Manual No. : KM-CABE
Vol. No. : WCABE-00

Workshop Manual

ZAXIS 130W

Wheeled Excavator

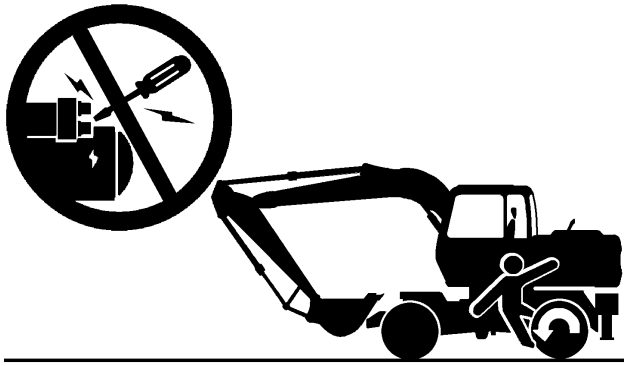
Service Manual (Manual No. KM-CABE) consists of the following three separate volumes;

Technical Manual (Operational Principle)	: Vol. No. TOCABE
Technical Manual (Troubleshooting)	: Vol. No. TTCABE
Workshop Manual	: Vol. No. WCABE

HITACHI

OPERATE ONLY FROM OPERATOR'S SEAT

- Inappropriate engine starting procedures may cause the machine to runaway, possibly resulting in serious injury or death.
  - Start the engine only when seated in the operator's seat.
  - NEVER start the engine while standing on the track or on ground.
  - Do not start engine by shorting across starter terminals.
  - Before starting the engine, confirm that all control levers are in neutral.



SA-084

012-E01B-0444

JUMP STARTING

- Battery gas can explode, resulting in serious injury.
  - If the engine must be jump started, be sure to follow the instructions shown in the “OPERATING THE ENGINE” chapter in the operator’s manual.
  - The operator must be in the operator’s seat so that the machine will be under control when the engine starts. Jump starting is a two-person operation.
  - Never use a frozen battery.
  - Failure to follow correct jump starting procedures could result in a battery explosion or a runaway machine.

SA-032

S013-E01A-0032

PRACTICE SAFE MAINTENANCE

To avoid accidents:

- Understand service procedures before doing work.
- Keep work area clean and dry.
- Do not spray water or steam inside cab.
- Never lubricate or service the machine while it is moving.
- Keep hands, feet and clothing away from power-driven parts.

- Before servicing the machine:

1) Park the machine on a level surface.
2) Lower the bucket to the ground.
3) Turn the auto-idle / acceleration selecltor off.
4) Run the engine at slow idle speed without load for 5 minutes.
5) Turn the key switch to OFF to stop engine.
6) Relieve the pressure in the hydraulic system by moving the control levers several times.
7) Remove the key from the switch.
8) Attach a “Do Not Operate” tag on the control lever.
9) Pull the pilot control shut-off lever to the LOCK position.
10) Allow the engine to cool.

REMOVE PAINT BEFORE WELDING OR HEATING

SA-029

- Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. If inhaled, these fumes may cause sickness.
  - Avoid potentially toxic fumes and dust.
  - Do all such work outside or in a well-ventilated area. Dispose of paint and solvent properly.

  - Remove paint before welding or heating:

1) If you sand or grind paint, avoid breathing the dust.
   Wear an approved respirator.
2) If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

511-E01A-0029

PREVENT BATTERY EXPLOSIONS

SA-032

- Battery gas can explode.
  - Keep sparks, lighted matches, and flame away from the top of battery.
  - Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
  - Do not charge a frozen battery; it may explode. Warm the battery to 16 °C (60 °F) first.
  - Do not continue to use or charge the battery when electrolyte level is lower than specified. Explosion of the battery may result.
  - Loose terminals may produce sparks. Securely tighten all terminals.
- Battery electrolyte is poisonous. If the battery should explode battery electrolyte may be splashed into eyes, possibly resulting in blindness.
  - Be sure to wear eye protection when checking electrolyte specific gravity.

512-E01C-0032

Floating Seal Precautions

1. In general, replace the floating seal with a new one after disassembling.
   If the floating seal is to be reused, follow these procedures:

   (1) Keep seal rings together as a matched set with seal ring faces together. Insert a piece of cardboard to protect surfaces.

   (2) Check the slide surface on seal ring (A) for scuffing, scoring, corrosion, deformation or uneven wear.

   (3) Check O-ring (B) for tears, breaks, deformation or hardening.

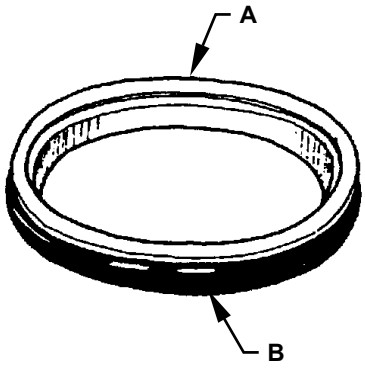
2. If incorrectly assembled, oil leakage or damage will occur. Be sure to do the following, to prevent trouble.

   (1) Clean the floating seal and seal mounting bores with cleaning solvent.
   Use a wire brush to remove mud, rust or dirt.
   After cleaning, thoroughly dry parts with compressed air.

   (2) Clean the floating seal and seal mounting bores. Check the bore surface for scuffing or scoring by touching the surface with touch.

   (3) Check that the O-ring is not twisted, and that it is installed correctly on the seal ring.

   (4) After installing the floating seal, check that seal ring surface (A) is parallel with seal mating face (C) by measuring the distances (A) and (C) at point (a) and (b), as illustrated. If these distances differ, correct the O-ring seating.



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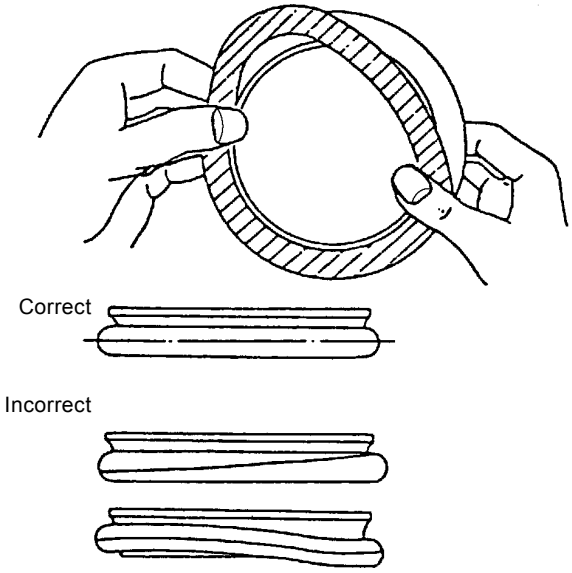

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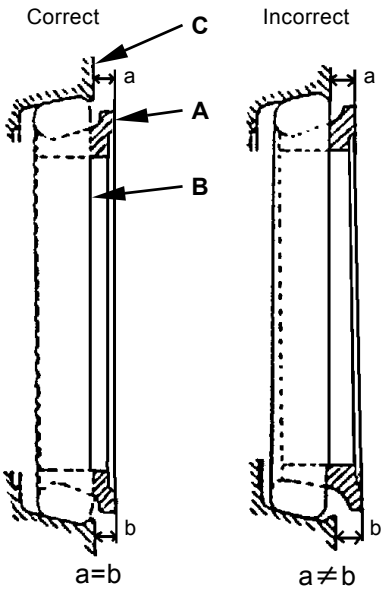
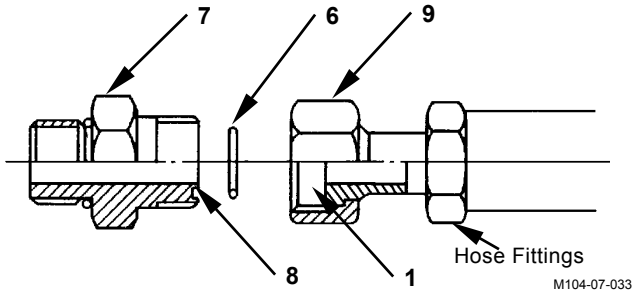


W110-03-05-004

O-ring Seal Joint

O-ring (6) seats against the end face of adapter (7) to seal pressure oil.

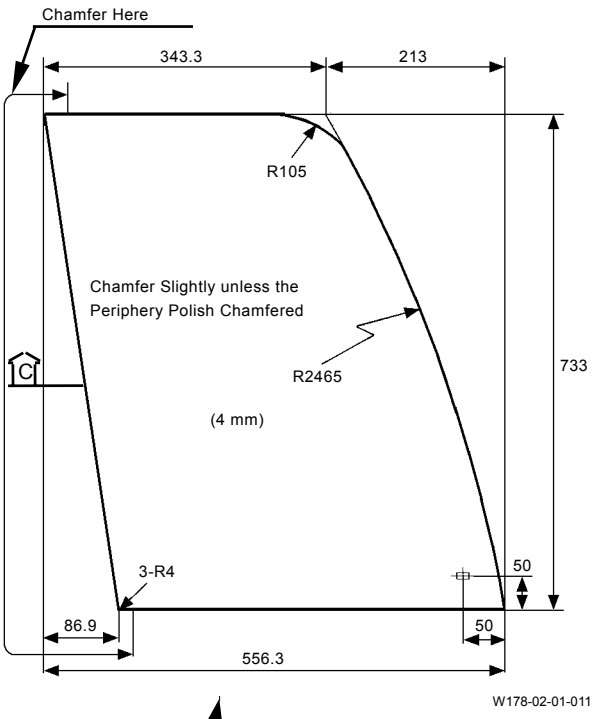
IMPORTANT:
1. **Be sue to replace O-ring (6) with a new one when reconnecting.**
2. **Before tightening nut (9), confirm that O-ring (6) is seated correctly in O-ring groove (e). Tightening nut (9) with O-ring (6) displaced will damage O-ring (6), resulting in oil leakage.**
3. **Take care not to damage O-ring groove (e) or sealing surface (10).**
   Damage to O-ring (6) will cause oil leakage.
4. **If nut (9) is loose and oil is leaking, do not re-tighten nut (9). Replace O-ring (6) with a new one and check that O-ring (6) is correctly seated in place, tighten nut (9).**



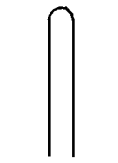
Wrench Size mm	Wrench Size mm	Tightening Torque
Union Nut	Hose Fittings	N·m (kgf·m, lbf·ft)
19	17	29.5 (3.0, 21.5)
22	19	69 (7.0, 51)
27	22	93 (9.5, 69)
32	27	137 (14.0,101)
36	30,32	175 (18.0,129)
41	36	205 (21.0,151)
46	41	205 (21.0,151)

MEMO

Unit: mm



W178-02-01-011



Section C and D

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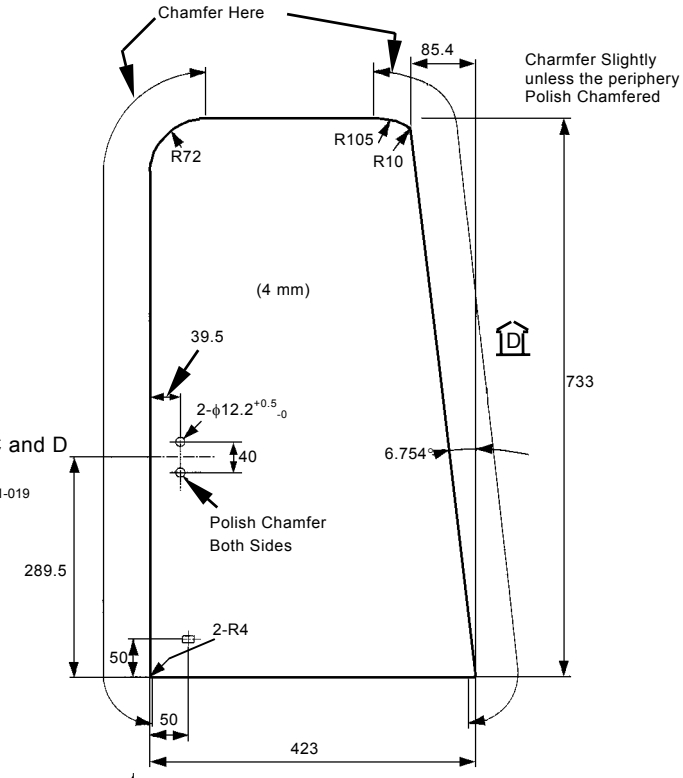

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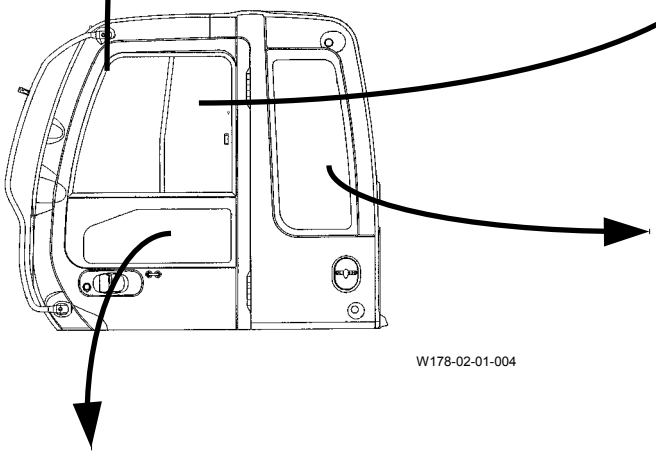

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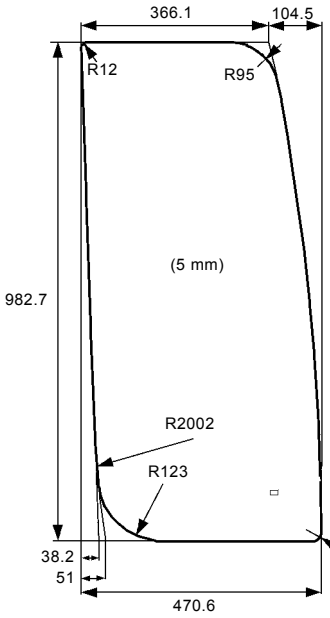
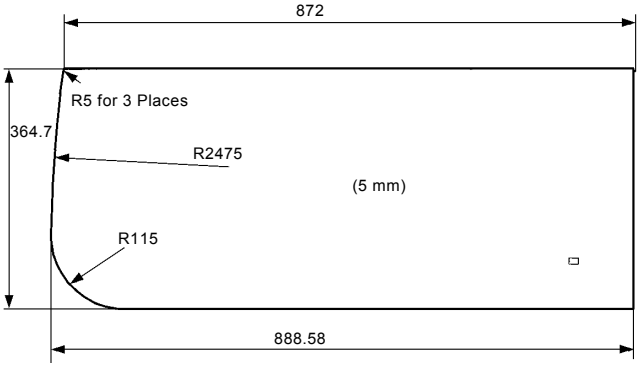


W178-02-01-009

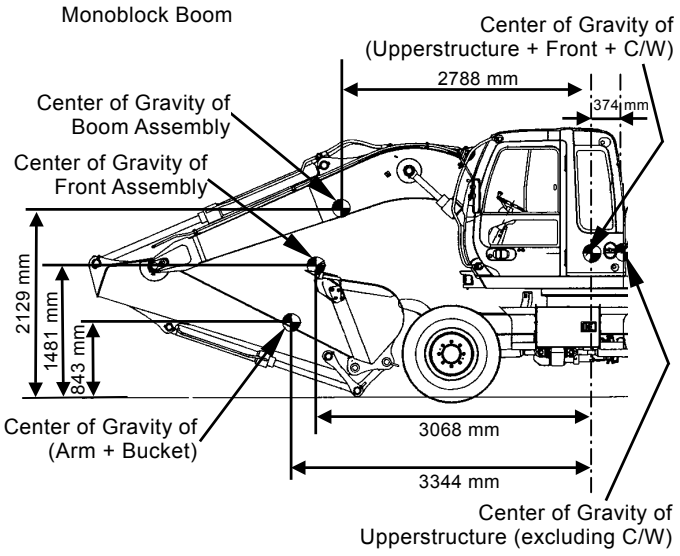


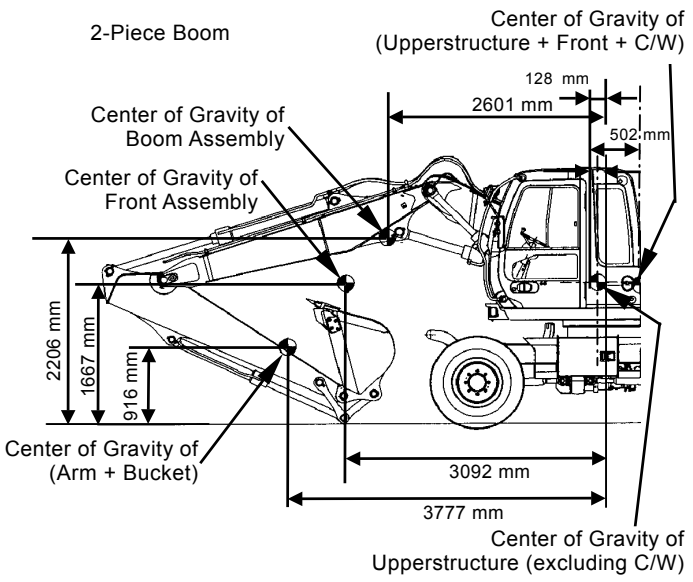
W178-02-01-010

CAUTION: Front attachment assembly weight:
Monoblock boom: 2000 kg (4410 lb)
2-Piece boom: 2410 kg (5320 lb)

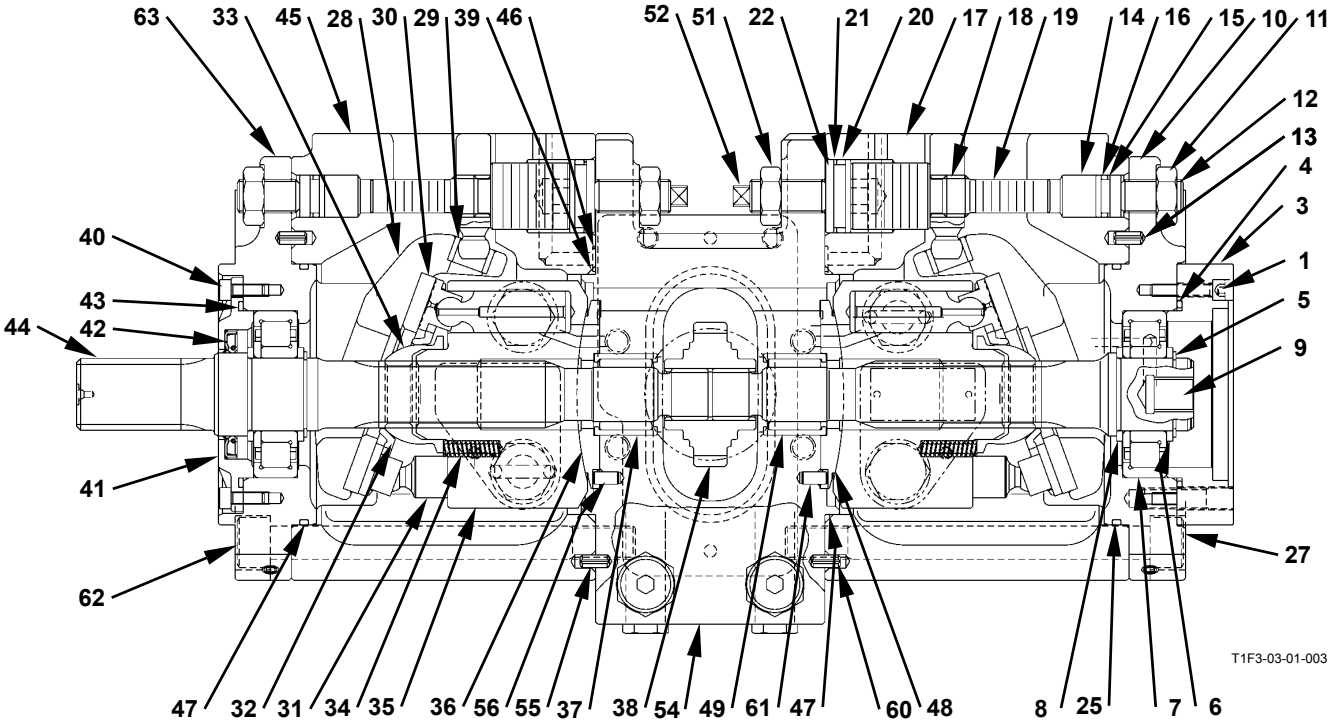
6. Install front attachment assembly. Then, fill with hydraulic oil.
   (Refer to “Remove and Install Front Attachment” group on page W4-1-2.)
   : 27 mm
   : 93 N·m (9.5 kgf·m, 69 lbf·ft)
   : 30 mm
   : 540 N·m (55 kgf·m, 400 lbf·ft)
   : 36 mm
   : 175 N·m (18 kgf·m, 129 lbf·ft)

7. Start the engine and set the front attachment in posture for checking hydraulic oil level in its tank. Inspect the hydraulic oil level and check if there is any oil leakage.





ASSEMBLE MAIN PUMP

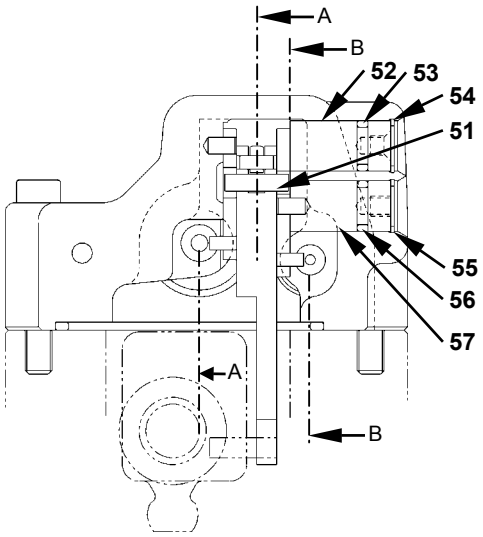


T1F3-03-01-003

1 - Socket Bolt (2 Used)
2 - *Steering Pump
3 - Cover
4 - O-Ring
5 - Retaining Ring (2 Used)
6 - Spacer (2 Used)
7 - Bearing (2 Used)
8 - Spacer (2 Used)
9 - Shaft
10 - Cover
11 - Nut (2 Used)
12 - Adjusting Screw (2 Used)
13 - Spring Pin (2 Used)
14 - Stopper (2 Used)
15 - Backup Ring (2 Used)
16 - O-Ring (2 Used)
17 - Housing
18 - Tilt Pin (2 Used)
19 - Servo Piston (2 Used)
20 - O-Ring (2 Used)
21 - Backup Ring (2 Used)
22 - Stopper (2 Used)
23 - *O-Ring (2 Used)
24 - *Plug (2 Used)
25 - O-Ring (2 Used)
26 - *Plug (8 Used)
27 - Socket Bolt (4 Used)
28 - Swash Plate (2 Used)
29 - Bushing (2 Used)
30 - Shoe Plate (2 Used)
31 - Plunger (18 Used)
32 - Retainer (2 Used)
33 - Spherical Bushing (2 Used)
34 - Spring (18 Used)
35 - Cylinder Block (2 Used)
36 - Valve Plate
37 - Needle Bearing
38 - Gear
39 - O-Ring
40 - Socket Bolt (4 Used)
41 - Cover
42 - Oil Seal
43 - O-Ring
44 - Shaft
45 - Housing
46 - O-Ring (18 Used)
47 - O-Ring (2 Used)
48 - Valve Plate
49 - Needle Bearing
50 - *Eye Bolt
51 - Nut (2 Used)
52 - Adjusting Screw (2 Used)
53 - Plug (8 Used)
54 - Valve Cover
55 - Spring Pin
56 - Pin
57 - *O-Ring (2 Used)
58 - *Plug (2 Used)
59 - *O-Ring
60 - Spring Pin (2 Used)
61 - Pin
62 - Socket Bolt (4 Used)
63 - Cover
64 - *Socket Bolt (2 Used)
65 - *Cover
66 - *O-Ring
67 - *PTO Gear Case
68 - *Socket Bolt (4 Used)
69 - *O-Ring
70 - *Pilot Pump
71 - *Socket Bolt (2 Used)

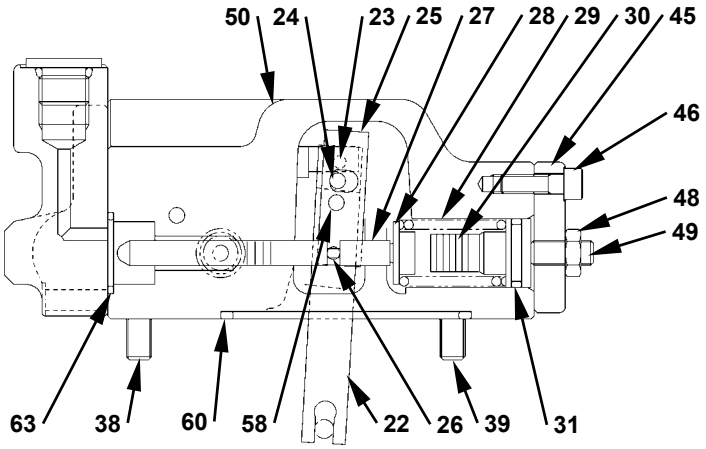
*NOTE: As for the components with * mark, refer to W2-3-4.*

ASSEMBLE REGULATOR (MAIN PUMP 2 SIDE)



