

Shop Manual Addendum

AVANCE

**PC200LL-6
PC220LL-6**

LOGGING EXCAVATOR

SERIAL NUMBERS **PC200LL-6** **A85001** and UP
PC220LL-6 **A85001**

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It is our policy to improve our products whenever it is possible and practical to do so. We reserve the right to make changes or add improvements at any time without incurring any obligation to install such changes on products sold previously.

Due to this continuous program of research and development, periodic revisions may be made to this publication. It is recommended that customers contact their distributor for information on the latest revision.

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IF A TOPIC IS NOT DIRECTLY ADDRESSED IN THE ADDENDUM FOR THE PC200LL OR PC220LL, PLEASE USE THE TOPIC CONTAINED IN THE STANDARD *SHOP MANUAL* UNDER THE HEADING OF PC200, PC200LC, PC220, OR PC220LC.

PRODUCT PUBLICATIONS INFORMATION

Various product Parts and Service Publications are available to all **KOMATSU** construction equipment owners, including operation and maintenance manuals, parts books and shop manuals.

Special publications, such as service tool, air conditioning and turbocharger shop manuals are also available as well as selected Operation & Service Manuals in foreign languages.

The Publications listed below are available for this particular machine(s).

DESCRIPTION	FORM NUMBER
PARTS BOOK	
Chassis and Engine - PC200LL-6.	BEPB009500
Chassis and Engine - PC220LL-6.	BEPB009600
OPERATION AND MAINTENANCE MANUAL	
Chassis and Engine.	CEAM008400
SHOP MANUAL	
Chassis.	CEBM005700
Engine.	SEBM010010
SAFETY MANUAL	
Excavator.	HE92-2

Parts and Service Publications can only be acquired by authorized **KOMATSU** distributors using the Komatsu America International Company Parts Inventory Processing System (PIPS).



If the PIPS system is not available at the distributor location, then the following Requisition for Technical Service Publications and Service Forms can be used. Form KDC91E is shown on the reverse side of this page.

SAFETY

SAFETY NOTICE

IMPORTANT SAFETY NOTICE

Proper service and repair is extremely important for the safe operation of your machine. The service and repair techniques recommended and described in this manual are both effective and safe methods of operation. Some of these operations require the use of tools specially designed for the purpose.

To prevent injury to workers, the symbols  and  are used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the OPERATION & MAINTENANCE MANUAL carefully BEFORE operating the machine.

1. Before carrying out any greasing or repairs, read all the precautions given on the decals which are fixed to the machine.
2. When carrying out any operation, always wear safety shoes and helmet. Do not wear loose work clothes, or clothes with buttons missing.
 - Always wear safety glasses when hitting parts with a hammer.
 - Always wear safety glasses when grinding parts with a grinder, etc.
3. If welding repairs are needed, always have a trained, experienced welder carry out the work. When carrying out welding work, always wear welding gloves, apron, glasses, cap and other clothes suited for welding work.
4. When carrying out any operation with two or more workers, always agree on the operating procedure before starting. Always inform your fellow workers before starting any step of the operation. Before starting work, hang UNDER REPAIR signs on the controls in the operator's compartment.
5. Keep all tools in good condition and learn the correct way to use them.
6. Decide a place in the repair workshop to keep tools and removed parts. Always keep the tools and parts in their correct places. Always keep the work area clean and make sure that there is no dirt or oil on the floor. Smoke only in the areas provided for smoking. Never smoke while working.

PREPARATIONS FOR WORK

1. Before adding oil or making repairs, park the machine on hard, level ground, and block the wheels or tracks to prevent the machine from moving.
2. Before starting work, lower blade, ripper, bucket or any other work equipment to the ground. If this is not possible, insert the safety pin or use blocks to prevent the work equipment from falling. In addition, be sure to lock all the control levers and hang warning signs on them.
3. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
4. Remove all mud and oil from the steps or other places used to get on and off the machine. Always use the handrails, ladders or steps when getting on or off the machine. Never jump on or off the machine. If it is impossible to use the handrails, ladders or steps, use a stand to provide safe footing.

PRECAUTIONS DURING WORK

1. When removing the oil filler cap, drain plug or hydraulic pressure measuring plugs, loosen them slowly to prevent the oil from spurting out. Before disconnecting or removing components of the oil, water or air circuits, first remove the pressure completely from the circuit.
2. The water and oil in the circuits are hot when the engine is stopped, so be careful not to get burned. Wait for the oil and water to cool before carrying out any work on the oil or water circuits.
3. Before starting work, remove the leads from the battery. ALWAYS remove the lead from the negative (-) terminal first.

4. When raising heavy components, use a hoist or crane. Check that the wire rope, chains and hooks are free from damage. Always use lifting equipment which has ample capacity. Install the lifting equipment at the correct places. Use a hoist or crane and operate slowly to prevent the component from hitting any other part. Do not work with any part still raised by the hoist or crane.
5. When removing covers which are under internal pressure or under pressure from a spring, always leave two bolts in position on opposite sides. Slowly release the pressure, then slowly loosen the bolts to remove.
6. When removing components, be careful not to break or damage the wiring, Damaged wiring may cause electrical fires.
7. When removing piping, stop the fuel or oil from spilling out. If any fuel or oil drips on to the floor, wipe it up immediately. Fuel or oil on the floor can cause you to slip, or can even start fires.
8. As a general rule, do not use gasoline to wash parts. In particular, use only the minimum of gasoline when washing electrical parts.
9. Be sure to assemble all parts again in their original places. Replace any damaged part with new parts.
 - When installing hoses and wires, be sure that they will not be damaged by contact with other parts when the machine is being operated.
10. When installing high pressure hoses, make sure that they are not twisted. Damaged tubes are dangerous, so be extremely careful when installing tubes for high pressure circuits. Also check that connecting parts are correctly installed.
11. When assembling or installing parts, always use the specified tightening torques. When installing protective parts such as guards, or parts which vibrate violently or rotate at high speed, be particularly careful to check that they are installed correctly.
12. When aligning two holes, never insert your fingers or hand. Be careful not to get your fingers caught in a hole.
13. When measuring hydraulic pressure, check that the measuring tool is correctly assembled before taking any measurements.
14. Take care when removing or installing the tracks of track-type machines. When removing the track, the track separates suddenly, so never let anyone stand at either end of the track.

GENERAL

This shop manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This shop manual mainly contains the necessary technical information for operations performed in a service workshop. For ease of understanding, the manual is divided into the following sections. These sections are further divided into each main group of components.

GENERAL

This section lists the general machine dimensions, performance specifications, component weights, and fuel, coolant and lubricant specification charts.

STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

TESTING, ADJUSTING AND TROUBLESHOOTING

This section explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs. Troubleshooting charts correlating "Problems" to "Causes" are also included in this section.

DISASSEMBLY AND ASSEMBLY

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

NOTICE

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your distributor for the latest information.

HOW TO READ THE SHOP MANUAL

VOLUMES

Shop manuals are issued as a guide to carrying out repairs. They are divided as follows:

- Chassis volume:** Issued for every machine model
- Engine volume:** Issued for each engine series

- Electrical volume:** Each issued as one to cover all models
- Attachment volume:** Each issued as one to cover all models

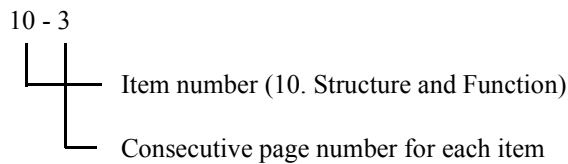
These various volumes are designed to avoid duplication of information. Therefore to deal with all repairs for any model, it is necessary that chassis, engine, electrical and attachment be available.

DISTRIBUTION AND UPDATING

Any additions, amendments or other changes will be sent to your distributors. Get the most up-to-date information before you start any work.

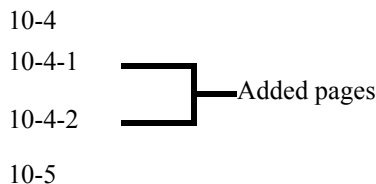
FILING METHOD

1. See the page number on the bottom of the page. File the pages in correct order.
2. Following examples show how to read the page number: Example:



3. Additional pages: Additional pages are indicated by a hyphen (-) and numbered after the page number. File as in the example.

Example:



REVISED EDITION MARK

When a manual is revised, an edition mark (①②③...) is recorded on the bottom outside corner of the pages.

REVISIONS

Revised pages are shown at the LIST OF REVISED PAGES between the title page and SAFETY page.

SYMBOLS

So that the shop manual can be of ample practical use, important places for safety and quality are marked with the following symbols.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
★	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.
	Weight	Weight of parts or systems. Caution necessary when selecting hoisting wire or when working posture is important, etc.
	Tightening torque	Places that require special attention for tightening torque during assembly.
	Coat	Places to be coated with adhesives and lubricants etc.
	Oil, water	Places where oil, water or fuel must be added, and the capacity.
	Drain	Places where oil or water must be drained, and quantity to be drained.

HOISTING INSTRUCTIONS

HOISTING



WARNING! Heavy parts (25 kg or more) must be lifted with a hoist etc. In the DISASSEMBLY AND ASSEMBLY section, every part weighing 25 kg or more is indicated clearly with the symbol



- If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
 1. Check for removal of all bolts fastening the part to the relative parts.
 2. Check for existence of another part causing interface with the part to be removed.

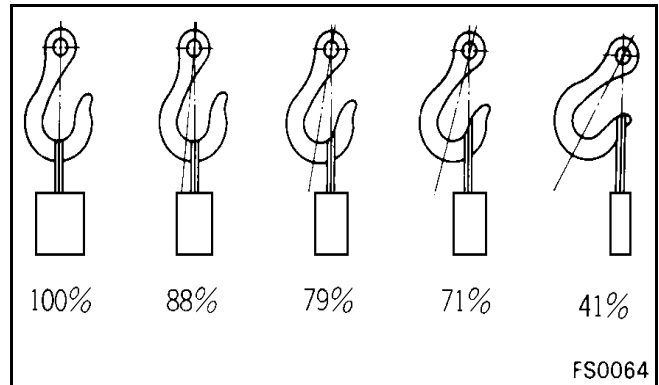
WIRE ROPES

1. Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

Wire ropes
(Standard "Z" or "S" twist ropes without galvanizing)

Rope diameter mm	Allowable load	
	kN	tons
10	9.8	1.0
11.2	13.7	1.4
12.5	15.7	1.6
14	21.6	2.2
16	27.5	2.8
18	35.3	3.6
20	43.1	4.4
22.4	54.9	5.6
30	98.1	10.0
40	176.5	18.0
50	274.6	28.0
60	392.2	40.0

- ★ The allowable load value is estimated to be 1/6 or 1/7 of the breaking strength of the rope used.
2. Sling wire ropes from the middle portion of the hook. Slings near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.

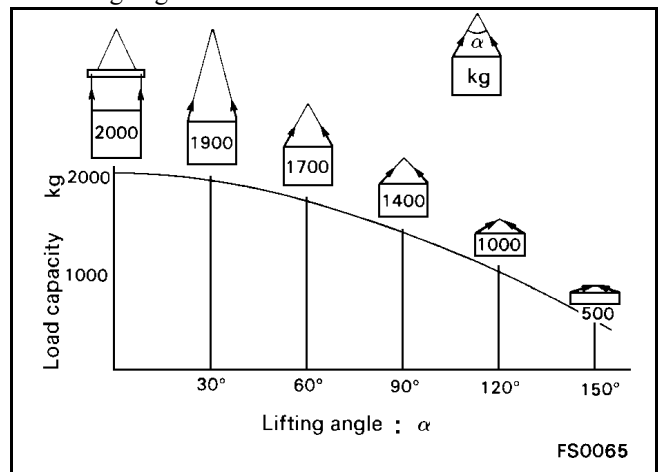


3. Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.



WARNING! Slings with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident

4. Do not sling a heavy load with ropes forming a wide hanging angle from the hook. When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various hanging angles. When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended. This weight becomes 1000 kg when two ropes make a 120° hanging angle. On the other hand, two ropes are subject to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°



COATING MATERIALS

★ The recommended coating materials prescribed in the shop manuals are listed below.


