Technical Manual

EX8 EX22
EX12 EX30
EX15
Excavator

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HITACHI

KM580E-01
T580-01

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EXCAVATORS
TECHNICAL MANUAL

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FOLLOW SAFE PROCECURES

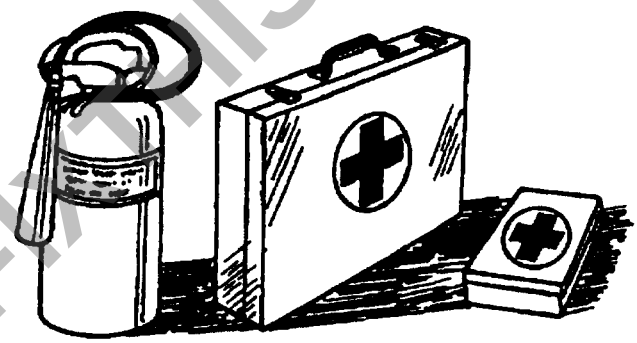
Unsafe work practices are dangerous. Understand service procedure before doing work; do not attempt shortcuts.

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



SA-020

HANDLE FLUIDS SAFELY – AVOID FIRES

Handle fuel with care; it is highly flammable. Do not refuel the machine while smoking or near open flame or sparks. Always stop engine before refueling machine. Fill fuel tank outdoors.



SA-018

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



SA-019

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Model	EX8	EX8 (Canopy type)
Type of front attachment	Backhoe with 0.70 m (2 ft 4 in.) arm	
Bucket capacity	PCSA and SAE: 0.024 m^3, CECE and JIS: 0.02 m^3	
Operating weight	740 kg (1 620 lb)	760 kg (1 670 lb)
Basic machine weight	570 kg (1 250 lb)	590 kg (1 300 lb)
Engine: KUBOTA Z482-B	5.9 kW (8.0 ps) / 2 300 min^{-1} (rpm)	
A : Overall width	810 mm (2 ft 8 in.)	
B : Overall height	1 280 mm (4 ft 2 in.)	2 050 mm (6 ft 9 in.)
C : Rear end swing radius	810 mm (2 ft 8 in.)	
D : Minimum ground clearance	170 mm (6.7 in.)	
E : Overall width of upperstructure	810 mm (2 ft 8 in.)	
F : Engine cover height	970 mm (3 ft 2 in.)	
G: Counterweight clearance	380 mm (15 in.)	
H: Undercarriage length	1 225 mm (4 ft 0 in.)	
I : Undercarriage width	810 mm (2 ft 8 in.)	
J : Sprocket center to idler center	900 mm (2 ft 11 in.)	
K : Track gauge	630 mm (2 ft 1 in.)	
L : Track shoe width	180 mm (7.1 in.) Rubber shoe	
Blade width	810 mm (2 ft 8 in.)	
Blade height	200 mm (7.9 in.)	
Swing speed	8.8min^{-1} (rpm)	
Travel speed	2.2 km / h (1.37mph)	
Gradeability	30° (tan $\theta = 0.58$)	
Ground pressure (Rubber shoe)	0.2 bar (0.20 kgf / cm^2, 2.8 psi)	0.21 bar (0.21kgf / cm^2, 3.0 psi)

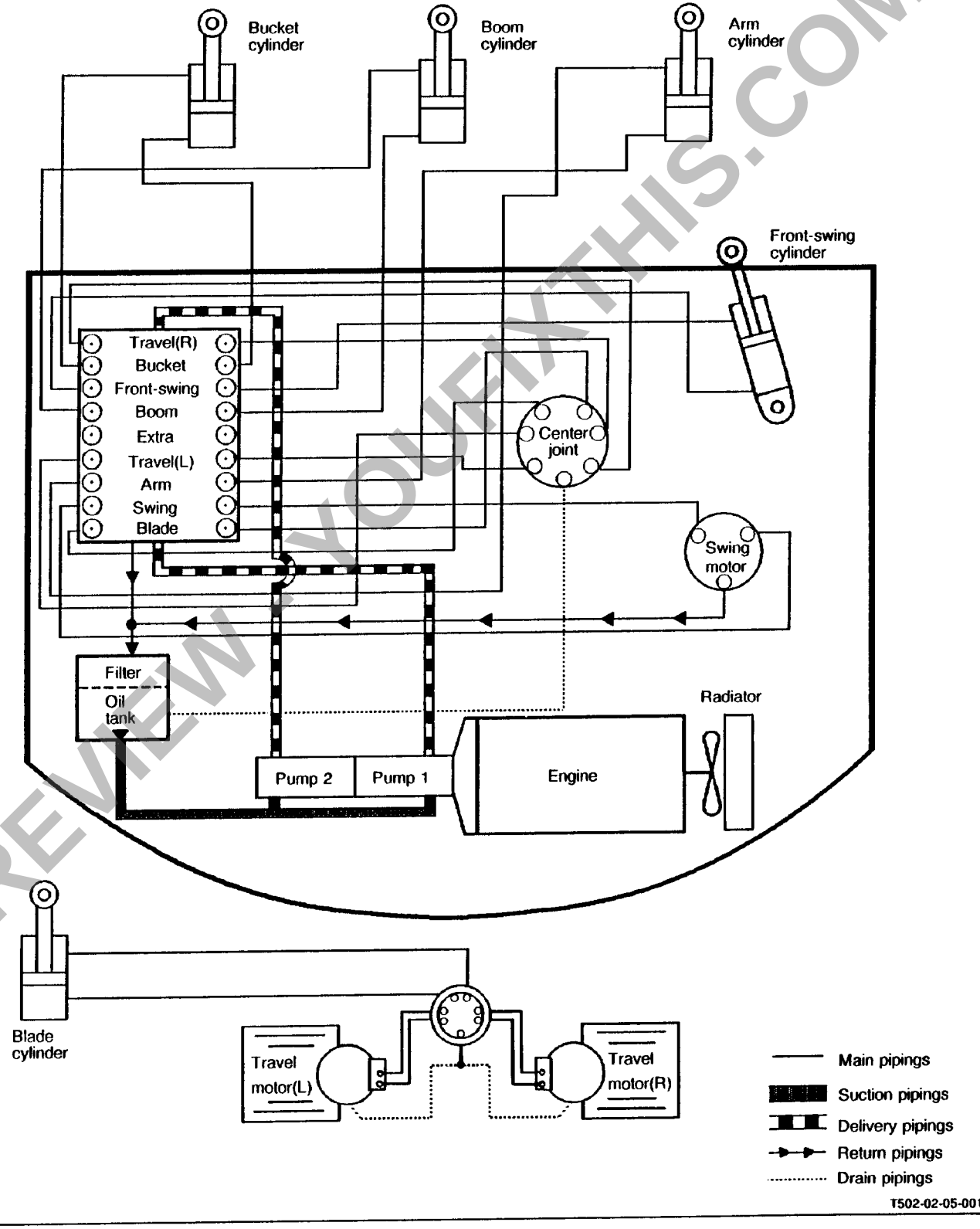
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GENERAL

Hydraulic oil pipings consist of main pipings and pilot pipings.
(EX8 has no pilot pipings due to no pilot system provided.)