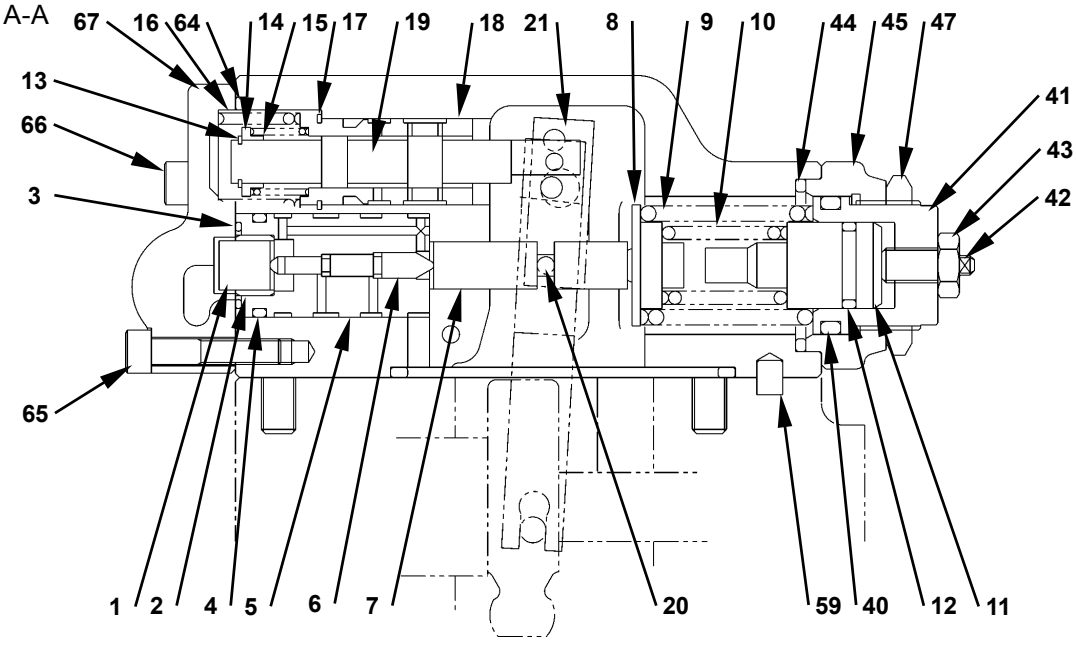
T1F3-03-01-006

Section B-B



T1F3-03-01-007

Section A-A



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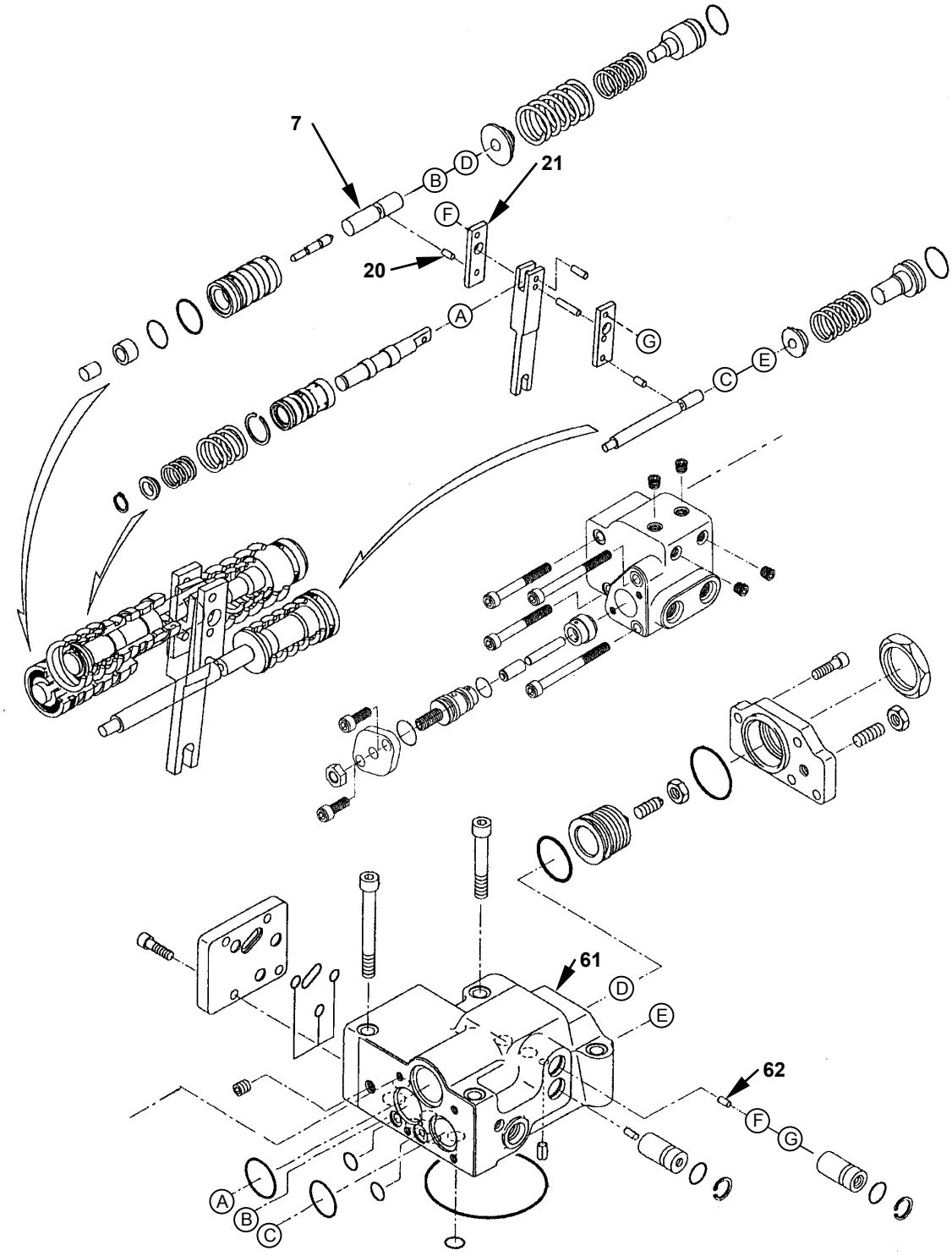
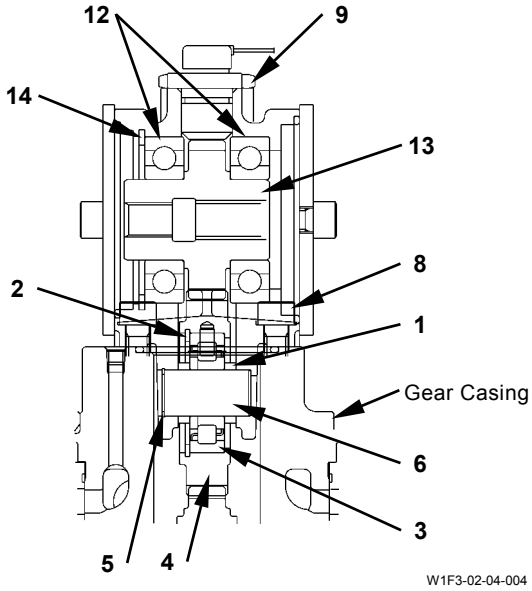
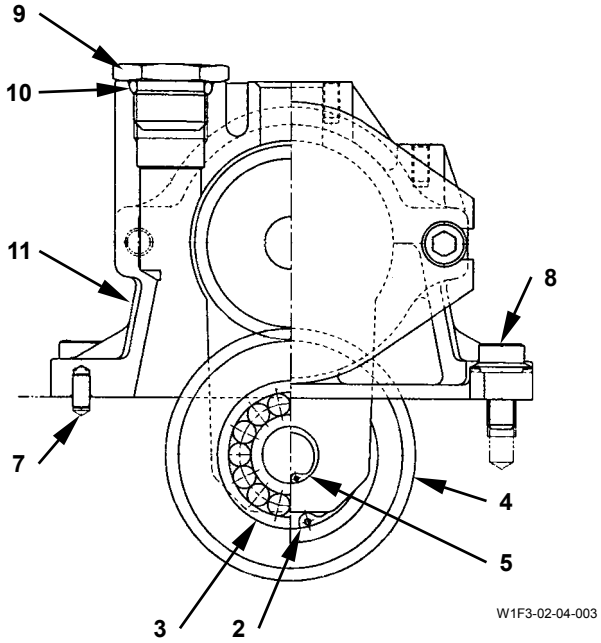


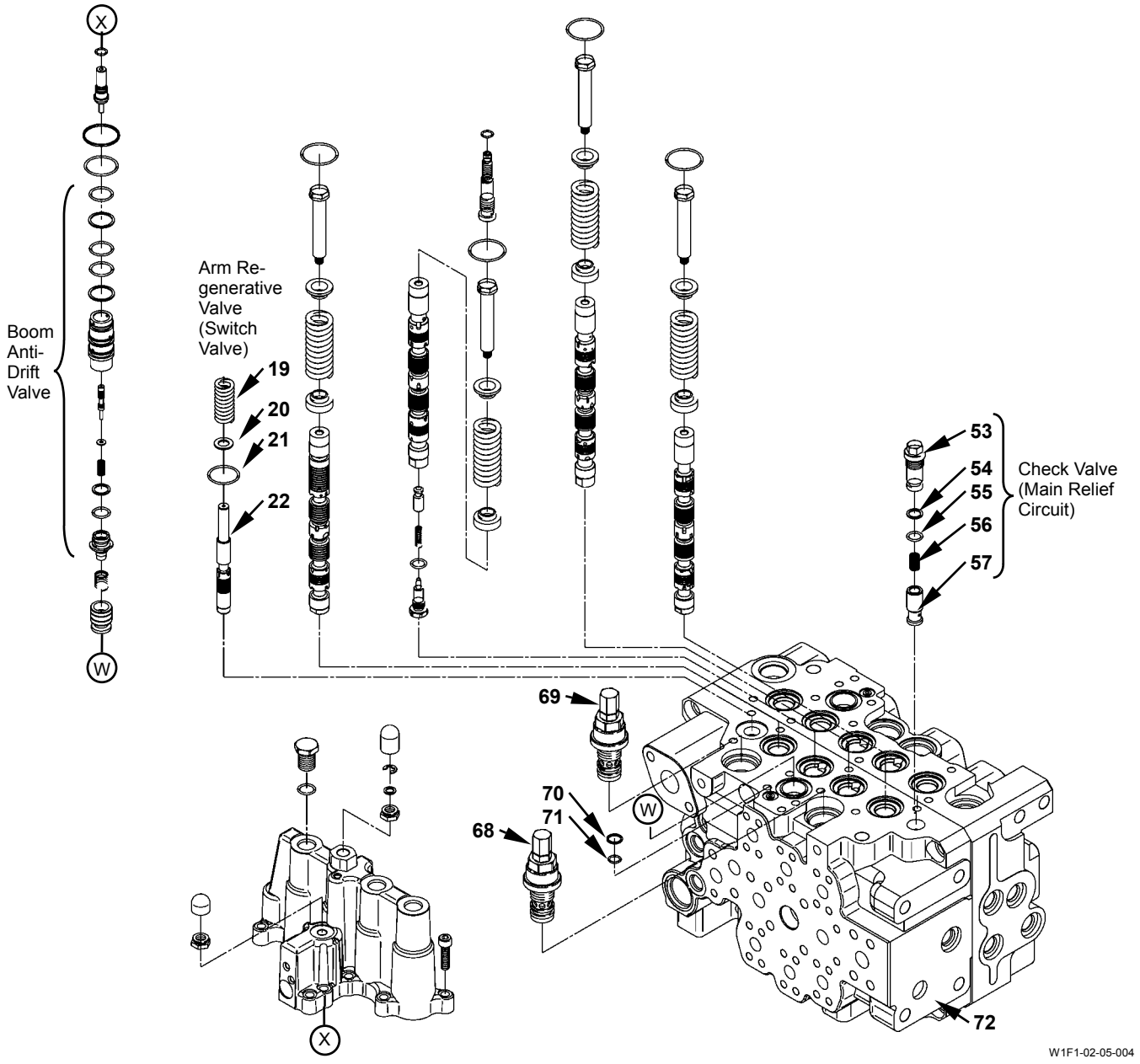
W1F3-02-04-007

ASSEMBLE PTO GEAR BOX

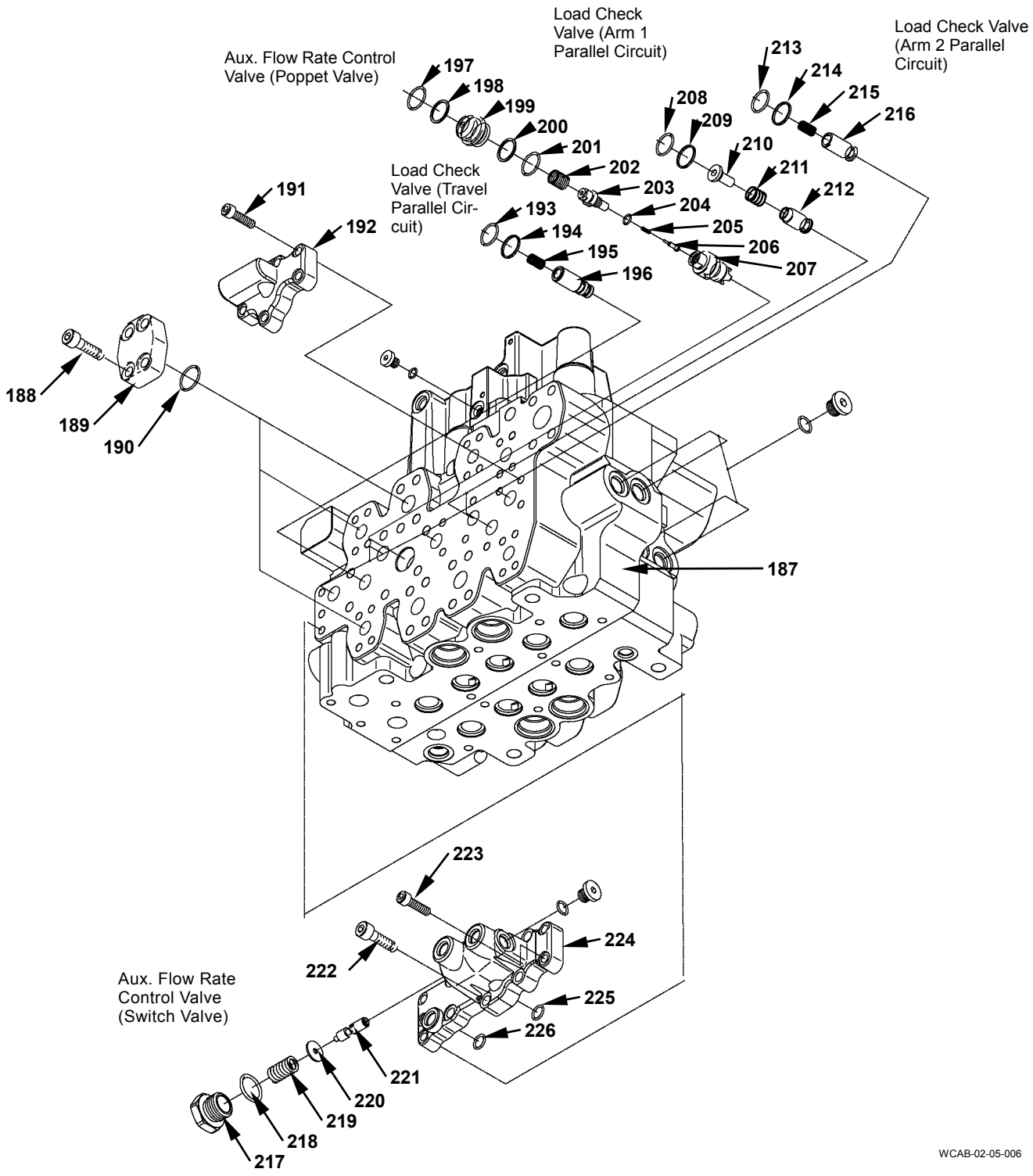




1 - Spacer (2 Used)
2 - Retaining Ring
3 - Bearing
4 - Gear
5 - Retaining Ring
6 - Pin
7 - Pin (2 Used)
8 - Socket Bolt (4 Used)
9 - Plug
10 - O-Ring (1B P24)
11 - Gear case
12 - Bearing (2 Used)
13 - Gear
14 - Retaining Ring



19 - Spring
20 - Washer
21 - O-Ring
22 - Spool
53 - Plug
54 - Backup Ring
55 - O-Ring
56 - Spring
57 - Poppet
68 - Overload Relief Valve
69 - Overload Relief Valve
70 - Backup Ring
71 - O-Ring
72 - Housing


Load Check Valve (Arm 1 Parallel Circuit)
Load Check Valve (Arm 2 Parallel Circuit)
Aux. Flow Rate Control Valve (Poppet Valve)
Load Check Valve (Travel Parallel Circuit)
Aux. Flow Rate Control Valve (Switch Valve)
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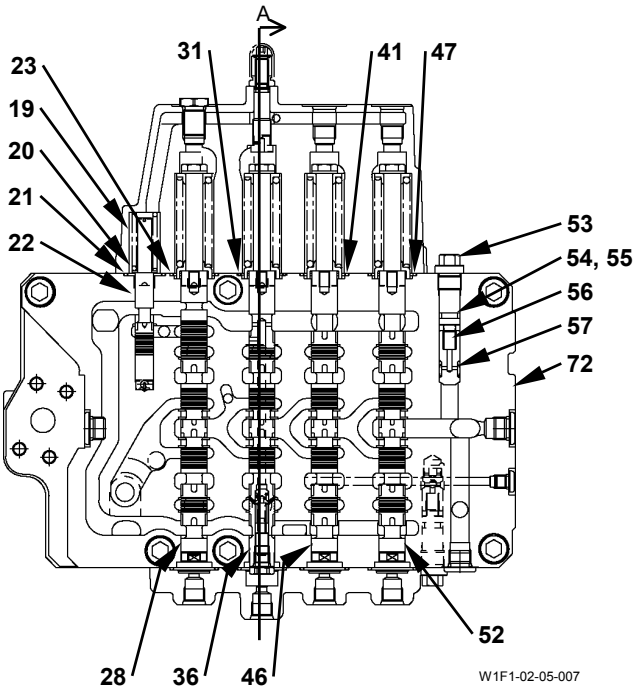
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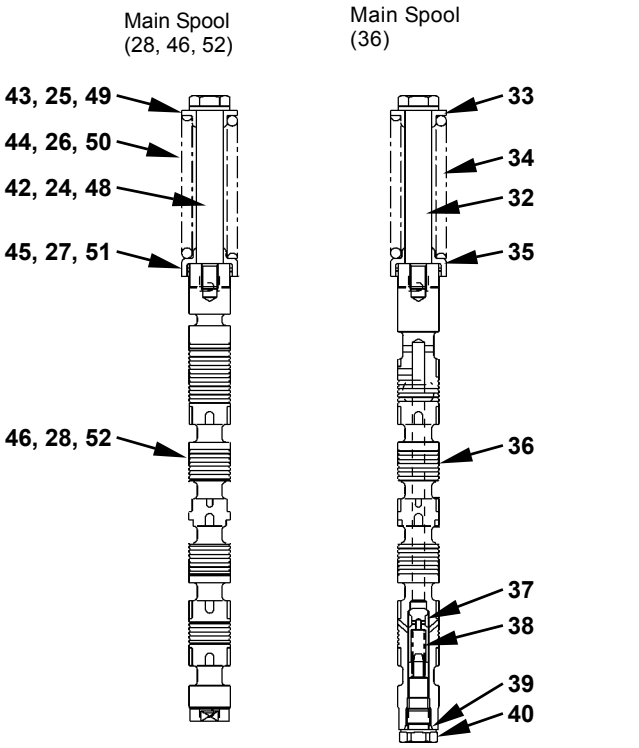
W1F1-02-05-007


Main Spool
(28, 46, 52)
Main Spool
(36)
43, 25, 49
44, 26, 50
42, 24, 48
45, 27, 51
46, 28, 52
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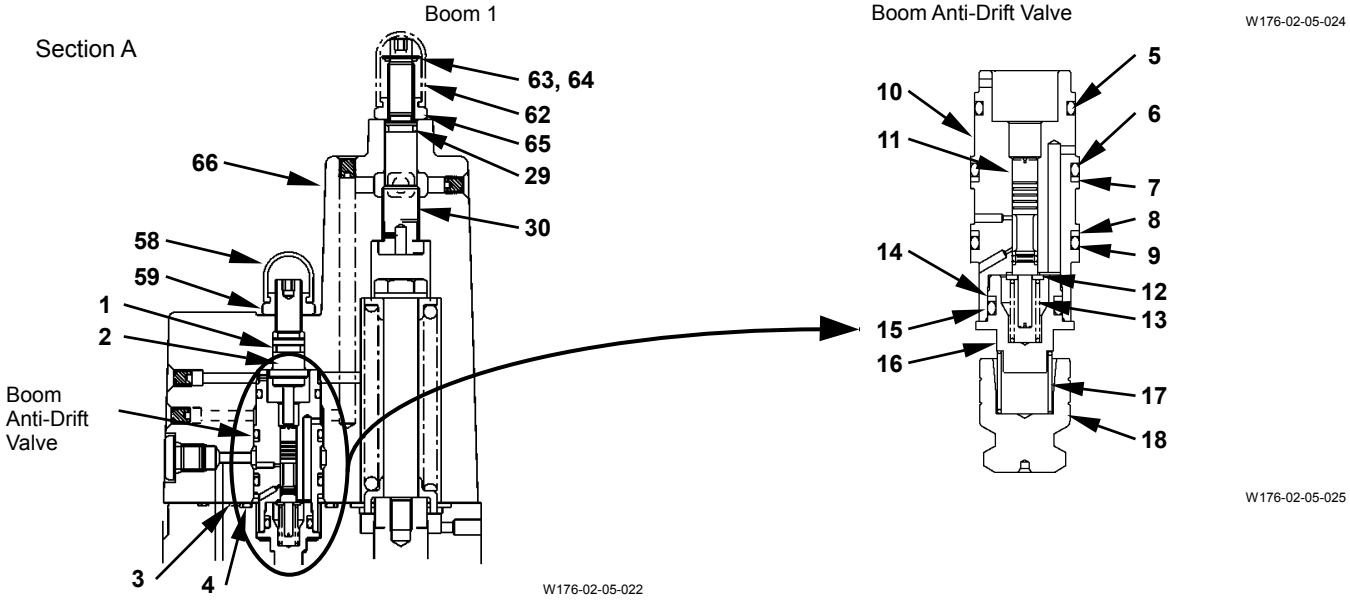
W176-02-05-024


Boom 1
Boom Anti-Drift Valve
Section A
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Boom
Anti-Drift
Valve
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W176-02-05-022
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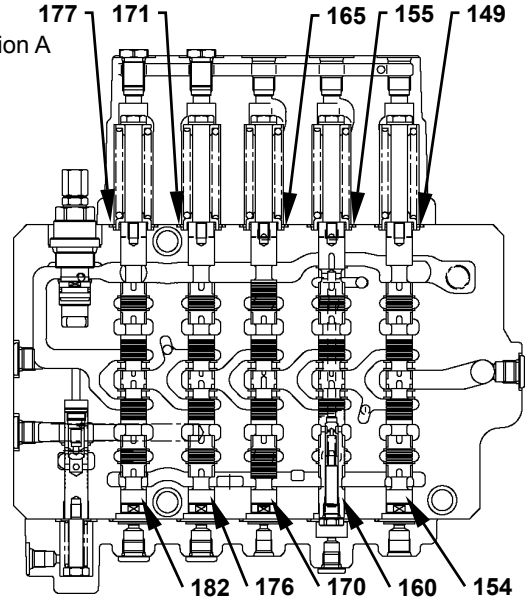
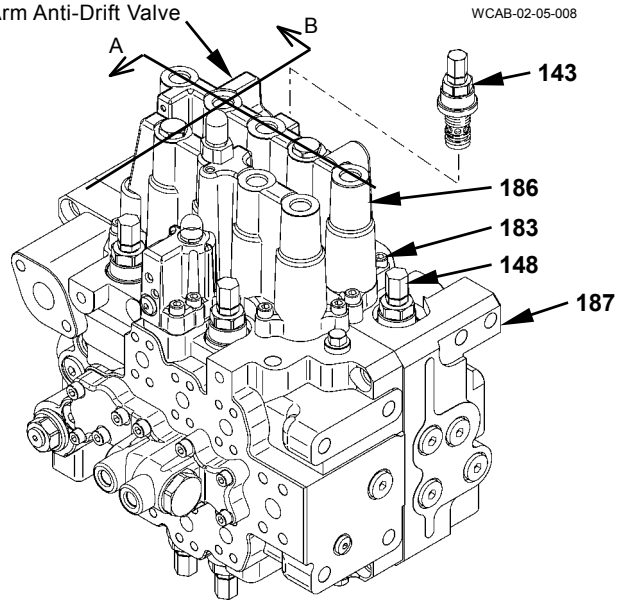
Section A



WCAB-02-05-008

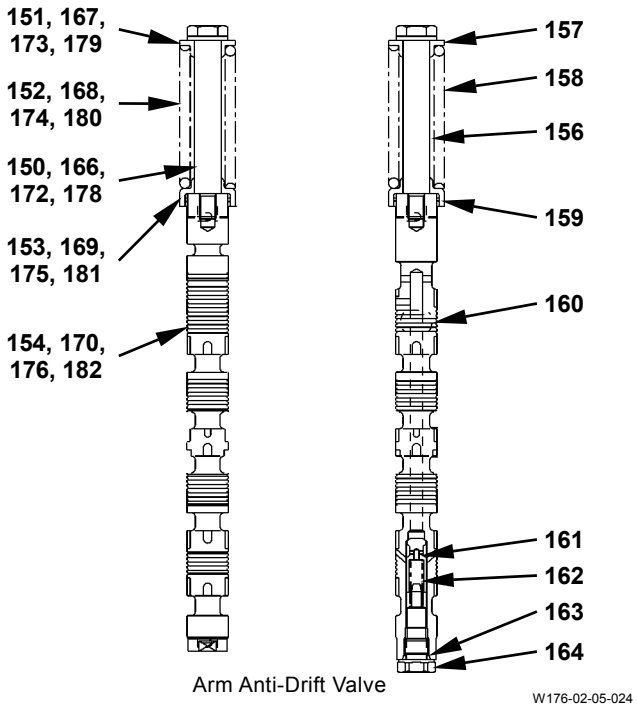
Arm Anti-Drift Valve



T176-03-03-038

Main Spool
(154, 170, 176, 182)