Category	Code	Part No.	Quantity	Container	Main applications, features
Adhesives	LT-1A	790-129-9030	150 g	Tube	<ul style="list-style-type: none"> Used to prevent rubber gaskets, rubber cushions and cork plugs from coming out
	LT-1B	790-129-9050	20 g (2 pes.)	Polyethylene container	<ul style="list-style-type: none"> Used in places requiring an immediately effective, strong adhesive. Used for plastics (except polyethylene, polypropylene, tetrafluoroethylene, and vinyl chloride), rubber, metal and non-metal.
	LT-2	09940-00030	50 g	Polyethylene container	<ul style="list-style-type: none"> Features: Resistance to heat, chemicals Used for anti-loosening and sealant purposes for bolts and plugs.
	LT-3	790-129-9060 (Set of adhesive and hardening agent)	Adhesive: 1 kg Hardening agent: 500 g	Can	<ul style="list-style-type: none"> Used as adhesive or sealant for metal, glass or plastic.
	LT-4	790-129-9040	250 g	Polyethylene container	<ul style="list-style-type: none"> Used as sealant for machined holes.
	Holtz MH 705	790-126-9120	75 g	Tube	<ul style="list-style-type: none"> Used as heat-resisting sealant for repairing engine.
	Three bond 1735	179-129-9140	2 g	Polyethylene container	<ul style="list-style-type: none"> Quick hardening type adhesive. Cure time: within 5 sec. to 3 min. Used mainly for adhesion of metals, rubbers, plastics and woods.
	Aron-alpha 201	790-129-9130	50 g	Polyethylene container	<ul style="list-style-type: none"> Quick hardening type adhesive. Quick cure type (max. strength after 30 minutes). Used mainly for adhesion of rubbers, plastics and metals.
	Loctite 648-50	79A-129-9110	50 cc	Polyethylene container	<ul style="list-style-type: none"> Features: Resistance to heat, chemicals Used at joint portions subject to high temperature.
Gasket sealant	LG-1	790-129-9010	200 g	Tube	<ul style="list-style-type: none"> Used as adhesive or sealant for gaskets and packing of power train case, etc.
	LG-3	790-129-9070	1 kg	Can	<ul style="list-style-type: none"> Features: Resistance to heat Used as sealant for flange surfaces and bolts at high temperature locations; used to prevent seizure. Used as sealant for heat resistant gasket for at high temperature locations such as engine pre-combustion chamber, exhaust pipe.


Category	Code	Part No.	Quantity	Container	Main applications, features
Gasket sealant	LG-4	790-129-9020	200 g	Tube	<ul style="list-style-type: none"> ● Features: Resistance to water, oil ● Used as sealant for flange surface, thread. ● Also possible to use as sealant for flanges with large clearance. ● Used as sealant for mating surfaces of final drive case, transmission case.
	LG-5	790-129-9080	1 kg	Polyethylene container	<ul style="list-style-type: none"> ● Used as sealant for various threads, pipe joints, flanges. ● Used as sealant for tapered plugs, elbows, nipples of hydraulic piping.
	LG-6	09940-00011	250 g	Tube	<ul style="list-style-type: none"> ● Features: Silicon based, resistant to heat, cold. ● Used as sealant for flange surface, thread. ● Used as sealant for oil pan, final drive case, etc.
	LG-7	09920-00150	150 g	Tube	<ul style="list-style-type: none"> ● Features: Silicon based, quick hardening type. ● Used as sealant for flywheel housing, intake manifold, oil pan, thermostat housing, etc.
	Three bond 1211	790-129-9090	100 g	Tube	<ul style="list-style-type: none"> ● Used as heat-resisting sealant for repairing engines.
Molybdenum disulphide lubricant	LM-G	09940-00051	60 g	Can	<ul style="list-style-type: none"> ● Used as lubricant for sliding parts (to prevent squeaking).
	LM-P	09940-00040	200 g	Tube	<ul style="list-style-type: none"> ● Used to prevent seizure or scuffing of the thread when press fitting or shrink fitting. ● Used as lubricant for linkage, bearings, etc.
Grease	G2-LI	SYG2-400LI SYG2-350LI SYG2-400LI-A SYG2-160LI SYGA160CNLI	Various	Various	<ul style="list-style-type: none"> ● General purpose type
	G2-CA	SYG2-400CA SYG2-350CA SYG2-400CA-A SYG2-160CA SYG2-160CNCA	Various	Various	<ul style="list-style-type: none"> ● Used for normal temperature, light load bearing at places in contact with water or steam.
	Molybdenum disulphide lubricant	SYG2-400M	400 g (10 per case)	Belows type	<ul style="list-style-type: none"> ● Used for places with heavy load.

STANDARD TIGHTENING TORQUE

STANDARD TIGHTENING TORQUE OF BOLTS AND NUTS

The following charts give the standard tightening torques of bolts and nuts. Exceptions are given in DISASSEMBLY AND ASSEMBLY.

Thread diameter of bolt	Width across flats		
		Nm	kgm
mm	mm		
6	10	13.2 ±1.4	1.35 ±0.15
8	13	31.4 ±2.9	3.20 ±0.3
10	17	65.7 ±6.8	6.70 ±0.7
12	19	112 ±9.8	11.5 ±1.0
14	22	177 ±19	18 ±2.0
16	24	279 ±29	28.5 ±3
18	27	383 ±39	39 ±4
20	30	549 ±58	56 ±6
22	32	745 ±78	76 ±8
24	36	927 ±98	94.5 ±10
27	41	1320 ±140	135 ±15
30	46	1720 ±190	175 ±20
33	50	2210 ±240	225 ±25
36	55	2750 ±290	280 ±30
39	60	3280 ±340	335 ±35

Thread diameter of bolt	Width across flats		
		Nm	kgm
mm	mm		
6	10	7.85 ± 1.95	0.8 ± 0.2
8	13	18.6 ± 4.9	1.9 ± 0.5
10	14	40.2 ± 5.9	4.1 ± 0.6
12	27	82.35 ± 7.85	8.4 ± 0.8

TIGHTENING TORQUE OF HOSE NUTS

Use these torques for hose nuts.

Nominal No.	Thread diameter	Width across flat	Tightening torque	
	mm	mm	Nm	kgm
02	14	19	24.5 ± 4.9	2.5 ± 0.5
03	18	24	49 ± 19.6	5 ± 2
04	22	27	78.5 ± 19.6	8 ± 2
05	24	32	137.3 ± 29.4	14 ± 3
06	30	36	176.5 ± 29.4	18 ± 3
10	33	41	196.1 ± 49	20 ± 5
12	36	46	245.2 ± 49	25 ± 5
14	42	55	294.2 ± 49	30 ± 5

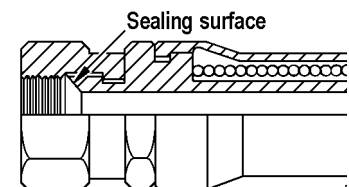
TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

Use these torques for split flange bolts.

Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	kgm
10	14	65.7 ± 6.8	6.7 ± 0.7
12	17	112 ± 9.8	11.5 ± 1
16	22	279 ± 29	28.5 ± 3

TIGHTENING TORQUE FOR FLARED NUTS

































Use these torques for flared part of nut.



Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	kgm
14	19	24.5 ± 4.9	2.5 ± 0.5
18	24	49 ± 19.6	5 ± 2
22	27	78.5 ± 19.6	8 ± 2
24	32	137.3 ± 29.4	14 ± 3
30	36	176.5 ± 29.4	18 ± 3
33	41	196.1 ± 49	20 ± 5
36	46	245.2 ± 49	25 ± 5
42	55	294.2 ± 49	30 ± 5

ALTERNATIVE FASTENERS

BOLT IDENTIFICATION CHART

TYPE/CLASS	DESCRIPTION	HEAD MARK
Type 5 Inch Thread	Three radial lines on top and none on side of head. Medium carbon steel quenched and tempered.	 
Type 5.2 Inch Thread	Three radial lines on top and none on side of head. Low carbon boron steel quenched and tempered.	 
Type 8 Inch Thread	Six radial lines on top and none on side of head. Medium carbon or carbon alloy steel quenched and tempered.	 
Type 8.2 Inch Thread	Six radial lines on top and none on side of head. Low carbon boron steel quenched and tempered.	 
Class 5.8 Metric Thread	Marked on top or side of head. Low or medium carbon steel.	 
Class 8.8 Metric Thread	Marked on top or side of head. Medium carbon or carbon alloy or low carbon boron steel quenched and tempered.	 
Class 9.8 Metric Thread	Marked on top or side of head. Medium carbon or carbon alloy or low carbon boron steel quenched and tempered.	 
Class 10.9 Metric Thread	Marked on top or side of head. Medium carbon or carbon alloy or low carbon boron steel quenched and tempered.	 
Type 8R Inch Thread	Six radial lines on head with type designation, none on sides. Medium carbon or medium carbon alloy steel quenched and tempered.	 
Type 8R Inch Thread	Six radial lines on head with type designation, none on sides. Low carbon boron steel quenched and tempered.	 
Type 9 Inch Thread	Six radial lines on head with type designation, none on sides. Medium carbon alloy steel quenched and tempered.	 
Type 9R Inch Thread	Six radial lines on head with type designation, none on sides. Medium carbon alloy steel quenched and tempered.	 
Class 10.9R Metric Thread	Marked on top or side of head. Medium carbon or carbon alloy steel quenched and tempered.	 
Class <u>10.9R</u> Metric Thread	Marked on top or side of head and underlined. Low carbon boron steel quenched and tempered.	 
Class 12.9 Metric Thread	Marked on top or side of head. Medium carbon alloy steel quenched and tempered.	 
Class 12.9R Metric Thread	Marked on top or side of head. Medium carbon alloy steel quenched and tempered.	 

GRADE 5 AND 8 NON-PHOSPHATE COATED HARDWARE

Recommended torque for all standard application nuts and bolts, provided; all thread surfaces are clean and lubricated with SAE-30 engine oil or joints are rigid, that is, no gaskets or compressible materials are used. When reusing nuts or bolts, use minimum torque values.

THREAD	GRADE 5	
	N•m	lbf ft
1/4NC	8	6
1/4NF	9	7
5/16NC	18	13
5/16NF	20	15
3/8NC	33	24
3/8NF	37	27
7/16NC	52	38
7/16NF	57	42
1/2NC	79	58
1/2NF	88	65
9/16NC	114	84
9/16NF	126	93
5/8NC	156	115
5/8NF	175	130
3/4NC	278	205
3/4NF	312	240
7/8NC	414	305
7/8NF	454	334
1NC	617	455
1NF	691	510
1-1/8NC	827	610
1-1/8NF	929	685
1-1/4NC	1166	860
1-1/4NF	1295	955
1-3/8NC	1532	1130
1-3/8NF	1749	1290
1-1/2NC	2034	1400
1-1/2NF	2291	1690
1-3/4NC	3213	2370
2NC	4813	3550

THREAD	GRADE 8	
	N•m	lbf ft
1/4NC	12	9
1/4NF	15	11
5/16NC	24	18
5/16NF	28	21
3/8NC	46	34
3/8NF	52	38
7/16NC	73	54
7/16NF	81	60
1/2NC	111	82
1/2NF	122	90
9/16NC	163	120
9/16NF	179	132
5/8NC	224	165
5/8NF	251	185
3/4NC	393	290
3/4NF	434	320
7/8NC	617	455
7/8NF	698	515
1NC	942	695
1NF	1064	785
1-1/8NC	1342	990
1-1/8NF	1505	1110
1-1/4NC	1898	1400
1-1/4NF	2102	1550
1-3/8NC	2481	1830
1-3/8NF	2827	2085
1-1/2NC	3295	2430
1-1/2NF	3701	2730
1-3/4NC	5166	3810
2NC	7810	5760

Multiply the standard torque by 0.65 when finished jam nuts are used, 0.7 when molykote, white lead or similar mixture are used as lubricants, 0.75 when parkerized bolts or nuts are used, 0.85 when cadmium plated bolts or nuts and zinc bolts with waxed zinc nuts are used or 0.9 when hardened surfaces are used under the nut or bolt head. The general torque must be used in all cases where special torques are not given. Values listed in this manual are lubricated (wet) threads; values should be increased 1/3 for non lubricated (dry) threads.

GRADE 8 PHOSPHATE COATED HARDWARE

NOMINAL THREAD	STANDARD TORQUE ± 10%	
	N•m	lbf ft
1/4	10	8
5/16	21	16
3/8	38	28
7/16	60	45
1/2	92	70
9/16	130	100
5/8	180	140
3/4	325	240
7/8	520	590
1	780	580
1-1/8	1110	820
1-1/4	1565	1160
1-3/8	2050	1520
1-1/2	2720	2020
1-3/4	3380	2510
2	5080	3780

This chart provides tightening torque for general purpose applications using original equipment standard hardware as listed in the Parts Books for the machine involved.

DO NOT SUBSTITUTE.

Original equipment standard hardware is defined as Grade 8, coarse thread bolts and nuts and thru hardened flat washers (Rockwell C 38-45), all phosphate coated and assembled without supplemental lubrication (as received) condition.

