YANMAR
SERVICE MANUAL

EXCAVATOR

MODEL SV15/SV17(EX)

1. GENERAL CAUTIONS FOR MAINTENANCE WORK

1. General Cautions for Maintenance Work

1-1 Correct Work

Correct work means the quickest possible completion of according to the correct procedures and the specified standards.

It is important when conducting certain operations always to bear in mind the equipment, tools, gauges, materials, oil and grease, etc. that you must have ready, as well as items to be checked, adjusted, or disassembled, and cautions to watch out for.

1-2 Safety Precautions

(1) Never attempt servicing while engine is running or immediately after stopping operation.
(2) Wear work cloths, safety shoes and helmet.
(3) Check the equipment and tools before use. Especially, be sure to check the crane, lifting equipment and tools.
(4) When working together with other persons, allocate everyone's share of job, arrange the signals and act in concert with the other persons.
(5) The operation of the crane and slinging work must be performed by qualified persons.
(6) Do not enter or pass under the raised load.
(7) Lift and support the massive parts by crane before removing the installation bolts.
(8) Disconnect cables from battery before repairing the electric system.
(9) Remove the battery when welding the machine.

1-3 Preparations

(1) Check the service record of the machine. (That is, check how many months or hours the machine has been used since the preceding overhaul, what was the trouble then and what parts were replaced.)
(2) Have all servicing tools ready, i.e., tools, measuring devices (which have received periodic maintenance), containers, oil & grease, etc.
(3) Have the service literature (operation manual, parts catalog, etc.) ready.

1-4 Cautions for Disassembly and Reassembly

(1) Clean the machine before disassembly.
(2) Check and record the condition of the machine before disassembly :
  • Model, machine number, operation hours
  • Reasons for repair, history of repair
  • Contamination of filters
  • Fuel and oil condition
  • Damage to parts, etc.
(3) Place alignment marks on the necessary parts to facilitate reassembly.
(4) Clean all the removed parts and new replacement parts and put them in order.
(5) Use new seals, split pins, etc. for reassembly.

1-10 Air Release of Hydraulic Equipment

When operating the machine after disassembly or parts replacement of the hydraulic equipment, piping, etc., be sure to release air from the hydraulic system. This is necessary to prevent seizure and cavitation of the hydraulic equipment. If the air is left in the hydraulic system, the air is compressed or expanded depending on the load, having an adverse effect on the smooth operation of the hydraulic equipment and shortening the service life.

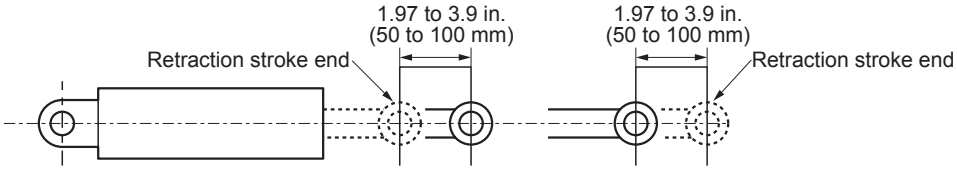
1. Air Release of Each Hydraulic Component

Run the engine at medium speed and activate the respective circuits for about 10 to 15 minutes.

2. Air Release of Hydraulic Cylinders

1) Set the Engine Speed at Low Idling Range.

2) Extend and Retract the Cylinder Up to 1.97 to 3.9 in. (50 to 100 mm) from Each Stroke End Slowly 4 or 5 Times.



Note :

The extension and retraction stroke is up to 1.97 in. (50 mm) from each stroke end for the blade cylinder.

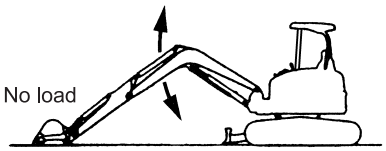
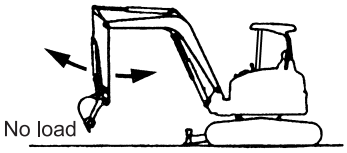
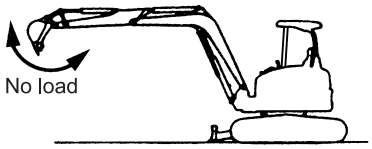
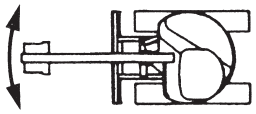
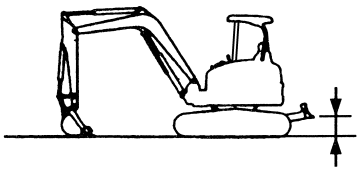
3) Then, Fully Extend and Retract the Cylinder 3 or 4 Times.

2. TECHNICAL DATA

Item			Unit	SV15	SV17	SV17EX
Electrical equipment						
	Alternator	Type		AC generator magnet		
		Nominal output	V-A	12-40		
		Rated speed	min^{-1} (rpm)	3500		
	Current limiter	Type		RS5121		
		Regulation voltage	V	14.0 to 16.0		
	Starter motor	Type		Reduction type		
		Nominal output	V-kW	12-1.4		
		Engagement		Magnet shift		
	Stop motor	Type	-	-		
		Nominal output	V-A	-		
	Stop solenoid	Type	-	1503ES-12S5SUC12S LC01		
		Maximum input	V-A	12-41.5		
	Hour meter		V-W	12-12		
	Horn		V-W	12-48		
	Fuse		A×pcs.	5×3		
	Monitor lamps	Battery charge alarm lamp	V-W	12-2		
		Engine oil pressure alarm lamp	V-W	12-2		
		Water temperature alarm lamp	V-W	12-2		
	Headlight		V-W	-		
	Boom light		V-W	-		
	Room lamp (for cabin)		V-W	-		
	Wiper motor (for cabin)		V-W	-		
	Cabin heater (for cabin)		V-W	-		
	Cigarette lighter (for cabin)		V-W	-		

3. Service Standards

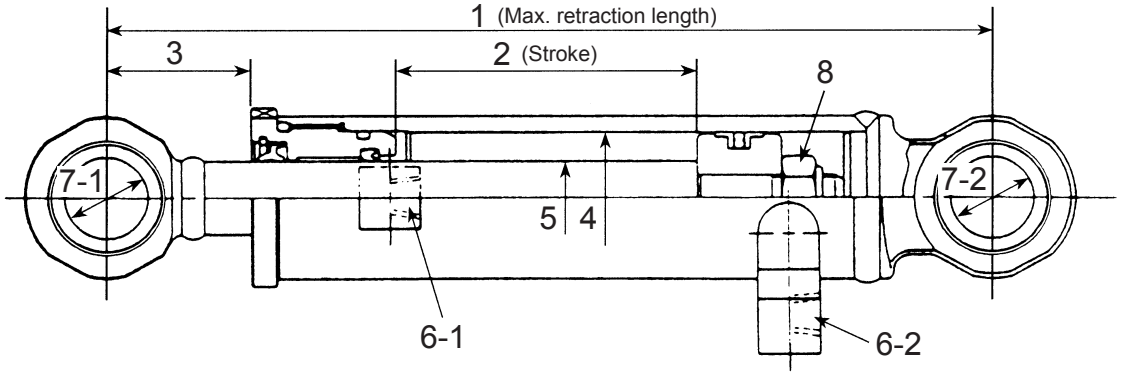
3-1 Machine Performance

Applicable model				SV15/SV17(EX)	
Item	Measuring condition		Unit	Standard	Allowance
Machine performance					
Working speed					
Boom speed Max. cylinder extension ⇕ Bucket teeth grounded	Machine position  • Engine : rated speed • Hydraulic oil temp. : 50 to 60 °C • Site : Firm, flat ground • Excluding cushion	Up	sec.	2.2	2.4
		Down		2.0	2.2
Arm speed Max. cylinder retraction ⇕ Max. cylinder extension	Machine position  • Engine : rated speed • Hydraulic oil temp. : 50 to 60 °C • Site : Firm, flat ground	Extend	sec.	2.3	2.5
		Retract		3.1	3.3
Bucket speed Max. cylinder retraction ⇕ Max. cylinder extension	Machine position  • Engine : rated speed • Hydraulic oil temp. : 50 to 60 °C • Site : Firm, flat ground	Dump	sec.	1.5	1.7
		Curl		2.2	2.4
Boom offset speed Max. cylinder retraction ⇕ Max. cylinder extension	Machine position  • Engine : rated speed • Hydraulic oil temp. : 50 to 60 °C • Site : Firm, flat ground • Full stroke	Right swing	sec.	3.1	3.4
		Left swing		3.1	3.4
Blade speed Max. cylinder retraction ⇕ Blade grounded	Machine position  • Engine : rated speed • Hydraulic oil temp. : 50 to 60 °C • Site : Firm, flat ground	Up	sec.	0.9	1.0
		Down		0.8	0.9

3-5 Hydraulic Equipment

3-5-1 Hydraulic Cylinders

SV15/17(EX)



Unit : mm

No. / Cylinder	1	2	3	4	5	6-1 / 6-2	7-1 / 7-2		8	
							Standard	Allowable limit	Nut size	Tightening torque N•m (kgf•m)
Boom	675	415	72	Ø60	Ø35	G1/4	Ø35	Ø35.5	M24	490.3 to 588.4 (50 to 60)
Arm (SV15)	686	439	63	Ø55	Ø35	G1/4 / G3/8	Ø30	Ø30.5	M24	490.3 to 588.4 (50 to 60)
Arm (SV17(EX))	902	453	265	Ø55	Ø35	G1/4 / G3/8	Ø30	Ø30.5	M24	490.3 to 588.4 (50 to 60)
Bucket	554	317	64	Ø55	Ø30	G1/4	Ø30	Ø30.5	M20	294.2 to 343.2 (30 to 35)
Boom swing	550	295	81	Ø65	Ø35	G1/4	Ø40	Ø40.5	M24	490.3 to 588.4 (50 to 60)
Blade	360	125	82	Ø60	Ø35	G1/4	Ø30	Ø30.5	M22	220 to 250 (22.4 to 25.5)
Track gauge change (SV17EX)	551	340	49	Ø60	Ø35	G1/4	Ø35	Ø35.5	M22	220 to 250 (22.4 to 25.5)

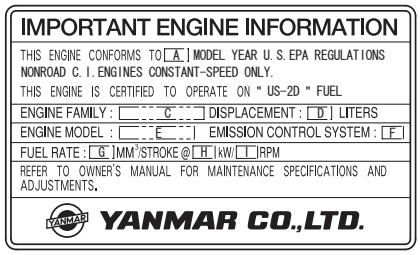
Nut for pipe

Symbol	Name
G (PF)	Straight pipe thread
R (PT)	Taper pipe thread (male)
Rc (PT)	Taper pipe thread (female)

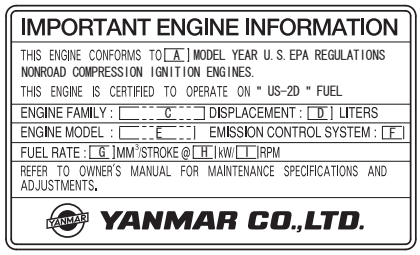
2) Engine Identification

To identify the engines, the following emission control labels are affixed on the engines.

