

SERVICE MANUAL

E27B

Compact Hydraulic Excavator

PIN number PV13 - and higher

Part number S5PV0023E02

English

August 2010

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COMPACT HYDRAULIC EXCAVATOR

SHOP
MANUAL model E27B

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MAINTENANCE SPECIFICATIONS

SYSTEM

DISASSEMBLING

TROUBLESHOOTING

E/G

OPT.

GENERAL SAFETY INFORMATION



Avoid injury!

The safety alert symbol is used to alert you to potential personal injury hazards. Carefully read and observe all the precautionary advice contained in this manual. Failure to comply could result in death or serious injury.

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- (1) Most accidents involving machine operating and maintenance can be avoided by following basic safety rules and precautions. Read and understand all the safety messages in this manual, the safety manual and the safety signs on the machine before you operate or service the machine. See your dealer if you have any questions.

NOTICE:

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) Read the operator's manual and make sure you understand the machine controls. All equipment has a limit. Make sure you understand the speed, brakes, steering, stability, and load characteristics of this machine.
- (3) DO NOT remove the operator's manual or the safety manual from the machine.
- (4) The safety information given in this manual does not replace safety codes, insurance needs, federal, state, or local laws. Make sure that your machine has the correct equipment according to these rules or laws.
- (5) Additional safety messages are used in the text of the manual to show specific safety hazards.
- (6) Operation, inspection and maintenance should be performed at designated intervals. It may be necessary to shorten the intervals based on machine operating conditions.
- (7) The safety information contained in the manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.
- (3) Pay close attention to safety messages in this manual and on the machine. All safety messages are identified by either "DANGER", "WARNING" and/or "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:



(SAFETY PRECAUTIONS)

WARNING

Read, understand and follow all safety precautions contained in this manual before performing any inspection or maintenance procedures on this machine, its system or components. Failure to comply could result in death or serious injury.

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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, check the weights noted in this manual. Use proper lifting procedures when removing any components. Weight of components table is shown in the Specification section.

- (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 performing maintenance or service. 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 if welding is necessary. 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 Operator's Compartment. Remove the ignition keys.
- (4) If possible, make all repairs with the machine parked on a firm level surface. Block the machine to prevent unexpected movement.
- (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

Wear goggles, safety shoes, hard hat, work clothes and work gloves to perform inspection and maintenance on this machine. Failure to comply could result in death or serious injury.

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- (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 20 kg (45 lbs) 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 cap screws 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 cap screws or nuts completely.
- (12) Use caution 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 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.

⚠ WARNING ⚠

Disconnect both the positive (+) and negative (-) battery cables from the battery before welding on the vehicle. Attach the welder ground cable no more than 0.61 m (2 ft) from the part being welded. Do not connect the ground cable to the welder to the cooling plate for the engine control module (ECM) or the engine control module itself. Welding on the engine or engine mounted components is not recommended or damage to the engine or components can result. Failure to comply could result in death or serious injury.

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- (15) Repairs which require welding should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of the parent metal. Make sure to disconnect 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. Lower the attachment and place the bucket on 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.

STOP ENGINE

Do NOT attempt any maintenance with engine running. Always stop the engine and allow machine to cool.

HOT SURFACE AND FLUIDS

Use caution and wear the proper safety equipment when working around hot areas. Never change oils, engine coolant or filters immediately after a machine has been stopped. Allow machine to cool down before performing maintenance procedure.

CLEANING PARTS

Use only approved cleaning solvents and proper equipment to clean parts.

⚠ WARNING ⚠

Never use gasoline, diesel fuel or other flammable solvents to clean parts. Always clean parts in a well ventilated area. Failure to comply could result in death or serious injury.

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NOTE:

This Manual is prepared as technical material containing the information necessary for the maintenance and repairing services of hydraulic excavators.

The material is categorized into 7 Chapters, Specification, Maintenance, System, Disassembly, Troubleshooting, Engine, and Installation Procedures for Optional Attachment.

- The Chapter "Specification" describes the specifications for entire machine and material. It contains information for attachment replacement and repair.
 - The Chapter "Maintenance" describes the material, which is helpful for maintenance service and adjustments for entire machine.
- The Chapter "System" describes the operating systems. It contains information for the hydraulic system, electric system, components, etc.
- The Chapter "Disassembly" describes the removal and installing of assembly mounted on the upper structure and undercarriage, and the assembling and disassembling of the associated hydraulic equipment.
- The Chapter "Troubleshooting" describes common faults and repair guidelines.
- The Chapter "Engine" describes the engine and the usage of the "Maintenance Manual" provided by the engine manufacturer.
- The Chapter "Installation Procedures for Optional Attachment" describes the equipment added by customer request.

Any modification or adaptation which is not approved by the manufacturer may invalidate the machine's initial conformity with safety requirements and warranty.

