Kawasaki

AAA-S85N3E00-00Z
(93211-00111)

WHEEL LOADER SHOP MANUAL

85ZIV-2

Powered by NISSAN PE6T44 Engine.

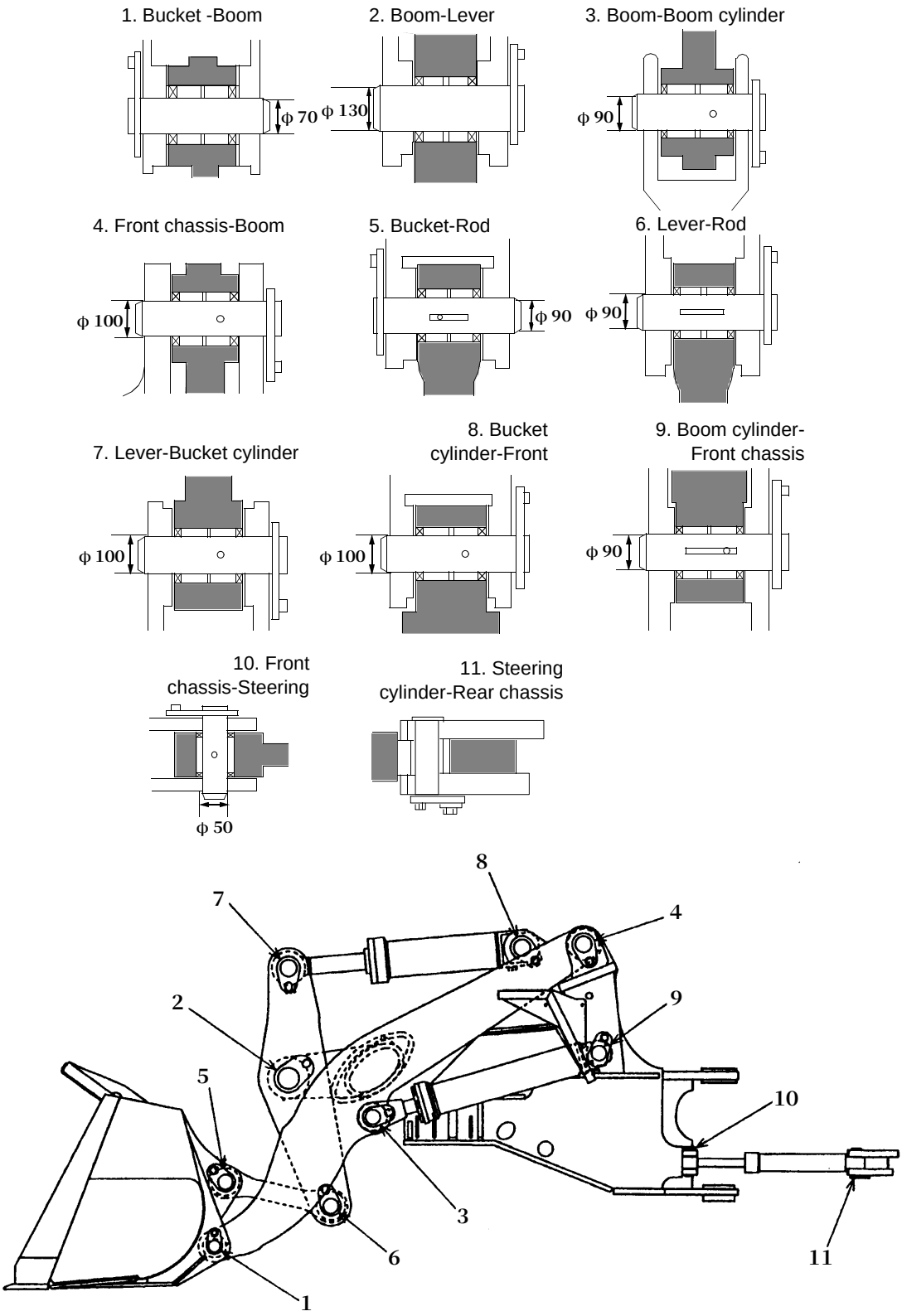
SERIAL NUMBERS
85N3-9001 and up.

General Information
Functions & Structure

Weight of Main Components

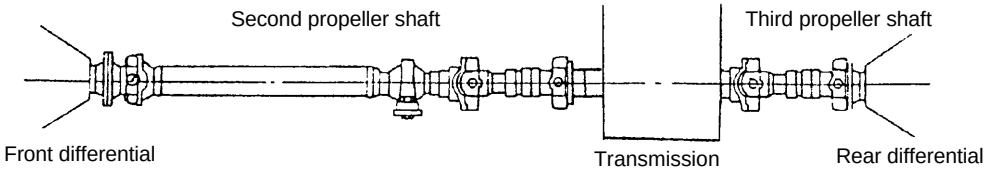
Item		(kg)	Remarks
Unit name	Part name		
Chassis	Bucket	1440	GSN bucket
	Boom	1250	Standard
	" Z " -Lever	360	
	Link (Bucke to Lever)	70	
	Engine room assembly	305	Including air cleaner and condenser
		265	Excluding air cleaner and condenser
	Hydraulic tank	150	Excluding oil
	Fuel tank	150	Excluding fuel
	Deck	65	Including hand rail
	Cab	560	ROPS cab
	Floor board	340	Including air conditioner unit and seat
	Front chassis	1680	Bare chassis
	Rear chassis	1360	Bare chassis
	Counter weight	1100	Standard
Power line	Engine	860	Excluding oil
	Radiator	200	Excluding water and oil
	Transmission	880	Excluding oil
	Second propeller shaft	55	
	Third propeller shaft	10	
	Air cleaner	18	
	Exhaust silencer (Muffler)	23	
	Front axle assembly	1300	Excluding tires and oil
	Rear axle assembly	1700	Excluding tires and oil (Including axle support)
	Differential	178	
Hydraulic system	Multiple control valve	54	
	Steering valve	22	
	Gear pump	33	
	Boom cylinder	200/pc	Excluding oil
	Bucket cylinder	215	Excluding oil
	Steering cylinder	38/pc	Excluding oil
Other	Tire	547/pc	With rim (23.5R25 ★); No Hydro Inflation
	Air conditioner unit	83	(In cab portion)
	Battery	40/pc	

Linkage


1. Bucket -Boom
ϕ 70
2. Boom-Lever
ϕ 130
3. Boom-Boom cylinder
ϕ 90
4. Front chassis-Boom
ϕ 100
5. Bucket-Rod
ϕ 90
6. Lever-Rod
ϕ 90
7. Lever-Bucket cylinder
ϕ 100
8. Bucket cylinder-Front
ϕ 100
9. Boom cylinder-Front chassis
ϕ 90
10. Front chassis-Steering
ϕ 50
11. Steering cylinder-Rear chassis
1
2
3
4
5
6
7
8
9
10
11

Adjusting yoke direction (phase) at reinstallation :

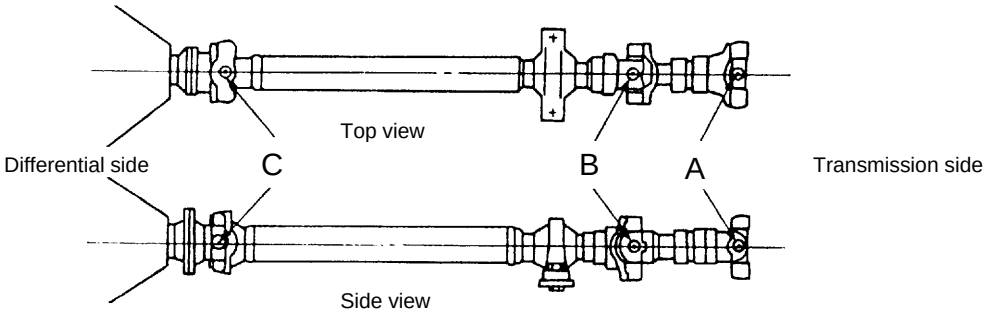
Adjust the yokes of the second and third propeller shafts to the same direction (phase).



- The propeller shaft attaches to the transmission shaft. The shaft from the front differential to the rear differential is referred to as the propeller shaft. The propeller shaft articulates as the machine turns.

When the propeller shaft is articulated due to machine steering, differences in the yoke phases (directions) will cause unbalance between the transmission torque and the reaction force. As a result, the propeller shaft extremely vibrates, and the service life of the shaft will be shortened.

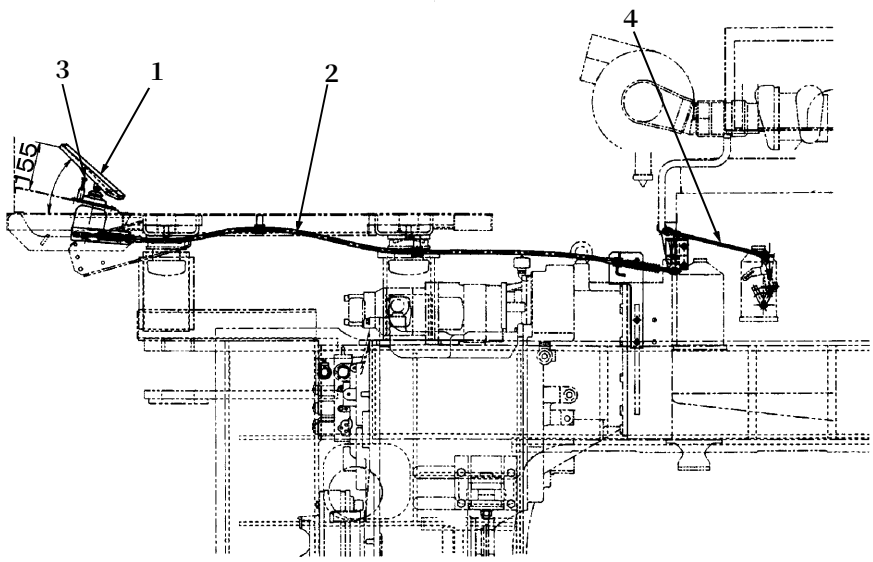
Adjusting yoke directions (second propeller shaft):



- As misalignment may produce an abnormal noise, be sure to align points (A), (B), and (C) of the yokes when reassembling the propeller shaft.

- To align the points (A), (B), and (C), insert spacer or shim into the pillow block section.

Fuel Control



85K22009

1. Accelerator pedal
2. Control cable
3. Pedal stop bolt
4. Return spring

Adjusting accelerator pedal:

Press the accelerator pedal at full stroke, and check that the stop bolt under the pedal comes in contact with the pedal just before the lever of the engine governor comes in contact with the full stroke stopper. If not, adjust the length of the stop bolt.

