

HYDRAULIC STEERING TYPE N



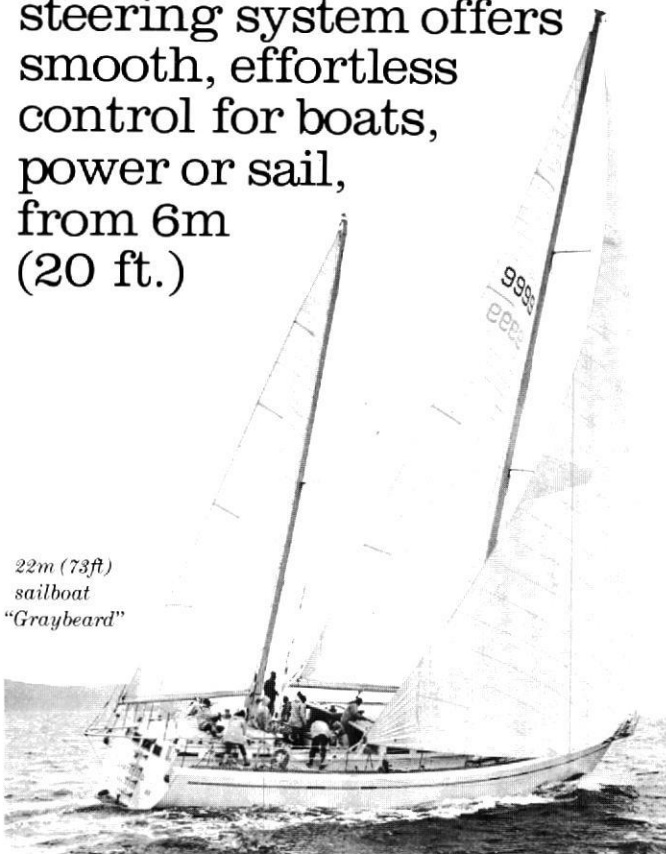
24m (80ft) fishing vessel "Ocean Marauder"



29m (95ft) passenger launch "Te-Kotuku"

The Wagner Type N steering system offers smooth, effortless control for boats, power or sail, from 6m (20 ft.)

22m (73ft)
sailboat
"Graybeard"



10m (32ft) twin tugs "Valerie L" and "Phyllis L"

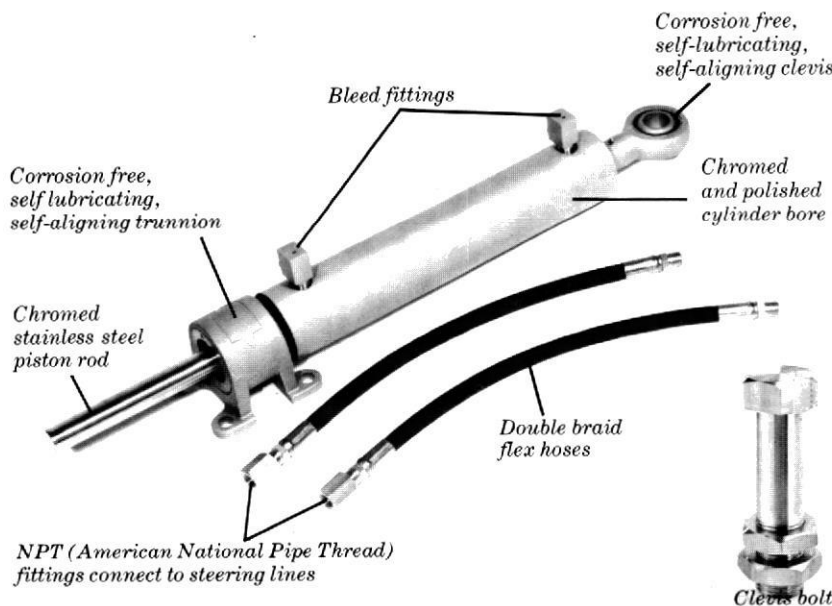
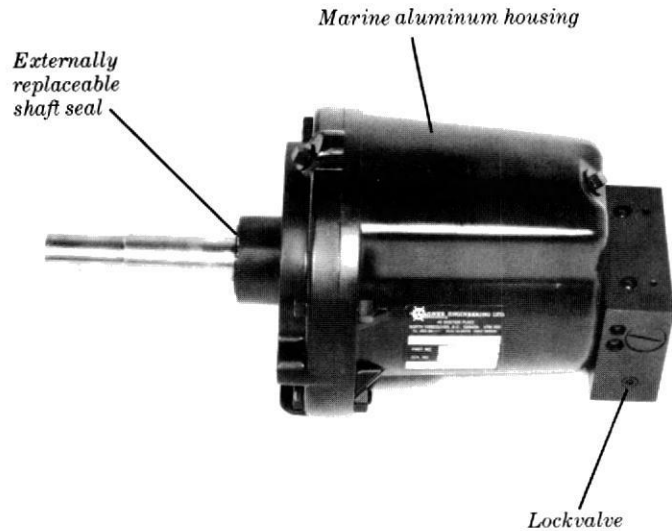
to 50m (165 ft.). This simple **reliable** system is economical and maintenance free with over 40 years of Wagner hydraulic steering experience built into every unit.