The information in this manual is provided on the basis of information that was available at the time the manual was written. Settings, procedures, part numbers, software and other items can change. These changes can affect the service that is given to the machine. Ensure that you have complete and current information before you start any machine operation

ATTENTION: *The engine and fuel system on your machine is designed and built to government emissions standards. Tampering by dealer, customers, operators and users is strictly prohibited by law. Failure to comply could result in government fines, rework charges, invalid warranty, legal action, and possible confiscation of the machine until rework to original condition is completed. Engine service and/or repairs must be done by a certified technician only.*

1. OUTLINE

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1. OUTLINE

Issue	Date of Issue	Applicable Machines	Remarks
First Edition	June, 2009	E10SR : PA03-05001~	S5PA0105E01 (NHK-EUR)
↑	February, 2010	CX50B : PJ06-08001~	↑ (CASE-AUS)
↑	↑	E50B : PJ06-08001~	↑ (NH-AUS)
↑	↑	SK20SR-5 : PM10-10001~ SK27SR-5 : PV13-33001~	↑ (KCM S.E.ASIA&OCE)
↑	March, 2010	SK30SR-5 : PW14-46519~ SK35SR-5 : PX15-21105~	↑ (KCM North America)
↑	↑	CX31B : PW14-46519~ CX36B : PX15-21105~	↑ (CASE-NA)
↑	↑	E30B : PW14-46519~ E35B : PX15-21105~	↑ (NH-NA)
↑	↑	CX27B : PV13-33292~	↑ (CASE-NA)
↑	↑	E27B : PV13-33292~	↑ (NH-NA)
↑	April, 2010	SK50SR-5 : PJ06-09807~	↑ (KCM North America)
↑	↑	CX50B : PJ06-09807~	↑ (CASE-NA)
↑	↑	E50B : PJ06-09807~	↑ (NH-NA)
↑	↑	SK30SR-5 : PW14-46519~ SK35SR-5 : PX15-21105~	↑ (KCM S.E.ASIA&OCE)
↑	↑	CX31B : PW14-46519~ CX36B : PX15-21105~	↑ (CASE-AUS)
↑	↑	E30B : PW14-46519~ E35B : PX15-21105~	↑ (NH-AUS)
↑	↑	CX27B : PV13-33001~	↑ (CASE-Australia)
↑	↑	E27B : PV13-33001~	↑ (NH-AUS)
↑	May, 2010	SK40SR-5 : PH07-06609~ SK50SR-5 : PJ06-09807~	↑ (KCM S.E.ASIA&OCE)
↑	↑	E50B : PJ06-09807~	↑ (NH-AUS)
↑	↑	CX50B : PJ06-09807~	↑ (CASE-AUS)
↑	↑	SK27SR-5 : PV13-33453~	↑ (NA)
↑	↑	CX27B : PV13-33453~	↑ (CASE-NA)
↑	↑	E27B : PV13-33453~	↑ (NH-NA)

1.1 GENERAL REPAIR SAFETY

1.1.1 PREPARATION



(1) UNDERSTAND THE OPERATING PROCEDURE

Read the OPERATOR'S MANUAL carefully to understand the operating procedure.

(2) CLEAN THE MACHINE

Remove soil, mud, and dust from the machine before servicing. This will allow better visibility of components and lessen contamination issues.

(3) INSPECTION

Identify the parts to be disassembled before starting work, determine the disassembling procedure by yourself considering the workshop situations etc., and request procurement of necessary parts in advance.

(4) RECORDING

Make note and record:

1. Inspection date and place.
2. Model name, applicable machine number, and hour meter read.
3. Repair issue, place and cause.
4. Visible oil leakage, water leakage and damage.
5. Clogging of filters, oil level, oil quality, oil contamination and loosening of connections.
6. Result of consideration if any problem exists based on the operation rate per month calculated from hour meter indication after the last inspection date.

(5) Arrangement and cleaning in service shop

1. Tools required for repair work.
2. Prepare space to place the disassembled parts.
3. Prepare oil containers for draining oil etc.

1.1.2 SAFETY IN DISASSEMBLING AND ASSEMBLING



WARNING



Avoid injury!

The safety alert symbol is used to alert you to potential personal injury hazards. Carefully read and observe all the precautionary advice contained in this manual. Failure to comply could result in death or serious injury.

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- (1) Be prepared for emergencies. Always have a first aid kit and a working fire extinguisher with you and know how to use each. Wear appropriate clothes with long sleeves, safety shoes, safety helmet and protective glasses.
- (2) Avoid loose-fitting clothing, loose or uncovered long hair, jewelry.
- (3) Use the correct protective equipment when servicing this machine. Hard hats, protective glasses, protective shoes, gloves, reflector type vests, respirators and ear protection are examples of the type of equipment that may be required.
- (4) Do not attempt maintenance work if you have not had the appropriate training or doubt your ability to perform the required service.
- (5) Read the repair procedure completely before starting any service or maintenance task.

1. OUTLINE

- (6) Before beginning any inspection or maintenance procedures, secure a "DO NOT OPERATE" tag to the operator's console to inform the operator that the machine will be inoperable for inspection and maintenance. This tag will prevent accidental starting of the machine.
- (7) Disconnect the battery before working on the electrical system. Know the consequences of disconnecting any electronic or computer devices.
- (8) Avoid lubrication or mechanical adjustments with the machine in motion or the engine operating. If the engine must be in operation to make certain adjustments, place the transmission in neutral, apply the parking brake, place the equipment in a safe position, securely block the tracks and use extreme caution.
- (9) Securely block the machine or any component that may fall before working on the machine or component. If possible, use a back up or secondary blocking device, also.
- (10) To prevent unexpected movement, securely block working elements when repairing or changing working tool parts such as cutting edges.
- (11) Never make repairs on pressurized components, fluid, gas or mechanical until the pressure has been relieved according to the manufacturer's instructions.
- (12) Use extreme caution when removing radiator caps, drain plugs, grease fittings or pressure taps. Park the machine and let it cool down before opening a pressurized tank.
- (13) Release all pressure before working on systems which have an accumulator. Use a piece of cardboard, newspaper, or wood to check for pressurized leaks to prevent fluid penetrating the skin. Pressurize accumulators with the proper gas according to manufacturer's recommendations.
- (14) When absolutely necessary to tow the machine, do not exceed the recommended towing speed. Be sure the towing machine has sufficient braking capacity to stop the towed load. If the towed machine cannot be braked, a tow bar must be used or two towing machines must be used. - one in front pulling and one in the rear to act as a brake. Avoid towing over long distances.
- (15) Observe proper maintenance procedures.
- (16) Whenever servicing or replacing hardened pins, etc., use a brass drift or other suitable material between the hammer and pin. Alternate: Use a brass hammer, drift or suitable material on the pin, etc.
- (17) Keep the brakes and steering systems in good operating condition.
- (18) Replace all missing, illegible or damaged safety signs. Keep all safety signs clean.
- (19) Use proper tools, and replace or repair defective tools.
- (20) Support the machine and attachment with supports or blocks if the work must be performed in a lift condition.

