KOBELCO

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SERVICE MANUAL

Hydraulic Excavator

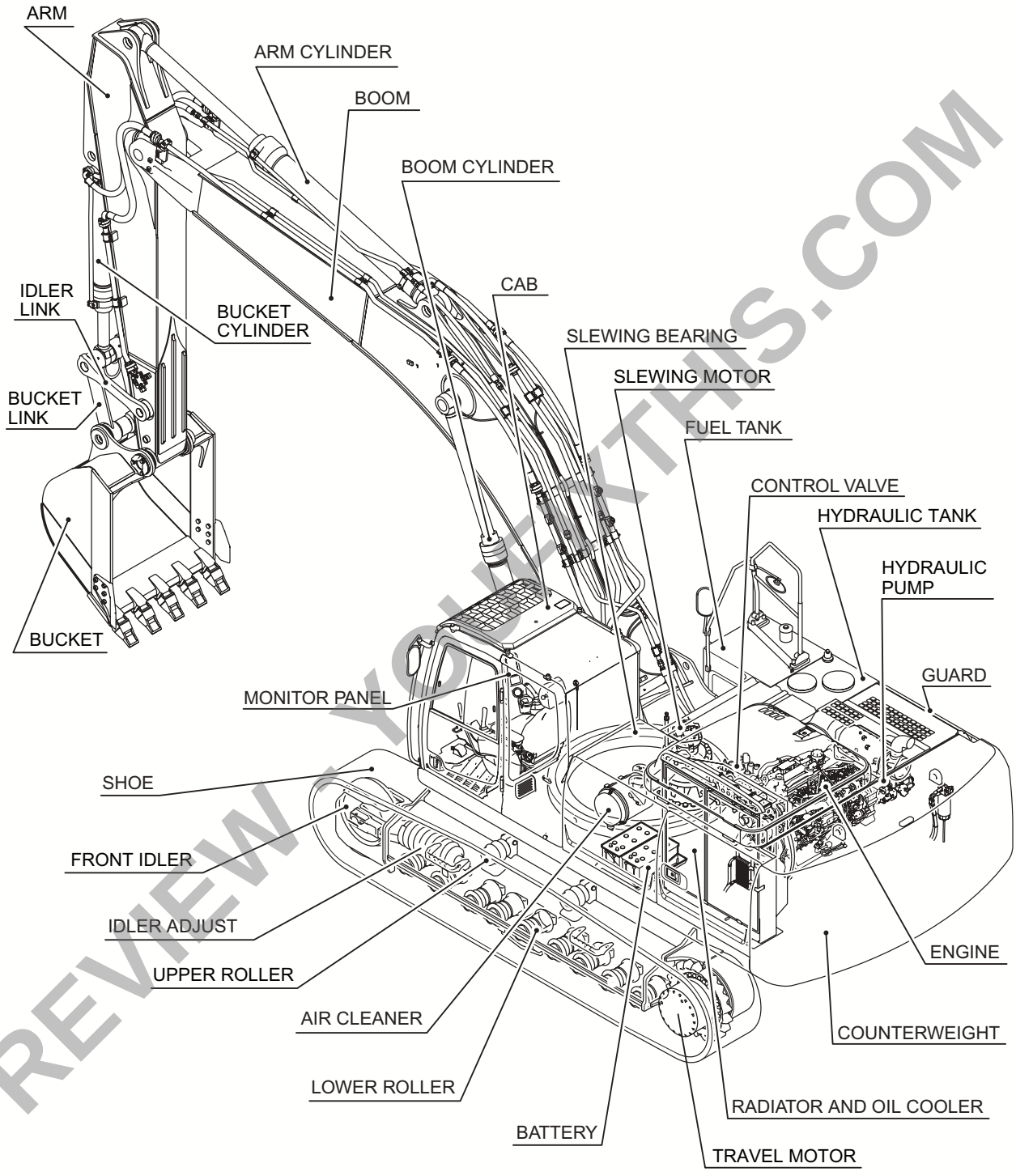
SK350-9
Tier 4

S5LC0026E03

Issued July 2011
1st Edition

APPLICABLE:
SK350-9 . . . . . YC12U2400 and higher ~

2.1 NAME OF COMPONENTS



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11.1 TIGHTENING TORQUES FOR CAPSCREWS AND NUTS

Table "Metric coarse thread (Not plated)" and Table "Metric fine thread (Not plated)" indicate tightening torques applicable to cases where no special note is given.
Overtightening of bolts may result in a twist-off and a fracture under load.
Insufficient tightening may lead to a loosening or loss of bolts. Always tighten bolts to proper torques.

Unit : N•m (lbf•ft)

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M6	P=1	4.4±0.5 (3.2±0.4)	3.7±0.4 (2.7±0.3)	9.6±1.0 (7.1±0.7)	8.1±0.8 (6.0±0.6)	17.4±1.8 (12.8±1.3)	14.7±1.5 (10.8±1.1)
M8	P=1.25	10.7±1.1 (7.9±0.8)	9.0±0.9 (6.6±0.7)	23.5±2.0 (17.3±1.5)	19.6±2.0 (14.5±1.5)	42.2±3.9 (31.1±2.9)	35.3±3.9 (26.0±2.9)
M10	P=1.5	21.6±2.0 (15.9±1.4)	17.9±1.8 (13.2±1.3)	46.1±4.9 (34.0±3.6)	39.2±3.9 (28.9±2.9)	83.4±8.8 (61.5±6.5)	70.6±6.9 (52.1±5.1)
M12	P=1.75	36.3±3.9 (26.8±2.9)	31.4±2.9 (23.2±2.1)	79.4±7.8 (58.6±5.8)	66.7±6.9 (49.2±5.1)	143±15 (105±11)	121±12 (89.2±8.9)
M14	P=2	57.9±5.9 (42.7±4.4)	49.0±4.9 (36.1±3.6)	126±13 (92.9±9.6)	106±10 (78.2±7.4)	226±20 (167±15)	191±19 (141±14)
M16	P=2	88.3±8.8 (65.1±6.5)	74.5±6.9 (55.0±5.1)	191±20 (141±15)	161±16 (119±12)	343±39 (253±29)	284±29 (209±21)
M18	P=2.5	122±12 (90.0±8.9)	103±10 (75.8±7.2)	265±29 (195±21)	226±20 (167±15)	481±49 (355±36)	402±39 (297±29)
M20	P=2.5	172±17 (127±13)	144±14 (106±10)	373±39 (275±29)	314±29 (232±21)	667±69 (492±51)	559±59 (412±44)
M22	P=2.5	226±20 (167±15)	192±20 (142±15)	500±49 (369±36)	422±39 (311±29)	902±88 (665±65)	755±78 (557±58)
M24	P=3	294±29 (217±21)	235±29 (173±21)	637±69 (470±51)	520±49 (383±36)	1160±118 (856±87)	941±98 (694±72)
M27	P=3	431±39 (318±29)	353±39 (260±29)	941±98 (694±72)	765±78 (564±58)	1700±167 (1250±123)	1370±137 (1010±101)
M30	P=3.5	588±59 (434±44)	490±49 (361±36)	1285±127 (948±94)	1079±108 (796±80)	2300±235 (1700±173)	1940±196 (1430±145)
M33	P=3.5	794±78 (586±58)	667±69 (492±51)	1726±177 (1270±131)	1451±147 (1070±108)	3110±314 (2290±232)	2610±265 (1930±195)
M36	P=4	1030±98 (760±72)	863±88 (637±65)	2226±226 (1640±167)	1863±186 (1370±137)	4010±402 (2960±297)	3360±333 (2480±246)

Tightening Torque For Metric Coarse Threads (Not Plated)

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PREFACE

(1) Working Conditions

1. Workers:
   More than one worker shall be 1st class service technician (having five years or more of field experience and having received training in operation).
2. Equipment:
   Jigs, tools, apparatuses and testers used in field service work will be available commercially. The maintenance plant will be equipped with a service shop, a crane and inspection apparatuses necessary for specific self inspection activities.
3. Place:
   A flat land where work may be performed and a service car or a truck crane is accessible.

(2) Range of standard maintenance time

1. Standard maintenance time=Direct maintenance time X Preparation time
2. Direct maintenance time: Net time actually spent for maintenance
3. Spare time:
   Time needed to move machines for service, prepare safety operations, discuss work, and process the needs of the team.

