

KOBELCO

SHOP MANUAL
EXCAVATOR
SK210-8
ACERA MARK 8
TIER III

YN91ZU0007P1 NA

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APPLICABLE:
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SK210 - 8 TABLE OF CONTENTS

SPECIFICATIONS SECTION

0-SAFETY

0.1 GENERAL SAFETY INFORMATION	0-2
0.2 SAFETY PRECAUTIONS	0-3

1-OUTLINE

1.1 GENERAL PRECAUTIONS FOR MAKING REPAIRS	1-3
1.1.1 PREPARATION BEFORE DISASSEMBLING	1-3
1.1.2 SAFETY WHEN DISASSEMBLING AND ASSEMBLING	1-3
1.1.3 DISASSEMBLING AND ASSEMBLING HYDRAULIC EQUIPMENT	1-3
1.1.4 ELECTRICAL EQUIPMENT	1-4
1.1.5 HYDRAULIC PARTS	1-5
1.1.6 WELD REPAIR	1-5
1.1.7 ENVIRONMENTAL ISSUES	1-5
1.2 INTERNATIONAL UNIT SYSTEM	1-6

2-SPECIFICATIONS

2.1 NAME OF COMPONENTS	2-3
2.2 GENERAL DIMENSIONS	2-4
2.2.1 SK210-8 [5.65m (18ft-6in) Boom+2.94m (9ft-8in) Standard Arm+0.80m ³ (1.05cu•yd) Bucket Shoe]	2-4
2.2.2 SK210-8 [5.65m (18ft-6in) Boom+3.5m (11ft-6in) Long Arm+0.70m ³ (0.92cu•yd) Bucket Shoe]	2-4
2.3 WEIGHT OF COMPONENTS	2-5
2.4 TRANSPORTATION	2-7
2.4.1 OVERALL DIMENSIONS OF MACHINE ON A TRAILER	2-7
2.4.2 DIMENSIONS OF ATTACHMENT	2-8
2.5 SPECIFICATIONS AND PERFORMANCE	2-9
2.5.1 SPEED AND CLIMBING CAPABILITY	2-9
2.5.2 ENGINE	2-9
2.5.3 HYDRAULIC COMPONENTS	2-9
2.5.4 WEIGHT	2-9
2.6 TYPE OF CRAWLER	2-10
2.7 COMBINATIONS OF ATTACHMENT	2-12
2.8 ENGINE SPECIFICATIONS	2-13
2.8.1 SPECIFICATIONS	2-13

3-ATTACHMENT DIMENSIONS

- 3.1 BOOM 3-3
 - 3.1.1 BOOM DIMENSIONAL DRAWING 3-3
 - 3.1.2 BOOM MAINTENANCE STANDARD 3-4
- 3.2 ARM 3-6
 - 3.2.1 ARM DIMENSIONAL DRAWING 3-6
 - 3.2.2 ARM MAINTENANCE STANDARD 3-7
- 3.3 BUCKET AND PIN 3-10
 - 3.3.1 BUCKET AND PIN DIMENSIONAL DRAWING 3-10
 - 3.3.2 BUCKET AND PIN DIMENSIONAL TABLE 3-11