1.1.3 DISASSEMBLING AND ASSEMBLING HYDRAULIC EQUIPMENT



(1) REMOVING HYDRAULIC EQUIPMENT

1. Before disconnecting any hydraulic line, fitting, disconnect, release the hydraulic pressure in the system.
2. Clean the exterior surface of the equipment before disassembling.
3. Carefully drain oil from the hydraulic lines into clean uncontaminated containers.
4. Apply plugs or caps on the line ends to avoid oil spillage and contamination.

(2) DISASSEMBLING HYDRAULIC EQUIPMENT

1. Do not disassemble, reassemble or modify the hydraulic equipment without the permission of the manufacturer, The manufacturer will not be responsible for the performance and function of the product after unauthorized modification. Such modifications may void the equipment warranty.
2. Use matching marks to facilitate reassembling work.
3. Before starting the work, read the disassembly procedure and determine if work can be completed correctly by service personnel.
4. Use the special jig and tools when specified.
5. Place the removed parts in order and attach tags to facilitate reassembly.
6. Note the location and quantity of parts commonly applied to multiple locations.

(3) INSPECTING PARTS

1. Ensure that the disassembled parts are free from seizure, interference and uneven contact.
2. Measure and record wear condition of parts and clearance.
3. If the problem is found in a part, repair or replace it with a new one.

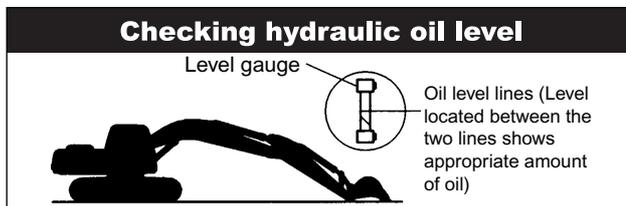
(4) REASSEMBLING HYDRAULIC EQUIPMENT

1. When cleaning parts, make certain ventilation is adequate. Wear a breathing mask if necessary.
2. Perform rough and finish cleaning before assembling.
3. Remove washing oil with air and apply clean hydraulic or gear oil for assembling.
4. Always replace the removed O-rings, backup rings and oil seals with new ones.
5. Remove dirt and moisture and degrease the surface where liquid gasket to be applied.
6. Remove rust preventive agent from the new parts before use.
7. Fit bearings, bushings and oil seals using special jigs.
8. Assemble the parts utilizing matching marks.
9. Ensure all the parts are completely assembled.

1. OUTLINE

(5) INSTALLING HYDRAULIC EQUIPMENT

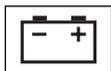
1. Ensure hydraulic oil and lubricant are properly supplied.
2. Perform air bleeding when :
 - a. Hydraulic oil changed
 - b. Parts of suction side piping replaced
 - c. Hydraulic pump installed
 - d. Slewing motor installed
 - e. Travel motor installed
 - f. Hydraulic cylinder installed
3. Perform air bleeding of the hydraulic pump and slewing motor after loosening the upper drain plug, starting the engine. Keep the engine at low idle.
Complete the air bleeding when seeping of hydraulic oil is recognized, and tightly plug.
4. Perform air bleed of the travel motor and the hydraulic cylinders by running the engine for more than 5 minutes at low speed without load.
5. Perform air bleeding of pilot line by performing a series of digging, slewing and travel.
6. Check hydraulic oil level after placing the attachment in the oil check position, and replenish oil if necessary.



NOTICE: Always make certain the machine has the correct hydraulic oil and always bleed air from the hydraulic system. Operating the equipment without oil or with air in the lines can result in damage to the machine.

NOTICE: Do not allow the hydraulic cylinder to bottom on the stroke end immediately after maintenance.

1.1.4 ELECTRICAL EQUIPMENT



BATTERY ACID CAUSES SEVERE BURNS. BATTERIES CONTAIN SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES OR CLOTHING.

ANTIDOTE: EXTERNAL - FLUSH WITH WATER.

ANTIDOTE: 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

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EXPLOSIVE GAS!

BATTERIES EMIT EXPLOSIVE HYDROGEN GAS AND OTHER FUMES WHILE CHARGING. VENTILATE THE CHARGING AREA. KEEP THE BATTERY AWAY FROM SPARKS, OPEN FLAMES, AND OTHER IGNITION SOURCES. NEVER CHARGE A FROZEN BATTERY. FAILURE TO COMPLY COULD RESULT IN DEATH OR SERIOUS INJURY.

