



NGP SERIES METERING PUMP

PARTS AND INSTRUCTIONAL MANUAL



NGP-6055 Shown

CDS-JOHN BLUE COMPANY

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SAFETY PRECAUTIONS

- Equipment should be operated only by responsible people.
- A careful operator is the best insurance against an accident.
- Fill system with WATER first and check output.
- Check all valves, fittings, hose clamps, etc. for wear / leaks before admitting process fluid to the system.
- Replace hoses when worn, cracked, or if leaking.

WARNING: USE OF THIS PRODUCT FOR ANY PURPOSES OTHER THAN ITS ORIGINAL INTENT, ABUSE OF THE PRODUCT, AND/OR MODIFICATION TO THE ORIGINAL PRODUCT IS STRICTLY PROHIBITED BY CDS-JOHN BLUE COMPANY. CDS-JOHN BLUE COMPANY RESERVES THE RIGHT TO DENY WARRANTY OR LIABILITY CLAIMS IN ANY/ALL SITUATIONS INVOLVING MISUSE, ABUSE OR MODIFICATION.

THE ORIGINAL INTENT OF THIS PRODUCT DOES NOT INCLUDE USE WHERE THE MAXIMUM ALLOWED SPEED, PRESSURE, OR TEMPERATURE IS EXCEEDED, AND IT DOES NOT INCLUDE APPLICATIONS UTILIZING FLUIDS THAT ARE NOT COMPATIBLE WITH THE PRODUCT'S COMPONENT MATERIALS. DO NOT USE THIS PRODUCT WITH FLAMMABLE OR COMBUSTIBLE FLUIDS SUCH AS GASOLINE, KEROSENE, DIESEL, ETC..., AND DO NOT USE IN EXPLOSIVE ATMOSPHERES. FAILURE TO FOLLOW THIS NOTICE MAY RESULT IN SERIOUS INJURY AND/OR PROPERTY DAMAGE AND WILL VOID THE PRODUCT WARRANTY. IF IN DOUBT ABOUT YOUR APPLICATION, CONTACT YOUR STOCKING DEALER OR THE CDS-JOHN BLUE TECHNICAL STAFF AT 1-800-253-2583.

Important Message to Owners / Operators of Pumps Equipped with Lever Actuated Throw Out Clutches

When using a pump operated by a lever actuated throw out clutch, the rope must be routed by use of eyelet pulleys such that the rope cannot become entangled with or come in contact with any moving parts of the tractor or the applicator such as PTO shafts, tractor tires, ground drive units, etc. If eyelet pulleys are not found packed in with the pump, please contact your selling agent or CDS – John Blue Company (1-800-253-2583) immediately before any operations are undertaken.

Verification must be made prior to any operation that the rope is clear of any moving parts while not only driving straight but when making turns either right or left. Verification must be made prior to any operation that the properly routed rope contains no loops, which might become entangled with any part of the equipment or operator.

At no time should the rope be attached to any clothing worn by or to any body parts of the operator such as hands, arms, legs, etc.

We fully understand these are normal precautions owners / operators should take prior to and while operating equipment. However, we wish to remind you that failure to comply with all safety regulations regarding instructing operators in the use of moving equipment and actual operation of the equipment may lead to serious injury and possible death.

To The Owner

This manual has been prepared and illustrated to assist you in the maintenance of your CDS – JOHN BLUE PUMP. Enter your serial number and the date of the purchase in the space provided below for future reference in service information or for ordering parts. Because our engineering department is constantly improving products, we reserve the right to make design and specification changes without notice.

Model Number: _____ Serial Number: _____ Purchase Date: _____

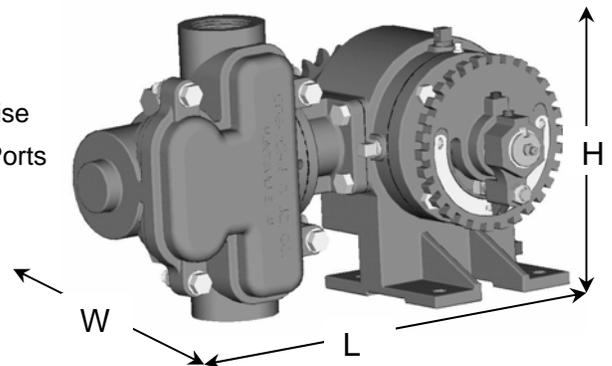
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PUMP SPECIFICATIONS

Universal Specifications

Operating Pressure:	MAX 120 PSI
Operating Speed:	MAX 450 RPM
Rotation:	Clockwise or Counter-clockwise
Plumbing:	1-1/2" NPT (f) Inlet & Outlet Ports
Drive:	No. 50 Roller Chain
Crankcase Lubrication:	SAE 90 Gear Oil
Grease Zerks:	Multipurpose Grease



Unique Specifications

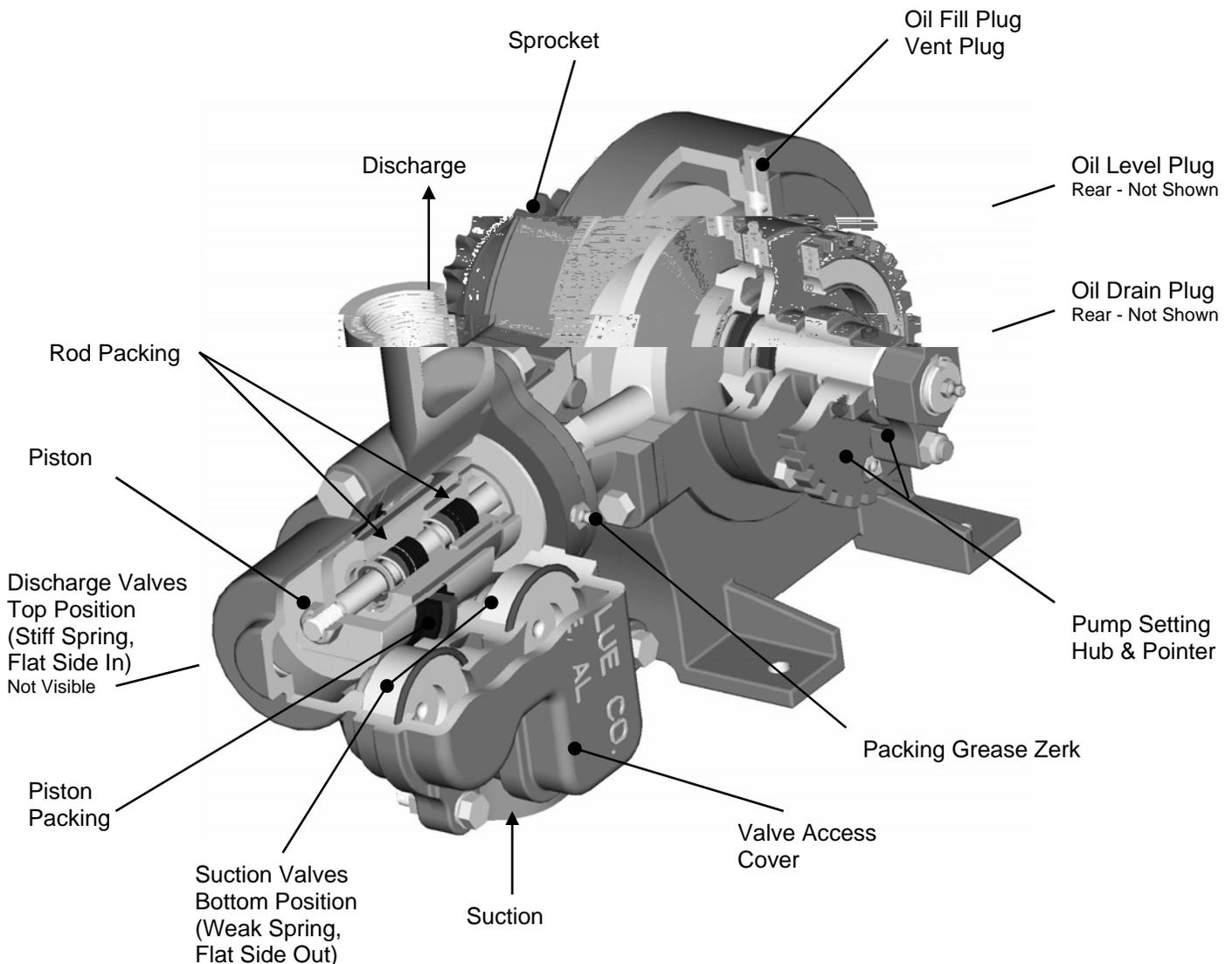
Pump Series:	<u>NGP-6050</u>	<u>NGP-7050</u>	<u>NGP-8050</u>	<u>NGP-9050</u>	
Output Volume	21.0	34.2	42.0	68.4	Max Gal/Min
Output Displacement	.047	.076	.093	.152	Max Gal/Rev
Required H.P.	2.25	3.00	4.50	6.00	Theoretical
Physical Dimensions	10x15x9	10x19x11	14x15x11	14x19x13	W x L x H (in.)
Weight	65	105	125	155	Lbs.
Crankcase Oil Capacity	0.5	1.5	2.5	5.4	Pints

PUMP CROSS SECTION

The NGP series pump is a positive displacement, variable stroke metering pump. It is specifically designed to accurately meter liquid fertilizer solutions. The pump's construction is of rigid thick walled cast iron cylinders and manifolds for durability and long life. Stainless steel construction of the dynamic wet-end 'working' components offers corrosion resistance to check valves, pistons, and rods.

The NGP series pump functions as a positive displacement, chain driven metering device which operates in direct relation to the ground speed through the ground drive system. The application rate can be set (covered under Pump Setting) before application begins and the GPA (Gallons Per Acre) application will be accurate regardless of the varying speeds of the drive mechanism.

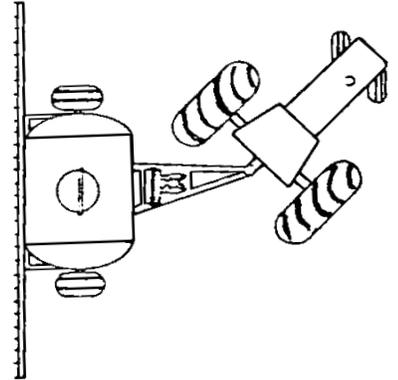
The NGP series pump is designed to control the overall gallons of solution metered over an acre, independent of downstream discharge pressure. The only function of the flow divider or row orifice in a CDS – John Blue pump system is to divide liquid accurately row to row, not to meter the overall application rate.



INSTALLATION

MOUNTING

- The NGP pump should be mounted on a rigid base in a horizontal position.
- The mount position should allow for a straight drive chain and proper tightness.
- Chain idlers should be installed on the slack side of the drive chain.
- The supplied rubber washers are installed between the pump and mount.
- Caution should be exercised on implements with wings or folding members to assure that sufficient area is allowed around the pump and plumbing to not cause contact or binding.
- Verify that the rear tractor wheel will clear the pump during sharp turns.
- The oil vent plug should be installed in the oil fill located on top of crankcase.



