

# **SV512-E Series**

## **SHOP MANUAL**

**SAKAI®**





## **PREFACE**

With extended use, component parts of a vehicle will inevitably deteriorate, leading to a performance-degraded machine. To make a machine maintain its performance at high level over a long operating hours without any problems, correct handling, quality preventive maintenance and repair are of vital importance. If a trouble occurs, rapid and effective tracking down of the cause is also of prime importance.

This manual provides instructions on SPECIFICATIONS, STRUCTURE/OPERATION, INSPECTION/ADJUSTMENT and TROUBLE-SHOOTING needed to perform above-mentioned works for SV512-E Series Vibrating Rollers. For TROUBLESHOOTING, this book uses flow charts to indicate diagnosis procedures. There are many procedures considered. Shown here represent examples. More reasonable ways to trace the source of faults will be available. Depending upon the conditions of troubles, find the most suitable diagnosis procedures.

The main purpose of this service literature is to serve as a guide for service personnel to acquire correct information on and servicing procedures for SV512-E Series machines in order to give a correct decisions on problems that the machines will confront, thus leading to quality servicing. Fully understand the instructions in this manual and make the best of it.

We will make our utmost efforts to make this book more substantial through revisions. Your opinions and advices will be particularly welcome and carefully considered.

For daily maintenance and periodical service schedule recommendation, refer to OPERATOR'S INSTRUCTION furnished separately.



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# SPECIFICATIONS

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# SPECIFICATIONS

## 1. External Views and Specifications

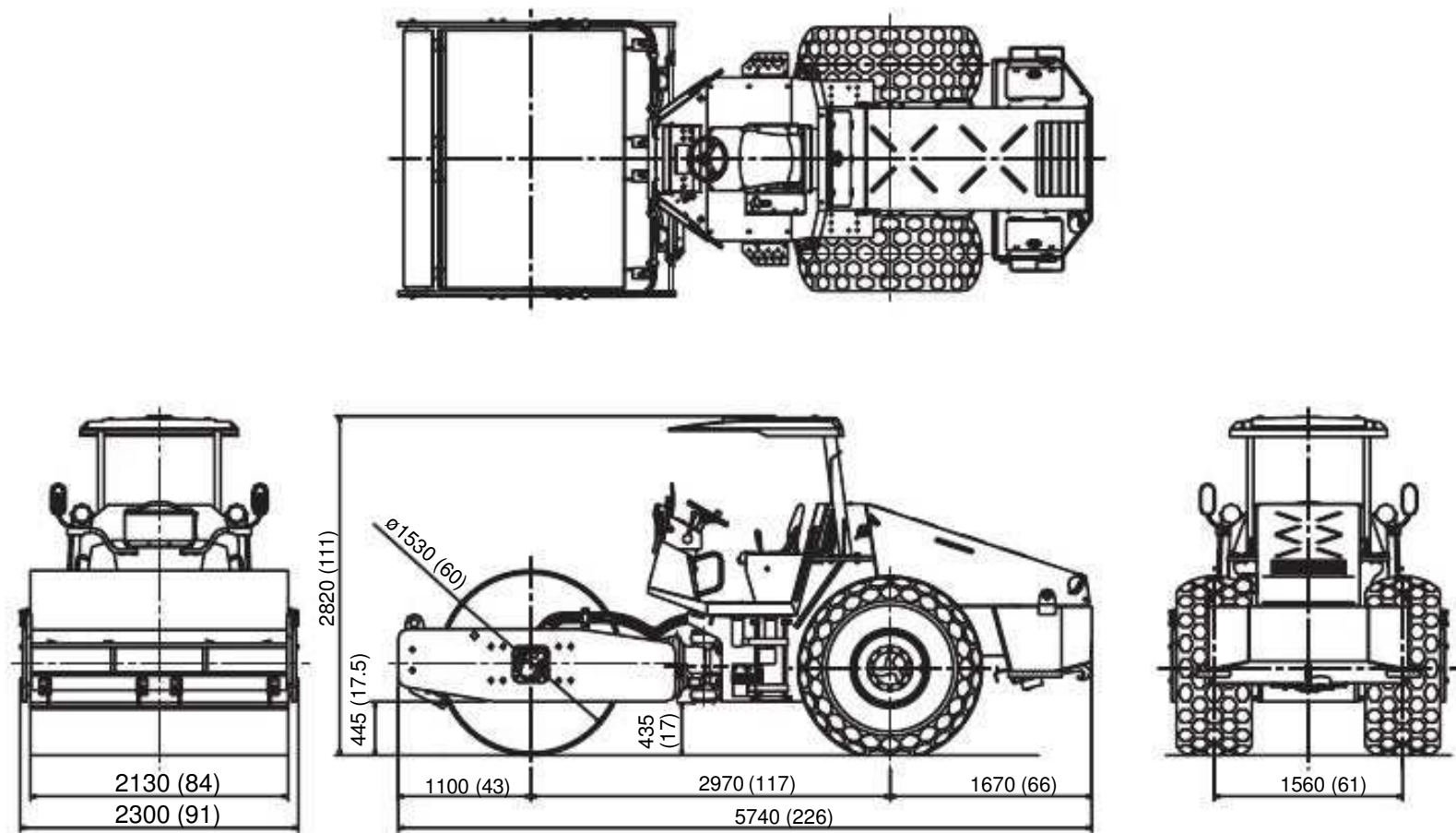
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SPECIFICATIONS

1. External Views and Specifications

1-1. SV512D-E

Unit in mm (in)



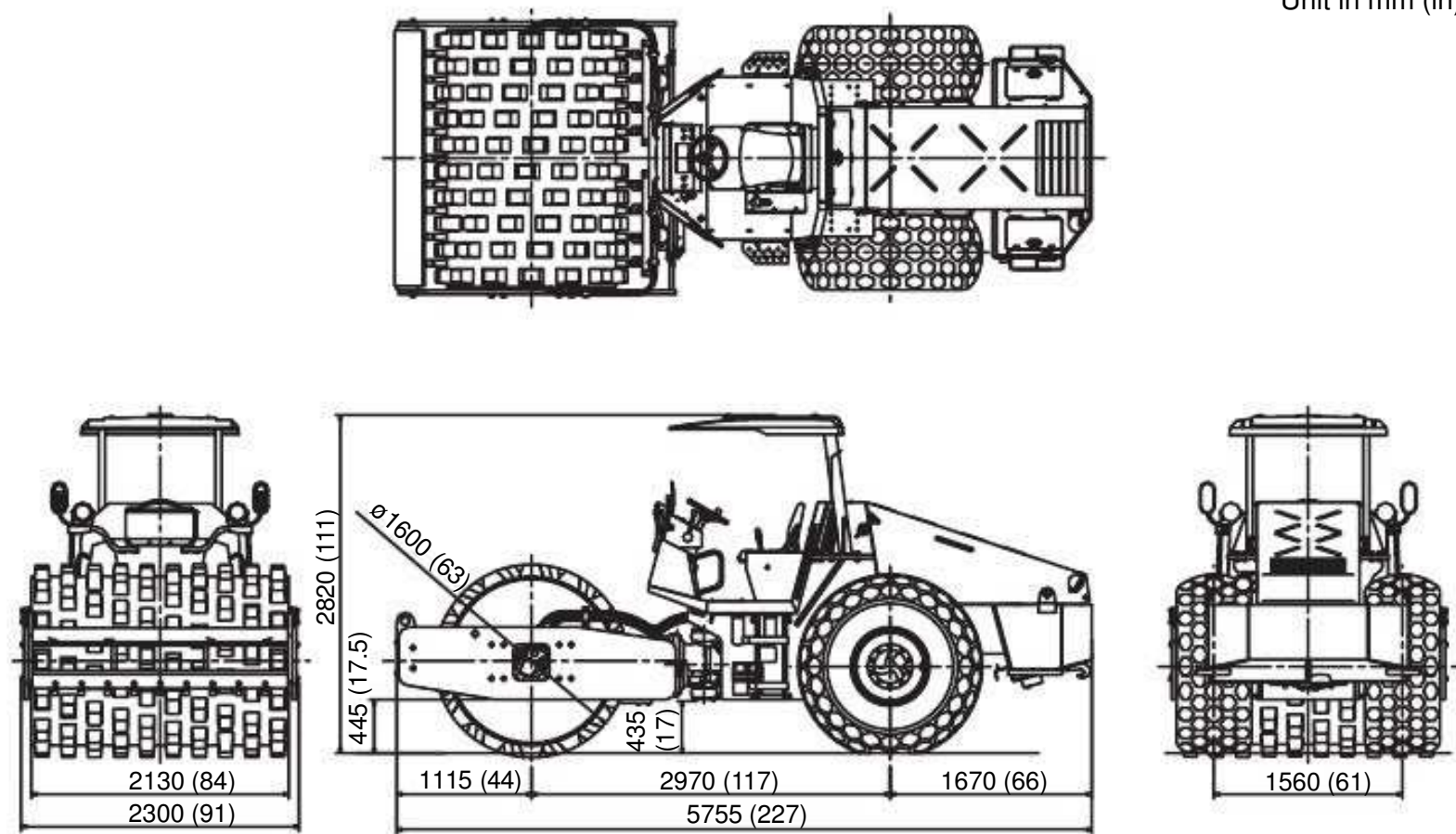
SV5121001

|                    |                                                     |                        |                                                            |                       |
|--------------------|-----------------------------------------------------|------------------------|------------------------------------------------------------|-----------------------|
| Model              | SV512D-E                                            | Vibrating power:       |                                                            |                       |
| Weight:            |                                                     | Minimum turning radius | 5.6 m (221")                                               |                       |
| Gross weight       | 10,500 kg (23,148 lb)                               | Gradability            | 62 % (32°)                                                 |                       |
| Load on front axle | 5,450 kg (12,015 lb)                                | Frequency              | Low amplitude                                              | High amplitude        |
| Load on rear axle  | 5,050 kg (11,133 lb)                                |                        | 36.7 Hz(2,200 vpm)                                         | 27.5 Hz(1,650 vpm)    |
| Dimension:         |                                                     | Centrifugal force      | Low amplitude                                              | High amplitude        |
| Overall length     | 5,740 mm (226")                                     |                        | 172 kN<br>(38,580 lb)                                      | 226 kN<br>(50,710 lb) |
| Overall width      | 2,300 mm (91")                                      | Engine:                |                                                            |                       |
| Overall height     | 2,820 mm (111")                                     | Model                  | Perkins "1004-40TW" Diesel Engine                          |                       |
| Wheelbase          | 2,970 mm (117")                                     | Type                   | Water-cooled, 4-cycle, 4-cylinder, direct injection type   |                       |
| Rolling width      | 2,130 mm (84")                                      | Bore x Stroke          | 100 x 127 mm (3.937" x 5.000")                             |                       |
| Wheel              |                                                     | Displacement           | 3.990 liters (243 cu.in)                                   |                       |
| Front              | Roll (dia. x width)<br>1,530 x 2,130 mm (60" x 84") | Performance            |                                                            |                       |
| Rear               | Tire<br>23.1-26-8PR (OR)                            | Rated speed            | 2,200 min <sup>-1</sup> (2,200 rpm)                        |                       |
| Ground clearance   | 435 mm (17")                                        | Rated output           | 85.5 kW (115 HP)                                           |                       |
| Curb clearance     | 445 mm (17.5")                                      | Max. torque            | 452 N·m<br>(333 lbf·ft/1,400 rpm)                          |                       |
| Performance:       |                                                     | Fuel consumption       | 245 g/kWh (0.402 lb/HPh)<br>/2,200 min <sup>-1</sup> (rpm) |                       |
| Travel speed       |                                                     | Tank capacity:         |                                                            |                       |
| Low                | 0 ~ 6 km/h (0 ~ 3.7 mile/h)                         | Fuel tank              | 250 liters (66 gal)                                        |                       |
| High               | 0 ~ 10 km/h (0 ~ 6.2 mile/h)                        | Hydraulic tank         | 50 liters (13 gal)                                         |                       |

**NOTE:** Gradability is the calculated value. It may vary with ground surface conditions.

1-2. SV512T-E

Unit in mm (in)



SV5121002

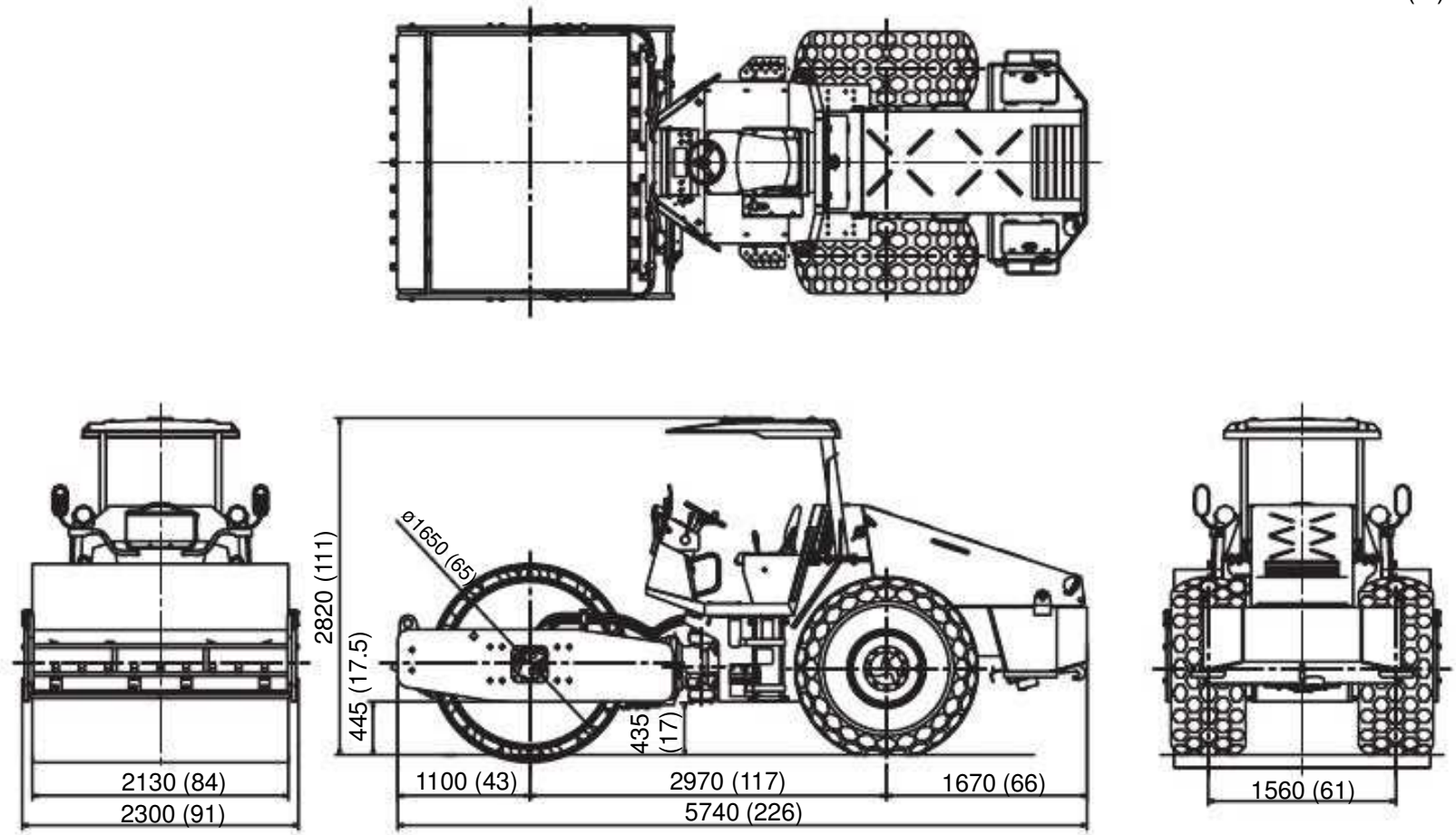
|                     |                                                     |                         |                                                            |                       |
|---------------------|-----------------------------------------------------|-------------------------|------------------------------------------------------------|-----------------------|
| <b>Model</b>        | <b>SV512T-E</b>                                     | <b>Vibrating power:</b> |                                                            |                       |
| <b>Weight:</b>      |                                                     | Minimum turning radius  | 5.6 m (221")                                               |                       |
| Gross weight        | 10,850 kg (23,920 lb)                               | Gradability             | 62 % (32°)                                                 |                       |
| Load on front axle  | 5,800 kg (12,787 lb)                                | Frequency               | Low amplitude                                              | High amplitude        |
| Load on rear axle   | 5,050 kg (11,133 lb)                                |                         | 36.7 Hz(2,200 vpm)                                         | 27.5 Hz(1,650 vpm)    |
| <b>Dimension:</b>   |                                                     | Centrifugal force       | Low amplitude                                              | High amplitude        |
| Overall length      | 5,755 mm (227")                                     |                         | 186 kN<br>(41,887 lb)                                      | 245 kN<br>(55,120 lb) |
| Overall width       | 2,300 mm (91")                                      | <b>Engine:</b>          |                                                            |                       |
| Overall height      | 2,820 mm (111")                                     | Model                   | Perkins "1004-40TW" Diesel Engine                          |                       |
| Wheelbase           | 2,970 mm (117")                                     | Type                    | Water-cooled, 4-cycle, 4-cylinder, direct injection type   |                       |
| Rolling width       | 2,130 mm (84")                                      | Bore x Stroke           | 100 x 127 mm (3.937" x 5.000")                             |                       |
| Wheel               |                                                     | Displacement            | 3.990 liters (243 cu.in)                                   |                       |
| Front               | Roll (dia. x width)<br>1,600 x 2,130 mm (63" x 84") | Performance             |                                                            |                       |
| Rear                | Tire<br>23.1-26-8PR (OR)                            | Rated speed             | 2,200 min <sup>-1</sup> (2,200 rpm)                        |                       |
| Ground clearance    | 435 mm (17")                                        | Rated output            | 85.5 kW (115 HP)                                           |                       |
| Curb clearance      | 445 mm (17.5")                                      | Max. torque             | 452 N•m<br>(333 lbf•ft/1,400 rpm)                          |                       |
| <b>Performance:</b> |                                                     | Fuel consumption        |                                                            |                       |
| Travel speed        |                                                     |                         | 245 g/kWh (0.402 lb/HPh)<br>/2,200 min <sup>-1</sup> (rpm) |                       |
| Low                 | 0 ~ 6 km/h (0 ~ 3.7 mile/h)                         | <b>Tank capacity:</b>   |                                                            |                       |
| High                | 0 ~ 10 km/h (0 ~ 6.2 mile/h)                        | Fuel tank               | 250 liters (66 gal)                                        |                       |
|                     |                                                     | Hydraulic tank          | 50 liters (13 gal)                                         |                       |

**NOTE:** Gradability is the calculated value. It may vary with ground surface conditions.

SPECIFICATIONS

1-3. SV512TF-E

Unit in mm (in)



SV5121003

|                     |                                                     |                         |                                                            |                       |
|---------------------|-----------------------------------------------------|-------------------------|------------------------------------------------------------|-----------------------|
| <b>Model</b>        | <b>SV512TF-E</b>                                    | <b>Vibrating power:</b> |                                                            |                       |
| <b>Weight:</b>      |                                                     | Minimum turning radius  | 5.6 m (221")                                               |                       |
| Gross weight        | 13,000 kg (28,660 lb)                               | Gradability             | 50 % (27°)                                                 |                       |
| Load on front axle  | 7,950 kg (17,527 lb)                                | Frequency               | Low amplitude                                              | High amplitude        |
| Load on rear axle   | 5,050 kg (11,133 lb)                                |                         | 36.7 Hz(2,200 vpm)                                         | 27.5 Hz(1,650 vpm)    |
| <b>Dimension:</b>   |                                                     | Centrifugal force       | Low amplitude                                              | High amplitude        |
| Overall length      | 5,740 mm (226")                                     |                         | 186 kN<br>(41,887 lb)                                      | 245 kN<br>(55,120 lb) |
| Overall width       | 2,300 mm (91")                                      | <b>Engine:</b>          |                                                            |                       |
| Overall height      | 2,820 mm (111")                                     | Model                   | Perkins "1004-40TW" Diesel Engine                          |                       |
| Wheelbase           | 2,970 mm (117")                                     | Type                    | Water-cooled, 4-cycle, 4-cylinder, direct injection type   |                       |
| Rolling width       | 2,130 mm (84")                                      | Bore x Stroke           | 100 x 127 mm (3.937" x 5.000")                             |                       |
| Wheel               |                                                     | Displacement            | 3.990 liters (243 cu.in)                                   |                       |
| Front               | Roll (dia. x width)<br>1,650 x 2,130 mm (65" x 84") | Performance             |                                                            |                       |
| Rear                | Tire<br>23.1-26-8PR (OR)                            | Rated speed             | 2,200 min <sup>-1</sup> (2,200 rpm)                        |                       |
| Ground clearance    | 435 mm (17")                                        | Rated output            | 85.5 kW (115 HP)                                           |                       |
| Curb clearance      | 445 mm (17.5")                                      | Max. torque             | 452 N·m<br>(333 lbf·ft/1,400 rpm)                          |                       |
| <b>Performance:</b> |                                                     | Fuel consumption        | 245 g/kWh (0.402 lb/HPh)<br>/2,200 min <sup>-1</sup> (rpm) |                       |
| Travel speed        |                                                     | <b>Tank capacity:</b>   |                                                            |                       |
| Low                 | 0 ~ 6 km/h (0 ~ 3.7 mile/h)                         | Fuel tank               | 250 liters (66 gal)                                        |                       |
| High                | 0 ~ 10 km/h (0 ~ 6.2 mile/h)                        | Hydraulic tank          | 50 liters (13 gal)                                         |                       |

**NOTE:** Gradability is the calculated value. It may vary with ground surface conditions.

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# STRUCTURE & OPERATION

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# STRUCTURE & OPERATION

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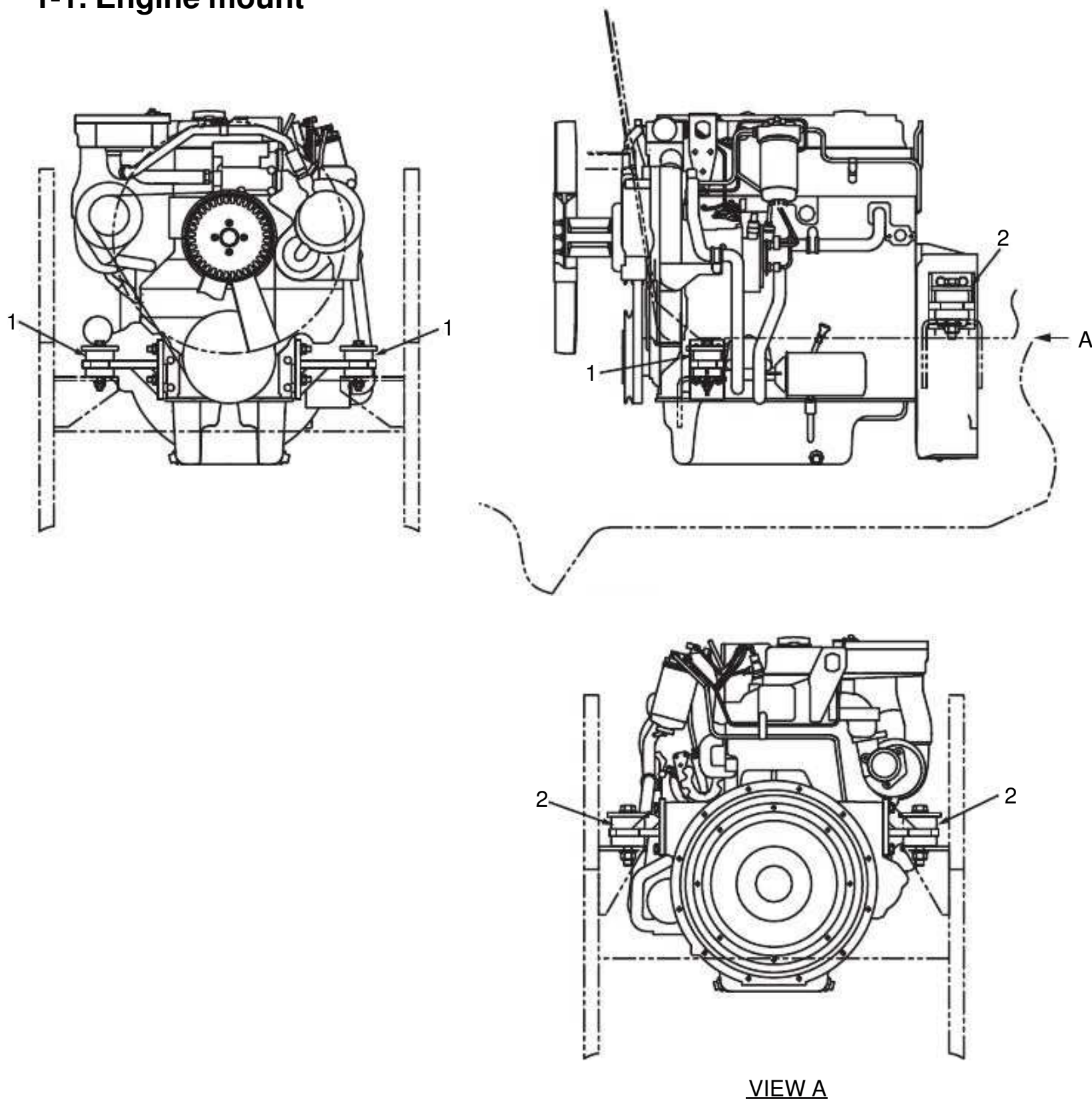
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# 1.Engine-related Units

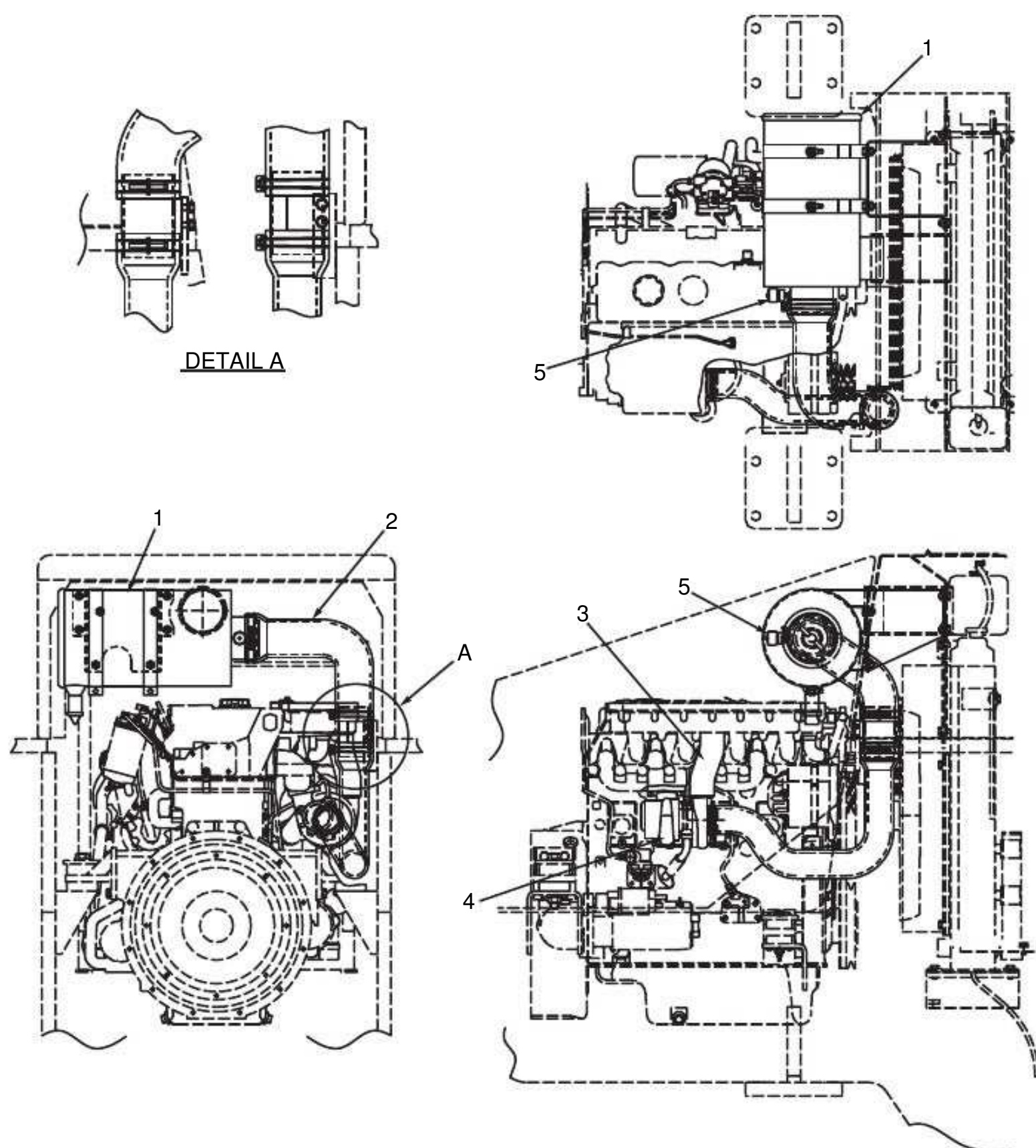
## 1-1. Engine mount



- 1. Engine mount (front)
- 2. Engine mount (rear)

SV5122001

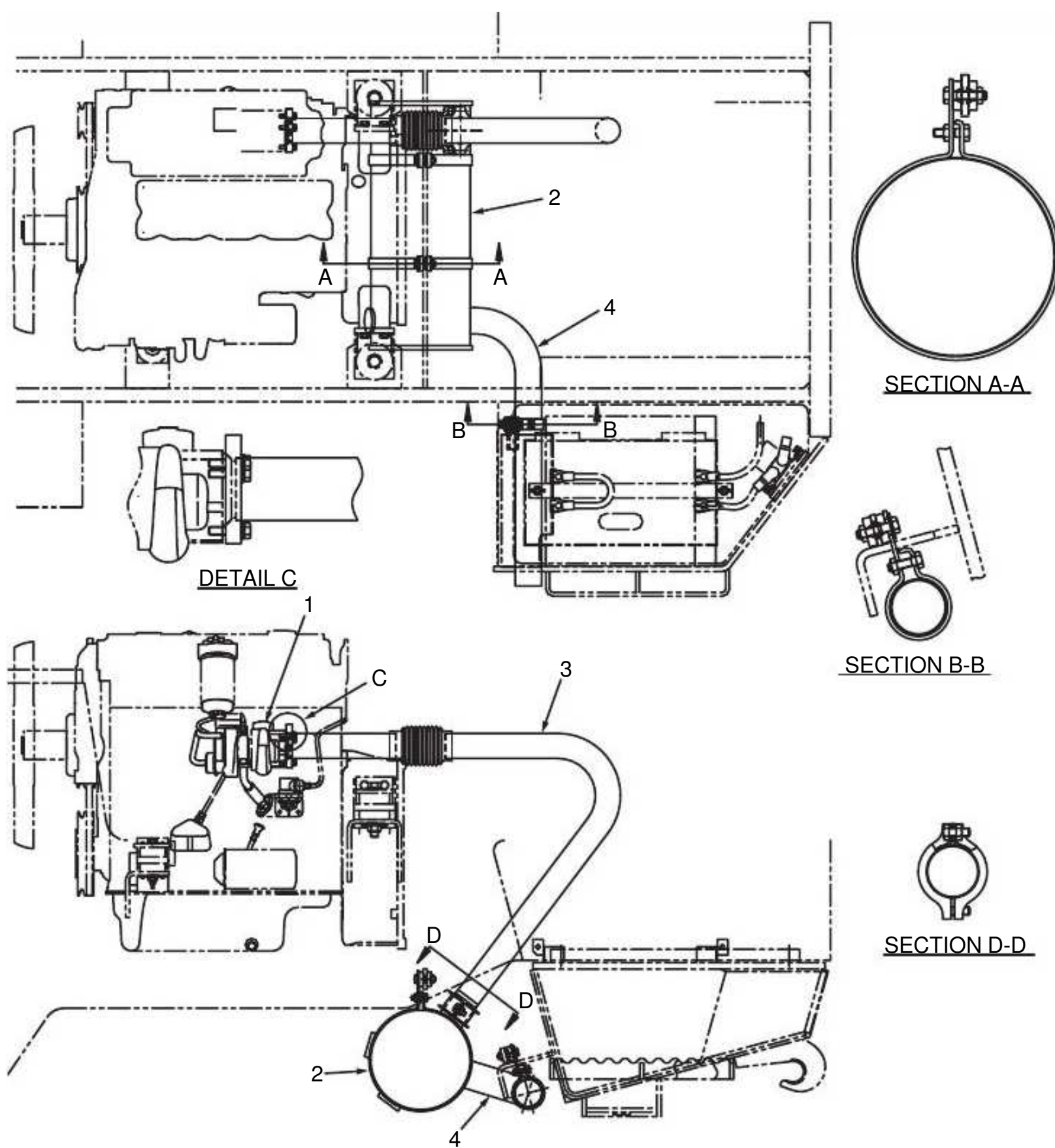
## 1-2. Intake system



SV5122002

- 1. Air cleaner
- 2. Intake hose
- 3. Feed pipe
- 4. Turbocharger
- 5. Restriction indicator

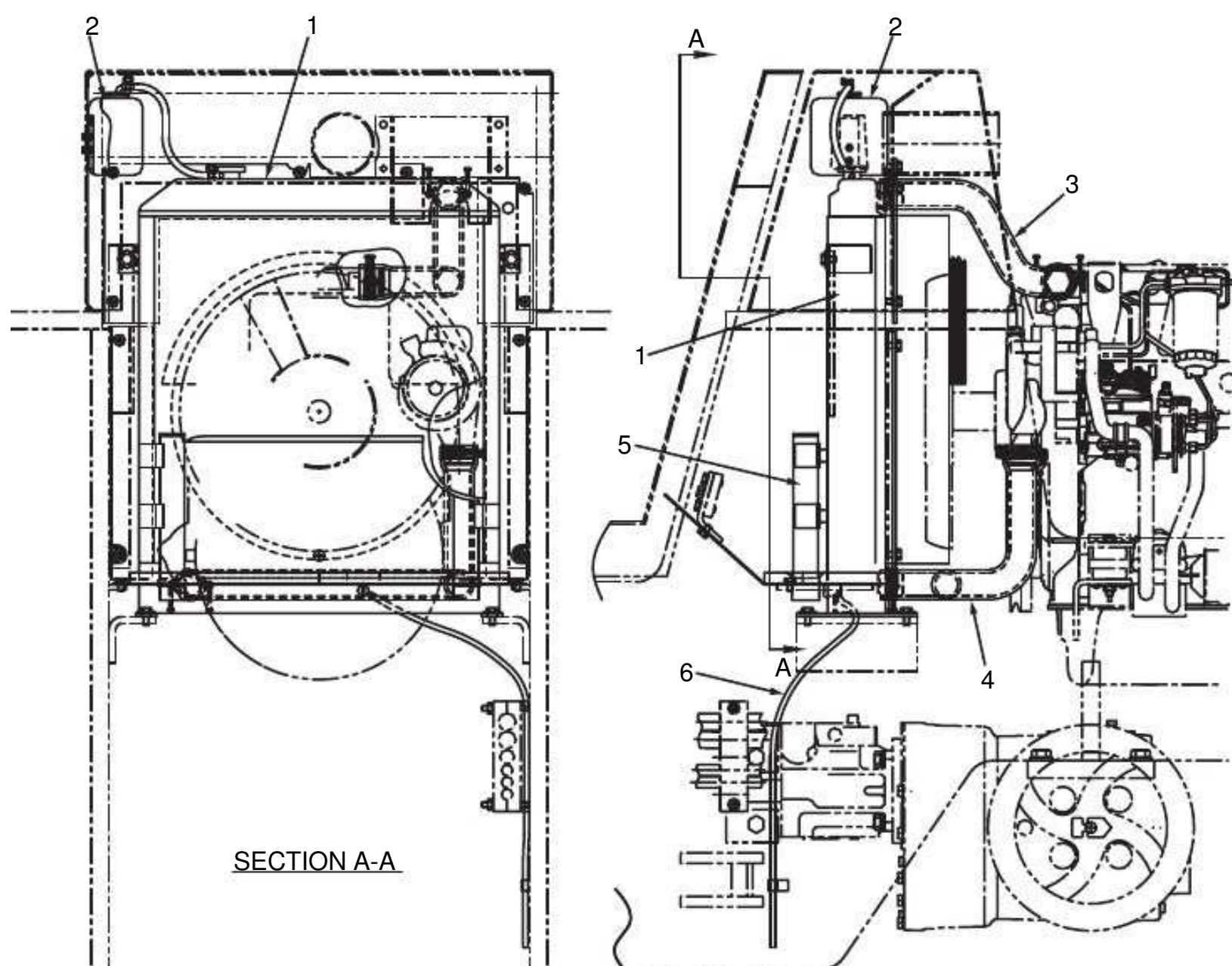
### 1-3. Exhaust system



- 1. Turbocharger
- 2. Muffler
- 3. Exhaust pipe
- 4. Exhaust pipe

SV5122003

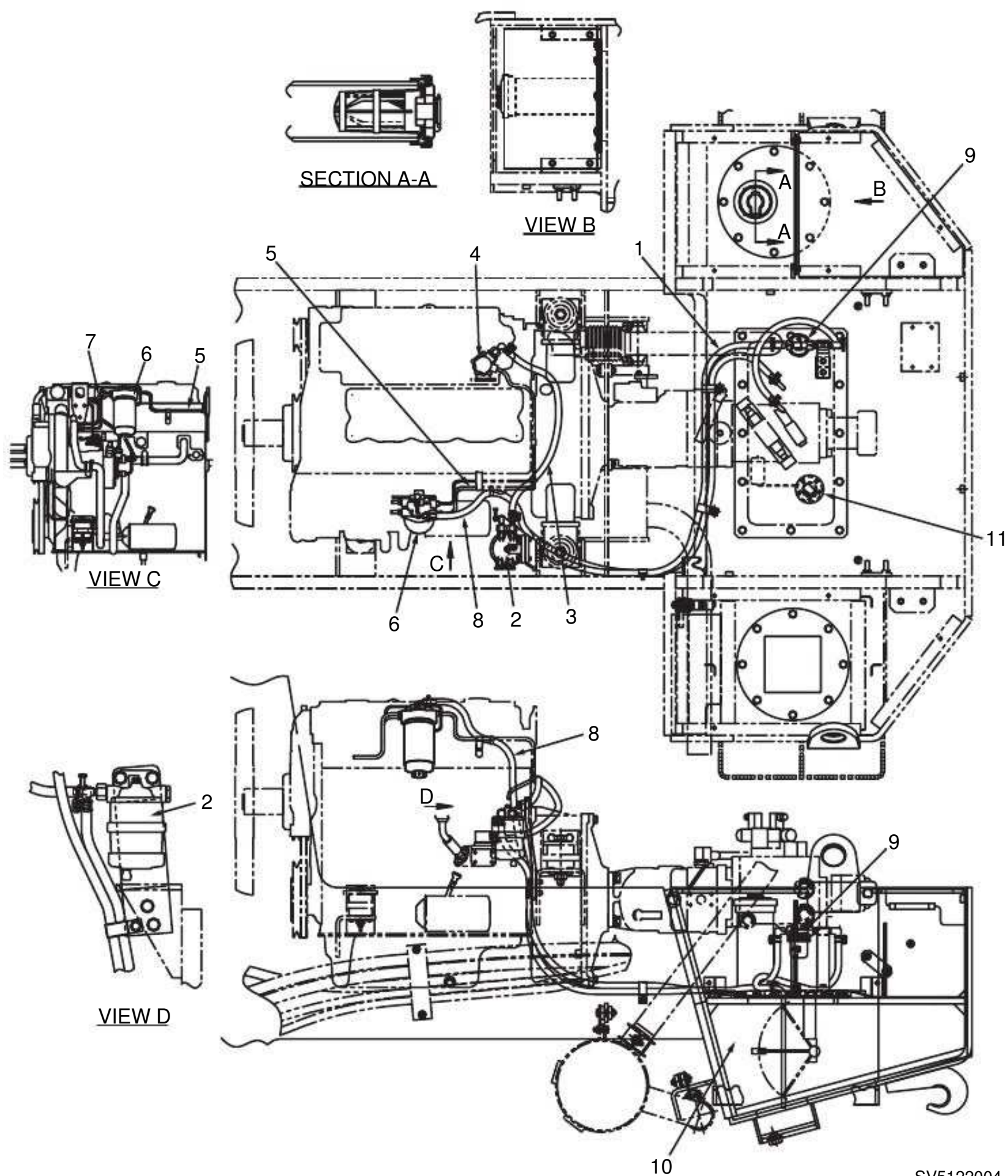
## 1-4. Cooling hosework & radiator



SV5122004

- 1. Radiator
- 2. Subtank
- 3. Radiator inlet hose
- 4. Radiator outlet hose
- 5. Oil cooler
- 6. Drain hose

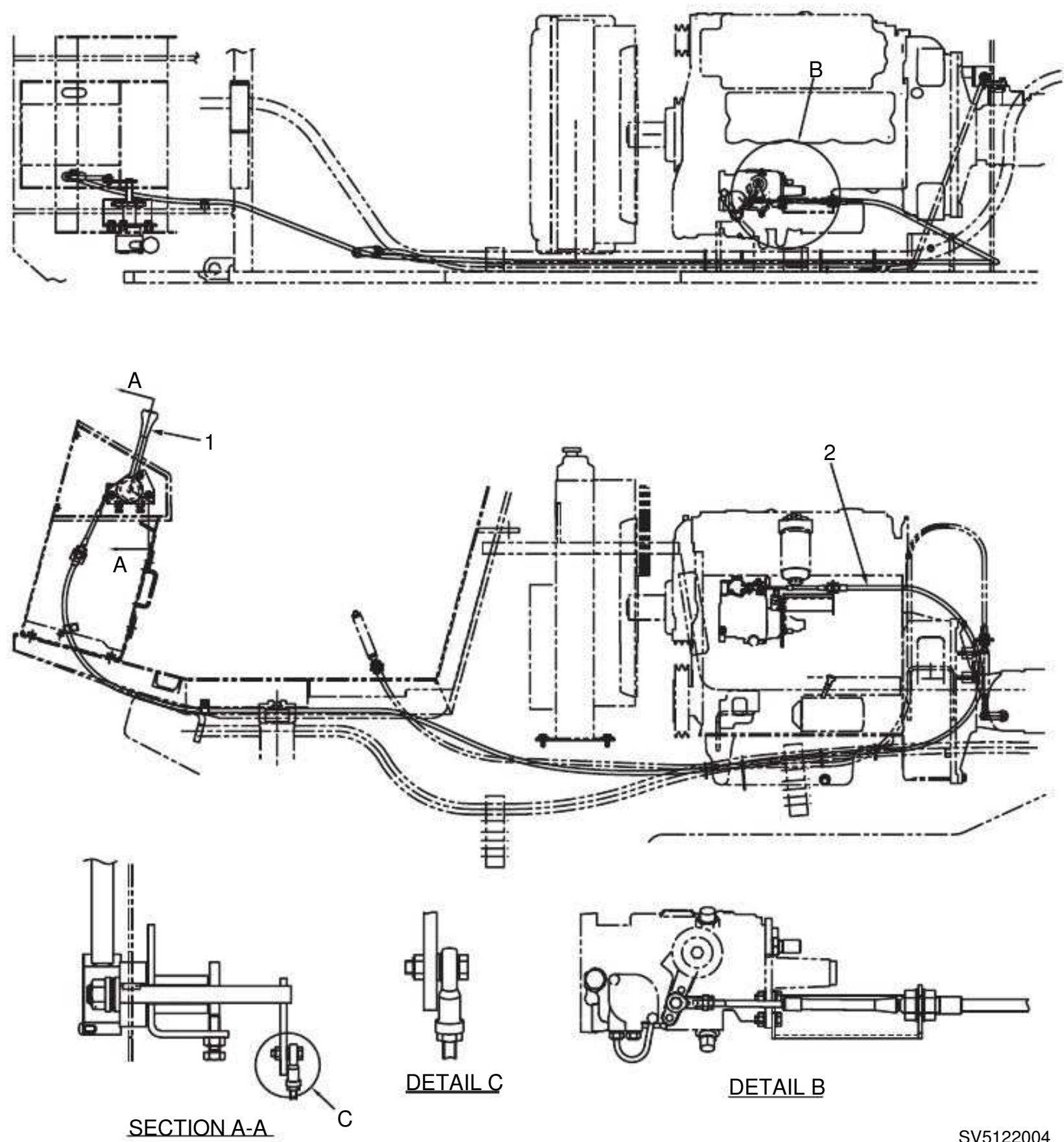
## 1-5. Fuel piping & fuel tank



SV5122004

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| 1. Hose (fuel tank to sedimenter) | 7. Pipe (filter to injection pump) |
| 2. Sedimenter                     | 8. Hose (to tank)                  |
| 3. Hose (sedimenter to feed pump) | 9. Filter                          |
| 4. Feed pump                      | 10. Fuel tank                      |
| 5. Pipe (feed pump to filter)     | 11. Fuel unit                      |
| 6. Filter                         |                                    |

1-6. Fuel controls



- 1. Throttle lever
- 2. Throttle cable

## 2. Description and Operation of Hydraulic System

### 2-1. Structure of hydraulic pump and motor

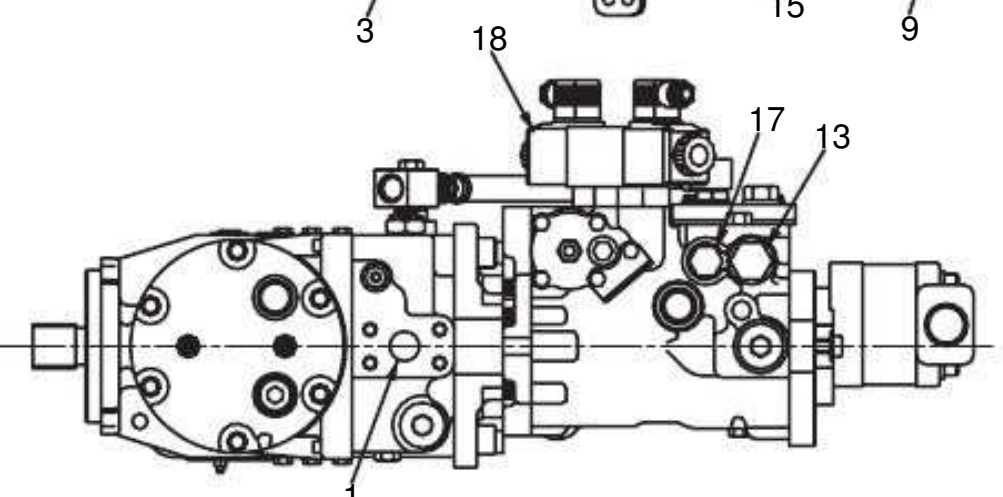
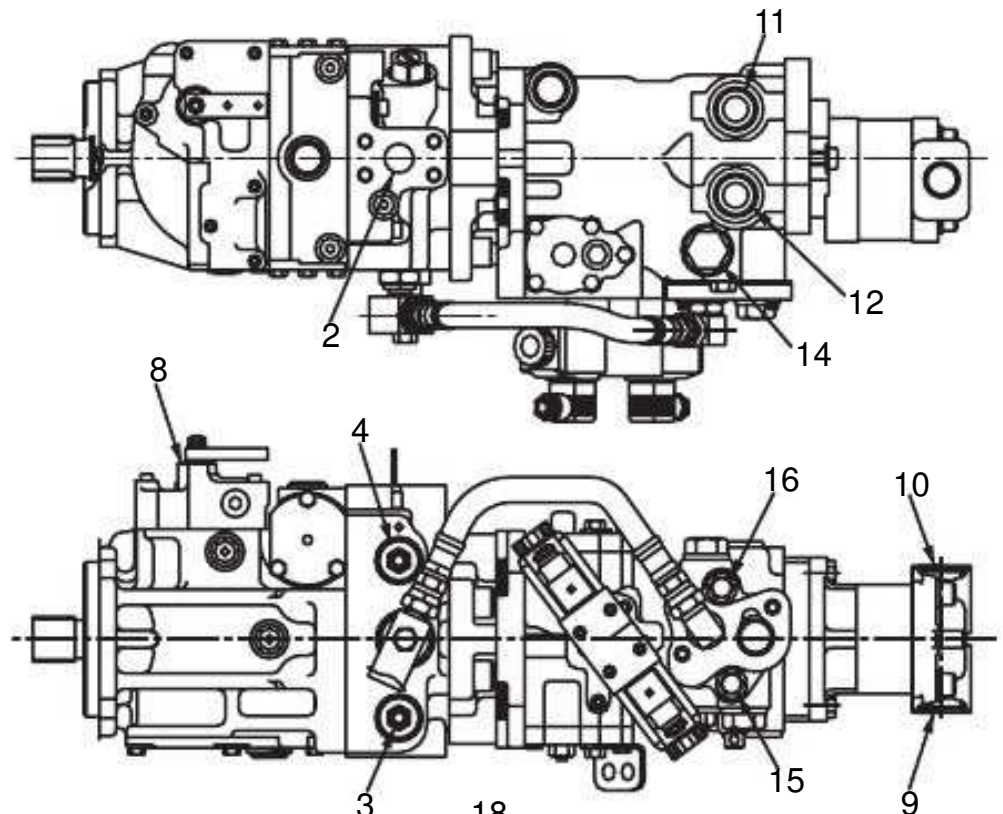
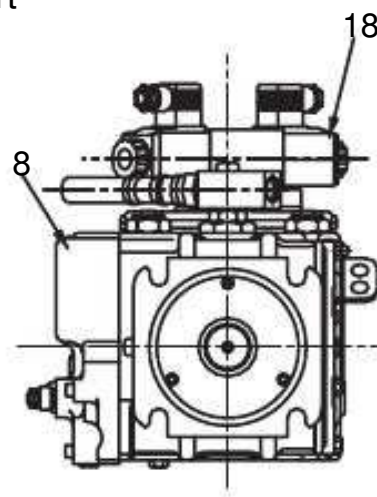
#### 2-1-1. Hydraulic pump ass'y (propulsion, vibrator, steering)