Main Spool (160)



Arm Anti-Drift Valve

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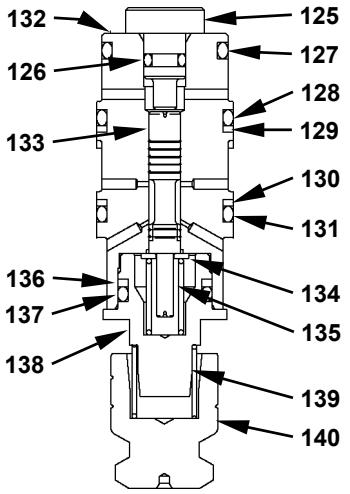
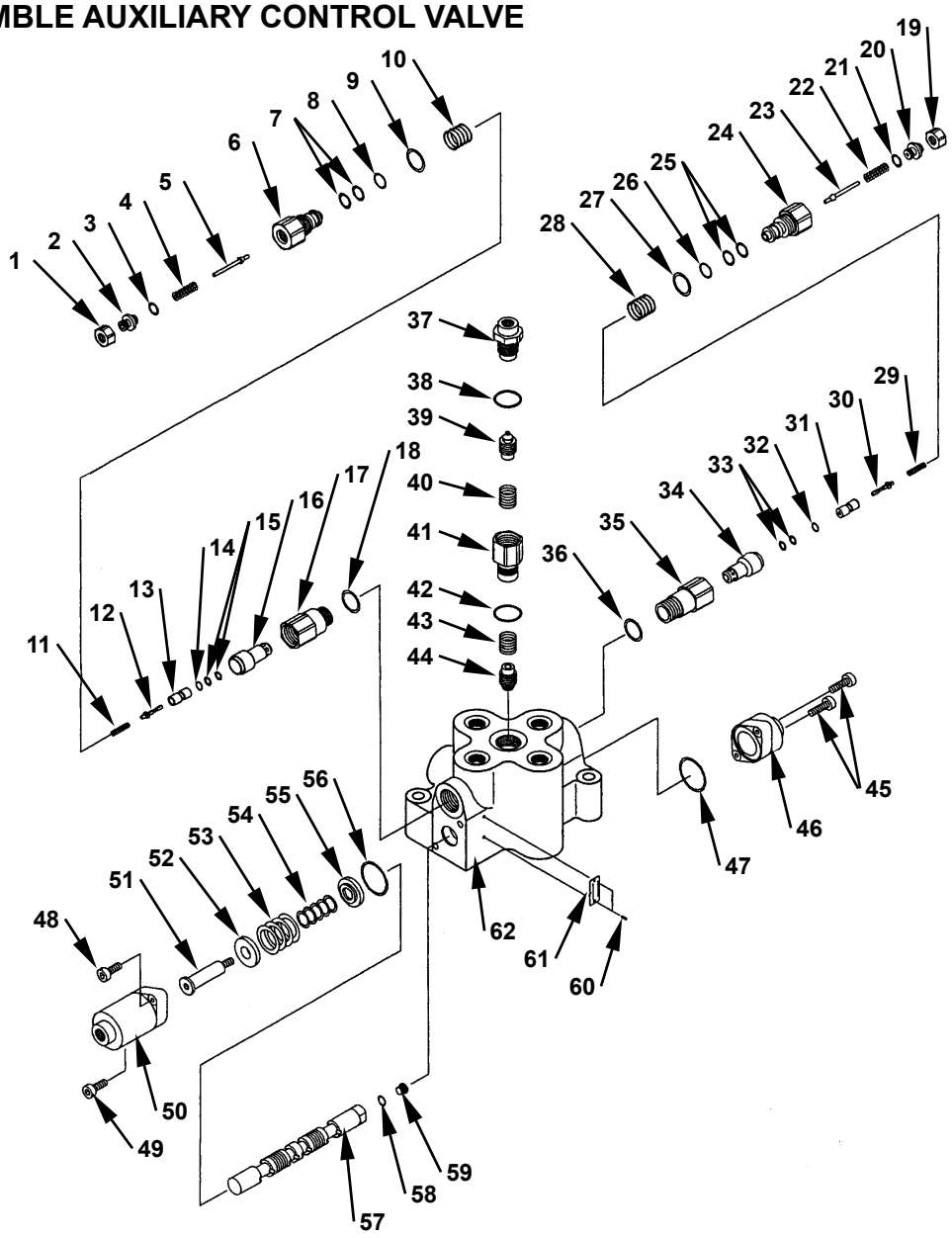
Section B



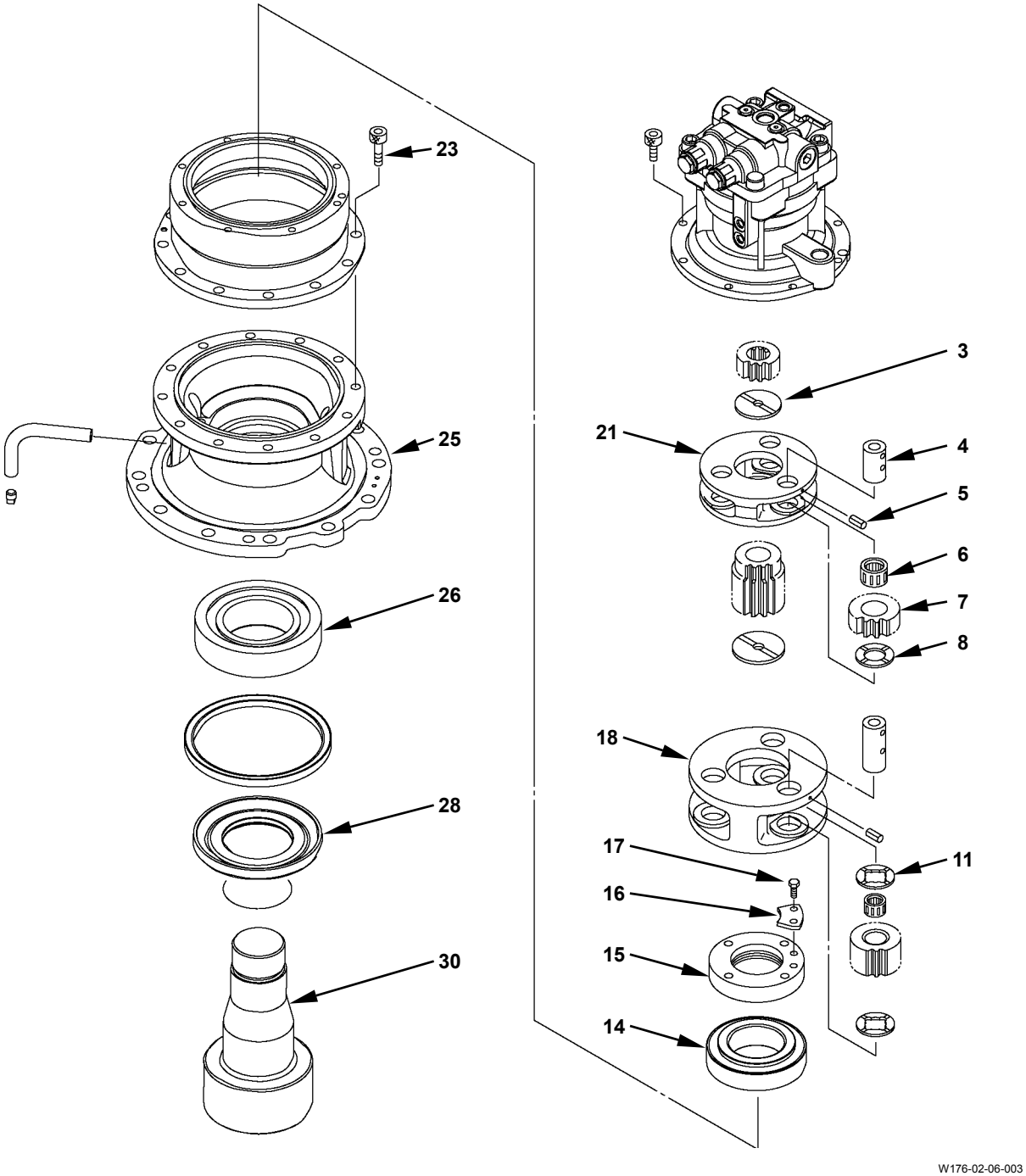
W176-02-05-027

DISASSEMBLE AUXILIARY CONTROL VALVE



W198-02-05-001

1 - Nut
2 - Bolt
3 - O-Ring
4 - Spring
5 - Valve
6 - Sleeve
7 - Backup Ring
8 - O-Ring
9 - O-Ring
10 - Spring
11 - Spring
12 - Pin
13 - Valve
14 - O-Ring
15 - Backup Ring
16 - Valve
17 - Sleeve
18 - O-Ring
19 - Nut
20 - Bolt
21 - O-Ring
22 - Spring
23 - Valve
24 - Sleeve
25 - Backup Ring
26 - O-Ring
27 - O-Ring
28 - Spring
29 - Spring
30 - Pin
31 - Valve
32 - O-Ring
33 - Backup Ring
34 - Valve
35 - Sleeve
36 - O-Ring
37 - Seat
38 - O-Ring
39 - Valve
40 - Spring
41 - Sleeve
42 - O-Ring
43 - Spring
44 - Poppet
45 - Socket Bolt (2 Used)
46 - Cover
47 - O-Ring
48 - Socket Bolt
49 - Socket Bolt
50 - Cover
51 - End Spool
52 - Seat
53 - Spring
54 - Spring
55 - Seat
56 - O-Ring
57 - Spool
58 - O-Ring
59 - Plug
60 - Drive Screw
61 - Plate
62 - Housing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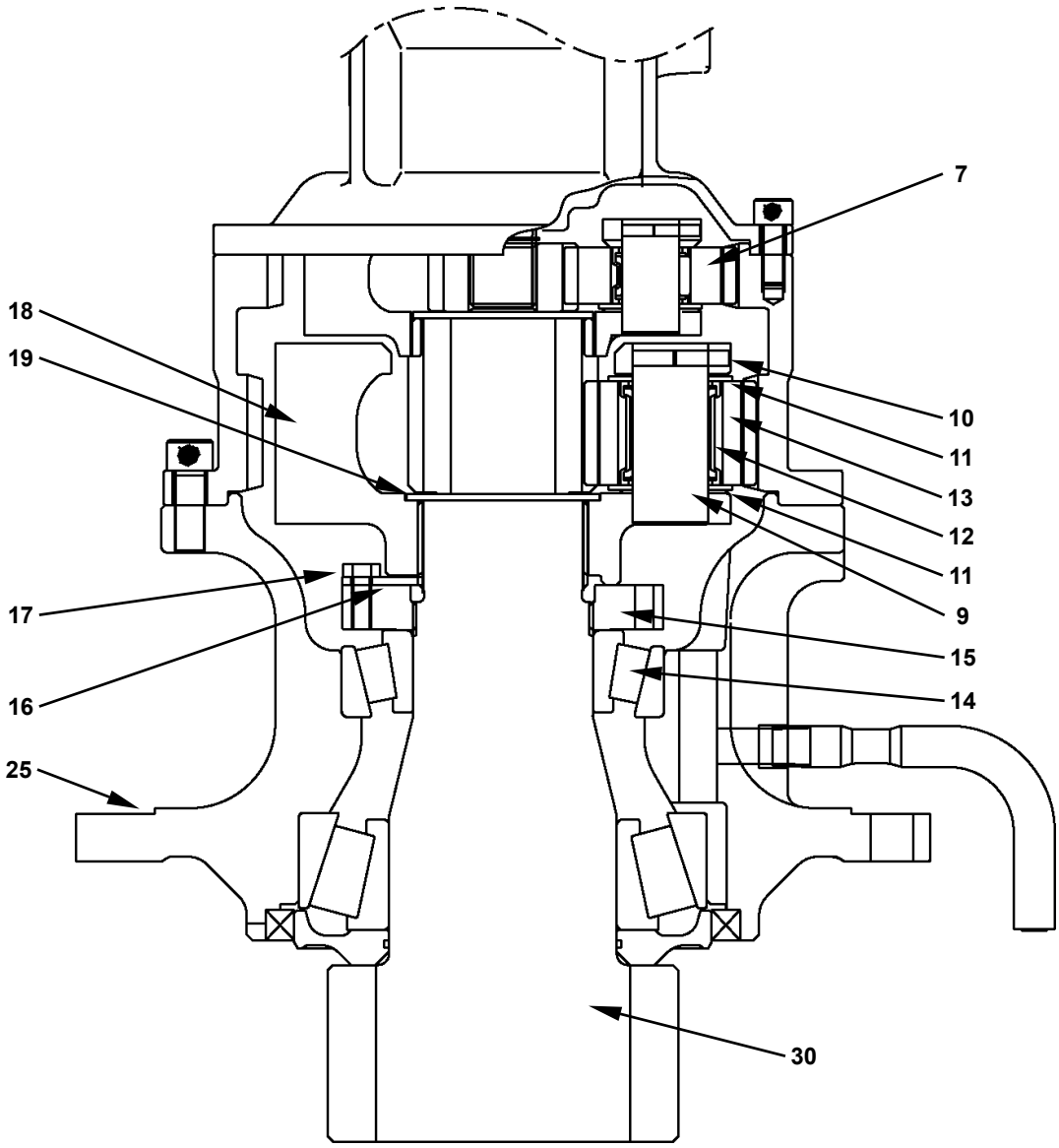
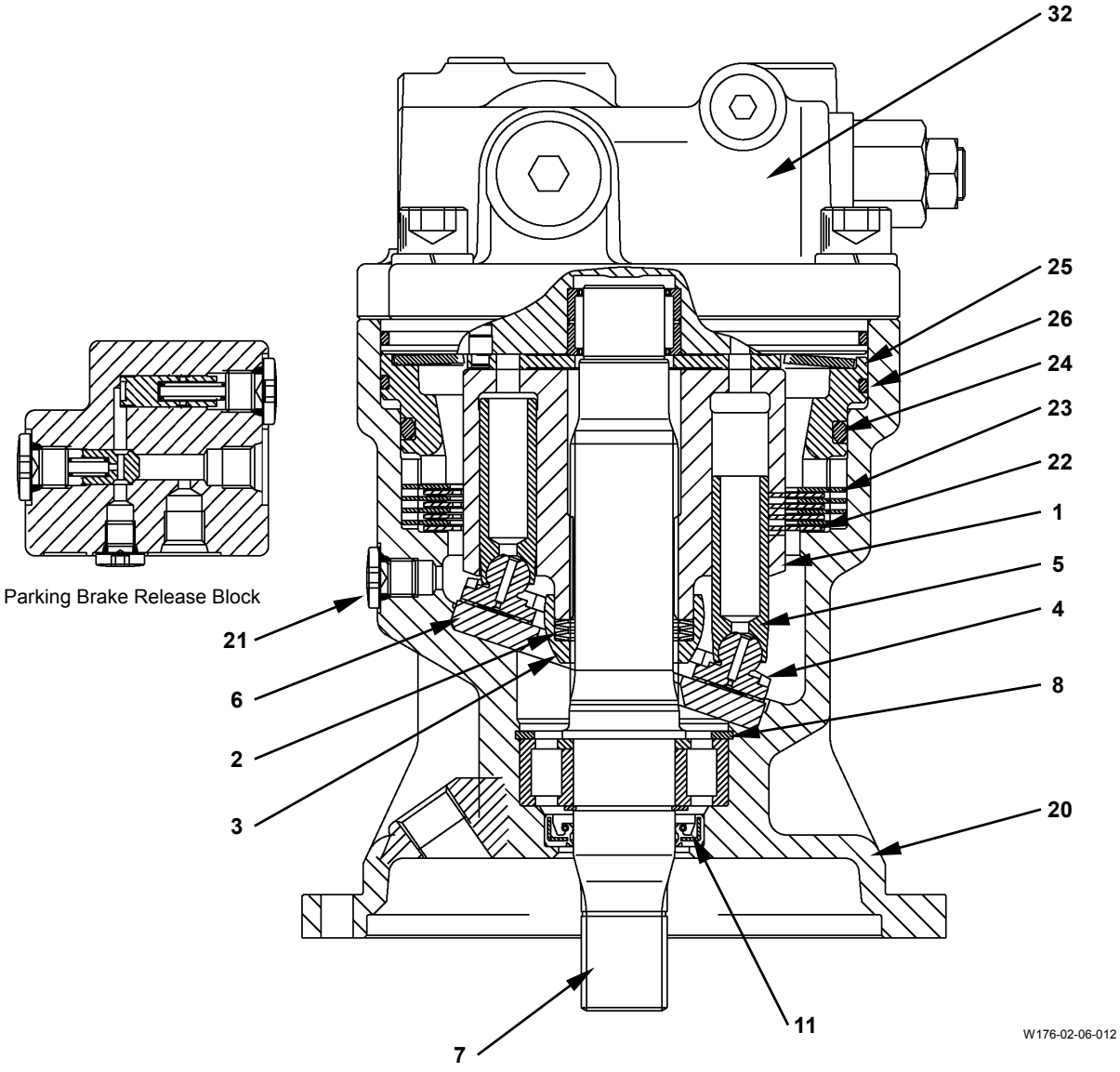


W176-02-06-004


32
25
26
24
23
22
1
5
4
8
20
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7
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6
2
3
Parking Brake Release Block
W176-02-06-012

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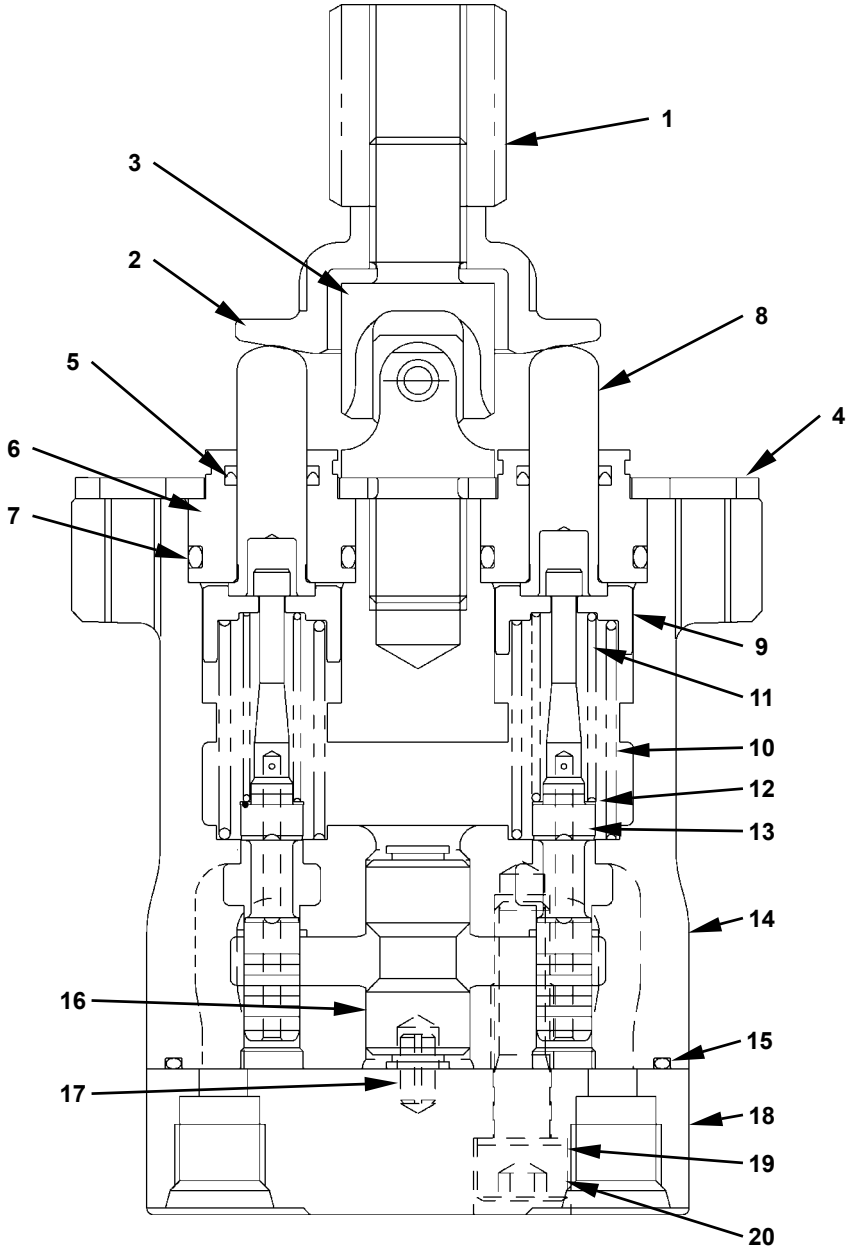
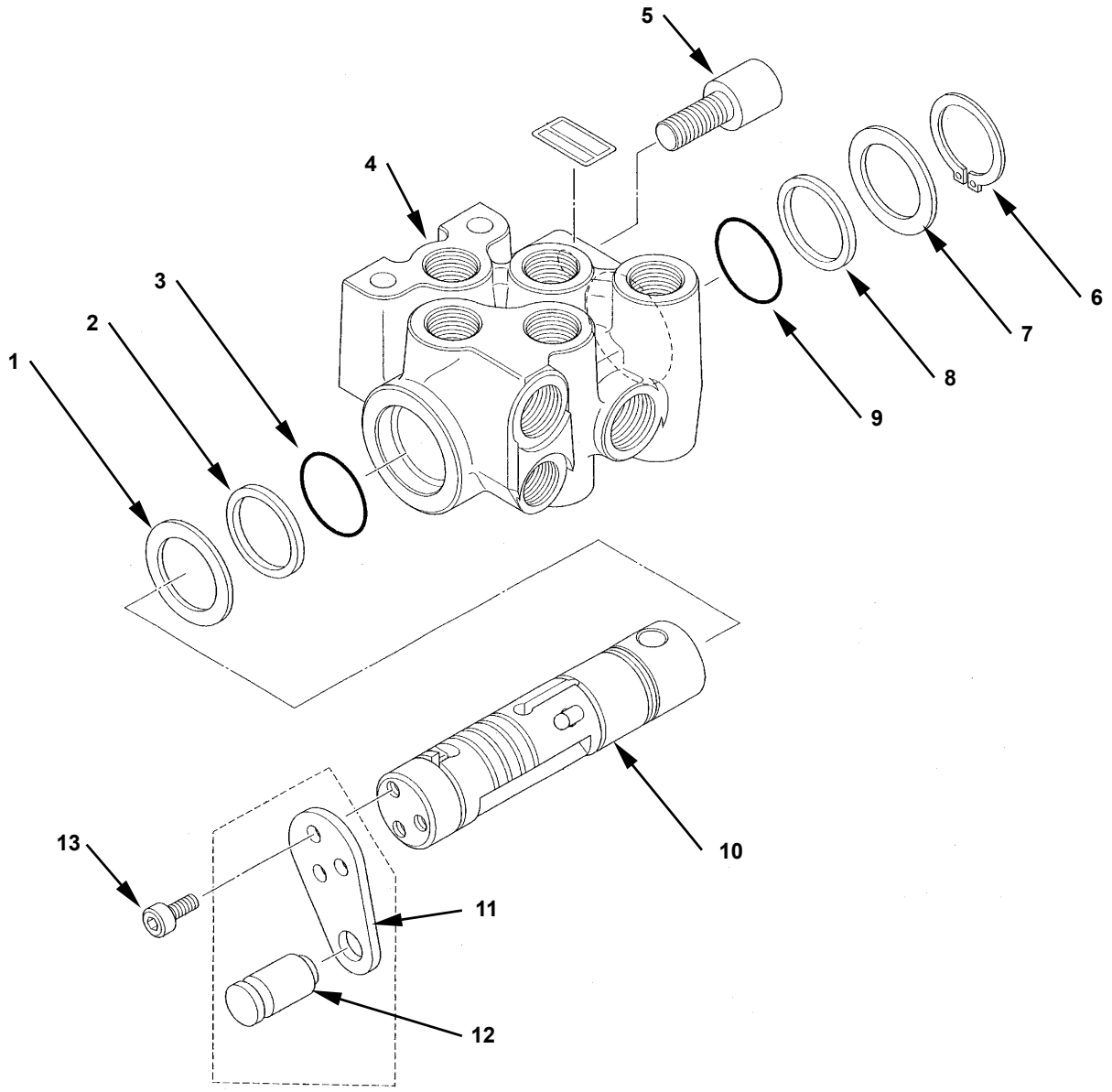
ASSEMBLE FRONT/SWING PILOT VALVE



1 - Screw Joint
2 - Cam
3 - Universal Joint
4 - Plate
5 - Oil Seal (4 Used)
6 - Bushing (4 Used)
7 - O-Ring (4 Used)
8 - Pusher (4 Used)
9 - Spring Seat (4 Used)
10 - Spring (4 Used)
11 - Spring (4 Used)
12 - Washer (4 Used)
13 - Spool (4 Used)
14 - Casing
15 - O-Ring
16 - Bushing
17 - Spring Pin
18 - Port Plate
19 - Seal Washer (2 Used)
20 - Socket Bolt (2 Used)

