 and N50-300 cylinders

Kit No. 119-0084 for N80-190 and N80-300 cylinders

If there is contamination in the steering system, all components, including the helm pumps, must be disassembled, cleaned and the tubing flushed. Kerosene, Varsol or Diesel oil is suitable for this flushing operation.

If the quality of the hydraulic oil is questionable, or water appears to be in the system, the system oil should be replaced with new oil from the recommended list.

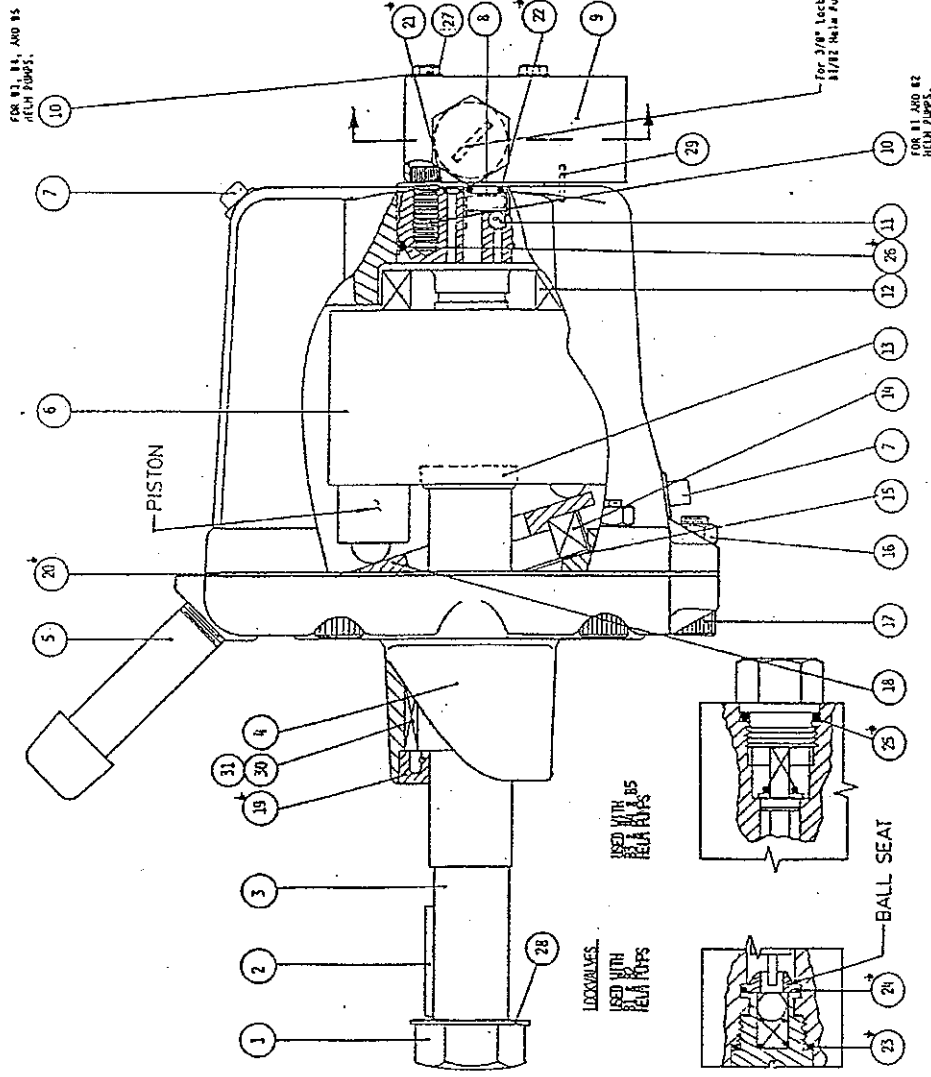
3. If the number of wheel turns is different when turning hardover to port and hardover to starboard, check the following:
  - a) The system is free of entrapped air.
  - b) The system is piped using only the two short lengths of flex hose supplied for the connection of the cylinder.

B1, B2 HELM PUMP

ITEM	QTY	PART NO.	DESCRIPTION
1	1	51-211011	DOIL
2	1	51-102007	KEY
3	1	320-0015	SHAFT
4	1	320-0045	FRONT PLATE
5	1	111-0004	DISPASTICK ASSEMBLY
6	1	310-0021	HOUSING, PISTON ROTOR ASSEMBLY B1 PUMP
7	2	310-0022	HOUSING, PISTON ROTOR ASSEMBLY B2 PUMP
8	2	41-132002	PLUG
9	2	91-990006	WIRE BALL STOP
10	2	400-0164	LOCKVALVE
11	2	51-209002	CAPSCREEN
12	2	21-206003	BALL
13	2	21-100008	BEARING
14	2	21-100002	KEY (ROTOR)
15	1	91-990003	BEARING CASE
16	4	51-509008	NUT
17	4	51-209003	CAPSCREEN
18	1	51-101005	WASHER
19	1	320-0210	Bearing
20	1	320-0210	Bearing

B3, B4, B5 HELM PUMP

ITEM	QTY	PART NO.	DESCRIPTION
1	1	51-211011	DOIL
2	1	51-102007	KEY
3	1	320-0015	SHAFT
4	1	320-0074	FRONT PLATE
5	1	111-0004	DISPASTICK ASSEMBLY
6	1	310-0023	HOUSING, PISTON ROTOR ASSEMBLY B3 PUMP
7	2	310-0024	HOUSING, PISTON ROTOR ASSEMBLY B4 PUMP
8	2	41-132002	PLUG
9	2	91-990006	WIRE BALL STOP
10	2	400-0164	LOCKVALVE
11	2	51-210018	CAPSCREEN
12	2	21-206003	BALL
13	2	21-100006	BEARING
14	2	21-100008	KEY (ROTOR)
15	1	91-990004	BEARING CASE
16	5	51-509009	NUT
17	5	51-209004	CAPSCREEN
18	1	320-0083	BEARING PLATE
19	2	21-101121	O-RING
20	2	51-100008	LOCKWASHER
21	1	51-101005	WASHER
22	1	51-120018	LOCATING PIN
23	1	21-200009	Bearing
24	1	21-200010	Bearing



**WAGNER**  
 MANUFACTURERS OF WAGNER PISTON ROTOR ASSEMBLY AND AUTOMATIC HELM PUMPS

**PARTS LIST FOR B1, B2, B3, B4 AND B5 HELM PUMPS**

DATE: 7/27/65  
 SCALE: \_\_\_\_\_  
 QUOTE NO: \_\_\_\_\_  
 DRAWING NO: C-1-370  
 REV: G

For 3/8" Lockvalve Located on B1/B2 Helm Pumps Only

FOR B1 AND B2 HELM PUMPS.

\*NOTE: ITEMS 13 through 26 ARE CONTAINED IN THE B1/B2 HELM PUMP PARTS LIST. SEE MANUAL P/N 180-0018 FOR PART NUMBERS OF INDIVIDUAL SEALS.

NOTICE

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. A positive mechanical method of preventing the tiller bolt and nut from loosening, such as a cotter pin against the nut, a slotted or castle nut, or locking tabs against the nut, is strongly recommended.

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