MAINTENANCE SECTION

11-TOOLS

- 11.1 STANDARD TORQUE SPECIFICATIONS FOR CAPSCREWS AND NUTS 11-3
- 11.2 SCREW SIZE 11-5
 - 11.2.1 CAPSCREW (BOLT) 11-5
 - 11.2.2 CAPSCREW (SOCKET BOLT) 11-5
 - 11.2.3 SOCKET SET SCREW 11-5
- 11.3 TORQUE SPECIFICATIONS FOR HOSE AND FITTINGS 11-6
 - 11.3.1 JOINT (O-RING TYPE) 11-6
 - 11.3.2 HYDRAULIC HOSE (30° FLARE TYPE) 11-6
 - 11.3.3 JOINT (ORS TYPE) 11-6
 - 11.3.4 SPLIT FLANGE 11-6
- 11.4 TORQUE SPECIFICATIONS FOR NUTS AND SLEEVES 11-7
- 11.5 PLUG 11-8
 - 11.5.1 PLUG FOR HYDRAULIC PIPE JOINT 11-8
 - 11.5.2 PLUG FOR HYDRAULIC EQUIPMENT 11-9
- 11.6 SPECIAL SPANNER FOR TUBE 11-11
- 11.7 SPECIAL TOOLS 11-12
- 11.8 APPLICATION OF SCREW LOCKING COMPOUND AND SEALING COMPOUND 11-14
- 11.9 SUCTION STOPPER 11-15
 - 11.9.1 COMPONENTS 11-15
 - 11.9.2 DIMENSION 11-15
 - 11.9.3 APPLICABLE MODEL 11-15
- 11.10 COUNTER WEIGHT LIFTING JIG 11-16
- 11.11 UPPER FRAME LIFTING JIG 11-17
- 11.12 ENGINE TURNOVER STAND 11-18
- 11.13 TRACK SPRING SET JIG 11-19