(3) Extra time (not included in the standard service time)

1. Repair time:
   Machining, sheet metal, welding, melt cutting, folding and extracting bolts, servicing parts, and painting.
2. Items excluded from service time because of uncertainty in time:
   Receiving a vehicle into shop, transfer, delivery, inspection on completion, investigation of causes of faults, diagnosis, and inspection.
3. Indirect time:
   Time for: field work, preparation of necessary parts before leaving for work, return for field work, waiting time because of user's convenience in the field, paper work after returning to shop, and preparation of bills.
4. Special time: Working in the early morning, at midnight and on holidays are to be calculated separately.
5. Separate calculation: The operating time for service cars, trucks with a crane and crane trucks.

(4) Applicable machine for estimation of standard maintenance time

1. Standard machine
2. A well maintained and controlled machine with a standard combination of attachments that is used in a general environment.

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13.1 HOW TO USE MAINTENANCE STANDARDS AND PRECAUTIONS

(1) Application

1. When the machine is new:
   Confirm the performances are in accordance with standard specifications as compared to the performance standards.
2. At specific self inspection: (Rule by country)
   Use the data for the criterion, for the purpose of correction, adjustment and replacement.
3. When performances are deteriorated:
   Determine whether it is caused by a fault or end of service life after long hours of operation, to be used for safety and economical considerations.
4. When main components are replaced:
   For example, use data to restore performances of pumps and other components.

(2) Terminology

1. Standard values:
   Values to be used to service or assemble a new machine. Where special notes are not given, these values represent standard specifications (machine with standard attachments and standard shoes).
2. Reference values for remedy:
   Values where readjustment is required. In order to ensure performance and safety it is strictly prohibited to use the machine over the specified values.
3. Service limit:
   This is the limit value where reconditioning is impossible without replacement of parts. If the value is expected to exceed the service limit before the next inspection and correction are performed; replace the parts immediately. The operation over the specified values causes damage to increase and requires the down time of the machine, and also causes safety problems.

(3) Cautions to be Exercised at Judgment

1. Evaluation of measured data:
   Disagreement of measuring conditions, variations of data peculiar to a new machine, and measuring errors are to be evaluated. Determine generally at what levels measured values are located, instead of determining whether or not values fall within or run out of the reference values.
2. Determining correction, adjustment or replacement:
   Machine performances deteriorate with time as parts wear and some deteriorated performances may be restored to new levels. Therefore, determine correction, adjustment or replacement, depending upon the operating hours, kind of work and circumstances in which the machine is placed, and condition the machine performances to its most desirable levels.

(4) Other Cautions to be Exercised

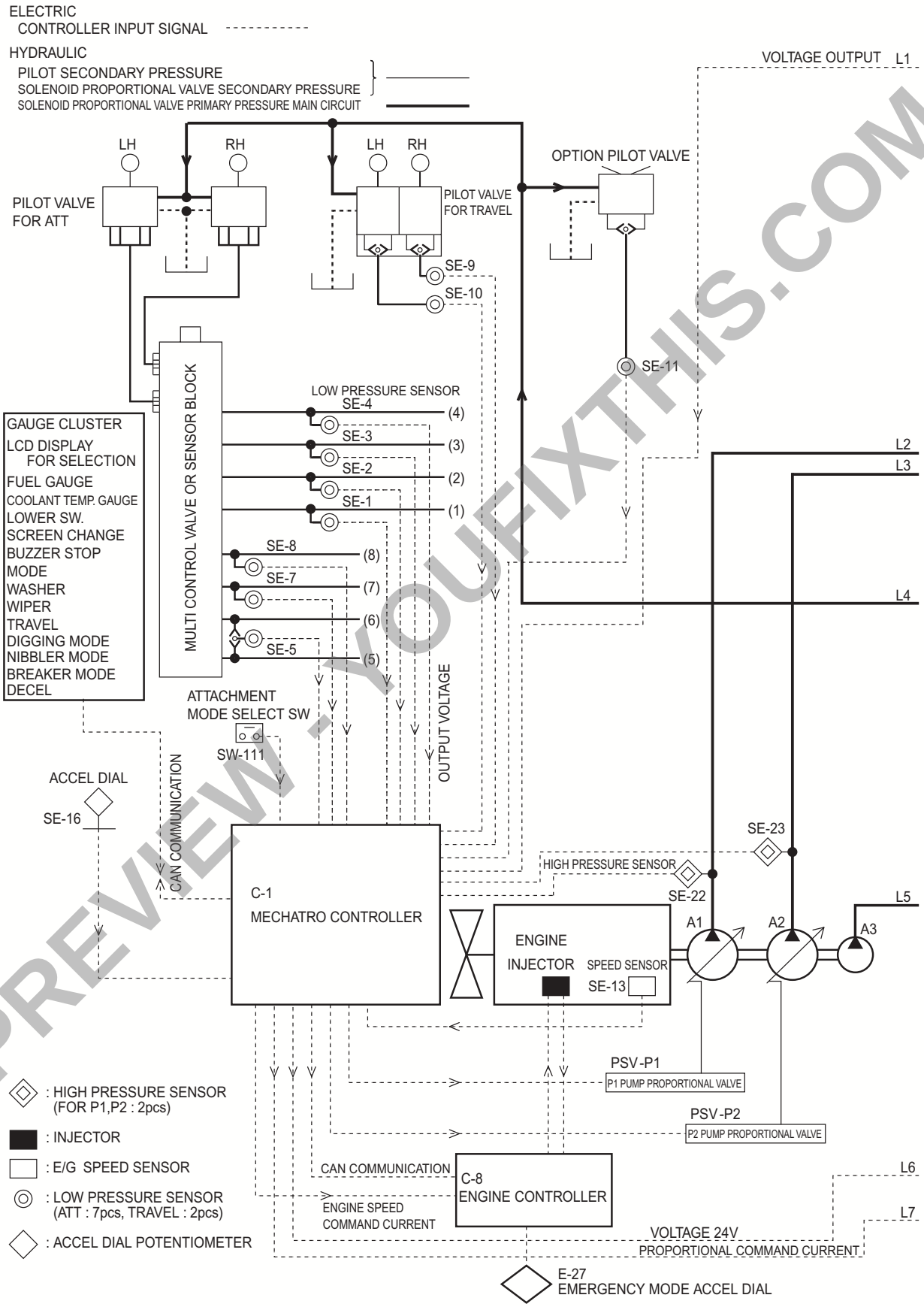
1. Parts liable to degrade:
   Rubber products, such as, hydraulic hoses:
   O-rings and oil seals deteriorate with time; replace them at regular intervals or at overhauls.
2. Parts requiring regular replacement:
   For critical hoses that are necessary to secure safety, we designate Very Important Parts (V.I.P) and recommend that they should be replaced regularly.
3. Inspection and replacement of oil and grease:
   In performing maintenance, it is necessary for the user to familiarize himself with how to handle the machine safely, cautions to be exercised and inspection/lubrication procedures. Refer to the operators manuals as well.

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21.1 SUMMARY OF MECHATRO CONTROL SYSTEM