<EX8>

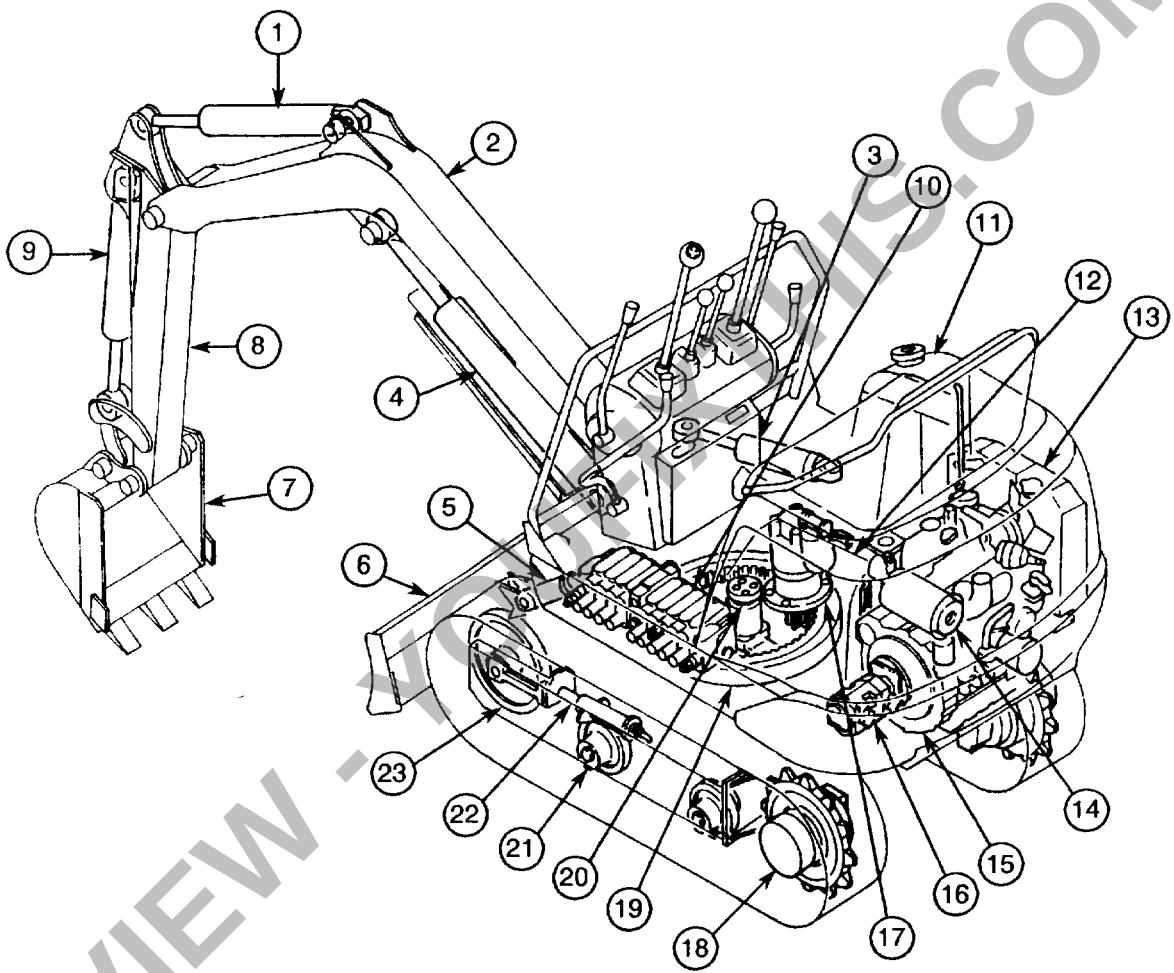


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OUTLINE

The hydraulic excavator consists of three main components.
They are the FRONT ATTACHMENT, UPPERSTRUCTURE and UNDERCARRIAGE.

EX8



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FRONT ATTACHMENT



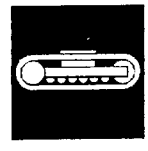
1— Arm Cylinder
2— Boom
3— Boom-swing Cylinder
4— Boom Cylinder
5— Blade Cylinder
6— Blade
7— Bucket
8— Arm
9— Bucket Cylinder

UPPERSTRUCTURE



10— Control Valve
11— Fuel Tank
12— Hydraulic Oil Tank
13— Radiator
14— Air Cleaner
15— Engine
16— Pump Device
17— Swing Device

UNDERCARRIAGE

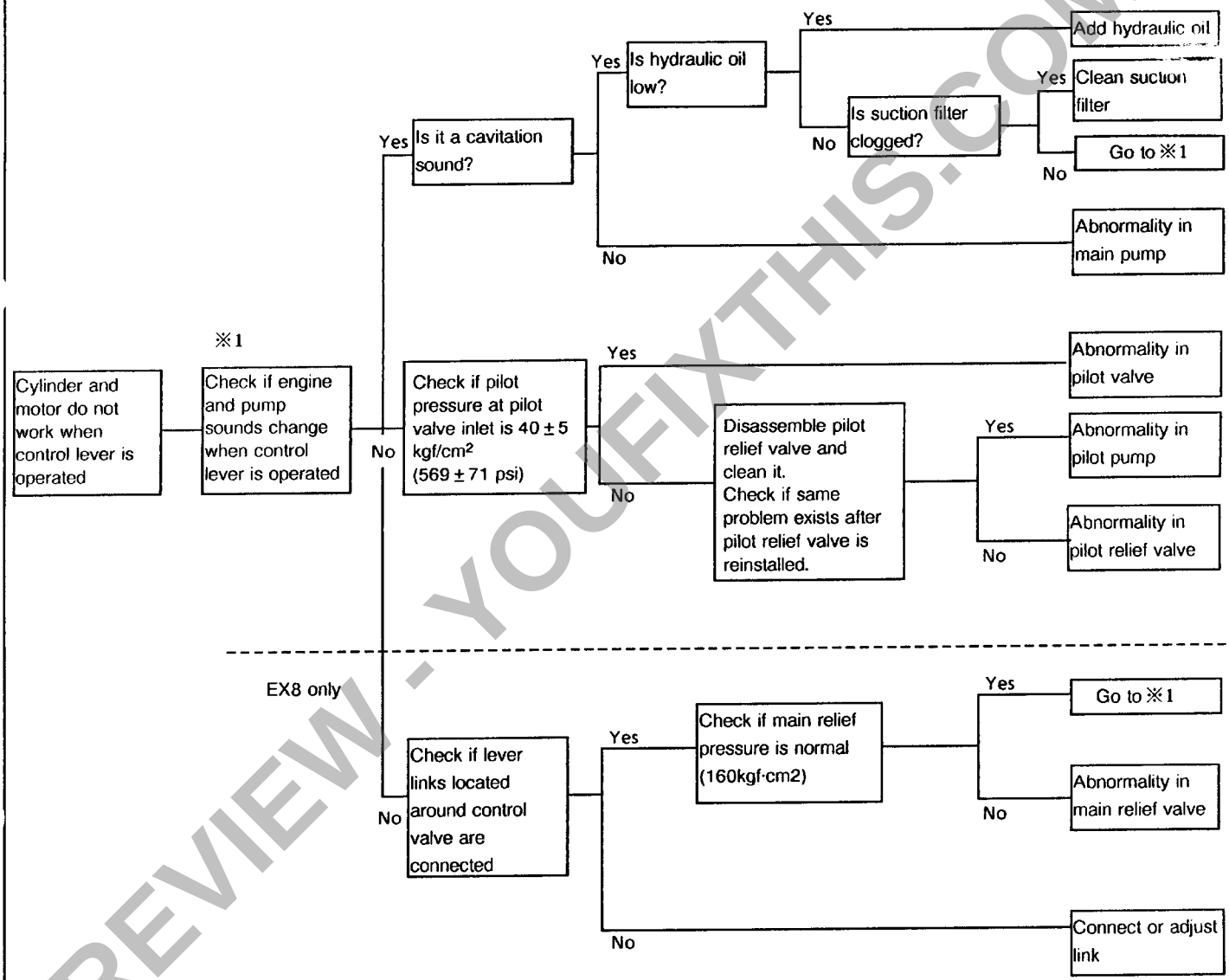


18— Travel Device
19— Swing Bearing
20— Center Joint
21— Lower Roller
22— Adjuster
23— Front Idler

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A-1 CYLINDER AND MOTOR DO NOT MOVE

Pilot system (pilot pump, pilot valve, pilot shut-off valve and so on) and/or pressure control system may have trouble (Except EX8).



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TEST 1: BATTERY CIRCUIT TEST (12 volt system)

