

750/760/860/960/965 LOADER BACKHOE SERVICE MANUAL

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Section

1001

STANDARD TORQUE SPECIFICATIONS AND LOCTITE PRODUCT CHART

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TORQUES SPECIFICATIONS (DECIMAL HARDWARE)

Use the torques in this chart when special torques are not given. These torques apply to fasteners with both UNC and UNF threads as received from suppliers dry, or when lubricated with engine oil. Not applicable if special graphities, Molydisulfide greases, or other extreme pressure lubricants are used.

Grade 5 Bolts, Nuts and Studs		
		
Size	Pound-inches	Newton metres
1/4 inch	8 to 11	12 to 15
5/16 inch	17 to 21	23 to 28
3/8 inch	35 to 42	48 to 57
7/16 inch	54 to 64	73 to 87
1/2 inch	80 to 96	109 to 130
9/16 inch	110 to 132	149 to 179
5/8 inch	150 to 180	203 to 244
3/4 inch	270 to 324	366 to 439
7/8 inch	400 to 480	542 to 651
1.0 inch	580 to 696	787 to 944
1-1/8 inchs	800 to 880	1085 to 1193
1-1/4 inchs	1120 to 1240	1519 to 1681
1-3/8 inchs	1460 to 1680	190 to 2278
1-1/2 inchs	1940 to 2200	2631 to 2983

Grade 8 Bolts, Nuts and Studs		
		
Size	Pound-inches	Newton metres
1/4 inch	12 to 15	16 to 20
5/16 inch	24 to 29	33 to 39
3/8 inch	45 to 54	61 to 73
7/16 inch	70 to 84	95 to 114
1/2 inch	110 to 132	149 to 179
9/16 inch	160 to 192	217 to 260
5/8 inch	220 to 264	298 to 358
3/4 inch	380 to 456	515 to 618
7/8 inch	600 to 720	814 to 976
1.0 inch	900 to 1080	1220 to 1465
1-1/8 inchs	1280 to 1440	1736 to 1953
1-1/4 inchs	1820 to 2000	2468 to 2712
1-3/8 inchs	2380 to 2720	3227 to 3688
1-1/2 inchs	3160 to 3560	4285 to 4827

NOTE : Use thick nuts with Grade 8 bolts.

TORQUE SPECIFICATIONS (METRIC HARDWARE)

Use the following torques when specifications are not given.

These values apply to fasteners with coarse threads as received from supplier, plated or unplated, or when lubricated with engine oil. These values do not apply if graphite or Molydisulfide grease or oil is used.

Grade 8.8 Bolts, Nuts and Studs		
		
Size	Pound-inches	Newton metres
M4	2 to 3	3 to 4
M5	5 to 6	7 to 8
M6	8 to 9	11 to 12
M8	19 to 23	26 to 31
M10	38 to 45	52 to 61
M12	66 to 79	90 to 107
M14	106 to 127	144 to 172
M16	160 to 200	217 to 271
M20	320 to 380	434 to 515
M24	500 to 600	675 to 815
M30	920 to 1100	1250 to 1500
M36	1600 to 1950	2175 to 2600

Grade 10.9 Bolts, Nuts and Studs		
		
Size	Pound-inches	Newton metres
M4	3 to 4	4 to 5
M5	7 to 8	9 to 11
M6	11 to 13	15 to 18
M8	27 to 32	37 to 43
M10	54 to 64	73 to 87
M12	93 to 112	125 to 150
M14	149 to 179	200 to 245
M16	230 to 280	310 to 380
M20	450 to 540	610 to 730
M24	780 to 940	1050 to 1275
M30	1470 to 1770	2000 to 2400
M36	2580 to 3090	3500 to 4200

Grade 12.9 Bolts, Nuts and Studs



Usually the torque values specified for grade 10.9 fasteners can be used satisfactorily on grade 12.9 fasteners.

TORQUE SPECIFICATIONS (STEEL HYDRAULIC FITTINGS)

Tube OD Hose ID	Thread size	Pound- inches	Newton metres
37 Degree flare fitting			
1/4 inch/ 6.4 mm	7/16-20	6 to 12	8 to 16
5/16 inch/ 7.9 mm	1/2-20	8 to 16	11 to 22
3/8 inch/ 9.5 mm	9/16-18	10 to 25	14 to 34
1/2 inch/ 12.7 mm	3/4-16	15 to 42	20 to 57
5/8 inch/ 15.9	7/8-14	25 to 58	34 to 79
3/4 inch/ 19.0 mm	1-1/16-12	40 to 80	54 to 108
7/8 inch/ 22.2 mm	1-3/16-12	60 to 100	81 to 135
1.0 inch/ 25.4 mm	1-5/16-12	75 to 117	102 to 158
1-1/4 inch/ 31.8 mm	1-5/8-12	125 to 165	169 to 223
1-1/2 inch/ 38.1 mm	1-7/8-12	210 to 250	285 to 338

Tube OD Hose ID	Thread size	Pound- inches	Newton metres
Straight threads with O-ring			
1/4 inch/ 6.4 mm	7/16-20	12 to 19	16 to 26
5/16 inch/ 7.9 mm	1/2-20	16 to 24	22 to 34
3/8 inch/ 9.5 mm	9/16-18	24 to 40	34 to 54
1/2 inch/ 12.7 mm	3/4-16	42 to 67	57 to 91
5/8 inch/ 15.9	7/8-14	58 to 92	79 to 124
3/4 inch/ 19.0 mm	1-1/16-12	80 to 128	108 to 174
7/8 inch/ 22.2 mm	1-3/16-12	100 to 160	136 to 216
1.0 inch/ 25.4 mm	1-5/16-12	117 to 187	159 to 253
1-1/4 inch/ 31.8 mm	1-5/8-12	165 to 264	224 to 357
1-1/2 inch/ 38.1 mm	1-7/8-12	250 to 400	339 to 542

Split flange mounting screws		
Size	Pound- inches	Newton metres
5/16-18	15 to 20	20 to 27
3/8-16	27 to 40	36 to 53
7/16-14	35 to 45	47 to 61
1/2-13	55 to 65	74 to 88
5/8-11	140 to 150	190 to 203

TORQUE SPECIFICATIONS (STEEL HYDRAULIC FITTINGS)

Nom. SAE dash size	Tube OD	Thread size	Pound-inches	Newton metres	Thread size	Pound-inches	Newton metres
O-ring face seal end					O-ring boss end fitting or lock nut		
-4	1/4 inch/ 6.4 mm	9/16-18	10 to 12	14 to 16	7/16-20	17 to 20	23 to 27
-6	3/8 inch/ 9.5 mm	11/16-16	18 to 20	24 to 27	9/16-18	25 to 30	34 to 41
-8	1/2 inch/ 12.7 mm	13/16-16	32 to 40	43 to 54	3/4-16	45 to 50	61 to 68
-10	5/8 inch/ 15.9 mm	1-14	46 to 56	62 to 76	7/8-14	60 to 65	81 to 88
-12	3/4 inch/ 19.0 mm	1-3/16-12	65 to 80	90 to 110	1-1/16-12	85 to 90	115 to 122
-14	7/8 inch/ 22.2 mm	1-3/16-12	65 to 80	90 to 110	1-3/16-12	95 to 100	129 to 136
-16	1.0 inch/ 25.4 mm	1-7/16-12	92 to 105	125 to 140	1-5/16-12	115 to 125	156 to 169
-20	1-1/4 inch/ 31.8 mm	1-11/16-12	125 to 140	170 to 190	1-5/8-12	150 to 160	203 to 217
-24	1-1/2 inch/ 38.1 mm	2-12	150 to 180	200 to 254	1-7/8-12	190 to 200	258 to 271

LOCTITE PRODUCT CHART

Product	Colour	Similar products	Gap (inches)	Strength (steel/steel)	Working temperature range-fahrenheit	Fixture/full cure (steel/steel) time	Primer	Description
#3	Dark brown					24 h	764	Form a Gasket (works with oil, fuel or greas) Pliable
80	Yellow					Fast	764	Weatherstrip adhesive
123	Clear					-	-	Parts cleaner fluid
220	Blue	290	0.076	65/164 in lbs	-54 to +122	6 min/24 h	747	Wicking threadlocker
221	Purple	222	0.127	86/50 in lbs	-54 to +150	2 min/24 h	747	Low strength threadlocker
222	Purple		0.127	51/28 in lbs	-54 to +150	10 min/24 h	747	Low strength threadlocker (small screws)
225	Brown	222	0.254	51/28 in lbs	-54 to +150	7 min/24 h	747	Low strength threadlocker
242	Blue		0.127	92/57 in lbs	-54 to +150	10 min/24 h	747	Medium strength threadlocker
262	Red	271	0.127	184/218 in lbs	-54 to +150	5 min/24 h	747	High strength threadlocker
270	Green	271	0.177	184/368 in lbs	-54 to +150	3 min/24 h	747	High strength threadlocker
271	Red	262	0.177	184/368 in lbs	-54 to +150	10 min/24 h	747	High strength threadlocker
272	Red	620	0.254	207/311 in lbs	-54 to +234	30 min/24 h	747	High temperature, high strength
275	Green	277	0.254	241/345 in lbs	-54 to +150	3 min/24 h	747	High strength threadlocker
277	Red		0.254	241/345 in lbs	-54 to +150	60 min/24 h	747	High strength threadlocker
290	Green		0.076	97/403 in lbs	-54 to +150	6 min/24 h	747	Wicking threadlocker
*404	Clear	495	0.156	224 psi	-54 to +82	30 sec/24 h	-	Instant adhesive
*406	Clear		0.101	224 psi	-54 to +82	15 sec/24 h	-	Surface insensitive adhesive
*409	Clear	454	0.203	175 psi	-54 to +82	50 sec/24 h	-	Gel instant adhesive
*414	Clear		0.156	175 psi	-54 to +82	30 sec/24 h	-	Instant adhesive
*415	Clear	454	0.254	175 psi	-54 to +82	50 sec/24 h	-	Gap filling instant adhesive (metals)
*416	Clear	454	0.254	175 psi	-54 to +82	50 sec/24 h	-	Gap filling instant adhesive (plastics)
*420	Clear		0.05	175 psi	-54 to +82	15 sec/24 h	-	Wicking instant adhesive
*422	Clear	454	0.05	196 psi	-54 to +82	60 sec/24 h	-	Gap filling instant adhesive
*430	Clear		0.127	175 psi	-54 to +82	20 sec/24 h	-	Metal bonding adhesive

* Products 404-496 (except for #445) are all instant adhesives (super glues) they differ mostly in viscosity.

Product	Colour	Similar products	Gap (inches)	Strength (steel/steel)	Working temperature range-fahrenheit	Fixture/full cure (steel/steel) time	Primer	Description
*445	White/Black		6.35	140 psi	-54 to +82	5 min/24 h	-	Fast setting 2 part epoxy
*454	Clear		0.254	224 psi	-54 to +82	15 sec/24 h	-	Surface insensitive gel instant adhesive
*495	Clear		0.101	175 psi	-54 to +82	20 sec/24 h	-	General purpose instant adhesive
*496	Clear		0.127	175 psi	-54 to +82	20 sec/24 h	-	Metal bonding adhesive
504	Brt orange	515	0.076	52 psi	-54 to +150	90 sec/24 h	None	Rigid gasket eliminator
510	Red		0.05	70 psi	-54 to +206	30 min/24 h	764	High temperature, gasket eliminator
515	Purple		0.254	52 psi	-54 to +150	1 hr/24 h	764	Gasket eliminator 515
518	Red	515	0.076	35 psi	-54 to +150	1 hr/24 h	764	Gasket eliminator 578 for aluminum
542	Brown	569	-	152/106 in lbs	-54 to +150	2 hr/24 h	747	Hydraulic sealant
545	Purple		-	28/23 in lbs	-54 to +150	4 hr/24 h	747	Low strength pneumatic/hydraulic sealant
549	Red	504	0.05	175 psi	-54 to +150	2 hr/24 h	747	Instant seal plastic gasket
554	White	277	0.381	276/240 in lbs	-54 to +150	2 to 4 hr/24 h	764	Refrigerant sealant
567	Orange	592	-	35 psi	-54 to +206	4 hr/24 h	764	Pipe sealant for stainless steel
568	Brown	277	0.381	175 psi	-54 to +150	12 hr/24 h	764	Plastic gasket
569	Brown	545	0.254	28/46 in lbs	-54 to +150	1 hr/24 h	764	Hydraulic sealant
570	Brown	592	-	28/46 in lbs	-54 to +150	6 hr/24 h	764	Steam sealant
571	White	592	0.381	46/23 in lbs	-54 to +150	2 to 4 hr/24 h	764	Pipe sealant
572	White	578, 575	-	92/31 in lbs	-54 to +150	24 hr/24 h	None	Gasketing
592	Black	-	0.05	35 psi	-54 to +206	4 hr/24 h	736	Pipe sealant with teflon
593	Green	-	6.35	28 psi	-54 to +206	30 min/24 h	-	RTV silicone
601	Green	609	0.127	210 psi	-54 to +150	10 min/24 h	747	Current PIN #609
609	Green	-	0.127	210 psi	-54 to +150	10 min/24 h	747	General purpose retaining compound
620	Green	640	0.381	210 psi	-54 to +234	30 min/24 h	747	High temperature. Retaining compound
635	Green	680	0.254	280 psi	-54 to +150	1 hr/24 h	747	High strength retaining compound
638	Green	680	0.381	287 psi	-54 to +150	10 min/24 h	747	High strength retaining compound
640	Green	620	0.177	210 psi	-54 to +206	1 hr/24 h	747	High temperature retaining compound
660	Silver	-	0.05	210 psi	-54 to +150	20 min/24 h	764	Quick metal
675	Green	609	0.127	210 psi	-54 to +150	20 min/24 h	747	General purpose retaining compound
680	Green	635	0.381	280 psi	-54 to +150	10 min/24 h	747	High strength retaining compound
706	Clear	755	-	-	-	-	-	Cleaning solvent
707	Amber	-	-	-	-	-	-	Activator for structural adhesives
736	Amber	-	-	-	-	-	-	Primer NF
738	Amber	-	-	-	-	-	-	Depend activator

Product	Colour	Similar products	Gap (inches)	Strength (steel/steel)	Working temperature range-fahrenheit	Fixture/full cure (steel/steel) time	Primer	Description
747	Yellow	-	-	-	-	-	-	Primer T
751	Clear	-	-	-	-	-	-	Activator for structural adhesives
755	Clear	-	-	-	-	-	-	Cleaning solvent
764	Green	-	-	-	-	-	-	Primer N
767	Silver	-	-	-	-54 to +878	-	-	Anti-seize lubricant

Section 1002

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FLUIDS AND LUBRICANTS

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CAPACITIES AND LUBRICANTS

Engine Oil

Capacity with filter replacement	10.7 litres
Type of oil	refer to "Engine oil recommendations"

Engine cooling system

Capacity	16.5 litres
Type of collant solution	refer to "Fluids and lubricants"

Fuel tank

Capacity	120 litres
Type of fuel	refer to "Fluids and lubricants"

Hydraulic system

Total hydraulic system capacity model 750.....	90 litres
Total hydraulic system capacity model 760.....	90 litres
Total hydraulic system capacity model 860.....	90 litres
Total hydraulic system capacity model 960.....	90 litres
Total hydraulic system capacity model 965.....	90 litres
Hydraulic reservoir filling capacity with filter replacement	45 litres
Hydraulic reservoir filling capacity without filter replacement	43 litres
Type of fluid	refer to "Fluids and lubricants"

Transmission

2-Wheel drive

Total system	19 litres
Filling with or without filter replacement	15 litres
Type of oil	API cd/se grade 10W30

4-Wheel drive

Total system	19 litres
Filling with or without filter replacement	15 litres
Type of oil	API cd/se grade 10W30

Front Axle

4-Wheel steer

Axle centre housing	8 litres
Axle hubs (each).....	4.5 litres
Type of oil	HI LOAD GEAR OIL

2-Wheel steer

Axle centre housing	8 litres
Axle hubs (each).....	1.1 litre
Type of oil	HI LOAD GEAR OIL

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Rear axle

4-Wheel steer

- Axle centre housing 8 litres
- Axle hubs (each)..... 4.5 litres
- Type of oil HI LOAD GEAR OIL

2-Wheel steer

- Capicity 22.5 litres
- Type of oil HI LOAD GEAR OIL

Brake fluid reservoir LHM brake fluid

ENGINE OIL RECOMMENDATIONS

The engine oil to be used depends on the ambient temperature.

Use only oil of the API/CD category.

NOTE : Do not put any performance additive or other additive in the sump. Oil change intervals shown in this manual are based on tests carried out on lubricants.

Temperate climates

-5°C to +40°C
Oil type SAE 30

Hot climates

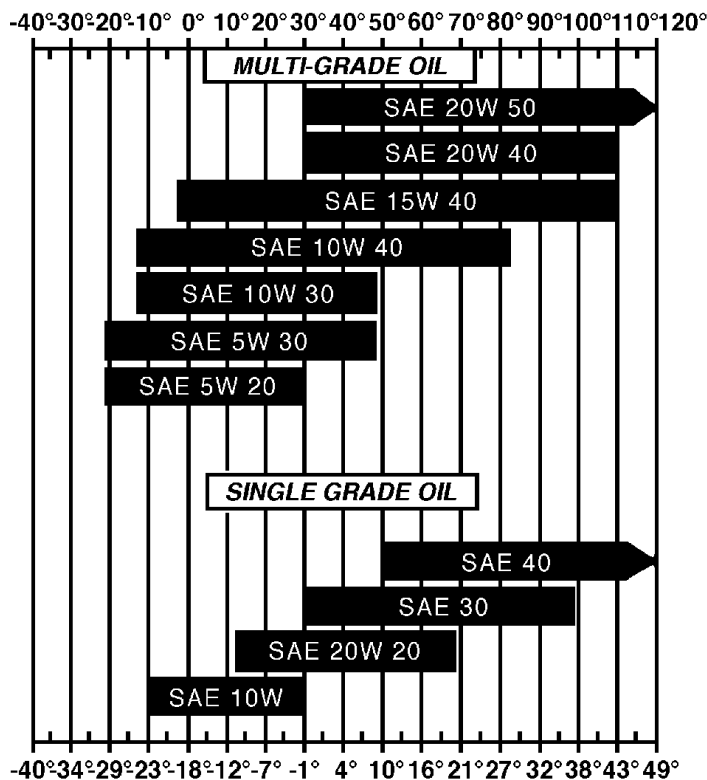
60°C and +
Oil type SAE 40

Cold climates

-30°C to + 10°C
Oil type SAE 10W30

Oil viscosity/Oil operating range

A



B

A : FAHRENHEIT TEMPERATURE
B : CENTIGRADE TEMPERATURE

1036LO

FLUIDS AND LUBRICANTS

Fluids and lubricants must have the correct properties for each application.



WARNING : *The conditions of use for individual fluids and lubricants must be respected.*

Hydraulic fluid

Hydraulic fluid is specially designed for the high pressure and the hydraulic system used on machines. The type of fluid to be used depends on the ambient temperature.

Temperate climates

-5°C to +40°C

Fluid type : ISO VG 46

Hot climates

5°C to +55°C

Fluid type : ISO VG 68

Cold climates

-20°C to +30°C

Fluid type : ISO VG 32

Transmission component oil

Extreme pressure oil is used for all cased transmission components.

Extreme pressure oil type API CD/SE.

Grade 10W30 or ISO VG 150

Grease

The type of grease to be used depends on the ambient temperature.

Temperate and hot climates

-20°C to + 60 °C

Extreme pressure grease EP NLGI.

Grade 2 with molybdenum disulphide.

Cold climates

-40 °C to + 20°C

Extreme pressure grease EP NLGI

Grade 0

Anti-freeze/anti-corrosion

Use anti-freeze in all seasons to protect the cooling system from corrosion and all risk of freezing.

For environments with a temperature higher than -36°C, use a mixture of 50% ethylene-glycol based anti-freeze.

For environments with a temperature lower than -36°C, a mixture of 40% water with 60% anti-freeze is recommended.

Fuel

The fuel to be used must be in conformity with the D975 standard of the American Society for Testing and Materials (ASTM).

Use No. 2 type fuel. The use of other fuels may cause a loss of engine power and excessive fuel consumption.

In cold weather, a mixture of No. 1 fuel and No. 2 fuel is temporarily permitted. Consult your fuel supplier.

If the temperature falls below the fuel cloud point (point at which wax appears), wax crystals in the fuel will cause a loss of engine power or make it impossible to start the engine.

IMPORTANT : *In cold weather, fill the fuel tank after each day's work, to prevent the formation of condensation.*

Fuel storage

Prolonged fuel storage causes foreign bodies or condensation water to accumulate in the storage tank. Many engine failures are caused by the presence of water in fuel.

The storage tank should be placed outdoors and the fuel should be kept at as low a temperature as possible. Condensation water should be drained off at regular intervals.

ENVIRONMENT

Before carrying out any maintenance operation on the machine and before disposing of used fluids or lubricants, always think of the environment. Never throw oil or fluid on the ground and never put them in leaky receptacles.

Consult a local recycling or environmental centre, to obtain information on the correct method of disposing of these materials.

PLASTIC AND RESIN PARTS

When cleaning plastic windows, the console, the instrument panel, the gauges, etc, avoid the use of petrol, paraffin, paint solvents, etc. Use only water, soap and a soft cloth.

The use of petrol, paraffin, paint solvents, etc will cause discoloration, cracks or deformation of these parts.

Section

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ENGINE AND RADIATOR REMOVAL AND INSTALLATION

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INSTALLATION 13



WARNING : *This symbol is used in this manuel to indicate important safety messages. When ever you see this symbo*l*, carefully read the message that follows, as there is a risk of serious injury.*

SPECIFICATIONS

Cooling System capacity :

System capacity	9.8 L
Expansion reservoir capacity.....	1 L
Engine/Radiator capacity.....	6.6 L
Coolant solution.....	See section 1002

SPECIAL TORQUE SETTINGS

Torque converter mounting bolts	41 Nm
Engine mounting bolts.....	M16 280 Nm
Engine mounting nuts.....	M10 48 Nm
Transmission mountings.....	M12 140 Nm
	M20 395 Nm

TOOLS REQUIRED

Engine lifting bracket

RADIATOR REMOVAL

Put identification tags on all disconnected hoses and wires. Close disconnected hoses and fittings with caps and plugs.

STEP 1

Park the machine on a level surface. Raise the loader and install the support strut to hold the loader.

STEP 2

Open the hood.

STEP 3

Remove the bolts, washers, and nuts from the pivot point on the hood.

STEP 4

Have another person help with the following procedure :

- A. Remove the retainers from the hood struts and disconnect the hood struts from the stud.
- B. Remove the hood from the machine.

STEP 5

Slowly remove the radiator cap.



WARNING : Do not remove the cap when the engine is hot. The circuit is still under pressure and you could be scalded.

NOTE : During installation, fill the radiator and coolant reservoir completely. See Section 1002 for coolant specifications. Start and run the engine until the coolant is at operating temperature. Stop the engine and check for leakage. When the coolant is cold, check the coolant reservoir level. Add coolant as required. Never remove the radiator cap to check the coolant level in the radiator.

STEP 6

Depressurize the hydraulic system as follows see section 8002.

STEP 7

Disconnect the hoses from the hydraulic filter.

STEP 8

Remove and fit blanks to the expansion reservoir hoses.

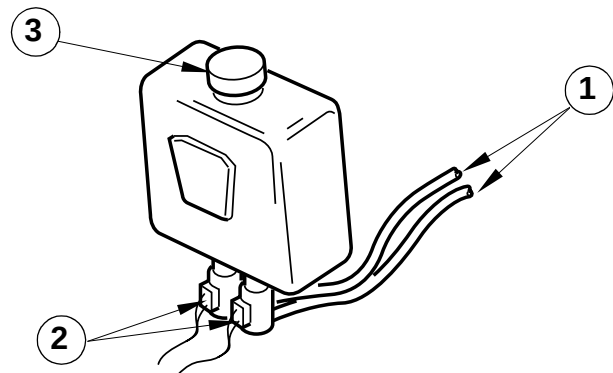
STEP 9

Tag and disconnect the wires on the audible warning device.

STEP 10

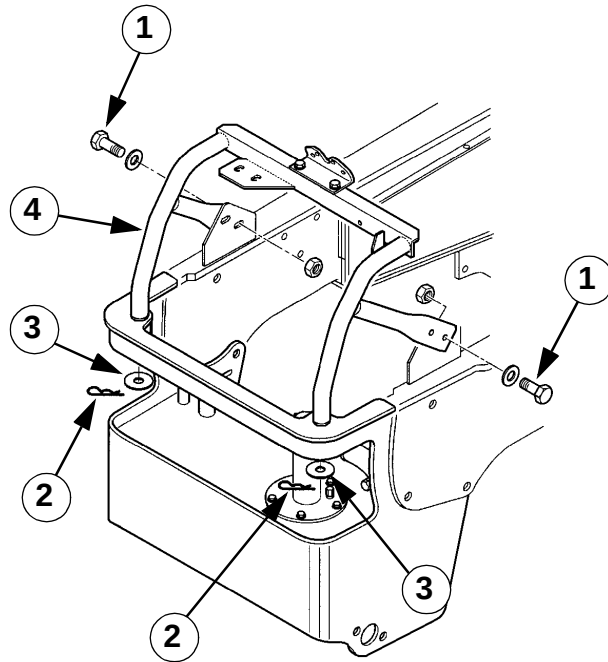
Tag and disconnect the wires on the hydraulic filter obstruction indicator.

STEP 11



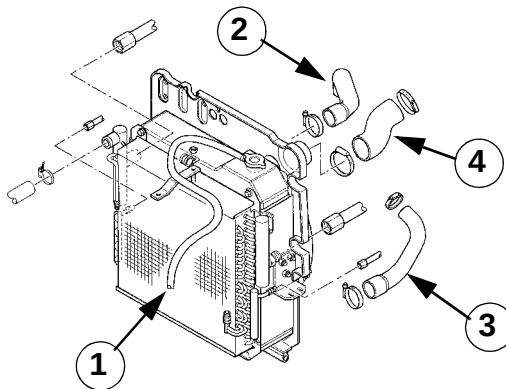
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Release the fluid pipes (1) and electrical connections (2) to the screen wash bottle (3) and tie back to the chassis.

STEP 12

CI98G516

Remove the hardware (1), the retaining pins (2), the washers (3) and support (4).

STEP 13

CI98G517

Disconnect the overflow hose (1) from the radiator neck.

STEP 14

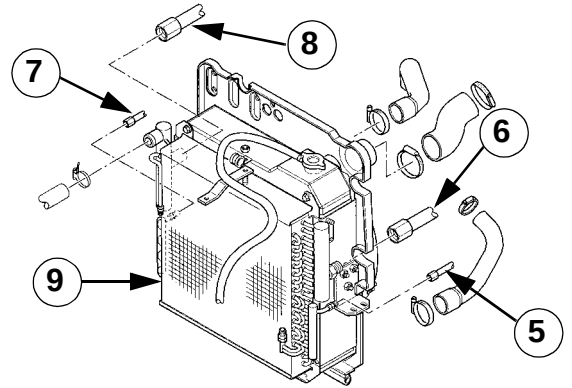
Loosen the clamp and disconnect the upper radiator hose (2).

STEP 15

Loosen the clamp and disconnect the lower radiator hose (3).

STEP 16

Loosen the clamp and disconnect the air cleaner hose (4).

STEP 17

CI98G517

Position a suitable drainage container beneath the hydraulic hose (5) and disconnect the hose from the oil cooler (9).

NOTE : Fit blanks to the hose and the oil cooler connection.

STEP 18

Repeat step (5) for the remaining hydraulic hoses (6), (7) and (8).

STEP 19

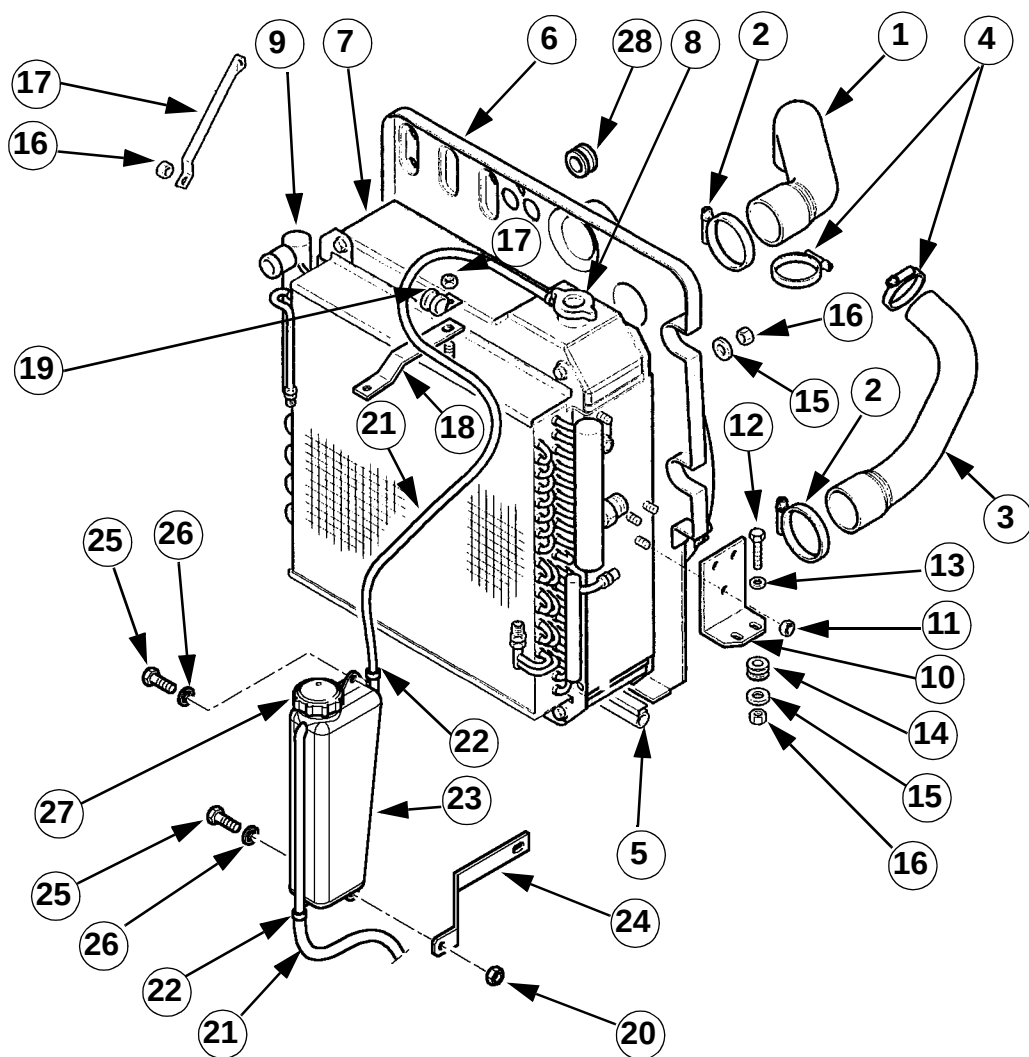
Remove the for radiator retaining screw.

STEP 20

Install a suitable sling around the radiator and remove the radiator.

NOTE : Installation of the radiator is the reverse of removal.

PERSPECTIVE VIEW



1. Hose	15. Washer
2. Collar	16. Nut
3. Hose	17. Bracket
4. Collar	18. Bracket
5. Seal	19. Collar
6. Shroud	20. Nut
7. Radiator	21. Hose
8. Cap, filler	22. Clamp
9. Cooler, oil	23. Tank, expansion
10. Bracket	24. Bracket
11. Nut	25. Screw
12. Screw	26. Washer
13. Washer	27. Plug
14. Stanchion	28. Grommet

CI98G505

ENGINE REMOVAL

Put identification tags on all disconnected hoses and wires. Close disconnected hoses and fittings with caps and plugs.

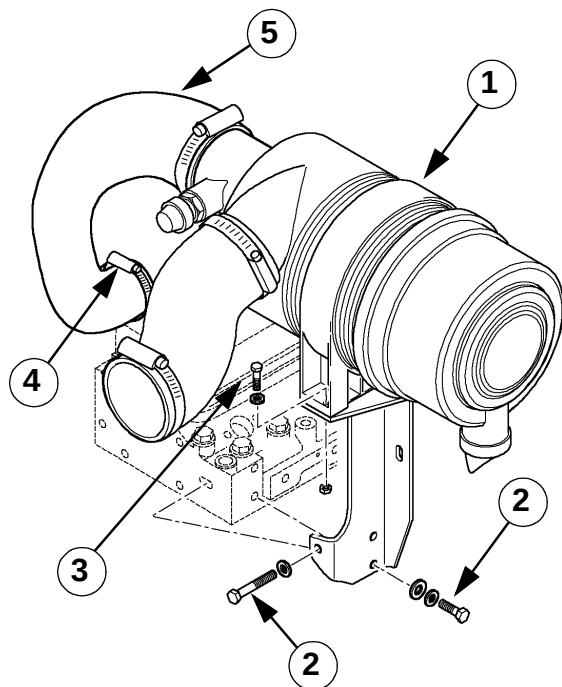
STEP 1

Remove the radiator see page 4.

STEP 2

Disconnect the battery.

STEP 3



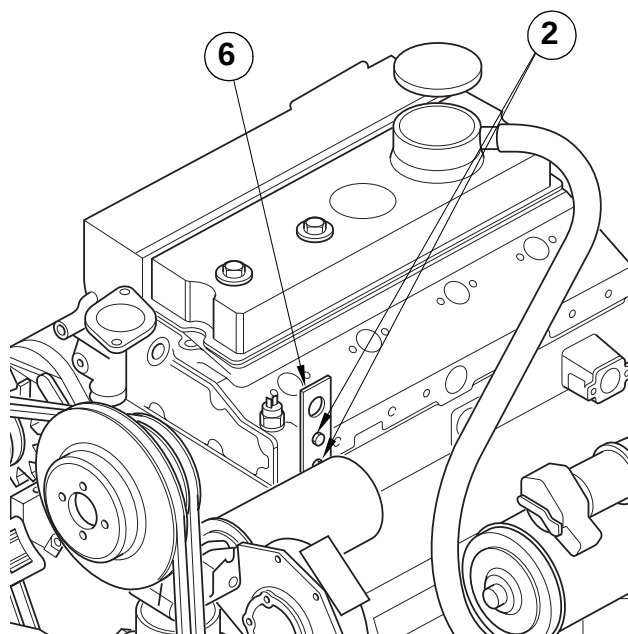
CI98G518

Remove the hose clip (4) from the air filter hose (5) at the turbocharger inlet.

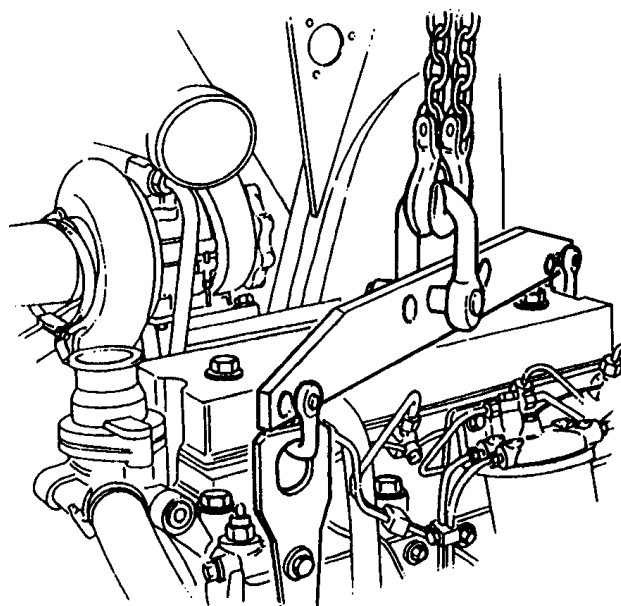
STEP 4

Support the air filter assembly (1) and remove the three bolts (2) from the cylinder head and two bolts (3) from the exhaust bracket. Remove the air filter assembly.

STEP 5

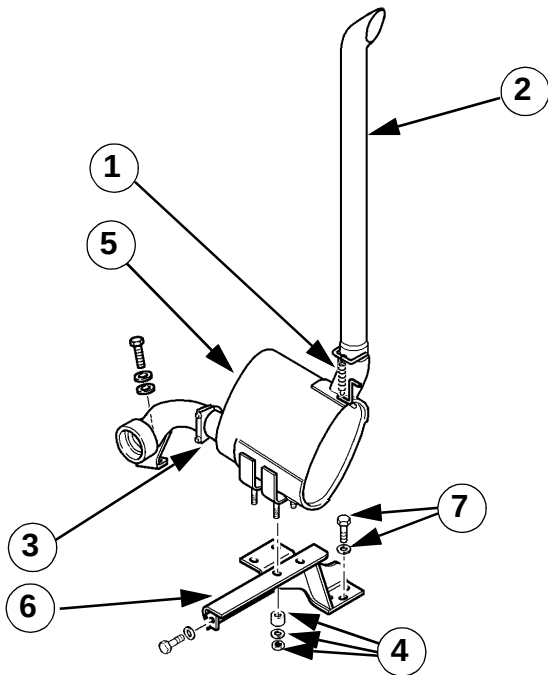


789M257A



789M256A

Install the engine lifting bracket (6) using two of the bolts (2) from the air filter bracket. The bracket is part of the machine tool kit.

STEP 6

CI98G519

Release the spring (1) and remove the exhaust pipe (2).

STEP 7

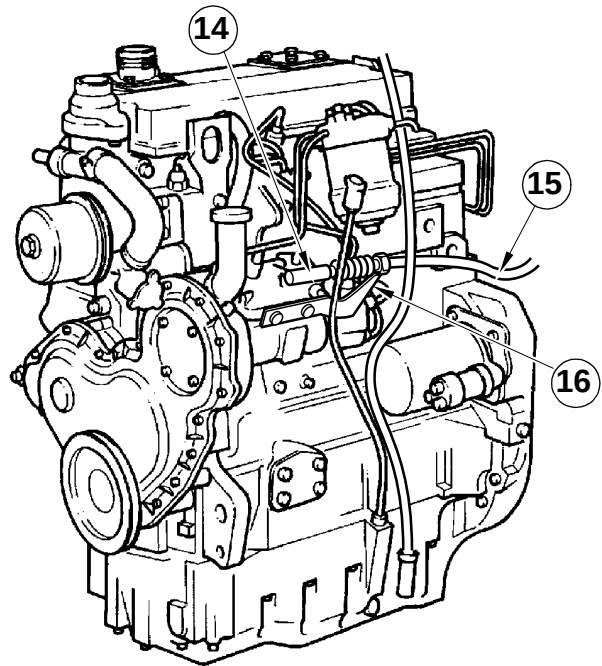
Release the clip (3) on the silencer to turbocharger connection and remove the nuts, washers and spacers (4). Remove the silencer (5) from the bracket (6).

STEP 8

Remove the three bolts and washers (7) from the exhaust bracket and remove the bracket.

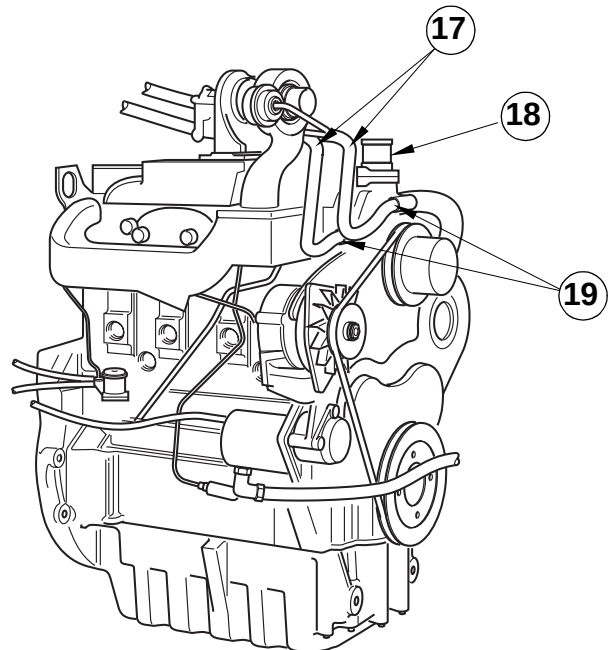
STEP 9

Remove the hydraulic oil pump drive shaft (see section 8004).

STEP 10

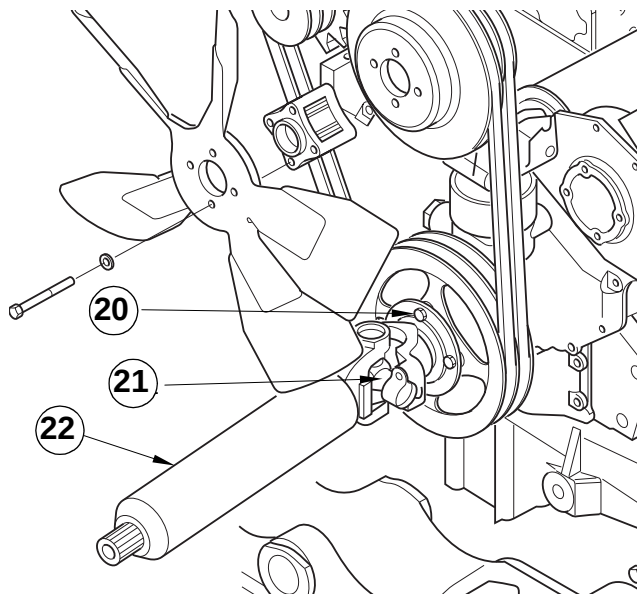
789M259A

Disconnect the throttle cable (15) from the fuel injection pump lever (14) and the bracket (16).

STEP 11

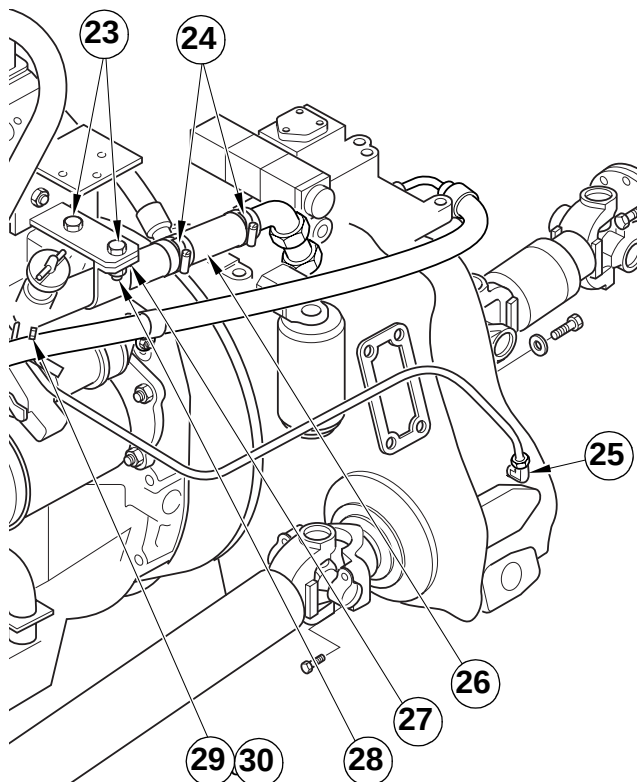
789M287A

Release the hose clips (19) on the heater hoses (17) at the thermostat housing (18). Remove the hoses and tie back under the scuttle.

STEP 12

789M261A

Remove the four bolts (20) in the hydraulic pump drive coupling (21) and remove the drive shaft (22).

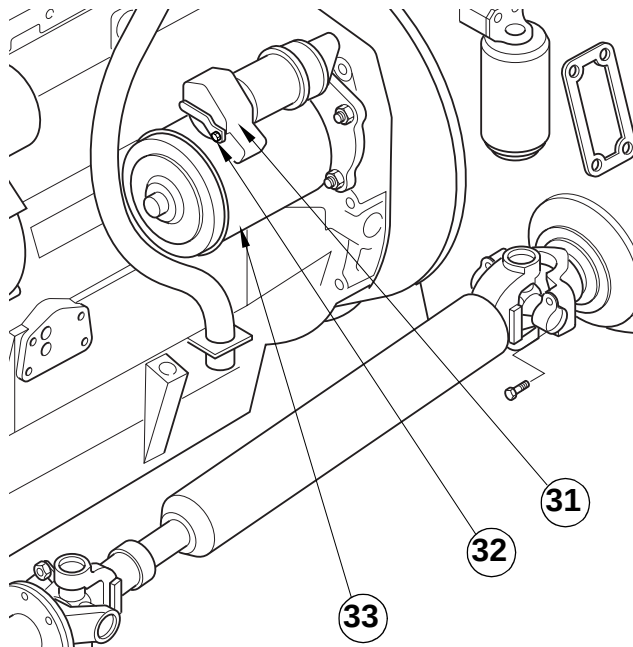
STEP 13

789M262A

Release the hose clips (24) on the transmission filler flexible pipe (26), remove the two bolts and nuts (23) and (28) in the support bracket (27) and the nut and bolt (29) and (30) in the dipstick pipe support.

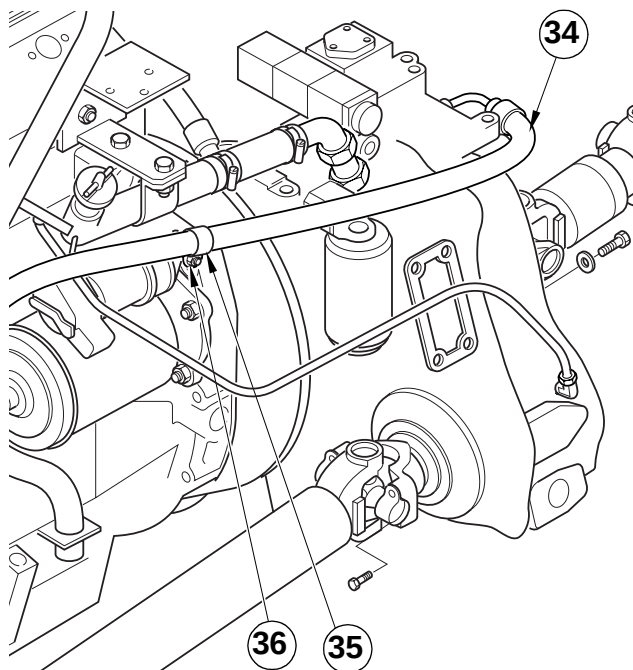
STEP 14

Release the dipstick pipe coupling (25) on the transmission and remove the dipstick assembly.

STEP 15

789M263A

Remove the nut (32) from the wiring cover (31) on the starter motor (33) and remove the cover.

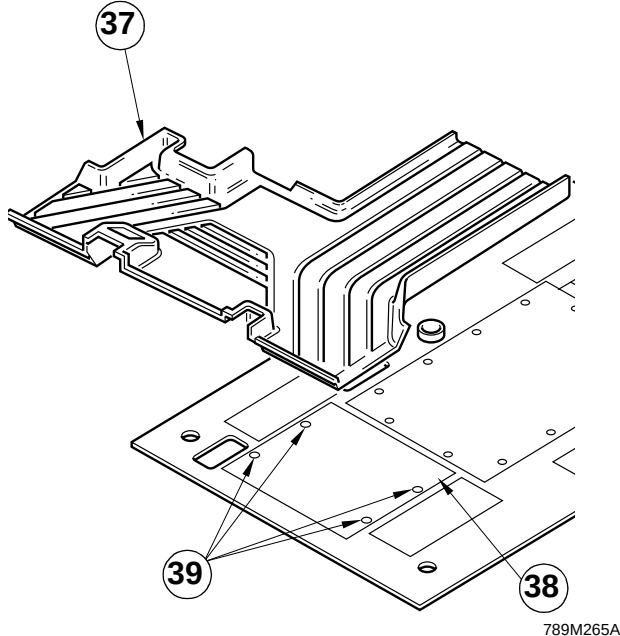
STEP 16

789M264A

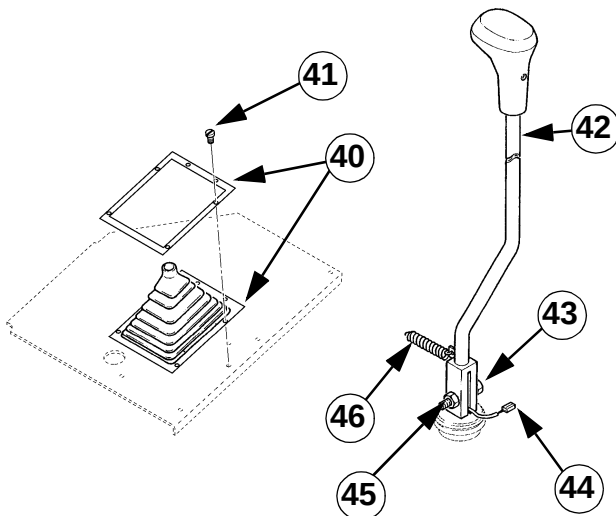
Remove the bolt and nut (36) in the clip (35) for the transmission oil cooler pipe (34), and release the pipe.

STEP 17

Disconnect and tag all wiring connections from the engine. These include the starter motor, the alternator, the water temperature switch, the oil pressure switch, the thermostat unit, the air filter restriction switch and the fuel injection pump stop solenoid.

STEP 18

Remove the front floor mat (37) in the cab. Remove the four screws (39) from the centre front floor plate (38) and remove the plate.

STEP 19

Remove the six screws (41) from the gear lever tower (40) and slide the tower up the lever (42).

STEP 20

Remove the six screws (41) from the gear lever tower (40) and slide the tower up the lever (42).

STEP 21

Disconnect the clutch switch wiring connection (44) and remove the spring (46) from the shift lever.

STEP 22

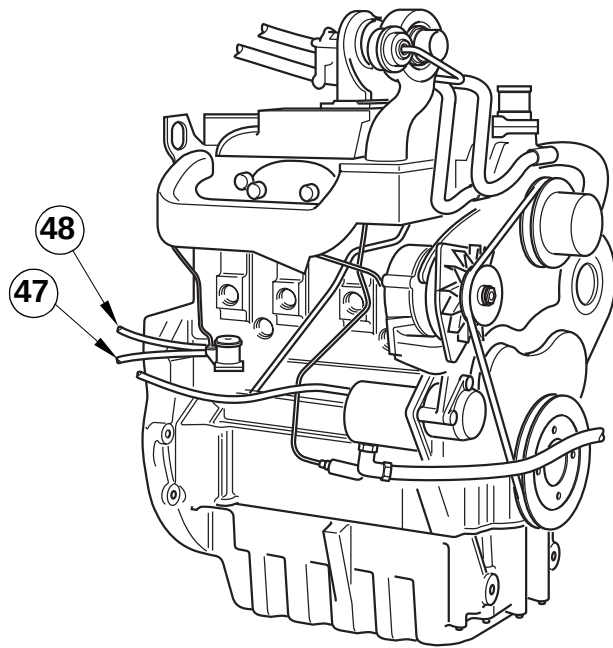
Remove the bolt and nut (43) and (45) from the shift lever and remove the lever from the transmission.

STEP 23

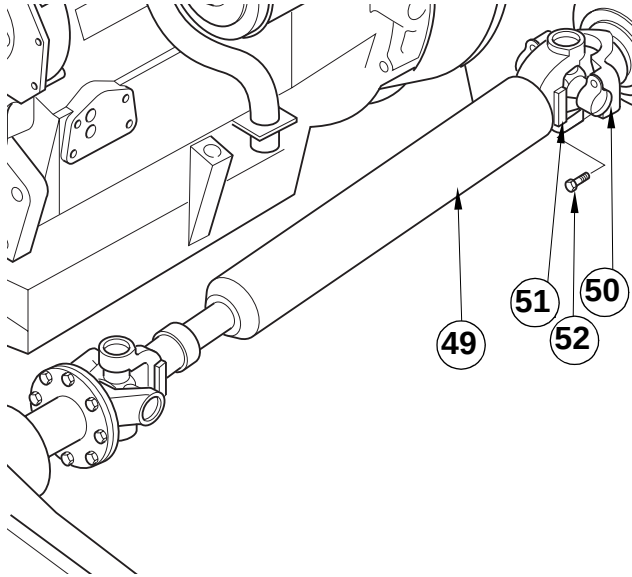
Put the wiring ties which attach the electrical harness to the support rail at the rear of the engine.

STEP 24

Release the oil cooler hose clamp on the right hand side of the chassis.

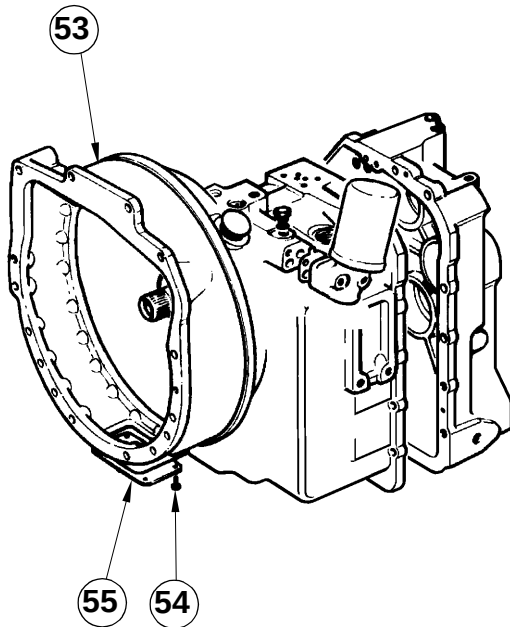
STEP 25

Disconnect the fuel inlet and discharge pipe (47) and (48) from the fuel lift pump.

STEP 26

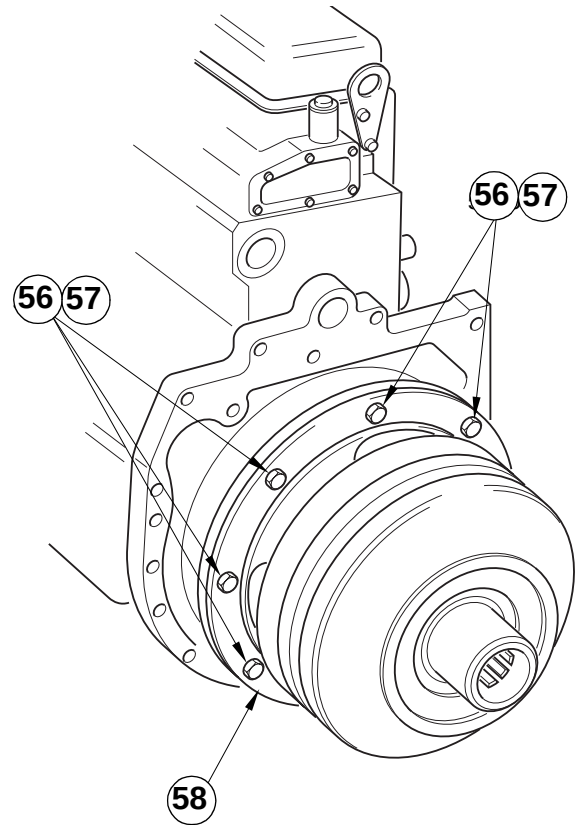
789M270A

Remove the four bolts (52) and the two bearing caps (51) from the rear coupling. Lower the propshaft (49). Make sure that the needle roller bearing cups (50) on the rear coupling are taped to the joint.

STEP 27

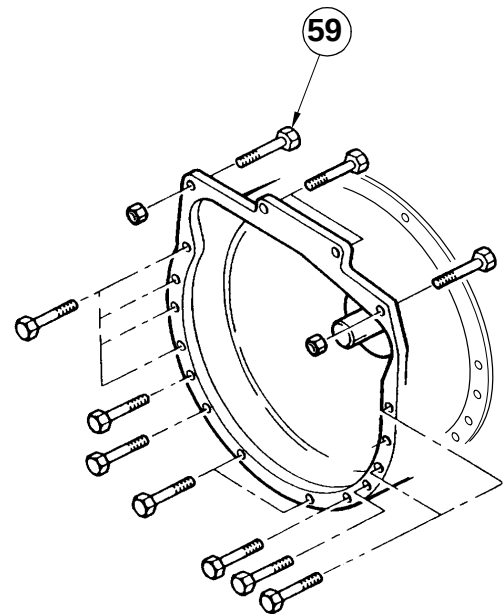
789M271A

Remove the four bolts (54) and the inspection plate (55) from the bottom of the bell housing (53).

STEP 28

789M272A

Remove the eight flywheel to torque converter bolts (56) and the washers (57) from the flex plate assembly (58).

STEP 29

789M273A

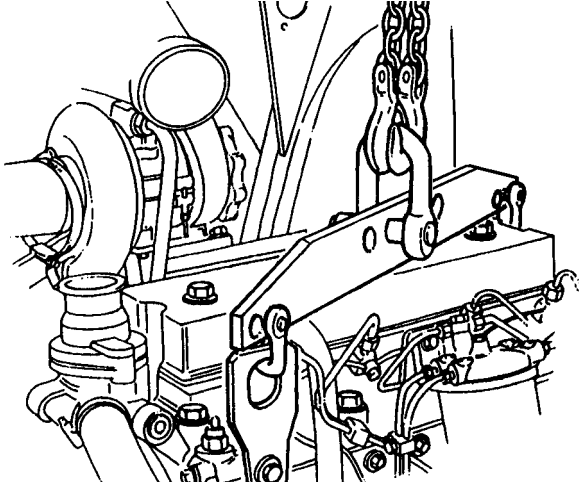
Remove all except two of the spacer housing bolts (59).

STEP 30

Position a trolley jack under the transmission, next to the front axle drive coupling flange. Raise the jack into contact with the transmission but DO NOT lift the transmission.

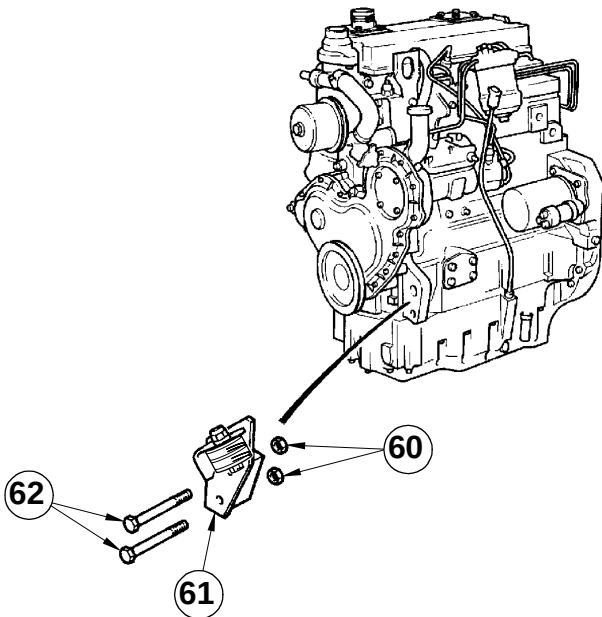
STEP 31

Attach the special lifting bracket to the engine.

STEP 32

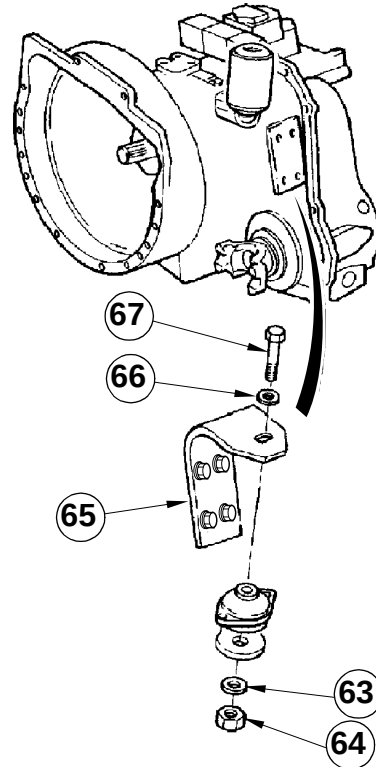
789M256A

Using a suitable hoist attached to the lifting bracket, apply tension to the lift chains. DO NOT raise the engine.

STEP 33

789M257A

Loosen the two bolts (62) and the nuts (60) from each engine bracket (61).

STEP 34

789M276A

Remove the centre bolt (67), the nuts (64) and the washers (63) and (66) from each transmission mounting plate (65).

STEP 35

Remove the rear propshaft.

STEP 36

Using the hoist and trolley jack, raise the engine/transmission unit sufficient to remove the engine mountings. (approximately 40 mm (1.5 in)).

STEP 37

Lower the engine/transmission unit and move it towards the rear of the machine until the rear propshaft slicing joint is completely closed.

STEP 38

Remove the two bolts in the spacer housing.

STEP 39

Hold the transmission to the rear, and move the engine forward on the hoist to disengage the torque converter spigot. Make sure that the torque converter does not disengage from the transmission input shaft when the engine moves forward.

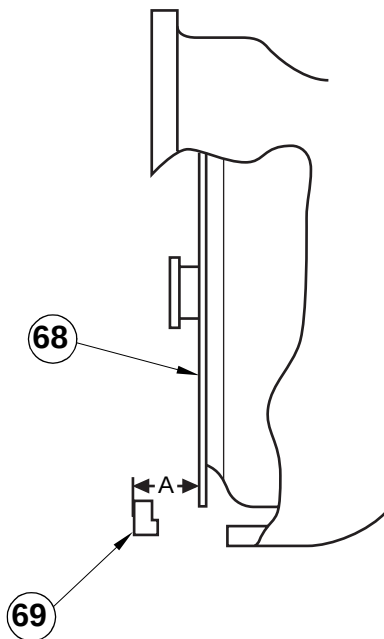
STEP 40

Remove the engine from the machine.

Installation

NOTE : *Install the engine in the reverse order of the removal but note the following :*

1.



789M277A

Before installation of the engine, make sure that the torque converter is correctly installed in the transmission. The flex plate face (68) must be at least 50 mm (2.0 in) from the transmission flywheel cover face (69) (measurement A). If the measurement A is 40 mm (1.5 in) or less, the torque converter is not correctly installed and must be removed and installed correctly.

2. During assembly of the engine to the transmission, make sure that the torque converter spigot enters the fly wheel bush correctly. To check, rotate the torque converter as the engine and transmission come together.

3. Torque tighten attaching parts as follows :

Flywheel to torque converter flexible plate bolts.....28 Nm (21 lbf ft)
Rear coupling bearing cap bolts 37 Nm (27 lbf ft)
Coupling flange bolts.....48 Nm (35 lbf ft)
Starter motor friction nuts.....36 Nm (26 lbf ft)

4. Before starting the engine, do steps 3 through 8.
5. Bleed air from fuel system (see section 3410).
6. Check the transmission oil level (see section 6002).
7. Check the engine oil level.
8. Replenish the radiator and header tank with coolant.
9. Check the hydraulic oil level.
10. Carry out a complete functional test of the machine. Check all connections and joints for leakage. Check all fluid levels with the engine stopped and cold.

Section

2401

ENGINES SPECIFICATIONS AND ADJUSTMENTS

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SPECIAL TOOLS

Tools required for a complete engine overhaul

MS.73	Adjustable valve seat cutters
PD.145D	Crankshaft rear oil seal drift (to be used with MS 550 handle)
PD.150B	Cylinder liner remover/replacer (main tool)
PD.150B-17	Adaptor for cylinder bores of 100 mm (3.937 inch) diameter. To be used with PD.150B main tool
PD.1556	Water pump/Camshaft adaptor (imperial) for PD.155C
PD.155B-5	Fuel pump/camshaft adaptor (metric) for PD.155C
PD.155C	Puller, camshaft gear
6118B	Valve spring compressor
PD.6118-7	Adaptor for 611 8B
PD.6118-8	Adaptor for 611 8B
PD.162	Timing case cover centralising tool
MS.550	Drift handle (To be used with PD.145D)
PD.170	Timing case seal installer
PD,17-6	Timing case seal installer

Sealants

Hylomar

Loctite 242

Loctite 575

Loctite Q Activator

SPECIAL TORQUE TENSIONS

Fasteners, rocker shaft brackets

Aluminium brackets	40 Nm
Cast iron and sintered steel brackets	75 Nm
Cap nuts, composite plastic rocker cover	20 Nm
Cap nuts, aluminium rocker cover	30 Nm
Setscrews, inlet manifold to cylinder head.....	44 Nm
Nuts (Cadmium plated), exhaust manifold to cylinder head	33 Nm
Setscrews, engine lift bracket	44 Nm

Piston and connecting rod assemblies

Nuts, connecting rods	125 Nm
Setscrews, connecting rods.....	155 Nm
Banjo bolts, piston cooling jets	27 Nm

Crankshaft assembly

Setscrews, main bearings (4 cylinder engines)	250 Nm
Setscrews, crankshaft pulley	115 Nm
Setscrews, viscous damper to crankshaft pulley	75 Nm
Cap screws, crankshaft damper to crankshaft pulley	35 Nm
Cap screws, crankshaft bonded damper to crankshaft pulley	35 Nm
Setscrews, rear oil seal housing to cylinder block	22 Nm
Cap screws, bridge piece to cylinder block.....	16 Nm
Cap screws, rear oil seal housing to bridge piece	13 Nm
Torx screw, rear oil seal housing to bridge piece	18 Nm

Timing case and drive assembly

Setscrews, timing case to cylinder block	22 Nm
Setscrews, timing case to cylinder block	44 Nm
Setscrews, hub of idler gear	44 Nm
Setscrews, camshaft gear	95 Nm
Setscrews, timing case cover to timing case	22 Nm
Nuts, timing case cover to timing case	22 Nm

Cylinder block

Setscrews, fitted instead of piston cooling jets	27 Nm

Fuel system

Nuts, high-pressure fuel pipes	22 Nm
Bolt banjo, leak-off connection.....	9 Nm
Gland nut, atomiser body	30 Nm
Setscrews, for the gear of the fuel injection pump	28 Nm
Torx screws, for timing plate	9 Nm
Setscrews, fuel lift pump.....	22 Nm
Nuts for flange of fuel injection pump	28 Nm
Locking screw of Bosch VE fuel injection pump	27 Nm
Locking screw of DP 200 fuel injection pump	10 Nm

Lubrication system

Plug, lubricating oil sump.....	34 Nm
Setscrews, oil pump to front bearing cap	22 Nm
Setscrews, cover for oil pump.....	28 Nm
Fasteners, lubricating oil sump.....	22 Nm

Cooling system

Setscrews, fan drive housing to timing case.....	44 Nm
Setscrews, fan drive pulley to hub	22 and 44 Nm
Setscrews, fan	22 Nm
Connector, oil cooler to oil filter head	58 Nm
Setscrews, coolant pump to timing case	22 Nm
Screw, cassette type cooler to oil filter head	37 Nm

Flywheel and housing

Setscrews, flywheel to crankshaft.....	105 Nm
Setscrews, cast iron flywheel housing to cylinder block	44 Nm
Head stamped 8.8.....	75 Nm
Head stamped 10.9.....	63 Nm
Head stamped 10.9.....	115 Nm
Setscrews, aluminium flywheel housing to cylinder block	70 Nm
Setscrews, flywheel housing to cylinder block (paper joint).....	70 Nm

Aspiration system

Nuts, turbocharger to manifold	44 Nm

Auxiliary equipment

Nut, compressor drive gear to compressor crankshaft.....	120 Nm
Nut, (30 A/F) compressor gears	130 Nm
Cap screw, bracket to idler hub	60 Nm
Cap screw, bracket to timing case	35 Nm

750 MACHINE (Engine in the Perkins manual)

Specifications

Engine model n°	Perkins 1004-42
Bore	103 mm (4.05 in)
Stroke	127 mm (5 in)
Cubic capacity	4.23 litres (257 cu in)
Cylinder arrangement	in line
N° of cylinders	4
fining order	1, 3, 4, 2
Compression ratio	18.5:1
Induction system	Naturally aspirated
Combustion system	Direct injection
Direction of rotation	Clockwise from the front

Power rating

SAE J1349 - nett	51.5 kW (69 bhp) at 2200 rpm
ISO 9429 (1989) - nett	49 kW (65.7 bhp) at 2200 rpm
Torque - SAE J1349 - nett	276 Nm (203.6 lbf ft) at 1200 rpm
Torque - ISO 9429 (1989) - nett	273.5 Nm (201 lbf ft) at 1200 rpm

Engine speeds

Low idle speed	850 rev/min
Rated speed	2200 rev/min
Max-off load speed	2420 rev/min

760 MACHINE (Engine in the Perkins manual)

Specifications

Engine model No	Perkins - 1004-40 T
Bore	100 mm (3.937 in)
Stroke	127 mm (5 in)
Cubic capacity	3.99 litres (243 cu in)
Cylinder arrangement	In-line
No. of cylinders	4
Firing order	1, 3, 4, 2
Compression ratio	17.25:1
Induction system	Turbo charged
Combustion system	Direct injection
Direction of rotation	Clockwise from the front

Power rating

SAE J1349 - nett	57.5 kW (77.1 bhp) at 2200 rpm
ISO 9429 (1989) - nett	57 kW (76.4 bhp) at 2200 rpm
Torque - SAE J1349 - nett	336.5 Nm (248.2 lbf ft) at 1400 rpm
Torque - ISO 9429 (1989) - nett	333 Nm (245.6 lbf ft) at 1400 rpm

Engine speeds

Low idle speed	850 rev/min
Rated speed	2200 rev/min
Max. off-load speed	2420 rev/min

860/960/965 MACHINE (Engine in the Perkins manual)

Specifications

Engine model No	1004 - 40T
Bore	100 mm (3.937 in)
Stroke	127 mm (5 in)
Cubic capacity	3.99 litre (243 cu in)
Cylinder arrangement	In-line
No. of cylinders	4
Firing order	1, 3, 4, 2
Compression ratio	17.25:1
Induction system	Turbo charged
Combustion system	Direct injection
Direction of rotation	Clockwise from the front

Power rating

SAE J1349 - nett	65.5 kW (87.8 bhp) at 2200 rpm
ISO 9429 (1989) - nett	64.5 kW (86.5 bhp) at 2200 rpm
Torque SAE J1349 - nett	366.5 Nm (270.3 lbf ft) at 1400 rpm
Torque - ISO 9429 (1989) nett	363 Nm (267.7 lbf ft) at 1400 rpm

Engine speeds

Low idle speed	850 rev/min
Rated speed	2200 rev/min
Max. off-load speed	2420 rev/min

DATA AND DIMENSIONS

NOTE : This information is given as a guide for personnel engaged on engine overhauls. The dimensions which are shown are those which are mainly used in the factory. The information applies to all engines, unless an engine type code is shown.

Cylinder head assembly

Cylinder head

Angle of valve seat:

- Inlet 46° (88° included angle) or 31° (118° included angle)
- Exhaust 46° (88° included angle)

Leak test pressure 200 kPa (29 lbf/in²) 2.04 kgf/cm²

Head thickness 102.79/103.59 mm (4.047/4.078 in)

Finish grade of head face for cylinder head gasket 1.10/3.20 micrometers

Diameter of parent bore for valve guide:

- Inlet 13.00/13.027 mm (0.5118/0.5128 in)
- Exhaust 14.00/14.027 (0.5512/0.5522 in)

Minimum permissible thickness after head face has been machined.....102.48 mm (4.035 in)

Inlet valves

Diameter of valve stem 9.46/9.49 mm (0.3725/0.3735 in)

Clearance in valve guide 0.02/0.10 mm (0.0008/0.0039 in)

Diameter of valve head 44.86/45.11 mm (1.766/1.776 in)

Angle of valve face 45° or 30°

Full length 122.65/123.30 mm (4.829/4.854 in)

Seal arrangement.....Rubber seal fitted to valve guide, colour green

Depth of valve head below the face of cylinder head

- Production limits.....1.40/1.70 mm (0.055/0.067 in)
- Service limit.....1.95 mm (0.077 in)

Exhaust valves

Diameter of valve stem 9.43/9.46 mm (0.371/0.372 in)

Clearance in valve guide 0.05/0.13 mm (0.002/0.005 in)

Maximum clearance in valve guide.....0.15 mm (0.006 in)

Diameter of valve head 37.26/37.52 mm (1.467/1.477 in)

Angle of valve face 45° or 30°

Full length 123.07/123.57 mm (4.845/4.865 in)

Seal arrangement.....Rubber seal fitted to valve guide, colour red

Depth of valve head below face of cylinder head:

- Production limits.....1.28/1.60 mm (0.050/0.063 in)
- Service limit.....1.85 mm (0.073 in)

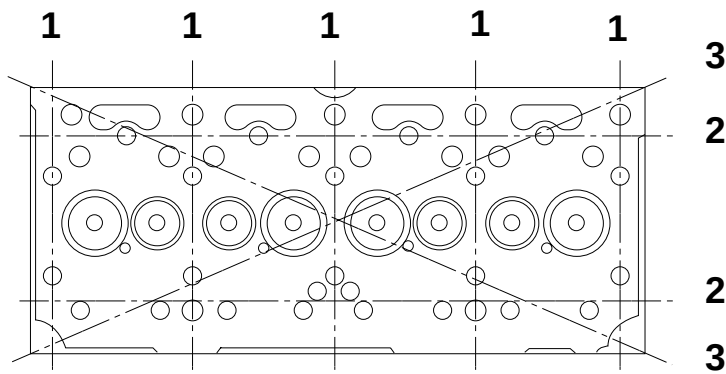
Maximum permissible distortion of cylinder head (A)

Four cylinder engines

1.....0.08 mm (0.003 in)

2.....0.15 mm (0.006 in)

3.....0.15 mm (0.006 in)



1/1-001

Valve guides

Inside diameter of partially finished guide	8.600/8.700 mm (0.3389/0.3425 in)
Inside diameter of finished guide.....	9.000/9.022 mm (0.3543/0.3552 in)
Outside diameter:	
Inlet.....	13.034/13.047 mm (0.5131/0.5137 in)
Exhaust.....	14.034/14.047 mm (0.5525/0.5530 in)
Interference fit of valve guide in cylinder head	0.007/0.047 mm (0.0003/0.017 in)
Full length	51.25 mm (2.018 in)
Protrusion from bottom of recess for valve spring	14.85/15.15 mm (0.585/0.596 in)

Valves springs

Fitted length.....	39.0 mm (1.54 in)
Load at fitted length	246/277.5 N (55.3/62.4 lbf) 25.1/28.3 kgf
Number of active coils	3.73
Number of coils.....	0
Direction of coils	Left hand

Tappets

Diameter of tappet stem	18.99/19.01 mm (0.7475/0.7485 in)
Diameter of tappet bore in cylinder block	19.05/19.08 mm (0.7500/0.7512 in)
Clearance of tappet in cylinder block.....	0.04/0.09 mm (0.0015/0.0037 in)

Rocker shaft

Outside diameter	19.01/19.04 mm (0.7485/0.7495 in)

Rocker levers and bushes

Diameter of parent bore for bush.....	22.23/22.26 mm (0.8750/0.8762 in)
Outside diameter of bush	22.28.22.31 mm (0.8770/0.8785 in)
Interference fit of bush in rocker lever.....	0.020/0.089 mm (0.0008/0.0035 in)
Internal diameter of fitted bush when reamed	19.06/19.10 mm (0.7505/0.7520 in)
Clearance between rocker lever bush and rocker shaft.....	0.03/0.09 mm (0.001/0.0035 in)
Maximum permissible clearance between rocker lever bush and rocker shaft.....	0.13 mm (0.005 in)

Piston and connecting rod assemblies

Pistons

Type	"Fastram" combustion bowl inserted top ring groove, graphite skirt
Diameter of bore for gudgeon pin	39.7003/39.7009 mm (1.5355/1.5358 in)
Height of piston above top face of cylinder block	0.26/0.50 mm (0.010/0.020 in)
Width of groove for top ring	Tapered
Width of groove for second ring	2.56/2.58 mm (0.1008/0.1016 in)
Width of groove for third ring	4.04/4.06 mm (0.1591/0.1598 in)
Service height grades	"H" and "L"

Piston cooling jets

Valve open pressure	178/250 kPa (26/36 lbf/in ²) 1.8/2.6 kgf/cm ²

Piston rings

Top compression ring	Barrel face, molybdenum insert, wedge (Turbo)
	Barrel face, molybdenum insert with a chamfer top of Inner face (NA)
Second compression ring	Taper face, cast iron
Oil scraper ring	Coil spring loaded, chromium faced
Width of top ring	Wedge-turbo
	2.48/2.49 mm (0.047/0.048 in) (NA)
Width of second ring	2.48/2.49 mm (0.097/0.098 in)
Width of third ring	3.98/3.99 mm (1.56/1.57 in)
Clearance of top ring in groove	Wedge (Turbo)
	0.08/0.11 mm (0.003/0.004 in) (NA)
Clearance of second ring in groove	0.07/0.1 mm (0.003/0.004 in) (Turbo)
	0.06/0.09 mm (0.002/0.003 in) (NA)
Clearance of third ring in groove	0.05/0.09 mm (0.002/0.003 in) (Turbo)
	0.04/0.08 mm (0.002/0.003 in) (NA)
Gap of top ring	0.35/0.80 mm (0.014/0.031 in) (Turbo)
	0.28/0.63 mm (0.011/0.025 in) (NA)
Gap of second ring	0.30/0.76 mm (0.012/0.030 in)
Gap of third ring	0.38/0.84 mm (0.015/0.033 in)

Connecting rods

Type	"H" section, wedge shape small end (Turbo)
	"H" section, square shape small end (NA)
Location of cap to connecting rod	Flat joint face with dowels
Diameter of parent bore for big end	67.21/67.22 mm (2.6460/2.6465 in)
Diameter of parent bore for small end	42.07/42.08 mm (1.656/1.657 in) (Turbo)
	38.89/38.92 mm (1.531/1.532 in) (NA)
Length grades	F, G, H, J, K, L
Service length grade	S

Big end bearings

Type:

- Naturally aspirated engines..... Steel back, aluminium/tin bearing material
- Turbocharged engines Steel back, lead bronze bearing material with lead finish

Width:

- Naturally aspirated engines.....31.62/31.88 mm (1.245/1.255 in)
- Turbocharged engines 31.55/31.88 mm (1.240/1.255 in)

Thickness at centre of bearings:

- Naturally aspirated engines.....1.835/1.842 mm (0.0723/0.0725 in)
- Turbocharged engines 1.835/1.844 mm (0.0723/0.0726 in)

Bearing clearance:

- Naturally aspirated engines.....0.035/0.081 mm (0.0014/0.0032 in)
- Turbocharged engines 0.030/0.081 mm (0.0012/0.0032 in)

Available undersize bearings -0.25 mm (-0.010 in); -0.51 mm (-0.020 in); -0.76 mm (-0.030 in)

Gudgeon pins

Production:

Type Fully floating

Outside diameter 39.694/39.700 mm (1.5628/1.5630 in) (Turbo)
34.920/34.925 mm (1.3748/1.3750 in) (NA)

Clearance fit in piston boss 0.003/0.015 mm (0.0001/0.0006 in)

Small end bushes

Type Steel back, lead bronze tin bearing materials

Outside diameter 42.16/42.19 mm (1.6600/1.6613 in) (Turbo)
38.94/39.03 mm (1.535/1.500 in) (NA)

Inside diameter (reamed) 39.723/39.738 mm (1.5638/1.5645 in) (Turbo)
34.94/34.96 mm (1.3258/1.3765 in) (NA)

Clearance between bush in small end and gudgeon pin 0.023/0.044 mm (0.0009/0.0017 in)

Crankshaft assembly

Crankshaft

Diameter of main journals:

- Four cylinder engines.....76.16/76.18 mm (2.998/2.999 in)

Maximum wear and ovality on journals and crank pins 0.04 mm (0.0016 in)

Width of front journal 36.93/37.69 mm (1.454/1.484 in)

Width of centre journal 44.15/44.22 mm (1.738/1.741 in)

Width of all other journals 39.24/39.35 mm (1.545/1.549 in)

Diameter of crank pins.....63.47/63.49 mm (2.499/2.500 in)

Width of crank pins 40.35/40.42 mm (1.589/1.591 in)

Diameter of flange 133.27/133.37 mm (5.247/5.251 in)

Depth of recess for spigot bearing:

- Four cylinder engines.....20.22/20.98 mm (0.796/0.826 in)

Bore of recess for spigot bearing:

- Four cylinder engines.....46.96/46.99 mm (1.849/1.850 in)

Crankshaft end-float 0.05/0.038 mm (0.002/0.015 in)

Maximum permissible end-float.....0.51 mm (0.020 in)

Undersize journals and crank pins -0.25 mm (-0.010 in); -0.51 mm (-0.020 in); -0.76 mm (-0.030 in)

Crankshaft heat treatment

- Introduction hardened Part numbers 3131H024
- Nitrocarburised Part numbers 3131H022, 31315991, 31315995, 31315681
- 60 hour Nitride Part numbers 3131H021

Main bearings

Four cylinder engines Steel back, 20% tin-aluminium bearing material

Bearing width

Four cylinder engines:

Centre bearing 36.32/36.70 mm (1.430/1.445 in)

All other bearings 31.62/31.88 mm (1.245/1.255 in)

Bearing thickness at centre

Four cylinder engines 2.083/2.089 mm (0.0820/0.0823 in)

Bearing clearance

Four cylinder engines:

All bearings 0.057/0.117 mm (0.0022/0.0046 in)

Crankshaft thrust washers

Type Steel back, lead bronze bearing material

Position Each side of centre main bearing

Thickness:

- Standard 2.26/2.31 mm (0.089/0.091 in)

- Oversize 2.45/2.50 mm (0.096/0.098 in)

Timing case and drive assembly

Camshaft

Diameter of number 1 journal 50.71/50.74 mm (1.9965/1.9975 in)

Diameter of number 2 journal 50.46/50.48 mm (1.9865/1.9875 in)

Diameter of number 3 journal

Four cylinder engines 49.95/49.98 mm (1.9665/1.9675 in)

Clearance of all journals 0.06/0.14 mm (0.0025/0.0055 in)

Cam lift:

- Inlet 7.62/7.69 mm (0.2999/0.3029 in)

- Exhaust 7.71/7.79 mm (0.3036/0.3066 in)

Maximum permissible ovality and wear on journals 0.05 mm (0.021 in)

End-float:

- Production limits 0.10/0.41 mm (0.004/0.016 in)

- Service limit 0.53 mm (0.021 in)

Width of spigot for thrust washer 5.64/5.89 mm (0.222/0.232 in)

Camshaft thrust washer

Type 360°

Depth of recess in cylinder block for thrust washer 5.46/5.54 mm (0.215/0.218 in)

Thickness of thrust washer 5.49/5.54 mm (0.216/0.218 in)

Relation ship of thrust washer to front face of cylinder block-0.05/+0.08 mm (-0.002/+0.003 in)

Camshaft gear

Number of teeth.....	56
Diameter of bore.....	34.93/34.95 mm (1.3750/1.3760 in)
Outside diameter of hub of camshaft.....	34.90/34.92 mm (1.3741/1.3747 in)
Clearance fit of gear on hub	0.008/0.048 mm (0.0003/0.0019 in)

Fuel pump gear

Number of teeth.....	56
Bore	36.00/36.06 mm (1.417/1.419 in)
Clearance fit on hub	0.003/0.075 mm (0.0001/0.0030 in)

Crankshaft gear

Number of teeth.....	28
Diameter of bore.....	47.625/47.650 mm (1.8750/1.8760 in)
Diameter of hub for gear on crankshaft	47.625/47.645 mm (1.8750/1.8758 in)
Transition fit of gear on crankshaft.....	-0.020/+0.048 mm (-0.0008/+0.0010 in)

Idler gear and hub

Number of teeth.....	63
Diameter of bore of gear.....	57.14/57.18 mm (2.2495/2.2512 in)
- With needle roller bearings	69.01/69.03 (2.717/2.718 in)
Width of gear and split bush assembly (fitted in position).....	30.14/30.16 mm (1.186/1.187 in)
Inside diameter of flanged bushes (fitted in position)	50.78/50.80 mm (1.9999/2.000 in)
Outside diameter of hub	50.70/50.74 mm (1.9960/1.9975 in)
- With needle roller bearing	54.987/55.000 mm (2.1648/2.1654 in)
Clearance of bushes on hub.....	0.04/0.10 mm (0.0016/0.0039 in)
End float of gear:	
- Production limits.....	0.10/0.20 mm (0.004/0.008 in)
- With needle roller bearings	0.24/0.33 mm (0.009/0.013 in)
- Service limit.....	0.38 mm (0.015 in)
Backlash for all gears	0.08 mm (0.003 in) minimum

Idler gear and hub for the Bendix compressor

Number of teeth.....	32
Diameter of bore of gear.....	55.010/55.025 mm (2.1657/2.1663 in)
Outside diameter of hub	49.990/50.000 mm (1.9960/1.9975 in)
End float of gear with needle roller bearing fitted	0.12/0.16 mm (0.005/0.006 in)
Backlash gear.....	0.07 mm (0.003 in) minimum

Cylinder block assembly**Cylinder block**

Height between top and bottom faces	441.12/441.33 mm (17.367/17.375 in)
Diameter of parent bore for cylinder liner	104.20/104.23 mm (4.103/4.104 in)
Depth of recess for flange of cylinder liner	3.81/3.91 mm (0.150/0.154 in)
Diameter of recess for flange of cylinder liner	107.82/107.95 mm (4.245/4.250 in)
Diameter of parent bore for main bearing.....	80.416/80.442 mm (3.1660/3.1670 in)

Camshaft bore diameter

- Four cylinder engines:

Number 1 (for bush).....	55.56/55.59 mm (2.188/2.189 in)
Number 2.....	50.55/50.60 mm (1.990/1.992 in)
Number 3.....	50.04/50.09 mm (1.970/1.972 in)

Cylinder liners

Type:

- Production	Dry, interference fit, flanged
Partially finished liner.....	Dry, interference fit, flanged, with flame ring
Outside diameter of production liner.....	104.25/104.28 mm (4.105/4.106 in)
Interference fit of production liner	0.03/0.08 mm (0.001/0.003 in)
Inside diameter of production liner	100.00/100.03 mm (3.937/3.938 in)
Maximum permissible wear of liner bore	0.25 mm (0.010 in)
Thickness of flange.....	3.81/3.86 mm (0.150/0.152 in)
Relative position of top of liner flange to top face of cylinder block	0.10 mm (0.004 in) above 0.10 mm (0.004 in) below

Cylinder liner specifications

IMPORTANT : *Specialist training and equipment is needed to machine the finish of a partially finished liner. For further information contact your nearest Perkins Distributor.*

Partially finished liner

Interference fit of liner in parent bore.....	0.025/0.076 mm (0.001/0.003 in)
Inside diameter of partially machined lined	99.162/99.415 mm (3.9040/3.9139 in)

Surface finish of the preliminary bore

Final size of liner before it is honed	99.873/99.924 mm (3.9320/3.9340 in)
Grade of surface finish.....	RA 3.2 to 4.0 micrometers
Maximum ovality and taper	0.02 mm (0.0008 in)

Surface finish of the diamond hone

Hone angle (cross hatch)	35°
Surface finish size, diamond honed	99.95 mm (3.9350 in)
Grade of surface finish.....	RA 2.2 to 3.0 micrometers
Maximum ovality and taper	0.012 mm (0.0005 in)

Surface finish of the silicone carbide base hone

Hone angle (cross hatch)	35°
Surface finish size, silicon carbide base hone	100.012 mm (3.9374 in)
Grade of surface finish.....	RA 1.3 to 1.6 micrometers
Maximum ovality and taper	0.010 mm (0.0004 in)

Surface finish of the silicone carbide plateau hone

Final surface finish size, silicon carbide (plateau hone)	100.017 mm (3.9375 in)
Final surface finish grade, silicon carbide (plateau hone).....	0.65/1.3 micrometers

Lubrication system

Lubricating oil pump - four cylinder engines

Type	Differential rotor, gear driven
Number of lobes	Inner rotor 6, outer rotor 7
Clearance of outer rotor to body:	
- Without balancer unit.....	0.15/0.34 mm (0.006/0.013 in)
Clearance of inner rotor to outer rotor	0.04/0.13 mm (0.001/0.004 in)
End-float of rotor assembly	0.03/0.010 mm (0.001/0.004 in)

Idler gear for lubricating oil pump

End float:

- Four cylinder engines	0.03/0.33 mm (0.001/0.0013 in)
Inside diameter of bush (fitted)	22.23/22.26 mm (0.875/0.866 in)
Outside diameter of idler shaft	22.19/22.21 mm (0.873/0.874 in)
Clearance of bush of idler gear on shaft	0.020/0.066 mm (0.0008/0.0026 in)

Oil pressure relief valve (standard)

Diameter of bore for plunger	18.24/18.27 mm (0.718/0.719 in)
Outside diameter of plunger	18.16/18.18 mm (0.715/0.716 in)
Clearance of plunger in bore	0.06/0.11 mm (0.002/0.004 in)
Length of spring (fitted):	
- Four cylinder engines	59.8 mm (2.4 in)
Load on spring (fitted):	
- Four cylinder engines	15.9/23.1 N (3.6/5.2 lbf) 1.6/2.4 kgf
Pressure to open valve (Four cylinder engines):	
- Without piston cooling jets	340/395 kPa (49/57 lbf/in ²) 3.4/4.0 kgf/cm ²
- With piston cooling jets	415/470 kPa (60/68 lbf/in ²) 4.2/4.8 kgf/cm ²

Oil filter

Type	Full flow, screw-on type canister
Pressure to open by-pass valve in filter	55/83 kPa (8/12 lbf/in ²) 0.6/0.8 kgf/cm ²
Pressure to open by-pass valve in oil cooler	172 kPa (25 lbf/in ²) 1.8 kgf/cm ²

Fuel system

Lucas fuel injection pump

Make	Lucas DP200 Series, pin timed, with a locking screw
Direction of rotation	Clockwise from drive end

Fuel lift pump - four cylinder engines

Type	Diaphragm, A.C. Delco, type XD
Method of drive	Eccentric on camshaft of engine
Static pressure (no delivery)	42/70 kPa (6/10 lbf/in ²) 0.4/0.7 kgf/cm ²
Test pressure (75% of minimum static pressure)	31 kPa (4.5 lbf/in ²) 0.32 kgf/cm ²

Fuel filter

Type	Twin parallel flow or single element

Cooling system

Coolant pump, belt driven

Type Centrifugal
 Outside diameter of shaft for pulley 24.587/24.600 mm (0.9679/0.9685 in)
 Inside diameter of bore of pulley 24.628/24.648 mm (0.9696/0.9704 in)
 Clearance fit of pulley on shaft 0.03/0.06 mm (0.001/0.002 in)
 Diameter of bore of impeller 15.872/15.893 mm (0.6248/0.6257 in)
 Outside diameter of shaft for impeller 15.9055/15.9182 mm (0.6263/0.6267 in)
 Interference fit of impeller on shaft 0.01/0.04 mm (0.0004/0.0016 in)
 Impeller to body clearance 0.69/0.89 mm (0.027/0.035 in)
 Diameter of bearing 62.000 mm (2.440 in)
 Diameter of bore for bearing 62.019/62.000 mm (2.441/2.400 in)
 Interference fit of bearing in pump body 0.01/0.04 mm (0.0004/0.0016 in)

Thermostat

Type:

- Single wax element, by-pass blanking

Part Number	Nominal temperature stamped on thermostat by-pass valve	"Start open" temperature	"Fully open" temperature	Minimum valve lift, fully open
2485613	82°C (180°F)	77/85°C (170/185°F)	92/98°C (198/208°F)	9 mm (0.35 in)
2485604	82°C (180°F)	77/85°C (170/185°F)	92/98°C (198/208°F)	9 mm (0.35 in)
2485C023	82°C (180°F)	80/84°C (176/183°F)	96°C (205°F)	9 mm (0.35 in)

Fan drive housing

Bore of housing for bearing 41.9655/41.9785 mm (1.6529/1.6522 in)
 Outside diameter of bearing 41.987/42.00 mm (1.6535/1.6530 in)
 Interference fit of bearing in housing 0.0085/0.0345 mm (0.00136/0.00033 in)
 Bore of hub 21.938/21.958 mm (0.8637/0.8645 in)
 Outside diameter of shaft 21.987/22.000 mm (0.8656/0.8661 in)
 Interference fit of shaft in hub 0.029/0.062 mm (0.0011/0.0024 in)
 Maximum permissible end-float of shaft 0.200 mm (0.0079 in)

Section

4001

ELECTRICAL SCHEMATIC

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ALPHABETICAL INDEX

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Section

4003

BATTERY

4003

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WARNING : *This symbol is used in this manual to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

Special Tools

Battery charger - For slow and standard charging it is necessary to use a constant current type, with an output of at least 14 amps and an upper voltage limit of 50 volts per battery. (A constant voltage charger limited to 16 volts will not recover a battery with an open circuit voltage below 11 volts.).

For fast charging, an output of 35 amps is required.

Digital voltmeter - with a precision of 0,2% or better and reading to two decimal places, over the range 0 to 19 volts.

High-rate discharge tester - with a capacity of at least 500 amps.

Thermometer - covering the range of - 10°C to 110°C (14° F to 230° F).

General description

The machines are equipped with a single or twin batteries. In temperate climates no maintenance will be needed throughout the life of the battery, unless a charging system fault develops, which may cause some water loss.

In hot climates there will be some water loss.

It is therefore good practice to check the electrolyte level every 250 hours.

	twin	single
Cold Cranking Performance (CCA) (amps) - SAE	590	825
Cold Starting Performance (CCA) (amps) - IEC	420	590
Reserve Capacity (Rc) (minutes)	130	200
Ampere Hour Capacity	72	115
Standard charge rate (amps)	9	14

Pre-delivery inspection

- Check the open circuit voltage. Refer to 4003-6. This precaution is very important when there is a long shipment/port handling time.
- If the voltage is above 12.5 volts the battery is good.
- If the voltage is below 12.5 volts, recharge per operations, see page 6 or 7, according to the state of the battery.

Stock machines

Due to the frequent starts, but with little work, the batteries on stock machines will become discharged more quickly, therefore check the open circuit voltage every 2 weeks. Refer to 4003-6.

If the voltage measures 12.3 volts or less, recharge the battery. Refer to 4003-8.

Quiescent current drain

The machines, ex-factory, have no permanently live circuits and should have zero quiescent current drain, when the key-switch is off and all lights are switched off.

It should be noted that permanently live accessories fitted by the dealer, such as a clock or theft alarm system, will place a quiescent drain on the battery. Typically the quiescent drain will be in the range of 10 -20 mA. If the quiescent drain measures 40 mA or more, there is a problem with the wiring insulation or the accessories, which must be cured.

BATTERY MAINTENANCE AND TEST

Battery safety



WARNING : NEVER add electrolyte to an already charged battery.



WARNING : Sparks can fly from electrical system or the engine. Before you operate this machine in an area which may contain inflammable vapour completely ventilate the area.



WARNING : A spark or naked flame can cause the hydrogen in a battery to explode. to avoid all risk of explosion, follow these instructions :

- Turn the battery master switch key to the "Off" position (circuit disconnected).
- When disconnecting the battery cables, always disconnect the negative (-) cable first.
- To reconnect the battery cables, always connect the negative (-) cables last.
- Never use metal parts to short circuit the terminals of a battery.
- Do not weld, grind or smoke near a battery.



WARNING : A battery produces explosive gases. Keep all flames, sparks and cigarettes away. Provide adequate ventilation when charging the battery or when using it in an enclosed space. Always wear eye protection and protective clothing when working on or near a battery.



WARNING : Battery acid causes severe burns. The battery contains sulphuric acid. Avoid contact with skin, eyes or clothing.

Antidote :

EXTERNAL : Flush with water.

INTERNAL : Drink large quantities of water or milk. Follow with milk of magnesia, a beaten egg or vegetable oil. Do not give fluids that induce vomiting. Call a doctor immediately.

EYES : Flush with water for 15 minutes and get prompt medical attention.



WARNING : When the battery electrolyte is frozen, the battery can explode if you try to charge the battery or try to jump start and run the engine using another battery. to prevent battery electrolyte from freezing, keep the battery at full charge.



CAUTION : Always connect/disconnect leads to/from the battery while the charger is switched off.



CAUTION : If the battery temperature rises to 60°C (140° F) stop the charging process and allow the battery to cool.



CAUTION : Always measure battery temperature in the centre cell.



CAUTION : Always place a damp cloth over the vent covers when charging a battery.



CAUTION : Use hot water to remove all evidence of corrosion from battery terminal post and connections, then smear with petroleum jelly or other non-acid grease.

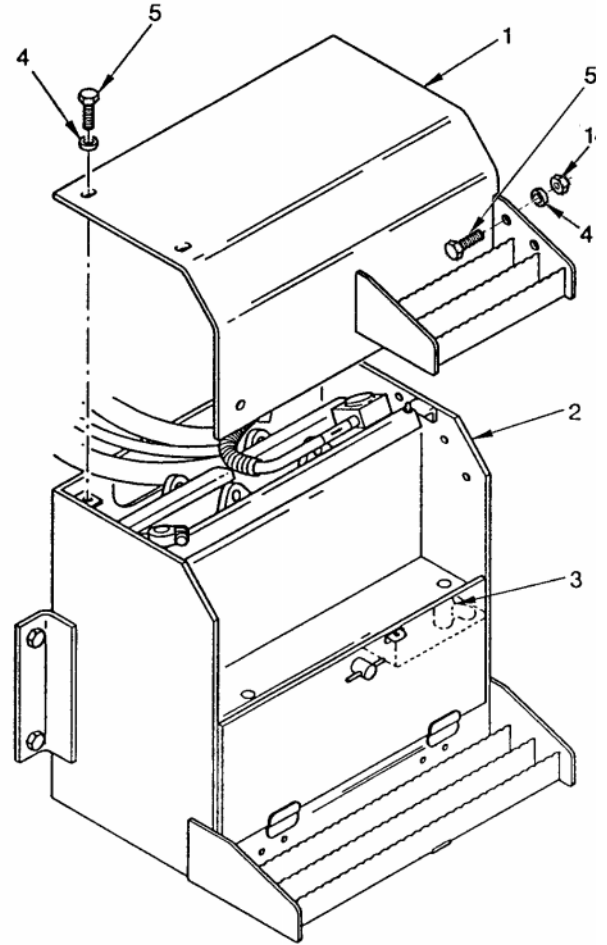
Removing the battery

Remove the battery as follows :

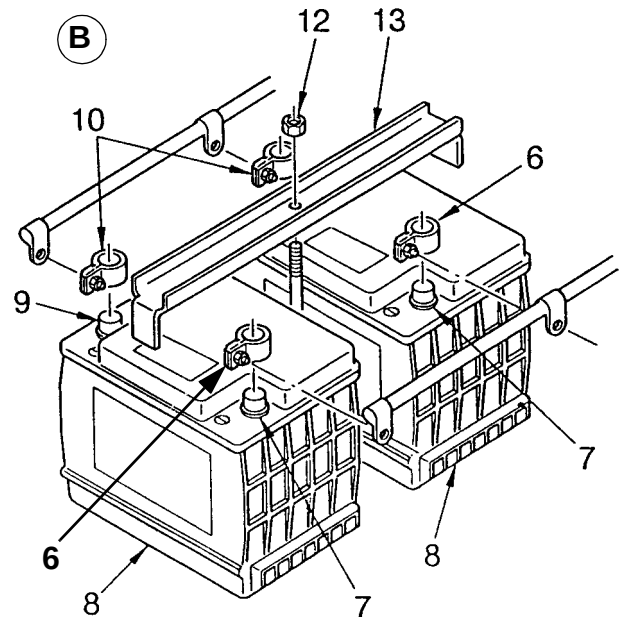
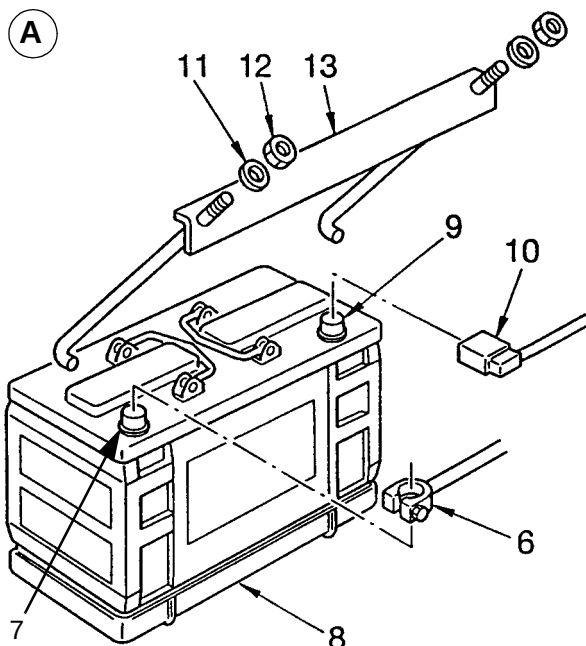
1. Remove the six bolts (5), the six washers (4) and the two nut (14), and remove the lid (1) from the battery box (2).
2. Open the tool box compartment below the battery box (2). If fitted, twist the handle (3) of the battery emergency cut-out switch and remove the handle.

NOTE : Operation of the handle (3) breaks the earth connection of the battery.

3. Read and obey the warning instructions on battery safety before electrical cables are disconnected from the battery (8). Refer to 4003-4.
4. Disconnect the cable clamp(s) (6) from the (-) negative terminal post(s) (7) of the battery (8).
5. Move the cable away from the battery (8) and attach the cable clamps (6) to the battery box (2) with temporary ties.
6. Disconnect the cable clamp(s) (10) from the (+) positive terminal post(s) (9) of the batteries (8).
7. Move the cables away from the battery (8) and attach the cable clamps (10) to the battery box (2) with temporary ties.
8. On the single battery installation A , remove the nuts (12) and the washers (11). On the twin battery installation B, remove the nut (12).
9. Remove the strap (13).
10. Remove the battery (batteries) (8) from the battery box (2).



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Installing the battery

The installation of the battery is the reverse of the removal.

Install the battery in the reverse order of the removal but note the following :

1. Make sure the battery box (2) contains no stones or debris that may damage the battery (8).
2. Clean any corrosion from the terminal posts (7) and (9) and the cable clamps (6) and (10).
3. Read and obey the warning instructions on battery safety before electrical cables are connected to the battery (8). Refer to 4003-4.
4. Before installing the lid (1) on the battery box (2), do an open circuit voltage test of the battery. Refer to 4003-6.
5. After installation, check the tension of the alternator belt.

Battery inspection before test or charge

Reject the battery if :

1. The electrolyte is excessively low.
2. Electrolyte levels vary by more than 20 mm (0.8 in) between cells.
3. Battery case, lid or mountings are cracked or damaged.
4. Terminals are damaged or loose in the case.

Test the open circuit voltage

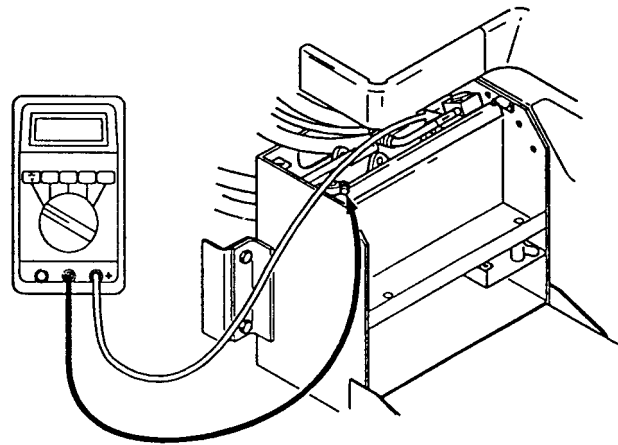
Test equipment

Digital voltmeter

Do the open circuit voltage test as follows :

1. The engine must be stopped and all electrical circuits switched off this test.
2. Measure the open circuit voltage of the battery only if it has not been charged or discharged in the past 16 hours.

If the machine has recently been started, switch on the headlights for 15 seconds then wait one minute before testing.



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3. Connect the voltmeter directly across both battery terminals and note the voltage. 12.5V or above no action required. Below 12.5V, recharge the battery. Refer to 4004-7/4004-8/4004-9.

Slow charge the battery

Special tools

Battery charger - constant current type with an output of at least 14A and an upper voltage limit of 50V per battery.

Charge procedure



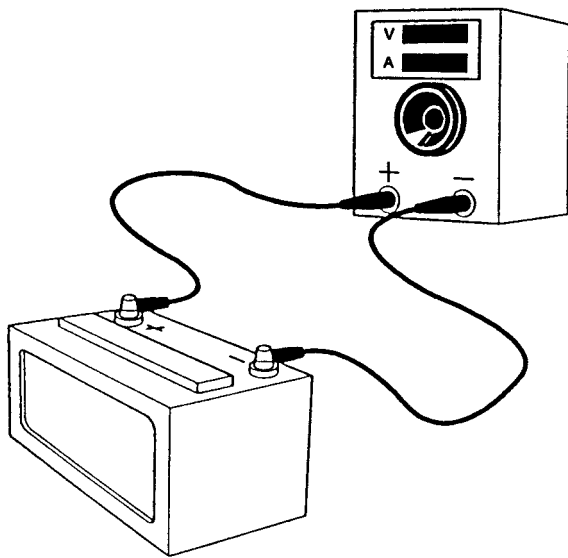
CAUTION : *Parallel charging is not recommended, therefore on machines fitted with twin batteries, charge each one individually.*

Slow charge the battery as follows :

1. Remove the battery from the machine. Refer to 4003-5.
2. If a battery has been neglected and produces an open circuit voltage of 11V or less, it will be completely discharged and the plates will have suffered sulphation. Initially the battery will draw higher than normal voltage but lower than specified current.

CURRENT FOR SINGLE BATTERY 9A

CURRENT FOR TWIN BATTERY 14A



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3. Connect the battery charger to the battery. Make sure the polarity of the connections is correct and connect the (+) positive connection first.
4. After 30 minutes, check the charging voltage (the charging current may still be lower than specified).

Below 12V reject the battery.

Above 16V reject the battery.

Between 12 to 16V, continue with charging process for 15 hours.



WARNING : *Check the battery temperature regularly and if it reaches 60°C (140° F) stop the charging process.*

5. Set the battery charger to OFF. Disconnect the cables from the battery. Make sure you disconnect the (+) positive cable first.
6. Allow the battery to stand for 24 hours.
7. Load test the battery. Refer to 4003-10.

Standard charge of the battery

Special tools

Battery charger - constant current type with an output of at least 14A.

Charge procedure



CAUTION : *Parallel charging is not recommended, therefore on machines fitted with twin batteries, charge each one individually.*

Do a standard charge of the battery as follows :

1. Remove the battery from the machine. Refer to 4003-5.



CAUTION : *Do not use the standard charge process on a battery producing an open circuit voltage of 11V or less.*

2. Connect the battery charger to the battery. Make sure the polarity of the connections is correct and connect the (+) positive cable first.
3. Set the battery charger to ON.
4. Set the appropriate charger current :
CURRENT FOR SINGLE BATTERY 9A
CURRENT FOR TWIN BATTERY 14A
5. Charge the battery for the time indicated in the table below :
6. Set the battery charger to OFF. Disconnect the cables from the battery. Make sure you disconnect the (+) positive cable first.
7. Load test the battery. Refer to 4003-10.
8. If required, install the battery. Refer to 4003-6.

MINIMUM charging period

Open circuit volts	Charge period (hours)
Above 12.5	0
12.4	3
12.3	4
12.2	5
12.1	6
12.0	7
11.9	8
11.8	9
11.7	10
11.6	11
11.0 to 11.6	12
Below 11.0	Use slow charge



WARNING : *Check the battery temperature regularly and if it reaches 60°C (140° F), stop the charging process.*

Fast charge of the battery

Special tools

Battery charger - constant current type with an output of at least 35A.

Charge procedure



CAUTION : *Parallel charging is not recommended, therefore on machines fitted with twin batteries, charge each one individually.*



CAUTION : *The standard charge should always be used in preference to the fast charge procedure.*

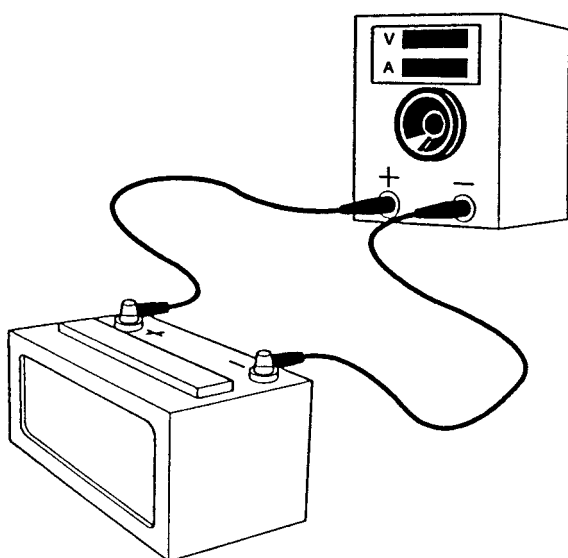
Do a fast charge of the battery as follows :

1. Remove the battery from the machine. Refer to 4003-5.



CAUTION : *Never use the fast charge procedure for batteries producing an open circuit voltage of 11V or less.*

2. Connect the battery charger to the battery. Make sure the polarity of the connections is correct and connect the (+) positive cable first.
3. Set the battery charger to ON.
4. Set the appropriate charge current :
CURRENT FOR SINGLE BATTERY 9A
CURRENT FOR TWIN BATTERY 14A



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5. Charge the battery for the time indicated by the table below :

MAXIMUM charging period	
Open circuit volts	Charge period (hours)
Above 12.5	0
12.4	0.25
12.3	0.5
12.2	0.75
12.1	1.0
12.0	1.25
11.9	1.5
11.8	1.75
11.7	2.0
11.6	2.25
11.0 to 11.6	2.5
Below 11.0	Use slow charge



WARNING : *Check the battery frequently as the high charging current can cause a rapid rise in temperature. Stop the charging process if the temperature reaches 60°C (140° F).*



CAUTION : *To avoid deterioration of the battery, do not exceed the charging time specified in the table.*

6. Set the battery charger to OFF. Disconnect the cable from the battery. Make sure you disconnect the (+) positive cable first.
7. Load test the battery. Refer to 4003-10.
Voltage above 10V - refit battery to the machine. Refer to 4003-6.
Voltage below 10V - charge battery using the standard charge procedure. Refer to 4004-8.
8. If required, install the battery. Refer to 4003-6.

Boost charging of the battery

Special tools

Battery charger - with an output of 60A.

Charge procedure



CAUTION : *Boost charging is not recommended. Boost charging may be carried out but the current must be limited to 60A.*



CAUTION : *Parallel charging is not recommended, therefore on machines fitted with twin batteries, charge each one individually.*

Boost charge the battery as follows :

1. Remove the battery from the machine. Refer to 4003-5.
2. Remove the vent manifolds from the battery.
3. Connect the battery charger to the battery. Make sure the polarity of the connections is correct and connect the (+) positive cable first.
4. Set the battery charger to ON.
5. Limit the battery charge to the minimum period required for the battery to start the engine.



WARNING : *Check the battery temperature frequently as the high charging current can cause a rapid rise in temperature. Stop the charging process if the temperature reaches 60°C (140° F).*

6. Set the battery charger to OFF. Disconnect the cables from the battery. Make sure you disconnect the (+) positive cable first.
7. Install the vent manifolds on the battery.
8. Install the battery. Refer to 4003-6.

Load testing of the battery

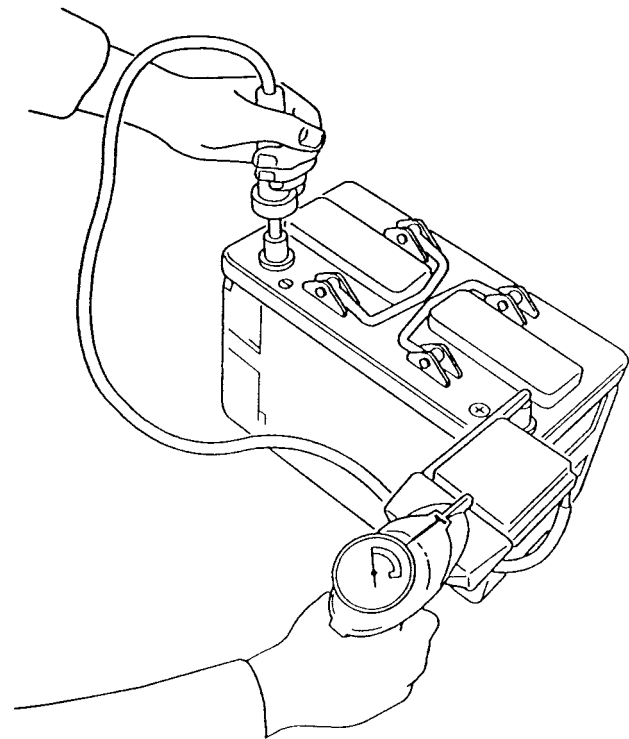
Test equipment

Current controlled, high rate discharge tester - with at least 500A capacity.

Digital voltmeter

Load test the battery as follows :

1. Remove the battery from the machine. Refer to 4004-5.
2. Set the appropriate current on the discharge tester :
CURRENT FOR SINGLE BATTERY 295A
CURRENT FOR TWIN BATTERY 410A
3. Connect the voltmeter across the battery terminals.
4. Apply the load tester across the battery terminals for 15 seconds and note the voltage during the test.
Above 10V and steady battery is serviceable
Above 10V but falling rapidly replace battery
Below 10V replace battery
5. If required, install the battery. Refer to 4003-6.



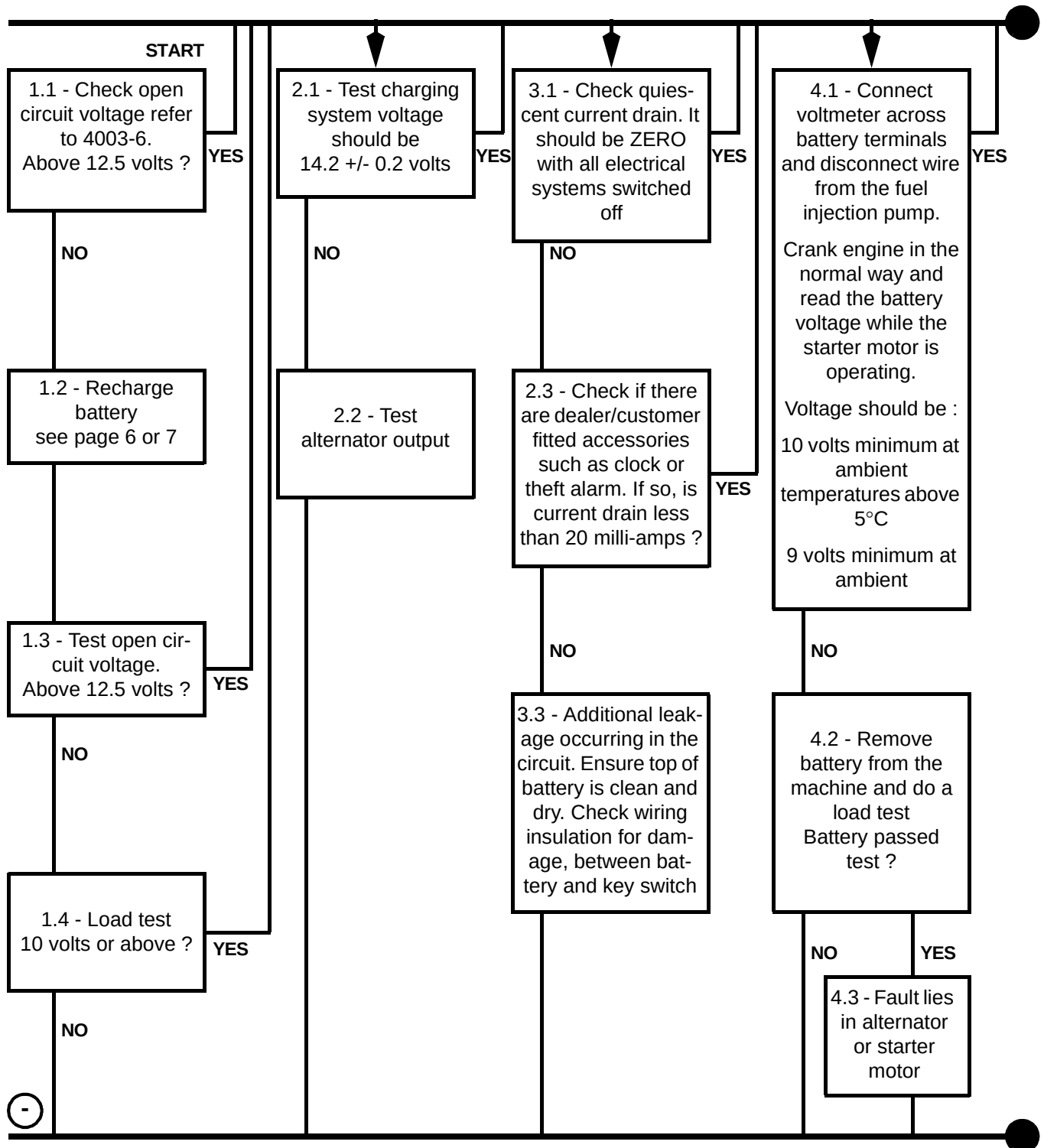
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Diagnostic test with the battery still on the machine

Fault : Battery performance seems poor

Proceed with battery test →

Test complete. Battery OK



Section

4004

STARTER MOTOR

4004

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WARNING : *This symbol is used in this manual to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

Special tools

0 - 20 V DC voltmeter

0 - 150 A ammeter

Mechanical tachometer 0 - 10,000 rev/min.

Tightening Torques

	Nm	lbf ft
Solenoid main 'BAT' terminal M8 stud	6.0	4.5
Cable fixing nut M10 stud	12.0	9.0
Solenoid terminal M8 nut	6.0	4.5
Solenoid terminal M10 nut	12.0	9.0
Starter terminal 1/4 BSF nut	4.0	3.0
Solenoid end-cover screws	2.0	1.5
Solenoid unit screws	6.0	4.5
Brush-plate screws	7.0	5.0
Starter earth nuts	8.0	6.0
Pole shoes fixing screws	41.0	30
Through bolts	11.0	8.0
Eccentric pivot pin lock-nut	20.0	15.0

Specifications

Pilot diameter	12.71 mm (0.5 in)
Light running speed	5500 - 8000 rev/min.
Light running current/voltage	115A at 11V
Pinion end clearance when engaged	0.13 - 1.14 mm (0.005-0.045 in)
New brush length	28.51 mm (1.226 in)
Renew brushes at	8 mm (0.3 in)
Spring pressure in workint position with new brushes	11.6 N (42 oz.)

Removing and installing the starter motor

Removing the starter motor

Remove the starter motor as follows:

1. Disconnect the battery see section 4003.

NOTE : *Make sure the key is removed from the start switch on the side console.*

2. Open the hood.
3. Remove the protective cover (13), the nut (12) and the cover (14) from the solenoid (4).
4. Note the installed positions of the electrical cables (9) and (17).

5. Remove the nut (11), the washer (10) and disconnect the four electrical cables (9) from the starter motor (8).
6. Remove the two nuts (15), the two washers (16) and disconnect the three electrical cables (17) from the solenoid (4).
7. Attach the electrical cables (9) and (17) to the structure of the engine with temporary ties.
8. Support the starter motor (8) and solenoid (4). Remove the three nuts (7) and the "P-clip" mounting bracket (6) from the studs (5).
9. Slide the starter motor (8) together with the solenoid (4) from the studs (5) and remove from the engine.
10. Put a warning sign in the cab to tell persons not to start the engine.

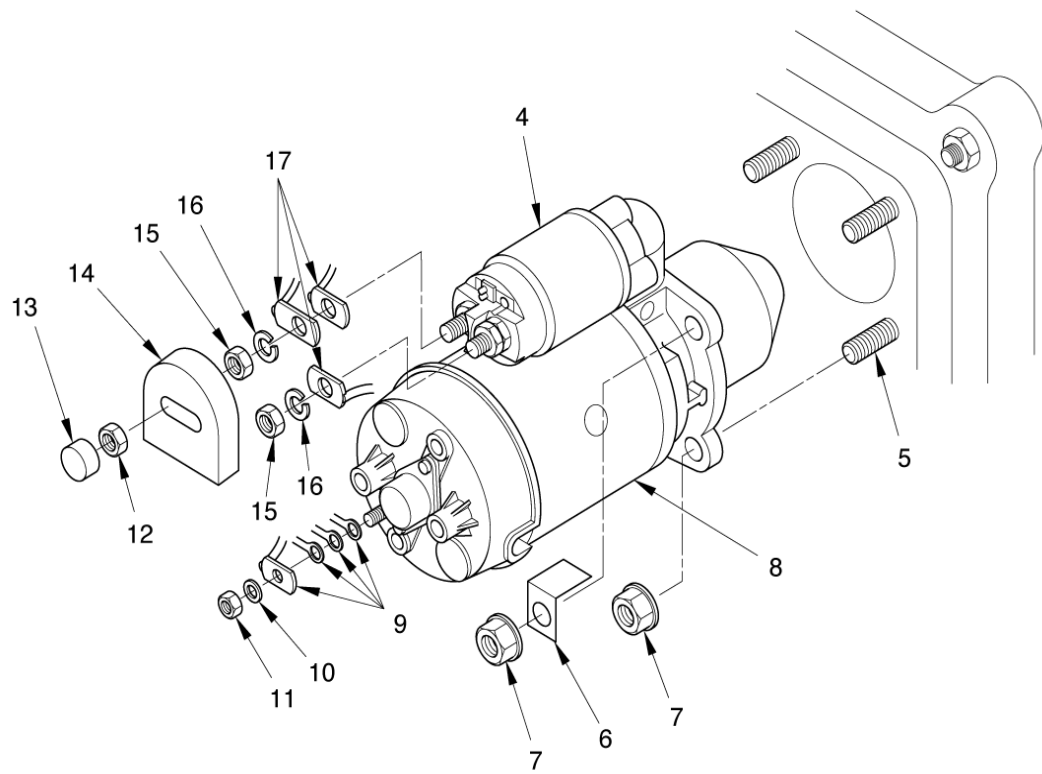
Installing the starter motor

NOTE : *The installation of the starter motor is the reverse of the removal.*

Install the starter motor in the reverse order of the removal but note the following:

1. Torque tighten the nuts (12): 12 Nm.
2. Torque tighten the nut (11): 6 Nm.
3. After installation do the following tests:
 - The battery voltage under load test, refer to page 7.
 - The starter motor terminal voltage under load test, refer to page 8.
 - The voltage drop on the insulated line test, refer to page 8.
 - The voltage drop across solenoid contact refer to page 9.

The voltage drop in earth line test, refer to page 10.



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Disassembling the starter motor

Disassemble the starter motor as follows:

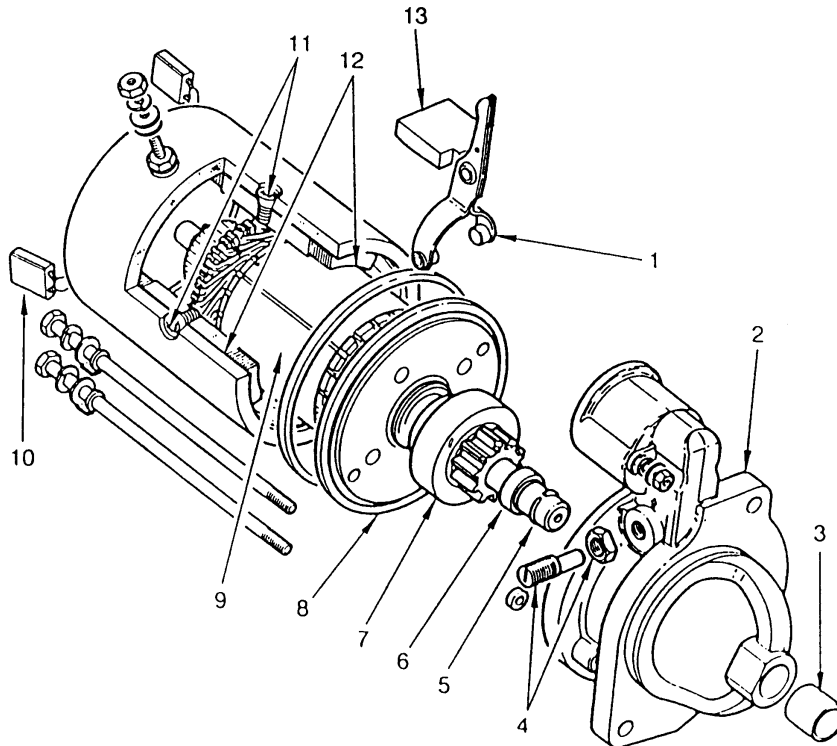
1. Remove the starter motor, refer to page 4.
2. Remove the solenoid assembly, refer to page 14.
3. Remove the end-cover, refer to page 12 (steps 3 through 6).
4. Remove the field winding brushes (10) from brush plate.
5. Remove the rubber grommet (13).
6. Slacken the locknut and remove the pivot pin (4). (The pivot is eccentric to the screw thread to allow adjustment of the pinion gear end-clearance).
7. Remove housing (2) and the pinion engagement lever (1).
8. Remove the armature and pinion assembly (9) from the motor body.
9. Use a suitable tube to punch the thrust-collar (6) towards the pinion and expose the snap-ring (5).
10. Remove the snap-ring (5).
11. Remove the thrust-collar (6).
12. Pull the pinion and the roller clutch (7), off the armature shaft.
13. Pull the intermediate plate (8) off the armature shaft.
14. Remove the four screws (11) and carefully pull the field windings (12) from the motor body.
15. Inspect and test the starter motor, refer to page 14.

Assembling the starter motor

NOTE : *The assembly of the starter motor is the reverse of the disassembly.*

Assemble the starter motor in the reverse order of the disassembly but note the following:

1. Apply Shell Retinax "A" grease or its equivalent onto the drive shaft splines, the thrust-collar (6) and the engagement lever (1).



789M049A

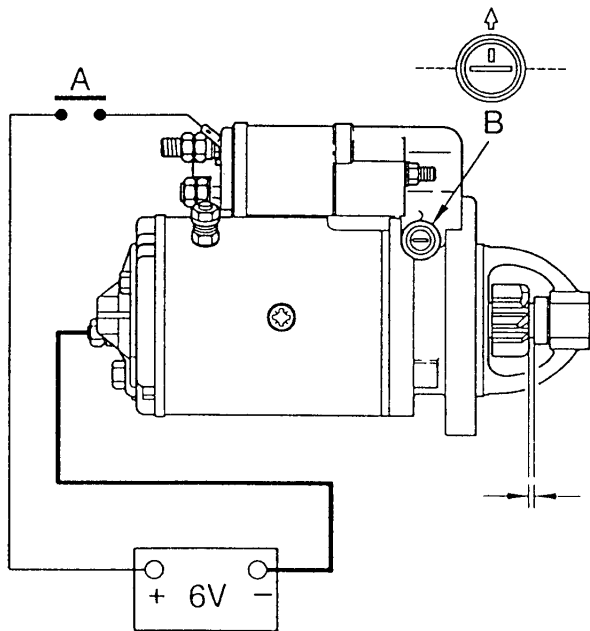
Adjusting the pinion stroke

Adjust the pinion stroke as follows:

1. Remove the starter motor, refer to page 4.
2. Screw the pivot pin (B) fully into the casting and then slacken off one full turn and position the marks on the head as shown.
3. Connect the solenoid to a 6V supply as shown, which will operate the solenoid only.
4. While the solenoid is energized push the pinion lightly, back against the yoke, to eliminate any free play and measure the gap between the pinion end face and the snap ring collar.
5. If necessary, turn the pivot pin (8) to obtain a clearance of 0.13 to 1.14 mm (0.005 to 0.045 in).
6. Tighten the locknut to 20 Nm (15 lbf ft).
7. Install the starter motor, refer to page 4.

Key

- A STARTER SWITCH
B PIVOT PIN



789M051A

Testing the battery voltage under load

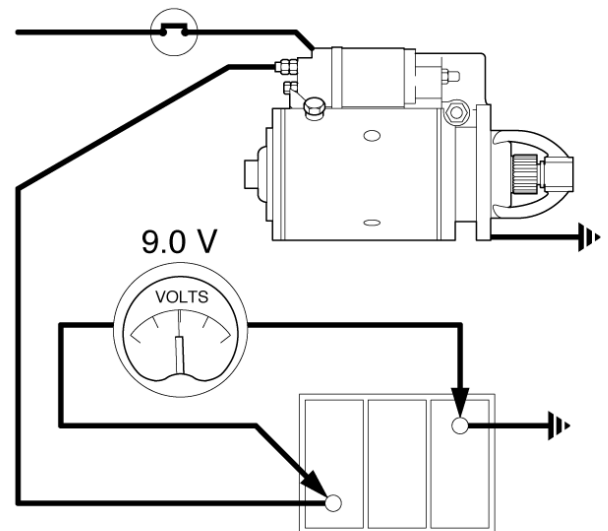
Test equipment

0 to 20 V dc voltmeter

NOTE : This test can be made with the starter motor still installed on the machine.

Do the battery voltage under load test as follows:

1. Check condition of battery or batteries, refer to page 9.
2. Open the hood.
3. Disconnect the wire from fuel injection pump to prevent the engine from starting.
4. Connect the voltmeter across the terminals as shown and with the engine fuel supply cut off, operate the starter.
5. The voltmeter should read approximately 9 V. A low voltage reading indicates excessive current flow in the circuit due to low resistance.
6. Reconnect the wire to the fuel injection pump if no further tests are required.
7. Close the hood.



789M052A

Testing the starter motor terminal voltage under load

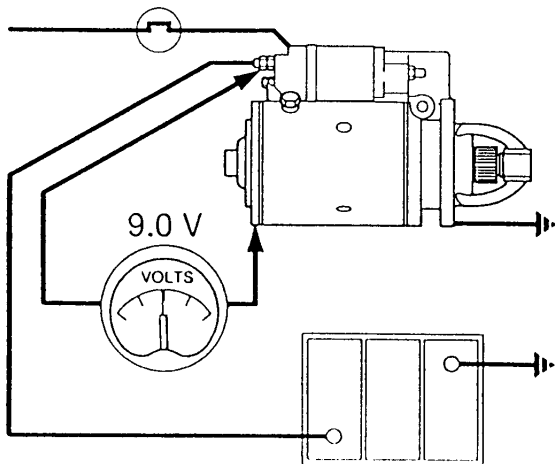
Test equipment

0 to 20 V dc voltmeter

NOTE : This test can be made with the starter motor still installed on the machine.

Do the starter motor terminal voltage under load test as follows:

1. Open the hood.
2. Remove the protective cover (13), the nut (12) and the cover (14), refer to page 4.
3. Disconnect the wire from the fuel injection pump, to prevent the engine from starting.
4. Connect the voltmeter between the starter input terminal and earth (end bracket). Crank the engine with the fuel cut off. The voltmeter reading should not be more than 0.5 V lower than in the battery voltage under load test, refer to page 7.
5. A low reading (more than 0.5 V difference between tests 1 and 2) indicates high resistance in cables or contacts.
6. High readings indicate high resistance in the starter motor itself.
7. Reconnect the wire to fuel injection pump if no further tests are required.
8. Install the cover (14), the nut (12) and the protective cover (13), refer to page 4.
9. Close the hood.



789M053A

Testing the voltage drop on the insulated line

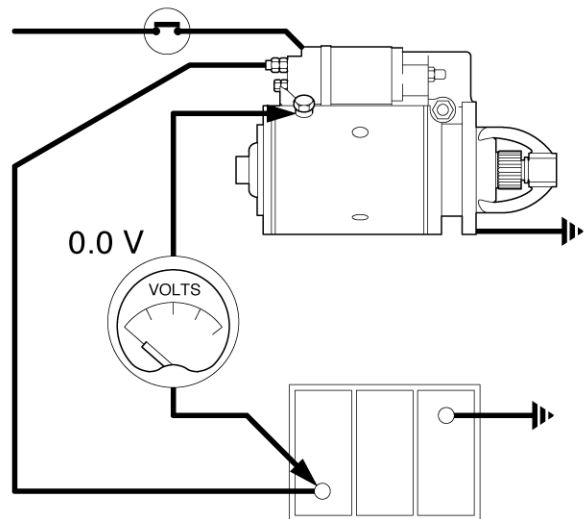
Test equipment

0 to 20 V dc voltmeter

NOTE : This test can be made with the starter motor still installed on the machine.

Do the voltage drop on the insulated line as follows:

1. Open the hood.
2. Connect the voltmeter between the starter terminal and the battery terminal.
3. When the starter switch is open, the voltmeter should register battery voltage. When the starter switch is closed, the voltmeter should read practically zero.
4. A high voltmeter reading indicates a high resistance in the starter circuit. Check all the insulated connections.
5. Do the voltage drop across the solenoid contacts test, refer to page 9.



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Testing the voltage drop across the solenoid contacts

Test equipment

0 to 20 V dc voltmeter

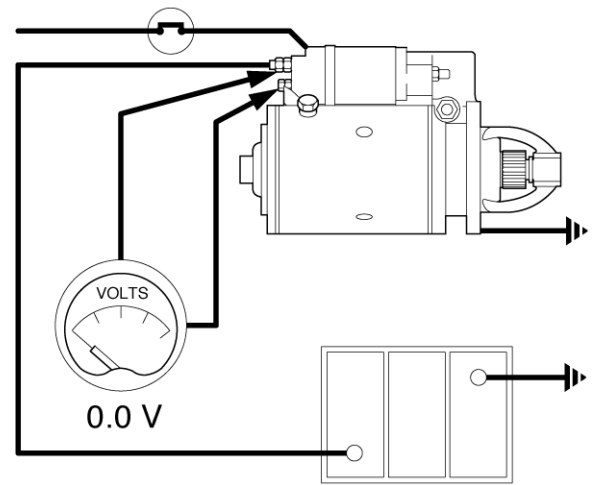
NOTE : *This test can be made with the starter motor still installed on the machine.*

Do the voltage drop across the solenoid contacts test as follows:

1. Remove the protective cover (13), the nut (12) and the cover (14), refer to page 4.
2. Connect the voltmeter across the two main solenoid terminals.
3. When the starter switch is open, the voltmeter should register battery voltage. When the starter switch is closed the reading should be zero or fractional value.
4. A zero or fractional reading indicates that the high resistance deduced in the voltage drop on the insulated line test must be due either to high resistance in the starter cables or soldered connections. A high reading (similar to the voltage drop on the insulated line test) indicates a faulty solenoid or connection, refer to page 8.
5. Install the cover (14), the nut (12) and the protective cover (13), refer to page 4.
6. Close the hood.

Key

- A STARTER SWITCH
B TACHOMETER POSITION



789M055A

Testing the voltage drop in earth line

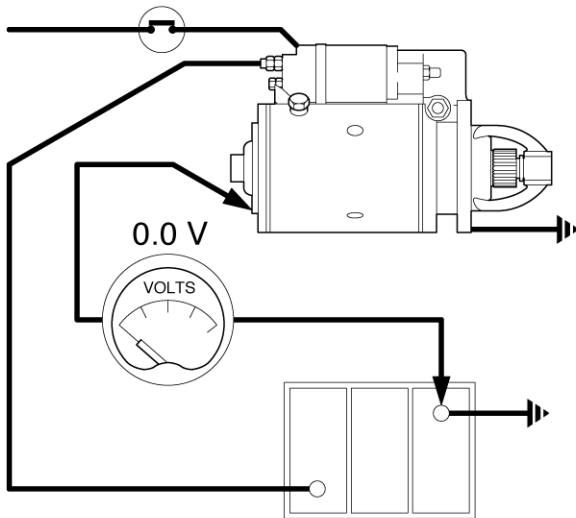
Test equipment

0 to 20 V dc voltmeter

NOTE : This test can be made with the starter motor still installed on the machine.

Do the voltage drop in earth line test as follows:

1. Open the hood.
2. Connect the voltmeter between the battery earth terminal and the starter earth (commutator end bracket).
3. When the starter switch is closed the voltmeter should read practically zero.
4. If reading is high, clean and tighten all earth connections and check bonding strap.
5. Close the hood.



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Testing the no-load current and speed

Test equipment

Test bench

Mechanical tachometer 0 to 10,000 rpm

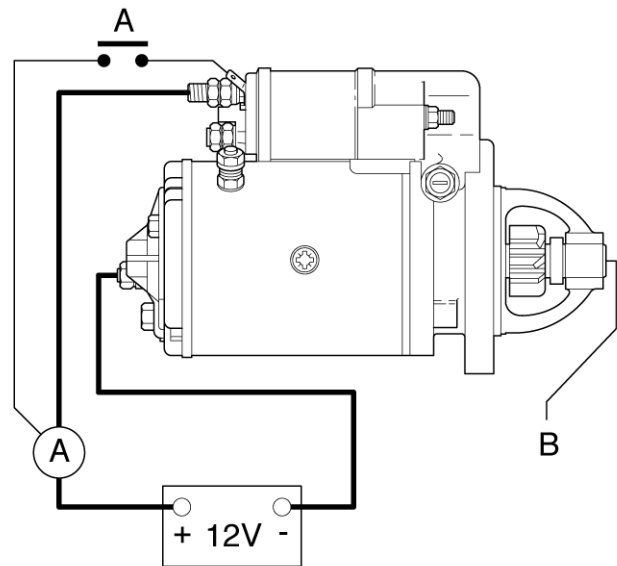
Ammeter up to 150 A capacity

Do the no-load current and speed test as follows:

1. If necessary, remove the starter motor from the machine, refer to page 4.
2. Connect an ammeter in circuit between the starter solenoid and battery.
3. Hold the tachometer against the end of the pinion shaft and operate the starter switch.
4. Max. current: 115 A at 11 V.
Max. speed: 5500 to 8000 rpm.
Excess current indicates that starter is faulty.
5. If low current is registered, do the continuity of contacts test, refer to page 11.
6. If starter fails to operate and there is no audible operation of solenoid, then connect the ammeter across the "STA" terminal and the battery.

Key

- A STARTER SWITCH
B TACHOMETER POSITION



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7. Operate the starter switch, the starter motor should run, indicating a faulty solenoid which must be replaced.
8. If the starter motor does not run, the motor itself is faulty.
9. If the starter motor fails to operate but the solenoid operation is audible, do the continuity of contacts test, refer to page 11.

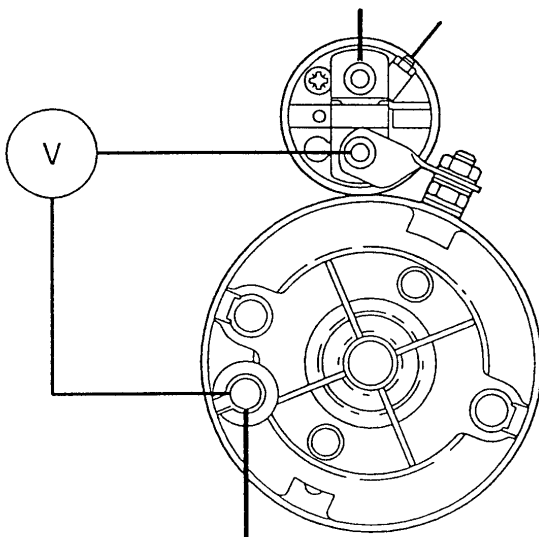
Testing the continuity of contacts

Test equipment

0 to 20 V dc voltmeter

Test the continuity of contacts as follows:

1. Open the hood.
2. Remove the protective cover (13), the nut (12) and the cover (14), refer to page 4.
3. Connect the voltmeter between motor and solenoid negative terminals and operate starter switch.
4. No voltage indicates a faulty solenoid. Replace the solenoid, refer to page 14.



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5. 12 V registered but motor fails to operate indicates faulty motor. Replace the starter motor, refer to page 4.
6. 12 V registered and motor operates, test the voltage drop across the contacts, refer to page 11.

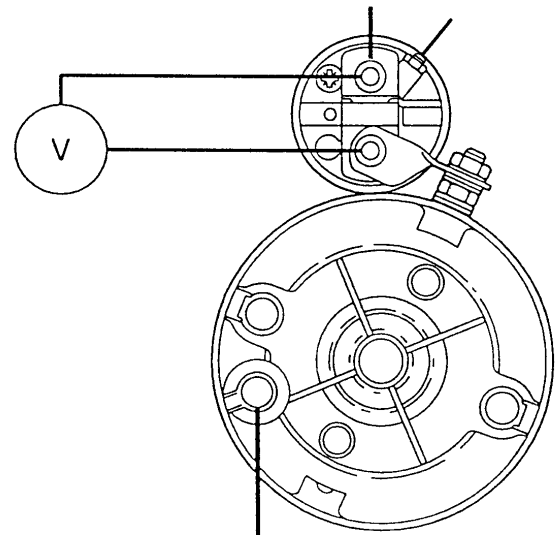
Testing the voltage drop across the contacts

Test equipment

0 to 20 V dc voltmeter

Test the voltage drop across the contacts as follows:

1. Connect the voltmeter across the solenoid terminals and operate starter switch.
2. Voltage across the terminals should be zero, if more, the solenoid is faulty and must be changed, refer to page 13.
3. If solenoid is satisfactory, service the starter motor, refer to page 14.



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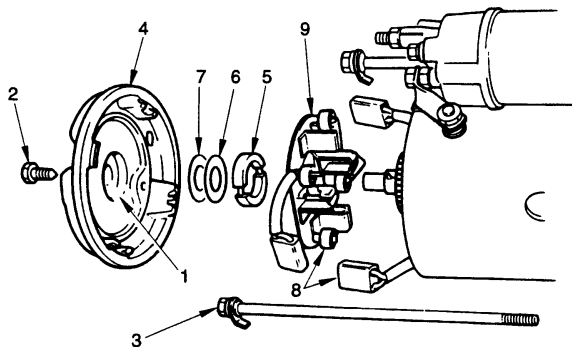
Servicing the end cover and brush carrier

Service the end cover and brush carrier as follows:

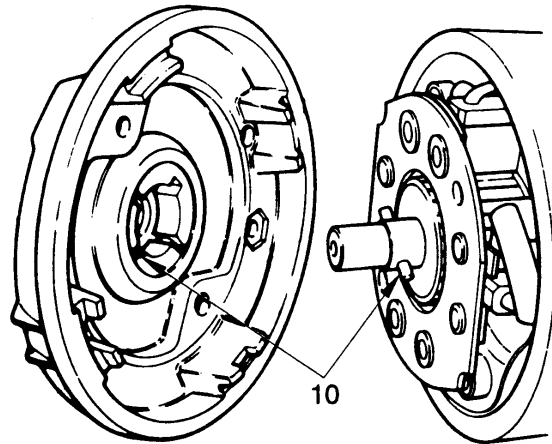
1. Open the hood.

NOTE : *If space within the engine compartment permits the removal of the motor body bolts (3), the end cover can be serviced without removing the starter motor from the engine, provided that the electrical cables to the starter are disconnected.*

2. If the end cover cannot be removed in situ, remove the starter motor, refer to page 4.
3. Remove the end cover securing screws (2), and both long bolts (3).
4. Lift off the cover (4) complete with brake assembly.
5. Remove the brake shoes (5) from the cover (4).
6. Remove the steel washer (6) and fibre washer (7).
7. Lift the springs and disengage the field coil brushes (8).
8. Remove the brush carrier assembly (9).
9. Polish the commutator with 600 to 1200 grade abrasive cloth/paper.
10. Thoroughly clean all components with white spirit and dry with compressed air.
11. Measure the length of the brushes (8). Replace the brushes which are 8 mm (5/16 in) or less in length, refer to page 13.
12. Install the brush carrier assembly (9).



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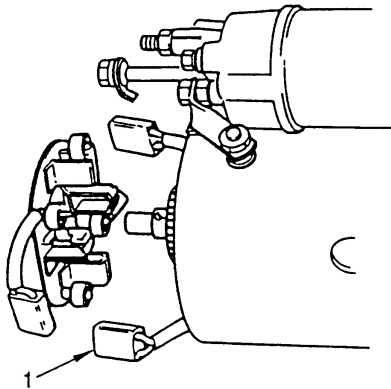
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13. Lift the springs and engage the brushes (8).
14. Test the strength of each brush spring and replace any which exert less than 11.6 N (42 oz.) with new brushes fitted.
15. Install the fibre washer (7), the steel washer (6) and the brake shoes (5) in the cover (4).
16. Turn the armature to position to drive-dogs (10) to engage the brake shoes (5).
17. Install the cover (4), the long bolts (3) and the screws (2).
18. Torque tighten the long bolts (3) to 11 Nm (8 lbf ft).
19. Check the clearance between the armature spindle and the brush (1). If the clearance is noticeable, replace the brush (1), refer to page 13.
20. If necessary, install the starter motor, refer to page 4.
21. Close the hood.

Replacing the starter motor brushes

Replace the brushes as follows:

1. Gain access to the brushes, refer to page 12 (steps 1 through 10).
2. On earth brushes, cut the flexible wires adjacent to the old brushes (1) and solder new brushes on to the flexible wires.
3. On insulated brushes, cut the flexible wires adjacent to the old brushes (1). Open the eyelet on the new brush. Apply a thin coat of solder and crimp the eyelet onto the flexible wire and solder together.
4. Install the cover, refer to page 12 (steps 12 through 21).



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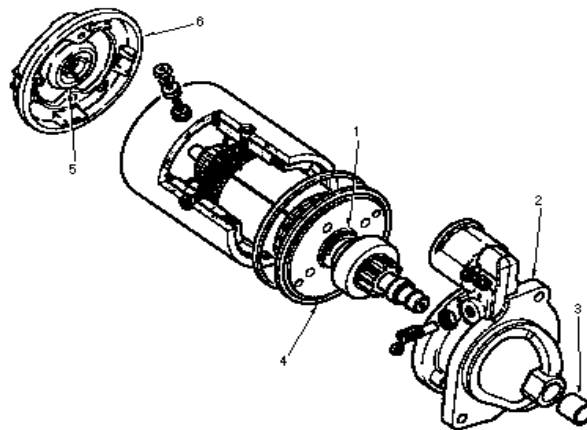
Replacing the bushes in the starter motor

Replace the bushes in the starter motor as follows:

1. Gain access, as necessary to the bush (1), (3) or (5) to be replaced, refer to page 6 or page 12.
2. If the bush (5) in the end cover (6) is to be replaced, remove the bush (5) using a 9/16 in, Whitworth tap.
3. If the bush (1) in the intermediate plate (4) is to be replaced, remove the bush (1) using a drift with a pilot diameter of 28.51 mm (1.226 in).
4. If the bush (3) in the housing (2) is to be replaced, remove the bush (3) using a drift having a pilot diameter of 17.03 mm (0.6705 in).
5. Immerse the replacement bush (1), (3) or (5) in clean engine oil for 24 hours.

NOTE : *The oil absorption time can be reduced by heating the oil to 100°C (212°F) for 2 hours and allowing it to cool before removing the brush. A thermometer is essential to prevent overheating the oil.*

6. Install the bush (5) into the end cover (6) using a drift having a pilot diameter of 12.71 mm (0.5 in).
7. Install the bush (1) into the intermediate plate (4) using a drift having a pilot diameter of 28.51 mm (1.226 in).
8. Install the bush (3) into the housing (2) using a drift having a pilot diameter of 17.03 mm (0.6705 in).
9. Assemble the starter motor as necessary, refer to page 6 or 12.

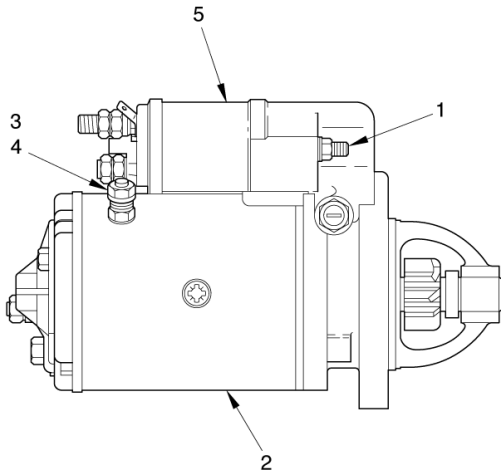


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Removing the starter motor solenoid

Remove the starter motor solenoid as follows:

1. Remove the starter motor, refer to page 4.
2. Remove the two nuts (3) and the copper link (4).
3. Remove the two nuts (1) which secure the solenoid (5) to the starter motor (2).
4. Remove the solenoid body (5).
5. Remove the solenoid plunger from the engagement lever.



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Installing the starter motor solenoid

NOTE : The installation of the starter motor solenoid is the reverse of the removal.

Install the starter motor solenoid in the reverse order of the removal but note the following:

1. Torque tighten the nuts (1), refer to page 3.
2. Torque tighten the nuts (3), refer to page 3.

Inspecting and testing the starter motor

Test equipment

110 volt insulation tester or ohmmeter

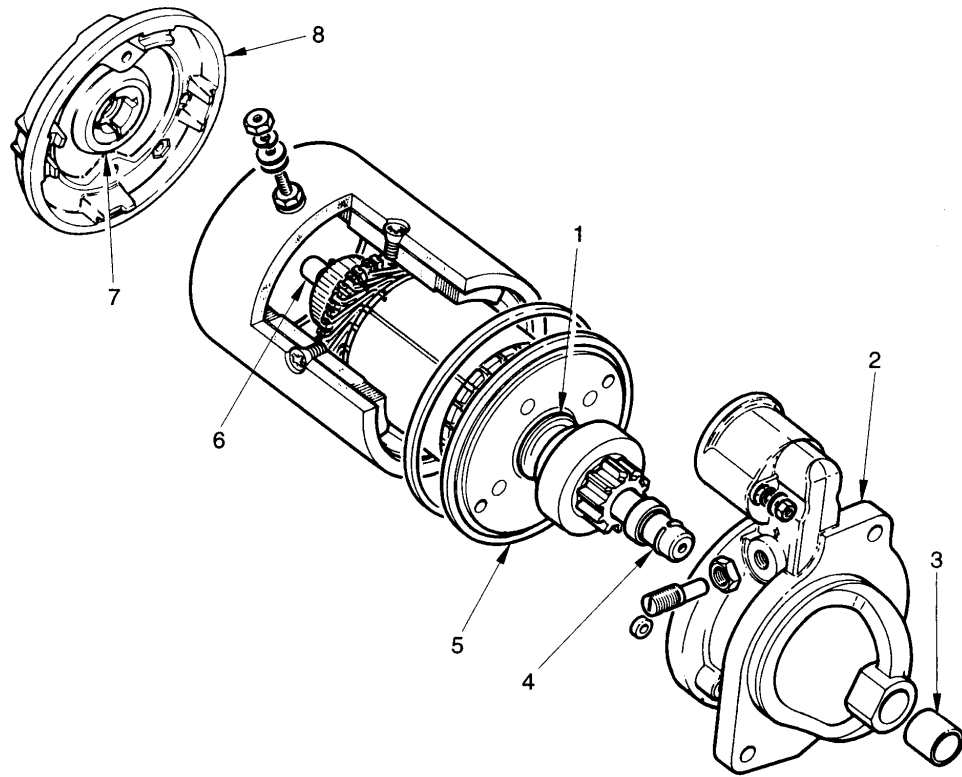
Inspect and test the starter motor as follows:

1. Inspect the bush (7) in the alternator cap (8). If the clearance between the bush (7) and the shaft (6) is noticeable, replace the bush (7), refer to page 13.
2. Partially disassemble the starter motor, refer to page 6 (steps 1 through 6).
3. Inspect the bush (3) in the drive housing (2). If the clearance between the bush (3) and the shaft (4) is noticeable, replace the bush (3), refer to page 13.
4. Continue to disassemble the starter motor, refer to page 6 (steps 7 through 12).
5. Inspect the bush (1) in the intermediate plate (5). If the clearance between the bush (1) and the shaft (4) is noticeable, replace the bush (1), refer to page 13.
6. Complete the disassembly of the starter motor, refer to page 6 (steps 13 and 14).
7. Use a 110 V insulation tester or ohmmeter, to check the insulation of the electrical components (steps 8 through 10).

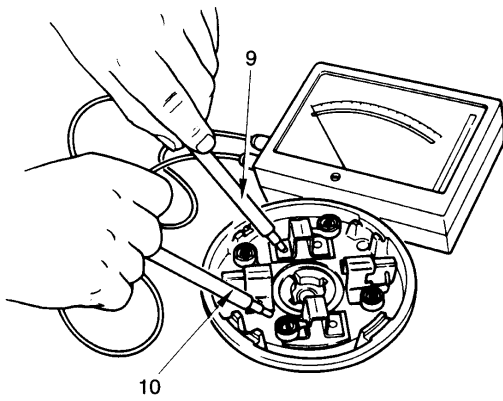


WARNING : Only trained electrical personnel must do these checks.

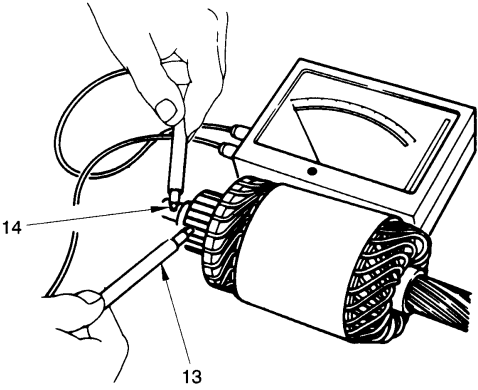
8. Touch one test probe (9) onto an insulated brush holder and the other (10) on an unpainted part of the carrier plate, refer to page 15. The ohmmeter must read infinity, as no current should pass between the probes. If the meter reads less than infinity, replace the brush holder.
9. Touch one probe (11) on the field terminal, the other (12) on a clean part of the motor body, but ensure neither brush touches the body, refer to page 15. The ohmmeter must read infinity, if the meter indicates less than infinity the field coils are shorting and must be replaced.
10. Touch one probe (14) onto the armature shaft, the other probe (13) onto a commutator segment, refer to page 15. The ohmmeter must read infinity. If the meter indicates less than infinity, the armature must be replaced.
11. Assemble the starter motor, refer page 6.



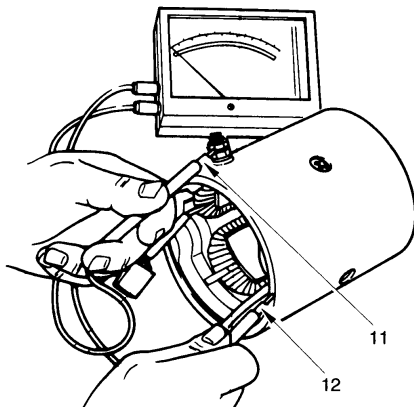
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Section

4005

**REMOVAL AND INSTALLATION
OF ELECTRICAL COMPONENTS**

4005

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

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WINDSCREEN WIPER MOTOR MAINTENANCE

Removing the front windscreen wiper motor

Remove the front windscreen wiper motor as follows :

1. On the front console, set the front windscreen wiper switch to the off position (parked).
2. Pull back the spring-loaded cover (1) of the wiper arm (2).
3. Remove the nut (3) and the lock washer (4).
4. Remove the wiper arm (2) and the wiper blade (5).
5. Pull down the visor for access.
6. Remove the screws and the washers of the front roof console. Move the front roof console to access the wiper motor (9).
7. Disconnect the washer tube from the rear of the washer jet. Blank off the washer tube.
8. Disconnect the electrical connector (6) from the harness.
9. Remove the nuts (7) and (8).
10. Carefully pull the drive shaft of the wiper motor through the grommet (10).
11. Note the position of the nut (11) on the drive shaft of the wiper motor (9).

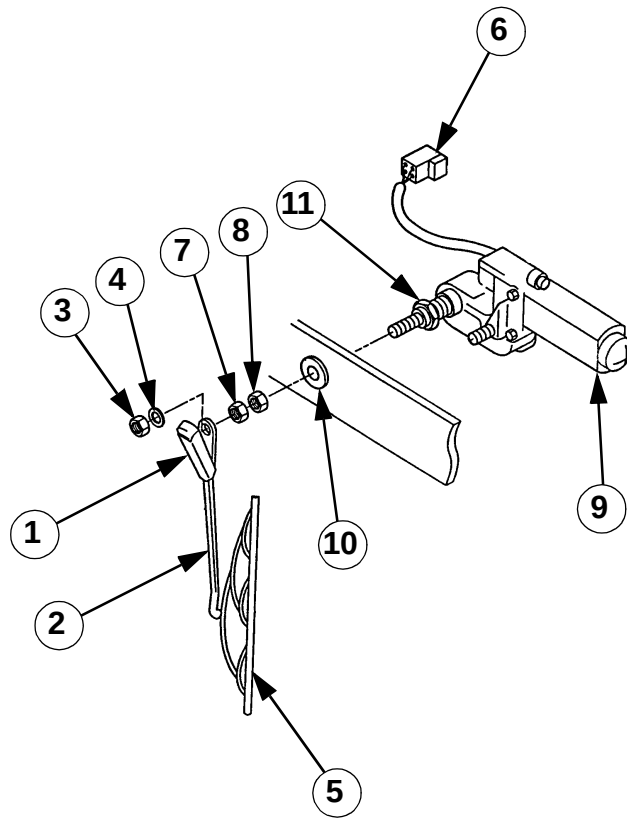
Installing the front windscreen wiper motor

NOTE : *The installation of the front windscreen wiper motor is the reverse of the removal.*

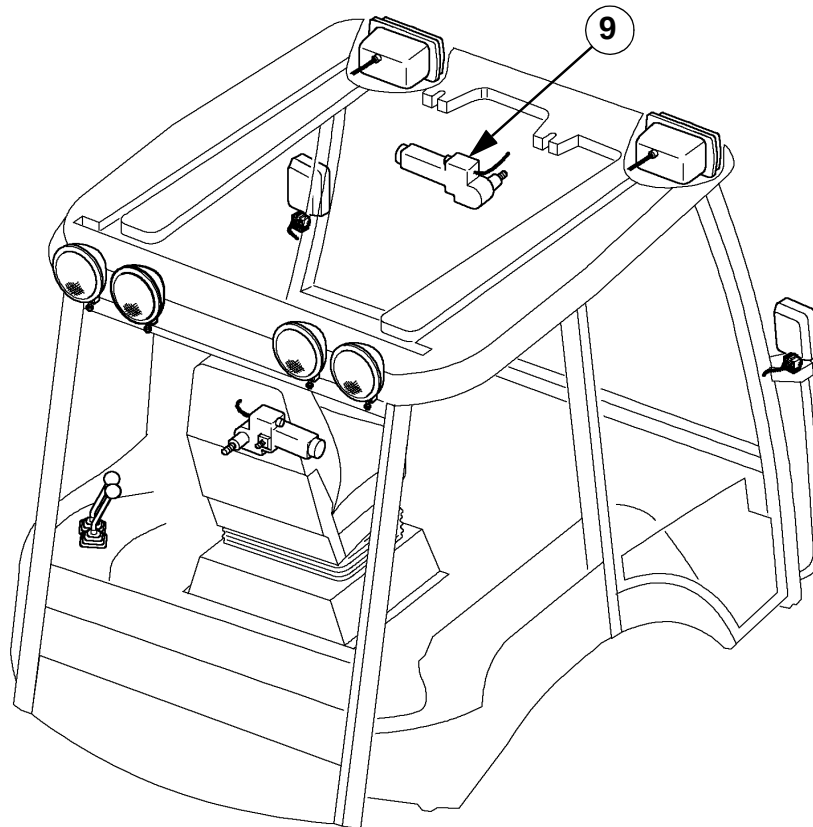
Install the front windscreen wiper motor in the reverse order of the removal but note the following :

1. After installation, check the operation and range of movement of the front windscreen wiper.

NOTE : *To prevent damage to the wiper blade (5), do not operate the windscreen wiper over a dry windscreen.*



CS98J549



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Removing the rear windscreen wiper motor

Remove the rear windscreen wiper motor as follows :

1. On the side console, set the rear windscreen wiper switch to the off position (parked).
2. Pull back the spring-loaded cover (7) of the wiper arm (8).
3. Remove the nut (6) and the lock washer (5).
4. Remove the wiper arm (8) and the wiper blade (9).
5. Remove the screws (15) and the cover (14).
6. Disconnect the electrical connector (16) from the harness.
7. Remove the cap nut (20), the washer (19) and the plastic washer (18).
8. Remove the nuts (4) and (3), the washer (2) and the plastic washer (1).
9. Remove the wiper motor (13) and the bracket (12).
10. Remove and discard the gasket (10).
11. Remove the screws (11) and remove the bracket (12) from the wiper motor (13).

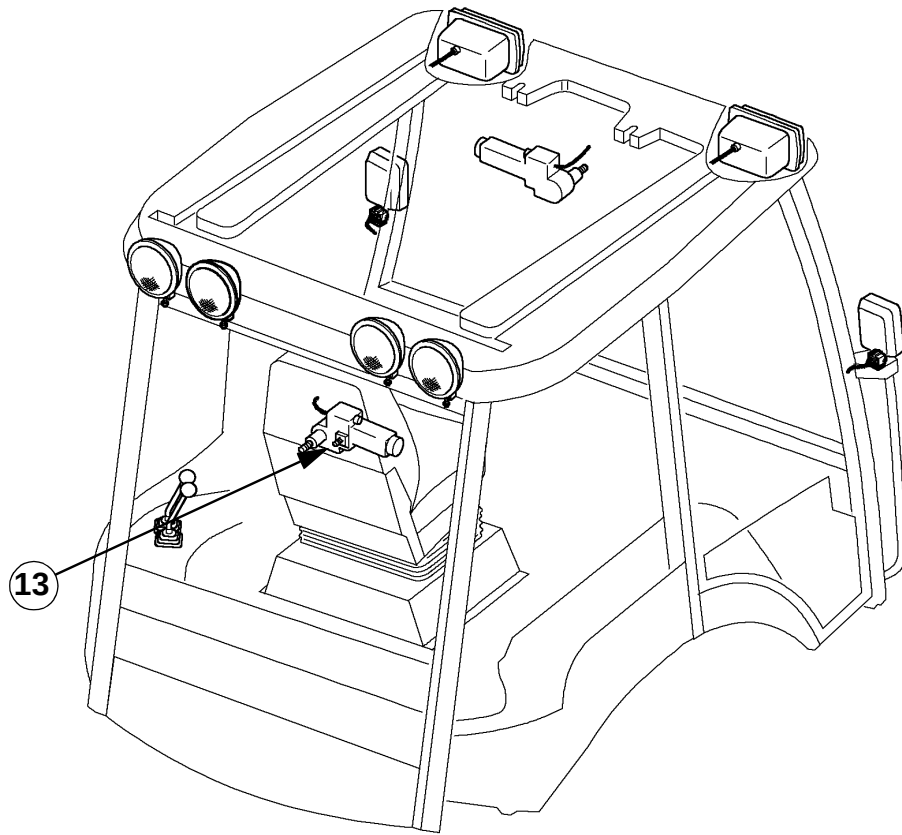
Installing the rear windscreen wiper motor

NOTE : *The installation of the rear windscreen wiper motor is the reverse of the removal.*

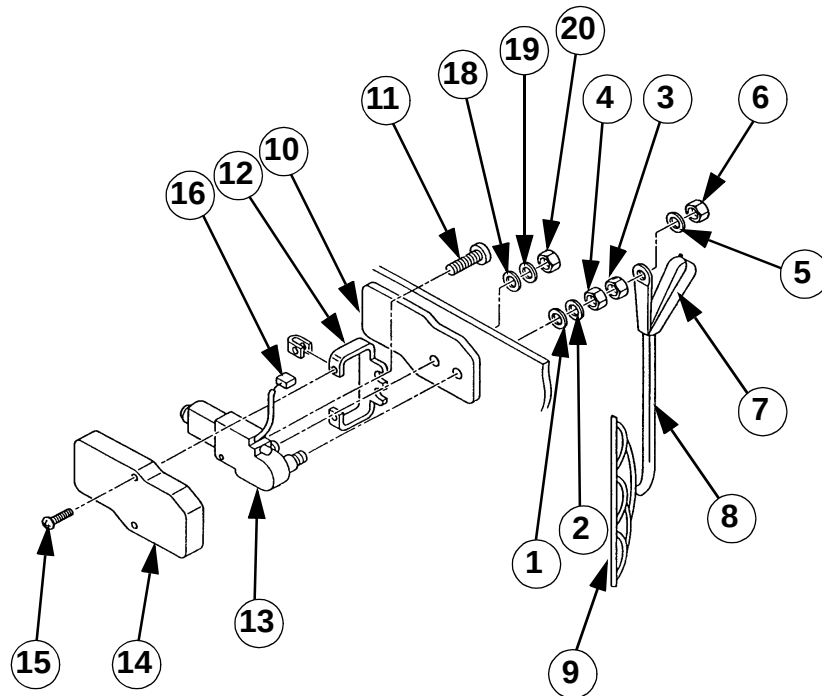
Install the rear windscreen wiper motor in the reverse order of the removal but note the following :

1. After installation, check the operation and the range of movement of the rear windscreen wiper.

NOTE : *To prevent damage to the wiper blade (9), do not operate the windscreen wiper over a dry windscreen.*



CI98J516



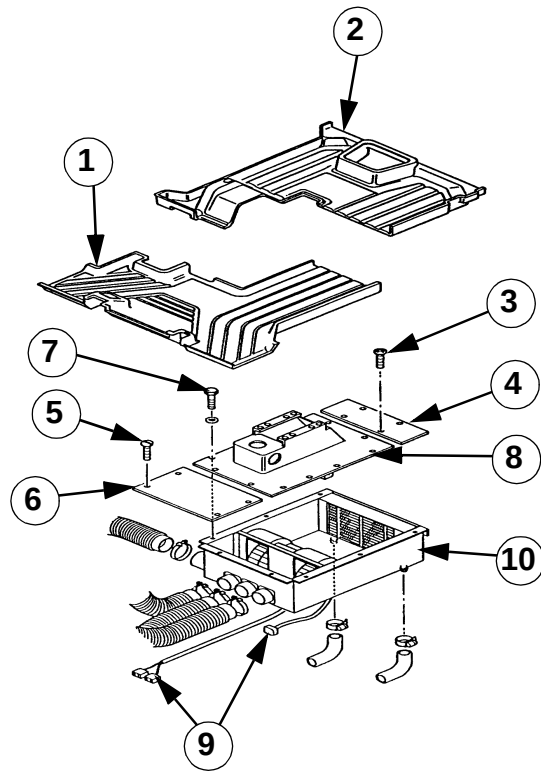
CS98J550

CABIN HEATER MAINTENANCE

Removing the cabin heater

Remove the cabin heater as follows :

1. Remove the seat. (See Section 9009).
2. Remove the floor mats (1) and (2).
3. Remove the screws (3) and the floor plate (4).
4. Remove the screws (5) and the floor plate (6).
5. Remove the screws (7) and the floor plate (8).
6. Place a container below the heater.
7. Remove the hose clips and disconnect the hoses.
8. On the heater disconnect the two electrical connectors (9).
9. Remove the heater (10) from the machine.



CS98J552

Installing the cabin heater

NOTE : *The installation of the cabin heater is the reverse of the removal.*

Install the cabin heater in the reverse order of the removal but note the following :

1. After installation, operate the cabin heater system. Make sure the hoses do not leak.

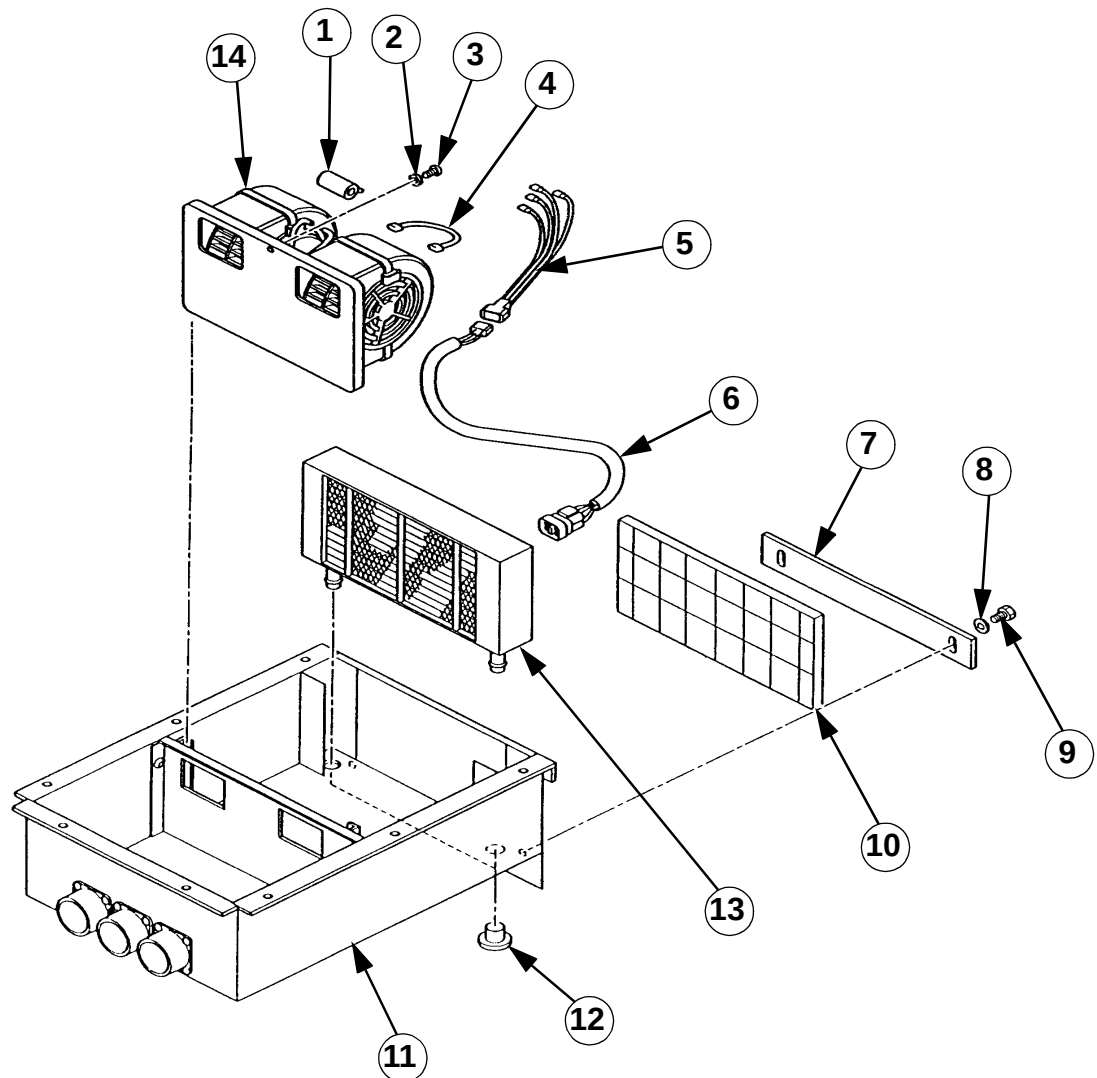
Disassembling the cabin heater

Disassemble the cabin heater as follows :

1. Remove the cabin heater from the machine.
2. Remove the screws (9), the washers (8) and the retaining plate (7).
3. Remove the filter (10) from the lip of the heater box (11).
4. Carefully lift the radiator (13) from the heater box (11) and remove the grommets (12).
5. Disconnect the harness (6) from the harness (5).
6. Note the positions of the wires of the harness (5) and the lead (4).
7. Disconnect the lead (4) from the resistor (1) and the blower motor (14).
8. Disconnect the wires of the harness (5) from the resistor (1) and the blower motor (14).
9. Release the clip (15) and remove the resistor (1).
10. Remove the screw (3) and the washer (2).
11. Carefully lift the blower motor (14) from the heater box (11).

Assembling the cabin heater

NOTE : The assembly of the cabin heater is the reverse of the disassembly.



WORKLIGHT MAINTENANCE

Removing a front worklight

NOTE : *The information given is applicable to the front left worklight. The procedure for the front right worklight is identical to the front left worklight. Front right worklight components are identified in parentheses after the front left worklight components.*

Remove a front worklight as follows :

1. Remove the screw (1).
2. Release the worklight (2), (3) from the structure.
3. Disconnect the electrical connector (4).
4. Remove the worklight, from the machine.

Installing a front worklight

NOTE : *The installation of a front worklight is the reverse of the removal.*

Install a front worklight in the reverse order of the removal but note the following.

1. After installation, on the side console, operate the front worklight switch. Make sure the front worklights (2) and (3) operate correctly.
2. To adjust the directional angle of the worklight, loosen or tighten screws (5).

Removing a rear worklight

NOTE : *The information given is applicable to the rear left worklight. The procedure for the rear right worklight is identical to the rear left worklight. Rear right worklight components are identified in parentheses after the rear left worklight components.*

Remove a rear worklight as follows :

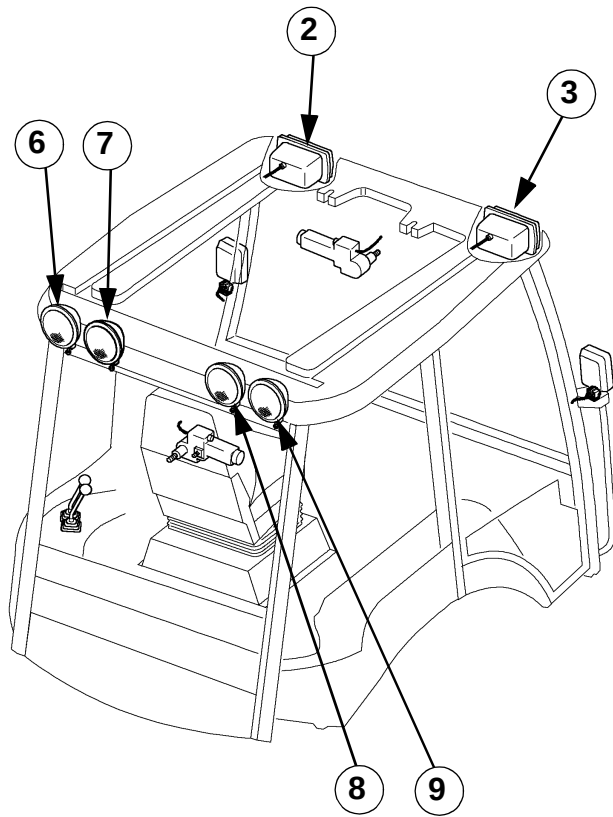
1. Support the worklight (6), (7), (8), (9) and remove the screws (10), the washer (11) and the nut (12).
2. Disconnect the electrical connector (14).
3. Remove the worklight (6), (7), (8), (9) from the machine.

Installing a rear worklight

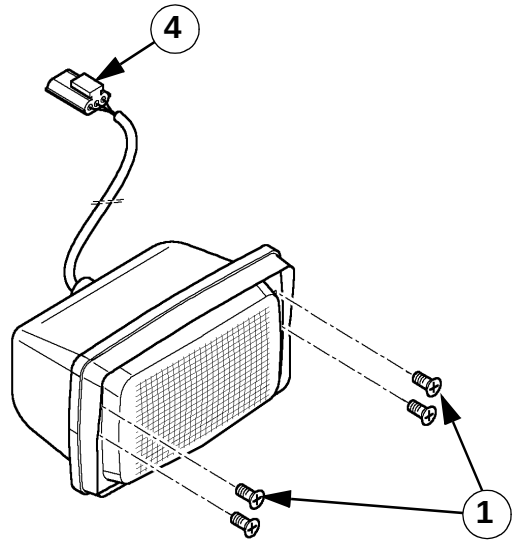
NOTE : *the installation of the rear worklight is the reverse of the removal.*

Install a rear worklight in the reverse order of the removal but note the following :

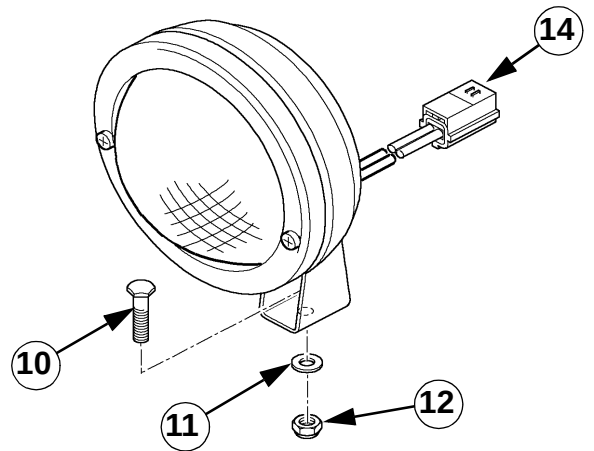
1. After installation on the side console, operate the rear worklight switch. Make sure the rear worklights operate correctly.
2. If necessary, loosen the nut and set the angle of the worklight (6), (7), (8), (9) to the required position and tighten the nut.



CI98J516



CI98J517



CI98J521

Replacing a bulb in a front worklight (A)

Replace a bulb in a front worklight as follow :

1. Make sure the applicable front worklight (A) is set to off.
2. Remove the screws (1).
3. Disconnect the electrocal connector (2).
4. Disengage the rubber cover (3).
5. Remove the screw (4), separate the reflector (5) and the cover (6).
6. Hold the replacement bulb (7) or (8) in a clean cloth or paper tissue, connect the electrical leads. Install the bulb (7) or (8) in the reflector (5).

NOTE : *You must not touch the quartz halogene bulbs. Fingerprints will blacken the bulb and reduce the light output.*

7. Put the reflector (5) and the cover (6) in position and install the screw (4).
8. Install the rubban cover (3).
9. Connect the electrical connector (2).
10. Install the front light (A) to the structure.
11. Set the applicable front worklight switch to on. Make sure the applicable front worklight comes on. Set the applicable front worklight switch to off. Make sure the applicable front worklight goes out.