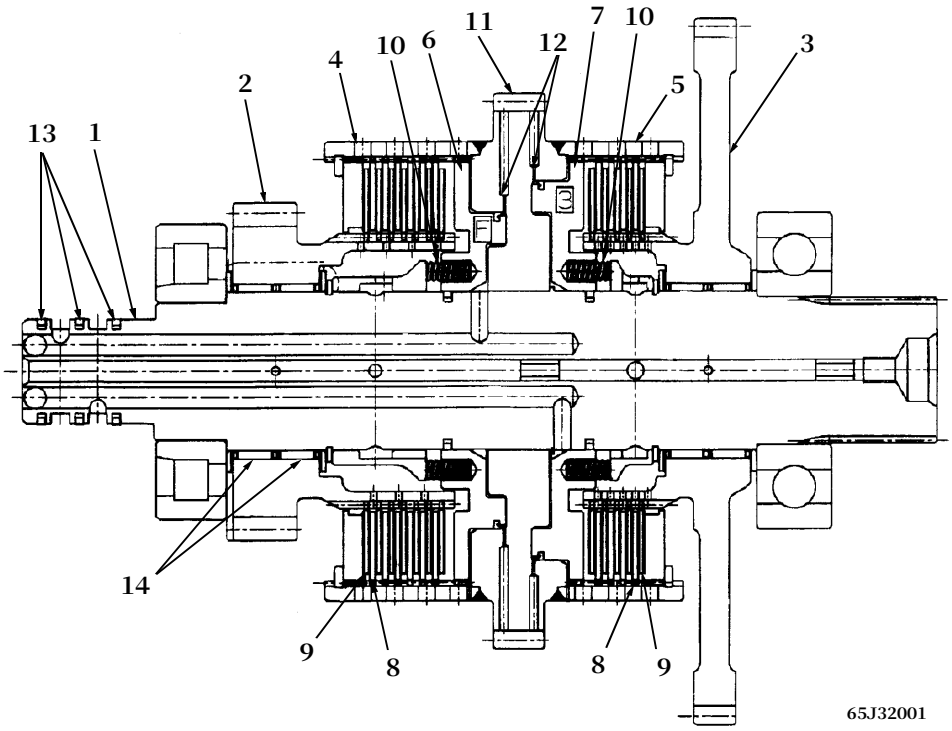
Caution regarding reinstallation of control cable:

Carefully tighten the joints at both ends of the control cable to prevent distortion or damage.

Clutch Pack

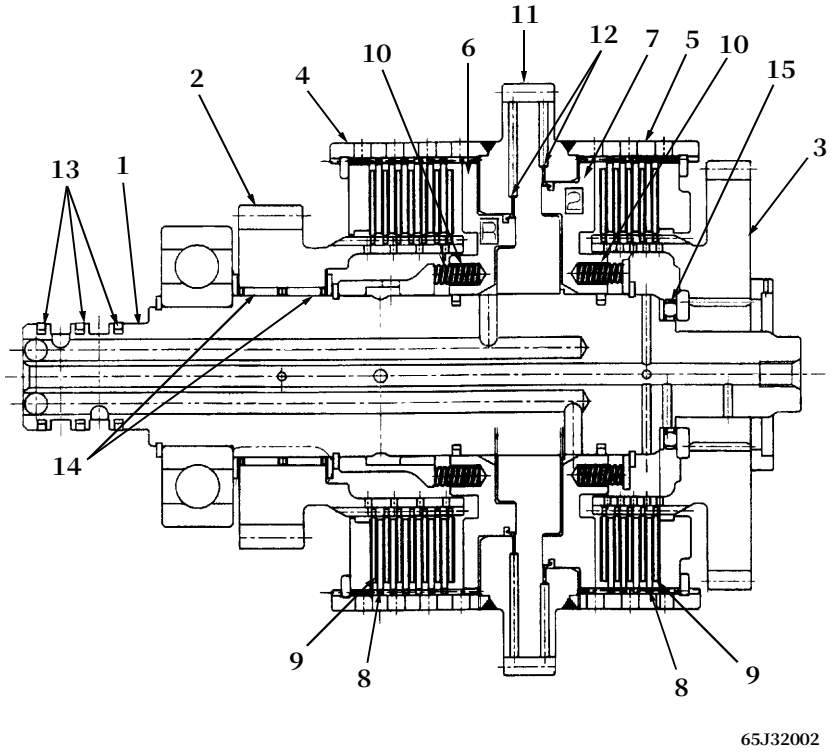
Forward and 3rd speed clutches

1. Counter shaft
2. Forward clutch gear
3. 3rd speed clutch gear
4. Forward clutch
5. 3rd speed clutch
6. Forward clutch piston
7. 3rd speed clutch piston
8. Steel plate
9. Friction plate
10. Return spring
11. Clutch drum (with counter gear)
12. Residual pressure preventive orifice
13. Seal rings
14. Needle bearings

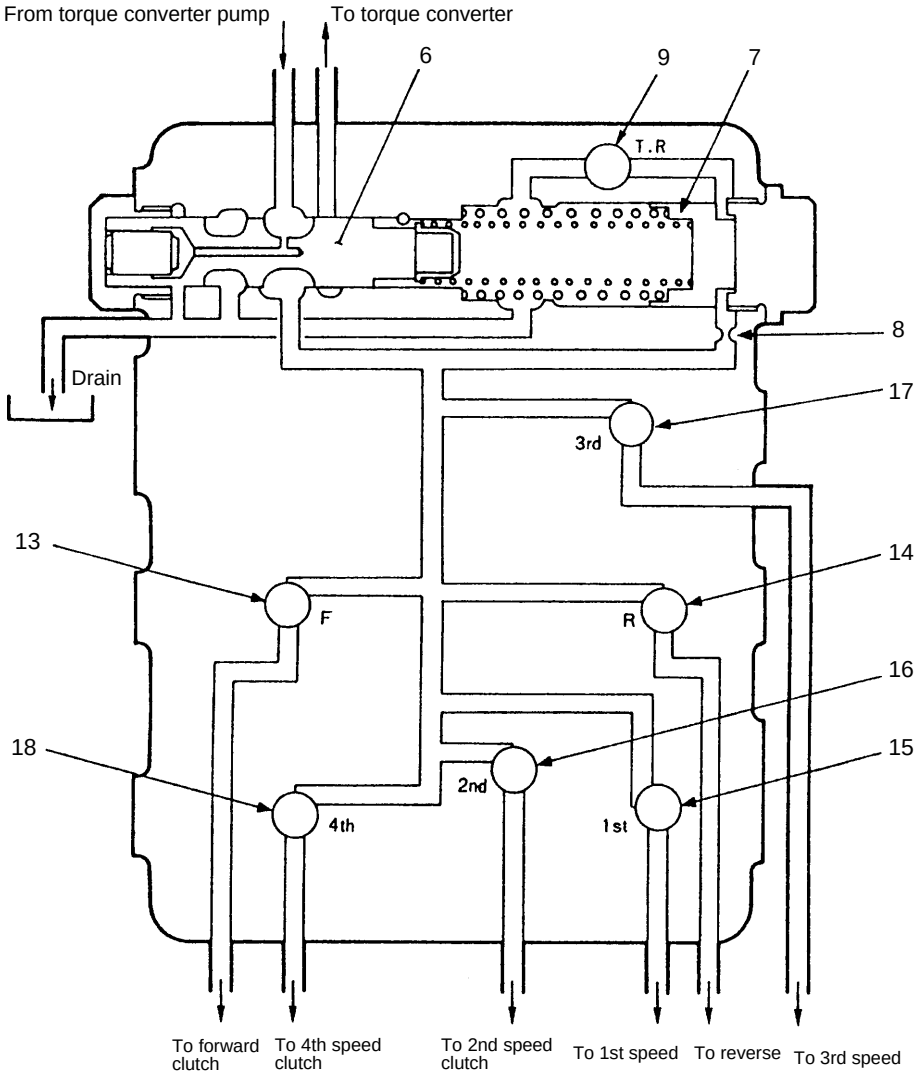


Reverse and 2nd speed clutches

1. Counter shaft
2. Reverse clutch gear
3. 2nd speed clutch gear
4. Reverse clutch
5. 2nd clutch
6. Reverse clutch piston
7. 2nd speed clutch piston
8. Steel plate
9. Friction plate
10. Return spring
11. Clutch drum (also used as counter gear)
12. Residual pressure preventive orifice
13. Seal rings
14. Needle bearings
15. Thrust bearing

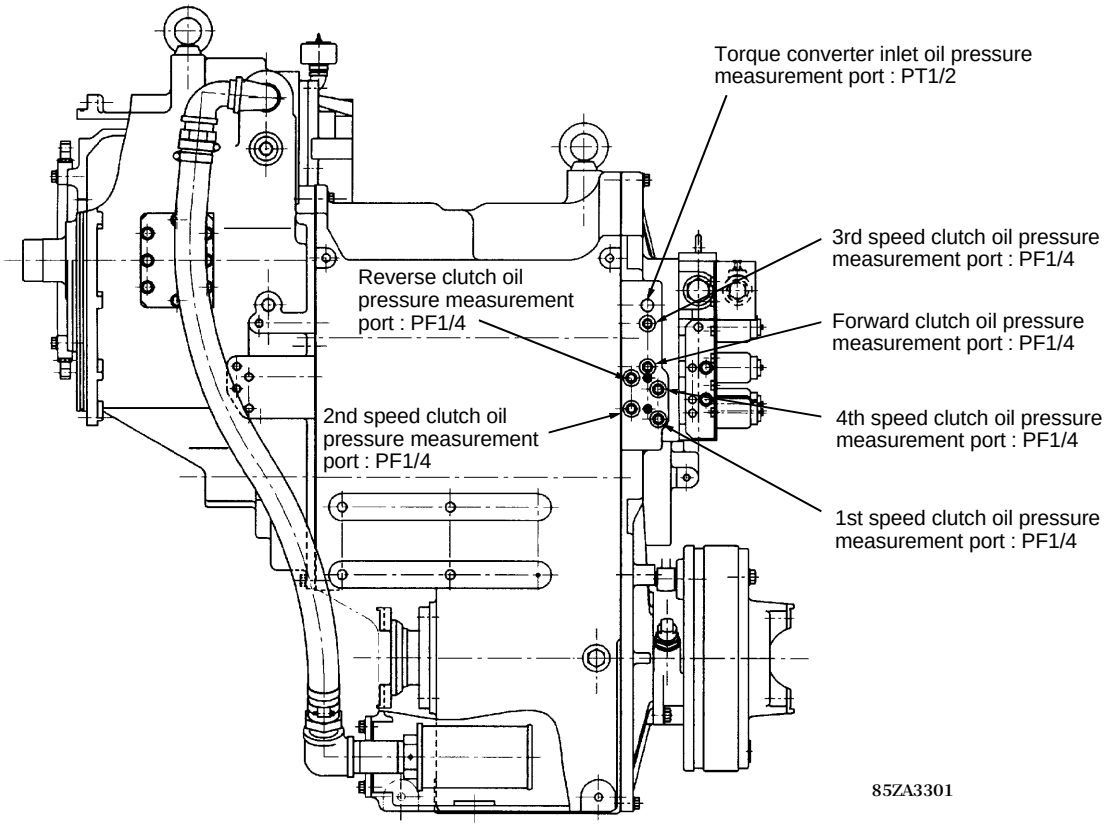


System Diagram



6. Clutch pressure regulator valve
7. Trimmer plug
8. Orifice (1.3^{mm}-dia.)
9. Trimmer solenoid valve
13. Forward clutch solenoid valve
14. Reverse clutch solenoid valve
15. 1st speed clutch solenoid valve
16. 2nd speed clutch solenoid valve
17. 3rd speed clutch solenoid valve
18. 4th speed clutch solenoid valve

each individual clutch pack and converter pressures.



- Pressure gauge 2.0MPa (20kgf/cm^2) with 2～3m hose
- Clutch oil pressure measurment value :
  1.3±0.2MPa (13±2kgf/cm^2) at engine idling speed (LI)
  1.5 ± 0.2MPa (15±2kgf/cm^2) at engine maximum speed (HI)
- Torque converter oil temperature : 50 to 80 ℃

1.Structure

Both sides of the gear consists of floating type pressure plates having balancing functions. The pressure plates maintain optimum clearance on both sides of the gear (pressure balance mechanism) so that the high volumetric efficiency is ensured.

