WSM

WORKSHOP MANUAL
KUBOTA EXCAVATOR

KX121-3
KX161-3

Kubota

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Code No.97899-60550

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B.Safety precautions for servicing, disassembly and reassembly

⚠ Safety precautions for servicing

Most accidents during servicing arise from carelessness. Please remember that safety involves both the welfare of the employees and improved work efficiency.

⚠ Safety precautions for Disassembly and reassembly

Machines must be diassembled and assembled efficiently and safely.
It is very important to thoroughly understand the construction and function of the machine, to make all appropriate preparations, and start operations according to the specified working procedures.

a. Safety measures before starting work

(1) Work clothes

1. Wear specified work cap and clothed. (Under no circumstances may workers wear undershirts only.)
   Cuffs must be kept buttoned, and any tears must be mended.)
2. Wear safety shoes.
3. Do not wear cotton gloves when working on the internal section of engine, reduction gears or hydrauricunits for repair or others, or when using a hammer. Wear leather gloves, however, when hoisting wires.

(2) Inspecting equipment and tools

1. Prepare equipment (cranes, fork lifts, tool, etc.) required for servicing and inspect for any problems before starting work.
2. Hammer heads (metal parts) must be firmly secured to their handles.
3. Check hosting tools (wire ropes, hoisting chains, etc.) before use.

(3) Keep workshop in order

1. Secure appropriate space needed for disassembly to the job.
2. Secure a clean, safe place for arranging disassembled parts.
3. Store volatile substances (gasoline, light oil, thinner, oily articles, etc.) in appropriate containers at selected locations to prevent fire hazards.

b. Safety measures during work

(1) Protectors

1. Wear goggles when using chisels for chipping.
2. Use appropriate protectors during welding.
3. Wear a helmet when working with a crane or at elevated locations.

(2) Team work

1. When working with two or more people, divide the work and maintain close communication.
2. Clane work must be carried out using predetermined signals.

(3) Disassembly and assembly

1. Do not wear gloves when using hammers.
2. Use rods of the specified soft material for removing pins. Do not use a hammer as a pad.
3. Do not place fingers in holes when centering.
4. Heavy parts must be adequately supported before removingbolts.

(4) Cranes

1. In principle, use a crane for objects heavier than 44lb (20kg).
2. Crane operation and hoisting must be performed only by qualified personal.
3. Pay careful attention to the center of gravity when hoisting, and do not stand under the lifted objects.

(5) Others

1. To work under a jacked-up carrier, be sure to place wood pieces under it.
2. When charging batteris, make sure there are no open flames in the immediate vicinity.
3. All electric tools must be grounded.
4. Before welding the machine, remove the battery.
   - When removing the battery, be sure to disconnect negative (-) cord first.
   - When mounting the battery, be sure tp connect the positive (+) cord first.

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Machine Quality Specifications

KX121-3, KX161-3: KE, KDG, KUK Version

Machine specification:Service port, Wrist rest, STD-arm, KBM-cab, KBM-bucket

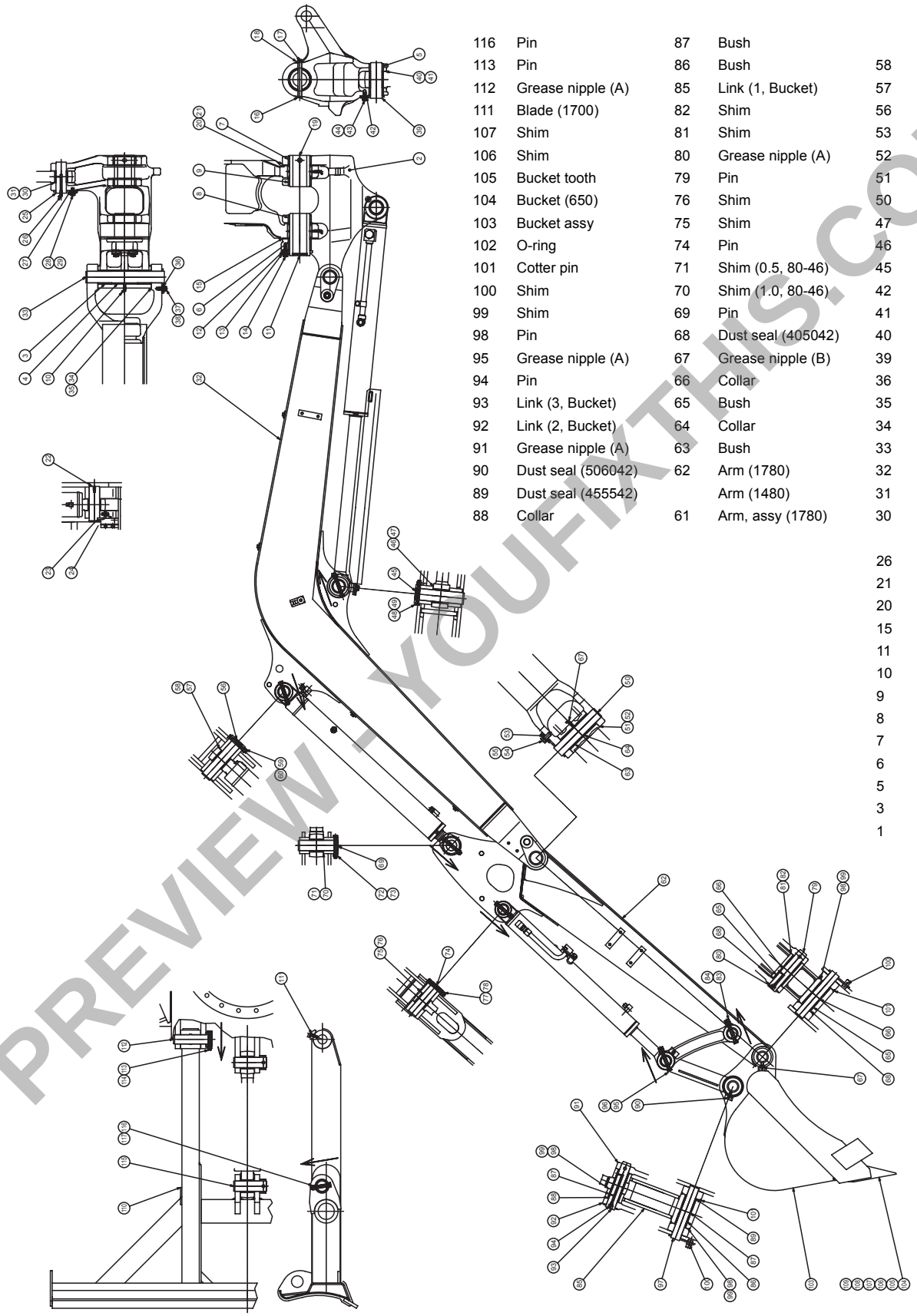
No		Specifications Items			Unit	KX121-3	KX161-3	Remarks
Q1	Main Spec. JIS A8404							
1	1	Machine size	Total length (Transport)		mm	5055 ± 101	5510 ± 110	
					inch	199.0 ± 4.0	216.9 ± 4.3	
	2		Total width		mm	1700 ± 17	1960 ± 20	
					inch	66.9 ± 0.7	77.2 ± 0.8	
	3		Total height (Canopy)		mm	-	-	
					inch	-	-	
	4		Total height (Cabin)		mm	2490 ± 25	2540 ± 25	
					inch	98.0 ±1.0	100.0 ± 1.0	
2	1	Weight	Machine weight (Canopy)		kg	-	-	Fuel tank
					lbs		-	
	2		Machine weight (Cabin)		kg	4060 ± 81	5070 ± 101	
					lbs	8951 ± 179	11177 ± 223	
3	1	Performance	Swivel speed	L	rpm	9.2 ± 0.9	9.3 ± 0.9	
	2			R	rpm	9.2 ± 0.9	9.3 ± 0.9	
	3		Travel speed	Rubber F1	km/h	3.0 ± 0.3	2.5 ± 0.3	
					mph	1.86 ± 0.19	1.55 ± 0.19	
	4			Rubber F2	km/h	5.0 ± 0.5	4.4 ± 0.4	
					mph	3.11 ± 0.3	2.73 ± 0.25	
	5			Iron F1	km/h	2.9 ± 0.3	2.2 ± 0.12	
					mph	1.80 ± 0.2	1.37 ± 0.12	
	6			Iron F2	km/h	4.7 ± 0.5	3.9 ± 0.4	
					mph	2.9 ± 0.3	2.4 ± 0.25	
	7		Gradeability		deg	30	30	
4	1	Rear end min. turning radius			mm	1300 ± 26	1090 ± 22	
					inch	51.2 ± 1.0	42.9 ± 0.9	
	2	Swivel frame rear ground clearance			mm	570 ± 11	620 ± 12	
					inch	22.4 ± 0.4	24.4 ± 0.5	
	3	Tambler center distance			mm	1710 ± 50	1990 ± 60	
					inch	67.3 ± 2.0	78.3 ± 2.4	
	4	Crawler total length			mm	2175 ± 65	2500 ± 75	
					inch	85.6 ± 2.6	98.4 ± 3.0	
	5	Crawler total width			mm	1700 ± 34	1960 ± 39	
					inch	66.9 ± 1.3	77.2 ± 1.5	
	6	Min. ground clearance			mm	330 ± 10	320 ± 10	
					inch	13.0 ± 0.4	12.6 ± 0.4	
5	1	Front attachment	Bucket heaped capacity	CECE	m^3			
					yd^3			
	2			SAE, JIS	m^3	0.12	0.17	
					yd^3	0.16	0.22	
	3		Bucket width		mm	600 ± 12	650 ± 13	Without side cutter
					inch	23.6 ± 0.5	25.6 ± 0.5	
	4		Swing angle	Canopy L	deg			
	5			Canopy R	deg			
	6			Cabin L	deg	75 ± 2	75 ± 2	
	7			Cabin R	deg	50 ± 2	48 ± 2	