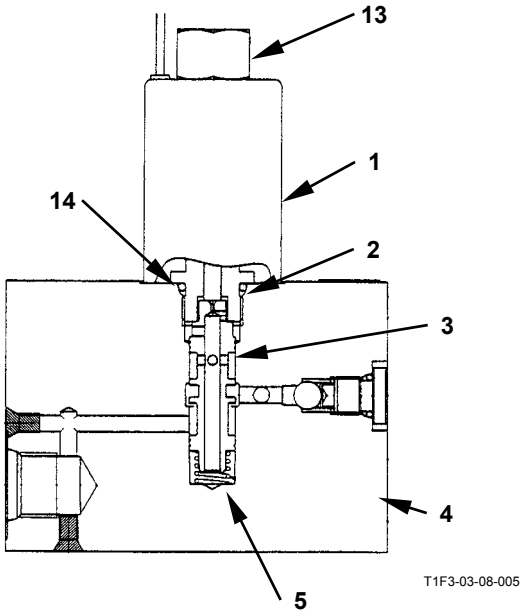
DISASSEMBLE PILOT SHUT-OFF VALVE



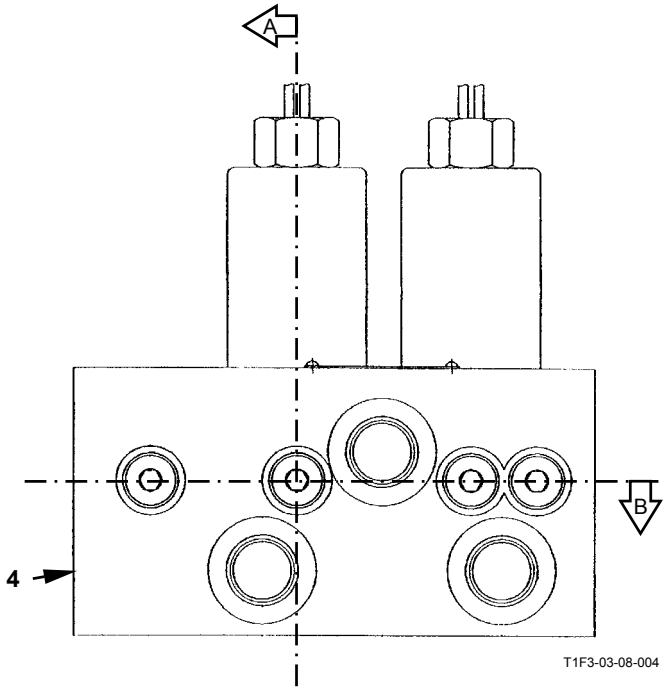
W178-02-08-005

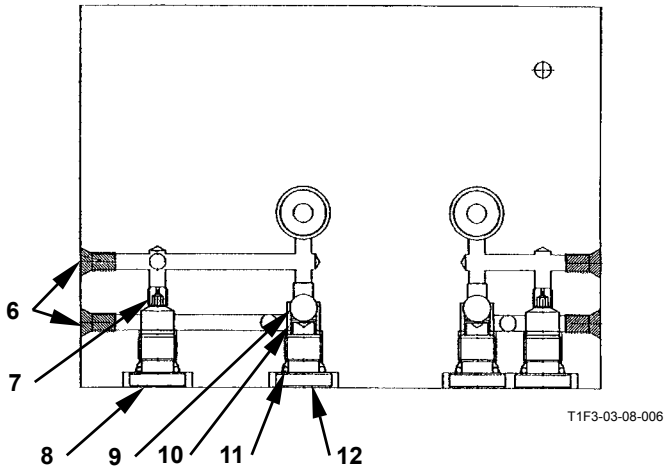
1 - Washer
2 - Backup Ring
3 - O-Ring
4 - Body
5 - Socket Bolt
6 - Retaining Ring
7 - Washer
8 - Backup Ring
9 - O-Ring
10 - Spool
11 - Bracket
12 - Pin
13 - Socket Bolt (3 Used)

CONSTRUCTION OF TRAVEL SHOCK-LESS VALVE



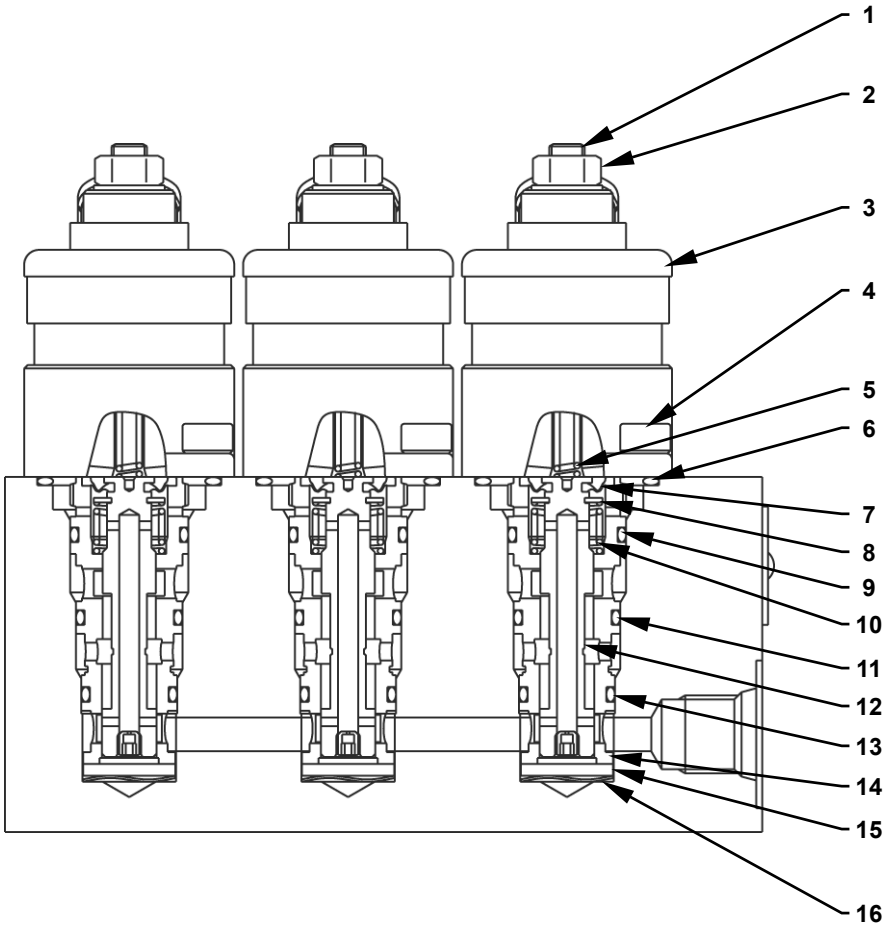
Section A





Section B

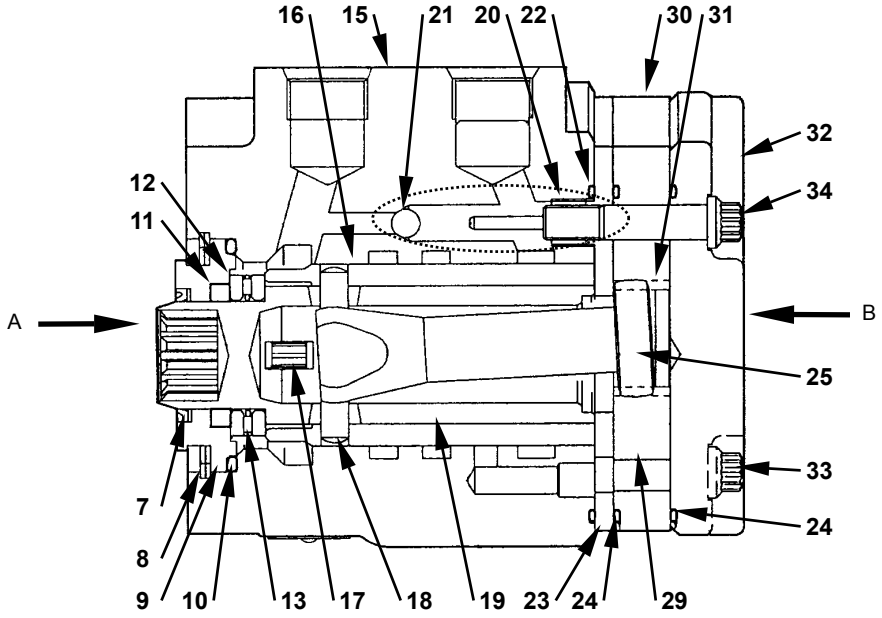
CONSTRUCTION OF 3-UNIT SOLENOID VALVE (FOR PUMP CONTROL)



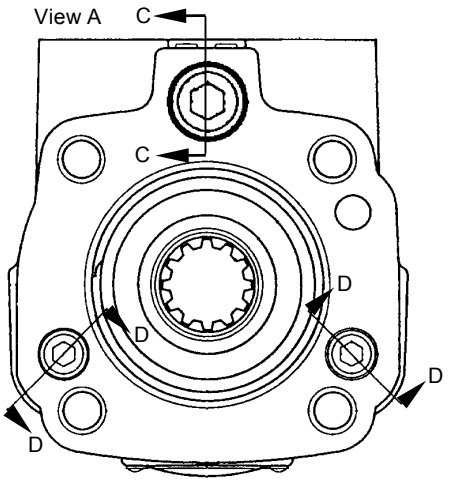
T1F3-03-10-016

Item No.	Part Name	Q'ty	Wrench Size (mm)	Tightening Torque			Remark
				N·m	(kgf·m)	(lbf·ft)	
1	Adjust Screw	3					
2	Lock Nut	3	: 10	5^{+2}_{-0}	$(0.5^{+0.2}_{-0})$	$(3.7^{+1.5}_{-0})$	
3	Solenoid	3					
4	Socket Bolt	6	: 4	5^{+2}_{-0}	$0.5^{+0.2}_{-0}$	$3.7^{+1.5}_{-0}$	
5	Spring	3					
6	O-Ring	3					
7	Diaphragm	3					
8	Washer	3					
9	O-Ring	3					
10	Spring	3					
11	O-Ring	3					
12	Spool	3					
13	O-Ring	3					
14	Sleeve	3					
15	Plate	3					
16	Washer	3					

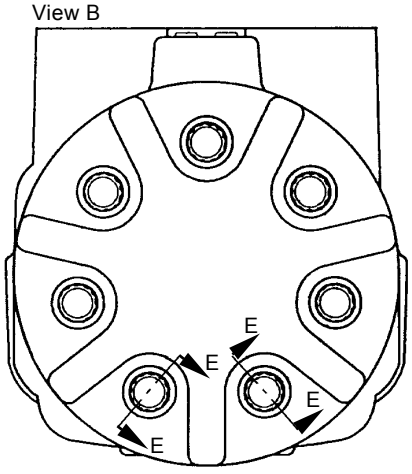
ASSEMBLE STEERING VALVE



T1F3-03-07-002

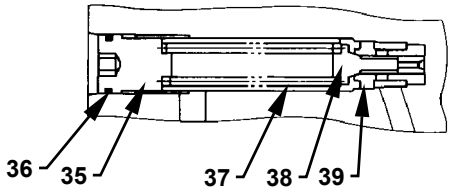


W1F3-02-13-001



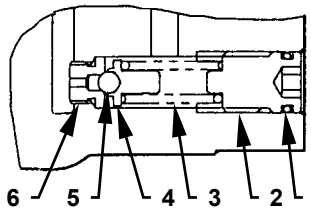
T487-03-02-005

Section C-C



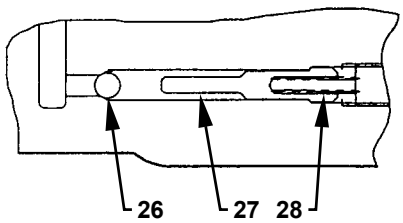
T1F3-03-07-003

Section D-D



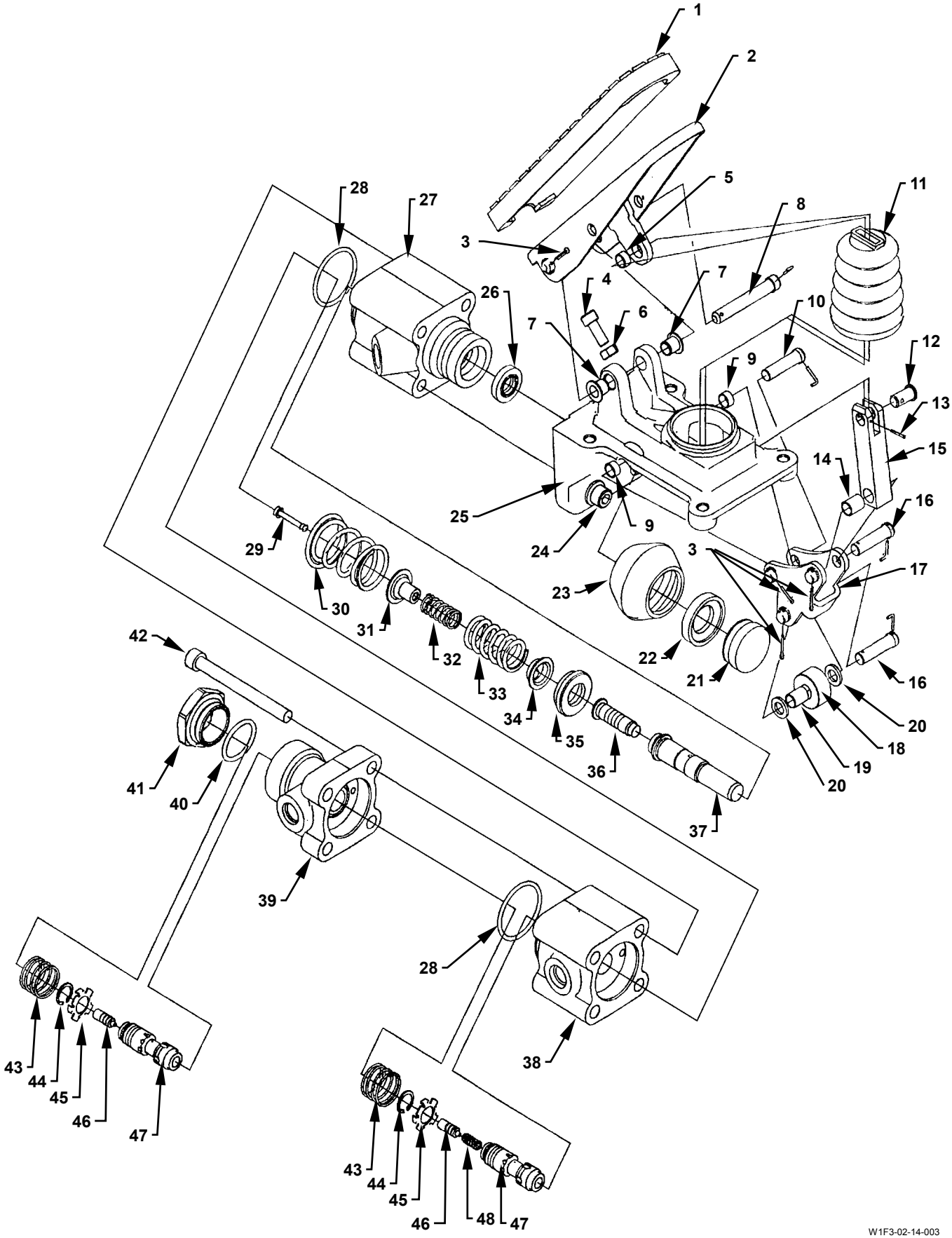
T487-03-02-007

Section E-E



T487-03-02-006

DISASSEMBLE BRAKE VALVE



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MEMO

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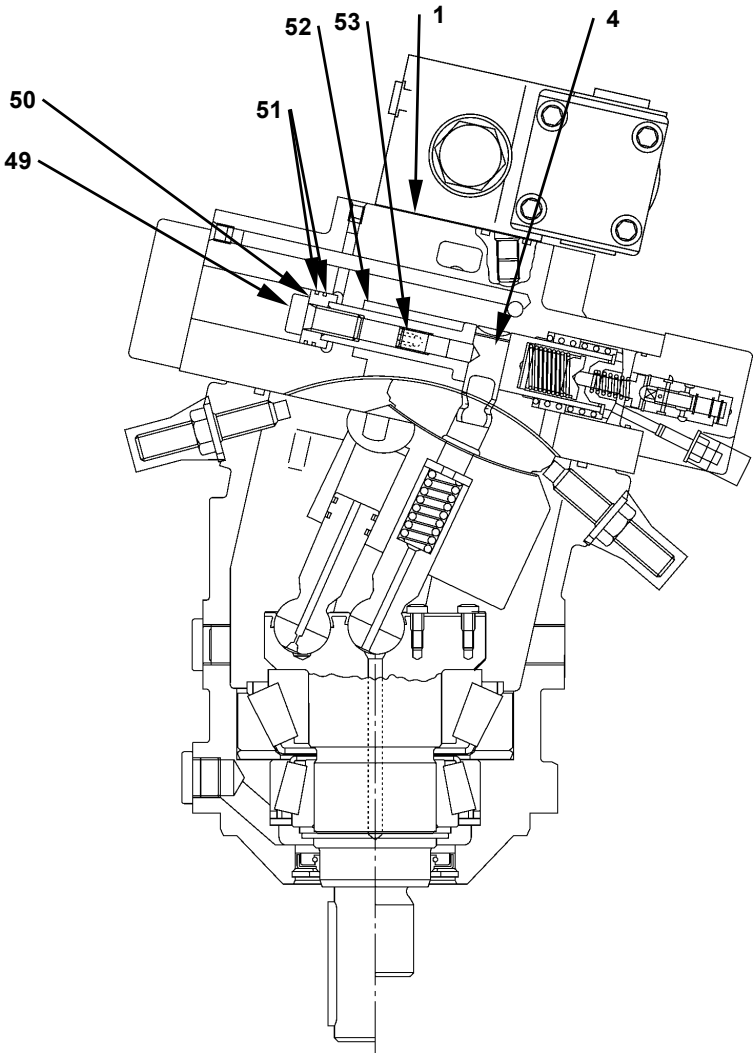
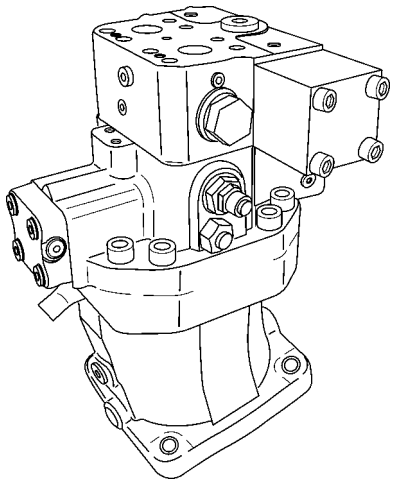
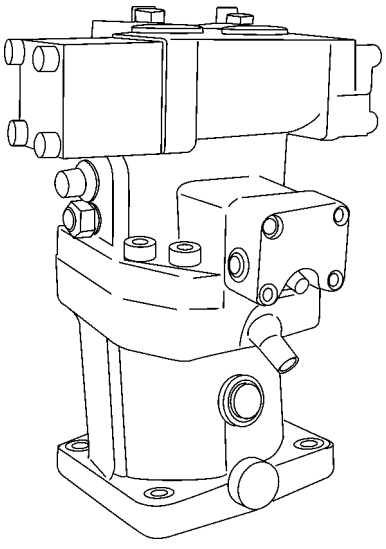


W1GL-03-02-007

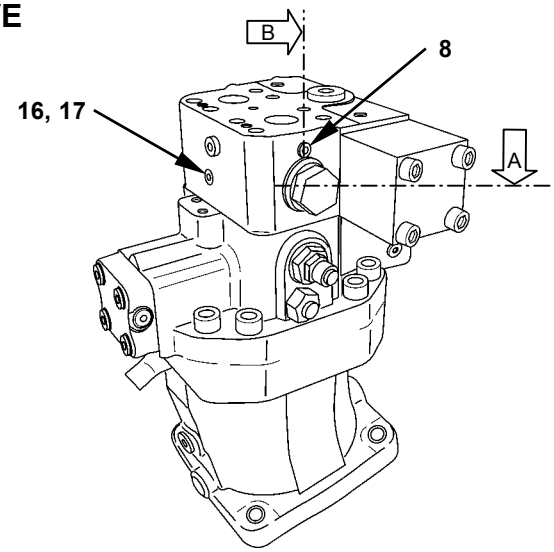


W1F3-03-02-002

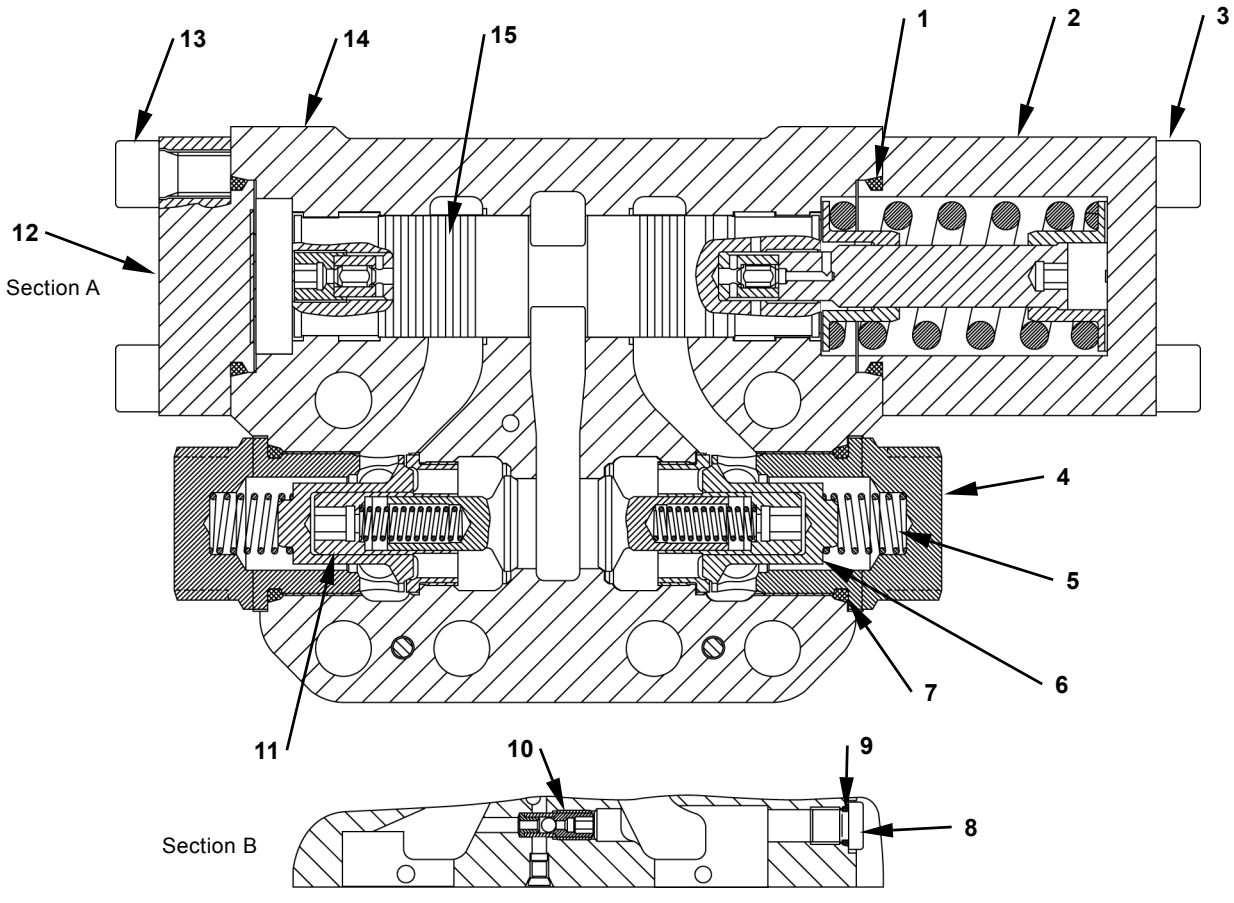


W1F3-03-02-003

ASSEMBLE BRAKE VALVE



W1F3-03-02-002



T1F3-03-05-034

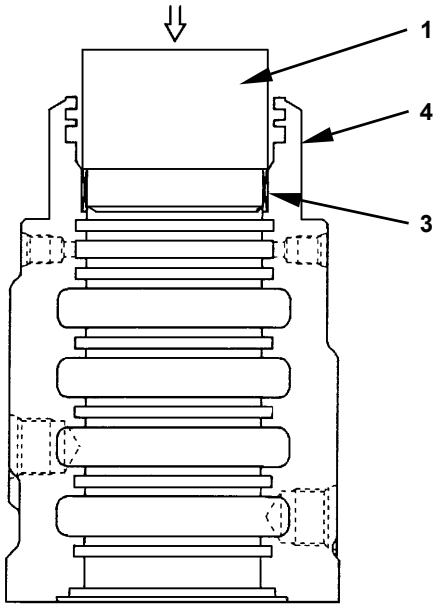
1 - O-Ring (2 Used)
2 - Cover
3 - Socket Bolt (4 Used)
4 - Plug (2 Used)
5 - Spring (2 Used)
6 - Check Valve (2 Used)
7 - O-Ring (2 Used)
8 - Plug
9 - O-Ring
10 - Shuttle Valve
11 - Check Valve Assembly (2 Used)
12 - Cover
13 - Socket Bolt (4 Used)
14 - Valve Casing
15 - Counterbalance Valve
16 - Plug
17 - Orifice

When replacing the body or spindle with a new one, the following procedures are required:

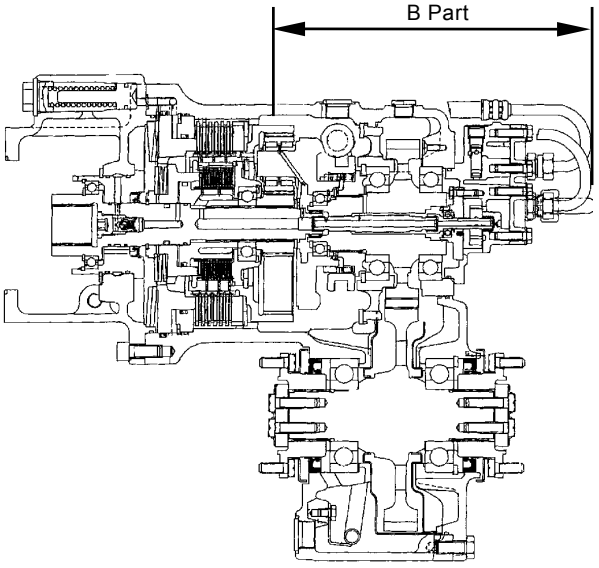
Press bushing (3) into body.

