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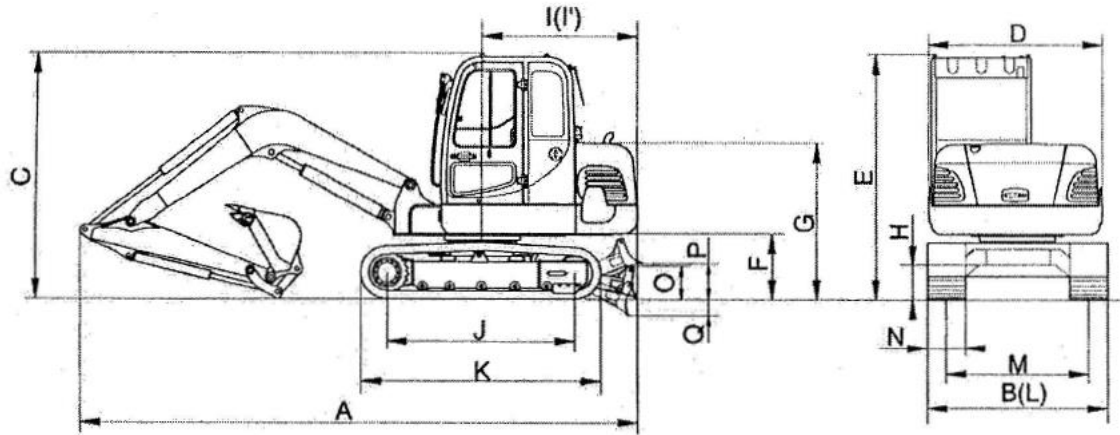
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SECTION 1 GENERAL

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2. SPECIFICATIONS

1) 3.0 m (9'10") mono boom, 1.6 m (5'3") arm



Description		Unit	Specification
Operating weight		kg	5,720
Bucket capacity (SAE heaped), standard		m ³	0.21
Overall length	A	mm	5,900
Overall width (400 mm track)	B		1,920
Overall height	C		2,500
Superstructure width	D		1,830
Overall height of cab	E		2,550
Ground clearance of counterweight	F		690
Engine cover height	G		1,650
Minimum ground clearance	H		380
Rear-end distance	I		1,640
Rear-end swing radius	I'		1,650
Distance between tumblers	J		1,990
Undercarriage length	K		2,530
Undercarriage width	L		1,900
Track gauge	M		1,500
Track shoe width, standard	N		400
Height of blade	O		350
Ground clearance of blade up	P		420
Depth of blade down	Q		540
Travel speed (low/high)			km/h
Swing speed		rpm	10.88
Gradeability		Degree (%)	35
Ground pressure (400 mm shoe)		kgf/cm ²	0.32

SECTION 2 STRUCTURE AND FUNCTION

Group 1 Pump Device	2-1
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2. FUNCTION

1) ROTARY PART

When high pressurized oil enters a cylinder through port(a), which is the inlet of balance plate(16), hydraulic pressure acting on the piston causes axial force F. The pressure force F works via the piston(10) upon the return plate(9) which acts upon the swash plate(7) via an hydrostatic bearing. Force F1 perpendicular to swash plate(7) and force F2 perpendicular to cylinder center.

Being transferred to the cylinder block(3) through piston, force F2 causes rotational moment at surroundings of cylinder.

Since cylinder block has 9 equidistantly arrayed pistons, rotational torque is transmitted to cylinder shaft in order by several pistons connected to the inlet port of high pressurized oil. When the direction of oil flow is reversed, rotational direction of cylinder is also reversed. Output torque is given by the equation.

$$T = \frac{p \times q}{2\pi}, q = Z \cdot A \cdot \text{PCD} \cdot \tan \theta, F_1 = \frac{F}{\cos \theta}, F_2 = F \tan \theta, S = \text{PCD} \times \tan \theta$$

Where p : Effective difference of pressure (kgf/cm²)

q : Displacement (cc/rev)

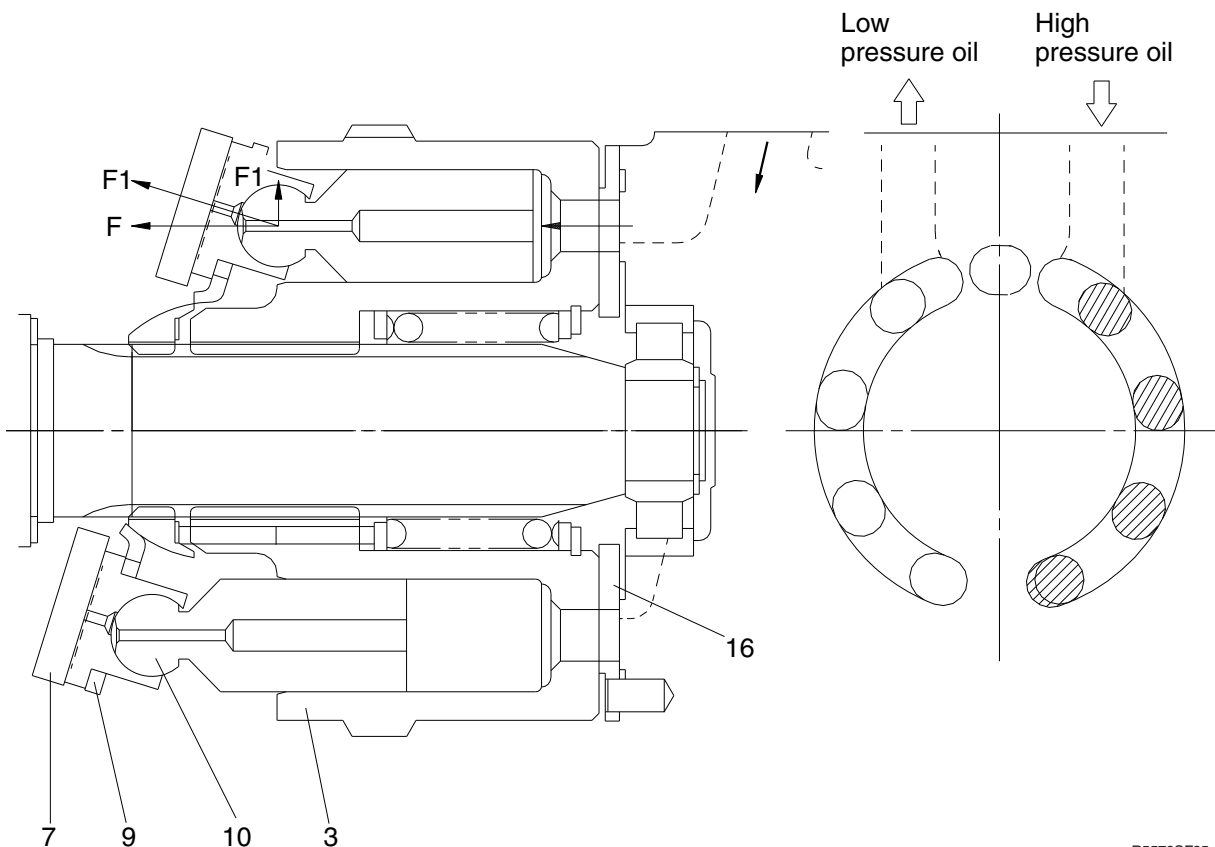
T : Output torque (kgf · cm)

Z : Piston number (9EA)

A : Piston area (cm²)