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E.Machine structure

a. Front attachment : KX121-3, EU-version



116	Pin	87	Bush		Arm, assy (1480)
113	Pin	86	Bush	58	Shim (0.5, 80-46)
112	Grease nipple (A)	85	Link (1, Bucket)	57	Shim (1.0, 80-46)
111	Blade (1700)	82	Shim	56	Pin
107	Shim	81	Shim	53	Spacer
106	Shim	80	Grease nipple (A)	52	Shim (0.5, 90-51)
105	Bucket tooth	79	Pin	51	Shim (1.0, 90-51)
104	Bucket (650)	76	Shim	50	Pin
103	Bucket assy	75	Shim	47	Shim (0.5, 80-51)
102	O-ring	74	Pin	46	Shim (1.0, 80-51)
101	Cotter pin	71	Shim (0.5, 80-46)	45	Pin
100	Shim	70	Shim (1.0, 80-46)	42	Spacer
99	Shim	69	Pin	41	Shim (0.5, 90-51)
98	Pin	68	Dust seal (405042)	40	Shim (1.0, 90-51)
95	Grease nipple (A)	67	Grease nipple (B)	39	Pin
94	Pin	66	Collar	36	Spacer
93	Link (3, Bucket)	65	Bush	35	Shim (0.5, 110-52)
92	Link (2, Bucket)	64	Collar	34	Shim (1.0, 110-52)
91	Grease nipple (A)	63	Bush	33	Pin
90	Dust seal (506042)	62	Arm (1780)	32	Boom (2870)
89	Dust seal (455542)		Arm (1480)	31	Shim (0.5)
88	Collar	61	Arm, assy (1780)	30	Shim 2

26	Grease nipple (A)
21	Thrust collar (3.5)
20	Thrust collar (3.2)
15	Thrust collar (3.2)
11	Pin
10	Grease nipple (B)
9	Bush
8	Bush
7	Bush
6	Bush
5	Bush
3	Bush (506060)
1	Swing bracket

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F. Maintenance intervals

a. KTC, KCL, KTA-version

No.	Check points		Intervals	Hour meter indicator																	Consequently		
				50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	1000			
1	Coolant		check	Daily check																			
			change																		every 2 years		
2	Fuel		check	Daily check																			
3	Engine oil		check	Daily check																			
			change	●					○					○					○		every 250 hrs		
4	Hydraulic oil		check	Daily check																			
			change																	○	every 1000 hrs	*1	
5	Lubrication points		—	Daily check																			
6	Radiator and oil cooler		check	Daily check																			
7	Washer liquid (cabin type)		check	Daily check																			
8	Engine and electrical wiring		check	Daily check																	every year		
9	Fuel tank, Fuel filter		drain	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	every 50 hrs		
10	Battery condition		check	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	every 50 hrs		
11	Greasing swing bearing teeth		—	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	every 50 hrs		
12	Fan belt tension		adjust				○				○				○				○	○	every 200 hrs		
13	Radiator hoses and clamps		check				○				○				○				○	○	every 200 hrs		
			replace																		every 2 years		
14	Air filter element	Outer element	clean				○				○				○				○	○	every 200 hrs	*2	@
			replace																	○	every 1000 hrs	*2	
		Inner element	replace																	○	every 1000 hrs	*2	
15	Greasing swing ball bearings		—				○				○				○				○	○	every 200 hrs		
16	Fuel filter element		replace																○		every 400 hrs		@
17	Engine oil filter	KX91-3	replace	●					○					○					○		every 250 hrs		
		KX121-3		●										○							every 500 hrs		
18	Drive unit oil		change		●										○						every 500 hrs		
19	Hydraulic return filter element		replace					●										○			every 500 hrs		
20	Hydraulic suction filter element		replace																	○	every 1000 hrs		
21	Filter in the pilot hydraulic system		replace																	○	every 1000 hrs		
22	Fuel injection nozzle injection pressure		check																		every 1500 hrs	*4	@
23	Front idler and track roller oil		change																		every 2000 hrs		
24	Alternator and starter motor		check																		every 2000 hrs		
25	Injection pump		check																		every 3000 hrs	*4	@
26	Radiator system		rinse																		every 2 years		
27	Fuel line and Intake air line		check				○				○				○				○	○	every 200 hrs		@
			replace																		every 2 years	*3	

IMPORTANT:

● First operation

*1 When using a hydraulic breaker, change hydraulic oil and return filter according to the table on □Hydraulic Oil Change (Including Exchange of the Suction Filter in the Hydraulic Tank) under □EVERY 1000 SERVICE HOURS□ in the chapter □REGULAR CHECKS AND MAINTENANCE WORK□.

*2 Clean and replace the air filter more frequently if used under dusty conditions. By heavy soiling, replace the filter.

*3 Replace only if necessary.

*4 Consult your local KUBOTA Dealer for this service.

- The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.
  Please see the Warranty Statement in detail.

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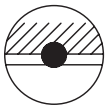
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G.Water and oil quantity

	Unit	KX121-3	**KX161-3**		Remarks
Radiator Canopy / Cab	L gal	7.4 / 7.7 1.96 / 2.03	←		Kubota LLC-N-50F 50%
Reserve tank	L gal	1.1 0.29	←		
Engine Crank case	L gal	8.5 2.2	←		SAE10W30(CD)
Hydraulic oil Full	L gal	75 19.8	←		ISO 46
Hydraulic oil Tank	L gal	46 12.2	←		ISO 46
Wheel motor	L gal	0.5 0.13	0.9 0.24		SAE90 (API GL-4)
Track roller	cc gal	80 0.02	←		SAE30(CD)
Upper roller	cc gal	60 0.02	←		SAE30(CD)
Front idler	cc gal	50 0.01	←		SAE30(CD)
Fuel tank	L gal	64 16.9	←		

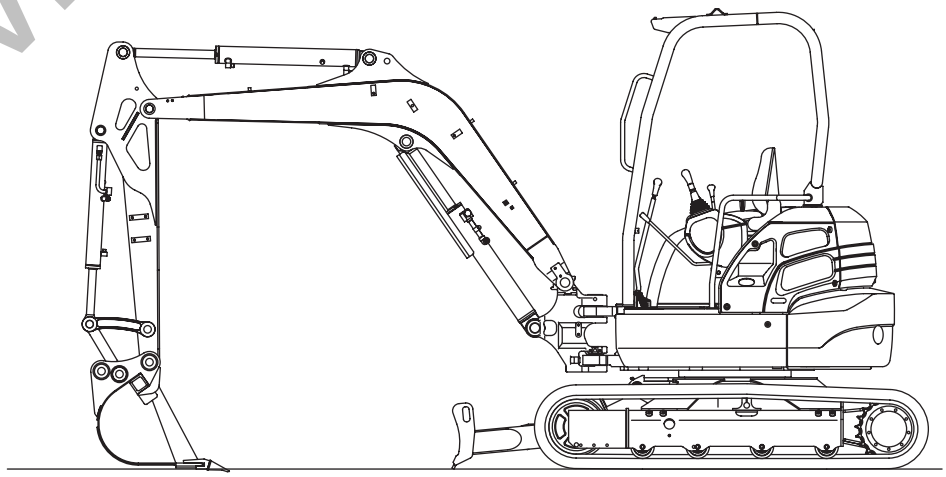
Inspection of hydraulic oil

When checking the hydraulic oil level, satisfy the following conditions and make sure the oil level is above the center the oil gauge.



The oil level is within the shaded area shown in the figure at left.