The torques shown also apply to the following;

Phosphate coated bolts used in tapped holes in steel or gray iron. Phosphate coated bolts used with phosphate coated prevailing torque nuts (nuts with distorted threads or plastic inserts). Phosphate coated bolts used with copper plated weld nuts.

Markings on bolt heads or nuts indicate material grade only and are not to be used to determine required torque.

STANDARD METRIC FASTENERS

NOMINAL THREAD	STANDARD TORQUE ± 10%	
	N•m	lbf ft
6	10	7
7	16	12
8	23	17
10	46	34
12	80	60
14	125	90
16	200	150
18	275	200
20	385	290
22	530	390
24	670	500
27	980	730
30	1330	990
33	1790	1330
36	2325	1730
39	3010	2240

This chart provides tightening torque for general purpose applications using original standard hardware as listed in the Parts Book for the machine involved.

DO NOT SUBSTITUTE.

Original standard hardware is defined as metric class 10.9 bolts and class 10.0 nuts and thru flat washers (Rockwell C 38-45), all phosphate coated and assembled without supplemental lubrication.

The torques shown also apply to the following;

Phosphate bolts used in tapped holes in steel or gray iron, with phosphate coated prevailing torque nuts or with copper plated weld nuts.

Markings on bolt heads or nuts indicate material class only and are not to be used to determine required torque.

HYDRAULIC TUBES AND FITTINGS

The torque figures are recommended for plain, cadmium or zinc plated fittings, dry or wet installations. Swivel nuts either swaged or brazed. Figures are for tube nuts used with 37° flared fittings and JIC - 37° seat o-ring boss plugs and swivel nuts.

Tube Nuts			O-ring Boss Plugs And Swivel Nuts	
For 37° Flared Fitting			JIC 37° Seat	
Size	Tubing OD	Thread	N•m	lbf ft
4	1/4	7/16-20	12 to 16	9 to 12
5	5/16	1/2-20	16 to 20	12 to 15
6	3/8	9/16-18	33 to 21	21 to 24
8	1/2	3/4-16	47 to 54	35 to 40
10	5/8	7/8-14	72 to 79	53 to 58
12	3/4	1-1/16-12	104 to 111	77 to 82
14	7/8	1-3/16-12	122 to 136	90 to 100
16	1	1-5/16-12	149 to 163	110 to 120
20	1-1/4	1-5/8-12	190 to 204	140 to 150
24	1-1/2	2-1/2-12	217 to 237	162 to 175
32	2	2-1/2-12	305 to 325	225 to 240

HOSE CLAMPS

This chart provides the tightening torques for hose clamps used in all rubber applications (radiator, air cleaner, operating lever boots, hydraulic system, fuel systems etc.).

Clamp Type and Size	Torque ± 0.6 N•m (5 lbf in)			
	Hydraulic System		All Others	
	N•m	lbf in	N•m	lbf in
T Bolt	---	---	6.2 to 7.3	55 to 65
Worm drive under 1-3/4 in open diameter	4.5 to 5.6	40 to 50	2.2 to 3.3	20 to 30
Worm drive over 1-3/4 in open diameter	---	---	4.5 to 5.6	40 to 50
Worm drive all Ultra-Tite	4.5 to 5.6	40 to 50	10.7 to 11.8	95 to 105

SPLIT FLANGE CONNECTIONS

The following chart provides the tightening torques for split flange connections used in hydraulic systems. Flanges and fitting shoulders should fit squarely. Install all bolts, finger tight, then torque evenly. Over torquing bolts will damage the flanges and/or bolts, which may cause leakage.

Flange Size	Bolt Size	Bolt Torque	
		N•m	lbf ft
1/2	5/16	20 to 24	15 to 18
3/4	3/8	30 to 37	22 to 27
1	3/8	37 to 47	27 to 35
1-1/4	7/16	47 to 61	35 to 45
1-1/2	1/2	62 to 79	46 to 58
2	1/2	75 to 88	55 to 65
2-1/2	1/2	107 to 123	79 to 91
3	5/8	187 to 203	138 to 150
3-1/2	5/8	159 to 180	117 to 133

ELECTRIC WIRE CODE

In the wiring diagrams, various colors and symbols are employed to indicate the thickness of wires. This wire code table will help you understand WIRING DIAGRAMS.

Example: 05WB indicates a cable having a nominal number 05 and white coating with black stripe.

CLASSIFICATION BY THICKNESS

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)	Applicable circuit
	Number of strands	Dia. Of strand (mm)	Cross section (mm)			
0.85	11	0.32	0.88	2.4	12	Starting, lighting, signal etc.
2	26	0.32	2.09	3.1	20	Lighting, signal etc.
5	65	0.32	5.23	4.6	37	Charging and signal
15	84	0.45	13.36	7.0	59	Starting (Glow plug)
40	85	0.80	42.73	11.4	135	Starting
60	127	0.80	63.84	13.6	178	Starting
100	217	0.80	109.1	17.6	230	Starting

CLASSIFICATION BY COLOR AND CODE

Priority	Circuits Classification	Charging	Ground	Starting	Lighting	Instrument	Signal	Other	
1	Primary	Code	W	B	B	R	Y	L	
		Color	White	Black	Black	Red	Yellow	Green	Blue
2	Auxiliary	Code	WR	—	BW	RW	YR	GW	LW
		Color	White & Red	—	Black & White	Red & White	Yellow & Red	Green & White	Blue & White
3	Auxiliary	Code	WB	—	BY	RB	YB	GR	LR
		Color	White & Black	—	Black & Yellow	Red & Black	Yellow & Black	Green & Red	Blue & Red
4	Auxiliary	Code	WL	—	BR	RY	YG	GY	LY
		Color	White & Blue	—	Black & Red	Red & Yellow	Yellow & Green	Green & Yellow	Blue & Yellow
5	Auxiliary	Code	WG	—	—	RG	YL	GB	LB
		Color	White & Green	—	—	Red & Green	Yellow & Blue	Green & Black	Blue & Black
6	Auxiliary	Code	—	—	—	RL	YW	GL	—
		Color	—	—	—	Red & Blue	Yellow & White	Green & Blue	—

CONVERSION TABLES

METHOD OF USING THE CONVERSION TABLE

The Conversion Table in this section is provided to enable simple conversion of figures. For details of the method of using the Conversion Table, see the example given below.

EXAMPLE

- Method of using the Conversion Table to convert from millimeters to inches.
 1. Convert 55 mm into inches.
 - A. Locate the number 50 in the vertical column at the left side, take this as ①, then draw a horizontal line from ①.
 - B. Locate the number 5 in the row across the top, take this as ②, then draw a perpendicular line down from ②.
 - C. Take the point where the two lines cross as ③. This point ③ gives the value when converting from millimeters to inches. Therefore, 55 millimeters = 2.165 inches.
 2. Convert 550 mm into inches.
 - A. The number 550 does not appear in the table, so divide by 10 (move the decimal one place to the left) to convert it to 55 mm.
 - B. Carry out the same procedure as above to convert 55 mm to 2.165 inches.
 - C. The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (move the decimal one place to the right) to return to the original value. This gives 550 mm = 21.65 inches.

Millimeters to inches		1 mm = 0.03937 in									
	0	1	2	3	4	5	6	7	8	9	
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354	
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748	
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142	
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536	
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929	
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323	
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717	
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110	
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504	
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898	

Millimeters to Inches

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0	0	0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to Pound

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0	0	2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.53	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

Liter to U.S. Gallon

1 L = 0.2642 U.S. Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.361	25.625	25.889	26.153

Liter to U.K. Gallon

1 L = 0.21997 U.K. Gal

	0	1	2	3	4	5	6	7	8	9
0	0	0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.699	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

kgm to ft. lb.

1 kgm = 7.233 ft. lb.

	0	1	2	3	4	5	6	7	8	9
0	0	7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	296.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	1005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.63	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kg/cm² to lb/in²1 kg/cm² = 14.2233lb/in²

	0	1	2	3	4	5	6	7	8	9
0	0	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	1863	1877	1892	1906	1920	19324	1949	1963	1977
140	1991	2005	2034	2048	2062	2077	2091	2105	2119	
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	2603	2617	2631	2646	2660	2674	2688
190	2702	2717	2731	2745	2759	2773	2788	2802	2816	2830
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

Temperature

Fahrenheit Centigrade Conversion; a simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vice versa is to enter the accompanying table in the center or boldface column of figures. These figures refer to the temperature in either Fahrenheit or Centigrade degrees. If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left. If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

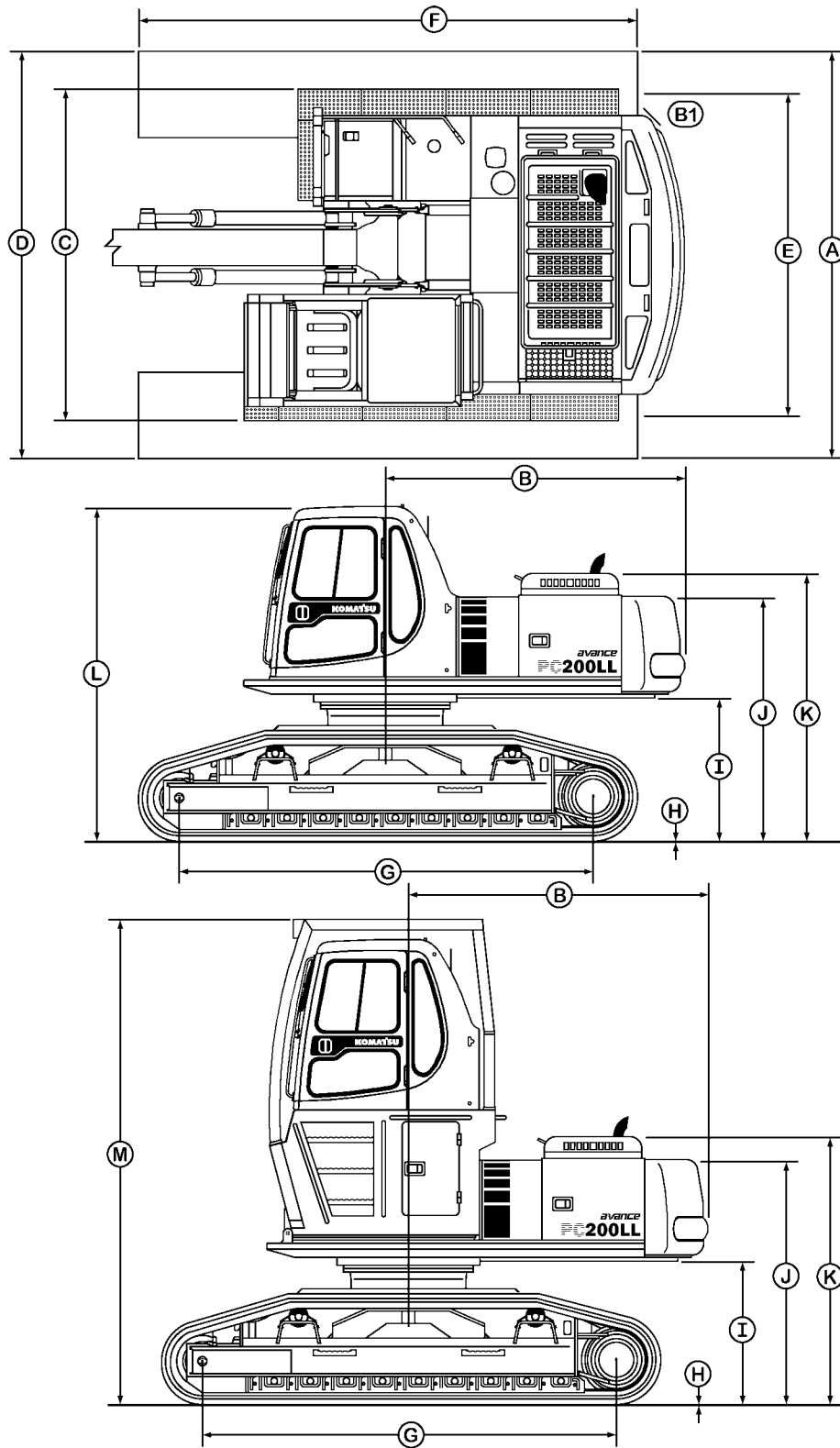
°C		°F	°C		°F	°C		°F	°C		°F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	.35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-7.2	19	66.2	12.2	54	129.2	31.7	89	192.2
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	30	86.0	18.3	65	149.0	37.8	100	212.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	175	347.0