(1) Emission control labels of US EPA

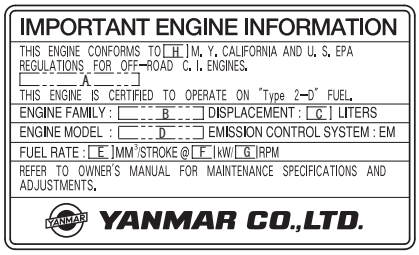


EPA label for constant speed engines



EPA label for variable speed engines

(2) Emission control label for both EPA and ARB

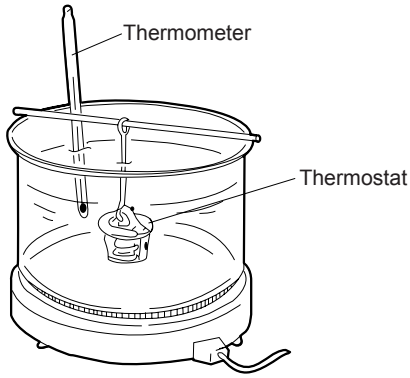


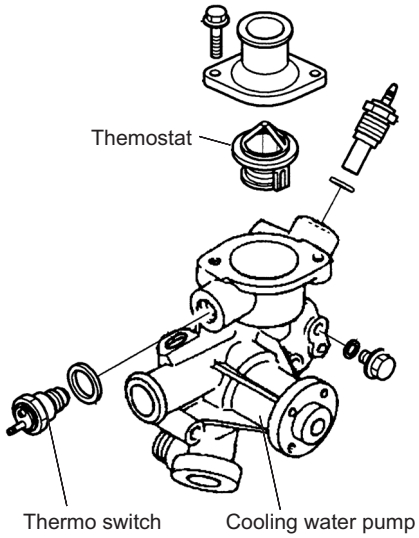
4-2-8 Checking the Sensors

1) Checking the Thermostat and the Thermoswitch

(1) Thermostat

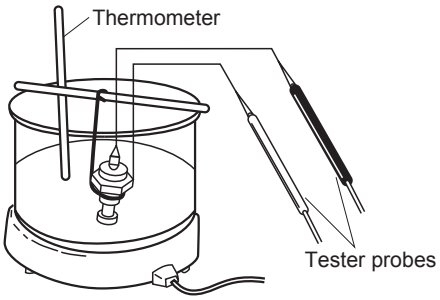
Put the thermostat into the water in a container. While measuring the water temperature, heat the water. Check that the thermostat functions at a temperature of 69.5 to 72.5 °C.





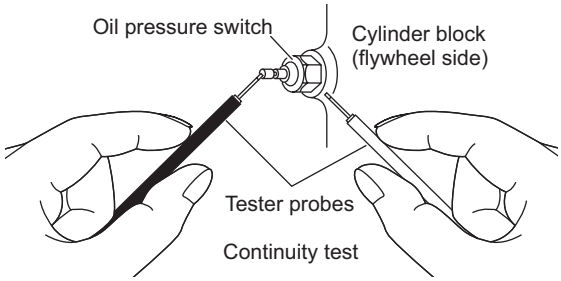
(2) Thermoswitch

Put the thermoswitch into the antifreeze or oil in a container. While measuring the liquid temperature, heat the liquid. If the tester shows continuity at a temperature of 107 to 113 °C, the thermoswitch is normal.



2) Hydraulic Switch

Remove the connector from the hydraulic switch. While running the engine, bring the tester probes into contact with the switch terminal and the cylinder block. If the tester shows continuity, the hydraulic switch is defective.

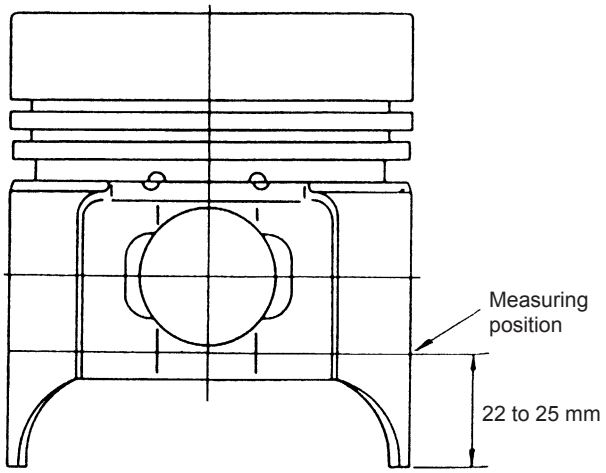


4-3-4 Piston and Piston Rings

1) Checking the Piston

(1) Remove carbon deposits from the head and combustion surface of the piston while taking care not to damage the piston. Check if there are any cracks or damage.

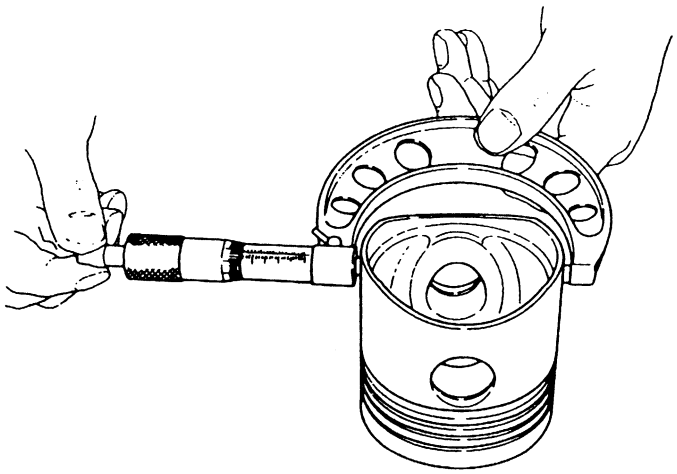
(2) Check the outer surface and ring grooves of the piston, and replace it if worn or damaged.



2) Measuring the Piston Outside Diameter

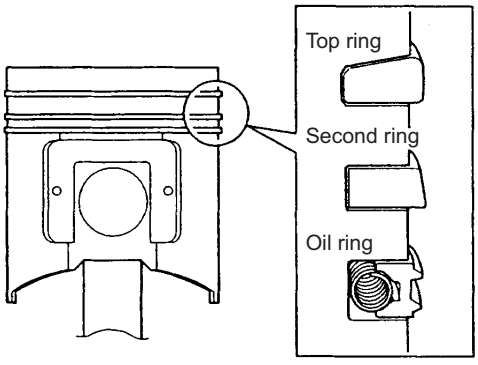
To measure the piston outside diameter, measure the long diameter of the oval hole in the vertical direction to the piston pin bush hole at a position which is 22 to 25 mm above from the lower end of the piston.

	Standard	Wear limit
Piston outside dia.	Refer to Section "3-2 1) Nominal and Allowable Values".	
Minimum clearance between piston and cylinder		



(Measuring the piston outside diameter)

3) Shapes of Piston Rings



Ring components

4-3-8 Gears

1) Checking the Gears

Check the teeth surfaces of each gear and replace the gear if the teeth are damaged, worn, or flaked.

2) Measuring the Backlashes

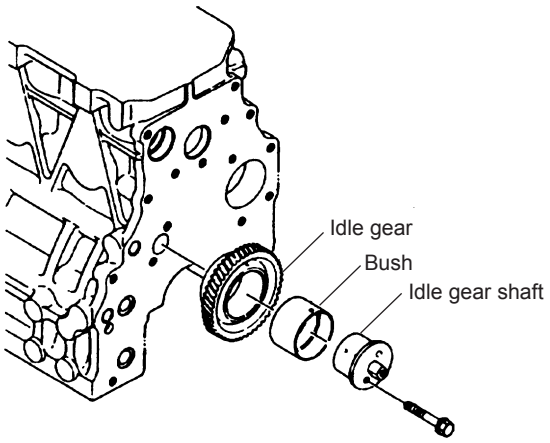
Apply a dial gauge onto the pitch circle of the gear, and measure the backlash.

		Standard	Wear limit
Backlash	Crank gear, cam gear, idle gear and fuel injection pump drive gear	Refer to Section "3-2 1) Nominal and Allowable Values".	
	Lubricating oil pump gear		

3) Checking and Measuring the Idle Gear Shaft and the Idle Gear

(1) Measure the idle gear bush inside diameter and the idle gear shaft outside diameter, and replace the bush or the idle gear shaft if the oil clearance exceeds the wear limit.

(2) Check that the oil holes in the idle gear shaft and the bush are aligned.

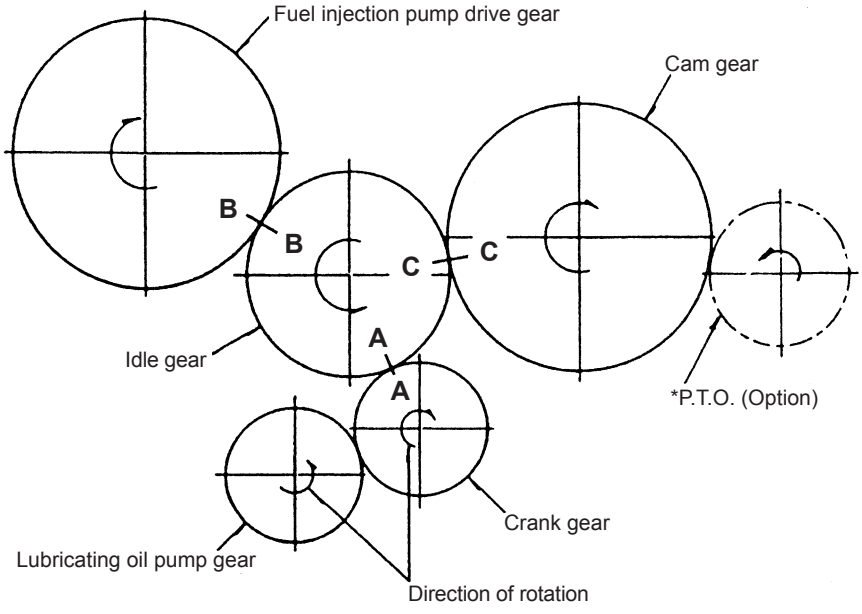


		Standard	Wear limit
Idle gear	Shaft outside dia.	Refer to Section "3-2 1) Nominal and Allowable Values".	
	Bush inside dia.		
	Oil clearance		

4) Gear Train

After installing all the gears, check that the matchmarkes A, B and C on the idle gear are aligned with those on the crank gear the fuel injection pump drive gear and the cam gear respectively.