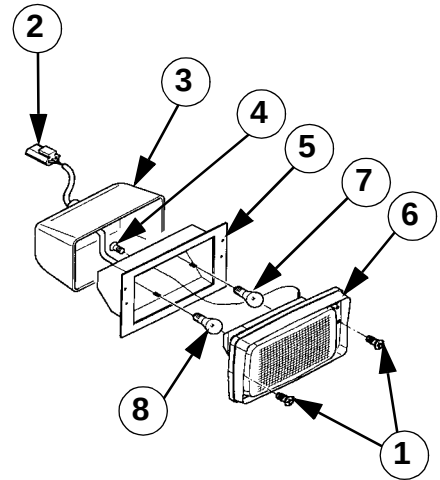
Replacing a bulb in a rear worklight (B)

Replace a bulb in a rear worklight as follow :

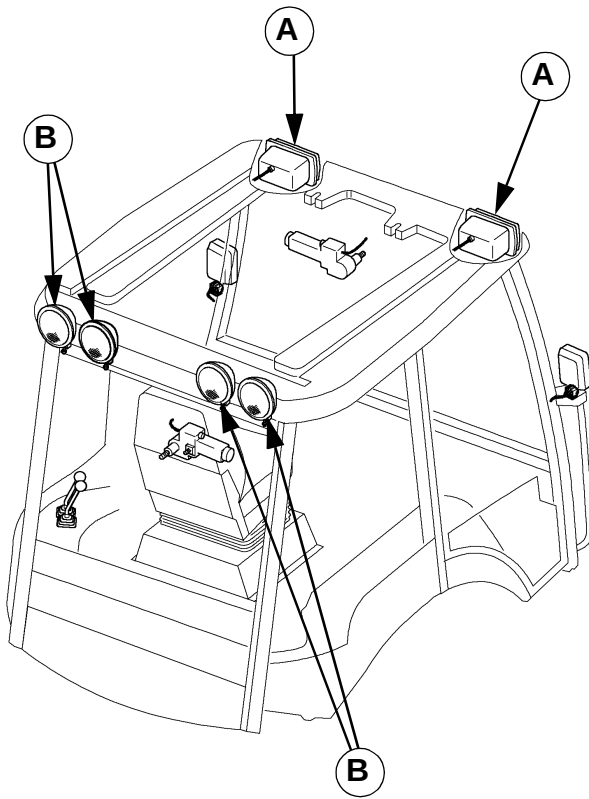
1. Make sure the applicable rear worklight (B) is set to off.
2. Remove the screw (9) and the reflector (10).
3. Hold the replacement bulbs (11) in a clean cloth or paper tissue, connect the electrical leads. Install the bulb (11) in the reflector (10).

NOTE : *You must not touch the quartz halogen bulbs. Fingerprints will blacken the bulbs and reduce the light out put.*

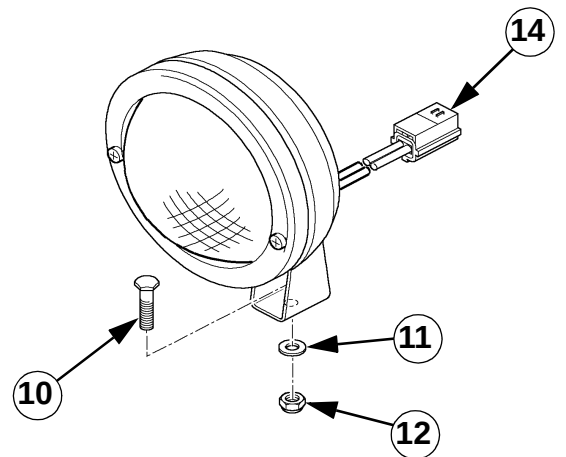
4. Put the reflector (10) in position and install the screws (9).
5. Set the applicable rear worklight switch to on. Make sure the applicable rear worklight come on. Set the applicable rear worklight switch to off. Make sure the applicable rear worklight goes out.



CS98E520



CI98J516



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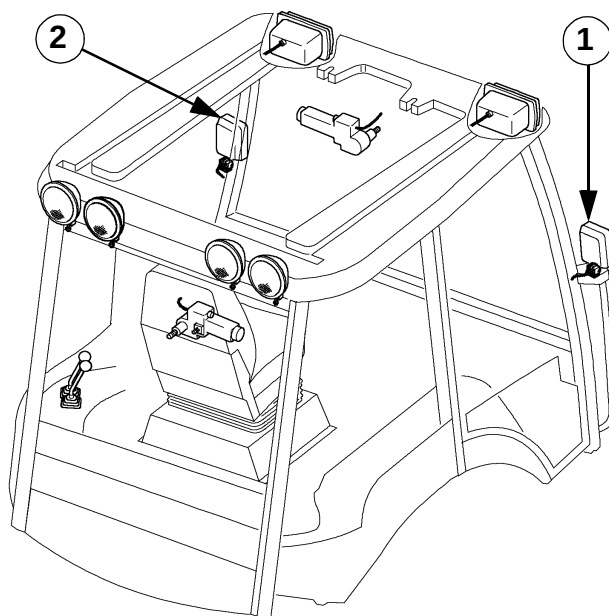
FRONTLIGHT MAINTENANCE

Removing a frontlight

NOTE : The information given is applicable to the left frontlight. The procedure for the right frontlight is identical to the left frontlight components are identified in parentheses after the left frontlight components.

Remove a frontlight as follows :

1. Support the frontlight (1), (2) and remove the nut (3) and the washer (4).
2. Disconnect the electrical connector (5).
3. Remove the frontlight (1), (2) from the machine.



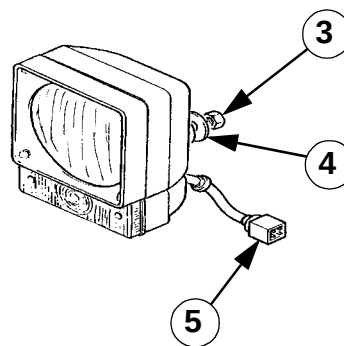
C198J516

Installing a frontlight

NOTE : The installation of a frontlight is the reverse of the removal.

Install a frontlight in the reverse order the removal but note the following.

1. After installation, operate the switch indicator. Make sure the front light (1) and (2) operate correctly.
2. If necessary, loosen the nut (3) and set the angle of the frontlight (1), (2) to the required position and tighten the nut (3).



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Replacing a bulb in a frontlight

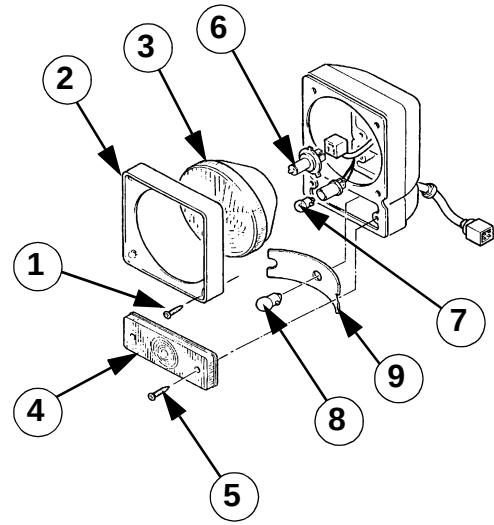
NOTE : *This information is applicable to all frontlight.*

Replace a bulbs in frontlight as follows :

1. Make sure the switch indicator is set to off.
2. Remove the screws (1), the bezel (2) and the reflector (3).
3. Remove the screws (5) and the lens (4).
4. Hold the replacement bulb dip beam/main beam (6) in a clean cloth or paper tissue, connect the electrical lead. Install the bulb (6) in the reflector (3).
5. Hold the replacement bulb light front (7) or the bulb turn indicator (8) in a clean cloth or paper tissue, install the bulb (7) in a reflector (3) and the bulb (8) in a reflector (9).

NOTE : *You must not touch the quartz halogene bulbs. Fingerprints will blacken the bulb and reduce the light output.*

6. Put the lens (4) in position and install the screw (5).
7. Put the reflector (3) and the bezel (2) and install the screws (1).
8. Set the switch indicator to on. Make sure the dip beam, main beam, light and turn indicator comes on. Set the switch indicator to off. Make sure the dip beam, main bam, light and turn indicator goes out.



CS98E523

REARLIGHT MAINTENANCE

Removing a rear light

NOTE : *The information given is applicable to the left rearlight. The procedure for the right rearlight is identical to the left rearlight.*

Remove a rearlight as follow :

1. Support the rearlight (1) and remove the nut (3) and the washer (2).
2. Disconnect the electrical connector (4).
3. Remove the rearlight (1) from the machine.

Installing a rearlight

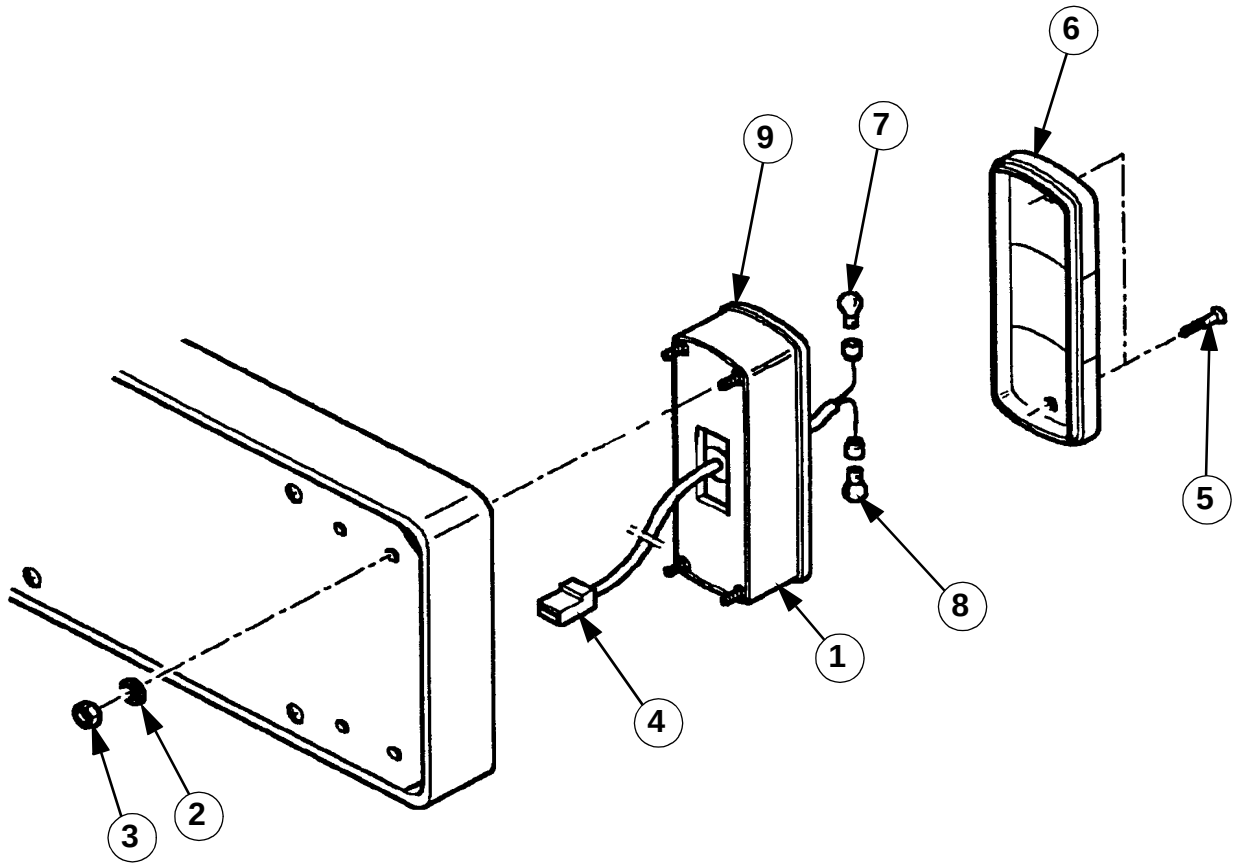
NOTE : *The installation of a rearlight is the reverse of the removal.*

1. After installation, operate the switch operator (light and turn indicator) and the stop light switch (stop light). Make sure the rearlight operate correctly.

Replacing a bulbs in a rearlight

Replace a bulbs in rearlight as follow :

1. Make sure the switch indicator and the stop light are set to off.
2. Remove the screws (5) and the lens (6).
3. Hold the replacement stop and light bulb (8) and turn indicator bulb (7) in a clean cloth or paper tissue, install the bulb (7) and (8) in the reflector (9).



INSTRUMENTS AND CONTROLS MAINTENANCE

Removing the stalk switch

Remove the stalk switch as follows:

1. Remove the steering wheel.
2. Remove the screws (2).
3. Remove the panel (1) of the steering column (9) to access the stalk switch (3).
4. Remove the screws (8) and the washers (7) and move the stalk switch (3) away from the bracket (6).
5. Note the positions and disconnect the electrical connectors (4) and (5) from the stalk switch (3). Attach the electrical connectors (4) and (5) to the bracket (6) with temporary ties.

Installing the stalk switch

NOTE : *The installation of the stalk switch is the reverse of the removal.*

Install the stalk switch in the reverse order of the removal but note the following:

1. After installation, do an operational check of the functions of the stalk switch (3).

Removing the forward/reverse switch

Remove the forward/reverse switch as follows:

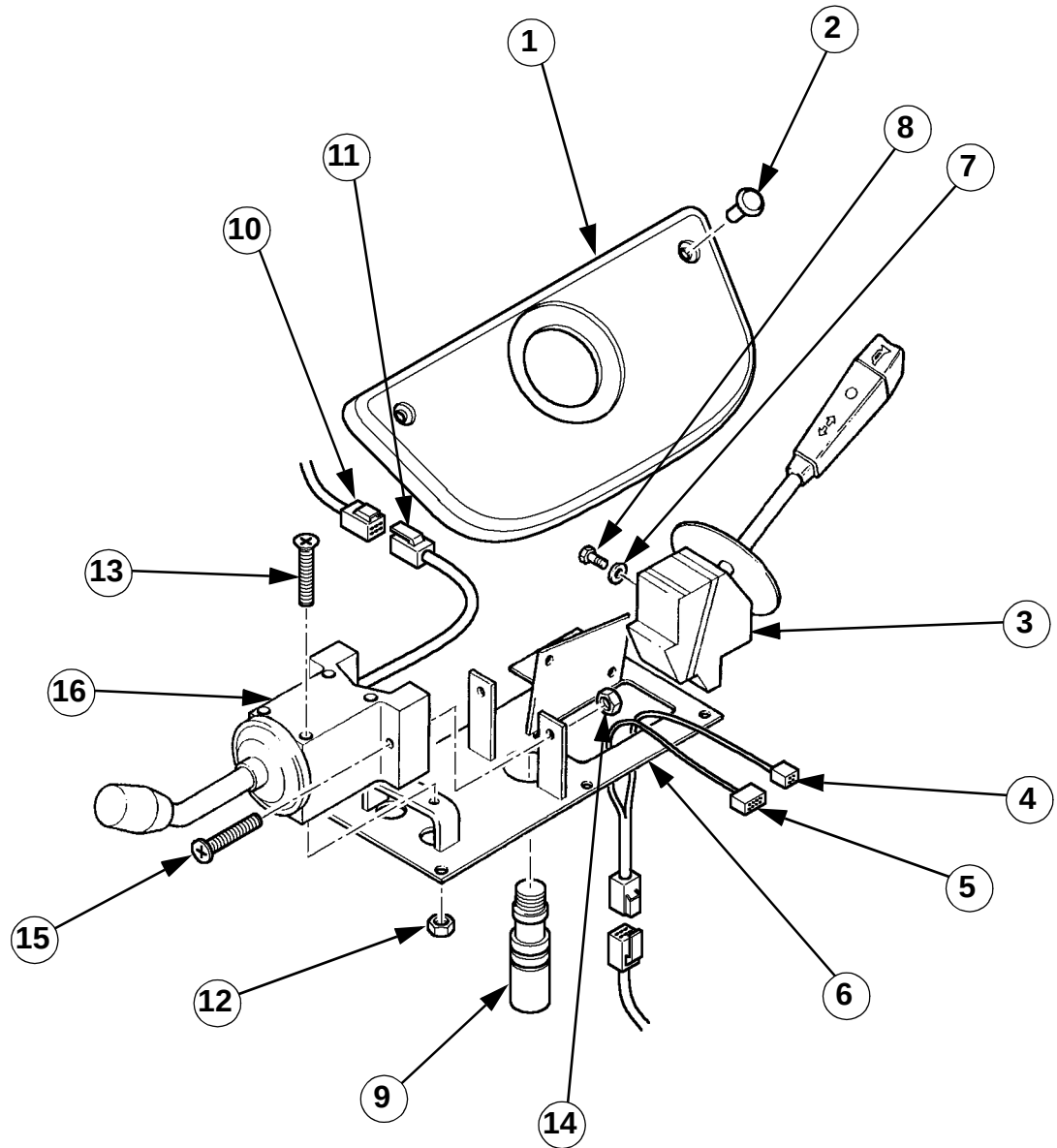
1. Remove the steering wheel.
2. Remove the screws (2).
3. Remove the panel (1) of the steering column (9) for access.
4. Disconnect the electrical connector (10) from the electrical connector (11). Attach the electrical connector (10) to the structure with temporary ties.
5. Remove the nuts (12) and the screws (13).
6. Remove the nuts (14) and the screws (15) and the forward/reverse switch (16).

Installing the forward/reverse switch

NOTE : *The installation of the forward/reverse switch is the reverse of the removal.*

Install the forward/reverse switch in the reverse order of the removal but note the following:

1. After installation, do an operational test of the function of the forward/reverse switch (16).



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Removing the steering mode switch

NOTE : This information is applicable to FERMEC 960 and 965 Models only.

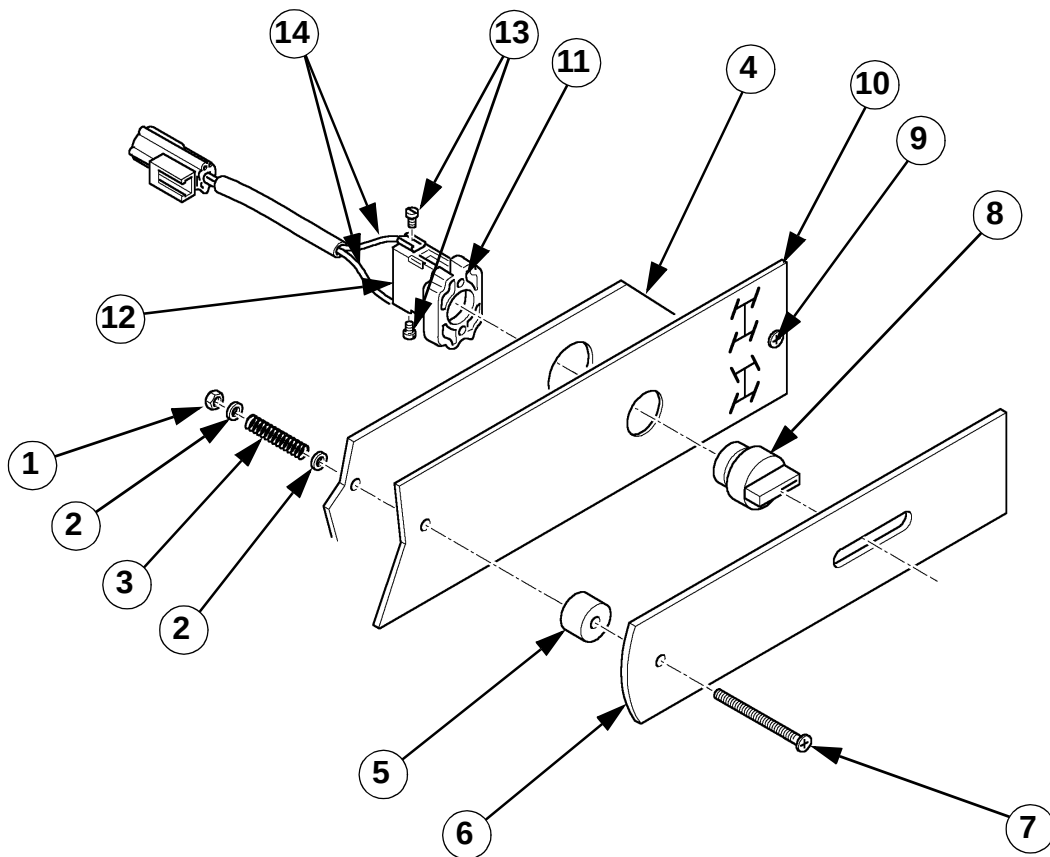
1. Remove the screws (9) from the side console (4).
2. Pull the plate (10) outwards away from the side console (4).
3. Note the position of the electrical wires (14).
4. Remove the screws (13) and disconnect the electrical wires (14) from the steering mode switch (12). Attach the electrical wires (14) to the side console (4) with temporary ties.
5. Remove the nuts (1), the washers (2) and the spring (3).
6. Remove the screw (7), the lever (6) and the spacer (5).
7. Loosen the screws (11) and remove the knob (8) from the switch (12).
8. Remove the switch (12).

Installing the steering mode switch

NOTE : The installation of the steering mode switch is the reverse of the removal

Install the steering mode switch in the reverse order of the removal but note the following:

1. Remove the temporary ties and connect the electrical wires (14) to the steering mode switch (12) with the screws (13) in the position noted during the removal procedure.
2. Put the switch (12) in position on the plate (10), install the knob (8) and tighten the screws (11).
3. Put the screws (7), the lever (6) and the spacer (5) in the position in the plate (10).
4. Install the washers (2), the spring (3) and the nuts (1).
5. Put the plate (10) in position on the front console (4) and the install the screws (9).
6. After installation, do an operational test of the switch function.



C198K501

Section

4007

ALTERNATOR

4007

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WARNING : *This symbol is used in this manual to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

Special tools

Test bench with facility for driving an alternator. (The alternator can also be tested while mounted on the machine, but use slave leads to make up the necessary circuit for the tests).

110 V alternating current supply



WARNING : *Ensure there is an earth leakage trip with a sensitivity of 30 mA on the 110 V supply.*

Photo-tachometer 0 - 6000 rev/min.

Moving coil ammeter 0 - 100 A DC

Moving coil voltmeter 0 - 20 V DC

Test light 12 V x 2.2 Watt

Battery 12 V

Switches : 2 required

Variable resistor with 70 A capacity

Test leads : 3 pairs

Small bearing puller

Compression spring balance

Specifications

Make	Magneti Marelli/Lucas
Type	A127, 12v negative earth
Maximum operating speed	15000 rev/min.
Maximum DC output at 6000 rev/min & stator winding resistance.	
55 A -	0.18 ohm/phase
Regulator controlled voltage	13.6 - 14.4 V
Rotor winding resistance	3.2 ohms
New brush length (from mouldings)	17 mm (0.67")
Renew regulator/brush box assembly at	5 mm (0.20")
Brush spring pressure (press brush to moulding)	1.3 - 2.7 N (4.7 - 9.8 oz.)
Shaft diameter and details	17mm diameter (Hex hole 8 mm A/F x 8.5 mm deep in threaded end of shaft).

Tightening Torques

	Nm	lbf ft
Through bolts	5.5	4.0
Shaft nuts	37.5	27.5
Rectifier fixing screws	3.5	2.5
Sundry screws :		
Regulator and brush box	2.5	2.0
Assembly terminal nuts :		
Main output terminal (6 mm)	4.75	3.5
Phase terminal (5 mm)	4.00	3.0

REMOVING AND INSTALLING THE ALTERNATOR

Removing the alternator

Remove the alternator as follows :

1. Disconnect the battery (see section 4003).
2. Open the hood.
3. Note the installed positions of the electrical cables.
4. On the 55A and 70A alternators, release the connector clip (25) and disconnect the electrical connector (20) from the alternator (7).
5. On the 55A and 70A alternators remove the protective cap (21), the nut (22) and the washer (23). Disconnect the electrical cable (24) from the alternator (7).
6. On the 100A alternator, remove the nuts (16) and the washers (15). Disconnect the electrical cables (11) through (14) from the alternator (7).
7. Attach the disconnected electrical cables to the structure of the engine with temporary ties.
8. Remove the bolt (5) and the washer (6) from the lever (4) and the alternator (7).
9. Loosen the bolts (9) and (17).
10. Turn the alternator (7) until you can slide the fan belt (8) from the pulley of the alternator (7).
11. Support the alternator and remove the bolts (9) and (17), the washers (10) and (18) and the spacer (19).
12. Lift the alternator (7) from the machine. Put a warning sign in the cab to tell persons not to start the engine.

Installing the alternator

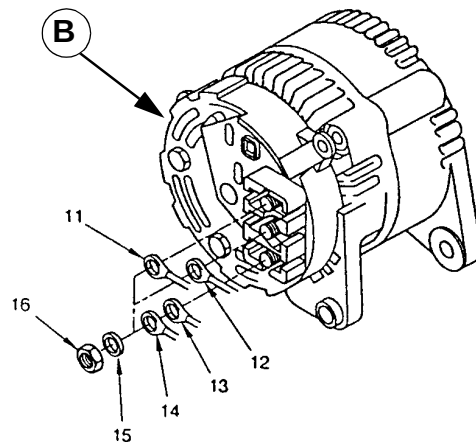
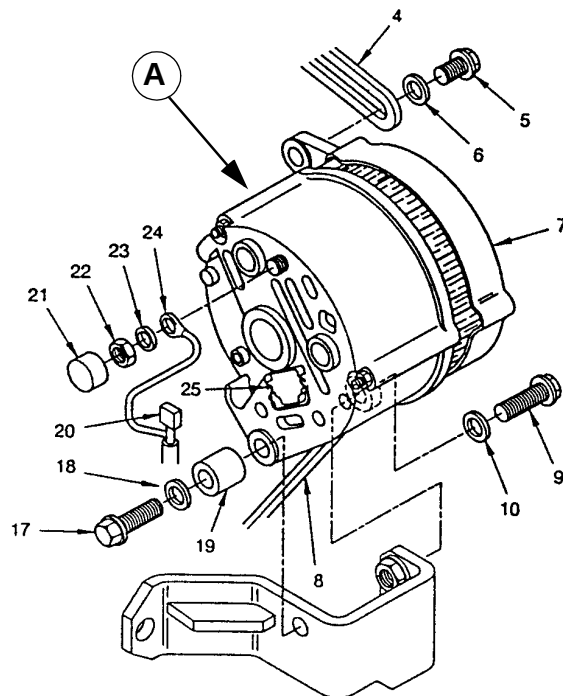
NOTE : The installation of the alternator is the reverse of the removal.

Install the alternator in the reverse order of the removal but note the following :

1. After installation, adjust the belt tension.
2. After installation and electrical connection test the alternator output. Refer to page 14.

A = 55A/70A Alternator

B = 100 A Alternator

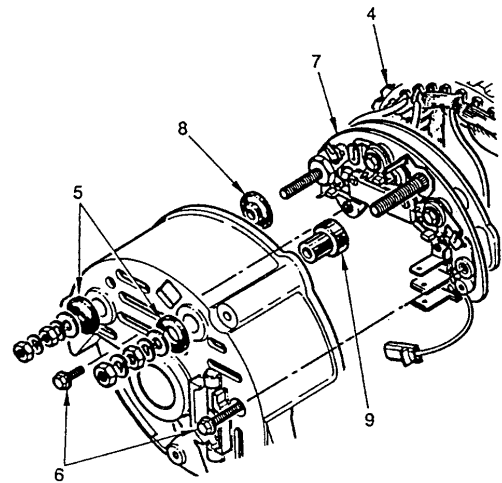


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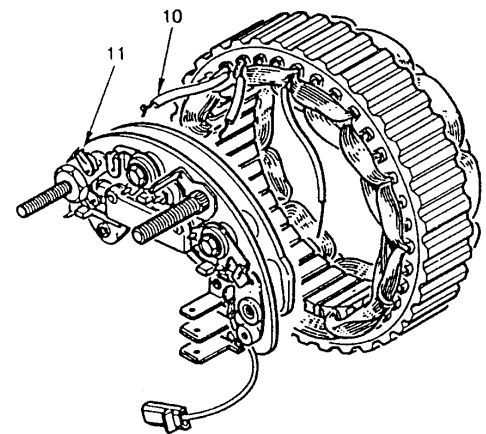
Disassembling the 55A or the 70A Alternator

Disassemble the 55A or the 70A alternator as follows :

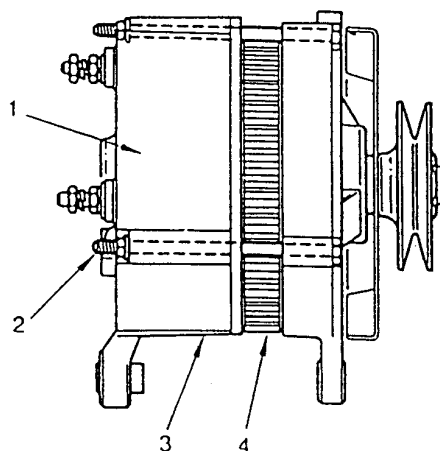
1. Remove the alternator (1) from the engine. Refer to page 4.
2. If installed, remove the suppression capacitor. Refer to page 12.
3. Remove the regulator and brush box. Refer to page 12.
4. Remove the three tie bolts and the nuts (2).
5. Remove the rear cover (3) and the stator (4) as an assembly by tapping the front cover lugs with a soft mallet.
6. Note the positions of and remove the nuts, the washers and the insulators (5) from the stud terminals.
7. Remove the retaining screws (6).
8. Remove the rectifier (7) and the stator (4) from the rear cover (3).
9. Note the position of and remove the short insulator (8).
10. Note the position of and remove the long insulator (9).
11. Unsolder the stator leads (10) from the tags (11) and separate the stator (4) and the rectifier (7).
12. Remove the nut and the spring washer (12).
13. Remove the pulley (13), and the fan (14) and the spacer (15).
14. Using a press, push the rotor shaft (16) out of the bearing in the front cover.
15. Remove the spacer (17).
16. Inspect and test the alternator. Refer to page 15.



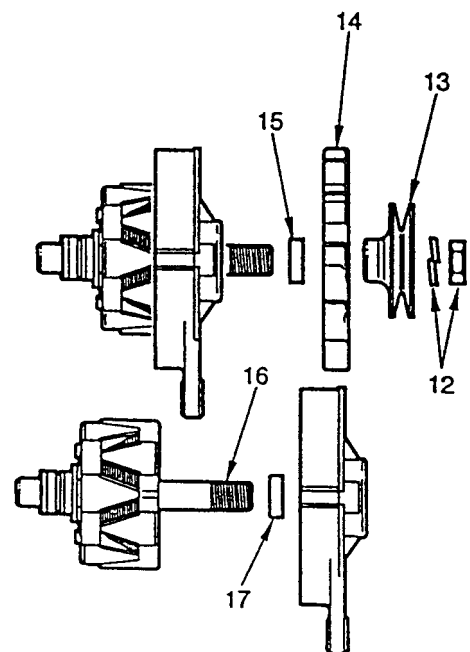
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CS98J512



CS98J510

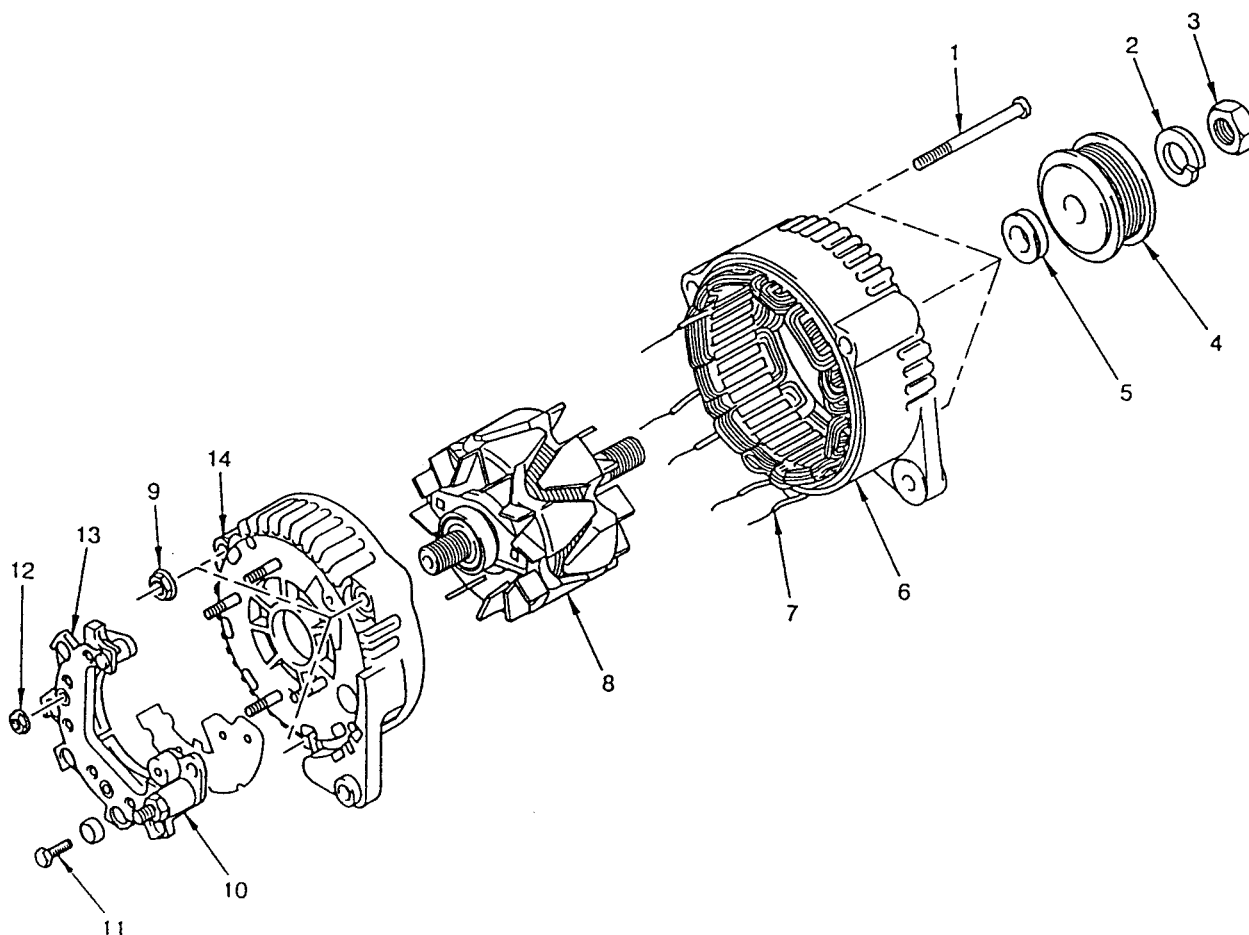


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Disassemble the 100A alternator

Disassemble the 100A as follows :

1. Remove the alternator from the engine. Refer to page 4.
2. Remove the regulator and brush box. Refer to page 12.
3. Unsolder the leads (7) of the stator (6) from the rectifier (13).
4. Remove the nuts (12) and the screws (11).
5. Separate the rectifier (13) from the slip-ring end bracket (14) and remove the rectifier (13).
6. Remove the nuts (9) the bolts (1) and the slip-ring end bracket (14).
7. Remove the nut (3) and the spring washer (2).
8. Remove the pulley (4) and the fan/rotor assembly (8).
9. Remove the spacer (5) from the shaft of the fan/rotor assembly (8).
10. Inspect and test the alternator. Refer to page 15.



Assembling the 55A or the 70A alternator

NOTE : *The assembly of the 55A or the 70A alternator is the reverse of the removal.*

Assemble the 55A or the 70A alternator in the reverse order of the removal but note the following :

1. Torque tighten the nut (12) to 50 to 70 Nm (37 to 52 lbf ft).

Assembling the 100A alternator

NOTE : *The installation of the 100A alternator is the reverse of the removal.*

Assemble the 100A alternator in the reverse order of the removal but note the following :

1. Torque tighten the nut (3) to 70 to 80 Nm (52 to 59 lbf ft).

Preliminary testing of the charging circuit

NOTE : *Preliminary testing may rectify a fault in the charging circuit and prevent the requirement to carry out other tests contained in this section.*

Test the charging circuit as follows :

1. Open the hood.
2. Examine the circuit cable connections. Make sure the connections are clean and tight.
3. Examine the components and wiring of the circuit. Make sure there are no signs of damage or overheating.
4. Examine the alternator drive belt. Make sure the tension is correct.
5. Examine the battery and the battery connections. Make sure the battery and the battery connections are in good condition. Refer to 4003.
6. If the above preliminary tests do not rectify the fault, continue the fault diagnosis process. Refer to page 8.
7. When the fault is rectified, close the hood.

General diagnosis

Battery indicator light stays out under all conditions

Flat battery

Test battery per section 4003.

Bad connection or broken cable

Continuity test.

Blown bulb or faulty switch

Continuity test.

Sticking alternator brushes

Service alternator.

Failed regulator

Max. output and voltage regulator test.
Replace regulator or change alternator if readings are low.

Failed field windings

Max output and voltage regulator tests.
Replace alternator if readings are low.

Battery indicator light stays on under all conditions (dims at low revs)

Internal short circuit (probably surge diode)

To test diode, wire into a battery circuit (two wires and a 5 watt bulb). When the terminal is connected to positive and the body to negative, the bulb should not light. If it does, fit a new diode. The bulb should light when the connectors are reversed.

Battery indicator light stays on (dims as engine speed increased, goes out at high engine speed)

Short circuit to earth

Continuity test. Voltage drop test.

Slack fan belt

Re-tighten or replace.

Battery not charging

Battery in poor condition

Test open circuit voltage. Charge/replace battery as necessary.

Voltage control faulty

Voltage regulator test. Change regulator.

High resistance (bad connection)

Continuity test. Renew or clean connections.

Leak to earth

Battery overcharging (early bulb failure, high consumption of distilled water)

Voltage control

Voltage regulator test. Change regulator.

Battery indicator light on when engine stationary (dims at cut-in speed and remains dim at high speed)

Internal short circuit

Max output test. Service or change the alternator.

Testing cable continuity

Test equipment

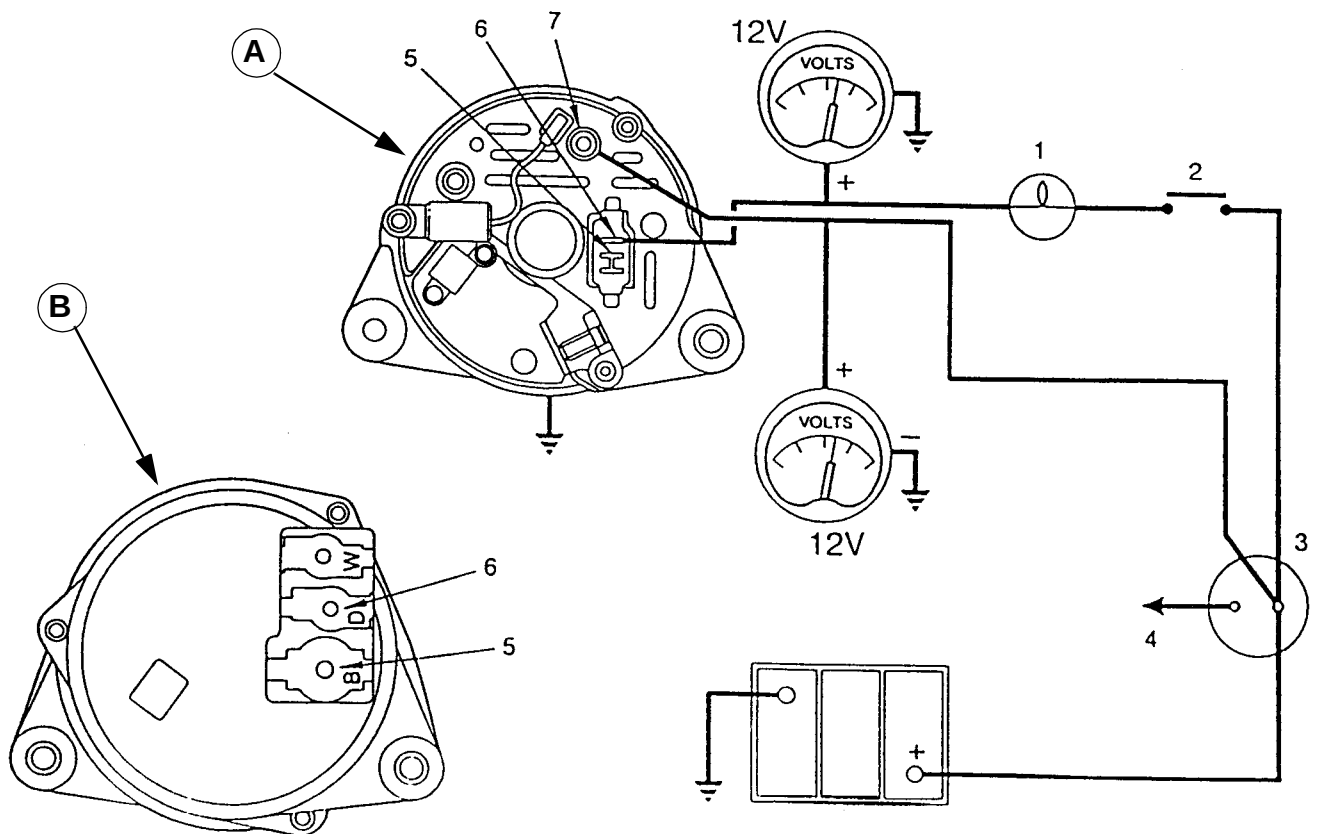
0 to 20 V dc voltmeter

Test the cable continuity as follows :

1. Open the hood.
2. If necessary, on the 55A or the 70A alternator, remove the protective cap from the main stud terminal (7).
3. Set the start switch (2) to the run position and check that the warning light (1) illuminates.
4. Using a voltmeter, check for battery voltage at the alternator main output lead (5) or the main stud terminal (7). If the voltmeter shows a low or zero voltage, inspect the electrical wiring for damage, and the connections for security.
5. Using a voltmeter, check for battery voltage at the indicator cable (6). If the voltmeter shows a low or zero voltage, inspect the electrical wiring for damage and the connections for security.
6. Set the start switch to off.
7. Remove the voltmeter.
8. If necessary, on the 55A or the 70A alternator, install the protective cap on the main stud terminal (7).
9. Close the hood.

A = 55A/70A Alternator

B = 100A Alternator



Testing the voltage regulator

Test equipment

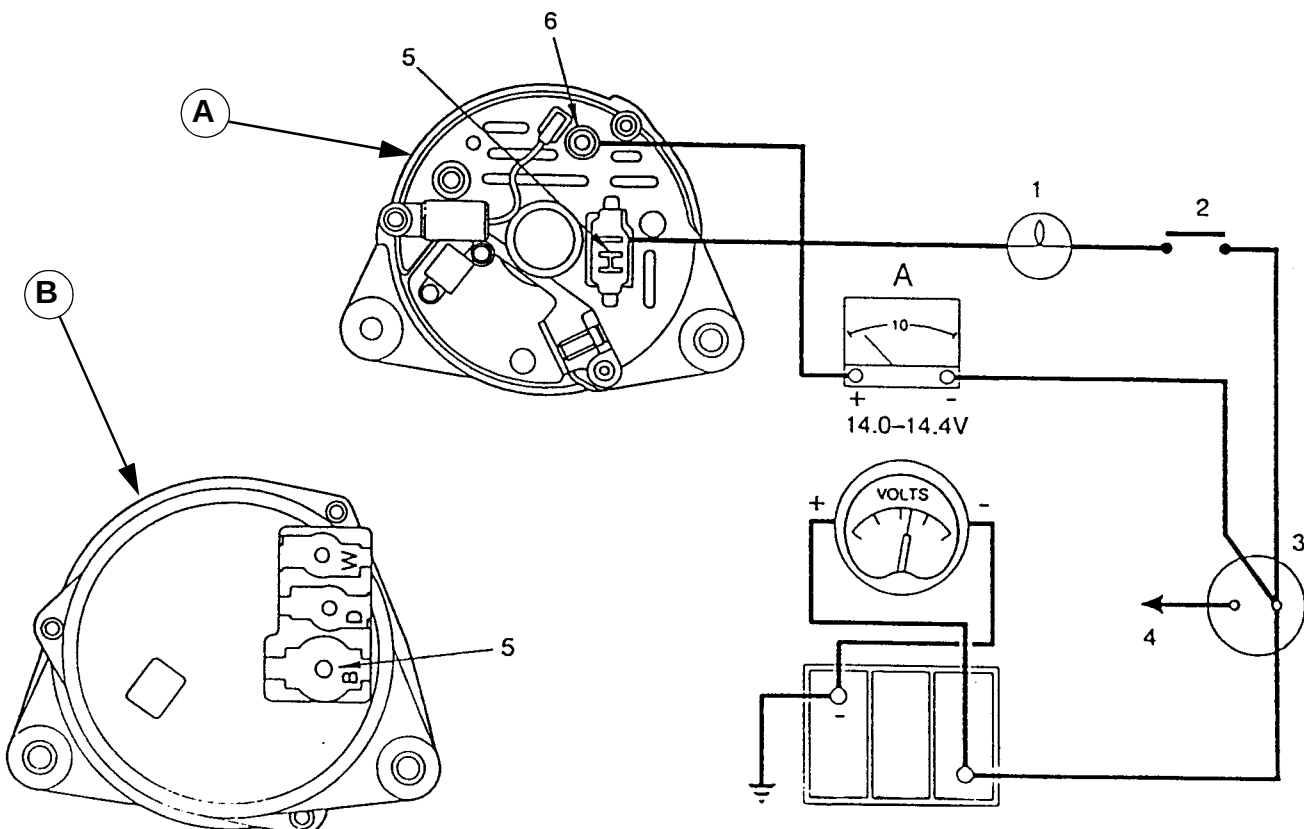
0 to 20 V dc voltmeter, 0 to 50A dc ammeter

Test the voltage regulator as follows :

1. Make sure, before you test the voltage regulator, that a well charged battery is installed on the machine. Refer to 4003.
2. Open the hood.
3. If necessary, on the 55A or the 70A alternator, remove the protective cap from the main stud terminal (6).
4. Disconnect the battery earth cable.
5. Connect an ammeter in series with the main output lead (5) or the main stud terminal (6) from the alternator. Connect a voltmeter across the battery terminals.
6. Reconnect the battery earth cable.
7. Start and run the engine at maximum speed until the ammeter reading is less than 10A.
8. Set the engine speed to 1000 rpm. Make sure the voltmeter shows a reading between 14.0 to 14.4V. If the reading is higher, there is a high resistance in the circuit.
9. If necessary, locate and rectify the high resistance in the circuit.
10. Switch the engine off.
11. Remove the voltmeter and ammeter from the machine.
12. If necessary, on the 55A or the 70A alternator, install the protective cap on the main stud terminal (6).
13. Close the hood.

A = 55A/70A ALTERNATOR

B = 100A ALTERNATOR



CS98J516

Testing the voltage drop

Test equipment

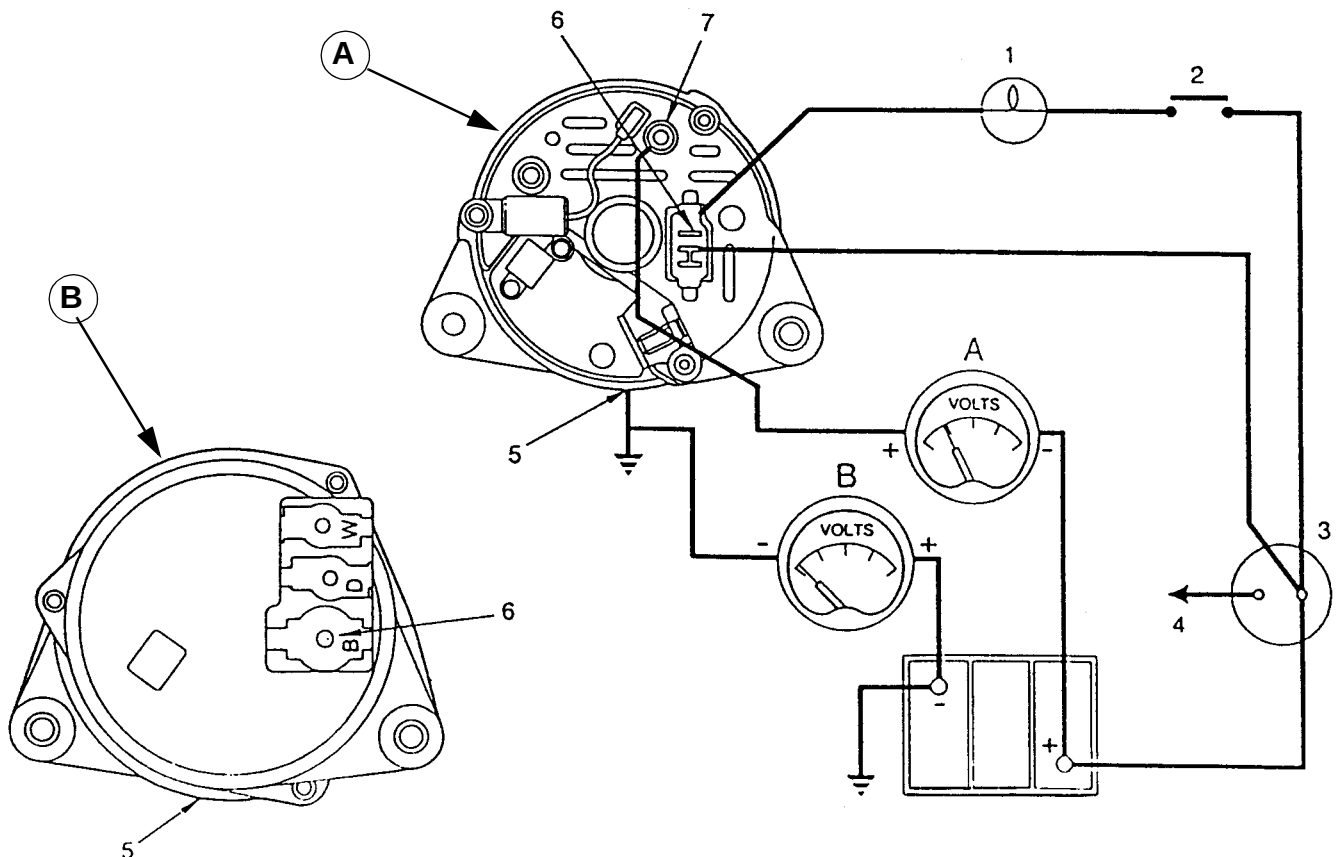
0 to 20V dc voltmeter

Test the voltage drop as follows :

1. Open the hood.
2. If necessary, on the 55A or the 70A alternator, remove the protective cap from the main stud terminal (6).
3. Connect a voltmeter between the battery positive terminal and the alternator main output lead (6) or the main stud terminal (7).
4. Start and run the engine at maximum speed.
5. Switch on all vehicle electrical loads. Make sure the voltmeter (A) reading is not more than 0.5V.
6. Switch the engine off.
7. Disconnect the voltmeter.
8. Connect the voltmeter between the battery earth terminal and the alternator body (5).
9. Start and run the engine at maximum speed. Switch on all vehicle electrical loads. Make sure the voltmeter (8) reading is not more than 0.25V.
10. Switch the engine off.
11. Remove the voltmeter from the machine.
12. If necessary, on the 55A or the 70A alternator, install the protective cap on the main stud terminal (6).
13. Close the hood.

A = 55A/70A ALTERNATOR

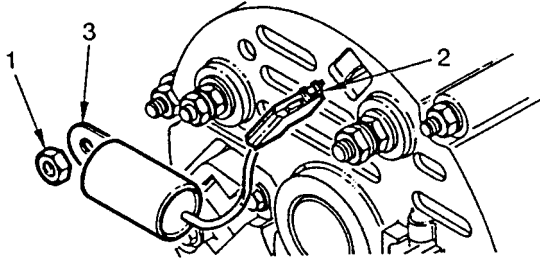
B = 100A ALTERNATOR



Removing the suppression capacitor

Remove the suppression capacitor as follows :

1. Open the hood.
2. Remove the nut (1) from the tie-bolt.
3. Disconnect the spade connector (2).
4. Remove the capacitor (3).



CS98J518

Installing the suppression capacitor

NOTE : The installation of the suppression capacitor is the reverse of the removal.

Install the suppression capacitor in the reverse order of the removal.

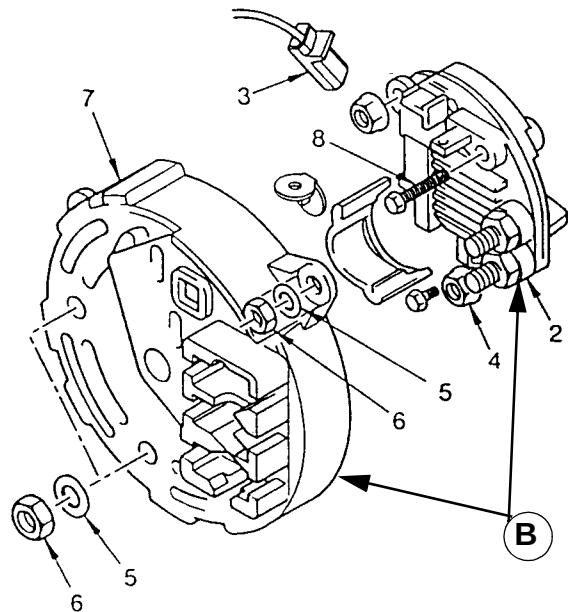
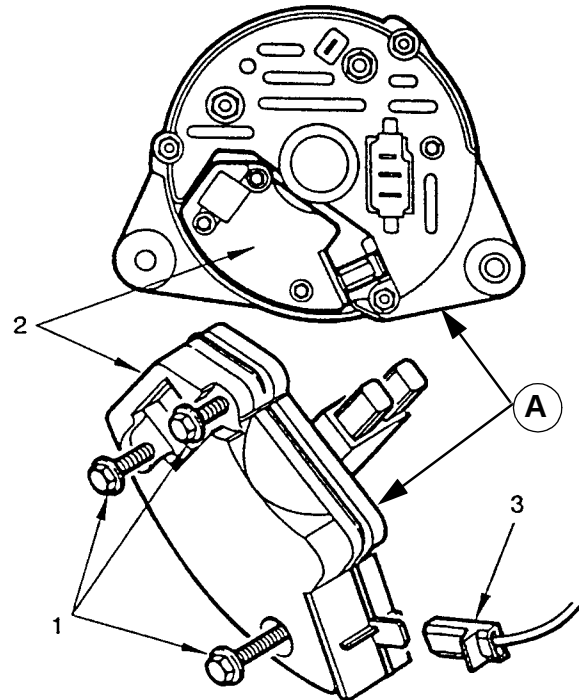
Removing the regulator and brush box

Special tools

Compression type spring balance.

Remove the regulator and brush box as follows :

1. Open the hood and disconnect the electrical cables from the alternator. Refer to page 4.
2. Only do the step which follows on the 55A or the 70A alternator.
3. Remove the suppression capacitor, if installed. Refer to page 12.
4. Remove the screws (1) and lift the regulator and brush box (2) from the alternator.
5. Only do the steps which follow on the 100A alternator.
6. Remove the nuts (6) the washers (5) and the rear cover (7).
7. Remove the screws (8) and the nuts (4).



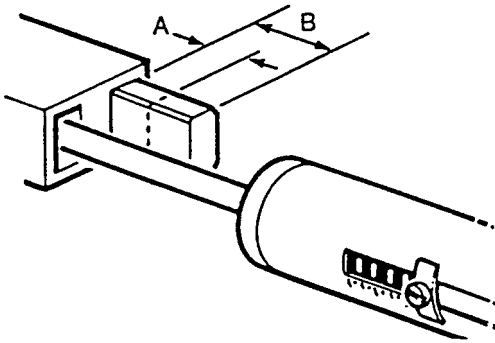
CS98J519

9. Disconnect the spade connector (3).
10. Remove the regulator and brush box (2).

A = 55A/70A ALTERNATOR

B = 100A ALTERNATOR

11. Measure the lengths of the brushes (10). Make sure new brushes are not less than 17 mm (0.67 in) in length (Dimension A). Make sure the minimum length of the brushes is not less than 5 mm (0.2 in) (Dimension B).
12. Replace the brushes (10) not within the limits given in step 11.
13. Measure the brush spring pressure by pushing the brush (10) into the brush box moulding using a compression type spring balance (9). Make sure the minimum pressure is 1.3 N (4.7 oz). Make sure the pressure is 2.7 N (9.8 oz.) when new brushes (10) are installed.



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Installing the regulator and brush box

NOTE : The installation of the regulator and brush box is the reverse of the removal.

Install the regulator and brush box in the reverse order of the removal but note the following :

1. Torque tighten the screws to 2.5 Nm (2.0 lbf ft).
2. After installation, test the voltage regulator. Refer to page 10.

Testing the rotor field circuit

Special equipment

Test bench

Test light 2.2W x 12V

Ammeter 0 to 100A

12V battery

Test the rotor field circuit as follows :

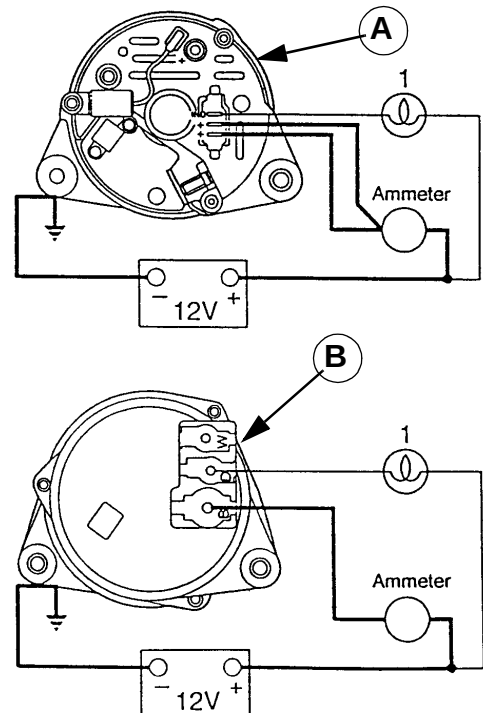
1. If necessary, remove the alternator from the machine and mount it on the test bench. Refer to page 4.

NOTE : This test can be done while the alternator is still installed on the machine, but you must disconnect all the vehicle wiring from the alternator and use the slave leads, the battery and the bulb.

2. Connect the alternator into the circuit shown but do not start the engine or run the alternator.
3. If the warning light (1) comes on, the rotor field circuit is correct.
4. If the warning light (1) fails to come on, examine and test the brushes, slip rings or rotor windings. Refer to page 12 or 15.
5. Disconnect the alternator from the test circuit.
6. If necessary, connect the vehicle wiring and install the alternator. Refer to page 4.

A = 55A/70A ALTERNATOR

B = 100A ALTERNATOR



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Testing the alternator output

Special equipment

Test bench

Two 150A ammeters

0 to 20V voltmeter

Photo-tachometer

Variable resistor - 70A/20V capacity

Test the alternator output as follows :

1. If necessary, remove the alternator. Refer to page 4.

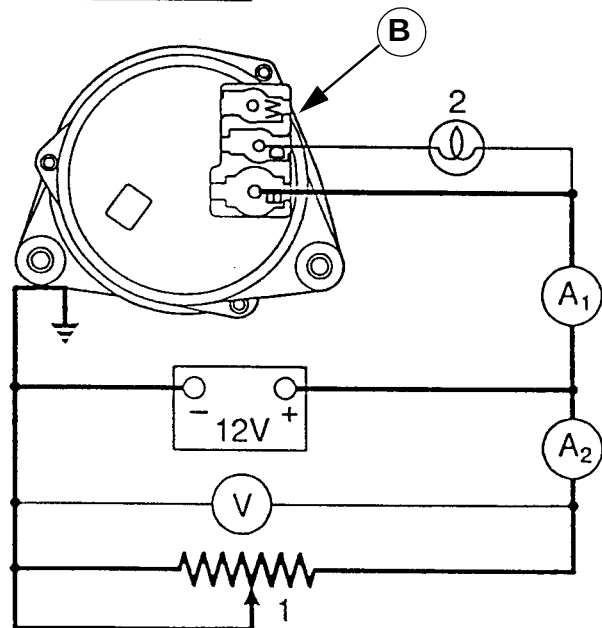
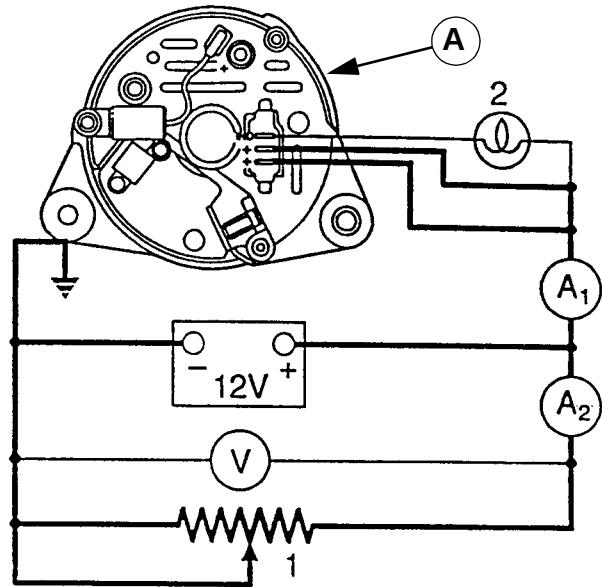
NOTE : This test can be done while the alternator is still installed on the machine, but you must disconnect all the vehicle wiring from the alternator and use the slave leads, the battery and the bulb.

2. Connect the alternator into the circuit shown , but do not start the engine or run the alternator.
3. Adjust the variable resistance (1) until the ammeter registers equal to or just above the alternator maximum rated output (55A, 70A or 100 A).
4. If necessary, start the engine.
5. Slowly increase the speed of the alternator.
6. If necessary, use the photo-tachometer to set the engine speed to 542 rpm or set the alternator speed to 1500 rpm. Make sure the voltmeter shows a reading of 13.5V and the warning light (2) goes off.
7. If necessary, use the photo-tachometer to set the engine speed to 2168 rpm or set the alternator speed to 6.000 rpm. Make sure the ammeter A1 shows a reading of :

Model A127-55 55A

Model A127-70 70A

Model A127-100 100A



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A = 55A/70A ALTERNATOR

B = 100A ALTERNATOR

8. If the ammeter A1 readings are not correct, stop the engine/alternator. If installed, remove the suppression capacitor and do the steps 3 through 7 again. Refer to page 12.
9. If the ammeter A1 readings are still not correct, examine and test the rectifier diodes, the rotor resistance and the stator windings as necessary. Refer to page 15.

10. If necessary, install the suppression capacitor. Refer to page 12.
11. If necessary, start the engine.
12. If necessary, use the photo-tachometer to set the engine speed to 2168 rpm or set the alternator speed to 6.000 rpm until the ammeter A1 shows a reading of less than 10A. Make sure the voltmeter (V) shows a reading between 13.6 to 14.4 V.
13. If the voltmeter reading is not within the limits, stop the engine/alternator and replace the regulator and brush box assembly. Refer to page 12 or 13.
14. Disconnect the alternator from the test circuit.
15. If necessary connect the vehicle wiring or install the alternator. Refer to page 4.

Inspecting and testing the alternator

Special equipment

110V ac supply - preferably with earth leakage trip (30 mA trip current).

110V insulation tester

0 to 150A ammeter

0 to 20V voltmeter

Ohmmeter

Test light 12V x 1.5W

Inspect and test the alternator as follows :

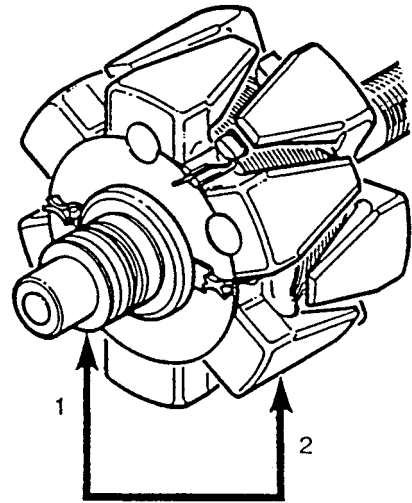
1. Disassemble the alternator. Refer to page 5 or 6.
2. Examine the slip rings (1). Make sure the slip rings (1) are clean and smooth. If necessary, use very fine (600 to 1200 grade) abrasive paper to make the slip rings (1) clean and smooth.
3. Touch each slip ring (1) with the probe of the ohmmeter to check the rotor field winding resistance/continuity. Make sure the ohmmeter reading shows 3.2 ohms.

4. Remove the ohmmeter.



WARNING : Only fully trained persons must carry out insulation tests involving 110V supply.

5. Touch the probes of the 110V supply onto the slip ring (1) and the rotor frame (2) as shown to test the insulation. Make sure no voltage indication is shown (resistance infinity or very high).

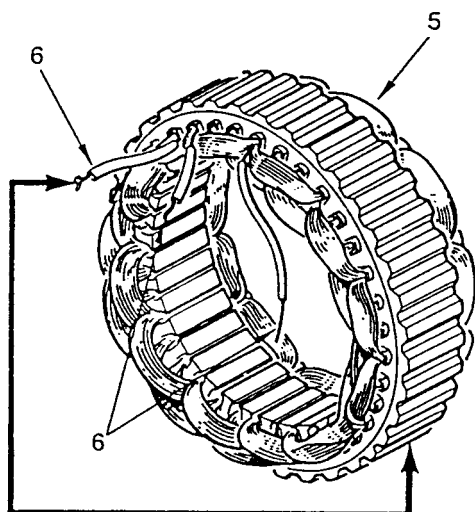
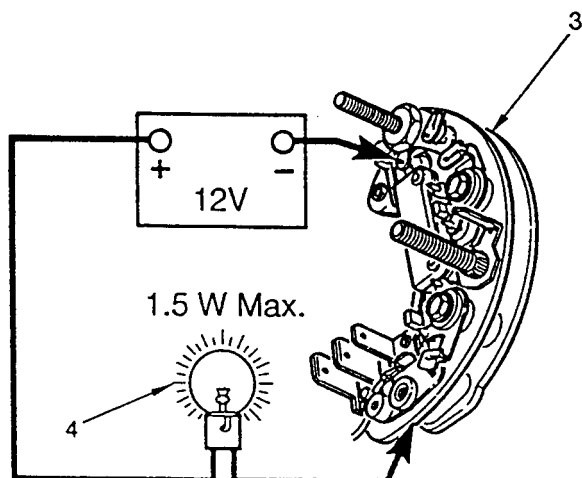


CS98J523

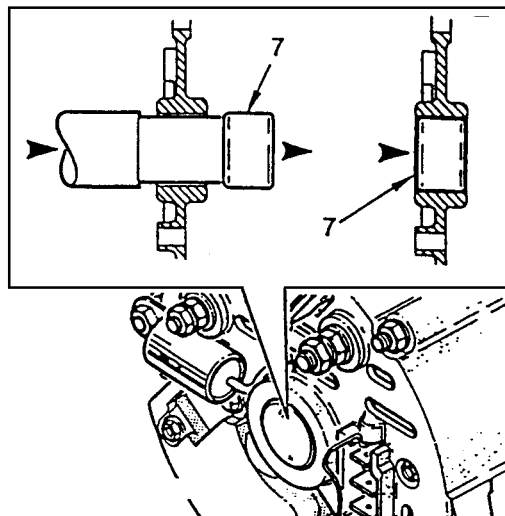
6. Remove the 110V supply.
7. Assemble the test circuit as shown.
8. Touch one probe of the circuit to each diode in turn and the other to the corresponding base plate on the rectifier (3).
9. Reverse the positions of the probes.
10. Make sure the test lamp (4) only illuminates during steps 8 or 9. If the lamp (4) fails this test ; the diode is faulty and the complete rectifier must be replaced.
11. Remove the test circuit.
12. Connect the test leads of a 110V ac insulation tester to the three wires (6) in turn.

NOTE : Attach the test leads with insulated clips to make the circuit before the tester is switched on.

13. If the tester shows a current flow the stator (5) must be replaced.
14. Examine the rotor poles and the stator (5) for signs of rubbing. If signs of rubbing are found, check the bearings in the front and the rear covers for excessive wear.
15. If the bearing in the rear cover is worn, remove and replace the bearing using a bearing press.



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16. If the bearing in the front cover is worn, replace the front cover.
17. Assemble the alternator. Refer to page 7.

Section

4008

STEERING, LOADER AND BUCKET CALIBRATION

4008

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SPECIAL TOOLS



CD99G084

Diagnostic terminal (Part N° 3621167M2)

O→ Key on the diagnostic tester will abort any monitor mode and proceed to the next step

Shift ? Press **Shift** release and press **?** if any of the following occur.

Once the diagnostic terminal is plugged into the 5 pin test point, in certain circumstances the display screen may be blank. By pressing key **Shift** then **?** it will initiate the terminal to the front screen which displays the version of software present in the HMU and daughter board.

Whilst at any stage of monitor or calibration pressing **Shift** then **?** on the keyboard of the diagnostic terminal will initiate the terminal to revert to the front screen.

CALIBRATION

Mode type calibration

1. Park the machine on a level surface.
2. Make sure that the area around and above the machine is free from obstructions and personnel.
3. With the engine running, press the red emergency stop button to isolate the hydraulic management unit.
4. Plug the diagnostic terminal into test socket on the side instrument panel.
5. Twist the emergency stop button to reset the system.

6. The terminal display will show :

Waiting for HMU

7. The terminal display will show :

FERMEC P100
DBD V - X.X.X
HMU V - X.X.X

8. The terminal display will show :

ENGLISH
"Y" or "N"

NOTE : *If N is selected, the calibration procedure can be displayed in French, German, Spanish, Italian or Danish.*

Once the required language has been selected.

9. The terminal display will show :

Calibrate ?
"Y" or "N"

NOTE : *If N is selected, the diagnostic terminal will go to monitor steering, see page 9.*

Press Y on the diagnostic terminal.

10. The terminal display will show :

Machine Type is
Fermec 965
"Y" or "N"

NOTE : *Three different model configurations are available. Fermec 960, Case 595LSP or Case 595SLE models.*

Press Y or N on the diagnostic terminal to choose the correct machine.

11. The terminal display will show :

Waiting for HMU

12. The terminal display will show :

Checking HMU is
set to correct
machine

If the machine type is correct, the diagnostic terminal will go to Calibrate steering, see page 4.

If the machine type is incorrect, the diagnostic terminal will return to Calibrate, see step 9

NOTE : *H.M.U. automatically retains the language which was last used and also the machine type (model).*

Loader calibration

1. Carry out steps 1 to 12 on page 3.
2. The terminal display will show :

CAL. Steering "Y" or "N"

NOTE : *If Y is selected, the diagnostic terminal will go to Calibrate steering, see page 4.*

Press N on the diagnostic terminal.

3. The terminal display will show :

CAL. Loader "Y" or "N"

NOTE : *If N is selected, the diagnostic terminal will go to Calibrate bucket, see page 6.*

Press Y on the diagnostic terminal.

4. The terminal display will show :

Right joystick is neutral ? type "Y" or "N"

NOTE : *If N is selected, the diagnostic terminal will go to Calibrate bucket.*

Press the hydraulic enable switch and make sure the joystick is in neutral position. Press Y on the diagnostic terminal.

5. The terminal display will show :

Set Loader to max height type "Y" or "N"

NOTE : *If N is selected, the diagnostic terminal will go to Calibrate bucket, see page 6.*

Use the right joystick to raise the loader arm to maximum raised position. Press Y on the diagnostic terminal.

6. The terminal display will show :

Set Loader to max depth posn type "Y" or "N"

NOTE : *If Y or N are selected, the diagnostic terminal will go to Calibrate bucket, see page 6.*

Use the right joystick to lower the loader arm to maximum lowered position. Press Y on the diagnostic terminal, the loader calibration is completed.

Loader bucket calibration

1. Carry out steps 1 to 12 on page 3.
2. The terminal display will show :

CAL. Steering "Y" or "N"

NOTE : *If Y is selected, the diagnostic terminal will go to Calibrate steering, see page 4.*

Press N on the diagnostic terminal.

3. The terminal display will show :

CAL. Loader "Y" or "N"

NOTE : *If Y is selected, the diagnostic terminal will go to Calibrate loader, see page 5.*

Press N on the diagnostic terminal.

4. The terminal display will show :

CAL. Bucket "Y" or "N"

NOTE : *If N is selected and :*

- *If the bucket is not calibrated and if the model is a Fermec 965 or Case 595LSP, the diagnostic terminal will go to Setup backhoe, see page 8.*
- *If the bucket is not calibrated and if the model is a Fermec 960 or Case 595SLE, the diagnostic terminal will return to Calibrate, see page 3.*
- *If the bucket is already calibrated, the diagnostic terminal will go to Save loader calibration. See Step 10.*

Press Y on the diagnostic terminal.

5. The terminal display will show :

Set Loader to Midway position type "Y" or "N"

NOTE : *If N is selected and :*

- *the model is a Fermec 965 or Case 595LSP, the terminal will go to Setup backhoe, see page 8.*
- *The model is a Fermec 960 or 595SLE, the terminal will return to Calibrate, see page 3.*

Press the hydraulic enable switch and use the right joystick to raise the loader arm to half-raised position. Press Y on the diagnostic terminal.

6. The terminal display will show :

Set Bucket to max Dump posn. type "Y" or "N"

NOTE : *If N is selected and :*

- *The model is a Fermec 965 or Case 595LSP, the terminal will go to Setup backhoe, see page 8.*
- *The model is a Fermec 960 or 595SLE, the terminal will return to Calibrate, see page 3.*

Use the right joystick to tilt the loader bucket completely forwards. Press Y on the diagnostic terminal.

7. The terminal display will show :

Set Bucket to max Crowd posn. type "Y" or "N"

NOTE : *If N is selected and :*

- *The model is a Fermec 965 or Case 595LSP, the terminal will go to Setup backhoe, see page 8.*
- *The model is a Fermec 960 or 595SLE, the terminal will return to Calibrate, see page 3.*

Use the right joystick to tilt the loader bucket completely backwards. Press Y on the diagnostic terminal.

8. The terminal display will show :

Set Bucket to
level position
"Y" or "N"

NOTE : *If N is selected and :*

- *The model is a Fermec 965 or Case 595LSP, the terminal will go to Setup backhoe, see page 8.*
- *The model is a Fermec 960 or Case 595SLE, the terminal will return to Calibrate, see page 3.*

Use the right joystick to bring the loader bucket cutting edge parallel to the ground (with the two red markers aligned). Press Y on the diagnostic terminal.

9. The terminal display will show :

MOVING
Front bucket
To start type Y
& WAIT !!

NOTE : *If N is selected and :*

- *The model is a Fermec 965 or Case 595LSP, the terminal will go to Setup backhoe, see page 9.*
- *The model is a Fermec 960 or Case 595SLE, the terminal will return to Calibrate, see page 3.*

Press Y and wait for the HMU to calculate the optimum bucket position.

10. After 3 beeps, the terminal display will show :

Save Loader Cal ?
type
"Y" or "N"

NOTE : *If N is selected and :*

- *The model is a Fermec 965 or Case 595LSP, the terminal will go to Setup backhoe, see page 8.*
- *The model is a Fermec 960 or Case 595SLE, the terminal will return to Calibrate, see page 3.*

Press Y on the diagnostic terminal.

11. The terminal display will show :

Parameters saved
in HMU

After 3 beeps, the loader bucket calibration procedure is completed.

Setup backhoe (Fermec 965 or Case 595LSP only)

1. Carry out steps 1 to 12 on page 3.
2. The terminal display will show :

CAL. Steering "Y" or "N"

NOTE : *If Y is selected, the diagnostic terminal will go to Calibrate steering, see page 4.*

Press N on the diagnostic terminal.

3. The terminal display will show :

CAL. Loader "Y" or "N"

NOTE : *If Y is selected, the diagnostic terminal will go to Calibrate loader, see page 5.*

Press N on the diagnostic terminal.

4. The terminal display will show :

CAL. Bucket "Y" or "N"

NOTE : *If Y is selected, the diagnostic terminal will go to Calibrate loader bucket, see page 6.*

Press N on the diagnostic terminal.

5. If the loader bucket is calibrated, the terminal display will show :

Save Loader Cal ? type "Y" or "N"

NOTE : *If Y is selected, the diagnostic terminal will save the parameters in the HMU, see page 7, Step 11.*

Press N on the diagnostic terminal.

6. The monitor display will show :

SETUP Backhoe ? "Y" or "N"

NOTE : *If N is selected, the diagnostic terminal will return to Calibrate, see page 3.*

Press Y on the diagnostic terminal.

7. The terminal display will show :

Left joystick is neutral ? type "Y" or "N"

With the left joystick in neutral position, press Y on the diagnostic terminal.

8. The terminal display will show :

ISO Backhoe ? type "Y" or "N"

European community (EEC) configuration, Press Y on the diagnostic terminal.

Non-European community (Non-EEC) configuration, Press N on the diagnostic terminal.

9. the terminal display will show :

Save Backhoe ? type "Y" or "N"

NOTE : *If N is selected, the diagnostic terminal will return to Calibrate, see page 3.*

Press Y on the diagnostic terminal.

10. The terminal display will show :

Parameters saved in HMU

After 3 beeps, the setup calibration procedure is completed.

DIAGNOSIS

1. Carry out steps 1 to 12 on page 3.
2. The terminal display will show :

Calibrate ? "Y" or "N"

NOTE : If Y is selected, the diagnostic terminal will go to Calibrate, see page 3, Step 9.

Press N on the diagnostic terminal.

Monitor steering diagnosis

3. The terminal display will show :

Monitor STEERING "Y" or "N"

NOTE : If N is selected, the diagnostic terminal will go to Monitor loader diagnosis, see Step 5.

Press the hydraulic enable switch and press Y on the diagnostic terminal.

4. The terminal display will show :

2WS Steer mode 480 480 480 480

NOTE : Change these values, using the steering wheel and the steering mode selector and check that the data displayed corresponds to the values given in note 1 on page 11.

If this is not the case:

- Calibrate the steering, if this has not already been done, see page 4.
- If steering calibration has already been carried out, repair or replace the defective component(s) in the circuit concerned. Calibrate once the circuit is operative.

Press button O→ to go to Monitor loader diagnosis.

Monitor loader diagnosis

5. The terminal display will show :

Monitor LOADER "Y" or "N"

NOTE : If N is selected and :

- the model is a Fermec 965 or Case 595LSP, the terminal will go to Monitor left joystick diagnosis, see Step 7.
- The model is a Fermec 960 or Case 595SLE, the terminal will go to Monitor right joystick diagnosis, see Step 9.

Press the hydraulic enable switch and press Y on the diagnostic terminal.

6. The terminal display will show :

/ 620 413/ / ~

NOTE : Change these values, using the right joystick and check that the data displayed corresponds to the values given in note 2 on page 12.

If this is not the case:

- Calibrate the loader arm, if this has not already been done, see page 5.
- If loader arm calibration has already been carried out, repair or replace the defective component(s) in the circuit concerned. Calibrate once the circuit is operative.

Key :

<	Bucket level	^	Bucket mode
=	Fork mode	~	Float

Press button O→

If the model is a Fermec 960 or Case 595LE, the diagnostic terminal will display "Monitor left joystick", see step 7.

If the model is a Fermec 965 or Case 595LSP, the diagnostic terminal will display "Monitor right joystick", see step 9.

Monitor joystick diagnosis

7. The terminal display will show :

```

Monitor
Left joystick
"Y" or "N"

```

NOTE : If N is selected, the diagnostic terminal will go to Monitor right joystick diagnosis, see Step 9.

Press Y on the diagnostic terminal.

8. The terminal display will show :

```

L-ST 50FE>L*
X 512
Y 512 #
Z 512

```

NOTE : Change these values, using the joystick and check that the data displayed corresponds to the values given in note 3 on page 12.

If this not the case, repair or replace the defective component(s) in the circuit concerned.

Key :

>	Seat forw'd	^	Seat up
L	Seat down	*	Override
<	Seat backw'd	#	Neutral switch active

Press button O→ to go to Monitor right joystick diagnosis.

9. The monitor display will show :

```

Monitor
Right joystick
"Y" or "N"

```

NOTE : If N is selected, the diagnostic terminal will go to Calibrate, see page 3.

Press Y on the diagnostic terminal.

10. The terminal display will show :

```

R-ST OOFE(*)
X 512#
Y 512
Z 512

```

NOTE : Change these values, using the right joystick and check that the data displayed corresponds to the values given in note 3 on page 12.

If this is not the case, repair or replace the defective component(s) in the circuit concerned.

Key :

(*)	T X Dump	#	Neutral switch active

Press button O→ , to terminate the diagnosis.

Note 1*Steering value range*

Straight	280 - 680
Anti-clockwise (LH lock)	20 - 400
Clockwise (RH lock)	500 - 870

Allowable tolerance between left and right wheels

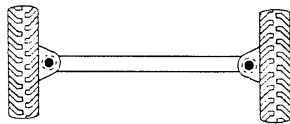
On front axle	90
On rear axle	90

Allowable tolerance between left and right wheels fully anti-clockwise (LH lock) and fully clockwise (RH lock)

Front wheels	200
Rear wheels	200

Front Axle

Steering Straight-ahead

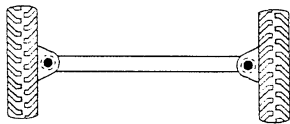


CS99G515

Value	Value	Maximum Difference between left and right hand potentiometers
280-680	280-680	90

Rear Axle

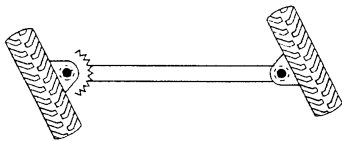
Steering Straight - ahead



CS99G515

Value	Value	Maximum Difference between left and right hand potentiometers
280-680	280-680	90

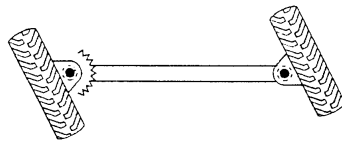
Steering Fully Anti-clockwise



CS99G517

Value	Value	Maximum Difference between left and right hand potentiometers
20-400	20-400	200

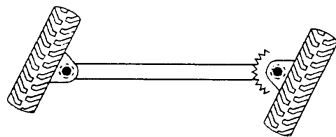
Steering Fully Anti-clockwise



CS99G517

Value	Value	Maximum Difference between left and right hand potentiometers
20-400	20-400	200

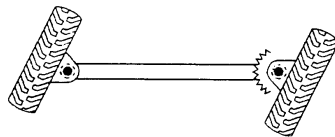
Steering Fully Anti-clockwise



CS99G516

Value	Value	Maximum Difference between left and right hand potentiometers
500-870	500-870	200

Steering Fully Anti-clockwise



CS99G516

Value	Value	Maximum Difference between left and right hand potentiometers
500-870	500-870	200

Note 2*Loader beam potentiometer values*

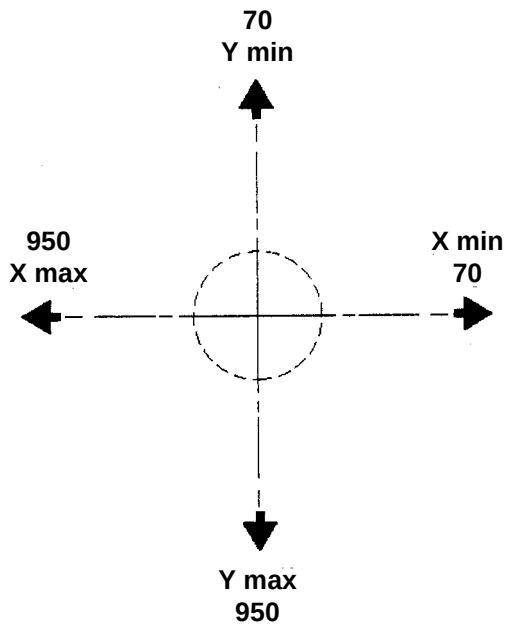
Maximum Depth	$770 \pm 10\% = 693 - 847$
Maximum Height	20 ~ 50 dependent on linkage adjustment

Loader bucket potentiometer values

Maximum crowd	$900 \pm 10\% = 810 \sim 990$
Maximum Dump	35
Bucket level position	620 (this value will represent the calibrated position)

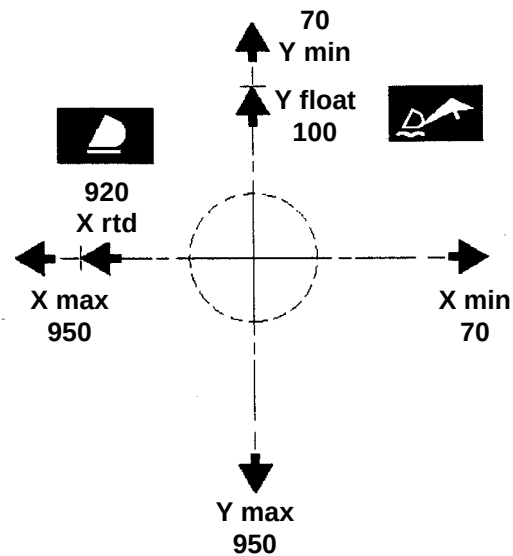
Note 3

Joystick value chart



CS99G518

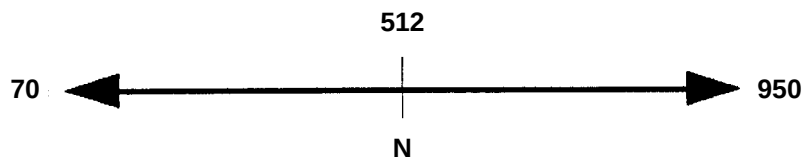
LH JOYSTICK
 X MIN = 70 Y MIN = 70
 NEUTRAL = 72 NEUTRAL = 512 +/- 20
 X MAX = 950 Y MAX = 950



CS99G519

RH JOYSTICK
 X MIN = 70 Y MIN = 70
 X RTD = 920 NEUTRAL = 512 +/- 20
 NEUTRAL = 512 Y FLOAT = 100
 X MAX = 950 Y MAX = 950

TOLERANCE - 20 VALUES UNLESS OTHERWISE STATED



CLAM MIN = 70
 CLAM MAX = 950

CS99G520

Section

5000

REMOVAL AND INSTALLATION OF STEERING COMPONENTS

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SPECIFICATIONS

Special torques

Steering wheel valve :

Nut..... 58 Nm

Front axle, 2 wheel steer/4 wheel drive:

Screws (5) and the nuts (4) 48 Nm

Front axle, 4 wheel steer/4 wheel drive:

Screws (8) and the nuts (7) 48 Nm

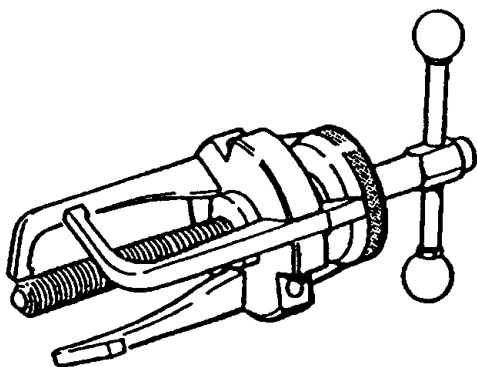
Screws (12) 30 Nm

Screws (14) 425 to 475 Nm

Steering cylinder :

Nut (3) 339 to 366 Nm

SPECIAL TOOL



CS98G526

MF 268A Steering wheel puller

STEERING SYSTEM GENERAL INFORMATION

Filtration

Following oil changes or repairs to the steering hydraulic system, start the engine, run at low idle speed and wait at least 20 seconds before turning the steering wheel. This will flush any particles through the hydraulic system back to the reservoir for filtering. If the steering wheel is turned prematurely, particles will be directed into the steering cylinders and take many hours to be circulated back through the filter ; during which time damage to the Orbitrol steering valve may occur.

Pressure testing

Steering and hydraulic systems are integrated into one hydraulic circuit, and therefore will interact with each other. In addition to the removal and installation described on the next page, reference should also be made to the diagnostic processes.

STEERING CONTROL VALVE

Removal

STEP 1

Park the machine on flat, level ground.

STEP 2

Dump the bucket, raise the loader beam and install the safety strut.

STEP 3

Lower the backhoe stabilizer legs to the ground. DO NOT lift the machine.

STEP 4

Release pressure in the hydraulic system (see section 8002).

STEP 5

Stop the engine and remove the ignition key from the keyswitch.

STEP 6

Remove the cab front mat and the floor plate.

STEP 7

Identify each hose on the Orbitrol steering valve.

STEP 8

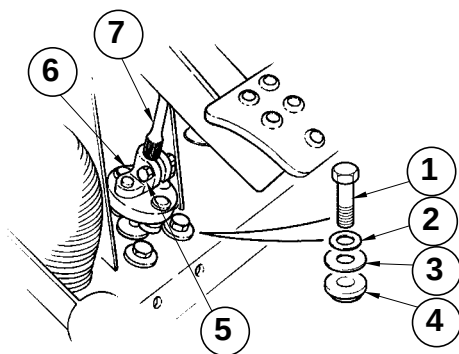
Disconnect the hoses.

STEP 9

Remove the plastic covers from the bulkhead.

STEP 10

Release the four mounting screws (1) the lock washers (2), the washers (3) and the rubber mountings (4) inside the cab/rops and lower the valve away from the bulkhead.



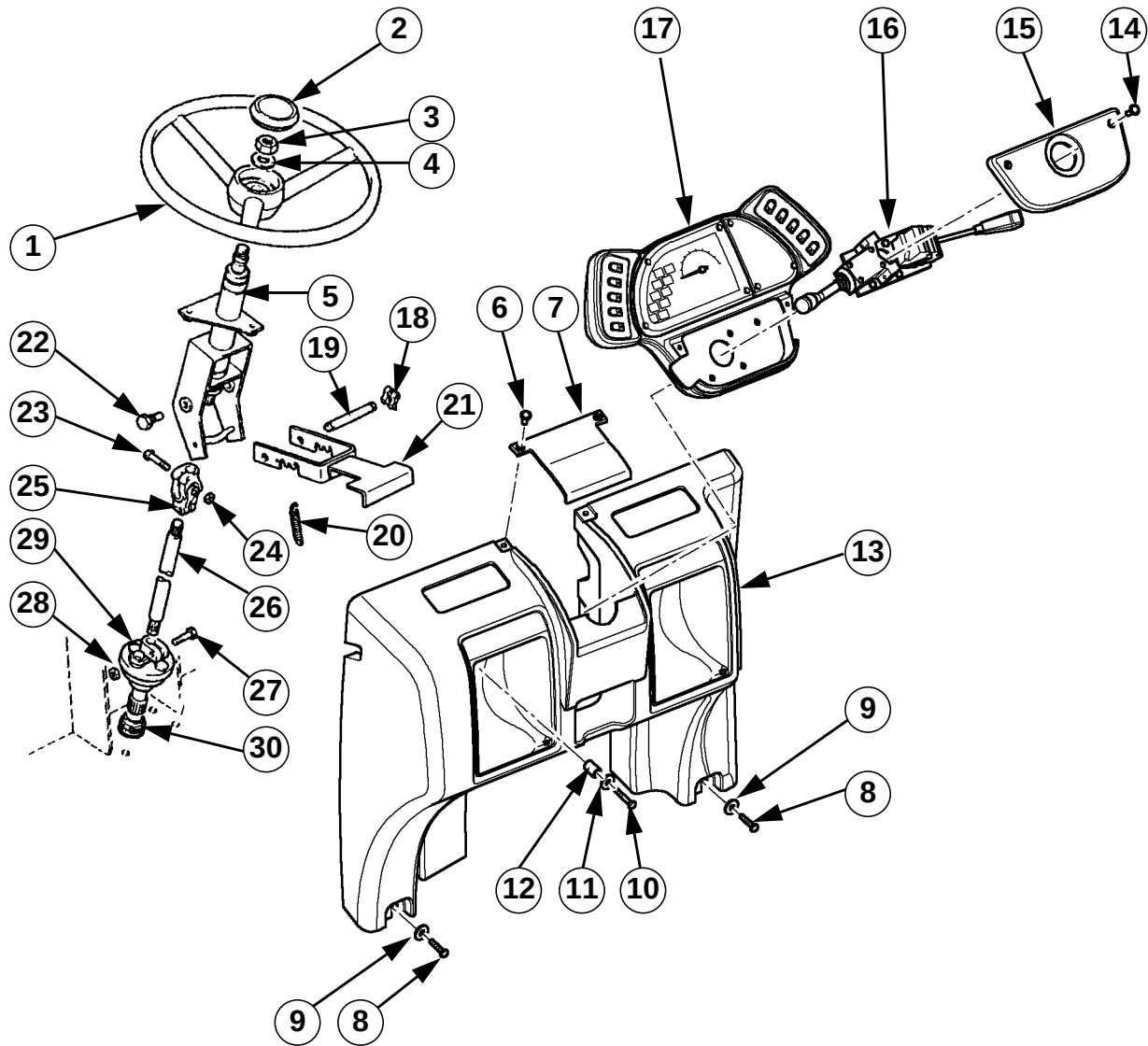
Installation

NOTE : Install the unit in the reverse order from that of removal but note the following :

1. Install the rubber mountings (4) with the large diameter upwards.
2. Release the bolt (5) on the steering unit coupling (6) to slide the coupling up the shaft (7).
3. Engage the coupling end spline in the steering unit with 1 to 2 mm (0.04 to 0.08 in) of the spline above the steering unit coupling.
4. Start the engine and carry out steps 5 through to 9.
5. Release the loader beam safety strut.
6. Lower the loader beam and backhoe stabilizers and raise the machine clear of the ground.
7. Operate the steering to check correct function and check for leaks.
8. Stop the engine.
9. Check the hydraulic oil level.

STEERING COLUMN AND FRONT INSTRUMENT PANEL

Exploded view



CI98M512

1. Steering wheel	11. Washer	21. Handle
2. Cover	12. Spacer	22. Screw
3. Nut	13. Console	23. Screw
4. Washer	14. Screw	24. Nut
5. Steering column	15. Cover sheet	25. Universal joint
6. Screw	16. Selector switch	26. Steering shaft
7. Plate	17. Instrument panel	27. Screw
8. Screw	18. Clip	28. Nut
9. Washer	19. Pin	29. Drive dog
10. Screw	20. Spring	30. Ring, seal

Removal and installation

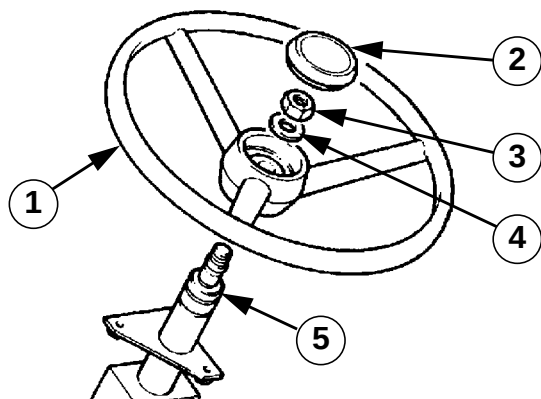
STEP 1

Park the machine on a level surface and apply the parking brake.

STEP 2

Lower the loader bucket and the backhoe stabilizers sufficiently to raise all the wheels from the ground.

STEP 3



CI98M513

Remove the cover (2) from the centre of the steering wheel (1).

STEP 4

Loosen and remove the nut (3) that holds the steering wheel (1) in place and remove the washer (4).

NOTE : When installing, tighten the nut (3) to 58 Nm.

STEP 5

Use the puller MF268A, to remove the steering wheel (1).

NOTE : When installing, put the steering wheel (1) on the steering column (5) so that the splines in the steering wheel mesh correctly with those on the steering column.

STEP 6

Loosen and remove the two screws (6) from the plate (7) and remove the plate (7).

STEP 7

Raise the floor mat, then loosen and remove the mounting screws (8) and washers (9) holding the lower part of the console (13). Loosen and remove the mounting screws (10), washers (11) and spacers (13) holding the upper part of the console (13). Remove the console.

STEP 8

Loosen and remove the two screws (14) from the cover (15) and remove the cover (15).

STEP 9

Loosen and remove the four screws of the front console panel and remove the front console.

STEP 10

Loosen and remove the three screws of the front console binacle and remove the front console binacle.

STEP 11

Disconnect the connector from the transmission shift lever.

STEP 12

Disconnect the connectors from the direction indicator switch.

STEP 13

Disconnect the connectors from the rocker switches from the instrument panel.

STEP 14

Loosen and remove the three mounting screws from the instrument panel (17).

STEP 15

Loosen and remove the three mounting screws holding the forward/reverse control lever and direction indicator assembly (16) to the steering column (5). Remove the assembly (16) along with the steering column (15).

STEP 16

Disconnect the contact switch from the brake pedal.

STEP 17

Remove the two clips (18) from the pin (19), remove the spring (20), then remove the adjustment handle assembly (21).

STEP 18

Loosen and remove the screw (27) and the nut (28) from the drive dog (29).

STEP 19

Loosen and remove the two mounting screws (22) from the steering column (5) and remove the steering column (5) with the steering column shaft (26) from the drive dog.

NOTE : When installing, follow the procedure in the reverse order from that of removal.

FRONT AXLE, 2 WHEEL STEER/2 WHEEL DRIVE

Removal

STEP 1

Park the machine on firm level ground.

STEP 2

Dump the bucket, raise the loader beam and install the safety strut.

STEP 3

Lower the backhoe stabilizer legs to the ground. DO NOT raise the machine.

STEP 4

Release the pressure from the hydraulic system. See section 8002.

STEP 5

Stop the engine.

STEP 6

Put suitable support stands under the chassis.

STEP 7

Remove the front axle wheels.

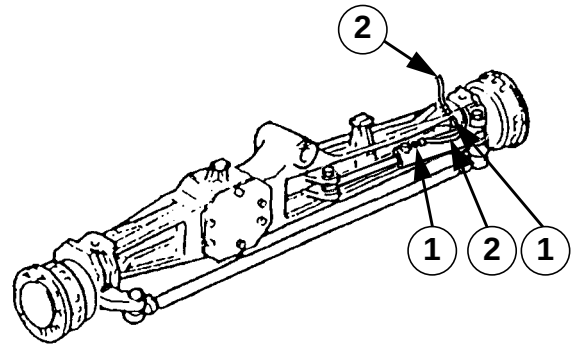
STEP 8

Using suitable trolley jacks support the axle beam at each end. DO NOT lift the machine.

STEP 9

Put a drainage tray under the steering hydraulic cylinder.

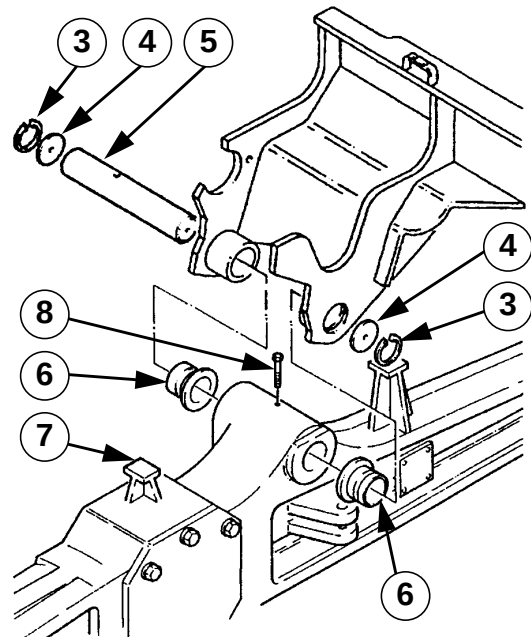
STEP 10



CS98M529

Release the steering hydraulic cylinder hoses (2) at the connections (1). Install plugs in the connections.

STEP 11



CS98M530

Remove the circlips (3) and the discs (9).

STEP 12

Remove the bolt (8).

STEP 13

Screw a slide hammer into pin (5) and pull out the pin.

STEP 14

Lower the axle to ground and remove the bearings (6).

Installation

NOTE : *Install the front axle in the reverse order from that of removal but note the following :*

STEP 1

If the bearings (6) are damaged or worn they must be replaced.

STEP 2

Use trolley jacks at each end of the axle beam to raise the axle into the chassis.

STEP 3

Check for oil leaks.

STEP 4

Check the hydraulic oil level.

STEP 5

Check the axle (5) and the hoses (2) for leaks.

STEP 6

Carry out a functional test of the steering system.

FRONT AXLE, 2 WHEEL STEER/4 WHEEL DRIVE

Removal

STEP 1

Park the machine on firm level ground.

STEP 2

Dump the bucket, raise the loader beam and install the safety strut.

STEP 3

Lower the backhoe stabilizer legs to the ground. DO NOT raise the machine.

STEP 4

Release the pressure from the hydraulic system. See section 8002.

STEP 5

Stop the engine.

STEP 6

Put suitable support stands under the chassis.

STEP 7

Remove the front axle wheels.

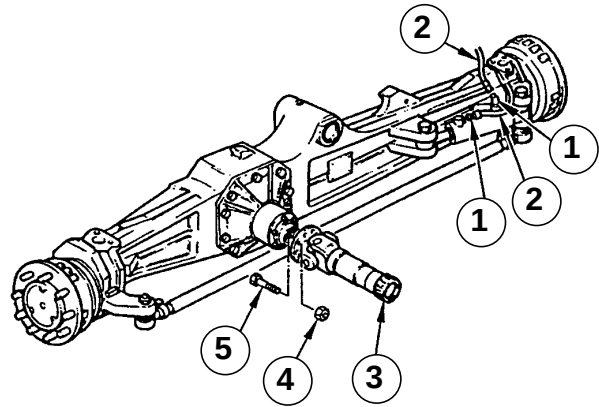
STEP 8

Using suitable trolley jacks, support the axle beam at each end. DO NOT lift the machine.

STEP 9

Put a drainage tray under the steering hydraulic cylinder.

STEP 10



CS98G527

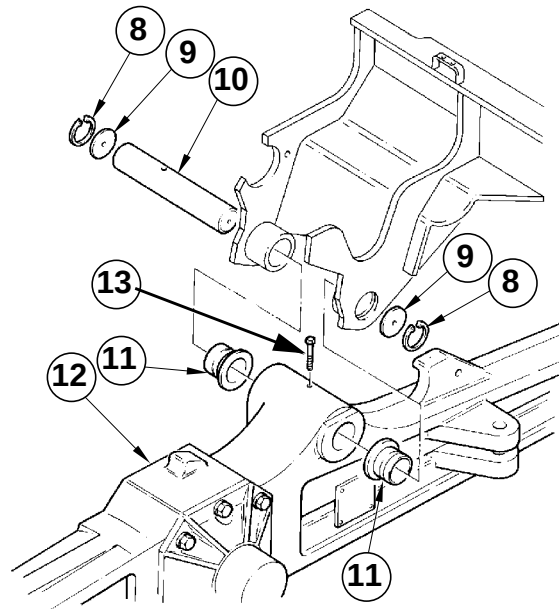
Release the steering hydraulic cylinder hoses (2) at the connections (1). Install plugs in the connections.

STEP 11

Support the front propshaft (3) and remove the eight screws (5) and the nuts (4).

NOTE : When assembling tighten the screws (5) and the nuts (4) to 48 Nm.

STEP 12



CS98M531

Remove the circlips (8) and the discs (9).

STEP 13

Remove the bolts (13).

STEP 14

Screw a slide hammer into pin (10) and pull out the pin.

STEP 15

Lower the axle to ground and remove the bearings (11).

Installation

NOTE : *Install the front axle in the reverse order from that of removal but note the following :*

STEP 1

If the bearings (11) are damaged or worn they must be replaced.

STEP 2

Use trolley jacks at each end of the axle beam to raise the axle into the chassis.

STEP 3

Check for oil leaks.

STEP 4

Torque tighten the bolts (5) and the nuts (4) to 48 Nm (35 lbf ft).

STEP 5

Check the hydraulic oil level.

STEP 6

Check the axle (10) and the hoses (2) for leaks.

STEP 7

Carry out a functional test of the steering system.

FRONT AXLE, 4 WHEEL STEER/4 WHEEL DRIVE

Introduction

The front axle assembly uses the same design features as the rear axle. The maintenance methods used for the axle are the same as for the rear axle, except for those given in this section.

Removal

STEP 1

Park the machine on firm level ground.

STEP 2

Dump the bucket, raise the loader beam and install the safety strut.

STEP 3

Lower the backhoe stabilizer legs to the ground. Do not raise the machine.

STEP 4

Release the pressure from the hydraulic system (see section 8002).

STEP 5

Stop the engine.

STEP 6

Operate the brake pedal to release pressure from the brake hydraulic system.

STEP 7

Put suitable support stands under the chassis.

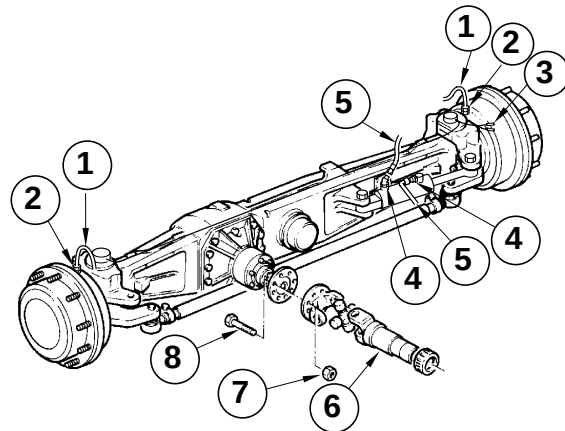
STEP 8

Remove the front axle wheels.

STEP 9

Using suitable trolley jacks support the axle beam at each end. Do not lift the machine.

STEP 10



CS98M532

Release the potentiometer harness connections (3) from the main harness.

STEP 11

Put a drainage tray under the steering hydraulic cylinder.

STEP 12

Release the steering hydraulic cylinder hoses (5) at the connection (4). Install plugs in the connections.

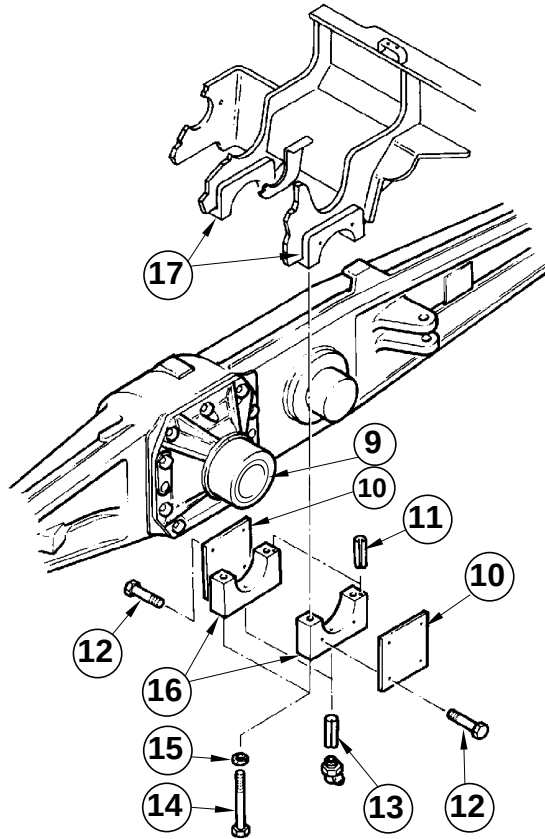
STEP 13

Clamp the brake hydraulic hoses (1) and release the connectors (2).

STEP 14

Support the front propshaft (6) and remove the eight screws (8) and the nuts (7).

NOTE : When assembling, tighten the screws (8) and the nuts (7) to a torque of 48 Nm.

STEP 15

CS98M533

Remove the eight screws (12) from the bearing cover plates (10) and remove the plates (10).

NOTE : When assembling, tighten the screw (12) to a torque of 30 Nm.

STEP 16

Remove the screws (14) and the washers (15) from the bearing caps (16).

NOTE : When assembling, tighten the screws (14) to a torque to 425 to 475 Nm.

STEP 17

Lower the axle carefully.

Installation

NOTE : Install the front axle in the reverse order from that removal but note the following :

STEP 1

Use trolley jacks at each end of the axle beam, to raise the axle into the chassis bearings (17).

STEP 2

Make sure that the bearing bushes (9) are correctly aligned for the roll pins (13) to enter and that the roll pins (11) are installed in the bearing caps (16).

STEP 3

After installation purge the air from the brake system.

STEP 4

Check the hydraulic oil level.

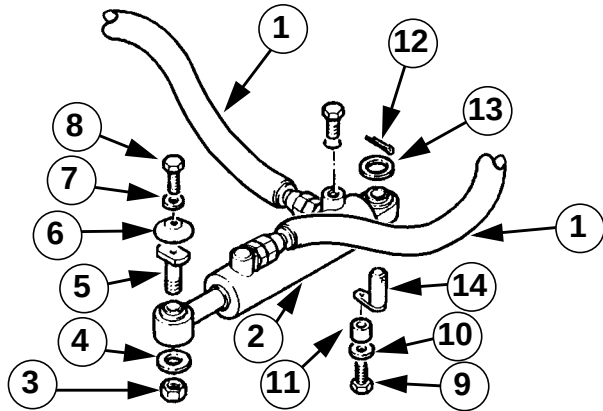
STEP 5

Carry out a functional test of the steering and braking systems.

STEERING CYLINDER

Removal and installation

STEP 1



CS98F517

Clean the hose connections (1) at the steering cylinder (2).

STEP 2

Put an identification tag on the hoses (1).

STEP 3

Disconnect the hoses (1) from the steering cylinder (2).

STEP 4

Install a plug in each hose (1).

STEP 5

Loosen and remove the nut (3) and the washer (4).

NOTE : When assembling, tighten the nut (3) to a torque between 339 and 366 Nm.

STEP 6

Loosen and remove the screw (8), the washer (7), the cover (6) and drive out the pin (5).

STEP 7

Loosen and remove the screw (9), the washer (10) and the spacer (11).

STEP 8

Remove the split pin (12), the washer (13) and the pin (14).

NOTE : When installing, proceed in the reverse order from that of removal.

Section

5001

STEERING SPECIFICATIONS PRESSURE CHECKS AND TROUBLESHOOTING

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SPECIFICATIONS

Orbitrol steering unit relief valve setting 170 to 175 bar (2466 to 2539 lbf/in²)

SPECIAL TOOLS

- Pressure gauge 0 to 250 bar (0 to 3675 lbf/in²)
- Slave joystick
- Voltage monitor
- Multimeter

TROUBLESHOOTING PROCEDURES

Check the machine for oil leaks and damaged or missing parts. Repair as required.

Is the oil in the hydraulic reservoir at the correct level ?

NO

Fill the hydraulic reservoir with the oil specified in Section 1002.

YES

Are the hydraulic hoses connected correctly ?

NO

Connect the hoses in accordance with the hydraulic schematic.

YES

With the oil at operating temperature and the engine running at low idle, is the steering wheel difficult to turn ?

NO

Troubleshooting procedure complete.

YES

Has the emergency stop button been reset ?

NO

Twist the emergency stop button to reset the hydraulic system.

YES

Has the hydraulics enable switch been set on ?

NO

Set the hydraulics enable switch to on.

YES

Did the green light in the hydraulics enable switch come on ?

NO

Replace the bulb in the hydraulics enable switch.

YES

Is the green light in the hydraulics enable switch flashing twice per second ?

NO

Continue with the procedure.

YES

Is the driver sat in the seat ?

NO

The warning is given if the driver is not seated.

YES

Has the light stopped flashing ?

NO

Replace the seat pressure switch.

YES

Did the fault warning alarm give a single “beep”

NO

Continue with the procedure.

YES

The seat is not properly locked in an operating position. Move the seat forwards until it locks. The seat should not swivel. Has the single “beep” fault warning alarm stopped ?

NO

Replace the seat position switches.

YES

Did the fault warning alarm give four “beeps” during start-up ?

NO

Continue with the procedure.

YES

The steering wheel position does not agree with the mode selected. Is the mode selector switch in the correct position ?

NO

With the engine running, select any steering mode. The wheels will align to the new mode and the alarm will stop.

YES

Has the four “beep” fault warning alarm stopped ?

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

YES

Did the fault warning alarm give four “beeps” whilst the machine was working ?

NO

Continue with the procedure.

YES

If the fault is in the front axle, switch to two wheel steer. Has the four “beeps” fault warning alarm stopped ?

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

YES

If the fault is in the rear axle, the rear steering will “Freeze”. Has the rear steering “frozen” ?

NO

Continue with the procedure.

YES

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected. Has the fault been corrected ?

NO

Do not operate the machine.

YES

Did the fault warning alarm give five "beeps"

NO

Continue with the procedure.

YES

There is a fault in the steering harness. Call your Service Department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected. Has the fault been corrected ?

NO

Do not operate the machine.

YES

Do the pump flow test for the inner section of the hydraulic pump (80 litres/min) as detailed in Section 8002. Is the hydraulic pump serviceable ?

NO

Replace or repair the hydraulic pump as detailed in the Service Manual.

YES

Do the Orbitrol steering unit relief valve test as detailed in this section. Is the Orbitrol steering unit serviceable ?

NO

Replace or repair the Orbitrol steering unit as detailed in the Service Manual.

YES

Has the steering system stopped working ?

NO

Troubleshooting procedure complete.

YES

Stop the engine and use the manual operation lever to move the steering spool of the loader valve. Does the spool move freely without jamming ?

NO

Remove the loader valve assembly and replace the steering spool.

YES

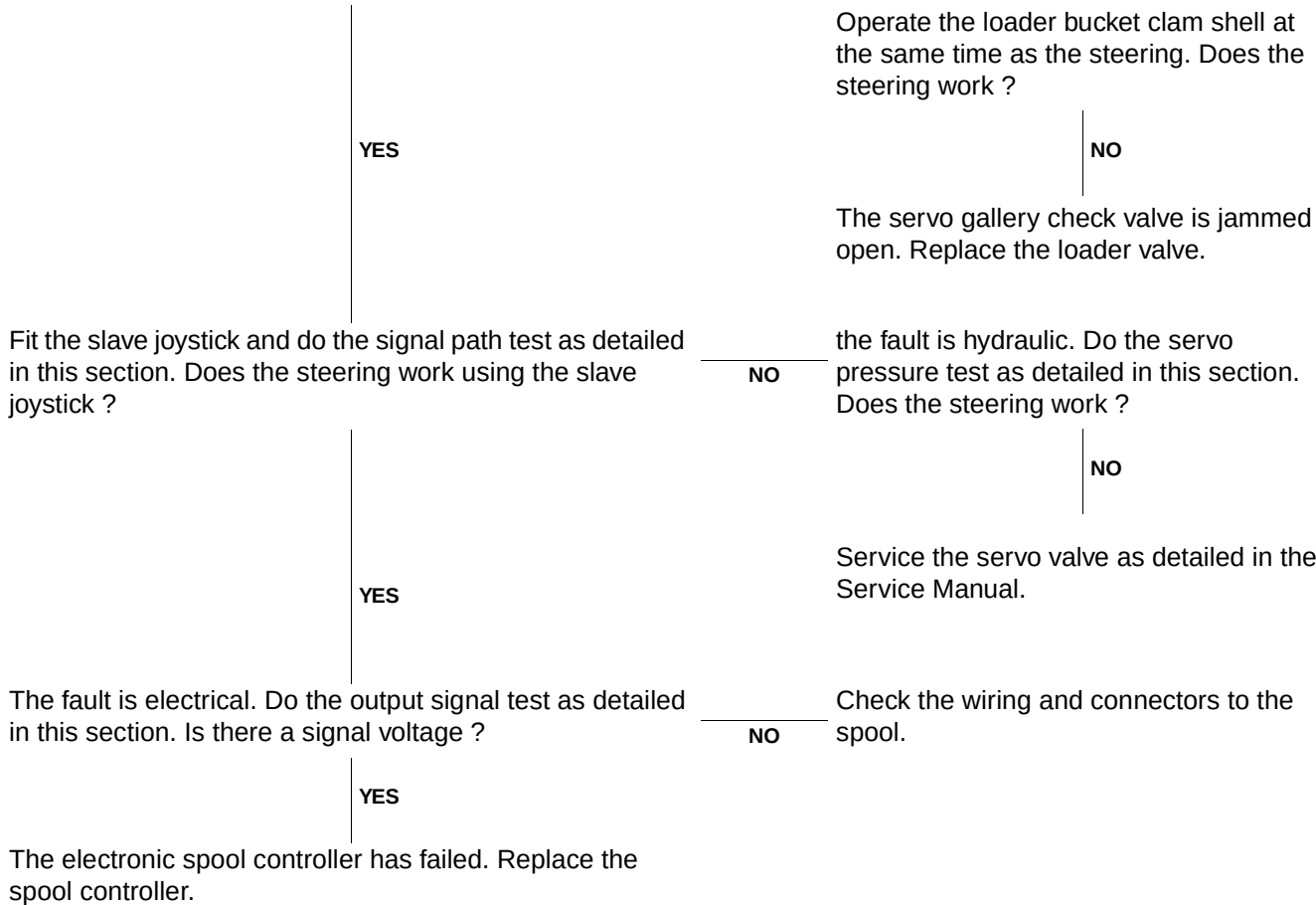
Start the engine and use the manual operation lever to move the steering spool. Does the steering work using the manual operation lever ?

NO

Operate the loader bucket at the same time as the steering. Does the steering work ?

YES

NO



CHECKING PISTON PACKING FOR THE STEERING CYLINDER

1. Apply the parking brake and lower the loader bucket to the floor.
2. Turn the steering wheel all the way to the right and stop the engine.
3. Depressurize the hydraulic system (See Section 8002).
4. Disconnect the hose at the left side of the steering cylinder.
5. Install a plug in the hose. The thread size 3/4-16.
6. Start the engine and run the engine at full throttle.
7. Turn the steering wheel all the way to the right and continue to turn the steering wheel to the right while another person checks for leakage at the open fitting.
8. If there is constant leakage, the piston packing is damaged and must be repaired. See Section 5003 for repair instructions.

NOTE: Carry out the same procedure for the rear axle steering cylinder.

ORBITROL STEERING UNIT RELIEF VALVE TEST

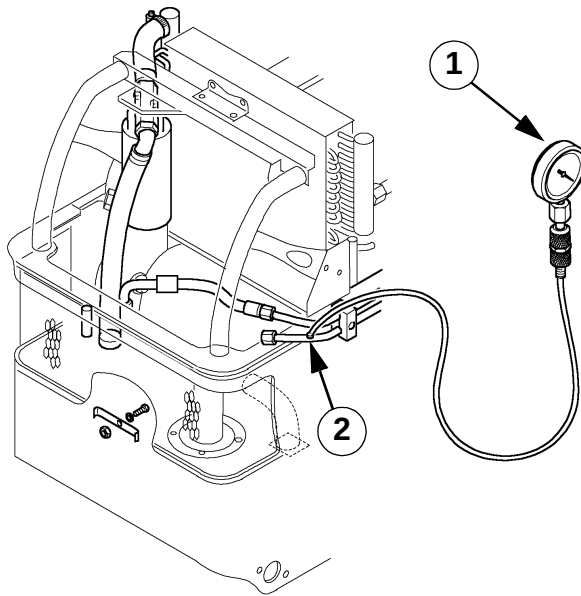
1. Work the machine until the temperature of the hydraulic oil is at least 60°C (140°F).
2. Park the machine on firm, flat ground.
3. Dump the bucket, raise the loader beam and install the safety strut.
4. Stop the engine and release the pressure from the hydraulic system.
5. Open the hood.
- 6.
7. Start and run the engine at 1800 rpm.
8. Turn the steering to full lock and check the relief valve pressure setting. This should be 170 to 175 bar.
9. Adjust the relief valve in the orbitrol steering unit if the pressure is not correct.

Adjustment

NOTE: The relief valve will not normally require adjustment unless the steering system pressure is not correct on test. The valve can be adjusted on the machine or on a test bench. This instruction describes setting on the machine, but the method of adjustment is the same when using a test bench.

Adjust the relief valve as follows :

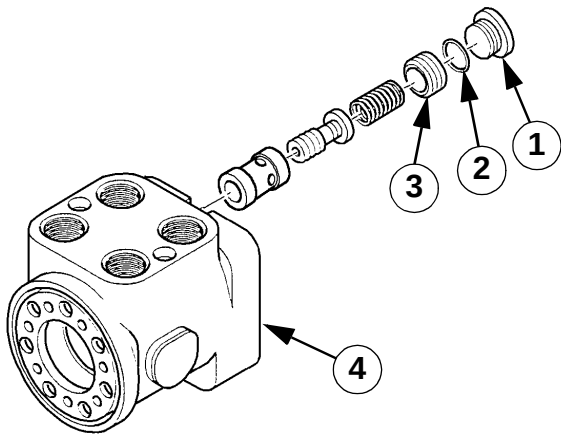
1. Park the machine on firm, level ground.
2. Fully crowd the bucket, raise the loader beam and fit the safety strut.
3. Lower the backhoe stabilizers to the ground. Do not raise the machine.
4. Stop the engine and depressurize the hydraulic system.
5. Fit the test equipment.



CI98N501

Connect the pressure gauge (1) to test point (2) on the outlet for the inner hydraulic pump.

6.



CS98N505

Remove the plug (1) from the steering unit (4) and turn the setting plug (3) in or out by one turn.

NOTE: To increase system pressure, screw the setting plug (3) in. To reduce system pressure, screw the setting plug (3) out.

7. Install the plug (1) in the steering unit and carry out the relief valve test.
8. Note the change in pressure and carry out further adjustments to set the correct pressure.
9. After the final adjustment, fit a new O-ring seal (2) on the plug (1) and install the plug (1).
10. Remove the test equipment.

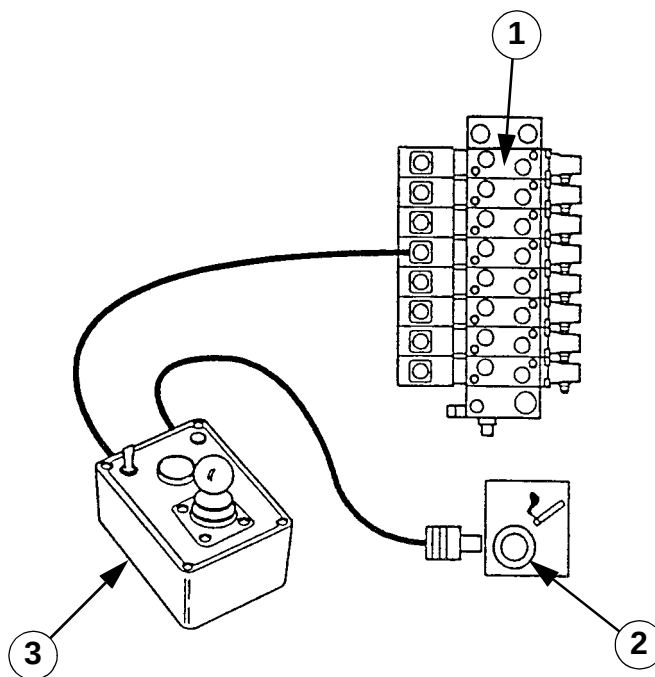
SIGNAL PATH TEST

Special tools

- Slave joystick
- Voltage monitor

Do the signal path test as follows :

1. Park the machine on a level surface and stop the engine.
2. Using the voltage monitor, check that the battery voltage is greater than 11.8V.
3. Lift the floor mat and remove the plate that gives access to the loader valve or to the backhoe valve.
4. Disconnect the Hirschmann plug from non-functioning spool of the valve assembly.
5. The slave joystick has two leads. Connect the lead with the Hirschmann plug to the steering spool and plug the other lead into the cigar lighter socket.
6. Set the two position switch on the slave joystick to FAST.
7. Start the engine and set the hydraulics enable switch to on. Make sure that the green light in the hydraulics enable switch is on.
8. Press and hold the yellow button on the slave joystick.
9. Move the joystick to operate the service.
10. If the service operates correctly, there is a fault in the electrical system.
11. If the service does not operate correctly, the fault is in the hydraulic system. Do the servo pressure test as detailed in this section.



1. Backhoe (or loader) valve
2. Cigar lighter socket
3. Slave joystick

CS98N509

OUTPUT SIGNAL TEST

Special tools

- Multimeter
- Voltage monitor

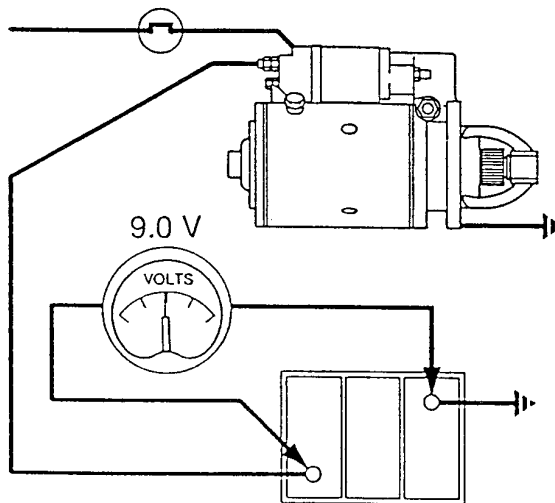
The voltage monitor comprises :

- An illuminated display which indicates voltages of between 25 to 75% of battery voltage in relation to joystick movement.
- Three colour coded sockets :
 - a. black = 0V = earth
 - b. red = V batt. = battery voltage
 - c. white = signal = signal voltage
- A lead fitted with a double sided Hirschmann plug.

Do the output signal test as follows :

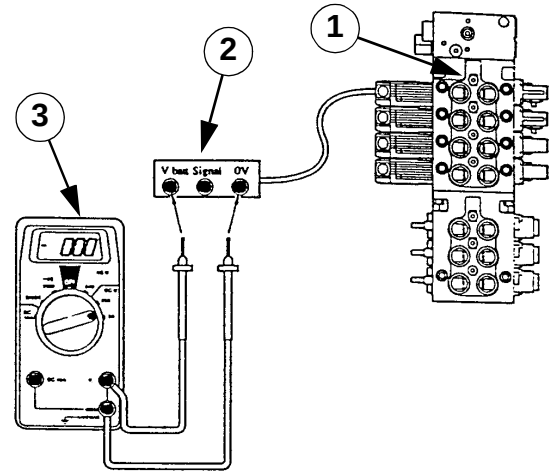
1. Park the machine on a level surface and stop the engine.
2. Lift the floor mat and remove the plate that gives access to the loader valve or to the backhoe valve.
3. Disconnect the Hirschmann plug from the steering spool of the valve assembly.

4. Connect the voltage monitor double sided plug to the steering spool.
5. Connect the Hirschmann plug to the voltage monitor double sided plug. The voltage monitor is now connected into the sided plug. The voltage monitor is now connected into the signal path between the hydraulic management unit and the steering spool.



CS98N510

6. Connect the multimeter leads to the voltage monitor as shown, and set the selector switch to the 20V dc range.
7. Turn the ignition key switch to the positive (+) position, but do not start the engine.
8. Set the hydraulics enable switch to on. Make sure that the green light in the hydraulics enable switch is on.
9. Electronic backhoe version only. Make sure that the seat is facing in the correct direction and that the operator is sat on the seat.
10. Move the joystick from the neutral position.
11. Note the battery voltage indicated on the multimeter. Make sure the battery voltage is a minimum of 11.8V.
12. If there is no battery voltage indicated, check the hydraulics enable switch, the emergency override switch, the relays, the fuses or the wiring for faults.
13. Move the joystick along each axis and record the voltages indicated on the voltage monitor. Make sure that the values increase and decrease smoothly as the joystick is moved.
14. Make sure that the indicated voltages are between 25 to 75% of the battery voltage in step 11.
15. If the signal readings are erratic, check the joystick and wiring for faults.
16. If there is no signal voltage, check the wiring and connections.



CS98N511

1. Backhoe (or loader) valve
2. Voltage monitor
3. Multimeter

Section

5001

**STEERING SPECIFICATIONS PRESSURE CHECKS
AND TROUBLESHOOTING
(MODELS 750 - 760 - 860)**

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SPECIFICATIONS

Location of steering relief valve	in steering control valve
Orbitrol steering unit relief valve setting	170 to 175 bar (2466 to 2539 lbf/in ²)
Solenoid valve :	
Flow	20 l/min
Pressure	250 bar

SPECIAL TOOLS

Pressure gauge 0 to 250 bar (0 to 3675 lbf/in²)

TROUBLESHOOTING PROCEDURES

Check the machine for oil leaks and damaged or missing parts. Repair as required.

Is the oil in the hydraulic reservoir at the correct level ?

YES

NO

Fill the hydraulic reservoir with the oil specified in Section 1002.

Are the hydraulic hoses connected correctly ?

YES

NO

Connect the hoses in accordance with the hydraulic schematic.

With the oil at operating temperature and the engine running at low idle, is the steering wheel difficult to turn ?

YES

NO

Does the steering control valve return to NEUTRAL when the steering wheel is not being turned ?

NO

Replace or repair the steering control valve according to instructions in Section 5002.

Check the setting of the steering relief valve according to the instructions in this section. Is the setting correct ?

YES

NO

See section 5002 and repair or replace the steering relief valve in the steering valve.

Check to see that the spool for the flow control valve in the inlet of the loader control valve moves freely. See Section 8005 and repair as required. Is there still a problem ?

YES

NO

Troubleshooting complete.

Check the piston packing for the steering cylinder according to instructions in this section. Is the piston packing good.

YES

NO

Repair as required according to instructions in Section 5003.

Do the flowmeter test for the hydraulic pump according the instructions in Section 8002. Is the hydraulic pump good ?

YES

NO

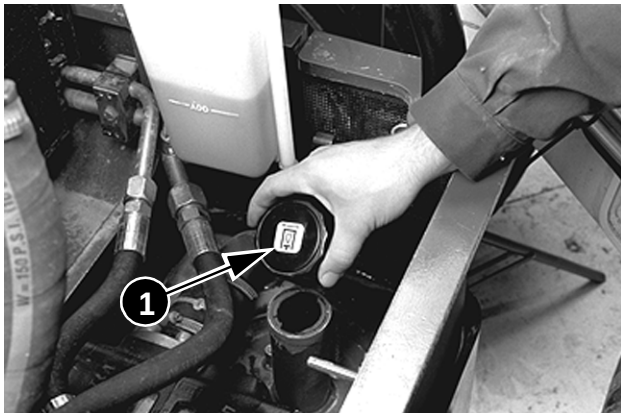
Replace or repair the hydraulic pump according to the instructions in Section 8004.

Replace or repair the steering control valve according to the instructions in Section 5002.

DEPRESSURIZING THE HYDRAULIC SYSTEM

Models 750, 760 and 860

1. Park the machine on a level surface.
2. Lower the loader and the backhoe to the ground and raise the stabilizers off the ground.
3. Switch off the engine.
- 4.



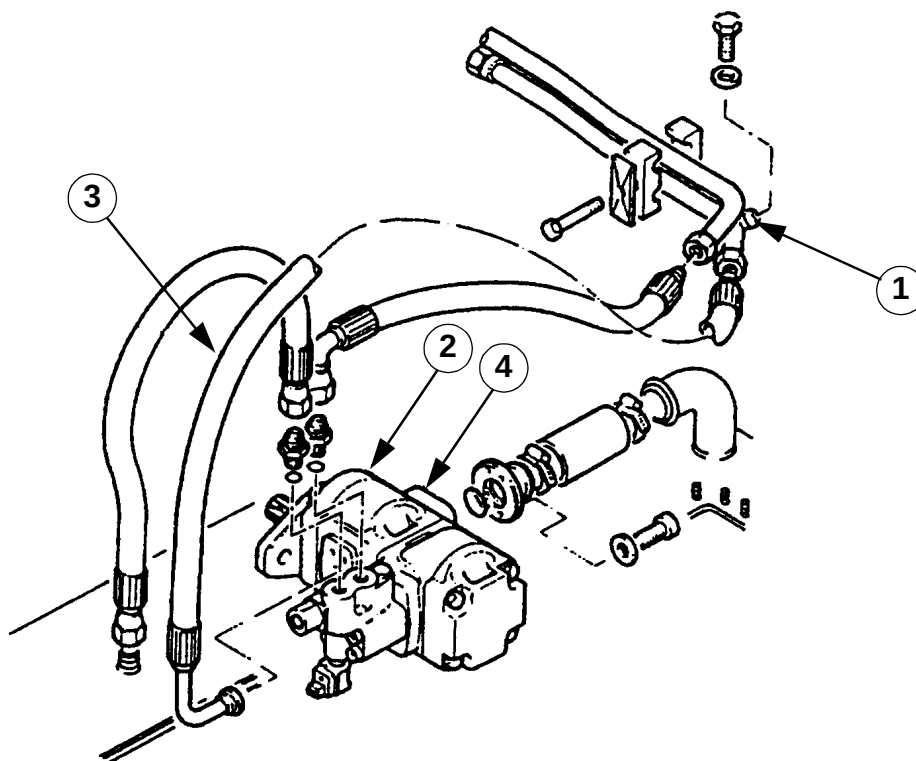
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Remove the hydraulic reservoir cap (1).

5. Move all the backhoe and the loader control levers in all directions several times until the loader and the backhoe are fully settled on the ground.
6. Refit the hydraulic reservoir cap.

CHECKING THE PRESSURE SETTING OF THE STEERING RELIEF VALVE

1. Park the machine on a level surface. Put the backhoe in the transport position and lower the loader bucket to the floor.
2. The oil must be at operating temperature. To heat the oil, do the following steps :
 - A. With the engine running at full throttle, hold the loader control lever in the ROLLBACK position for 15 seconds.
 - B. Put the loader control lever in the NEUTRAL position for 15 seconds.
 - C. Repeat steps A and B until the temperature of the oil is 125°F (51°C) or the side of the reservoir is very warm.
3. See the illustration below. Use a pressure gauge with a capacity of at least 276 bar. Connect the pressure gauge to the quick disconnect fitting at Test Port 1. The quick disconnect fitting is located inside the LH frame rail to the left of the engine.
4. With the engine running at full throttle, turn and hold the steering wheel all the way to the right or to the left and read the gauge. Make a record of the reading.
5. Decrease the engine speed to low idle for two minutes and stop the engine.
6. Compare the reading with the specification on page 2. If the reading is not correct, see Adjustment, consult Section 5002 and repair or replace the steering control valve.



CS99E519

1. Test port 1
2. Hydraulic pump
3. To inlet of steering priority valve
4. From reservoir

CHECKING PISTON PACKING FOR THE STEERING CYLINDER

1. Apply the parking and lower the loader bucket to the floor.
2. Turn the steering wheel all the way to the right and stop the engine.
3. Disconnect the hose at the left side of the steering cylinder.
4. Install a plug in the hose.
5. Start the engine and run the engine at full throttle.
6. Turn the steering wheel all the way to the right and continue to turn the steering wheel to the right while another person checks for leakage at the open fitting.
7. If there is constant leakage, the piston packing is damaged and must be repaired. See Section 5003 for repair instructions.

Adjustment

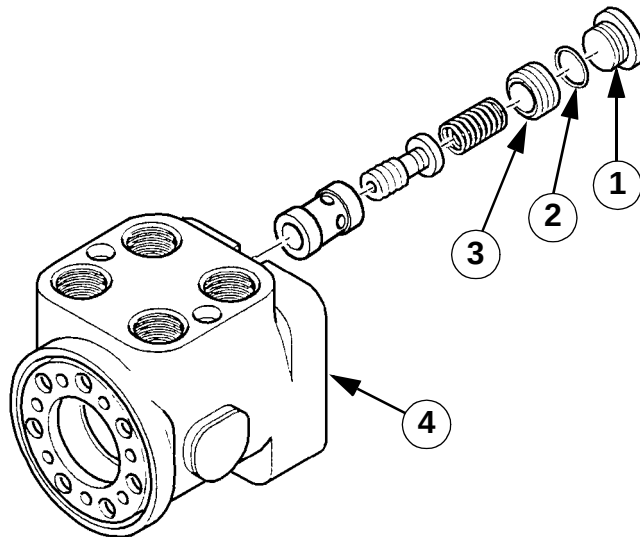
NOTE : The relief valve will not normally require adjustment unless the steering system pressure is not correct on test. The valve can be adjusted on the machine or on a test bench. This instruction describes setting on the machine, but the method of adjustment is the same when using a test bench.

Adjust the relief valve as follows :

1. Park the machine on firm, level ground.
2. Fully crowd the bucket, raise the loader beam and fit the safety strut.
3. Lower the backhoe stabilizers to the ground. Do not raise the machine.
4. Stop the engine and depressurize the hydraulic system (see page 4).
5. Fit the test equipment.
- 6.

NOTE : To increase system pressure, screw the setting plug (3) in. To reduce system pressure, screw the setting plug (3) out.

7. Install the plug (1) in the steering unit and carry out the relief valve test.
8. Note the change in pressure and carry out further adjustments to set the correct pressure.
9. After the final adjustment, fit a new O-ring seal (2) on the plug (1) and install the plug (1).
10. Remove the test equipment.



CS9E520

Remove the plug (1) from the steering unit (4) and turn the setting plug (3) in or out by one turn.

Section

5002

5002

STEERING CONTROL VALVE

TABLE OF CONTENTS

SPECIAL TORQUES.....2

SPECIALS TOOLS.....2

STEERING CONTROL VALVE 3

SPECIAL TORQUES

Screw (6) and (7) 33 Nm

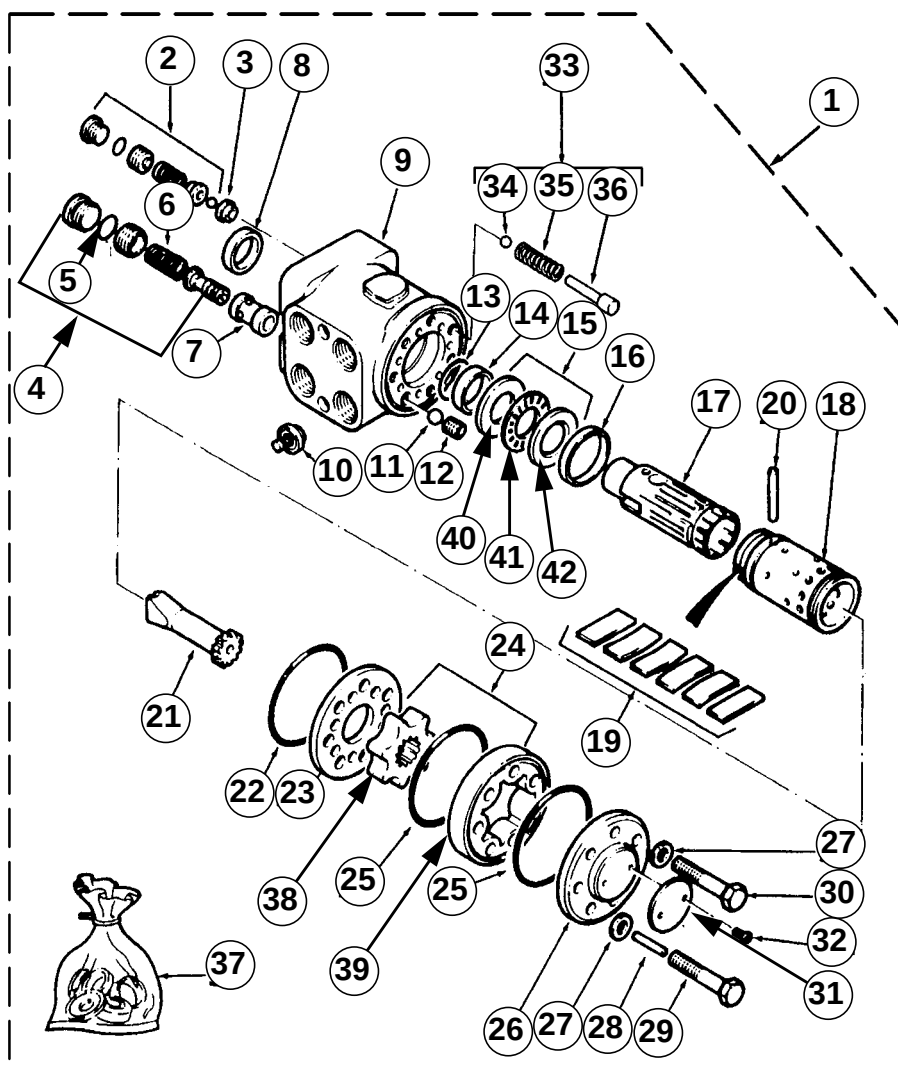
SPECIALS TOOLS

Slip seal installation tool MS 62A

Drive shaft assembly tool FS8 #1

STEERING CONTROL VALVE

Perspective view



C198G503

1. Valve control	10. Limiter	21. Drive shaft	32. screw
2. Kit, parts	11. Ball	22. O-ring	33. Valve relief
3. Seat	12. Seat	23. Spacer plate	34. Ball
4. Valve, press, relief	13. O-ring	24. Gear, set	35. Spring
5. Ring, seal	14. Ring, seal	25. O-ring	36. Pin
6. Spring	15. Bearing, needle	26. End plate	37. Package, seals
7. Seat	16. Seal	27. Washer	38. Rotor
8. Dust seal	17. Spool	28. Pin, split	39. Stator
9. Body	18. Sleeve, coupling	29. Screw	40. Thrust washer
	19. Centering springs	30. Screw	41. Thrust bearing
	20. Pin, split	31. Plate	42. Thrust washer

Disassembly

STEP 1

Put the steering control valve (9) in the vise so that the end plate is up.

Remove the six screws (30), the one special screw (29) and the washers (27).

NOTE : Make a mark on the main body, to indicate the position of the special bolt.

STEP 2

Remove the end plate (26).

STEP 3

Remove the rotor (38) and the stator (39).

STEP 4

Remove and discard both O-ring seal (25) from the stator (39).

STEP 5

Remove the drive shaft (21).

STEP 6

Remove the spacer plate (23).

STEP 7

Remove and discard the O-ring (22) from the body (9).

STEP 8

Remove the two screws (32), the plate (31) of the end plate (26).

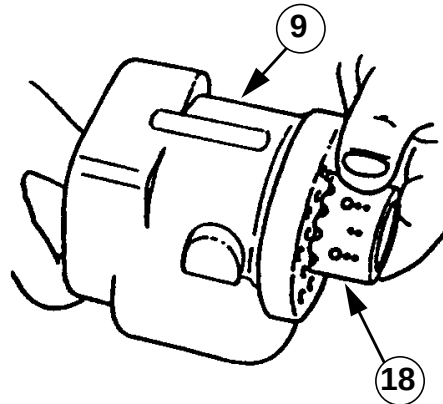
STEP 9

Shake out the pin (36), the spring (35) and the steel ball (34).

STEP 10

Unscrew the threaded bush (12) from the check valve and remove the steel ball (1).

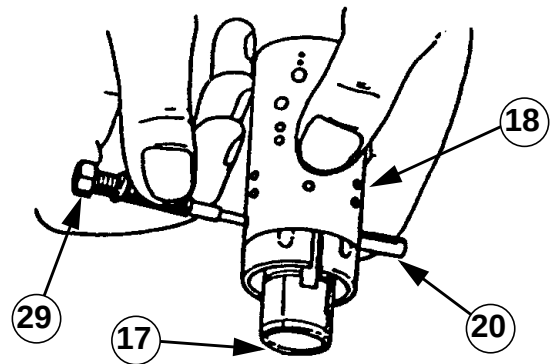
STEP 11



CS98G530

Remove the valve spool assembly (18) from the steering unit body (9).

STEP 12

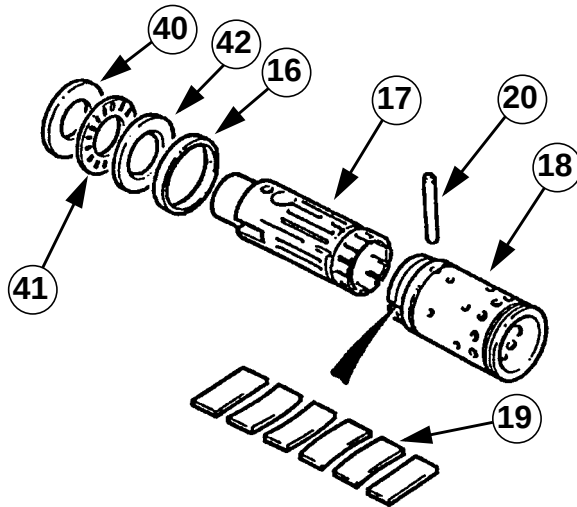


CS98G531

With the cross pin (20) in the housing (18) horizontally, and the spool drive end (17) supported, use the special bolt (29) from the end plate (26) to remove the cross pin (20).

STEP 13

Press the spool from the drive end (17) and the sleeve, ring, bearing races and needle bearing will be pushed out of the housing as an assembly.

STEP 14

CS98G533

Slide the seal (16), the thrust washer (40) and (42) and the thrust bearing (41) from the spool (17). The outer thrust washer may stick in the housing, make sure it has come out.

STEP 15

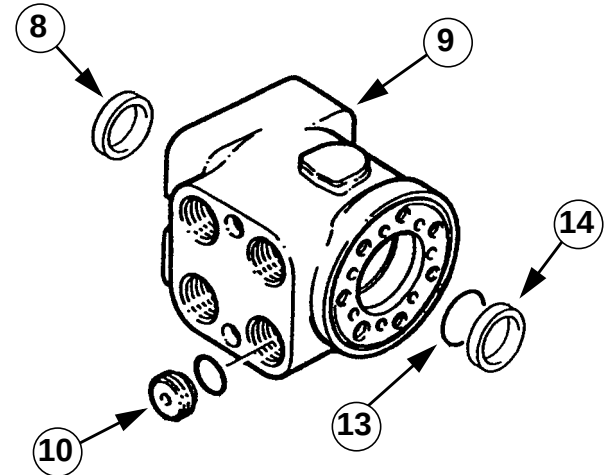
Use the special bolt (29) from the end-plate (26) to press out the cross pin (20).

STEP 16

Carefully press the spool (17) out of the sleeve (18).

STEP 17

Press the centering springs (19) out of the slots in the spool (17).

STEP 18

CS98G534

Remove the dust seal (8), the slip ring (14) and the O-ring (13). Discard the O-ring (13) from the steering unit body (9).

STEP 19

Unscrew the limiter (10) from the inlet port and discard the O-ring.

STEP 20

Remove the kit, parts (2) and the seat (3).

STEP 21

Remove the valve, press, relief (4) and the seat (7).

Inspection

Use cleaning solvent to clean all parts. Put the parts on paper towels until the parts are dry. Do not use cloths to wipe the parts dry.

The leaf spring pack (19) has two flat and four curved leaves which are all grey in colour.

If any mating surfaces in the sleeve, spool or valve body is marked, replace the complete valve spool assembly.

Assembly

NOTE : *Assemble the steering unit in the reverse order of the disassembly but note the following :*

STEP 1

Lubricate all parts with clean hydraulic oil.

STEP 2

Assemble the leaf springs (19) by placing the two flat leaf springs into the slot in the spool (17) and insert the ends of the curved leaf springs between them. Press the complete spring pack (19) into place.

STEP 3

When guiding the ring (16) over the sleeve, make sure it can rotate without contacting the springs (19).

STEP 4

When assembling the bearing races (40) and (42) and the needle bearing (41), make sure that the inner bearing race (16) is fitted with the internal chamfer against the shoulder on the spool (18).

STEP 5

Install a new dust seal (8) in the body (9) with the open side facing outwards.

STEP 6

Install new O-ring seals (25), (22) and (13).

STEP 7

During installation of the drive shaft (21), note the position of the slot A in the shaft end. Use the special tool FS8#1 to keep the shaft (21) at the correct height.

STEP 8

Rotate the shaft to engage the cross pin in the drive shaft slot, and rotate the sleeve assembly until the cross pin and the slot are parallel with face B.

STEP 9

Take care when assembling the rotor (38) on the drive shaft (21). The rotor will only fit on the drive shaft spline in one position.

STEP 10

Install new washers (27) on the bolts (30) and (29).

STEP 11

Install the special bolt (29) in the hole marked during disassembly.

NOTE : *Torque tighten the bolts (27) and (29) to 33 Nm (24 lbf ft).*

Section

5003

STEERING CYLINDERS

5003

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LOCK WIRE LUG, FAILURE.....	7
Extraction	7

SPECIFICATIONS

Working pressure	180 bar max
Oil Temperature Range	-30°C - + 80°C

SPECIAL TORQUE

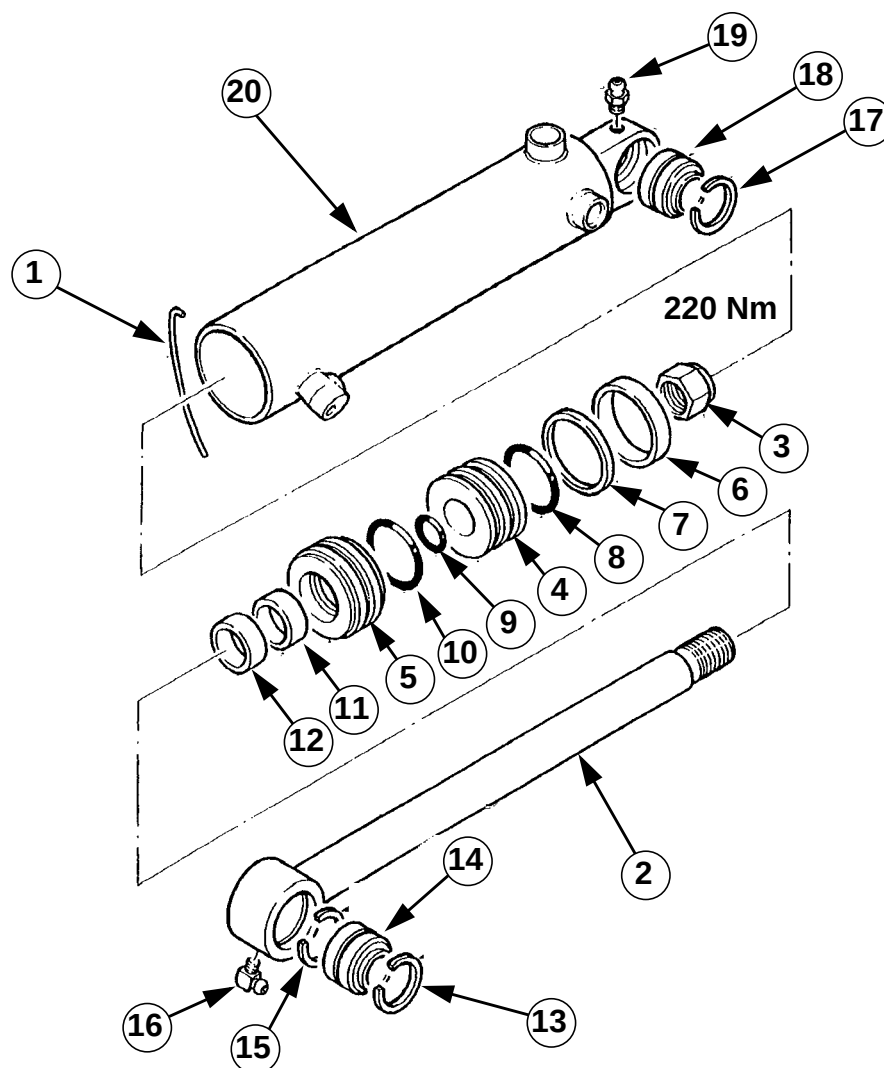
Piston nut.....	220 Nm

SPECIAL TOOLS

- 1 Bench mounted, cylinder jig
- 2 Peg wrench
- 3 Silicone rubber sealant
- 4 Loctite 242
- 5 Anti-seize/Anti-corrosion compound

STEERING CYLINDER

Perspective view

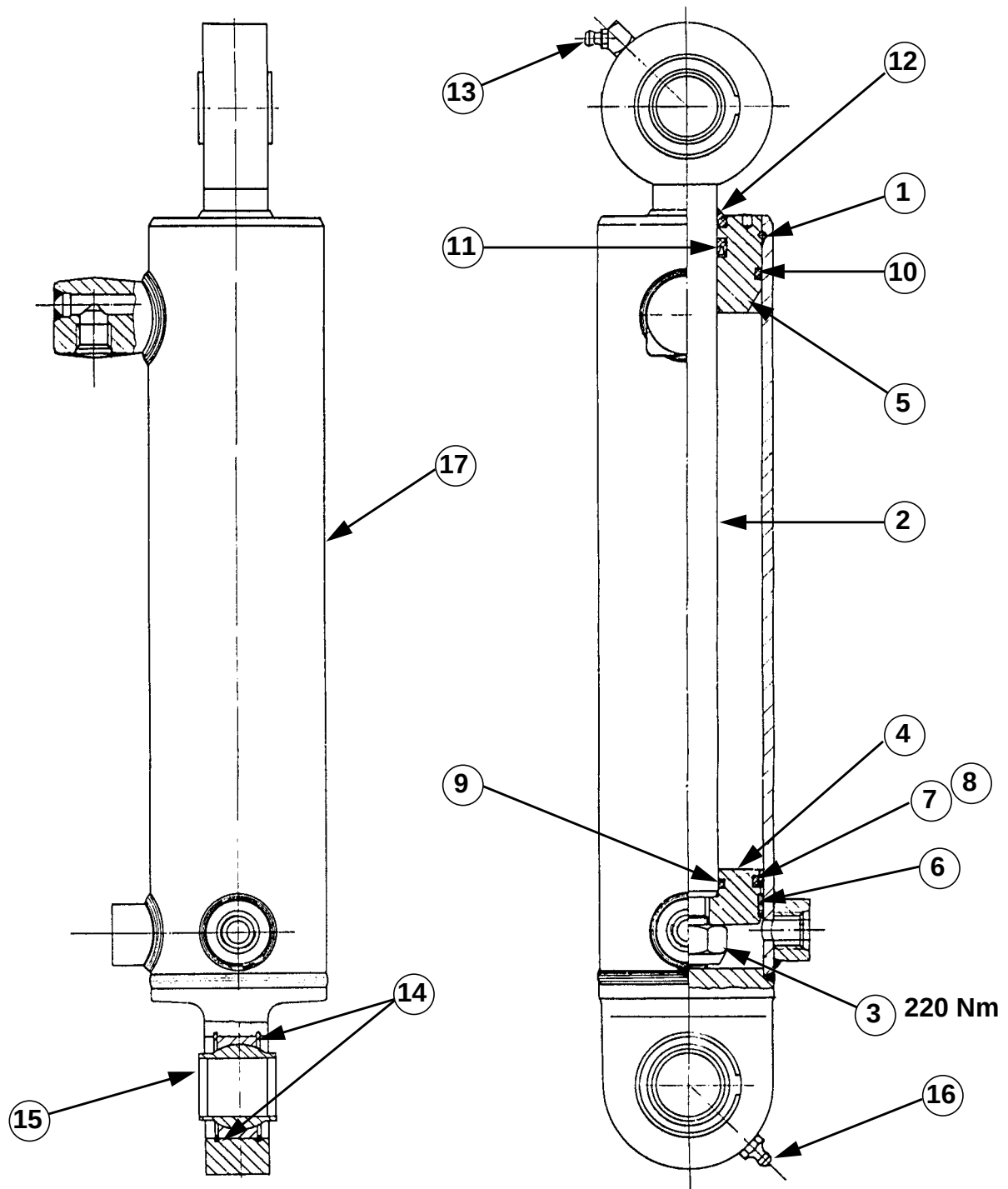


- 1. Retaining ring
- 2. Rod, piston
- 3. Nut
- 4. Piston, cylinder
- 5. Gland, cylinder
- 6. Piston guide ring
- 7. Ring, seal

- 8. O-Ring
- 9. O-Ring
- 10. O-Ring
- 11. Seal
- 12. Wiper ring,
- 13. Ring, snap
- 14. Bushing

- 15. Ring, snap
- 16. Fitting, grease
- 17. Ring, snap
- 18. Bushing
- 19. Fitting, grease
- 20. Tube cylinder

CI98J515

CROSS - SECTIONAL VIEW

CS98J558

1. Retaining ring	7. O-Ring	13. Fitting, grease
2. Rod piston	8. Piston seal	14. Ring, snap
3. Nut	9. O-Ring	15. Bushing
4. Piston cylinder	10. O-Ring	16. Fitting, grease
5. Gland cylinder	11. Seal	17. Tube, cylinder
6. Piston guide ring	12. Wiper ring	

Disassembly and assembly

STEP 1

Remove the cylinder from the machine (see section 5000).

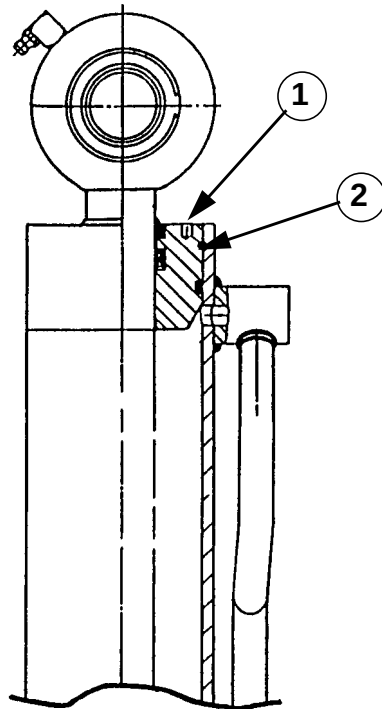
STEP 2

Drain the cylinder.

STEP 3

Mount cylinder into the jig, to prevent it turning.

STEP 4



CS98J555

Use the peg wrench to rotate the rod bearing (1) clockwise, (as viewed from the rod-end of the cylinder), until the bevelled end of the lock-wire (2) is visible through the slot in the side of the cylinder.



WARNING : Do not rotate the rod bearing in the opposite direction, as the bevelled end of the lock-wire may jam in the groove and break off the drive lug.

STEP 5

Reverse the rotation of the rod bearing when the end of the lock-wire is visible. The lock-wire will normally feed out through the slot without aid. If the wire does not enter the slot, insert a small screwdriver to act as a guide.

NOTE : For assembly, fit a new lock-wire and wind it in, by rotation the bearing anti-clockwise (as viewed from the rod end of the cylinder). Fill the slot with putty or silicone rubber sealant to prevent water ingress.

STEP 6

If the lug on the lock-wire is broken off (see page 7).

STEP 7

Pull the ram rod and bearing from the cylinder, if this proves difficult (see page 7).

NOTE : For assembly, coat the outside of the gland with a good quality anti-seizure rust product.

STEP 8

Mount the rod eye into the cylinder jig and release the nut which retains the piston.

NOTE : When assembly the piston nut, use Loctite 242 and tighten to a torque of 220 mN.

STEP 9

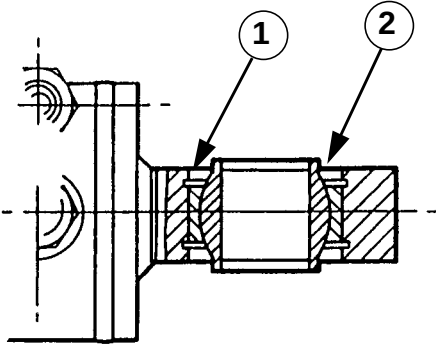
Remove the piston and seals.

NOTE : The piston seal may need a tapered guide to assist fitment. Uneven and prolonged stretching may cause permanent distortion. Wrap the bearing strip into the groove on the piston.

STEP 10

Remove the rod bearing.

STEP 11



CS98J559

Prise the snap ring (1) from its groove and push out the spherical bearing (2) (head and rod end).

Inspection

If either the cylinder bore or rod are marked, the component must be replaced.

NOTE : *For assembly, follow the same procedure in reverse order.*

LOCK WIRE LUG, FAILURE

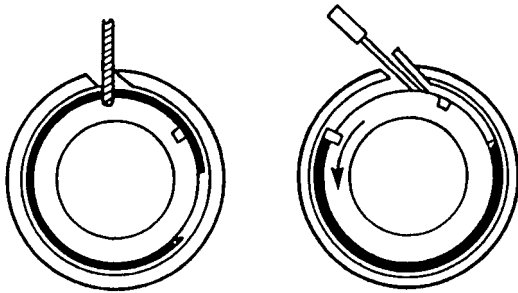
Extraction

Failure of the lock-wire lug will prevent the bearing from being removed from the cylinder. However the old lock-wire can be removed by using the following process :

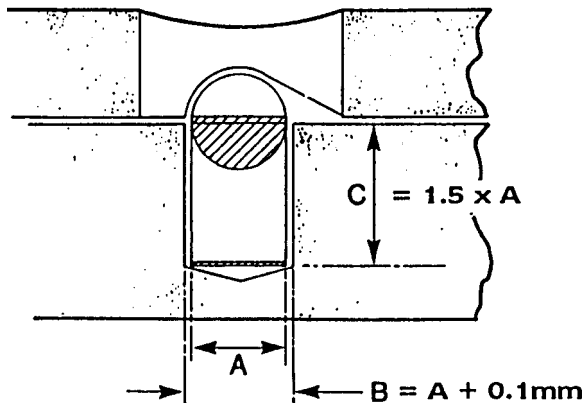
STEP 1

Through the insertion hole, centre punch the lock-wire as near to the centre of the wire as possible.

STEP 2



CS98J556



CS98J557

Use a drill of the size (B), and drill through the lock-wire and into the bearing to the depth (C).



WARNING : The drilled hole must not be drilled deeper than shown, or the drill may break through the bearing, in which case the bearing must be scrapped.

STEP 3

Cut off a section of Lock-wire or piano wire of diameter (A), to the length (C) and insert it into the blind hole. This will now take the place of the lug and drive the broken lock-ring out in the normal way.

STEP 4

After complete withdrawal of the lock-wire pull the piston rod sharply out until it contacts the end cap bearing, this will normally remove it.

NOTE : In the event of failure to remove the bearing in this way, due to burrs around the lock-wire grooves, it is suggested that either a hydraulic press or a hand operated pump is used to remove the bearing.



WARNING : If a hydraulic pump is used to dismantle the bearing from the cylinder, extreme care must be taken to purge all air from the cylinder before pressurisation.

COMPRESSED AIR INSIDE THE CYLINDER AT THIS STAGE IS EXTREMELY DANGEROUS.

Robust restraints should be attached to both rod-eye and the cylinder mounting, as a further precaution.

Section

5005

FRONT AXLE
**TWO WHEEL DRIVE MACHINES/
TWO WHEEL STEER MACHINES 750**

5005

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SPECIFICATIONS

Toe-in.....0 to 3 mm (0.9 - 13 inch)

SPECIAL TOOLS

- Ball joint separator
- Hub lifting bracket
- Polymer 400 special lubricant for the kingpins
- Sealastic 732 liquid gasket
- Loctite 542
- Loctite 270



WARNING : *This symbol is used in this manuel to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIAL TORQUES

Drain plugs/refill plugs (M22 x 1.5)	40 Nm (29 lbf ft)
Screws - Kingpin cover	190 Nm (140 lbf ft)
Nuts - track rod ball joint	135 Nm (100 lbf ft)

WHEEL HUB

Removal



WARNING : The kingpins are sealed for life. Maintain absolute cleanliness during assembly.



WARNING : Polymer 400 lubricant must be used to avoid premature wear and /or seizure of the kingpin bearings.

STEP 1

Raise the machine on the loader bucket and backhoe stabilizers.

STEP 2

Stop the engine.

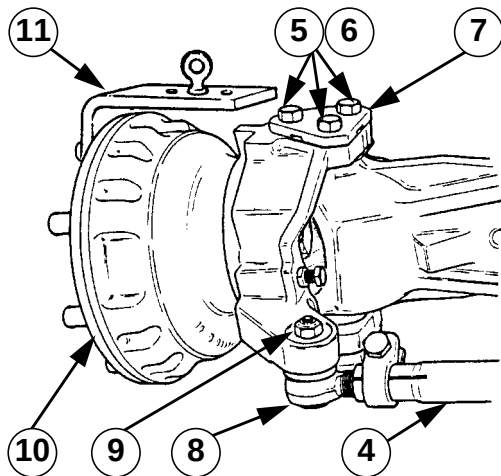
STEP 3

Remove the front wheels.

STEP 4

Drain the oil from the hub.

STEP 5



CS98K512

Remove the nuts (9) from the track rod ball joint (8).

NOTE : When assembling, tighten the nuts (9) to 135 Nm.

STEP 6

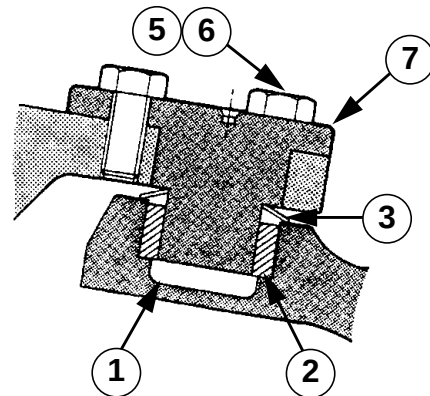
Use a ball joint separator to remove the track rod (4) from the steering knuckle.

STEP 7

Attach a lifting bracket (11) to the wheel mounting flange on the hub (10) and use a hoist to take the weight of the complete hub assembly.

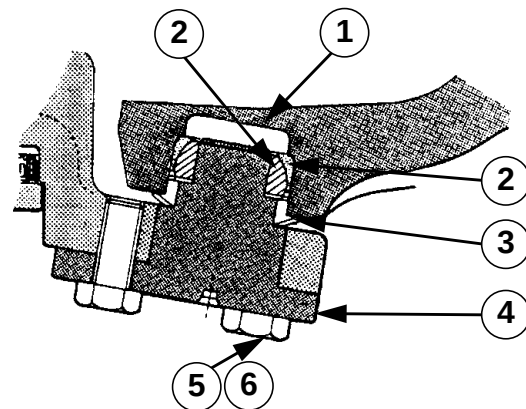
STEP 8

TOP KINGPIN



CS98K513

BOTTOM KINGPIN



CS98K514

Release the three bolts (5) and the spring washers (6) from the top and the bottom kingpin caps (7) and (4).

NOTE : When assembling tighten the nuts (5) to 190 Nm.

STEP 9

Prise out the top kingpin and the disc springs (3).

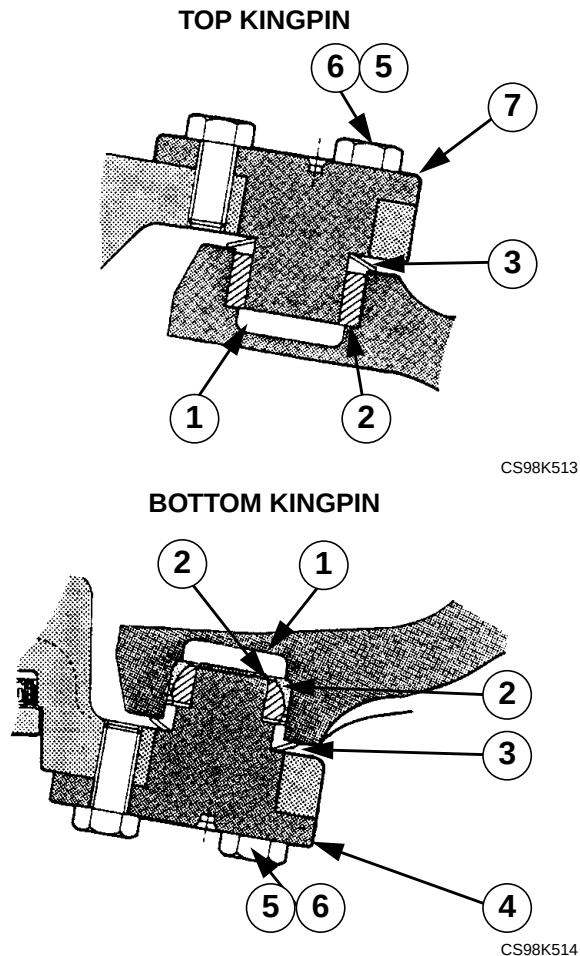
STEP 10

Prise out the bottom kingpin and disc springs (3) carefully move the hub (10) away from the axle.

Installation

NOTE : *Install the wheel hub in the reverse order from that of removal but note the following.*

STEP 1



If the bearings (1) and (2) are worn, they must be replaced.

NOTE : *The inner spherical race is a press fit onto the bottom, kingpin. The outer spherical race and the top, parallel bush (2) must be chilled before pressing into the housing.*

STEP 2

Pack the top and bottom kingpin bearings with Polymer 400 grease.

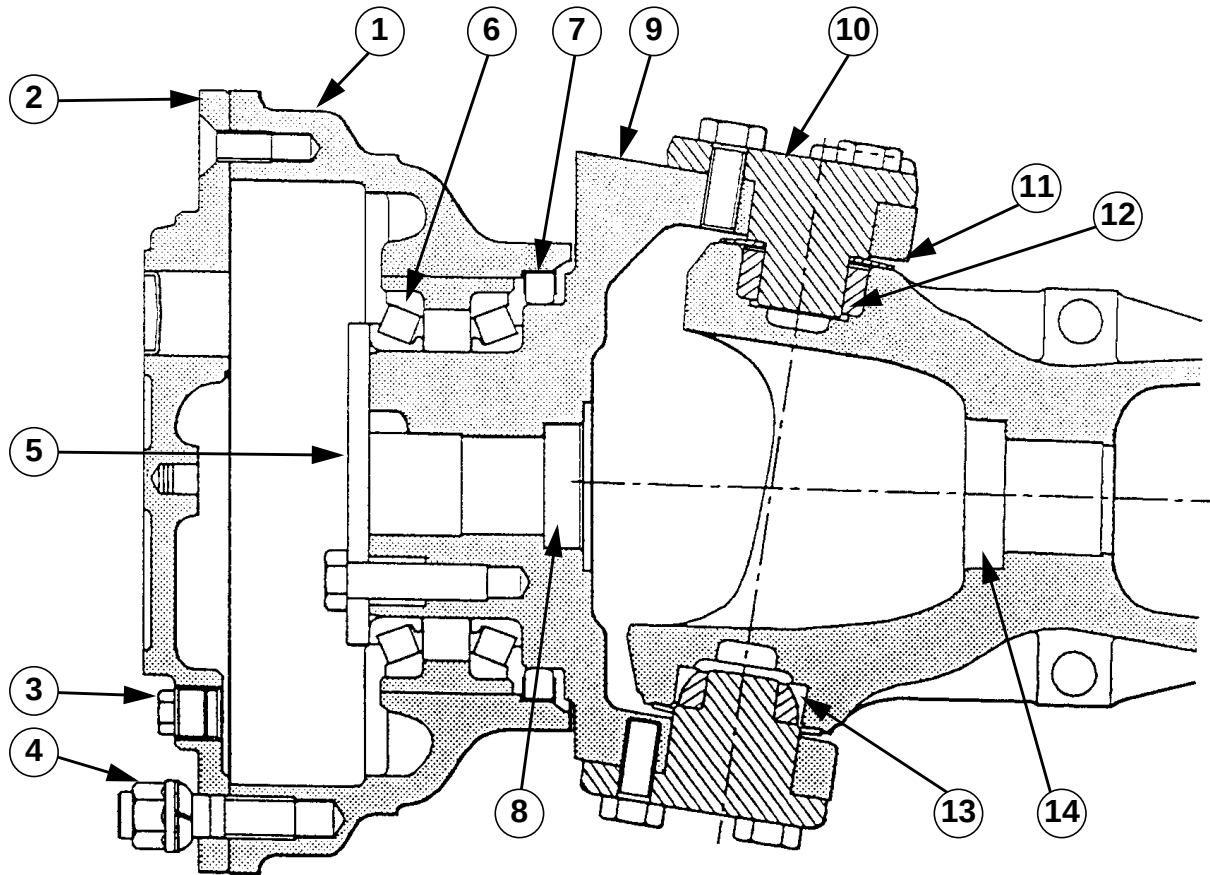
STEP 3

Install the disc springs (3). Top concave face down, bottom-concave face up.

STEP 4

Fill the hub with oil.

Cross-sectional drawing



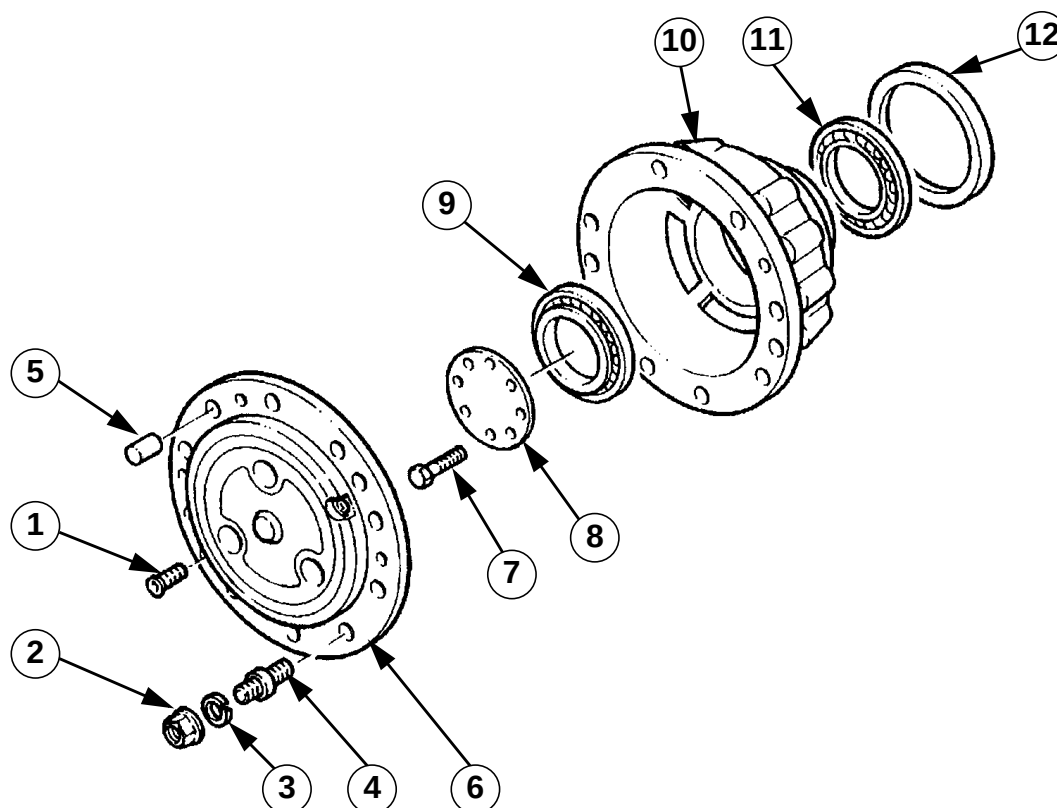
CS98K515

1. Hub	6. Tapered roller bearing	11. Belleville washer
2. Wheel flange	7. Oil seal	12. Top king pin bush
3. Oil fill/level/drain plug	8. Plug	13. Bottom king pin bearing (spherical)
4. Wheel stud and nut	9. Steering knuckle	14. Plug
5. Clamping plate	10. King pin	

WHEEL HUB SERVICE

Disassembly

STEP 1



CS98K516

Remove both socket head screws (1) from the wheel flange (6).

STEP 2

Remove both flanged wheel nuts (2), washers (3) and studs (4).

STEP 3

Remove the pins (5).

STEP 4

Use a soft faced mallet to separate the wheel flange from the hub. There are two dowel pins and silicone rubber gasket material which will grip the components.

STEP 5

Remove the eight bolts (7) and clamping plate (8).

STEP 6

Pull the wheel hub (10) from steering knuckle. This will be tight, as the inner race of the outer taper roller bearing (9) will be removed along with the hub.

STEP 7

Remove both external bearing races from the hub.

STEP 8

Remove the inner race of the inner bearing (11) from the steering knuckle.

STEP 9

Remove the oil seal (12).

Assembly

NOTE : Assemble the wheel hub in the reverse order of the disassembling but note the following.

1. There is no adjustment of the hub bearings pre-load which is determined by the machining of the hub and steering knuckle.
2. Thoroughly clean and de-grease the mating surfaces of the wheel flange and hub then assemble using sealastic 732 liquid gasket.

Section

5006

FRONT AXLE
FOUR WHEEL DRIVE MACHINES /
TWO WHEEL STEER MACHINES
750/760/860

5006

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIFICATIONS

The front axle assembly is a double reduction steer drive type. The axle comprises a conventional four pinion differential without a locking mechanism. Drive is transmitted to the hub via drive shafts having double universal joints at the steering articulation points. The final drive hubs have three planetary gears.

Marque	CARRARO
Planetary gear oil capacity	1.1 L
Oil type	SAE-EP 85W140
Drive axle oil capacity	8 L
Toe-in	0 to 3 mm

Clearances

Crown wheel/pinion shaft backlash	0.18 - 0.24 mm

Pre-load of taper roller bearings

Differential and bevel pinion rolling torques are measured by means of a spring balance and cord wound around the groove in the bevel pinion shaft.

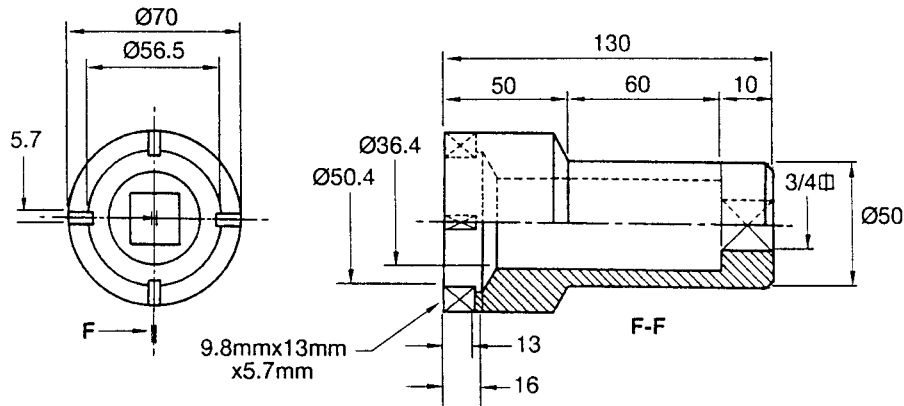
Cord pull for the bevel pinion bearings alone	92 to 137 Newtons or 9 to 13.43 kg
Additional cord pull for the differential	28.7 to 42.8 Newtons or 2.8 to 4.2 kg

SPECIAL TORQUES

Hub - cover screws	80 Nm
Drain plugs/refill plugs (M22 x 1.5)	40 Nm
Screws - steering lock adjust	120 Nm
Bolts - ring gear carrier to steering knuckle	235 Nm
Screws - kingpin cover	190 Nm
Bolts - differential bearing caps	266 Nm
Screws - differential ring nut, lock plate	10 Nm
Bolts - differential to axle case	169 Nm
Bolts - bevel gear to differential case, fit with Loctite 270	78 Nm
Screws - pinion shaft cover	12 Nm
Nuts - track rod ball joint	135 Nm
Nuts - track rod clamps	70 Nm
Nuts - wheel disc to hub	300 Nm

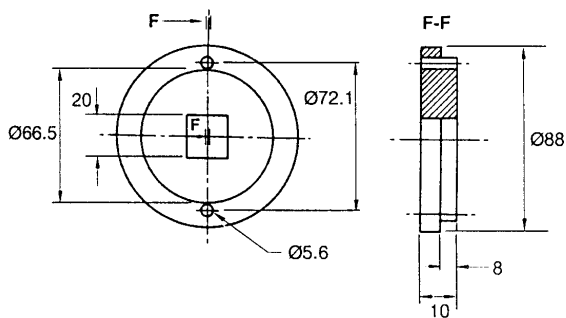
SPECIAL TOOLS

- Ball joint separator
- Hub lifting bracket
- Dial gauge with magnetic stand
- Spring balance and cord



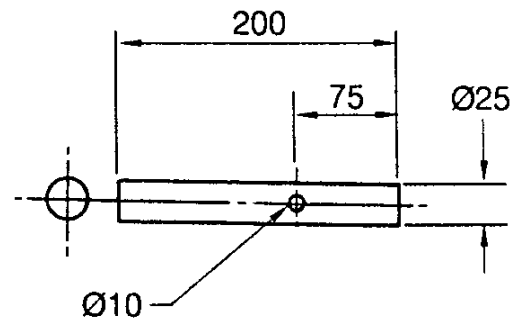
FS17 ≠ 2 Wrench for input shaft ring nut

CS98M502



FS17 ≠ 5 Wrench for differential ring nuts

CS98M503



FS17 ≠ 1 Measuring bar-see drawing

CS98M504

Special grease

POLYMER 400 for sealed king pin bearings

Sealants

Sealastic 732 liquid gasket

Loctite 270

Loctite 542

FINAL DRIVE HUB

Removal



WARNING : The kingpins are sealed for life. Maintain absolute cleanliness during assembly.



