AAA-S85C3V00-012
(93211-00071)

WHEEL LOADER SHOP MANUAL

85ZIV-2

Powered by CUMMINS M11-C Engine.

SERIAL NUMBERS
85C3-5501 and up.

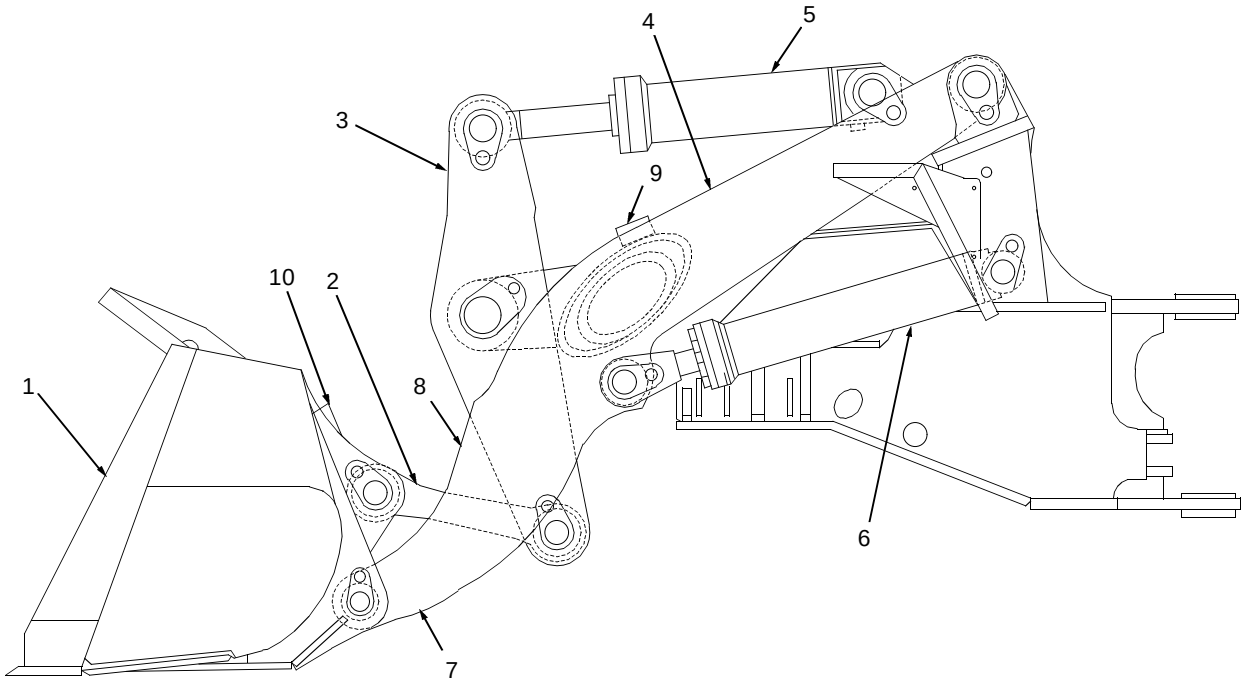
General Information
Functions & Structure

Weight of Main Components

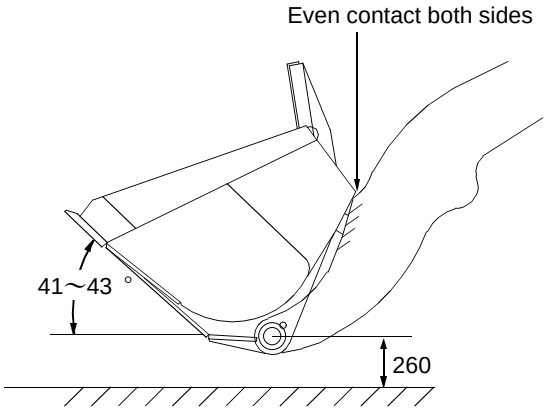
Item		(kg)	Approx. Weight (lb)	Remarks
Unit name	Part name			
Chassis	Bucket	1440	3170	GSN bucket
	Boom	1250	2750	Standard
	" Z " -Lever	360	790	
	Link (Bucke to Lever)	70	155	
	Engine room assembly	305	670	Including air cleaner and condenser
		265	580	Excluding air cleaner and condenser
	Hydraulic tank	150	330	Excluding oil
	Fuel tank	150	330	Excluding fuel
	Deck	40	90	Including hand rail
	Cab and floor board	900	1980	Including ope. board, instrument panel and control box
	Front chassis	1680	3700	Bare chassis
	Rear chassis	1360	3000	Bare chassis
	Counter weight	1100	2430	Standard
Power line	Engine	1000	2200	Excluding oil
	Radiator	200	440	Excluding water and oil
	Transmission	880	1940	Excluding oil
	Second propeller shaft	55	120	
	Third propeller shaft	10	22	
	Air cleaner	18	40	
	Exhaust silencer (Muffler)	23	50	
	Front axle assembly	1300	2870	Excluding tires and oil
	Rear axle assembly	1700	3750	Excluding tires and oil (Including axle support)
	Differential	178	390	
Hydraulic system	Multiple control valve	54	120	
	Steering valve	22	48	
	Gear pump	49	107	
	Boom cylinder	200/pc	440/pc	Excluding oil
	Bucket cylinder	215	475	Excluding oil
	Steering cylinder	38/pc	85/pc	Excluding oil
Other	Tire	510/pc	1125/pc	With rim (23.5-25-16PR); No Hydro Inflation
	Air conditioner unit	83	185/pc	(In cab portion)
	Battery	40/pc	90/pc	

Front Chassis

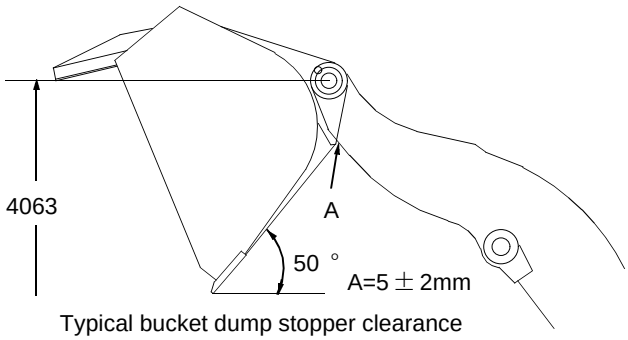
Loading system



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



Typical bucket roll-back stopper adjustment
(Contact attachment supplier for details on non-standard attachments)

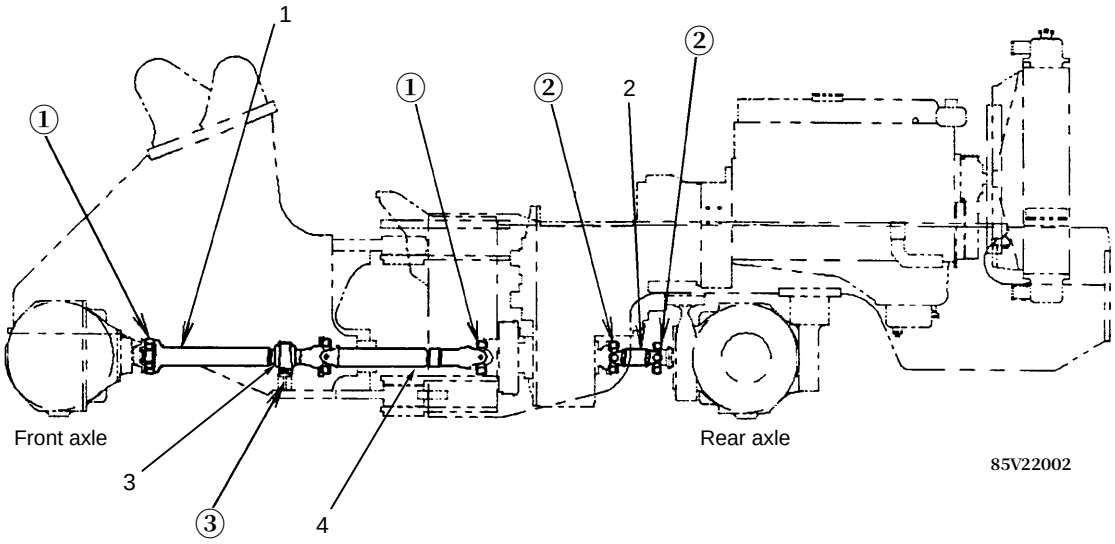


Typical bucket dump stopper clearance
(Contact attachment supplier for details on non-standard attachments)
To increase clearance increase height of #9
To reduce clearance decrease height of #9

Propeller Shaft

The engine power transmitted to the torque converter, the transmission and is then transmitted to the second and the third propeller shafts to the front and the rear axle.

