KOBELCO

# SERVICE MANUAL

## Hydraulic Excavator

## SK350-9
## Tier 4

S5LC0026E03

Issued July 2011
1st Edition

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

# HYDRAULIC EXCAVATOR

# SHOP MANUAL model SK350-9

# INDEX





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Book Code No.**S5LC0026E03**

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## NOTE:

This Manual is prepared as a technical document where the information necessary for the maintenance and repairing services of our hydraulic excavators are collected, and is categorized into 7 Chapters, Specification, Maintenance, System, Disassembly, Troubleshooting, Engine, and Installation Procedures for Optional Attachment.

- The Chapter “Specification” describes the specifications for the entire machine, and are instructive for replacement and repairing attachments.
- The Chapter “Maintenance” describes the documentation, which is helpful for maintenance service and adjustments for the entire machine.
- The Chapter “System” describes the operating systems: hydraulic system, electric system, components, and so on.
- The Chapter “Disassembly” describes the removal and installation of the assembly mounted on the upper structure and undercarriage, and the assembly and disassembly of the associated hydraulic equipment.
- The Chapter “Troubleshooting” describes how to find the equipment fault.
- The Chapter “Engine” describes the use of the “Maintenance Manual” provided by the engine supplier.
- The Chapter “Installation Procedures for Optional Attachment” describes the supplements added on request as required.

This Manual may be properly revised due to the improvement of products, modification of specifications, etc. There are cases where the system on an actual machine and a part of the contents of this manual may differ due to the variations of specifications by each country. For the section in which the description is not understood, contact our distributor.

A number is assigned to every part handled in this Manual on account of the description, but the parts cannot be supplied as service parts. Therefore, a parts order must be placed with respective formal part numbers from the Parts Manual for the applicable machine.

# 1. OUTLINE

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| Issue | Data of Issue | Applicable Machines | Remarks |
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# 1.1 GENERAL PRECAUTIONS FOR MAKING REPAIRS

## 1.1.1 PREPARATION BEFORE DISASSEMBLING


**(1) Knowledge of operating procedure**

Read Operator's Manual carefully to understand the operating procedure.

**(2) Cleaning machines**

Clean machines of soil, mud, and dust before bringing the machines into the service shop. Bringing a soiled machine into the service shop causes less efficient work and damage to parts.

**(3) Inspecting machines**

Confirm the disassembling section before starting the work, determine the disassembly procedure, taking the conditions in work shop into account, and request to procure the necessary parts in advance.

**(4) Recording**

Record the following items and keep the documentation to prevent malfunction from reacurring.

1. Inspecting date and place.
2. Model name, serial number and records on the hour meter.
3. Trouble condition, place, and cause.
4. Visible oil leaks, water leaks and damage.
5. Clogging of filters, oil level, oil quality, oil contamination and loose fasteners.
6. Examine the problems on the basis of the monthly operation rate with the last inspection date and records on the hour meter.

**(5) Arrangement and cleaning in service shop**

1. Tools required for repair work.
2. Prepare the places to put the disassembled parts.
3. Prepare oil pans for leaking oil, etc.

## 1.1.2 SAFETY WHEN DISASSEMBLING AND ASSEMBLING


**(1) Safety**

1. Wear appropriate clothing, safety shoes, safety helmet, goggles, and clothes with long sleeves.
2. Attach a "Do Not Operate" tag on the control lever, and begin a meeting before starting the work.
3. Stop the engine before starting inspection and maintenance.
4. Confirm the position of the first-aid kit and fire extinguisher, and also where to make contact for emergencies.
5. Choose a hard, level and safe place to park the machine, and always put the attachment on the ground.
6. Use hoist, etc. to remove heavy parts that weight (23kg [50 lb] or more).
7. Use proper tools, and change or repair defective tools.
8. Machine and attachment required to work in the lifting condition should be securely supported with supports or blocks.

## 1.1.3 DISASSEMBLING AND ASSEMBLING HYDRAULIC EQUIPMENT

**(1) Removing hydraulic equipment assemblies**

1. Before removing tubes and hoses, release the pressure in the hydraulic oil tank, or open the cover on the return side to tank, and take out the filter.
2. Drain the oil in the removed pipes and hoses into a pan to prevent the oil from spilling on the ground.
3. Plug or cap hoses, tubes, and fittings to prevent oil leaking, entry of dust, etc.
4. Clean the outside surface of equipment, etc. before disassembling, and drain hydraulic oil and gear oil before putting them on the work bench.

**(2) Disassembling hydraulic equipment**

1. Since performance and function of hydraulic equipment after disassembly and assembly results in immunity from responsibility on the manufacture's side, disassembly, assembly and modification without permission are strictly prohibited.
2. If it is unavoidably necessary to disassemble and modify, it should be carried out by experts or personnel qualified through service training.
3. Place matching marks on parts for easier reassembling.
4. Before disassembling, read disassembling Instructions in advance, and determine if the disassembly and assembly are permitted or not.
5. For parts that require the use jigs and tools, always use the specified jigs and tools.
6. For parts which cannot be removed in the specified procedure, never force the removal. Check for the cause first.
7. The removed parts should be put in order and tagged so they can be installed correctly.
8. For common parts, pay attention to the quantity and places.