WARNING : Polymer 400 lubricant must be used to avoid premature wear and/or seizure of the kingpin bearings.

STEP 1

Raise the machine on the loader bucket and backhoe stabilizers.

STEP 2

Stop the engine.

STEP 3

Release the pressure from the hydraulic system (see section 8002).

STEP 4

Remove the steering cylinder (see section 5000).

STEP 5

Remove the front axle (see section 5000).

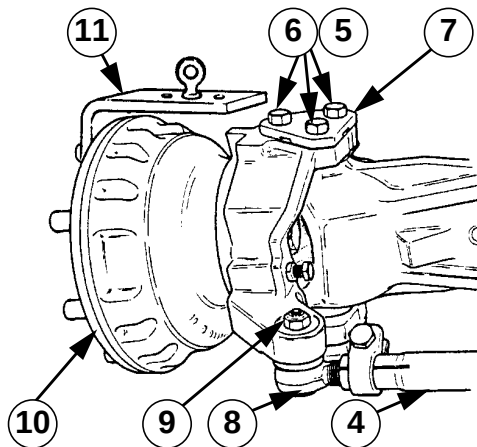
STEP 6

Remove the front wheels.

STEP 7

Drain the oil from the hub.

STEP 8



CS98K512

Remove the nuts (9) from the track rod ball joint (8).

NOTE : When assembling, tighten the nuts (9) to 135 Nm.

STEP 9

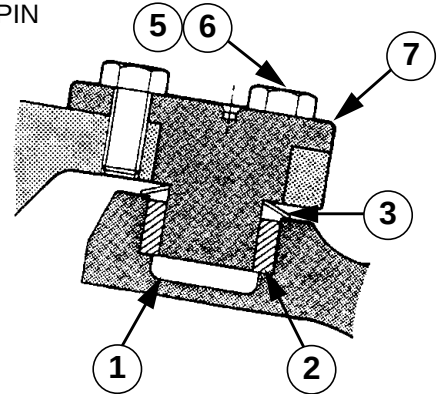
Use a ball joint separator to remove the track rod (4) from the steering knuckle.

STEP 10

Attach a lifting bracket (11) to the wheel mounting flange on the hub (10) and use a hoist to take the weight of the complete hub assembly.

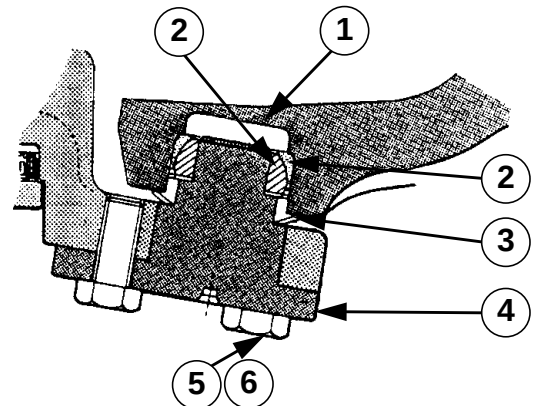
STEP 11

TOP KINGPIN



CS98K513

BOTTOM KINGPIN



CS98K514

Release the three bolts (5) and the spring washers (6) from the top and the bottom kingpin caps (7) and (4).

NOTE : When assembling tighten the nuts (5) to 190 Nm.

STEP 12

Prise out the top kingpin and the spring washer (3).

STEP 13

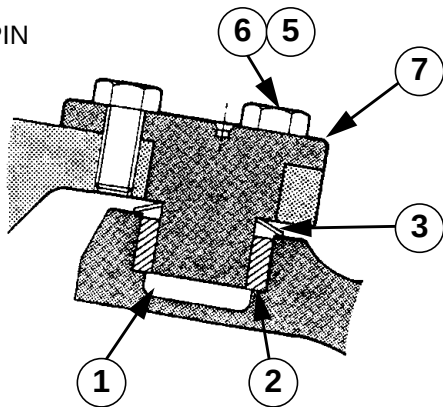
Prise out the bottom kingpin and spring washer (3) carefully move the hub (10) away from the axle guiding the drive shaft through the outer bearing and the seals to prevent damage to these components.

Installation

NOTE : *Install the final drive hub in the reverse order from that of removal but note the following.*

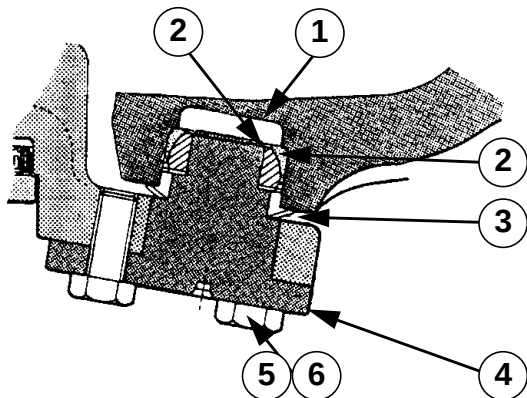
STEP 1

TOP KINGPIN



CS98K513

BOTTOM KINGPIN



CS98K514

If the bearings (1) and (2) are worn, they must be replaced.

NOTE : *The inner spherical race is a press fit onto the bottom kingpin. The outer spherical race and the top parallel bush (2) must be chilled before pressing into the housing.*

STEP 2

Pack the top and bottom kingpin bearings with Polymer 400 grease.

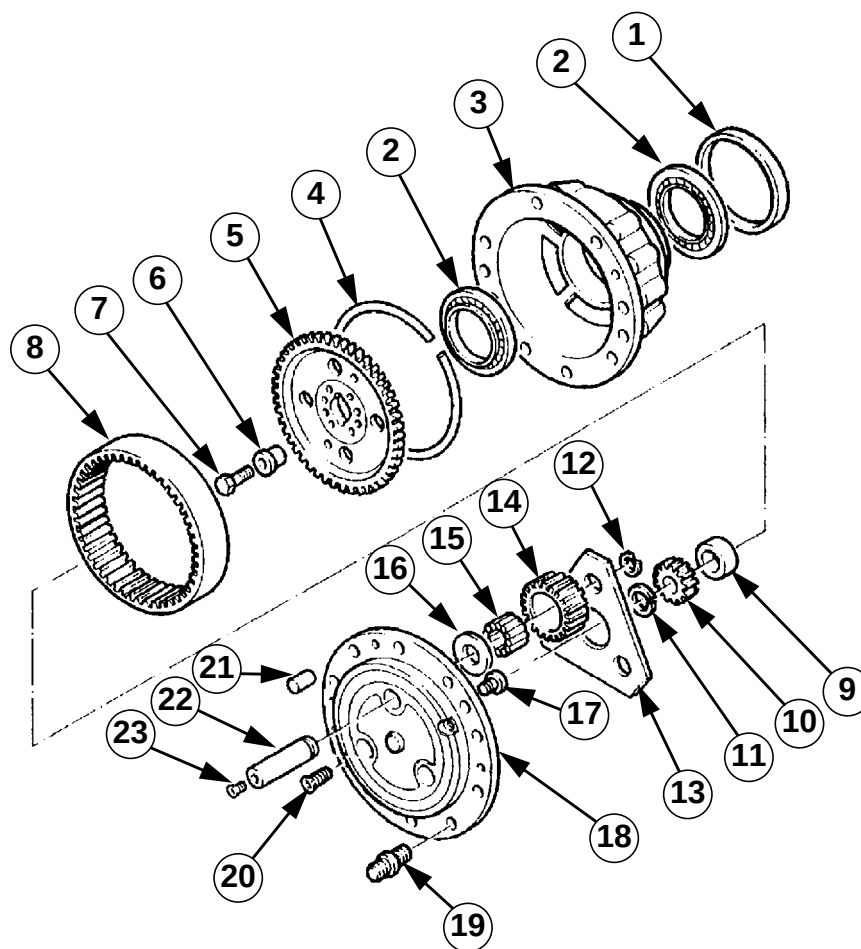
STEP 3

Install the spring washers (3). Top-concave face down, bottom - concave face up.

STEP 4

Fill the hub with oil.

Exploded view

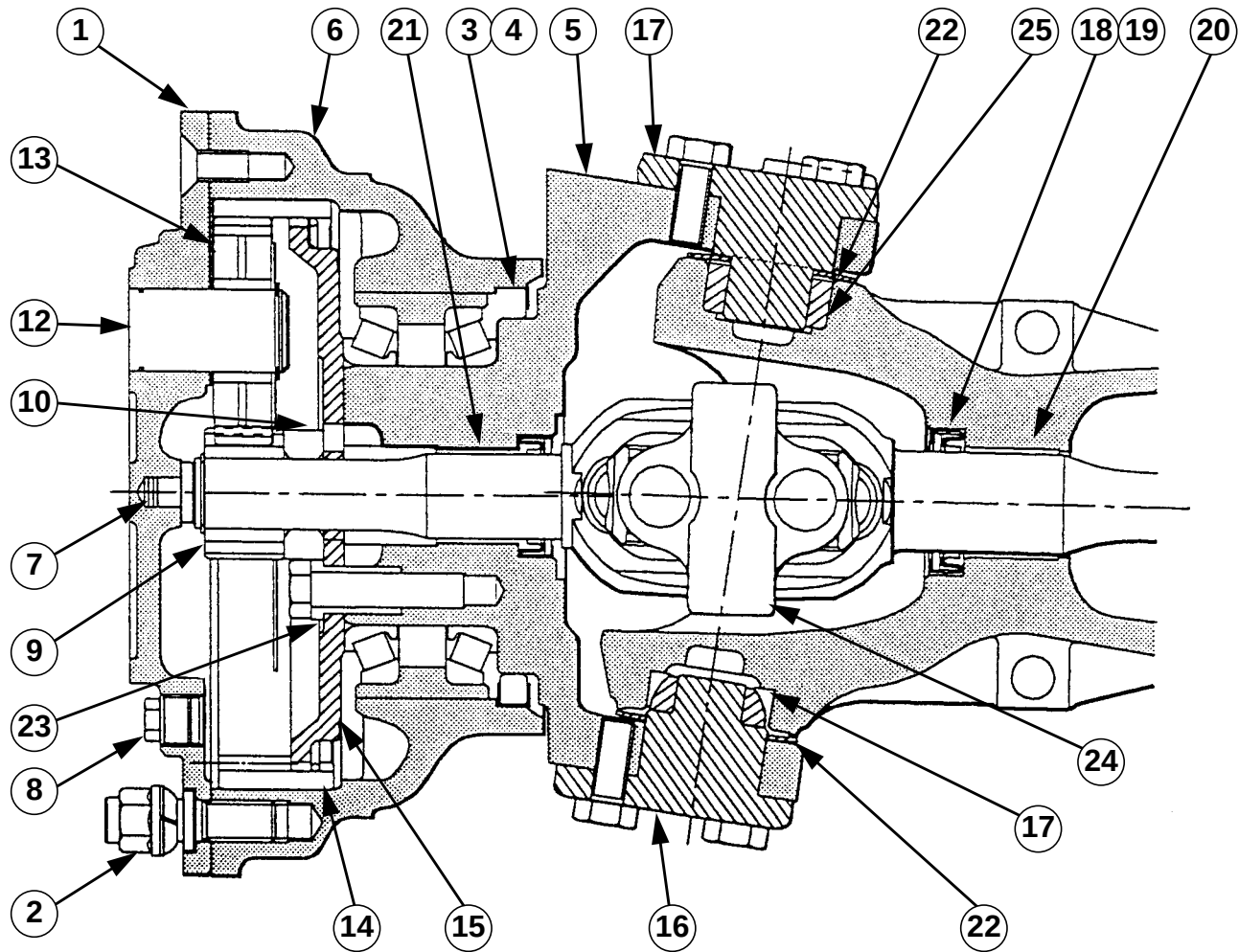


CS98M505

1. Seal	9. Spacer ring	17. Plug
2. Bearing	10. Sun gear	18. Flanged wheel
3. Hub	11. Circlip	19. Wheel stud
4. Snap-ring	12. Circlip	20. Screw
5. Ring gear carrier	13. Retainer	21. Pin
6. Tube dowel	14. Planetary gear	22. Gear pin
7. Bolt	15. Needle roller bearing	23. Screw
8. Ring carrier	16. Thrust washer	

Cross - Sectional drawing

The illustration applies to both left and right final drive hubs.



CS98M506

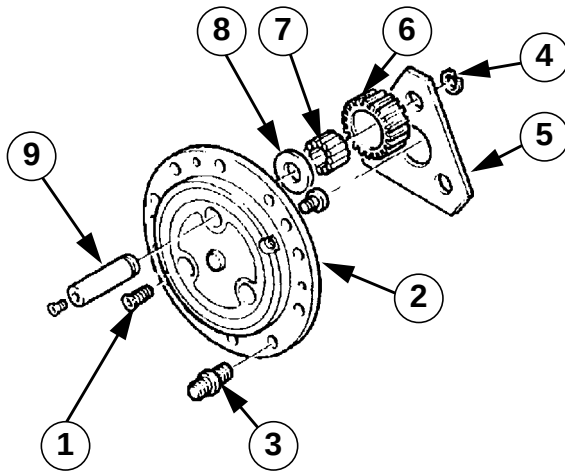
1. Wheel mounting flange and planetary carrier	14. Ring gear
2. Wheel stud	15. Ring gear carrier
3. Dust seal	16. King pin
4. Oil seal	17. Bottom king pin bearing (spherical)
5. Steering knuckle	18. Dust seal
6. Hub	19. Oil seal
7. Thrust plug	20. Drive shaft bush
8. Oil fill/level/drain plug	21. Drive shaft bush
9. Sun gear	22. Disc spring
10. Spacer	23. Tube dowels
11. Thrust ring	24. Double universal joint
12. Planetary gear pin	25. Top king pin bearing (plain)
13. Planetary gear	

Disassembly

STEP 1

Drain the oil from the hub.

STEP 2



CS98M507

Remove both socket head screws (1) from the wheel flange (2).

STEP 3

Remove both flanged wheel studs (3).

STEP 4

Use a soft-faced mallet to separate the planetary carrier from the hub. There are two dowel pins and silicone rubber gasket material which will grip the components.

STEP 5

Place the wheel flange face down on a bench then remove the circlip (4) from each planetary gear pin.

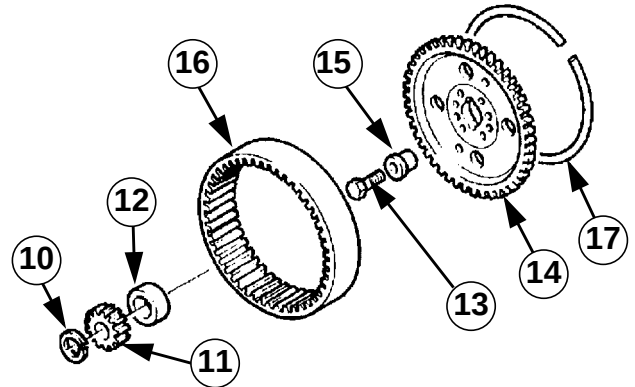
STEP 6

Lift off the retainer (5), planetary gear (6), uncaged needle roller bearing (7) and thrust washer (8) from each planetary gear pin (9).

STEP 7

Do not remove the planetary gear pins as they are not available as a serviceable part.

STEP 8



CS98M509

Remove the circlip (10) from the drive shaft.

STEP 9

Pull off the sun gear (11) and spacer ring (12).

STEP 10

Remove all four bolts (13) retaining the ring gear carrier (14) to the steering knuckle.

STEP 11

Fit the bolts removed by instruction (10) into the threaded holes in the ring gear carrier and proceed to jack the carrier and tube dowels (15) off the steering knuckle.

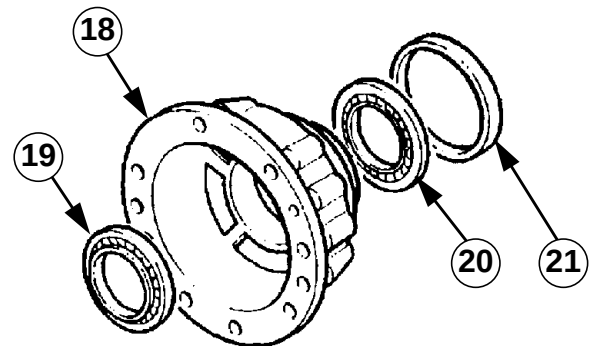
STEP 12

Remove the ring carrier (14) from the ring gear (16).

STEP 13

Remove the snap-ring (17).

STEP 14



CS98M508

Pull the wheel hub (18) off the steering knuckle, this will be tight, as the inner race of the outer taper roller bearing (19) will be removed along with the hub.

STEP 15

Remove both external bearing races from hub.

STEP 16

Remove the inner race of the inner bearing (20) from steering knuckle.

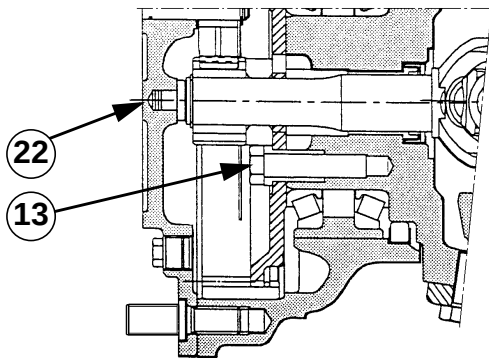
STEP 17

Remove the oil seal (21) and dust seal.

Assembly

NOTE : Assemble the final drive hub in the reverse order from that of removal but note the following.

1. Use petroleum jelly to assist assembly of the needle rollers (7) into each planetary gear (6).
2. Insert the planetary pinions shafts (9) from the cover side.
3. There is no adjustment of the hub bearing preload which is determined by the machining of the hub and the knuckle.
- 4.



CS98M510

5. The ring gear carrier retaining bolts (13) must be tightened to 235 Nm (173 lbf ft).
6. Drive shaft end-float is non-adjustable, but if the thrust plug (22) is worn it must be replaced.
7. Thoroughly clean and de-grease the mating surfaces of both the planetary carrier and hub then assemble using Sealastic 732 Liquid Gasket.
8. Tighten both countersunk socket head screws (1) to 80 Nm (60 lbf ft).
9. Apply Loctite 542 to the threads of flanged wheel studs and tighten to 70 Nm (52 lbf ft).
10. If the plain wheel studs have been removed apply Loctite 270 and tighten to 70 Nm (52 lbf ft).

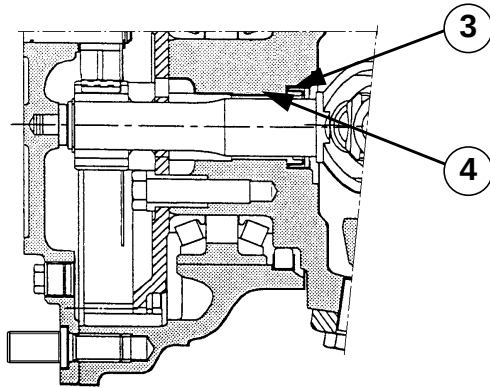
DRIVE SHAFT

Disassembly

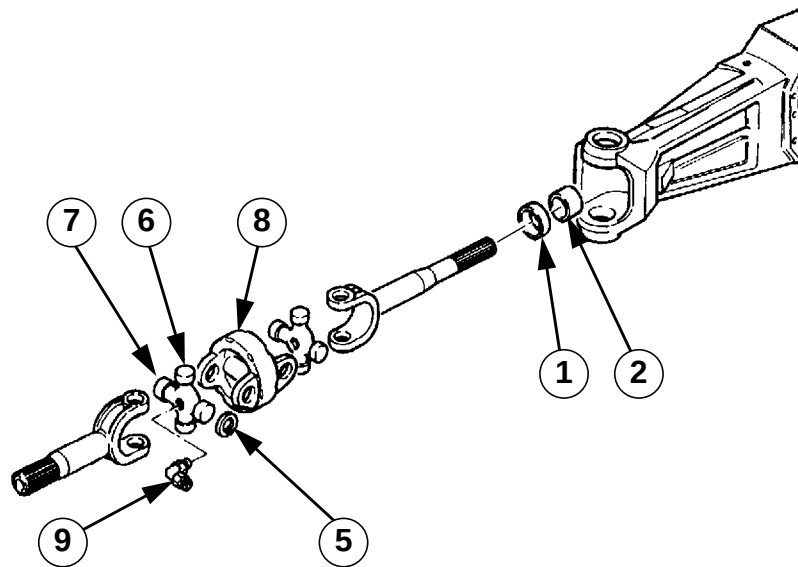
STEP 1

Disassemble the final drive hub (see page 9).

STEP 2



CS98M510



CI98M503

Remove the oil seals (1) and (3) from the axle housing and hub.

STEP 3

Use a general purpose puller to extract the bushes (2) and (4).

STEP 4

Remove the circlip (5) from each of the four bearings on one spider.

STEP 5

Remove two bearing cups (6) and disengage the spider from the drive shaft.

STEP 6

Remove the remaining two cups (7) and disengage the spider from the link (8).

STEP 7

Remove the lubricator (9) from the cup (7).

STEP 8

Repeat the steps 4, 5 and 6 on the other spider.

Assembly

NOTE : *Assemble the drive shaft in the reverse order from that of removal but note the following.*

1. Fit new bushes, and oil seals into the axle and hub.
2. Assemble both spiders, with bearing cups and circlips, to the centre link first, then fit each drive shaft to the spiders.

NOTE : *Take particular care not to damage the bushes or seals when refitting the drive shaft. If these components are worn, they must be replaced.*

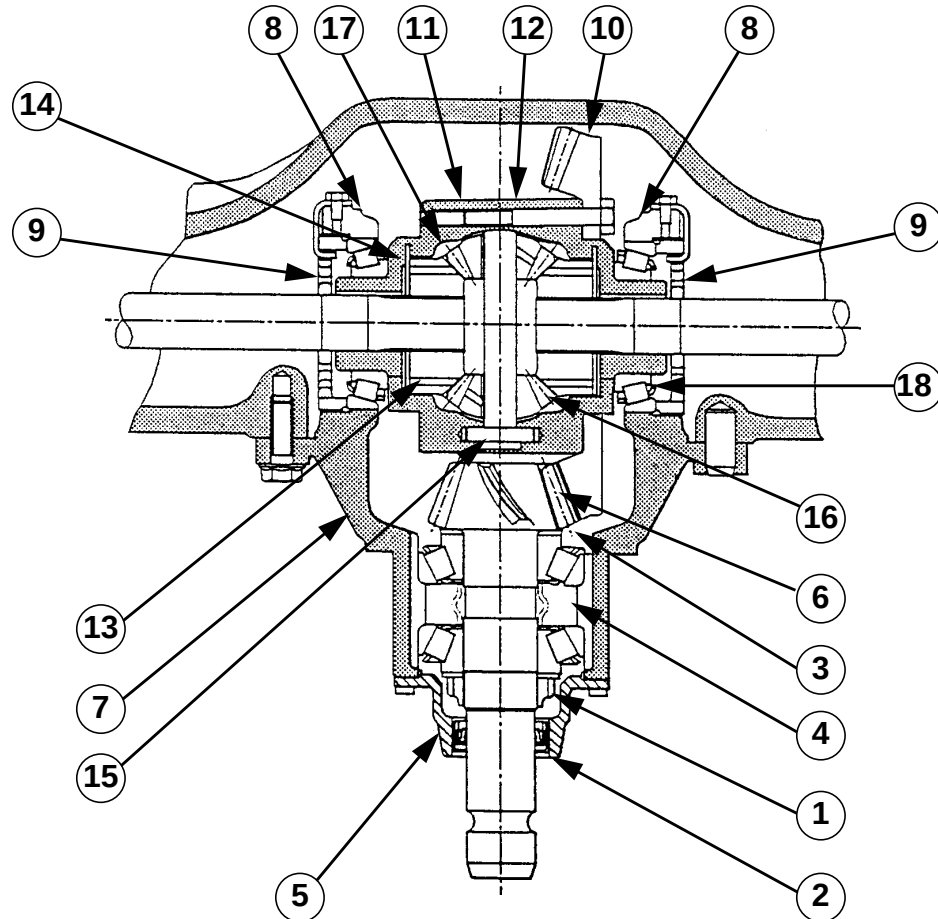
DIFFERENTIAL

General description

This axle is a double reduction steer-drive type. The axle comprises a conventional two pinion / two side gear differential without a locking mechanism. Drive is transmitted to the hub via drive shafts having double universal joints at the steering articulation points.

Final drive hubs have three planetary gears.

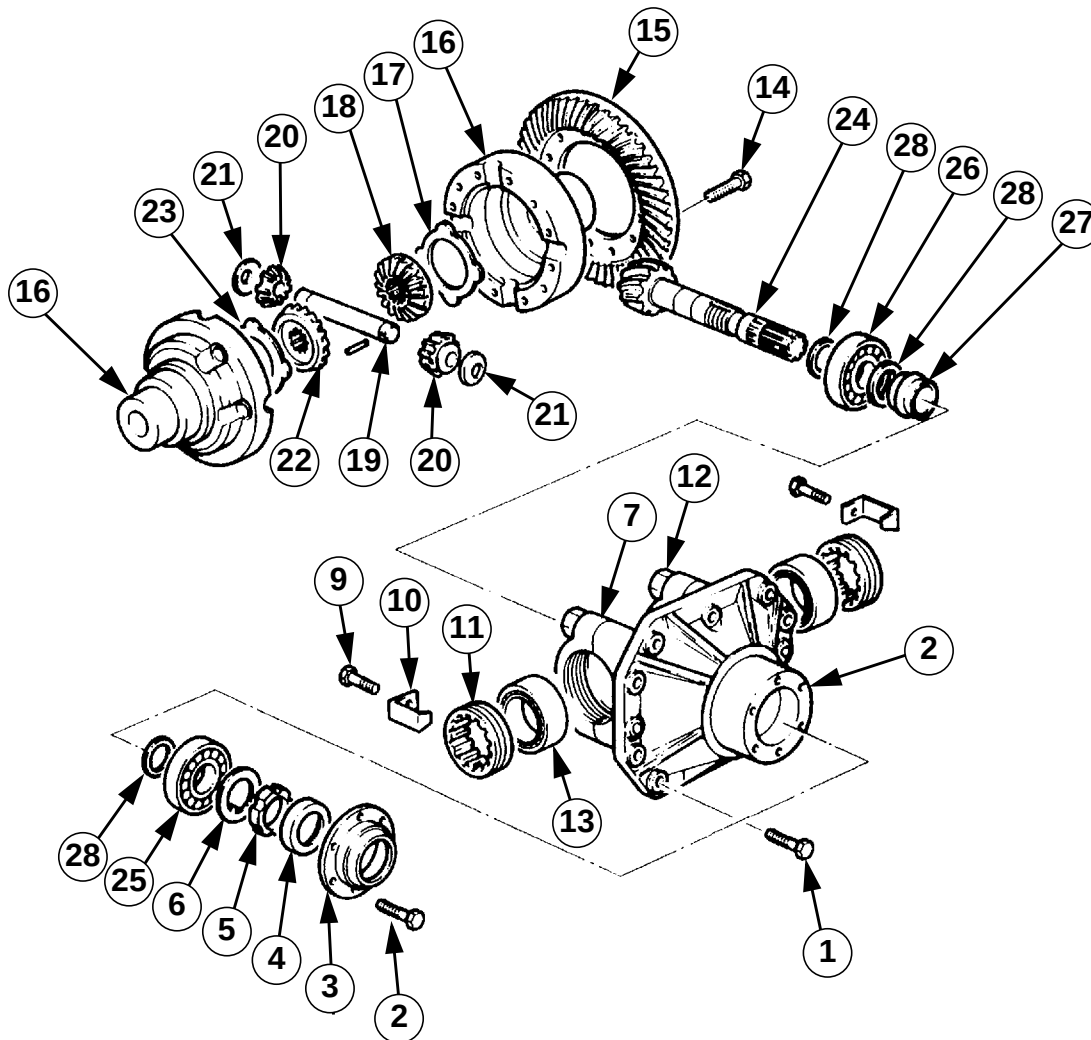
Cross-sectional drawing



1. Ring nut	10. Crownwheel
2. Oil seal	11. Differential case
3. Shim	12. Differential case
4. Collapsible spacer and special washers	13. Side gear
5. Cover	14. Thrust ring
6. Bevel pinion	15. Differential pinion shaft
7. Differential carrier	16. Differential pinion
8. Differential carrier cap	17. Spherical thrust washer
9. Ring nut	18. Differential carrier bearings

CS98M512

Exploded view



CI98M504

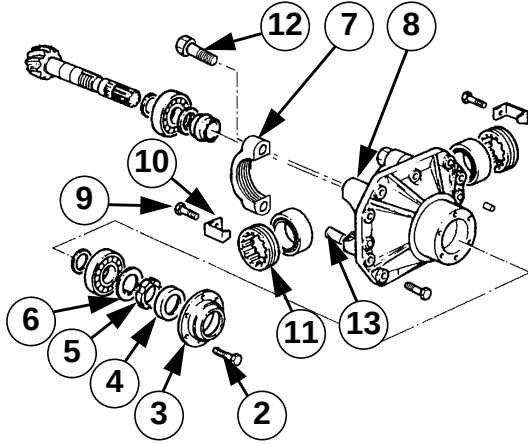
1. Bolt	11. Ring nut	21. Spherical thrust washer
2. Screw	12. Bolt	22. Pinion
3. Cover	13. Bearing race	23. Thrust ring
4. Oil seal	14. Bolt	24. Pinion shaft
5. Ring nut	15. Crown wheel	25. Bearing
6. Tab washer	16. Differential case	26. Bearing
7. Bearing cap	17. Thrust ring	27. Collapsible spacer
8. Carrier	18. Side gear	28. Washer
9. Bolt	19. Pinion shaft	
10. Lock plate	20. Pinion	

Disassembly

STEP 1

Remove the final drive hubs and the final drive shaft (see page 5).

STEP 2



CI98M505

Remove the ten bolts (1) from the differential carrier (8).

STEP 3

Install two screws in the threaded holes in the differential carrier (8) and jack the carrier from the dowels (13).

NOTE : The combination of the dowels and the silicone rubber sealant makes removal of the differential carrier from the axle difficult unless this jacking procedure is used.

STEP 4

Remove the screws (2) from the pinion shaft end-cover (3).

STEP 5

Use a soft-faced mallet to separate the cover, complete with oil seal (4), from the carrier housing.

NOTE : The seal is held in place with a silicone rubber gasket material.

STEP 6

Prise open the staked lip on the ring nut (5) and unscrew it with wrench FS17 $\neq$ 2. The ring nut is tight, so a soft metal wedge must be used to prevent the pinion shaft turning. Remove the tab washer (6).

STEP 7

Mark the bearing caps (7) and carrier (8), for correct assembly.

STEP 8

Remove the bolt (9) and lock-plate (10) from each bearing cap.

STEP 9

Unscrew the ring nuts (11) from either side of the carrier.

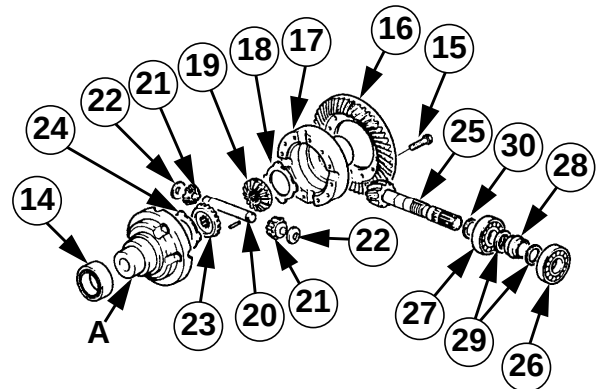
STEP 10

Remove bolts (12) and both bearing caps. Use a soft mallet to disengage the caps from the dowels (13).

STEP 11

Lift the differential and the crown wheel unit out of the carrier (8).

STEP 12



CI98M506

Pull the bearing races (14) off the differential case.

STEP 13

Mark both halves of the differential case to ensure correct assembly.

STEP 14

Remove the bolts (15) which fasten the crownwheel and differential case halves together.

STEP 15

Stand the differential case on the bearing spigot "A" with the crown wheel side uppermost (shown horizontal for clarity).

STEP 16

Lift off the crown wheel (16) and the top half of the differential case (17).

STEP 17

Remove the thrust ring (18) and side gear (19).

STEP 18

Lift out the pinion shafts (20) complete with pinions (21) and spherical thrust washers (22).

STEP 19

Remove the remaining side gear (23) and thrust ring (24).

STEP 20

Push the pinion shaft (25) through the bearings and remove bearings (26) and (27), collapsible spacer (28), washers (29) and shims (30).

STEP 21

Pull the bearing outer races from the differential carrier.

Inspection

1. Inspect all bearings for spalling or other wear, if any is found the bearing must be replaced.
2. Check the tooth contact areas from both the crown wheel and pinion, which should have a smooth polished appearance. If the surfaces are pitted or scuffed, check the quality and grade of oil used.

Assembly

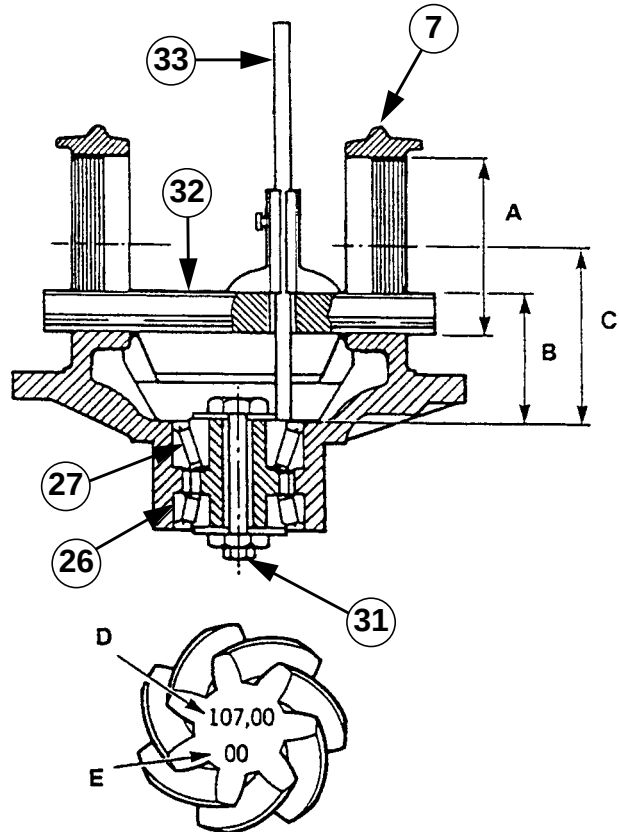
NOTE : The assembly of the differential unit comprises the following sub-tasks :

- Setting the pinion bevel mesh.
- Setting the bevel pinion bearing pre-load.
- Assembling the differential unit.
- Setting the crown wheel and pinion backlash.
- Setting the differential carrier bearing pre-load.
- Installing the differential unit.

Set the pinion bevel mesh as follows :

STEP 1

Fit both pinion bearing outer races into the differential carrier.

STEP 2

CS98M516

Fit both differential bearing caps (7) and torque tighten the bolts to 266 Nm (196 lbf ft).

STEP 3

Fit the pinion bearing inner races (26) and (27).

STEP 4

Fit a bolt and nut (31) with large washers through the pinion bearings and tighten until the bearing cones are hard to turn by hand. Do not over tighten or the bearings will be damaged.

STEP 5

Measure the diameter of the bore "A" and note the size.

STEP 6

Measure the diameter of the measuring of the measuring bar (32) tool n° FS17 $\neq$ 1, then lay it across the differential carrier bearing bores and insert the depth gauge (33) through the hole in the shaft.

STEP 7

Measure the distance between the top of the shaft and the face of the pinion bearing inner race (27) (Dimension B).

STEP 8

To find distance "C" calculate the measurements as follows (in mm) $C = B$ minus diameter of bar FS17 $\neq$ 1 plus $A - 2$.

STEP 9

To find the amount of shims (2) required ; the number 'D' (in mm) etched on the pinions must be subtracted from dimension C.

Shim thickness required = C minus D.

D = bevel pinion protrusion dimension

E = pinion mating number

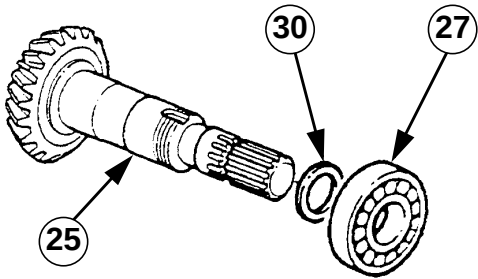
Shim rings are available in the thickness shown in the table.

mm	in.	mm	in.
2.50	0.0984	3.00	0.1181
2.60	0.1024	3.10	0.1221
2.70	0.1063	3.20	0.1260
2.80	0.1102	3.30	0.1300
2.90	0.1142	3.40	0.1340

STEP 10

Remove the clamp bolt and washers.

STEP 11



CS98M517

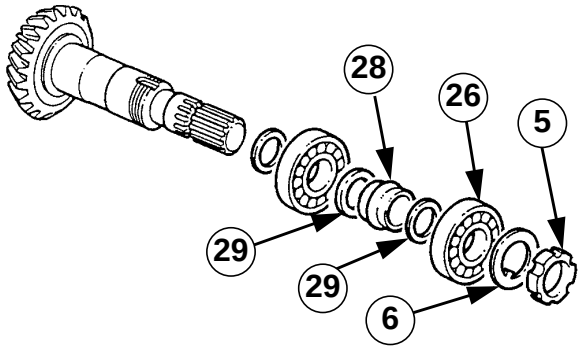
Fit the correct shim ring (30) on the pinion shaft (25) but ensure the largest internal chamfer is towards the pinion gear.

STEP 12

Press the inner bearing race (27) onto the pinion shaft (25).

Set the bevel pinion bearing pre-load as follows :

STEP 1



CS98M518

Insert the pinion shaft into the differential carrier and fit a new collapsible spacer (28), with a new washer (29) each side of it.

STEP 2

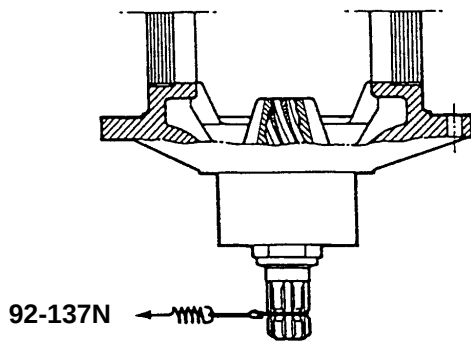
Push on the second bearing inner race (26).

STEP 3

Fit the tab (6) washer and a new ring-nut (5).

STEP 4

Secure the carrier in a vice and wind a thin cord around the groove in the pinion shaft. Attach a spring balance to the cord.

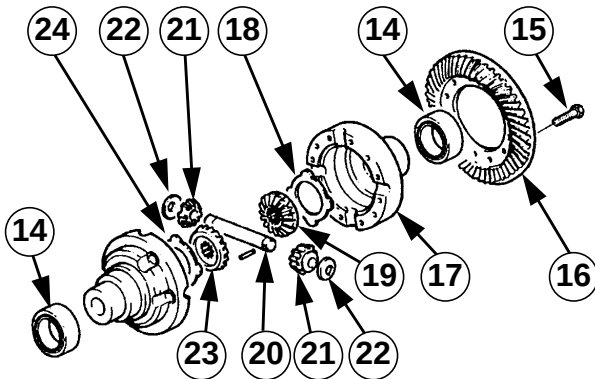
STEP 5

CS98M519

Tighten the pinion ring-nut gradually, until the spring balance shows that a sustained pull of between 92 to 137 Newtons (19.8 to 29.6 lbf) is required to keep the pinion shaft turning.

STEP 6

Stake the ring nut into the groove on the pinion shaft.

Assembling the differential**STEP 1**

CS98M520

Stand the differential case (17) (crown wheel side) on its carrier bearing spigot, and install the thrust ring (18) and side gear (19).

STEP 2

Assemble the pinions (21) and thrust washers (22) to their shaft (20) and fit them into the differential case make sure that the pin in the shaft is in position.

STEP 3

Turn the other half of the differential case onto its bearing spigot and install the thrust ring (24) and side gear (23). While holding the ends of the pinion shaft, turn differential case (17) over and lay it onto the bottom half aligning the marks on both cases.

STEP 4

Thoroughly de-grease the threads of the bolts (15) and those in the differential case. Fit the crown wheel (16). Apply Loctite 270 on bolt threads before installing. Then tighten to 78 Nm (58 lbf ft).

STEP 5

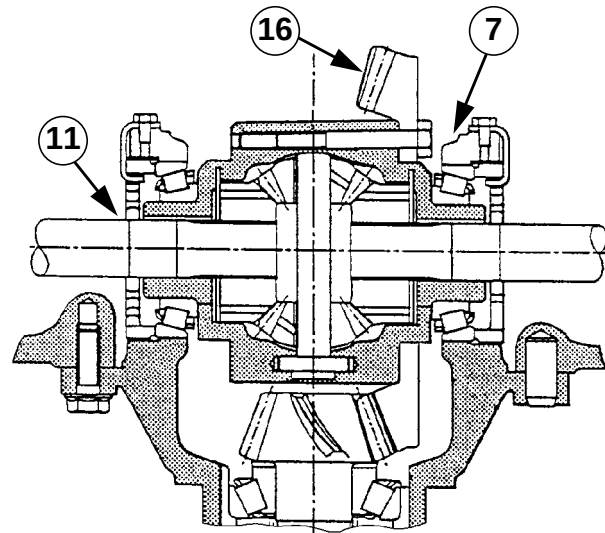
Fit the carrier bearings (14) onto the differential case spigots.

STEP 6

Remove the bearing caps from differential carrier.

STEP 7

Fit the outer races onto the carrier bearings and lower the differential assembly into the carrier.

STEP 8

CS98M521

Fit the bearing caps (7), bolts (12, not shown) and ring nuts (11) which should be adjusted to ensure that there is sufficient backlash between the crown wheel (16) and pinion, before tightening the (12) bolts to 266 Nm (195 lbf ft).



WARNING : *If there is no backlash between crown wheel and pinion, damage will occur when the bolts are tightened.*

NOTE : *Do not assemble the ring nut lock plates and the bolts until the differential backlash settings are completed.*

Setting the crown wheel and pinion backlash

STEP 1

The correct backlash between crown wheel and pinion is 0.18 to 0.24 mm (0.007 to 0.009 in). Adjustment is made by turning the ring nuts (11) to move the differential assembly into or out of mesh with the pinion. The ring nuts can be difficult to turn. To release the nuts, slacken the bolts and the bearing cap a small amount. Do not slacken them more than necessary.

STEP 2

Use wrench FS17 $\neq$ 5 to turn the ring (11) on the crown wheel side in a clockwise direction until the crown wheel and pinion are in close mesh. Tap the bearing cap with a soft face hammer to aid movement of the ring nut (11) and bearing alignment.

STEP 3

Use wrench FS17 $\neq$ 5 to turn the other ring nut (11) in a clockwise direction until all clearance has been removed. This position is obvious as the ring nut (11) will become very difficult to move.

STEP 4

Position a dial gauge in contact with and at 90° to, a tooth on the crown wheel.

STEP 5

Push the crown wheel into and out of mesh with the pinion to check the amount of backlash. Rotate the crown wheel and note the readings obtained at different positions. If the backlash is different, position the dial gauge on the tooth which has the smallest reading to make the final adjustment.

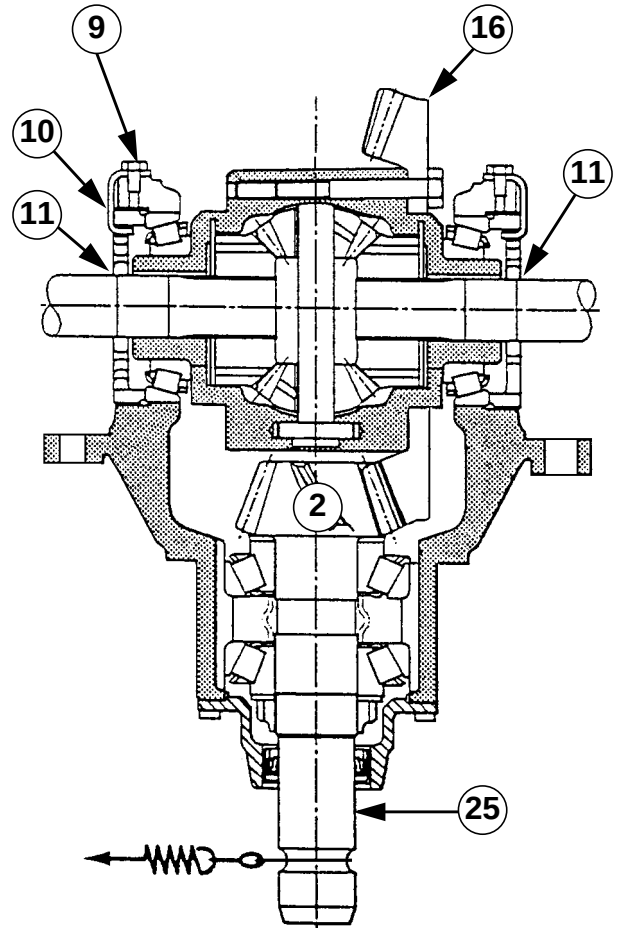
STEP 6

To make the final adjustment move the crown wheel into or out of mesh with the pinion by turning each ring-nut (11) an equal amount. Continue until the dial gauge shows a backlash of 0.18 to 0.24 mm (0.007 to 0.009 in).

Set the differential carrier bearing pre-load as follows :

When the backlash is adjusted it is necessary to pre-load the bearings.

NOTE : *It is essential not to disturb other adjustments, so pre-load is achieved by moving both ring nuts (11) a specific amount.*



CS98M522

STEP 1

Wrap a cord around the groove in the spiral bevel pinion shaft and attach a spring balance to the cord. Measure the pull required to keep the pinion shaft and differential turning. Note the measurement.

STEP 2

Tighten each ring nut (11) by an equal amount starting with 1/2 turn.

STEP 3

Measure the line pull again.

STEP 4

Continue to adjust the ring nuts (11) until a line pull between 121 and 180 Newtons (27.2 and 40.5 lbf) is required to turn the pinion continuously.

STEP 5

Fit the lock plates (10) and the bolts (9) to prevent the ring nuts (11) moving. Torque tighten the bolts (9) to 10 Nm (7 lbf ft).

STEP 6

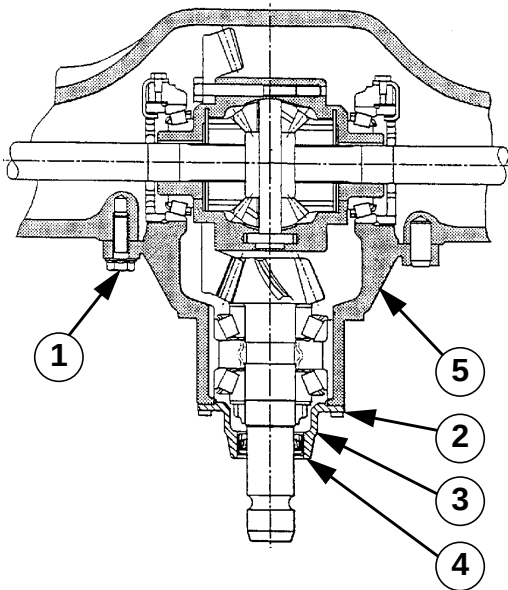
Torque tighten the carrier bearing cap bolts to 266 Nm (196 lbf ft).

STEP 7

Check the crown wheel backlash again.

Install the differential unit as follows :

STEP 1



CS98M523

Install a new seal (4) in the pinion shaft cover (3).

STEP 2

Remove the grease from the mating surfaces of the differential carrier (5) and cover (3). Apply Sealastic 732 liquid gasket and fit the cover. Torque tighten bolts (2) to 12 Nm (9 lbf ft).

STEP 3

Clean the mating surfaces on axle housing and the differential carrier (5).

STEP 4

Apply Sealastic 732 liquid gasket to one surface and install the differential assembly into the axle housing.

STEP 5

Tighten the 10 bolts (1) to 169 Nm (125 lbf ft).

STEP 6

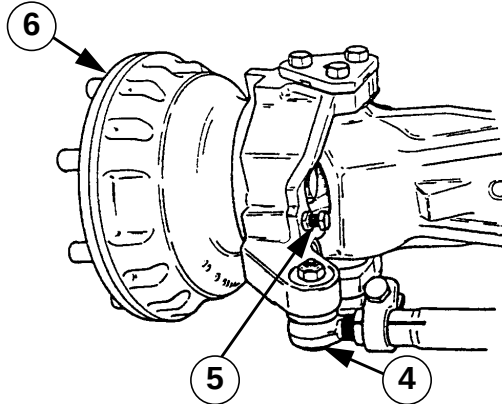
Install the final drive hubs and the drive shafts (see page 5).

FRONT AXLE MAINTENANCE

Checking the steering lock adjustment

NOTE : The steering lock should never exceed the angle given below or the drive shaft universal joints will wear excessively.

STEP 1



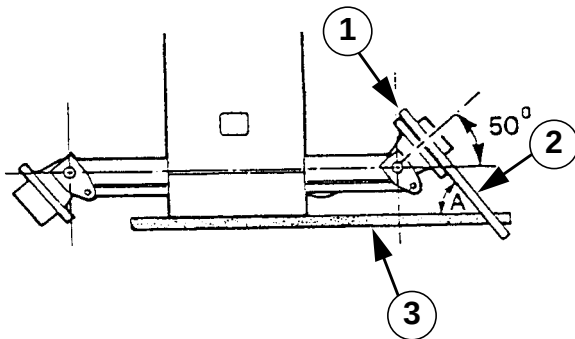
CS98K517

Disconnect the track rod (4) at one end.

STEP 2

Turn the left hand hub (6) to maximum left-hand steering angle.

STEP 3



CS98K518

Place a long straight edge (3) against the axle input flange or against the machine hardnose. Make sure the straight edge is parallel with the axle centre-line.

STEP 4

Place a second straight edge (2) against the wheel hub flange (1).

STEP 5

Measure the angle "A" at which both straight edges intersect. Subtract angle A from 90° to give the steering lock, for example :

Angle A = 40

Steering angle $90^\circ - 40^\circ = 50^\circ$

STEP 6

Adjust the left-hand stop (5) for maximum left steering lock and right-hand stop for maximum right steering lock.

NOTE : The steering angle must not exceed 52°.

STEP 7

Re-connect the track rod end (4) and remove the straight edges (2) and (3).

Toe-in adjustment

Adjustment

1. Toe-in can be measured with the wheels still mounted. If they are removed, straight edges can be attached to each hub and in this case the toe-in must be measured at a similar radius to the wheel rim. Measurements be taken while the straight edges are horizontal and pointing forwards.
2. Measure the distance between wheel rims in front of the axle, mark position on wheel rim.
3. To average out any wheel distortion, turn the wheels 180°, until the marks made on wheel rim are directly behind the axle. Again, measure the distance between the front of the rims.
4. Toe-in should be 0 - 2 mm (0 - 0.08 inch).
5. Slacken the clamp at each end of the track rod tube and rotate the tube to adjust the toe-in.
6. Tighten the clamp nuts to 70 Nm (52 lbf ft).

Section

5007

FRONT AXLE

**FOUR WHEEL DRIVE MACHINES/
FOUR WHEEL STEER MACHINES**

5007

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIFICATIONS

Make Carraro
 Type 2625 FR
 Planetary gear oil capacity 4,5L
 Oil type See Section 1002
 Drive axle oil capacity 15 L

Brake

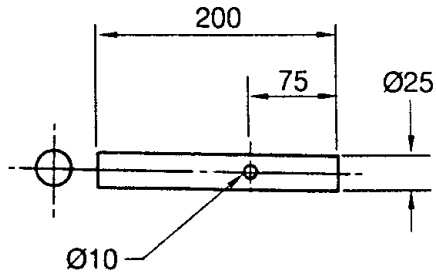
Brake Disk Thickness, New 9.90 to 10.10 mm
 Service Limit 8 mm

SPECIAL TORQUES

Stud-planetary gear carrier 70 Nm
 Hub-countersunk screws 80 Nm
 Drain plugs/refill plugs (M22 x 1,5) 40 Nm
 Drain plugs-refill plugs (M30) 80 Nm
 Screws-steering lock adjust 120 Nm
 Bolts-ring gear carrier to steering knuckle 235 Nm
 Bolts-kingpin caps 300 Nm
 Bolts-differential bearings caps 266 Nm
 Screws-differential ring-nut, lock plate 13 Nm
 Bolts-differential to axle case 169 Nm
 Bolts-bevel gear to differential case, fit with loctite 270 78 Nm
 Bolts-pinion shaft cover 12 Nm
 Nuts-track rod ball joint 135 Nm
 Nuts-track rod clamps 70 Nm
 Nuts-wheel disc to hub 300 Nm
 Front axle pivot to chassis bolts 425 to 475 Nm

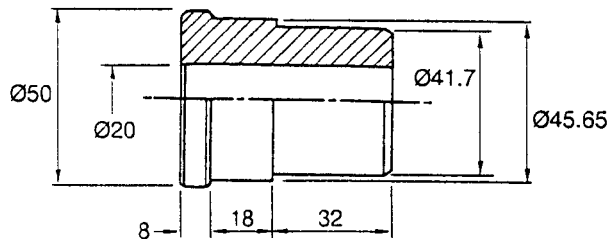
SPECIAL TOOLS

- Ball joint separator
- Hub lifting bracket
- Dial gauge with magnetic stand
- Spring balance and cord



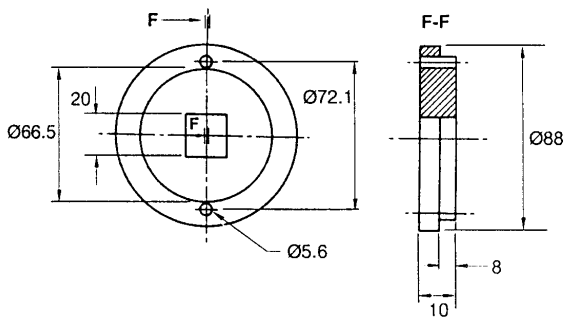
FS17 # 1 Measuring bar-see drawing.

CS98M504



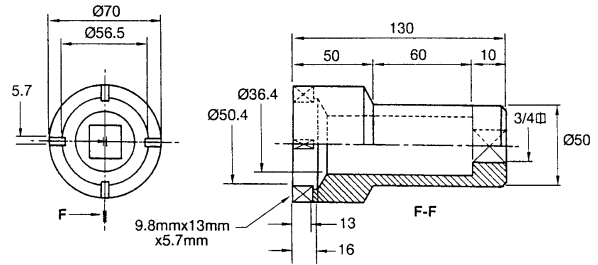
FS17 # 3 Mandrel for drive shaft bush-axle housing side.

CS98M511



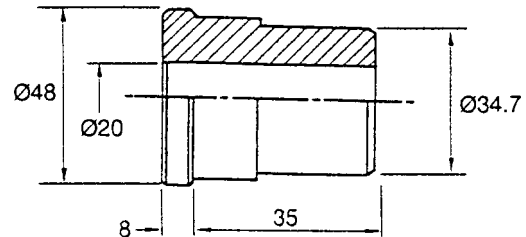
CS98M503

FS17 # 5 Wrench for differential ring nuts



FS17 # 2 Wrench for input shaft ring nut.

CS98M502



FS17 # 4 Mandrel for drive shaft bush-hub side.

CS98M513

Special grease

POLYMER 400 for sealed king pin bearings

Sealants

Sealastic 732 liquid gasket

POTENTIOMETER

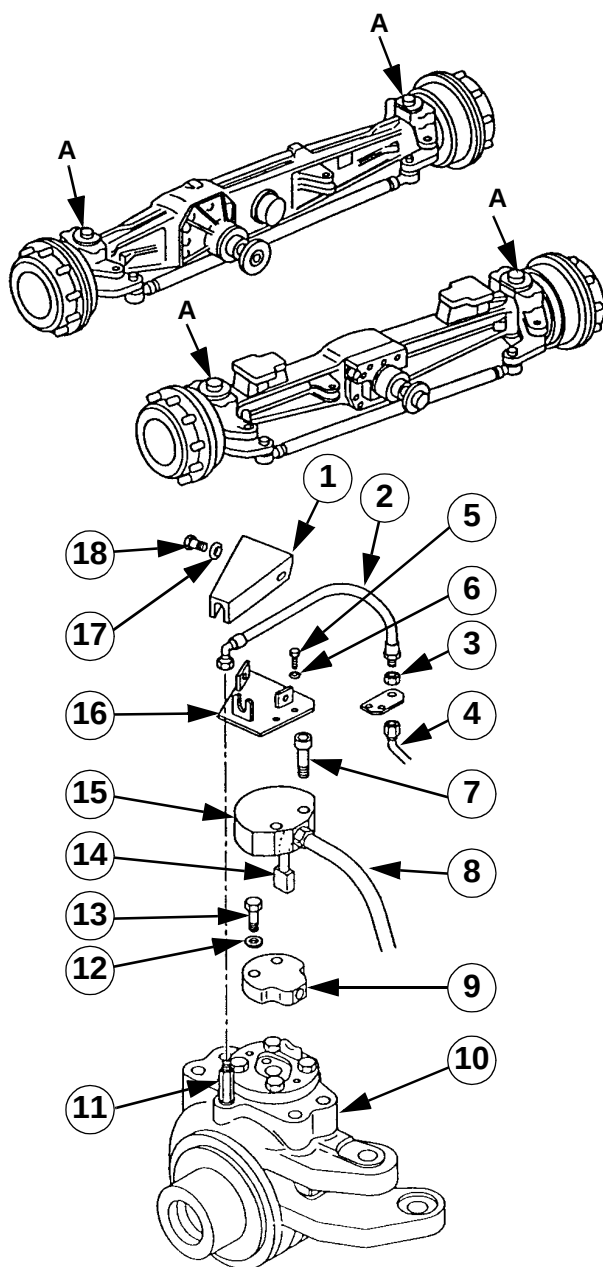
Removal

NOTE : This information is applicable to potentiometers installed on the front and rear axles.

STEP 1

Remove the wheel from the applicable axle.

STEP 2



Remove the bolts (18), the washers (17) and the cover (1).

STEP 3

Place a suitable container below the axle.

STEP 4

Remove the nut (3) and the flexible brake hose (2). Put caps on the flexible brake hose (2) and open ends of the adaptor (11) and the tube (4).

STEP 5

Remove the bolts (5), the washers (6) and the base (16).

STEP 6

Remove the cap screws (7) and the cover (15).

STEP 7

Disconnect the electrical connector (14) from the potentiometer (9). Attach the harness (8) to the structure with temporary ties.

STEP 8

Remove the bolts (13), the washers (12).

STEP 9

Remove the potentiometer (9) from the housing (10).

Installation

NOTE : Install a steering angle potentiometer in the reverse order from that of removal but note the following :

STEP 1

After installation, bleed the brake system. (See section 7000).

STEP 2

After installation, calibrate the steering system (See Section 4008).

CS98K527

FINAL DRIVE HUB

Removal



WARNING : *If the right rear hub is removed it is essential to engage the differential lock and wedge the pedal down to maintain engagement. Failure to do this will allow the differential lock components to fall into the axle housing and will require that the opposite hub and differential assembly be removed to retrieve and assemble the components.*



WARNING : *The kingpins are sealed for life. Maintain absolute cleanliness during assembly.*



WARNING : *Polymer 400 lubricant must be used to avoid premature wear and/or seizure of the kingpin bearings.*

STEP 1

Raise the machine on the loader bucket and backhoe stabilizers.

STEP 2

Stop the engine.

STEP 3

Release the pressure from the hydraulic system (see section 8002).

STEP 4

Remove the front axle (see section 5000).

STEP 5

Remove the steering cylinder (see section 5000).

STEP 6

Remove the front wheels.

NOTE : *When assembling, tighten the wheel nuts to 300 Nm.*

STEP 7

Drain the oil from the hub and the brake system.

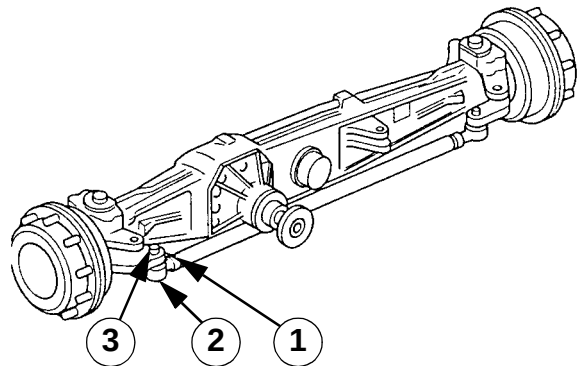
STEP 8

Remove the steering potentiometer (see page 5).

STEP 9

Tie the wiring harness back to the axle housing to prevent damage.

STEP 10



CS98K528

Remove the nut (3) from the track rod ball joint (2).

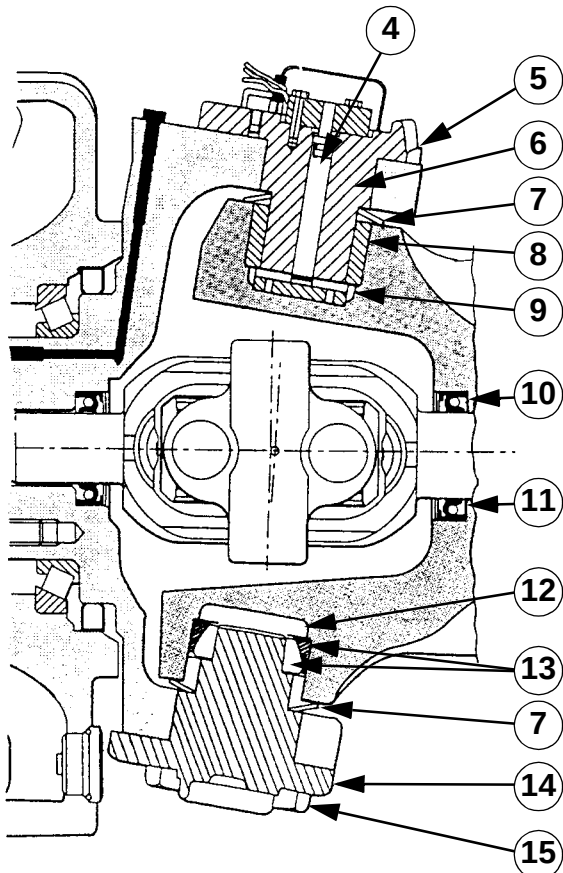
NOTE : *When assembling, tighten the track rod nut (3) to 135 Nm.*

STEP 11

Use a ball-joint separator to remove the track rod from the steering knuckle (1).

STEP 12

Attach a lifting bracket to the wheel mounting flange on the hub and use a hoist to take the weight of the complete hub assembly.

STEP 13

CS98K529

Release the four bolts (5) and (15) from the top and the bottom kingpins (6) and (14).

NOTE : When assembling, tighten the lower kingpin (14) and the bolts (15) to 300 Nm and the upper kingpin bolts (5) to 300 Nm.

STEP 14

Prise out the top kingpin (6) and remove it along with the potentiometer drive shaft (4).

STEP 15

Remove the disc springs (7).

STEP 16

Prise out the bottom kingpin (14) and carefully move the hub away from the axle, guiding the drive shaft through the outer bearing and the seals (10) and (11) to prevent damage to these components.

Installation

NOTE : Install a final drive hub in the reverse order from that of removal but note the following.

STEP 1

Chill the upper kingpin bush (8) and inner spherical race (13) if new bearings are fitted to axle housing. The inner spherical bearing (13) is a press fit on the kingpin.

STEP 2

Fill the top and bottom kingpin bearings with Polymer 400 grease.

STEP 3

Take care not to damage the outer bearing (10) and the seals (11) when installing the hub/drive shaft.

STEP 4

Install the disc spring (7). Top-concave face down, bottom-concave face up.

STEP 5

Install a new O-ring on the potentiometer drive shaft (4).

STEP 6

Fill the hub with oil.

STEP 7

Install the steering potentiometer (see page 5).

STEP 8

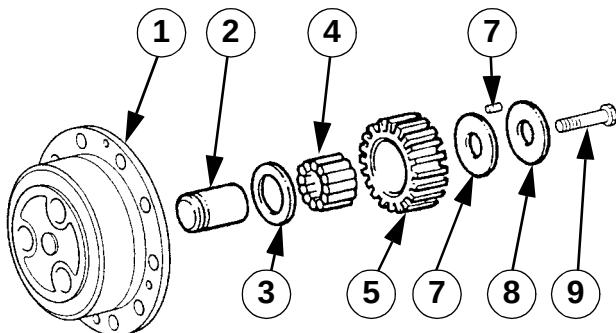
Purge the air from the brake system (See section 7000).

Disassembly

STEP 1

Remove the final drive hub (see page 6).

STEP 2



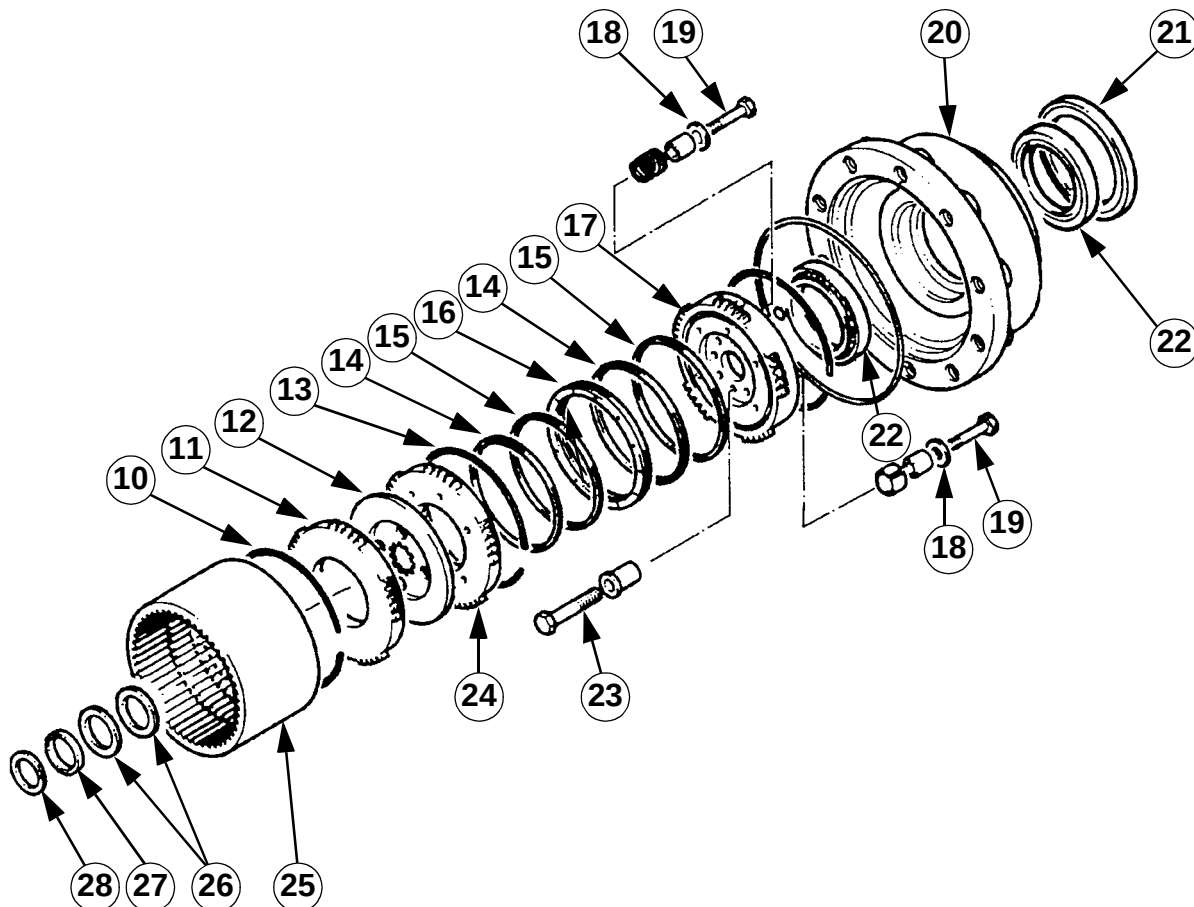
CS98K536

Remove the screws (9) which hold the planetary pinion shaft thrust washers (6) and (8) and remove the washers and the pin (7).

STEP 3

Remove the planetary pinion (5) and thrust washers (3). The pinions contain 28 uncaged needle roller bearings (4).

NOTE : The shaft (2) is a press fit in the carrier (1) and should not move when the gear is removed.



CS98K537

STEP 4

Remove the large circlip (10) from within the ring gear (25).

STEP 5

Remove the outer reaction plate (11).

STEP 6

Remove the bronze friction disc (12).

STEP 7

Remove the small circlip (28) and the spacer (27).

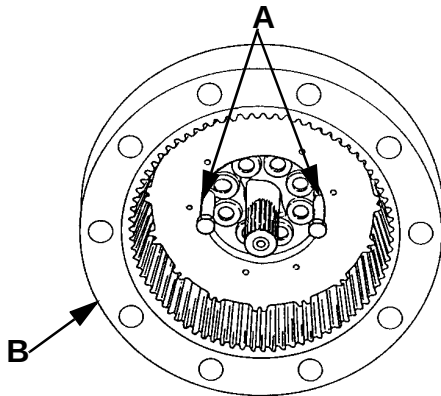
STEP 8

Remove the thrust washer (26).

STEP 9

Remove all eight bolts (23).

NOTE : When assembly, tighten, the bolts (23) to 235 Nm.

STEP 10

CS98K538

Install two M10 screws (A) in the tapped holes and carefully jack off the ring gear (25) and the inner reaction plate assembly (24). The inner reaction plate is held by the eight tube dowels, and the jacking process must be done evenly.

STEP 11

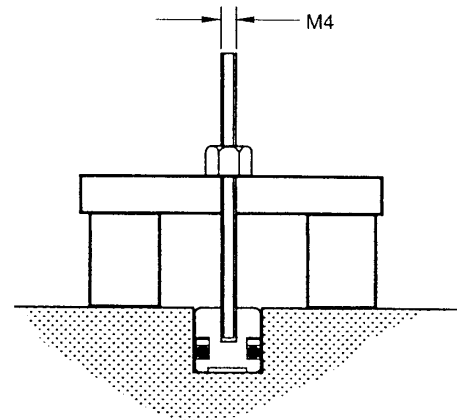
Remove the ring gear (25) and inner reaction plate assembly (24).

STEP 12

Remove the six bolts (19) and the washers (18) from the piston hub assembly (17) and lift off the inner reaction plate (24).

STEP 13

Remove the large circlip (13) from the ring gear (25) and slide out the piston hub assembly (17).

STEP 14

CS98K533

Make two M4 studs and small bridge pieces as show, to remove the piston from the hub. Great care will be needed during this operation as the annular piston will tend to jam, if it is pulled unevenly.

STEP 15

Note the relative positions of the seals (15) the backup rings (14) and piston (16) in both the outer and inner tracks before removing the assembly.

STEP 16

Pull the wheel hub (20) off the steering knuckle. This will be tight as the inner race of the outer taper roller bearing will be removed along with the hub.

STEP 17

Remove the seal (21).

STEP 18

Remove the inner race of the bearing from the steering knuckle.

STEP 19

Remove both external bearing races (22) from the hub (20).

Inspection

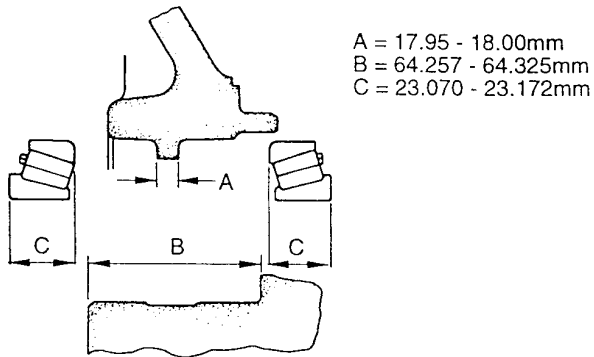
Inspect the final drive hub as follows :

1. The brake friction discs have a new thickness of 9.90 to 10.10 mm (0.390 to 0.398 in) and must be replaced when worn to 8 mm (0.315 in) thickness.

Assembly

NOTE : Assemble a final drive hub in the reverse order from that of disassembly but note the following :

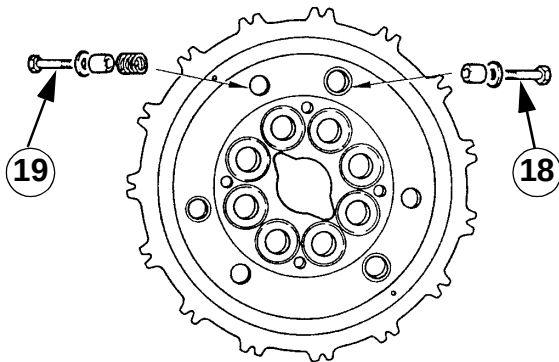
1.



CS98K534

The special arrangement of taper bearings do not require a specific pre-load setting due to the machining tolerances. However it is advisable to check that the dimensions shown are correct before starting assembly of the hub.

2.



CS98K535

NOTE : The bolts (18) have washers, bushes and springs assembled in specific order and in specific positions in the hub as illustrated.

3. Install new O-ring seals throughout
4. Tighten the wheel nut studs to 70 Nm.
5. Tighten the countersunk screws to 80 Nm.
6. Tighten the wheel nuts to 300 Nm.
7. Purge air from the brake system (See section 7000).

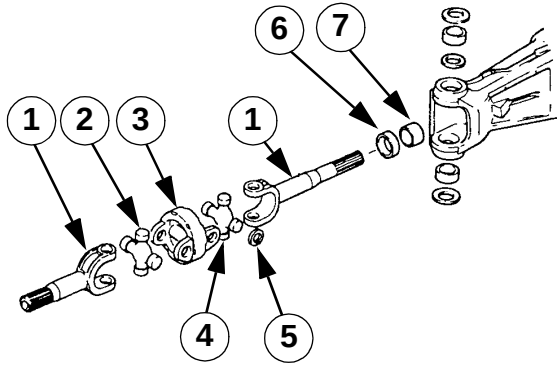
DRIVE SHAFT

Disassembly

STEP 1

Disassemble the final drive hub (see page 6).

STEP 2



CS98K543

Remove the dust seal and oil seal (6) from both the axle housing and hub.

STEP 3

Use a general purpose puller to extract the bushes (7) from the axle and hub.

STEP 4

Remove the circlip (5) from each of the four bearings on the spider (2).

STEP 5

Remove two bearing caps (4) and disengage the spider from the drive shaft (1).

STEP 6

Remove the remaining two caps (4) and disengage the spider (2) from the link (3).

STEP 7

Carry out steps 4, 5 and 6 to disassemble the other spider.

Assembly

NOTE : Assemble the drive shaft in the reverse order from that of disassembly but note the following :

STEP 1

Remove all the bearing caps (4) from a spider (2). Fill the caps with grease to retain the needle roller bearings.

STEP 2

Use the drifts FS17 ≠ 3 and FS17 ≠ 4 to assemble the dust seals (6) and the bushes in the axle and hub.

NOTE : Take particular care not to damage the bushes or seals when refitting the drive shaft. If these components are worn they must be replaced.

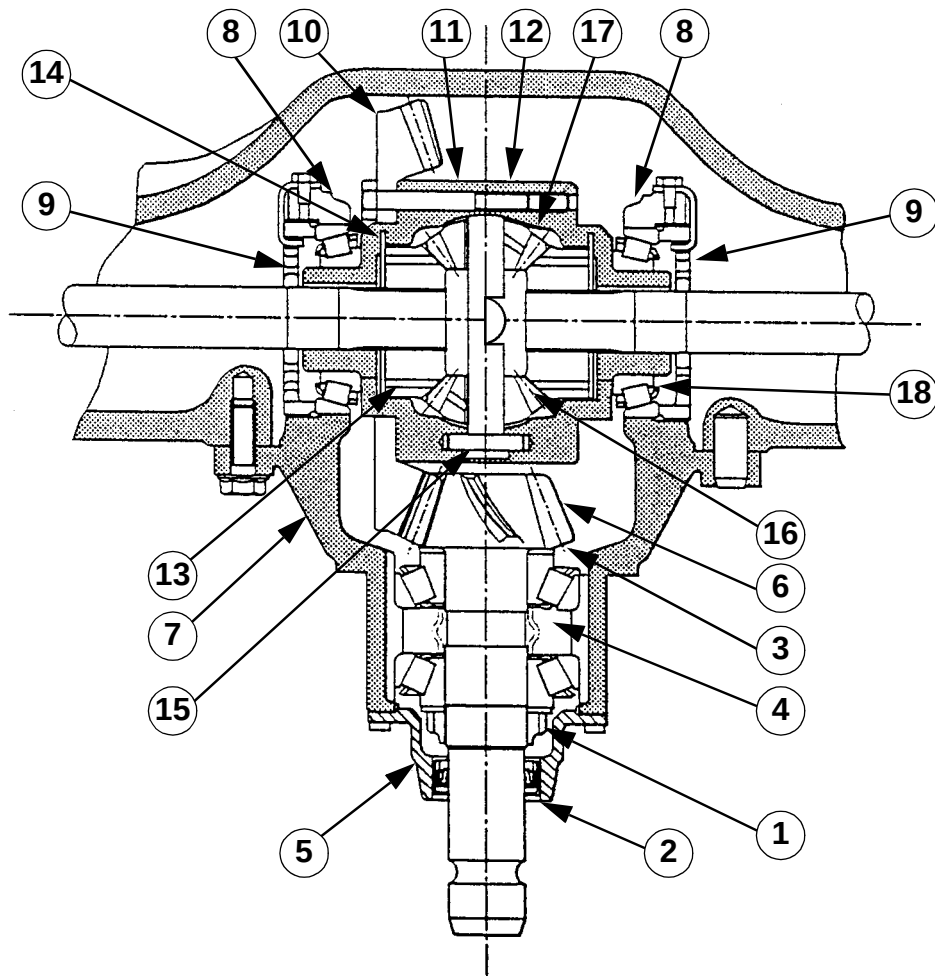
DIFFERENTIAL

General description

This axle is a double reduction steer-drive type. The axle comprises a conventional two pinion / two side gear differential without a locking mechanism. Drive is transmitted to the hub via drive shafts having double universal joints at the steering articulation points.

Final drive hubs have three planetary gears.

Cross-sectional drawing



1. Ring nut	10. Crownwheel
2. Oil seal	11. Differential case
3. Shim	12. Differential case
4. Collapsible spacer and special washers	13. Side gear
5. Cover	14. Thrust ring
6. Bevel pinion	15. Differential pinion shaft
7. Differential carrier	16. Differential pinion
8. Differential carrier cap	17. Spherical thrust washer
9. Ring nut	18. Differential carrier bearings

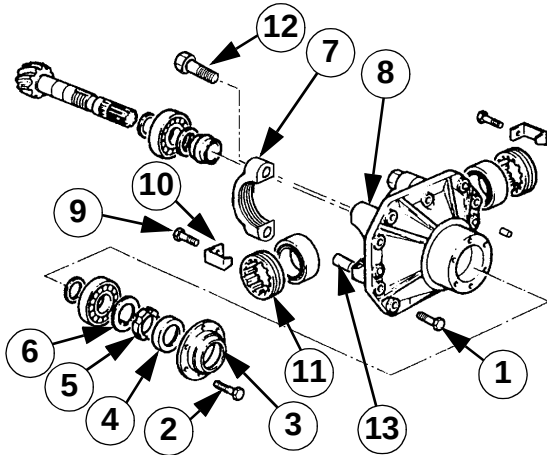
CS98M514

Disassembly

STEP 1

Remove the final drive hubs and the final drive shaft (see page 5).

STEP 2



CI98M509

Remove the ten bolts (1) from the differential carrier (8).

STEP 3

Install two screws in the threaded holes in the differential carrier (8) and jack the carrier from the dowels (13).

NOTE : The combination of the dowels and the silicone rubber sealant makes removal of the differential carrier from the axle difficult unless this jacking procedure is used.

STEP 4

Remove the screws (2) from the pinion shaft end-cover (3).

STEP 5

Use a soft-faced mallet to separate the cover, complete with oil seal (4), from the carrier housing.

NOTE : The seal is held in place with a silicone rubber gasket material.

STEP 6

Prise open the staked lip on the ring nut (5) and unscrew it with wrench FS17 $\neq$ 2. The ring nut is tight, so a soft metal wedge must be used to prevent the pinion shaft turning. Remove the tab washer (6).

STEP 7

Mark the bearing caps (7) and carrier (8), for correct assembly.

STEP 8

Remove the bolt (9) and lock-plate (10) from each bearing cap.

STEP 9

Unscrew the ring nuts (11) from either side of the carrier.

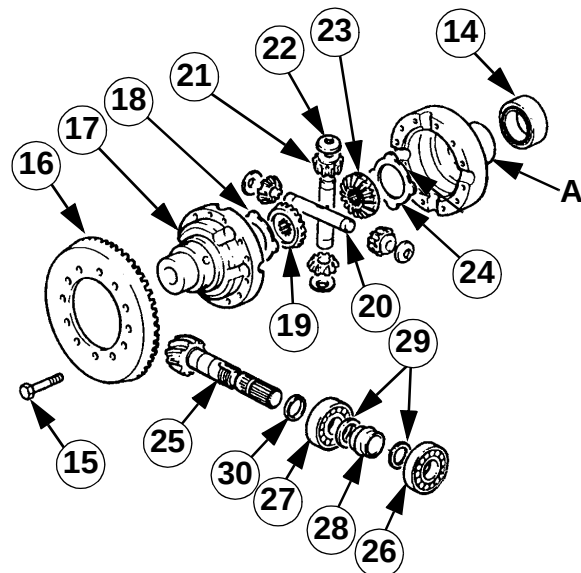
STEP 10

Remove bolts (12) and both bearing caps. Use a soft mallet to disengage the caps from the dowels (13).

STEP 11

Lift the differential and the crown wheel unit out of the carrier (8).

STEP 12



CI98M510

Pull the bearings races (14) off the differential case.

STEP 13

Mark both halves of the differential case to ensure correct assembly.

STEP 14

Remove the bolts (15) which fasten the crownwheel and differential case halves together.

STEP 15

Stand the differential case on the bearing spigot "A" with the crown wheel side uppermost (shown horizontal for clarity).

STEP 16

Lift off the crown wheel (16) and the top half of the differential case (17).

STEP 17

Remove the thrust ring (18) and side gear (19).

STEP 18

Lift out the pinion shafts (20) complete with pinions (21) and spherical thrust washers (22).

STEP 19

Remove the remaining side gear (23) and thrust ring (24).

STEP 20

Push the pinion shaft (25) through the bearings and remove bearings (26) and (27), collapsible spacer (28), washers (29) and shims (30).

STEP 21

Pull the bearing outer races from the differential carrier.

Inspection

1. Inspect all bearings for spalling or other wear, if any is found the bearing must be replaced.
2. Check the tooth contact areas from both the crown wheel and pinion, which should have a smooth polished appearance. If the surfaces are pitted or scuffed, check the quality and grade of oil used.

Assembly

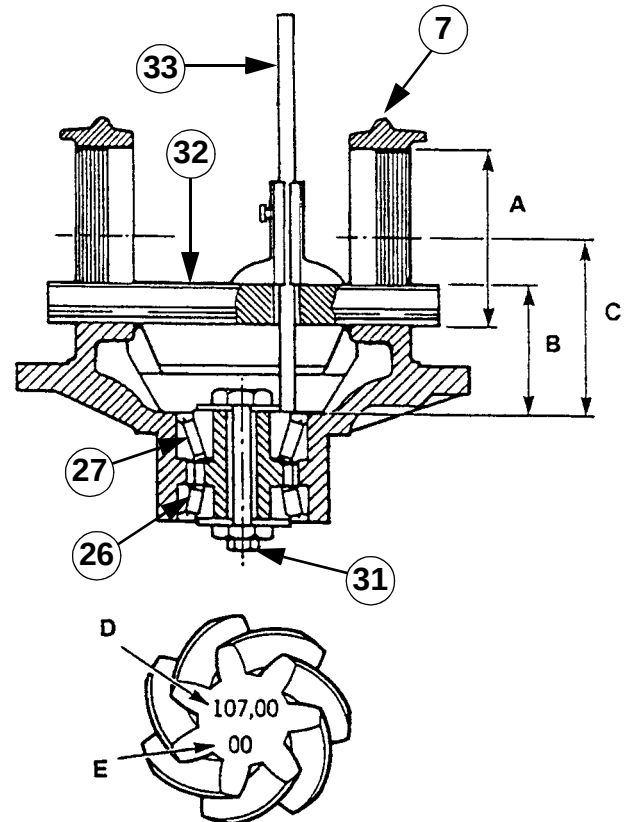
NOTE : *The assembly of the differential unit comprises the following sub-tasks :*

- Setting the pinion bevel mesh.
- Setting the bevel pinion bearing pre-load.
- Assembling the differential unit.
- Setting the crown wheel and pinion backlash.
- Setting the differential carrier bearing pre-load.
- Installing the differential unit.

Set the pinion bevel mesh as follows :

STEP 1

Fit both pinion bearing outer races into the differential carrier

STEP 2

CS98M516

Fit both differential bearing caps (7) and torque tighten the bolts to 266 Nm (196 lbf ft).

STEP 3

Fit the pinion bearing inner races (26) and (27).

STEP 4

Fit a bolt and nut (31) with large washers through the pinion bearings and tighten until the bearing cones are hard to turn by hand. Do not over tighten or the bearings will be damaged.

STEP 5

Measure the diameter of the bore "A" and note the size.

STEP 6

Measure the diameter of the measuring of the measuring bar (32) tool n° FS17 ≠1, then lay it across the differential carrier bearing bores and insert the depth gauge (33) through the hole in the shaft.

STEP 7

Measure the distance between the top of the shaft and the face of the pinion bearing inner race (27) (Dimension B).

STEP 8

To find distance "C" calculate the measurements as follows (in mm) $C = B$ minus diameter of bar FS17 ≠ 1 plus $A - 2$.

STEP 9

To find the amount of shims (2) required ; the number 'D' (in mm) etched on the pinions must be subtracted from dimension C.

Shim thickness required = C minus D.

D = bevel pinion protrusion dimension

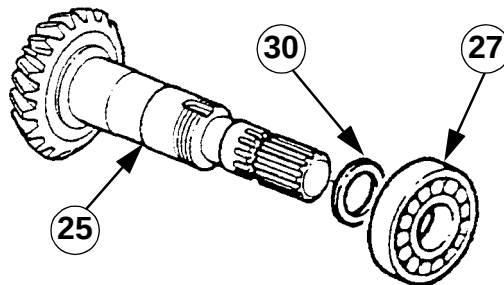
E = pinion mating number

Shim rings are available in the thickness shown in the table.

mm	in.	mm	in.
2.50	0.0984	3.00	0.1181
2.60	0.1024	3.10	0.1221
2.70	0.1063	3.20	0.1260
2.80	0.1102	3.30	0.1300
2.90	0.1142	3.40	0.1340

STEP 10

Remove the clamp bolt and washers.

STEP 11

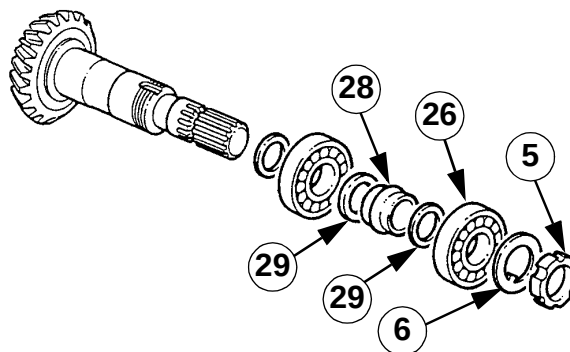
CS98M517

Fit the correct shim ring (30) on the pinion shaft (25) but ensure the largest internal chamfer is towards the pinion gear.

STEP 12

Press the inner bearing race (27) onto the pinion shaft (25).

Set the bevel pinion bearing pre-load as follows :

STEP 1

CS98M518

Insert the pinion shaft into the differential carrier and fit a new collapsible spacer (28), with a new washer (29) each side of it.

STEP 2

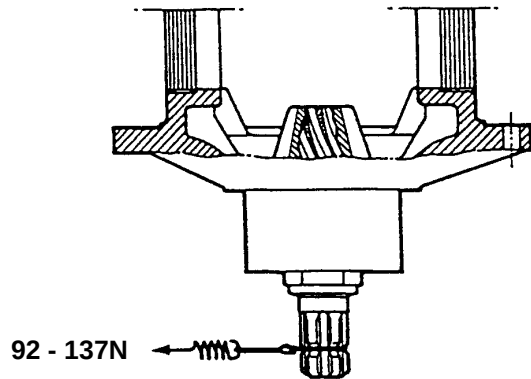
Push on the second bearing inner race (26).

STEP 3

Fit the tab (6) washer and a new ring-nut (5).

STEP 4

Secure the carrier in a vice and wind a thin cord around the groove in the pinion shaft. Attach a spring balance to the cord.

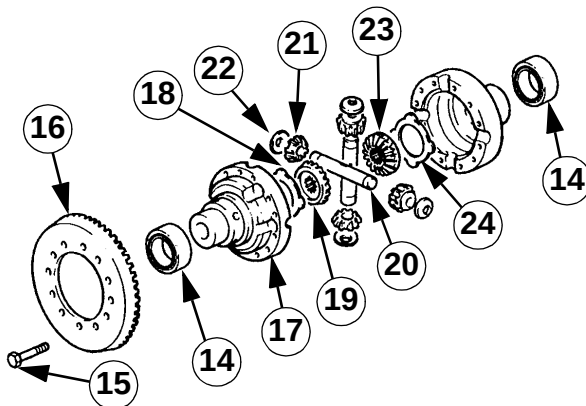
STEP 5

CS98M519

Tighten the pinion ring-nut gradually, until the spring balance shows that a sustained pull of between 92 to 137 Newtons (19.8 to 29.6 lbf) is required to keep the pinion shaft turning.

STEP 6

Stake the ring nut into the groove on the pinion shaft.

Assembling the differential**STEP 1**

CI98M511

Stand the differential case (17) (crown wheel side) on its carrier bearing spigot, and install the thrust ring (18) and side gear (19).

STEP 2

Assemble the pinions (21) and thrust washers (22) to their shaft (20) and fit them into the differential case make sure that the pin in the shaft is in position.

STEP 3

Turn the other half of the differential case onto its bearing spigot and install the thrust ring (24) and side gear (23). While holding the ends of the pinion shaft, turn differential case (17) over and lay it onto the bottom half aligning the marks on both cases.

STEP 4

Thoroughly de-grease the threads of the bolts (15) and those in the differential case. Fit the crown wheel (16). Apply Loctite 270 on bolt threads before installing. Then tighten to 78 Nm (58 lbf ft).

STEP 5

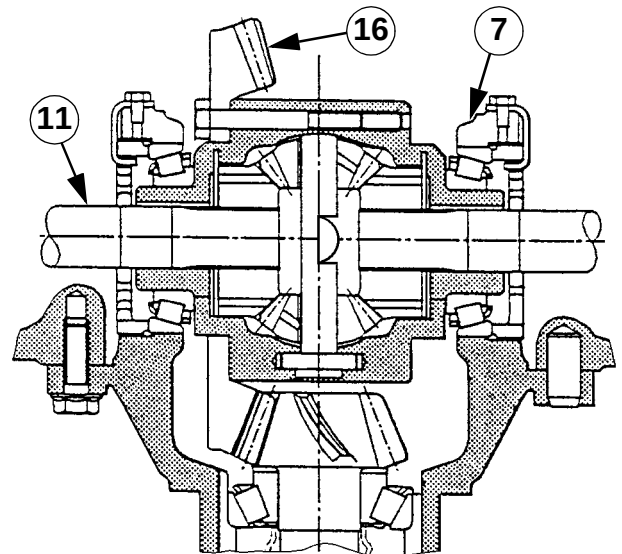
Fit the carrier bearings (14) onto the differential case spigots.

STEP 6

Remove the bearing caps from differential carrier.

STEP 7

Fit the outer races onto the carrier bearings and lower the differential assembly into the carrier.

STEP 8

CS98M515

Fit the bearing caps (7), bolts (12, not shown) and ring nuts (11) which should be adjusted to ensure that there is sufficient backlash between the crown wheel (16) and pinion, before tightening the (12) bolts to 266 Nm (195 lbf ft).



WARNING : *If there is no backlash between crown wheel and pinion, damage will occur when the bolts are tightened.*

NOTE : *Do not assemble the ring nut lock plates and the bolts until the differential backlash settings are completed.*

Setting the crown wheel and pinion backlash

STEP 1

The correct backlash between crown wheel and pinion is 0.18 to 0.24 mm (0.007 to 0.009 in). Adjustment is made by turning the ring nuts (11) to move the differential assembly into or out of mesh with the pinion. The ring nuts can be difficult to turn. To release the nuts, slacken the bolts and the bearing cap a small amount. Do not slacken them more than necessary.

STEP 2

Use wrench FS17 $\neq$ 5 to turn the ring (11) on the crown wheel side in a clockwise direction until the crown wheel and pinion are in close mesh. Tap the bearing cap with a soft face hammer to aid movement of the ring nut (11) and bearing alignment.

STEP 3

Use wrench FS17 $\neq$ 5 to turn the other ring nut (11) in a clockwise direction until all clearance has been removed. This position is obvious as the ring nut (11) will become very difficult to move.

STEP 4

Position a dial gauge in contact with and at 90° to, a tooth on the crown wheel.

STEP 5

Push the crown wheel into and out of mesh with the pinion to check the amount of backlash. Rotate the crown wheel and note the readings obtained at different positions. If the backlash is different, position the dial gauge on the tooth which has the smallest reading to make the final adjustment.

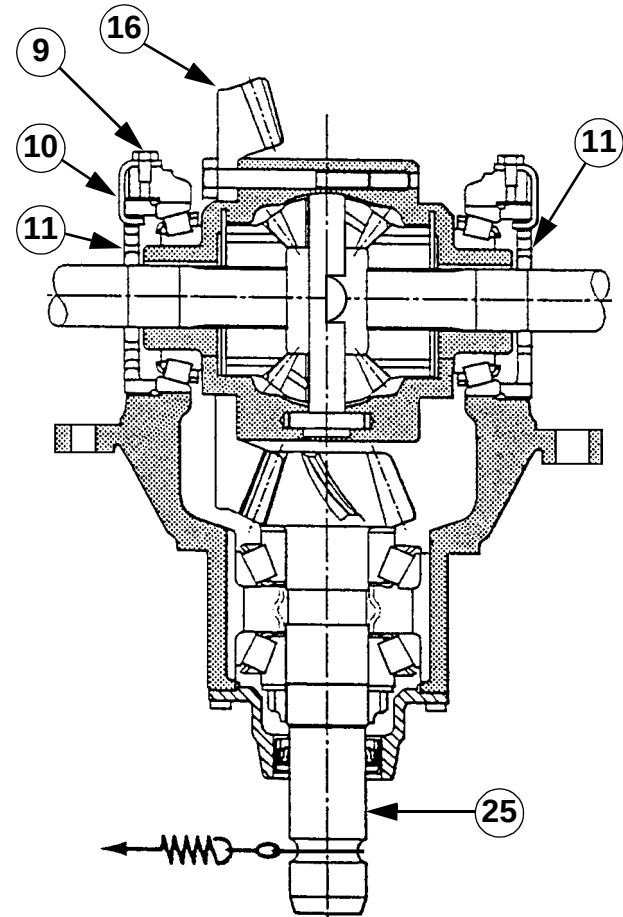
STEP 6

To make the final adjustment move the crown wheel into or out of mesh with the pinion by turning each ring-nut (11) an equal amount. Continue until the dial gauge shows a backlash of 0.18 to 0.24 mm (0.007 to 0.009 in).

Set the differential carrier bearing pre-load as follows :

When the backlash is adjusted it is necessary to pre-load the bearings.

NOTE : *It is essential not to disturb other adjustments, so pre-load is achieved by moving both ring nuts (11) a specific amount.*



CS98M520

STEP 1

Wrap a cord around the groove in the spiral bevel pinion shaft and attach a spring balance to the cord. Measure the pull required to keep the pinion shaft and differential turning. Note the measurement.

STEP 2

Tighten each ring nut (11) by an equal amount starting with 1/2 turn.

STEP 3

Measure the line pull again.

STEP 4

Continue to adjust the ring nuts (11) until a line pull between 121 and 180 Newtons (27.2 and 40.5 lbf) is required to turn the pinion continuously.

STEP 5

Fit the lock plates (10) and the bolts (9) to prevent the ring nuts (11) moving. Torque tighten the bolts (9) to 10 Nm (7 lbf ft).

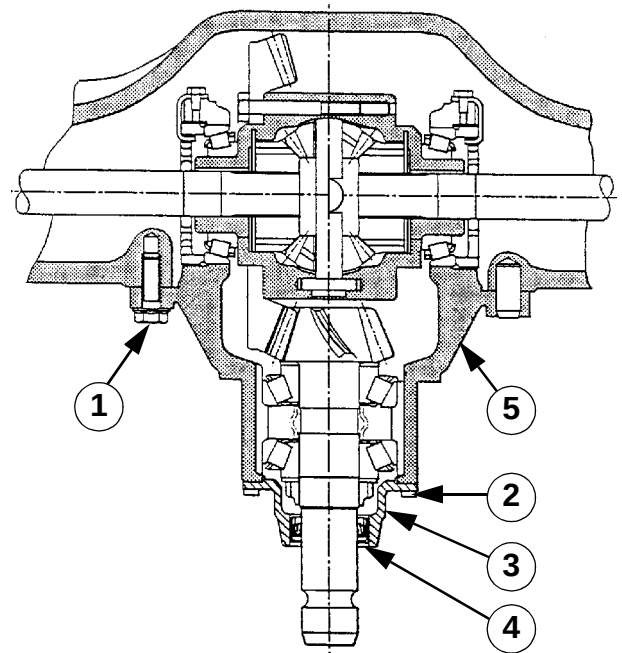
STEP 6

Torque tighten the carrier bearing cap bolts to 266 Nm (196 lbf ft).

STEP 7

Check the crown wheel backlash again.

Install the differential unit as follows :

STEP 1

CS98M527

Install a new seal (4) in the pinion shaft cover (3).

STEP 2

Remove the grease from the mating surfaces of the differential carrier (5) and cover (3). Apply Sealastic 732 liquid gasket and fit the cover. torque tighten bolts (2) to 12 Nm (9 lbf ft).

STEP 3

Clean the mating surfaces on axle housing and the differential carrier (5).

STEP 4

Apply Sealastic 732 liquid gasket to one surface and install the differential assembly into the axle housing.

STEP 5

Tighten the 10 bolts (1) to 169 Nm (125 lbf ft).

STEP 6

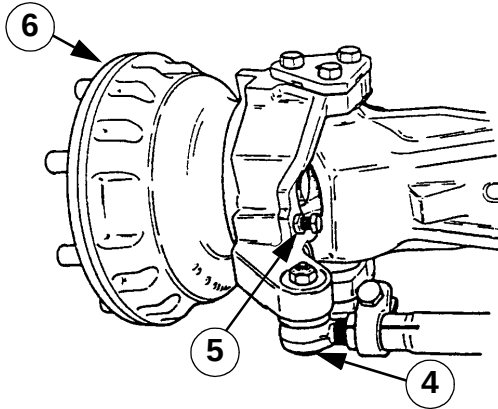
Install the final drive hubs and the drive shafts (see page 5).

FRONT AXLE MAINTENANCE

Checking the steering lock adjustment

NOTE : The steering lock should never exceed the angle given below or the drive shaft universal joints will wear excessively.

STEP 1



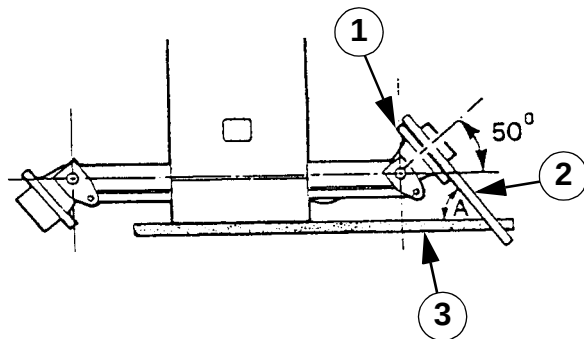
CS98K517

Disconnect the track rod (4) at one end.

STEP 2

Turn the left hand hub (6) to maximum left-hand steering angle.

STEP 3



CS98K518

Place a long straight edge (3) against the axle input flange or against the machine hardnose. Make sure the straight edge is parallel with the axle centre-line.

STEP 4

Place a second straight edge (2) against the wheel hub flange (1).

STEP 5

Measure the angle "A" at which both straight edges intersect. Subtract angle A from 90° to give the steering lock, for example :

Angle A = 40

Steering angle $90^\circ - 40^\circ = 50^\circ$

STEP 6

Adjust the left-hand stop (5) for maximum left steering lock and right-hand stop for maximum right steering lock.

NOTE : The steering angle must not exceed 52°.

STEP 7

Re-connect the track rod end (4) and remove the straight edges (2) and (3).

Toe-in adjustment

Adjustment

1. Toe-in can be measured with the wheels still mounted. If they are removed, straight edges can be attached to each hub and in this case the toe-in must be measured at a similar radius to the wheel rim. Measurements be taken while the straight edges are horizontal and pointing forwards.
2. Measure the distance between wheel rims in front of the axle, mark position on wheel rim.
3. To average out any wheel distortion, turn the wheels 180°, until the marks made on wheel rim are directly behind the axle. Again, measure the distance between the front of the rims.
4. Toe-in should be 0 - 2 mm (0 - 0.08 inch).
5. Slacken the clamp at each end of the track rod tube and rotate the tube to adjust the toe-in.
6. Tighten the clamp nuts to 70 Nm (52 lbf ft).

Section

6000

REMOVAL AND INSTALLATION OF POWER TRAIN COMPONENTS

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SPECIFICATIONS

Gear box	
Make	TURNER
Type	Compact plus
Gear box oil	API CD/SE Grade 10W30
Oil capacity	
Total circuit	19 litres
Filling capacity with or without filter change	15 litres
Rear Axle (2-Whell steer machines)	
Type of oil	API CD/SE Grade 20W30
Oil capacity	22.5 litres
Rear Axle (4-Whell steer machines)	
Make	Carraro
Type	2625
Type of oil	Hiload gear oil
Oil capacity	12.5 litres

SPECIAL TORQUES

Mounting bolts for the gear box	395 Nm
Bolts for mounting the gear box to the engine flywell housing.....	140 Nm
Bols for mounting the torque converter to the flywell.....	41 Nm
Mounting bolts for the rear axle	250 to 270 Nm
Bolts for the front drive shaft.....	34 to 41 Nm
Bolts for rear drive shaft to the gearbox (2- Whell steer machines).....	61 to 81 Nm
Bolts for mounting the rear shaft to the gearbox (4-Whell steer machines).....	105 Nm
Bolts for mounting the rear drive shaft to the rear axle (4-Whell steer machines).....	48 Nm

GEAR BOX REMOVAL AND INSTALLATION

Removal

STEP 1

Park the machine on a level surface.

STEP 2

Position 150 mm blocks under each stabilizer foot and fully lower stabilizers. There must be at least 915 mm clearance between the ground and the lower rail of the backframe. Fit struts to the stabilizers to prevent leak down or block the backframe.

STEP 3

Fit the bucket tooth guard, then raise the loader and fit the safety struts. Dump the bucket. Stop the engine and release pressure from the hydraulic system.

STEP 4

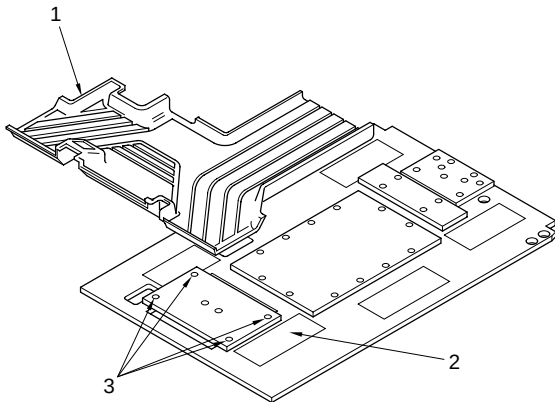
Disconnect the cables of the battery.

NOTE : *Disconnect always the negative (-) cable in the terminal position.*

STEP 5

Remove one rear wheel.

STEP 6

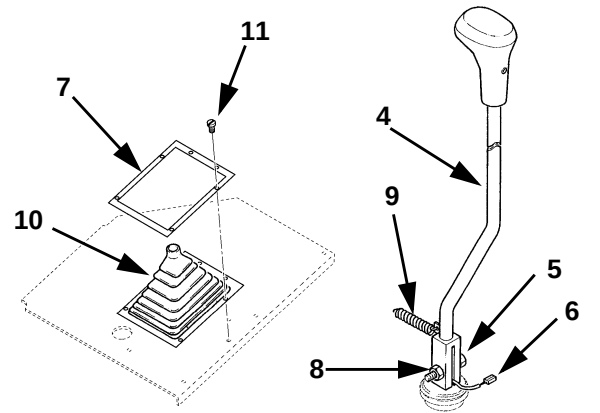


Remove the front floor mat (1) and the four bolts (3) from the centre floor plate (2). Remove the plate (2).

STEP 7

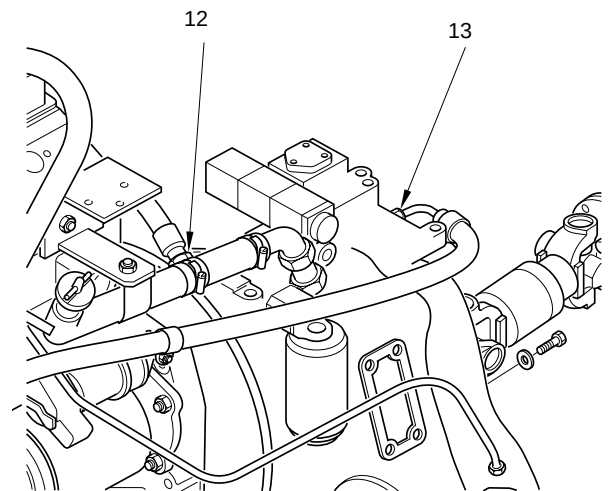
Disconnect the wiring harness from the solenoid valves and temperature sender.

STEP 8



Remove the screws (11) and holder (7) from the shift lever gaiter (10) and slide the gaiter up the lever (4). Disconnect the clutch switch wiring connection (6) and remove the spring (9) from the shift lever (4). Remove the bolt (5) and the nut (8) from the shift lever (4) and remove the lever from the transmission.

STEP 9



Disconnect the transmission oil cooler pipes (12) and (13).

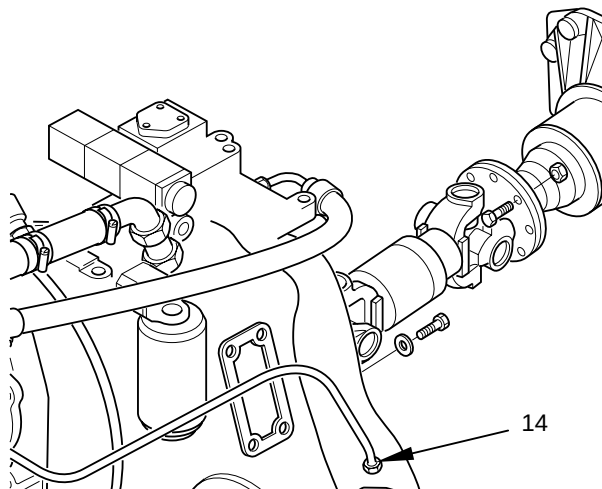
Release the oil cooler pipe support on the left hand side of the bell housing and tie back the pipe.

STEP 10

Disconnect the transmission oil filler pipe coupling, and the solenoid valve and oil temperature sensor connections.

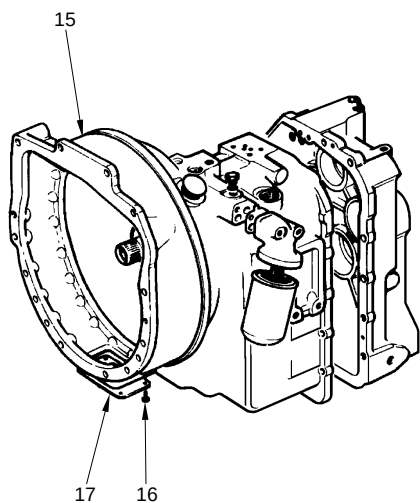
STEP 11

Drain the transmission oil (see Operator's Manual).

STEP 12

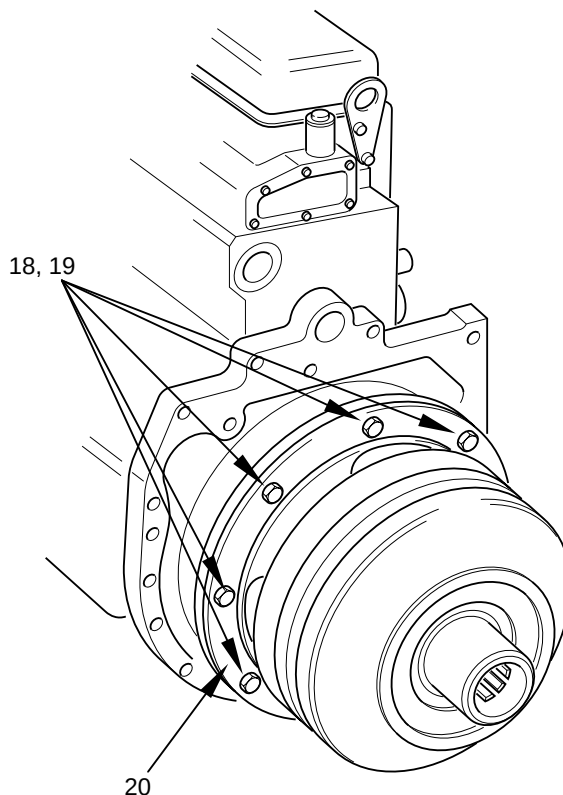
789M427A

Disconnect the transmission oil dipstick coupling (14).

STEP 13

789M428A

Remove the four bolts (16) and the inspection plate (17) from the bottom of the bell housing (15).

STEP 14

789M429A

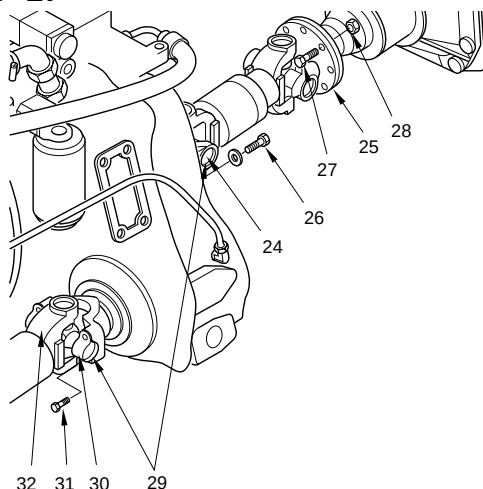
Remove the eight flywheel to torque converter bolts (18) and the washers (19) from the torque converter flexible plate assembly (20) through the inspection hole (17).

STEP 15

Remove the oil filter canister (see Operator's Manual). Remove the two bolts from the filter head and remove the filter head.

STEP 16

Install the transmission drain plug.

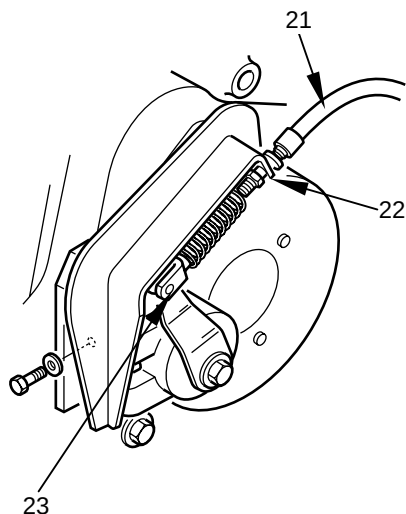
STEP 17

789M431A

Remove the four bolts (31) and the two bearing caps (30) from the front propshaft coupling (32). Lower the propshaft and make sure the needle roller bearing cups (29) are taped to the joint.

Remove the eight bolts (27) and the nuts (28) from the rear drive axle flange (25) and the four bolts (26) and the two bearing caps (24) on the rear driveshaft coupling. Remove the propshaft. Make sure the needle roller bearing cups (29) on the front coupling are taped to the joint.

NOTE : Only step 18 on 4 wheel steer machines.

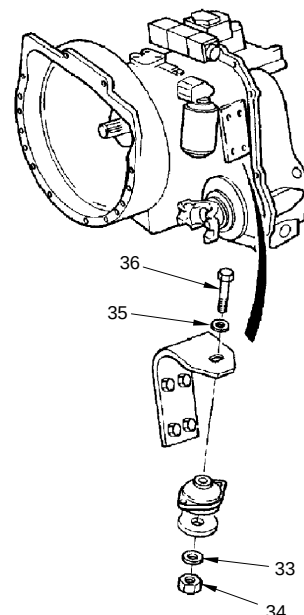
STEP 18

789M430A

Disconnect the parking brake cable (21) at the lever (23) and the bracket (22).

STEP 19

Put a trolley jack under the transmission and raise the jack to support the transmission. **DO NOT** lift the transmission.

STEP 20

789M432A

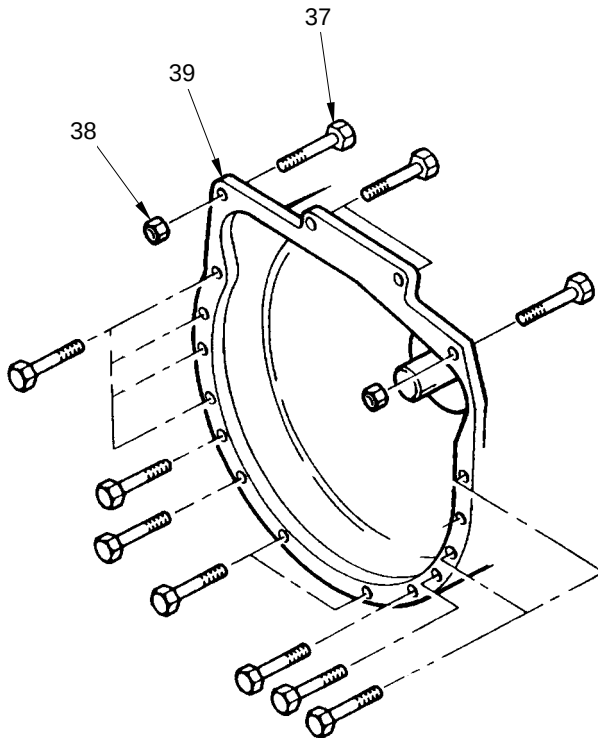
Remove the centre bolts (36), the nuts (34) and the washers (33) and (35) from each transmission mounting.

STEP 21

Put a trolley jack under the engine sump. raise the jack and support the engine with blocks. **DO NOT** lift the engine.

STEP 22

Remove the trolley jack from under the engine and put it in position under the transmission.

STEP 23

Note the positions of the bolts (37) and the nuts (38). Remove the bolts (37) and the nuts (38) from the bell housing (39).

STEP 24

Raise the transmission on the trolley jack and pull the transmission to the rear to disengage the torque converter spigot from the flywheel.



WARNING : Make sure that the transmission does not slip on the jack when moving. This may cause damage to the torque converter and flywheel.

STEP 25

Lower the transmission and remove from the chassis.

Installation

Install the gear box in the reverse order of the removal but note the following :

1. Using a trolley jack move the transmission under the chassis.
2. Make sure that the torque converter is fitted correctly on the transmission input shaft.

3. When assembling the engine and transmission, make sure that the torque converter drive spigots are in mesh with the spigots on the transmission oil pump. To check, rotate the torque converter whilst bolting the gearbox to the bell housing.



WARNING : If you are unable to rotate the torque converter, you must stop tightening the gearbox to the bell housing or you will damage the oil pump drive. Remove the gearbox and re-align the torque converter drive spigot with the spigots of the transmission oil pump.

4. Install the bolts (37) and the nuts (38) in the bell housing (39) in the positions noted during the removal procedure. Tighten the bolts (37) and the nuts (38) by hand. Do not torque tighten until the transmission is installed in its mountings.
 5. Torque tighten the bell housing bolts (37) and nuts (38) to 140 Nm.
Torque tighten the transmission mounting centre bolts (36) and nut (34) to 395 Nm.
 6. Before installation, fit a new gasket on the oil filter head.
 7. Before installation lubricate the seal face and the new filter canister with clean transmission oil.
 8. Install the new filter. Turn the filter until the seal is in contact with the filter head and tighten the filter a further half turn by hand.
 9. Torque tighten the bolts (18) to 41 Nm (30 lbf ft).
 10. Install the eight bolts and nuts (1 and 3) in coupling flange (2). Torque tighten the bolts (27) and the nuts (28) to 48 Nm.
 11. Connect the cables of the battery.
- NOTE :** Connect always the positive (+) cable in the first position.
12. After installation, fill the transmission with oil (see Operator's Manual).
 13. After transmission oil replenishment, start the engine and check all transmission oil pipe couplings for leaks.
 14. For a few minutes drive the machine in first and second gear, then stop the machine.
 15. Raise the backhoe stabilizers and remove the packing pieces.
 16. Carry out a functional test of the transmission.
 17. Check for oil leaks and rectify any faults if found.

REAR AXLE REMOVAL AND INSTALLATION (2 Wheel steer machines)

Removal

STEP 1

Park the machine on a level surface.

STEP 2

Lift the machine with the stabilizer legs and support the machine on suitable heavy duty stands under the backframe.

STEP 3

Remove the rear wheels.

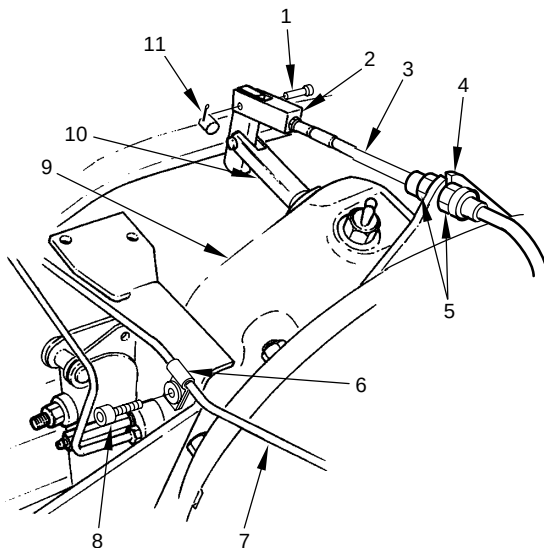
STEP 4

Clamp the flexible hose between the brake fluid reservoir and the inlet pipe assembly. Disconnect the flexible hose from the inlet pipe assembly. (See section 7000).

STEP 5

Remove the four bolts which retain the loader cable support brackets each side of the axle centre housing.

STEP 6



789M453A

Lever the differential lock actuator (10) in. Remove the split pin (11) and the clevis pin (1). Disconnect the clevis (2) from the differential lock actuator (10). Discard the split pin (11). Release the locknuts (5) from the differential cable (3) at the bracket (4).

Slacken the locknuts on each outer cable and disconnect the inner cable ends of both handbrake cables. Secure the handbrake cables clear of the rear axle (9) with temporary ties.

Remove the socket head bolt (8) and "P clip" (6) which support the metal brake pipes (7) on the brake actuators. Remove the brake line from the slave cylinder.

STEP 7

Remove all four bolts and self-locking nuts which secure the propshaft to the axle pinion flange.

STEP 8

Secure the propshaft with temporary ties to prevent disengagement of the sliding joint.

STEP 9

Support the axle on a suitable trolley jack.

STEP 10

Remove the two inner bolts each side, which secure the axle to the chassis.

STEP 11

Make sure the trolley jack fully supports the weight of the rear axle (9) and then carefully remove the two outer bolts each side.

STEP 12

Carefully lower the axle. Make sure no cables are trapped and that the differential lock actuator does not foul the chassis.

STEP 13

Remove the rear axle (9) sideways from the machine.

Installation

Install the rear axle in the reverse order of the reversal but not the following :

1. During installation, make sure the differential lock actuator does foul under the chassis when raising the rear axle (9).
2. During installation, make sure the bracket for the loader control cables slide neatly each side of the centre housing when raising the rear axle (9) into position.
3. Torque tighten the axle mounting bolts and nuts to 250 to 270 Nm).
4. Install a new split pin (11). After installation, purge air from the brake system (see section 7000).
5. After installation, adjust the brakes (see section 7000).

REAR AXLE REMOVAL AND INSTALLATION (4 Wheel steer machines)

Removal

STEP 1

Park the machine on a level surface.

STEP 2

Lift the machine with the stabilizer legs and support the machine on suitable heavy duty stands under the backframe.

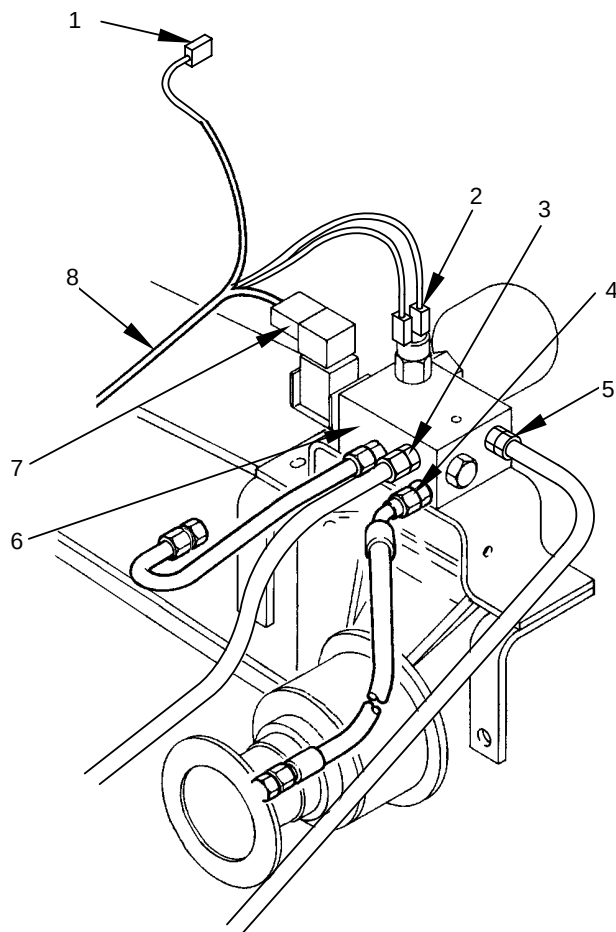
STEP 3

Depressurize the hydraulic system (see section 8002)

STEP 4

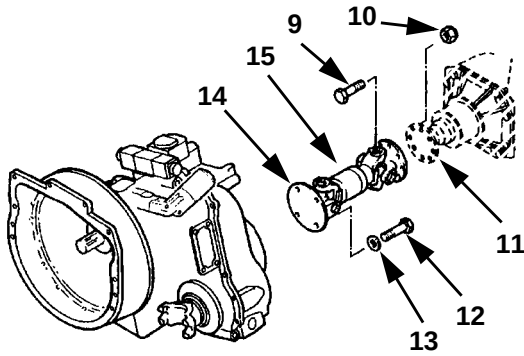
Remove the rear wheels.

STEP 5



789M455A

Remove the hydraulic hoses (3), (4) and (5). Disconnect the wiring harness (8) at the hydraulic oil pressure switch (2) and differential lock solenoid (7). Disconnect the wiring harness (8) at the steering potentiometer connection (1).

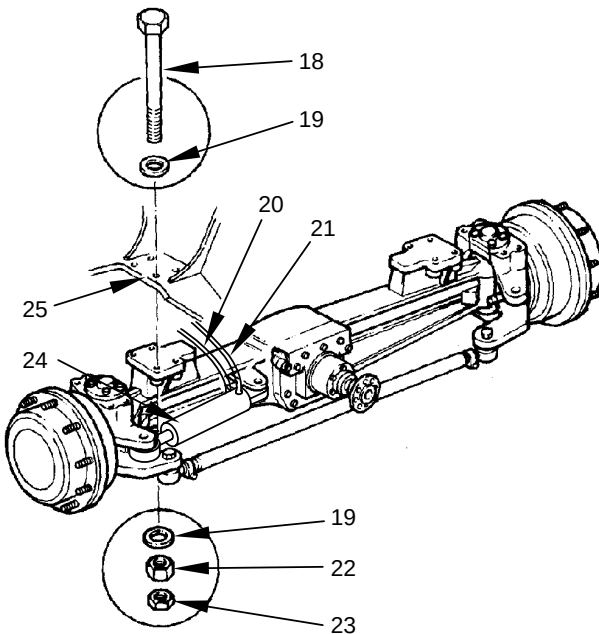
STEP 6

CI98J501

Remove the eight bolts (9) and the nuts (10) from the propshaft flange (11), remove the four bolts (12) and washers (13) from the coupling half (14) and remove the propshaft (15) from the machine.

STEP 7

Put a trolley jack under the centre of the axle. Raise the jack to support the axle. DO NOT lift the machine.

STEP 8

789M457A

Disconnect the hoses (20) and (21) at the steering cylinder (24).

Remove the eight locknuts (23), the nuts (22) and the washers (19) from the axle bolts (18). Remove the axle bolts (18) and washers (19).

STEP 9

Lower the axle and remove from under the machine.

Installation

Install the rear axle in the reverse order of the removal but note the following :

1. Torque tighten the axle mounting bolts (18) and nuts (22) to 250 to 270 Nm.
2. Torque tighten the bolts (9) and the nuts (10) to 48 Nm.
3. Torque tighten the bolts (12) to 105 Nm.
4. After installation start the engine to pressurize the hydraulic and the brake systems and do steps 5 through 7.
5. Stop the engine and check the hydraulic oil level and brake system levels.
6. Purge air from the brake system (see section 7000).
7. Lower the backhoe stabilizer legs and remove the stands.
8. Lower the machine and carry out a functional test of all hydraulic, driving, steering and brake functions.

Section

6002

TRANSMISSION SPECIFICATIONS, PRESSURE CHECKS AND TROUBLESHOOTING

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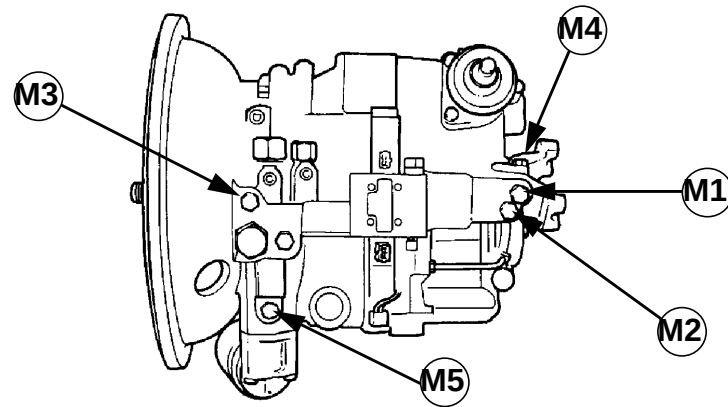
SPECIFICATIONS

	Engine at 2000 rpm	Test point
Oil pump outlet pressure	14 to 15 bar	M5
Reverse clutch pressure	13.5 to 14.5 bar	M2
Forward clutch pressure	13.5 to 14.5 bar	M1
Torque converter relief valve pressure.....	6.5 to 7.5 bar	M3
Lubrication pressure	1.5 to 3 bar	M4
Four wheel drive clutch pressure	14 to 15 bar	M6
Normal Transmission oil operating oil.....		80°C

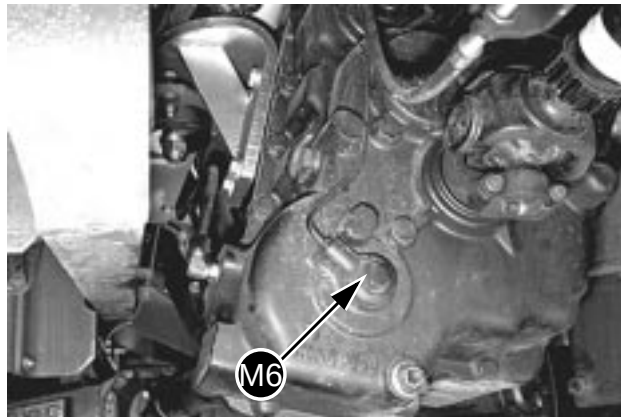
SPECIAL TOOLS

Hydraulic test kit
9/16" UNF adaptor

LOCATION OF TEST POINTS ON THE TRANSMISSION



CI98G502

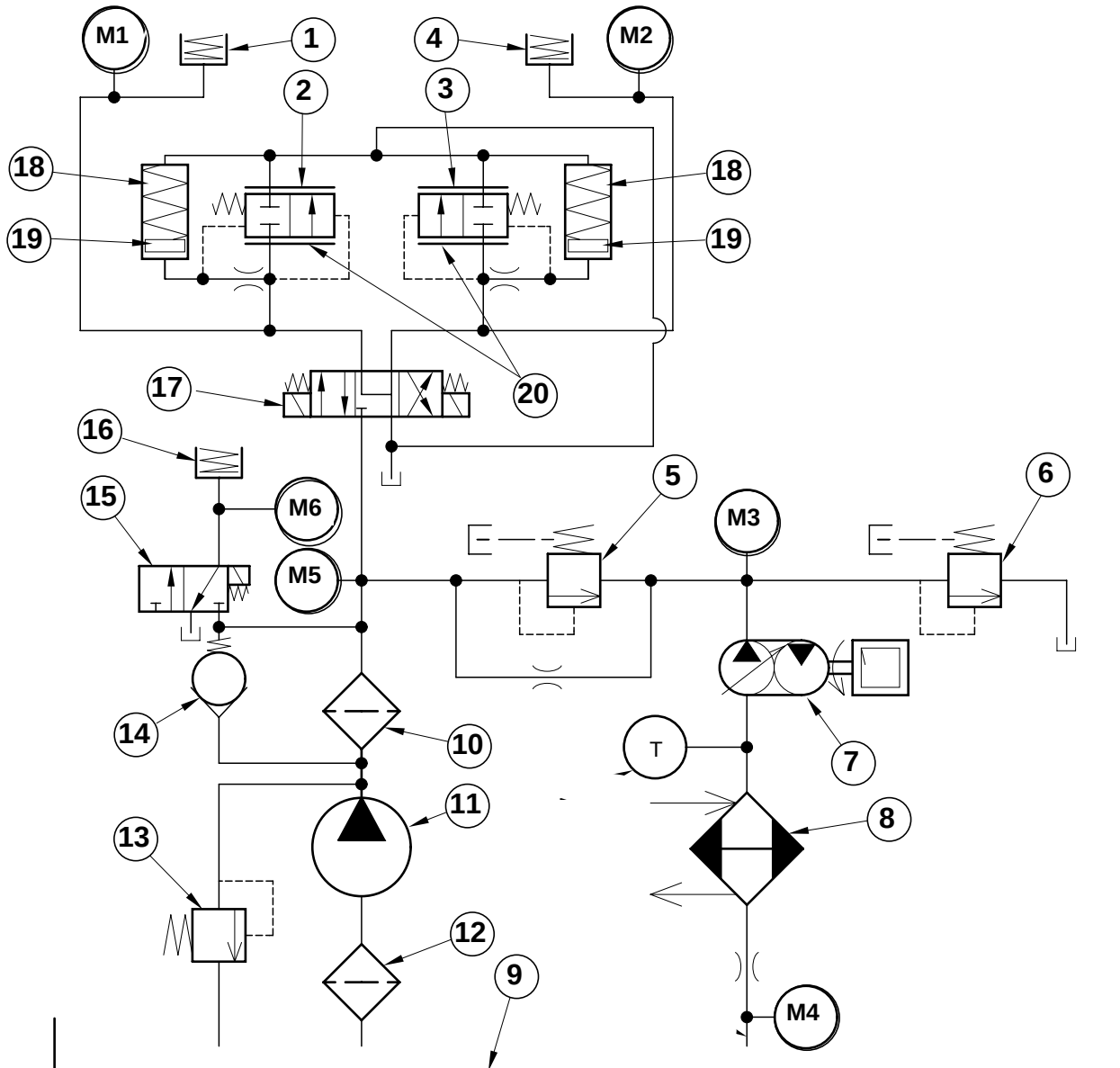


CK98G001

M1 Forward clutch test point
M2 Reverse clutch test point
M3 Torque converter test point

M4 Lubrication pressure test point
M5 Oil pump test point
M6 Four wheel drive test point

HYDRAULIC SCHEMATIC



789M419A

1. Forward clutch piston	14. Bypass valve
2. Forward modulation valve	15. Four wheel drive selector valve
3. Reverse modulation valve	16. Four wheel drive clutch piston
4. Reverse clutch piston	17. Forward and reverse selector valve
5. Clutch pressure regulating valve	18. Modulation spring
6. Torque converter safety valve	19. Modulation piston
7. Torque converter	20. Modulation valve spool
8. Oil cooler	T. Temperature sensor
9. Sump	M1. Forward clutch pressure test connection
10. Pressure filter	M2. Reverse clutch pressure test connection
11. Oil pump	M3. Torque converter pressure test connection
12. Suction strainer	M4. Lubrication pressure test connection
13. Cold start relief valve	M5. Oil pump pressure test connection
	M6. Four wheel drive pressure test connection

TROUBLESHOOTING PROCEDURES

Transmission fails to drive in forward or reverse

Check the machine for oil leaks and damaged or missing parts. Repair as required.

Is the oil in the sump at the correct level ?

NO → Fill the sump with the oil specified in Section 1002.

YES
↓

Do the oil pump pressure test as detailed in this section.
Is the oil pump serviceable ?

NO → Replace or repair the oil pump as detailed in Section 6007.

YES
↓

Is the cold start relief valve operating correctly ?

NO → Replace or repair the cold start relief valve as detailed in Section 6007

YES
↓

Do the relevant clutch pressure test as detailed in this section. Is the clutch serviceable ?

NO → Replace or repair the clutch as detailed in Section 6007.

YES
↓

Are the clutch shaft sealing rings serviceable ?

NO → Replace the clutch shaft sealing rings as detailed in Section 6007.

YES
↓

Do the torque converter relief valve test as detailed in this section. Is the torque converter relief valve serviceable ?

NO → Replace or repair the torque converter relief valve as detailed in Section 6007.

YES
↓

Do the circuit pressure test as detailed in this section. Is the circuit pressure correct ?

NO → Replace or repair the torque converter or the oil cooler as detailed in Section 6007.

YES
↓

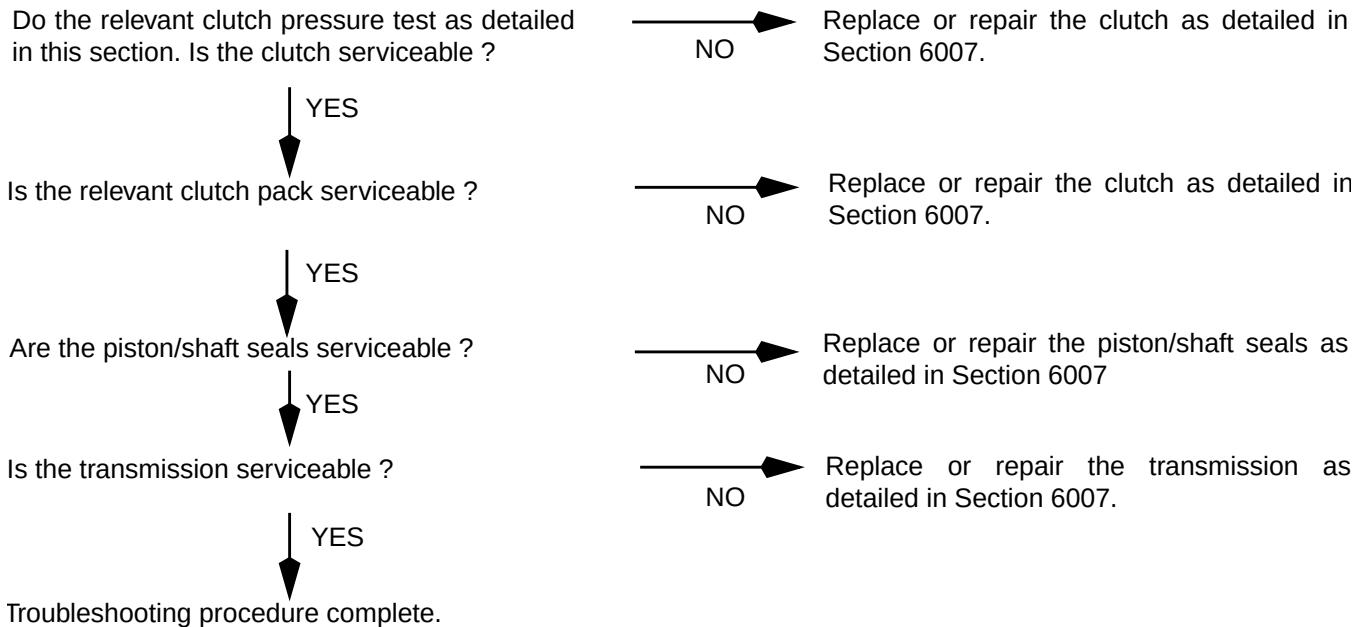
Is the transmission serviceable ?

NO → Replace or repair the transmission as detailed in section 6007.

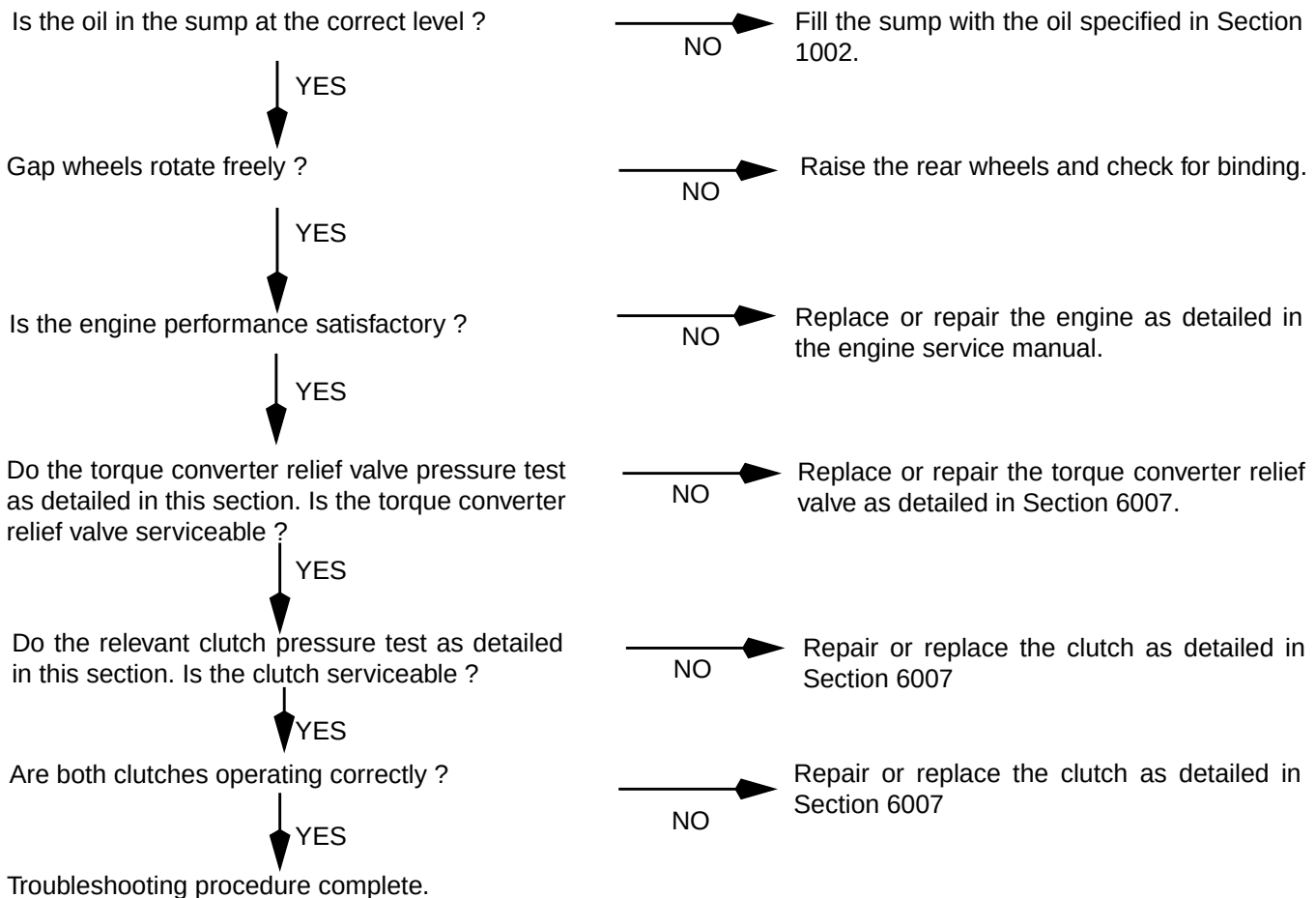
YES
↓

Troubleshooting procedure complete

Transmission drives in one direction only



Loss of power or slow take-up drive



Transmission overheating

Is the oil in the sump at the correct level ?

YES

Is the oil cooler operating correctly ?

YES

Do the oil pump pressure test as detailed in this section. Is the oil pump serviceable ?

YES

Do the torque converter relief valve pressure test as detailed in this section. Is the torque converter relief valve serviceable ?

YES

Do the circuit pressure test as detailed in this section I. Is the circuit pressure correct ?

YES

Is the machine being operated correctly ?

YES

Troubleshooting procedure complete.

NO

Fill the sump with the oil specified in Section 1002 or remove excess oil from the sump.

NO

Remove and flush the oil cooler.

NO

Replace or repair the oil pump as detailed in Section 6007.

NO

Replace or repair the torque converter relief valve as detailed in Section 6007.

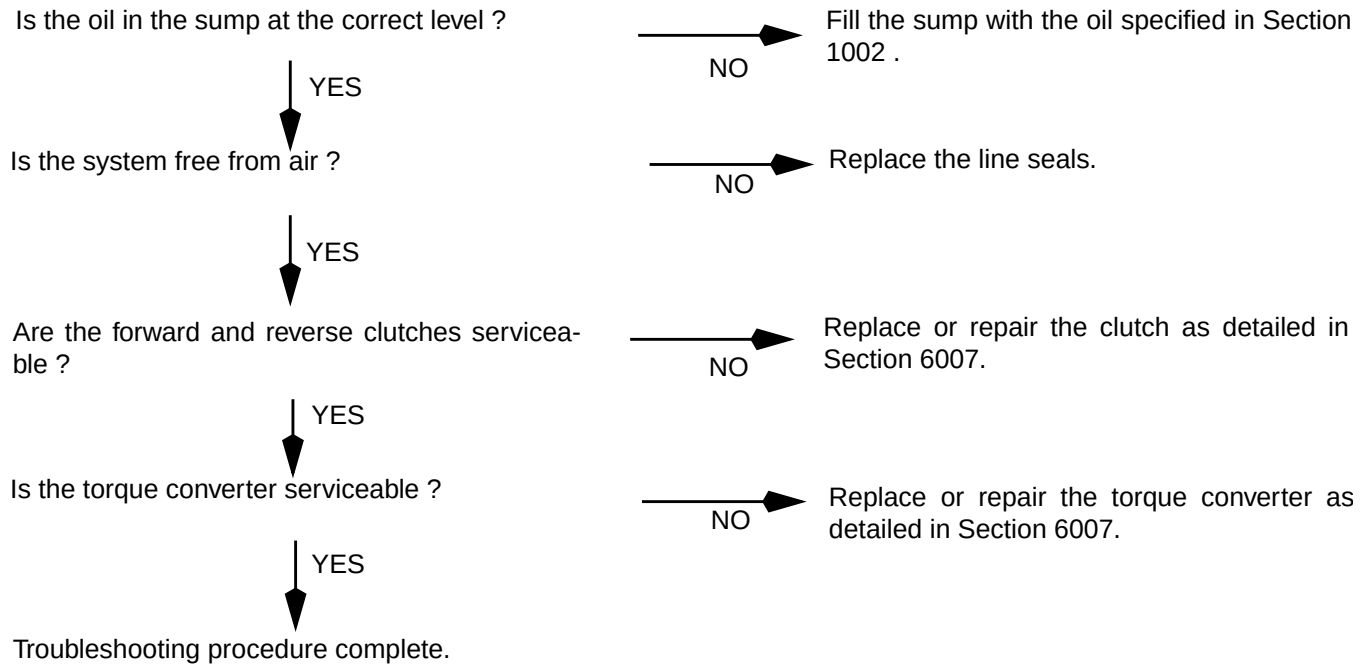
NO

Replace or repair the torque converter as detailed in Section 6007.

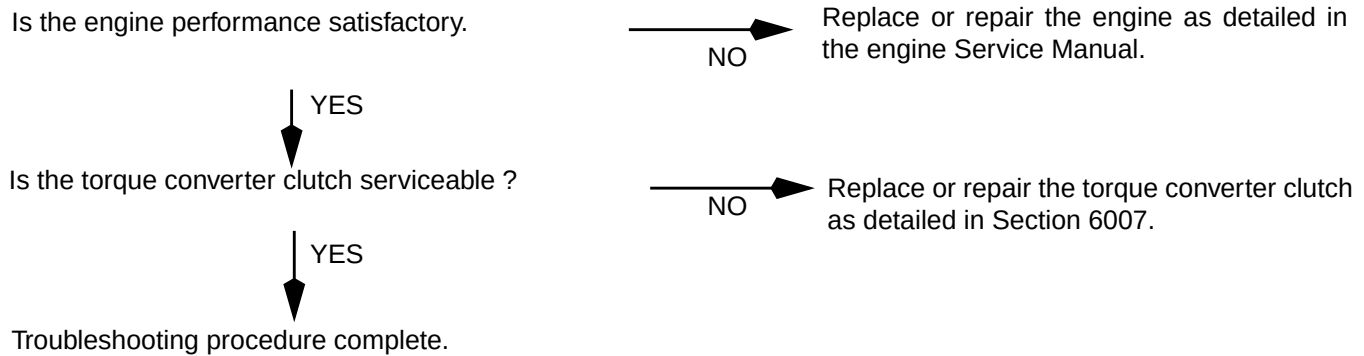
NO

Train the operator.

High stall speed



Low stall speed



Machine hesitates when changing between forward and reverse

Is the oil in the sump at the correct level ?

YES

Do the oil pump pressure test as detailed in this section. Is the oil pump serviceable ?

YES

Do the forward and reverse clutch pressure tests as detailed in this section. Are the clutches serviceable ?

YES

Troubleshooting procedure complete.

NO

Fill the sump with the oil specified in Section 1002 .

NO

Replace or repair the oil pump as detailed in Section 6007.

NO

Replace or repair the clutches as detailed in Section 6007.

Four wheel drive does not work

Are the universal joints and the drive shaft serviceable ?

YES

Is there a power supply at the four wheel drive selector valve solenoid ?

YES

Is the four wheel drive selector valve solenoid operating correctly ?

YES

Do the four wheel drive clutch pressure test as detailed in this section. Is the four wheel drive clutch serviceable ?

YES

Troubleshooting procedure complete.

NO

Replace or repair the universal joint or drive shaft as detailed in Section 5006 or 6000.

NO

Check the fuse and the connections.

NO

Replace or repair the four wheel drive selector valve solenoid as detailed in Section 4001.

NO

Replace or repair the four wheel drive clutch as detailed in Section 6007.

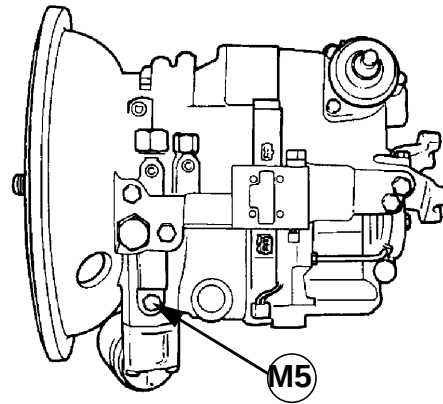
OIL PUMP PRESSURE TEST

Special tools

Pressure gauge 0 to 50 bar with adaptor.

Test procedure

1. Park the machine on a level surface.
2. Work the machine until the transmission reaches its working temperature of 80°C.
3. Stop the engine and set the parking brake to on.
4. Remove the test point M5 plug and connect the pressure gauge to the test point.
5. Start the engine and set the engine speed at 2200 rpm. The pressure gauge reading must be 14 to 15 bar.
6. Stop the engine, remove the pressure gauge and adaptor and install plug.



CI98G502

M5. Oil pump pressure test connection

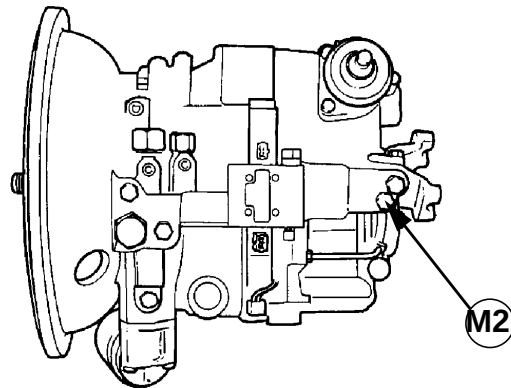
REVERSE CLUTCH PRESSURE TEST

Special tool :

Pressure gauge 0 to 50 bar with adaptor.

test procedure

1. Park the machine on a level surface.
2. Works the machine until the transmission reaches its working temperature of 80°C.
3. Stop the engine and set the parking brake to on.
4. Remove the test point M2 plug and connect the pressure gauge to the test point.
5. Start the engine, select reverse travel direction and set the engine speed at 2200 rpm. The pressure gauge reading must be 13.5 to 14.5 bar.
6. Stop the engine, remove the pressure gauge and adaptor and install plug.



CI98G502

M2. Reverse clutch test point

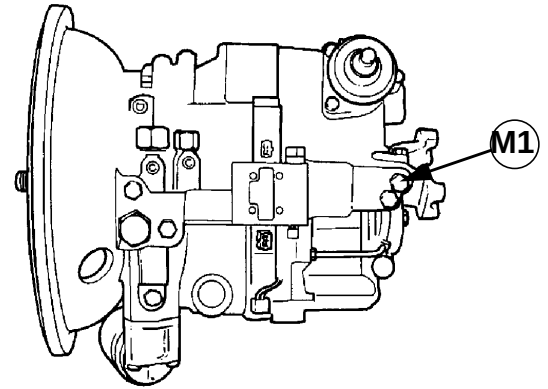
FORWARD CLUTCH PRESSURE TEST

Special tools

Pressure gauge 0 to 50 bar with adaptor.

Test procedure

1. Park the machine on a level surface.
2. Work the machine until the transmission reaches its working temperature at 80°C.
3. Stop the engine and set the parking brake to on.
4. Remove the test point M1 plug and connect the pressure gauge to the test point.
5. Start the engine, select forward travel direction and set the engine speed at 2200 rpm. The pressure gauge reading must be 13.5 to 14.5 bar.
6. Stop the engine, remove the pressure gauge and adaptor and install plug.



M1. Forward clutch test point

C198G502

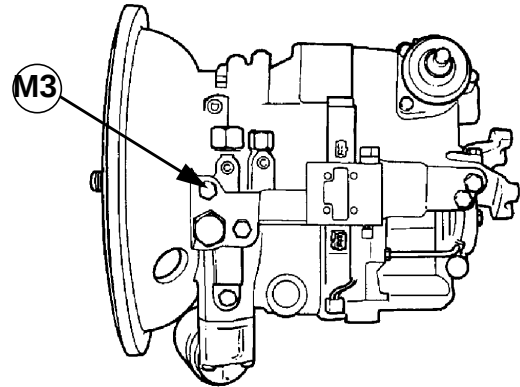
TORQUE CONVERTER RELIEF VALVE PRESSURE TEST

Special tools

Pressure gauge 0 to 50 bar with adaptor.

Test procedure

1. Park the machine on a level surface.
2. Work the machine until the transmission reaches its working temperature of 80°C.
3. Stop the engine and set the parking brake to on.
4. Remove the test point M3 plug and connect to the pressure gauge to the test point.
5. Start the engine and set the engine speed at 2200 rpm. The pressure gauge reading must be 6.5 to 7.5 bar.
6. Stop the engine, remove the pressure gauge and adaptor and install plug.



M3. Torque converter test point

C198G502

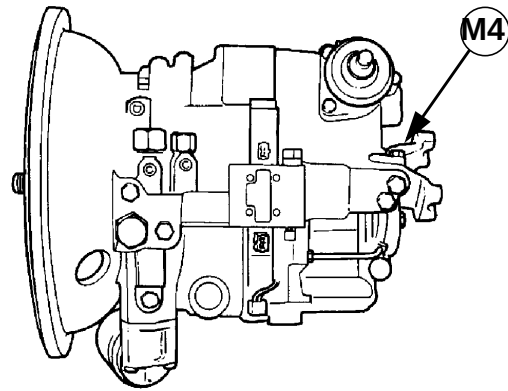
LUBRIFICATION CIRCUIT PRESSURE TEST

Special tools

Pressure gauge 0 to 50 bar with adaptor.

Test procedure

1. Park the machine on a level surface.
2. Work the machine until the transmission reaches its working temperature of 80°C.
3. Stop the engine and set the parking brake to on.
4. Remove the test point M4 plug and connect the pressure gauge to the test point.
5. Start the engine and set the engine speed at 2200 rpm. The pressure gauge reading must be 1.5 to 3 bar.
6. Stop the engine, remove the pressure gauge and adaptor and install plug.



CI98G502

M4. Lubrification pressure test point.

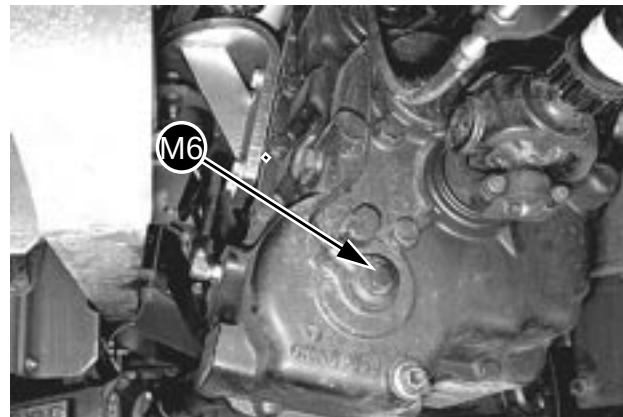
FOUR WHEEL DRIVE CLUTCH PRESSURE TEST

Special tools

Pressure gauge 0 to 50 bar with adaptor.

Test procedure

1. Park the machine on a level surface.
2. Work the machine until the transmission reaches its working temperature of 80°C.
3. Stop the engine and set the parking brake to on.
4. Remove the test point M6 plug and connect the pressure gauge to the test point.
5. Start the engine and set the engine speed at 2200 rpm. The pressure gauge reading must be 14 to 15 bar.
6. Stop the engine, remove the pressure gauge and adaptor and install plug.



CK98G001

M6. Four wheel drive test point.

Section

6003

WHEELS AND TYRES

6003

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIAL TORQUES

Front wheel mounting nut tightness (Models 750, 760 and 860)	300 Nm
Rear wheel mounting nut tightness (Models 750, 760 and 860)	300 Nm
Front wheel mounting nut tightness (Models 960 and 965)	300 Nm
Rear wheel mounting nut tightness (Models 960 and 965)	300 Nm

SPECIAL TOOLS

- Bead unseating tool
- Mallet (for unseating beads)
- Tyre lever 1000 mm, long (x2)
- Tyre lever 500 mm, long (x2)
- Wire brush
- Approved tyre mounting lubricant
- Remote control inflation line with clip-on-chuck
- Air/water inflation gauge

TYRE PRESSURE

Model 750

Dimensions and tyres		Inflation pressure	
Front	W8Lx16, 9x16 10P F2	4.9 bar	71 psi
Rear	W15x28, 16.9x28 10P R4 SGI	2.5 bar	36 psi
Front	9x18, 10.5/80x18 10P SGL	5.1 bar	74 psi
Rear	DW15L30, 16.9x30 10P R4	2.2 bar	32 psi
Front	W8Lx16, 9x16 10P F2	4.9 bar	71 psi
Rear	DW16x26, 18.4 12P GRIPSTER	1.8 bar	26 psi
Front	9x18, 10.5/80x18 10P SGL	5.1 bar	74 psi
Rear	W15x28, 16.9x28 10P R4 SGI	2.5 bar	36 psi
Front	W8Lx16, 11Lx16 12P	4.4 bar	64 psi
Rear	W15x28, 16.9x28 10P R4 SGI	2.5 bar	36 psi
Front	W8Lx16, 11Lx16 12P	4.4 bar	64 psi
Rear	W15Lx24, 19.5L IT525 R4	1.9 bar	28 psi
Front	W8Lx16, 11Lx16 12P	4.4 bar	64 psi
Rear	W15Lx24, 16.9x24 10P R4	3.0 bar	44 psi
Front	9x18, 10.5/80 10P 13 GDYR	5.1 bar	74 psi
Rear	W15Lx24, 19.5L IT525 R4	1.9 bar	28 psi
Front	18x11, 12.5x18 10P R4 FSTNE	3.0 bar	44 psi
Rear	W15x28, 16.9x28 10P R4 SGI	2.5 bar	36 psi
Front	18x11, 12.5x18 10P R4 FSTNE	3.0 bar	44 psi
Rear	DW15L30, 16.9x30 10P R4	2.2 bar	32 psi
Front	18x11, 12.5x18 10P R4 FSTNE	3.0 bar	44 psi
Rear	DW15L30, 16.9x30 14P R4	2.8 bar	41 psi
Front	18x11, 12.5/80x18 10P SGI	3.3 bar	45 psi
Rear	DW16x26, 18.4 12P GRIPSTER	1.8 bar	26 psi

Model 760

Dimensions and tyres		Inflation pressure	
Front	12.5/80x18 10P LUG	4.4 bar	64 psi
Rear	W15Lx24, 19.5L IT525 R4	1.9 bar	28 psi
Front	18x11,12.5x18 10P R4 FSTNE	3.0 bar	44 psi
Rear	W15x28, 16.9x28 10P R4 SGI	2.5 bar	36 psi
Front	18x11,12.5x18 10P R4 FSTNE	3.0 bar	44 psi
Rear	DW15x30, 16.9x30 10P R4	2.2 bar	32 psi
Front	18x11,12.5x18 10P R4 FSTNE	3.0 bar	44 psi
Rear	DW15 15L30, 16.9x30 14P R4	2.8 bar	41 psi
Front	18x11,12.5x18 10P R4 SGI	3.1 bar	45 psi
Rear	DW16x26, 18.4 12P GRIPSTER	1.8 bar	26 psi

Model 860

Dimensions and tyres		Inflation pressure	
Front	12.5/80x18 10P LUG	2.5 bar	36 psi
Rear	DW15x30, 16.9x30 10P R4	2.2 bar	32 psi
Front	13x20, 16/70x20 10P SGL	2.5 bar	36 psi
Rear	DW15 15L30, 16.9x30 14P R4	2.8 bar	41 psi
Front	13x20, 16/70x20 10P SGL	2.5 bar	36 psi
Rear	DW16x26, 18.4 12P GRIPSTER	1.8 bar	26 psi
Front	12.5/80x18 10P LUG	4.4 bar	64 psi
Rear	W15Lx24, 19.5L IT525 R4	1.9 bar	28 psi

Models 960 and 965

Dimensions and tyres		Inflation pressure	
Front	W15Lx24, 16.9x24 12P R4 SG	1.8 bar	26 psi
Rear	W15Lx24, 16.9x24 12P R4 SG	2.6 bar	36 psi
Front	W15Lx24, 17.5L R24 IT500	3.0 bar	44 psi
Rear	W15Lx24, 17.5L R24 IT500	3.0 bar	44 psi
Front	W15Lx24, 16.9 145P NOKIA	1.8 bar	26 psi
Rear	W15Lx24, 16.9 145P NOKIA	2.6 bar	36 psi
Front	W15Lx24, 16.9RxM27	2.5 bar	36 psi
Rear	W15Lx24, 16.9RxM27	2.5 bar	36 psi
Front	W15Lx24, 17.5LRxM27	2.5 bar	36 psi
Rear	W15Lx24, 17.5LRxM27	2.5 bar	36 psi

SAFETY PRECAUTIONS

- **NEVER** re-inflate a tyre that has been run flat or seriously underinflated without removing and checking for tyre, tube or rim damage.
- **ALWAYS** use specialized tools as recommended by tyre suppliers for mounting and demounting of tyres.
- **ALWAYS** inspect inside of tyre for loose cords, cuts, penetrating objects, or other carcass damage. Repairable damage should be repaired before installing tube. Tyres with irreparable damage should be discarded.
- **ALWAYS** inspect inside of tyre for loose cords, cuts, penetrating objects, or other carcass damage. Repairable damage should be repaired before installing tube. Tyres with irreparable damage should be discarded.
- **ALWAYS** clean and inspect rim.
- **NEVER** rework, weld, heat or braze rims.
- **ALWAYS** check rim diameter to be sure it exactly matches rim diameter moulded on tyre.
- **ALWAYS** inspect the inside of tyre for dirt, liquids, or foreign material and remove before installing the tube.
- **NEVER** install tubes that have buckled or creased.
- **ALWAYS** use new tubes in new tyres.
- **NEVER** use a tube in a casing larger or smaller than that for which the tube was designed by the manufacturer.
- **ALWAYS** check to be sure tube is clean before installing in the tyre.
- **ALWAYS** lubricate with approved tyre mounting lubricant. Never use anti-freeze, silicones or petroleum-base lubricants.
- **NEVER** hit tyre or rim with hammer.
- **ALWAYS** use extension hose with a gauge and a clip-on chuck so that operator may stand aside during inflation.
- **ALWAYS** inspect valve cores and sealing cap for proper air retention. Replace damaged or leaky cores or caps.
- **ALWAYS** inflate tyre to the tyre manufacturer's recommended cold operating pressure.

PREPARATION

Before mounting a tyre on a used rim, be sure the flange area (particularly the bead seat area) is clean and smooth. Remove any build-up of rust, corrosion or old rubber with a chisel or wire brush. Never mount a tyre on a rim where any parts show cracks, damage, or have been repaired by welding or brazing.

Thoroughly inspect inside of casing for damage or foreign material. Make sure that both tyre and tube are completely dry, as moisture deteriorates the cord fabric of the tyre and may result in eventual failure of the tyre.

Lubricate both beads with a thin solution of vegetable oil soap in water, or equivalent rubber lubricant recommended for this requirement (never use petroleum-based solutions or silicones).

Wheel Nuts

If a wheel is removed and replaced for puncture repair or any other reason the wheel nuts must be tightened to the torques given in the specifications section of this manual and checked daily until stabilized.



WARNING : *Many machines use special wheel nuts and washers, which must never be substituted by a standard wheel nut. When fitted, always use the special washers under the rear wheel nuts. If either the nut or washers are lost they must only be replaced with genuine Aftercare parts.*

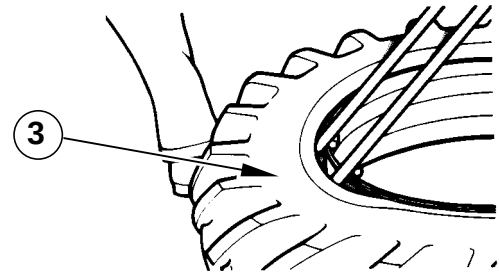
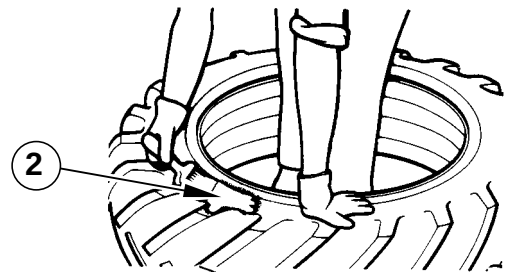
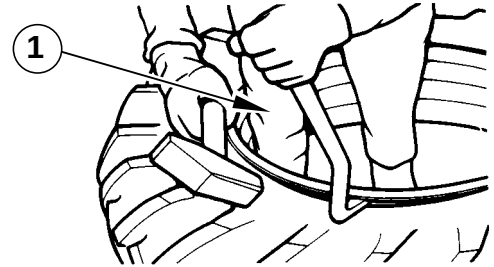
INNER TUBE

Special tools

- Bead unseating tool
- Mallet
- Tyre levers

Removal

1. Lay the wheel on the ground with the valve uppermost.
2. Deflate tyre by removing the valve core.
3. Remove the valve retaining nut.
4. Drive the bead unseating tool (1) between the tyre and the rim, taking care not to damage rim or tyre.
5. After bead has been released from the rim, invert the wheel and repeat step 4.
6. Lubricate the rim (2), tyre and base of the tube with a solution of soap and water or an approved lubricant.
7. Starting at the valve location, pry the tyre (3) off the rim, taking small bites with tyre levers, and ensuring that the bead on the opposite side is fully located in rim well.
8. With the wheel in a vertical position, pull tyre forwards and remove tube (4).
9. Examine the bead seating area of the rim. Remove any build-up of rust, corrosion or old rubber. Inspect inside tyre casing for debris or damage.



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Installation

Install the inner tube in the reverse order from that of removal but note the following :

1. Install the inner tube until it is rounded out. Place the tube in the tyre with the valve (5) located through valve hole in the rim. Refit the valve retaining nut, finger tight.
2. Install the tyre, starting opposite the valve location taking small bites with long tyre levers (6) and keeping the fixed part of the bead fully located in the well.

NOTE : A solution of soap and water, or similar rubber lubricant, brushed on to the rim and bead will help fitment.



WARNING : Care must be taken not to pinch the tube when fitting.

3. Centre the tyre on the rim and inflate (see page 3).

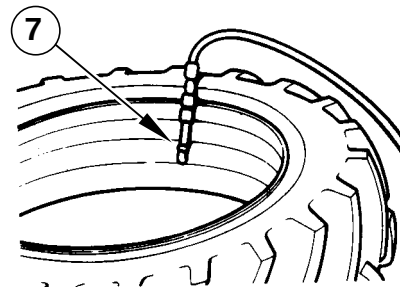
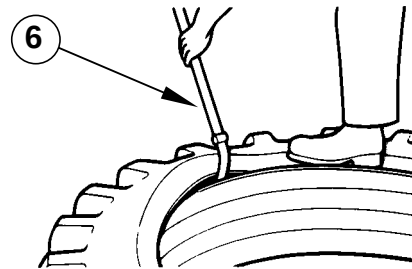
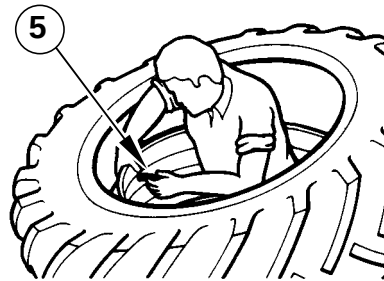


WARNING : Never stand over the assembly when inflating, remote control inflation equipment should be used.

4. Remove the valve core and completely deflate the tyre.
5. Refit the valve core and inflate to recommended pressure.



WARNING : If beads fail to seat at the recommended pressure the tube may be pinched, do not increase the pressure but remove the valve core and release tyre from rim. Lubricate tyre, bead and rim then re-inflate at the recommended pressure. Repeat process until both beads are properly seated. When seating beads, inflation beyond the recommended pressure may break the bead or rim with explosive force, sufficient to cause serious physical injury or death. Inspect both sides of tyre to ensure both beads are evenly seated, if not then completely deflate tyre and repeat the complete remounting procedure.



789M524A

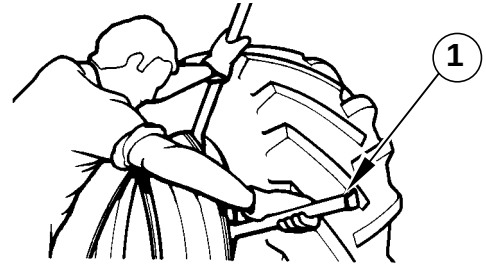
TYRE

Special tools

- Bead unseating tool
- Mallet
- Tyre levers

Removal

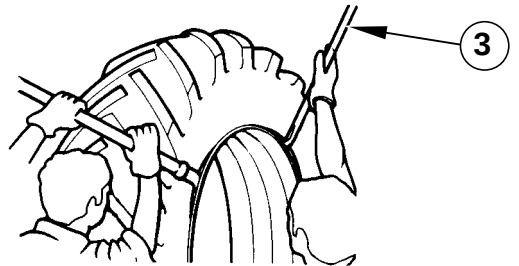
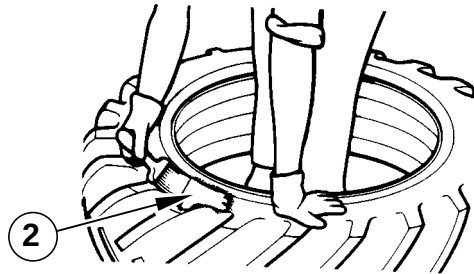
1. Remove inner tube as stated in operation (see page 6).
2. With the wheel in a vertical position pry off the tyre taking small bites with the tyre levers (1). The use of rubber lubricant will help removal.



Installation

Install the tyre in the reverse order from that of removal but note the following :

3. Place the rim on the ground, lubricate the bead and rim and place the tyre on rim (2).
4. Refit tyre to rim, using long tyre levers (3).
5. Refit inner tube (see page 7).



789M525A

Section

6004

REAR AXLE 2 - WHEEL STEER
Series 750 - 760 - 860

6004

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WARNING : *This symbol is used in this manual to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIFICATIONS

Differential.....	Cast iron beam with centre differential
Hubs	Spiral Bevel Crownwheel and pinion with differential lock
Gear lubricant.....	Planetary reduction type with disc brakes.
Capacities	10 W 30 Universal
Center bowl	22.5 litres

SPECIAL TORQUES

Stud wheel nut.....	70 Nm (52 lbf ft)
Hub-nuts/bolts	75 Nm (55 lbf ft)
Drain plugs-refill plugs (M22 x 1.5).....	40 Nm (30 lbf ft)
Drain plugs-refill plugs (M30).....	80 Nm (60 lbf ft)
Nuts/bolts-axle mounting	230 Nm (170 lbf ft)
Bolts-crownwheel housing.....	108 Nm (80 lbf ft)
Bolts-differential lock cap.....	108 Nm (80 lbf ft)
Bolts-bevel crownwheel to case, fit with Loctite 270.....	160 Nm (120 lbf ft)
Bolts-pinion shaft, fit with Loctite 515	203 Nm (120 lbf ft)
Nuts-differential bearing clamp bar.....	27 Nm (20 lbf ft)
Nuts/bolts - transport housing.....	130 Nm (96 lbf ft)
Nuts-wheel disc to hub	300 Nm (220 lbf ft)

Pre-load of taper roller bearings

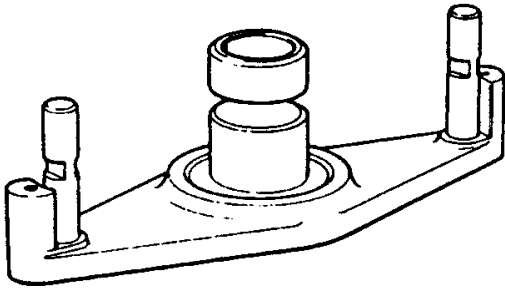
Bevel pinion rolling torques are measured by means of a spring balance and cord wound around the groove in the bevel pinion shaft.

Cord pull for the bevel pinion bearings 92 to 110 Newtons (21 to 25 lbf).

Clearances

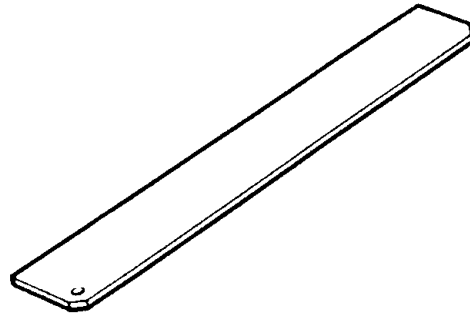
Tooth clearance of bevel gear/pinion 0.18 to 0.24 mm (0.007 to 0.009 in).

SPECIAL TOOLS



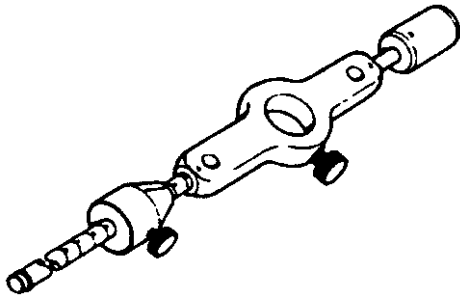
MF 267A Final drive bearing pre-load gauge.

CS98G501



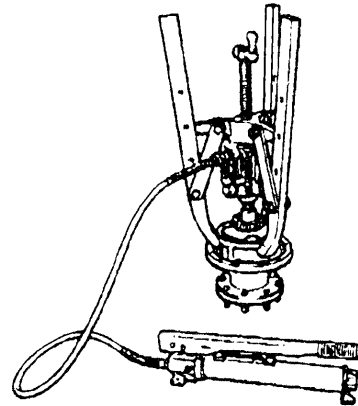
MF 245D-1 Straight edge.

CS98G507



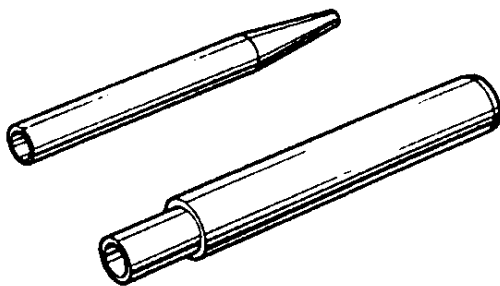
FT 4062A Differential bearing pre-load gauge.

CS98G503



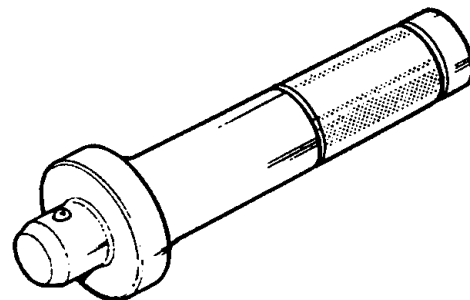
MS 1713.

CS99F500



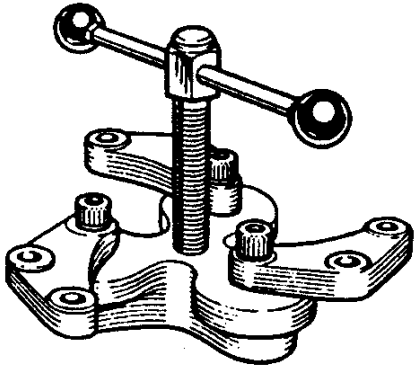
MF 467 Seal protector.

CS98G505



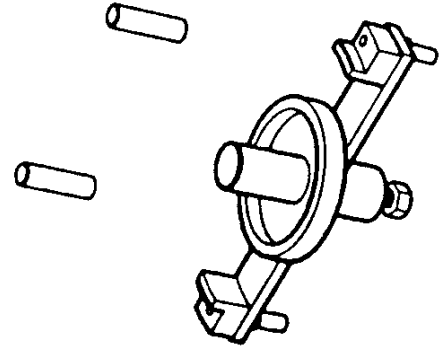
550 Universal handle.

CS98G504



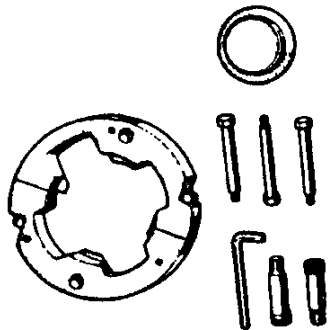
555 Universal puller.

CS98G506



CS98G509

- MF 265A Extractor.
- MF 267-1 Adaptor for tool.
- MF 535D-1.
- Hydraulic press.
- 3/8 in. UNF bolt.



CS98G508

555-2B RH differential bearing puller.

SPECIAL SEALANTS

Loctite grade 270

Loctite grade 515

Casco Metalock ML 15

FINAL DRIVE HUB

Removal

Remove the final drive hub as follows :

STEP 1

Remove the applicable rear wheel.