12-STANDARD MAINTENANCE TIMETABLE

12.1 STANDARD WORKING TIME TABLE FOR THE MAINTENANCE OF EXCAVATOR.... 12-4

13-MAINTENANCE STANDARD AND TEST PROCEDURE

13.1 HOW TO USE THE MAINTENANCE STANDARD..... 13-3

13.2 PERFORMANCE INSPECTION STANDARD TABLE 13-4

13.3 MEASUREMENT OF ENGINE SPEED 13-6

 13.3.1 MEASUREMENT OF ENGINE SPEED 13-6

13.4 MEASUREMENT OF HYDRAULIC PRESSURE..... 13-7

 13.4.1 PREPARING TO MEASURE HYDRAULIC PRESSURE 13-7

 13.4.2 PLACE TO INSTALL PRESSURE GAUGE 13-7

 13.4.3 PRESSURE ADJUSTMENT POSITION..... 13-8

 13.4.4 PROCEDURE FOR ADJUSTING RELIEF VALVE 13-10

13.5 MEASURING TRAVEL PERFORMANCES 13-12

 13.5.1 TRAVEL SPEED..... 13-12

 13.5.2 DEVIATION OF TRAVEL..... 13-12

 13.5.3 PERFORMANCES OF PARKING BRAKE 13-13

 13.5.4 DRAIN RATE OF TRAVEL MOTOR..... 13-14

13.6 MEASURING SWING PERFORMANCES 13-15

 13.6.1 SWING SPEED..... 13-15

 13.6.2 PERFORMANCE OF SWING BRAKE..... 13-15

 13.6.3 PERFORMANCE OF SWING PARKING BRAKE 13-16

 13.6.4 DRAIN RATE OF SWING MOTOR..... 13-17

13.7 MEASURING ATTACHMENT OPERATING PERFORMANCES 13-18

 13.7.1 OPERATING TIME OF CYLINDERS..... 13-18

 13.7.2 CYLINDER LEAK CHECK 13-19

13.8 MEASURING PERFORMANCES OF SWING BEARING..... 13-20

13.9 MECHATRO CONTROLLER 13-21

 13.9.1 ENGINE CONTROL INPUT / OUTPUT 13-21

 13.9.2 ENGINE CONTROL..... 13-22

 13.9.3 ADJUSTMENT OF MECHATRO CONTROLLER OUTPUT
 (A-B-C ADJUSTMENT)..... 13-24

 13.9.4 OPERATIONS IN THE EVENT OF A MECHATRO CONTROLLER FAILURE 13-29

SYSTEM SECTION

21-MECHATRO CONTROL SYSTEM

21.1 SUMMARY OF MECHATRO CONTROL SYSTEM.....21-4

21.1.1 MECHATRO CONTROL SYSTEM IN GENERAL21-4

21.1.2 UNLOAD VALVE CONTROL21-6

21.1.3 POSITIVE CONTROL & P-Q CONTROL21-7

21.1.4 BOOM UP CONFLUX CONTROL21-9

21.1.5 ARM IN RECIRCULATION & CONFLUX CONTROL21-10

21.1.6 ARM-IN ANTI-CAVITATION CONTROL.....21-12

21.1.7 ARM-OUT CONFLUX CONTROL21-13

21.1.8 BUCKET DIGGING (DUMP) CONFLUX CONTROL21-14

21.1.9 BUCKET DIGGING ANTI-CAVITATION CONTROL21-15

21.1.10 SWING PRIORITY CONTROL21-17

21.1.11 TRAVEL STRAIGHT CONTROL21-18

21.1.12 TRAVEL INDEPENDENT CONTROL.....21-20

21.1.12 PRESSURE RELEASE CONTROL21-22

21.1.13 N&B SWITCH CONTROL (OPTION).....21-23

21.1.14 OPTION CONFLUX CONTROL (OPTION)21-24

21.2 MECHATRO CONTROLLER21-25

21.2.1 SUMMARY OF MULTI DISPLAY21-25

21.2.2 SELF DIAGNOSIS DISPLAY21-30

21.2.3 SERVICE DIAGNOSIS DISPLAY FUNCTION21-32

21.2.4 TROUBLE HISTORY DIAGNOSIS21-42

21.2.5 TROUBLE DIAGNOSIS MODE21-43

21.2.6 SET PROCEDURE OF MAINTENANCE SCHEDULE21-44

21.2.7 ADJUSTING PROCEDURE OF DISPLAY21-45

21.2.8 MECHATRO CONTROL EQUIPMENT21-49

22-HYDRAULIC SYSTEM

22.1 SUMMARY.....22-3

22.2 HYDRAULIC CIRCUITS AND COMPONENTS22-4

22.3 COLOR CODING STANDARD FOR HYDRAULIC CIRCUITS.....22-8

22.4 NEUTRAL CIRCUIT22-8

22.5 TRAVEL CIRCUIT22-10

22.6 BUCKET CIRCUIT22-12

22.7 BOOM CIRCUIT22-14

22.8 SWING CIRCUIT22-18

22.9 ARM CIRCUIT22-20

22.10 COMBINED CIRCUIT22-26

22.11 PRESSURE DRAINING (RELEASING) CIRCUIT22-30

23-ELECTRICAL SYSTEM

23.1	ELECTRIC CIRCUIT DIAGRAM	23-3
23.2	ELECTRICAL EQUIPMENT LIST	23-7
23.3	HARNESS	23-9
23.3.1	HARNESS LIST	23-9
23.3.2	INSTRUMENT PANEL ASSY	23-10
23.3.3	CONTROLLER INSTALL	23-11
23.3.4	TUNER INSTALL	23-11
23.3.5	UPPER ELECTRIC ASSY	23-12
23.3.6	UPPER HARNESS ASSY	23-13
23.3.7	UPPER HARNESS ASSY (FLOOR PLATE)	23-24
23.3.8	CAB HARNESS ASSY	23-30
23.3.9	BOOM HARNESS ASSY	23-33
23.3.10	INSTALLING BOOM LIGHT	23-33
23.3.11	INSTALLING UPPER LIGHT	23-34
23.3.12	FLASHER LAMP INSTALL	23-35
21.1.13	ALARM ASSEMBLY	23-36

24-COMPONENTS SYSTEM

24.1	HYDRAULIC COMPONENTS	24-3
24.1.1	HYDRAULIC PUMP, REGULATOR	24-3
24.1.2	CONTROL VALVE	24-21
24.1.3	PILOT VALVE (ATT)	24-59
24.1.4	PILOT VALVE (TRAVEL)	24-63
24.1.5	SWING MOTOR UNIT	24-65
24.1.6	TRAVEL MOTOR	24-75
24.1.7	SWIVEL JOINT	24-89
24.1.8	CYLINDER	24-91
24.2	ELECTRIC EQUIPMENT	24-97
24.2.1	ELECTRIC EQUIPMENT LIST	24-97
24.2.2	SPECIFICATION OF ELECTRIC EQUIPMENT	24-100

