SHOP MANUAL

model SK25SR

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KOBELCO

APPLICABLE No. SK25SR-6 PV14-40043～

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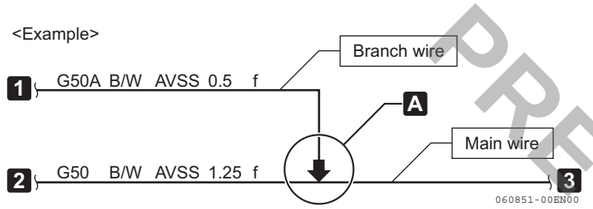
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2-9 Wiring Diagram

■ How to Read Wiring Diagrams

● Intersections and Wire Connections

<Example>

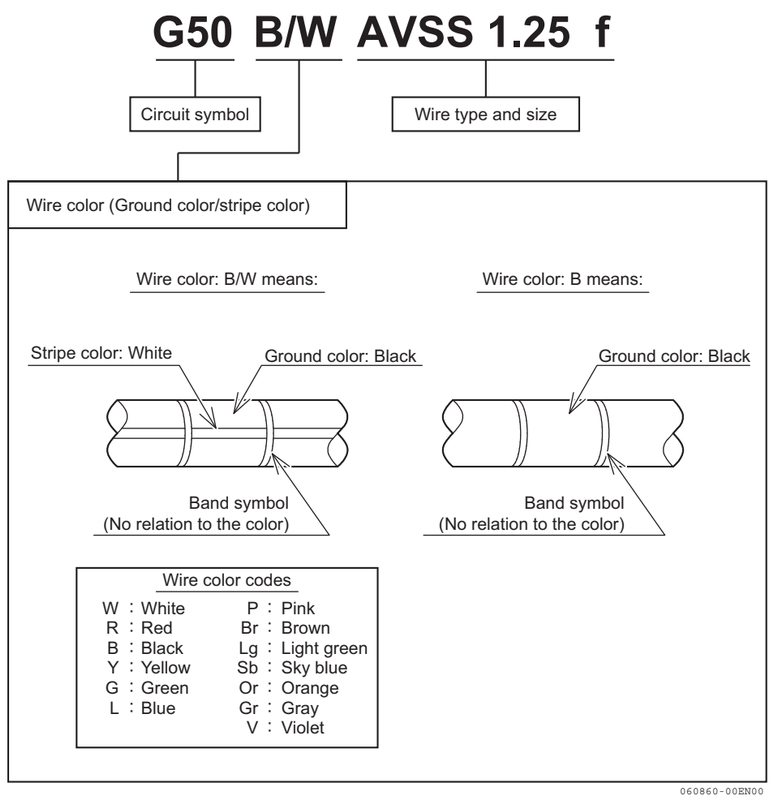


The point of arrow **A** on the main wire shown in the figure above represents an intersection of the branch wire and the main wire.
The direction of the arrow indicates which one is the branch wire (the arrowed line represents the branch wire) and also shows the division between the branch wire and the main wire.

In the example above, the wires are divided as follows.

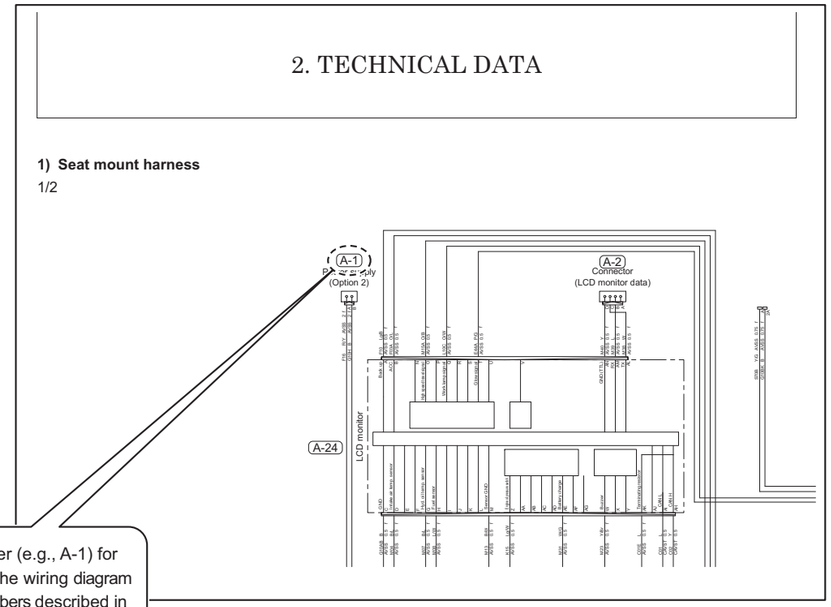
1 to the point of arrow **A** : Branch wire G50A B/W AVSS 0.5 f
2 to **3** : Main wire G50 B/W AVSS 1.25 f

● How to Read Wiring Symbols

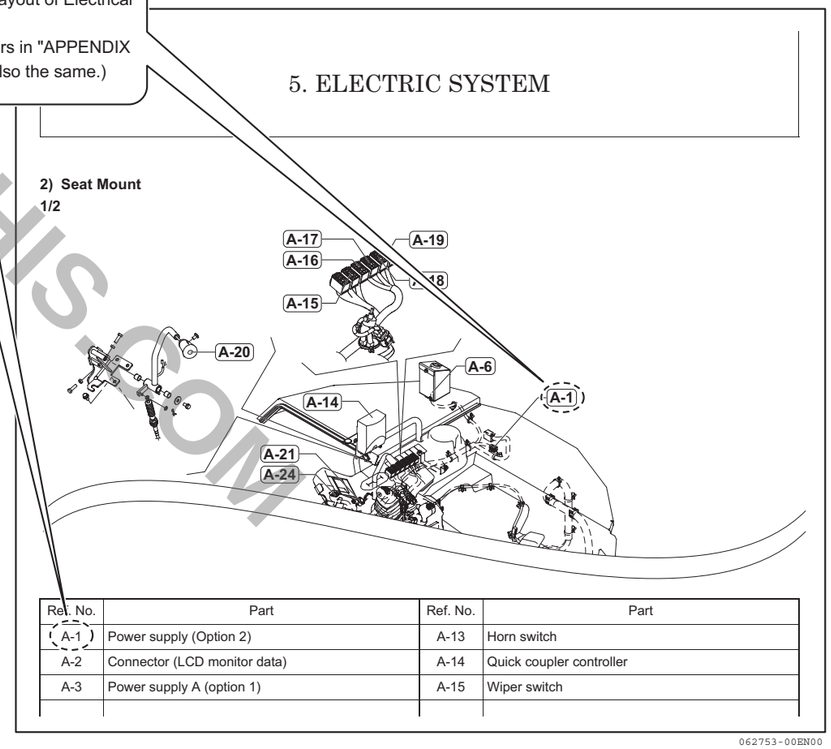


● Reference numbers

<Example>



Each reference number (e.g., A-1) for electric equipment in the wiring diagram corresponds to the numbers described in Section "5-1-1 Parts Layout of Electrical Equipment".
(The reference numbers in "APPENDIX Wiring Diagram" are also the same.)