2.Functions of pressure plates

Rotating gears feed the pressurized oil along the circumference of the case to the outlet port. The pressurized oil is also sent to the high-pressure area in the rear of the pressure plate. The pressure plate is pressed to the gear side so that the clearance between the pressure plate and the side surface of the gear is kept very small. The pressing force to the plate is adjusted to an appropriate value by setting the optimum high-pressure area of the plate.

The high-pressure area in the rear of the pressure plate is enclosed by the O-ring and the backup seal.

To prevent the gear-sealing area from extremely high pressure due to confined oil, there is a confined oil bypass groove at the gear-sealing area of the pressure plate.

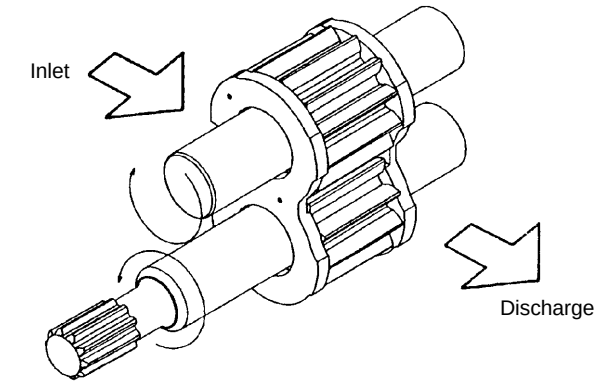
3.Bushing lubrication

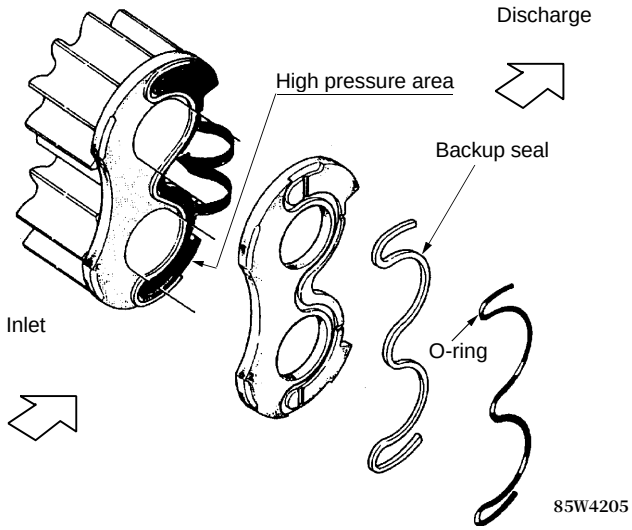
The lubrication system uses the oil fed from the pressurized tank.

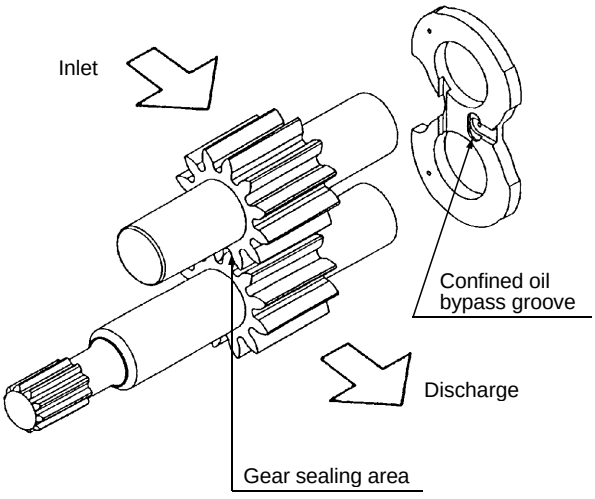
Part of the oil fed from the inlet port is sent to the bushings to lubricate them. After that, the oil is returned to the inlet side and then sent to the discharge side.

Bushings require lubrication to maintain a long service life. Avoid bushing damage due to a lack of lubrication oil by :

- Starting up a new pump with oil supplied to it.
- Allow new pump to idle (low rpm/no load) for 5 minutes.
- Use the proper viscocity for the coldest possible start up temperature. Change viscocity if seasonal temperature changes are great (more than 20℃ [40 ℉]).

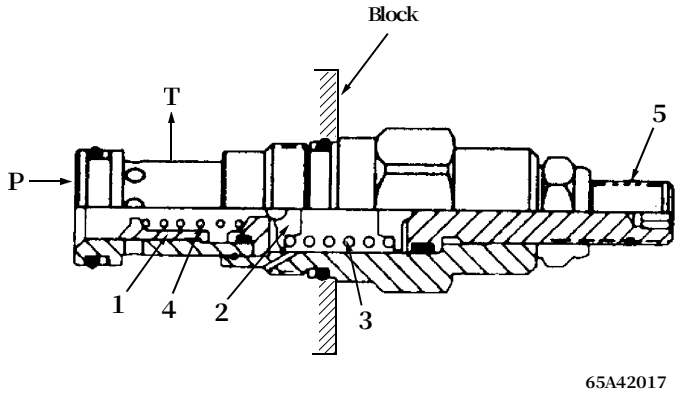






Relief valve
Function

The relief valve is placed between the pump and the pilot valve. The pilot relief valve regulates the oil pressure in the pilot circuit to a safe operating range.
The pressure is held constant whenever the engine is running.
When the pilot circuit pressure reaches the operating pressure the relief valve opens and directs some of the oil back to the tank.



65A42017

1. Poppet
2. Pilot poppet
3. Pilot spring
4. Spring
5. Adjusting screw

Note : Adjusting screw adjustable range : 5 turns

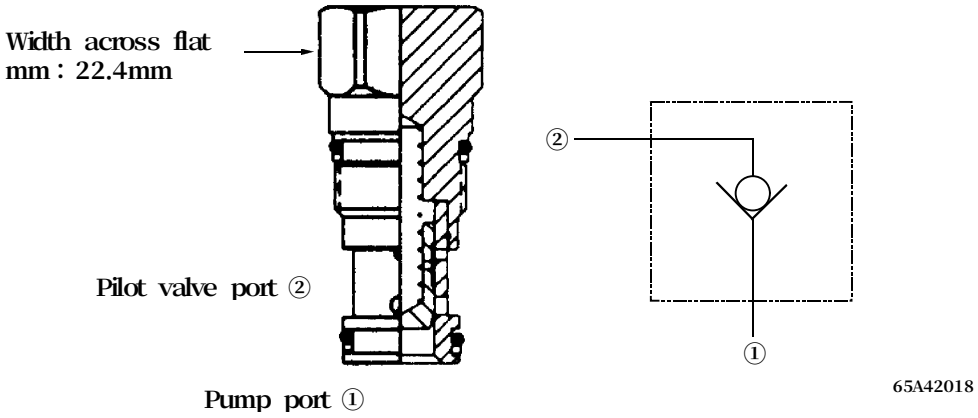
Operation

• When oil pressure is lower than the set point
Oil discharged from the pump passes through the orifice of the poppet (1) and reaches to the pilot poppet (2). The pilot poppet (2) is pushed to the left by the pilot spring (3) and closes the port.

• When oil pressure exceeds the set point
When the pumped oil pressure surpasses the set spring pressure 3.6±0.3MPa(37±3kgf/cm^2) of the pilot poppet (2), the pilot poppet (2) opens to allow oil to escape into the tank. In the result, the force pushes the relief poppet (1) to the left decreases and thereby the relief poppet (1) moves to the right, allowing high-pressure oil in the pump line into the tank line.

Adjust to the set pressure at 3.6MPa(37kgf/cm^2) using the adjusting screw (5).

Check valve
Construction



65A42018

Overload relief valve (with make-up function)

(Installed on both the rod and bottom sides of the bucket line)

Function

Each overload relief valve (with make-up function) is installed between the cylinder and the control plunger. When the plunger is in the neutral position, if external force on the cylinder becomes too high and the oil pressure will be greatly increased, the overload relief valve returns the oil to the tank to protect the cylinders and pipes from breakage.

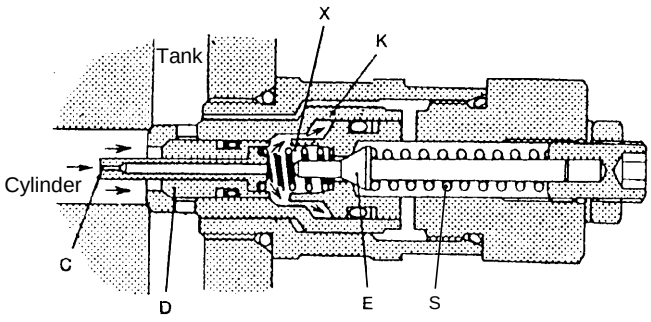
Operation

Operation as overload relief vavle

- **When the oil pressure is at the set point or below.**

  The pressurized oil is fed to the chamber X via the orifice of poppet C. Poppet E is closed due to the normal oil pressure (below set pressure) and spring S tension, therefore, the oil line from cylinder to the tank is completely closed.

  The pressure area in the chamber X is bigger than the area of the cylinder port on sleeve K, therefore, sleeve K is moved to the left to seat the valve at the cylinder port.

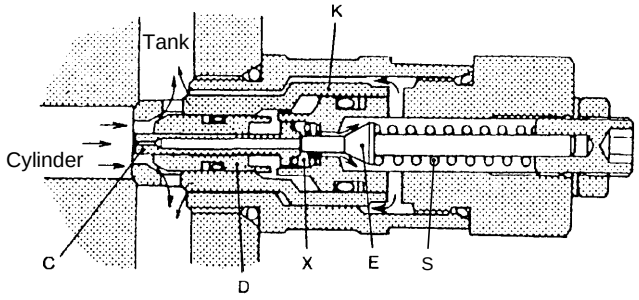


- **When the oil pressure exceeds the set point**

  The pilot poppet E is opened by compressing spring S and the oil returns to the tank along sleeve K.

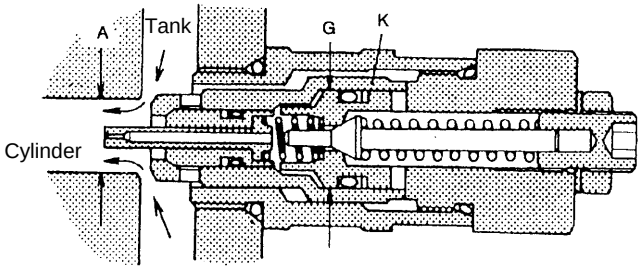
  As a result, the pressure in the chamber X is low compared with that of the cylinder side.

  Poppets C and D, therefore, are moved to the right and the high pressure oil from the cylinder is returned to the tank.