25-AIR CONDITIONER SYSTEM

25.1	BASIC AIR CONDITIONER SYSTEM (HVAC AIR CONDITIONER)	25-2
25.1.1	AIR CYCLE	25-3
25.1.2	AUTO AIR CONDITIONER SYSTEM OUTLINE	25-4
25.2	COMPONENT AND CONSTRUCTION	25-5
25.2.1	COMPONENT	25-5
25.2.2	CONSTRUCTION	25-6
25.3	PIPING	25-9
25.3.1	AIR CONDITIONER	25-9
25.3.2	RECEIVER DRYER ASSY	25-11
25.4	FUNCTION	25-12
25.4.1	MECHANISM OF COOLING CIRCUIT	25-12
25.4.2	COOLING CIRCUIT	25-14
25.4.3	COMPONENT PARTS	25-15
25.5	DISASSEMBLY AND ASSEMBLY	25-19
25.5.1	PRECAUTIONS TO BE EXERCISED IN OPERATION	25-19
25.5.2	DISASSEMBLY AND ASSEMBLY OF UNIT	25-20
25.6	CHARGING REFRIGERANT	25-24
25.6.1	PRECAUTIONS TO BE EXERCISED IN OPERATION	25-24
25.6.2	OPERATING PROCEDURE	25-25
25.6.3	CHARGING PROCEDURE	25-26
25.7	ELECTRIC CIRCUIT	25-32
25.7.1	WIRING DIAGRAM AND CONNECTORS	25-32
25.7.2	STRUCTURE AND OPERATION OF EACH PART AND INSPECTION	25-34
25.8	TROUBLESHOOTING	25-37
25.9	SELF DIAGNOSIS FUNCTION ON DISPLAY OF PANEL	25-44
25.9.1	POSITION OF INDICATION FOR FAILURE	25-44
25.9.2	EXPLANATION OF INDICATION FOR FAILURE	25-44
25.9.3	EXPLANATION OF MONITOR MODE	25-46

DISASSEMBLING SECTION

31-DISASSEMBLY AND ASSEMBLING

31.1	DISASSEMBLY & ASSEMBLY OVERVIEW	31-3
31.1.1	GENERAL INFORMATION	31-3
31.1.2	TORQUE SPECIFICATIONS	31-3

32-ATTACHMENT

32.1	REMOVING AND INSTALLING	32-3
32.1.1	ATTACHMENT ASSEMBLY	32-3
32.1.2	BUCKET	32-3
32.1.3	ARM	32-6
32.1.4	BOOM	32-9
32.2	DISASSEMBLING AND ASSEMBLING	32-13
32.2.1	CYLINDER	32-13

33-UPPER STRUCTURE

33.1	OPERATOR SEAT	33-3
33.1.1	OPERATOR SEAT	33-3
33.1.2	CAB	33-4
33.1.3	BATTERY	33-6
33.1.4	GUARD	33-7
33.1.5	UNDER COVER	33-13
33.1.6	FUEL TANK	33-14
33.1.7	HYDRAULIC TANK	33-16
33.1.8	HYDRAULIC PUMP	33-20
33.1.9	AIR CLEANER	33-25
33.1.10	MUFFLER	33-26
33.1.11	COUNTERWEIGHT	33-28
33.1.12	RADIATOR & OIL COOLER	33-29
33.1.13	ENGINE	33-35
33.1.14	CONSOLE COVER	33-38
33.1.15	CONTROL VALVE	33-39
33.1.16	PILOT VALVE (FOR ATT)	33-42
33.1.17	PILOT VALVE (FOR TRAVEL)	33-43
33.1.18	SWING MOTOR UNIT	33-45
33.1.19	SWIVEL JOINT	33-47
33.1.20	UPPER FRAME	33-50
33.2	DISASSEMBLING AND ASSEMBLING	33-53
33.2.1	HYDRAULIC PUMP • REGULATOR	33-53
33.2.2	CONTROL VALVE	33-79
33.2.3	PILOT VALVE (ATT)	33-110
33.2.4	PILOT VALVE (FOR TRAVEL)	33-120
33.2.5	SWING MOTOR UNIT	33-129
33.2.6	SWIVEL JOINT	33-156

