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1. STRUCTURE

This service manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.
This service manual mainly contains the necessary technical information for operations performed in a service workshop.
For ease of understanding, the manual is divided into the following sections.

SECTION 1 GENERAL
This section explains the safety hints and gives the specification of the machine and major components.

SECTION 2 STRUCTURE AND FUNCTION
This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

SECTION 3 HYDRAULIC SYSTEM
This section explains the hydraulic circuit, single and combined operation.

SECTION 4 ELECTRICAL SYSTEM
This section explains the electrical circuit, monitoring system and each component. It serves not only to give an understanding electrical system, but also serves as reference material for trouble shooting.

SECTION 5 TROUBLESHOOTING
This section explains the troubleshooting charts correlating problems to causes.

SECTION 6 MAINTENANCE STANDARD
This section gives the judgement standards when inspecting disassembled parts.

SECTION 7 DISASSEMBLY AND ASSEMBLY
This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

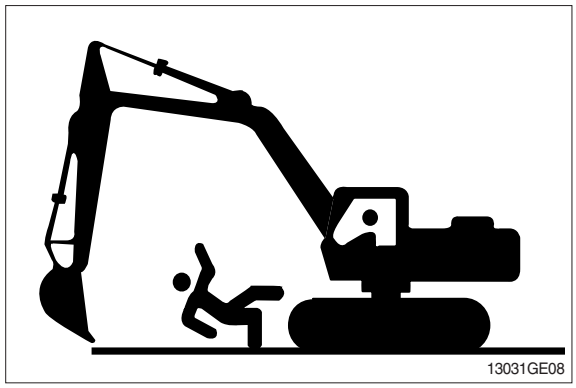
SECTION 8 COMPONENT MOUNTING TORQUE
This section shows bolt specifications and standard torque values needed when mounting components to the machine.

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your HYUNDAI distributor for the latest information.

KEEP RIDERS OFF EXCAVATOR

Only allow the operator on the excavator. Keep riders off.

Riders on excavator are subject to injury such as being struck by foreign objects and being thrown off the excavator. Riders also obstruct the operator's view resulting in the excavator being operated in an unsafe manner.

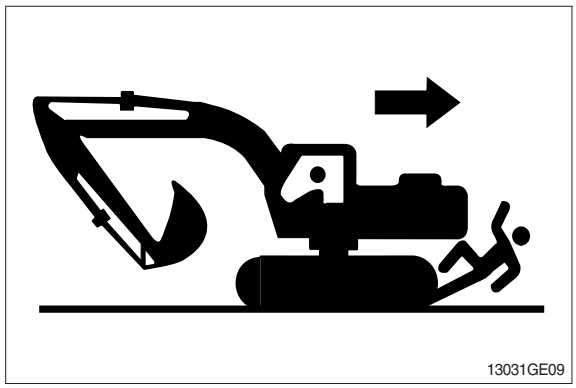


MOVE AND OPERATE MACHINE SAFELY

Bystanders can be run over. Know the location of bystanders before moving, swinging, or operating the machine.

Always keep the travel alarm in working condition. It warns people when the excavator starts to move.

Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the excavator.



OPERATE ONLY FORM OPERATOR'S SEAT

Avoid possible injury machine damage. Do not start engine by shorting across starter terminals.

NEVER start engine while standing on ground. Start engine only from operator's seat.

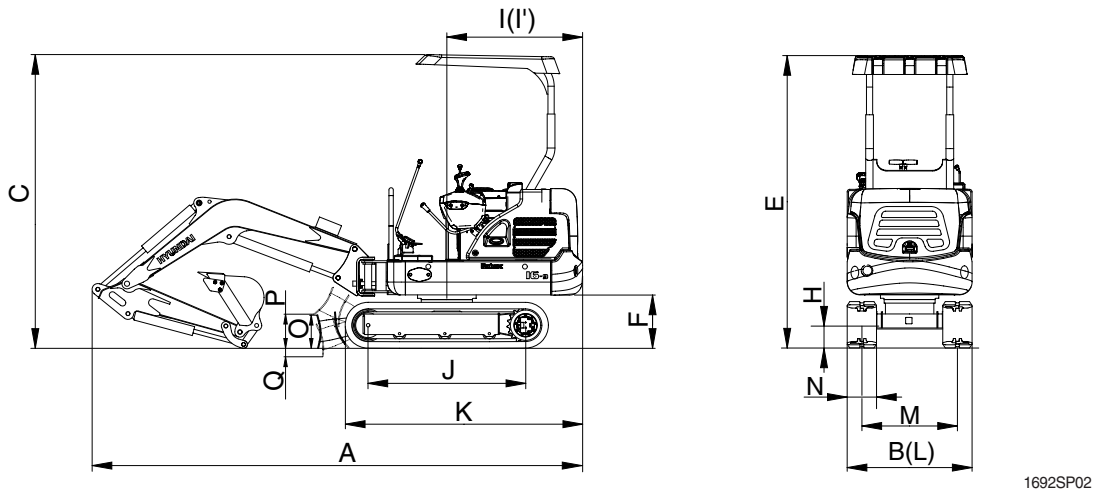
PARK MACHINE SAFELY

Before working on the machine:

- Park machine on a level surface.
- Lower bucket to the ground.
- Turn auto idle switch off.
- Run engine at 1/2 speed without load for 2 minutes.
- Turn key switch to OFF to stop engine. Remove key from switch.
- Move pilot control shutoff lever to locked position.
- Allow engine to cool.

2. SPECIFICATIONS

1) 1.80 m (5' 11") MONO BOOM, 0.96 m (3' 2") ARM, WITH BOOM SWING POST



1692SP02

Description		Unit	Specification
Operating weight (canopy)		kg (lb)	1650 (3640)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.04 (0.05)
Overall length	A	mm (ft-in)	3840 (12' 7")
Overall width, with 230 mm shoe (extension crawler)	B		980~1250 (3' 3" ~ 4' 1")
Overall height	C		2300 (7' 7")
Overall height of canopy	E		2300 (7' 7")
Ground clearance of counterweight	F		415 (1' 4")
Minimum ground clearance	H		150 (0' 6")
Rear-end distance	I		1065 (3' 6")
Rear-end swing radius	I'		1065 (3' 6")
Distance between tumblers	J		1230 (4' 0")
Undercarriage length	K		1590 (5' 3")
Undercarriage width (extension crawler)	L		980~1250 (3' 3" ~ 4' 1")
Track gauge (extension crawler)	M		750~1020 (2' 6" ~ 3' 4")
Track shoe width, standard	N		230 (9")
Height of blade	O		250 (0' 10")
Ground clearance of blade up	P		170 (0' 7")
Depth of blade down	Q		240 (0' 9")
Travel speed (low/high)		km/hr (mph)	2.2/4.1 (1.4/2.5)
Swing speed		rpm	9.3
Gradeability		Degree (%)	30 (58)
Ground pressure 230 mm rubber shoe (canopy)		kgf/cm^2 (psi)	0.27 (3.84)
Max traction force		kg (lb)	1550 (3420)

4) Operation of boom lock valve

(1) Holding

In the boom spool neutral condition,

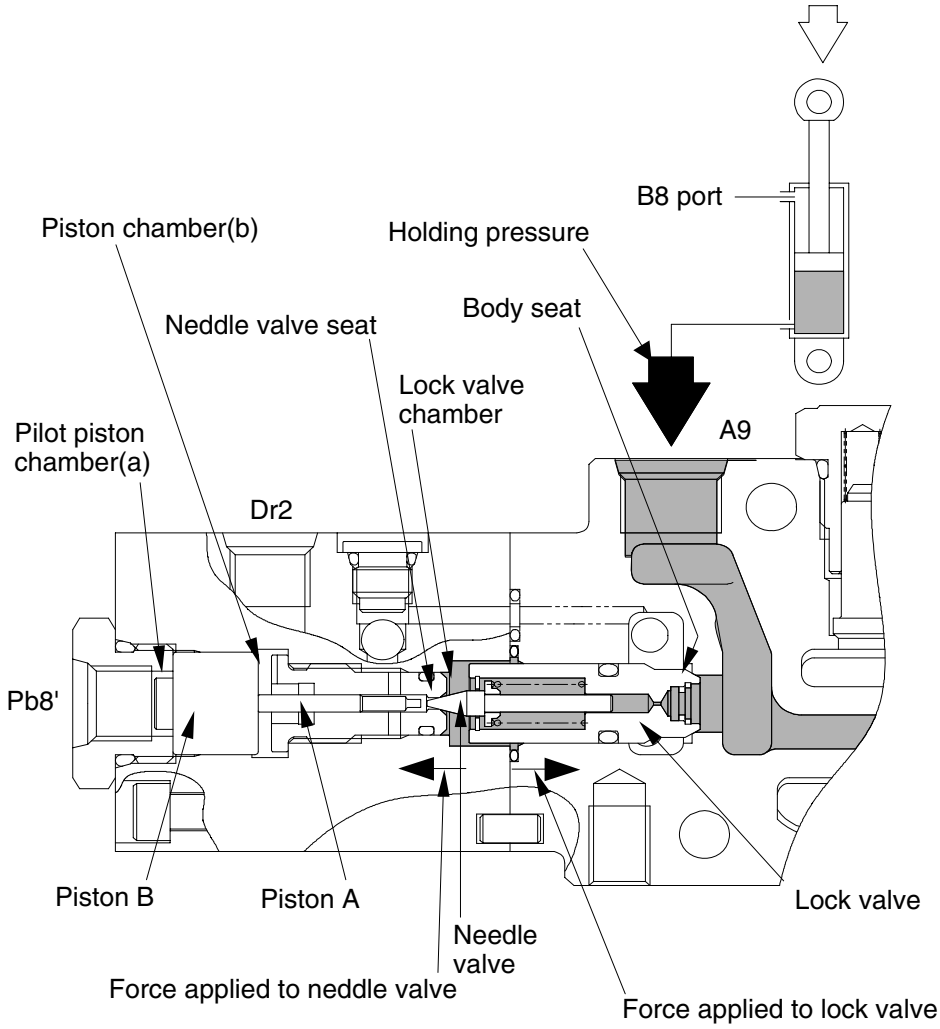
- The pilot piston chamber (a) is connected to the drain passage through the pilot port (Pb8') for releasing the boom lock valve.
- The piston chamber (b) is also connected to the drain passage through the drain port (Dr2).