WARNING : *Water ballasted wheels are extremely heavy and should only be removed using a crane or similar lifting device.*

STEP 2

Remove the drain plug (5). Drain the oil from the final drive hub and partially drain the rear axle centre housing (see section 6000).

STEP 3

Scribe a double mark (12) across the ring gear (11) and the trumpet housing (1) and a single mark (10) across the ring gear (11) and the outer housing (9).

STEP 4

Remove the nuts (7), the spring washers (6) and the bolts (2).

STEP 5

Remove the outer housing (9) and the ring gear (11).

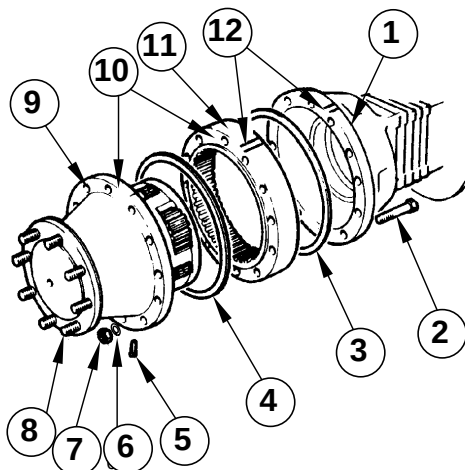
NOTE : *Do not withdraw the axle shaft.*

STEP 6

Remove and discard the gaskets (3) and (4).

STEP 7

Clean the recesses in which the ring gear spigots locate and ensure there is no burr or deformity which could cause leakage.



789M458A

Installation

NOTE : *Install the final drive hub in the reverse order to that of the removal but note the following :*

1. Install new gaskets (3) and (4).
2. Make sure that the scribe marks (10) and (12) are correctly aligned to ensure the teeth of the ring gear (11) are in full engagement, OTHERWISE SEVERE DAMAGE CAN OCCUR.
3. Torque tighten the nuts (7) and bolts (2) to 75 Nm (55 lbf ft).
4. Clean the wheel stud threads (8).
5. Lightly oil the wheel stud threads (8) and install the applicable rear wheel. Progressively torque tighten the wheel nuts to 300 Nm (220 lbf ft).

NOTE : *It will be necessary to check the torque of the wheel nuts daily until the torque figures hold.*

6. Check the rear axle oil level (see section 6002).

Disassembling

Disassemble a final drive hub as follows :

STEP 1

Remove the final drive hub.

STEP 2

Remove and discard the roll pin (6) which anchors the planetary pinion shaft (2).

STEP 3

Install all the 3/8 in. UNF bolt (1) in the planetary pinion shaft (2).

STEP 4

Carefully remove the planetary pinion shaft (2).

NOTE : *Try not to dislodge the needle roller bearings (4) from the planetary pinion (3).*

STEP 5

Remove the 3/8 in UNF bolt (1).

STEP 6

Remove the planetary pinion (3) and the two thrust washers.

STEP 7

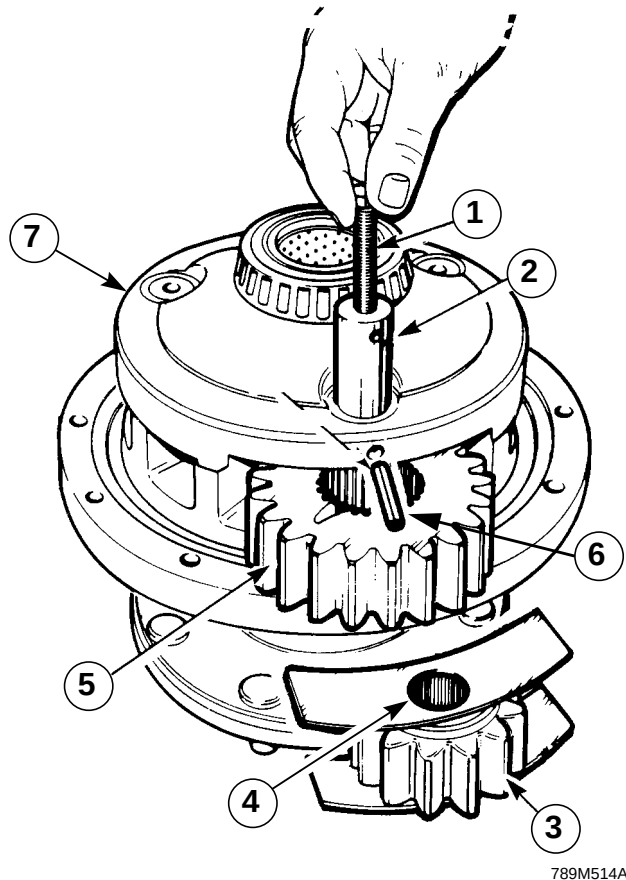
Repeat Steps 2 through 6 on the other two planetary pinions.

STEP 8

Remove the sun gear (5).

STEP 9

Using a suitable puller, remove the bearing cone from the carrier (7).

**STEP 10**

Using a soft metal drift, drive the bronze bush into the carrier (7).

STEP 11

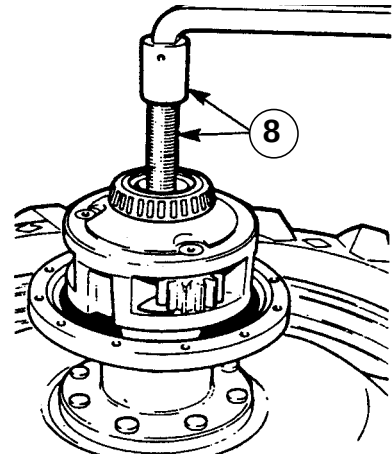
Remove the bronze bush and the adaptor through the slot in the converter (7).

STEP 12

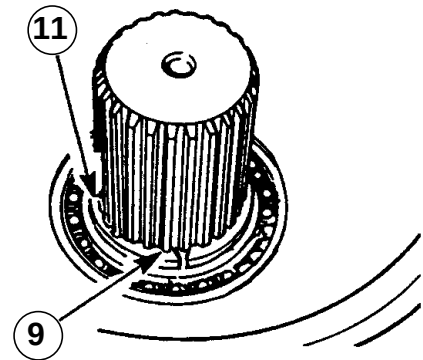
Lay the dismantled rear wheel on the workshop floor, with the convex side of wheel centre upwards.

STEP 13

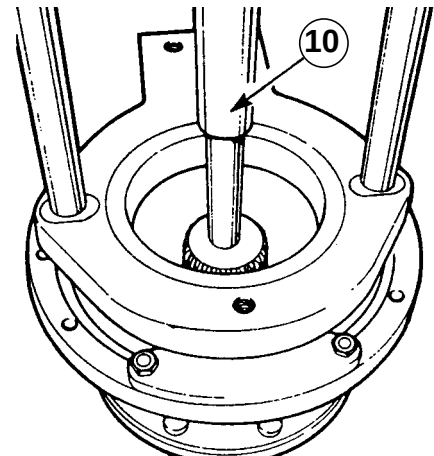
Fit the final drive hub assembly to the wheel and secure it with two wheel nuts.

STEP 14

Fit the collar of the special tool MS 1713 (8) through the slot in the carrier (7) and assemble both parts of the tool together. Remove the carrier (7) from the wheel axle.

STEP 15

Remove the snap ring (9).

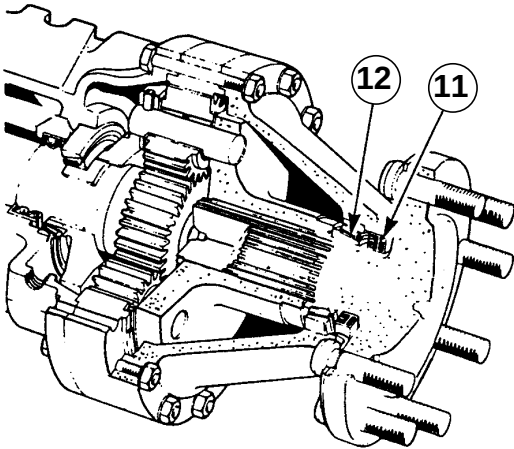
STEP 16

Press the wheel axle (10) out of the housing.

STEP 17

Lift out the bearing cone.

STEP 18



CS98G513

Remove and discard the outer seal (11).

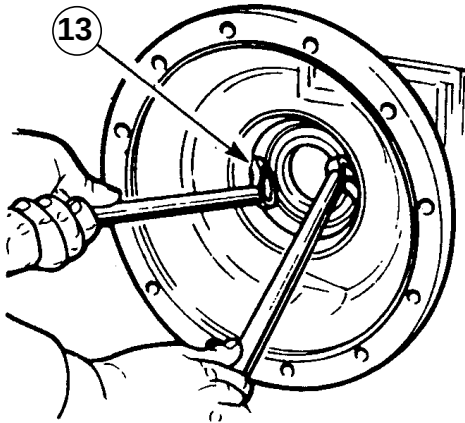
STEP 19

Remove the bearing cup (12).

STEP 20

Remove the axle shaft.

STEP 21



CS98G514

Use two pry bars to remove the inner bearing cup and shims (13).

Inspection

STEP 1

Clean all parts in cleaning solvent.

STEP 2

Discard all seals and O-rings.

STEP 3

Inspect the bearing cups and the rollers in the wheel bearings for flat areas, pitting, scoring, and other damage. Also check the inner race for damage. If you find any of these defects, you must install a new wheel bearing and bearing cup.

STEP 4

Inspect the pinion shafts for wear and damage. Use new parts as required.

STEP 5

Inspect the teeth on the pinion gears, the drive shaft, and the ring gear for wear, pitting, scoring, and other damage. Use new parts as required.

STEP 6

Inspect the needle bearings for the pinion gears for flat areas, pitting, scoring, and other damage. If you find any of these defects, also inspect the bores of the pinion gears and use new parts as required.

Assembling

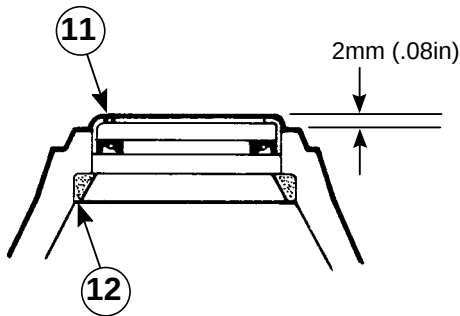
NOTE : Assemble a final drive hub in the reverse order to that of the removal but note the following.

STEP 1

Refit the bearing cup (12) and ensure it is fully seated.

STEP 2

Smear a new outer seal (11) lightly with Hylomar, then drive it into the housing. The metal face must be on the outside and the 2 mm (0.080 in.) proud of the housing. Fill the seal cavity with petroleum jelly.



789M516A

STEP 3

Carefully, insert the wheel axle (10) through the outer seal (11).

STEP 4

Drive the bearing cone fully onto the wheel axle, and seat the rollers in the cup.

STEP 5

Fit the snap ring (9) and ensure it seats fully in the groove. Use a suitable puller to draw the outer housing assembly firmly against the snap ring (9).

STEP 6

Press the bearing cone onto the spigot of the epicyclic hub.

STEP 7

Assemble the planetary pinions and the sun gear in the hub.

STEP 8

If the needle rollers (4) were dislodged, refit them using petroleum jelly, not grease, there are 58 needle rollers per planet gear (two rows of 29, plus spacer washer).

STEP 9

Ensure that the holes in the casting (7) and shaft (2) are aligned.

STEP 10

Install a new roll pin (6)

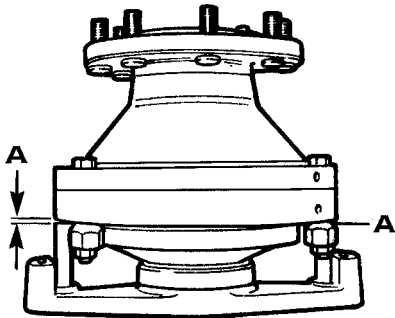
STEP 11

Use a hydraulic press to push the epicyclic hub onto the wheel axle (10).

STEP 12

Bolt the ring gear to the outer housing with four bolts from the epicyclic unit and four wheel nuts as spacers. These bolts should be equally spaced around the ring gear.

NOTE : Ensure that the ring gear is correctly fitted i.e., with the teeth in full engagement.



789M517A

STEP 13

Place the bearing cup on the spigot in the centre of the special tool MF 267A, but do not fit the shims.

STEP 14

Place the epicyclic unit on the special tool MF 267A and use two feeler gauges to measure the gap at points "A". Both measurements must be equal.

STEP 15

Select a shim or shims from the table shown, where

A =	The gap measurement with the feeler gauges
B =	The shim thickness required
C =	The shim thickness available
D =	Shim part numbers

STEP 16

Install the shims on the trumpet housing.

STEP 17

Install the inner bearing cup, and ensure it is fully seated.

STEP 18

Install the axle shaft.

STEP 19

Remove the four bolts and spacers from the ring gear and outer housing.

STEP 20

Use new cork gaskets and refit the ring gear and outer housing.

A		B		C		D
mm	in	mm	in	mm	in	
0.025 - 0.13	0.001 to 0.005	0.76	0.030	0.13	0.005	894 757 MI
0.15 - 0.25	0.006 to 0.010	0.64	0.025	0.25	0.0001	894758 MI
0.28 - 0.38	0.011 to 0.015	0.51	0.020	0.38	0.015	894 759 MI
0.41 - 0.51	0.016 to 0.020	0.38	0.015			
0.53 - 0.64	0.021 to 0.025	0.25	0.010			
0.66 - 0.76	0.026 to 0.030	0.13	0.005			
0.79 - 0.89	0.031 to 0.035	0.0	0.0			

TRUMPET HOUSING

Removal

NOTE : *This description is for trumpet housings without a differential lock mechanism, but the procedure is similar for either housing.*

Remove the trumpet housing as follows :

STEP 1

Remove the applicable rear wheel.

STEP 2

Only carry out Step 3 if you remove a right trumpet housing.

STEP 3

Apply the differential lock.

STEP 4

Screw the brake adjusters in.

NOTE : *This prevents the interior components from accidental disassembly and possible damage.*

STEP 5

Remove the 12 nuts and bolts (2), but note carefully the position and orientation of the brackets.

STEP 6

Carefully pull the trumpet housing (1) away from the centre housing.



WARNING : *The trumpet housing (1) is very heavy and must be properly supported to prevent damage to the differential or bearings.*

STEP 7

Stand the trumpet housing (1) on the wheel studs (6), on a block of wood, to prevent damage.

NOTE : *A wheel laid flat on the ground with the convex face of the wheel centre uppermost provides an ideal jig to hold the trumpet housing for service. Secure the trumpet housing to the wheel with 2 nuts.*

STEP 8

Remove the two countersunk screws (5).

STEP 9

Lift the carrier plate (3) off the trumpet housing (1).

STEP 10

Remove and discard the large O-ring seal (4).

Installation

NOTE : *Install the trumpet housing in the reverse order to that of the removal but note the following :*

STEP 1

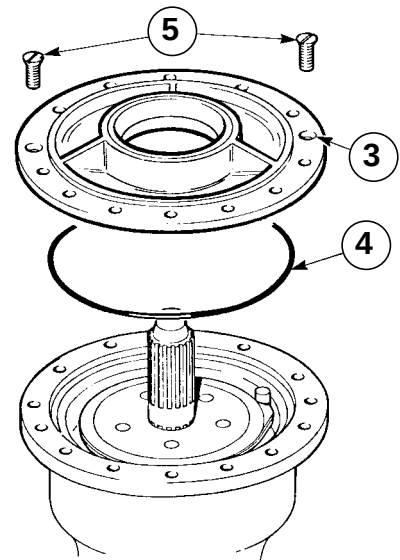
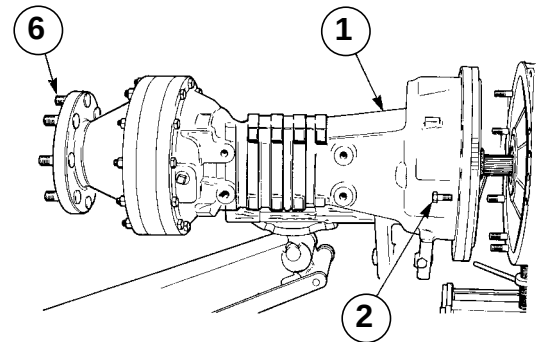
Install a new O-ring seal (4) into the trumpet housing (1) NOT on the carrier plate spigot. Smear some petroleum jelly onto the O-ring seal (4) to hold it in place.

STEP 2

Lock the screws (5) with a centre punch mark on the perimeter of the heads.

STEP 3

Install the trumpet housing (1) and torque tighten the nuts and the bolts (2) to 130 Nm (95 lbf ft).



789M518A

DIFFERENTIAL LOCK

Removal

Remove the differential lock as follows :

STEP 1

Remove the differential lock operating lever assembly.

STEP 2

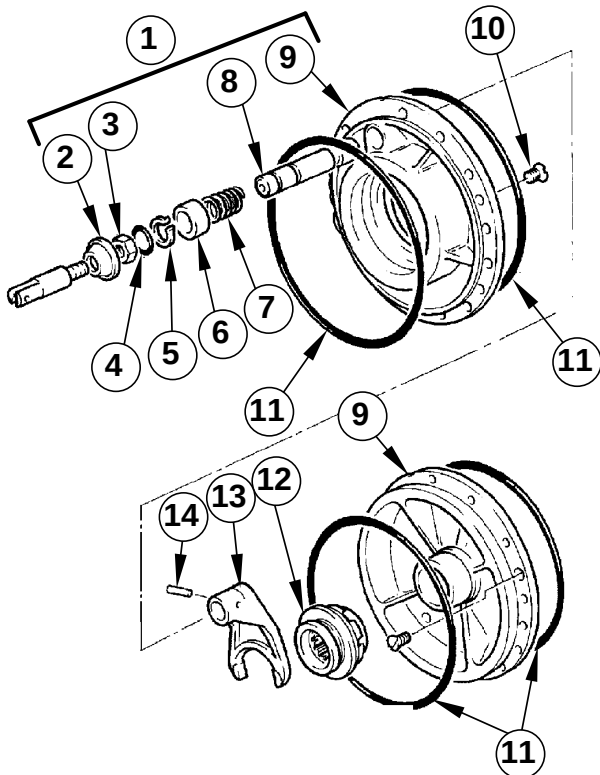
Remove the right trumpet housing from the machine (see page 9).



WARNING : *The trumpet housing is very heavy and must be properly supported to prevent damage to the differential unit or the bearings.*

STEP 3

Stand the trumpet housing on the wheel studs on a block of wood to prevent damage.



789M463A

STEP 4

Lift the rubber seal (2) and release the locknut (3).

STEP 5

Remove the actuator complete (1) with the rubber seal (2) and the locknut (3).

STEP 6

Drive out the pin (14) and remove the fork (13) and the coupler (12).

STEP 7

Remove the screws (10), the carrier plates (9) and the O-ring seals (11). Discard the O-ring seals (11).

STEP 8

Remove the shaft (8) a complete with the spring (7), the collar (6) the circlip (5) and the O-ring seal (4). Discard the O-ring seal (4).

STEP 9

Use the puller MS 555 and MF 555-2B to remove the differential bearing cone (15).

STEP 10

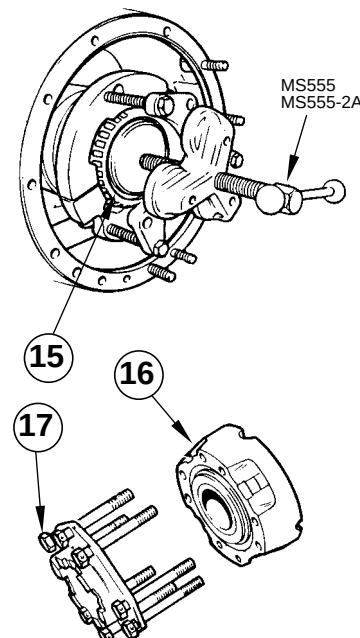
Remove the eight bolts (17).

STEP 11

Remove the differential lock cap (16).



WARNING : *Do not dislodge the case or the differential gears will fall out.*



789M471A

Inspection

Inspect the differential lock as follows :

STEP 1

Examine the coupler (12) and the fork (13) for wear or damage.

STEP 2

Examine the differential lock cap (16) and the shaft (8) for wear or damage.

Installation

NOTE : *Install the differential lock in the reverse order to that of the disassembly but note the following :*

STEP 1

Torque tighten the bolts (17) progressively and evenly to 108 Nm (80 lbf ft).

STEP 2

Install a new O-ring seal (4) on the shaft (8).

STEP 3

If a new shaft (8) is assembled, install a new collar (6) and a new circlip (5).

STEP 4

Install new O-ring seals (11) on the carrier plates (9).

DIFFERENTIAL UNIT

Disassembly

Disassemble the differential unit as follows :

STEP 1

Remove the rear axle from the machine (see Section 6000).



WARNING : *The trumpet housing is very heavy and must be properly supported to prevent damage to the differential or bearings.*

STEP 2

Remove the left trumpet housing (see page 9).

STEP 3

Stand the trumpet housing on the wheel studs, on a block of wood, to prevent damage.

NOTE : *A wheel laid flat on the ground with its convex face upwards provides a good jig to hold the trumpet housing for service. Secure the trumpet housing with two nuts on the wheel mounting studs.*



WARNING : *The differential unit is heavy and awkward to handle. Take care when removing and refitting it.*

STEP 4

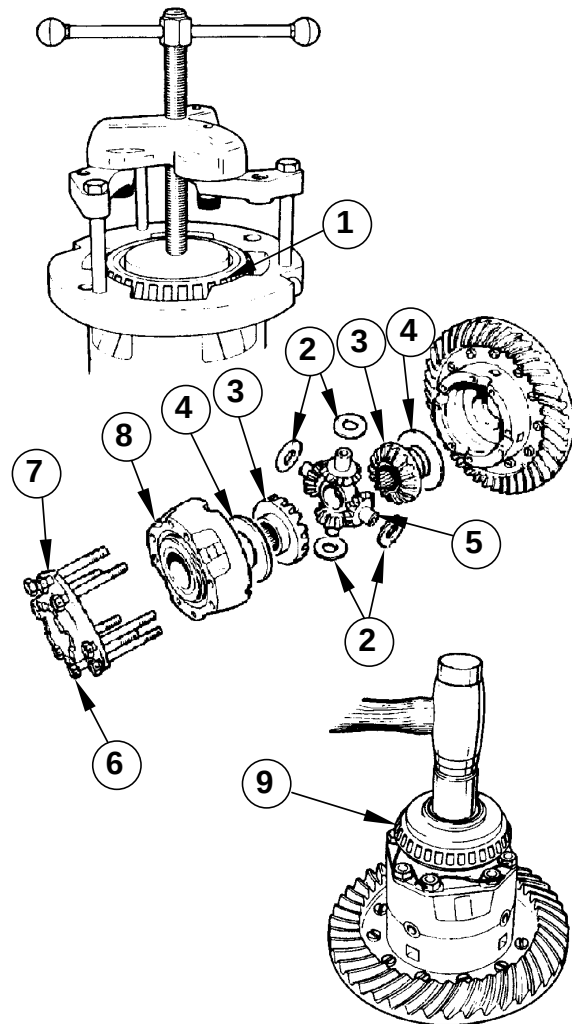
Manoeuvre the differential assembly out of the centre housing.

STEP 5

Place the differential unit on a stand or in a vice.

STEP 6

Use the pullers MS 555 and MF 555-2B to remove the bearing (1) from the right side of the differential unit.



789M462

STEP 7

Mark the two halves of the differential case, to ensure correct assembly.

STEP 8

Remove the eight bolts (6).

STEP 9

Remove the coupler cap (7) and the right half of the differential case (8).

STEP 10

Remove the cross and pinion assembly (5) complete with the thrust washers (2).

STEP 11

Remove the side gears (3) and their thrust washers (4).

Inspection

Inspect the differential unit as follows :

1. Examine all of the differential components and replace any that are worn or damaged.

NOTE : *If any of the differential gears are worn, a full set of four new gears must be fitted. If these are required, the side gears should also be replaced.*

Assembly

NOTE : *Assemble the differential unit in the reverse order to that of the disassembly but note the following :*

STEP 1

Make sure the alignment markings on the differential case are correct.

STEP 2

Torque tighten bolts (6) to 108 Nm (80 lbf ft).

STEP 3

Make sure the differential unit engages with the splines on the axle shaft.

STEP 4

If the differential bearings or the case have been replaced, the pre-load of the bearings must be checked.

CROWNWHEEL AND PINION

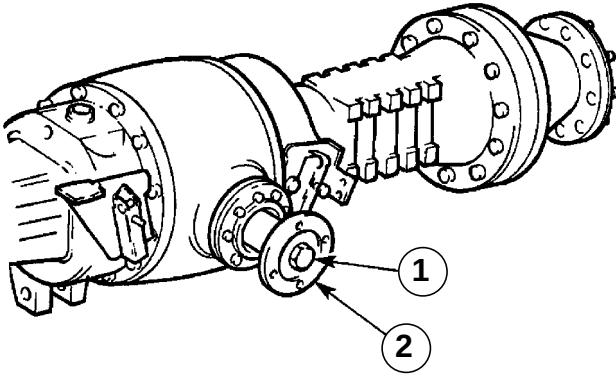
Disassembly

Disassemble the crownwheel and pinion as follows :

STEP 1

Remove the axle from the machine (see Section 6000).

STEP 2



CS98G553

Remove the bolt (1) and the coupler (2).

STEP 3

Remove the differential unit (see page 12).

STEP 4

Place the differential unit on a bench with the teeth facing downwards.

STEP 5

Centre punch each of the rivet heads (10) in the middle.

STEP 6

Use a 13 mm (0.5 in) drill, to drill out each of the rivet heads (10) until they become detached from their shanks.

STEP 7

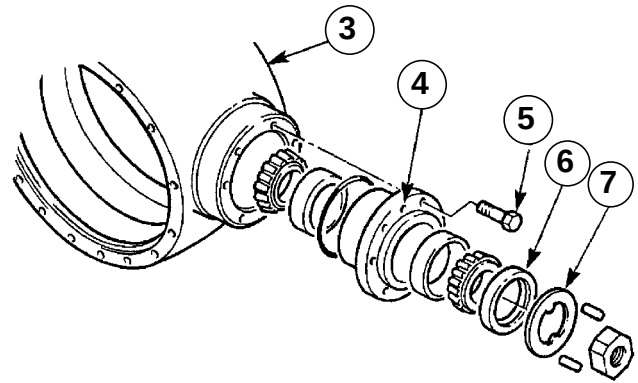
Drive out the rivets (10).

STEP 8

Drive off the crownwheel.

NOTE : *Crownwheels and pinions are supplied as matched sets, therefore when fitting a new crownwheel, the pinion must also be replaced.*

STEP 9



CS98G554

Remove the lip seal (6).

STEP 10

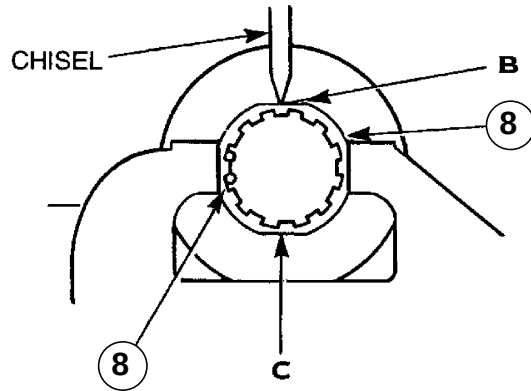
Remove the six bolts (5).

STEP 11

Screw two of the bolts (5) into the tapped holes in the flange and proceed to jack the pinion assembly (4) out of the centre housing (3).

STEP 12

Place the pinion (4) in a vice fitted with soft jaws, and grip the ring-nut (8) across the flats under which the pins are fitted.

STEP 13

CS98G555

Use a cold chisel to cut 1/2 to 2/3 through the ring nut (8) at points "B" and "C".

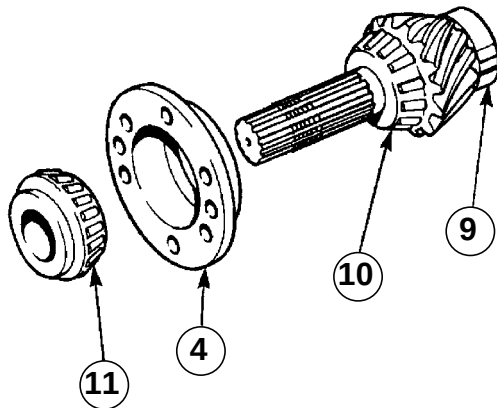
STEP 14

Reposition the pinion (4) in the vice and chisel down the splines into the cuts already made. A few heavy blows will fracture the ring nut (8) and allow it to be removed.

NOTE : Great care should be taken to avoid damaging the thread of the pinion, if it is to be used again.

STEP 15

Remove the thrust washer (7).

STEP 16

CS98G556

Remove the housing, complete with the front bearing cone.

STEP 17

Use a light duty press to remove the two taper roller bearings (11).

STEP 18

Remove and discard the snap ring which secures the pilot bearing (9) and the pinion.

STEP 19

Use a press to remove the pilot bearing (9).

Inspection

Inspect the crownwheel and pinion as follows :

1. Examine all components for signs of wear, scoring or pitting. Any faulty or worn parts must be replaced.

NOTE : If the pinion is damaged, the crownwheel must also be replaced as these are only supplied in matched sets. The taper roller bearings are serviced as a pair, assembled with the housing. New snap rings should always be fitted.

Assembly

NOTE : Assemble the crownwheel and pinion in the reverse order to that of the disassembling but note the following :

STEP 1

Press the pilot bearing (9) onto the pinion.

STEP 2

Secure the pilot bearing (9) with a new snap ring.

STEP 3

Press the taper roller bearing (11) onto the pinion.

STEP 4

Locate the pinion in its housing (4) and fit the outer bearing cone.

STEP 5

Fit the thrust washer (7) and a new ring nut (8), and tighten by hand.

STEP 6

Hold the flange in a vice, fitted with soft jaws.

STEP 7

Fit the pre-load gauge, (special tool FT 4062A) to the pinion and tighten the ring-nut (8) to give a pre-load reading of 21-25 kgf cm (18-22 lbf in).

NOTE : *If a pre-load gauge is not available, wrap some string around the pinion shaft and attach the end to a spring balance. A pull of 10-11 kg (21-25 lbf) should be necessary to keep the shaft rotating.*

STEP 8

Remove the gauge, tap the pinion firmly, with a soft-faced mallet, to centralize the bearings, then check the pre-load again.

STEP 9

Secure the ring-nut by driving a hardened pin (13) down either side of one of the pinion splines directly under one of the flats on the ring nut (8).

NOTE : *The pins must be driven flush with the ring nut.*

STEP 10

Freely lubricate the pinion assembly with clean oil, of the correct grade.

STEP 11

Fit a new oil seal in the pinion housing.

STEP 12

Install a new O-ring under the flange of the pinion housing.

STEP 13

Ensure the locating pin is aligned, before the housing is pressed into place.

STEP 14

Tighten the six bolts (5) to 108 Nm (80 lbf ft).

STEP 15

When the thrust washer (7) shows signs of wear it must be renewed.

STEP 16

Install a new circlip.

STEP 17

Apply Loctite 515 to the end face of the pinion shaft, then fit the coupler (2) and torque tighten the bolt (1) to 203 Nm (150 lbf ft).

STEP 18

Ensure that the mating faces of the differential case (16) and the new crownwheel (14) are perfectly flat.

STEP 19

Install the left hand differential case with the mating face upwards, in the MF 10 bench stand, or a vice.

STEP 20

Thoroughly degrease the crownwheel (14), differential case flange (16) the bolts (17) and the nuts (15).

STEP 21

Collect together all items necessary for rapid assembly. These items are : Torque wrench, 3/4" A/F socket Loctite 270.

STEP 22

Open the epoxy resin kit 1852 913 M91. It contains :

- One jar containing 10 ml of resin. (This jar is also used as a mixing vessel).
- One jar containing 5 ml of hardener.
- One glass stirring rod.
- One brush.



WARNING : *Avoid excessive, or repeated skin contact. Observe the directions on the container.*

STEP 23

Pour the hardener into the resin jar and mix thoroughly using the glass rod.

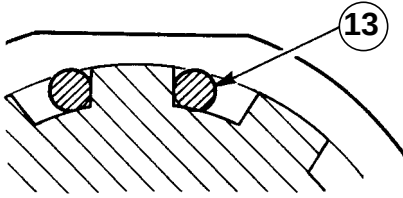
STEP 24

Apply an even coating of adhesive to both mating surfaces.

STEP 25

Press the differential case (16) on to the crownwheel (14).

NOTE : *These two components are an interference fit and must, therefore, have their bolt holes aligned accurately before being fitted together.*

**STEP 26**

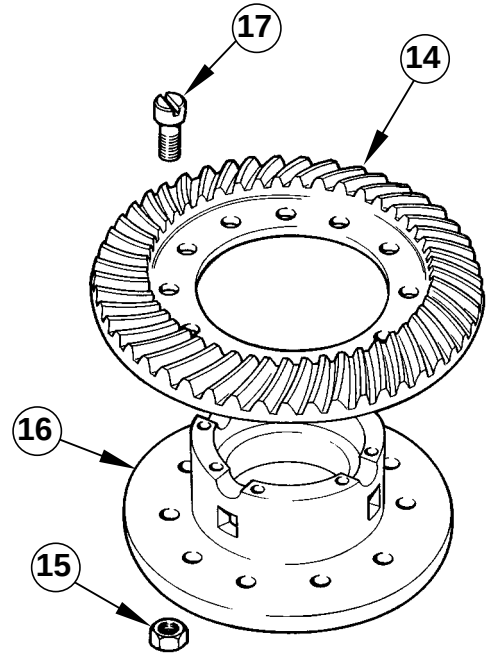
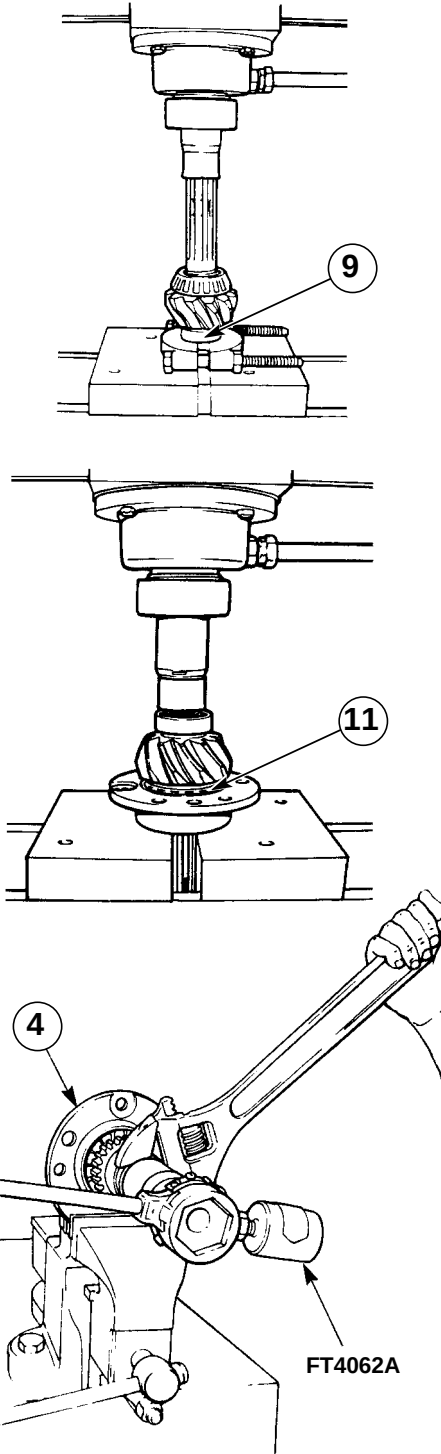
Install the twelve bolts (17) with their heads adjacent to the crownwheel teeth.

STEP 27

Apply two drops of Loctite 270 to the first thread of each bolt.

STEP 28

Fit the nuts (15) and tighten them progressively and evenly to 160 Nm (120 lbf ft).



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789M520A

STEP 29

Refit the differential components (see page 14).

NOTE : *Steps 23 through 28 must be completed within 30 minutes of mixing the resin and hardener.*

STEP 30

Cure the resin bonding by subjecting the differential assembly to uniform heating as follows :

120°C (248°) for at least 1 hour.

or 40 °C (105°F) for at least 12 hours, or 30 °C (86 °F) for at least 16 hours, or 20°C (68°F) for a least 24 hours).



WARNING : *Do not exceed 120°C (248° F).*

STEP 31

Press the bearing cone onto the right side of the differential.

STEP 32

Press in the left differential bearing cup.

STEP 33

Before installing the trumpet housings, set the differential bearing pre-load.

SETTING THE DIFFERENTIAL BEARING PRE-LOAD

NOTE : This check must be carried out whenever the differential unit is stripped or if the bearings have been replace.

Set the pre-load as follows :

STEP 1

All pre-load checks are made on the right side (differential lock side).

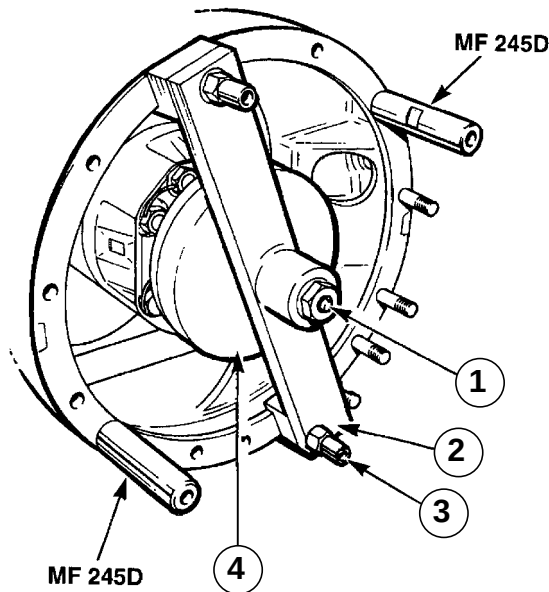
STEP 2

Assemble the left-hand side, complete with the carrier plate.

STEP 3

The right carrier plate must not have the bearing cup or the chip shield fitted.

STEP 4



Screw a setting gauge (special tool MF 245D) onto two diametrically opposite studs. Remove one stud from an adjacent location to fit the upper gauge.

STEP 5

Remove another stud from the centre housing and fit it in the tapped hole as illustrated.

STEP 6

Place the bearing cup (4) on the bearing cone and fit the centralizer.

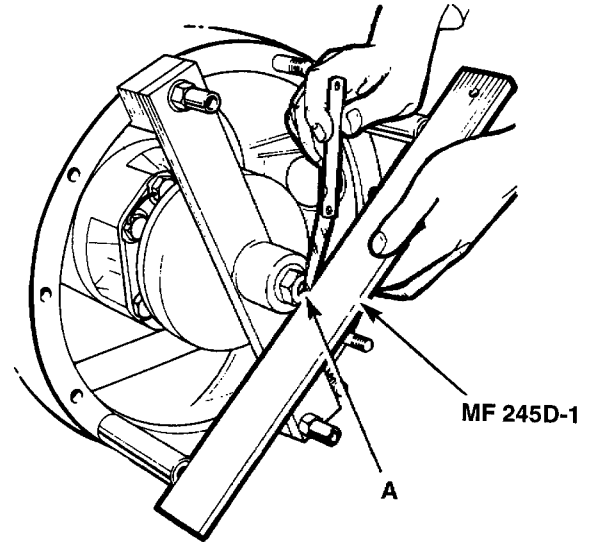
STEP 7

Position the clamp bar (2) and secure it with the two tube nuts (3).

STEP 8

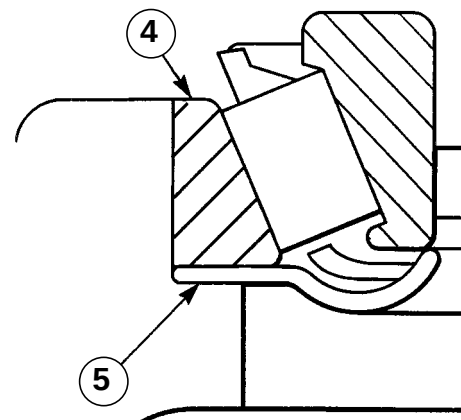
Tighten the clamp bar nut (1) to 27 Nm (20 lbf ft) whilst using a lever to turn the differential unit. This will ensure correct seating and location of the bearings.

STEP 9



Place the straight edge (special tool MFS35D-1) in position and use feeler gauges to measure the gap "A".

STEP 10



To determine the correct chip shield (5), use the chart, where :

A =	the gap measured with the feeler gauges
B =	the identity stamped on the chip shield
C =	the part number of each thickness of chip shield.

STEP 11

Remove the special tools MF245D, and refit the studs to the holes from which they were removed.

STEP 12

Place the new chip shield (5) in the carrier plate, with the concave face towards the differential.

STEP 13

Refit the bearing cup (4) and ensure it is fully seated.

STEP 14

Refit the carrier plate and the trumpet housing (see page 11).

A mm	B inch		C
0,45-0,53	0.019-0.021	●●●●●●●● ●	168 054 M1
0,61-0,66	0.024-0.026	●●●●●●●●	521 401 M1
0,74-0,79	0.029-0.031		187 689 M1
0,86-0,91	0.034-0.036	●	892 173 M1
0,99-1,04	0.039-0.041	●●	892 172 M1
1,22-1,17	0.044-0.046	●●●	892 171 M1
1,25-1,30	0.049-0.051	●●●●	892 170 M1
1,37-1,42	0.054-0.056	●●●●●	191 124 M1

Section

6007

GEAR BOX

6007

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WARNING : *This symbol is used in this manual to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIFICATIONS

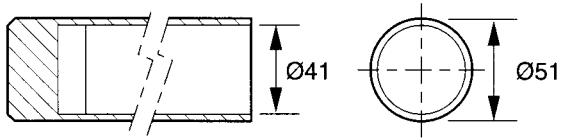
Manufacturer.....	Turner
Type	PowerPower shuttle 2
Capacities	
Total system	19 litres
Refill capacity with or without filter change.....	15 litres
Type of transmission oil	API CD/SE Grade 10W30
Clutch construction, Forward /Reverse.....	6 steel plates
	6 organic friction material plates
4 WD.....	9 steel plates
	8 organic friction material plates
Organic material	Raymark 57901-2
Clearance and settings	
Shaft end float (all shafts)	0.025 to 0.076 mm
Gear end floats input shaft primary gears Forward and reverse	0.41 to 0.61 mm
Output shaft assembly (rear) 4 th gear.....	0.20 to 0.56 mm
3 rd gear	0.38 to 0.84 mm
2 nd gear	0.36 to 0.56 mm
1 st gear	0.33 to 0.51 mm
4 wd output gear	0.18 to 0.28 mm

SPECIAL TORQUES

Strainer bolts	24 Nm
Pump mounting	24 Nm
Output yoke bolts.....	79 Nm
Pressure test plugs.....	47 Nm
Transmission Case bolts.....	54 Nm
Shift detent plug.....	47 Nm
Shift fork screw	22 Nm
Shift lever screw	22 Nm
Drain plugs	45 Nm
Torque converter relief valve.....	27 Nm
Pressure regulator valve.....	53 Nm
Cold start valve.....	53 Nm
4 WD solenoid valve	38 Nm
Direction control valve (replace plastic plugs after tightening).....	7.7 Nm

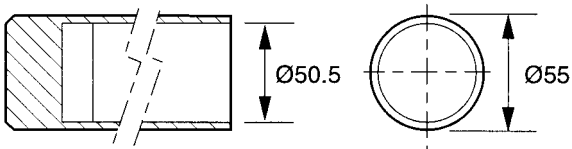
SPECIAL TOOLS AND SEALANTS

Special tools



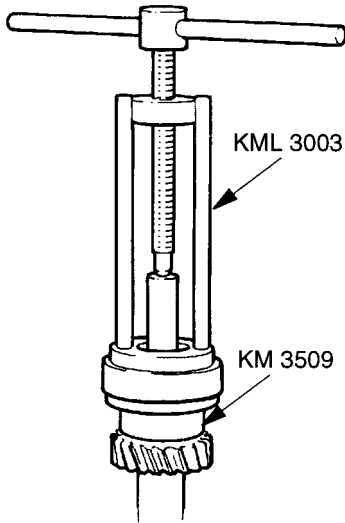
CS98G515

F5 4/1 # 1 Tube for the replacement of the countershaft bearings, output shaft front/rear bearing and 4 WD.



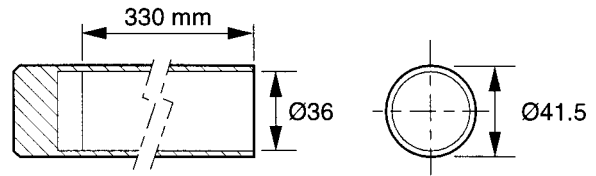
CS98G517

F5 4/1 # 3 Tube - for the replacement of the 1st gear, bearing bush, on the output shaft.



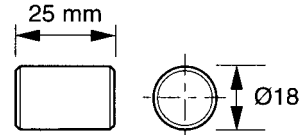
CS98G519

KML 3003 Bearing puller, use with collets.
KM 3509 collet input and reverse idler shaft bearings.



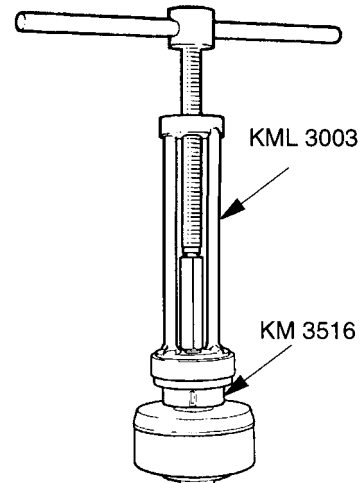
CS98G516

F5 4/1 # 2 Tube - for the replacement of the reverse idler shaft bearings and input shaft bearings.



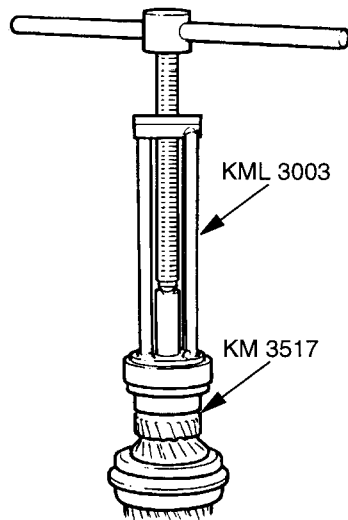
CS98G518

F5 4/1 # 4 Slave shift rail.



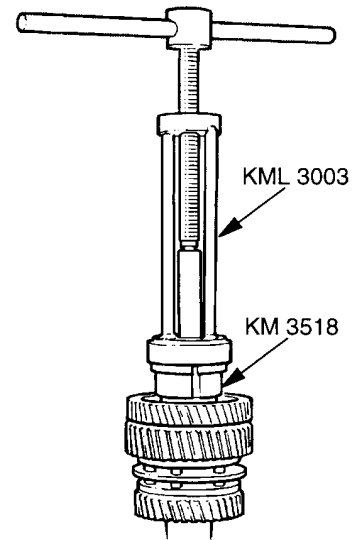
CS98G520

KML 3003 Bearing puller, use with collets.
KM 3516 Collet - 4 WD shaft bearing.



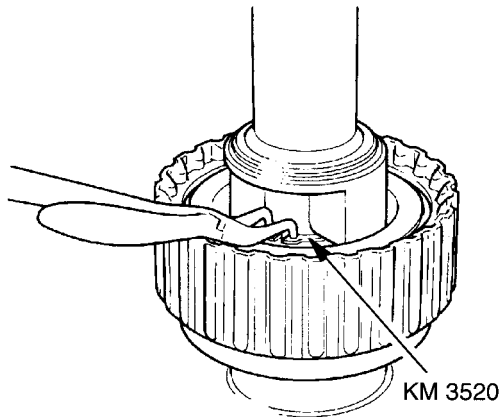
CS98G521

KML3003 Bearing puller, use with collets.
KM 3517 Collet - Output shaft front bearing.



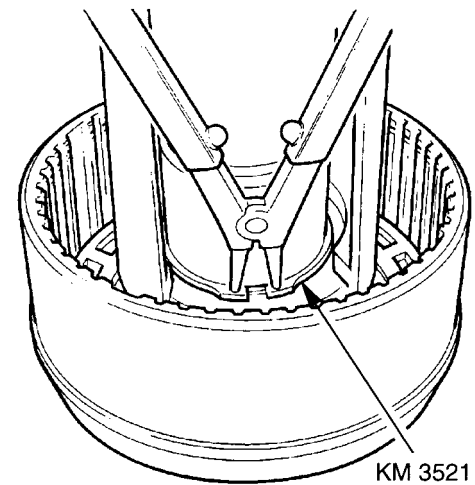
CS98G522

KML 3003 Bearing puller, use with collets.
KM 3518 Collet - Output shaft rear bearing and countershaft rear bearing.



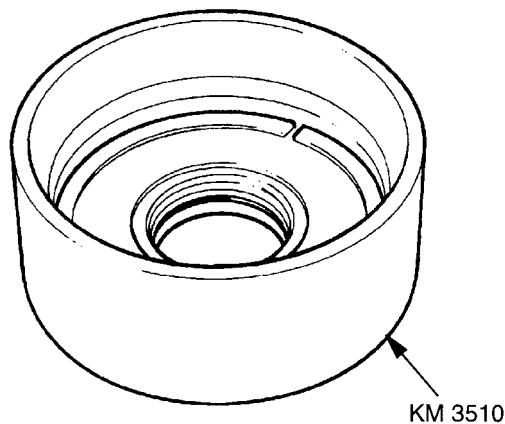
CS98G523

KM3520 Spring compressor - Forward and reverse clutch.



CS98G525

KM 3521 Spring compressor - 4 WD clutch.



CS98G524

KM 3510 Sizing ring - 4 WD clutch piston seal.

Sealants

Omnico FD 10.

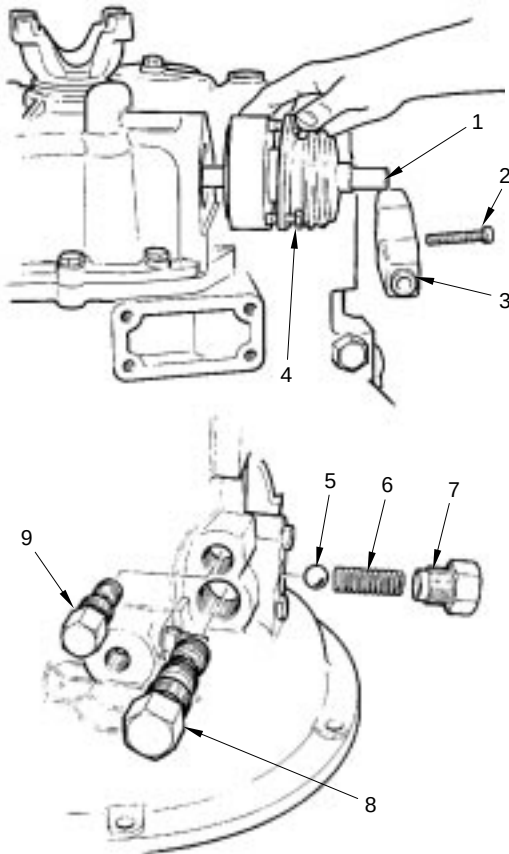
Loctite 5203.

Loctite 638 Spline Lock - 4 WD output gear.

DISASSEMBLY AND ASSEMBLY OF THE GEAR BOX HOUSING

Disassembly

STEP 1

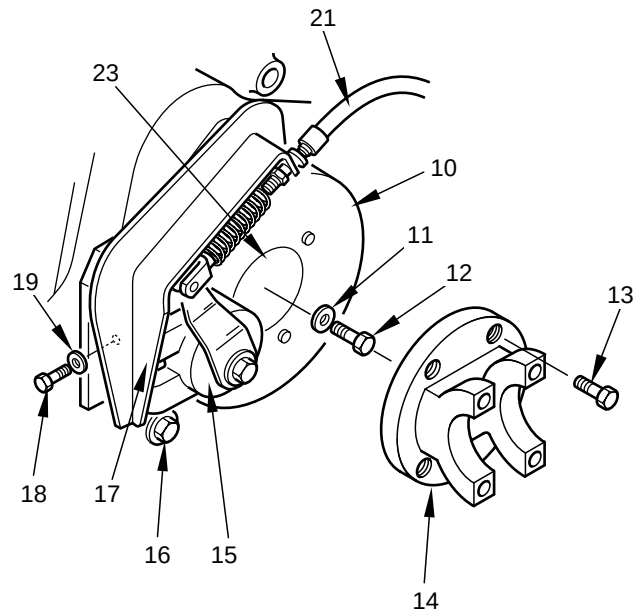


789M293A

Remove the torque converter from the transmission.
Stand the transmission on the bench or in a transmission stand with the bell housing down.
Remove the three bolts (4) and withdraw the gearshift stub shaft assembly (1).
Remove the four capscrews (2) and the solenoid valve unit (3).
Remove the pressure regulator valve (8).
Remove the torque converter relief valve (9).
Remove the cold start valve by unscrewing the plug (7) and removing the spring (6) and the ball (5).

NOTE : Only do step 2 on 4 wheel steer machines with transmission brake.

STEP 2

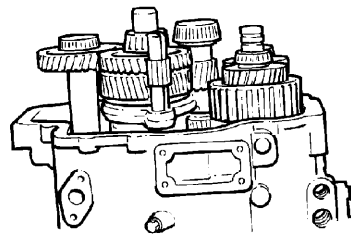
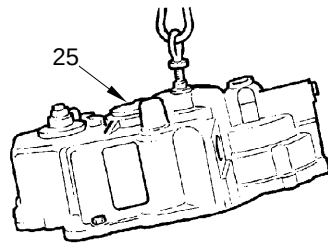
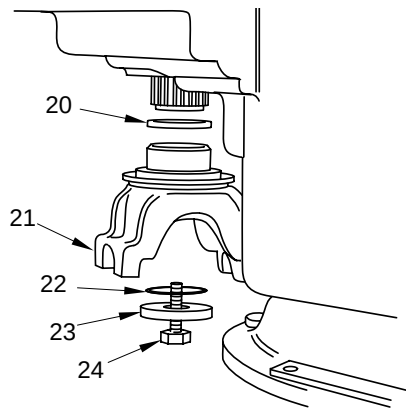


789M328A

Release the two bolts (18) and the washers (19) in the brake cable bracket (17) and remove the bracket. Release the two bolts (16) in the parking brake calliper (15) and remove the calliper. Release the four bolts (13) in the coupling half (14) and remove the coupling. Release the bolt (12) and the special washer (11) from the brake disc (10) and remove the brake disc.

NOTE : Only do step 3 on 2 wheel steer machines.

STEP 3



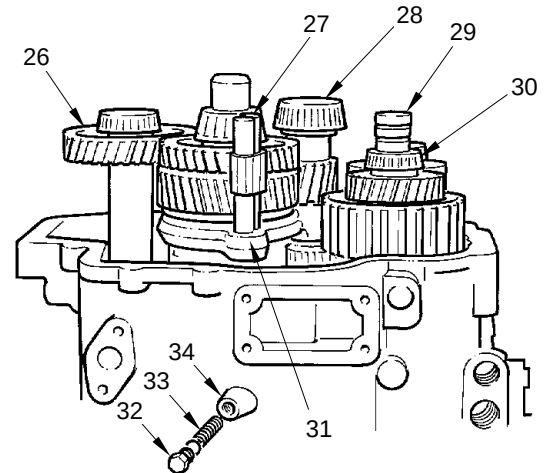
789M327A

Remove the bolt (24), the washer (23) and the O-ring seal (22), then pull the coupling (21) and spacer (20) off the 4WD output shaft.

STEP 4

Remove all seventeen screws and use a suitable hoist to lift off the rear case (25). Some bearing races and their shims may fall from the rear case as it is lifted. Make a careful note of their relative positions to help assembly.

STEP 5



789M294A

Remove the 4WD shaft (26).

Tilt the countershaft (28) and lift out the input shaft (29).

Remove the reverse idler shaft (30).

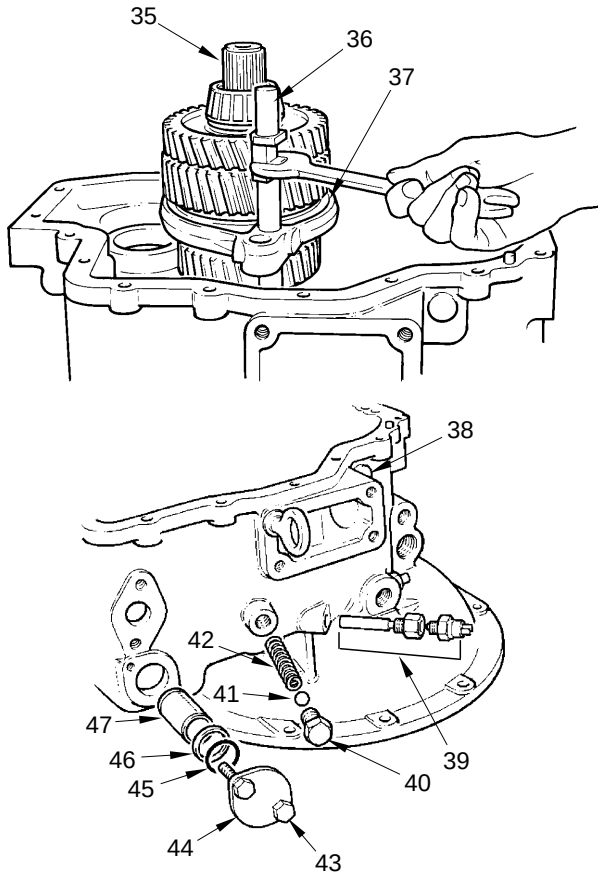
Remove the countershaft (28).

Remove the plug (32) and withdraw the detent spring (33) and the ball (34).

Remove the screw from the 1st/2nd speed shift fork (31).

Turn the shift rail (27) through 90° and remove it from the transmission.

Use a magnetic probe to remove the interlock ball from the same bore as detent plug (32).

STEP 6

789M329A



WARNING : Refit the plug in the detent bore to prevent the ball and spring ejecting as the 3rd/4th shift rail is removed.

Remove the screw from the 3rd/4th speed shift fork (37).

Turn the 3rd/4th speed shift rail (36) through 90° and withdraw it from the housing.

Remove both of the shift forks.

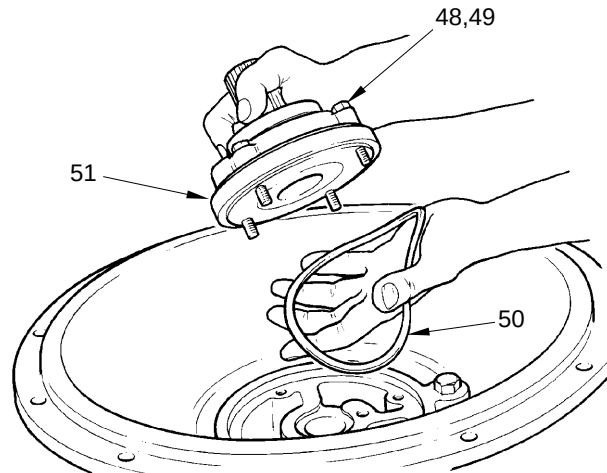
Remove the plug (40), the second detent spring (42) and the ball (41).

Remove the output shaft assembly (35).

If fitted, remove the 4th gear lockout switch assembly (39).

Remove the two screws (43) and lift off the cover (44), the O-ring seal (45), the spacer (46) and the strainer (47).

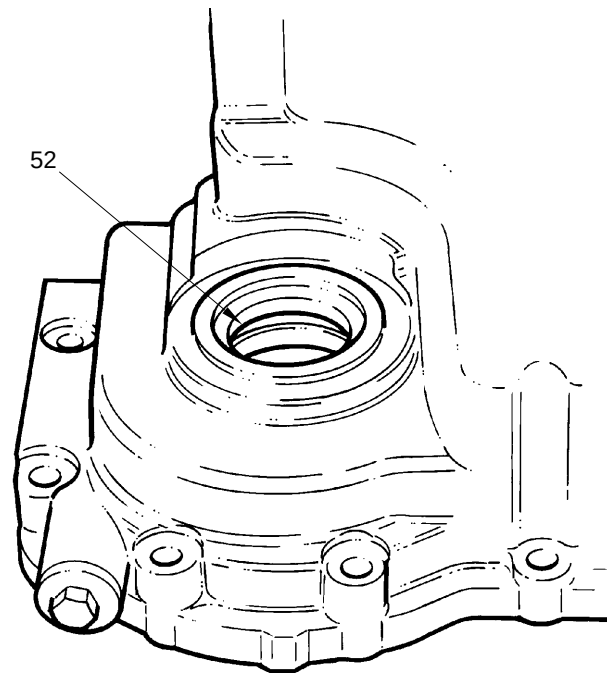
Remove and discard the expansion plug (38).

STEP 7

789M330A

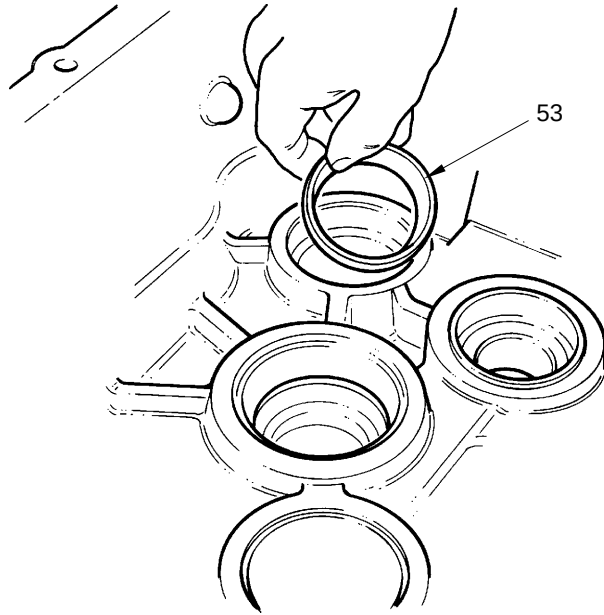
Remove and discard the oil filter.

Lift the transmission and turn it to stand on the rear end face. Remove the four screws (48) and the copper washers (49). Remove the pump (51) and the seal ring (50). Discard the seal ring (50).

STEP 8

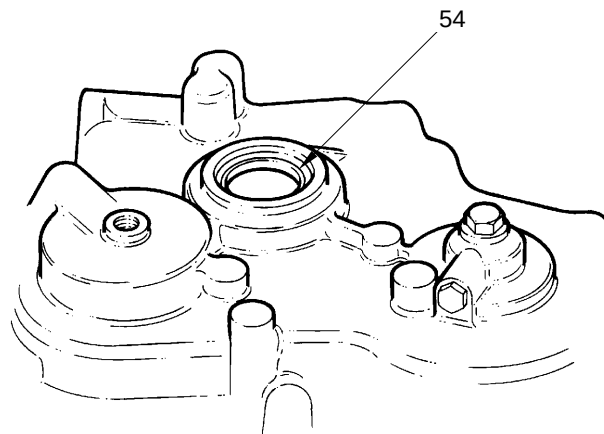
789M331A

Remove the 4WD shaft seal (52) from the front case.

STEP 9

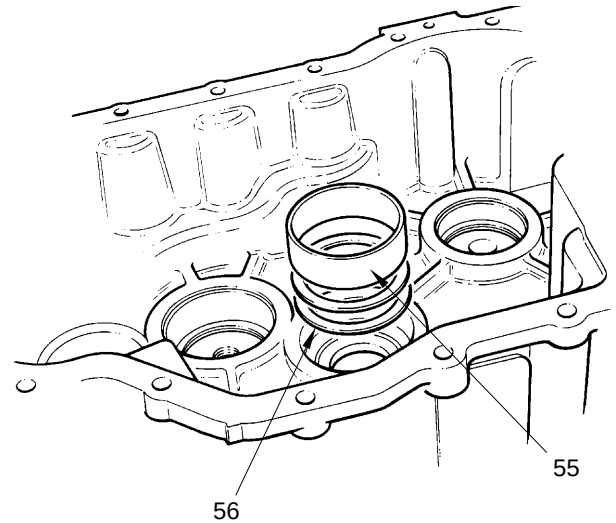
789M332A

Remove the bearing outer races (53) from the front housing, but make a careful note of their relative positions for assembly.

STEP 10

789M333A

Remove the output shaft seal (54) from the rear case.

STEP 11

789M334A

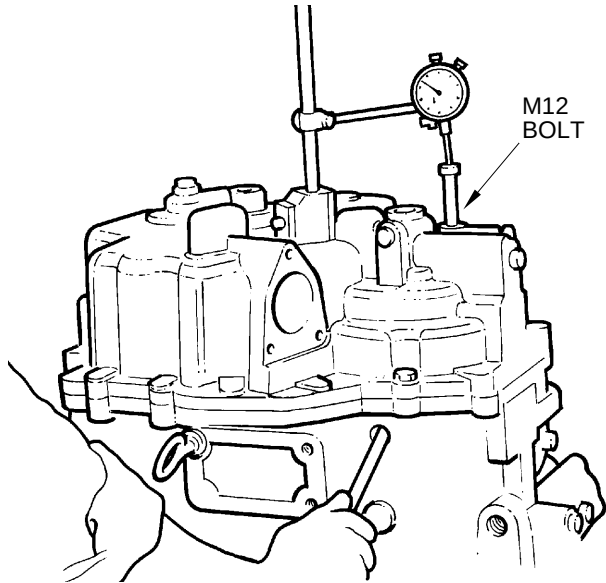
If necessary remove the bearings (55) and the shim packs (56) from the rear case.

Assembly

Assemble the transmission in the reverse order of the disassembly but note the following :

1. On 4-WD drive machines, install a new 4WD shaft seal (52) in the front case.
2. Install a new ring seal (50).
3. Torque tighten the bolts (48) to 24 Nm.
4. Invert the front case to install the bearing outer races (53).
5. Use a suitable drift to install the output shaft seal (54).
6. Before assembly clean the mating faces of the front and rear cases.

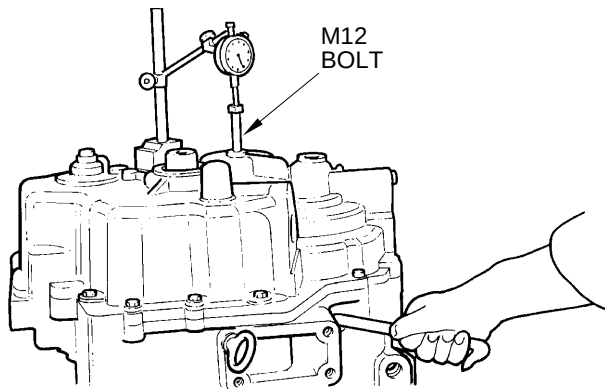
7.



789M335A

Remove the closure plug and screw an M12 bolt into the end of the reverse idler shaft, put a dial indicator on the shaft end as shown. Use a pry bar to lift the shaft and note the end-float, which should be 0.025 to 0.076 mm.

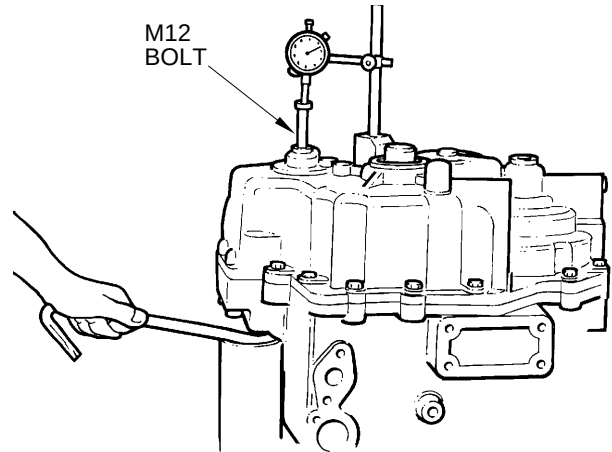
8.



789M336A

Remove the closure plug and screw an M12 bolt into the end of the countershaft shaft. Put a dial indicator on the shaft end as shown. Use a pry bar to lift the shaft and note the end-float, which should be 0.025 to 0.076 mm.

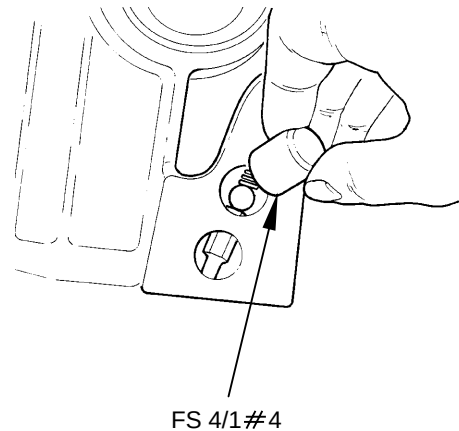
9.



789M337A

On 4-WD machines, remove the closure plug and screw an M12 bolt into the end of the 4WD output shaft. Put a dial indicator on the shaft end as shown. Use a pry bar to lift the shaft and note the end-float which should be 0.025 to 0.076 mm. If the end-float is incorrect remove the rear case and adjust the shim panels (55) until the correct end-float is achieved.

10.

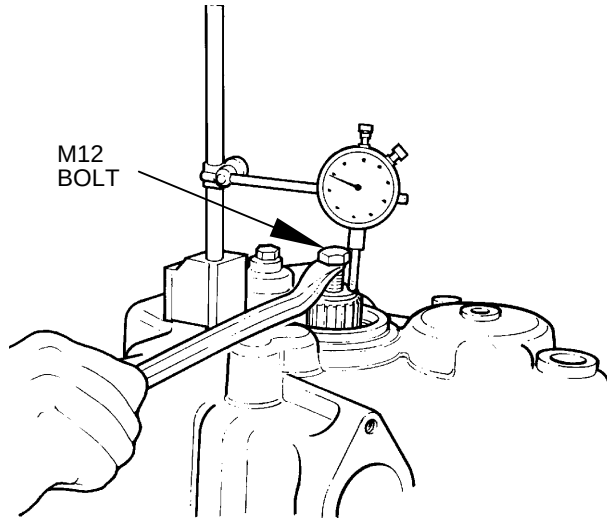


789M512A

Use a suitable tool to hold the inner detent spring and the ball into the case and insert the special tool FS 4/1 #4 (slave shift rail) to hold them in place.

11. Torque tighten the shift fork bolt (37) to 22 Nm.
12. Carefully engage the 1st/2nd speed shift fork in the grooves of the synchromesh.
13. Install the output shaft/shift rail assembly carefully to engage the shift rail (27) in the bore and smoothly displace the special tool FS 4/1 #4 (slave shift rail).

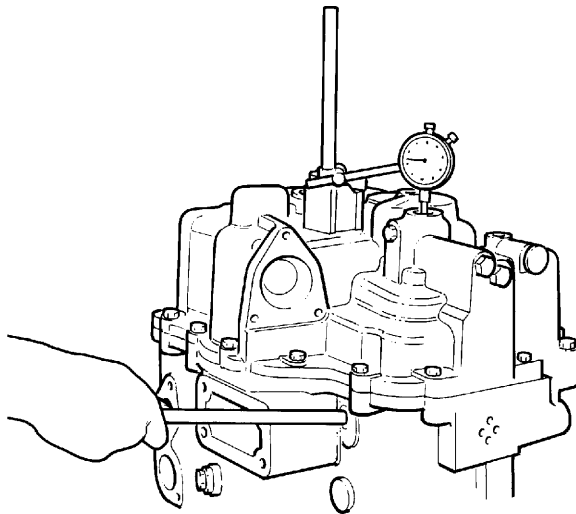
14.



789M338A

After installation of the rear case, screw an M12 bolt into the end of the output shaft and position a dial gauge on the end of the shaft, as shown. Use a suitable pry bar under the head of the bolt to raise the shaft and measure the end float, which should be 0.025 to 0.076 mm.

15.



789M339A

Put the dial gauge on the end of the input shaft and use a pry bar to raise the shaft and measure the end float, which should be 0.025 to 0.076 mm.

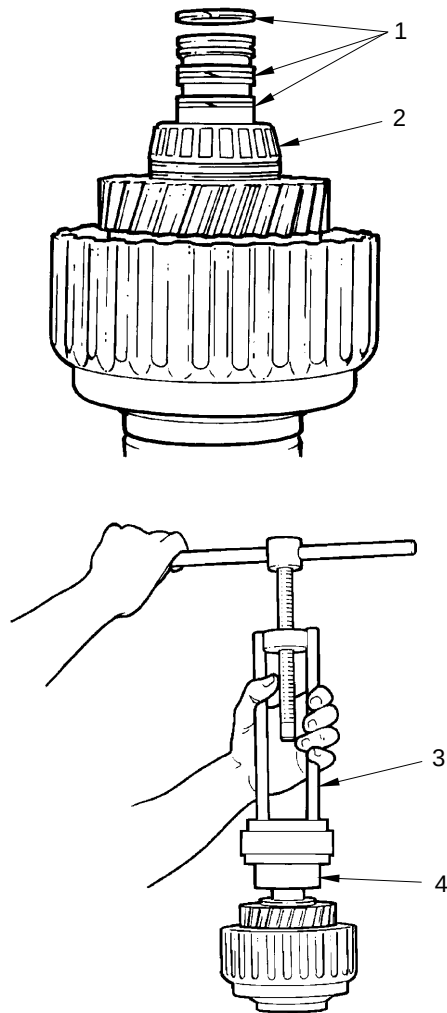
If necessary, remove the rear case and adjust the shim packs for the input and output shaft bearings.

16. Torque tighten the special bolt to the 1st/2nd gear fork to 22 Nm. Check the interlock ball is correctly positioned and functions properly.
17. Torque tighten the detent plug (32) to 47 Nm.
18. Install three new O-ring seals in the front case.
19. Before assembly coat the rear case mating face with Omnicote on the transmission case. Install all seventeen bolts and tighten to 54 Nm.
20. Install a new expansion plug (38).
21. Torque tighten the three shaft plugs in the rear case to 47 Nm.
22. Torque tighten the bolts (12) and (24) to 79 Nm.
23. Torque tighten the bolts (13) to 105 Nm.
24. Torque tighten the bolts (16) to 105 Nm.
25. Torque tighten the plug (7) to 54 Nm.
26. Torque tighten the torque converter relief valve (9) to 27 Nm.
27. Torque tighten the pressure regulator valve (8) to 53 Nm.
28. Install new O-ring seals in the control valve (3), then attach the valve to the transmission with four capscrews.
29. Torque tighten the capscrews (2) to 7.7 Nm.
30. Install a cleaned stainer (47) and torque tighten the screws (43) to 24 Nm.
31. Before assembly, coat the mating faces of the lever assembly (1) with Omnicote. Torque tighten the bolts (4) to 20 Nm.

DISASSEMBLY AND ASSEMBLY OF THE INPUT SHAFT

Disassembly

STEP 1



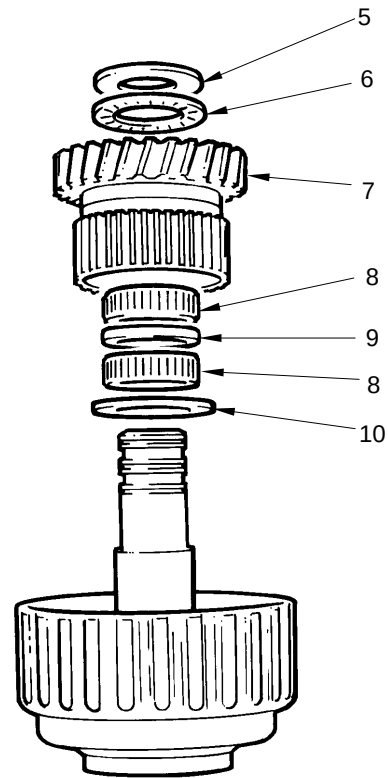
789M342A

Clamp the shaft in a vice fitted with soft jaws and remove the three seal rings (1).

Use special tools KML 3003 (3) and KM 3509 (4) to remove the rear bearing (2).

NOTE : When assembling, use the tube, F5 4/1#2 to replace the bearing (2). Install three new sealing rings (1) to the shaft.

STEP 2



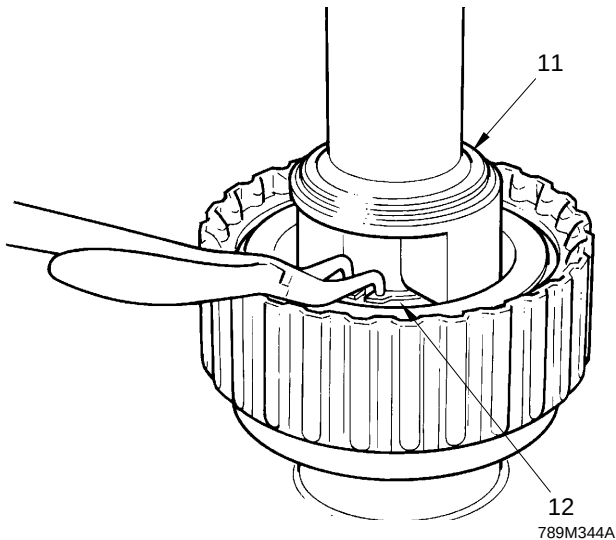
789M343A

Remove the thrust washer (5) and needle roller bearing (6).

Remove the reverse gear/clutch hub (7).

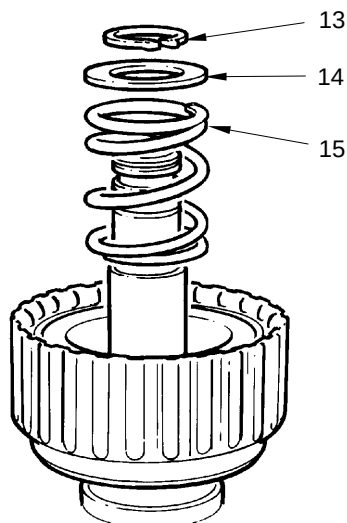
Remove both needle roller bearings (8) and the spacer (9) between them.

Remove the thrust washer (10).

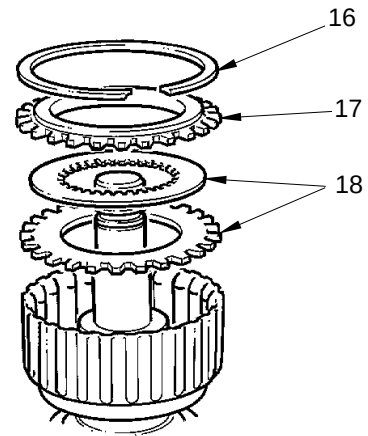
STEP 3

Use special tool KM 3520 (11) to compress the clutch spring, then remove the snap-ring (12) and gradually release the spring compression.

NOTE : When assembling, use the special tool 3520 (11) to compress the clutch spring, then fit the snap-ring (12) in its groove. Make sure the snap-ring is fully closed before releasing the spring compressor.

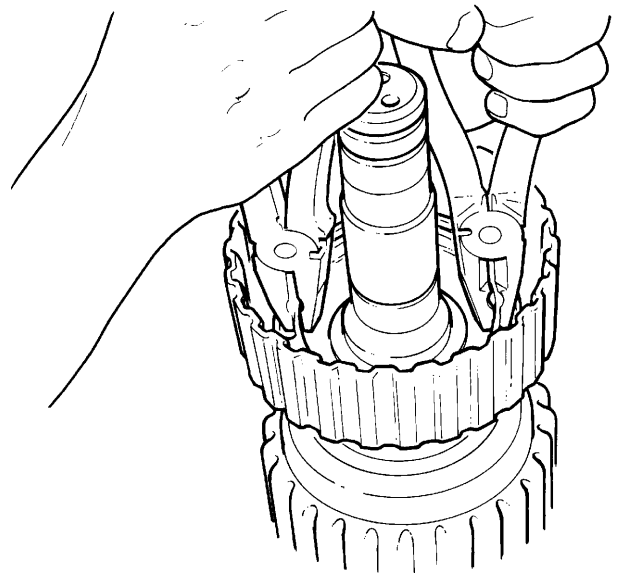
STEP 4

Remove the circlip (13), the retainer (14) and the spring (15).

STEP 5

Remove the large internal snap-ring (16).
Remove the clutch cover plate (17).
Remove all the clutch plates (18).

NOTE : If you will be using new friction discs, soak the friction discs in clean transmission oil for at least an hour before assembly. If you are using the old friction discs, make sure that the friction surfaces are coated with transmission oil before assembly.

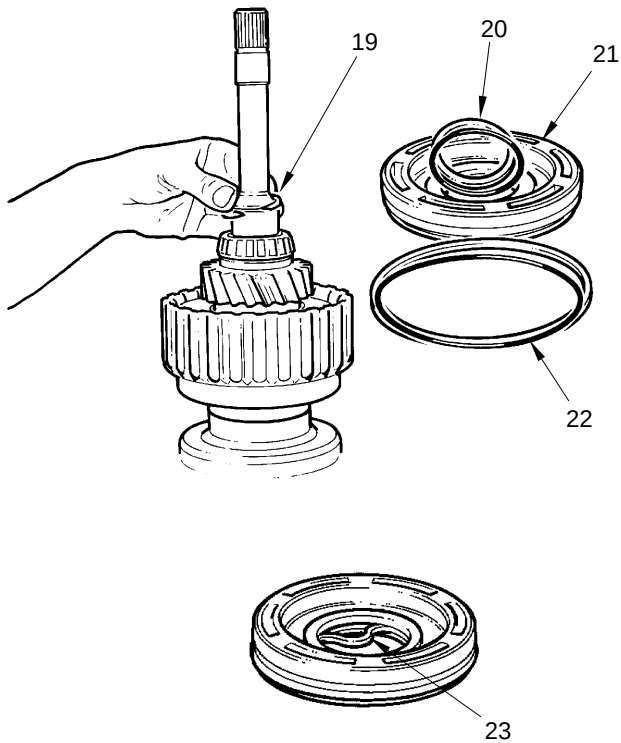
STEP 6

Use two pairs of pliers to pull the piston (21) evenly out of the clutch drum.
Invert the clutch shaft and remove the sealing ring (22).

STEP 7

Disassemble the forward clutch (refer to steps 1 through 6 of this procedure).

STEP 8

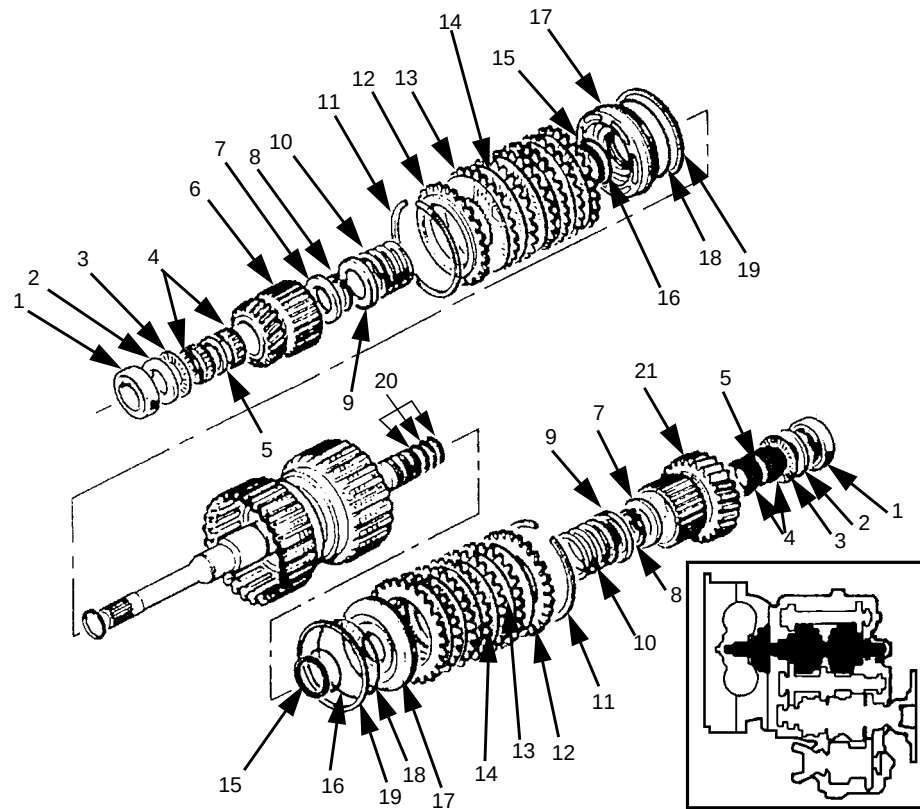


789M348A

Remove both the internal and external composite seals (19), (20) and (23) from both pistons (21).

NOTE : When assembling, install new piston seal rings (19), (20), (22), and (23).

NOTE : The assembly of the input shaft is the reverse of the disassembly.



CS98G545

1. Bearing	8. Snap-ring	15. Ring
2. Trust washer	9. Retainer	16. O-ring
3. Needle bearing	10. Spring	17. Piston
4. Needle bearing	11. Snap-ring	18. O-ring
5. Spacer	12. Cover plate	19. Ring
6. Forward gear	13. Friction disc	20. Ring
7. Trust washer	14. Clutch plate	21. Reverse gear

Inspection

STEP 1



BP95F128

Check for wear and damage on the sealing rings (large and small) and in the grooves for the sealing rings. It is probable that you will have sealing rings that look like the sealing ring shown above. The plating is worn off in some spots, leaving dark areas on the contact surface. This condition is normal. The plating is a break-in lubrication plating, not a protective plating. It is normal for the plating to wear in this way. This is a good sealing ring which can be used again.

STEP 2

Check the teeth on the gears for wear and damage. If a tooth is badly damaged, be sure to inspect the gear or spline that is in mesh with the damaged gear.

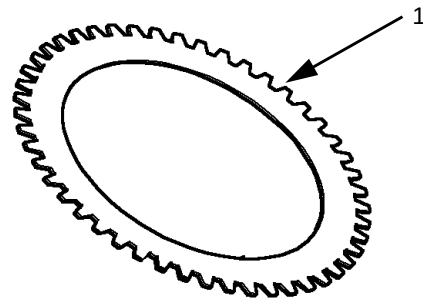
STEP 3

Check the splines on the output shaft for wear and damage. Check the passages in the output shaft to be sure that the passages are open and free of foreign material.

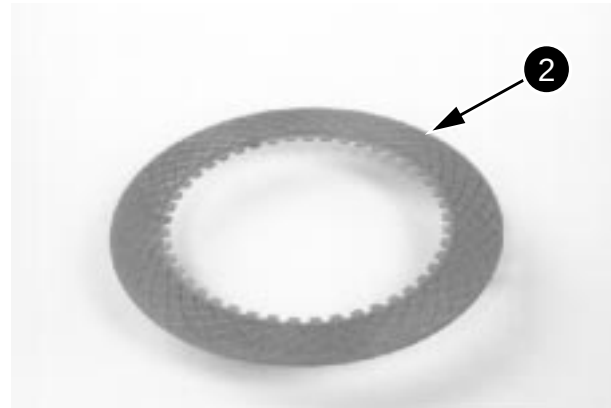
STEP 4

Check the ball bearings and the needle bearings for flat areas, pitting and other damage. Replace as necessary.

STEP 5



CI98G523



BP95F131

Use a straight edge to check each steel disc (1) and each friction disc (2) to be sure each part is flat. If a steel disc (1) or a friction disc (2) is not flat, a new part must be installed during assembly. If the friction discs (2) are smooth or almost smooth, use new parts during assembly. Inspect the steel discs (1) for pitting, scoring, or other damage. If there is any damage, use new parts during assembly. Also, check the splines for wear. Inspect the bore and the shaft in the clutch housing for damage that will cause leakage when the clutch is assembled. Use new parts as required during assembly. If you will be using new friction discs, soak the friction discs in clean transmission oil for at least an hour before assembly. If you are using the old friction discs, make sure that the friction surfaces are coated with transmission oil before assembly.

DISASSEMBLY AND ASSEMBLY OF THE REVERSE IDLER SHAFT

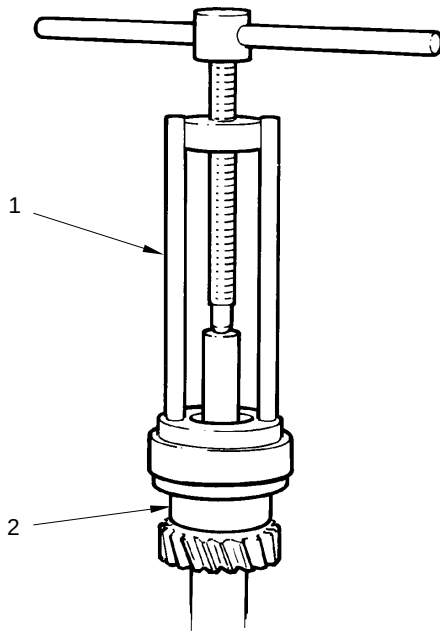
Disassembly

STEP 1

Use special tool KML 3003 (1) and KM 3509 (2) to remove the front bearing (4).

STEP 2

Use the same tools to remove the rear bearing.

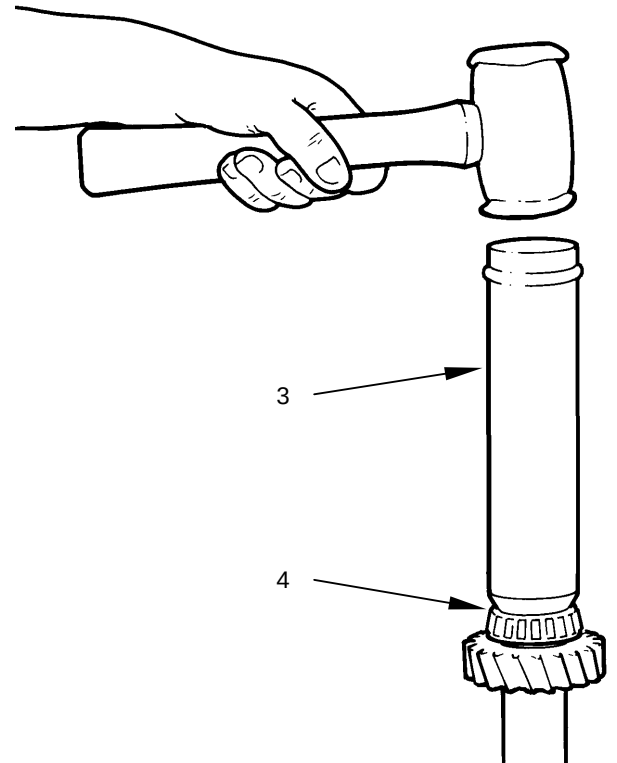


789M349A

Assembly

STEP 1

Use tube F5 4/1#2 (3) to fit the bearings (4) onto the shaft.



789M434A

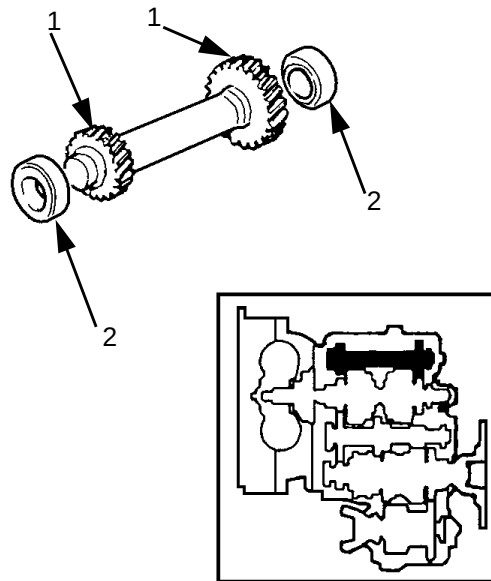
Inspection

STEP 1

Check the teeth (1) on the gears for wear and damage. If a tooth is badly damaged, be sure to inspect the gear or spline that is in mesh with the damaged gear.

STEP 2

Check the bearing (2) for flat areas, pitting, and other damage. Replace as necessary.



STEP 3

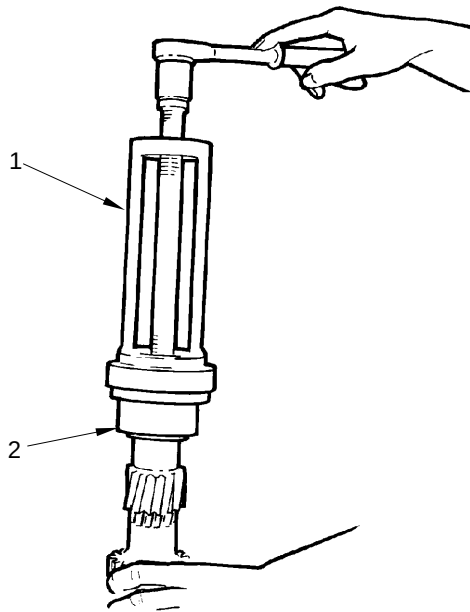
Checks the splines on the reverse idler shaft for wear and damage.

CS98G546

DISASSEMBLY AND ASSEMBLY OF THE MAIN SHAFT

Disassembly

STEP 1



789M340A

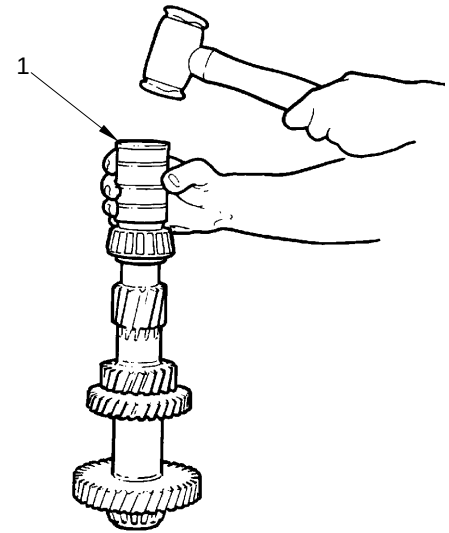
Use special tools KML 3003 (1) and KM 3518 (2) to pull off the rear bearing.

STEP 2

Use special tools KML 3003 and KM 3519 to pull off the front bearing.

Assembly

STEP 1



789M341A

Use tube FS4/1 #1 (1) to refit the front and rear bearings.

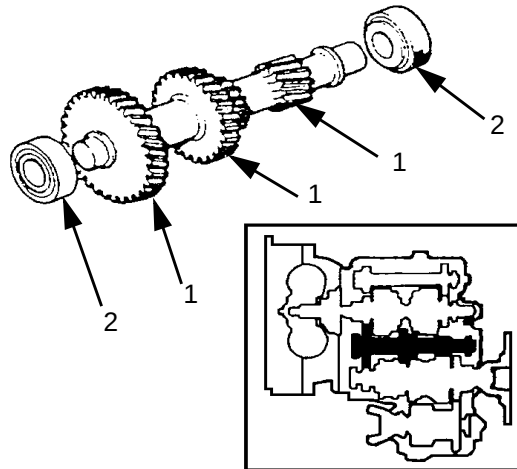
Inspection

STEP 1

Check the teeth (1) on the gears for wear and damage. If a tooth is badly damaged, be sure to inspect the gear or spline that is in mesh with the damaged gear.

STEP 2

Check the bearings (2) for flat areas, pitting, and other damage. Replace as necessary.



STEP 3

Check the splines on the main shaft for wear and damage.

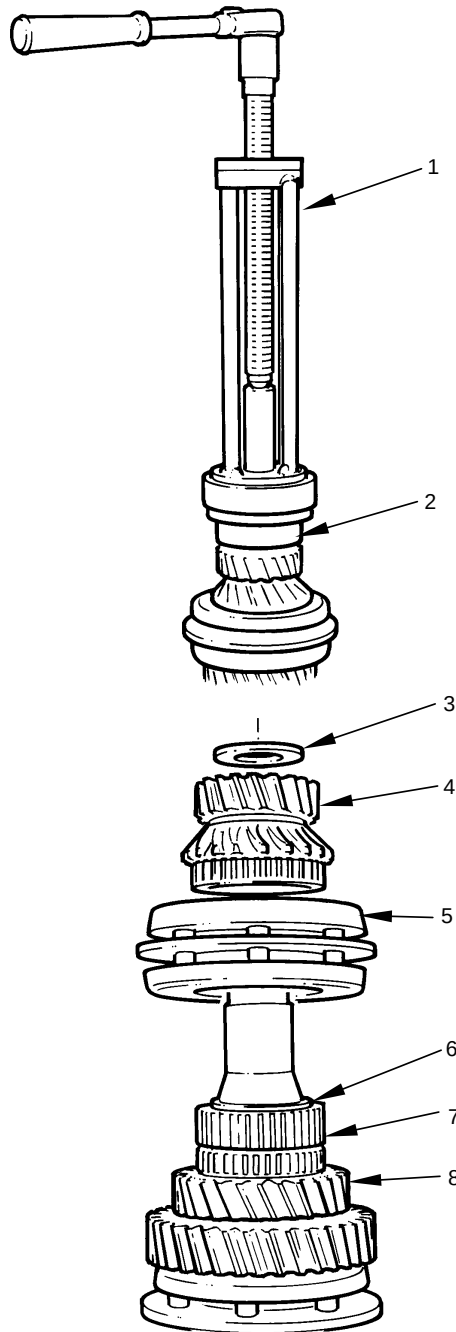
CI98G512

DISASSEMBLY AND ASSEMBLY OF THE OUTPUT SHAFT

Disassembly

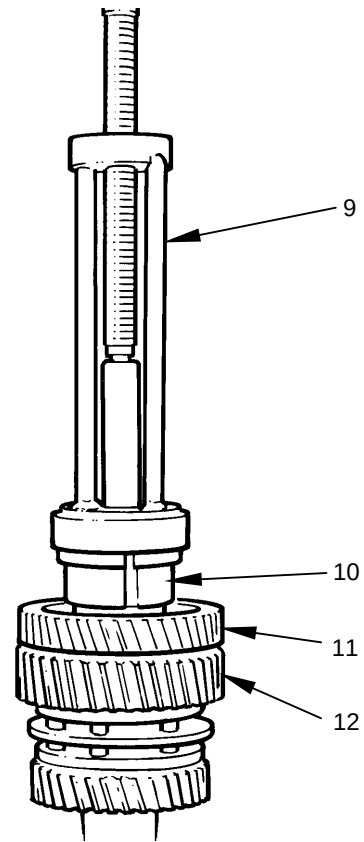
STEP 2

STEP 1



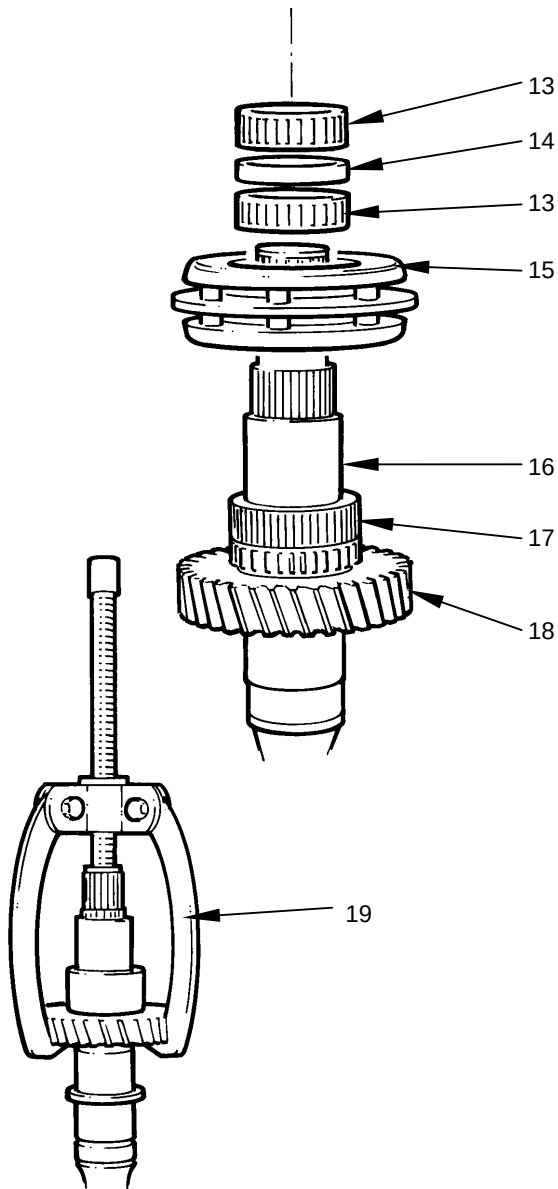
789M435A

Clamp the shaft in a vice fitted with soft jaws.
 Use the special tools KML 3003 (1) and KM 3517 (2)
 to pull the front bearing off the shaft.
 Remove the thrust washer (3).
 Remove the 4th gear (4).
 Remove the 3rd/4th synchromesh unit (5).
 Remove the circlip (6).
 Remove the synchromesh hub (7).
 Remove the 3rd gear (8).



789M436A

Turn the shaft over and use special tools KML 3003
 (9) and KM 3518 (10) to remove the rear bearing.
 Remove the 4-wheel drive gear (11).
 Remove the 1st gear (12).

STEP 3

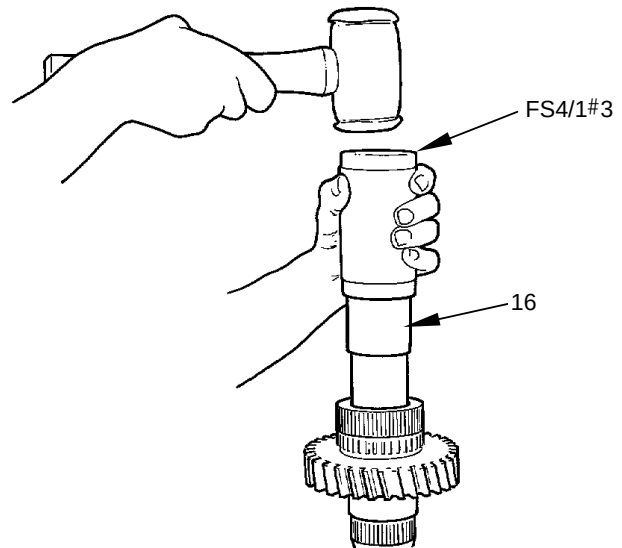
789M437A

Remove both needle roller bearings (13) and the spacer (14) which separates them. Remove the 1st/2nd gear synchromesh unit (15). Use a three legged puller (19) to remove the bearing sleeve (16), the synchromesh hub (17) and the 2nd gear (18).

Assembly

Assemble the output shaft in the reverse order of the disassembly but note the following.

1.

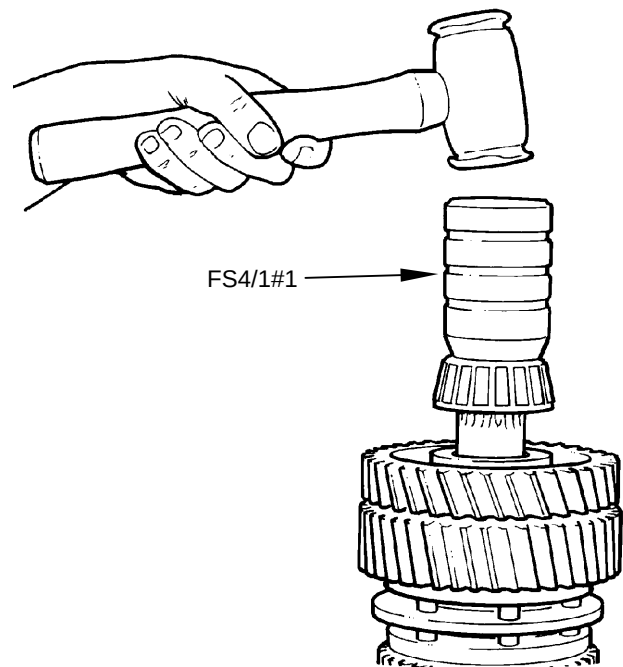


789M438A

Use the tube FS4/1 #3 to drive the bearing sleeve (16) onto the shaft.

2. Before assembly, coat the 4-wheel drive gear (11) with Loctite 638 spline lock the direct equivalent.

3.



789M439A

Use the tube FS4/1 #1 to install the rear bearing. Use the tube FS4/1 #1 to install the front bearing.

Inspection

STEP 1

Check the teeth on the gears for wear and damage. If a tooth is badly damaged, be sure to inspect the gear or spline that is in mesh with the damaged gear.

STEP 2

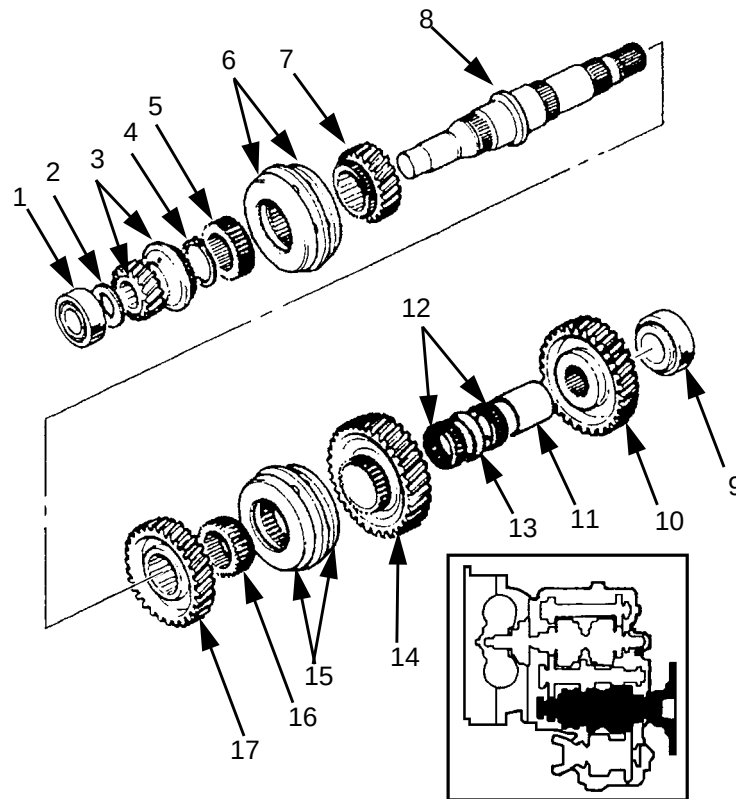
Check the splines on the output shaft for wear and damage. Check the passages in the output shaft to be sure that the passages are open and free of foreign material.

STEP 3

Check the bearings for flat areas, pitting, and other damage. Replace as necessary.

STEP 4

Check the teeth in the synchronizer assemblies for wear and damage. Replace as necessary.



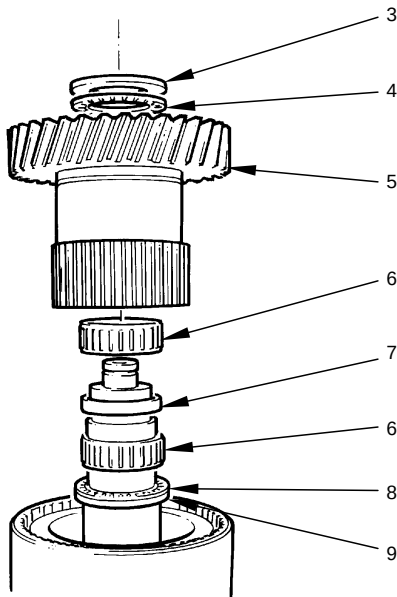
1. Front bearing	10. 4 WD gear
2. Thrust washer	11. Bearing sleeve
3. 4th gear	12. Needle bearing
4. Snap ring	13. Spacer
5. Synchronismesh hub	14. 1st gear
6. 3 rd/4th Synchronismesh unit	15. 1st/2nd synchronismesh unit
7. 3rd gear	16. Synchronismesh hub
8. Shaft	17. 2nd gear
9. Rear bearing	

CI98G511

DISASSEMBLY AND ASSEMBLY OF THE 4-WHEEL DRIVE SHAFT

Disassembly

STEP 1



789M440A

Clamp the splined end of the shaft in a vice fitted with soft jaws.

Remove the seal.

Use special tools KML 3003 and KM 3516 to remove the rear bearing.

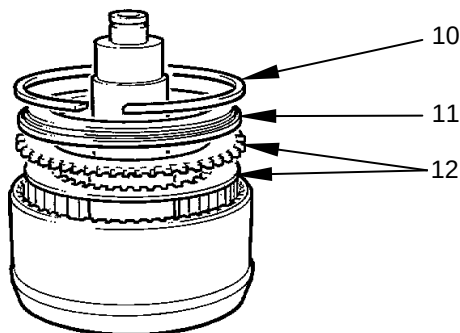
Remove the thrust washer (3) and the bearing (4).

Remove the gear/clutch hub (5).

Remove both needle roller bearings (6) and the spacer (7) which separates them.

Remove the second thrust bearing (8) and the washer (9).

STEP 2



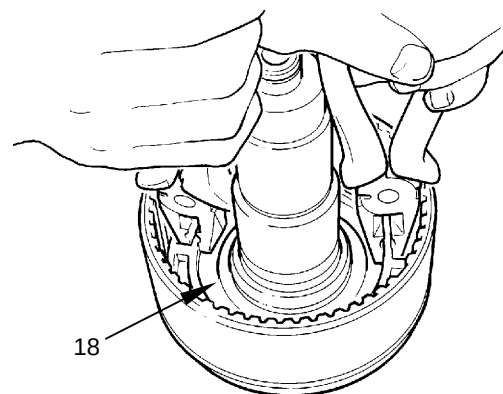
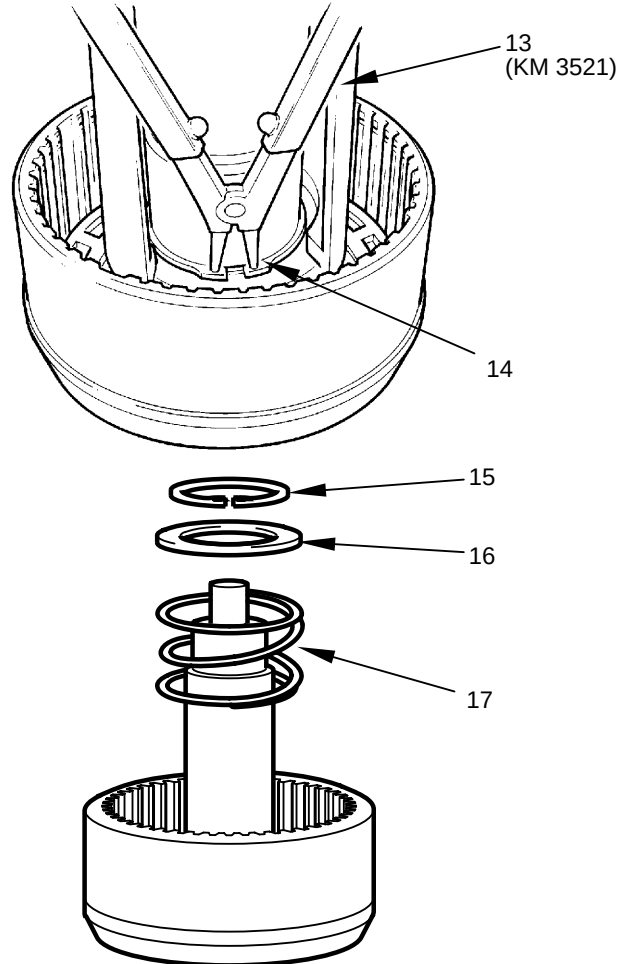
789M441A

Remove the internal snap-ring (10)

Remove the clutch cover plate (11).

Remove all the clutch plates (12).

STEP 3

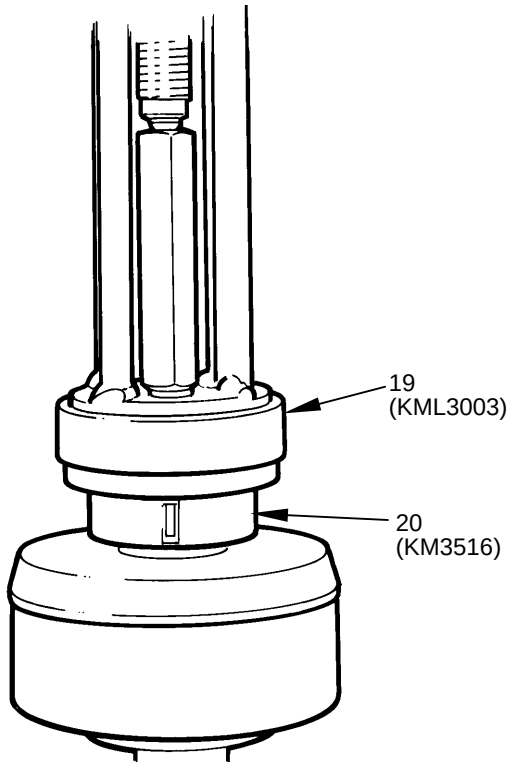


789M442A

Use special tool KM 3521 (13) to compress the clutch spring (17), then release the circlip (15). Slowly relieve the spring compression.

Remove the circlip (15), the retainer (16) and the spring (17).

Use two pairs of pliers to lift the piston (18) evenly, out of the drum.

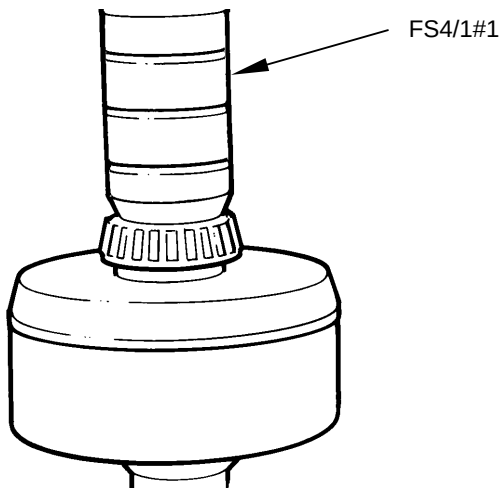
STEP 4

789M443A
Invert the shaft and use special tools KML 3003 (19) and KM 3516 (20) to remove the front bearing. Remove the inner and outer piston seals.

Assembly

Assemble the 4-wheel drive shaft in the reverse order of the disassembly but note the following :

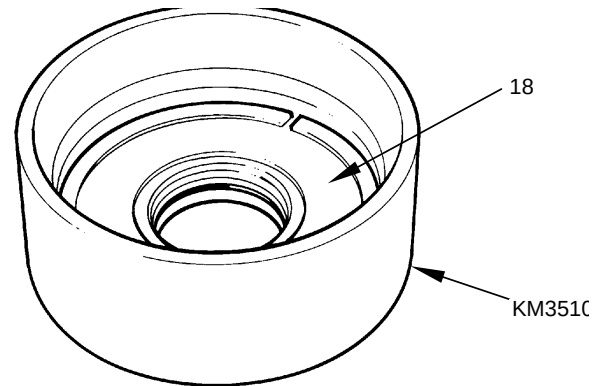
1.



789M444A
Use tube FS4/1 #1 to fit the front and the rear bearings.

2. Install new piston seals, the outer seal can be soaked in warm water to assist assembly.

3.



789M445A
Push the piston assembly (18) into tool KM 3510 to compress the outer seal. Leave the piston in the special tool for approximately 30 minutes. Remove the piston and immediately fit it into the clutch drum.

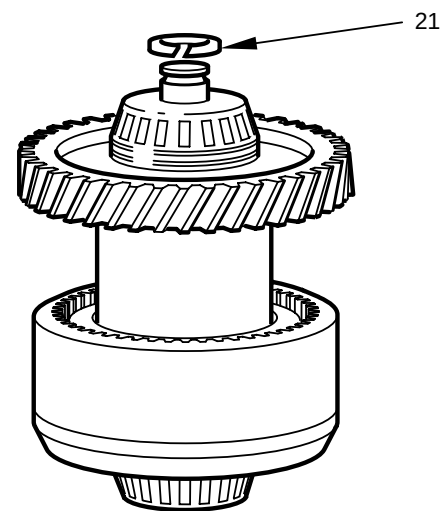
4. Use special tool KM 3521 (13) to compress the spring. Do not release the spring compressor until the circlip is completely closed in the groove.

5. The clutch has nine steel plates and eight bronze plates. Assemble them into the drum with a steel plate first, followed by a bronze plate and then another steel plate until all the clutch plates are fitted. The last plate should be steel.

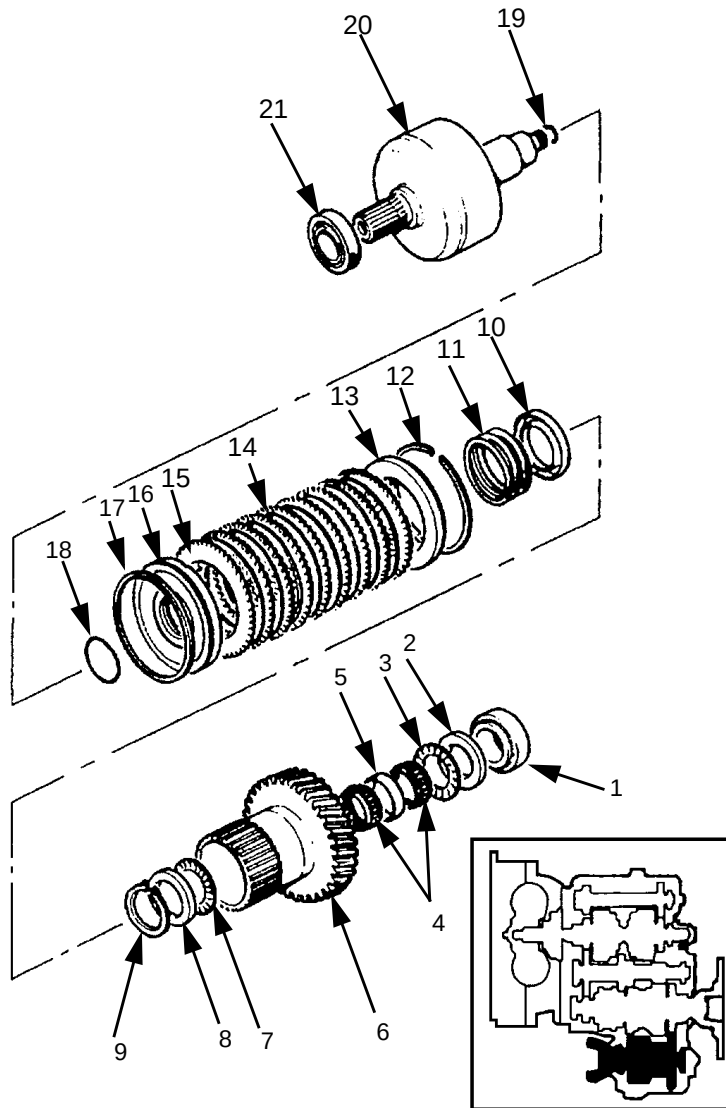
6. Install the clutch cover plate and retain it with the large internal snap ring.

7. After installation, press the thrust washer (3) against the shoulder and measure the end-float, which must be between 0.05 to 0.28 mm.

8.



789M446A
Install a new seal ring (21) on the shaft.



- 1. Rear bearing
- 2. Thrust washer
- 3. Bearing
- 4. Needle bearing
- 5. Spacer
- 6. Gear/clutch hub
- 7. Trust bearing
- 8. Washer

- 9. Snap-ring
- 10. Retainer
- 11. Spring
- 12. Snap-ring
- 13. Cover plate
- 14. Plate
- 15. Friction disc

- 16. Piston
- 17. Seal ring
- 18. O-ring
- 19. Ring
- 20. Shaft
- 21. Front bearing

CS98G544

Inspection

STEP 1



BP95F128

Check for wear and damage on the sealing rings (large and small) and in the grooves for the sealing rings. It is probable that you will have sealing rings that look like the sealing ring shown above. The plating is worn off in some spots, leaving dark areas on the contact surface. This condition is normal. The plating is a break-in lubrication plating, not a protective plating. It is normal for the plating to wear in this way. This is a good sealing ring which can be used again.

STEP 2

Check the teeth on the gears for wear and damage. If a tooth is badly damaged, be sure to inspect the gear or spline that is in mesh with the damaged gear.

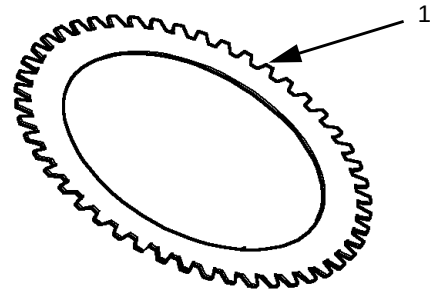
STEP 3

Check the splines on the output shaft for wear and damage. Check the passages in the output shaft to be sure that the passages are open and free of foreign material.

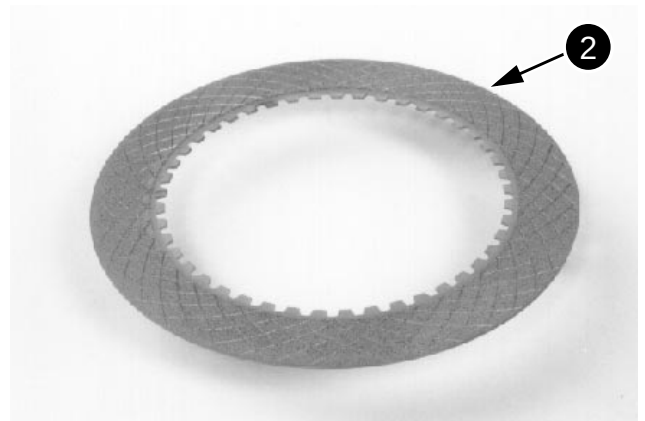
STEP 4

Check the ball bearings and the needle bearings for flat areas, pitting, and other damage. Replace as necessary.

STEP 5



CI98G523



BP95F131

Use a straight edge to check each steel disc (1) and each friction disc (2) to be sure each part is flat. If a steel disc (1) or a friction disc (2) is not flat, a new part must be installed during assembly. If the friction discs (2) are smooth or almost smooth, use new parts during assembly. Inspect the steel discs (1) for pitting, scoring, or other damage. If there is any damage, use new parts during assembly. Also, check the splines for wear. Inspect the bore and the shaft in the clutch housing for damage that will cause leakage when the clutch is assembled. Use new parts as required during assembly. If you will be using new friction discs, soak the friction discs in clean transmission oil for at least an hour before assembly. If you are using the old friction discs, make sure that the friction surfaces are coated with transmission oil before assembly.

OIL PUMP

The oil pump has no service parts and should not be disassembled for repair. The front seal can be removed and installed using suitable tools with the pump assembled on the transmission.

Section

6008

REAR AXLE 4 - WHEEL STEER

6008

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WARNING : *This symbol is used in this manual to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

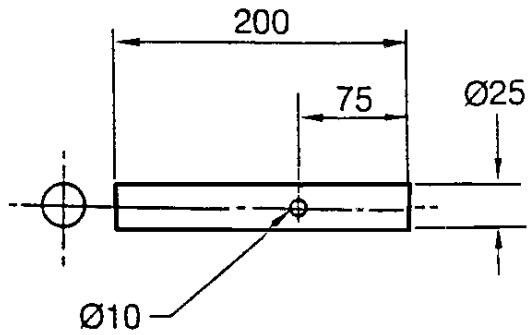
SPECIFICATIONS

Marque	Carraro
Type	26.25FR
	Cast iron beam with centre differential and steering hubs
Differential	Crownwheel oil pinion with differential lock
Hubs	Planetary reduction type with net disc brakes
Drive shafts	Dull floating with double universal joint at the steering pivot point
Toe - in	0 to 3 mm (0 to 0.118 in)
Pre - load of taper roller bearings	Differential and bevel pinion rolling torques are measured by means of a spring balance and cord wound around the groove in the bevel pinion shaft. Cord pull for the bevel pinion bearings alone = 92 to 137 Newtons (21 to 30 lbf). Additional cord pull for the differential = 28.7 to 42.8 Newtons (6 to 10 lbf)
Clearances	Tooth clearance of bevel gear/pinion 0.18 to 0.24 mm (0.007 to 0.009 in)
Special grease	Polymer 400 for sealed kingpin bearings

SPECIAL TORQUES

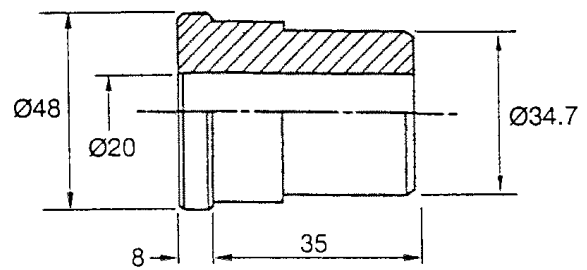
Stud - planetary gear carrier	70 Nm (52 lbf ft)
Hub - countersunk screws	80 Nm (60 lbf ft)
Drain plugs - refill plugs (M22 x 1.5)	40 Nm (30 lbf ft)
Drain plugs - refill plugs (M30)	80 Nm (60 lbf ft)
Screws - steering lock adjust	120 Nm (88 lbf ft)
Bolts - ring gear carrier to steering knuckle	235 Nm (173 lbf ft)
Bolts - Kingpin caps	300 Nm (220 lbf ft)
Bolts - differential bearing caps	226 Nm (167 lbf ft)
Screws - differential ring-nut, lock plate	13 Nm (10 lbf ft)
Bolts - differential to axle case	169 Nm (125 lbf ft)
Bolts - bevel gear to differential case, fit with Loctite 270	78 Nm (58 lbf ft)
Bolts - pinion shaft cover	12 Nm (9 lbf ft)
Nuts - track rod ball joint	135 Nm (100 lbf ft)
Nuts - track rod clamps	70 Nm (52 lbf ft)
Nuts - wheel disc to hub	300 Nm (220 lbf ft)
Bolts - piston (M6)	10 Nm (7.5 lbf ft)
Bleed screw	10 Nm (7.5 lbf ft)
Stud - wheel nut	70 Nm (52 lbf ft)
Bolts - piston hub	235 Nm (173 lbf ft)

SPECIAL TOOLS



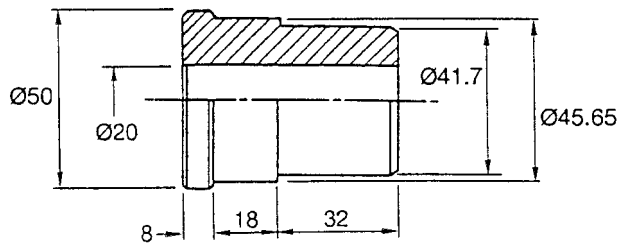
FS17 #1 Measuring bar

CS98G566



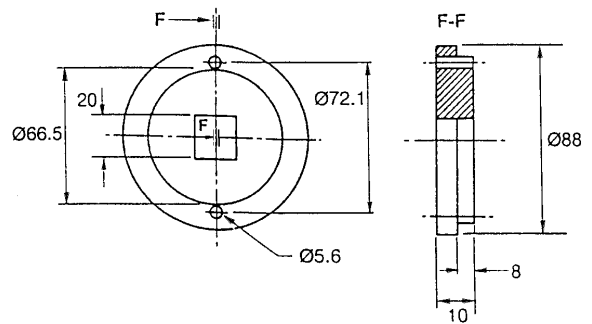
FS17 #4 Mandrel for drive shaft bush - hub side

CS98G568



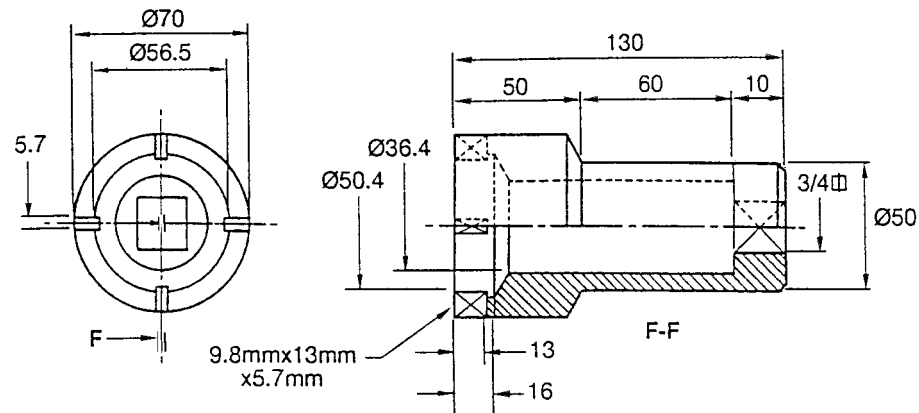
FS17 #3 Mandrel for drive shaft bush - axle housing side

CS98G567



FS17 #5 Wrench for differential ring nuts

CS98G569



CS98G570

- FS17 $\neq$ 2 Wrench for input shaft ring nut.
- 2 Straight edges.
- Ball joint separator.
- Hub lifting bracket.
- Dial gauge with magnetic stand.
- Spring balance and cord.
- Protractor.
- Sealactic 732 liquid gasket.

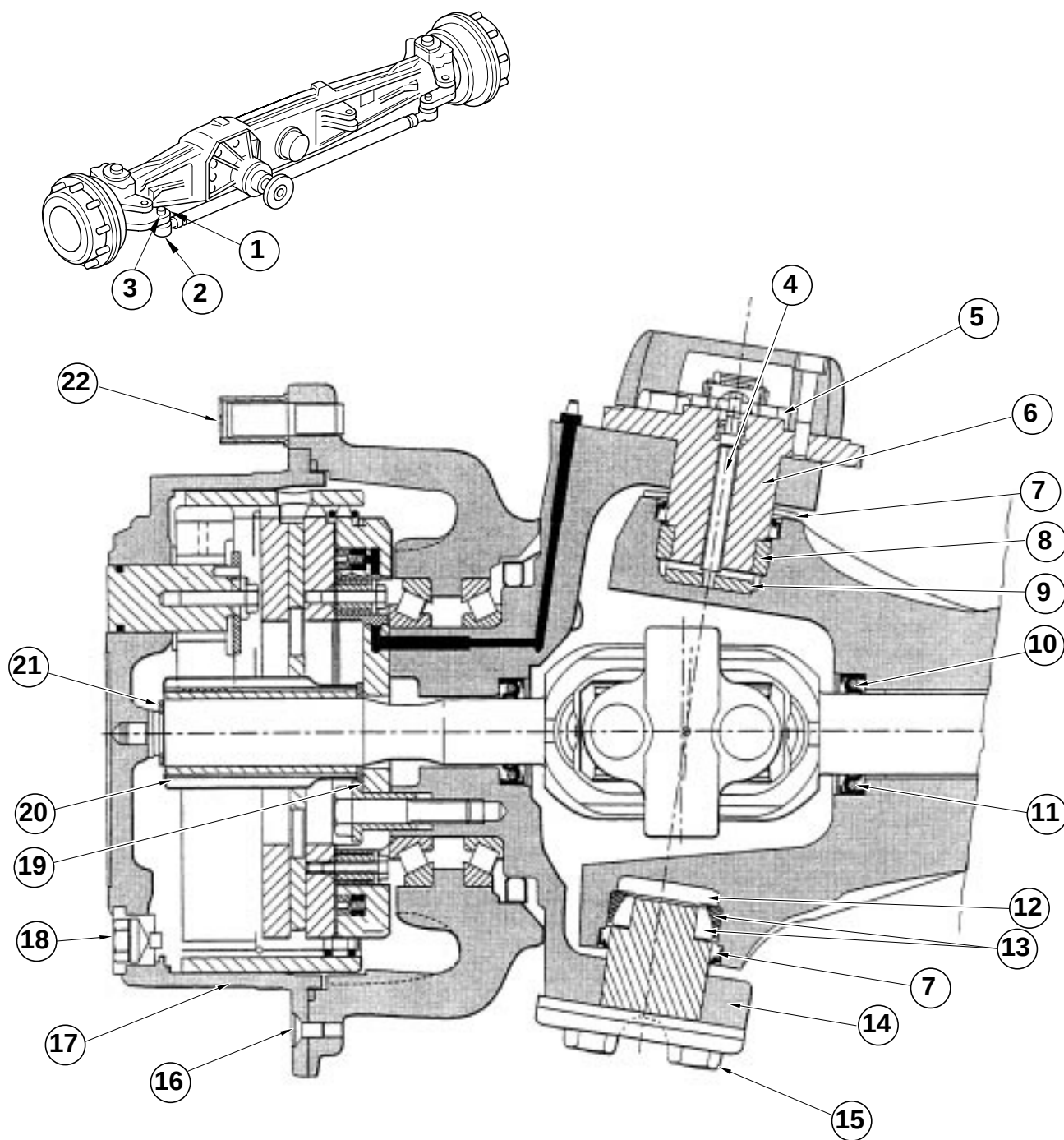
Introduction

On 4-wheel steer machines, the axle has a cast steel centre beam with a four pinion differential and steering stub axles mounted on pivot bearings. The differential has a hydraulically operated lock. Power is transmitted to the hub reduction units by drive shafts which have double universal joints at the steering pivot point. A wet disc brake is fitted in each hub as part of the hub reduction drive unit.

A double acting hydraulic steering cylinder is mounted on the right of the axle to control rear wheel steering, with a tie rod transferring movement between the hubs.

FINAL DRIVE HUB

Removal





WARNING : *If the right rear hub is removed it is essential to engage the differential lock and wedge the pedal down to maintain engagement. Failure to do this will allow the differential lock components to fall into the axle housing and will require that the opposite hub and differential assembly be removed to retrieve and assemble the components.*



WARNING : *The kingpins are sealed for life. Maintain absolute cleanliness during assembly.*



WARNING : *Polymer 400 lubricant must be used to avoid premature wear and/or seizure of the kingpin bearings.*

Remove a final drive hub as follows :

STEP 1

Raise the machine on the loader bucket and backhoe stabilizers. Support the machine under the backframe with suitable heavy duty stands.

STEP 2

Stop the engine.

STEP 3

Remove the rear wheels.

STEP 4

Drain the oil from the hub and the brake system.

STEP 5

Remove the steering potentiometer.

STEP 6

Tie the cap and the wiring back to the axle housing to prevent damage.

STEP 7

Remove the nuts (3) from the track rod ball joint (2).

STEP 8

Use a ball-joint separator to remove the track rod from the steering knuckle (1).

STEP 9

Remove the two flanged wheel studs (22).

NOTE : *Install two wheel nuts on each stud and then turn the inner nuts to remove the studs.*

STEP 10

Remove the two screws (16) from the wheel mounting flange (17) and the planetary carrier.

STEP 11

Prise off the wheel mounting flange (17).

STEP 12

Position the filler plug (18) at top dead centre and remove the filler plug.

STEP 13

Remove the bleed nipple from the inner reaction plate.

STEP 14

Remove the circlip (21) from the sun gear (20).

STEP 15

Remove the sun gear (20) and the thrust washer (19).

NOTE : *This prevents removal of the drive shaft when the hub is removed.*

STEP 16

Attach a lifting bracket to the wheel mounting flange on the hub. Attach a suitable lifting sling to the hub and use a hoist to take the weight of the complete hub assembly.

STEP 17

Release the four bolts (5) and (15) from the top and the bottom kingpin (6) and (14).

STEP 18

Prise out the top kingpin (6) and remove it along with the potentiometer drive shaft (4).

STEP 19

Remove the disc springs (7).

STEP 20

Prise out the bottom kingpin (14) and carefully move the hub away from the axle, guiding the drive shaft through the outer bearing and the seal (10) and (11) to prevent damage to these components.

Installation

NOTE : *Install a final drive hub in the reverse order of the removal but note the following :*

STEP 1

Chill the upper kingpin bush (8) and inner spherical race (13) if new bearings are fitted to axle housing. The inner spherical bearing (13) is a press fit on the kingpin.

STEP 2

Fill the top and bottom kingpin bearings with Polymer 400 grease.

NOTE : *Torque tighten the lower kingpin (14) and the bolts (15) to 300 Nm (221 lbf ft).*

STEP 3

Install a new O-ring on the potentiometer drive shaft (4).

NOTE : *Torque tighten the bolts (5) to 300 Nm (221 lbf ft).*

NOTE : *Torque tighten the screws (16) to 80 Nm (60 lbf ft).*

NOTE : *Torque tighten the flanged wheel studs to 70 Nm (50 lbf ft).*

STEP 4

Fill the hub with oil (see page 19).

STEP 5

Purge the air from the brake system.

Disassembling

Disassemble the hub as follows :

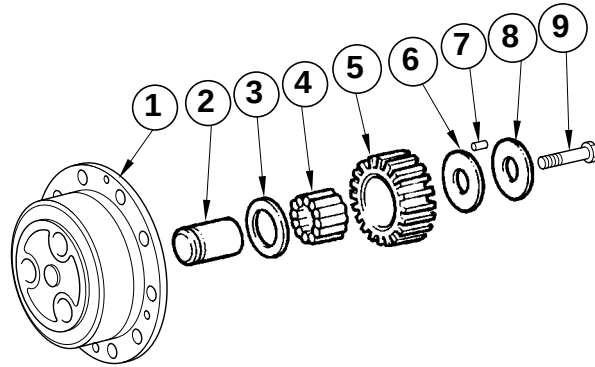
STEP 1

Only do step 2 if the hub bush or seal are to be replaced.

STEP 2

Remove the hub (see page 7).

STEP 3



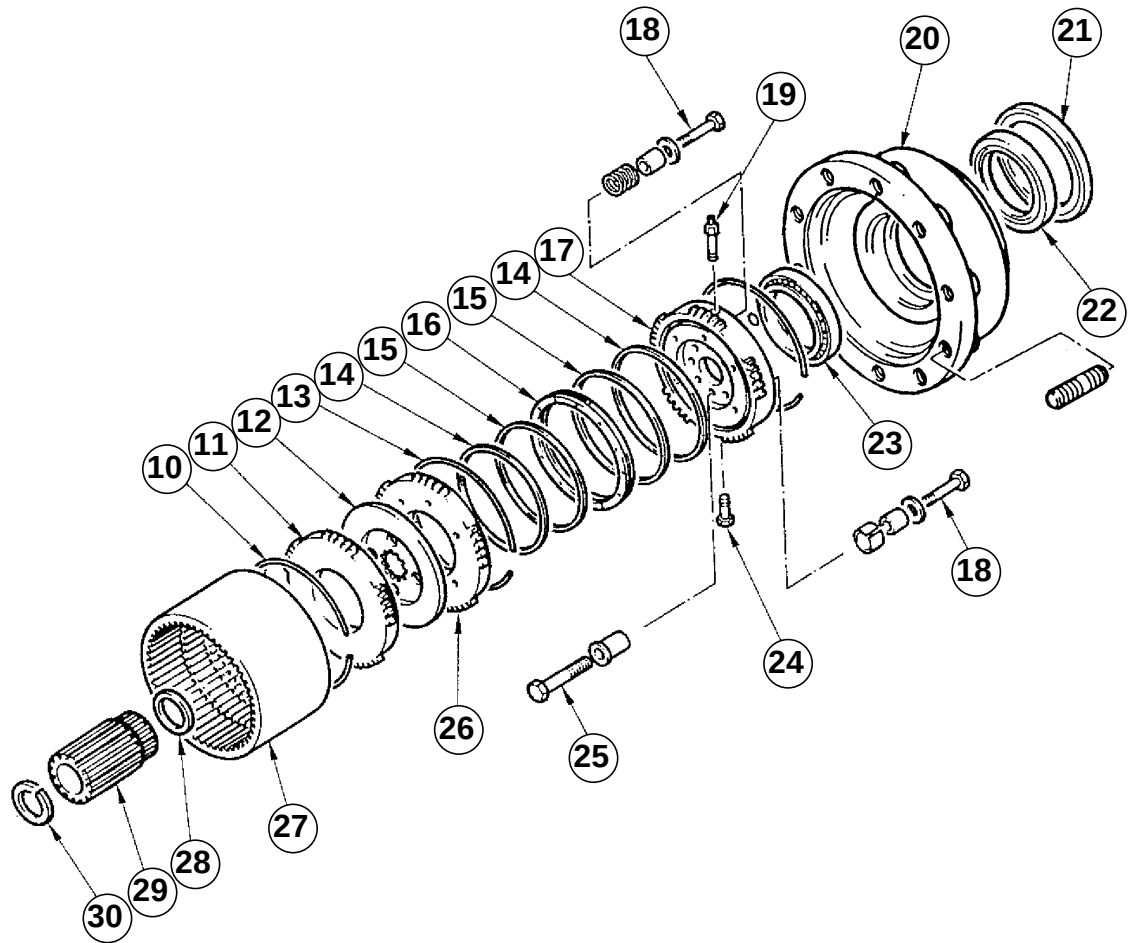
789M402A

Remove the screws (9) which hold the planetary pinion shaft thrust washers (6) and (8) and remove the washers and the pin (7).

STEP 4

Remove the planetary pinions (2) and thrust washers (3). The pinions contain 28 uncaged needle roller bearings (4).

NOTE : *The shaft (2) is a press fit in the carrier (1) and should not move when the gear is removed.*

STEP 5

CS98G571

Remove the large circlip (10) from within the ring gear (27).

STEP 6

Remove the outer reaction plate (11).

STEP 7

Only do steps 8 if step 2 was not carried out.

STEP 8

Remove the bronze friction disc (12).

STEP 9

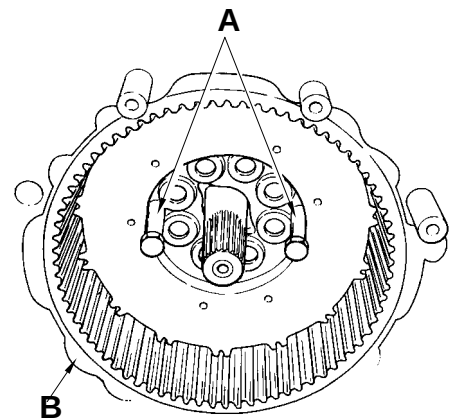
Remove the small circlip (30) and the short, splined shaft (29).

STEP 10

Remove the thrust washer (28).

STEP 11

Remove all eight bolts (25).

STEP 12

789M404A

Install two M10 screws (A) in the tapped holes in the ring gear and carefully jack off the ring gear and inner reaction plate assembly. The inner reaction plate is held by the eight tube dowels, and the jacking process must be done evenly.

STEP 13

Remove the ring gear (27) and inner reaction plate assembly (26).

STEP 14

Only do step 15 if step 2 was not carried out.

STEP 15

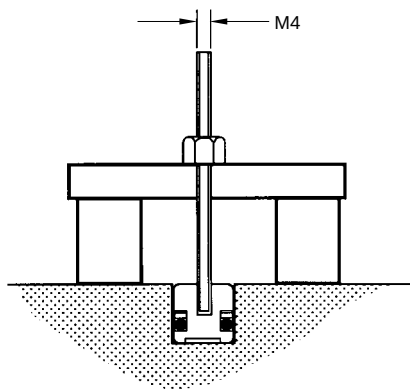
Remove the tube/bleed screw (19) and drain plug (24).

STEP 16

Remove the six bolts (18) from the piston hub assembly (17) and lift off the inner reaction plate (26).

STEP 17

Remove the large circlip (13) from the ring gear (27) and slide out the piston hub assembly (17).

STEP 18

789M405A

Make two M4 studs and small bridge pieces as shown, to remove the piston from the hub. Great care will be needed during this operation as the annular piston will tend to jam, if it is pulled unevenly.

STEP 19

Note the relative positions of the seals (14) the backup rings (15) and piston (16) in both the outer and inner tracks before removing the assembly.

STEP 20

Pull the wheel hub (20) off the steering knuckle. This will be tight as the inner race of the outer taper roller bearing will be removed along with the hub.

STEP 21

Remove the seal (21).

STEP 22

Remove the inner race of the bearing from the steering knuckle.

STEP 23

Remove both external bearing races (22) and (23) from the hub (20).

Inspection

Inspect the final drive hub as follows :

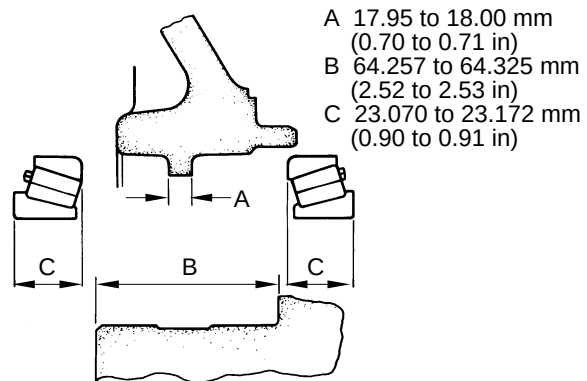
The brake friction discs have a new thickness of 9.90 to 10.10 mm (0.390 to 0.398 in) and must be replaced when worn to 8 mm (0.315 in) thickness.

Assembling

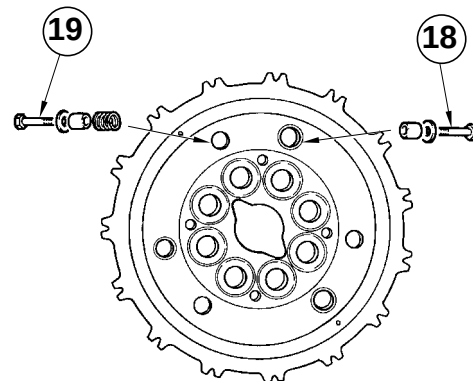
Assemble a final drive hub in the reverse order of the disassembly but note the following :

STEP 1

The special arrangement of taper bearings do not require a specific pre-load setting due to the machining tolerances. However it is advisable to check that the dimensions shown are correct before starting assembly of the hub.



789M406A

STEP 2

789M407A

Torque tighten the bolts (18) to 10 Nm (7.4 lbf ft).

NOTE : The bolts (18) have washers, bushes and springs assembled in specific order and in specific positions in the hub as illustrated.

STEP 3

Torque tighten the bolts (25) to 235 Nm (173 lbf ft).

STEP 4

Install new O-ring seals throughout.

STEP 5

Torque tighten the drain plug (24) and the bleed screw (19) to 10 Nm (7.4 lbf ft).

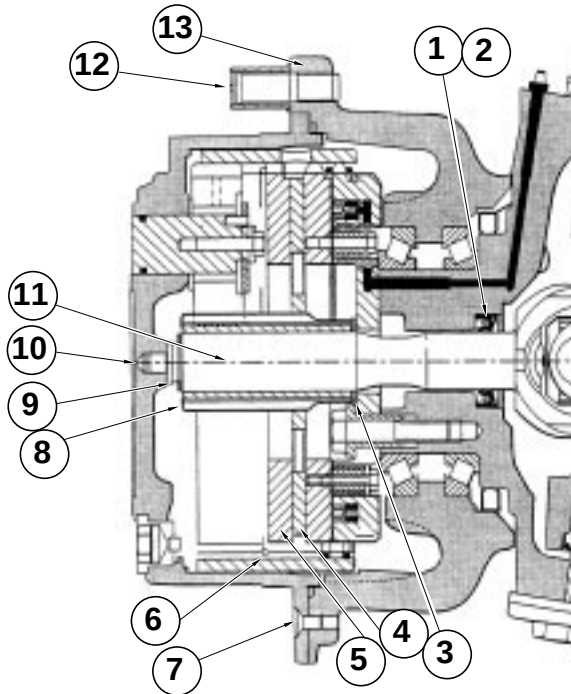
DRIVE SHAFT

Removal

STEP 1

Remove the hub assembly (see page 7).

STEP 2



Remove both countersunk screws (7).

STEP 3

Remove both flanged wheel studs (12).

STEP 4

Remove the carrier (13).

STEP 5

Remove the circlip (9).

STEP 6

Remove the sun gear (8) and the thrust washer (3).

STEP 7

Remove the large circlip (6).

789M408A

STEP 8

Remove the outer reaction plate (5).

STEP 9

Remove the brake disc (4).

STEP 10

Pull the drive shaft (11) from the hub.

Inspection

STEP 1

Inspect the seal (1) and the bush (2) for wear. If there are signs of wear or damage always replace these items.

STEP 2

Inspect the thrust pad (10) and the washer (8) for wear and replace if necessary.

STEP 3

Check the condition of the brake disc (4) which must be replaced when worn to 8 mm (0.3 in) thick.

Installation

Install the drive shaft in the reverse order of the removal but note the following :

STEP 1

Make sure the mating faces of the hub and the planetary carrier (13) are thoroughly clean.

STEP 2

Before installation coat the planetary carrier (13) mating face with Sealastic 732 liquid gasket.

STEP 3

Torque tighten the countersunk screws (7) to 80 Nm (60 lbf ft).

NOTE : *Torque tighten the countersunk screws (7) before the studs (12) or they may not align with the planetary carrier (13).*

STEP 4

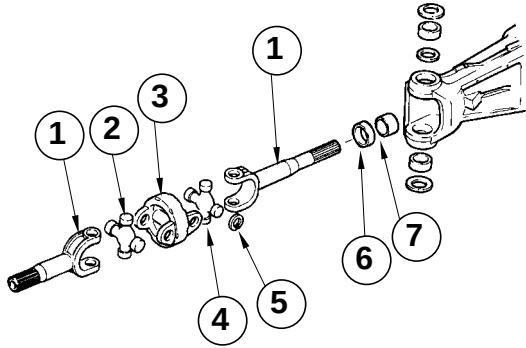
Torque tighten the studs (12) to 70 Nm (50 lbf ft).

Disassembling

STEP 1

Remove the drive shaft (see page 12).

STEP 2



789M409A

Remove the dust seal and oil seal (6) from both the axle housing and hub.

STEP 3

Use a general purpose puller to extract the bushes (7) from the axle and hub.

STEP 4

Remove the circlip (5) from each of the four bearings on one spider (2).

STEP 5

Remove two bearing caps (4) and disengage the spider from the drive shaft (1).

STEP 6

Remove the remaining two caps (4) and disengage the spider (2) from the link (3).

STEP 7

Carry out steps 4, through 6 to disassemble the other spider.

Assembling

Assemble the drive shaft in the reverse order of the disassembly but note the following :

STEP 1

Remove all the bearing caps (4) from a spider (2). Fill the caps with grease to retain the needle roller bearings.

STEP 2

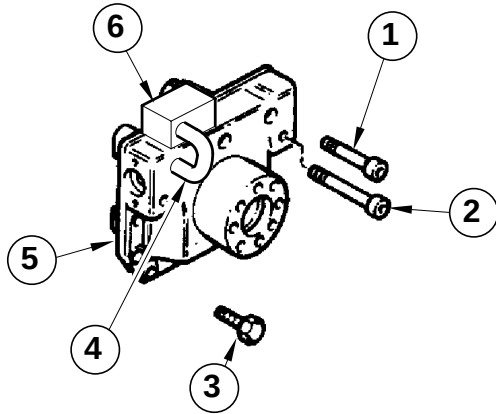
Use the drifts FS17 ≠ 3 and FS17 ≠ 4 to assemble the dust seals (6) and the bushes in the axle and hub.

DIFFERENTIAL UNIT

Disassembling

STEP 1

Remove the final drive hubs and the final drive shaft (see page 7 and page 12).



789M410A

STEP 2

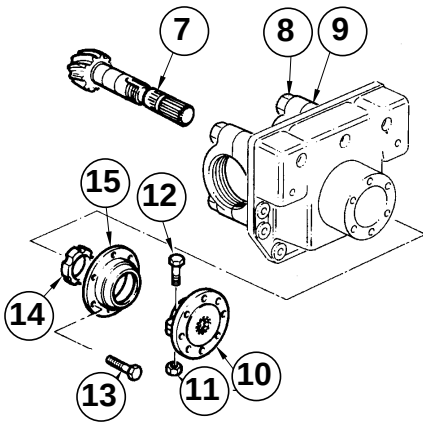
Disconnect the pipe (4) at the unions on the differential carrier (5) and differential valve (6).

STEP 3

Remove the three capscrews (1) and seven bolts (2) and (3) from the differential carrier (5).

STEP 4

Remove the differential carrier (5).



789M411A

STEP 5

Remove the nut (11) and the bolt (12) in the drive coupling (10), and remove the coupling (10).

STEP 6

Remove the screws (13) from the pinion shaft end cover (15).

STEP 7

Remove the end cover (15).

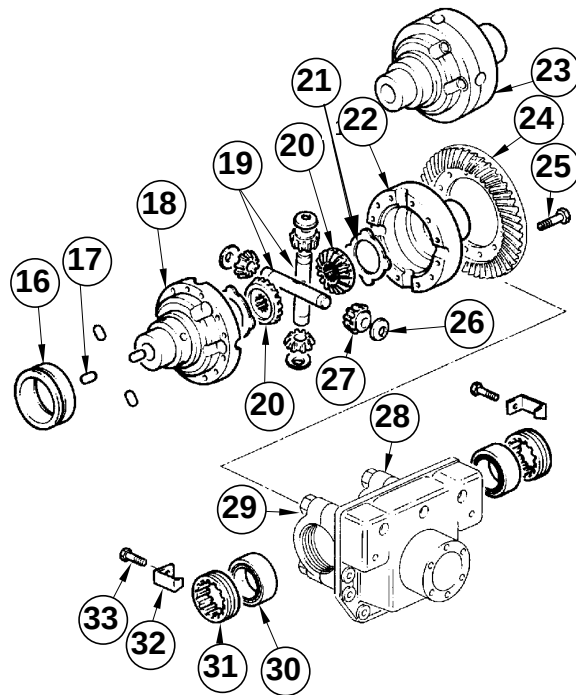
STEP 8

Release the staked lip on the ring-nut (14) and remove it from the pinion shaft. Use a soft metal wedge to lock the crownwheel and pinion.

STEP 9

Mark the differential bearing caps (8) and carrier (9) to aid assembly.

STEP 10



789M412A

Remove the bolts (33) and the lock-plate (32) from each bearing cap (28).

STEP 11

Unscrew the ring nuts (31) from either side of the carrier (5).

STEP 12

Remove the four bolts (29) and both bearing caps (28).

STEP 13

Lift the differential and the crownwheel unit out of the carrier (5).

STEP 14

Pull the bearings (30) out of the differential case.

STEP 15

Mark both halves of the differential case to ensure correct assembly.

STEP 16

Remove the bolts (25) which fasten the crownwheel (9) and differential case halves (18) and (22) together.

STEP 17

Stand the differential case on a bearing spigot with the crownwheel side uppermost.

STEP 18

Remove the top half of the differential case.

STEP 19

Remove the side gear (20) and thrust washer (21).

STEP 20

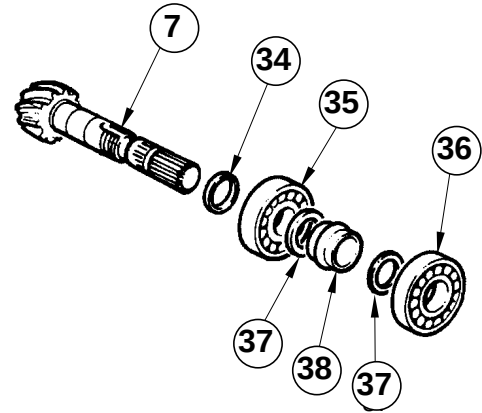
Lift out both pinion shafts (19) complete with pinions (27) and the spherical thrust washers (26).

STEP 21

Remove the remaining side gear (20) and thrust washer (21).

STEP 22

Remove the differential lock sleeve (16) and pins (17) from the differential case half (18).

STEP 23

Push the pinion shaft (19) through the bearing (35) and remove the bearing (35), the collapsible spacer (38) and the shims (34) and (37).

STEP 24

Pull the bearing outer races (36) from the differential carrier (5).

Inspection

1. Inspect all bearings for spalling or other wear, if any is found the bearing must be replaced.
2. Check the tooth contact areas on both the crownwheel and pinion, which should have a smooth polished appearance. If the surfaces are pitted or scuffed, check the quality and grade of oil used.

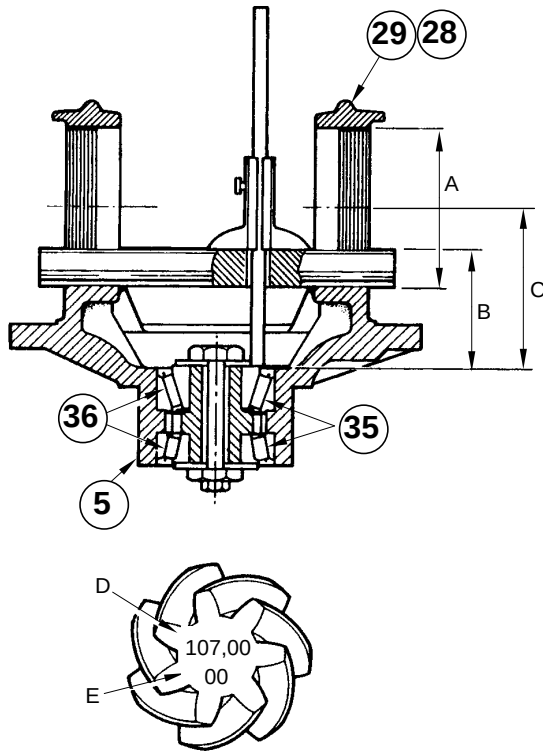
Assembling

NOTE : *The assembly of the differential unit comprises the following sub-tasks :*

- Setting the pinion bevel mesh.
- Setting the pinion bevel pre-load.
- Assembling the differential unit.
- Setting the crownwheel and pinion backlash.
- Setting the differential carrier bearing pre-load.
- Installing the differential unit.

Set the pinion bevel mesh as follows :

STEP 1



789M414

Fit both pinion bearing outer races (36) into the differential carrier (5).

STEP 2

Fit both differential bearing caps (28) and torque tighten the bolts (29) to 266 Nm (196 lbf ft).

STEP 3

Fit the pinion bearing inner races (35).

STEP 4

Fit a bolt and nut, with large washers (4) through the pinion bearings (35) and (36) and tighten until the bearing cones are hard to turn by hand. Do not over tighten or the bearings will be damaged.

STEP 5

Measure the diameter of the bore "A" and note the size.

STEP 6

Measure the diameter of the measuring bar tool no. FS17 $\neq$ 1, then lay it across the differential carrier bearing bores and insert the depth gauge through the hole in the shaft.

STEP 7

Measure distance between the top of the shaft and the face of the pinion bearing inner race (35) (Dimension B).

STEP 8

To find distance "C" calculate the measurements as follows (in mm) :

$C = B \text{ minus diameter of bar FS17 } \neq 1 \text{ plus } A/2.$

STEP 9

To find the amount of shims (34) required ; the number "D" (in mm) etched on the pinions must be subtracted from dimension C.

Shim thickness required = C minus D.

D = bevel pinion protrusion dimension

E = pinion mating number

Shim rings are available in the thickness shown in the table.

mm	in	mm	in
2.50	(0.0984)	3.00	(0.1181)
2.60	(0.1024)	3.10	(0.1221)
2.70	(0.1063)	3.20	(0.1260)
2.80	(0.1102)	3.30	(0.1300)
2.90	(0.1142)	3.40	(0.1340)

STEP 10

Remove the clamp bolt and washers.

STEP 11

Fit the correct shim ring (34) on the pinion shaft (7) but ensure the largest internal chamfer is towards the pinion gear.

STEP 12

Press the inner bearing race (35) onto the pinion shaft (7).

Set the bevel pinion bearing pre-load as follows :

STEP 1

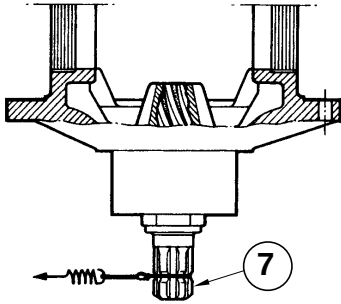
Insert the bevel pinion (7) into the differential carrier (5) and fit a new collapsible spacer (38) with a new ring (37) each side of it.

STEP 2

Fit the second bearing inner race (36).

STEP 3

Fit the tab washer and a new ring-nut (14).

STEP 4

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Secure the carrier (5) in a vice and wind a thin cord around the groove in the pinion shaft (7). Attach a spring balance to the cord.

STEP 5

Tighten the pinion ring-nut (14) gradually, until the spring balance shows that a sustained pull of between 92 to 137 Newtons (21 to 30 lbf) is required to turn the pinion shaft continuously.

STEP 6

Stake the flange of the ring-nut (14) into the groove on the pinion shaft (7).

Assemble the differential as follows :

STEP 1

Stand the differential case (22) (crownwheel side) on its carrier bearing spigot, and install the thrust ring (21) and the side gear (20).

STEP 2

Assemble the four pinions (27) and thrust washers (26) to their shafts (19) and put them into the differential case (22).

STEP 3

Turn the differential case (22) onto its bearing spigot and install the thrust washer (21) and side gear (20). While holding the ends of the appropriate pinion shaft, turn differential case (18) over and lay it onto case (22) aligning the marks on both cases.

STEP 4

Remove the grease from the threads of the bolts (25) and those in the differential case (18). Install the crownwheel (24). Apply Loctite 270 on the bolt threads. Insert the bolts (25) and torque tighten to 78 Nm (57 lbf ft).

STEP 5

Fit the carrier bearings (30) onto differential case spigots.

STEP 6

Remove the bearing caps (28) from the differential carrier (5).

STEP 7

Put the outer races onto the carrier bearings and lower the differential assembly into the carrier (5).

STEP 8

Install bearing caps (28) and the bolts (29). Install the ring nuts (31) and adjust them to make sure that there is clearance between the crownwheel (24) and the pinion. Torque tighten the bearing cap bolts (29) to 266 Nm (196 lbf ft).



WARNING : *If there is no clearance between crownwheel and pinion, damage will occur when the bearing cap bolts are tightened.*

NOTE : *Do not assemble the ring nut lock plates (32) and the bolts (33) until the differential clearance settings are completed.*

Set the crownwheel and pinion backlash as follows :

STEP 1

The correct backlash between crownwheel (24) and pinion is 0.18 to 0.24 mm (0.007 to 0.009 in). Adjustment is made by turning the ring nuts (31) to move the differential assembly into or out of mesh with the pinion. the ring nuts (31) can be difficult to turn. To release the nuts, slacken the bearing cap bolts (29) a small amount. Do not slacken them more than necessary.

STEP 2

Use wrench FS17 $\neq$ 5 to turn the ring nut (31) on the crownwheel side in a clockwise direction until the crownwheel (24) and pinion are in close mesh. Tap the bearing cap (28) with a soft face hammer to aid movement of the ring nut (31) and bearing alignment.

STEP 3

Use wrench FS17 $\neq$ 5 to turn the other ring nut (31) in a clockwise direction until all bearing clearance has been removed. This position is obvious as the ring nut (31) will become very difficult to move.

STEP 4

Position a dial gauge (2) in contact with and at 90° to, a tooth on the crownwheel (24).

STEP 5

Push the crownwheel (24) into and out of mesh with the pinion to check the amount of backlash. Rotate the crownwheel (24), and note the readings obtained at different positions. If the backlash is different, position the dial gauge on the tooth which has the smallest reading to make the final adjustment.

STEP 6

To make the final adjustment move the crownwheel (24) into or out of mesh with the pinion by turning each ring nut (31) an equal amount. Continue until the dial gauge shows a backlash of 0.18 to 0.24 mm (0.007 to 0.009 in).

Set the differential carrier bearing pre-load as follows :

When the backlash is adjusted it is necessary to pre-load the bearings.

NOTE : *It is essential not to disturb other adjustments, so pre-load is achieved by moving both ring nuts (31) a specific amount.*

STEP 1

Wrap a cord around the groove in the spiral bevel pinion shaft, attach a spring balance to the cord. Measure the pull required to keep the pinion shaft and differential turning. Note the measurement.

STEP 2

Tighten each ring nut (31) by an equal amount start with 1/2 turn.

STEP 3

Measure the line pull again.

STEP 4

Continue to adjust the ring nuts (31) until a line pull 121 to 180 Newtons (27 to 40 lbf) turns the pinion continuously.

STEP 5

Fit lock plates (32) and bolts (33) to prevent the ring nuts (31) moving. Torque tighten the bolts (33) to 10 Nm (7 lbf ft).

STEP 6

Torque tighten the carrier bearing cap bolts (29) to 266 Nm (196 lbf ft).

STEP 7

Check the crownwheel backlash again.

Install the differential unit as follows :

STEP 1

Install a new seal in the pinion shaft cover (15).

STEP 2

Remove the grease from the mating surfaces of the differential carrier (5) and cover (15). Apply Sealastic 732 liquid gasket and fit the cover. Torque tighten bolts (13) to 12 Nm (9 lbf ft).

STEP 3

Clean mating surfaces on axle housing and differential carrier (5).

STEP 4

Apply Sealastic 732 liquid gasket to one surface and install the differential assembly into axle housing.

STEP 5

Tighten the seven bolts (2) and the three capscrews (1) to 169 Nm (125 lbf ft).

STEP 6

Connect the hydraulic pipe (4) at the unions on the differential lock valve (6) and differential carrier (5).

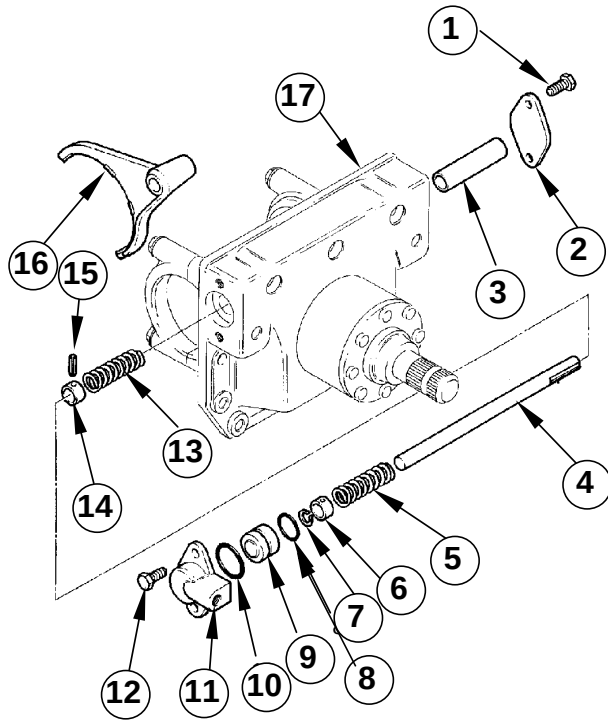
STEP 7

Install the final drive hub and drive shafts (see page 7 and 12).

DIFFERENTIAL LOCK

Disassembling

STEP 1



789M472A

Remove the differential unit (see page 14).

STEP 2

Remove the two screws (12) and the hydraulic cylinder (11).

STEP 3

Remove and discard the O-ring seal (10).

STEP 4

Remove the two screws (1) and the flange (2).

STEP 5

Push the shaft (4) towards the cylinder end and remove the circlip (7), the ring (6) and the spring (5).

NOTE : *Shaft movement will be limited by the stroke of the fork (16) in the differential lock sleeve on the differential.*

STEP 6

Push the shaft (4) away from the cylinder end and remove the bush (3) and the spring (13). The ring (14) will be held on the shaft (4) by the pin (15). Withdraw the shaft (4) completely from the fork (16).

STEP 7

Rotate the fork (16) around the differential lock sleeve and remove.

STEP 8

Remove the piston (9) from the cylinder (11).

STEP 9

Remove and discard the O-ring seal (8) from the piston (9).

Assembling

Assemble the differential lock in the reverse order of the assembly but note the following :

STEP 1

Install a new O-ring seal (8) on piston (9).

STEP 2

Lubricate the piston (9) with hydraulic oil before installation in the cylinder (11).

STEP 3

Install a new O-ring seal (10) in the hydraulic cylinder (11).

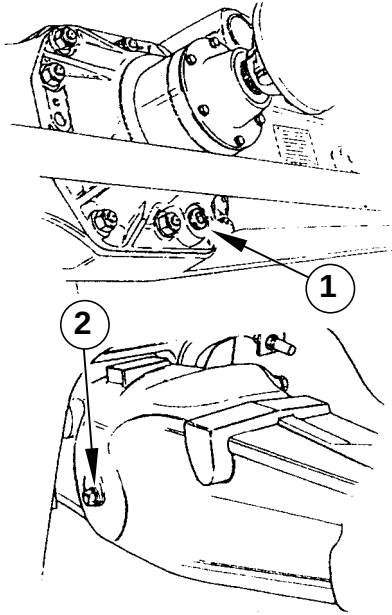
STEP 4

Clean the mating faces for the differential carrier (17) and the flange (2) and apply a coat of Sealastic 732 liquid gasket to the flange (2).

MAINTENANCE

Checking the rear axle centre housing oil level

STEP 1



Park the machine on level ground and remove the level/filler plug (2). Oil should be up to the level of the hole.

STEP 2

If required, add oil of the correct grade, then install the level/filler plug (2).

Replacing the rear axle centre housing oil

STEP 1

Remove the drain plug (1) and drain out all oil into a suitable container.

STEP 2

Install the drain plug.

STEP 3

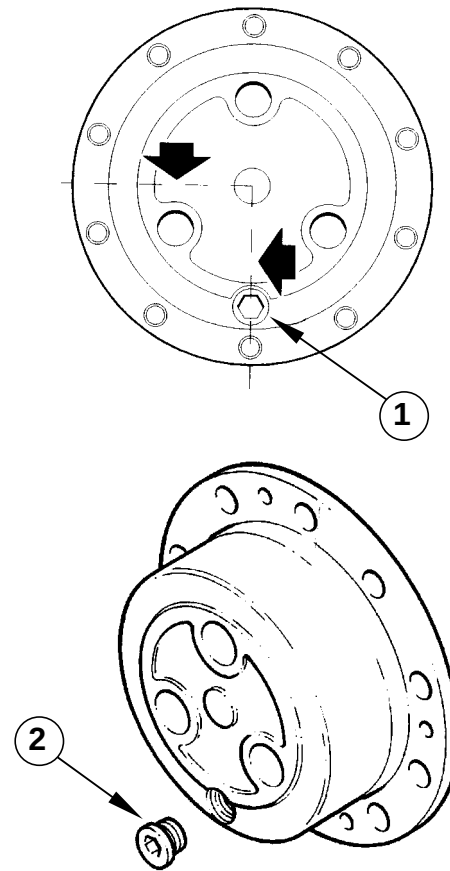
Remove the level plug (2) and add oil until it emerges from the hole.

STEP 4

Install the level plug (2).

Checking the rear axle hub oil level

STEP 1



Rotate the wheel until plug (1) is level with the centreline of the axle.

STEP 2

If required, add oil of the correct grade until it begins to flow out through the plug hole.

STEP 3

Install the plug (1).

Replacing the rear axle hub oil

STEP 1

Rotate the wheel until the plug (1) is at the bottom.

STEP 2

Remove the plug (1) and drain out all oil into a suitable container.

STEP 3

Rotate the wheel until the plug (1) is level with the centreline of the axle.

STEP 4

Fill with correct grade oil until oil begins to leak from the hole.

STEP 5

Install the plug (1).

Checking and adjusting the rear axle toe-in

STEP 1

Drive the machine in a straight line with 4-wheel steer engaged. Select 2-wheel steer and stop the machine without rotating the steering wheel.

STEP 2

Raise the machine on the loader bucket and backhoe stabilizers.

STEP 3

Stop the engine.

STEP 4

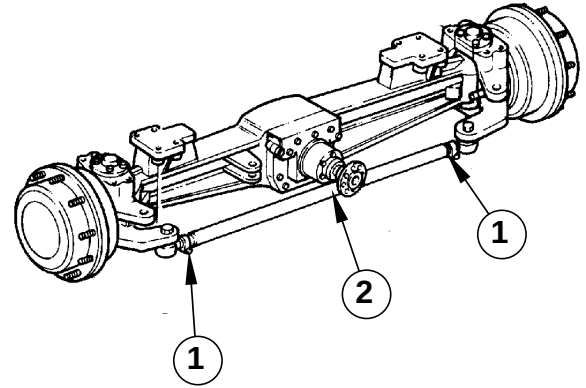
Mark each wheel rim at a point in front of and behind the axle at axle centre height.

STEP 5

Measure the distance between the rims at each mark.

STEP 6

The distance between the marks must be 3 mm (0.118 in) greater at the rear marks.

STEP 7

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To adjust the toe-in release the locknuts (1) at each end of the tie rod (2) and rotate the tie rod to open or close the toe-in.

STEP 8

When the toe-in is correct, tighten the locknuts (1) to 70 Nm (52 lbf ft).

Checking and adjusting the steering lock

STEP 1

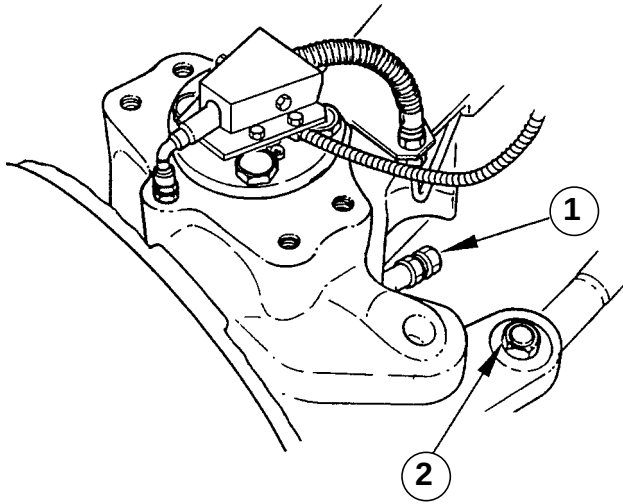
Raise the machine on the loader bucket and the backhoe stabilizers.

STEP 2

Stop the engine.

STEP 3

Remove the wheels.

STEP 4

CS98G572

Remove the nut (2) and release the ball joint with the ball joint separator.

STEP 5

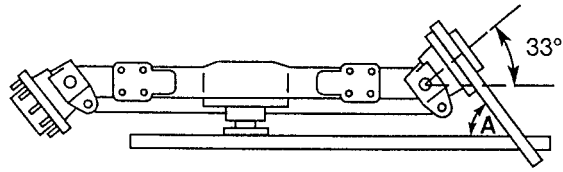
Turn the left hand hub to the maximum left hand steering angle.

STEP 6

Place a long straight edge against the axle input flange and ensure the straight edge is parallel with axle centreline.

STEP 7

Place second straight edge against the wheel hub flange.

STEP 8

CS98G573

Measure angle A at which both straight edges intersect. Subtract angle A from 90° to give steering lock, for example :

Angle A = 57°

Steering angle 90° minus $57^\circ = 33^\circ$

STEP 9

Using the adjusting bolt (1) adjust the left hand stop for maximum left steering lock and right hand stop for maximum right steering lock. The steering angle must not exceed 33°.

STEP 10

Install the wheels.

Section

7000

REMOVAL AND INSTALLATION OF BRAKE COMPONENTS

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MASTER CYLINDER (2-wheel steer machines)

Removal

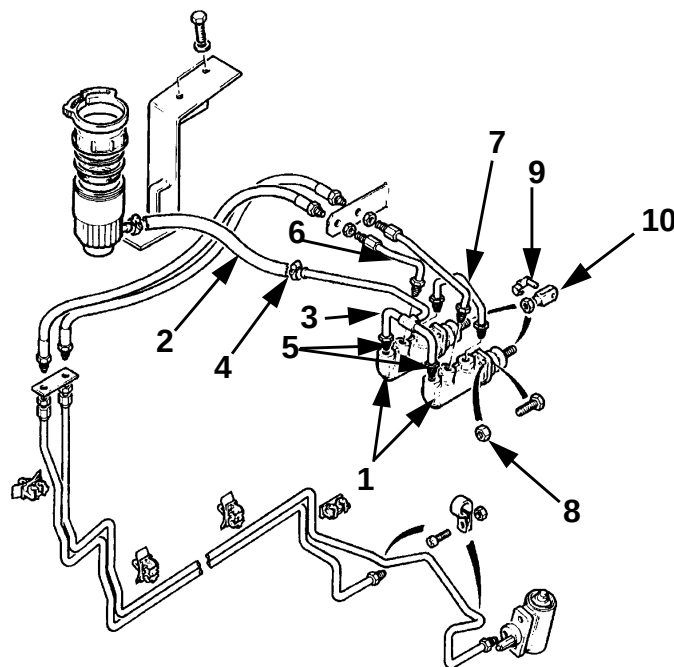
NOTE : There are two master cylinders, connected by a balance tube and compensator valves. Removal of one master cylinder is described here.

1. Park the machine on a level surface. Raise the loader and lock the support strut to hold the loader. Place blocks under the rear wheels and stop the engine.
2. Open the hood.
3. Inside the cab, remove the trim panels from around the brake pedals to access the brake master cylinders (1).
4. Remove the clevis pin (9) that fastens the clevis (10) on to the master cylinder (1) to the brake pedal.
5. Clamp the flexible hose (2) between the brake reservoir and the inlet pipe assembly (3).
6. Release the hose clip (4) and pull the flexible hose (2) from the inlet pipe assembly (3).
7. Disconnect the inlet unions (5) from BOTH master cylinders (1).
8. Remove the inlet pipe assembly (3).
9. Disconnect the pipe (6) from the pressure port of the master cylinder (1) to be removed.
10. Disconnect the balance pipe (7) from BOTH master cylinders (1).
11. Remove the 2 nyloc nuts (8) and the master cylinder (1).

Installation

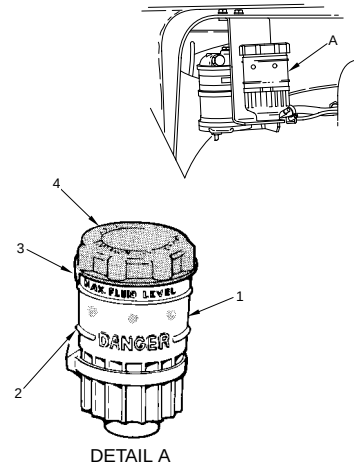
NOTE : The installation of the master cylinder is the reverse of the removal.

1. Set the clearance of the master cylinder push rod, so that when the brake pedal is against its return. Stop the push rod does not pre-load the brake master cylinder.
2. Replenish the brake reservoir with the correct grade of fluid (see section 1002).
3. Adjust the brakes (see page 4).
4. Purge air from the brake system (see page 5).



CHECKING THE BRAKE SYSTEM FLUID LEVEL (2-wheel steer machines)

1. Park the machine on firm level ground.
2. Raise the loader beam to maximum height and fit the safety support.
3. Stop the engine.
4. Open the hood.
5. Check that the fluid level is midway between the marks (2) and (3) moulded on the reservoir.
6. If required, clean the area around the cap (4) and remove the cap.
7. Fill the reservoir to midway between the marks (2) and (3) with suitable brake fluid (see section 1002). Make sure you do not overfill the reservoir (1).