34-TRAVEL SYSTEM

34.1	REMOVING AND INSTALLING	34-3
34.1.1	TRAVEL SYSTEM	34-3
34.1.2	CRAWLER	34-3
34.1.3	UPPER ROLLER	34-7
34.1.4	LOWER ROLLER	34-13
34.1.5	FRONT IDLER (IDLER ADJUSTER ASSY)	34-21
34.1.6	SPROCKET	34-30
34.1.7	TRAVEL MOTOR	34-33
34.1.8	SWING BEARING	34-35
34.2	REMOVAL AND INSTALLATION OF TRAVEL MOTOR UNIT	34-38
34.2.1	TRAVEL MOTOR	34-38

TROUBLESHOOTING SECTION

46-TROUBLESHOOTING (BY ERROR CODES)

46.1 EVALUATION OF ACTUAL PROBLEM AT THE SITE46-3
46.2 CLASSIFICATION OF FAILURE AND TROUBLESHOOTING.....46-4
46.3 MECHATRO CONTROLLER BLOWN FUSE46-4
46.4 TROUBLESHOOTING BY ERROR CODE.....46-4

47-TROUBLESHOOTING (BY SYMPTOM)

47.1 HYDRAULIC SYSTEM.....47-3
47.2 ELECTRIC SYSTEMS47-27
 47.2.1 WIRING CHECKING PROCEDURE.....47-27
 47.2.2 TROUBLE47-30
47.3 ENGINE RELATED TROUBLESHOOTING.....47-33

48-TROUBLESHOOTING (BY DIAGNOSIS MODE)

48.1 TROUBLE DIAGNOSIS MODE48-3

ENGINE SECTION

51-ENGINE

SECTION 1 - DIAGNOSTICS EW - 1-1
SECTION 2 - 6.7 L T/A ENGINE OVERHAULEW - 1-2
SECTION 3 - RECHARGING AND START-UPEW - 1-3

SAFETY

GENERAL SAFETY INFORMATION



Do not operate or perform any maintenance on this machine until all instructions found in the OPERATOR'S MANUAL and this MANUAL have been thoroughly read and understood.

Improper operation or maintenance of this machine may cause accidents and could result in serious injury or death.

Always keep the manual in storage.

If it is missing or damaged, place an order with your dealer for a replacement.

If you have any questions, consult your dealer.

- (1) Most accidents, which occur during operation, are due to neglect of precautionary measures and safety rules. Sufficient care should be taken to avoid these accidents. Incorrect operation, lubrication or maintenance services are very dangerous and may cause injury or death of personnel. Therefore all precautionary measures, NOTES, DANGERS, WARNINGS and CAUTIONS contained in the manual and on the machine should be read and understood by all personnel before starting any work with or on the machine.
- (2) Operation, inspection, and maintenance should be carefully carried out, and safety must be given the first priority. Messages of safety are indicated with marks. The safety information contained in the manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.
- (3) Messages of safety appear in the manual and on the machine : All messages of safety are identified by either word of "DANGER", "WARNING" and "CAUTION".

- 1) **DANGER-** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury and is represented as follows:



- 2) **WARNING-** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury and is represented as follows:



- 3) **CAUTION-** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against possible damage to the machine and its components and is represented as follows:



- (4) It is very difficult to forecast every danger that may occur during operation. However, safety can be ensured by fully understanding proper operating procedures for this machine according to methods recommended by Manufacturer.
- (5) While operating the machine, be sure to perform work with great care, so as not to damage the machine, or allow accidents to occur.
- (6) Continue studying the manual until all Safety, Operation and Maintenance procedures are completely understood by all persons working with the machine.