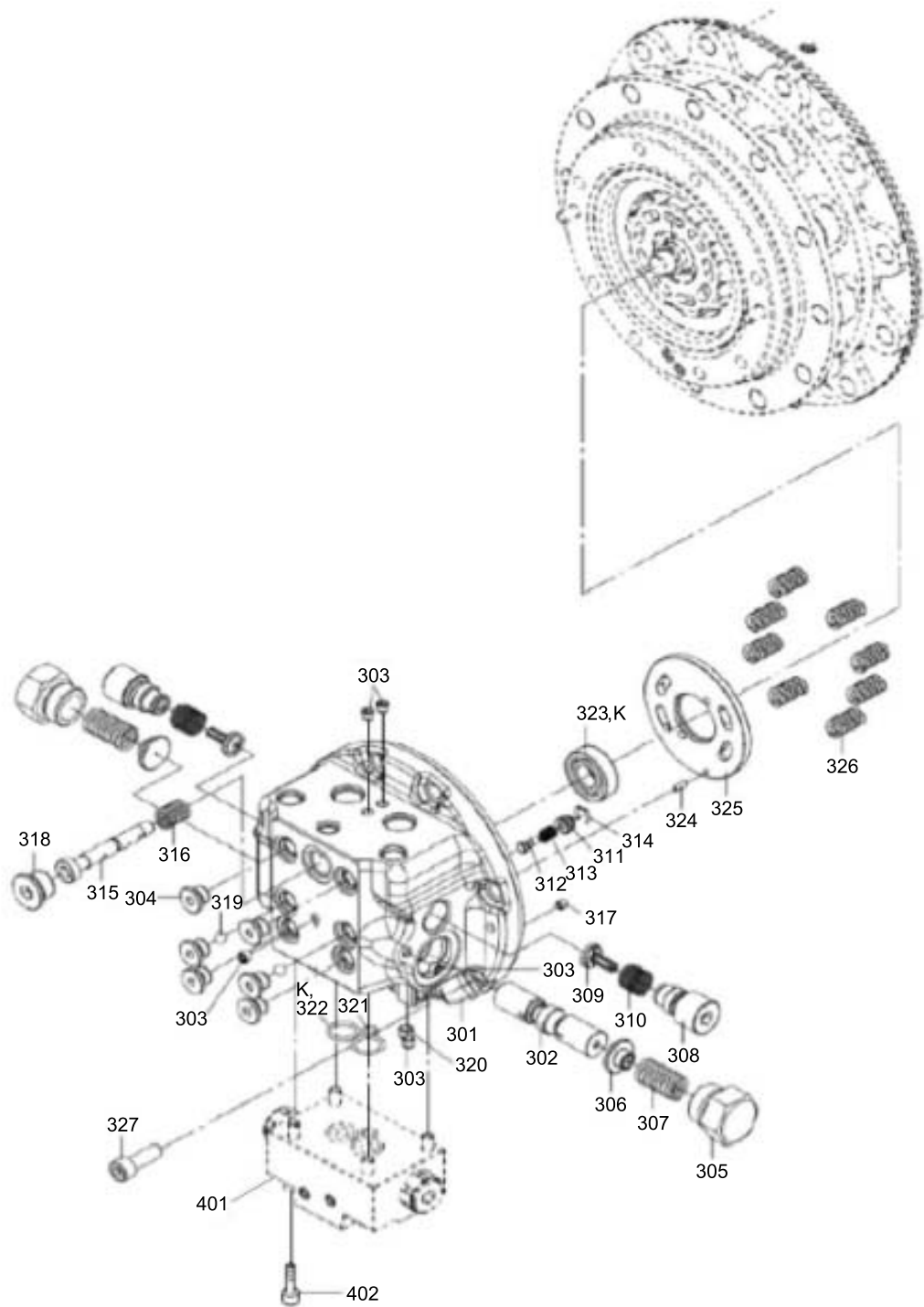
θ : Tilting angle of swash plate (degree)

S : Piston stroke (cm)



R5572SF35

TRAVEL MOTOR (4/4)



60S2TM23

301	Rear plange	309	Check valve	317	Orifice	325	Timing plate
302	Main spool	310	Spring	318	Plug assy	326	Spring
303	Plug	311	Valve sheet	319	Steel ball	327	Socket bolt
304	Plug assy	312	T type valve	320	Plug	401	Relief valve assy
305	Plug assy	313	Spring	321	O-ring	402	Bolt
306	Spring retainer	314	Ring	322	O-ring		
307	Main spring	315	2-speed spool	323	Bearing		
308	Check plug	316	Spring	324	Pin		

SECTION 3 HYDRAULIC AND ELECTRICAL SYSTEM




Group 1 Hydraulic Circuit	3-1
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3. Functions

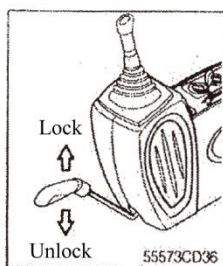
1) Menu



2) Structure

No	Main menu	Sub-menu	Description
1	 Fault diagnosis	Active fault diagnosis Logged fault diagnosis	Confirmation and deletion of faults recorded in MCU and engine ECM
2	 Change setting	Time setting Start limit	Time setting Start limit and password change
3	 Screen setting	Operation screen Screen brightness Language Version Info	Working mode selection Brightness setting Language setting Device information confirmation

3) Safety lever



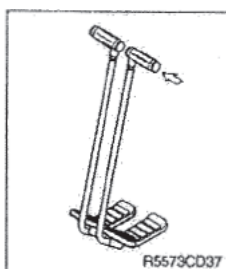
(1) When this lever is in the LOCK position, the console box will be raised, the pilot oil line will be cut off, and the working device and swing will not work.

※ Be sure to raise the lever to the LOCK position when leaving from operator's seat.

(2) By pushing the lever to UNLOCK position, the machine is operational.

※ Do not use the safety lever as a handle when getting on or off the machine.

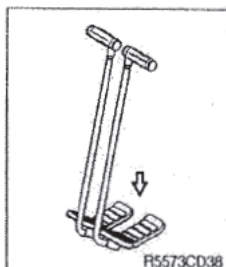
4) Travel lever



(1) This lever is mounted on the travel pedal and used for traveling by hand. The operation principle is same as that of the travel pedal.

(2) Refer to the "Traveling of Machine" for details.

5) Travel pedal

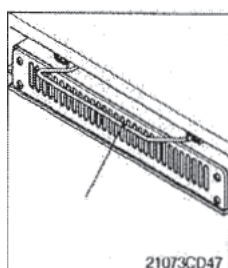


(1) This pedal is used to move the machine forward or backward.

(2) If the left side pedal is pressed, the left track will move. If the right side pedal is pressed, the right track will move.

(3) Refer to the "Traveling of Machine" for details.