(From the gear case side)

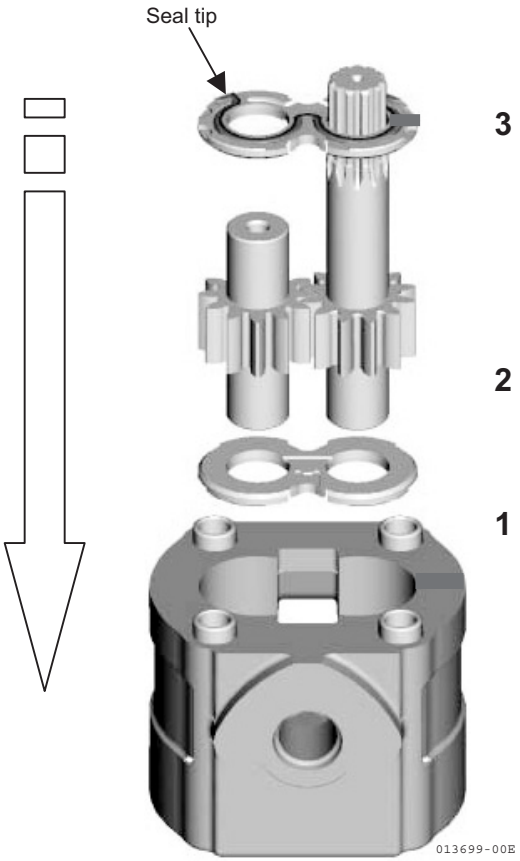


CHAPTER 6

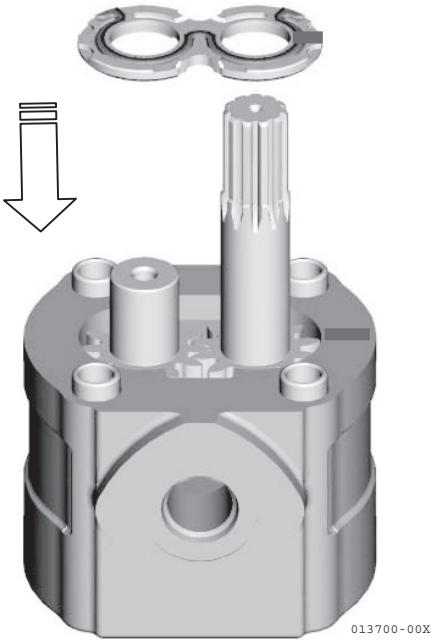
HYDRAULIC EQUIPMENT

6. Reassembling Components

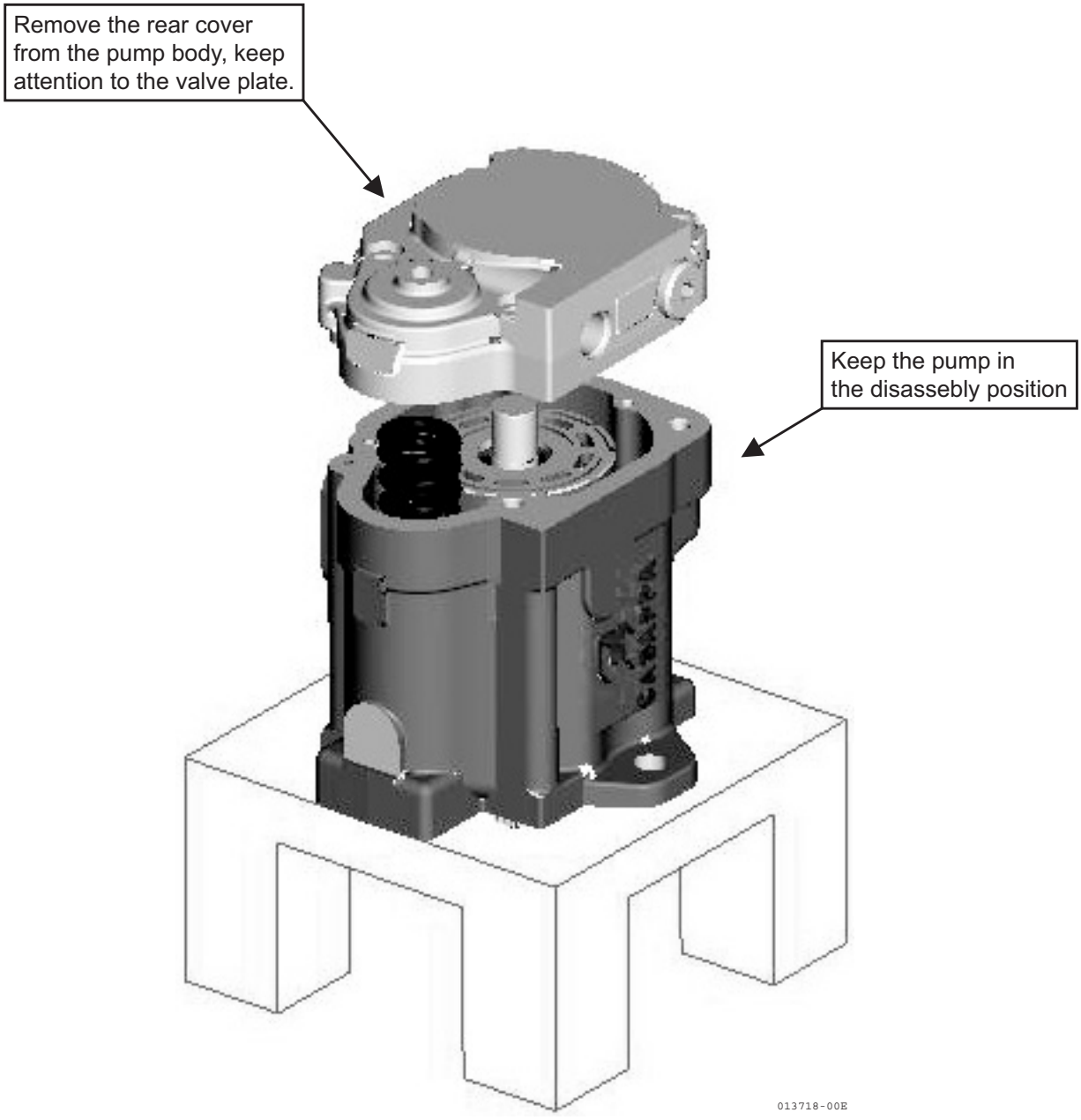
Reassemble the gears and the plates, using as reference the mark previously made.
Insert in the body the rear plate **1**.
Please remember that the seal tips are turned toward the suction side and that the flat surfaces are turned toward the gear sides.



Insert the gears **2** in their previous position.
Insert the upper plate **3** (reference sign).

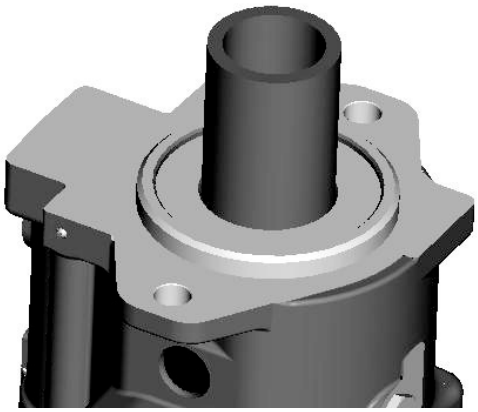


4. Components Disassembly

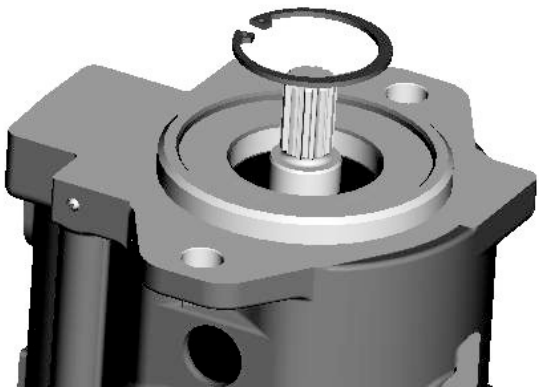


11. Sealing the Drive Shaft Reassemble

Change the SHAFT SEAL BAUM3SLX7 25X52X7 code 39950510 and check its sliding surface
(drive shaft) and housing, grease the sealing ring.



Assemblethe sealing ring with a buffer



Assemblethe snapring, and visual check to ensure that the circlip is corretly located in the groove

013730-00X

Procedure	
Anti-cavitation check valve replacement On the distribution element in question, unscrew the anticavitation Reassembly : torque : 32 ± 10% N.m.	
Remove: - plug, - anti-cavitation check valve. Replace seal of pressure relief valve plug. Reassemble parts in reverse order.	
Plug replacement On the distribution element in question, unscrew the plug (8 mm socket wrench). Reassembly : torque : 32 ± 10% N.m.	
Replace plug seal or plug.	

7. Maintenance Instruction of Inlet and Distribution element equipped with Translation Stand-by

1. Introduction

- This dedicated manual deals with the instructions relative to servicing and maintenance operations for SX10 Translation Inlet and distribution element (See maintenance instruction manual RE 64132-S for further information) .
- It is recommended that only qualified personnel perform the installation, connection and maintenance of this device, and that all operations shall be carried out in compliance with the technical standards in force and the cleanliness regulations specific to this type of installation.

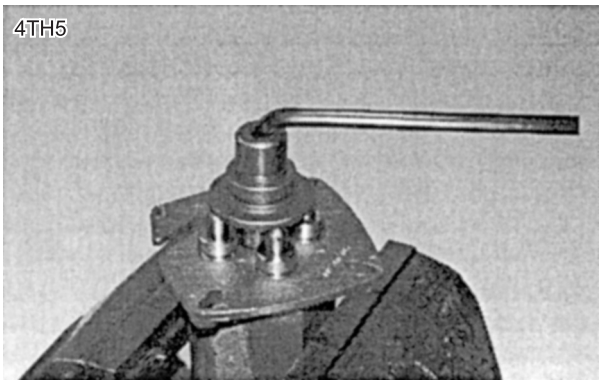
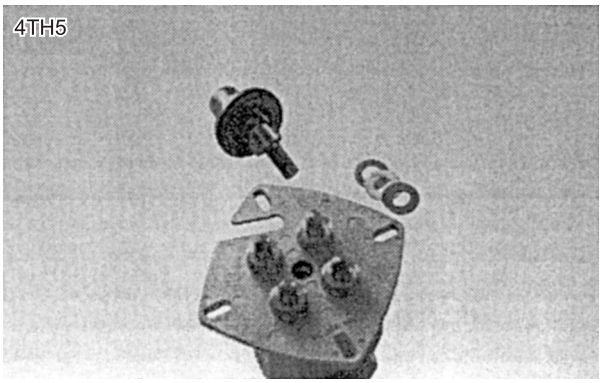
To ensure maximum performance and safety during maintenance operations we advise you to
Read the manual RE64132-S together with this instruction thoroughly

- All information, illustrations, instructions and characteristics contained in these documents are based on the latest product information available at the time of publication. In its attempts to maintain a high-quality product, BOSCH REXROTH reserves the right to make design or technical modifications at any time and without prior notification.