SUCTION PLUMBING

- An adequately sized 30 mesh strainer should be installed on the suction side of the pump and should be checked at each tank filling for debris, which could cause suction restriction, starving the pump of flow.
- The NGP pump does produce suction to pull fluid from the tank; however, it is recommended to mount the pump level or below the tank, if possible, to assure the most effective and quickest prime.
- Install the process fluid suction line as straight as possible avoiding restrictions from kinks or extremely sharp turns. This will ensure even flow during maximum pump output.
- Quick connect fittings should be checked and double checked to verify that no leakage is present. Quick connects, although commonly necessary, quite often can produce a suction leak if installed in a bind allowing air to enter the pump, causing loss of prime and / or reduction in pump output.
- It is recommended that suction line hoses be double clamped. Again, this is an area that can produce a suction air leak into the pump, even if no drip from the hose is present.

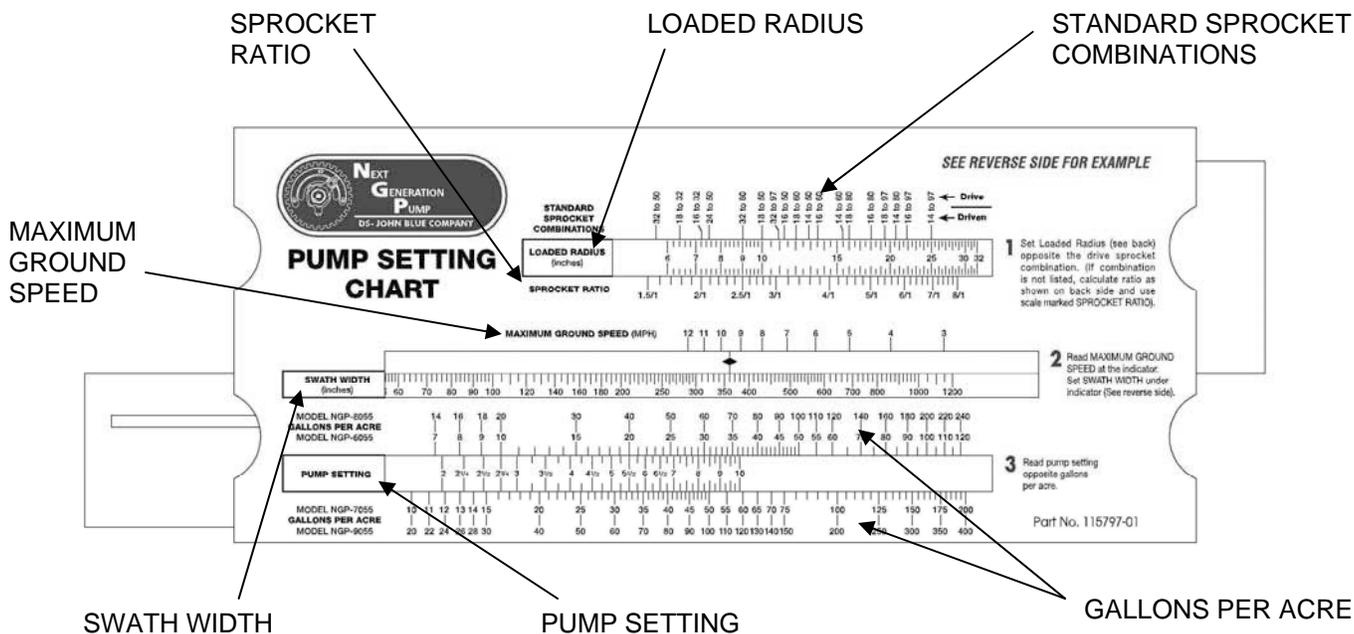
DISCHARGE PLUMBING

- It is not recommended to install a discharge strainer as these could clog with debris causing significant discharge pressure and possible system damage in positive displacement pump applications.
- Flow dividers may be installed either directly on top of the discharge port or remote mounted.
- Orifice applications must pay particular attention for proper orifice sizing for the specified application rate.
- It is recommend that applications using a double piston pump with two flow dividers remove the common manifold and plumb each flow divider independently to each piston to assure accuracy.
- On – The – Go Variable Rate applications require that a CDS – John Blue Co. flow divider distribution manifold be used that will automatically and accurately adjust for varying on the go rate changes.

WARNING: The flow range of a NGP pump far exceeds the flow curve of a single orifice operating below 120 psi. For Example: An orifice application at 30 psi discharge pressure for a rate of 20 GPA @ 4 mph will produce 422 psi when the rate is adjusted to 50 GPA and ground speed increased to 6 mph.

PUMP SETTING

The NGP pump output is determined by the drive sprocket ratio and the stroke length. Slide Chart 115698-91 is used to determine the scale setting required to adjust the stroke length for a desired output.



SPROCKET RATIO

Standard Sprocket Combinations

Standard sprocket combinations may be used for equipment with only one chain from the ground or press wheel sprocket to the pump sprocket. For example: an applicator with a 60 tooth drive sprocket on the tire driving a 16 tooth driven sprocket on the pump can use the 16 to 60 mark on the slide chart.

Non-Standard Sprocket Combinations

If you are using sprocket combinations with multiple sprockets, such as with a jack shaft, use the following formula to determine sprocket ratio:

$$\frac{\text{Drive Sprocket}}{\text{Driven Sprocket}} = \text{Sprocket Ratio}$$

For example: an applicator with a 50 tooth on the drive wheel, driving to a 24 tooth on the jack shaft, then a 36 tooth on the jack shaft driving up to a 16 tooth pump driven sprocket, would yield a 4.69 drive ratio.

$$\frac{50 \text{ T (@ Drive Wheel)}}{24 \text{ T (@ Driven Shaft)}} \times \frac{36 \text{ T (@ Drive Shaft)}}{16 \text{ T (@ Driven Pump)}} = \frac{50}{24} \times \frac{36}{16} = 4.69 \text{ Sprocket Ratio}$$

Set the sprocket ratio on the slide chart using the 4.69 calculation for the example above.

LOADED RADIUS

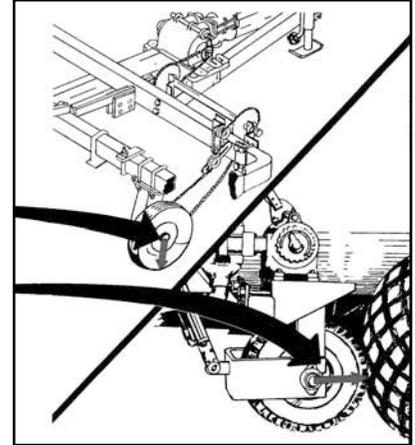
The measurement for the loaded radius must be from the Manufacturer of the tire or be measured under loaded conditions. The loaded radius tire is always the tire that has the first drive sprocket attached to its hub.

Ground Wheel Drive Arrangement

Measure the loaded radius from the center of the hub to the bottom of the tire where it rests on the ground.

Press Wheel Drive Arrangement

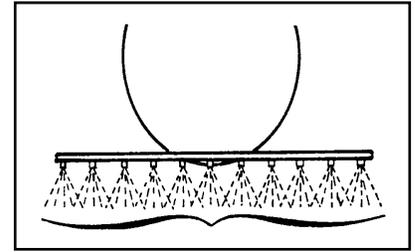
Measure the loaded radius from the center of the press wheel shaft to where the wheel rests against the tire. The press wheel must be engaged for normal operation to give an accurate reading.



SWATH WIDTH

To determine the swath width, count the number of outlets and multiply by the distance (inches) between any two outlets, nozzles, or shanks. This assumes that all outlets are equally spaced, if outlets are not evenly spaced, figure the entire length of the boom or toolbar from end nozzle to end nozzle and allow for coverage beyond the ends.

For example, an 11 row boom at 30" would have a swath width of 330"



SETTING THE PUMP

Read the desired pump setting from the bottom scale on the pump setting chart. Loosen the setting pointer nut and rotate the setting hub until the setting pointer is over the desired setting. The 115681-01 setting wrench will facilitate rotation of the setting hub. Once proper pump setting is achieved, tighten the setting pointer nut.

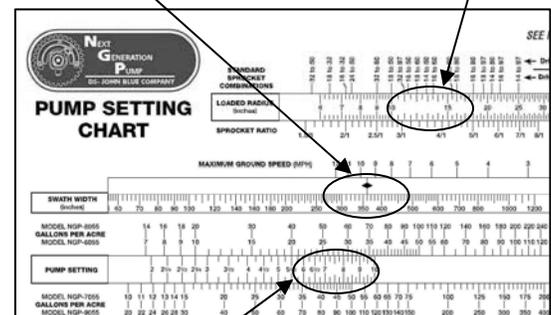
EXAMPLE:

An applicator is equipped with a NGP-6050 series pump, 11L x 15" tires, a 60 tooth drive sprocket, and a 16 tooth pump driven sprocket. It is desired to apply 33 gallons per acre on a 360" swath. The following steps will determine correct pump setting:

1. Set loaded radius of tire (13.5") under the sprocket combination of 16 to 60 in the top window.
2. Set the swath width (360") under the diamond in the middle window.
3. Read that the pump setting is approx. 9 at 33 gallons per acre on the NGP-6055 scale in the bottom window.
4. Set the pump to setting 9 to achieve 33 gallons per acre

Note: The max. ground speed is read above the diamond as approx. 9 mph to avoid exceeding 450 pump rpm.

- 2 SET SWATH WIDTH AT DIAMOND
- 1 SET LOADED RADIUS AT SPROCKET RATIO



- 3 READ PUMP SETTING

INITIAL PUMP START UP

Verify that all installation guidelines have been followed as outlined in the installation section of this manual.

- Fill the tank full of water to test for leaks in the plumbing system and output of the pump.
- Fully open the valve at the tank allowing water to fill the suction line and check for leaks.
- Set the pump to pump setting 10.
- Before installing nozzles or orifices (if used), prime the pump and purge the system of air and foreign material by slowly pulling the applicator 100 to 200 yards.
- Turn off the valve at the tank, open strainer, check for foreign material and clean the screens.
- The CDS – John Blue flow divider is automatic and requires no calibration; however, if nozzles or orifices are used, verify that the orifices are sized properly as to not produce high discharge pressure.
- Pull the machine over known acreage and verify the application accuracy with water prior to field application of chemical. Note that tank level marks can give false readings if read on uneven ground.

PUMP CALIBRATION

The NGP pump is calibrated from the factory; however, if the setting scale, hub, or pointer is replaced, use the following procedure to calibrate the pump output with scale readings.

