SANY

SY335C9C4K
Crawler Hydraulic Excavator

Shop Manual

- Compiled for experienced technicians, this shop manual aims to provide technical information required for maintenance and repair of the machine.

- Work equipment or optional components not available locally may be included in this shop manual. Consult authorized Sany dealers for information on these parts and components. Material or technical specification is subject to change without prior notice.

- If the clearance between the parts exceeds the clearance limit, they must be replaced or repaired.

1.2.6 Interference limit

- The allowable maximum interference between the hole of a part and the shaft of another part to be assembled is called the "interference limit".
- The interference limit shows the repair limit of the part of smaller tolerance.
- If the interference between the parts exceeds the interference limit, they must be replaced or repaired.

1.3.2 Points to remember when handling hydraulic equipment

With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

1. Be careful of the operating environment

   Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or places where there is a lot of dust.

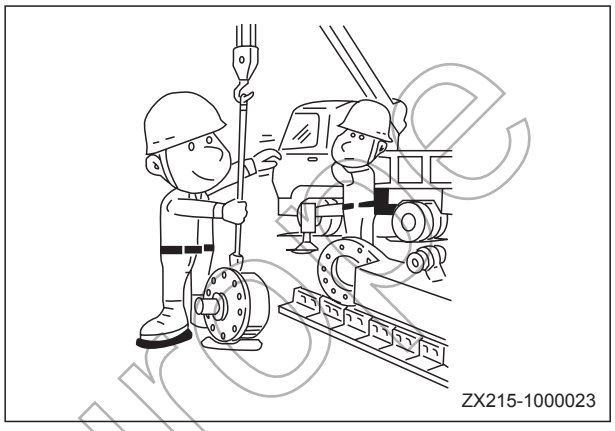

Fig. 1-22

2. Disassembly and maintenance work in the field

   If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to check the performance after repairs, so it is desirable to use unit exchange. Disassembly and maintenance of hydraulic equipment should be carried out in a specially prepared dust-proof workshop, and the performance should be checked with special test equipment.

3. Sealing openings

   After any piping or equipment is removed, the openings should be sealed with caps, tapes, or vinyl bags to prevent any dirt or dust from entering. If the opening is left open or is blocked with a rag, there is danger of dirt entering or of the surrounding area being made dirty by leaking oil so never do this. Do not simply drain oil out onto the ground, but collect it and ask the customer to dispose of it, or take it back with you for disposal.

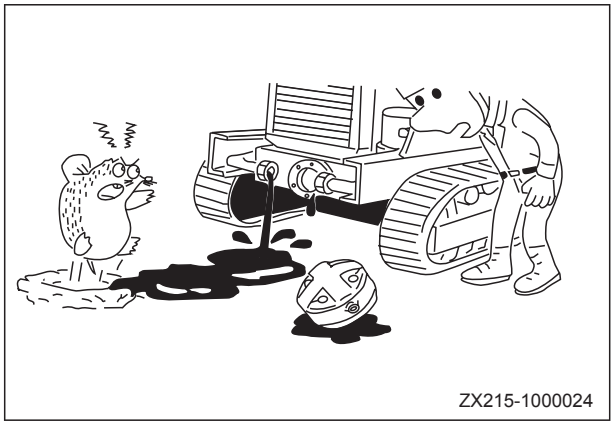

Fig. 1-23

Inches to Millimeters

in.			mm	in.			mm
		1/64	0.3969			33/64	13.0969
	1/32		0.7938		17/32		13.4938
		3/64	1.1906			35/64	13.8906
1/16			1.5875	9/16			14.2875
		5/64	1.9844			37/64	14.6844
	3/32		2.3813		19/32		15.0813
		7/64	2.7781			39/64	15.4781
1/8			3.1750	5/8			15.8750
		9/64	3.5719			41/64	16.2719
	5/32		3.9688		21/32		16.6688
		11/64	4.3656			43/64	17.0656
3/16			4.7625	11/16			17.4625
		13/64	5.1594			45/64	17.8594
	7/32		5.5563		23/32		18.2563
		15/64	5.9531			47/64	18.6531
1/4			6.3500	3/4			19.0500
		17/64	6.7469			49/64	19.4469
	9/32		7.1438		25/32		19.8438
		19/64	7.5406			51/64	20.2406
5/16			7.9375	13/16			20.6375
		21/64	8.3344			53/64	21.0344
	11/32		8.7313		27/32		21.4313
		23/64	9.1281			55/64	21.8281
3/8			9.5250	7/8			22.2250
		25/64	9.9219			57/64	22.6219
	13/32		10.3188		29/32		23.0188
		27/64	10.7156			59/64	23.4156
7/16			11.1125	15/16			23.8125
		29/64	11.5094			61/64	24.2094
	15/32		11.9063		31/32		24.6063
		31/64	12.3031			63/64	25.0031
1/2			12.7000	1			25.4000

Kg/cm² to Kpa

kg/cm²	0	1	2	3	4	5	6	7	8	9	kg/cm²
	Kpa	Kpa	Kpa	Kpa	Kpa	Kpa	Kpa	Kpa	Kpa	Kpa	
-	-	98.1	196.1	294.2	392.3	490.3	588.4	686.5	784.5	882.6	-
10	980.7	1078.7	1176.8	1274.9	1372.9	1471.0	1569.1	1667.1	1765.2	1863.3	10
20	1961.3	2059.4	2157.5	2255.5	2353.6	2451.7	2549.7	2647.8	2745.9	2843.9	20
30	2942.0	3040.1	3138.1	3236.2	3334.3	3432.3	3530.4	3628.5	3726.5	3824.6	30
40	3922.7	4020.7	4118.8	4216.9	4314.9	4413.0	4511.1	4609.1	4707.2	4805.3	40
50	4903.4	5001.4	5099.5	5197.6	5295.6	5393.7	5491.8	5589.8	5687.9	5786.0	50
60	5884.0	5982.1	6080.2	6178.2	6276.3	6374.4	6472.4	6570.5	6668.6	6766.6	60
70	6864.7	6962.8	7060.8	7158.9	7257.0	7355.0	7453.1	7551.2	7649.2	7747.3	70
80	7845.4	7943.4	8041.5	8139.6	8237.6	8335.7	8433.8	8531.8	8629.9	8728.0	80
90	8826.0	8924.1	9022.2	9120.2	9218.3	9316.4	9414.4	9512.5	9610.6	9708.6	90
100	9806.7	9904.8	10002.8	10100.9	10199.0	10297.0	10395.1	10493.2	10591.2	10689.3	100

Kpa to Kg/cm²

Kpa	0	100	200	300	400	500	600	700	800	900	Kpa
	kg/cm²	kg/cm²	kg/cm²	kg/cm²	kg/cm²	kg/cm²	kg/cm²	kg/cm²	kg/cm²	kg/cm²	
-	-	1.020	2.039	3.059	4.079	5.099	6.118	7.138	8.158	9.177	-
1000	10.197	11.217	12.237	13.256	14.276	15.296	16.316	17.335	18.355	19.375	1000
2000	20.394	21.414	22.434	23.454	24.473	25.493	26.513	27.532	28.552	29.572	2000
3000	30.592	31.611	32.631	33.651	34.670	35.690	36.710	37.730	38.749	39.769	3000
4000	40.789	41.809	42.828	43.848	44.868	45.887	46.907	47.927	48.947	49.966	4000
5000	50.986	52.006	53.025	54.045	55.065	56.085	57.104	58.124	59.144	60.163	5000
6000	61.183	62.203	63.223	64.242	65.262	66.282	67.302	68.321	69.341	70.361	6000
7000	71.380	72.400	73.420	74.440	75.459	76.479	77.499	78.518	79.538	80.558	7000
8000	81.578	82.597	83.617	84.637	85.656	86.676	87.696	88.716	89.735	90.755	8000
9000	91.775	92.795	93.814	94.834	95.854	96.873	97.893	98.913	99.933	100.952	9000
10000	101.972	102.992	104.011	105.031	106.051	107.071	108.090	109.110	110.130	111.149	10000

2.2.1 Rules and shop behavior

- Study all shop rules relating to the procedure carefully and constantly apply them. When in doubt about any task, get help! DO NOT take chances.

- Know your job. It is foolish, and often disastrous, to make repairs to a machine without first receiving proper instructions. Always use the shop manual when performing any repair tasks. Get additional help if you are NOT sure what must be done or how a task should be performed.

- The shop is a place to work, not play. It is NOT a place for “horseplay”. A “joker” in a repair shop is a “walking hazard” to everyone. Daydreaming or socializing on the job also increases your chances of injury.

- If you must smoke, smoke only in the area provided for smoking. Never smoke while on the shop floor or work area.

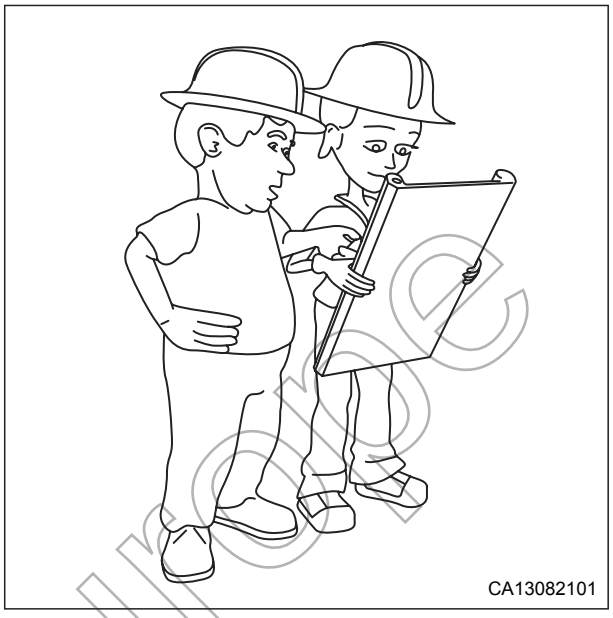

Fig. 2-1

2.2.2 Housekeeping

- Oils, grease, fuel, antifreeze or any fluid spills should be mopped up immediately. These items pose a serious slip hazard. Regardless of who was responsible for the spill, it is your job as a shop employee to secure and clean up the spill area.

- Keep the shop clean. Scrap or old parts should be disposed of properly. Never allow them to remain on the shop floor.

- All equipment and tools must be put back in their proper storage areas after each use. It's imperative that you do not let a shop become cluttered and disorganized in order to prevent accidents.

- Always keep in mind, proper house cleaning is vital for a safe and pleasant work environment.

Fig. 2-2

2.2.21 Track Recoil Springs

If you are making repairs to a machine equipped with tracks, always be aware of the dangers involved with track recoil springs. This spring is under extreme pressure at all times. If it is disassembled by mistake, the spring may fly out and cause serious injury.

Be careful when removing or installing tracks on track-type machines. When removing the master track link the track system may separate suddenly and cause possible injury.

Always stand clear of the track travel path when separating the master link section of the track.

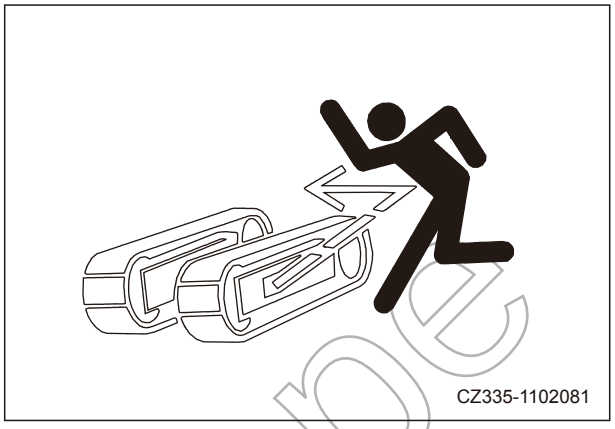

Fig. 2-22

2.2.22 High-Pressure Fluid Lines

Always keep in mind that these systems are under high pressure. When inspecting or replacing piping or hoses, always check to be sure the pressure in the system has been relieved before proceeding. Working on a system still under pressure could lead to serious injury, always do as follows:

- If you will be removing a line or component with fluid in the system, always cap and seal the opening to avoid leakage or system contamination.
- Never carry out inspections or replace items while the system is under pressure.
- Never use any part of your body to check or feel for leaks. Always wear safety glasses and leather gloves when checking for leaks and use a piece of wood or cardboard when checking for leaks from small holes.
- If high pressure fluids should penetrate your skin or get into your eyes, seek medical attention immediately.

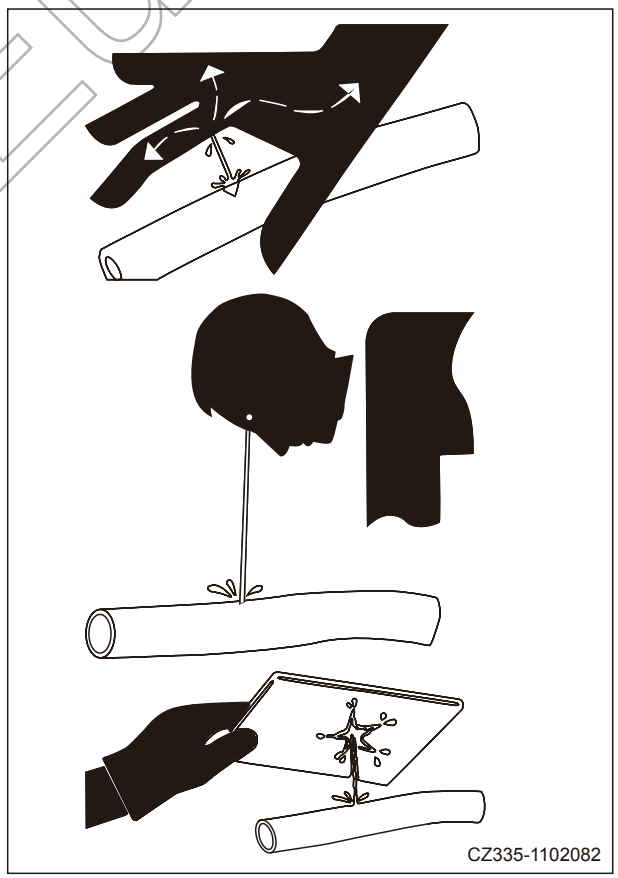

Fig. 2-23

SANY

Specifications

3 Specifications

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Structure and Function

4 Structure and Function

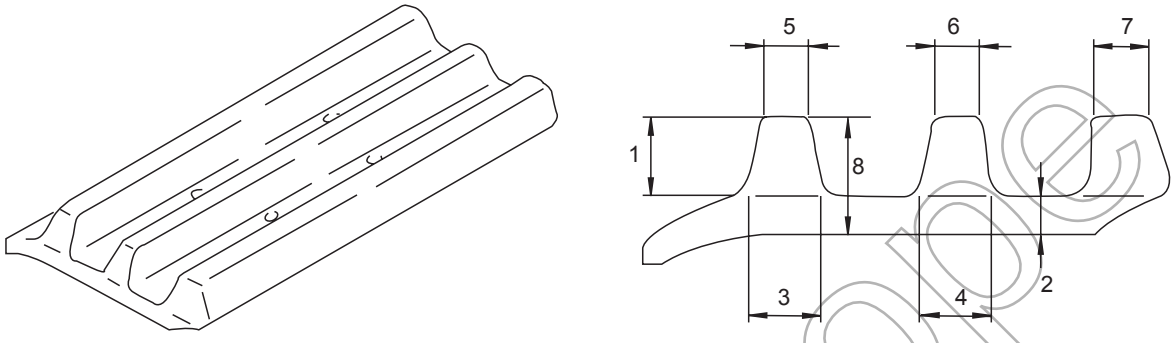
(1) Plug
(2) Oil seal
(3) Self-aligning bearing
(4) Ring gear (No. of teeth:66)
(5) No. 2 planetary carrier
(6) No. 1 planetary carrier
(7) No. 2 sun gear (No. of teeth: 18)
(8) No. 1 sun gear (No. of teeth:15)
(9) Swing motor
(10) No. 1 planetary gear (No. of teeth:25)
(11) No. 2 planetary gear GP
(12) No. 2 planetary gear (No. of teeth:23)
(13) Spring pin
(14) Swing reducer screw plug
(15) Grease fitting
(16) Self-aligning bearing
(17) Bearing sealing
(18) Swing pinion
(19) Dipstick
(20) Oil filling pipe

Specifications

Reduction ratio: 25

No.	Check item	Criteria		Remedy
		Standard clearance	Clearance limit	
21	Backlash between swing motor shaft and No. 1 sun gear	0.18 – 0.28	—	Replace
22	Backlash between No. 1 sun gear and No.1 planetary gear	0.16 – 0.50	1.00	
23	Backlash between No. 1 planetary gear and ring gear	0.18 – 0.59	1.10	
24	Backlash between No. 1 planetary carrier and No. 2 sun gear	0.39 – 0.71	1.20	
25	Backlash between No. 2 sun gear and No.2 planetary gear	0.16 – 0.50	0.90	
26	Backlash between No. 2 planetary gear and ring gear	0.18 – 0.59	1.00	
27	Backlash between No. 2 planetary carrier and swing pinion	0.07 – 0.23	—	
28	Backlash between swing pinion and swing bearing	0.22 – 1.32	2.00	

4.3.7 Triple grouser shoe



ZX215-1002014

Fig. 4-12

Unit: mm

No.	Check item	Criteria		Remedy
1	Height	Standard size	Repair limit	Build-up welding or replace
		36	21.3	
2	Thickness	13		
3	Length of base	29		
4		24		
5	Length at tip	22		
6		16		
7		22		
8	Thickness	Standard size	Repair limit	
		49	34.3	

4.4.4 Pilot pump

For location of pilot pump see **“Hydraulic pump” on page 4-25**.