21.1.1 MECHATRO CONTROL SYSTEM IN GENERAL



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22.1 SUMMARY

22.1.1 FUNCTION AND FEATURES OF HYDRAULIC CIRCUIT

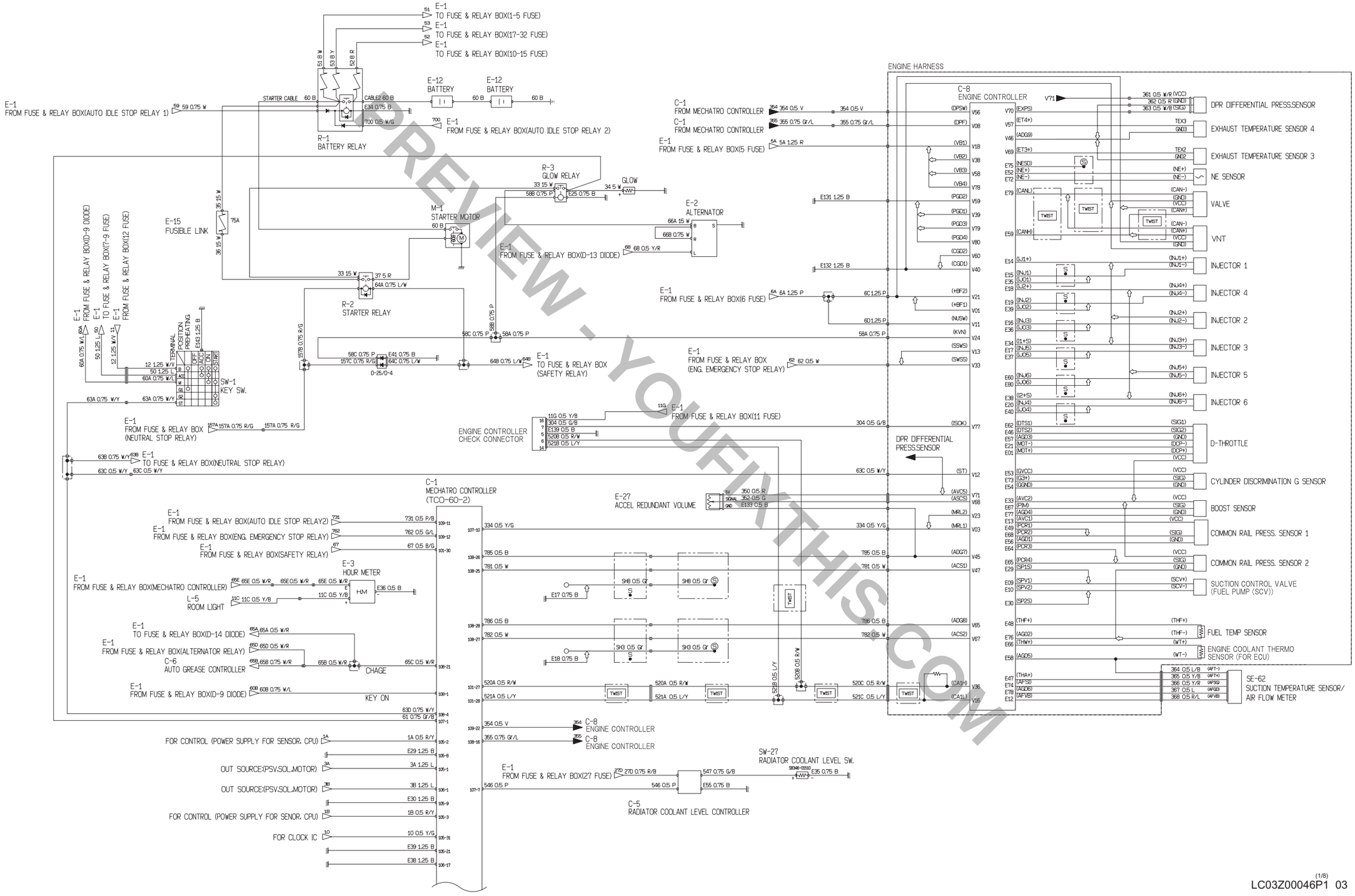
The hydraulic circuits are built up with the following functions and features in order to achieve easy operability, safety, mass volume handling and low fuel consumption.

Perfor-mance	Device	Function	Features
Easy operability and safety	Travel	● Travel straight	● Travel straight at combined operation
		● Travel 2-speed change & Auto 1st (low) speed return	● 1-2 travel speed change and low speed / high torque at heavy duty
		● Auto parking brake	● Automatic braking when parking
		● Motor overrun protection	● Prevents overrunning of travel motor on the down hill slope.
		● Travel pilot operation	● Prevents hunting by the built in travel shockless mechanism
	Swing	● Reverse rotation protective function	● Easy positioning to protect it from swinging back when stops swinging.
		● Swing priority circuit (simultaneous operation of arm in and swing motions)	● Easy operation of stable swing speed, arm slanted leveling, swing press digging
		● Automatic swing parking brake	● Swing parking brake when operating at on a slope
	Attachment	● Hydraulic pilot control system	● Light action with operating lever
		● Pilot safety lock system	● Cut out of pilot circuit by safety lock lever.
		● Lock valve (boom / arm)	● Protect boom and arm from unexpected drop (Natural fall).
		● Holding valve for boom (Option)	● Prevention of boom falling when boom head side piping breaks
	Others	● Pressurized hydraulic oil tank	● To prevent hydraulic oil from entering dust and to promote self suction ability of pump
		● Suction strainer	● Remove dust on suction side.
		● Line filter ; pilot circuit	● To prevent pilot operating circuit from malfunctioning
		● Return circuit	● To prevent hydraulic oil from contamination
		● Cooling hydraulic oil by oil cooler	● To prevent hydraulic oil from being deteriorated.
		● Pressure draining circuit	● To release the main circuit pressure for piping repair work.
		● Main control valve with optional valve	● Optional piping and additional work are easy
		● Switching of return line for N&B machine in the cab (Option)	● Switching of return line for N&B machine is able to change with a switch in the cab
Mass handling capability	Pump	● Electric flow controlled variable displacement pump	● Pump delivery rate control by a current command to the solenoid proportional valve of the variable displacement pump
		● Positive flow rate control	● Flow control by positive pilot control pressure
		● Hydraulics backup control	● Backup control by hydraulic when the electric flow controlled variable displacement pump fails.
	Attachment	● Boom up conflux circuit	● Speed up of boom up operation
		● Arm conflux circuit	● Speed up of arm operation
		● Bucket conflux circuit	● For speed-up of bucket operation (digging & dump)
		● Optimum operation by work mode select (H,S)	● Efficient operation in all work modes
Low fuel consumption	Micro computer	● Auto accel	● Reduce fuel consumption and noise by lowering engine speed when control lever is in neutral position.

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23.1 ELECTRIC CIRCUIT DIAGRAM



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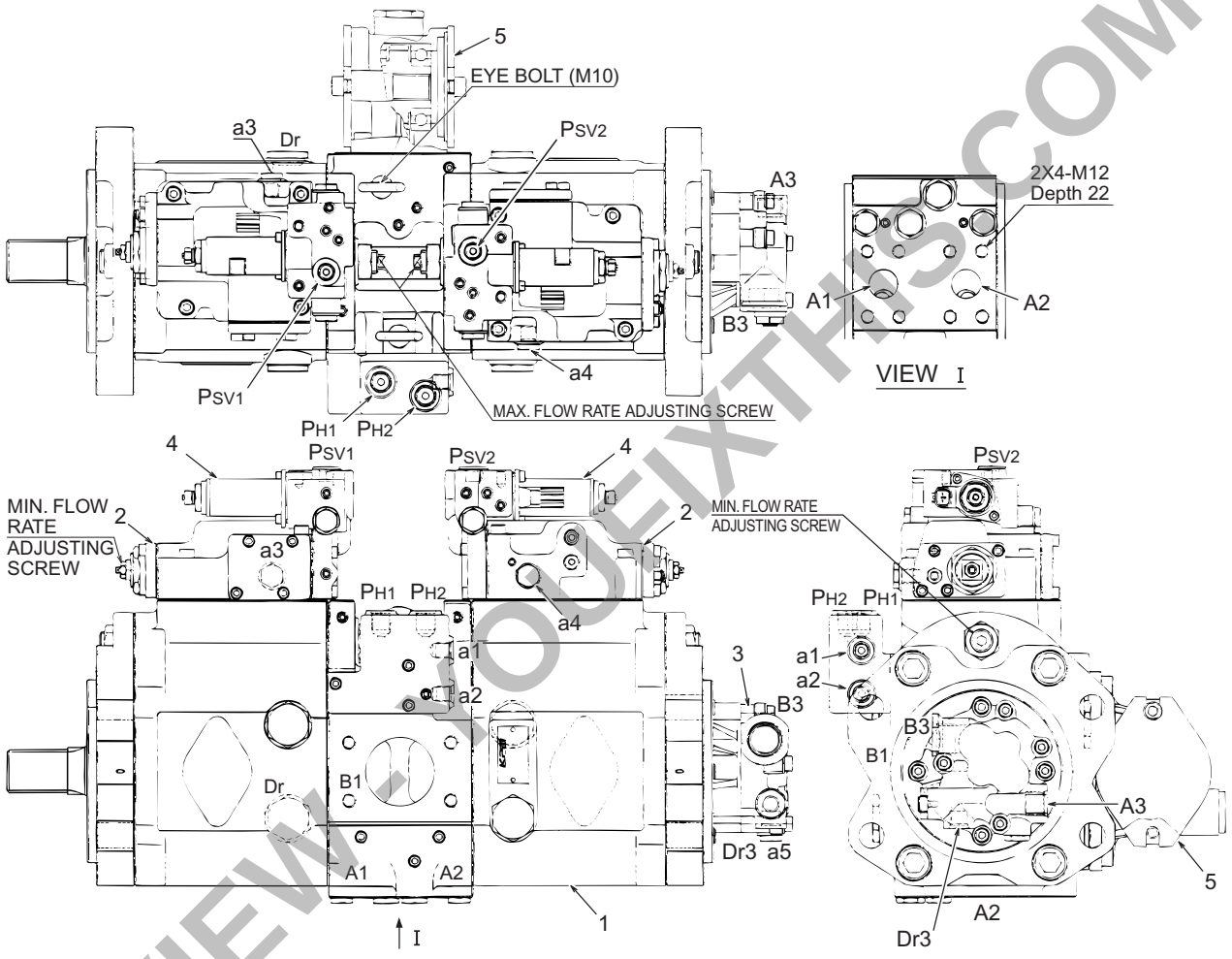
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24.1 HYDRAULIC COMPONENTS