1) Oil temp. should be between 10 ~ 30 °C, 50 ~ 86 °F.
2) Stance of front attachment :
   Swing : Straight forward
   Arm : Vertical to the ground
   Bucket : On the ground at its bottom
   Dozer blade : Down to the ground

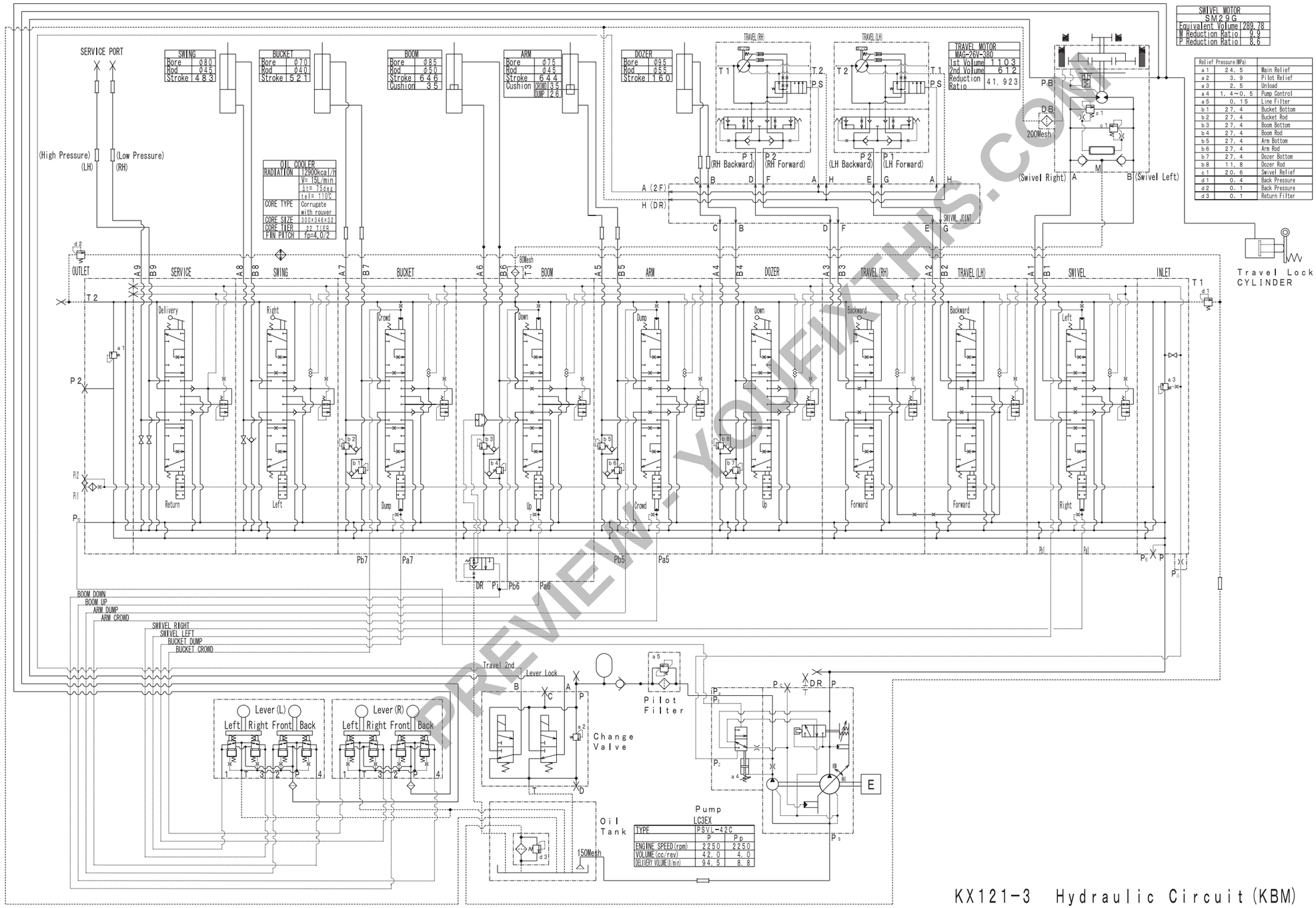


3) Air breather hose is connected to the oil tank. (Not pressurized type.)

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I. Hydraulic circuit diagram

a. KX121-3 European - version



KX121-3 Hydraulic Circuit (KBM)

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A.Troubleshooting

a. Case - Study : Abnormal speed

	Problems	Probable causes	Remedies	Ref.Fig.
1	The speed of all actuators is low.	1) The engine rpm is low.	1) Adjust the accelerator cable or link. 2) Check the engine systems (fuel system, compression system).	
		2) The quantity of working fluid in the hydraulic oil tank is too small. The oil quality is poor.	1) Replenish or replace the working fluid.	
		3) The suction line (suction filter) is clogged.	1) Check the suction line. Replace the suction filter.	
		4) The control differential pressure of the LS regulator is too low. The locknut of the differential pressure control spring in the LS regulator is loosened or maladjusted. (If the speed of all actuators is too high, suspect that the control differential pressure is too high.)	1) Actually measure the front unit or the swivel speed and make an adjustment so as to bring the setting of the spring within specifications. In the figure, tightening the setscrew increases the actuator speed and loosening the setscrew decreases the speed.	Fig.15
		5) Gear pump volumetric efficiency is too low, so that LS control pressure difference is not enough.	1) Check gear pump delivery pressure and volumetric efficiency. Renew gear pump.	
		6) Leak from the PLS signal circuit (abnormal conditions of the PLS signal circuit in the control valve)	1) Check the hose connections for leak. Disassemble and check the PLS signal circuit in the control valve.	
		7) Insufficient pressure due to defects in the unload valve seat	1) Measure the unload pressure. Disassemble and clean the unload valve seat.	Fig.2
		8) Insufficient pressure due to defects in the main relief valve seat	1) Measure and readjust the main relief pressure. Disassemble and clean the relief valve seat.	Fig.1
		9) Shut-off valve of inlet section is loosened, so that main pump pressure got down to tank.	1) Check shut-off valve and retighten.	
		10) Defects or wear in the pump-mounting coupling	1) Repair or replace the pump coupling.	
		11) Breakage or wear in the pump drive shaft	1) Replace the shaft.	
		12) Seizure, breakage or wear in the pump internal parts	1) Repair or replace the pump.	
2	The speed of all the actuators in the hydraulic pilot system is too low.	1) The pilot filter is clogged.	1) Clean the pilot filter. Replace the filter if necessary.	Fig.6
		2) Dust caught in the changeover valve or wear has caused the pilot primary pressure to drop.	1) Disassemble and clean the changeover valve and adjust the pilot relief pressure.	Fig.7
		3) Pilot primary relief valve is misadjusted.	1) Check the pressure and readjust it with shim.	
		4) Insufficient discharge quantity of the pilot pump	1) Test the pilot pump performance. Replace the pump if it is defective.	
3	All the speeds on the R or L side in the pilot manipulation system are too low or the manipulation is poor.	1) The screen built in the pilot valve on the R or L side is clogged.	1) Disassemble and clean the screen.	
		2) The pilot primary line on the R or L side is defective or the pilot valve is defective.	1) Check the defective pilot valve primary line. Replace the pilot valve assembly if necessary.	Fig.8, 9
4	The speed of a certain hydraulic pilot section is too low.	1) The control spool has got stuck in the neutral position.	1) Disassemble and service the pilot valve. Eliminate the cause of the stick. Replace the assembly if necessary.	Fig.10
		2) The relevant spool of the pilot valve has got stuck. (In both the A and B ports, a stick is rare.)	1) Measure the pilot secondary pressure. Adjust the pressure using a shim.	Fig.8, 9
		3) The pilot secondary pressure is too low.	1) Check the pilot spool for abnormal wear. Replace the valve assembly if necessary.	

Fig.1 Main relief valve

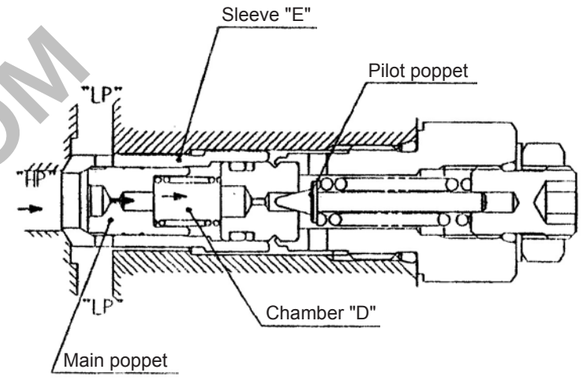


Fig. 2 Unload valve(KX161-3)

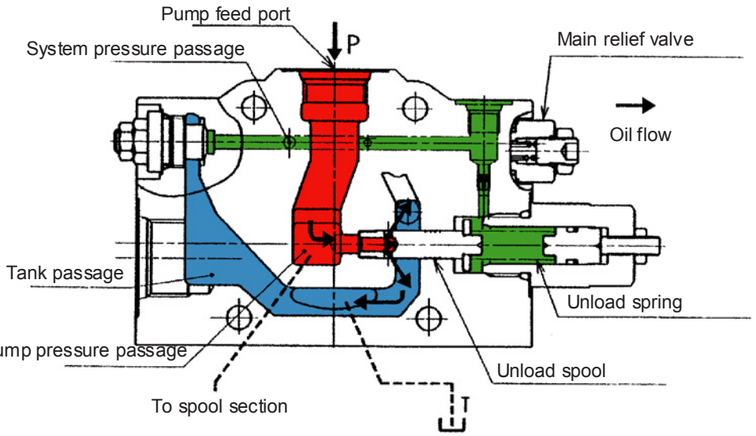
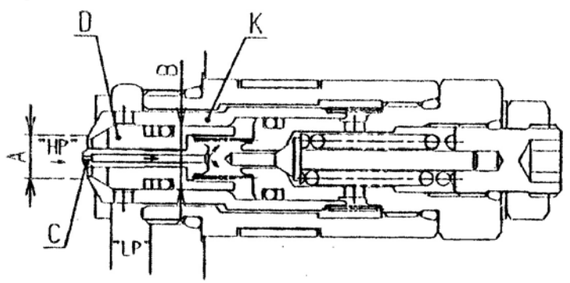