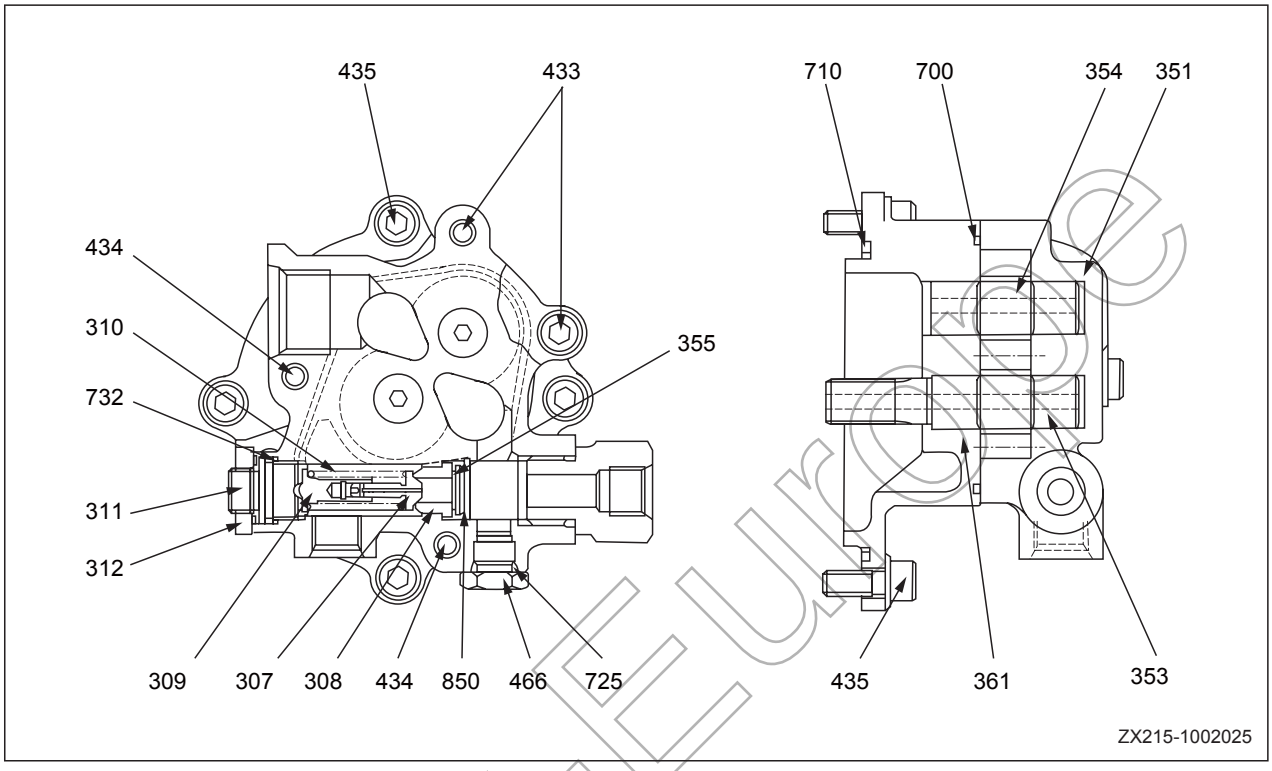


Fig. 4-22

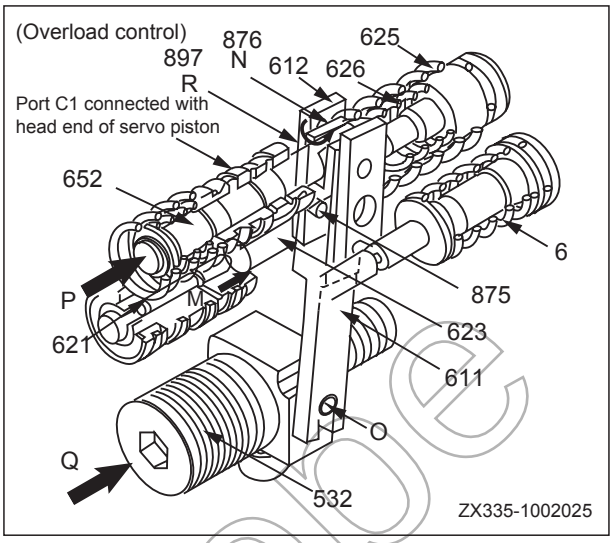
307: Valve stem
308: Valve base
309: Retainer
310: Spring
311: Adjusting screw
312: Nut
351: Body
353: Gear shaft
354: Gear shaft
355: Filter element
361: Body
433: Screw
434: Screw
435: screw
466: Plug
700: Washer
710: O-ring
725: O-ring
732: O-ring
850: Washer

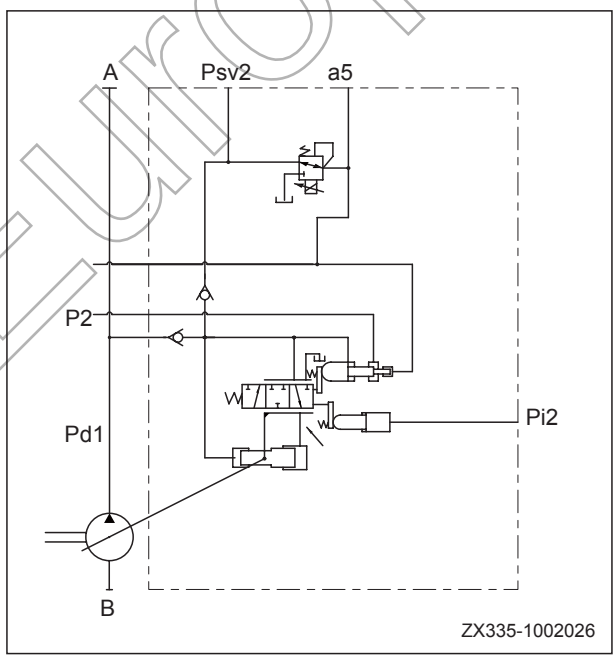
Function

- The engine actuates the main pump and the drive shaft of the pilot pump through the transmission case, and drives the pilot pump through gear engagement.

Action against overloading

When output pressure Pd1 of this pump rises, as it acts on the step portion of compensation plunger (621), the compensation lever (623) moves in direction M and it will not stop until it comes to a position where the output pressure Pd1 is balanced with the forces of outer spring (625) and inner spring (626). The movement of compensation lever is transmitted to lever (1) (612) via pin (875), which rotates around pivot N in direction indicated by the arrow. Rotation of lever (1) is also transmitted to feedback lever (611) via pin (897), which rotates around pivot O in the same indicated direction as N. Along with this, the spool (652) connected with feedback lever moves in direction P. The movement of spool in direction P enables output pressure Pd1 to be directed into head end of servo piston via spool and port C1. While the output pressure Pd1 is introduced to rod end of servo piston. Due to area difference, the servo piston moves in direction Q and the inclination angle reduces. The flow decreases as a result. As the feedback lever is connected with servo piston and spool, when servo piston moves in direction Q, the feedback lever will rotates around pivot R. In this way, the spool returns to its original position. Through such movement, the gap between spool and valve body is closed slowly. The servo piston will not stop until the gap is completely closed.





Basic operation principle

- Oil from pump P1 flows to the pump port (P1) of valve block A (101), and then enters neutral bypass (21) and parallel passage (22). Oil from pump P2 flows into the pump port (P2) of valve block B (102), and then enters neutral bypass (18) and parallel passage (6).

- Oil from pump P1 flows through neutral bypass (21) and tank passage (23), and returns to the tank from tank port (R1). Oil from pump P2 flows through neutral bypass (18) and tank passage (4), and returns to the tank from tank port (R1).

- When the control levers of the pilot control valves are operated to change the valves, oil from pump P2 flows into neutral bypass (18) and then into right travel spool (314). On the one hand, option spool (309), boom 1 spool (303), bucket spool (304) and arm 2 spool (306) is fed with oil through parallel passage (6). On the other hand, oil from pump P1 enters left travel spool (310) via neutral bypass (21). In addition, swing spool (305), boom 2 spool (307), arm 1 spool (302) is fed with oil through parallel passage (22).

4.5.4.3 Bucket

a. Bucket DIG

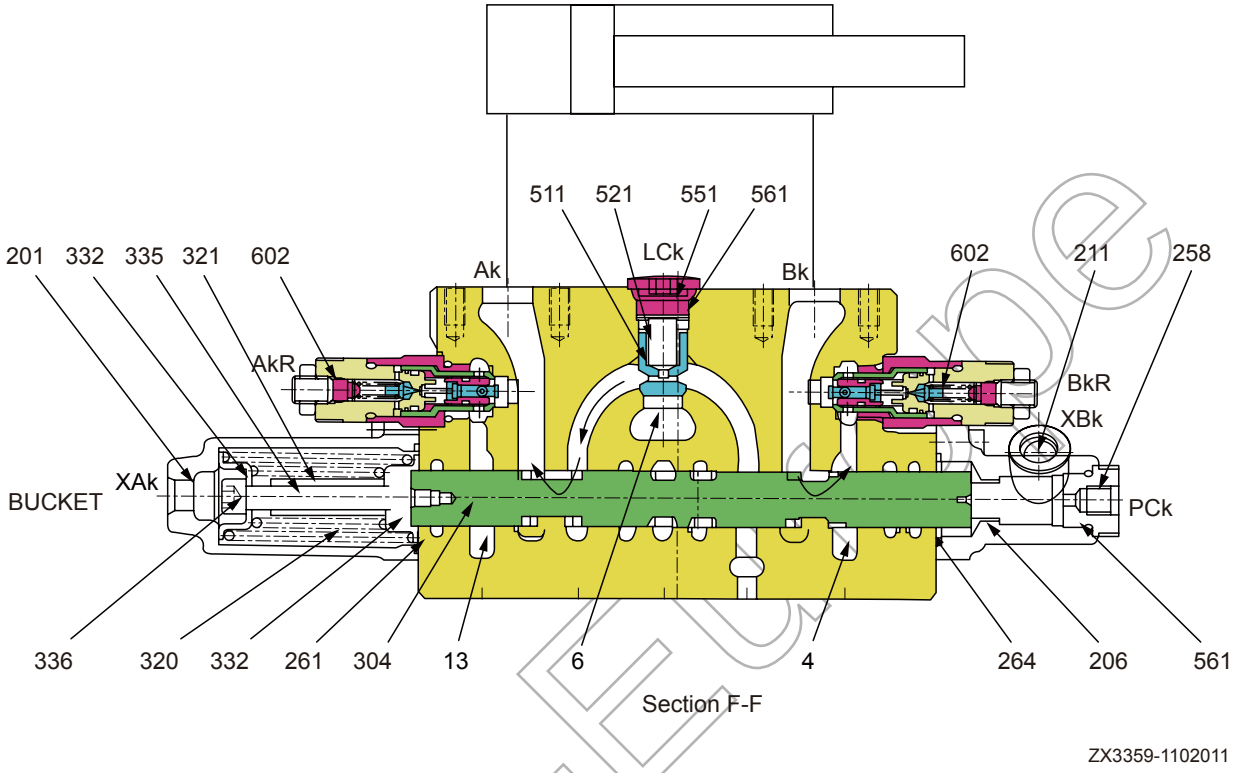


Fig. 4-47

4. Tank passage
6. Parallel passage
13. Tank passage
304. Bucket spool
320. Spring
321. Spring
LCk. Check valve

Basic operation principle

- When the bucket is dumping, the pilot pressure oil fl ows to port XBk, and bucket spool (304) moves upward after overcoming the force of spring (320) and (321).
- Oil from pump P2 fl ows to parallel passage (6), opens the check valve Lck and enters bucket spool (304) via the U-passage. It then fl ows out of port Bk via the periphery of the spool and enters the piston rod of bucket cylinder.
- On the other hand, return oil from the piston head of bucket cylinder flows to port Ak, passes the periphery of the spool and tank passage (13) and returns to the tank via tank port R2.

a. Function as the port relief valve

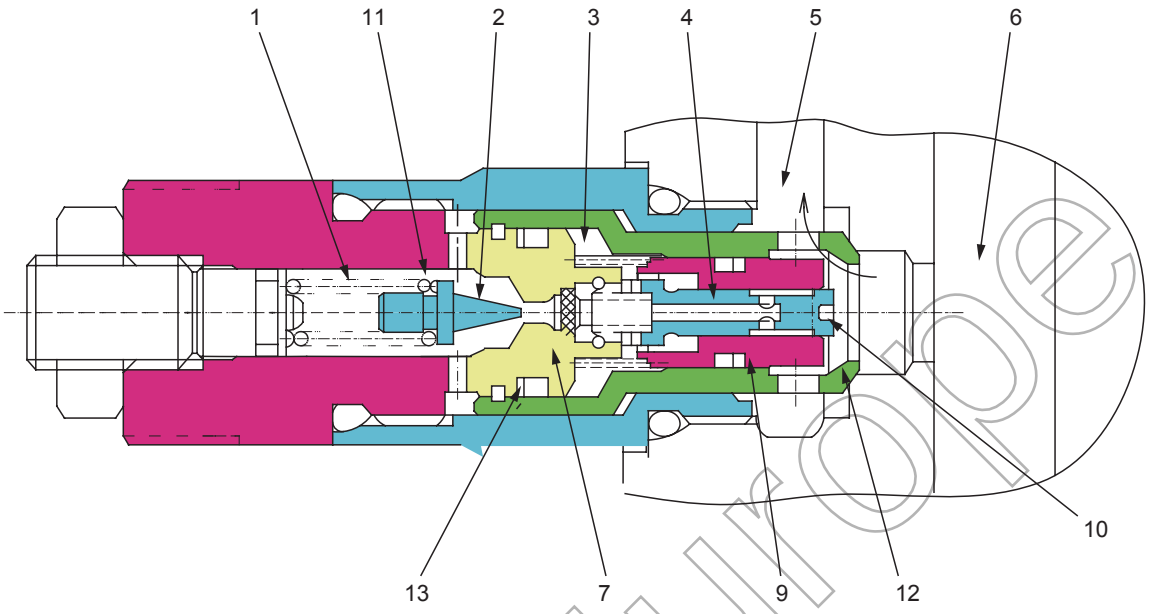


Fig. 4-56

- When pressure at tank port (6) increases and reaches the set pressure, pilot valve (2) is opened after overcoming the force of spring (1). Oil inside chamber (11) flows to tank passage (5) via passage (13). The pressure passing tank port (6) pushes plunger (10) to the left until it contacts sleeve (7). Oil in tank port (6) passes the inner passage (4) of plunger (10) and spring chamber (3) and flows to chamber (11). Oil passes the clearance between the outer diameter of the end of plunger (10) and the inner diameter of the main valve (9), and a difference of pressure is generated between tank port (6) and inner passage (4). When pressure in spring chamber (3) drops, main valve (9) moves to the left, and the valve seat (12) of main valve (9) is opened. Oil at tank port (6) flows to tank passage.