##### Propulsion pump:

1. Port A (reverse travel)
2. Port B (forward travel)
3. Multi-function valve (port A)
4. Multi-function valve (port B)
5. Circuit pressure gauge port (Port A)
6. Circuit pressure gauge port (port B)
7. Charge relief valve
8. Control valve

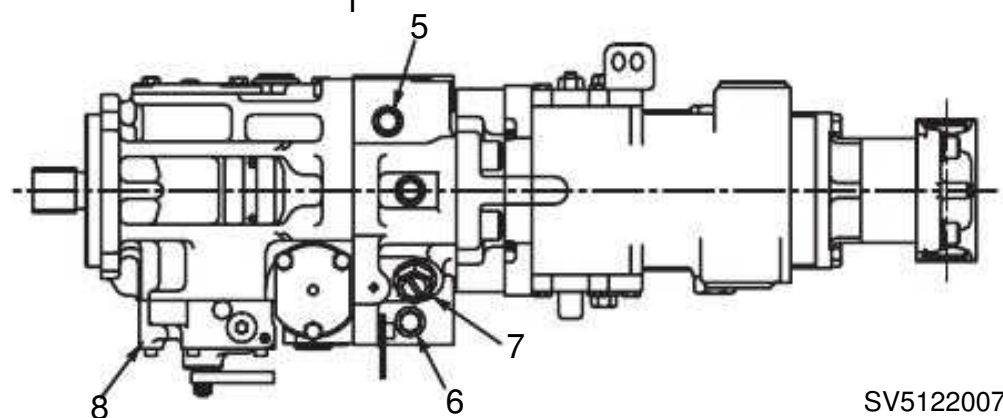
##### Steering pump:

9. Suction port
10. Delivery port



##### Vibrator pump:

11. Port A2 (low amplitude)
12. Port B2 (high amplitude)
13. High pressure relief valve (port A2)
14. High pressure relief valve (port B2)
15. High pressure gauge port (port A2)
16. High pressure gauge port (port B2)
17. Charge relief valve
18. Amplitude selector solenoid valve



SV5122007

##### Specifications

- Model: PV07546-608

##### Propulsion pump

- Displacement: 75cm<sup>3</sup>/rev(cc/rev)
- Pressure setting: 41.8MPa (6,050psi) {426kgf/cm<sup>2</sup>}
- Charge pressure setting: 2.4MPa (340psi) {24kgf/cm<sup>2</sup>}

##### Vibrator pump

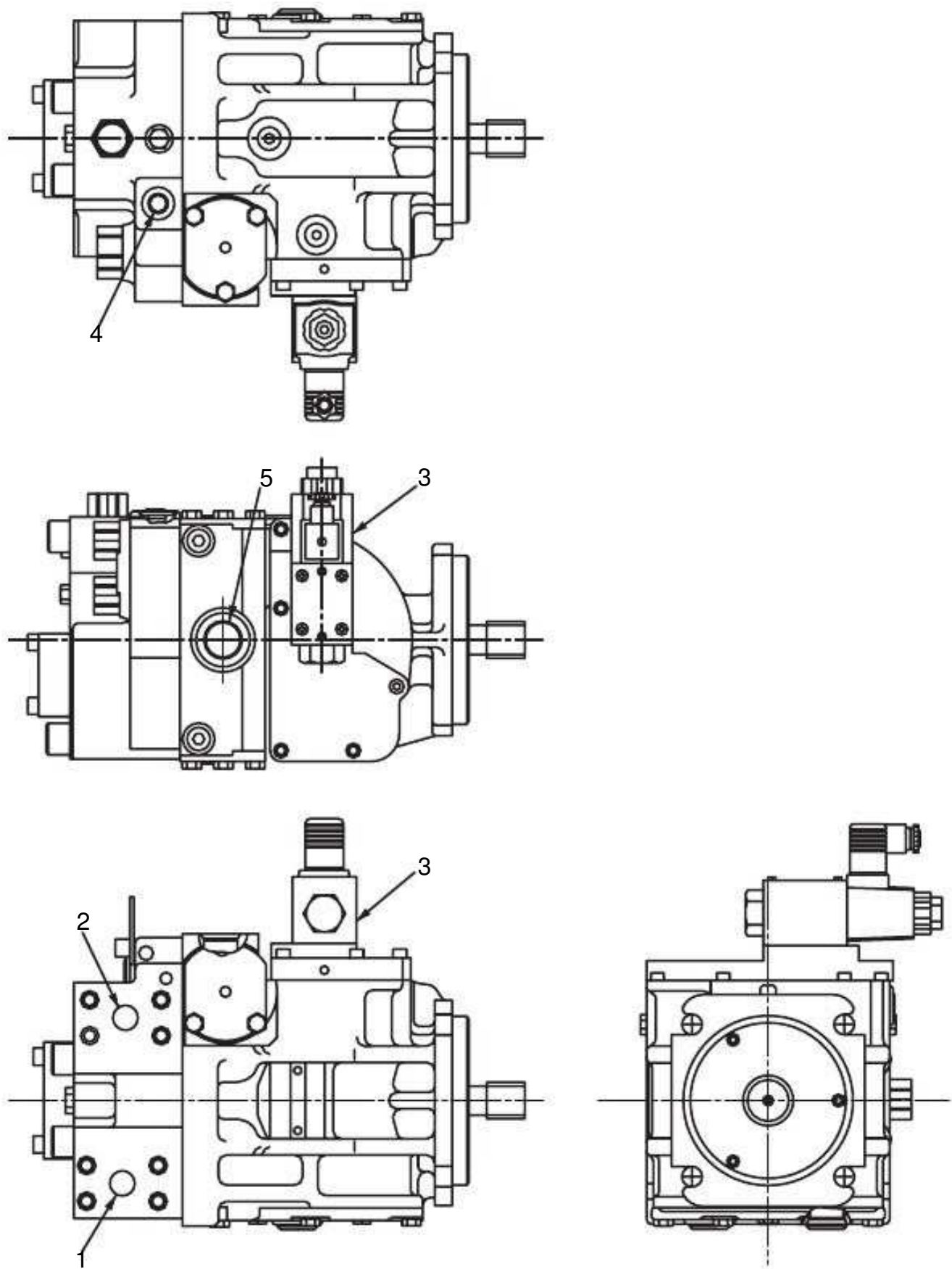
- Displacement: 45.9cm<sup>3</sup>/rev (cc/rev) (low amplitude)  
35cm<sup>3</sup>/rev (cc/rev) (high amplitude)
- Pressure setting: 25.0MPa (3,620psi) {255kgf/cm<sup>2</sup>}

- Charge circuit setting: 2.4MPa (340psi) {24kgf/cm<sup>2</sup>}

##### Steering pump

- Displacement: 24.9cm<sup>3</sup>/rev(cc/rev)
- Pressure setting: 15.0MPa (2,180psi) {153kgf/cm<sup>2</sup>} (valve in Orbitrol)

2-1-2. Propulsion motor (rear drive)

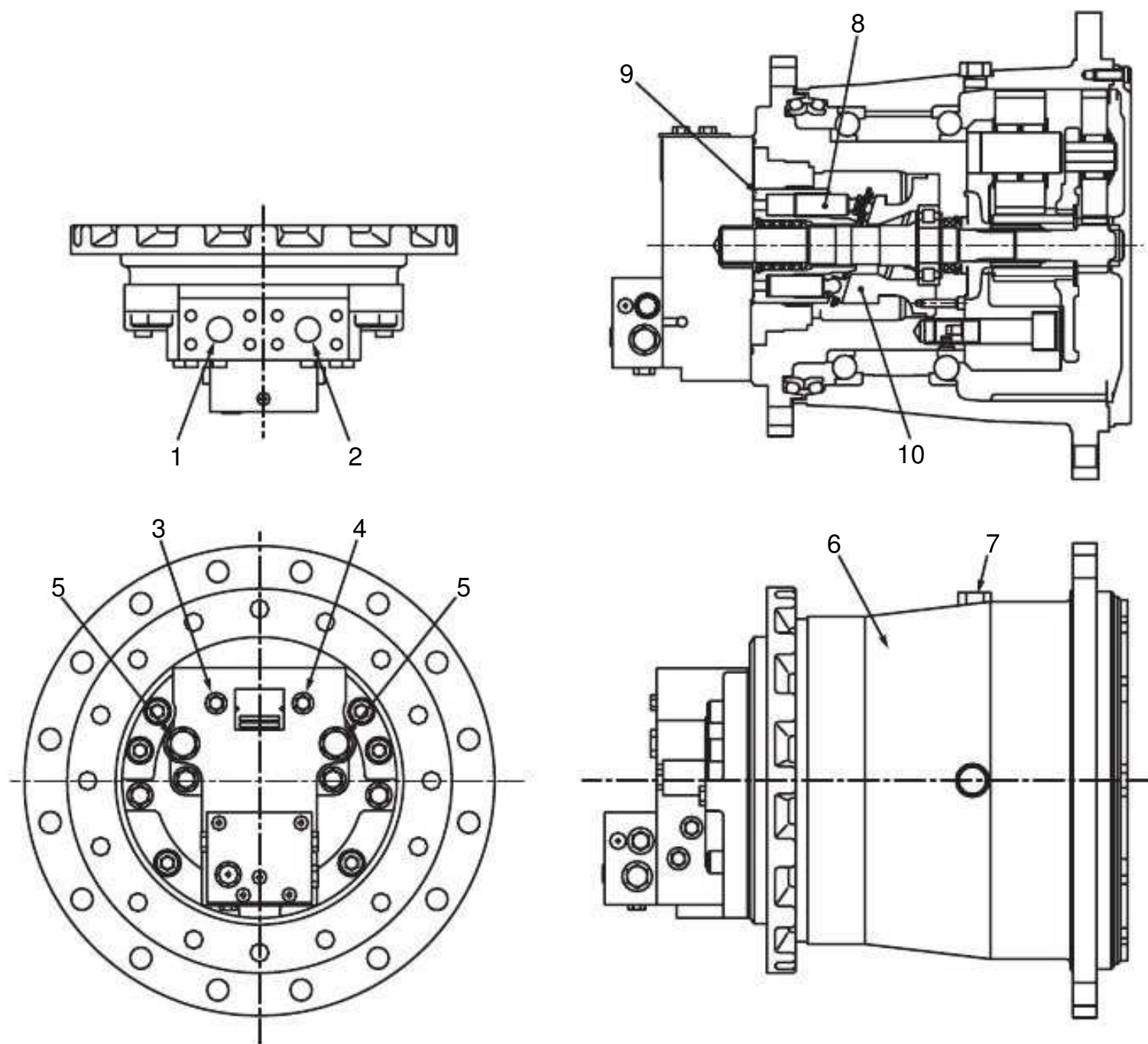


SV5122008

- 1. Port A (forward travel)
- 2. Port B (reverse travel)
- 3. Speed select solenoid valve
- 4. Speed shift circuit port  
(to operate servo piston)
- 5. Drain port

- Specifications
- Model: MV075-607
  - Displacement:  
(Min): 28cm<sup>3</sup>/rev(cc/rev)  
(Max): 75cm<sup>3</sup>/rev(cc/rev)
  - Circuit pressure setting:  
41.8MPa (6,050psi) {426kgf/cm<sup>2</sup>}  
(high pressure relief valve in pump)
  - Low pressure relief valve setting:  
2.22MPa (330psi) {23.6kgf/cm<sup>2</sup>}

### 2-1-3. Propulsion motor (front drive)



SV5102012

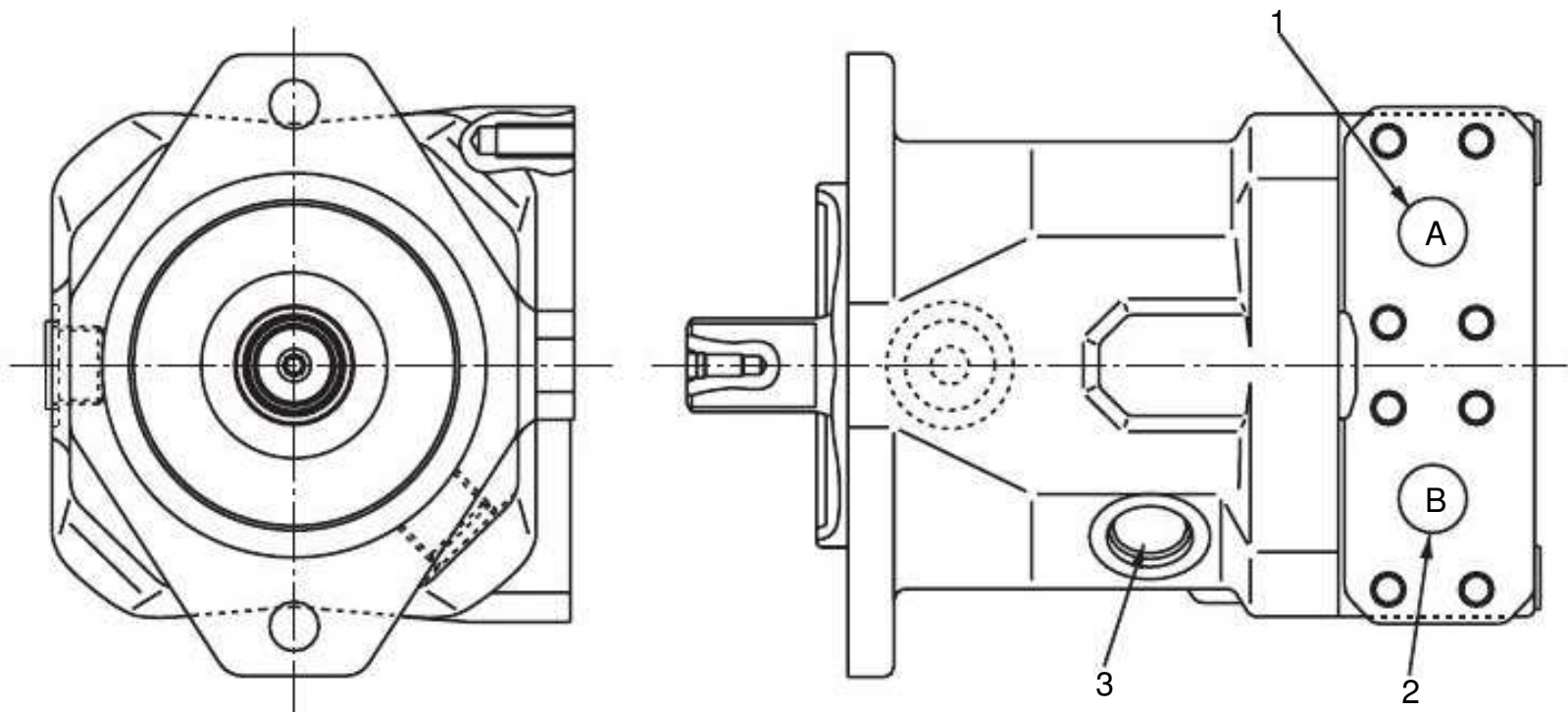
1. Port B (forward travel)
2. Port A (reverse travel)
3. High pressure gauge port (port B)
4. High pressure gauge port (port A)
5. Drain port
6. Reduction gear
7. Fill hole

- Motor:**
8. Piston
  9. Cylinder block
  10. Swashplate

#### Specifications

- Model: MF75
- Displacement: 75cm<sup>3</sup>/rev(cc/rev)
- Circuit pressure setting:  
41.8MPa (6,050psi) {426kgf/cm<sup>2</sup>}  
(high pressure relief valve in pump)

2-1-4. Vibrator motor



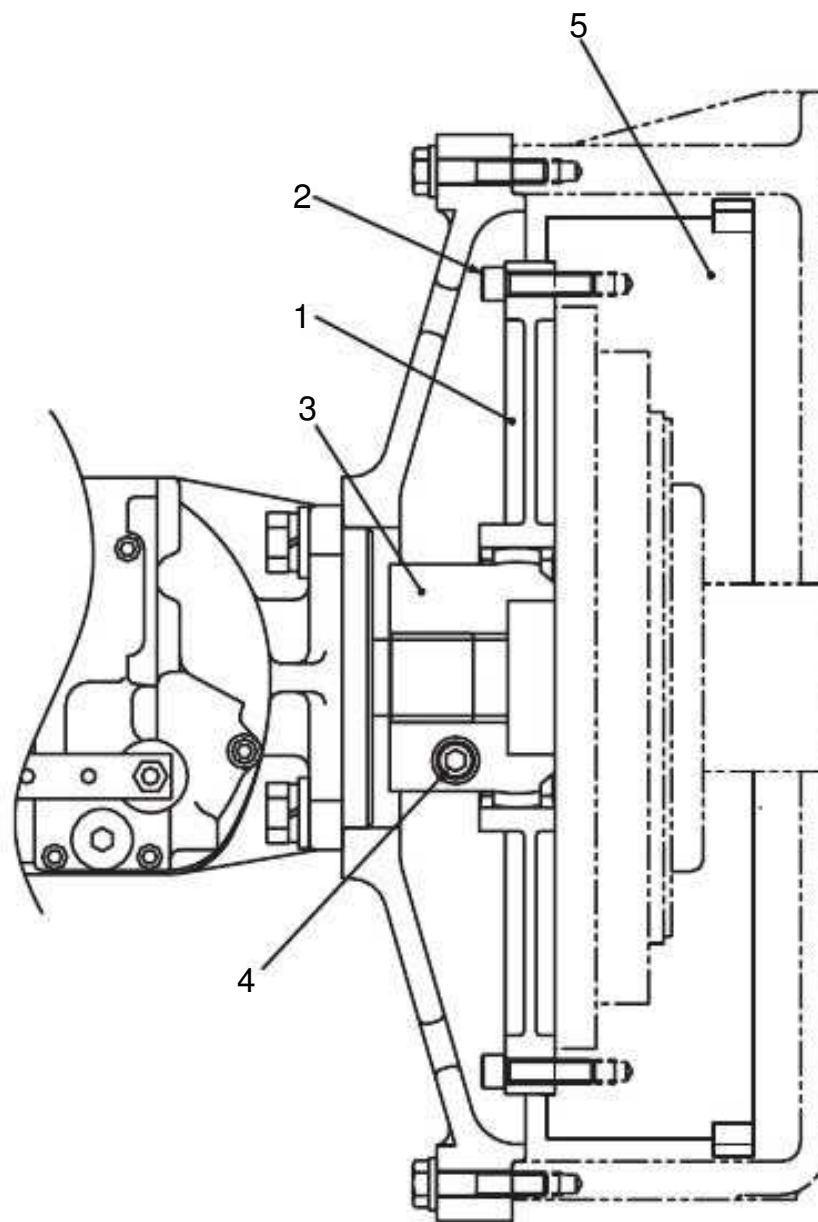
SV5122009

- 1. Delivery port (Lo)
- 2. Delivery port (Hi)
- 3. Drain port

- Specifications
- Model : A10FM
  - Displacement : 44.5cm<sup>3</sup>/rev(cc/rev)
  - Circuit pressure setting : 25MPa (3260psi) {255kgf/cm<sup>2</sup>}  
(high pressure relief valve in vibrator pump)

## 2-2. Coupling & hydraulic circuit

### 2-2-1. Coupling



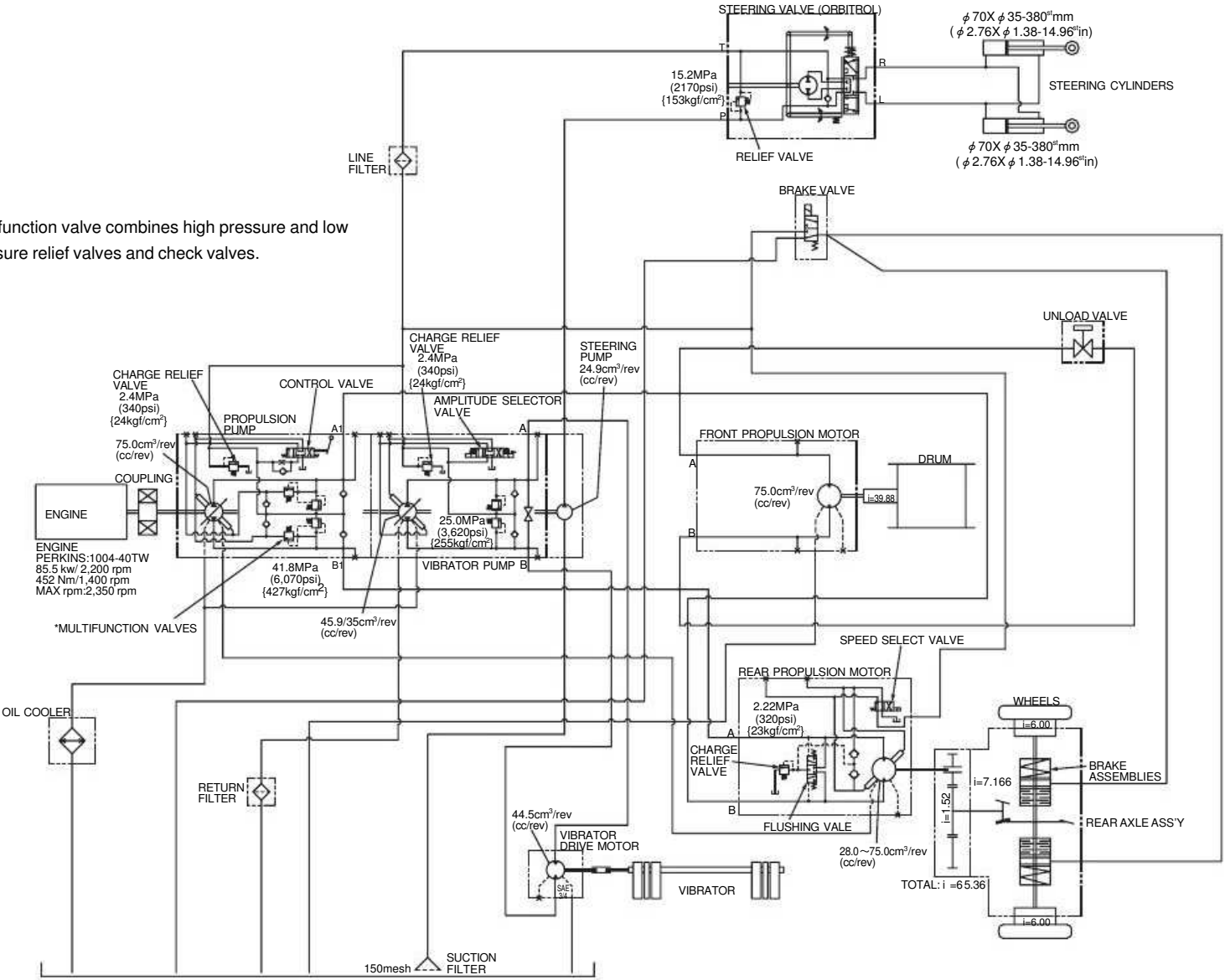
SV5122010

- 1. Flange
- 2. Bolt
- 3. Hub
- 4. Bolt
- 5. Flywheel

# MEMO

2-2-2. Hydraulic circuit

\* Multifunction valve combines high pressure and low pressure relief valves and check valves.

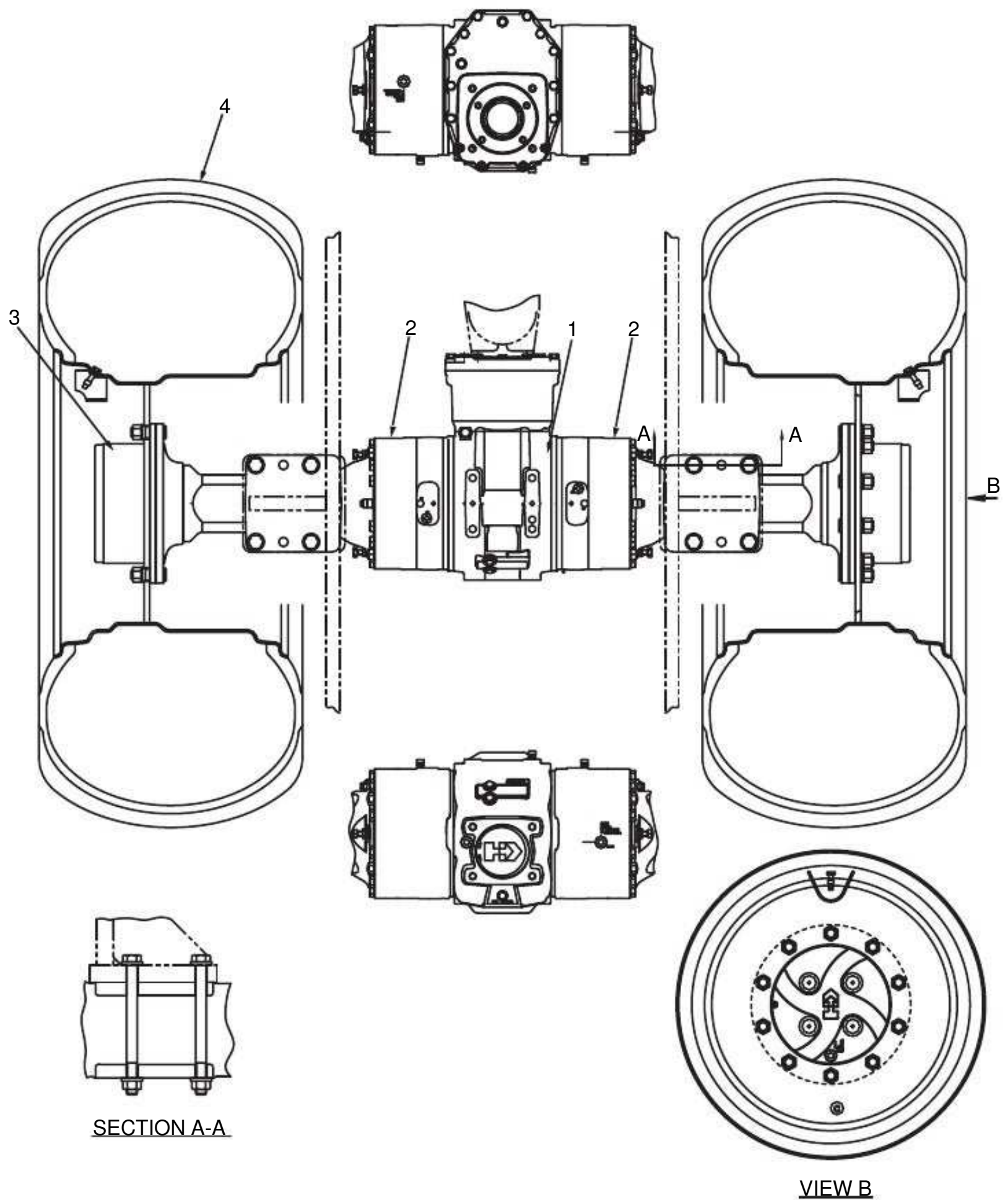


SV5122011



## 2-3. Description and operation of propulsion system

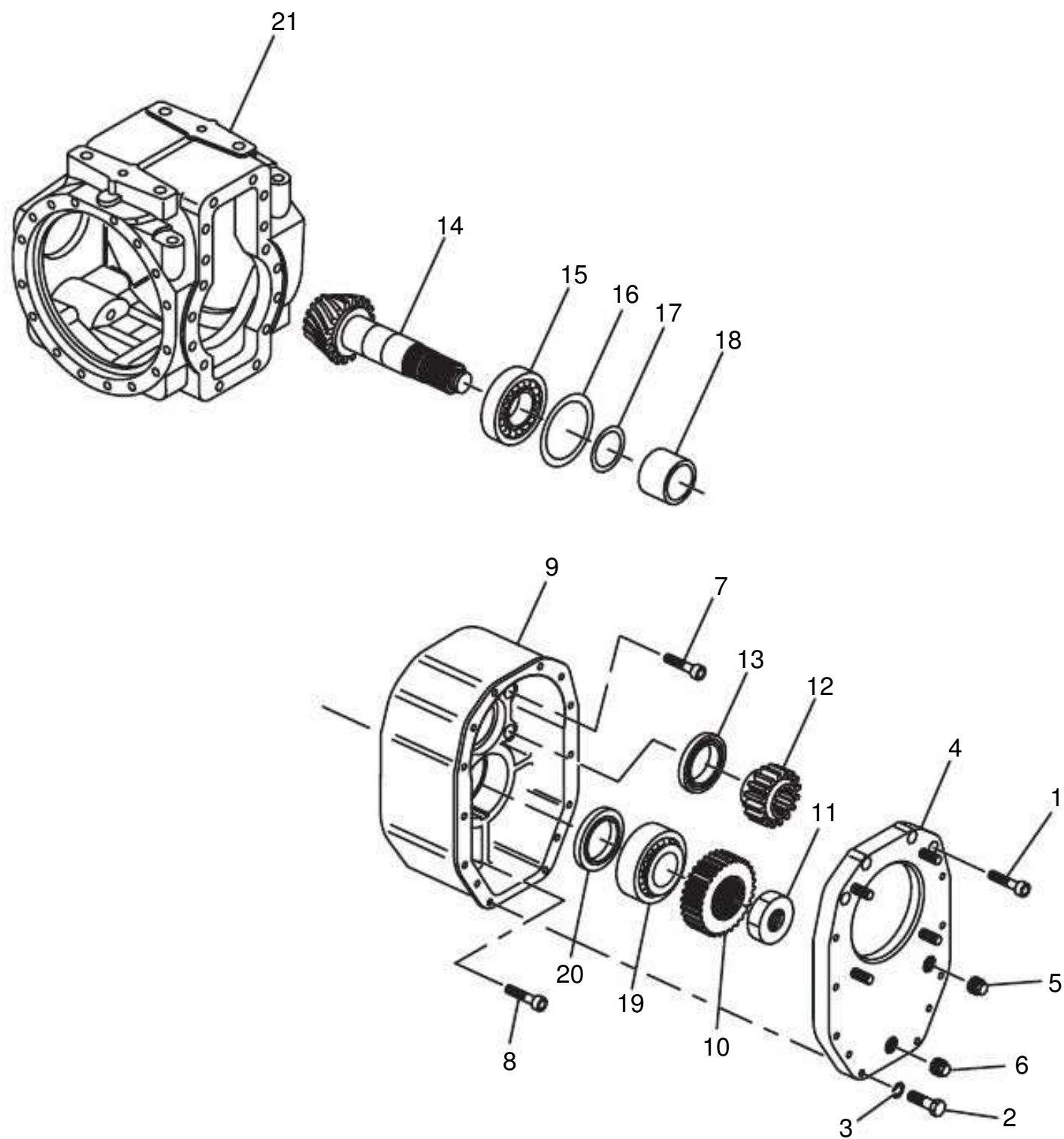
### 2-3-1. Rear axle ass'y



SV5122012

1. Differential
2. Brakes
3. Final drive
4. Tires

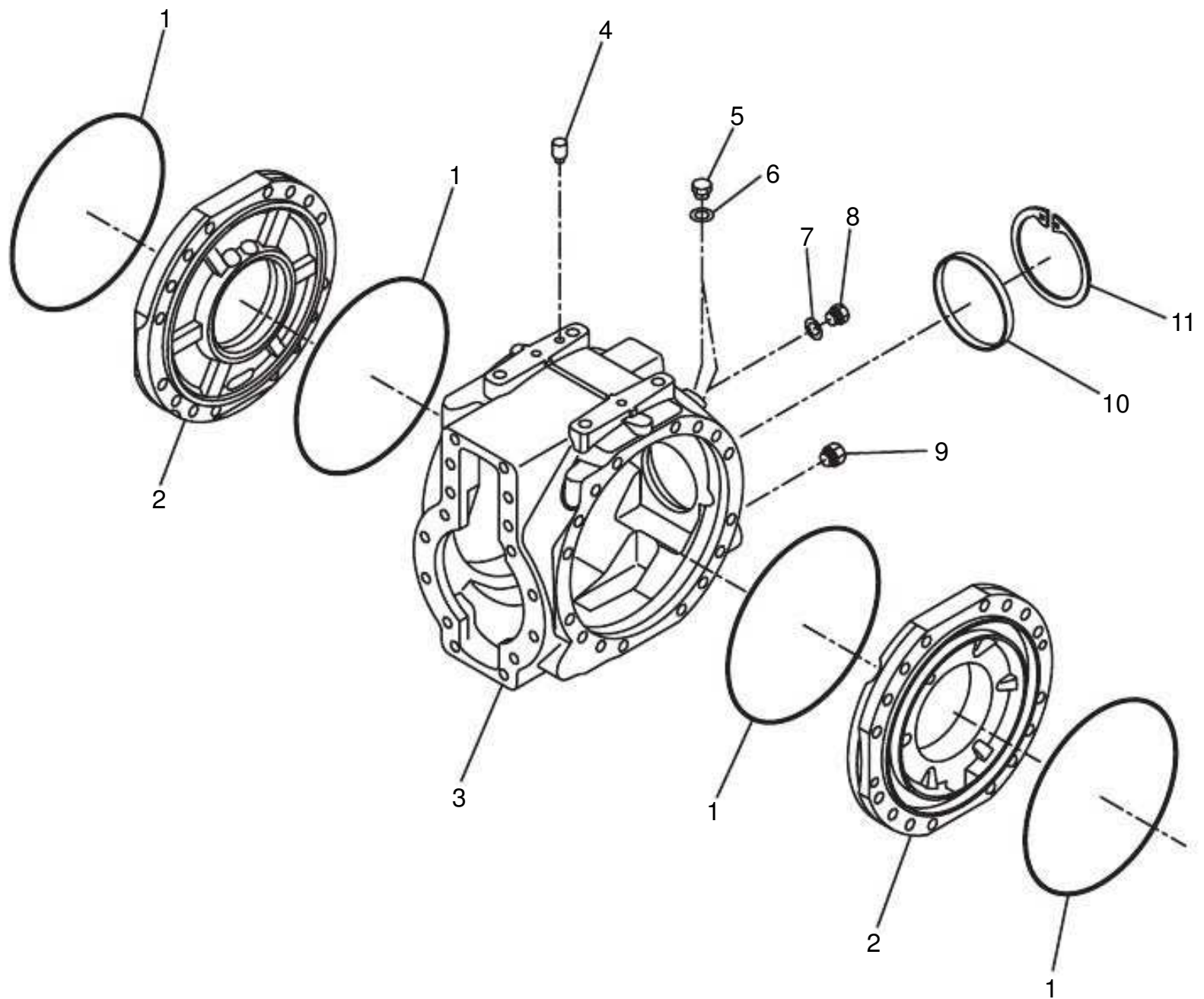
2-3-2. Differential (1/2)



SV5122013

- |           |                        |             |
|-----------|------------------------|-------------|
| 1. Bolt   | 8. Bolt                | 15. Bearing |
| 2. Bolt   | 9. Housing             | 16. Shim    |
| 3. Washer | 10. Gear               | 17. Shim    |
| 4. Cover  | 11. Nut                | 18. Spacer  |
| 5. Plug   | 12. Gear               | 19. Bearing |
| 6. Plug   | 13. Seal               | 20. Seal    |
| 7. Bolt   | 14. Bevel pinion shaft | 21. Housing |

### 2-3-2. Differential (2/2)



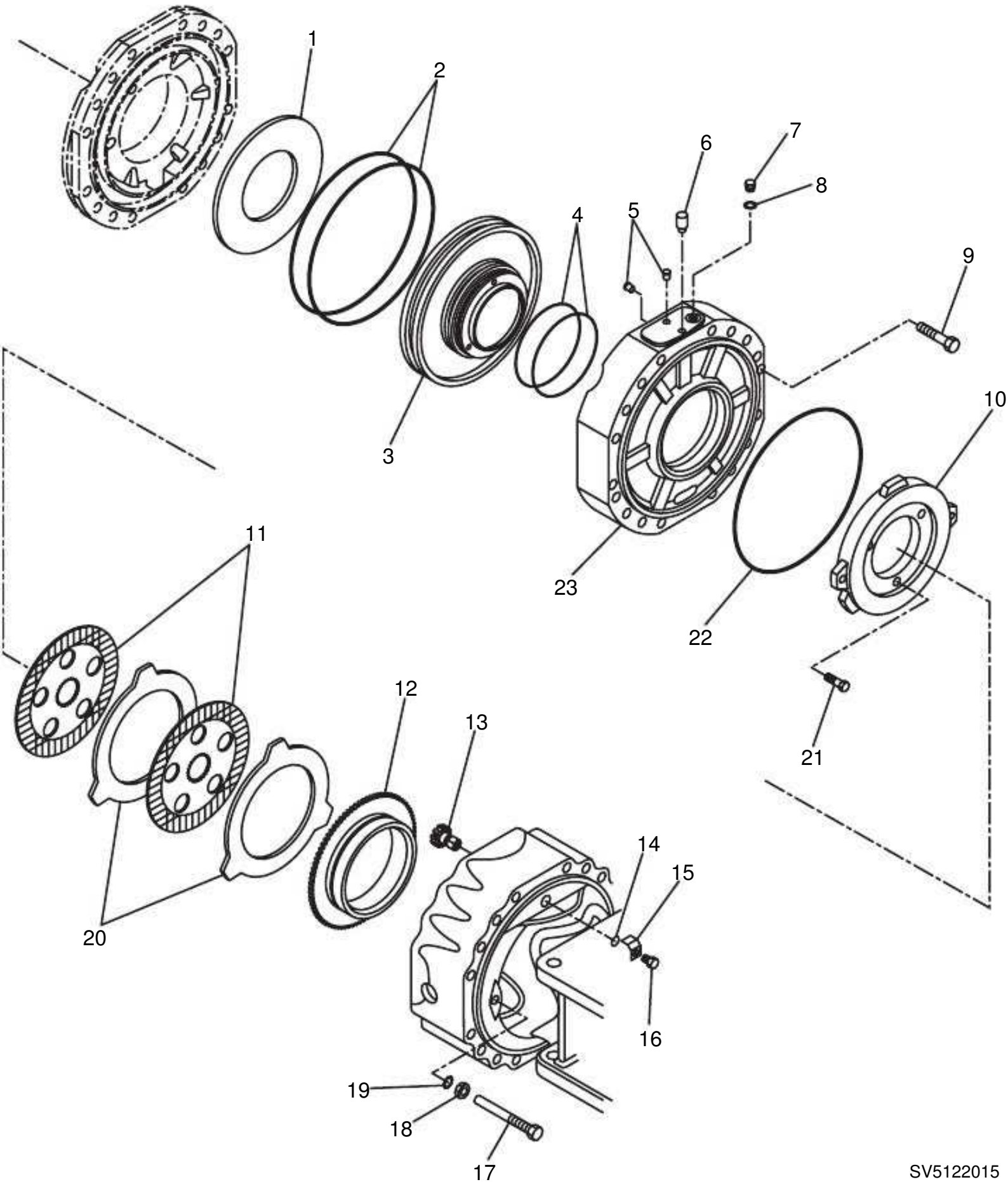
SV5122014

1. O-ring  
2. Cover  
3. Housing  
4. Vent

5. Bolt  
6. Seal washer  
7. Seal washer  
8. Plug

9. Magnet plug  
10. Ring  
11. Snap ring

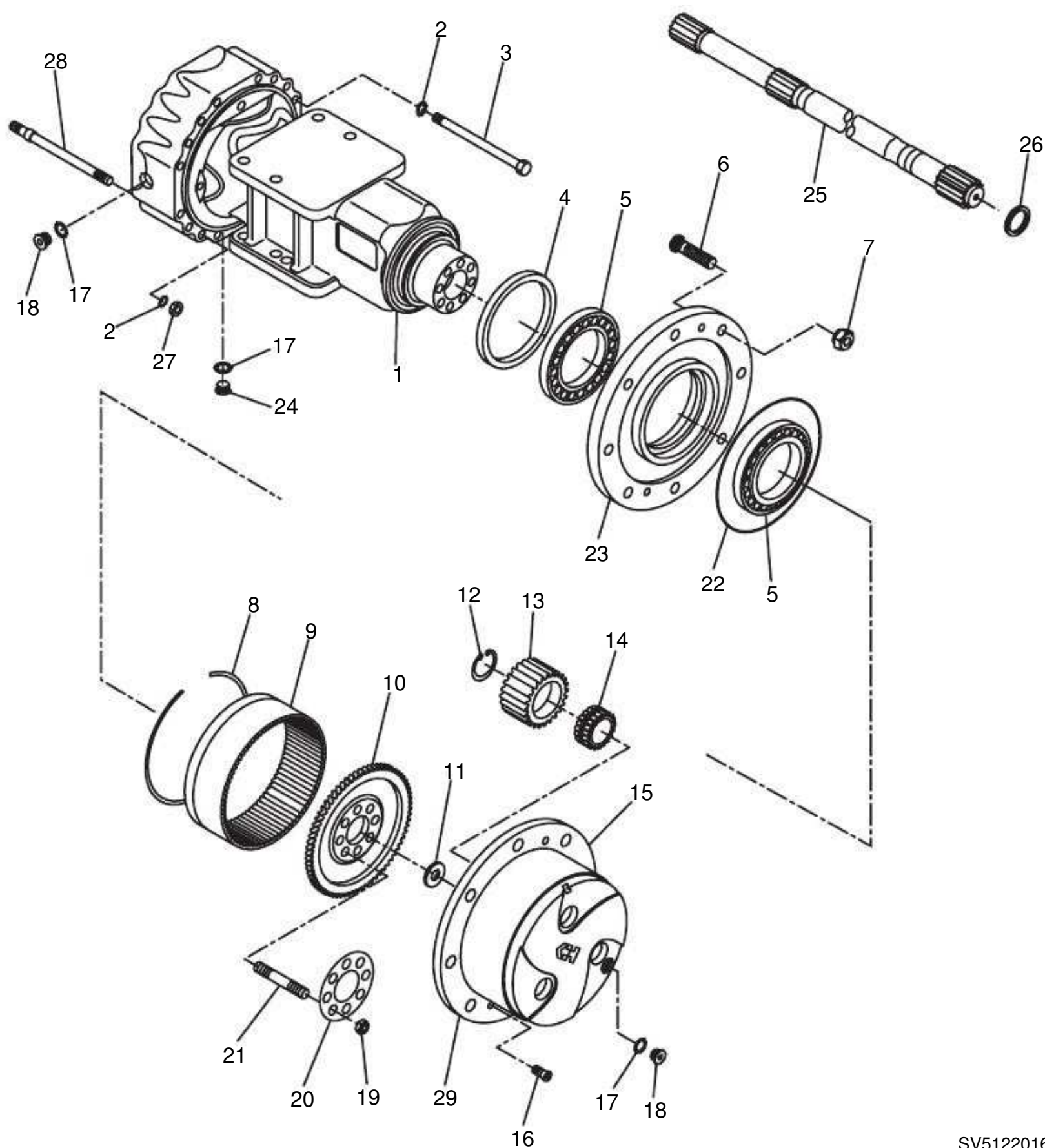
2-3-3. Brake



SV5122015

- |                |                   |                             |
|----------------|-------------------|-----------------------------|
| 1. Spring      | 9. Bolt           | 17. Bolt                    |
| 2. O-ring      | 10. Disc          | 18. Nut                     |
| 3. Piston      | 11. Brake disc    | 19. Lock washer             |
| 4. O-ring      | 12. Ring          | 20. Intermediate brake disc |
| 5. Grub bolt   | 13. Pinion        | 21. Cylinder bolt           |
| 6. Vent        | 14. O-ring        | 22. O-ring                  |
| 7. Bolt        | 15. Locking plate | 23. Cover                   |
| 8. Seal washer | 16. Hexagon bolt  |                             |

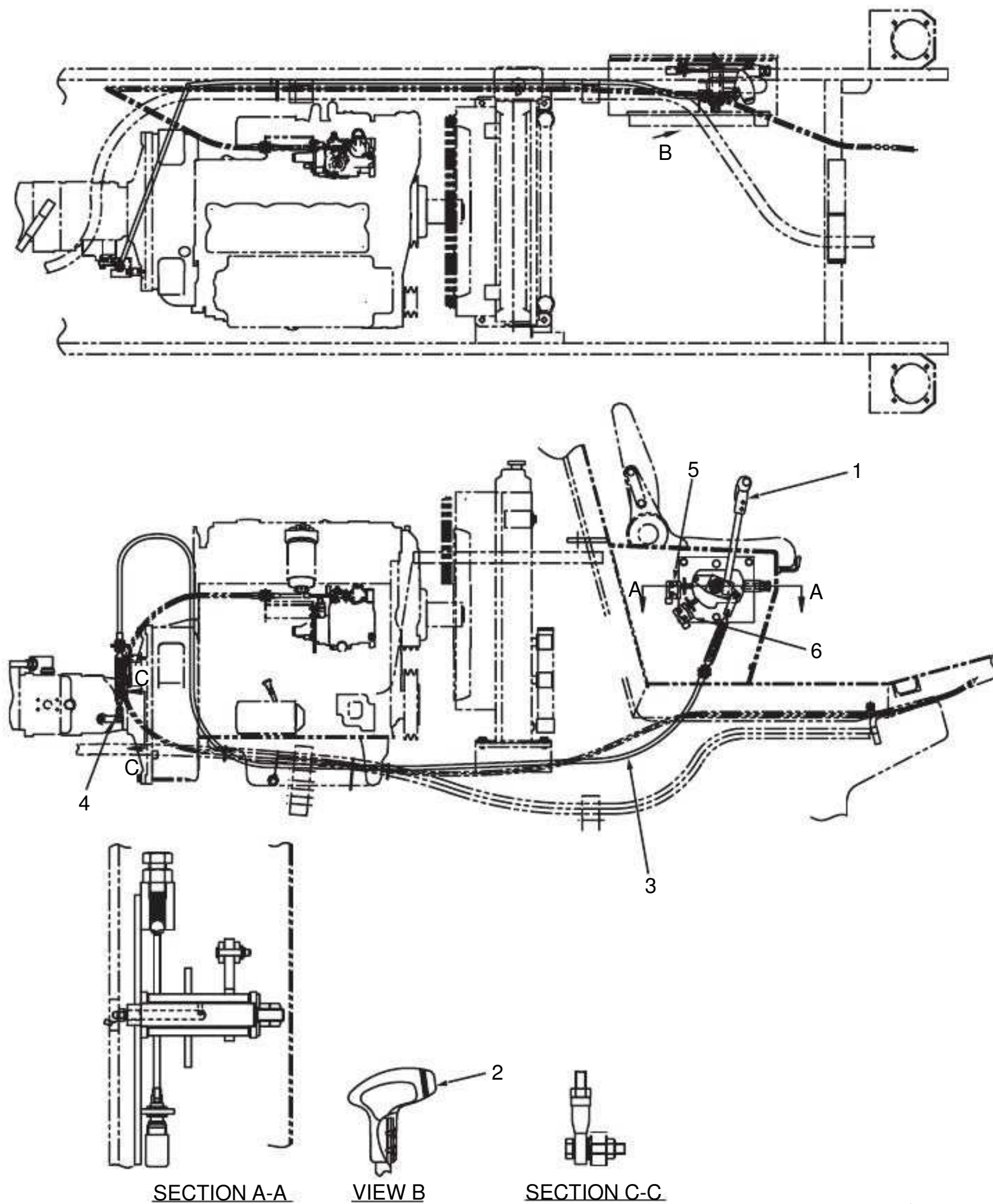
### 2-3-4. Final drive



SV5122016

- |                       |                         |                         |
|-----------------------|-------------------------|-------------------------|
| 1. Axle case          | 11. Friction washer     | 21. Stud                |
| 2. Spring washer      | 12. Ring                | 22. O-ring              |
| 3. Bolt               | 13. Planet gear         | 23. Wheel hub           |
| 4. Seal               | 14. Bearing             | 24. Magnet plug         |
| 5. Bearing            | 15. Planet gear carrier | 25. Half shaft          |
| 6. Wheel stud         | 16. Countersunk bolt    | 26. Seal                |
| 7. Wheel nut          | 17. Seal washer         | 27. Nut                 |
| 8. Circlip            | 18. Plug                | 28. Stud                |
| 9. Ring gear          | 19. Nut                 | 29. Planet gear carrier |
| 10. Ring gear support | 20. Locking plate       |                         |