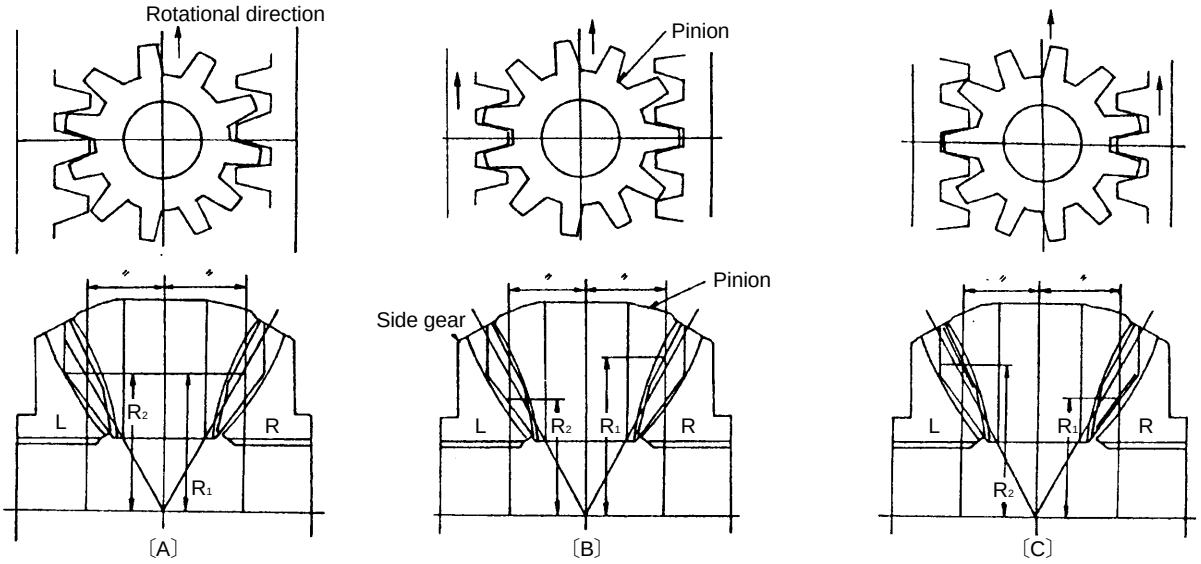
For the second propeller shaft, the universal joint and slip joint type spline shaft are used for smooth power transmission at any steering angle or change in propeller shaft length.
The third propeller shaft is the fixed type with universal joints.



1. 2nd propeller shaft
2. 3rd propeller shaft(fixed type)
3. Center bearing
4. Slip joint

①142N-m (14.5kgf-m) (105 lb-ft) With liquid adhesive Three bond 1327
②83N-m (8.5kgf-m) (61 lb-ft) With liquid adhesive Three bond 1327
③216N-m (22.0kgf-m) (159 lb-ft)

TPD gear operation(cont'd)



The surface resistance values of the right and left wheels are identical to each other.

The surface resistance of the left wheel is low due to sandy ground or the like.

The surface resistance of the right wheel is low.

1) When the traction of the right and left wheels are identical to each other, the pinion and side gears will be engaged as shown in figure [A]. In this case, the torque arms of both side gears are identical to each other ($R_1 = R_2$). As a result, identical driving force will be applied to both the right and left wheels.
2) If the left wheel loses traction the engagement position between the pinion and side gears will be shifted as shown in figure [B] to quickly rotate(spin) the left wheel. As a result, the torque arms of the both side gears differ from each other ($R_1 > R_2$), and the driving force of the left wheel is small. As a result, tire slipping can be reduced.
   When the driving force of the left wheel is reduced(slipping occurs), the driving force of the right wheel will be increased to limit the reduction in the total amount of the driving force.
   Assuming that the driving torque of the right wheel is T_R, and that of the left wheel is T_L, the relation between T_R and T_L can be expressed as follows:

$$\frac{T_R}{T_L} = \frac{R_1}{R_2}$$

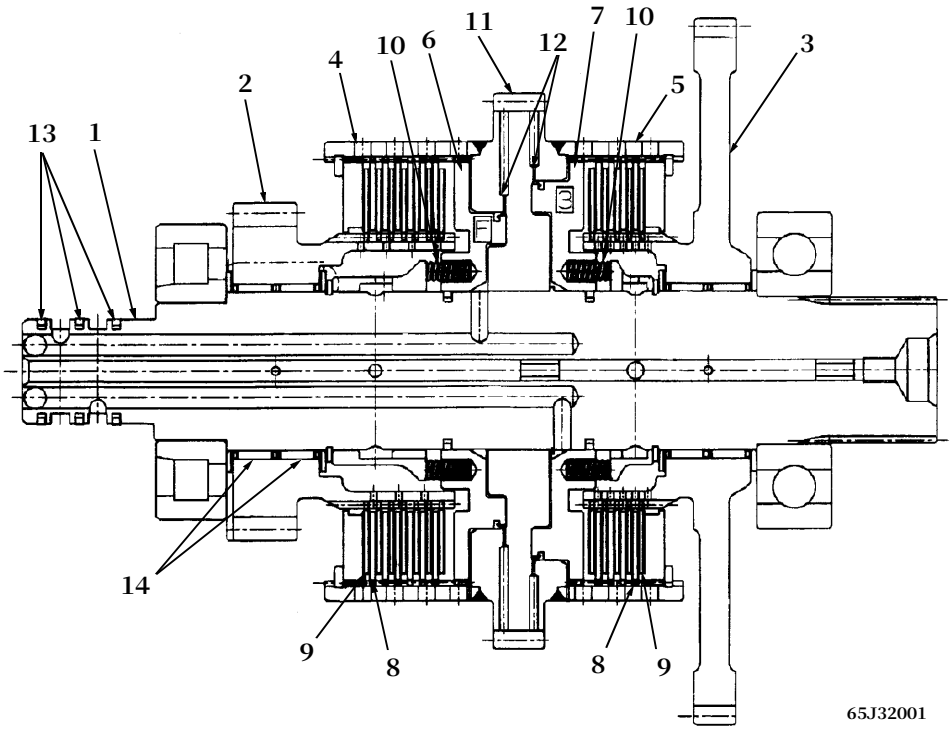
   The value obtained from the above formula is referred to as the bias ratio. The limit of the bias ratio is 1.82. In other words, until the difference in the surface resistance between the right and left tires is increased to 82%, the pinion gear will be properly engaged with the shifted side gears, and driving force will be properly applied to both the side gears to prevent the tires from slipping.
3) If the surface resistance of the right wheel is reduced, the engagement position between the pinion and side gears will be shifted as shown in figure [C] above. In this case, the right and left sides are reversed compared with the above description.