Therefore, the piston (B) maintains the condition shown in the figure.

The boom cylinder holding pressure (shown in half-tone dot meshing) is applied to the lock valve chamber as shown in the figure to :

- Press the needle valve against the needle valve seat.
- Press the lock valve against the body seat.

Then, oil leakage from the boom cylinder head side is prevented to stop the movement of the boom cylinder due to leakage.



Operation of boom lock valve (holding)

R35Z72MCV15

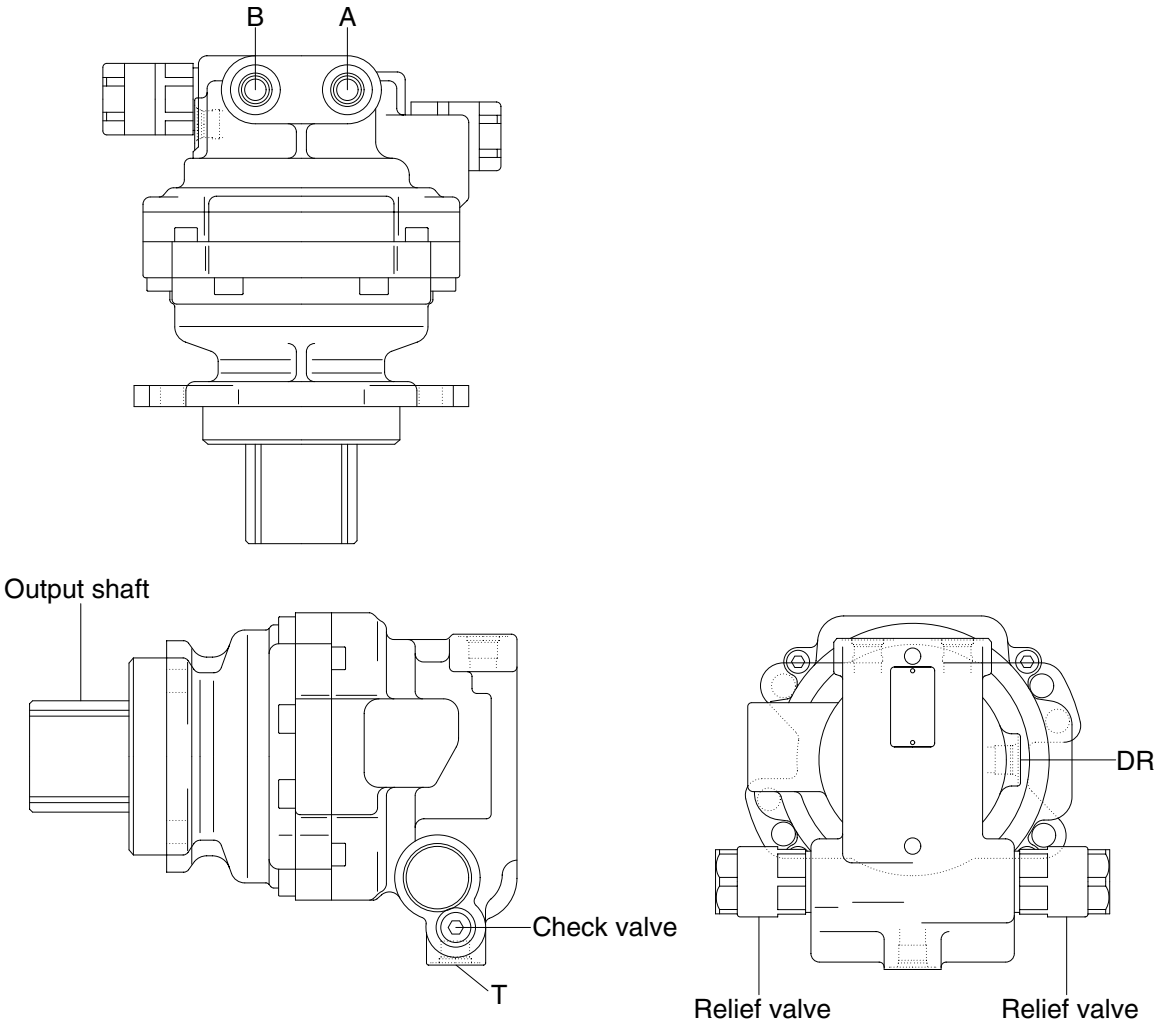
GROUP 3 SWING DEVICE

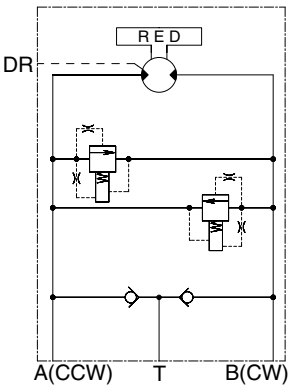
1. STRUCTURE

Swing device consists swing motor and swing reduction gear.

1) SWING MOTOR

Swing motor include mechanical relief valve, make up valve and check valve.





HYDRAULIC CIRCUIT

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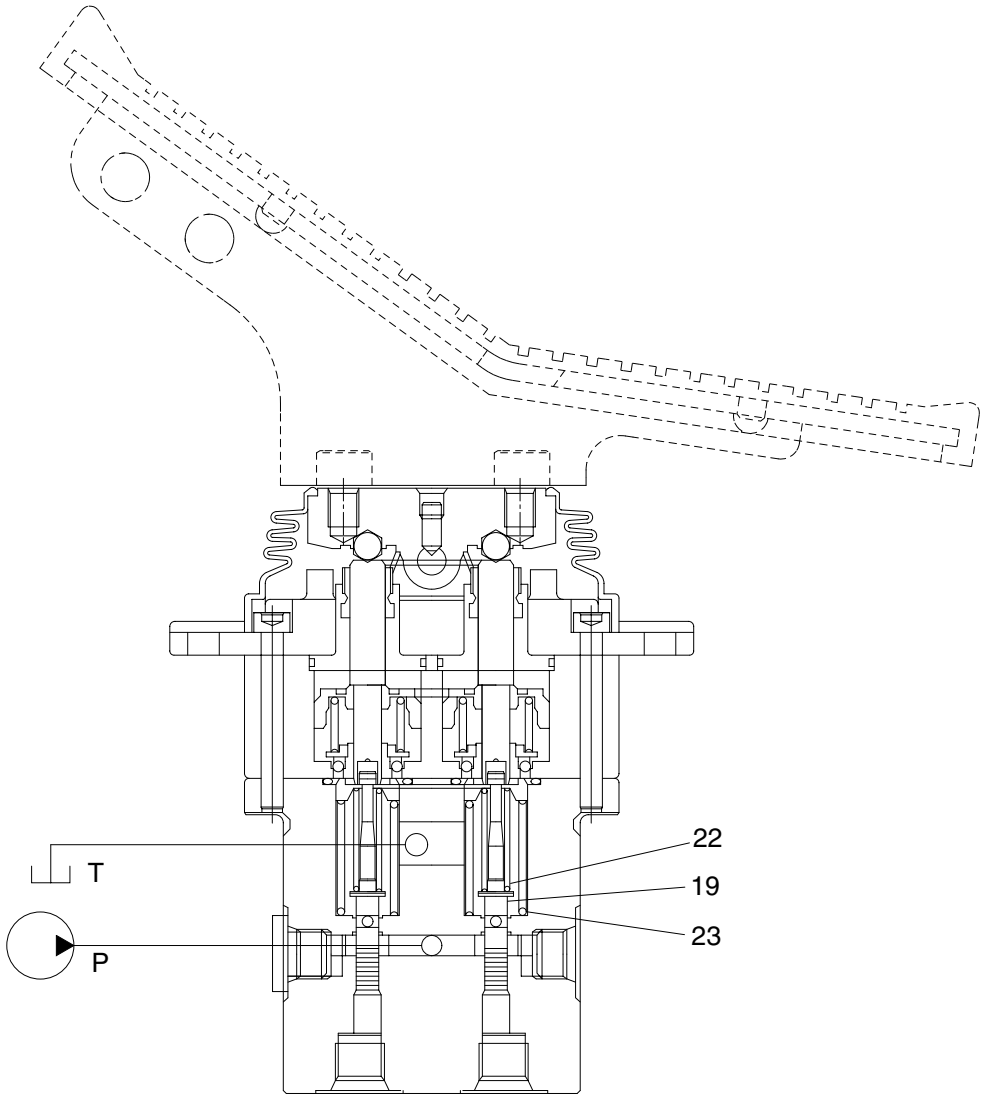
Port	Port name	Port size
A	Main port	PF 3/8
B	Main port	PF 3/8
DR	Drain port	PF 3/8
T	Make up port	PF 3/8