01 GENERAL

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GENERAL ASSEMBLY DRAWING

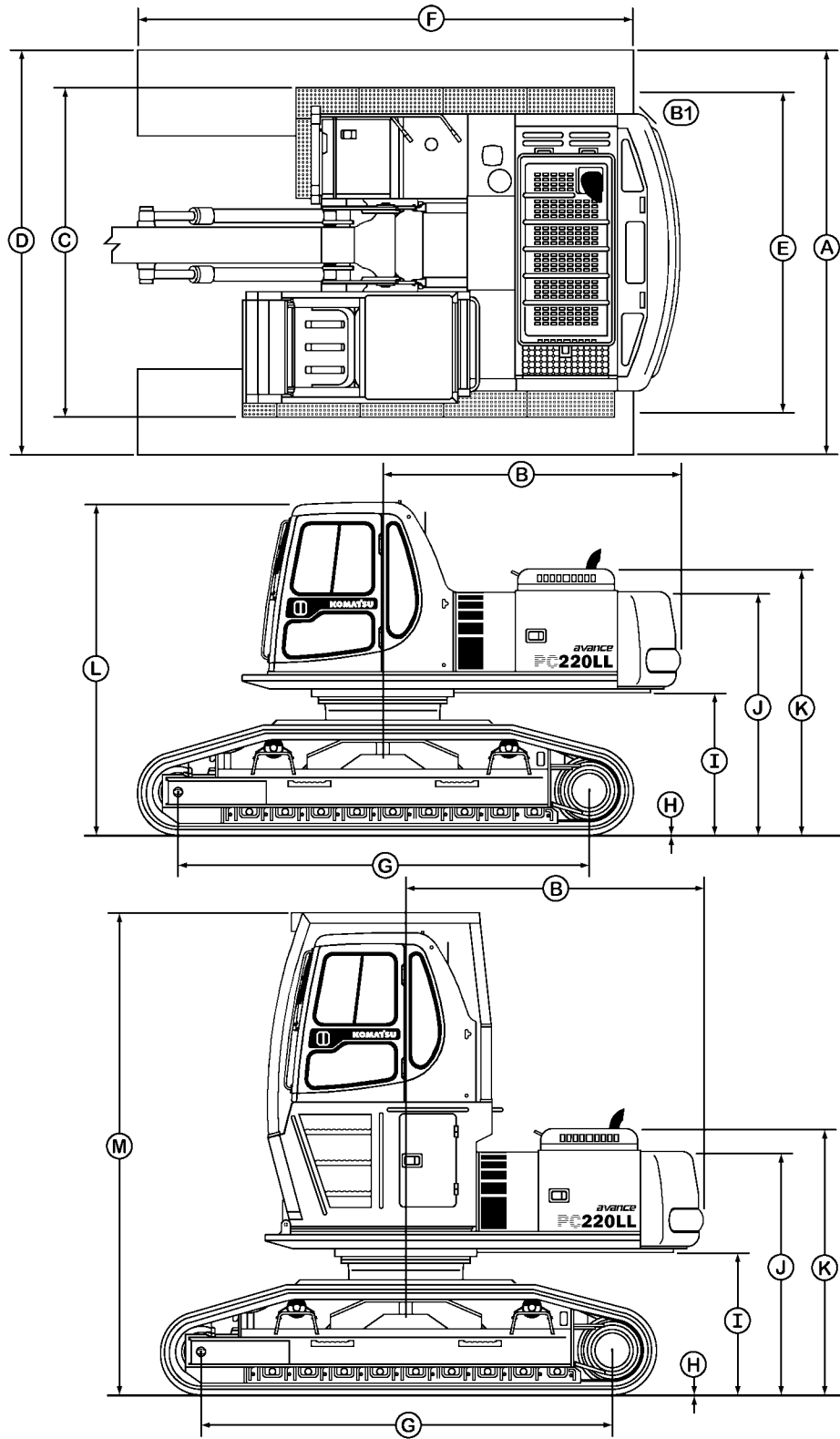
PC200LL



PC040006

Item	Description	Dimension	
A	Overall width	3320 mm	
B	Tail swing radius	2860 mm	
	Swing center to rear end distance	2855 mm	
C	Upper structure width	3220 mm	
D	Width of crawler	600 mm shoes	3220 mm
		700 mm shoes	3320 mm
		800 mm shoes	3420 mm
		900 mm shoes	3520 mm
E	Track gauge	2620 mm	
F	Track length	4610 mm	
G	Length of track on ground	3805 mm	
H	Grouser height	26 mm	
I	Ground clearance, counterweight	1340 mm	
	Minimum ground clearance	711 mm	
J	Machine height	2295 mm	
K	Engine compartment height	2580 mm	
L	Overall height	w/o riser	3230 mm
M		with riser	4610 mm

PC220LL-6



PC040005

Item	Description	Dimension	
A	Overall width	3495 mm	
B	Tail swing radius	2860 mm	
	Swing center to rear end distance	2855 mm	
C	Upper structure width	3220 mm	
D	Width of crawler	600 mm shoes	3395 mm
		700 mm shoes	3495 mm
		800 mm shoes	3595 mm
		900 mm shoes	N/A
E	Track gauge	2795 mm	
F	Track length	4610 mm	
G	Length of track on ground	3805 mm	
H	Grouser height	26 mm	
I	Ground clearance, counterweight	1340 mm	
	Minimum ground clearance	711 mm	
J	Machine height	2295 mm	
K	Engine compartment height	2580 mm	
L	Overall height	w/o riser	3230 mm
M		with riser	4610 mm

SPECIFICATIONS

PC200LL-6

		Machine Model	PC200LL-6
		Serial numbers	A85001 and up
		Operating Weight (W/O work equipment)	(kg) 21,000
Performance	Swing speed	(rpm)	12.4
	Swing maximum slope angle (w/std work equipment)	(°)	20
	Travel speed	(km/h)	Lo: 3.0 Mi: 4.1 Hi: 5.5
	Gradeability	(°)	35
	Ground pressure (shoe width: 700 mm)	(kPa(kg/cm ²))	37.27 (0.38)
Dimensions	Overall length (for transport)	(mm)	No KA work equipment
	Overall width	(mm)	3320
	Overall width of track	(mm)	3320
	Overall height (for transport)	(mm)	3230 (W/O RISER)
	Overall height to top of cab	(mm)	3230 (W/O RISER) 4610 (W RISER)
	Ground clearance of counterweight	(mm)	1340
	Minimum ground clearance	(mm)	711
	Tail swing radius	(mm)	2860
	Minimum swing radius of work equipment	(mm)	No KA work equipment
	Height of work equipment at minimum swing radius	(mm)	No KA work equipment
	Length of track on ground	(mm)	3805
	Track gauge	(mm)	2620
	Height of engine hood	(mm)	2580

Machine Model		PC200LL-6	
Serial Number		A85001 and up	
Engine	Model	S6D102E-1	
	Type	4 cycle, water cooled, in line, vertical, direct injection, with turbocharger	
	No. of cylinders - bore x stroke	6 - 102 mm x 120 mm	
	Piston displacement	5.9L (5883 cc)	
	Performance	Flywheel horsepower	Net 99 kW (133 HP) @ 2000 rpm
			Gross 104 kW (140 HP) @ 2000 rpm
		Max torque	564 Nm (57.5 kgm) /1600 rpm
		High idle in H/O mode	2000 ± 70 rpm
		Min speed at no load	970 ± 50 rpm
	Min fuel consumption	219 g/kWh (160 g/HPh)	
	Starting motor	24V, 5.5 kW	
	Alternator	24V, 70A	
	Battery	12V, 170Ah x 2	
	Radiator core type	CWX-4	
Undercarriage	Carrier roller	2 on each side	
	Track roller	10 on each side	
	Track shoe	Assembly type triple grouser	
Hydraulic system	Hydraulic pump	Type x No. Variable displacement piston type x 2	
		Delivery Piston type: 206x2 L/min	
		Set pressure Piston type: 355 kg/cm ²	
	Control valve	Type x No. 6 spool x 1	
		Control method Hydraulic type	
	Hydraulic Motor	Travel motor Piston type (with brake valve, parking brake) x 2	
		Swing motor Piston type (with safety valve, parking brake) x 1	
	Hydraulic cylinder	Reciprocating piston	
	Hydraulic tank	Box shaped, open	
	Hydraulic filter	Tank return side	
Hydraulic cooler	Air cooled (SFT-1)		

PC220LL-6

Machine Model		PC220LL-6	
Serial numbers		A85001 and up	
Operating Weight (W/O work equipment)		(kg)	21,310
PERFORMANCE	Swing speed	(rpm)	12.4
	Swing maximum slope angle (w/std work equipment)	(°.)	17.5
	Travel speed	(km/h)	Lo: 3.0 Mi: 4.1 Hi: 5.5
	Gradeability	(°.)	35
	Ground pressure (shoe width: 700 mm)	(kPa(kg/cm ²))	41.16 (0.42)
DIMENSIONS	Overall length (for transport)	(mm)	No KA work equipment
	Overall width	(mm)	3495
	Overall width of track	(mm)	3495
	Overall height (for transport)	(mm)	3230 (W/O RISER) 3730 (W RISER TILTED)
	Overall height to top of cab	(mm)	3230 (W/O RISER) 4610 (W RISER)
	Ground clearance of counterweight	(mm)	1340
	Minimum ground clearance	(mm)	711
	Tail swing radius	(mm)	2860
	Minimum swing radius of work equipment	(mm)	No KA work equipment
	Height of work equipment at minimum swing radius	(mm)	No KA work equipment
	Length of track on ground	(mm)	3805
	Track gauge	(mm)	2795
	Height of engine hood	(mm)	2580

Machine Model		PC220LL-6	
Serial Number		A85001 and up	
Engine	Model	S6D102E-1	
	Type	4 cycle, water cooled, in line, vertical, direct injection, with turbocharger and aftercooler	
	No. of cylinders - bore x stroke	6 - 102 mm x 120 mm	
	Piston displacement	5.9L (5883 cc)	
	Performance	Flywheel horsepower	124 kW (166 HP) @ 2100 rpm
		Max torque	627 Nm (64.0 kgm) /1500 rpm
		High idle in H/O mode	2200 ± 70 rpm
		Min speed at no load	970 ± 50 rpm
		Min fuel consumption	218 g/kWh
	Starting motor	24V, 5.5 kW	
	Alternator	24V, 70A	
	Battery	12V, 170Ah x 2	
Radiator core type	CWX-4		
Undercarriage	Carrier roller	2 on each side	
	Track roller	10 on each side	
	Track shoe	Assembly type triple grouser	
Hydraulic system	Hydraulic pump	Type x No.	Variable displacement piston type x 2
		Delivery	Piston type: 215 x 2 L/min
		Set pressure	Piston type: 355 kg/cm ²
	Control valve	Type x No.	6 spool x 1
		Control method	Hydraulic type
	Hydraulic Motor	Travel motor	Piston type (with brake valve, parking brake) x 2
		Swing motor	Piston type (with safety valve, parking brake) x 1
	Hydraulic cylinder	Reciprocating piston	
	Hydraulic tank	Box shaped, open	
	Hydraulic filter	Tank return side	
Hydraulic cooler	Air cooled (SFT-1)		

WEIGHT TABLE

WARNING! This weight table is a guide for use when transporting or handling components.

Unit: kg

Machine model	PC200LL-6	PC220LL-6
Serial Number	A85001 and up	
Engine assembly	770	780
• Engine	535	545
• Damper	6	
• Hydraulic pump	150	
Radiator, oil cooler assembly	124	
Hydraulic tank, filter assembly (exc oil)	136	
Fuel tank (exc fuel)	122	
Revolving frame	2475	2455
Operators cab	300	
Operators seat	29	
Counterweight	4880	
Swing machinery	225	205
Control valve (standard)	170	
Swing motor	53	
Travel motor	98 x 2	
Center swivel joint	42	
Track frame assembly	6916	6996
• Track frame	4050	4130
• Swing circle	280	
• Idler	140 x 2	
• Idler cushion	140 x 2	
• Carrier roller	40 x 4	
• Track roller	40 x 20	
• Final drive (includes travel motor)	340 x 2	
• Track frame undercover	53 x 2	
• Track frame full roller guard	140 x 2	

FUEL COOLANT AND LUBRICANTS

It is not our policy to approve fuel, coolant and lubricants or to guarantee performance in service. The responsibility for the quality of the fuel, coolant and lubricant must remain with the supplier. When in doubt, consult your distributor. The specified fuel, coolant and lubricants recommended for this machine are as shown in the following table.