Clutch Pack

Forward and 3rd speed clutches

(S/N 85C3-5701～)

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

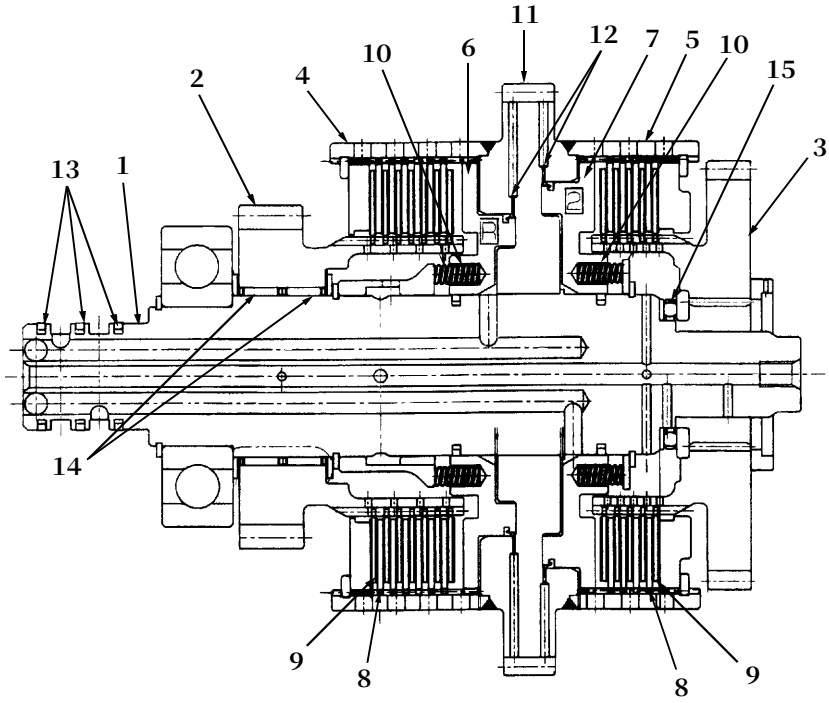


65J32001

Reverse and 2nd speed clutches

(S/N 85C3-5701～)

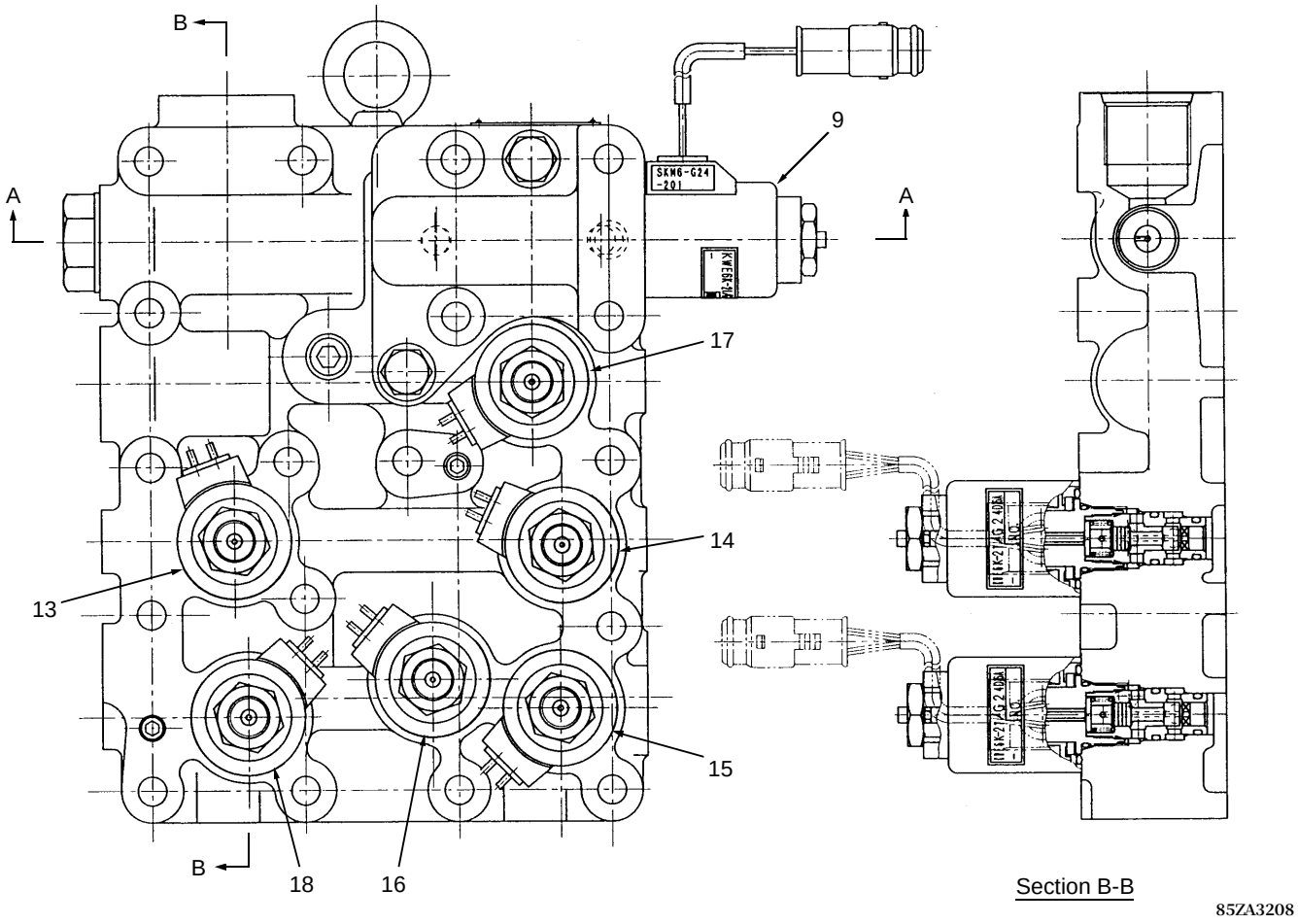
1. Counter shaft
2. Reverse clutch gear
3. 2nd speed clutch gear
4. Reverse clutch
5. 2nd clutch
6. Reverse clutch piston
7. 2nd speed clutch piston
8. Steel plate
9. Friction plate
10. Return spring
11. Clutch drum (also used as counter gear)
12. Residual pressure preventive orifice
13. Seal rings
14.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

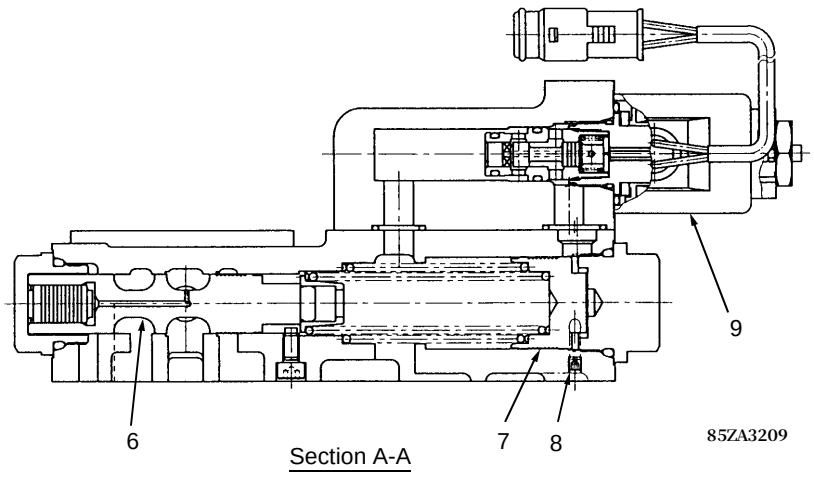


65J32002

Control Valve

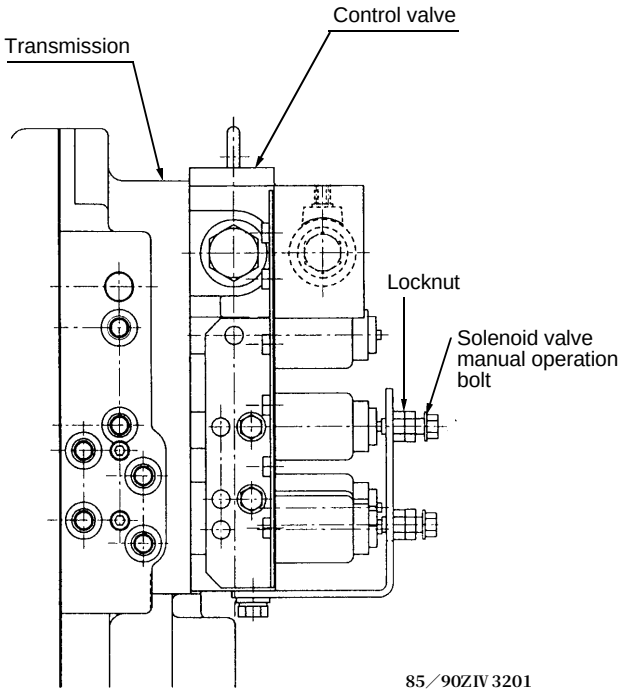
Construction





Manual Operation of Clutch Solenoid Valve

If the electric control system malfunctions, the solenoid valves will not operate. In this case, the valves may be manually operated to move the vehicle to a safe place. The manual operation bolts are installed over several solenoid valves; the forward, reverse, 1st speed, and 2nd speed clutch solenoid valves.