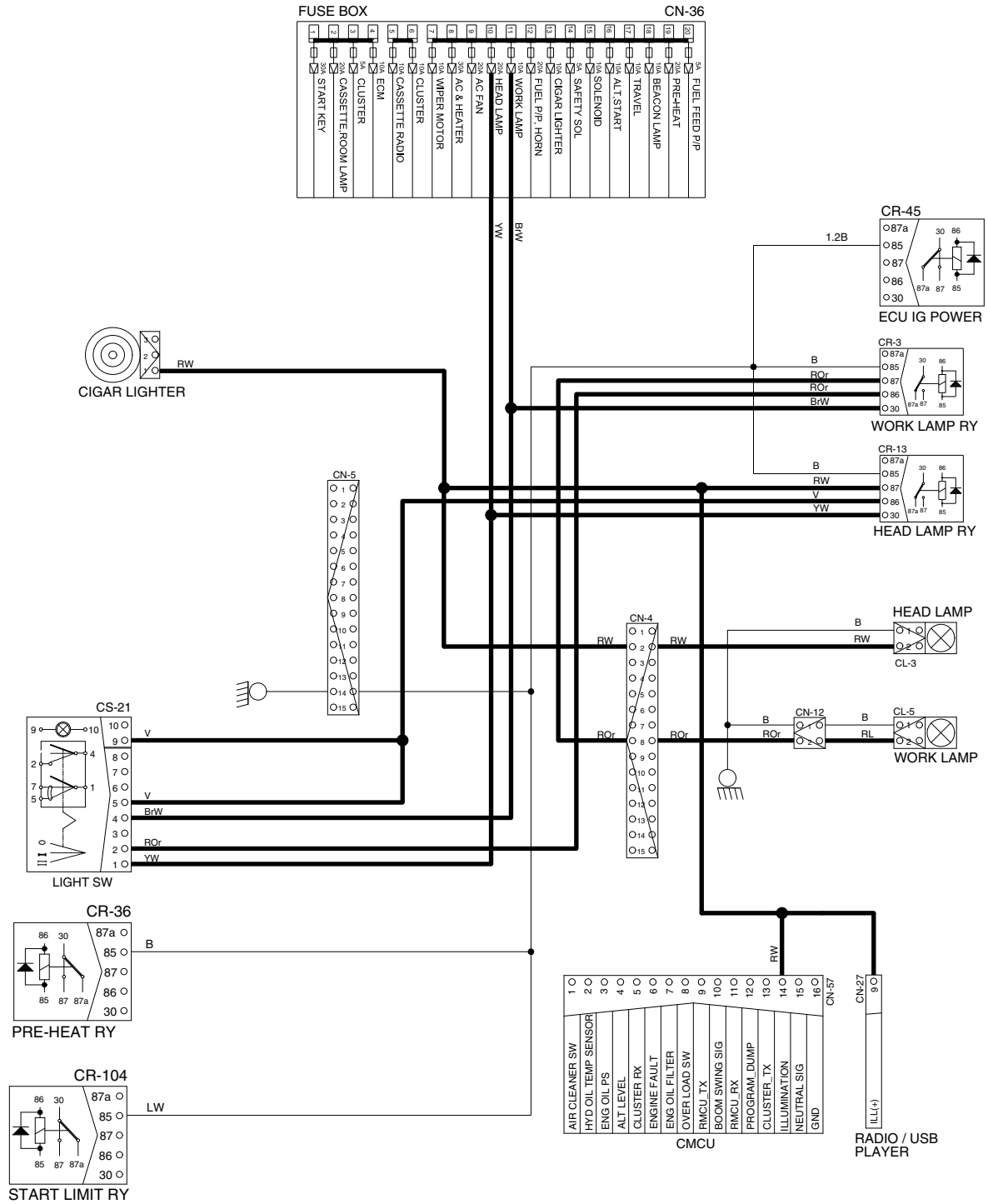
6) Seat and console box adjust lever



(1) This lever is used to move the seat and console box to fit the contours of the operator's body.

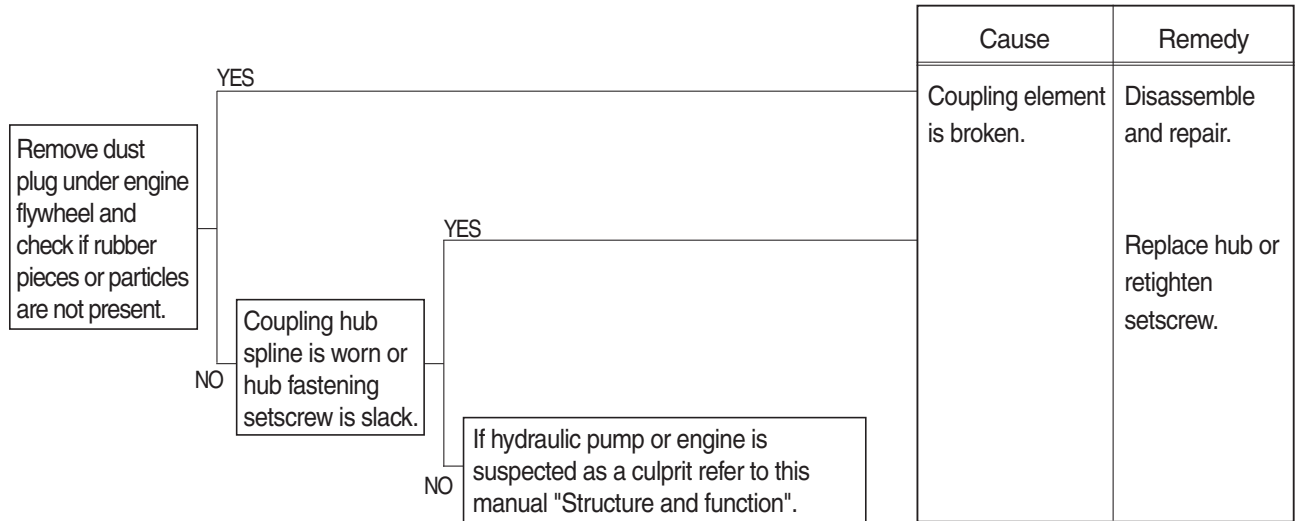
(2) Pull the lever to adjust forward or backward over 90 mm (3.5").