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- (1) Disconnect battery before performing any electrical repairs.
- (2) Handle batteries carefully.
- (3) Turn the key OFF prior to connecting and disconnecting battery.
- (4) Disconnect electrical connectors by holding and pressing the lock. Do not pull the wire to apply force.
- (5) Connect the connector and ensure it is completely locked.
- (6) Turn the key OFF prior to touching the terminal of starter or generator.
- (7) Remove the ground (earth) terminal of battery when handling tools around the battery or its relay.
- (8) Do not splash water on the electrical equipment and connectors when cleaning the machine or components.
- (9) Check for moisture adhesion inside waterproof connector after removal. If moisture adhesion is found, dry it completely with low pressure before the connection.

1. OUTLINE

1.1.5 HYDRAULIC PARTS



(1) O-ring

- Ensure O-rings have elasticity and are not damaged.
- Use the appropriate O-rings. O-rings are made of various kinds of materials and have a variety of compositions in order to adhere to a variety of parts. Always use O-rings designed specifically for component being repaired.
- Fit the O-rings without distortion and/or wrinkles or folds.
- Always replace floating seals as a pair.

(2) Flexible hose (F hose)

- Use the appropriate parts. Different parts are used depending on the working pressure even if the size of fitting and the total length of the hose is same.
- Tighten the fitting at the specified torque.
Ensure no kink, tension, interference nor oil leakage is recognized.

1.1.6 WELDING REPAIR

- (1) Refer repair welding to qualified personnel according to the appropriate procedure.
- (2) Disconnect the ground (earth) cable of the battery before starting the repair.
Failure to do so will cause damage to the electrical equipment.
- (3) Do not weld near flammable materials.
- (4) Before starting the repair of the attachment, do not fail to cover the plated surface of the piston rod with flameproof shield to prevent it from being exposed to sparks.

1.1.7 ENVIRONMENTAL MEASURES

- (1) Engine exhaust fumes can cause death or serious injury. If necessary to run the engine, make certain there is adequate ventilation.
- (2) Waste disposal
Dispose of the following parts according to the relevant regulations :
Waste oil and waste container
Battery
- (3) High pressure fluids
High pressure fluid can penetrate the skin and cause serious injury. Search for leaks with a piece of cardboard. Protect hands and body from high-pressure fluids. If an injury occurs, seek medical treatment immediately. Any fluid injected into the skin must be surgically removed or gangrene may develop.
- (4) Precautions for handling hydraulic oil
Exposure of eyes to hydraulic oil will cause inflammation. Wear protective safety glasses before handling to avoid an accident. If an eye is exposed to the oil, take the following emergency measures :
-When an eye exposed :
Immediately flood with water.
-When swallowed :
Do not let induce vomiting, seek medical treatment immediately.
-When skin exposed:
Wash with water and soap.
- (5) Others
Use replacement parts and lubricants authorized as the manufacturer's genuine parts.

1.2 INTERNATIONAL UNIT CONVERSION SYSTEM (Based on MARKS' STANDARD HANDBOOK FOR MECHANICAL ENGINEERS)

Introduction

Although this manual includes International System of Unit and Foot-Pound System of Units, if you need SI unit, refer to the following international system of units.

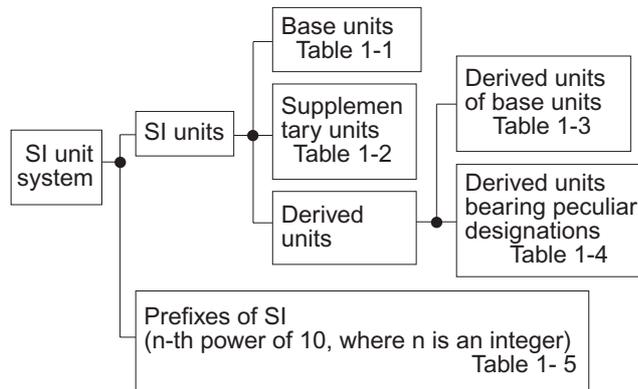
Given hereinafter is an excerpt of the units that are related to this manual.

1. Etymology of SI Unites

French: Le Systeme International d' Unites

English: International System of Units

2. Construction of SI Unit System



(1) Base units

Table 1-1

QUANTITY	UNIT	SYMBOL
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Amount of substance	mol	mol
Luminous intensity	candela	cd

(2) Supplementary units

Table 1-2

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

(3) Derived Units

Table 1-3

QUANTITY	UNIT	SYMBOL
Area	square meter	m ²
Volume	cubic meter	m ³
Velocity	meter per second	m/s
Acceleration	meter per second squared	m/s ²
Density	kilogram per cubic meter	kg/m ³

(4) Derived Units bearing Peculiar Designations

Table 1-4

QUANTITY	UNIT	SYMBOL	FORMULA
Frequency	hertz	Hz	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

1. OUTLINE

(5) Prefixes of SI

Table 1-5

PREFIX	SYMBOL	MULTIPLICATION FACTORS
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 1-6

QUANTITY	Gravitational	SI	CONVERSION FACTOR
Mass	kg	kg	
Force	kgf	N	1 kgf=9.807 N
Torque	kgf•m	N•m	kgf•m=9.807 N•m
Pressure	kgf/cm ²	MPa	1 kgf/cm ² =0.09807 MPa
Motive Power	PS	kW	1 PS=0.7355 kW
Revolution	rpm	min ⁻¹	r/min *1

*1 Units that are allowed to use.