RESERVOIR	TYPE	AMBIENT TEMPERATURE										CAPACITY (L)	
		°C	-30	-20	-10	0	10	20	30	40	50	Specified	Refill
Crankcase	Engine oil See page 01-11.	SAE 30										26.3	24.0
		SAE 10W											
		SAE 10W-30											
		SAE 15W-40											
Damper case												0.75	--
Swing case		SAE 30										5.5	5.5
Final drive (each)												4.4	4.2
Front idler (each)												0.07 TO 0.08	0.07 TO 0.08
Track roller (each)		SAE 30										0.19 TO 0.21	0.19 TO 0.21
Top idler (each)												0.23 TO 0.25	0.23 TO 0.25
Hydraulic system	SAE 10W										PC200 239 PC220 246	166	
	SAE 10W-30												
	SAE 15W-40												
Fuel tank	DF	D975 No. 2										340	--
		D975 No. 1											
All lube fittings	Grease	Komatsu Super Grease or NLGI No.2 lithium MPG with 3% molybdenum disulfide										FILL AS INSTRUCTED	
Cooling system	See COOLANT SPECIFICATIONS on page 01-12.										PC200 22.2 PC220 23.2	--	

API: American Petroleum Institute

NLGI: National Lubricating Grease Institute

ASTM: American Society of Testing and Materials

SAE: Society of Automotive Engineers

Specified Capacity: Total amount of oil including oil for components and piping.

Refill Capacity: Amount of oil needed to refill system during normal maintenance.

Other equipment may be necessary when operating the machine at temperatures below -20°C, therefore consult your distributor for your specific needs.

ENGINE OIL SPECIFICATIONS

NORMAL OPERATION

Oil performance recommendations are as follows:

- The use of a quality engine lubricating oil combined with appropriate oil and filter change intervals are critical factors in maintaining engine performance and durability.
- Komatsu Engine Oil or multi-viscosity engine oil meeting American Petroleum Institute (API) performance classification CF-4, CG-4, CF-4/SG or CG-4/SH or MIL-L-2104D or E is recommended.

NOTICE:

Classification CD, CE, CD/SF or CE/SF oils may be used in areas where CF-4, CG-4, CF-4/SG or CG-4/SH oil is not yet available. If API classification CC or CC/CD is used, reduce the engine oil change interval by half.

- A sulfated ash limit of 1.0 to 1.5 mass percent is suggested for optimum valve and piston deposit and oil consumption control. The sulfated ash **must not** exceed 1.85 mass percent. The sulfated ash limit of 1.85 mass percent has been placed on all engine lubricating oils recommended for use in the engine. Higher ash oils can cause valve and/or piston damage and lead to excessive oil consumption.
- The API service symbol displays the following information. The upper half of the symbol displays the appropriate oil categories; the lower half may contain words to describe oil energy conserving features. The center section identifies the SAE oil viscosity grade.

Oil viscosity recommendations are as follows:

- The use of a multi-grade lubricating oil has been found to improve oil consumption control and improve engine cranking in cold temperatures while maintaining lubrication at high operating temperatures.
- While SAE 15W-40 multi-viscosity oil is recommended for most operating climates, refer to the previous table for oil viscosity recommendations for extreme climates.

NOTICE:

Limited use of low viscosity oils, such as SAE 10W-30 may be used for easier starting and providing sufficient oil flow at ambient temperatures below -5°C. However, continuous use of low viscosity oils can decrease engine life due to wear.

- Special "break-in" lubricating oils are not recommended for a new or rebuilt engine. Use the same type of oil during the "break-in" as specified for normal operation.
- Additional information regarding lubricating oil availability throughout the world is available in the "E.M.A. Lubricating Oils Data Book for Automotive and Industrial Engines." The data book may be ordered from the Engine Manufacturers Association, 401 North Michigan Ave., Chicago, IL U.S.A. 60611. The telephone number is (312) 644-6610.

ARCTIC OPERATION

If an engine is operated in ambient temperatures consistently below -23°C and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic engine oil API performance classification CF-4, CG-4, CF-4/SG or CG-4/SH with adequate low temperature properties such as SAE 5W-20 or 5W-30.

The oil supplier **must** be responsible for meeting the performance service specifications.

NOTICE:

The use of a synthetic base oil does not justify extended oil change intervals. Extended oil change intervals can decrease engine life due to factors such as: corrosion, deposits and wear.

DAMPER CASE, SWING MACHINERY CASE, TRACK FRONT IDLERS, TRACK ROLLERS, TOP CARRIER ROLLERS AND HYDRAULIC SYSTEM OIL SPECIFICATIONS

Komatsu Engine Oil or engine oil meeting American Petroleum Institute (API) performance classification CF-4, CG-4, CF-4/SG or CG-4/SH or MIL-L-2104D or E is recommended.

NOTICE:

Classification CD, CE, CD/SF or CE/SF oils may be used in areas where CF-4, CG-4, CF-4/SG or CG-4/SH oil is not yet available.

NOTICE:

The track front idlers, track rollers and top carrier rollers are lubricated for the life of the component. Lubrication should only be necessary during rebuild.

FINAL DRIVE OIL SPECIFICATIONS

Komatsu Engine Oil or engine oil meeting American Petroleum Institute (API) performance classification CF-4, CG-4, CF-4/SG or CG-4/SH or MIL-L-2104D or E is recommended.

NOTICE:

Classification CD, CE, CD/SF or CE/SF oils may be used in areas where CF-4, CG-4, CF-4/SG or CG-4/SH oil is not yet available.

DIESEL FUEL SPECIFICATIONS

WARNING! Possible fire hazard - never mix gasoline, gasohol and/or alcohol with diesel fuel. This practice creates an extreme fire hazard and under certain conditions an explosion which could result in personal injury or death.



WARNING! Never remove the fuel tank filler cap or refill the fuel tank while the engine is running or when hot or when the machine is indoors. Fumes are dangerous, a spark or flame could result in a fire or explosion.

NOTICE:

Due to the precise tolerances of diesel fuel injection systems, it is extremely important that the fuel be kept clean and free of contaminants or water. Contaminates or water in the system can cause severe damage to both the injection pump and nozzles.

REMARK

Below -12°C the paraffin in ASTM Grade No. 2-D diesel fuel will change to wax particles and clog the fuel filters. For best results use Grade No. 1-D diesel fuel in cold weather.

For normal service above -10°C, the use of ASTM Grade No. 2-D diesel fuel with a minimum Cetane number of 40 is recommended. The use of No. 2-D diesel fuel will result in optimum engine performance under most operating conditions. Fuels with Cetane numbers higher than 40 may be needed in high altitudes or extremely low ambient temperatures to prevent misfires and excessive smoke.

At operating temperatures below -10°C or extended engine idling, use ASTM Grade No. 1-D diesel fuel. The use of lighter fuels can reduce fuel economy.

Where a winterized blend of Grade No. 2-D and No. 1-D fuels is available, it may be substituted for Grade No. 1-D fuel. However, it is the supplier's responsibility to provide the fuel for the anticipated ambient temperature.

Use a low sulfur content fuel having a cloud point that is at least 10 degrees below the lowest expected fuel temperature. Cloud point is the temperature at which crystals begin to form in the fuel.

The viscosity of the fuel **must** be kept above 1.3 cSt to provide adequate fuel system lubrication.

Optionally, the equivalent grades of recognized Federal Government specifications may be used; the latest revisions of VV-F-800a.

COOLANT SPECIFICATIONS

GENERAL

Selection and maintenance of the engine coolant is important to long engine life. The following information provides recommendations for selecting the engine coolant and maintaining the supplemental coolant additives (SCA).

Heavy duty diesel engines require a balanced coolant mixture of water, antifreeze, and supplemental coolant additives. Supplemental coolant additive recommendations are included. The coolant mixture **must** be drained and replaced at the specified service interval shown or every two years of operation, whichever comes first.

WATER

Use water which has a low mineral content. Water used in conjunction with antifreeze, coolant filters and inhibited water must meet the following standards:

- Total Hardness -** Not to exceed 170 parts per million (10 grains/gallon maximum) to prevent scale deposits. Water containing dissolved magnesium and calcium (the usual reason for water hardness) above the specified amount will cause scale deposits to develop in the engine.
- Chlorides -** Not to exceed 40 parts per million (2.5 grains/gallon maximum) to prevent corrosion.
- Sulfites -** Not to exceed 100 parts per million (5.8 grains/gallon maximum) to prevent corrosion.
- Dissolved Solids -** Not to exceed 340 parts per million (20 grains/gallon maximum) to minimize sludge deposits, scale deposits, corrosion or a combination of these.

If any of the above requirements cannot be met, use distilled, de-ionized, or de-mineralized water. To determine if local water supplies meet these standards, water samples can be tested by water treatment laboratories. Softened water that is prepared using common salt (sodium chloride) contains excessive amounts of chlorides and should not be used.

NOTICE:

Never use water alone in the cooling system because rust, scale deposits and corrosion will occur.

ANTIFREEZE

In climates where the temperature is above -34°C use a coolant mixture that contains 50 percent antifreeze. Antifreeze is essential in any climate. It broadens the operating temperature range by lowering the coolant freezing point and by raising its boiling point. Do not use more than 50 percent antifreeze in the mixture unless additional freeze protection is required. Never use more than 68 percent antifreeze under any condition.

An antifreeze concentration greater than 68% will adversely affect freeze protection and heat transfer rates. Antifreeze concentrations between 68 and 100% actually have a higher freezing point than a 68% antifreeze concentration and should not be used due to reduced heat transfer rates.

Ethylene glycol, low silicate antifreeze is recommended. The antifreeze should contain no more than 0.1% anhydrous alkali metasilicate. Low silicate antifreeze is recommended to avoid the formation of silica-gel (hydro-gel). This gel formation can occur when the cooling system contains an over concentration of high silicate antifreeze and/or supplemental coolant additive. DO NOT use methanol or alcohol as an antifreeze because of its low boiling point.

Antifreeze may retain its freeze protection for more than one season but coolant conditioners must be added to maintain corrosion protection. Antifreeze formulated with methoxy propanol, or propylene glycol, is not recommended for this system.

NOTICE:

Do not mix types of antifreeze solutions. Mixed solutions make it impossible to determine the protection against freezing. Antifreeze containing sealer or anti-leak additives should NOT be used in this system. Sealer or anti-leak additives will cause plugging problems in the cooling system.



WARNING! Use extreme caution when adding coolant to a hot radiator to avoid being burned. Wear gloves and goggles and keep face away from the filler neck.

Check the solution periodically and at normal operating temperature, to be sure the cooling system has sufficient protection against freezing. An antifreeze concentration greater than 68% will adversely affect antifreeze protection and heat transfer rates. Antifreeze concentrations between 68% and 100% actually have a higher freezing point than a 68% antifreeze concentration and should not be used due to reduced heat transfer rates. The following table shows the approximate percentage of antifreeze solution required for various temperatures.

Approximate Freezing Point	Percentage of Antifreeze Concentration by Volume	Specific Gravity at 16°C (60°F)
0°C (32°F)	0%	1.000
-7°C (20°F)	15%	1.025
-12°C (10°F)	25%	1.040
-18°C (0°F)	33%	1.053
-23°C (-10°F)	40%	1.062
-29°C (-20°F)	45%	1.070
-34°C (-30°)	48%	1.074
-40°C (-40°)	53%	1.080
-46°C (-50°)	56%	1.083
-51°C (-60°)	59%	1.088
-57°C (-70°)	62%	1.092
-62°C (-80°)	65%	1.095
-68°C (-90°)	67%	1.097
-69°C (-92°)	68%	1.098

REMARK

Do not use a 100% antifreeze solution for freezing protection, This will cause severe corrosion in the cooling system and if not detected will cause radiator and oil cooler core damage. Use a water/antifreeze solution as described in the preceding table.

In tropical climates where antifreeze availability may be limited, use a corrosion inhibitor or supplemental coolant additive (SCA), to protect the engine cooling system.

SUPPLEMENTAL COOLANT ADDITIVES

1. All supplemental cooling system additives, including those in antifreeze solutions, become depleted through normal operation. If the coolant additives in antifreeze are allowed to become depleted, the antifreeze becomes corrosive and attacks and coats the metallic surfaces of the cooling system which reduces heat transfer. Cooling system conditioners which contain these additives must be added to maintain corrosion protection.
2. SOLUBLE OIL IS NOT RECOMMENDED for use in this engine as its use will reduce heat transfer and allow internal engine damage.
3. There are no miracle additives that will increase heat transfer or prevent overheating. Conditioned water is still the best coolant.
4. A corrosion inhibitor/conditioner is recommended to inhibit corrosion in the cooling system for the following reasons:
 - Improved compatibility with high silicate antifreezes to minimize hydro-gel formation if over concentration occurs.
 - Provides engine protection in the following areas:
 - Solder corrosion/bloom
 - Copper corrosion/erosion/stress cracking
 - Oil fouling
 - Cylinder liner cavitation corrosion
 - Aluminum cavitation corrosion
 - Seal and gasket degradation

Maintenance of Supplemental Coolant Additives

Keeping the engine coolant properly inhibited will keep the engine and radiator free of rust, scale deposits and corrosion.