(1) Case where pedal is in neutral position



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The force of the spring (22) that determines the output pressure of the pilot valve is not applied to the spool (19). Therefore, the spool is pushed up by the spring (23) to the position of port 2 in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

2. STARTING CIRCUIT

1) OPERATING FLOW

Battery(+) terminal → Master switch [CS-74] → Fusible link [CN-60]
- → Start key [CS-2 (1)]
- → I/conn [CN-1 (1)] → Fuse box No.1
- → Glow timer [CR-36 (1)]
- → Power relay [CR-35 (30)]

※ **Start switch : ON**

Start switch ON
- → [CS-46 (2)] → I/conn [CN-2 (8)] → Fuse box No. 2, 3 (power is supplied) → I/conn [CN-2 (2)]
  - → Safety relay [CN-165 (3)]
  - → Power relay [CR-35 (85) → (87)] →
    Fuse box (all power is supplied with electric component)
  - → Glow timer [CR-24 (3)]
- → [CS-46 (3)] → Control timer [CR-79 (3)]

※ **Start switch : START**

Start switch START [CS-46 (4)] → Start relay [CR-23 (C1) → (2)] → Starter [CN-45 (S)] →
Start motor operating

2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	Start	① - GND (Battery) ② - GND (Start key) ③ - GND (Starter B^+) ④ - GND (Starter M)	10~12.5 V

※ GND : Ground

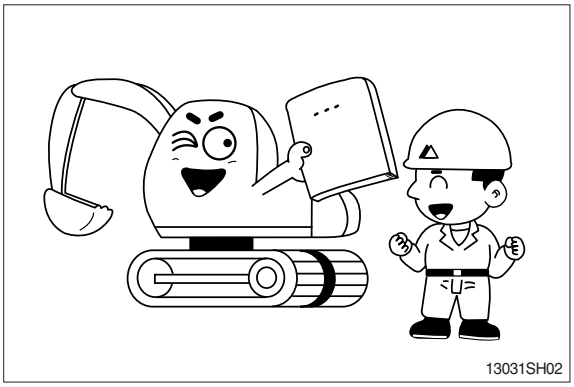
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CR-36	SUMITOMO	2	Safety relay	6195-0060	-
CR-77	KET	4	Control timer	MG620046	-
CR-79	KET	3	Control timer	MG620044	-
SENSOR					
CD-2	AMP	3	Fuel sender	S816-003002	S816-102002
CD-8	AMP	2	Water temp sender	85202-1	-
CD-9	-	1	Water temp switch	7123-2115	-
CD-10	-	1	Air cleaner	S823-025212	-
CD-11	KET	2	Travel pressure switch	MG640795	-
CD-12	KET	2	Travel pressure switch	MG640795	-
CD-18	-	1	Engine oil pressure	7123-2115	-
DO-1	-	2	Diode	S816-002002	21EA-50570
DO-6	-	2	Diode	S816-002002	21EA-50550
SWITCH					
CS-2	-	2	Start key switch	S813-030201	-
CS-4	AMP	3	Safety switch	-	S814-102001
CS-5	-	1	Horn switch	S822-014002	-
	-	1		-	S822-114002
CS-8	-	10	Travel speed switch	250-10PRG	-
CS-16	-	10	Travel alarm switch	250-10PRG	-
CS-21	-	10	Light switch	250-10PRG	-
CS-23	SWF	10	Spare	593757	-
CS-46	KET	4	Start switch	MG651926	-
CS-67	SWF	10	Quick clamp switch	593757	-
CS-74	RING TERM	1	Battery (+)	ST710287-2	-
CS-83	-	10	Extension valve switch	250-10PRG	-

2. DIAGNOSING PROCEDURE

To carry out troubleshooting efficiently, the following steps must be observed.