SAFETY PRECAUTIONS

WARNING

The proper and safe lubrication and maintenance procedures for this machine, are outlined in the OPERATOR'S MANUAL for the machine.

Improper 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 service technician 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 technician 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 decal 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, 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 to 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.

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- (13) Always use the proper tools that are in good condition and that are suited for the job at hand. Be sure you understand how to use them before performing any service work.
- (14) Reinstall all fasteners with the same part number. Do not use a lesser quality fastener if replacements are necessary.
- (15) Repairs which require welding should be performed only with the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine the type of metal being welded and select the correct welding procedure. Use electrodes, rods or wire to provide a weld metal strength equivalent at least to that of the parent metal. Make sure to disconnect the battery before any welding procedures are attempted.
- (16) Do not damage wiring during removal operations. Reinstall the wiring so it is not damaged nor will be damaged in operation of the machine by contacting sharp corners, or by rubbing against some object or hot surface. Do not connect wiring to a line containing fluid.
- (17) Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution and replace the guard or shield after repair is completed.
- (18) The maintenance and repair work while holding the bucket raised is dangerous due to the possibility of a falling attachment. Don't fail to lower the attachment and place the bucket to the ground before starting the work.
- (19) Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Very small (pinhole) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use card-board or paper to locate pinhole leaks.
- (20) Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure must be installed correctly.
- (21) Do not operate a machine if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.
- (22) Be careful when servicing or separating the tracks (crawlers). Chips can fly when removing or installing a track (crawlers) pin. Wear safety glasses and long sleeve protective clothing. Tracks (crawlers) can unroll very quickly when separated. Keep away from front and rear of machine. The machine can move unexpectedly when both tracks (crawlers) are disengaged from the sprockets. Block the machine to prevent it from moving.

NOTE:

This Manual contains important information necessary for the maintenance and repair of your hydraulic excavator. Information is categorized into 6 Chapters, Specification, Maintenance, System, Disassembly, Troubleshooting and Engine.

- The Chapter "Specification" describes the specifications for entire machine and material, which is instructive for replacement and repairing attachments.
- The Chapter "Maintenance" describes the standards and procedures, which is helpful for maintenance service and adjustments for the entire machine.
- The Chapter "System" describes the operating system such as the hydraulic system, electric system, components, and so on.
- The Chapter "Disassembly" describes the removal and installation of assemblies mounted on the upper structure and undercarriage, and the assembling and disassembling of the associated hydraulic equipment.
- The Chapter "Troubleshooting" describes how to find faulty equipment.
- The Chapter "Engine" describes the engines making use of the "Maintenance Manual" provided by the suppliers.

Kobelco reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.



1. OUTLINE

TABLE OF CONTENTS

1.1	GENERAL PRECAUTIONS FOR MAKING REPAIRS	1-3
1.1.1	PREPARATION BEFORE DISASSEMBLING	1-3
1.1.2	SAFETY WHEN DISASSEMBLING AND ASSEMBLING	1-3
1.1.3	DISASSEMBLING AND ASSEMBLING HYDRAULIC EQUIPMENT	1-3
1.1.4	ELECTRICAL EQUIPMENT	1-4
1.1.5	HYDRAULIC PARTS	1-5
1.1.6	WELD REPAIR	1-5
1.1.7	ENVIRONMENTAL ISSUES.....	1-5
1.2	INTERNATIONAL UNIT SYSTEM	1-6

1. OUTLINE

Issue	Date of Issue	Applicable Machines	Remarks
First edition	January, 2007	SK210-8 : YQ11-06001~	