Over 50,000 Wagner steering systems have been installed worldwide — in pleasure craft, work and fishing boats and many types of larger vessels. The basic manual system includes a helm pump and lockvalve combination connected by tubing to a steering cylinder. It's that easy! Optional power steering and autopilot pumpsets are simply connected to the two hydraulic lines leading to the steering cylinder. Wagner Type N steering systems are available in 12 progressive sizes to provide a custom

installation for any size of vessel over 6m (20 ft.). It is the ideal steering system for new boats and the perfect replacement for obsolete and complicated mechanical steering. Special internal automatic valving makes filling the system easy — and entrapped air is continuously purged preventing pressure locking and ensuring a 'solid' feel. Wagner hydraulic steering is exceptionally tough and reliable; providing long and virtually maintenance free performance through all types of operating conditions.

The Helm Pump

Smooth operating, high efficiency axial piston pumps provide the 'power' to the steering cylinder when the steering wheel is turned. They are matched to cylinder size to give a suitable number of wheel turns according to the rudder torque. The helm pumps are combined with a back mounted lockvalve which 'blocks' rudder feedback and isolates each pump in a multiple station system. Each pump has only two suction balls, operating only for reservoir make-up or when filling. (Others use a ball in each of 5 or 6 pistons, all operating once per shaft revolution, greatly increasing the possibility of failure due to contamination.) The system is filled simply by pouring the recommended oil into the helm pump filler — no external pressurization is required.



The Type N cylinder

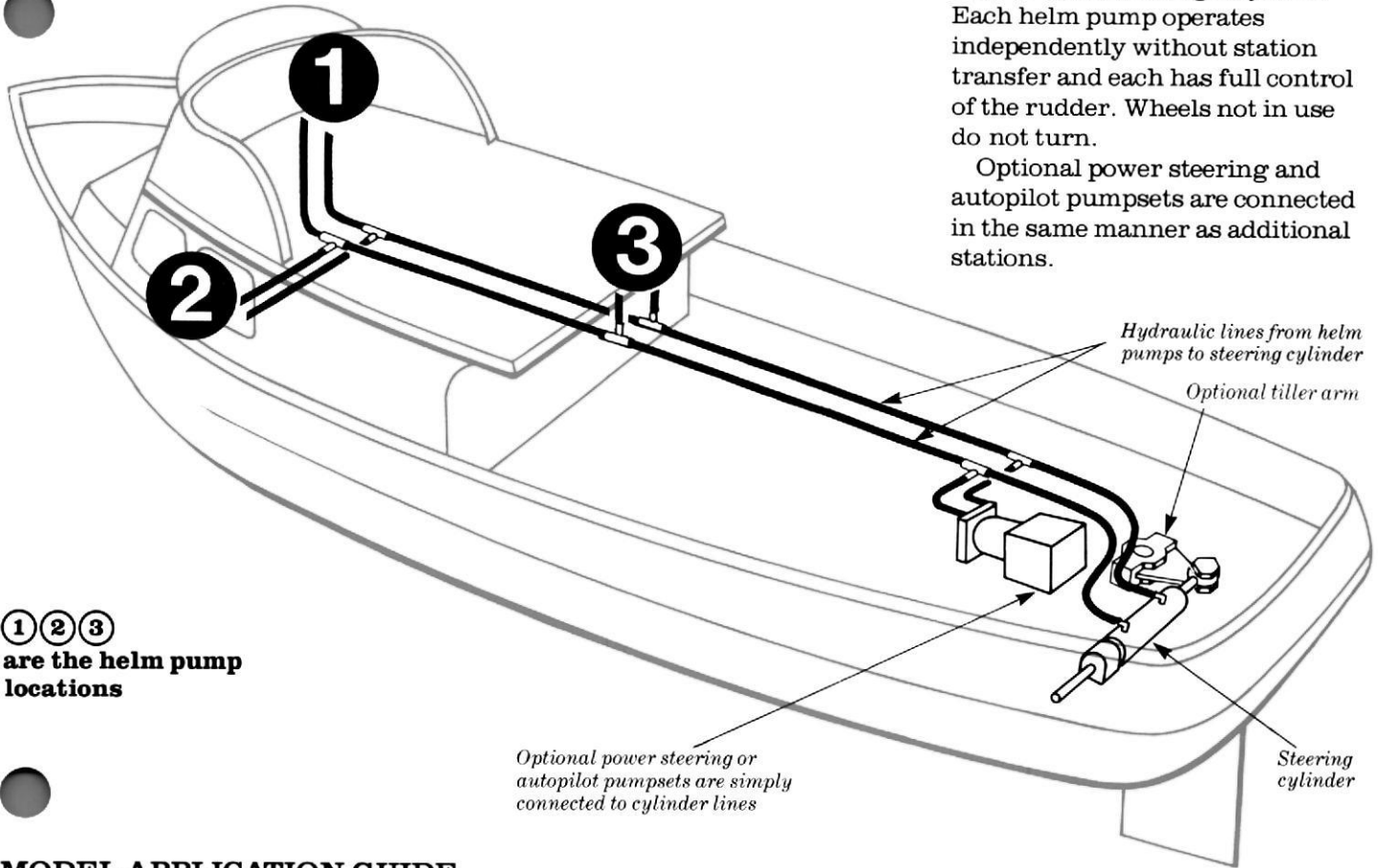
The strong, compact steering cylinders are constructed of corrosion free brass and stainless steel. Self-lubricating, self-aligning spherical bearings at the trunnion and clevis eliminate critical installation alignment. Clevis bolts are high strength bronze. Bleed fittings at the cylinder ports reduce installation time. Piston and rod seals of special design operate on smooth chrome surfaces to ensure a long, trouble free commercial service life.