- Remove the valve cover and outboard cylinder (see maintenance section).
- Set the pump on pump setting 5 for all pump sizes.
- Rotate the crankshaft until the piston is as far in as it will go. Measure the distance from the end of the piston to the inboard cylinder flange. Rotate the crankshaft until the piston is as far out as it will go and measure again to the same place. The difference in length is the stroke length, which at pump setting 5 should be 9/16" for the NGP-6050 & NGP-8050 or 15/16" for the NGP-7050 & NGP-9050.
- If the distance is less than the required amount, reset the pointer at a higher setting, if it is greater; reset the pointer at a lower setting. Repeat this procedure to obtain the required measurement.
- Once accomplished, loosen the setting scale screws until the 5 is directly under the pointer and secure the scale in position with the three scale screws.
- Replace the outboard cylinder and valve cover, making sure that the valves are in their proper orientation as covered under the maintenance section.

PUMP ACCURACY

A catch test may be performed to verify accuracy, not as a calibration method, by priming the pump and catching all of the pumped fluid from the discharge for a known number of revolutions. See chart below:

<u>Pump Series</u>	<u>Pump Setting</u>	<u># of Revolutions</u>	<u>Total Pump Output</u>
NGP-6050	8	10	3 Pints
NGP-7050	8-1/4	10	5 Pints
NGP-8050	8	10	6 Pints
NGP-9050	8-1/4	10	10 Pints

MAINTENANCE

- Check oil daily and fill crankcase with a quality grade SAE 90 weight gear oil. Oil level must be visible at oil level check plug on back of crankcase. The level plug is located at same height as the crankshaft.
- Lubricate all grease zerks on roller chain sprocket spacer, outboard cover plate, crankshaft end, and at stuffing box flange daily. Fill zerks until grease is visibly seen seeping from mating parts. For the stuffing box flange zerk, grease will be seen seeping from the vent on the opposite side of the flange.
- Pump oil should be changed seasonal or in extreme use conditions.
- Visually inspect sprocket and drive chain daily for excessive wear or corrosion. Lubricate chain regularly to reduce corrosion. Chain alignment must be straight.

STORAGE

IMPORTANT – KEEP AIR OUT AND KEEP FROM FREEZING

Keep air out of the pump! This is the only way to prevent corrosion. Even for short periods of storage, the entrance of air into the pump causes RAPID and SEVERE CORROSION. Freezing temperatures can cause the fluid or water to freeze internally to the pump, which can cause severe damage to the wet-end castings.

OVERNIGHT

Suspension fertilizer must be flushed from the pump for ANY storage period. For Clear Liquids:

1. Steady or rising temperatures: leave pump and hoses filled with solution. DO NOT DRAIN nor admit air to the pumps.
2. Cooling weather: (solution likely to salt out), fill pump with water and leave filled. DO NOT admit air.
3. Freezing temperature: fill pump with RV-antifreeze and leave filled, DO NOT admit air.

ONE TO TWO WEEKS

ACCEPTABLE: Flush pump thoroughly with 5 to 10 gallons of a solution that will neutralize the liquid last pumped (refer to that manufacturer's instructions). Fill with clean water and DO NOT DRAIN. Keep pump sealed to exclude air. If freezing temperatures are remotely possible, the winter storage procedure (see below) must be used to avoid damage to the pump castings.

PREFERRED: Flush pump as detailed above. IMMEDIATELY fill all passages in pump with straight RV-antifreeze which contains a rust inhibitor. Place 1-1/2" NPT PVC plugs in the suction and discharge fittings to keep pump full and exclude air.

WINTER STORAGE

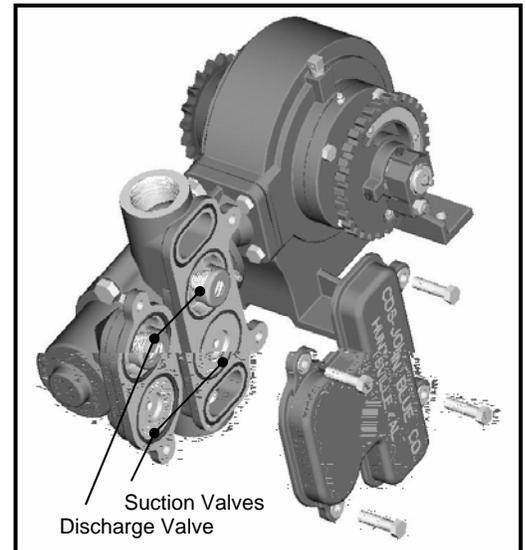
1. Flush pump as detailed above.
2. With pump set on 10, draw in straight RV-antifreeze until the discharge is clean. If system utilizes a flow divider (FD), pump the RV-antifreeze through the FD manifold until it is seen in the discharge lines. Fill pump and plug suction and discharge fittings of pump to retain RV-antifreeze.

SERVICE MAINTENANCE

Proper maintenance of the NGP pump will ensure a service life for many years. Rebuilding and / or servicing check valves, piston flange packing, piston rod packing, and crankcase components is an economical way to ensure optimum service. This type of service is simple, and can be done by almost all end users. The parts list and schematic section shows the position of all service kit items, which includes all seals, packing, and gaskets. Gasket kits and component parts can be ordered through any authorized CDS – John Blue distributor.

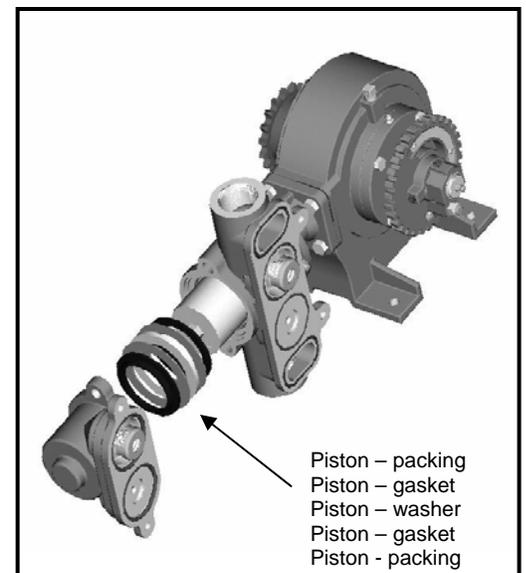
CLEAN AND INSPECT CHECK VALVES

- Remove the valve cap exposing all 4 check valves. Take care in removal to notice the orientation of the valves. Discharge valves use a tighter spring and are on top, flat side in. Suction valves use a weaker spring and in the bottom, flat side out.
- Valves should be removed by hand, do not use a screw driver or pry-bar as damage can result. Push each valve disc off its o-ring seat ensuring that the spring reseats each disc evenly and that no debris is present. Inspect the o-rings for cuts or cracks which could allow air to enter or cause the discs to not seat properly.
- Check the port o-rings positioned near the top and bottom of the inboard cylinder in an oval shaped groove. This o-ring should not be removed unless visible damage is present. The o-rings should be fully installed in the groove with no cuts or cracks. Once all valves are checked for debris or damage and o-rings are in position, re-install valves in proper orientation, replace the cover, and tighten the bolts evenly.



PISTON PACKINGS

- With valve cover removed, remove the ½” long bolts securing the outboard cylinder. Remove the outboard cylinder exposing the piston – gaskets, washer, and packing.
- Remove the first piston – packing, gasket, and washer; notice the orientation of the packing lip. Remove the second piston gasket and packing from the inboard cylinder; again noticing the orientation of the packing lip.
- Inspect the packing and replace if necessary, gaskets should always be replaced once removed. The piston - packing should be pliable and without cracks or nicks to perform properly.
- Clean the cavities of both the inboard and outboard cylinder as well as the valve cap while disassembled. Discoloration of the plunger and / or lateral scoring of the piston can be deceiving, but not necessarily detrimental.
- Inspect piston for deep grooves, radial scoring, or severe abrasion. The best method is by feel.
- Assemble in reverse manner taking care for proper orientation of the piston – packing, gaskets, and washer.



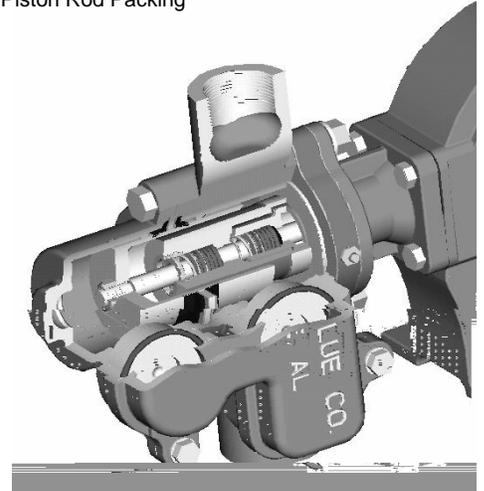
PISTON ROD PACKINGS

The rod packing consists of 2 sets of self-tightening 'V' rings which seal around the piston rod to prevent pumped fluid from leaking and protect the crankcase from contamination. Virtually any leakage of the *pumped fluid* through the vent in the side of the stuffing box is an indication that these rod packing need replacement. However, it is not uncommon for *oil* to drip from this drain.

Removal of rod packing:

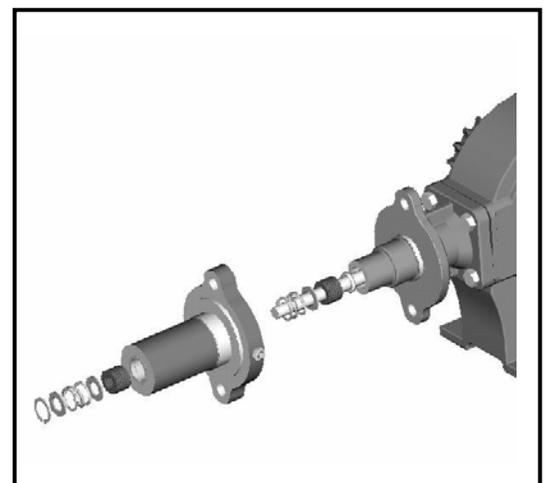
- With the valve cap and cylinders removed, remove the piston nut and piston by rotating piston counter-clockwise, use a belt wrench or cloth nearest to the nut end to prevent damage to the piston.
- Remove the stuffing box and gasket which house the wet-end piston rod packing.
- Remove the snap ring from the end of the stuffing box, allowing the washer, spring, and washer to slip out. The L-1031-2 insert should not be removed from the stuffing box. The rod packing set can be removed with a hook or screwdriver by prying the multi-piece rod packing set out of the cavity. Once removed it must be replaced with a new service rod packing set.
- There is no snap ring on the second set closest to the crankcase located in the crosshead guide. This set may be removed in the same manner as the first set. There is a secondary o-ring rod seal located at the bottom of the set which also should be replaced.
- Inspect the piston rod for any deep scoring and replace if necessary. A polished wear pattern may be evident and is not detrimental; however, deep grooves indicate the piston rod assembly should be replaced.
- The crosshead guide may be removed from crankcase to allow for inspection of the connecting rod bushing. If damaged or slop is present, this should be replaced.