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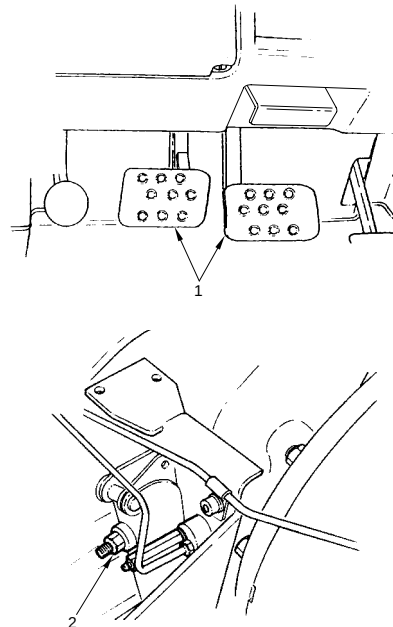
CHECKING AND ADJUSTING THE BRAKES (2-wheel steer machines)

1. Park the machine on a level surface.
2. Lower the bucket until flat on the ground and loader position the shift gear lever to N (neutral) position.
3. Chock both front wheels, and release the parking brake.
4. Use the stabilizers to lift both rear wheels of the ground. Lower machine on to stands or blocks with rear wheels off clear of the ground.
5. Stop the engine.
6. Unlatch both brake pedals (1) and press firmly on each pedal in turn.
13. Use the stabilizers to lower the machine to the ground.
14. Return the stabilizer legs to the fully retracted position.
15. Do a functional test of the brakes before taking the machine on to a public highway.

NOTE : Do steps 7 through 9 if :

- The stroke of either pedal exceeds 90 mm, measured from the centre of one pedal to the centre of the other.
- Either pedal touches the trim panel.

7. Starting on one side, tighten the adjusting nut (2) by hand until the brake just locks the well.
8. Loosen the adjusting nut 1.5 turns. Make sure the well turns freely. Turn the nut clockwise to reduce brake travel and anti-clockwise to increase brake travel.
9. Repeat the procedure on the other wheel.
10. Re-latch the brake pedals.
11. Engage the handbrake.
12. Start the engine, use the stabilizers to lift the machine and remove the stands or blocks.



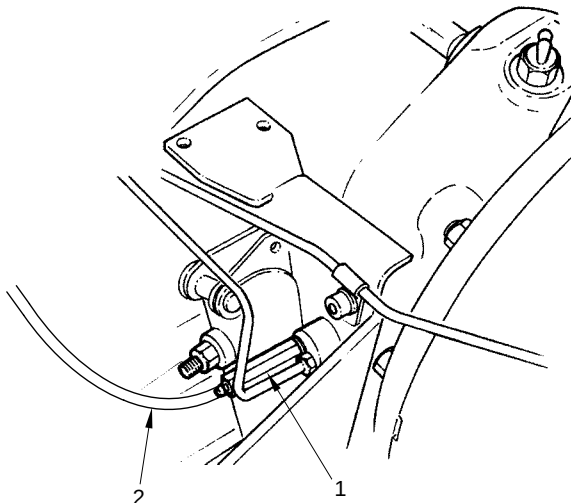
789M325A

PURGE AIR FROM THE BRAKE SYSTEM (2-wheel steer machines)

NOTE : *This machine is equipped with hydraulic brakes which must be purged if any part of the brake system has been disconnected. It is important that this procedure is used to make sure of satisfactory brake operation. The brakes may be purged either manually or by using a pressurized venting kit. the procedure can only be completed by two people.*

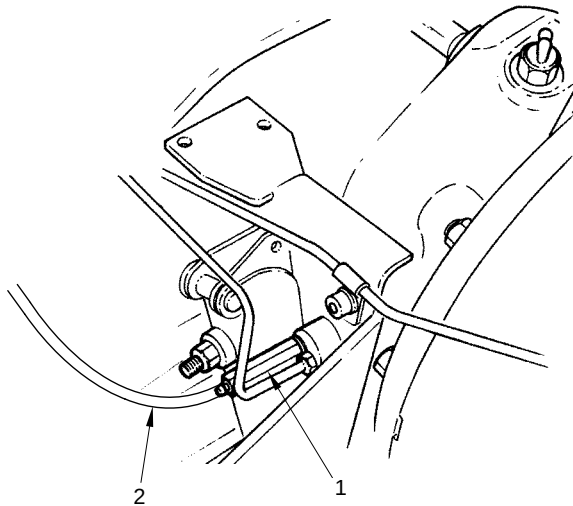
Manual venting

1. Park the machine on flat level ground.
 2. Fully dump the loader bucket and lower it to the ground.
 3. Lower the backhoe stabilizers and raise the rear wheels clear of the ground.
 4. Stop the engine.
 5. Ensure the brakes are adjusted correctly (see page 4).
 6. Check the brake system fluid level (see page 4).
 7. Fit clear plastic tubes (2) to the vent screws (1). Position the other ends of the tubes (2) to drain into suitable containers.
 8. Open the left and the right vent screws (1).
 9. Allow the brake fluid to drain into the containers until an air-free flow of brake fluid is obtained.
- NOTE :** *This operation may be aided by pumping the brake fluid by pressing and releasing the brake pedals. Make sure the brake pedals remain latched together and that the brake fluid in the reservoir remains above the danger mark at all times.*
10. Unlatch the brake pedals and close the left vent screw (1).
 11. Press and release the right brake pedal five times.
 12. Close the right vent screw (1) and open the left vent screw (1).
 13. Depress the left brake pedal 12 to 15 mm and hold it in this position.
 14. Press and release the right brake pedal five times or until an air-free flow of brake fluid is obtained from the left vent screw (1). Close the left vent screw (1).
 15. Operate the left and the right brake pedals. Make sure the operation is firm and not "spongy".
 16. Only do steps 17 through 21 if the operation of the pedals is not yet firm.
 17. Press the left brake pedal.
 18. Open the left vent screw (1) until the flow of brake fluid stops.
 19. Close the left vent screw (1) and release the left brake pedal.
 20. Do steps 17 through 19 until the left brake pedal is firm.
 21. Repeat steps 17 through 20 on the right vent screw (1) and the right brake pedal.
 22. Latch the left and the right brake pedals together.
 23. Remove the plastic tubes (2) and the containers.
 24. Check the brake system fluid level (see page 4).



Venting with pressure kit

1. Park the machine on flat level ground.
2. Fully dump the loader bucket and lower it to the ground.
3. Lower the backhoe stabilizers and raise the rear wheels clear of the ground.
4. Stop the engine.
5. Ensure the brakes are adjusted correctly (see page 4).
6. Check the brake system fluid level (see page 4).
7. Fit the pressure purging kit.
8. Make sure the left vent screw (1) is closed and open the right vent screw (1). Do not operate the brake pedals.
9. Close the right vent screw (1) when the fluid exhausting vent screw is clear and free of entrapped air. Make sure the brake fluid in the reservoir remains above the danger mark at all times.
10. Depress the left brake pedal 12 to 15 mm.
11. Open the left vent screw (1).
12. Close the left vent screw (1) when the fluid exhausting vent screw is clear and free of entrapped air.
13. Operate the left and the right brake pedals. Make sure the operation is firm and not "spongy".
14. Only do step 12 if the operation of the brake pedals is not yet firm.
15. Repeat steps 8 through 14 until the operation of the brake pedals is firm.
16. Latch the left and the right brake pedals together.
17. Remove the plastic tubes (2) and the containers.
18. Check the brake system fluid level (see page 4).



789M297A

MASTER CYLINDER (4-wheel steer machines)

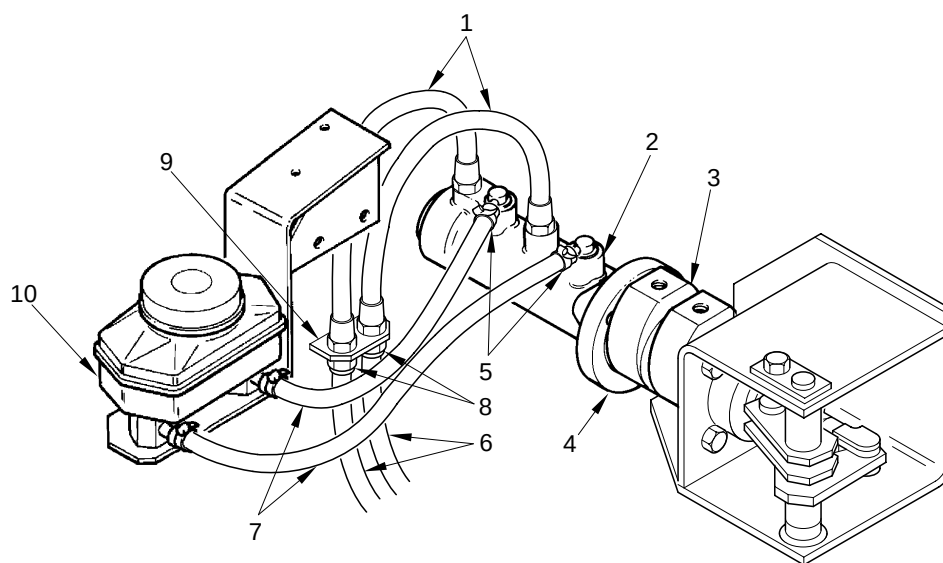
Removal and installation

1. Park the machine on a level surface. Raise the loader and lock the support strut to hold the loader. Stop the engine.
2. Open the hood.
3. Clamp the feed hoses (7) between the reservoir (10) and the master cylinder (2).
4. Loosen the worm drive clips (5) and disconnect the hoses (7) at the master cylinder (2).
5. Disconnect the steel brake pipes (6) at the unions (8) on the bracket (9).
6. Remove the locknuts on the flexible brake pipes (1) and release the pipes from the bracket (9).
7. Remove the three bolts (4) from the master cylinder (2) and remove the cylinder from the booster unit (3).

NOTE : The installation of the master cylinder is the reverse of the removal.

NOTE : After installation, purge the air from the brake system (see page 16).

NOTE : After installation, check the brake system oil level (see page 15).



789M326A

BOOSTER UNIT (4-wheel steer machines)

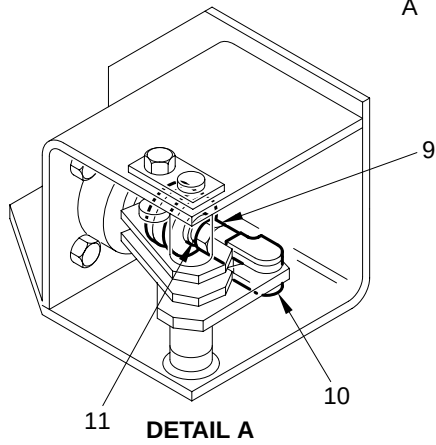
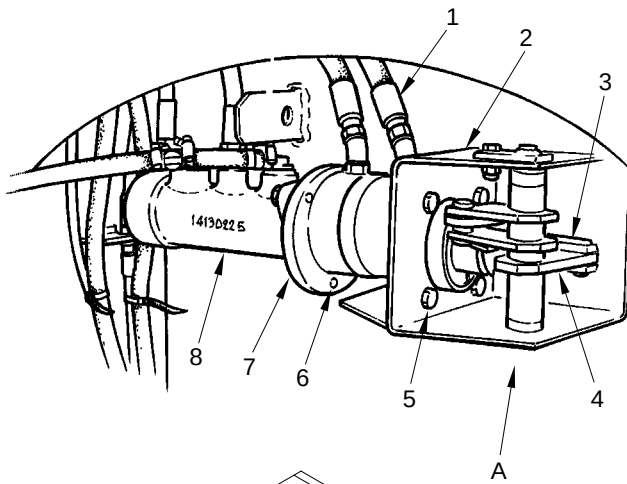
Removal

1. Park the machine on a level surface. Raise the loader and lock the support strut to hold the loader. Place blocks under the rear wells and stop the engine.
2. Open the hood.
3. Release the hydraulic system pressure :
4. Operate the brake pedal to release the brake system hydraulic pressure.
5. Remove the three bolts and washers (6) and disconnect the master cylinder (8) from the brake booster (7).
6. Clamp the two hoses (1) from the brake booster (7).
7. Remove the clevis pin (3) and disconnect the pivot (4) from the brake booster (7).
8. Remove the four bolts (5) and the brake booster (7) from the mounting bracket (2).

Installation

Install the brake booster unit in the reverse order of the removal but note the following :

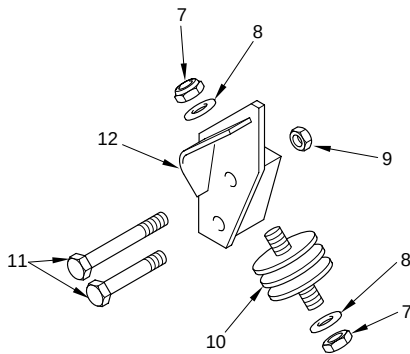
1. When the clevis pin (3) is installed, there must be free movement of 2 to 3 mm between connecting rod (11) and the booster unit piston. If there is no movement or excess movement, release the locknut (9) and adjust the clevis (10). Tighten the locknut (9) and install the clevis pin (3).
2. Safety the clevis pin (3) with a new split pin.
3. After installation, start the engine, check for leakage at the booster unit connections and do steps 4 through 7.
4. Make sure that the brake hydraulic system low oil pressure lamp goes off.
5. Operate the brake pedal to pressurize the brake system.
6. Carry out a functional test of the brake system.
7. Check the hydraulic oil level.



BRAKE SYSTEM PUMP (4-wheel steer machines)

Removal

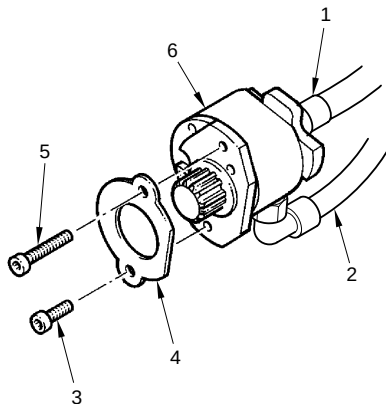
1. Park the machine on firm level ground.
2. Crowd the loader bucket fully and raise the loader beam. Install the safety support.
3. Lower the backhoe stabilizers, DO NOT raise the machine.
4. Stop the engine.
5. Operate the brake pedal to release brake system hydraulic pressure.
6. Open the hood.
7. Put a jack under the engine oil sump and raise it to support the engine, DO NOT lift the engine.
- 8.



789M313A

Remove the two nuts (7) and the washers (8) on the right hand engine mounting (10). Remove the two engine mounting plate bolts (11) and the nuts (9).

9.



789M312A

Disconnect the pump hydraulic suction line (2) and the discharge line (1). Move the engine plate to allow access to the lower pump case cap screws (3). Remove the two pump case cap screws (3) and (5). Remove the pump (6) and gasket (4).

Installation

Install the brake system pump is the reverse of the removal but note the following :

1. Install a new gasket (4).
2. Torque tighten the cap screws (3) and (5) to 40 Nm.
3. Torque tighten the bolts (11) and the nuts (9) to 280 Nm.
4. Torque tighten the nuts (7) to 48 Nm.
5. After installation, start the engine check the pump connections for leaks and do steps 6 through 9.
6. Make sure that the brake system low oil pressure warning lamp goes off.
7. Operate the brake pedal to pressurize the brake system.
8. Carry out a functional test of the brake system.
9. Check the hydraulic oil level.

PRESSURE MAINTAINING VALVE (4-wheel steer machines)

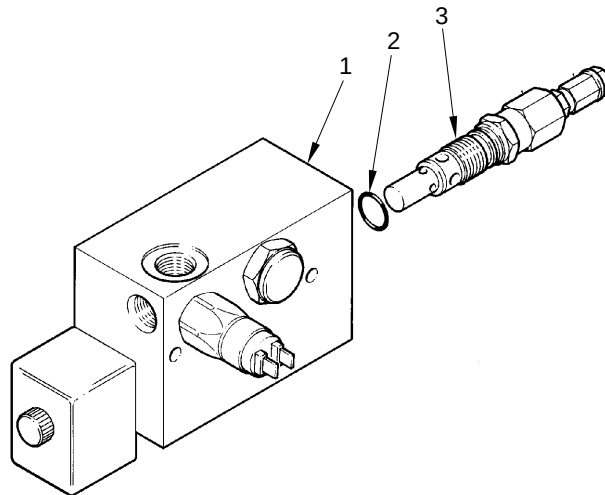
Removal

1. Park the machine on firm level ground.
2. Lower the loader bucket to the ground.
3. Lower the backhoe stabilizers, DO NOT lift the machine.
4. Stop the engine.
5. Operate the brake pedal to release pressure from the brake hydraulic system.
6. Remove the valve (3) from the manifold (1) and discard the O-ring seal (2).

Installation

Install the pressure maintaining valve in the reverse order of the removal but note the following :

1. Install a new O-ring seal (2) on the valve body (3).
2. Torque tighten the valve (3) to 30 Nm.
3. After installation, start the engine, check the valve joint for leakage and do steps 4 through 7.
4. Make sure that the brake hydraulic system low oil pressure warning lamp switches off.
5. Stop the engine.
6. Check the hydraulic oil level.
7. Carry out a functional test of the brake system.



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DIFFERENTIAL LOCK SOLENOID VALVE (4-wheel steer machines)

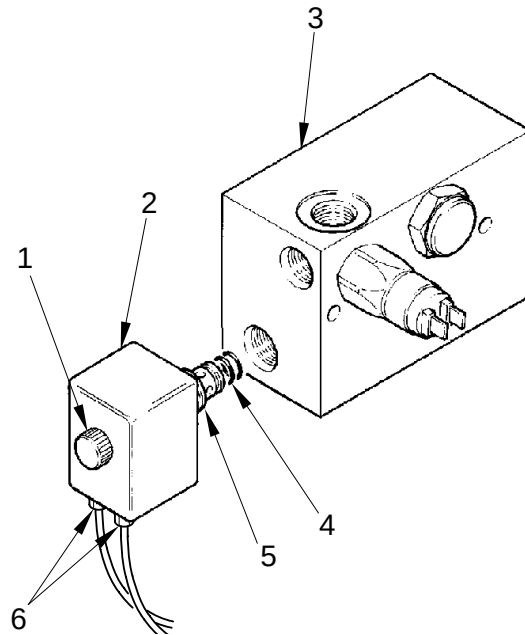
Removal

1. Park the machine on firm level ground.
2. Lower the loader bucket to the ground.
3. Lower the backhoe stabilizers, DO NOT lift the machine.
4. Stop the engine.
5. Operate the brake pedal to release pressure from the brake hydraulic system.
6. Disconnect the electrical connections (6) at the solenoid (2).
7. Remove the screw (1) and the solenoid (2) from the valve (5).
8. Unscrew the valve (5) from the manifold (3) and discard the O-ring seals (4).

Installation

Install the differential lock solenoid valve in the reverse order the removal but note the following :

1. Install the new O-ring seals (4) on the valve body (5).
2. After installation, start the engine, check the valve joint for leakage and do steps 3 through 6.
3. Make sure that the brake hydraulic system low oil pressure warning lamp switches off.
4. Stop the engine.
5. Check the hydraulic oil level.
6. Carry out a functional test of the brake system.



789M318A

LOW - PRESSURE WARNING SWITCH (4-wheel steer machines)

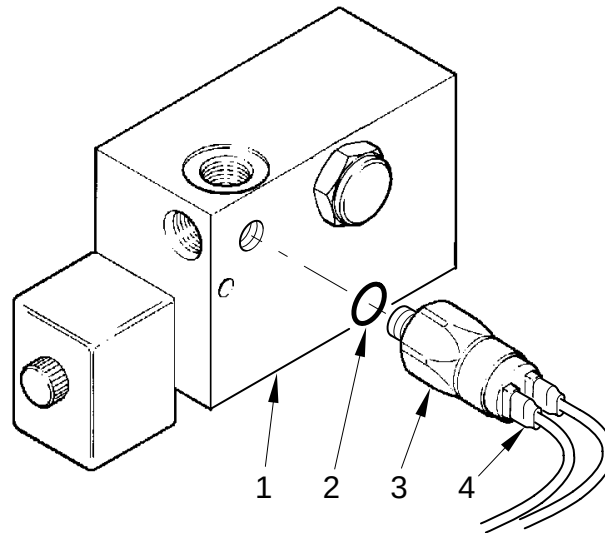
Removal

1. Park the machine on firm level ground.
2. Lower the loader bucket to the ground.
3. Lower the stabilizers. DO NOT lift the machine.
4. Stop the engine.
5. Operate the brake pedal to release pressure from the brake hydraulic system.
6. Disconnect the electrical connections (4).
7. Remove the switch (3) from the manifold (1) and discard the O - ring seal (2).

Installation

Install the low pressure warning switch in the reverse order of the removal but note the following :

1. Install a new O-ring (2) on the switch (3).
2. Torque tighten the switch (3) to 30 Nm.
3. After installation, start the engine, check the switch joint for leakage and do steps 4 through 7.
4. Make sure that the brake hydraulic system low oil pressure warning lamp switches off.
5. Stop the engine.
6. Check the hydraulic oil level.
7. Carry out a functional test of the brake system.



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BRAKE SYSTEM PRESSURE RELIEF VALVE (4-wheel steer machines)

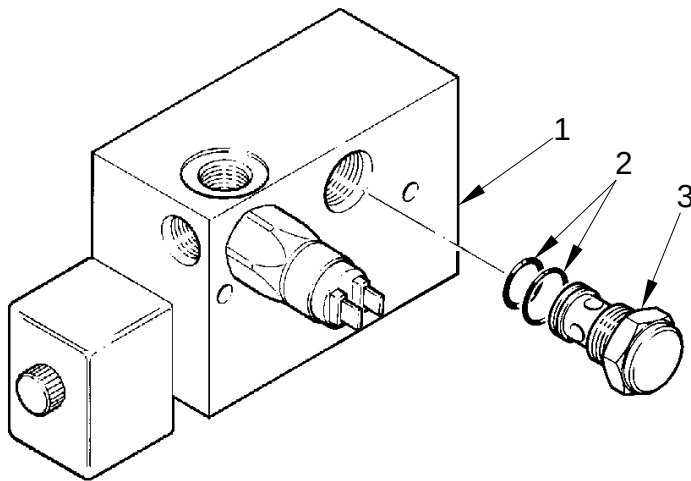
Removal

1. Park the machine on firm level ground.
2. Lower the loader bucket to the ground.
3. Lower the backhoe stabilizers. DO NOT lift the machine.
4. Stop the engine.
5. Operate the brake pedal to release pressure in the brake hydraulic system.
6. Remove the valve (3) from the manifold (1) and discard the O - ring seal (2).

Installation

Install the pressure maintaining valve in the reverse order of the removal but note the following :

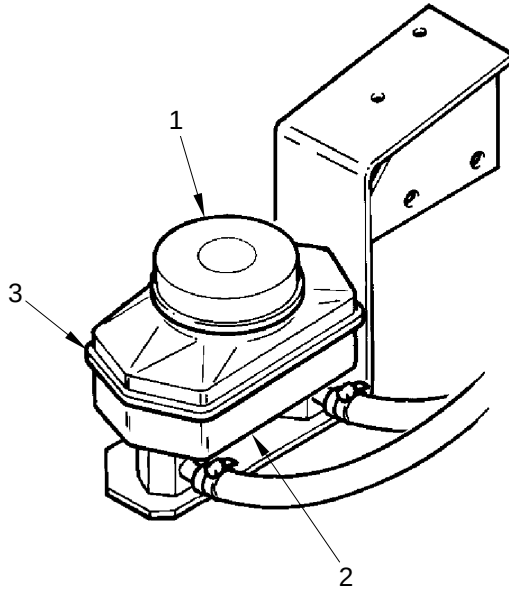
1. Install a new O-ring (2) on the valve (3).
2. Torque tighten the valve (3) to 30 Nm.
3. After installation, start the engine, check the valve joint for leakage and do steps 4 through 7.
4. Make sure that the brake hydraulic system low oil pressure warning lamp switches off.
5. Stop the engine.
6. Check the hydraulic oil level.
7. Carry out a functional test of the brake system.



789M320A

CHECKING THE BRAKE SYSTEM FLUID (4-wheel steer machines)

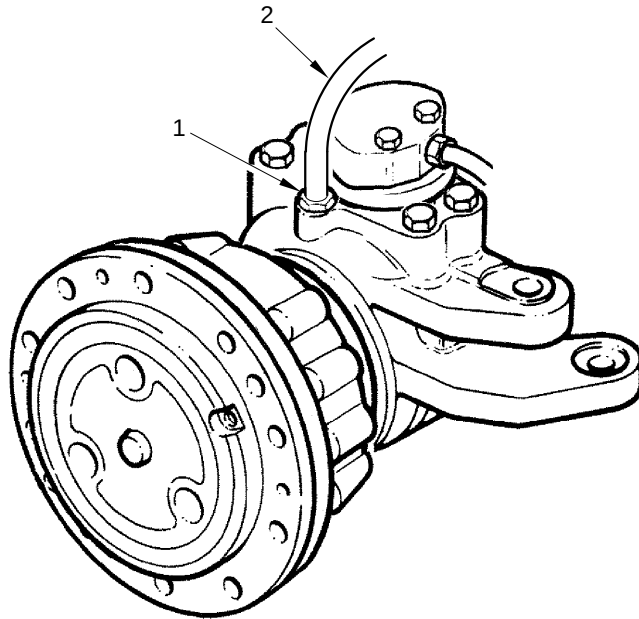
1. Park the machine on firm level ground.
2. Raise the loader beam to maximum height and fit the safety support.
3. Stop the engine.
4. Open the hood.
5. Check that the fluid is level with the moulded line (3) on the reservoir (2).
6. If required, clean the area around the cap (1) and then remove the cap.
7. Fill the reservoir to the line (3) with suitable brake fluid (see section 1002). Make sure you do not overfill the reservoir (2).
8. Install the cap (1) on the reservoir (2).



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PURGE AIR FROM THE BRAKE SYSTEM (4-wheel steer machines)

1. Park the machine on flat level ground.
2. Fully dump the loader bucket and lower it to the ground.
3. Stop the engine.
4. Check the brake system fluid level (see page 15).
5. Attach a length of plastic tube (2) to the vent screw (1) on the left rear axle.
6. Loosen the vent screw (1) a 1/2 turn while an assistant presses and holds down the brake pedal. Make sure the brake fluid in the reservoir does not fall below its minimum level.
7. Tighten the vent screw (1).
8. Tell the assistant to release the brake pedal.
9. Repeat steps 6, 7 and 8 until brake fluid free of air is released from the vent screw (1).
10. Remove the plastic tube (2).
11. Check the oil level in the brake reservoir (see page 15).
12. Repeat step 5 through 11 on the right rear, the left front and the right front brakes in that order.



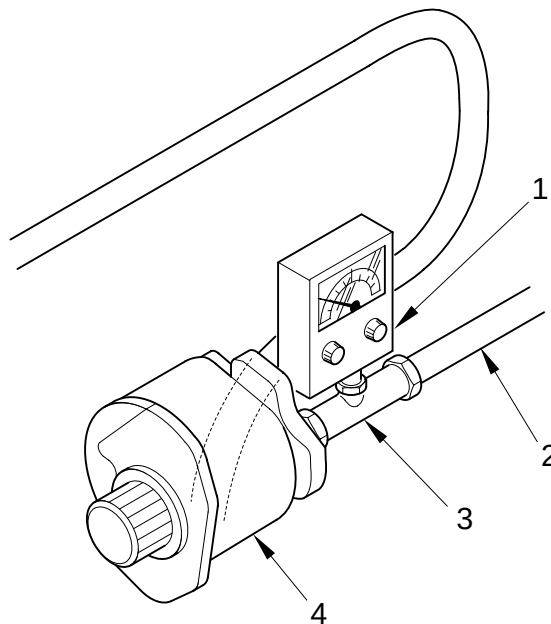
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BRAKE SYSTEM PUMP PERFORMANCE CHECK (4-wheel steer machines)

1. Park the machine on flat level ground.
2. Lower the loader bucket to the ground.
3. Lower the backhoe stabilizers, DO NOT raise the machine.
4. Stop the machine.
5. Release the hydraulic system pressure.
6. Operate the brake pedal to release the brake system hydraulic pressure.
7. Open the hood.
8. Disconnect the pressure pipe (8) from the pump (4) at the right side of the rear engine timing cover.
9. Connect a T-piece adaptor (3) to the pressure pipe outlet on the pump (4).
10. Re-connect the pressure pipe (2) to the T-piece adaptor (3).
11. Install a 0 to 15 litres flowmeter (1) to the T-piece adaptor (3).
12. Start the engine and allow the brake system fluid to stabilize at its normal working temperature.
13. Set the engine speed to 2200 rpm.
14. Check the reading of the flowmeter is between 11.7 to 13 litres.

NOTE : *If the fluid flow is not within the limits, a replacement pump must be installed.*

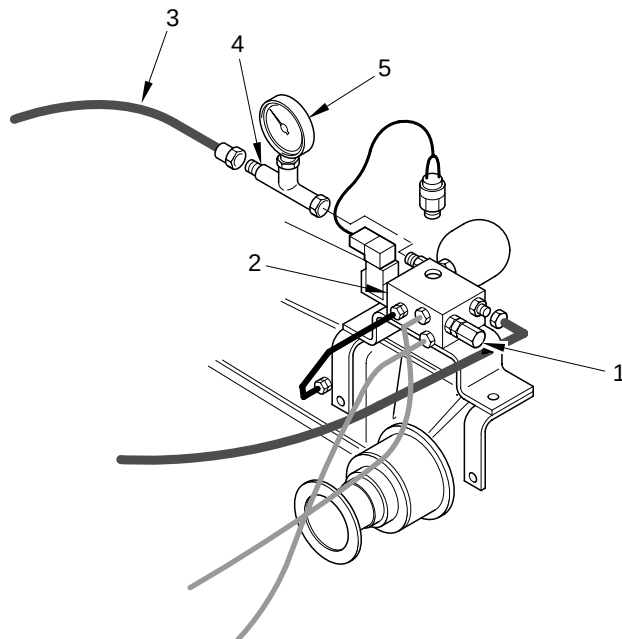
15. Stop the engine.
16. Release the hydraulic system pressure.
17. Operate the brake pedal to release the brake system hydraulic pressure.
18. Remove the flowmeter (1) from the T-piece adaptor (3).
19. Disconnect the pressure pipe (2) from the T-piece adaptor (3).
20. Remove the T-piece adaptor (3) from the pump (4) and reconnect the pressure pipe (2) to the pump (4).
21. Purge air from the brake system (see page 16).
22. Do an operational test of the brake system. Make sure there are no leaks from the connections that have been disturbed.
23. Close the hood.



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PRESSURE CHECK OF PRESSURE MAINTAINING VALVE (4-wheel steer machines)

1. Park the machine on flat level ground.
2. Lower the loader bucket to the ground.
3. Lower the backhoe stabilizers, DO NOT raise the machine.
4. Stop the engine.
5. Release the hydraulic system pressure :
6. Operate the brake pedal to release the brake system hydraulic pressure.
7. Disconnect the hose (3) from the valve (2).
8. Connect a T-piece adaptor (4) to the valve (2).
9. Re-connect the hose (3) to the T-piece adaptor (4).
10. Install a 0 to 40 bar pressure gauge (5) on the T-piece adaptor (4).
11. Start the engine and allow the brake system fluid to stabilize at its normal working temperature.
12. Set the engine speed to 2200 rpm.
13. Check the reading of the pressure gauge (5) is 25 bar. If necessary turn the adjuster (1) until the correct pressure shows on the pressure gauge (3).
14. Stop the engine.
15. Release the hydraulic system pressure.
16. Operate the brake pedal to release the brake system hydraulic pressure.
17. Remove the pressure gauge (5) from the T-piece adaptor (4).
18. Disconnect the hose (3) from the valve (2).
19. Remove the T-piece adaptor (4) from the valve (2).
20. Reconnect the hose (3) to the valve (2).
21. Purge air from the brake system (see page 16).
22. Do an operational test of the brake system. Make sure there are no leaks from the connections that have been disturbed.



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Section

7003

DISASSEMBLY AND ASSEMBLY OF BRAKE COMPONENTS

7003

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SPECIAL TOOLS

Universal gear puller

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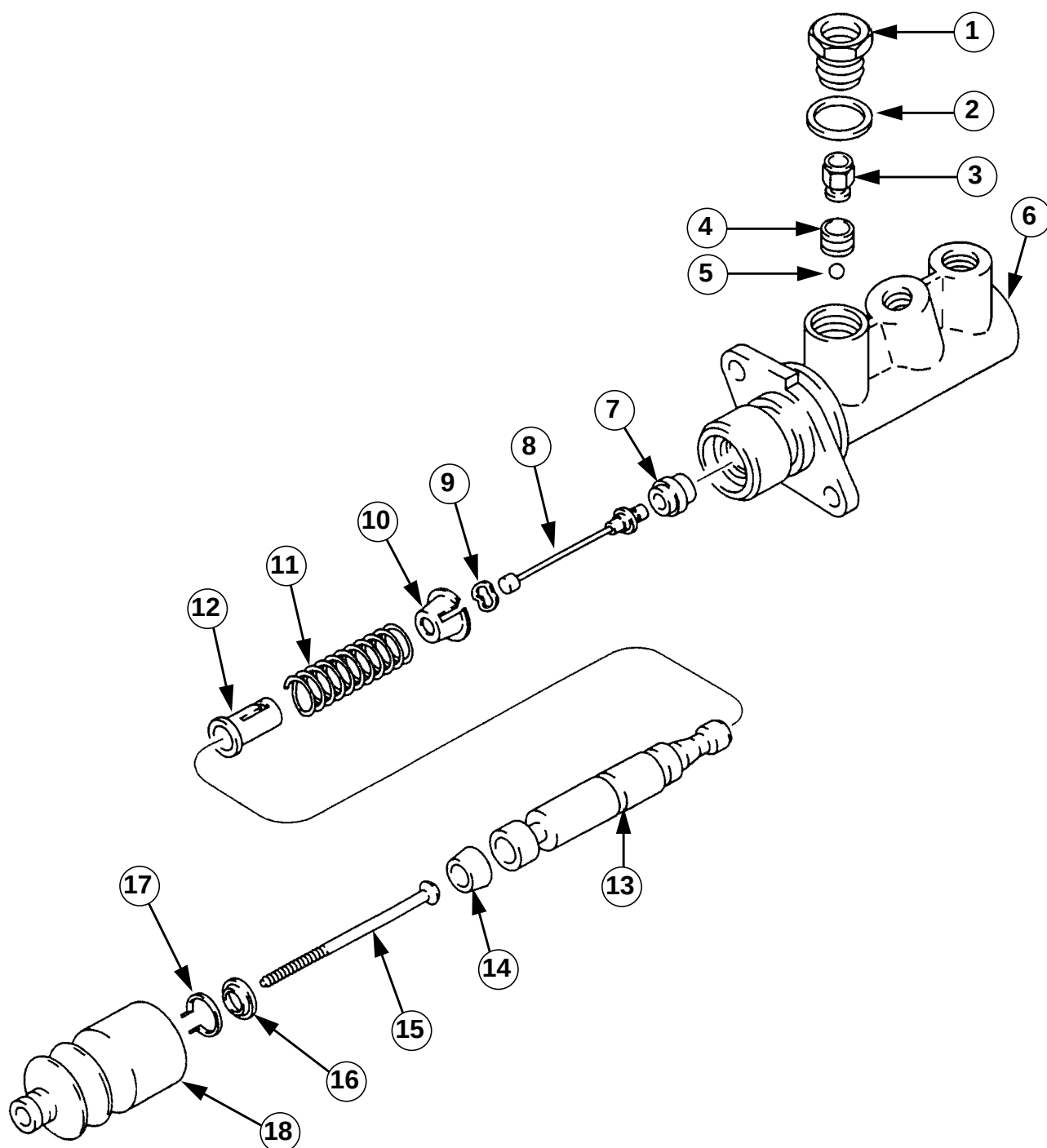
MASTER CYLINDER (2 Wheel steer machines)

Disassembly

1. Clean the outside of the master cylinder.
2. Fasten the body (6) of the master cylinder in the vise.
3. Remove the flow valve adapter (1) from the master cylinder.
4. Remove the flow valve (3) from the master cylinder.
5. Remove the ball (5) from the master cylinder.
6. Remove the gasket (2) from the flow valve adapter (1).
7. Remove the flow valve seal (4) from the flow valve (3).
8. Loosen the lock nut. Remove the clevis and lock nut from the push rod (15).
9. Remove the boot (18) from the body (6).
10. Remove the snap ring (17) from the body (6).
11. Remove the push rod (15) and washer (16) from the body (6).
12. Hit the open end of the master cylinder against a piece of wood to move the piston assembly to the end of the master cylinder.
13. Pull the piston assembly from the master cylinder.
14. There is a small tab in the spring seat (12) that holds the spring seat (12) on the piston (13). Use a screwdriver to lift up the tab.
15. Remove the check valve assembly from the piston (13).
16. Remove the seal (14) from the piston (13).
17. Disconnect the check valve seat (10) from the spring seat (12).
18. Remove the spring (11) from the spring seat (12).
19. Remove the check valve seat (10) from the check valve piston (8).
20. Remove the wave spring (9) from the check valve piston (8).
21. Remove the check valve seal (7) from the check valve piston (8).

Inspection

1. Inspect the bores in the body (6) for scoring, pitting or other damage. If the bores in the body (6) are damaged a new master cylinder must be used.
2. Check the tab in the spring seat (12). Push the tab down a small amount so that the tab will engage the end of the piston (8). To hold the check valve assembly in place. If the tab is broken, use a new master cylinder.
3. Inspect the flow valve (3), ball (5), check valve piston (8), and the push rod (15) for scoring, pitting or other damage. If the flow valve (3), ball (5), check valve piston (8), piston (13) or the push rod (15) are damaged a new master cylinder must be used.

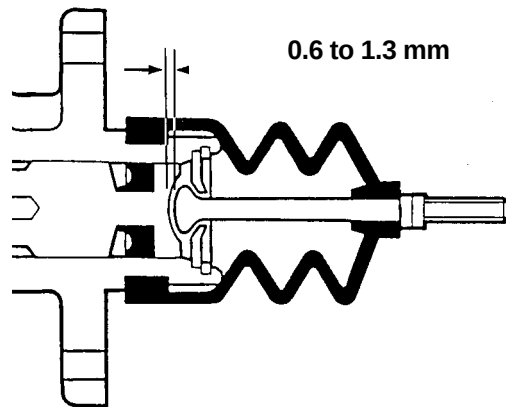


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1. Flow valve adapter	8. Check valve piston	15. Push rod
2. Gasket	9. Wave spring	16. Washer
3. Flow valve	10. Check valve seat	17. Snap ring
4. Flow valve seal	11. Spring	18. Boot
5. Ball	12. Spring seat	
6. Body	13. Piston	
7. Check valve seal	14. Seal	

Assembly

1. Install the check valve seal (7) on the check valve piston (8).
2. Install the spring (11) on the spring seat (10).
3. Install the check valve assembly in the spring (11). Engage the stem of the check valve piston (8) in the spring seat (12).
4. Install the check valve assembly on the piston (13). Push the check valve assembly onto the piston (13) until the tab in the spring seat (12) engages the end of the piston (13).
5. Install the seal (14) on the piston (13).
6. Lubricate the bore of the body (6) with clean hydraulic fluid.
7. Install the piston assembly into the bore of the body (6).
8. Push the piston assembly into the bore until the push rod (15) and washer (16) can be installed.
9. Install the push rod (15) and washer (16).
10. Install the snap ring (17).
11. Install the boot (18).
12. Install the lock nut and the clevis on the push rod (15). Do not tighten the lock nut on the push rod at this time.
13. Install the ball (5) in the body (6).
14. Lubricate the flow valve seal (4) and the flow valve (3) with clean hydraulic oil. Install the flow valve (3) in the bore in the master cylinder. The flow valve (3) must be centred in the bore of the master cylinder.
15. Install a new gasket (2) on the flow valve adapter (1).
16. Carefully start the flow valve adapter (1) into the bore in the master cylinder by hand. If the flow valve adapter (1) cannot be turned into the master cylinder completely by hand remove the flow valve adapter (1) from the master cylinder and make sure that the flow valve (3) is in the center of the bore in the master cylinder.
17. Repeat step 16 until the flow valve adapter (1) can be turned completely into the master cylinder by hand.
18. Tighten the flow adapter (1) to 30 to 40 pound-feet (41 to 47 Nm).
19. See section 7000 and install the master cylinder on the machine.
20. Depress the brake pedal and allow the piston to return. Adjust the push rod to piston clearance to 0.025 to 0.050 inch (0.6 to 1.3 mm). Turn the clevis clockwise to shorten or counter clockwise to lengthen. Tighten the lock nut against the clevis, see the illustration below.



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MASTER CYLINDER (4 Wheel steer machines)

Disassembly

1. Clean the outside of the master cylinder.
2. Remove the snap-ring (1) and withdraw the rear piston assembly.
3. Grip the centre land A of the rear piston assembly and remove the bolt (2), the spring cap (3), the spring (4), the spring seat (5), the spacer (6) and the seal retainer (7).
4. Remove the single lip seal (8) and the shim (9).
5. Remove the rear single lip seal (10).
6. Remove the hexagonal plug (11), the spring cap (12) and the spring (13).
7. Remove the O-ring seal (14) from the hexagonal plug (11).
8. Remove the spring seat (15) and the seal (16).
9. Remove the front piston assembly through the front of the master cylinder.
10. Remove the seal (17) and the shim ring (18) from the spigot end of the front piston.
11. Remove the double lip seal (19) from the front piston.
12. Prise the plastic inlet pipe (20) from the port adjacent to the hexagonal plug (11).
13. Remove the seal (21) from the plastic inlet pipe (20).
14. Remove the pin (22) in the inlet port.

Inspection

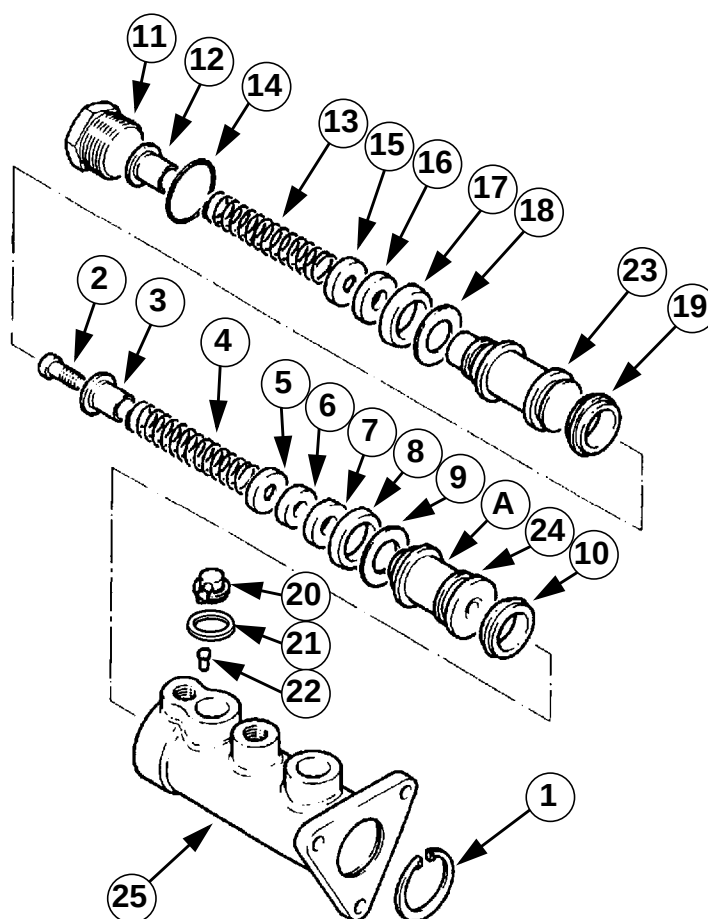
1. Renew the complete master cylinder assembly if the bore is scored or has a discernible wear step.
2. Thoroughly clean and dry all metal components.
3. Renew all rubber seals and lubricate them during assembly, with the correct grade of brake fluid.

Assembly

The assembly of the brake master cylinder is the reverse of the disassembly.

NOTE : *The bolt (2) has a patch of thread locking compound. If this has deteriorated install a new bolt.*

NOTE : *Install a new O-ring seal on the hexagonal plug (11).*



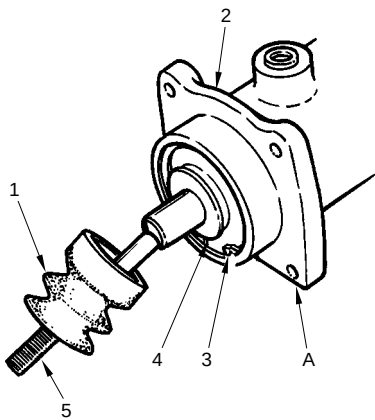
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1. Snap-ring	10. Single lip seal	19. Double lip seal
2. Bolt	11. Hexagonal plug	20. Plastic inlet pipe
3. Spring cap	12. Spring cap	21. Seal
4. Spring	13. Spring	22. Pin
5. Spring seat	14. O-ring seal	23. Front piston
6. Spacer	15. Spring seat	24. Rear piston
7. Seal retainer	16. Seal	25. Body
8. Single lip seal	17. Seal	
9. Shim	18. Shim ring	

BOOSTER UNIT (4- Wheel steer machines)

Disassembly

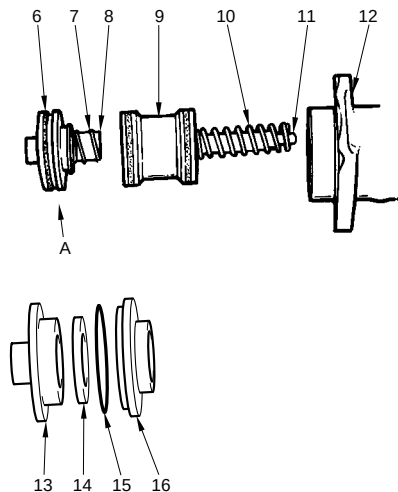
1.



Remove gaiter (1) from the brake booster (2). Clamp the booster unit in a vice with flange (A) upwards. Press the end cover (4) into the cylinder bore and remove the snap-ring (3).

NOTE : The actuator rod (5) will remain in the gaiter (1) as it is removed.

2.

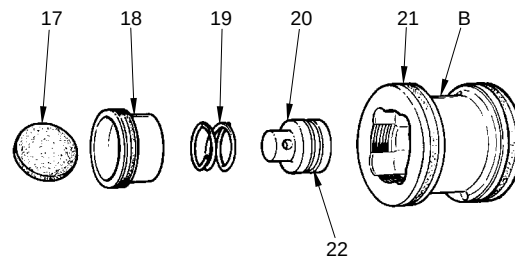


Remove the rear cover assembly (6) with the actuator sleeve (8) and the spring (7). Push the sleeve (8) out of the rear cover assembly.

Remove the spring (7) and separate the rear cover discs (13) and (16) to release the seal (15) and the inner chevron seal (14).

Remove the piston assembly (9) from the body (12). Remove spring (10) and pull the piston rod (11) out of the piston assembly (9).

3.

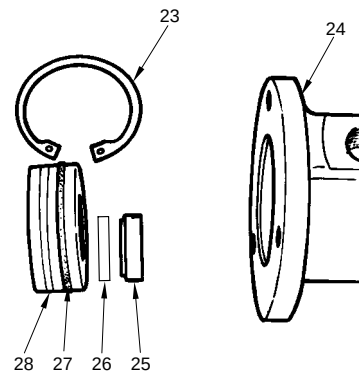


Clamp the centre of the piston (21) in a vice at B. Using a peg wrench remove the cup (18) from the piston.

Remove the disc (17) from the cup (18). Discard the disc (17).

Remove the inner piston return spring (19) and the O-ring seal (22) from the inner piston (20). Discard the O-ring seal (22).

4.



Remove the snap-ring (23) from flange (24) of the booster unit.

Remove the front cover assembly (28).

Remove the seal retainer (25), the chevron seal (26) and the O-ring seal (27). Discard the O-ring seal (27).

Inspection

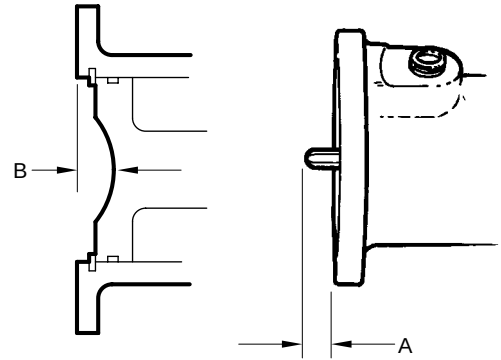
1. Examine the booster cylinder bore. If there is any wear, replace the unit.
2. Check all components for scratching or marks which indicate temporary seizure.
3. Make sure that the snap-ring (23) on the actuator sleeve (24) is in good condition.

Assembly

Assemble the brake booster unit in the reverse order of the disassembly but note the following :

1. Install a new chevron seal (26) in the end cover (28).
2. Install a new O-ring seal (27) on the cover (28).
3. Before assembly, lubricate the cover assembly with clean hydraulic oil.
4. Install a new O-ring seal (22) on inner piston (20).
5. Before assembly, lubricate the inner piston assembly with clean hydraulic oil.
6. Install a new disc (17) in the cup (18).
7. Before assembly, lubricate the piston rod (11) and the piston assembly (9) with clean hydraulic oil.
8. Install a new chevron seal (14) and a new O-ring seal (15).
9. Before assembly, lubricate the actuator sleeve (8) and the front cover assembly with clean hydraulic oil.

10.



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When the brake booster is fully assembled, measure the distance A between the flange and the end of the dome nut.

On the master cylinder, measure the depth B from the flange to the point where the dome nut touches.

NOTE : *Dimension A should be less than dimension B but without excessive clearance.*

BRAKE SYSTEM PUMP (4 Wheel steer machines)

Disassembly

1. Open the tags on the lock washer (13).
2. Remove the shaft nut (12).
3. Use the gear puller to remove the gear (14) from the drive shaft (10).
4. Remove the key (11) from the drive shaft (10).
5. Remove the four bolts (1) and the washers (2) from the pump body (8).
6. Remove the end plate (3) from the pump body (8) and discard the O-ring seal (4).
7. Remove the two rings (5) and (6) and the bearing assembly (7) from the pump body (8).
8. Remove the two gear shafts (9) and (10) from the pump body (8).
9. Remove the flange (18) and O-ring seal (19) from the pump body (8). Discard the O-ring seal (19).
10. Remove the outer seal (15), the snap-ring (16) and the inner seal (17) from the flange (18).
11. Remove the two rings (20) and (21) and bearing assembly (22) from the pump body (8).

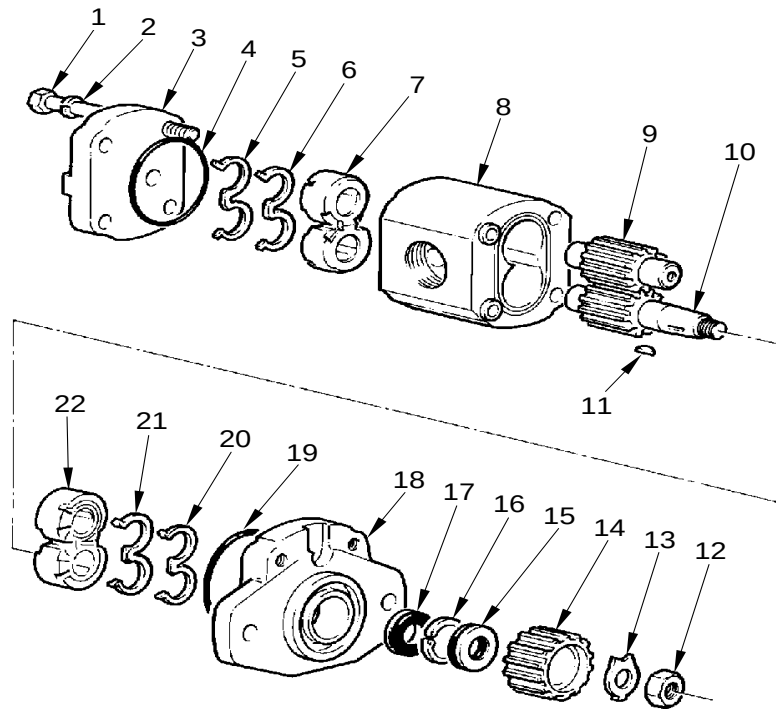
Inspection

1. Check that the bores of the pump body are free from scratches and cuts. If the damage is severe install a new pump.
2. Check the gear teeth for chips and wear.
3. Check the drive shaft seal diameter for marks or grooving. If the gears are severely damaged, install a new pump.
4. Check the bearing assembly faces and bores for scoring or wear. If the bearings are severely damaged install a new pump.

Assembly

Assemble the pump in the reverse order of the disassembly but note the following :

1. Install a new seals (15) and (17).
2. Install a new backup ring (20) and a new ring (21) in the bearing (22).
3. Install a new O-ring seal (14) in the pump body (8).
4. Before assembly, lubricate the gears (9) and (10) and the pump body with clean hydraulic oil.
5. Install a new backup ring (5) and a new ring (7).
6. Install a new O-ring seal (4) on the pump body (8).



1. Bolt
2. Washer
3. End plate
4. O-ring seal
5. Backup ring
6. Ring
7. Bearing assembly
8. Body
9. Gear shaft
10. Drive shaft
11. Key

12. Shaft nut
13. Lock washer
14. Gear
15. Outer seal
16. Snap-ring
17. Inner seal
18. Flange
19. O-ring seal
20. Backup ring
21. Ring
22. Bearing assembly

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Section

8001

REMOVAL AND INSTALLATION OF HYDRAULIC COMPONENTS

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REMOVAL AND INSTALLATION OF THE LOADER CONTROL VALVE (Models 750, 760 and 860).....14

REMOVAL AND INSTALLATION OF THE LOADER CONTROL VALVE (Models 960 and 965).....15

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REMOVAL AND INSTALLATION OF THE OIL COOLER

STEP 1

Park the machine on a level surface.

STEP 2

Raise the loader beam, fully dump the loader bucket and install the safety strut. Stop the engine and open the engine cover.

STEP 3

Depressurize the hydraulic system (see section 8002).

STEP 4

Thoroughly clean the oil cooler, the hoses and the work area before starting work.

STEP 5

Disconnect the hose (11) from the radiator (8).

STEP 6

Remove the nut (1), the clip (2) and the stay (3) from the oil cooler (12).

STEP 7

Fit identifying tags to each of the hydraulic hoses as an aid to installation.

STEP 8

Position a suitable drainage container beneath the hydraulic hose (6) and disconnect the hose from the oil cooler (12).

NOTE : *Fit blanks to the hose and the oil cooler connection.*

STEP 9

Repeat step 8 for the remaining hydraulic hoses (7), (15) and (16).

STEP 10

Release the hose clip (13) and disconnect the return hose (14) from the oil cooler (12).

NOTE : *Fit blanks to the hose and to the oil cooler connection.*

STEP 11

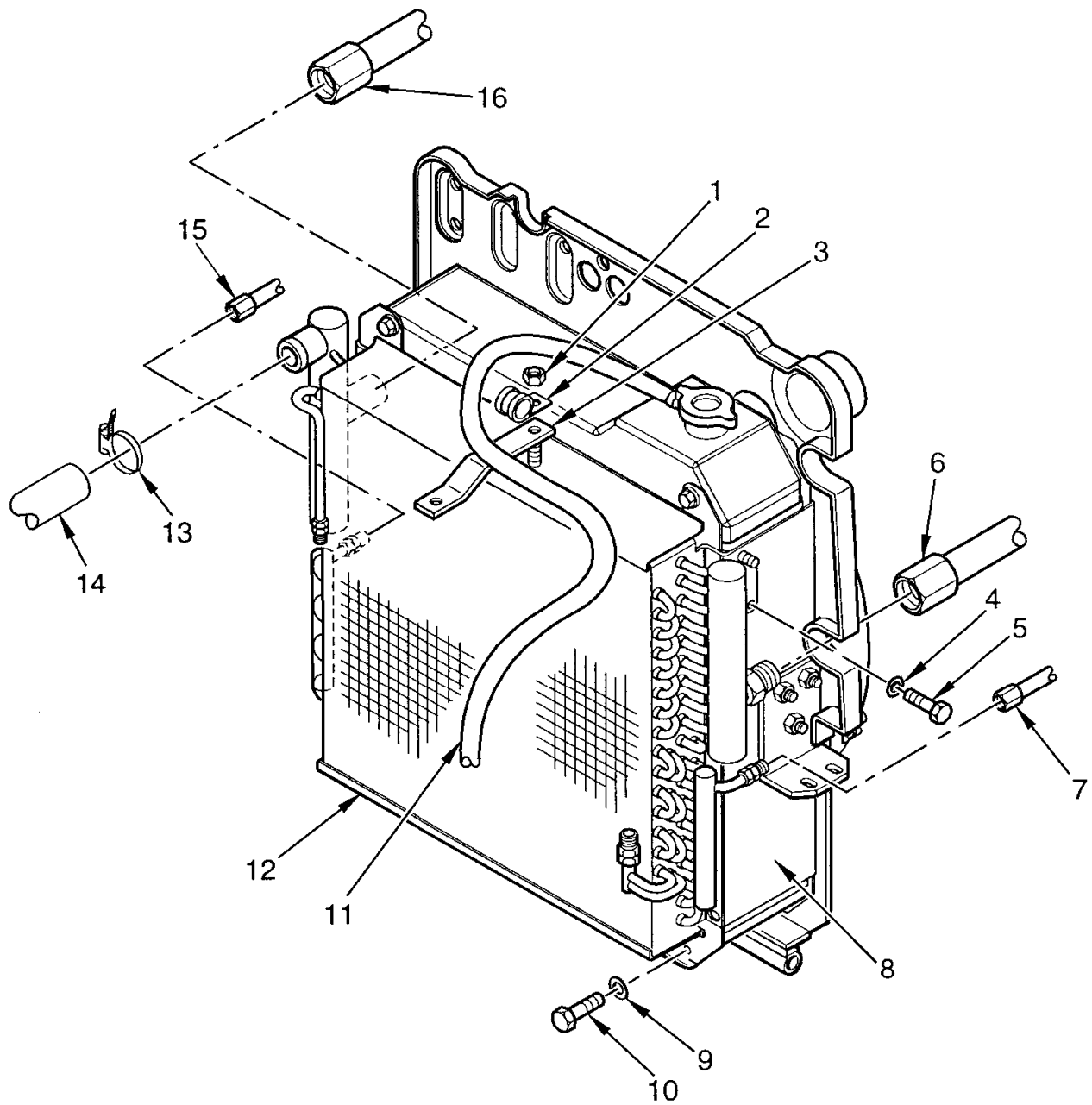
Support the oil cooler (12) and remove the bolts (5) and (10) and the washers (4) and (9) attaching it to the radiator (8).

STEP 12

Remove the oil cooler (12) from the machine and drain it into a suitable container.

NOTE : *The installation of the oil cooler is the reverse of the removal.*

NOTE : *After installation, operate all backhoe services until they function smoothly and without hesitation. Stop the engine and check the oil level in the hydraulic reservoir, top up if necessary.*



REMOVAL AND INSTALLATION OF THE HYDRAULIC PUMP

STEP 1

Park the machine on a level surface.

STEP 2

Fully raise the loader beam, dump the loader bucket and install the safety strut. Stop the engine and open the engine cover.

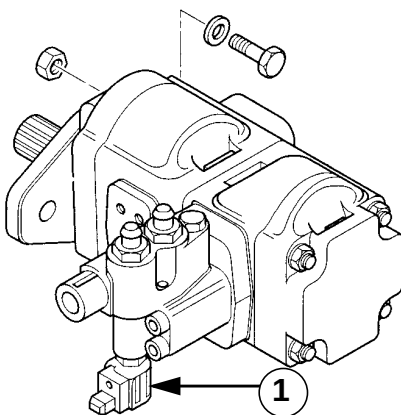
STEP 3

Depressurize the hydraulic system (see section 8002).

STEP 4

Thoroughly clean the hydraulic pump and the hoses before starting work.

STEP 5



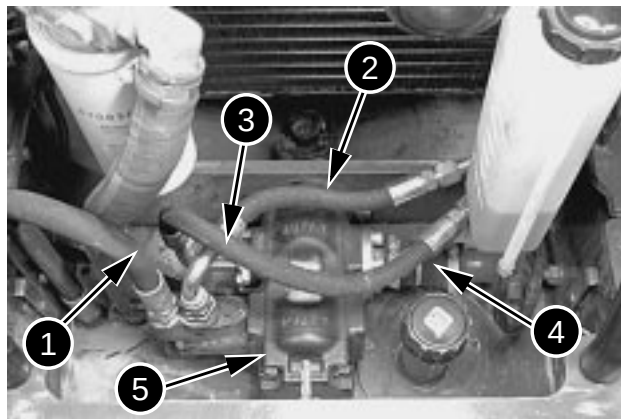
CI98G525

Disconnect the electrical connector from the unloader valve solenoid (1).

STEP 6

Fit identifying tags to each of the hydraulic hoses from the hydraulic pump.

STEP 7

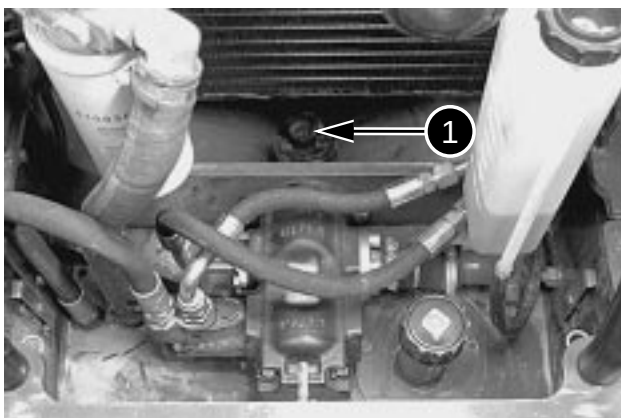


CK98G026

Disconnect the hoses (1) to (4) from the pump assembly (5). Fit blanks to all connections.

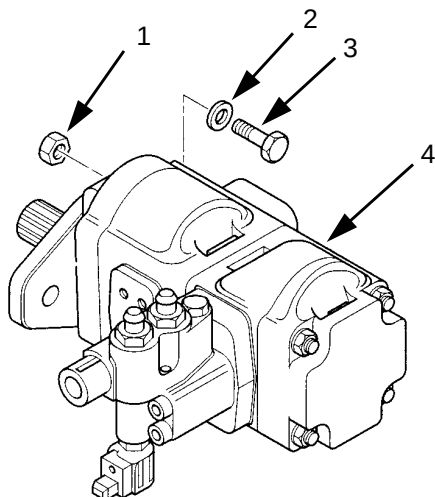
NOTE : For installation, mount new O-ring seals into the hoses (3) and (4).

STEP 8



CK98G026

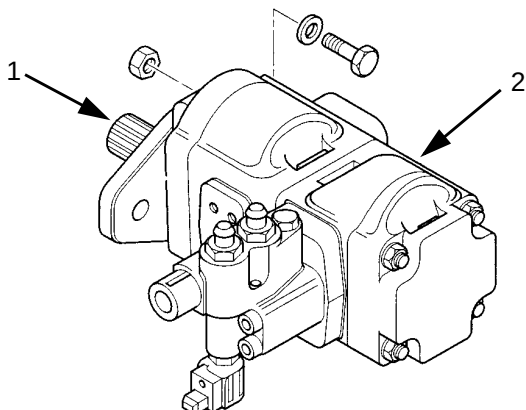
Support the engine mounted drive shaft (1).

STEP 9

CI98G525

Remove the nuts (1), the bolts (3) and the washers (2) that attach the pump assembly (4) to the chassis.

NOTE : For installation, tighten the nuts (1) a torque of 84 Nm.

STEP 10

CI98G525

Carefully draw the pump drive shaft (1) from the engine mounted drive shaft and remove the pump assembly (2) from the chassis.

NOTE : For installation, splined pump drive shaft to be coated with grease to assembly with drive shaft.

REMOVAL AND INSTALLATION OF THE UNLOADER VALVE

STEP 1

Park the machine on a level surface.

STEP 2

Fully raise the loader beam, dump the loader bucket and install the safety strut. Stop the engine and open the engine cover.

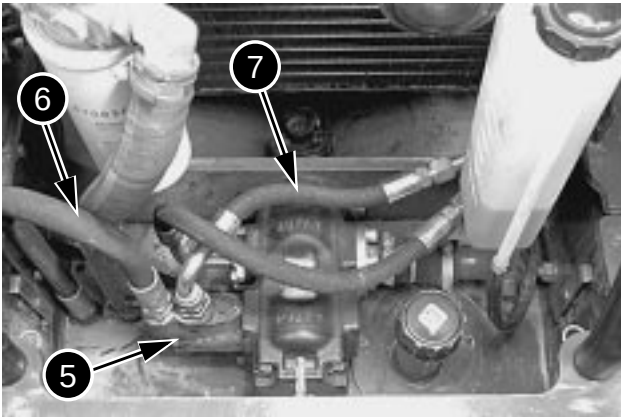
STEP 3

Depressurize the hydraulic system (see section 8002).

STEP 4

Thoroughly clean the unloader valve and the hoses before starting work.

STEP 5



CK98G026

Disconnect the hoses (6) and (7) from the unloader valve (5) and fit blanks to all connections.

STEP 6

Disconnect the electrical connector from the unloader valve solenoid (2).

STEP 7

Remove the bolts (4) and the lockwashers (3) attaching the unloader valve (5) to the hydraulic pump (1).

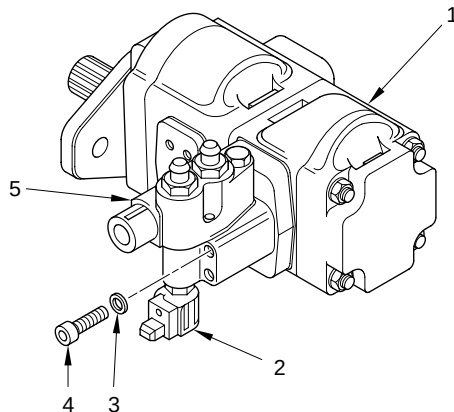
NOTE : For installation, mount new lockwashers (3) and tighten the bolts (4) a torque of 50 Nm.

STEP 8

Remove the unloader valve (5) from the hydraulic pump (1) and fit blanks to open ports on the hydraulic pump (1) and the unloader valve (5).

NOTE : The installation of the unloader valve is the reverse of the removal.

NOTE : After installation, operate all backhoe services until they function smoothly and without hesitation. Stop the engine and check the oil level in the hydraulic reservoir, top up if necessary.



REMOVAL AND INSTALLATION OF THE EXTENDING DIPPERSTICK CONTROL VALVE

STEP 1

Park the machine on a level surface. Lower the loader bucket to the floor and stop the engine.

STEP 2

Depressurize the hydraulic system (see section 8002).

STEP 3

Thoroughly clean the extending dipperstick control valve, the hoses and the work area before starting work.

STEP 4

Fit identifying tags to each of the hydraulic parts as an aid to installation.

STEP 5

Disconnect the hydraulic hoses (1) through (5) from the extending dipperstick control valve and fit blanks to all hose and valve connections.

NOTE : For installation, tighten each hydraulic hose connection a torque of 70 Nm.

STEP 6

Remove the pin (8) and disconnect the control rod (9) from the spool of the extending dipperstick control valve (7).

STEP 7

Remove the nuts (11), the washers (10) and the bolts (6) attaching the extending dipperstick control valve (7) to the mounting bracket (12).

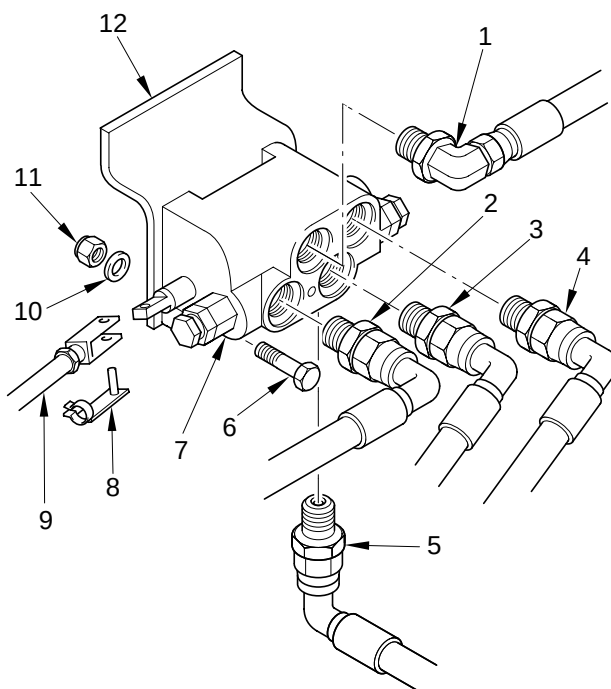
NOTE : For installation, tighten the nuts (11) a torque of 105 Nm.

STEP 8

Remove the extending dipperstick control valve (7) from the machine.

NOTE : The installation of the extending dipperstick control valve is the reverse of the removal.

NOTE : After installation, operate the extending dipperstick and make sure that the extending dipperstick operates correctly. Stop the engine and check the oil level in the hydraulic reservoir, to up if necessary.



789M106

REMOVAL AND INSTALLATION OF THE BACKHOE CONTROL VALVE (Models 750, 760, 860 and 960)

STEP 1

Park the machine on a level surface. Lower the loader bucket to the floor.

STEP 2

If the backhoe is equipped with an extendahoe, install the extendahoe lock pin.

Lower the stabilizers until the stabilizer pads just touch the floor.

Extend the backhoe straight behind the machine with the backhoe bucket resting on the floor and stop the engine.

STEP 3

Depressurize the hydraulic system (see section 8002).

STEP 4

Lift the floor mat and remove the plate that gives access to the backhoe valve assembly (1).

STEP 5

Thoroughly clean the backhoe valve (1), the hoses and the work area before starting work.

STEP 6

Fit identifying tags to each controls rod as an aid to installation.

STEP 7

Disconnect the control rods from the spool valves.

STEP 8

Fit identifying tags to each of the hydraulic hoses and pipes, as an aid to installation.

STEP 9

Disconnect the hydraulics hoses and pipes from the backhoe valve assembly (1) and fit blanks to all hose and pipe connections.

NOTE : For installation, tighten each hydraulic hose connection a torque of 70 Nm.

STEP 10

Remove the fitting (2) and (3).

STEP 11

Support the backhoe valve assembly (1) using packing and a jack.

STEP 12

Remove the bolts (4) and the washers (5) attaching the backhoe valve assembly (1) to the bracket (6).

NOTE : For installation, tighten the bolts (4) a torque of 105 Nm.



WARNING : Do not attempt to lift the backhoe valve assembly (1) on your own.

STEP 13

Move the backhoe valve assembly (1) rear wards a short distance to clear the bracket (6).

STEP 14

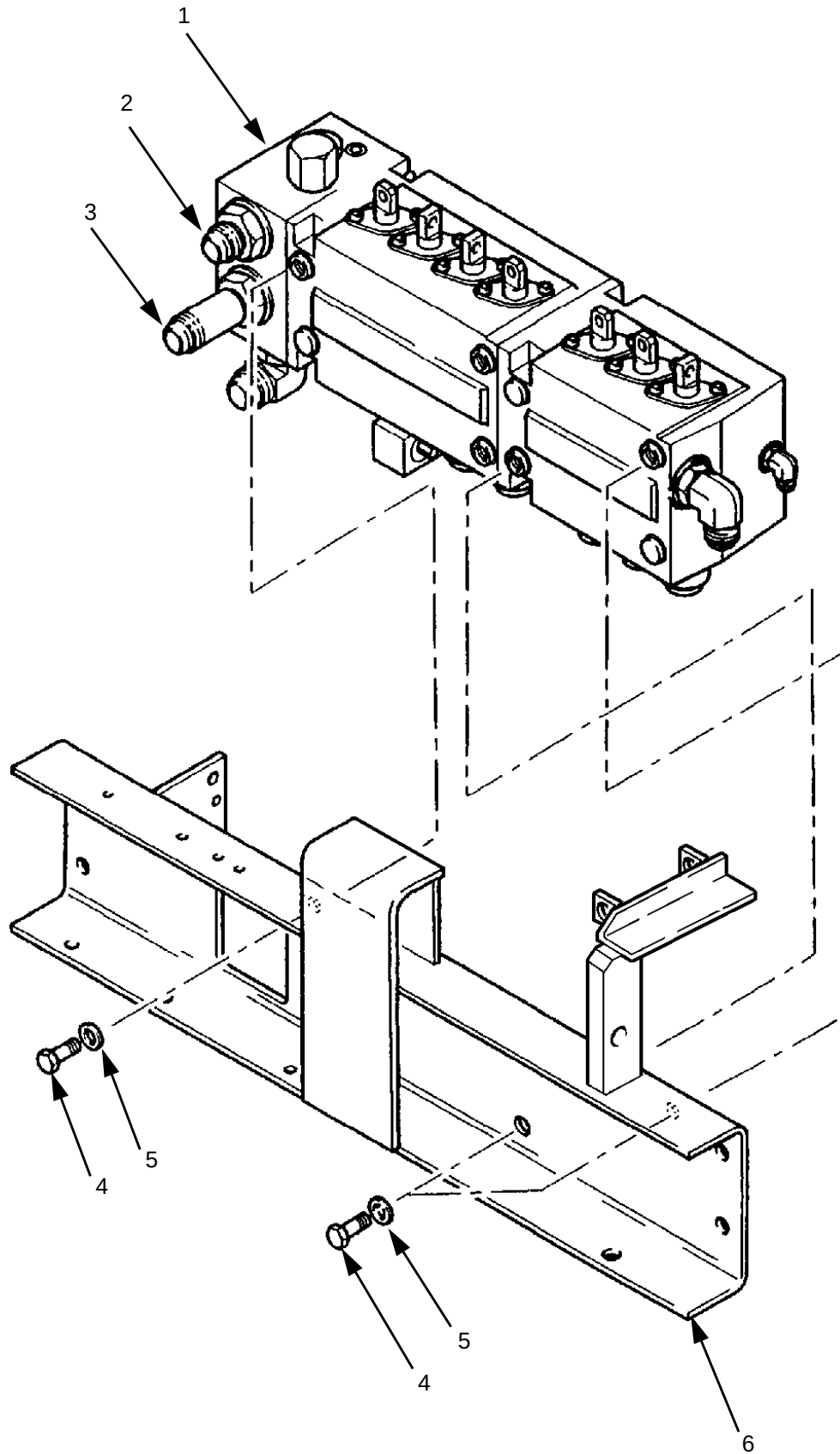
Steady the backhoe valve assembly (1) and slowly lower the jack until the assembly can be removed from the machine.

STEP 15

Move the backhoe valve assembly (1) clear of the machine.

NOTE : The installation of the backhoe valve assembly (1) is the reverse of the removal.

NOTE : After installation, operate the backhoe services and make sure all the services operate correctly. Stop the engine and check the oil level in the hydraulic reservoir, top up if necessary.



REMOVAL AND INSTALLATION OF THE BACKHOE CONTROL VALVE (Model 965)

STEP 1

Park the machine on a level surface. Lower the loader bucket to the floor.

STEP 2

If the backhoe is equipped with an extendahoe, install the extendahoe lock pin.
Extend the backhoe straight behind the machine with the backhoe bucket resting on the floor and stop the engine.

STEP 3

Depressurize the hydraulic system (see section 8002).

STEP 4

Disconnect the battery leads.

STEP 5

Lift the floor mat and remove the plate that gives access to the backhoe valve assembly (1).

STEP 6

Thoroughly clean the backhoe valve (1) the hoses and the work area before starting work.

STEP 7

Fit identifying tags to each controls rod as an aid to installation.

STEP 8

Disconnect the control rods from the spool valves.

STEP 9

Fit identifying tags to each Hirschmann plug as an aid to installation.

STEP 10

Remove the Hirschmann plug from each spool valve.

STEP 11

Fit identifying tags to each of the hydraulic hoses and pipes, as an aid to installation.

STEP 12

Disconnect the hydraulics hoses and pipes from the backhoe valve assembly (1) and fit blanks to all hose and pipe connections.

NOTE : For installation, tighten each hydraulic hose connection a torque of 70 Nm.

STEP 13

Remove the fitting (2) and (3).

STEP 14

Support the backhoe valve assembly (1) using packing and a jack.

STEP 15

Remove the bolts (5) and the washers (4) attaching the backhoe valve assembly (1) to the bracket (6).

NOTE : For installation, tighten the bolts (4) a torque of 105 Nm.



WARNING : Do not attempt to lift the backhoe valve assembly (1) on your own.

STEP 16

Steady the backhoe valve assembly (1) and slowly lower the jack until the assembly can be removed from the machine.

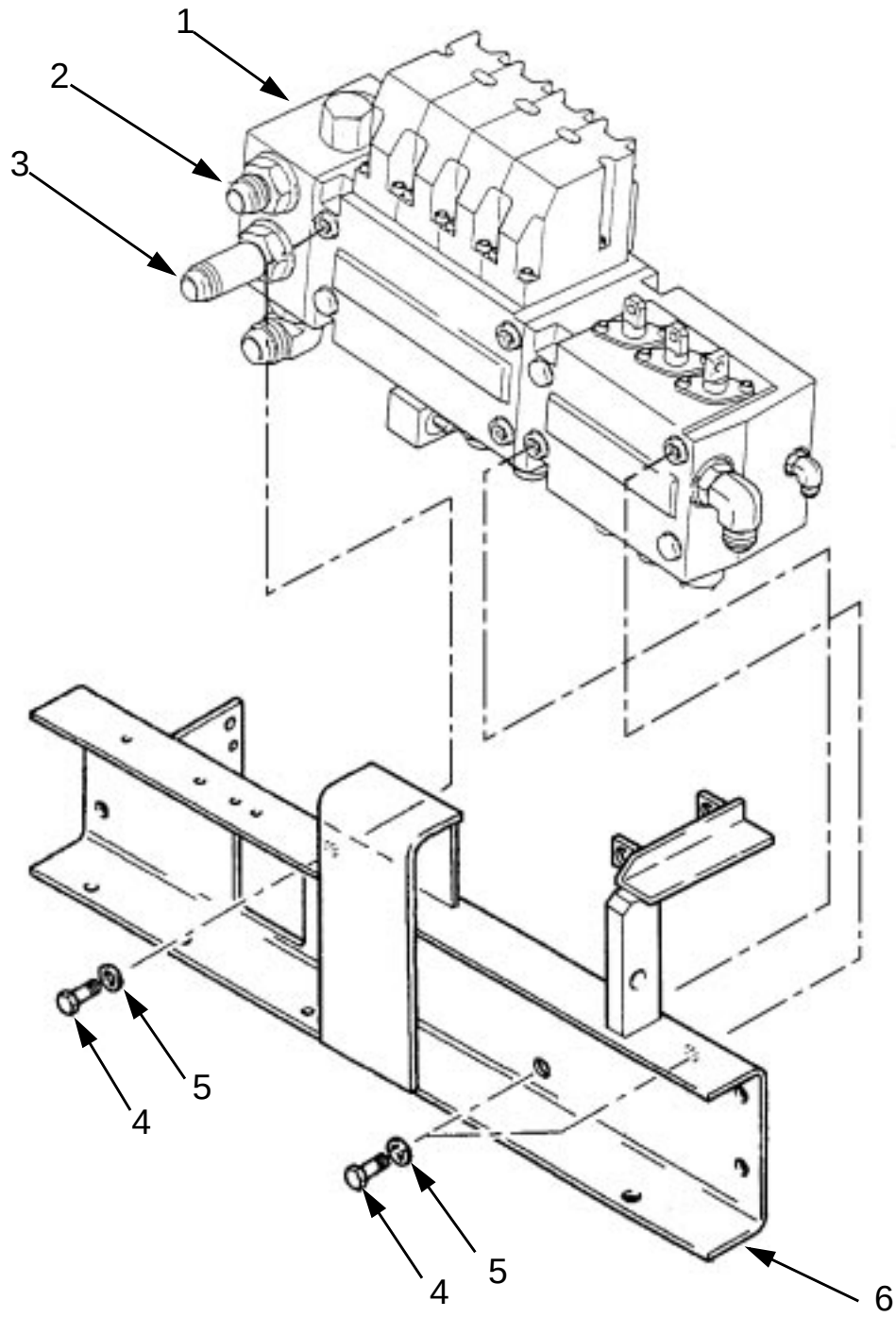
STEP 17

Move the backhoe valve assembly (1) clear of the machine.

NOTE : The installation of the backhoe valve assembly (1) is the reverse of the removal.

NOTE : After installation, operate the backhoe services and make sure all the services operate correctly.

Stop the engine and check the oil level in the hydraulic reservoir, top up if necessary.



REMOVAL AND INSTALLATION OF THE LOADER CONTROL VALVE (Models 750, 760 and 860)

STEP 1

Park the machine on a level surface. Lower the loader bucket to the floor and stop the engine.

STEP 2

Depressurize the hydraulic system (see section 8002).

STEP 3

Remove the gaiter to access the loader controls and the loader valve assembly.

STEP 4

Thoroughly clean the loader valve, the hoses and the work area before starting work.

STEP 5

Disconnect the wiring for the magnetic detent located on the bucket section of the loader control valve.

STEP 6

Fit identifying tags to each controls rod as an aid to installation.

STEP 7

Disconnect the control rods from the loader valve assembly.

STEP 8

Fit identifying tags to each of the hydraulic hoses and pipes, as an aid to installation.

STEP 9

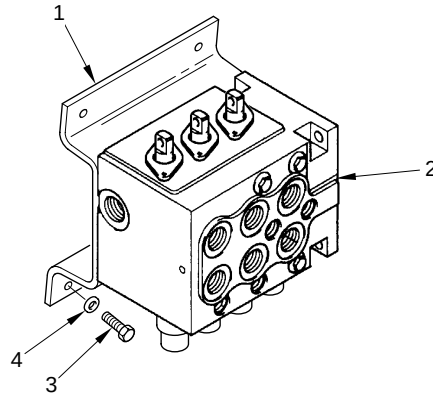
Disconnect the hydraulic hoses and pipes from the loader valve assembly and fit blanks to all hose and pipe connections.

NOTE : For installation, tighten each hydraulic hose connection a torque of 70 Nm.

STEP 10

Support the loader valve assembly using packing and a jack.

STEP 11



789M374A

Remove the bolts (3) and the washers (4) attaching the mounting plate (1) to the chassis. Steady the loader valve assembly (2) and slowly lever the jack until the valve can be removed from the machine.

NOTE : For installation, tighten the bolts (3) a torque of 105 Nm.

STEP 12

Move the loader valve assembly clear of the machine.

NOTE : The installation of the loader valve assembly is the reverse of the removal.

NOTE : After installation, operate the loader services and make sure all the services operate correctly. Stop the engine and check the oil level in the hydraulic reservoir, top up if necessary.

REMOVAL AND INSTALLATION OF THE LOADER CONTROL VALVE (Models 960 and 965)

STEP 1

Park the machine on a level surface. Lower the loader bucket to the floor and stop the engine.

STEP 2

Depressurize the hydraulic system (see section 8002).

STEP 3

Disconnect the battery leads.

STEP 4

Lift the floor mat and remove the plate that gives access to the loader valve assembly.

STEP 5

Thoroughly clean the loader valve, the hoses and the work area before starting work.

STEP 6

Fit identifying tags to each Hirschmann plug as an aid to installation.

STEP 7

Remove the Hirschmann plug from each spool valve.

STEP 8

Fit the identifying tags to each of the hydraulic hoses and pipes, as an aid to installation.

STEP 9

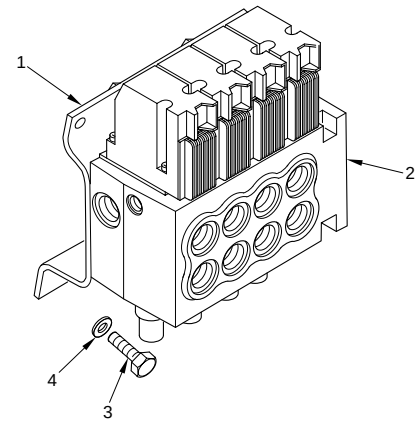
Disconnect the hydraulic hoses and pipes from the loader valve assembly and fit blanks to all hose and pipe connections.

NOTE : For installation, tighten each hydraulic hose connection a torque of 70 Nm.

STEP 10

Support the loader valve assembly using packing and a jack.

STEP 11



789M103A

Remove the bolts (3) and the washers (4) attaching the mounting plate (1) to the chassis. Steady the loader valve assembly (2) and slowly lever the jack until the valve can be removed from the machine.

NOTE : For installation, tighten the bolts (3) a torque of 105 Nm.

STEP 12

Move the loader valve assembly clear of the machine.

NOTE : The installation of the loader valve assembly is the reverse of the removal.

NOTE : After installation, operate the loader services and make sure all the loader services operate correctly. Stop the engine and check the oil level in the hydraulic reservoir, top up if necessary.

Section

8002

**HYDRAULIC SPECIFICATIONS,
TROUBLESHOOTING AND PRESSURE CHECKS**

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SPECIFICATIONS

All machines

Hydraulic oil specification DIN 51524

Hydraulic oil viscosity

- below 30°C (86°C) System ISO VG46

- above 30°C (86°C) ISO 68

Hydraulic reservoir capacity 45 litres

750B - 760B

Hydraulic pump outlet pressure

- outer section (62 l/mn) 207 bar

- inner section (80 l/mn) 225 bar

860B - 960B - 965B

Hydraulic pump outlet pressure

- outer section (80 l/mn) 190 bar

- inner section (80 l /mn) 225 bar

Brake booster pump

- Engine idling 12 bar

- Engine at 2200 rpm 16 bar

All machines

Unloader valve operating pressure.....207 to 214 bar

Back pressure valve pressure

- engine idling 34 to 35 bar

- engine at 2200 rpm 49 to 50 bar

Electrica calibration of the machine (see section 4008)

Brake booster pump (see section 7000)

SPECIAL TOOLS

All machines

Pressure gauge 0 to 50 bar.

Pressure gauge 0 to 100 bar.

Pressure gauge 0 to 300 bar .

Adaptator to replace a circuit relief valve

Flow meter

Gate valve and hose

960B - 965B

Slave joystick

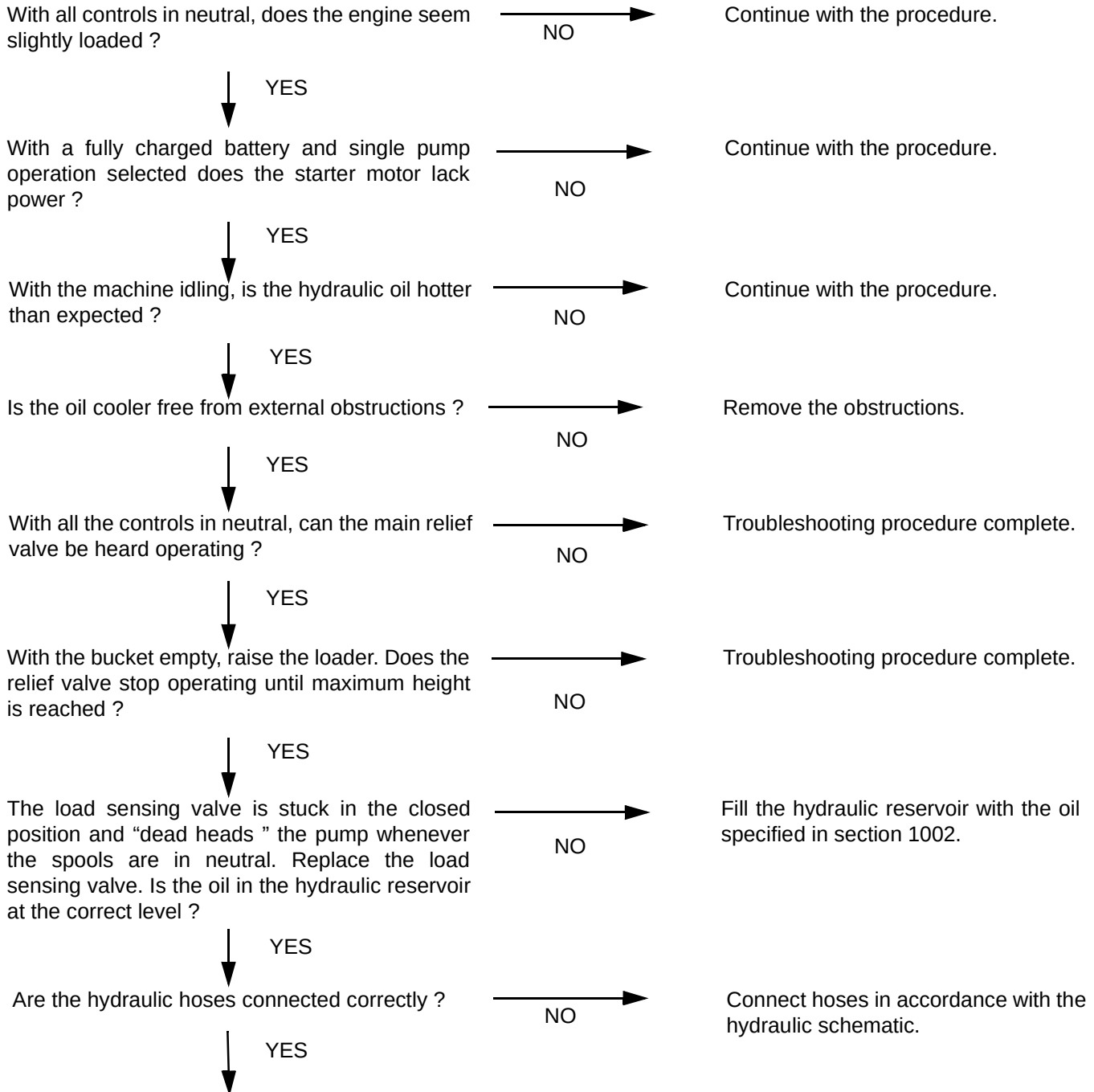
Elektron diagnostic terminal

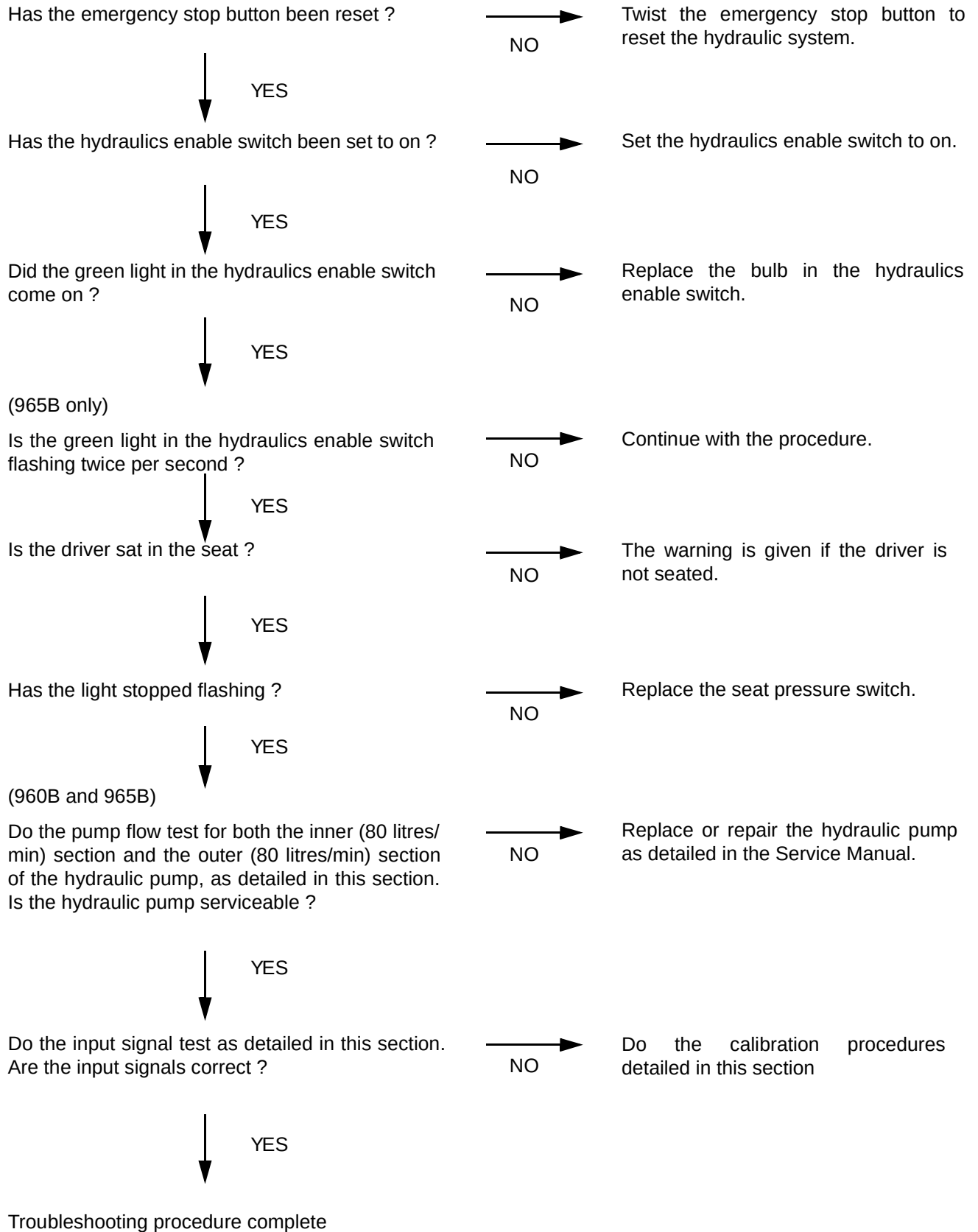
TROUBLESHOOTING PROCEDURES

General

Check the machine for oil leaks and damaged or missing parts. Repair as required.

(965B and 960B)





Fault warning alarms

Did the fault warning alarm give a single "beep" ?

YES

The seat is not properly locked in an operating position. Move the seat forward until it locks. The seat should not swivel. Has the single "beep" fault warning alarm stopped ?

YES

(965B and 960B)

Did the fault warning alarm give two "beeps" ?

YES

There is a fault in the loader bucket levelling system. Check the wiring, the connectors and the potentiometers on the bucket linkage and the beam pivot, for damage. Are any of the components damaged ?

YES

Replace or repair the damaged components. Has the two "beep" fault warning alarm stopped ?

YES

Did the fault warning alarm give three "beep" ?

YES

(960B only)

There is faulty joystick signal. It is dangerous to operate the machine with this fault. Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected. Has the fault been corrected ?

YES

NO

Continue with the procedure.

NO

Replace the seat position switches.

NO

Continue with the procedure.

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

NO

Continue with the procedure.

NO

Do not operate the machine.

(965B only)

There is a faulty joystick signal. It is dangerous to operate the machine with this fault. Put the seat in forward facing position (loader operation). Do the "beeps" stop ?

YES

The fault is in the left joystick. Call your Service department immediately and describe the symptoms that you have found. The machine must be operated until the fault has been corrected. Has the fault been corrected ?

YES

(965B and 960B)

Did the fault warning alarm give four "beeps" ?

YES

There is a steering error. Refer to the troubleshooting procedures contained in Section 5001 of this manual. Has the four "beep" fault warning alarm stopped ?

YES

Did the fault warning alarm give five "beeps" ?

YES

There is a fault in the steering harness. Refer to the troubleshooting procedures contained in Section 5001 of this manual. Has the five "beep" fault warning alarm stopped ?

YES

Did the blue warning light on the side console come on ?

YES

The loader bucket is in float mode. De-select float mode, has the blue warning light gone out ?

YES

NO

The fault is in the right joystick. Call your Service department immediately and describe the symptoms that you have found. the machine must not be operated until the fault has been corrected.

NO

Do not operate the machine

NO

Continue with the procedure.

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

NO

Continue with the procedure.

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

NO

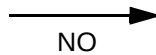
Continue with the procedure.

NO

Remove the loader valve assembly and replace the bucket spool.

(965B only)

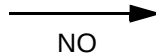
Did the fault warning alarm give a continuous "beep" ?



Continue with the procedure

↓
YES

The manual override switch is selected. Release the manual override switch. Has the continuous "beep" stopped ?



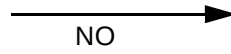
Replace or repair the manual override switch

↓
YES

Troubleshooting procedure complete.

Loader or backhoe service does not work

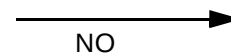
Stop the engine and use the manual operation lever to move the spool of the non-functioning service. Does the spool move freely without "jamming".



Remove the loader valve assembly or the backhoe valve assembly and replace the non-functioning spool.

↓
YES

Start the engine and use the manual operation lever to move the spool of the non-functioning service. Does the service work using the manual operation lever ?



Operate the loader bucket at the same time as the non-functioning service. Does the service work ?

↓
NO

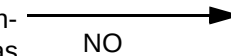
Operate the loader bucket clam shell at the same time as the non-functioning service. Does the service work ?

↓
NO

The servo gallery check valve is jammed open. Replace the loader valve assembly or the backhoe valve assembly.

↓
YES

Fit the slave joystick to the spool of the non-functioning service and do the signal path test as detailed in this section. Does the service work using the slave joystick ?



The fault is hydraulic. Do the servo pressure test as detailed in this section. Does the service work ?

↓
NO

Service the servo valve as detailed in the Service Manual.

↓
YES

The fault is electrical. Do the output signal test as detailed in this section. Is there a signal voltage ?

NO

Check the wiring and the connectors to the spool of the non-functioning service.

YES

Do the input signal test as detailed in this section. Are the input signals correct ?

NO

Do the calibration procedures as detailed in Section 4008.

YES

Troubleshooting procedure complete.

If the steering service has stopped working, refer to the troubleshooting procedures contained in Section 5001 of this manual.

Loader or backhoe service operates slowly

Does the loader or backhoe service operate at the correct speed when unloaded, but slowly when a load is applied ?

NO

Continue with the procedure.

YES

Do the unloader valve pressure test as detailed in this section. Is the unloader valve serviceable ?

NO

Replace the unloader valve as detailed in the Service Manual.

YES

Troubleshooting procedure complete.

Controls operate slowly

With the bucket in the air, operate the dipperstick. Does the dipperstick start slowly, but eventually move at the normal speed ?

NO →

Continue with the procedure.

YES ↓

Operate the dipperstick, the bucket and the boom together. Is the delay longer ?

NO →

Continue with the procedure.

YES ↓

The accumulator check valve is partially closed. Do the servo pressure test as detailed in this section. Does the service operate correctly ?

NO →

Service the servo valve as detailed in the Service Manual.

YES ↓

Troubleshooting procedure complete.

Accumulator loses pressure rapidly when the engine is switched off

Start the engine and run it for 20 seconds. Switch off the engine and set the ignition key switch to the + position.

NO →

The accumulator check valve is stuck open. Remove the backhoe valve assembly and replace the return-side module.

Set the hydraulics enable switch to on. Make sure that the green light in the switch is on .

Can the controls be used to fully depressurise the loader and the backhoe ?

YES ↓

Troubleshooting procedure complete.

Return to dig function does not work

Do the input signal test as detailed in this section. Do the signals need calibrating ?

NO →

Continue with the procedure.

YES ↓

Do the calibration procedures as detailed in this section. Does the return to dig function work better at maximum engine speed than at 1000 rpm ?

NO →

Continue with the procedure.

YES ↓

Do the back pressure valve pressure test as detailed in this section. Is the back pressure valve serviceable ?

NO

Replace or repair the back pressure valve as detailed in the Service Manual.

YES

Does the return to dig function work correctly ?

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

YES

Troubleshooting procedure complete.

Loader bucket self-level malfunction

Does the material spill forwards out of the bucket as it is raised ?

NO

Continue with the procedure.

YES

Does self-levelling begin when the loader bucket is higher than 1,2 m from the ground ?

NO

Continue with the procedure.

YES

Recalibrate or replace the potentiometer. Is the self-level function operating correctly ?

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

YES

Troubleshooting procedure complete.

Does the material spill backwards out of the bucket as it is raised ?

NO

Continue with the procedure.

YES

Does the self-levelling begin when the loader bucket is lower than 1.2 m from the ground ?

NO

Continue with the procedure.

YES

Recalibrate or replace the potentiometer. Is the self-level function operating correctly ?

NO

Call your Service department immediately and describe the symptoms that you have found. The machine must not be operated until the fault has been corrected.

YES

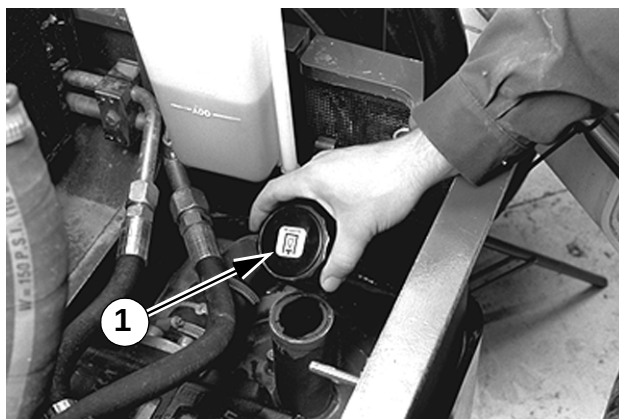
Troubleshooting procedure complete.

DECOMPRESSING THE HYDRAULIC SYSTEM

Decompress the hydraulic system as follows :

Models 750B, 760B and 860B

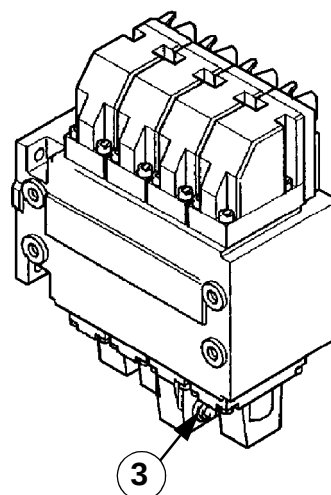
1. Park the machine on a level surface.
2. Lower the loader and the backhoe to the ground, and raise the stabilizers off the ground.
3. Switch off the engine.
4. Remove the hydraulic reservoir cap (1).
5. Move all the backhoe and the loader control levers in all directions several times until the loader and the backhoe are fully settled on the ground.
6. Refit the hydraulic reservoir cap.



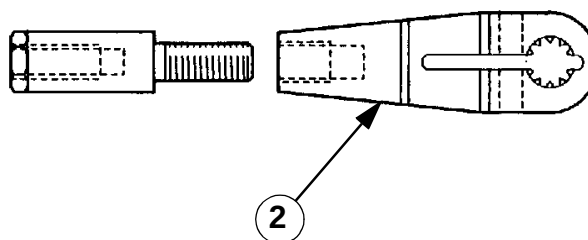
CD98G001

Models 960B and 965B

1. Park the machine on a level surface.
2. Lower the loader and the backhoe to the ground, and raise the stabilizers off the ground.
3. Switch off the engine.
4. Remove the hydraulic reservoir cap (1).
5. Place the special wrench (2) on the nut (3) of each of the loader and backhoe control valve sections.
6. Turn the wrench (2) as far as it will go from top to bottom.
7. Repeat this operation on each (loader and backhoe) control valve section.
8. Refit the hydraulic reservoir cap (1).



C198J518



CS98J538

DECOMPRESSING THE HYDRAULIC SYSTEM

Prior to carrying out any service operation on the hydraulic system, it is first necessary to release the pressure in all the circuits.

Before doing this, make sure that the ride control function (optional) is not operating.

960 B type

STEP 1

Lower the loader attachment and the backhoe attachment until they are resting on the ground.

STEP 2

Stop the engine, engage parking brake.

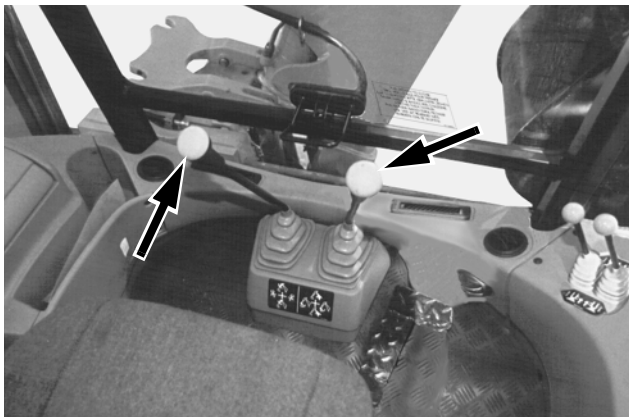
STEP 3



CD99E021

Turn the starter switch key to "On" position and press the hydraulic enable switch to enable the system. Place the loader control lever in float position, then operate the lever from left to right several times to release the hydraulic pressure.

STEP 4



CP98F024

Operate the backhoe attachment controls in all directions.

965 B type

STEP 1

Lower the loader attachment and the backhoe attachment until they are resting on the ground.

STEP 2

Stop the engine, engage parking brake.

STEP 3



CP99D009

Turn the starter switch key to "On" position and press the hydraulic enable switch.

STEP 4



CK99E013

Press the loader or backhoe attachment selector button to obtain control of the attachment behind the operator's seat.

NOTE : Depending on the position of the seat, this will either be the loader attachment or the backhoe.

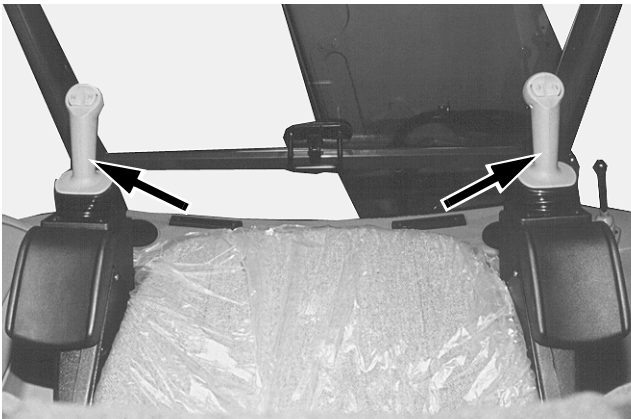
STEP 5

With backhoe attachment



Place the loader control lever in float position, then operate the lever from left to right several times.

With backhoe attachment



CP99E004

Non -EC configuration

Push the left-hand control lever forwards and hold it in that position. Pull the right hand control lever rearwards and hold it in that position, at the same time moving the lever from left to right.

EC configuration

Pull the left-hand control lever rearwards and hold it in that position.

Push the right-hand control lever forwards and hold it in that position, at the same time moving the lever from left to right.

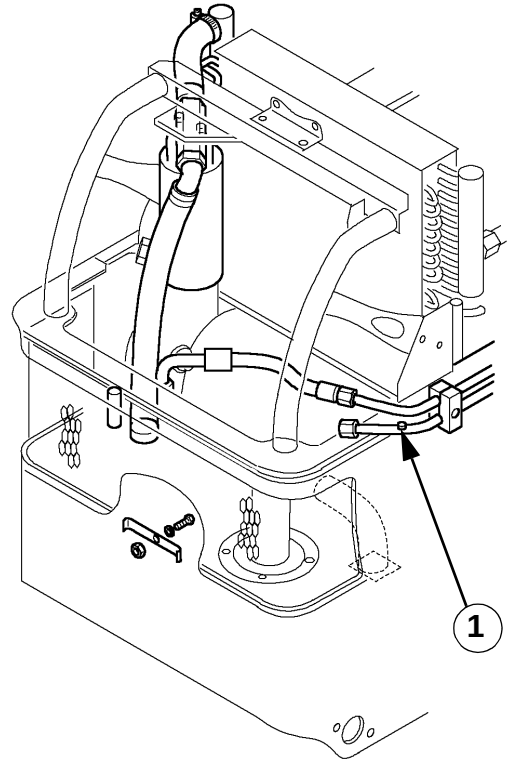
NOTE : *If, for some reason, there is no electrical current, operate the attachments manually (See "Manual operation of the loader arms" and "Manual operation of the backhoe attachment" in the "Operating instructions" Section.*

RELIEF VALVE TESTS

Main relief valve pressure test

Pressure check for 750B, 760B and 860B

1. Park the machine on a level surface. Put the backhoe in the transport position and lower the loader bucket to the floor.
2. Work the machine until the temperature of the hydraulic oil is 50°C .
3. Raise the loader beam and install the safety strut.
4. Stop the engine and depressurize the hydraulic system.
5. Open the cover.
6. Remove the plug (1) and connect the 0 to 300 bar pressure gauge to the test point (1) M10x100 in the pump outlet piping.
7. For sideshift machine, do steps 8 and 9.
8. Remove the hydraulic line between the digger valve and the clamp valve.
9. Remove the adaptor from the digger valve and connect an M10x100 adaptor and a 0 to 400 bar pressure gauge in its place.
10. For centermount machine, do steps 11 and 12.
11. Remove the hydraulic line between the digger valve and the quick-attach valve.
12. Remove the adaptor from the digger valve and connect an M10x100 adaptor and 0 to 400 bar pressure gauge in its place.



CI98J519

13. Clear all personnel away from the machine.
14. Start the engine and run it at 2200 rpm.
15. Fully dump the bucket to operate the main relief valve. Make sure the pressure gauge reads 225 bar.

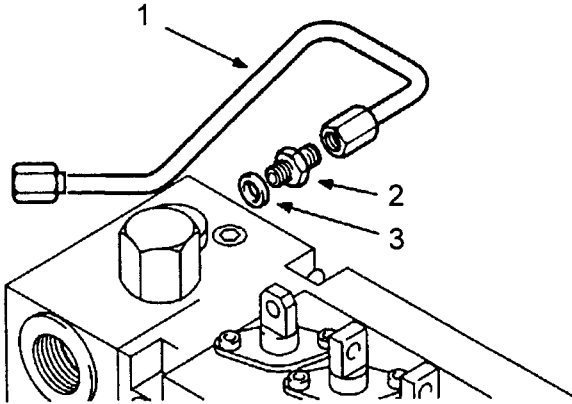
NOTE : *If the pressure is below this specification adjust the pilot for the main relief valve.*

16. Remove the hydraulic test kit from the test point (1) and install the plug.
17. For the sideshift machine, refit the hydraulic line between the digger valve and the clamp valve.
18. For the centermount machine, refit the hydraulic line between the digger valve and the quick-attach valve.
19. Close the cover.

Pressure check for 960B and 965B

The main relief valve is housed in the backhoe control valve inlet module.

1. Sideshift machines only. With the engine stopped, remove the feed pipe (1), union (2) and seal (3) to the backhoe clamp valve.



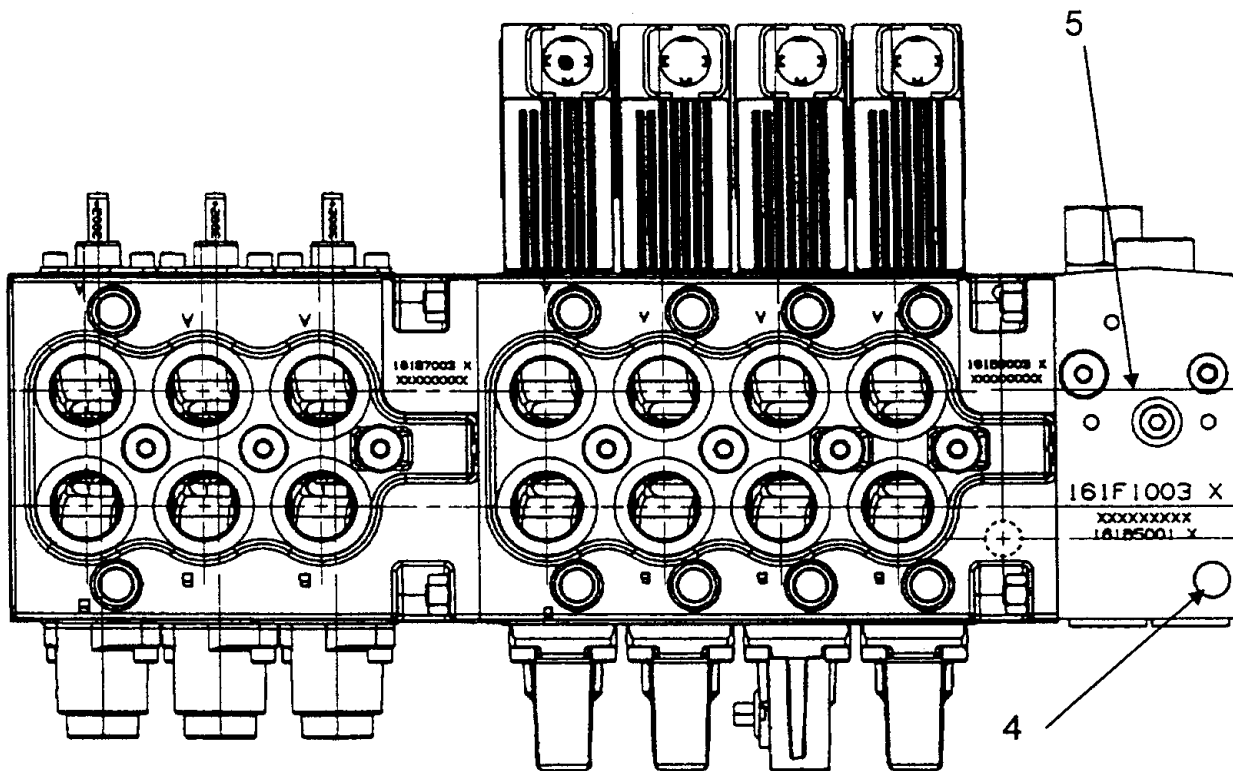
CS98J539

2. Centermount machines only. Remove pressure gallery plug.
3. Insert adaptor from the pressure test kit into the backhoe control valve where the union/plug was removed from.

4. Attach the hydraulic test hose and 0-400 bar pressure gauge to the adaptor.
5. Start the engine and set the RPM to 1800 on the hand throttle.
6. **Select slow mode** (single pump flow) on the side console switch.

NOTE : By selecting slow mode (single pump), the hydraulic system is not influenced by the 62 litre outer pump or the unloader valve.

7. Fully retract a stabiliser leg.
8. With the leg fully retracted, the main relief valve housed in the inlet module of the inlet module of the backhoe valve block will operate. The main relief valve pressure is set at $225 \pm \frac{7}{0}$ bar. Should the pressure recorded on the gauge be less than 225 bar, the main relief valve pilot valve (4) should be adjusted.



CS98J540

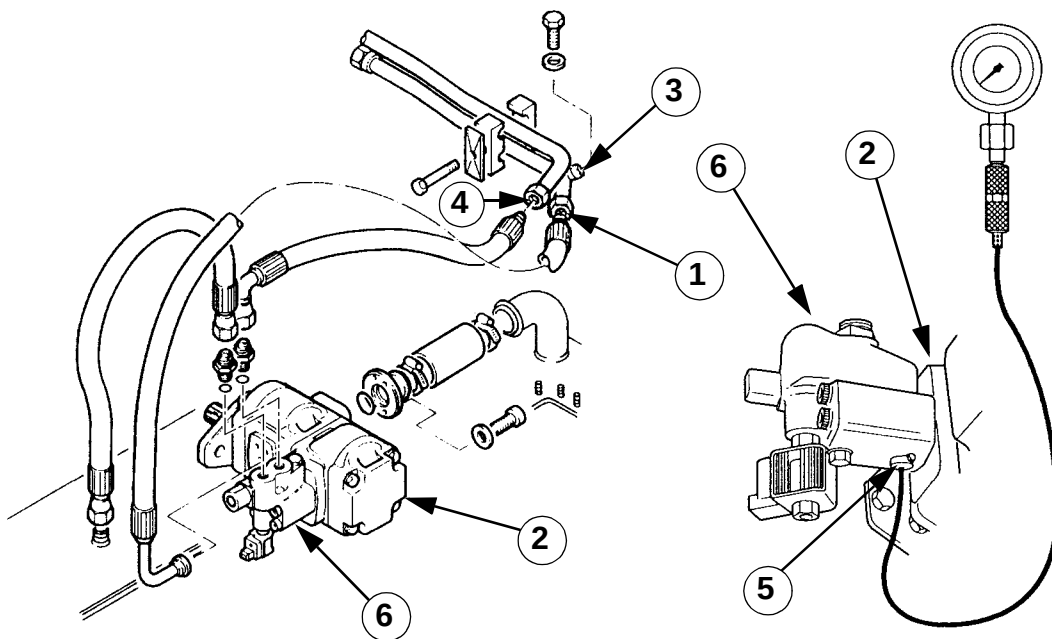
To adjust the pilot valve, remove the black plastic cap, and using a 6 mm Allen key, adjust the pressure. to increase the pressure turn the Allen key clockwise, to reduce the pressure, turn the Allen key anti-clockwise.

NOTE : *If the pressure cannot be adjusted to 225 bar it indicates that the inlet compensator housed in the inlet module is not allowing full pressure to build up in the cylinder. Any such cases should be notified to the Service Department. Having carried out steps 2 to 7 the inner pump, the inlet compensator and the main relief valve for the hydraulic system have been checked.*

9. Stop the engine, relieve hydraulic pressure, remove the pressure checking gauge, hose and adaptor and refit the seal, union and feed pipe for the backhoe clamp, (Sideshift machines) and the plug (Centermount machines).
10. Start the engine, raise the loader to maximum height and fit the safety support strut.
11. Remove the pump guard.
12. With the engine stopped, fit adaptor from the pressure test kit into the unloader valve pressure checking point closest to the pump body.
13. Attach the hydraulic test hose and 0-400 bar pressure gauge to the adaptor.
14. Start the engine and set the RPM at 1800 on the hand throttle.
15. **Select fast mode** (dual pump flow) on the side console switch.
16. Raise the backhoe boom to within 15 cm of cylinder rod, from it's maximum height.
17. Partially select the boom lever to raise the boom to maximum height. It will be found that the pressure registered on the gauge will gradually increase until a point is reached where the gauge needle drops to zero. This point is where the unloader valve operates.
18. The correct operating pressure of the unloader valve is $207 \pm \begin{smallmatrix} 7 \\ 0 \end{smallmatrix}$ bar.
19. If the unloader valve operates outside the above limits, the unloader relief valve capsule must be replaced.
20. Having checked the unloader valve, the engine must be stopped, the gauge, hose and adaptor removed and the blanking plug fitted.
21. Refit the pump guard, start the engine and lift the loader to maximum height and remove the safety support strut.

PUMP TEST

1. Park the machine on a level surface.
2. Work the machine until the temperature of the hydraulic oil is 50°C.
3. Raise the loader beam and install the safety strut and stop the engine.
4. Depressurize the hydraulic system.
5. Remove the pump guard.
6. Connect the flow meter to the outlet port (1) of the inner (80 l/mn) section of the hydraulic pump.
7. Connect the pressure gauge to the test point M10x100 (3) in the pump outlet piping.
8. Start the engine and run it at 2200 rpm.
9. Check that the pump outlet pressure and flow are correct. Refer to page 3.
10. If the pump flow rate is less than the minimum flow rate specified, replace the pump.
11. Stop the engine and depressurize the system.
12. Remove the pressure gauge and the flow meter from the inner section of the pump.
13. Connect the flow meter to the outlet port (4) of the outer (60 or 80 l/mn) section of the hydraulic pump.
14. Connect the pressure gauge to the test port (5) M10x100 on the underside of the unloader valve (6) fitted on the pump (2).
15. Start the engine and run it at 2200 rpm.
16. Check that the pump outlet pressure and flow are correct. Refer to page 3.
17. If the pump flow rate is less than the minimum flow rate specified, replace the pump.
18. Slowly raise the loader beam against the cylinder internal cushioning. This will raise the system pressure until the unloader valve operates.
19. Record the unloader valve operating pressure.
20. When the unloader valve operates, check that the pump outlet pressure is 0 to 5 bar and that the outlet flow is 0 litre/min.
21. Check that the unloader valve operating pressure is correct. Refer to page 3.
22. If the unloader valve operating pressure is outside the specified limits, replace the unloader valve.
23. Slowly increase the pressure to 175 bar and check that the minimum flow rate for the outer (62 litre/min) section of the pump has been restored. Refer to page 3.
24. Install the pump guard.



C198J522

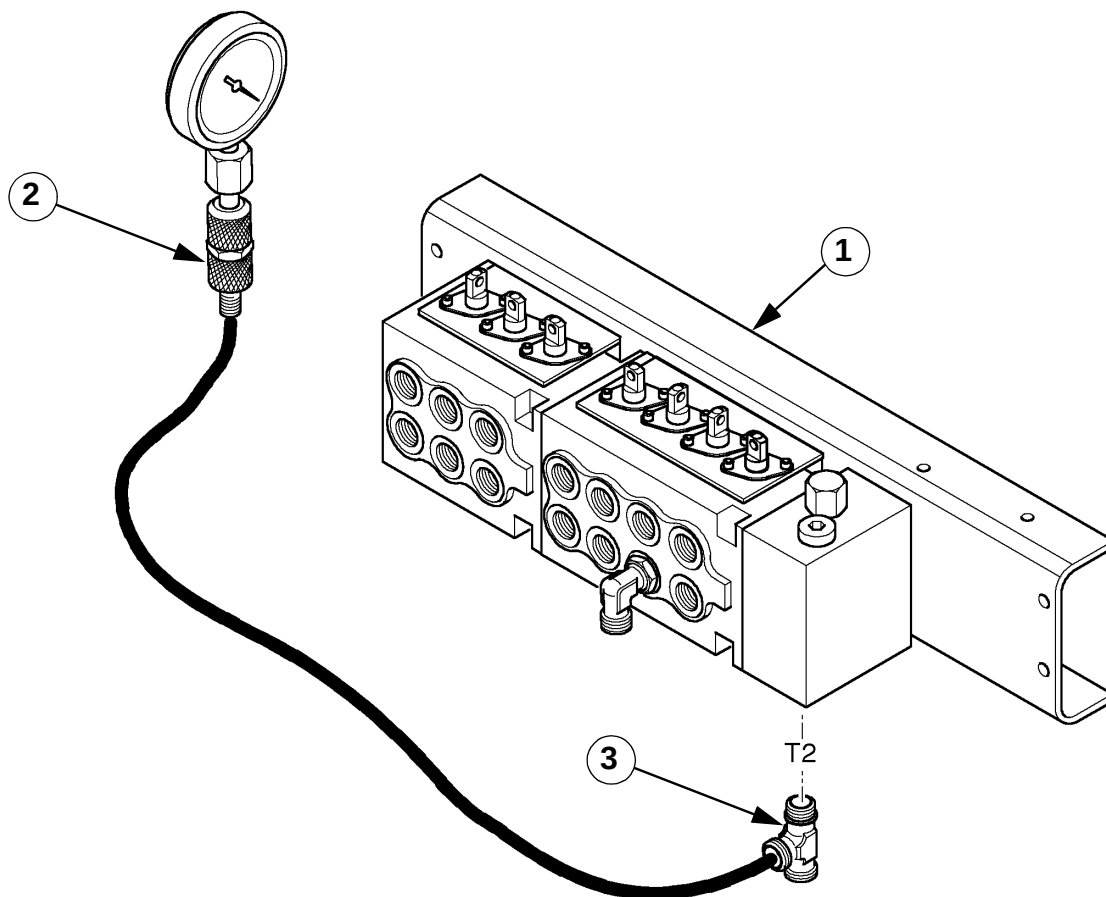
BACK PRESSURE VALVE PRESSURE TEST

Special tools

- Pressure gauge 0 to 100 bar.

Test procedure

1. Park the machine on a level surface.
2. Stop the engine and depressurize the hydraulic system as detailed in this section.
3. Lift the floor mat and remove the plate that gives access to the backhoe valve.
4. Install the tee fitting (3) on port T2 of the control valve and connect the 0 to 100 bar pressure to the tee fitting (3)..
5. Start the engine.
6. With the engine idling, note the pressure indicated on the pressure gauge.
7. Increase the engine speed to 2200 rpm and note the pressure indicated on the pressure gauge.
8. Check the pressures noted in steps 6 and 7 against the specifications on page 3.
9. If the back pressure valve operating pressure is outside the limits given in the specifications, replace the backhoe valve.
10. Fully crowd the backhoe bucket and hold it stalled. Check that the pressure indicated on the pressure gauge is between 52 and 53 bar.



1. Backhoe valve
2. Pressure gauge
3. Tee

CI98G504

CHECKING THE SYSTEM FOR OPTIONAL RIDE CONTROL

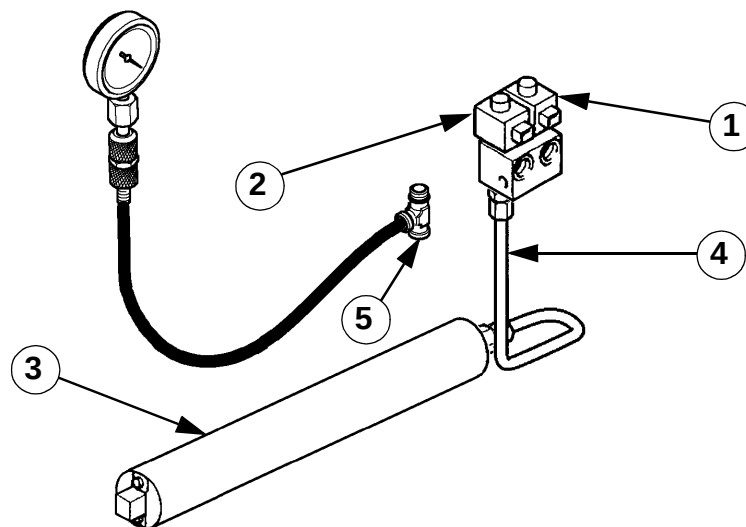
Right solenoid valve for ride control (Accumulator)

1. Make sure that the oil side of the accumulator is completely discharged by doing the following :
 - Put the ride control switch in the ON position.
 - Lower the loader to the floor. Put the loader control lever in the float position.
 - Stop the engine. Put the key switch in the ON position.
 - Depressurize the hydraulic circuit.
 - Find the right and left solenoid valves for the ride control system. Depress the pin in the solenoid valves to release any pressure in the loader lift circuit.
2. Put the ride control switch and key switch in the OFF position.
3. Put the loader control lever in the neutral position.
4. Disconnect the tube (4) between the right solenoid valve and the accumulator at the right solenoid valve (1).
5. Remove the elbow fitting from the right solenoid valve (1).
6. Install an adjustable Tee fitting in the right solenoid valve (1).

7. Connect the tube (4) from the accumulator to the adjustable Tee (5) fitting in the right solenoid valve (1).

NOTE : Use a hose and fittings from the fitting kit or the flowmeter fitting kit to make the following connections.

8. Connect a hose and the pressure gauge with a capacity of at least 400 bar to the adjustable tee (5) fitting in the right solenoid valve (1).
9. Start and run the engine at low idle. Move the loader control lever to the RAISE position while you read the pressure gauge. The pressure gauge should read approximately 0 bar. If the pressure gauge indicates more than 17 bar and repair or replace the right solenoid valve (section 8009).
10. Lower the loader bucket to the floor.
11. Put the ride control switch in the ON position.
12. Move the loader control lever to the RAISE position while you read the pressure gauge. The pressure gauge should indicate approximately 344 bar. If the pressure gauge does not indicate approximately 344 bar repair or replace the right solenoid valve (1) for ride control (section 4001 and 8009).



C199G505

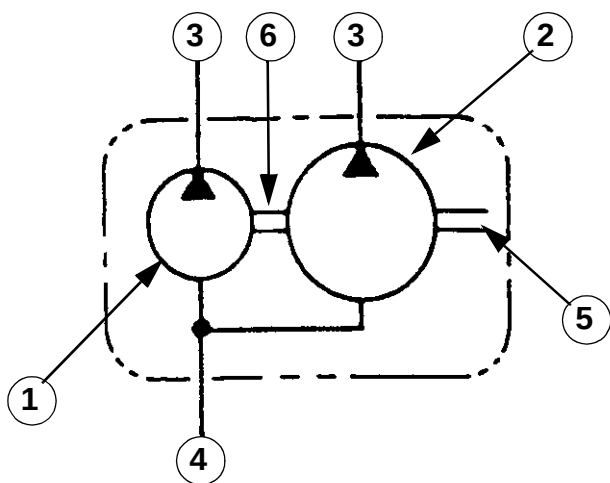
1. Right solenoid valve for ride control (accumulator).
2. Left solenoid valve for ride control (tank)
3. Accumulator
4. Tube from right solenoid valve to accumulator.

Left Solenoid Valve for Ride control (Tank)

NOTE : *See page 16 for location of parts*

1. Put the ride control switch in the ON position.
2. Move the loader control lever to the LOWER position until the loader bucket is on the floor, continue to lower the loader bucket to raise the machine off the floor. The loader must not be able to lift and hold the machine off the floor. If the loader can lift and hold the machine, repair or replace the left solenoid valve (section 4001 and 8009).
3. If required, lower the machine to the floor.
4. Put the ride control switch in the OFF position.
5. Move the loader control lever to the LOWER position until the loader bucket is on the floor, continue to lower the loader bucket to raise the machine off the floor. The loader must be able to lift and hold the machine off the floor. If the loader cannot lift and hold the machine off the floor, repair or replace the left solenoid valve (section 4001 and 8009).
6. If required, lower the machine to the floor.

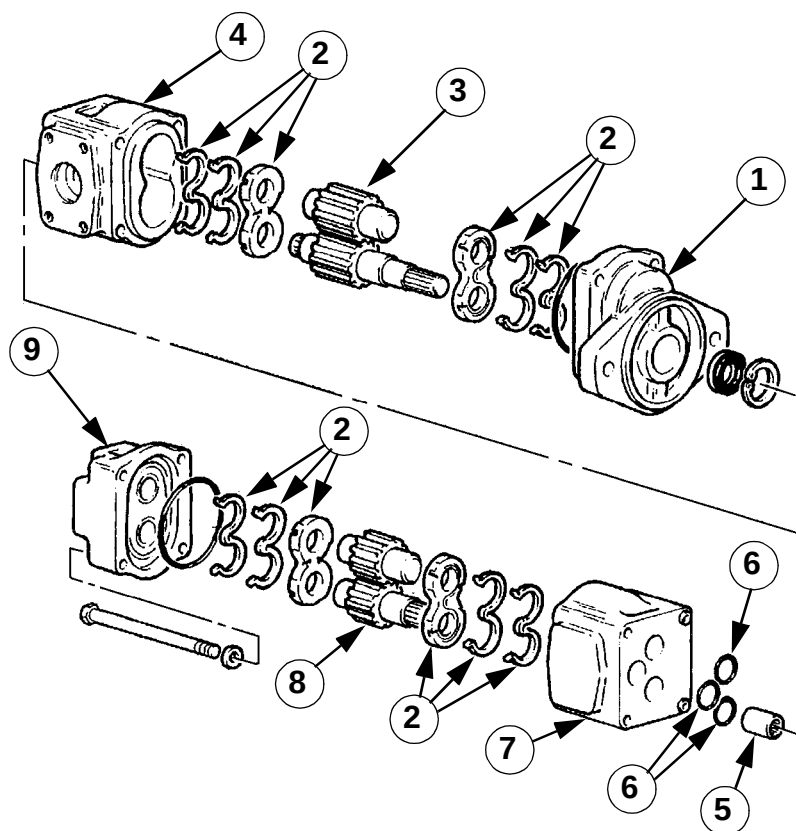
HYDRAULIC PUMP



1. Rear section
2. Front section
3. Outlet
4. Inlet
5. Drive shaft
6. Coupling

CS98J543

**Generates oil flow for the complete hydraulic system,
except brake booster**

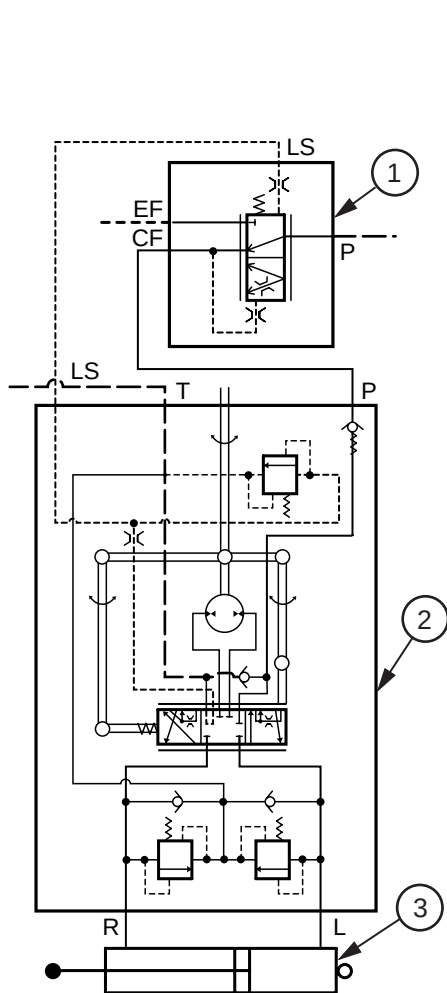


1. Front plate
2. Gaskets
3. Front section gears
4. Front section
5. Coupling

6. O-ring
7. Rear section
8. Rear section gears
9. Rear plate

CI99G503

STEERING CONTROL VALVE

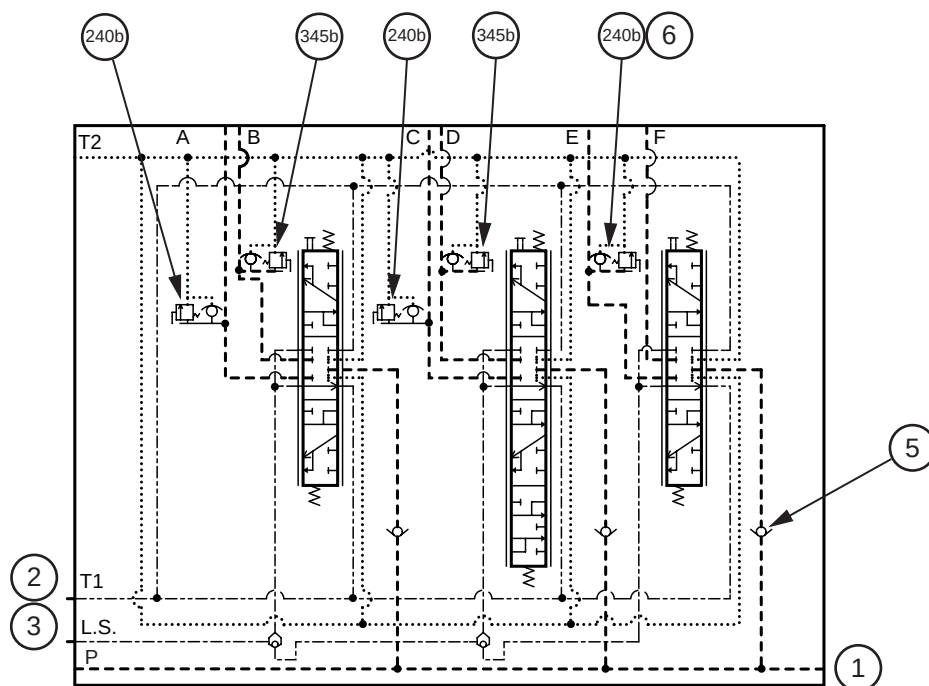


- P. From pump to control valve
- EF. To loader control valve or to extendahoe control valve
- T. To hydraulic reservoir
- R. Right
- L. Left
- 1. Steering priority valve
- 2. Steering control valve
- 3. Cylinder

CM99G007

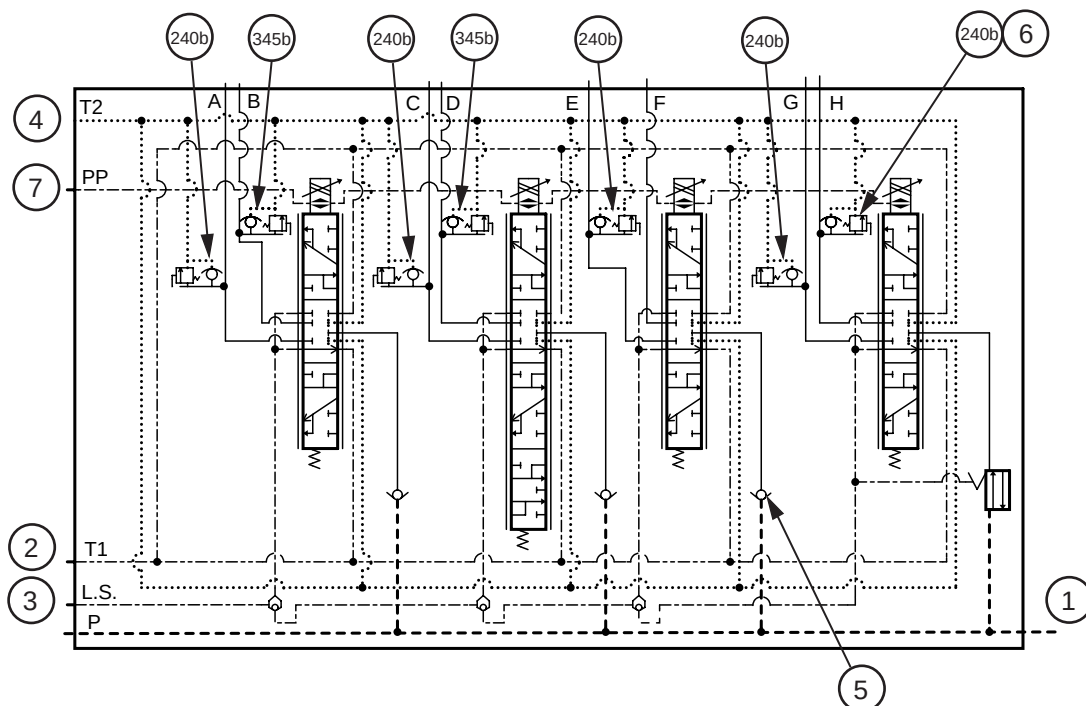
LOADER CONTROL VALVE

750B-760B-860B series



CM99G003

960B-965B series



CM99G004

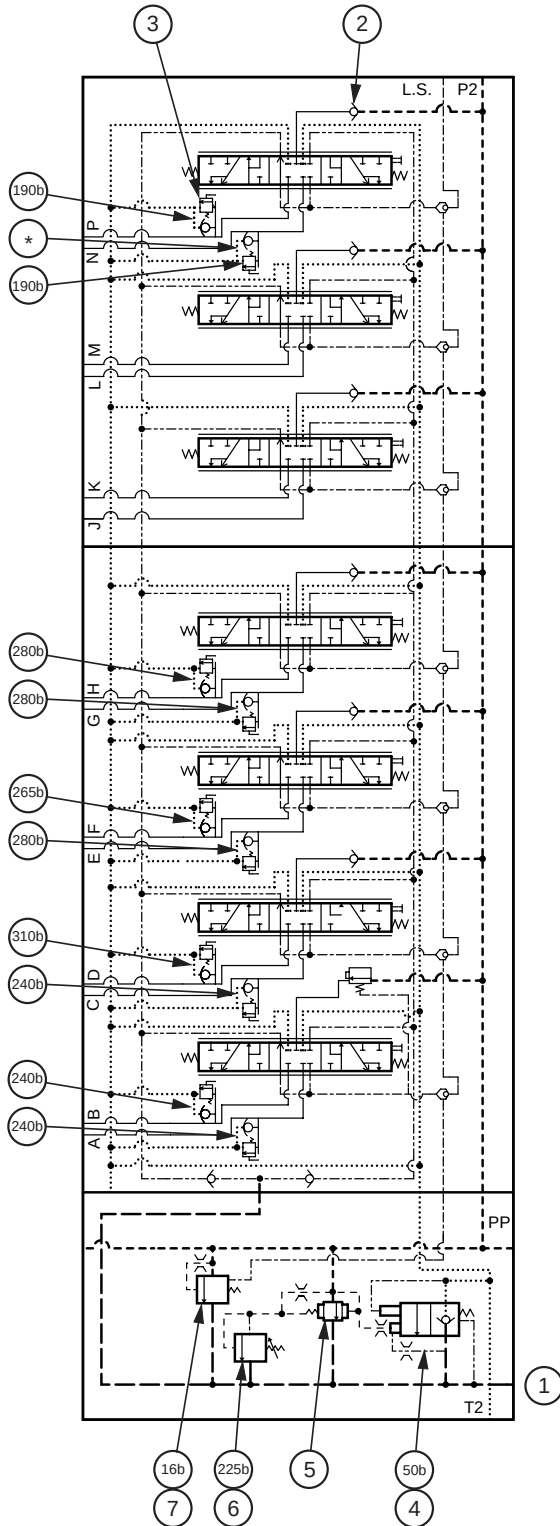
1. Inlet
2. Outlet
3. To backhoe control valve
4. To backhoe control valve inlet section
5. Check valve
6. Main relief valve
7. Load sensing

- A-B. To bucket cylinder
- C-D. To loader beam cylinder
- E-F. To auxiliary cylinder
- G-H. To steering cylinder (4 WS)

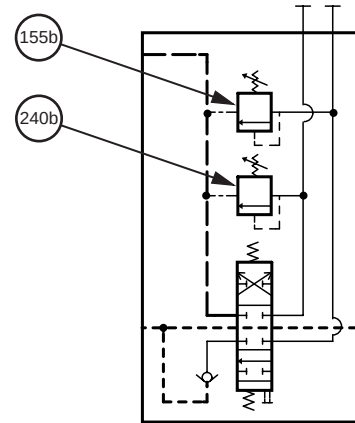
BACKHOE CONTROL VALVE

750B-760B-860B-960

Extendable dipper valve



CM99G005



CM99G008

1. Inlet
2. Anticavitation valve
3. Circuit relief valve
4. Regeneration valve
5. Full flow relief valve
6. Relief valve pilot valve
7. Compensation valve

A-B. To slew cylinders

C-D. To boom cylinder

E-F. To dipper cylinder

G-H. To bucket cylinder

J-K. To stabilizer cylinder

L-M. To stabilizer cylinder

N-P. To hammer or auxilliary cylinder

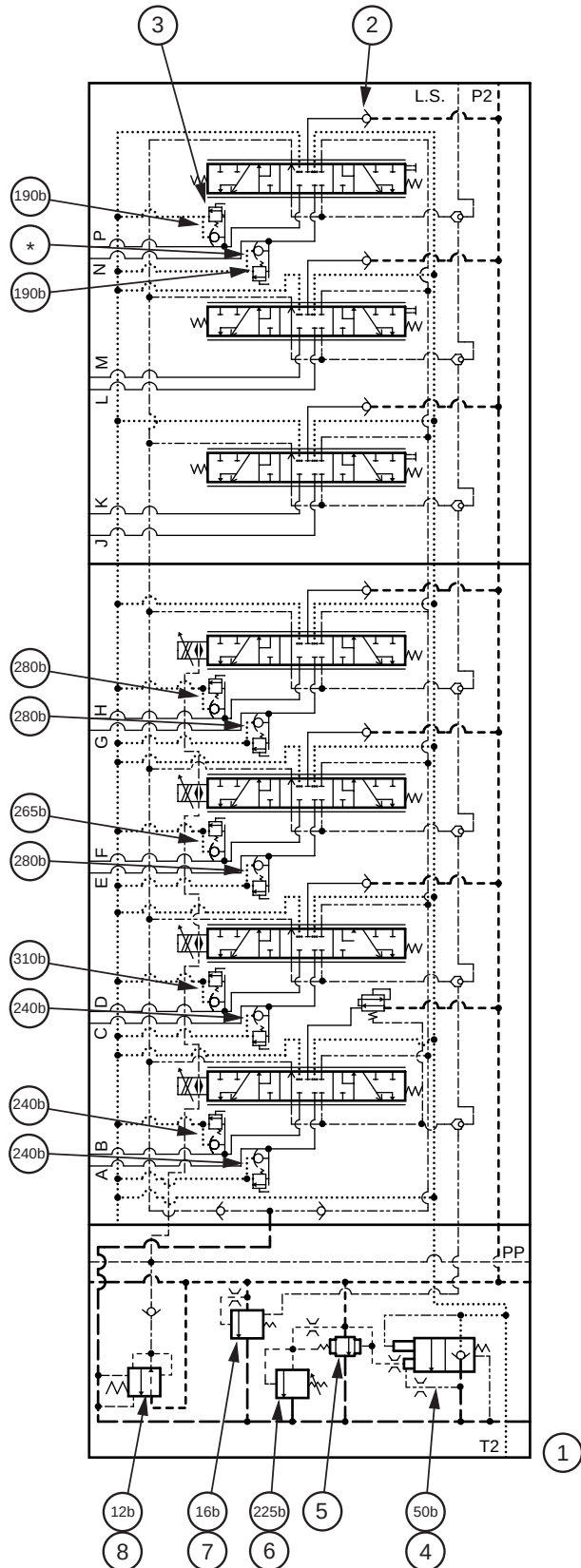
* Remove the forced feed valve when using the hydraulic hammer option.

NOTE : For correct identification and in the interests of safety the corresponding pressure setting is engraved on the side of each valve.

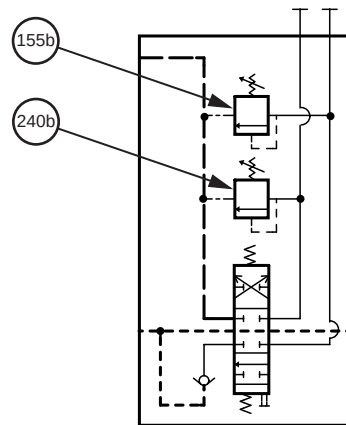
BACKHOE CONTROL VALVE

Serie 965

Extendable dipper valve



CM99G006



CM99G008

1. Inlet
 2. Anticavitation valve
 3. Circuit relief valve
 4. Regeneration valve
 5. Full flow relief valve
 6. Relief valve pilote valve
 7. Compensation valve
 8. Pilot pressure valve
- A-B.** To slew cylinders
C-D. To boom cylinder
E-F. To dipper cylinder
G-H. To bucket cylinder
J-K. To stabilizer cylinder
L-M. To stabilizer cylinder
N-P. To hammer or auxilliary cylinder

* Remove the forced feed valve when using the hydraulic hammer option.

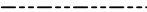
NOTE : For correct identification and in the interests of safety the corresponding pressure setting is engraved on the side of each valve.

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HYDRAULIC CIRCUIT DESCRIPTION

1. Hydraulic reservoir	23. Left stabilizer control valve
2. Hydraulic pump	24. Backhoe bucket control valve
3. Loader control valve	25. Backhoe dipper control valve
4. Backhoe control valve	26. Backhoe boom control valve
5. Hydraulic oil cooler	27. Backhoe slew control valve
6. Slew cylinder	28. Loader bucket control valve
7. Slew cylinder	29. Loader beam control valve
8. Steering cylinder	30. Loader auxiliary control valve
9. Right stabilizer cylinder	31. Extendable dipper valve
10. Left stabilizer cylinder	32. Accumulator
11. Return hydraulic oil filter	33. Unloader valve
12. Loader bucket cylinder	34. Feed hydraulic oil filter
13. Loader beam cylinder	35. Steering control valve
14. 7 in 1 bucket cylinder	36. Steering priority valve
15. Extendable cylinder	37. Orbitrol
16. Backhoe bucket cylinder	38. Hammer
17. Backhoe dipper cylinder	39. Inlet compensator
18. Backhoe boom cylinder	40. Adjustable pilot for MRV
19. Backhoe auxiliary hydraulic control valve	41. MRV
20. Quick attach valve	42. Back pressure valve
21. Clamp valve	43. Right stabilizer load holding
22. Right stabilizer control valve	44. Left stabilizer load holding
	45. Boom load holding.
	46. Clamp cylinders

Legend

	Centermont boom only
	Sideshift boom only
	Pilot pressure (electronic machine only)
	Pressure
	Return - Suction (low pressure)
	Return (high pressure)
	Load sensing

Section

8003

8003

CLEANING THE HYDRAULIC SYSTEM

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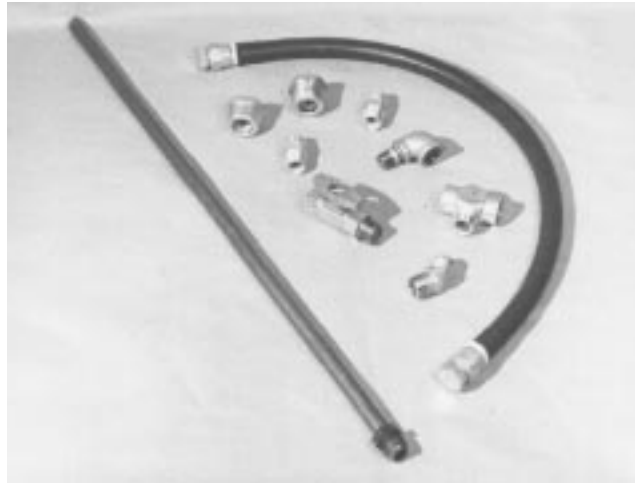
CLEANING THE HYDRAULIC SYSTEM 5

SPECIAL TOOLS



806127

The part number for the Portable Filter is CAS-10162A.



806128

The part number for the Fitting Kit is CAS-10508.

GENERAL INFORMATION

Contamination in the hydraulic system is a major cause of the malfunction of hydraulic components. Contamination is any foreign material in the hydraulic oil. Contamination can enter the hydraulic system in several ways.

1. When you drain the oil or disconnect any line.
2. When you disassemble a component.
3. From normal wear of the hydraulic components.
4. From damaged or worn seals.
5. From a damaged component in the hydraulic system.

All hydraulic systems operate with some contamination. The design of the components in this hydraulic system permits efficient operation with a small amount of contamination. An increase in this amount of contamination can cause problems in the hydraulic system. The following list includes some of these problems.

1. Cylinder rod seals leak.
2. Control valve spools do not return to neutral.
3. Movement of control valve spools is difficult.
4. Hydraulic oil becomes too hot.
5. Pump gears, housing, and other parts wear rapidly.
6. Relief valves or check valves held open by dirt.
7. Quick failure of components that have been repaired.
8. Cycle times are slow; machine does not have enough power.

If your machine has any of these problems, check the hydraulic oil for contamination. See Types of Contamination below. If you find contamination, use the Portable Filter to clean the hydraulic system.

TYPES OF CONTAMINATION

There are two types of contamination, microscopic and visible.

1. Microscopic contamination occurs when very fine particles of foreign material are in suspension in the hydraulic oil.
2. These particles are too small to see or feel. Microscopic contamination can be found by identification of the following problems or by testing in a laboratory. Examples of the problems:
 - a. Cylinder rod seal leak.
 - b. Control valve spools do not return to NEUTRAL.
 - c. The hydraulic system has a high operating temperature.

3. Visible contamination is foreign material that can be found by sight, touch, or odor. Visible contamination can cause a sudden failure of components. Examples of visible contamination:

- a. Particles of metal or dirt in the oil.
- b. Air in the oil.
- c. The oil is dark and thick.
- d. The oil has the odor of burned oil.
- e. Water in the oil. See page 7.

CLEANING THE HYDRAULIC SYSTEM

- 1.** Prepare the portable filter on page 3 by doing the following steps:
 - a. Remove all the hydraulic oil from the inlet and outlet hoses for the portable filter.
 - b. Remove the filter element from the portable filter.
 - c. Remove all hydraulic oil from the portable filter.
 - d. Clean the inside of the housing for the filter element.
- 2.** You must know whether the contamination is microscopic or visible. See Types of Contamination on page 4.
- 3.** If the contamination is microscopic:
 - a. Check the maintenance schedule for the machine to learn if the hydraulic oil must be changed. If needed, change the hydraulic oil. See Section 1002 for specifications. Change the hydraulic filter.
 - b. Do steps 6 through 35.
- 4.** If the contamination is visible:
 - a. Change the hydraulic oil and hydraulic filter. See Section 1002 for oil specifications.
 - b. Do steps 5 through 35.
- 5.** Check the amount of contamination in the hydraulic system by doing the following steps:
 - a. Disassemble one cylinder in two different circuits. Check for damage to seals, scoring of the cylinder wall, etc. Repair the cylinders as necessary.
 - b. If, in your judgment, the damage to the cylinders was caused by severe contamination and is not the result of normal wear, it is necessary to remove, clean and repair valves, pump, lines, cylinders, hydraulic reservoir, etc. in the hydraulic system.
- 6.** Connect a vacuum pump to the fitting used for the hydraulic return circuit (optional) start the vacuum pump.
- 7.** Loosen and remove the drain plug from the reservoir.
- 8.** See the fitting kit shown on page 3. Install the valve in the hole for the drain plug. Make sure that the valve is closed.
- 9.** Stop the vacuum pump.
- 10.** Connect the inlet hose for the portable filter to the valve that is installed in the hole for the drain plug.
- 11.** Disconnect the vacuum pump from the filler cap opening on the hydraulic reservoir.
- 12.** Install the outlet hose for the portable filter in the hydraulic reservoir.
- 13.** Open the valve that is installed in the hole for the drain plug.
- 14.** Move the switch for the portable filter to the ON position. Start and run the engine at 1500 rpm (r/min).
- 15.** Run the portable filter for 10 minutes.
- 16.** Continue to run the portable filter. Increase the engine speed to full throttle. Heat the oil to operating temperature by doing the following steps:
 - a. Hold the bucket control lever in the ROLLBACK position for 15 seconds.
 - b. Return the bucket control lever to NEUTRAL for 30 seconds.
 - c. Repeat steps 16a through 16b until the oil in the hydraulic system is at operating temperature.
- 17.** Continue to run the engine at full throttle. Continue to run the portable filter.
- 18.** Operate each hydraulic circuit to completely extend and retract the cylinders. Continue to operate each hydraulic circuit two times, one after the other, for 45 minutes.
- 19.** Decrease the engine speed to low idle.
- 20.** Continue to run the portable filter for 10 minutes.
- 21.** Stop the portable filter.
- 22.** Stop the engine.
- 23.** Remove the hose from the hydraulic reservoir.

- 24.** Close the valve that is installed in the hole for the drain plug.
- 25.** Disconnect the inlet hose for the portable filter from the valve.
- 26.** Connect a vacuum pump to the breather hose of the hydraulic reservoir.
- 27.** Start the vacuum pump.
- 28.** Remove the valve from the hole for the drain plug.
- 29.** Install the drain plug.
- 30.** Stop the vacuum pump. Disconnect the vacuum pump from the hydraulic reservoir.
- 31.** Remove the hydraulic filter element from the machine.
- 32.** Install a new hydraulic filter element on the machine.
- 33.** Check the oil level in the hydraulic reservoir. Add oil as required. See Section 1002 for specifications.
- 34.** Start the engine. Check for oil leakage around the new hydraulic filter.
- 35.** Stop the engine.

FLUSHING WATER FROM THE HYDRAULIC SYSTEM

1. Start and run the engine at 1500 rpm (r/min).
2. Completely retract the cylinders of all attachments on the machine.



WARNING : *If retracting the cylinder rods causes the attachment to be raised, block the attachment in place before proceeding to the next step!*

NOTE : *Any attachment or part of an attachment that is raised must be supported with acceptable equipment to prevent the attachment from falling.*

3. Loosen and remove the filler cap from the reservoir.
4. Drain the hydraulic oil from the reservoir.
 - a. The reservoir holds approximately 45 litres of hydraulic oil.
 - b. Have available acceptable equipment to drain the hydraulic oil.
 - c. Remove the drain plug from the bottom of the reservoir.
5. Remove the hydraulic oil filter from the machine.
6. Install a new hydraulic oil filter on the machine.
7. Install the drain plug in the bottom of the reservoir.
8. Fill the hydraulic reservoir with 43 litres of Case Fluid. See Section 1002 for specifications.
9. Move each control lever in both directions to release pressure in the hydraulic circuits.
10. Disconnect the line from the rod end and closed end of each cylinder.
11. Be sure all control levers are in the NEUTRAL position.
12. Start the engine and run the engine at low idle.

IMPORTANT : *Check the oil level in the hydraulic reservoir frequently while doing step 13. Have another person hold a container under the hydraulic lines while you do step 13.*

13. Slowly move each control lever in both directions until oil begins to flow from the open line. Hold the control lever in place until clean oil flows from the open line.

14. Stop the engine.

NOTE : *Any attachment or part of an attachment that is raised must be supported with acceptable equipment to prevent the attachment from falling.*

15. Connect the line to the CLOSED end of each cylinder.
16. Start the engine and run the engine at low idle.
17. Slowly and completely extend all cylinders. As the piston rod comes out of the cylinder, oil will be pushed out of the rod end of the cylinder.
18. Support the loader frame so that the loader frame will stay in the RAISED position.
19. Stop the engine.
20. Connect the lines to the rod end of the cylinders.
21. Check the oil level in the hydraulic reservoir. Add oil as required. See Section 1002 for specifications.
22. Install the filler cap for the reservoir.

Section

8004

HYDRAULIC PUMP AND UNLOADER VALVE

8004

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SPECIFICATIONS

Manufacturer.....	ULTRA
Pump Type (Front pump)	2PR037
Pump Type (Rear pump) series 750/760.....	2PR029
Pump type (Rear pump) series 860/960/965.....	2PR037
Theoretical displacement (Front pump)	37 cc/rev
Theoretical displacement (Rear pump) series 750/760.....	29.0 cc/rev
Theoretical displacement (Rear pump) series 860/960/965.....	37 cc/rev
Maximum continuous pressure P1 (Front pump).....	230 bar
Maximum continuous pressure P1 (Rear pump)	220 bar
Maximum speed at pressure P1.....	2200 rev/min
Minimum speed at pressure P1	500 rev/min
Rotation when viewed on end of driveshaft.....	Anti-clockwise
Operation temperature range	continuous 0°C to 80°C, Cold start - 20°C, Max intermittent 100°C
Shaft seal type.....	Single Nitrile
Centre Seal Type	Single Nitrile
Weight	25 Kg (55 lb)

SPECIAL TORQUE

Spring seat	45 Nm
Unloader valve screws.....	50 Nm

Disassembly

STEP 1

Thoroughly clean the outside of the pump and the work area before starting work.

STEP 2

Remove the screws that attach the unloader valve to the pump, and remove the unloader valve.

STEP 3

Mark the end cover (19), the outer pump body (15), the inner pump body (12) and mounting flange (4) as an aid to assembling.

STEP 4

Remove the screw (20) and the washers (21).

STEP 5

Remove the end cover (19) from the outer pump body (15). It may be necessary to use a soft faced mallet to separate the components.

STEP 6

Remove and discard the O-ring seal (5) from the end cover (19).

STEP 7

Note the position of the gears (17) and (18) and the bearing plates (7) and (8) as an aid to assembling.

STEP 8

Remove the ring (6), the back-up ring (7) and the bearing plate (8) from the outer pump body (15).

STEP 9

Remove the drive gear (18) and the driven gear (17) from the outer pump body (15).

STEP 10

Remove the bearing plate (8), the back-up ring (7) and the ring (6) from the outer pump body (15). Remove the outer pump body (15) from the inner pump body (12). It may be necessary to use a soft faced mallet to separate the components.

STEP 11

Remove the spindle coupling (13) from the outer pump body (15).

STEP 12

Remove and discard the O-ring seals (14) from the outer pump body (15).

STEP 13

Remove the mounting flange (4) from the inner pump body (12). It may be necessary to use a soft faced mallet to separate the components.

STEP 14

Remove and discard the O-ring seal (5) from the mounting flange (4).

STEP 15

Remove the snap ring (3) and the shaft seal (2) from the mounting flange (4). Discard the shaft seal (2).

STEP 16

Note the position of the gears (11) and (10) and the bearing plates (8) as an aid to assembling.

STEP 17

Remove the ring (6), the back-up ring (7) and the bearing plate (8) from the inner pump body (12).

STEP 18

Remove the driven gear (11) and the drive gear (10) from the inner pump body (12).

STEP 19

Remove the bearing plate (8), the back-up ring (7) and the ring (6) from the inner pump body (12).

STEP 20

Remove all sealant from the inner pump body (12), the mounting flange (4), the outer pump body (15) and the end cover (19).

Inspection

NOTE : *If the hydraulic pump fails any of the following inspections, it must be replaced.*

STEP 1

Inspect the mounting flange (4) and the end cover, (19) for damage to the grooves for the O-ring seals (5).

STEP 2

Inspect the mounting flange (4) for damage to the seal (2) groove.

STEP 3

Inspect the outer pump body (15) for damage to the grooves for the O-ring seal (14).

STEP 4

Inspect the faces of the inner pump body (12) and the outer pump body (15) which contact the O-rings (5) for damage.

STEP 5

Inspect the low pressure side of the inner pump body (12) for a gear "cut-in" that is deeper than 0.15 mm (0.006 in) or if the body has a scored or matt appearance.

STEP 6

Inspect the side faces of the driven gears (11) an (17) and the drive gears (10) and (18) for scoring and wear.

STEP 7

Inspect the contact faces of the bearing plates (8) for wear.

STEP 8

Inspect the drive gears (10) and (18) for wear on the bearing surfaces.

STEP 9

Inspect the spines on the drive gears (10) and (18) and the coupling (13) for wear or damage.

STEP 10

Inspect the bearing surfaces of the bearing plates (8) for wear or damage.

STEP 11

Inspect the bolt (20) for damage, distortion and security of attachment.

Assembly

STEP 1

Thoroughly clean all components and the work area before starting work.

STEP 2

Inspect the hydraulic pump (see page 5).

STEP 3

Before assembling, lubricate each component with the specified hydraulic oil (see section 8002).

STEP 4

Fit the ring (6) and the back-up ring (7) into the bearing plate (8).

STEP 5

Install the bearing plate (8) into the inner pump body (12) in the position noted during dismantling.

STEP 6

Make sure that the two small holes in the bearing plate (8) are adjacent to the low pressure side C of the inner pump body (12) and that the gaps in the ring (6) and the back-up ring (7) are adjacent to the inlet port.

STEP 7

Install the driven gear (11) and the drive gear (10) in the positions noted during dismantling.

STEP 8

Install the bearing plate (8) into the inner pump body (12) in the position noted during dismantling.

STEP 9

Make sure that the two small holes in the bearing plate (8) are adjacent to the low pressure side of the inner pump body (12).

STEP 10

Fit the back-up ring (7) and the ring (6) into the bearing plate (8).

STEP 11

Fit a new shaft seal (2) into the mounting flange (4) with the integral spring facing inwards.

STEP 12

Secure the shaft seal (2) in the mounting flange (4) using the snap ring (3).

STEP 13

Fit a new O-ring (5) into the groove in the mounting flange (4).

STEP 14

Apply a small amount of sealant to the joint face of the mounting flange (4).

STEP 15

Install the mounting flange (4) onto the inner pump body (12) in the position marked during dismantling.

STEP 16

Make sure that the drain hole in the rear face of the mounting flange (4) is adjacent to the low pressure side of the inner pump body (12).

STEP 17

Fit new O-rings (14) into the outer pump body (15).

STEP 18

Fit the spindle coupling (13) into the outer pump body (15).

STEP 19

Install the outer pump body (15) onto the inner pump body (12) in the position marked during dismantling.

STEP 20

Fit the ring (6) and the back-up ring (7) into the bearing plate (8).

STEP 21

Install the bearing plate (8) into the outer pump body (15) in the position noted during dismantling.

STEP 22

Make sure that the two small holes in the bearing plate (8) are adjacent to the low pressure side of the outer pump body (15).

NOTE : *The low pressure side of the outer pump body (15) is the side without a port.*

STEP 23

Install the driven gear (17) and the drive gear (18) in the positions noted during dismantling.

STEP 24

Make sure that the drive gear (18) is correctly engaged with the spindle coupling (13).

STEP 25

Install the bearing plate (8) into the outer pump body (15) in the position noted during dismantling.

STEP 26

Make sure that the two small holes in the bearing plate (8) are adjacent to the low pressure side of the outer pump body (15).

STEP 27

Fit the back-up ring (7) and the ring (6) into the bearing plate (8).

STEP 28

Fit a new O-ring into the groove in the end cover (19).

STEP 29

Apply a small amount of sealant to the joint face of the end cover (19).

STEP 30

Install the end cover (19) onto the outer pump body (15) in the position marked during dismantling.

STEP 31

Mount the screws (20) and the washers (21) in the pump assembly.

STEP 32

Pour a small amount of the specified hydraulic oil into the ports, and make sure that the drive shaft rotates easily and freely.

STEP 33

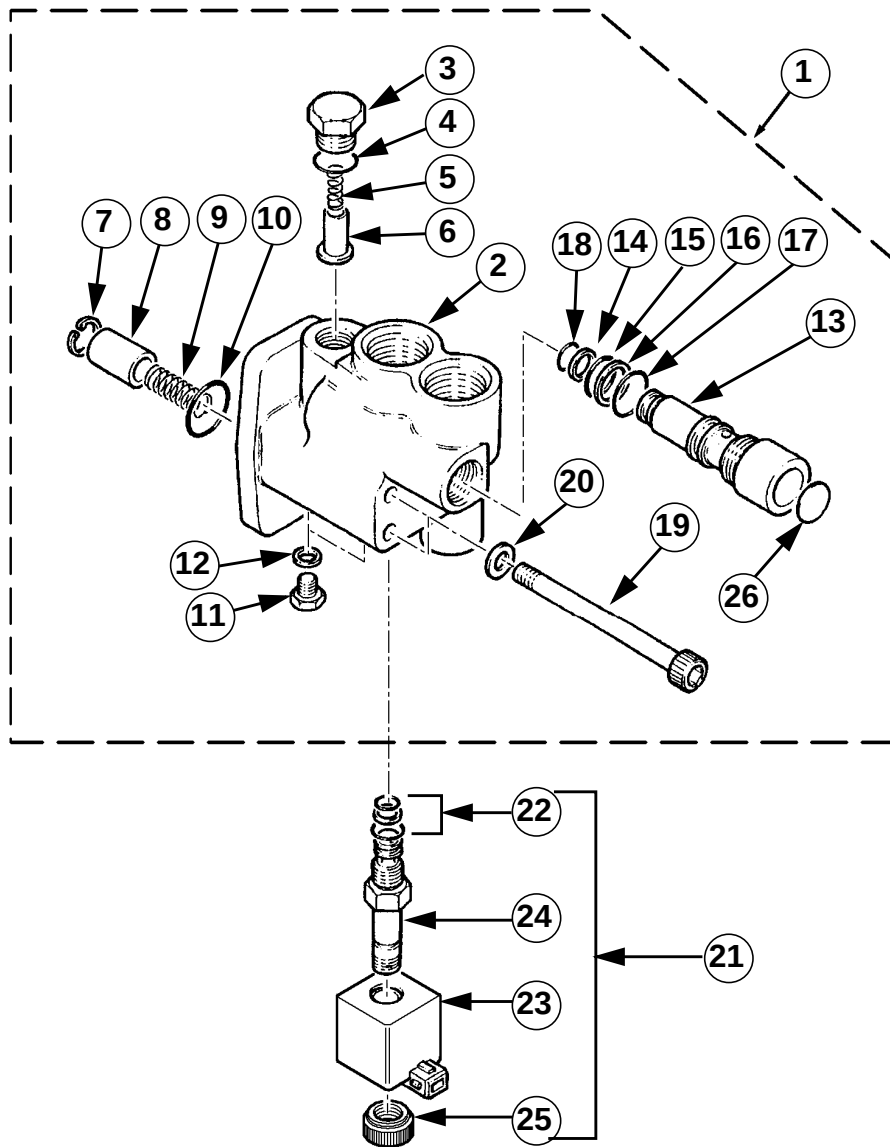
Attach the unloader valve to the pump using the screws.

STEP 34

Using the torque wrench, torque tighten the unloader valve securing screws to 50 Nm (37 lbf ft).

UNLOADER VALVE

Perspective view



1. Unloader valve

2. Valve body

3. Spring seat

4. O-ring seal

5. Spring

6. Check valve

7. Snap ring

8. Spool

9. Spring

10. O-ring seal

11. Plug

12. Washer

13. Relief valve

14. Back up ring

15. O-ring

16. Back up ring

17. O-ring seal

18. O-ring

19. Screw

20. Washer

21. Solenoid valve

22. Kit, seals

23. Coil

24. Spool

25. Nut

26. Plug

CI98F040

Disassembly

STEP 1

Remove the spring seat (3), the spring (5) and the check valve (6) from the valve body (2).

STEP 2

Remove and discard the O-ring seal (4) from the spring seat (3).

STEP 3

Using a "C" spanner, remove the relief valve (13) from the valve body (2).

STEP 4

Remove the O-ring seals (18), (15) and (17) and the back-up rings (14) and (16) from the relief valve (13).

STEP 5

Discard the O-ring seals (18), (15) and (17).

STEP 6

Remove the nut (23) and the coil (22) from the spool (24).

STEP 7

Remove the spool (24) from the valve body (2).

STEP 8

Remove the O-ring seals and the back-up ring (25) from the spool (24).

STEP 9

Discard the O-ring seals.

STEP 10

Remove the snap ring (7), the unloader spool (8) and the spring (9) from the valve body (2).

STEP 11

Remove and discard the O-ring seals (10) from the valve body (2).

Inspection

If any components fail the following inspections, they must be replaced.

STEP 1

Inspect the spring seat (3) for damaged threads.

STEP 2

Inspect the check valve spring (5) for damage.

STEP 3

Inspect the check valve (6) for wear or damage to the valve seat.

STEP 4

Inspect the relief valve (13) for wear or damage, particularly to the threads.

STEP 5

Inspect the spool (24) for wear or damage, particularly to the threads.

STEP 6

Inspect the valve body (2) for damage to the valve bores and metering edges and particularly for damage to the threads.

STEP 7

Inspect the unloader spool spring (9) for damage.

STEP 8

Inspect the unloader spool (8) for damage. Check that the orifice in the spool is not blocked. Make sure that the spool slides freely in the bore of the valve body (2) and that the cleaning wire is not missing or damaged.

Assembly

NOTE : *The assembly of the unloader valve is the reverse of the assembly.*

Assemble the unloader valve in the reverse order of the disassembly but note the following :

STEP 1

Thoroughly clean all components and the work area before starting work.

STEP 2

Inspect the unloader valve (see page 9).

STEP 3

Before assembling, lubricate each component with the specified hydraulic oil.

STEP 4

Install a new O-ring (10) into the valve body (2).

STEP 5

During assembly, make sure that the spool slides freely in the bore of the body (2).

STEP 6

Install new O-ring seals on the spool (24).

STEP 7

Install new O-ring seals (18), (15), and (17) on the relief valve (13).

STEP 8

Install a new O-ring seal (4) to the spring seat (3).

STEP 9

Torque tighten the spring seat (3) to 45 Nm.

Section

8005

LOADER CONTROL VALVE

8005

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SPECIFICATIONS

Loader control valve 2 spools	
Manufacturer	Danfoss
Loader control valve 3 spools	
Manufacturer	Danfoss
Loader control valve 4 spools electronic	
Manufacturer	Danfoss
Pressure settings.....	See section 8002

SPECIAL TORQUE

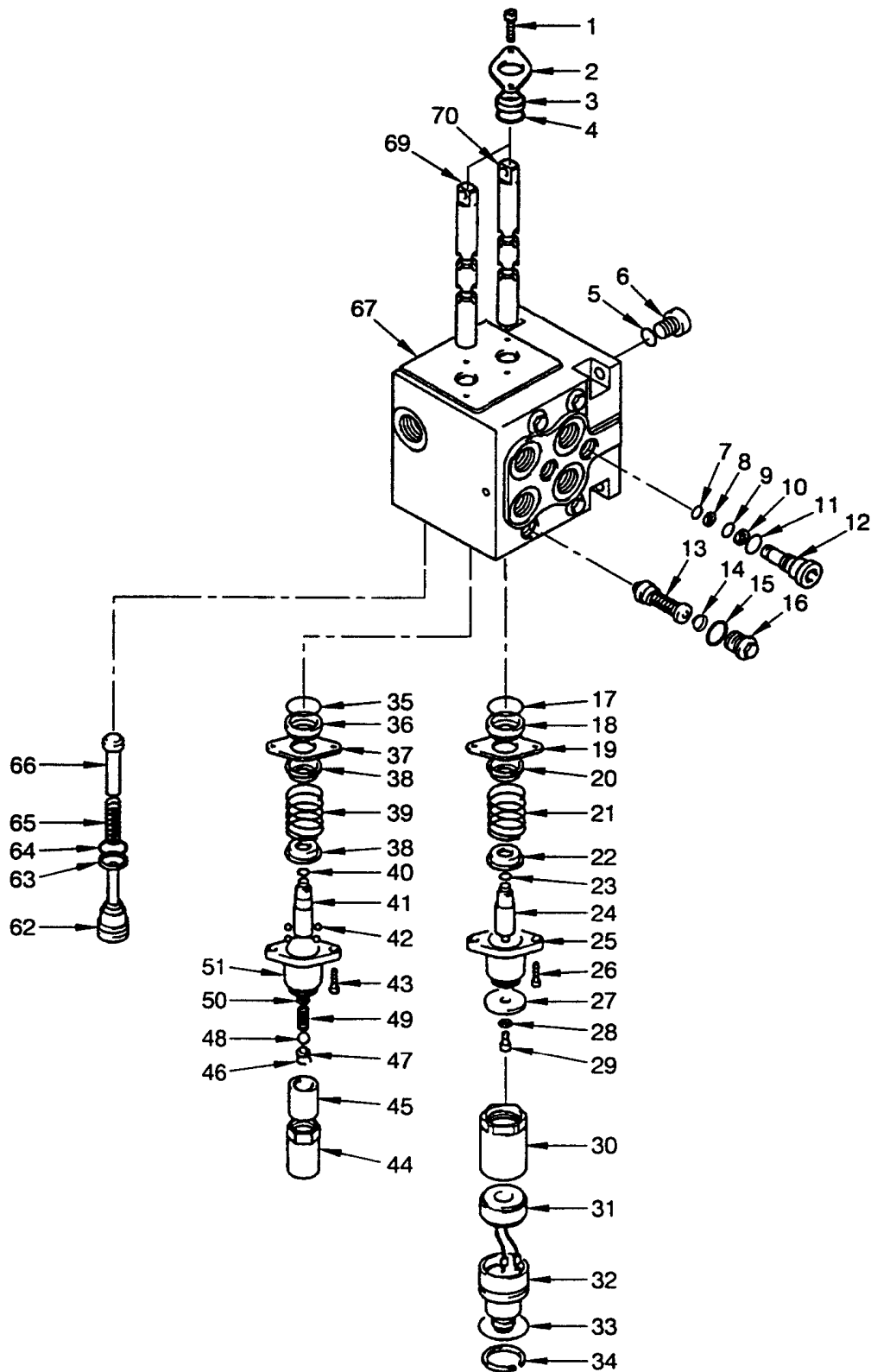
Loader control valve 2 spools and 3 spools	
Check valve plug (62)	55 to 65 Nm (40.6 to 48.0 lbf ft)
Load sensing valve (12).....	22 to 28 Nm (16.2 to 20.7 lbf ft)
Chock valve plug (16)	35 to 45 Nm (25.8 to 33.2 lbf ft)
Plug (6)	55 to 65 Nm (40.6 to 48.0 lbf ft)
Plate attachment bolts	105 Nm (77.5 lbf ft)
Loader control valve 4 spools electronic	
Compensator plug (53) and (42)	55 to 65 Nm (40.6 to 48.0 lbf ft)
Check valve plug (23)	55 to 65 Nm (40.6 to 48.0 lbf ft)
Load sensing valve (13).....	22 to 28 Nm (16.2 to 20.7 lbf ft)
Chock valve plug (12)	35 to 45 Nm (25.8 to 33.2 lbf ft)
Plug (7)	55 to 65 Nm (40.6 to 48.0 lbf ft)
Capscrews (24), (1), (41) and (57)	7 to 9 Nm (5.2 to 6.6 lbf ft)
Plug (39)	8 to 12 Nm (5.9 to 8.9 lbf ft)
Attachment bolts.....	105 Nm (77.5 lbf ft)

SPECIAL TOOLS

Torque wrench 0 to 120 Nm (0 to 88.6 lbf ft)

LOADER CONTROL VALVE (2 spools) (series 750 - 760)

Perspective view



Description

1	Screw	25	Housing	49	Spring
2	Plate	26	Screw	50	Spacer
3	Wiper	27	Armature	51	Housing
4	O-ring seal	28	Washer	62	Check valve plug
5	O-ring seal	29	Screw	63	Back-up-ring
6	Plug	30	Housing	64	O-ring seal
7	O-ring seal	31	Coil	65	Spring
8	Backup ring	32	Connector	66	Poppet
9	O-ring seal	33	O-ring seal	67	Body
10	Backup ring	34	Circlip	69	Spool
11	O-ring seal	35	O-ring seal	70	Spool
12	Load sensing valve	36	Wiper		
13	Valve	37	Plate		
14	Spring	38	Seat		
15	O-ring seal	39	Spring		
16	Shock valve plug	40	O-ring seal		
17	O-ring seal	41	Plug		
18	Wiper	42	Ball		
19	Plate	43	Screw		
20	Seat	44	Housing		
21	Spring	45	Sleeve		
22	Seat	46	Circlip		
23	O-ring seal	47	Retainer		
24	Plug	48	Ball		

Disassembling

STEP 1

Remove the bolts, the washers and the mounting plate from the loader valve assembly.

STEP 2

Thoroughly clean the loader valve block before starting work.

STEP 3

Remove the screws (1) and the plates (2).

STEP 4

Remove the wipers (3) and the O-ring seals (4). Discard the O-ring seals (4).

STEP 5

Remove the housing (44) and the sleeve (45).

STEP 6

Remove the circlip (46) and the retainer (47).

STEP 7

Remove the ball (48), the spring (49) and the spacer (50).

STEP 8

Remove the screws (43) and the housing (51).

STEP 9

Remove the plug (41) and the balls (42) from the housing (51).

STEP 10

Remove and discard the O-ring seal (40) from the plug (41).

STEP 11

Remove the seats (38), the spring (39) and the plate (37).

STEP 12

Remove the wiper (36) and the O-ring seal (35) from the body (67). Discard the O-ring seal (35).