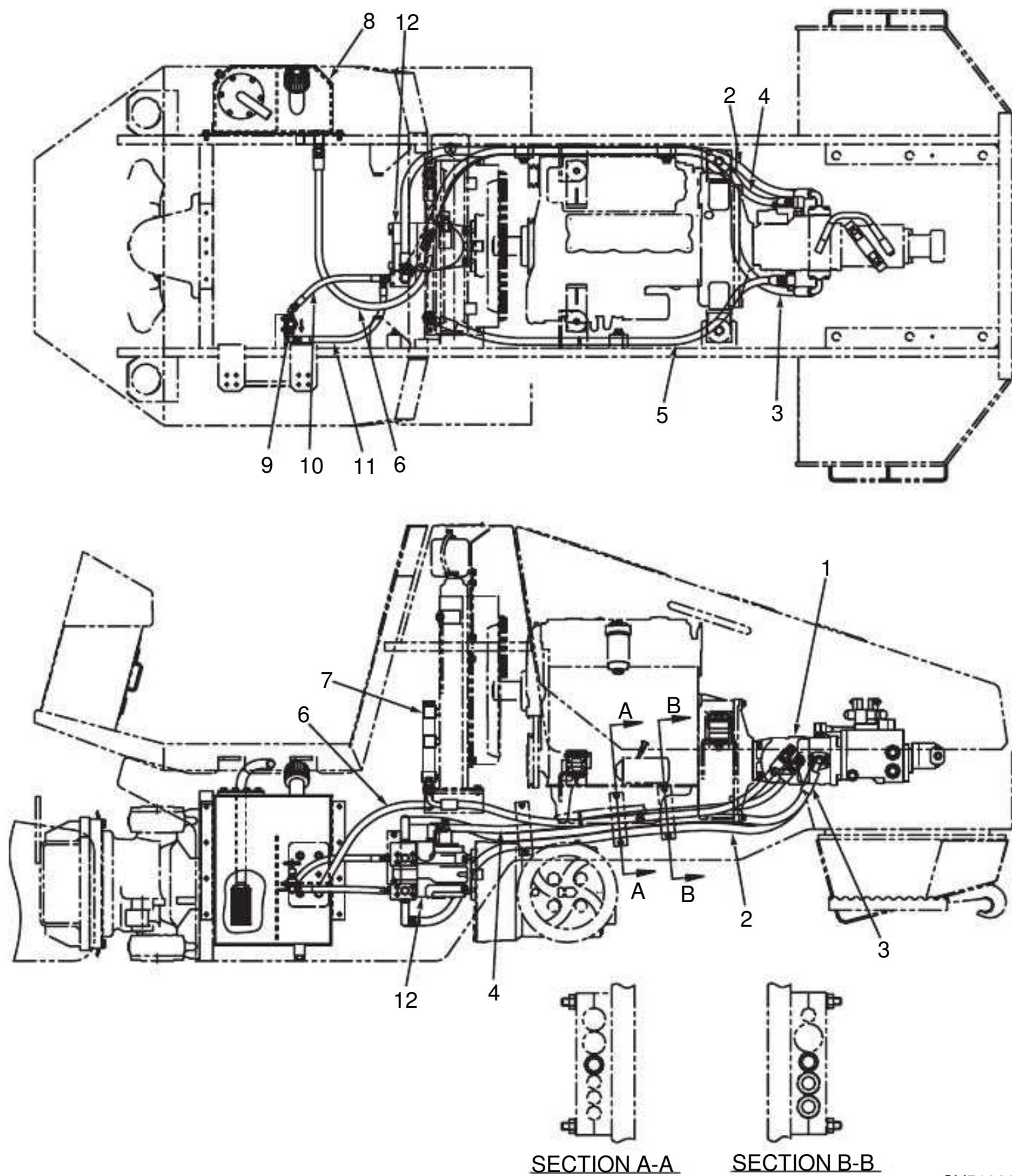
### 2-3-5. Travel controls (forward-reverse)



SV5122017

1. Forward-reverse lever
2. Vibrator switch
3. Cable
4. Control lever
5. Interlock switch
6. Reverse alarm switch

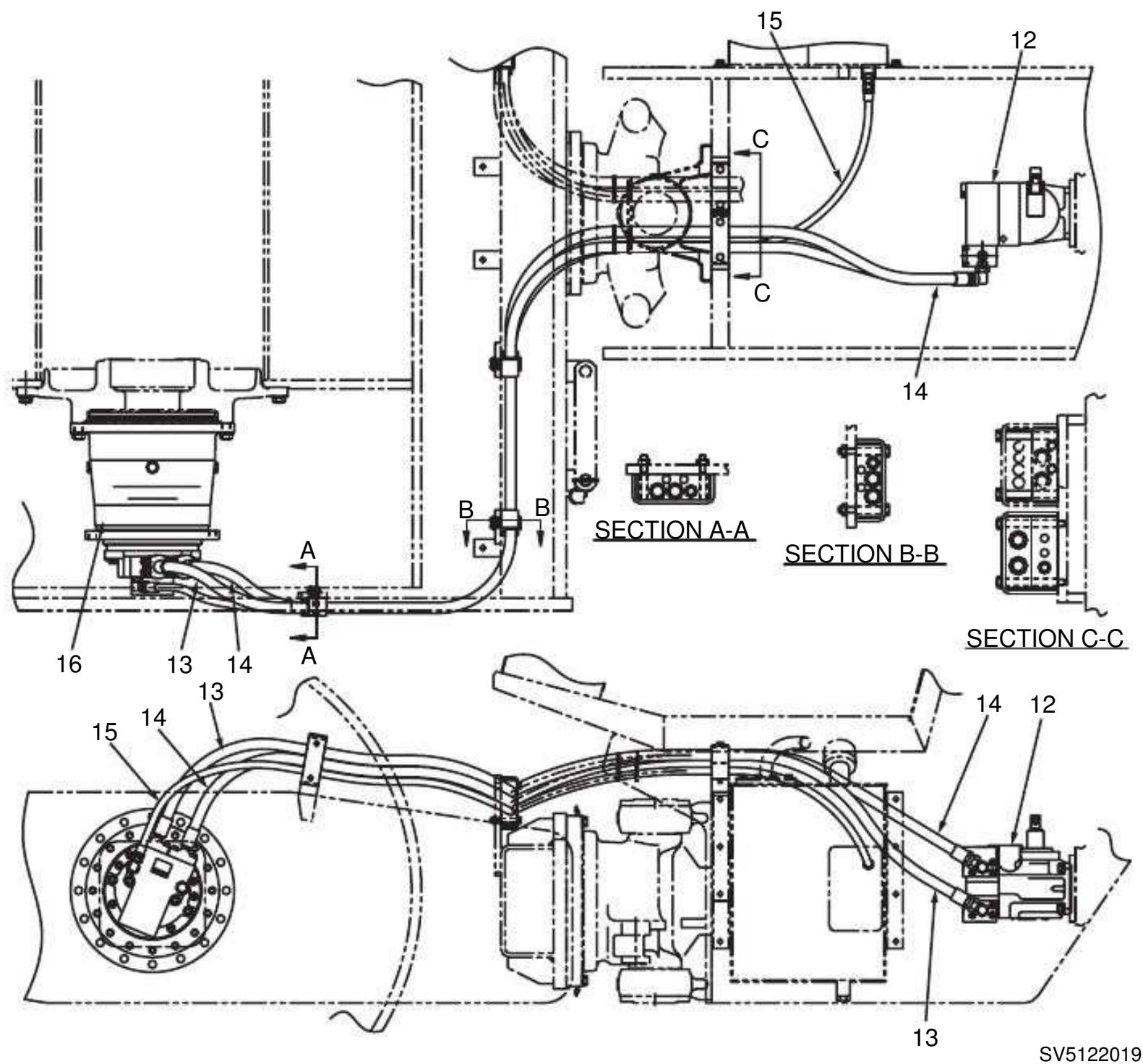
### 2-3-6. Hydraulic hosework (rear drive)



SV5122018

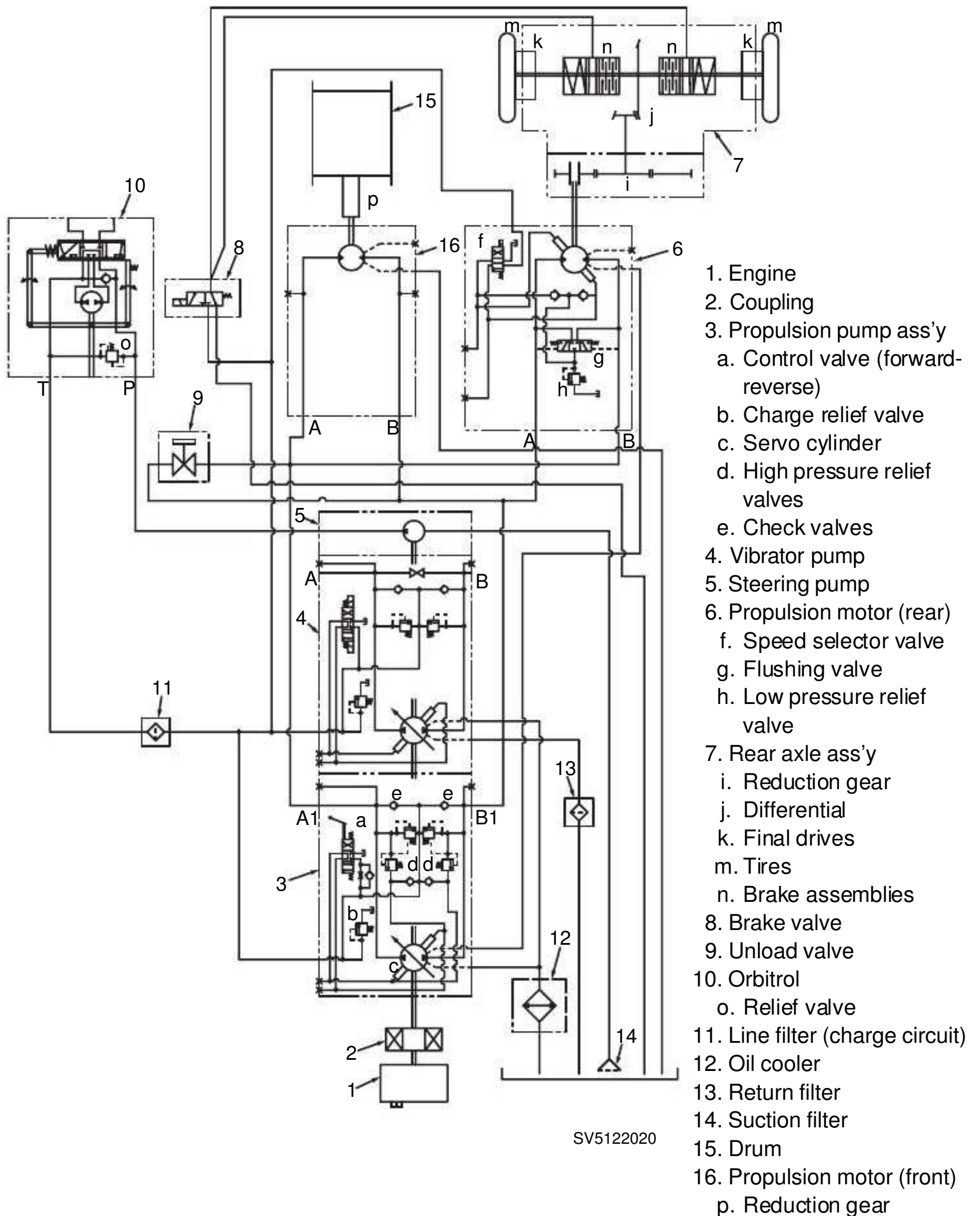
- |                                        |                             |
|----------------------------------------|-----------------------------|
| 1. Propulsion pump                     | 7. Oil cooler               |
| 2. High pressure hose (forward travel) | 8. Hydraulic tank           |
| 3. High pressure hose (reverse travel) | 9. Unload valve             |
| 4. Hose (motor to pump)                | 10. Hose (unload)           |
| 5. Hose (pump to oil cooler)           | 11. Hose (unload)           |
| 6. Hose (oil cooler to tank)           | 12. Propulsion motor (rear) |

2-3-7. Hydraulic hosework (front drive)



- 12. Propulsion motor (rear)
- 13. High pressure hose (forward travel)
- 14. High pressure hose (reverse travel)
- 15. Return hose
- 16. Propulsion motor (front)

2-3-8. Propulsion circuit (rear drive specification)



SV5122020

### 2-3-9. Description and operation of propulsion line

◆ For the circuit diagram, refer to page 2-025.

#### Description:

- Made up of propulsion pump (3), rear propulsion motor (6), rear axle ass'y (7), front propulsion motor (16), drum (15) and brake valve (8).

Rear axle ass'y (7) includes reduction gear (i), differential (j), final drives (k), pneumatic tires (m) and brake assemblies (n).

#### Basic function of propulsion pump and motor:

##### Propulsion pump

- A piston pump is used. By varying swashplate angle which varies the piston stroke, forward travel, bringing to neutral and backing are achieved.

##### Propulsion motor

- Piston motors are used. The front motor is a fixed displacement motor in which the piston stroke is not variable, while the rear motor is a variable displacement type which controls the piston stroke by varying the swashplate angle.

#### Operation (It is assumed that the machine travels forward.):

★The parking brake is supposed to have been released.

- ◆ Assemblies such as pump ass'y and motor ass'y are indicated by numbers such as "1" and "2", while component parts of assemblies are shown by small letters such as "a" and "b".

★For the circuit diagram, refer to page 2-025.

- Operation of the forward-reverse lever (F-R lever) forward puts pump servo valve (a) into function. Servo piston (c) tilts the pump swashplate in the forward travel direction.
- Propulsion pump (3) discharges oil from its port B1. Then the oil flow branches into two lines; one line connecting to forward travel port (A) of rear motor (6) and the other line to forward travel port (B) of front motor (16).
- The oil fed into the forward travel ports of the motors drives the motors, flowing out from the

opposite side ports (port A in front motor and port B in rear motor) and joins again to flow into suction port (A1) in propulsion pump (3). At the same time, part of oil is drained to the tank via flushing valve (g), low pressure relief valve (h), and the motor casing.

**NOTE: Because the propulsion circuit is a closed circuit, the relationship between the suction port and discharge port is reversed when the travel direction is reversed.**

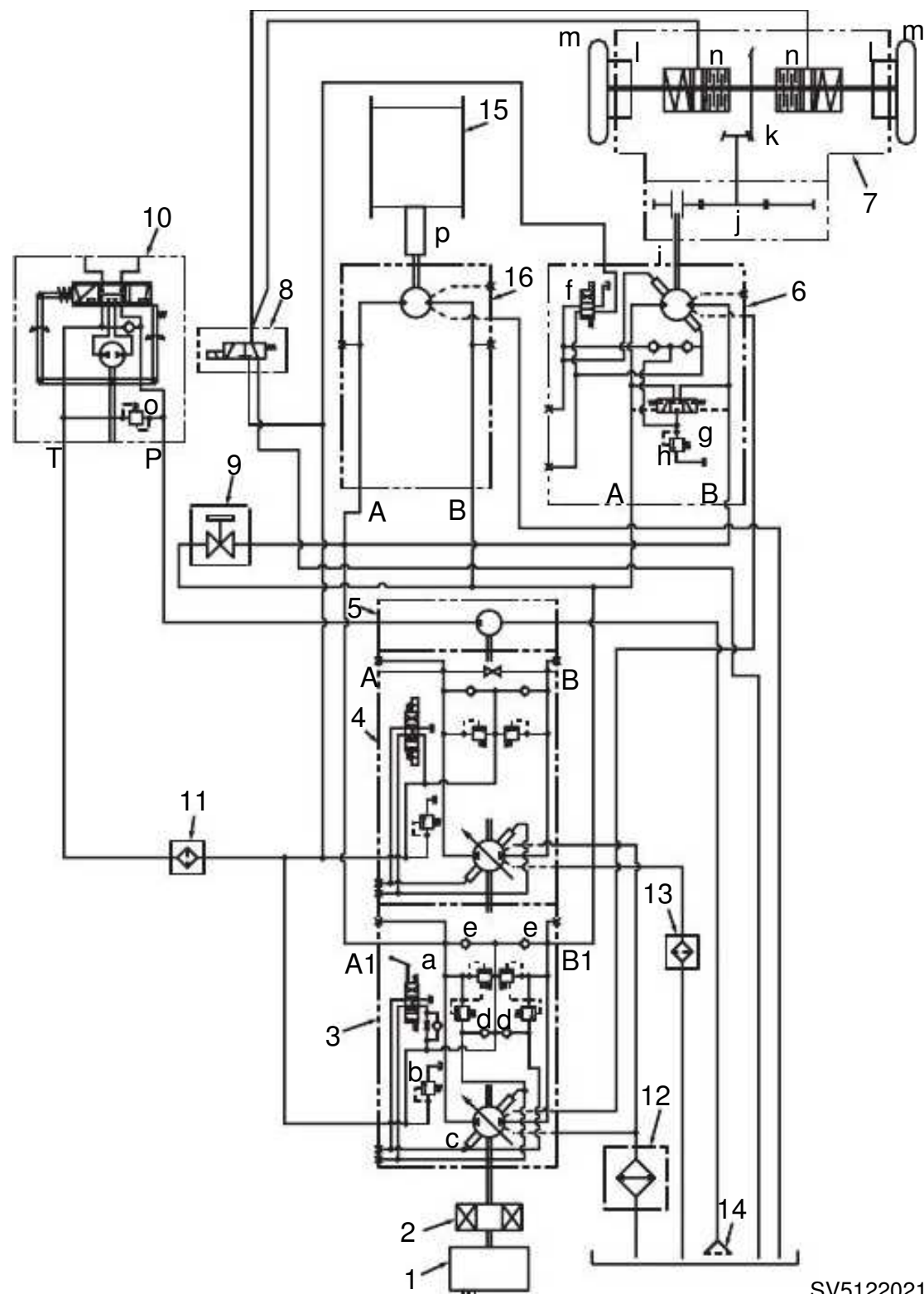
- The power from rear motor (6) is delivered to tires (m) through reduction gear (i) built in rear axle ass'y (7), the reduction mechanism in differential (j) and final drives (k).
- The drive from front motor (16) is conveyed to drum (15) via reduction gear (p).

### Two-step Speed selection (High-Low)

- ◆ From Low to High
- Rear motor (6) incorporates speed select solenoid valve (f). Setting the selector switch to the rabbit icon feeds the pressurized oil via the valve to piston (i) in the speed shift mechanism.
- This tilts the motor swashplate to the direction in which the piston stroke is reduced. (The motor displacement decreases from  $75\text{cm}^2$  to  $28\text{cm}^2$ .)
- This decrease in displacement increases the vehicle speed with the pump delivery remaining constant.

### To rerelease parking brake:

- Rear axle ass'y (7) contains brake assemblies (n).
- Actuation of the brake switch on the instrument panel in the driver's station energizes brake valve (8). The oil under pressure is fed, via brake valve (8), into the brake cylinders.
- This moves the brake pistons against the compression spring load, releasing the brake.



SV5122021

### **Circuit protection against high pressure**

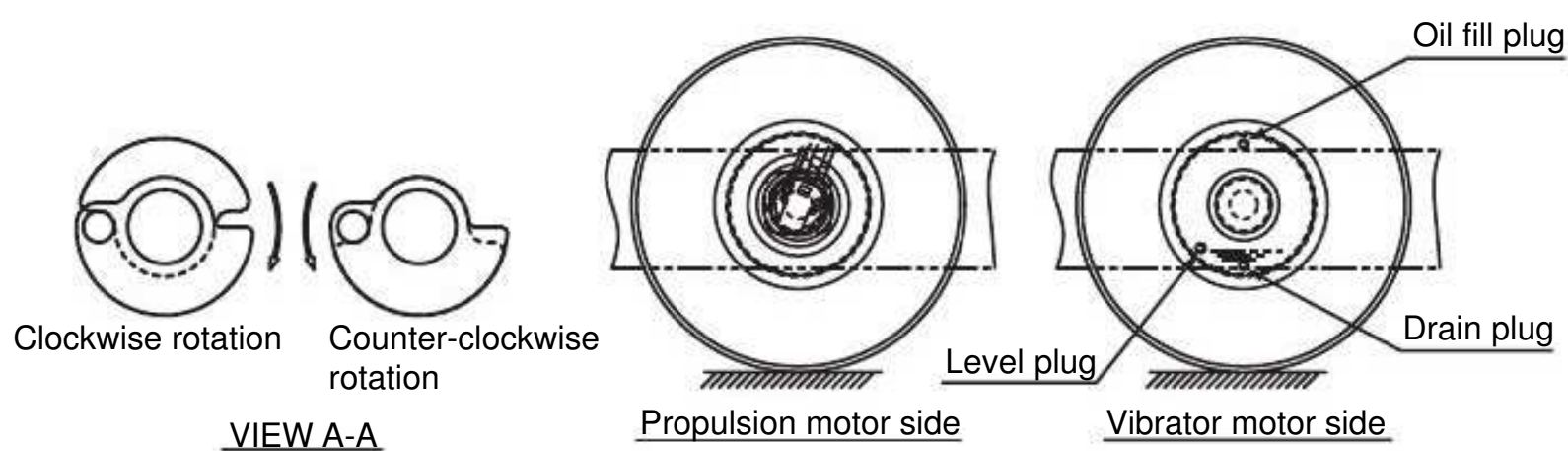
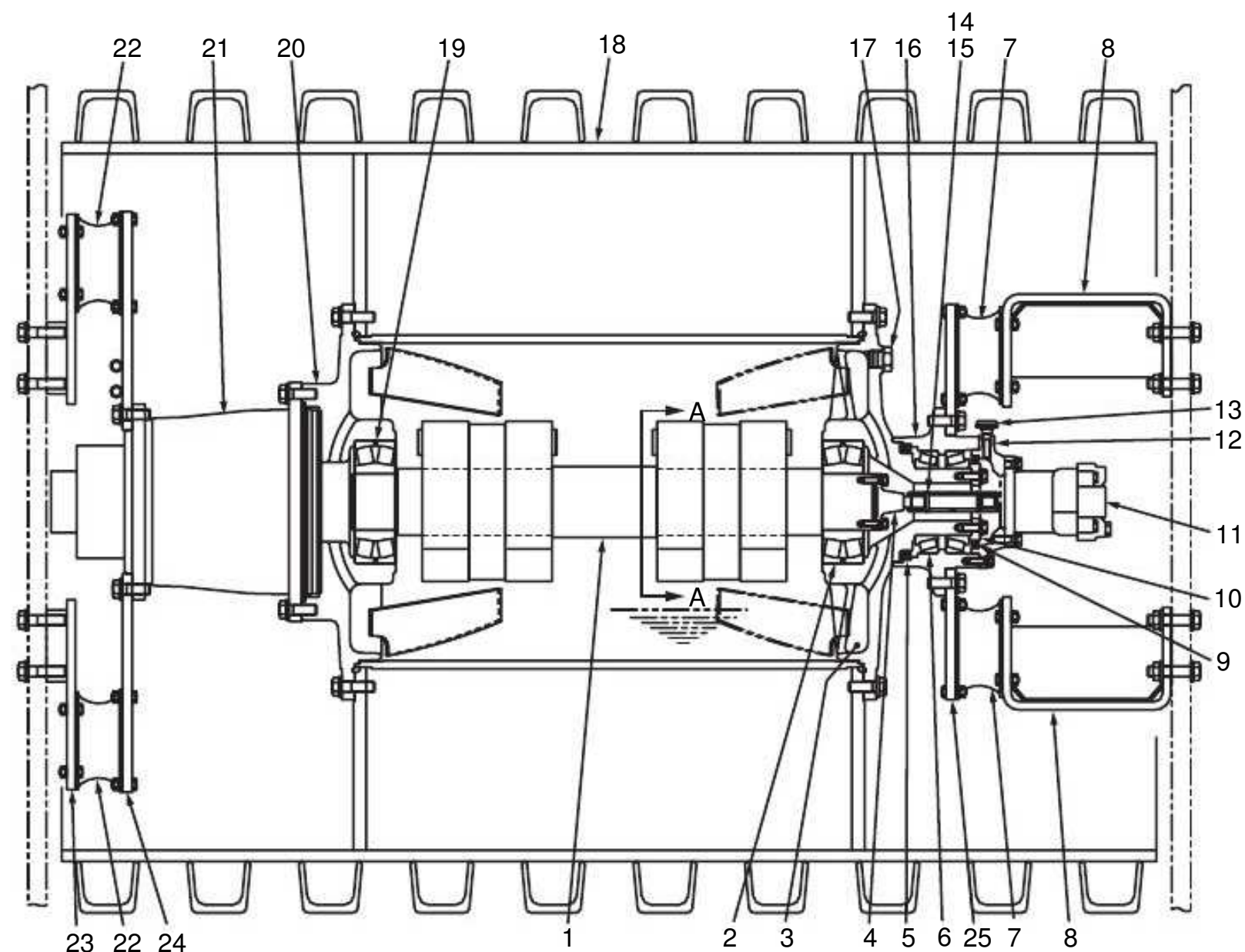
- High pressure relief (d) built in propulsion pump (3) open to relieve the pressure if the system pressure exceeds the setting of the valves.

### **Charge circuit**

- The propulsion circuit is of a closed circuit, which needs feeding of oil into it for making up deficiency.
- In the charge circuit, oil from steering pump (5) flows into steering valve, Orbitrol (10), then the whole amount of oil goes to propulsion pump (3) via filter (11) irrespective of the steering wheel operation.
- Charge relief valve (b) built in propulsion pump (3) maintains the pressure to operate the pump swashplate when the F-R lever is in the neutral position. When travelling, low pressure relief valve (h) built in propulsion motor (6) performs oil renewal, cooling or removal of foreign material as well as keeping the necessary pressure to control the pump swashplate angle.



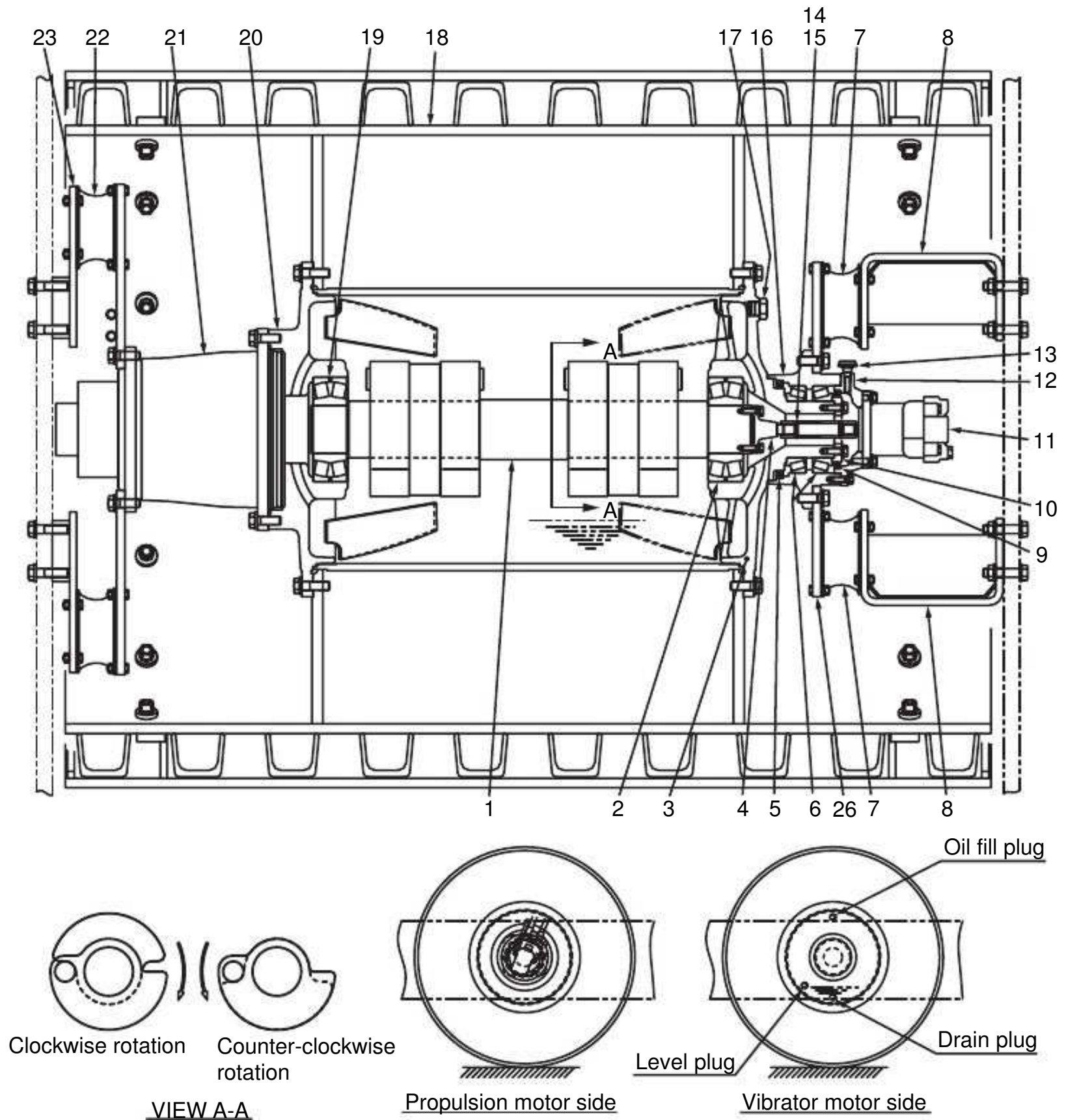
### 2-4-2. Drum & vibrator (model T)



SV5122023

- |                   |                    |                      |            |
|-------------------|--------------------|----------------------|------------|
| 1. Vibrator shaft | 8. Holder          | 15. Spring pin       | 22. Damper |
| 2. Roller bearing | 9. Oil seal        | 16. Housing          | 23. Holder |
| 3. Axle shaft     | 10. Cover          | 17. Plug             | 24. Disc   |
| 4. Shaft          | 11. Vibrator motor | 18. Tamping drum     | 25. Disc   |
| 5. Oil seal       | 12. Cover          | 19. Roller bearing   |            |
| 6. Roller bearing | 13. Breather       | 20. Axle shaft       |            |
| 7. Damper         | 14. Sleeve         | 21. Propulsion motor |            |

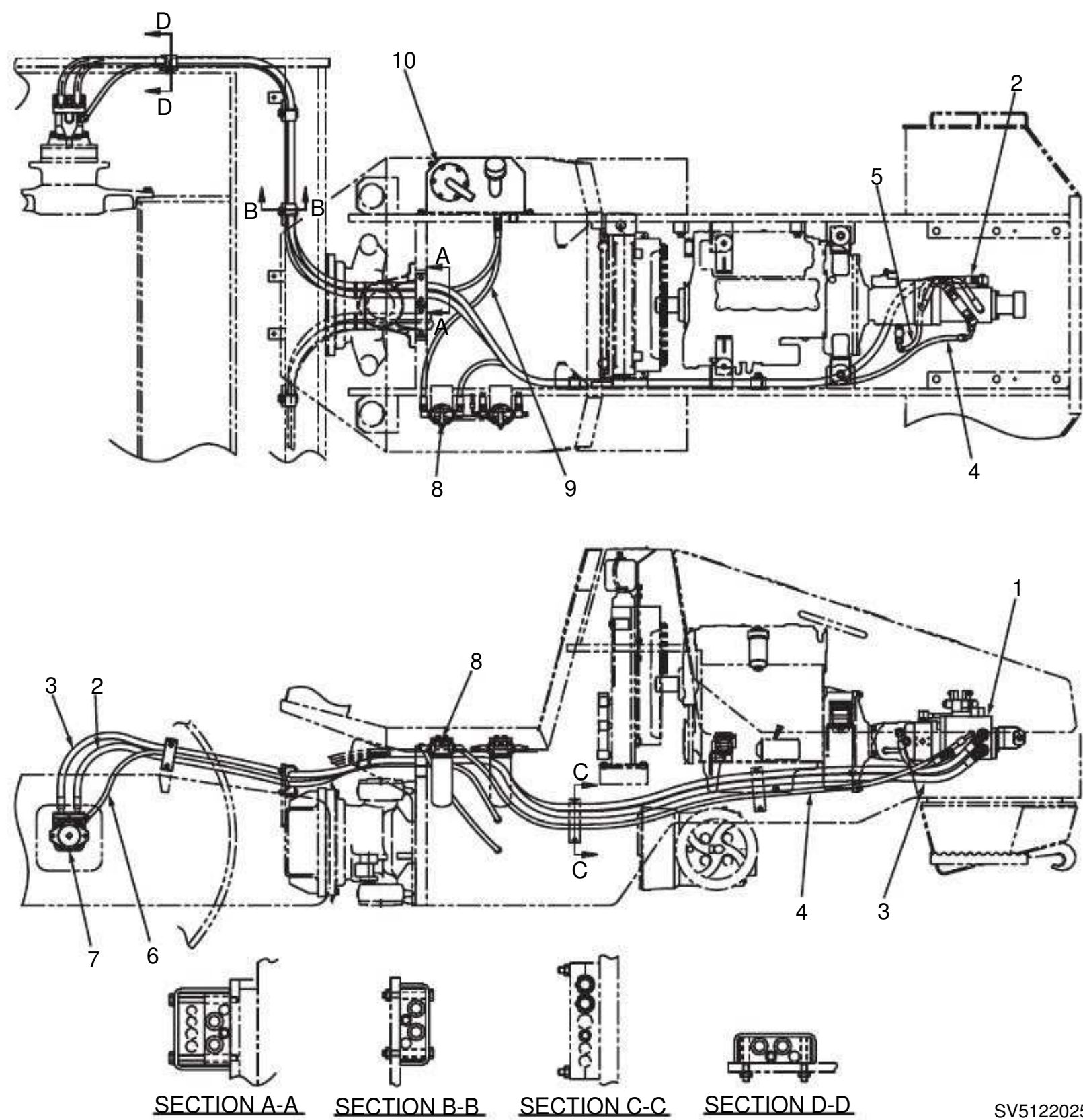
### 2-4-3. Drum & vibrator (model TF)



SV5122024

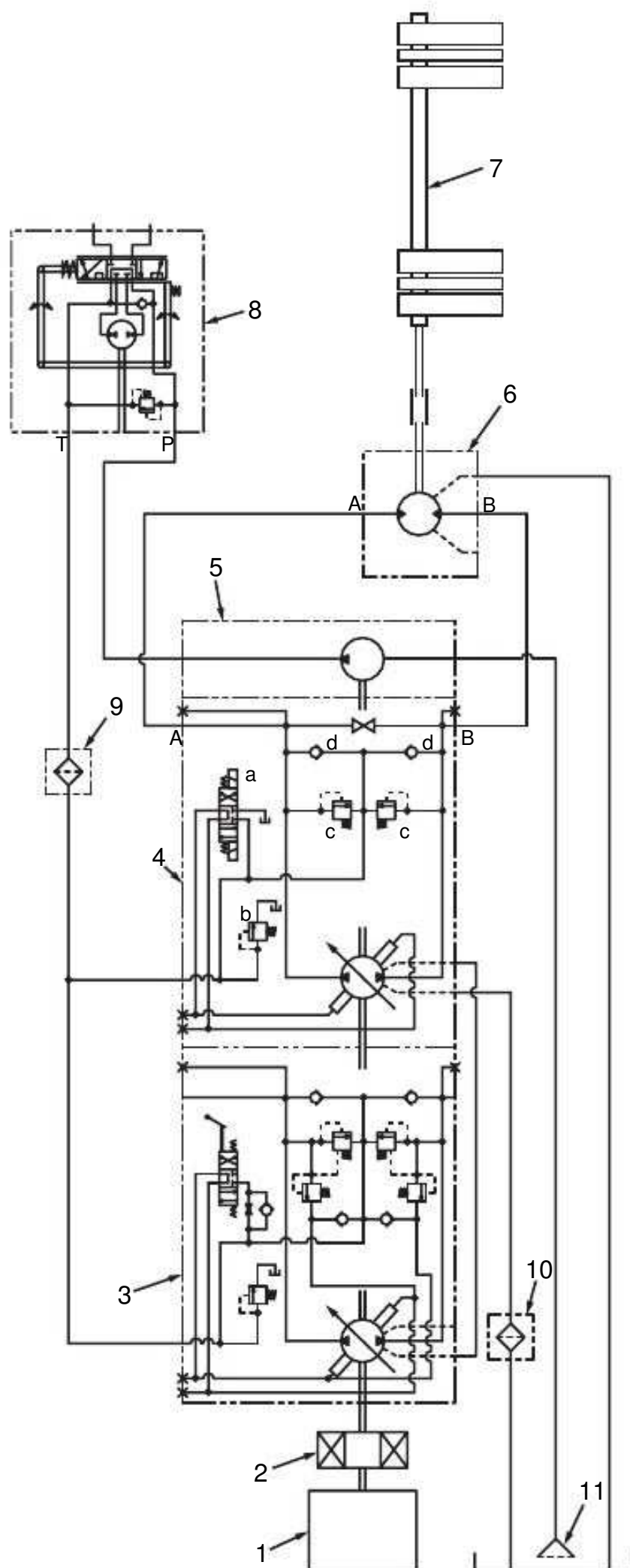
- |                   |                    |                      |               |
|-------------------|--------------------|----------------------|---------------|
| 1. Vibrator shaft | 8. Holder          | 15. Spring pin       | 22. Damper    |
| 2. Roller bearing | 9. Oil seal        | 16. Housing          | 23. Holder    |
| 3. Axle shaft     | 10. Cover          | 17. Plug             | 24. Disc      |
| 4. Shaft          | 11. Vibrator motor | 18. Tamping drum     | 25. Flat drum |
| 5. Oil seal       | 12. Cover          | 19. Roller bearing   | 26. Disc      |
| 6. Roller bearing | 13. Breather       | 20. Axle shaft       |               |
| 7. Damper         | 14. Sleeve         | 21. Propulsion motor |               |

2-4-4. Vibrator hosework



SV5122025

## 2-4-5. Vibrator circuit



1. Engine
2. Coupling
3. Propulsion pump ass'y
4. Vibrator pump
  - a. Amplitude select valve
  - b. Charge relief valve
  - c. High pressure relief valves
  - d. Check valves
5. Steering pump
6. Vibrator motor
7. Vibrator
8. Orbitrol
9. Line filter (charge circuit)
10. Return filter
11. Suction filter

SV5122026

## 2-4-6. Description and operation of vibrating system

### Description

- Made up of vibrator pump (4), vibrator motor (6) and vibrator (7).

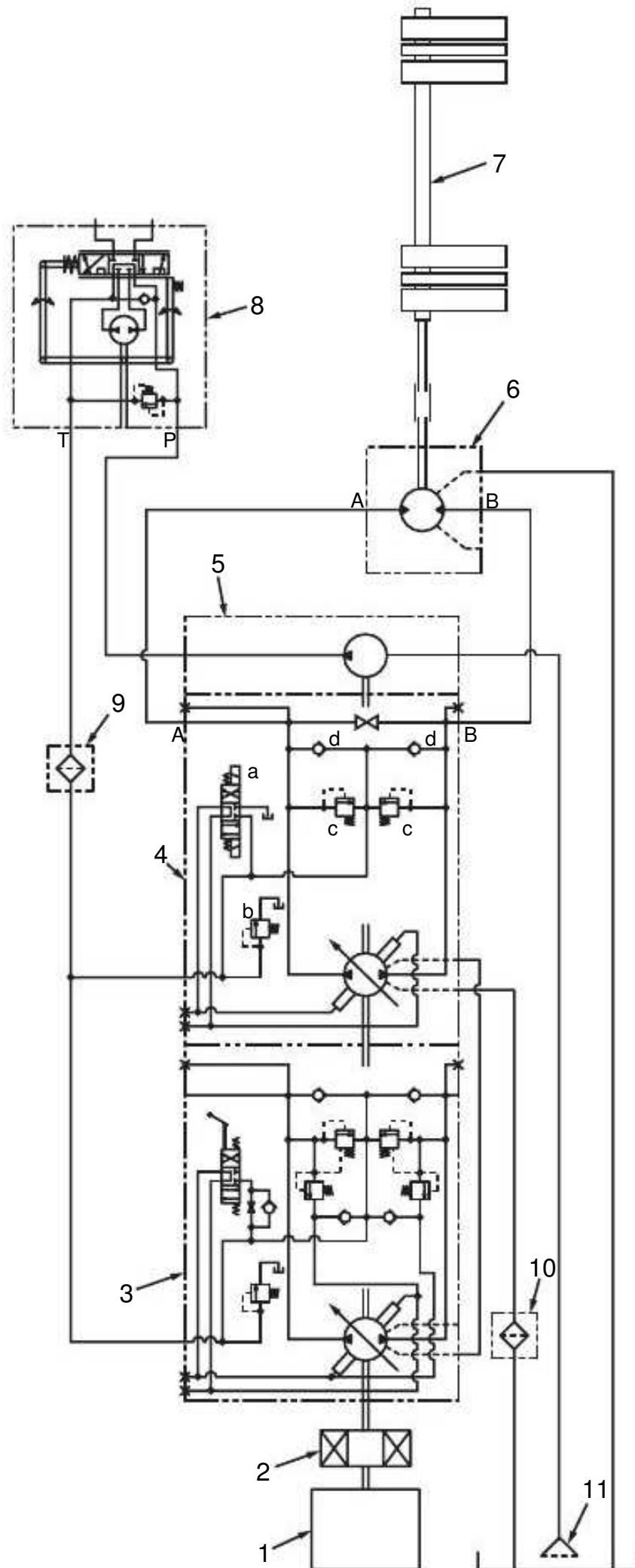
### Basic function of vibrator pump and motor

- Vibrator pump  
A piston pump is in use. Varying the pump swashplate angle varies the piston stroke to select low amplitude, neutral and high amplitude.
- Vibrator motor  
A fixed displacement piston motor is used. The displacement per rotation of the motor shaft is not variable.

### Operation (It is assumed that HIGH amplitude is selected.)

- The operation of the amplitude selector switch actuates amplitude select valve (a) built in vibrator pump (4) to discharge oil from the high amplitude port (port B).
- Oil fed into the high amplitude port (port B) of the motor powers the motor and displaced from the opposite side port (port A), getting back to the pump suction port (port A).

**NOTE: Because the vibrator system also uses a closed circuit (HST) like the propulsion circuit, every time the amplitude selection is changed from low amplitude to high or vice versa, the function of the pump inlet and outlet is reversed with each other.**



SV5122027

### **Charge circuit**

\* See the circuit diagram on page 2-034.

- The vibrator circuit is also of a closed circuit, which needs feeding of oil into it for making up for deficiency and for other purposes.
- In the charge circuit, oil from steering pump (5) flows into Orbitrol (8), then the whole amount of oil goes to propulsion pump (3) via filter (9) irrespective of the steering wheel operation.
- Charge relief valve (b) maintains the charge pressure when the machine is not in motion. When travelling, the charge pressure is kept by the low pressure relief valve (h).

\*Refer to 'Description and operation of propulsion line', 2-3-9.

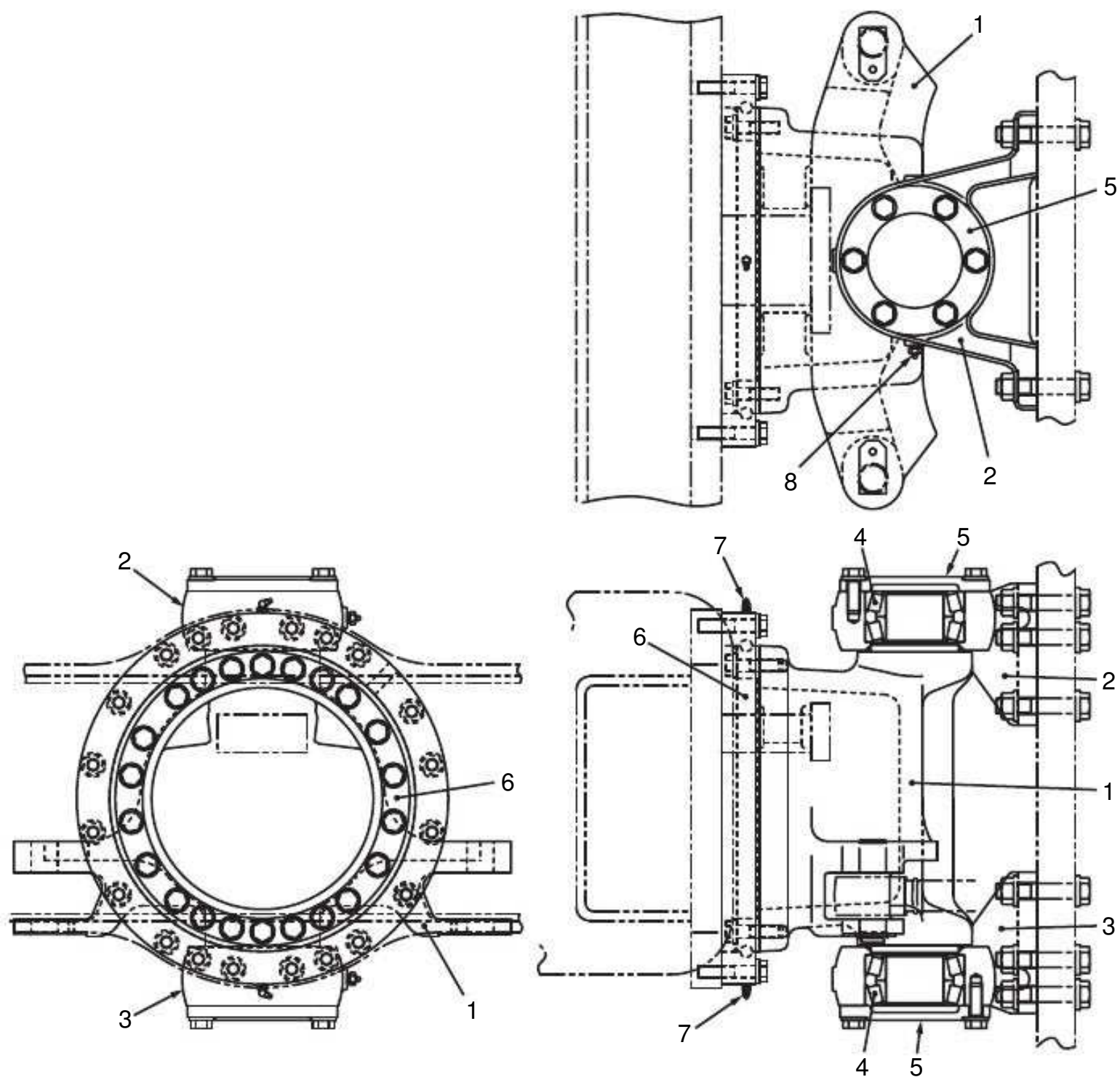
### **Circuit protection against high pressure**

\* See the circuit diagram on page 2-034.

- High pressure relief valves (c) built in the vibrator pump relieve pressure to protect the circuit when the pressure exceeds the setting of the valves.