4.5.7.5 Boom 1 and Boom 2 (E - E)

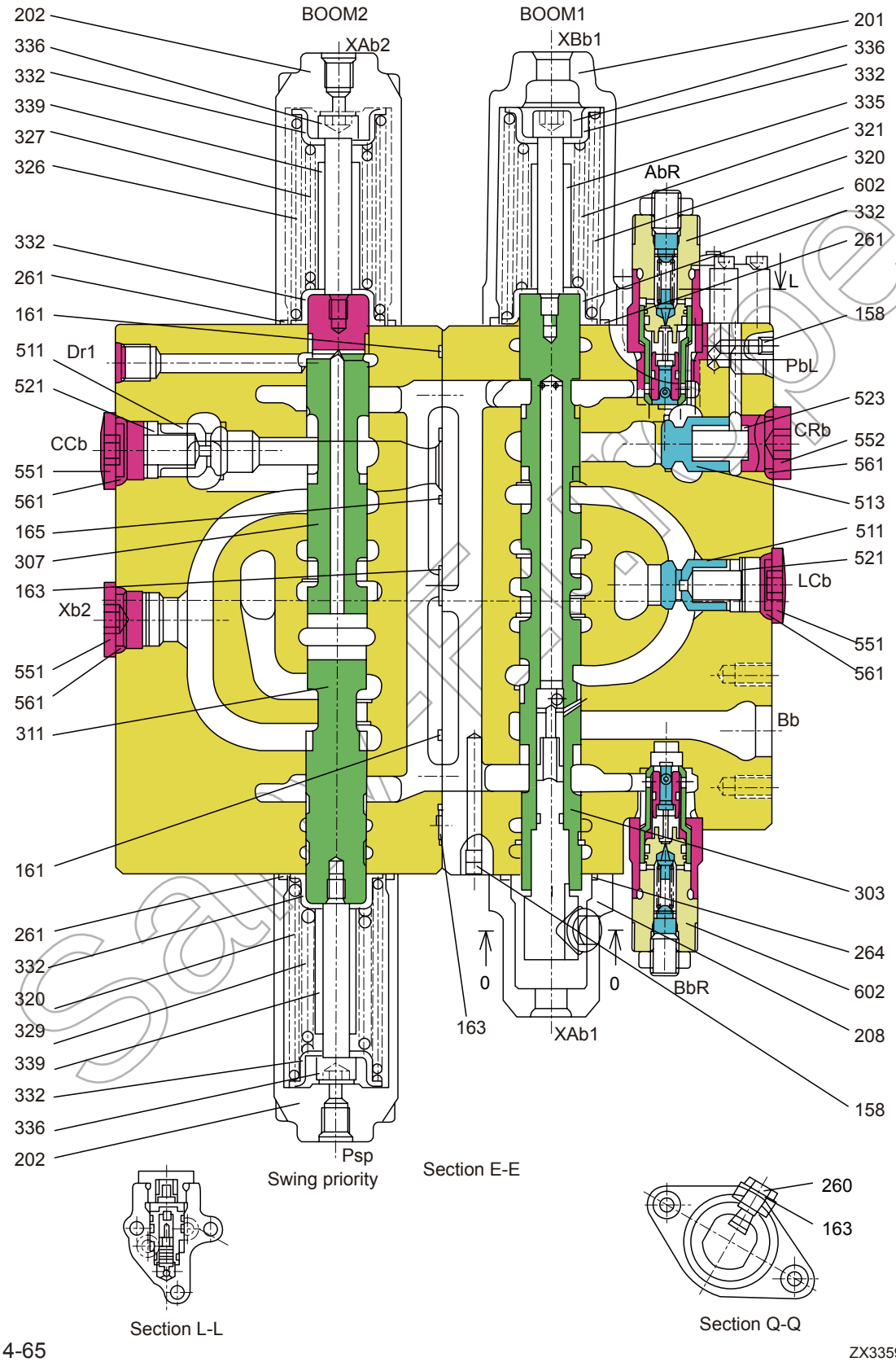


Fig. 4-65

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4.6.4 Reverse prevention valve

4.6.4.1 Operation drawing

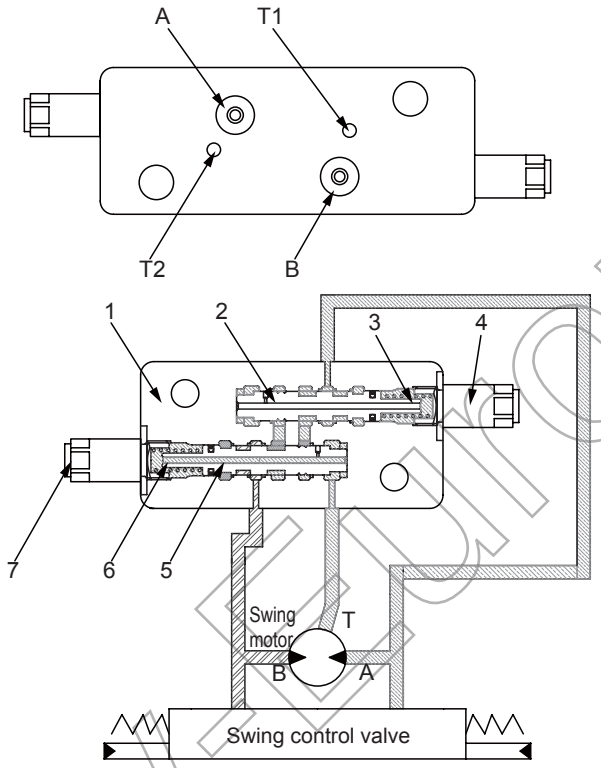

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Fig. 4-75

(1) Valve body
(2) Spool (A side)
(3) Spring (A side)
(4) Plug
(5) Spool (B side)
(6) Spring (B side)
(7) Plug

E. Shuttle valve function for high pressure selection

- The counterbalance valve can function as a shuttle valve to release travel brake. When hydraulic oil is fed to port P1, piston (1) moves to the right, as shown in fig. 4. At this time, drain circuit F of motor body is cut off, and circuit D leading to cylinder chamber E for travel braking is connected. Hydraulic oil flows to circuit G via the orifice, and enters travel brake cylinder chamber E to release travel brake. In addition, piston (1) moves to neutral position, as shown in fig 5 when motor stops. Circuit D is closed and drain circuit F of motor body is connected. Hydraulic oil in travel braking cylinder chamber E is conducted to the drain circuit of motor body, and travel brake is applied.

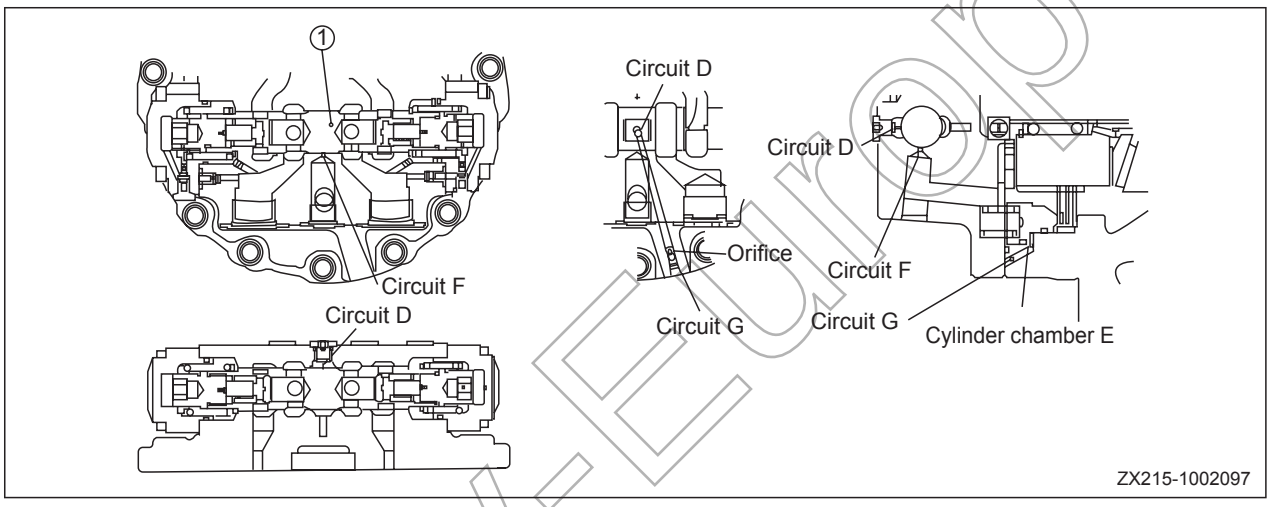


Fig. 4-84

High pressure selection function---selection of high pressure

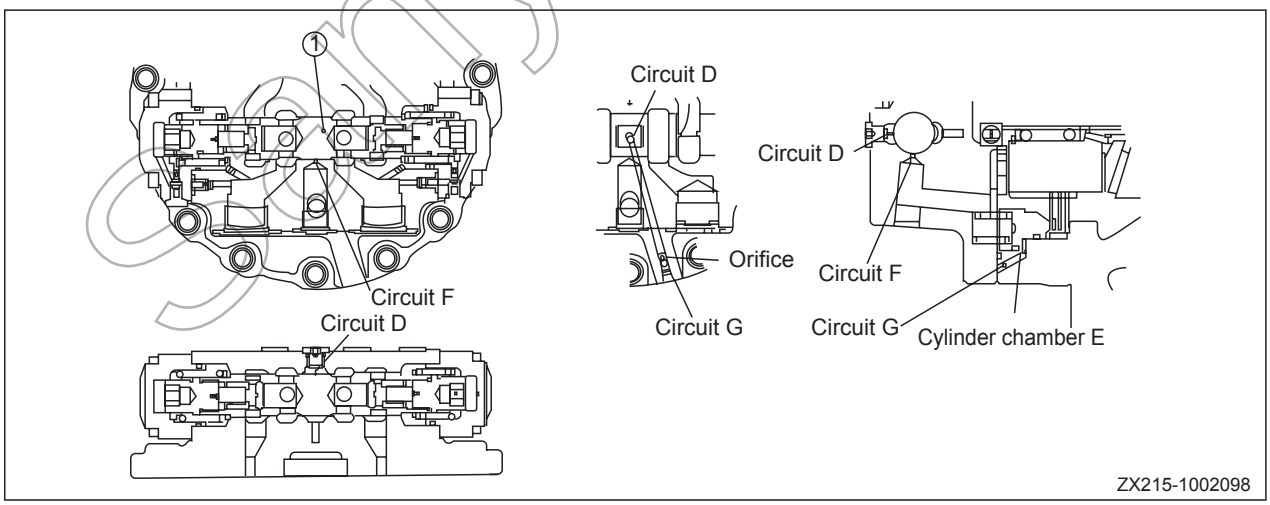


Fig. 4-85

High pressure selection function---opening of oil drain to motor housing

Components	Check item	Allowable limit	Remedy
1-2-1 Valve sheet	1. Assembly 2-2 piston assembly hole	Roughness 0.8 a, scratch >0.02mm or surface roughness	Replace valve sheet and parts
	2. Valve sheet inner diameter and piston outer diameter	Roughness 0.8 a, scratch >0.02mm or surface roughness 0.060	
	3. Assembly 2-11 sliding valve spool assembly hole	Roughness 0.8 a, scratch >0.02mm or surface roughness	
	4. Sliding valve sheet inner diameter and valve spool outer diameter	Roughness 0.8 a, scratch >0.02mm or surface roughness 0.060.	
	5. Relief valve assembly sliding piston and valve seat	Scratch >0.02mm or surface roughness	
1-2-9 Spool assembly	1. Valve spool out diameter	Roughness 0.8 a, scratch >0.02mm or surface roughness	Replace valve sheet and parts
	2. Slide valve spool outer diameter and valve sheet inner diameter	Roughness 0.8 a, scratch >0.02mm or surface roughness 0.060.	
1-2-7-9 Movable piston	1. Sliding portion of valve sheet and valve seat	Scratch >0.02mm or surface roughness	Replace relief valve assembly
1-2-7-1 Case	1. Sling portion of the movable piston (outer diameter)	Scratch >0.02mm or surface roughness	
1-4-7 Spring	1. Dimension	Free length 61.0	
	2. Appearance	Deformation and surface damage	
1-18 Spring	1. Dimension	Free length 39.0	
	2. Appearance	Deformation and surface damage	
1-20 Spring	1. Dimension	Free length 41.5	
	2. Appearance	Deformation and surface damage	
1-2-4 Spring	1. Dimension	Free length 48.5	
	2. Appearance	Deformation and surface damage	
1-2-10 Spring	1. Dimension	Free length 28.3	
	2. Appearance	Deformation and surface damage	
O-ring and oil seal		When being removed	Replace o-ring and oil seal

Table 4-3

3. Fine control (When control lever is returned)

- When lever (5) starts to return, plunger (1) is pushed up by the force of centering spring (3) and pressure at port (P1).
- Because of this, orifice (f) is connected to drain chamber (D), and the pressurized oil at port (P1) is released.
- If the pressure of port (P1) is lowered excessively, plunger (1) is pushed down by metering spring (2).
- Orifice (f) is shut off from drain chamber (D), and it is almost simultaneously interconnected to pump pressure chamber (PP).
- Pump pressure is supplied until the pressure at port (P1) recovers to the level equivalent to the lever position.
- When the spool of the control valve returns, the oil in drain chamber (D) flows in from orifice (f) in the valve on the side that is not working. The oil passes through port (P2) and enters chamber (B) to replenish the chamber with pressurized oil.

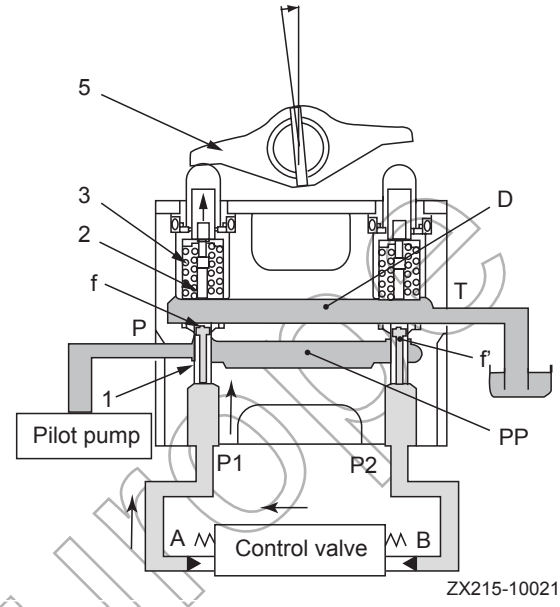


Fig. 4-110

4. At full stroke

- Lever (5) pushes down piston (4), and retainer (9) pushes down plunger (1).
- Orifice (f) is shut off from drain chamber (D), and is interconnected to pump pressure chamber (PP).
- Therefore, the pilot pressure oil from the self pressure reducing valve passes through orifice (f) and flows to chamber (A) from port (P1) to push the control valve spool.
- The oil returning from chamber (B) passes from port (P2) through orifice (f) and flows to drain chamber (D).

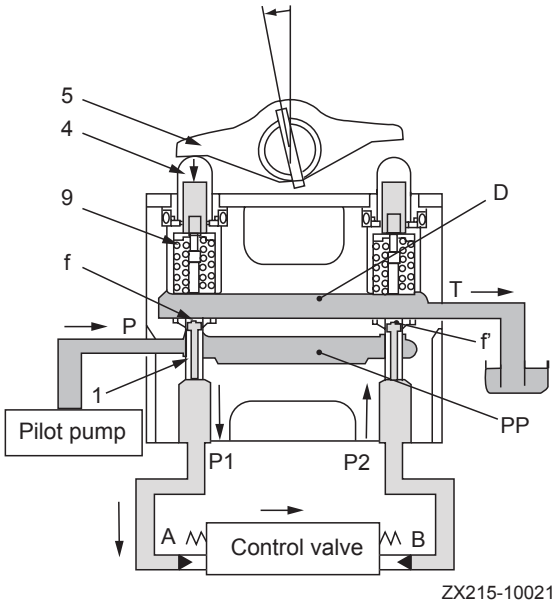


Fig. 4-111

Unit: mm

No.		Standard size	Tolerance
1		φ110	-0.071 -0.036
2		131	+1.5 0
3		316	-0.3 -0.8
4		φ110	-0.071 -0.036
5		598	±1
6		236.5	±0.5
7		950	±1
8		3178	±3
9		3078.5	±1
10		468	±1
11		732	±0.2
12		728	±0.5
13		513.6	—
14		1703	—
15		φ90	-0.036 -0.071
16		345	0 -1.0
17		φ90	-0.03 -0.06
18	Arm itself	329	0 -0.5
	When press fitting bushing	344	—
19	Min.	1,990	—
	Max.	3,275	—

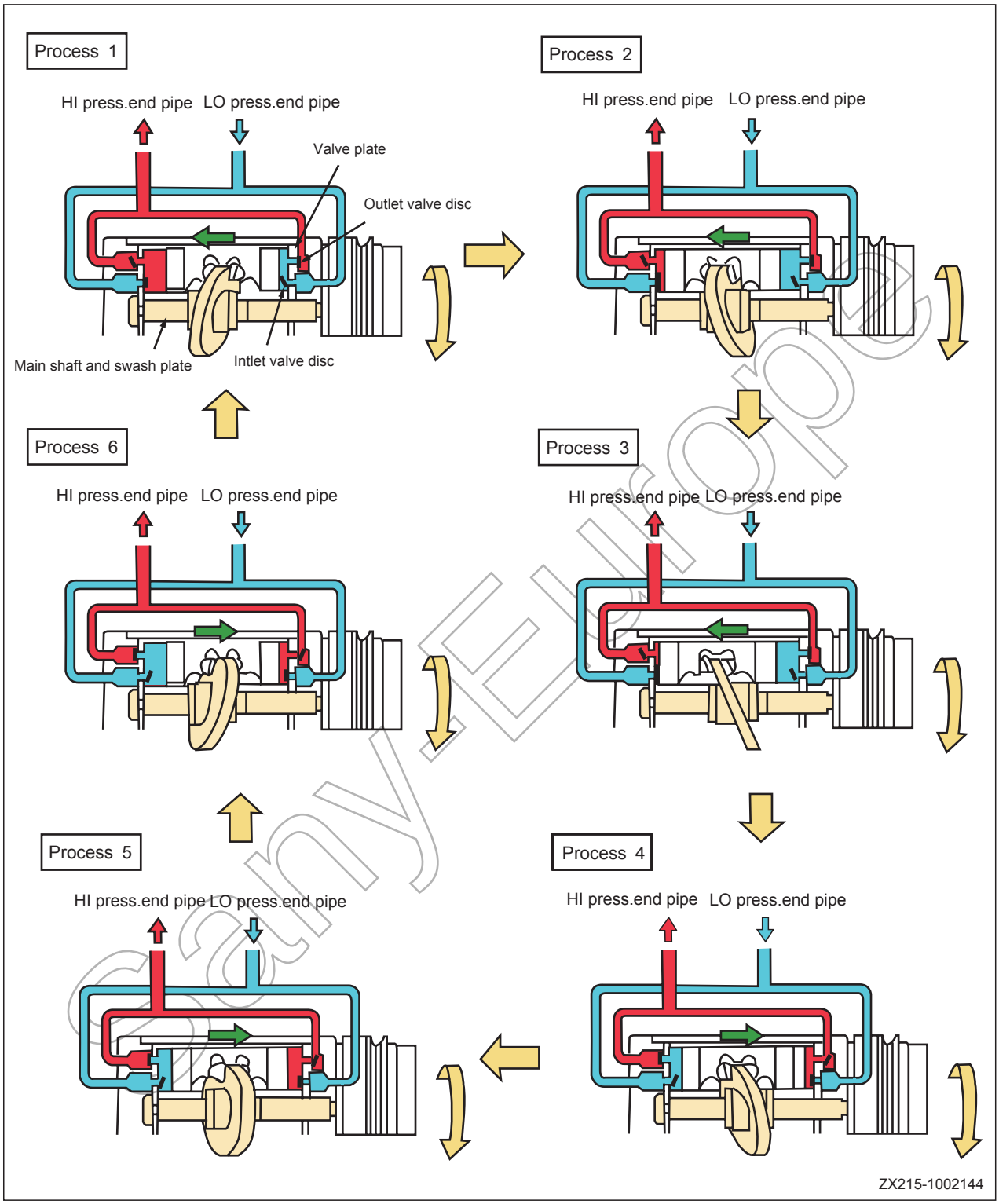


Fig. 4-129

Step 3: Air - proof check

1) Keep the Hi- and Lo-pressure valve of the manifold pressure gauge under closed state for more than 5 minutes, and make sure the pointer on the gauge does not return to zero.