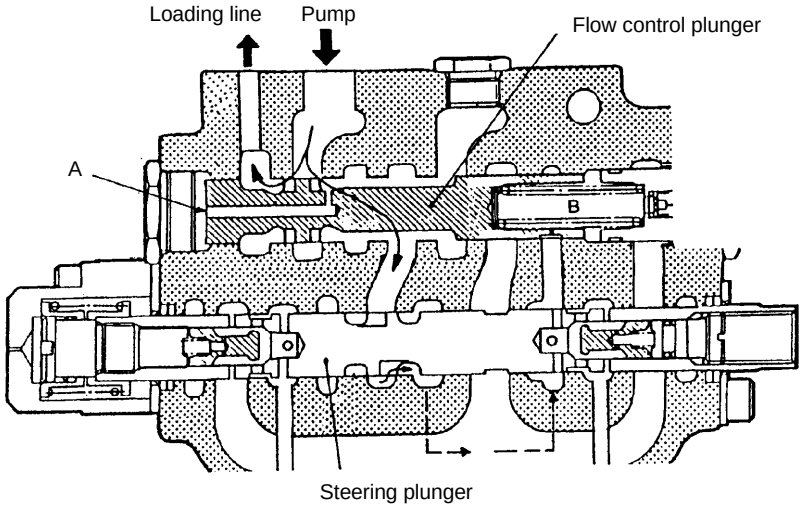
- **Operation as make-up valve**

  When the cylinder pressure drops to a pressure lower than that of the tank port, sleeve K is moved to the right due to difference in the right and left pressures (pressure area=G-A). As a result, sleeve K is moved to the right ,and the oil fed from the tank goes to the cylinder to increase the pressure.



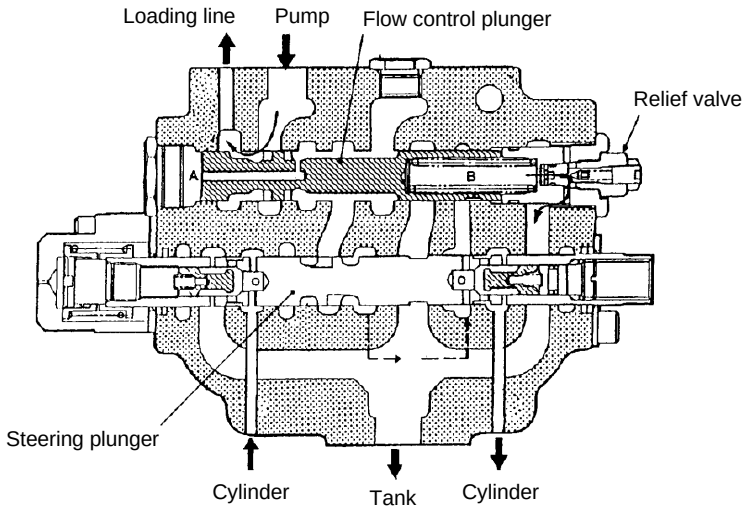
Main relief valve

- **When the oil pressure is at the set point or below.**



In the above figure, the steering plunger is opened, and chambers A and B are filled with oil. The flow control plunger is balanced at the position shown in the figure.

- **When the oil pressure exceeds the set point.**



When the pressure in the cylinder line rises above the set point (oil pressure in chamber A and B rise also), the oil in chamber B opens the relief valve and flows to the tank line. As a result, the pressure in chamber A is higher than that of chamber B.

The flow control plunger, therefore, is moved to the right, and all the oil from the pump is sent to the loading line.

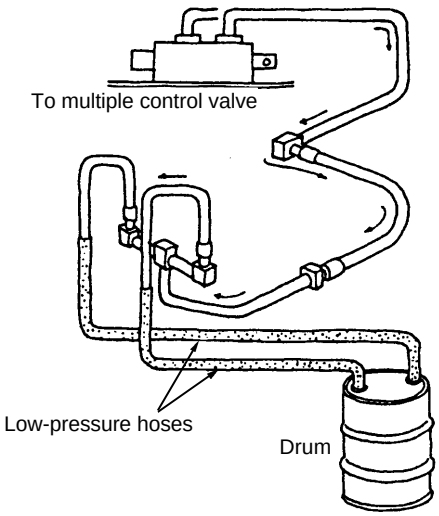
Pressure is still being applied to the steering cylinders.

3. Flushing pipes

Flushing pipes connected to the damaged cylinder

- Generally, the cylinder debris will not be stuck in pipes. Most of broken pieces are caught by the multiple control valve or return filter, and some of them are sent into the hydraulic tank. However, for precaution's sake, flush all the pipes connected to the broken cylinder.
- If there are long and thick low-pressure hoses, as the figures, disconnect the cylinder hoses from the cylinder, and then connect the low-pressure hoses to the connectors of the cylinder hoses. Insert the other ends of low-pressure hoses into a drum. Flush the pipes with oil for 10 seconds by operating engine at full speed. The pipes and hoses will be cleared of debris, and the control valve will be also cleared of debris if there are any residual pieces.
  Use the hydraulic oil in the hydraulic tank for this oil flushing method. Therefore, be sure to clean the inside of the hydraulic tank before flushing the pipes.
- If there are no long and thick hoses, disconnect the cylinder hoses and pipes, and feed light oil or cleaning solvent into the pipes and hoses. Cover the both ends and shake the hoses and pipes. After that, discharge light oil or cleaning solvent from the pipes and hoses. The broken pieces will be discharged together with the oil or solvent.

[Flushing pipes]

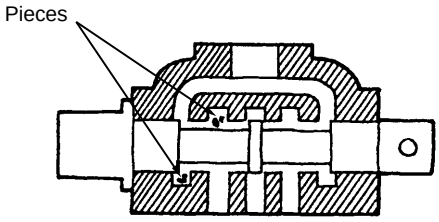


IMPORTANT

Oil level must be kept full in hydraulic tank, or pump damage may results.

4. Disassembling and checking valves

Remove all the plungers and relief valves, and then check their sliding surfaces for scratches. Also check the grooves on the bodies for residual broken pieces.
For a detailed description of valve disassembly and reassembly, refer to "Hydraulic Group Disassembly and Reassembly".

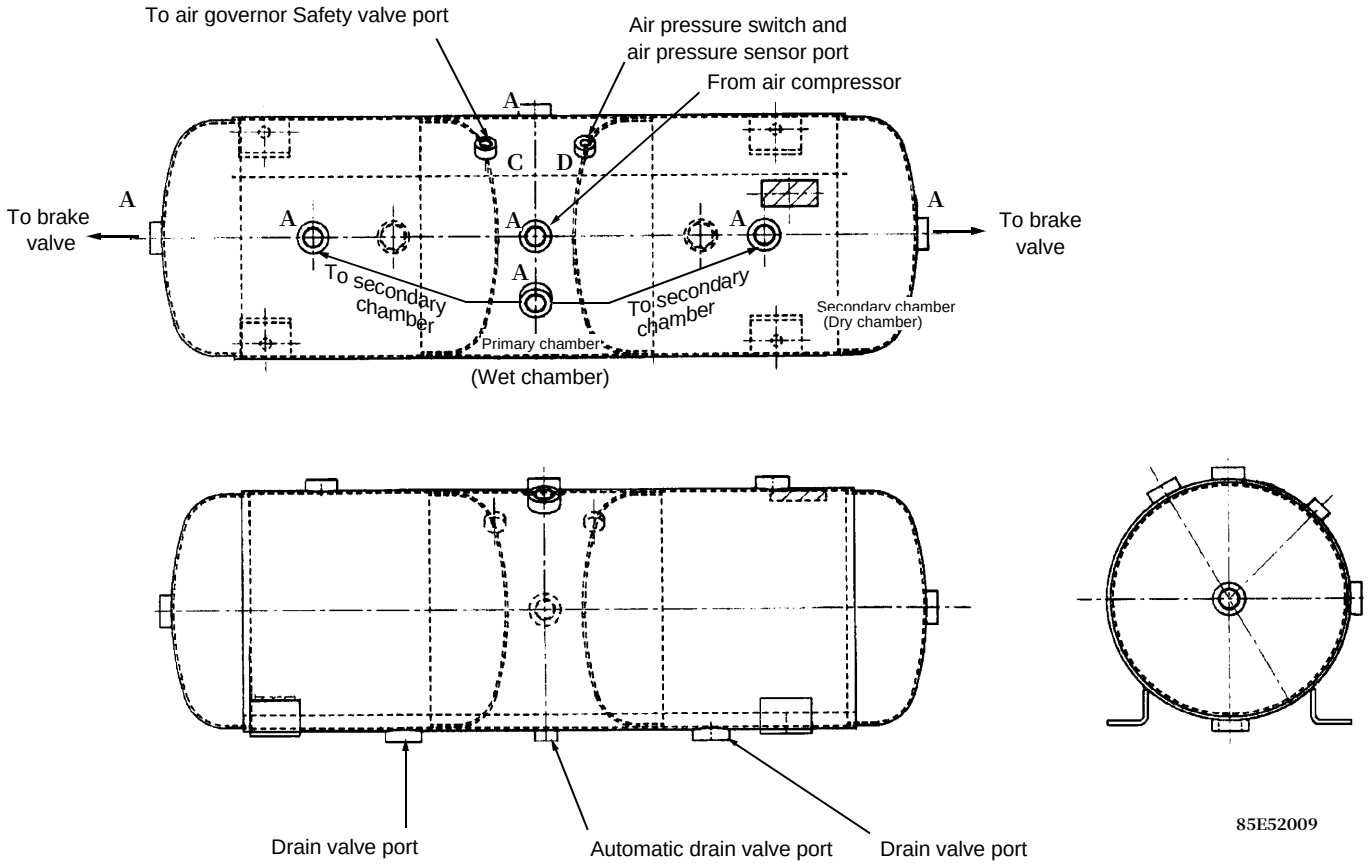


Air tank

Construction

The air tank consists of one primary chamber (wet chamber) and two secondary chambers (dry chambers). The air from the air compressor is fed into the primary chamber first. The primary chamber then feeds air into the secondary chambers.

The secondary chambers supply air to the right and left brake valves. The primary chamber has safety valve, air pressure sensor, automatic drain valve, and air pressure switch. The secondary chambers have manual drain valves.



Capacity of air tank

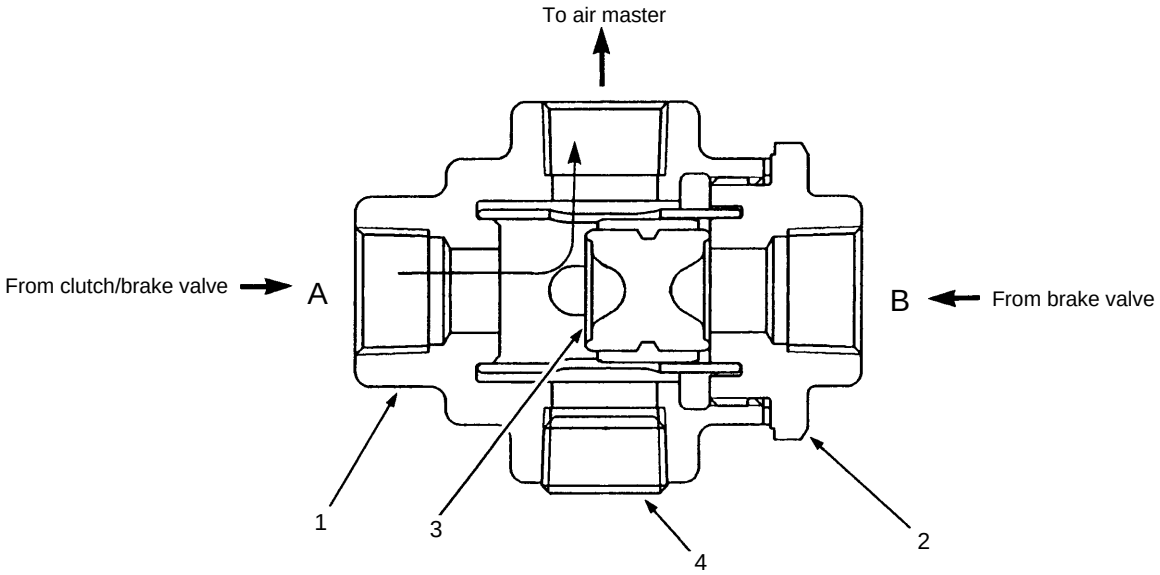
		Capacity (*l*)
Primary chamber		6
Secondary chamber	right	14.5
	left	14.5

Dimensions of screws used for unit installation

Mark	Q'ty	Dimension (inch)
A	7 points	PT1/2
B	2	PT3/4
C	2	PT1/4
D	1	PT1/8

Double Check Valve

Construction



The double check valves are installed between the brake valve and the air master. When the right or left brake valve is depressed, or if one of the brake valve malfunctions, the double check valve prevents reverse flow of air to ensure proper operation of the air master.