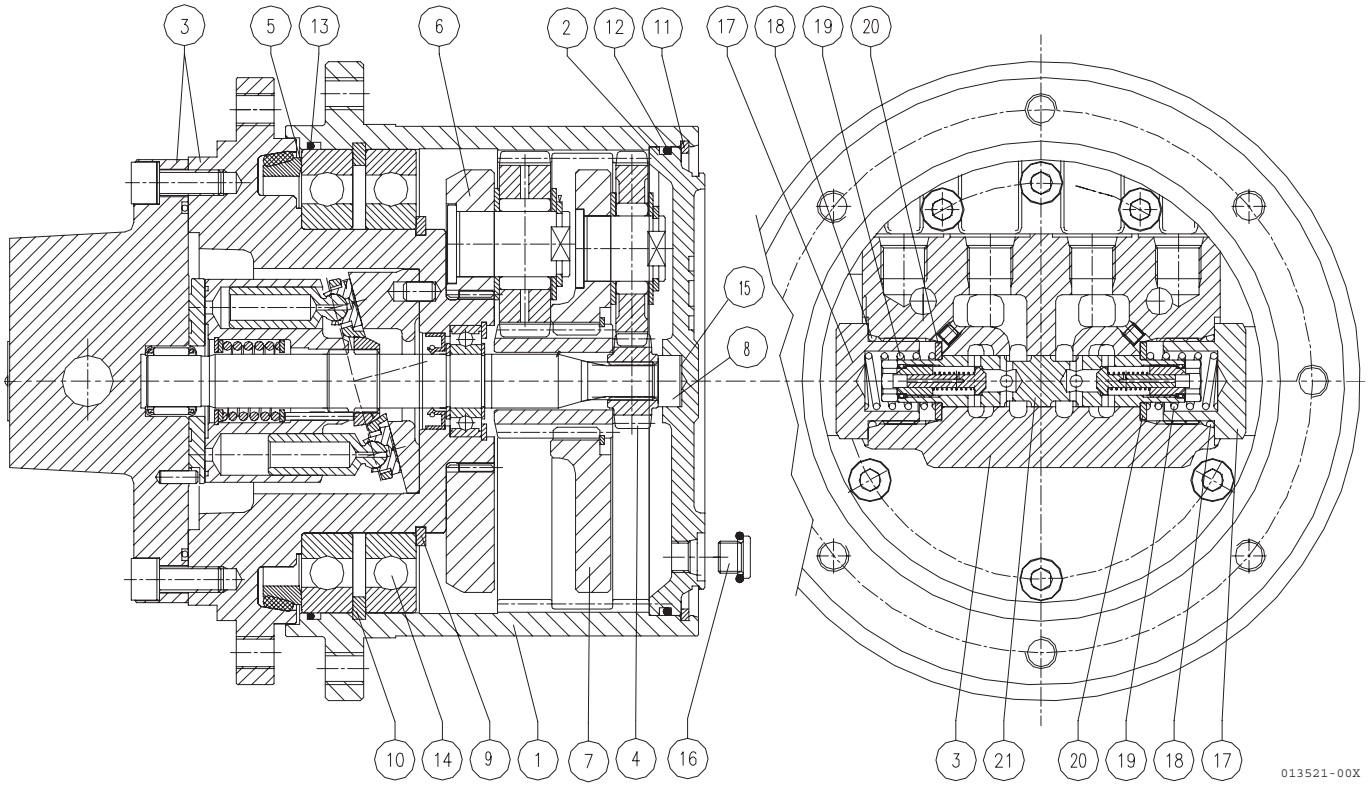
4. 1) General Recommendations

- Before removing the parts, the unit and its surroundings must be thoroughly cleaned (Do not direct the jet of a pressure washing unit directly at the unit).
- No impurities must enter the hydraulic system.
- Make sure to collect any possible oil leakage in a suitable receptacle.
- Wear protective clothing and use suitable equipment to prevent accidents, particularly concerning the hydraulic fluid.
- Set all actuators connected to the machine in neutral position (on the ground, at lower limit...) to avoid accidents which could result from uncontrolled movements of the equipment when the hydraulic system is disconnected or open.
- With the machine off, release the pressure remaining in the system by manipulating all of the distribution spools.

3) Cardan Replacement

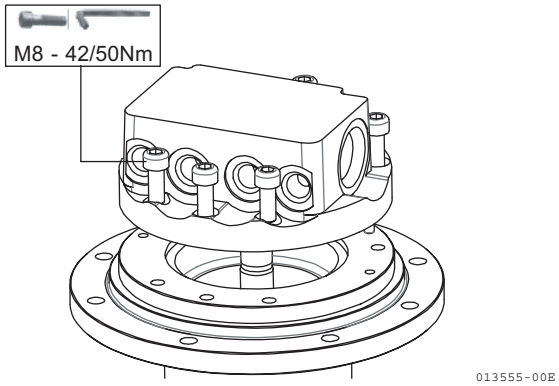
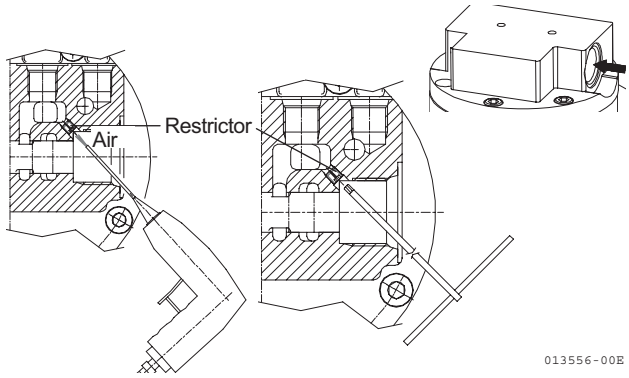
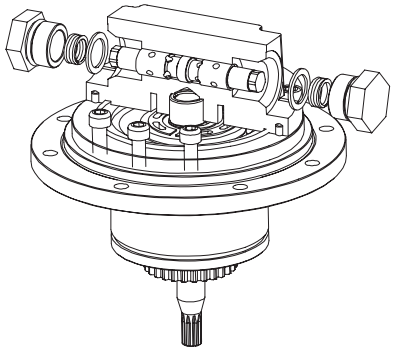
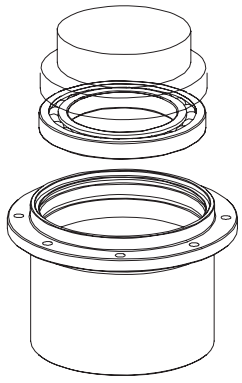
Procedure	
Preliminary operations Remove the pilot control unit from the machine's arm rest. Secure the pilot control unit in a vice (clamp onto the body). Remove the handle. ***Note :*** *It is recommended to remove the pilot control unit from the machine. Nevertheless, the servicing on machine is possible by securing the unit into a vice-grip wrench (65 opening). This is performed by extracting the body from the arm rest so as to clamp the vice-grip wrench onto the body in order to hold it above the arm rest.* **Removal of the cardan** Fit an Allen wrench into the assembly screw and unscrew it (8 mm Allen wrench). Reassembly : torque : 45±4 N·m Remove : - the cardan, - the shim (s) Reassembly : Adjust the pre-depression of the cardan by selecting the shims necessary to obtain play-free contact between the switch-plate and the plungers. In neutral position, the depression of the plungers must not exceed 0.2 mm. In order to check this value, observe the displacement of the plunger located opposite to the one being pressed. ***Note :*** *The pre-depression may be difficult to achieve on site. Could be necessary to readjust it after reassembly and system working control.*	 

2. Section Drawing and Spare Part List



N°	Code	Description	Q'ty
1	1725.008.025	Output housing	1
2	1725.110.001	End cover	1
3	1725.333.097	Motor mor 15,76	1
4	1725.517.042	Sun gear	1
5	1725.806.099	Lappeda bearing + Front seal	1
6	4725.007.200	Planetary gear set	1
7	4725.010.200	Planetary gear set	1
8	1725.825.042	Pad	1
9	9010.603.000	External retaining ring	1
10	9010.646.000	Internal retaining ring	1
11	9010.661.000	Internal retaining ring	1
12	9030.234.951	O-ring 2,62×139,37	1
13	9030.235.001	O-ring 2,62×145,72	1
14	9110.624.000	Ball bearing 16019	1
15	9479.008.014	Shims kit 12,2×19,8	1
16	9510.018.059	1/8" gas plug with o-ring	2
17	20M16.027	Valve plug	2
18	24OR2-119	O-RING 2,62×23,47	2
19	20M16.028	Valve spring	2
20	20M16.029	Valve washer	2
21	6.701880003	Counterbalance valve spool	1

5725.KIT.0026 : Basic seal kit
5725.KIT.0027 : Major rebuilt kit (5725.KIT.0026 + item 5)

Procedure	
Install the motor cover onto the hub with the six head cap screw with relatives washers and tighten to a torque.	
Clean the two M5 restrictors with air. In case they are damaged or very dirty removing the restrictors with a key, clean the calibrated holes and reinstalling in their threaded holes.	
Install the valve in the following sequence: valve piston, washers, springs, plugs and relatives O-rings. After assembly of the hydraulic motor, check that the drive shaft turns freely with no binding.	
Using the tool (Code M725.000.16.01) shown on page 6-5-21 as a support, install the first ball bearing.	