2. SPECIFICATIONS

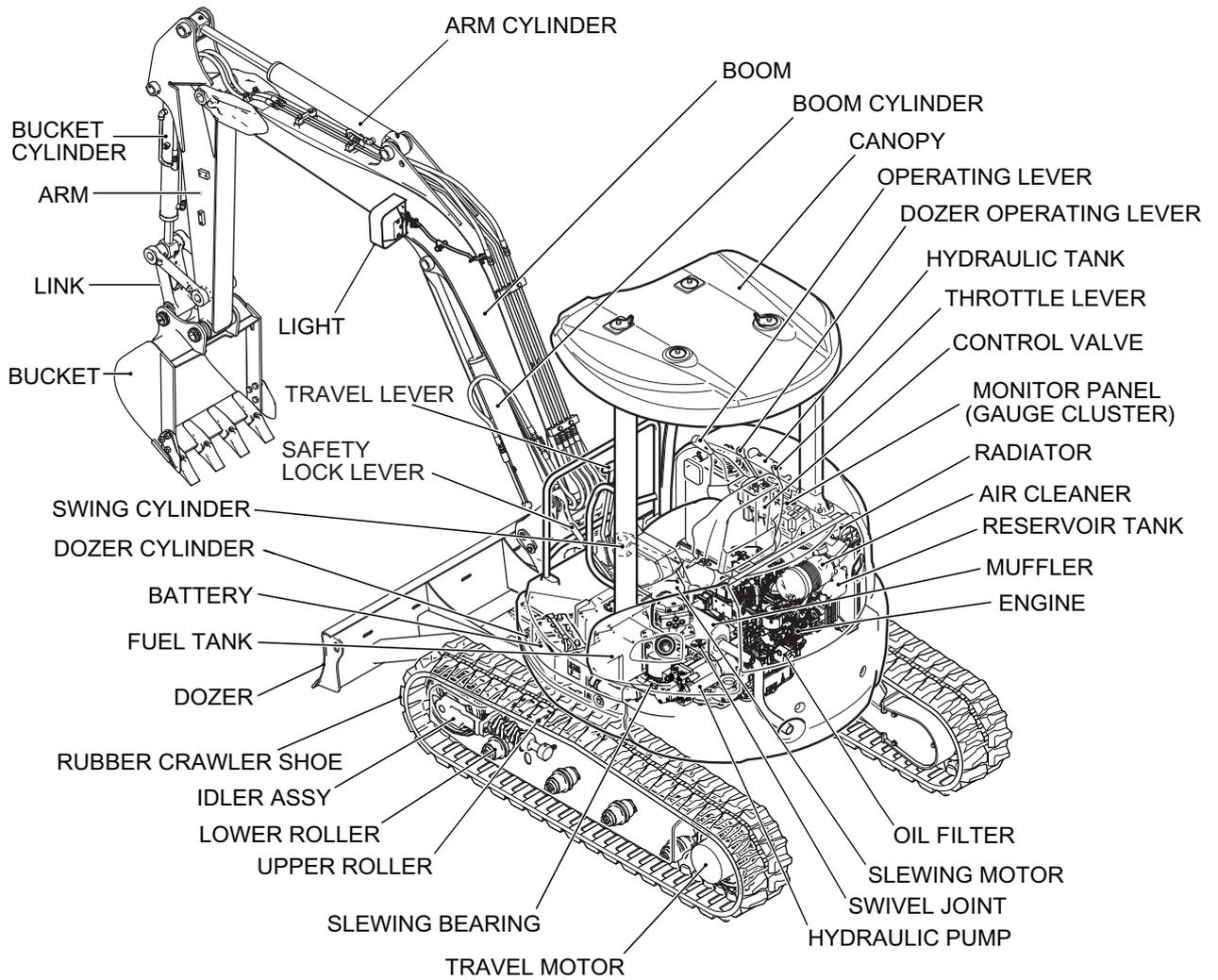
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2. SPECIFICATIONS

Issue	Date of Issue	Applicable Machines	Remarks
First Edition	May, 2010	: PV13-	S5PV0222E01 (NA)
Revision	June, 2010	: PV13-33453~	S5PV0222E02 (NA)

2.1 COMPONENT LOCATION



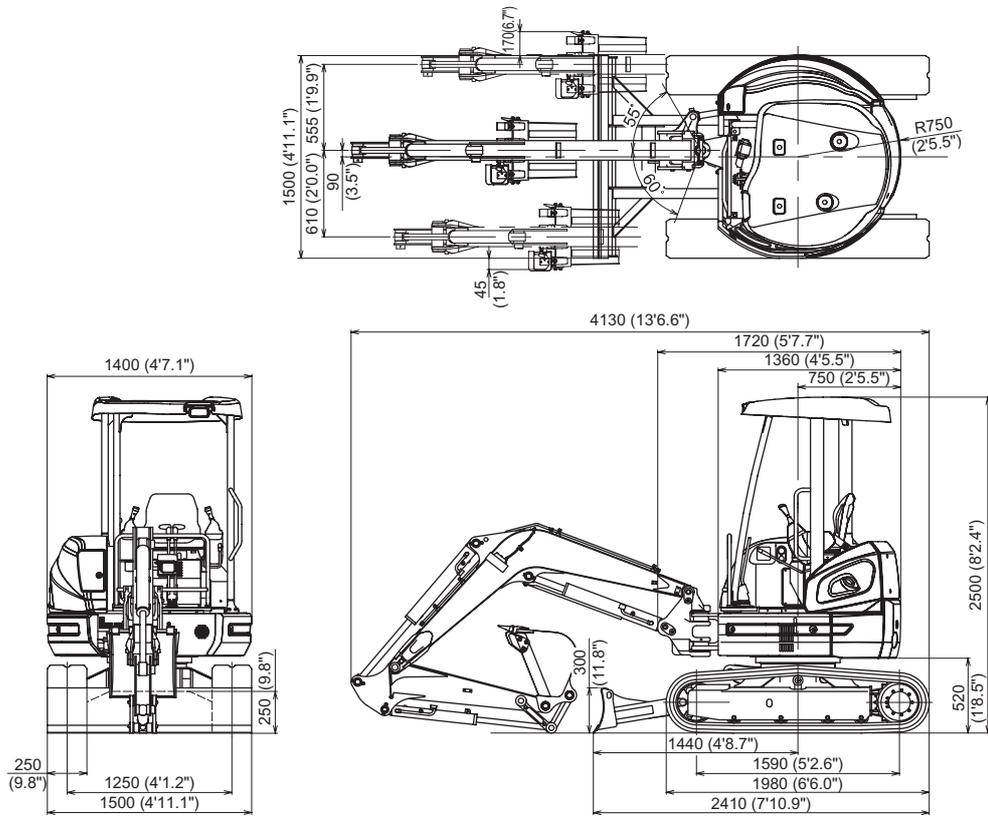
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2. SPECIFICATIONS

