



Caterpillar

Service Manual

988

Wheel Loader

S/n 87A to 87A2384

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Service Manual

CT-S-988 W/L E

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SERVICE MANUAL

for

CATERPILLAR

988

WHEEL LOADER

SERIAL NUMBERS 87A1-87A2384

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Install new toric sealing rings or floating ring seals. Seat the toric sealing rings uniformly in the relief of the ring seal. Be sure the toric sealing ring is not twisted. It must set straight against the lip which keeps it from falling off the floating ring seal.

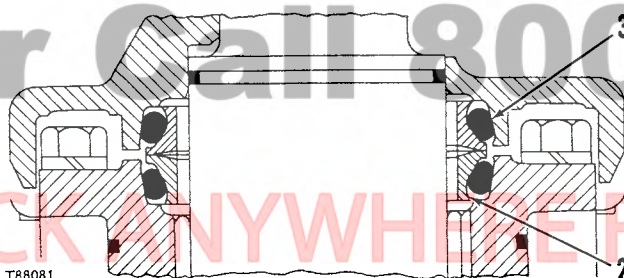
Duo-Cone floating seal installation tools are available for various size seals.

SEAL INSTALLING TOOL SELECTION CHART			
DUO-CONE SEAL GROUP	METAL RING SEAL	TORIC SEALING RING	SEAL INSTALLER
4K6049	4K174	4K173	1S8966
7M481	7M480	7M475	9M5143
5M1176	4M2621	2M344	8M7911
5M8647	1M9012	1M9011	8M9395 (1S576)
5M1177	4M659	4M660	8M7912
5M7294	4M735	4M736	8M7913
4D4510	4D4471	4D4472	1S4320
2M2858	1M3098	1M3097	5M2196
1M8747	8H2229	8H2262	5M2158
1M8746	8H2230	8H2265	5M2160
1M8748	8H2231	6H1309	5M2162
4S5001 & 7S1527	4S5002 & 7S1528	3S4672	5S4275
5K5288	5K5126	5K5129	5S4276
5K1078	5K1069	5K1075	2S8027
4D8960	4D8959	4D3472	7S3128

T93960

If an installer tool is not used, install the toric sealing ring and floating ring seal as an assembly by pressing on the toric sealing ring. Use finger pressure only. Be sure the toric sealing ring is seated uniformly in the recess of both the floating ring seal and the retainer. Make sure it sets in the bore straight and against the lip that keeps it from falling out of the retainer. **Do not use a screwdriver or stick to assemble the toric sealing ring in the retainer. Use finger pressure only.**

Before assembling floating ring seals together, wipe faces of seals with lint-free tissue to remove any foreign material and fingerprints. Place one drop of oil on the cleaning tissue and coat the sealing surfaces of the seals. Be careful to prevent any oil from contacting the toric sealing ring or its mating surfaces.



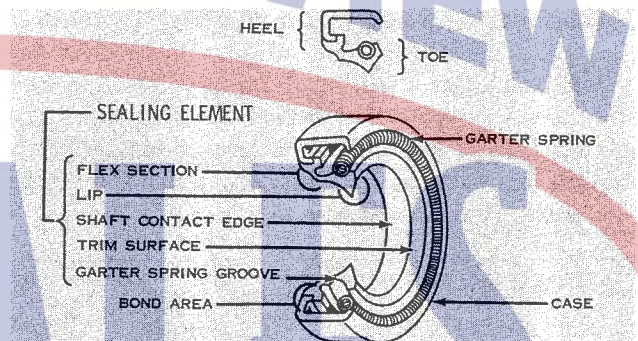
Duo-Cone floating seals installed with metal floating ring seal (2) and toric sealing ring (3) properly positioned.

Lip-Type Rubber Seals

Lubricate the lips of lip-type rubber seals before installation. Use the same type lubricant in which

the seal will be operating. Do not use grease on any seal except a grease seal.

The main parts of a lip-type seal are the case, sealing element, and garter spring. The picture below illustrates the construction of a simple lip-type seal. The cross section at the top shows the terms "heel" and "toe" used to identify the sides of a single element seal. With few exceptions, the toe of an oil seal with one lip is next to the lubricant that is sealed. Some seals have a second auxiliary lip, which does not carry a garter spring. Use the spring-loaded lip to orient the installation of such seals.