7. Torque Wrench Setting (N x m)

Screw on steel or cast iron

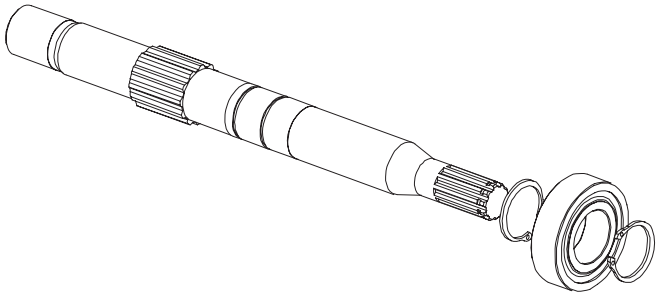
ISO METRIC THREAD - coarse pitch											
Nom. size	pitch	quality 4.8		quality 6.8		quality 8.8		quality 10.9		quality 12.9	
(mm)	(mm)	min	max	min	max	min	max	min	max	min	max
4	0,7	1,5	1,9	2,3	2,8	3,1	3,8	4,4	5,3	5,2	6,3
5	0,8	3,0	3,7	4,5	5,5	6,0	7,3	8,5	10,3	10,2	12,4
6	1	5,2	6,3	7,8	9,5	10,4	12,7	14,7	17,8	17,6	21,4
8	1,25	12,5	15,2	18,7	22,7	25,0	30,3	35,1	42,6	42,1	51,1
10	1,5	25,0	30,3	37,4	45,5	49,9	60,6	70,2	85,2	84,2	102,3
12	1,75	42,5	51,6	63,7	77,4	85,0	103,2	119,5	145,1	143,4	174,2
14	2	67,6	82,1	101,5	123,2	135,3	164,3	190,2	231,0	228,3	277,2
16	2	102,4	124,3	153,6	186,5	204,8	248,6	287,9	349,6	345,5	419,6
18	2,5	142,7	173,3	214,1	259,9	285,4	346,6	401,4	487,4	481,7	584,9
20	2,5	200	243	300	364	400	486	562	683	675	819
22	2,5	268	326	402	489	537	652	755	916	906	1.100
24	3	346	420	518	629	691	839	972	1.180	1.166	1.416
27	3	504	612	756	918	1.008	1.224	1.418	1.721	1.701	2.066
30	3,5	688	835	1.032	1.253	1.375	1.670	1.934	2.349	2.321	2.818

ISO METRIC THREAD - fine pitch											
Nom. size	pitch	quality 4.8		quality 6.8		quality 8.8		quality 10.9		quality 12.9	
(mm)	(mm)	min	max	min	max	min	max	min	max	min	max
8	1	13,1	15,9	19,7	23,9	26,2	31,8	36,9	44,8	44,2	53,7
10	1,25	26,0	31,5	38,9	47,3	51,9	63,0	73,0	88,6	87,6	106,4
12	1,25	45,3	55,0	67,9	82,4	90,5	109,9	127,3	154,6	152,8	185,5
12	1,5	43,9	53,3	65,8	79,9	87,8	106,6	123,4	149,9	148,1	179,8
14	1,5	71,4	86,7	107,1	130,0	142,8	173,4	200,8	243,8	241,0	292,6
16	1,5	107,2	130,1	160,8	195,2	214,3	260,3	301,4	366,0	361,7	439,2
18	1,5	154,9	188,0	232,3	282,1	309,7	376,1	435,6	528,9	522,7	634,7
20	1,5	215	261	322	391	430	522	604	734	725	881
22	1,5	286	347	429	521	572	695	805	977	966	1.173
24	2	367	446	551	669	734	891	1.032	1.254	1.239	1.504
27	2	531	645	797	968	1.063	1.291	1.495	1.815	1.793	2.178
30	2	739	897	1.108	1.345	1.477	1.794	2.077	2.522	2.493	3.027

Above mentioned torque tables correspond to an axial preload, which is between 70% and 85% of the screw material yield stress.

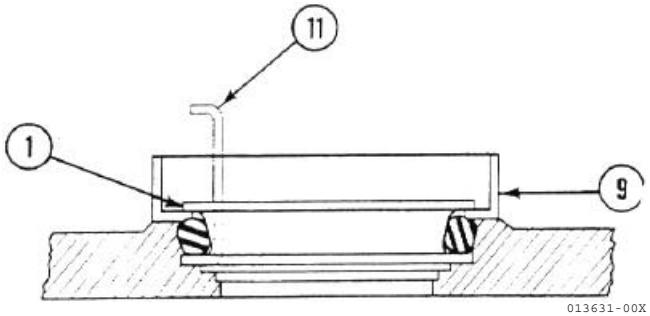
Coefficient of Friction: 0,14

With lubricated thread use 70% of above mentioned tables.
When quality 12,9 fasteners are used in tapped holes in grey cast iron, the fasteners should be torqued to quality 10.9 specifications.

Procedure	
Remove the first external retaining ring, the ball bearing can now be removed. The second external retaining ring can now be removed.	 013649-00X

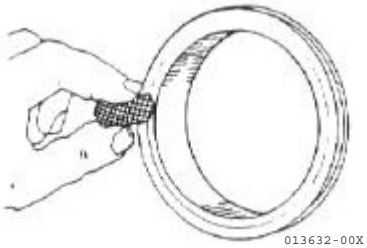
The unit can now be re-assembled by reversing the above procedure. Please keep in mind the following requirements: 1) If one of the gears of the planetary units has been damaged it is advisable to replace the damaged planetary stage assembly complete with the sun gear. The reason is obvious, in that damage from one gear can cause microscopic fatigue cracks in mating gear teeth, leading to premature failure after servicing. 2) Use standard mechanical procedures, such lubricating O-rings, seals, etc..., upon reassembly.	

The seal can be adjusted by gently pushing the toric into position by hand or by using a fabricated adjustment hook. If the seal can not be adjusted to meet the standout height specification, remove the seal and repeat the procedure.

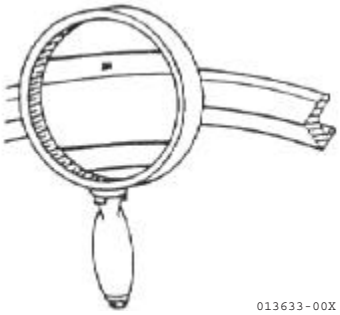


If small adjustments are necessary, do not push directly on the seal ring 1 ; use the installation tool 9 to push down or the adjustment tool 11 to pull up.

A thin film of light oil should be applied to the seal faces prior to assembly. Use an applicator, a disposable tissue or a clean finger to distribute the oil evenly. Be careful not to get any oil on the rubber toric rings.



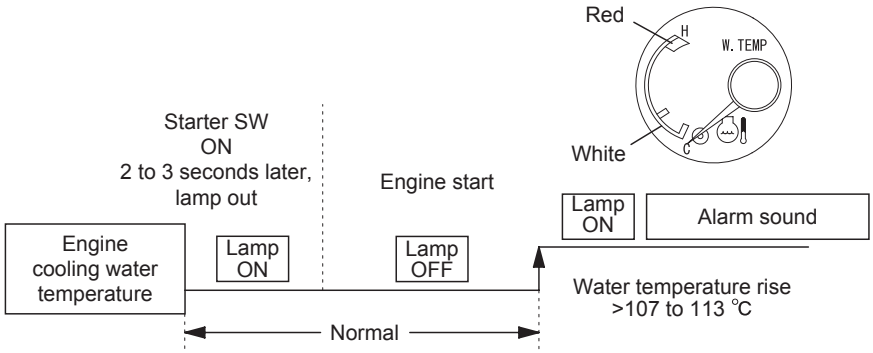
Be sure there is no visible debris on either of the seal faces-even a small piece of lint can hold the seal faces apart and cause leakage.



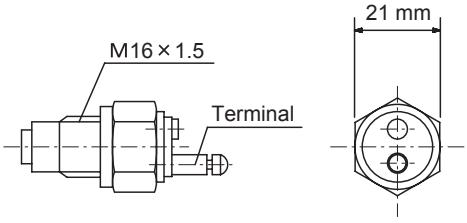
After successful installation, wait one minute for the Trichlor to dry before assembling the two seal halves in the final loaded position. This delay is to allow any excess solvent to dry so thet the torics roll, rather than slide, in the housingas the faceload is increased. If the toric slide, this can produce a nonuniform load that can result in poor seal performance.

When the alarm buzzer sounds, check the following items.
[1] Degeneration of engine oil
[2] Clogging of oil filter element
[3] Malfunction of engine oil pressure switch
Refer to Section "4-1-8 Checking the Sensors" for the checking procedure of the engine oil pressure switch.
[4] Malfunction of pressure control valve
[5] Wear or breakage of engine oil pressure pump

(2) Overheating sensor (water temperature switch)
The water temp. meter indicates the engine cooling water temperature.
The pointer should be within the white range while the engine is running.
If the pointer goes up to the red range, the engine is overheating.

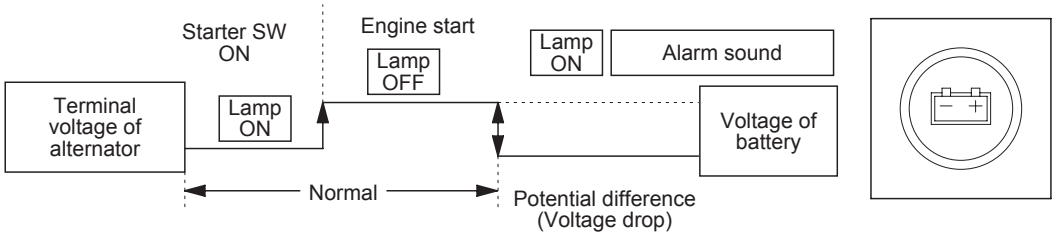


Turned on : Cooling water temp. : 107 to 113°C
Turned off : Cooling water temp. : 100°C or less
Installation position : Cooling water pump on engine

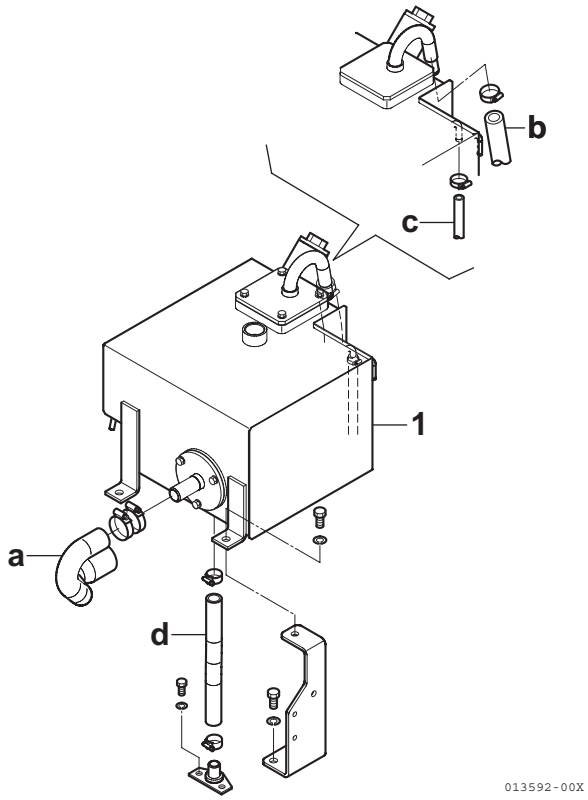
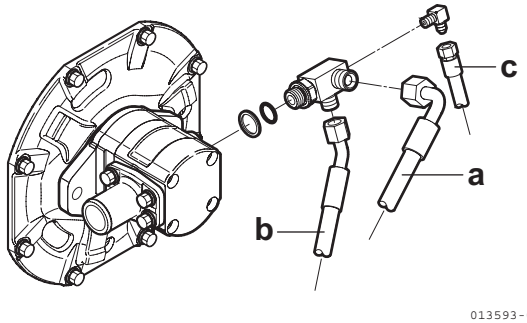
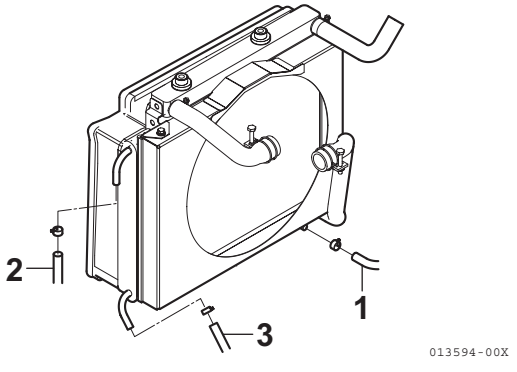


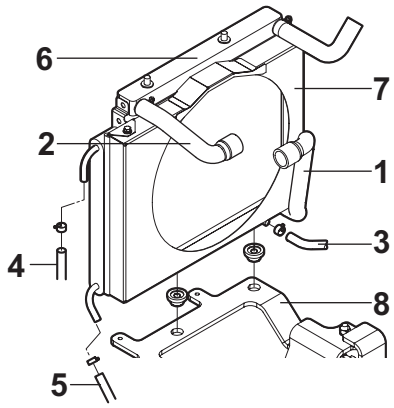
When the alarm buzzer sounds, check the following items.
[1] Refer to Section "4-1-7 Checking the Cooling Water System and Radiator for Water Leakage" and "10. Trouble-shooting".