Piston Rod Packing



Re-assembly and replacement of rod packing:

- Carefully re-install the crosshead guide and gasket and bolt to crankcase, if removed.
- Lubricate piston rod and install o-ring first, then carefully install the first 'V' ring packing set. The set consists of a bottom adapter, 4 rings, and a top adapter. Each component should be inserted one at a time and pressed firmly in place. The 4 rings have a 'V' shape and are oriented so as the 'V' point is pointed towards the crankcase, for both sets. Install the washer and spring.
- Install second set in the stuffing box in a similar manner, there is no secondary o-ring required in this set. Install the washer, spring, then washer and hold in place with snap ring.
- Lubricate piston rod and stuffing box, then slide stuffing box carefully back over rod, being extremely careful to push straight on the piston rod so as the rods threads do not damage the 'V' ring set.
- Re-assemble piston, inboard, and outboard cylinder in reverse manner. Continue with valves in proper orientation, valve cover, and secure all bolts evenly.
- Finally, lubricate the stuffing box grease zerk until grease seeps out of the stuffing box vent hole.

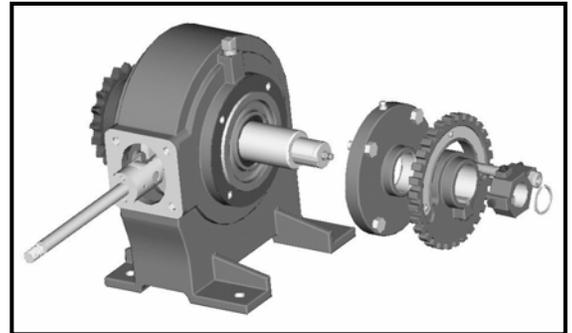


CRANKCASE DISASSEMBLY

Major pump repair requires some in-depth knowledge on working tolerances for internal parts. We recommend that you contact your nearest CDS-John Blue sales and service dealer for best results in major pump repair. Shaft oil seals have been upgraded from previous L & LM series pumps to include a wiper ring. The oil seals are enclosed in a greaseable cavity to flush debris from around the seal, which is a contributing factor to premature oil seal failure. The oil seals may be replaced by following the OUTBOARD & INBOARD COMPONENTS section below. All instruction and visual representation in this section is shown with wet-end components removed which is covered in the maintenance sections preceding this section.

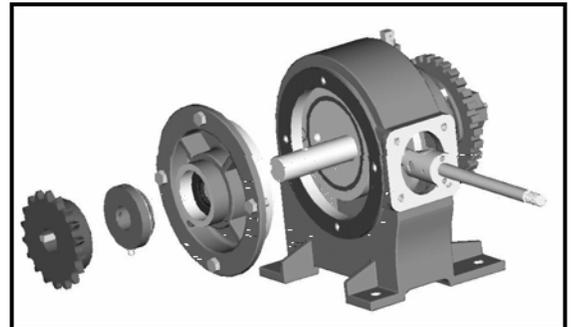
OUTBOARD COMPONENTS

- Remove the retaining ring, pump setting hub, and pointer.
- Remove the flange cover exposing the oil seal in its cavity.
- Remove the oil seal which may be done with a screw driver, taking care not to scar the internal shaft or housing.
- Inspection of the stroke setting sleeve should be made for wear at the seal location as well as the flange gasket for tears prior to re-assembly.



INBOARD COMPONENTS

- Remove the sprocket from shaft and sprocket spacer, inspecting the o-ring and thrust washer for wear, cuts, or damage and replace as necessary.
- Remove the cover plate. It may be necessary to remove any marks in the crankshaft from the sprocket / spacer set-screws with a light emery cloth in order for the cover plate to slip off with the bearing.
- Remove the oil seal with a screw driver, taking care not to scar the housing or shaft.
- If only the oil seal is being replaced, the cover plate should be re-installed first, then the oil seal. Inspect the shaft for wear at the seal location, as well as the cover plate gasket for tears, replace as necessary.



INTERNAL COMPONENTS

The following inspection points should be made prior to disassembly if required:

- With inboard and outboard components removed, examine for sediment in the crankcase. A small amount of metal wear and 'grit' in the oil is normal, large sediment may require further disassembly.
- Check for metal and/or fertilizer discoloration to the oil. If fertilizer is present, the crankcase should be disassembled and each component examined for rust pitting or deterioration.
- Holding the crankcase firmly, take hold of the connecting rod and push / pull. If you feel obvious end play, disassemble all components and inspect for wear, particularly the eccentrics and connecting rod.

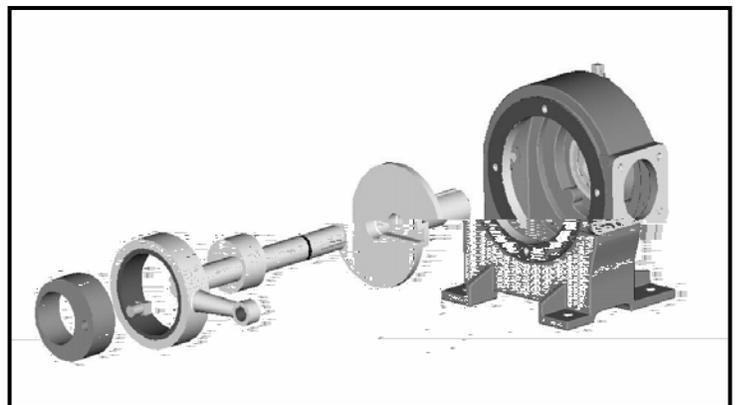
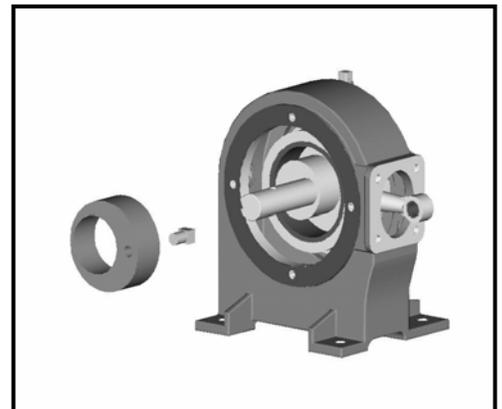
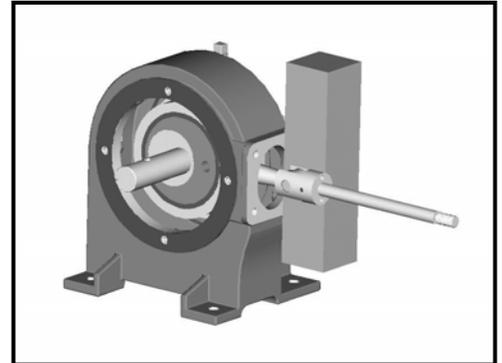
INTERNAL DISASSEMBLY

Reference to the schematic section is recommended prior to disassembly of the internal crankcase components to familiarize yourself with components. The wet-end components, inboard, and outboard components should be removed prior to internal disassembly as outlined in previous sections of this manual.

- Supporting the piston rod with a wood block, locate the crosshead pin, which connects the piston rod and connecting rod and carefully drive pin out with a hammer and punch.
- Inspect the connecting rod bushing for damage and replace as necessary during re-assembly.
- Slide the outer eccentric and eccentric pin out of the crankcase.
- The connecting rod can then be removed by carefully sliding it out the side of the pump at an angle.
- The shaft can then be removed as shown with the inner eccentric still in place.

Note: Double piston pumps will require the stroke transfer sleeve to be removed with the shaft exposing the second piston eccentric and connecting rod for removal.

- The stroke setting sleeve is there removed.
- The eccentric pins may slide out during any part of this process and should be accounted for, single pumps utilize 1, double pumps utilize 3 [ref schematic].
- Examine all components, giving more attention to ones showing 'galling' than to ones which are undersize, yet smooth.



CRANKCASE RE-ASSEMBLY

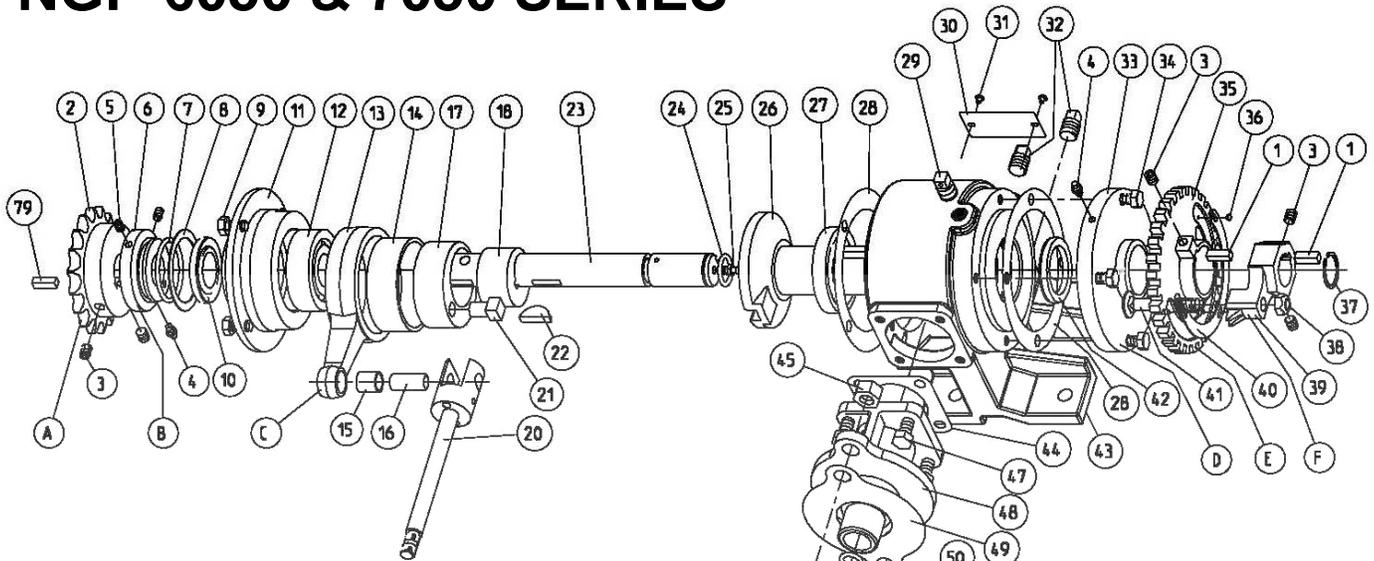
- All components in the gasket kit should be used during re-assembly.
- Reassemble the crankcase in reverse order.
- When assembling the shaft, oil the shaft o-ring and carefully insert into stroke setting sleeve.
- It is extremely important that all eccentric pins engage appropriate mating slots.
- Coat all bolts threads with gasket sealant before installing in crankcase.