Optimized strength-to-weight tiller arms are available for every model and suit all standard installation configurations.

Multiple Steering Stations

Any number of steering stations may be used in a single system. Each helm pump operates independently without station transfer and each has full control of the rudder. Wheels not in use do not turn.

Optional power steering and autopilot pumpsets are connected in the same manner as additional stations.



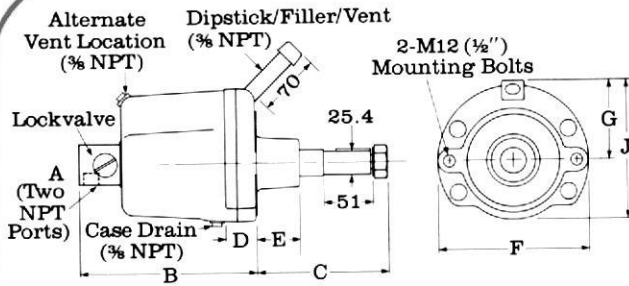
① ② ③
are the helm pump locations

*MODEL APPLICATION GUIDE

System Model	Displacement Hulls								Planing Hulls	
	Tug Boats		Work and Pleasure Boats		Sailboats					
	•Length	HP	•Length	HP	Balanced Rudder		Unbalanced Rudder			
				•Length	▲Area	•Length	▲Area	•Length	HP	
NX1-63	5-9	125	8-12	140	8-12	0.3-1.0	8-11	0.3-0.7	8-14	400
NX1-100	6-9	130	9-12	150	10-14	0.5-1.2	9-12	0.4-0.8	10-15	450
NX2-126	7-9	140	12-14	160	12-15	0.9-1.4	11-15	0.6-0.9	12-16	500
NX1-160	8-12	160	12-15	170	14-17	1.3-1.6	12-15	0.8-1.1	13-17	600
NX2-200	8-12	180	12-18	180	15-18	1.4-1.8	13-16	0.9-1.4	14-18	650
NX1-250	8-12	200	12-20	190	15-20	1.5-2.0	14-18	1.0-1.5	14-19	700
NX2-320	9-12	250	15-22	200	16-21	1.6-2.4	15-19	1.1-1.7	17-21	750
NX1-400	10-14	300	18-24	250	16-22	1.8-2.8	15-20	1.2-1.8	18-22	850
NX2-500	11-16	350	18-25	300	17-24	1.9-3.0	16-22	1.3-2.0	18-24	900
NX1-630	14-18	400	20-26	350					20-25	950
NX2-800	15-20	500	20-30	400					22-27	1000
NX2-1260	20-26	800	25-37	650					25-35	1200

•Overall length in meters (1 foot = .3 meters)
▲Area in sq. meters (1 sq. foot = .09 sq. meters)

*This is a reference guide only and system selection must be decided by a torque calculation. Minimum information required: description of boat, rudder dimensions and hull speed.