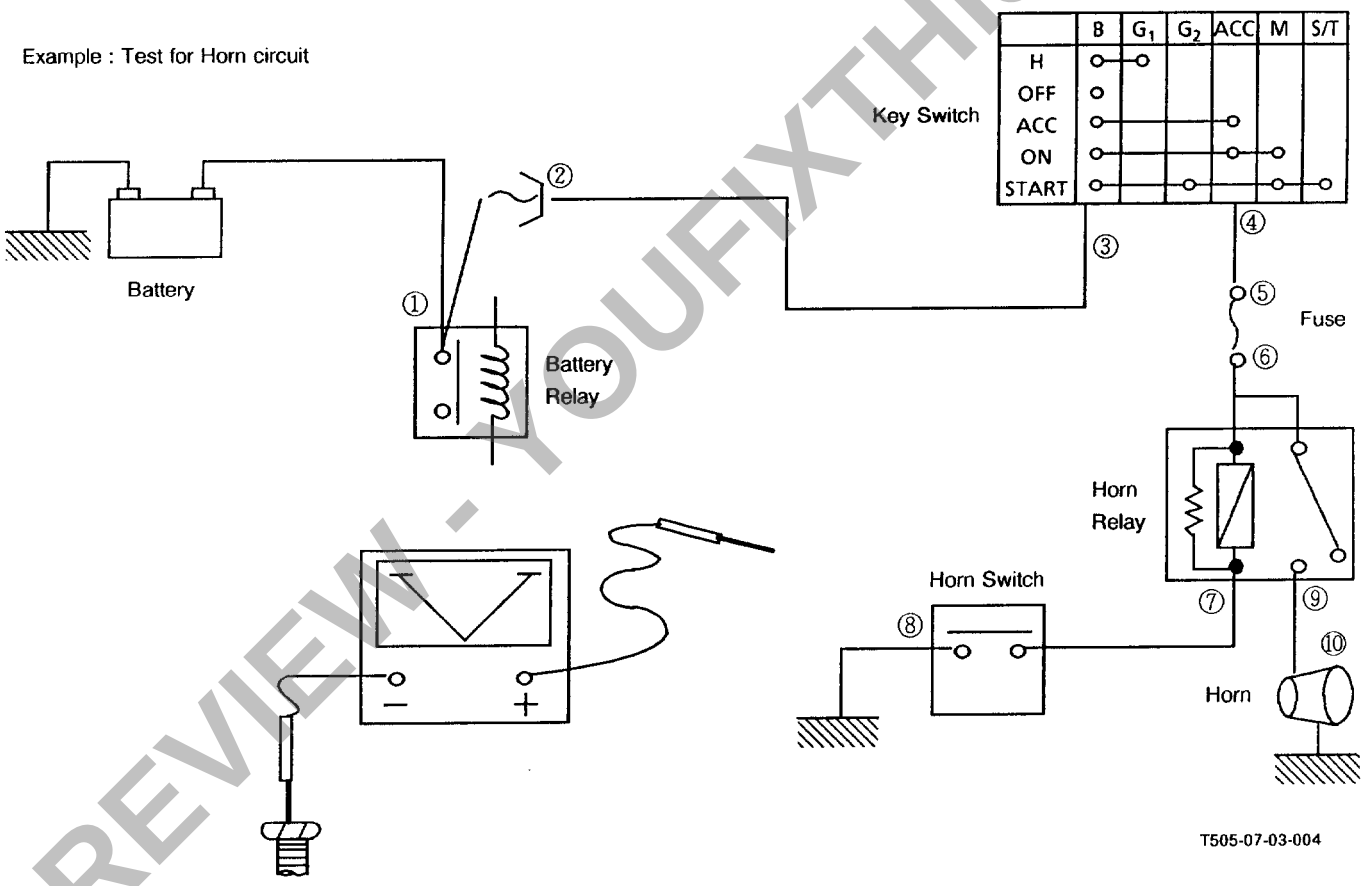
Use this procedure if the starter fails to rotate, horn does not sound, and work lights fail to come on. Trace the circuit, locate and correct the cause of the problem.

(1) Supply current to the circuit to be tested by turning the key switch ON (engine OFF), and turn all switches in the circuit ON.

(2) Select voltage (v) on the voltmeter. Ground the negative (-) probe and touch the positive (+) probe to the test point. Test these points in order, starting either nearest the power source or furthest away from the power source.

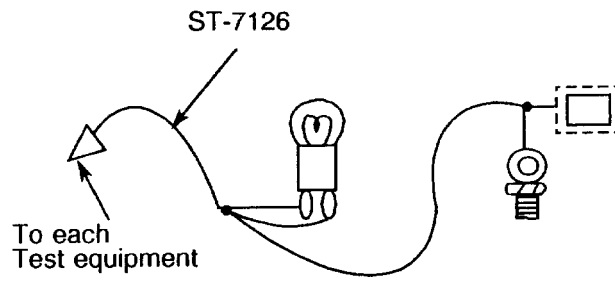
If a reading of approximately 12 volts is obtained, it indicates that the circuit is OK from the battery to that test point. When a reading of less than 12 volts is obtained, the component or wiring problem has been located.

Example : Test for Horn circuit



This procedure is applicable to the following circuits : Lights, Hour meter, Windshield washer, Horn, Monitor panel, Starter, Alternator, Glow plugs, etc.

When a voltmeter is not available, an alternate test procedure is to use a lamp harness. Lamp harness (ST-7126) is approved alternate test equipment.

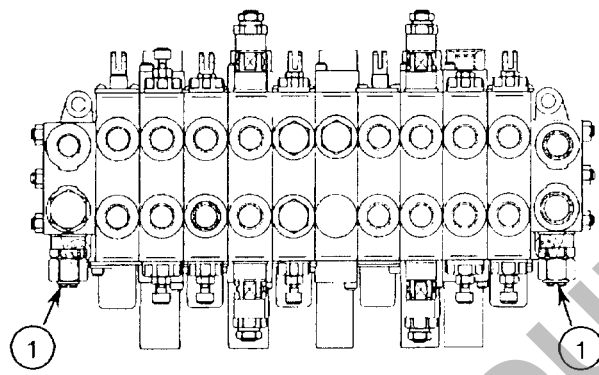


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Evaluation

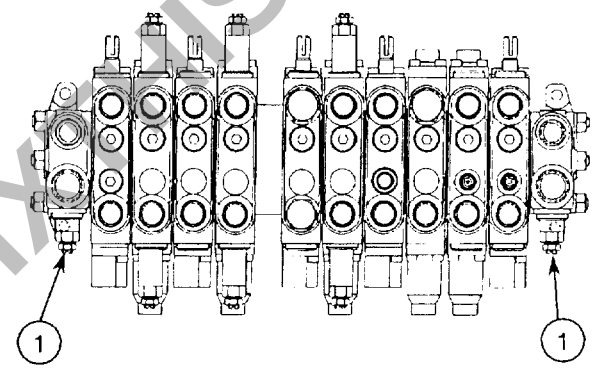
The mean relief pressure should meet the following specifications:

Model		Standard	Allowable limits (kgf/cm2)	Remarks
EX8	~Serial No. 302	165 ± 10 kgf/cm2	Maximum: 175, Minimum: 130	
	Serial No. 303~	175 ± 10 kgf/cm2	Maximum: 185, Minimum: 150	
EX12		175 ± 10 kgf/cm2	Maximum: 185, Minimum: 140	
EX15		175 ± 10 kgf/cm2	Maximum: 185, Minimum: 140	
EX22		175 ± 10 kgf/cm2	Maximum: 185, Minimum: 140	
EX30		210 ± 10 kgf/cm2	Maximum: 220, Minimum: 170	



①Main relief valve

T505-06-04-004



T505-06-04-005

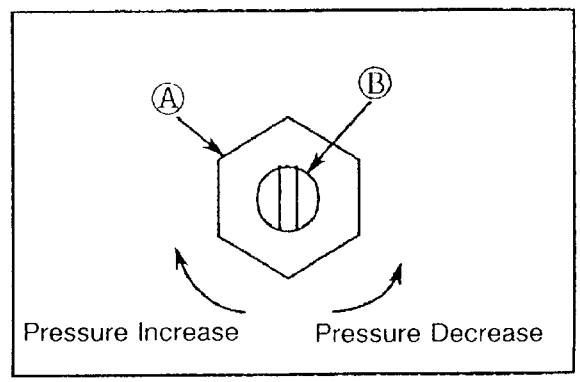
Adjustment:

If the mean pressure is not within specifications, adjust it as follows:

1. Loosen lock nut (A).
2. Turn adjusting screw (B).
3. After adjustment. retighten the lock nut to specification.

Torque Specifications:

EX8:	0.1 to 0.2 kgf·m
EX12·15:	4.2 to 5.0 kgf·m
EX22·30:	2 + 0.3 kgf·m



T505-06-04-006

Pressure Variations by Turning Adjusting Screw

Model	Adjusting Screw Turn	Pressure (kgf/cm2)	Remarks
EX8	1·1/2·1/4 turn	46·23·11.5	
EX12	1·1/2·1/4 turn	98·49·24.5	
EX15	1·1/2·1/4 turn	98·49·24.5	
EX22	1·1/2·1/4 turn	78·39·19.5	
EX30	1·1/2·1/4 turn	110·55·27.5	

4. Recheck the setting pressure after completing adjustment.

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SERVICE REFILL CAPACITIES

EX8

Description	liter	US gal	Imp gal	Reference
Fuel tank	9.0	2.4	2.0	
Engine oil	1.9	0.5	0.4	
Engine coolant	2.3	0.6	0.5	
Hydraulic oil tank	13.0	3.4	2.8	
Hydraulic system	21.0	5.5	4.6	
Travel reduction devices	0.3×2	0.08×2	0.07×2	
Swing internal gear	0.2	0.05	0.04	
Front idlers	0.015×2	0.003×2	0.003×2	Engine oil SAE No.30 (CD class)
Lower rollers	0.040×4	0.010×4	0.008×4	↑

EX12·EX15

Description	liter	US gal	Imp gal	Reference
Fuel tank	20.0	5.3	4.4	
Engine oil	4.5	1.2	1.0	
Engine coolant	3.5	0.9	0.8	
Hydraulic oil tank	21.0	5.5	0.4	
Hydraulic system	32.0	8.4	7.0	
Travel reduction devices	0.33×2	0.08×2	0.07×2	
Swing internal gear	0.6	0.15	0.13	
Front idlers	0.008×2	0.002×2	0.001×2	Engine oil SAE No.30 (CD class)
Lower rollers	0.030×6	0.007×6	0.006×6	↑

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FUEL

Tank capacity
EX8 9.0 liter (2.4 US gal, 2.0 Imp gal)
EX12·EX15 20.0 liter (5.3 US gal, 4.4 Imp gal)
EX22·EX30 50.0 liter (13.2 US gal, 11.0 Imp gal)

Service points	Numbers of service points	Interval (Hours)						
		8	50	100	250	500	1000	2000
1. Drain water from fuel tank	1	▒						
2. Replace fuel filter element	1	Every 500 hours (every 400 hours for EX8).						
3. Clean feed pump strainer	1					▒		

RECOMMENDED FUEL
Use high quality diesel fuel only (ASTM D 975 No.2D).
Kerosene must not be used.