PARTS LISTING – NGP-6050 & NGP-7050 Series

ITEM	PART DESCRIPTION	NGP-6050 PART #	NGP-7050 PART #
1	KEY	L-1020	L-1020
2	SPROCKET RC50-18T	112661-01	112661-01
	-K NO SPROCKET	NOT USED	NOT USED
	-R SPROCKET RC40-18T	113905-01	113905-01
3	5/16 X 3/8 SET SCREW	90532	90532
4	GREASE FITTING	H-28	H-28
5	5/16 X 3/8 SET SCREW	90532	90532
6	SPROCKET SPACER	115625-01	115625-01
7	O-RING	S-316	S-316
8	THRUST WASHER	115626-01	115626-01
9	5/16 X 1 HEX BOLT	90637	90637
10	OIL SEAL	115621-01	115621-01
11	COVER PLATE	115723-01	115623-01
12	BEARING	L-3019	L-3019
13	CONNECTING ROD	L-1008-A	113630-01
14	JOURNAL BEARING	L-928	113629-01
15	ROD BUSHING	113588-01	113588-01
16	ROD PIN	105895-01	105895-01
17	ECCENTRIC - OUTER	L-1013-A	113633-01
18	ECCENTRIC - INNER	L-1015	L-3017
19	TRANSFER SLEEVE	NOT USED	NOT USED
20	PISTON ROD ASSEMBLY	115712-91	105900-91
21	ECCENTRIC PIN	L-3004	L-3004
22	WOODRUFF KEY	108093-01	A-4333
23	CRANKSHAFT	115614-01	115614-01
24	O-RING	L-1022	L-1022
25	GREASE ZERK	115647-01	115647-01
26	SETTING SLEEVE	115718-01	115618-01
27	BEARING	L-1007-A	L-1007-A
28	GASKET	L-1006	L-3002
29	VENT PLUG	S-350	S-350
30	NAME PLATE	111958-01	111958-01
31	DRIVE SCREW	A-3557	A-3557
32	OIL PLUG	C-431-B	C-431-B
33	FLANGE COVER	115724-01	115724-01
34	5/16 X 1 HEX BOLT	90637	90637
35	SETTING HUB	115627-01	115627-01
36	SETTING SCALE SCREW	A-368	A-368
37	SNAP RING	115791-01	115791-01
38	3/8 SELF-LOCKING NUT	A-3097	A-3097
39	SETTING POINTER	115628-01	115628-01
40	SETTING SCALE	115645-01	115645-01
41	3/8 X 2-1/4 CARRIAGE BOLT	115646-01	115646-01
42	OIL SEAL	115622-01	115622-01
43	CRANKCASE	115720-01	115620-01
44	GASKET - CROSSHEAD	115711-01	115611-01
45	1/2 HEX NUT	92029	92029
	-S STAINLESS	92030	92030
46	NOT USED		
47	HEX BOLT	90637	90860
48	CROSSHEAD GUIDE	115700-01	115600-01
49	GASKET - STUFFING BOX	115610-01	115610-01
	-U FUMIGANT	104828-01	104828-01
50	O-RING	111943-01	111943-01
	-U FUMIGANT	L-1109-U	L-1109-U
51	PACKING 'V' SET	L-1109	L-1109
52	PACKING WASHER	L-1041	L-1041
53	PACKING SPRING	L-1063	L-1063
54	GREASE ZERK	H-30	H-30

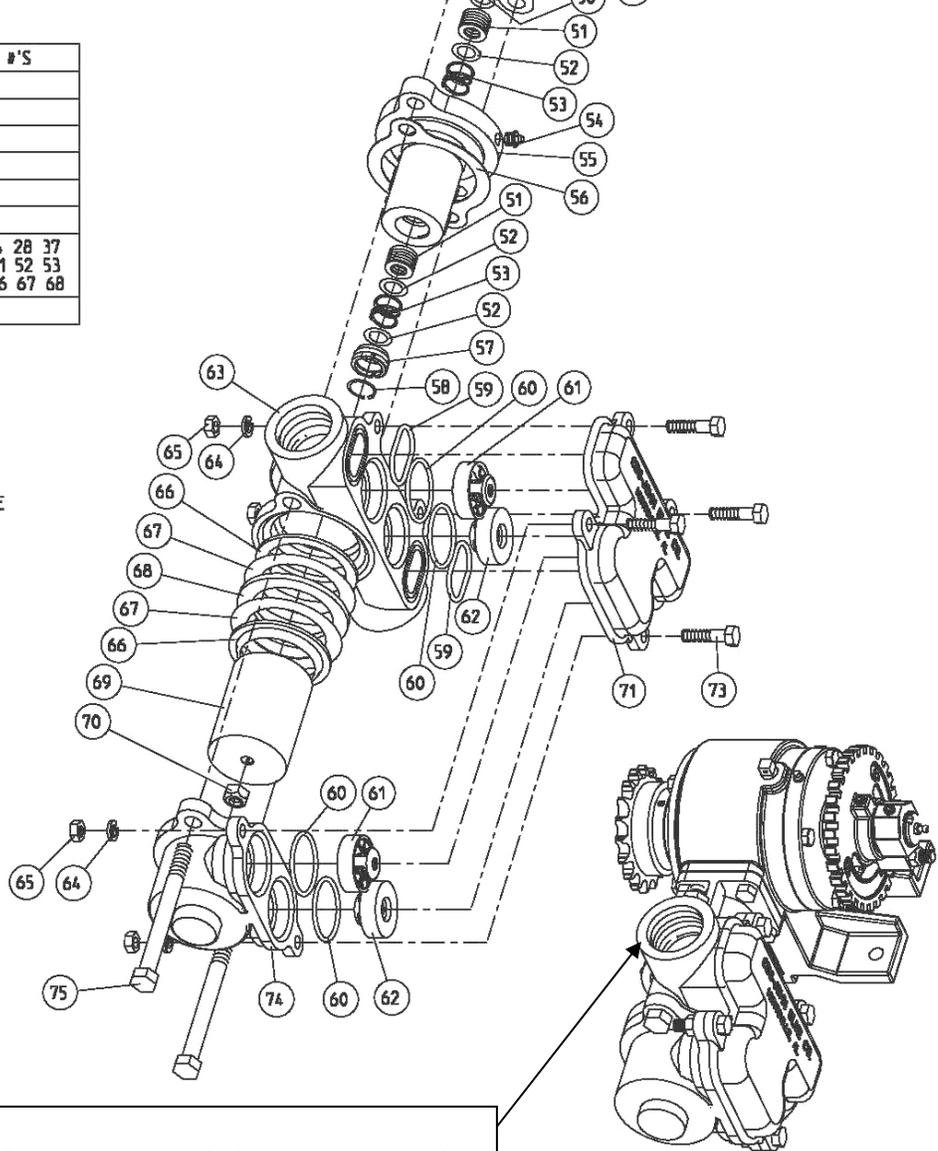
ITEM	PART DESCRIPTION	NGP-6050 PART #	NGP-7050 PART #
55	STUFFING BOX	115790-01	115690-01
	-S STAINLESS	115790-01S	115690-01S
56	GASKET - INBOARD CYL.	115710-01	115710-01
	-U FUMIGANT	104826-02	104826-02
57	STUFFING BOX INSERT	L-1031-2	L-1031-2
	-S STAINLESS	NOT USED	NOT USED
58	PACKING - SNAP RING	L-1042	L-1042
59	O-RING	S-316	115604-01
	-S STAINLESS	104824-01	115612-01
	-U FUMIGANT	104824-01	115612-01
60	O-RING	L-3031	A-2848
	-S STAINLESS	114768-01	114870-01
	-U FUMIGANT	114768-01	114870-01
61	DISCHARGE VALVE	115707-91	115607-91
62	SUCTION VALVE	115706-91	115606-91
63	INBOARD CYLINDER	115701-02	115601-02
	-FLG FLANGED INBOARD CYL 220	115701-02FLG	115601-02FLG
	-S STAINLESS	115701-02S	115601-02S
64	3/8 LOCK WASHER	93024	93024
	-S STAINLESS	93025	93025
65	3/8 HEX NUT	92024	92024
66	PLUNGER – PACKING	L-1045-V	L-1045-V
	-B PLUNGER – PACKING BUNA	L-1045-A	L-1045-A
67	PLUNGER – GASKET	L-1098	L-1098
	-U FUMIGANT	114769-01	114769-01
68	PLUNGER – WASHER	L-1044-A	L-1044-A
69	PLUNGER	103290-91	112816-91
70	PLUNGER - LOCKING NUT	L-1047	L-1047
71	VALVE COVER	115703-01	115603-01
	-S STAINLESS	115703-01S	115603-01S
72	1/2 FLAT WASHER	NOT USED	NOT USED
	-DR NOT USED	NOT USED	NOT USED
73	3/8 X 1-1/2 HEX BOLT	90911	90911
	-S STAINLESS	90654	90654
74	OUTBOARD CYLINDER	115702-01	115602-01
	-S STAINLESS	115702-01S	115602-01S
75	1/2 HEX BOLT	90704	90705
	-S STAINLESS (2 BOLTS USED)	90693/90687	90693/90687
76	GASKET – MANIFOLD	NOT USED	NOT USED
	-DR NOT USED	NOT USED	NOT USED
77	MANIFOLD – COMMON	NOT USED	NOT USED
	-S NOT USED	NOT USED	NOT USED
	-DR NOT USED	NOT USED	NOT USED
78	1/2 HEX BOLT	NOT USED	NOT USED
	-DR NOT USED	NOT USED	NOT USED
79	SPROCKET KEY	106493-01	106493-01
A	SPROCKET ASSY. RC50-18T	106532-01	106532-01
	-K NO SPROCKET	NOT USED	NOT USED
	-R SPROCKET ASSY. RC40-18T	113907-01	113907-01
B	SPROCKET SPACER ASSY.	115624-91	115624-91
C	CONNECTING ROD ASSY.	L-1008-B	113645-91
D	FLANGE COVER ASSY.	115725-91	115725-91
E	SETTING HUB ASSY.	115629-91	115629-91
F	SETTING POINTER ASSY.	115630-91	115630-91
G	GASKET KIT	115788	115688
	-S GASKET KIT - STAINLESS	115788-S	115688-S
	-U GASKET KIT - FUMIGANT	115788-U	115688-U
H	OPERATORS KIT	115787	115787
N/S	SLIDE CHART	115698-91	115698-91
N/S	SETTING WRENCH	115631-01	115631-01

NGP-6050 & 7050 SERIES



ITEM	DESCRIPTION	INCLUDES ITEM #'S
A	SPROCKET	2 3
B	SPACER	4 5 6 7 8
C	CONNECTING ROD	13 14 15
D	FLANGE COVER	4 33
E	SETTING HUB	3 35 36 40
F	SETTING POINTER	3 39
G	GASKET KIT	7 8 10 15 24 28 37 42 44 49 50 51 52 53 56 58 59 60 66 67 68
H	OPERATORS KIT	NOT SHOWN