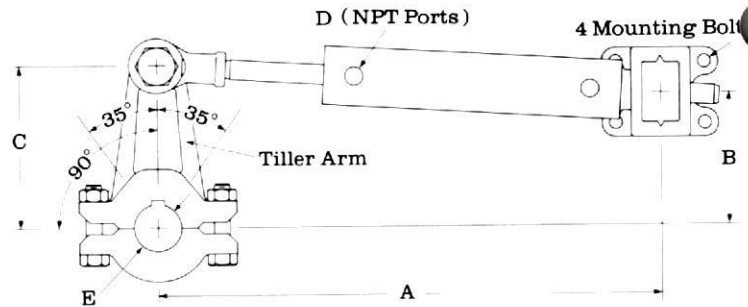
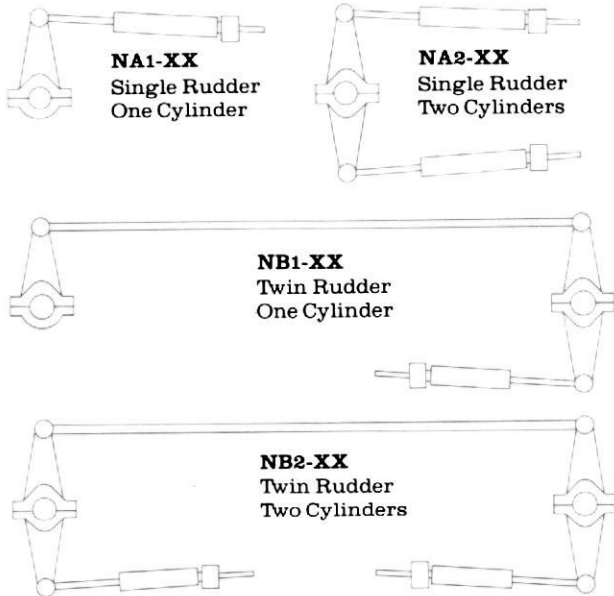
Helm Pump Model	Overall Dimensions (mm)							
	A	B	C	D	E	F	G	J
B1	3/8	195	127	35	48	165	89	159
B2	3/8	195	127	35	48	165	89	159
B3	3/4	247	140	48	29	203	108	210
B4	3/4	247	140	48	29	203	108	210

25.4 mm = 1 inch

System Model	Torque *2 x 35°		Suggested Helm Pump		Type N Steering Cylinder						E Maximum Tiller Arm Bore		
					Displacement		Overall Dimensions (mm)						
	kg-m	lb. ft	Model	Turns	Model	cm ³	in ³	A	B	C	D	mm	in.
NX1-63	63	456	B1	3.0	N40-120	127	7.7	402	85	104	1/4	48	1.89
NX1-100	100	723	B1	4.7	N40-190	200	12.2	507	135	165	1/4	56	2.20
NX2-126	126	912	B2	3.8	N40-120	254	15.5	402	85	104	1/4	48	1.89
NX1-160	160	1157	B2	4.8	N50-190	314	19.1	542	135	165	3/8	65	2.56
NX2-200	200	1446	B2	6.1	N40-190	400	24.5	507	135	165	1/4	56	2.20
NX1-250	250	1808	B3	4.8	N50-300	495	30.2	707	214	261	3/8	75	2.95
NX2-320	320	2314	B3	6.0	N50-190	628	38.3	542	135	165	3/8	65	2.56
NX1-400	400	2893	B3	7.7	N80-190	802	49.0	645	135	165	1/2	88	3.46
NX2-500	500	3616	B3	9.5	N50-300	990	60.4	707	214	261	3/8	75	2.95
NX1-630	630	4557	B4	7.8	N80-300	1267	77.3	810	214	261	1/2	100	3.94
NX2-800	800	5786	B4	9.9	N80-190	1604	97.9	645	135	165	1/2	88	3.46
NX2-1260	1260	9114	B4	15.6	N80-300	2534	154.6	810	214	261	1/2	100	3.94

*Torque ratings at 7000 kPa (1000 psi) 25.4 mm = 1 inch

STANDARD SYSTEM CONFIGURATIONS



SYSTEM MODEL CODE

N x 1 - 63

Torque (kg.m) @ 7000 kPa

'1': One cylinder
'2': Two cylinders

Use 'A': Single rudder
Use 'B': Twin rudder
Use 'X': if unknown

CYLINDER MODEL CODE

N 40 - 120

Stroke (mm)

Bore (mm)



40 Gostick Place,
North Vancouver, B.C.
Canada V7M 3G2
Telephone (604) 988-1111
Telex 04-352755

**Wagner —
dependable
since 1937**



TYPE N MANUAL HYDRAULIC STEERING

Reference:
P/N 190-0003

ISSUE:
March/85

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.)

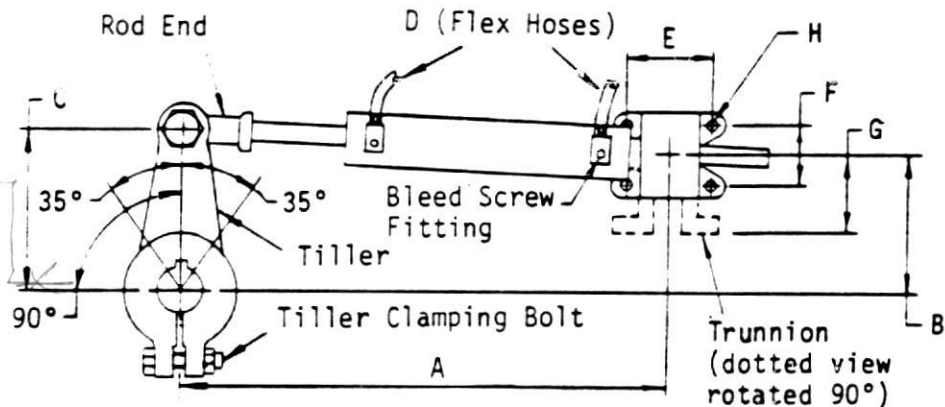
When locating the tiller on the rudder stock, the cylinder flex hoses and the bleed screw fittings must be accessible and must not contact the deckhead, etc. Leave clearance below the tiller to adjust the rudder packing gland.