**(3) Inspecting parts**

1. Check that the disassembled parts are free from adherence, interference and an uneven working face.
2. Measure the wear of parts and clearance, and record the measured values.
3. If an abnormality is detected, repair or replace the parts.

**(4) Reassembling hydraulic equipment**

1. Ventilate the room during parts cleaning.
2. Before assembly, clean parts roughly first, and then completely.
3. Remove adhering oil by compressed air, and apply hydraulic oil or gear oil, and then assemble them.
4. Replace the removed O-rings, back-up rings and oil seals with new ones, and apply oil on them before assembling.
5. Remove dirt and water on the surfaces where liquid sealants are applied, and apply liquid sealant on them.
6. Remove rust preventives on new parts before assembling.
7. Use special tools to fit bearings, bushings and oil seals.
8. Assemble parts matching the marks made before disassembly.
9. After completion, check that there is no omission of parts.

**(5) Installing hydraulic equipment**

1. Confirm the correct hydraulic oil and lubrication oil.
2. Air pressure release is required in the following cases;
   a. Hydraulic oil change
   b. Replacement of parts on suction pipe side
   c. Removing and attaching hydraulic pump
   d. Removing and attaching swing motor
   e. Removing and attaching travel motor
   f. Removing and attaching hydraulic cylinder
3. For air bleed of the hydraulic pump and swing motor, loosen the drain plug on the upper part, start engine, and run at low idle, then bleed air until hydraulic oil comes out. When the hydraulic oil comes out, tighten plug securely.
4. For air bleed of travel motors and hydraulic cylinders, start engine and operate it for 10 minutes or more at no-load and low speed.
5. Air in pilot circuit can be bleed out by only operating digging, swing and traveling motions thoroughly.
6. Check hydraulic oil level.
   Move attachments to the hydraulic oil check position, and check hydraulic oil level in the tank. Refill oil if the oil level is lower than the specified level.
   How to check oil level in the hydraulic oil tank

**Important imformation**


Oil level of hydraulic oil tank.
If the indicator is within level marks, the oil quantity is acceptable.

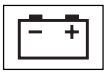
**WARNING**

If hydraulic oil and lubricating oil are not filled and the air bleed is not performed, the hydraulic equipment may be damaged.

**WARNING**

For cylinders, don't move cylinders to the stroke end at the beginning.

## 1.1.4 ELECTRICAL EQUIPMENT

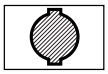


(1) The disassembly of electrical equipment is not allowed.
(2) Handle equipment with care so as not to drop it or bump it.
(3) Connector should be removed by unlocking while holding the connector.
Never stress in tension the caulked section by pulling wire.
(4) Check that connector is connected and locked completely.
(5) Engine key off before removing and connecting connector.
(6) Engine key off before touching terminals of starter and alternator.
(7) Remove battery grounding terminal before beginning work close to battery and battery relay with tools.
(8) Wash machine with care to prevent splashing water on electrical equipment and connectors.
(9) When water has entered in the waterproofed connector, the removing of water is not easy. So check the removed waterproofed connector with care to protect it from entry of water. If moisture adheres on it, dry it completely before connecting.

**WARNING**

Battery fluid is dangerous.
The battery fluid is dilute sulfuric acid and causes loss of eyesight when adhering on eyes, and causes scald on skin and clothes. When the fluid has adhered on body parts, take an emergency measure immediately and see a doctor for medical advice.
-When it has adhered on skin; wash with soap and water.
-When it has splashed in eyes; wash in water for 10 minutes or more immediately.
-When it has spilled out in large quantity; Use sodium bicarbonate to neutralize, or wash away with water.
-When it has been swallowed; drink milk or water.
-When it has adhered on clothes; Wash clothes immediately.

## 1.1.5 HYDRAULIC PARTS



**(1) O-ring**

- Check that O-ring is free from flaw and has elasticity before fitting.
- Even if the size of the O-ring is equal, the usage differs, for example in dynamic and static sections, the rubber hardness also differs according to the pressure force, and also the quality differs depending on the materials to be seated. So, choose the proper O-ring.
- Fit O-rings without distortion and bend.
- Floating seals should be put in pairs.

**(2) Flexible hose (F hose)**

- Even if the connector and length of the hose are the same, the parts differ according to the withstanding pressure. Use proper parts.
- Tighten it to the specified torque, and check that it is free from twist, over tension, interference, and oil leak.