IMPORTANT: Be careful not to allow dust, dirt, water or other foreign materials into the fuel system.

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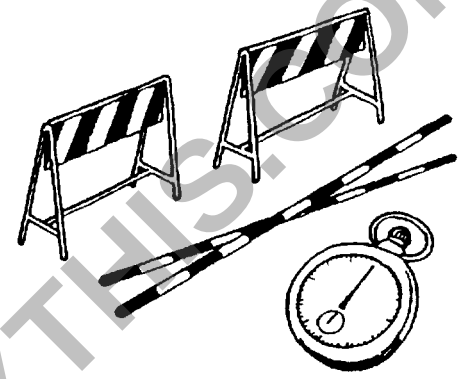
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PREPARATION FOR PERFORMANCE TESTS

Observe the following rules in order to carry out performance tests accurately and safely.

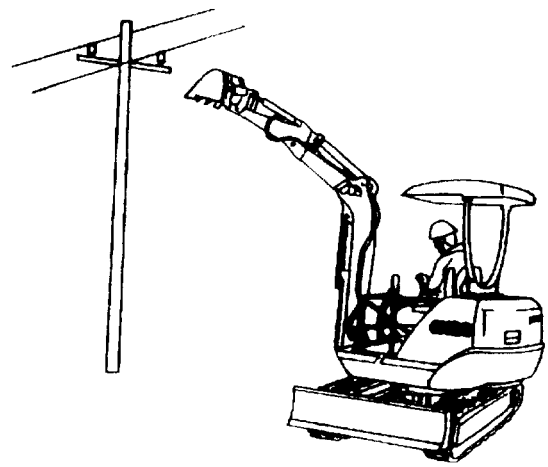
1. THE MACHINE
   Before starting to test, repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on.

2. TEST AREA
   (1) Select a hard, flat surface.
   (2) Secure enough space to allow the machine to run straight more than 20m, and to make a full swing with the front attachment extended.
   (3) If required, rope off the test area and provide signboards to keep unauthorized personnel away.



T105-06-01-003

3. PRECAUTIONS
   (1) Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
   (2) Operate the machine carefully and always give first priority to safety.
   (3) While testing, always take care to avoid hazards such as landslides or contact with high-voltage power lines. Always confirm that there is sufficient space for full swings.
   (4) Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.



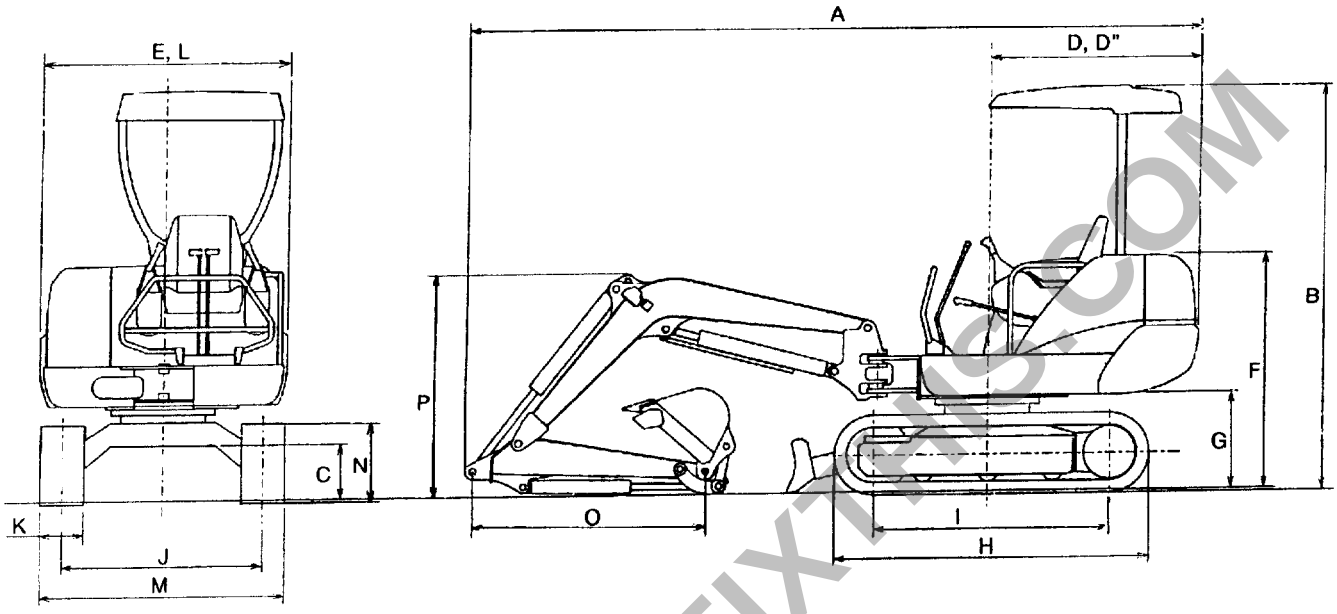
T505-06-01-003

4. MAKE PRECISE MEASUREMENTS
   (1) Accurately calibrate test instruments in advance to obtain correct data.
   (2) Carry out tests under the exact test conditions prescribed for each test item.
   (3) Repeat the same test and confirm that the test data obtained can be procured repeatedly. Use mean values of multiple measurements if necessary.

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EX22·EX30 (Canopy type)



T505-01-02-001

Unit : mm (ft in.)

Model	EX22				EX30			
A: Overall length	4 205 (13' 10")				4 670 (15' 4")			
B: Overall height	※ ★ 2 340 (7' 8")				※ ★ 2 350 (7' 9")			
C: Minimum ground clearance	※ 310 (1' 0")				※ 320 (1' 0")			
D: Rear end length	1 205 (3' 12")				1 340 (4' 5")			
D": Rear end swing radius	1 230 (4' 0")				1 350 (4' 5")			
E: Overall width of upperstructure	1 420 (4' 8")							
F: Engine cover height	※ 1 340 (4' 5")				※ 1 350 (4' 5")			
G: Counterweight clearance	※ 540 (1' 9")				※ 550 (1' 10")			
H: Undercarriage length	1 765 (5' 10")				2 035 (6' 8")			
I: Sprocket center to idler center	1 350 (4' 5")				1 600 (5' 3")			
J: Track gauge	1 150 (3' 9")				1 220 (4' 0")			
K: Track shoe width	250 (9.8") Grouser	250 (9.8") Rubber	300 (11.8") Grouser	400 (1' 4") Triangular	300 (11.8") Grouser	300 (11.8") Rubber	400 (1' 4") Grouser	400 (1' 4") Triangular
L: Overall width	1 420 (4' 8")	1 420 (4' 8")	1 450 (4' 9")	1 550 (5' 1")	1 520 (5' 0")		1 620 (5' 4")	
M: Undercarriage width	1 400 (4' 7")	1 400 (4' 7")						
N: Track height	※ ★ 445 (1' 5")				※ ★ 485 (1' 7")			
O: Arm length	1 090 (3' 7")		1 390 (4' 8")		1 270 (4' 2")		1 570 (5' 2")	
P: Boom hight	1 285 (4' 3")		1 650 (5' 5")		1 360 (4' 6")		1 735 (5' 8")	
Blade width	1 400 (4' 7")				1 520 (5' 0")			
Blade height	300 (11.8")							

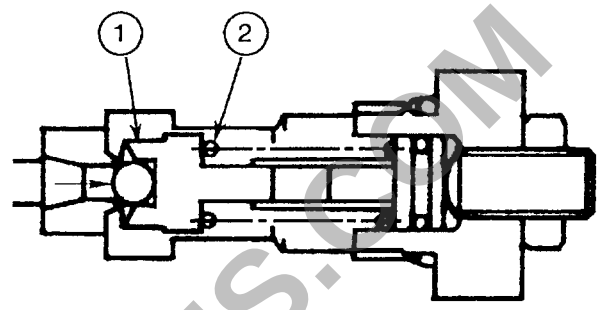
※ When the grouser shoe is used. ★ Track shoe lug (grouser shoe) height included.