2) If the pointer returns to near zero, a leakage is available somewhere. Check and adjust the pipe joint. Tighten the joint and conduct another evacuating operation until no leakage is detected.

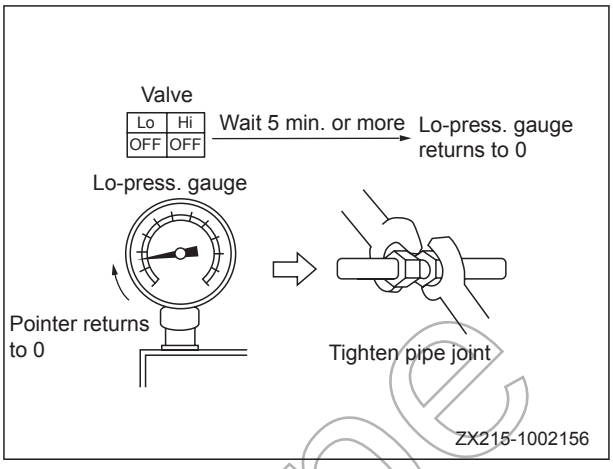


Fig. 4-142

Step 4: Leak check

1) Connect the green hose that is previously connected to the vacuum pump to the fluorine cylinder.

2) Connect the other end of the green hose to the pressure gauge. Open the valve of the cylinder and press the vent valve of the pressure gauge. (Do not press the valve with naked hand to avoid frostbite caused by refrigerant). Release the air in the hose with the pressure of the refrigerant. (Release the vent valve when you hear a squeezing sound).

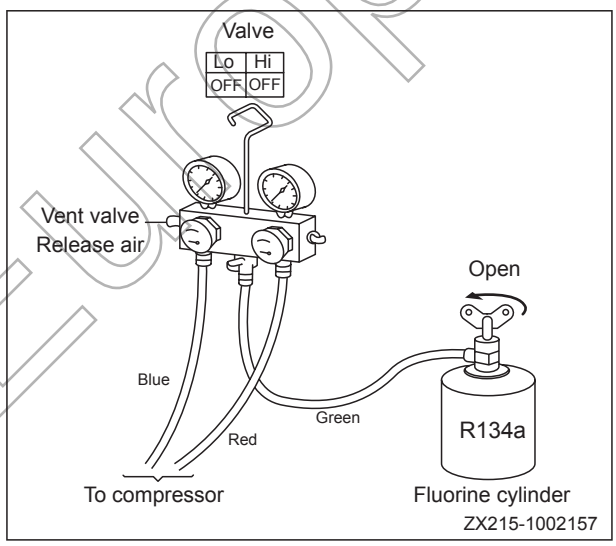


Fig. 4-143

3) Add refrigerant until pressure reading on the Lo-pressure gauge is 1kgf/cm² . Hi-pressure valve of the gauge is open at this time. Close the Hi-pressure valve when feeding is finished.

4) Use a leak detector to check if leakage is available in the cooling system.

5) Make necessary repairs (tightening) if leakage is observed.

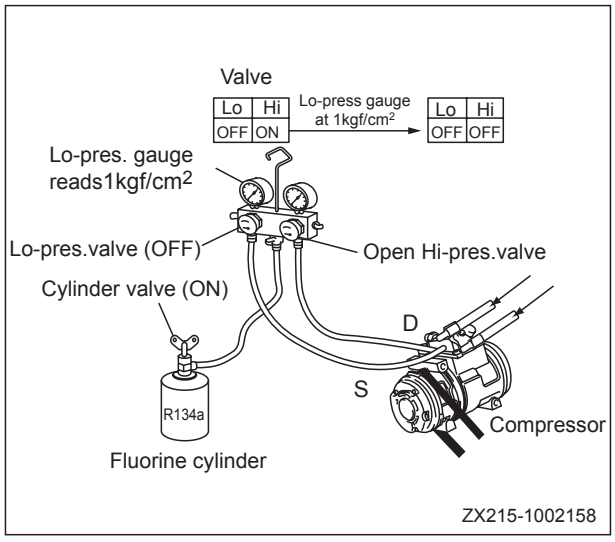


Fig. 4-144

- Over-charging of refrigerant or insufficient refrigeration of condenser

Symptom: Insufficient refrigeration

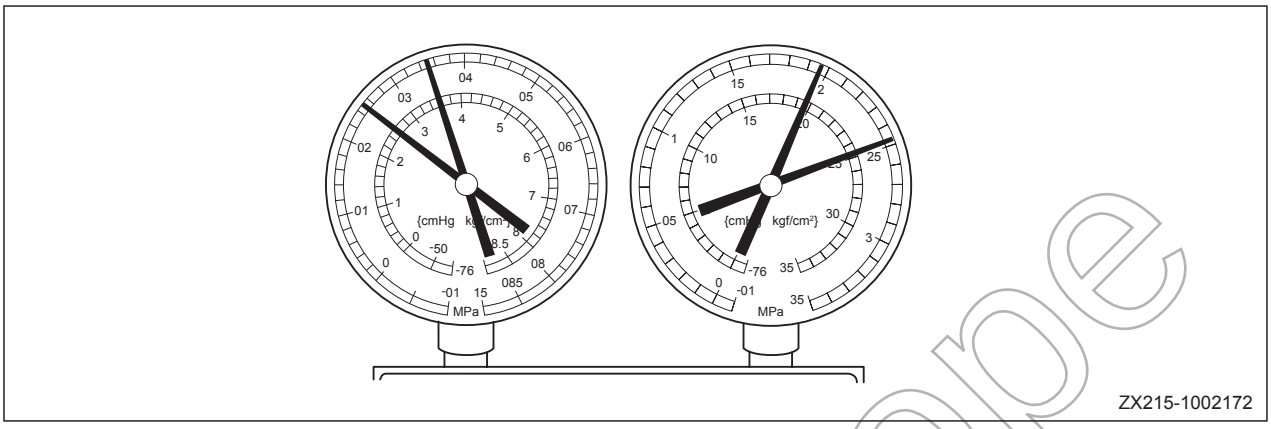
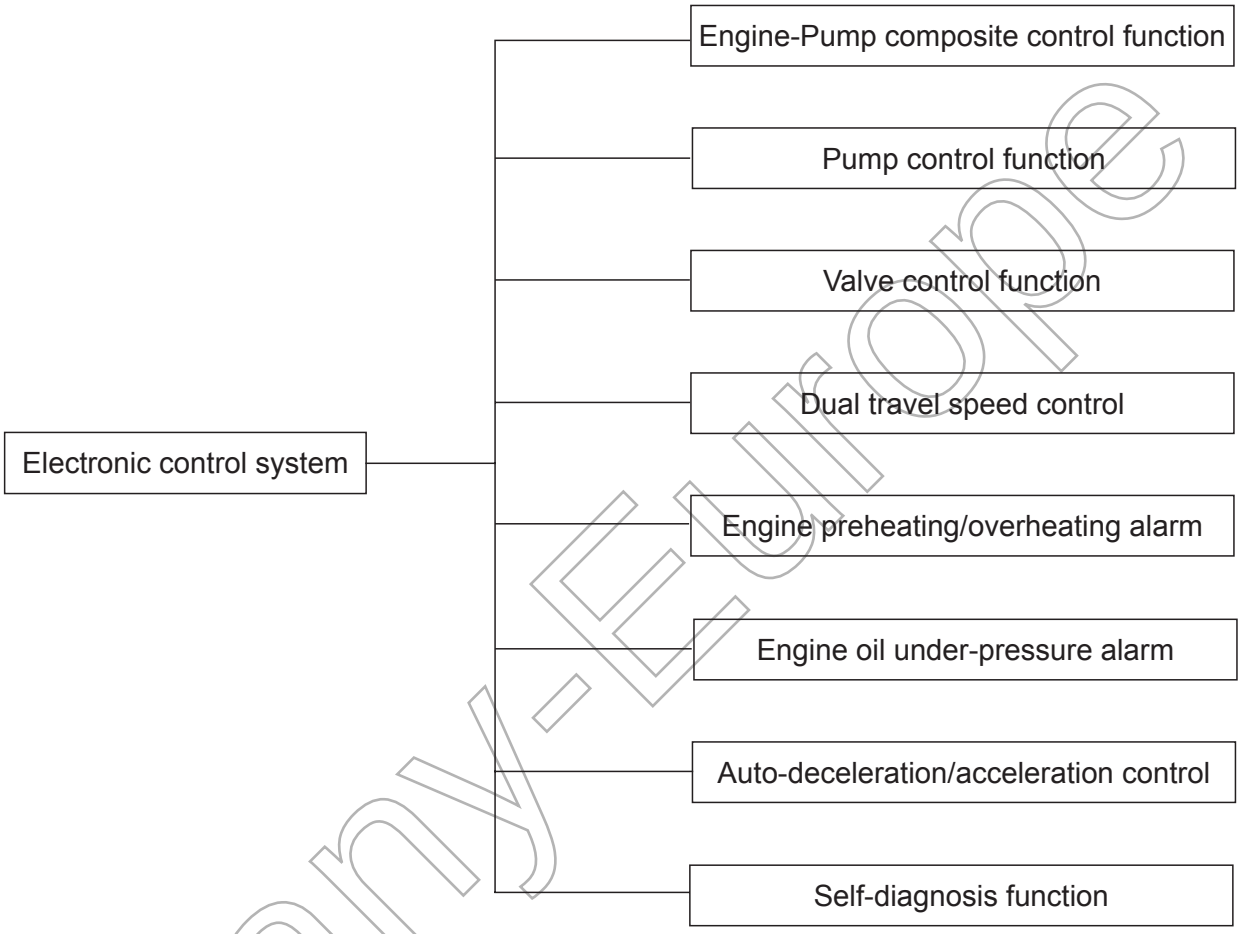


Fig. 4-157

Symptom	Cause	Analysis	Remedy
• Pressure at both Hi- and Lo-pressure sides very high • No foam can be observed via the sight glass even when engine speed drops.	• Over-filling of refrigerant in the system. Refrigerating performance inadequate. • Insufficient refrigeration of condenser	• Over-filling of refrigerant • Condenser fins clogged or fan motor error.	• Clean the condenser • Check the working condition of fan motor • If the two above items are normal, check the volume of refrigerant. Add refrigerant.

4.9 Electrical Control System

4.9.1 Control function



★ For detailed information about self-diagnosis function, see "Troubleshooting"

Valve control system function:

- Front pump flow control
- Rear pump flow control

Specifications

Valve model	8KWE5G-30/G24WR-829
Voltage range	0~28V
Current range	0~1.5A
Rated current	700mA
Resistance	17Ω
Recommended	80HZ/0.2A

Table 4-7

Front pump flow control

Function

- Supply current to front pump solenoid proportional valve, control the angle of pump swash plate, limit operation flow.

Operation

- When the machine is in operation, the controller collects pilot pressure signal and checks if swing operation or left travel is available. When conditions are met, it controls the front pump solenoid proportional valve.

Rear pump flow control

Function

- Supply current to rear pump solenoid proportional valve, control the angle of pump swash plate, limit operation flow.

Operation

- When the machine is in operation, the controller collects pilot pressure signal and checks if right travel is available. When conditions are met, it controls the front pump solenoid proportional valve.

NOTE: When the machine is under level 2 lockout condition, the rear pump solenoid valve can also be controlled so as to limit the bucket operation flow.

Secondary relief function

- Relief pressure under normal operating condition is 34.3 mpa. When the secondary relief function is actuated, relief pressure rises to about 37.5 mpa. Oil pressure rises to a higher level.

- Operating condition

Condition	Relief pressure
Normal operation	34.3 mpa
Secondary boosting switch ON	37.5 mpa

Table 4-8

4.10 Monitoring System

4.10.1 Working principle

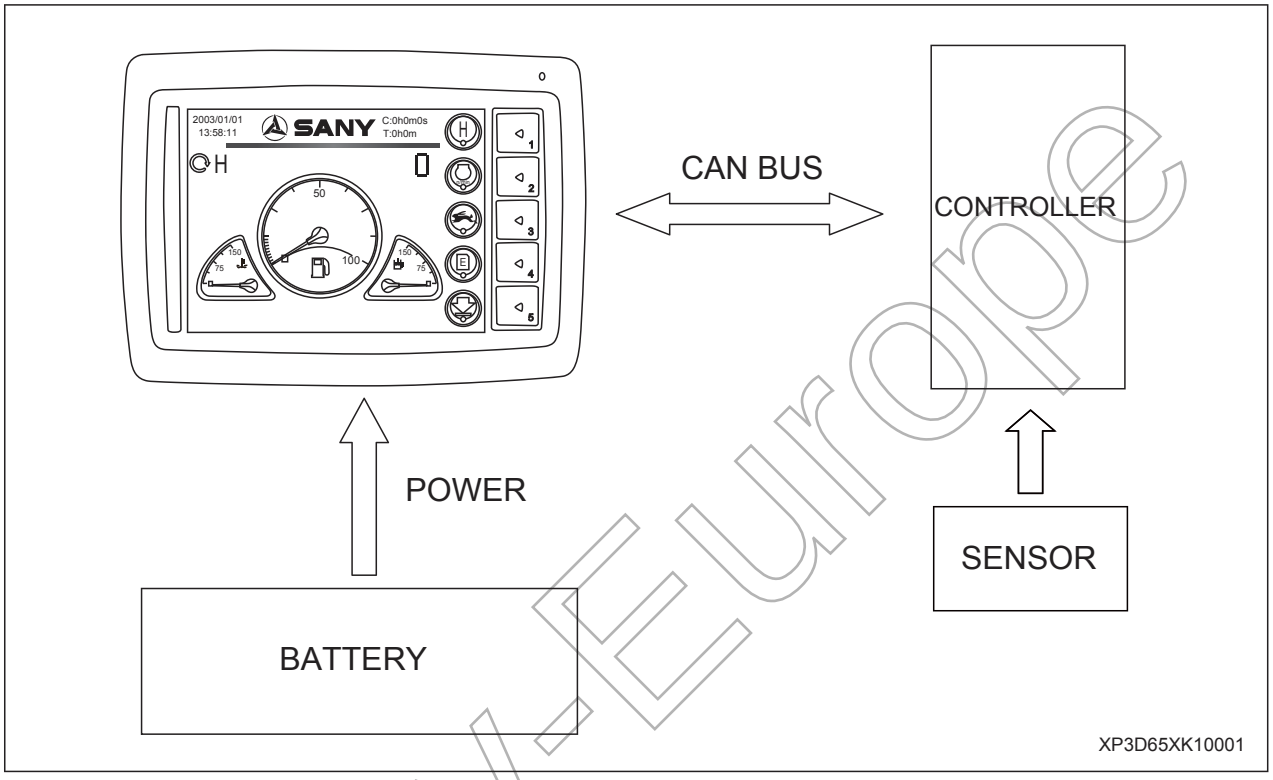


Fig. 4-193

- Machine condition is monitored via sensors mounted on different locations of the machine. The controller processes signals it has collected from the sensors and displays respective information on monitor screen, telling the operator of machine condition.
- The monitor panel also contains mode selector and functional keys used to control machine system.
- Information on the monitor panel includes primarily:

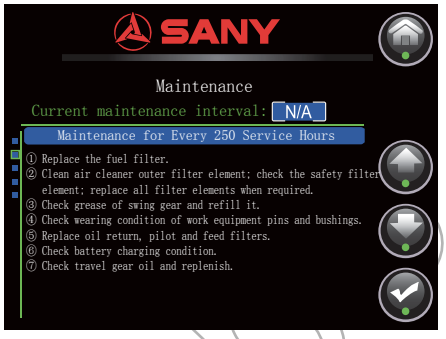
1. Alert information when the machine has a fault

2. Machine condition (such as hydraulic oil temperature and fuel level)

3. Machine running condition (speed, gear position, service hours, etc.)

4.10.4.8 Maintenance information

Maintenance information at current interval is displayed (The right figure is just an example of maintenance information for every 50 service hours).



XP335-14090107

Fig. 4-205

Operation

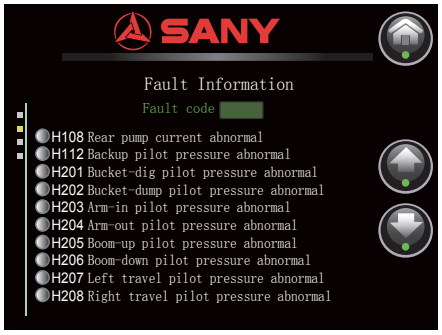
- Press ◂1 to return to System Information.
- Press ◂3 to view maintenance information for last interval.
- Press ◂4 to view maintenance information for next interval.
- Press 5 to return to System Information.

4.10.4.9 Fault information

Fault codes and explanation are displayed

Operation

- Press ◂1 to return to System Information.
- Press ◂3 to view previous page of Fault Information.
- Press ◂4 to view next page of Fault Information.