- G — GASKET KIT
- H — OPERATORS KIT
 - MANUAL
 - WRENCH
 - SLIDE CHART
 - MOUNTING HARDWARE



220 FLANGE ADAPTERS:

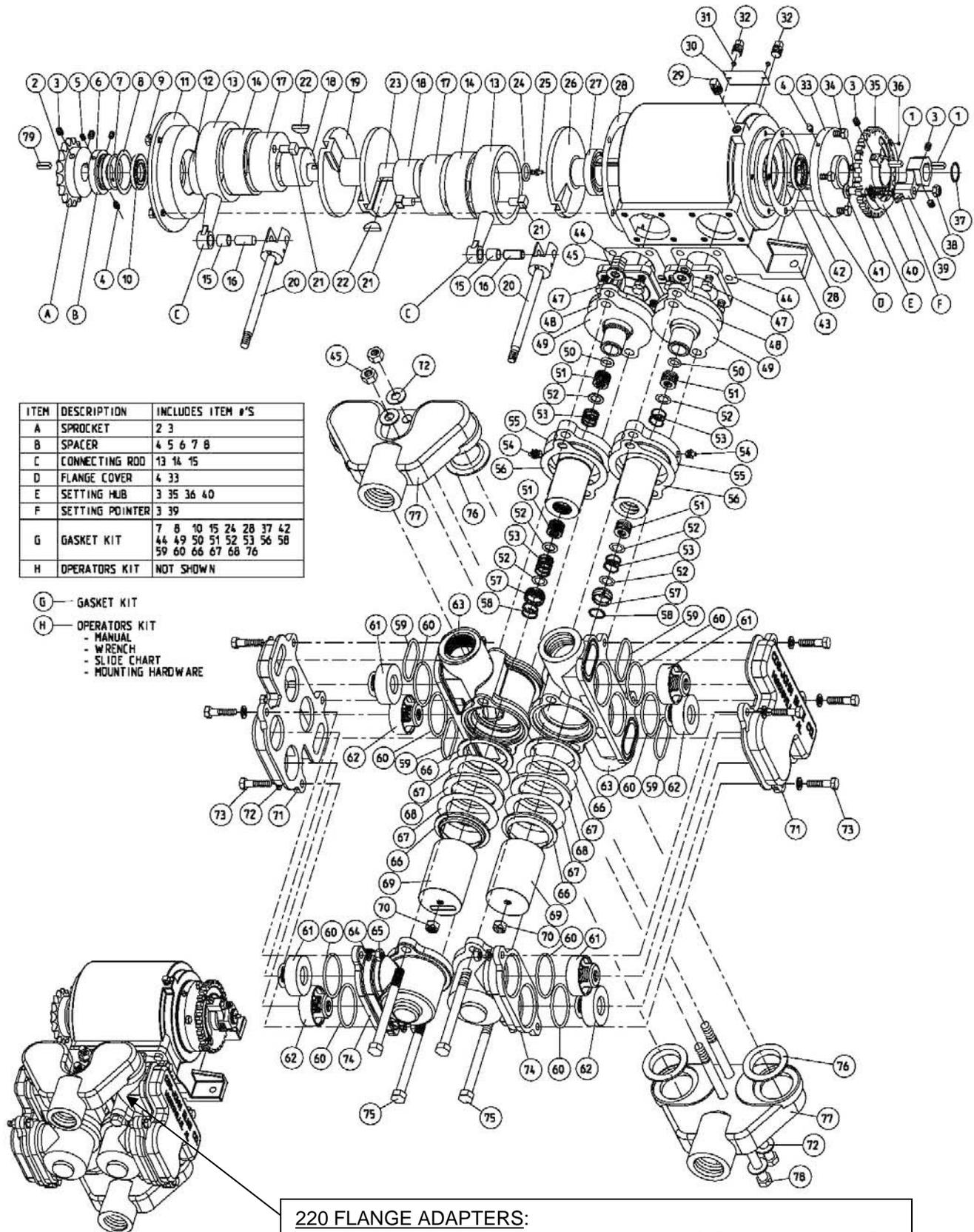
- CAST IRON PUMPS USE 115701-02FLG OR 115601-02FLG
- STAINLESS USE 116083-01S ADAPTERS

PARTS LISTING – NGP-8050 & NGP-9050 SERIES

ITEM	PART DESCRIPTION	NGP-8050	NGP-9050
		PART #	PART #
1	KEY	L-1020	L-1020
2	SPROCKET RC50-18T	112661-01	112661-01
	-K NO SPROCKET	NOT USED	NOT USED
	-R SPROCKET RC40-18T	113905-01	113905-01
3	5/16 X 3/8 SET SCREW	90532	90532
4	GREASE FITTING	H-28	H-28
5	5/16 X 3/8 SET SCREW	90532	90532
6	SPROCKET SPACER	115625-01	115625-01
7	O-RING	S-316	S-316
8	THRUST WASHER	115626-01	115626-01
9	5/16 X 1 HEX BOLT	90637	90637
10	OIL SEAL	115621-01	115621-01
11	COVER PLATE	115723-01	115623-01
12	BEARING	L-3019	L-3019
13	CONNECTING ROD	L-1008-A	113630-01
14	JOURNAL BEARING	L-928	113629-01
15	ROD BUSHING	113588-01	113588-01
16	ROD PIN	105895-01	105895-01
17	ECCENTRIC - OUTER	L-1013-A	113633-01
18	ECCENTRIC - INNER	L-1015	L-3017
19	TRANSFER SLEEVE	115783-01	115683-01
20	PISTON ROD ASSEMBLY	115712-91	105900-91
21	ECCENTRIC PIN	112686-01	L-3004
22	WOODRUFF KEY	108093-01	A-4333
23	CRANKSHAFT	115681-01	115681-01
24	O-RING	L-1022	L-1022
25	GREASE ZERK	115647-01	115647-01
26	SETTING SLEEVE	115718-01	115618-01
27	BEARING	L-1007-A	L-1007-A
28	GASKET	L-1006	L-3002
29	VENT PLUG	S-350	S-350
30	NAME PLATE	111958-01	111958-01
31	DRIVE SCREW	A-3557	A-3557
32	OIL PLUG	C-431-B	C-431-B
33	FLANGE COVER	115724-01	115724-01
34	5/16 X 1 HEX BOLT	90637	90637
35	SETTING HUB	115627-01	115627-01
36	SETTING SCALE SCREW	A-368	A-368
37	SNAP RING	115791-01	115791-01
38	3/8 SELF-LOCKING NUT	A-3097	A-3097
39	SETTING POINTER	115628-01	115628-01
40	SETTING SCALE	115645-01	115645-01
41	3/8 X 2-1/4 CARRIAGE BOLT	115646-01	115646-01
42	OIL SEAL	115622-01	115622-01
43	CRANKCASE	115780-01	115680-01
44	GASKET - CROSSHEAD	115711-01	115611-01
45	1/2 HEX NUT	92029	92029
	-S STAINLESS	92030	92030
46	NOT USED		
47	HEX BOLT	90637	90860
48	CROSSHEAD GUIDE	115700-01	115600-01
49	GASKET - STUFFING BOX	115610-01	115610-01
	-U FUMIGANT	104828-02	104828-02
50	O-RING	111943-01	111943-01
51	PACKING 'V' SET	L-1109	L-1109
	-U FUMIGANT	L-1109-U	L-1109-U
52	PACKING WASHER	L-1041	L-1041
53	PACKING SPRING	L-1063	L-1063
54	GREASE ZERK	H-30	H-30

ITEM	PART DESCRIPTION	NGP-8050	NGP-9050
		PART #	PART #
55	STUFFING BOX	115790-01	115690-01
	-S STAINLESS	115790-01S	115690-01S
56	GASKET - INBOARD CYL.	115710-01	115710-01
	-U FUMIGANT	104826-02	104826-02
57	STUFFING BOX INSERT	L-1031-2	L-1031-2
	-S STAINLESS	NOT USED	NOT USED
58	PACKING - SNAP RING	L-1042	L-1042
59	O-RING	S-316	115604-01
	-S STAINLESS	104824-01	115612-01
	-U FUMIGANT	104824-01	115612-01
60	O-RING	L-3031	A-2848
	-S STAINLESS	114768-01	114870-01
	-U FUMIGANT	114768-01	114870-01
61	DISCHARGE VALVE	115707-91	115607-91
62	SUCTION VALVE	115706-91	115606-91
63	INBOARD CYLINDER	115701-02	115601-02
	-FLG FLANGED INBOARD CYL 220	115701-02FLG	115601-02FLG
	-S STAINLESS	115701-02S	115601-02S
64	3/8 LOCK WASHER	93024	93024
	-S STAINLESS	93025	93025
65	3/8 HEX NUT	92024	92024
66	PLUNGER – PACKING	L-1045-V	L-1045-V
	-B PLUNGER – PACKING BUNA	L-1045-A	L-1045-A
67	PLUNGER – GASKET	L-1098	L-1098
	-U FUMIGANT	114769-01	114769-01
68	PLUNGER – WASHER	L-1044-A	L-1044-A
69	PLUNGER	103290-91	112816-91
70	PLUNGER - LOCKING NUT	L-1047	L-1047
71	VALVE COVER	115703-01	115603-01
	-S STAINLESS	115703-01S	115603-01S
72	1/2 FLAT WASHER	93013	93013
	-DR DUAL RATE [CYLINDERS]	NOT USED	NOT USED
73	3/8 X 1-1/2 HEX BOLT	90911	90911
	-S STAINLESS	90654	90654
74	OUTBOARD CYLINDER	115702-01	115602-01
	-S STAINLESS	115702-01S	115602-01S
75	1/2 HEX BOLT	90704	90705
	-S STAINLESS (2 BOLTS USED)	90693/90687	90693/90687
76	GASKET – MANIFOLD	112696-01	112696-01
	-DR DUAL RATE [CYLINDERS]	NOT USED	NOT USED
77	MANIFOLD – COMMON	115796-01	115696-01
	-S STAINLESS	115796-01S	115696-01S
	-DR DUAL RATE [CYLINDERS]	NOT USED	NOT USED
78	1/2 HEX BOLT	115793-01	115693-01
	-DR DUAL RATE [CYLINDERS]	NOT USED	NOT USED
79	SPROCKET KEY	106493-01	106493-01
A	SPROCKET ASSY. RC50-18T	106532-01	106532-01
	-K NO SPROCKET	NOT USED	NOT USED
	-R SPROCKET ASSY. RC40-18T	113907-01	113907-01
B	SPROCKET SPACER ASSY.	115624-91	115624-91
C	CONNECTING ROD ASSY.	L-1008-B	113645-91
D	FLANGE COVER ASSY.	115725-91	115725-91
E	SETTING HUB ASSY.	115629-91	115629-91
F	SETTING POINTER ASSY.	115630-91	115630-91
G	GASKET KIT	115789	115689
	-S GASKET KIT - STAINLESS	115789-S	115689-S
	-U GASKET KIT - FUMIGANT	115789-U	115689-U
H	OPERATORS KIT	115787	115787
N/S	SLIDE CHART	115698-91	115698-91
N/S	SETTING WRENCH	115631-01	115631-01