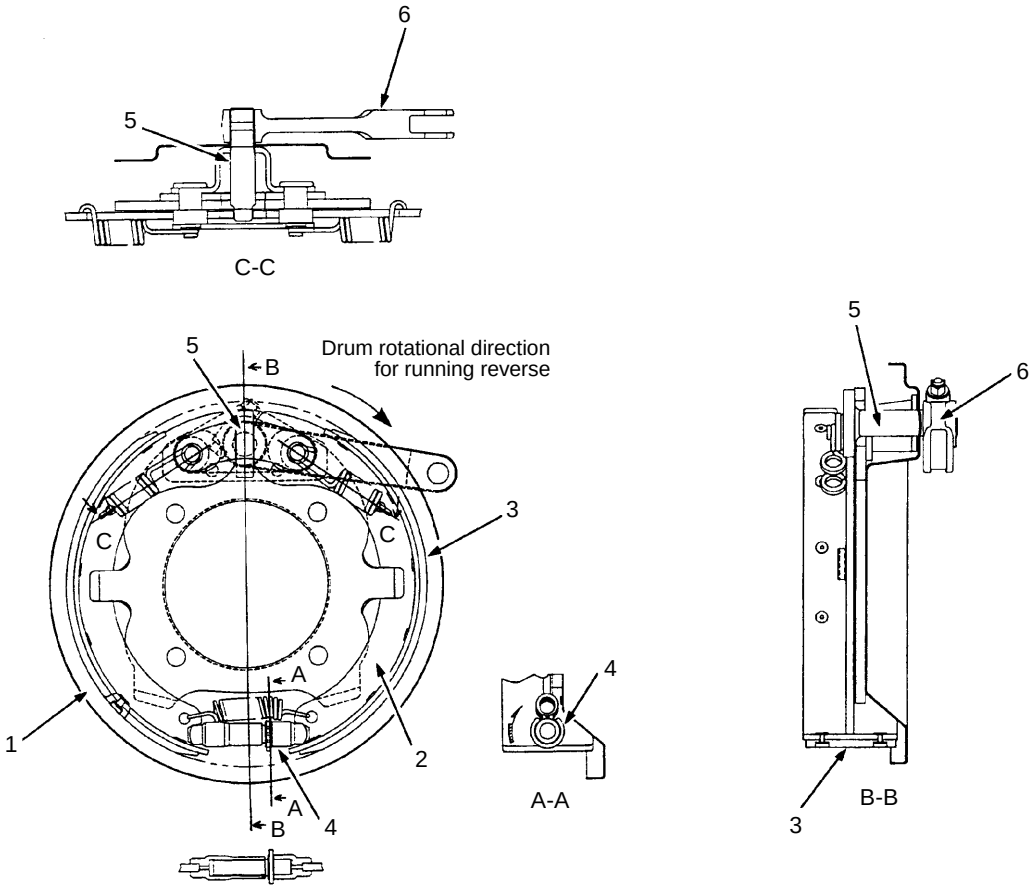
1. Body
2. Cap
3. Shuttle
4. Plug

Operation

When the clutch/brake pedal (left side) is depressed, air flows through port (A) and applies pressure to the shuttle (3). When the shuttle moves to the right, the air flows to the air master and port (B) is blocked. (see the figure above).

When the brake pedal (right side) is depressed, air flows through port (B) and applies pressure to the shuttle (3). When the shuttle moves to the left, the air flows to the air master and port (A) is blocked.

Construction



When the parking switch is turned on (pulled out), air is discharged from the air cylinder, and the air cylinder rod pulls up the lever (6).
Since the lever (6) is connected to the cam shaft (5), the cam shaft rotates when the lever is pulled up. The rotation of the cam shaft causes the shoes on both sides of the cam to expand. As a result, the rotating brake drum is stopped.
For adjustment, refer to "Adjusting parking brake clearance".

∗ The parking brake is designed to hold a machine that is stopped. If used to stop a moving machine it will cause rapid brake shoe wear and require frequent adjusment.

1. Brake drum
2. Brake shoe
3. Brake lining
4. Adjusting screw
5. Cam shaft
6. Lever

Checking Wear of Service Brake Friction Plate

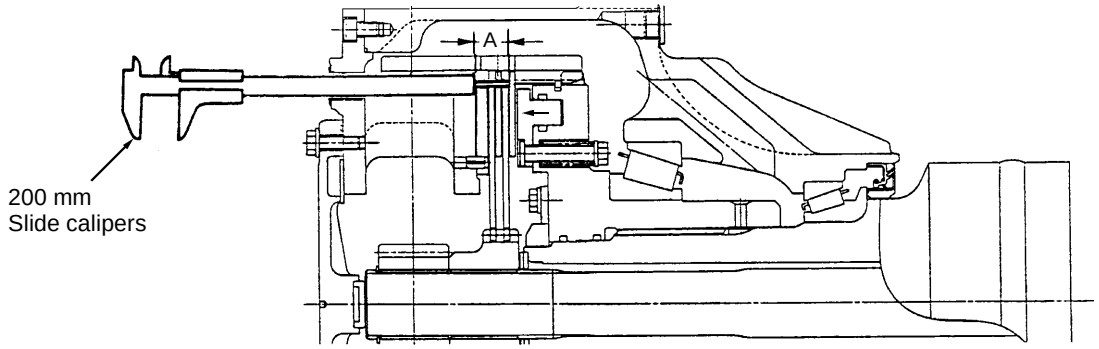
⚠ WARNING

Unexpected movement of machine could cause serious injury or death. To prevent such an accident, observe the following items before checking the brake valve:

- **Park the machine on level ground.**
- **Apply the parking brake.**
- **Stop the engine.**
- **Determine the signals between the persons related to this work for engine starting to prevent an accident.**
- **Prohibit any person from walking into the dangerous area.**

IMPORTANT

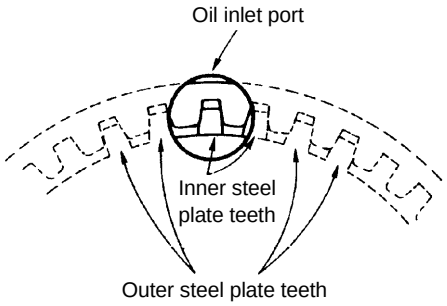
After inserting calipers, do not rotate the wheels. If the wheels are rotated, the calipers may be caught and broken by the reduction gear. In this case, the reduction gear should be disassembled.



Turn the planetary gear so that the oil supply plug is positioned at the top. Check that the teeth of steel plates are as shown in the right figure (only one section of the plate circumference is as shown in the figure).
Insert calipers to the inner steel plate to measure the dimension A.

Note : During measurement, be sure the service brake is applied and the air pressure is in the green zone.

The wear limit for dimension A is 25.1mm. Note that dimension A is 29mm when the plate is new and unused.

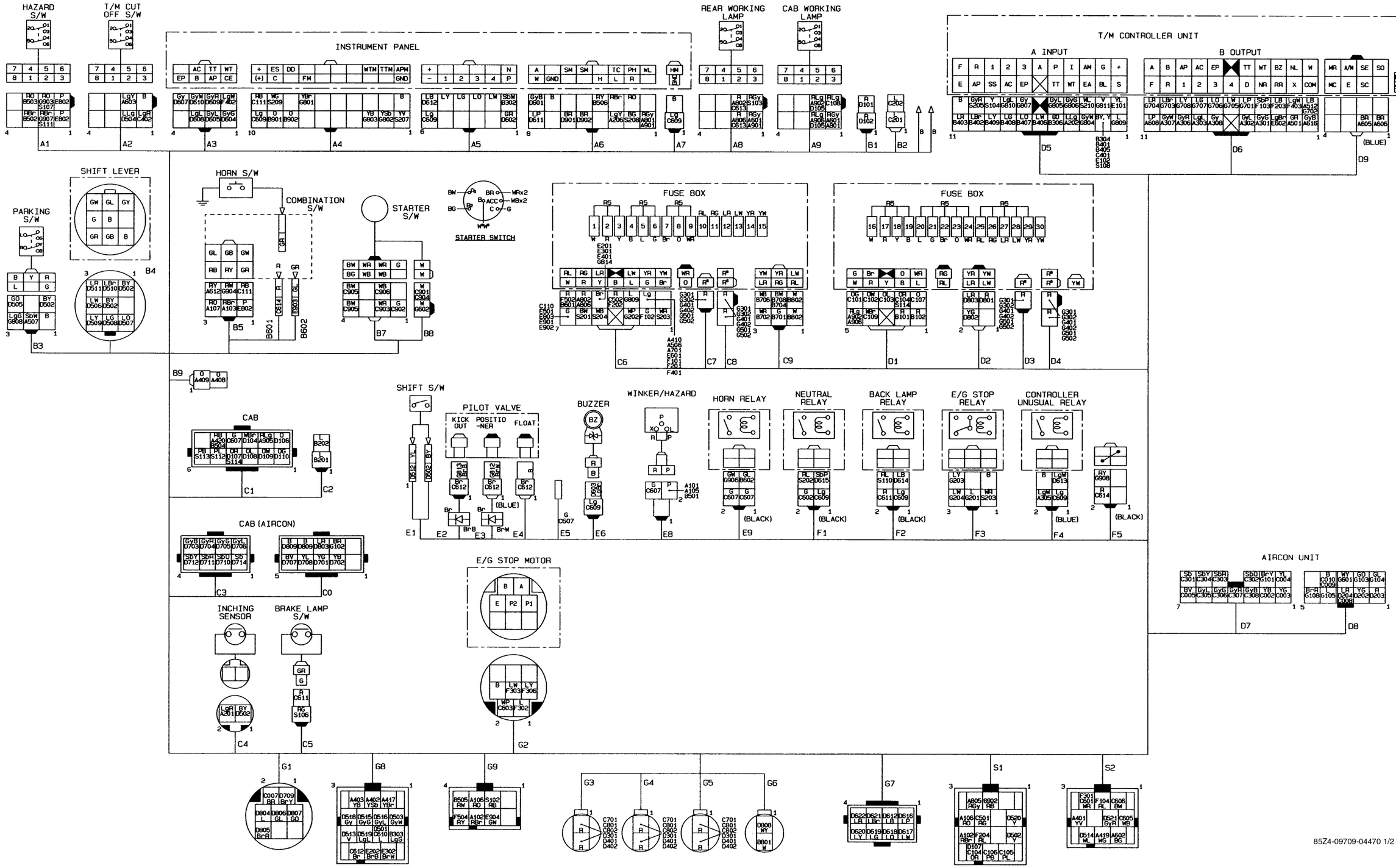


IMPORTANT

To replace the friction and steel plates only, loosen the air breather nipple, and release the internal pressure from the line between the brake piston chamber and auto-adjuster valve. In addition, check that the return spring resets the brake piston to the initial (fully retracted) position. After that, install new plates.
If you do not follow the above procedure, the friction plates may be seized in a short operation time.