## 2-5. Steering system

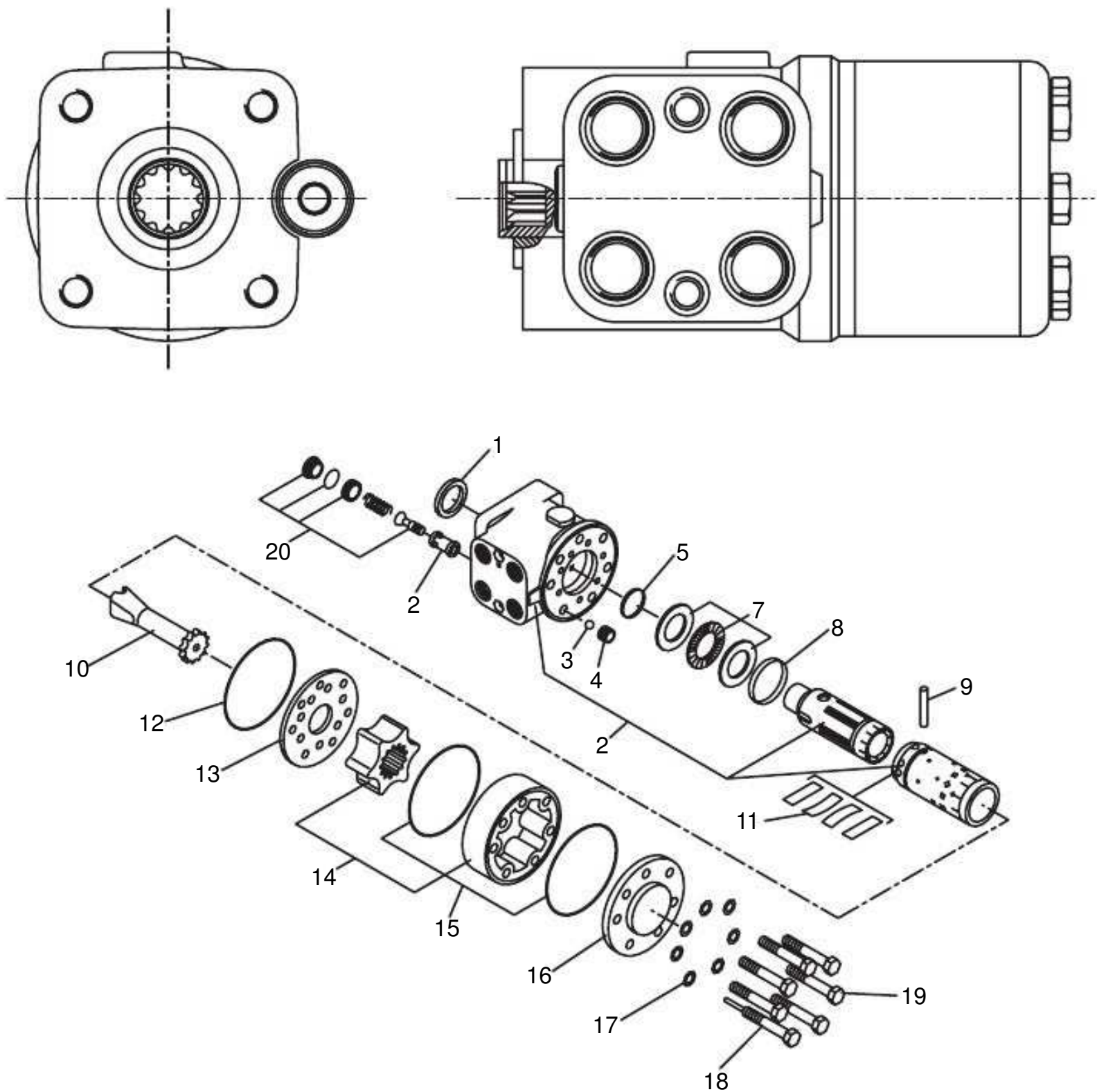
### 2-5-1. Center pin



SV5102035

- 1. Yoke
- 2. Bracket (upper)
- 3. Bracket (lower)
- 4. Roller bearing
- 5. Cover
- 6. Bearing
- 7. Grease fitting
- 8. Grease fitting

2-5-2. Orbitrol

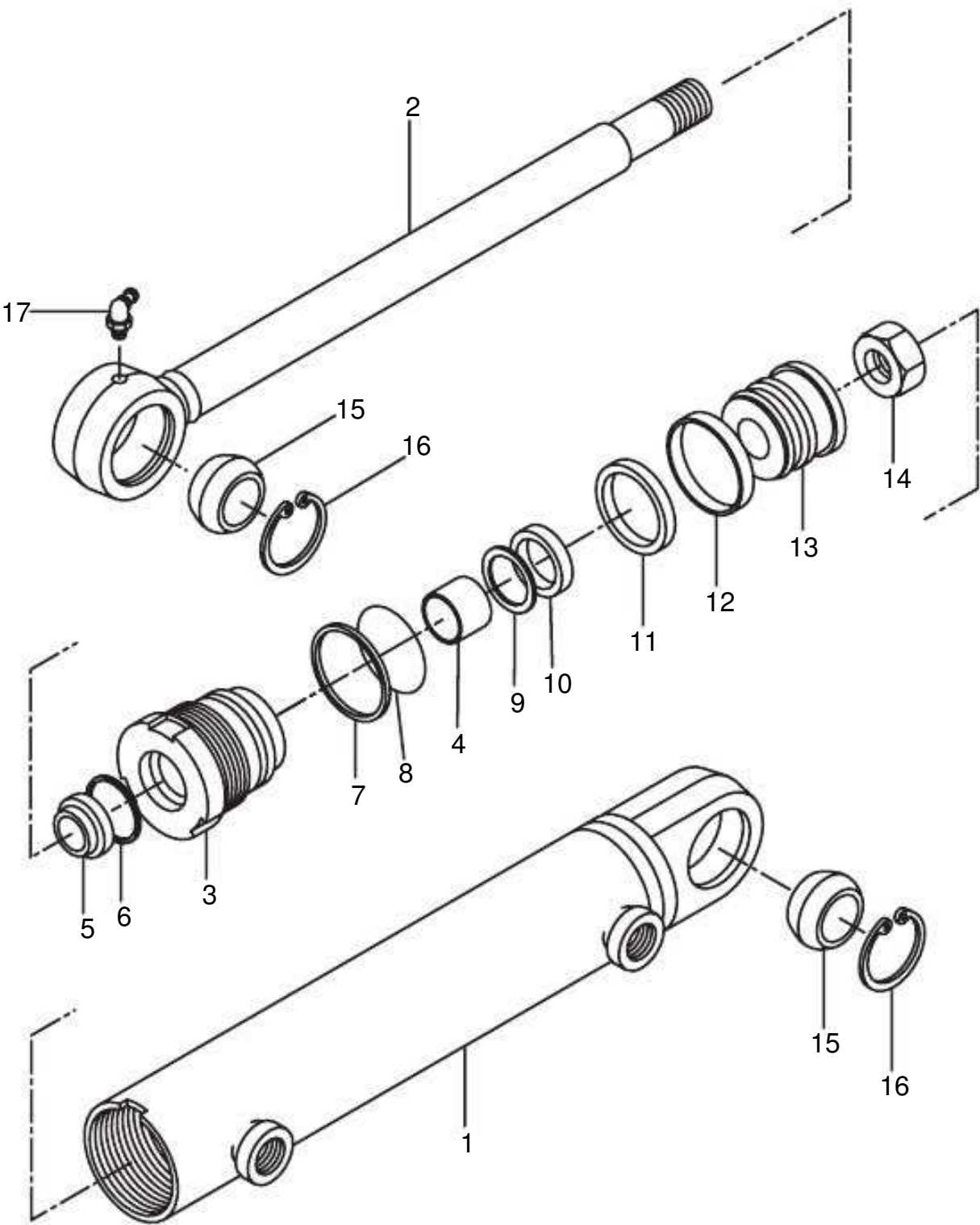


SV5122028

- |                                                        |                                        |
|--------------------------------------------------------|----------------------------------------|
| 1. Dust seal ring                                      | 11. Set of springs                     |
| 2. Housing, spool and sleeve (not supplied separately) | 12. O-ring                             |
| 3. Ball                                                | 13. Distributor plate                  |
| 4. Thread bushing                                      | 14. Gearwheel set                      |
| 5. Lip-seal                                            | 15. O-ring                             |
| 7. Bearing assembly                                    | 16. End cover                          |
| 8. Ring                                                | 17. Washer                             |
| 9. Cross pin                                           | 18. Screw with pin                     |
| 10. Cardan shaft                                       | 19. Screw                              |
|                                                        | 20. Complete relief valve without seat |

- Specifications
- Valve system: Open center non-load reaction
  - Displacement: 400 cm<sup>3</sup>/rev (cc/rev)
  - Relief valve setting: 15.0 MPa (2,180 psi) {153 kgf/cm<sup>2</sup>}

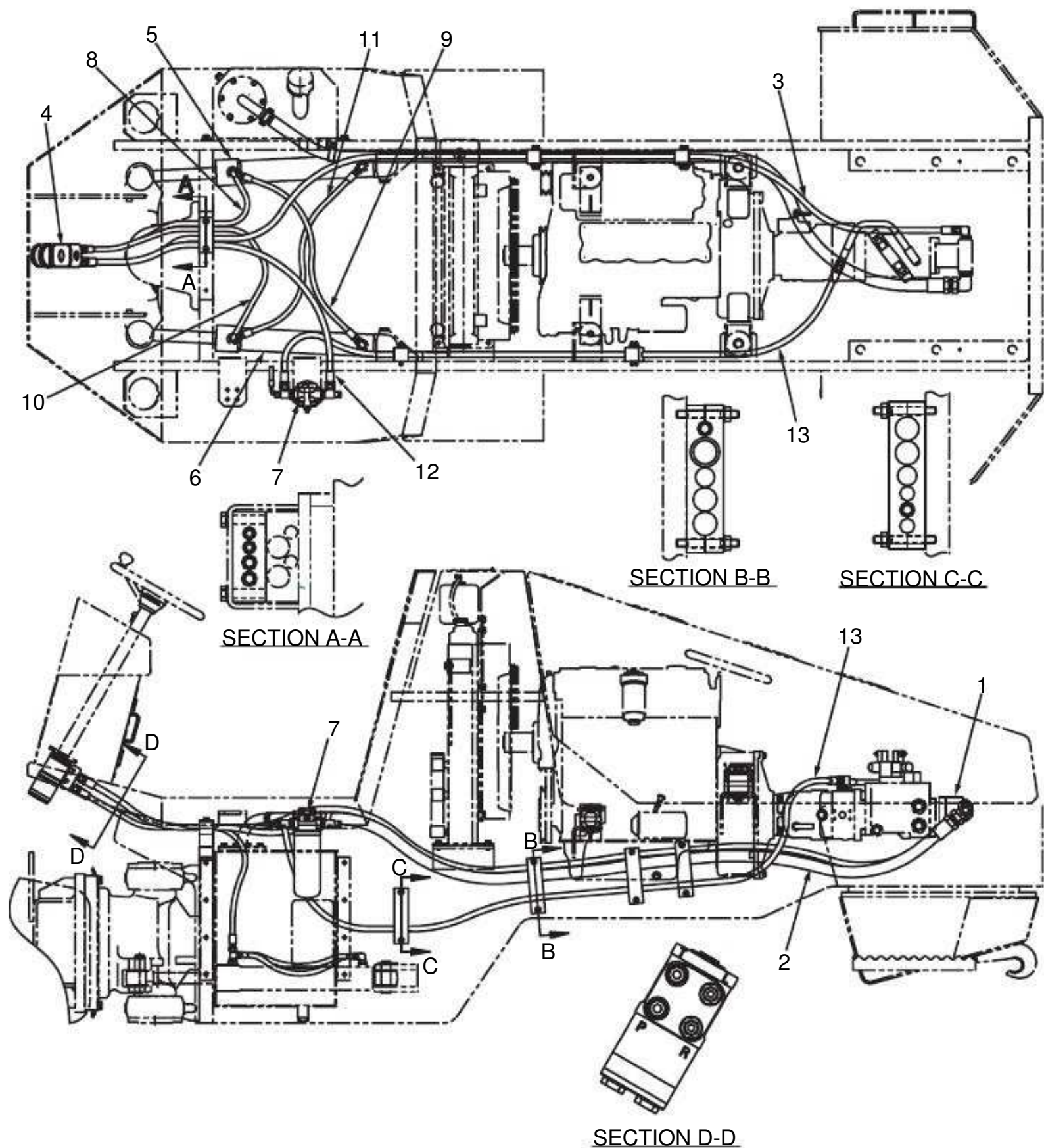
2-5-3. Steering cylinder



SV5122029

- |                 |                  |                       |
|-----------------|------------------|-----------------------|
| 1. Tube Ass'y   | 8. O-ring        | 15. Spherical bearing |
| 2. Piston rod   | 9. Back up ring  | 16. Ring              |
| 3. End cap      | 10. U-packing    | 17. Grease fitting    |
| 4. Bush         | 11. Slipper seal |                       |
| 5. Dust seal    | 12. Wear-ring    |                       |
| 6. Stopper      | 13. Piston       |                       |
| 7. Back up ring | 14. Nut          |                       |

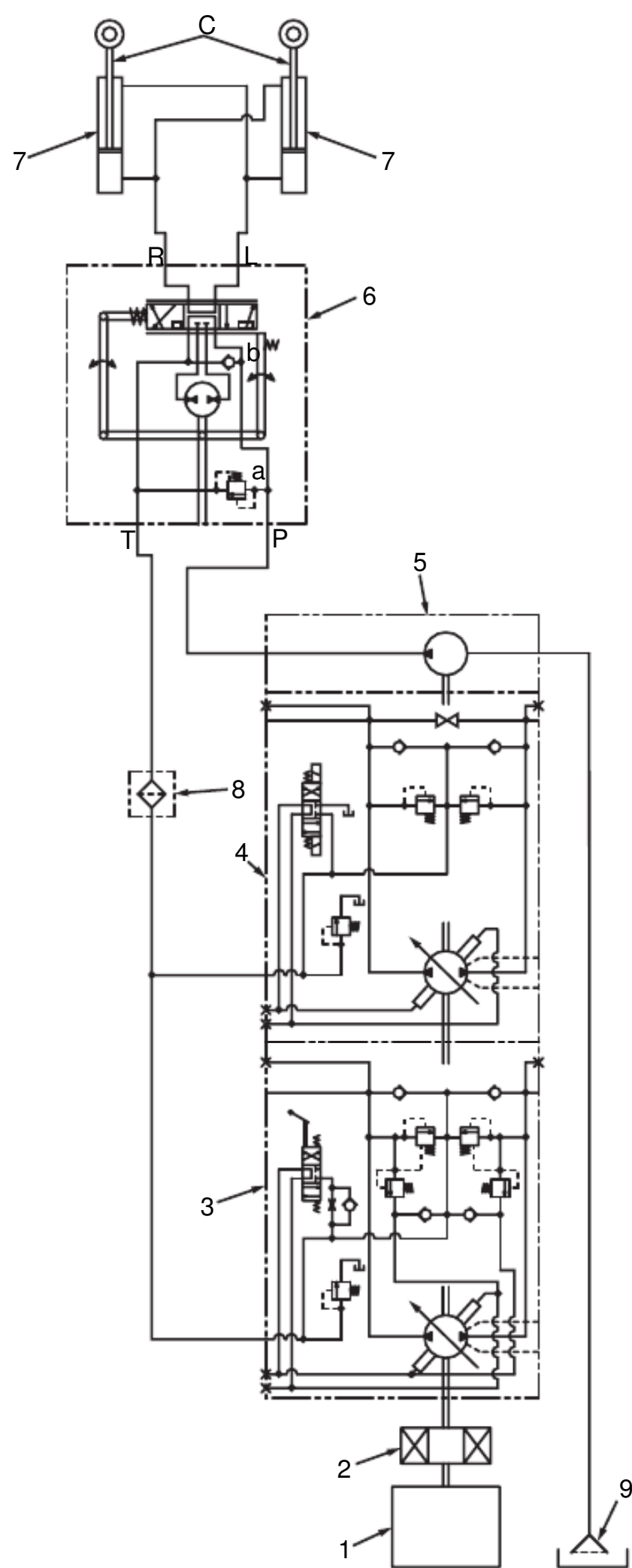
## 2-5-4. Steering hosework



SV5122030

- |                              |                                      |
|------------------------------|--------------------------------------|
| 1. Steering pump             | 8. High pressure hose (right turn)   |
| 2. Suction hose              | 9. High pressure hose (right turn)   |
| 3. Feed hose                 | 10. High pressure hose (left turn)   |
| 4. Orbitrol                  | 11. High pressure hose (left turn)   |
| 5. Steering cylinder (right) | 12. Hose (Orbitrol to filter)        |
| 6. Steering cylinder (left)  | 13. Hose (filter to propulsion pump) |
| 7. Line filter               |                                      |

2-5-5. Steering circuit



- 1. Engine
- 2. Coupling
- 3. Propulsion pump
- 4. Vibrator pump
- 5. Steering pump
- 6. Orbitrol
  - a. Relief valve
  - b. Check valve
- 7. Steering cylinders
  - c. Piston rods
- 8. Line filter (charge circuit)
- 9. Suction filter

SV5122031

## 2-5-6. Description and operation of steering system

### Description:

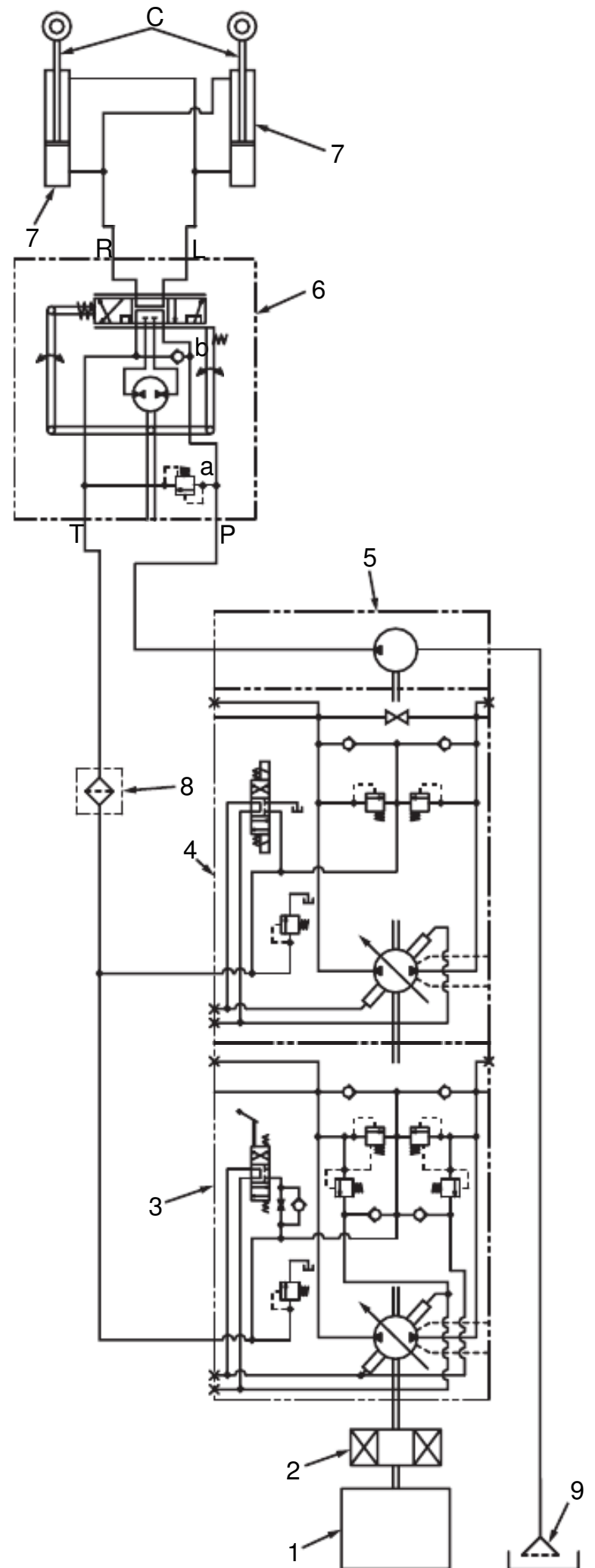
- The steering system is made up of steering/charge pump (5), Orbitrol (6), steering cylinders (7) and line filter (8).  
The steering mechanism is of an articulated type in which the machine frame is articulated at its center.

### Operation

- Oil from pump (5) enters Orbitrol (6). The valve feeds an amount of oil to steering cylinders (7). The amount of oil handled varies with the direction in which the steering wheel is rotated and with the speed at which the steering wheel is turned.
- The fluid fed into both steering cylinders (7) moves the piston rods (c) to achieve steering. The oil displaced from the opposite side of the pistons flows, through Orbitrol (6) and line filter (8), to the charge line of propulsion pump (3) and vibrator pump (4).

★ Refer to the “Charge circuit” for the propulsion pump.

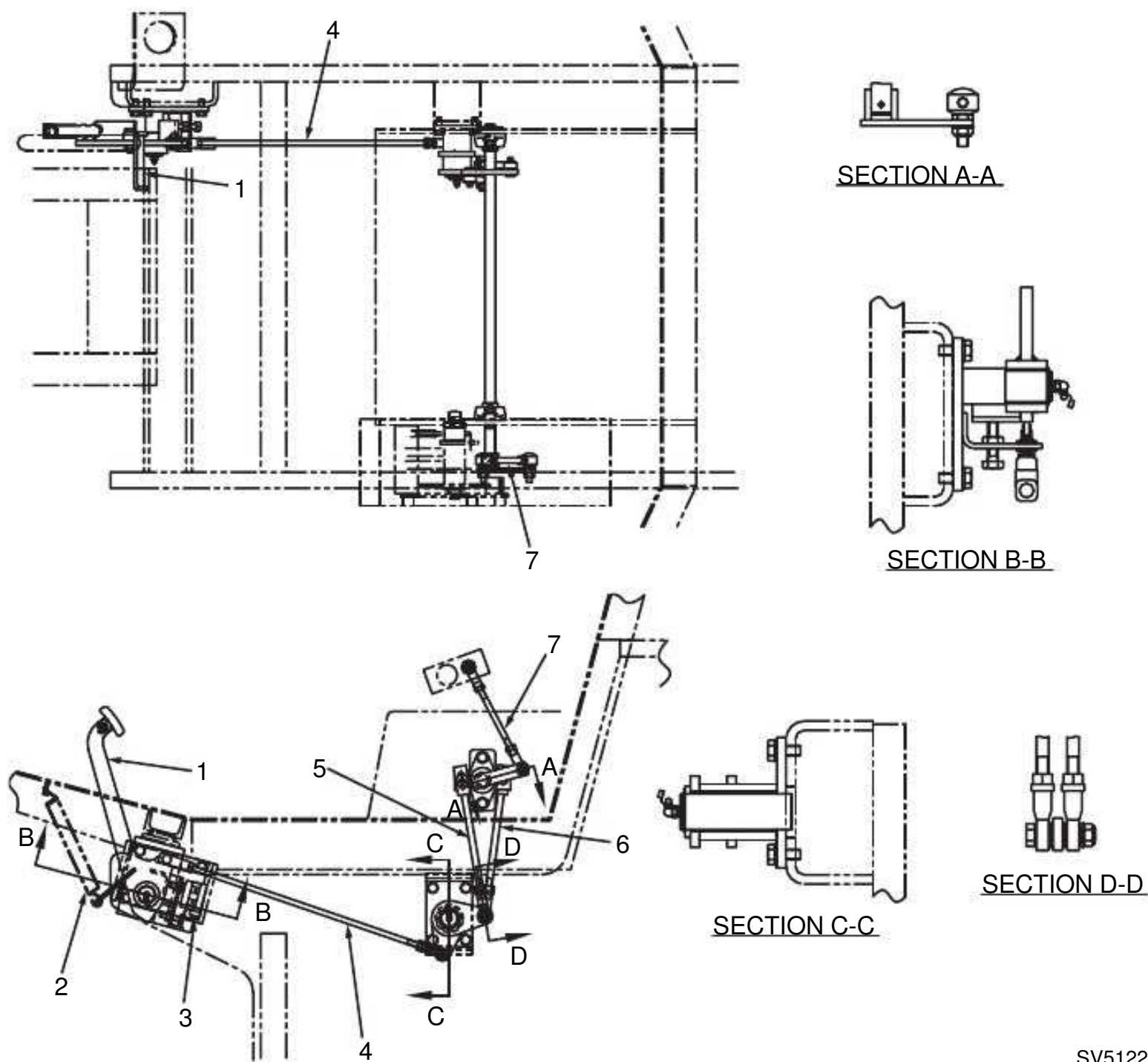
- Relief valve (a) built in Orbitrol (6) opens to relieve the pressure if the system pressure exceeds the setting of the valve, thus protecting the circuit.



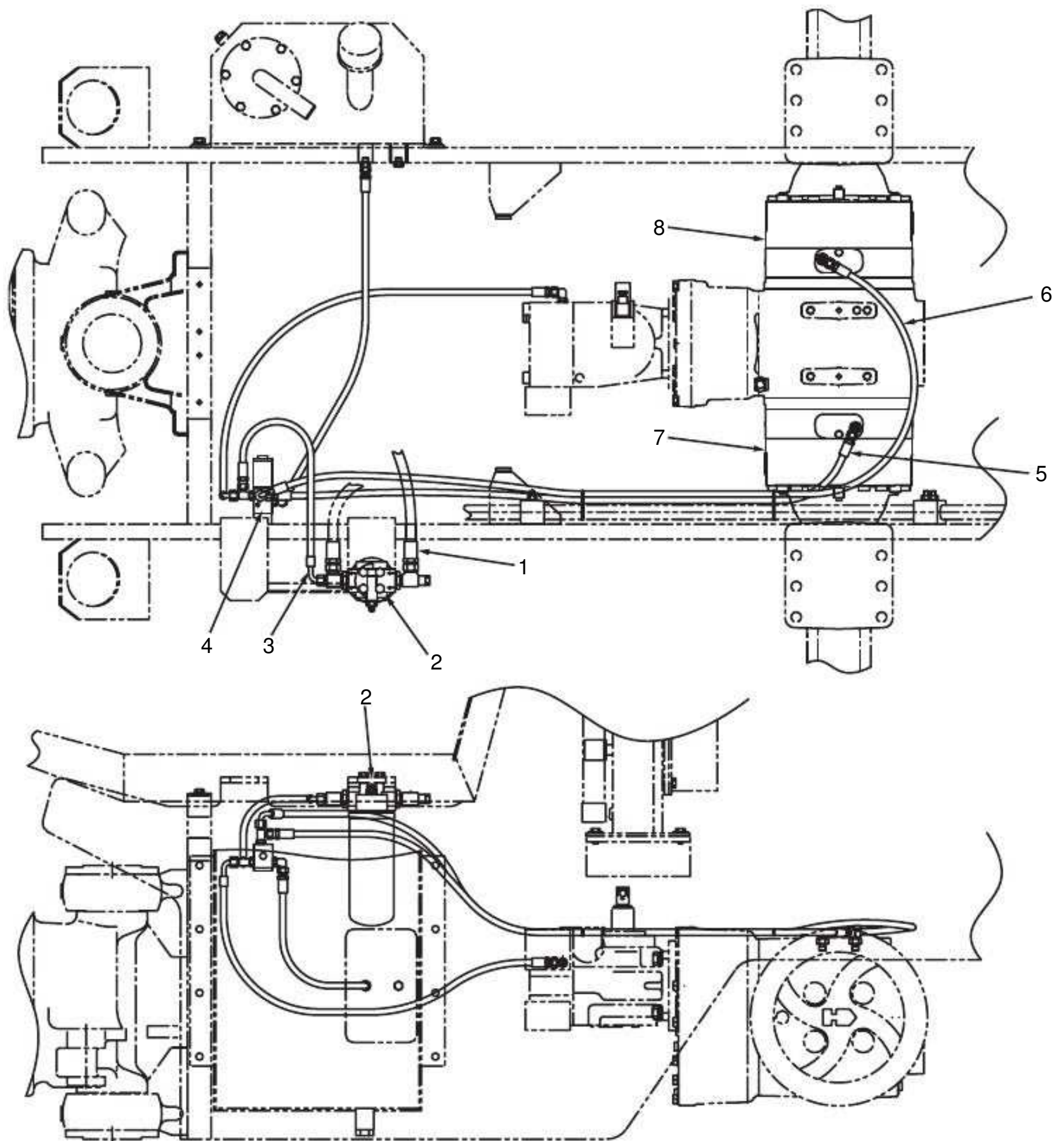
SV5122032

### 3. Brake System

#### 3-1. Brake pedal & linkage



### 3-2. Hydraulic hosework (brakes)



SV5122034

- |                                                    |                    |
|----------------------------------------------------|--------------------|
| 1. Charge hose (filter inlet)                      | 7. Left hand disc  |
| 2. Line filter (charge circuit)                    | 8. Right hand disc |
| 3. Hose (filter to brake valve)                    |                    |
| 4. Brake valve                                     |                    |
| 5. Hose (brake valve to discs in left hand brake)  |                    |
| 6. Hose (brake valve to discs in right hand brake) |                    |

### 3-3. Description and Operation of Brake Circuit

#### Description:

- Made up of brake pedal (1), foot brake switch (2), F-R lever (3), return-to-neutral rods (4), (5), parking brake switch (6), brake valve (7) and brake assemblies (8).

The foot brake switch is ON with the brake pedal released and Off if pushed down on.

#### Operation:

##### To release parking brake:

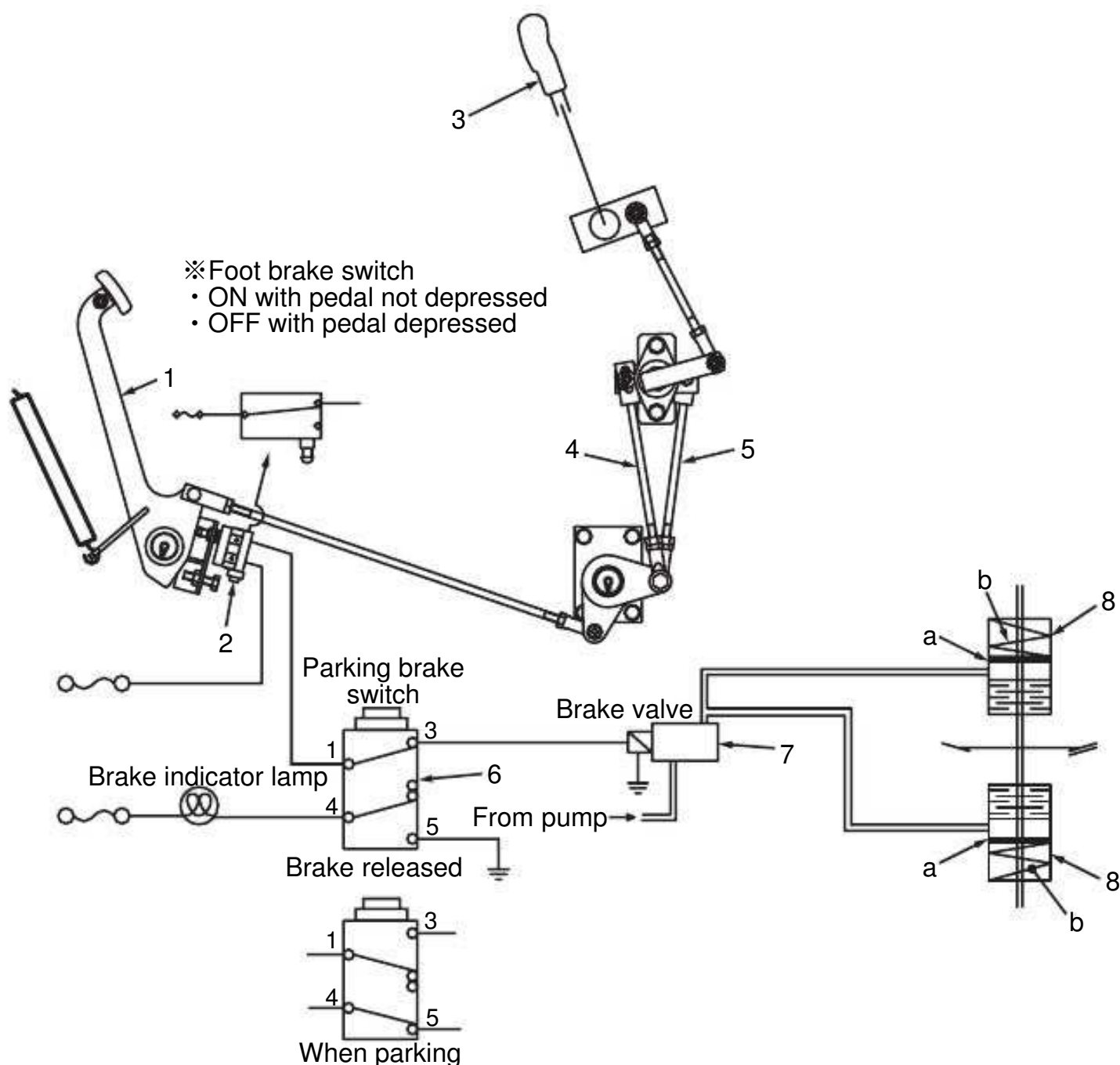
- When parking brake switch (6) is set to the RELEASE position, the contacts of parking brake switch (6) close the circuit to brake valve (7) and breaks the circuit to the brake indicator lamp.
- This leads the pressurized fluid through brake valve (7) to pistons (a) of brake assemblies (8) to compress springs (b). Brake is freed.

##### To apply parking brake (Brake pedal not depressed):

- If parking brake (6) is put in the APPLY position, the contacts of parking brake switch (6) break the circuit to brake valve (7) and close the brake indicator lamp circuit.
- This stops feeding the fluid from brake valve (7) to brake assemblies (8). Springs (b) move pistons (a) toward the brake discs and plates so that they make a close contact with each other. The brake is applied. The indicator lamp comes on simultaneously.

##### When brake pedal is pushed down on:

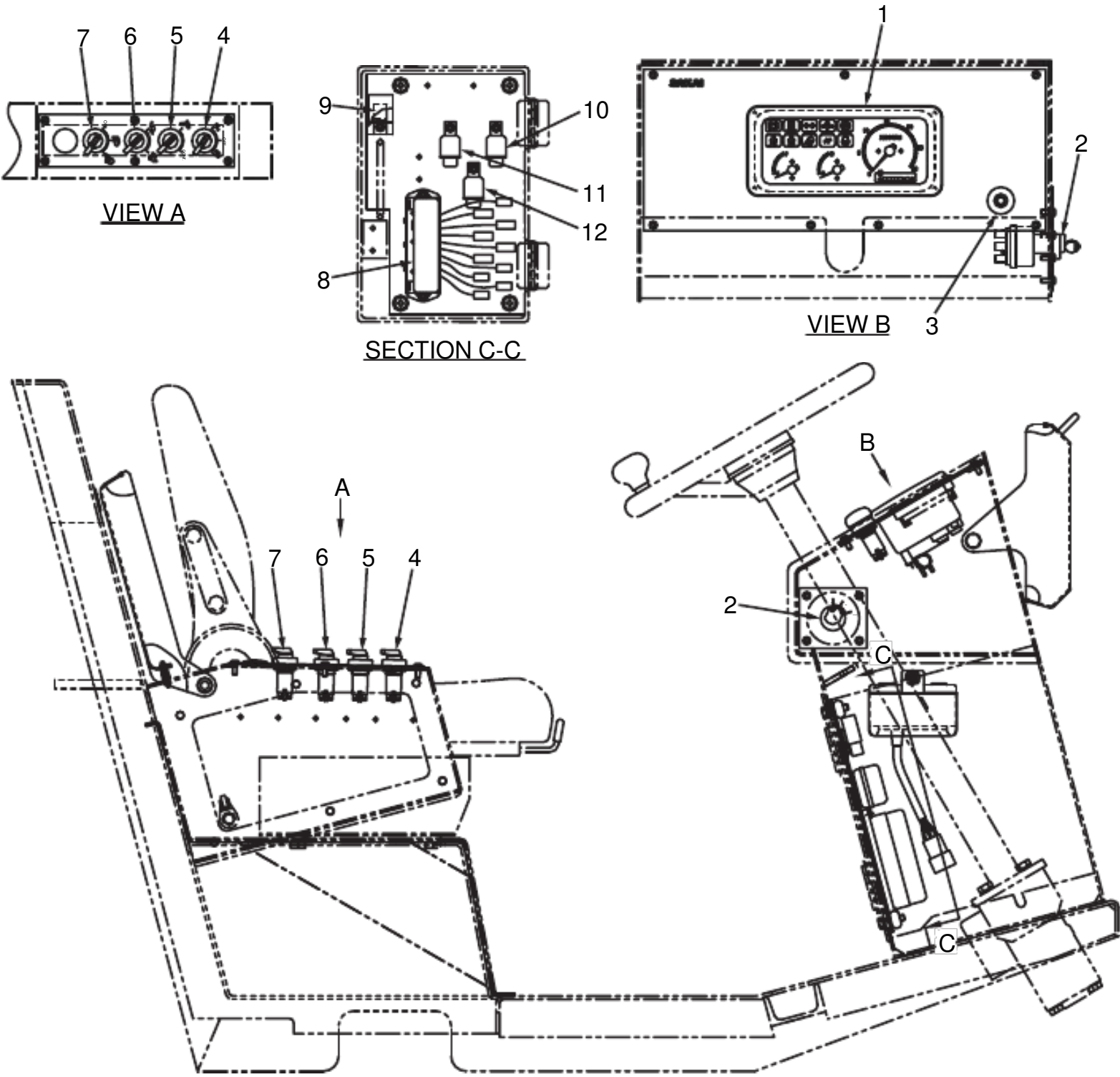
- If brake pedal (1) is depressed, foot brake switch (2) is switched off to break the circuit to parking brake switch (6). This applies the brake even if parking brake switch is in the RELEASE position.



SV5122035

# 4. Electric System

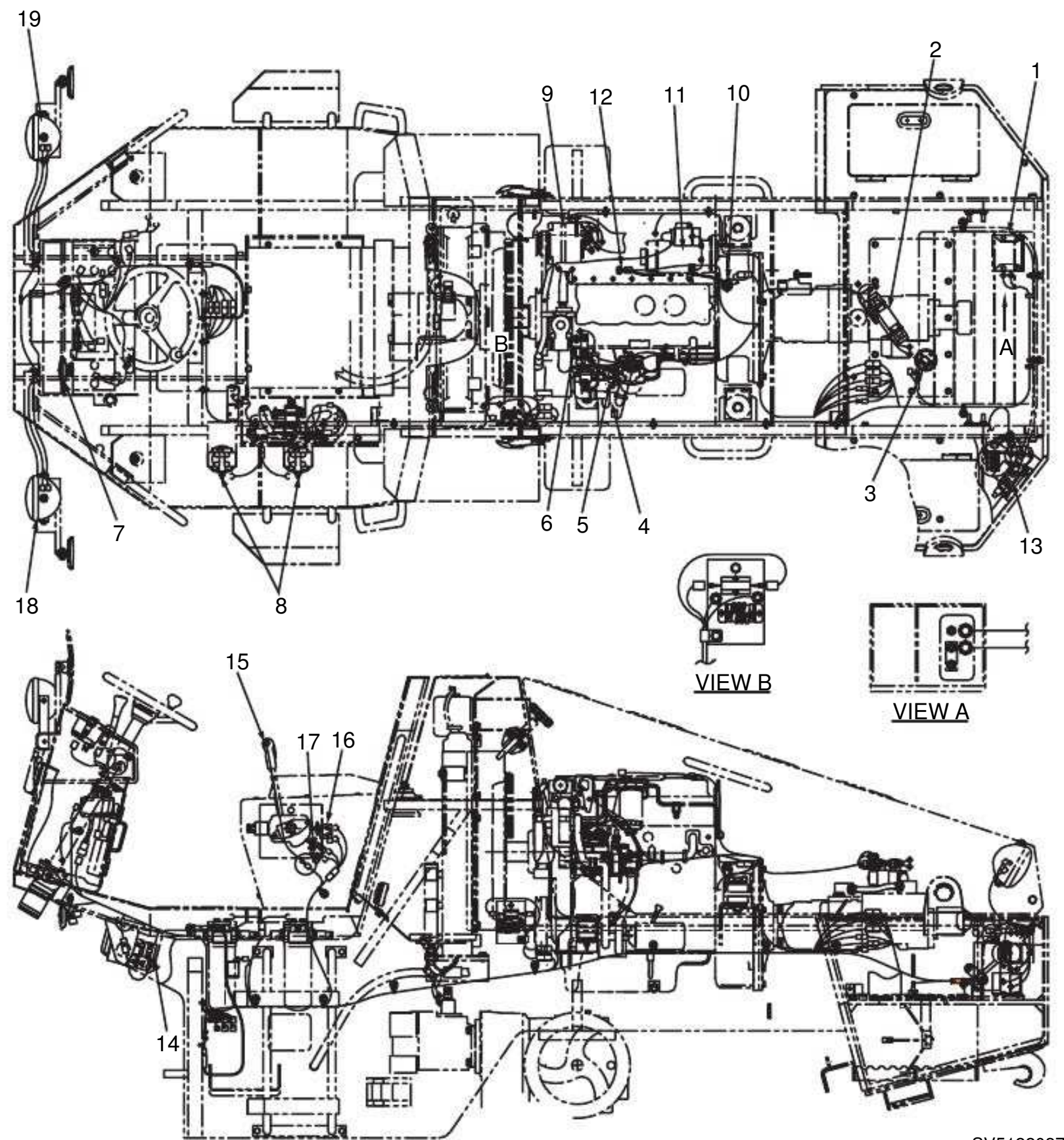
## 4-1. Locations of instrument panel and relays



SV5122036

- |                              |                      |
|------------------------------|----------------------|
| 1. Panel (combination meter) | 7. Lighting switch   |
| 2. Starter switch            | 8. Fuse box          |
| 3. Brake switch              | 9. Diode unit        |
| 4. Amplitude selector switch | 10. Lamp check relay |
| 5. CONT-MAN selector         | 11. Interlock relay  |
| 6. Speed selector switch     | 12. Horn relay       |

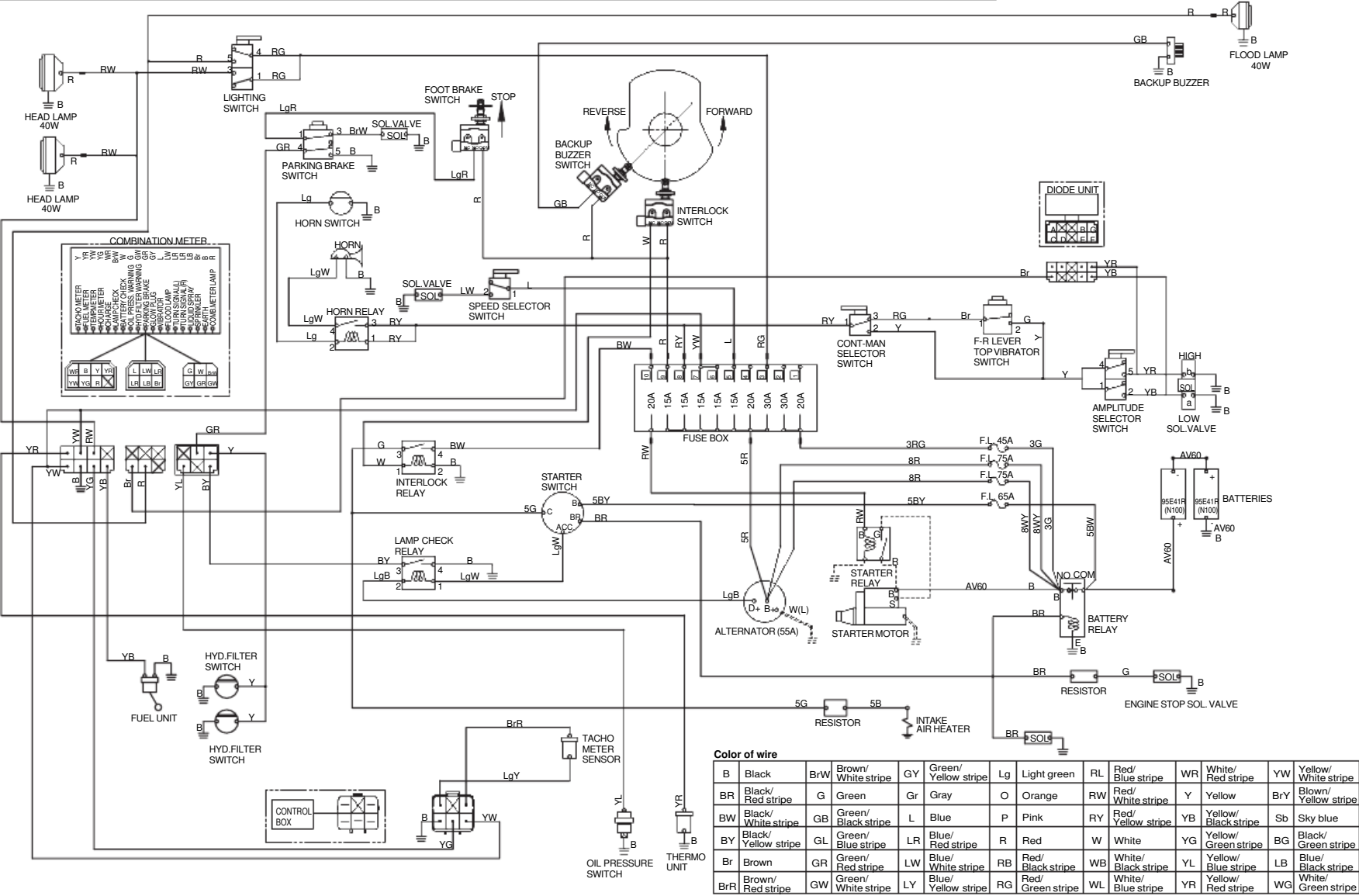
## 4-2. Locations of electric components



SV5122037

- |                                 |                       |                            |
|---------------------------------|-----------------------|----------------------------|
| 1. Backup buzzer                | 8. Filter switch      | 15. Vibrator ON-OFF switch |
| 2. Amplitude select valve       | 9. Alternator         | 16. Interlock switch       |
| 3. Fuel unit                    | 10. Tachometer unit   | 17. Backup buzzer switch   |
| 4. Oil pressure switch (engine) | 11. Starter motor     | 18. Head lamp (left)       |
| 5. Engine stop solenoid         | 12. Intake air heater | 19. Head lamp (right)      |
| 6. Thermo unit                  | 13. Battery relay     |                            |
| 7. Horn                         | 14. Brake switch      |                            |

4-3. Electric wiring diagram



SV5122038

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# INSPECTION & ADJUSTMENT

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# INSPECTION & ADJUSTMENT

## 1.Standard Value Chart

- 1-1. Standard value chart for engine, travel speed and hydraulic pressure .....3-002

## 2.Inspection & Adjustment

- 2-1. Measurement and adjustment of pressure in propulsion main circuit .....3-101  
2-2. Measurement of propulsion charge pressure .....3-103  
2-3. Measurement of parking brake release pressure .....3-105  
2-4. Measurement of vibrator circuit pressure .....3-106  
2-5. Measurement and adjustment of vibrator charge pressure .....3-108  
2-6. Measurement and adjustment of steering circuit pressure .....3-110  
2-7. Adjustment of throttle linkage .....3-111  
2-8. Adjustment of F-R lever linkage .....3-112

### ★Precautions for Use of Standard Value Chart

- 1) Values in the chart are based upon ones when the machine leaves the factory. They should be used for estimation of wear after extended operation and for guidance when the machine is repaired.
- 2) Values in the chart are ones based on various test results etc. They should be used for a guide for fault finding practice in due consideration of the past repair frequency and operating record of the machine.
- 3) Values in the chart should not be used for the standard for claim application.

### ★Precautions for Checking, Adjustment and Troubleshooting

- ⚠ For checking, adjustment and troubleshooting, park the machine on level ground and secure with the safety pins engaged.
- ⚠ When working with other workers, use hand signals positively and keep people not concerned away from the work area.
- ⚠ Cool off the coolant or hydraulic fluid when removing the radiator cap or the hydraulic tank filler cap. Hot fluids can burn you.
- ⚠ Do not put your hands close to parts in motion such as fan belts.

1. Standard Value Chart

1-1. Standard value chart for engine, travel speed and hydraulic pressure

| Item               |                                                                        |                         | Measuring conditions                                                                                                                                             | Unit                                | Standard value for new machine                                                                                      | Permissible range        |
|--------------------|------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------|
| Engine             | Low idle                                                               |                         | • Coolant temp.<br>: Green zone on gauge<br>• Hydraulic oil working temperature : 50 ± 5°C (122±41°F)                                                            | min <sup>-1</sup> (rpm)             | 800 ± 25                                                                                                            | _____                    |
|                    | High idle                                                              |                         |                                                                                                                                                                  |                                     | 2,300 ± <sup>0</sup> <sub>50</sub>                                                                                  | _____                    |
|                    | Rated speed                                                            |                         |                                                                                                                                                                  |                                     | 2,200                                                                                                               | _____                    |
| Travel speed       | All-wheel drive type (identical speed for forward and reverse travels) | Low                     | • Engine at full throttle<br>• Coolant temp.<br>: Green zone on gauge<br>• Hydraulic oil working temperature : 50 ± 5°C (122±41°F)                               | km/h (mph)                          | 0 ~ 6.0 ± 1.5<br>(0 ~ 3.7 ± 0.9)                                                                                    | _____                    |
|                    |                                                                        | High                    |                                                                                                                                                                  |                                     | 0 ~ 10.0 ± 1.5<br>(0 ~ 6.2 ± 0.9)                                                                                   | _____                    |
| Hydraulic pressure | Propulsion                                                             | Main circuit pressure   | • Hydraulic oil temperature : 50 ± 5°C (122±41°F)<br><br>• Refer to measurement procedures for relevant circuit pressures in “Inspection and Adjustment” section | MPa (psi)<br>{kgf/cm <sup>2</sup> } | 41.8 ± <sup>0</sup> <sub>2.0</sub><br>(6,070 ± <sup>0</sup> <sub>20</sub> )<br>{427 ± <sup>0</sup> <sub>20</sub> }  | 38.8<br>(5,630)<br>{396} |
|                    |                                                                        | Charge circuit pressure |                                                                                                                                                                  |                                     | 2.4 ± <sup>0</sup> <sub>0.3</sub><br>(340 ± <sup>0</sup> <sub>40</sub> )<br>{24.0 ± <sup>0</sup> <sub>3.0</sub> }   | 2.1<br>(300)<br>{21.0}   |
|                    | Vibrator                                                               | Main circuit pressure   |                                                                                                                                                                  |                                     | 25.0 ± <sup>0</sup> <sub>1.0</sub><br>(3,620 ± <sup>0</sup> <sub>140</sub> )<br>{255 ± <sup>0</sup> <sub>10</sub> } | 23.5<br>(3,400)<br>{240} |
|                    |                                                                        | Charge circuit pressure |                                                                                                                                                                  |                                     | 2.4 ± <sup>0</sup> <sub>0.3</sub><br>(340 ± <sup>0</sup> <sub>40</sub> )<br>{24.0 ± <sup>0</sup> <sub>3.0</sub> }   | 2.1<br>(300)<br>{21.0}   |
|                    | Steering relief pressure                                               |                         |                                                                                                                                                                  |                                     | 15.0 ± <sup>0</sup> <sub>0.5</sub><br>(2,170 ± <sup>0</sup> <sub>70</sub> )<br>{153 ± <sup>0</sup> <sub>5.0</sub> } | 13.8<br>(2,000)<br>{141} |
|                    | Parking brake release pressure                                         |                         |                                                                                                                                                                  |                                     | 2.4 ± <sup>0</sup> <sub>0.3</sub><br>(340 ± <sup>0</sup> <sub>40</sub> )<br>{24.0 ± <sup>0</sup> <sub>3.0</sub> }   | 2.1<br>(300)<br>{21.0}   |
|                    |                                                                        |                         |                                                                                                                                                                  |                                     |                                                                                                                     |                          |
|                    |                                                                        |                         |                                                                                                                                                                  |                                     |                                                                                                                     |                          |

## 2. Inspection & Adjustment

### 2-1. Measurement and adjustment of pressure in propulsion main circuit

⚠ Park on level ground. Apply the parking brake. Stop the engine and block the wheels.

⚠ Make certain that the parking brake functions adequately.

#### 1. Measurement

★ Hydraulic oil temperature:  $50 \pm 5^\circ\text{C}$  ( $122 \pm 41^\circ\text{F}$ )

1) Remove gauge port plugs (1) and (2) from the propulsion pump and mount a pressure gauge together with adapter ①.

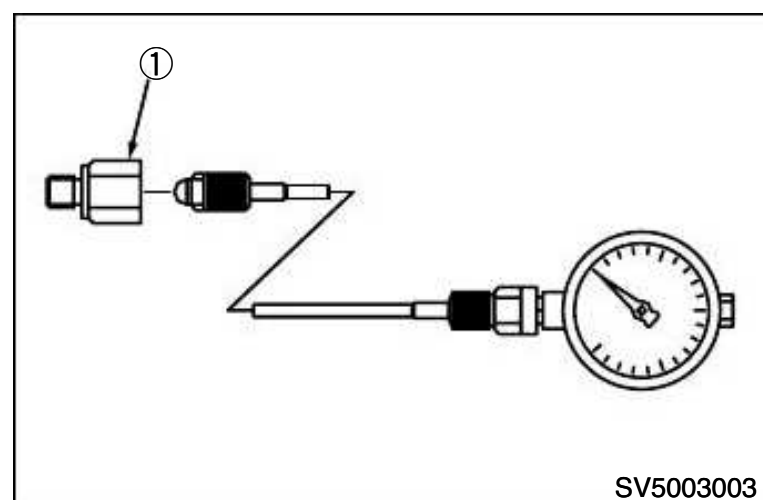
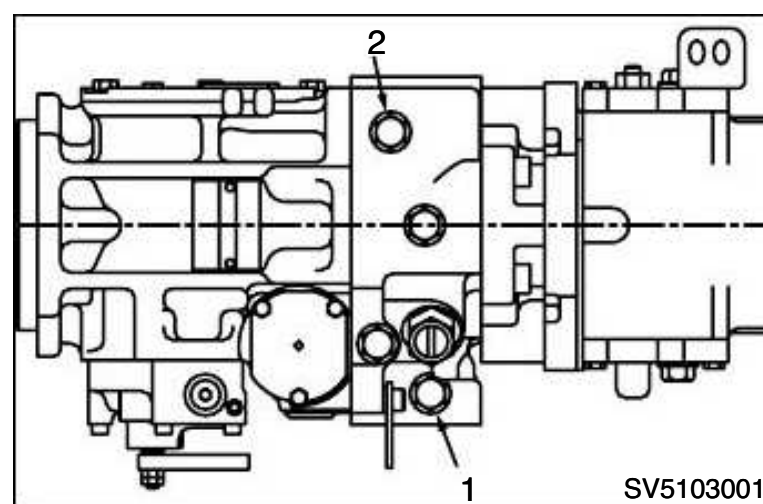
- Gauge port: 9/16-18UNF
- Port (1): for forward travel
- Port (2): for reverse travel
- Pressure gauge:  
0 ~ 60 MPa (0 ~ 9,000 psi)  
{0 ~ 600 kgf/cm<sup>2</sup>}

2) Apply the parking brake by actuating the parking brake switch, and operate the speed shift lever to select the High speed.