HEAD AND WORK LAMP CIRCUIT



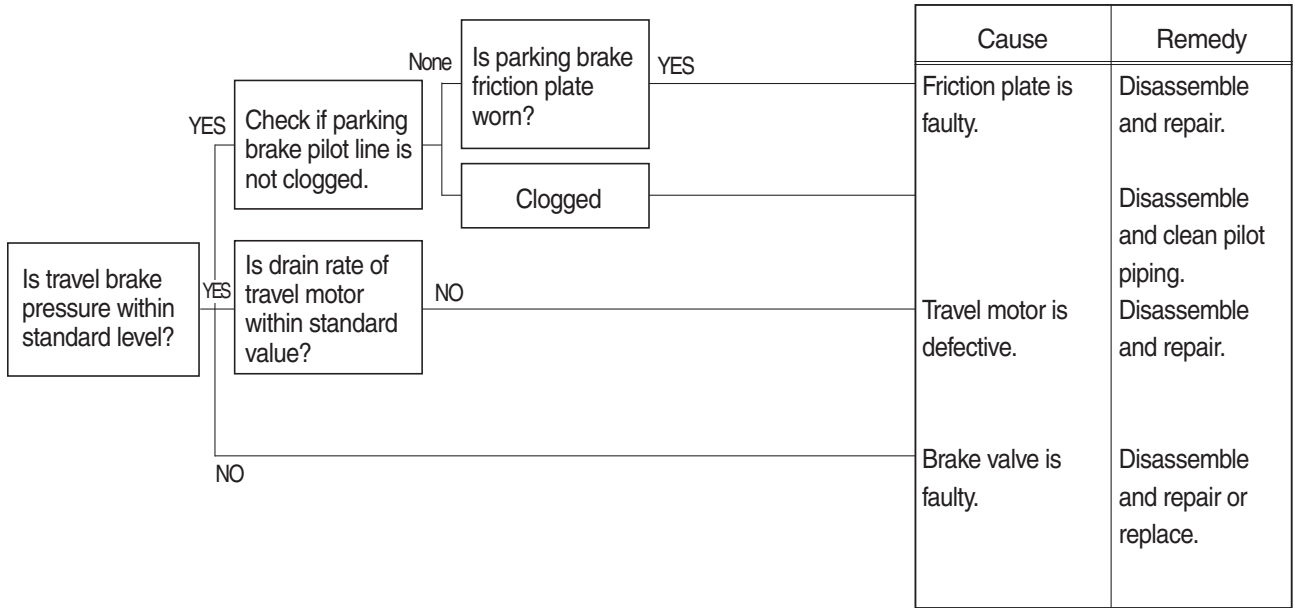
2. DRIVE SYSTEM

1) UNUSUAL NOISE COMES OUT OF PUMP CONNECTION

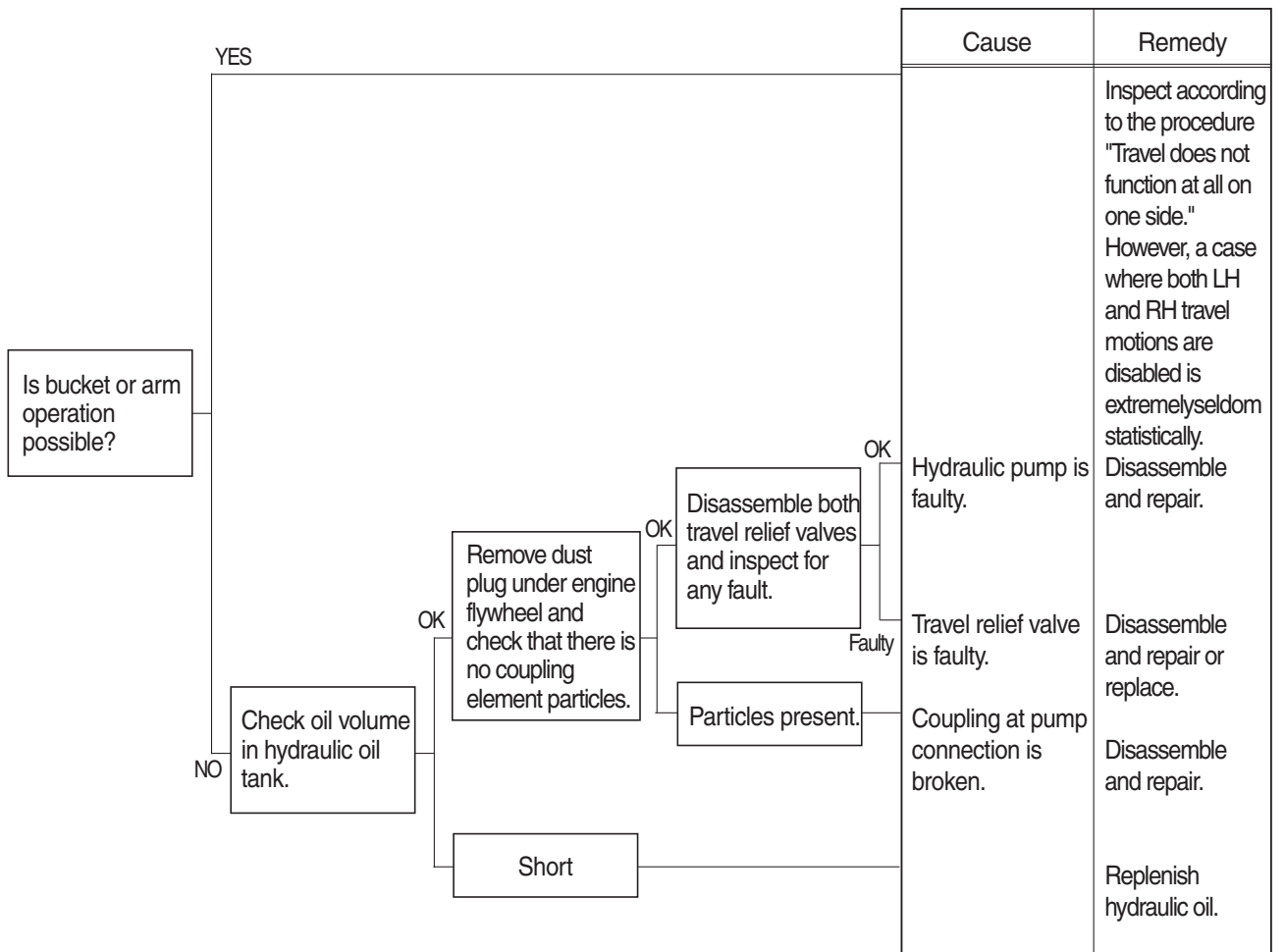


3) MACHINE DOES NOT STOP ON A SLOPE

Machine is pulled forward as sprocket rotates during digging operation.

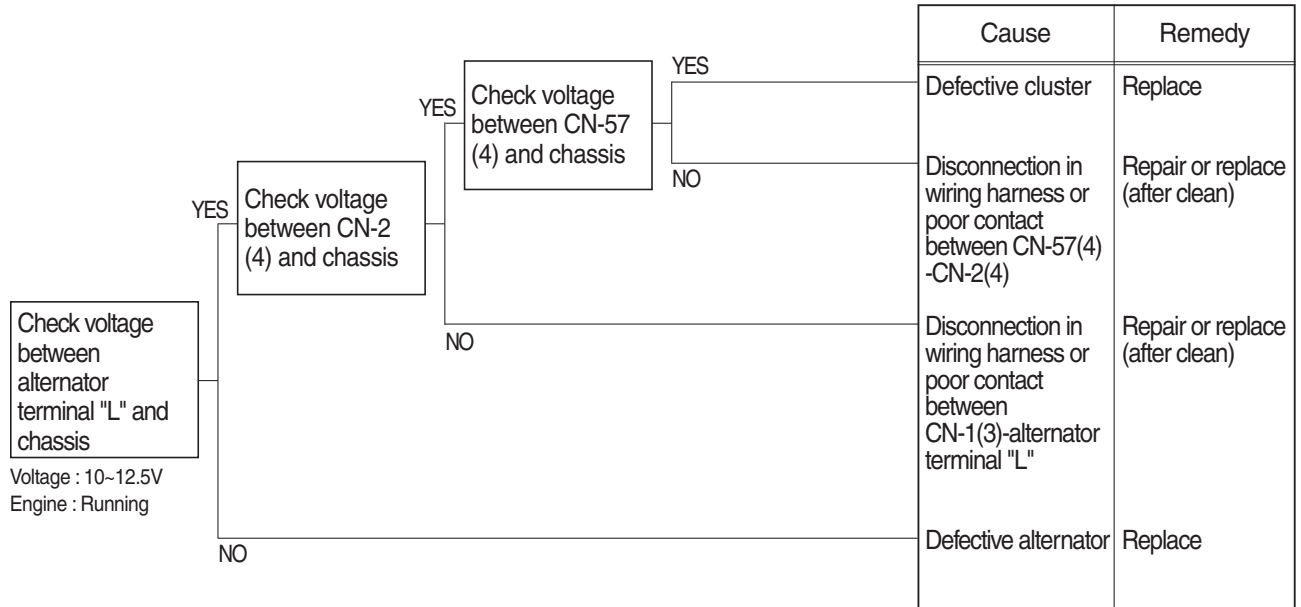


4) LH AND RH TRAVEL MOTIONS ARE IMPOSSIBLE



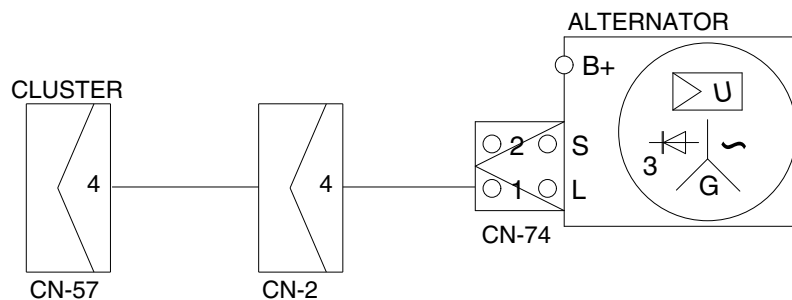
2. BATTERY CHARGING WARNING LAMP LIGHTS UP (starting switch : ON)

- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



Check voltage

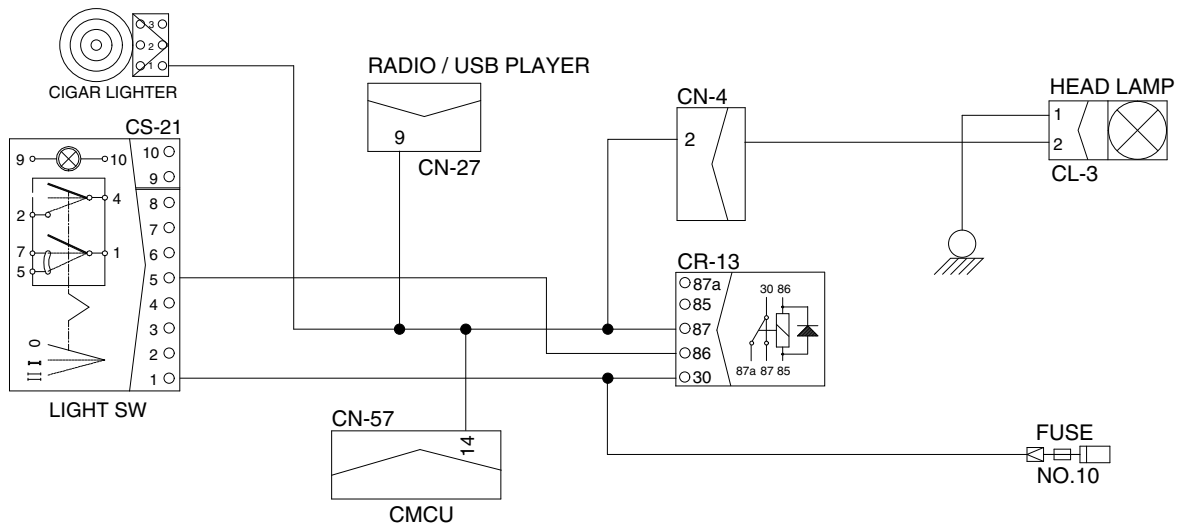
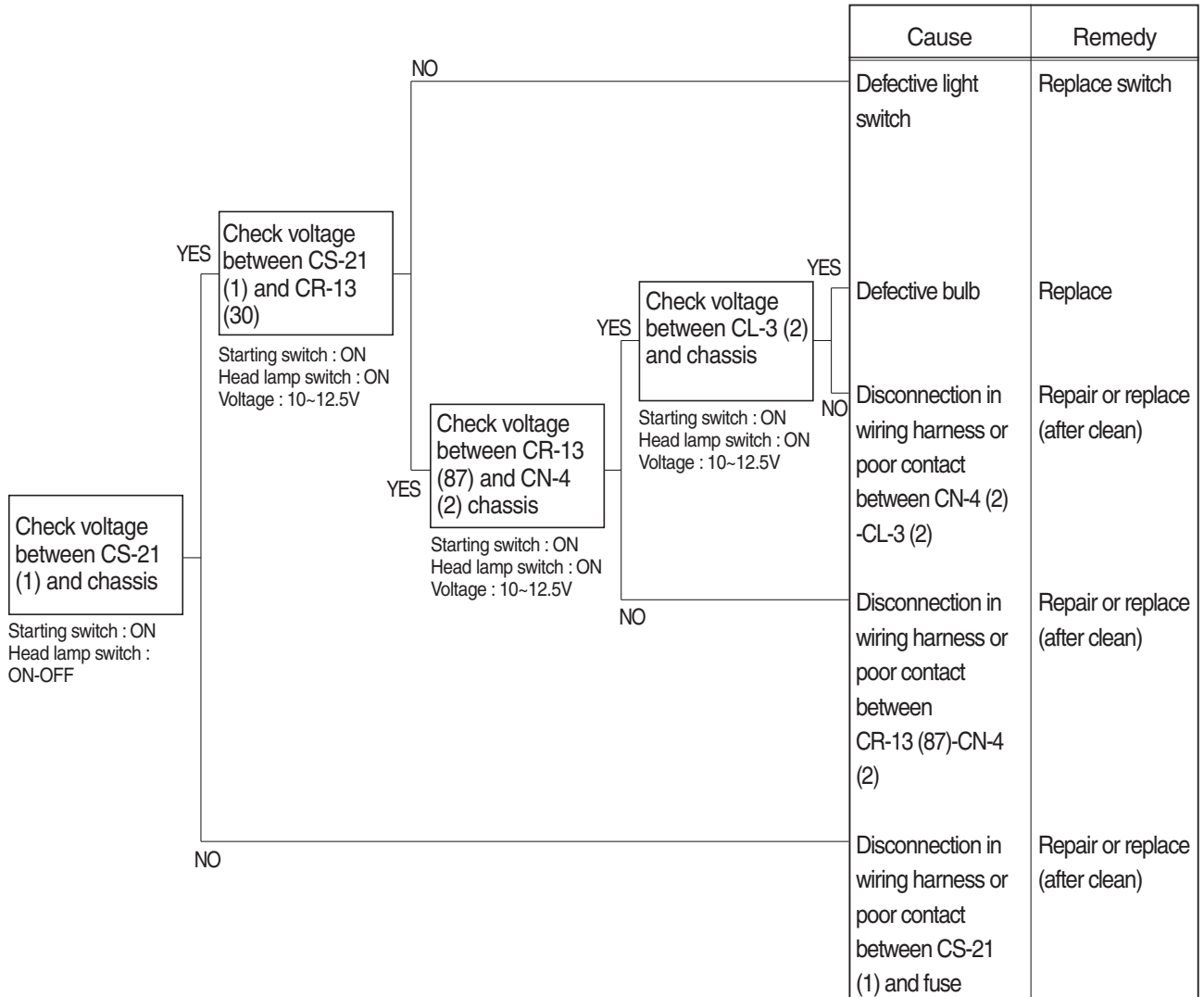
YES	10 ~ 12.5V
NO	0V



60S5TS02

12. WHEN STARTING SWITCH IS TURNED ON, HEAD LAMP DOES NOT LIGHTS UP

- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.10.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



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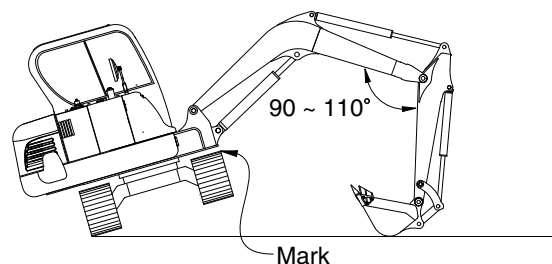
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4) TRACK REVOLUTION SPEED

(1) Measure the track revolution cycle time with the track raised off ground.

(2) Preparation

- ① Adjust the tension of both side tracks to be equal.
- ② On the track to be measured, mark one shoe with chalk.
- ③ Swing the upperstructure 90° and lower the bucket to raise the track off ground. Keep the boom-arm angle between 90 to 110° as shown. Place blocks under machine frame.
- ④ Keep the hydraulic oil temperature at $50 \pm 5^\circ\text{C}$.



555C96MC06

(3) Measurement

- ① Select the following switch positions.
 - Travel mode switch : 1 or 2 speed
- ② Operate the travel control lever of the raised track in full forward and reverse.
- ③ Rotate 1 turn, then measure time taken for next 3 revolutions.
- ④ Raise the other side of machine and repeat the procedure.
- ⑤ Repeat steps ③ and ④ three times and calculate the average values.

(4) Evaluation

The revolution cycle time of each track should meet the following specifications.

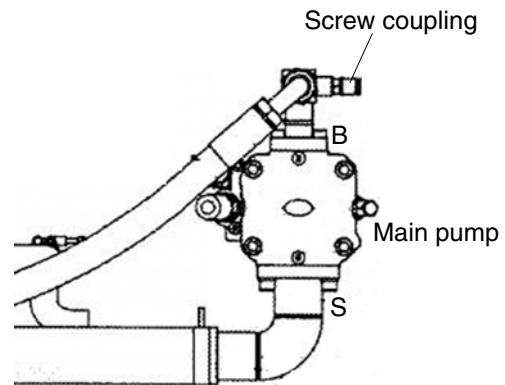
Unit : Seconds / 3 revolutions

Model	Travel speed	Standard	Maximum allowable
HX60S	1 Speed	20.5 ± 1.5	26
	2 Speed	10.8 ± 1.5	14

13) PILOT PRIMARY PRESSURE

(1) Preparation

- ① Stop the engine.
- ② Push the pressure release button to bleed air.
- ③ Loosen the screw coupling on the pilot pump delivery port (B) and connect pressure gauge.
- ④ Start the engine and check for oil leakage from the port.
- ⑤ Keep the hydraulic oil temperature at $50 \pm 5^{\circ}\text{C}$.



(2) Measurement

- ① Measure the primary pilot pressure.

60S7MA14

(3) Evaluation

The average measured pressure should meet the following specifications:

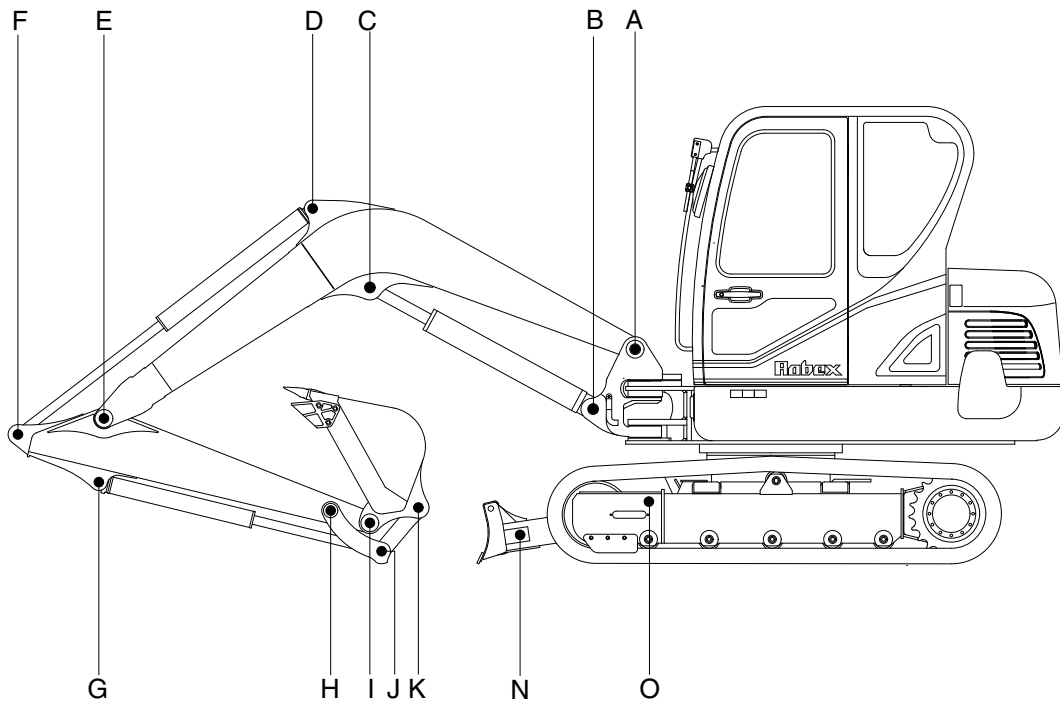
Unit : kgf / cm²

Model	Standard	Remarks
HX60S	35 ± 2	

(2) Hydraulic valve and motor

No.	Part name	Point to be checked	Standard	Action
12	Body 1	Spool sliding contact surface	No abnormal damage, wear	Relpace whole body 1 kit
13	Counter valve spool Two-speed spool Shuttle spool	Body 1 sliding contact surface	No abnormal damage, wear	Relpace whole body 1 kit
14	Body 2	Spline tooth surface	No abnormal damage, wear	Replace whole body 2 kit
		Control piston sliding contact surface	No abnormal damage, wear Clearance between piston and body 2 is 0.023 mm or smaller	
		Swash plate installaion surface	No abnormal damage, wear	
		Ball sliding contact surface	No abnormal damage, wear	
15	Shaft	Spline tooth surface	No abnormal damage, wear	Replace shaft kit
		Oil seal sliding contact surface	No abnormal damage, wear (0.025 mm or greater)	
16	Cylinder barrel	Piston sliding contact surface	No abnormal damage, wear Clearance between piston and cylinder barrel is 0.030 mm or smaller	Replace cylinder barrel kit
		Valve place sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace cylicder barrel kit
17	Valve plate	Cylinder barrel sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace cylicder barrel kit
18	Pistons Shoes	Cylinder barrel sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Replace cylinder barrel kit
		Swash plate sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace cylicder barrel kit
		Loose of shoe calking part	Loose is smaller than 0.3 mm	Replace cylinder barrel kit
19	Shoe holder	Barrel holder sliding contact surface	No abnormal damage, wear	Replace cylinder barrel kit
20	Barrel holder	Spline tooth surface	No abnormal damage, wear	Replace cylinder barrel kit
		Shoe holder sliding contact surface	No abnormal damage, wear	
21	Swash plate	Shoe sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace
		Ball sliding contact surface	No abnormal damage, wear	Replace
22	Control piston	Body 2 sliding contact surface	Clearance between piston and body 2 is 0.023 mm or smaller	Replace body 2 kit
23	Oil seal	Lip surface	No abnormal damage, wear and deformation	Replace
24	Ball bearing	Rolling contact surface	No abnormal damage, flaking	Replace
25	Springs	Surface	No crack	Replace
26	O-rings	Surface and hardness	No damage, deformation, and hardening	Replace

6. WORK EQUIPMENT



60S6MC01

Unit : mm

Mark	Measuring point (pin and bushing)	Normal value	Pin		Bushing		Remedy & Remark
			Recomm. service limit	Limit of use	Recomm. service limit	Limit of use	
A	Boom Rear	55	54	53.5	55.5	56	Replace
B	Boom Cylinder Head	60	59	58.5	60.5	61	"
C	Boom Cylinder Rod	60	59	58.5	60.5	61	"
D	Arm Cylinder Head	50	49	48.5	50.5	51	"
E	Boom Front	50	49	48.5	50.5	51	"
F	Arm Cylinder Rod	50	49	48.5	50.5	51	"
G	Bucket Cylinder Head	45	44	43.5	45.5	46	"
H	Arm Link	45	44	43.5	45.5	46	"
I	Bucket and Arm Link	45	44	43.5	45.5	46	"
J	Bucket Cylinder Rod	45	44	43.5	45.5	46	"
K	Bucket Link	45	44	43.5	45.5	46	"
N	Blade cylinder	55	54	53.5	55.5	56	"
O	Blade and frame link	35	34	33.5	35.5	36	"

2) PLUG FOR THE REGULATING UNIT REPLACEMENT

※ The control block does not need to be removed from the machine to perform this operation.

▲ Oil pressure

Place all of the machine's actuators connected to the control block in neutral position.
Release stored pressure by operating all the spools.

Environment damages risk

Install a vacuum pump on the tank to limit oil leakage during this operation.

Collect possible leaks with a suitable receptacle.

Unscrew the plug (27 mm socket wrench or open end spanner).



Reassembly :

- Install the plug on the inlet element.
- Torque : $10.5 \pm 10\%$ kg.m



6. Complet control block disassembly / assembly

Remove the control block from the machine.
Remove the 4 nuts (13 mm ring wrench).



Remove the outlet element.
Separate the distribution elements with the seal plates from the inlet element.



In case of inlet element replacement, remove the tie rods with a stud puller.

Reassembly:

Check the cleanliness of the element faces.
Replace the seal plates between distribution elements, the inlet element and the outlet element.

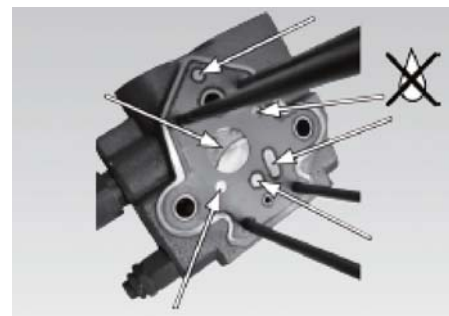


- ※ When reassembling, make sure the seals plates are correctly positionned so that the seals location fit with the canals.

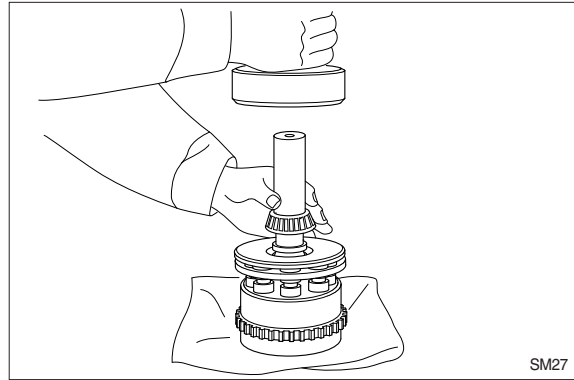
Carefully wipe oil traces of no-opening cavities between element face and seal plate.

If the inlet element is to be replaced, torque for the 4 tie rods :
- $3.06 \pm 10\%$ kg.m

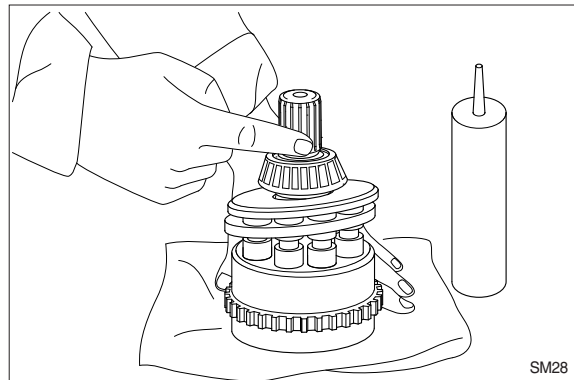
Reassemble elements in reverse order.



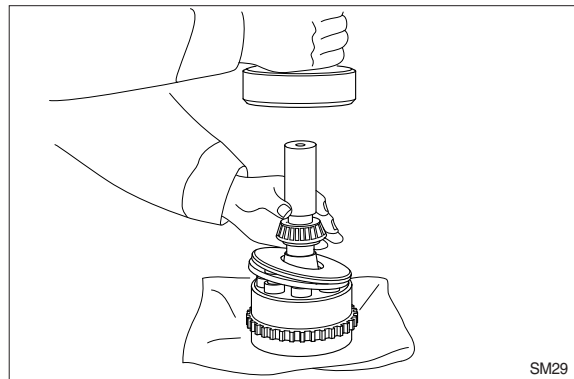
- ⑤ Assemble inner race of taper roller bearing (5) to cylinder block (3).



- ⑥ Apply loctite to bearing mounting area of inner race of cylinder block (3) lightly.