Fig. 3 Overload relief valve

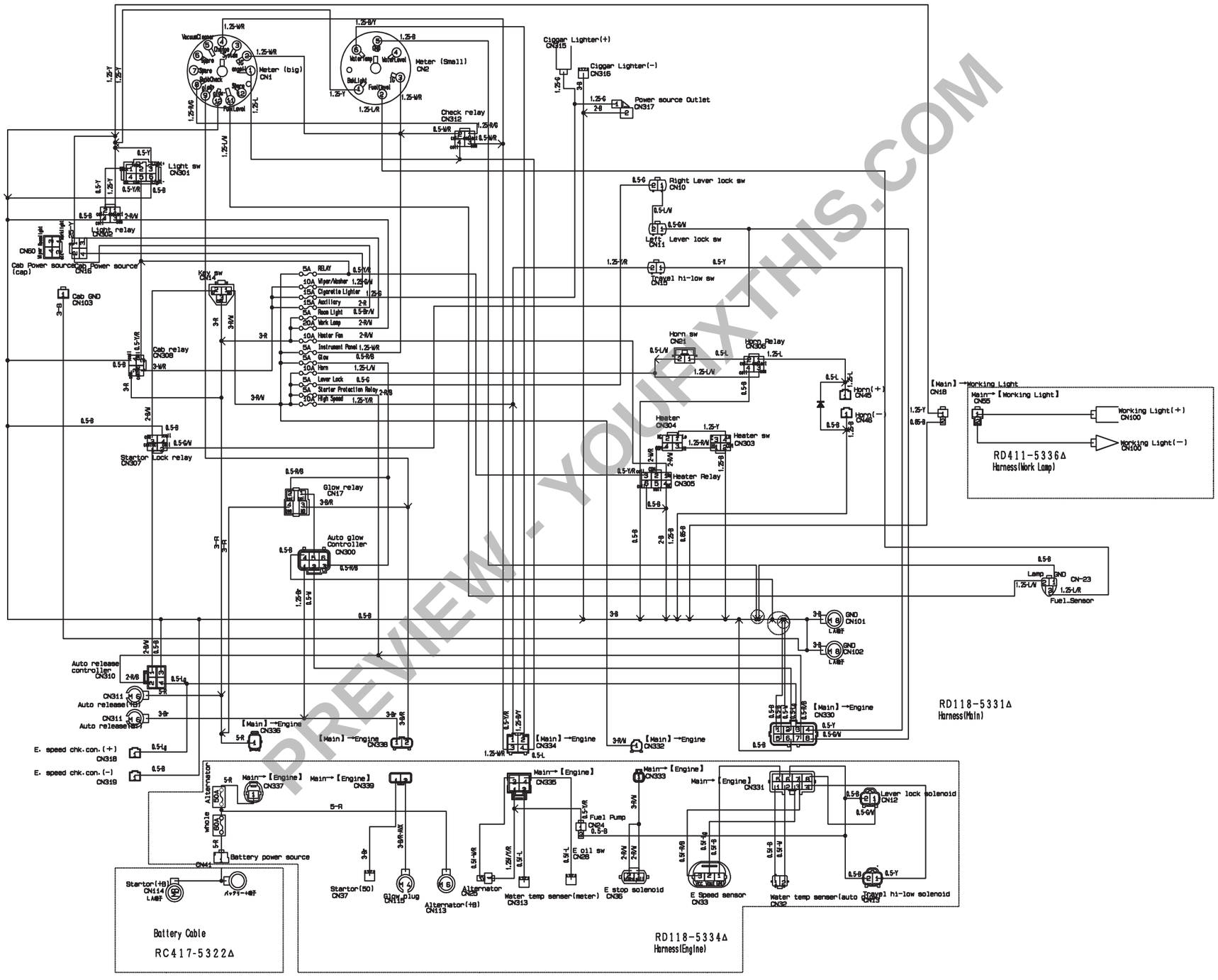


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B.Circuit diagram

a. Electric Circuit Diagram: KX121-3, KX161-3



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(2) Display and identification of errors in operating mode

If any of the AI control devices gets in trouble during the machine run, the system lamp (red) starts blinking and indicates the type of error as listed in Table 1.

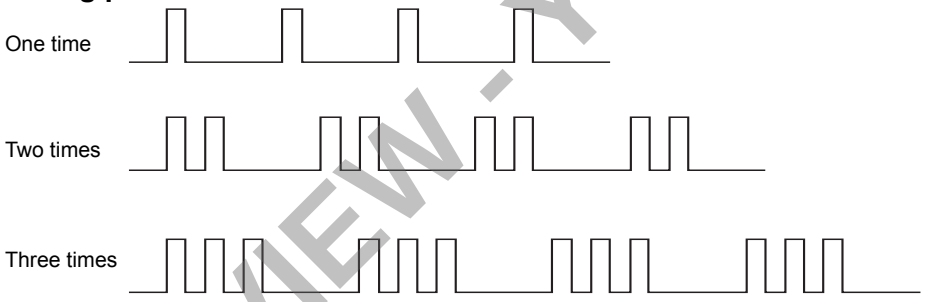
Table 1 System lamp blinks in operating mode

Fail No.	Fail symptom	Trouble indicator lamp blinking times in operating mode
(1)	Water temperature sensor line break	-
(2)	Acceleration sensor line break	2
(3)	Governor sensor line break	3
(4)	AI motor drive line break	4
(5)	Self-holding relay circuit malfunction	5
(6)	AI motor drive line short-circuit	6
(7)	AI motor restrict malfunction	-
(8)	Engine speed sensor line break	-
(9)	Starter motor auto release	-
(10)	Battery voltage abnormal	10
(11)	Controller system malfunction	11

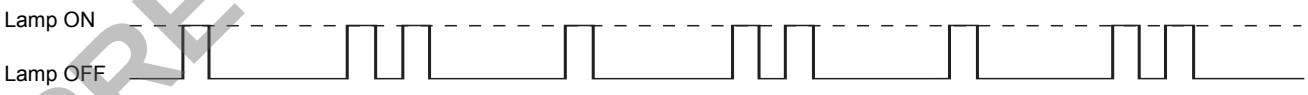
Remarks:

1. The lamp keeps blinking for a predetermined time. The microcomputer has been programmed to recognize these errors as machine troubles.
2. If the detection voltage of the acceleration sensor or governor sensor drops and stays below 0.2 V for 150 msec or so, for example, the microcomputer judges this as a breakdown and gives a signal to make the lamp blink.
3. If two or more failures occur at a time – governor sensor line break and AI motor drive line break at once, for example, the lamp starts blinking twice and 3 times soon after. This cycle is repeated.

Blinking pattern



In case No.1 and No. 2 fails exist, lamp blinking pattern should be as follows.



Fail contents only in the operating mode are recorded in the AI controller.

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(8) Tightening torque of bolts and nuts

Refer to the tightness torque table below.

Bolts, Nuts / Nomial Dia.	4T (4)	7T (7)	9T (9)
	SS41	S40C, S45C	SCr4
M6	7.8 ~ 9.3 N·m 0.80 ~ 0.95 kgf·m 5.8 ~ 6.9 ft·lbf	9.8 ~ 11.3 N·m 1.00 ~ 1.15 kgf·m 7.2 ~ 8.3 ft·lbf	12.3 ~ 14.2 N·m 1.25 ~ 1.45 kgf·m 9.0 ~ 10.5 ft·lbf
M8	17.7 ~ 20.6 N·m 1.80 ~ 2.10 kgf·m 13.0 ~ 15.2 ft·lbf	23.5 ~ 27.5 N·m 2.40 ~ 2.80 kgf·m 17.4 ~ 20.3 ft·lbf	29.4 ~ 34.3 N·m 3.00 ~ 3.50 kgf·m 21.7 ~ 25.3 ft·lbf
M10	39.2 ~ 45.1 N·m 4.00 ~ 4.60 kgf·m 28.9 ~ 33.3 ft·lbf	48.0 ~ 55.9 N·m 4.90 ~ 5.70 kgf·m 35.4 ~ 41.2 ft·lbf	60.8 ~ 70.6 N·m 6.20 ~ 7.20 kgf·m 44.8 ~ 52.1 ft·lbf
M12	62.8 ~ 72.6 N·m 6.40 ~ 7.40 kgf·m 46.3 ~ 53.5 ft·lbf	77.5 ~ 90.2 N·m 7.90 ~ 9.20 kgf·m 57.1 ~ 66.5 ft·lbf	103.0 ~ 117.7 N·m 10.50 ~ 12.00 kgf·m 75.9~ 86.8 ft·lbf
M14	107.9 ~ 125.5 N·m 11.00 ~ 12.80 kgf·m 79.6 ~ 92.6 ft·lbf	123.6 ~ 147.1 N·m 12.60 ~ 15.0 kgf·m 91.1 ~ 108.5 ft·lbf	166.7 ~ 196.1 N·m 17.00 ~ 20.00 kgf·m 123.0 ~ 144.7 ft·lbf
M16	166.7 ~ 191.2 N·m 17.00 ~ 19.50 kgf·m 123.0 ~ 141.0 ft·lbf	196.1 ~ 225.6 N·m 20.00 ~ 23.00 kgf·m 144.7 ~ 166.4 ft·lbf	259.9 ~ 304.0 N·m 26.50 ~ 31.00 kgf·m 191.7 ~ 224.2 ft·lbf
M18	245.2 ~ 284.4 N·m 25.00 ~ 29.0 kgf·m 180.8 ~ 209.7 ft·lbf	274.6 ~ 318.7 N·m 28.00 ~ 32.50 kgf·m 202.5 ~ 235.1 ft·lbf	343.2~ 402.1 N·m 35.00 ~ 41.00 kgf·m 253.2 ~ 296.5 ft·lbf
M20	333.4~ 392.2 N·m 34.00 ~ 40.00 kgf·m 245.9 ~ 389.3 ft·lbf	367.7 ~ 431.5 N·m 37.50 ~ 44.0 kgf·m 271.2 ~ 318.2 ft·lbf	519.8 ~ 568.8 N·m 53.00 ~ 58.00 kgf·m 383.3 ~ 419.5 ft·lbf