T87198

Lip-type seal construction.

If, during installation, the seal lip must pass over a shaft that has splines, a keyway, rough surface or a sharp edge, the lip can easily be damaged. Shim stock or other such material can be formed around the area to provide a smooth surface over which to slide the seal.

HYDRAULIC SYSTEMS

Cleanliness

Dirt and like contaminants in a hydraulic system affect operation and will result in serious damage to the system components. Dirty hydraulic systems are a major cause of machine failures.

Keep the system clean:

- When removing components of a hydraulic system cover all openings in both the component and the machine.
- If evidence of metal or rubber particles are found in the hydraulic system, flush the entire system.
- Disassemble and assemble hydraulic components on a clean surface. Clean all metal parts in a nonflammable cleaning fluid. Then lubricate all components to aid in assembly.

Safety

Before servicing any hydraulic system, NEUTRALIZE THE HYDRAULIC PRESSURE.

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 GENERAL INSTRUCTIONS

PROCEDURE:

1. Place all implements (bucket, ripper, dozer, etc.) on the ground. (In some instances a removal procedure may require the implement to be blocked in a certain position. Consult the removal and installation topics pertaining to that implement).
2. With the engine shut-off, move all the control levers to all positions to insure there is no pressure in the system.
3. Place all control levers in HOLD position.

When attached hydraulic equipment is removed from a machine which will continue to be used, the hydraulic system lines must be securely blocked. High pressure protective covers are available. The following chart lists the protective covers for various size hydraulic hoses. One O-ring seal is required with each protective cover.

APPROXIMATE HOSE SIZE				PRO - TECTIVE COVER	O - RING SEAL	TWO BOLT FLANGE	SPLIT FLANGE
INCHES		MILLIMETERS					
O.D.	I.D.	O.D.	I.D.				
1.00	.50	25,4	12,7	5H4017	5F7054	5F6804	1H5278
1.06	.62	26,9	15,7	8S7668	4J8996	—	6K3253
1.25	.75	31,7	19,0	5H4013	5F1678	5F2046	2K190
1.50	1.00	38,1	25,4	5H4019	4F7391	5F2442	1H3305
2.00	1.25	50,8	31,7	5H4020	4F7952	—	3H3667
2.25	1.50	57,1	38,1	2J2668	7F8267	—	3H4330

Do not use the thin sheet metal covers designed for shipping and storage. These covers can rupture when high pressure is applied.

Sealing Elements

Inspect all sealing elements (O-rings, gaskets, etc.) when disassembling and assembling the hydraulic system components. Install new elements if necessary.

Hydraulic Lines

When installing metal tubes, tighten all bolts finger-tight. Then, in this order, tighten the bolts at the rigid end, the adjustable end, and the mounting brackets. After the tubes are mounted, install the hoses. Connect both ends of the hose with all bolts finger-tight. Position the hose so it does not rub the machine or another hose and has a minimum of bending and twisting. Tighten bolts in both couplings.

Due to manufacturing methods there is a natural curvature to a hydraulic hose. The hose should be installed so any bend is with this curvature. In case of replacement hoses with angled-stem, reusable fittings, the hose curvature must be taken into con-

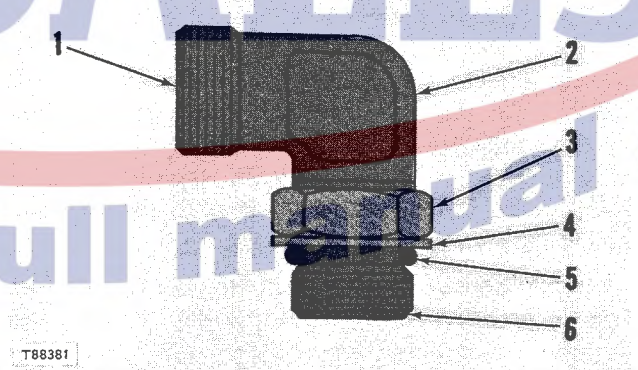
sideration when assembling and positioning the angled stems.