STEP 13

Carefully remove the spool (69) from the body (67).

STEP 14

Remove the circlip (34), the connector (32) and the coil (31) from the housing (30).

STEP 15

Remove and discard the O-ring seal (33).

STEP 16

Remove the housing (30) from the housing (25).

STEP 17

Remove the screw (29), the washer (28) and the armature (27) from the housing (25).

STEP 18

Remove the screws (26) and the housing (25).

STEP 19

Remove the plug (24) from the housing (25).

STEP 20

Remove and discard the O-ring seal (23) from the plug (24).

STEP 21

Remove the seats (22) and (20), the spring (21) and the plate (19).

STEP 22

Remove the wiper (18) and the O-ring seal (17) from the body (67). Discard the O-ring seal (17).

STEP 23

Carefully remove the spool (70) from the body (67).

STEP 24

Remove the plug (6) from the body (67).

STEP 25

Remove and discard the O-ring seal (5) from the plug (6).

STEP 26

Remove the shock valve plug (16), the spring (14) and the valve (13) from the body (67).

STEP 27

Remove and discard the O-ring seal (15) from the shock valve plug (16).

NOTE : Repeat steps 25 and 26 for the remaining shock valve.

STEP 28

Remove the load sensing valve (12) from the body (67).

STEP 29

Remove the O-ring seals (7), (9) and (11) and the backup rings (8) and (10) from the load sensing valve (12). Discard the O-ring seals (7), (9) and (11).

NOTE : Repeat steps 28 and 29 for the remaining load sensing valve.

STEP 30

Remove the check valve plug (62), the spring (65) and the poppet (66) from the body (67).

STEP 31

Remove the O-ring seal (64) and the back-up ring (63) from the check valve plug (62). Discard the O-ring seal (64).

Inspection

NOTE : If any of the components fail the following inspection, they must be replaced.

STEP 1

Inspect the body (67) for damage to the bores and valve seats and particularly to the threads.

STEP 2

Inspect the plugs (6), (14), (24), (41) and (62) for wear or damage, particularly to the threads.

STEP 3

Inspect the springs (14), (21), (39), (49) and (65) for damage.

STEP 4

Inspect the valves (12) and (13), the spools (68), (69) and (70), the poppet (66), and the seats (20), (22) and (38) for wear and damage.

Assembling

Assemble the loader valve assembly in the reverse order of the disassembly but note the following :

STEP 1

Thoroughly clean all components and the work area before starting work.

NOTE : Inspect the loader valve block (see page 5).

NOTE : Before assembling, lubricate each component with the specified hydraulic oil (see section 8002).

STEP 2

Install a new O-ring seal (64) on the check valve plug (62).

NOTE : Torque tighten the check valve plug (62) to 55 to 65 Nm (40.6 to 48.0 lbf ft).

STEP 3

Install new O-ring seals (7), (9) and (11) on the load sensing valves (12).

NOTE : Torque tighten the load sensing valve (12) to 22 to 28 Nm (16.2 to 20.7 lbf ft).

STEP 4

Install new O-ring seals (15) to the shock valve plug (16).

NOTE : Torque tighten the shock valve plug (16) to 35 to 45 Nm (25.8 to 33.2 lbf ft).

STEP 5

Install a new O-ring seal (5) on the plug (6).

NOTE : Torque tighten the plug (6) to 55 to 65 Nm (40.6 to 48.0 lbf ft).

STEP 6

Install new O-ring seals (4), (17), (35) and (61) into the body (67).

STEP 7

Install a new O-ring seal (33) into the connector (32).

STEP 8

Install a new O-ring seal (23) on the plug (24).

STEP 9

Install a new O-ring seal (40) on the plug (41).

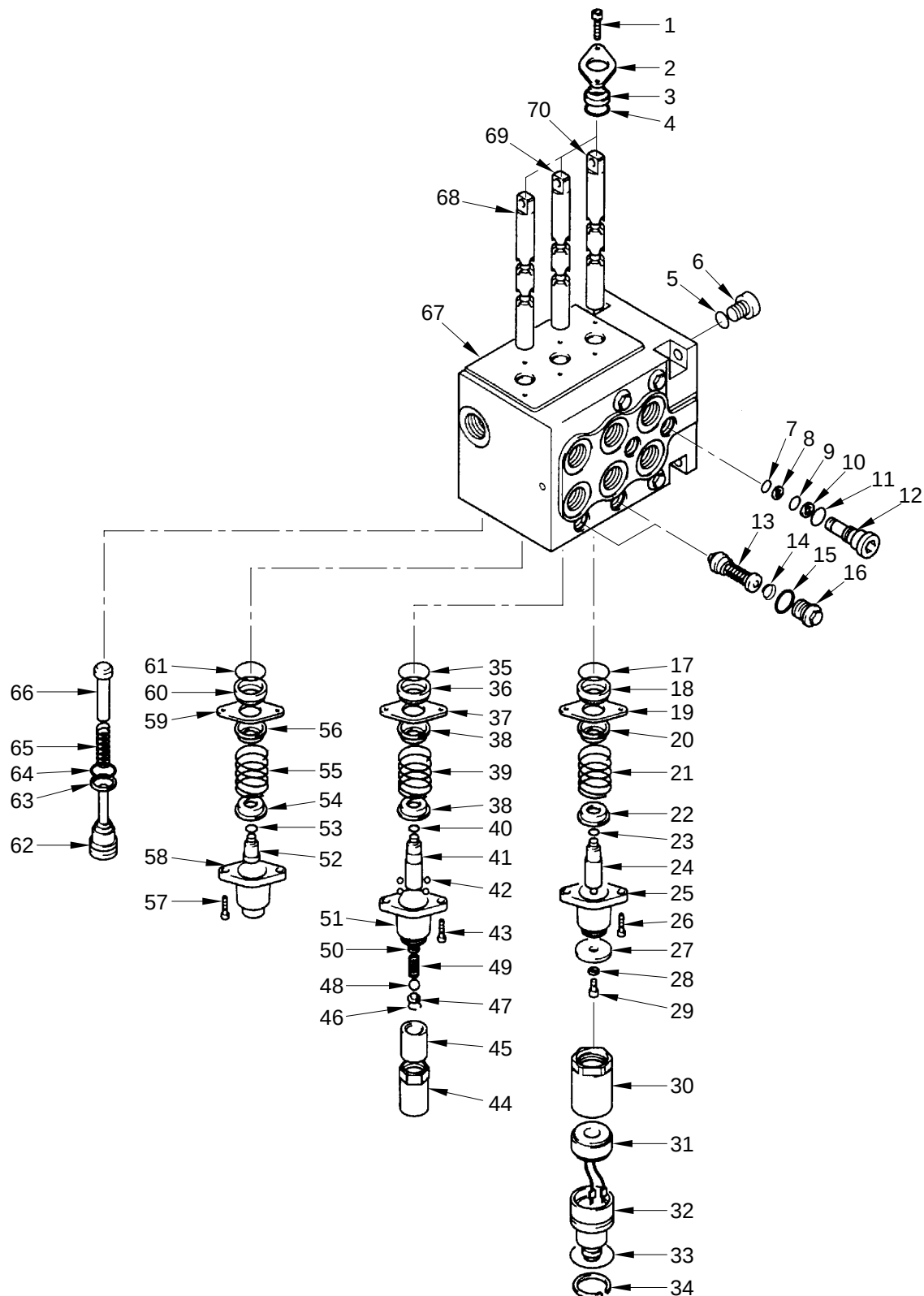
STEP 10

Install a new O-ring seal (53) on the plug (52).

NOTE : Torque tighten the plate attachment bolts to 105 Nm (77.5 lbf ft).

LOADER CONTROL VALVE (3 spools - 7 in 1) (series 750 - 760 - 860)

Perspective view



Description

1	Screw	25	Housing	49	Spring
2	Plate	26	Screw	50	Spacer
3	Wiper	27	Armature	51	Housing
4	O-ring seal	28	Washer	52	Plug
5	O-ring seal	29	Screw	53	O-ring seal
6	Plug	30	Housing	54	Seat
7	O-ring seal	31	Coil	55	Spring
8	Backup ring	32	Connector	56	Seat
9	O-ring seal	33	O-ring seal	57	Screw
10	Backup ring	34	Circlip	58	Housing
11	O-ring seal	35	O-ring seal	59	Plate
12	Load sensing valve	36	Wiper	60	Wiper
13	Valve	37	Plate	61	O-ring seal
14	Spring	38	Seat	62	Check valve plug
15	O-ring seal	39	Spring	63	Backup ring
16	Shock valve plug	40	O-ring seal	64	O-ring seal
17	O-ring seal	41	Plug	65	Spring
18	Wiper	42	Ball	66	Poppet
19	Plate	43	Screw	67	Body
20	Seat	44	Housing	68	Spool
21	Spring	45	Sleeve	69	Spool
22	Seat	46	Circlip	70	Spool
23	O-ring seal	47	Retainer		
24	Plug	48	Ball		

Disassembling

STEP 1

Remove the bolts, the washers and the mounting plate from the loader valve assembly.

STEP 2

Thoroughly clean the loader valve block before starting work.

STEP 3

Remove the screws (1) and the plates (2).

STEP 4

Remove the wipers (3) and the O-ring seals (4). Discard the O-ring seals (4).

STEP 5

Remove the screws (57) and the housing (58).

STEP 6

Remove the plug (52) from the housing (58).

STEP 7

Remove and discard the O-ring seal (53) from the plug (52).

STEP 8

Remove the seats (54) and (56), the spring (55) and the plate (59).

STEP 9

Remove the wiper (60) and the O-ring seal (61) from the body (67). Discard the O-ring seal (61).

STEP 10

Carefully remove the spool (68) from the body (67).

STEP 11

Remove the housing (44) and the sleeve (45).

STEP 12

Remove the circlip (46) and the retainer (47).

STEP 13

Remove the ball (48), the spring (49) and the spacer (50).

STEP 14

Remove the screws (43) and the housing (51).

STEP 15

Remove the plug (41) and the balls (42) from the housing (51).

STEP 16

Remove and discard the O-ring seal (40) from the plug (41).

STEP 17

Remove the seats (38), the spring (39) and the plate (37).

STEP 18

Remove the wiper (36) and the O-ring seal (35) from the body (67). Discard the O-ring seal (35).

STEP 19

Carefully remove the spool (69) from the body (67).

STEP 20

Remove the circlip (34), the connector (32) and the coil (31) from the housing (30).

STEP 21

Remove and discard the O-ring seal (33).

STEP 22

Remove the housing (30) from the housing (25).

STEP 23

Remove the screw (29), the washer (28) and the armature (27) from the housing (25).

STEP 24

Remove the screws (26) and the housing (25).

STEP 25

Remove the plug (24) from the housing (25).

STEP 26

Remove and discard the O-ring seal (23) from the plug (24).

STEP 27

Remove the seats (22) and (20), the spring (21) and the plate (19).

STEP 28

Remove the wiper (18) and the O-ring seal (17) from the body (67). Discard the O-ring seal (17).

STEP 29

Carefully remove the spool (70) from the body (67).

STEP 30

Remove the plug (6) from the body (67).

STEP 31

Remove and discard the O-ring seal (5) from the plug (6).

STEP 32

Remove the shock valve plug (16), the spring (14) and the valve (13) from the body (67).

STEP 33

Remove and discard the O-ring seal (15) from the shock valve plug (16).

NOTE : Repeat steps 32 and 33 for the remaining shock valve.

STEP 34

Remove the load sensing valve (12) from the body (67).

STEP 35

Remove the O-ring seals (7), (9) and (11) and the backup rings (8) and (10) from the load sensing valve (12). Discard the O-ring seals (7), (9) and (11).

NOTE : Repeat steps 34 and 35 for the remaining load sensing valve.

STEP 36

Remove the check valve plug (62), the spring (65) and the poppet (66) from the body (67).

STEP 37

Remove the O-ring seal (64) and the back-up ring (63) from the check valve plug (62). Discard the O-ring seal (64).

Inspection

NOTE : If any of the components fail the following inspection, they must be replaced.

STEP 1

Inspect the body (67) for damage to the bores and valve seats and particularly to the threads.

STEP 2

Inspect the plugs (6), (14), (24), (41), (52) and (62) for wear or damage, particularly to the threads.

STEP 3

Inspect the springs (14), (21), (39), (49), (55) and (65) for damage.

STEP 4

Inspect the valves (12) and (13), the spools (68), (69) and (70), the poppet (66), and the seats (20), (22), (38) and (54) for wear and damage.

Assembling

Assemble the loader valve assembly in the reverse order of the disassembly but note the following :

STEP 1

Thoroughly clean all components and the work area before starting work.

NOTE : Inspect the loader valve block.

NOTE : Before assembling, lubricate each component with the specified hydraulic oil (see section 8002).

STEP 2

Install a new O-ring seal (64) on the check valve plug (62).

NOTE : Torque tighten the check valve plug (62) to 55 to 65 Nm (40.6 to 48.0 lbf ft).

STEP 3

Install new O-ring seals (7), (9) and (11) on the load sensing valves (12).

NOTE : Torque tighten the load sensing valve (12) to 22 to 28 Nm (16.2 to 20.7 lbf ft).

STEP 4

Install new O-ring seals (15) to the shock valve plug (16).

NOTE : Torque tighten the shock valve plug (16) to 35 to 45 Nm (25.8 to 33.2 lbf ft).

STEP 5

Install a new O-ring seal (5) on the plug (6).

NOTE : *Torque tighten the plug (6) to 55 to 65 Nm (40.6 to 48.0 lbf ft).*

STEP 6

Install new O-ring seals (4), (17), (35) and (61) into the body (67).

STEP 7

Install a new O-ring seal (33) into the connector (32).

STEP 8

Install a new O-ring seal (23) on the plug (24).

STEP 9

Install a new O-ring seal (40) on the plug (41).

STEP 10

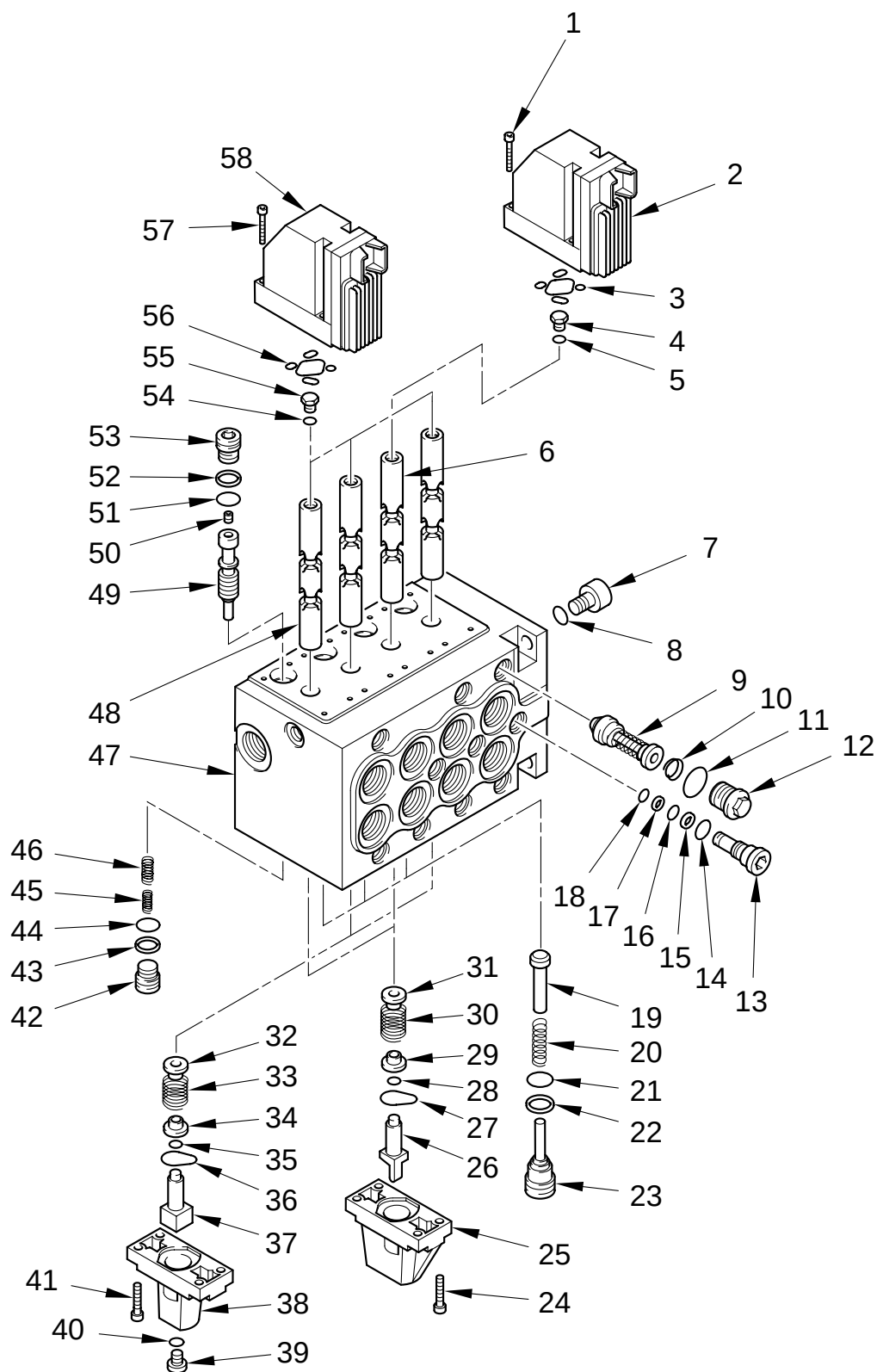
Install a new O-ring seal (53) on the plug (52).

NOTE : *Torque tighten the plate attachment bolts to 105 Nm (77.5 lbf ft).*

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LOADER CONTROL VALVE **(4 spools electronic) (series 960-965)**

Perspective view



Description

1	Capscrew	21	O-ring seal	41	Capscrew
2	Module	22	Back-up ring	42	Compensator plug
3	Seal	23	Check valve plug	43	Back-up ring
4	Plug	24	Capscrew	44	O-ring seal
5	O-ring seal	25	Housing	45	Spring
6	Spool	26	Screw	46	Spring
7	Plug	27	O-ring seal	47	Body
8	O-ring seal	28	O-ring seal	48	Spool
9	Valve	29	Seat	49	Spool
10	Spring	30	Spring	50	Restrictor
11	O-ring seal	31	Seat	51	O-ring seal
12	Shock valve plug	32	Seat	52	Back-up ring
13	Load sensing valve	33	Spring	53	Compensator plug
14	O-ring seal	34	Seat	54	O-ring seal
15	Back-up ring	35	O-ring seal	55	Plug
16	O-ring seal	36	O-ring seal	56	Seal
17	Back-up ring	37	Screw	57	Capscrew
18	O-ring seal	38	Housing	58	Module
19	Poppet	39	Plug		
20	Spring	40	O-ring seal		

Disassembling

STEP 1

Remove the bolts, the washers and the mounting plate from the loader valve assembly.

STEP 2

Thoroughly clean the loader valve block before starting work.

STEP 3

Remove the capscrews (1), the module (2) and the seals (3) from the body (47). Discard the seals (3).

STEP 4

Remove the plug (4) from the spool (6).

STEP 5

Remove and discard the O-ring seal (5) from the plug (4).

STEP 6

Remove the capscrews (24) and the housing (25) from the body (47).

STEP 7

Remove the screw (26), the seat (29), the spring (30) and the seat (31) from the body (47).

STEP 8

Remove and discard the O-ring seal (28) from the screw (26).

STEP 9

Remove and discard the O-ring seal (27) from the body (47).

STEP 10

Carefully remove the spool (6) from the body (47).

STEP 11

Remove the capscrews (57), the module (58) and the seals (56) from the body (47). Discard the seals (56).

STEP 12

Remove the plug (55) from the spool (48).

STEP 13

Remove and discard the O-ring seal (54) from the plug (55).

STEP 14

Remove the plug (39) from the housing (38).

STEP 15

Remove and discard the O-ring seal (40) from the plug (39).

STEP 16

Remove the capscrews (41) and the housing (38) from the body (47).

STEP 17

Remove the screw (37), the seat (34), the spring (33) and the seat (32) from the body (47).

STEP 18

Remove and discard the O-ring seal (35) from the screw (37).

STEP 19

Remove and discard the O-ring seal (36) from the body (47).

STEP 20

Carefully remove the spool (48) from the body (47).

NOTE : Repeat steps 11 to 20 for the remaining spools.

STEP 21

Remove the plug (7) from the body (47).

STEP 22

Remove and discard the O-ring seal (8) from the plug (7).

STEP 23

Remove the shock valve plug (12), the spring (10) and the valve (9) from the body (47).

STEP 24

Remove and discard the O-ring seal (11) from the shock valve plug (12).

NOTE : Repeat steps (23) and (24) for the remaining shock valves.

STEP 25

Remove the load sensing valve (13) from the body (47).

STEP 26

Remove the O-ring seals (14), (16) and (18) and the back-up rings (15) and (17) from the load sensing valve (13). Discard the O-ring seals (14), (16) and (18).

NOTE : Repeat steps 25 and 26 for the remaining load sensing valves.

STEP 27

Remove the check valve plug (23), the spring (20) and the poppet (19) from the body (47).

STEP 28

Remove the O-ring seal (21) and the back-up ring (22) from the check valve plug (23). Discard the O-ring seal (21).

NOTE : Repeat steps 27 and 28 for the remaining check valves.

STEP 29

Remove the compensator plug (42) and the springs (45) and (46) from the body (47).

STEP 30

Remove the O-ring seal (44) and the back-up ring (43) from the compensator plug (42). Discard the O-ring seal (44).

STEP 31

Remove the compensator plug (53), the restrictor (50), and the spool (49) from the body (47).

STEP 32

Remove the O-ring seal (51) and the back-up ring (52) from the compensator plug (53). Discard the O-ring seal (51).

Inspection

NOTE : If any of the components fail the following inspections, they must be replaced.

STEP 1

Inspect the body (47) for damage to the bores and valve seats and particularly to the threads.

STEP 2

Inspect the plugs (4), (7), (12), (23), (39), (42), (53) and (55) for wear or damage, particularly to the threads.

STEP 3

Inspect the springs (20), (30), (33), (45) and (46) for damage.

STEP 4

Inspect the valves (9) and (13), the spools (6), (48) and (49) the screws (26) and (37), the poppet (19), the seats (29), (31), (32) and (34) for wear and damage.

STEP 5

Inspect the restrictor (50) for wear or damage. Check that the restrictor is not blocked.

STEP 6

Inspect the modules (2) and (58) and the housings (24) and (38) for damage.

Assembling

NOTE : *The assembly of the loader valve is the reverse of the disassembly.*

STEP 1

Thoroughly clean all components and the work area before starting work.

NOTE : *Inspect the loader valve block (see page 14).*

NOTE : *Before assembling, lubricate each component with the specified hydraulic oil (see section 8002).*

STEP 2

Install a new O-ring seal (51) on the compensator plug (53).

NOTE : *Torque tighten the compensator plug (53) to 55 to 65 Nm (40.6 to 48.0 lbf ft).*

STEP 3

Install a new O-ring seal (44) on the compensator plug (42).

NOTE : *Torque tighten the compensator plug (42) to 55 to 65 Nm (40.6 to 48.0 lbf ft).*

STEP 4

Install a new O-ring seal (21) on the check valve plug (23).

NOTE : *Torque tighten the check valve plug (23) to 55 to 65 Nm (40.6 to 48.0 lbf ft).*

STEP 5

Install new O-ring seals (14), (16) and (18) on the load sensing valve (13).

NOTE : *Torque tighten the load sensing valve (13) to 22 to 28 Nm (16.2 to 20.7 lbf ft).*

STEP 6

Install a new O-ring seal (11) to the shock valve plug (12).

NOTE : *Torque tighten the shock valve plug (12) to 35 to 45 Nm (25.8 to 33.2 lbf ft).*

STEP 7

Install a new O-ring seal (8) to the plug (7).

NOTE : *Torque tighten the plug (7) to 55 to 65 Nm (40.6 to 48.0 lbf ft).*

STEP 8

Install a new O-ring seal (27) into the body (47) and a new O-ring seal (28) to the screw (26).

NOTE : *Torque tighten the capscrews (24) to 7 to 9 Nm (5.2 to 6.6 lbf ft).*

STEP 9

Install a new O-ring seal (5) to the plug (4).

STEP 10

Install new seals (3) to the module (2).

NOTE : *Torque tighten the capscrews (1) to 7 to 9 Nm (5.2 to 6.6 lbf ft).*

STEP 11

Install a new O-ring seal (36) into the body (47) and a new O-ring seal (35) to the screw (37).

NOTE : *Torque tighten the capscrews (41) to 7 to 9 Nm (5.2 to 6.6 lbf ft).*

STEP 12

Install a new O-ring seal (40) to the plug (39).

NOTE : *Torque tighten the plug (39) to 8 to 12 Nm (5.9 to 8.9 lbf ft).*

STEP 13

Install a new O-ring seal (54) to the plug (55).

STEP 14

Install new seals (56) to the module (58).

NOTE : *Torque tighten the capscrews (57) to 7 to 9 Nm (5.2 to 6.6 lbf ft).*

NOTE : *Torque tighten the attachment bolts to 105 Nm (77.5 lbf ft).*

Section

8006

CYLINDERS

8006

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIFICATIONS

	Dipper cylinder	Backhoe bucket cylinder Models 750 and 760	Backhoe bucket cylinder Models 860, 960 and 965
Type	100/65 C1083	90/60 C724	95/60 C724
Weight kg (lb)	82 (181)	53.8 (119)	55.5 (123)
Dash-pot in small chamber	-	X	X
Dash-pot in large chamber	-	-	-
Stroke (mm)	1083	724	724
Tube internal diameter (mm)	100	90	95
Rod diameter (mm)	65	60	60

	Loader bucket cylinder Models 750 and 760	Loader bucket cylinder Models 860, 960 and 965	Boom cylinder Models 750 and 760
Type	105/60 C515	115/60 C515	115/65 C974
Weight kg (lb)	56.9 (126)	58.1 (128)	85.6 (189)
Dash-pot in small chamber	-	-	-
Dash-pot in large chamber	X	X	X
Stroke (mm)	515	515	974
Tube internal diameter (mm)	105	115	115
Rod diameter (mm)	60	60	65

	Boom cylinder 4.5 Models 860, 960 and 965	Boom cylinder 4.9 Models 860, 960 and 965	Extendable dipper cylinder
Type	120/65 C974	120/65 C994	63/38 C1346
Weight kg (lb)	87.5 (193)	89.1 (197)	36.3 (80)
Dash-pot in small chamber	-	-	X
Dash-pot in large chamber	X	X	-
Stroke (mm)	974	994	1346
Tube internal diameter (mm)	120	120	63
Rod diameter (mm)	65	65	38

	Loader lift cylinder Models 750 and 760	Loader lift cylinder Models 860, 960 and 965	Quick attach cylinder
Type	Ø 85/50	Ø 90/50	Ø 40/16
Weight kg (lb)	42 (93)	43 (95)	-
Dash-pot in small chamber	-	-	-
Dash-pot in large chamber	-	-	-
Stroke (mm)	785	785	22
Tube internal diameter (mm)	85	90	40
Rod diameter (mm)	50	50	16

	Slew cylinder	Stabilizer centremount cylinder	Stabilizer sideshift cylinder
Type	Ø 90/45	Ø 89/57	Ø 70/45
Weight kg (lb)	-	-	-
Dash-pot in small chamber	-	-	-
Dash-pot in large chamber	X	X	-
Stroke (mm)	225	646	643
Tube internal diameter (mm)	90	89	70
Rod diameter (mm)	45	57	45

	Multi-purpose loader bucket clamping cylinder
Type	Ø 70/38
Weight (kg)	-
Dash-pot in small chamber	-
Dash-pot in large chamber	-
Stroke (mm)	245
Tube internal diameter (mm)	70
Rod diameter (mm)	38

SPECIAL TORQUE SETTINGS

Cylinder	Screw-in bearing	Lock screw	Piston	Stop screw	Piston bolt	Piston nut
Dipper	320-550 Nm	2.3 Nm	-	-	1780-2180 Nm	-
Backhoe bucket	320-550 Nm	2.3 Nm	-	-	1780-2180 Nm	-
Loader bucket	320-550 Nm	2.3 Nm	2300-2500 Nm	20-25 Nm	-	-
Boom	320-550 Nm	2.3 Nm	2300-2500 Nm	20-25 Nm	-	-
Extendable dipper	-	-	-	-	-	790-810 Nm
Loader lift Models 750 and 760	350-400 Nm	-	1000-1100 Nm	20-25 Nm	-	-
Loader lift Models 860, 960 and 965	350-400 Nm	-	1170-1220 Nm	20-25 Nm	-	-
Slew	370-420 Nm	-	1050-1100 Nm	20-25 Nm	-	-
Stabiliser centremount	-	-	650-700 Nm	20-25 Nm	-	-
Stabiliser side shift	300-350 Nm	-	-	-	-	800-850 Nm

SPECIAL TOOLS



B786441M

This tool is used to remove and install cylinder glands.

The part number on the gland wrench is CAS 1456. This tool is first used on page 8.



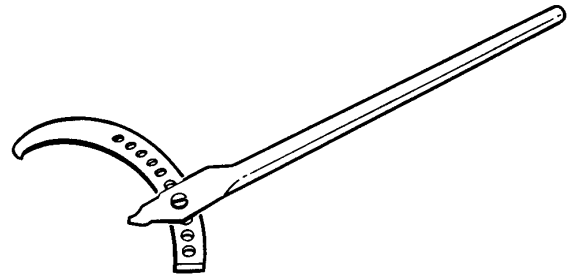
B795329M

The torque multiplier is used to loosen and tighten the piston cap screw and pistons. Use the torque multiplier according to the instructions of the manufacturer. The part number of the torque multiplier is CAS-1039. This tool is first used on page 8.



B505802M

The tool shown is used to install the seal in the glands of the cylinders. This tool is first used on page 8.



PDF0247

This tool is used to remove and install cylinder glands.

- Gland tightening wrench OEM 6203 opening capacity : 120 mm to 323 mm. This tool is first used on page 28.
- Gland tightening wrench OEM 6206 opening capacity : 38 mm to 101 mm. This tool is first used on page 32.

DIPPER CYLINDER

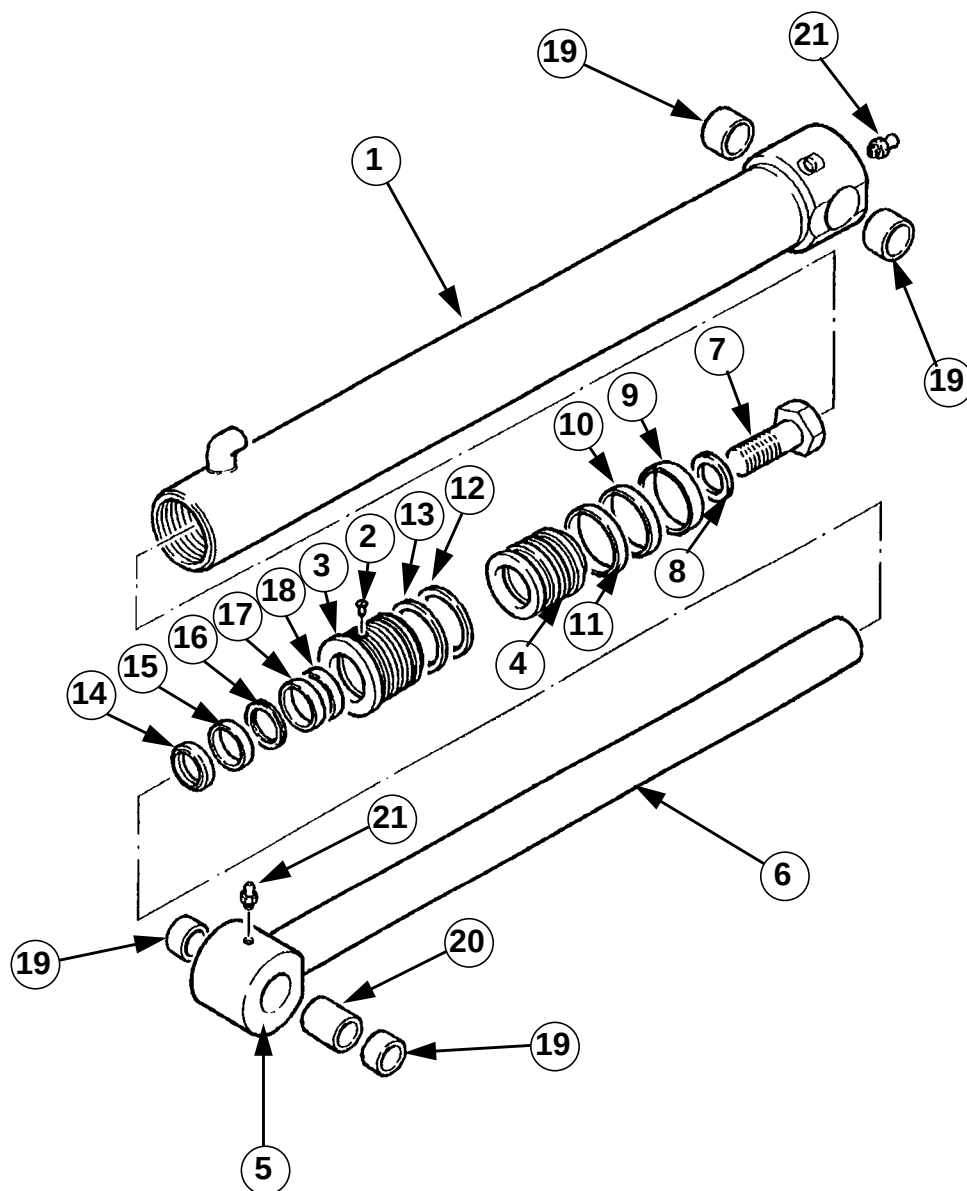
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Loosen and remove the lock screw (2) from the gland (3) and tube (1).
3. Use the gland wrench CAS1456 on page 7, to loosen and remove the gland (3) from the tube (1).
4. Pull the piston rod (6) straight out of the tube (1) to prevent damage to the tube (1).
5. Fasten the piston rod eye (5) in a vice and put a support below the piston rod (6) near the piston (4). Use a shop cloth between the support and the piston rod (6) to prevent damage to the piston rod (6).
6. Loosen and remove the cap screw (7) and hardened washer (8) that holds the piston (4). Use the torque multiplier shown on page 7 for cap screws that have a high torque value.
7. Remove the piston (4) from the piston rod (6).
8. Remove the gland (3) from the piston rod (6).
9. Remove the carrier ring (9), seal (10) and carrier ring (11) from the piston (4).
10. Remove the O-ring (12), back-up ring (13), wiper (14), carrier ring (15), wide seal (16), buffer seal (17) and carrier ring (18) from the gland (3).

Inspection

1. Clean the piston (4), gland (3), piston rod (6), tube (1), hardened washer (8), and cap screw (7) in cleaning solvent.
2. Discard the parts that were removed from the piston (4) and the gland (3).
3. Illuminate the inside of the tube (1). inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (6) is straight. If the piston rod (6) is not straight, install a new piston rod (6).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the bushing (19) in the piston rod eye (5) and the closed end of the tube (1), replace as required.
7. Inspect the gland (3) for rust and clean and remove rust as required.
8. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-ring (12). Remove as required.
9. Inspect the piston (4) for damage and wear. If the piston (4) is damaged or worn, a new piston must be used.

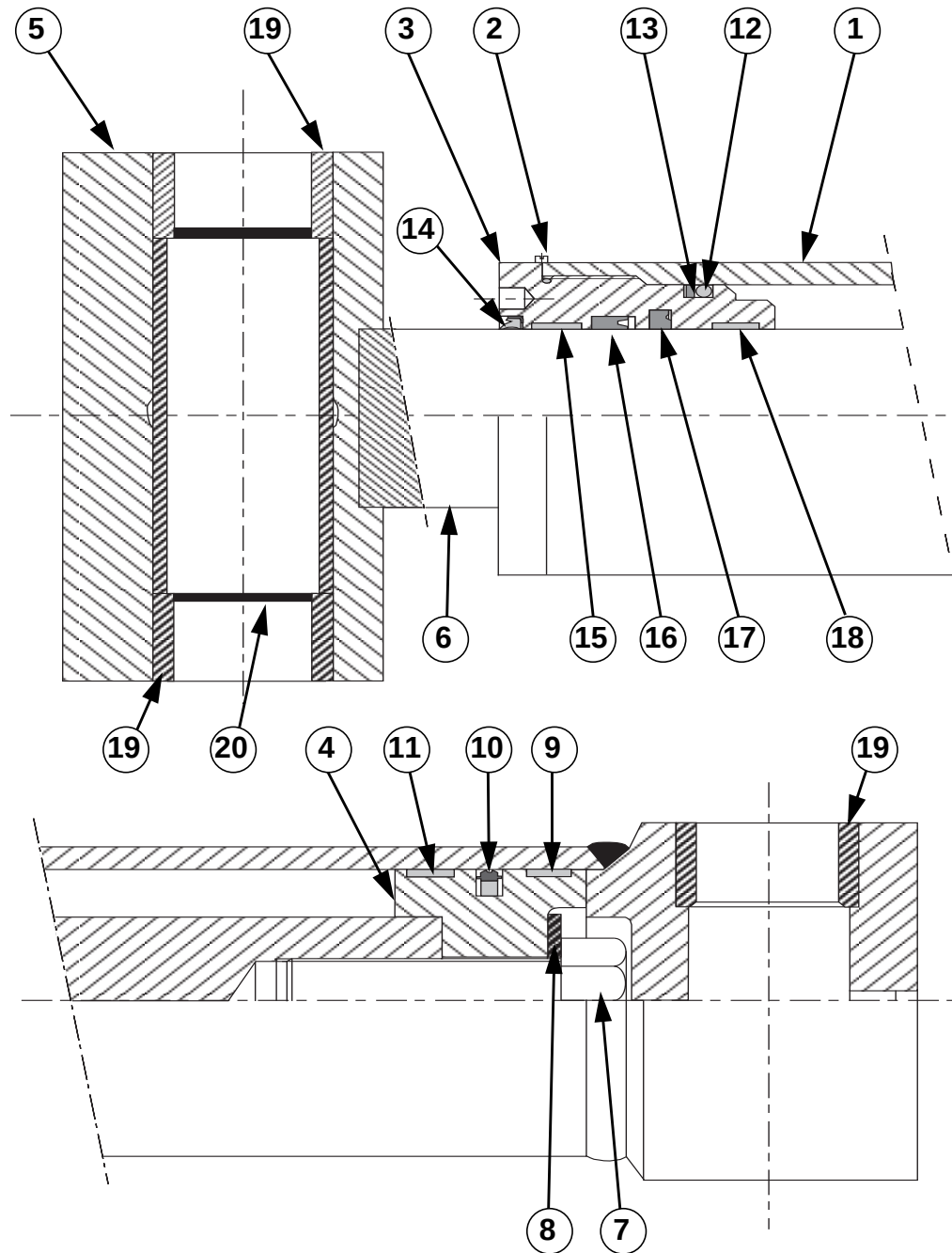


1. Tube	8. Hardened washer	15. Carrier ring
2. Lock screw	9. Carrier ring	16. Wide seal
3. Gland	10. Seal	17. Buffer seal
4. Piston	11. Carrier ring	18. Carrier ring
5. Piston rod eye	12. O-ring	19. Bushing
6. Piston rod	13. Back-up ring	20. Spacer
7. Cap screw	14. Wiper	21. Grease fitting

C198K516

Assembly

1. Install the buffer seal (17) in the gland (3). The side of the buffer seal (17) with the lip must be toward the small end of the gland (3).
2. Install the wide seal (16) in the gland. the wide seal (16) is to be installed as shown on page 11. The wide seal (16) can be difficult to install. Use the tool shown on page 7.
3. Install the carrier rings (15) and (18) in the gland (3).
4. Install a new wiper (14) in the gland (3). The wiper (14) is to be installed as shown on page 11.
5. Install the O-ring (12) next to the back-up ring (13) in the groove on the outside of the gland (3), as shown on page 11.
6. Fasten the piston rod eye (5) in the vice.
7. Remove any marks and sharp edges on the chamfer at the end of the piston rod (6).
8. Lubricate the bore of the gland (3) with clean oil.
9. Push the gland (3) onto the piston rod (6). If necessary, use a soft hammer to drive the gland (3) onto the piston rod (6).
10. Put a support below and near the end of the piston rod (6). Use a shop cloth between the support and the piston rod (6) to prevent damage to the piston (4).
11. Put the piston (4) on the end of the piston rod (6).
12. Put the hardened washer (8) on the cap screw (7).
13. Clean the threads on the end of the piston rod and the threads of the cap screw using Loctite cleaning solvent. Allow to dry. Apply Loctite 242 to the piston rod threads 6.4 mm from the open end of the piston rod so that there is 12.7 mm of Loctite 242 on the piston rod threads. DO NOT apply Loctite to the first 6.4 mm of the piston rod threads.
14. Install the cap screw (7). Tighten the cap screw (7) to the torque value on page 6 for the cylinder that is being repaired. A torque multiplier can be used to help tighten the cap screw.
15. Install a new seal (10) in the centre groove on the outside of the piston (4).
16. Install a new carrier rings (9) and (11) in each groove on the outside ends of the piston (4).
17. Lubricate the inside of the tube (1) and the piston (4) with clean oil. Use a piston ring compression tool to hold the new carrier rings in place.
18. Push the tube (1) straight onto the piston (4).
19. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the carrier rings and seal.
20. When the piston (4) is in the smooth part of the tube (1), start the gland (3) into the tube (1).
21. Lubricate the O-ring (12) on the gland (3) with clean oil.
22. Tighten the gland (3) to a torque between 320 and 550 Nm. If the lock screw (2) holes become aligned in this torque range, install the lock screw (2). Tighten the lock screw (2) to 2.3 Nm. If the lock screw (2) holes are not aligned, carry out steps 23 through 25.
23. Tighten the gland (3) to a torque between 320 and 550 Nm.
24. Use a N°26 drill and drill a hole half in the gland (3) and half in the tube (1). Drill to a depth of 11 mm. Do not drill in line with a hole in the gland (3) for the gland wrench.
25. Install the lock screw (2). Tighten the lock screw (2) to 2.3 Nm.



1. Tube
2. Lock screw
3. Gland
4. Piston
5. Piston rod eye
6. Piston rod
7. Cap screw

8. Hardened washer
9. Carrier ring
10. Seal
11. Carrier ring
12. O-ring
13. Back-up ring
14. Wiper

15. Carrier
16. Wide seal
17. Buffer seal
18. Carrier ring
19. Bushing
20. Spacer

CM98K005

BACKHOE BUCKET CYLINDER

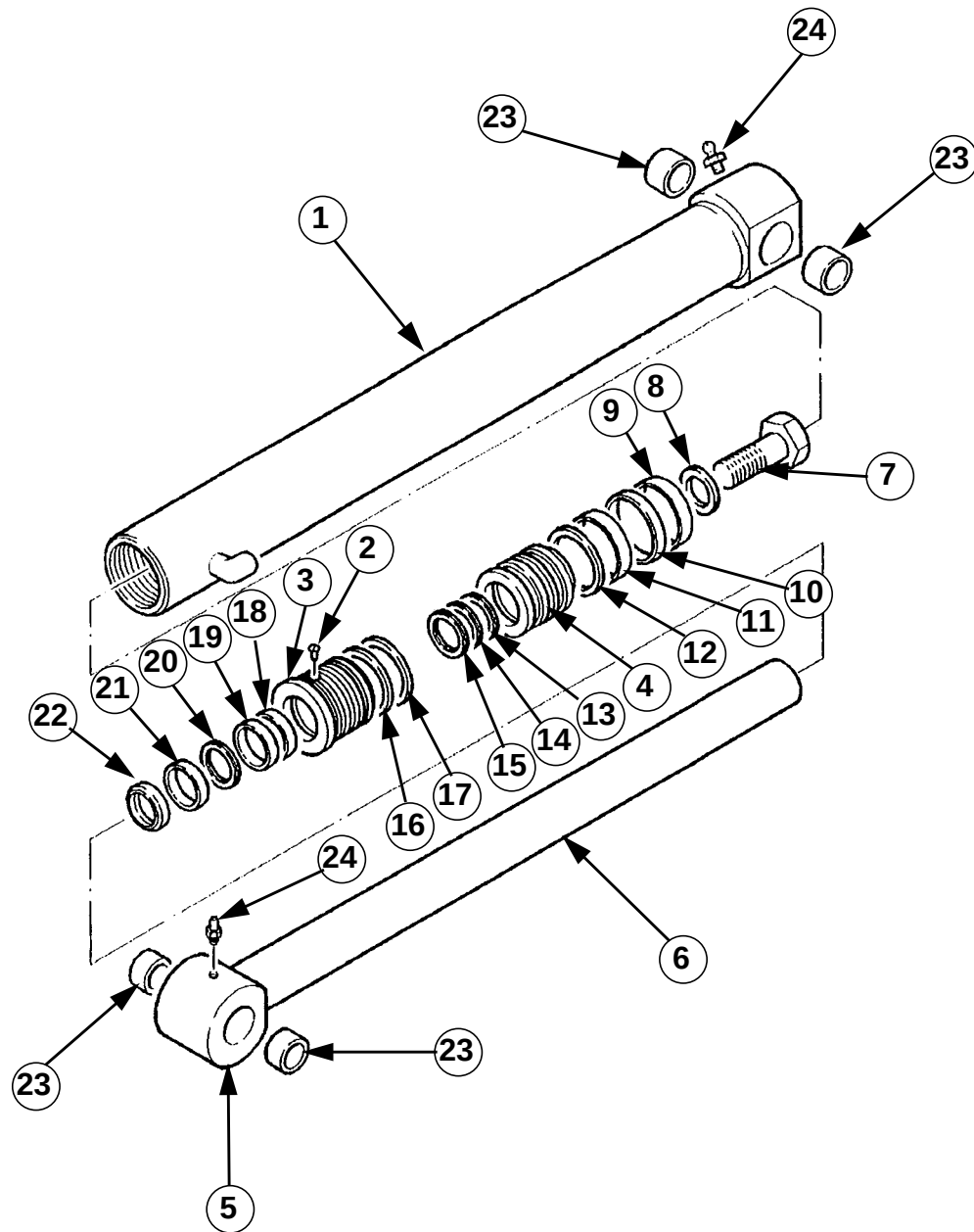
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Loosen and remove the lock screw (2) from the gland (3) and tube (1).
3. Use the gland CAS1456 on page 7, to loosen and remove the gland (3) from the tube (1).
4. Pull the piston rod (6) straight out of the tube (1) to prevent damage to the tube (1).
5. Fasten the piston rod eye (5) in a vice and put a support below the piston rod (6) near the piston (4). Use a shop cloth between the support and the piston rod (6) to prevent damage to the piston rod (6).
6. Loosen and remove the cap screw (7) and hardened washer (8) that holds the piston (4). Use the torque multiplier shown on page 7 for cap screws that have a high torque value.
7. Remove the piston (4) from the piston rod (6).
8. Remove the gland (3) from the piston rod (6).
9. Remove the carrier ring (9), seal (10), carrier ring (11), bayonet ring (12), back-up rings (13) and (15) and O-ring (14) from the piston (4).
10. Remove the O-ring (17), back-up ring (16), wiper (22), carrier ring (21), wide seal (20), buffer seal (19) and carrier ring (18) from the gland (3).

Inspection

1. Clean the piston (4), gland (3), piston rod (6), tube (1), hardened washer (8), and cap screw (7) in cleaning solvent.
2. Discard the parts that were removed from the piston (4) and the gland (3).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (6) is straight. If the piston rod (6) is not straight, install a new piston rod (6).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the bushing (23) in the piston rod eye (5) and the closed end of the tube (1), replace as required.
7. Inspect the gland (3) for rust and clean and remove rust as required.
8. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-ring (17). Remove as required.
9. Inspect the piston (4) for damage and wear. If the piston (4) is damaged or worn, a new piston must be used.



- 1. Tube
- 2. Lock screw
- 3. Gland
- 4. Piston
- 5. Piston rod eye
- 6. Piston rod
- 7. Cap screw
- 8. Hardened washer

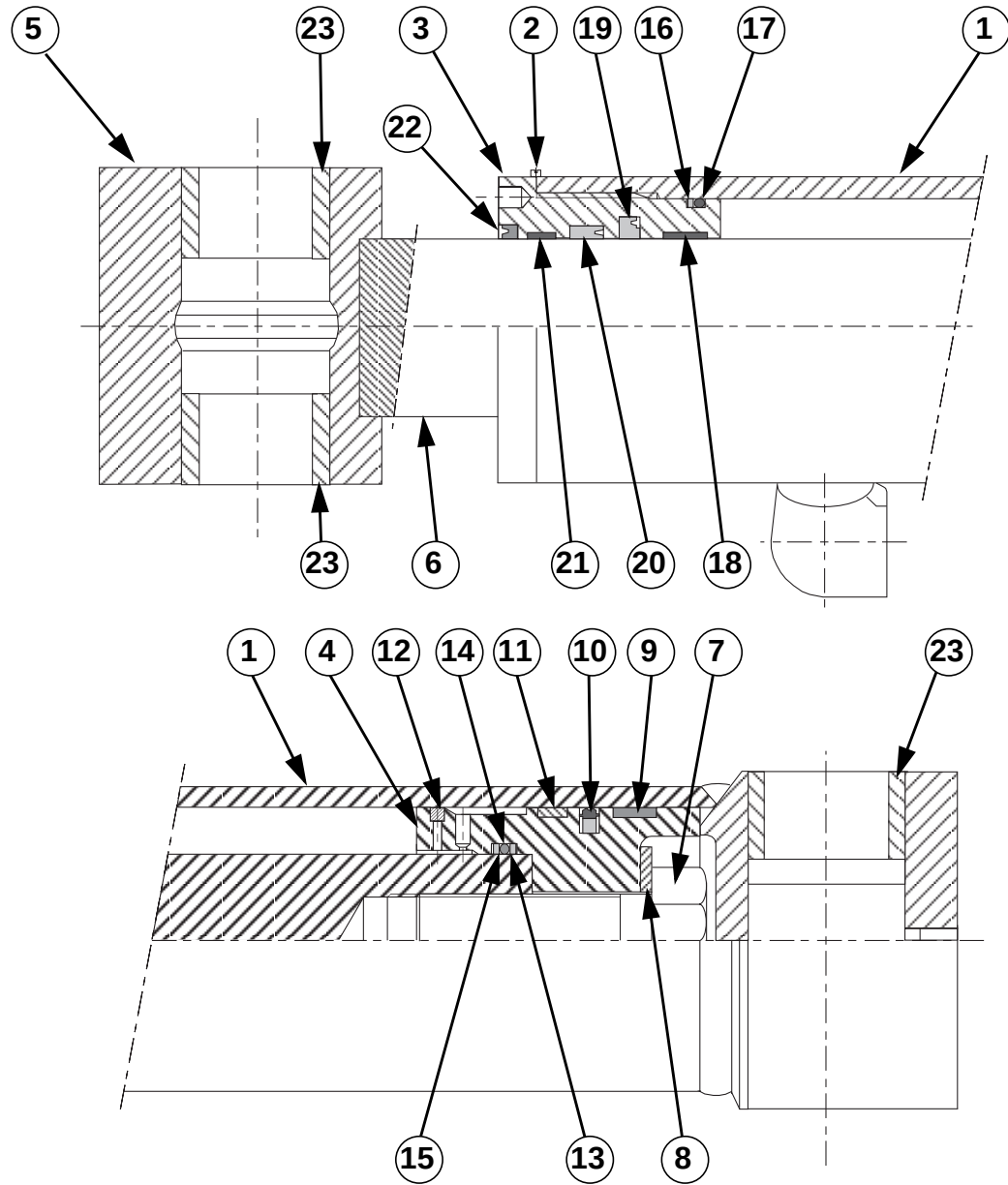
- 9. Carrier ring
- 10. Seal
- 11. Carrier ring
- 12. Bayonet ring
- 13. Back-up ring
- 14. O-ring
- 15. Back-up ring
- 16. Back-up ring

- 17. O-ring
- 18. Carrier ring
- 19. Buffer seal
- 20. Wide seal
- 21. Carrier ring
- 22. Wiper
- 23. Bushing
- 24. Grease fitting

CI98K517

Assembly

1. Install the buffer seal (19) in the gland (3). The side of the buffer seal (19) with the lip must be toward the small end of the gland (3).
2. Install the wide seal (26) in the gland. the wide seal (26) is to be installed as shown on page 15. The wide seal (20) can be difficult to install. Use the tool shown on page 7.
3. Install the carrier rings (18) and (21) in the gland (3).
4. Install a new wiper (22) in the gland (3). The wiper (22) is to be installed as shown on page 15.
5. Install the O-ring (17) next to the back-up ring (16) in the groove on the outside of the gland (3), as shown on page 15.
6. Fasten the piston rod eye (5) in the vice.
7. Remove any marks and sharp edges on the chamfer at the end of the piston rod (6).
8. Lubricate the bore of the gland (3) with clean oil.
9. Push the gland (3) onto the piston rod (6). If necessary, use a soft hammer to drive the gland (3) onto the piston rod (6).
10. Install a new back-up ring (13) in the piston (4).
11. Install a new O-ring (14) in the piston (4).
12. Install a new back-up ring (15) in the piston (4).
13. Put a support below and near the end of the piston rod (6). Use a shop cloth between the support and the piston rod (6) to prevent damage to the piston (4).
14. Put the piston (4) on the end of the piston rod (6).
15. Put the hardened washer (8) on the cap screw (7).
16. Clean the threads on the end of the piston rod and the threads of the cap screw using Loctite cleaning solvent. Allow to dry. Apply Loctite 242 to the piston rod threads 6.4 mm from the open end of the piston rod so that there is 12.7 mm of Loctite 242 on the piston rod threads. DO NOT apply Loctite to the first 6.4 mm of the piston rod threads.
17. Install the cap screw (7). Tighten the cap screw (7) to the torque value on page 6 for the cylinder that is being repaired. A torque multiplier can be used to help tighten the cap screw.
18. Install a new bayonet ring (12) in the end groove on the outside of the piston (4).
19. Install a new carrier ring (11) in the piston (4).
20. Install a new seal (10) in the piston (4).
21. Install a new carrier ring (9) in the piston (4).
22. Lubricate the inside of the tube (1) and the piston (4) with clean oil. use a piston ring compression tool to hold the new rings in place.
23. Push the tube (1) straight onto the piston (4).
24. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the rings and seal.
25. When the piston (4) is in the smooth part of the tube (1), start the gland (3) into the tube (1).
26. Lubricate the O-ring (17) on the gland (3) with clean oil.
27. Tighten the gland (3) to 320 to 550 Nm. If the lock screw (2) holes become aligned in this torque range, install the lock screw (2). Tighten the lock screw (2) to 2.3 Nm. If the lock screw (2) holes are not aligned, carry out Steps 28 through 30.
28. Tighten the gland (3) to a torque between 320 and 550 Nm.
29. Use a N° 26 drill a hole half in the gland (3) and half in the tube (1). Drill to a depth of 11 mm. Do not drill in line with a hole in the gland (3) for the gland wrench.
30. Install the lock screw (2). Tighten the lock screw (2) to 2.3 Nm.



CM98K006

1. Tube	9. Carrier ring	17. O-ring
2. Lock screw	10. Seal	18. Carrier ring
3. Gland	11. Carrier ring	19. Buffer seal
4. Piston	12. Bayonet ring	20. Wide seal
5. Piston rod eye	13. Back-up ring	21. Carrier ring
6. Piston rod	14. O-ring	22. Wiper
7. Capscrew	15. Back-up ring	23. Bushing
8. Hardened washer	16. Back-up ring	

LOADER BUCKET CYLINDER

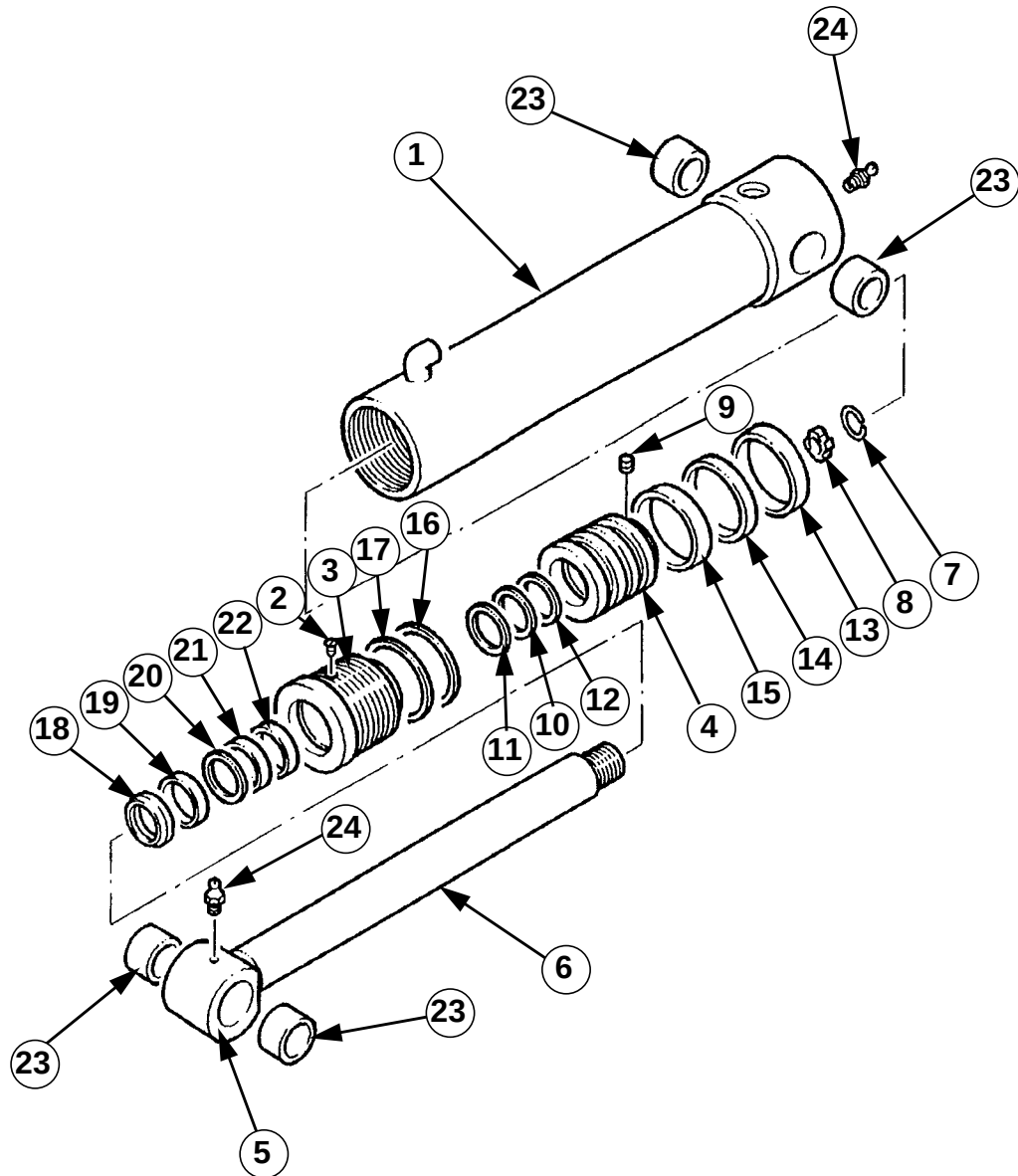
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Loosen and remove the lock screw (2) from the gland (3) and tube (1).
3. Use the gland wrench CAS 1456 shown on page 7 to loosen and remove the gland (3) from the tube (1).
4. Pull the piston rod (6) straight out of the tube (1) to prevent damage to the tube (1).
5. Fasten the piston rod (5) eye in a vise and put a support below the piston rod (6) near the piston (4). Use a shop cloth between the support and the piston rod (6) to prevent damage to the piston rod (6).
6. Remove the retaining ring (7) and dash-pot bushing (8) from the piston rod (6).
7. Loosen and remove the stop screw (9) from the piston (4) and discard the stop screw (9).
8. Loosen and remove the piston (4) from the piston rod (6). Use a torque multiplier shown on page 7 for pistons that have a high torque value.
9. Remove the gland (3) from the piston rod (6).
10. Remove the carrier ring (13), seal (14), carrier ring (15), back-up rings (11) and (12) and O-ring (10) from the piston (4).
11. Remove the O-ring (16), back-up ring (17), wiper (18), carrier ring (19), wide seal (20), buffer seal (21) and carrier ring (22) from the gland (3).

Inspection

1. Clean the piston (4), gland (3), piston rod (6) and tube (1) in cleaning solvent.
2. Discard the parts that were removed from the piston (4) and the gland (3).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (6) is straight. If the piston rod (6) is not straight, install a new piston rod (6).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the bushings (23) in the piston rod eye (5) and the closed end of the tube (1). Replace as required.
7. Inspect the gland (3) for rust and clean and remove rust as required.
8. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-ring (16) and remove as required.
9. Inspect the piston (4) for damage and wear. If the piston (4) is damaged or worn, a new piston (4) must be used.

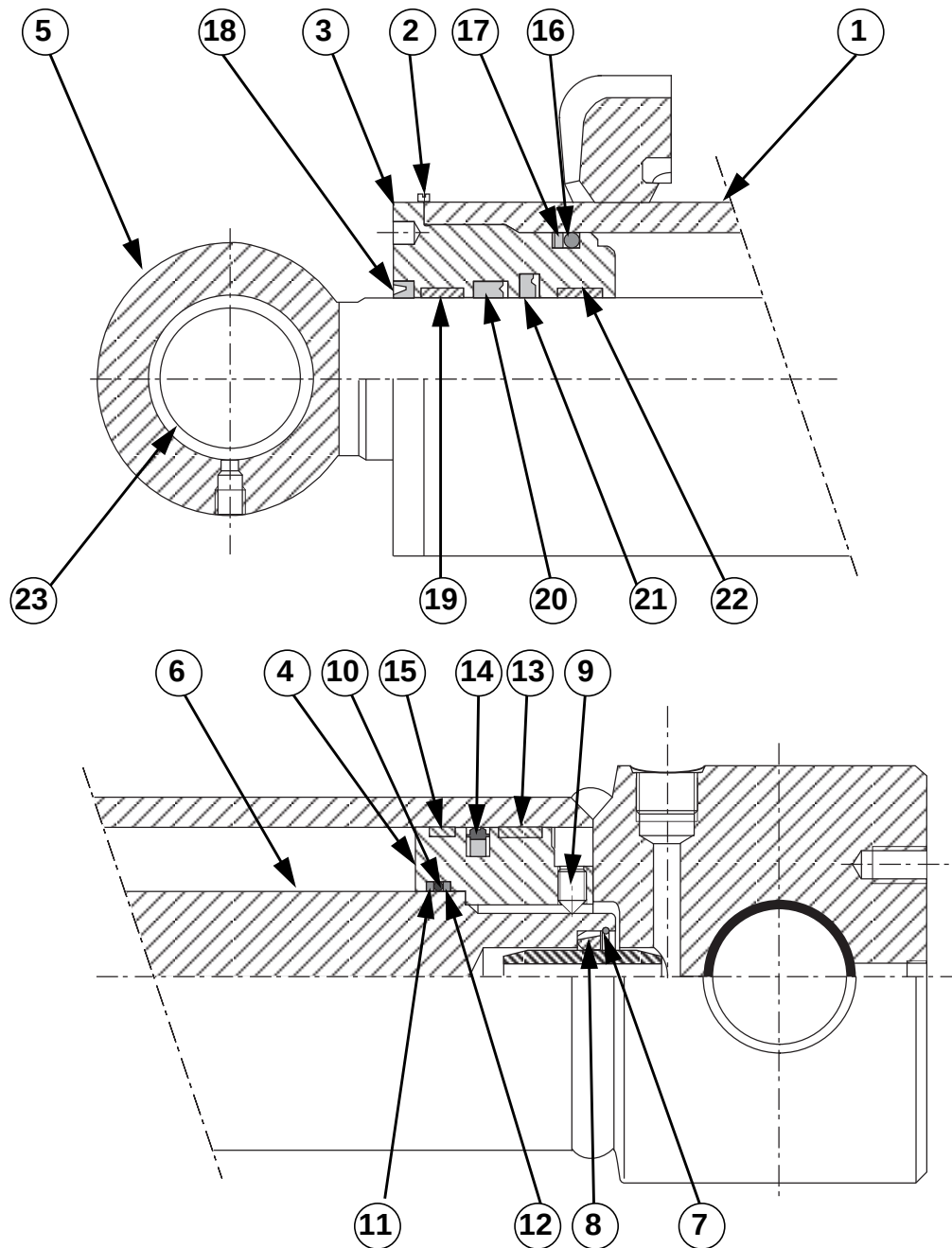


CI98K518

1. Tube	9. Stop screw	17. Back-up ring
2. Lock screw	10. O-ring	18. Wiper
3. Gland	11. Back-up ring	19. Carrier ring
4. Piston	12. Back-up ring	20. Wide seal
5. Piston rod eye	13. Carrier ring	21. Buffer seal
6. Piston rod	14. Seal	22. Carrier ring
7. Retaining ring	15. Carrier ring	23. Bushing
8. Dash-pot bushing	16. O-ring	24. Grease fitting

Assembly

1. Install the buffer seal (21) in the gland (3). The side of the buffer seal (21) with the lip must be toward the small end of the gland (3).
2. Install the wide seal (20) in the gland. The wide seal is to be installed as shown on page 19. The wide seal can be difficult to install. Use the tool shown on page 7.
3. Install the carrier rings (19) and (22) in the gland (3).
4. Install a new wiper (18) in the gland (3). The wiper (18) is to be installed as shown on page 19.
5. Install the O-ring (16) next to the back-up ring (17) in the groove on the outside of the gland (3), as shown on page 19.
6. Fasten the piston rod eye (5) in the vice.
7. Remove any marks and sharp edges on the chamfer at the end of the piston rod (6).
8. Lubricate the bore of the gland (3) with clean oil.
9. Push the gland (3) onto the piston rod (6). If necessary, use a soft hammer to drive the gland (3) onto the piston rod (6).
10. Install the Dash-pot bushing (8) and retaining ring (7) in the piston rod (6).
11. Install a new back-up ring (12) in the piston (4).
12. Install a new O-ring (10) in the piston (4).
13. Install a new back-up ring (11) in the piston (4).
14. Put a support below and near the end of the piston rod (6). use a shop cloth between the support and the piston rod (6) to prevent damage to the piston (4).
15. Put the piston (4) on the end of the piston rod (6).
16. Tighten the piston (4) to the torque value on page 6 for the cylinder that is being repaired. A torque multiplier can be used to help tighten the piston (4).
17. Install a new stop screw (9) in the piston (4), tighten the stop screw to 20 to 25 Nm.
18. Install a new seal (14) in the centre groove on the outside of the piston (4).
19. Install a new carrier rings (15) and (13) in each groove on the outside ends of the piston (4).
20. Lubricate the inside of the tube (1) and the piston (4) with clean oil. Use a piston ring compression tool to hold the new carrier rings in place.
21. Push the tube (1) straight onto the piston (4).
22. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the carrier rings and seal.
23. When the piston (4) is in the smooth part of the tube (1), start the gland (3) into the tube (1).
24. Lubricate the O-ring (16) on the gland (3) with clean oil.
25. Tighten the gland (3) to a torque between 320 and 550 Nm. If the lock screw (2) holes becomes aligned in this torque range, install the lock screw (2). tighten the lock screw (2). Tighten the lock screw (2) to 2.3 Nm. If the lock screw (2) holes are not aligned, carry out steps 26 through 28.
26. Tighten the gland (3) to a torque between 320 and 550 Nm.
27. Use a N° 26 drill and drill a hole half in the gland (3) and half in the tube (1). Drill to a depth of 11 mm. Do not drill in line with a hole in the gland (3) for the gland wrench.
28. Install the lock screw (2). Tighten the lock screw (2) to 2.3 Nm.



CM98K007

1. Tube	9. Stop screw	17. Back-up ring
2. Lock screw	10. O-ring	18. Wiper
3. Gland	11. Back-up ring	19. Carrier ring
4. Piston	12. Back-up ring	20. Wide seal
5. Piston rod eye	13. Carrier ring	21. Buffer seal
6. Piston rod	14. Seal	22. Carrier ring
7. Retaining ring	15. Carrier ring	23. Bushing
8. Dash-pot bushing	16. O-ring	

BOOM CYLINDER

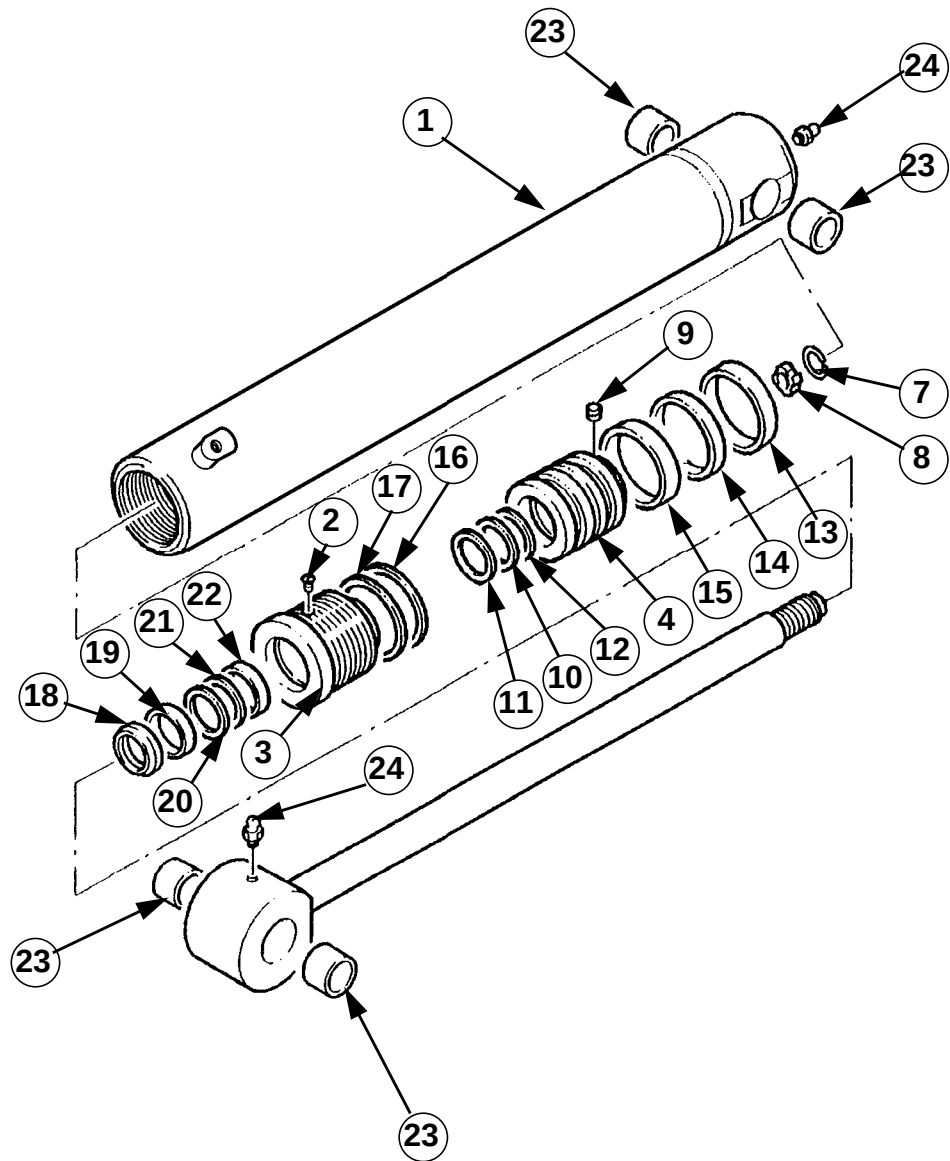
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Loosen and remove the lock screw (2) from the gland (3) and tube (1).
3. Use the gland wrench CAS1456 shown on page 7 to loosen and remove the gland (3) from the tube (1).
4. Pull the piston rod (6) straight out of the tube (1) to prevent damage to the tube (1).
5. Fasten the piston rod (5) eye in a vice and put a support below the piston rod (6) near the piston (4). Use a shop cloth between the support and the piston rod (6) to prevent damage to the piston rod (6).
6. Remove the retaining ring (7) and dash-pot bushing (8) from the piston rod (6).
7. Loosen and remove the stop screw (9) from the piston (4) and discard the stop screw (9).
8. Loosen and remove the piston (4) from the piston rod (6). Use a torque multiplier shown on page 7 for pistons that have a high torque value.
9. Remove the gland (3) from the piston rod (6).
10. Remove the carrier ring (13), seal (14), carrier ring (15), back-up rings (11) and (12) and O-ring (10) from the piston (4).
11. Remove the O-ring (16), back-up ring (17), wiper (18), carrier ring (19), wide seal (20), buffer seal (21) and carrier ring (22) from the gland (3).

Inspection

1. Clean the piston (4), gland (3), piston rod (6) and tube (1) in cleaning solvent.
2. Discard the parts that were removed from the piston (4) and the gland (3).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (6) is straight. If the piston rod (6) is not straight, install a new piston rod (6).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the bushings (23) in the piston rod eye (5) and the closed end of the tube (1). Replace as required.
7. Inspect the gland (3) for rust and clear and remove rust as required.
8. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-ring (16) and remove as required.
9. Inspect the piston (4) for damage and wear. If the piston (4) is damaged or worn, a new piston (4) must be used.



1. Tube
2. Lock screw
3. Gland
4. Piston
5. Piston rod eye
6. Piston rod
7. Retaining ring
8. Dash-pot bushing

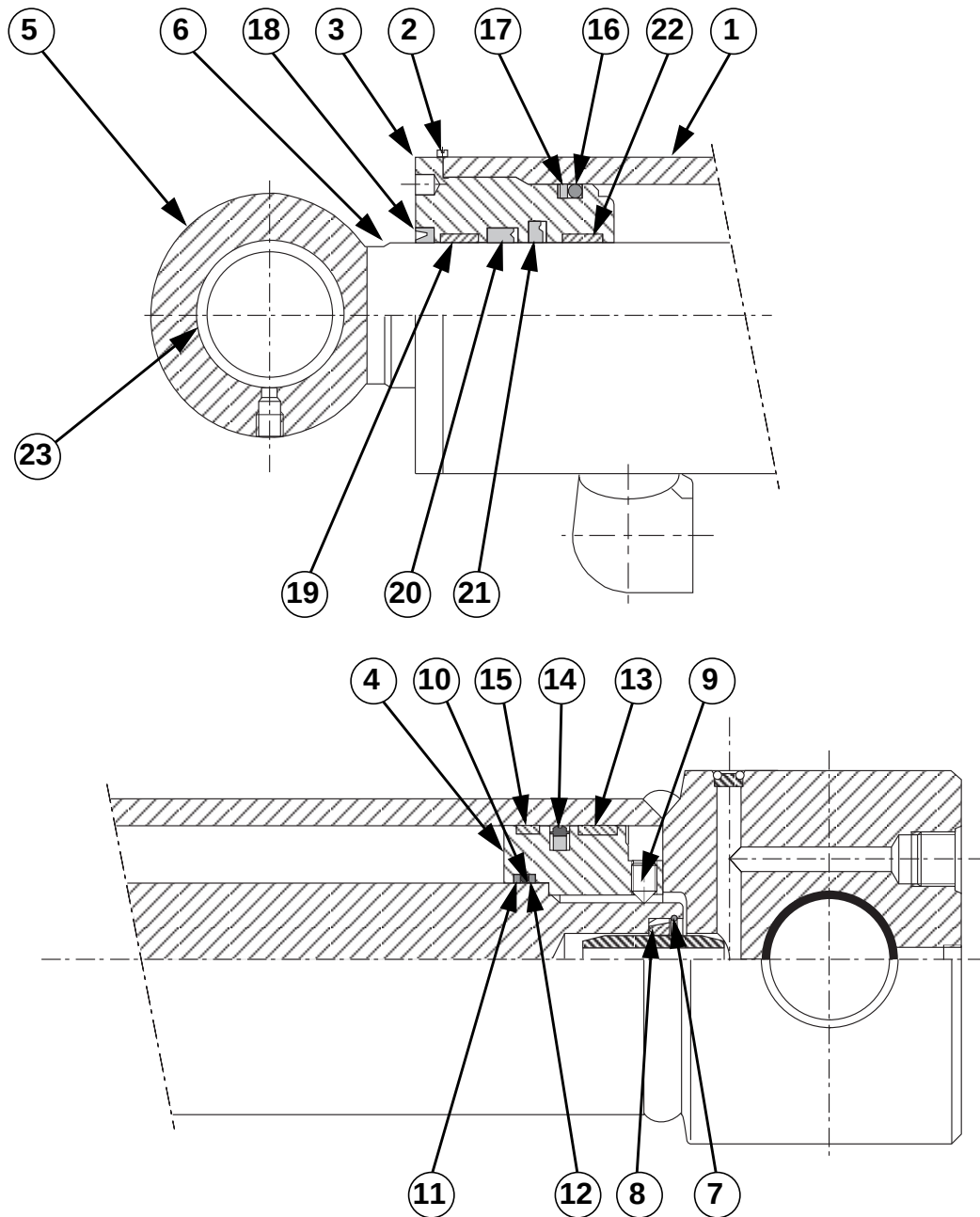
9. Stop screw
10. O-ring
11. Back-up ring
12. Back-up ring
13. Carrier ring
14. Seal
15. Carrier ring
16. O-ring

17. Back-up ring
18. Wiper
19. Carrier ring
20. Wide seal
21. Buffer seal
22. Carrier ring
23. Bushing
24. Grease fitting

CI98K519

Assembly

1. Install the buffer seal (21) in the gland (3). The side of the buffer seal (21) with the lip must be toward the small end of the gland (3).
2. Install the wide seal (20) in the gland. The wide seal is to be installed as shown on page 23. The wide seal can be difficult to install. use the tool shown on page 7.
3. Install the carrier rings (19) and (22) in the gland (3).
4. Install a new wiper (18) in the gland (3). The wiper (18) is to be installed as shown on page 23.
5. Install the O-ring (16) next to the back-up ring (17) in the groove on the outside of the gland (3), as shown on page 23.
6. Fasten the piston rod eye (5) in the vice.
7. Remove any marks and sharp edges on the chamfer at the end of the piston rod (6).
8. Lubricate the bore of the gland (3) with clean oil.
9. Push the gland (3) onto the piston rod (6). If necessary, use a soft hammer to drive the gland (3) onto the piston rod (6).
10. Install the dash-pot bushing (8) and retaining ring (7) in the piston rod (6).
11. Install a new back-up ring (12) in the piston (4).
12. Install a new O-ring (10) in the piston (10) in the piston (4).
13. Install a new back-up ring (11) in the piston (4).
14. Put a support below and near the end of the piston rod (6). use a shop cloth between the support and the piston rod (6) to prevent damage to the piston (4).
15. Put the piston (4) on the end of the piston rod (6).
16. Tighten the piston (4) to the torque value on page 6 for the cylinder that is being repaired. A torque multiplier can be used to help tighten the piston (4).
17. Install a new stop screw (9) in the piston (4), tighten the stop screw to a torque between 20 and 25 Nm.
18. Install a new seal (14) in the centre groove on the outside of the piston (4).
19. Install a new carrier rings (15) and (13) in each groove on the outside ends of the piston (4).
20. Lubricate the endside of the tube (1) and the piston (4) with clean oil. use a piston ring compression tool to hold the new carrier rings in place.
21. Push the tube (1) straight onto the piston (4).
22. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the carrier rings and seal.
23. When the piston (4) is in the smooth part of the tube (1), start the gland (3) into the tube (1).
24. Lubricate the O-ring (16) on the gland (3) with clean oil.
25. Tighten the gland (3) to a torque between 320 and 550 Nm. If the lock screw (2) holes become aligned in this torque range, install the lock screw (2). tighten the lock screw (2) to 2.3 Nm. If the lock screw (2) holes are not aligned, carry out Steps 26 through 28.
26. Tighten the gland (3) to torque between 320 and 550 Nm.
27. Use a N° 26 drill and drill a hole half in the gland (3) and half in the tube (1). Drill to a depth of 11 mm. Do not drill in line a hole in the gland (3) for the gland wrench.
28. Install the lock screw (2). Tighten the lock screw (2) to 2.3 Nm.



- 1. Tube
- 2. Lock screw
- 3. Gland
- 4. Piston
- 5. Piston rod eye
- 6. Piston rod
- 7. Retaining ring
- 8. Dash-pot bushing

- 9. Stop screw
- 10. O-ring
- 11. Back-up ring
- 12. Back-up ring
- 13. Carrier ring
- 14. Seal
- 15. Carrier ring
- 16. O-ring

- 17. Back-up ring
- 18. Wiper
- 19. Carrier ring
- 20. Wide seal
- 21. Buffer seal
- 22. Carrier ring
- 23. Bushing

CM98K008

EXTENDABLE DIPPER CYLINDER

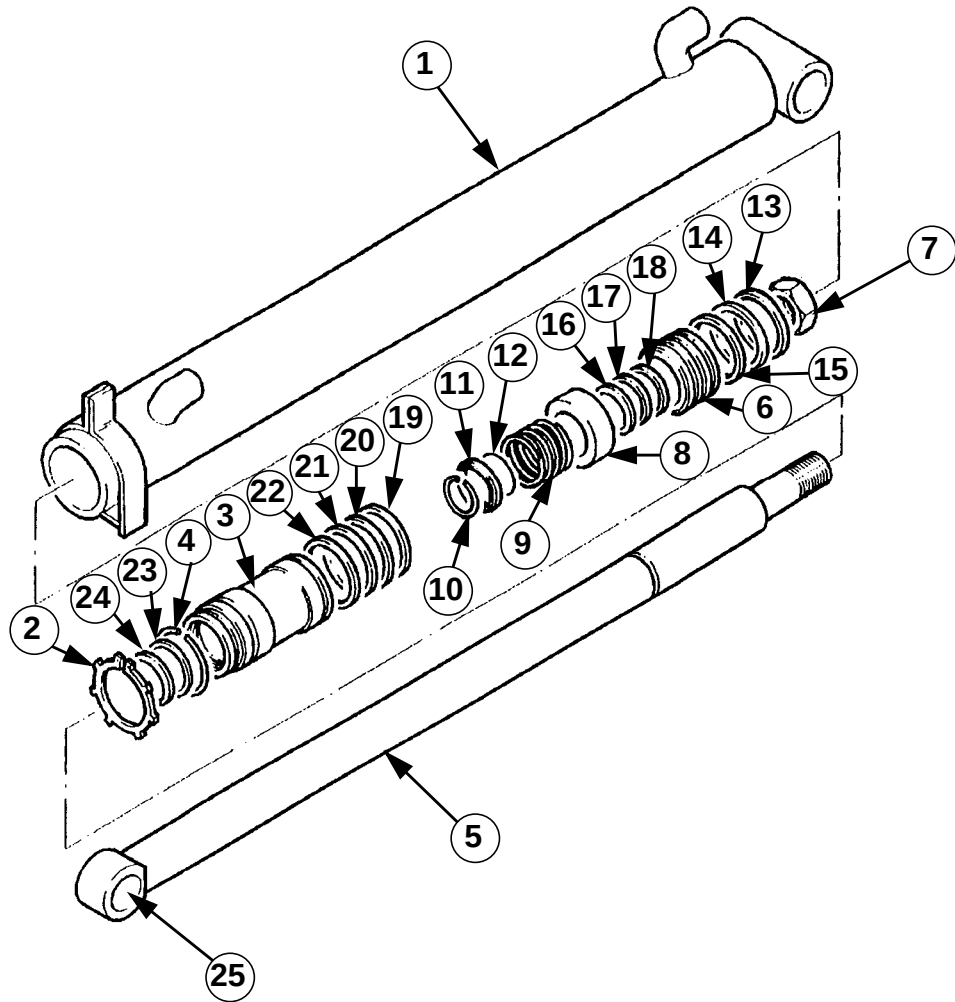
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Remove the snap ring (2) from the gland (3).
3. Push the gland inwards towards the interior of the tube (1) to free the ring (4).
4. Remove the ring (4) from the tube (1).
5. Pull the piston rod (5) straight out of the tube (1) to prevent damage to the tube (1).
6. Fasten the piston rod eye (25) in a vice and put a support below the piston rod (5) near the piston (6). use a shop cloth between the support and the piston rod (5) to prevent damage to the piston rod (5).
7. Loosen and remove the nut (7) that hold the piston (6). Use the torque multiplier shown on page 7 for nuts that have a high torque value.
8. Remove the piston (6) from the piston rod (5).
9. Remove the spacer (8) from the piston rod (5).
10. Remove the spring (9) from the piston rod (5).
11. Remove the dash-pot bushing (11) from the piston rod (5).
12. Remove the ring (10) from the piston rod (5).
13. Remove and discard the O-ring (12) from the Dash-pot bushing (11).
14. Remove the gland (3) from the piston rod (5).
15. Remove the carrier rings (13) and (15), seal (14), back-up rings (16) and (18) and O-ring (17) from the piston (6).
16. Remove the O-rings (19) and (21), back-up rings (20) and (22), wide seal (23) and wiper (24) from the gland (3).

Inspection

1. Clean the piston (6), gland (3), piston rod (5), spacer (8), spring (9) and dash-pot bushing (11) in cleaning solvent.
2. Discard the parts that were removed from the piston (4) and the gland (3).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (5) is straight. If the piston rod (5) is not straight, install a new piston rod (5).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the gland (3) for rust and clean and remove rust as required.
7. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-rings (19) and (21). Remove as required.
8. Inspect the piston (6) for damage or wear. If the piston (6) is damaged or worn, a new piston (6) must be used.

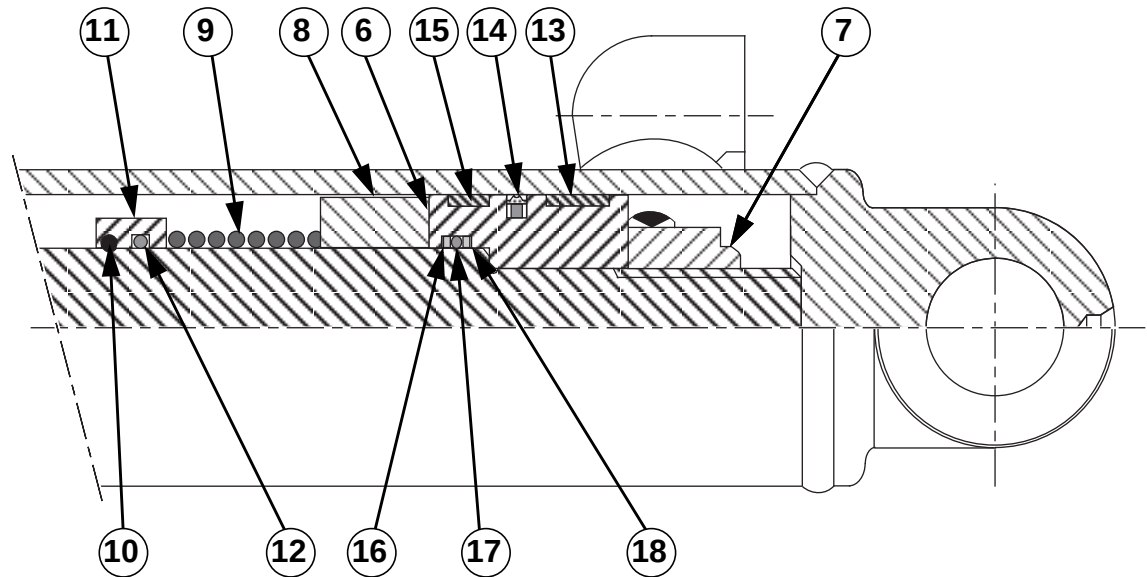
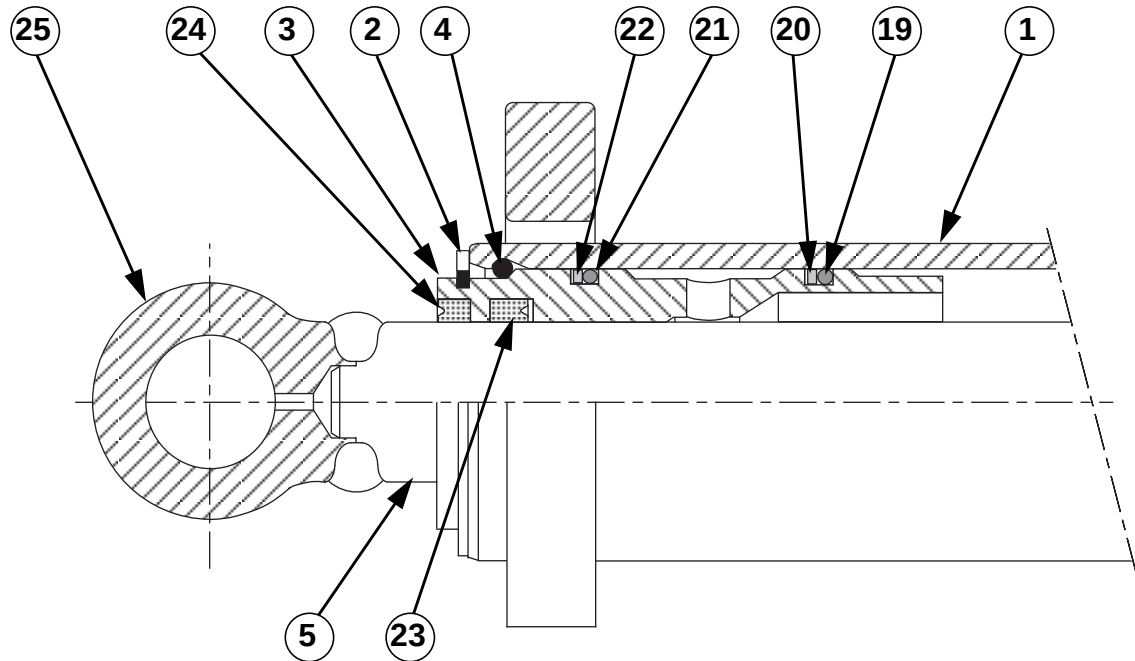


1. Tube	10. Ring	19. O-ring
2. Snap ring	11. Dash-pot bushing	20. Back-up ring
3. Gland	12. O-ring	21. O-ring
4. Ring	13. Carrier ring	22. Back-up ring
5. Piston rod	14. Seal	23. Wide seal
6. Piston	15. Carrier ring	24. Wiper
7. Nut	16. Back-up ring	25. Piston rod eye
8. Spacer	17. O-ring	
9. Spring	18. Back-up ring	

CI98K520

Assembly

1. Install the wide seal (23) in the gland (3). The wide seal (23) is to be installed as shown on page 27. The wide seal (23) can be difficult to install. Use the tool shown on page 7.
2. Install a new wiper (24) in the gland (3). The wiper is to be installed as shown on page 27.
3. Install a new back-up ring (22) in the groove on the outside of the gland (3).
4. Install the O-ring (21) next to the back-up ring (22) in the groove on the outside of the gland (3), as shown on page 27.
5. Install a new back-up ring (20) in the groove on the outside of the gland (3).
6. Install the O-ring (19) next to the back-up ring (20) in the groove on the outside of the gland (3), as shown on page 27.
7. Fasten the piston rod eye (25) in the vice.
8. Put a new snap ring (2) of the piston rod (5) near the piston rod eye (25).
9. Remove any marks and sharp edges on the chamfer at the end of the piston rod (5).
10. Lubricate the bore of the gland (3) with clean oil.
11. Push the gland (3) onto the piston rod (5). If necessary, use a soft hammer to drive the gland (3) onto the piston rod (5).
12. Put a support below and near the end of the piston rod (5). use a shop cloth between the support and the piston rod (5) to prevent damage to the piston (3).
13. Install a new ring (10) on the piston rod (5)
14. Install a new O-ring (12) in the dash-pot bushing (11).
15. Install a dash-pot bushing (11) on the piston rod (5).
16. Install a spring (9) on the piston rod (5).
17. Install a spacer (8) on the piston rod (5).
18. Install a new back-up ring (18) in the piston (6).
19. Install a new O-ring (17) in the piston (6).
20. Install a new back-up ring (16) in the piston (6).
21. Put the piston (6) on the end of the piston rod (5).
22. Install a new nut (7) in the piston rod (5). Tighten the nut (7) to a torque between 790 and 810 Nm. A torque multiplier can be used to help the tighten the nut (7).
23. Install a new seal (14) in the centre groove on the outside of the piston (6).
24. Install a new carrier rings (13) and (15) in each groove on the outside ends of the piston (6).
25. Lubricate the inside of the tube (1) and the piston (6) with clean oil. Use a piston ring compression tool to hold the new carrier rings in place.
26. Push the tube (1) straight onto the piston (6).
27. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the carrier rings and seal.
28. Lubricate the O-rings (19) and (21) on the gland (3) with clean oil.
29. Push the gland (3) into the tube (1) in order to obtain the necessary access to be able to install the ring (4) in its groove.
30. Draw the piston rod out in the axis of the rod in order to be able to install the gland (3) in the tube (1).
31. Install a new snap ring (2) on the gland (3).



CM98K009

1. Tube	10. Ring	19. O-ring
2. Snap ring	11. Dash-pot bushing	20. Back-up ring
3. Gland	12. O-ring	21. O-ring
4. Ring	13. Carrier ring	22. Back-up ring
5. Piston rod	14. Seal	23. Wide seal
6. Piston	15. Carrier ring	24. Wiper
7. Nut	16. Back-up ring	25. Piston rod eye
8. Spacer	17. O-ring	
9. Spring	18. Back-up ring	

SLEW CYLINDER

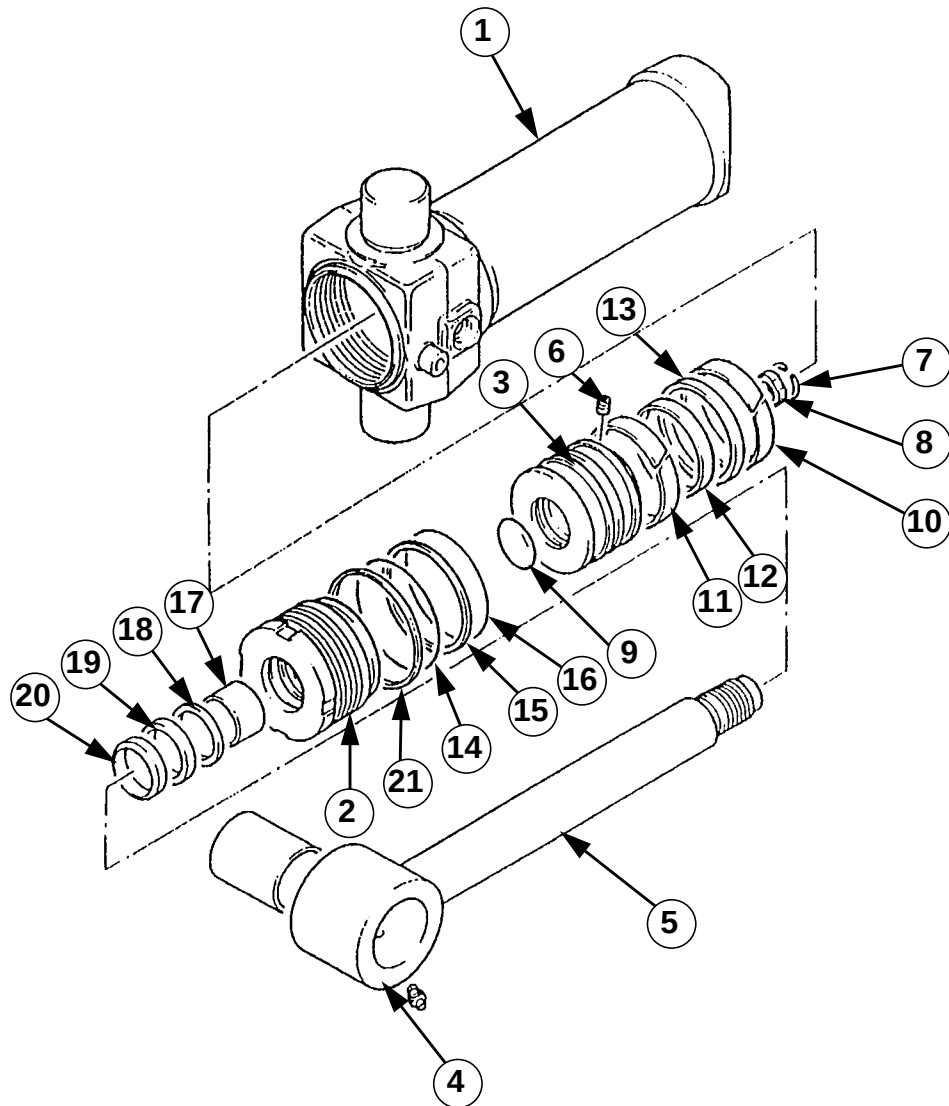
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Free the gland (2) by turning the retaining ring (21) out from the slots.
3. Use a gland wrench OEM 6203 shown on page 7 to loosen and remove the gland (2) from the tube (1).
4. Pull the piston rod (5) straight out of the tube (1) to prevent damage to the tube (1).
5. Fasten the piston rod eye (4) in a vice and put a support below the piston rod (5) to prevent damage to the piston rod (5).
6. Loosen and remove the stop screw (6) from the piston (3). Discard the stop screw (6).
7. Loosen and remove the piston (3) from the piston rod (5). Use a torque multiplier shown on page 7 for pistons that have a high torque value.
8. Remove the gland (2) from the piston rod (5).
9. Remove the snap ring (7) and dash-pot bushing (8) from the piston rod (5).
10. Remove the O-ring (9), carrier rings (10) and (11), back-up ring (12) and seal (13) from the piston (3).
11. Remove the O-ring (14), back-up ring (15), O-ring (16), bushing (17), buffer seal (18), wide seal (19), wiper (20) and retaining ring (21) from the gland (2).

Inspection

1. Clean the piston (3), gland (2), piston rod (5), and tube (1) in cleaning solvent.
2. Discard the parts that were removed from the piston (3) and the gland (2).
3. Illuminate the inside of the tube (1). inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (5) is straight. If the piston rod (5) is not straight, install a new piston rod (5).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the gland (2) for rust and clean and remove rust as required.
7. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-rings (14) and (16). Remove as required.
8. Inspect the piston (3) for damage and wear. If the piston (3) is damaged or worn, a new piston (3) must be used.

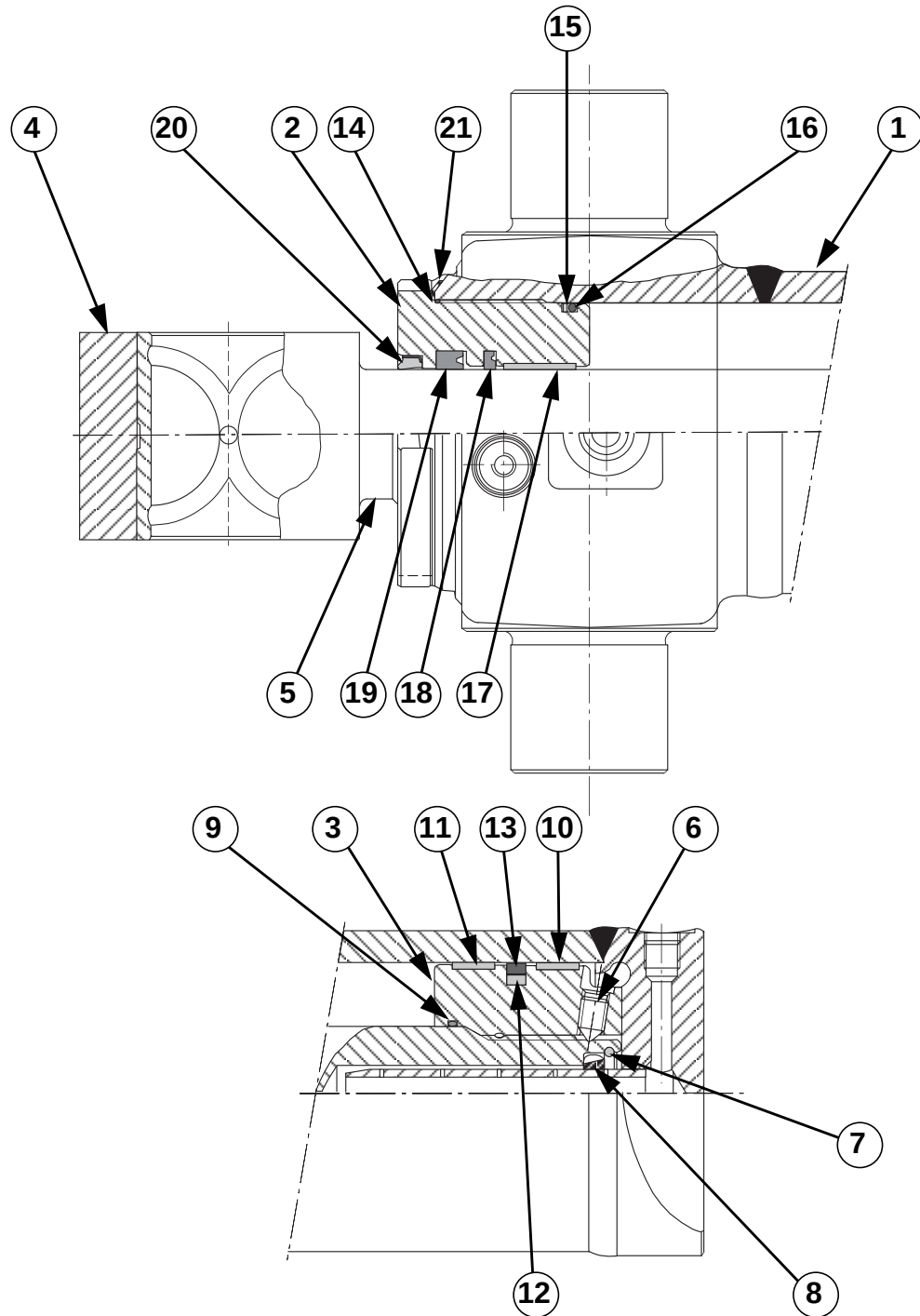


CS98K523

1. Tube	8. Dash-pot bushing	15. Back-up ring
2. Gland	9. O-ring	16. O-ring
3. Piston	10. Carrier ring	17. Bushing
4. Piston rod eye	11. Carrier ring	18. Buffer seal
5. Piston rod	12. Back-up ring	19. Wide seal
6. Stop screw	13. Seal	20. Wiper
7. Snap ring	14. O-ring	21. Retaining ring

Assembly

1. Install the bushing (17) in the gland (2).
2. Install the buffer seal (18) in the gland (2). The side of the buffer seal (18) with the lip must be toward the small end of the gland (3).
3. Install the wide seal (19) in the gland. The wide seal (19) is to be installed as shown on page 31. The wide seal (19) can be difficult to install. Use the tool shown on page 7.
4. Install a new wiper (20) in the gland (2). The wiper is to be installed as shown on page 31.
5. Install a new retaining ring (21) of the gland (2).
6. Install the O-ring (16) next to the back-up ring (15) in the groove on the outside of the gland (2) as shown on page 31.
7. Install the O-ring (14) of the gland (2).
8. Fasten the piston rod eye (4) in the vice.
9. Remove any marks and sharp edges on the chamber at the end of the piston rod (5).
10. Lubricate the bore of the gland (2) with clean oil.
11. Push the gland (2) onto the piston rod (5). Use a soft hammer to drive the gland (2) onto the piston rod (5).
12. Put a support below and near the end of the piston rod (5). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston (3).
13. Install the dash-pot bushing (8) and a new snap ring (7) in the piston rod (5).
14. Install a new O-ring (9) in the piston (3).
15. Put the piston (3) on the end of the piston rod (5).
16. Tighten the piston (3) to the torque value on page 6 for the cylinder that is being repaired. A torque multiplier can be used to help tighten the piston (7).
17. Apply Loctite NR275 to a new stop screw (6) threads and install a new stop screw (6) in the piston (3). Tighten the stop screw to a torque between 20 and 25 Nm.
18. Install a new back-up ring (12) in the centre groove on the outside of the piston (3).
19. Install a new seal (13) on top of the back-up ring (12) as shown on page 31.
20. Install a new carrier rings (10) and (11) in each groove on the outside ends of the piston (3).
21. Lubricate the inside of the tube (1) and the piston (3) with clean oil. Use a piston ring compression tool to hold the new carrier ring in place.
22. Push the tube (1).
23. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly. Be careful not to damage the carrier rings and seal.
24. When the piston (3) is in the smooth part of the tube (1).
25. Lubricate the O-rings (14) and (16) on the gland (2) with clean oil.
26. Tighten the gland (2) to a torque between 370 and 420 Nm.
27. Prevent the gland from turning by pening the retaining ring (21) into the tube (1) slots, using a hammer and drift.



1. Tube
2. Gland
3. Piston
4. Piston rod eye
5. Piston rod
6. Stop screw
7. Snap ring

8. Dash-pot bushing
9. O-ring
10. Carrier ring
11. Carrier ring
12. Back-up ring
13. Seal
14. O-ring

15. Back-up ring
16. O-ring
17. Bushing
18. Buffer seal
19. Wide seal
20. Wiper
21. Retaining ring

CM98K010

LOADER LIFT CYLINDER

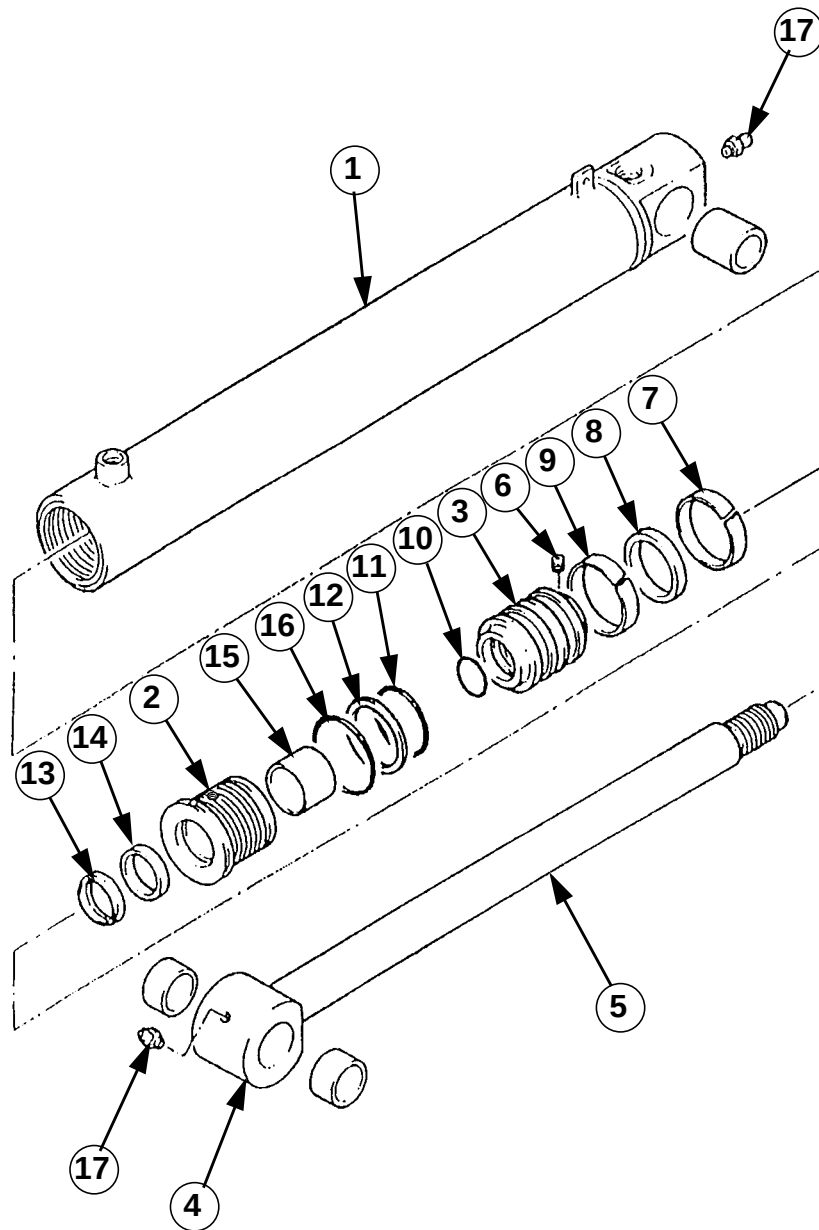
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Use a gland wrench OEM 6206 shown on page 7 to loosen and remove the gland (2) from the tube (1).
3. Pull the piston rod (5) straight out of the tube (1) to prevent damage to the tube (1).
4. Fasten the piston rod eye (4) in a vice and put a support below the piston rod (5) near the piston (3). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston rod (5).
5. Loosen and remove the stop screw (6) from the piston (3). Discard the stop screw (6).
6. Loosen and remove the piston (3) from the piston rod (5). Use a torque multiplier shown on page 7 for pistons that have a high torque value.
7. Remove the gland (2) from the piston rod (5).
8. Remove the carrier rings (7) and (9), seal (8) and O-ring (10) from the piston (3).
9. Remove the back-up ring (12), O-ring (11), bushing (15), wide seal (14), wiper (13) and O-ring (16) from the gland (2).

Inspection

1. Clean the piston (3), gland (2), piston rod (5), and tube (1) in cleaning solvent.
2. Discard the parts that were removed from the piston (3) and the gland (2).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (5) is straight. If the piston rod (5) is not straight, install a new piston rod (5).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the gland (2) for rust and clean and remove rust as required.
7. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-rings (11). Remove as required.
8. Inspect the piston (3) for damage and wear. If the piston (3) is damaged or worn, a new piston (3) must be used.



1. Tube
2. Gland
3. Piston
4. Piston rod eye
5. Piston rod
6. Stop screw

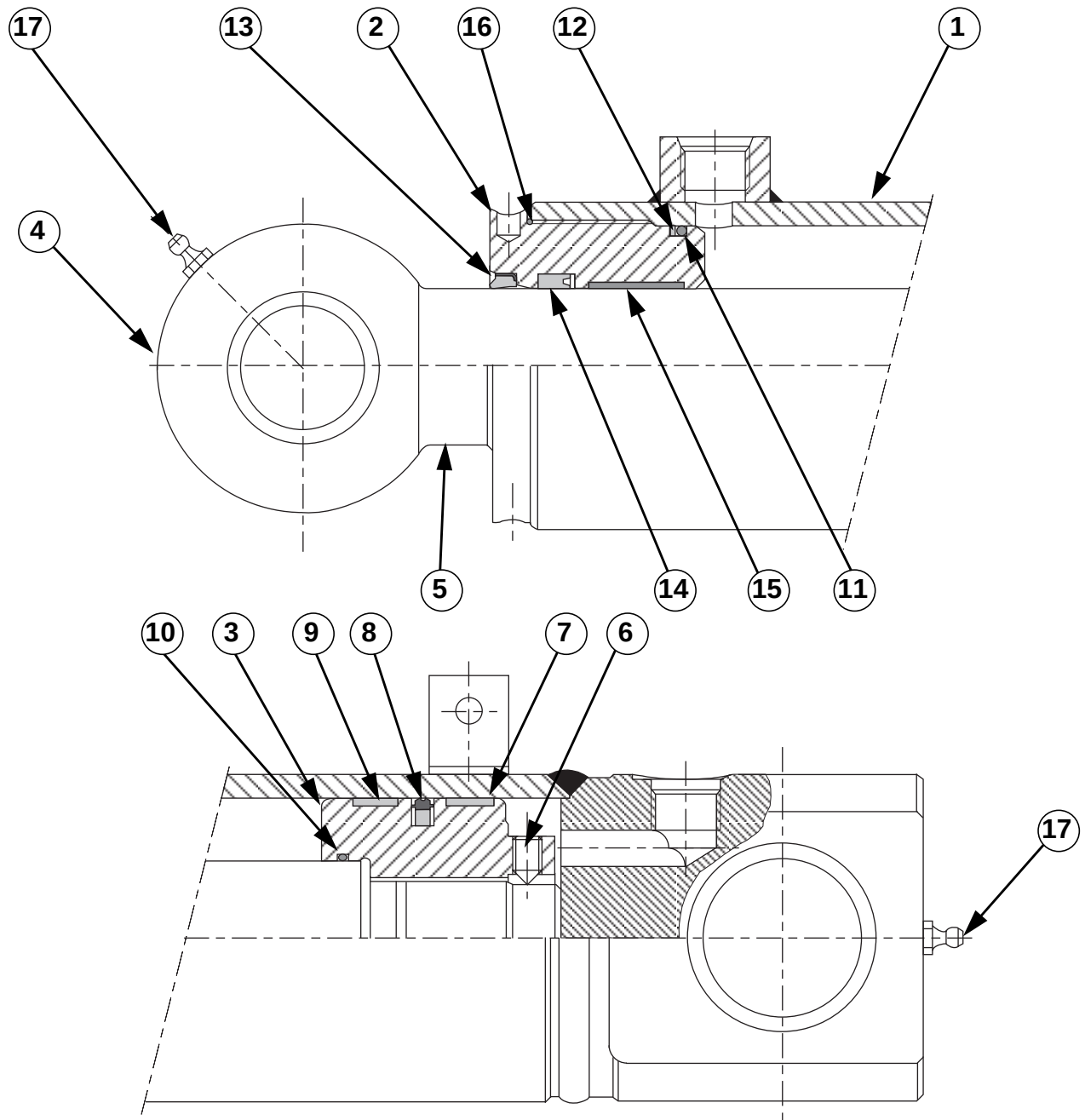
7. Carrier ring
8. Seal
9. Carrier ring
10. O-ring
11. O-ring
12. Back-up ring

13. Wiper
14. Wide seal
15. Bushing
16. O-ring
17. Grease fitting

CS98K524

Assembly

1. Install the bushing (15) in the gland (2).
2. Install the wide seal (14) in the gland. The wide seal (14) is to be installed as shown on page 35. The wide seal (14) can be difficult to install. Use the tool shown on page 7.
3. Install a new wiper (13) in the gland (2). The wiper is to be installed as shown on page 35.
4. Install the O-ring (11) next to the back-up ring (12) in the groove on the outside of the gland (2), as shown on page 35.
5. Install a new O-ring (16) of the gland (2).
6. Fasten the piston rod eye (4) in the vice.
7. Remove any marks and sharp edges on the chamfer at the end of the piston rod (5).
8. Lubricate the bore of the gland (2) with clean oil.
9. Push the gland (2) onto the piston rod (5). If necessary, use a soft hammer to drive the gland (2) onto the piston rod (5).
10. Put a support below and near the end of the piston rod (5). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston (3).
11. Install a new O-ring (10) in the piston (5).
12. Put the piston (3) on the end of the piston rod (5).
13. Tighten the piston (3) to the torque value on page 6 for the cylinder that is being repaired. A torque multiplier can be used to help tighten the piston (3).
14. Apply Loctite 642 to a new stop screw (6) threads and install a new stop screw (6) in the piston (3). Tighten the stop screw to a torque between 20 and 25 Nm.
15. Install a new seal (8) in the centre groove on the outside of the piston (3).
16. Install a new carrier rings (7) and (9) in each groove on the outside ends of the piston (3).
17. Lubricate the inside of the tube (1) and the piston (3) with clean oil. Use a piston ring compression tool to hold the new carrier rings in place.
18. Push the tube (1) straight onto the piston (3).
19. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the carrier rings and seal.
20. When the piston (3) is in the smooth part of the tube (1), start the gland (2) into the tube (1).
21. Lubricate the O-ring (10) on the gland (2) with clean oil.
22. Apply Loctite ss-1122 to the gland (3) threads and tighten the gland (3) to a torque between 350 and 400 Nm.



- 1. Tube
- 2. Gland
- 3. Piston
- 4. Piston rod eye
- 5. Piston rod
- 6. Stop screw

- 7. Carrier ring
- 8. Seal
- 9. Carrier ring
- 10. O-ring
- 11. O-ring
- 12. Back-up ring

- 13. Wiper
- 14. Wide seal
- 15. Bushing
- 16. O-ring
- 17. Grease fitting

CM98K011

STABILIZER CYLINDER (sideshift version)

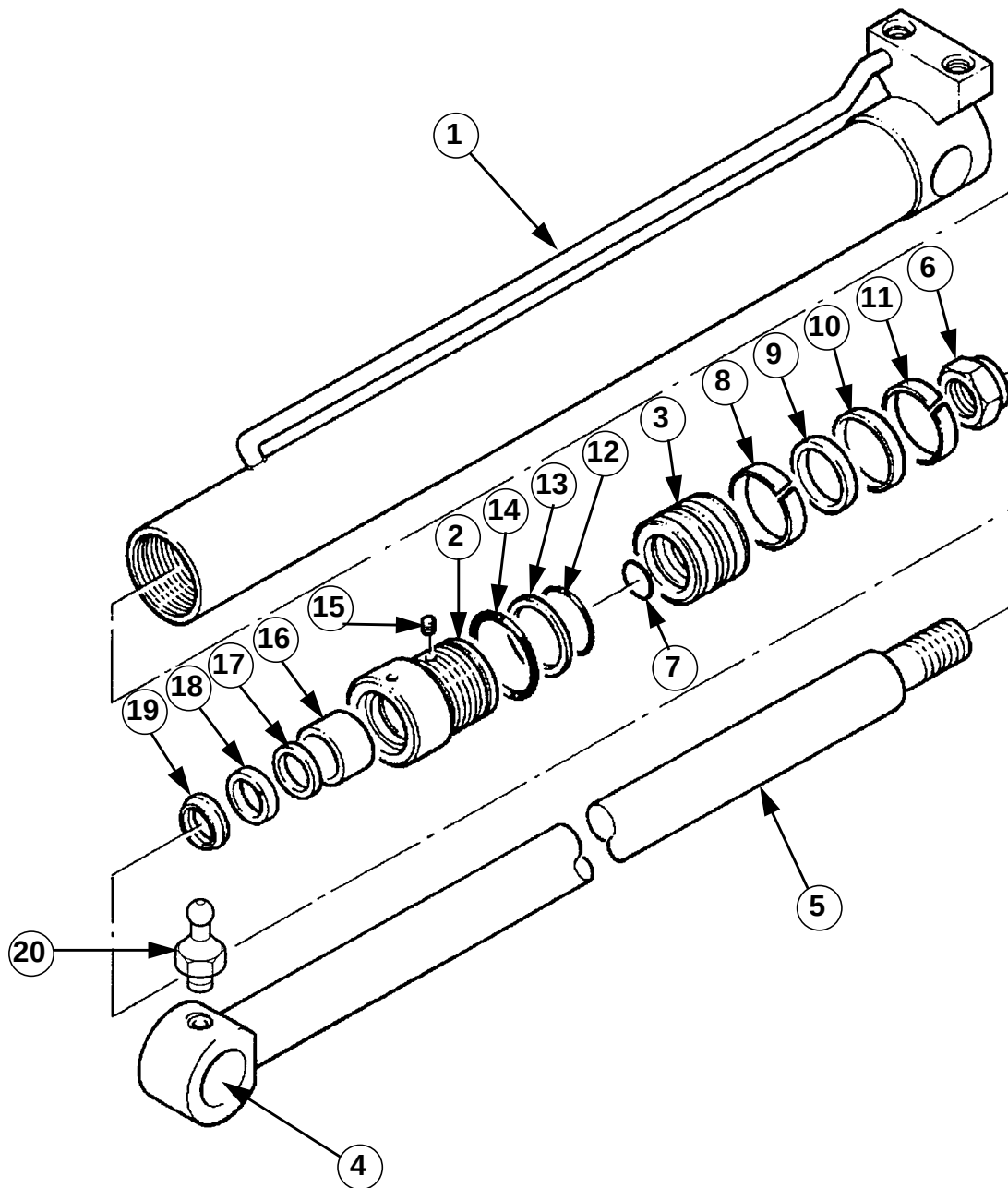
Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Use a gland wrench OEM 6206 shown on page 7 to loosen and remove the gland (2) from the tube (1).
3. Pull the piston rod (5) straight out of the tube (1) to prevent damage to the tube (1).
4. Fasten the piston rod eye (4) in a vice and put a support below the piston rod (5) near the piston (3). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston rod (5).
5. Loosen and remove the lock nut (6) that holds the piston (3). Use the torque multiplier shown on page 7 for lock nuts that have a high torque value.
6. Remove the piston (3) from the piston rod (5).
7. Remove the gland (2) from the piston rod (5).
8. Remove the O-ring (7), carrier rings (8) and (11), back-up ring (9) and seal (10) from the piston (3).
9. Remove the O-ring (12), back-up ring (13), O-ring (14), retaining plug (15), bushing (16), buffer seal (17), wide seal (18) and wiper (19) from the gland (2).

Inspection

1. Clean the piston (3), gland (2), piston rod (5), and tube (1) in cleaning solvent.
2. Discard the parts that were removed from the piston (3) and the gland (2).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (5) is straight. If the piston rod (5) is not straight, install a new piston rod (5).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the gland (2) for rust and clean and remove rust as required.
7. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-rings (14) and (12). Remove as required.
8. Inspect the piston (3) for damage and wear. If the piston (3) is damaged or worn, a new piston (3) must be used.

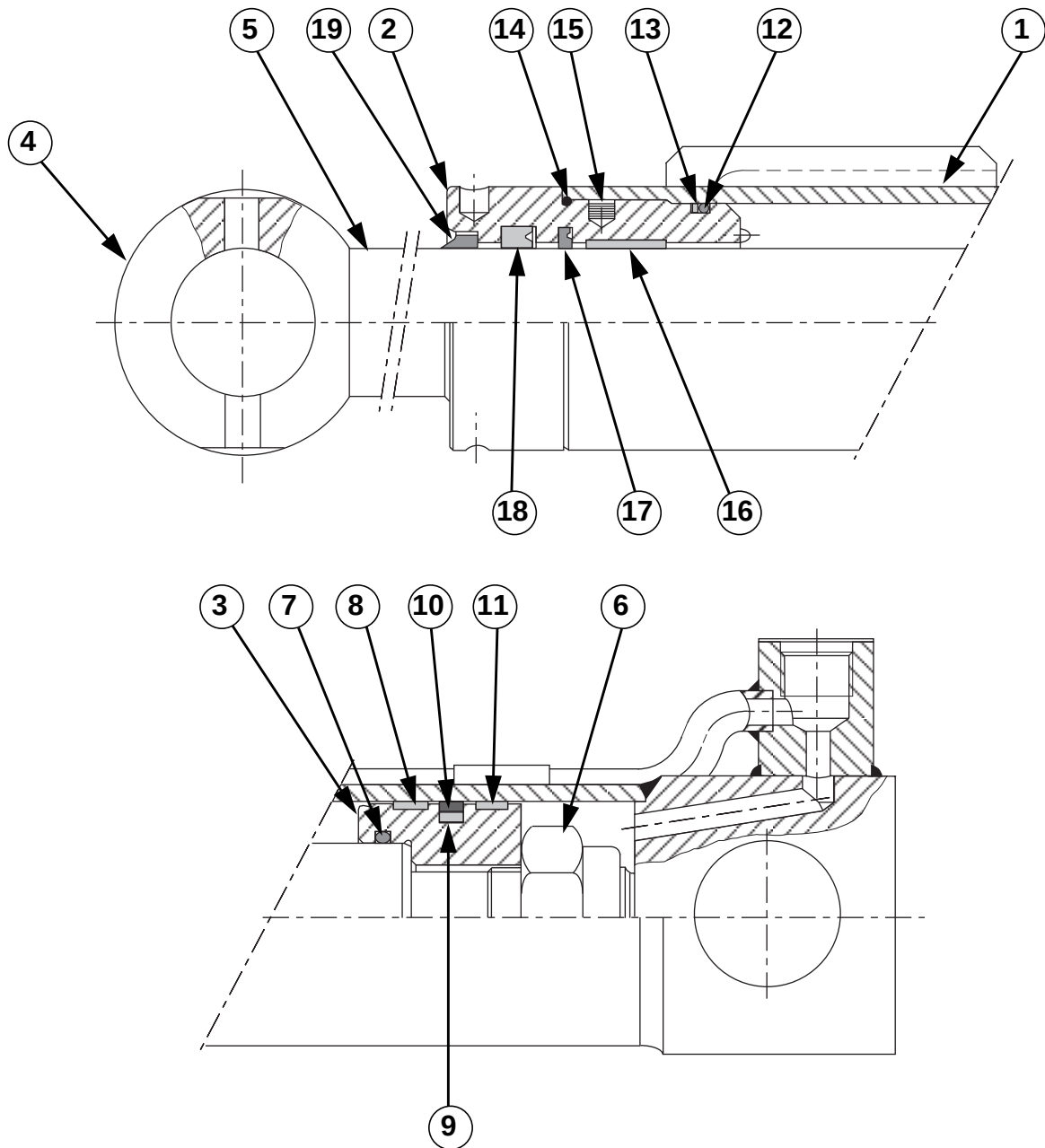


1. Tube	8. Carrier ring	15. Retaining plug
2. Gland	9. Back-up ring	16. Bushing
3. Piston	10. Seal	17. Buffer seal
4. Piston rod eye	11. Carrier ring	18. Wide seal
5. Piston rod	12. O-ring	19. Wiper
6. Lock nut	13. Back-up ring	20. Grease fitting
7. O-ring	14. O-ring	

CS98K525

Assembly

1. Install the bushing (15) in the gland (2).
2. Install the buffer seal (17) in the gland (2). The side of the buffer seal (17) with the lip must be toward the small end of the gland (3).
3. Install the wide seal (18) in the gland. The wide seal (18) is to be installed as shown on page 39. The wide seal (18) can be difficult to install. Use the tool shown on page 7.
4. Install a new wiper (19) in the gland (2). The wiper is to be installed as shown on page 39.
5. Install a new retaining plug (15) in gland (2).
6. Install the O-ring (12) next to the back-up ring (13) in the groove on the outside of the gland (2) as shown on page 39.
7. Install the O-ring (14) of the gland (2).
8. Fasten the piston rod eye (4) in the vice.
9. Remove any marks and sharp edges on the chamber at the end of the piston rod (5).
10. Lubricate the bore of the gland (2) with clean oil.
11. Push the gland (2) onto the piston rod (5). Use a soft hammer to drive the gland (2) onto the piston rod (5).
12. Put a support below and near the end of the piston rod (5). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston (3).
13. Install a new O-ring (7) in the piston (3).
14. Put the piston (3) on the end of the piston rod (5).
15. Apply Loctite HTS 915 066 to the threads of a new lock nut (6) and install the new lock nut (6) in the piston rod (5). Tighten the lock nut (6) to a torque between 800 and 850 Nm. A torque multiplier can be used to help tighten the lock nut (6).
16. Install a new back-up ring (9) in the centre groove on the outside of the piston (3).
17. Install a new seal (10) on top of the back-up ring (9) as shown on page 39.
18. Install a new carrier rings (8) and (11) in each groove on the outside ends of the piston (3).
19. Lubricate the inside of the tube (1) and the piston (3) with clean oil. Use a piston ring compression tool to hold the new carrier rings in place.
20. Push the tube (1) straight onto the piston (3).
21. Start the tube (1) onto the piston rod assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the carrier rings and seal.
22. When the piston (3) is in the smooth part of the tube (1) start the gland (2) into the tube (1).
23. Lubricate the O-rings (12) and (14) on the gland (2) with clean oil.
24. Tighten the gland (2) to a torque between 300 and 350 Nm.



- 1. Tube
- 2. Gland
- 3. Piston
- 4. Piston rod eye
- 5. Piston rod
- 6. Lock nut
- 7. O-ring

- 8. Carrier ring
- 9. Back-up ring
- 10. Seal
- 11. Carrier ring
- 12. O-ring
- 13. Back-up ring
- 14. O-ring

- 15. Retaining plug
- 16. Bushing
- 17. Buffer seal
- 18. Wide seal
- 19. Wiper

CM98K012

STABILIZER CYLINDER (centremount version)

Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment be careful to prevent damage to the tube (1).
2. Use the gland wrench OEM 6206 shown on page 7 to rotate the gland (2) clockwise (as viewed from the piston rod eye of the cylinder), until the bevelled end of the ring (3) is visible through the slot in the side of the cylinder.

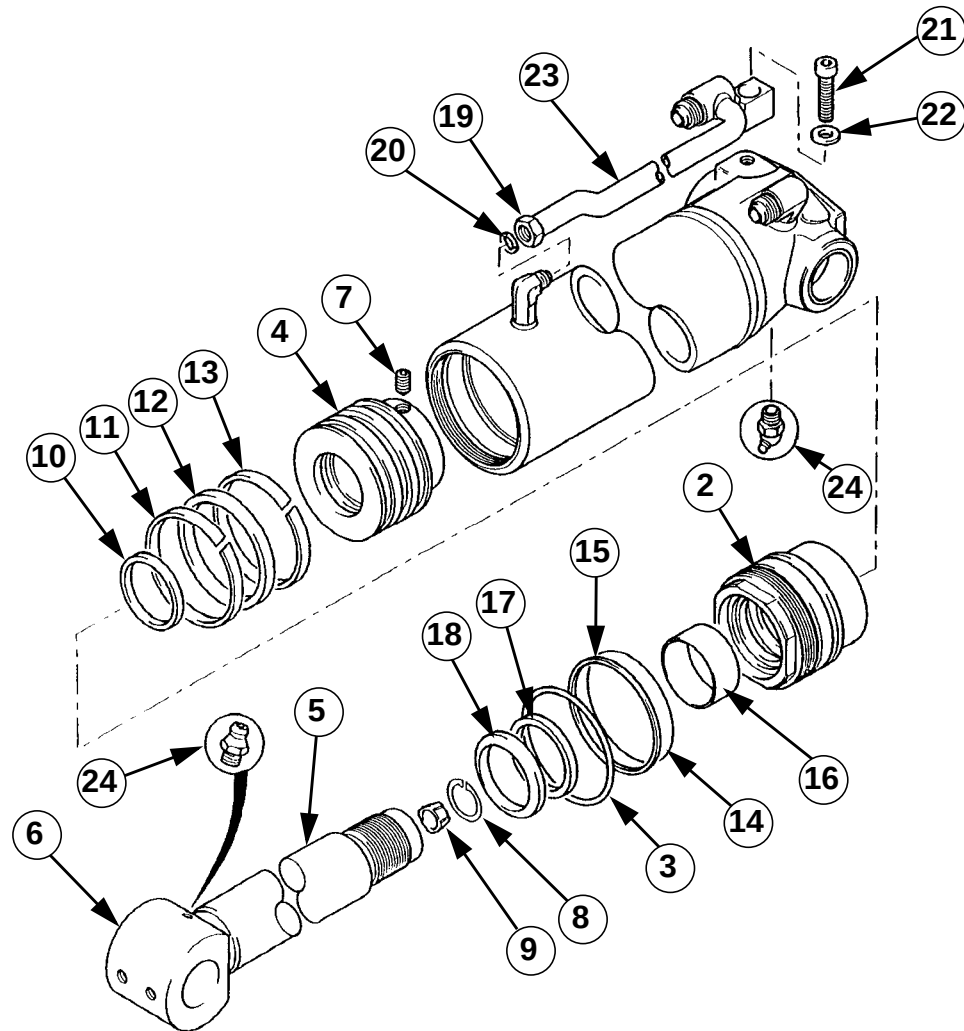


WARNING : *Do not rotate the gland (2) in the opposite direction, as the bevelled end of the ring (3) may jam in the groove and break off the drive lug.*

3. Reverse the rotation of the gland (2) when the end of the ring (3) is visible. The ring (3) will not normally feed out through the slot without aid. If the ring (3) does not enter the slot, insert a small screwdriver to act as a guide.
4. If the lug on the ring (3) is broken off, see page 50.
5. Pull the piston rod (5) straight out of the tube (1) to prevent damage to the tube (1).
6. Fasten the piston rod eye (6) in a vice and put a support below the piston rod (5) near the piston (4). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston rod (5).
7. Loosen and remove the stop screw (7) from the piston (4). Discard the stop screw (7).
8. Loosen and remove the piston (4) from the piston rod (5). Use a torque multiplier shown on page 7 for pistons that have a high torque value.
9. Remove the gland (2) from the piston rod (5).
10. Remove the snap ring (8) and dash-pot bushing (9).
11. Remove the O-ring (10), carrier rings (11) and (13) and seal (12) from the piston (4).
12. Remove the O-ring (14), back-up ring (15), bushing (16), wide seal (17) and wiper (18) from the gland (2).
13. Disconnect nut (19) from the tube (1) and remove the ring (20).
14. Remove the bolt (21) and washer (22) from the pipe (23).
15. Remove the pipe (23) from the tube (1).

Inspection

1. Clean the piston (4), gland (2), piston rod (5) and tube (1) in cleaning solvent.
2. Discard the parts that were removed from the piston (4) and the gland (2).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (5) is straight. If the piston rod (5) is not straight, install a new piston rod (5).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the gland (2) for rust and clean and remove rust as required.
7. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-ring (14). Remove as required.
6. Inspect the piston (4) for damage and wear. If the piston (4) is damaged or worn, a new piston (4) must be used.

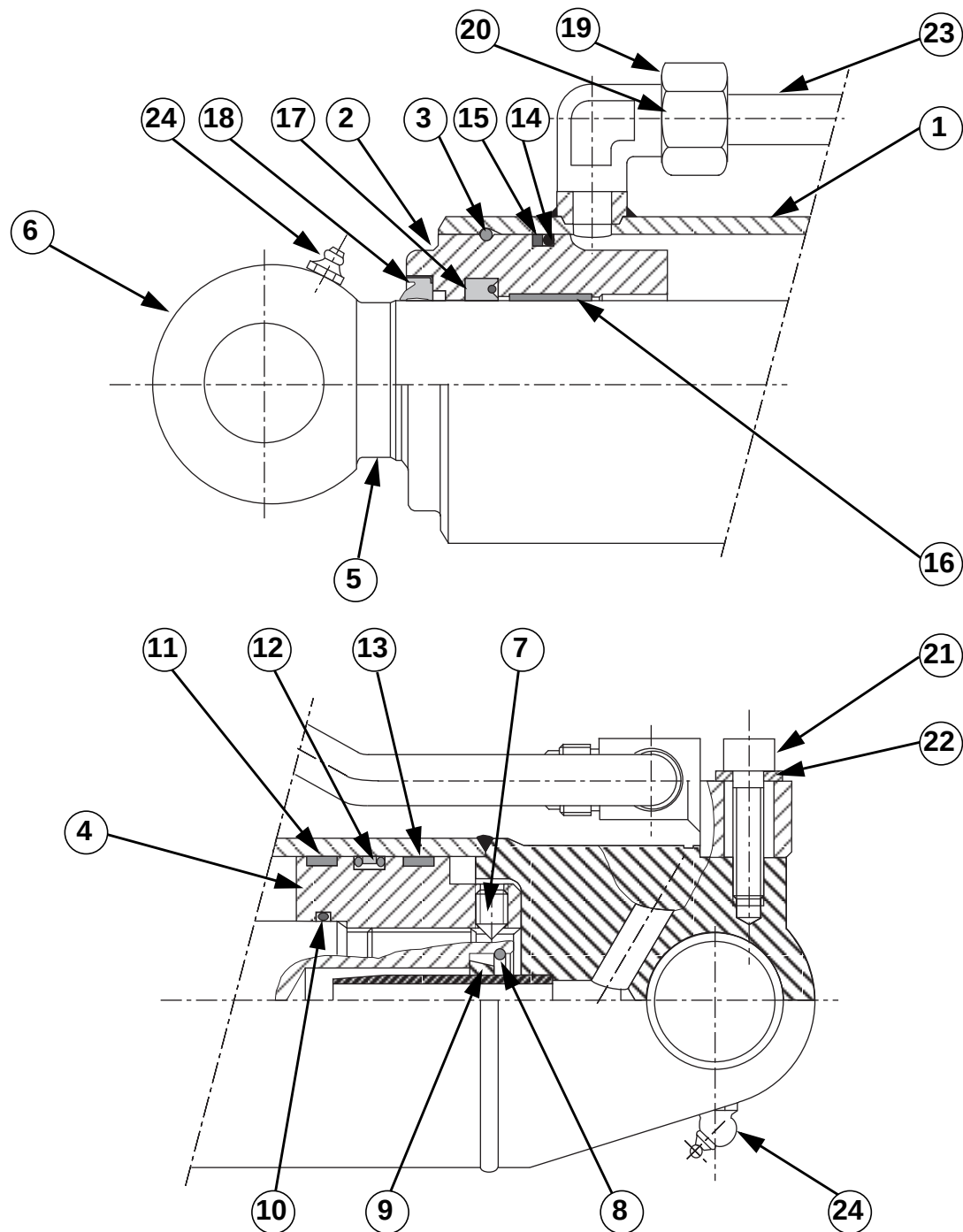


CI98K521

1. Tube	9. Dash-pot bushing	17. Wide seal
2. Gland	10. O-ring	18. Wiper
3. Ring	11. Carrier ring	19. Nut
4. Piston	12. Seal	20. Ring
5. Piston rod	13. Carrier ring	21. Bolt
6. Piston rod eye	14. O-ring	22. Washer
7. Stop screw	15. Back-up ring	23. Pipe
8. Snap ring	16. Bushing	24. Grease fitting

Assembly

1. Install the bushing (16) in the gland (2).
2. Install the wide seal (17) in the gland (2). The wide seal (17) is to be installed as shown on page 43. The wide seal (17) can be difficult to install. Use the tool shown on page 7.
3. Install a new wiper (18) in the gland (2). The wiper is to be installed as shown on page 43.
4. Install the O-ring (14) next to the back-up ring (15) in the groove on the outside of the gland (2) as shown on page 43.
5. Fasten the piston rod eye (6) in the vice.
6. Remove any marks and sharp edges on the chamber at the end of the piston rod (5).
7. Lubricate the bore of the gland (2) with clean oil.
8. Push the gland (2) onto the piston rod (5). Use a soft hammer to drive the gland (2) onto the piston rod (5).
9. Put a support below and near the end of the piston rod (5). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston (4).
10. Install the dash-pot bushing (9), a new snap ring (8) in the piston rod (5).
11. Install a new O-ring (10) in the piston (4).
12. Put the piston (4) on the end of the piston rod (5).
13. Tighten the piston (4) to the torque value on page 6 for the cylinder that is being repaired. A torque multiplier can be used to help tighten the piston (4).
14. Apply Loctite 648 to the threads of a new stop screw (7) and install the new stop screw (7) in the piston (4). Tighten the stop screw (7) to a torque between 20 and 25 Nm.
15. Install a new seal (12) in the centre groove on the outside of the piston (4).
16. Install new carrier rings (11) and (13) in each groove on the outside ends of the piston (4).
17. Lubricate the inside of the tube (1) and the piston (4) with clean oil. Use a piston ring compression tool to hold the new carrier rings in place.
18. Push the tube (1) straight onto the piston (4).
19. Start the tube (1) onto the piston rod assembly. Push the tube (1) onto the piston rod assembly until the compression tool is pushed off the piston rod assembly. Be careful not to damage the carrier rings and seal.
20. Lubricate the O-ring (14) on the gland (2) with clean oil.
21. Install the gland in the tube (1).
22. Install a new ring (3) and wind it in, by rotating the gland anti-clockwise (as viewed from the rod end of the cylinder). Fill the slot with putty or silicone rubber sealant to prevent water ingress.
23. Put the pipe (23) on the tube (1).
24. Put the washer (22) on the bolt (21).
25. Install and tighten the bolt (21) in the cylinder.
26. Install a new ring (20) and tighten the nut (19) on the fitting.



CM98K013

1. Tube	9. Dash-pot bushing	17. Wide seal
2. Gland	10. O-ring	18. Wiper
3. Ring	11. Carrier ring	19. Nut
4. Piston	12. Seal	20. Ring
5. Piston rod	13. Carrier ring	21. Bolt
6. Piston rod eye	14. O-ring	22. Washer
7. Stop screw	15. Back-up ring	23. Pipe
8. Snap ring	16. Bushing	24. Grease fitting

QUICK ATTACH CYLINDER

Special tools

- Hydraulic press or dismantling jig.

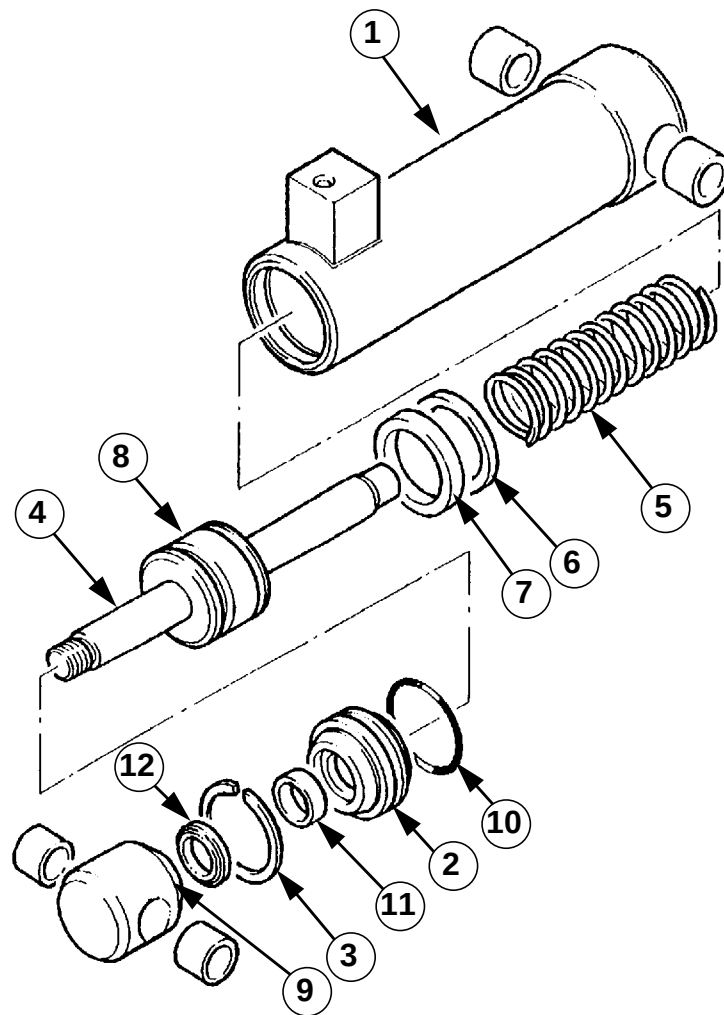
Disassembly

This is a small hydraulic cylinder that will normally be replaced if it fails, though for those few occasions where replacement is impossible, follow the procedure here to avoid injury by the large spring inside the cylinder.

1. Securely clamp the tube (1) into the mounting jig or clamp it in a vice under a hydraulic press.
2. Press the piston 15 mm into the tube (1), then push the gland (2) inside the tube (1) to allow access to the snap-ring (3).
3. Remove the snap ring (3) from the tube (1).
4. Carefully release tension on the piston until all spring compression is relieved.
5. Pull the piston rod (4) straight out of the tube (1) to prevent damage to the tube (1).
6. Remove the spring (5) from the tube (1).
7. Remove the felt ring (6) and piston seal (7) from the piston (8).
8. Clamp the piston end of the rod in a vice and unscrew the piston rod eye (9).
9. Remove the gland (2) from the piston rod (4).
10. Remove the O-ring (10), wide seal (11) and wiper (12) from the gland (2).

Inspection

1. The piston (8) is shrunk onto the piston rod (4) and so cannot be removed. In the unlikely event that the piston (8) has moved out of position it must be replaced with a new piston rod assembly.
2. Clean the piston rod assembly, gland (2) and spring (5) in cleaning solvent.
3. Discard the parts that were removed from the piston (8) and gland (2).
4. Inspect the tube bore for rust which is not critical providing it does not extend more than 82 mm from the head end of the cylinder.
5. Inspect the spring for serious corrosion.



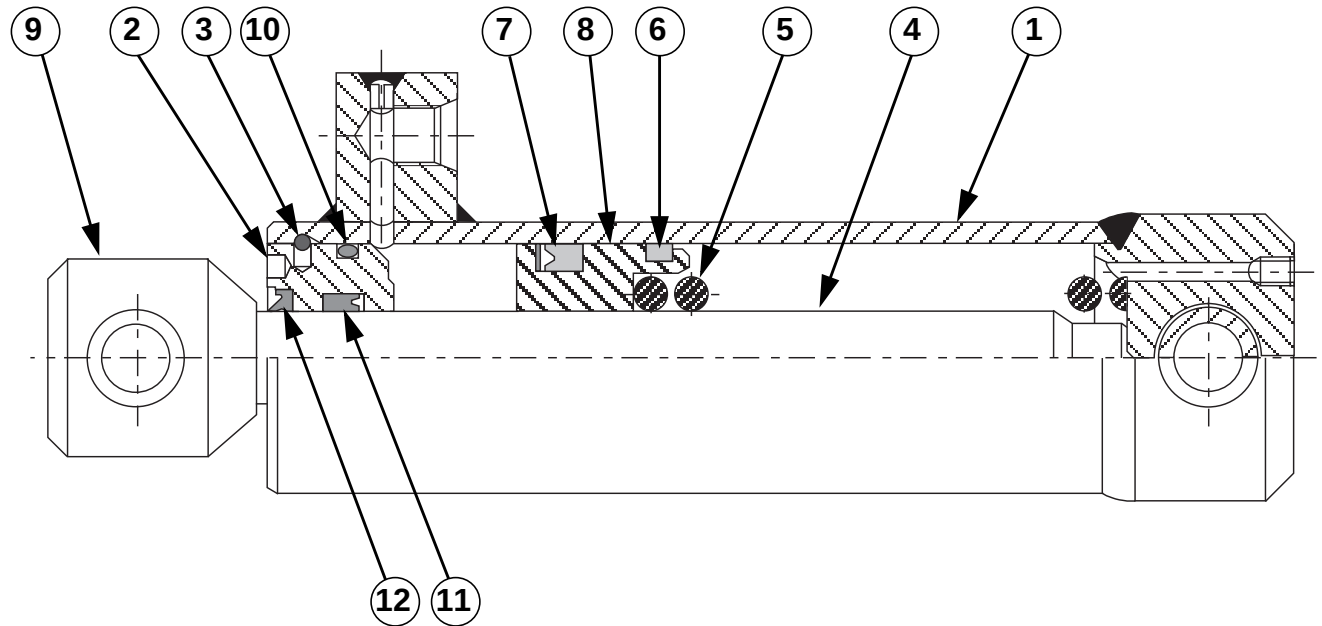
- 1. Tube
- 2. Gland
- 3. Snap ring
- 4. Piston rod
- 5. Spring
- 6. Felt ring

- 7. Piston seal
- 8. Piston
- 9. Piston rod eye
- 10. O-ring
- 11. Wide seal
- 12. Wiper

CI98K522

Assembly

1. Install a new wide seal (11) in the gland (2). The wide seal (11) is to be installed as shown on page 47. The wide seal (11) can be difficult to install. Use the tool on page 7.
2. Install a new O-ring (10) on the groove on the outside of the gland (2).
3. Install a new wiper (12) in the gland (2). The wiper (12) is to be installed as shown on page 47.
4. Install a new piston seal (7) on the piston (8). The piston seal (7) is to be installed as shown on page 47.
5. Install a new felt ring (6) on the piston (8) with the lip towards the spring (5).
6. Lightly oil the gland (2) and slide it onto the piston rod (4).
7. Apply Loctite 648 to the threads and refit the piston rod eye (9) to the piston rod (4).
8. Mount the tube (1) in the jig or vice on the press.
9. Install the spring (5) in the tube (1).
10. Press the piston rod back into the tube, being careful to ensure the seals are not damaged as they enter the cylinder barrel.
11. Press the piston rod further in, until the gland (2) can be pushed in past the snap ring groove.
12. Install the snap ring (3) in the tube (1).
13. Carefully release the compression of the spring until the gland (2) is tight against the snap ring (3). Then remove the cylinder assembly from the jig or vice.



CM98K014

1. Tube	7. Piston seal
2. Gland	8. Piston
3. Snap ring	9. Piston rod eye
4. Piston rod	10. O-ring
5. Spring	11. Wide seal
6. Felt ring	12. Wiper

MULTI-PURPOSE LOADER BUCKET CLAMPING CYLINDER

Disassembly

Clean the outside of the cylinder.

1. Fasten the tube (1) in a vice or other holding equipment. Be careful to prevent damage to the tube (1).
2. Use the gland wrench OEM6206 shown on page 7 to loosen and remove the cap (2) from the tube (1).
3. Pull the piston rod (5) straight out of the tube (1) to prevent damage to the tube (1).
4. Fasten the piston rod eye (4) in a vice and put a support below the piston rod (5) near the piston (3). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston rod (5).
5. Remove the clip (6) securing the piston (3) to the piston rod (5).
6. Loosen and remove the piston (3) from the piston rod (5). Use a torque multiplier shown on page 7 for piston that have a high torque value.
7. Remove the gland (7) from the piston rod (5).
8. Remove the cap (2) from the piston rod (5).
9. Remove the O-rings (8) and (9), back-up ring (10), and wide seal (11) from the gland (7).
10. Remove the seal (13) from the piston (3).
11. Remove the wiper (12) from the cap (2).

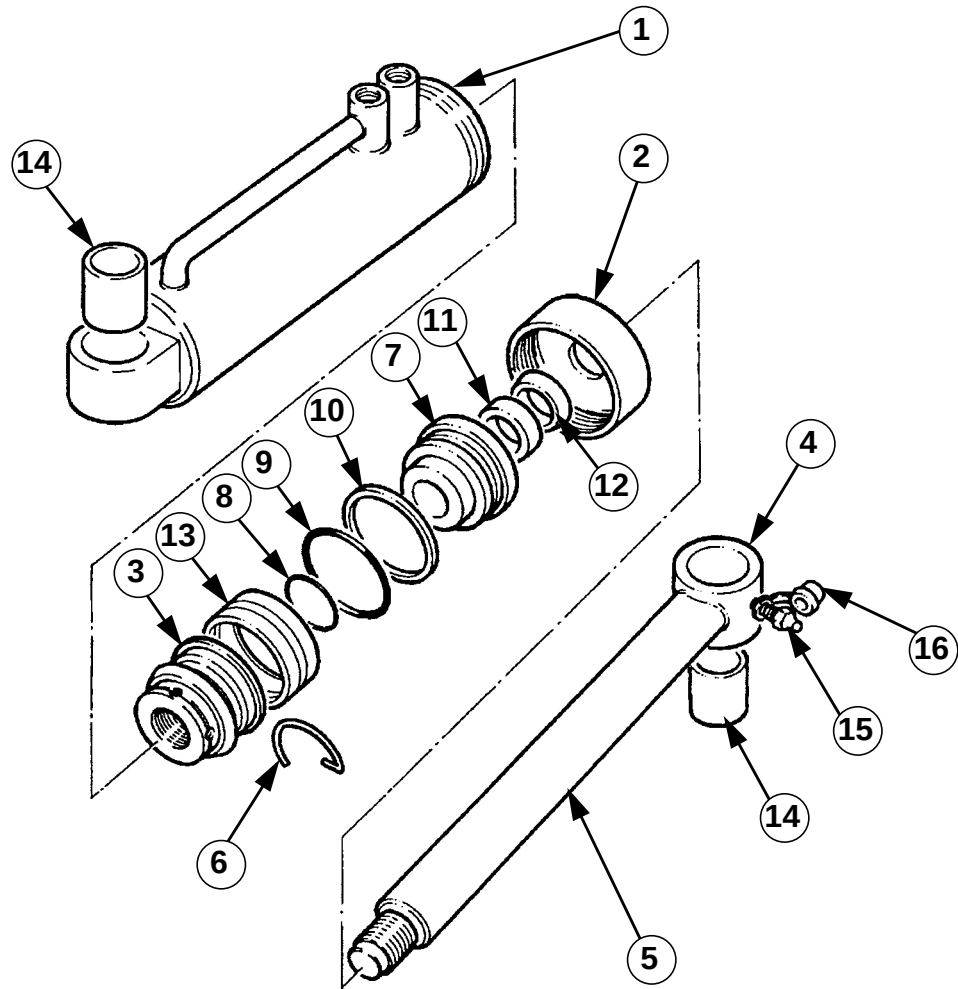
Inspection

1. Clean the piston (3), gland (7), piston rod (5), tube (1) and cap (2) in cleaning solvent.
2. Discard the parts were removed from the piston (3) and the gland (7).
3. Illuminate the inside of the tube (1). Inspect the inside of the tube (1) for deep grooves and other damage. If there is damage to the tube (1), a new tube (1) must be used.
4. Check to be sure that the piston rod (5) is straight. If the piston rod (5) is not straight, install a new piston rod (5).
5. Remove small scratches on the inside of the tube (1) with emery cloth of medium grit. Use the emery cloth with a rotary motion.
6. Inspect the bushings (14) in the piston rod eye (4) and closed end of the tube (1). Replace as required.
7. Inspect the gland (7) for rust and clean and remove rust as required.

8. Inspect the gland end of the tube (1) for sharp edges that will cut the gland O-ring (9) and remove as required.
9. Inspect the piston (3) for damage and wear. If the piston (3) is damaged or worn, a new piston (3) must be used.

Assembly

1. Install a new wiper (12) in the cap (2). Orientate the wiper (12) with the lip pointing towards the cap (2).
2. Install the wide seal (11) in the gland (7). The side of the wide seal (11) with the lip must be toward the small end of the gland (7). The wide seal (11) can be difficult to install. Use the tool on page 7.
3. Install the O-ring (9) next to the back-up ring (10) in the groove on the outside of the gland (7).
4. Install a new O-ring (8) in the gland (7).
5. Fasten the piston rod eye (4) in the vice.
6. Remove any marks and sharp edges on the chamfer at the end of the piston rod (5).
7. Install the cap (2) on the piston rod (5).
8. Lubricate the bore of the gland (7) with clean oil.
9. Push the gland (7) onto the piston rod (5). If necessary, use a soft hammer to drive the gland (7) onto the piston rod (5).
10. Put a support below and near the end of the piston rod (5). Use a shop cloth between the support and the piston rod (5) to prevent damage to the piston (3).
11. Put the piston (3) on the end of the piston rod (5).
12. Tighten the piston (3) for the cylinder that is being repaired. A torque multiplier can be used to help tighten the piston (3).
13. Install a new seal (13) in the piston (3).
14. Install a new clip (16) securing the piston (3) to the piston rod (5).
15. Lubricate the inside of the tube (1) and the piston (3) with the clean oil.
16. Push the tube (1) straight onto the piston (3).
17. Lubricate the O-ring (9) on the gland (7) with clean oil.
18. Install the gland (7) in the tube (1).
19. Apply Loctite 242 to the threads of the tube (1) and the cap (2).
20. Tighten the cap (2).



CS98K526

- 1. Tube
- 2. Cap
- 3. Piston
- 4. Piston rod eye
- 5. Piston rod
- 6. Clip
- 7. Gland
- 8. O-ring

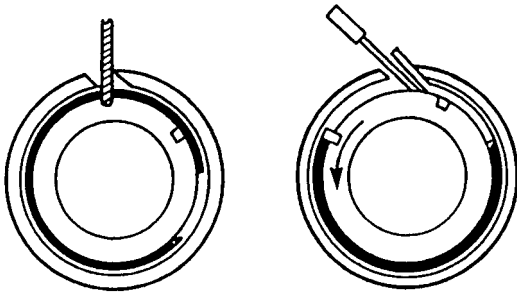
- 9. O-ring
- 10. Back-up ring
- 11. Wide seal
- 12. Wiper
- 13. Seal
- 14. Bushing
- 15. Grease nipple
- 16. Cap

RING LUG FAILURE

Extraction

Failure of the ring lug will prevent the gland from being removed from the cylinder. However the old ring can be removed by using the following process :

1. Through the insertion hole, centre punch the ring as near to the centre of the ring as possible.
- 2.



CS98J556

3. Cut off a section of ring or piano wire of diameter (A), to the length (C) and insert it into the blind hole. This will now take the place of the lug and drive the broken ring out in the normal way.
4. After complete withdrawal of the ring pull the piston rod sharply out until it contacts the gland, this will normally remove it.

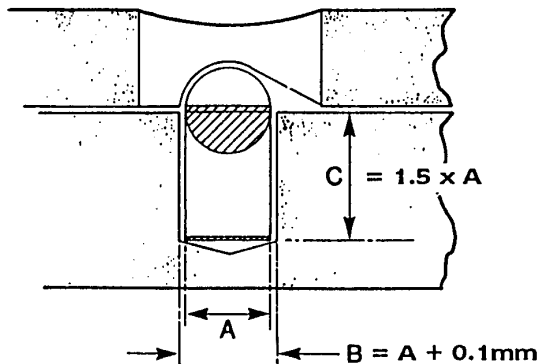
NOTE : In the event of failure to remove the gland in this way, due to burrs around the ring grooves, it is suggested that either a hydraulic press or a hand operated pump be used to remove the gland.

WARNING : If a hydraulic pump is used to dismantle the gland from the cylinder, extreme care must be taken to purge all air from the cylinder before pressurisation.



COMPRESSED AIR INSIDE THE CYLINDER AT THIS STAGE IS EXTREMELY DANGEROUS.

Robust restraints should be attached to both the piston rod-eye and the cylinder mounting, as a further precaution.



CS98J557

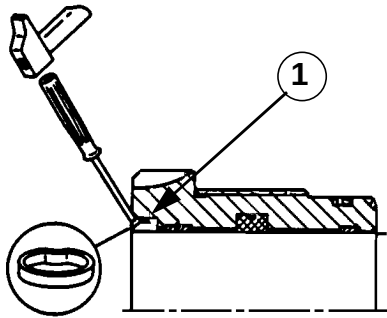
Use a drill of the size (B), and drill through the ring and into the gland to the depth (C).



WARNING : The drilled hole must not be drilled deeper than shown, or the drill may break through the gland, in which case the gland must be scrapped.

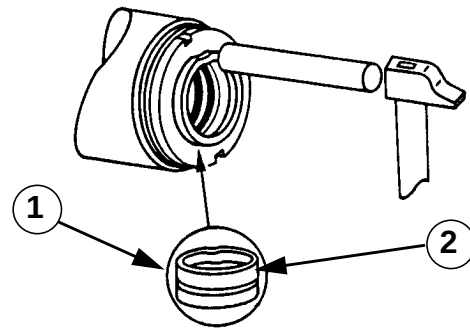
REMOVING AND INSTALLING THE WIPER

1.



PDH0314
Use a hammer and drift to force the wiper seal (1) and remove it.

2.



PDH0315
Fit a new wiper ring (1) using the old wiper ring (2) to assist, as shown in the drawing.

Section

8007

BACKHOE CONTROL VALVE

8007

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SEPARATING THE BACKHOE CONTROL VALVE BLOCK ASSEMBLY

1. Thoroughly clean the outside of the backhoe control valve block assembly.
2. Remove the nuts (1) and the washers (2) from the studs (3).
3. Remove the inlet module (4) from the 4 spool valve (12).
4. Remove the O-rings (5) to (11) from the inlet module (4) and discard them.

NOTE : The O-rings may remain on the 4 spool valve (12).

5. Remove the nuts (13) and the washers (14) from the studs (15).

6. Separate the 4 spool valve (12) from the 3 spool valve (16).

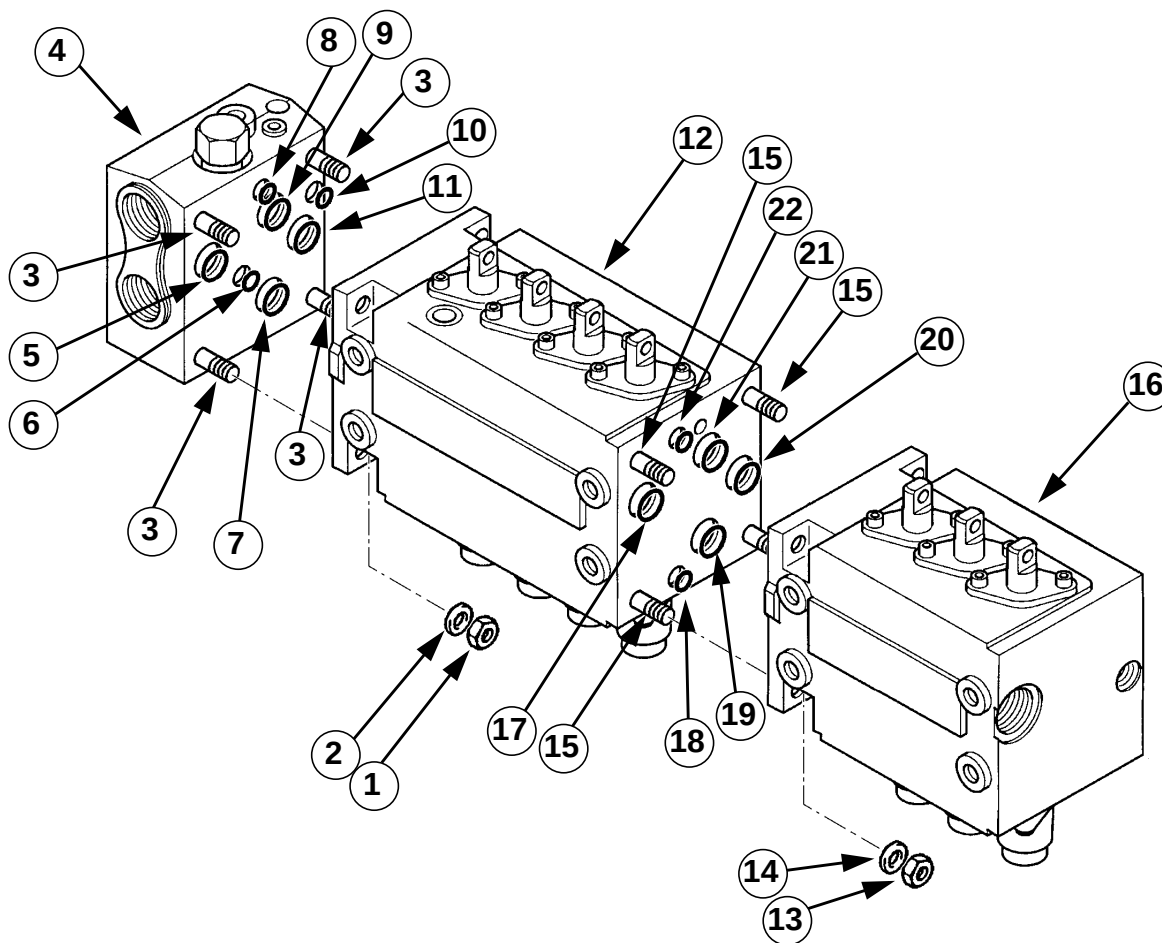
7. Remove the O-rings (17) to (22) from the 4 spool valve and discard them.

NOTE : The O-rings may remain on the 3 spool valve.

NOTE : Assembly is in the reverse order from that of assembly.

NOTE : When assembling, systematically replace all the O-rings by new ones.

NOTE : When assembling, tighten the nuts (1) and (13) to a torque of 23.5 Nm.

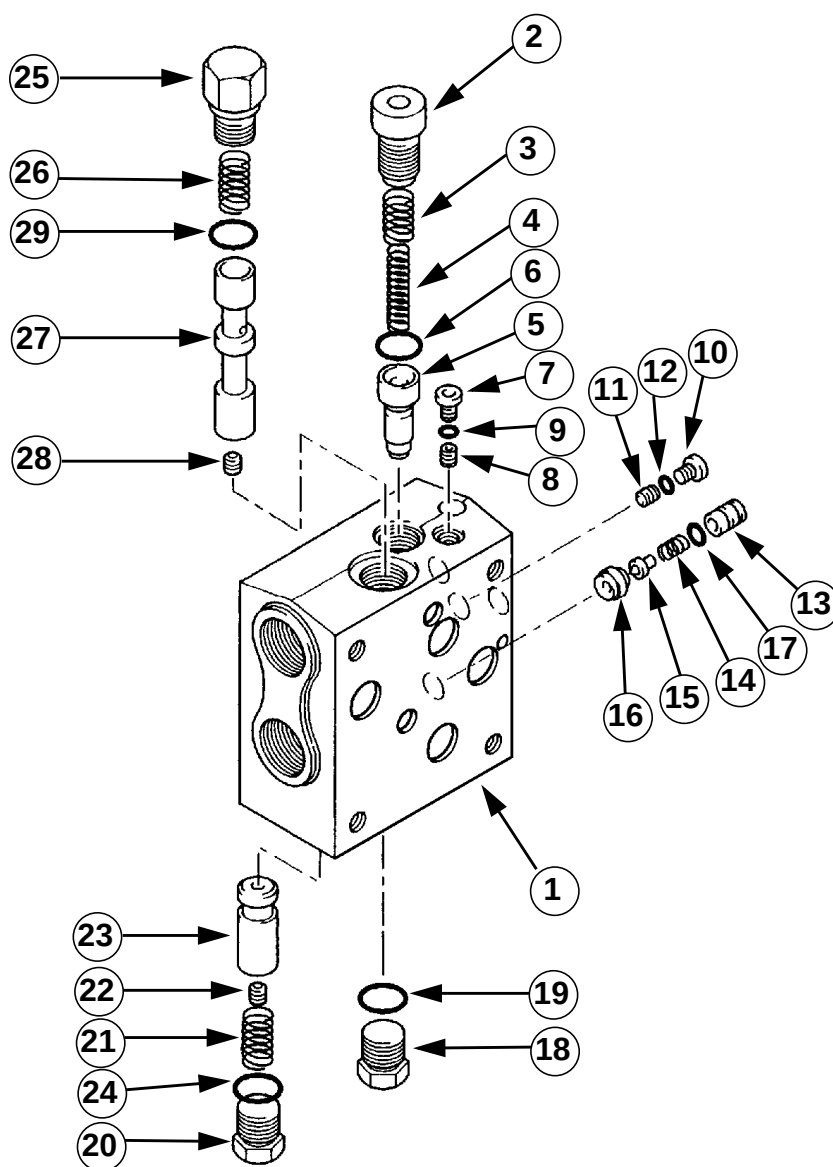


C198J502

INLET MODULE (Models 750,760 and 860)

Disassembly

1. Remove the back pressure valve plug (2), the springs (3) and (4) and the back pressure valve (5) from the inlet module (1).
2. Remove and discard the O-ring seal (6) from the back pressure valve plug (2).
3. Remove the plug (7) and the restrictor (8) from the inlet module (1).
4. Remove and discard the O-ring seal (9) from the plug (7).
5. Remove the plug (10) and the restrictor (11) from the inlet module (1).
6. Remove and discard the O-ring seal (12) from the plug (10).
7. Remove the pilot pressure relief valve adjuster (13), the spring (14), the poppet (15) and the seat (16) from the inlet module (1).
8. Remove and discard the O-ring seal (17) from the pilot pressure relief valve adjuster (13).
9. Remove the plug (18) from the inlet module (1).
10. Remove and discard the O-ring seal (19) from the plug (18).
11. Remove the main relief valve plug (20), the spring (21), the restrictor (22) and the poppet (23) from the inlet module (1).
12. Remove and discard the O-ring seal (24) from the main relief valve plug (20).
13. Remove the inlet compensator spool valve plug (25), the spring (26), the spool (27) and the restrictor (28) from the inlet module (1).
14. Remove and discard the O-ring seal (29) from the inlet compensator spool valve plug (25).



CI98J503

1. Inlet module	10. Plug	20. Main relief valve plug
2. Back pressure valve plug	11. Restrictor	21. Spring
3. Spring	12. O-ring seal	22. Restrictor
4. Spring	13. Pilot pressure relief valve adjuster	23. Poppet
5. Back pressure valve	14. Spring	24. O-ring seal
6. O-ring seal	15. Poppet	25. Inlet compensator spool valve plug
7. Plug	16. Seat	26. Spring
8. Restrictor	17. O-ring seal	27. Spool
9. O-ring seal	18. Plug	28. Restrictor
	19. O-ring seal	29. O-ring seal

Inspection

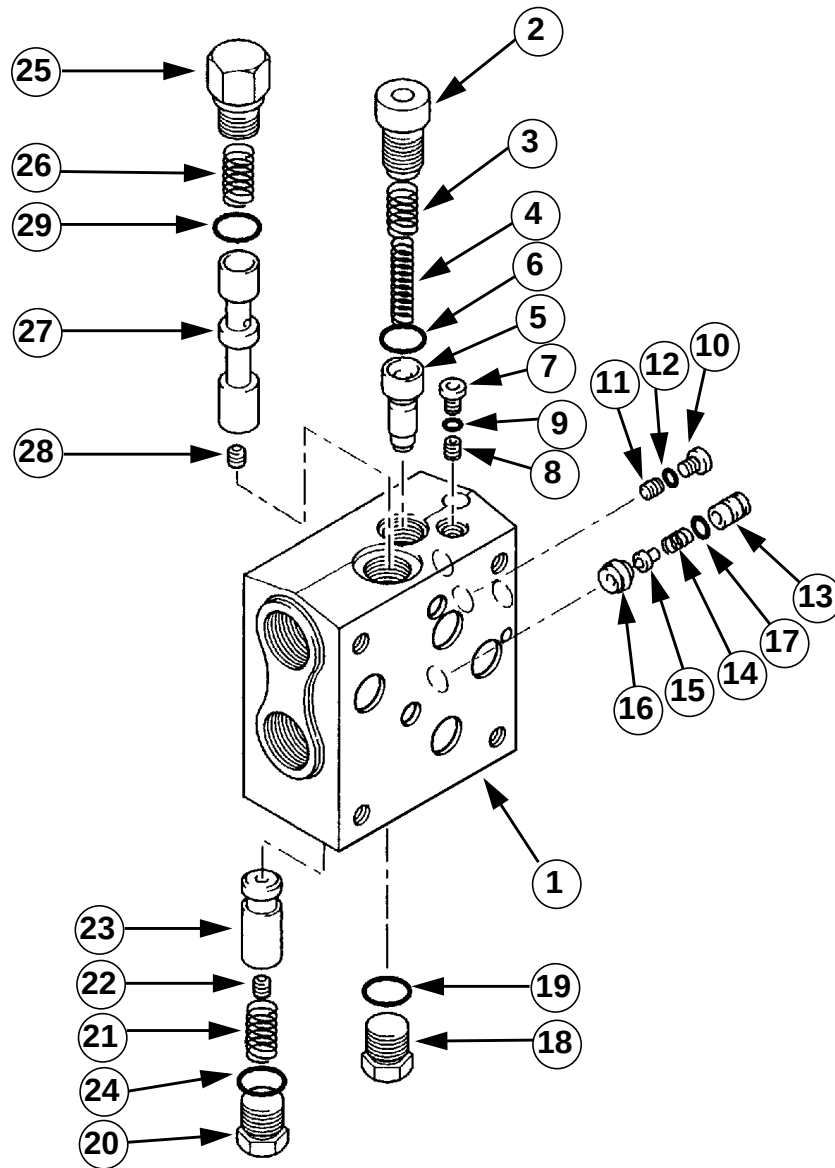
NOTE : *If any of the components fail the following instructions, they must be replaced.*

1. Inspect the inlet module (1) for damage to the bores and valve seats and particularly to the threads.
2. Inspect the plugs (2), (7), (10), (18), (20) and (25) for wear damage, particularly to the threads.
3. inspect the back pressure valve (5) and the spool (27) for wear or damage.
4. Inspect the poppets (15) and (23) for wear or damage.
5. Inspect the adjuster (13) and the seat (16) for wear or damage.
6. Inspect the springs (3), (4), (14), (21) and (26) for damage.
7. Inspect the restrictor (8), (11), (22) and (28) for wear or damage. Check that the restrictor are not blocked or working loose.

Assembly

Assemble the inlet module in the reverse order of the disassembly but note the following :

1. Thoroughly clean all components and the work areas before starting work.
2. Inspect the inlet module.
3. Before assembling, lubricate each component with the specified hydraulic oil.
4. Install a new O-ring seal (29) to the inlet compensator spool valve plug (25).
5. Torque tighten the inlet compensator spool valve plug to 75 to 105 Nm.
6. Install a new O-ring seal (24) to the main relief plug (20).
7. Torque tighten the main relief valve plug (20) to 75 to 105 Nm.
8. Install a new O-ring seal (19) to the plug (18).
9. Torque tighten the plug (12) to 75 to 105 Nm.
10. Install a new O-ring (17) to the pilot pressure relief valve adjuster (13).
11. Torque tighten the seat (16) to 17 to 23 Nm.
12. Install a new O-ring seal (12) to the plug (10).
13. Torque tighten the restrictor (11) to 3 to 5 Nm.
14. Torque tighten the plug (10) to 8 to 12 Nm.
15. Install a new O-ring seal (9) to the plug (7).
16. Torque tighten the restrictor (8) to 3 to 5 Nm.
17. Torque tighten the plug (7) to 8 to 12 Nm.
18. Install a new O-ring seal (6) to the back pressure valve plug (2).
19. Torque tighten the back pressure valve plug (2) to 75 to 105 Nm.



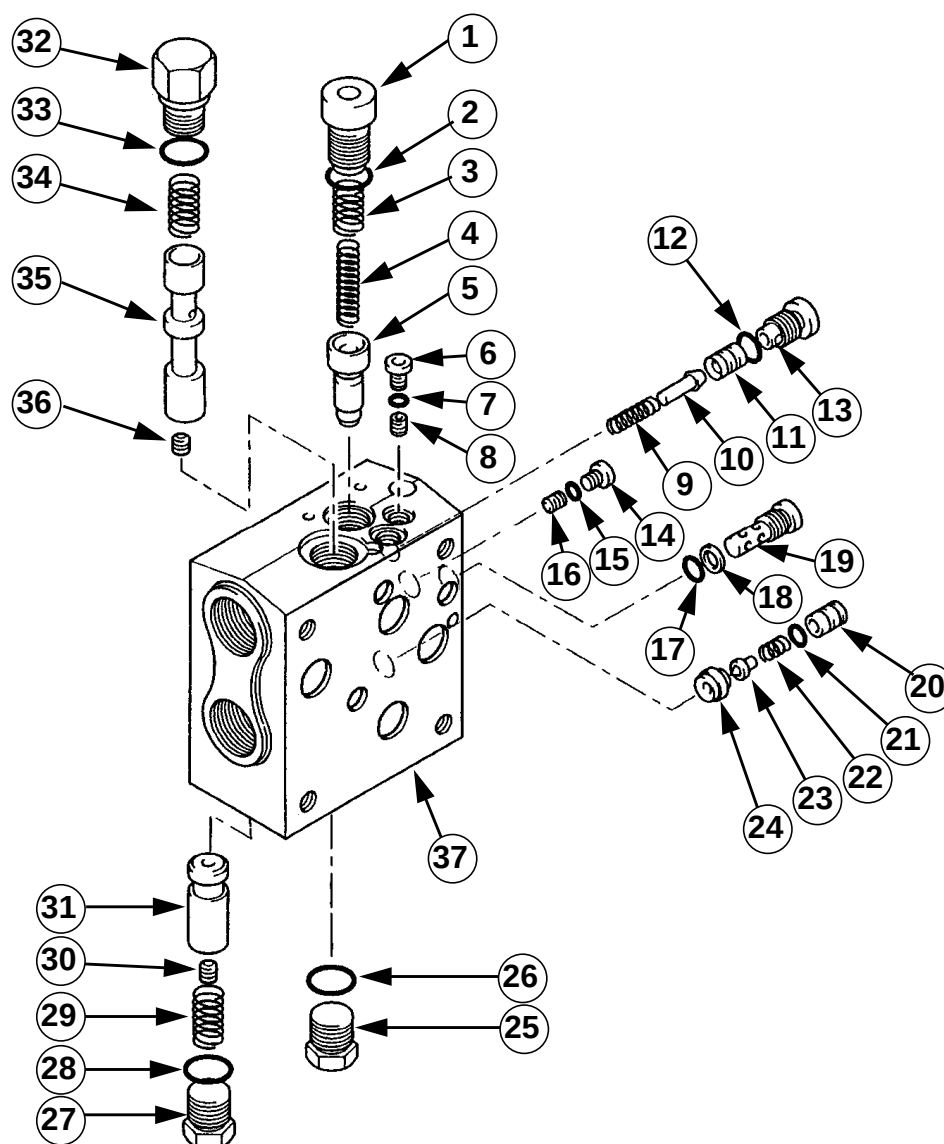
CI98J503

1. Inlet module	10. Plug	20. Main relief valve plug
2. Back pressure valve plug	11. Restrictor	21. Spring
3. Spring	12. O-ring seal	22. Restrictor
4. Spring	13. Pilot pressure relief valve adjuster	23. Poppet
5. Back pressure valve	14. Spring	24. O-ring seal
6. O-ring seal	15. Poppet	25. Inlet compensator spool valve plug
7. Plug	16. Seat	26. Spring
8. Restrictor	17. O-ring seal	27. Spool
9. O-ring seal	18. Plug	28. Restrictor
	19. O-ring seal	29. O-ring seal

INLET MODULE (Models 960 and 965)

Disassembly

1. Remove the back pressure valve plug (1), the springs (3) and (4) and the back pressure valve (5) from the inlet module (37).
2. Remove and discard the O-ring seal (2) from the back pressure valve plug (1).
3. Remove the plug (6) and the restrictor (8) from the inlet module (37).
4. Remove and discard the O-ring seal (7) from the plug (6).
5. Remove the pilot pressure valve poppet (13), the spool (11), the poppet (10) and the spring (9) from the inlet module (37).
6. Remove and discard the O-ring seal (12) from the pilot pressure valve poppet (13).
7. Remove the plug (14) and the restrictor (16) from the inlet module (37).
8. Remove and discard the O-ring seal (15) from the plug (14).
9. Remove the accumulator check valve (19) from the inlet module (37).
10. Remove the O-ring seal (17) and the back-up ring (18) from the accumulator check valve (19). Discard the O-ring seal (17).
11. Remove the pilot pressure relief valve adjuster (20), the spring (22), the poppet (23) and the seat (24) from the inlet module (37).
12. Remove and discard the O-ring seal (21) from the pilot pressure relief valve adjuster (20).
13. Remove the plug (25) from the inlet module (37).
14. Remove and discard the O-ring seal (26) from the plug (30).
15. Remove the main relief valve plug (27), the spring (29), the restrictor (30) and the poppet (31) from the inlet module (37).
16. Remove and discard the O-ring seal (28) from the main relief valve plug (27).
17. Remove the inlet compensator spool valve plug (32), the spring (34), the spool (35) and the restrictor (36) from the inlet module (37).
18. Remove and discard the O-ring seal (33) from the inlet compensator spool valve plug (32).