Hint : To aid quick measurement on the front axle-raise the front of the machine so the front tires clear the ground by about 25mm. This allows easy rotation of the wheel to align the gear teeth.

Electrical Wiring Diagram(1/2)(85ZIV) (S/N 85N3-9051～)



85Z4-09709-04470 1/2

Fusible Link/Fuse

For the purpose of protection, the electrical circuit has fusible link and fuses.

⚠ CAUTION

Possible burn hazard. Before replacing a fuse, be sure to turn off the starter switch.

IMPORTANT

- **Replace a fuse with the same capacity.**
- **If a fuse blows immediately after replacement, the electric system is defective. Localize the defective part, and then repair it.**

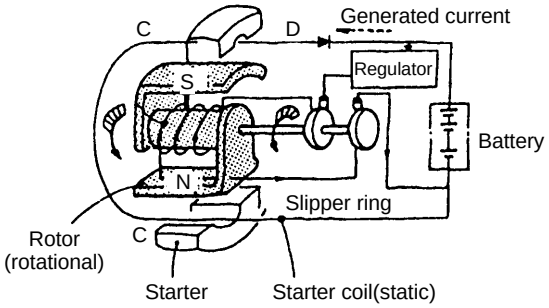
Fuse inside the control box

2 PERSONS CAB F. WIPER(LH) (OPTION)	5A
2 PERSONS CAB F. WIPER(RH) (OPTION)	5A
R. WIPER	5A
F. WIPER	10A
CIGARETTE LIGHTER	10A
F. WORK LIGHT	10A
RADIO	3A
SPARE	10A
SPARE	10A
SPARE	5A
SPARE	5A
AIRCON(OPTION)	5A
AIRCON(OPTION)	20A
AIRCON(OPTION)	20A
SPARE	20A

LIGHTING HEAD LIGHT	20A
R. WORK LIGHT	10A
BOOM KICKOUT BUCKET POSITIONER	10A
BACK LAMP STOP LAMP TURN SIGNAL	15A
PARKING BRAKE CONTROLLER	10A
BUZZER MONITOR	5A
SPARE	15A
SPARE	15A
R. WINDOW HEATING	20A
4WAY FLASHER HORN	15A
PREHEAT	15A
SAFETY RELAY	5A
E/G STOP MOTOR	5A
NEUTRAL RELAY	5A
BATTERY RELAY	5A

Principle of alternator power generation

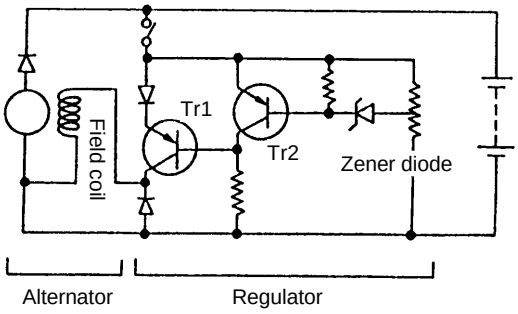
For the alternator, the power is transfered to the magnet (rotor) via the slipper ring to excite the magnet (rotor), and the generated current flows through the outside stator coil. Conductor C-C' wound on the stator is fixed. When inner rotor N-S rotates in the arrow direction, the current will flow through the conductor in the arrow direction to the battery via diode D. After a half turn, diode D prevents the current from reversing, therefore the current will not flow in the dotted-line arrow direction. As a result, the one-way current, direct current in other words, will flow through the battery so that it can be charged.



Principle of alternator

IC regulator

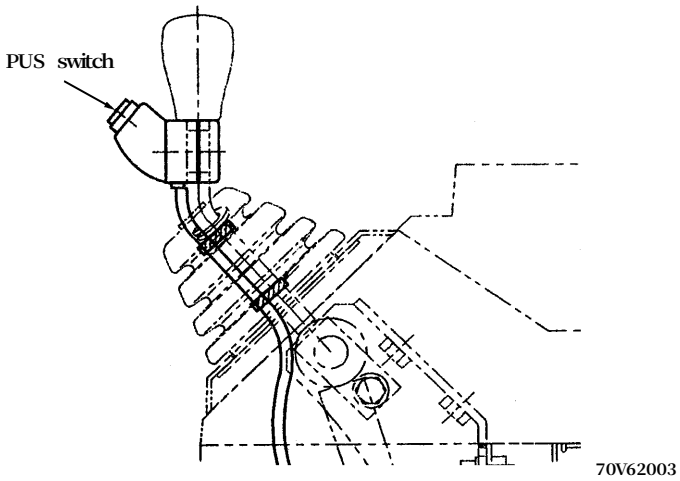
"IC" is the abbreviation of "intergrated circuit". The integrated circuit of this regulator has one board (ceramic material, etc.) where circuit elements are connected so that disconnection from each other is not possible. The IC regulator, therefore, is microminiaturized and lightweight, and consists of voltage relay section and field relay section. The IC regulator is incorporated in the alternator. The right figure shows the basic circuit of a transistor-type regulator. The IC regulator functions in the same way as the circuit shown in the figure.



Basic circuit of transistor-type regulator

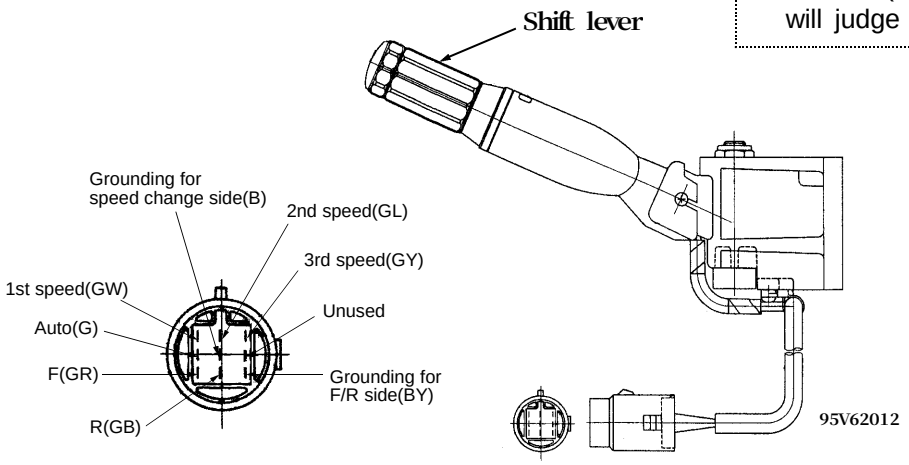
Operation of PUS switch

The PUS switch is attached to the boom control lever. In any operation mode, pressing the PUS switch during 2nd speed operation shifts the 2nd speed to 1st speed. After that, if the PUS switch is pressed again, the speed is changed from the 1st to the 2nd, or to moving the shift lever to neutral or to the opposite direction, the speed will be changed to the 2nd again. Note that when the speed is shifted, the "S" LED indicator of the controller will momentarily light (blink).

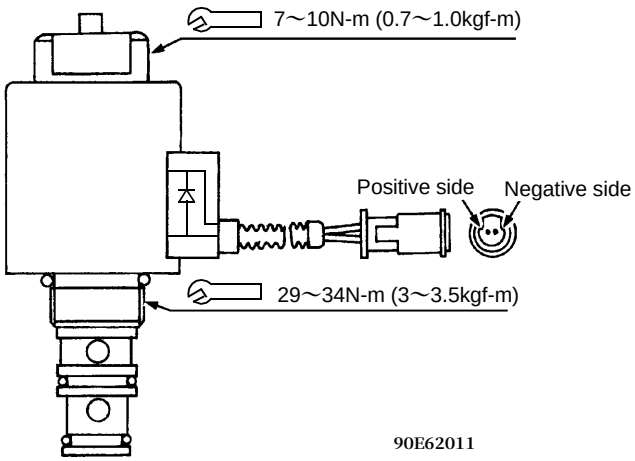


Shift lever

✱ **Shift lever neutral (N) position**
The shift lever has no neutral (N) contact. Therefore, if neither the forward nor the reverse (F and R) signal is input, the controller will judge that the shift lever is at the neutral

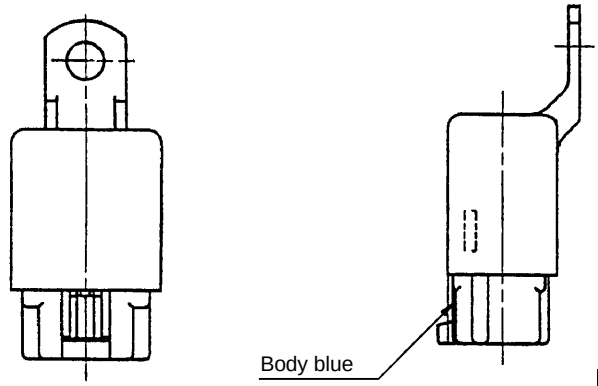


Clutch solenoid valve (Common to F. R. 1. 2. 3. 4 and trimmer)

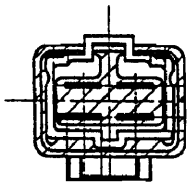


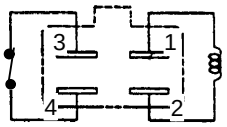
Solenoid valve(with built-in diode)	
Rated voltage	DC24V
Coil resistance value	Approx. 26 Ω

Controller failure relay (S/N 85N3-9051～)



65A62208





Internal connection dia.