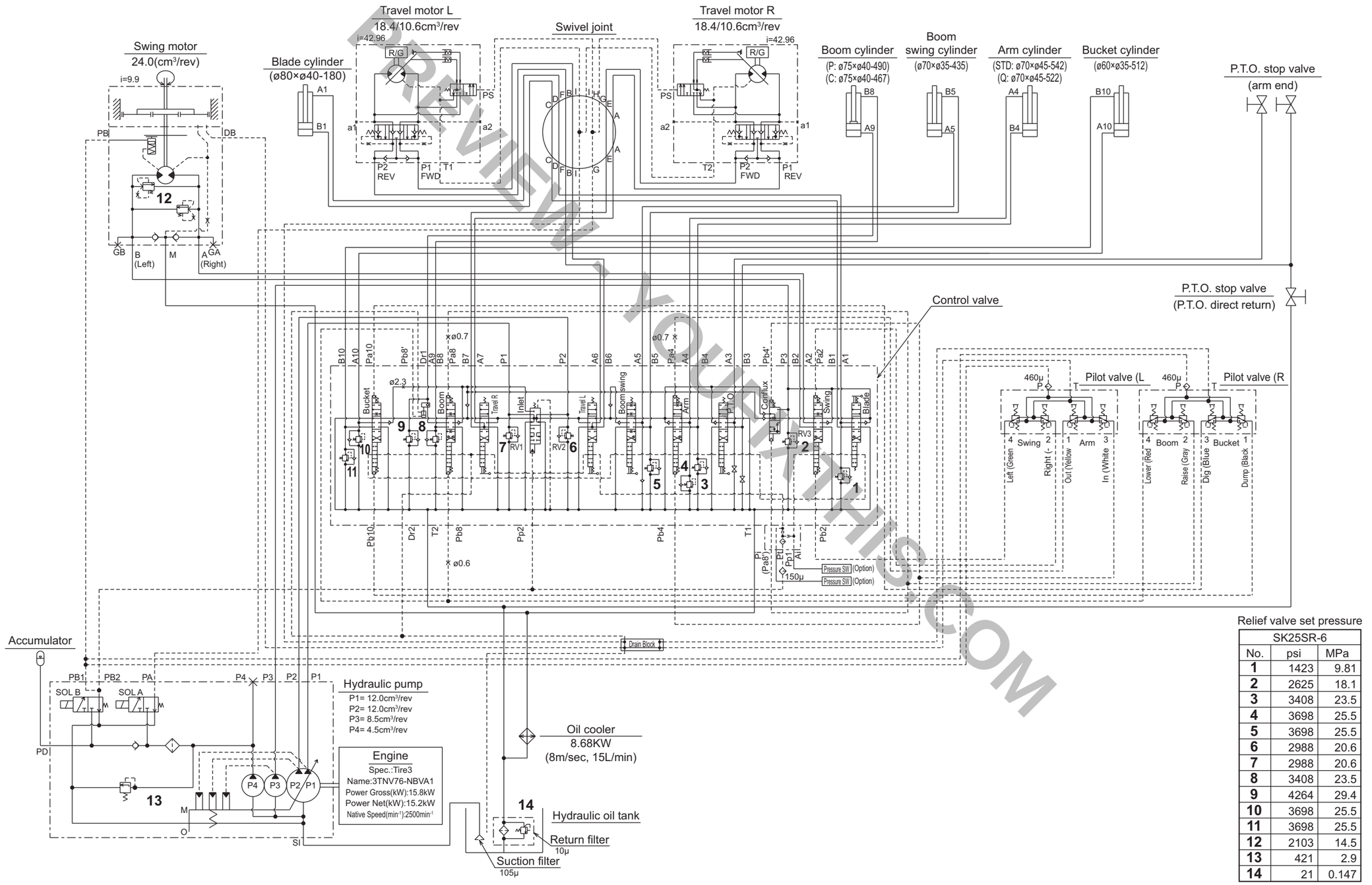


Ref. No.	Part	Ref. No.	Part
A-1	Power supply (Option 2)	A-13	Horn switch
A-2	Connector (LCD monitor data)	A-14	Quick coupler controller
A-3	Power supply A (option 1)	A-15	Wiper switch

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2-8 Hydraulic Circuit Schematic

Applicable model : SK25SR-6



Relief valve set pressure

SK25SR-6		
No.	psi	MPa
1	1423	9.81
2	2625	18.1
3	3408	23.5
4	3698	25.5
5	3698	25.5
6	2988	20.6
7	2988	20.6
8	3408	23.5
9	4264	29.4
10	3698	25.5
11	3698	25.5
12	2103	14.5
13	421	2.9
14	21	0.147

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4-2-4 Cylinder Head

Cylinder Head Components

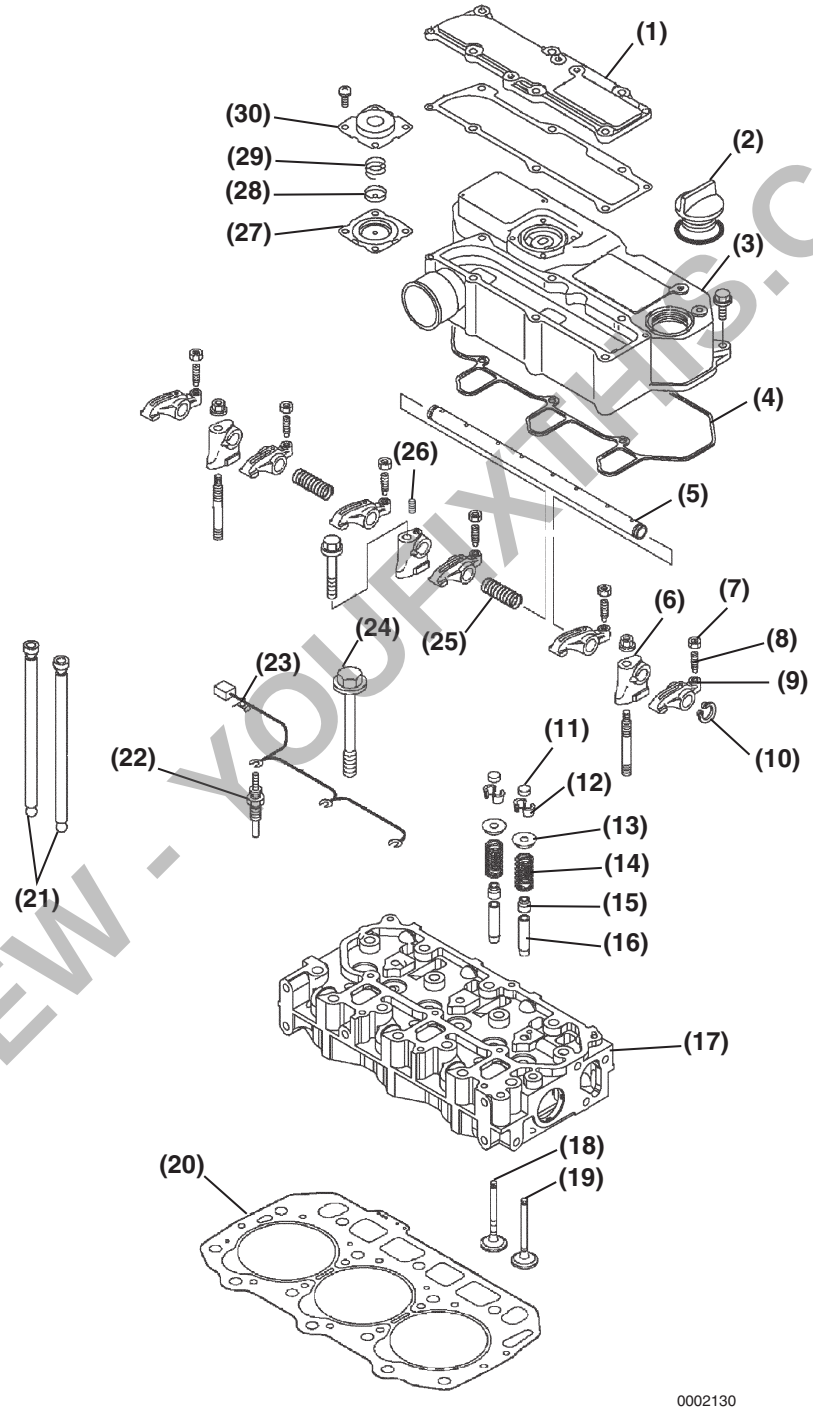


Figure 4-2-1

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3-7 List of Tightening Torque