24.1.1 HYDRAULIC PUMP - REGULATOR

24.1.1.1 SUMMARY

(1) Outside view and Hydraulic port



No.	Parts	Q'TY
1	Main pump assy	1
2	Regulator assy	2
3	Gear pump assy (for pilot)	1
4	Solenoid proportional reducing valve	2
5	PTO unit (option)	1

Hydraulic ports

Code	Ports name	Size
A1,2	Delivery port	SAE 6000psi 1"
B1	Suction port	SAE 2500psi 2 1/2"
Dr	Drain port	PF3/4-20
PSV1,2	Servo assist port	PF1/4-13
PH1,2	Pressure sensor port	PF3/8-17
a1~a4	Gauge port	PF1/4-15
a5	Gauge port	PF1/4-14
A3	Delivery port of gear pump	PF1/2-19
B3	Suction port of gear pump	PF3/4-20.5
Dr3	Drain port of gear pump	PF3/8-15

Hydraulic Pump - Regulator

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24.2 ELECTRICAL EQUIPMENT

24.2.1 ELECTRICAL EQUIPMENT LIST

Group	Code	Part Name	Part No.
(C) Controller	C - 1	Mechatro controller	YN22E00425F1
	C - 2	Gauge cluster	YN59S00028F1
	C - 4	Air conditioner AMP. (including panel)	LQ20M01328P1
	C - 5	Engine coolant level controller	VHS834701230
	C - 8	Engine controller	VH89661E0062
(D) Diode	D - 4	Diode	YN02D01001P1
	D - 5	Diode	Accessory of relay box
	D - 6	Diode	↑
	D - 9	Diode	↑
	D - 10	Diode	↑
	D - 12	Diode	↑
	D - 13	Diode	↑
	D - 14	Diode	↑
	D - 15	Diode	↑
	D - 16	Diode	↑
	D - 17	Diode	↑
	D - 18	Diode	YN02D01001P1
	D - 19	Diode	↑
	D - 20	Diode	Accessory of relay box
	D - 21	Diode	↑
	D - 22	Diode	↑
	D - 23	Diode	↑
	D - 25	Diode	YN02D01001P1
	D - 66	Diode	↑
	D - 67	Diode	↑
(E) Electric fittings	E - 1	Fuse and Relay box	YN24E00016F2
	E - 2	Alternator	VH27060E0040
	E - 3	Hour meter	LQ58S00002P1
	E - 5	Horn high	LC53S00001D1
	E - 6	Horn low	LC53S00001D2
	E - 8	Speaker left	YT54S00006P1
	E - 9	Speaker right	↑
	E - 10	Receiver dryer	YN54S00041P1
	E - 11	Air-con compressor	YX91V00001F1
	E - 12	Battery	2411U22
	E - 22	DC-DC Converter	YN77S00017P1
	E - 23	12V Socket	YN81S01002P1

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25.1 BASIC SYSTEM OF AIR CONDITIONER (HVAC AIR CONDITIONER)

The air-conditioner is the unit that places evaporator and heater core parallel, and unifies a blower fan and internal / external air switching unit. This unit changes hot air to cool air.

25.1.1 AIR CYCLE

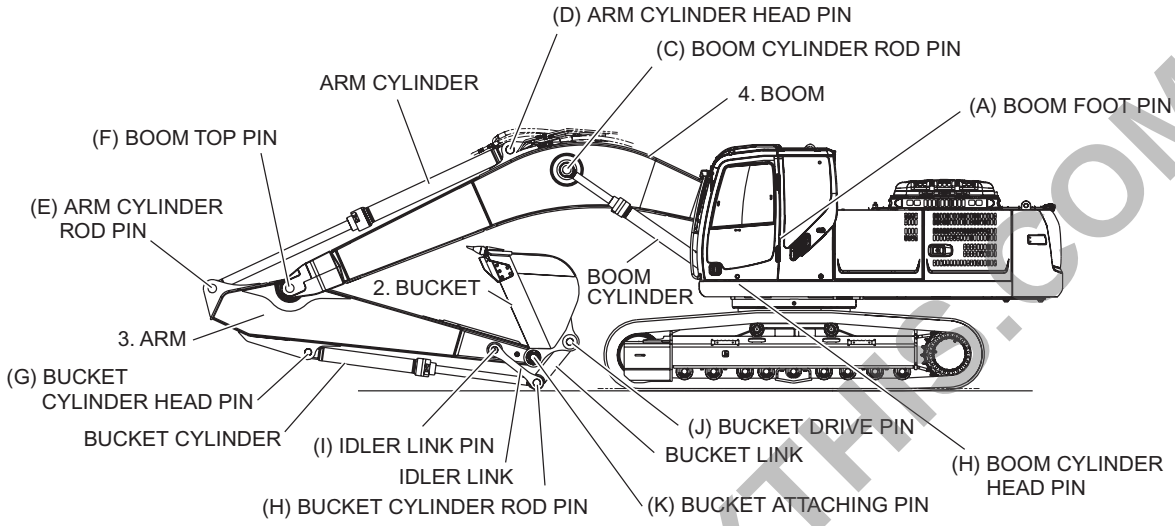
- Heater
  Internal air or external air is taken in through inlet and the air is passing through the filter and heat exchange is performed with hot air (heating) at the heater core of the air-conditioner unit, and then the heated air is blown through the ducts.
- Cooler
  Internal air or external air is taken in through inlet and the air is passing through the filter and heat exchange is performed with cold air (dehumidifying and cooling) at the evaporator of the air-conditioner unit, and then the cooled air is blown through the ducts.
- Heater system
  The heater recycles (circulates) the cooling water in the engine, and the hot water delivered by the engine flows in the heater core of the air-conditioner unit and then heat exchange is performed.
  The internal air is heated and the heated air blows through the grille provided on the inside of cab.
  The blown air temperature is controlled by the temperature control switch on the control panel, and the operation is controlled by the air mixing damper on the air-conditioner unit.

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32.1 REMOVING AND INSTALLING

32.1.1 ATTACHMENT ASSY

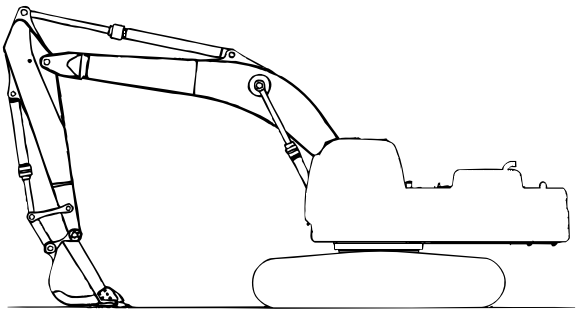


Front Attachment And Position

32.1.2 BUCKET

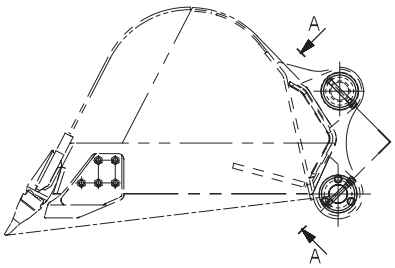
32.1.2.1 REMOVING BUCKET

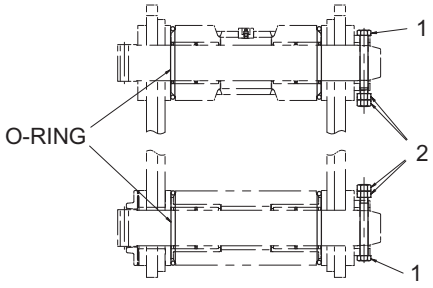
(1) Put the machine in position to remove bucket.