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OVERLOAD RELIEF VALVE

EX8

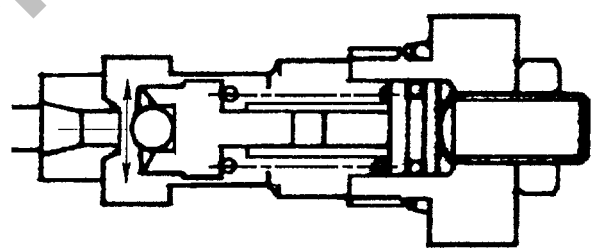
Poppet (1) is pushed to left side by spring (2).



T502-02-04-005

RELIEF OPERATION

When oil pressure becomes more than the valve setting pressure, poppet (1) is moved to right side to release pressure oil.



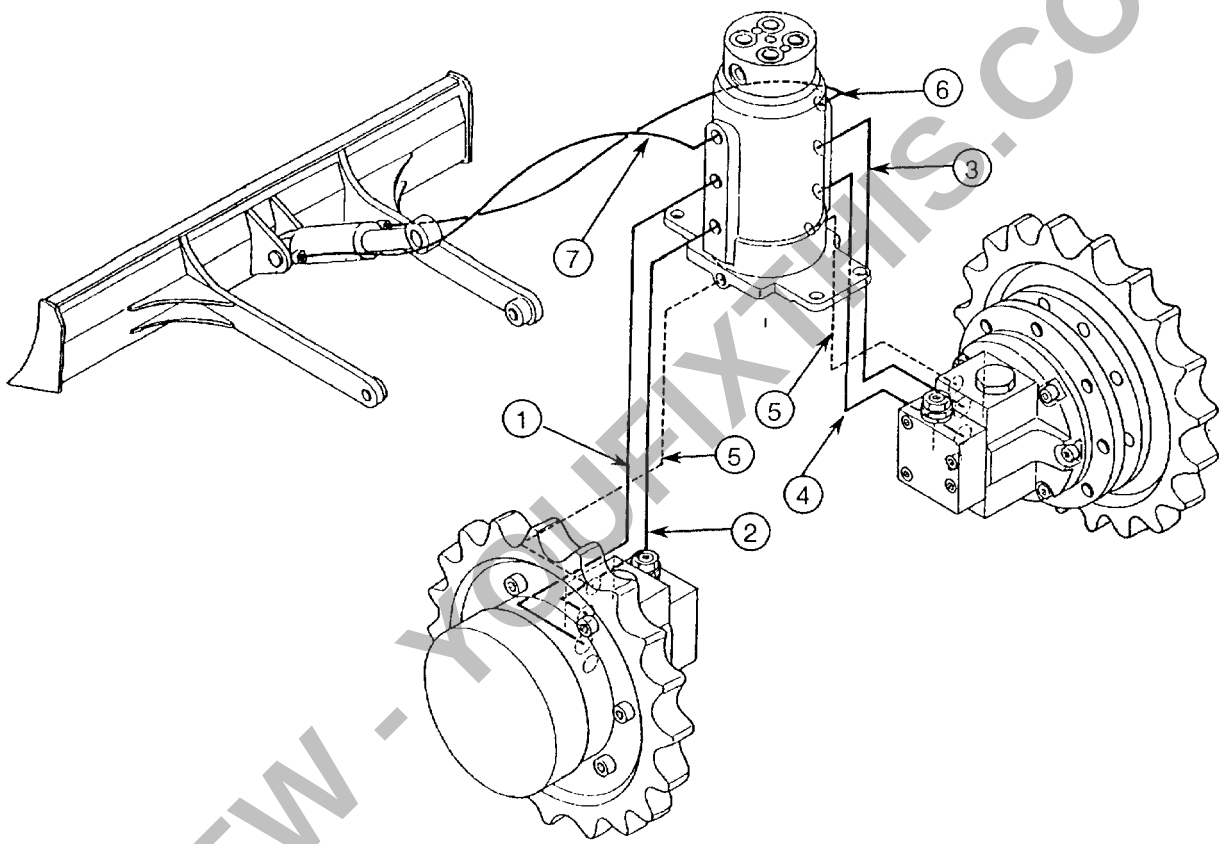
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1— Poppet 2— Spring

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(EX8,EX12,EX15)



T504-03-03-001

The spindle is secured to the upperstructure with the lock pin and the housing is fastened to the undercarriage with four bolts. When the upperstructure swings, the spindle revolves together with the upperstructure.
The pressure oil is fed to both right and left travel motors through the passages in the spindle and housing. The oil seal prevents oil leaks from the clearance between the spindle and housing.

1— Port DR 〔Drain〕
2— Port B 〔Travel Motor(R) Reverse〕
3— Port D 〔Travel Motor(L) Reverse〕
4— Port A 〔Travel Motor(R) Forward〕
5— Port C 〔Travel Motor(L) Forward〕
6— Port F 〔Blade Lower〕
7— Port G 〔Travel Speed Change〕
8— Port E 〔Blade Raise〕

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SECTION 07
TROUBLESHOOTING

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Group 02- Hydraulic System

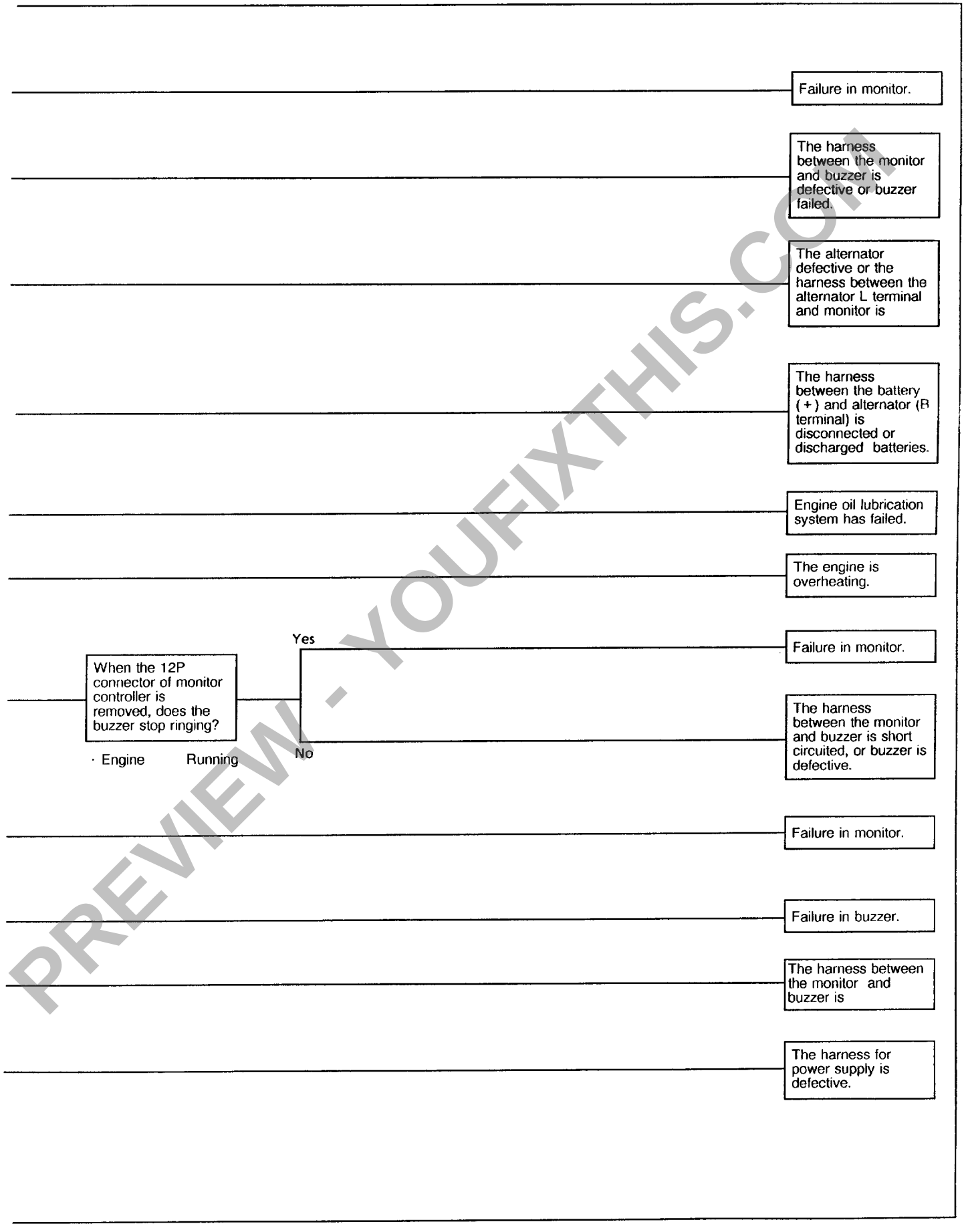
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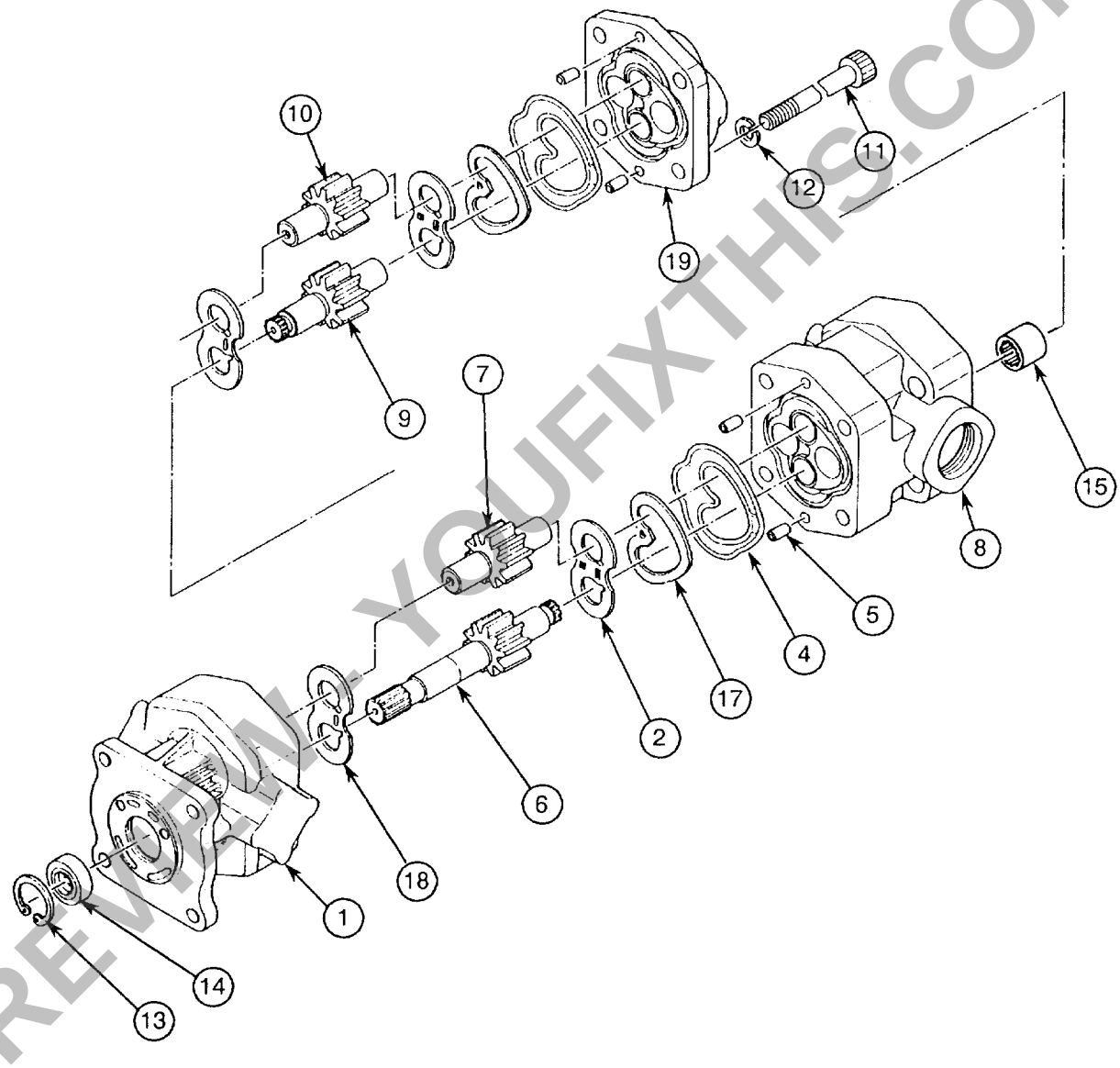
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T07-03-29