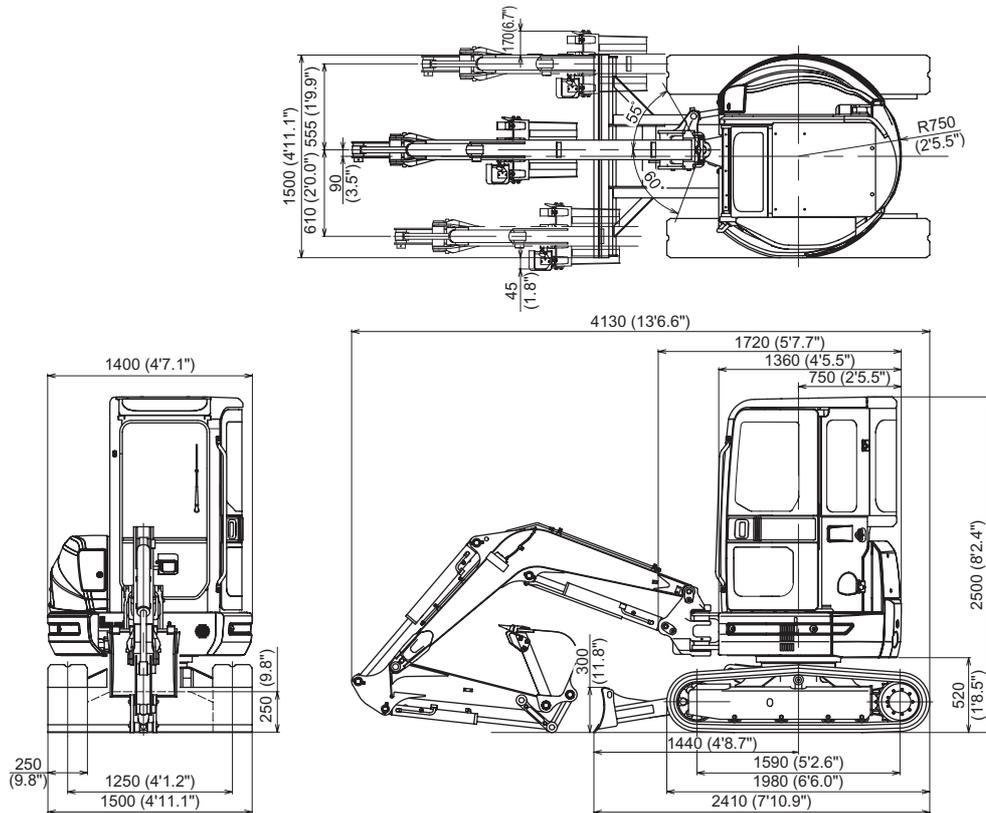
2.2 MACHINE DIMENSIONS

(1) (CANOPY)

Unit: mm (ft-in)



(2) (CAB)



2.3 SPECIFICATIONS AND PERFORMANCE

SPEED AND GRADEABILITY

Model					
Applicable Machines	PV13-33453~				
Shoe Type	Rubber shoe		Iron shoe (OPT)		
Slewing Speed	min ⁻¹ {rpm}	8.7 (8.7)			
Travel Speed	km/h (mph)	Low (1st)	High (2nd)	Low (1st)	High (2nd)
		2.3	4.0	2.3	4.0
Gradeability	% (degree)	58(30)			

ENGINE

Model (YANMAR)	3TNV82A-SYB			
Type	Water-cooled, 4-cycle type Swirl chamber type diesel engine			
Number of cylinders-Bore X Stroke	3 - 82 dia. mm X 84 mm (3.23 in X 3.31 in)			
Total Displacement	L	1.330 (81.2 cu-in)		
Output Rating	kW/min ⁻¹ {PS/rpm}	15.9/2,200 (21.6/2,200)		
Intermediate Torque (Net)	N-m/min ⁻¹ (lbf-ft/rpm)	79.0~86.0/1,320±100 (58.3~63.4/1,320±100)		
Starting Motor	V X kW	12 X 1.7		
Generator	V X A	12 X 40		

HYDRAULIC COMPONENTS

Hydraulic Pump	Variable displacement axial piston + gear pump			
Hydraulic Motor	Axial piston			
Hydraulic Motor w/Reducer (Travel)	2-Axial piston, 2-Speed motor			
Control Valve	10-spool multiple control valve			
Cylinder (Boom, Arm, Swing, Bucket, Dozer)	Double action cylinder			
Return Filter	Safety valve containing/Filter Type (30μ)			

SIDE DIGGING & DOZER

Type	Boom swing by hydraulic cylinder			
Boom Swing Angle	Right	55 degrees		
	Left	60 degrees		
Stroke of Dozer (above/below)	mm (in)	445 / 335 (17.5/13.2)		

2. SPECIFICATIONS

WEIGHT

Machine Weight	kg (lb)	Rubber shoe	Iron shoe
		2,490 (5490)	2,620 (5780)
Upper slewing body	kg (lb)	1,310 (2890)	<--
Travel system	kg (lb)	830 (1830)	960 (2120)
Attachment (Boom+STD Arm+STD Bucket)	kg (lb)	300 (660)	
Oil & Water	kg (lb)	50 (110)	

Note

This figure is calculated with standard bucket.