(9) Types and materials of bolts and nuts

[ex. bolts]

Types	Material	Tensile strength	Hardness	Bolt head marking	
4T	SS41	Over 392 MPa 4000 kgf/cm^2 56892 lbf/in^2	H_RB 62 ~ 98	(4)	No mark or marked 4
7T	S40C S45C	Over 686 MPa 7000 kgf/cm^2 99561 lbf/in^2	H_RC 20 ~ 28	(7)	Marked 7
9T	SCr4	Over 882 MPa 9000 kgf/cm^2 128007 lbf/in^2	H_RC 28 ~ 34	(9)	Marked 9

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b. Exchange of bucket (Kubota Japan Bucket)

CAUTION

* When replacing the bucket, wear a hard helmet, goggles and other protective gears.
* When working in buddy system, fully understand signals from each other for added safety.

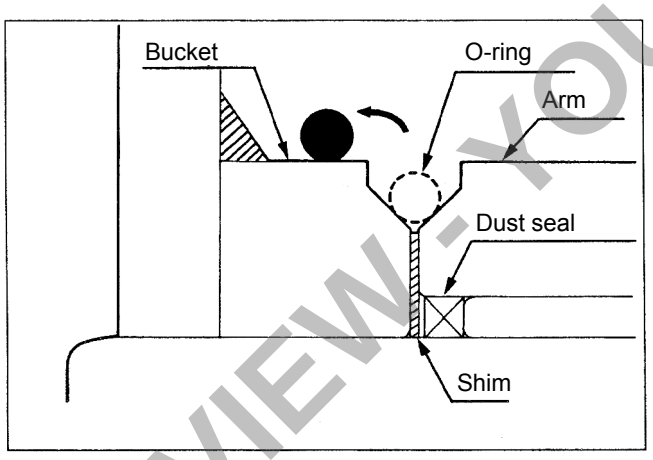
Take the following procedures to replace the bucket.

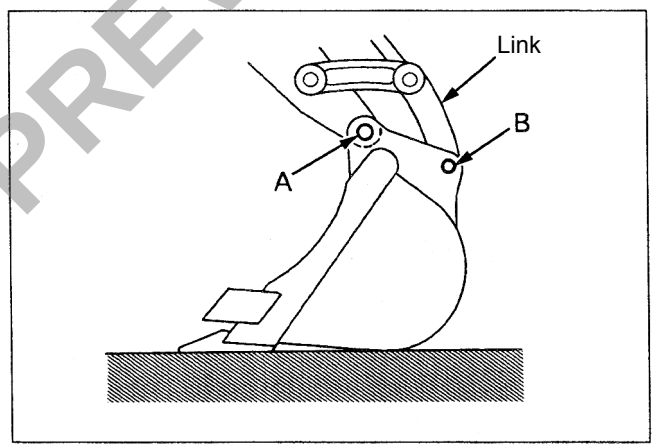
IMPORTANT

* Be careful to keep the drawn-out pins free of sand and mud.
* A dust seal is attached at each end of the bushing. In removing and fitting the pins, be careful not to damage the dust seals.

■ Removing the bucket

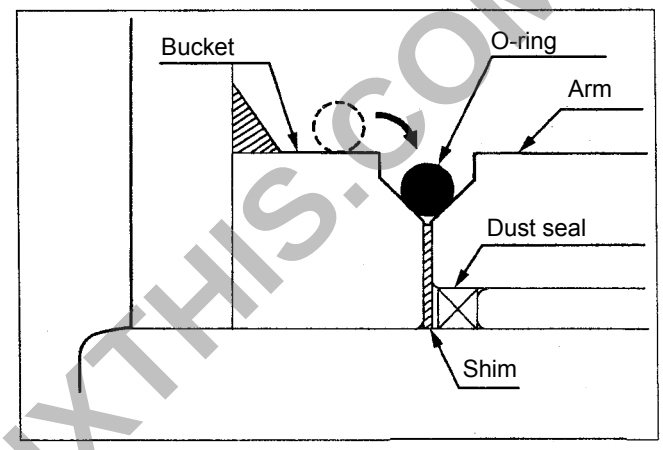
1. Place the bucket just on a flat, level ground.
2. Stop the engine and let out pressure from the hydraulic system.
3. Detach the O-ring from the groove and draw out the pins A and B.





■ Fitting the bucket

1. Place the O-ring on the boss of the bucket.
2. Align the arm with the hole A, put the shims at both ends of the arm, and couple them with the pins. Align the link with the hole B, put the shims at both ends of the link, and couple them with the pins.
3. Apply and tighten up the pin fixing bolts.
4. Fit the O-ring in the groove.

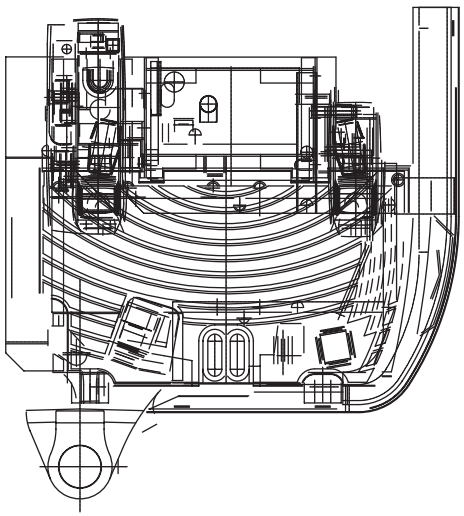


5. Grease up the pins.

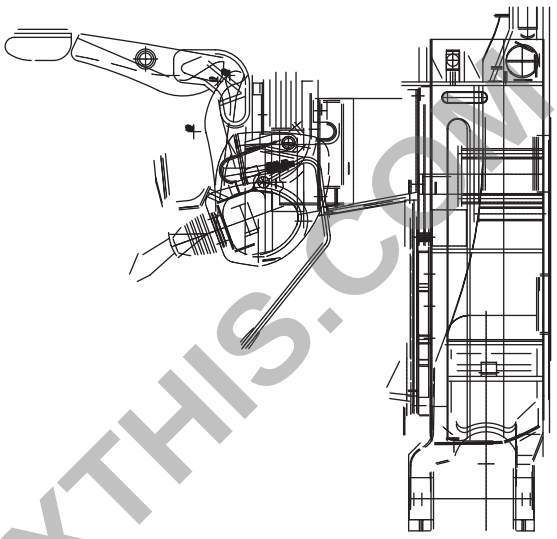
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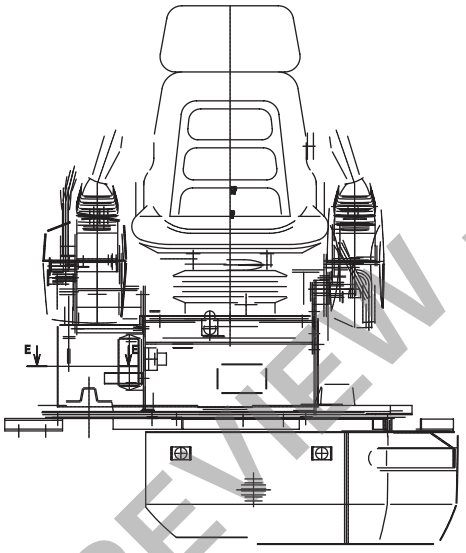
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b. Seat & control box

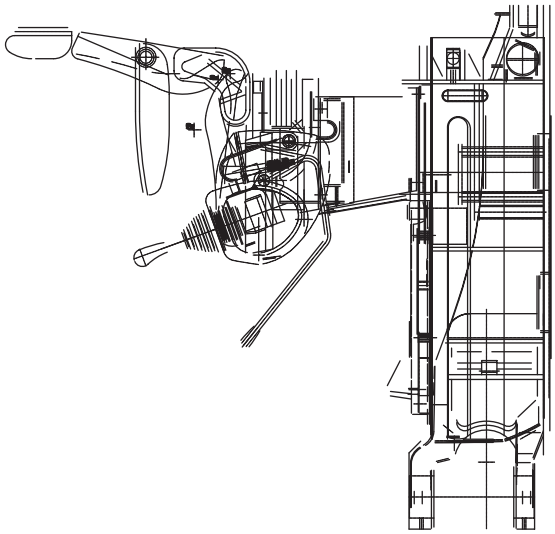


EU-version





KTC, KCL, KTA-version



1. Seat
   EU-version: Wrist rest type
   KTC, KCL, KTA-version: Arm rest type

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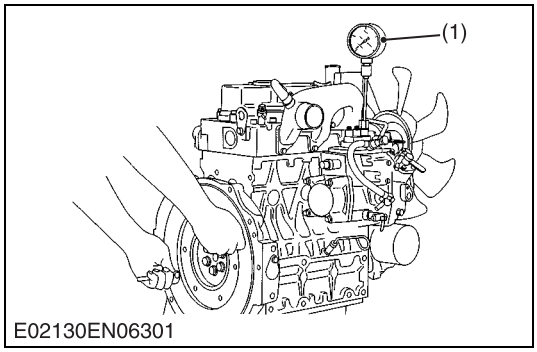
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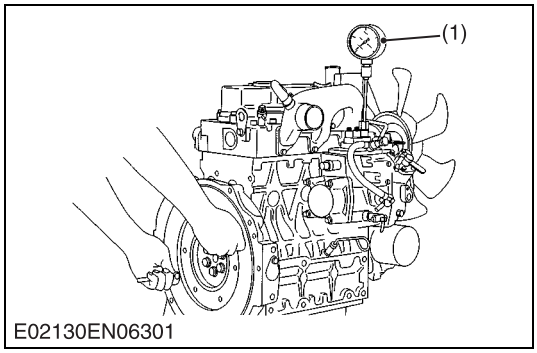
Fuel Tightness of Pump Element