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.

5"
23/4
26/4

CYLINDER & TILLER



CYLINDER MODEL	DISPLACEMENT		OVERALL DIMENSIONS (mm)							H (BOLT DIA.)	
	cm ³	in ³	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.

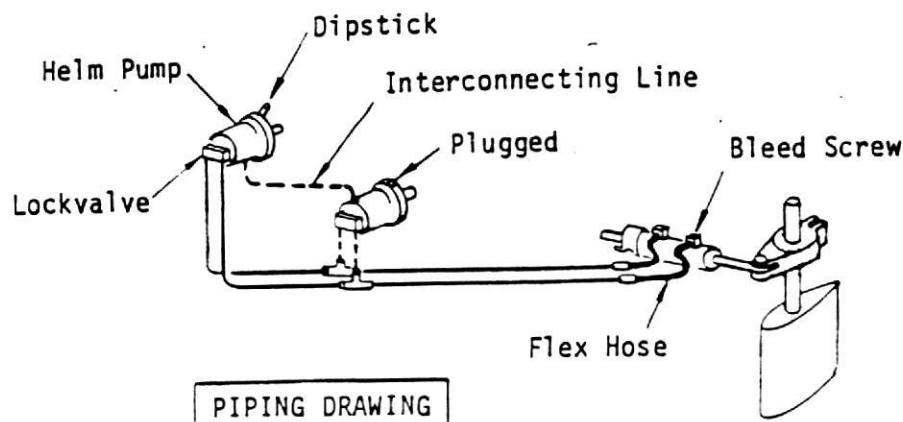
If the cylinder is installed correctly, the piston will bottom in the cylinder and stop the rudder at the correct hardover angle on both sides of midships. On commercial vessels it is recommended to install mechanical rudder stops to hit the tiller arm just before the cylinder piston bottoms.

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 3/4 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 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 plastic tubing assembled with a black plastic fitting 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.

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.

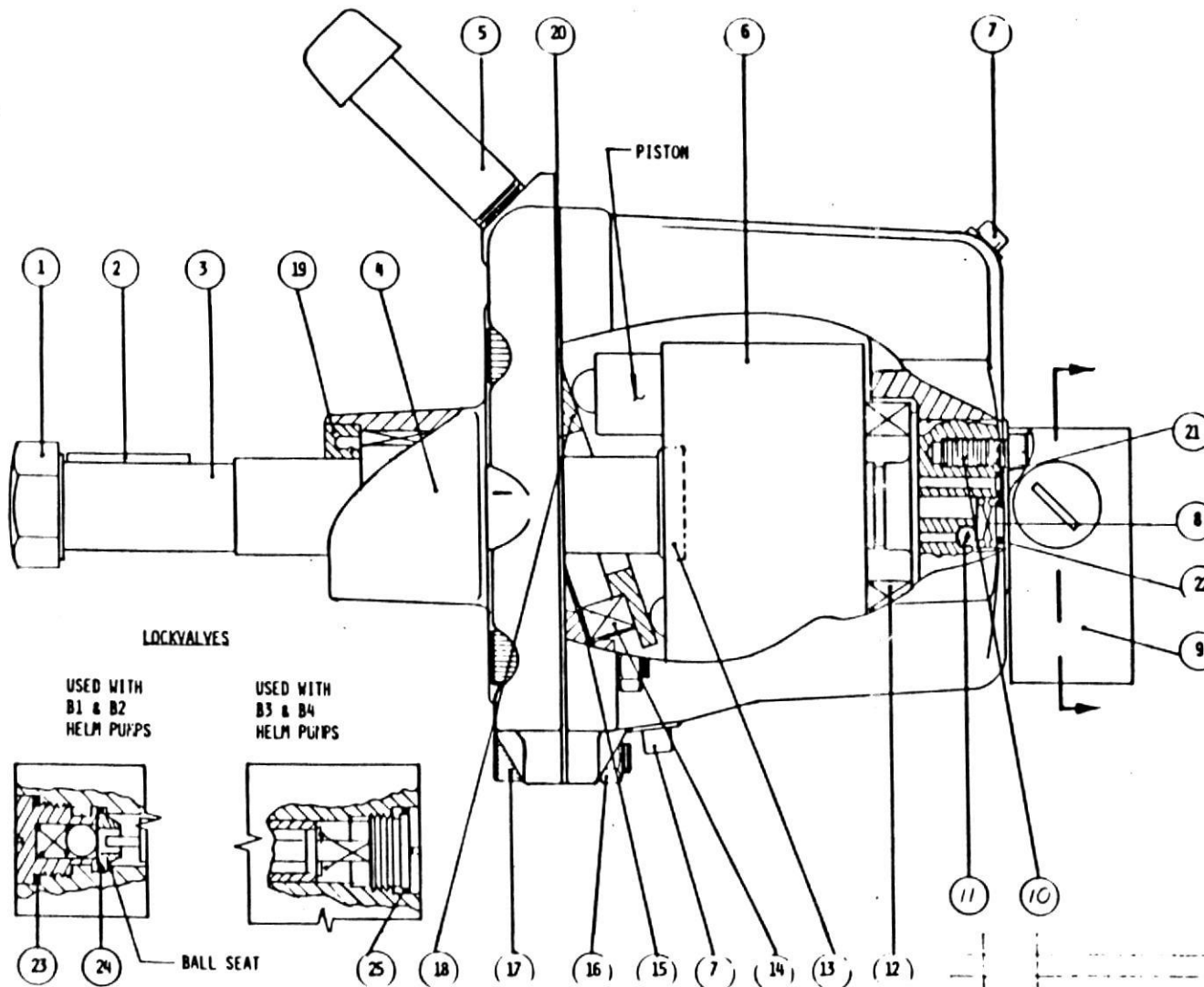
B PUMP SEAL KIT P.N. 119-0085
 Refer to Items 19 to 25 and Seal Kit
 Installation Manual Ref. No. 190-0018