CI98J504

1. Back pressure valve plug	14. Plug	26. O-ring seal
2. O-ring seal	15. O-ring seal	27. Main relief valve plug
3. Spring	16. Restrictor	28. O-ring seal
4. Spring	17. O-ring seal	29. Spring
5. Back pressure valve	18. Back-up ring	30. Restrictor
6. Plug	19. Accumulator check valve	31. Poppet
7. O-ring seal	20. Pilot pressure relief valve adjuster	32. Inlet compensator spool valve plug
8. Restrictor	21. O-ring seal	33. O-ring seal
9. Spring	22. spring	34. Spring
10. Poppet	23. Poppet	35. Spool
11. Spool	24. Seat	36. Restrictor
12. O-ring seal	25. Plug	37. Inlet module
13. Pilot pressure valve poppet		

Inspection

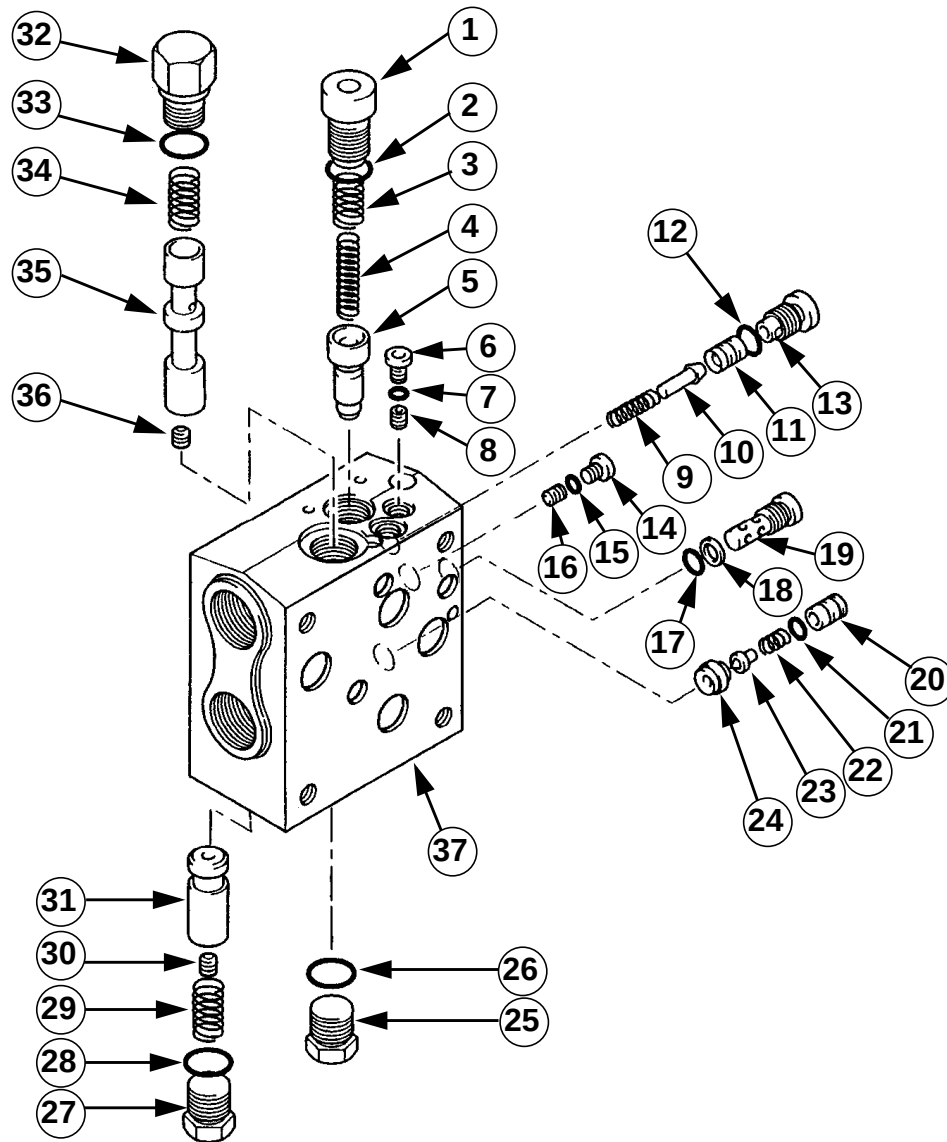
NOTE : *If any of components fail the following instructions, they must be replaced.*

1. Inspect the inlet module (37) for damage to the bores and valve seats and particularly to the threads.
2. Inspect the plug (1), (6), (14), (25), (27) and (32) for wear damage, particularly to the threads.
3. Inspect the back pressure valve (5) and the spools (11) and (35) for wear or damage.
4. Inspect the poppets (10), (13), (23) and (31) for wear or damage.

Assembly

Assemble the inlet module in the reverse order of the disassembly but note the following :

1. Thoroughly clean all components and the work areas before starting work.
2. Inspect the inlet module.
3. Before assembling, lubricate each component with the specified hydraulic oil.
4. Install a new O-ring seal (33) to the inlet compensator spool valve plug (32).
5. Torque tighten the inlet compensator spool valve plug (32) to 75 to 105 Nm.
6. Install a new O-ring seal (28) to the main relief valve plug (27).
7. Torque tighten the main relief valve plug (27) to 75 to 105 Nm.
8. Install a new O-ring seal (26) to the plug (25).
9. Torque tighten the plug (25) to 75 to 105 Nm.
10. Install a new O-ring (21) to the pilot pressure relief valve adjuster (20).
11. Torque tighten the seat (24) to 17 to 23 Nm.
12. Install a new O-ring seal (17) to the accumulator check valve (19).
13. Torque tighten the accumulator check valve (19) to 22 to 28 Nm.
14. Install a new O-ring seal (15) to the plug (14).
15. Torque tighten the restrictor to 3 to 5 Nm.
16. Torque tighten the plug (14) to 8 to 12 Nm.
17. Install a new O-ring seal (12) to the pilot pressure valve poppet (13).
18. Torque tighten the pilot pressure valve poppet (13) to 22 to 28 Nm.
19. Install a new O-ring seal (7) to the plug (9).
20. Torque tighten the restrictor to 3 to 5 Nm.
21. Torque tighten the plug (6) to 8 to 12 Nm.
22. Install a new O-ring seal (2) to the back pressure valve plug (1).
23. Torque tighten the back pressure valve plug (1) to 75 to 105 Nm.
5. Inspect the check valve (19), the adjuster (20) and the seat (24) for wear or damage.
6. Inspect the springs (3), (4), (9), (22), (29) and (34) for damage.
7. Inspect the restrictors (8), (16), (30) and (36) for wear or damage. Check that the restrictors are not blocked or working loose.



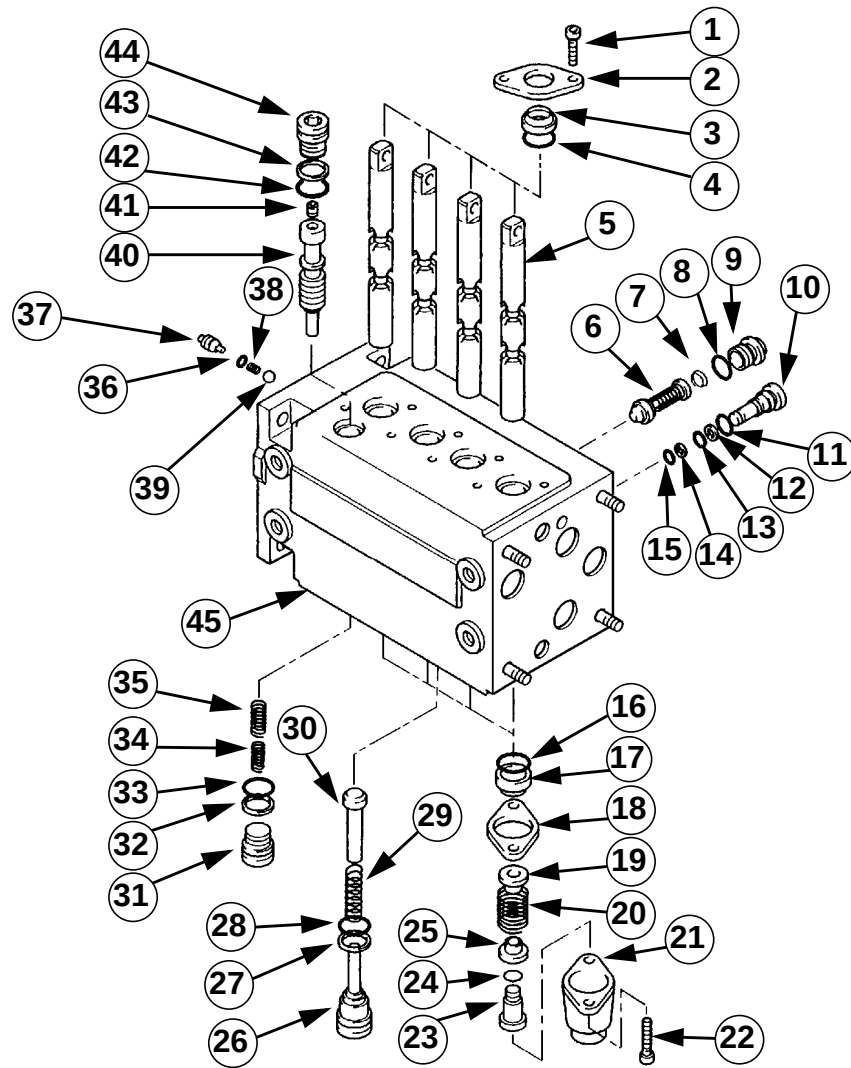
CI98J504

1. Back pressure valve plug	14. Plug	26. O-ring seal
2. O-ring seal	15. O-ring seal	27. Main relief valve plug
3. Spring	16. Restrictor	28. O-ring seal
4. Spring	17. O-ring seal	29. Spring
5. Back pressure valve	18. Back-up ring	30. Restrictor
6. Plug	19. Accumulator check valve	31. Poppet
7. O-ring seal	20. Pilot pressure relief valve adjuster	32. Inlet compensator spool valve plug
8. Restrictor	21. O-ring seal	33. O-ring seal
9. Spring	22. Spring	34. Spring
10. Poppet	23. poppet	35. Spool
11. Spool	24. Seat	36. Restrictor
12. O-ring seal	25. Plug	37. Inlet module
13. Pilot pressure valve poppet		

FOUR SPOOL VALVE BLOCK (Models 750, 760, 860 and 960)

Disassembly

1. Thoroughly clean the four spool valve block before starting work.
2. Remove the capacitors (1), the plate (2), the wiper (3) and the O-ring seal (4) from the body (45). Discard the O-ring (4).
3. Remove the capscrews (22) and the housing (21) from the body (45).
4. Carefully remove the screw (23), the seat (25), the spring (20), the seat (19), the plate (18), the wiper (17) and the O-ring seal (16) from the body (45). Discard the O-ring seal (16).
5. Remove and discard the O-ring seal (24) from the screw (23).
6. Carefully remove the spool (5) from the body (45).
7. Repeat steps 2 to 6 for the remaining spools.
8. Remove the shock valve plug (9), the spring (7) and the valve (6) from the body (45).
9. Remove and discard the O-ring seal (8) from the shock valve plug (9).
10. Repeat steps 8 and 9 for the remaining shock valves.
11. Remove the load sensing valve (10) from the body (45).
12. Remove the O-ring seals (11), (13) and (15) and the back-up rings (12) and (14) from the load sensing valve (10). Discard the O-ring seals (11), (13) and (15).
13. Repeat steps 11 and 12 for the remaining load sensing valves.
14. Remove the check valve plug (26), the spring (29) and the poppet (30) from the body (45).
15. Remove the O-ring seal (28) and the back-up ring (27) from the check valve plug (26). Discard the O-ring seal (28).
16. Repeat steps 14 and 15 for the remaining check valves.
17. Remove the check valve plug (37), the spring (38) and the ball (39) from the body (45).
18. Remove and discard the O-ring seal (36) from the check valve plug (37).
19. Repeat steps 18 and 19 for the remaining check valve.
20. Remove the compensator plug (31) and the springs (34) and (35) from the body (45).
21. Remove the O-ring seal (33) and the back-up ring (32) from the compensator plug (31). discard the O-ring seal (33).
22. Remove the compensator plug (44), the restrictor (41) and the spool (40) from the body (45).
23. Remove the O-ring seal (42) and the back-up ring (43) from the compensator plug (44). Discard the O-ring seal (42).



C198J505

1. Capacitors	16. O-ring seal	31. Compensator plug
2. Plate	17. Wiper	32. Back-up ring
3. Wiper	18. Plate	33. O-ring seal
4. O-ring seal	19. Seat	34. Spring
5. Spool	20. Spring	35. Spring
6. Valve	21. Housing	36. O-ring seal
7. Spring	22. Cap screws	37. Check valve plug
8. O-ring seal	23. Screw	38. Spring
9. Shock valve plug	24. O-ring seal	39. Ball
10. Load sensing valve	25. Seat	40. Spool
11. O-ring seal	26. Check valve plug	41. Restrictor
12. Back up ring	27. Back up ring	42. O-ring seal
13. O-ring seal	28. O-ring seal	43. Back-up ring
14. Back up ring	29. Spring	44. Compensator plug
15. O-ring seal	30. Poppet	45. Body.

Inspection

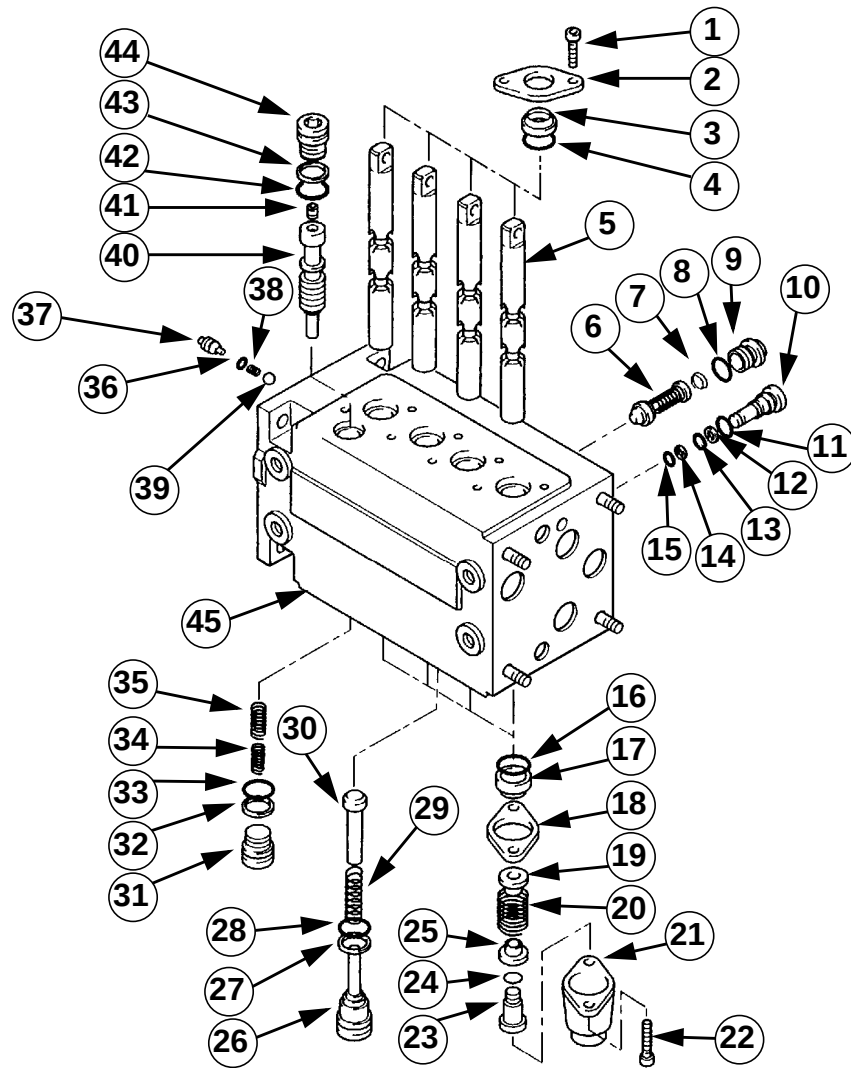
NOTE : *If any of the components fail the following instructions, they must be replaced.*

1. Inspect the body (45) for damage to the bores and valve seats and particularly to the treads.
2. Inspect the plug (9), (26), (31), (37) and (44) for wear or damage, particularly to the threads.
3. Inspect the springs (7), (20), (29), (34), (35) and (38) for damage.
4. Inspect the valves (6) and (10), the spools (5) and (40), the screw (23), the poppet (30), the seats (11) and (25) and the ball (39) for wear or damage.
5. Inspect the restrictor (41) for wear or damage. Check that the restrictor is not blocked.
6. Inspect the plates (2) and (18), the housings (21) and the wipers (3) and (17) for damage.

Assembly

Assemble the four spool valve block in the reverse order of the disassembly, but note the following :

1. Thoroughly clean all components and the work area before starting work.
2. Inspect the four valve block.
3. Before assembling, lubricate each component with the specified hydraulic oil.
4. Install a new O-ring seal (42) on the compensator plug (44).
5. Torque tighten the compensator plug (44) to 55 to 65 Nm.
6. Install a new O-ring seal (33) on the compensator plug (31).
7. Torque tighten the compensator plug (31) to 55 to 65 Nm.
8. Install a new O-ring seal (36) to the check valve plug (37).
9. Install a new O-ring seal (28) on the check valve plug (26).
10. Torque tighten the check valve plug (26) to 55 to 65 Nm.
11. Install new O-ring seals (11), (13) and (15) on the load sensing valve (10).
12. Torque tighten the load sensing valve (10) to 22 to 28 Nm.
13. Install new O-ring seal (8) to the shock valve plug (9).
14. Torque tighten the shock valve plug (9) to 35 to 45 Nm.
15. Install a new O-ring seal (16) into the body (45) and a new O-ring seal (24) to the screw (23).
16. Torque tighten the capscrews (22) to 7 to 9 Nm.
17. Install a new O-ring seal (4) into the body (45).
18. Torque tighten the capscrews (1) to 7 to 9 Nm.



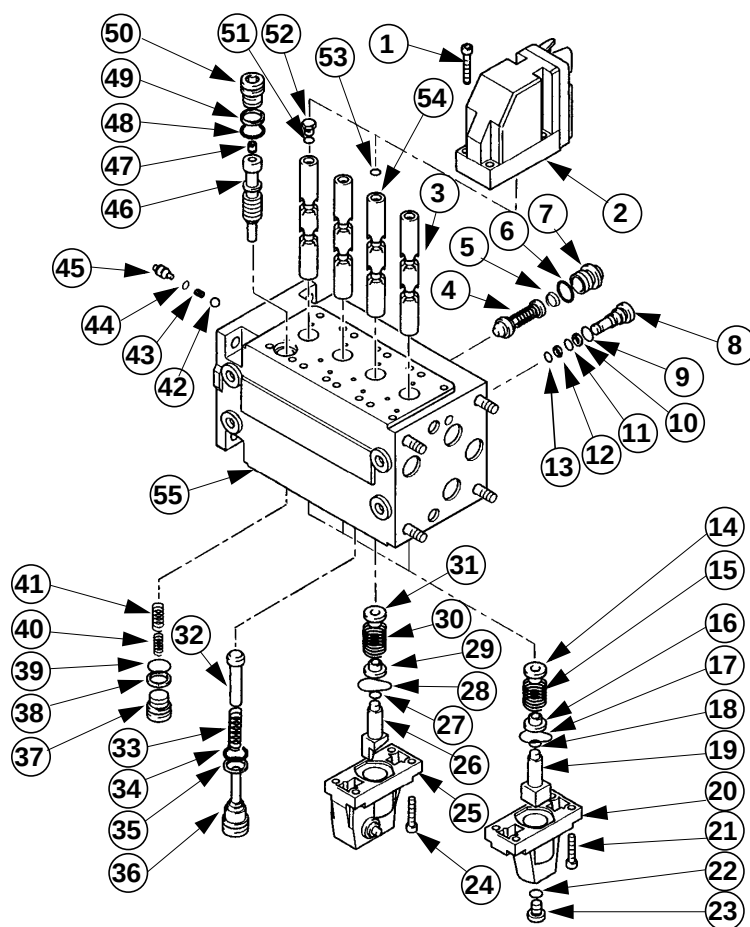
C198J505

1. Capacitors	16. O-ring seal	31. Compensator plug
2. Plate	17. Wiper	32. Back-up ring
3. Wiper	18. Plate	33. O-ring seal
4. O-ring seal	19. Seat	34. Spring
5. Spool	20. Spring	35. Spring
6. Valve	21. Housing	36. O-ring seal
7. Spring	22. Capscrews	37. Check valve plug
8. O-ring seal	23. Screw	38. Spring
9. Shock valve plug	24. O-ring seal	39. Ball
10. Load sensing valve	25. Seat	40. Spool
11. O-ring seal	26. Check valve plug	41. Restrictor
12. Back-up ring	27. Back-up ring	42. O-ring seal
13. O-ring seal	28. O-ring seal	43. Back-up ring
14. Back-up ring	29. Spring	44. Compensator plug
15. O-ring seal	30. Poppet	45. Body

FOUR SPOOL VALVE BLOCK (Model 965)

Disassembly

1. Thoroughly clean the four spool valve block before starting work.
2. Remove capscrews (1), the module (2) and the seals (53) from the body (55). Discard the seals (53).
3. Remove the plug (52) from the spool (3) and (54).
4. Remove and discard the O-ring seal (51) from the plug (52).
5. Remove the capscrews (24) and the housing (25) from the body (55).
6. Remove the screw (26), the seat (29), the spring (30) and the seat (31) from the body (55).
7. Remove and discard the O-ring seal (27) from the screw (26).
8. Remove and discard the O-ring seal (28) from the body (55).
9. Carefully remove the spool (54) from the body (55).
10. Remove the plug (23) from the housing (20).
11. Remove and discard the O-ring seal (22) from the plug (23).
12. Remove the capscrews (21) and the housing (20) from the body (55).
13. Remove the screw (19), the seat (16), the spring (15) and the seat (14) from the body (55).
14. Remove and discard the O-ring seal (18) from the screw (19).
15. Remove and discard the O-ring seal (17) from the body (55).
16. Carefully remove the spool (3) from the body (55).
17. Repeat steps 2 to 4 and 10 to 16 for the remaining spools.
18. Remove the shock valve plug (7) the spring (5) and the valve (4) from the body (55).
19. Remove and discard the O-ring seal (6) from the shock valve plug (7).
20. Repeat steps 18 and 19 for the remaining shock valves.
21. Remove the load sensing valve (8) from the body (55).
22. Remove the O-ring seals (9), (11) and (13) and the back-up rings (10) and (12) from the load sensing valve (8). Discard the O-ring seals (9), (11) and (13).
23. Repeat steps 21 and 22 for the remaining load sensing valves.
24. Remove the check valve plug (36) the spring (33) and the poppet (32) from the body (55).
25. Remove the O-ring seal (34) and the back-up ring (35) from the check valve plug (36). Discard the O-ring seal (34).
26. Repeat steps 24 and 25 for the remaining check valves.
27. Remove the check valve plug (45), the spring (43) and the ball (42) from the body (55).
28. Remove and discard the O-ring seal (44) from the check valve plug (45).
29. Repeat steps 27 and 28 for the remaining check valve.
30. Remove the compensator plug (37) and the springs (40) and (41) from the body (55).
31. Remove the O-ring seal (39) and the back-up ring (38) from the compensator (37). Discard the O-ring seal (39).
32. Remove the compensator plug (50), the restrictor (47) and the spool (46) from the body (55).
33. Remove the O-ring seal (48) and the back-up ring (49) from the compensator plug (50). Discard the O-ring seal (48).



CI98J506

1. Capscrews	20. Housing	39. O-ring seal
2. Module	21. Capscrews	40. Spring
3. Spool	22. O-ring seal	41. Spring
4. Valve	23. Plug	42. Ball
5. Spring	24. Capscrews	43. Spring
6. O-ring seal	25. Housing	44. O-ring seal
7. Shock valve plug	26. Screw	45. check valve plug
8. Load sensing valve	27. O-ring seal	46. Spool
9. O-ring seal	28. O-ring seal	47. Restrictor
10. Back-up ring	29. Seat	48. O-ring seal
11. O-ring seal	30. Spring	49. Back-up ring
12. Seat	31. Seat	50. Compensator plug
13. Spring	32. Poppet	51. O-ring seal
14. Seat	33. Spring	52. Plug
15. Spring	34. O-ring seal	53. Seal
16. Seat	35. Back-up ring	54. Spool
17. O-ring seal	36. Check valve plug	55. Body
18. O-ring seal	37. Compensator plug	
19. Screw	38. Back-up ring	

Inspection

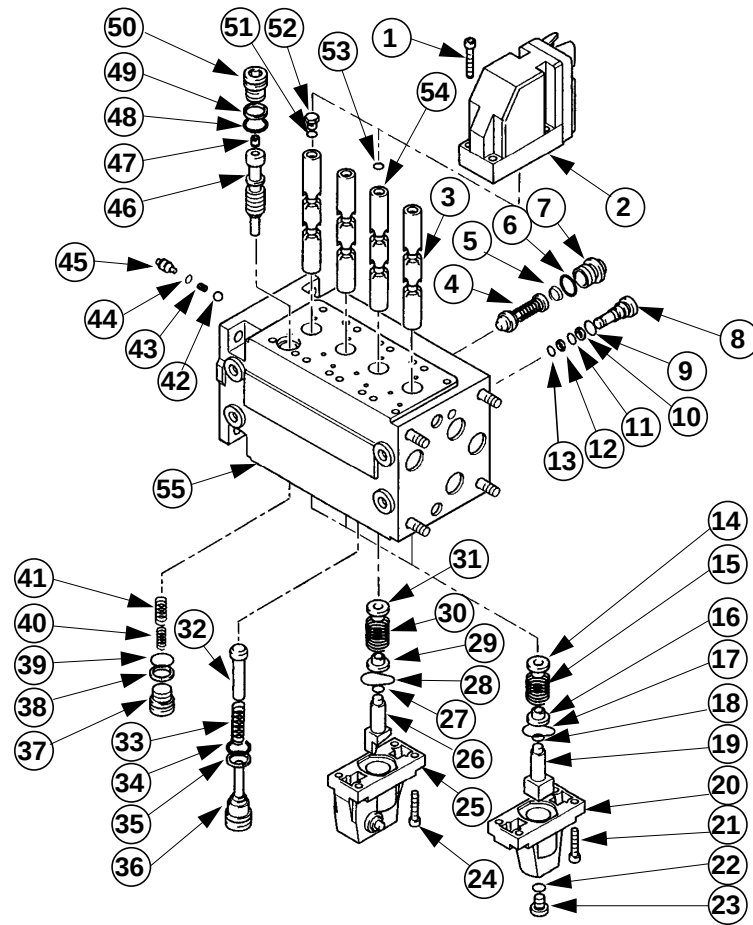
NOTE : *If any components fail the following inspections, they must be replaced.*

1. Inspect the body (55) for damage to the bores and valve seats and particularly to the threads.
2. Inspect the plugs (7), (23), (37), (45), (50) and (52) for wear or damage, particularly to the threads.
3. Inspect the springs (5), (15), (30), (33), (40), (41) and (43) for damage.

Assembly

Assemble the four spool valve block in the reverse order of the disassembly, but note the following :

1. Thoroughly clean all components and the work area before starting work.
2. Inspect the four spool valve block.
3. Before assembling, lubricate each component with the specified hydraulic oil.
4. Install a new O-ring seal (48) on the compensator plug (50).
5. Torque tighten the compensator plug (50) to 55 to 65 Nm.
6. Install a new O-ring seal (39) on the compensator plug (37).
7. Torque tighten the compensator plug (37) to 55 to 65 Nm.
8. Install a new O-ring seal (44) to the check valve plug (45).
9. Install a new O-ring seal (34) on the check valve plug (36).
10. Torque tighten the check valve plug (36) to 55 to 65 Nm.
4. Inspect the valves (4) and (8), the spools (3), (46) and (54), the screws (19) and (26), the poppet (32), the seats (14), (16), (29) and (31) and the ball (42) for wear or damage.
5. Inspect the restrictor (47) for wear or damage. check that the restrictor is not blocked.
6. Inspect the module (2) and the housings (20) and (25) for damage.
11. Install new O-ring seals (9), (11) and (13) on the load sensing valve (8).
12. Torque tighten the load sensing valve (8) to 22 to 28 Nm.
13. Install a new O-ring seal (6) seal to the shock valve plug (7).
14. Torque tighten the shock valve plug (7) to 35 to 45 Nm.
15. Install a new O-ring seal (28) into the body (55) and a new O-ring seal (27) to the screw (26).
16. Torque tighten the capscrews (24) to 7 to 9 Nm.
17. Install a new O-ring seal (22) to the plug (23).
18. Torque tighten the plug (23) to 8 to 12 Nm.
19. Install a new O-ring seal (17) into the body (55) and a new O-ring seal (18) to the screw (19).
20. Torque tighten the capscrews (21) to 7 to 9 Nm.
21. Install a new O-ring seal (51) to the plug (52).
22. Torque tighten the capscrews (1) to 7 to 9 Nm.



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1. Capscrews	20. Housing	39. O-ring seal
2. Module	21. Capscrews	40. Spring
3. Spool	22. O-ring seal	41. Spring
4. Valve	23. Plug	42. Ball
5. Spring	24. Capscrews	43. Spring
6. O-ring seal	25. Housing	44. O-ring seal
7. Shock valve plug	26. Screw	45. Check valve plug
8. Load sensing valve	27. O-ring seal	46. Spool
9. O-ring seal	28. O-ring seal	47. Restrictor
10. Back-up ring	29. Seat	48. O-ring seal
11. O-ring seal	30. Spring	49. Back-up ring
12. Back-up ring	31. seat	50. Compensator plug
13. O-ring seal	32. Poppet	51. O-ring seal
14. Seat	33. Spring	52. Plug
15. Spring	34. O-ring seal	53. Seal
16. Seat	35. Back-up ring	54. Spool
17. O-ring seal	36. Check valve plug	55. Body
18. O-ring seal	37. Compensator plug	
19. Screw	38. Bac-up ring	

THREE SPOOL OR TWO SPOOL VALVE BLOCK

Disassembly

1. Thoroughly clean the three spool or two spool valve block before starting work.
2. Remove capscrews (1), the plate (2), the wiper (3) and the O-ring seal (4) from the body (31). Discard the O-ring seal (4).
3. Remove the capscrews (25) and the housing (24) from the body (31).
4. Carefully remove the screw (23), the seat (21), the spring (20), the seat (19), the plate (18), the wiper (17) and the O-ring seal (16) from the body (31). discard the O-ring seal (16).
5. Remove and discard the O-ring seal (22) from the screw (23).
6. Carefully remove the spool (5) from the body (31).
7. Repeat steps 2 to 6 for the remaining spools.

NOTE : Steps 8 and 9 are only valid for the 3 spool valve.

8. Remove the shock valve plug (9), the spring (7) and the valve (6) from the body (31).

Inspection

NOTE : If any of the components fail the following inspections, they must be replaced.

1. Inspect the body (31) for damage to the bores and valve seats and particularly to the threads.
2. Inspect the plugs (9) and (26) for wear or damage, particularly to the threads.
3. Inspect the springs (7), (20) and (29) for damage.

Assembly

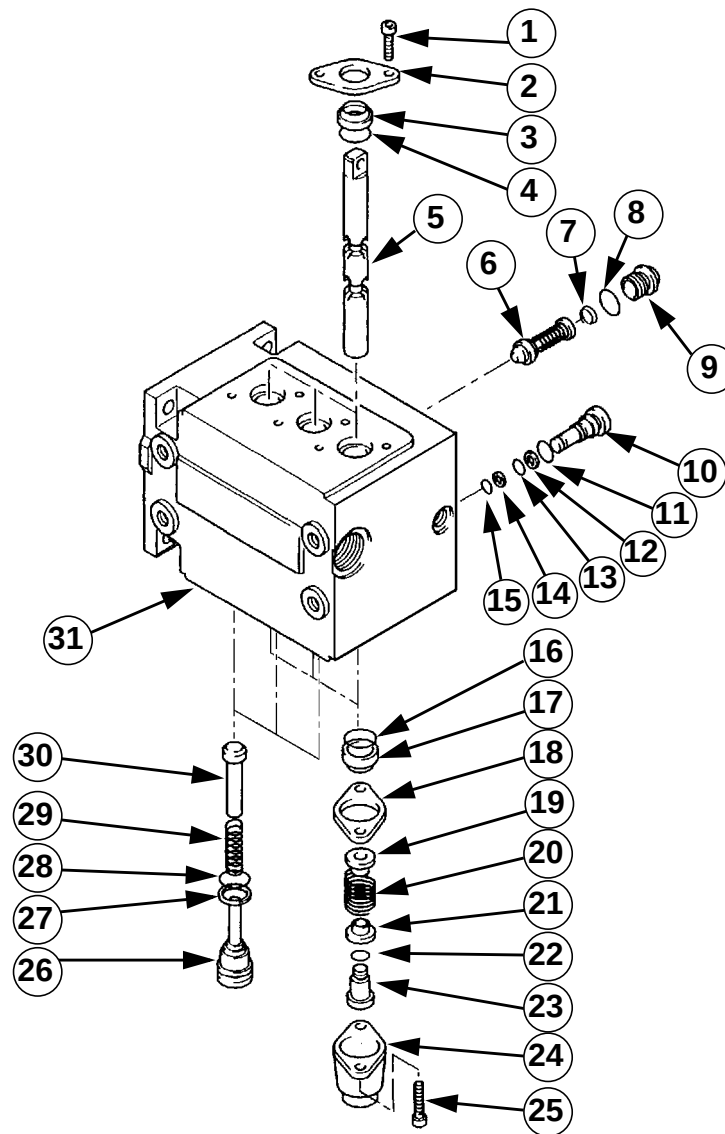
The assembly of the three spool or two spool valve block in the reverse order of the disassembly but note the following :

1. Thoroughly clean all components and the work area before starting work
2. Inspect the three spool valve or two spool block.
3. Before assembling, lubricate each component with the specified hydraulic oil.
4. Install a new O-ring seal (28) on the check valve plug (26).
5. Torque tighten the check valve plug (26) to 55 to 65 Nm.
6. Install new O-ring seals (11), (13) and (15) on the load sensing valve (10).

9. Remove and discard the O-ring seal (8) from the shock valve plug (9).
10. Remove the load sensing valve (10) from the body (31).
11. Remove the O-ring seals (11), (13) and (15) and the back-up rings (12) and (14) from the load sensing valve (10). Discard the O-ring seals (11), (13) and (15).
12. Repeat steps 10 and 11 for the remaining load sensing valves.
13. Remove the check valve plug (26), the spring (29) and the poppet (30) from the body (31).
14. Remove the O-ring seal (28) and the back-up ring (27) from the check valve plug (26). Discard the O-ring seal (28).
15. Repeat steps 13 and 14 for the remaining check valves.

4. Inspect the valves (6) and (10), the spool (5), the screw (23), the poppet (30) and the seats (19) and (21) for wear or damage.
5. Inspect the plates (2) and (18) the housing (24) and the wipers (3) and (17) for damage.

7. Torque tighten the load sensing valve (10) to 22 to 28 Nm.
8. Install a new O-ring seal (8) to the shock valve plug (9).
9. Torque tighten the shock valve plug (9) to 35 to 45 Nm.
10. Install a new O-ring seal (16) into the body (31) and a new O-ring seal (22) to the screw (23).
11. Torque tighten the capscrews (25) to 7 to 9 Nm.
12. Install a new O-ring seal (4) into the body (31).
13. Torque tighten the capscrews (1) to 7 to 9 Nm.



1. Capscrews	12. Back-up ring	23. Screw
2. Plate	13. O-ring seal	24. Housing
3. Wiper	14. Back-up ring	25. Capscrews
4. O-ring seal	15. O-ring seal	26. check valve plug
5. Spool	16. O-ring seal	27. Back-up ring
6. Valve	17. Wiper	28. O-ring seal
7. Spring	18. Plate	29. Spring
8. O-ring seal	19. Seat	30. Poppet
9. Shock valve plug	20. Spring	31. Body
10. Load sensing valve	21. Seat	
11. O-ring seal	22. O-ring seal	

CI98J507

Section

8008

EXTENDING DIPPERSTICK CONTROL VALVE

8008

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THE EXTENDING DIPPERSTICK CONTROL VALVE 4

 Disassembly 4

 Assembly 6

 Inspection 6

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THE EXTENDING DIPPERSTICK CONTROL VALVE

Disassembly

STEP 1

Thoroughly clean the extending dipperstick control valve before standing work.

STEP 2

Note the position of each connector (15), (17), (20) (21) and (28) in the valve body (11).

STEP 3

Remove the connectors (15), (17), (20), (21) and (28) from the valve body (11).

NOTE : *When assembly, torque tighten the connectors (15), (17), (20), (21) and (28) to 70 Nm.*

STEP 4

Remove and discard the O-ring seals (14), (16), (19), (27) and (29) from the connectors (15), (17), (20), (21) and (28).

NOTE : *When assembly, install new O-ring seals (14), (16), (19), (27) and (29) to the connectors (15), (17), (20), (21) and (28).*

STEP 5

Remove the check valve securing bolt (18), the plug (22), the spring (25) and the check valve (26) from the valve body (11).

NOTE : *When assembly, make sure that the hole in the plug (22) is aligned with the securing bolt hole (18) in the valve body (11).*

NOTE : *When assembly, apply 2 or 3 drops of Loctite thread locking fluid to the threads of the securing bolt hole (18) in the valve body (11).*

NOTE : *When assembly, torque tighten the check valve securing bolt (18) to 20 to 24 Nm.*

STEP 6

Remove the O-ring seal (24) and the back-up ring (23) from the plug (22). Discard the O-ring seal (24).

NOTE : *When assembly, install a new O-ring seal (24) on the plug (22).*

STEP 7

Remove the relief valves (12) and (30) from the valve body (11).

NOTE : *When assembly, torque tighten the relief valve (12) and (30) to 20 to 24 Nm.*

STEP 8

Remove and discard the O-ring seals (13) and (32) from the relief valves (12) and (30).

NOTE : *When assembly, install new O-ring seals (13) and (32) to the relief valves (12) and (30).*

STEP 9

Remove the capscrews (10), the washers (9) and the cap (8) from the valve body (11).

NOTE : *When assembly, torque tighten the capscrews (10) to 5 to 8 Nm.*

STEP 10

Remove the screw (7) the seat (6), the spring (5), the seat (4) and the plate (3) from the valve body (11).

NOTE : *When assembly, apply Loctite hydraulic seal to the screw (7).*

NOTE : *When assembly, torque tighten the screw (7) to 5 to 8 Nm.*

STEP 11

Remove the back-up ring (2) and the O-ring seal (1) from the valve body (11). Discard the O-ring seal (1).

NOTE : *When assembly, install new O-ring seals (1) in the valve body (11).*

STEP 12

Remove the cap screws (37), the washers (36) and the plate (35) from the valve body (11).

NOTE : *When assembly, torque tighten the cap screws (37) to 5 to 8 Nm.*

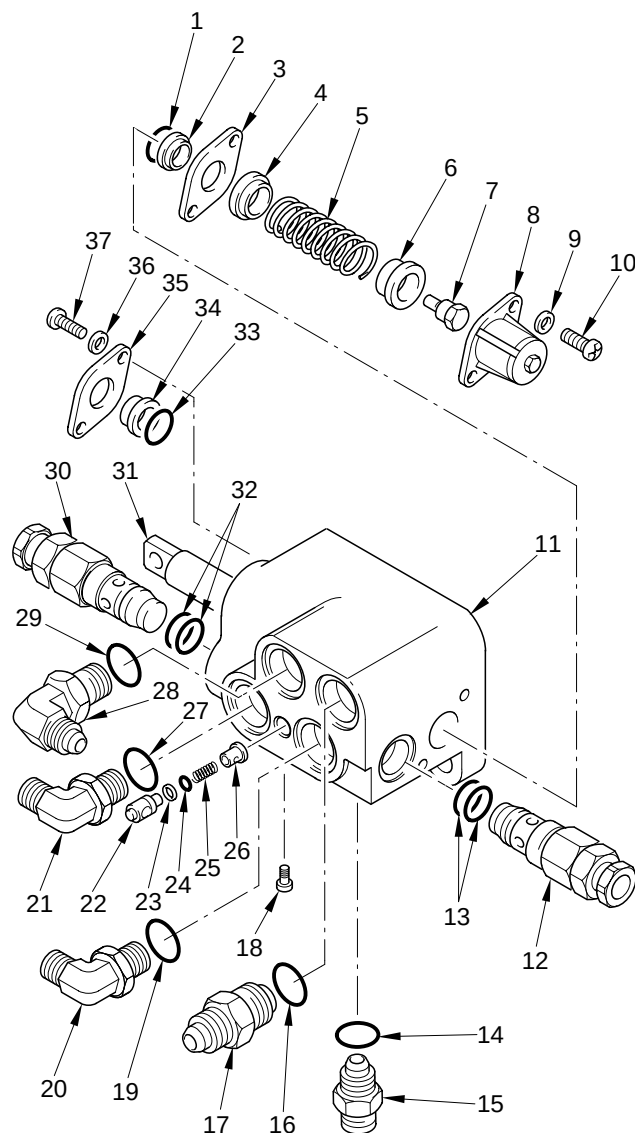
STEP 13

Carefully remove the spool (31) from the valve body (11).

STEP 14

Remove the back-up ring (34) and the O-ring seal (33) from the valve body (11). discard the O-ring seal (33).

NOTE : *When assembly, install new O-ring seal (33) in the valve body (11).*



1. O-ring seal
2. Back-up ring
3. Plate
4. Seat
5. Spring
6. Seat
7. Screw
8. Cap
9. Washers
10. Capscrew

11. Valve body
12. Relief valve
13. O-ring seals
14. O-ring seal
15. Connector
16. O-ring seal
17. Connector
18. Securing bolt
19. O-ring seal
20. Connector

21. Connector
22. Plug
23. Back-up ring
24. O-ring seal
25. Spring
26. Check valve
27. O-ring seal
28. Connector
29. O-ring seal
30. Relief valve

31. Spool
32. O ring seals
33. O-ring seal
34. Back-up ring
35. Plate
36. Washer
37. Capscrew

789M107A

Assembly

The assembly of the extending dipperstick control valve is the reverse of the disassembly.

NOTE : *Thoroughly clean all components and the work area before starting work.*

NOTE : *Inspect the extending dipperstick control valve.*

NOTE : *Before assembling, lubricate each component with the specified hydraulic oil.*

Inspection

If any of the components fail the following inspections, they must be replaced.

STEP 1

Inspect the valve body (11) for damage to the bores and valve seats and particularly to the treads.

STEP 2

Inspect the connectors (15), (17), (20), (21) and (28) for damaged threads.

STEP 3

Inspect the springs (5) and (25) for damage.

STEP 4

Inspect the valves (12), (26) and (30), the spool (31), the screw (7), the seats (4) and (6) for wear or damage.

STEP 5

Inspect the plug (22) and the bolt (18) for damage, particularly to the threads.

STEP 6

Inspect the cap (8) and the plates (3) and (35) for damage.

Section

8010

PRIORITY DEMAND VALVE

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PRIORITY DEMAND VALVE 3

 Removal and installation 3

 Disassembly and assembly..... 4

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PRIORITY DEMAND VALVE

Removal and installation

NOTE : The valve is fitted on the left hand side of the chassis next to the gearbox.

STEP 1

Park the machine on a level surface. Lower the loader bucket to the floor and stop the engine.

STEP 2

Depressurize the hydraulic system (see Section 8002).

STEP 3

Remove the front floor mat.
Remove the transmission inspection floor plate.

STEP 4

Place a drainage tray under the valve (1).

STEP 5

Remove the pipe connections (2), (3) and hose connections (4), (5).

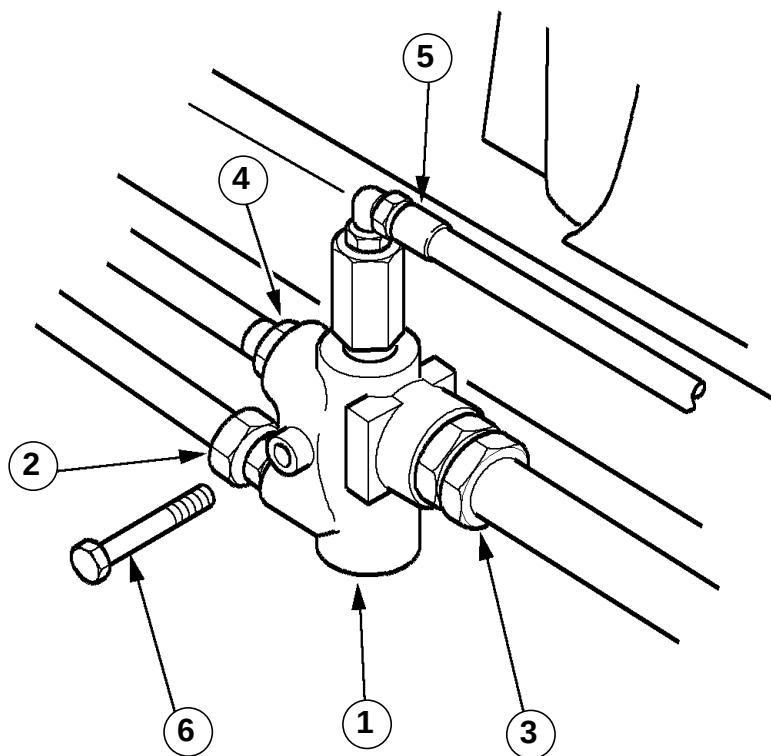
STEP 6

Support the valve (1) and remove the bolt (6).

NOTE : The installation of the priority demand valve is the reverse of the removal. After installation carry out a functional test of the machine steering and hydraulic system.

Check for leakage at the pipe connections.

Check the hydraulic oil level in the hydraulic reservoir, top up if necessary.



CI98G536

Disassembly and assembly

STEP 1

Remove the adaptor (1) and discard the seal (2).

NOTE : For assembly, install a new seal (2) on adaptor (1).

STEP 2

Remove the control spring (3).

STEP 3

Remove the plug (8) and the seal (7) from the opposite end of the valve body (4) and push out the spool (5).

NOTE : For assembly, install a new seal (7) on plug (8).

NOTE : The valve (6) should only be removed from the spool (5) if it is damaged.

NOTE : The assembly of the priority demand valve is the reverse of disassembly.

NOTE : For assembly, lubricate all parts with clean hydraulic oil.

Inspection

STEP 1

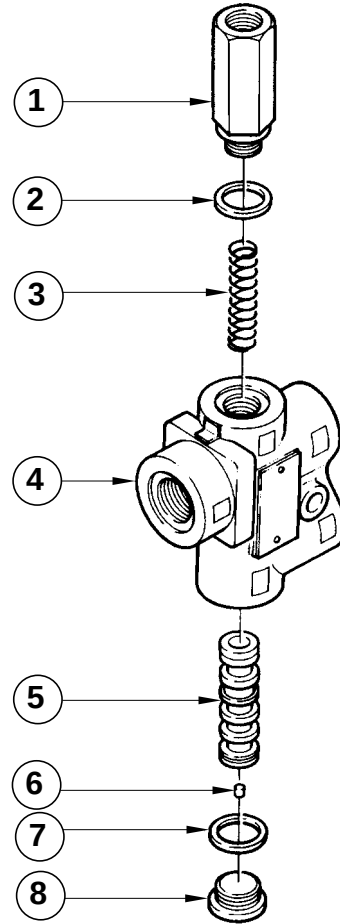
Thoroughly clean and dry all parts with a suitable solvent.

STEP 2

Use low pressure air to make sure that the orifice in valve (6) is clear.

STEP 3

Check that the cross drawing in spool is clear.



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STEP 4

Check the spool (5) and the valve body (4) for scratches or wear. The complete valve must be replaced if there is damage to either port.

STEP 5

Inspect the control spring (3) for cracks or wear.

Section

9001

PEDALS AND LEVERS

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

SPECIFICATIONS

Engine speeds

750, 760, 860 and 960 Versions

Low idle	850 rpm
High idle.....	2200 rpm

965 Version

Low idle	550 to 750 rpm
High idle.....	2200 rpm

Brake pedal setting distance.....	336 to 346 mm

Brake pedal free travel.....	0.5 to 1.3 mm

Backhoe control lever setting distance	
Standard and ISO Versions.....	254 mm
X pattern Version.....	251 mm

Backhoe levier separation	
Standard and ISO Versions.....	287 mm
X pattern Version.....	307 mm

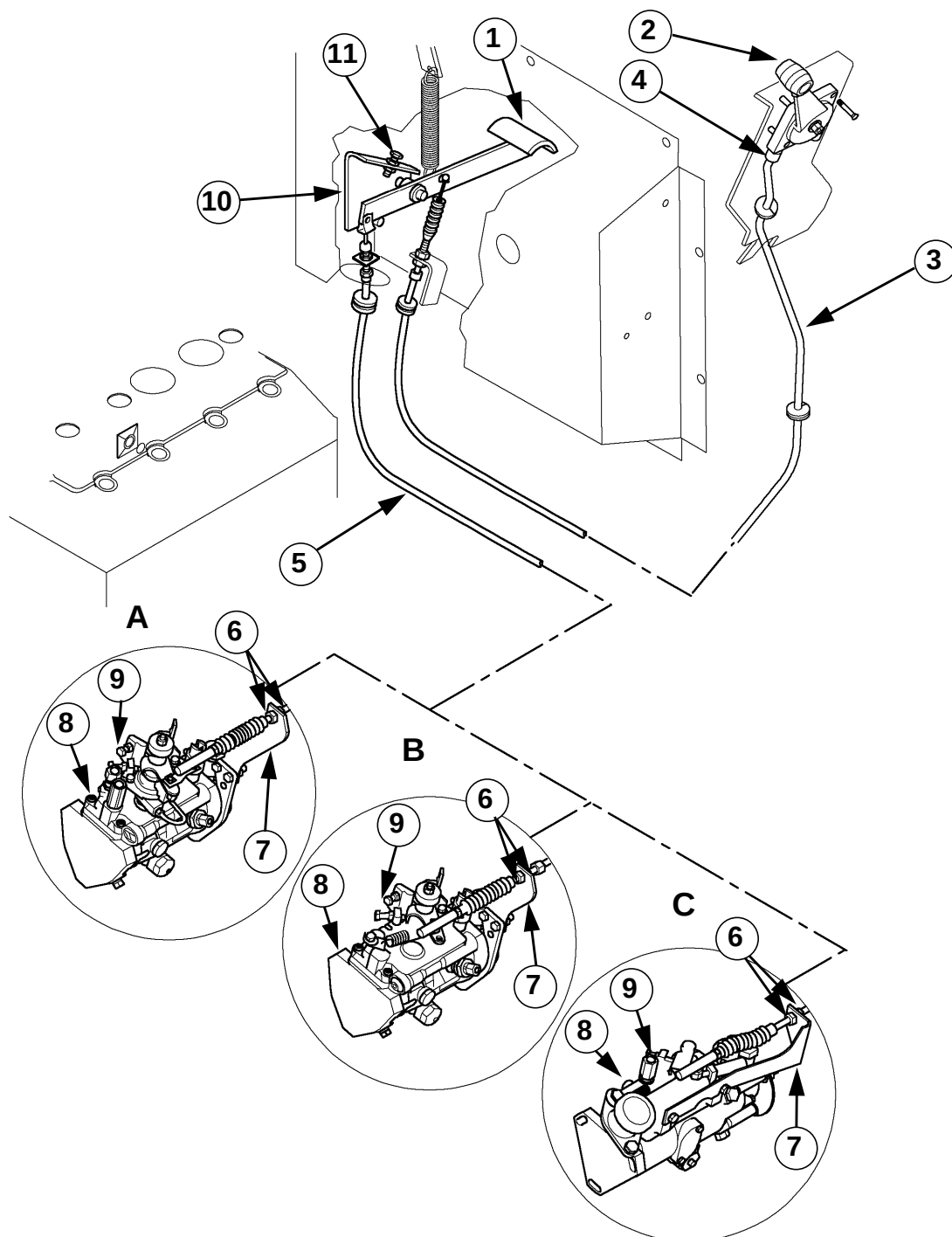
Backhoe levier separation	
Standard and ISO Versions.....	287 mm
X pattern Version.....	307 mm

Backhoe levier separation	
Standard and ISO Versions.....	287 mm
X pattern Version.....	307 mm

THROTTLE ADJUSTMENT

Adjustment procedure

1. Park the machine on a level surface.
2. Switch off the engine.
3. Move the hand throttle lever to the max. rpm position.
4. Check that the throttle lever on the engine fuel pump is in contact with the top screw (9).
5. If the throttle lever is not in contact with the stop screw (9), adjust the length of the cable (5) using the locknuts (6) at the throttle bracket (7).
6. Set the throttle pedal (1) to the max. rpm position and hold it there.
7. Check that the gap between the throttle pedal (1) and the stop bolt (11) on the mounting bracket (10) is less than 0 to 0.5 mm.
8. If the gap between the throttle pedal (1) and the stop bolt (11) is greater than 0 to 0.5 mm adjust the length of the stop bolt (11) to bring the gap within limits.
9. Move the hand throttle lever (2) to the min. rpm position.
10. Start the engine.
11. Check that the engine rpm is 850 rpm.
12. If the engine rpm is incorrect, adjust the stop screw on the engine fuel pump to bring the rpm within limits.
13. Make sure that the hand throttle lever (2) is in contact with the stop on the hand throttle assembly.



CI98G527

1. Throttle pedal
2. Hand throttle lever
3. Hand throttle cable
4. Hand throttle stop
5. Throttle cable
6. Locknuts
7. Throttle bracket

8. Fuel pump
9. Stop screw
10. Mounting bracket
11. Stop bolt

- A. Series 750 and 760 with green engine
- B. Series 860, 960 and 965 with green engine
- C. Series 750, 760 and 860 with blue engine

PARKING BRAKE ADJUSTMENT (750, 760 and 860 Versions)



WARNING : Before making adjustments to the parking brake is correctly adjusted (see Section 7000).

STEP 1

Park the machine on hard level ground, lower the loader bucket to the ground and place blocks under the rear wheels.

STEP 2

Release the parking brake and stop the engine.

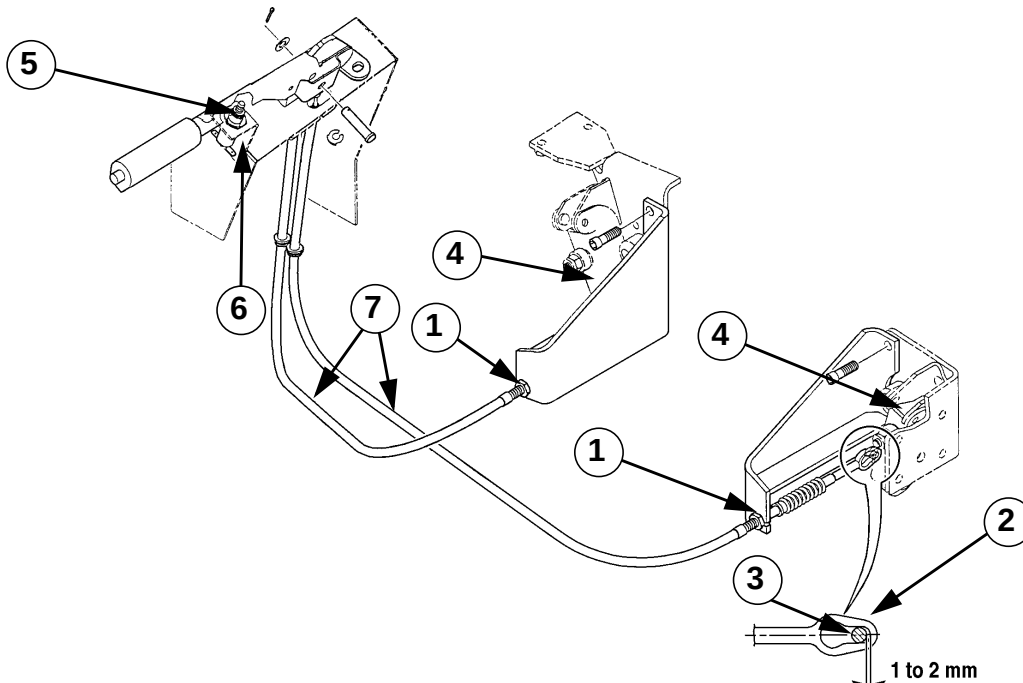
STEP 3

Make sure the cables (7) are correctly attached to the parking brake lever.

STEP 4

Adjust the lock nuts (1) on the cables so that the play between the end of the cable eyes (2) and the brake lever pins (3), (4) measures 1 to 2 mm.

NOTE : The cables must not be taut.



- 1. Lock nut
- 2. Eyes
- 3. Pin
- 4. Brake lever

- 5. Contactor
- 6. Plate
- 7. Cable

PARKING BRAKE SWITCH ADJUSTMENT (750, 760 and 860 Versions)

STEP 1

Place the parking brake in released position.

STEP 2

Tighten the contactor (5) in the plate (6) until the contactor plunger is completely compressed.

STEP 3

Loosen the contactor two complete turns and then lock it in this position.

CI98F510

PARKING BRAKE ADJUSTMENT (960 and 965 Versions)

STEP 1

Park the machine on hard level ground, lower the loader bucket to the ground and place blocks under the rear wheels.

STEP 2

Release the parking brake and stop the engine.

STEP 3

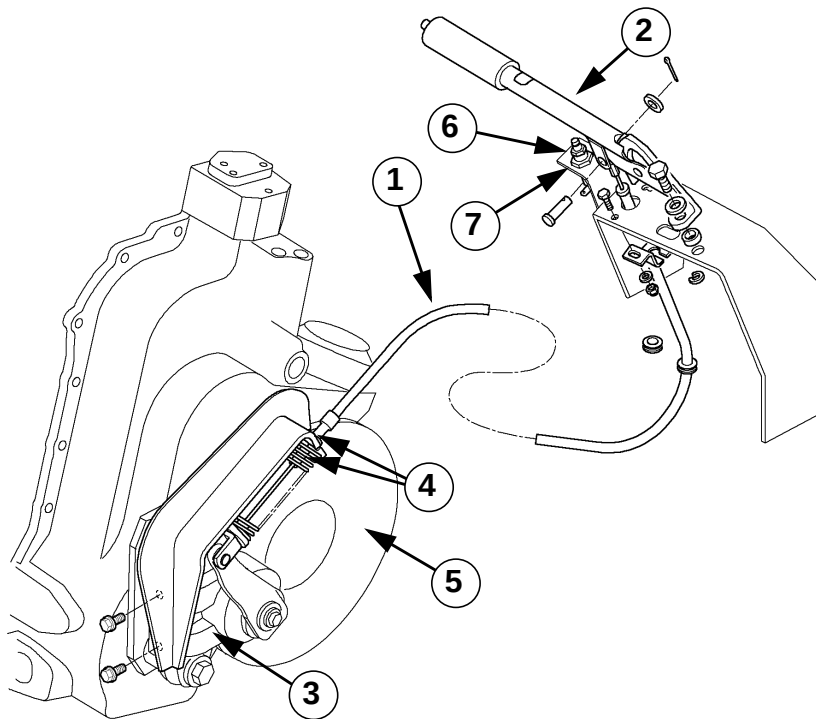
Make sure the cable (1) is correctly attached to the parking brake lever (2).

STEP 4

At the brake calliper (3), adjust the cable locknuts (4) to remove any play from the brake cable (1). Make sure that the clearance between the brake calliper (4) and the brake disc (5), is not reduced.

STEP 5

Set the parking brake to on. Make sure that by the 7th notch on the brake lever ratchet, the brake disc (5) is fully clamped.



- 1. Cable
- 2. Brake lever
- 3. Brake calliper

- 4. Cable locknuts
- 5. Brake disc

- 6. Contactor
- 7. Plate

CI98G528

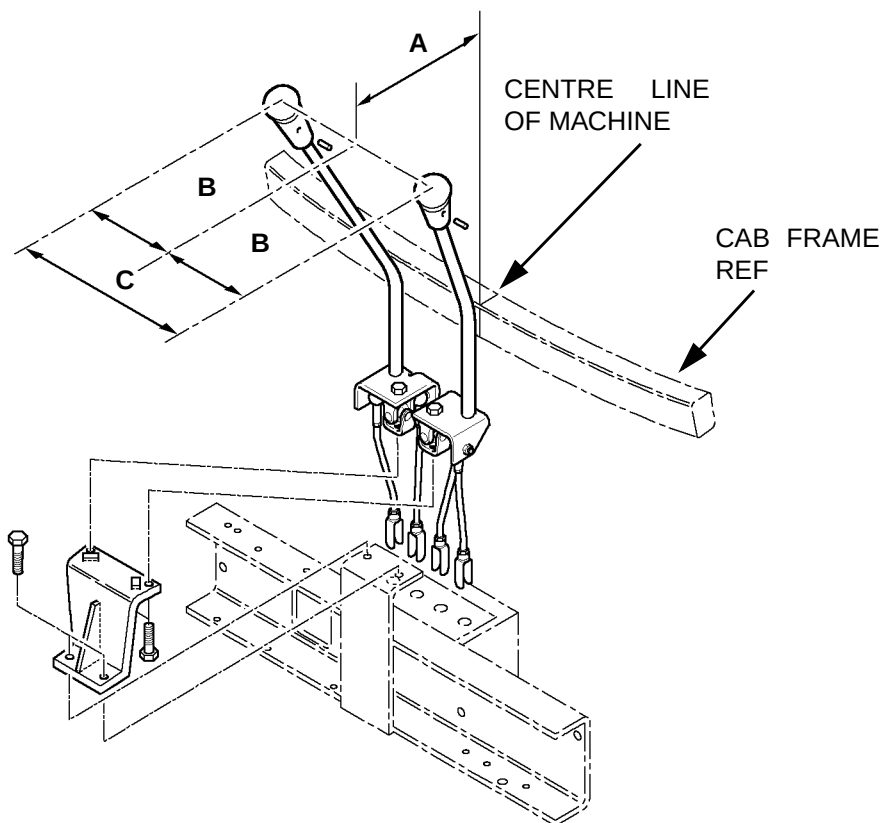
BACKHOE CONTROL LEVER ADJUSTMENT

Adjustment procedure

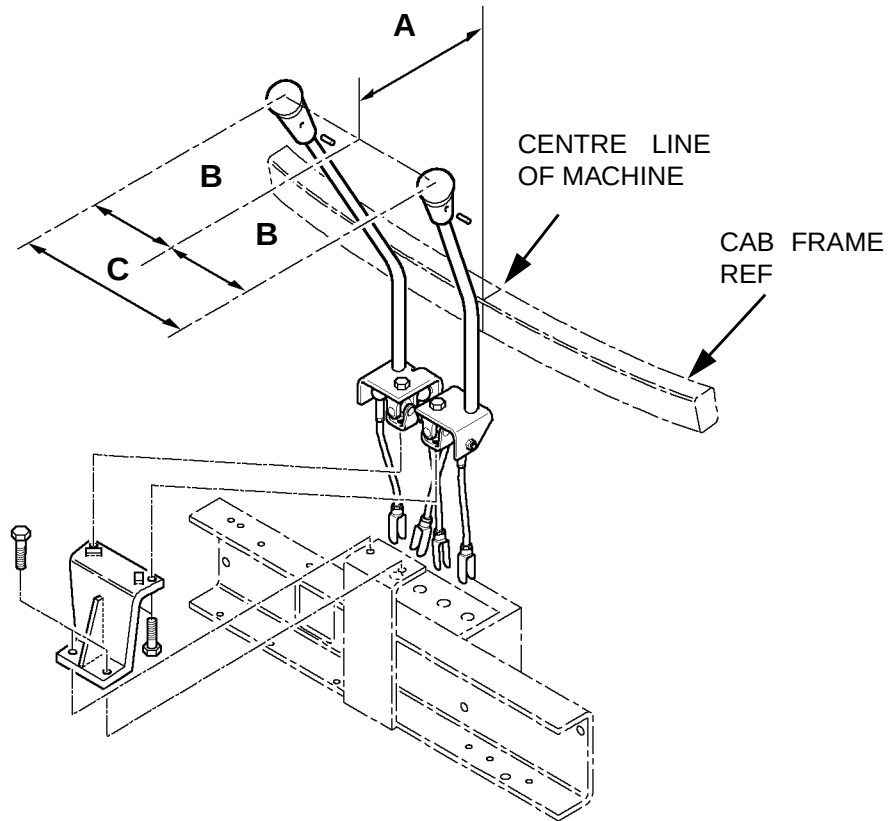
1. Park the machine on a level surface.
2. Switch off the engine.
3. Check that the distance from the cab frame to the top of the backhoe control levers corresponds to A.
4. Check that the distance between the top of each backhoe control lever and the centre line of the machine corresponds to B.
5. Adjust the control rods at the backhoe valve assembly until the distances are correct.

Version	A	B	C
Standard mm (in)	254 (10)	143.5 (5.65)	287 (11.3)
I.S.O. mm (in)	254 (10)	143.5 (5.65)	287 (11.3)
X Pattern mm (in)	251 (9.88)	153.5 (6.04)	307 (12.08)

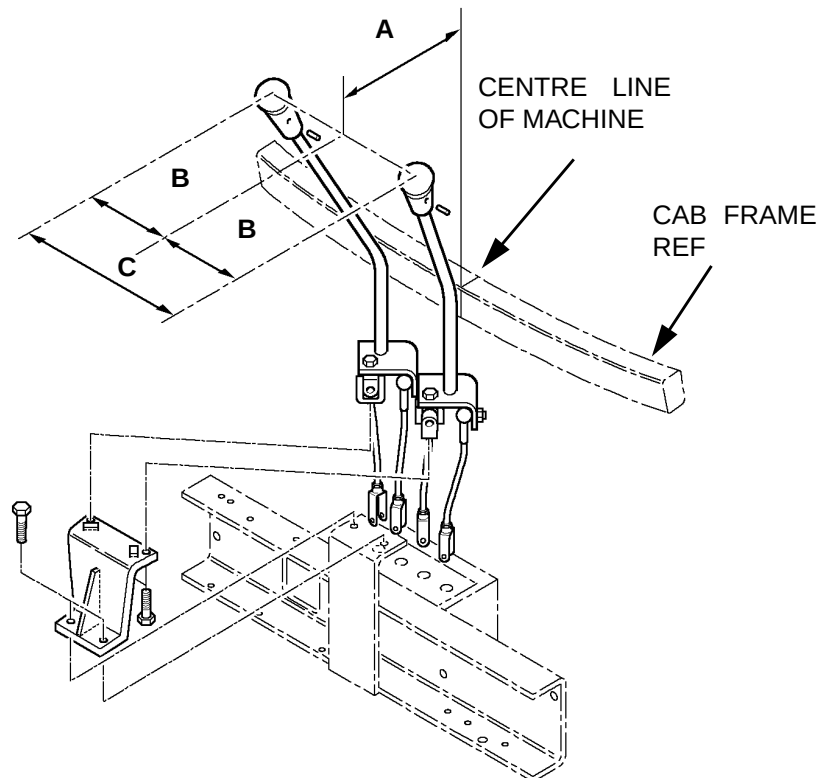
Standard version



C198G529

I.S.O. Version

CI98G530

X Pattern Version

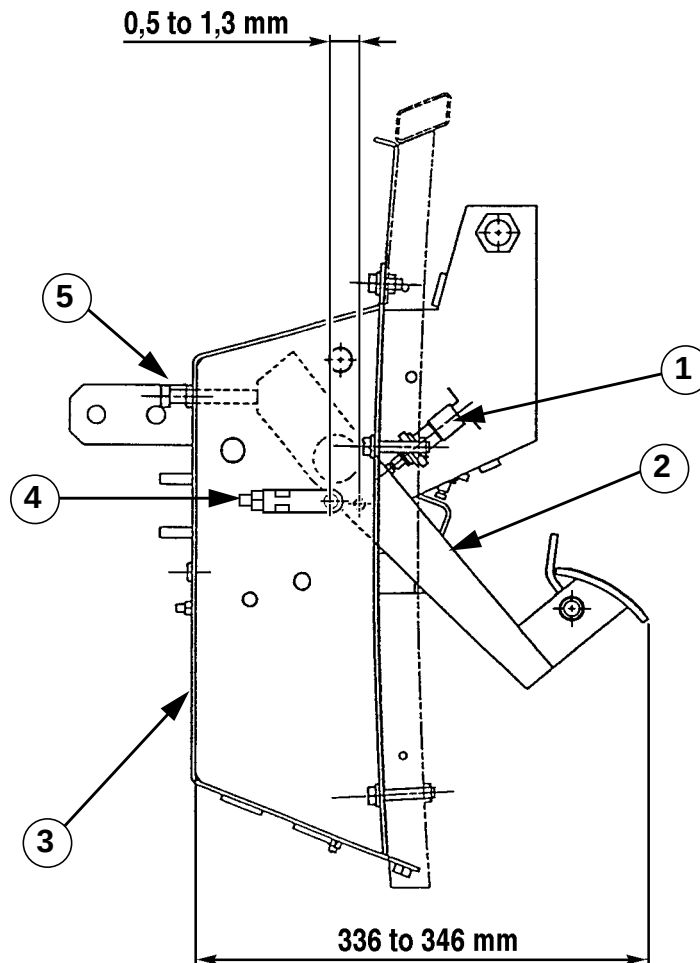
CI98F511

BRAKE PEDAL AND PUSH ROD ADJUSTMENT

Adjustment procedure

NOTE : 750, 760 and 860 Versions, carry out the procedure on the left-hand and right-hand brake pedals.

1. Park the machine on a level surface.
2. Switch off the engine.
3. Check that the distance from the back face of the control box (3) to the front edge of the brake pedal (2) is between 336 and 346 mm.
4. If the distance from the back face of the control box (3) to the front edge of the brake pedal (2) is not correct, adjust the length of the stop bolt (5) to bring the distance within limits.
5. Make sure that the brake light switch (1) operates correctly. Adjust the position of the brake light switch as required.
6. Release the push rod clevis (4) from the brake pedal.
7. Make sure that the push rod is in contact with the master cylinder piston.
8. Check that the distance from the centre of the clevis pin hole to the centre of the clevis attachment hole on the brake pedal, is between 0.5 and 1.3 mm (see section 7003).
9. If the distance from the centre of the clevis pin hole to the centre of the clevis attachment hole on the brake pedal is not correct, adjust the clevis to bring the distance within limits.
10. Make sure that when the brake pedal is operated, the gap between the push rod and the master cylinder piston is taken up before the master cylinder piston starts to move.



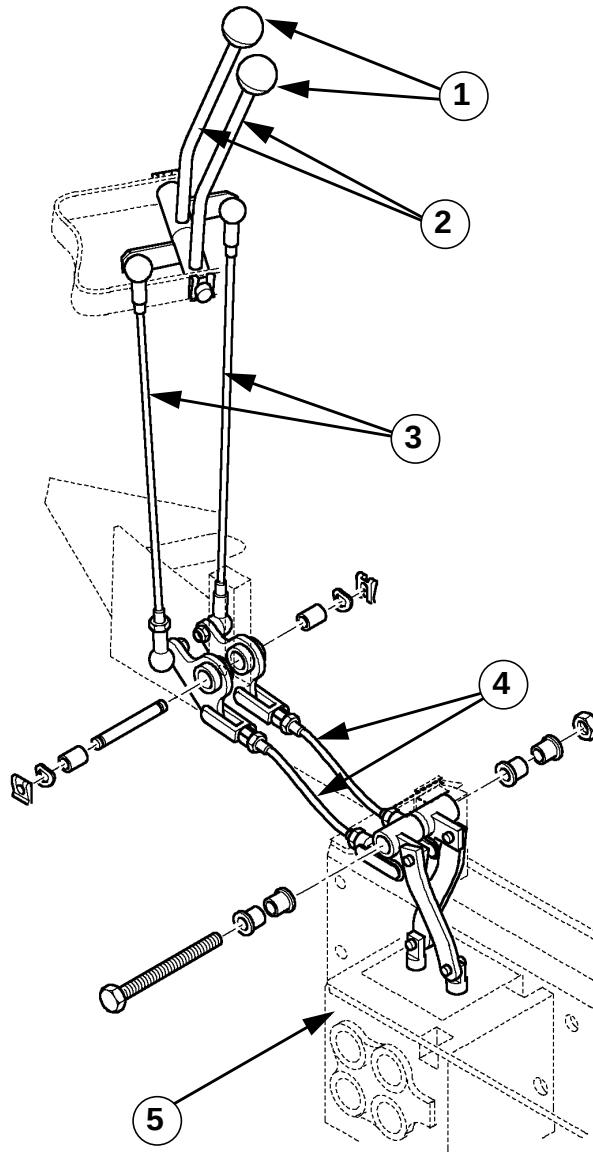
CI98F515

1. Brake light switch	4. Push rod clevis
2. Brake pedal	5. Stop bolt
3. Control box	

STABILIZER CONTROL LEVER ADJUSTMENT

Adjustment procedure

1. Park the machine on a level surface.
2. Switch off the engine.
3. Make sure that both stabilizer control levers are vertical and that the knobs are in line.
4. Adjust the connecting rods located behind the left side trim panel to make the control levers vertical or to align the knobs.
5. Operate each stabilizer control lever over its full range of movement. Make sure that the relevant spool on the backhoe valve operates over its full stroke.
6. If the stroke of the spool is not correct, adjust the length of the appropriate rod assembly at the backhoe valve.



1. Knob	4. Rod assembly
2. Stabilizer control lever	5. Backhoe valve
3. Connecting rod	

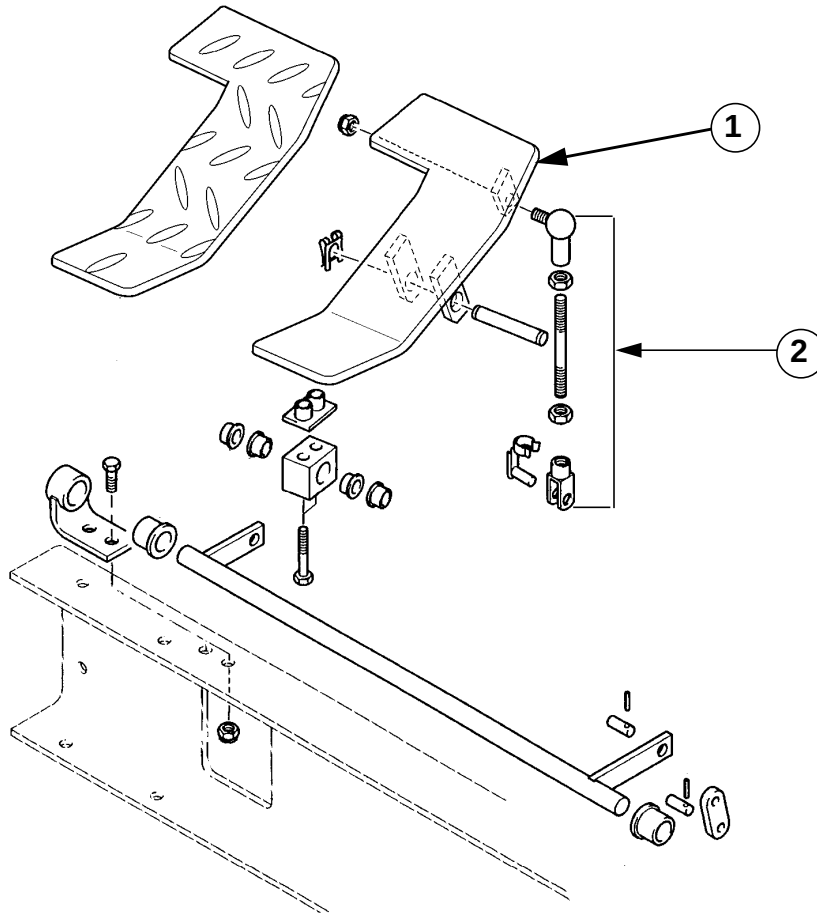
CI98F512

AUXILIARY FUNCTION CONTROL PEDAL ADJUSTMENT

Adjustment procedure

NOTE : *This procedure is only applicable if the machine is fitted with auxiliary functions.*

1. Park the machine on a level surface.
2. Switch off the engine.
3. Operate the auxiliary function control pedal over its full range of movement. Make sure that the auxiliary spool on the backhoe valve operates over its full travel.
4. If the stroke of the spool is not correct, adjust the length of the rod assembly at the backhoe valve.



1. Auxiliary function control pedal
2. Rod assembly

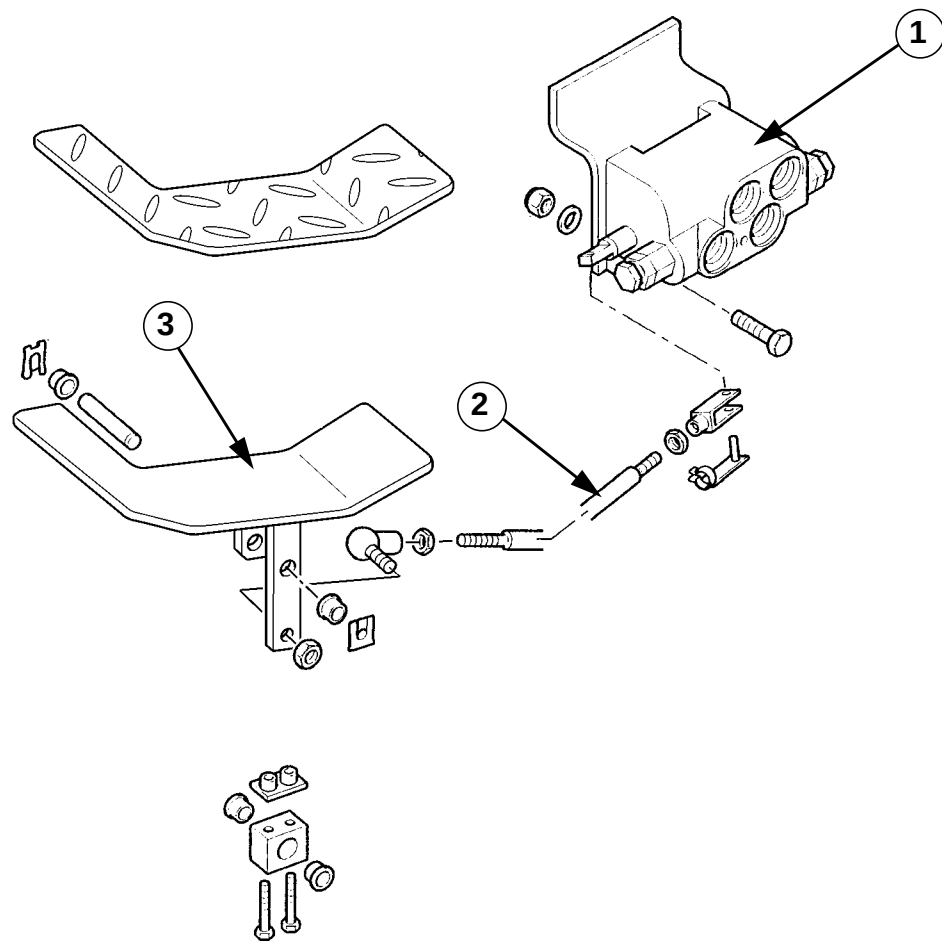
CI98F516

TELESCOPIC DIPPER CONTROL PEDAL ADJUSTEMENT

Adjustment procedure

NOTE : *This procedure is only applicable if the machine is fitted with a telescopic dipper.*

1. Park the machine on a level surface.
2. Switch off the engine.
3. Operate the telescopic dipper control pedal over its full range of movement. Make sure that the spool in the telescopic dipper control valve operates over to its full travel in both directions.
4. If the stroke of the spool is not correct, adjust the length of the rod assembly at the telescopic dipper control valve.
5. With the control pedal in the central position, make sure that the spool in the telescopic dipper control valve is in the neutral position.



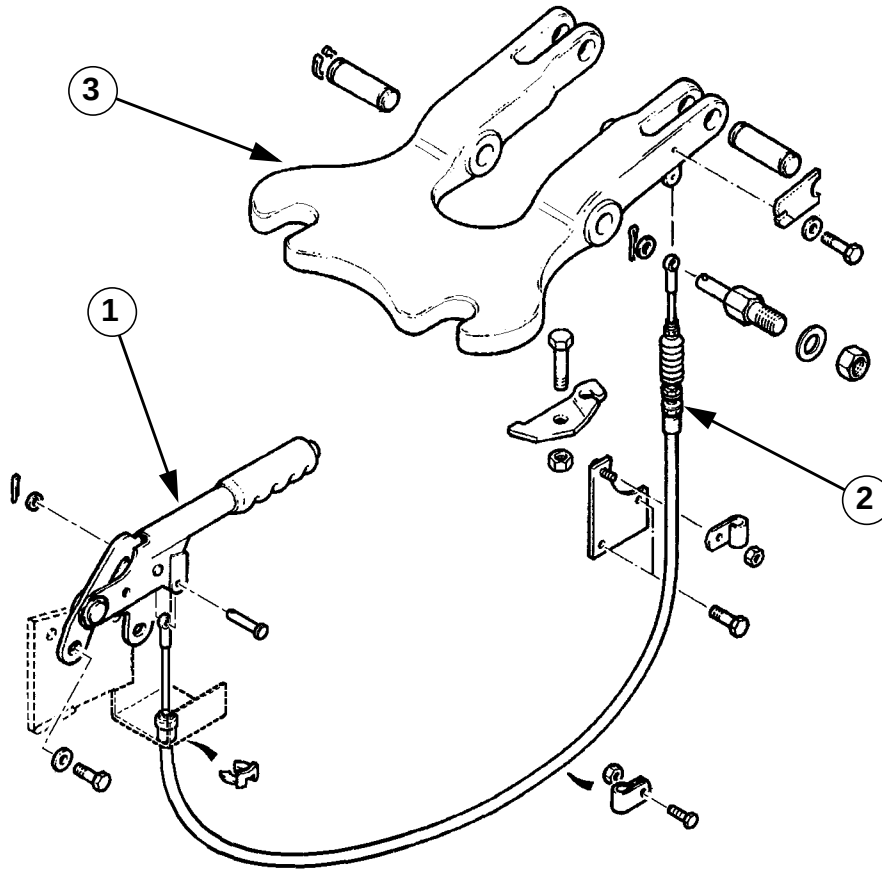
1. Control valve
2. Rod

3. Control pedal

CI98F513

BOOM LATCH CABLE ADJUSTMENT

1. Make sure the cable is correctly fixed to the boom latch control lever (1).
2. Adjust the cable sheath stop (2) on the latch side of the boom, so the cable is slightly slack.
3. Try the boom latch a few times. If the catch (3) does not engage in its housing, slacken the cable by moving the cable sheath stop (2) towards the boom.



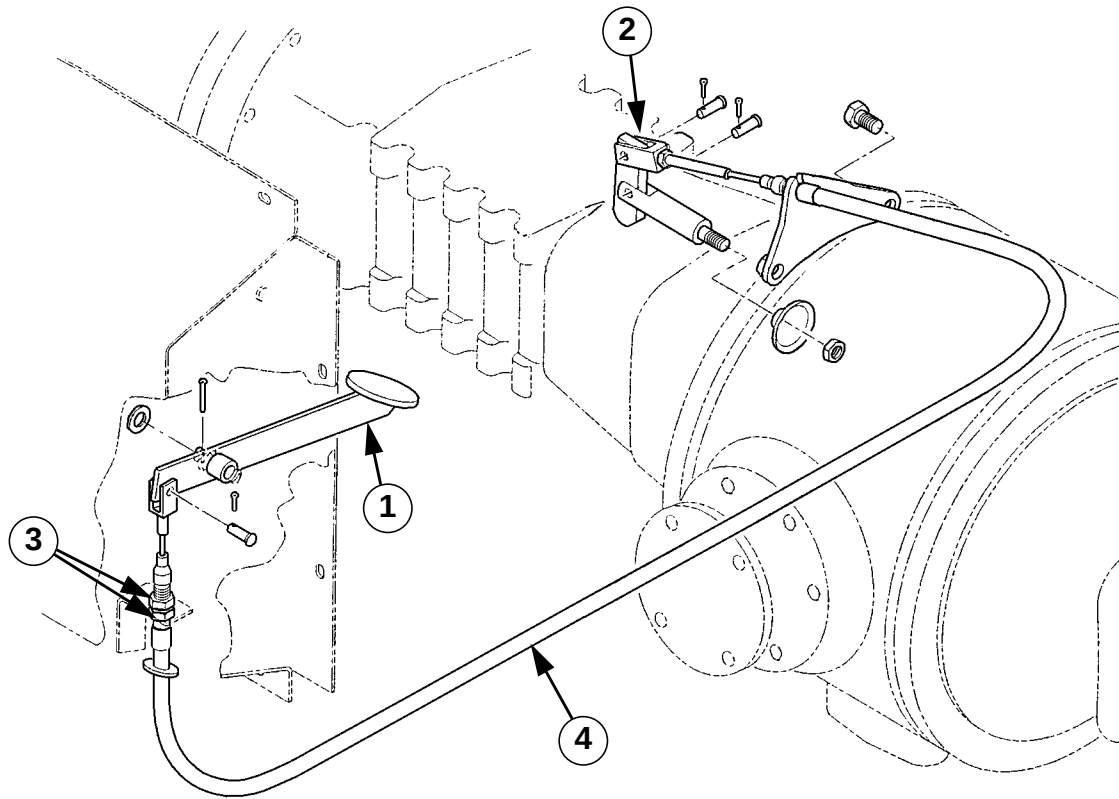
1. Boom latch control lever
2. Sheath stop

3. Catch

CI98F514

DIFFERENTIAL LOCK PEDAL ADJUSTMENT

1. With the differential lock fully applied. There must be 70 to 80 mm clearance between the differential lock pedal (1) and the floor of the cab.
2. If the clearance is not correct, make adjustment at the clevis (2) or at the set of cable jam nuts (3).



CI98F517

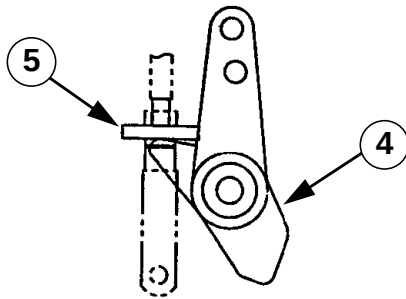
1. Differential lock pedal	3. Cable jam nuts
2. Clevis	4. Differential lock cable

ADJUSTMENT OF ANTI ROLLBACK

1. Park the machine on a level surface.
2. Ensure the loader controls are set correctly.
3. Check the gas strut (1) length 610 mm.
4. Check the rod assy (2) length 723 mm.
5. Position the bucket /lift arm pivot pin pin 675 mm above ground.
6. Roll back the bucket until contact stops on the lift arm (fully crowded).
7. Ensure the link assy (3) is in contact with the bucket link.
- 8.

10. Release the spring (8) to allow the lever (4) to stop on the plate (9). Check that the lever (7) does not foul the cab cross member.
11. Lower the lift arm to ground.
12. Raise the lift arm until the bucket commences to self level (Roll FWD).
13. Check the height of the bucket (lift arm pivot above ground (640 to 710 mm)).
14. If outside range, reposition the lever (7) by one spline. Repeat until self levelling is obtained.

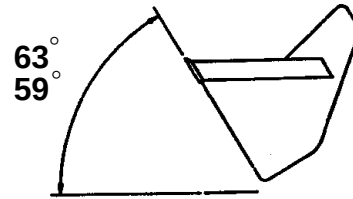
NOTE : *Bucket position when levelling. Adjust the lever (7) relative to the arm (10) to obtain levelling angles.*



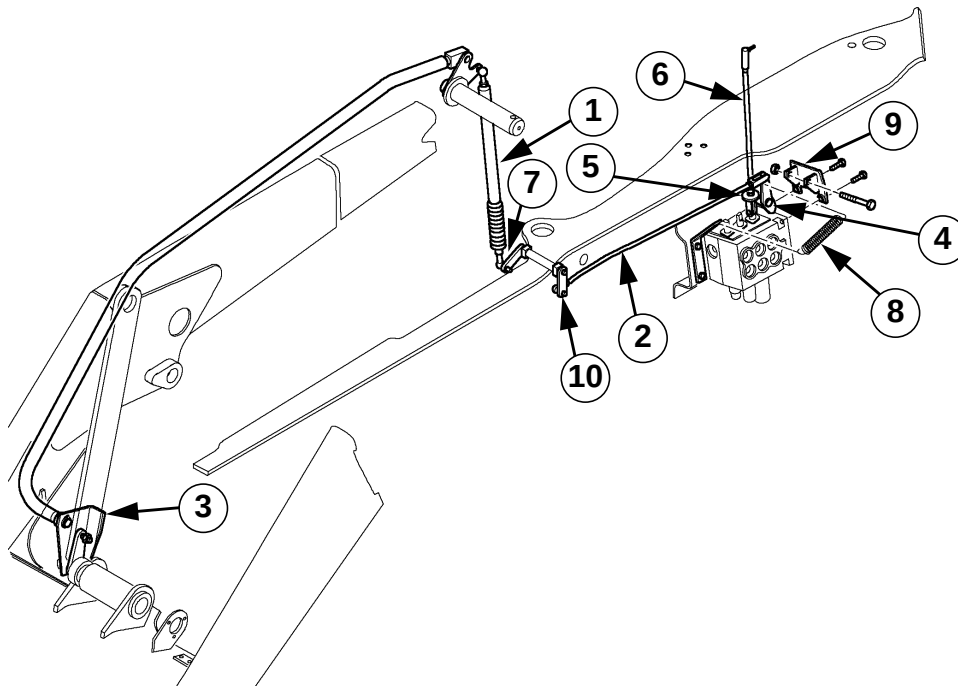
CI98N507

Ensure the lever (4) just makes contact with the disc (5) on the bucket control rod (6) in neutral position.

9. Position the lever (7) to suit.



CI98N506



CI98N505

Section

9006

LOADER

9006

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LOADER BUCKET POTENTIOMETER (Models 960 and 965) 32

 Removal 32

 Installation 32

LOADER BEAM POTENTIOMETER (Models 960 and 965).....33

 Removal 33

 Installation 33



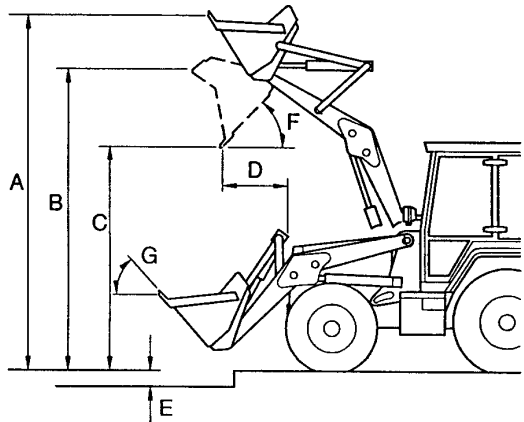
WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

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SPECIFICATIONS

Loader operating data 700 and 800 Models

The following dimensions apply to 700 and 800 Models, 4WD machines equipped with 18.4 x 26 rear tyres and 16-70 x 20 front tyres except where specified differently.

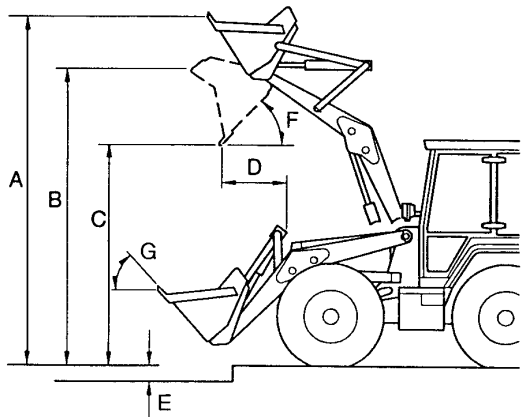


CS98M582

Overall height fully raised (A).....	4439 mm
Height to hinge pin (B).....	3564 mm
Dump height - dump angle 45° (C).....	2708 mm
Reach maximum height 45° dump (D)	727 mm
Dig depth (E)	100 mm
Dump maximum angle (F)	57°
Roll-back angle at ground level (G)	47°

Loader operating data 900 Models

The following dimensions apply to 960 and 965 Models with standard loader bucket and 16.9 x 24 front and rear tyres.

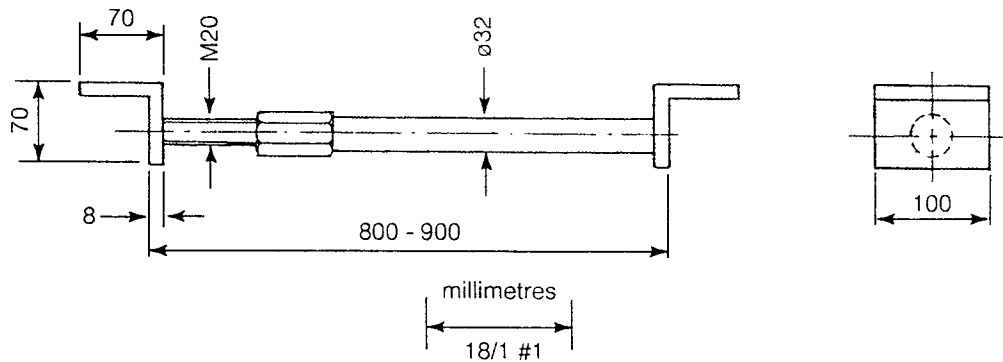


CS98M583

Overall height fully raised (A).....	4439 mm
Height to hinge pin (B).....	3564 mm
Dump height - dump angle 45° (C).....	2708 mm
Reach maximum height 45° dump (D)	917 mm
Dig depth (E)	100 mm
Dump angle maximum (F)	57°
Roll-back angle at ground level (G)	47°

SPECIAL TOOLS

- Hand press
- Multi-purpose grease
- Torque wrench 0 to 250 Nm
- Torque wrench 0 to 2500 Nm
- Rope
- Cylinder clamp
- Suitable jacks and packing
- Blanks
- Identifying tags
- "C" spanners
- Loctite 648
- Loctite 242
- Ring compressor
- Suitable lifting equipment
- Drainage container
- Lifting equipment with 100 kg capacity



CS98M584

- Loader beam expander

SPECIAL TORQUES

Standard loader bucket (Installation)	
Bolts (1), (9), (6) and (11)	60 Nm
Standard loader bucket (Assembly)	
Bolt (1)	60 Nm
Nuts (4) and (6)	230 Nm
Loader bucket 7 in 1 (Installation)	
Bolt (11)	12 Nm
Bolts (15), (18), (7) and (13)	60 Nm
Loader bucket 7 in 1 (Assembly)	
Bolts (33) and (18)	60 Nm
Bolts (38), (27) and (21)	30 Nm
Bolts (3) and (6)	230 Nm
Bucket cylinder and links	
Bolt (24)	60 Nm
Quick-attach unit	
Bolt (3)	30 Nm
Bolts (18), (11) and (14)	60 Nm
Loader beam cylinder	
Bolt (13)	30 Nm
Bolt (2)	60 Nm
Bolt (11)	230 Nm
Loader beam (Installation)	
Bolts (9)	60 Nm
Loader beam (Assembly)	
Bolts (5), (11), (12), (17) and (28)	30 Nm
Bolts (18) and (22)	12 Nm

INTRODUCTION

Description

The loader beam consists of two, fabricated angled beams, joined together at one end by a fabricated cross member, to make a single beam assembly.

One end of the loader beam is attached to the chassis at the front of the machine and the beam can be raised and lowered using two hydraulic cylinders, one mounted on either side of the machine.

Fabricated links are attached to the loader beam cross member and to the bucket or the quick-attach unit. The links support hydraulic cylinder which is used to raise (crowd) or lower (dump) whichever item of equipment is attached to the loader beam.

The optional quick attach unit can be fitted directly onto the loader beam and enables buckets and other equipment to be quickly attached to, or detached from, the machine.

A multi-purpose bucket incorporating a hydraulically operated clam shell, can be attached to the loader beam or used with the quick attach unit, instead of the standard loader bucket.

An optional fork kit can be fitted to the multi-purpose bucket.

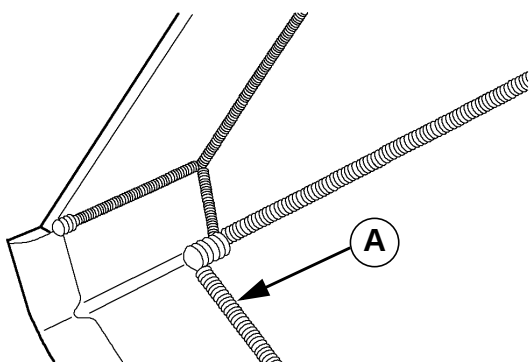
Operation

The hydraulic cylinders are supplied from the hydraulic system. (See Section 8002).

On electronic machines, the loader valve is controlled electronically using a joystick.

REPLACEMENT OF WELD-ON CUTTING EDGE FOR STANDARD BUCKETS

1. If the bucket is not removed from the machine, raise the bucket to a suitable height and use suitable supports to hold the loader frame and bucket in place.
2. If the bucket is equipped with bucket teeth, use carbon arc rod to remove the bucket teeth.
3. Use carbon arc rod or an acetylene cutting torch to remove the welds that hold the cutting edge. Keep distortion to a minimum when removing the cutting edge.
4. When removing the bottom rear weld for the cutting edge DO NOT cut through the floor of the bucket.

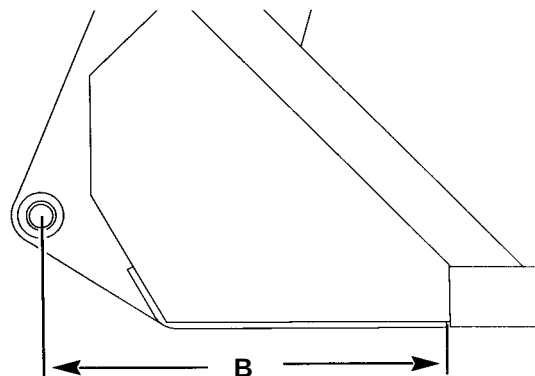


CS98M585

A LONG LIPPED BUCKET WELD

5. Use a grinder to remove any welds or extra metal on the bucket that will prevent the new cutting edge from fitting correctly.

6. Put the cutting edge in place and use C-clamps to hold the cutting edge in place. See the illustration for the correct position of the cutting edge.

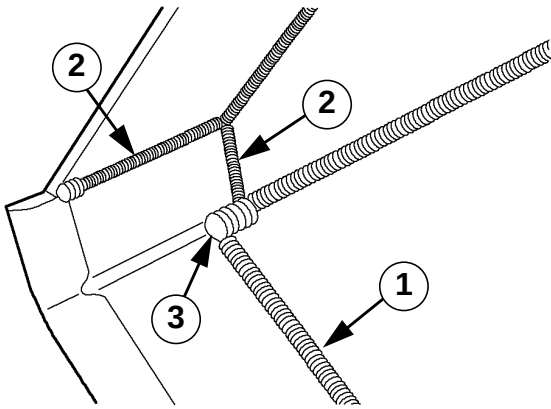


CS98M586

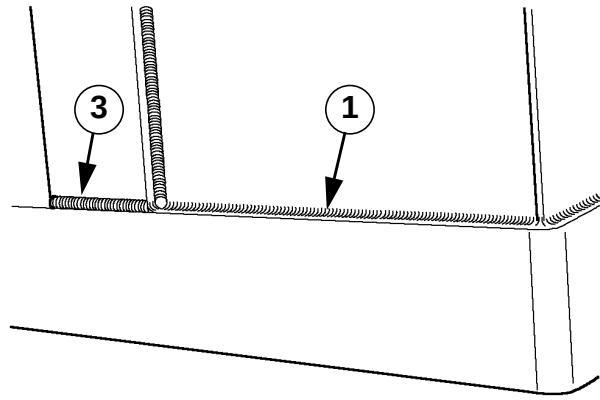
B LONG LIP BUCKET

7. Use E-7018 welding rod and weld the cutting edge to the bucket.
8. When welding the floor of the bucket to the top of the cutting edge :
 - A. Start at one end of the bucket and weld toward the centre until one welding rod is used.
 - B. Start at the centre of the bucket and weld in both directions from centre until one welding rod is used.
 - C. Start at the other end of the bucket and weld toward the centre until one welding rod is used.
 - D. Continue to weld the cutting edge to the bucket using this method until welding is complete.
9. If bucket teeth were removed from the old cutting edge, install the bucket teeth according to instructions in this section.

WELD SPECIFICATIONS FOR STANDARD BUCKET

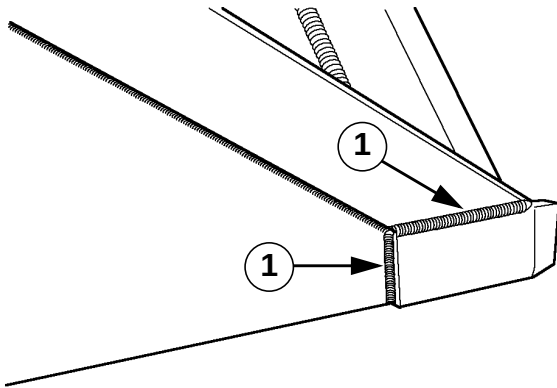


CS98M587



CS98M588

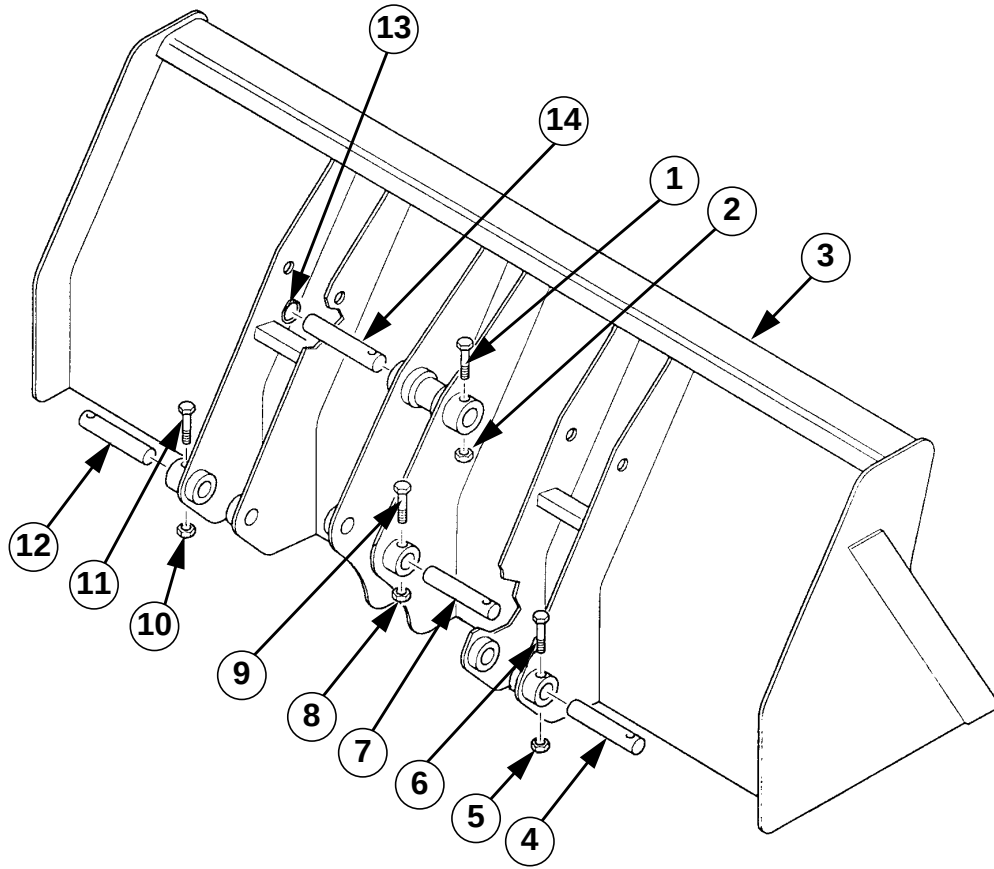
1. (6 mm) Fillet
2. Fill Groove
3. Fill Corner



CS98M589

STANDARD LOADER BUCKET

Removal and installation



CS98M590

1. Park the machine on a level surface.
2. Lower the loader beam and position the bucket flat on the ground.
3. Switch off the engine.
4. Only carry out steps 5 and 6 on machines with mechanical loader controls.
5. Remove the cover from the handbrake mechanism.
6. Remove relay No.1.
7. Remove the bolt (1) and the locknut (2) securing the link attachment pin (14) to the bucket (3). Discard the locknut (2).

NOTE : When installing, install a new locknut (2) on the bolt (1) and tighten the bolt (1) to a torque of 60 Nm.

8. Remove the circlip (13) from the pin (14).
9. Using a hammer and a soft metal drift, remove the pin (14) from the bucket (3).
10. Support the weight of the bucket cylinder with a rope or webbing sling.
11. Remove the bolt (9) and the locknut (8) securing the cylinder attachment pin (7) to the bucket (3). Discard the locknut (8).

NOTE : When installing, install a new locknut (8) on the bolt (9) and tighten the bolt (9) to a torque of 60 Nm.

12. Remove the pin (7) from the bucket (3).
13. Remove the bolts (6) and (11) and the locknuts (5) and (10), securing the beam attachment pins (4) and (12) to the bucket (3). Discard the locknuts (5) and (10).

NOTE : When installing, install new locknuts (5) and (10) on the bolts (6) and (11) and tighten the bolts (6) and (11) to a torque of 60 Nm.

14. Remove the pins (4) and (12) from the bucket (3).
15. Start the engine and retract the bucket cylinder until it is the same length as the bucket links.
16. Reverse the machine a short distance away from the loader bucket. Insert a robust bar through the loader beams, the bucket links and the rod end of the bucket cylinder.

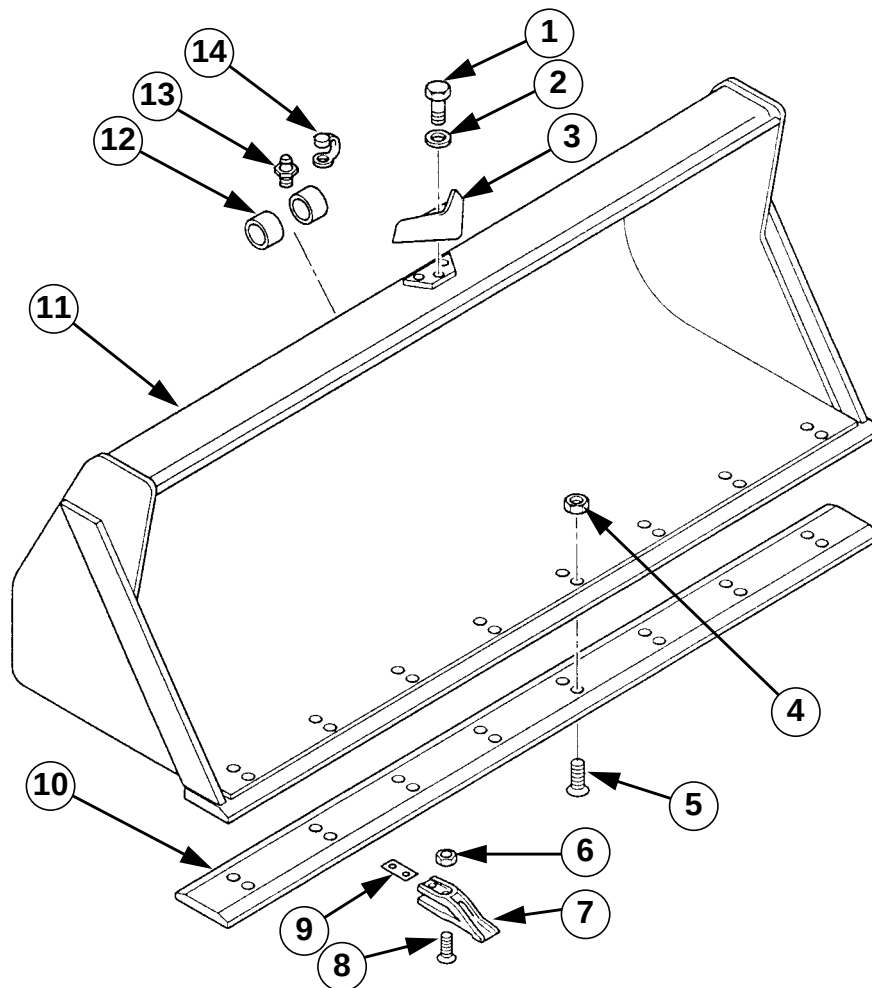


WARNING : *Do not operate the bucket function whilst the bucket cylinder is restrained by the bar or you will damage the bucket links and the loader beams.*

NOTE : *Install the standard loader bucket in the reverse order from that of removal.*

NOTE : *After installation, make sure that the loader bucket operates correctly.*

Disassembly



CS98M591

1. Using suitable lifting equipment, lift the bucket assembly and place it securely on suitable packing.
2. Make sure that there is sufficient space available beneath the lower front edge of the bucket, to allow for the removal of the blade (if fitted) or the teeth (if fitted).
3. Remove the bolts (1), the washers (2) and the guard (3) from the bucket (11).

NOTE : When assembling, tighten the bolts (1) to a torque of 60 Nm.

4. Remove the cap (14) and the grease nipple (13) from the bucket (11).

NOTE : When assembly, apply the specified grease to the grease nipple (13).

5. Using a hand operated press, remove and discard the bushes (12) from the bucket (11).

NOTE : When assembling, install new bushes (12) in the bucket (11).

6. If a blade (10) is fitted to the bucket (11), place jacks and suitable packing beneath the blade (10).
7. Remove the nuts (4) and the bolts (5) attaching the blade (10) to the bucket (11).

NOTE : When assembling, tighten the nuts (4) to a torque of 230 Nm.

8. Carefully lower the blade (10) clear of the bucket (11).
9. If teeth (7) are fitted to the bucket (11), remove the nuts (6) and the bolts (8) attaching the teeth (7) to the bucket (11).

NOTE : When assembling, tighten the nuts (6) to a torque of 230 Nm.

10. Carefully remove the teeth (7) and the shims (9) from the bucket (11).

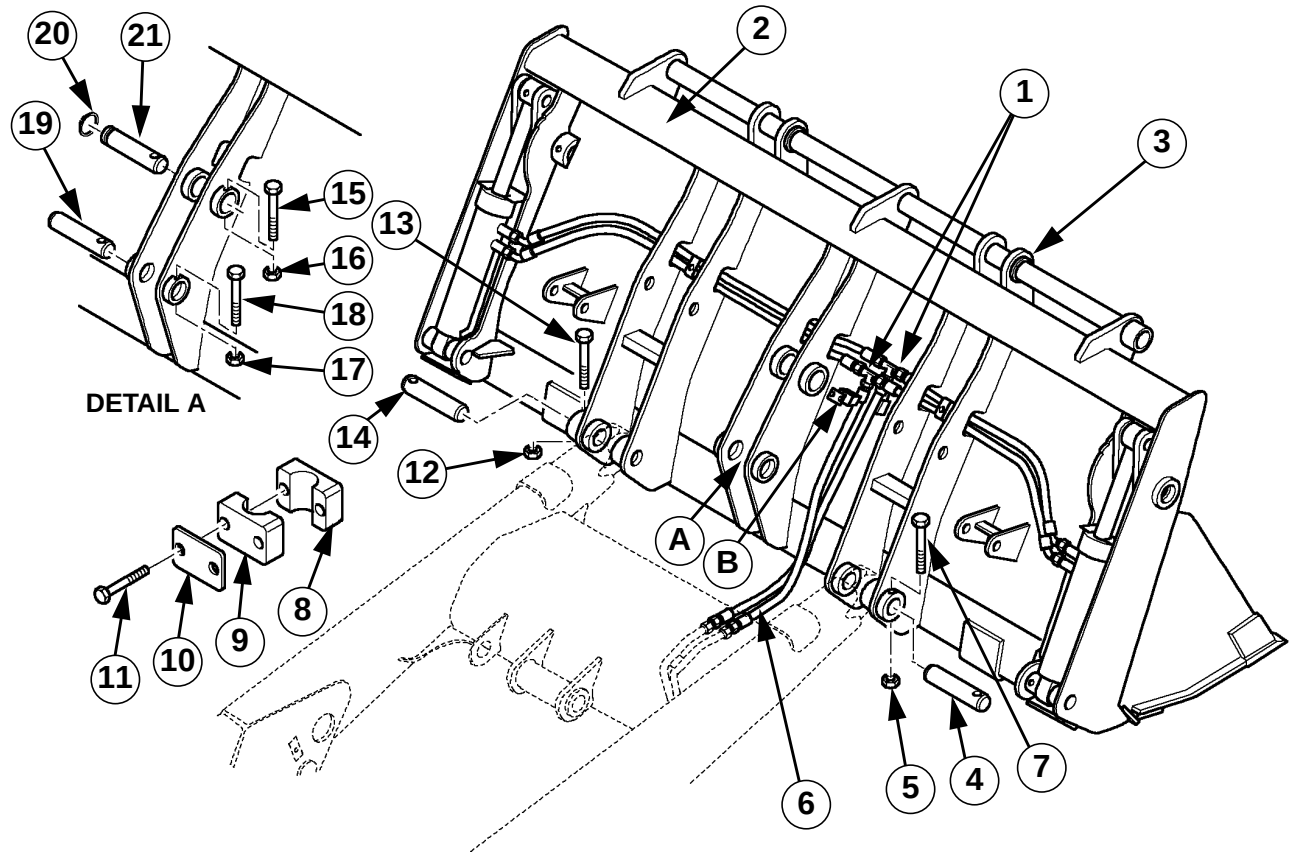
Inspection

1. Inspect the loader bucket (11) for damage. Repair as required.
2. Inspect the blade (10) if fitted, for wear or damage. Replace the blade if worn or damaged.
3. Inspect the teeth (7), if fitted, for wear or damage. Replace the teeth if worn or damaged.
4. Inspect all threaded components for wear or damage. Replace the components if worn or damaged

Assembly

NOTE : *Assemble the standard loader bucket in the reverse order from that of disassembly but note the following :*

- Thoroughly clean all bolt holes and surrounding areas where the teeth are to be fitted.



CS98M592

1. Park the machine on a level surface.
 2. Close the clamshell.
 3. Lower the loader beam and place the bucket flat on the ground.
 4. Switch off the engine.
 5. Depressurize the hydraulic system (see Section 8002).
 6. If fitted, put the forks (3) into the stowed position and secure them using the pins.
 7. Remove the bolts (11), the plates (10) and the clamps (8) and (9) from the bucket (2).
- NOTE :** When installing, tighten the bolts (11) to a torque of 12 Nm.
8. Place a suitable drainage container beneath the hose (6) connections.
 9. Note the position of the hoses (6) as an aid to installation.
 10. Disconnect the hoses (6) from the tee pieces (1).

11. Fit blanks to the hoses (6) and tee piece (1) connections.
 12. Tie the hoses (6) to the loader beam to keep them clear of the bucket (2).
 13. Remove the bolt (15) and the locknut (16) securing the link attachment pin (21) to the bucket (2). Discard the locknut (16).
- NOTE :** When installing, install a new locknut (16) and tighten the bolt (15) to a torque of 60 Nm.
14. Remove the circlip (20) from the pin (21).
 15. Support the loader cylinder with a rope or webbing sling and remove the pin (21) from the bucket (2).
 16. Remove the bolt (18) and the locknut (17) securing the cylinder attachment pin (19) to the bucket (2). Discard the locknut (17).
- NOTE :** When installing, install a new locknut (17) and tighten the bolt (18) to a torque of 60 Nm.
17. Remove the pin (19) from the bucket (2).

18. Remove the bolts (7) and (13) and the locknuts (5) and (12) securing the beam attachment pins (4) and (14) to the bucket (2). Discard the locknuts (5) and (12).

NOTE : *When installing, install new locknuts (5) and (12) and tighten the bolts (7) and (13) to a torque of 60 Nm.*

19. Remove the pins (4) and (14) from the bucket (2).
20. Start the engine and retract the bucket cylinder until it is the same length as the bucket links.
21. Reverse the machine away from the multi-purpose loader bucket. Insert a robust bar through the loader beams, the bucket links and the rod end of the bucket cylinder.

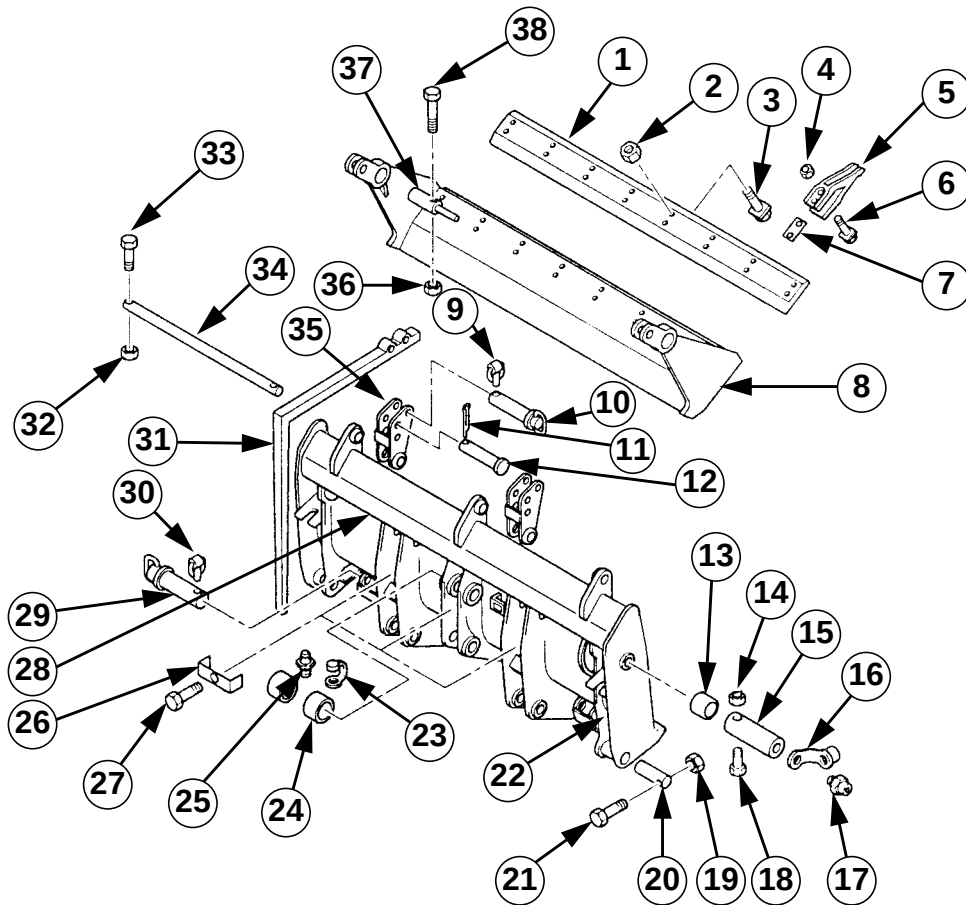


WARNING : *Do not operate the bucket function whilst the bucket cylinder is restrained by the bar or you will damage the bucket links and the loader beams.*

NOTE : *Install the multi-purpose bucket in the reverse order from that of the removal but note the following :*

22. After installation, make sure that the multi-purpose loader bucket operates correctly.
23. After installation, check the level of the hydraulic oil and replenish if necessary (see Section 8002).

Disassembly and assembly



CS98M593

1. Attach suitable lifting equipment to the fork (31) and support its mass.
2. If the fork (31) is in the stowed position, remove the linch pin (30) and the securing pin (29).
3. Remove the split pin (11) and the pin (12) from the pivot (35) and from the fork (31). Discard the split pin (11).

NOTE : When assembling, install a new split pin (11) on the pin (12).

4. Remove the linch pin (9) and the securing pin (10) from the pivot (35) and from the fork (31).
5. Lift the fork (31) clear of the bucket (28).
6. Repeat Steps 1 to 5 for the remaining fork (31).
7. Remove the locknut (32) and the bolt (33) which secure the shaft (34) to the bucket (28). Discard the locknut (32).

NOTE : When assembling, install a new locknut (32) and tighten the bolt (33) to a torque of 60 Nm.

8. Carefully, remove the shaft (34) from the attachment points on the bucket (28) and from the pivots (35).
9. Remove the pivots (35) from the shaft (34).
10. Attach suitable lifting equipment to the clam bucket (8) and support its mass.
11. Remove the nuts (36) and the bolts (38) which secure the clamping cylinder upper attachment pins (37) to the clam bucket (8).

NOTE : When assembling, tighten the bolts (38) to a torque of 30 Nm.

12. Remove the clamping cylinder upper attachment pins (37) from the clam bucket (8) and from the clamping cylinders (22).
13. Remove the locknuts (14) and the bolts (18) which secure the pins (15) to the bucket (28). Discard the locknuts (14).

NOTE : When assembling, install new locknuts (14) and tighten the bolts (18) to a torque of 60 Nm.

14. Remove the pins (15) from the bucket (28) and from the clam bucket (8).
15. Remove the caps (16) and the grease nipples (17) from the pins (15).

NOTE : *When assembling, apply the specified grease to the grease nipple (17).*

16. Lift the clam bucket (8) clear of the bucket (28) and place it securely on suitable packing.
17. Make sure that there is sufficient space available beneath the lower front edge of the clam bucket (8), to allow for the removal of the blade (if fitted) or the teeth (if fitted).
18. If a blade (1) is fitted to the clam bucket (8), place jacks and suitable packing beneath the blade (1).
19. Remove the nuts (2) and the bolts (3) that attach the blade (1) to the clam bucket (8).

NOTE : *When assembling, tighten the bolts (3) to a torque of 230 Nm.*

NOTE : *If the bolt threads or the nut is damaged, it might be necessary to use an acetylene cutting torch to remove the bolts. DO NOT apply heat to or cut on the bucket surface. To prevent damage to the bucket surface, the use of a cutting torch should be restricted to the cutting edge side only.*

20. Carefully lower the blade (1) clear of the clam bucket (8).
21. If teeth (5) are fitted to the clam bucket (8), remove the nuts (4) and the bolts (6) that attach the teeth (5) to the clam bucket (8).

NOTE : *When assembling, tighten the bolts (6) to a torque of 230 Nm.*

22. Carefully remove the teeth (5) and the shims (7) from the clam bucket (8).
23. Note the position and quantity of the shims (7) as an aid to assembling.
24. Fit identifying tags to the hydraulic hoses as an aid to assembling.
25. Disconnect the hydraulic hoses from the clamping cylinders (22).
26. Fit blanks to the hoses and to the clamping cylinder (22) connections.
27. Remove the bolts (27) and the clamps (26) that secure the hydraulic hoses to the bucket (28).

NOTE : *When assembling, tighten the bolts (27) to a torque of 30 Nm.*

28. Remove the hydraulic hoses from the bucket (28).
29. Remove the nuts (19) and the bolts (21) which secure the clamping cylinder lower attachment pins (20) to the bucket (28).

NOTE : *When assembling, tighten the bolts (21) to a torque of 30 Nm.*

30. Remove the clamping cylinder lower attachment pins (20) and the clamping cylinders (22) from the bucket (28).
31. Remove the cap (23) and the grease nipple (25) from the bucket (28).

NOTE : *When assembling, apply the specified grease to the grease nipple (25).*

32. Using a hand operated press, remove and discard the bushes (13) and (24) from the bucket (28).

NOTE : *When assembling, install new bushes (13) and (24) into the bucket (28).*

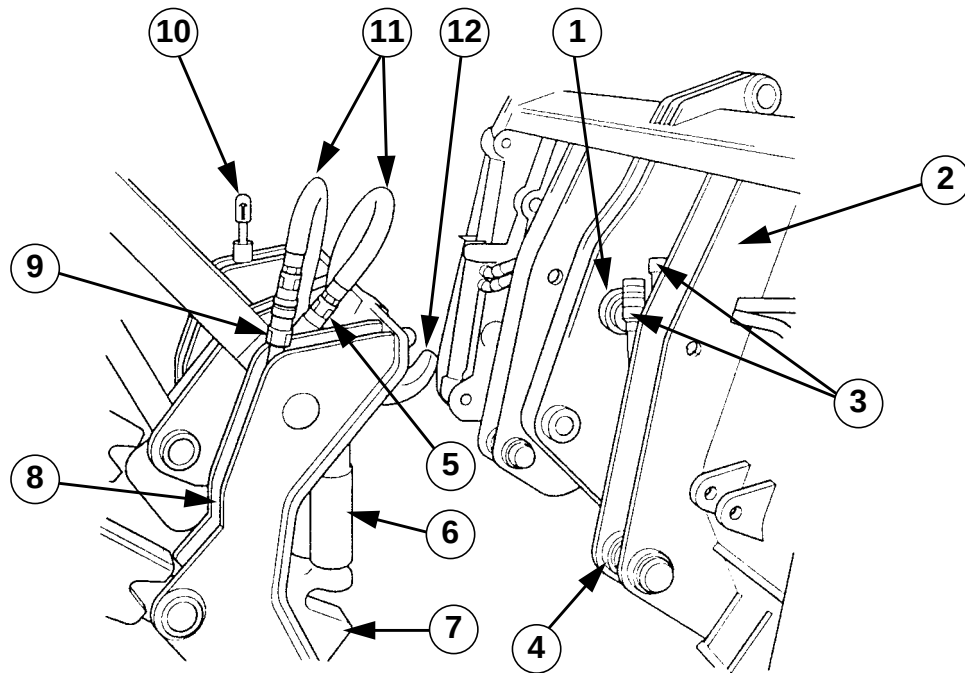
Inspection

1. Inspect the clam bucket (8) and the bucket (28) for damage. Repair as required.
2. Inspect the blade (1) if fitted, for wear or damage. Replace the blade if worn or damaged.
3. Inspect the teeth (5) if fitted, for wear or damage. Replace the teeth if worn or damaged.
4. Inspect all threaded components for wear or damage. Replace the components if worn or damaged.
5. Inspect the hydraulic hoses for wear or damage. Replace the hoses if worn or damaged.
6. Inspect the clamping cylinders (22) for wear, damage or leakage. Service the clamping cylinders as required.
7. Inspect the forks (31), the shaft (34) and the pivots (35) for wear or damage. Replace the components if worn or damaged.
8. Inspect the pins (9), (10), (12), (15), (20), (29), (30) and (37) for wear or damage. Replace the pins if worn or damaged.

NOTE : *Assemble the multi-purpose bucket in the reverse order from that of disassembly.*

MULTI-PURPOSE LOADER BUCKET FROM A QUICK ATTACH UNIT

Removal



CS98M594

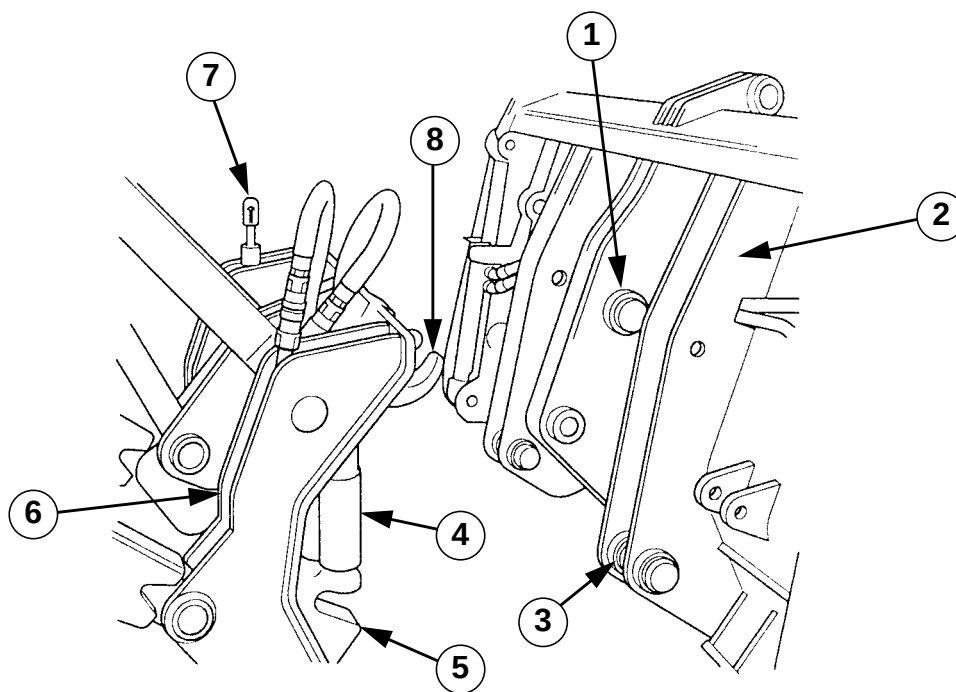
1. Park the machine on a level surface.
2. Close the clamshell and fully crowd the loader bucket.
3. Lower the loader beam until the bucket is flat on the ground.
4. Switch off the engine.
5. Depressurize the hydraulic system (see Section 8002).
6. If fitted, put the forks into the stowed position and secure them using the pins.
7. Make sure that the solenoid valve connector (5) and the tube connector (9) on the quick attach unit (8) are clean and free from obstructions.
8. Disconnect the hydraulic hoses (11) from the couplings (3) on the bucket (2), and connect them to the solenoid valve connector (5) and the tube connector (9) on the quick attach unit (8).
9. Start the engine.
10. Press the right side of the multi-purpose bucket control rocker switch, until the clamping cylinders (6) on the quick attach unit (8) are fully retracted.
11. Make sure that the indicator (10) is visible above its housing.
12. Operate the joystick to dump the quick attach unit (8) so that the hooks (7) and (12) are disengaged from the bucket pins (1) and (4).
13. Reverse the machine away from the multi-purpose loader bucket (2).

Installation

NOTE : Install the multi-purpose bucket onto the quick attach unit in the reverse order from that of removal but note the following.

1. After installation, make sure that the multi-purpose loader bucket operates correctly.
2. After installation, check the level of the hydraulic oil, replenish if necessary (see section 8002).

STANDARD LOADER BUCKET FROM A QUICK ATTACH UNIT



CS98M595

1. Park the machine on a level surface.
2. Lower the loader beam until the bucket is flat on the ground.
3. If fitted, put the forks into the stowed position and secure them using the pins.
4. Press the right-side of the multi-purpose bucket control rocker switch, until the clamping cylinders (4) on the quick attach unit (6) are fully retracted.
5. Make sure that the indicator (7) is visible above its housing.
6. Operate the joystick to dump the quick attach unit (6) so that the hooks (5) and (8) are disengaged from the bucket pins (1) and (3).
7. Reverse the machine away from the multi-purpose loader bucket (2).

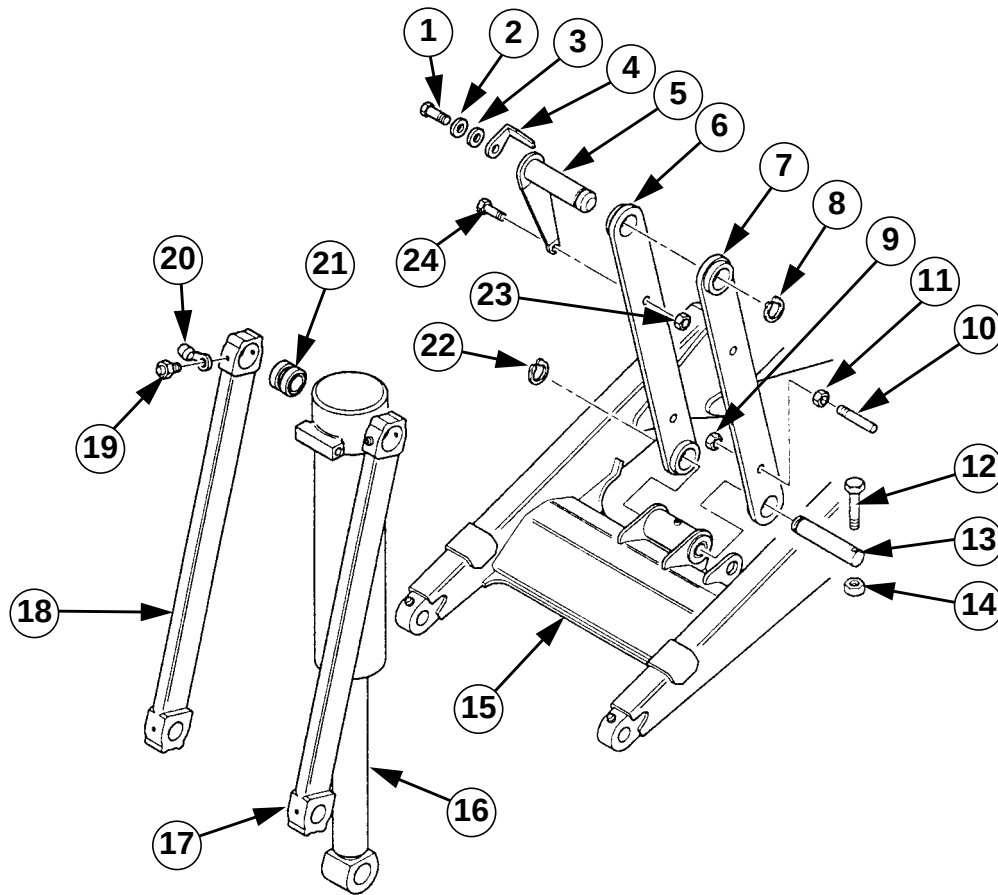
Installation

NOTE : *Install a standard loader bucket onto a quick attach unit in the reverse order from that of removal but note the following :*

- After installation, make sure that the loader bucket operates correctly.

BUCKET CYLINDER AND LINKS

Removal



CS98M596

1. Park the machine on a level surface.
 2. Lower the loader beam and position the bucket flat on the ground.
 3. Depressurize the hydraulic system (see section 8002).
 4. Remove the loader bucket (see page 9 or 11).
 5. Fit identifying tags to the hydraulic hoses as an aid to installation.
 6. Place a suitable drainage container beneath the hose connections.
 7. Disconnect the hydraulic hoses from the bucket cylinder (16).
 8. Fit blanks to the hose connections and to the bucket cylinder connections.
 9. Remove the nuts (9) and (11) and the potentiometer operating stud (10) from the link (7).
 10. Attach suitable lifting equipment to the bucket cylinder (16).
 11. Remove the circlip (8) from the pin (5).
 12. Support the link (7).
 13. Remove the locknut (23) and the bolt (24) attaching the pin (5) to the link (6). Discard the locknut (23).
 14. Using a hammer and a soft metal drift, remove the pin (5).
- NOTE :** When installing, install a new locknut (23) and tighten the bolt (24) to a torque of 60 Nm.

15. When the pin (5) is sufficiently removed, remove the soft metal drift and lower the link (7) onto the loader crossbeam.
16. Support the link (6) and fully remove the pin (5).
17. Lower the link (6) onto the loader beam.
18. Remove the bucket cylinder (16) and lower it to the ground.
19. Service the bucket cylinder (16).

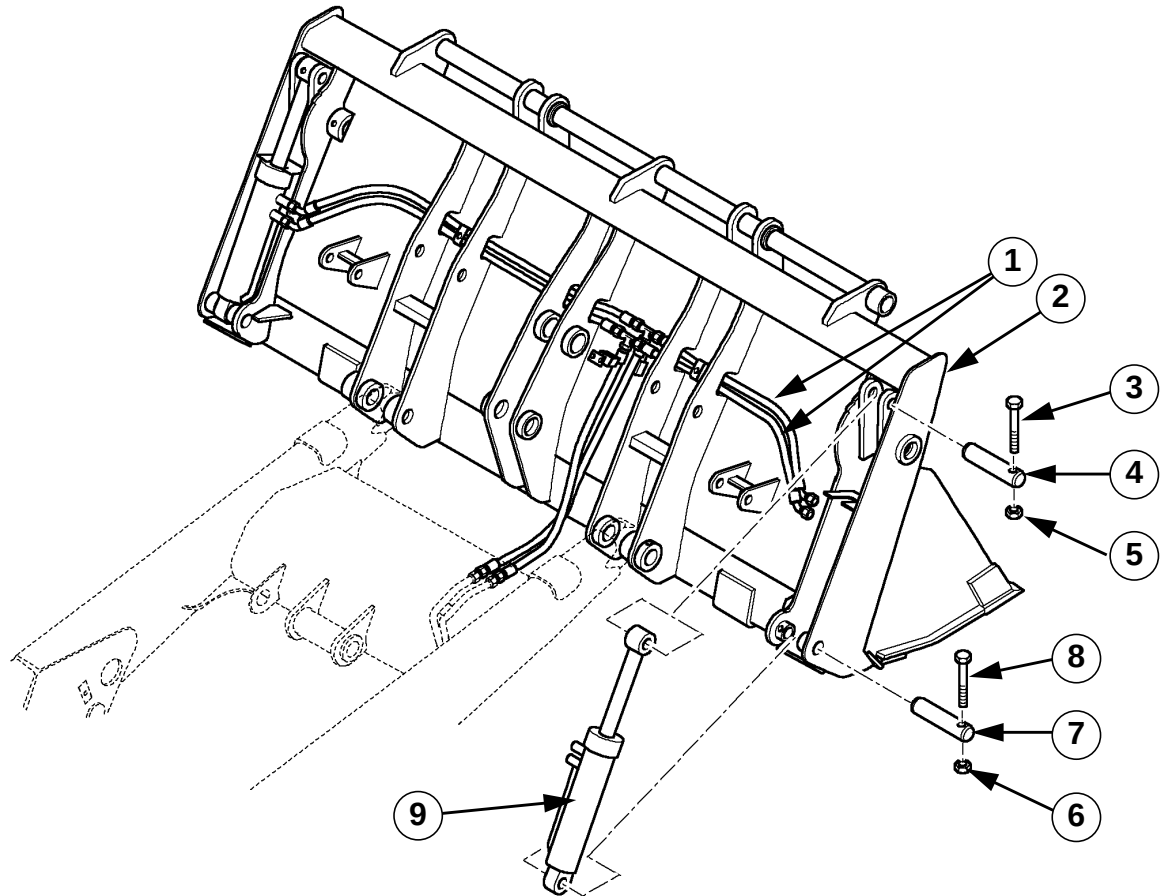
Installation

NOTE : *Install the bucket cylinder and links in the reverse order from that of removal but note the following.*

1. After installation, apply the specified grease to the grease nipples (19).
2. After installation of the loader bucket, make sure that the bucket cylinder (16) operates correctly.
3. Check the level of the hydraulic oil, replenish if necessary (see section 8002).

MULTI-PURPOSE LOADER BUCKET CLAMPING CYLINDER

Removal



CS98M597

1. Park the machine on a level surface.
2. Remove the multi-purpose loader bucket (see page 15).
3. Fit identifying tags to the hydraulic hoses (1) as an aid to installation.
4. Place a suitable drainage container beneath the hose connections.
5. Disconnect the hydraulic hoses (1) from the clamping cylinder (9).
6. Fit blanks to the hose connections and to the clamping cylinder connections.
7. Remove the nut (6) and the bolt (8) securing the clamping cylinder lower attachment pin (7) to the loader bucket (2).
8. Remove the clamping cylinder lower attachment pin (7) from the loader bucket (2) and from the clamping cylinder (9).
9. Remove the nut (5) and the bolt (3) which secure the clamping cylinder upper attachment pin (4) to the loader bucket (2).
10. Remove the clamping cylinder upper attachment pin (4) from the loader bucket (2) and from the clamping cylinder (9).
11. Remove the clamping cylinder (9) from the loader bucket (2).

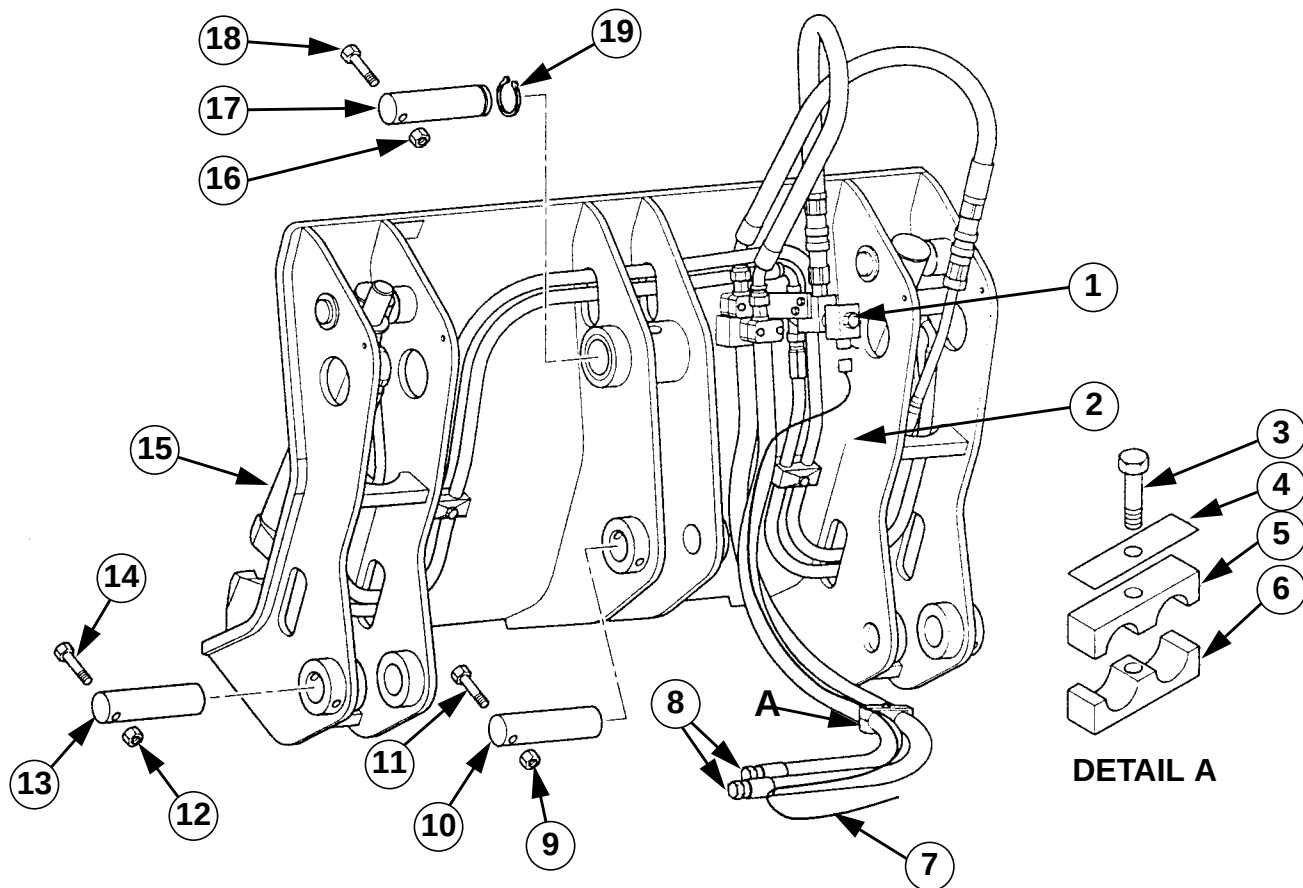
Installation

NOTE : *Install of the multi-purpose loader bucket clamping cylinder in the reverse order from that of removal but note the following :*

1. Make sure that the multi-purpose loader bucket clamp cylinder operates correctly.
2. Check the level of the hydraulic oil, replenish if necessary (see Section 8002).

QUICK ATTACH UNIT

Removal



CS98M598

1. Park the machine on a level surface.
 2. Remove the multi-purpose loader bucket, if fitted (see page 15).
 3. Remove the standard loader bucket, if fitted (see page 11).
 4. Switch off the engine.
 5. Depressurize the hydraulic system (see section 8002).
 6. Place a suitable drainage container beneath the hose (8) connections on the loader beam.
 7. Note the position of the hoses (8) as an aid to installation.
 8. Disconnect the hoses (8) from the connections on the loader beam.
 9. Fit blanks to the hoses (8) and to the connections on the loader beam.
 10. Remove the bolt (3), the plate (4) and the clamps (5) and (6) attaching the hydraulic hoses (8) to the loader beam.
- NOTE :** When installing, tighten the bolt (3) to a torque of 30 Nm.
11. Disconnect the electrical cable (7) from the solenoid valve (1).
 12. Remove and discard the tie wraps attaching the electrical cable (7) to the hydraulic hoses (8).
 13. Remove the bolt (18) and the locknut (16) securing the link attachment pin (17) to the quick attach unit (2). Discard the locknut (16).
- NOTE :** When installing, install a new locknut (16) and tighten the bolt (18) to a torque of 60 Nm.
14. Remove the circlip (19) from the pin (17).

15. Support the loader beam links and remove the pin (17) from the quick attach unit (2).
16. Remove the bolt (11) and the locknut (9) securing the cylinder attachment pin (10) to the quick attach unit (2). Discard the locknut (9).

NOTE : *When installing, install a new locknut (9) and tighten the bolt (11) to a torque of 60 Nm.*

17. Support the bucket cylinder and remove the pin (10) from the quick attach unit (2).
18. Tie the two loader beam links and the bucket cylinder together using rope, to prevent them from swinging.
19. Remove the bolts (14) and the locknuts (12) securing the beam attachment pins (13) to the quick attach unit (2). Discard the locknuts (12).

NOTE : *When installing, install a new locknuts (12) and tighten the bolts (14) to a torque of 60 Nm.*

20. Remove the pins (13) from the quick attach unit (2).
21. Start the engine and reverse the machine away from the quick attach unit.

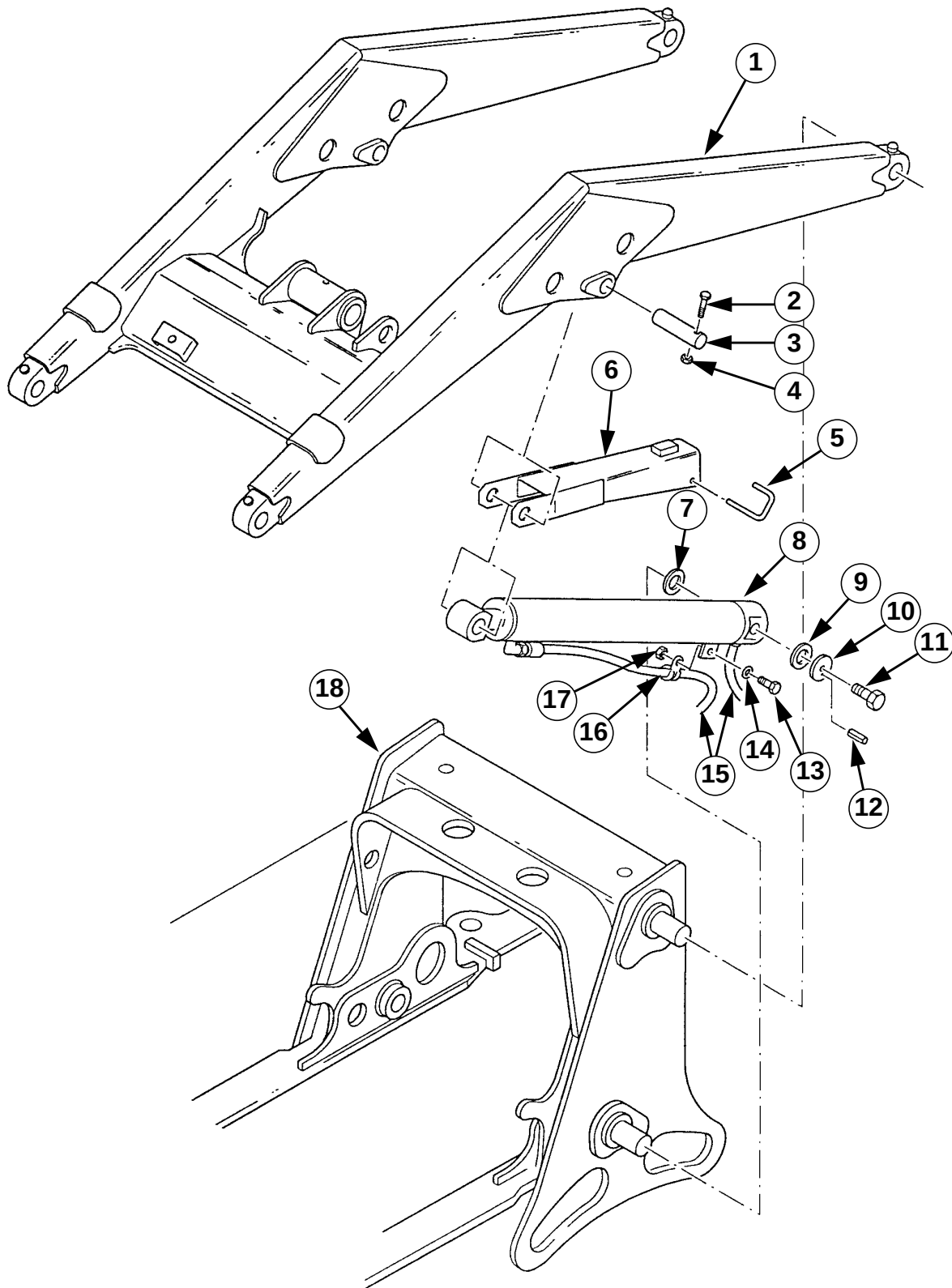
Installation

NOTE : *Install the quick attach unit in the reverse order from that of removal but note the following :*

1. Use new tie wraps to attach the electrical cable (7) to the hydraulic hoses (8).
2. After installation, make sure that the quick attach unit clamping cylinders (15) operate correctly.
3. After installation, check the level of the hydraulic oil, replenish if necessary (see Section 8002).

LOADER BEAM CYLINDER

Perspective view



Removal

1. Park the machine on a level surface.
2. Fully crowd the loader bucket and lower the loader beam until the bucket is flat on the ground.
3. Depressurize the hydraulic system (see Section 8002).
4. Fit identifying tags to the hydraulic hoses (15) as an aid to installation.
5. Place a suitable drainage container beneath the hose connections.
6. Disconnect the hydraulic hoses (15) from the loader beam cylinder (8).
7. Fit blanks to the hose connections and to the cylinder connections.
8. Remove the nut (17), the washer (14), the bolt (13) and the clip (16) attaching the front hydraulic hose (15) to the loader beam cylinder (8).

NOTE : *When installing, tighten the bolt (13) to a torque of 30 Nm.*

9. Attach suitable lifting equipment to the loader beam cylinder (8).

NOTE : *The safety strut (6) is only installed on the left side loader beam cylinder.*

10. Release the pin (5) attaching the safety strut (6) to the loader beam (1).
11. Remove the locknut (4) and the bolt (2) securing the pin (3) to the loader beam (1). Discard the locknut (4).

NOTE : *When installing, install a new locknut (4) and tighten the bolt (2) to a torque of 60 Nm.*

12. Remove the pin (3) from the loader beam (1) and from the loader beam cylinder (8).
13. Remove the safety strut (6) from the loader beam cylinder (8).
14. Remove the bolt (11), the washer (10) and the thrust washer (9) attaching the loader cylinder (8) to the chassis (18).

NOTE : *When installing, tighten the bolt (11) to a torque of 230 Nm.*

15. Remove the loader cylinder (8) from the pin on the chassis (18).
16. Remove the thrust washer (7) from the chassis (18).

Installation

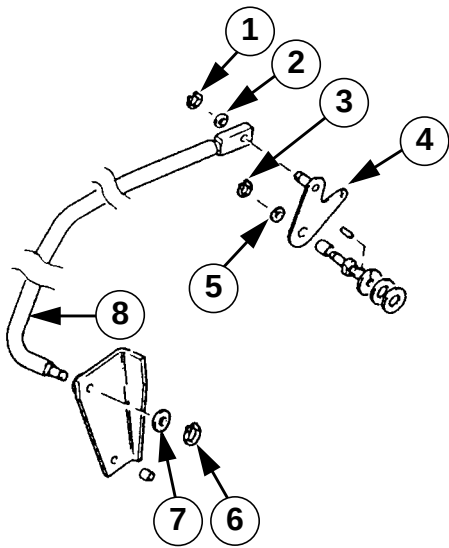
NOTE : *Install the loader beam cylinder in the reverse order from that of removal but note the following :*

1. After installation, make sure that the loader beam cylinder operates correctly.
2. After installation, check the level of the hydraulic oil, replenish if necessary (see Section 8002).

LOADER BEAM

Removal

1. Park the machine on a level surface.
2. Remove the loader bucket (see page 11).
3. Remove the bucket cylinder and links (see page 21).
4. If fitted, remove the quick attach unit (see page 24).
5. Remove the loader beam cylinders (see page 26).
6. Only carry out steps 7 through 10 on machines with mechanical loader controls.
- 7.

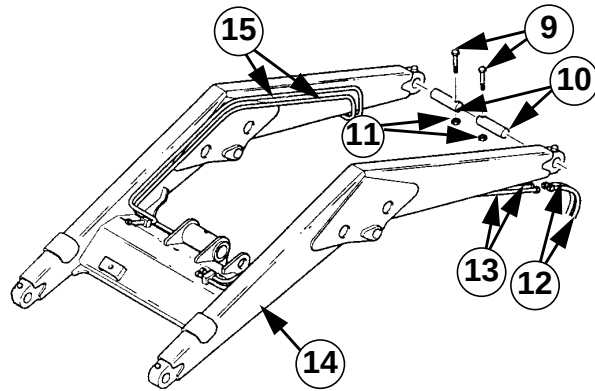


CS98M600

Remove the circlip (1) and the washer (2) from the top pivot pin of the feedback link (8).

8. Remove the circlip (6) and the washer (7) from the bottom pivot pin of the feedback link (8).
9. Remove the feedback link (8).
10. Remove the nut (3) and the washer (5) and slide the bellcrank (4) from the pivot pin.
11. Only carry out step 12 on machines with electronic loader controls.
12. Disconnect the bucket linkage and remove the loader bucket potentiometer (see page 33).
13. Remove the hood.

14.



CS98M601

Fit identifying tags to the hydraulic pipes (13) and (15) as an aid to installation.

15. Place suitable drainage container beneath the pipe connections.
16. Disconnect the hydraulic pipes (13) and (15) from the hydraulic hoses (12).
17. Fit blanks to the pipe connections and to hose connections.
18. Attach a suitable lifting equipment to the loader beam (14). Make sure the two front slings are approximately 800 mm (31 in) longer than the rear pair.
19. Remove the locknuts (11) and the bolts (9) which secure the pins (10) to the chassis. Discard the locknuts (11).

NOTE : When installing, install new locknuts (11) and tighten the bolts (9) to a torque of 60 Nm.

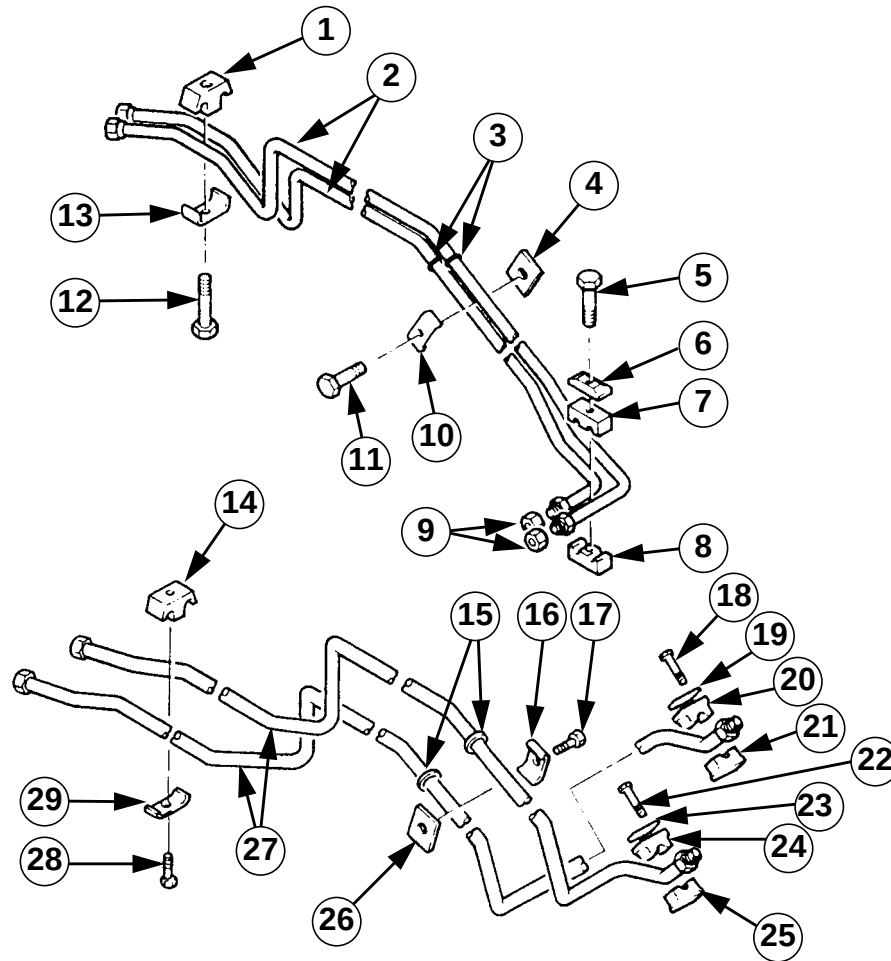
20. Carefully remove the pins (10) that attach the loader beam (14) to the chassis.
21. Lift the loader beams (14) clear of the machine. If the loader beams (14) grip the tower and make removal difficult, use the loader beam expander to jack the loader beams apart to aid their removal.

Installation

NOTE : *Install the loader beam in the reverse order from that of removal but note the following :*

1. Shims are only fitted adjacent to the outer face of the beam pivot. The self locking nut and bolt which retain the inner end of each beam pivot pin should be tightened to 67 Nm (50 lbf ft).
2. The bolts on the outer ends of the loader beam pivots must be tightened to 230 Nm (170 lbf ft).
3. The self-locking nut and bolt, which retain the pivot pin for the rod end of each beam lift cylinder, should be tightened to 48 Nm (35 lbf ft).
4. Only carry out Step 6 on machine with electronic loader controls.
5. Calibrate the loader (see Section 4008).

Disassembly and assembly



CS98M602

1. Remove the bolts (5), (11) and (12), the plate (6), the clamps (1), (7), (8), (10) and (13) and the pad (4) attaching the auxiliary services hydraulic pipes (2) to the loader beam.

NOTE : When assembling, tighten the bolts (5), (11) and (12) to a torque of 30 Nm.

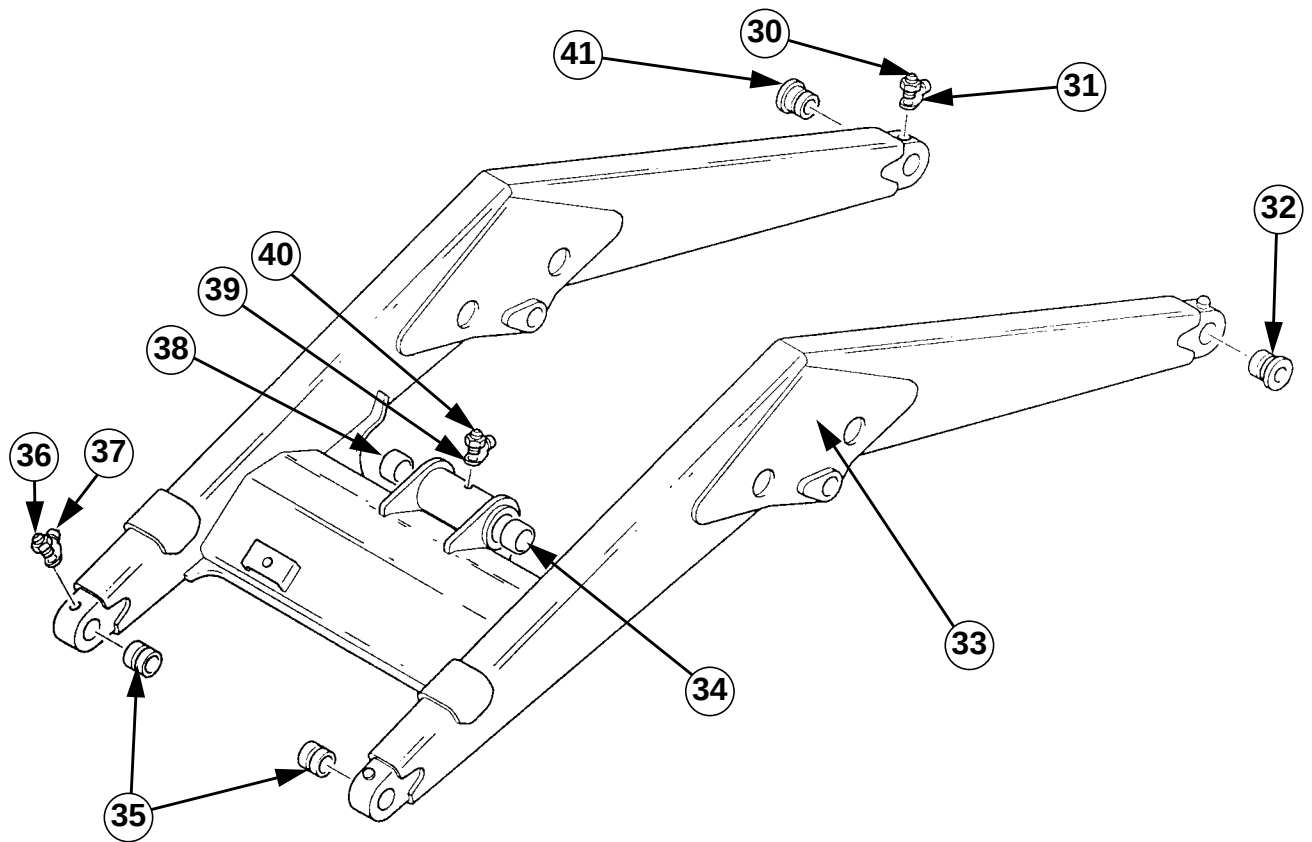
2. Remove the hydraulic pipes (2) from the loader beam.
3. If fitted, remove the caps (9) from the hydraulic pipes (2).
4. Remove the ring (3) from each hydraulic pipe (2).
5. Remove the bolts (17), (18), (22) and (28), the plates (19) and (23), the clamps (14), (16), (20), (21), (24), (25) and (29) and the pad (26) which attach the bucket cylinder hydraulic pipes (27) to the loader beam.

NOTE : When assembling, tighten the bolts (17) and (28) to a torque of 30 Nm.

NOTE : When assembling, tighten the bolts (18) and (22) to a torque of 12 Nm.

6. Remove the hydraulic pipes (27) from the loader beam.
7. Remove the ring (15) from each hydraulic pipe (27).

8.



CS98M603

Remove the grease nipples (30), (36) and (40) and the caps (31), (37) and (39) from the loader beam (33).

NOTE : *when assembling, apply the specified grease to the grease nipples (30), (36) and (40).*

9. Using a hand press, remove and discard the bushes (32), (34), (35), (38) and (41) from the loader beam (33).

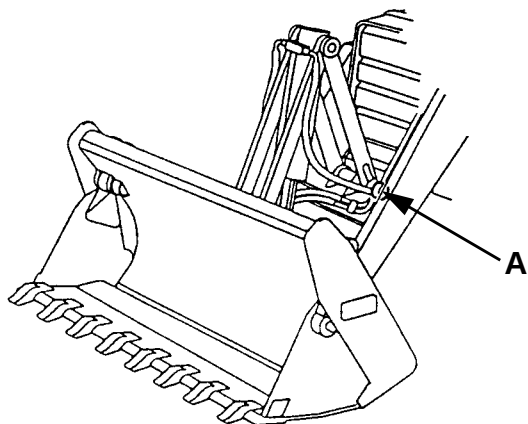
NOTE : *When assembling, install new bushes (32), (34), (35), (38) and (41) into the loader beam (33).*

NOTE : *Assemble the loader beam in the reverse order from that of disassembly.*

LOADER BUCKET POTENTIOMETER (Models 960 and 965)

Removal

1.

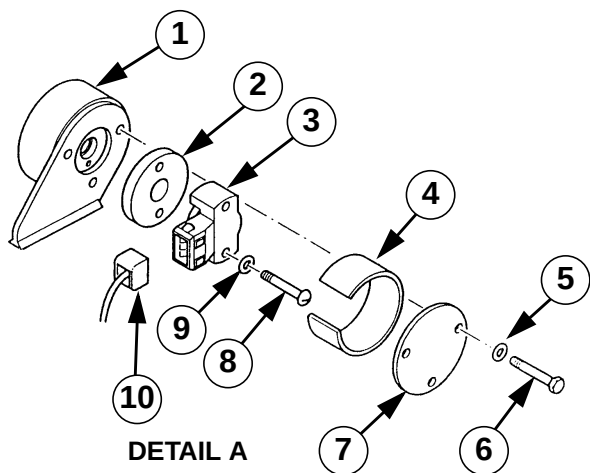


CS98M604

Installation

NOTE : *Install the loader bucket potentiometer in the reverse order from that of removal but note the following :*

- After installation, calibrate the loader system (see Section 4008).



DETAIL A

CS98M605

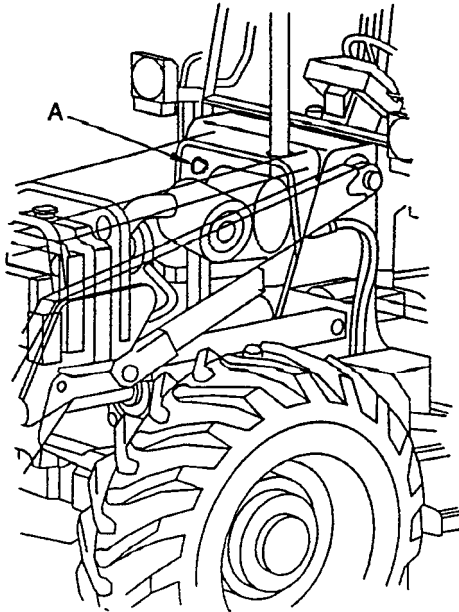
Note the position of the plate (7) and remove the bolts (6) and the washers (5).

2. Remove the plate (7) and the tube (4).
3. Disconnect the electrical connector (10) from the potentiometer (3).
4. Remove the screws (8) and the washers (9).
5. Remove the potentiometer (3) and the spacer (2).

LOADER BEAM POTENTIOMETER (Models 960 and 965)

Removal

1. Open the hood and engage the hood prop.
- 2.

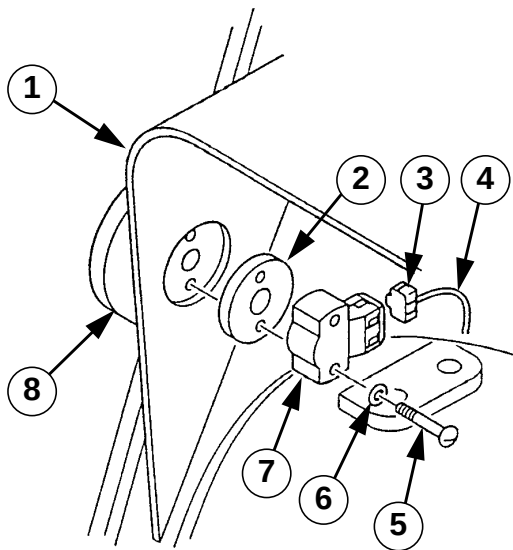


CS98M606

Installation

NOTE : *Install the loader beam potentiometer in the reverse order from that of removal but note the following :*

- After installation, calibrate the loader system (see Section 4008).



DETAIL A

CS98M607

Disconnect the electrical connector (3) and attach the harness (4) to the structure with temporary ties.

3. Remove the bolts (5) and the washers (6).
4. Remove the potentiometer (7) and the spacer (2).

Section

9007

CAB AND ROPS

2006

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CAB 3

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REMOVAL AND INSTALLATION OF THE CAB GLAZING PANEL 12

REMOVAL AND INSTALLATION OF THE REAR WINDSCREEN GLAZING PANEL 13

**WARNING :** *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

CAB

Special tools

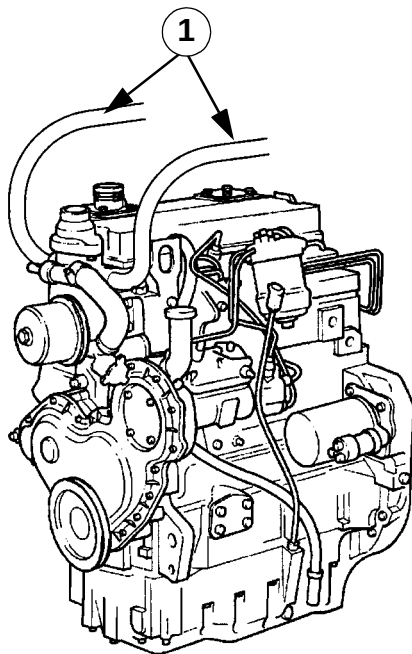
- Lifting frame

Removal



Refrigerant gas is dangerous. Always ask a specialist company to empty, flush or fill the air conditioning system.

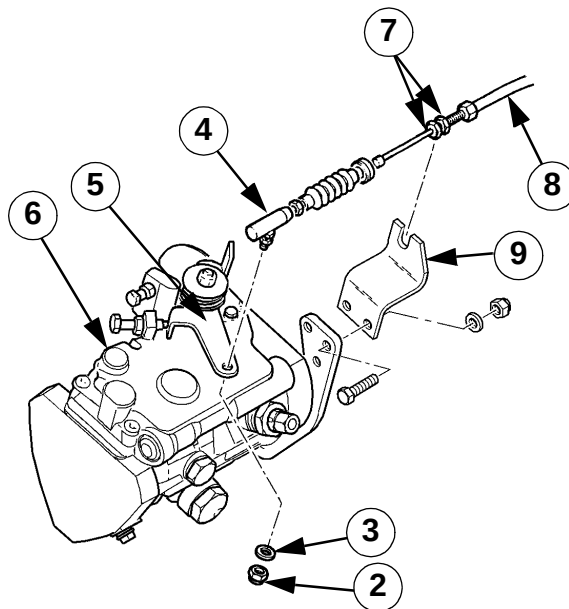
1. Drain the refrigerant from the air conditioning system (if fitted).
2. Park the machine on level ground. Lower the loader to the ground. If space allows, position the backhoe boom and dipper fully stretched out on the ground. If space is limited, position the backhoe on the boom transport safety lock.
3. Lower the stabilizer legs until the rear wheels are just clear of the ground. Release the pressure from the hydraulic system. Position robust stands under the chassis and then remove the rear wheels.
4. Open the hood.
- 5.



CS98M535

Place a suitable drainage tray below the engine. Disconnect the heater hoses (1) from the engine and drain the radiator coolant.

6. Remove the front and rear floor mats from the cab. Remove the access panels from the cab floor.
7. Disconnect the battery negative lead (see Section 4003).
8. Remove the rear fenders (see Section 9011).
- 9.

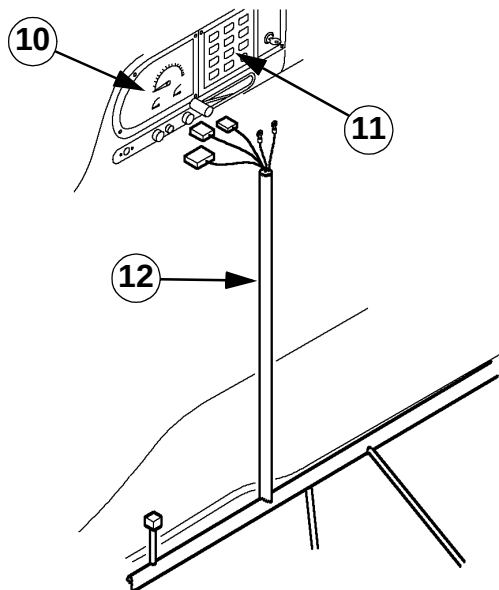


CI98M514

Loosen and remove the nut (2), the washer (3) and disconnect the ball joint (4) from the lever (5) on the fuel injection pump (6). Loosen the locknuts (7) and disconnect the throttle cable (8) from the bracket (9).

10. Disconnect the heater hoses from the thermostat housing.

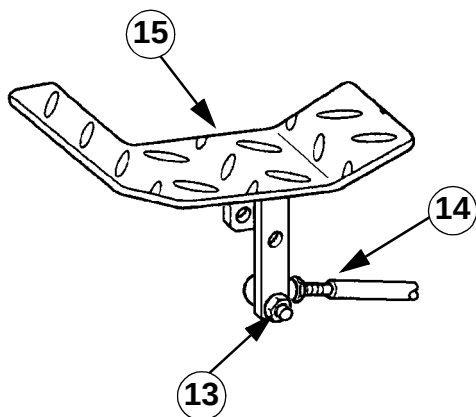
11.



CI98M515

Remove the side console tachymeter housing (10) and the switch housing (11). Then disconnect the cab supply cable (12).

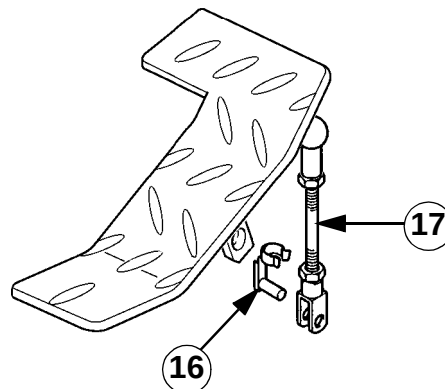
12.



CI98M516

If an extending dipperstick is fitted, remove the nut (13) and disconnect the control linkage (14) of the extending dipperstick from the pedal (15).

13.

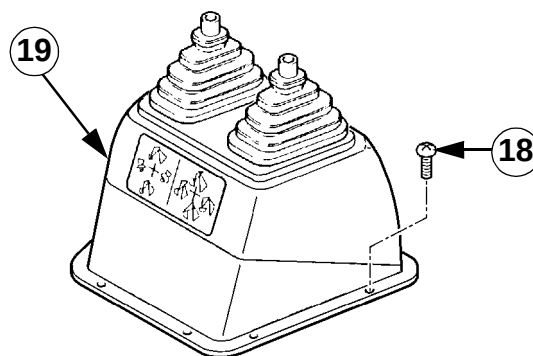


CI98M517

If a hammer attachment is fitted, remove the locking pin (16) from the control rod (17) and the spool.

14. Only carry out Steps 15 and 16 on machines with mechanical backhoe controls.

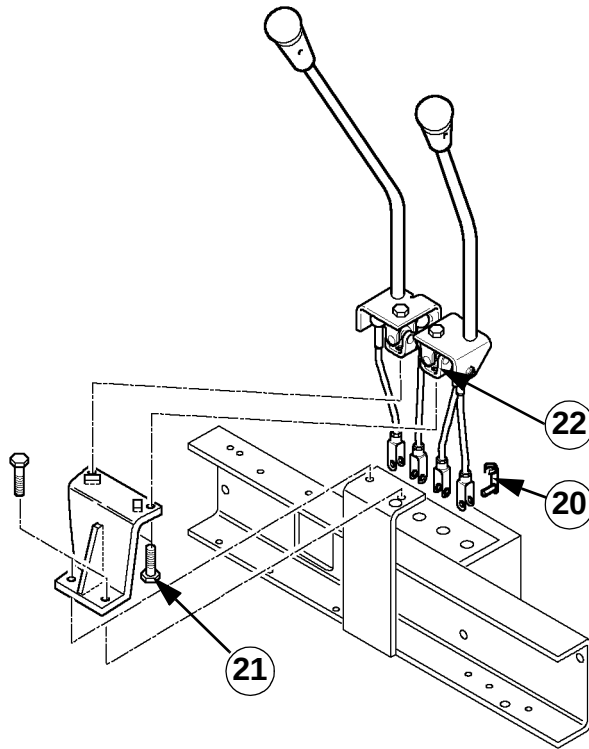
15.



CI98M518

Remove the screws (18) and move the tower (19) to access the controls.

16.



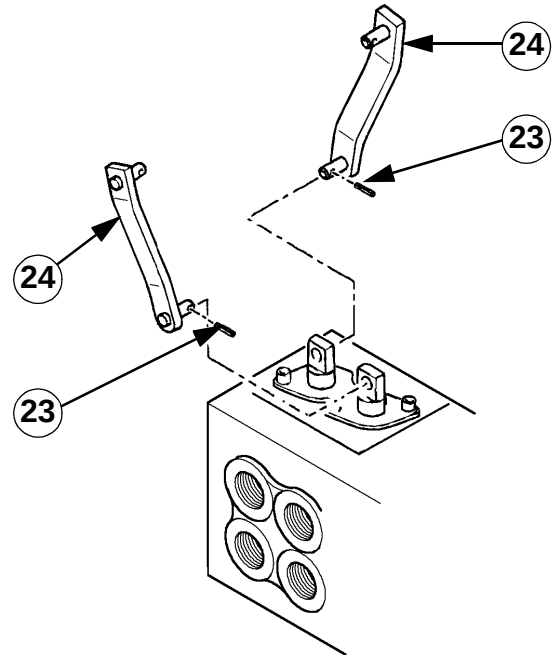
CI98M519

Disconnect the four quick-release clevis pins (20) from the spools. Remove the bolts (21) to disconnect the yokes (22). Move the tower (19) clear of the valve block.

17. Only carry out Step 18 on 965 machines.

18. Fit identification tags to each Hirschmann plug as an aid to installation and remove the Hirschmann plug from each backhoe control valve spool.