## 1.1.6 WELD REPAIR

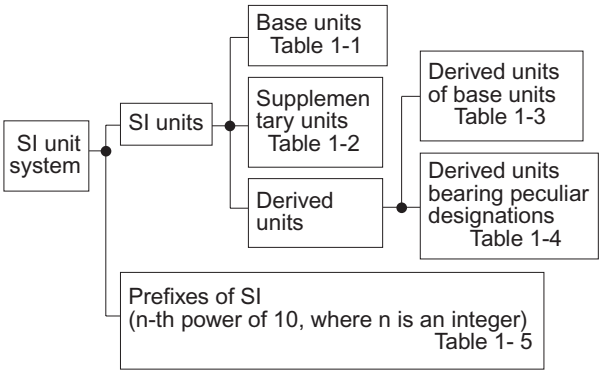
(1) The weld repair should be carried out by qualified personnel in the specified procedure after disconnecting the grounding cable of battery. If the grounding cable is not disconnected, the electrical equipment may be damaged.
(2) Remove parts which may cause fire due to the entry of spark beforehand.
(3) Repair attachments that are damaged, giving particular attention to the plated section of piston rod to protect it from sparks, and don't fail to cover the section with flame-proof covers.

## 1.1.7 ENVIRONMENTAL ISSUES

(1) Engine should be started and operated in the place where air can be sufficiently ventilated.
(2) Waste disposal
The following parts follow the regulation.
Waste oil, waste container and battery
(3) Precautions for handling hydraulic oil
Hydraulic oil may cause inflammation of eyes.
Wear goggles to protect eyes when handling oil.
-When oil gets in your eyes ;
Wash your eyes with water until the stimulus is gone.
-When it has been swallowed ;
Don't force the individual to vomit, immediately get medical treatment.
-When it has adhered on skin ;
Wash with soap and water.
(4) Others
For spare parts, grease and oil, use KOBELCO genuine parts and lubricants.

## 1.2 INTERNATIONAL UNIT SYSTEM

Introduction
Although this manual uses the SI units system. Outline of SI units system is described here.
Given hereinunder are an excerpt of the units that are related to this manual :
1. Etymology of SI Units
English : International System of units
2. Construction of SI Unit System




(1) Basic Units

**Table1-1**

| QUANTITIES | DESIGNATION | SIGN |
|---|---|---|
| Length | Meter | m |
| Mass | Kilogram | kg |
| Time | Second | s |
| Current | Ampere | A |
| Thermodynamic temperature | Kelvin | K |
| Gram molecule | Mol | mol |
| Luminous intensity | Candela | cd |

(2) Supplementary Units

**Table1-2**

| QUANTITIES | DESIGNATION | SIGN |
|---|---|---|
| Plain angle | Radian | rad |
| Solid angle | Steradian | sr |

(3) Derived Units of Basic Units

**Table1-3**

| QUANTITIES | DESIGNATION | SIGN |
|---|---|---|
| Area | Square meter | $m^2$ |
| Volume | Cubic meter | $m^3$ |
| Velocity | Meter per second | m/s |
| Acceleration | Meter per second / second | $m/s^2$ |
| Density | Kilogram per cubic meter | $kg/m^3$ |

(4) Derived Units bearing Peculiar Designations

**Table1-4**

| QUANTITY | UNIT | SYMBOL | FORMULA |
|---|---|---|---|
| Frequency | hertz | Hz | 1Hz=1/s |
| Force | newton | N | $kg \cdot m/s^2$ |
| Pressure and Stress | pascal | Pa | $N/m^2$ |
| Energy, Work and Quantity of heat | joule | J | N•m |
| Power | watt | W | J/s |
| Quantity of electricity | coulomb | C | A•s |
| Electric potential difference, Voltage, and Electromotive force | volt | V | W/A |
| Quantity of static electricity and Electric capacitance | farad | F | C/V |
| Electric resistance | ohm | Ω | V/A |
| Celcius temperature | celcius degree or degree | °C | (t+273.15)K |
| Illuminance | lux | lx | l $m/m^2$ |

(5) Prefixes of SI

**Table1-5**

| PREFIX | | POWER |
|---|---|---|
| DESIGNATION | SIGN | |
| Giga | G | $10^{9}$ |
| Mega | M | $10^{6}$ |
| Kilo | k | $10^{3}$ |
| Hecto | h | $10^{2}$ |
| Deca | da | 10 |
| Deci | d | $10^{-1}$ |
| Centi | c | $10^{-2}$ |
| Milli | m | $10^{-3}$ |
| Micro | μ | $10^{-6}$ |
| Nano | n | $10^{-9}$ |
| Pico | p | $10^{-12}$ |

(6) Unit Conversion Table

**Table1-6**

| QUANTITIES | JIS | SI | REMARKS |
|---|---|---|---|
| Mass | kg | kg | |
| Force | kgf | N | 1kgf=9.807N |
| Torque | kgf•m | N•m | 1kgf•m=9.807N•m |
| Pressure | $kgf/cm^2$ | MPa | $1kgf/cm^2$=0.098MPa |
| Motive power | PS | kW | 1PS=0.7355kW |
| Revolution | r.p.m | $min^{-1}$ | $1r.p.m=1min^{-1}$ |

# 2. SPECIFICATIONS

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