B1 & B2 HELM PUMP

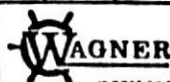

ITEM	QUANTITY	PART NO.	DESCRIPTION
1	1	320-0063	BOLT
2	1	51-102007	KEY
3	1	310-0003	SHAFT ASSEMBLY
4	1	320-0045	FRONT PLATE
5	1	111-0004	DIPSTICK ASSEMBLY
6	1	310-0021 310-0022	HOUSING PINTLE & ROTOR ASSEMBLY B1 PUMP HOUSING PINTLE & ROTOR ASSEMBLY B2 PUMP
7	2	41-132002	PLUG
8	2	31-100020	SPRING
9	1	400-0002	LOCKVALVE
10	2	51-209002	CAPSCREW
11	2	21-300002	BALL
12	1	21-100006	BEARING
13	1	320-0135	KEY (ROTOR)
14	1	21-100002	BEARING
15	1	91-990003	BEARING CAGE
16	4	51-509009	NUT
17	4	51-209003	CAPSCREW

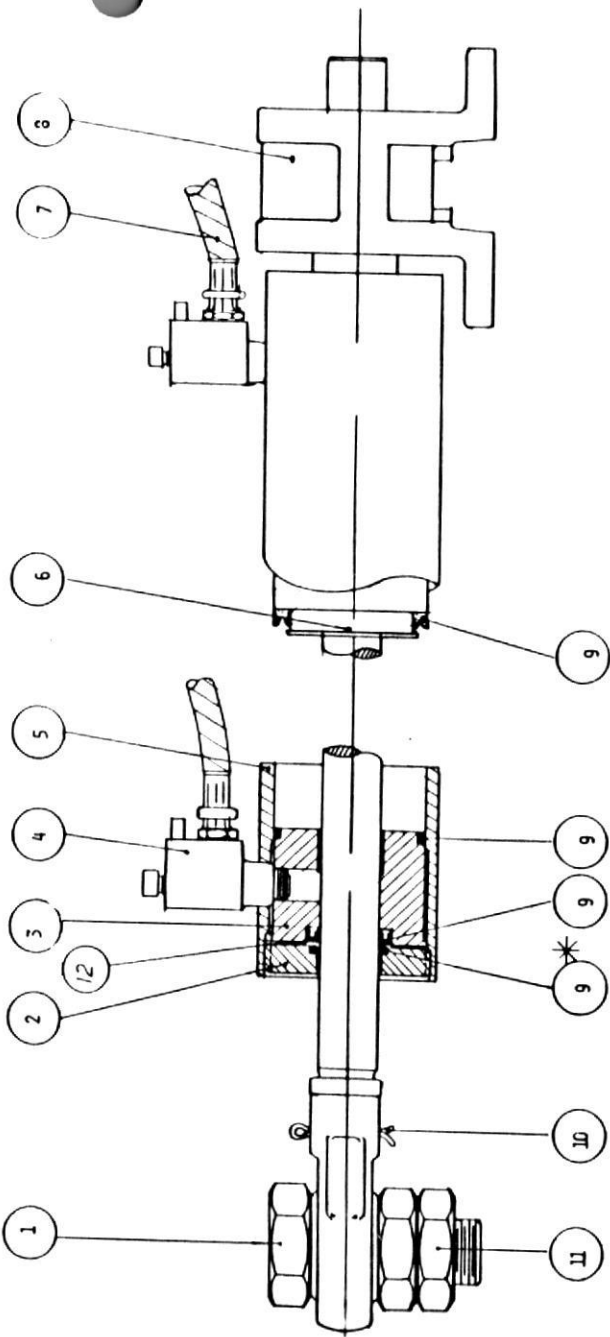
B3 & B4 HELM PUMP

ITEM	QUANTITY	PART NO.	DESCRIPTION
1	1	320-0063	BOLT
2	1	51-102007	KEY
3	1	310-0006	SHAFT ASSEMBLY
4	1	310-0008	FRONT PLATE ASSEMBLY
5	1	111-0004	DIPSTICK ASSEMBLY
6	1	310-0023 310-0024	HOUSING, PINTLE ROTOR ASSEMBLY B3 PUMP HOUSING, PINTLE ROTOR ASSEMBLY B4 PUMP
7	2	41-132002	PLUG
8	2	31-100004	SPRING
9	1	400-0009	LOCKVALVE
10	2	51-209002	CAPSCREW
11	2	21-300002	BALL
12	1	21-100016	BEARING
13	1	51-102008	KEY (ROTOR)
14	1	21-100016	BEARING
15	1	91-990004	BEARING CAGE
16	8	51-509000	NUT
17	8	51-203004	CAPSCREW
18	1	320-0083	BEARING PLATE



02/01/83 SPRING WAS 31-100020
 01/11/82 NUTS & BOLTS PN T/CAD PL

ITEM	QUANTITY	DESCRIPTION	MATERIAL
 WAGNER ENGINEERING LTD <small>40 DOBICK PLACE NORTH VANCOUVER B.C. CANADA V1M 3G3</small> <small>Manufacturers of MARINE HYDRAULIC STEERING GEARS and AUTOMATIC PILOTS</small>			
TITLE PARTS LIST FOR MODELS B1, B2, B3 & B4 HELM PUMPS			
<small>DRAWN BY</small> 	<small>DATE</small> 	<small>SCALE</small> 	<small>QUOTE NO</small>
