93211-00143
January 2009

Foreword

To ensure good machine performance, reduce failures or problems, and prolong the service life of each component, it is necessary to operate the machine as is directed in the Operator and Maintenance Manual.

To effectively diagnose and repair the machine, it is important to follow the guidelines laid out in this Shop Manual.

General Information
Function and structure

For the engine, refer to the engine Shop Manual provided by the engine manufacturer.

The purpose of this manual is to provide information on the product and the correct maintenance and repair methods. Please read this manual to ensure correct troubleshooting and good repair service.

This manual will be periodically reviewed and revised for more satisfactory content. If you have any opinion or requests, please inform us.

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Cautions on Safety

⚠ WARNING

Unexpected movement of the machine may cause an accident resulting in injury or death.
Therefore, to provide repair service with the engine running, be sure to observe the following items:

- Park the machine on level ground.
- Apply the parking brake.
- Block the tires with chocks to prevent the tires from moving.
- Determine the signals between the service man.
- Prohibit any person from walking into dangerous areas.
    - Near articulation areas of the machine
    - Under the machine
    - Around the engine
    - In front of or behind the machine

⚠ WARNING

Operation under the boom or the bucket may lead to severe accidents.
Make sure to apply the safety lock of the boom and the bucket control lever provided in the cab, remove the starter key, and attach a "DO NOT OPERATE!" tag to the cab.

⚠ CAUTION

Be careful not to be burnt by bursting high pressure oil.
Release the pressure remaining inside the circuit and open the cap of the hydraulic oil tank before removing the plug from the pressure measurement port so that the internal pressure of the hydraulic oil tank is released and burst of the high pressure oil can be prevented.

⚠ WARNING

Entering the articulation area of the machine body while the engine is running may cause severe accidents.
Make sure to stop the engine, pull out the starter key, and attach a "DO NOT OPERATE!" tag to the cab before entering the articulation area.

⚠ CAUTION

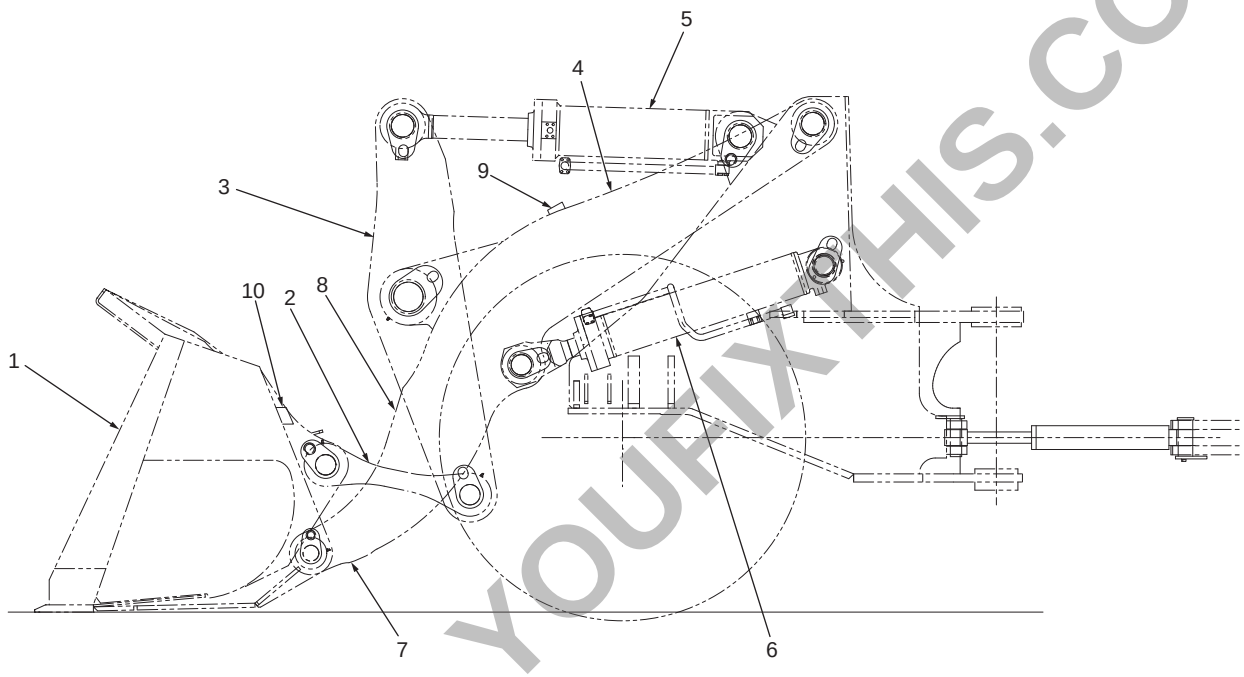
Touching the fan or the V belt of the engine or the hot area while the engine is running may cause severe accidents.
Make sure to stop the engine before opening the engine room side cover.

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Front Chassis

Loading linkage



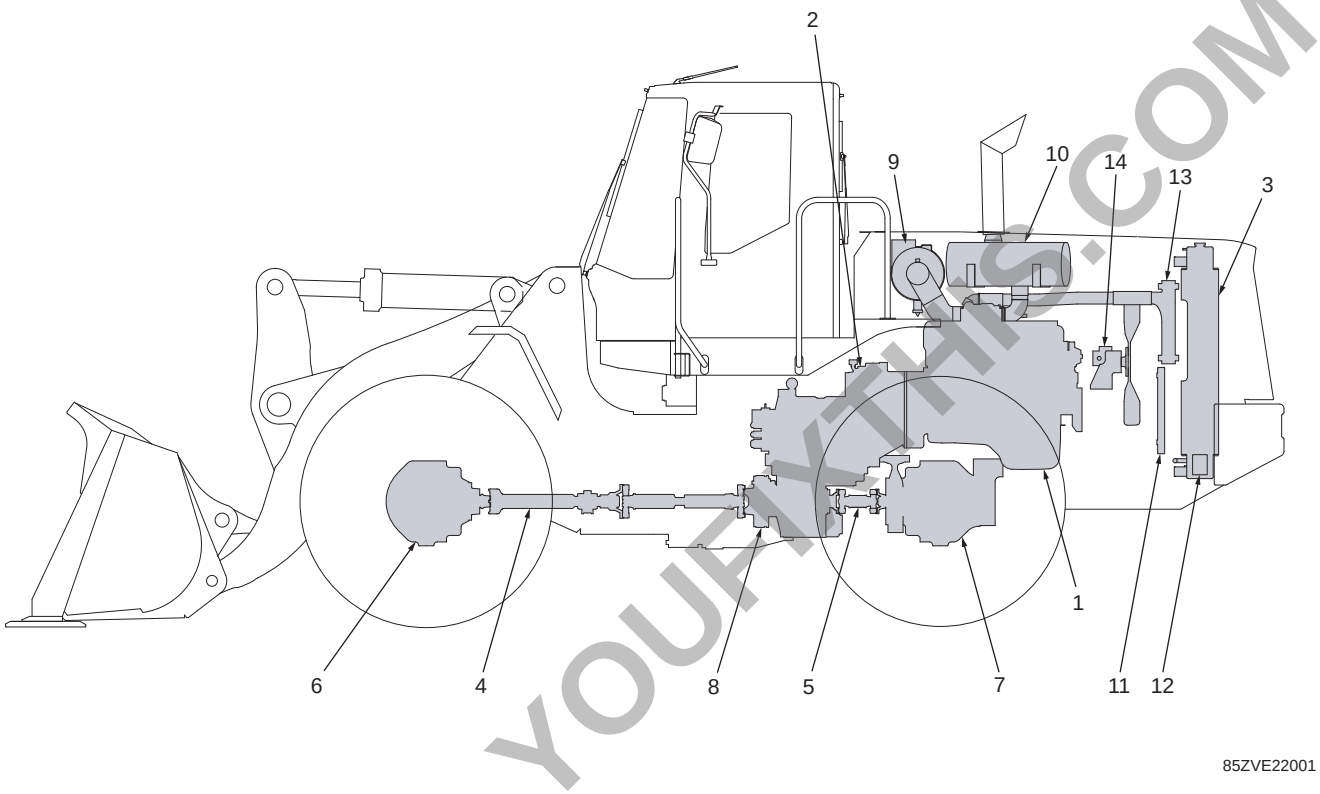
85ZVE12001

1. Bucket
2. Link
3. Lever
4. Boom
5. Bucket cylinder
6. Boom cylinder
7. Dump stopper surface
8. Roll-back stopper surface
9. Lever stopper surface
10. Bucket stop plate
    (Design differs by manufacturer of the attachment)

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Power Line



85ZVE22001

1. Engine
2. Torque converter and transmission
3. Radiator
4. 2nd propeller shaft
5. 3rd propeller shaft
6. Front axle differential gear
7. Rear axle differential gear
8. Parking brake
9. Air cleaner
10. Muffler
11. Hydraulic oil cooler
12. Torque converter oil cooler (bottom tank of radiator)
13. Air charge cooler
14. Fan motor

The power output from the engine is transmitted to the transmission through the torque converter (combined with the transmission). The speed and direction are changed according to the engagement of the transmission clutches. The power is then transmitted through the second and third propeller shafts to the differential gears of front and rear axles.