⚠ WARNING

During engine running manual operation of a solenoid valve may cause unexpected movement of the vehicle. The movement may cause an accident resulting in injury or death. To prevent such an accident, be sure to stop the engine and remove the starter key before you manually operate the solenoid valves. In addition, hang a "DO NOT START!" tag in the cab.

To manually operate the solenoid valve, remove the bolt, the locknut, and insert the bolt (M10×30mm (L)).

IMPORTANT

The transmission will be damaged, if manual operation bolts for the forward and reverse solenoid valves or the 1st and 2nd speed solenoid valves are inserted at the same time. Therefore select forward or reverse and solenoid valve for bolt insertion, and also select 1st or 2nd speed solenoid valve for bolt insertion.

IMPORTANT

After emergency moving of the vehicle to a safe place, be sure to remove the manual operation bolts, replace the locknuts, and reset the solenoid valves to the original positions.

Specifications of hydraulic tank

Type		Sealed pressure type
Tank capacity (at center of level gauge) (*l*)		130 (34 Gal)
Return filter	Filtration area (cm^2)	25,500
	Filtration particle size (μ)	10
	Relief valve opening pressure MPa (kgf/cm^2) (psi)	0.1 ± 0.02 (1.0 ± 0.2) (14 ± 2.8)
Oil filling port (also used as air breather)	Suction side setting pressure MPa (kgf/cm^2) (psi)	0.01 (0.01) (0.14)
	Discharge side setting pressure MPa (kgf/cm^2) (psi)	0.08 (0.8) (11)
	Filtration area (cm^2)	235
	Filtration particle size (μ)	10
	Pushing load before turning cap required for removing or installing cap (kg)	19～22 (42～48lb)

Detent magnet solenoid

The detent magnet works to hold the lever at it's position, when the lever is shifted to "Bucket Roll Back" or "Boom Raise" or "Boom Float" position.

When the proximity switch for the bucket positioner or the boom kick-out (option) is turned on, the magnet coil is energized and magnetized so that the holding plate is held by magnetic force.

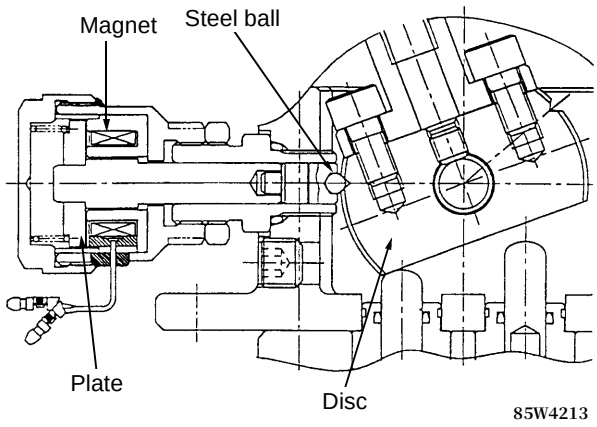
When the lever is shifted, the steel ball is positioned at the detent notch and the lever is held at that position.

As a result, pilot oil moves the multiple control valve plunger to the full stroke position, and the pressurized oil fed from the main pump flows to the cylinder.

When the proximity switch is turned off, the magnet coil is de-energized and de-magnetized. The steel ball is pushed out of the detent notch by the return spring (6) so that the control lever is returned to the neutral position.

When the control lever is set to the "Boom Float" position, the control lever will be held at the "Float" position. The "Boom Float" magnet is not switched and is energized and magnetized whenever the key switch is on.

For "Boom Float" position, manually reset the control lever.



Main relief valve

Function

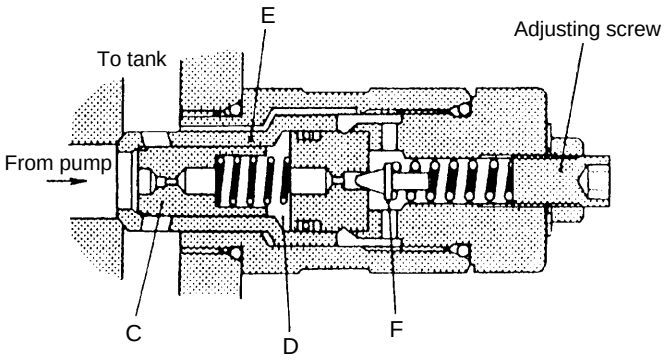
The main relief valve is installed between the pump and the control plunger. When the cylinder comes to the stroke end, or if the pressure is above the set pressure, the oil fed from the pump will be discharged into the tank through this valve (main relief valve) to prevent the pump and pipes from damage.

Operation

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

The pressurized oil fed from the pump flows through the orifice of main poppet C and then into the chamber D. The pressures applied to the both sides of the main poppet are equalized and the main poppet C is moved to the left due to the area difference.

The pressure area in the chamber D is larger than the area of the pump side of the sleeve E, therefore, the pump port is closed by sleeve E.

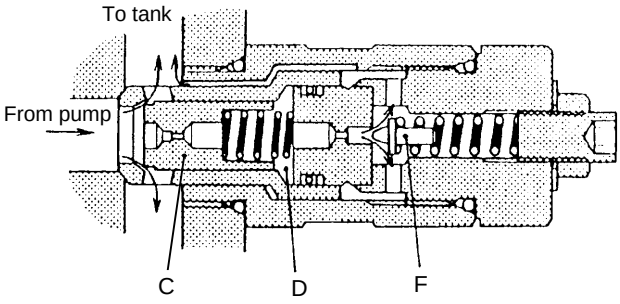


- **When the oil pressure exceeds the set point**

When the oil pressure exceeds the set spring force of the pilot poppet, the pilot poppet F is opened, and the oil flows along the sleeve and returns to the tank.

As a result, the pressure in the chamber D drops below the pump-side pressure, therefore the main poppet C is moved to the right, and the high-pressure oil in the pump line is returned to the tank line.

The set pressure 20.6MPa (210kgf/cm^2) (2986psi) can be adjusted by turning the adjusting screw.



Note : Clogging of the orifice in poppet C will cause low pressure.

Another possible cause of low pressure is contamination in, or damage to, the seat of poppet C or F.

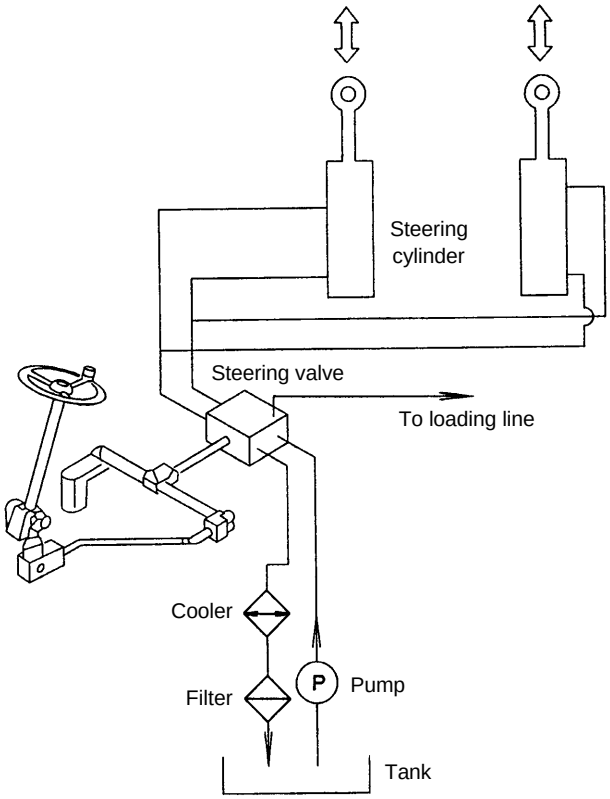
Steering System

Operation

The steering wheel is connected to the steering valve via the drop arm and the drag link.