3) Start the engine and set the throttle to high idle.

4) Move the F-R lever so that the pressure in the port to be measured may build up. Take the pressure reading quickly.

★ Immediately when the measurement has been taken, bring the lever to the neutral position.



## 2. Adjustment

If the measured value falls outside the permissible range, adjust as follows:

- 1) If locknut (5) of multifunction valve (7) (forward travel) or multifunction valve (8) (reversing) has no signs of looseness, dismount and disassemble the cut off valve to clean.

★ **Do not loosen locknut (5) to keep the setting unchanged.**

★ **Renew parts having signs of damages.**

• Tightening torque:

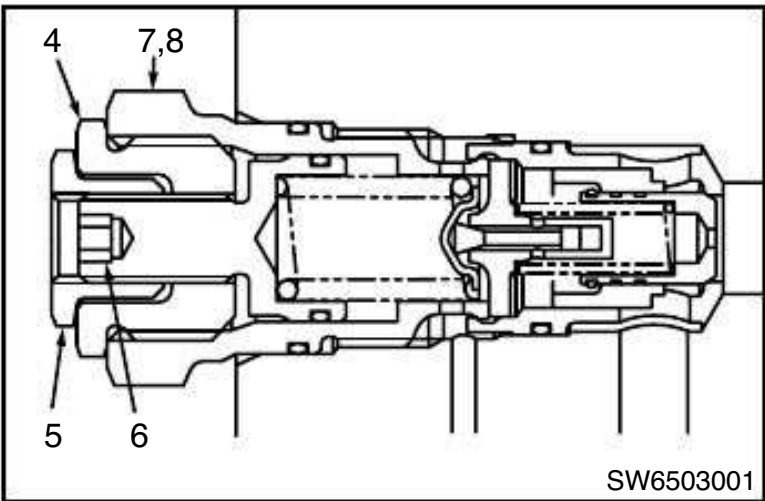
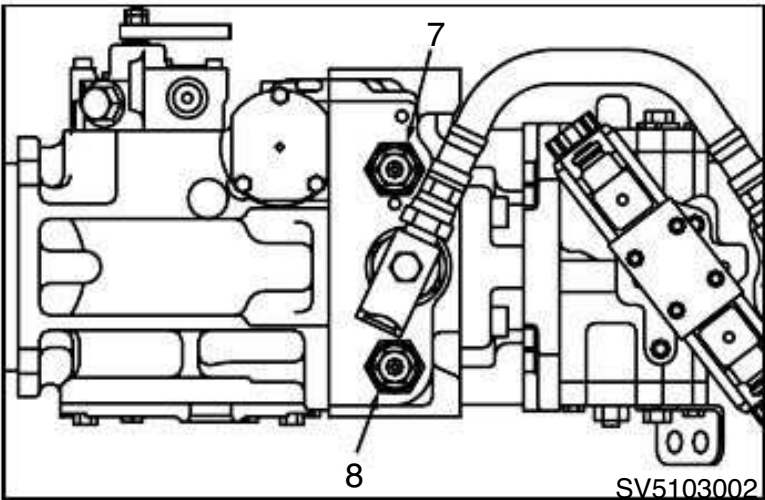
Item (4): 41.2 N·m (304 lbf·ft) {420 kgf·cm}

Item (5): 9.1 N·m (6.7 lbf·ft) {92 kgf·cm}

Item (7), (8): 79.4 N·m (58.6 lbf·ft)  
{810 kgf·cm}

★ **Carefully perform disassembly and reassembly taking necessary measures to prevent entry of foreign matter.**

- 2) To adjust the setting, loosen locknut (5) and rotate adjust screw (6).
  - Adjust screw rotation:  
Clockwise ➡ Pressure increases  
Counterclockwise ➡ Pressure decreases
  - Increase or decrease in pressure per 1/4 turns of adjust screw:  
2.1 MPa (300 psi) {21 kgf/cm<sup>2</sup>}
- 3) For the pressure measurement during the adjustment, use procedures as stated in step 2-1-1.
- 4) When the adjustment is complete, tighten locknut (5) and recheck to see if correctly adjusted.
- 5) If the valve is beyond adjustment, take necessary measures referring to relevant items in “TROUBLESHOOTING”.



## 2-2. Measurement of propulsion charge pressure

▲ Park the machine on level ground. Apply the parking brake. Stop the engine and block the wheels.

★ Because oil is supplied from the steering circuit, make sure, before the measurement, that the steering system works correctly.

★ Because the propulsion charge circuit connects to the vibrator charge circuit, place a spacer (12mm in diameter and 10mm in thickness) on the plug of charge relief valve (16).

\* For the location of valve (16), see Fig.SV5103009, P. 3-108.

When the measurement and adjustment are complete, remove the spacer to restore the charge relief valve setting.

★ When placing and removing the spacer, use caution not to lose the shims on the plug.

### 1. Measurement

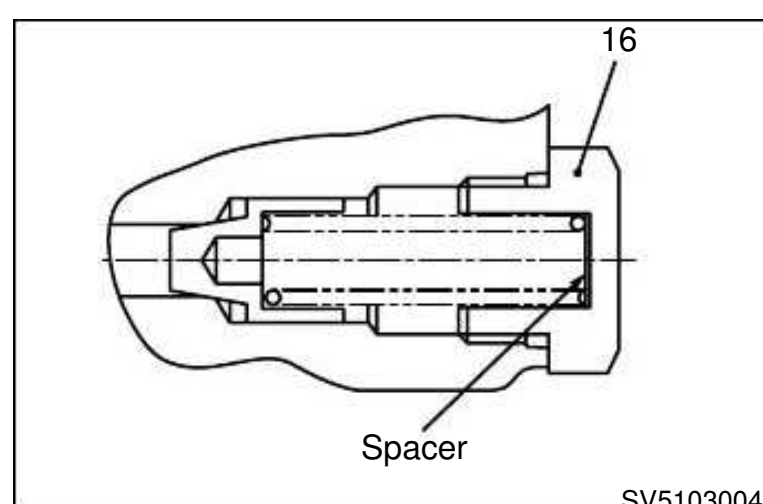
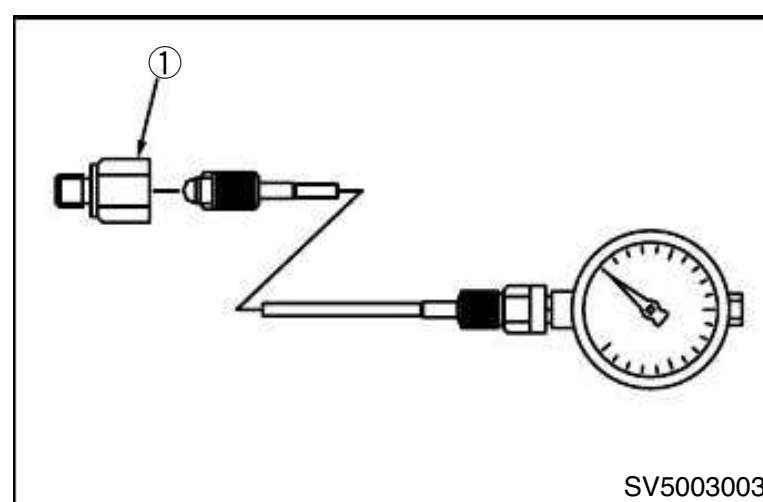
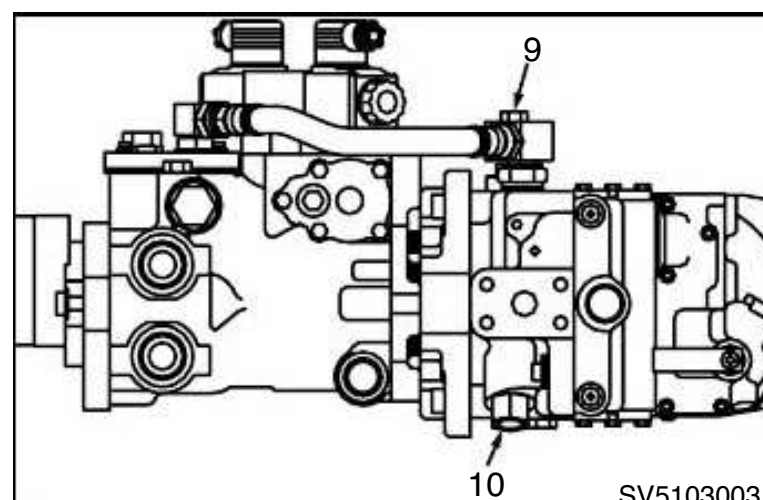
★ Hydraulic oil temperature:  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 41^{\circ}\text{F}$ )

1) Remove the plug of gauge port (9) in the propulsion charge port elbow, mount a pressure gauge with adapter ①.

- Gauge port: PF9/16-18UNF
- Pressure gauge:  
0 ~ 5 MPa (0 ~ 700 psi) {0 ~ 50 kgf/cm<sup>2</sup>}

2) Start the engine and set the throttle to high idle.

3) Move the F-R lever slightly forward and backward. The charge pressure will vary. Take the maximum pressure reading.



### 2.Adjustment

If the measurements are not within the permissible range, adjust as follows:

- 1) If locknut (11) of charge relief valve (10) has no signs of looseness, dismount, disassemble and clean charge relief valve (10).

\* For the location of valve (10), refer to Fig.SV5103003, page 3-103.

★ **Renew parts with signs of damage.**

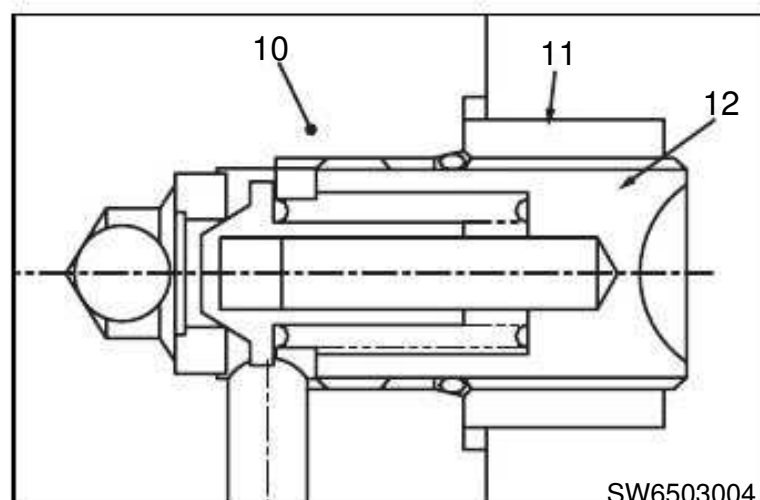
- Tightening torque:

Item (11)

51.4 N·m (37.9 lbf·ft) {524 kgf·cm}

★ **Carefully perform disassembly and reassembly taking necessary measures to prevent ingress of foreign matter.**

- 2) To adjust the setting, loosen locknut (11) and rotate adjust screw (12).
  - Adjust screw rotation:
    - Clockwise ➡ Pressure increases
    - Counterclockwise ➡ Pressure decreases
  - Increase or decrease in pressure per 1/4 turns of adjust screw:
    - 0.29 MPa (41 psi) {2.9 kgf/cm<sup>2</sup>}
- 3) For the pressure measurement during the adjustment, use procedures as described in step 2-2-1) above.
- 4) When the adjustment is complete, tighten locknut (11) and recheck to see if correctly adjusted.
- 5) If the valve is beyond adjustment, take necessary measures referring to relevant items in the "TROUBLESHOOTING".



## 2-3. Measurement of parking brake release pressure

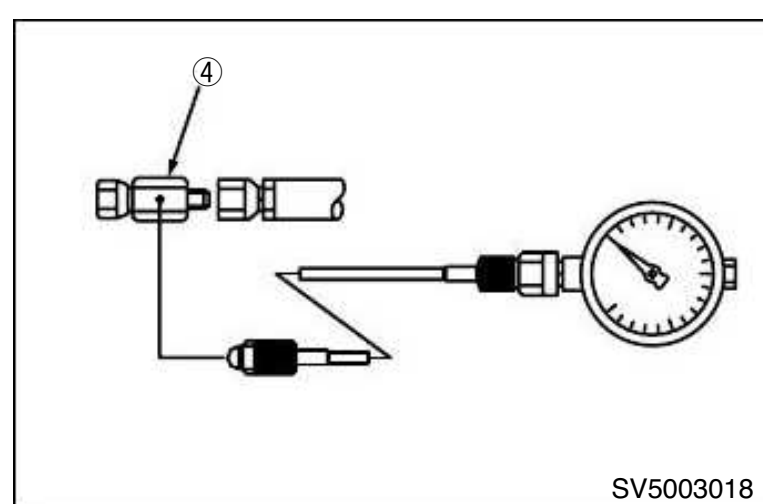
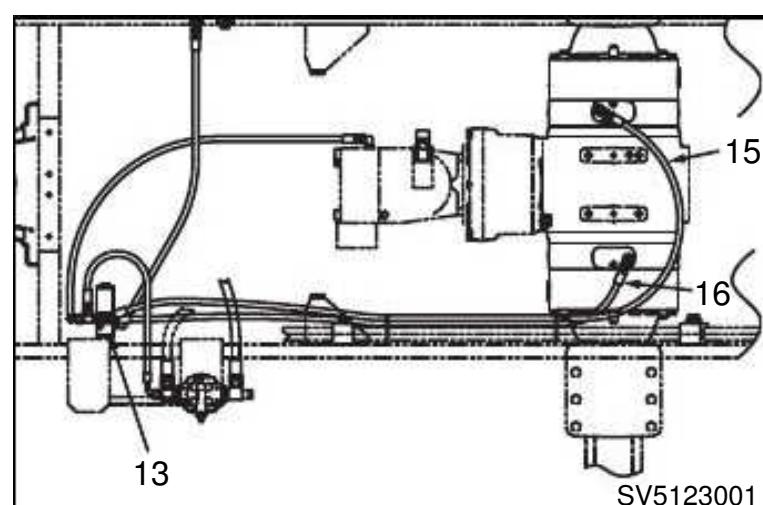
**⚠** Park on level ground. Apply the parking brake. Stop the engine and block the wheels.

### 1. Measurement

★ Hydraulic oil temperature:  $50 \pm 5^{\circ}\text{C}$  ( $122 \pm 41^{\circ}\text{F}$ )

★ Because the charge pressure is also used for releasing the brake, make sure, before the measurement, that the charge pressure is correct.

- 1) Disconnect brake release hose (15) or (16) from brake valve (13), and fit a pressure gauge with adapter ④.
  - Pressure gauge:  
0 ~ 5 MPa (0 ~ 700 psi) {0 ~ 50 kgf/cm<sup>2</sup>}
- 2) Start the engine and set the throttle to high idle.
- 3) Make sure that the F-R lever stays in the neutral position.
- 4) Press down the parking brake switch to free the brake and read the pressure required to release the brake.



## 2-4. Measurement of vibrator circuit pressure

⚠ Park on level ground. Apply the parking brake. Stop the engine and block the wheels.

★ Make sure that the F-R lever stays in the accurate neutral position when the pump is in neutral.

### 1. Measurement

★ Hydraulic oil temperature:  $50 \pm 5^\circ\text{C}$  ( $122 \pm 41^\circ\text{F}$ )

1) Remove plugs (1) and (2) from the high pressure hose elbows connected to the vibrator pump. Attach a pressure gauge with adapter ①.

- Gauge ports: 7/16-20UNF

- Gauge port (1): High amplitude

- Gauge port (2): Low amplitude

- Pressure gauge:

- $0 \sim 40 \text{ MPa}$  ( $0 \sim 9000 \text{ psi}$ )  $\{0 \sim 600 \text{ kgf/cm}^2\}$

2) Disconnect the two high pressure hoses from the vibrator motor. Blank off the hoses.

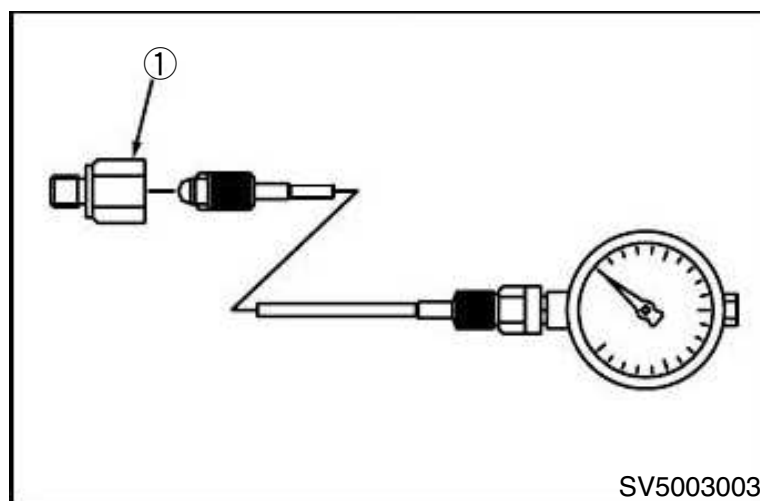
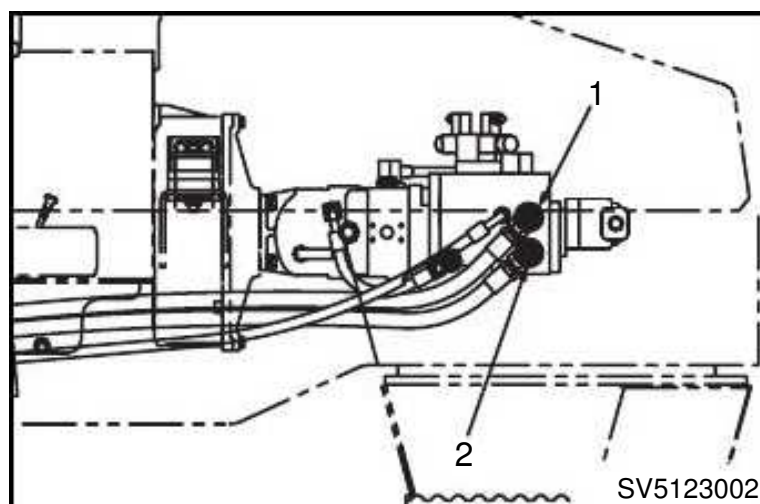
★ Also plug the motor ports to prevent ingress of foreign matter.

3) Start the engine and set the throttle to high idle.

4) Switch ON the vibrator by pressing down the vibrator switch on top of the F-R lever and take the measurement of the pressure.

★ When the measurement is complete, switch OFF the vibrator as quickly as practicable.

★ The procedure (Starting the vibrator → Pressure measurement → Shutting down the vibrator) should not exceed 3 seconds.



## 2. Adjustment

If measured pressures do not fall within the specified range, adjust as follows:

- 1) Remove, disassemble and wash clean high pressure relief valve (3) (high amplitude) or high pressure relief valve (4) (low amplitude).

★ **Renew parts with signs of damages.**

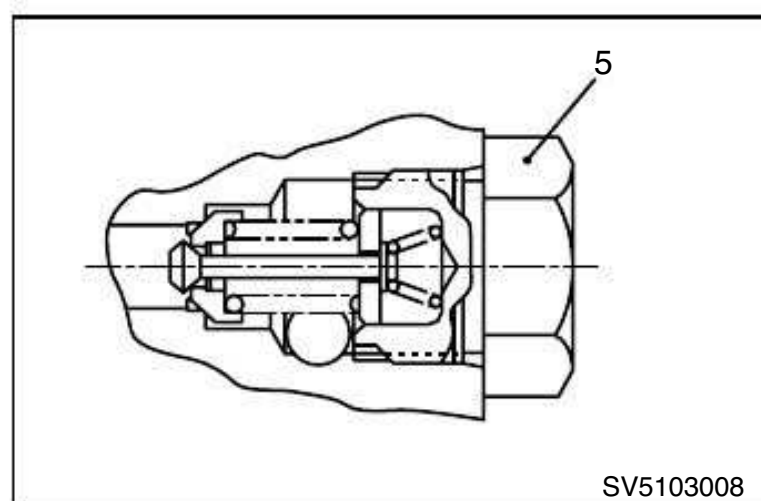
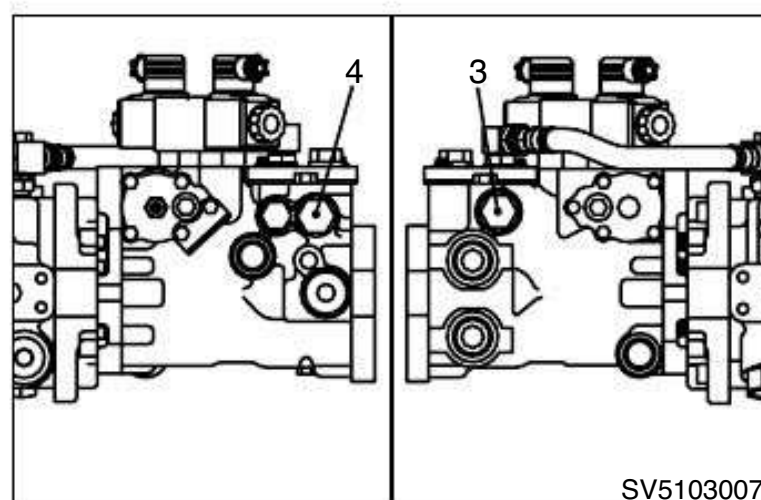
★ **The relief valves are not adjustable.**

• Tightening torque:

Item (5): 176 N·m (130 lbf·ft) {1800 kgf·cm}

★ **Carefully perform disassembly and reassembly taking necessary means to avoid ingress of foreign matter.**

- 2) If a difficulty is encountered to adjust the pressure to the correct level, take necessary means referring to appropriate instructions in the chapter, TROUBLESHOOTING.



## 2-5. Measurement and adjustment of vibrator charge pressure

⚠ Park on level ground. Apply the parking brake. Stop the engine and block the wheels.

★ Because the steering circuit feeds the vibrator charge circuit, make sure that the steering system functions correctly.

★ Make sure that the F-R lever stays in the accurate neutral position when the pump is in neutral.

★ Because the vibrator charge circuit connects to the propulsion charge circuit in parallel, block charge relief valve (10) by fully screwing adjusting screw (12).

\* For the location of valve (10), locknut (11) and screw (12) refer to Fig.SV5103003, page 3-103 and SW6503004, page 3-104.

★ When screwing adjusting screw (12), record the number of turns at which the screw is rotated. When the measurement and adjustment are complete, restore the setting of charge relief valve (10) by screwing out adjusting screw (12) by the same amount and tightening locknut (11).

### 1. Measurement

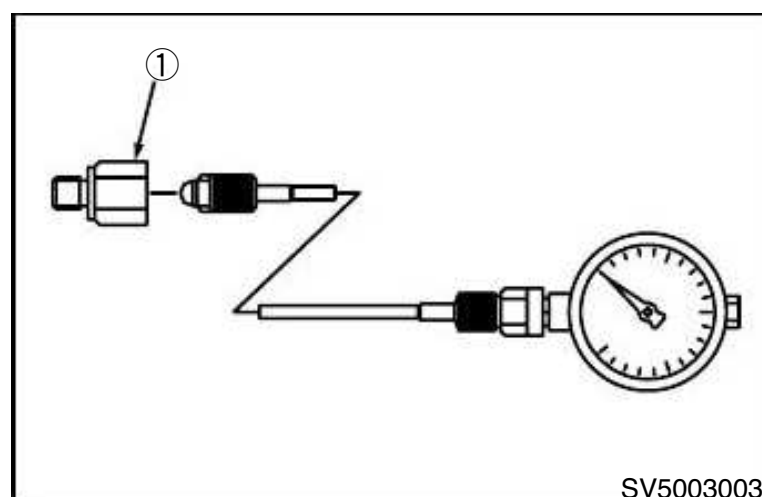
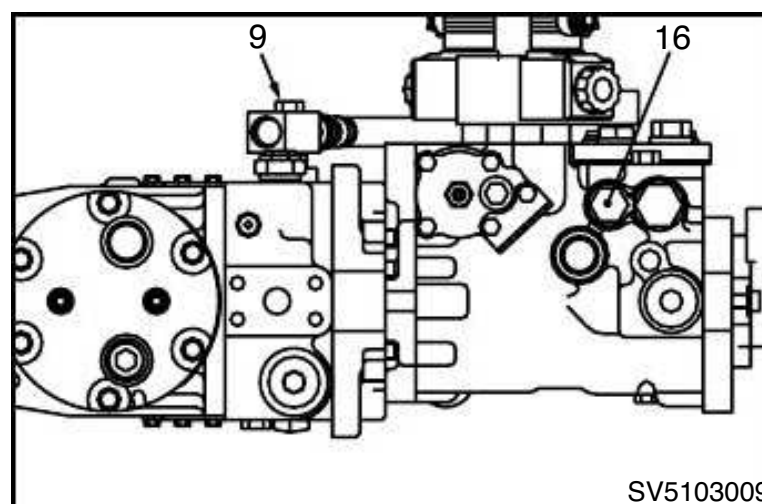
★ Hydraulic oil temperature:  $50 \pm 5^\circ \text{C}$  ( $122 \pm 41^\circ \text{F}$ )

1) Remove the plug from gauge port (9) provided at the elbow connected to the propulsion pump charge port. Attach a pressure gauge with adapter ①.

- Gauge ports: 9/16-UNF
- Pressure gauge:  
0 ~ 5 MPa (0 ~ 700 psi) {0 ~ 50 kgf/cm<sup>2</sup>}

2) Start the engine and set the throttle to high idle.

3) Move the F-R lever slightly forward and backward. The charge pressure will vary. Read the maximum charge pressure.



## 2. Adjustment

If measured pressures do not fall within the specified range, adjust as follows:

- 1) Remove, disassemble and wash clean charge relief valve (16).

\* For the location of valve (16), refer to Fig.SV5103009, page 3-108.

★ **Renew parts with signs of damages.**

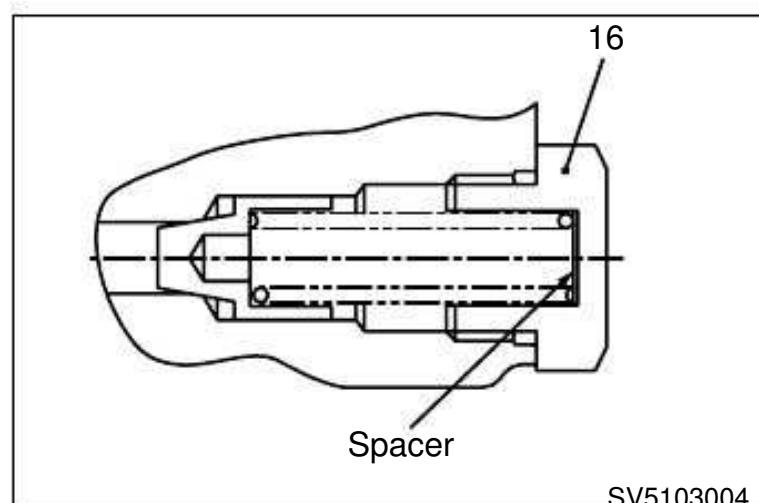
★ **The relief valve is not adjustable.**

• Tightening torque:

Item (16): 73.5 N·m (54.2 lbf·ft) {750 kgf·cm}

★ **Carefully perform disassembly and reassembly taking necessary means to avoid ingress of foreign matter.**

- 2) If it is unable to adjust the pressure to the correct level, take necessary means referring to appropriate instructions in the chapter, TROUBLESHOOTING.



## 2-6. Measurement and adjustment of steering circuit pressure

▲ **Park on level ground. Apply the parking brake. Stop the engine and block the wheels.**

★ **Because the propulsion charge circuit makes use of the pressure of return oil from the steering circuit, check to see if the pressure in the propulsion charge circuit is normal.**

### 1. Measurement

★ **Hydraulic oil temperature:  $50\pm5^{\circ}\text{C}$  ( $122\pm41^{\circ}\text{F}$ )**

1) Disconnect feed hose (1) from the steering cylinder, and connect a pressure gauge to the hose end using adapter ⑤.

• Pressure gauge:

0 ~ 25 MPa (0 ~ 3,500 psi) {0 ~ 250 kfg/cm<sup>2</sup>}

2) Start the engine. Ensuring that the F-R lever is in the neutral position, set the throttle lever to high idle.

3) Rotate the steering wheel clockwise to full lock to allow the relief valve to function and take the reading of the pressure gauge.

★ **Do not allow the relief valve to function (stays open) longer than 3 seconds.**

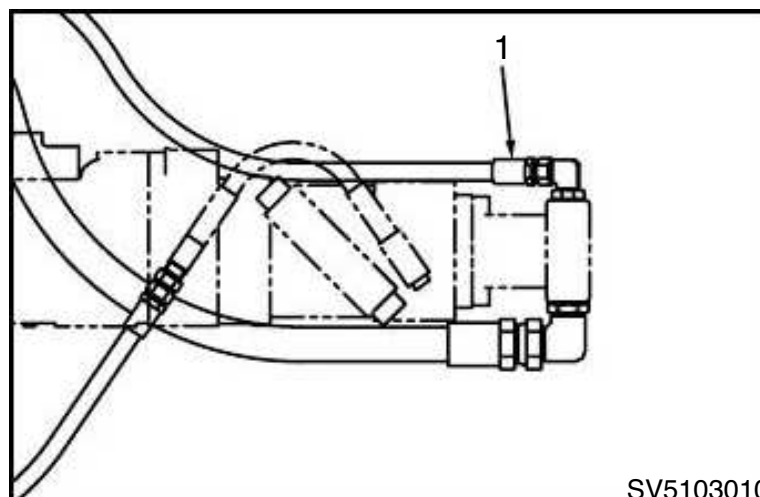
### 2. Adjustment

If the measured value is not within the permissible range, disassemble and clean the relief valve built in Orbitrol.

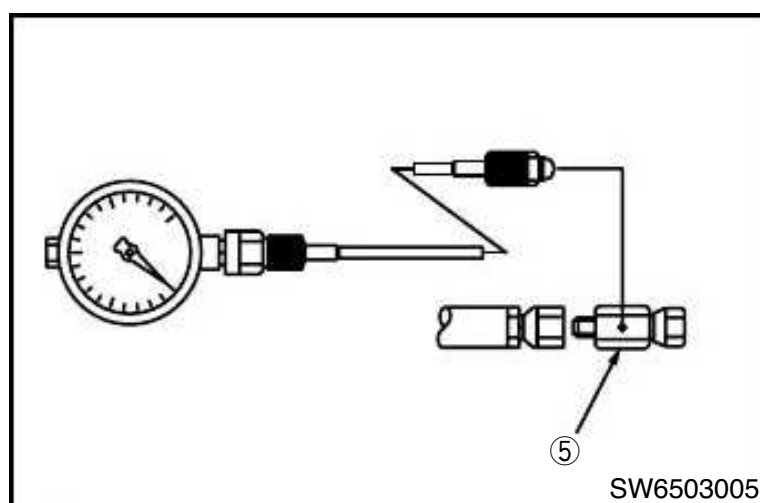
★ **The valve is not adjustable.**

★ **Renew parts if found to be damaged.**

★ **Carefully perform disassembly and reassembly taking necessary means to avoid ingress of foreign matter.**



SV5103010



SW6503005

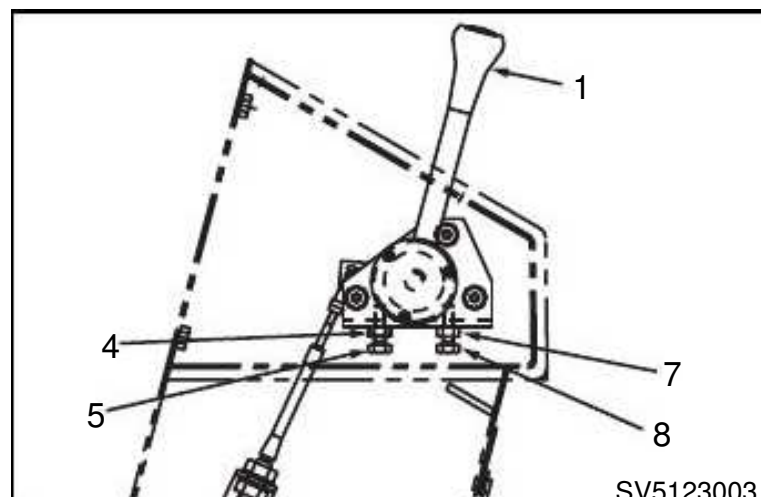
## 2-7. Adjustment of throttle linkage

★ When the throttle linkage has been renewed (or reconnected) or if the high idle or low idle rpm is not to specification, adjust as follows:

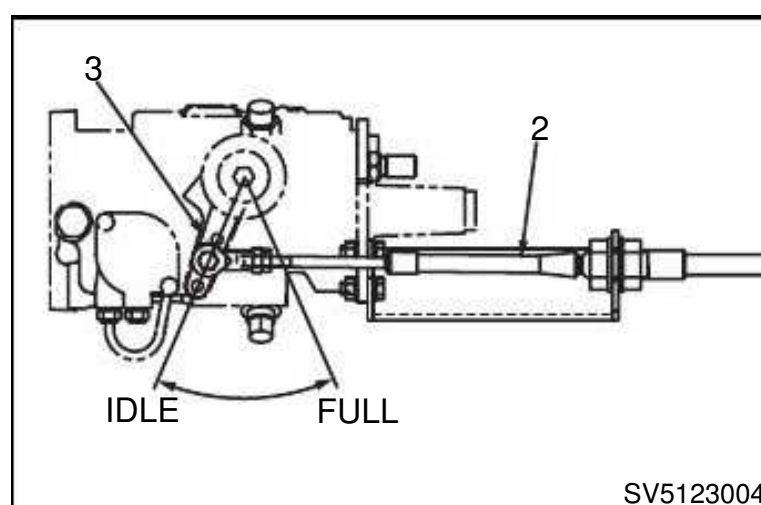
### 1. Adjustment

★ Coolant temperature for adjustment: Green area on gauge

1) Set throttle lever (1) to the LOW idle position.



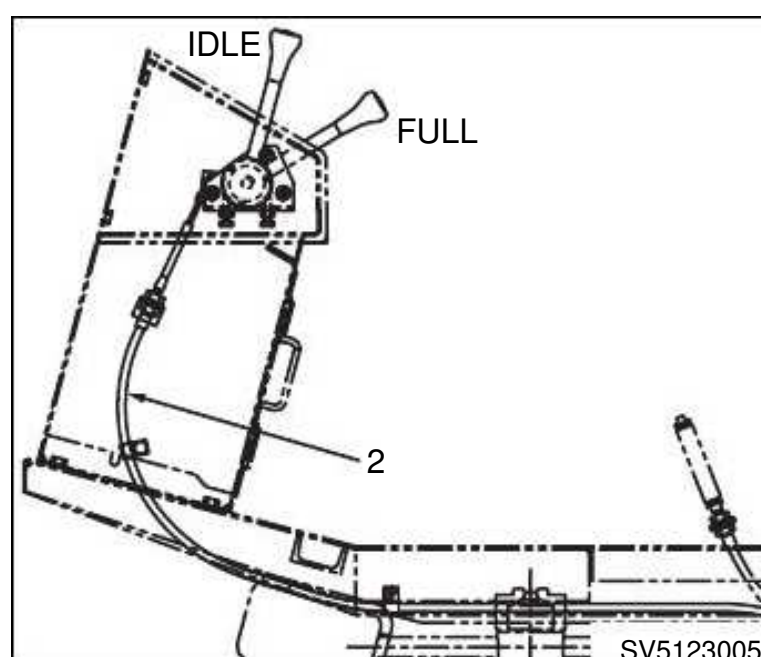
2) Connect throttle cable (2) to fuel injection pump governor lever (3).



3) Start the engine. Loosen locknut (4) and adjust stop screw (5) until correct LOW idle revolution is reached.

★ LOW idle:  $850 \pm 5 \text{ min}^{-1} (\text{rpm})$

4) Move throttle lever (1) fully toward operator. Loosen locknut (7) and adjust stop bolt (8) so that governor lever (3) makes contact with the stopper located on the full throttle side inside the injection pump.



5) Start the engine and check that the HIGH idle rpm is to specification. \*HIGH idle:  $2,300 \pm 25 \text{ min}^{-1} (\text{rpm})$

◆ If the HIGH idle is not as specified with the governor lever (3) in contact with the stopper on the full throttle side, adjust the injection nozzles, repair or renew the fuel injection pump.

★ The engine of this machine is equipped with an exhaust gas control system, and is incapable of adjustment on the HIGH idle side.

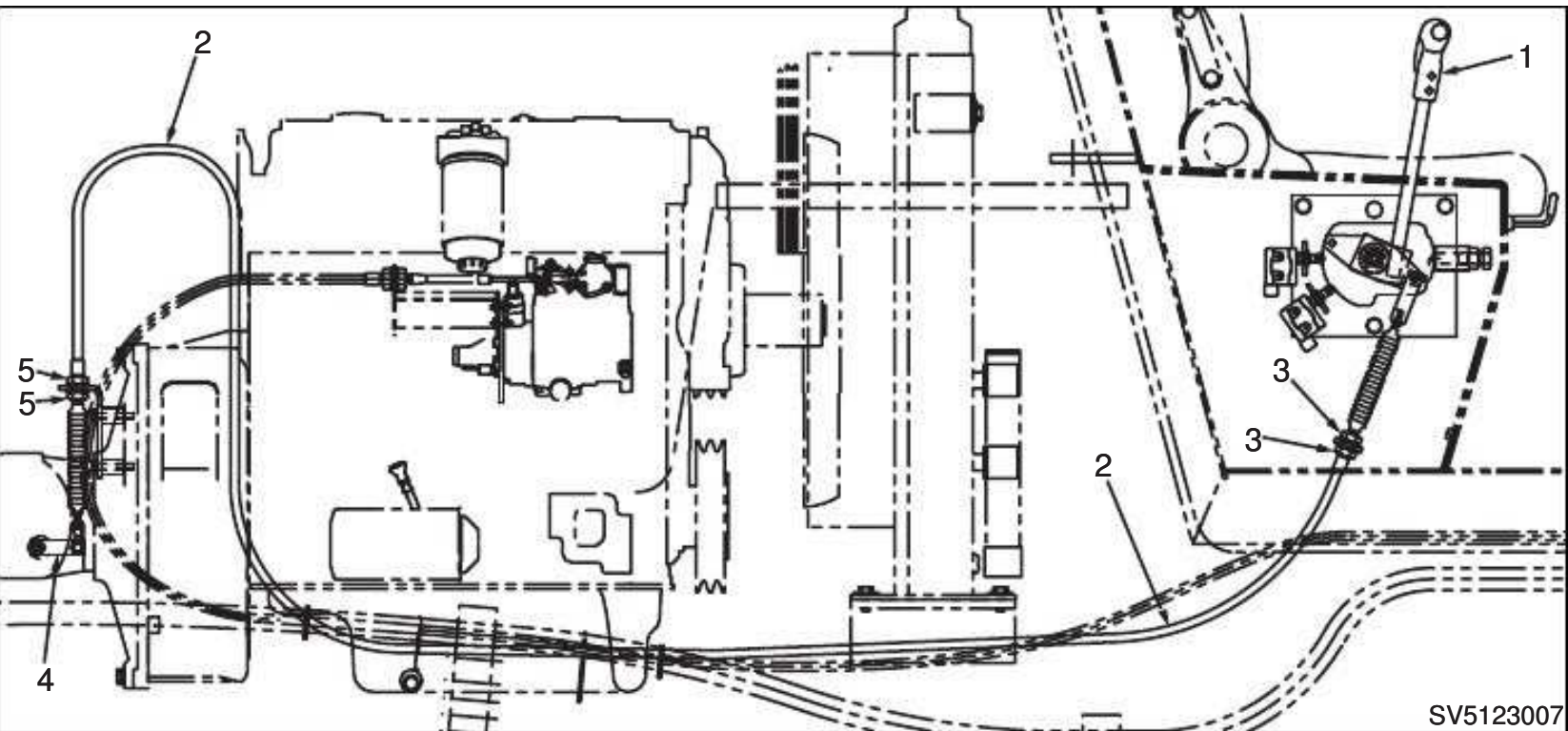
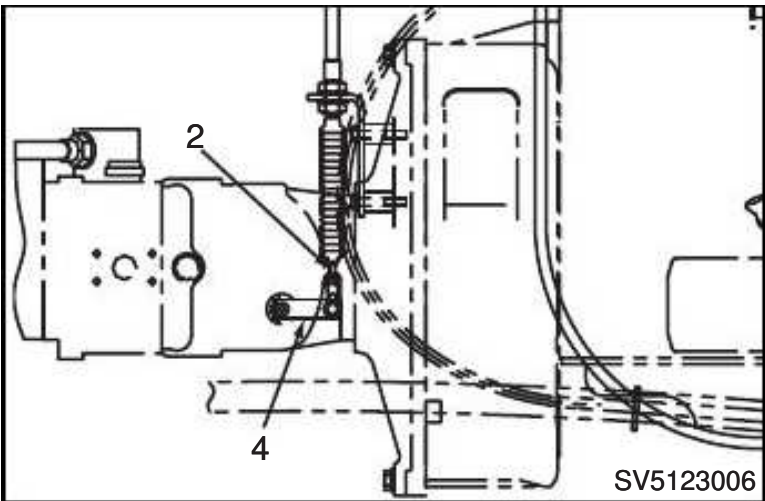
## 2-8. Adjustment of F-R lever linkage

★ In case the propulsion pump or cable has been renewed (or reconnected) or if the pump fails to stay in the correct neutral position, adjust as described below:

### 1. Adjustment

- 1) Put F-R lever (1) in the neutral position. Connect cable (2) and fix the cable with nuts (3).
- 2) Secure propulsion control lever (4) in the neutral position. Connect cable (2) and secure with nuts (5).
- 3) Move the F-R lever to its full extent (forward and backward) to see if pump control lever(4) surely follows the F-R lever movement.
- 4) To adjust the neutral position, rotate nuts (5), while moving the F-R lever (neutral → forward → neutral → backward → neutral), so that the F-R lever travel from the neutral position to the position in which the machine starts traveling is equal for both forward and backward traveling.

★ Perform this adjustment on level and flat concrete pavement with the engine running at high idle.



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# TROUBLESHOOTING

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# TROUBLESHOOTING

|                                                                                                         |       |
|---------------------------------------------------------------------------------------------------------|-------|
| 1. Precautions for troubleshooting .....                                                                | 4-002 |
| 2. How to diagnose the machine .....                                                                    | 4-003 |
| 3. How to use this chapter, "TROUBLESHOOTING"<br>and how to follow the troubleshooting flow chart ..... | 4-004 |
| 4. Precautions for diagnosis of electric circuit .....                                                  | 4-006 |
| 5. Troubleshooting for electric system (Mode E) .....                                                   | 4-201 |
| 6. Troubleshooting for hydraulic and mechanical systems (Mode H) ..                                     | 4-401 |

## 1. Precautions for Troubleshooting

- ⚠ **Park the machine on level ground. Make sure that the safety pins are engaged, wheels chocked and parking brake applied.**
- ⚠ **When working with other workers, use hand signals authorized, and keep people not concerned away from the work area.**
- ⚠ **If the radiator cap is carelessly removed from a hot engine, hot coolant will gush out to cause a burn. Remove the cap only when the engine has been cooled off.**
- ⚠ **Exercise care not to touch hot parts or not to be caught in rotating parts.**
- ⚠ **When disconnecting electric wires, disconnect the battery negative (-) cable.**
- ⚠ **When taking off plugs or caps from units which are under pressure such as hydraulic, water and air pressures, remove residual pressure. Fit gauge securely**

- Troubleshooting is to determine the root cause of troubles, repair faulty parts as quickly as practicable, and prevent recurrence of the troubles.
- Important when conducting troubleshooting practice is of course to well understand the structure and function of machines to be handled. For effective troubleshooting, however, it is of prime importance to have a clear picture of the trouble concerned by contacting the operator.

### 1. When a trouble has occurred, do not attempt to disassemble blindly.

Disassembling in a hurry will invite disadvantageous situations as described below:

- Parts which need not be disassembled may be disassembled.
- Tracing the cause of trouble will become more difficult.

These will cause increased service costs because of wasteful service hours, spare parts or expendables like oil or grease. To make matters worse, such a careless practice will invite operator's (customer's) distrust. For these reasons, sufficient advance investigations and diagnosis in accordance with troubleshooting procedures specified are essential for efficient fault finding practices.

### 2. Questions to be addressed to the operator (customer) .

- 1) Are there any trouble other than the one in question?
- 2) Was there any abnormal condition with the machine before the trouble occurs?
- 3) Did the trouble occur suddenly without signs of abnormal conditions in advance?
- 4) In what occasion did the trouble occur?
- 5) Has the machine been repaired before the trouble occurs? If so, when has it been repaired?
- 6) Did similar trouble occur in the past?

### 3. Before-diagnosis inspection

- 1) Perform daily inspections.
- 2) Perform other inspections required for diagnosis.

### 4. Confirmation of trouble

Know the degree of the trouble. Determine whether it is a trouble cause by improper design etc. or the trouble was caused by incorrect handling.

★ **When making the trouble reccur in an attempt to trace the source of the trouble by putting the machine in motion, use care not to cause more damage to the machine.**

### 5. Troubleshooting

From the results of items 2 to 4 above, narrow down the cause of the trouble, and pinpoint the source of the trouble by utilizing the diagnosis flow chart.

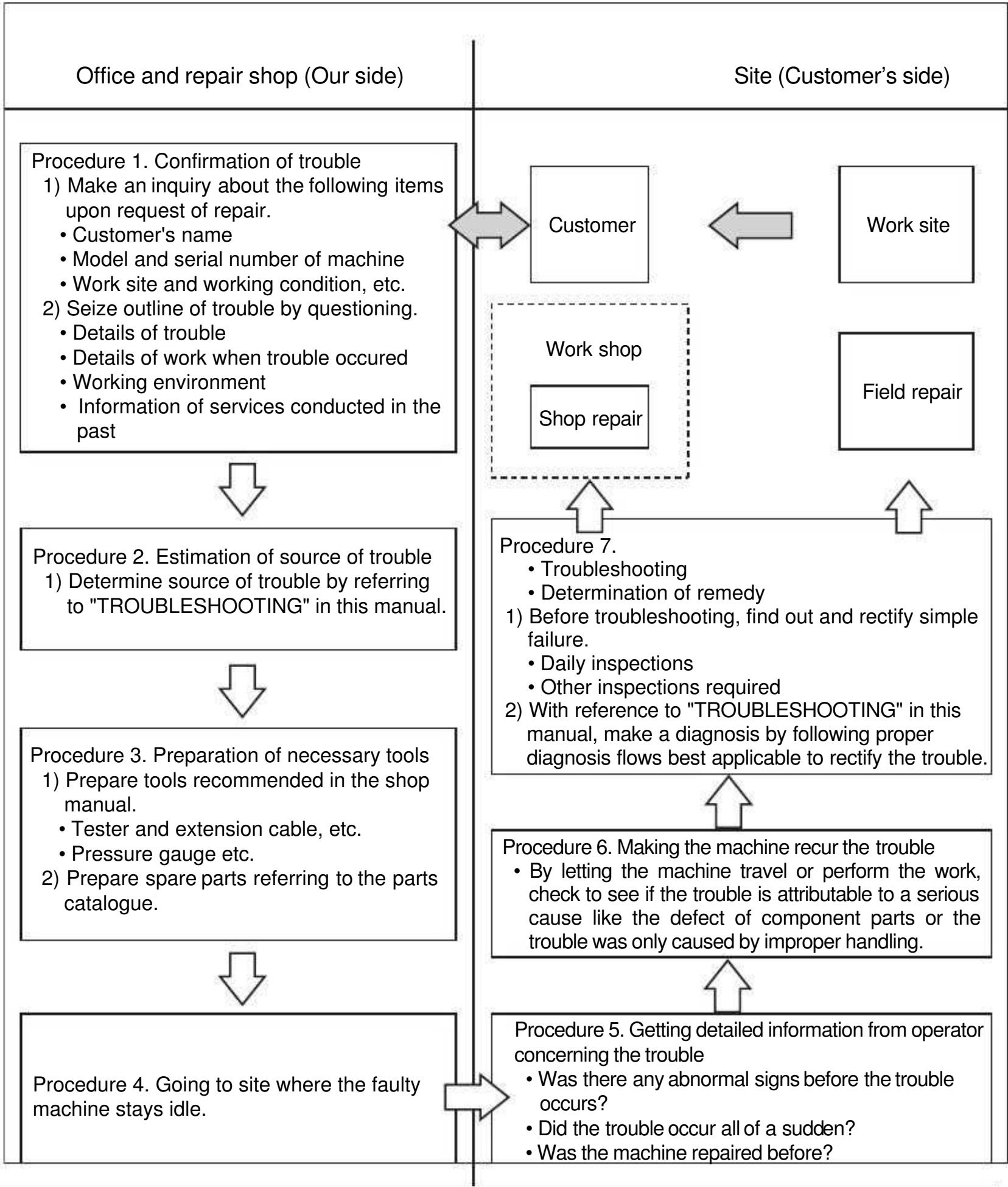
★ **The basic points of the diagnosis are:**

- 1) Start from the simple portion.
- 2) Start from the portion having a high probability to solve the problem.
- 3) Investigate related matters.