XP335-14090108

Fig. 4-206

SANY

Standard Values

5 Standard Values

Machine postures for measuring (For all models)

Control value: Spool stroke

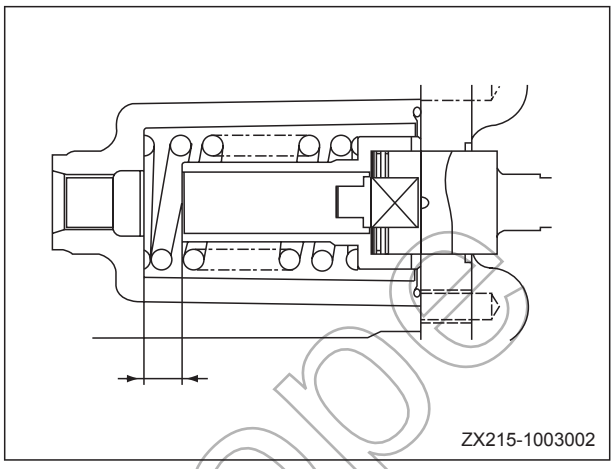


Fig. 5-1

Swing 1: Swing brake angle, time taken to start swing, time taken to swing

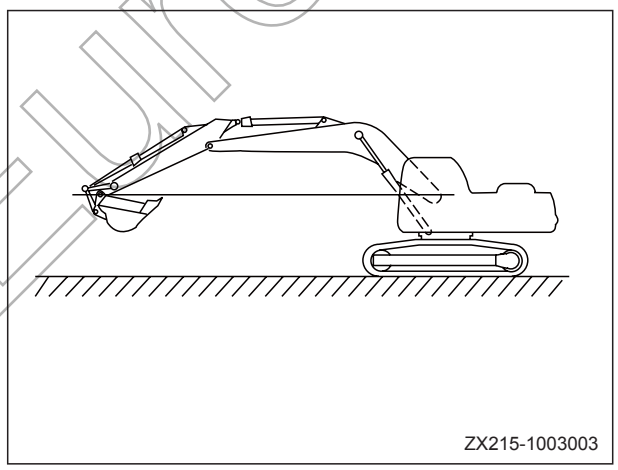


Fig. 5-2

Swing 2: Hydraulic drift of swing

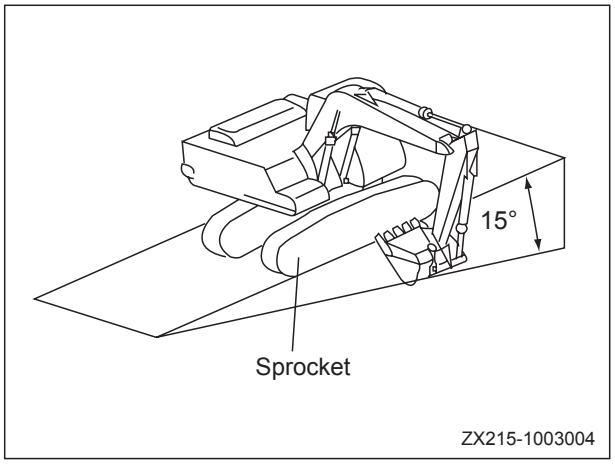


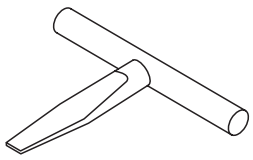
Fig. 5-3

6.2 Valve Clearance - Adjust

- Service Standard

Location	Service Item	Standard Value	Limits	Remedy
Air intake valve	Valve clearance (engine cold)	0.305	—	Adjust
Air outtake valve	Valve clearance (engine cold)	0.559	—	Adjust

- Special Tools

Symbol	Tool Name and Shape	Part Number	Application
a	Flat head screwdriver 	MH060008	Valve clearance adjustment (Vehicle mounted)

Check and adjust valve clearance in cold state as per the following procedures:

6.2.1 Testing

1. Remove the rocker arm cover.
2. Turn the No.1 piston or the No.6 piston to the top dead center of compression stroke by following the procedure below.
   a. Turn the engine until the top dead center on the crankshaft belt pulley aligns with the timing pointer.
   b. Turn the No.1 piston or the No.6 piston to the top dead center of compression stroke.

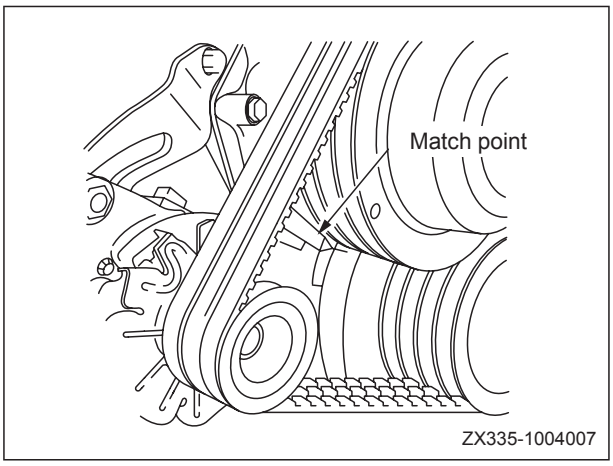


Fig. 6-4

6.4.2 Adjusting

1. Align the timing pointer with the specific mark on the crankshaft pulley.

2. Perform step 3 through step 6 described in the testing procedure.

3. Loosen the four (4) nuts on the fuel injection pump.

4. Injection timing turns the fuel injection pump in advance along the drive shaft of fuel injection pump in order to make it face outward (getting away from the cylinder block).

   Injection timing turns the fuel injection pump in retard along the drive shaft of fuel injection pump in order to make it face inward (approaching the cylinder block).

   Ref: 1 mm difference between the two marking lines approximates 2º of crankshaft angle.

5. Keep operating the hand pump to transfer the fuel while slowly turning the fuel injection pump. Stop turning the injection pump when no oil is seen coming out of the fuel delivery valve body of No.1 cylinder. Adjustment of fuel injection pump position is now finished.

6. Tighten the four (4) nuts of fuel injection pump.

7. Remove again the fuel delivery valve body and assemble the spool, spring and seat. Tighten the valve assembly to the specific torque.

8. Install the injection tube of No.1 cylinder and tighten it to the specific torque.

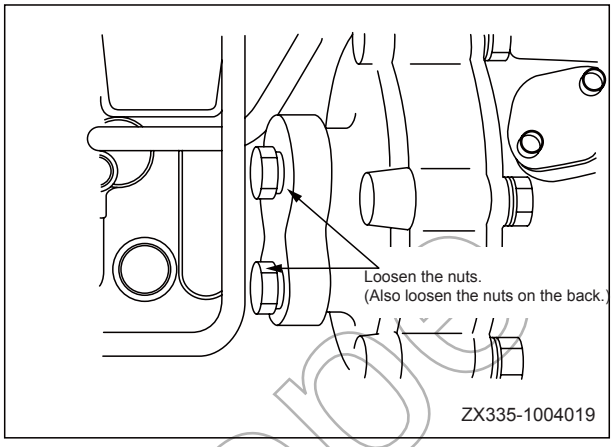


Fig. 6-16

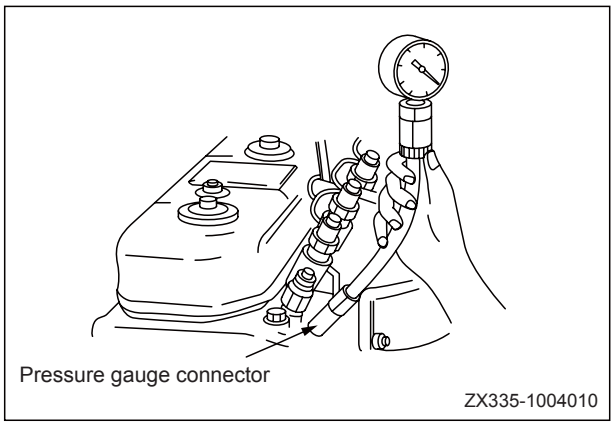


Fig. 6-17

- Pressure rises as the retainer turns right and pressure drops as the retainer turns left.
- One full turn of the retainer is equivalent to about 12.5 MPa {128 kgf/cm²}

Locknut:

53.5±4.9 N·m {5.5±0.5 kgf·m}

3) Check the pressure again after adjustment. Measure the pressure according to the procedure described above.

- Connect the pilot hose before measuring the pressure.
- Adjustment of the high pressure setting side will affect the low pressure setting side. The low pressure setting side is, therefore, to be adjusted too.

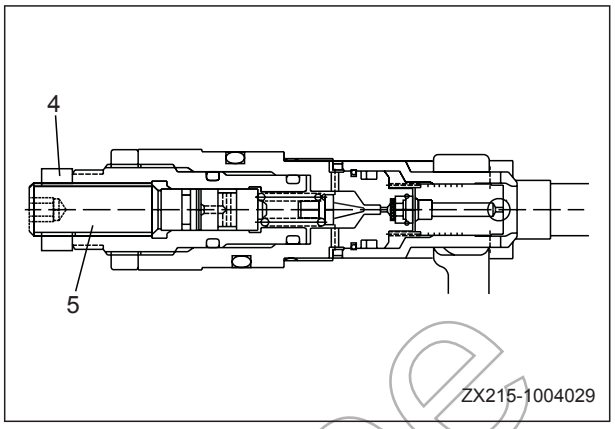


Fig. 6-29

6.15 Oil Leakage - Measure

6.15.1 Measure oil leakage from boom cylinder

1. Start the engine and keep the engine running until the hydraulic oil temperature reaches a point within the operational range. Fully extend the boom cylinder.

   Release the residual pressure in the circuits. See **"Residual Pressure in Hydraulic Circuit - Release" on page 6-34**.

2. Disconnect the hose (1) on the cylinder head side and blind the hose end with a cap.

   Be careful not to disconnect the hose on the cylinder bottom side.

3. Start the engine and apply relief pressure to the bottom side of the cylinder while the engine is running at high idle.

4. Hold this condition for 30 seconds. Measure oil leakage for one minute.

5. Make sure that the machine returns to its normal condition after measurement.

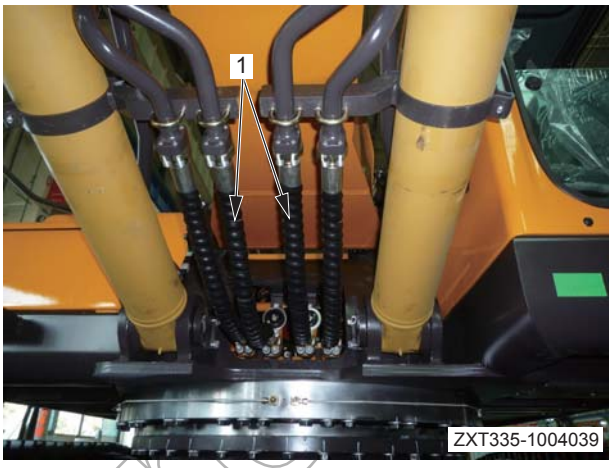


Fig. 6-39

7 TROUBLESHOOTING

7.1 Points to Remember When Troubleshooting

- Stop the machine on a level ground, and check that lock pins, blocks, and parking brake are securely fitted.
- When carrying out the operation with two or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.
- If the radiator cap is removed when the engine is hot. Hot coolant may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.
- Be extremely careful not to touch any hot parts or to get caught in any rotating parts.
- When disconnecting wiring, always disconnect the negative (–) terminal of the battery first.
- When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first. When installing measuring equipment, be sure to connect it properly.

The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure.

When carrying out troubleshooting, important point is to understand the structure and function.

However, a short cut to effective troubleshooting is to ask the operator various questions to form some idea of possible causes of the failure that would produce the reported symptoms.

1. When carrying out troubleshooting, do not hurry to disassemble the components.

   If components are disassembled immediately any failure occurs:

   - Parts that have no connection with the failure or other unnecessary parts will be disassembled.
   - It will become impossible to find the cause of the failure.

   It will also cause a waste of man-hours, parts, or oil or grease, and at the same time, will also lose the confidence of the user or operator.

   For this reason, when carrying out troubleshooting, it is necessary to carry out thorough prior investigation and to carry out troubleshooting in accordance with the fixed procedure.

7.4.6 SWP connectors

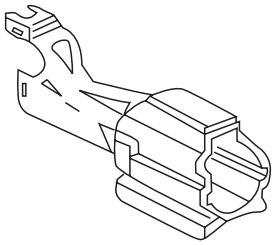
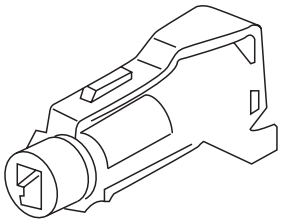
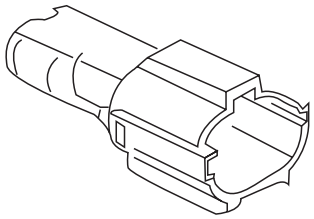
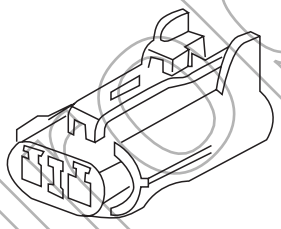
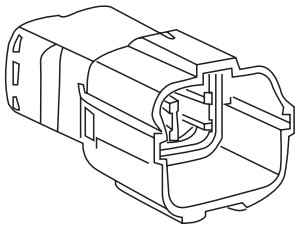
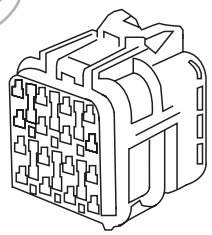
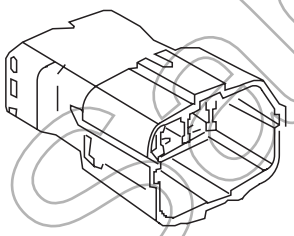
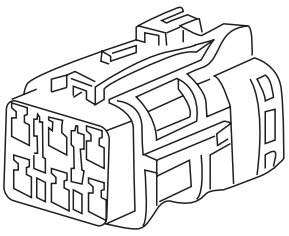
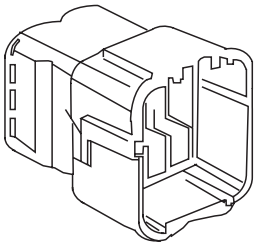
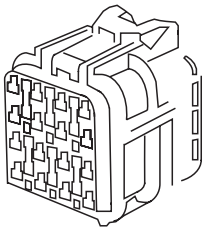
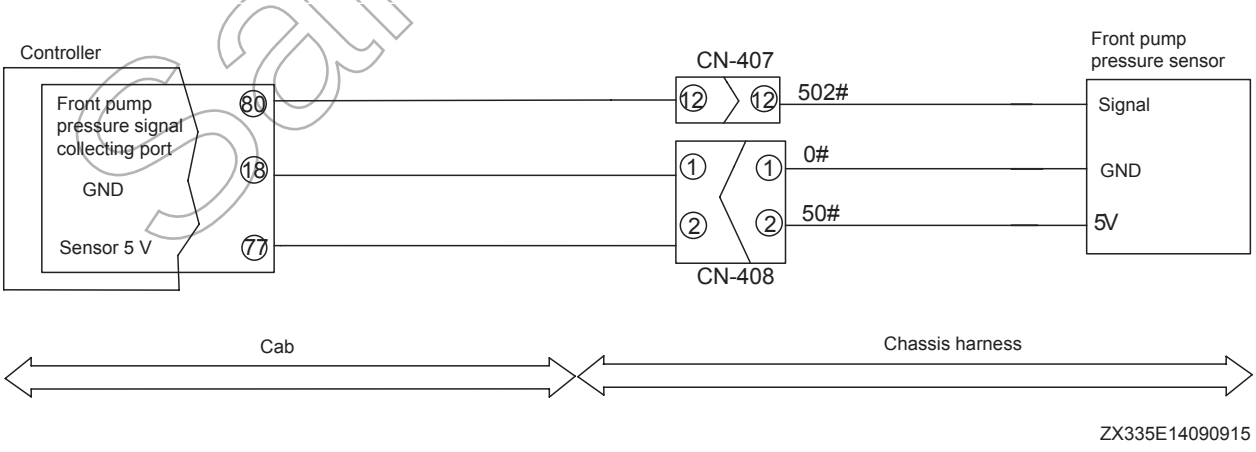
Male (Plug)	Female (Socket)
	
7222-7414-40	7123-7414-40 (No.of pin: 1)
	
7222-1424-40	7123-1424-40 (No.of pin: 2)
	
7222-7464-40	7123-7464-40 (No.of pin: 6)
	
7222-7484-40	7123-7484-40 (No.of pin: 8)
	
7222-7564-40	7123-7564-40 (No.of pin: 16)

Fig. 7-10

E321 Rear pump output pressure abnormal

Failure Code	Service Code	Trouble	Reading of rear pump output pressure is abnormal. Only output alarm is enabled. .
21	E321		
Failure description	A pressure feedback voltage other than 0.25~4.75V lasts more than 3 seconds when the power is on.		
Response from controller	Only output alarm is enabled.		
Symptom of machine	—		

Possible causes and standard value in normal state	Cause		Standard value in normal state/References for troubleshooting		
	1	Failure of 5V power supply	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between 1 and 2 of CN-408	Voltage	About 5V
	2	Open circuit of signal wire	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between CN407 12 and controller port pin 80	Resistance	≤1Ω
			Between CN-408 2 and ground		≤1Ω
	3	Short circuit of signal wire (grounded)	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between CN-408 2 and ground	Resistance	≥2MΩ
	4	Failure of sensor	★ Turn engine start switch to OFF position. Then, keep it in the ON position to perform troubleshooting.		
			Between CN-407 12 and ground	Voltage	0.5±0.2V
	5				



ZX335E14090915

Fig. 7-17

E434 Front pump proportional solenoid coil over-current

Failure Code	Service Code	Trouble	Front pump proportional solenoid coil over current. The system operates slowly.
34	E434		
Failure description	Front pump proportional solenoid valve Current above 1300 mA and lasts for 3 sec.		
Response from controller	Stop the solenoid coil when failure is detected. Power supply must be restored.		
Symptom of machine	System operates slowly.		