3-7-1 Machine

Applicable model			SK25SR-6		
Equipment No		Tightening part	Thread size	Tightening torque ft•lbf (N•m)	Adhesive
Engine / Electrical equipment					
	1	Engine mount vibroisolating rubber	Nut 10	19 to 23 (24.5 to 32.3)	
	2	Engine × Engine mount (Fore Left)	M10×25	32.5 to 43.4 (44.1 to 58.9)	ThreeBond 1324
	3	Engine × Engine mount (Fore Right)	M10×25	32.5 to 43.4 (44.1 to 58.9)	ThreeBond 1324
	4	Engine × Engine mount (Rear Left)	M10×25	32.5 to 43.4 (44.1 to 58.9)	ThreeBond 1324
	5	Engine × Engine mount (Rear Right)	M10×25	32.5 to 43.4 (44.1 to 58.9)	ThreeBond 1324
	6	Engine mount × Stopper (Left)	M10×25	32.5 to 43.4 (44.1 to 58.9)	ThreeBond 1324
	7	Engine mount × Stopper (Fore Right)	M10×25	32.5 to 43.4 (44.1 to 58.9)	ThreeBond 1324
	8	Air cleaner	M8×20	15 to 16 (19.6 to 22.6)	
	9	Air cleaner intake hose	Hose clip 70	1.6 to 1.8 (2.16 to 2.45)	
	10	Cooling water hose	Hose clip 41	1.8 to 2.2 (2.45 to 2.94)	
	11	Oil cooler hose	Hose clip 22	2.9 to 3.6 (3.9 to 4.9)	
	12	Fuel level gauge unit	M5×12 (Pan head screw)	0.87 to 1.0 (1.18 to 1.47)	
	13	Fuel level gauge hose	Hose band 13	0.75 to 1.0 (0.98 to 1.47)	
	14	Fuel oil tank drain valve	R3/8	15 to 21 (19.6 to 29.4)	Loctite 577
	15	Fuel oil tank holding band	Nut 10	1.9 to 2.2 (2.45 to 2.94) <Tank holding side>	18.1 to 23.8 (24.5 to 32.3) <Lock nut side>
	16	Battery holding rod	Nut 6	1.5 to 2.2 (1.96 to 2.94) (Lower <holding>)	3.6 to 4.3 (4.9 to 5.88) (Upper <Locknut>)
	17	Accelerator cable locknut	Nut 6	2.9 to 3.6 (3.92 to 4.90)	
	18	Wire harness × Starter motor terminal	Nut 8	4.5 to 8.6 (5.88 to 11.77)	
	19	LCD monitor × Panel cover	M6×20	0.75 to 1.0 (1.0 to 1.5)	
	20	Panel cover (lower) × Panel cover (upper)	M5×14 (Tapping screw)	1.9 to 2.4 (2.55 to 3.3)	
	21	Safety switch (Travel speed)	Locknut (Fine thread) 20	14 to 18 (19.6 to 24.5)	
	22	Safety switch (Cut-off lever)	Locknut (Fine thread) 20	14 to 18 (19.6 to 24.5)	
	23	Accelerator dial (holding nut)	Nut (Fine thread) M9	1.02 to 1.08 (1.33 to 1.47)	

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5-4 Error Code List

Error code	Classification	Error description	Detection condition	Causes	Corrective measures
00 000091.00	Caution	Accelerator sensor malfunction: above normal operating range (SAEJ1843)	Sensor voltage is 4.6 V or more, or 0.2 V or less.	• Connection failure of connectors • Harness wiring failure (engine control dial wiring disconnected or short circuited to GND) • Defective accelerator sensor • Engine ECU internal circuit failure	Check the connectors, harnesses and engine control dial. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000091.01	Caution	Accelerator sensor failure: below normal operating range (SAEJ1843)	Sensor voltage is 4.6 V or more, or 0.2 V or less.	• Connection failure of connectors • Harness wiring failure (engine control dial wiring disconnected or short circuited to GND) • Defective accelerator sensor • Engine ECU internal circuit failure	Check the connectors, harnesses and engine control dial. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000091.02	Caution	Accelerator sensor malfunction: intermittent failure	Sensor voltage is 4.6 V or more, or 0.2 V or less.	• Connection failure of connectors • Harness wiring failure (nearly broken wiring of sensor signal line, sensor 5 V line or sensor GND line) • Defective accelerator sensor • Engine ECU internal circuit failure	Check the connectors, harnesses and accelerator sensor. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000091.03	Caution	Accelerator sensor malfunction: short circuit to high voltage side	Sensor voltage is 4.6 V or more, or 0.2 V or less.	• Connection failure of connectors • Harness wiring failure (sensor GND line disconnected or sensor signal line short circuited to power supply) • Defective accelerator sensor • Engine ECU internal circuit failure	Check the connectors, harnesses and accelerator sensor. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000091.04	Caution	Accelerator sensor malfunction: short circuit to low voltage side	Sensor voltage is 4.6 V or more, or 0.2 V or less.	• Connection failure of connectors • Harness wiring failure (sensor signal line disconnected or short circuited to GND, or sensor 5V line disconnected or short circuited to GND) • Defective accelerator sensor • Engine ECU internal circuit failure	Check the connectors, harnesses and accelerator sensor. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000091.15	Caution	Accelerator sensor malfunction: disabled (SAEJ1843)	Sensor voltage is 4.6 V or more, or 0.2 V or less.	Engine ECU map data setting fault	Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000100.01	Warning	Abnormal engine oil pressure	Engine oil pressure switch is on after engine has started.	• Low engine oil pressure • Defective engine oil system • Harness wiring failure (engine oil pressure switch wiring short circuited to GND) • Defective engine oil pressure switch • Engine ECU internal circuit failure	Inspect the engine oil system. Check the harnesses and engine oil pressure switch. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000100.04	Warning	Engine oil pressure switch failure	Engine oil pressure switch is off while engine is stopped with starter switch in the "ON" position.	• Connection failure of connectors • Harness wiring failure (engine oil pressure switch wiring disconnected or short circuited to power supply) • Defective engine oil pressure switch • Engine ECU internal circuit failure	Check the connectors, harnesses and engine oil pressure switch. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000110.00	Warning	Engine coolant temperature sensor malfunction: too high	Sensor voltage is 4.8 V or more.	• Engine overheating • Insufficient amount of engine coolant • Defective engine cooling system • Defective coolant temperature sensor system	Inspect the engine cooling system. Check the connectors, harnesses and coolant temperature sensor. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000110.02	Warning	Engine coolant temperature sensor malfunction: intermittent failure	Error undefined is detected 10 times.	• Connection failure of connectors • Harness wiring failure (nearly broken wiring of sensor signal line, sensor 5 V line or sensor GND line) • Defective coolant temperature sensor • Engine ECU internal circuit failure	Check the connectors, harnesses and coolant temperature sensor. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.
00 000110.03	Warning	Engine coolant temperature sensor malfunction: short circuit to high voltage side	Sensor voltage is 4.8 V or more.	• Connection failure of connectors • Harness wiring failure (sensor signal line disconnected or short circuited to power supply, or sensor GND line disconnected) • Defective coolant temperature sensor • Engine ECU internal circuit failure	Check the connectors, harnesses and coolant temperature sensor. Turn the starter switch to the “OFF” position and then to the “ON” position to check if the error code is displayed again.