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 carrying into the service shop.
Carrying a soiled machine into the service shop, causes making less efficient work and damage of parts.
- (3) Inspecting machines
Confirm the disassembling section before starting work, determine the disassembly procedure taking the conditions in work shop into account, and request to procure necessary parts in advance.
- (4) Recording
Record the following items to keep contact and prevent malfunction from recurring.
 - 1) Inspecting date, place
 - 2) Model name, Serial number and Record on hour meter
 - 3) Trouble condition, place, cause
 - 4) Visible oil leak, water leak and damage
 - 5) Clogging of filters, oil level, oil quality, oil contamination and looseness.
 - 6) Examine the problems on the basis of monthly operation rate with the last inspection date and records on 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 "Don't operate" tag to control lever, and begin a meeting before starting the work.
- 3) Before starting inspection and maintenance stop the engine.
- 4) Confirm the position of first-aid kit and fire extinguisher, and also where to make contact for emergency measure and ambulance to prepare for accidents and fire.
- 5) Choose a hard, level and safe place. The attachment **must** be fully on the ground.
- 6) Use hoist, etc. to remove parts of heavy weight (23kg [50 lb] or more).
- 7) Use proper tools, and change or repair defective tools.
- 8) Machine and attachment required to be serviced in the lifting condition should be supported with hoists and blocked securely.

1.1.3 DISASSEMBLING AND ASSEMBLING HYDRAULIC EQUIPMENT



- (1) Removing hydraulic equipment assy
 - 1) Before removing pipes, release the pressure in the hydraulic system.
 - 2) Drain the oil in the removed pipes into a pan to prevent the oil from spilling on the ground.
 - 3) Install plugs or caps in pipe ends to prevent oil from leaking, entry of dust, etc.
 - 4) Clean the outside surface of the machine area to be worked on before disassembling. Drain hydraulic oil and gear oil before putting parts on the work bench.
- (2) Disassembling hydraulic equipment
 - 1) Make alignment marks on parts for assembly.
 - 2) Before disassembling, read Disassembling Instruction in advance, and determine if the disassembly and assembly are permitted or not.
 - 3) For parts which are required to use jig and tools, don't fail to use the specified jig and tools.
 - 4) Parts that can not be removed in the specified procedure, never force removal. First check for the cause.
 - 5) The removed parts should be put in order and tagged for ease of assembly.
 - 6) For common parts, pay attention to the quantity and places.

1. OUTLINE

(3) Inspecting parts

- 1) Check the disassembled parts for damage or heavy wear.
- 2) Measure the wear of parts and clearance, and record the measured values.
- 3) If a part has damage or heavy wear, replace the part.

(4) Reassembling hydraulic equipment

- 1) During the parts cleaning, ventilate the room.
- 2) Before assembly, thoroughly clean all parts.
- 3) Apply clean hydraulic oil or gear oil prior to assembly.
- 4) Replace the removed O-ring, back-up rings and oil seal with new ones, and apply grease or oil on them before assembling.
- 5) Fully clean the surface on which liquid sealants are applied.
- 6) Before assembling, remove rust preventives on new parts.
- 7) Use special tools to fit bearings, bushing and oil seals.
- 8) Assemble parts using the alignment marks made during disassembly.

(5) Installing hydraulic equipment

- 1) Confirm hydraulic oil and lubrication oil.
- 2) Air release is required in the following cases ;
 1. Change of hydraulic oil
 2. Replacement of parts on suction pipe side
 3. Removing and attaching hydraulic pump
 4. Removing and attaching swing motor
 5. Removing and attaching travel motor
 6. Removing and attaching hydraulic cylinder



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

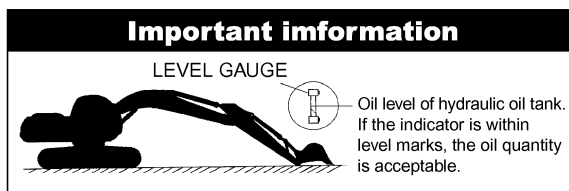
- 3) For air removal in the hydraulic the pump and swing motor, loosen but do not remove the drain plug on the upper housing, start engine and run in low idle until hydraulic fluid flows from the port. Tighten the plug securely.
- 4) For air removal from the travel motor and hydraulic cylinder, start engine and operate for 10 minutes or more at no-load and low idle.