Possible causes and standard value in normal state	Cause		Standard value in normal state/References for troubleshooting		
	1	Open circuit of wire harness	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between CN-434 1 and controller pin 104	Resistance	≤1Ω
			Between CN-434 2 and ground		≤1Ω
	2	Short circuit of wire harness (grounded)	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between CN-434 1 and wire 0#	Resistance	≤1MΩ
	3	Failure of proportional valve coil	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Unplug connector CN-434, and measure resistance between 1 and 2 of solenoid valve	Resistance	17.5Ω
	4	Failure of controller	No troubleshooting can be done for failure occurs in the inner of controller. (Except for the above reasons, the controller must be replaced in case of this failure.)		
	5				

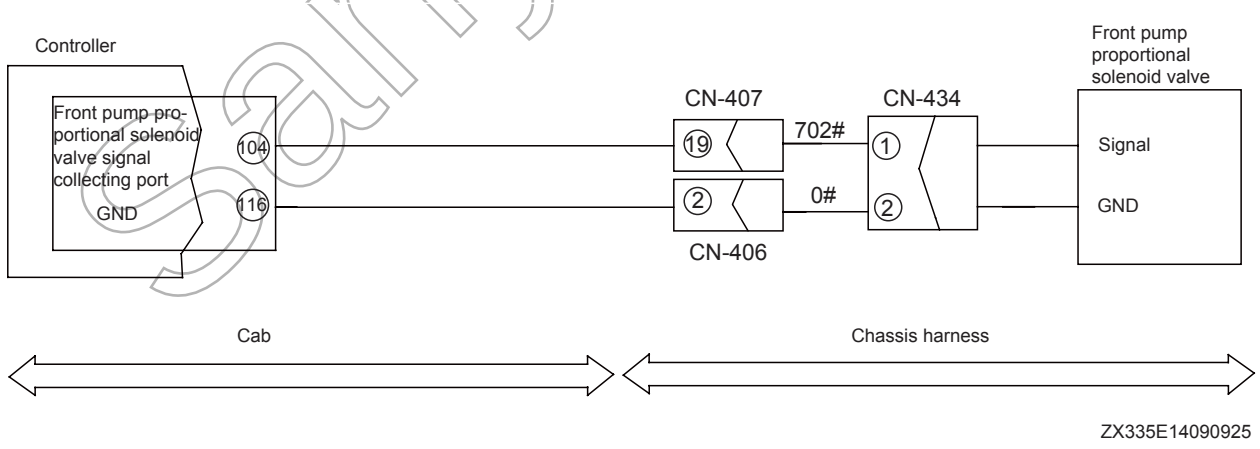


Fig. 7-27

E-5 Preheating function fails

Trouble	Engine does not preheat.
Related information	

Possible causes and standard value in normal state	Cause		Standard value in normal state/References for troubleshooting		
	1	Failure of preheat fuse	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between wire 21# and preheat relay pin 3# (contact)	Resistance	≤1Ω
	2	Short circuit of wire (grounded)	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between preheat relay pin 3# and ground	Resistance	≥1 MΩ
	3				

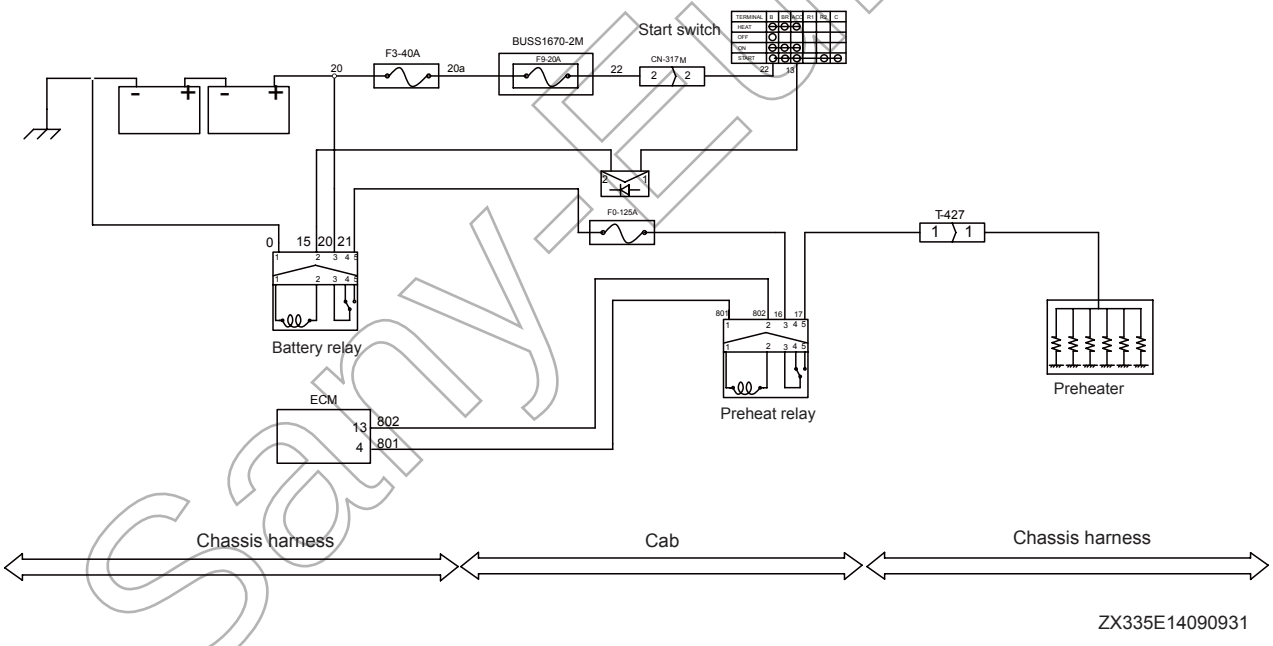


Fig. 7-33

E-16 Wiper does not work

Trouble	Wiper does not work
Related information	

Possible causes and standard value in normal state		Cause	Standard value in normal state/References for troubleshooting		
	1	Internal failure of wiper motor	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between wiper wire 21# and ground	Resistance	>10Ω
	2	Open circuit of wire	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Between 2 of CN504F and 2 of CN-122	Resistance	≤1Ω
			Between wiper switch wire 35L# and 5 of CN-122		≤1Ω
			Between wiper switch wire 35H# and 4 of CN-122		≤1Ω
	3	Short circuit of wire (grounded)	★ Turn engine start switch to OFF position. Keep it in the OFF position to perform troubleshooting.		
			Harness (from CN-504F 5 to CN-122 2) and ground	Resistance	≥1MΩ
	4				

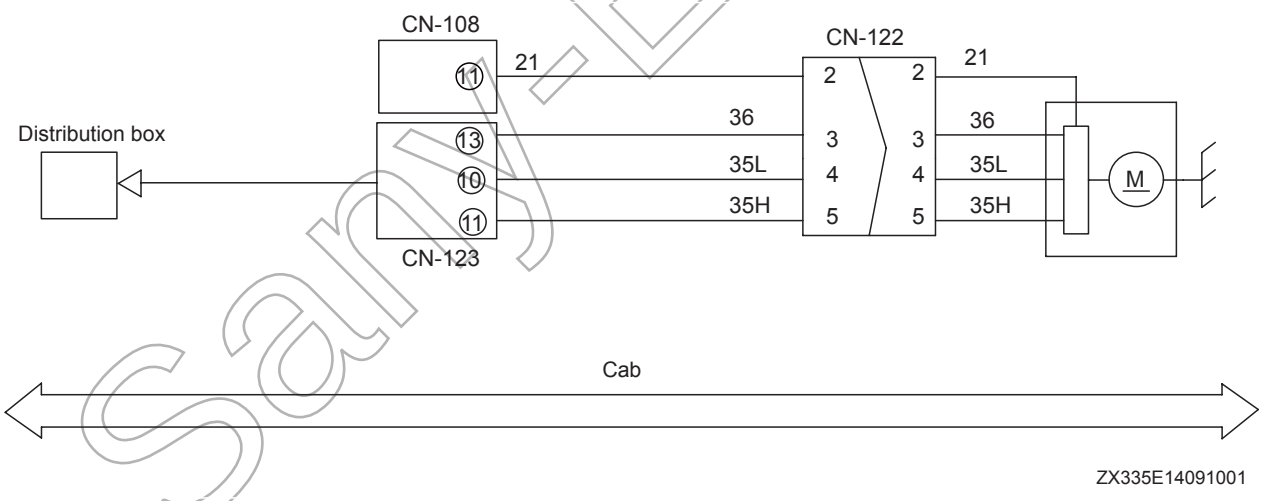


Fig. 7-43

7.4.11 Troubleshooting of Hydraulic and Mechanical Systems (H - Mode)

H-8 Bucket speed or power is low

Trouble	● The bucket moves slowly.
Related information	● Set working mode to (S) and fuel control dial at position (10) to carry out troubleshooting.

<table>
<tr><th rowspan="10">Possible causes and standard value in normal state</th><th colspan="2">Cause</th><th colspan="2">Standard value in normal state/References for troubleshooting</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Malfunction of right pilot valve (bucket circuit)</td><td colspan="2">★ Stop the engine. Perform troubleshooting while the engine is running at high idle.</td></tr>
<tr><td>Bucket control lever</td><td>Pilot valve output pressure</td></tr>
<tr><td>"NEUTRAL"</td><td>0 {0}</td></tr>
<tr><td>Bucket CURL or Bucket DUMP</td><td>≥3.5MPa
{36 kg/cm²}</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Failure of pressure sensor</td><td colspan="2">★ Stop the engine. Perform troubleshooting while the engine is running at high idle.</td></tr>
<tr><td colspan="2">Check the pressure sensor by replacing it with a new one.</td></tr>
<tr><td>3</td><td>Malfunction of bucket control valve (spool)</td><td colspan="2">Spool of bucket control valve may have malfunction. Check it directly.</td></tr>
<tr><td>4</td><td>Malfunction or defective seal of bucket control valve (relief valve and makeup valve)</td><td colspan="2">Relief valve and makeup valve in bucket control valve may have malfunction or defective seal. Check the valves directly.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Failure of bucket cylinder</td><td colspan="2">★ Stop the engine. Perform troubleshooting while the engine is running at high idle.</td></tr>
<tr><td colspan="2">Charge the bucket with a load of approximate 1260 kg. Cut off the oil passage to the high-pressure side of the cylinder. Disconnect the cylinder from the main valve. Measure the displacement of piston for 15 minutes after the cylinder becomes stable. If the measured value is greater than 10 mm, it is deemed that cylinder has a defective seal. For more information on the measuring procedure, see "Work Equipment Hydraulic Drift - Test" on page 6-32.</td></tr>
</table>

H-19 Swing operation fails

Trouble (1)	• Upper structure fails to swing in either direction.
Related information	• Set working mode to (S) and fuel control dial at position (10) to carry out troubleshooting.

Possible causes and standard value in normal state	Cause		Standard value in normal state/References for troubleshooting	
	1	Malfunction of swing motor (parking brake)	Parking brake of swing motor may have malfunction. Check it directly.	
	2	Improper adjustment or malfunction of swing motor (relief valve)	★ Stop the engine. Perform troubleshooting while the engine is running at high idle.	
			Swing control lever	Swing relief pressure
			Swing relief	25.5~28.5 MPa {260~291 kg/cm²}
			If oil pressure does not become normal after adjustment, swing motor relief valve may have malfunction or internal defect. Check the relief valve directly.	
	3	Failure of swing motor	★ Stop the engine. Perform troubleshooting while the engine is running at high idle.	
			Swing control lever	Leakage from swing motor
			Swing relief	≥10 ml/min
	4	Failure of swing mechanism	Swing mechanism may have internal defect. Check it directly. ★ Internal defect of swing mechanism can be determined with abnormal noise, overheat, and metal powder or debris contained in the oil drained.	

Trouble (2)	• Upper structure only fails to swing in one direction.
Related information	• Set working mode to (S) and fuel control dial at position (10) to carry out troubleshooting.

Possible causes and standard value in normal state	Cause		Standard value in normal state/References for troubleshooting	
	1	Malfunction of pilot valve	★ Stop the engine. Perform troubleshooting while the engine is running at high idle.	
			Left control lever	Pilot valve output pressure
			"NEUTRAL"	0 {0}
			Swing	≥3.5MPa {≥36 kg/cm²}
	2	Malfunction of swing control valve (spool)	Spool of swing control valve may have malfunction. Check it directly.	
	3	Defective seal of swing motor (makeup valve)	Seal of makeup valve in swing motor may have defect. Check it directly. ★ Failure of the seal can be determined by swapping the right and left makeup valves and check for any changes.	

8.4 Injection Pump AS

8.4.1 Removal

NOTICE

- **Disconnect the cable from negative post of the battery before proceeding.**

1. Discharge engine coolant.

   Volume: 52 L

2. Open engine hood (1) and radiator cover (2).

3. Disconnect air intake steel tube (3) and hose (4).

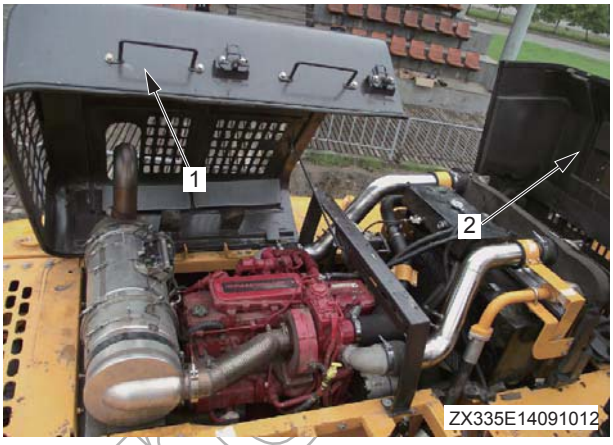


Fig. 8-2

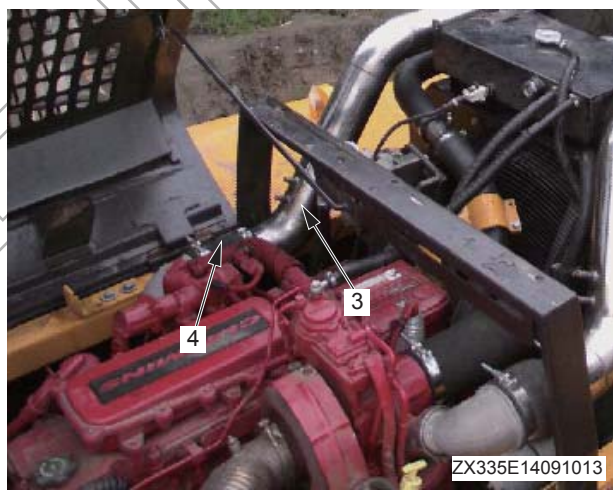


Fig. 8-3

4. Disconnect the pipe lines (5) and (6) between fuel filter and fuel injection pump.

5. Remove fuel filter bracket (7), fuel filter assembly (8) and crankcase vent pipe (9). Disconnect cable (10).

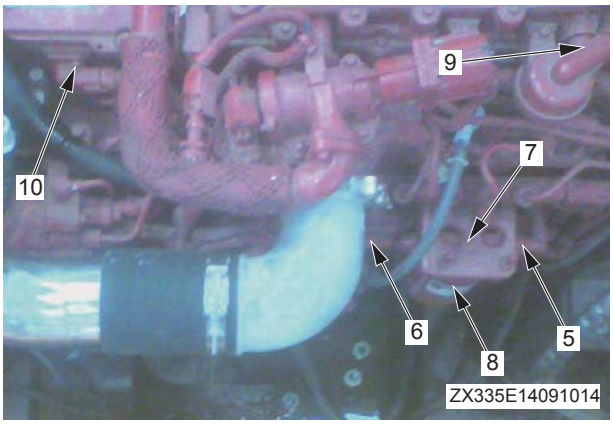


Fig. 8-4

5. Remove intercooler air intake tube (6), air outtake tube (7) and bracket (8).

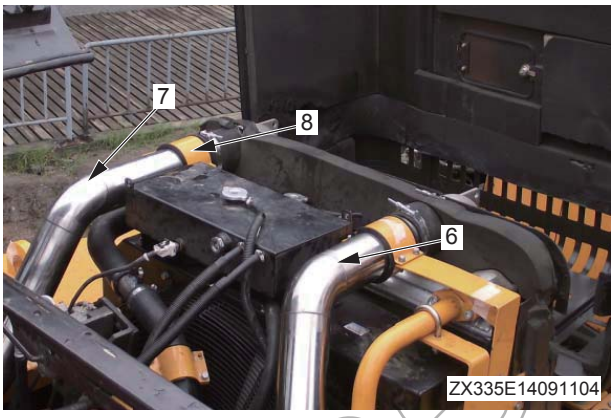


Fig. 8-22

6. Remove water compensation pipe (9), auxiliary tank air pipe (20) and water level sensor cable (11).

7. Disconnect engine coolant delivery hose (12).

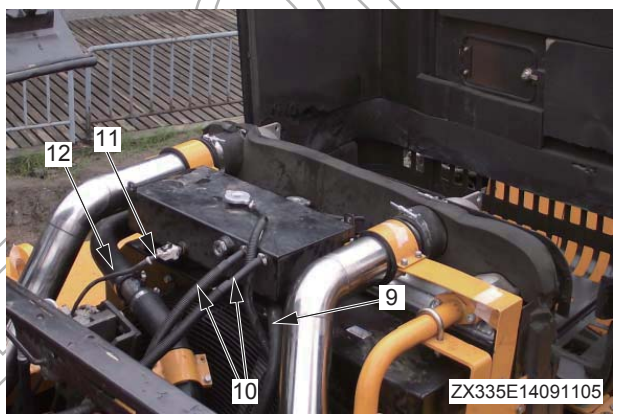


Fig. 8-23

8. Remove engine coolant feeding hose (13).

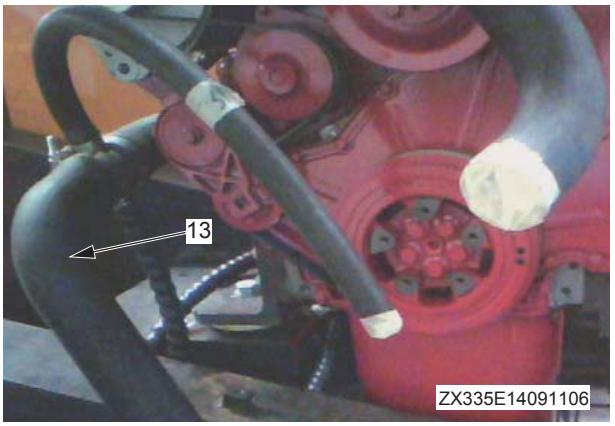


Fig. 8-24

8.10.2 Installation

- Installation is to be performed in the reverse order of removal.