1. Clean body (4) and bushing (3).
2. Press bushing (3) into body (4) using pressing tool.

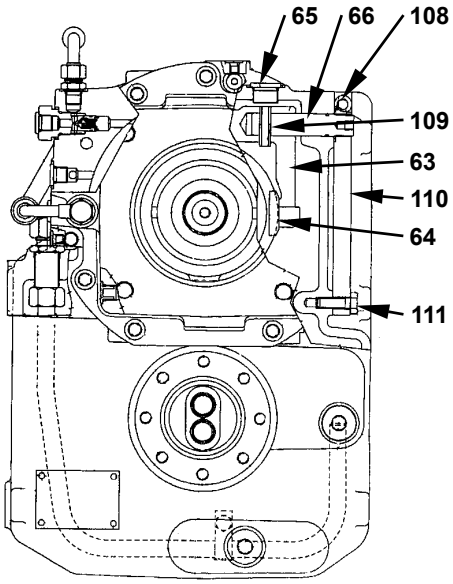
   Pressing force: 0.5 to 1.5 tons
   Pressing tool (1): ST 7331



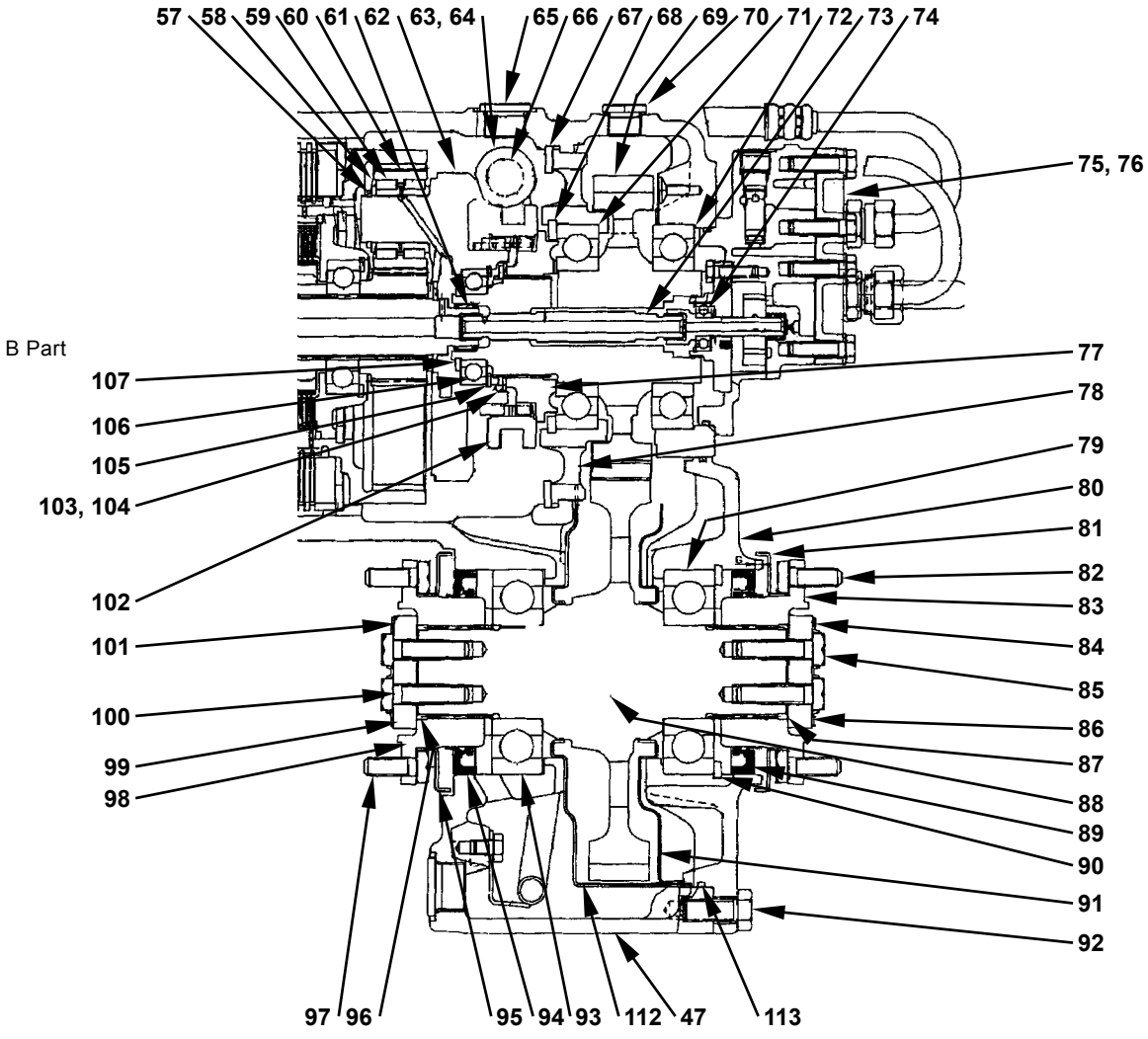
W105-03-03-029



W1F3-03-05-005

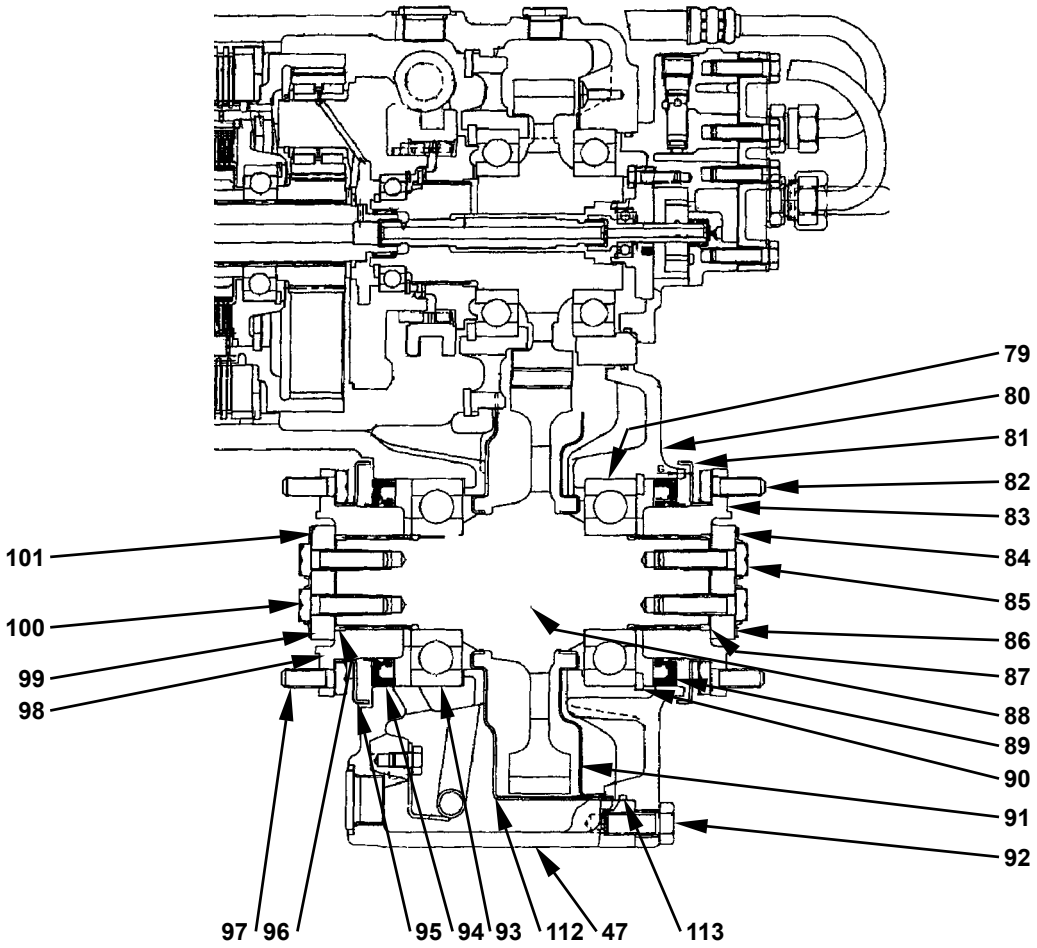


W1F3-03-05-006



W1F3-03-05-008

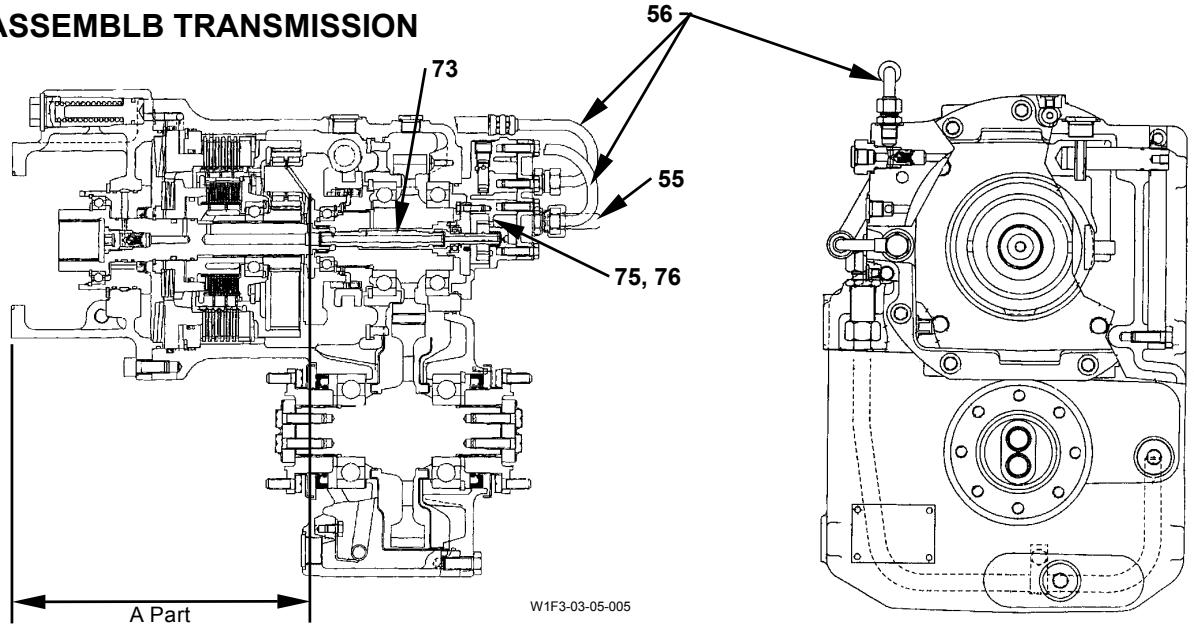
ASSEMBLE FINAL DRIVE AND DIFFERENTIAL



W1F3-03-05-008

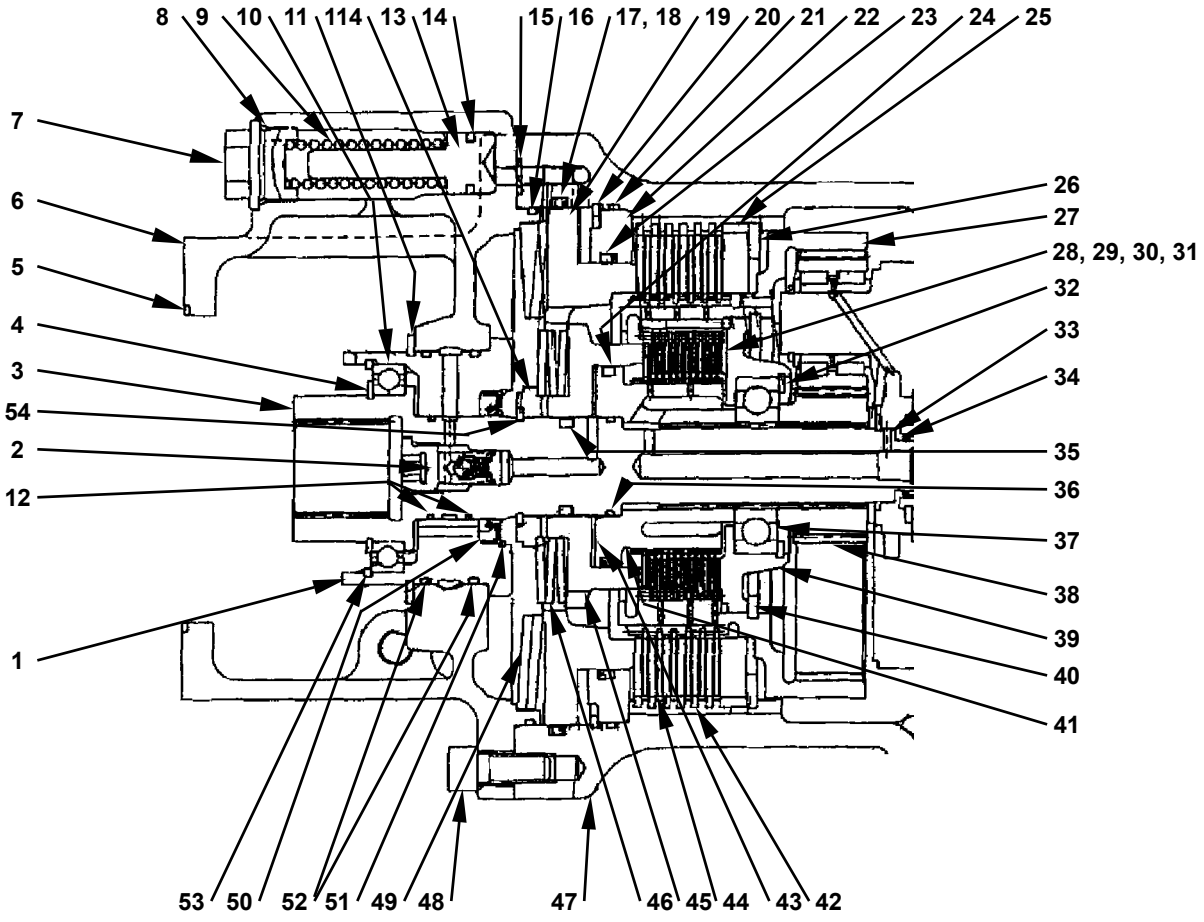
47 - Gear Case
79 - Bearing
80 - Cover
81 - Plate
82 - Bolt (8 Used)
83 - Flange
84 - Lock Plate
85 - Bolt (2 Used)
86 - Plate
87 - O-Ring
88 - Gear
89 - Seal
90 - Retaining Ring
91 - Cover
92 - Bolt (7 Used)
93 - Bearing
94 - Seal
95 - Plate
96 - O-ring
97 - Bolt (8 Used)
98 - Flange
99 - Plate
100 - Bolt (2 Used)
101 - Lock Plate
112 - Cover
113 - O-ring