When the steering wheel is turned, pressure is applied to the steering plunger depending on the wheel turning amount and direction, and the hydraulic oil goes to the steering cylinders.

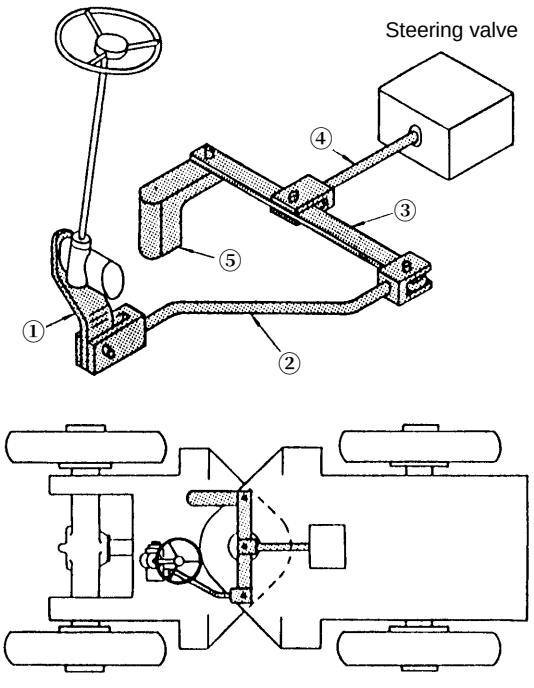
When the steering valve plunger is in neutral, almost all the hydraulic oil from the steering pump (front pump) goes to the loading line.



Feed back system

(1)Neutral position

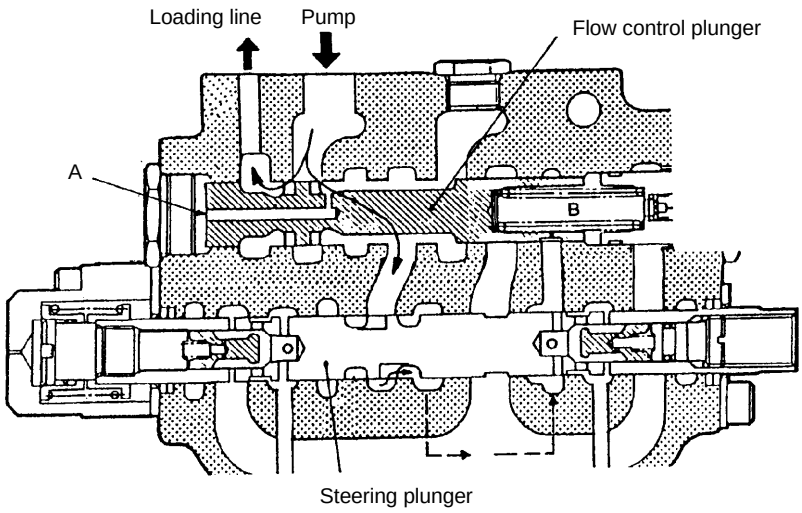
While the steering wheel is not turned, the plunger ④ is in the neutral position.



80ZⅣ 4216

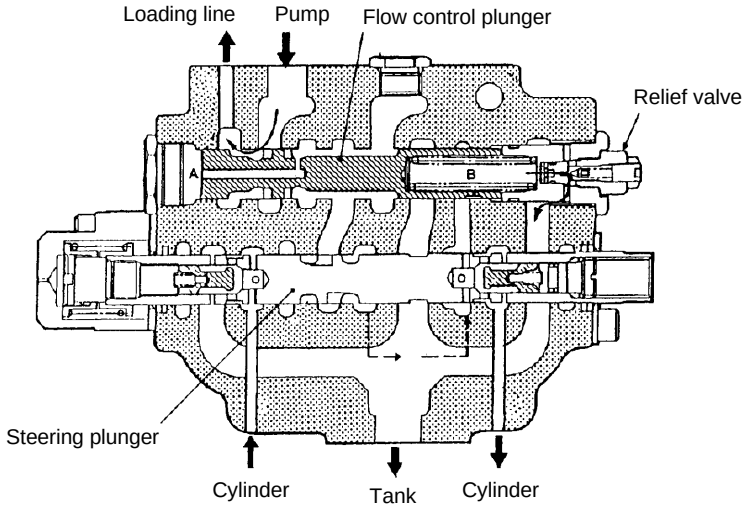
Main relief valve

- **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.**



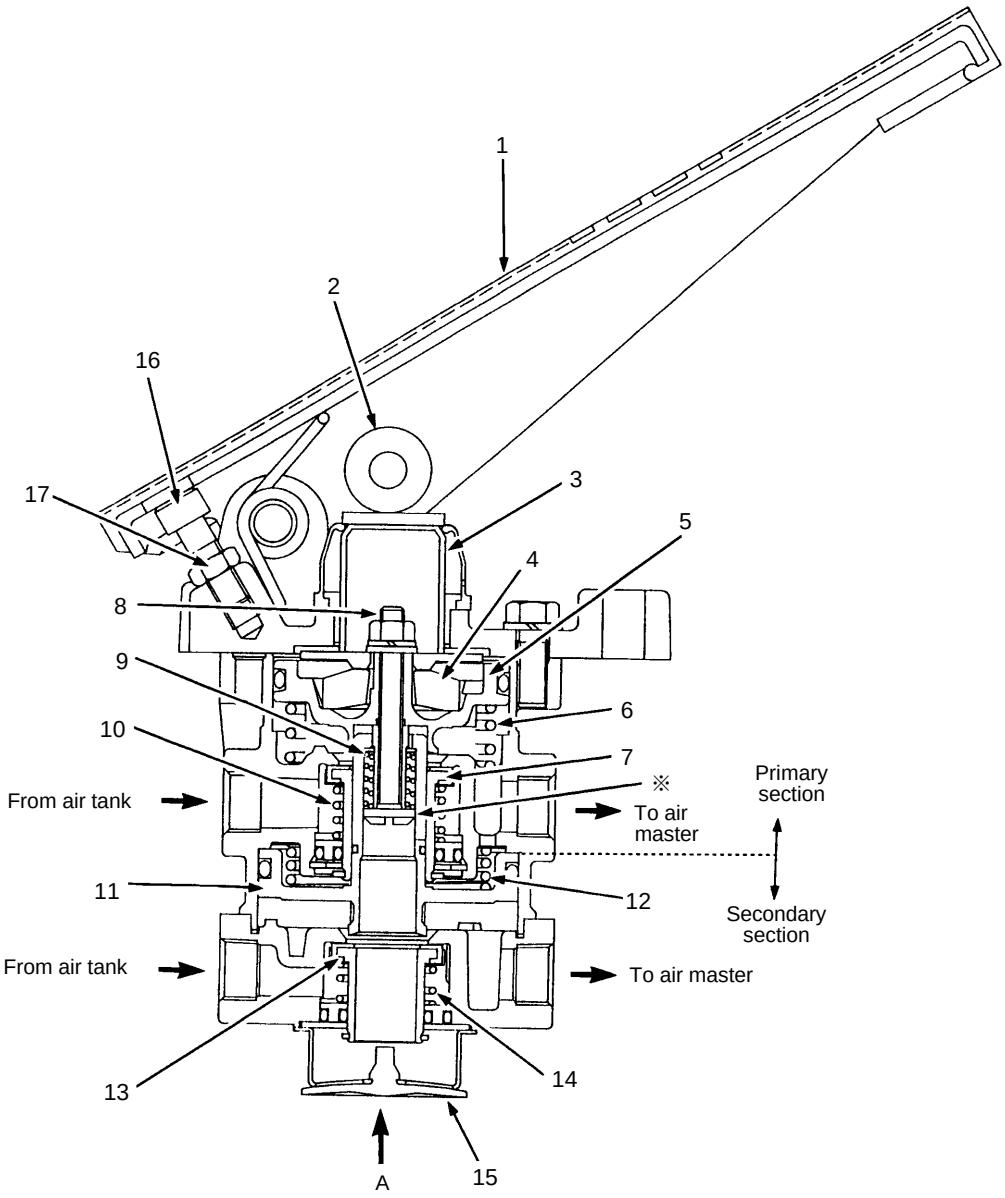
When the pressure in the cylinder line rises above the set point (oil pressure in chamber A and B rise also), the oil in chamber B opens the relief valve and flows to the tank line. As a result, the pressure in chamber A is higher than that of chamber B. The flow control plunger, therefore, is moved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