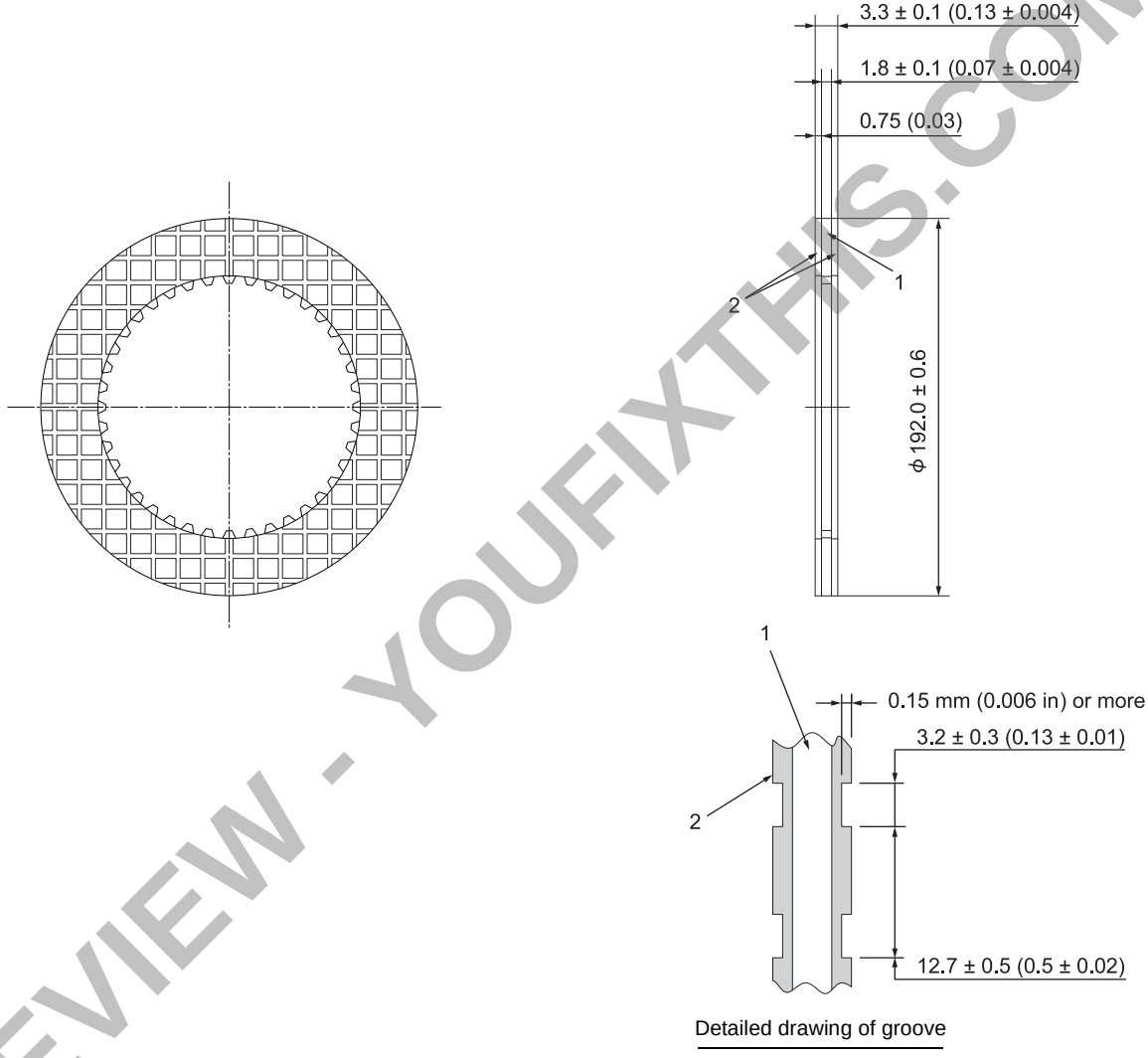
Finally the power is transmitted through the axles to the planetary gears, and tires to move the machine.

On the back side of the engine, there is a radiator. The radiator incorporates engine coolant, torque converter oil cooler, air charge cooler and an external air type hydraulic oil cooler. On the second propeller shaft side of the transmission, a parking brake is installed.

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Friction plate: mm (in)



Detailed drawing of groove

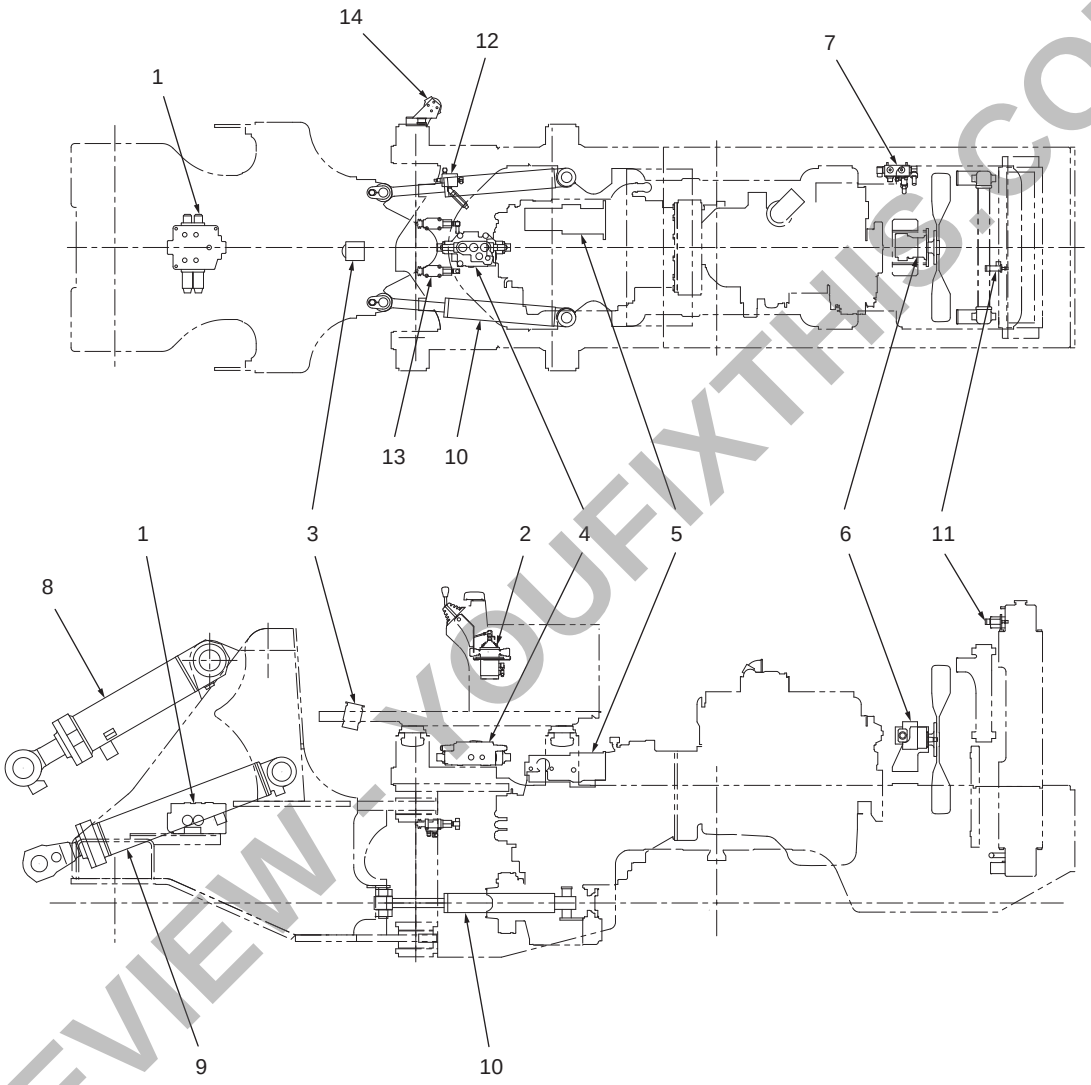
85ZV32001

1. Plate
2. Facing

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Layout of Hydraulic Units



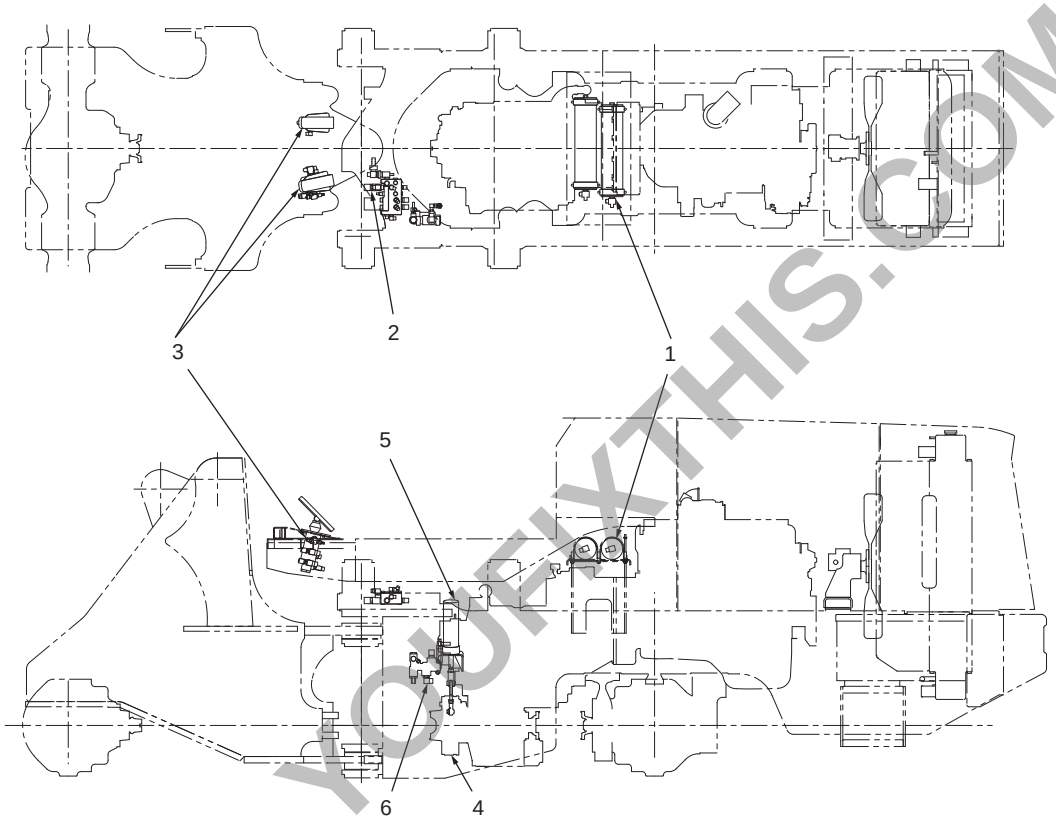
85ZVE42002

1. Multiple control valve
2. Pilot valve
3. Orbitrol®
4. Steering valve
5. Hydraulic pump (3 section)
6. Fan motor
7. Relief valve (for fan)
8. Bucket cylinder
9. Boom cylinder
10. Steering cylinder
11. Thermo sensing valve
12. Reducing valve (Steering pilot)
13. Stop valve
14. T/C line filter