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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.

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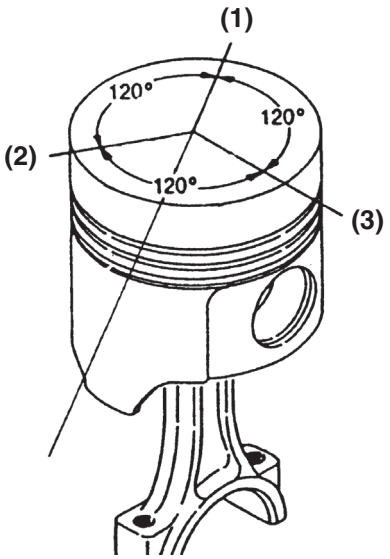
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1 – Top Compression Ring End Gap
2 – Second Compression Ring End Gap
3 – Oil Ring End Gap

Figure 4-2-89

Installation of Crankshaft

1. If removed, reinstall the key and timing gear on crankshaft.
2. Install new bearing inserts **(Figure 4-2-90, (1))** and thrust bearing **(Figure 4-2-90, (2))** in the cylinder block and main bearing caps. Be sure the oil holes in the upper bearing shells align with the oil ports in the cylinder block. Apply a liberal coat of clean engine oil to the bearings and crankshaft journals.

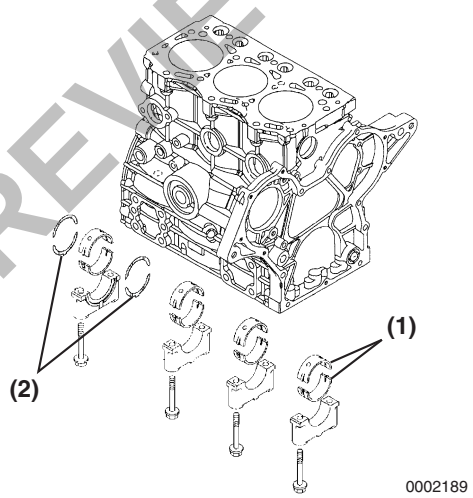


Figure 4-2-90

3. Install the crankshaft in the engine.

IMPORTANT

The main bearing caps are numbered and have arrows for proper positioning. The No. 1 cap is at the flywheel end. The arrows point toward the flywheel end of the engine.

4. Reinstall the main bearing caps.
5. Apply a light coat of clean engine oil to the bearing cap bolts and tighten the bolts to the specified torque in two stages (1/2 then full torque). *See "3-7-2 Engine Tightening Torque" section for tightening torque.*
6. Rotate the crankshaft to ensure it turns freely.
7. Apply ThreeBond Liquid Gasket No. 1212, Part No. 977770-01212 to the mounting flange of the flywheel housing **(Figure 4-2-91, (2))**.
8. Align the flywheel housing with the two dowel pins **(Figure 4-2-91, (3))**.
9. Reinstall flywheel housing and seal assembly.
10. Reinstall the flywheel **(Figure 4-2-91, (1))** and tighten the bolts to the specified torque. *See "3-7-2 Engine Tightening Torque" section for tightening torque.*

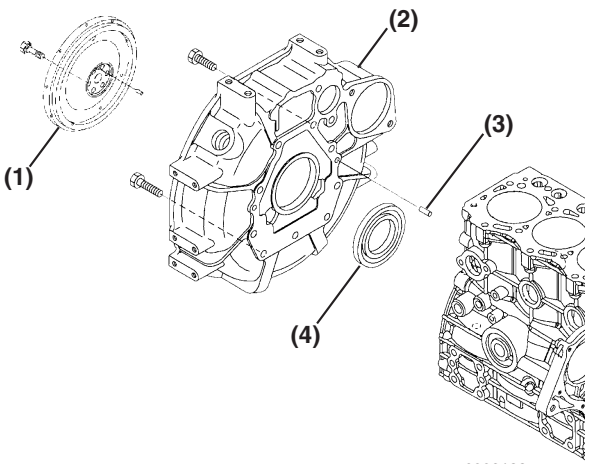


Figure 4-2-91

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2. TECHNICAL DATA

2. Technical Data

2-1 Specifications

Item				Unit	SK25SR-6
Main specifications of machine					
Dimensions					
Overall length (Transportation position)				in. (mm)	161.8 (4110)
				in. (mm)	162.2 (4120)
Cabin	Overall height		Transportation position	in. (mm)	99.6 (2530)
			Traveling position	in. (mm)	99.6 (2530)
	Overall width		Full machine width	in. (mm)	59.1 (1500)
Canopy	Overall height		Transportation position	in. (mm)	99.2 (2520)
			Traveling position	in. (mm)	99.2 (2520)
	Overall width		Full machine width	in. (mm)	59.1 (1500)
Tumbler center distance (Steel track / rubber track)				in. (mm)	62.6 (1590)
Track gauge				in. (mm)	49.2 (1250)
Minimum ground clearance				in. (mm)	12.6 (320)
Traveling performance					
Travel speed	Steel track		Low speed (Forward/Reverse)	MPH (km/hr)	1.7 (2.8)
			High speed (Forward/Reverse)	MPH (km/hr)	2.8 (4.5)
	Rubber track		Low speed (Forward/Reverse)	MPH (km/hr)	1.7 (2.8)
			High speed (Forward/Reverse)	MPH (km/hr)	2.8 (4.5)
Permissible water depth limit				in. (mm)	19.7 (500)
Work performance					
Bucket	Width (Standard)			in. (mm)	15.7 (400)
	[Standard. JIS heaped capacity]			cu.ft. (cu.m)	2.19 (0.06)
	Number of teeth / Installation method			pcs.	3 / Rubber pin lock type
Work range					
Maximum digging depth	With blade raised			in. (mm)	98.0 (2490)
	With blade on the ground			in. (mm)	105.9 (2690)
Maximum depth of vertically digging				in. (mm)	45.3 (1150)
Maximum dumping height				in. (mm)	111.4 (2830)
Minimum front swing radius (with boom in front center)			Cabin	in. (mm)	76.8 (1950)
			Canopy	in. (mm)	
Minimum front swing radius (with boom in full swing)			Cabin	in. (mm)	65.0 (1650)
			Canopy	in. (mm)	

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2-6 Periodic Inspection and Servicing