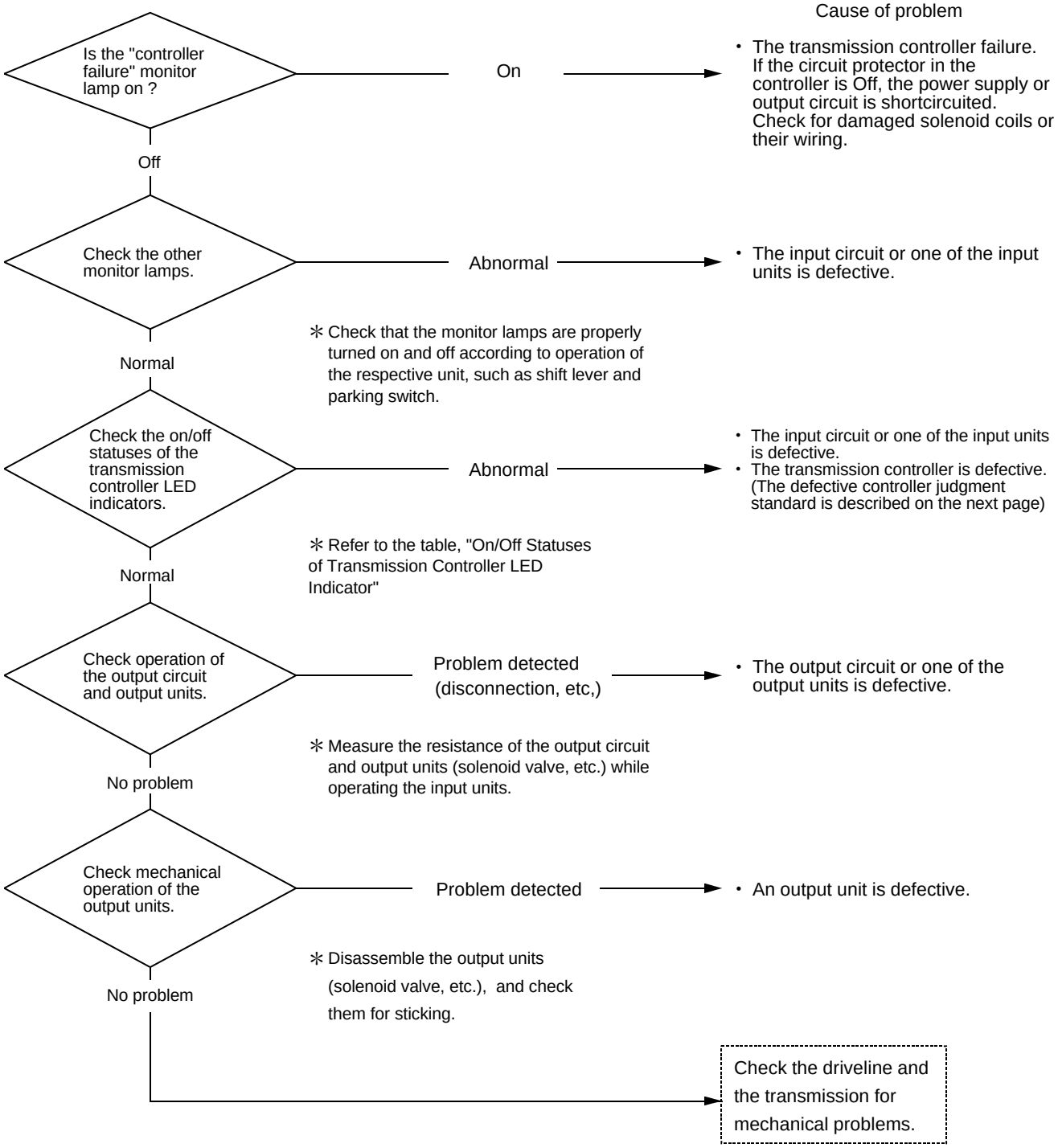
CPU	Between "1"and "2"	Between "3" and "4"	Monitor lamp
Normal	Electric power supply	OFF	OFF
Defective	No electric power supply	ON	ON

Flow Chart for Troubleshooting of Electrical Transmission Control System

For a problem regarding transmission control, check the electric control system first, and then check the mechanical system.

To check the electric control system, determine the cause of the problem while referring to the flow chart below, and then solve the problem.

Standard troubleshooting flowchart



Diagnostic (Controller)

1. Failure code indication for current failure:
   If more than one failure code is stored in memory the current one is displayed first. To review older failure codes switch ON the diagnostic switch.

2. Shift lever failure detection codes (codes 11, 12, 23):
   Codes 11 and 12 indicate a short circuit in either the shift lever or the wiring. Code 23 indicates an open circuit in the shift lever or a broken wire. The machine may operate normality in all but one speed.

3. QUAD switch malfunction code (code 25):
   Normally the switch is not pushed for more than 10 seconds. If the switch stays ON (contacts closed) for more than 10 seconds the controller considers it to be a short circuit in the switch or its wiring. If, for some reason, the operator does hold the switch down for more than 10 seconds the code 25 will be stored in the controller but the machine will operate normally.

4. Inching (declutch) switch malfunction code (code 26):
   When using the inching (also called declutch or clutch-cutout) switch it is normal for it to be ON (contacts closed) while the left brake pedal is depressed. However, if the switch remains ON for more than 3 minutes the controller considers that there is a short in the switch or its wiring. Should the operator keep the pedal depressed more than 3 minutes the malfunction code will be stored in the controller but the machine will continue to operate normary.

5. Solenoid open circuit codes (codes 51～56, 81～88):
   If the transmission solenoid coil is internally open, has high resistance (more than 35 Ω), or a broken wire between the controller and the solenoid coil, the machine will not move in the gear that has the open circuit (malfunction codes 51-56). The symptom may be the same as 2 above. Read the malfunction code to determine which malfunction has actually occurred.

6. Machine speed sensor malfunction (code 72) indicates the machine speed sensor is internally open or the wiring between the sensor and the controller is disconnected or broken.

7. No malfunction code recorded (code FF):
   If the diagnostic switch is installed and pressed and there are no malfunction codes stored in memory the display will be shown "FF". If the machine will not move and "FF" is displayed check the input LED's to be sure there are no open circuit (except code 23 which is for speed circuits〔1,2,3,A〕only) from the shift lever will not be stored in memory.

⚠ WARNING

Unexpected movement of the machine may cause an accident resulting in injury or death. Be sure to observe the following items before starting work.

- **Position the machine on level ground, and lower the bucket onto the groung.**
- **Block the tires with chocks to prevent them from moving.**

<Step 2>Checking output circuit and cable

Disconnect the connector from the problem solenoid valve, and then set the starter switch to the ON position (engine OFF ; shift lever set to problem speed ; parking brake OFF). Measure the voltage of the connector terminal on the cable side using a tester.

Example : Measure the voltage between terminals LY and LB to check the connector of the 1st speed solenoid valve.

Note : Power is supplied to a solenoid valve only when the shift lever is set to the corresponding position. (When the output LED on) To check the 4th speed connector, be sure to cancel the automatic shift function.

IMPORTANT

When measuring voltage, do not shortcircuit two terminals of a connector. This is because the electronic parts inside the controller may be damaged.

Checking positive cable

Terminals to be checked	Voltage	Judgment
Between terminals L B and body grounding (For 1st speed solenoid)	Approx. 24V	Normal
	Approx. 0V	Abnormal

Checking negative cable

Terminals tobe checked	Voltage	Judgment
Between terminals LY and body grounding (For 1st speed solenoid)	Approx. 1V	Normal
	Approx. 24V	Abnormal

<Solution> If the voltage is abnormal, judge that the cable is disconnected. In this case, check the next connector (G7 shown in the figure), and find the defective unit. Repair or replace the defective unit.

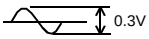
•

(S/N 85N3-9001～9050)
Speedometer circuit

Speed sensor

The speed sensor is installed on the output shaft of transmission (parking brake part) and is transmitting the pulse according to the machine speed.

Output pulse : 16 pulse/1 rev. sensor

Output voltage : 0.3V/21min^{-1} 

Odometer converter

The converter is to drive the odometer and is installed under the instrument panel.

Speedometer

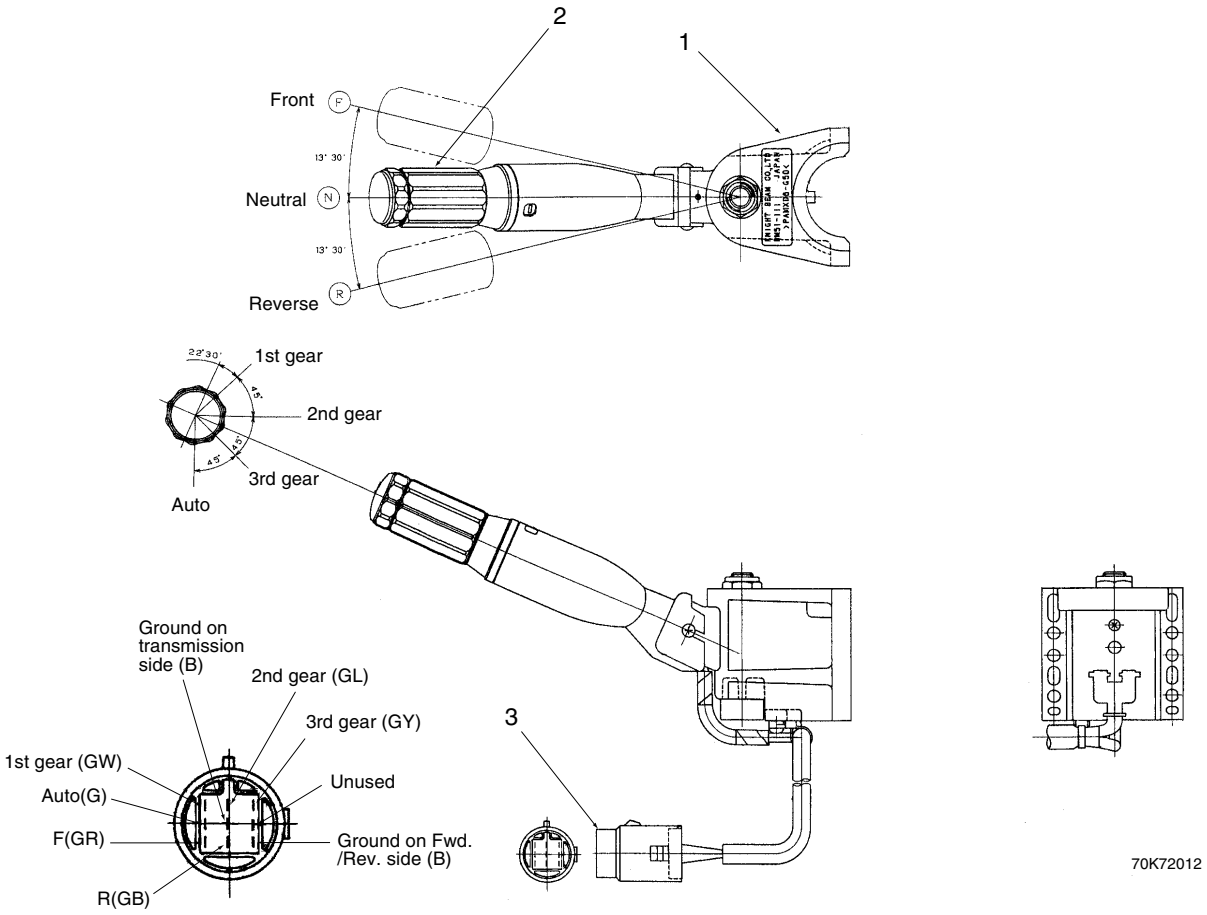
Input frequency (Hz)		Indicator speed (km/h)
With odometer	Without odometer	
27.3	68.2	10
54.6	136.4	20
81.9	204.6	30
109.2	272.8	40

Monitor symbols and actuation conditions

Error warning lamps (which are lit in red)

No.	Item to be monitored	Monitor lamp	Operation condition	Buzzer	Lamp test	Remarks
11	Controller failure		Defective controller CPU	○	○	
12	Air pressure		446±29 kPa (4.75±0.3 kgf/cm^2) or less	○	○	
13	Brake		Oil level below lower limit for 3 seconds	○	○	
			Abnormal air master stroke (loss of brake oil pressure)	○		Alarm self holding
14	Engine oil pressure		49±10 kPa (0.5±0.1 kgf/cm^2) or below during engine operation	○	○	
15	Engine water temperature		101±2°C or more (214±4°F) or more	—	○	
16	Torque-converter (transmission) oil temperature		120±5°C or more (248±9°F) or more	—	○	
17	Clogged air cleaner		Filter resistance: 635±58 mmAq or more	—	○	
18	Charging condition		Defective charge system	—	—	
10	Centralized alarm		For items 11 through 17	—	○	Flashing type

Transmission shift lever assembly



1. Bracket assembly
2. Grip
3. Connector

Cooling circuit

The figure on the right shows the cooling circuit of the air conditioner.