New machines are delivered with antifreeze protection. Service at a regular scheduled interval specified with a replacement coolant filter.

Each time the coolant is drained and replaced, the coolant must be recharged with supplemental coolant additives. New coolant can be correctly charged with coolant additives by using a replacement coolant filter and/or concentrate.

If coolant is added between drain intervals, additional coolant additives may be required.

Coolant Testing for Conditioner Concentration

When the cooling system is maintained as recommended, the conditioner concentration should be satisfactory. The SCA concentration must not fall below 1.0 unit per 3.8 L or exceed 2 units per 3.8 L of coolant. The only accurate method for testing chemical concentrations in coolant with mixed chemical compounds is a laboratory analysis.

NOTICE:

Inadequate concentration of the coolant additive can result in major corrosive damage to cooling system components. Over-concentration can cause formation of gel that can cause restriction, plugging of passages and overheating.

Replenishing Coolant Conditioner

Install a "precharge" coolant filter when the coolant is changed or a significant (more than 50%) coolant loss occurs. Install a service coolant filter as specified. When antifreeze is added, add coolant conditioner equal to 1.0 unit per 3.8 L of antifreeze.

NOTICE:

Mixing of DCA4 and other supplemental coolant additives is not recommended because there is currently no test kit available to measure concentration levels with mixed chemical solutions.

Supplemental Coolant Additive Maintenance Guide

Use supplemental coolant additives to protect the engine cooling system from corrosion. Antifreeze alone does not provide enough corrosion protection for a heavy duty diesel engine. Supplemental corrosion protection must be supplied through periodic additions of supplemental coolant additives to the coolant. To protect against corrosion, a new coolant charge must be brought up to 0.26 SCA unit per liter of coolant (initial charge). Maintain the correct SCA concentration by changing the service coolant filter at each engine oil and filter change interval.

Each time the coolant is drained and replaced, the coolant must be recharged with supplemental coolant additives. Use the appropriate replacement coolant filter listed in following tables. The coolant mixture must be drained and replaced. The amount of a replacement inhibitor is determined by the length of the service interval and the cooling system capacity. Refer to the DCA4 Unit Guide for the selection of the correct filter to replenish the SCA. If coolant is added between drain intervals, additional SCA will be required. Check the coolant DCA concentration level anytime make up coolant is added to the system. The SCA concentration must not fall below 0.13 units per liter or exceed 0.5 units per liter.

DCA4 UNIT GUIDE	
Fleetguard Part No.	DCA4 Units
DCA4 Coolant Filter	
WF-2070	2
WF-2071	4
WF-2072	6
WF-2073	8
WF-2074	12
WF-2075	15
WF-2076	23
WF-2077	0
DCA4 Liquid	
DCA60L	4
DCA80L	1760
DCA4 Powder	
DCA95	20

NOTE 1 - After draining and replacing coolant, always precharge the cooling system to maintain the SCA concentration between 1.0 and 2.0 units per 3.8 L.

NOTICE:

When performing service which requires draining the cooling system, discard the coolant. Reusing coolant can introduce contaminants or over concentrated chemicals, resulting in premature failure of cooling system components.

NOTE 2 - To precharge cooling systems larger than 114 L do the following:

- Install appropriate service filter listed in the above table based on cooling system capacity.

Example: 360 L cooling system capacity
 -15 Units (1) WF-2075 Filter
 80 Units

The answer represents the additional units required to precharge the cooling system. Four bottles of powder, part number DCA95, will provide a sufficient amount of SCA units (80) to precharge the example cooling system.

- Install the appropriate service filter at the next and subsequent maintenance intervals.

NOTE 3 - Change the coolant filter at every engine oil and filter change interval to protect the cooling system.

Maintain a nominal SCA concentration of 1.0 unit per 3.8 L of coolant in the system. Less than 0.5 units per 3.8 L indicates an under-concentrated coolant solution. More than 2.0 units per 3.8 L indicates an over-concentrated coolant solution.

To check the SCA concentration level, use coolant test kit, CC-2626. Instructions are included with the test kit.

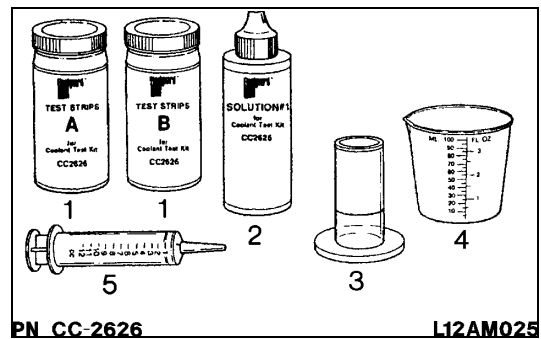
SCA Unit Concentration Guide		
Number of Solution A Drops to Cause Color Change	Coolant Condition	Action Required
0 - 10 Drops	Extremely under-concentrated - less than 0.4 SCA units per 3.8 L	Initially charge the system to a minimum of 1.0 SCA unit per 3.8 L.
11 - 16 Drops	Marginally under-concentrated - 0.45 to 0.8 SCA units per 3.8 L	Add SCA liquid units to maintain 1.0 SCA unit per 3.8 L minimum or change the DCA 4 coolant filter.
17 - 25 Drops	Acceptable - 0.85 to 1.3 SCA units per 3.8 L	None.
26 - 35 Drops	Highly acceptable - 1.35 to 2.0 SCA units per 3.8 L	None.
36 - 55 Drops	Marginally over-concentrated - 2.1 to 3.3 SCA units per 3.8 L	Review maintenance practice.
Over 55 Drops	Extremely over-concentrated	Drain 50% of the coolant and replace with water antifreeze mixture. Retest the system for correct SCA unit concentration.

Cooling System Test Kit

The following cooling system test kit may be purchased from your distributor.

This Fleetguard® coolant test kit, part number CC-2626 is used to check the concentration of coolant additives in the cooling system.

1. Test strip bottles
2. Solution #1 bottle
3. Small plastic container
4. Large plastic cup
5. Syringe

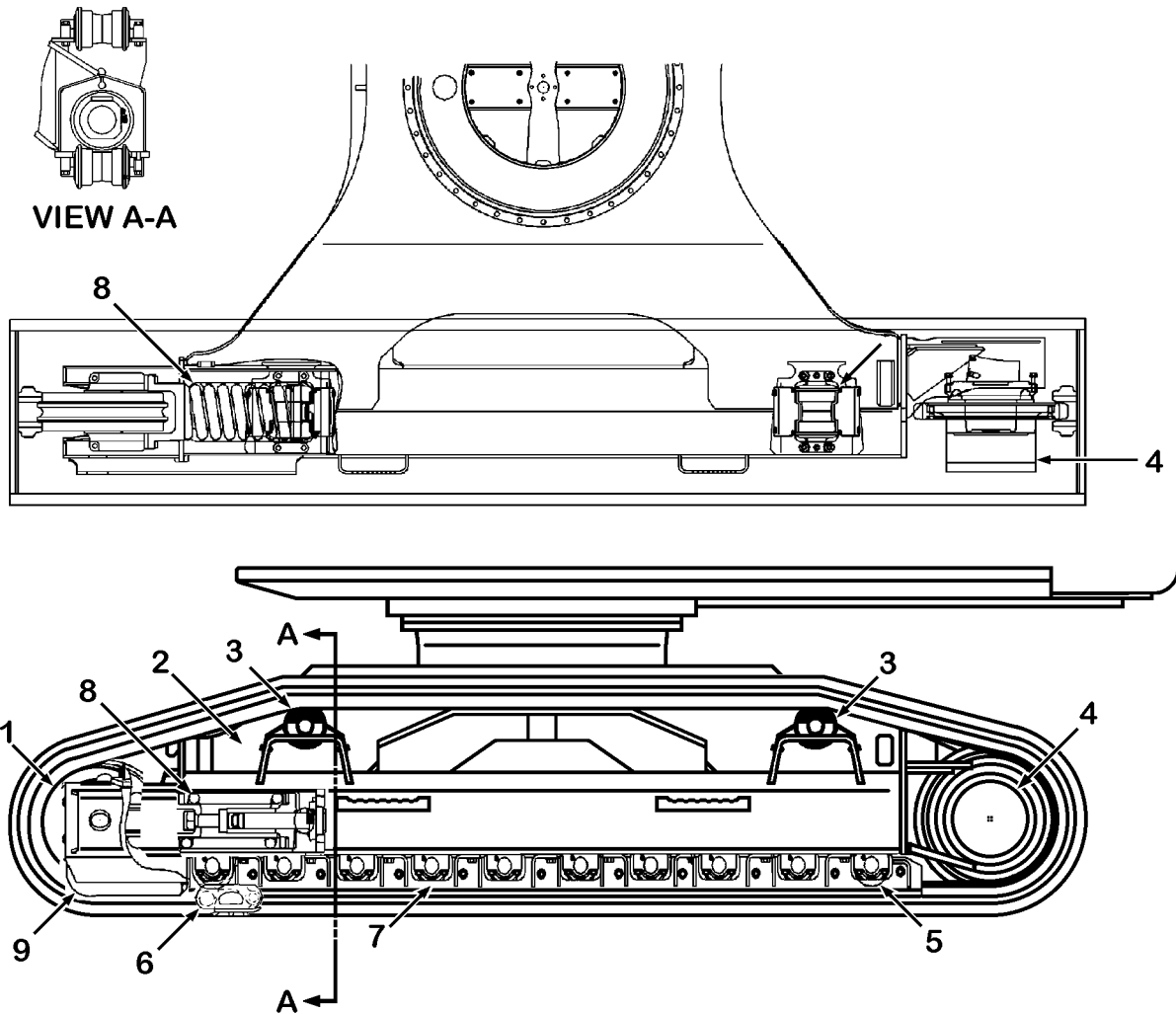


10 **STRUCTURE AND FUNCTION**

TRACK FRAME • RECOIL SPRING 10-2
CAB RISER AND RELATED PARTS 10-3

TRACK FRAME • RECOIL SPRING

★ The diagram shows the PC200LL-6



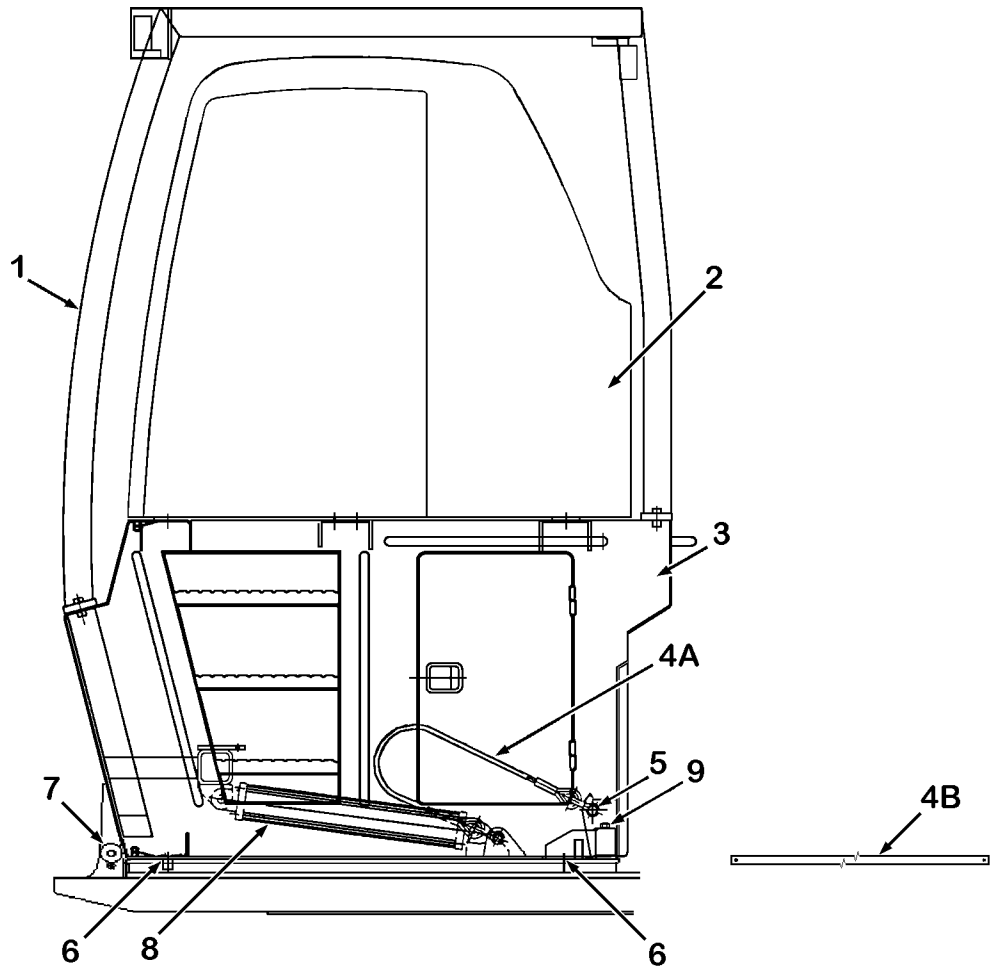
VESM0174

- 1. Idler
- 2. Track frame
- 3. Carrier roller
- 4. Final drive
- 5. Track roller
- 6. Track shoe
- 7. Full roller guard
- 8. Recoil spring
- 9. Front guard