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

Check & service items			Daily	Every 50 hrs	Every 100 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 2000 hrs
General	Check falling off, breakage of parts		◇							
	Check loosened bolts & nuts, retighten		◇							
	Check engine condition		◇							
	Clean		□							
Fuel oil	Check & supply of oil to the tank		◇(○)							
	Drain the fuel tank			□						
	Water separator	Check, drain	◇							
		Clean					□			
	Replace the fuel filter element						●			
Lube oil	Engine oil	Check, resupply	◇							
		Replace		● 1st time		●				
	Replace the engine oil filter element			● 1st time		●				
	Travel reduction gear oil	Check, resupply				○				
		Replace			● 1st time			●		
Coolant	Check & supply of coolant		◇							
	Check coolant leakage		◇							
	Check & clean radiator fins					□				
	Check & adjust the fan-belt tension		◇	□ 1st time		□				
	Clean & check the cooling system, and replace the coolant							●within one year		
Rubber hose	Check & replace fuel oil pipe, cooling water pipe		◇							●within two years
Governor lever	Adjust the governor lever and accelerator device					□				
Air cleaner	Clean air cleaner					□				
	Replace air cleaner element						●			
Hydraulic system	Hydraulic oil	Check, resupply	◇							
		Replace						●		
	Clean suction filter					□ 1st time		□		
	Replace return filter					● 1st time	●			
	Check for abnormality of hydraulic pump		◇							
	Check function of accumulator									◇
Grease	Check grease-up positions, grease		■							
	Greasing the swing gears and the swing bearings			■						
Undercarriage	Check, adjust track tension		◇							

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2-7 Fuel, Lube Oil and Grease Recommended

Item	Recommended type	Capacity
Fuel oil	Diesel light oil (Ultra low sulfur)	8.0 Gals. (30.5L)
Engine oil	Engine oil SAE10W30, CD class	0.9 Gals. (3.4 L)
Hydraulic oil	Hydraulic oil ISO VG46	In the tank: 6.6 Gals. (25 L) Other parts: 3.7 Gals (14 L)
Travel reduction gear oil	Gear oil SAE90 (GL-4)	0.53 Qts. (0.5 L) each
Idler	Engine oil SAE 30, CC class	0.074 Qts. (0.07 L)
Track roller		0.063 Qts. (0.06 L)
Carrier roller	Lithium soap group (extreme pressure type) multi-purpose grease NLGI No.2	0.021 Qts. (0.02 L)
Cooling water	KOBELCO genuine long-life coolant (LLC) 50 % added water	Radiator: 0.9 Qts. (3.4L) Subtank: 0.1 Qts. (0.4 L)
Grease	Lithium soap group (extreme pressure type) multi-purpose grease NLGI No.2	-

■ Mixture ratio of cooling water and antifreeze

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)	0.60 (0.57)	1.00 (0.95)	1.20 (1.14)	1.40 (1.33)	1.61 (1.52)	1.81 (1.71)	2.01 (1.90)	2.21 (2.09)
Amount of water	Qts. (L)	3.41 (3.23)	3.01 (2.85)	2.82 (2.66)	2.62 (2.47)	2.42 (2.28)	2.21 (2.09)	2.01 (1.90)	1.81 (1.71)

Note :

At the delivery from the factory, water and anti-freeze are mixed in the ratio shown above for the -31°F (-35°C) temperature.

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4. Engine

4-1 Safety

4-1-1 Safety Statements

Yanmar is concerned for your safety and your machine's condition. Safety statements are one of the primary ways to call your attention to the potential hazards associated with Yanmar TNV engine operation. Follow the precautions listed throughout the manual before operation, during operation and during periodic maintenance procedures for your safety, the safety of others and to protect the performance of your engine. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if you need to replace a part that has a label attached to it, make sure you order the new part and label at the same time.



This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

⚠ DANGER

Danger (the word "DANGER" is in white letters with a red rectangle behind it) - indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Danger is limited to the most extreme situations.

⚠ WARNING

Warning (the word "WARNING" is in black letters with an orange rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Caution (the word "CAUTION" is in black letters with a yellow rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Caution without the safety alert symbol indicates a potentially hazardous situation that can cause damage to the machine, personal property and / or the environment or cause the machine to operate improperly.

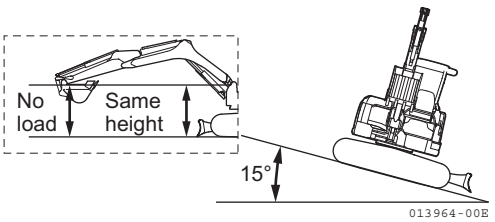
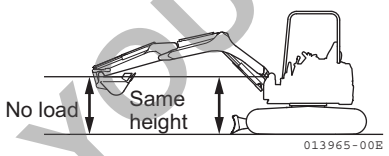
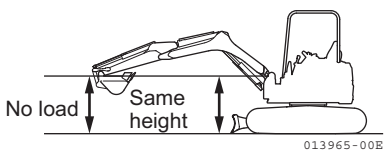
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Applicable model			SK25SR-6	
Item	Measuring condition	Unit	Standard	Allowable
Machine performance				
Drift of cylinders				
Boom swing drift (Cylinder rod extension)	Machine position  • Engine: stopped • Hydraulic oil temp.: 122 to 140 °F (50 to 60 °C) • Site: Firm, flat ground • Make the boom and bucket pins the same height. • Park the machine on a slope with an inclination of 15 degrees and turn the upperstructure 90 degrees to the crawler and engage the swing lock. • Measure the cylinder rod extension after 10 min.	in. (mm).	0.24 (6.0) or less	0.35 (9.0)
Swing drift at stopping	Machine position  • Engine: Rated speed • Hydraulic oil temp.: 122 to 140 °F (50 to 60 °C) • Site: Firm, flat ground • Make the boom and bucket pins the same height. • Make match marks on the outer race and the inner race of the swing bearing (or the track frame). • Measure shifted distance between both marks after making one turn with no load.	in. (mm)	6.0 (153) or less, 30 degrees or less	9.1 (230) or less, 45 degrees or less
Swing time	Machine position  • Engine: Rated speed • Hydraulic oil temp.: 122 to 140 °F (50 to 60 °C) • Site: Firm, flat ground • Make one idling turn with no load, then measure the time necessary to make 5 turns.	sec.	30.0	34.0

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Cleaning of Cylinder Head Components

⚠ WARNING

FUME / BURN HAZARD!



- **Always read and follow safety related precautions found on containers of hazardous substances like parts cleaners, primers, sealants and sealant removers.**
- **Failure to comply could result in death or serious injury.**

Thoroughly clean all components using a non-metallic brush and an appropriate solvent. Each part must be free of carbon, metal filings and other debris.

Inspection of Cylinder Head Components

Visually inspect the parts. Replace any parts that are obviously discolored, heavily pitted or otherwise damaged. Discard any parts that do not meet its specified limits.

NOTICE

Any part which is found defective as a result of inspection or any part whose measured value does not satisfy the standard or limit must be replaced.

NOTICE

Any part determined to not meet the service standard or limit before the next service, as determined from the state of current rate of wear, should be replaced even though the part currently meets the service standard limit.

IMPORTANT

Mark all valve train components so they can be installed in their original locations.

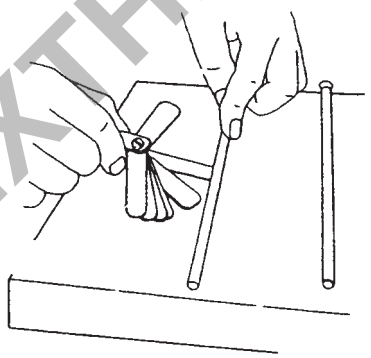
Note: Record all measurements taken during inspection.

Inspection of Push Rods

Push Rod Bend

Determine if the bend of the push rods is within the specified limit.