### 6. Basic remedy for the trouble

Even if a trouble is rectified, it will develop again if its cause is not determined. It is of prime importance to trace the very cause of the trouble.

2. How to Diagnose the Machine



### 3. How to Use this Chapter, "TROUBLESHOOTING" and How to Follow the Troubleshooting Flow Chart

1. Troubleshooting codes

- 1) Electric system: E-01 to E-15
- 2) Hydraulic and mechanical systems: H-01 to H-10

2. How to follow the troubleshooting flow

★ See example shown on page 4-005.

① Troubleshooting code No.and fault symptom  
On top of the flow chart are code No.and fault symptom.

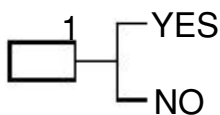
② General precautions  
Under the code and fault symptom are precautions (with mark ★) common to the whole items in the flow chart. Though these precautions are not indicated inside each box (□) which contains checking instructions, pay attention to these precautions when making inspections described in the box (□).

③ Sub classification  
To make diagnosis easier or for simplified flow chart, fault symptom is subclassed . Ex. a)  
Starter does not run

④ How to forward the diagnosis

- Each box (□) contains diagnosis procedure. Depending upon these results of inspection or measurement, proceed to YES or NO line.
- Normally, if the result is YES then proceed to upper line. If NO then go to the lower line.

NOTE: The number above each box (□ ) is a reference number. It does not mean a sequence in which diagnoses proceed.



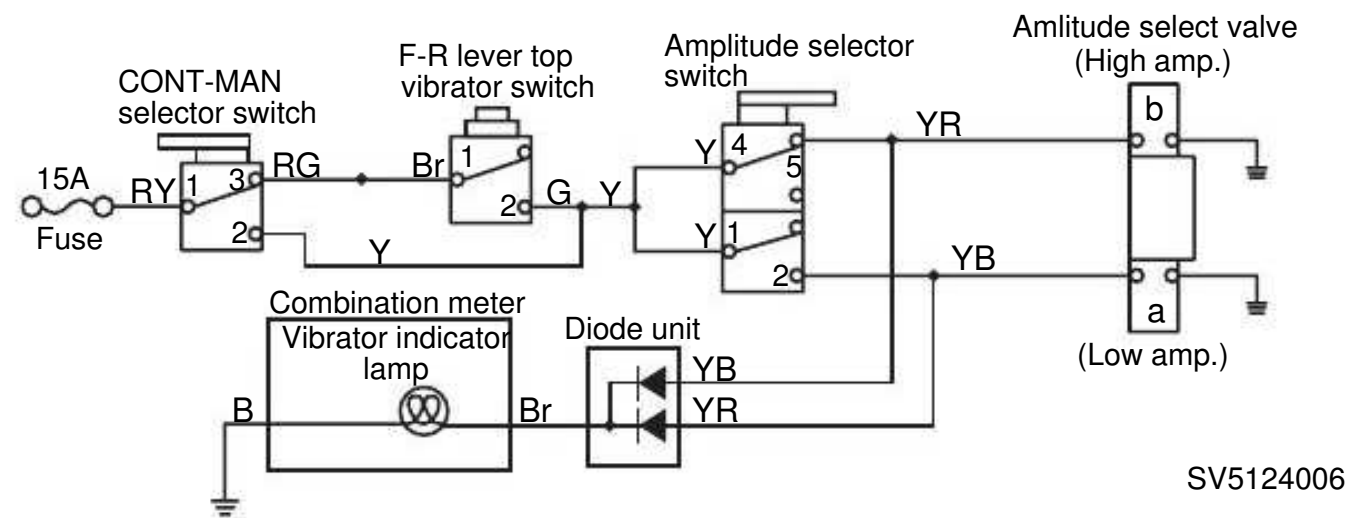
- As a result of a diagnosis, if YES line or NO line directly goes to the description in CAUSE column, take necessary action as indicated in REMEDY column.
- Under each box (□) are normal values and conditions necessary for inspection and adjustment. If the result gives an affirmative answer to the question in the box or agrees with the normal value indicated under the box, go to YES line. Otherwise, go to NO line.
- The normal values were taken from the standard value list.
- For locations of component parts such as relay mentioned in the flow chart, see drawings which show locations of key units. Line colors mentioned in the flow charts are indicated in the electric wiring diagram shown under the flow charts. In the actual machine, each harness is identified by color.

① E-07 Vibrator does not work

- ② ★First check to see if the fuse has burnt.  
★Measure the voltage with the starter switch ON.
- ③ a) Both CONT and MANUAL modes are inoperative
- ④

|                                                                                                                                             |                                                                                                                                                                                        | Possible cause                                                                                                                                               | Remedy                |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <div>1</div> <div>Does stated voltage appear at CONT-MAN selector switch terminal 1 that carries wire RY?<br/>• 20~28V</div> <div>YES</div> | <div>2</div> <div>Does stated voltage appear at F-R lever top vibrator switch terminal 2 that carries wire<br/>• 20 - 28V<br/>Vibrator switch:<br/>CONT or MANUAL</div> <div>YES</div> | Wire Y from amplitude selector switch terminals 1, 4 to F-R lever top vibrator switch terminal 2 not connected or incorrectly connected (from branch point). | Repair or renew wire. |
|                                                                                                                                             | NO                                                                                                                                                                                     | Vibrator switch faulty.                                                                                                                                      | Renew.                |
|                                                                                                                                             | NO                                                                                                                                                                                     | Wire RY from fuse to CONT-MAN selector switch terminal 1 not connected or incorrectly connected.                                                             | Repair or renew wire. |

Electric wiring diagram for mode E-07



## 4. Precautions for Diagnosis of Electric Circuit

1. When disconnecting or connecting connectors or harnesses, cut the power supply.
2. Before making a diagnosis, check the connectors or harnesses for poor connection.  
★ If a connector is at fault, check it by repeating connection and disconnection several times.
3. Before proceeding to the next step, reconnect removed connectors or harnesses in place.  
★ Care must be used for the controller circuit. If the power source is switched on with the connector disconnected, this can cause an incorrect measurement.
4. When making a diagnosis of circuits (measurement of voltage, resistance, current, test for continuity, etc.), check to see if tester readings vary by shaking connectors or harnesses.  
★ If readings vary, a possible cause is a poor connection of the circuit.
5. For voltage measurement, turn the starter switch ON. For resistance checking, let the switch stay in the Off position.  
★ If necessary to take a measurement of resistance by energizing relays or other units with the starter switch ON, necessary instructions are given in the flow charts.

5. Troubleshooting for Electric System (Mode E)

E-01 Engine does not start ..... 4-202

E-02 Engine does not stop ..... 4-206

E-03 Intake air heater does not become red-hot ..... 4-207

E-04 No charging (charge lamp stays bright) ..... 4-208

E-05 Backup buzzer does not sound ..... 4-209

E-06 Horn does not sound ..... 4-210

E-07 Vibrator does not work ..... 4-211

E-08 Parking brake is not released ..... 4-214

E-09 Low-High speed selection not made ..... 4-215

E-10 Headlamps and flood lamp do not come on ..... 4-216

E-11 Fuel gauge reads wrong ..... 4-218

E-12 Coolant temperature gauge reads wrong ..... 4-219

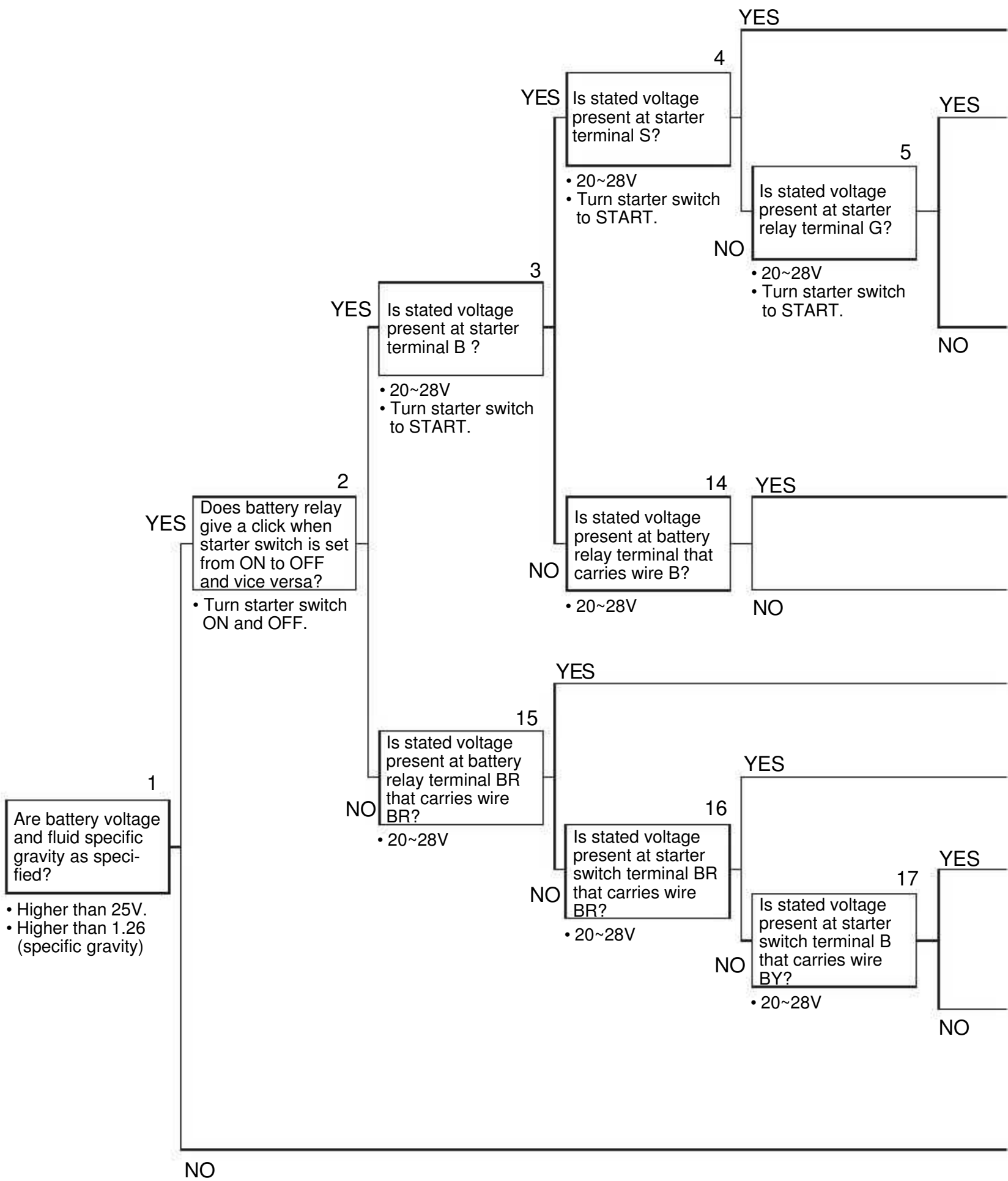
E-13 Charge warning lamp, engine oil pressure warning lamp,  
hydraulic oil filter warning lamp and parking brake indicator lamp  
do not come on with starter switch ON ..... 4-220

Wire color code

|     |                         |     |                         |     |                              |     |                               |    |                         |    |                         |
|-----|-------------------------|-----|-------------------------|-----|------------------------------|-----|-------------------------------|----|-------------------------|----|-------------------------|
| B   | Black                   | BrY | Brown/<br>Yellow stripe | L   | Blue                         | LgW | Light green/<br>White stripe  | W  | White                   | YG | Yellow/<br>Green stripe |
| BR  | Black/<br>Red stripe    | G   | Green                   | LB  | Blue/<br>Black stripe        | LgY | Light green/<br>Yellow stripe | WB | White/<br>Black stripe  | YL | Yellow/<br>Blue stripe  |
| BW  | Black/<br>White stripe  | GB  | Green/<br>Black stripe  | LR  | Blue/<br>Red stripe          | R   | Red                           | WG | White/<br>Green stripe  | YR | Yellow/<br>Red stripe   |
| BY  | Black/<br>Yellow stripe | GL  | Green/<br>Blue stripe   | LW  | Blue/<br>White stripe        | RB  | Red/<br>Black stripe          | WL | White/<br>Blue stripe   | YW | Yellow/<br>White stripe |
| Br  | Brown                   | GR  | Green/<br>Red stripe    | LY  | Blue/<br>Yellow stripe       | RG  | Red/<br>Green stripe          | WR | White/<br>Red stripe    | Gy | Gray                    |
| BrB | Brown/<br>Black stripe  | GW  | Green/<br>White stripe  | Lg  | Light green                  | RL  | Red/<br>Blue stripe           | WY | White/<br>Yellow stripe | O  | Orange                  |
| BrR | Brown/<br>Red stripe    | GY  | Green/<br>Yellow stripe | LgB | Light green/<br>Black stripe | RW  | Red/<br>White stripe          | Y  | Yellow                  | Sb | Sky blue                |
| BrW | Brown/<br>White stripe  |     |                         | LgR | Light green/<br>Red stripe   | RY  | Red/<br>Yellow stripe         | YB | Yellow/<br>Black stripe | P  | Pink                    |

E-01 Engine does not start

- ★Set the F-R lever to the neutral position.
- ★For voltage measurement, turn the starter switch ON.
  - a) Starter motor does not operate. (1/2)

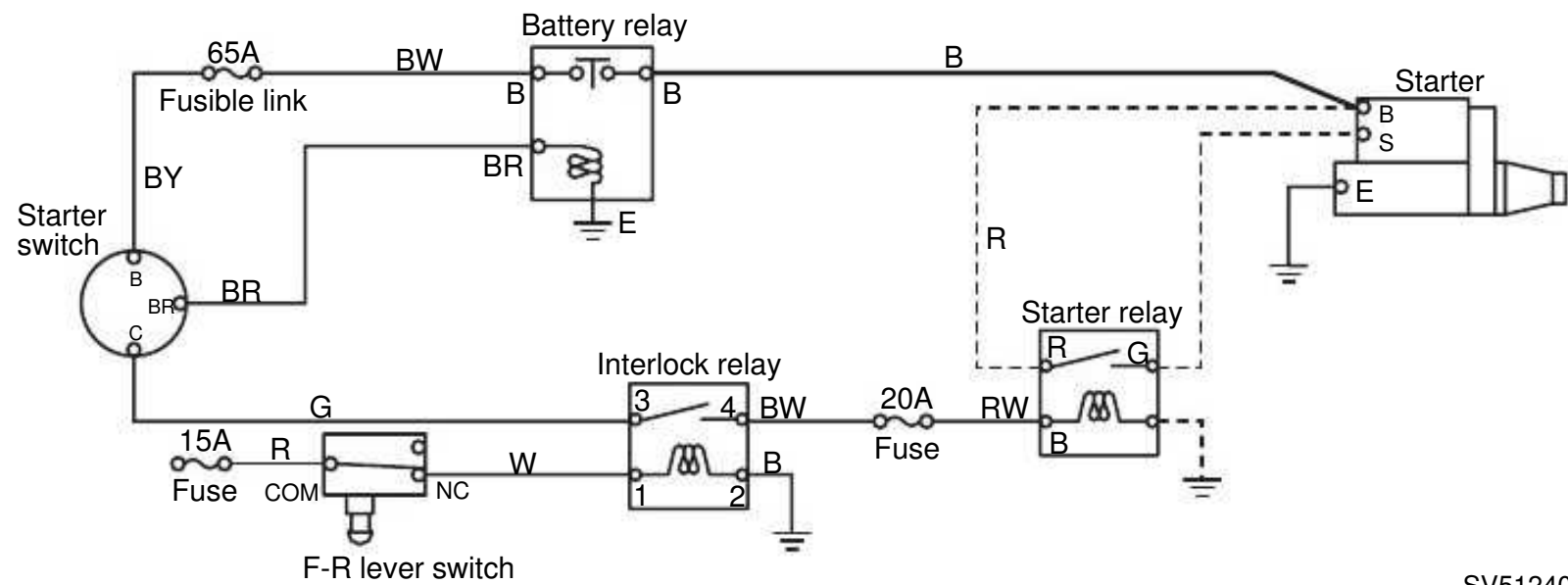


|                                                                                                                         |                                                                            | Possible cause                                                                                               | Remedy                                    |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------|
|                                                                                                                         |                                                                            | Starter faulty.                                                                                              | Renew.                                    |
|                                                                                                                         |                                                                            | Wire from starter relay terminal G to starter terminal S not connected or incorrectly connected.             | Repair or renew wire.                     |
| <div>6</div> <div>Is specified voltage fed to starter relay terminal R?</div> <div>• 20~28V</div>                       | YES                                                                        | Starter relay faulty or its earth wire not connected or incorrectly connected.                               | • Renew relay.<br>• Repair or renew wire. |
|                                                                                                                         | Is specified voltage fed to starter relay terminal B that carries wire RW? |                                                                                                              |                                           |
|                                                                                                                         | • 20~28V<br>• Turn starter switch to START.                                | NO                                                                                                           | To “A” on page 4-204                      |
|                                                                                                                         | NO                                                                         | Wire B from starter relay terminal B to starter terminal B not connected or incorrectly connected.           | Repair or renew wire.                     |
|                                                                                                                         |                                                                            | Wire B from battery relay to starter terminal B not connected or incorrectly connected.                      | Repair or renew wire.                     |
|                                                                                                                         |                                                                            | Battery relay contact faulty.                                                                                | Renew.                                    |
|                                                                                                                         |                                                                            | Battery relay coil faulty.                                                                                   | Renew.                                    |
|                                                                                                                         |                                                                            | Wire BR from starter switch terminal BR to battery relay terminal BR not connected or incorrectly connected. | Repair or renew wire.                     |
|                                                                                                                         |                                                                            | Starter switch faulty (between B and BR).                                                                    | Renew.                                    |
| <div>18</div> <div>Is specified voltage fed to battery relay terminal B that carries wire BW?</div> <div>• 20~28V</div> | YES                                                                        | Wires BY and BW from battery relay to starter switch terminal B not connected or incorrectly connected.      | Repair or renew wire.                     |
|                                                                                                                         | NO                                                                         | Wire B from battery to battery relay not connected or incorrectly connected.                                 | Repair or renew cable.                    |
|                                                                                                                         |                                                                            | Battery capacity lowered.                                                                                    | Charge or renew.                          |

a) Starter is inoperative. (2/2)

|   |                                                                                                                                  | Possible cause | Remedy                                                                                                                                                                                                                                                                                                                                                                                                      |
|---|----------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A | 8<br>Is specified voltage fed to interlock relay terminal 4 that carries wire BW?<br>• 20~28V<br>• Turn starter switch to START. | YES            | Wires BW,RW from interlock relay terminal 4 to starter relay terminal B not connected or incorrectly connected.<br><br>Interlock relay faulty or its earth wire not connected or incorrectly connected.<br><br>• Repair.<br>• Repair or renew wire.                                                                                                                                                         |
|   | 9<br>Is specified voltage fed to interlock relay terminal 3 that carries wire G?<br>• 20~28V<br>• Turn starter switch to START.  | YES            |                                                                                                                                                                                                                                                                                                                                                                                                             |
|   | 10<br>Is specified voltage fed to interlock relay terminal 1 that carries wire W?<br>• 20~28V<br>• Turn starter switch to START. | YES            |                                                                                                                                                                                                                                                                                                                                                                                                             |
|   |                                                                                                                                  | NO             |                                                                                                                                                                                                                                                                                                                                                                                                             |
| B | 11<br>Is specified voltage fed to F-R lever switch that carries wire W?<br>• 20~28V                                              | YES            | Wire W from F-R lever switch to interlock relay terminal 1 not connected or incorrectly connected.<br><br>F-R lever switch faulty.<br><br>Wire R from fuse to F-R lever switch not connected or incorrectly connected (including fuse).<br><br>Wire G from starter switch terminal C to interlock switch terminal 3 not connected or incorrectly connected.<br><br>Starter switch faulty (between B and C). |
|   | 12<br>Is specified voltage fed to F-R lever switch that carries wire R?<br>• 20~28V                                              | YES            |                                                                                                                                                                                                                                                                                                                                                                                                             |
|   | 13<br>Is specified voltage fed to starter switch terminal C that carries wire G?<br>• 20~28V<br>• Turn starter switch to START.  | YES            |                                                                                                                                                                                                                                                                                                                                                                                                             |
|   |                                                                                                                                  | NO             |                                                                                                                                                                                                                                                                                                                                                                                                             |

Electric wiring diagram for mode E-01a)

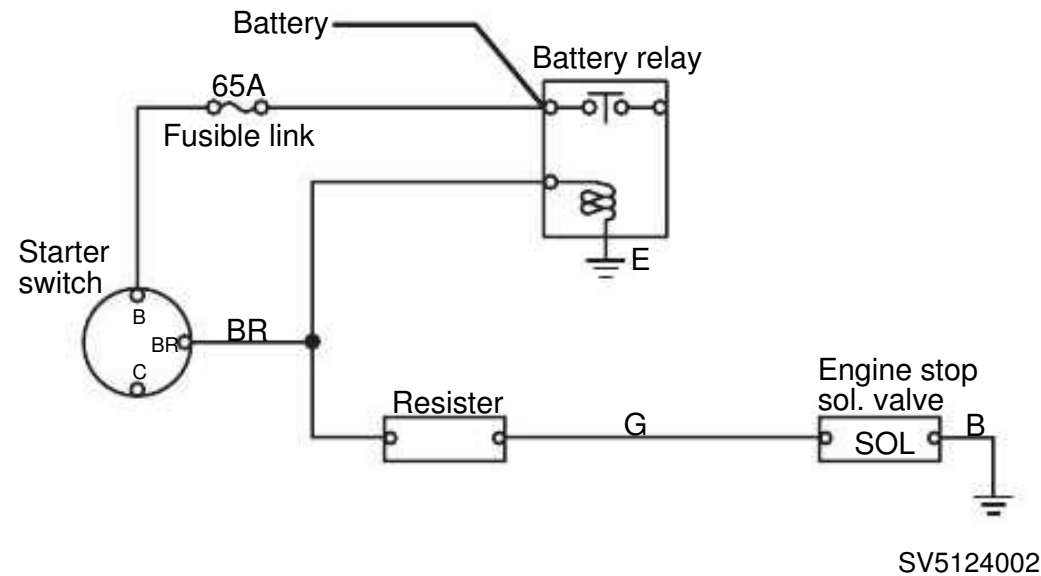


SV5124001

b) Engine stop solenoid does not operate (Starter is normal)

|                                                                                                                                 |     |                                                                                                 | Possible cause                                                                                     | Remedy                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| <div>1<br/>Is resistance of solenoid as specified and is it insulated from machine body?<br/>• 20~28V<br/>• Higher than 1</div> | YES | 2<br>Is resistance of solenoid earth wire as specified?<br>• Lower than 1<br>• Disconnect wire. | 3<br>Is specified voltage present at solenoid terminal that carries wire G?<br>• 20~28V            | YES<br>Injection pump stop lever or linkage malfunctioning.<br>Correct. |
|                                                                                                                                 | YES | NO                                                                                              | NO<br>To "A" on this page                                                                          |                                                                         |
|                                                                                                                                 | NO  |                                                                                                 | Solenoid earth wire not connected or incorrectly connected.                                        | Repair or renew wires.                                                  |
|                                                                                                                                 |     |                                                                                                 | Engine stop solenoid faulty.                                                                       | Renew.                                                                  |
|                                                                                                                                 |     |                                                                                                 | Wire G from resistor to solenoid not connected or incorrectly connected.                           | Repair or renew wires.                                                  |
| <div>A<br/>4<br/>Is specified voltage present at resistor terminal that carries wire G?<br/>• 20~28V</div>                      | YES |                                                                                                 | Resistor faulty.                                                                                   | Renew.                                                                  |
|                                                                                                                                 | NO  | 5<br>Is specified voltage present at resistor terminal that carries wire BR?<br>• 20~28V        | YES<br>Wire BR from starter switch terminal BR to resistor not connected or incorrectly connected. | Repair or renew wires.                                                  |
|                                                                                                                                 |     | NO                                                                                              |                                                                                                    |                                                                         |

Electric wiring diagram for mode E-01b)



E-02 Engine does not stop

★Measure the voltage with the starter switch OFF.

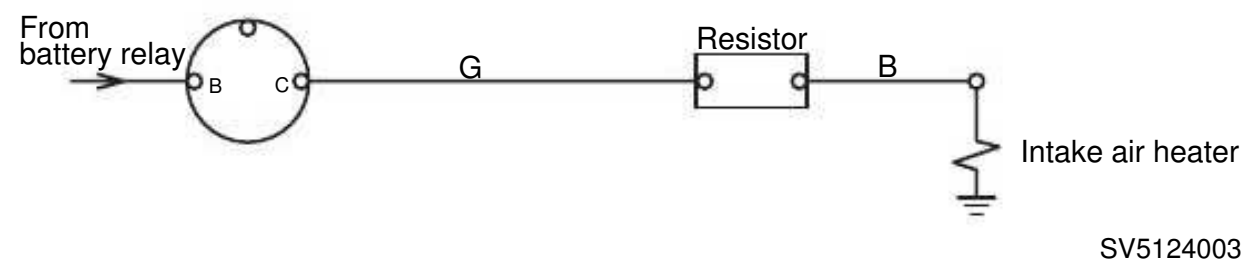
|                                                                                                                        |     | Possible cause                            | Remedy |
|------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------|--------|
| <div>1</div> <div>1s stated voltage fed to engine stop solenoid that carries wire G?</div> <div>• Lower than 1V.</div> | YES | Engine stop solenoid faulty.              | Renew. |
|                                                                                                                        | NO  | Starter switch faulty (between B and BR.) | Renew. |

※For electric wiring diagram, refer to E-01b)

E-03 Intake air heater does not become red-hot

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  | Possible cause                                                                            | Remedy                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|-------------------------------------------------------------------------------------------|-----------------------|
| <div>1</div> <div>Does stated voltage appear at heater terminal that carries wire B?</div> <div>• 18~28V</div> <div>• Turn starter switch to START.</div> <div>YES</div> <div>NO</div> <div>2</div> <div>Does stated voltage appear at resistor terminal that carries wire B?</div> <div>• 18~28V</div> <div>• Turn starter switch to START.</div> <div>YES</div> <div>NO</div> <div>3</div> <div>Does stated voltage appear at resistor terminal that carries wire G?</div> <div>• 18~28V</div> <div>• Turn starter switch to START.</div> <div>YES</div> <div>NO</div> |  |  | Intake air heater faulty.                                                                 | Renew.                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  | Wire B from resistor to air heater not connected or incorrectly connected.                | Repair or renew wire. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  | Register faulty.                                                                          | Renew.                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  | Wire G from starter switch terminal C to resistor not connected or incorrectly connected. | Repair or renew wire. |

Electric wiring diagram for mode E-03



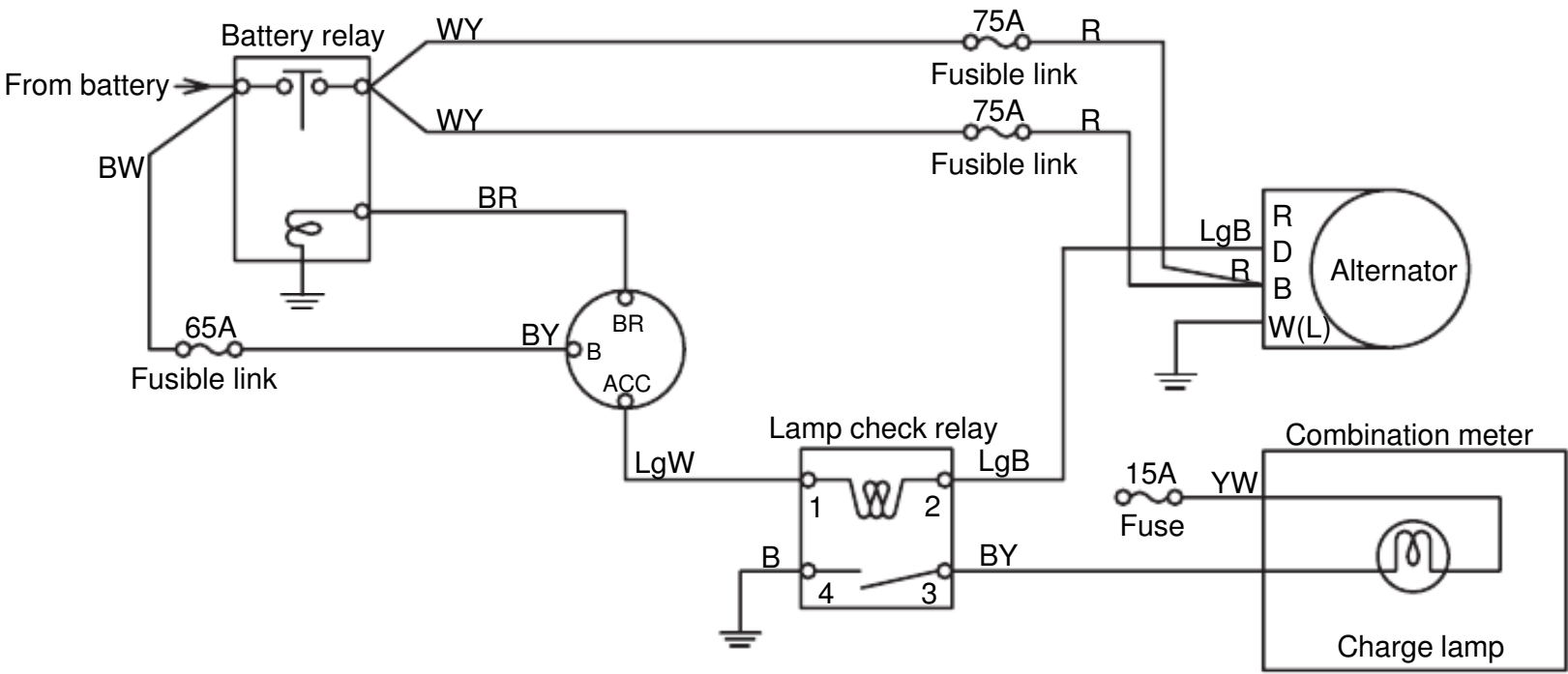
E-04 No charging (charge lamp stays bright)

★The voltage measurement should be taken with the starter switch ON.

★First, check to see if fuse has burnt.

|                                                                                                                                                               |     |                                                                                                                                         | Possible cause                                                                                  | Remedy                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------|
| <div>1<br/>Does specified voltage appear at alternator terminal D that carries wire LgB?<br/>• 27.5~29.5V<br/>• Run engine at higher than medium speed.</div> | YES |                                                                                                                                         | Alternator faulty.                                                                              | Renew.                |
|                                                                                                                                                               | NO  | <div>2<br/>Does specified voltage appear at alternator terminal B that carries wire R?<br/>• 20~28V<br/>• Turn starter switch ON.</div> | Alternator faulty.                                                                              | Renew.                |
|                                                                                                                                                               |     |                                                                                                                                         | Alternator earth wire not connected or incorrectly connected.                                   | Repair or renew wire. |
|                                                                                                                                                               |     |                                                                                                                                         | Wire R (WY) from battery relay to alternator terminal B not connected or incorrectly connected. | Repair or renew wire. |

Electric wiring diagram for mode E-04



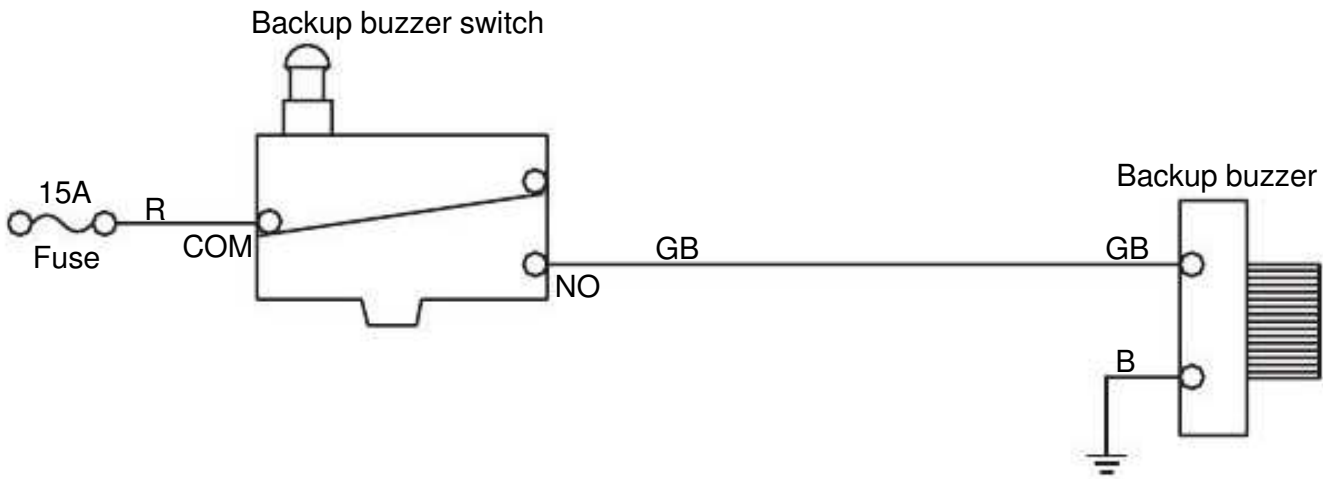
SV5124004

E-05 Backup buzzer does not sound

- ★First, check that the fuse is not blown.
- ★The voltage measurement should be taken with the starter switch ON.

|                                                                                                                                            |     |                                                                                                                                     |                                                                                                      | Possible cause                                                                             | Remedy                |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------|
| <div>1<br/>Does specified voltage appear at backup buzzer terminal that carries wire GB?<br/>• 20~28V<br/>• Move F-R lever Backward.</div> | YES | 2<br>Is resistance of backup buzzer earth wire as specified?<br>• Less than 1<br>• Disconnect wire from reverse alarm.              | YES                                                                                                  | Backup buzzer faulty.                                                                      | Renew.                |
|                                                                                                                                            |     | NO                                                                                                                                  |                                                                                                      | Backup buzzer earth wire not connected or incorrectly connected.                           | Repair or renew wire. |
|                                                                                                                                            | NO  | 3<br>Does specified voltage appear at backup buzzer switch terminal that carries wire GB?<br>• 20~28V<br>• Move F-R lever Backward. | YES                                                                                                  | Wire GB from backup buzzer switch to backup buzzer not connected or incorrectly connected. | Repair or renew wire. |
|                                                                                                                                            |     | NO                                                                                                                                  | 4<br>Does specified voltage appear at backup buzzer switch terminal that carries wire R?<br>• 20~28V | YES<br>Backup buzzer switch faulty.                                                        | Renew.                |
|                                                                                                                                            |     |                                                                                                                                     | NO                                                                                                   | Wire R from backup buzzer switch to fuse not connected or incorrectly connected.           | Repair or renew wire. |

Electric wiring diagram for mode E-05



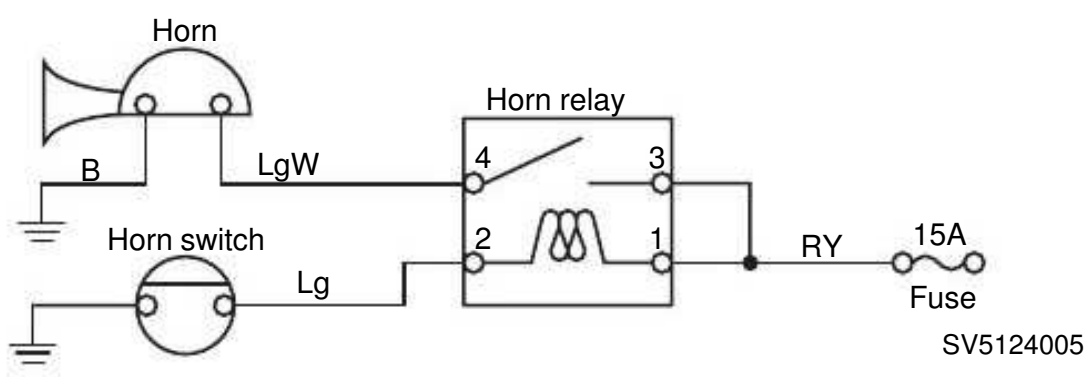
SV5124010

E-06 Horn does not sound

- ★First, check that fuse is not blown.
- ★Take the voltage measurement with the starter switch ON.

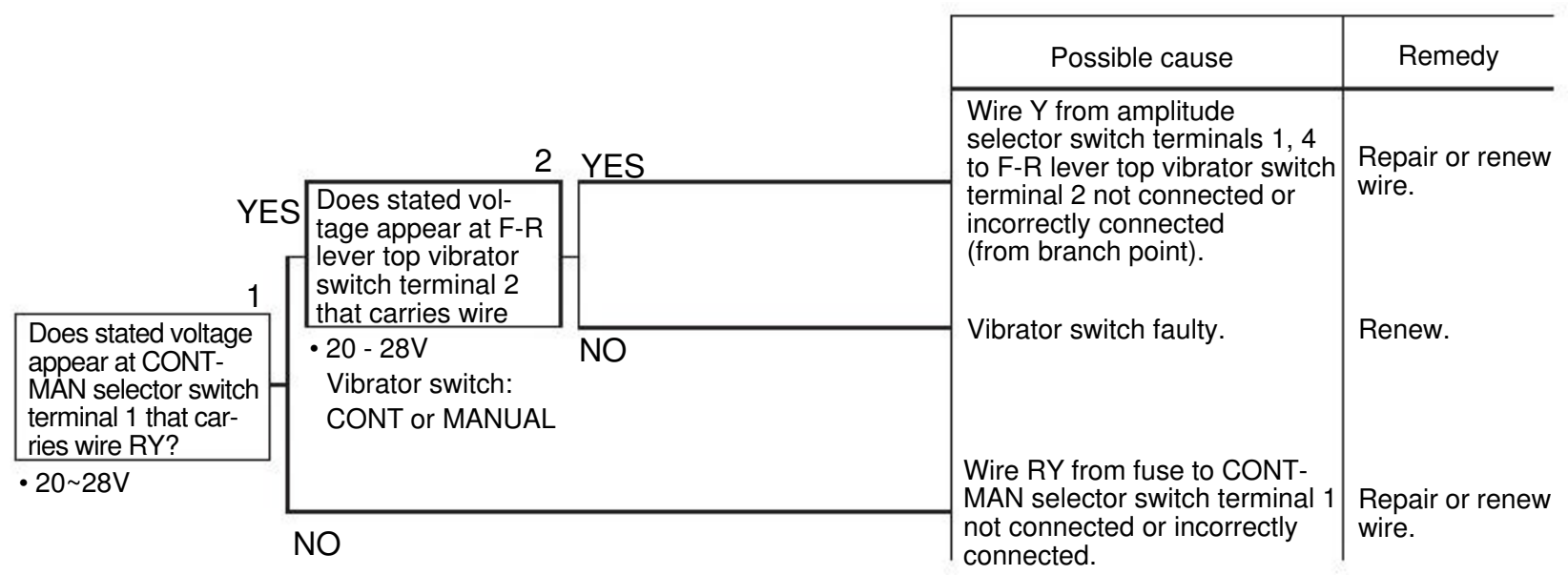
|                                                                                                                                                                |     |                                                                                                                                                                                  |                                                                                                                                                       | Possible cause                                                                            | Remedy                |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------|--------|
| <div>1</div> <div>Is stated voltage present at horn terminal that carries wire LgW?</div> <div>• 20~28V<br/>• Switch ON horn switch.</div>                     | YES | <div>2</div> <div>Is resistance of horn earth wire as specified?</div> <div>• Lower than 1<br/>• Disconnect wire from horn.</div>                                                | YES                                                                                                                                                   | Horn faulty.                                                                              | Renew.                |        |
|                                                                                                                                                                |     | NO                                                                                                                                                                               |                                                                                                                                                       | Horn earth wire not connected or incorrectly connected.                                   | Repair or renew wire. |        |
|                                                                                                                                                                | NO  | <div>3</div> <div>Is stated voltage present at horn relay terminal 4 that carries wire LgW?</div> <div>• 20~28V<br/>• Switch ON horn switch.</div>                               | YES                                                                                                                                                   | Wire LgW from horn to horn relay terminal 4 not connected or incorrectly connected.       | Repair or renew wire. |        |
|                                                                                                                                                                |     | NO                                                                                                                                                                               | <div>4</div> <div>Is stated voltage present at horn relay terminals 3 and 1 that carry wire RY?</div> <div>• 20~28V</div>                             | YES<br>To "A" on this page                                                                |                       |        |
|                                                                                                                                                                |     |                                                                                                                                                                                  |                                                                                                                                                       | Wire RY from horn relay terminals 3 and 1 to fuse not connected or incorrectly connected. | Repair or renew wire. |        |
| <div>A</div> <div>5</div> <div>Is stated voltage present at horn switch terminal that carries wire Lg?</div> <div>• 20~28V<br/>• Switch OFF horn switch.</div> | YES | <div>6</div> <div>Is resistance between horn switch terminals normal?</div> <div>• Switch ON horn switch.<br/>• Lower than 1<br/>• Disconnect earth wire from horn switch.</div> | YES                                                                                                                                                   | Horn switch faulty.                                                                       | Renew.                |        |
|                                                                                                                                                                |     | NO                                                                                                                                                                               | <div>7</div> <div>Is resistance of horn switch earth wire as specified?</div> <div>• Lower than 1<br/>• Disconnect earth wire from horn switch.</div> | YES                                                                                       | Horn switch faulty.   | Renew. |
|                                                                                                                                                                |     |                                                                                                                                                                                  | NO                                                                                                                                                    | Horn switch earth wire not connected or incorrectly connected.                            | Repair or renew wire. |        |
|                                                                                                                                                                | NO  | <div>8</div> <div>Is stated voltage present at horn relay terminal 2 that carries wire Lg?</div> <div>• 20~28V<br/>• Switch OFF horn switch.</div>                               | YES                                                                                                                                                   | Wire Lg from horn relay terminal 2 to horn switch not connected or incorrectly connected. | Repair or renew wire. |        |
|                                                                                                                                                                |     |                                                                                                                                                                                  |                                                                                                                                                       | NO                                                                                        | Horn relay faulty.    | Renew. |

Electric wiring diagram for mode E-06

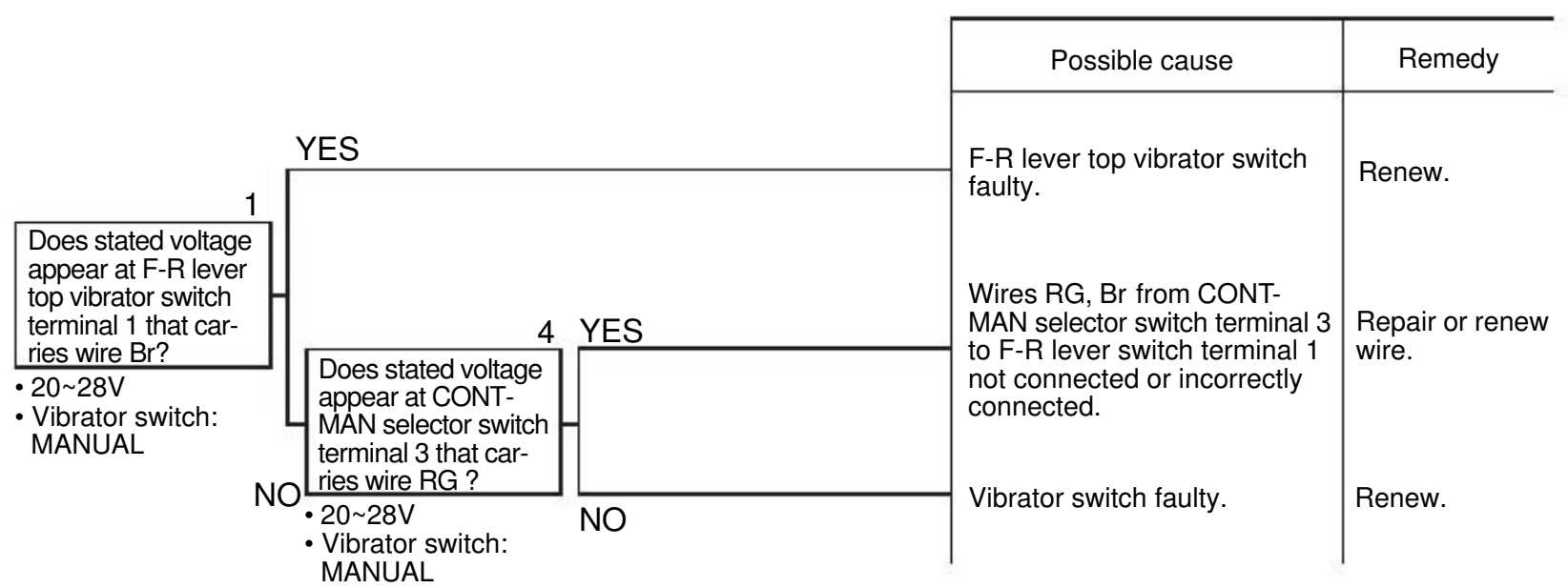


E-07 Vibrator does not work

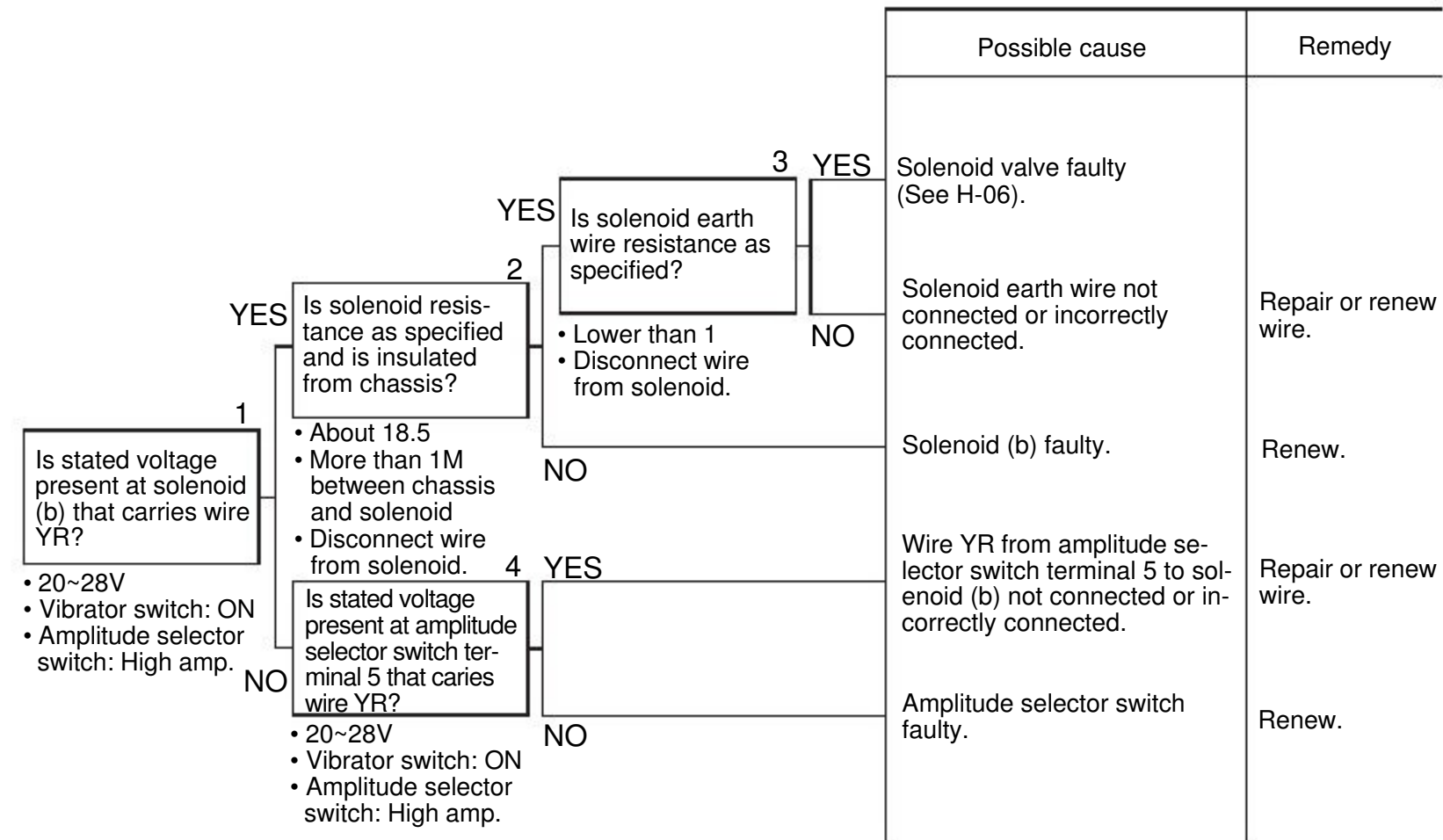
- ★First check to see if the fuse has burnt.
- ★Measure the voltage with the starter switch ON.
  - a) Both CONT and MANUAL modes are inoperative



- b) Mode MANUAL is inoperative.  
(Mode CONT is checked in item a) above.)