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Brake Units Layout



85ZVE52002

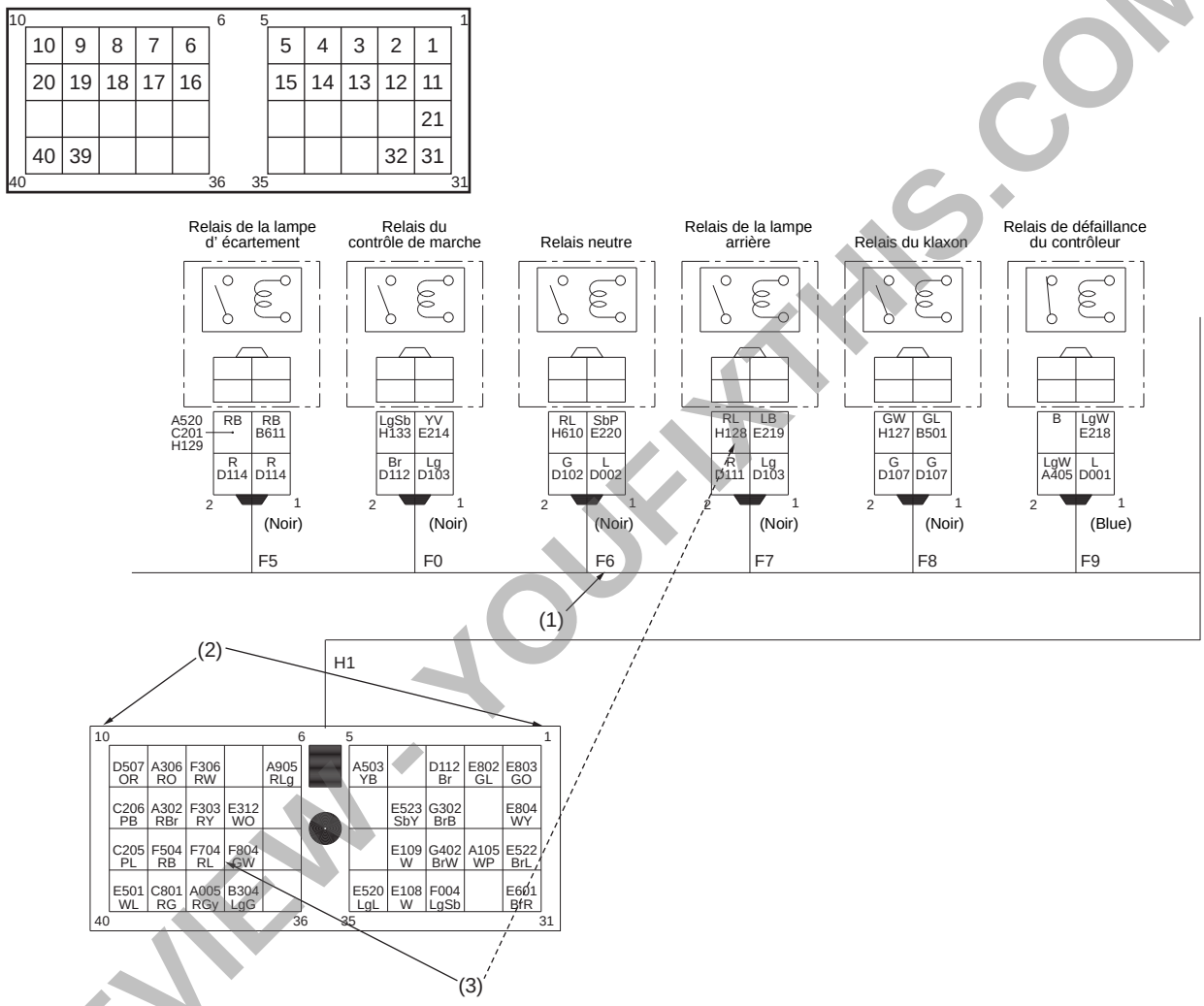
1. Accumulator
2. Solenoid valve (for parking)
3. Brake valve
4. Parking brake
5. Spring chamber (for parking brake)
6. Unloader valve

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Utilisation des schémas des câblages électriques (FRANÇAIS)

Exemple



95ZV62001

Les schémas des câblages électriques sont basés sur la méthode de l'adressage. Suivant cette méthode, un symbole correspond à chaque connecteur et à chaque borne du connecteur de manière à localiser facilement la borne de connection de l'autre extrémité du câble.

Exemple 1
Symbole au-dessous (ou au-dessus) du connecteur, comme F6:
Il indique l'adresse du connecteur.

Exemple 2
Symbole sur le connecteur multibornes, comme 1 et 10:
Il indique le numéro de la borne et le sens de la numérotation.

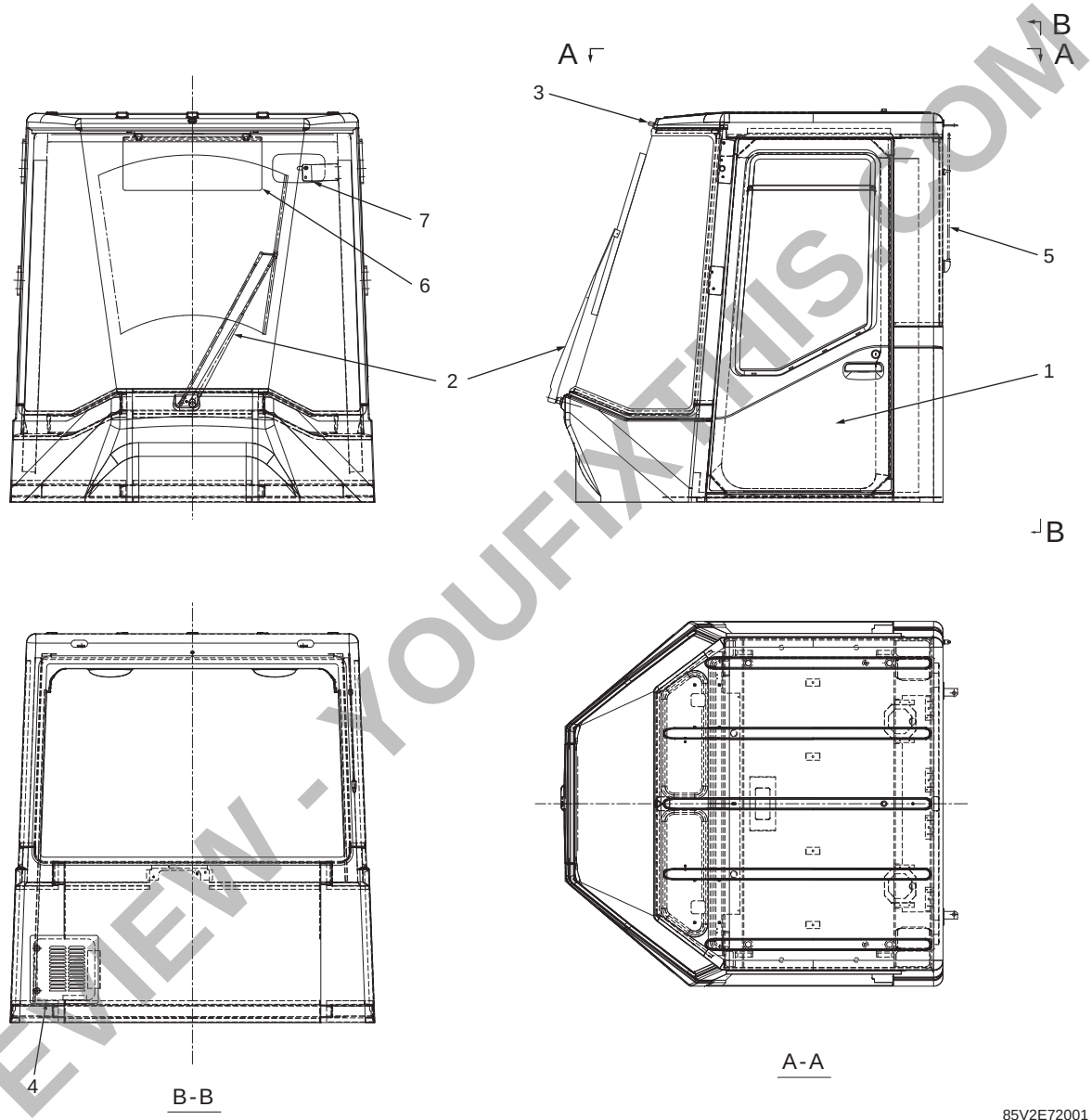
Exemple 3
Contrôle de la borne du connecteur à laquelle F704 RL (point (3)) est connectée:

1. F704
   Indique que la borne est connectée à la 4ème borne du connecteur F7.
   Contrôlez la description de la 4ème borne du connecteur F7 (F704), elle indique que la borne F704 est connectée à H128. Ceci signifie que la 4ème borne du connecteur F7 est connectée à la 28ème borne du connecteur H1.
2. RL
   Indique la couleur du fil. "RL" signifie que la couleur de l'isolation est rouge, et "L" que la raie bleu est sur l'isolation rouge.