ASSEMBLB TRANSMISSION

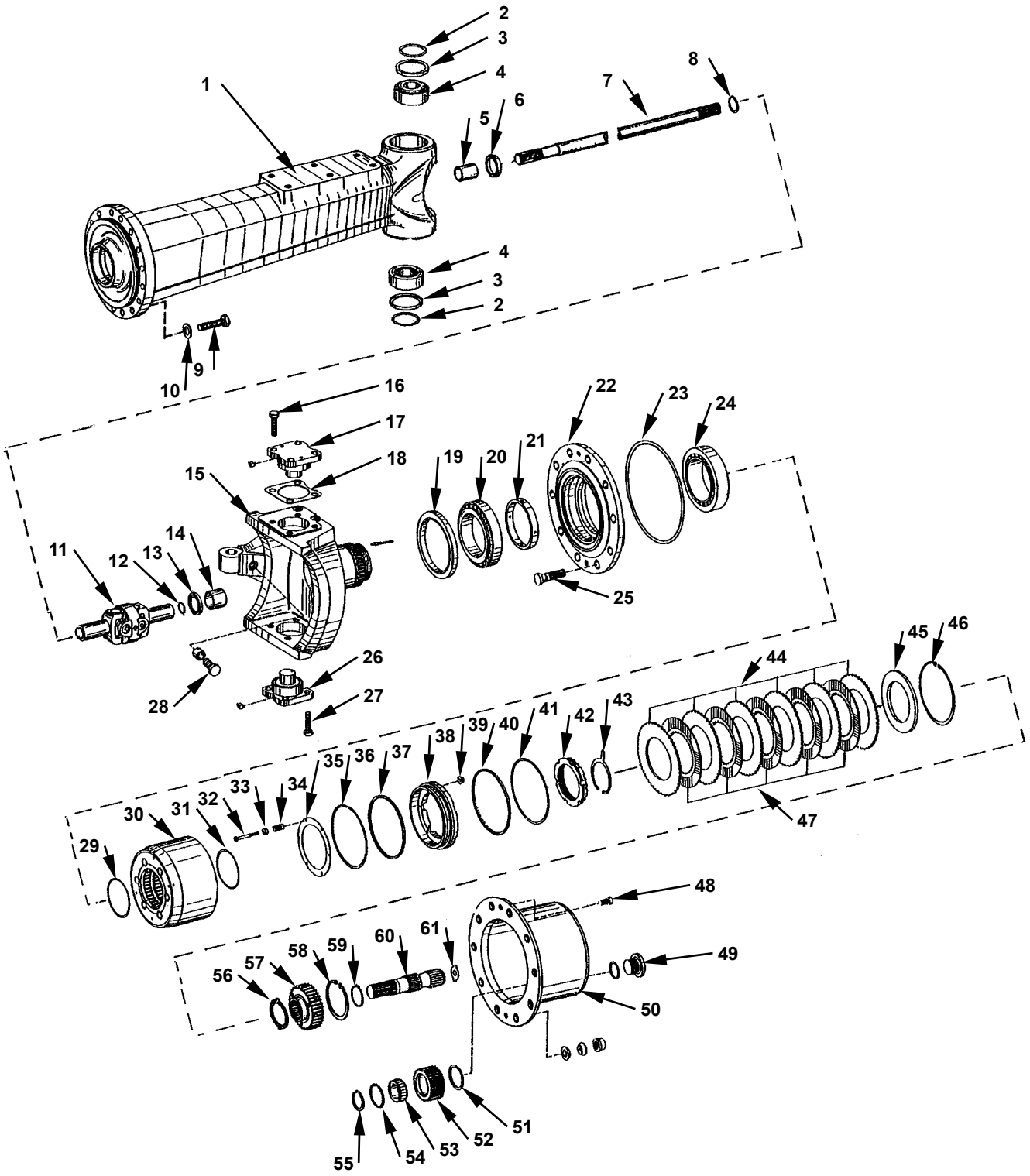


W1F3-03-05-006

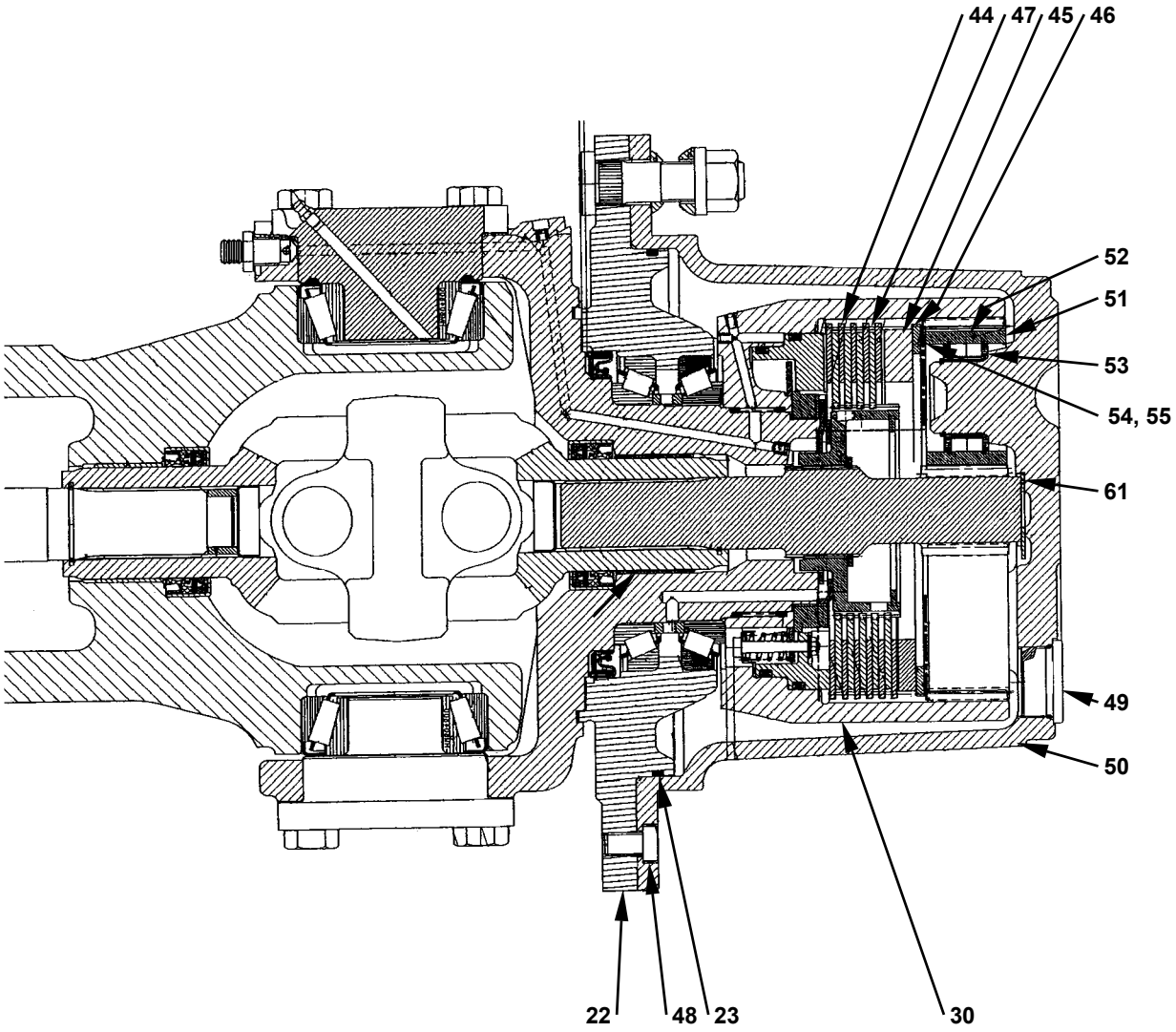
A Part



W1F3-03-05-007

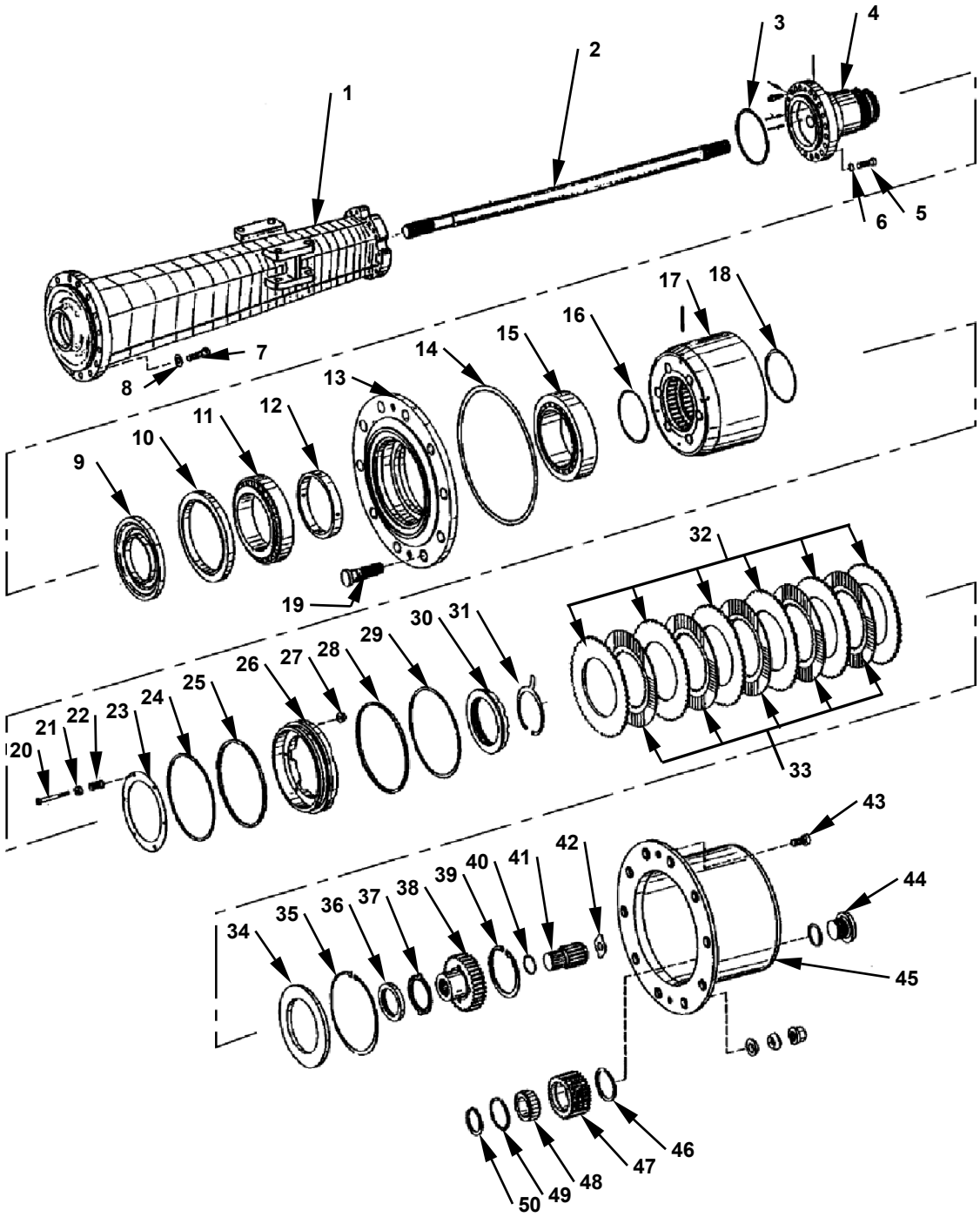


W1F3-03-05-011

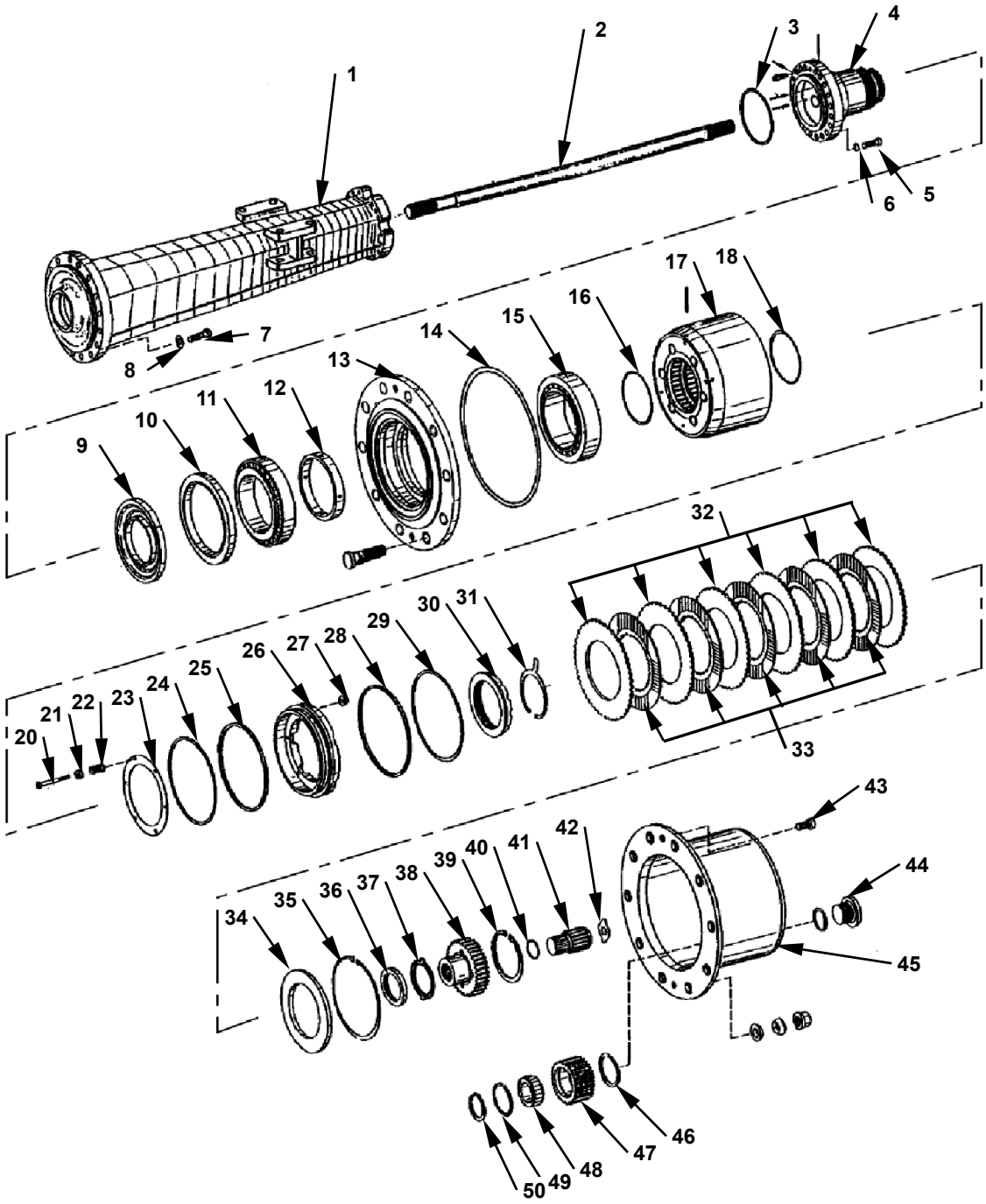


W1F3-03-05-003

DISASSEMBLE REAR AXLE



W1F3-03-05-018



W1F3-03-05-018

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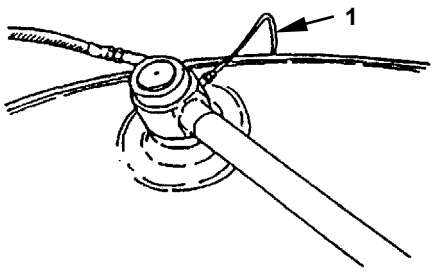
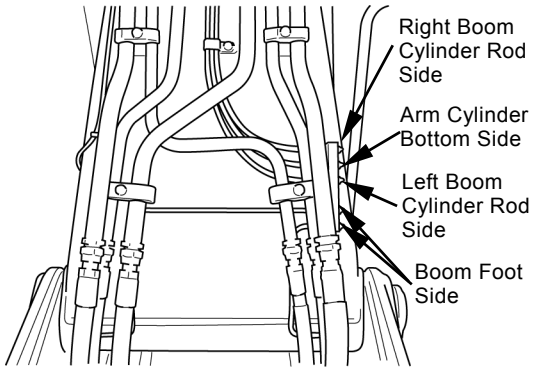
MEMO

9. Connect grease pipe (1) onto the boss at boom cylinder rod side. (2 places both left and right)
   : 17 mm
   : 24.5 N·m (2.5 kgf·m, 18 lbf·ft)



W105-04-01-002

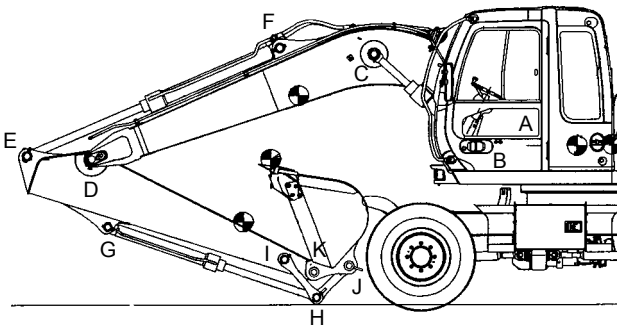
10. Add grease to the boom cylinder rod side, bottom side and boom foot side.



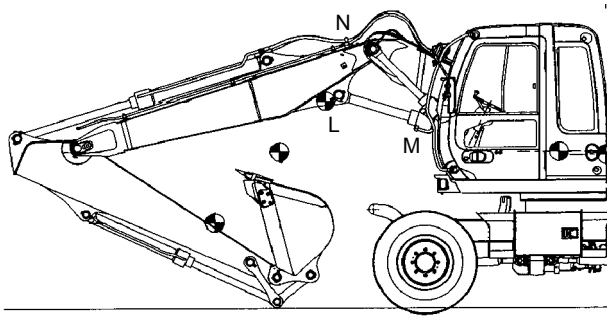
W1F3-04-01-010

MAINTENANCE STANDARD

Pin and Bushing



WCAB-04-01-007



WCAB-04-01-008

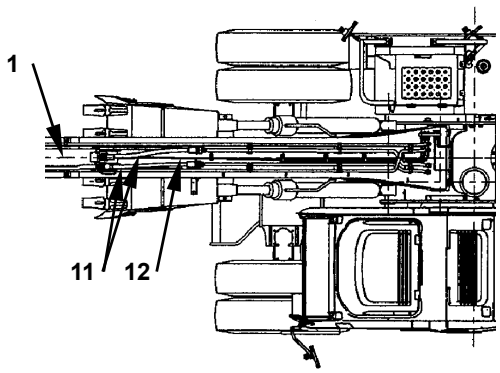
Unit: mm (in)

	Item	Standard	Allowable Limit	Remedy
A	Pin	71 (2.81)	70.0 (2.76)	Replace
	Bushing	71 (2.81)	72.5 (2.85)	
B	Pin	80 (3.15)	79.0 (3.11)	
	Boss (Main Frame)	80 (3.15)	81.5 (3.21)	
	Bushing (Boom Cylinder)	80 (3.15)	81.5 (3.21)	
C	Pin	71 (2.80)	70.0 (2.76)	
	Bushing (Boom Cylinder)	71 (2.80)	72.5 (2.85)	
	Boss (Boom)	71 (2.80)	72.5 (2.85)	
D	Pin	71 (2.80)	70.0 (2.76)	
	Bushing	71 (2.80)	72.5 (2.85)	
E	Pin	71 (2.80)	70.0 (2.76)	
	Boss (Arm)	71 (2.80)	72.5 (2.85)	
	Bushing (Arm Cylinder)	71 (2.80)	72.5 (2.85)	
F	Pin	71 (2.80)	70.0 (2.76)	
	Boss (Boom)	71 (2.80)	72.5 (2.85)	
	Bushing (Arm Cylinder)	71 (2.80)	72.5 (2.85)	

6. Disconnect hoses (11) (2 used) from the bottom of arm cylinder (1). Attach a cap onto the open ends. In case the hose-rupture safety valve is equipped, refer to the “Remove and Install Hose-Rupture Safety Valve”.
   : 36 mm

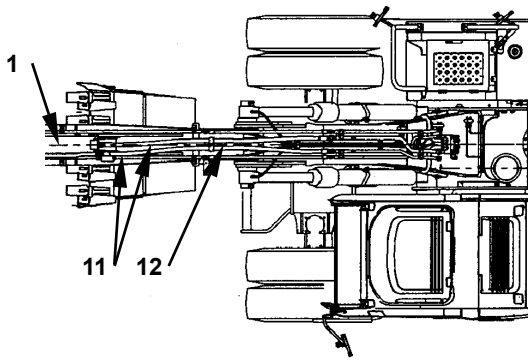
7. Disconnect grease hose (12) from arm cylinder (1).

Monoblock Boom



WCAB-04-01-005

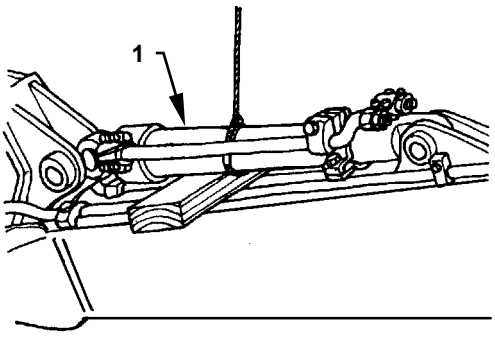
2-Piece Boom



WCAB-04-01-003

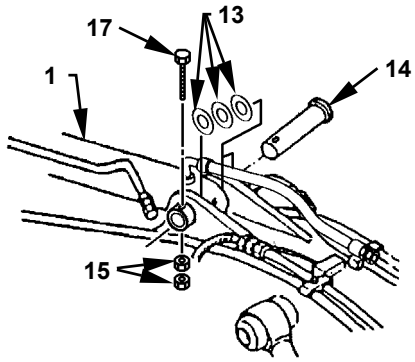
CAUTION: Arm cylinder weight: 167 kg (370 lb)

8. Attach a sling at the arm cylinder (1) center of gravity. Lift arm cylinder (1) off.



W102-04-02-016

9. Remove nuts (15) and bolt (17) from the tube side of arm cylinder (1). Push out pin (14). Remove thrust plates (13) and remove arm cylinder (1).
   : 30 mm



W187-04-02-007

Install Blade Cylinder

CAUTION: Prevent person from injury. Metal fragments may fly when a hammer is used to install the pins. Be sure to wear necessary protection, such as goggles, hardhat and etc.

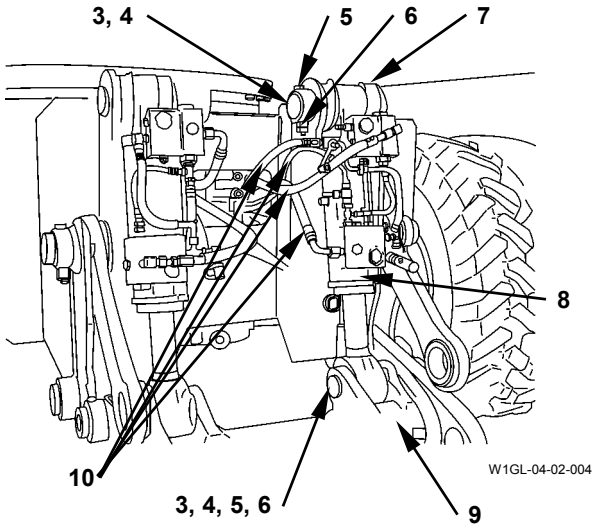
CAUTION: Blade cylinder (8) weight: 55 kg (120 lb)

1. Lift and hold blade cylinder (8). Align the pin (3) holes of the blade cylinder (8) bottom side and bracket (7) and the rod side and blade (9).
   Install thrust plate (4) and drive pins (3) (2 used).
   Install bolts (5) (2 used) and nuts (6) (4 used).
   : 24 mm
   : 210 N·m (21.5 kgf·m, 155 lbf·ft)

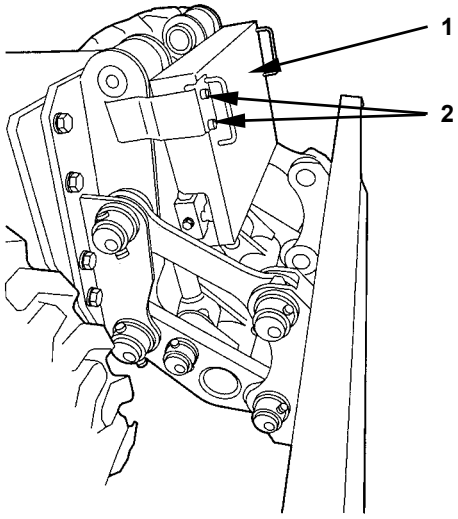
2. Connect hoses (10) (4 used) to blade cylinder (8).
   : 19 mm
   : 24.5 N·m (2.5 kgf·m, 18.0 lbf·ft)
   : 27 mm
   : 93 N·m (9.5 kgf·m, 69 lbf·ft)

3. Install protection cover (1) to blade cylinder (8) with bolts (2) (4 used).
   : 19 mm
   : 90 N·m (9.2 kgf·m, 66 lbf·ft)

IMPORTANT: After installation, operate the cylinder several times to stroke end to bleed air from the circuit.



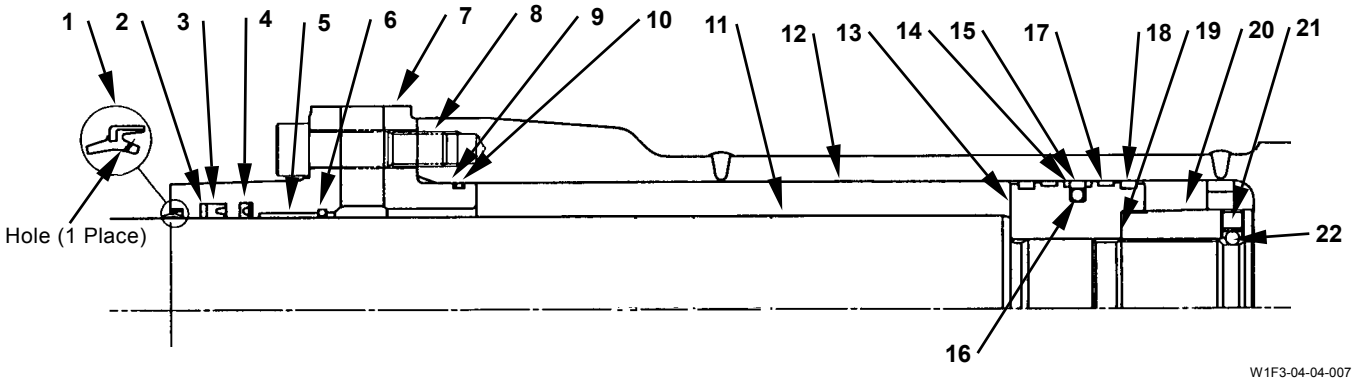
W1GL-04-02-004



W1GL-04-01-013

ASSEMBLE CYLINDER (Positioning)

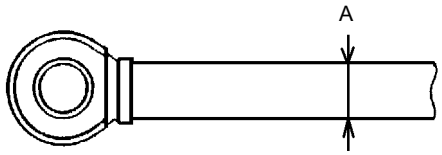
Positioning Cylinder



1 - Wiper Ring
2 - Backup Ring
3 - U-Ring
4 - Buffer Ring
5 - Bushing
6 - Retaining Ring
7 - Cylinder Head
8 - Socket Bolt (2 Used)
9 - Backup Ring
10 - O-Ring
11 - Piston Rod
12 - Cylinder Tube
13 - Piston
14 - Backup Ring (2 Used)
15 - Seal Ring
16 - O-Ring
17 - Slide Ring
18 - Slide Ring
19 - Shim
20 - Nut
21 - Set Screw
22 - Steel Ball

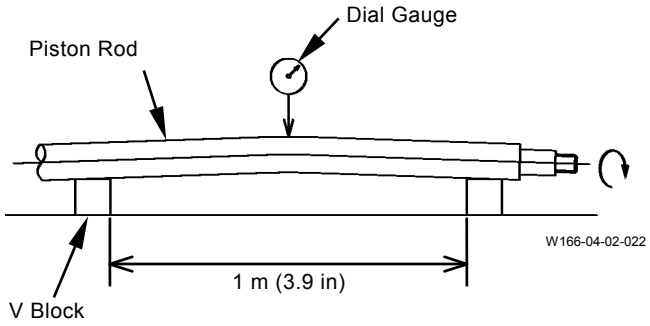
MAITENANCE STANDARD

Piston Rod



W105-04-02-094

Rod Bend and Run Out



Unit: mm (in)

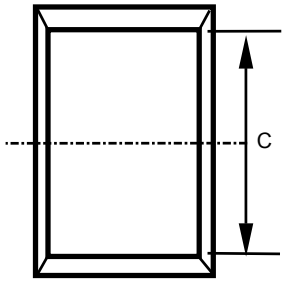
Cylinder Name		Recommended Size After Re-manufacturing (A)
Boom	2-Piece	$75^{-0.023}_{-0.053}$ ($2.95^{-0.001}_{-0.002}$)
	Monoblock	$70^{-0.023}_{-0.053}$ ($2.76^{-0.001}_{-0.002}$)
Arm		$80^{-0.01}_{-0.023}$ ($3.15^{-0.0004}_{-0.001}$)
Positioning		$95^{-0.012}_{-0.027}$ ($3.74^{-0.005}_{-0.001}$)
Bucket		$70^{-0.023}_{-0.053}$ ($2.76^{-0.001}_{-0.002}$)

Unit: mm (in)

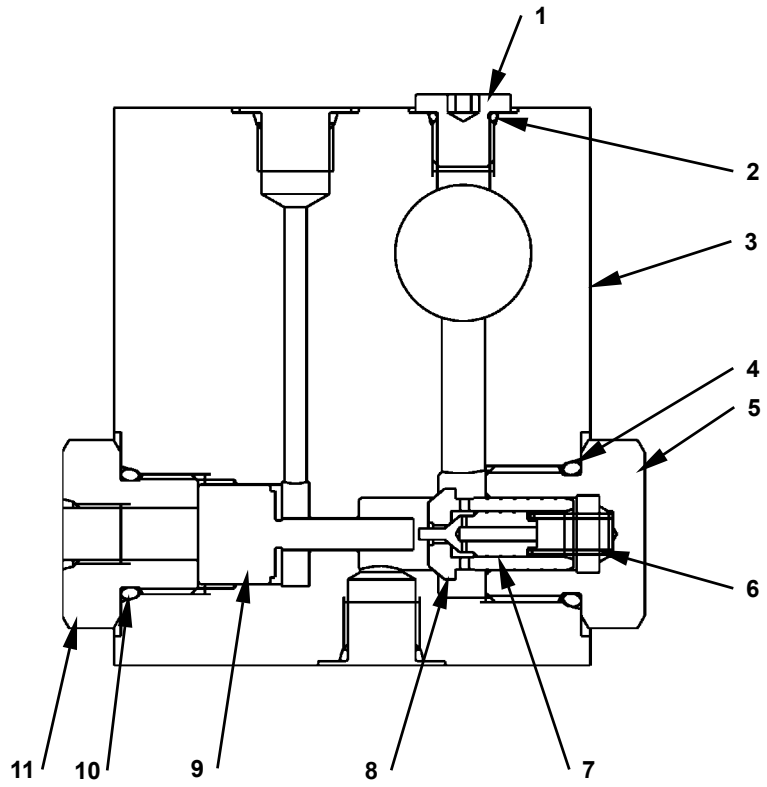
Bend	Run out	Remedy
0.5 (0.020)	1.0 (0.039)	Repair
1.0 (0.039)	2.0 (0.079)	Replace

Wear to inner Diameter of Rod Bushing
Unit: mm (in)

Cylinder Name		Standard inner Dimeter (C)	Allowable Limit	Remedy
Boom	2-Piece	$75^{-0.06}_{-0.19}$ ($2.95^{-0.002}_{-0.007}$)	+0.3	Replace
	Monoblock	$70^{-0.06}_{-0.19}$ ($2.76^{-0.002}_{-0.007}$)	+0.3	Replace
Arm		$80^{-0.06}_{-0.19}$ ($3.15^{-0.002}_{-0.007}$)	+0.3	Replace
Positioning		$95^{-0.06}_{-0.19}$ ($3.74^{-0.002}_{-0.007}$)	+0.3	Replace
Bucket		$70^{-0.06}_{-0.19}$ ($2.76^{-0.002}_{-0.007}$)	+0.3	Replace



CONSTRUCTION OF OPERATE-CHECK VALVE (FOR BLADE/STABILIZER)



T1F3-03-10-003

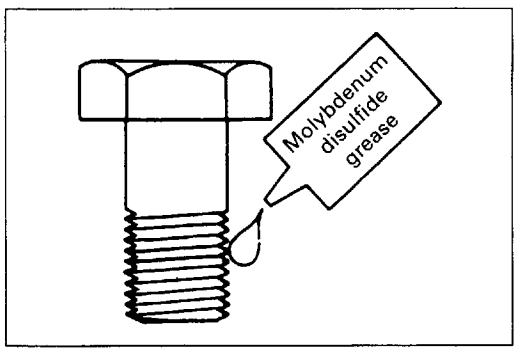
Item No.	Part Name	Q'ty	Wrench Size	Tightening Torque			Remark
				N·m	(kgf·m)	(lbf·ft)	
1	Plug	1	: 6 mm				
2	O-Ring	1					1B P11
3	Casing	1					
4	O-Ring	1					1B P26
5	Plug	1	: 36 mm	360±36	(37±3.7)	(265±26.5)	
6	Spring	1					ϕ1.0×ϕ8.5×31.0 mm
7	Poppet	1					
8	Check Valve	1					
9	Piston	1					
10	O-Ring	1					1B P24
11	Plug	1	: 36 mm	240±24	(24±2.4)	(175±17.5)	

MAIN DATA AND SPECIFICATIONS

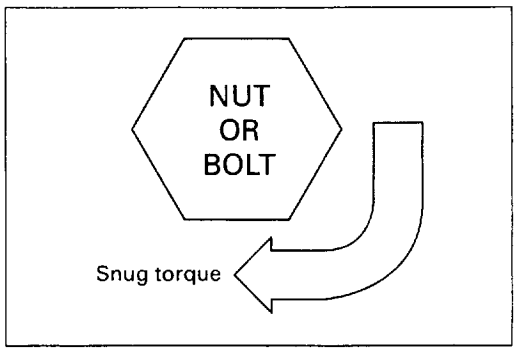
Item \ Engine Model		CC-4BG1TCG	BB-4BG1TRG
Engine type		Water cooled, four cycle, vertical in-line overhead valve	
Combustion chamber type		Direct injection	
Cylinder liner type		Dry	
No. of cylinders – bore × stroke	mm (in)	4 – 105 × 125 (4.13 × 4.92)	
Total piston displacement	L (cid)	4.329 (464)	
Compression ratio		18 to 1	
Engine dimensions Length × width × height	mm (in)	908 × 698 × 892 (35.7 × 27.5 × 27.5)	900 × 718 × 892 (35.4 × 28.3 × 35.1)
Engine weight (Dry)	kg (lb)	370 (816)	360 (794)
Fuel injection order		1–3–4–2	
Specified fuel		Diesel fuel (ASTM D975 No. 2D)	
Injection pump		In-line plunger, Bosch A type	
Governor		Mechanical, RSV type	
Injection nozzle		Multi hole	
Injection starting pressure	MPa (kgf/cm^2/psi)	18.1 (185/2,630)	
Injection timing (BTDC)	(deg)	10	9
Fuel filter type		Cartridge (spin-on)	
Water sedimentor	(If so equipped)	Sediment/water level indicating type	
Compression pressure (At warm)	MPa (kgf/cm^2/psi)	3.04 (31/441) at 200 min^{-1} at sea level	
Valve clearances (At cold)	Intake mm (in)	0.40 (0.016)	
	Exhaust mm (in)	0.40 (0.016)	
Lubrication method		Pressurized circulation	
Oil pump		Gear type	
Main oil filter type		Full flow, cartridge (spin-on)	
Engine oil capacity	OIL PAN L (US gal)	MAX 13.2 (3.49), MIN 10 (2.64)	
	TOTAL SYSTEM capacity	MAX 16.2 (4.28), MIN 13 (3.43)	
Oil cooler		Water cooled integral type	
Cooling method		Pressurized forced circulation	
Coolant volume (engine only)	L (US gal)	8.5 (2.25)	
Water pump		Belt driven impeller type	
Thermostat type		Wax pellet type	
Alternator	V-A	24–50	
Starter	V-KW	24–4.5	
Turbocharger manufacturer		MITSUBISHI	
Turbocharger model		TD04HL	

ANGULAR NUT AND BOLT TIGHTENING METHOD

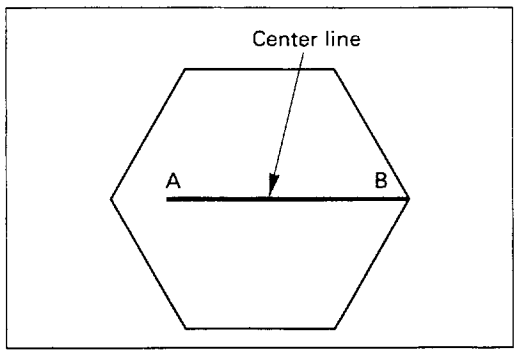
1. Carefully wash the nuts and bolts to remove all oil and grease.