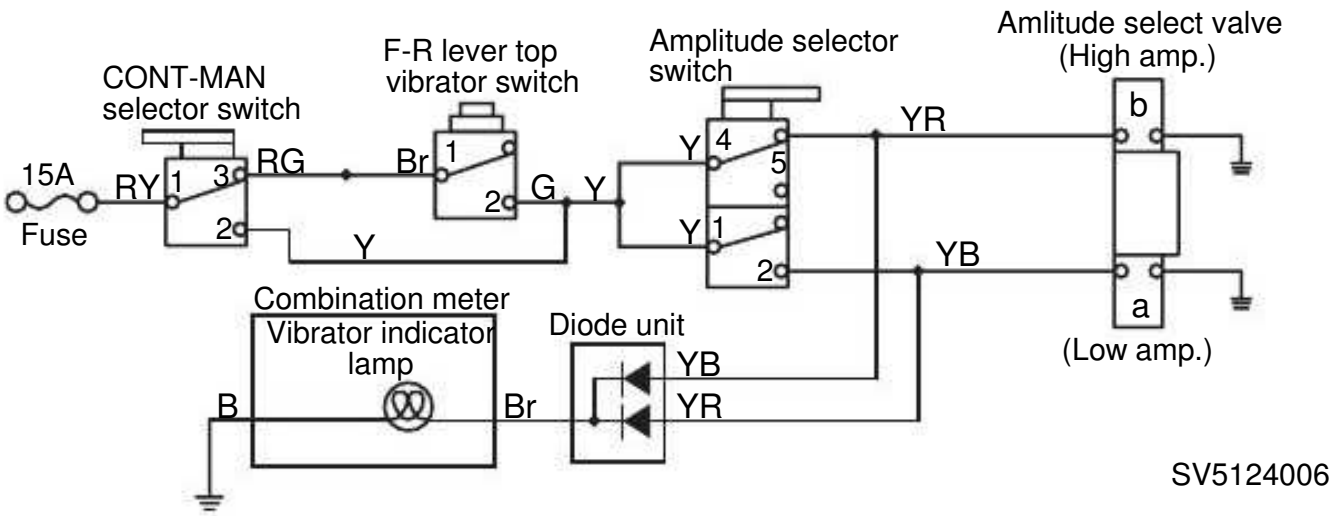
c) High amplitude mode is inoperative.



d). Low amplitude mode is inoperative.

|                                                                                                                                                                       |     |                                                                                                                                                                                           |     | Possible cause                                                                                                              | Remedy                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <div>1<br/>Is specified voltage present at solenoids (a) that carries wire YB?<br/>• 20~28V<br/>• Vibrator switch: ON<br/>• Amplitude selector switch: Low amp.</div> | YES | <div>2<br/>Is solenoid resistance as specified and is insulated from chassis?<br/>• About 18.5<br/>• More than 1M between chassis and solenoid<br/>• Disconnect wire from solenoid.</div> | YES | <div>3<br/>Is resistance of solenoid earth wire as specified?<br/>• Lower than 1<br/>• Disconnect wire from solenoid.</div> | Solenoid valve faulty (See H-06). |
|                                                                                                                                                                       | YES | NO                                                                                                                                                                                        | NO  | Solenoid earth wire not connected or incorrectly connected.                                                                 | Repair or renew wire.             |
|                                                                                                                                                                       | NO  | YES                                                                                                                                                                                       | YES | Solenoid (a) faulty.                                                                                                        | Renew.                            |
|                                                                                                                                                                       | NO  | NO                                                                                                                                                                                        | NO  | Wire YB from amplitude selector switch terminal 2 to solenoid (a) not connected or incorrectly connected.                   | Repair or renew wire.             |
|                                                                                                                                                                       |     |                                                                                                                                                                                           |     | Amplitude selector switch faulty.                                                                                           | Renew.                            |

Electric wiring diagram for mode E-07

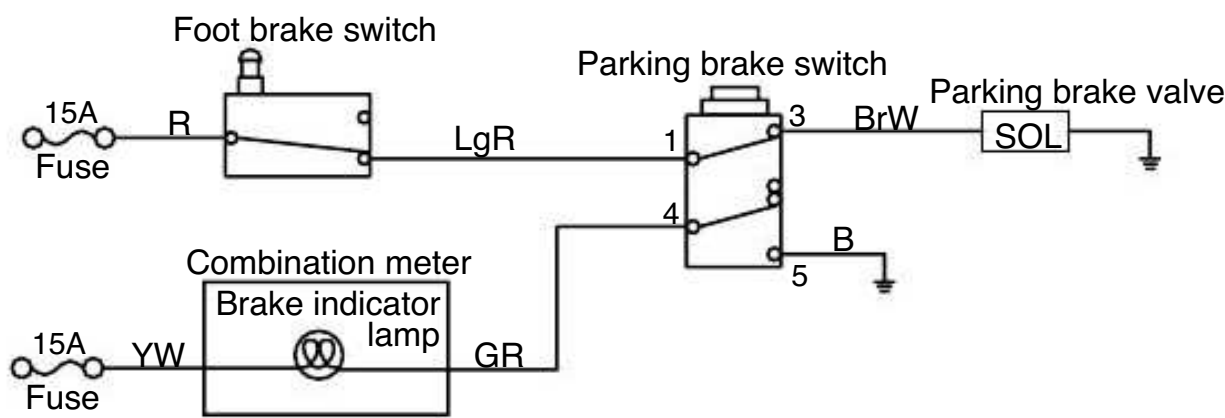


E-08 Parking brake is not released

- ★First, check to see if fuse has burnt.
- ★Measure the voltage with the starter switch ON.
- ★Diagnose with the foot brake pedal not depressed.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  | Possible cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Remedy                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>1</div> <div>Is stated voltage present at solenoid terminal that carries wire BrW?</div> <div>• 20~28V</div> <div>• Set parking brake switch to DISENGAGE.</div> <div>YES</div> <div>2</div> <div>Is solenoid resistance as specified and is solenoid insulated from body?</div> <div>• About 27</div> <div>• More than 1M between chassis and solenoid</div> <div>• Disconnect wire from solenoid.</div> <div>NO</div> <div>3</div> <div>Is solenoid earth wire resistance as specified?</div> <div>• Lower than 1</div> <div>• Disconnect wire from solenoid.</div> <div>YES</div> <div>4</div> <div>Is stated voltage present at parking brake switch terminal 3 that carries wire BrW?</div> <div>• 20~28V</div> <div>• Set parking brake switch to DISENGAGE.</div> <div>YES</div> <div>5</div> <div>Is stated voltage present at parking brake switch terminal 1 that carries wire LgR?</div> <div>• 20~28V</div> <div>NO</div> <div>6</div> <div>Is stated voltage present at foot brake switch terminal that carries wire LgR?</div> <div>• 20~28V</div> <div>YES</div> <div>7</div> <div>Is specified voltage present at foot brake switch that carries wire R?</div> <div>• 20~28V</div> <div>NO</div> |  |  | <div>Brake valve defective.<br/>(See mode H-09.)</div> <div>Solenoid earth wire not connected or incorrectly connected.</div> <div>Brake valve solenoid faulty.</div> <div>Wire BrW from parking brake switch terminal 3 to parking brake valve solenoid not connected or incorrectly connected.</div> <div>Parking brake switch faulty.</div> <div>To “A” on this page.</div> <div>Wire LgR from foot brake switch to parking brake switch terminal 1 not connected or incorrectly connected.</div> <div>Foot brake switch faulty.</div> <div>Wire R from fuse to foot brake switch not connected or incorrectly connected.</div> | <div>Repair or renew wire.</div> <div>Renew.</div> <div>Repair or renew wire.</div> <div>Renew.</div> <div>Renew.</div> <div>Repair or renew wire.</div> |

Electric wiring diagram for mode E-08



SV5104008



E-10 Headlamps and flood lamp do not come on

- ★First check to see if the fuse has burnt.
- ★Measure the voltage with the starter switch ON.

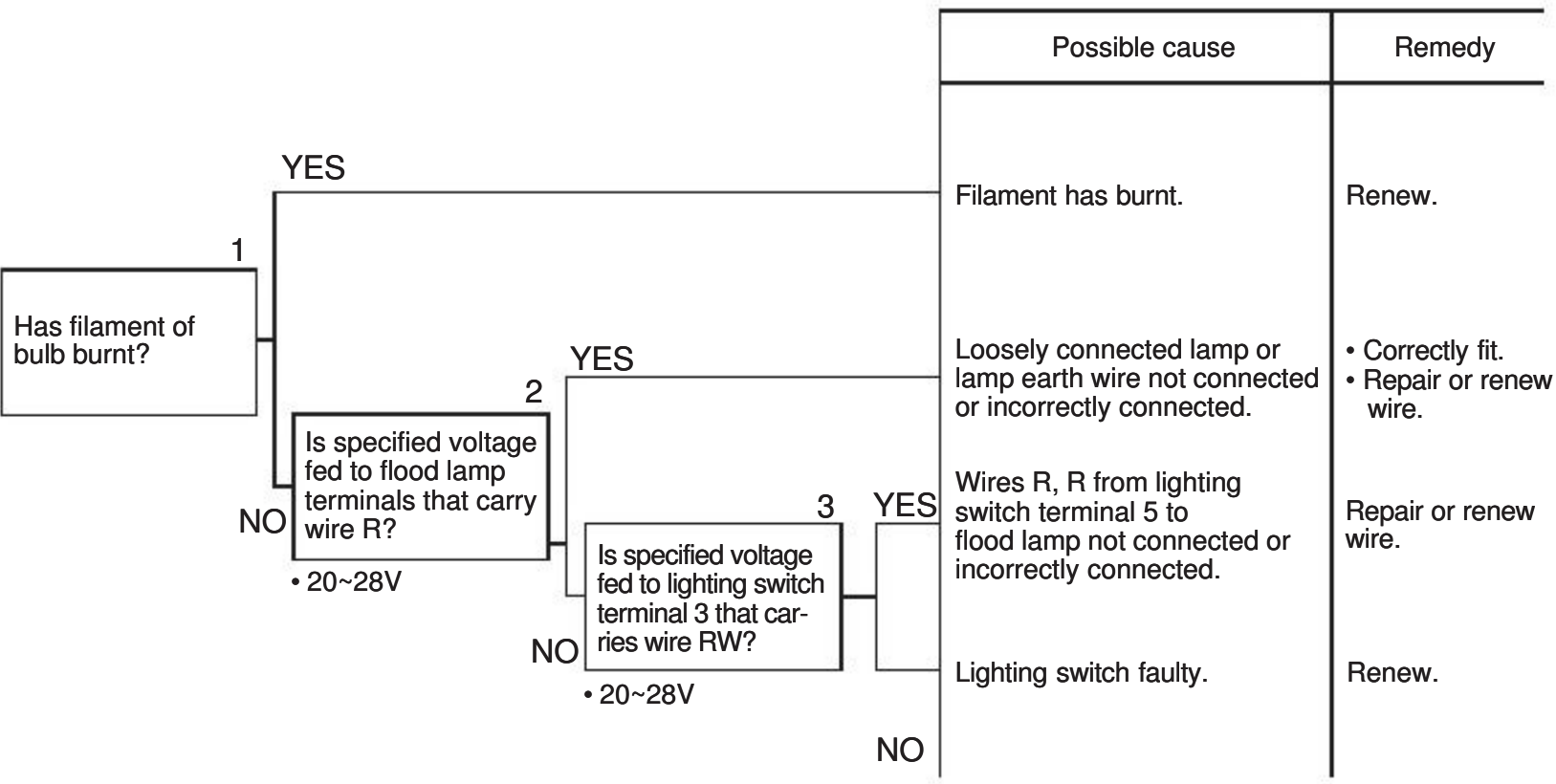
a) Both headlamps and flood lamp do not come on

|                                                                                                                     |     | Possible cause                                                                                               | Remedy                |
|---------------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------|-----------------------|
| <div>1</div> <div>Is specified voltage fed to lighting switch terminals 1, 4 that carry wire RG?<br/>• 20~28V</div> | YES | Lighting switch faulty.                                                                                      | Renew.                |
|                                                                                                                     | NO  | Wire RG from fuse to lighting switch terminals 1, 4 not connected or incorrectly connected (including fuse). | Repair or renew wire. |

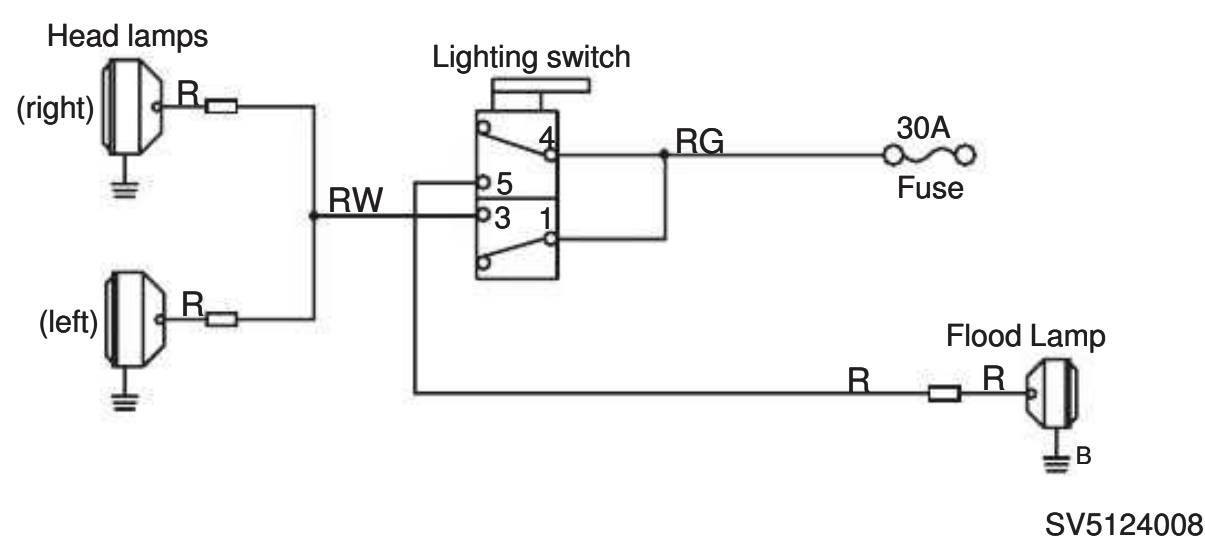
b)Headlamps do not come on

|                                                     |     | Possible cause                                                                                                    | Remedy                                                                                           |                       |
|-----------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------|
| <div>1</div> <div>Has filament of bulb burnt?</div> | YES | Filament has burnt.                                                                                               | Renew.                                                                                           |                       |
|                                                     | NO  | <div>2</div> <div>Is specified voltage fed to lamp terminals that carry wire R?<br/>• 20~28V</div>                | Loosely connected lamp or lamp earth wire not connected or incorrectly connected.                | Correctly fit.        |
|                                                     |     | <div>3</div> <div>Is specified voltage fed to lighting switch terminal 3 that carries wire RW?<br/>• 20~28V</div> | Wires RW, R from lighting switch terminal 3 to headlamps not connected or incorrectly connected. | Repair or renew wire. |
|                                                     | YES | Lighting switch faulty.                                                                                           | Renew.                                                                                           |                       |
|                                                     | NO  |                                                                                                                   |                                                                                                  |                       |

c) Flood lamp do not come on



Electric wiring diagram for mode E-10



E-11 Fuel gauge reads wrong

- ★Other gauges and lamps are normal.
- ★Measure the voltage with the starter switch ON.

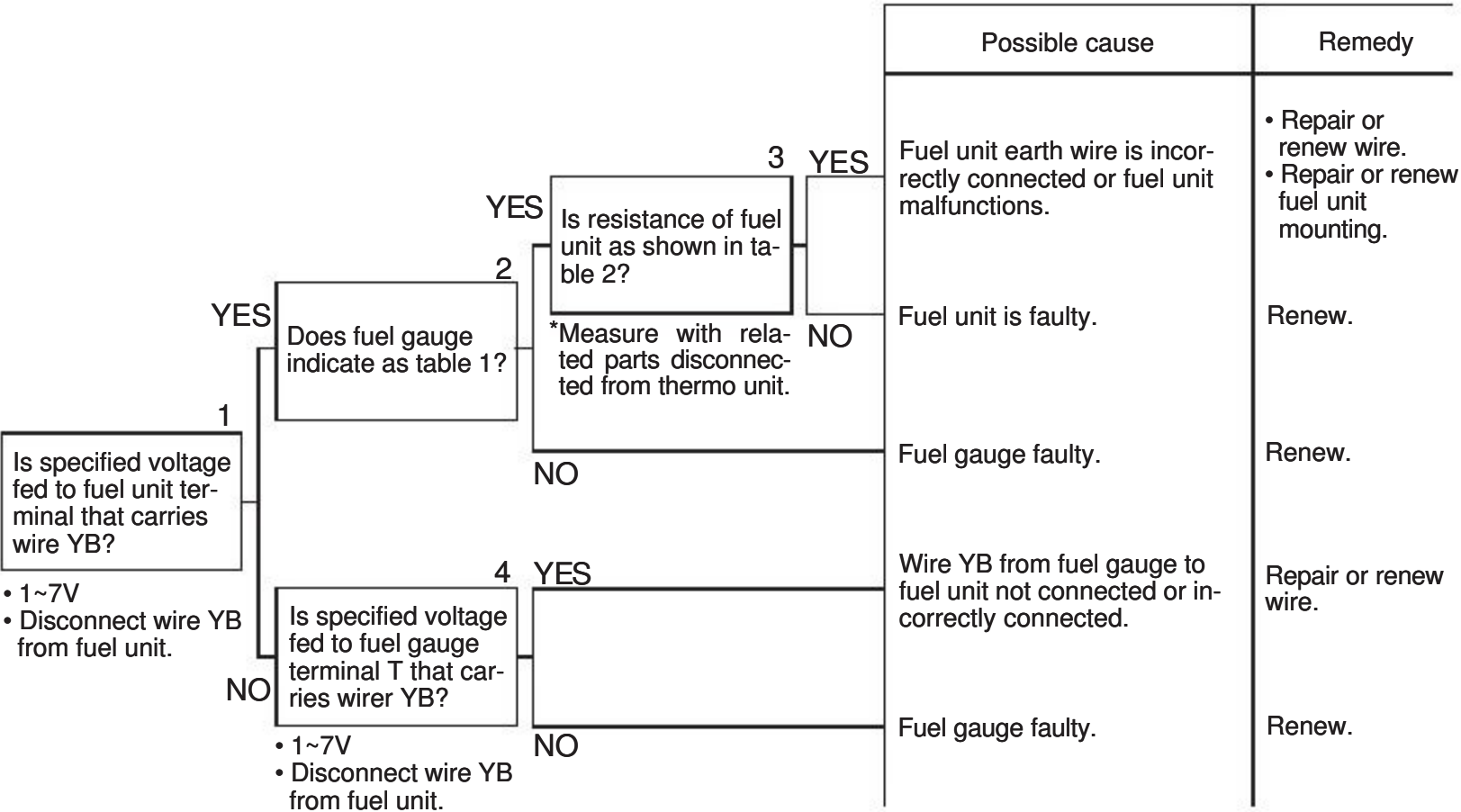


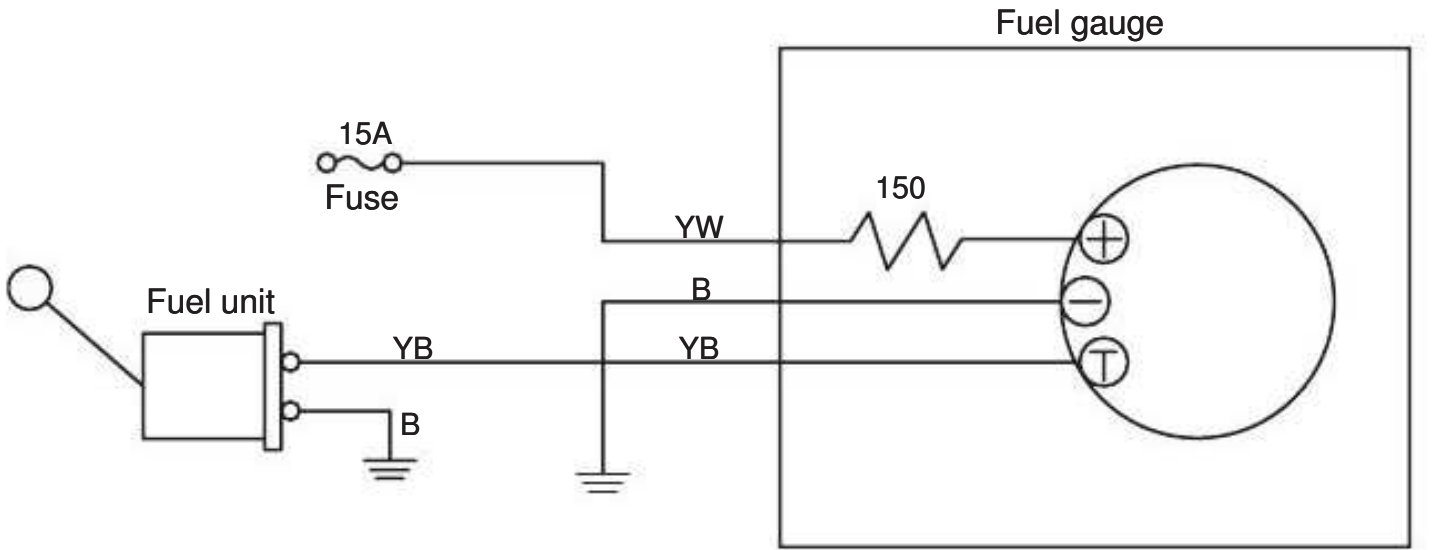
Table 1

| Fuel unit wire YB | Gauge reading |
|-------------------|---------------|
| Disconnected      | Lowest        |
| Grounded          | Highest       |

Table 2

| Thermounit temperature | Resistance(Ω) |
|------------------------|---------------|
| Full                   | 10~17.5       |
| Empty                  | 82.5~90       |

Electric wiring diagram for mode E-11



SV5104009

E-12 Coolant remperature gauge reads wrong

- ★Other gauges and lamps operate correctly.
- ★Measure the voltage with the starter switch ON.

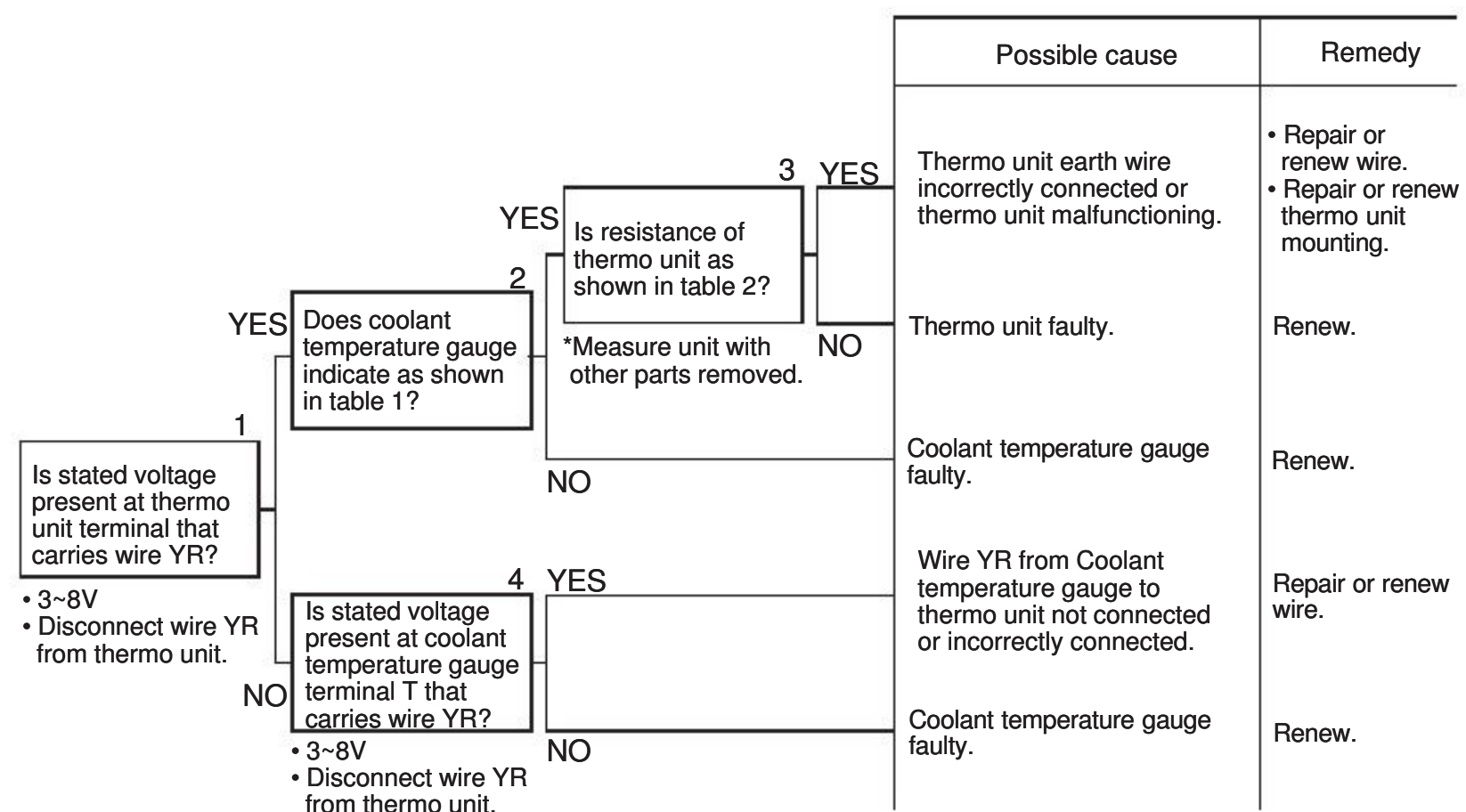


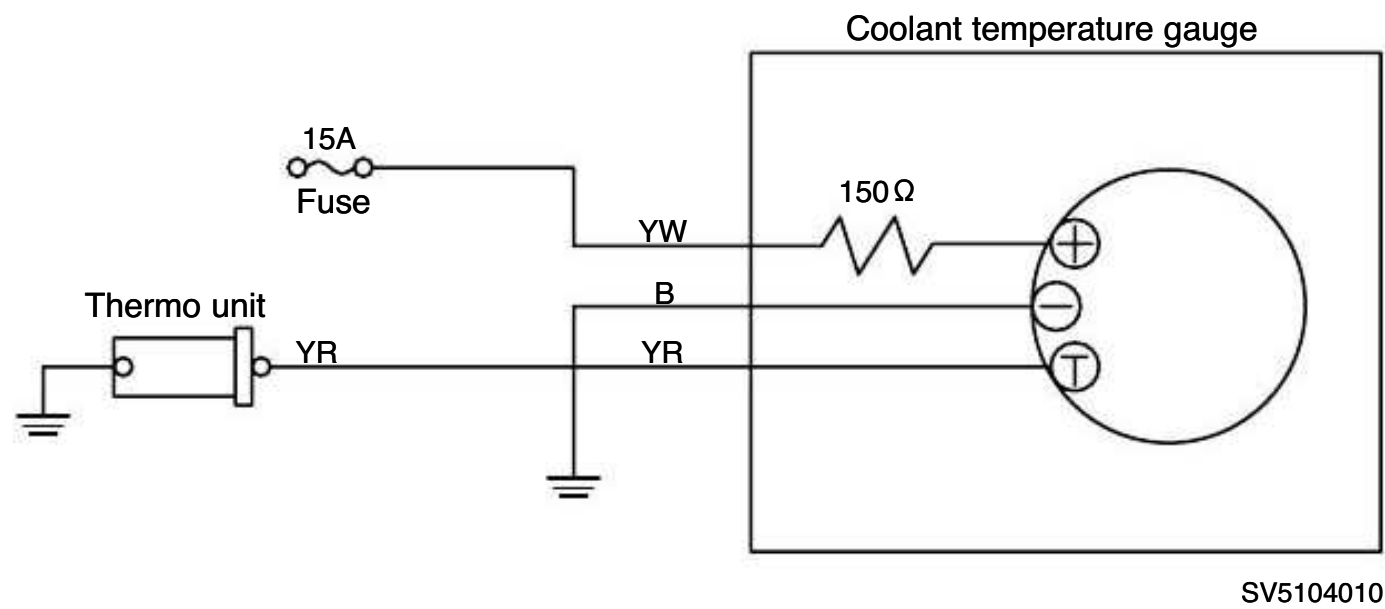
Table 1

| Thermo unit terminal wire YR | Gauge reading |
|------------------------------|---------------|
| Disconnected                 | Lowest        |
| Grounded                     | Highest       |

Table 2

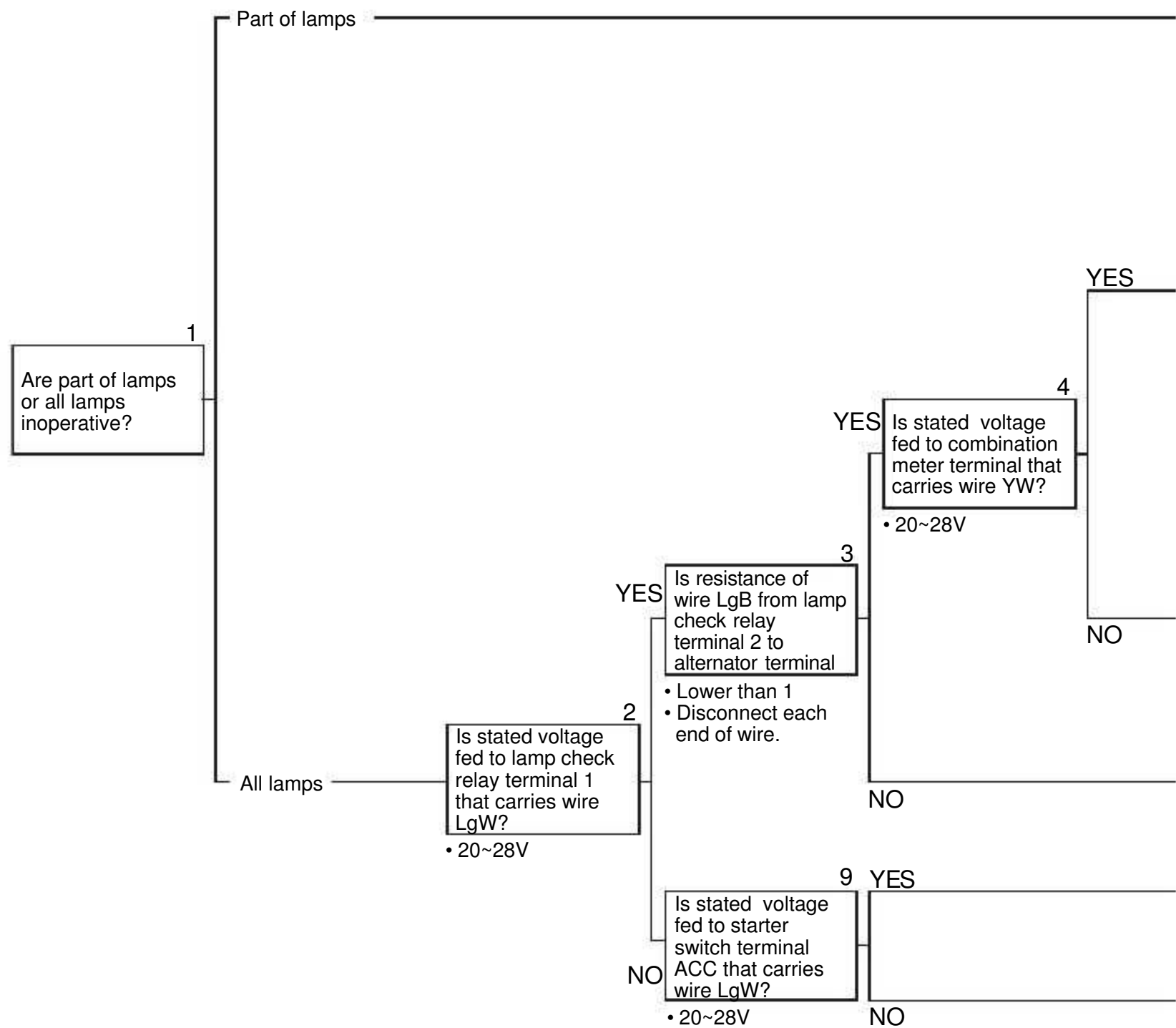
| Thermo unit temperature | Resistance(Ω) |
|-------------------------|---------------|
| 50℃                     | 150~158       |
| 100℃                    | About 27.4    |

Electric wiring diagram for mode E-12



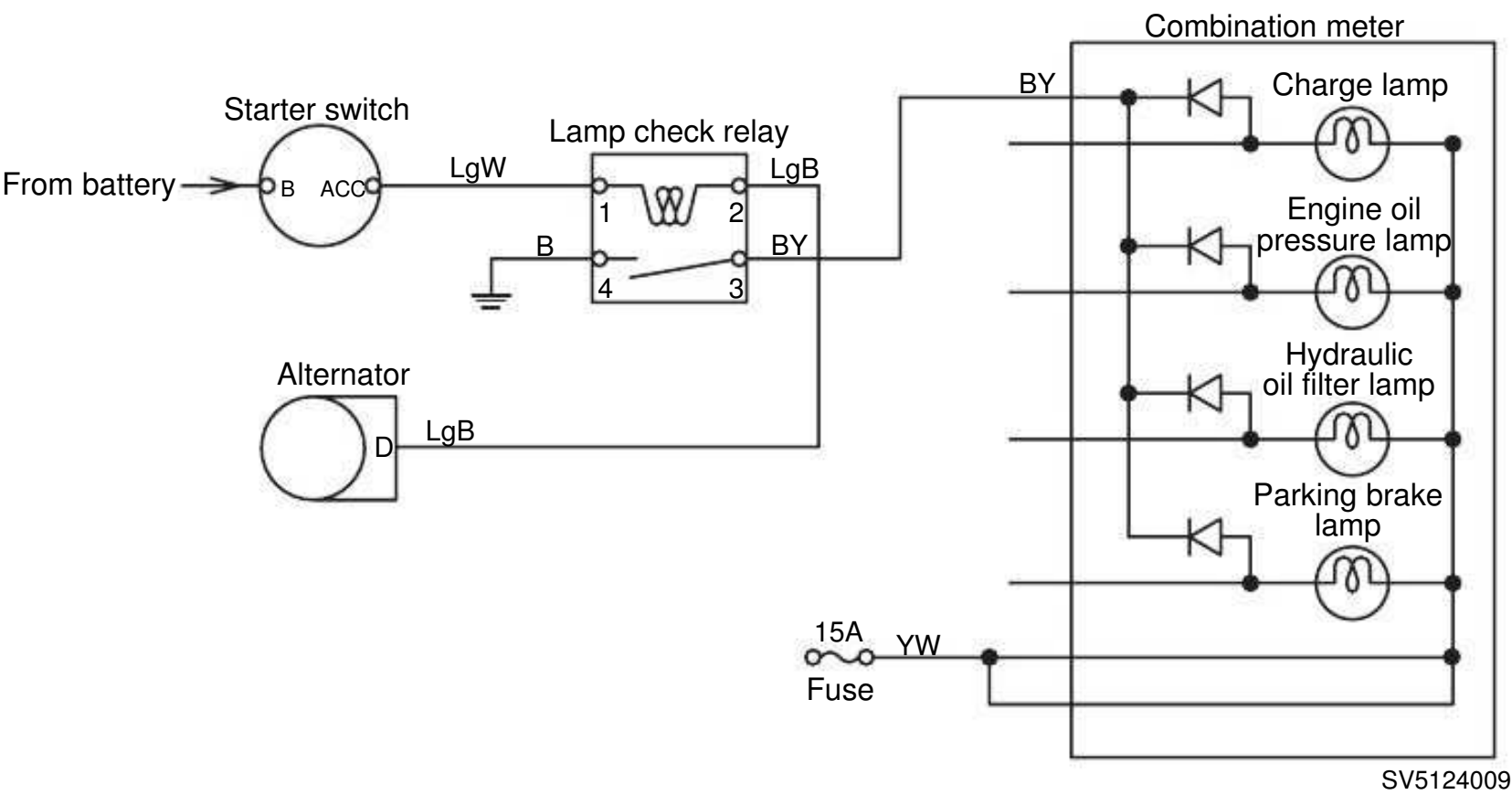
E-13 Charge warning lamp, engine oil pressure warning lamp, hydraulic oil filter warning lamp and parking brake indicator lamp do not come on with starter switch ON.

- ★These lamps illuminate only when the starter switch is turned to the ON position (for bulb failure check) and when unusual conditions have occurred.
- ★Measure the voltage with the starter switch ON.



|                                                                                           |     | Possible cause                                                                                                                                          | Remedy                                                         |
|-------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
|                                                                                           |     | Lamp bulb damaged.                                                                                                                                      | Renew.                                                         |
| <div>Does lamp check relay give a working sound (a click)?<br/>• Starter switch ON.</div> | YES |                                                                                                                                                         |                                                                |
|                                                                                           | 5   | Is resistance of wire BY from combination meter to lamp check relay terminal 3 as specified?<br>• Lower than 1<br>• Disconnect each end of wire BY(YG). | YES<br>Renew combination meter.<br>NO<br>Repair or renew wire. |
|                                                                                           | 6   |                                                                                                                                                         |                                                                |
|                                                                                           | 7   | Is resistance of lamp check relay earth wire as specified?<br>• Lower than 1<br>• Disconnect earth wire from relay.                                     | YES<br>Renew.<br>NO<br>Repair or renew wire.                   |
| <div>Does starter run?<br/>• Turn starter switch to START.</div>                          | 8   |                                                                                                                                                         |                                                                |
|                                                                                           | YES |                                                                                                                                                         |                                                                |
|                                                                                           | NO  |                                                                                                                                                         |                                                                |
|                                                                                           |     | Fuse has burnt.                                                                                                                                         | Renew.                                                         |
|                                                                                           |     | Wire LgB from lamp check relay terminal 2 to alternator terminal D not connected or incorrectly connected.                                              | Repair or renew wire.                                          |
|                                                                                           |     | Wire LgW from starter switch terminal ACC to lamp check relay terminal 1 not connected or incorrectly connected.                                        | Repair or renew wire.                                          |
|                                                                                           |     | Starter switch faulty (between terminals B and ACC).                                                                                                    | Renew.                                                         |

Electric wiring diagram for mode E-13



6. Troubleshooting for Hydraulic and Mechanical Systems  
(Mode H)

Fault modes for hydraulic and mechanical systems and possible source of troubles .....4-402

H-01 Unusual sounds ..... 4-404

H-02 Hydraulic fluid too hot ..... 4-405

H-03 Not propelled ..... 4-406

H-04 Travel speed not gained or low traction .....4-410

H-05 Low-High speed not selected ..... 4-414

H-06 Vibrator does not work ..... 4-415

H-07 Weak vibratory force ..... 4-416

H-08 Steering not performed ..... 4-417

H-09 Heavy or slow steering ..... 4-417

H-10 Poor function of parking brake ..... 4-418

H-11 Parking brake not released ..... 4-418

Fault modes for hydraulic and mechanical systems and possible sources of troubles

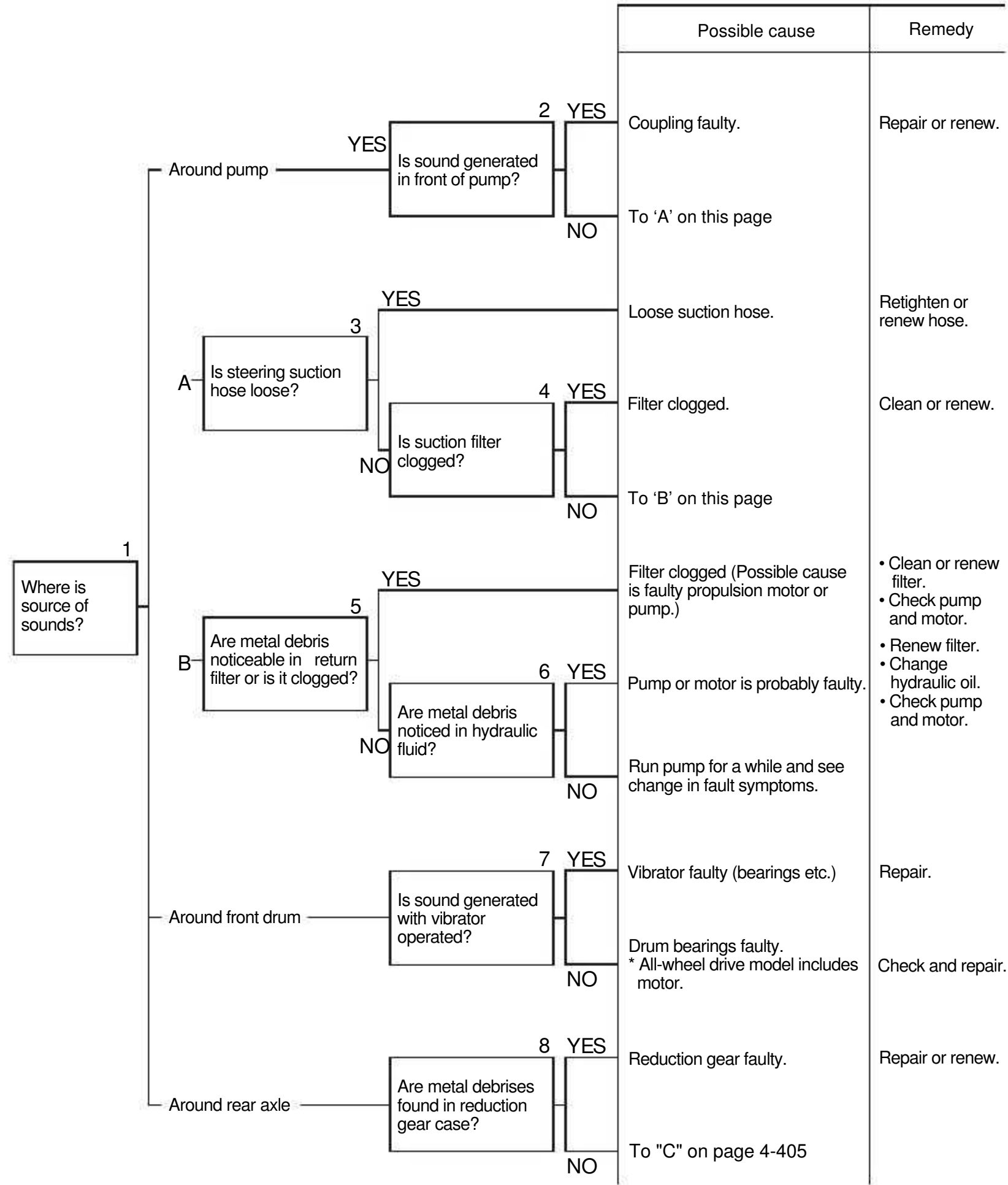
| Possible source of trouble |                                            |                              | Fault mode                 | Unusual sounds         | Hydraulic fluid too hot | Propulsion                   |       |                                  |   |
|----------------------------|--------------------------------------------|------------------------------|----------------------------|------------------------|-------------------------|------------------------------|-------|----------------------------------|---|
|                            |                                            |                              |                            |                        |                         | Not propelled                |       | Speed not gained or low traction |   |
|                            |                                            |                              |                            |                        |                         |                              |       |                                  |   |
| a) Forward and reverse     |                                            | b) Either forward or reverse |                            | a) Forward and reverse |                         | b) Either forward or reverse |       |                                  |   |
| Propulsion                 | Propulsion pump                            |                              | Inside of pump             |                        |                         | ●                            |       |                                  |   |
|                            |                                            |                              | Servo valve/servo linkage  |                        |                         | ●                            | ●     | ●                                | ● |
|                            |                                            |                              | Multifunction valve        |                        |                         |                              | ●     |                                  |   |
|                            |                                            |                              | Charge relief valve        |                        |                         | ●                            |       | ●                                |   |
|                            | Rear drive                                 | Motor                        | Inside of Motor            |                        |                         | ●                            |       | ●                                |   |
|                            |                                            |                              | Speed range select valve   |                        |                         |                              |       |                                  |   |
|                            |                                            | Rear axle                    | Flushing valve             |                        |                         | ●                            |       | ●                                |   |
|                            |                                            |                              | Reduction gear             | ●                      |                         | ●                            |       | ●                                |   |
|                            | Differential                               |                              | ●                          |                        | ●                       |                              | ●     |                                  |   |
|                            | Final drive                                |                              | ●                          |                        | ●                       |                              | ●     |                                  |   |
|                            |                                            |                              | Parking brake              |                        |                         | ●                            |       | ●                                |   |
|                            | Brake valve                                |                              |                            |                        | ●                       |                              | ●     |                                  |   |
|                            | Front drive                                | Inside of motor              |                            |                        | ●                       |                              | ●     |                                  |   |
|                            |                                            | Reduction gear               |                            |                        | ●                       |                              | ●     |                                  |   |
| Vibrator                   | Pump                                       |                              | Pump                       |                        |                         |                              |       |                                  |   |
|                            |                                            |                              | Amplitude select valve     |                        |                         |                              |       |                                  |   |
|                            |                                            |                              | High pressure relief valve |                        |                         |                              |       |                                  |   |
|                            |                                            |                              | Charge relief valve        |                        |                         | ●                            |       | ●                                |   |
|                            | Motor unit                                 |                              |                            |                        |                         |                              |       |                                  |   |
|                            | Vibrator                                   |                              | ●                          |                        |                         |                              |       |                                  |   |
| Steering                   | Steering pump                              |                              |                            |                        |                         |                              |       |                                  |   |
|                            | Orbitrol (including pressure relief valve) |                              |                            |                        |                         |                              |       |                                  |   |
|                            | Steering cylinder                          |                              |                            |                        |                         |                              |       |                                  |   |
|                            | Steering mechanism                         |                              |                            |                        |                         |                              |       |                                  |   |
|                            | Steering column                            |                              |                            |                        |                         |                              |       |                                  |   |
| Others                     | Coupling                                   |                              | ●                          |                        | ●                       |                              |       |                                  |   |
|                            | F-R lever linkage                          |                              |                            |                        | ●                       | ●                            | ●     |                                  |   |
| Oil cooler                 |                                            |                              |                            | ●                      | ●                       | ●                            |       |                                  |   |
| Suction filter             |                                            |                              | ●                          |                        |                         |                              |       |                                  |   |
| Diagnosis code             |                                            |                              | H-01                       | H-02                   | H-03a                   | H-03b                        | H-04a | H-04b                            |   |

| Propulsion                  | Vibrator                          |                                    |                                   |                                    | Steering         |                           | Parking brake   |                       |
|-----------------------------|-----------------------------------|------------------------------------|-----------------------------------|------------------------------------|------------------|---------------------------|-----------------|-----------------------|
| Speed range<br>not selected | Inoperative                       |                                    | Weak vibratory force              |                                    | Not<br>performed | Heavy or<br>slow steering | Poor<br>braking | Brake not<br>released |
|                             | a) Both low amp.<br>and high amp. | b) Either low amp.<br>or high amp. | a) Both low amp.<br>and high amp. | b) Either low amp.<br>or high amp. |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 | ●                     |
| ●                           | ●                                 |                                    | ●                                 |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
| ●                           |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           | ●               | ●                     |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 | ●                     |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             | ●                                 | ●                                  | ●                                 | ●                                  |                  |                           |                 |                       |
|                             | ●                                 | ●                                  | ●                                 | ●                                  |                  |                           |                 |                       |
|                             |                                   | ●                                  |                                   | ●                                  |                  |                           |                 |                       |
| ●                           | ●                                 |                                    | ●                                 |                                    |                  |                           |                 | ●                     |
|                             | ●                                 |                                    | ●                                 |                                    |                  |                           |                 |                       |
|                             | ●                                 |                                    | ●                                 |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    | ●                | ●                         |                 |                       |
|                             |                                   |                                    |                                   |                                    | ●                | ●                         |                 |                       |
|                             |                                   |                                    |                                   |                                    | ●                | ●                         |                 |                       |
|                             |                                   |                                    |                                   |                                    | ●                | ●                         |                 |                       |
|                             |                                   |                                    |                                   |                                    | ●                | ●                         |                 |                       |
|                             | ●                                 |                                    |                                   |                                    | ●                | ●                         |                 |                       |
| ●                           |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
|                             |                                   |                                    |                                   |                                    |                  |                           |                 |                       |
| H-05                        | H-06a                             | H-06b                              | H-07a                             | H-07b                              | H-08             | H-09                      | H-10            | H-11                  |

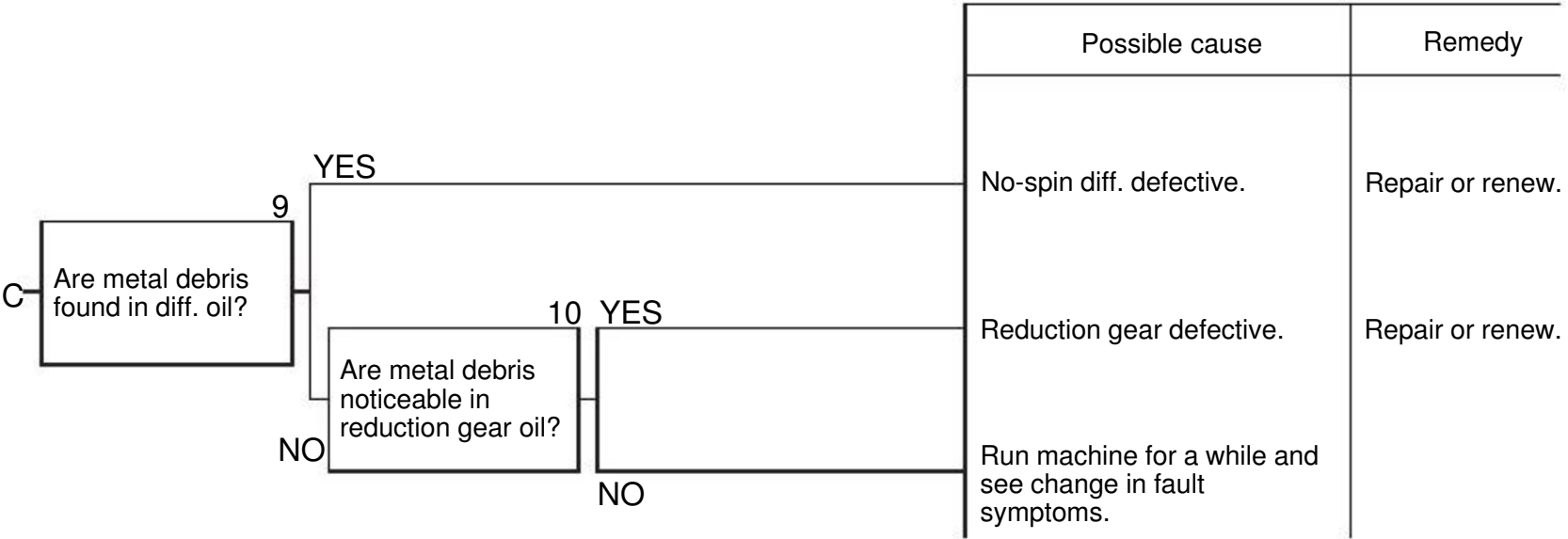
H-01 Unusual sounds

★Before diagnosis, check for oil level in the tank.