After the hoses are installed, follow this procedure: With the diesel engine running, move the appropriate control levers to move the implement to every possible position. Observe the hoses during the cycle. Then lower the implement to the ground. Shut off the diesel engine and eliminate any twisting, rubbing and/or excessive drooping of hoses by rotating the stem of the hoses.

Hydraulic Fittings

Fitting Bodies with Straight Threads and O-ring Seals

This type of fitting is used in several applications. The tube end of the body will vary in design depending upon the application. However, the installation procedure of the fitting body into its mating boss will be the same. If the tube end of the fitting body is as illustrated (either elbow or straight body) a presetting procedure is necessary to assemble the sleeve onto the tube before connecting the tube to end. See the topic ASSEMBLY OF SLEEVES ONTO TUBES, TYPE A.



Typical example of an elbow body assembly. Parts are: 1-End of fitting body (connects to tube). 2-Fitting body. 3-Locknut. 4-Backup washer. 5-O-ring seal. 6-End of fitting (screws into mating boss).

1. Place the nut, washer and seal as far back on the fitting body as possible. Hold the components in this position and screw the fitting into its boss until the washer just contacts the face of the boss.
2. Place the fitting assembly in its correct angular position by turning the body out (counter-clockwise), a maximum of 359°. Tighten the nut finger-tight.

NOTE

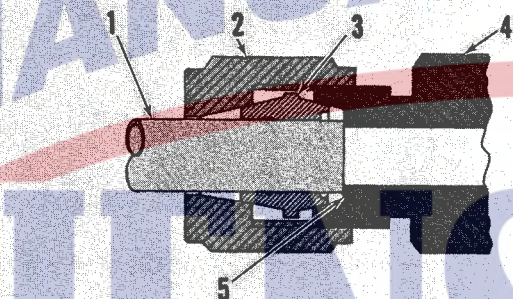
If the fitting is a connector (straight fitting), the hex on the body takes the place of the nut. Install this type fitting by tightening the hex against the face of the boss.

3. Install the assembled tube onto the tube end of the body, finger-tight. Tighten the nut positioning the body. Then tighten the nut on the tube assembly.

Assembly of Sleeves onto Tubes

Type A

It is necessary to preset this type of sleeve onto the tube before the tube assembly is installed on the fitting body.



Typical example of a sleeve-type fitting. Parts are: 1-Tube, 2-Nut, 3-Sleeve, 4-Presetting tool, 5-Shoulder of tool (4).

1. Lubricate the sleeve and the threads on presetting tool and nut.

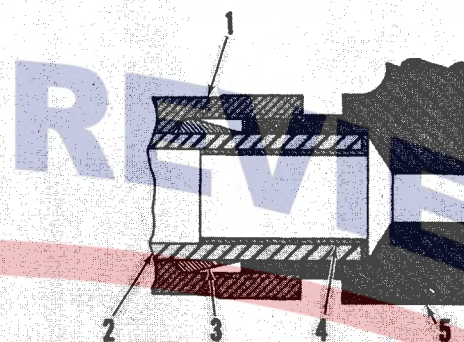
NOTE

Presetting tools are commercially available; however, the fitting body can be used in place of a presetting tool. If the fitting body is used, the body should be removed from the machine to permit satisfactory presetting.

2. Place the nut on the tube with the threaded end of the nut toward the end of the tube.
3. Place the sleeve onto the tube so the short-tapered heavy end faces the presetting tool as illustrated.
4. Bottom tube end against shoulder of tool.
5. Assemble the nut to the tool finger-tight. Then tighten the nut until the threads on the tool are no longer visible.
6. Remove the tube from the presetting tool. Check to be certain sleeve does not move longitudinally. (The sleeve can rotate on the tube.)
7. When the tube assembly is assembled onto the fitting body, tighten the nut until the threads on the body are no longer visible. Refer to the topic FITTING BODIES WITH STRAIGHT THREADS AND O-RING SEALS for the installation of the fitting bodies.