2.4 MACHINE & COMPONENTS WEIGHT (DRY)

Unit ; kg (lb)

MODEL				
	RUBBER SHOE		IRON SHOE	
	CANOPY	CAB	CANOPY	CAB
COMPLETE MACHINE	2,490 (5490)	2,630 (5800)	2,620 (5780)	2,760 (6080)
UPPER FRAME ASSEMBLY (ASSY OF FOLLOWING)	1,310 (2890)	1,450 (3200)	1,310 (2890)	1,450 (3200)
UPPER FRAME	265 (584)	<--	<--	<--
CANOPY / CAB	85 (187)	220 (485)	85 (187)	220 (485)
ENGINE	130 (287)	<--	<--	<--
HYDRAULIC PUMP	18 (40)	<--	<--	<--
RADIATOR	3 (7)	<--	<--	<--
HYDRAULIC TANK	30 (66)	<--	<--	<--
FUEL TANK	4 (9)	<--	<--	<--
SWING BRACKET	59 (130)	<--	<--	<--
SWING CYLINDER	23 (51)	<--	<--	<--
SLEWING MOTOR	32 (71)	<--	<--	<--
CONTROL VALVE	24 (53)	<--	<--	<--
COUNTERWEIGHT	290 (639)	<--	<--	<--
GUARD - BONNET	97 (214)	<--	<--	<--
BOOM CYLINDER	24 (53)	<--	<--	<--
LOWER FRAME ASSEMBLY (ASSY OF FOLLOWING)	830 (1830)	<--	960 (2120)	<--
LOWER FRAME	328 (723)	<--	<--	<--
SLEWING BEARING	36 (79)	<--	<--	<--
TRAVEL MOTOR	27X2 (60X2)	<--	<--	<--
LOWER ROLLER	6X8 (13X8)	<--	<--	<--
FRONT IDLER	17X2 (37X2)	<--	<--	<--
IDLER ADJUSTER	11X2 (24X2)	<--	<--	<--
SPROCKET	5X2 (11X2)	<--	<--	<--
250mm (9.8") RUBBER CRAWLER SHOE	80 (176)X2	<--	-	-
250mm (9.8") IRON SHOE	-	-	147X2 (324X2)	<--
SWIVEL JOINT	11 (24)	<--	<--	<--
DOZER	117 (260)	<--	<--	<--
DOZER CYLINDER	20 (44)	<--	<--	<--
ATTACHMENT ASSEMBLY (ASSY OF FOLLOWING)	300 (662)	<--	<--	<--
BOOM ASSEMBLY	125 (276)	<--	<--	<--
BOOM	88 (194)	<--	<--	<--
ARM CYLINDER	28 (62)	<--	<--	<--
ARM ASSEMBLY	95 (209)	<--	<--	<--
ARM	51 (112)	<--	<--	<--
BUCKET CYLINDER	17 (37)	<--	<--	<--
BUCKET LINK	6 (13)	<--	<--	<--
IDLER LINK	2X2 (4X2)	<--	<--	<--
BUCKET ASSEMBLY (STD)	64 (141)	<--	<--	<--
FLUIDS (ASSY OF FOLLOWING)	50 (110)	<--	<--	<--
HYDRAULIC OIL	24 (53)	<--	<--	<--
FUEL	22 (49)	<--	<--	<--
COOLANT	4 (9)	<--	<--	<--

2

2. SPECIFICATIONS

Note

Bucket weight is shown with standard bucket weight

2.5 TRANSPORTATION

GROUND TRANSPORTATION

1. Machine Preparation

- a. Know the total weight, length, width and height of the machine being transported. Know route to be traveled. Investigate bridges, overpasses, height of road signs on route.
- b. Obtain any permits required from proper government agencies for machine transportation.
- c. Use only a trailer with a rated capacity sufficient to transport the machine.
- d. Make certain trailer has ramps or a ramp is available for loading and unloading the machine.

2. Loading the Machine



Never attempt to load or unload machine without ramps. Failure to comply could result in death or serious injury

B121

- a. Apply parking brakes on tractor and trailer and chock trailer wheels before attempting to load or unload machine.
- b. Lower ramps of trailer.
- c. Start the machine.
- d. Set travel speed to LOW - 1st speed.
- e. Move throttle control to low idle position.
- f. Raise the attachment and slowly travel machine up trailer ramps and over rear axles of trailer.
- g. Slowly move machine completely onto trailer until in proper transport position.
- h. Slowly swing machine 180° until attachment is toward rear of trailer.
- i. Slowly lower boom until attachment rests on trailer bed.
- j. Do not have bucket and arm cylinder at full stroke during transport as this may cause damage to cylinders.