2. Apply a coat of molybdenum disulfide grease to the threads and setting faces of the nuts and bolts.

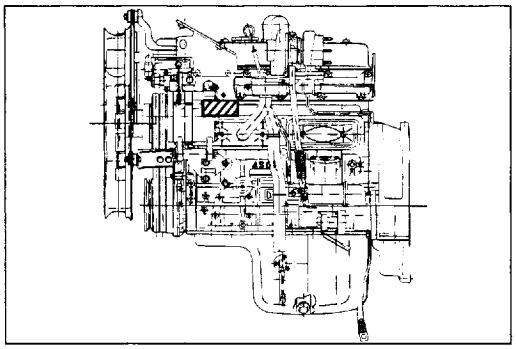


3. Tighten the nuts and bolts to the specified torque (snug torque) with a torque wrench.



4. Draw a line [A-B] across the center of each bolt.

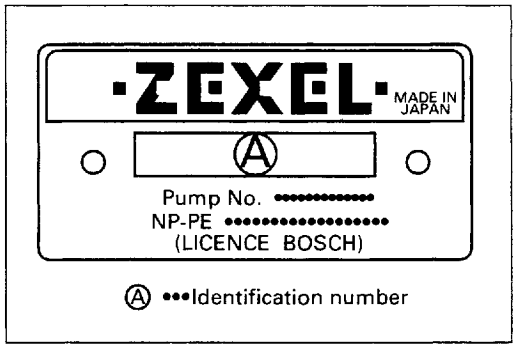
IDENTIFICATIONS



MODEL IDENTIFICATION

Engine Serial Number

The engine number is stamped on the front left hand side of the cylinder body.



INJECTION PUMP IDENTIFICATION

Injection Pump Number

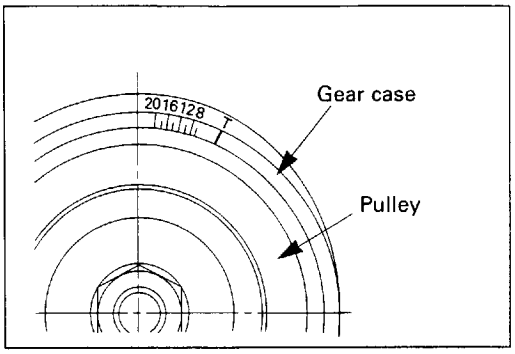
Injection volume should be adjusted after referring to the adjustment data applicable to the injection pump installed.

The injection pump identification number (A) is stamped on the injection pump identification plate.

Note:

Always check the identification number before beginning a service operation.

Applicable service data will vary according to the identification number. Use of the wrong service data will result in reduced engine performance and engine damage.



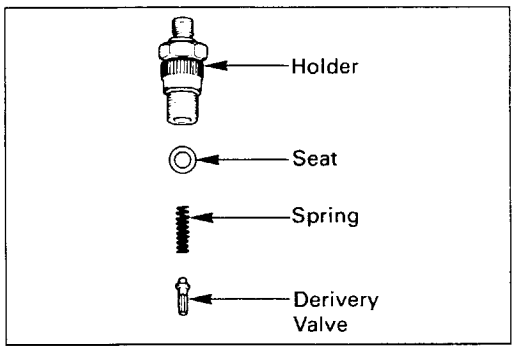
Degree

Engine Model	Injection Timing
AA-4BG1TCG-01	9
CC-4BG1TCG	10
BB-4BG1TRG	9

Note:

Injection pump injection timing will vary among identical engines contact your machine supplier or nearest ISUZU engine service outlet for the specifications applicable to your engine.

These specifications have been set by ISUZU and the OEM manufacturer.



7. Remove the delivery valve holder from the No. 1 plunger.
8. Reinstall the delivery valve internal parts (seat, spring, and valve) to the delivery valve holder.
9. Reinstall the delivery valve holder assembly to the No. 1 plunger and tighten it to the specified torque.

N·m (kgf·m/lb.ft)

Delivery Valve Holder Torque	39–44 (4–4.5/29–33)

10. Install the No. 1 cylinder injection pipe and tighten it to the specified torque.

N·m (kgf·m/lb.ft)

Injection Pipe Nut Torque	28–32 (2.9–3.3/21–24)

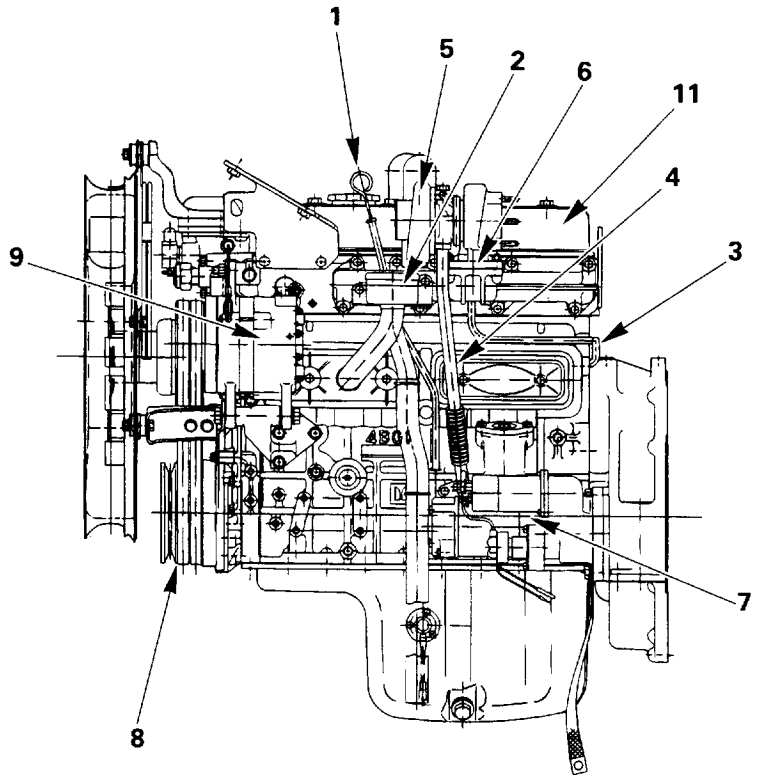
Note:

DO NOT OVERTIGHTEN THE INJECTION PUMP BODY.

THE INJECTION PUMP BODY IS MADE OF ALUMINUM. OVERTIGHTENING WILL DISTORT THE INJECTION PUMP BODY SHAPE AND ADVERSELY AFFECT CONTROL RACK OPERATION.

EXTERNAL PARTS DISASSEMBLY STEPS
(Left-hand side)

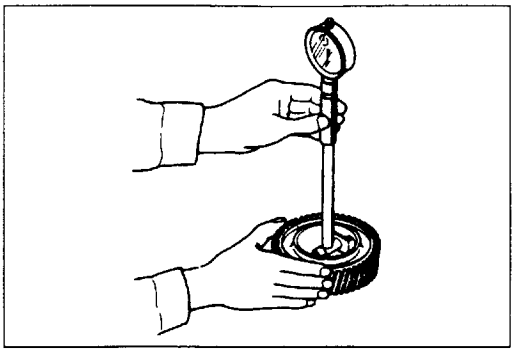
MODEL CC-4BG1TRB



Disassembly Steps

1. Dipstick and guide tube
2. Air breather
3. Oil feed pipe
4. Oil drain pipe
▲ 5. Turbocharger
6. Gasket
7. Starter
8. Fan belt
9. Alternator
10. Fan pulley
11. Cylinder head cover

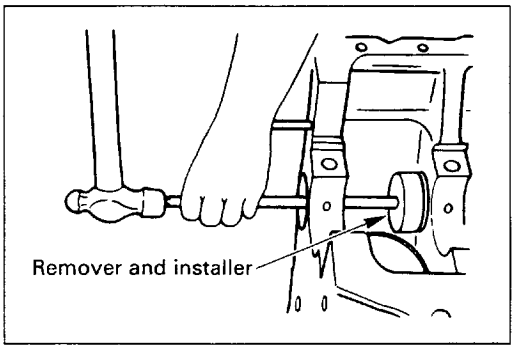
MEMO



2. Use a dial indicator to measure the idler gear inside diameter.

mm (in)

	Standard	Limit
Idler Gear and Idler Gear Shaft Clearance	0.025–0.085 (0.001–0.003)	0.2 (0.008)



CAMSHAFT

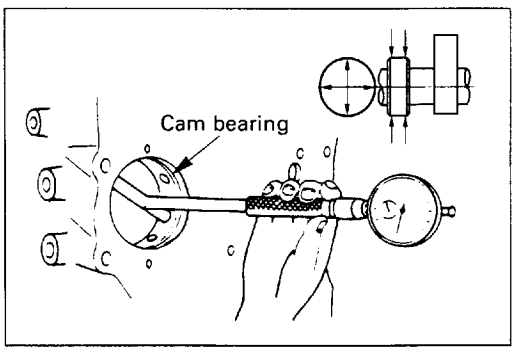
1. Use the camshaft bearing remover and installer to remove camshaft bearing from the cylinder body.

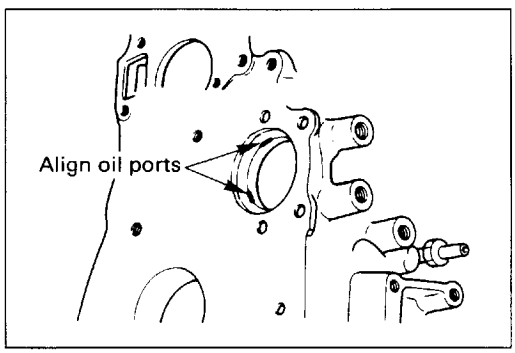
   Camshaft Bearing Remover and Installer: 9-8523-1818-0

2. Measure the clearance between the cam journal and the camshaft bearing.

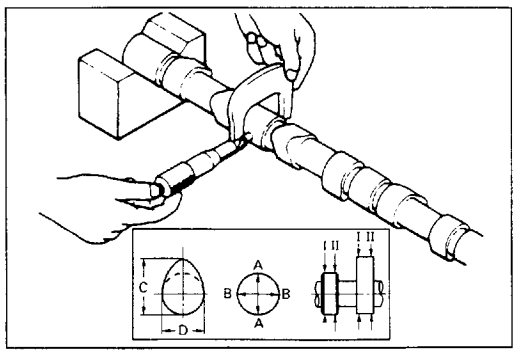
mm (in)

	Standard	Limit
Cam Journal and Cam Bearing Clearance	0.03–0.09 (0.001–0.004)	0.15 (0.006)





3. Align the camshaft bearing oil holes with the mating oil ports (machined on the cylinder body camshaft bearing fitting bore).

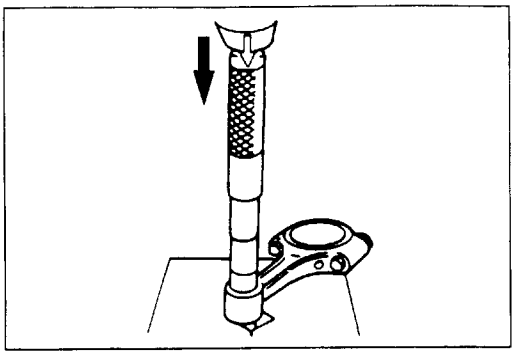


4. Use a micrometer to measure the cam lobe height.

   If the cam lobe height is less than the specified limit, the camshaft must be replaced.

mm (in)

		Standard	Limit
Cam Journal Diameter		55.94–55.97 (2.202–2.204)	55.6 (2.189)
Cam Nose Height (C-D)	In	7.34	6.82
	Exh	7.73	7.21



Connecting Rod Bushing Installation

Use the connecting rod bushing installer to install the connecting rod bushing.

Connecting Rod Bushing Installer: 9-8523-1369-0

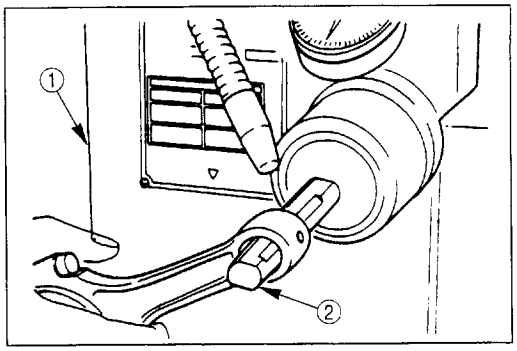
Note:

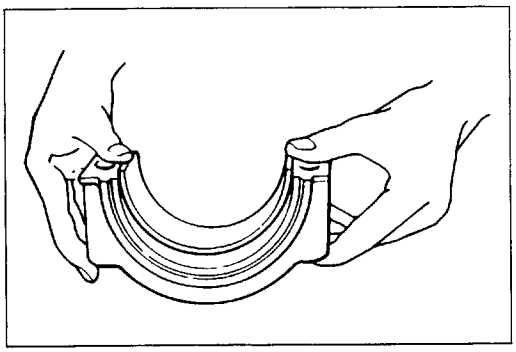
The connecting rod bushing oil port must be aligned with the connecting rod oil port.

3. Use a piston pin hole grinder ① fitted with a reamer ② or an adjustable pilot reamer to ream the piston pin hole.

mm (in)

	Standard
Connecting Rod Bushing Inside Diameter	35.017–35.025 (1.3786–1.3789)





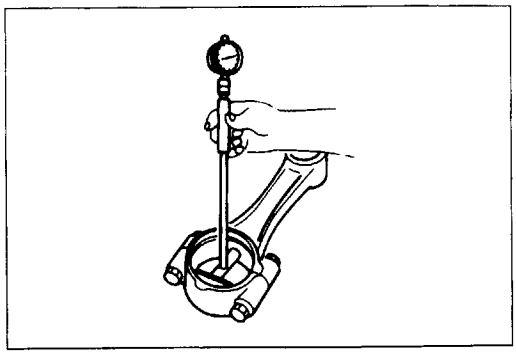
Connecting Rod Bearing Inspection

1. Fit the connecting rod bearing lower half into the connecting rod bearing cap.
2. Check the connecting rod bearing lower half tension.

   If the tension is insufficient, the bearing must be replaced.
3. Tighten the connecting rod and the bearing cap to the specified torque.

N·m (kgf·m/lb.ft)

	1st step	2nd step
Connecting Rod and Bearing Cap Bolt Tightening Torque	39 (4/29)	60°–90°



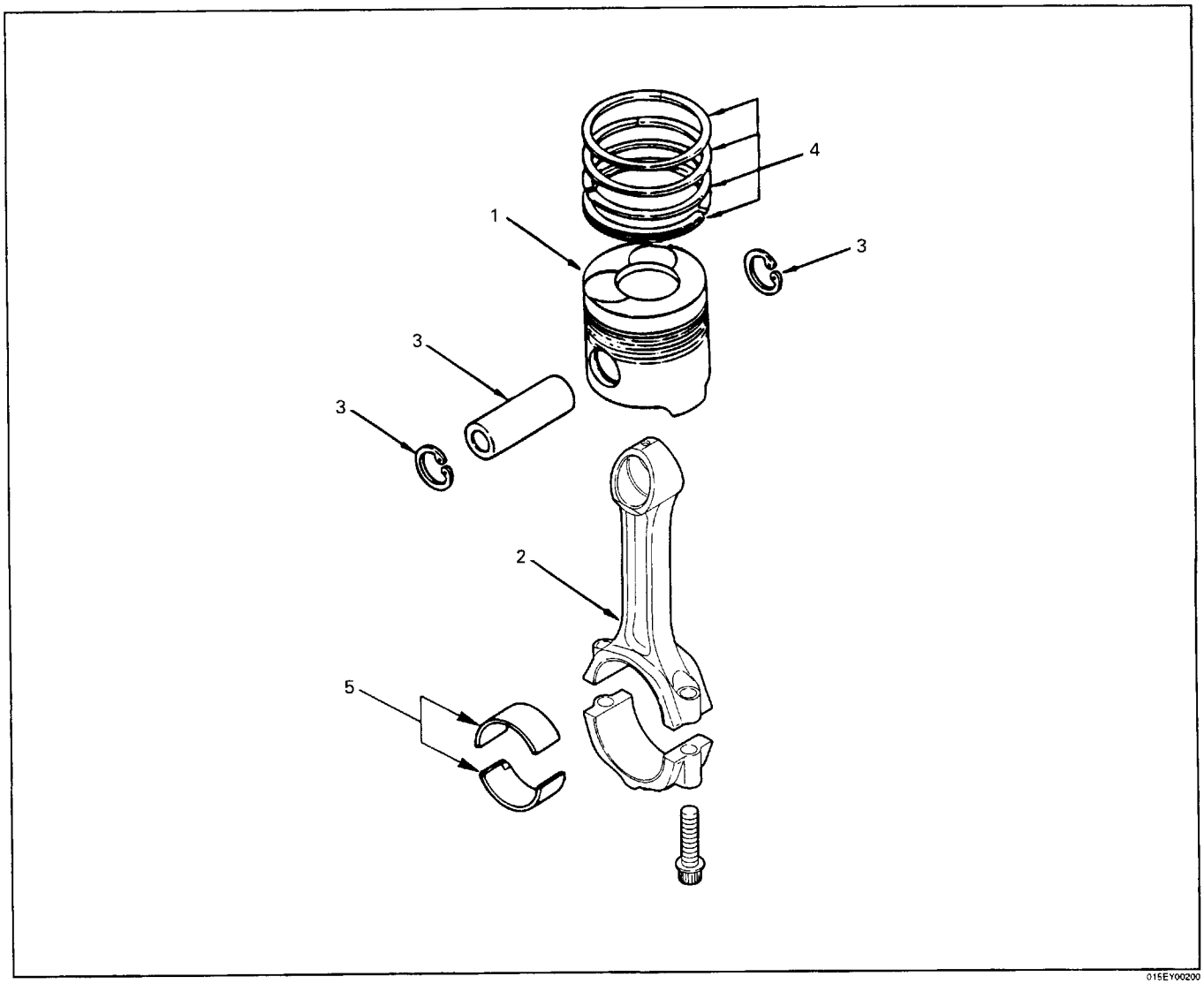
4. Use an inside dial indicator to measure the connecting rod inside diameter.

mm (in)

Connecting Rod Bearing Nominal Diameter	64 (2.520)

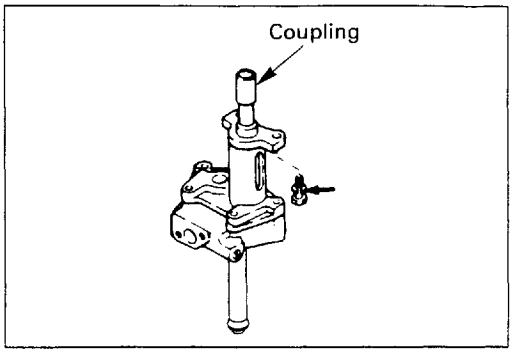
PISTON AND CONNECTING ROD REASSEMBLY STEPS

MIRROR COMPONENT



Reassembly Steps

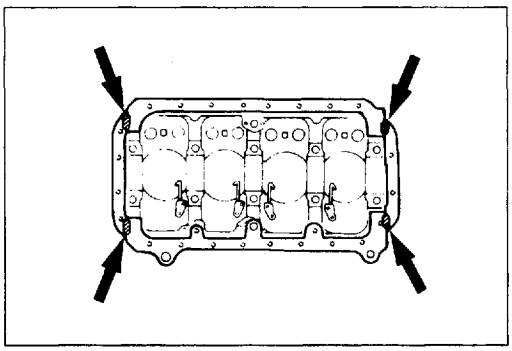
▲ 1. Piston
▲ 2. Connecting-rod
▲ 3. Piston pin, Snap ring
▲ 4. Piston ring
▲ 5. Connecting rod bearing



2) Install the oil pump with the coupling.
3) Tighten the oil pump bolts to the specified torque.

N·m (kgf·m/lb.ft)

Oil Pump Bolt Torque	42–62 (4.3–6.3/31–46)



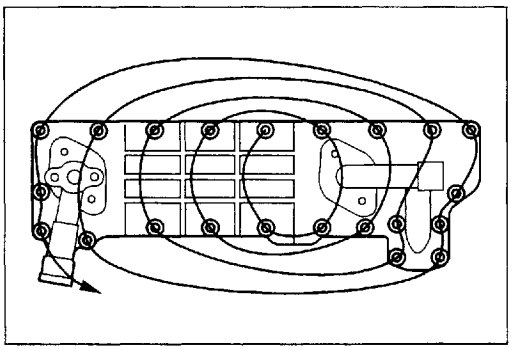
13. Oil Pan

1) Apply liquid gasket to the area indicated by the arrows in the illustration.
2) Install the oil pan gasket
3) Install the oil pan.

Tighten the oil pan bolts to the specified torque.

N·m (kgf·m/lb.ft)

Oil Pan Bolt Torque	21–30 (2.1–3.1/15–22)



14. Oil Cooler

1) Apply liquid gasket to the oil cooler gasket.
2) Install the oil cooler gasket to the oil cooler body case.
3) Install the oil cooler.

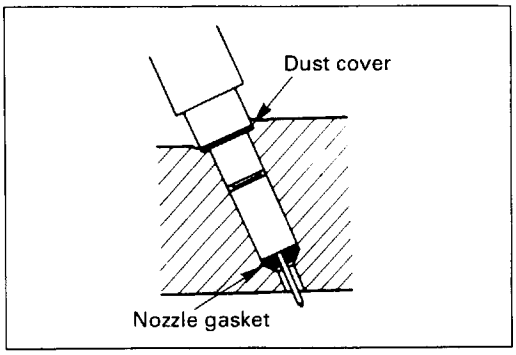
Tighten the oil cooler bolts to the specified torque.

Start from the middle and work out to either side.

Refer to the illustration

N·m (kgf·m/lb.ft)

Oil Cooler Torque	16–25 (1.6–2.6/12–19)



Important Operation

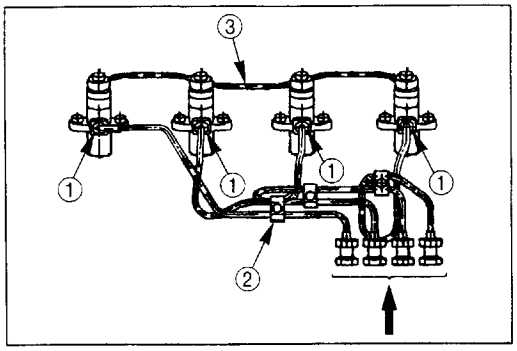
2. Injection Nozzle

Install the injection nozzles with the injection nozzle gaskets.

Be careful not to damage the nozzle tips.

N·m (kgf·m/lb.ft)

Injection Nozzle Bolt Torque	17 – 21 (1.7 – 2.1/12 – 15)



3. Injection Pipe and Fuel Leak Off Pipe

1) Install the fuel injection pipes ① and tighten the bolts to the specified torque.

N·m (kgf·m/lb.ft)

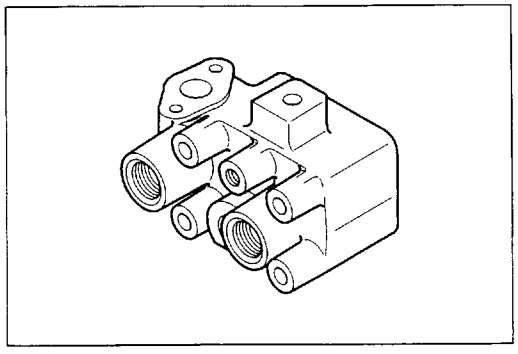
Injection Pipe Torque	28 – 32 (2.9 – 3.3/21 – 24)

2) Carefully position and set the clips ②.

It is very important that each clip be positioned correctly.

An improperly positioned clip will result in objectionable fuel pulsing noise and injection pipe breakage.

3) Install the fuel leak off pipes ③.



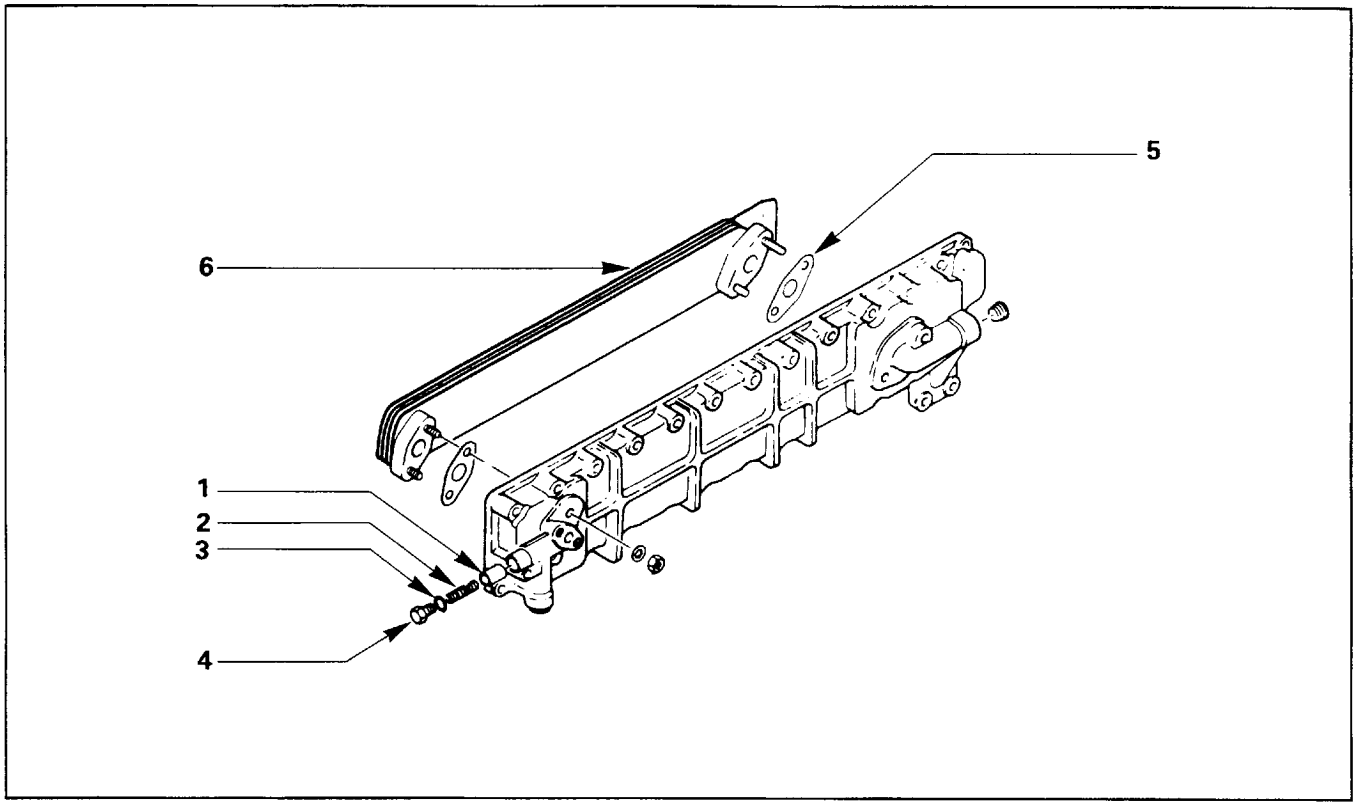
4. Oil port cover

Install the oil port cover with tightening the bolts securely.