STEP 1. Study the machine system

Study and know how the machine is operating, how the system is composing, what kinds of function are installed in the machine and what are specifications of the system components by the machine service manual.
Especially, deepen the knowledge for the related parts of the trouble.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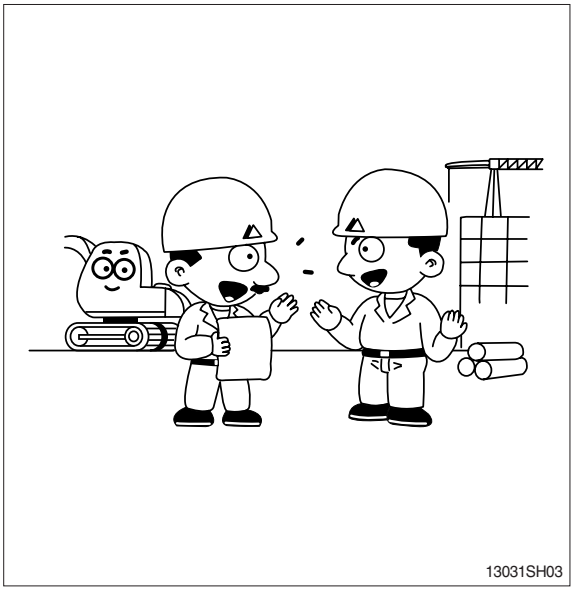
STEP 2. Ask the operator

Before inspecting, get the full story of malfunctions from a witness --- the operator.

1) How the machine is used and when it is serviced?
2) When the trouble was noticed and what work the machine was doing at that time?
3) What is the phenomenon of the trouble? Was the trouble getting worse, or did it come out suddenly for the first time?
4) Did the machine have any troubles previously? If so, which parts were repaired before.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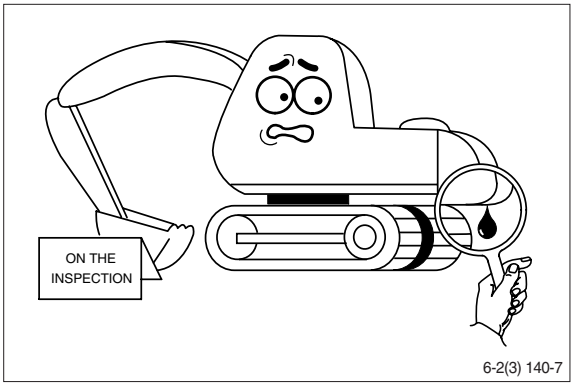
STEP 3. Inspect the machine

Before starting troubleshooting, check the machine for the daily maintenance points as shown in the operator's manual.

And also check the electrical system including batteries, as the troubles in the electrical system such as low battery voltage, loose connections and blown out fuses will result in malfunction of the controllers causing total operational failures of the machine.



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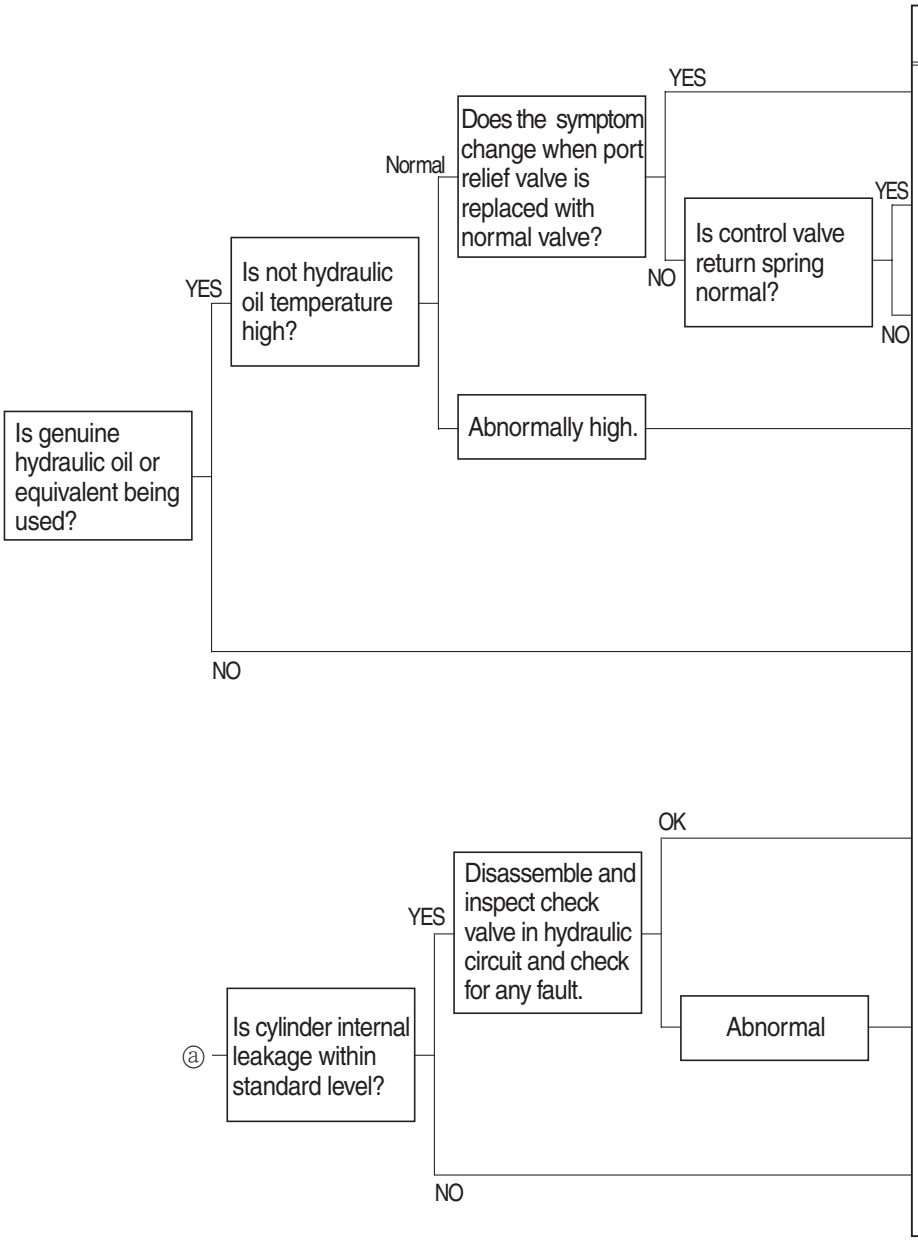
3) BOOM, ARM OR BUCKET CYLINDER EXTENDS OR CONTRACTS ITSELF AND ATTACHMENT FALLS