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Cabin



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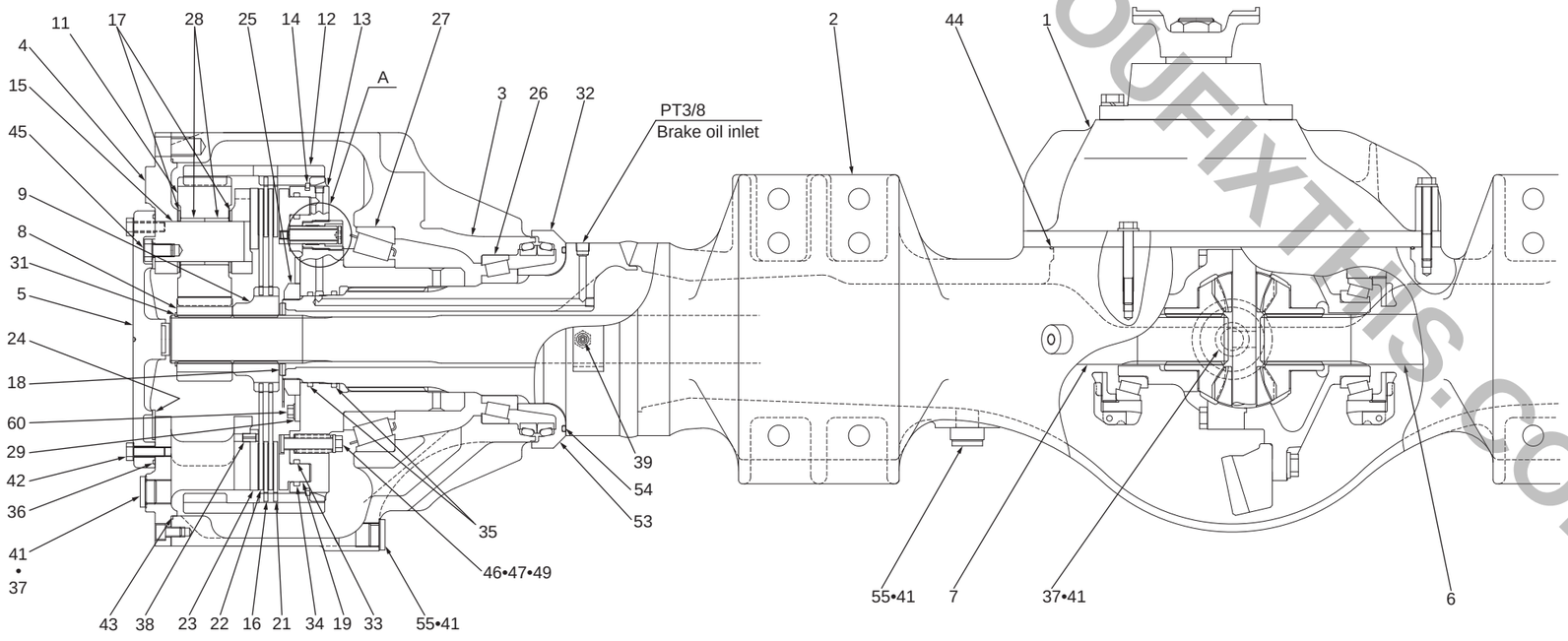
The cabin equipped with the ROPS (Roll Over Protective Structure) is provided as standard.

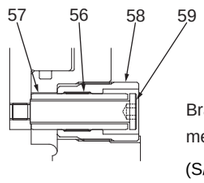
1. Door (left side)
2. Front wiper
3. Window washer jet nozzle
4. Outside air suction port (air conditioner)
5. Antenna
6. Sun visor
7. Rear view mirror

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Axle Assembly

The only difference between the front and rear axle is the differential housing (1) and axle housing (2).
Other parts are the same as the rear axle assembly.





Brake adj. mechanism
(S/N 85C4-9001~9016)

A-Detail

K85ZVE22007

1. Differential assembly
2. Axle housing assembly
3. Wheel hub
4. Spider (planetary carrier)
5. Cover
6. Axle shaft
7. Axle shaft
8. Sun gear
9. Disc gear
10. —
11. Planetary gear
12. Internal gear
13. Internal gear hub
14. Snap ring
15. Planetary pin
16. Separation disc
17. Wear ring
18. Wear ring
19. Piston
20. —
21. Separation disc
22. Friction disc
23. Brake backing plate
24. Plate
25. Axle nut
26. Taper roller bearing (inner)
27. Taper roller bearing (outer)
28. Needle cage
29. Axle lock plate
30. —
31. Snap ring
32. Floating seal
33. D-ring
34. D-ring
35. O-ring
36. O-ring
37. Magnet plug
38. Spring pin
39. Bleed screw
40. —
41. Seal washer
42. Bolt
43. O-ring
44. O-ring
45. Bolt
46. Socket bolt
47. Spring
48. —
49. U-nut
50. —
51. —
52. —
53. Ring
54. O-ring
55. Plug
56. Spring
57. Sleeve
58. Bushing
59. Socket bolt
60. Bolt

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85ZV
SHOP MANUAL
Troubleshooting

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93211-00220

Kawasaki

93211-00220

June 2004

SHOP MANUAL

WHEEL LOADER

85ZV

Troubleshooting
Measurement for Performance Check

Powered by CUMMINS QSL9 ENGINE

Serial No. 85C4-9001~

Measuring Clutch Oil Pressure and Time Lag

⚠ WARNING

Unexpected movement of the machine may cause an accident resulting in injury or death. Therefore, to provide repair service with the engine running, be sure to observe the following items:
- **Park the machine on level ground.**
- **Apply the parking brake.**
- **Block the tires with chocks to prevent the tires from moving.**
- **Determine the signals between the service men.**
- **Prohibit any person from walking into dangerous areas.**
  - **Near articulation area of the machine**
  - **Under the machine**
  - **Around the engine**
  - **In front of or behind the machine**

Measurement instruments:

- Pressure gauge: 4.9 MPa (50 kgf/cm²) (1,000 psi)
  with 2 ~ 3 m (6 ~ 10 ft.) hose
  Pressure measurement port: PF1/4
- Tachometer
- Stop watch

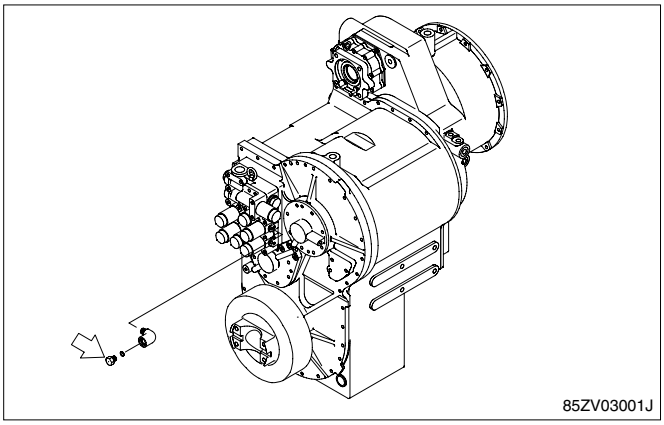
Warm-up the engine before measuring the clutch oil pressure and time lag

Clutch oil pressure measurement procedure

1) Lower the boom to the lowest limit, and lower the bucket onto the ground.
2) Set the parking brake to the "ON" position.
3) Set the transmission shift lever to the neutral position.
4) Stop the engine. Attach the pressure gauge to the pressure measurement port. Place the gauge inside the operator's area, start the engine.
5) As the clutch oil pressure rises just after the engine is started, adjust the engine to the specified speed before the pressure measurement.
6) Measure and record the pressure in each speed range.
7) Change the transmission speed range while keeping the shift lever at the neutral position. Check that the pressure instantaneously lowers just after speed change, and then rises to the original pressure again.

- Standard measurement value

Clutch pressure MPa (kgf/cm²) (psi)	Engine speed	Low idle	1.3 ± 0.2 (13 ± 2) (185 ± 28)
		High idle	1.5 ± 0.2 (15 ± 2) (213 ± 28)
Clutch time lag (sec)	Neutral1st forward speed (engine speed: 1,500 min⁻¹ (rpm))		0.3 ± 0.1