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DISASSEMBLE AND ASSEMBLE PUMP DEVICE (EX8, EX12, EX15, EX22)

EX8



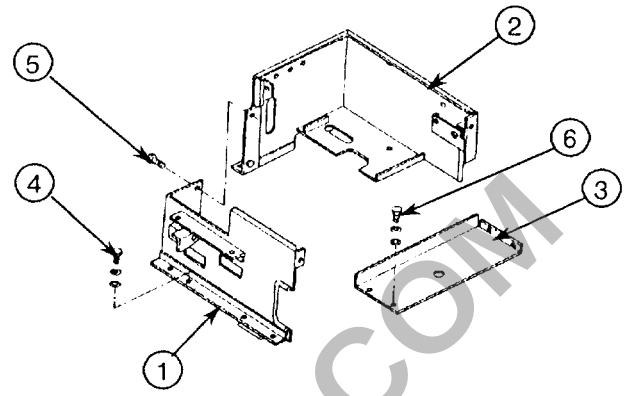
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1— Body 1
2— Plate
4— Seal
5— Dowel Pin
6— Drive Gear 1
7— Driven Gear 1
8— Body 2
9— Drive Gear 2
10— Driven Gear 2
11— Socket Bolt
12— Washer
13— Retaining Ring
14— Oil Seal
15— Coupling
17— Ring
18— Plate
19— Cover

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15. Install covers (1),(2),(3) using 10 bolts (4),(5),(6).

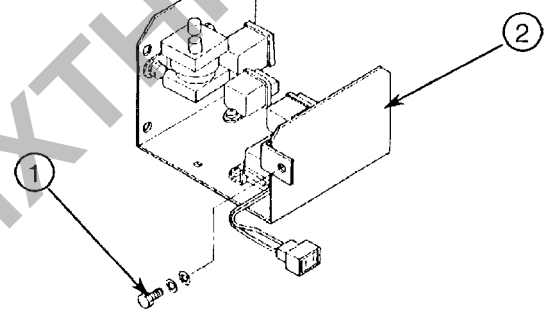
: 17 mm : 49 N·m (36 lb·ft, 5 kgf·m)



W504-02-06-005

16. Install relay bracket (2) using bolt (1).

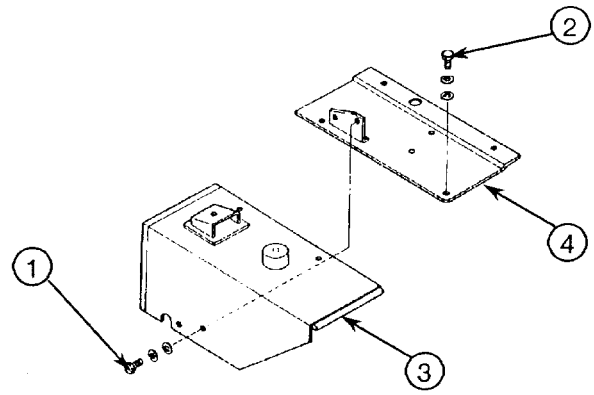
:17 mm : 49 N·m (36 lb·ft, 5 kgf·m)



W504-02-06-004

17. Install cover (3) and plate (4) using six bolts (1),(2).

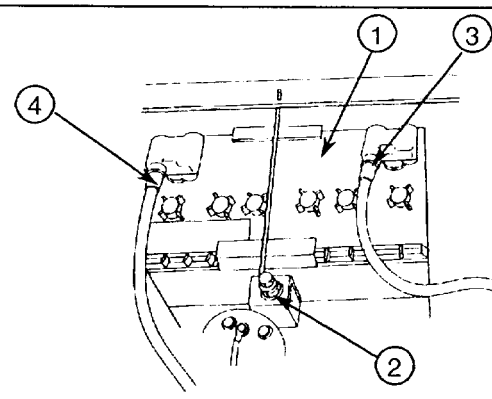
: 17 mm : 49 N·m (36 lb·ft, 5 kgf·m)