1. Remove the stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Install the injection pump pressure tester (1) to the injection pump.
4. Set the speed control lever to the maximum speed position.
5. Turn the flywheel ten times or more to increase the pressure.
6. If the pressure can not reach the allowable limit, replace the injection pump assembly.

Fuel tightness of pump element	Allowable limit	14.7 MPa 150 kgf/cm^2 2133 psi

(1) Injection Pump Pressure Tester

W1036694



Fuel Tightness of Delivery Valve

1. Remove the stop solenoid
2. Remove the injection pipes and glow plugs.
3. Set a pressure tester to the fuel injection pump.
4. Turn the flywheel and raise the pressure to approx. 14.7 MPa (150 kgf/cm^2, 2133 psi).
5. Now turn the flywheel back about half a turn (to keep the plunger free). Maintain the flywheel at this position and clock the time taken for the pressure to drop from 14.7 to 13.7 MPa (from 150 to 140 kgf/cm^2, from 2133 to 1990 psi).
6. Measure the time needed to decrease the pressure from 14.7 to 13.7 MPa (from 150 to 140 kgf/cm^2, from 2133 to 1990 psi).
7. If the measurement is less than allowable limit, replace the injection pump assembly.

Fuel tightness of delivery valve	Factory spec.	5 seconds 14.7 → 13.7 MPa 150 → 140 kgf/cm^2 2133 → 1990 psi

(1) Injection Pump Pressure Tester

W1036852

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(3) Procedures for LS Control Valve Troubleshooting

In the event of hydraulic trouble with the LS controller for KX121-3/161-3, complete the following basic check items and check the manipulation of the hydraulic pilot system.

(1) Basic check items: Quantity of oil, quality of oil, filter clogging, oil leak, air suction, engine conditions and the method of manipulating this machine
(2) Trouble with the hydraulic pilot system?
    1) All the hydraulic pilot systems?
    2) Certain hydraulic pilot system?
(3) Trouble with the actuator side?

If the check above detects no trouble, suspect the control valve or the pump.
With the following five items related to the control valve in mind, manipulate this machine or measure the pressure to pinpoint defective portions.
The use of the five check items makes it relatively easy to pinpoint trouble in detail. Get to work on the control valve first.

Basically, the control valve consists of the following parts. Trouble phenomena occur as shown below. It is preferable that the following steps be performed to determine the cause of trouble.

1) Unload valve

Make a check if the unload pressure is not built up at the maximum rpm under no load with the valve placed in the neutral position.

KX121-3: 25 kgf/cm^2, 2.45 MPa, 356 psi
KX161-3: 22 kgf/cm^2, 2.16 MPa, 313 psi
(Check the pump discharge quantity.)

2) Main relief valve

Make a check if the main relief pressure is not built up.

KX121-3: 250 kgf/cm^2, 24.5 MPa, 3556 psi
KX161-3: 240 kgf/cm^2, 23.5 MPa, 3414 psi
If any one actuator is relieved, the main relief pressure is built up.
(For the dozer UP only, however, there is a 120 k overload relief valve.)

3) Spool in the valve section

1. The spool must work at a full stroke under the secondary pressure of the pilot valve.
2. If the spool does not work at a full stroke even when the secondary pressure is the specified pressure, suspect that the spool has got stuck.
3. If the cylinder speed does not increase even when the spool works at a full stroke, suspect that the spool is misassembled.

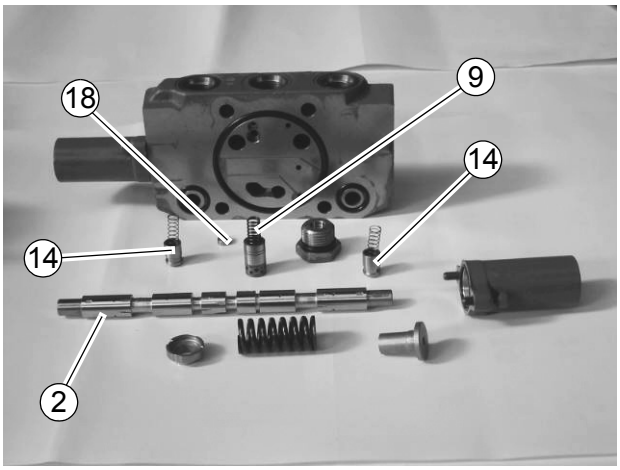
4) Shuttle valve (Shuttle plate, high pressure selection valve)

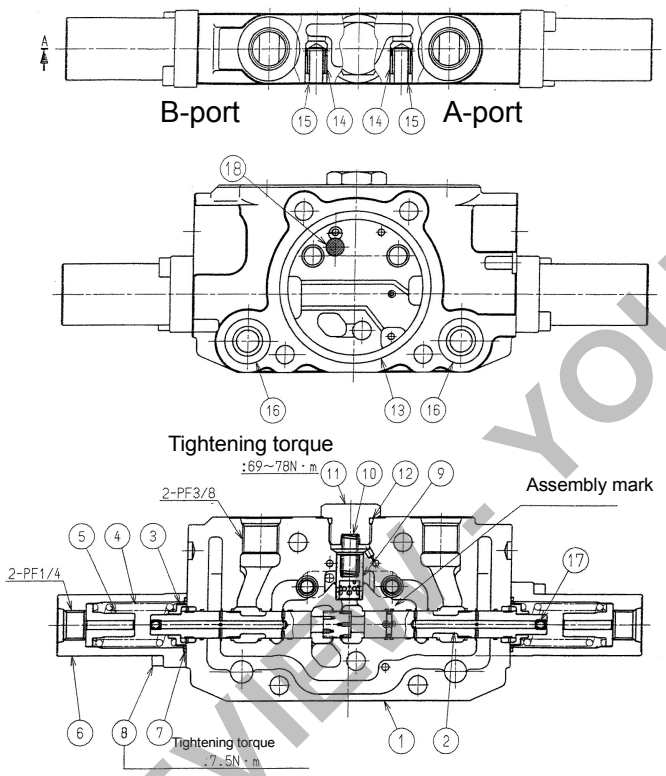
1. If the shuttle valve does not move normally due to a stick, its own high pressure leaks from the shuttle valve, causing the PLS pressure to the compensation spool and the PLS pressure to the LS regulator to decrease, respectively. As a result, tilting takes place so as to reduce the pump discharge quantity, so that the actuator speed decreases.
2. Similar phenomena occur in the sections downstream from the section of the defective shuttle valve.
3. The sections upstream from the section of the defective shuttle valve work normally.
4. If the section of the defective shuttle valve and the sections upstream from it are manipulated at the same time, the PLS pressure to the pump acts on the upstream sections and the pump is normally LS-controlled.
5. If the shuttle valve gets stuck, the same phenomena occur in both the A and B ports.