● No. of rollers

Model	No. of rollers (each side)
PC200LL	10
PC220LL	10

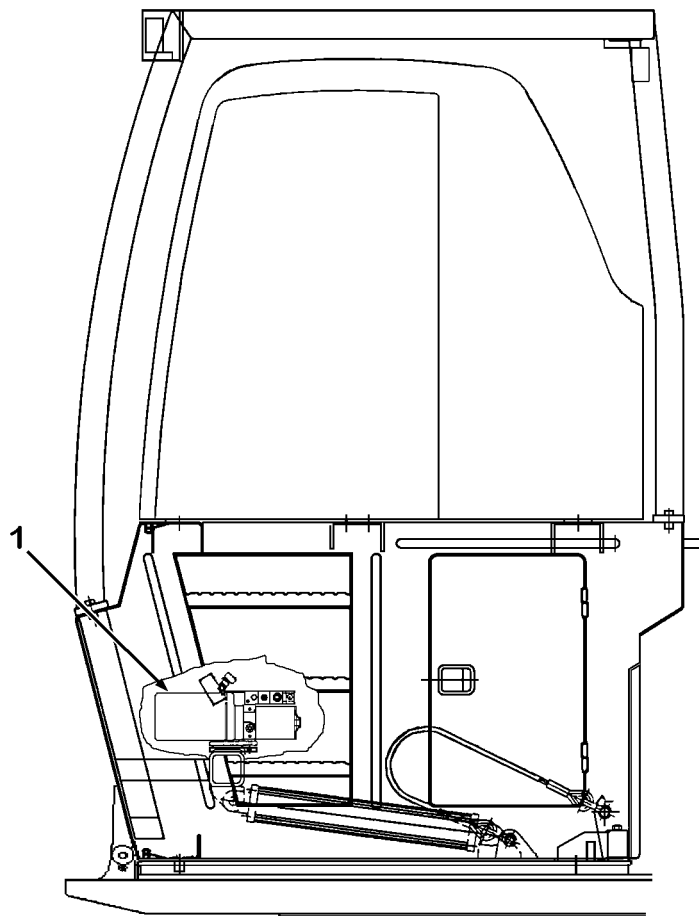
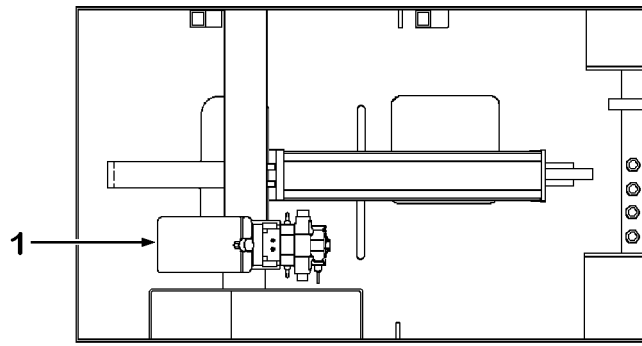
CAB RISER AND RELATED PARTS



VESM0175

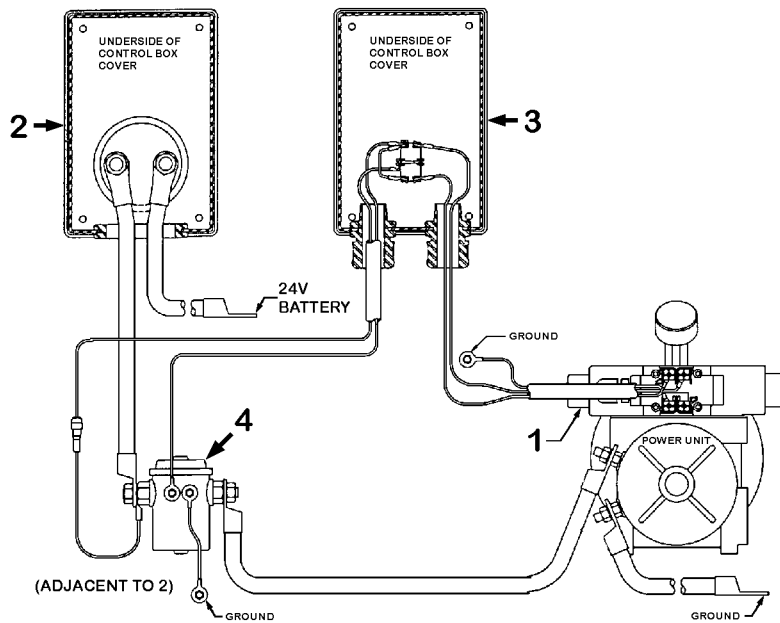
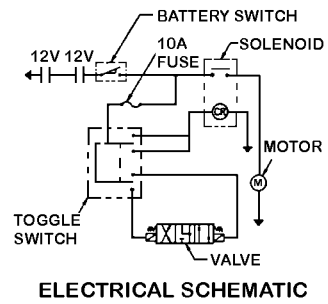
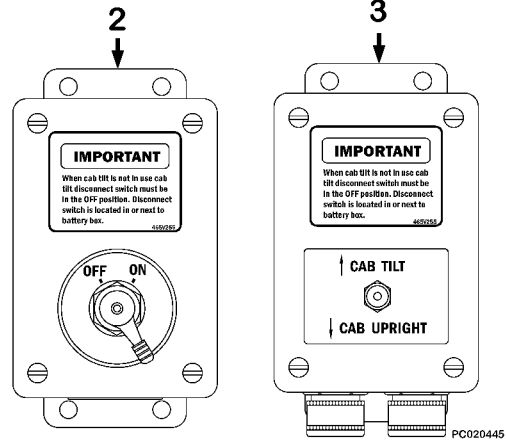
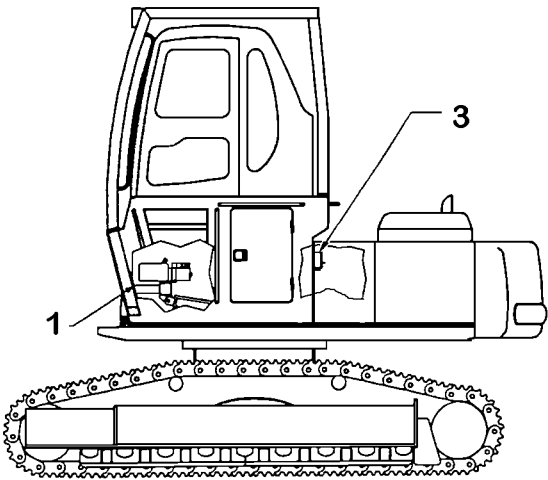
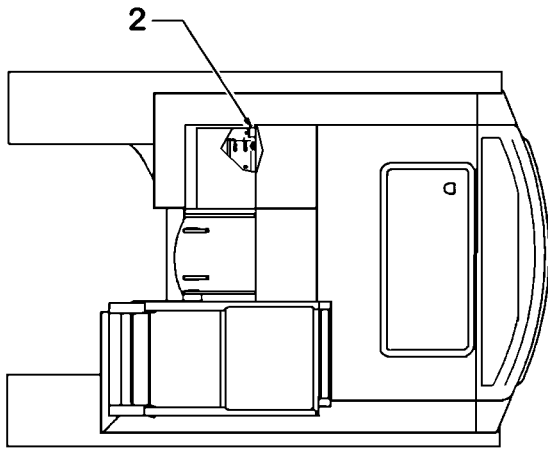
1. Over Cab Guard
2. Cover
3. Riser
- 4A. Safety Cable
- 4B. Shipping Bar (Use when shipping machine per Operation and Maintenance Manual Specs. Replace Safety Cable w/shipping bar)
5. Shackle
6. Mounting bolt locations
7. Riser Pivot Pins
8. Cylinder
9. Bolt Storage Nuts

NOTE: Items 4A, 5, 6, and 8 are located inside riser



VESM0176

1. Power unit



- 1. Power unit
- 2. Battery switch box

- 3. Tilt Switch box
- 4. Solenoid

VESM0178

MEMORANDUM

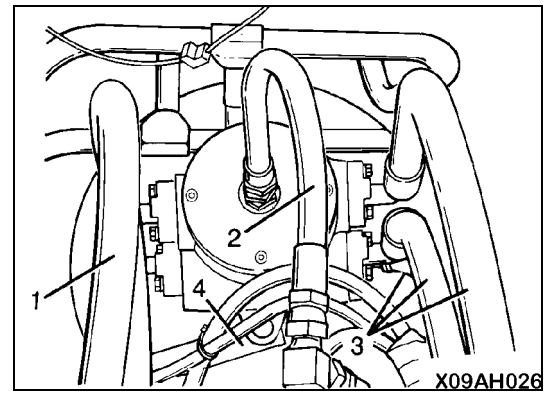
30 DISASSEMBLY AND ASSEMBLY

REVOLVING FRAME	30-2
Removal	30-2
RECOIL SPRING	30-3
Disassembly	30-3
Assembly	30-4
COUNTERWEIGHT	30-5
Removal	30-5
Installation	30-5

REVOLVING FRAME

Removal

1. Remove 2 boom cylinder assemblies. For details, see BOOM CYLINDER ASSEMBLY, Removal.
2. Remove work equipment assembly. For details, see WORK EQUIPMENT, Removal.
3. Remove counterweight assembly. For details, see COUNTERWEIGHT, Removal.
4. Disconnect top mounting hoses (1), (2), and (3) of swivel joint assembly at swivel joint assembly end.
5. Remove stopper link (4).



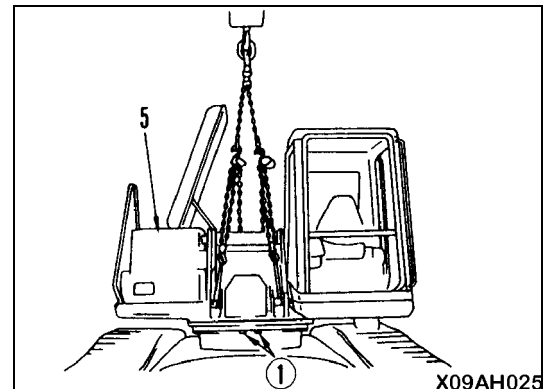
6. Remove mounting bolts, then lift off revolving frame assembly (5).
- ★ Leave 2 bolts ① each at the front and rear, use a lever block to adjust the balance of the revolving frame assembly to the front and rear, and left and right, then remove the remaining bolts, and lift off.