NGP-8050 & 9050 SERIES



ITEM	DESCRIPTION	INCLUDES ITEM #'S
A	SPROCKET	2 3
B	SPACER	4 5 6 7 8
C	CONNECTING ROD	13 14 15
D	FLANGE COVER	4 33
E	SETTING HUB	3 35 36 40
F	SETTING POINTER	3 39
G	GASKET KIT	7 8 10 15 24 28 37 42 44 49 50 51 52 53 56 58 59 60 66 67 68 76
H	OPERATORS KIT	NOT SHOWN

- (G) — GASKET KIT
- (H) — OPERATORS KIT
 - MANUAL
 - WRENCH
 - SLIDE CHART
 - MOUNTING HARDWARE

220 FLANGE ADAPTERS:

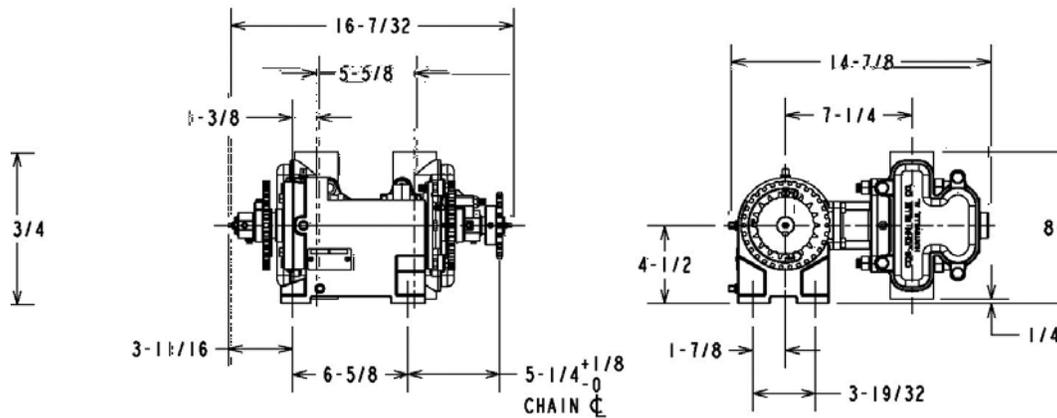
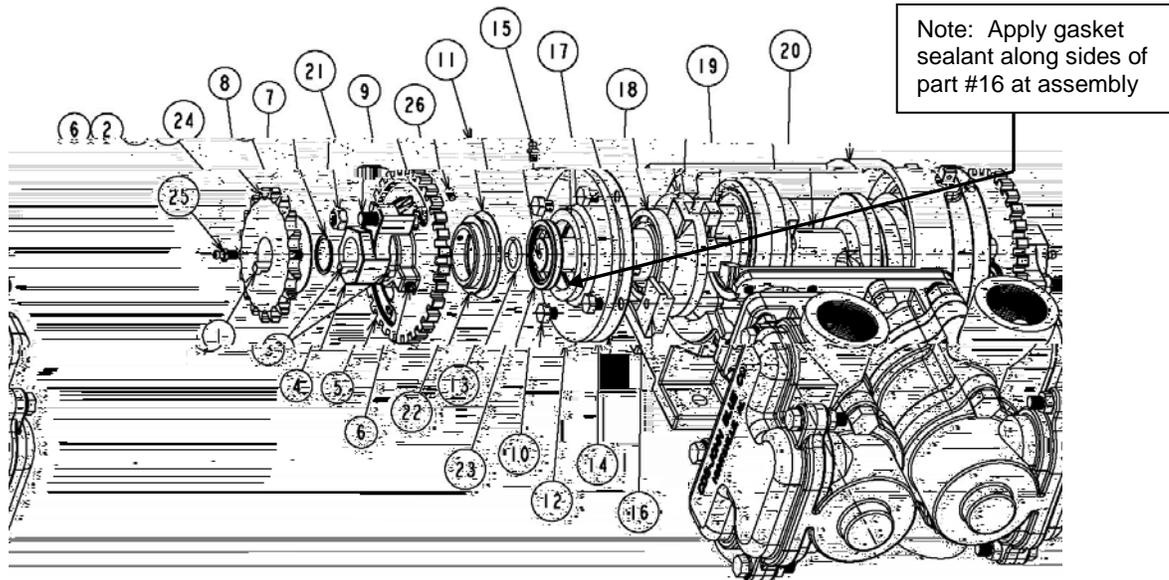
- CAST IRON PUMPS USE 115701-02FLG OR 115601-02FLG ON "DR" PUMPS WITHOUT MANIFOLD
- STAINLESS AND MANIFOLDS USE 116083-01S ADAPTERS

PARTS LISTING – NGP-8055-AR

- **Parts unique to the NGP-8055-AR assembly**
(refer to the NGP-8050/9050 chart for common/shared parts)

ITEM	PART DESCRIPTION	PART #
1	SPROCKET KEY	106493-01
2	SPROCKET	116055-01
3	KEY	L-1020
4	SETTING POINTER	115628-01
5	SETTING SCALE	115646-01
6	5/16 X 3/8 SET SCREW	90532
7	3/8 X 2-1/4 CARRIAGE BOLT	115646-01
8	3/8 SELF LOCKING NUT	A-3097
9	THRUST WASHER	115626-01
10	5/16" X 1 BOLT	90637
11	GREASE FITTING	H-28
12	COVER PLATE	116053-01
13	O-RING	S-316
14	GASKET	L-1006

ITEM	PART DESCRIPTION	PART #
15	BEARING	L-1007-A
16	CRANKCASE INSERT BLOCK	116049-01
17	SHORT SETTING SLEEVE	116052-01
18	ECCENTRIC PIN	L-3004
19	SPACER SLEEVE	116051-01
20	CRANKCASE	116048-01
21	#10-32 X 1/4 SET SCREW	90502
22	SEAL COVER	116054-01
23	OIL SEAL	115622-01
24	SNAP RING	115791-01
25	GREASE ZERK	115647-01
26	MAIN SHAFT	116050-01



NGP Clutch Kit Assembly (optional)

Universal Clutch Components

- Assemble as shown in the first schematic figure, and ensure that the clutch yoke²¹ is installed against the clutch jaw¹⁹ according to the schematic for each assembly (either tight or with a 5/16" gap).
- It may be necessary to loosen the set screws on the pump's stroke adjustment pointer to slide the main shaft over to allow clutch spacer⁴ to fit correctly. Be sure to re-tighten the set screws.
- Grease all fittings³ daily during seasonal usage.

Manual Clutch: NGP-xxxx-050

Conversion Kit # 115670

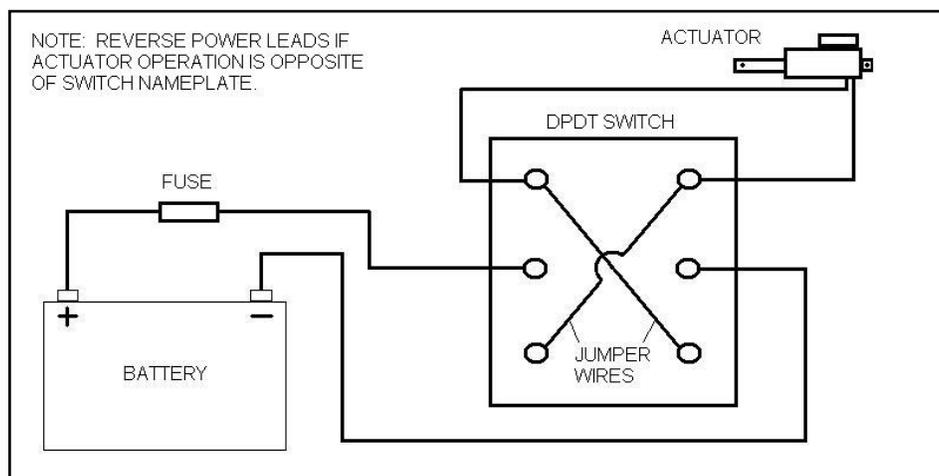
- Assemble as shown in the second schematic figure, and ensure that the shift rod²³ and pin assembly³⁴⁻³⁸ are aligned with throw out cam²⁹ so that the clutch is smoothly engaged/disengaged.
- Place one end of the torsion spring²⁷ over the 5/16" x 1-1/2" bolt⁵⁷ after assembling the bolts to the mounting plate²⁷ and the other end against the ear on the throw out bracket²⁸.

Electric Clutch: NGP-xxxx-058

Conversion Kit # 115672

- Assemble as shown in the third schematic figure – be sure to note the required 5/16" gap between the yoke and clutch jaw when retracted.
- A double pole / double throw (DPDT) switch must be obtained and wired to the actuator⁴⁸. The switch should be rated for 10A min., and can be either a sustaining or a momentary centering type.
- A 10 Amp fuse must be installed before the switch – see the diagram below for connecting the switch and actuator.

Electric Actuator/Switch Wiring Diagram:



Hydraulic Clutch: NGP-xxxx-059

Conversion Kit # 115671

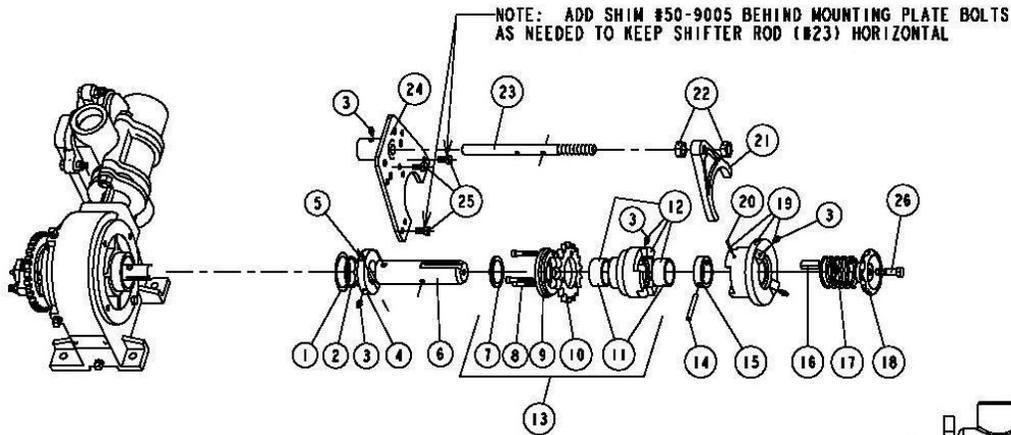
- Assemble as shown in the fourth schematic figure, and ensure that the jam nut²² is fully threaded onto the shifter rod²³.