W504-02-06-003

18. Put battery (1) back. Tighten bolts (2) to secure battery (1). Connect battery terminals (3),(4).

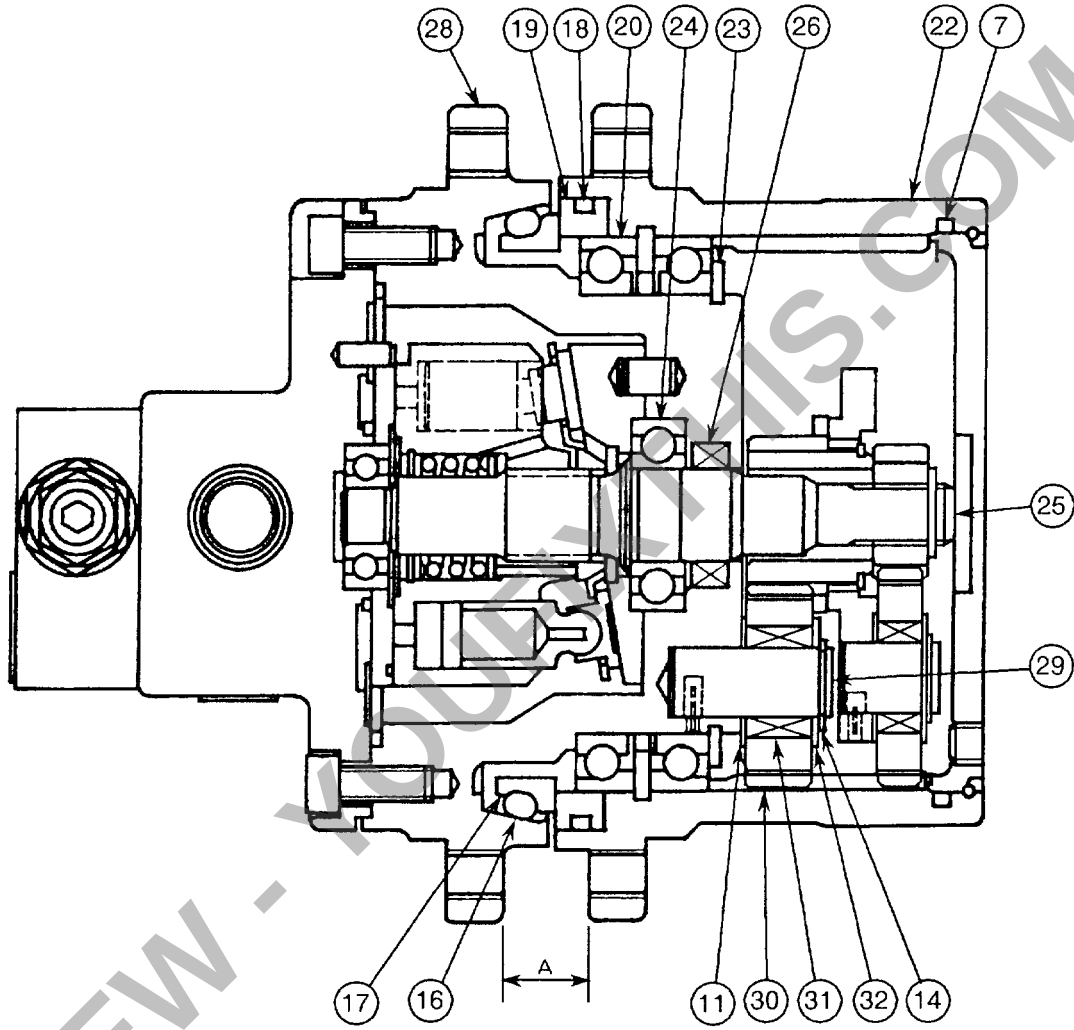
: 17 mm : 49 N·m (36 lb·ft, 5 kgf·m)



W504-02-06-002

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EX12, EX15



W503-03-02-002

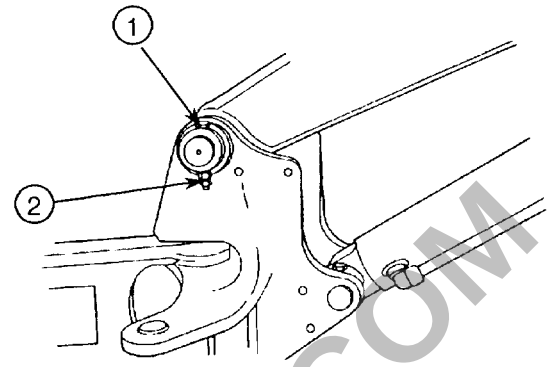
7— O-ring	17— Seat	22— Ring Gear	28— Housing
11— Thrust Washer	18— O-ring	24— Ball Bearing	29— Pin
14— Retaining Ring	19— Seal Ring	25— Drive Shaft	31— Needle Bearing
16— O-ring	20— Ball Bearing	26— Oil Seal	32— Thrust Washer

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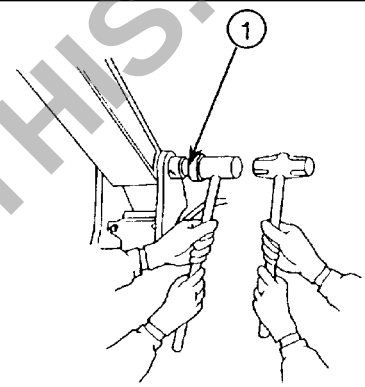
7. Loosen nut (2) to remove boom-foot pin securing bolt (1).

:17mm



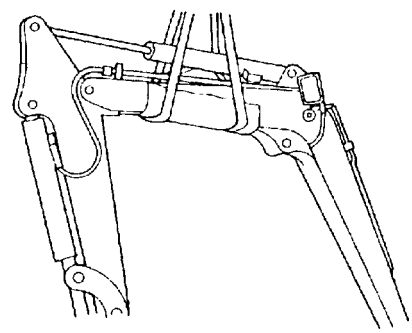
W507-04-01-006

8. Remove boom-foot pin (1).



W507-04-01-007

10. Remove the front attachment, and put it on a safe place.

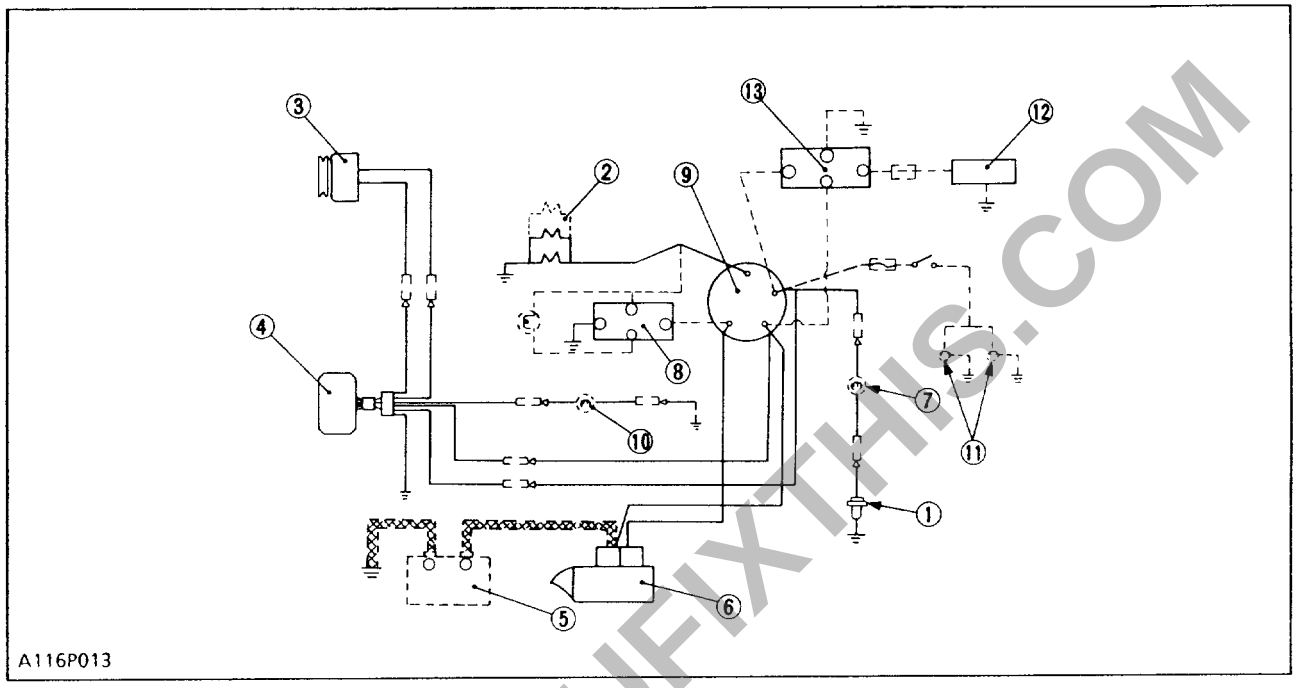


W507-04-01-005

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ELECTRICAL SYSTEM



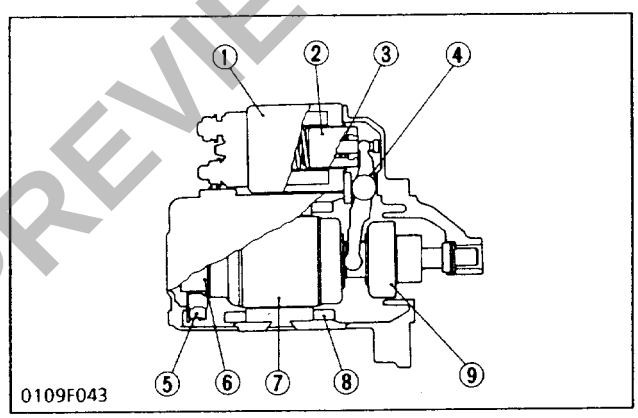
The electrical system of the engine consists of a starting system (including a starter, glow plugs and others), a charging system (including an AC dynamo, a regulator and others), a battery and an oil switch.