Position To Remove Bucket

(2) Removing capscrew (1)
Loosen the double nut (2) and pull out the capscrew (1).





SECTION A-A

Removing Capscrew (1)

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33.1.2 CAB

33.1.2.1 REMOVAL

(1) Remove floor mat.

(2) Remove cover assembly (A8).

1. Remove cover (A9) and loosen 4 sems bolts (A38) M6X20.
   Tools: Phillips screwdrive
2. Disconnect harness connector of power socket and remove cover assembly (A8).

(3) Removal of cover assembly (A10).

1. Remove cover (A11) and loosen 2 sems bolts (A38) M6X20.
   Tools: Phillips screwdriver
2. Remove cover assembly (A10).

(4) Removal of harness connector.
(See Chapter 23 "Electric System")

1. Disconnect connectors on cab harness at rear right of cab.
2. Disconnect antenna cable for tuner located at rear left of cab.
3. Disconnect harness for cab light located at rear left of cab.

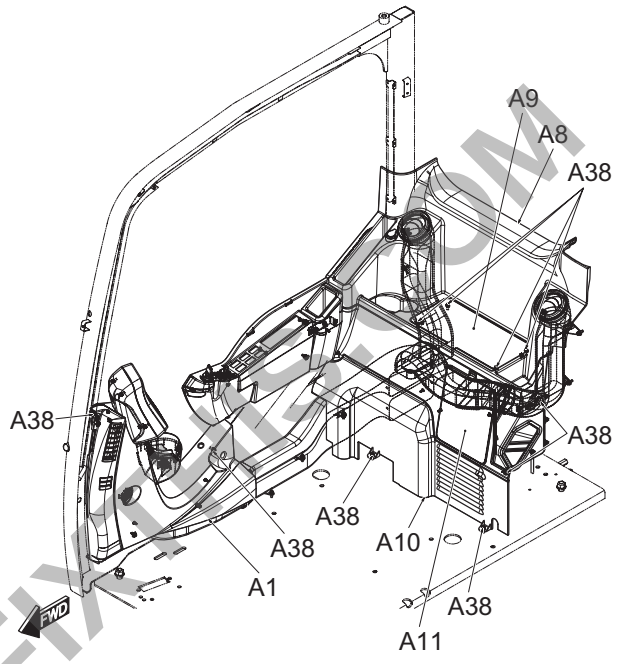
(5) Removal of cover assembly (A1).

1. Loosen 2 sems bolts (A38) M6X20.
   Tools: Phillips screwdriver
2. Disconnect harness connector of hour-meter and remove cover assembly (A1).

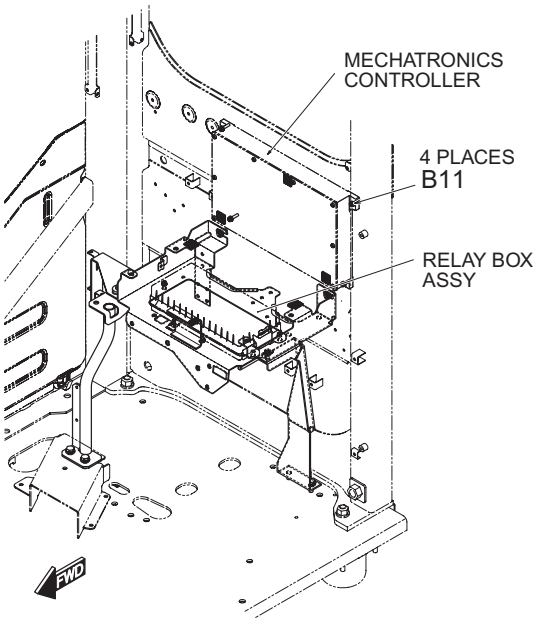
(6) Remove plastic tube for window washer located at right front of cab.

(7) Removal of mechatro-controller.

1. Loosen 4 sems bolts (B11) M6X25.
2. With harnesses connected, remove the mechatro controller, and place it in front of it temporally.



Disassembly And Assembly Of Right Panels (A1), (A8) And (A10)



Removal Of Mechatro-Controller

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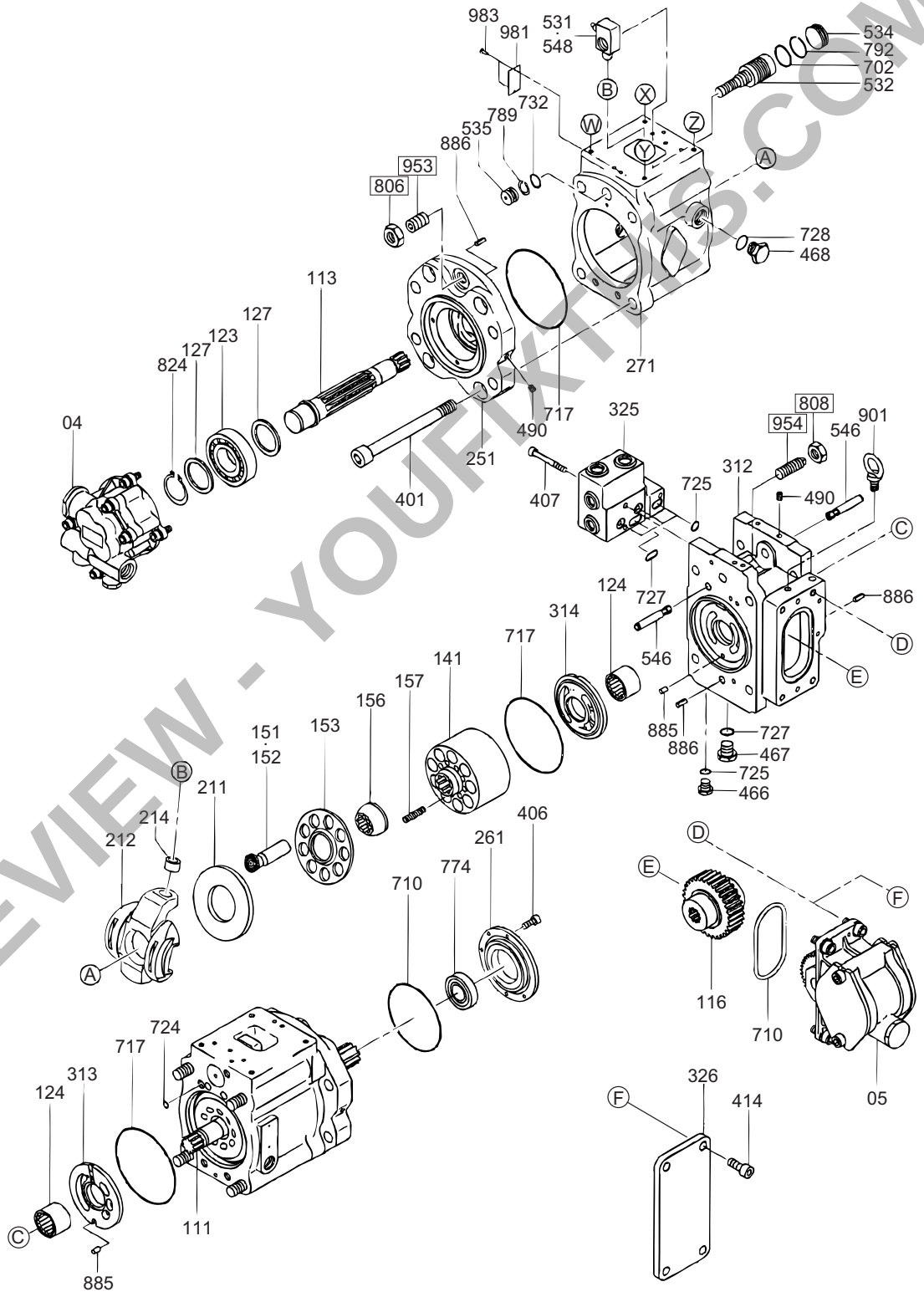
33.2 DISASSEMBLING AND ASSEMBLING