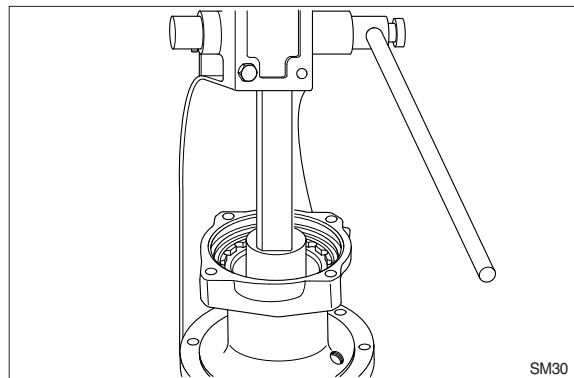
- ⑦ Assemble bushing (6) to cylinder block (3).



(3) Oil seal

Apply three bond of white color on outer surface of oil seal (2) and assemble and insert it.

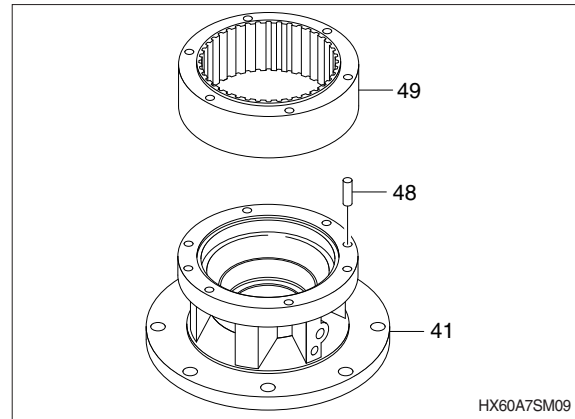
- ※ Before assembling, lubricate lip of oil seal with grease.



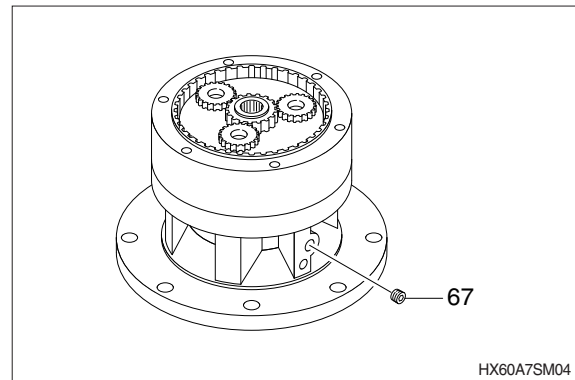
(5) Place ring gear (49) on the case by matching it with knock pin (48) hole.

(6) Insert 2 knock pins (48) by using jig.

※ Be sure to check the hole location of oil gage before inserting.

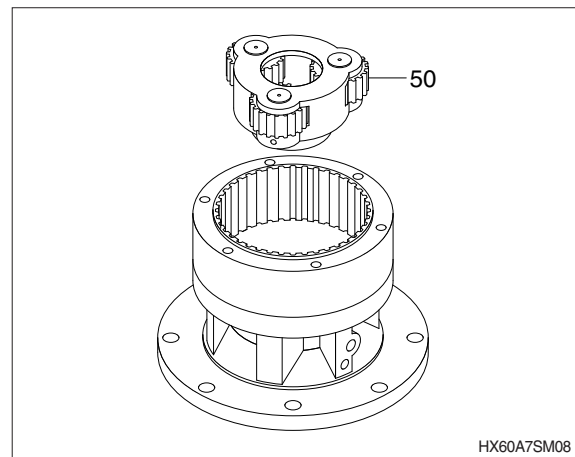


(7) Screw drain plug into drain plug (67) after winding sealing tape.



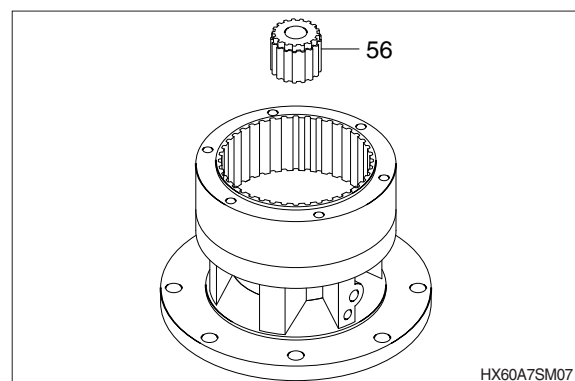
(8) Mount No.2 carrier assembly (50) in the case sub assembly and install bolts into 2 TAP holes (M6) as shown in figure.

※ Turn the carrier slowly by hand to adjust the matching holes when assembling.



(9) Install No.2 sun gear (56).

※ Be sure to check the direction of sun gear (56) when assembling.



2. HYDRAULIC MOTOR SECTION (DISASSEMBLING)

1) Remove the seven hexagon socket head cap bolts.

※ Hexagon size: 8mm

※ If you fix the motor with a vice, protect it with aluminum plates or equivalent.



7078TM03

2) Remove the body-1 from the body-2.

※ Pay attention not to come off and damage the valve plate.



7078TM04/04A

3) Remove the valve plate, spring-B and retainer.

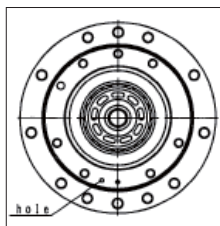
※ The bearing and spring pin are not able to disassemble, because they are press-fitted.



7078TM05/05A

4) Remove the brake piston assembly from the body-2.

※ The brake piston removes when the air comes into the inside from the hole. Do not blow it suddenly, The brake piston assembly fly out.

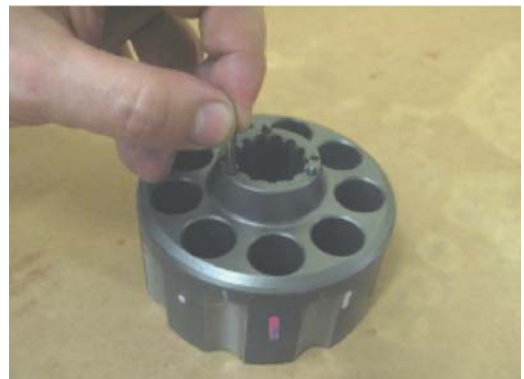
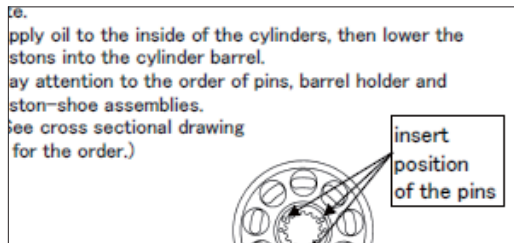


7078TM06

- 12) Place the piston-shoe assemblies into the shoe holder.



- 13) Place 3 pins, barrel holder and 9 piston-shoe assemblies in that order into the cylinder barrel.



7078TM04/04A

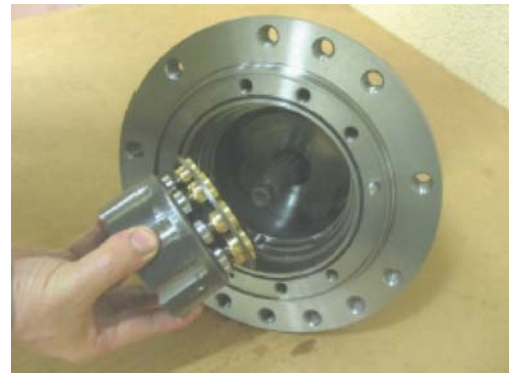
- ※ Apply oil to the inside of the cylinders, then lower the pistons into the cylinder barrel.
- ※ Pay attention to the order of pins, barrel holder and piston-shoe assemblies. (See cross sectional drawing for the order.)



7078TM05/05A

- 14) Inset the cylinder barrel assembly into the body 2 so that the shoes contact the swash plate.

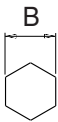
- ※ Pay attention not to lose the each part.