1. Place the push rods on a flat inspection block or layout bed.
2. Roll the push rods until a gap can be observed between a portion of the push rod and the surface of the block or layout bed.
3. Use a feeler gauge to measure the gap **(Figure 4-2-11)**. *See "3-2 Engine Service Standard" section for the service limit.*



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Figure 4-2-11

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12. Apply ThreeBond Liquid Gasket No. 1212, Part No. 977770-01212, or equivalent sealant to the sealing surface of the fuel injection pump drive gear access cover. Reinstall the cover on the front of the gear case and tighten the bolts.
13. Reinstall the fuel injection high-pressure lines. *See Installation of High-Pressure Fuel Injection Lines on page 4-3-8.*

IMPORTANT

When installing a new or repaired fuel injection pump, add 5 - 7 oz (150 - 200 cc) of new, clean engine oil to the fuel injection pump at the fill plug located in the upper outside section of the governor housing.

14. Reinstall the coolant pump V-pulley **(Figure 4-3-21, (4))**, spacer **(Figure 4-3-21, (3))** (if equipped) and engine cooling fan **(Figure 4-3-21, (2))**.

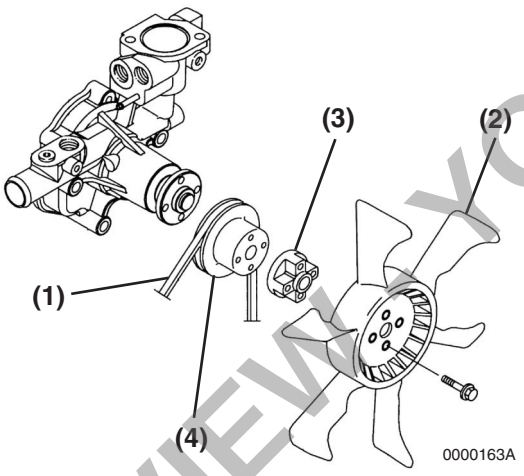


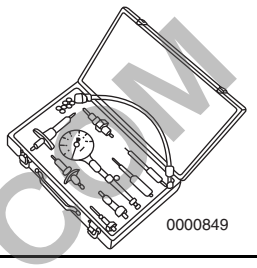
Figure 4-3-21

15. Reinstall the cooling fan V-belt **(Figure 4-3-21, (1))**.
16. Reinstall the cooling fan guard (if equipped).
17. Prime the fuel system.
18. Operate the engine and check for fuel and lube oil leaks.

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4-9 Troubleshooting

4-9-1 Special Service Tools

Compression Gauge Kit	For measuring compression pressure Part No. TOL-97190080	

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6-1-1 Control Valve Operation

1) Oil Flow from Hydraulic Pump

(1) Piston pump P1

The oil from the piston pump P1 is fed to the right travel motor and the boom and bucket cylinders through the port P1 of the inlet section, the travel (R), boom and bucket sections.

(2) Piston pump P2

The oil from the piston pump P2 is fed to the left travel motor, the boom swing and arm cylinders and the P.T.O. through the port P2 of the inlet section, the travel (L), boom swing, arm and P.T.O. sections.

(3) Gear pump P3

The oil from the gear pump P3 flows through the port P3 of the parallel-flow divider to the blade and swing sections, and also to the arm and P.T.O. sections to be combined with the oil from the piston pump P2.

2) Simultaneous Operation of Boom and Bucket

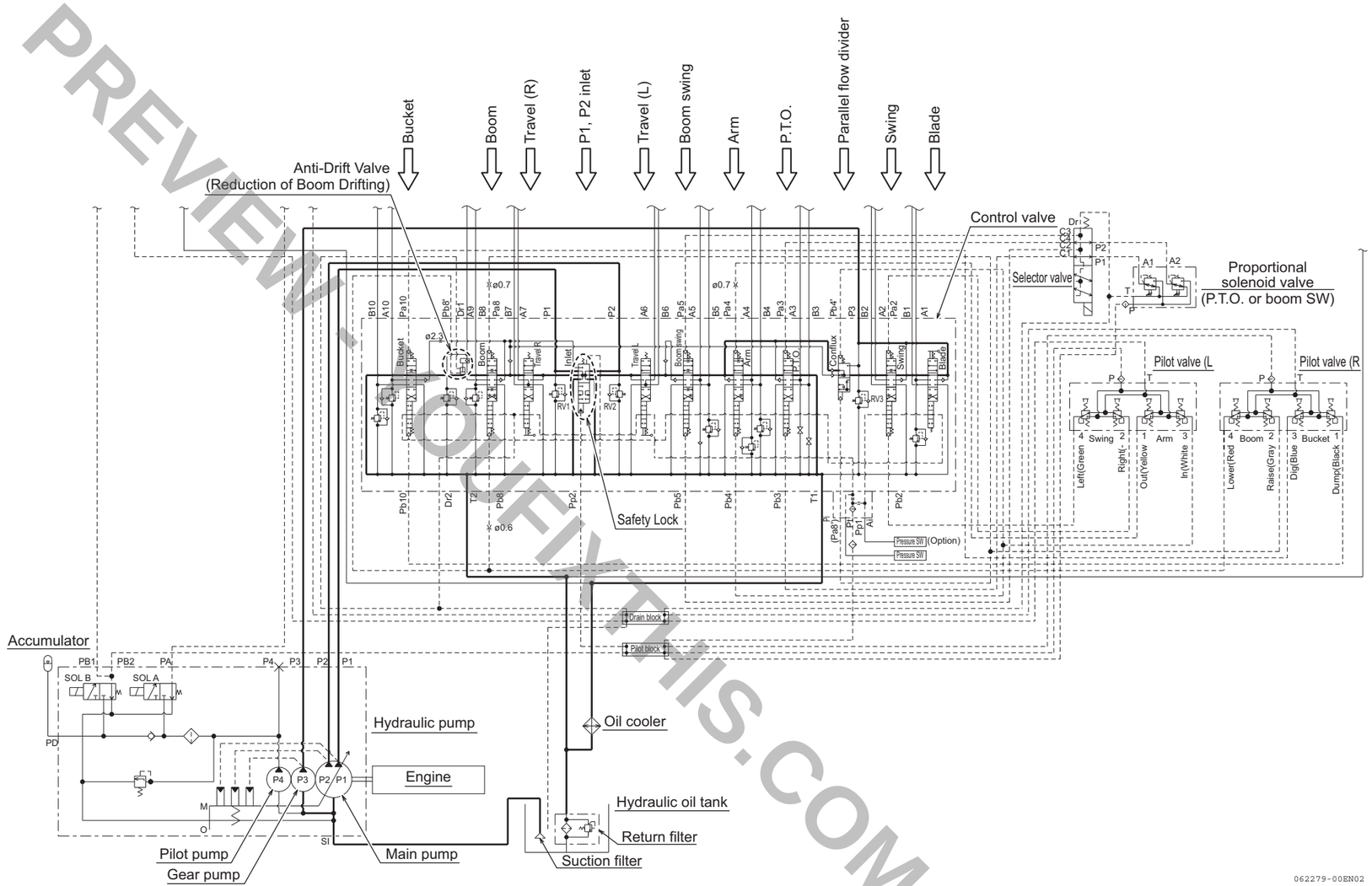
A parallel passage is provided for the boom and bucket sections. The parallel passage has a throttle in the bucket section, so that the oil can flow to the boom section more smoothly than to the bucket section when the boom is given a heavier load. Therefore, the boom and the bucket can be operated simultaneously.

3) Anti-Drift Valve (Reduction of Boom Drifting)

The anti-drift valve is installed in the boom section to reduce the boom drifting.