33.2.1 HYDRAULIC PUMP - REGULATOR

33.2.1.1 HYDRAULIC PUMP

33.2.1.1.1 Structural exploded view

(1) Main pump



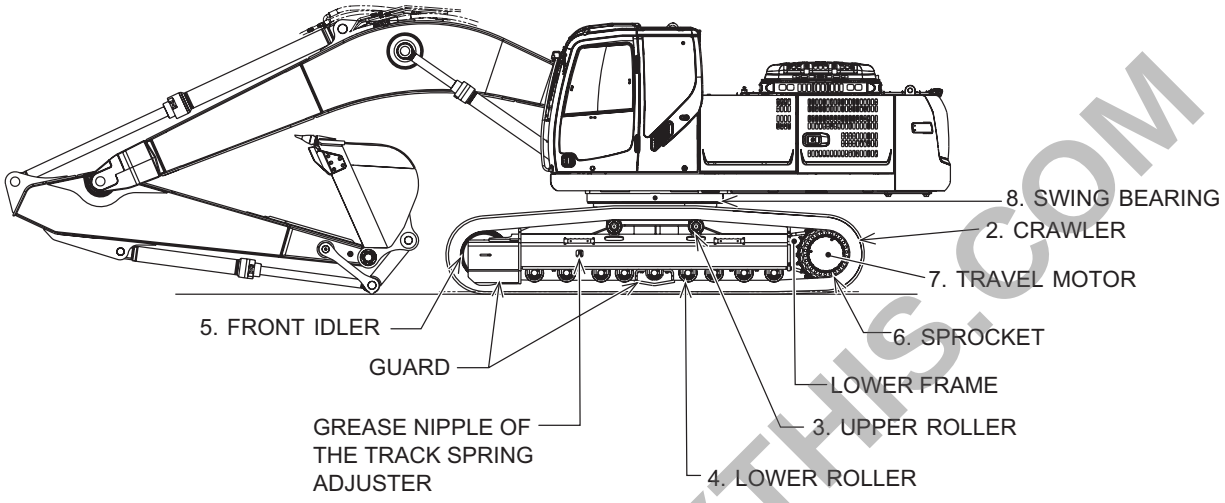
Structural Exploded View Of Main Pump

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34.1 REMOVING AND INSTALLING

34.1.1 TRAVEL SYSTEM



Designation And Location Of Undercarriage

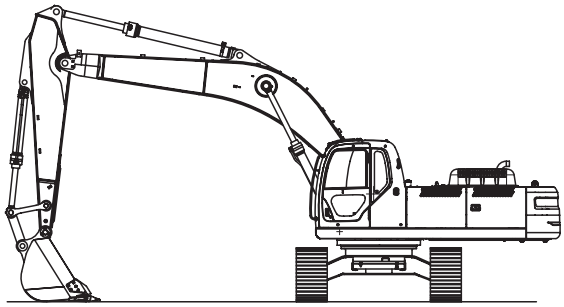
34.1.2 CRAWLER 34.1.2.1 REMOVING CRAWLER

(1) Position the machine to remove crawler.

(2) Pushing out master pin.

1. Find the master pin and place it in its removing/fixing position shown in right Figure.

2. Loosen the grease nipple and slacken crawler tracks.
   Tools: Socket: 19 mm



Crawler Removing Position

CAUTION

When loosening the grease nipple of the adjuster, do not loosen it more than one turn.

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46.1 JUDGMENT OF ACTUAL THING AT SITE

(1) Get to the site as quickly as possible.
Verify model, serial number, situation of trouble and field, and notify person of arrival time.

(2) Verify background of why trouble occurred.

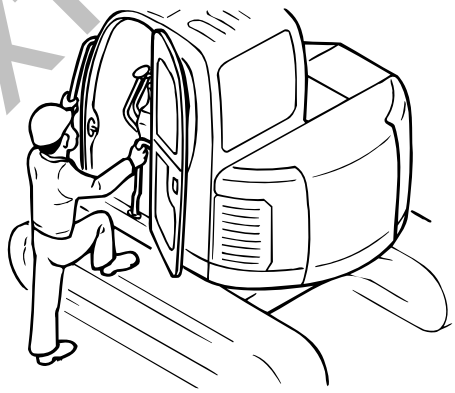
1. Model name and serial number
2. Kind of attachment
   Check that the combination of attachment is proper or that the operating method is not unreasonable.
3. Operating time by hour-meter
4. History of trouble occurred and additional works.
5. Recurrence of past trouble, or problems on the additional works.



Verifying Background That Trouble Occurred

(3) How to diagnose trouble.

1. Verify defective part.
2. Make the condition of trouble again.
3. Where defective parts cannot be verified, surmise causes systematically.
4. Verify reasons for surmise.
5. Report methods, procedure, and period for repairing to user.



Confirm The Symptoms Of The Trouble

(4) Explanation of the cause of trouble.

1. Explain the cause of trouble to clients. For example, oil leak through piston is caused by flaws on the piston rod. And the method of using the machines should be explained so that the same kind of trouble does not reoccur.
2. Treatment of damaged parts
   The damaged parts to be claimed and returned are evidence so they should be handled with care. Protect them from entry of water, soils, etc. into port of hydraulic unit, etc. and return them. And also use care not to flaw and damage those surfaces.



Diagnosing Fail By Means Troubleshooting

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47.1 HYDRAULIC SYSTEM

Preface:
The troubleshooting for the failures shown below are explained here.
Identify the failure and trouble, and carry forward the troubleshooting in order of the failure item number.
(1) All controls do not function/slow
(2) Engine down/stalled
(3) Move at lever neutral position
(4) Poor fine operability
(5) Slow boom up, insufficient power
(6) Slow boom down, insufficient power for lifting up body
(7) Slow arm in, insufficient power
(8) Slow independent arm out (in the air)
(9) Slow bucket digging
(10) Slow bucket dumping
(11) Swing operation not functioned/slow
(12) Noise during swing operation
(13) Swing on a slope drifts when control lever is in neutral position
(14) Swing drifts when swing operation is stopped
(15) Slow travel speed/weak
(16) Travel deviation
(17) Travel 1st/2nd speed not changed
(18) Travel parking on a slope is not held
(19) Travel does not run straight when both crawlers and attachment are operated simultaneously
(20) Slow breaker (crusher) operation, weak power
(21) Option selector valve malfunction: not switched to breaker circuit
(22) Option selector valve malfunction: not switched to nibbler circuit

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HINO DIESEL ENGINE WORKSHOP MANUAL

J08E-UV

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HINO

(Shovel)

KSS-Z4J8-002E

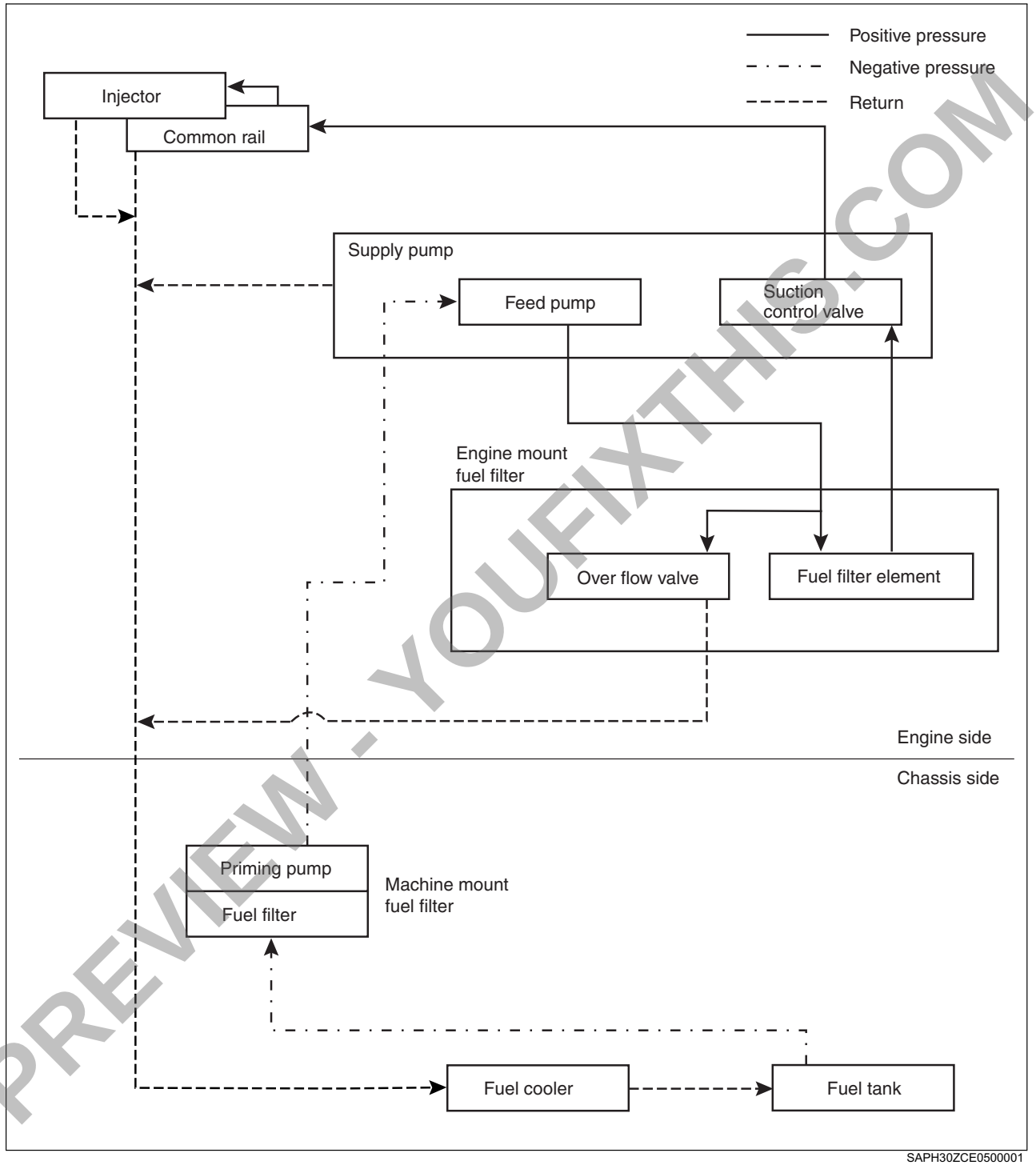
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Fuel System