<small>REVISION NOTES</small>			<small>DRAWING NO</small> 1-370
			<small>REV</small> 02



N40 x 120 CYLINDER C/W BLEED FITTINGS & HOSES ASSY. NO. 120-0012			
N40 x 120 C/W BLEED FITTINGS LESS HOSES ASSY. NO. 700-0005			
NO.	QTY.	PART NO.	DESCRIPTION
1	1	290-0004	TILLER BOLT
2	1	720-0003	RETAINER NUT
3	2	720-0005	CYLINDER END
4	2	290-0010	BLEED FITTING
5	1	720-0006	CYLINDER BARREL
6	1	710-0001	PISTON ROD ASSEMBLY
7	2	41-007025	HOSE
8	1	710-0002	TRUNNION ASSEMBLY
9	1	119-0082	SEAL KIT
10	1	51-182005	COTTER PIN
11	2	290-0007	TILLER NUT
12	2	91992001	WASHER

N50 x 190 CYLINDER C/W BLEED FITTINGS AND HOSES ASSY. NO. 120-0014			
N50 x 190 CYLINDER C/W BLEED FITTINGS LESS HOSES ASSY. NO. 700-0007			
NO.	QTY.	PART NO.	DESCRIPTION
1	1	290-0005	TILLER BOLT
2	1	720-0019	RETAINER NUT
3	2	720-0020	CYLINDER END
4	2	290-0011	BLEED FITTING
5	1	720-0021	CYLINDER BARREL
6	1	710-0007	PISTON ROD ASSEMBLY
7	2	41-007002	HOSE
8	1	710-0005	TRUNNION ASSEMBLY
9	1	119-0083	SEAL KIT
10	1	51-182003	COTTER PIN
11	2	290-0008	TILLER NUT
12	2	91992002	WASHER


N80 x 190 CYLINDER C/W BLEED FITTINGS AND HOSES ASSY. NO. 120-0016			
N80 x 190 CYLINDER C/W BLEED FITTINGS LESS HOSES ASSY. NO. 700-0009			
NO.	QTY.	PART NO.	DESCRIPTION
1	1	290-0006	TILLER BOLT
2	1	720-0034	RETAINER NUT
3	2	720-0036	CYLINDER END
4	2	290-0012	BLEED FITTING
5	1	720-0037	CYLINDER BARREL
6	1	710-0011	PISTON ROD ASSEMBLY
7	2	41-007003	HOSE
8	1	710-0010	TRUNNION ASSEMBLY
9	1	119-0084	SEAL KIT
10	1	51-182003	COTTER PIN
11	2	290-0009	TILLER NUT
12	2	91992003	WASHER