NOTICE: *Do not put chains over or against any hydraulic line or hoses.*

3. Fasten machine to trailer with chains or cables.

During transportation, the bucket or attachments may hit the canopy or the cab. Therefore, set the machine in the transporting position by observing following points:

- a. Extend the bucket cylinder fully.
- b. Extend the arm cylinder fully.
- c. Lower the boom.
- d. If machine cannot be transported with arm cylinder fully extended, remove bucket or attachment and extend arm cylinder.
- e. Use cable or wire rope with sufficient capacity to secure front and rear of the machine to trailer. Chock the tracks, use the lower frame front and rear brackets to secure machine to trailer. Also, make sure to secure front and rear of each track.
- f. Securely fasten all loose parts, as well as removed parts from the machine to the trailer or transporting platform.

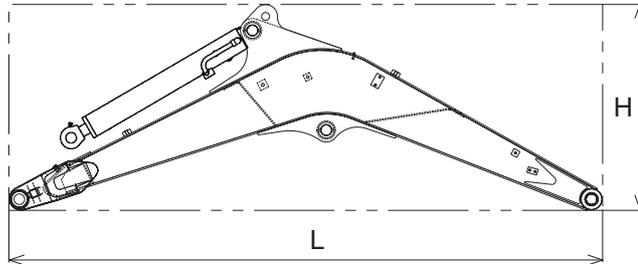
NOTICE: *Place a cover over the exhaust pipe of the machine and secure to avoid water entering the engine.*

2. SPECIFICATIONS

(2) TRANSPORTATION DIMENSION AND WEIGHT OF ATTACHMENT

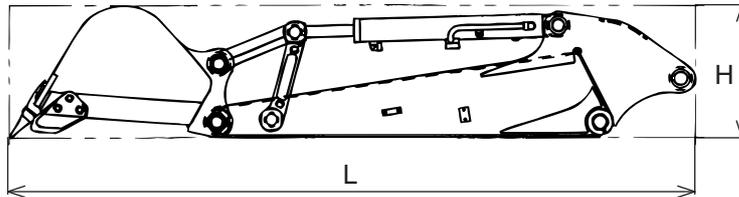
1. BOOM WITH ARM CYLINDER

Model	
L X H X W mm(ft-in)	2,230 X 775 X 220 (7'3.8" X 2'6.5" X 8.7")
Weight w/Arm cyl. kg (lb)	125 (276)



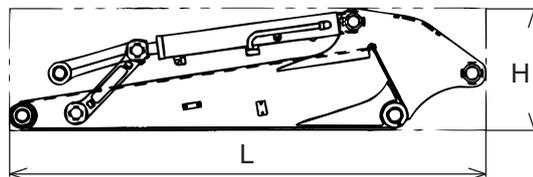
2. ARM AND BUCKET

Model	
L X H X W mm (ft-in)	2,050 X 400 X 500 (6'8.7" X 1'3.7" X 1'7.7")
Weight kg (lb)	160 (353)



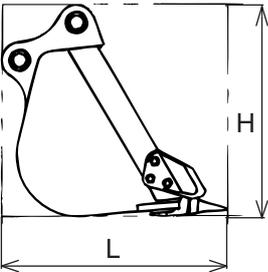
3. ARM

Model	
L X H X W mm (ft-in)	1,440 X 400 X 250 (4'8.7" X 1'3.7" X 9.8")
Weight kg (lb)	95 (209)



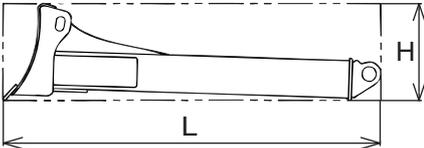
4. BUCKET (standard bucket)

Model	
Heaped capacity m ³ (cu-yd)	0.08 (0.105)
L X H X W mm (ft-in)	650 X 550 X 500 (2'1.6" X 1'9.7" X 1'7.7")
Weight kg (lb)	60 (132)



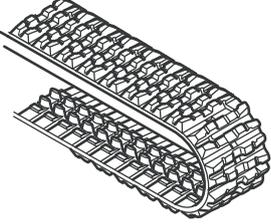
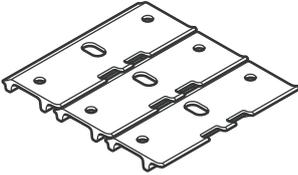
5. DOZER WITHOUT CYLINDER WEIGHT

Model	
L X H X W mm (ft-in)	1,110 X 290 X 1,500 (3'7.7" X 11.4" X 4'11.1")
Weight kg (lb)	117 (258)

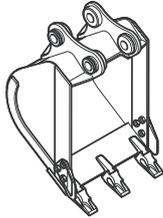


2. SPECIFICATIONS

2.6 TYPE OF CRAWLER SHOES

Type	Model	Shoe width mm (in)	Total Crawler width mm (ft•in)	Number of Link	Ground pressure kPa (psi)	
					CANOPY	CAB
Rubber shoe 	E27B	250 (9.8")	1,500 (4'11.1")	80	28 (4.1)	30 (4.4)
Iron shoe (option) 	E27B	250 (9.8")	1,500 (4'11.1")	41	30 (4.4)	31 (4.5)

2.7 TYPE OF BUCKET

Type	Model	Heaped capacity m ³ (cu.yd)	Outer width mm (in)		Number of tooth	Weight kg (lb)	Remarks
			with side cutter	without side cutter			
Back hoe bucket 	E27B	0.08 (0.105)	500 (1'7.7")	435 (1'5.1")	3	60 (132)	Standard size

2

Note

This table shows standard bucket.