(3) Battery charge
When there occurs a potential difference between the output voltage of the alternator and the voltage of the battery, the lamp goes on and the buzzer sounds.



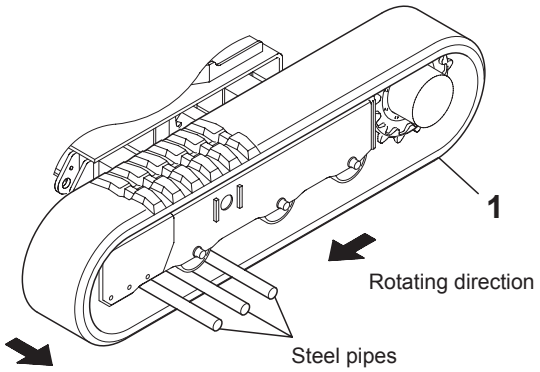
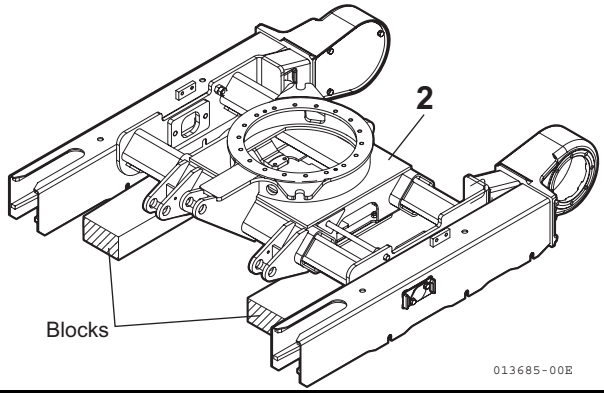
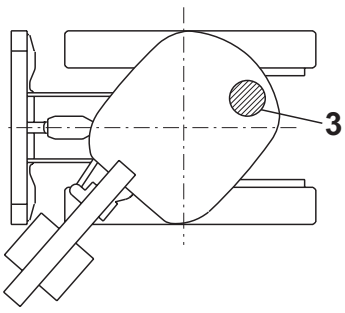
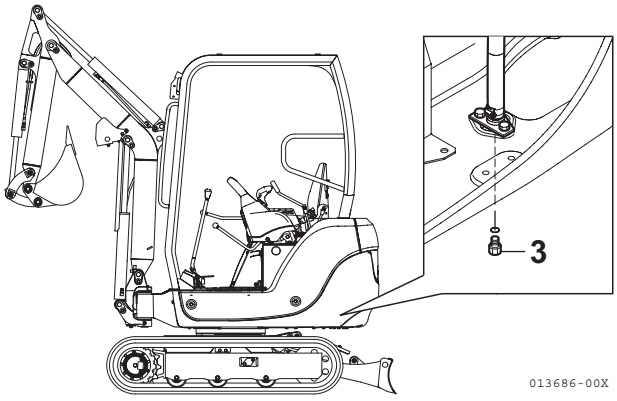
When the alarm buzzer sounds, check the following items.
[1] Degeneration or malfunction of battery.
[2] Refer to Section "7-1-4 Circuit Description of Engine Start and Stop, and Battery Charging".

Procedure	
(28) Remove the hoses connected to the hydraulic oil tank **1**. **a**. Suction hose **b**. Return hose (control valve to hydraulic oil tank) **c**. Return hose (joint to hydraulic oil tank) ***Note :*** *Remove the return hose from the joint.* **d**. Hydraulic oil drain hose	
(29) Remove the hydraulic hoses from the hydraulic pump. **a**. Hose (MAIN) **b**. Hose (PILOT) **c**. Hose (MESUR EMENT)	
(30) Remove the cooling water drain hose **1**. (31) Remove the hydraulic hoses **2**, **3** from the oil cooler.	

Procedure	
(5) Remove the hoses A **1** and C **2** from the engine. (6) Remove the cooling water drain hose **3**. (7) Remove two hoses **4**, **5** from the oil cooler. (8) Remove the radiator **6** (with the shroud **7**) from the fuel tank mount **8**.	

7-2-7 Removal and Reinstallation of Track Gauge Change Cylinder

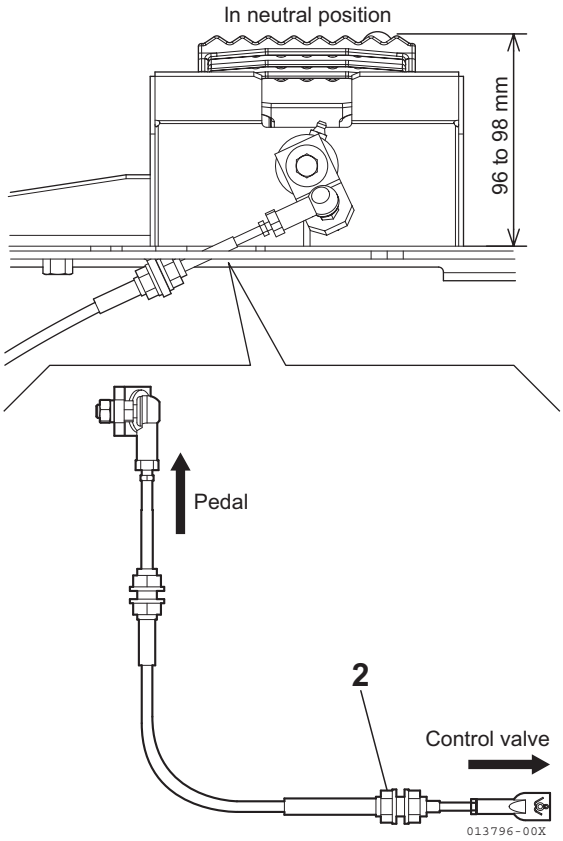
1) Removal of Track Gauge Change Cylinder

Procedure	
(1) Widen the track frame fully by operating the track gauge change cylinder, and then remove the right rubber crawler **1**. ***Note :*** *Refer to Section "7-2-5 Removal and Reinstallation of Crawler".*	
(2) Raise the machine using the implement and the blade, and then place blocks under the lower center frame **2**. ***Note :*** *Place blocks which have sufficient height to allow work under the lower center frame **2**.*	
(3) Swing the upperstructure so that the drain plug **3** of the hydraulic oil tank is positioned halfway between the right and left crawlers, and then stop the engine. (4) Remove the drain plug **3** from the hydraulic oil tank and drain the hydraulic oil. Hydraulic oil quantity: 16.0 L	 

7-3-8 Adjustment of P.T.O. Pedal

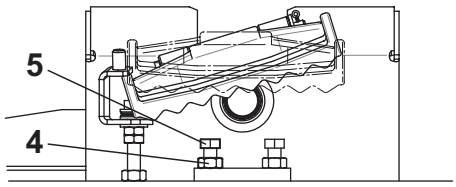
1) Setting Pedal Level

(1) Remove the step.
(2) Loosen the nut **2**.
(3) Adjust the boom swing pedal by turning the nut **2** so that the pedal will be level.
(4) Tighten the nut **2**.



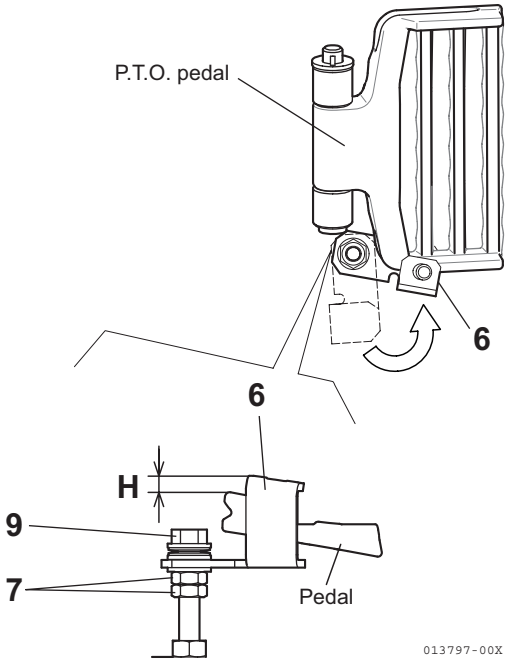
2) Adjustment of Stopper Bolts

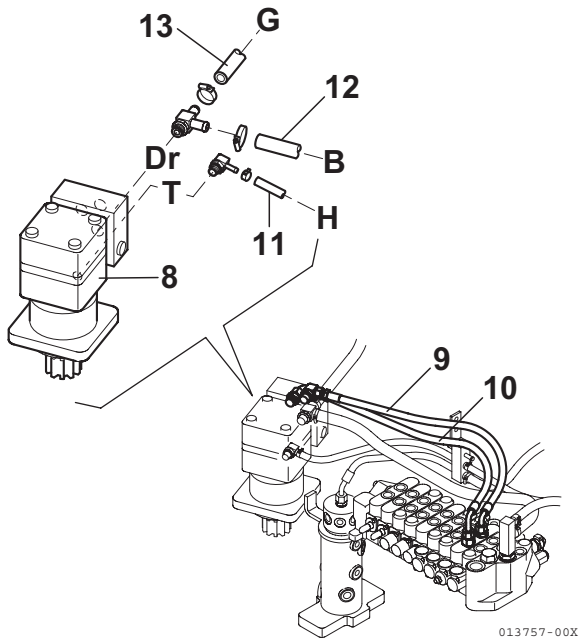
(1) Loosen the lock nuts **4** and screw in the stopper bolts **5** so that they will not touch the boom swing pedal.
(2) Move the boom swing pedal to its stroke end, and loosen the stopper bolt **5** until the bolt head touches the pedal (for each stopper bolt).
(3) Loosen the stopper bolt **5** one more turn and tighten the lock nut **4** to fix it.