(1/2)

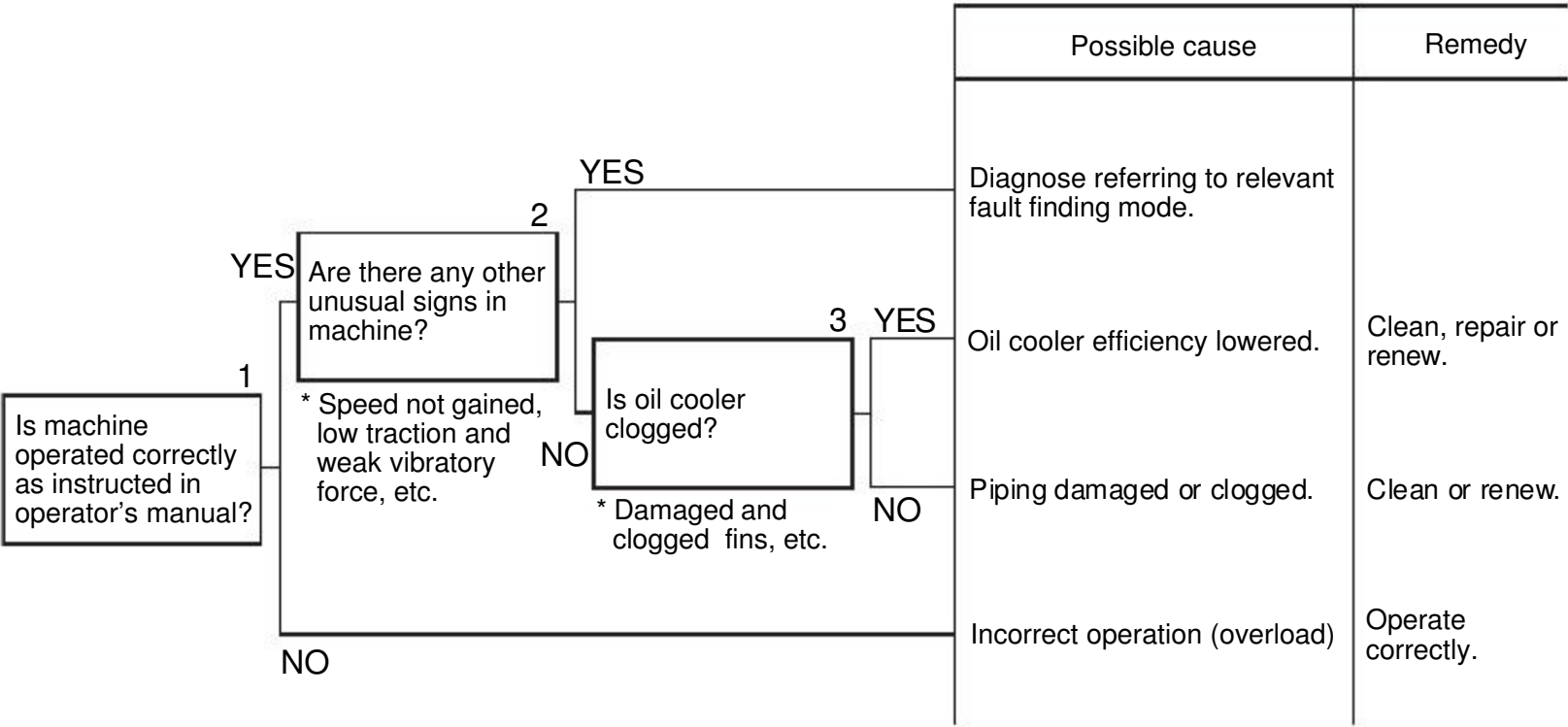


(2/2)



H-02 Hydraulic fluid too hot

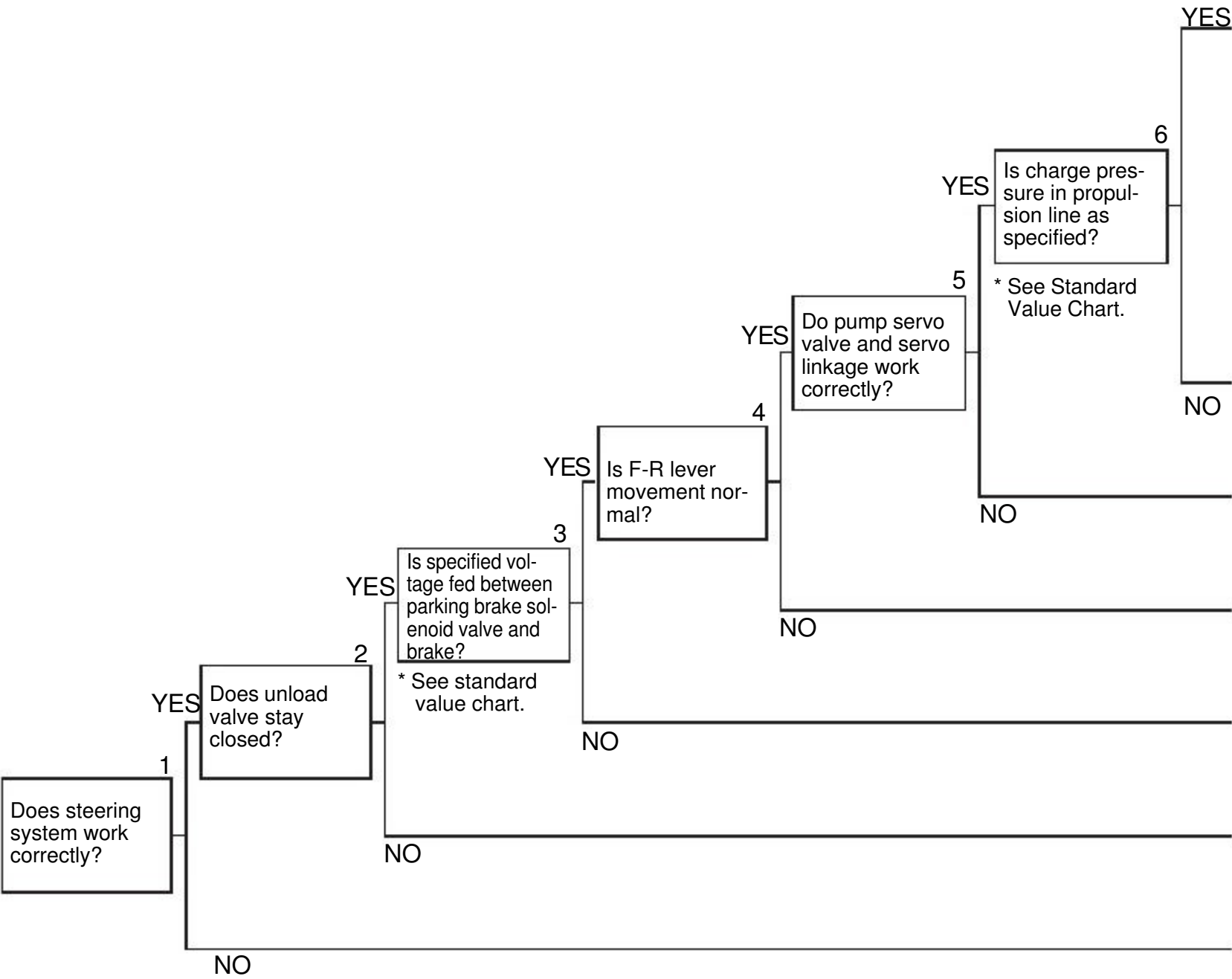
★Before diagnosis, check oil level in tank.



H-03 Not propelled

- ★Diagnose electric systems first. If they are normal, then use the following procedures.
- ★Start with checking the oil level in the hydraulic tank.

a) Not propelled in both directions (forward and backward).  
(1/2)



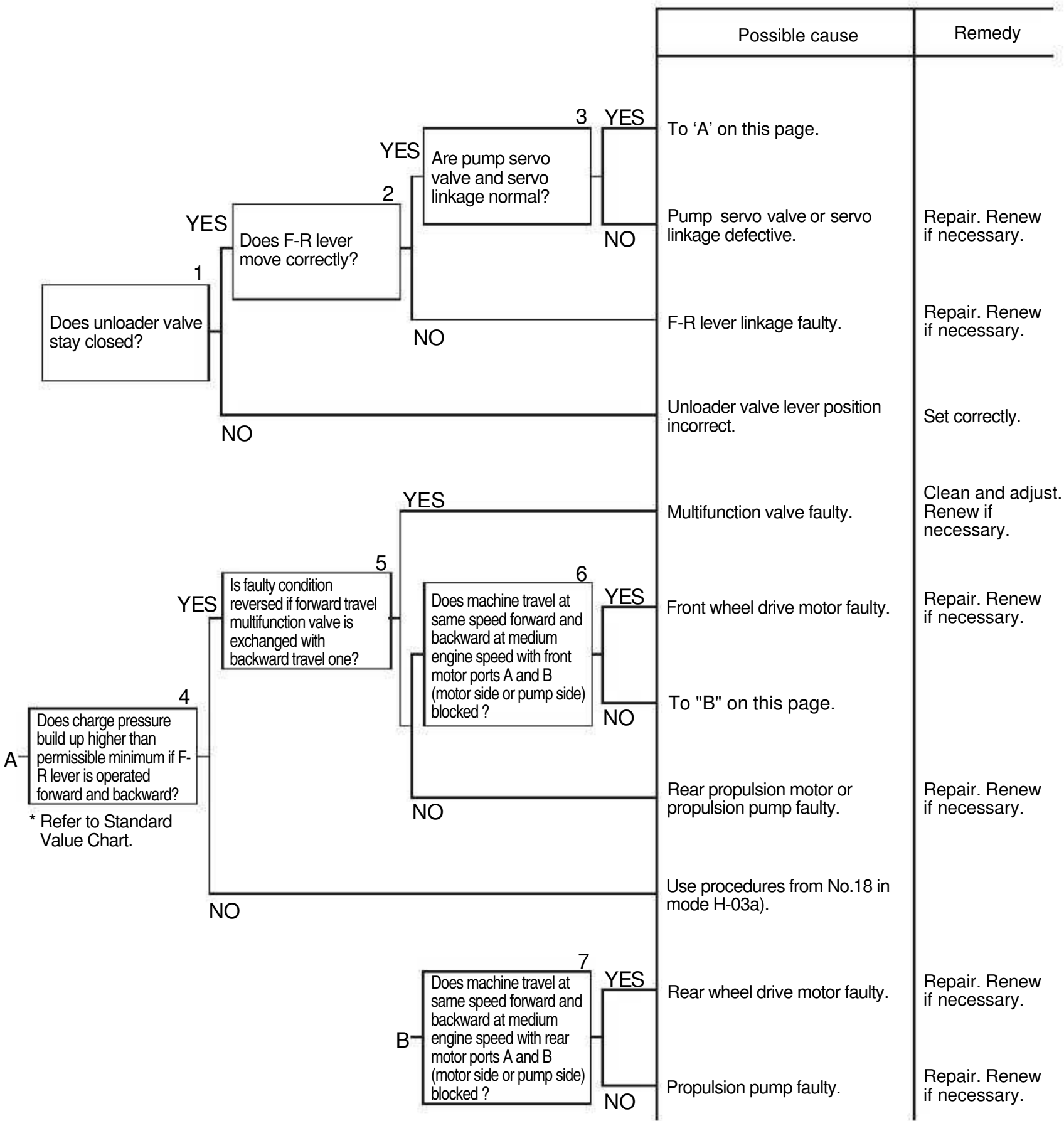
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Possible cause                                       | Remedy                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------|--------------------------|
| <div><div>7</div><div>Is charge pressure higher than permissible level with F-R lever in forward and backward positions?<br/>* Refer to Standard Value Chart.</div><div>YES</div><div>NO</div><div>8</div><div>Does propulsion main circuit pressure go up with F-R lever operated?</div><div>YES</div><div>NO</div><div>9</div><div>Are metal debris noticeable in front motor reduction gear oil?</div><div>YES</div><div>NO</div><div>10</div><div>Are metal debris noticeable in rear motor reduction gear oil?</div><div>YES</div><div>NO</div><div>11</div><div>Are metal chips noticeable in diff. oil?</div><div>A</div><div>YES</div><div>NO</div></div> |  | Front motor reduction gear defective.                | Repair or renew.         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Front motor defective.                               | Repair or renew.         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Rear reduction gear defective.                       | Repair or renew.         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | To 'A' on this page.                                 |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | To 'C' on page 4-408.                                |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Differential faulty.                                 | Repair or renew.         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | To 'B' on page 4-408.                                |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | To 'D' on page 4-408.                                |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | To 'E' on page 4-408.                                | Repair or renew wire.    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Servo valve and servo linkage faulty.                | Repair or renew.         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | F-R lever linkage faulty.                            | Adjust, repair or renew. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Use procedures in H-10 (Parking brake not released). |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Unloader valve partly open.                          | Close.                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | Coupling or pump faulty.                             | Repair or renew.         |

Troubleshooting for Hydraulic and Mechanical Systems

(2/2)

|   |                                                                                                                                                      | Possible cause                                                                       | Remedy                  |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------|
| B | 12 YES<br>Are metal debris noticeable in rear final drive oil?                                                                                       | Rear final drive faulty.                                                             | Repair or renew.        |
|   | NO                                                                                                                                                   | Rear motor defective.                                                                | Repair or renew.        |
| C | 13 YES<br>Is problem corrected if multifunction valve is disassembled and cleaned?                                                                   | Multifunction valve faulty.                                                          | Clean, adjust or renew. |
|   | NO 14 YES<br>Is problem corrected if front motor ports A, B are blocked?                                                                             | Leakage at front motor pistons etc.                                                  | Repair or renew.        |
|   | NO                                                                                                                                                   | Leakage at rear motor pistons etc. or propulsion pump pistons etc.                   | Repair or renew.        |
| D | 15 YES<br>Does charge pressure build up higher than permissible minimum if rear motor Flushing valve is blocked?<br>* Refer to Standard Value Chart. | Low pressure relief valve in flush valve faulty.                                     | Clean, adjust or renew. |
|   | NO 16 YES<br>Does charge pressure build up higher than permissible minimum if front motor ports A, B are blocked?<br>* Open unloader valve.          | Leakage at sliding surfaces of front motor pistons etc.                              | Repair or renew.        |
|   | NO 17 YES<br>Does charge pressure build up higher than permissible minimum if rear motor ports A, B are blocked?<br>* Open unloader valve.           | Leakage at sliding surfaces of rear motor pistons etc.                               | Repair or renew.        |
|   | NO                                                                                                                                                   | Leakage at sliding surfaces of propulsion pump pistons or vibrator pump pistons etc. | Repair or renew.        |
|   | YES                                                                                                                                                  | Propulsion pump charge relief valve faulty.                                          | Clean, adjust or renew. |
| E | 18 YES<br>Is problem corrected if propulsion pump charge relief valve is disassembled, cleaned and adjusted?<br>* Refer to Standard Value Chart.     | Vibrator pump charge relief valve faulty.                                            | Clean, adjust or renew. |
|   | NO 19 YES<br>Is problem corrected if vibrator pump charge relief valve is disassembled, cleaned and adjusted?<br>* Refer to Standard Value Chart.    | Leakge at sliding surfaces of front propulsion motor pistons etc.                    | Repair or renew.        |
|   | NO 20 YES<br>Does charge pressure build up higher than permissible minimum if front motor ports A, B are blocked?<br>* Open unloader valve.          | To 'F' on this page.                                                                 | Repair or renew.        |
|   | NO 21 YES<br>Does charge pressure build up higher than permissible minimum if rear motor ports A, B are blocked?<br>* Open unloader valve.           | Leakge at sliding surfaces of rear propulsion motor pistons etc.                     | Repair or renew.        |
|   | NO                                                                                                                                                   | Leakage at sliding surfaces of propulsion pump pistons or vibrator pump pistons etc. | Repair or renew.        |

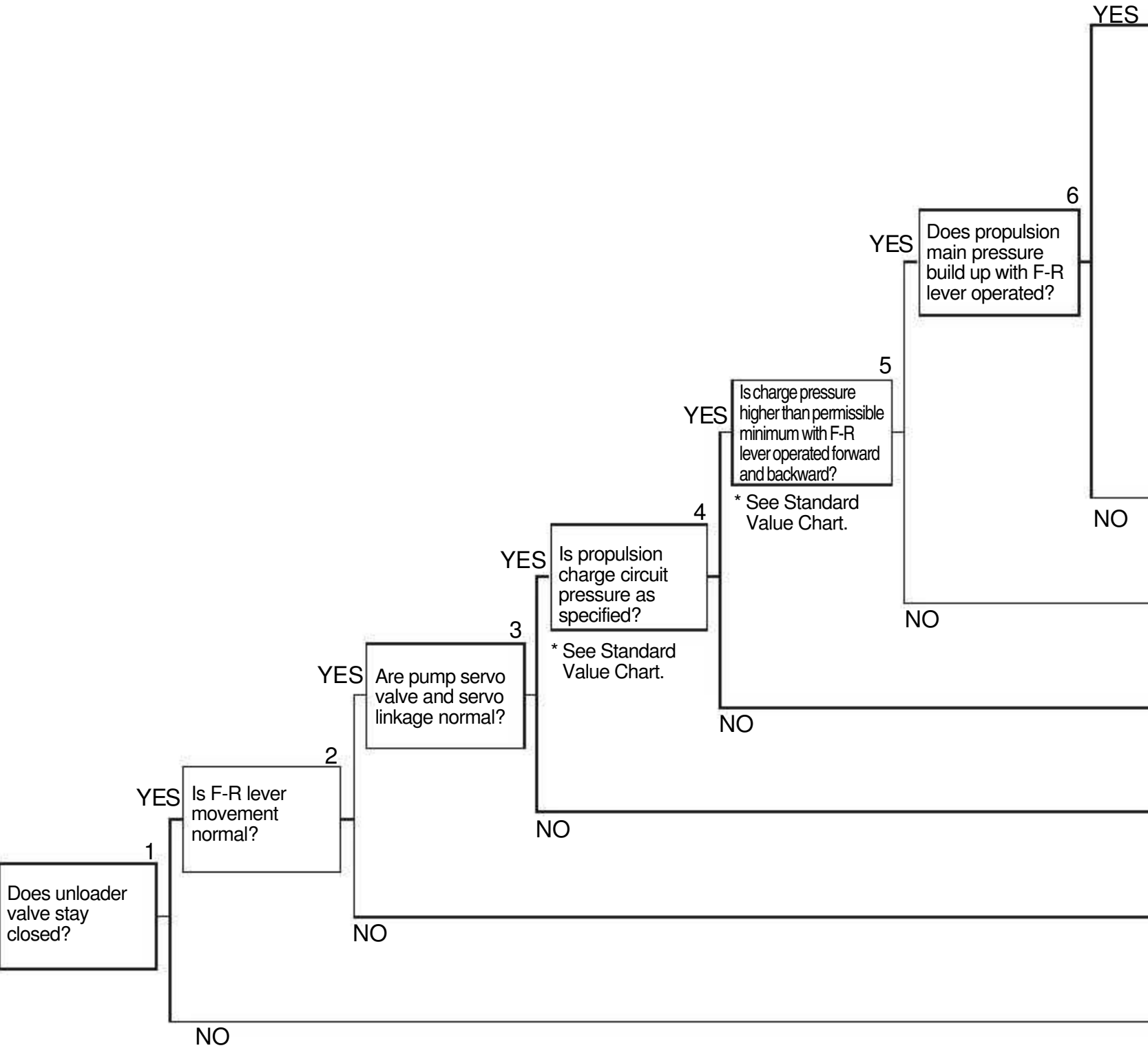
b) Not propelled either forward or backward.



H-04 Travel speed not gained or low traction

- ★Start diagnosis with electric systems. If they are normal, use the procedures below:
- ★Check oil level in the hydraulic tank before proceeding to the following procedures.

a) Speed not gained in both travel directions.  
(1/2)



|        |  | Possible cause                                  | Remedy                      |
|--------|--|-------------------------------------------------|-----------------------------|
| 7 YES  |  | Front wheel drive motor reduction gear damaged. | Repair. Renew as necessary. |
| NO     |  | Front drive motor damaged.                      | Repair. Renew as necessary. |
| YES    |  | Rear drive motor reduction gear damaged.        | Repair. Renew as necessary. |
| 8 YES  |  | Differential faulty.                            | Repair. Renew as necessary. |
| NO     |  | 9 YES                                           | Rear final drive faulty.    |
| NO     |  | NO                                              | Rear motor damaged.         |
| 10 YES |  |                                                 |                             |
| NO     |  |                                                 |                             |
| 11 YES |  | Propulsion pump performance lowered.            | Repair. Renew as necessary. |
| NO     |  | Propulsion motor performance lowered.           | Repair. Renew as necessary. |
|        |  | To 'A' on page 4-412.                           |                             |
|        |  | To 'B' on page 4-412.                           |                             |
|        |  | To 'C' on page 4-412.                           |                             |
|        |  | Servo valve or servo linkage faulty.            | Repair. Renew as necessary. |
|        |  | F-R lever linkage faulty.                       | Repair. Renew as necessary. |
|        |  | Unloader valve incorrectly operated.            | Operate correctly           |

Drain oil from front motor reduction gear. Are metal debris noticeable in oil?

Drain oil from rear motor reduction gear. Are metal debris noticeable in oil?

Drain oil from differential. Are metal debris noticeable in oil?

Drain oil from rear final drive. Are metal debris noticeable in oil?

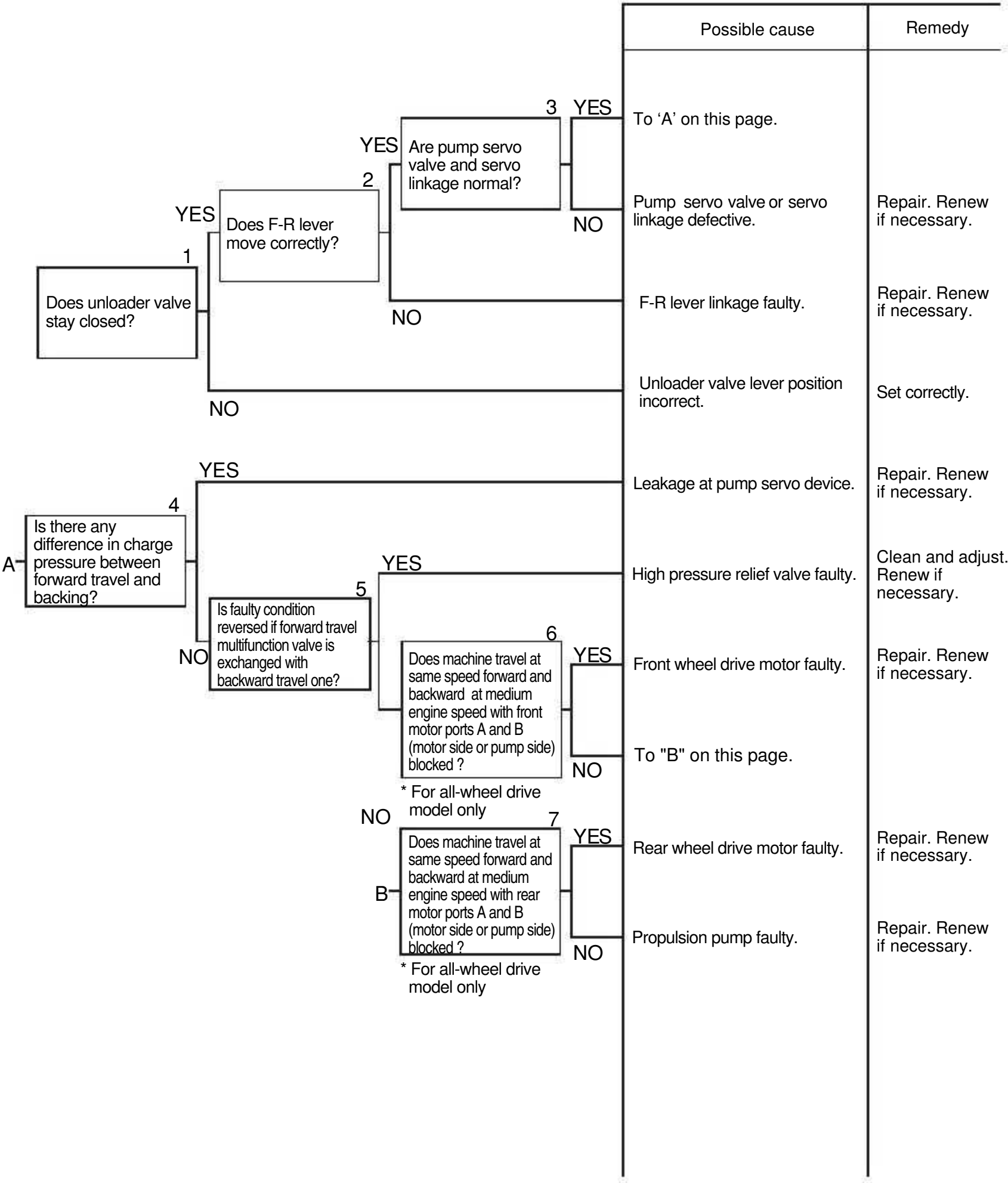
Is amount of drain in front and rear motors normal?

\* Due to difficulty in deciding checking sequence, a 'YES' line on this page carries three checking items. Generally, checking items with smaller reference number have higher probability.

(2/2)

|   |    |                                                                                                                                                  | Possible cause                                                                                                          | Remedy                                   |
|---|----|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| A | 12 | Is problem rectified if multifunction valve is disassembled and cleaned?                                                                         | Multifunction valve faulty.                                                                                             | Clean and adjust.<br>Renew as necessary. |
|   |    | YES                                                                                                                                              |                                                                                                                         |                                          |
|   |    | NO                                                                                                                                               |                                                                                                                         |                                          |
|   | 13 | Is problem corrected if front motor ports A, B are blocked?                                                                                      | Leakage at front propulsion motor pistons etc.                                                                          | Repair or renew.                         |
|   |    | YES                                                                                                                                              |                                                                                                                         |                                          |
|   |    | NO                                                                                                                                               | Leakage at rear drive motor pistons or propulsion pump pistons etc.                                                     | Repair or renew.                         |
| B | 14 | Does charge pressure build up higher than permissible minimum if rear motor flushing valve is blocked?<br>* Refer to Standard Value Chart.       | Low pressure relief valve in flushing valve faulty.                                                                     | Clean and adjust.<br>Renew as necessary. |
|   |    | YES                                                                                                                                              |                                                                                                                         |                                          |
|   |    | NO                                                                                                                                               |                                                                                                                         |                                          |
|   |    | 15                                                                                                                                               |                                                                                                                         |                                          |
|   |    | Does charge pressure build up higher than permissible minimum if front motor ports A, B are blocked?<br>* Open unloader valve.                   | Leakage at sliding surfaces of front motor pistons etc.                                                                 | Repair or renew.                         |
|   | 16 | Does charge pressure build up higher than permissible minimum if rear motor ports A, B are blocked?<br>* Open unloader valve.                    | Low pressure relief valve in flush valve faulty.                                                                        | Repair or renew.                         |
|   |    | YES                                                                                                                                              |                                                                                                                         |                                          |
|   |    | NO                                                                                                                                               |                                                                                                                         |                                          |
|   |    | 17                                                                                                                                               |                                                                                                                         |                                          |
|   |    | Is problem corrected if propulsion charge relief valve is disassembled, cleaned and adjusted?<br>* Refer to Standard Value Chart.                | Leakage at sliding surfaces of propulsion pump pistons or vibrator pump pistons.                                        | Repair or renew.                         |
| C | 18 | Is problem corrected if vibrator charge relief valve is disassembled, cleaned and adjusted?<br>* Refer to Standard Value Chart.                  | Propulsion pump charge relief valve faulty.                                                                             | Clean and adjust.<br>Renew as necessary. |
|   |    | YES                                                                                                                                              |                                                                                                                         |                                          |
|   |    | NO                                                                                                                                               |                                                                                                                         |                                          |
|   |    | 19                                                                                                                                               |                                                                                                                         |                                          |
|   |    | Does charge pressure build up higher than permissible minimum if front motor ports A, B are blocked?<br>* Open unloader valve.                   | Vibrator pump charge relief valve faulty.                                                                               | Clean and adjust.<br>Renew as necessary. |
|   | 20 | Does charge pressure build up higher than permissible minimum if rear drive motor ports A and B are blocked?<br>* Refer to Standard Value Chart. | Leakage at sliding surfaces of front drive motor pistons etc.                                                           | Repair or renew.                         |
|   |    | YES                                                                                                                                              |                                                                                                                         |                                          |
|   |    | NO                                                                                                                                               | To 'D' on this page.                                                                                                    |                                          |
| D |    |                                                                                                                                                  | Leakage at sliding surfaces of rear drive motor pistons etc.                                                            | Repair or renew.                         |
|   |    |                                                                                                                                                  | • Leakage at sliding surfaces of propulsion pump or vibrator pump pistons etc.<br>• Internal leakage in brake cylinder. | Repair or renew.                         |

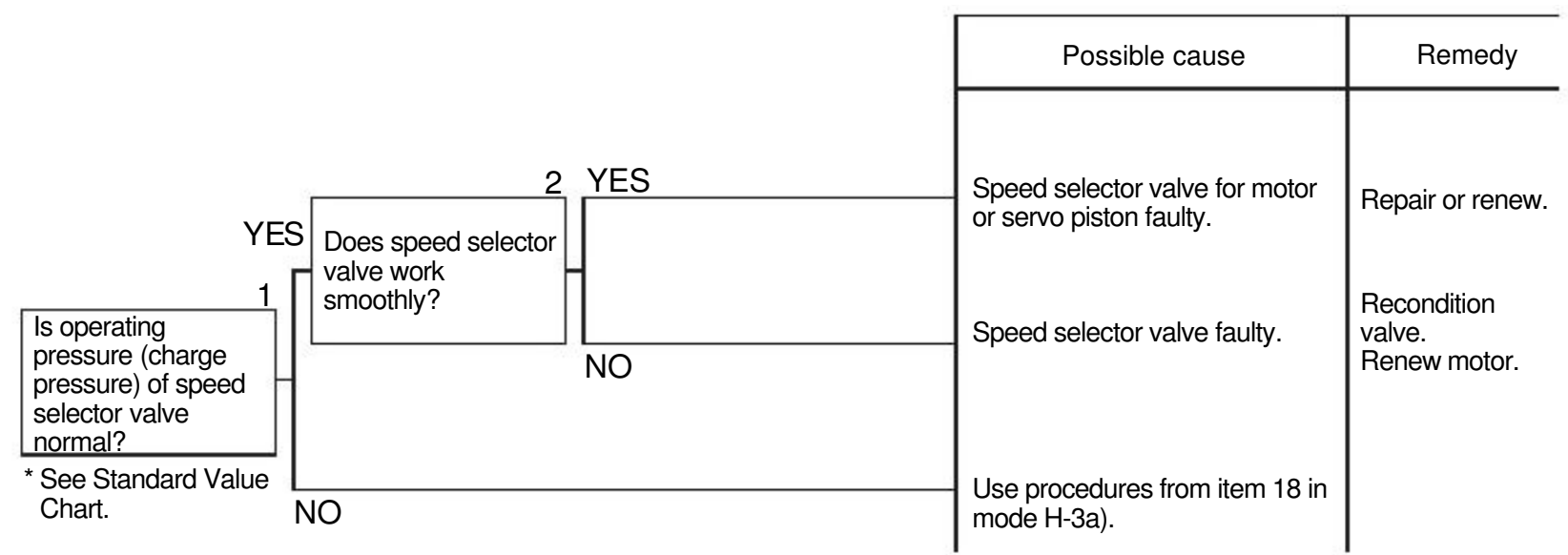
b) Speed not gained or low traction in either forward or backward travel.



H-05 Low-High speed not selected

★Check the level in the hydraulic oil tank before diagnosis starts.

★First check to see if the electric system has no ploblem.



H-06 Vibrator does not work

★Diagnose electric systems first. If they are normal, then use procedures as instructed below:

★Check the oil level in the hydraulic tank before proceeding to the following procedures.

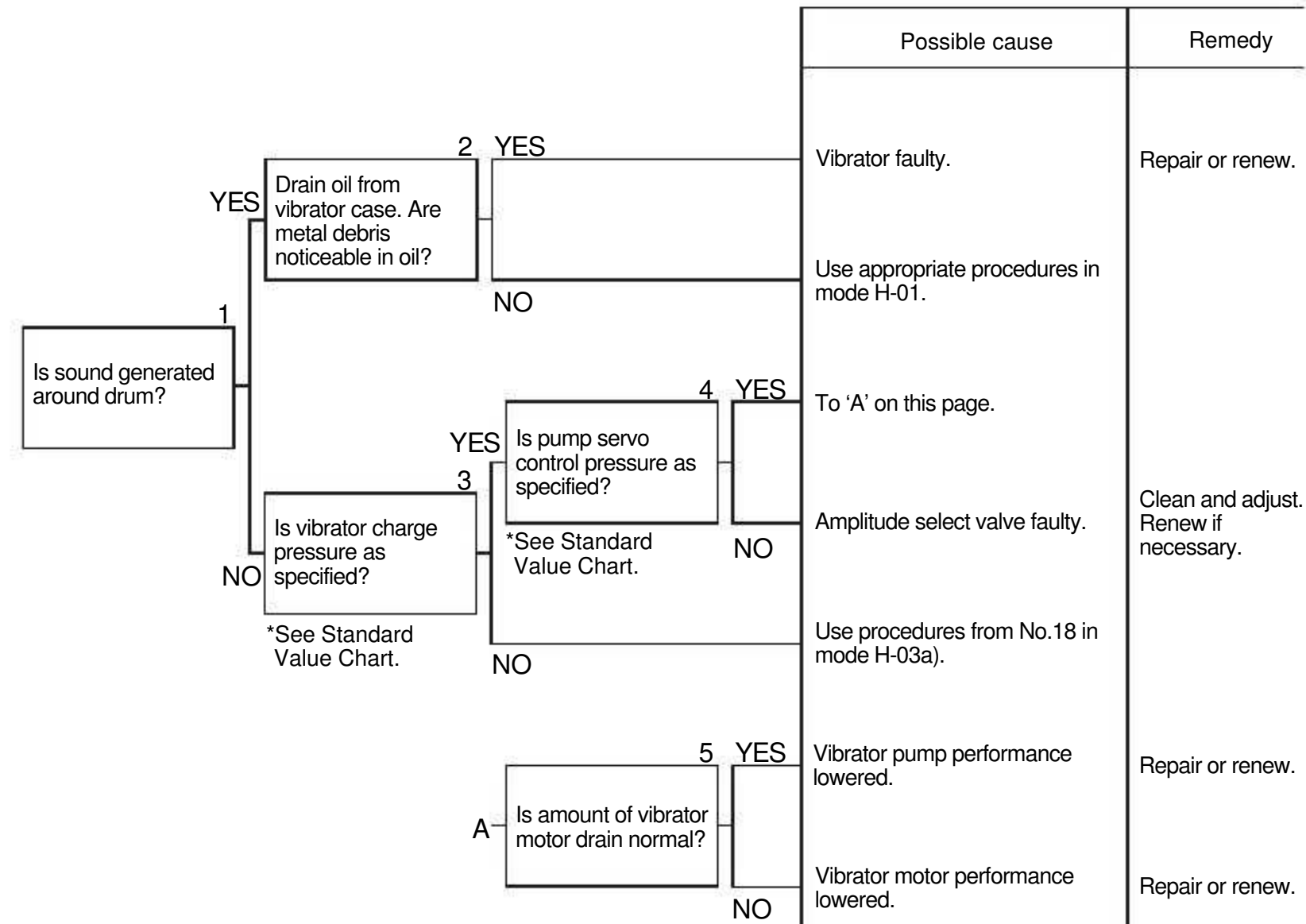
a) Both high and low amplitude modes are inoperative.

|                                                                                                                                                                                                                                                                                                |  | Possible cause                                                             | Remedy                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------------------|---------------------------------------|
| <div><div>1</div><div>Is unusual sound generated around pump?</div><div>YES</div><div>NO</div><div>2</div><div>Is travel normal?</div><div>YES</div><div>NO</div><div>3</div><div>Is charge pressure as specified?</div><div>YES</div><div>NO</div><div>*See Standard Value Chart.</div></div> |  | Use appropriate items in mode H-01.                                        |                                       |
|                                                                                                                                                                                                                                                                                                |  | To 'A' on this page.                                                       |                                       |
|                                                                                                                                                                                                                                                                                                |  | Use procedures from No.18 in mode H-03a).                                  |                                       |
|                                                                                                                                                                                                                                                                                                |  | Use appropriate items in mode H-03.                                        |                                       |
| <div><div>4</div><div>Does circuit pressure build up to relief setting if amplitude selector switch is operated?</div><div>YES</div><div>NO</div><div>5</div><div>Is there a motor rotating sound?</div><div>YES</div><div>NO</div></div>                                                      |  | Vibrator faulty.                                                           | Repair or renew.                      |
|                                                                                                                                                                                                                                                                                                |  | Motor shaft splines or sleeve faulty.                                      | Repair or renew.                      |
|                                                                                                                                                                                                                                                                                                |  | Vibrator pump amplitude select valve or pump faulty.                       | Repair or renew.                      |
| b) Either front or rear vibrator is inoperative.                                                                                                                                                                                                                                               |  |                                                                            |                                       |
| <div><div>1</div><div>Is pump servo pressure normal?</div><div>YES</div><div>NO</div><div>2</div><div>Is faulty condition reversed if high pressure relief valve on high amplitude side is exchanged with that on low amplitude side?</div><div>YES</div><div>NO</div></div>                   |  | High pressure relief valve incorrectly adjusted or foreign matter present. | Clean and adjust. Renew if necessary. |
|                                                                                                                                                                                                                                                                                                |  | Pump servo pistons faulty.                                                 | Repair or renew.                      |
|                                                                                                                                                                                                                                                                                                |  | Amplitude select valve faulty.                                             | Clean and adjust. Renew if necessary. |

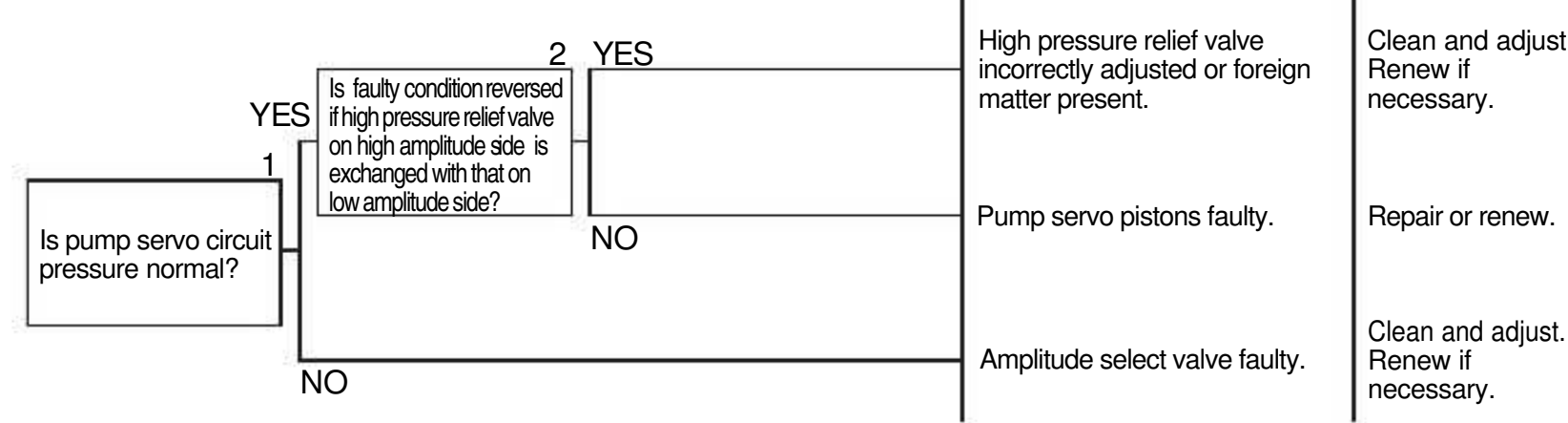
H-07 Weak vibratory force

- ★Diagnose the electric systems first. If they are normal, use procedures as follows:
- ★Check the oil level in the hydraulic tank before proceeding to the following procedures.

a) Both high and low amplitude modes are inoperative.

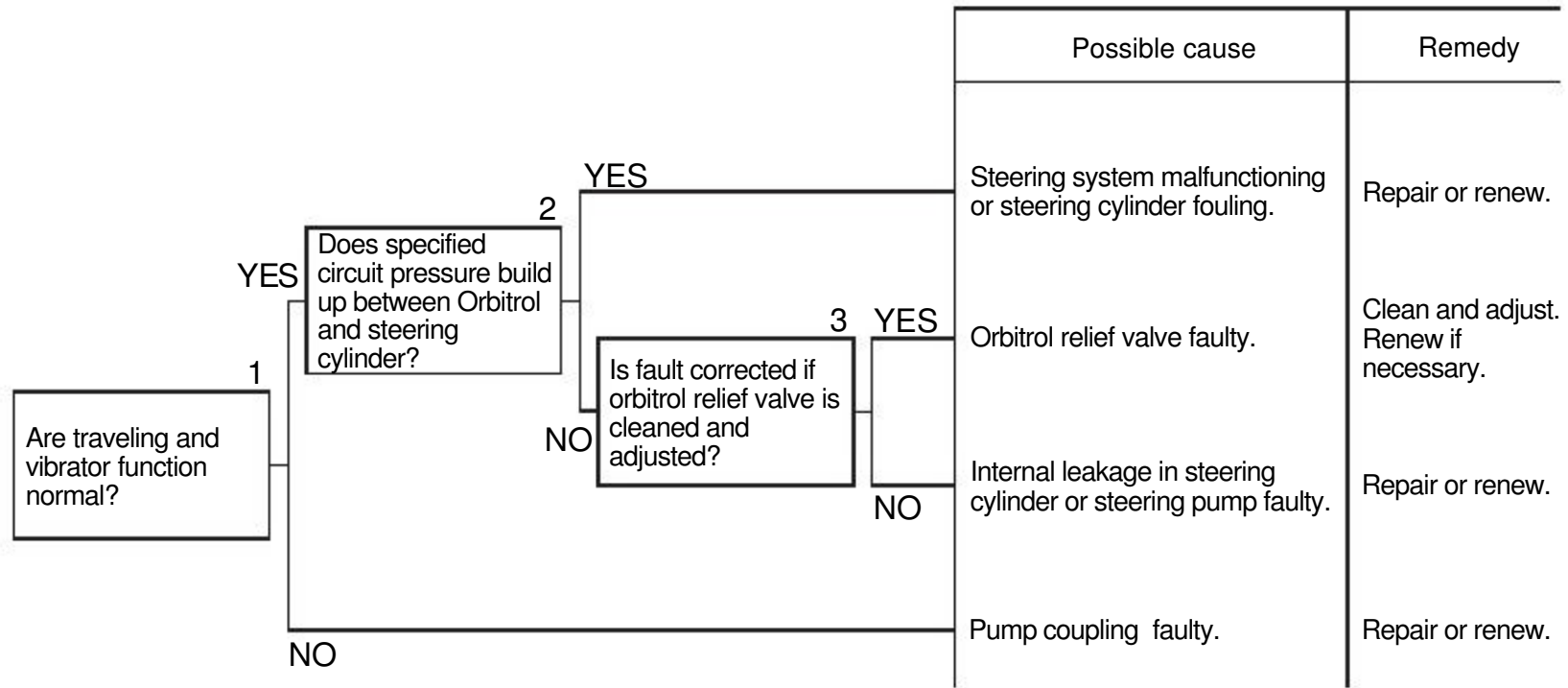


b) Either high amplitude mode or low amplitude mode is inoperative.



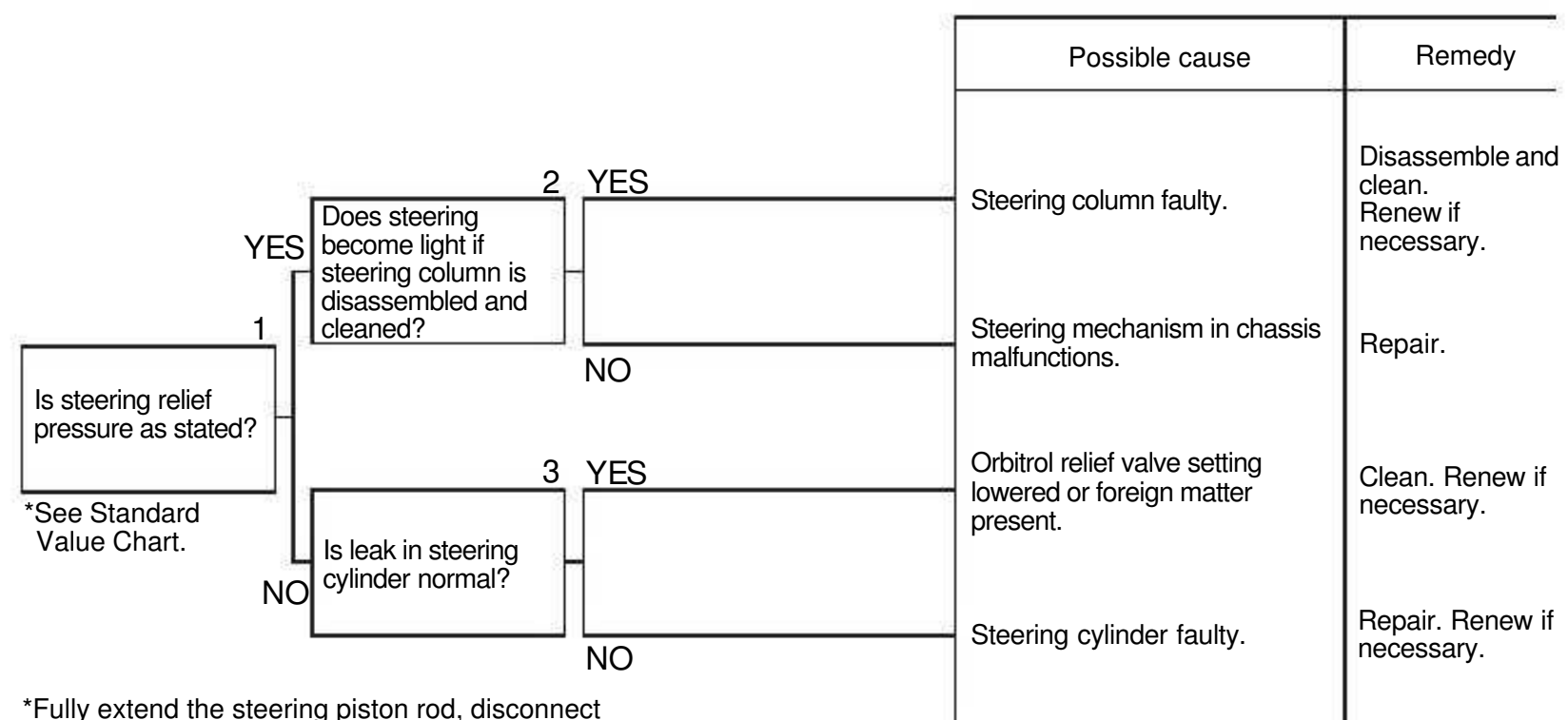
H-08 Steering not performed

★Start with checking the oil level in the hydraulic tank.

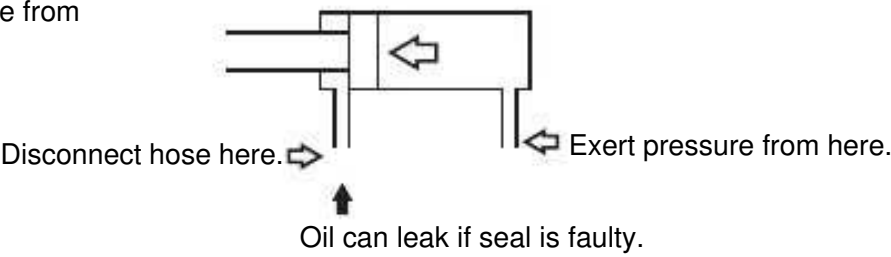


H-09 Heavy or slow steering

★Start with checking the oil level in the hydraulic tank.



\*Fully extend the steering piston rod, disconnect hose from piston rod side. Exert pressure from cylinder head side.



H-10 Poor function of parking brake

- ★Diagnose the electric systems first. If they are normal, then use the following procedures.
- ★Start with checking the oil level in the hydraulic tank.

|                                                                                                                                                             |       | Possible cause                                   | Remedy               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------|----------------------|
| <div>Does specified pressure build up between parking brake solenoid valve and brake as specified?</div> <div>• When brake is applied: 0MPa (0kg/cm²)</div> | 1 YES | Brake faulty (Discs or plates worn or deformed). | Renew or renew wire. |
|                                                                                                                                                             | NO    | Parking brake solenoid valve faulty.             | Renew.               |

H-11 Parking brake not released

- ★Diagnose the electric systems first. If they are normal, then use the following procedures.
- ★Start with checking the oil level in the hydraulic tank.

|                                                                                    |       | Possible cause                                                           | Remedy                                      |
|------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------|---------------------------------------------|
| <div>Is charge pressure as specified?</div> <div>* See Standard Value Chart.</div> | 1 YES | Is pressure between parking brake solenoid valve and brake as specified? |                                             |
|                                                                                    | 2 YES |                                                                          |                                             |
|                                                                                    | NO    | • When brake is released: NO<br>* Refer to Standard Value Chart.         | Use procedures from item 18 in mode H-03a). |