■ NOTE
- Components marked * are not included in the basic model.

(1) Oil Pressure Switch
(2) Glow Plug
(3) AC Dynamo
(4) Regulator
*(5) Battery
(6) Starter
*(7) Oil Lamp
*(8) Lamp Timer
*(9) Key Switch
*(10) Charge Lamp
*(11) Light
*(12) Solenoid
*(13) Timer

[1] STARTING SYSTEM

(1) Starter



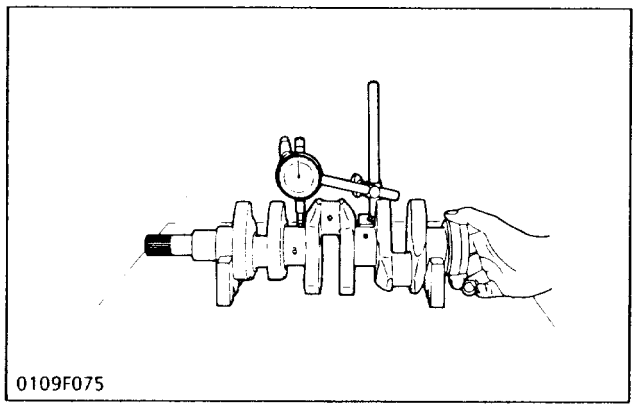
The starter is of the electromagnetic drive type.
It is composed of a starting motor and a solenoid switch.

(1) Solenoid Switch
(2) Plunger
(3) Spring
(4) Shift Lever
(5) Brush
(6) Commutator
(7) Armature
(8) Field Coil
(9) Overrunning Clutch

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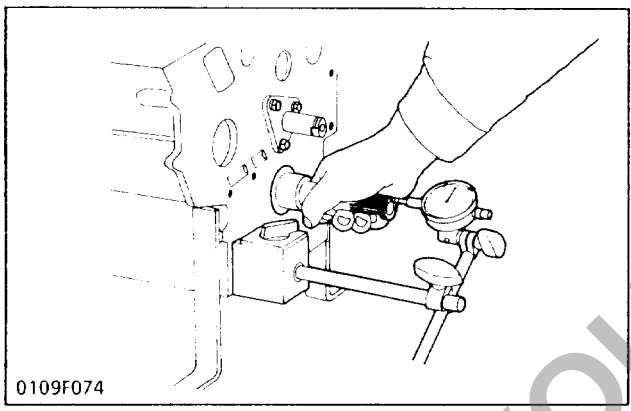
[4] CRANKSHAFT


0109F075

Crankshaft Alignment

1. Support the crankshaft with V-blocks on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle.
2. Rotate the crankshaft on the V-blocks and measure the circle runout.
3. If the circle runout exceeds the allowable limit, replace the crankshaft.

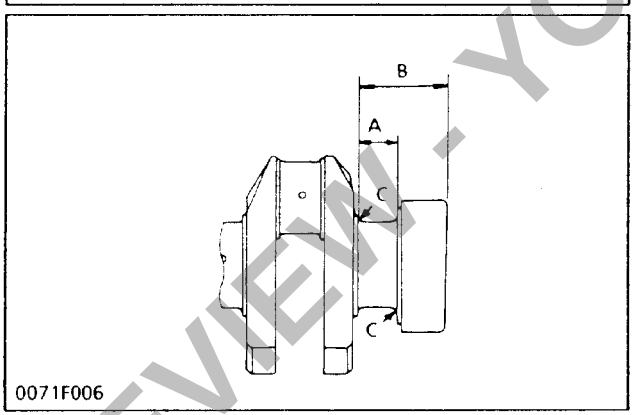
Circle runout	Allowable limit	0.08 mm 0.0031 in.


0109F074

Crankshaft Side Clearance

1. Set a dial indicator with its tip on the end of the crankshaft.
2. Measure the side clearance by moving the crankshaft to the front and rear.
3. If the measurement exceeds the allowable limit, replace the thrust bearings.
4. If the same size bearing is useless because of the crankshaft journal wear, replace it with an oversize one referring to the table and figure.

Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.5 mm 0.020 in.



0071F006

(Reference)

- Oversize thrust bearing

Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in	Thrust bearing 1 02	15261-23951	020 OS
	Thrust bearing 2 02	15261-23971	020 OS
0.4 mm 0.016 in	Thrust bearing 1 04	15261-23961	040 OS
	Thrust bearing 2 04	15261-23981	040 OS

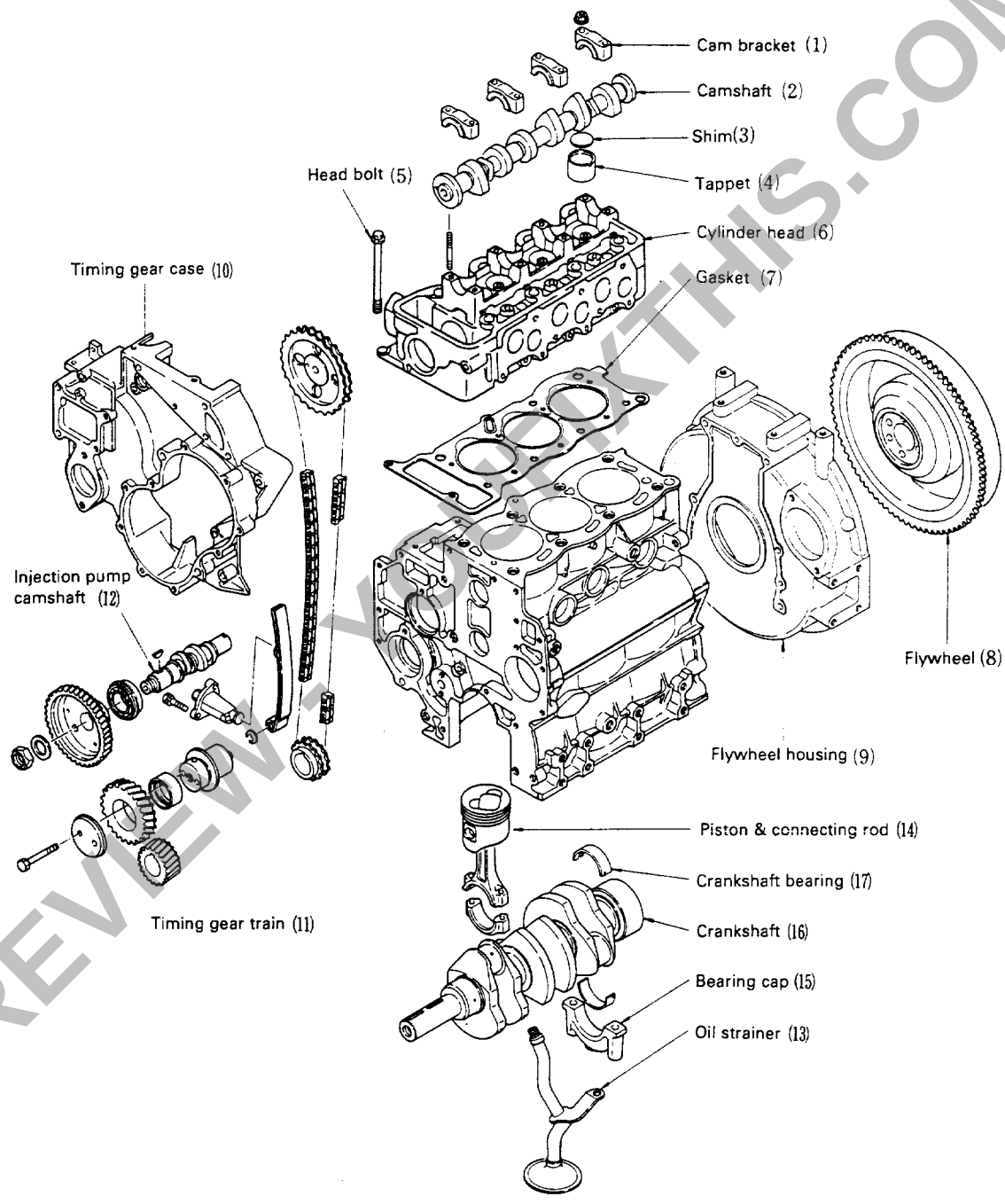
- Oversize dimensions of crankshaft journal

Oversize / Dimension	0.2 mm 0.008 in.	0.4 mm 0.016 in.
A	23.40 to 23.45 mm 0.9134 to 0.9154 in.	23.80 to 23.85 mm 0.9213 to 0.9232 in.
B	46.1 to 46.3 mm 1.815 to 1.823 in.	46.3 to 46.5 mm 1.823 to 1.831 in.
C	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
The crankshaft journal must be fine-finished to higher than ▽▽▽▽ (0.4S)		

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3KR1, 3KR2 models



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