BRAKE GROUP

52

Brake Valve

Construction



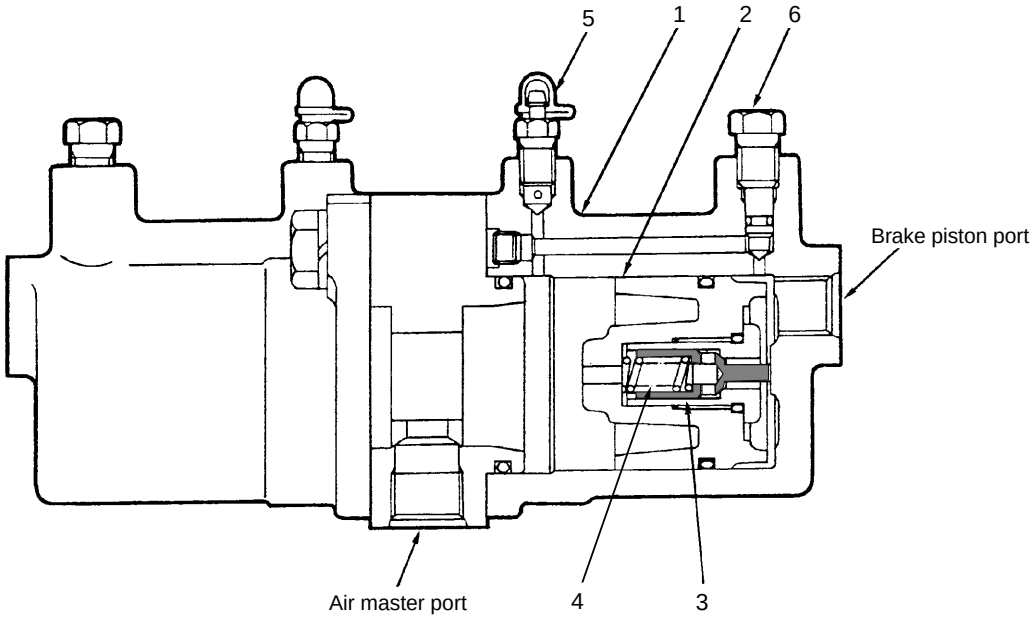
The valve inlet and outlet ports are shown by displacement drawing.

※ ••••••• There are four slits in this section of the relay piston. The slits serve as exhaust ports when the brake pedal is released.

1.Brake pedal
2.Roller
3.Plunger
4.Rubber spring
5.Upper piston
6.Upper piston return spring
7.Upper valve
8.Stem
9.Stem springs
10.Upper valve spring
11.Relay piston
12.Relay piston spring
13. Lower valve
14. Lower valve spring
15.Exhaust valve
16.Brake pedal angle setting screw
17. Locknut

Auto-adjuster Valve

Construction



85V52002

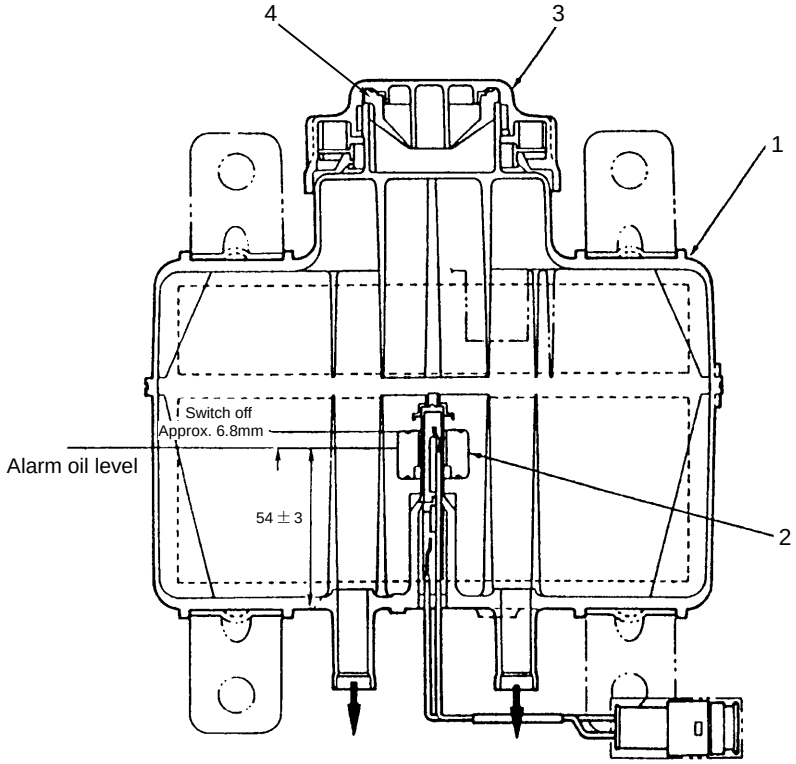
1.Cylinder
2.Piston
3.Check valve
4.Spring
5.Air bleeder
6.Plug

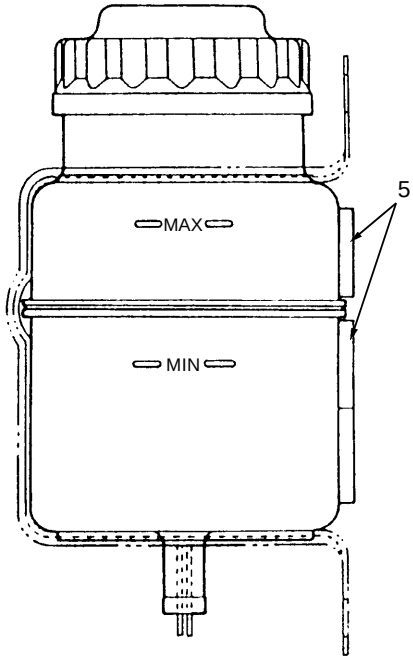
The auto-adjuster valve is installed between the air master and the brake piston, and ensures constant return distance of the brake piston. In addition, the auto-adjuster valve also ensures constant stroke of the brake pedal even if the brake disc is worn.

Check valve specifications

Dia. of pressure receiving section	9mm
Valve opening pressure	1.4MPa (14.5kgf/cm^2) (206psi)

Brake Oil Tank





Tank capacity: 2,400cc, maximum
1,200cc, minimum

1.Tank
2.Float
3.Cap
4.Baffle (for pouring)
5.Rubber mounting pads

Operation of level switch

When the brake oil level is 56mm below the maximum position, the switch will open and the alarm will be activated.

Above the "MIN" level the switch is closed and the alarm is turned off.