N·m (kgf·m/lb.ft)

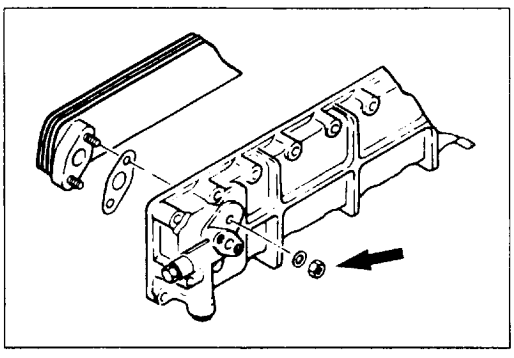
Oil Port Cover Bolt Torque	30 – 50 (3.1 – 5.1/22 – 37)

REASSEMBLY



Reassembly Steps

1. By-pass valve
2. By-pass valve spring
3. O-ring; plug
4. By-pass valve plug
5. Element gasket
▲ 6. Oil cooler element



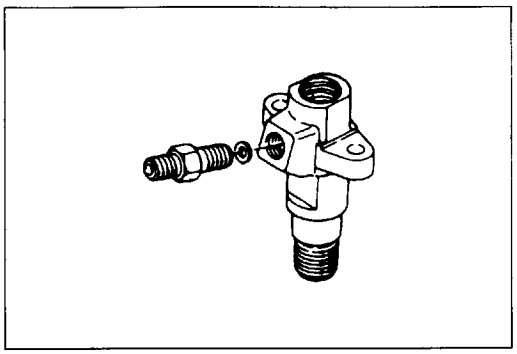
Important Operation

6. Oil Cooler Element

Install the oil cooler element to the oil cooler, and tighten the cooler element fixing nuts to the specified torque.

N·m (kgf·m/lb.ft)

Oil Cooler Element Fixing Nut Torque	20–26 (2.0–2.7/14–20)

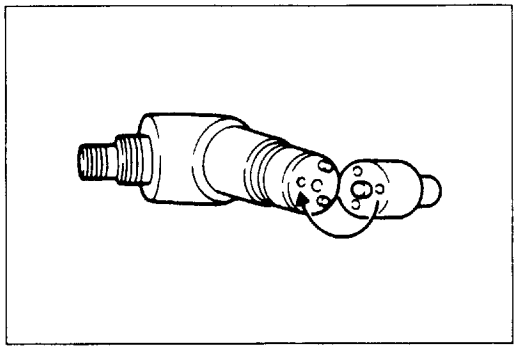


Important Operation

3. Injection Pipe Connector

N·m (kgf·m/lb.ft)

Nozzle Connector Torque	49 – 59 (5.0 – 6.0/36 – 43)

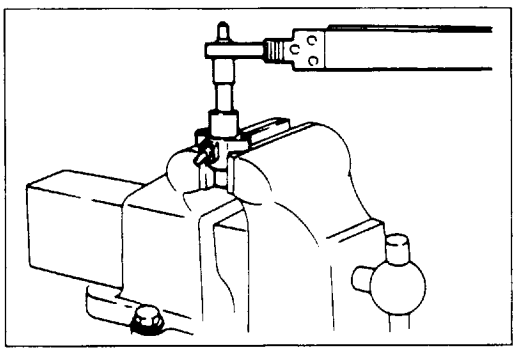


4. Injection Nozzle

There must be no oil on the contact surfaces of the injection nozzle and the injection nozzle holder.

Clean these contact surfaces with diesel fuel before installation.

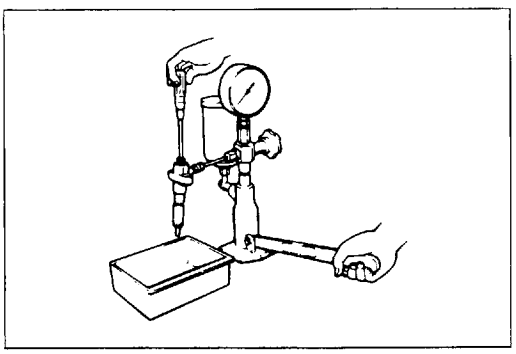
The nozzle dowel pin must be aligned with the dowel hole in the nozzle holder body.



5. Retaining Nut

N·m (kgf·m/lb.ft)

Nozzle Retaining Nut Torque	59 – 78 (6 .0 – 8.0/43 – 58)



Injection Starting Pressure Adjustment

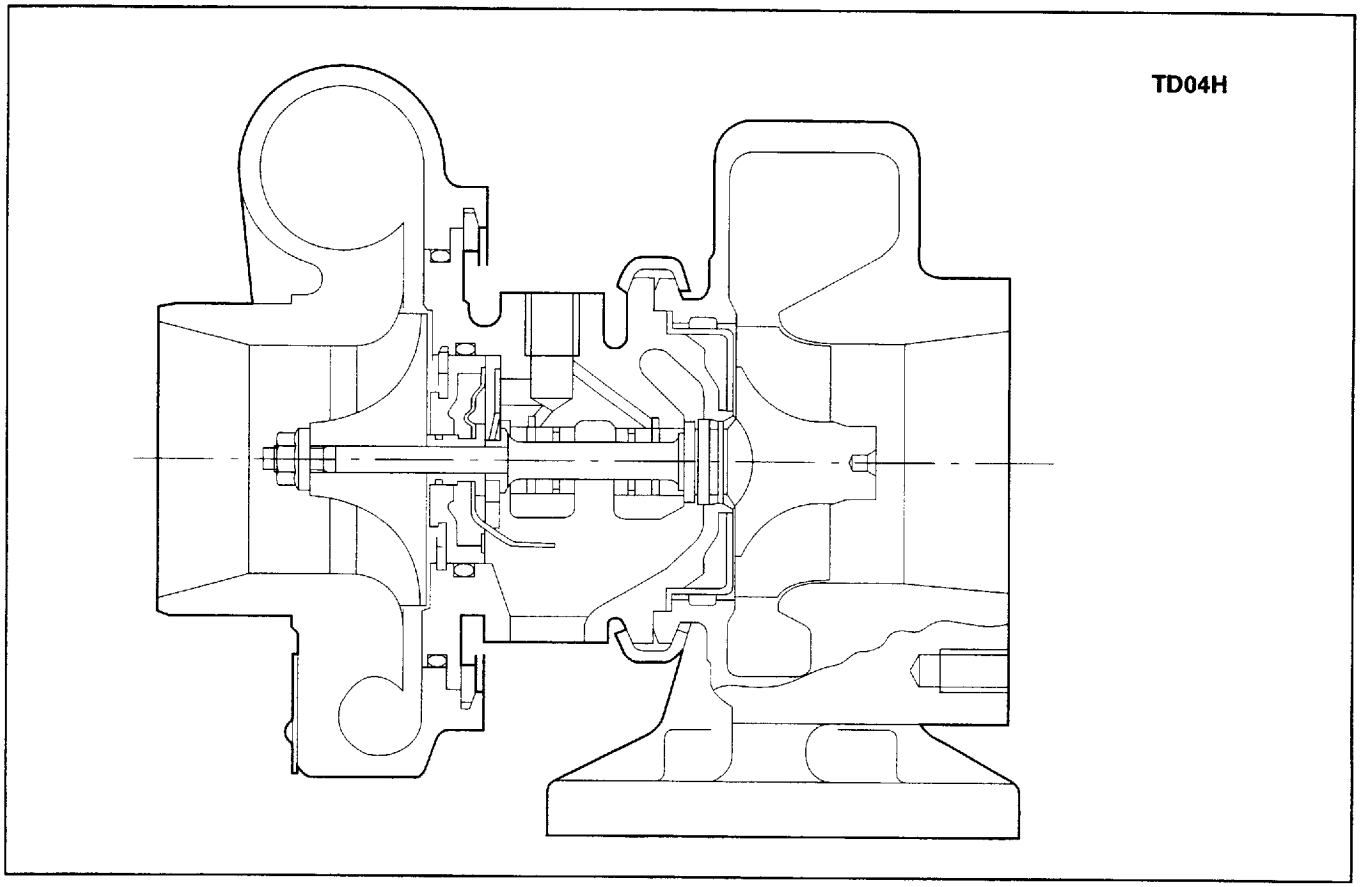
The injection nozzle injection starting pressure can be adjusted after the adjusting screw is installed.

Refer to "FUEL SYSTEM" on Page 2-4 of the "MAINTENANCE" Section of this Workshop Manual.

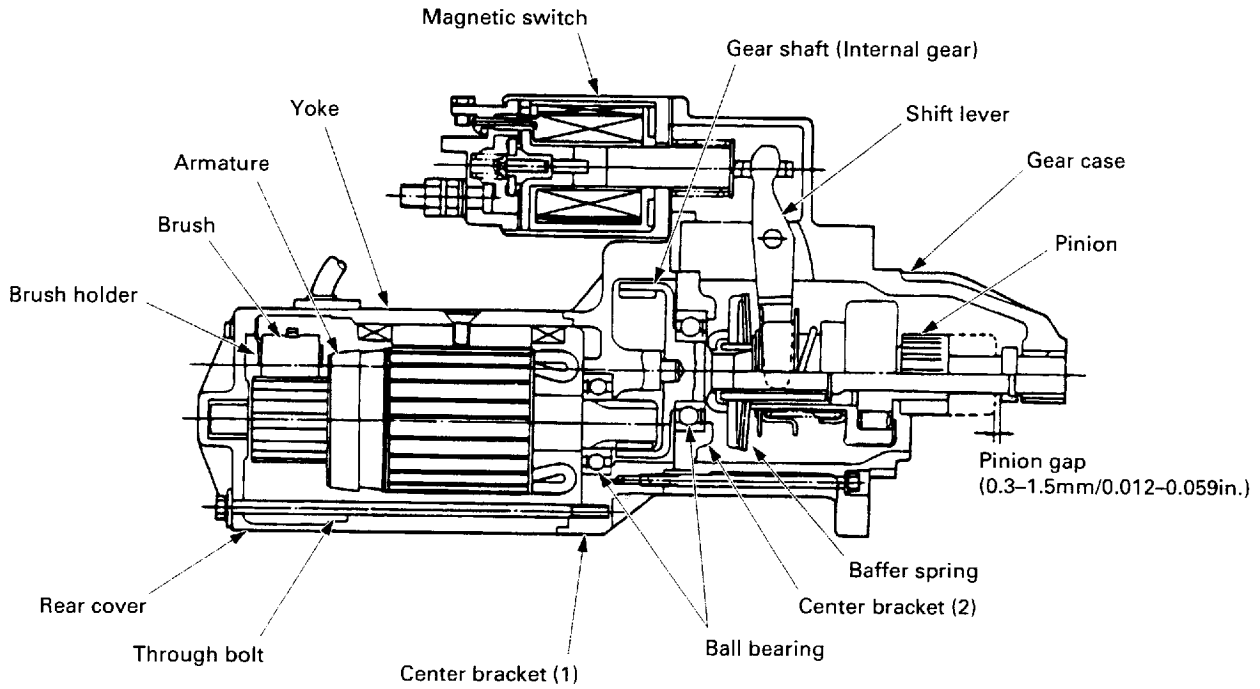
MPa (kgf/cm^2/psi)

Injection Starting Pressure	18.1 (185/2630)

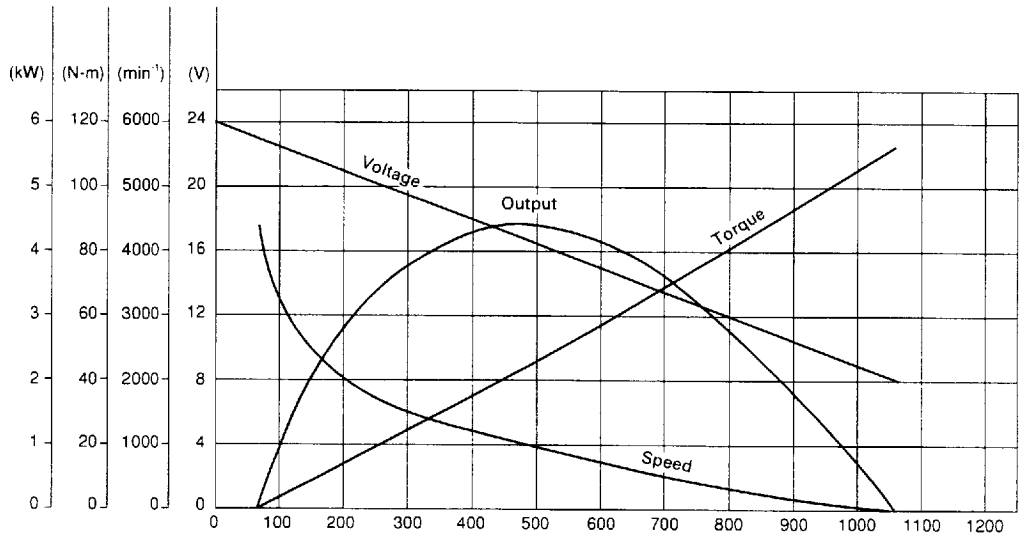
GENERAL DESCRIPTION



STARTER SECTIONAL VIEW



PERFORMANCE



PERFORMANCE TEST

For the performance test of the starter, a no-load test is conducted according to the procedures mentioned below.

Before the performance test, fix the starter on the test bench.

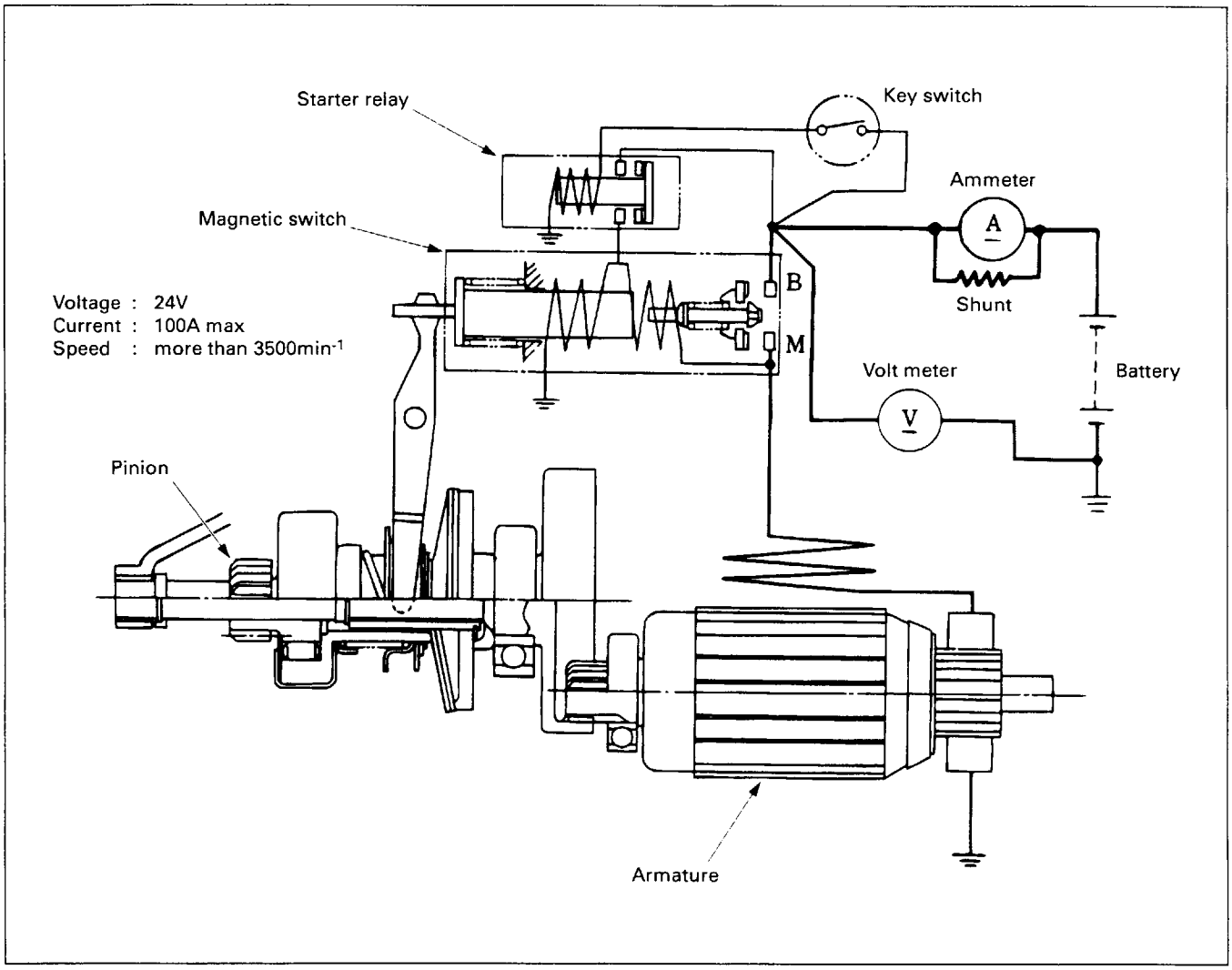
Note: Since the rated time is 30 sec., conduct the test promptly.

No-Load Test

See the following figure for connection.

Close the key switch, and the starter will be energized and will start rotating.

Then, measure the current and the number of revolutions.



REASSEMBLY

To reassemble the alternator, follow the reverse of disassembling procedure, and observe the following precautions:

(1) Lubrication is not required. Both bearing are prelubricated.

Note:

For the rotor bearing with resin bands, grease should not be applied. Remove oils completely to prevent creep of the bearing if found on the bearing box.

(2) High temperature solder (Melting point of 466° F) should be used.

Solder quickly, use a 180–270 watts soldering iron no more than about 5 seconds because the rectifier may be damaged if it is overheated.

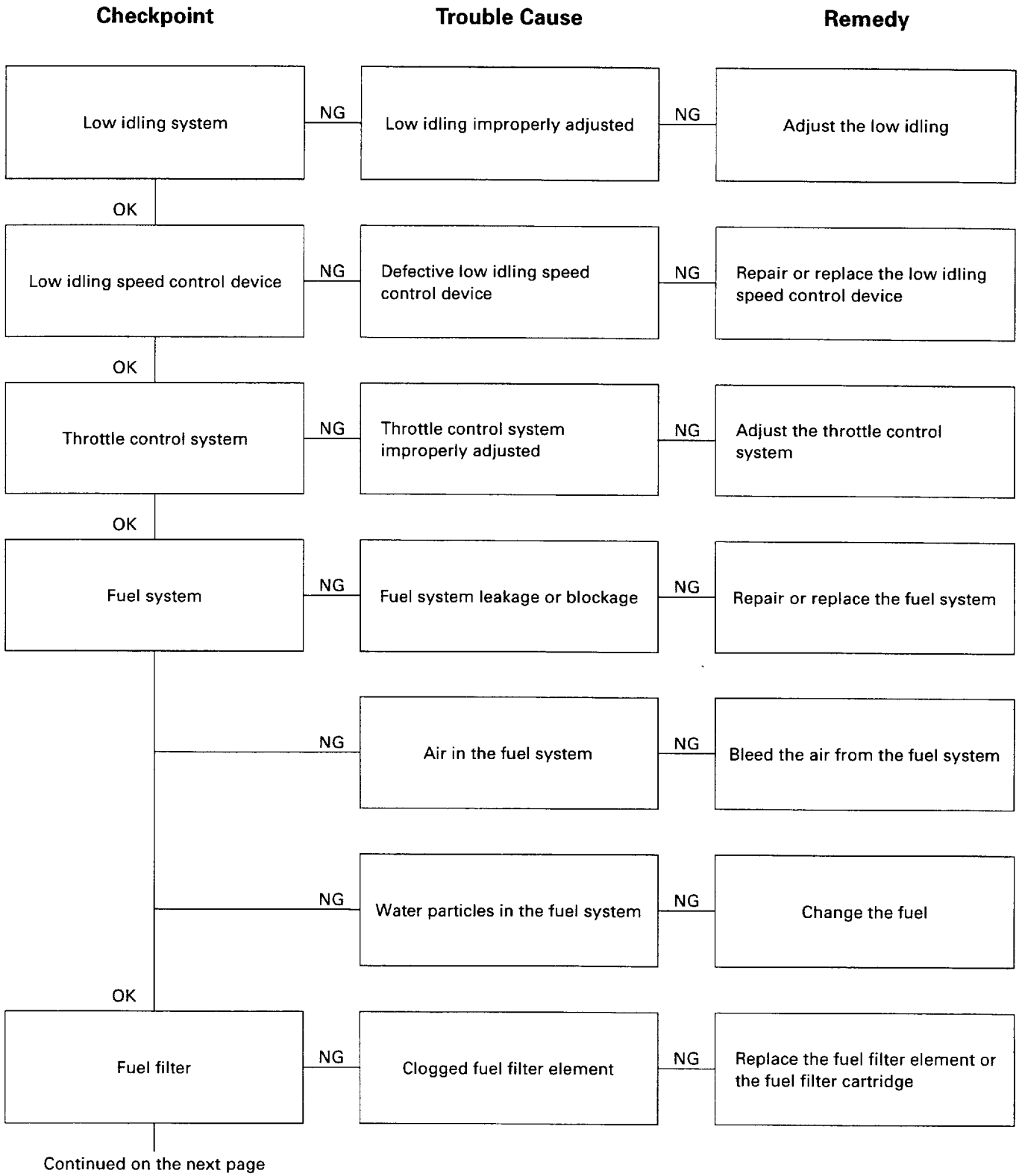
(3) Tightening torque.

- Pulley securing nut. : 147 N·m
- Through bolts. : 4.9 N·m
- Bearing retainer screws. : 3.4 N·m
- Coil assembly retaining screws. : 3.4 N·m
- Rectifier retaining screw. : 3.4 N·m
- Regulator retaining screws. : 3.4 N·m
- Nut for stud bolt. : 8.8 N·m

(4) To assemble the rear bracket / starter assembly and front bracket / rotor assembly.

a. Since the rotor bearing and rear bracket fitting is tight, before installing the rotor into the rear bracket assembly, heat the area around the bearing box of the rear bracket to 122 to 144° F.
b. After the alternator has been completely assembled, rotate the pulley slowly by hand to be sure that the rotor turns smooyhly.

UNSTABLE LOW IDLING



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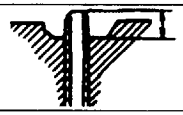
WHITE EXHAUST SMOKE

Checkpoint		Trouble Cause		Remedy
Fuel	NG	Water particles in the fuel	NG	Replace the fuel
OK				
Fuel injection timing	NG	Delayed fuel injection timing	NG	Adjust the fuel injection timing
OK				
Compression pressure	NG	Blown out cylinder head gasket Worn cylinder liner Piston ring sticking or broken Improper seating between the valve and the valve seat	NG	Replace the related parts
OK				
Turbocharger	NG	Defective turbocharger	NG	Replace the turbocharger
OK				
Inlet and exhaust valves Valve seals	NG	Defective valve seals Worn valves stems and valve guides	NG	Replace the valve seals, the valves, and the valve guides
OK				
Piston rings	NG	Piston rings worn, broken or improperly installed	NG	Replace the piston rings or properly install
OK				
Cylinder liners	NG	Cylinder lines scored or worn	NG	Replace the cylinder liners

MEMO

Major Category	Name of Part	Inspection Item	Nominal Dimension	Assembly Standard Value	Limit	Repair Procedure	Comments
Valve System	Valves	Inlet valve stem wear	Dia. 9 (0.3543)		Dia. 8.88 (0.3496)	Replace valve and valve guide together	Measure valve stem at three positions
		Exhaust valve stem wear					
		Clearance between inlet valve stem and valve guide		0.039 – 0.071 (0.0015 – 0.0028)	0.20 (0.008)	Replace valve and valve guide together	
		Clearance between exhaust valve stem and guide		0.064 – 0.096 (0.0025 – 0.0038)	0.25 (0.0098)		
		Interference between valve guide and cylinder head		0.024 (0.0009)			Apply oil to valve guide and press in
		Valve thickness 	1.5 (0.059)		1.00 (0.039)	Replace valve and valve guide together	
		Height of valve guide above cylinder head 	14.1 (0.555)				Reference value
		Valve stem oil seal lip	Dia. 8.5 (0.335)		Dia. 8.8 (0.346)	Replace oil seal	Don't damage lip.
	Valve spring	Tension N (kgf/lb) (When compressed to installed length) 44.5mm(1.752in)		142 (14.5/30.9)	127 (13.0/28.7)	Replace valve spring	
		Free height mm (in)		60.6 (2.39)	58.0 (2.28)		
		Inclination  mm (in)		less than 1.9 (0.075)	2.7 (0.106)		