Clutch oil pressure test port location

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85ZV

SHOP MANUAL

Disassembly & Reassembly
Service Standard

93211-00160

Kawasaki

93211-00160

January 2004

SHOP MANUAL

WHEEL LOADER

85ZV

Disassembly & Reassembly
Service Standard

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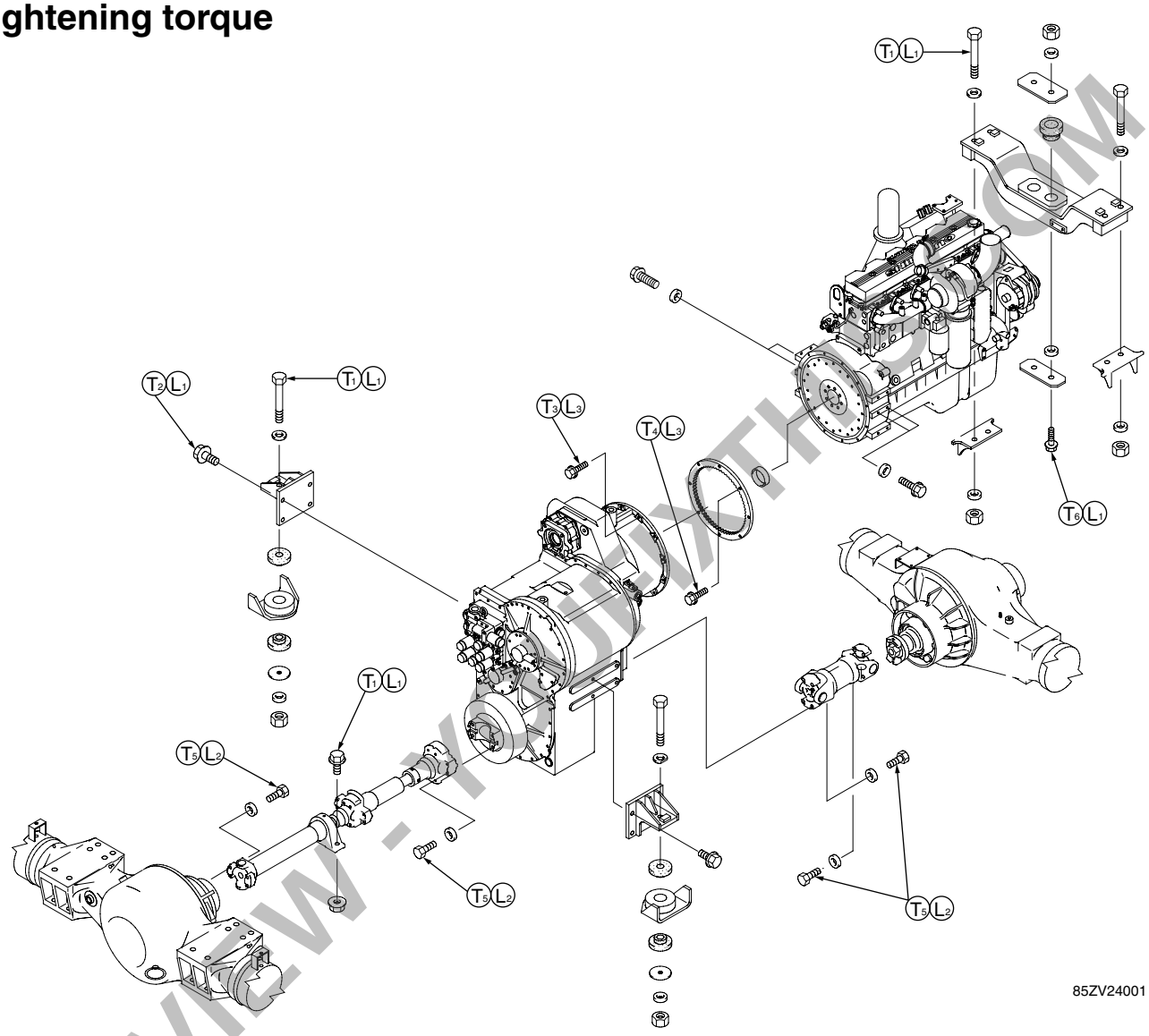
Powered by CUMMINS QSL9 ENGINE

Serial No. 85C4-9001~

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Power Line

Tightening torque



: Bolt tightening torque

T_1: 417 N-m (42.5 kgf-m) (307 lb-ft)

T_2: 230 N-m (23.5 kgf-m) (170 lb-ft)

T_3: 53 N-m (5.4 kgf-m) (39 lb-ft)

T_4: 67 N-m (6.8 kgf-m) (49 lb-ft)

T_5: 142 N-m (14.5 kgf-m) (105 lb-ft)

T_6: 441 N-m (45.0 kgf-m) (325 lb-ft)

Always replace drive shaft bolts with new bolts – Never reuse.

L_1: Screw lock agent (Loctite® 262) application

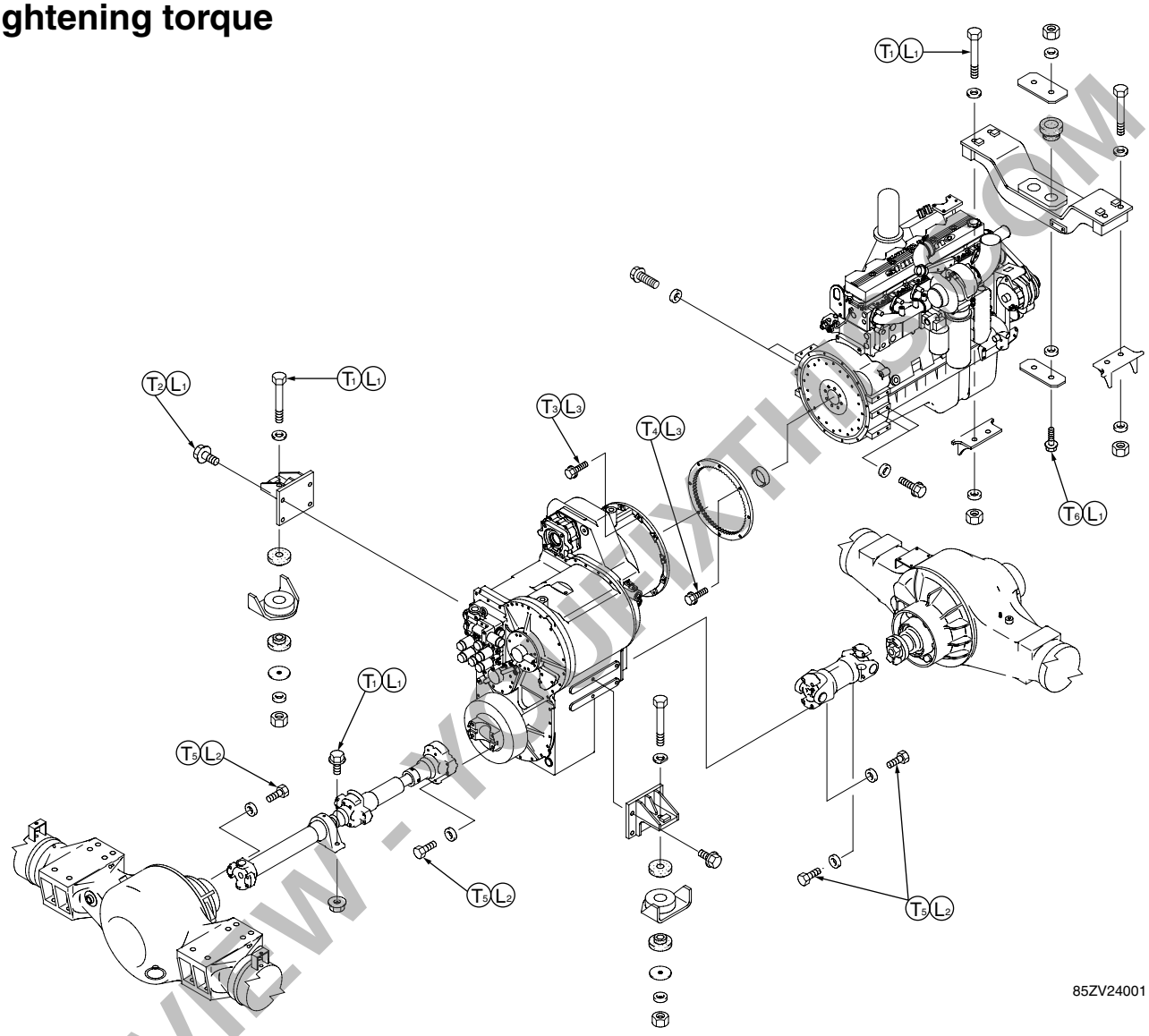
L_2: Screw lock agent (Three Bond 1327) application

L_3: With lubrication oil (Engine oil or gear oil)

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Torque Converter and Transmission Assembly

Tightening torque



: Bolt tightening torque

T_1: 417 N-m (42.5 kgf-m) (307 lb-ft)

T_2: 230 N-m (23.5 kgf-m) (170 lb-ft)

T_3: 53 N-m (5.4 kgf-m) (39 lb-ft)

T_4: 67 N-m (6.8 kgf-m) (49 lb-ft)

T_5: 142 N-m (14.5 kgf-m) (105 lb-ft)

T_6: 441 N-m (45.0 kgf-m) (325 lb-ft)

Always replace drive shaft bolts with new bolts – Never reuse.

L_1: Screw lock agent (Loctite® 262) application

L_2: Screw lock agent (Three Bond 1327) application

L_3: With lubrication oil (Engine oil or gear oil)

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Hydraulic Pump Assembly

Removing and reinstalling hydraulic pump assembly

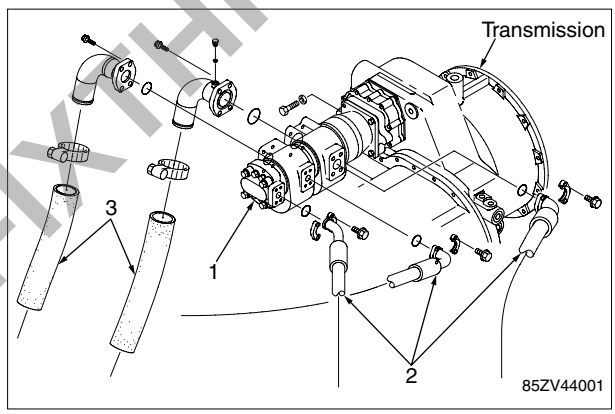
1.Removing hydraulic pump assembly

⚠ DANGER

Entering the articulation area while engine is running may cause serious injury or death.
So, when entering the area, stop the engine and place "DO NOT START " or "DO NOT OPERATE" tag on steering wheel.

⚠ CAUTION

Removing hoses and plugs without bleeding residual pressure could cause injuries or burns from hot oil under pressure.
Before removing hoses and plugs, relieve residual pressure. Relieve internal pressure from hydraulic tank to prevent oil from spraying.



Before starting work:
a) Remove the cab and the floor board by referring to Section 14.
b) Clean the area around the hydraulic pump.

1) Disconnect outlet hose (2) and suction hose (3) from hydraulic pump (1).

Note: Cover the hoses with plastic, plugs or caps to protect from dust and dirt.