N40 x 190 CYLINDER C/W BLEED FITTINGS AND HOSES ASSY. NO. 120-0013			
N40 x 190 CYLINDER C/W BLEED FITTINGS LESS HOSES ASSY. NO. 700-0006			
NO.	QTY.	PART NO.	DESCRIPTION
1	1	290-0004	TILLER BOLT
2	1	720-0003	RETAINER NUT
3	2	720-0005	CYLINDER END
4	2	290-0010	BLEED FITTING
5	1	720-0016	CYLINDER BARREL
6	1	710-0004	PISTON ROD ASSEMBLY
7	2	41-007025	HOSE
8	1	710-0002	TRUNNION ASSEMBLY
9	1	119-0082	SEAL KIT
10	1	51-182005	COTTER PIN
11	2	290-0007	TILLER NUT
12	2	91992001	WASHER

N50 x 300 CYLINDER C/W BLEED FITTINGS AND HOSES ASSY. NO. 120-0015			
N50 x 300 CYLINDER C/W BLEED FITTINGS LESS HOSES ASSY. NO. 700-0008			
NO.	QTY.	PART NO.	DESCRIPTION
1	1	290-0005	TILLER BOLT
2	1	720-0019	RETAINER NUT
3	2	720-0020	CYLINDER END
4	2	290-0011	BLEED FITTING
5	1	720-0031	CYLINDER BARREL
6	1	710-0008	PISTON ROD ASSEMBLY
7	2	41-007002	HOSE
8	1	710-0005	TRUNNION ASSEMBLY
9	1	119-0083	SEAL KIT
10	1	51-182003	COTTER PIN
11	2	290-0008	TILLER NUT
12	2	91992002	WASHER

N80 x 300 CYLINDER C/W BLEED FITTINGS AND HOSES ASSY. NO. 120-0017			
N80 x 300 CYLINDER C/W BLEED FITTINGS LESS HOSES ASSY. NO. 700-0010			
NO.	QTY.	PART NO.	DESCRIPTION
1	1	290-0006	TILLER BOLT
2	1	720-0034	RETAINER NUT
3	2	720-0036	CYLINDER END
4	2	290-0012	BLEED FITTING
5	1	720-0048	CYLINDER BARREL
6	1	710-0012	PISTON ROD ASSEMBLY
7	2	41-007003	HOSE
8	1	710-0010	TRUNNION ASSEMBLY
9	1	119-0084	SEAL KIT
10	1	51-182003	COTTER PIN
11	2	290-0009	TILLER NUT
12	2	91992003	WASHER

* NOTE: Use on N80x190, N80x300 cylinders only.

DETAIL	QUANTITY	DESCRIPTION	MATERIAL
 WAGNER ENGINEERING LTD 40 GOSDICK PLACE NORTH VANCOUVER B.C. CANADA V7M 3G3 Manufacturers of MARINE HYDRAULIC STEERING GEARS and AUTOMATIC PILOTS			
TITLE			
TYPE N CYLINDER PARTS LIST			
DRAWN	DATE	SCALE	QUOTE NO
REVISION NOTES	DRAWING NO		
DESIGN CHANGE # 3166 AMJ/03	REV.		
	C-790 02		

WARRANTY OF WAGNER ENGINEERING LTD.
(HEREINAFTER CALLED WAGNER)

WAGNER warrants that all products of its manufacture meet high standards of quality and performance and are warranted to be free from defective materials and workmanship when used in the manner and service intended for a period of twelve months after delivery.

This warranty provides labour during normal working hours only, and on the premises of WAGNER.

In the event that WAGNER is required to perform warranty work outside their normal working hours or place of business, the following costs or expenses shall be paid for by the customer:

1. All transportation to the job site and return to the normal place of business.
2. All travelling time to the job site and return to the normal place of business -- at current service rates.
3. All labour for gaining access to, removing, servicing, replacing and testing WAGNER products, including waiting time -- at current service rates.
4. All labour performed by others.
5. Reasonable living expenses if personnel are unable to return to their normal place of business in the same day.
6. All communication charges.
7. All customs duties.

WAGNER will not assume any costs or expenses for special, direct, incidental or consequential damages.

No other warranty or conditions, express or implied, shall be binding upon WAGNER ENGINEERING LTD.

In the case of products supplied, but not manufactured by WAGNER, the warranty will be that of the original manufacturer only.

All products eligible for warranty claims must be sent freight prepaid to WAGNER accompanied by a copy of the original delivery documentation and details of the complaint. All goods will be returned freight collect by the least expensive means unless advised otherwise. The warranty will not be honoured if, upon examination, it is determined that the equipment has been abused, modified, misapplied, misused, neglected, or contaminated.

To ensure prompt handling, please register your warranty claim with your WAGNER sales representative prior to returning goods.

Address returned goods to:

Warranty Claims
WAGNER ENGINEERING LTD.
40 Gostick Place
NORTH VANCOUVER, B.C.
Canada V7M 3G2

Phone: (604) 988-1111
Telex: 04-352755
Cable: "WAGENG"