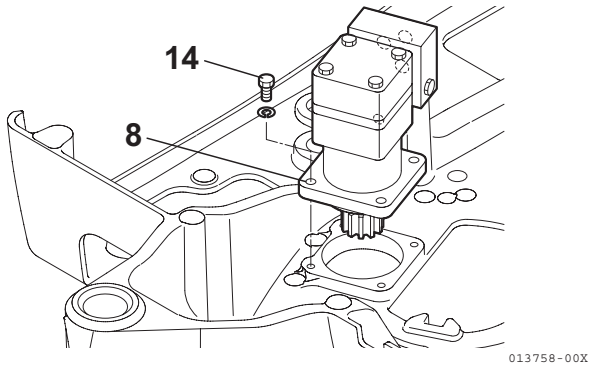


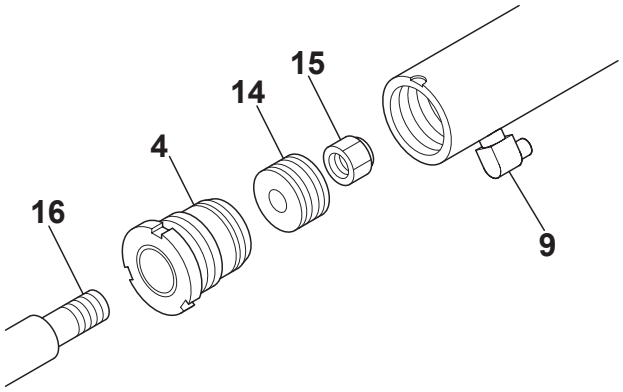
3) Adjustment of Pedal Lock

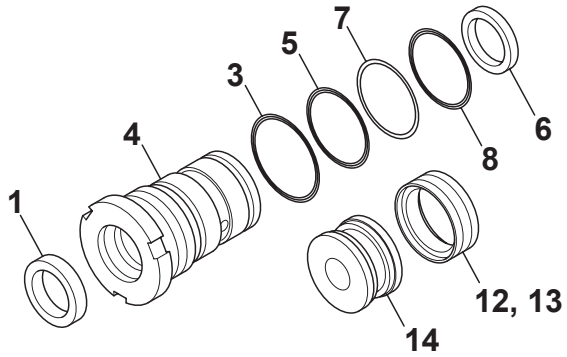
(1) After the adjustment of the pedal stroke, move the P.T.O. pedal to its stroke end on the left and place the P.T.O. pedal lock **6** on the P.T.O. pedal.
(2) Adjust the clearance H between the P.T.O. pedal lock **6** and the P.T.O. pedal to 2 mm or less with the bolt **9**.
(3) Adjust the operating force for the P.T.O. pedal lock **6** at the end A, with the double nut **7**, to a value within a specified range : 10.7 to 18.7 N (1.0 to 2.0 kg).



Procedure	
(4) Remove the hydraulic hoses from the swing motor **8**. • Hose **9** (control valve to swing motor) • Hose **10** (control valve to swing motor) • Drain hose **11** (swing motor to drain block) • Drain hose **12** (control valve T to swing motor) • Drain hose **13** (swing motor to oil cooler)	

(5) Remove the mounting bolts **14** and remove the swing motor **8**.	

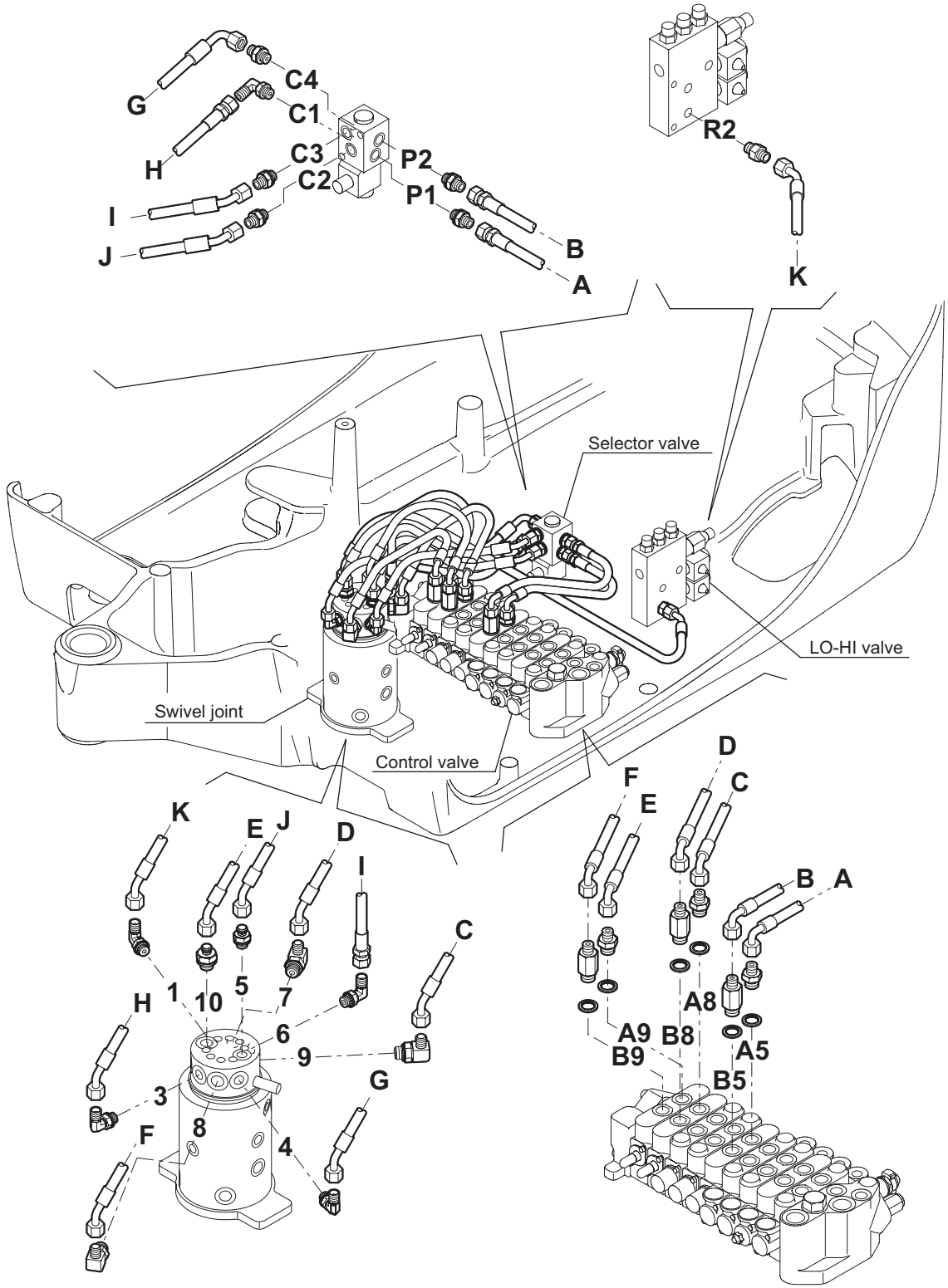
Procedure	
(6) Disassembly of bucket, arm, boom swing, blade and track gauge change cylinders Remove the U-nut **15**, and then the piston **14** and the head **4** in that order.	

(7) Remove the O-rings **3**, **5** and **8**, the dust seal **1**, the ISI packing **6**, the RGU packing **12** and the PWL bearing **13**. ***Note :*** *Use a sharp tool to raise each of the O-rings, the ISI packing, the RGU packing or the PWL bearing, and then insert a spatula to remove it.*	

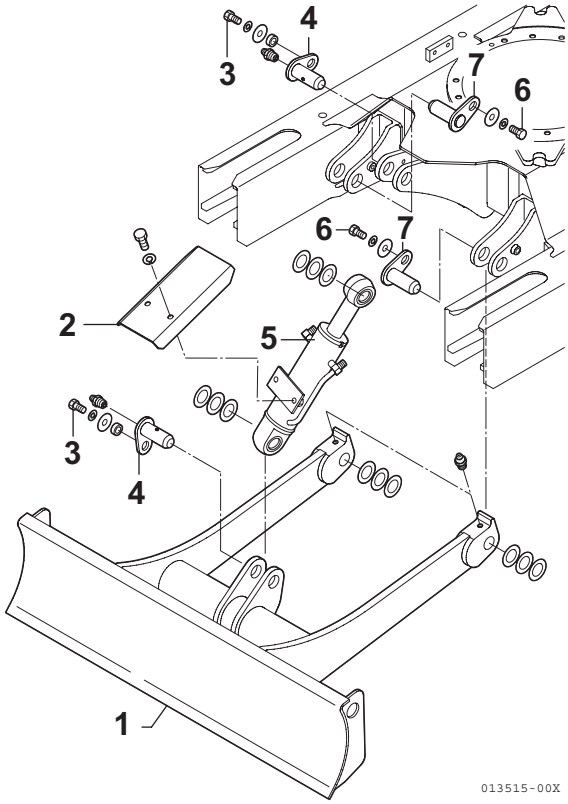
5) Upperstructure (SV17EX)

(Control valve → Swivel joint)

(Control valve → Boom swing cylinder)



4) Removal of Blade

Procedure	
(1) Turn the implement to the blade side, lower the bucket and the blade **1** to the ground and stop the engine. (2) Remove the protector **2** and remove the hydraulic hoses. (3) Remove the bolts **3** (M10) and pull out the pins **4**. Then remove the blade cylinder **5**. (4) After roping the blade **1**, remove the bolts **6** (M10) and pull out the pins **7**. Then remove the blade. ***Note :*** *Remove the blade using a lifting device.*	

9. REFERENCE DATA

9. Fuel, Lube Oil and Grease Recommended

Item	Type
Engine oil	Engine oil SAE10W30, CD class
Travel reduction gear oil	SAE 90 (GL-4)
Hydraulic oil	ISO VG46
Fuel	Diesel light oil
Engine cooling water	YANMAR genuine long-life coolant (LLC) 51% added water