※1

Mounting bolts (final drive assembly): 245~309 N·m {25~31 kgf·m}

- Hydraulic oil adding

  Add hydraulic oil through the filler opening to the specified level. Start the engine to circulate oil in the hydraulic system, and check the oil level again.

- Air bleeding

  For more information, see **“Air in Each Component - Bleed” on page 6-40**.

8.11 Swing Motor and Swing Drive AS

8.11.1 Removal

Release the residual pressure in the hydraulic circuit. Refer to **“Residual Pressure in Hydraulic Circuit - Release” on page 6-34**.

Lower the work equipment to the ground. Stop the engine. Press the release button of the breather valve to release residual pressure in the hydraulic tank. Place the hydraulic lockout control in the LOCK position.

1. Disconnect the hoses (1) to (7).

    1) Between hydraulic tank and swing motor (port DR)

    2) Between central swivel joint and swing motor (port DR)

    3) Between swing motor and main valve (port M)

    4) Between swing motor and main valve (port HA)

    5) Between swing motor and main valve (port HB)

    6) Between swing motor and solenoid valve block (port PG)

    7) Between swing motor and main valve Px port (port SH)

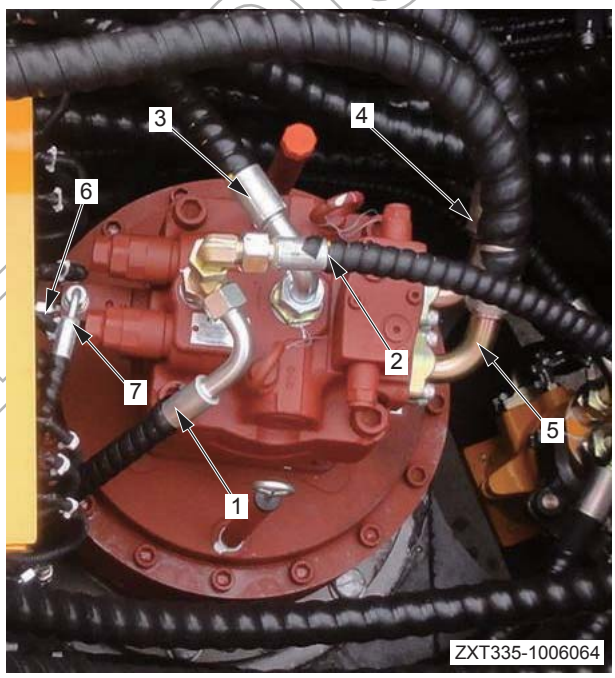


Fig. 8-73

2) Install No. 1 carrier assembly (3) and the plate (4).

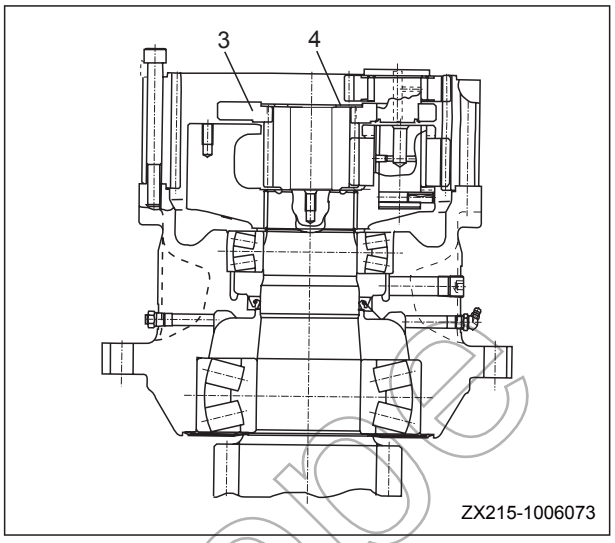


Fig. 8-95

9. No. 1 sun gear assembly

Install No. 1 sun gear (2).

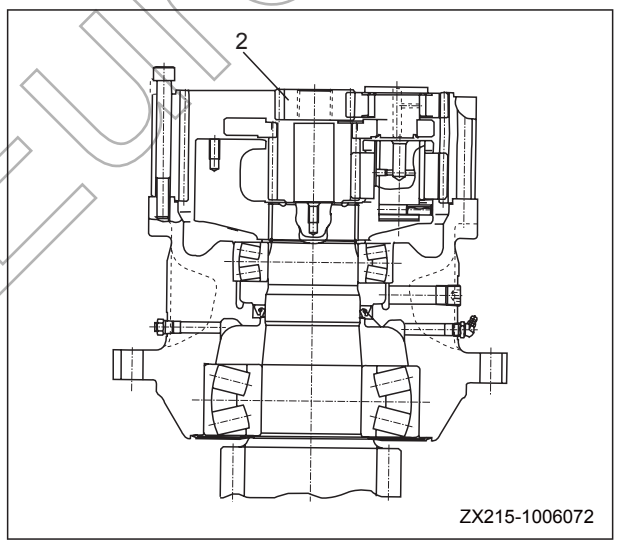


Fig. 8-96

8.15 Swing Bearing AS

8.15.1 Removal

1. Remove the swing frame assembly. Refer to **“Swing Frame AS” on page 8-65**.

2. Dismount the 36 bolts (1) to remove the swing bearing assembly.

※1

Fig. 8-115

3. Hoist the swing bearing assembly (2).

※2

Swing bearing assembly: 583 kg

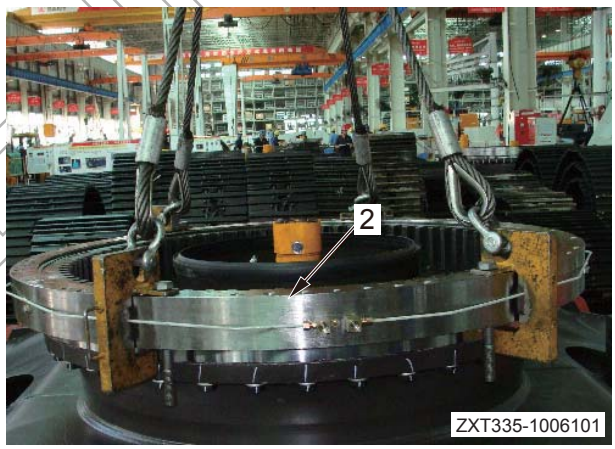


Fig. 8-116

8.17.4 Assembly

1. Install the dust seal (11) on the rotary shaft (12).

   ★ Let the lip face the housing while installing the dust seal.

2. Install O-ring (10), gasket (9) onto rotary block (6).

3. Fix the rotary shaft (12) on a work bench. Install the rotary block (6) on the shaft (12).

   ★ Since the clearance between the rotary block (6) and the shaft (12) is approximately 0.1 mm, install the rotary block (6) on the shaft (12) slowly and vertically. Be careful not to damage the seals and the O-ring seal.

4. Use a rubber hammer to tap the rotary block (6) in order to match the rotary shaft (12) properly.

5. Install O-ring (3), retaining ring (7) onto rotary block.

6. Install the cover (2). Tighten the bolts (1).

   Fixing bolts: 49 N·m{5 kgf·m}

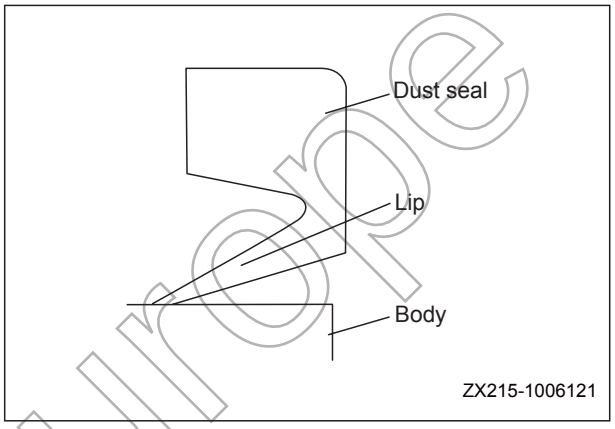


Fig. 8-132

8.20 Hydraulic Pump AS

8.20.1 Removal

Lower the work equipment to the ground and stop the engine. Press the release button of the breather valve to release residual pressure in the hydraulic tank.

Disconnect the cable from the negative (-) post of the battery before performing the job.

★ Tag each line so as to ensure correction installation.

1. Remove the oil inlet filter element from the hydraulic tank and stop oil outflow with an oil stopper.

   ★ If no oil stopper is used, remove the drain plug and drain the oil from the hydraulic tank and from circuits.

   Hydraulic tank: Approx. 380 L

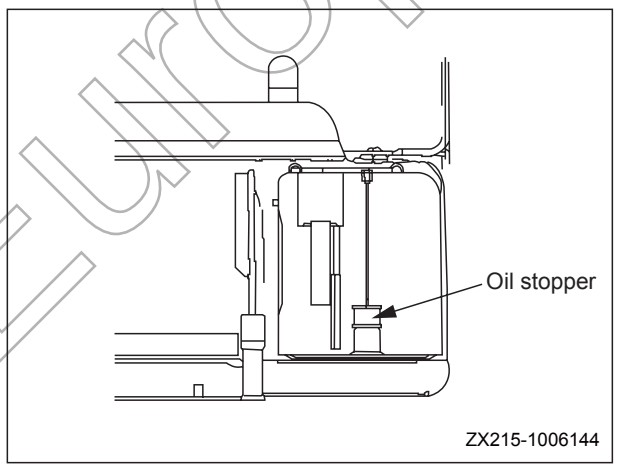


Fig. 8-156

2. Lift the engine hood (1).

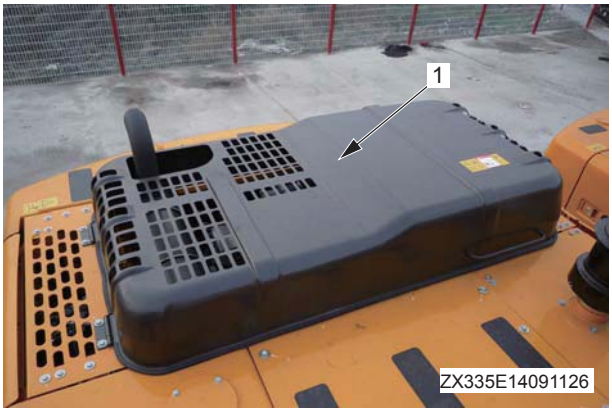


Fig. 8-157

8.24.1 Disassembly

1. Drain the oil and remove the tubing.

2. Fix the cylinder.

   - Fix the cylinder in a vertical or level manner. A vertically fixed cylinder can be disassembled and assembled easily.

   - The pin bore in the head end can be used for fixing of the cylinder. The pin roll can prevent the cylinder from turning.

   - Remove the tubing in case of tubing interference while fixing the cylinder.

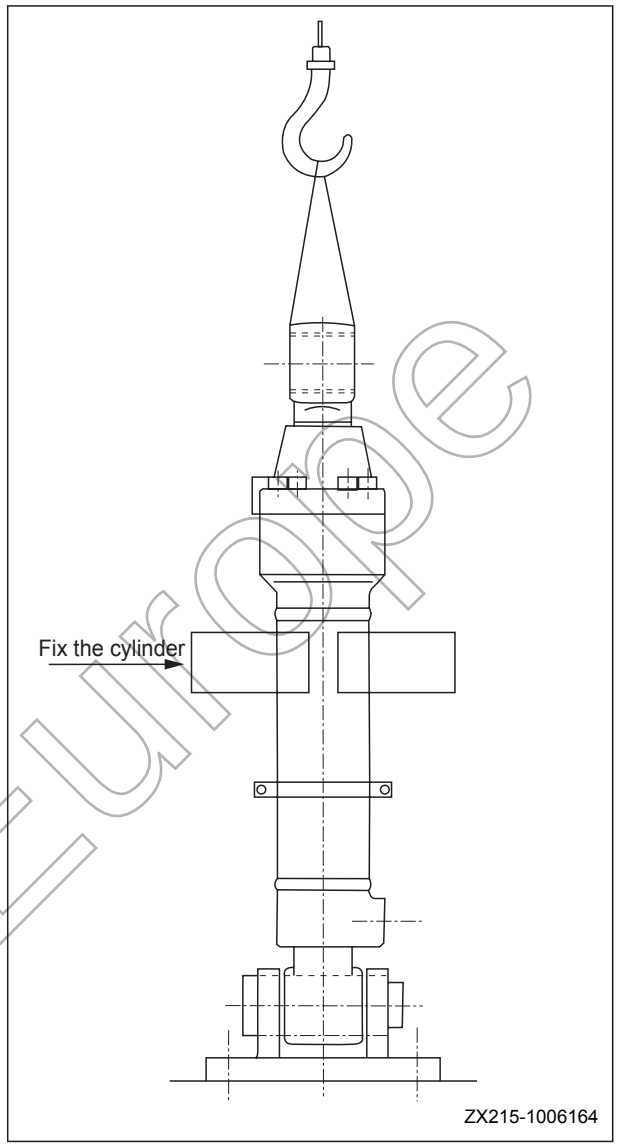


Fig. 8-173

3. Removal of cylinder head

   - Unscrew the bolts with Allen Wrench.

   - Using an extension rod, as shown in the illustration on the right, will make the work easy.

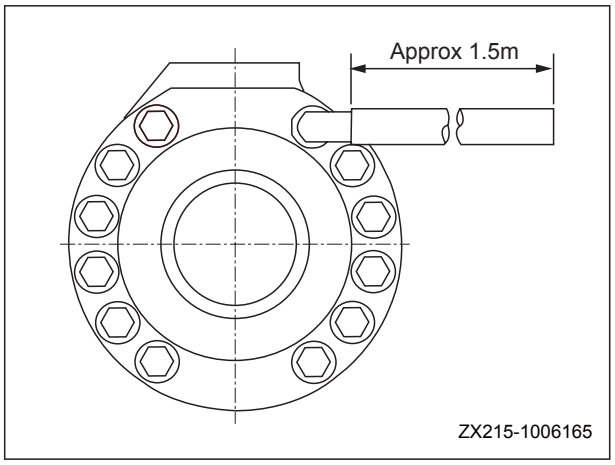


Fig. 8-174

8.25 Work Equipment AS

8.25.1 Removal

Fully extend the arm and the bucket. Lower the work equipment to the ground. Move the hydraulic lockout control to the LOCK position.

Release residual pressure in the hydraulic circuit. See **“Residual Pressure in Hydraulic Circuit - Release” on page 6-34**.

1. Disconnect the grease hose (1).
2. Lift the boom cylinder assembly (2). Remove the lock bolt (3).
3. Remove the plate (4) and then the pin (5).

※1

★ There are shims installed. Count the shims and check the thickness. Place the shims in a safe place.

4. Start the engine and retract the piston rod.

★ Secure the piston rod with a wire rope in order to prevent the piston from slipping out. Place the cylinder on a bench or support. The grease fitting on the bottom side must be removed in the later case.

★ Remove the other boom cylinder in the same way.

5. Remove the hose (6) and the hose (7) of the cylinder.

★ Cork the hoses to prevent outflow of oil. Secure the hoses to the side of valve.

6. Remove the inter-connector (8) used for work lamp.

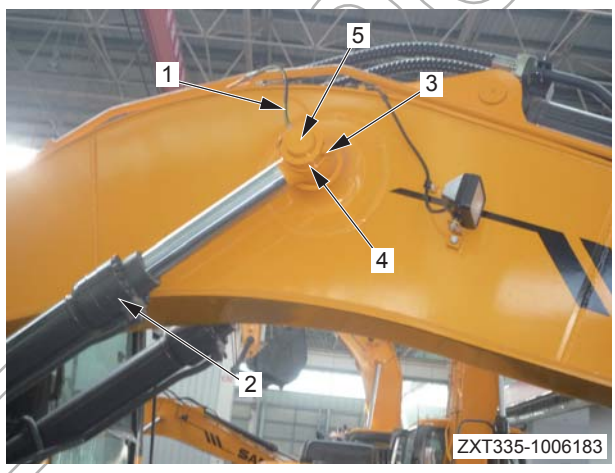


Fig. 8-195

Fig. 8-196

5. Remove external air filter (9).

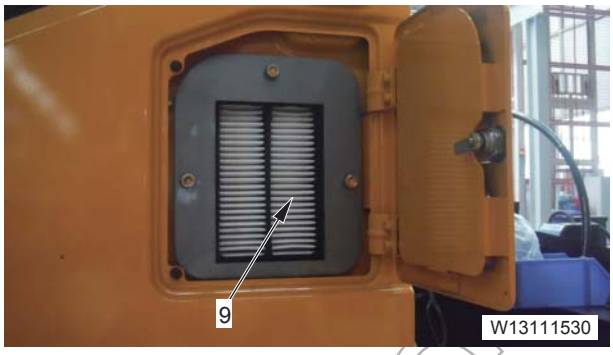


Fig. 8-217

6. Disconnect the external air duct (10).

Fig. 8-218

7. Remove the storage box on the armrest (11).

Fig. 8-219

3) Apply priming paint (for painted surface) evenly onto the surface where sealing rubber is to be adhered and where adhesive agent is to be applied (on the cab (8)).