Type B

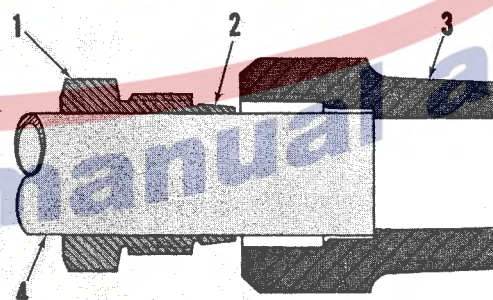
1. Place the nut and sleeve onto the tube. Install the sleeve so the thick end faces away from the body.
2. Install the insert into the tube.



Typical example of sleeve and insert-type fitting. Parts are: 1-Nut, 2-Tube, 3-Sleeve, 4-Insert, 5-Fitting body.

3. Bottom the tube and insert in the body as illustrated.
4. Tighten the nut 1½ turns past finger-tight.

Type C



Typical example of a shear-type fitting. Parts are: 1-Nut, 2-Sleeve, 3-Fitting body, 4-Tube.

With the nut and sleeve installed loosely in the body, install the tube through the nut and sleeve until the end of the tube is seated against the shoulder in the fitting body.

Grip the tube firmly to prevent twisting or turning and tighten nut until a slight "give" or decreased resistance is felt. The "give" indicates that the sleeve has been sheared from the nut. Tighten the nut an additional 1½ turns. It is not necessary to tighten the nut all the way down.

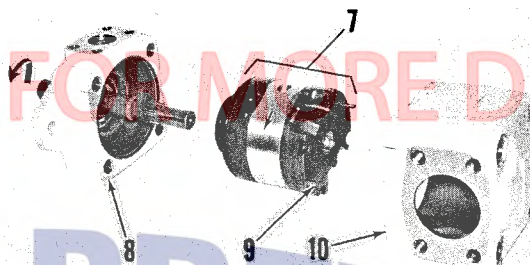
Hydraulic Valves

Examine all valves, valve bores and valve seats for nicks, burrs and/or scratches. (Rough spots may be removed with a crocus cloth or fine emery

SERVICE MANUAL GENERAL INSTRUCTIONS

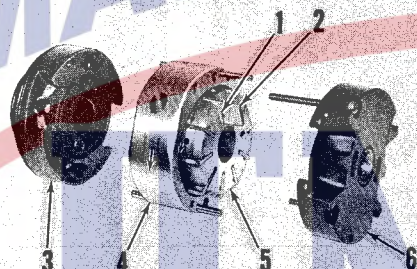
Assemble the vanes (and inserts) in the rotor and the rotor into the ring as illustrated. The sharp edges of the vanes and the arrows on the ring and rotor must point in the direction of **pump rotation** when the cartridge is installed in the pump cover. Note that the passage (A) and passages (C) are angled toward the direction of pump rotation.

If new O-ring seals and back-up rings are to be installed on the pressure plate, they must be installed as illustrated. Lubricate the components. Then install the back-up rings so the concave side faces the mating O-ring seal.



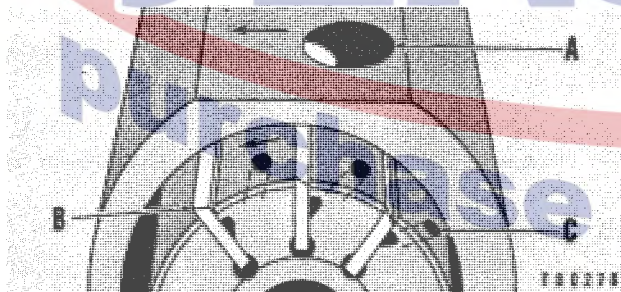
T91391

This shows the assembly of a typical pump. The rotation of the pump is clockwise. The parts are: 7-Pump cartridge. 8-Pump body. 9-Pins. 10-Pump cover.

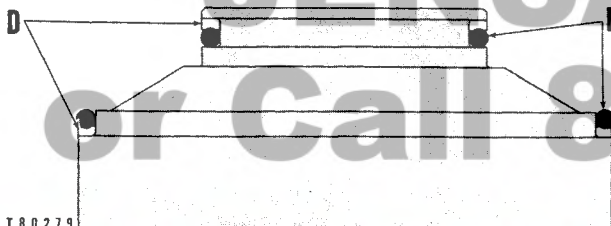


T91389

This is a typical example of the pump cartridge components. The parts illustrated are 1-Inserts. 2-Vanes. 3-Pressure plate. 4-Ring. 5-Rotor. 6-Wear plate.