Fuel system diagram

JP30ZCE050402001



SAPH30ZCE0500001

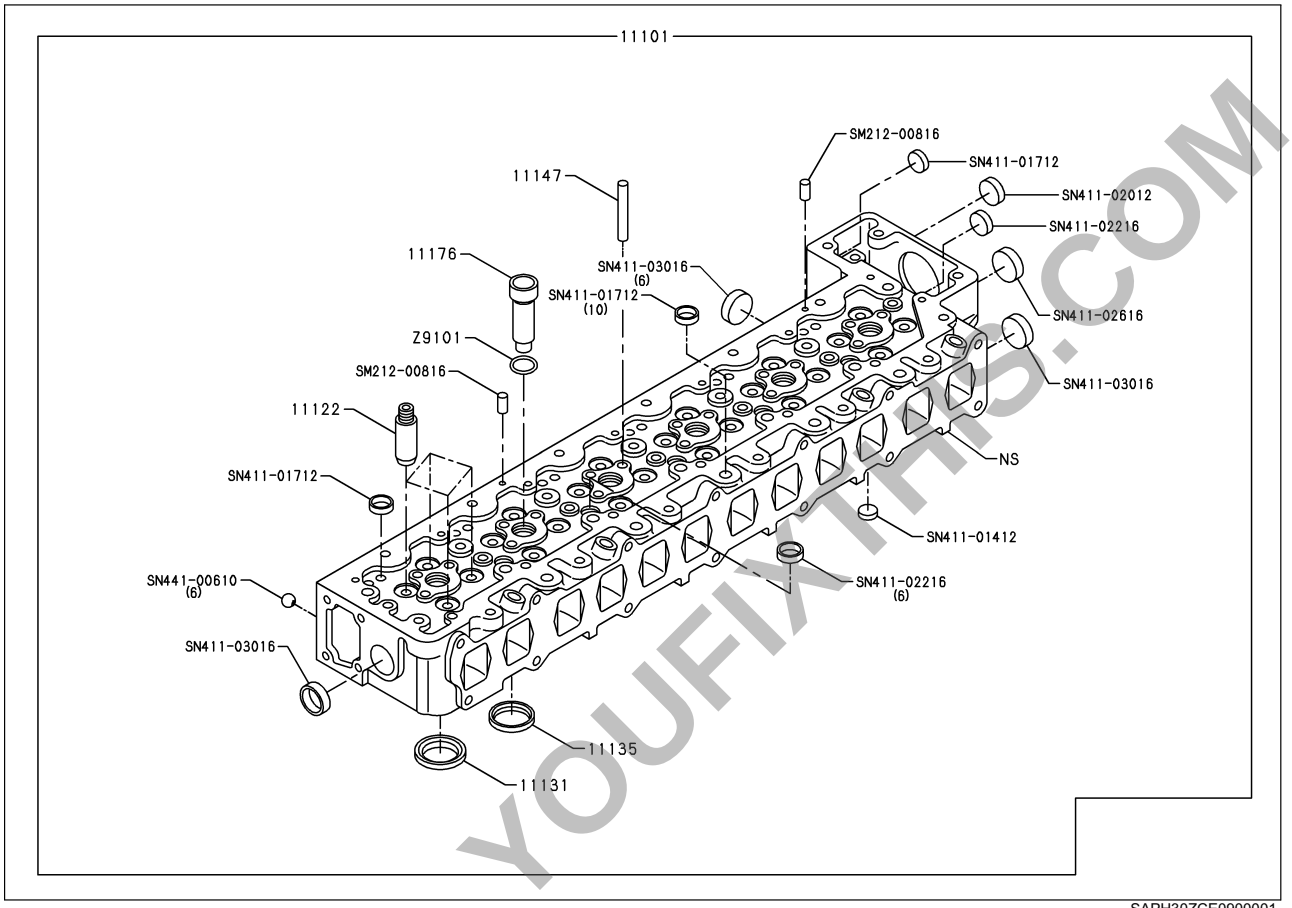
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Cylinder Head

Part layout

JP30ZCE090402001



SAPH30ZCE0900001

11101	Cylinder head assembly	11135	Exhaust valve seat
11122	Valve guide	11176	Nozzle seat
11131	Intake valve seat	Z9101	Gasket*

*Parts not to be reused.

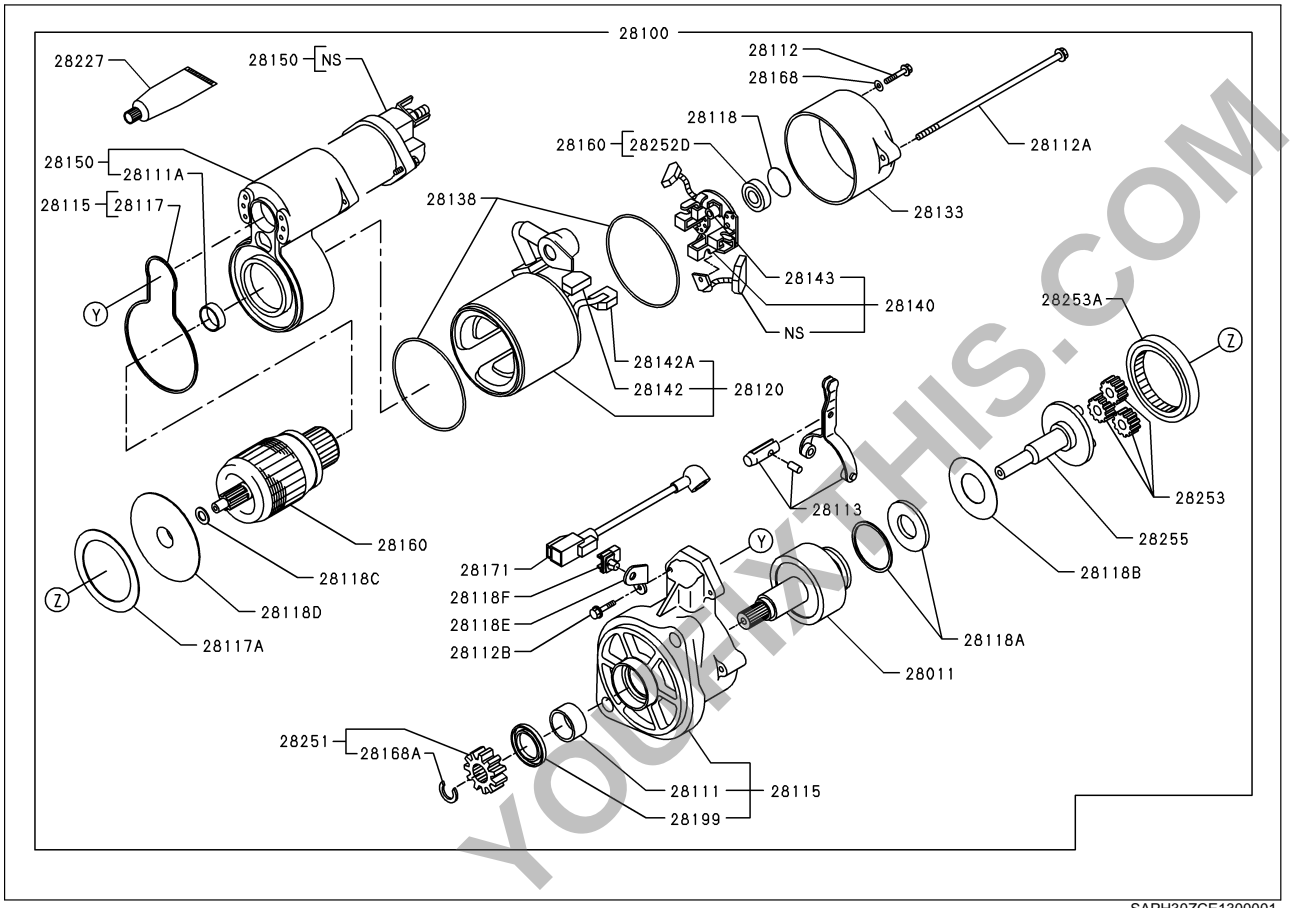
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Starter