Priming paint (for painted surface): Sunrise MSI Primer 24

- Do not apply primer more than twice; otherwise, the performance of the primer will be reduced.

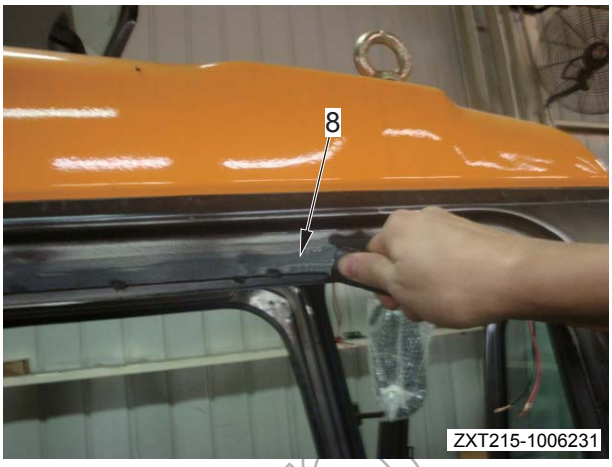


Fig. 8-240

- Applying location: Cover the whole area of (a). Dimension of (a): 25mm

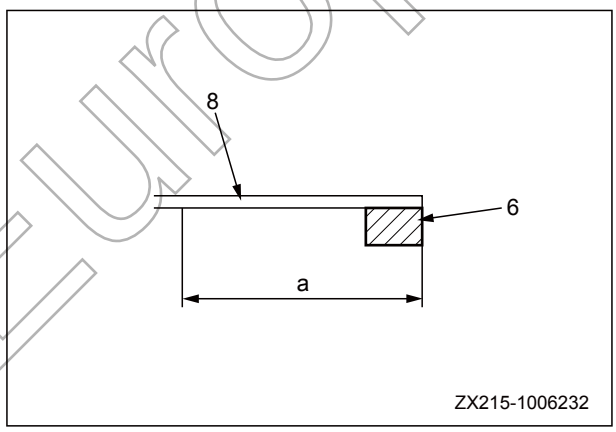


Fig. 8-241

- Besides the above locations, apply primer also onto the right window glass and the cab door lower window glass.
  - Additional priming area on the right window glass: (b)

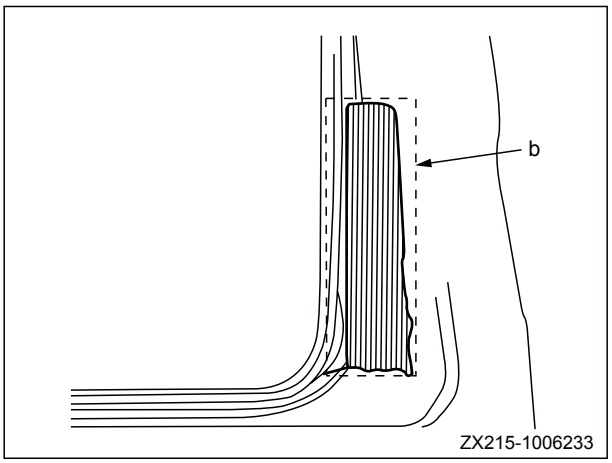


Fig. 8-242

2) Use foam polystyrene blocks (9) and rubber band (10) to fix the glass and the rubber seal as illustrated.

9. After the glass has been fixed, remove all the remaining primer and adhesive on the cab and on the glass.

   - Clean the adhesive with unleaded gasoline before it is hardened.
   - Do not apply impacting force onto the glass when cleaning it.

10. Protection of fixed window glass

    1) Remove the positioning chips, foam polystyrene blocks and the rubber band after 10 hours.

       (Condition: Temperature: 20; humidity: 60%)

    2) Wait for another 14 hours after the removal of positioning chips, foam polystyrene blocks and rubber band before operating the machine.

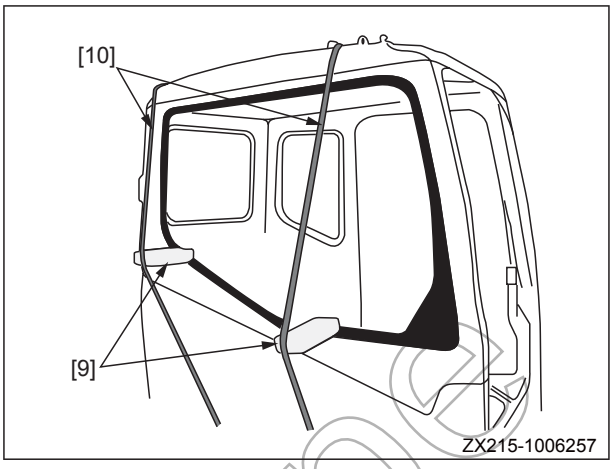


Fig. 8-267

8.32 Radio

8.32.1 Structure

1. Main structure

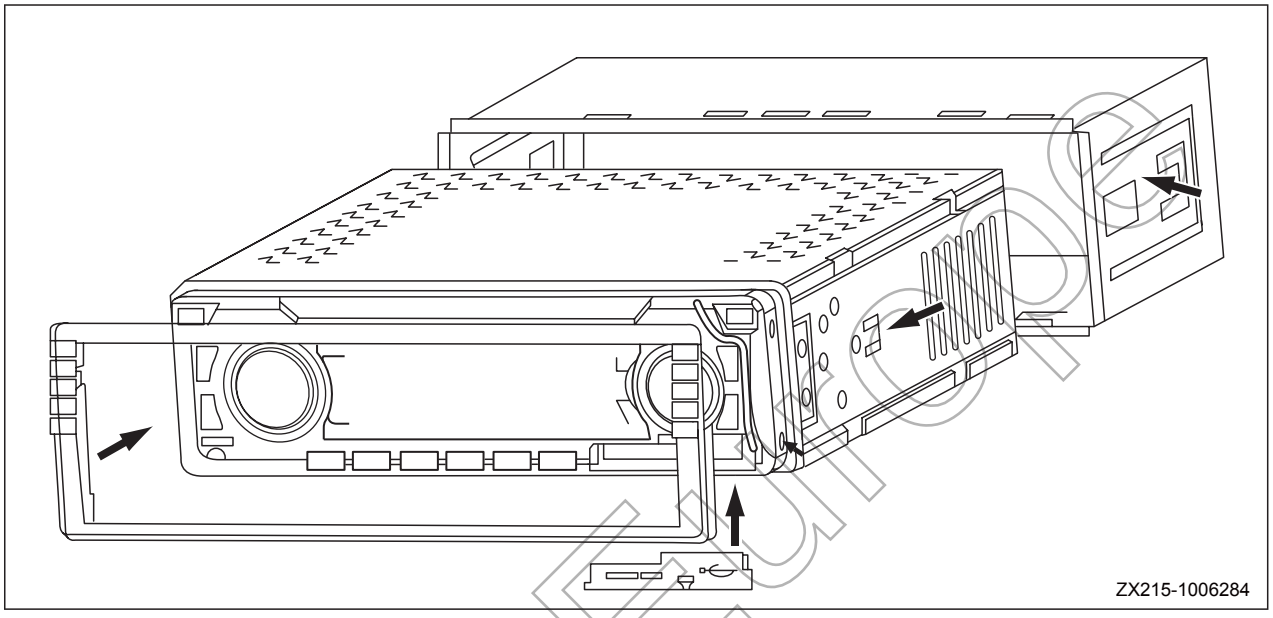


Fig. 8-292

2. Wiring

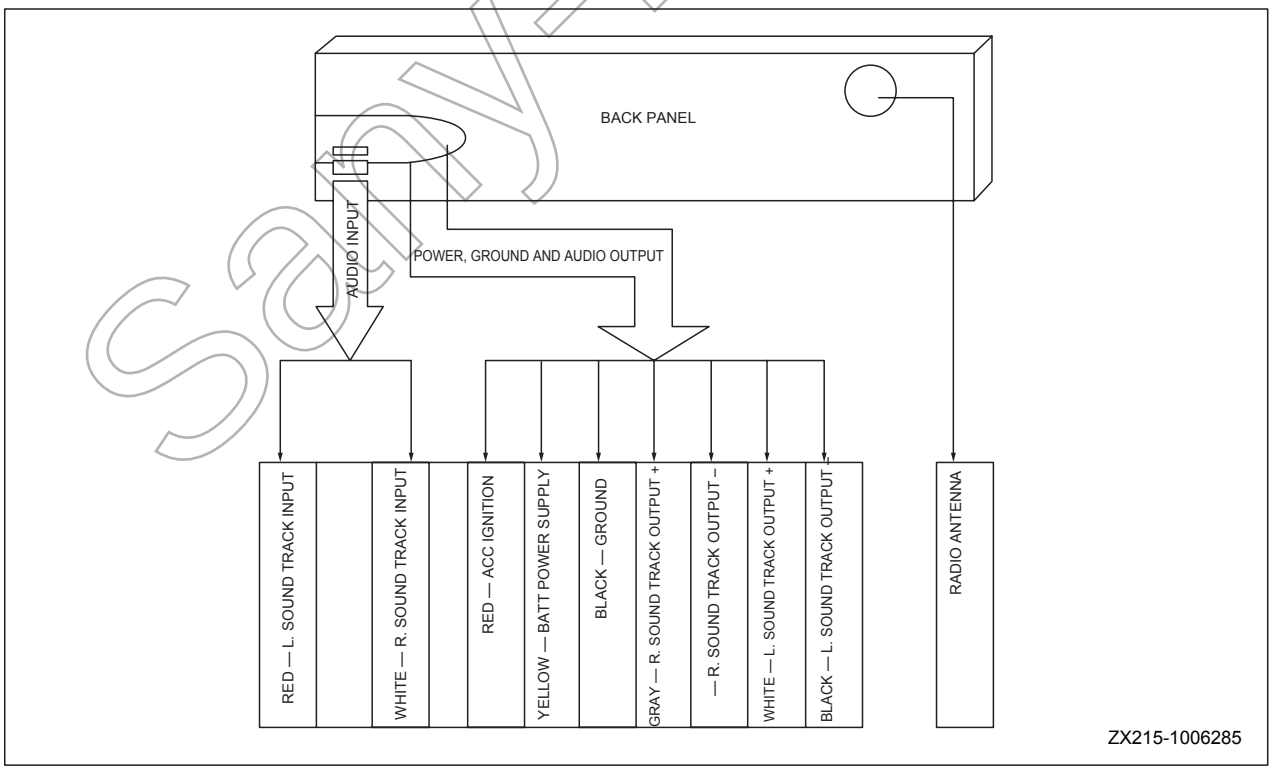


Fig. 8-293

8.36 Wiper

8.36.1 Structure

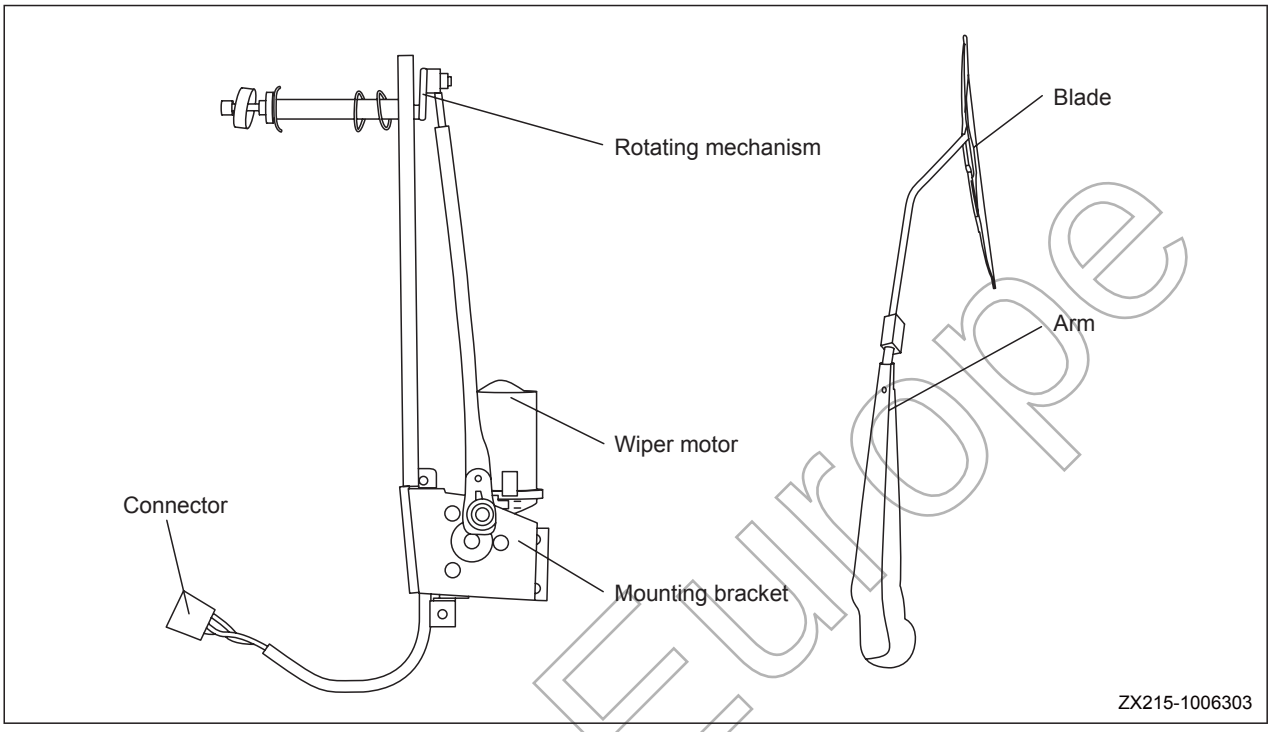


Fig. 8-310

8.36.2 Working principle

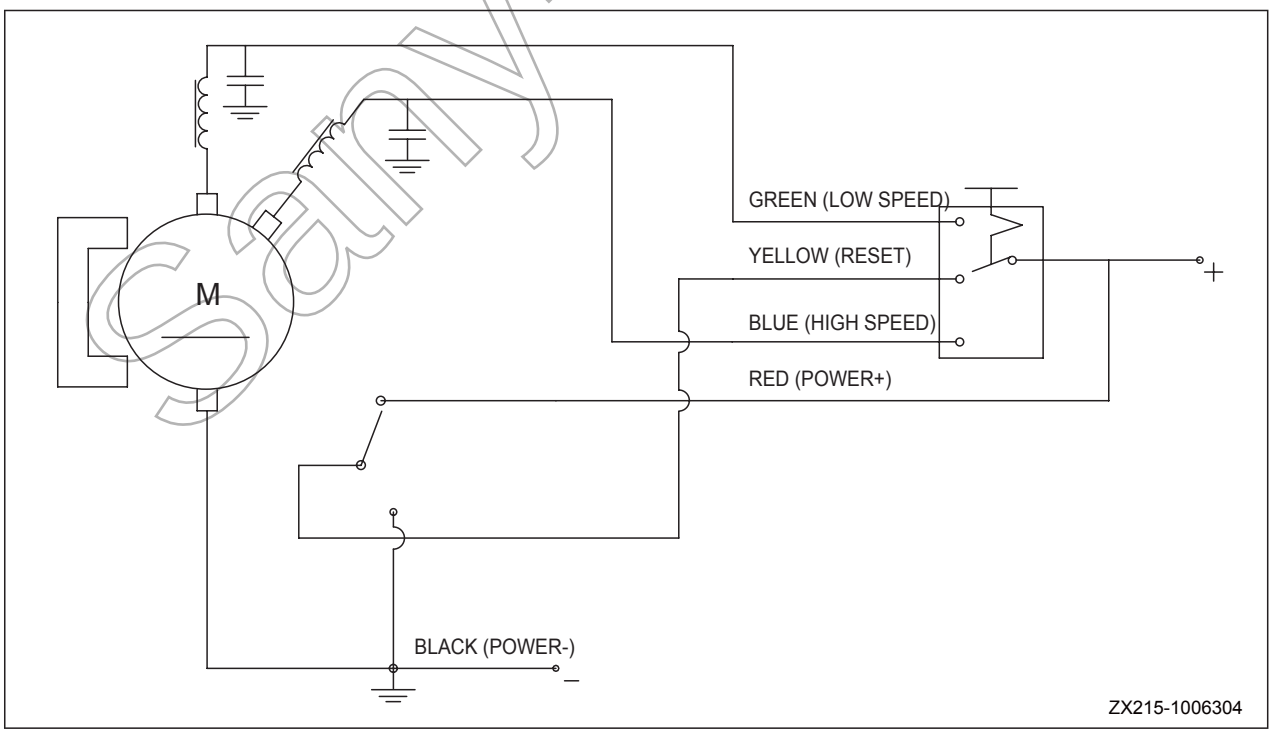


Fig. 8-311