4) Safety Lock

When the lock lever is set to the "LOCK" position, the spool of the inlet section is in the neutral position, so that the oil from the piston pumps P1 and P2 flows back to the hydraulic oil tank through the return passage. Therefore, the implement does not operate and the machine does not travel even when the control or travel lever is operated.



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4) Bucket Operation

(1) Bucket curl operation

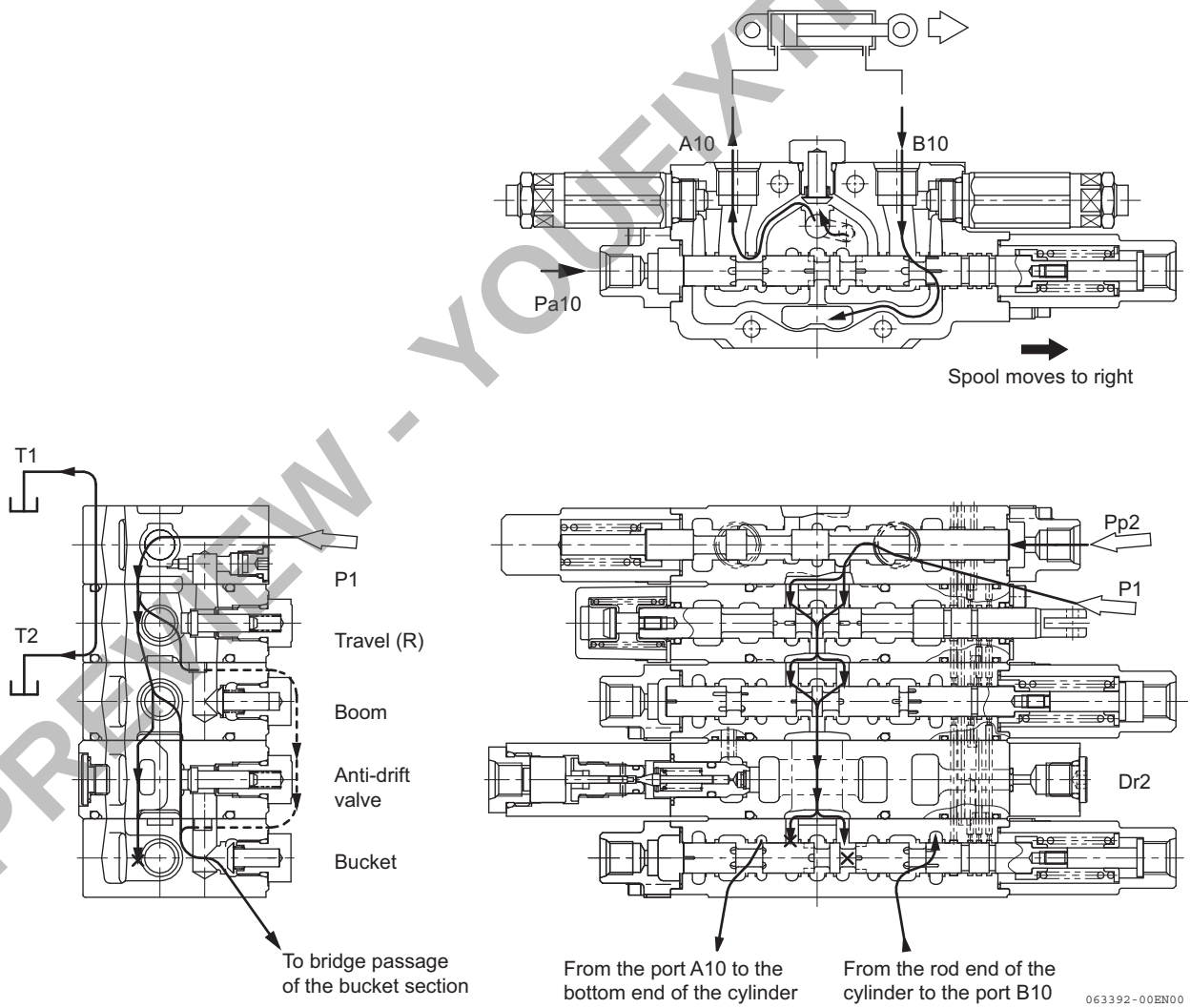
When the bucket control lever is moved to the left to curl the bucket, the oil from the pilot valve flows to the port Pa10 to move the spool of the bucket section.

The P1 by-pass passage is blocked by the bucket spool as the spool has been moved, so that the oil from the port P1 flows through the check valve above the by-pass passage in the travel section and the check valve on the by-pass valve of the anti-drift valve to the parallel passage in the section.

The passage between the port A10 and the bridge passage is opened as the bucket spool has been moved, so that the oil flowed to the parallel passage flows through the load check valve in the bucket section and the bridge passage to the port A10, and is fed to the bottom end of the bucket cylinder.

Meanwhile, the return oil from the rod end of the bucket cylinder flows through the port B10 to the return oil passage, which is opened as the bucket spool has been moved.

Thus, the bucket cylinder is retracted to dump the bucket.