2) Remove the hydraulic pump retainer bolts.
Torque for assembly:
: Bolt: 142 N-m (14.5 kgf-m) (105 lb-ft)

3) Remove hydraulic pump (1).
: Hydraulic pump: 55 kg (120 lbs)

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Unloader Valve

Removing and reinstalling unloader valve

1.Removing unloader valve

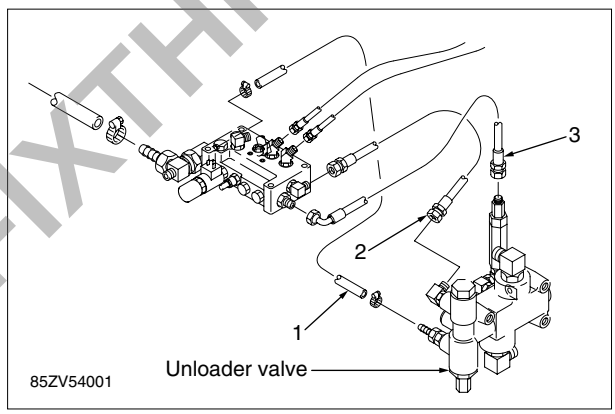
⚠ WARNING

Unexpected movement of machine could cause an accident resulting in injury or death. To prevent such an accident, observe the following items:

- **Park machine on level ground.**
- **Block front wheels with chocks to prevent wheels from moving.**
- **Before starting work, be sure to remove the engine key, and hang a "DO NOT START!" tag on the steering wheel or the operator's seat, or disconnect the negative side of the battery.**

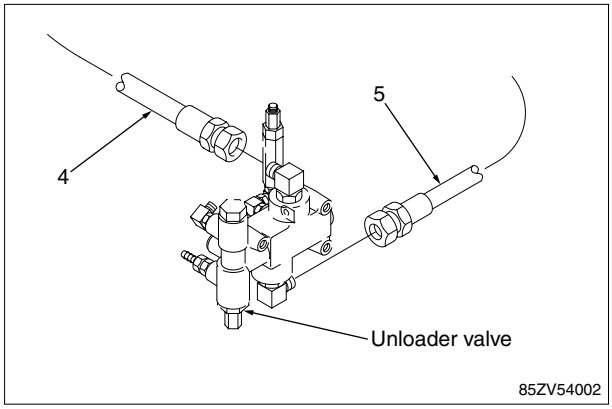
Before starting work:

- Stop the engine. Depress the brake pedal many times until there is no brake pressure.
- Press the hydraulic oil tank cap, and relieve the internal pressure from the hydraulic oil tank.
- Prepare a container to catch drained oil.



1) Remove hoses (1) (2) (3) from the unloader valve.

2) Remove hoses (4) (5) from the unloader valve.



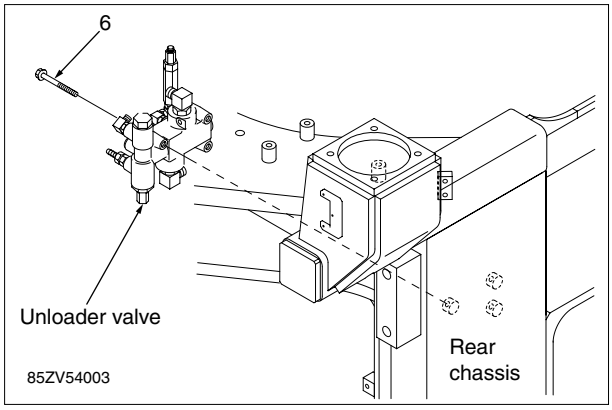
3) Remove bolts (6) and then remove the unloader valve.
   Torque for assembly:
   : Bolt (6): 53 N-m (5.4 kgf-m) (39 lb-ft)
   : Unloader valve: 4 kg (8.8 lbs)

2.Reinstalling unloader valve

To reinstall the unloader valve, follow the above removal procedure in the reversed direction.

Replace all O-rings and seals during reinstallation.

Note: After reinstallation, completely bleed the brake line of air, and check performance of the unloader valve.
To bleed the brake line of air, refer to Section 24.
To check performance of the unloader valve, refer to Section 53.



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Air Conditioner

Removing and reinstalling air conditioner

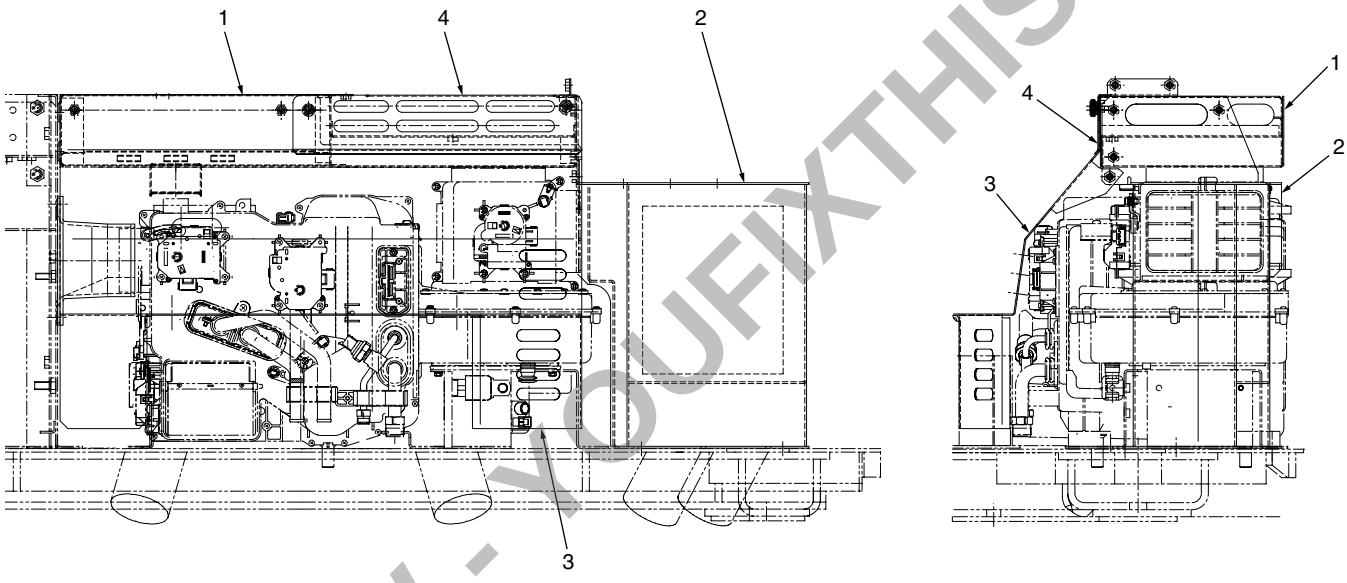
1.Removing the air conditioner

Before starting work:

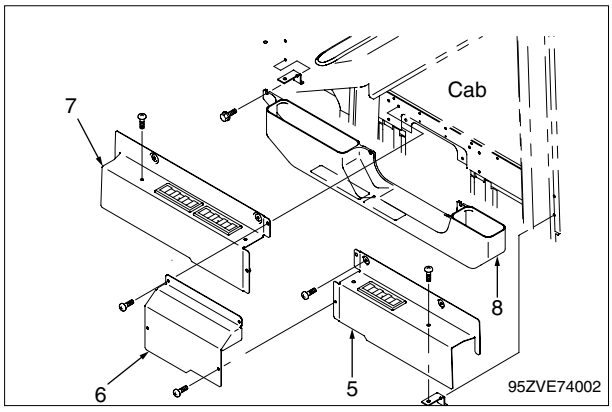
a)Remover the seat in the cab.

b)Collect the air conditioner refrigerant using the proper recovery method.

c)Remove the floor mat in the cab.



1) Remove the box (1) (2).
2) Remove the cover (3) and the plate (4).
3) Remove the cover (5) (6) (7) from the cab.
4) Remove the duct (8).



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CONTENTS

85ZV General Information 00-1
- How to Use Manual 00-2
  - Safety precautions 00-2
  - Symbols 00-3
- Outline 00-4
  - Layout of main components 00-4
  - Inspection and maintenance table 00-5
  - Recommended lubricants 00-8
  - Coolant 00-9
  - Lubrication chart 00-10
  - Weight of main components 00-11
  - Bolt tightening torque 00-12
  - Hose band tightening torque 00-16
  - Liquid gasket and screw lock agent 00-17
  - Cautions regarding welding repair service 00-19

85ZV Measurement for Performance Check 03-1
- Cautions on Safety 03-2
- Standard Measurement Values for Performance Check 03-3

85ZV Function & Structure Chassis Group 12-1
- Front Chassis 12-2
  - Loading linkage 12-2
  - Loading linkage pin 12-4
- Rear Chassis 12-5
  - Fuel tank 12-5
  - Floor board mount 12-6
- Center Pin 12-7
  - Upper center pin 12-7
  - Lower center pin 12-7
  - Dust seal 12-8

85ZV Check & Adjustment Chassis Group 13-1
- Linkage Pin 13-2
  - Liner 13-2

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Cautions on Hydraulic Parts Replacement

After oil or a part is replaced, malfunction or seizure may occur during running-in. Such trouble is often caused by faulty air bleeding or lubrication after replacement.

After replacing oil or a part, be sure to observe the following work procedure to prevent occurrence of trouble.

Work procedure

1. In the case of new oil pump, lubricate its inside with new oil prior to installation, and confirm that it can be turned smoothly by hand.

2. After the oil pump or cylinder was made empty for oil replacement, repair, etc., restart the operation as follows.

(a) Before installing pipes, pour new oil into the pump or the cylinder.

(b) Operate the engine at low-idling speed for 5 minutes or more. Do not operate any hydraulic functions during this period.

(c) While keeping the engine at low-idling speed, move each cylinder 5 times or more respectively.