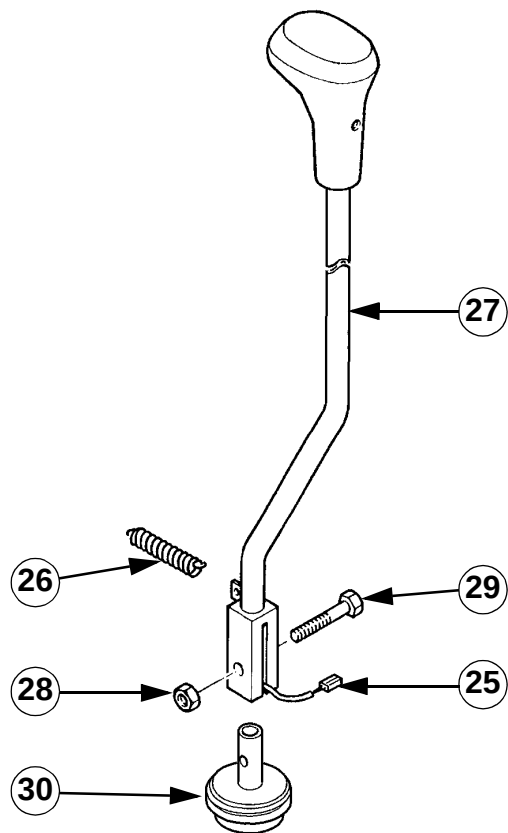
19.



CS98M536

Remove the pins (23) and disconnect the stabilizer control linkages (24) from the valve block.

20.



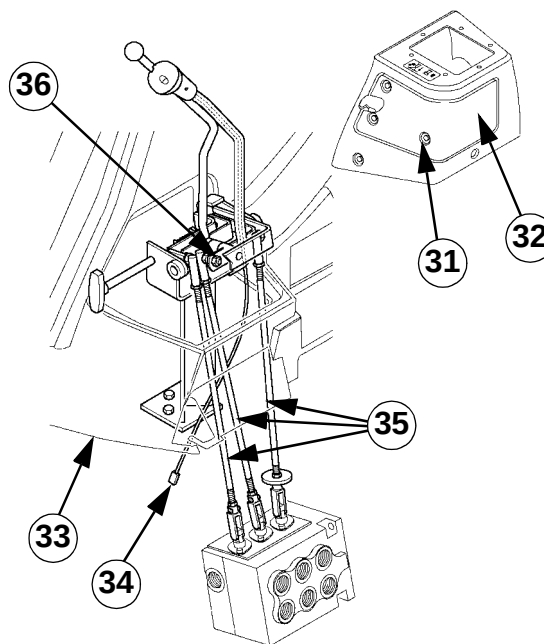
CI98M520

Disconnect the electrical connector (25) from the declutch switch. Disconnect the spring (26) from the gear stick (27).

Remove the nut (28) and the bolt (29) and disconnect the gear stick (27) from the gearbox stub shaft (30).

21. Only carry out Step 22 on machines with mechanical loader controls.

22.



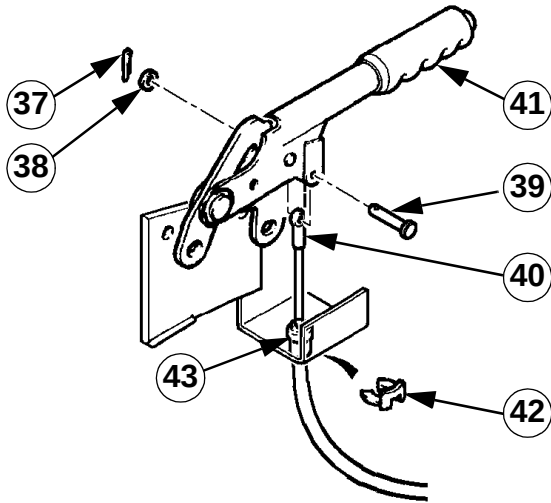
CI98M521

Remove the screws (31) and the inspection cover (32) from the tower (33). Disconnect the electrical connector (34) from the loader lever declutch switch. Note the positions and settings of the control rods (35). Remove the nuts (36) and disconnect the controls rods (35).

23. Only carry out Step 24 on 960 and 965 machines.

24. Fit identification tags to each Hirschmann plug as an aid to installation and remove the Hirschmann plug from each loader control valve spool.

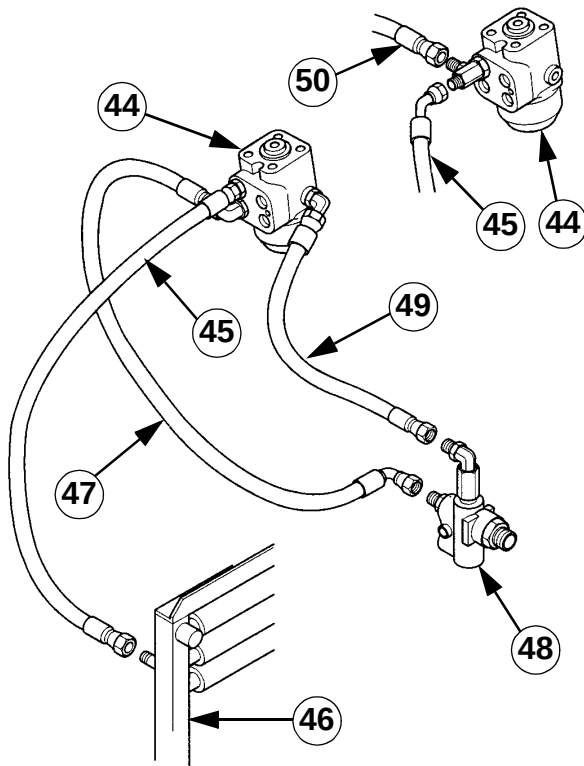
25.



CI98M522

Remove and discard the split pin (37). Remove the washer (38) and the clevis pin (39) and disconnect the cable (40) from the backhoe transport lock lever (41). Remove the circlips (42) from the outer cable (43) and feed the cable (40) back through the cab floor.

26.



CS98M537

Disconnect the steering system hydraulic hoses between the orbitrol steering valve (44) and the steering cylinder at the steering cylinder.

Remove the clamping block from the steering system hydraulic hoses adjacent to the right side of the engine.

Disconnect the steering system return hydraulic hose (45) at the oil cooler (46).

Disconnect the hydraulic feed hose (47) from the priority valve (48).

Disconnect the load sensing hydraulic hose (49) from the priority valve (48).

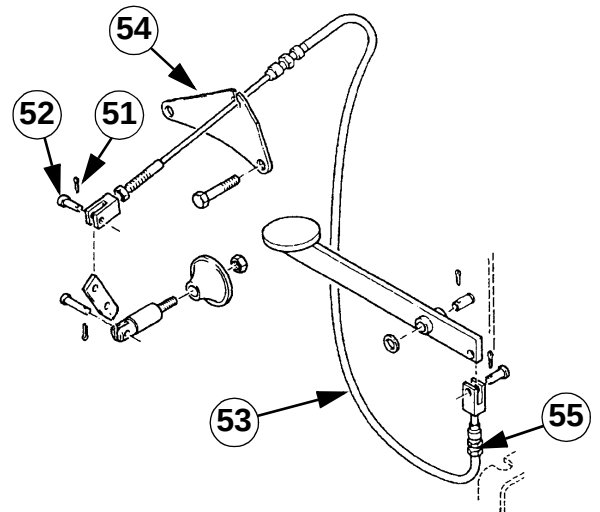
27. Only carry out Step 28 on 4-wheel steer machines.

28. Disconnect the hydraulic hose (50) from the orbitrol steering valve (44).

29. Put caps on the open ends of all hydraulic hoses, the orbitrol steering valve (44), the priority valve (48) and the oil cooler (46).

30. Only carry out Step 31 on 2-wheel steer machines.

31.

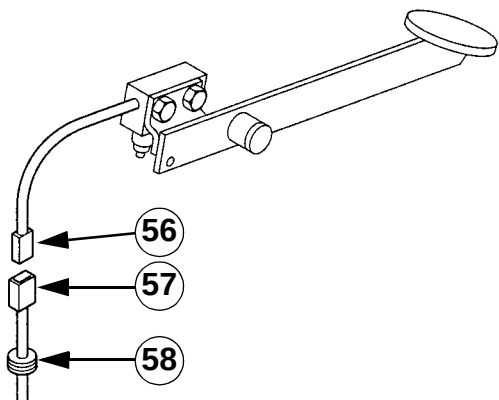


CI98M523

Remove and discard the split pin (51) and remove the clevis pin (52). Remove the cable (53) from the bracket (54). Note the setting of the cable (53) of the differential lock and loosen the locknuts (55).

32. Only carry out Step 29 on 4 wheel steer machines.

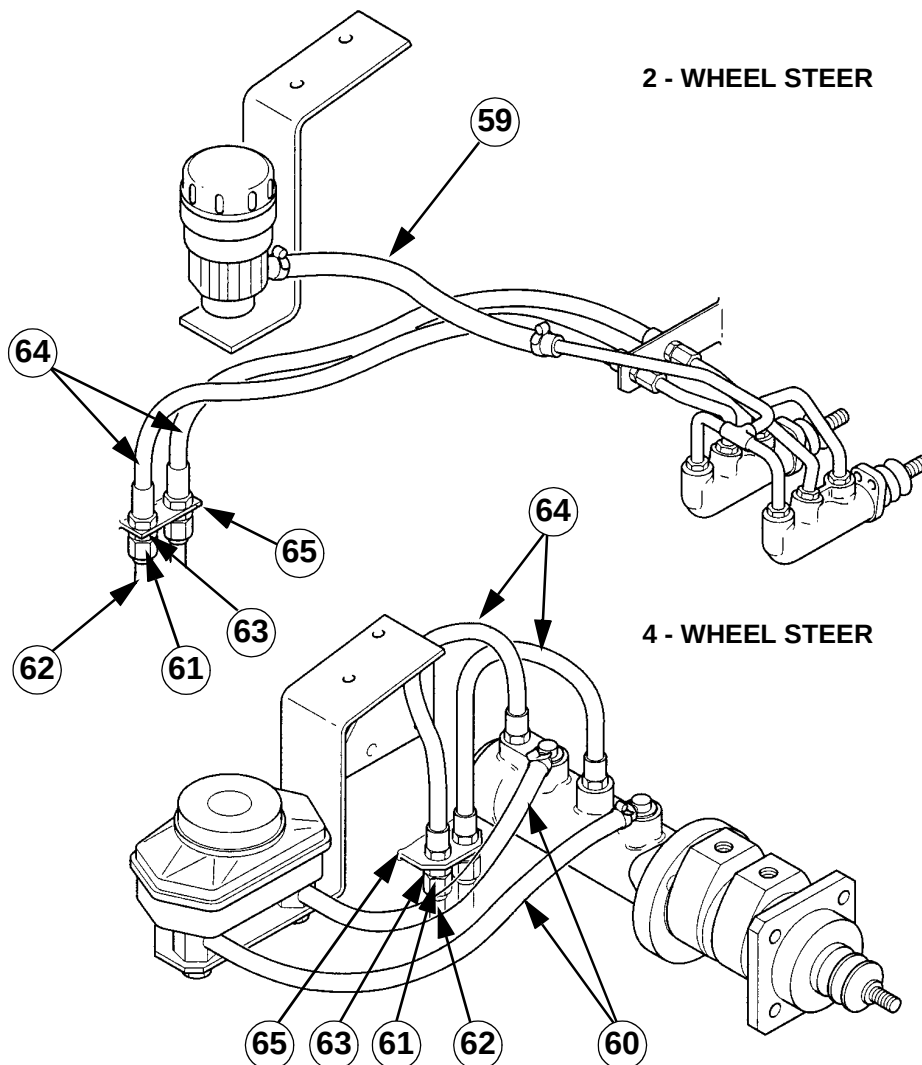
33.



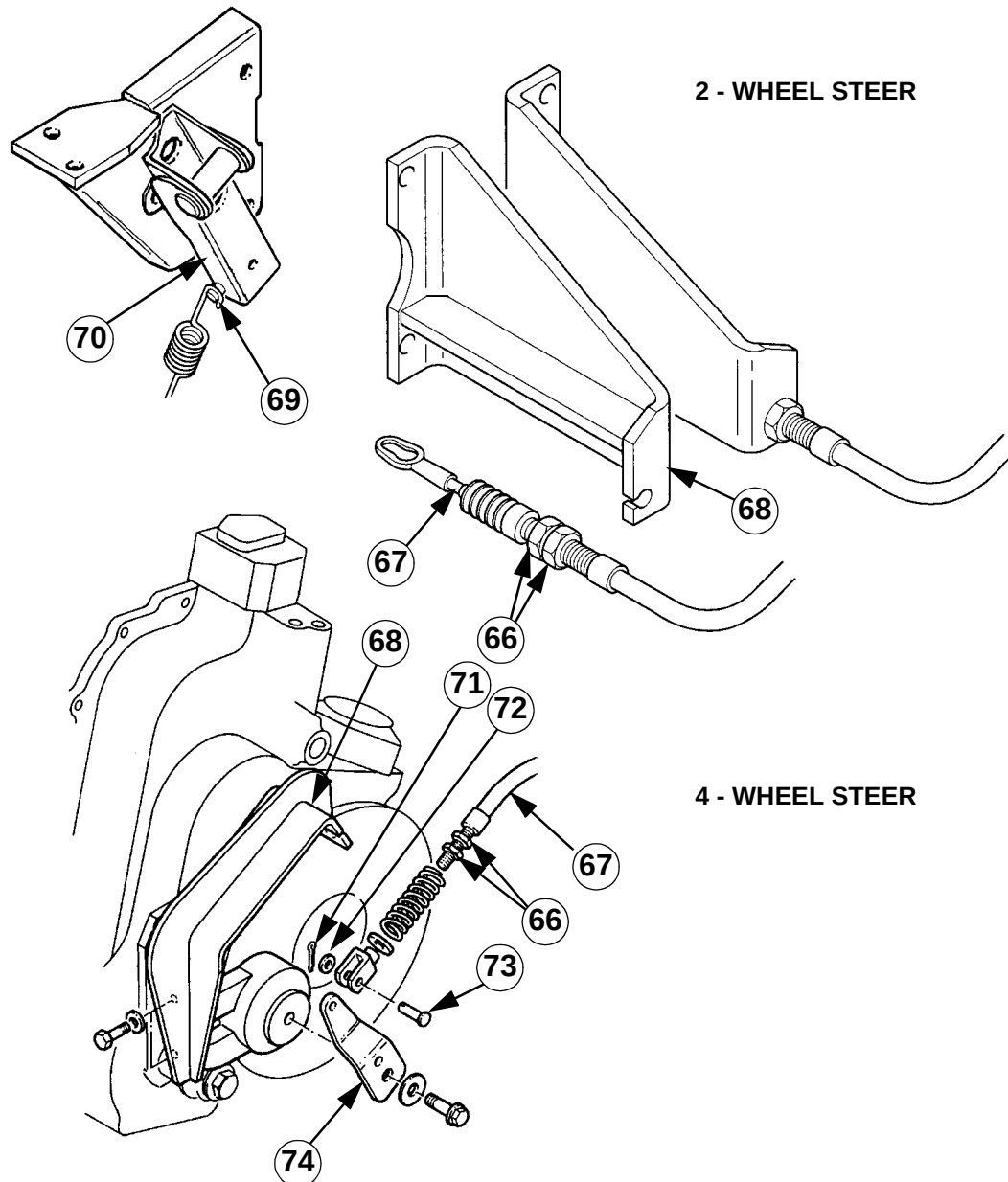
CS98M538

Disconnect the electrical connector (56) from the electrical connector (57). Remove the grommet (58) and pull the electrical connector (57) through the access hole in the cab floor.

34. Only carry out Step 35 on 2-wheel steer machines.
35. Clamp the flexible brake hose (59).
36. Only carry out Step 37 on 4-wheel steer machines.
37. Clamp the flexible brake hoses (60).
38. Disconnect the brake tube nuts (61) and move the brake tubes (62) slightly to one side. Remove the locknuts (63) from the flexible brake hoses (64) and pull the hoses (64) clear the bracket (65). Put caps on the open ends of the brake tubes (62) and the flexible brake hoses (64).

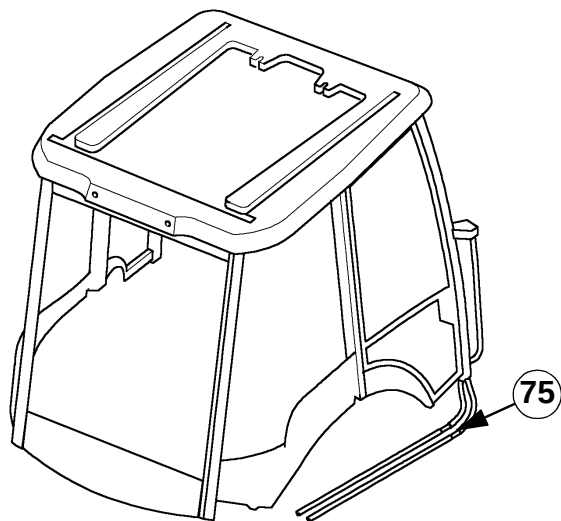


39. Loosen the locknuts (66).
40. Move the brake cables (67) away from the brackets (68).
41. Only carry out Step 42 on 2-wheel steer machines.
42. Disconnect the brake cables (67) from the stud pin (69) on the brake actuator (70).
43. Only carry out Step 44 on 4-wheel steer machines.
44. Remove and discard the split pin (71). Remove the washer (72) and the clevis pin (73) and disconnect the brake cable (67) from the brake lever (74).



CS98M540

45.



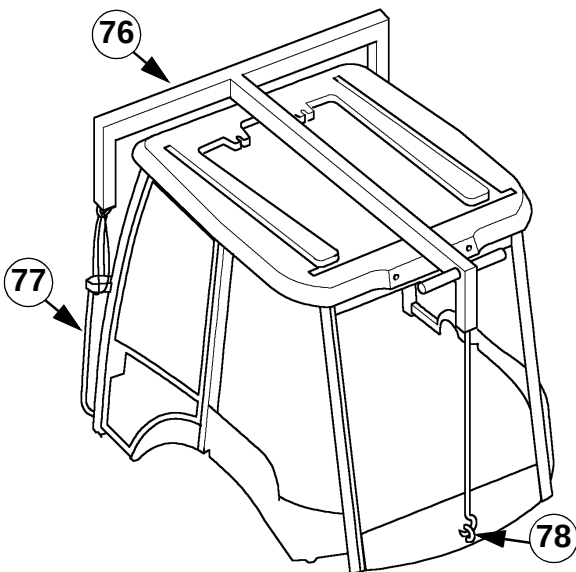
CI98M524

Disconnect the windscreen wash tubes (75). Put caps on the open ends of the tubes (75).



WARNING : *Correct and adequate lifting equipment must be used to remove the cab from the chassis.*

46.



CI99A512

Position the lifting frame (76) above the cab. Attach the front of the lifting frame (76) with straps to the front hand rails (77). Hook the rear of the lifting frame (76) to the lifting eye (78) under the cab rear plastic cover.

47. Connect the lifting frame (76) to a suitable lifting device. Take up the slack in the lifting frame (76) to support the weight of the cab. Do not lift the cab.

48. Remove the plugs (79) at the front attachment points.
49. Note the positions of the mountings (80) and (81) and the washers (82) through (83) and (84).
50. At the front attachment points, remove the nuts (85), the washers (82) and the mountings (81).
51. At the front attachment points, remove the washers (83) and (84) and the bolts (86).
52. At the rear attachment points, remove the nuts (85) and the washers (82) and (83).
53. At the rear attachment points, remove the mountings (81), the washers (84) and the bolts (86).
54. Lift the cab slightly. Make sure all control cables, electrical harnesses and hoses at the cab/chassis interface are disconnected.
55. Move the cab rearwards until the cab bulkhead is clear of the loader tower on the chassis.
56. Lift the cab clear of the machine.

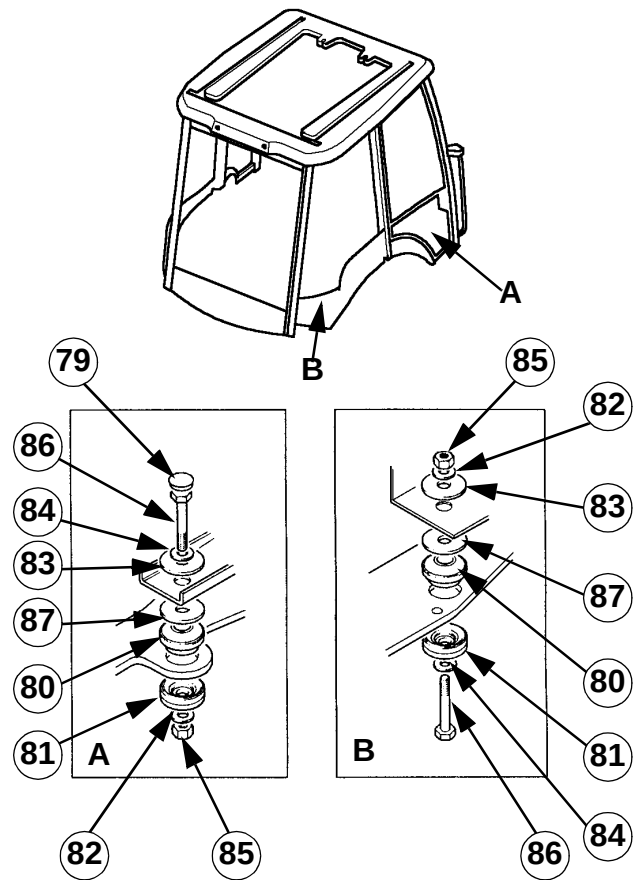
NOTE : *If insufficient overhead clearance exists, it may be necessary to rotate the cab through 90° to clear the machine.*

57. Remove the air ducting from the front bulkhead to prevent damage before lowering the cab.
58. Remove the washers (87) and the mountings (80).
59. Lower the cab onto a suitable padded trestle or blocks.
60. Tie back all control cables, electrical harnesses and hoses on the cab and the chassis to prevent damage.

Installation

Install the cab in the reverse order of the removal but note the following :

1. Torque tighten the nuts (85) and the bolts (86) to 395 Nm.
2. Secure the clevis pins (73) with a new split pin (71).
3. Secure the clevis pin (52) with a new split pin (51).
4. Secure the clevis pin (39) with a new split pin (37).



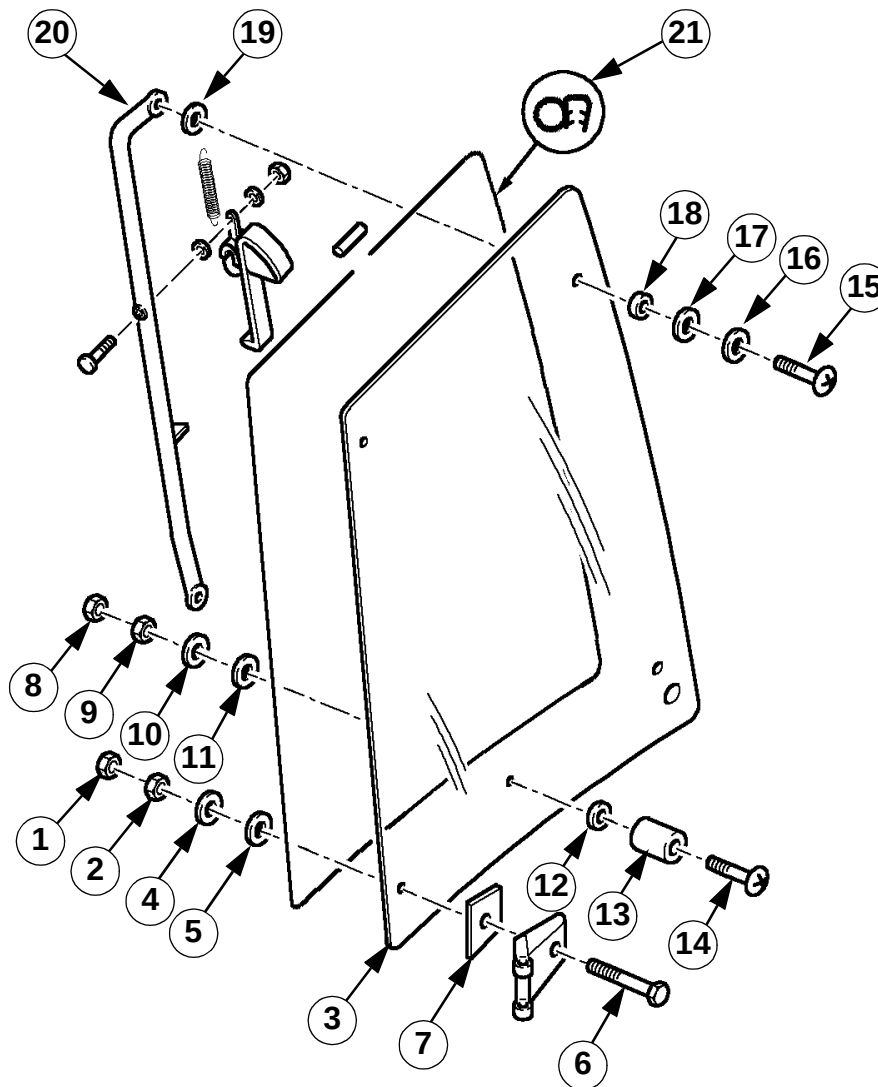
C198M525

5. Bleed the brake system (see Section 7000).
6. When the cab is fully installed, carry out an operational test of all systems of the machine. Make sure all systems and functions operate correctly and that there are no leaks from pipes and hoses which have been disturbed.

REMOVAL AND INSTALLATION OF THE CAB GLAZING PANEL

1. Remove the caps (1) from the nuts (2).
2. Support the window glazing panel (3) and remove the nut (2), the washer (4), the rubber washer (5), the screw (6) and the gasket (7).
3. Remove the window glazing panel (3) and support it on a padded surface.
4. Only carry out Steps 5 through 7 if you install a replacement window glazing panel.
5. Remove the cap (8), the screw (9), the washer (10), the rubber washers (11) and (12), the screw (14) and the retainer (13).
6. Remove the screws (15), the washers (16), the rubber washers (17) and (19), the spacers (18) and the handle (20).
7. Remove the seal (21).

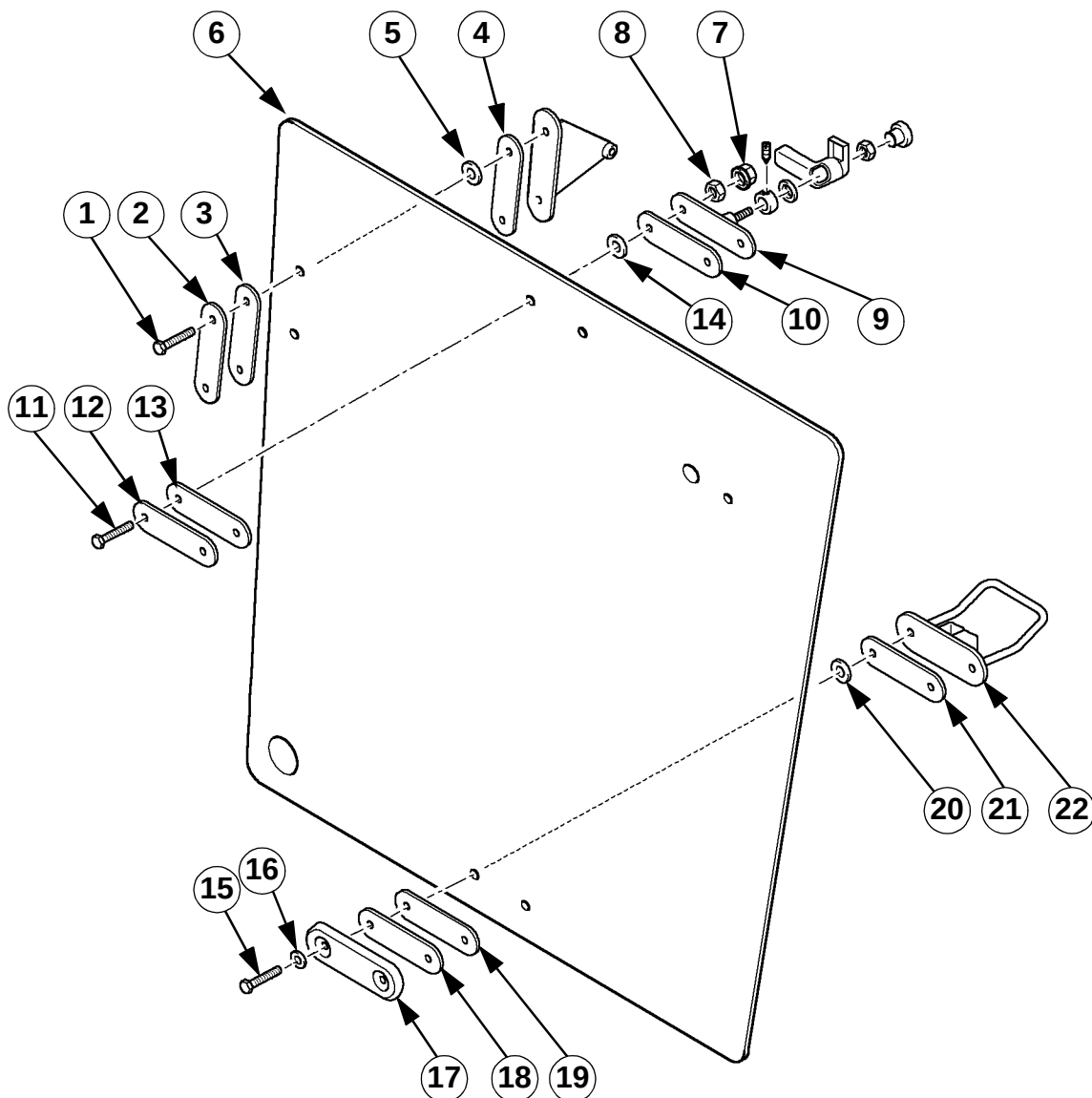
NOTE : *Install the cab glazing panel in the reverse order from that removal.*



CI98M526

REMOVAL AND INSTALLATION OF THE REAR WINDSCREEN GLAZING PANEL

1. Remove the rear windscreen wiper motor (see Section 4005).
2. Open the rear windscreen panel.
3. Support the rear windscreen panel and remove the screws (1), the plate (2), the gaskets (3) and (4) and the spacers (5).
4. Remove the rear windscreen panel and support it on a padded surface.
5. Only carry out Steps 6 through 10 if you install a replacement rear windscreen glazing panel (6).
6. Remove the caps (7) from the nuts (8).
7. Remove the nuts (8), the upper handle assembly (9) and the gasket (10).
8. Remove the screws (11), the plate (12), the gasket (13) and the spacer (14).
9. Remove the screws (15), the washers (16), the cover (17), the plate (18) and the gasket (19).
10. Remove the spacer (20), the gasket (21) and the lower handle (22).



Section

9008

BACKHOE

9008

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SPECIAL TOOLS

Lifting equipment for 3000 kg load
Support
Trolley jack



WARNING : *This symbol is used in this manual to indicate important safety messages. When ever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

STANDARD BACKHOE BUCKET

Removal

STEP 1

Park the machine on flat, level ground.

STEP 2

Lower the stabilizers until the rear wheels are just clear of the ground.

STEP 3

Place the bucket flat on the ground.

STEP 4

Stop the engine, engage parking brake and remove the starter switch key.

STEP 5



CD98F048

Remove the snap ring and the connecting rod/bucket linkage pin.

STEP 6

Start the engine.

STEP 7

Retract the bucket cylinder rod.

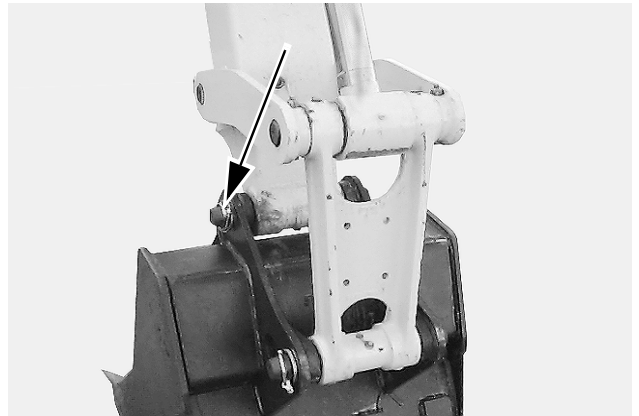
STEP 8

Operate the attachment controls so that the dipper/bucket linkage pin is not under load from the dipper.

STEP 9

Stop the engine, engage parking brake and remove the starter switch key.

STEP 10



CD98F049

Remove the snap ring and the dipper/bucket linkage pin.

STEP 11

Start the engine.

STEP 12

Operate the attachment controls so as to disconnect the dipper from the bucket.

Installation

STEP 1

Start the engine.

STEP 2

Extend the bucket cylinder rod to bring the connecting rod into his housing.

STEP 3



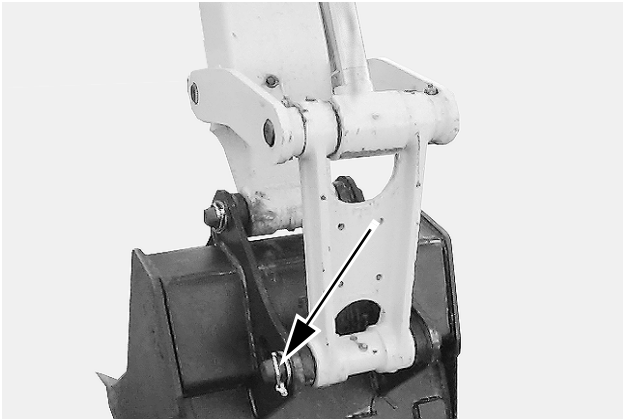
CD98F048

Install the connecting rod/bucket linkage pin and install the snap ring.

STEP 4

Slightly raise the attachment and then operate the bucket and dipper control to bring the dipper lugs in line with the bucket lugs.

STEP 5



CD98F049

Install the dipper/bucket linkage pin and install the snap ring.

QUICK ATTACH BACKHOE BUCKET (Optional)



WARNING : *Never place your hands inside the quick coupler if the engine is running.*

Removal

STEP 1

Place the bucket on flat, level ground.

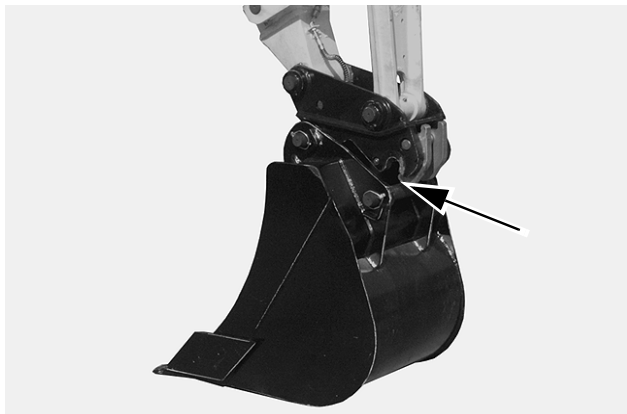
STEP 2



CD98F024

Press and hold the switch down to unlock the backhoe quick attach.

STEP 3



CD98K015

Operate the bucket control lever so as to disengage the pin and release the switch.

STEP 4



CD98K015

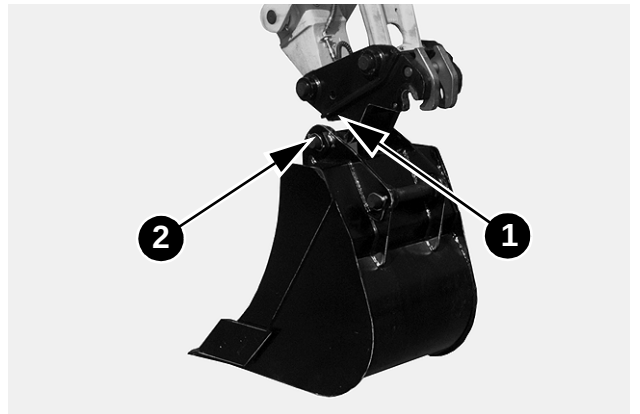
Operate the dipper control lever so as to unhook the bucket.

Installation

STEP 1

Make sure that the bucket to be installed is in a safe position on flat, level ground.

STEP 2



CD98K015

Operate the dipper control lever so as to bring the quick attach hook (1) around the pin (2) of the bucket.

STEP 3



CK98F024

Press and hold the switch down to unlock the backhoe quick attach.

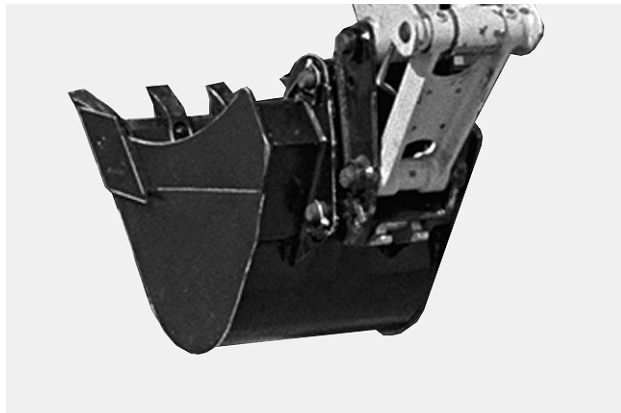
STEP 4



CD98K014

Operate the bucket control lever so that the pin is fully engaged in the quick coupler hook.

STEP 5



CK98K006

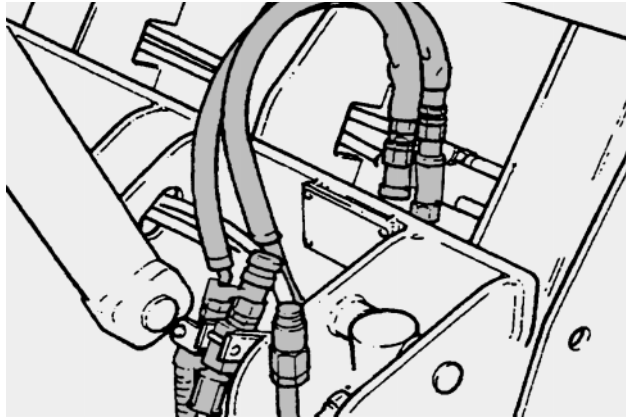
Raise the dipper and retract the bucket until the teeth are in the vertical position and release the switch.

NOTE : *Remaining in the operator's seat, visually check that the bucket or attachment is locked in position. This is best done by slewing the backhoe until it is at right angles to the line of the machine and slowly crowding and dumping the bucket or attachment.*

QUICK ATTACH LOADER BUCKET (Optional)

Removal

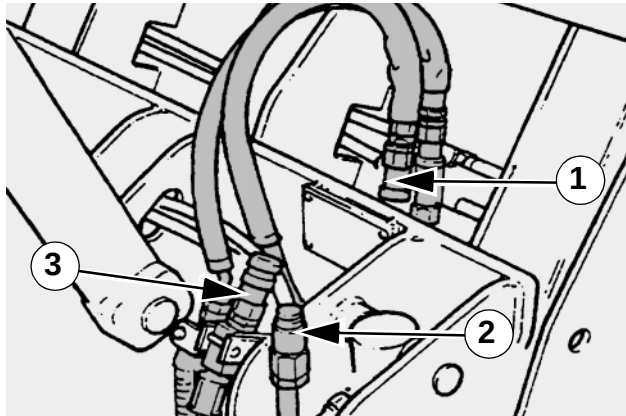
STEP 1



CS98G543

Place the loader bucket on a flat, level ground, stop the engine, engage parking brake, remove the starter switch key and release pressure in the hydraulic system. (See Section 8002).

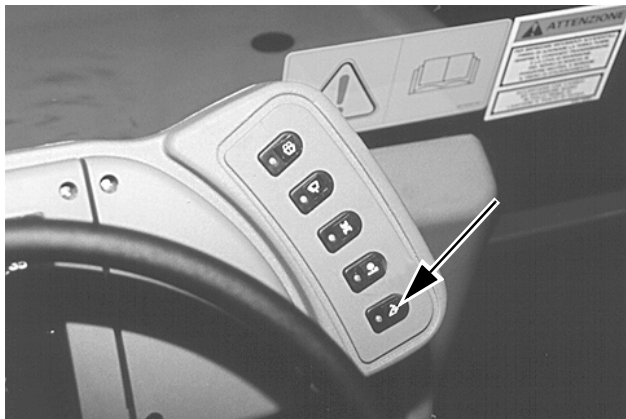
STEP 2



CS98G543

Disconnect the hoses from the bucket couplers (1) and connect to the solenoid valve (2) and tube (3).

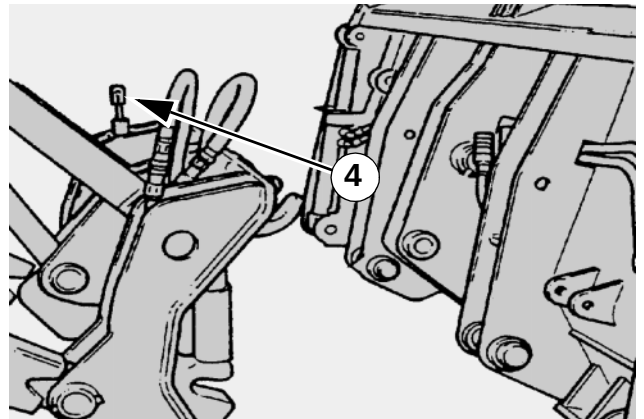
STEP 3



C198J508

Start the engine, press and hold the switch down to unlock the loader quick attach.

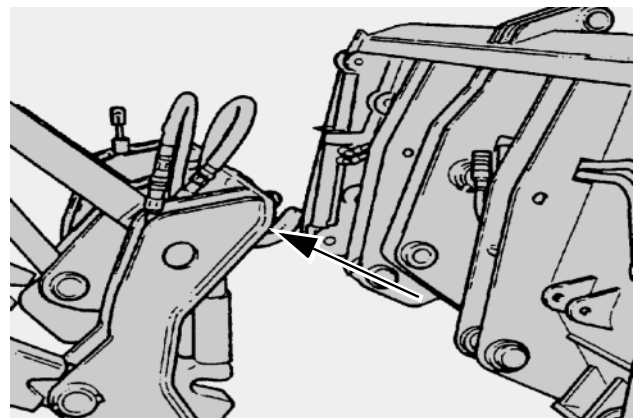
STEP 4



CS98G542

Push the clamshell operating lever forward until the clamp pins on the quick-attach are fully retracted (indicator (4) raised clear of the tube).

STEP 5

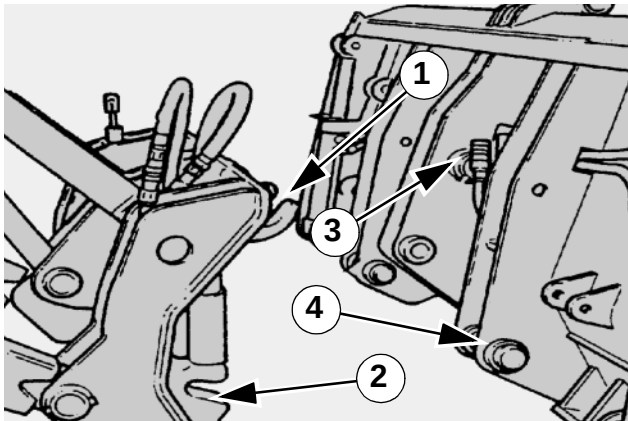


CS98G542

With the bucket on the ground, slowly drive the machine in reverse whilst dumping the bucket to disengage the quick-attach hook from the bucket pins.

Installation

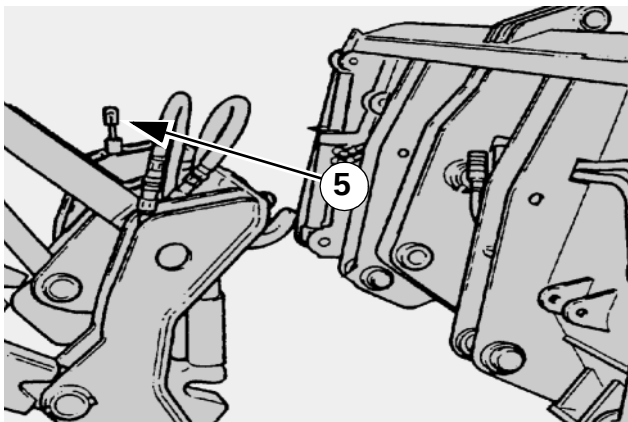
STEP 1



CS98G542

Position the hooks (1) and (2) in alignment with the bucket pins (3) and (4). The quick-attach must be slightly dumped.

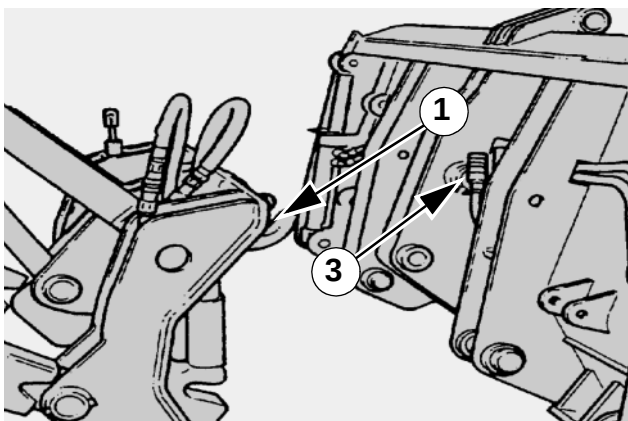
STEP 2



CS98G542

Press and hold the switch, then push the clamshell operating lever forward until the clamp pins on the quick-attach are fully retracted (indicator (5) raised clear of the tube). Move the clamshell lever to the neutral position and release the switch.

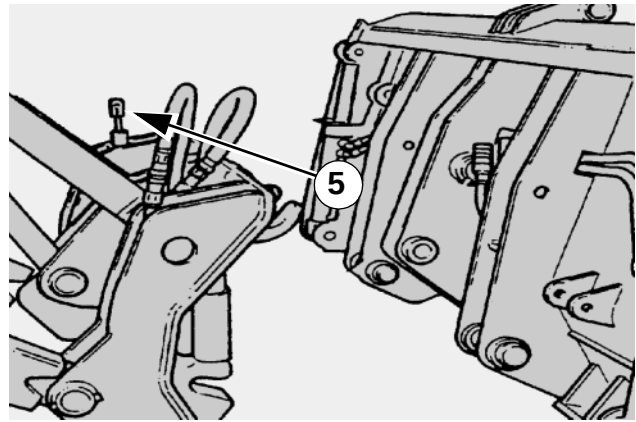
STEP 3



CS98G542

Engage the top hooks (1) with the top pins (3) then fully crowd the bucket.

STEP 4



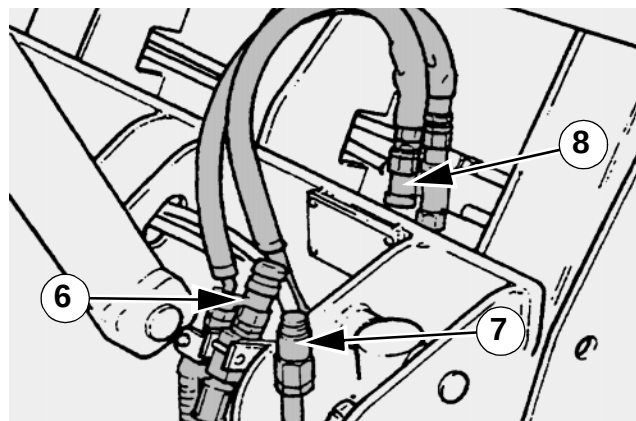
CS98G542

Press and hold the switch, then pull back the clamshell operating lever to lock the bucket onto the quick-attach (indicator (5) retracted into the tube). Allow sufficient time for both pins to lock.

STEP 5

Place the bucket onto the ground, stop the engine, engage parking brake, remove the starter switch key and release pressure in the hydraulic system. (See Section 8002).

STEP 6



CS98G543

Disconnect the hoses from the solenoid valve (6) and tube (7) and connect them to the bucket couplers (8).

BOOM/DIPPER ASSEMBLY

Special tools

- Lifting equipment for 3000 kg load

Removal

NOTE : Put identification tags on all disconnected hoses and tubes. Protect open disconnected hoses, tubes and fittings with caps and plugs. Protect open.

STEP 1

Park the machine on a level surface.

STEP 2

Lower the stabilizer legs.

STEP 3

Remove the backhoe bucket (see page 3 or 5).

STEP 4

Position the boom at 90° to the backframe, extend the dipper fully and lower it to the ground.

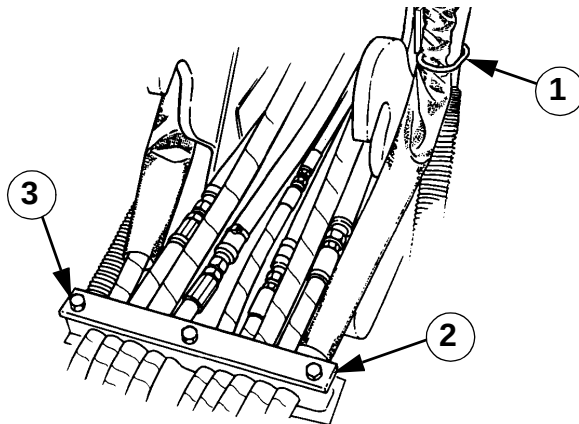
STEP 5

If the backhoe is equipped with an extending dipperstick, install the extending dipperstick lock pin.

STEP 6

Release the pressure from the hydraulic system.

STEP 7

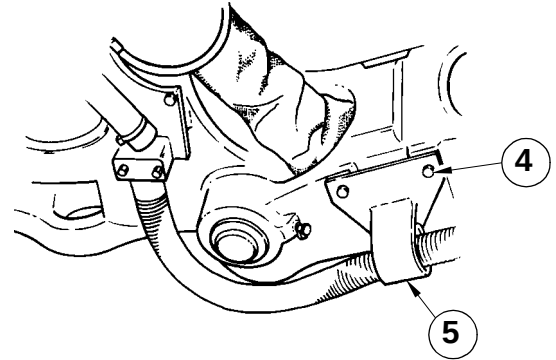


CI98J508

Remove the hook (1) from each of the boom side plates.

Remove the bolts (3) which secure the hose clamps (2) on the boom assembly. Remove the steel bar and plastic clamp.

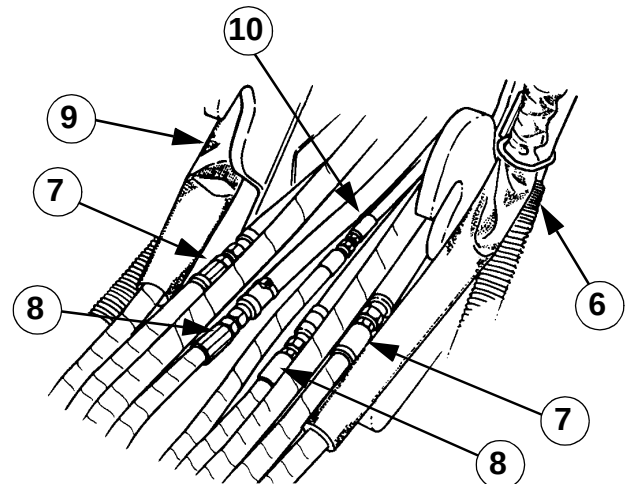
STEP 8



789M376A

If a rock breaker is attached, there are two brackets (5) each side, at the base of the boom which must be removed. there are two bolts (4) in each bracket.

STEP 9



CI98J509

Label each of the hoses (6) and (9) attached to the dipperstick cylinder and remove the hoses.

Label and then disconnect the hoses from the boom cylinder.

Label and then disconnect the hoses to the bucket cylinder at the unions (7) at the base of the boom.

Label and then disconnect the dipper hoses.

If an extending dipperstick is fitted label the hoses and then disconnect them at the unions (8) at the base of the boom.

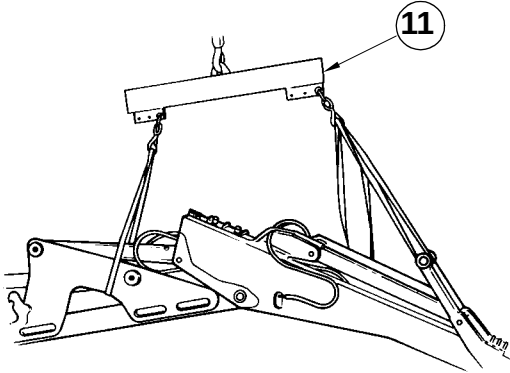
Disconnect the small hose for the quick-attach cylinder at the union (10) at the base of the boom.

If a rock breaker is fitted disconnect the hoses at the point where they enter the boom superstructure.



WARNING : *The boom/dipper assembly is very heavy. Make sure the slings and lifting equipment are adequate. Injury or death may be caused if the boom/dipper assembly falls from the lifting equipment.*

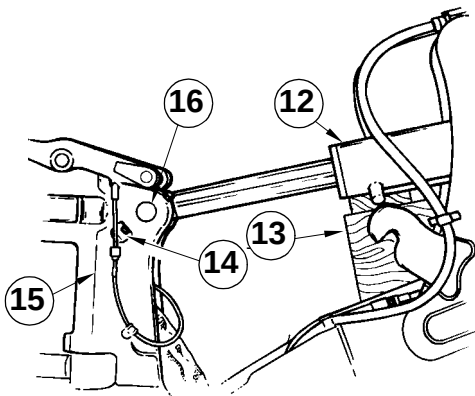
STEP 10



789M378A

Attach suitable lifting equipment with a spreader and slings (11) to support the boom/dipper assembly.

STEP 11



789M379A

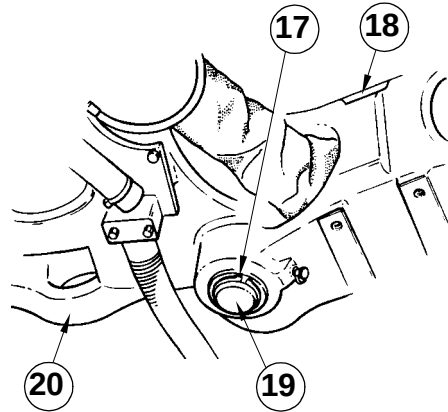
Fit a block of wood (13) under the boom cylinder and use wedges to bridge any gap remaining between the wood and the cylinder (12).

Remove the bolt and locknut (14) which retain the pivot pin (16) for the boom cylinder rod end.

Use a hammer and soft punch to drive the pivot pin (16) out of the boom cylinder (12).

Take the weight of the boom (15) and the dipper assembly on the hoist.

STEP 12



789M380A

Remove the circlip (17) from the boom pivot pin. Use a large hammer and soft punch to drive out the boom pivot pin (19).

Move the boom and dipperstick assembly (20) away from the swing casting (18).

Installation

Install the boom in the reverse order of the removal, but note the following :

1. Make sure that the hoses are correctly reconnected with no twists or kinks.
2. Do a complete functional test of the backhoe to check the correctness of the hose routing.
3. Check the level of the fluid in the hydraulic system.

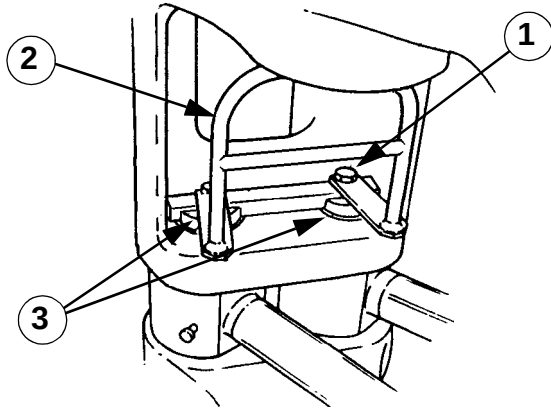
BOOM SWING TOWER

Removal

STEP 1

Remove the bom/dipper assembly (see page 7).

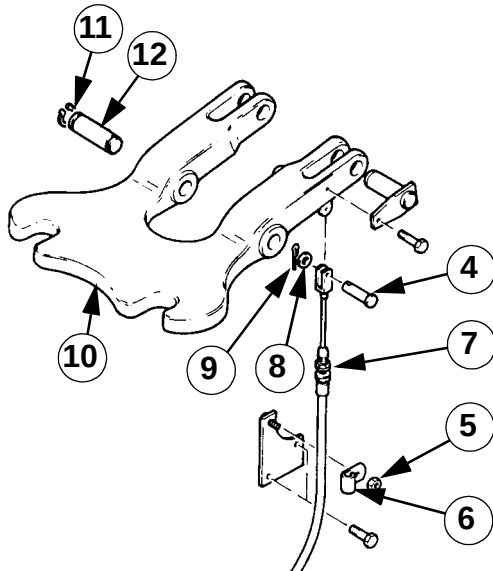
STEP 2



C198J510

Remove the two bolts (1) from the location bar/hose bracket (2) and remove the bracket from the slew/swing cylinder pivot pins (3).

STEP 3



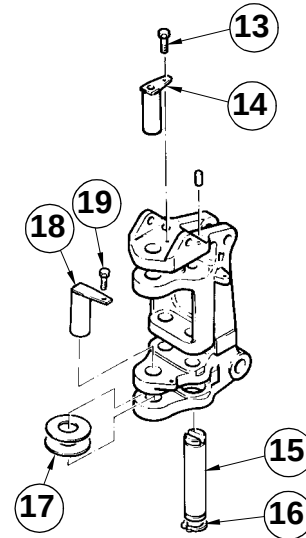
CS99F503

Remove and discard the split pin (9).
Remove the clevis pin (4) and the washer (8) and disconnect the cable (7) from the transport bracket (10).
Remove the nut (5) from the "P" clip (6) and release the cable (7).
Remove the circlips (11) from the pins (12).
Remove the pins (12) and the transport bracket (10).



WARNING : The boom swing tower is very heavy. Make sure the slings and lifting equipment are adequate. Injury or death may be caused if the slew casting falls from the lifting equipment.

STEP 4



789M383A

Remove the circlips (16) from the top and bottom of both slew cylinder pivot pins (15) and remove the pins (15).

Attach a suitable sling and hoist to take the weight of the swing casting.

Note the position of the thrust washers (17) on the lower pivot.

Remove the bolt (19) from the lower swing pivot pin.

Remove the lower swing pivot pin (18) from the casting.

Ensure that the weight of the swing casting is fully supported by the hoist, and then remove the upper swing pivot pin retaining bolt (13).

Remove the upper swing pivot pin (14).

Carefully feed the hoses through the swing post as it is withdrawn from the mast casting or centre pivot.

Installation

Install the boom tower in the reverse order of the removal but note the following :

1. Before installation, apply the specified grease to the upper and lower swing pivot pins (14) and (18) and the pins (15).
2. Install a new split pin (9).

MAST CASTING

Specials tools

- Lifting equipment



WARNING : Use lifting equipment to remove the mast casting.



WARNING : DO NOT support the casting on a jack.



WARNING : DO NOT allow the slew cylinder to support the full weight of the assembly.

Removal

STEP 1

Remove the boom/dipper assembly (see page 7).

STEP 2

Remove the boom swing tower (see page 9).

STEP 3

Disconnect the clamp hydraulic system hose at the upper tee piece on the mast casting.

STEP 4

Disconnect the hydraulic hoses from the slew cylinders.

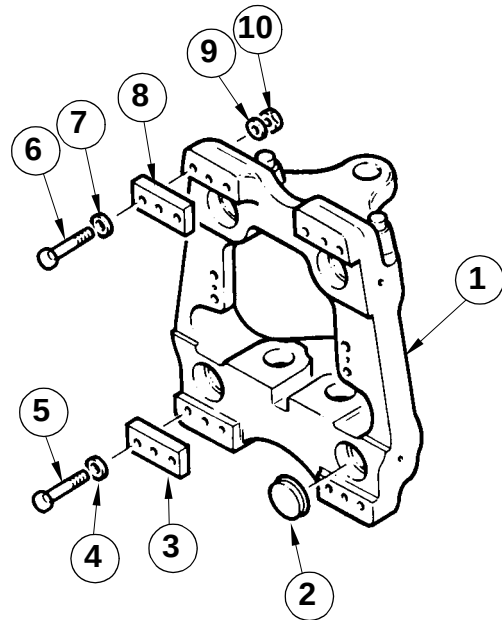


WARNING : The mast casting is very heavy. Make sure the lifting equipment is adequate. Injury or death may be caused if the mast casting falls from the lifting equipment.

STEP 5

Attach suitable lifting equipment to the casting.

STEP 6



789M384A

Remove the bolts (5) and (6) the washers (4), (7) and (9) and the nuts (10) from the plates (3) and (8).

Remove the mast casting (1) from the backframe. Make sure that the slew cylinder do not the contact the backframe rail.

Installation

Install the mast casting in the reverse order of the removal, but note the following :

1. Make sure the clamp seals (2) do not become dislodged from the mast assembly during installation on the backframe.
2. Torque tighten the bolts (5) and (6) and the nuts (10) to 1065 Nm.
3. After installation, check the hydraulic oil level.
4. After installation, grease the backframe pivot pins.
5. After installation, do a functional test of the backhoe and sideshift.

CLAMP SEALS

Special tools

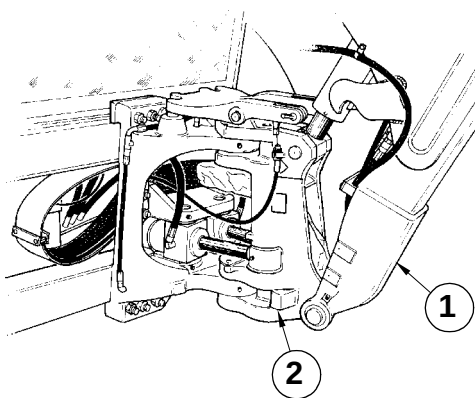
- Lifting equipment
- Support
- Trolley jack

Removal and installation



WARNING : During this procedure the boom assembly will be disconnected from the machine. It must be supported by lifting equipment or support frames at a dipperstick pivot and the swing casting.

1. Park the machine on firm, level ground.
2. Slew the backhoe until it is in line with the machine and engage the travel lock.
3. Extend the backhoe to between half and three quarters full reach and ground the bucket (1).
4. Release the sideshift clamp.
5. Lower the stabilizers to the ground but DO NOT raise the machine.
6. Stop the engine.
7. Release the pressure in the hydraulic system and set the hydraulic enable switch to OFF.
8. Use suitable lifting equipment to support the boom at the dipperstick pivot and boom pivot.
9. Put the trolley jack under the slew casting (2) and raise the casting off the backframe. DO NOT lift the machine from the ground.



789M385A

1. Boom	5. Seal
2. Slew casting	6. Piston
3. Washer	7. Plate
4. Nut	8. Washer

10. Remove the six bolts (9), the washers (8) and (3) and the nuts (4) in the lower plates (7).

Remove the six bolts (10), the washers (3) and (11) and the nuts (4) in the upper plates (12).

NOTE : When installing, torquetighten the bolts (9) and (10) and the nuts (4) to 1065 Nm.



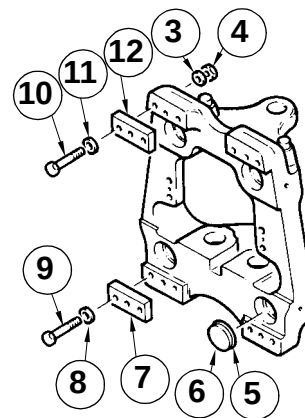
WARNING : Make sure that the backhoe will not move before staring work on the clamp pistons and seals.

11. Start the engine and raise the stabilizer legs. Use the trolley jack to raise or lower the mast casting (2).
12. Drive the machine forward slowly until there is approximately 125 mm between the backframe and the mast casting.
13. Remove the pistons (6).
14. Remove the seals (5).

NOTE : The installation of the clamp seals is the reverse of the removal.

Inspection

1. Clean the around the seals (5)
2. Inspect the machined faces on the casting for burns or damage. Remove burns and sharp edges.



789M386A

- | |
|------------|
| 9. Bolt |
| 10. bolt |
| 11. Washer |
| 12. Plate |

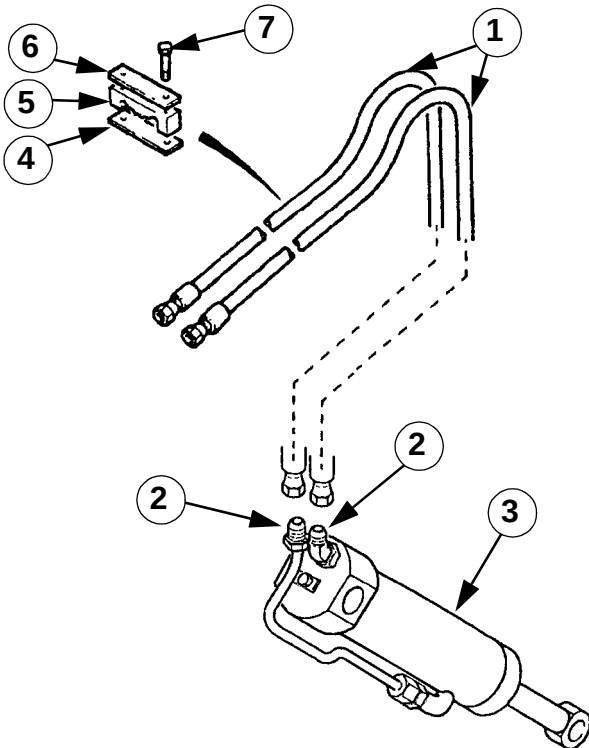
STANDARD DIPPERSTICK

Special tools

- Lifting equipment

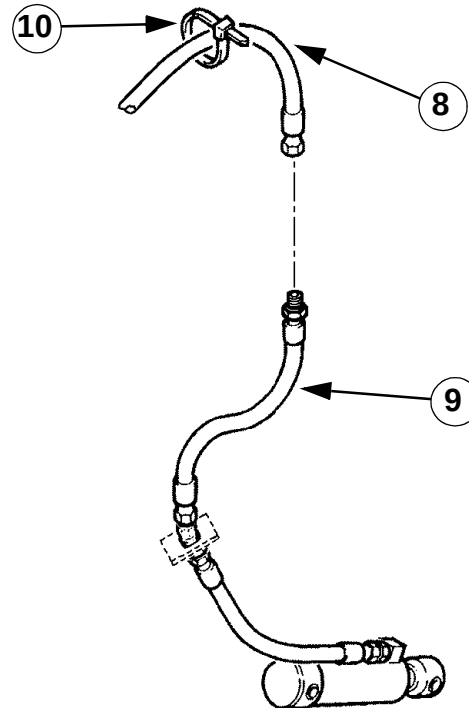
Removal

1. Remove the backhoe bucket and secure the bucket linkage to prevent movement.
2. Lower the stabilizers but DO NOT lift the machine.
3. Position the boom at 90° to the backframe and fully extend the dipperstick.
4. Lower the boom onto a suitable support and lower the dipperstick to the ground.
5. Release the pressure from the hydraulic system.
6. Put suitable drainage trays below the boom and the dipperstick.
7. Remove the bolts (7), the clamping plates (6), the clamps (5) and the pads (4) attaching the bucket cylinder hoses (1) to the dipperstick.
8. Disconnect the hoses (1) from the elbows (2) of the bucket cylinder (3). Put identification labels on the hoses (1) to aid installation.
9. Put caps on the hoses (1) and the elbows (2).
10. Secure the hoses (1) clear of the dipperstick with temporary ties.



C198J511

11. Only do steps 12 through 14 if the machine has a backhoe quick-attach facility installed.
12. Disconnect the quick-attach facility installed. Hydraulic connectors (9).
13. Put caps on the quick-attach hydraulic hose (8) and the hydraulic connectors (9). Put an identification label on the hose (8) to aid installation.
14. Remove and discard the tie-wraps (10) as necessary and secure the quick-attach hydraulic hose clear of the dipperstick with temporary ties.



C198J512

15. Only do steps 16 through 18 on machines with a hammer attachment facility installed.
16. Disconnect the hammer hydraulic hoses. Put identification labels on the hoses to aid installation.
17. Put caps on the open ends of the hoses.
18. Secure the hoses clear of the dipperstick with temporary ties.



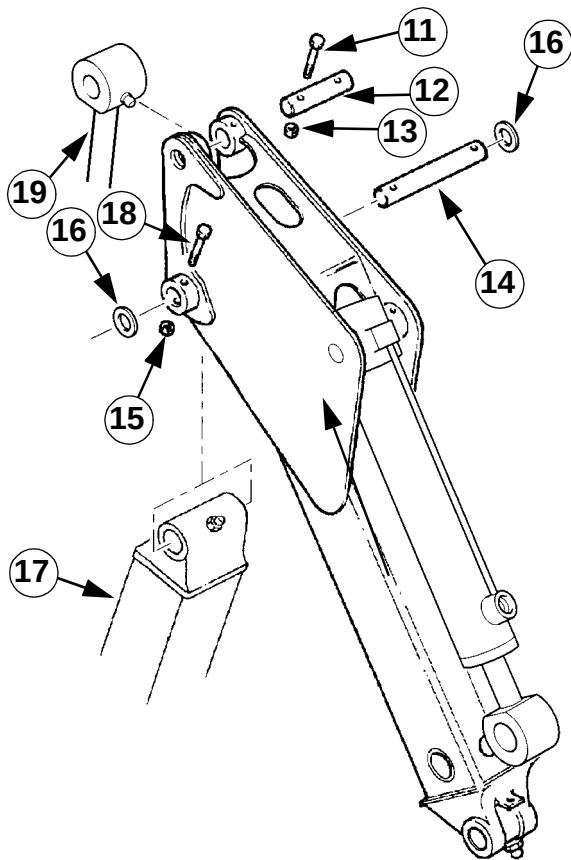
WARNING : *The dipperstick is very heavy. Make sure slings and lifting equipment are adequate. Injury or death may be caused if the dipperstick falls from the lifting equipment.*

19. Attach suitable slings and lifting equipment to the dipperstick. Take the weight of the dipperstick on the lifting equipment but DO NOT lift the machine.
20. Remove the locknuts (13) and the bolts (11).
21. Use a hammer and a soft metal drift to remove the pin (12) and disconnect the dipper cylinder (19) from the dipperstick.
22. Remove the locknuts (15) and the bolts (18).
23. Use a hammer and a soft metal drift to remove the pin (14) and disconnect the dipperstick from the boom (17).
24. Remove the washers (16).
25. Use the lifting equipment to remove the dipperstick from the machine.

Installation

Install the standard dipperstick in the reverse order of the removal but note the following :

1. Before installation, lubricate the pin (12) and the pin (14) with the specified grease.
2. Torque tighten the nuts (13) and the nuts (15) to 60 Nm.
3. Torque tighten the bolts (7) to 30 Nm.
4. After installation, do steps 5 through 7.
5. Lubricate the boom (17), the dipperstick, the bucket linkage and the bucket with the specified grease.
6. Check and replenish the hydraulic oil level.
7. Start the engine and operate the backhoe controls. Make sure the backhoe operates correctly and there are no leaks from the hose connections which have been disturbed.



CS98J506

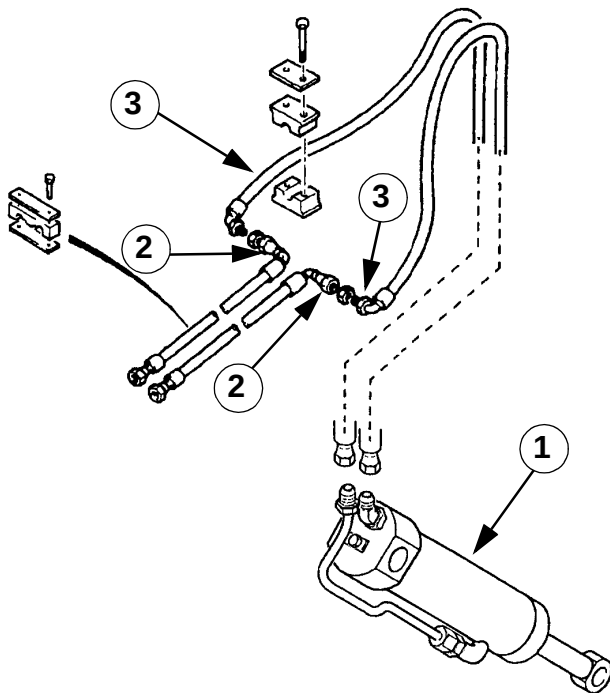
EXTENDING DIPPERSTICK

Special tools

- Lifting equipment

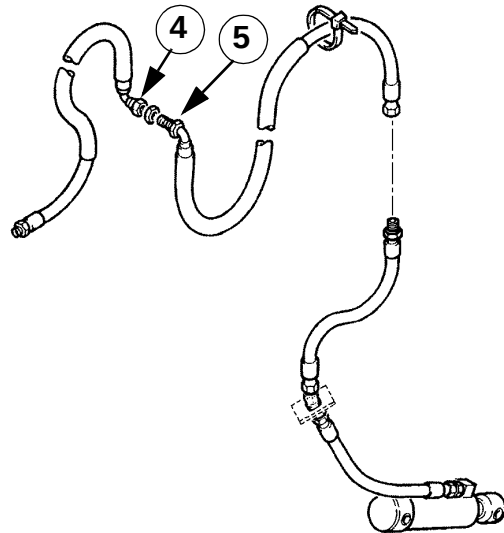
Removal

1. Remove the backhoe bucket and secure the bucket linkage to prevent movement.
2. Lower the stabilizers but DO NOT lift the machine.
3. Position the boom at 90° to the backframe and lower the extending dipperstick to the ground.
4. Release the pressure from the hydraulic system.
5. Put suitable draining trays below the boom and the extending dipperstick.
6. Position a support below the boom to prevent its movement.
7. Disconnect the hoses (2) from the hoses (3) which supply the bucket cylinder (1).
8. Put caps on the hoses (2) and the hoses (3). Put identification labels on the hoses (2) and the hoses (3) to aid installation.
9. Secure the hoses (2) and the hoses (3) with temporary ties.



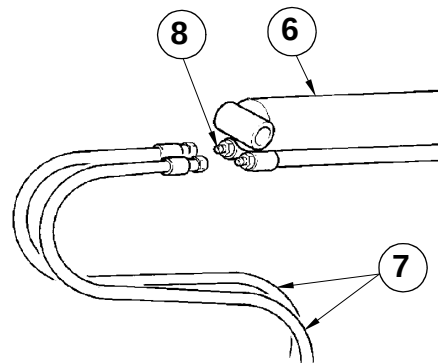
CI98J513

10. Only do steps 11 through 12 on machines with a backhoe quick-attach facility installed.
11. Disconnect the quick-attach hydraulic hose (4) from the hydraulic connectors (5).
12. Put caps on the quick-attach hydraulic hose (4) and the hydraulic connectors (15). Put an identification label on the hose (4) to aid installation.



CI98J514

13. Disconnect the hoses (7) from the hydraulic connectors (8) of the extending dipperstick cylinder (6).
14. Put caps on the hoses (7) and the hydraulic connectors (8). Put identification labels on the hoses (7) and the hydraulic connectors (8) to aid installation.
15. Secure the hoses (7) clear of the extending dipperstick with temporary ties.



789M392A

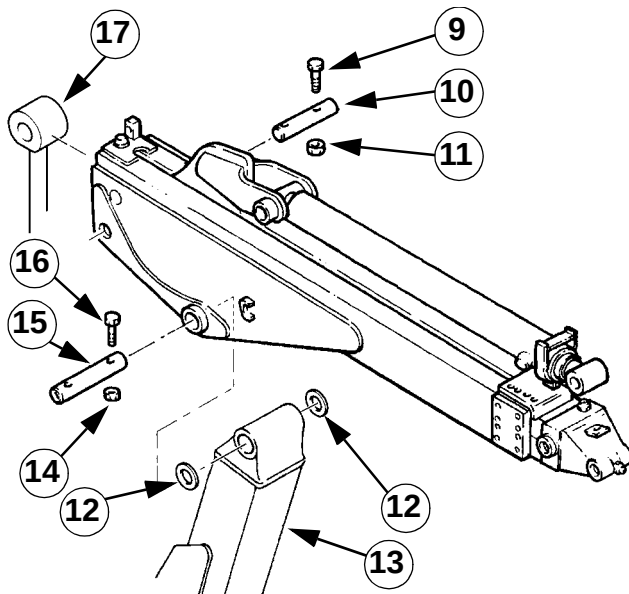
16. Only do steps 17 through 19 on machines with a hammer attachment facility installed.

17. Disconnect the hammer hydraulic hoses. Put identification labels on the hoses to aid installation.
18. Put caps on the open ends of the hoses.
19. Secure the hoses clear of the dipperstick with temporary ties.



WARNING : *The extending dipperstick is very heavy. Make sure slings and lifting equipment are adequate. injury or death may be caused if the extending dipperstick falls from the lifting equipment.*

20. Attach suitable slings and lifting equipment to the dipperstick on the lifting equipment but DO NOT lift the machines.
21. Remove the locknuts (11) and the bolts (9).
22. Use a hammer and a soft metal drift to remove the pin (20) and disconnect the dipper cylinder (17) from the extending dipperstick.
23. Remove the locknuts (14) and the bolts (16).
24. Use a hammer and a soft metal drift to remove the pin (15) and disconnect the extending dipperstick from the boom (13).
25. Remove the washers (12).
26. Use the lifting equipment to remove the extending dipperstick from the machine.



CS98J507

Installation

Install the extending dipperstick in the reverse order of the removal, but note the following :

1. Before installation, lubricate the pin (10) and the pin (15) with the specified grease.
2. Torque tighten the nuts (11) and the nuts (14) to 60 Nm.
3. After installation, do steps 4 through 6.
4. Lubricate the boom (13), the extending dipperstick, the bucket linkage and the bucket with the specified grease.
5. Check and replenish the hydraulic oil level.
6. Start the engine and operate the backhoe controls. Make sure the backhoe operates correctly and there are no leaks from the hose connections that have been disturbed.

CHECKING AND ADJUSTING THE EXTERNAL WEAR PADS

Check and adjust the top and bottom bearing pads

1. Position the dipperstick so that the inner section is extended approximately 300 mm and is resting on the bottom bearing pad (11).
2. Remove the eight bolts (1), the spacers (13) and the top plate (2).
3. Slide out the old bearing pad (12) and replace it with a new one.
4. Install the plate (2), the spacers (13) and the bolts (1). Torque tighten the bolts (1) to 140 Nm.
5. Lower the dipperstick until the bucket contacts the ground so that the inner telescopic section is pressed against the top bearing pad.
6. Remove the three bolts (9) and the retainer plate (8).
7. Remove the bottom bearing pad (11) and shims (10).
8. Install a new bearing pad (11) and adjust the shim thickness to give a maximum gap of less than 1 mm.

NOTE : Shims (10) are available in 0,5 mm, 1 mm, 2 mm and 4 mm thickness.

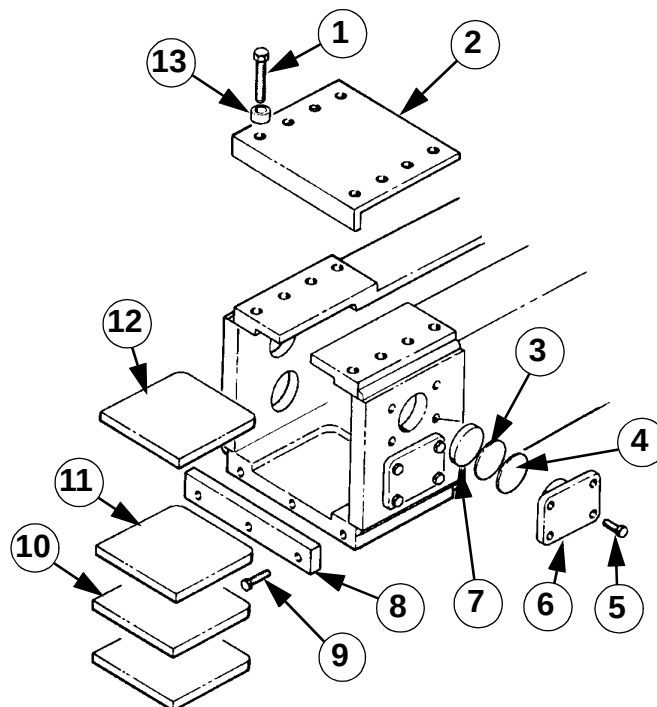
9. Install the retainer plate (8) and torque tighten the bolts (9) to 140 Nm.

Check and adjust the side wear pads

1. Remove the bolts (5), the housings (6), the shims (3) and (4) and the bearing pads (7).
2. Assemble a 1 mm shim (4), a 2 mm shim (3) and a new bearing pad (7) in the two housings (6).
3. Assemble the housings (6) on one side of the dipperstick housing with the bolts (5).
4. Push the inner section hard against the bearing pads just fitted.
5. Install two new bearing pads into the remaining housings (6).
6. Install the housings (6) to the opposite side of the outer section. Install and partially tighten the bolts (5).
7. Measure the clearance between the inner section and the bearing pads.
8. Remove the housings assembled in step 14 and add shims (3) and (4) behind the bearing pads (7) to achieve a total clearance between the bearing pads and the inner section of less than 1 mm.

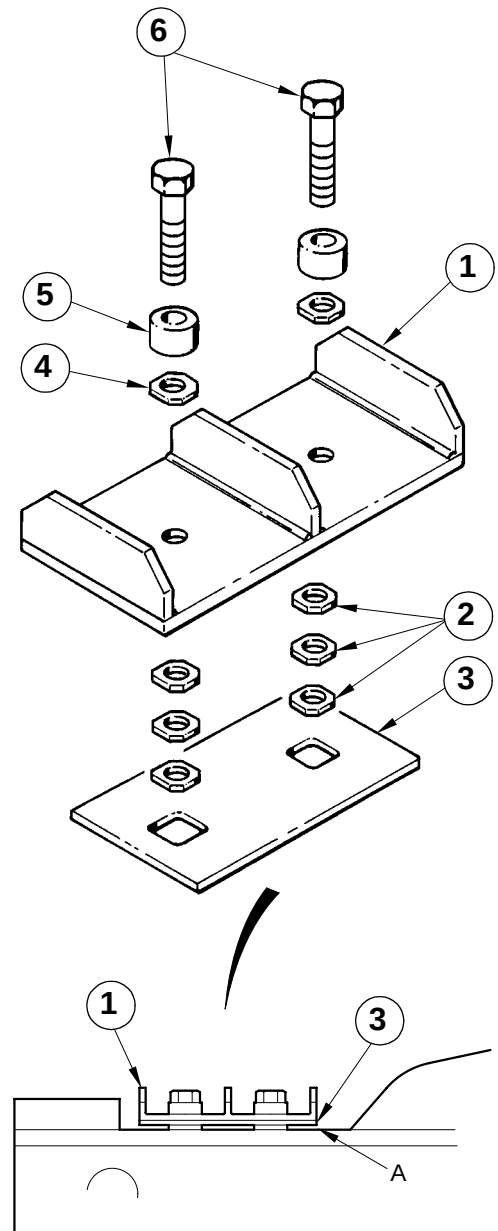
NOTE : Use the thickest shims available and put the thin shim in the housing (6). Shims are available in 1 mm or 2 mm thickness.

9. Install and torque tighten the bolts (5) to 60 Nm.



CHECKING AND ADJUSTING THE UPPER WEAR PAD

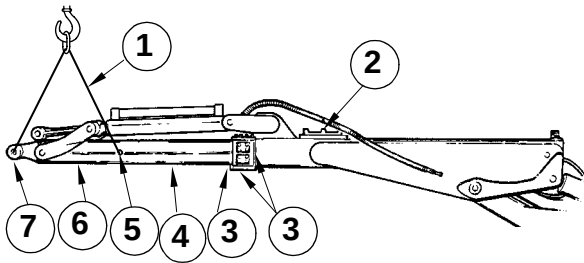
1. Position the digger to full reach and 3/4 extension of the extending dipperstick, but with the bucket 50 mm off the ground. Any wear will show as a gap between the outer wear pad (3) and the dipperstick. A maximum gap of 1 mm is permitted at A.
2. If adjustment is necessary, release both bolts (6) and remove the spacers (5) and the spare shims (4).
3. Remove the cover plate (1) and the second set of shims (2) which must be equally reduced in thickness to compensate for the measured wear. Use the spare shims removed at step 2 to obtain the correct shim thickness.
4. Install the cover plate (1) the spare shims (4), the spacers (5) and the bolts (6). Torque tighten the bolts (6) to 670 Nm.



789M395A

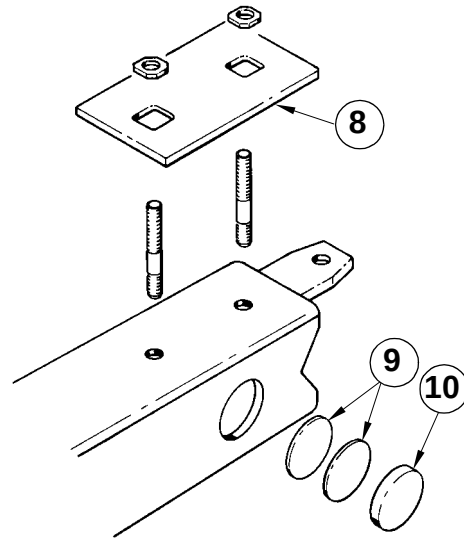
CHECKING AND ADJUSTING THE INTERNAL WEAR PADS

1. Remove the bucket, the bucket linkage and the bucket cylinder from the external dipperstick.
2. Lower the boom and the dipperstick until they are horizontal and extend the dipperstick 3/4 out.
3. Remove the external wear pads from the front end of the dipperstick (top pad, bottom pad and four side panels). (See page 18).
4. Extend the inner section (6) fully and remove the circlips from the extension cylinder (5). Drive out the pin with the soft metal bar.
5. Remove the bolts on the upper bearing (2), and remove the spacers, the spare shims and the retaining plate.
6. Support the inner section (6) by means of a chain sling (1) and bars inserted through the bucket ramm mounting hole (5) and the bucket pivot pin hole (7). Slide the inner section out of the dipperstick.



789M396A

7. Remove the wear pads (8) and (10) and the shims (9) from the sides and the top, at the rear of the dipperstick inner section.
8. With no shims, fit two new wear pads (10) into each side of the inner section and measure the width over the wear pad faces. This is dimension A.



789M397A

9. Measure the internal width of dipperstick outer section. This Dimension B. The thickness of the shims (9) required = (Dim. B minus Dim. A) minus 0.5 to 1 mm. Shims (9) must be divided equally (up to 1 mm difference is allowed) and placed under the side wear pads (10). A smear of heavy grease will help retain them during assembly.
10. Install a new, top rear, wear pad (8) over the two studs and the spacers.
11. Install the inner section (4) in the dipperstick.
12. Align the cylinder rod eye and fit the pin and circlip (5).
13. Assemble the top, bottom and side view pads. (See page 18).
14. Install the bucket cylinder, the bucket linkage and the bucket.

Section

9009

SEAT AND SEAT BELT

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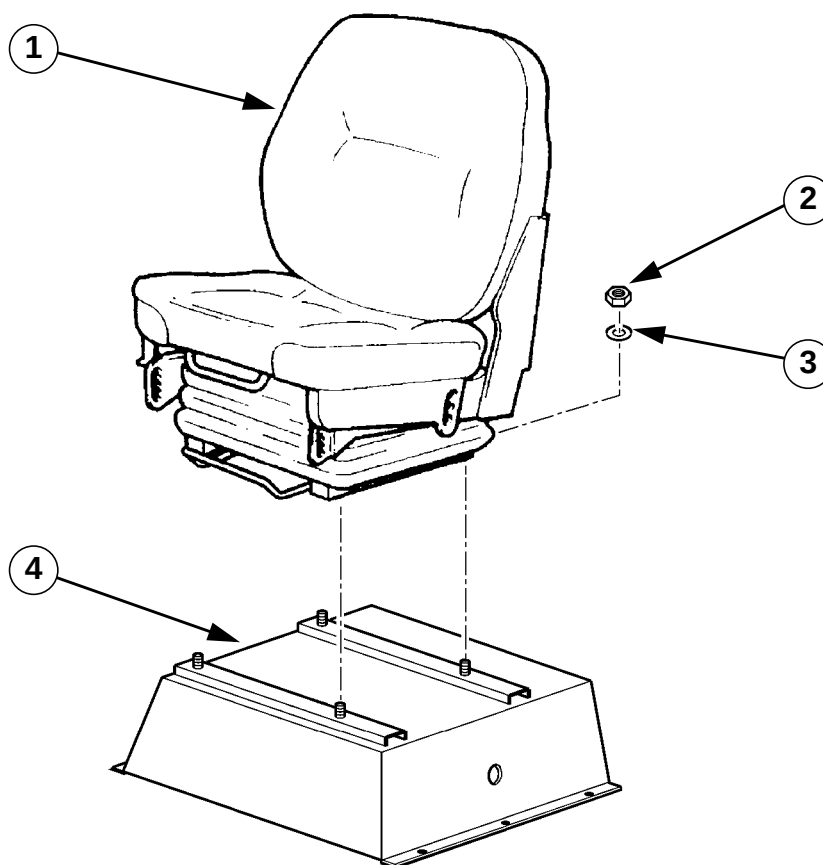
 Installation 9



WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

DRIVERS SEAT (Models 750, 760, 860, 960)

Removal and installation



1. Note the positions and remove the nuts (2), and the washers (3) from the pedestal (4).



WARNING : *The drivers seat is heavy. Get help to remove the drivers seat from the cab and use suitable lifting equipment.*

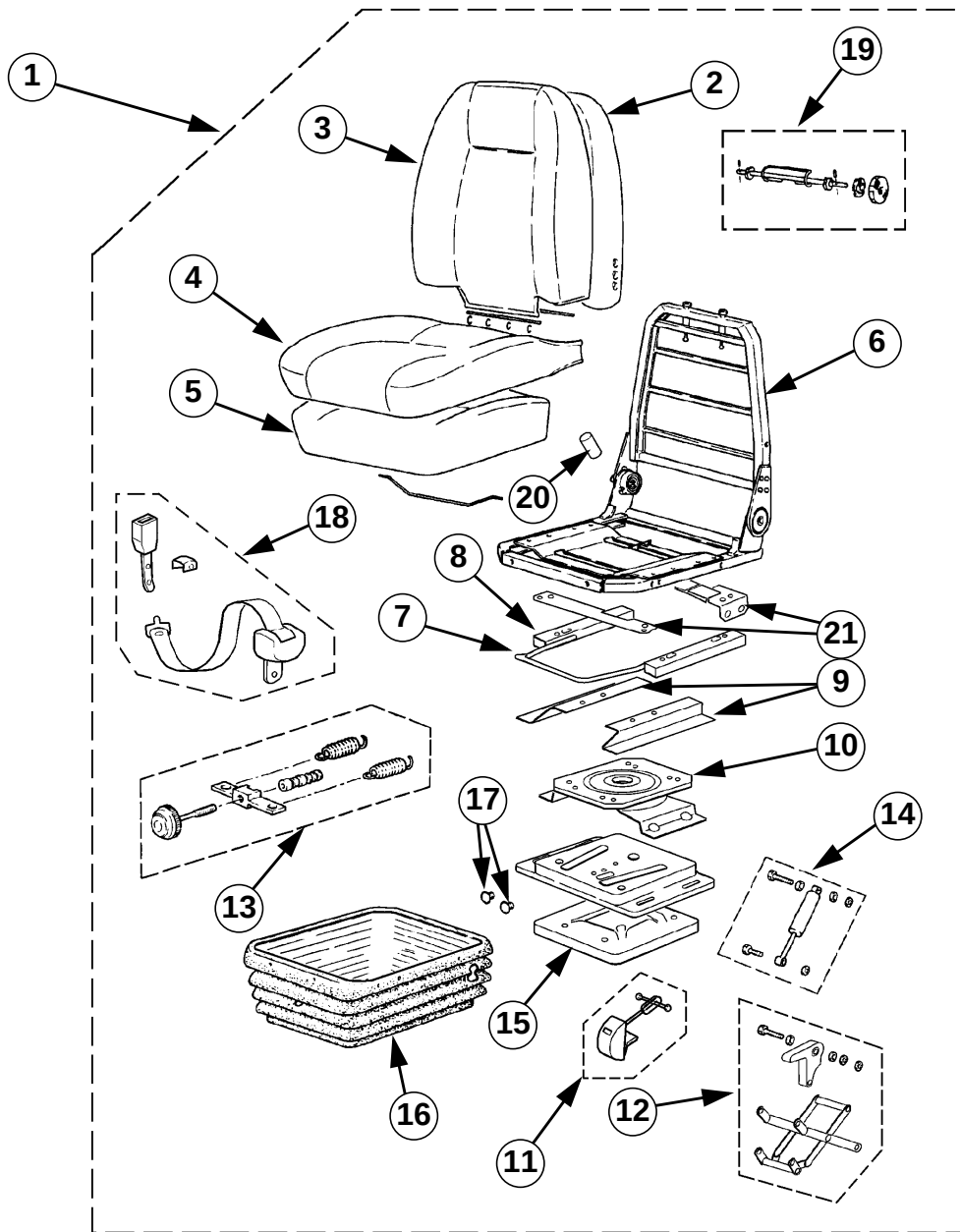
2. Get a person to help you lift the drivers seat (1).
3. Open the rear windscreen, a side window or a door.
4. Get a person to help you remove the drivers seat (1) from the machine through one of the apertures opened in step 4.

NOTE : *The installation of the drivers seat is the reverse of the removal.*



WARNING : *The drivers seat is heavy. Get help to install the drivers seat in the cab and use suitable lifting equipment.*

Description

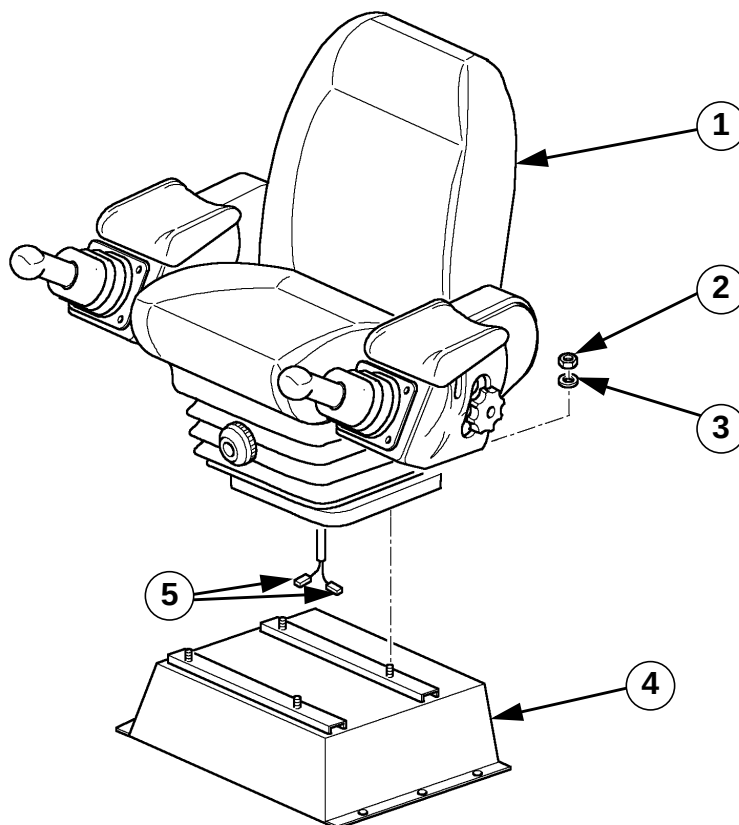


CI98N503

1. Seat assembly	8. Slide	16. Boot
2. Backrest	9. Support seat	17. Middlebuster
3. Cushion backrest	10. Pivot, rotation	18. Belt, seat
4. Cushion, seat	11. Handle (Height adjustment)	19. Kit, parts (Backrest adjustment)
5. Seat	12. Kit, parts	20. Handle assembly (Tilt)
6. Seat, structure	13. Handle (Adjustment handle)	21. Mount
7. Handle (silver and horizontal adjustment)	14. Shock absorber	
	15. Suspension	

DRIVERS SEAT (Model 965)

Removal and installation



CS98N544

1. Note the positions and remove the bolts (2), and the washers (3) from the pedestal (4).
2. Only do step 3 on machines with electronic loader controls.



WARNING : *The drivers seat is heavy. Get help to remove the drivers seat from the cab and use suitable lifting equipment.*

3. Get a person to help you lift the drivers seat (1) slightly and disconnect the electrical connector (5).
4. Open the rear windscreen, a side window or a door.
5. Get a person to help you remove the drivers seat (1) from the machine through one of the apertures opened in step 4.

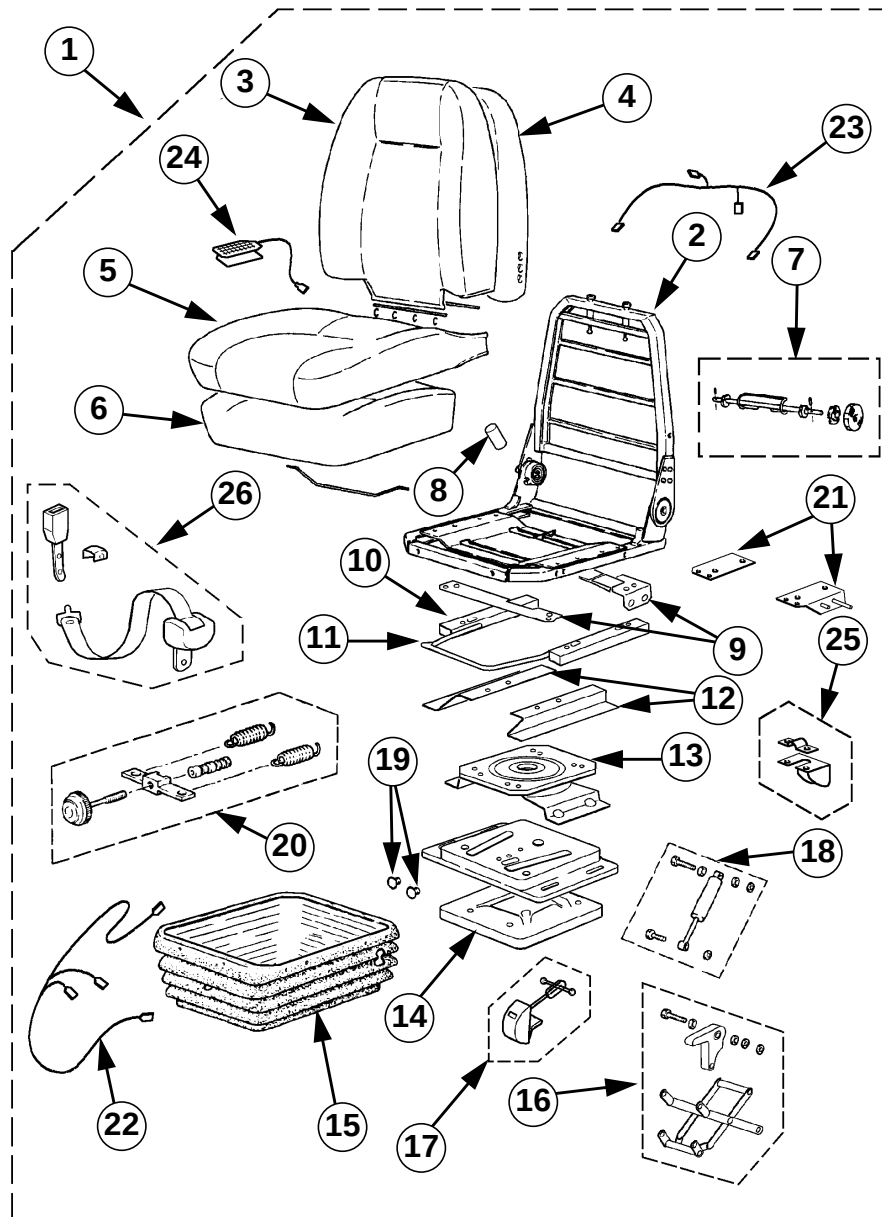
NOTE : *Install the drivers seat in the reverse from that of removal but note the following :*



WARNING : *The drivers seat is heavy. Get help to install the drivers seat in the cab and use suitable lifting equipment.*

1. On machine with electronic loader controls, do an operational test of the loader controls. Make sure the system operates correctly.
2. On machines with electronic backhoe controls, do an operational test of the backhoe controls. Make sure the system operates correctly.

Description



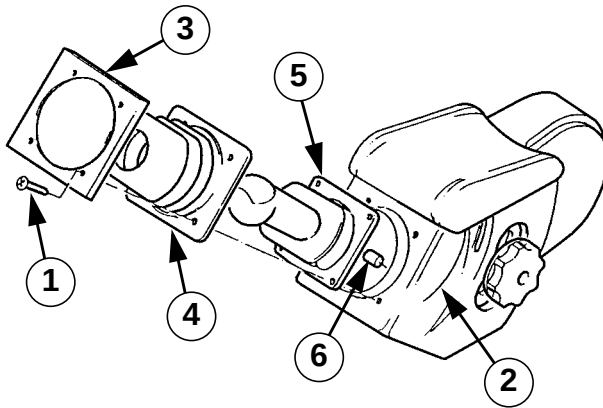
C198N504

1. Seat assembly	10. Slide	18. Shock absorber
2. Seat structure	11. Handle (Silver and horizontal adjustment)	19. Middlebuster
3. Cushion, backrest	12. Support seat	20. Handle Adjustment handle)
4. Backrest	13. Pivot, rotation	21. Mount
5. Cushion, seat	14. Suspension	22. Harness (Lower)
6. Seat	15. Boot	23. Harness (Upper)
7. Kit, parts (Backrest adjustment)	16. Kit, parts	24. Sensor
8. Handle Assembly (tilt)	17. Handle (height adjustment)	25. Protector
9. Mount		26. Belt, seat

JOYSTICK

Removal and installation (Model 965)

NOTE : The figure shows a left joystick. The procedure to remove the right joystick is identical to that for the left joystick.



CS98N540

1. Remove the screws (1) from the seat arm (2).
2. Remove the clamp (3) and the gaiter (4) from the joystick (5).
3. Lift the joystick (5) from the seat arm (2) and disconnect the electrical connector (6) from the joystick (5).
4. Attach the electrical connector (6) to the structure of the seat arm (2) with temporary ties.

NOTE : Install the joystick in the reverse order from that of removal but note the following :

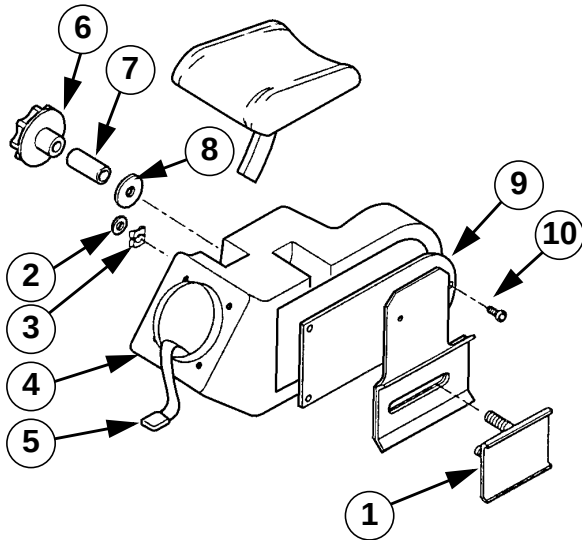
- After installation, do a test of the input signal.

SEAT ARM REST ASSEMBLY

Removal and installation

NOTE : This procedure applies to machines with electronic backhoe controls only. The procedure given is for a right seat arm rest assembly. The procedure for a left seat arm rest assembly is identical.

1. Remove the joystick (see page 7).
- 2.



CS98N541

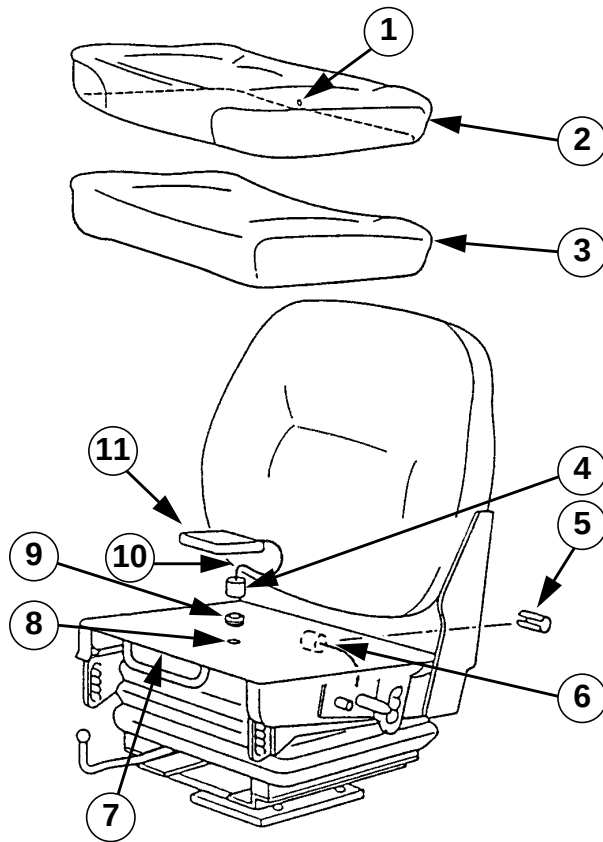
Remove the clip (3) and the washer (2).

3. Remove the handwheel (6), the spacer (7) and the washer (8).
4. Slide the seat arm rest assembly from the mounting bracket on the seat (1).
5. Support the seat arm rest assembly during step 6.
6. Remove the screws (10) and separate the housing (4) from the backplate (9).
7. Note the routing and release the harness (5) from the housing (4).

NOTE : *Install the seat arm rest assembly in the reverse order from that of removal.*

DRIVERS SEAT PRESSURE PAD (MODEL 965)

Removal



CS98N542

1. Remove the clip (5) from the seat cover (2) and the rear edge of the seat pan (7). Release the press stud (1) from the seat cover (2).
2. Release the edge trim of the seat cover (2) from the edges of the seat pan (7).
3. Remove the seat cover (2) and the seat foam cushion (3) from the seat pan (7).
4. Disconnect the electrical connector (4) from the electrical connector (6).
5. Disengage the grommet (9) from the hole (8) in the seat pan (7).
6. Carefully lift the seat pressure pad (11) from the seat and route the electrical cable (10) and the electrical connector (4) clear of the hole (8) in the seat pan (7).
7. Remove the grommet (9) from the electrical cable (10).

Installation

NOTE : Install the driver's seat pressure pad in the reverse order from that of removal but note the following :

1. After installation, sit the driver's seat, start the engine and do steps 2 through 5.
2. On the side console, set the hydraulic enable switch to on.
3. Stand up from the driver's seat. Make sure the green light of the hydraulic enable switch, on the side console, flashes twice every second.
4. Sit in the driver's seat. Make sure the flashing of the green light in the hydraulic enable switch, on the side console, stops.
5. On the side console, set the hydraulic enable switch to off and stop the engine.

Section

9011

REMOVAL AND INSTALLATION OF COMPONENTS

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WARNING : *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message that follows, as there is a risk of serious injury.*

REMOVAL AND INSTALLATION OF THE FRONT COUPLING

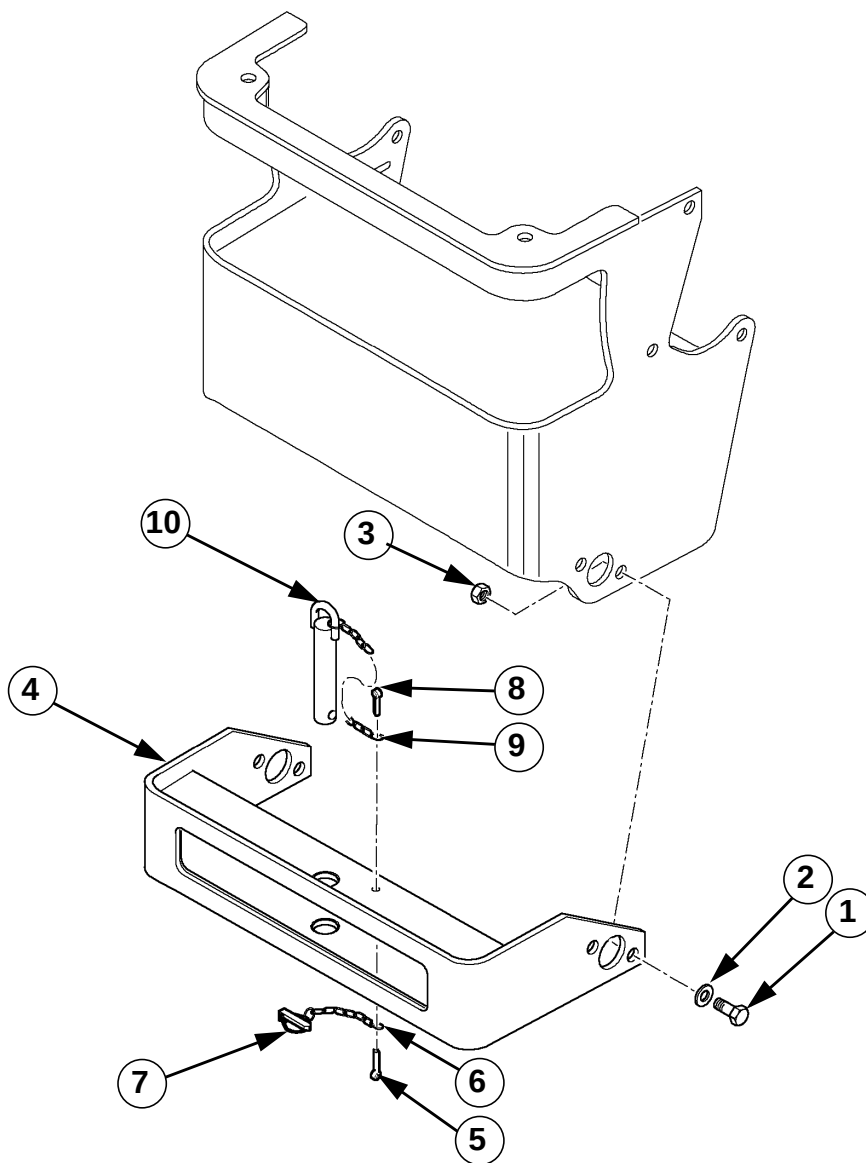
1. Remove the bolts (1), the washers (2) and the nuts (3).
2. Remove the hitch (4) from the machine.
3. Only carry out Steps 4 through 7 if you replace the hitch (4).
4. Remove the split pin (5).
5. Remove the chain (6) and the security pin (7) from the hitch (4).

6. Remove the split pin (8).

7. Remove the chain (9) and the hitch pin (10) from the hitch (4).

NOTE : *Installation of the hitch (4) is the reverse order from that of removal.*

NOTE : *When installing, install new split pins (5) and (8).*



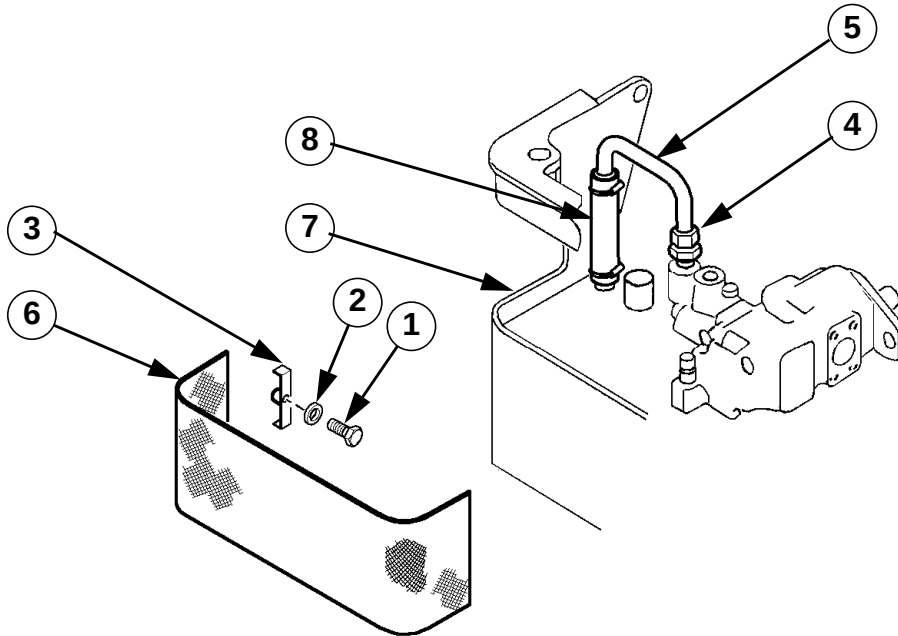
C198M501

REMOVAL AND INSTALLATION OF THE GRILLE

1. Remove the four bolts (1), four washers (2) and four clamp brackets (3).
2. Loosen the nut (4) and orientate the tube (5) in such a way as to be able to slide the grille (6) between the hydraulic reservoir (7) and the hose (8).
3. Tighten the nut (4).

NOTE : *Installation of the grille is in the reverse order from that of removal.*

NOTE : *After installing the grille, return the tube (5) to its initial position.*



CI98K508

REMOVAL AND INSTALLATION OF THE REAR FENDER

The rear left-hand fender is illustrated. The procedure for the rear right-hand fender is identical.

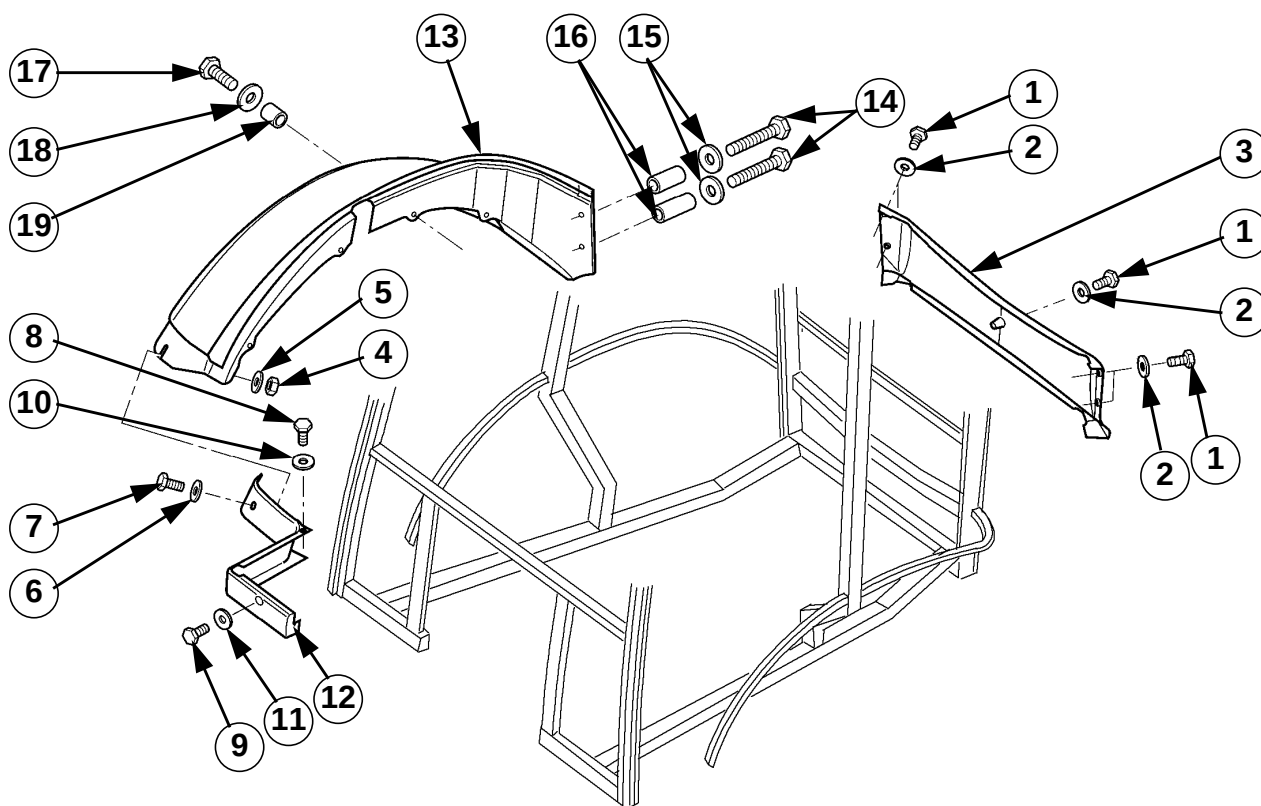
1. Remove the bolts (1) and washers (2) from the panel (3).
2. Remove the panel (3) from the machine.
3. Remove the nut (4), the washers (5) and (6) and the bolt (7).
4. Remove the bolts (8) and (9) and the washers (10) and (11).
5. Remove the sill (12) from the machine.
6. Remove the rear wheel.

WARNING: The rear fender is heavy and difficult to manoeuvre. Get help to remove the rear fender from the machine.

7. Get help to support the rear fender (13) during Steps 8 through 10.
8. Remove the bolts (14), the washer (15) and the spacers (16) from the rear fender (13).
9. Remove the bolts (17), the washers (18) and the spacers (19) from the rear fender (13).
10. Remove the rear fender (13) from the machine.

NOTE : The installation of the rear fender is in the reverse order from that of removal.

NOTE : After installation on machines with 4-wheel steer facility, operate the 4-wheel steer system. Make sure the rear wheels do not foul the rear fender (13).



CI98M502

REMOVAL AND INSTALLATION OF THE HYDRAULIC RESERVOIR

1. Park the machine on a level surface.
2. Raise the loader and lock the support strut to hold the machine.
3. Release the hydraulic system pressure (see section 8002).
4. Drain the hydraulic reservoir (1).
5. Open the hood.
6. Remove the grille (see page 4).
7. Remove the front coupling (see page 3).
8. Remove the split pins (2) and washers (3) from the support (4).
9. Loosen the hose clips (5) and (6) and disconnect the hydraulic hoses (7) and (8) from the hydraulic reservoir (1). Put caps on the open ends of the hydraulic hoses and the hydraulic reservoir.
10. Loosen and remove the bolts (9), washers (10) and disconnect the manifold (11) and O-ring (12) from the hydraulic pump (13).

NOTE : *when installing , install a new O-ring (13) in the manifold (11).*

11. If fitted, disconnect the return pipe (14) from the filler (15). Fit the blanking caps to both connections.



WARNING: *The hydraulic reservoir is very heavy. Get help to remove the hydraulic reservoir from the machine.*

12. Support the hydraulic reservoir (1) on a suitable trestle.
13. Remove the nuts (16), washers (17) and (19) and bolt (18).
14. Carefully, remove the hydraulic reservoir (1) from the machine.
15. Only carry out 16 through 21 if you replace the hydraulic reservoir (1).

16. Loosen the hose clip (20) and remove the manifold (11) and hose (21) from the hydraulic reservoir.

17. Remove the bolts (22), O-rings (23) and remove the level indicator (24) from the hydraulic reservoir (1). Remove the O-rings (25).

NOTE : *When installing, install new O-rings (23) and (25).*

18. Remove the bolts (26) and washers (27) from the filler (15).

19. Remove the filler (15) from the hydraulic reservoir (1).

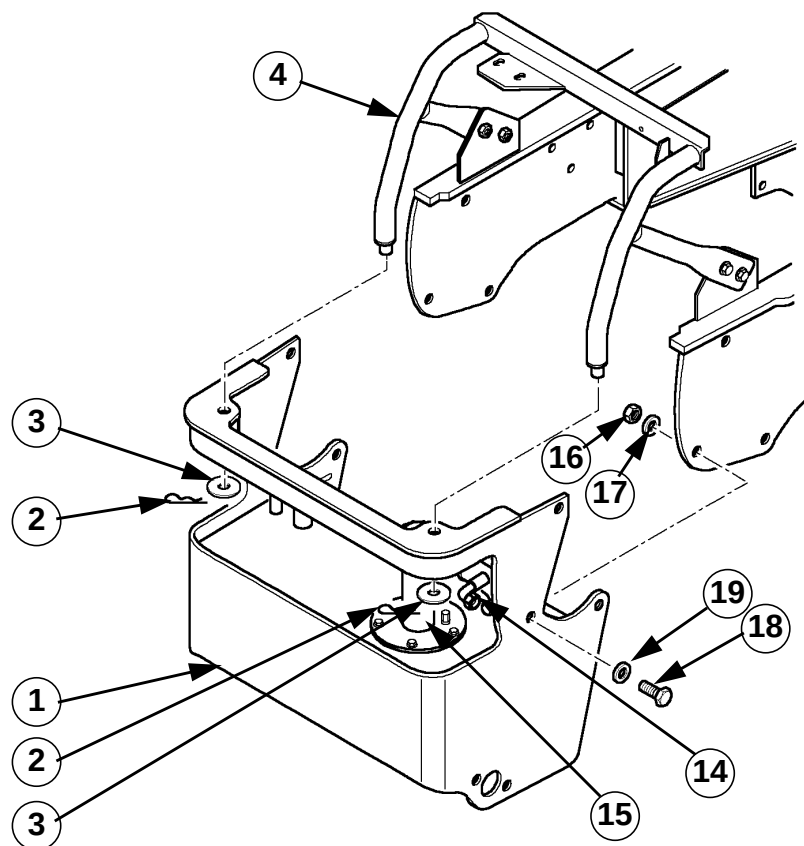
20. Remove the seal (28).

NOTE : *When assembling, install a new seal (28).*

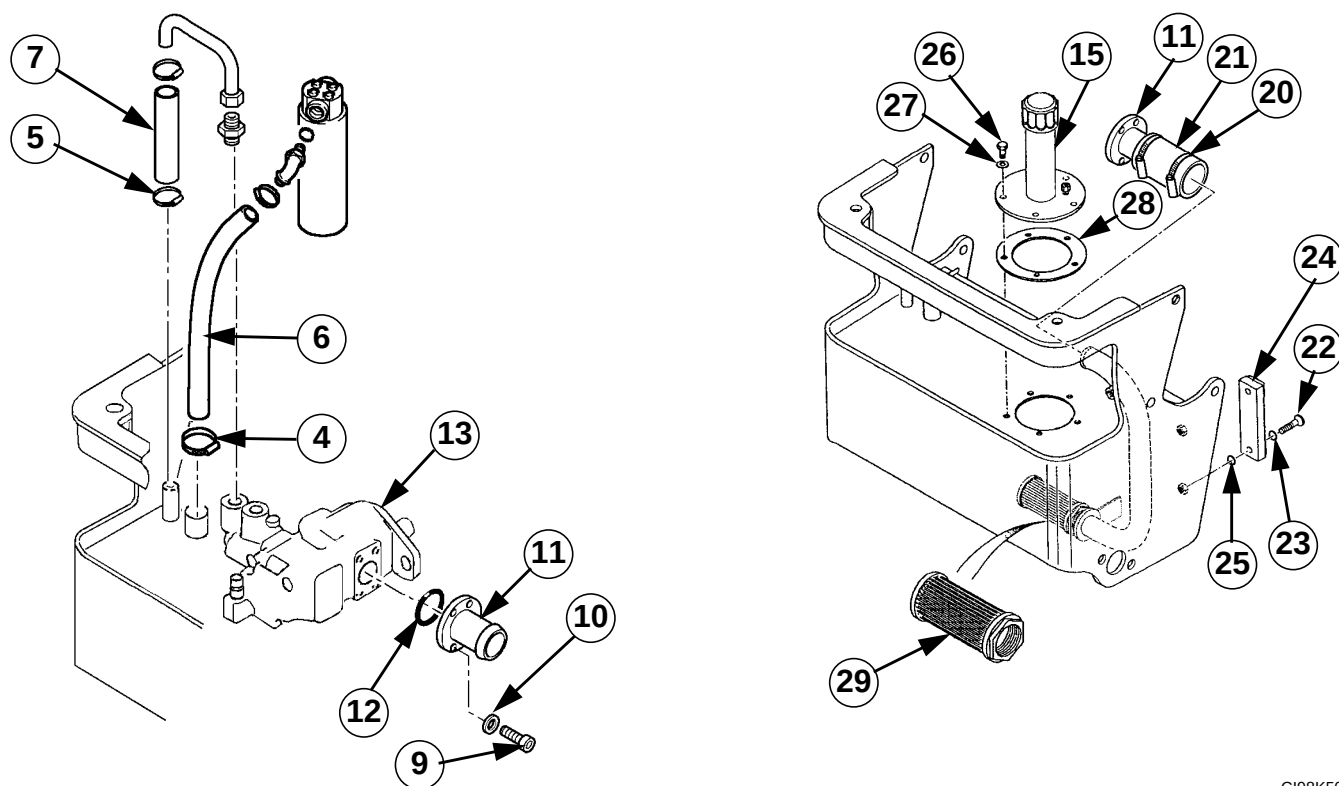
21. Unscrew the suction strainer (29) and remove it from the hydraulic reservoir (1).

NOTE : *The installation of the hydraulic reservoir is in the reverse order from that removal.*

NOTE : *After installation, start the engine and operate the hydraulic functions of the machine. Make sure the hydraulic components and hoses which have been disturbed do not leak. check the oil level in the hydraulic reservoir, top up if necessary.*



CI98K503



CI98K504

CI98K507

REMOVAL AND INSTALLATION OF THE FUEL TANK

1. Put a suitable container in position below the fuel tank (1).
2. Remove the drain plug (2) and the washer (3).

NOTE : *When installing, install a new washer (3).*

3. Remove the fuel tank filler cap (4) and drain the fuel into the container.
4. Disconnect the electrical connector (5) from the electrical connector (6).
5. Remove the spring hose clip (7) and disconnect the fuel hose (8) from the tank stub pipe (9).
6. Remove the spring hose clip (10) and disconnect the fuel hose (11) from the fuel contents sensor (12).
7. Put caps on the open ends of the fuel contents sensor (12), the tank stub pipe (9) and the fuel hoses (8) and (11).



WARNING: *The fuel tank is heavy. Get help to remove it from the machine.*

8. Support the fuel tank (1) on a suitable trolley jack and remove the nuts (13), the bolts (14) and the washers (15).
9. Lower the fuel tank (1) to the floor.

10. Only carry out Steps 11 through 17 if you install a replacement fuel tank (1).

11. Remove the nuts (16), the washers (18), the bolts (17) and the fender extension (19).

12. Remove the strainer (20).

13. Remove the snap ring (21).

14. Remove the fuel contents sensor (12) from the fuel tank.

15. Remove the seal (22).

NOTE : *When installing, install a new seal (22).*

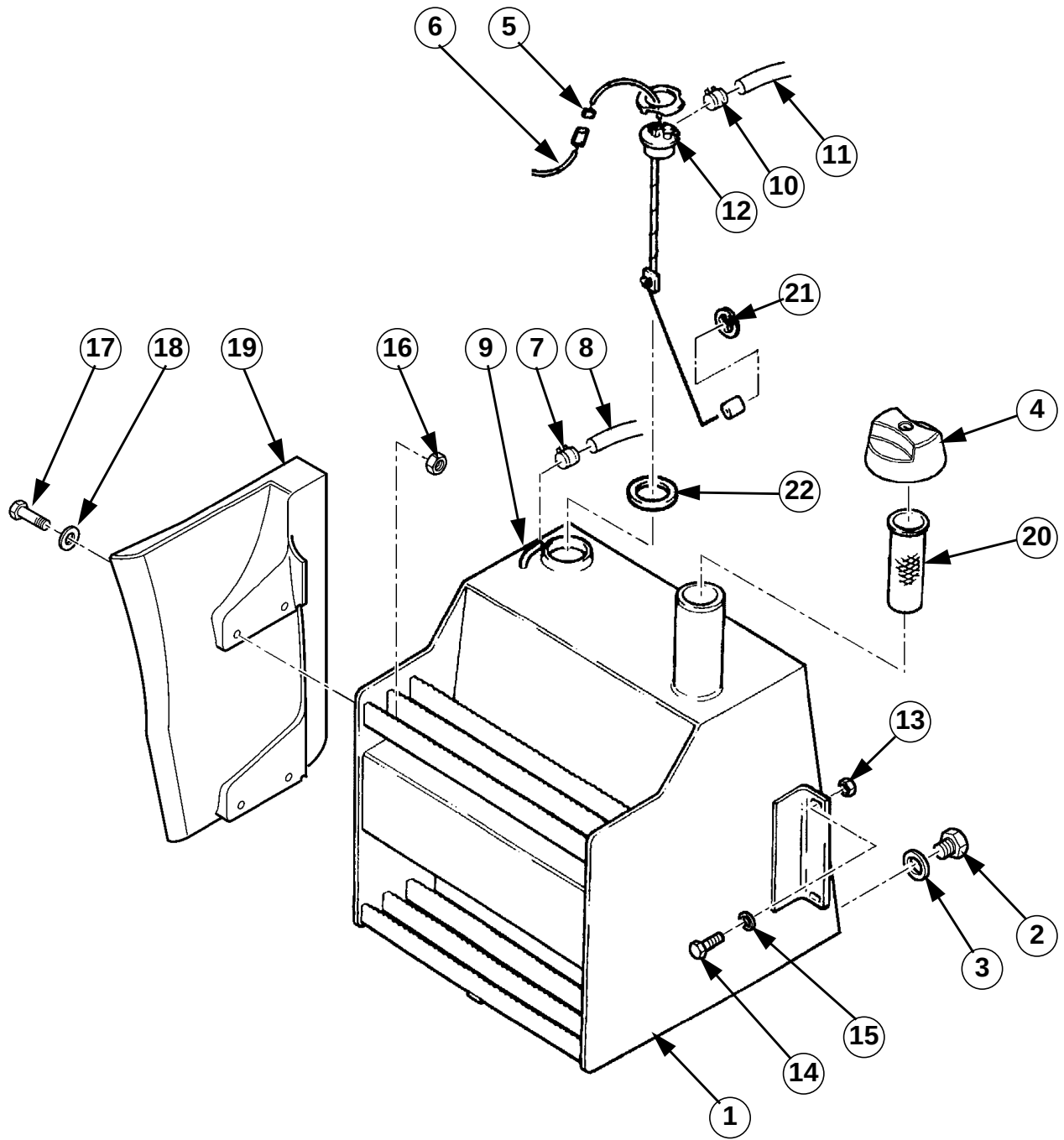
16. Flush the fuel tank (1) with clean fuel.

17. Wash the strainer (20) with clean fuel and dry with a suitable air supply.

NOTE : *The installation of the fuel tank is in the reverse order from that removal.*

NOTE : *After installation, fill the fuel tank (1) with the correct grade of fuel and install the fuel filter cap (4).*

NOTE : *After installation, start the engine. Make sure there are no leaks from the fuel tank (1) or the connections to the tank which have been disturbed. On the side console, make sure the fuel contents gauge shows full. Stop the engine.*



REMOVAL AND INSTALLATION OF THE BATTERY/TOOL BOX

1. Remove the tools from the battery tool box (1).
2. Remove the battery (see Section 4003).
3. Disconnect the electrical leads from the emergency cut-out (2), if fitted.
4. Remove the fuse box from the plate (3).
5. Remove the harness from the battery/tool box (1).



WARNING: *The battery/tool box is heavy. Get help to remove it from the machine.*

6. Remove the nuts (4), the bolts (5) and the washers (6).
7. Remove the battery/tool box (1) from the machine.

8. Only carry out Steps 9 through 13 if you install a replacement battery/tool box (1).

9. Remove the nuts (7), the washers (8), the bolts (9) and the fender extension (10) of the battery/tool box (1).

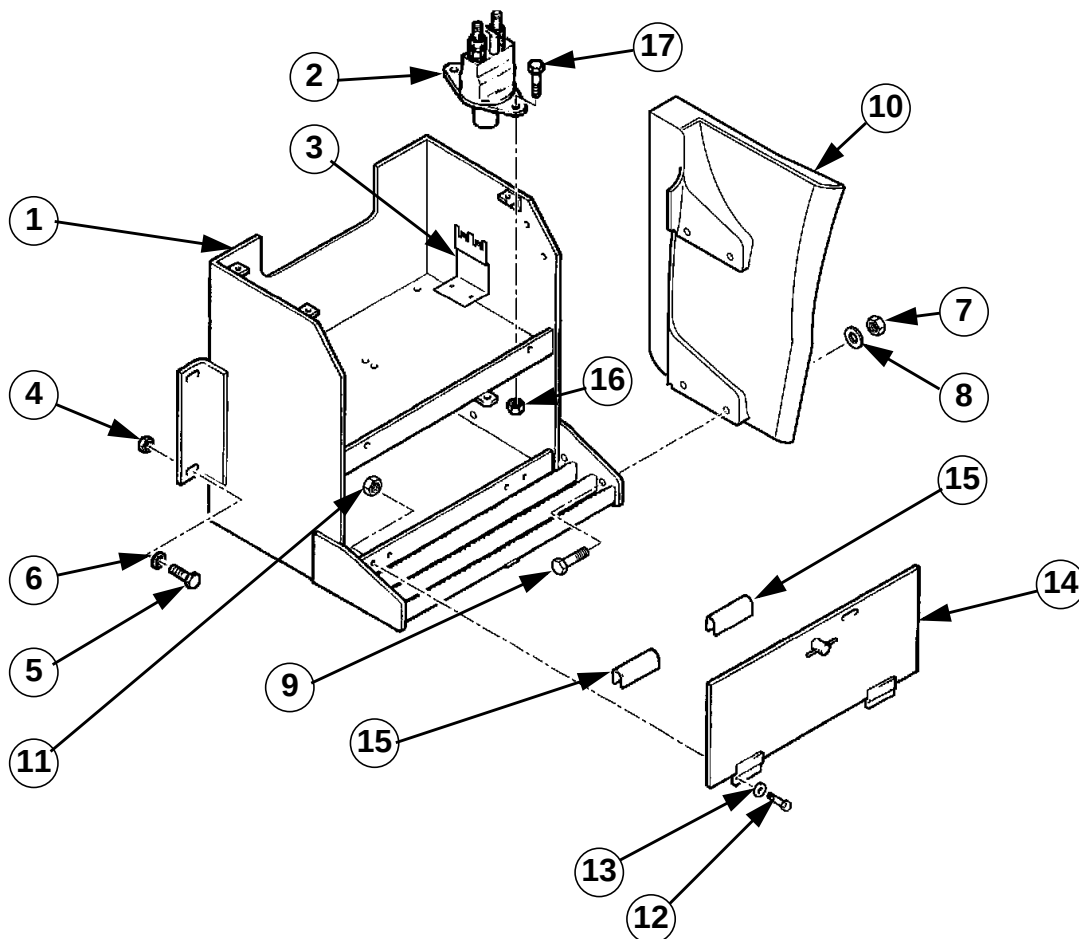
10. Remove the nuts (11), the washers (13) and the bolts (12).

11. Remove the door (14) and the beading (15).

12. If fitted, remove the nuts (16), the bolts (17) and emergency cut-out (2).

13. Remove the engine control gearbox unit from the battery/tool box (1).

NOTE : *The installation of the battery/tool box is in the reverse order from that of removal.*



CI98K505

REMOVAL AND INSTALLATION OF THE FRONT FENDER (Models 750, 760 and 860)

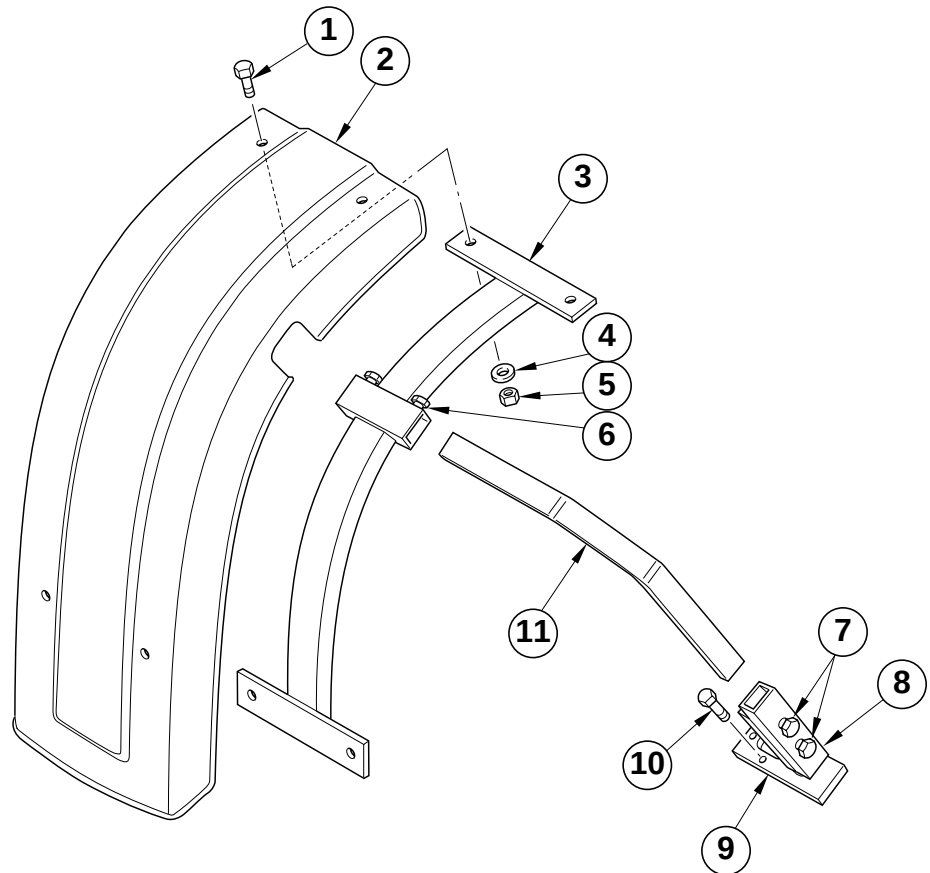
Left fender is illustrated. The procedure for right fenders is identical.

1. Remove the nuts (5), the washers (4) and the bolts (1) and remove the fender (2) from the bracket (3).
2. Loosen the bolts (6) and slide the bracket (3) from the support (11).
3. Loosen the bolts (7) and remove the support (11) from the rotator (8).

4. Remove the bolts (10) and the support (9).

NOTE : The installation of the front fender is in the reverse order from that of removal.

NOTE : After installation, turn the front wheels through their full range. Adjust the position of the bracket (3) on the support (11) and the position of the support (11) in the rotator (8) as necessary. Make sure the front wheels do not foul the fenders.



789M123A

REMOVAL AND INSTALLATION OF THE FRONT FENDER (Models 960 and 965)

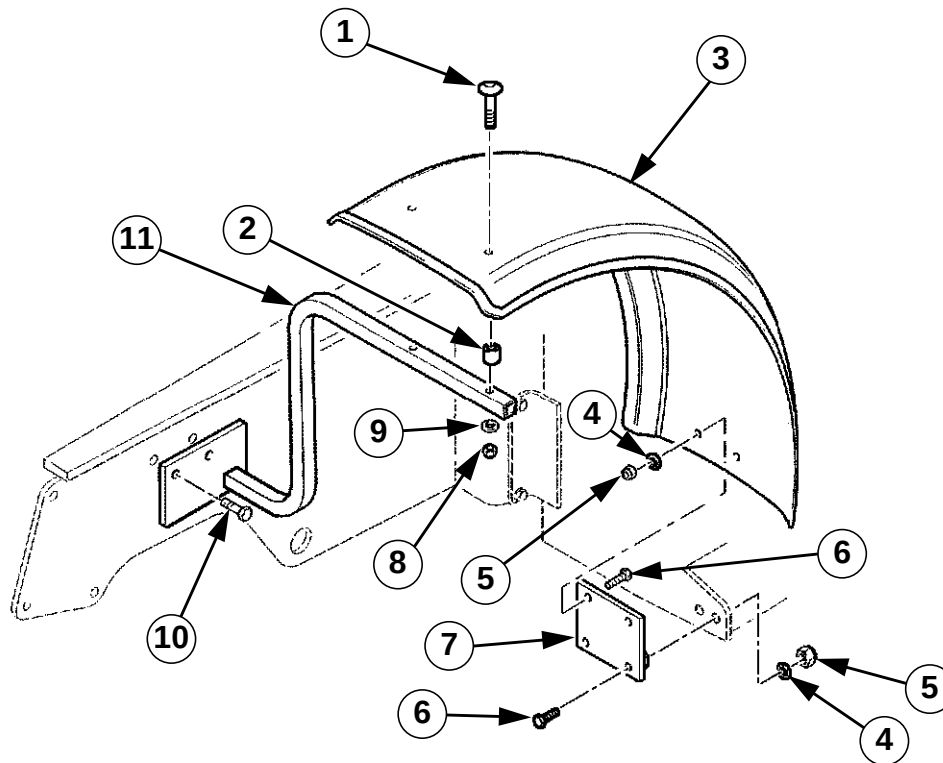
Left fender is illustrated. The procedure for right fenders is identical.

1. Remove the nuts (5), bolts (6) and the washers (4).
2. Remove the bracket (7) and the spacers (4).
3. Remove the nuts (8), the washers (9) and the bolts (1).
4. Remove the fender (3) and the spacers (2).

5. Remove the bolts (10) and the bracket (11).

NOTE : The installation of the front fender is in the reverse order from that of removal.

NOTE : After installation, turn the front wheels through their full range. Make sure the front wheels do not foul the fenders.



CI99F501

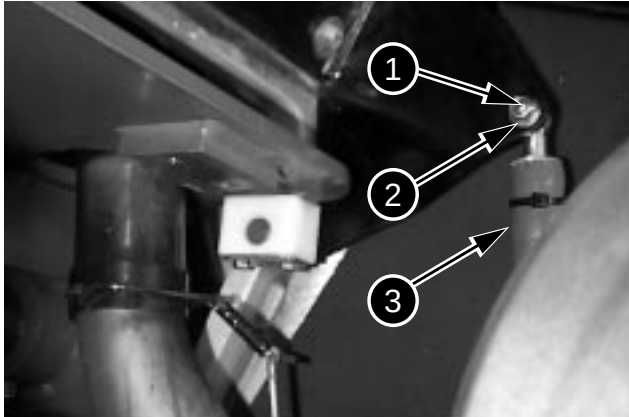
REMOVAL AND INSTALLATION OF THE ENGINE HOOD

1. Park the machine on a level surface.
2. Raise the loader and lock the support strut to secure the loader.
3. Open the engine hood.



WARNING: *The engine hood is heavy. Get help to remove the engine hood from the machine.*

4.

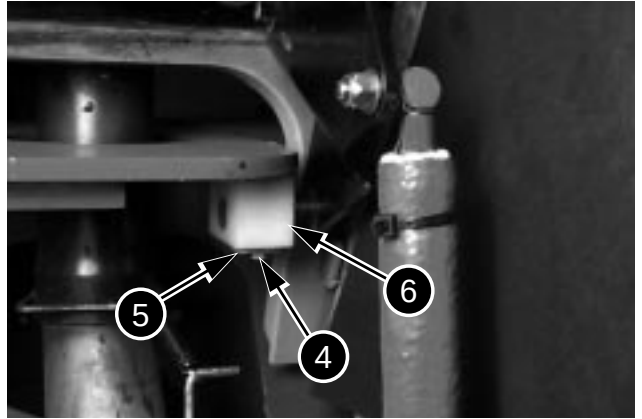


CD98M002

Remove the locknuts (1) and the washers (2) and disconnect the cylinder gas struts (3) from the engine hood.

5. Support the hood with suitable chocks or lifting gear. Move the cylinder gas struts away from the engine hood and attach them to the engine with temporary ties.

6.



CD98M003

Remove the bolts (4), the plates (5) and the clamps (6) from the engine hood articulation pins.

7. Remove the engine hood from the machine.

NOTE : *The installation of the engine hood is in the reverse order from that of removal.*

STABILIZER HYDRAULIC CYLINDER (Sideshift Machines)

This information is applicable to a left-hand stabilizer hydraulic cylinder. The procedure for a right-hand stabilizer hydraulic cylinder is identical.

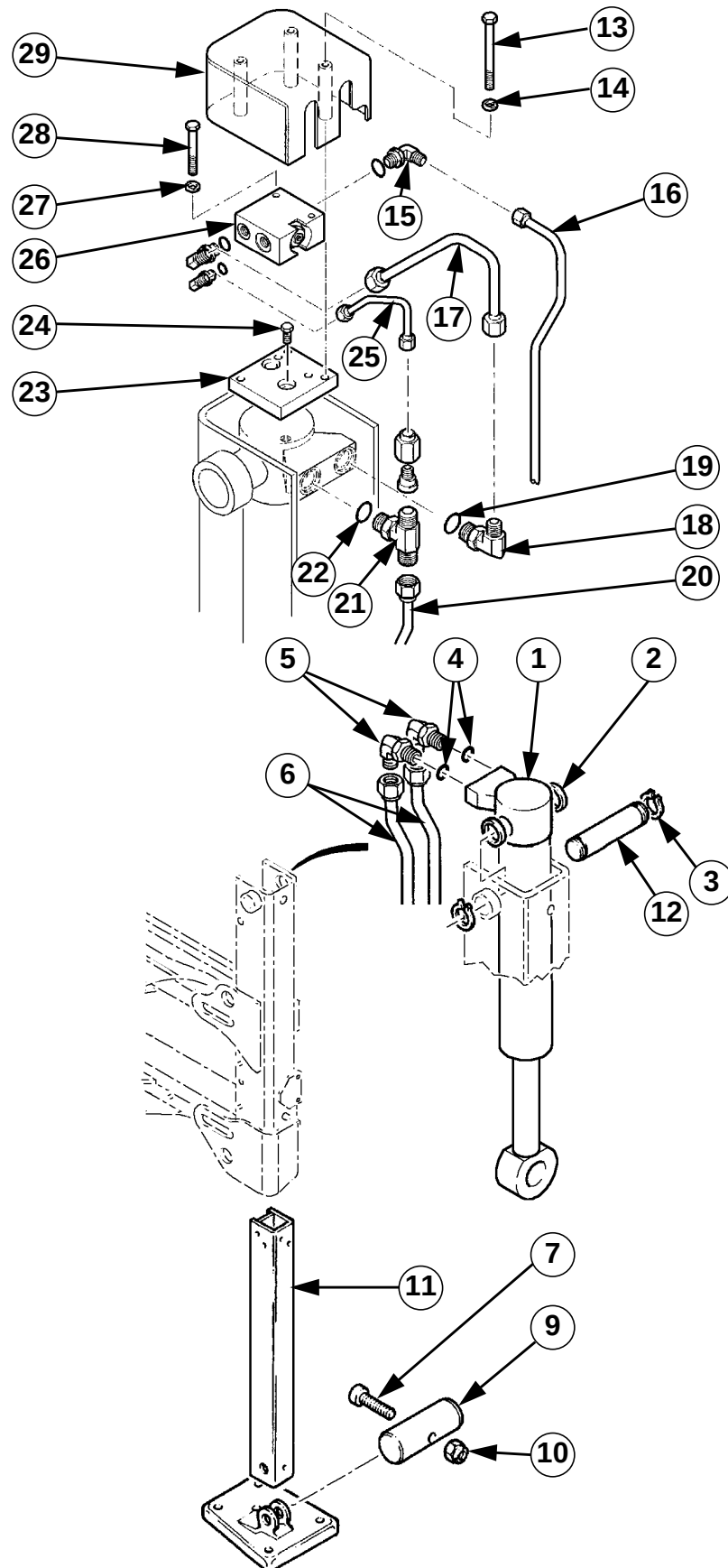
Removal

1. Park the machine on firm, level ground and lower the stabilizer legs (11). Make sure the machine is not raised from the ground.
2. Release the pressure from the hydraulic system (see section 8002).
3. Place a suitable container below the hydraulic lines and connections.
4. Remove the bolts (13), the washers (14) and the cover (29).
5. Only carry out Steps 6 through 11 on machines with a safety valve fitted.
6. Disconnect the hydraulic lines (20) and (25) from the T-piece (21).
7. Disconnect the hydraulic lines (16) and (17) from the elbows (15) and (18).
8. Remove the bolts (28) and the washers (27).
9. Remove the safety valve (26) complete with the hydraulic lines (17) and (25).
10. Remove the bolts (24) and the spacer (23).
11. Put caps on the elbows (15) and (18), the T-piece (21) and the hydraulic lines (16), (17), (20) and (25).
12. Only carry out Step 13 on machines with no safety valve fitted.
13. Disconnect the hydraulic lines (6) from the elbows (5). Put caps on the elbows (5) and the open ends of the hydraulic lines (6).
14. Remove the circlips (3) and the spacers (2) from the upper pin (12).
15. Use a soft metal drift to remove the upper pin (12).
16. Support the stabilizer hydraulic cylinder (1) at its upper eye with suitable lifting equipment.
17. Remove the nut (10) and the screw (7).
18. Use a soft metal drift to remove the lower pin (9).
19. Remove the stabilizer hydraulic cylinder (1) from the stabilizer leg (11).
20. Only carry out Step 21 if you install a replacement stabilizer hydraulic cylinder (1) on machines with a safety valve (26) fitted.
21. Remove the T-piece (21), the elbow (18) and discard the O-ring seals (19) and (22). Put caps on the T-piece (21), the elbow (18) and the stabilizer hydraulic cylinder (1).
22. Only carry out Step 23 if you install a replacement stabilizer hydraulic cylinder (1) on machines with no safety valve (26) fitted.
23. Remove the elbows (5) and discard the O-ring seals (4). Put caps on the elbows (5) and the stabilizer hydraulic cylinder (1).

Installation

Install the stabilizer hydraulic cylinder in the reverse order from that of removal but note the following :

1. Install new O-ring seals (19) and (22), on the elbow (18) and the T-piece (21).
2. Install new O-ring seals (4).
3. Torque tighten the screw (7) and the nut (10) to 60 Nm.
4. Apply Molykot Cu 7439 plus grease, or a recognised equivalent, to the upper pin (12).
5. After installation replenish the hydraulic system.
6. After installation, carry out an operational test of the stabilizer hydraulic cylinder (1). Make sure there are no leaks from the hydraulic lines and connections that have been disturbed.



TYPICAL STABILIZER HYDRAULIC LINES (sideshift machines)

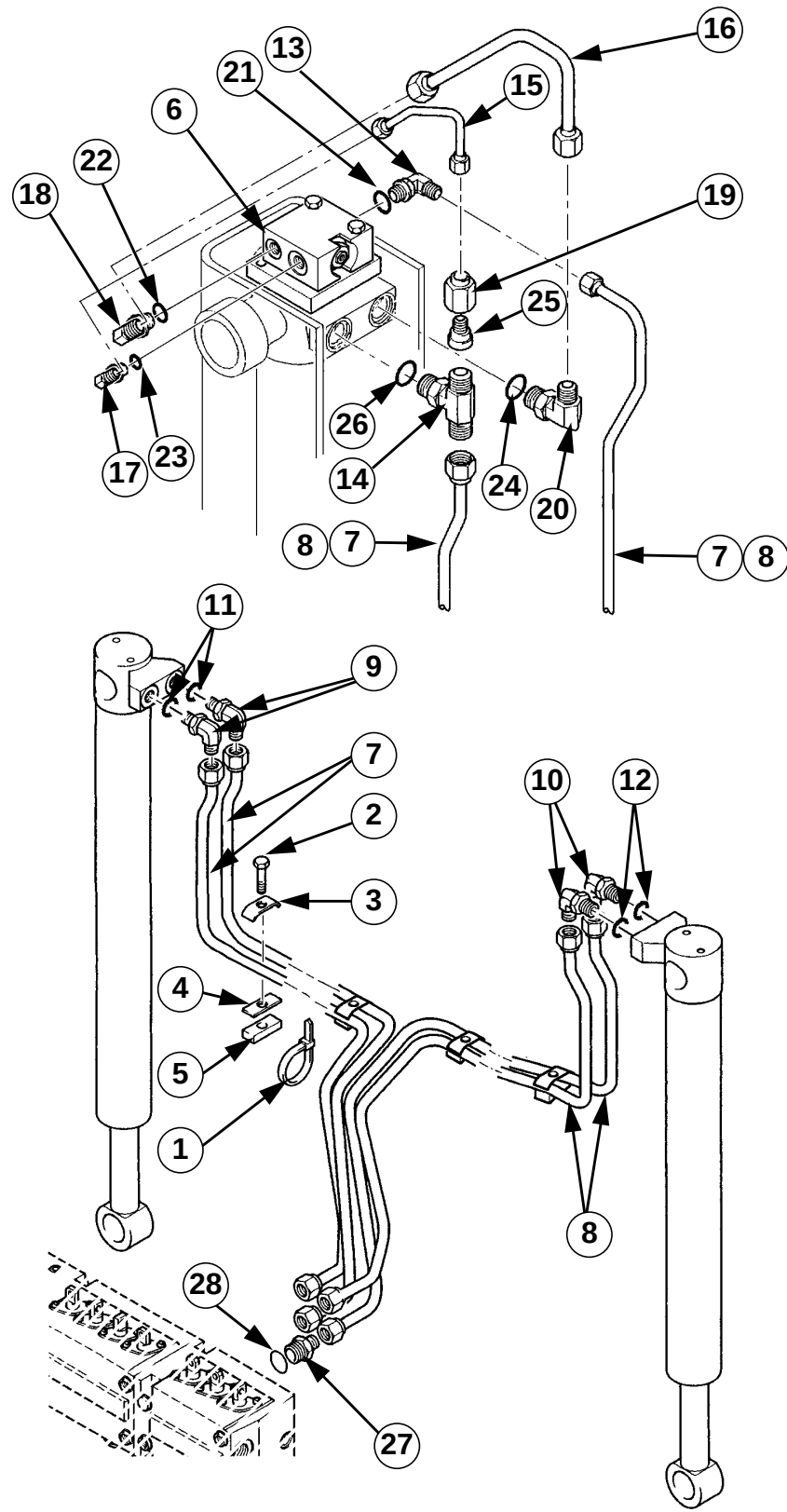
Removal

1. Park the machine on firm, level ground and lower the stabilizer legs. Make sure the machine is not raised from the ground.
2. Release the pressure from the hydraulic system (see section 8002).
3. Place a suitable container below the hydraulic lines.
4. Note the positions. Remove and discard the tie-wraps (1) which attach the electrical harness to the hydraulic lines.
5. Note the positions. Remove the bolts (2), the clamps (3), the plates (4) and spacers (5).
6. Only carry out Steps 7 and 8 on machines with no safety valve (6) fitted.
7. Disconnect the pipes (7) and (8) from the elbows (9) and (10).
8. Remove the elbows (9) and (10). Remove and discard the O-ring seals (11) and (12).
9. Only carry out Steps 10 and 15 on machines with a safety valve (6) fitted.
10. Remove the pipes (7) and (8) from the elbows (13) and T-pieces (14).
11. Disconnect the pipes (15) and (16) from the elbows (17) and (18).
12. Disconnect the pipes (15) from the nuts (19).
13. Disconnect the pipes (16) from the elbows (20).
14. Remove the elbows (13), (17), (18) and (20). Remove and discard the O-ring seals (21), (22), (23) and (24).
15. Remove the T-pieces (14), the nuts (19) and the connectors (25). Remove and discard the O-ring seals (26).
16. Disconnect the pipes (7) and (8) from the adaptators (27). Remove the pipes (7) and (8).
17. Remove the adaptators (27). Remove and discard the O-ring seals (28).
18. Put caps on the open ends of the pipes, the elbows, the T-pieces and the adaptors.

Installation

Install typical stabilizer hydraulic lines in the reverse order from that of removal but note the following :

1. Install new O-ring seals (28) on the adaptators (27).
2. Install new O-ring seals (11) and (12) on the elbows (9) and (11).
3. Install new O-ring seals (26) on the T-piece (14).
4. Install new O-ring seals (21), (22), (23) and (24) on the elbows (13), (17), (18) and (20).
5. After installation, replenish the hydraulic system.
6. After installation, carry out an operational test of the stabilizer hydraulic system. Make sure there are no leaks from the hydraulic lines and connections that have been disturbed.



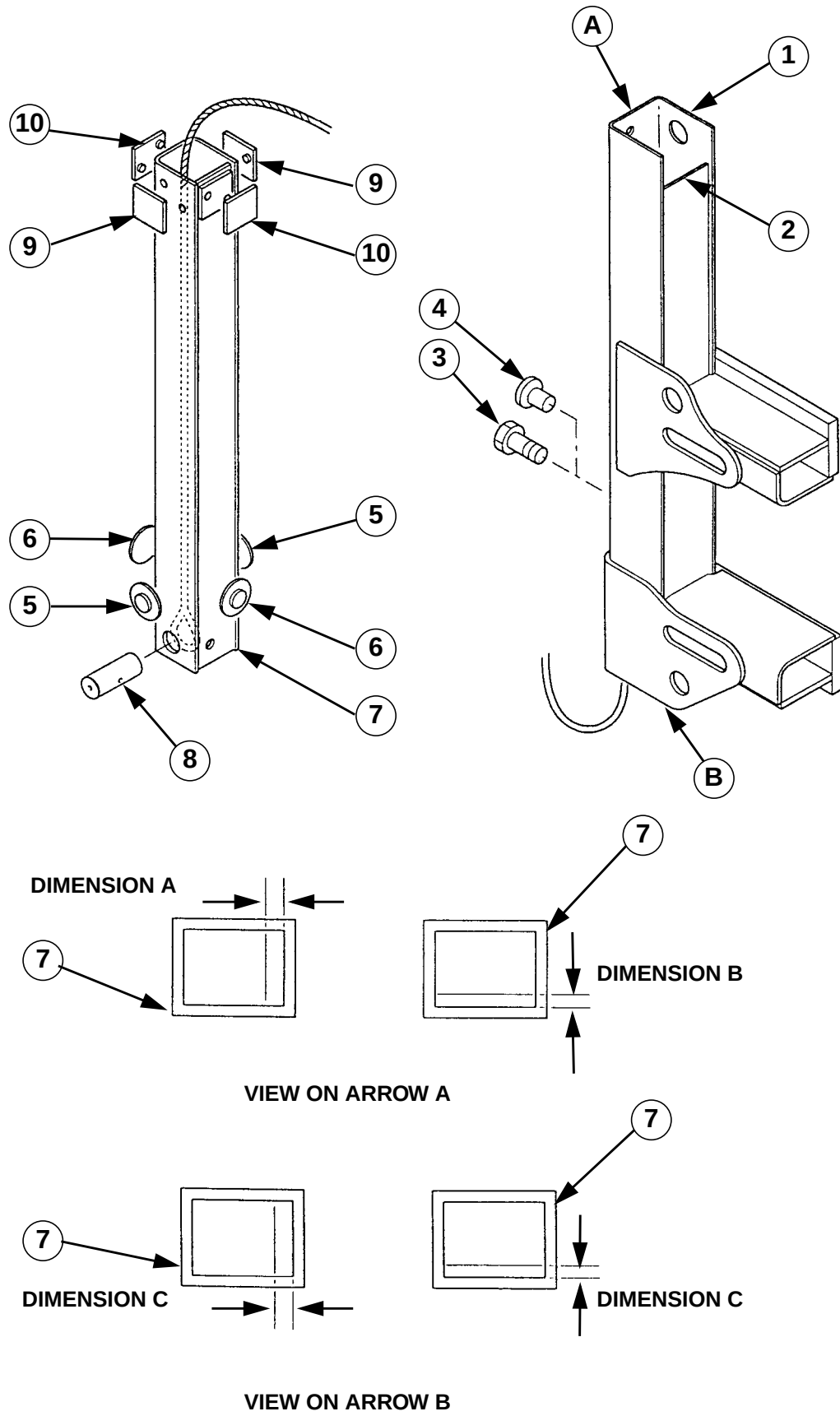
CHECKING AND ADJUSTING THE STABILIZER WEAR PADS (Sideshift machines)

1. Park the machine on firm, level ground and lower the stabilizer leg (7) to a convenient working height. Make sure the foot of the stabilizer is not on the ground.
2. Remove the plastic plug (4) from the boss on the stabilizer post (1).
3. Screw a suitable bolt (3) into the boss on the stabilizer post (1) and clamp the stabilizer leg (7) to the stabilizer post (1).
4. Release the pressure from the hydraulic system (see section 8002).
5. Remove the stabilizer hydraulic cylinder (see page 14).
6. Insert a suitable short pin (8) into the stabilizer leg (7). Make sure the short pin (8) is in the stabilizer leg (7). Make sure the short pin (8) passes only through the stabilizer leg (7) and does not touch the inner surfaces of the stabilizer post (1).
7. Route a suitable length of rope or chain down through the stabilizer leg (1) and attach it to the short pin (8).
8. Remove the bolt (3) from the boss on the stabilizer post (1).
9. Pull the rope and raise the stabilizer leg (7) to access the upper wear pads (9) and (10) and the lower wear pads (5) and (6).
10. Remove the upper wear pads (9) and (10) from the stabilizer leg (7).
11. Remove the lower wear pads (5) and (6) from the stabilizer post (1).
12. Remove any debris from the spigot holes in the stabilizer leg (7) and the stabilizer post (1). Make sure there is no debris between the inner surfaces of the stabilizer post (1) and the outer surfaces of the stabilizer leg (7).
13. Inspect the lower parts of the stabilizer leg (7) and the stabilizer post (1) for damage. Make sure all welds are in good condition and the bottoms of the stabilizer leg (7) and the stabilizer post (1) are not flared.
14. If necessary, fully remove the stabilizer leg (7) to repair any damage found during Step 13.
15. Only carry out Step 16 if you fully removed the stabilizer leg (7).
16. Put the stabilizer leg (7) in position and lower it into the stabilizer post (1).
17. Lower the stabilizer leg (7) until its top aligns with the top of the inboard face (2) of the stabilizer post (1).
18. Position the stabilizer leg (7) with one of its outer surfaces touching the corresponding inner surface of the stabilizer post (1).
19. Measure and note the clearance between the opposite outer surface of the stabilizer leg (7) and the corresponding inner surface of the stabilizer post (1) (Dimension A).
20. Carry out Steps 18 and 19 again on the outer surface of the stabilizer leg (7) adjacent to the surface positioned during step 18 (Dimension B).
21. Determine the thickness of the replacement upper wear pads (9) required by dividing Dimension A by two. Determine the thickness of the replacement upper wear pads (10) required by dividing Dimension B by two.
22. Raise the stabilizer leg (7) to access the holes for the wear pad spigots.
23. Select and install the replacement upper wear pads (9) and (10) in the stabilizer leg (7).

NOTE : *Replacement upper wear pads are colour coded by thickness.*

Colour	Thickness
	mm
Yellow	4.5
Black	5
Grey	5.5
Neutral	6
Red	6.5

NOTE : *It is not possible to remove the stabilizer leg through the bottom of the stabilizer post. It must be lifted out through the top of the stabilizer post.*



24. Lower the stabilizer leg (7) until its bottom aligns with the bottom of the stabilizer post (1).
25. Position the stabilizer leg (7) with one of its outer surfaces touching the corresponding inner surface of the stabilizer post (1).
26. Measure and note the clearance between the opposite outer surface of the stabilizer leg (7) and the corresponding inner surface of the stabilizer post (1) (Dimension C).
27. Carry out Steps 25 and 26 again on the outer surface of the stabilizer leg (7) adjacent to the surface positioned during step 25 (Dimension D).
28. Determine the thickness of the replacement lower wear pads (5) required by dividing Dimension C by two. Determine the thickness of the replacement lower wear pads (6) required by dividing Dimension D by two.
29. Raise the stabilizer leg (7) to access the holes for the wear pads spigots.
30. Select and install the replacement lower wear pads (9) and (10) in the stabilizer post (1).

NOTE : *Replacement lower round wear pads are colour coded by thickness.*

Colour	Thickness
	mm
Yellow	4.5
Black	5
Grey	5.5
Neutral	6
Red	6.5

31. Position the stabilizer leg (7) at a convenient working height.
32. Screw a suitable bolt (3) into the boss on the stabilizer post (1) and clamp the stabilizer leg (7) to the stabilizer post (1).
33. Remove the short pin (8) and the length of rope.



WARNING: *You could be injured if you remove the bolt (3) before making sure the stabilizer leg (7) is in contact with the ground.*

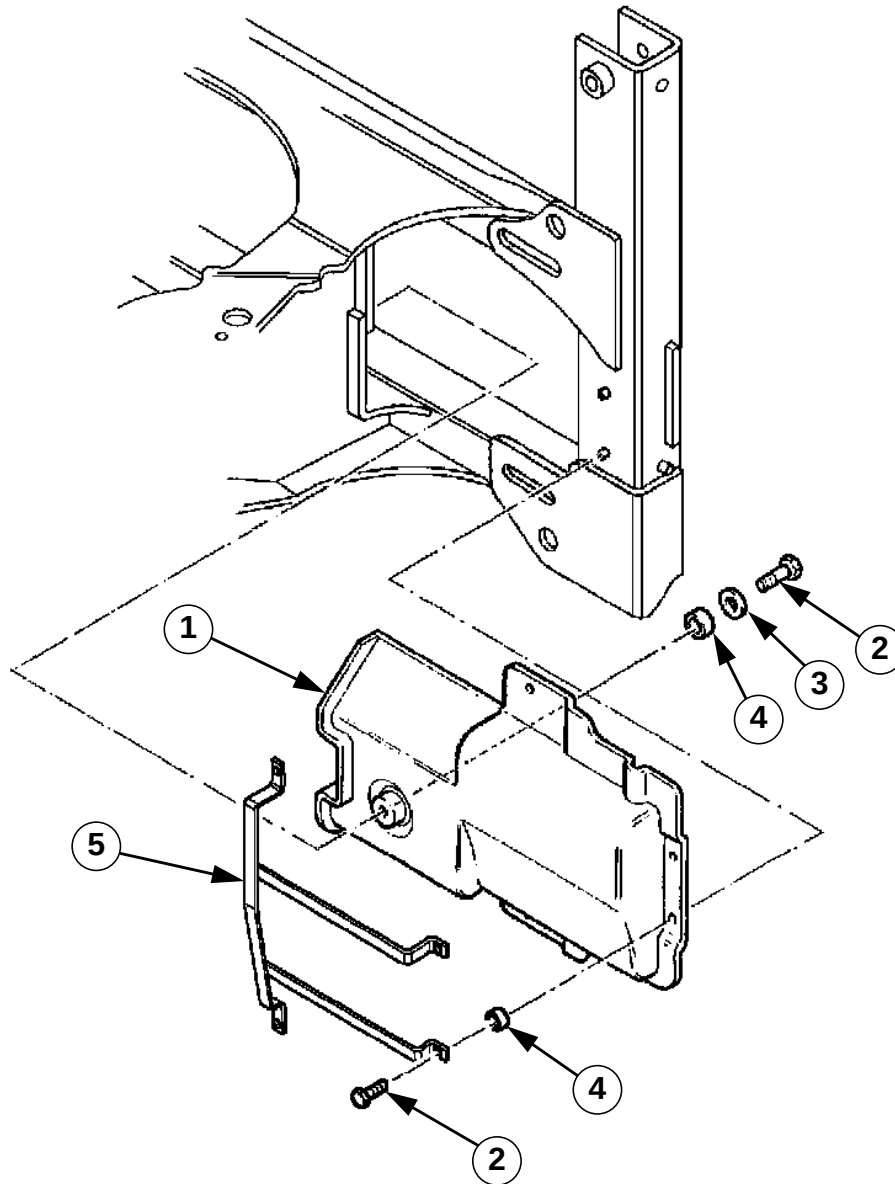
34. Remove the bolt (3) and install the plastic plug (4).
35. Install the stabilizer hydraulic cylinder (see page 14).

REMOVAL AND INSTALLATION OF THE REAR FRAME GUARD (Sideshift machine)

This information is applicable to the left rear frame guard. The procedure for the right rear frame guard is identical.

1. Start the engine and position the sideshift to access the rear frame guard (1).
2. Stop the engine.
3. Remove the bolts (2), the washers (3) and the spacers (4).
4. Remove the rear frame guard (1) and reinforcements (5) from the machine.

NOTE : The installation of the rear frame guard is in reverse order from that of removal.



CI99F503

REMOVAL AND INSTALLATION OF THE STABILIZER HYDRAULIC CYLINDER (Centremount machines)

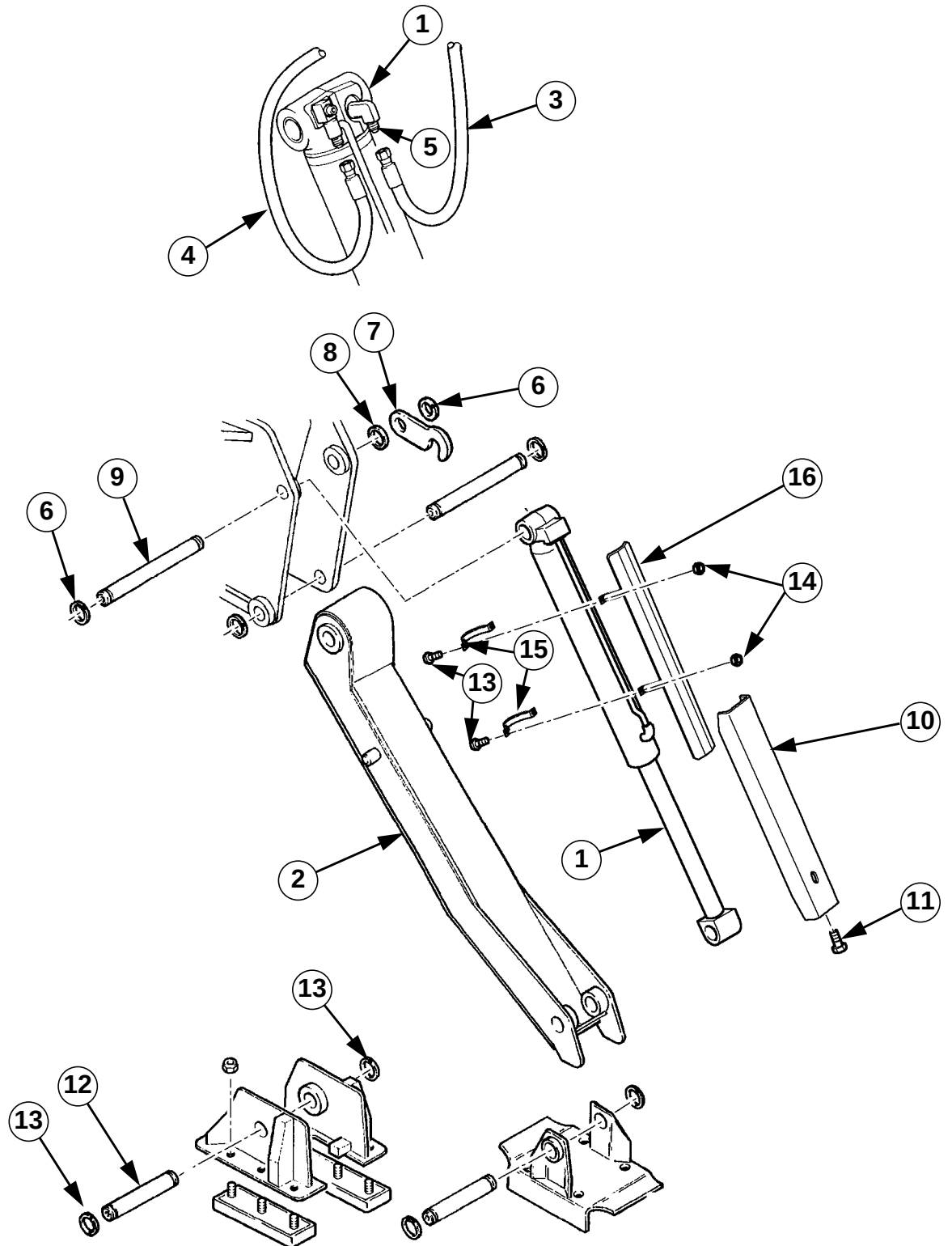
This information is applicable to a left-hand stabilizer hydraulic cylinder. The procedure for a right-hand stabilizer hydraulic cylinder is identical.

1. Park the machine on firm, level ground and lower the stabilizer legs (2). Make sure the machine is not raised from the ground.
2. Release the pressure from the hydraulic system (see section 8002).
3. Place a suitable container below the hydraulic lines and connections.
4. Disconnect the flexible hoses (3) and (4) from the adaptors (5). Put caps on the flexible hoses (3) and (4) and the adaptors (5).
5. Remove the circlips (6), the hook (7) and the washer (8) from the upper pin (9).
6. Support the stabilizer hydraulic cylinder (1) at its upper eye with suitable lifting equipment.
7. Use a soft metal drift to remove the upper pin (9).
8. If fitted, remove the bolts (11) and the rock guard (10).
9. Remove the circlips (13) from the lower pin (12).
10. Use a soft metal drift to remove the lower pin (12).
11. Remove the stabilizer hydraulic cylinder (1) from the stabilizer leg (2).
12. Only carry out Step 13 if you install a replacement stabilizer hydraulic cylinder (1) on machine.
13. If fitted, remove the bolts (13), the nuts (14), the clamp bracket (15) and the guide (16) from the stabilizer hydraulic cylinder (1).

NOTE : *The installation of the stabilizer hydraulic cylinder is in the reverse order from that of removal.*

NOTE : *After installation, replenish the hydraulic system.*

NOTE : *After installation, carry out an operational test of the stabilizer hydraulic cylinder (1). Make sure that there are no leaks from the hydraulic lines and connections that have been disturbed.*



STABILIZER LEG (Centremount machines)

This information is applicable to a left-hand stabilizer leg. The procedure for a right-hand stabilizer leg is identical.

Removal

1. Park the machine on firm level ground and lower the stabilizer legs (1). Make sure the machine is not raised from the ground.
2. Release the pressure from the hydraulic system (see section 8002).
3. If fitted, remove the bolts (2) and the rock guard (3).
4. Remove the circlips (4) from the lower pin (5).
5. Use a soft metal drift to remove the lower pin (5).
6. Move the foot (6) from the stabilizer leg (1).
7. Move the stabilizer hydraulic cylinder (7) away from the stabilizer leg (1) and support in this position with temporary ties.

8. Remove the circlips (8) from the pivot pin (9).



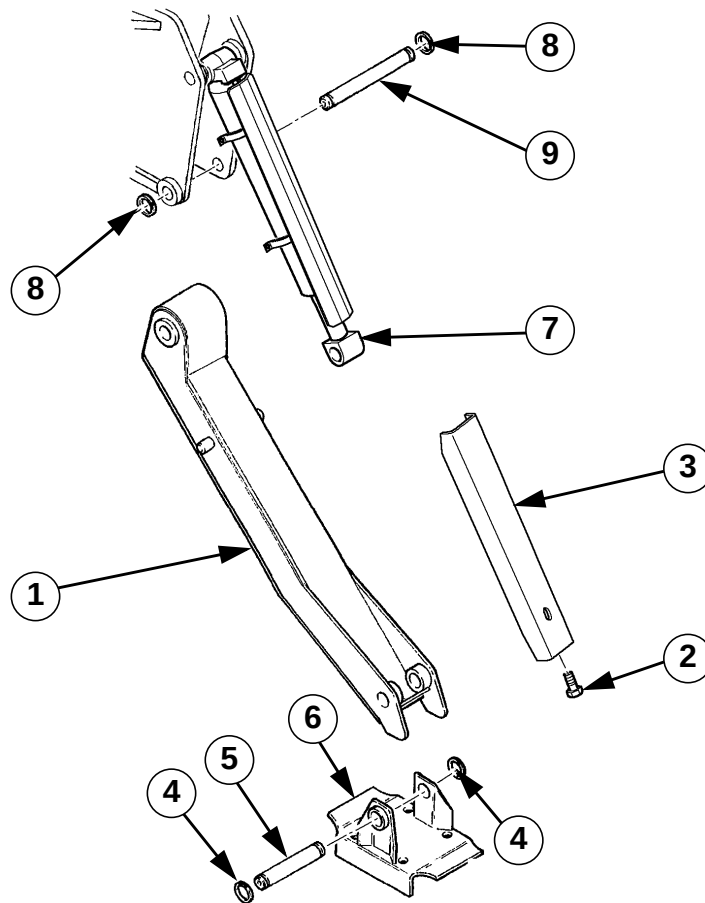
WARNING: The stabilizer leg is heavy. Support the stabilizer leg with rope or a suitable trestle and get help to remove it from the machine.

9. Use a soft metal drift to remove the pivot pin (9) and remove the stabilizer leg (1) from the machine.

Installation

Install a stabilizer leg in the reverse order of the removal but note the following :

1. Lubricate the pivot pin (9) through the grease nipple in the stabilizer leg (1) with a suitable multi-purpose lithium base (EP) molybdenum grease.
2. After installation, the stabilizer service. Make sure the stabilizer leg (1) operates correctly.



TYPICAL STABILIZER HYDRAULIC LINES (Centremount machines)

This information is applicable to left-hand typical stabilizer hydraulic lines. the procedure for right-hand typical stabilizer hydraulic lines is identical.

Removal

1. Park the machine on flat, level ground and lower the stabilizer legs. Make sure the machines is not raised from the ground.
2. Release the pressure from the hydraulic system (see section 8002).
3. Place a suitable container below the stabilizer hydraulic lines.
4. Note the positions. Remove and discard the tie-wraps (1) which attach the electrical harness to the hydraulic lines.
5. Disconnect the flexible hoses (2) from the adaptors (3).
6. Disconnect the flexible hoses (2) from the unions (4).
7. Remove the flexible hoses (2) and put caps on the stabilizer hydraulic cylinders.
8. Remove the unions (4). Remove and discard the O-ring seals (5).
9. Disconnect the pipes (6) from the unions (7).
10. Disconnect the pipes (6) from the unions (8).
11. Remove the pipe (6).
12. Remove the unions (7). Remove and discard the O-ring seals (9).
13. Remove the unions (8). Remove and discard the O-ring seals (10).
14. Put caps on the flexible hoses (2), the pipes (6), the valve block (11), the unions (4), (7) and (8) and the selector block (12).

Installation

Install typical stabilizer hydraulic lines in the reverse order from that of removal but note the following :

1. Make sure the work area and all the components and tools are clean.
2. Install new O-ring seals (5), (9) and (10).
3. Install new tie-wraps (1) on the electrical harness and the hydraulic lines in the positions noted during the removal procedure.
4. After installation, replenish the hydraulic system.
5. After installation, carry out an operational test of the stabilizer hydraulic system. Make sure there are no leaks from the hydraulic lines and connections that have been disturbed.