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[2] Swiewl section

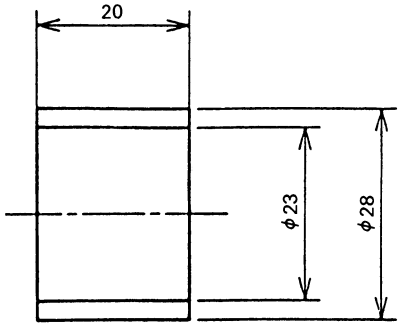
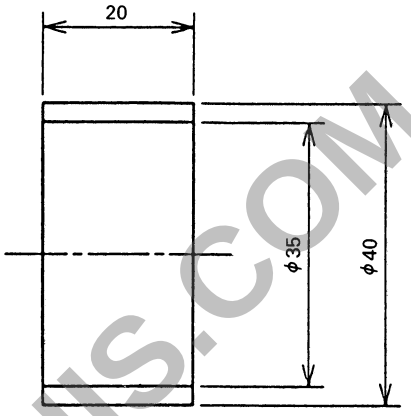
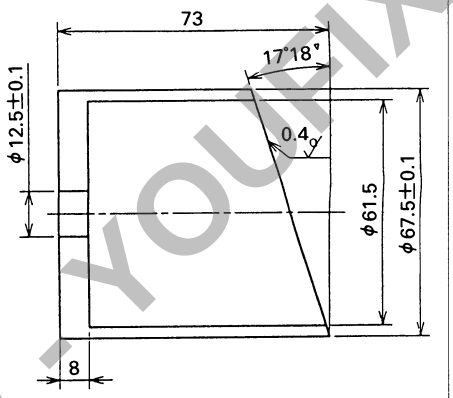
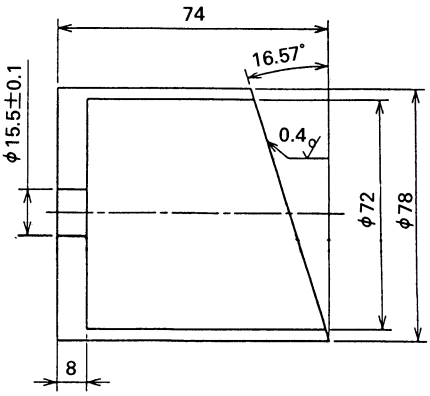




(1) Valve housing
(2) Main spool
(3) Spring seat
(4) Spring ; free length=
outer dia.=
(5) Spring seat
(6) Cap
(7) O-ring ; NOK S22
(8) Socket head bolt ; M5 × 0.8 × 18 - 12.9
(9) Compensation spool ; U/R 2.5 mm^2
(10)Spring ; 2.0 K
(11)IPlug
(12)O-ring
(13)O-ring ; AS568-144, HS70
(14)Load check valve
(15)Spring ; free length=
outer dia.=
(16)O-ring ; JIS B2401-1-A, P16
(17)Plug
(18)Shuttle plate
(High pressure selection valve)

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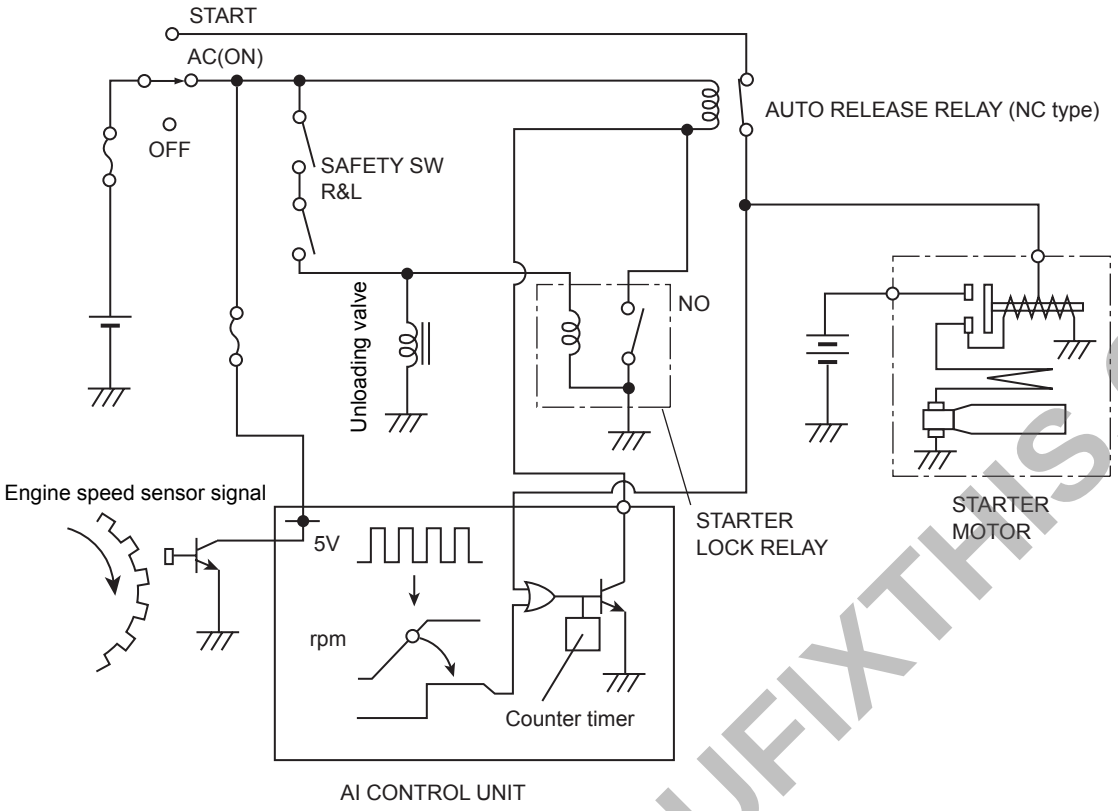
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Jig No.	Name *Nom* Name	KX41-2	KX61-2·71-2·91-2 **KX91-3, 101-3**
19	Ball bearing fitting jig *Outil de montage du roulement á billes* Einbau-Spannvorrichtung für Kugellager	 S35C	 S35C
20	Swash plate fitting jig *Outil de fixation de plateau isolant* Einbau-Spannvorrichtung für Taumelscheibe		

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m.Starter lock relay & auto release relay (AI-version)



(1) Safety start system

1) The starter lock relay is deactivated only when the right or left safety switches on the safety lock lever is off. Because the automatic release relay is of NC type, the starter motor can be activated just by turning the key switch to the START position.
2) When the safety lock lever switch turns on, the starter lock relay is activated and then the automatic release relay is deactivated. By this, the starter motor is powered off to keep the engine from getting started.
   (Raise the safety lock lever, and the safety switch turns off. Lower it, and the safety switch turns on.)

The automatic release relay is of NC (Normally Closed) type.

3) Either engine speed sensor signal or key-SW-start-position signal activates the transistor ON and results to open the auto release relay.

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(3)-5 FUNCTION

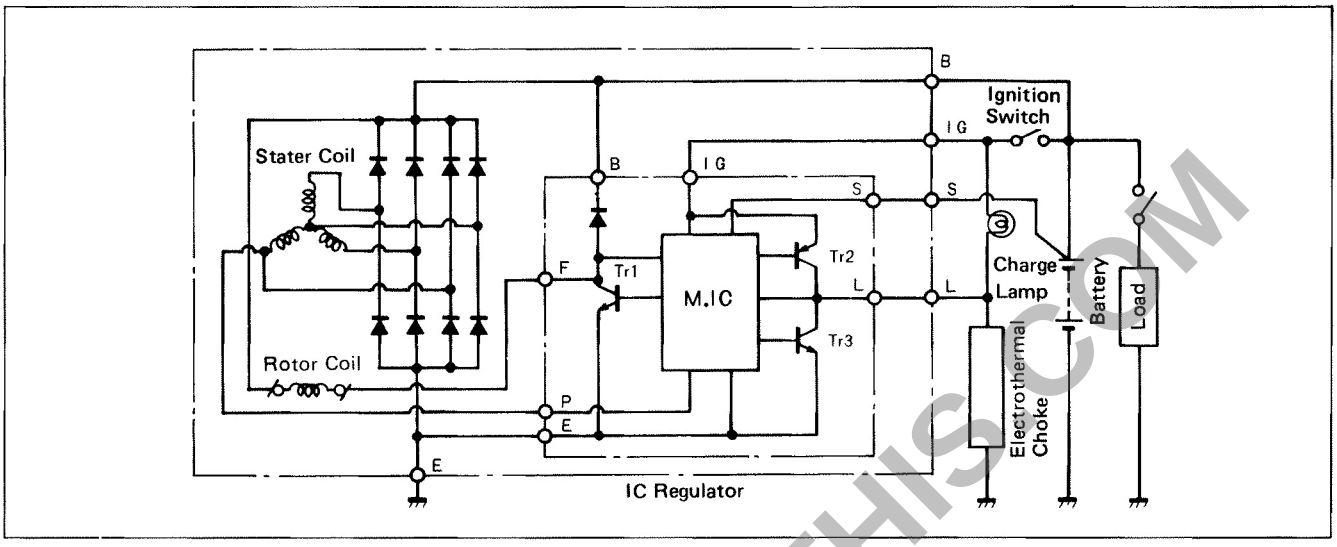


Fig.9 Overall circuit

Overall circuit of charging system is shown in Figure 9. The inner circuit of the IC regulator is comprises a hybrid IC which has a built-in monolithic (M-IC). Since the internal circuit of a monolithic IC is very complex and no suitable equipment circuit interpreting its function is available, it is referred to as M.IC circuit in the explanation of IC regulator functions.

(1) Ignition Switch on while Engine is Stopped.