At this time,
- Move each cylinder to a place near the stroke end so that hydraulic pressure does not go over relief.
- Lower the boom slowly. Dump the bucket slowly. Do not activate the make up valves from rapid activation of circuits.

(d) Perform general operations, and confirm that abnormal sound, heat generation and any other abnormality is not detected.

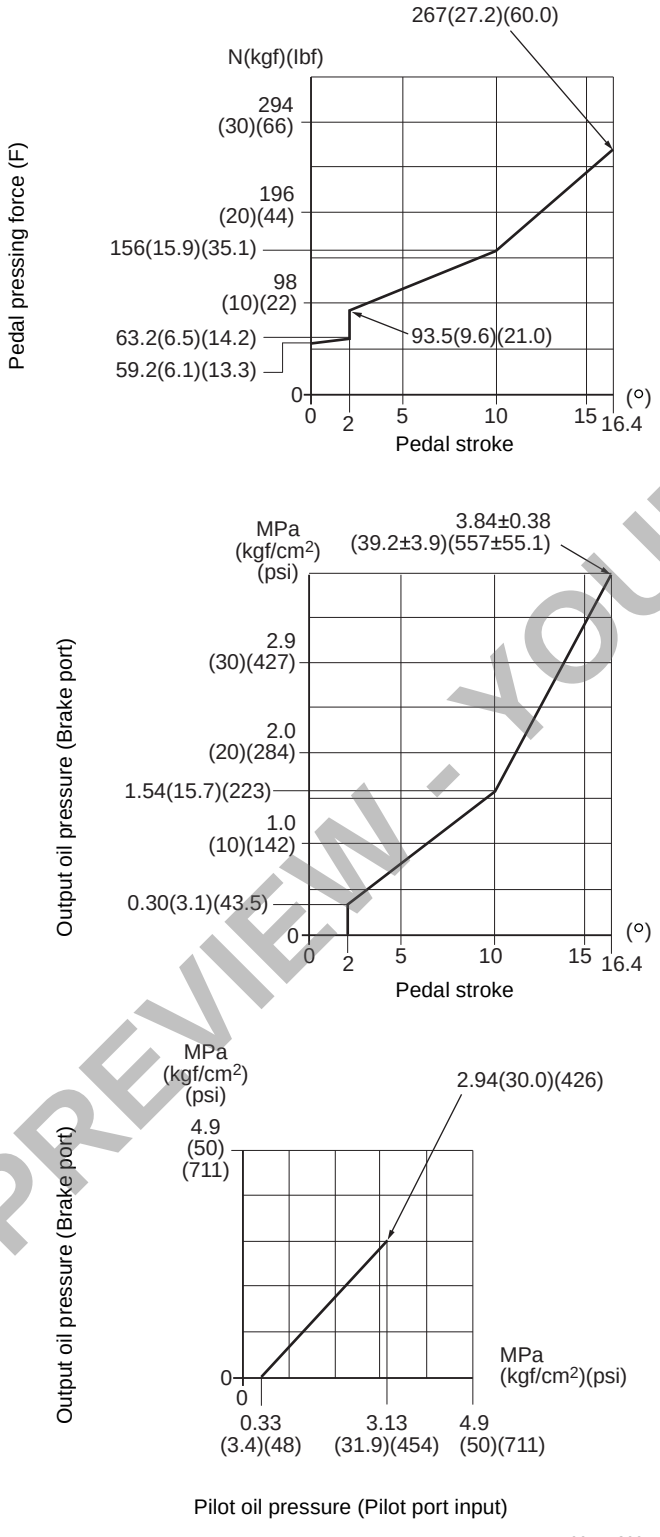
(e) Observe the hydraulic oil level sight gauge and confirm that there are no bubbles in the hydraulic oil.

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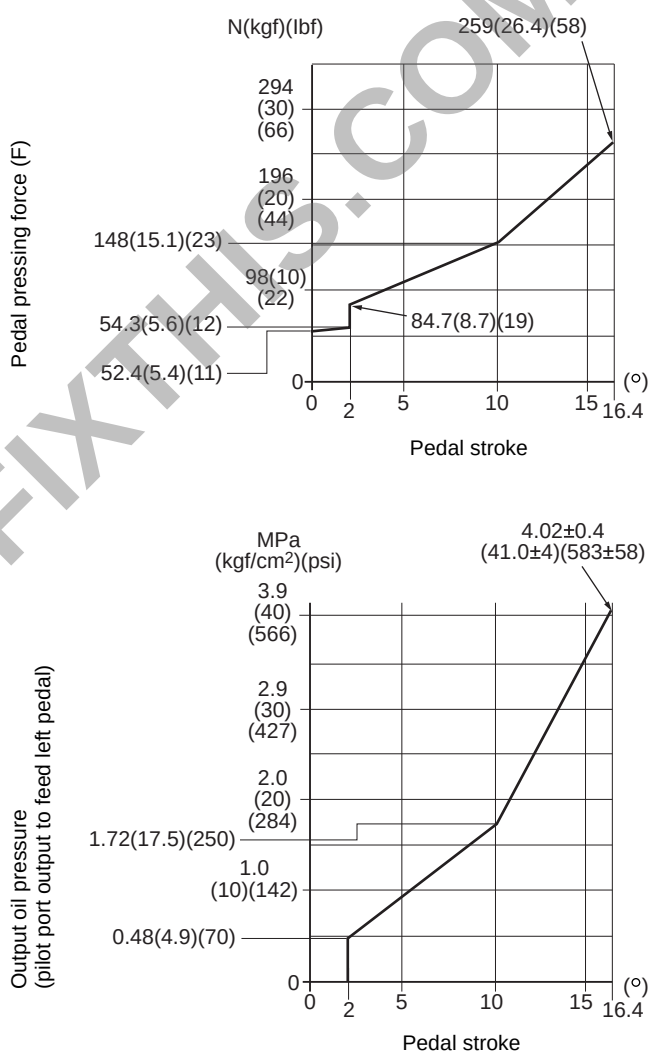
(S/N 85C4-9017~)

Main valve (Left pedal, tandem type)



K90ZV52007

Pilot valve (Right pedal)

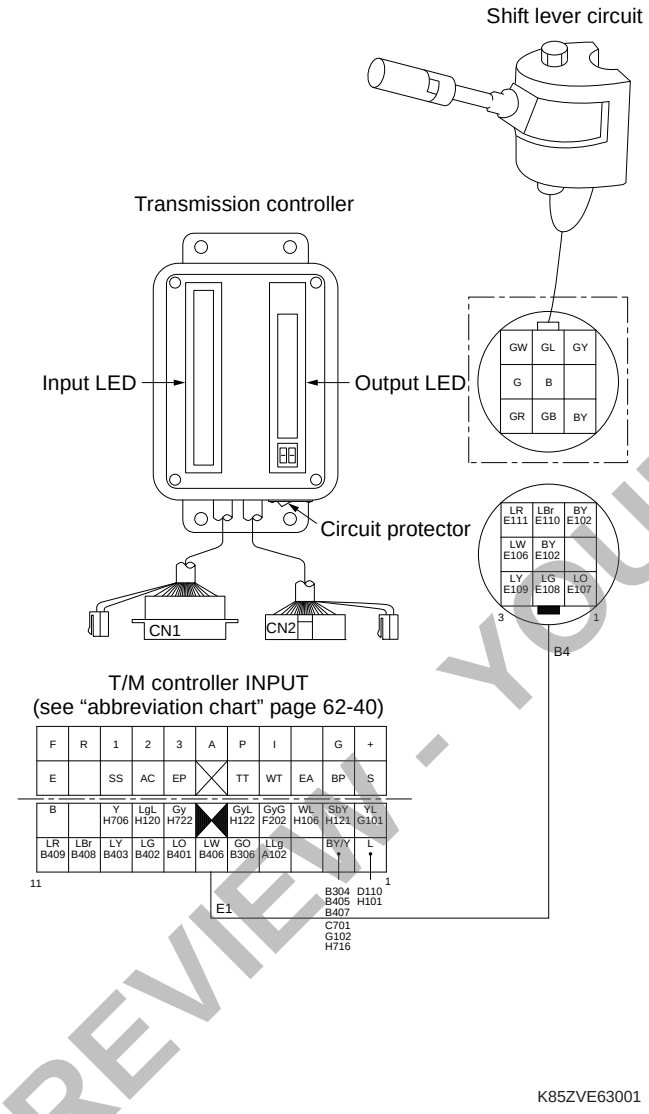


K90ZV52008

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<Step 2> Checking conductivity of shift lever input circuit cable



K85ZVE63001

Connect connector B4 to the shift lever, and disconnect connector CN1 from the transmission controller. Check the conductivity of the cable connector terminals.

Shift lever position	Terminals to be checked	Check result	Judgment
F	LR-BY (E111 to E102)	Conductive	Normal
R	LBr-BY (E110 to E102)		
1	LY-BY (E109 to E102)		
2	LG-BY (E108 to E102)		
3	LO-BY (E107 to E102)		
A	LW-BY (E106 to E102)		

If a line is not conductive, judge that the cable is defective. Also check that only the above terminals are conductive. Otherwise there could be a short circuit in the wiring.