Part layout

JP30ZCE130402001



SAPH30ZCE1300001

28011	Clutch sub-assembly	28138	Packing*
28100	Starter	28140	Brush holder assembly
28111	Bushing	28142	Brush
28111A	Bushing	28143	Spring
28113	Lever	28150	Center bracket
28115	Start drive housing	28160	Armature assembly
28117	Packing*	28168A	Retainer clip*
28117A	Packing*	28199	Dust protector
28118	Plate	28251	Pinion
28118A	Plate	28252D	Bearing*
28118B	Plate	28255	Shaft assembly
28118D	Cover	28253	Planetary gear
28120	Yoke assembly	28253A	Internal gear
28133	Commutator end frame		

*Parts not to be reused.

Tightening torque

28112	3.6-4.9N·m{37-49kgf·cm, 3-4 lbf·ft}	28112	14-16N·m{140-160kgf·cm, 10-12 lbf·ft}
28112A	15.7-17.6N·m {160-179kgf·cm, 12-13 lbf·ft}		

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16 FAILURE DIAGNOSIS FOR EACH ENGINE STATUS

FAILURE DIAGNOSIS FOR EACH ENGINE STATUS

..... 16-2
Engine mechanical 16-2
Alternator 16-5
Starter 16-6
Turbocharger 16-7
DPR filter 16-9

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SAFETY PRECAUTIONS

WARNING

The proper and safe lubrication and maintenance for this machine, recommended by Manufacturer, are outlined in the OPERATOR'S MANUAL for the machine.
Improper performance of lubrication or maintenance procedures are dangerous and could result in injury or death. Read and understand the MANUAL before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this machine. This makes it important to use caution when performing service work. A knowledge of the system and or components is important before the removal or disassembly of any component.

Because of the size of some of the machine components, the serviceman or mechanic should check the weights noted in this manual. Use proper lifting procedures when removing any components. Weight of components table is shown in the section "Specifications."

The following is a list of basic precautions that must always be observed.

(1) Read and understand all Warning plates and decals on the machine before Operating, Maintaining or Repairing this machine.

(2) Always wear protective glasses and protective shoes when working around machines. In particular, wear protective glasses when using hammers, punches or drifts on any part of the machine or attachments. Use welders gloves, hood/goggles, apron and the protective clothing appropriate to the welding job being performed. Do not wear loose fitting or torn clothing. Remove all rings from fingers, loose jewelry, and confine long hair and loose clothing before working on this machinery.

(3) Disconnect the battery and hang a "Do Not Operate" tag in the Operators Compartment. Remove ignition keys.

(4) If possible, make all repairs with the machine parked on a firm level surface. Block the machine so it does not roll while working on or under the machine. Hang a "Do Not Operate" tag in the Operators Compartment.

(5) Do not work on any machine that is supported only by lift, jacks or a hoist. Always use blocks or jack stands, capable of supporting the machine, before performing any disassembly.

WARNING

Do not operate this machine unless you have read and understand the instructions in the OPERATOR'S MANUAL. Improper machine operation is dangerous and could result in injury or death.

(6) Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.

(7) Lower the bucket, dozer, or other attachments to the ground before performing any work on the machine. If this cannot be done, make sure the bucket, dozer, ripper or other attachment is blocked correctly to prevent it from dropping unexpectedly.

(8) Use steps and grab handles when mounting or dismounting a machine. Clean any mud or debris from steps, walkways or work platforms before using. Always face the machine when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.

(9) To avoid back injury, use a hoist when lifting components which weigh 20kg (45lbs) or more. Make sure all chains, hooks, slings, etc., are in good condition and are the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.

(10) To avoid burns, be alert for hot parts on machines which have just been stopped and hot fluids in lines, tubes and compartments.

(11) Be careful when removing cover plates. Gradually back off the last two capscrews or nuts located at opposite ends of the cover or device and carefully pry cover loose to relieve any spring or other pressure, before removing the last two capscrews or nuts completely.

(12) Be careful when removing filler caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the machine has just been stopped because fluids can be hot.

(13) Always use the proper tools that are in good condition and are suited for the job at hand. Be sure you

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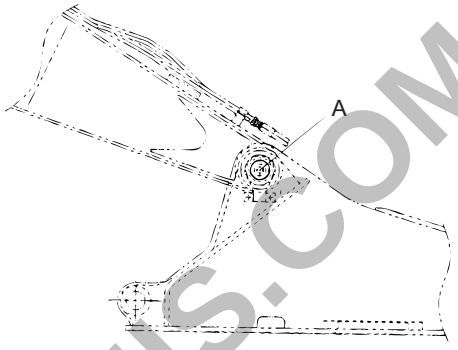
32.1.4.3 ATTACHING BOOM

(1) Attaching boom foot pin (A)

First of all, insert boom foot pin (A) and install the boom assembly.

Attach it in the reverse procedure of removing, paying attention to the following points.

1. When aligning the pin holes, do not put your finger in the pin holes, align them visually.
2. Check that the dust seals are not damaged and replace as necessary.
3. When inserting the pin, coat the shaft with grease.
4. Refer to paragraph 32.1.3.2 about installing jam nuts.
5. When installing boom and cylinder, check the clearance of the mounting section in the thrust direction, and decide the thickness of the shim according to the maintenance standard.
6. When attaching the shims, attach the resin shim first and then fill the gap with iron shims.
7. Tightening torque



Boom Foot Pin (A)

Classfication	Size	Tightening torque	
		N·m	lbf·ft
Metric threads	M20	181	133
PF,PT threads	1/8"	16.7	12.3
	1/4"	36.3	26.8
	3/8"	73.5	54.2

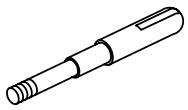
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Electrical

Special tool

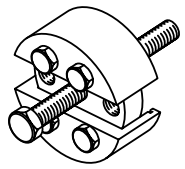
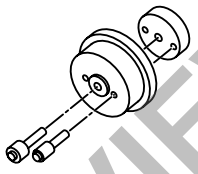
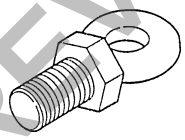
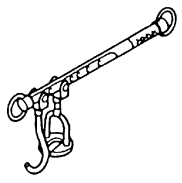
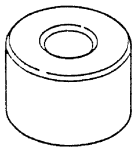
JP30ZCE030901003

Shape	Part No.	Name	Remark
	S0944–41210 (09444–1210)	Compression gauge	For V ribbed belt tension adjustment
	–	MITSUBOSHI BELTING LTD. Belt Tension Meter (DOCTOR TENSION® TYPE-III)	For V ribbed belt tension adjustment

Engine Mechanical

Special tool

JP30ZCE030901004

Shape	Part No.	Name	Remark
	S0942–01731 (09420–1731)	Oil seal puller	For crankshaft front oil seal removal
	S0940–71030 (09407–1030)	Oil seal press	For crankshaft front oil seal press-fit
	S0943–31070 (09433–1070)	Eye bolt	For assembly/disassembly of cylinder head
	S0947–01170 (09470–1170)	Valve spring press	For assembly/disassembly of valve spring retainer
	S0947–11520 (09471–1520)	Guide	For valve guide press-fit

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