This shows the correct assembly of ring, rotor and vanes. A-Passage in ring. B-Sharp edge of vane. C-Passage in rotor.



T80279

This shows the correct installation of the back-up rings on the pressure plate. D-Back-up rings. E-O-ring seals.

Be certain the pins in the cartridge align with the holes in the pump cover. The arrow on the pump cartridge must point in the same direction as the pump shaft turns.

FRACTIONS, DECIMALS AND MILLIMETERS

The following table shows fractions and decimals of an inch and the millimeter equivalents.

INCHES	MM	INCHES	MM
$\frac{1}{8}$	.016 0,40	$\frac{3}{4}$	.516 13,10
$\frac{1}{4}$	.031 0,79	$\frac{7}{8}$	.531 13,49
$\frac{3}{8}$	.047 1,19	$\frac{1}{2}$	.547 13,89
$\frac{1}{2}$	.062 1,59	$\frac{1}{8}$	.562 14,29
$\frac{5}{8}$	.078 1,98	$\frac{3}{8}$	.578 14,68
$\frac{3}{4}$	.094 2,38	$\frac{1}{4}$	.594 15,08
$\frac{7}{8}$	.100 2,54	$\frac{1}{8}$	.600 15,24
$\frac{1}{8}$	.109 2,78	$\frac{3}{8}$	.609 15,48
$\frac{1}{4}$	.125 3,18	$\frac{1}{2}$	.625 15,88
$\frac{3}{8}$	.141 3,57	$\frac{3}{4}$	.641 16,27
$\frac{1}{2}$	.156 3,97	$\frac{7}{8}$	.656 16,67
$\frac{5}{8}$	.172 4,37	$\frac{1}{4}$	.672 17,07
$\frac{3}{4}$	.188 4,76	$\frac{1}{8}$	.688 17,46
$\frac{7}{8}$	.203 5,16	$\frac{3}{8}$	.703 17,86
$\frac{1}{8}$	.219 5,56	$\frac{1}{2}$	.719 18,26
$\frac{1}{4}$	.234 5,95	$\frac{3}{4}$	.734 18,65
$\frac{3}{8}$	.250 6,35	$\frac{1}{4}$	.750 19,05
$\frac{1}{2}$	.266 6,75	$\frac{3}{8}$	.766 19,45
$\frac{5}{8}$	.281 7,14	$\frac{1}{2}$	.781 19,84
$\frac{3}{4}$	.297 7,54	$\frac{3}{4}$	.797 20,24
$\frac{7}{8}$	.312 7,94	$\frac{7}{8}$	.812 20,64
$\frac{1}{8}$	.328 8,33	$\frac{1}{4}$	.828 21,03
$\frac{1}{4}$	.344 8,73	$\frac{3}{8}$	.844 21,43
$\frac{3}{8}$	.359 9,13	$\frac{1}{2}$	.859 21,83
$\frac{1}{2}$	.375 9,53	$\frac{3}{4}$	.875 22,23
$\frac{5}{8}$	.391 9,92	$\frac{7}{8}$	.891 22,62
$\frac{3}{4}$	.400 10,16	$\frac{1}{4}$	.900 22,86
$\frac{7}{8}$	.406 10,32	$\frac{3}{8}$	.906 23,02
$\frac{1}{8}$	.422 10,72	$\frac{1}{2}$	.922 23,42
$\frac{1}{4}$	.438 11,11	$\frac{3}{4}$	.938 23,81
$\frac{3}{8}$	.453 11,51	$\frac{7}{8}$	.953 24,21
$\frac{1}{2}$	.469 11,91	$\frac{1}{4}$	.969 24,61
$\frac{5}{8}$	.484 12,30	$\frac{3}{8}$	.984 25,00
$\frac{3}{4}$	.500 12,70	1.....	1.000 25,40

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