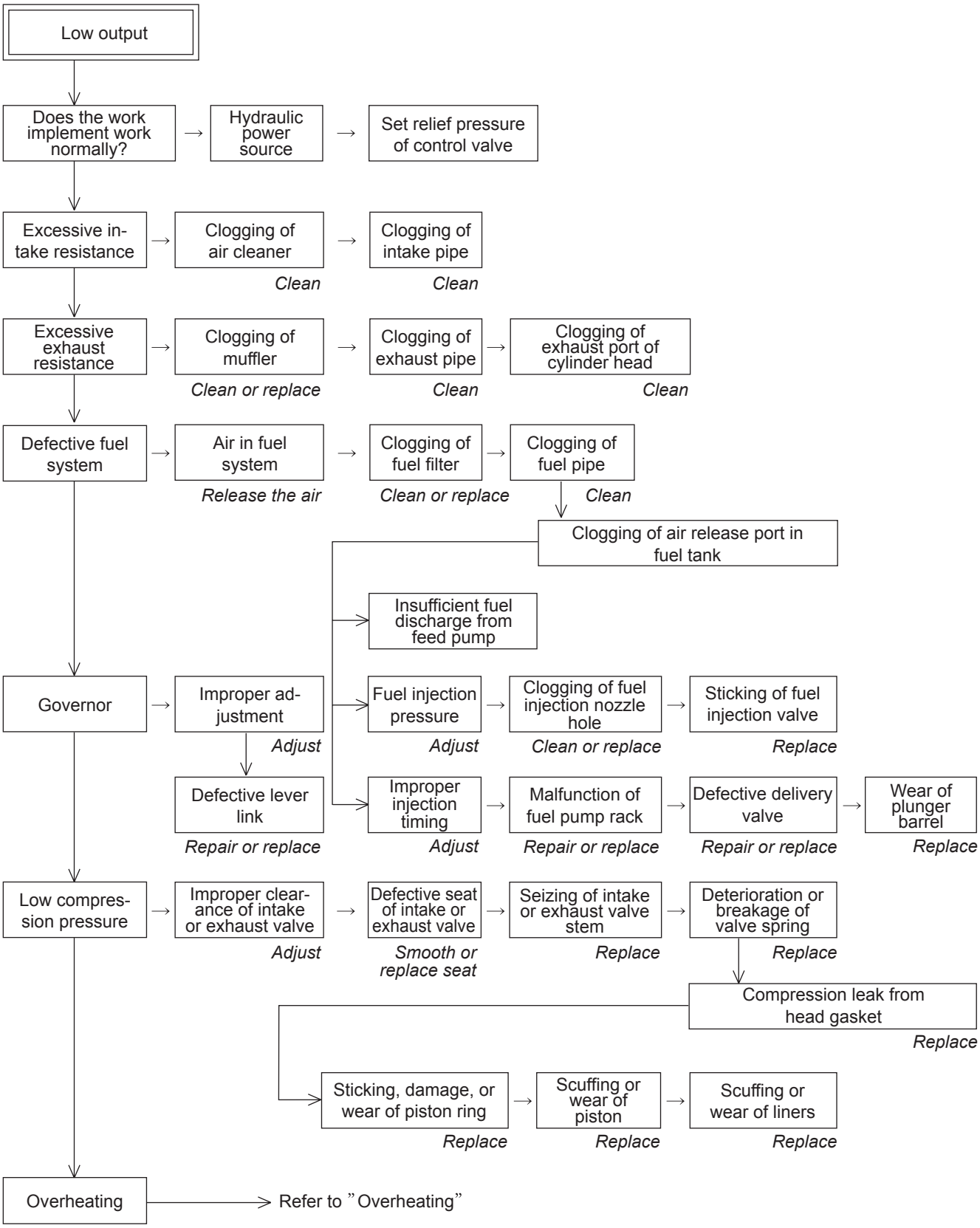
Part be refilled	Oil type	Recommendations based on temperature ranges (°F) -4 14 32 50 68 86 (°C) (-20) (-10) (0) (10) (20) (30)	Prescribed amount of oil	Amount of oil to be changed
Engine oil pan	Engine oil	SAE 10WCD SAE 10W-30CD SAE 15W-40CD	3.0 Qts. (2.8 L)	3.0 Qts. (2.8 L)
Travel reduction gear	Gear oil	SAE 90 (GL-4)	0.53 Qts. (0.5 L) (For right and left each)	0.53 Qts. (0.5 L) (For right and left each)
Hydraulic oil system	Hydraulic oil	ISO VG46	In the tank 4.2 Gals. (16.0 L) Other parts 2.2 Gals. (8.5 L)	4.2 Gals. (16.0 L)
Fuel tank	Light oil	No.2-D No.3-D No.3-D (S)	6.5 Gals. (24.5 L)	–
Cooling system	Water	YANMAR genuine long-life coolant (LLC) added	Radiator 2.6 Qts. (2.5 L) Subtank 0.42 Qts. (0.4 L)	–

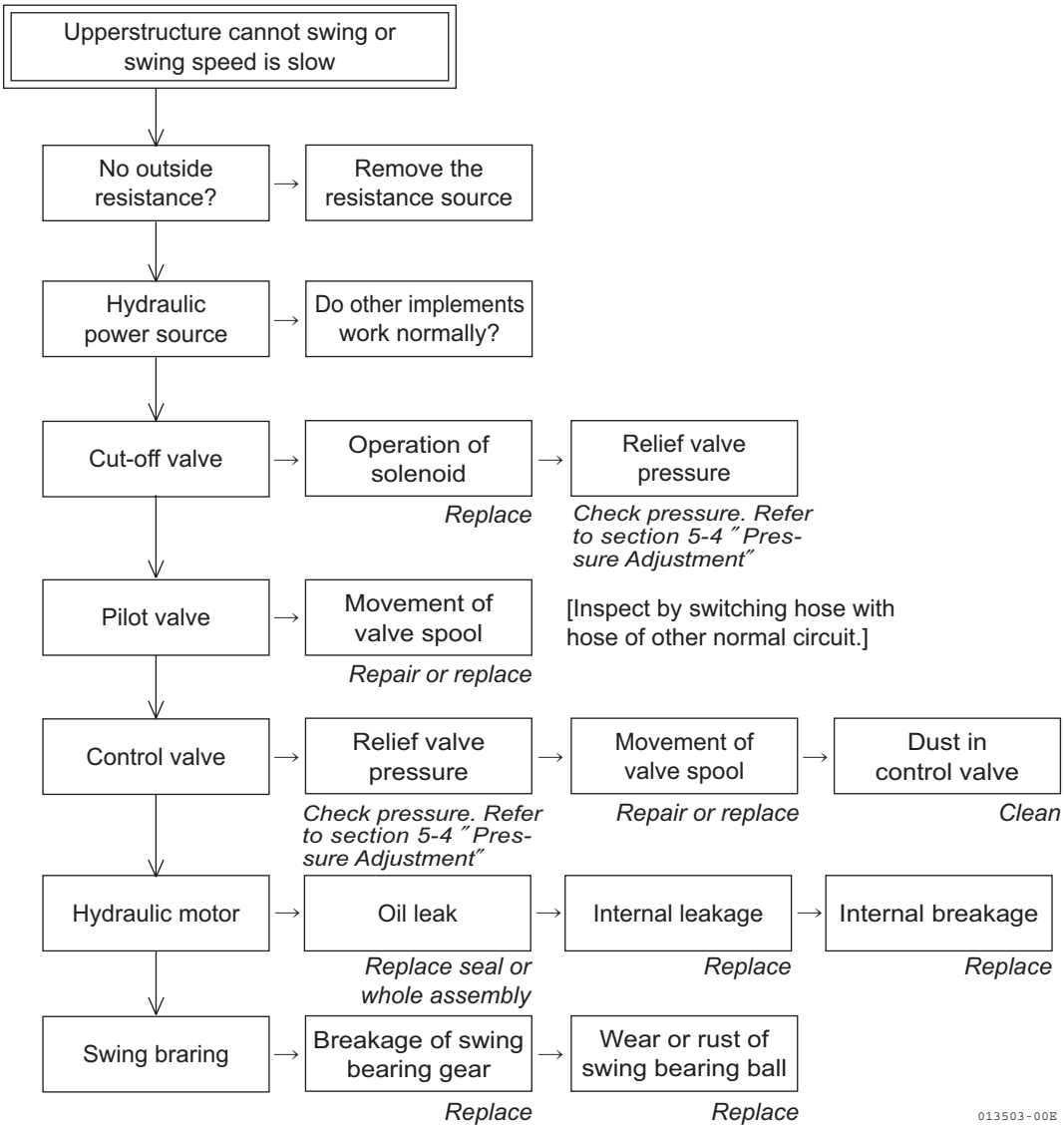
Lowest temperature	°F (°C)	23 (-5)	14 (-10)	5 (-15)	-4 (-20)	-13 (-25)	-22 (-30)	-31 (-35)	-40 (-40)
Amount of anti-freeze	Qts. (L)	0.42 (0.4)	0.85 (0.8)	0.95 (0.9)	1.06 (1.0)	1.16 (1.1)	1.37 (1.3)	1.59 (1.5)	1.69 (1.6)
Amount of water	Qts. (L)	2.64 (2.5)	2.22 (2.1)	2.11 (2.0)	2.01 (1.9)	1.90 (1.8)	1.69 (1.6)	1.48 (1.4)	1.37 (1.3)

Note :

At the delivery, water and antifreeze are mixed at the ratio for -31 °F (-35 °C) temperature above.

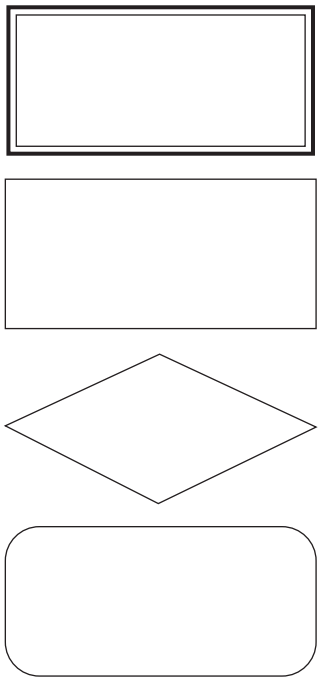
10. TROUBLESHOOTING




Upperstructure cannot swing or swing speed is slow
No outside resistance?
Remove the resistance source
Hydraulic power source
Do other implements work normally?
Cut-off valve
Operation of solenoid
Relief valve pressure
Replace
Check pressure. Refer to section 5-4 ″Pressure Adjustment″
Pilot valve
Movement of valve spool
[Inspect by switching hose with hose of other normal circuit.]
Repair or replace
Control valve
Relief valve pressure
Movement of valve spool
Dust in control valve
Check pressure. Refer to section 5-4 ″Pressure Adjustment″
Repair or replace
Clean
Hydraulic motor
Oil leak
Internal leakage
Internal breakage
Replace seal or whole assembly
Replace
Replace
Swing braring
Breakage of swing bearing gear
Wear or rust of swing bearing ball
Replace
Replace
013503-00E

10-2-2 Electrical Equipment on Panel

(1) How to read the chart



: Trouble

: Inspection/repair instructions

: Check item

: Factors in trouble or treatment

(2) Refer to the wiring diagram for the number of the connector terminal and lead wire color.

(3) Color marks of leads

W (White)	B(Black)	R (Red)	Y (Yellow)
G (Green)	L (Blue)	Br (Brown)	Lg (Light green)
O (Orange)	Gr (Grey)		

Combination of colors

Example : W R .....(Red stripes on white background)

→ Marking color

→ Background color