WARNING! When removing the revolving frame assembly, be careful not to hit the center swivel joint assembly

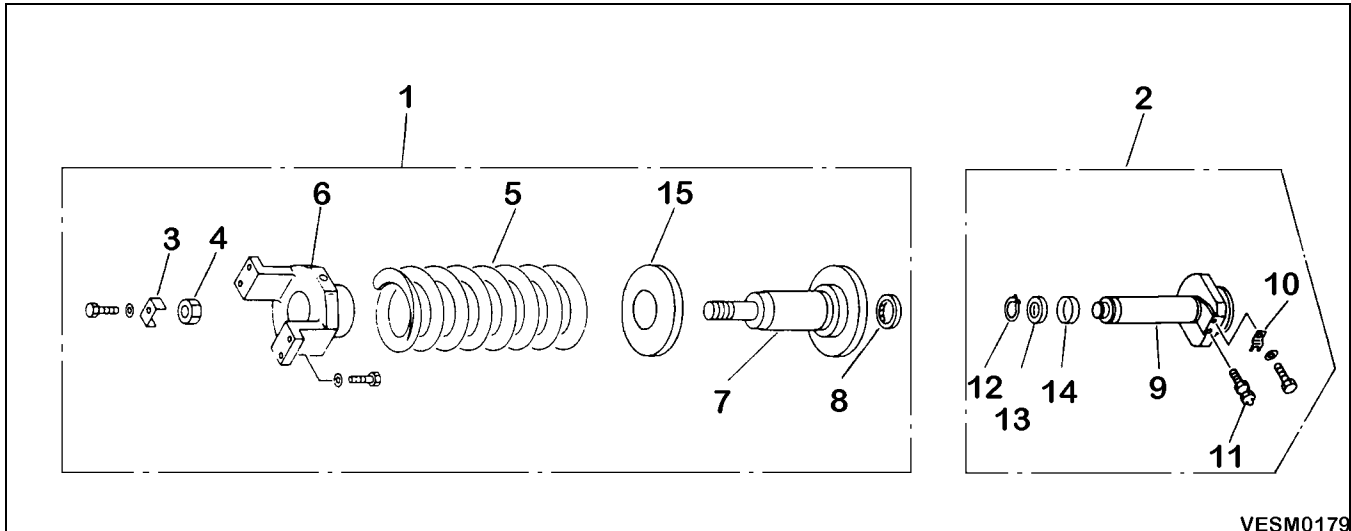


Revolving frame assembly: Approximate weight **6340 kg**



RECOIL SPRING

Disassembly



1. Remove piston assembly (2) from recoil spring assembly (1).
2. Disassembly of recoil spring assembly

A. Set recoil spring assembly (1) to tool H1.



WARNING! The recoil spring is under large installed load, so be sure to set the tool properly. Failure to do this is dangerous.

★ Installed load of spring:
 PC200, PC220:..... **139.3 kN (19,200 kg)**

B. Apply hydraulic pressure slowly to compress spring, and remove lock plate (3), then remove nut (4).

★ Compress the spring to a point where the nut becomes loose.

★ Release the hydraulic pressure slowly and release the tension of the spring.

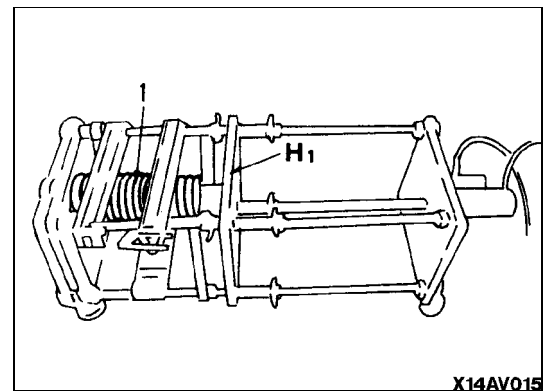
★ Free length of spring:
 PC200, PC220:..... **603.5 mm**

C. Remove yoke (6), plate (15), cylinder (7), and dust seal (8) from spring (5).

3. Disassembly of piston assembly

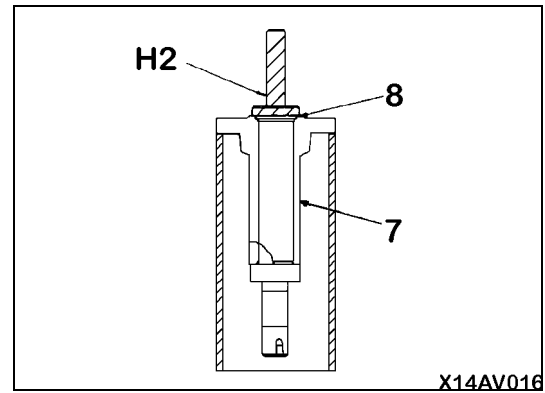
A. Remove lock plate (10) from piston (9), then remove valve (11).


B. Remove snap ring (12), then remove U-packing (13) and ring (14).



Assembly

1. Assembly of piston assembly
 - A. Assemble ring (14) and U-packing (13) to piston (9), and secure with snap ring (12).
 - B. Tighten valve (11) temporarily, and secure with lock plate (10).
2. Assembly of recoil spring assembly
 - A. Using tool **H2**, install dust seal (8) to cylinder (7).
 - B. Assemble cylinder (7), plate (15), and yoke (6) to spring (5), and set in tool **H1**.



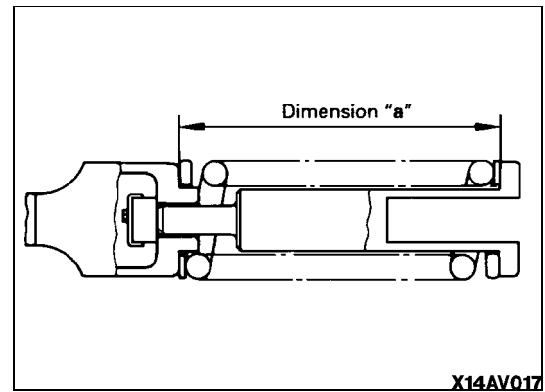
 Sliding portion of cylinder: **Grease (G2-L1)**


- C. Apply hydraulic pressure slowly to compress spring, and tighten nut (4) so that installed length of spring is dimension "a", then secure with lock plate (3).

★ Installed length "a" of spring:
 PC200, PC220: **452 mm**

- D. Remove recoil spring assembly (1) from tool **H1**.

3. Assemble piston assembly (2) to recoil spring assembly (1).



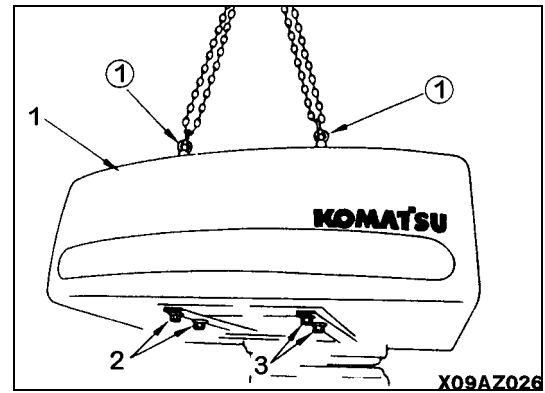
 Sliding portion of piston, wear ring: **Grease (G2-L1)**

- ★ Assemble the cylinder assembly so that the mounting position of the valve is 90° to the side.
- ★ Fill the inside of the cylinder with **300 cc** of grease (**G2-L1**), then bleed air and check that grease comes out of the grease hole.

COUNTERWEIGHT

Removal

1. Set eyebolts ① to counterweight assembly (1), and sling.
2. Remove mounting bolts (2) and (3). ❖1
- ★ Be careful not to lose the shims when removing.
3. Lift off counterweight (1) horizontally with wire or chain block. ❖2
- ★ Be careful not to hit the engine, radiator and cooler assembly.



Counterweight assembly: PC200 4,880 kg
 PC220 6,481 kg

Installation

- Carry out installation in the reverse order of removal.



Thread of mounting bolt: Thread tightener (LT-2)

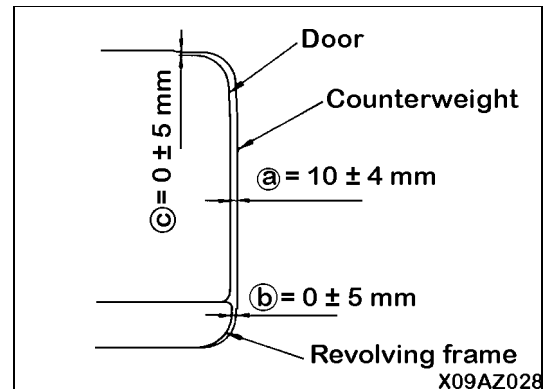


Mounting bolt: 1,323 ± 147 Nm (135 ± 15 kgm)



- ★ Installing and adjusting counterweight

1. Sling counterweight with crane and set in position on frame.
2. Push counterweight and install shim and mounting bolts (2) and (3), and adjust to following dimensions.
 - A. Clearance from revolving frame: . . 10 ± 5 mm (left and right)
 - B. Clearance from bodywork door: . . 10 ± 5 mm (left and right)
 - C. Stepped difference **b** from revolving frame in left-to-right direction: Max. 5 mm
 - D. Stepped difference **a** from bodywork door in left-to-right direction: 10 ± 4 mm
 - E. Stepped difference **c** from bodywork top cover in vertical direction: Max. 5 mm



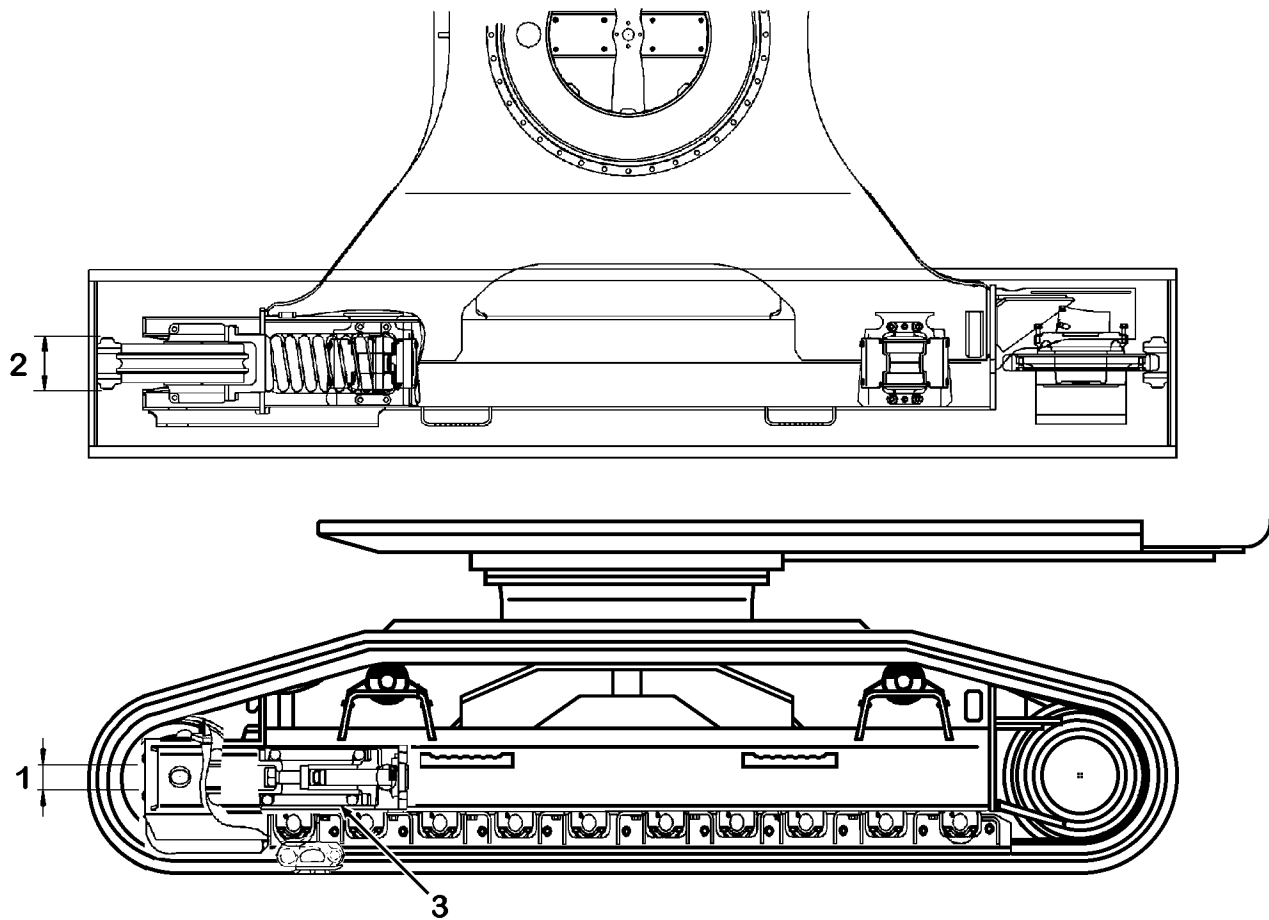
MEMORANDUM

40 MAINTENANCE STANDARD

TRACK FRAME • RECOIL SPRING 40-2

TRACK FRAME • RECOIL SPRING

★ The diagram shows the PC200LL-6



VESM0180
Unit: mm

No.	Check Item	Criteria				Remedy	
			Standard size	Tolerance	Repair limit		
1	Vertical width of idler guide	Track frame	107			Rebuild or replace	
		Idler support	105				
2	Horizontal width of idler guide	Track frame	250				
		Idler support	247.4				
3	Recoil spring	Standard size			Repair limit		Replace
		Free length X O.D.	Installed length	Installed load	Free length	Installed load	
		PC200LC PC220LC	603.5 X 239	466	12,900 kg	576	

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