Cause	Remedy
Port relief valve is faulty.	Disassemble and repair or replace.
Control valve's return spring is faulty.	Disassemble and replace.
	Locate the cause of hydraulic oil temperature rise and lower it to proper level.
	Replace with genuine hydraulic oil or equivalent.
Pressure tightness between control valve casing and spool is poor.	Disassemble and repair.
Contact surface between poppet and seat is poor.	Disassemble and repair.
Cylinder is faulty.	Disassemble and repair.

3) TRAVEL SPEED

(1) Measure the time required for the excavator to travel a 20m test track.

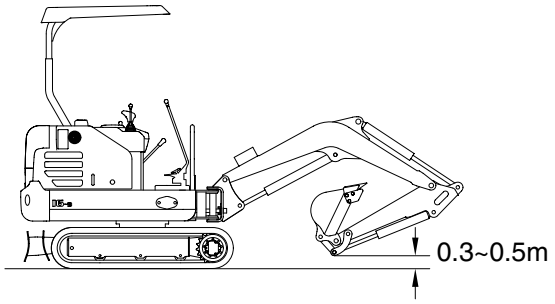
(2) Preparation

① Adjust the tension of both tracks to be equal.

② Prepare a flat and solid test track 20m in length, with extra length of 3 to 5m on both ends for machine acceleration and deceleration.

③ Hold the bucket 0.3 to 0.5m above the ground with the arm and bucket rolled in.

④ Keep the hydraulic oil temperature at 50±5°C.



1696MS04

(3) Measurement

① Measure both the low and high speeds of the machine.

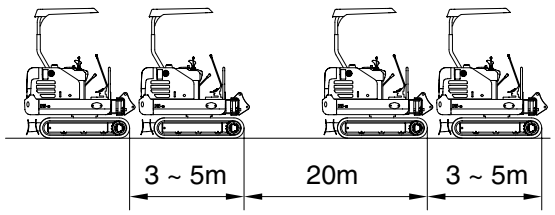
② Before starting either the low or high speed tests, adjust the travel mode switch to the speed to be tested.

③ Start traveling the machine in the acceleration zone with the travel levers at full stroke.

④ Measure the time required to travel 20m.

⑤ After measuring the forward travel speed, turn the upperstructure 180° and measure the reverse travel speed.

⑥ Repeat steps ④ and ⑤ three times in each direction and calculate the average values.



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(4) Evaluation

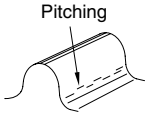
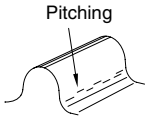
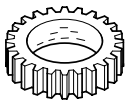
The average measured time should meet the following specifications.

Unit : Seconds / 20m

Model	Travel speed	Standard	Maximum allowable	Remarks
R16-9	1 Speed	32.7±2.0	40.8	
	2 Speed	17.6±1.0	22.0	

2) STANDARD FOR PARTS INSPECTION

(1) Reduction gear section

Part	Extent of the damage	Inspection standard	Action
A internal gear	Excessive wear of the surface	Pitching area 5% or more of the gear surface 	Replace the pinion kit.
Carrier 1	Damage to spline section	By visual	Replace the carrier kit.
S1 gear b1 gear	Excessive wear of the surface	Pitching area 5% or more of the gear surface 	Replace the carrier kit.
	Excessive wear of the bearing surface	By visual pitching, flaking 	
Ring	Excessive wear of the bearing surface	By visual pitching, flaking 	Replace the carrier kit.
Roller	Excessive wear of the bearing surface	By visual pitching, flaking 	Replace the carrier kit.
Other (screw, etc.)	Damage, excessive rust	-	Replace each part.