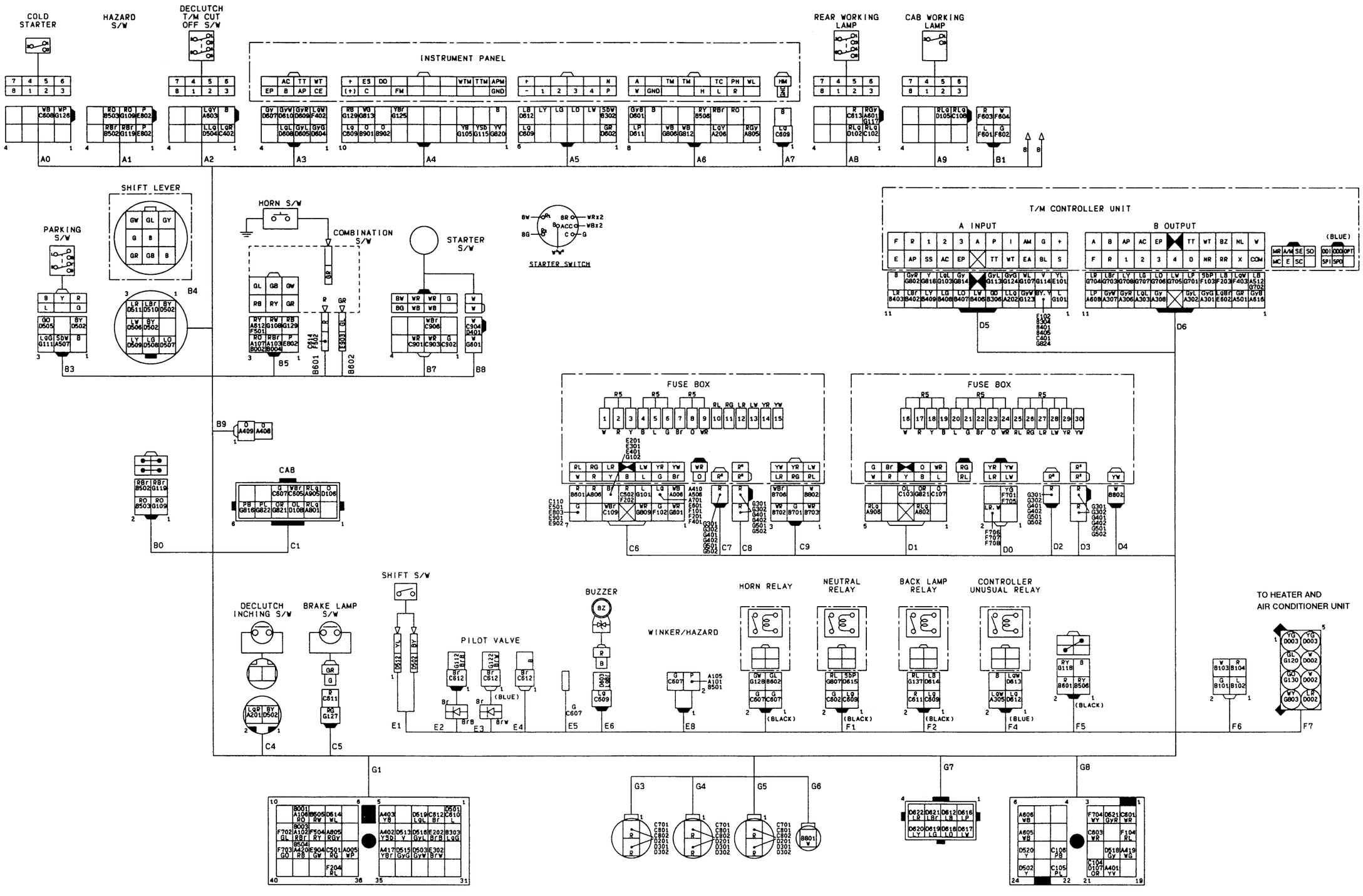
The switch is non-replaceable. If defective the tank assembly must be replaced.

- Reed switch is closed during normal operation.
- Reed switch is open when the tank level is low or empty.

ELECTRICAL GROUP

62

ELECTRICAL WIRING DIAGRAM (1/2)(85ZIV) (S/N 85C3-5801～)



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.**

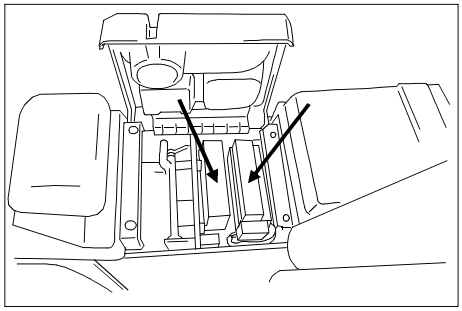
Fuse inside the control box

SPARE	5A
SPARE	5A
R. WIPER	5A
F. WIPER	10A
SPARE	10A
F. WORK LIGHT	10A
SPARE	3A
R. WORK LIGHT(CAB)	10A
SPARE	10A
SPARE	5A
SPARE	5A
SPARE	5A
AIRCON(OPTION)	20A
AIRCON(OPTION)	20A
AIRCON(OPTION)	20A

(Front)

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
COLD STARER	15A
SPARE	15A
SPARE	15A
4WAY FLASHER HORN ROOM LAMP	15A
SPARE	15A
RADIO	5A
FUEL VALVE	5A
NEUTRAL RELAY	5A
BATTERY RELAY	5A

(Rear)



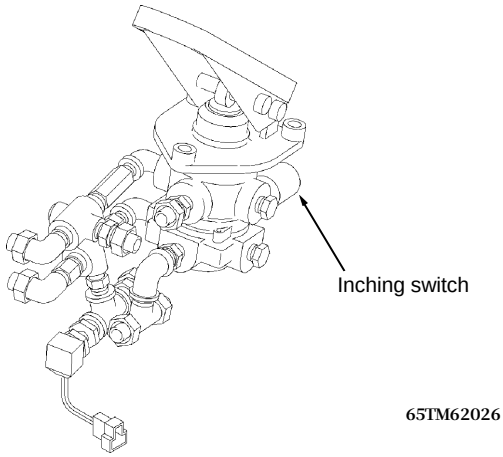
Connector CN3(Input)	
No.	Signal
1	Diag sw
2	Auto/manual switching signal
3	
4	
5	Reset sw
6	1 ・2 ・5 COM ground
7	
8	

Connector CN4	
No.	signal
1	D/D Switch * OPT
2	D/D Relay * OPT
3	(Spare) Solenoid valve
4	Steering circuit pressure
5	Steering circuit pressure warning lamp
6	

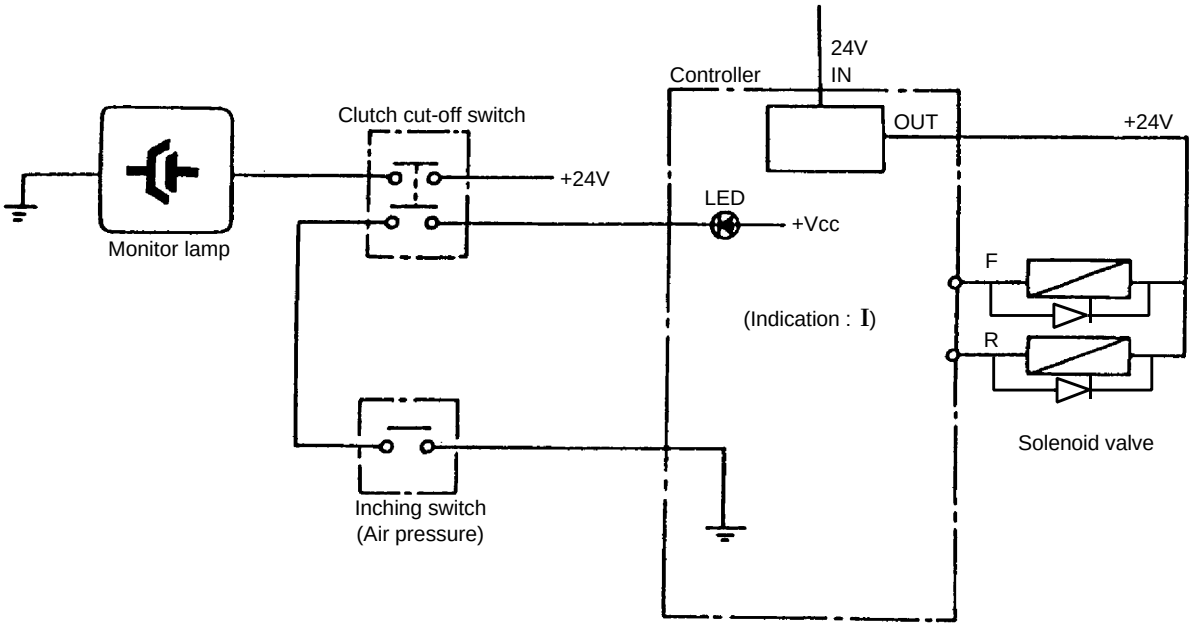
Note : Connect No.2 and No.6 terminals of connector CN3 using a jumper wire to cancel the automatic shift function.