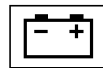
For cylinder, don't move it to the stroke end at beginning.

- 5) Air in pilot circuits can only be removed by operating digging, swing and traveling motions thoroughly.
- 6) Check hydraulic oil level.
Move attachments to hydraulic oil check position, and check hydraulic oil level of tank. Add oil if the oil level is lower than the specified level.

How to check oil level of hydraulic oil tank



1.1.4 ELECTRICAL EQUIPMENT



- (1) Handle equipment with care so as not to drop or bump it.
- (2) Connectors should be removed by unlocking while holding the connector.
Never stress the sealed end of a connector by pulling on the wire.
- (3) Check that connector is completely connected and securely locked.
- (4) Turn the engine key OFF before disconnecting and connecting connectors.
- (5) Turn the engine key OFF before touching terminals of starter and alternator.
- (6) Remove battery grounding terminal before beginning work close to battery and battery relay with tools.
- (7) Wash machine with care so as not to splash water on electrical equipment and connectors.
- (8) Before connecting a waterproofed connector, check the connector ends for moisture. If moisture is present, dry it completely before connecting.



BATTERY ACID CAUSES SERVER BURNS.

Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote:

- **EXTERNAL- Flush with water.**
- **INTERNAL - Drink large quantities of water or milk. DO NOT induce vomiting. Seek medical attention immediately.**
- **EYES - Flush with water for 15 minutes and seek medical attention immediately.**
- **BATTERIES PRODUCE EXPLOSIVE GASES. Keep sparks, flame, cigars and cigarettes away. Ventilate when charging or using in enclosed area. Always wear eye protection when working near batteries. Wash hands after handling. KEEP OUT OF REACH OF CHILDREN.**
- **When battery acid has spilled out in large quantity, use sodium bicarbonate to neutralize, or wash away with water.**

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 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. Always install the correct O-ring.
- Install O-ring so there is no distortion or twist.
- Floating seal should be put in pairs.

(2) Flexible hose (F hose)

- Even if the connector and length of hose are the same, the parts can differ according to the pressure rating. Use the correct parts.
- Tighten hose to the specified torque. Check that it is free from twist, over tension, interference, and oil leaks.

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 before starting.
- (3) When repairing attachments which are damaged, give particular attention to the plated section of piston rod to protect it from sparks. Cover the section with flame-proof material.

1.1.7 ENVIRONMENTAL ISSUES

- (1) Engine should be started and operated in an area where air can be sufficiently ventilated.
- (2) Waste disposal
Follow local regulations for the disposal of Waste oil and batteries.
- (3) Precautions for handling hydraulic oil
Hydraulic oil may cause inflammation of eyes. Wear goggles to protect eyes when handling.
 - When it has got in eyes ;
Wash eyes with water until the oil is gone.
 - When it was swallowed ;
Do not induce vomiting. Seek immediate medical attention.
 - When it has contact with the skin ;
Wash with soap and water.

1. OUTLINE

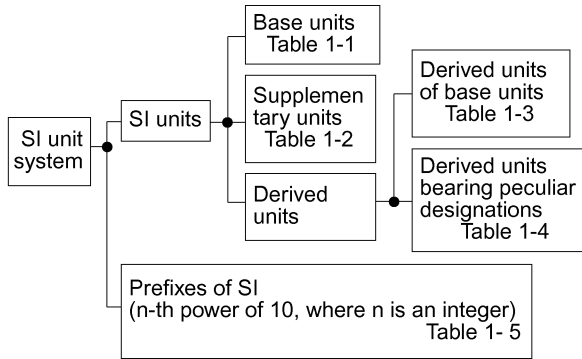
1.2 INTERNATIONAL UNIT SYSTEM

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 • 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

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