(2) Hydraulic motor section

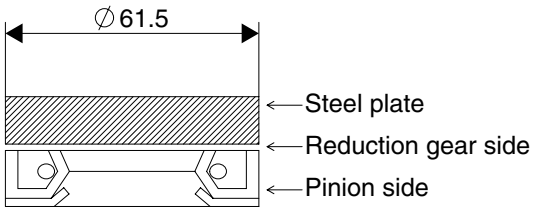
Part	Extent of the damage	Inspection standard	Action
Shaft	Excessive wear of the spline section	Worn depth : 25 μm or more	Replace the hydraulic motor assembly.
Cylinder barrel	Excessive wear to the sliding surface of the valve plate	Worn depth : 20 μm or more	Replace the cylinder barrel kit.
Valve plate	Excessive wear to the sliding surface of the cylinder barrel	Worn depth : 20 μm or more	Replace the cylinder barrel kit.
Piston shoe	Wear of joint section of shoe	Play of piston and shoe : 0.3 mm or more by hand operation	Replace the cylinder barrel kit.
Swash plate	Excessive wear to the sliding surface of the shoe	Worn depth : 0.1 mm or more	Replace the swash plate kit.
Other (screw, etc.)	Damage, excessive rust	-	Replace each part.

2) REDUCTION GEAR SECTION

(1) Press-fit the oil seal (123) into the body (101).

※ Pay attention to the direction of the oil seal, use round steel plate for pressing to prevent misalignment.

Steel plate outer diameter : ø 61.5



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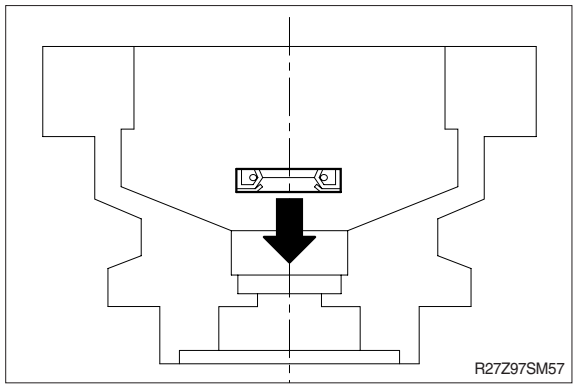

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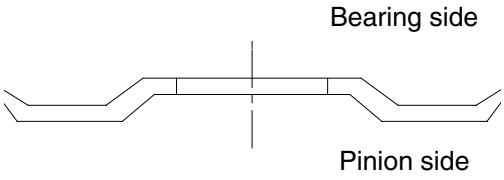
(2) Place the ring seal (113) onto the pinion shaft (104).

※ Pay attention to direction of the ring seal.



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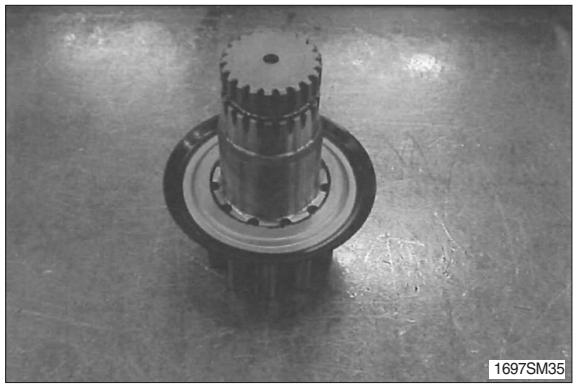

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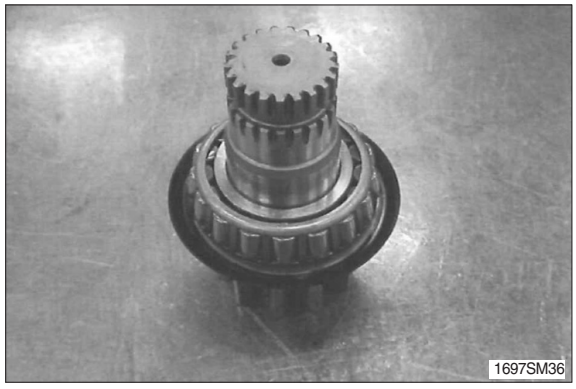
(3) Press-fit the inner ring of the bearing (121) to the pin pinion shaft (104).

※ After press fitting, apply grease onto the surface of the rollers, and turn them manually so that the grease can spread to the whole roller surface.



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