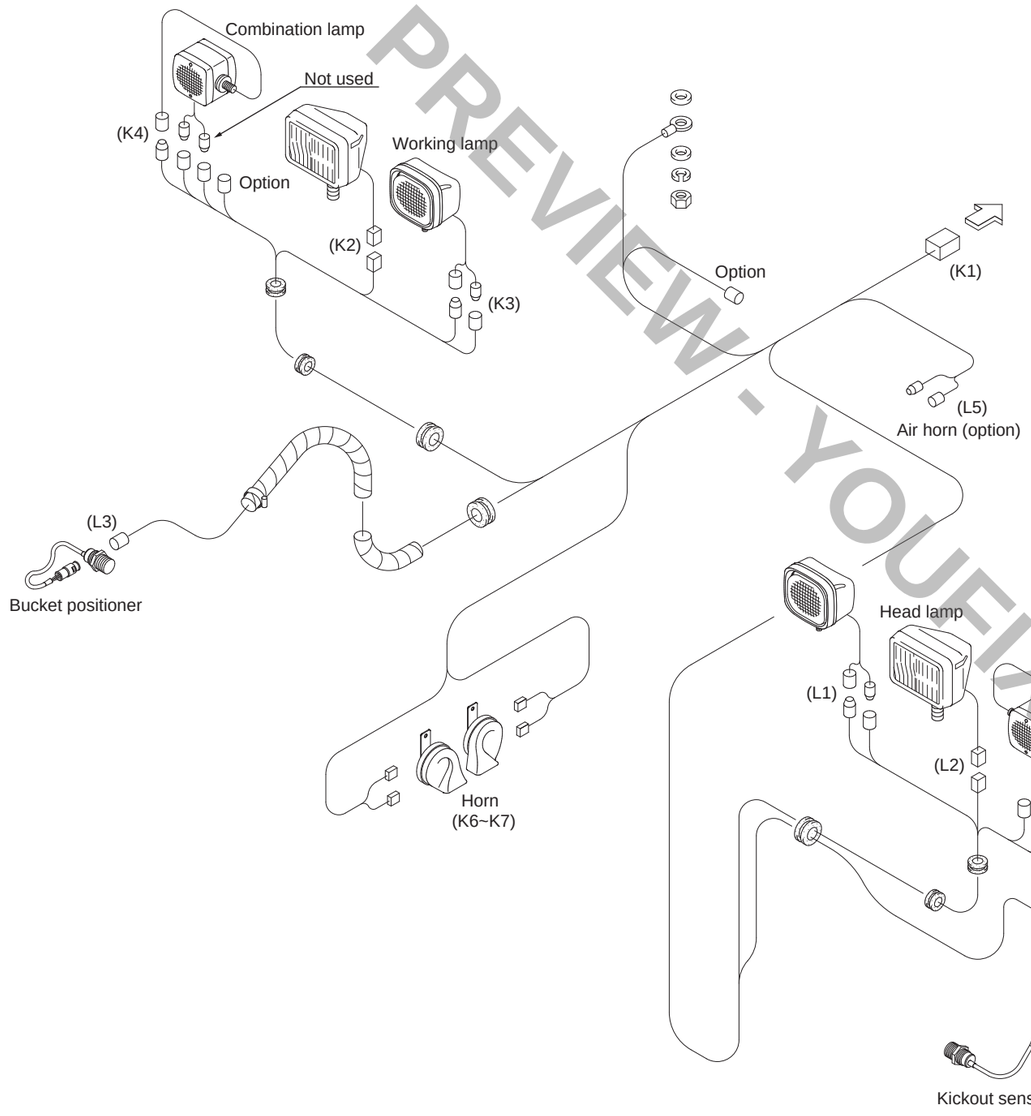
<Solution>

Repair or replace the defective cable.

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Front chassis



85ZVE62025

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Boom

Removing and reinstalling boom

1. Removing boom

⚠ WARNING

Unexpected movement of machine could cause an accident resulting in injury or death.
- **Position machine on level ground, and block tires with chocks, etc. to prevent them from moving.**
- **Lower bucket to ground, and release residual pressure from the hydraulic oil tank and lines.**
- **Apply the parking brake, remove starter key, and hang a "DO NOT START ENGINE!" tag on steering wheel.**

⚠ WARNING

Hitting the parts quenched such as bearing, shaft, pin and tooth by a steel-hammer could cause a breakage resulting in injury or death.
- **Keep persons away from working area.**
- **Use a support plate in case a steel hammer is used.**
- **Use a copper-hammer or a plastic hammer.**
- **Always wear protection goggles.**

1) Remove pin (3) connecting bucket (1) and the link (2).

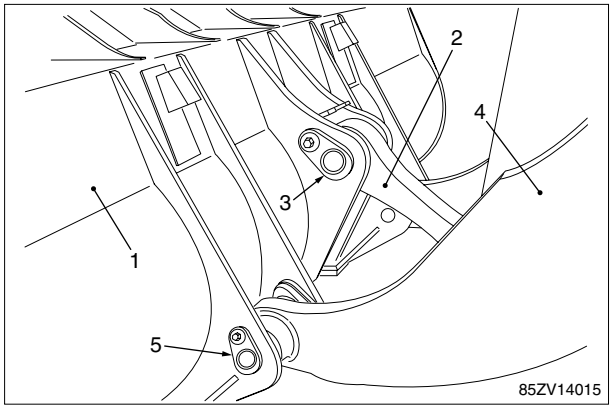
Note: There are shims in the pin sections.
Carefully store removed shims, and correctly reinsert shims when reinstalling the bucket.

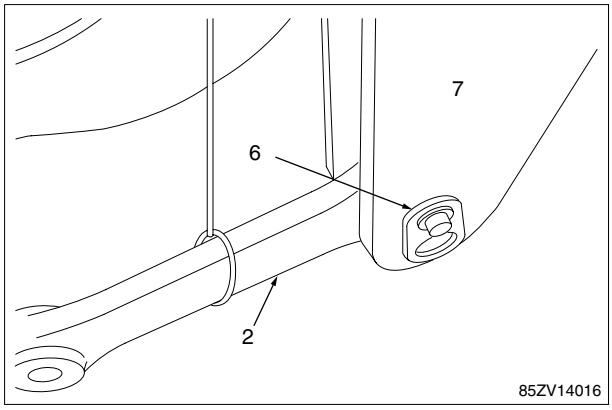
2) Remove connection pin (5) from boom (4) and bucket (1) to remove bucket.

: Bucket: 1,775 kg (3,915 lbs)

3) Attach sling to link (2), and then remove connection pin (6) from lever (7) and link (2).

: Link: 80 kg (180 lbs)





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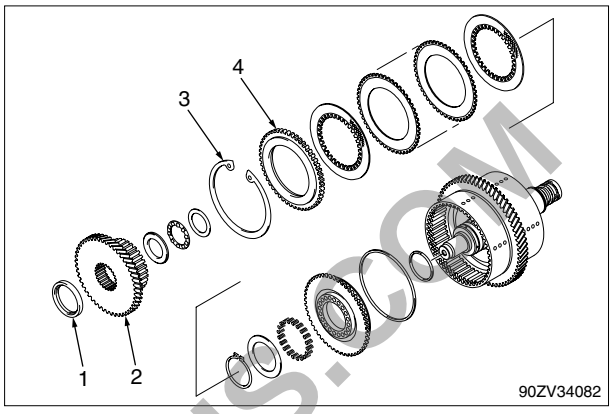
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2nd Speed Clutch Pack

Disassembling and reassembling 2nd speed clutch pack

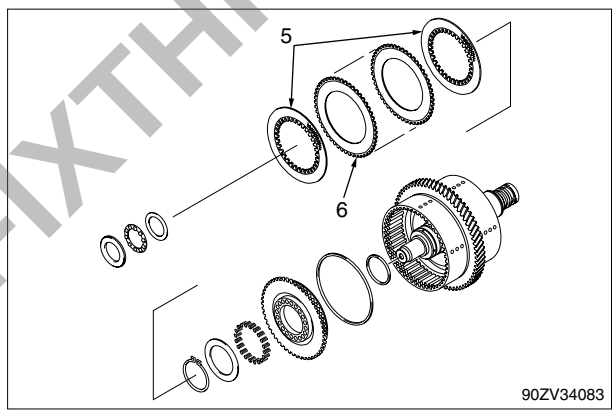
1. Disassembling 2nd speed clutch pack

1) Remove spacer (1) and gear (2). After that, remove snap ring (3) and backing plate (4).

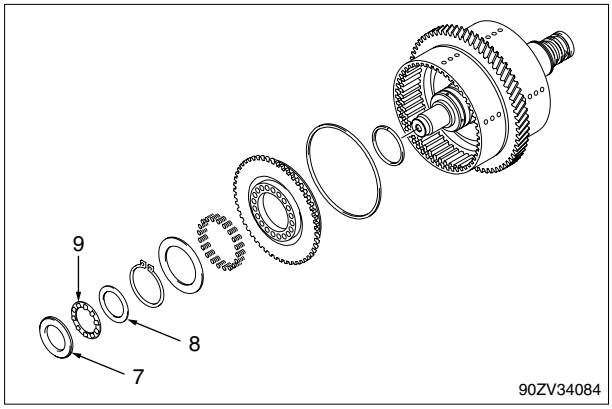


2) Remove friction plates (5) and steel plates (6).

Note: - Number of friction plates: 5
Number of steel plates: 4
- After reinstalling the piston (13), be sure to insert the friction plate (5) first.

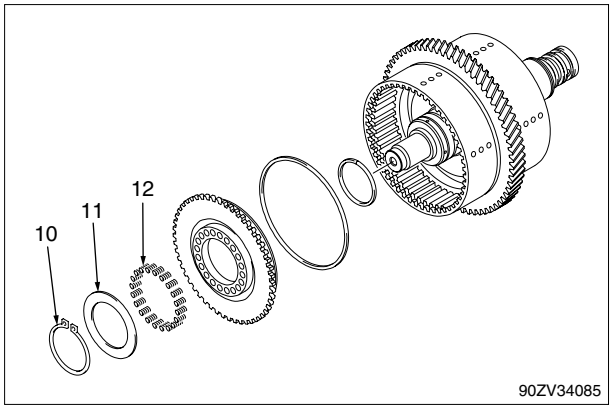


3) Remove thrust washer (7), thrust bearing (9) and thrust washer (8). Store the thrust washers for possible reuse.



4) Depress plate (11) and remove snap ring (10), and plate (11).

5) Remove 20 springs (12).



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