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6. Service standard

1) Parts inspection

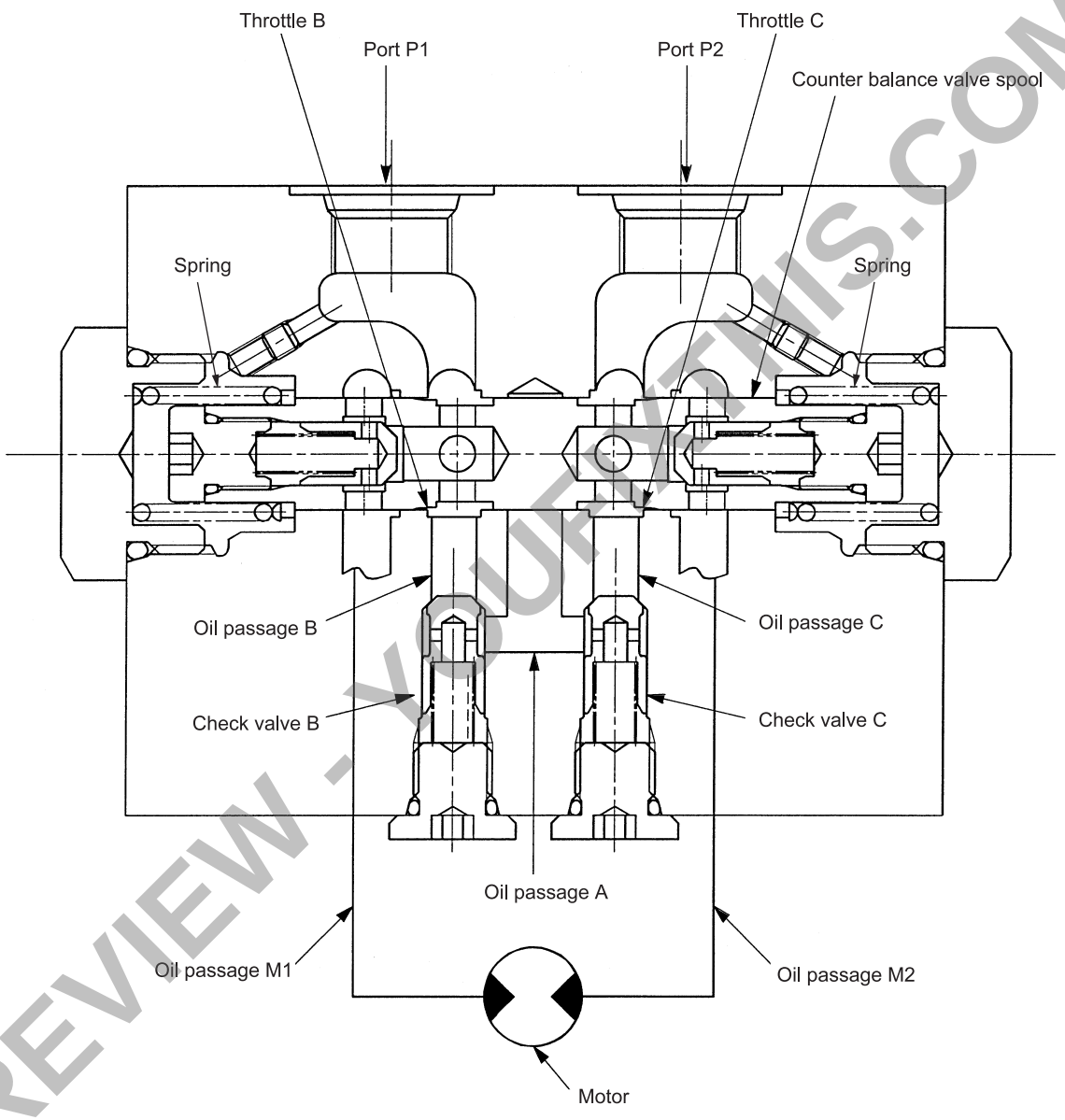
Parts	Inspection Items	Criteria and Corrective Actions
Valve bodies	(1) Check for scratches, rust and corrosion.	(1) Replace if any of the following portions are damaged. • Sliding portion in contact with the spool, especially the land portion to which holding pressure is applied. • Flange portion through which the spool enters. • Port seal portion in contact with the O-ring • Seat portion of each relief valve or overload relief valve • Damage to any other portion that will result in damage to normal function.
Spool	(1) Check for scratches, scuffing, rust and corrosion. (2) Insert spool into valve body and push and pull spool while turning it to check spool movement.	(1) Replace if the outer sliding portion has flaws that are caught on a nail. (2) Repair or replace if the spool does not move smoothly.
Check valve (Load check valve)	(1) Check check valve body and spring for damage. (2) Insert check valve in check valve retainer and operate it to check valve operation.	(1) Repair or replace if the seat portion is flawed or dented. (2) The check valve is normal if valve operation is smooth. If not, replace.
Spring related parts	(1) Check return spring retainer, plug and cover for rust, corrosion, deformation and breakage.	(1) Replace parts that do not operate smoothly or that are so badly damaged that its durability will be affected.
Spool seals and related parts	(1) Check O-rings for hardening, deformation and flaws (2) Check dust wiper for deformation and flaws. (3) Check oil seal retainer for rusts, corrosion and deformation.	(1) Replace. (2) Replace. (3) Repair or replace.
System relief valves and circuit relief valves	(1) Check for visible rusts (2) Check valve seat contact face for damage (3) Check springs for defects (4) Check O-rings and back-up rings for damage	(1) Replace. (2) Replace if the contact face flawed or dented. (3) Replace. (4) In principle, replace all of them.

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3) Anti-Cavitation Valve

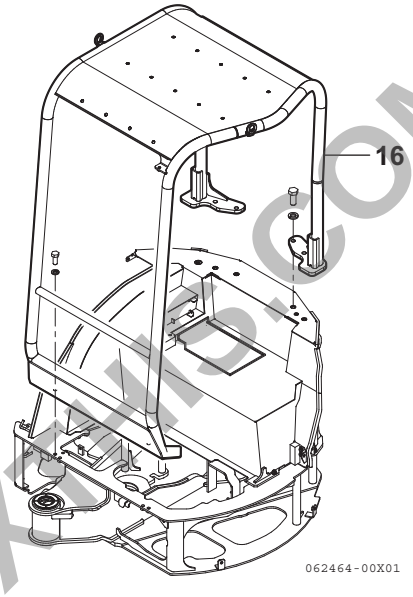
This anti-cavitation mechanism works together with the counter balance valve.

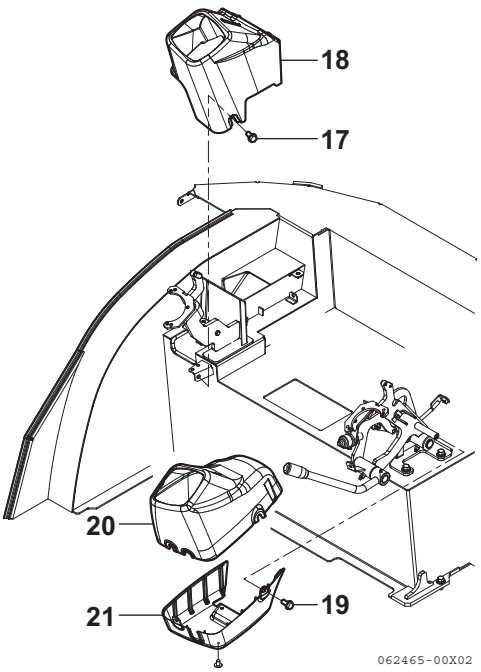
Compared with conventional counter valance mechanism, this mechanism has oil passages A, B and C and check valves B and C in addition.



Anti-cavitation valve (in neutral state)

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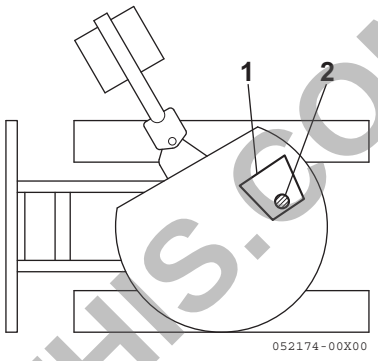
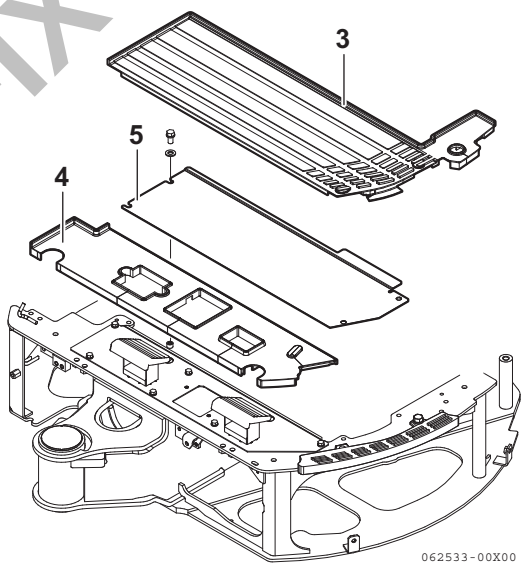
Procedure	
(11) Remove canopy **16**.	

(12) Loosen two bolts **17** to remove lever R cover **18**. (13) Loosen three bolts **19** to remove lever cover L (top) **20** and lever cover L (bottom) **21**.	

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7-5-4 Removal and Reinstallation of Swing Motor

1) Removal

Procedure	
(1) Swing upperstructure so that drain plug **2** of hydraulic oil tank **1** is positioned halfway between right and left tracks. Then lower bucket to ground and stop engine. (2) Drain hydraulic oil from hydraulic oil tank or evacuate hydraulic oil tank using compression vacuum. (Refer to Section "7-5-8 Removal and Reinstallation of Hydraulic Oil Tank" for procedure for draining hydraulic oil.)	
(3) Remove floor mat A **3**, floor mat B **4** and step **5**.	

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