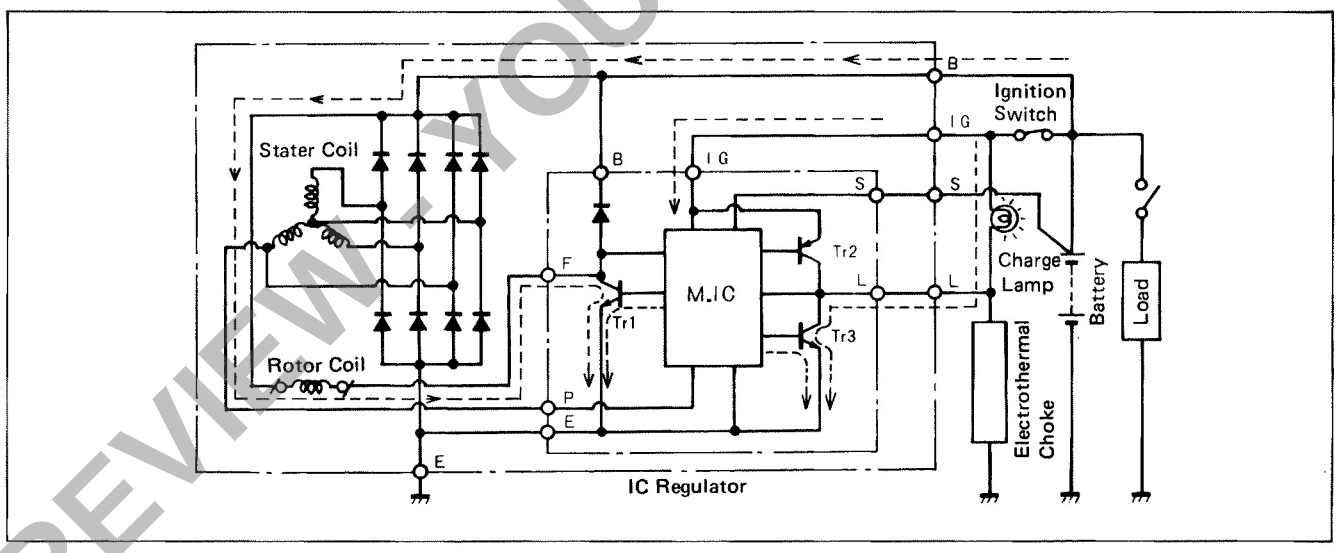


Fig.10 Ignition switch on while engine is stopped

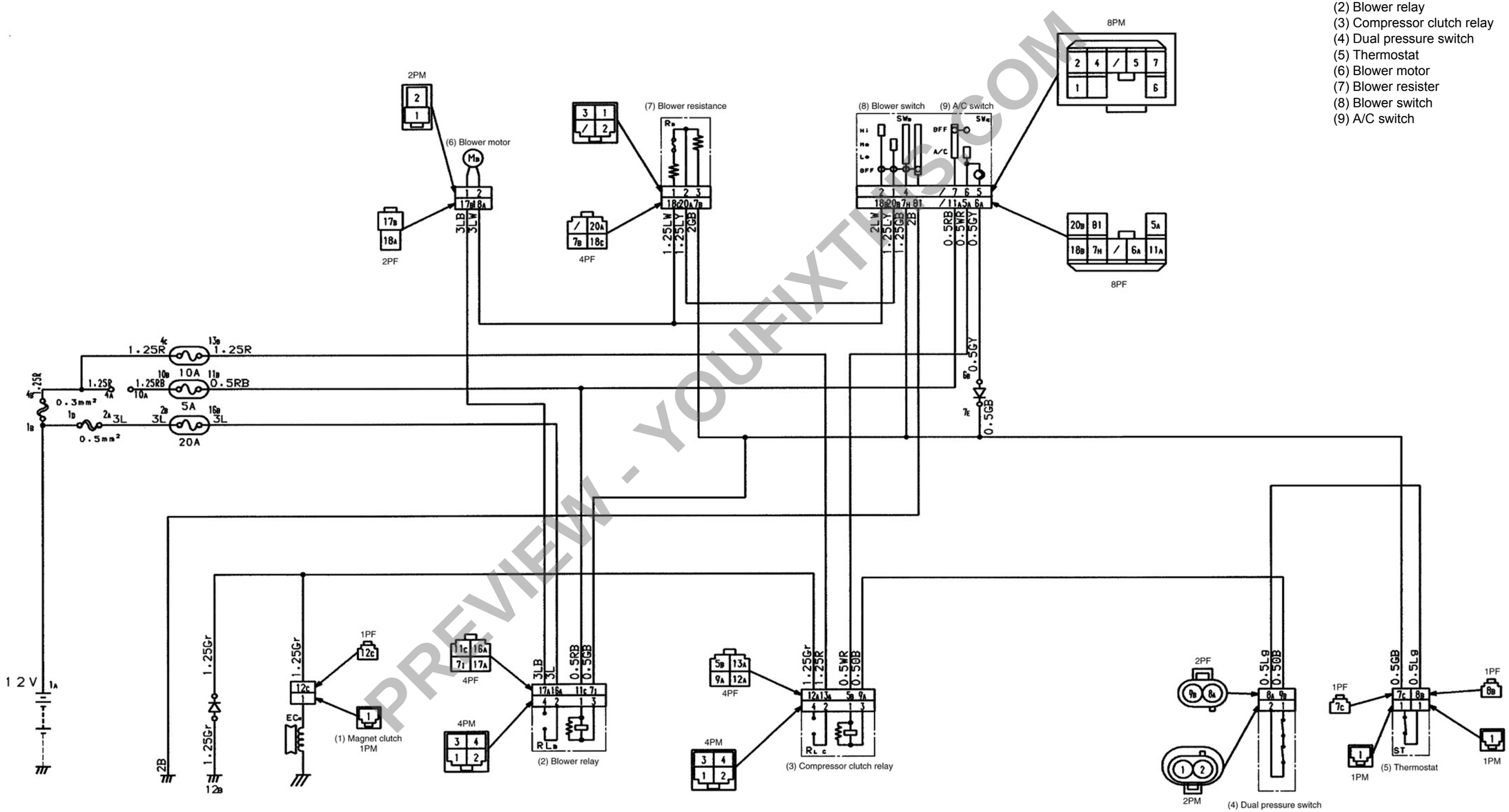
The M.IC detects the battery voltage applied to the IG terminal and turns T_{r1} :ON". Then the initial exciting current flows through the rotor coil. (To reduce battery discharge current when ignition switch is turned on, T_{r1} turns "ON" and "OFF" intermittently and keeps current to a minimum of approx. 0.17A)

During this period, the generator is not running and no electricity is generated. Voltage at P terminal at this time is 0V, and M.IC detects this and sends a signal to T_{r3} to turn it "ON". The charge lamp is turned on now.

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c. A/C system, electric circuit diagram



(1) Magnet clutch
(2) Blower relay
(3) Compressor clutch relay
(4) Dual pressure switch
(5) Thermostat
(6) Blower motor
(7) Blower resister
(8) Blower switch
(9) A/C switch

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E.Precaution for Installation and Maintenance

Important service points for high quality and long life.

<table>
<tr><th>Item</th><th>Description</th><th>Possible problem in case of control failure</th></tr>
<tr><td>1. Storage place of A/C parts (all)</td><td>Store them in an indoor place not exposed to rain water.</td><td>Water or dust entry into circuit
↓
Circuit clogged</td></tr>
<tr><td>2. Plugs</td><td>●Do not remove them until connecting.
Limit the receiver's open time to shorter than 3 minutes (because of the desiccant inside).
●Be sure to put in the plugs if you have to leave the spot during connecting.</td><td>↑</td></tr>
<tr><td rowspan="3">3. Pipe connections</td><td>Tightening torque of pipe fixture nuts and bolts
<table>
<tr><th>Connection</th><th>Tube size or bolt size</th><th>Tightening torque N•m</th></tr>
<tr><td rowspan="3">Nut type</td><td>+B pipe (liquid pipe)</td><td>11.8~14.7</td></tr>
<tr><td>D1/2 pipe (discharger pipe)</td><td>19.6~24.5</td></tr>
<tr><td>D5/6 pipe (suction pipe)</td><td>29.4~34.3</td></tr>
<tr><td rowspan="2">Block joint</td><td>Receiver's M6 bolt (4T)</td><td>3.92~6.86</td></tr>
<tr><td>Other M6 bolts (6T)</td><td>7.65~11..8</td></tr>
</table></td><td>Gas leak</td></tr>
<tr><td>Pipe connections
Tighten up the pipe unions and nuts by applying two wrenches at once.</td><td>Cracks in brazed spot
↓
Gas leak</td></tr>
<tr><td>Oil application on O rings
Apply the ND-OIL8 new refrigerant compressor oil to the O rings. Be sure to use the ND-OIL8 oil, not any other such as ND-OIL6, 7, and Suniso.</td><td>Refrigerant cloudiness</td></tr>
<tr><td>4. Pipe clamps</td><td>Use clamps that match the diameters of hoses and tubes. Make sure the pipe connections withstand possible vibrations.</td><td>Pipe damage, hose wear-out
↓
Gas leak</td></tr>
<tr><td>5. Vacuum buildup</td><td>• Use the high-/low-pressure service valve.
• Continue for 10 minutes or longer at -101 kPa, (- 1.03 kgf/cm2), - 14.6 psi</td><td>Poor removal of water and air from circuit
↓
Poor cooling, circuit clogged</td></tr>
<tr><td>6. Drain hose connection</td><td>Connect the drain hose below the unit drain pan. Make sure there is no air trap.</td><td>Drain water leak</td></tr>
<tr><td rowspan="2">7. Refrigerant charging</td><td>(1) Gas charging (during cycle operation)
1) Feed through the high-pressure side without cycle operation. (Never feed through the low-pressure side, nor keep on the cycle operation.)
2) Then add through the low-pressure side during cycle operation.</td><td>Liquid compression
↓
Compressor failure</td></tr>
<tr><td>(2) Liquid charging (without cycle operation)
Be sure to feed through the high-pressure side (never through the low-pressure side).</td><td>↑</td></tr>
</table>

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