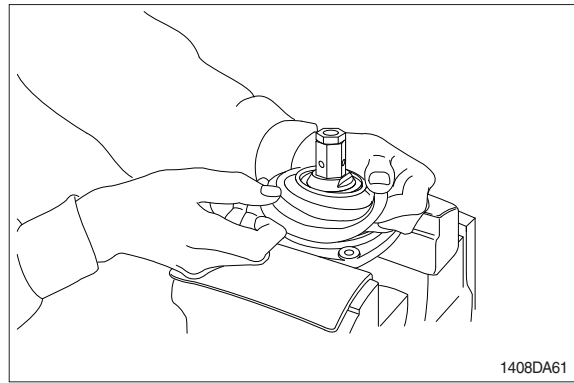
7078TM06

2) TOOLS AND TIGHTENING TORQUE

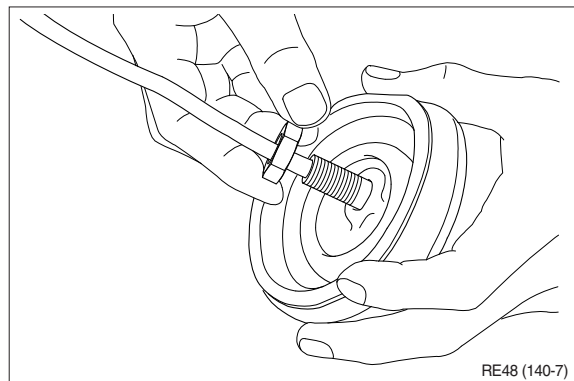
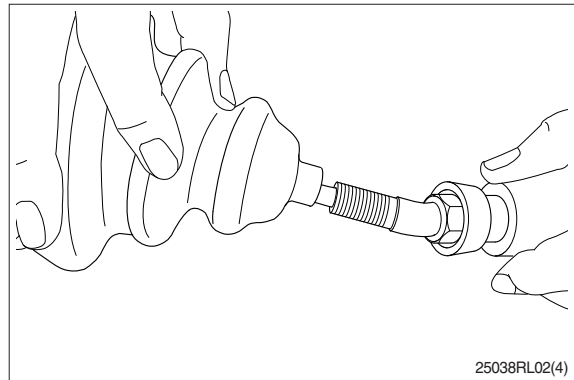
(1) Tools

Tool name	Remark	
(L) Hexagonal wrench	10	
Spanner	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

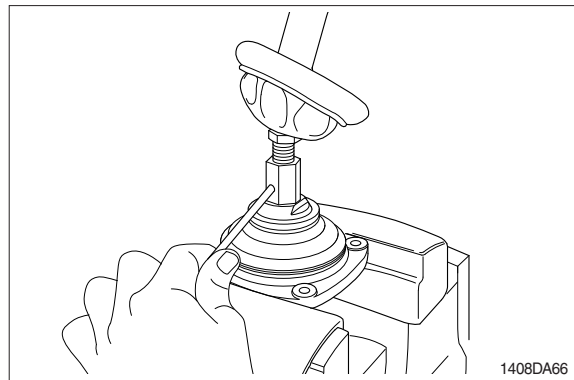
(14) Fit boot (14) to plate.



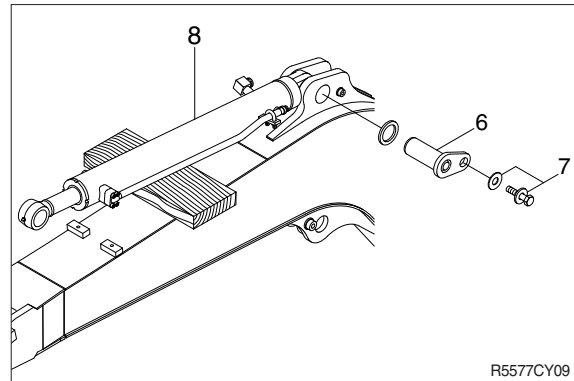
(15) Fit boot (25) and lock nut (24), and handle subassembly is assembled completely.



(16) Pull out cord and tube through adjusting nut hole provided in direction 60° to 120° from casing hole.



- ⑤ Sling arm assembly (8) and remove bolt (7) then pull out pin (6).
- ⑥ Remove arm cylinder assembly (8).
 - Weight : 54 kg (119 lb)

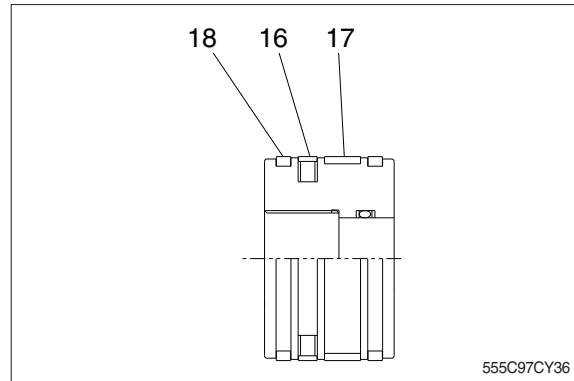


(2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the arm cylinder.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

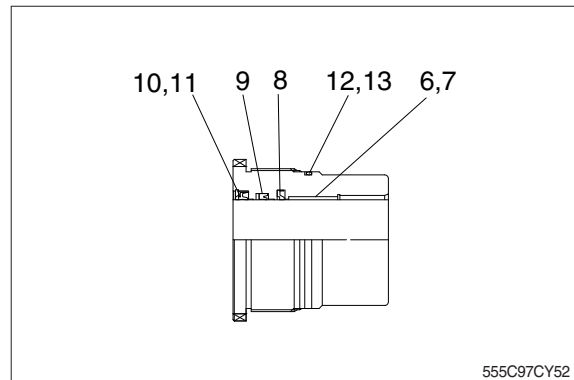
(3) Disassemble the piston assembly

- ① Remove wear ring (17).
 - ② Remove dust ring (18) and piston seal (16).
- ※ Exercise care in this operation not to damage the grooves.



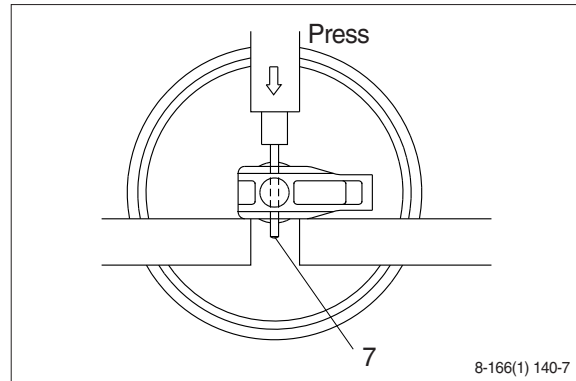
(4) Disassemble gland assembly

- ① Remove back up ring (12) and O-ring (13).
 - ② Remove snap ring (11), dust wiper (10).
 - ③ Remove U-packing (9) and buffer seal (8).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.

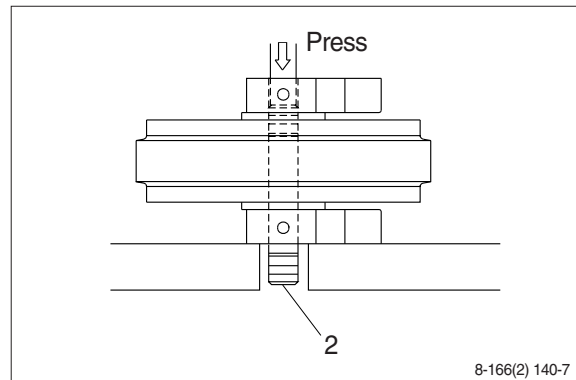


(2) Disassembly

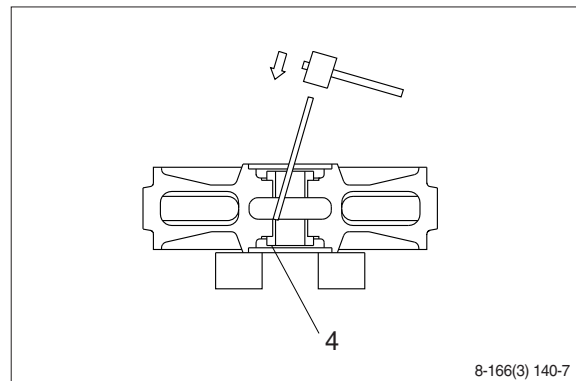
- ① Remove plug and drain oil.
- ② Draw out the spring pin (7), using a press.



- ③ Pull out the shaft (2) with a press.
- ④ Remove seal (3) from idler (1) and bracket (5).
- ⑤ Remove O-ring (6) from shaft.



- ⑥ Remove the bushing (4) from idler, using a special tool.
- ※ Only remove bushing if replacement is necessary.



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