Clutch Kit Parts List

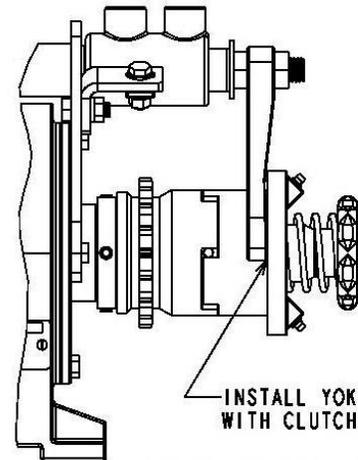
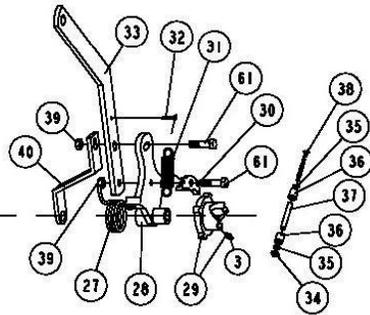
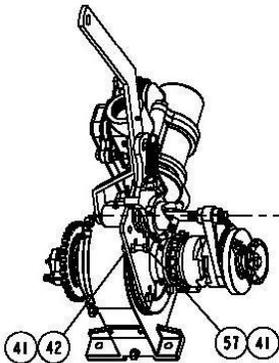
ITEM	PART DESCRIPTION	PART #	-X050 MANUAL	-X058 ELEC.	-X059 HYD.
1	WASHER	115626-01	X	X	X
2	O-RING	S-316	X	X	X
3	GREASE FITTING	H-28	X	X	X
4	CLUTCH SPACER	115639-01	X	X	X
5	3" DOWEL PIN	115640-01	X	X	X
6	SHAFT EXTENSION	115638-01	X	X	X
7	THRUST WASHER	115651-01	X	X	X
8	¼-20 X 1" SOCKET CAP SCREW	90512	X	X	X
9	SPROCKET RETAINER	115632-01	X	X	X
10	CLUTCH SPROCKET 18T-RC50	115637-01	X	X	X
11	CLUTCH BEARING	115650-01	X	X	X
12	CLUTCH CARRIER ASSY	115663-91	X	X	X
13	SPROCKET CARRIER ASSEMBLY	115664-91	X	X	X
14	2" DOWELL PIN	115194-01	X	X	X
15	CLUTCH COLLAR	115641-01	X	X	X
16	3/8" SQ KEY	115642-01	X	X	X
17	CLUTCH SPRING	108907-01	X	X	X
18	HAND WHEEL	A-50	X	X	X
19	CLUTCH JAW ASSEMBLY	115662-91	X	X	X
20	KEY RETAINER – ROLL PIN	S-4248	X	X	X
21	CLUTCH YOKE	115635-01	X	X	X
22	5/8" JAM NUT	92037	X	X	X
23	SHIFTER ROD	115643-01	X	X	X
24	CLUTCH MOUNTING PLATE	115993-91	X	X	X
25	5/16 X 1 HEX BOLT	90637	X	X	X
26	3/8 X 1-1/4 HEX BOLT	90653	X	X	X
27	TORSION SPRING	114165-01	X	X	X
28	BRACKET - THROW OUT	L-3007	X		
29	CAM - THROW OUT	A-2757-A	X		
30	PAWL - THROW OUT	A-2758-A	X		
31	SPRING – THROW OUT	F-48	X		
32	COTTER PIN 5/32" X 1"	94010	X		
33	LEVER - THROW OUT	L-3064	X		
34	# 10 SQ NUT	92014	X		
35	WASHER	A-697	X		
36	CAM ROLLER	A-2762	X		
37	ROLL PIN	A-2763	X		
38	2-1/4 RD HEAD SCREW	90953	X		
39	3/8 NUT	92024	X		
40	HANDLE SUPPORT	115661-01	X		
41	5/16 – 18 HEX NUT	92020	X	X	X
42	5/16 LOCK WASHER	93023	X	X	X
43	5/16 FLAT WASHER	93010			X
44	MOUNT - ACTUATOR	115995-91		X	
45	1-3/4" PIN	114002-01		X	
46	COTTER PIN 1/16 X ½"	94002		X	
47	BRACKET - SHIFTER	114001-01		X	
48	ELECTRIC ACTUATOR	114003-01		X	
49	2" PIN	114594-01		X	
50	BRACKET - CYLINDER	115998-01			X
51	5/8 SAE FLAT WASHER	93016			X
52	PISTON	105463-01			X
53	CYLINDER	105449-01			X
54	HOUSING	105447-01			X
55	HYD CYLINDER REPAIR KIT	106531			KIT
56	HYD CYLINDER ASSEMBLY	113557-91			KIT
57	5/16 X 1-1/2 HEX BOLT	115158-01	X		
58	3/8 X 1 HEX BOLT	90860			X
59	3/8 LOCK WASHER	93024		X	X
60	3/8 X 4-1/2 HEX BOLT	90667		X	
61	3/8 X 1-1/2 HEX BOLT	90655	X		
62	5/16 X 1-3/4 SQ. HD BOLT	90554		X	
N/S	PULLEY	A-2765	X		
N/S	ROPE – 12'	A-2766	X		

Clutch Kit Schematics

UNIVERSAL COMPONENTS: (FOR ALL KITS)

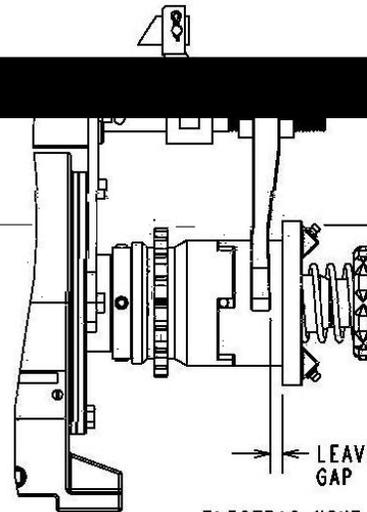
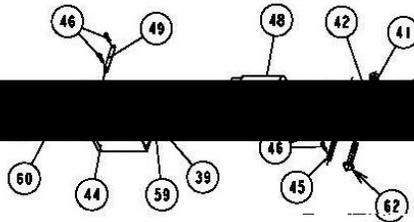
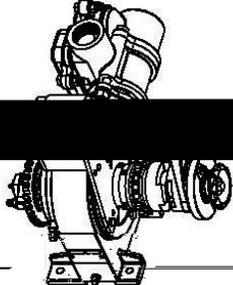


NGP-x050 MANUAL SHIFT COMPONENTS



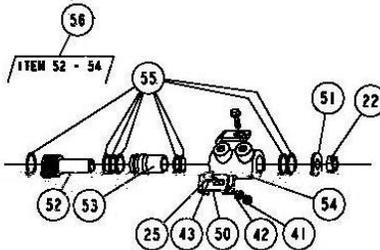
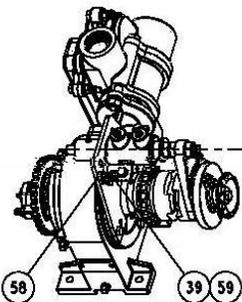
INSTALL YOKE FLUSH WITH CLUTCH JAW
HYDRAULIC AND MANUAL YOKE SETUP - RETRACTED

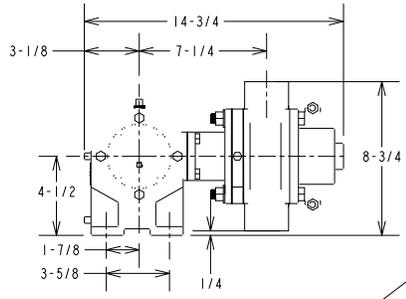
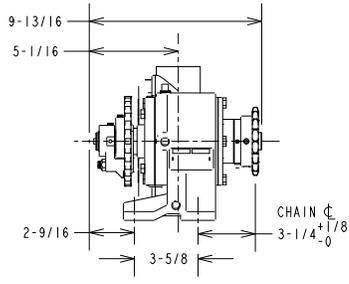
NGP-x058 ELECTRIC SHIFT COMPONENTS



← LEAVE 5/16" GAP
ELECTRIC YOKE SETUP - RETRACTED

NGP-x059 HYDRAULIC SHIFT COMPONENTS





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4-13/16 < >

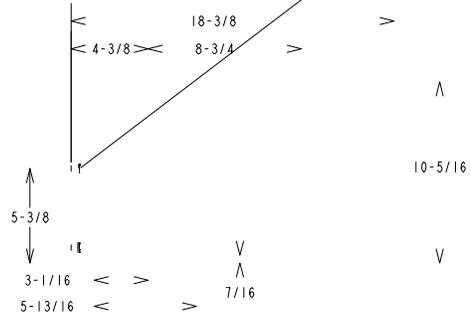
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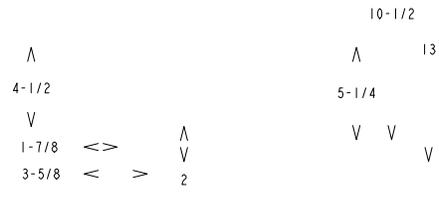
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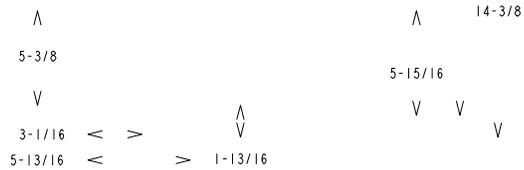
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3-1/4 < > 15-3/4 < >
< >



4-3/8 < > 18-3/8 < >
< > < >



TROUBLE SHOOTING

ISSUE	PROBABLE CAUSE
Pump hard or impossible to prime	Valves damaged or in wrong place
	Debris lodged in valves
	Suction line leaks or restriction
	Pump set too low
	Packing worn
	Tank Valve Closed
	Clogged suction strainer
Pump building too much pressure	Boom orifices / nozzles wrong size
	Debris lodged in discharge lines
	Excessive ground speed
Low / Under Metering	Valves damaged or in wrong place
	Debris lodged in valves
	Suction line leaks or restriction
	Pump set too low
	Excessive tire slippage
	Clogged suction strainer
High / Over Metering	Valves damaged or in wrong place
	Debris lodged in valves
	Excessive suction head pressure
	Pump set too high
Fluid leaks through when stopped	Valves damaged
	Excessive suction head pressure
	Debris lodged in valves
Fertilizer leaks out stuffing box vent hole	Rod packing worn out
Pump using excessive oil	Oil seals or o-rings worn / leaking
Pump leaking oil around oil seals	Vent plug not installed or plugged
Pump turns hard or skids ground tire	Excessive pressure or speed

Clutch Models

ISSUE	PROBABLE CAUSE
Clutch face contact showing excessive wear	Yoke position on shifter rod is too far out
Clutch won't disengage	Yoke position on shifter rod is too far in
Clutch won't engage	Check main spring for breakage
	Check jaws for severe wear / non-engagement
Clutch doesn't engage / disengage	Manual – Check all manual components for operation
	Electric – Check all wiring & actuator operation
	Hydraulic – Check hydraulics and cylinder operation

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