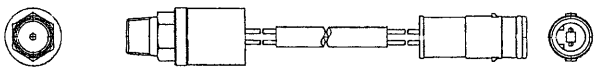
Inching

Pressing down the left brake pedal applies air pressure to the inching switch, and the contacts of the inching switch are closed. In this status, the power of the forward/reverse clutch solenoid valve is turned off. The transmission is set in neutral. At the same time, the "I" LED indicator of the controller will light. To cancel this inching function, turn off the clutch cut-off switch on the operator panel, and the function of the left brake is switched to brake only. The left brake pedal may be used as a brake only pedal just like the right brake pedal. In addition, the T/M CUT OFF monitor lamp of the operator panel will go out.



65TM62026





Setting	
Air pressure : 177±20kPa (1.8±0.2kgf/cm²) or less (26±2.8psi)	Between both terminals : OFF
Air pressure : 216±20kPa (2.2±0.2kgf/cm²) or more (31±2.8psi)	〃 : ON

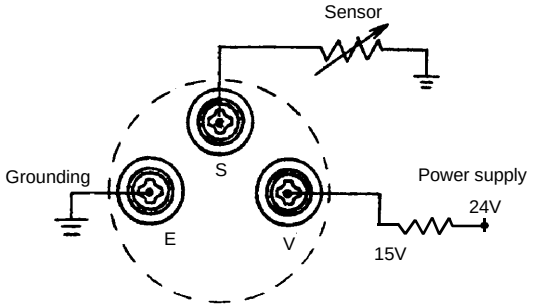
65V62008

Gauge circuit

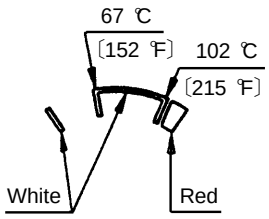
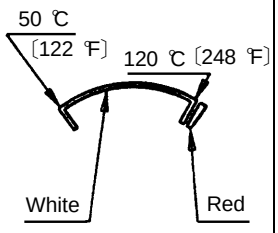
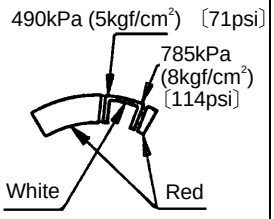
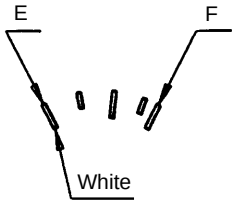
Sensors respectively detect the temperature, pressure, and fuel level, and then convert them into electric signals. The signals are transmitted to the corresponding gauges that indicate the transmitted values.

terminals (Ω)	
Between S and E	110
Between S and V	110
Between E and V	150

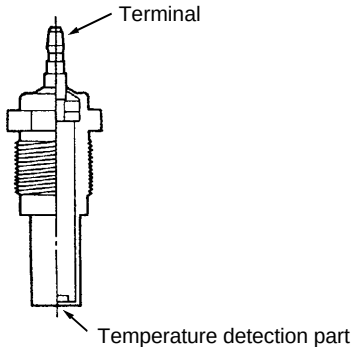
Note : If a gauge is removed from the panel, the resistance between the terminals will differ from the standard value shown in the table.



Viewed from rear of instrument panel

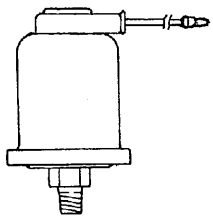
Gauge	Engine water temperature	T/C .T/M oil temperature	Air pressure	Fuel level
Indication				

Temperature sensor (For engine water temperature and torque converter oil temperature)



Temperature of detection part (℃)	60 〔140 ℉〕	80 〔176 ℉〕	100 〔212 ℉〕	120 〔248 ℉〕
Resistance (Ω) between terminal and body	56.3	29.5	16.5	10

Pressure sensor (For air puressure)



Pressure (kPa)	490 (5kgf/cm²) 〔71psi〕	785 (8kgf/cm²) 〔114psi〕
Resistance (Ω) between terminal and body	31.9	17.2

Fuel level sensor

Fuel level	E	F
Resistance (Ω) between two terminals	80	10

In parking status(during engine operation)

◎ LED on ◎-◎-◎ Related LED on			Machine condition	Usual parking	Emergency	Circuit protector OFF	Circuit protector on when controller failure alarm is on
			Shift lever position	Neutral	Other than neutral		
Input side LED window	F	Shift lever position ・F			◎		◎
	R	Shift lever position ・R			◎		◎
	1	Shift lever position ・1		◎	◎		◎
	2	Shift lever position ・2		◎	◎		◎
	3	Shift lever position ・3		◎	◎		◎
	A	Shift lever position ・A		◎	◎		◎
	M	Automatic shift cancel					
	S	Shift switch (QUAD Sw)					
	P	Parking switch					
	I	Inching switch					
Output side LED window	F	Clutch solenoid valve ・F			◎		
	R	Clutch solenoid valve ・R			◎		
	1	Clutch solenoid valve ・1		◎	◎		
	2	Clutch solenoid valve ・2		◎	◎		
	3	Clutch solenoid valve ・3		◎	◎		
	4	Clutch solenoid valve ・4					
	D	Trimmer plug solenoid valve					
	N	Neutral relay		◎			
	RR	Back-up relay			(◎)		
	X	Controller failure alarm relay		◎	◎		
	BZ	Buzzer			◎	◎	◎
	SS	Speed sensor input signal					

(◎) : LED ON only shift lever "reverse" position

Checking Inching (declutch) Input Circuit

〔Transmission controller LED indicator〕

Checking conditions

1) Engine "OFF" key "ON"
2) Air pressure above 490kPa (5kgf/cm^2) 〔71psi〕

Turn the transmission cut-off switch on the instrument panel "ON". Note that the transmission cut-off monitor lamp will light if the lamp circuit is not defective. Press down the left brake pedal, and check the on/off status of the transmission controller "I" LED indicator.

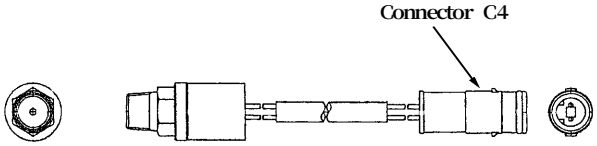
Transmission cut-off monitor lamp

Transmission cut-off switch	Input LED " I "		Judgment		Remarks
	Brake pedal				
	Pressed down	Released			
ON	◎	-	Normal		
	-	-	Abnormal	Disconnect	Inching impossible
	◎	◎	Abnormal	Defective sw or shortcircuit	Machine stays in the inching (declutch) mode
OFF	-	-	Normal		Inching function cancel

◎ On
- Off

<Step 1>Checking inching switch

Check that the brake air pressure is 216±20kPa (2.2 ±0.2kgf/cm^2) (33±3psi) or more. After that, press down the left brake pedal, and check the resistance of the inching switch at the connector C4. If the connector resistance dose not change from ∞Ω to 0 Ω, the piston of the switch is sticking, or the cable is disconnected. Repair or replace the defective unit.



65V62008

Setting	
Air pressure : 177±20kPa (1.8±0.2kgf/cm^2) (26 ± 3psi) or less	Between both terminals : OFF
Air pressure : 216±20kPa (2.2±0.2kgf/cm^2) (31 ± 3psi) or more	Between both terminals : ON