In this circuit diagram, the area which cools down the air inside the cabin is the evaporator. The cooling circuit utilizes the fact that the refrigerant absorbs heat (latent heat of evaporation) from the adjacent area when evaporated, and cools down the air inside the cabin.

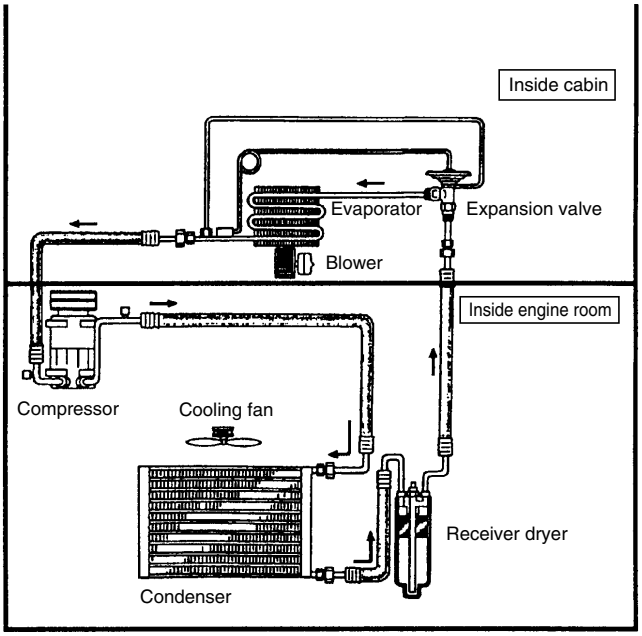
The area where the refrigerant is evaporated is the evaporator. The "cooling" effect can be obtained only when the air to be cooled down is continuously fed to the area around the evaporator by the blower fan and the liquid refrigerant (wet evaporation refrigerant with low degree of dryness) is supplied into the evaporator.

For example, in order to cool down the air to 15°C, the refrigerant can absorb the latent heat of evaporation from the air only when it is evaporated at a temperature lower than 15°C. It can be seen from the figure in the previous page that the pressure of the refrigerant inside the evaporator should be 353 kPa (3.6 kgf/cm^{2}G) or less to realize it. And in order to keep sufficient cooling effect, the supplied refrigerant quantity should be adjusted so that the refrigerant supplied to the evaporator is completely evaporated inside the evaporator into dry vapor or gas. Thus, the term "evaporator".

This is the area where a "change of state" from a liquid to a gas is completed.

Accordingly, the cooling circuit should be so constructed as to reduce the pressure inside the evaporator and supply proper quantity of refrigerant into the evaporator so that the evaporator can cool down the air sufficiently.

The supplied refrigerant quantity can be adjusted by the expansion valve. The pressure inside the evaporator is kept at a low value by the closing action of the expansion valve and the suction action of the compressor. The compressor works as a pump which circulates the refrigerant. The refrigerant in the dry vapor status returns into liquid by the compression action of the compressor and heat change (heat radiation) of the condenser.

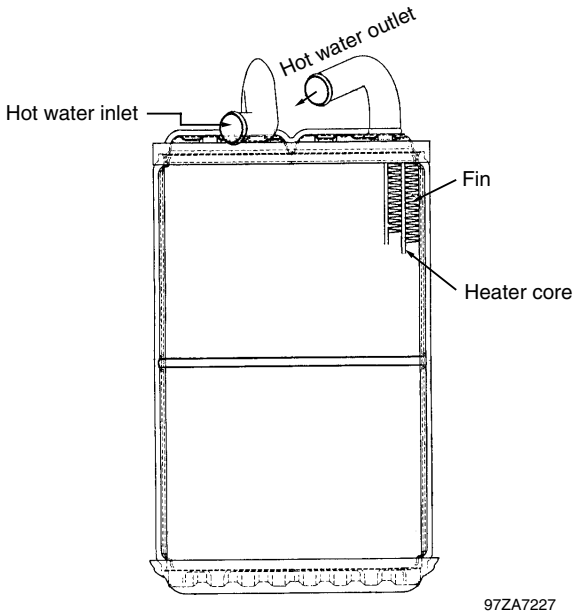


Structure of cooling circuit 97ZA7217

Heater radiator

The heater radiator utilizes the engine cooling water as the heat source. When going through the heater radiator, the air receives heat from the heater radiator fins and is warmed.

The hot water inside the heater radiator is forcedly circulated by the engine water pump.

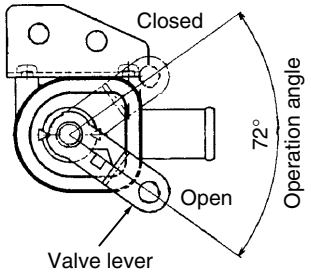


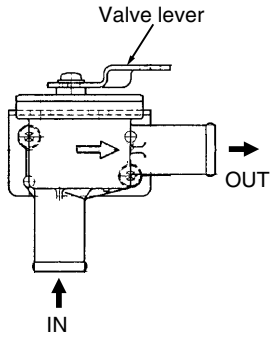
Troubleshooting the heater radiator

Item	Symptom	Cause	Action
Water leak	Water leaks from heater core.	1. Joint portion of supply area 2. Cracks in heater core main body	1) Repair/replacement
Blockage in circuit	Air inside cabin does not become warm.	1. Blockage inside heater radiator	1) Replacement
Blockage in fins	Air quantity is small.	1. Blockage in fins	1) Cleaning

Water valve

The water valve is mounted on the inlet side of the heater radiator, and changes the opening position of the valve lever in accordance with operation of the vent temperature control switches provided on the control panel to adjust the flow rate of the hot water going through the heater radiator.



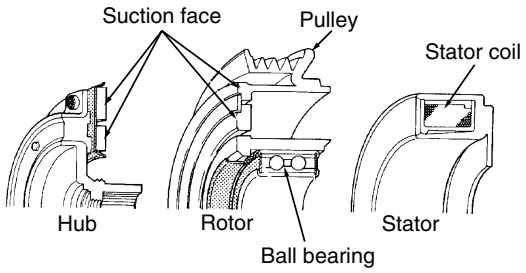


Troubleshooting the water valve

Item	Symptom	Cause	Action
Defective water stop	During maximum cooling, air inside cabin does not become cool enough.	1. Water valve 2. Defective connection between valve lever and link	1) Repair/replacement
Water leak	Water leaks.	1. Joint portion in supply area 2. Cracks in water valve main body	1) Repair/replacement
Blockage in circuit	Air inside cabin does not become warm.	1. Blockage inside water valve	1) Repair/replacement

The hub of the magnetic clutch is fitted onto the shaft of the compressor. While the compressor is not driven, the hub is separated from the rotor and only the pulley is rotating. When the air conditioner switch is set to ON, the current flows in the stator coil, the stator works as a magnet and engages the hub, then the compressor rotates together with the pulley.

When the current applied on the stator coil is set to OFF, the hub is not immediately separated but rotates together with the pulley because the pulley has residual magnetism. Accordingly, clearance is provided between the hub and pulley so that they are not in close contact with each other during disengagement. This clearance is called air gap.



Magnet clutch 97ZA7250

Specifications

Model	L50
Voltage	24VDC
Power consumption	40W
Drive belt	Type B (one piece)
Air gap	0.5 ± 0.15mm

Troubleshooting the compressor and magnetic clutch

Item	Symptom	Casue	Action
Suction or exhaust valve is damaged.	·Compressor temperature is abnormally high. ·High pressure is abnormally low, and low pressure is abnormally high. ·Air bubbles cannot be seen through sight glass.	1. Suction or exhaust valve	1) Repair/replacement
	·Abnormal sounds are made while clutch is turned on.		
Clutch draw voltage is low.	·Compressor does not rotate	1. Stator coil	1) Replacement
Power is not supplied to stator coil.		1. Wiring on main body 2. Control amplifier 3. Pressure switch	1) Repair 1) Replacement 1) Replacement
Gap between hub and rotor is large.		1. Magnetic clutch worn	1) Replacement
Compressor main body is defective (seized, etc.).		1. Shaft, piston	1) Repair/replacement
Clutch bearing is damaged.	·Abnormal sounds are made while clutch is turned off.	1. Clutch bearing	1) Replacement
Contact or slippage caused by too small gap between hub and rotor		1. Magnetic clutch	1) Replacement
V belt is slack.		1. V belt	1) Repair/replacement
Compressor main body is defective.	·Abnormal sounds are made while clutch is turned on.	1. Faulty components inside compressor	1) Repair/replacement
V belt is slack.		1. V belt	1) Repair/replacement

Refrigerant charging tools

·Vacuum pump

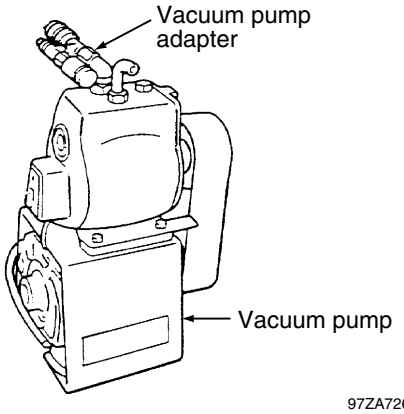
A vacuum pump, or a recycling pump should be used to eliminate the moisture inside the circuit.

An adapter can be used to vacuum out refrigeration systems. However, caution must be used not to release refrigerants to the atmosphere.

IMPORTANT

Never mix refrigerants in an air conditoning system.

Be sure labels clearly mark refrigerants before connecting a recycle machine to system.



·Charging hose and quick joints

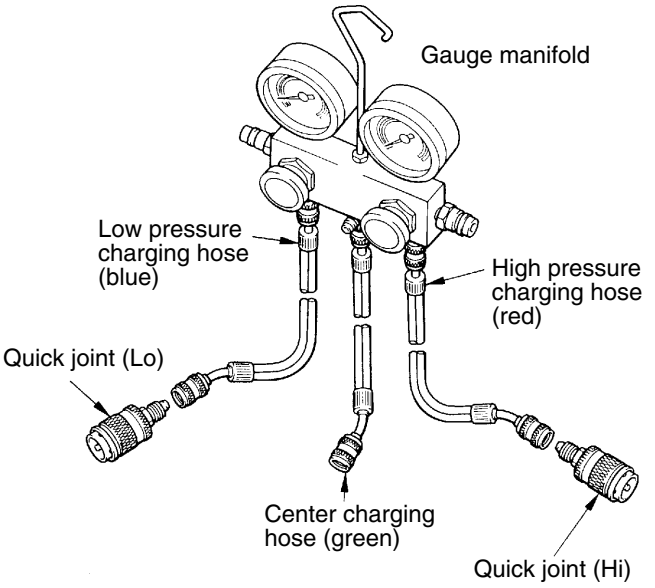
These three hose of three colors are used to evacuate the air and charge the gas. (The colors may be different depending on the manufacturer.)

By attaching two quick joints (one for Hi and the other for Lo) to the charging hose used for Freon R12, the charging hose can be used for Freon R134a.

Red hose: Connects the high pressure valve of the gauge manifold and the high pressure charging valve (with "H" mark on its cap) located in the upper portion of the receiver dryer.

Blue hose: Connects the low pressure valve of the gauge manifold and the low pressure charging valve (with "L" mark on its cap) of the compressor.

Green hose: Connects the center valve of the gauge manifold and the vacuum pump (or the service can valve).



·Gauge manifold

It is used to evacuate the air and charge the gas, and equipped with a high pressure gauge, a low pressure gage, many valves and hose mounting nipples as shown in the figure on the right.